ELECTRICITY BEFORE INDEPENDENCE

COLONIAL CALCUTTA AND THE POLITICS OF TECHNOLOGY, 1880s-1930s

THESIS SUBMITTED FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY IN ARTS

AT JADAVPUR UNIVERSITY, KOLKATA

BY

RITAM SENGUPTA

CENTRE FOR STUDIES IN SOCIAL SCIENCES, CALCUTTA

(AFFILIATED TO JADAVPUR UNIVERSITY)

R-1 BAISHNABGHATA-PATULI TOWNSHIP

KOLKATA, WEST BENGAL -700094

2022

Certified that the Thesis entitled

ELECTRICITY BEFORE INDEPENDENCE COLONIAL CALCUTTA AND THE POLITICS OF TECHNOLOGY, 1880s-1930s.

submitted by me for the award of the Degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out under the Supervision of

Dr. Ritajyoti Bandyopadhyay

And that neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere / elsewhere.

Countersigned by the
Supervisor : Ritajyoti Bandyopadhyay
Dated : 05.05.2022

Candidate : Rita Sanyal
Dated : 05.05.2022

For

my mother, Upama Sengupta

and my father, Pitam Sengupta

Acknowledgment

This thesis and the research involved in it has been a long affair. The writing of it has been interrupted by the situation of the pandemic and a major accident that I underwent last year. I also discovered during writing that the distressing memory of having dropped out of a research degree previously was still quite fresh. Especially on these counts but also due to the generally humbling nature of the writing process, I have become very aware of the rather generous support provided by my friends and family that has sustained me emotionally, materially and intellectually and helped me finish this thesis. Foremost within this support system have been my parents Upama Sengupta and Pitam Sengupta and my sister Rishika Sengupta. My mother and father have consistently been a wall to fall back on every time I have despaired about my work and the psychological side-effects associated with it. To them I dedicate this thesis for the simple reason that they have always assured me that there is light at the end of the tunnel. My sister has been equally kind and encouraging and it is impossible to imagine how our family would have held it together during the pandemic had it not been for her responsible handling of the difficulties presented by the situation. My brother-in-law Tushar Kanti Ghosh has also been a calming influence and my darling nephew Tehai has been the most entertaining accompaniment to my writing. I also want to thank my cousins Piyal Sen and Basabdatta Ghosh. They have been heartening influences in my life and I have always been able to count on their support, more so during the writing period.

My supervisor Ritajyoti Bandyopadhyay has been the most patient guide I could hope for in this unintendedly long journey. He has over time been a key intellectual provocateur for my work and I have barely even begun addressing the rich and diverse ways in which he has engaged with my research. But my situation over the years has also required something more than an academic mentor. On many other counts, psychological, social, political and even financial, Ritajyoti has always been extremely forthcoming with his help. I am truly fortunate to have worked with someone like him and also for the intimacy and friendship we have shared for some time. I have also benefitted immensely from interacting with Dr. Priya Sangameswaran at the Centre for Studies in Social Sciences, Calcutta (CSSSC) in terms of crucially shaping the initial questions that I began

my research with. Prof. Rosinka Chaudhuri, Prof. Manabi Majumdar and Dr. Anirban Das' (also at CSSSC) critical inputs have led me to think about the research in new ways that I still have to incorporate categorically in my writing. The few brief conversations about my research with Dr. Rohan Deb Roy and Dr. Bodhisattva Kar similarly nudged me in fascinating directions that I hope to chart more properly in the near future. The same can be said about Prof. Graeme Gooday's suggestions that will definitely contribute to how I develop this thesis further.

I would like to acknowledge the remarkable efforts and the aid of the staff, archivists and librarians at the West Bengal State Archives, the Town Hall Archives and the National Library in Kolkata, the Institute of Engineering and Technology Archives and the British Library in London and the National Archives of India in New Delhi. The library and the vernacular archives of the CSSSC have also been extremely useful in my research. At the Centre, for their constant readiness to facilitate any researcher's work, special thanks is due to Jayati Yagnik, Sanchita Bhattacharya and Kamalika Mukherjee. Finally Kavita Bhowal has helped me with tricky bureaucratic issues whenever the need has arisen and I cannot thank her enough for patiently giving me her time on every occasion that I have made an odd request.

My research has benefitted from multiple sources of academic funding, support and interaction. The first three years of my research was aided by the ICSSR doctoral research fellowship. After this, I was employed as a Research Associate at the Calcutta Research Group working on a project with Prof. Ranabir Samaddar that was a rich learning experience. I was awarded the Inlaks Research and Travel Grant in 2018 and the Charles Wallace Short Research Grant in 2019 for conducting research in the UK. I remain grateful to the trustees of these foundations for making it possible for India-based researchers like me to consult sources outside our immediate access. A Pre-Doctoral Research Fellowship at the Max Planck Institute for the History of Science (MPIWG) at Berlin in 2019-'20 helped me continue my research further. In the course of this fellowship, conversations with Dr. Thomas Turnbull, Dr. Skuli Skullison, Dr. Lisa Onaga and Prof. Dagmar Schafer enriched my ideas manifold. Finally, interactions with Dr. Nitin Sinha and the ERC project on the history of domestic servants that he led helped me

significantly in framing the concerns of the first chapter. I also worked for the last year as a Research Assistant with his new ERC project on histories of temporality in South Asia. Dr. Sinha has been rather munificent with sharing his ideas and also in offering other kinds of support. In the unsparing world of South Asian academia I think this is rare.

My friends deserve an entire book of acknowledgments for how they fuelled my ideas, propped up my sagging morale and kept me relatively lively and functioning in the course of research and writing. Priyankar Dey literally taught me how to do archival research. For this and for his ready intelligence regarding many things of academic or artistic interest, I thank him. Twisha Deb and Ronny Sen with their company, their art and their generosity helped me tremendously during a hard and listless part of my life. My long association with Sayantan Saha Roy and Iman Mitra since our college days continues to be delightful, inspiring and familiarly pleasurable. They have also been strikingly supportive as I have meandered through ups and downs in my life and research. Koonal Duggal and Anuradha Banerjee have opened up their respective homes in Delhi when I have visited, for which I am grateful. They have however been much more than kind hosts and I deeply cherish our revelries and the friendship that we forged. The love and kindness that Mansha Tandon and Nikhit Shetty have shown towards me can only be compared to the rather copious volumes of shit-talk that we indulge in regularly, that is also suprisingly, quite thought-provoking. Delhi weekends will hardly be the same after they move to Bombay. On her trips to Calcutta Rukmini Banerjee has often lent a kind ear to my rants and endured the boring reiterations of my ideas. In turn her empathetic company has taught me some significant life lessons. Hanging out with my ‘Lunch Family’ Hardeep Dhillon and Catherine Peters made my London research stay really enjoyable. Even as we are separated by great distances, I have been deeply moved by the care and concern that both of them have shown as I was going through some difficult times.

Conversations with Aditya Ramesh have been both fun and motivating as they often made me realise that I was after all on track to something of value in my research. The firebrand Ufaque Paiker’s sharp academic insights and insistence about not forgetting the politics to our research stirs me while it is also difficult to not enjoy the humour in her

critique. Tapsi Mathur has been most helpful with finding me a number of sources and texts crucial for my research. But over and above that she has been a characteristically soothing presence as we have shared many of our anxieties, doubts and aspirations. May we continue to occupy the corner spots at many a future conference and frown at all who pass by. Ria De has kept me grounded as I huffed and puffed through the everyday travails of research. It has been hugely comforting that she is usually just a (very frequent) phone call away. We remain bonded by the millions of words we exchange and by the sharing of our various mutual dislikes. Tamishra Basu is another main reason that I managed to avoid the cruel pinch of loneliess as I struggled with writing. Over the many years that we have known each other I have developed a very indulgent association with both her kindness and her eccentricities. I can only hope that I have been able to reciprocate adequately to the emotional sustenance that I have always received from her.

I cannot imagine what trajectory my life, my ideas and my research would have taken in the last few years had I not met my partner Kena Wani. Our endless discussions on historical, social and political issues have taught me myriad things about research and also about reining in impossible ambitions. She has consistently stymied my insecurities and prodded me to think better and in a more ethically responsive way. But it is really the ease and delight of her companionship coupled with her ample affection that eventually relaxed my anxieties about the writing and research process. Kena's presence insinuated some crucial optimism in my life, that helped when the process of research seemed only too atomistic and lonely. It is this hope that has eventually enabled me to finally bring my research to completion.

Abstract

The main objective of this thesis is to open up the history of electrification in colonial Calcutta, and in some ways more broadly colonial India, as a process marked by active contingencies rather than by technical and economic certainties describing a uniform ascent to technological consolidation. In tracing the contingent character of the adoption of electricity in colonial India, the thesis firstly tries to query the constitution of the demand for electrical energy in the city of Calcutta. Given that electric fans became the primary object and medium of electrification in the colonial city, the thesis tries to understand how this demand for fans could be connected to the pre-existing habit of being serviced continuously by the manually operated device known as the punkah. After recounting this pre-history, most of the thesis deals more directly with the conditions enabling the setting up of electricity networks in the city (and elsewhere in India) by focussing upon colonial law-making and regulation since late 19th century when electric systems were first being proposed in India, till about the 1930s. The thesis mainly studies this legal and administrative lineage of considerable influence through analysing the deliberations around the rules and conditions that were devised to govern electricity distribution in colonial India. It shows how colonial legal codification and administration became a site of anxious differentiation in comparison to developing metropolitan norms of governing technical conduct. Moreover, the urge to facilitate private capital led this form of legal and regulatory activism to follow divergent paths in relation to the prevalent prescriptions of techno-scientific logics and create characteristically flexible parameters of electrical practice. The thesis also describes how such administration was plagued by a fundamental complication concerning how and under what kind of authority and 'expertise' the technology and commerce of electricity was to be governed. In the process, the administrative regime left ample scope for the emergence of a native intermediary class of electrical agents and workers who crucially bridged the gap between the uncertainties fostered by regulation and the actualities of electrical practice. Shaping up in this manner, regulatory interventions and allowances also had bearings for the establishment of infrastructural networks, the extra-legal practices for 'tapping' into such networks and most significantly, for the critical question of the *safe* production and distribution of electricity. The thesis analyses the negotiations surrounding these issues as the politics marking the transfer of electrical technology to the colony.

Contents

Acknowledgment i

Abstract v

Introduction 1

Chapter 1: A pre-history of Electricity: Punkah-pulling in colonial India 43

Chapter 2: The beginnings of the colonial regulation of electricity and the legal excision of municipal control 84

Chapter 3: Making the 1903 Electricity Act: Expertise, technical questions and the reticence to regulate 137

Chapter 4: Making the 1910 Electricity Act: The problem of electrical learning and attention to consumer issues 206

Chapter 5: The Conferences of Electrical Inspectors and the long-term evolution of electrical regulation and unruly electrical issues 267

Conclusion 334

References and Bibliography 337

Introduction

1. The key concerns of the thesis

The main objective of this thesis is to open up the history of electrification in colonial Calcutta, and in some ways more broadly colonial India, as a process marked by active contingencies rather than by technical and economic certainties describing a uniform ascent to technological consolidation. This hypothesis is proposed in line with the very conventional, but also very fundamental concern of the broader field of the history of technology as well as the narrower sub-field of the history of 'technology transfer' in colonial settings.[1] Remaining faithful to this concern of challenging the inevitability/self-evident character of technological advancement/change, this thesis explores the possibility that the process of electrification in late 19th and early 20th century Calcutta was neither an end point of a singular, linear mode of innovation,[2] nor something of a natural transition from a possibly organic to an inorganic regime of energy use.[3] In the process the thesis tries to understand how the transfer of electrical technology to the colony became implicated in a particular kind of politics of its own. This political implication could be related to the reconfiguration of technical facts and objects as they came to be set up, practiced and governed in this specific colonial context. The political implication of technology could also be understood by how the given context itself could be gradually reshaped as it became the site for the production, supply and use of the novel technology of electricity.

In tracing the contingent character of the adoption of electricity in colonial India, the thesis firstly tries to query the constitution of the demand for electrical energy in the city

[1]Bjiker and Law's (1994, 1-17) 'General Introduction' to their edited collection Shaping Technology/Building Society and Bjiker's (1994) Sociohistorical Technology Studies continue to remain important guides to approach the subject of the history of technology. The most adequate review of field of technology under colonial conditions is that of Arnold (2005).

[2]Doing the history of technology against various kinds of innovation centricism, by focussing on the dispersal of technological functions and evolution and on issues of use and maintenance is best exemplified in David Edgerton's The Shock of the Old (2011).

[3] The reference here is to E.A. Wrigley's (2010) well-known argument about the English Industrial Revolution caused by the pressing issue of moving from an organic regime of energy marked by muscles, timber and the like that was meeting its limits by the 18th century, to an inorganic regime based on the widespread use of coal. Andreas Malm (2016) has more recently criticised Wrigley's claim about a natural necessity of moving to fossil fuels by showing how the this shift was in many ways shaped by the inclination of English factory owners to curtail labour problems. Cf. Moore (2015).

of Calcutta. Given that electric fans became the primary object and medium of electrification in the colonial city, the thesis tries to understand how this demand for fans could be connected to the pre-existing habit of being serviced continuously by the manually operated device known as the punkah. This leads to a kind of pre-history of electricity use in colonial Calcutta in terms of the specific organisation of service and labour that sustained the system of incessant punkah use. After recounting this pre-history, most of the thesis deals more directly with the conditions enabling the setting up of electricity networks in the city (and elsewhere in India) by focussing upon colonial law-making and regulation since late 19th century when electric systems were first being proposed in India. The thesis rounds up its analyses with the 1930s as a period when legal and regulatory administration of electricity in the colony had coalesced into certain stable norms, though such norms hardly implied any necessary uniformity of technical standards. Such norms were also often directly contested by consumers and intermediary agents involved with the use of electricity.

Four Acts were put in place by the initiative of the Imperial and Provincial Governments in 1887, 1895, 1903 and 1910 to govern the production and distribution of current electricity in colonial India, each borrowing from its precedents. In 1922 a significant effort was made to amend the 1910 Act following detailed discussions by electrical officers. The 1922 Electricity (Amendment) Act was in a way the last enactment of significance in the legal administration of the technical aspects of electricity supply under colonial rule in India. The amended 1910 Act as the parent legislation and the Indian Electricity Rules that were brought along with the Act have had a very long career interspersed with episodic but not necessarily drastic amendments. In 1937 and with independence in 1947, certain new organizations were created to coordinate the country-wide supply of electricity like the Central Electricity Authority and the State Electricity Boards. But fundamental principles of governing the technical conduct of electricity with respect to the practices of electricity suppliers and consumers as enunciated under the 1910 Act stayed relatively unchanged. In 1956 both the 1910 Act and the rules associated with it underwent a fresh round of amendment. The amendment of the 1910 Act related more to determining the new relationships between electrical licensees and state

governments.[4] The new amended rules on the other hand continued to draw most of their inspiration from the existing procedures of governing technical affairs as carried over from the period of colonial rule.[5] Eventually the 1910 Act and the body of rules of colonial vintage were finally repealed in 2003 with a new Electricity Act.

Quite clearly then principles for the technical conduct of electricity in India have had a distinctively long colonial lineage. This thesis mainly studies this legal and administrative lineage of considerable influence through analysing the deliberations around the rules and conditions that were devised to govern electricity distribution in colonial India. A perusal of these legal and regulatory discussions will also lead us further, towards perceiving the beginnings of electrification in colonial India/Calcutta as a specific trajectory with its own distinctive characteristics within the global spread of current electricity production and distribution. This specific trajectory was charted as colonial legal codification and administration became a site of anxious differentiation, whereby law sought to actively supplement technology towards the production of suitable outcomes on the terrain of electrification and in favour of private capital. The thesis demonstrates that the urge to facilitate private capital led this form of legal activism to follow a course parallel to certain globally concurrent processes of technical standardisation, to create characteristically flexible parameters of electrical practice.

More generally, the legal and regulatory administration of electricity in colonial India often took divergent paths in relation to the prevalent prescriptions of techno-scientific logics that were still in search of stable articulation in the early days of electrical technology. The thesis also describes how such administration was plagued by a fundamental complication concerning how and under what kind of authority and 'expertise' the technology and commerce of electricity was to be governed. In the process, the administrative regime left ample scope for the emergence of a native intermediary class of electrical agents and workers who crucially bridged the gap

[4]See for this, Report of the Advisory Board Constituted by the Government of India under section 35 of the Indian Electricity Act, 1910 in connection with amendments to the Indian Electricity Act, 1910, New Delhi, 1954.

[5]See 'The Indian Electricity Rules, 1956', on http://ilo.org/dyn/natlex/docs/ELECTRONIC/96642/114248/F-121636447/IND96642.pdf (last accessed, April 18, 2022).

between the uncertainties fostered by regulation and the actualities of electrical practice. Shaping up in this manner, regulatory interventions and allowances also had bearings for the establishment of infrastructural networks, the extra-legal practices for 'tapping' into such networks and most significantly, for the critical question of the *safe* production and distribution of electricity. The thesis analyses the negotations surrounding these issues as the politics marking the transfer of electrical technology to the colony.

2. A growing field of histories of electricity in India

In beginning to locate the concerns of the thesis within an existing body of academic work, it is useful to proceed by taking its titular proposition and asking what does it mean to do a history of 'Electricity before Independence' in India? Two recent overviews by Ute Hasenöhrl and Pierre Lanthier posit a roughly similar four-fold periodisation of electrification in the region separated by significant events like the First World War, political independence in 1947 and the 'liberalisation' of the power sector around the 1990s.[6] Thus an early period of 'enclave electrification' or 'slow beginnings' marking relatively limited development is followed by a period of transition starting from the end of the First World War which occasions growing state interest and funding in electricity projects, describing a kind of 'developmental colonialism'.[7] The colonial period in turn comes logically posed in many ways against the conjuncture of decolonization, around the middle of the twentieth century, which arguably initiates something of a 'take off' period in the history of the production and use of electricity in the region.[8]

Certain studies, while pioneering for placing electricity in India within a historical trajectory rather than casting it simply as a technical and economic problem to be solved,

[6] See Lanthier (2016) and Hasenöhrl (2018). For another take on how electrification was dictated by international connections that also described the limits of British imperial control over this new energy form and its development (somewhat in contradistinction from coal) in the early 20th century, see Shamir (2016).

[7] In quantitative terms: between 1917 and 1950, installed capacity in India went up substantially from 129 MW to 1713 MW. On another note, Ludden (2005) provides an important direction in thinking about development regimes in South Asia including forms of developmentalism that could have colonial provenance.

[8] By the end of the year of independence 1947, the generation capacity of electricity was just about 1,363 MW and by 1990, the installed capacity had gone up to 63,636 MW thus showing a substantially greater rate of increase in the post-independence era of 5-year planning than in the colonial period.

have shown limited interest in the colonial commencement of the development of electricity in the region.[9] Opening up the field in this regard was Sunila Kale's monograph *Electrifying India* which historicised the development of provincial and agrarian electoral factions within the federal structure of the new nation through state-ordained provisioning of rural electricity from around the 1960s.[10] More recently, Elizabeth Chatterjee has re-conceived this problem of rural electrification after independence as the definitively Indian chapter of the energy-intensive global development of the 'Anthropocene' in the twentieth century.[11] She argues that this later Indian trajectory of energy use was based less on the profiteering of a 'fossil capitalism' as conceived notably by scholars like Andreas Malm and Jason W. Moore for the western world, and more on a 'fossil developmentalism', that yielded much to demands of postcolonial democracy and statecraft.[12]

Important for our purposes is to point out that both Kale and Chatterjee in different ways take the legacy of the colonial period primarily as having led up to a condition of *scarcity* in relation to the production and use of electricity in India.[13] Kale however has been careful to differentiate between various regional trajectories of electrical development (or under-development) marked by the post-WWI context of heightened demand, as also by the Government of India (GOI) Act of 1919, that devolved some power over electricity production and distribution to the provinces.[14] In doing so, she builds upon the western Indian context of expanded hydro-electrification in Bombay city and Presidency, delivered through the private commercial initiative of the Tatas.[15] She also follows the work of historians S. Y. Rao and John Lourduswamy who depict similarly expansive

[9] Political economic consideration of independent India's trajectories of electrification is of course a thriving field of research. A recent thorough collection of articles representing particular regions of India is the edited volume of Kale et.al. (2018)
[10]Kale (2014a).
[11]Chatterjee (2020).
[12]See Malm (2016) and Moore (2015).
[13] For this also see Kale (2004), Chatterjee (2019). Lanthier's (2014) study of why nationalization of electricity companies was not brought about in independent India also falls back on an explanation emphasizing underdevelopment.
[14]Kale (2014b).
[15]A sympathetic history of this initiative from early 20th century is that of Mahaluxmivala (1936)

electrical developments in the Madras Presidency, after the creation of relatively more autonomous regional territorial units by the 1919 and 1935 constitutional reforms.[16]

More detailed historical enquiries into the 'slow beginnings' of electrification in the main cities of colonial India have actually yielded quite interesting results than that allowed for by the sheer fact of scarcity or underdevelopment of electricity. One such study, that of Rao and Lourduswamy, confirms the charge of racial enclavism in early electrical development in the first two decades of the introduction of electricity to Madras, where its functions are shown to have remained wedded to a narrowly imperial instrumentality of maintaining authority and cultural superiority.[17] A more complex set of observations have also emerged which have attempted to deconstruct the suggestion about the exclusivity of enclavist development, to understand how native subjects interacted with the new and in many ways public technology of electricity, even when they did not come to possess or design it in their own right. Of definite importance here is Hasenöhrl's foray into the history of lighting in colonial Bombay that reveals ambivalent dispositions that the colonial subjects of the city maintained in relation to both the novel affordances of electric illumination as well as the newer forms of darknesses that proliferated in the interstices of public lighting devices.[18]

The case of colonial Delhi's interaction with electricity in the first few chapters of Coleman's engrossing monograph *A Moral Technology*,makes for a similarly complex account.[19] Coleman deftly narrates the transitioning of electric light from a spectacle-oriented sublime object of ritual association that infused life into the grand Durbars of 1903 and 1911, to becoming implicated in a moral economy of bureaucratic and public interest that insists on public ownership of electricity supply by the 1930s.[20] In between

[16] See Rao (2010) and Lourduswamy and Rao (2010). Histories of hydro-power in India starting from the immediately pre-independence decades has been another framework of studying electricity. Cf. Sonachalam (1970), Klingensmith (2007) and D'Souza (2003). Other influential histories of hydropower from the global South include the work of Tischler (2013), Hoag (2013), Mitchell (2002).

[17]Rao and Lourduswamy (2010). Chikowero (2007) also provides a striking account of such racially partitioned uses of electric lighting in colonial Bulawayo in a similar period. Also Cf. Mohsin (2017). The history of lighting in urban conditions is a large field of study. Cf. McMahon (2018), Nye (2018) and Wishnitzer (2020).

[18]Hasenöhrl (2019).

[19] Coleman (2017).

[20] Other scholars who have connected issues of illumination and spectacle with imperial power are Cohn, (1987, 632-642), Protschky (2012), Apter (2002), Thomas (2007) and Willis (2011) (amongst others)

this passage from a 'tool of empire' to an object of municipal demand, he inserts the possibility of an ethical anti-colonialism that manifests against the ruthless energy of electricity by espousing a Gandhian logic of ritual and work as embodied in the *charkha*. Taken together, Hasenöhrl and Coleman's work alert us to the fact that there is much to be historically deciphered about the conditions of early electrification in colonial India. Such conditions involved not simply the limits of the imperial delivery of electricity, but also saw the emergence of complicated subjective and collective forms of engaging with the colonial 'transfer' of technology. Their works thus urge a deeper engagement with the terms of the 'arrival' of the new form of energy.

While such histories of electrical development in Indian cities have begun dealing with the colonial subject's association with the outcome of electrical technology like electrical lighting, the more infrastructural elements of the 'transfer' of electricity supply systems – like for instance law, regulation or finance – have gone largely unnoticed. An exception in this matter is the work of Suvobrata Sarkar on electrical developments in colonial Calcutta that has significant overlaps with some concerns of this thesis. Sarkar traces aspects of technological makeup, legal governance and most importantly, the native technical agency involved in the 'coming' of electricity to Calcutta. The third element in this triad is exquisitely analysed by him in terms of how British rule hindered the growth of technical expertise in India even as local technical talent sprung up to learn the tricks of the new electrical trade/science, both as more humble 'mechanics' as well as on receiving training as electrical engineers.[21] Sarkar also studies closely the new curricula of the limited number of, yet important electrical engineering courses run out of the Sibpur Regional Engineering College and eventually the Jadavpur Engineering College.

However in treating the technical and legal-regulatory setup of electricity, Sarkar ends up taking a consistently uncritical approach that dissolves all character of contingency in the history of Calcutta's electrification', to yield a rather straightforward narrative of technological ascent.[22] This narrative discovers easy "pioneers" and a "modern wizard" in the British expert regime mediating the electrification of Calcutta, quite

[21]Sarkar (2020, 29-79, 190-243). I engage more with this work in the fifth chapter of the thesis.
[22]Sarkar, (2015, 2018).

anachronistically thinks of electricity as a "superior" technology, and consigns a range of contrary positions that emerged in the course of legal and technical debates to being merely episodic in the onward march of new technology. He thus ends up describing colonial legal regulation primarily as a necessary appendage to the incremental and very linearly presented progress of 'electrification' in cities like Calcutta.[23] We do not really get a sense of how colonial law possibly mediated or in some ways structured the development of electrical networks except for a simple chronological charter of its enactments, paired with an equally simplified step-by-step progression of the expansion of the electrical network in Calcutta.

Perhaps one reason for Sarkar's broader lack of interest in developing a critical understanding of techno-legal debates concerning the establishment of electricity supply systems in places like colonial Calcutta stems from the contention that such systems were tested and standardized in England and were more objects of social emplacement rather than legal or technical amendment or innovation in India.[24] This position however maintains an easy separation between society and technology and it is also quite difficult to uphold for colonial settings on more empirical terms. Unlike the considerable history of prior technical testing of railway and telegraph technology in metropolitan settings before the process of 'transfer' to India, colonial India experienced the coming of electrical technology at a time when mandates of standardized technical practice were still evolving all over the world, and specifically so in the UK. In such circumstances colonial law explictly chose to compete with parallel processes of standardization in the metropole, often resulting in distinctive kinds of technical practice and technological constitutions. The colonial administration of electricity supply thus can very well be studied to decipher such distinctive developments. Law and regulation need not have been a neutral medium of supplanting already tested techno-social verdicts pronounced elsewhere, onto the colony where a complex terrain of 'reception' awaited to queer the pitch. Rather it is possible to study how the regulatory interventions of the colonial state cut across both the processes of the 'transfer' of technology and technical system-

[23] Sarkar (2020, 115-189)

[24]This is indicated in the 'Introduction' to Sarkar's book (2020, 1-28). This is a view also taken by a historian of 'electrification' in mandate Palestine, Ronen Shamir (2013, 4), who suggests that this could be the general situation for colonial regions.

building as well as the terrain of the reception of technology, to engender a particular kind of politics of its own.

Returning at this point to the question of what it means to do the history of 'Electricity before Independence', it is appropriate to admit that comparison with post-independence rates of electrification in India does indeed reveal the colonial period to be abysmally deficient in degrees of power use. Electric supply in urban centres like Madras, Bombay or Calcutta too was relatively underdeveloped under colonial rule compared to later periods. Yet, as the above discussion of the growing field of histories of electricity in India might indicate, the question of 'Electricity before Independence' nonetheless invites vital consideration of how colonial and urban conditions of the early supply of electricity could have very well been imbued with historical significance that allows us to better comprehend the problems of electricity use over a longer term in India. The assessment of this historical significance need not necessarily await a teleological resolution towards energy abundance, to be pursued in its own right. More directly put, the colonial past of early electrification in India could in certain ways be quite impossible to discount for any adequate consideration of the history of how electricity became fundamental to modern lives and livelihoods in India.

This thesis studies myriad indices of administrative, technical, economic and social consequence that accompanied the legal and regulatory governance of electricity over the first five decades of electrification in India. In encompassing all such issues the archive of electrical law in colonial India thickens considerably. This documentary volume perhaps compares unfavourably with the actual and rather limited magnitude of electrification that took place at the larger scale of India till at least the first two decades of the twentieth century (if not later). Yet this volume of legal discussions also belies any simple understanding of a purported colonial disinterest in electrification in the region (to be corrected by later nationalist initiative).[25] It rather pushes us to consider how mandates

[25]In Kale's reckoning, unlike railways, canal irrigation and telegraphy, "electricity remained incidental to the 'new imperialism' that stretched from latter half of the nineteenth century to the first half of the twentieth." She makes this claim on the basis of the "much more brief" historical record left by electricity in the colonial period (Kale, 2014b, 455). The ample archive of colonial law and administration concerning electricity complicates this understanding. It points to certain influential and anticipatory systems of control

of colonial legality and regulation interacted with the beginnings of electrification in urban centres like Calcutta, in an era when electricity was primarily conceived as a service provided through private capital.

Discussions around the law and regulation of electricity also invite us to comprehend how social practices around the distribution and use of electricity implicated the legal-regulatory regime of the colonial state in certain recurring problems that constituted its field of reference for years to come. While the indiscipline of consumers formed one part of this, another significant portion of regulatory concerns concentrated upon the character of technical learning and practice of the intermediaries involved in the conduct of the new kind of energy. Exploring such concerns of the colonial regime also demonstrates, if only inadvertently, the critical role played by such (native) intermediaries in the setting up of electric supply in the Indian context. Finally, the study of the law and regulation governing electricity supply also allows us to trace certain limitations marking electrification projects in the colony that often related to the hesitancy about setting up fixed and safe standards of electrical systems. The thesis demonstrates that this hesitancy led to expanding scope for personalized (human) mediation in the conduct of technology while also creating lingering issues of unruly technical practice and frequent electrical mishaps.

As narrated through such indices, the history of 'Electricity before Independence' could in many ways be revelatory of a number of formal and informal processes and practices that continued to mediate the establishment of electricity supply in India well into a later period of more widespread electrification in the region. And in this sense the historical account presented in this thesis could also have a kind of genealogical relevance for understanding the urgency of the present that histories of 'electrification' in India have often committed to. We are only gradually coming to terms with the analysis by the likes of Chatterjee of how intense attachment to electricity and the promotion of such an attachment by the postcolonial state makes the Indian history of energy use a specific chapter in the planetary development of the 'Anthropocene'. But electricity use in India is

(or decontrol) being created by the colonial state which are missed by analyses like Kale's that focus simply on the (comparatively meagre) volume of electrification in the colonial period.

also an activity with thick social entanglements. It is still mediated crucially by informal engagements with *mistris* on the one hand to diverse kinds of wiring practices on the other hand and it also continues to involve a consistent incidence of serious electrical accidents.[26] Moreover, what perhaps stands out as the most uniquely complicated aspect of this electricity-saturated present of ours is the still staggering rate of Transmission and Distribution (T&D) losses – the difference between the amount of energy entering the network post generation and that expended at the consumer's end – undergone by the country's power supply system. Above 30 per cent of power produced in India is regularly dissipated technically due to sub-standard infrastructure or 'lost' to pilferage and theft.[27] This certainly aggravates the complex implication of the region with the trajectory of the 'Anthropocene'.

In focussing upon the legal and regulatory administration of electricity over the first five deacdes of the arrival of this new technology, this thesis attempts to commence the unravelling of the complex past that inheres in the thick social implication of electricity use in India as described by the above-mentioned issues. Such issues, concerning the installation and maintenance of electrical setups through informal wiring agents like *mistris*, or of suboptimal and sub-standard technical networking, or of unsafe electrical practice and finally that of the incessant theft/'loss' of electricity, can be too easily forgotten in the drive to link the history of electricity in India to markers of increased production and consumption. Instead, this thesis suggests that the prohibitions and allowances crafted by colonial administration in the governance of electricity created certain inaugural conditions within which such issues proliferated. This thesis then maps the specific co-constitution of law and regulation and such 'problems' of electricity supply, practice and use in colonial India. In doing so, it also purports to make a specific contribution to histories of technology transfer in colonial contexts. We discuss this further in the following section.

[26]On electric accidents in India see Krishnakant and Singh (2020). On the present of electricity supply and use in India see Gupta (2015).

[27] Currently referred to by the financialised term 'Aggregate Technical and Commercial Losses'. See: https://data.gov.in/catalog/aggregate-technical-commercial-atc-losses-power-sector (last accessed May 18, 2022).

3. Histories of colonial technology transfer

The analysis of technological systems in service of imperialism as distinct from an understanding of them as value-agnostic imports brought to colonies in course of the imperial globalization of the 19th and 20th centuries,[28] owes in significant measure to the canonical volumes by Daniel Headrick titled *Tools of Empire* and *Tentacles of Progress*.[29] These two works sought to define a common and new character of imperial dominance stretching from the mid-19th to the mid-20th century.[30] For Headrick, this dominance emerged from big technological systems like the railways, steamships and the telegraph, that 19th century British colonialism introduced to African and Asian regions. He argued that this dominance amounted to a unidirectional flow of technological implements without a corresponding export of scientific knowledge and consequently a technologically mediated subjection of the respective colonies to an imperial commercial project. This basic structure of colonial dominance is also confirmed by David Arnold's encyclopedic take on the subject of colonial science and technology in India.[31] He however differs from Headrick's approach by pointing more to the institutional and ideological demands of colonial rule that mediated the functioning of technology in the service of the Raj. Other revisionist works by scholars like Gyan Prakash and Pratik Chakrabarti on the histories of colonial techno-scientific enterprises have developed more complicated models of understanding imperial control over colonial populations in India.[32] These historians have shown how such control was exercised through exhibitory and performative modes of deploying technology that drew native acquiescence both by means of wonder as well as of pedagogy. Prakash has also invoked the problem of how an inward looking formation of nationalism eventually had to define and legitimize itself in the image of this western 'technological grid', which had fundamentally recast the

[28] The reference here is to George Basalla's (1967) three stage model of the import of science and technology into the western world that has now been entirely refuted. For a critique see Raina (1999)
[29] Headrick (1981, 1988).
[30] For question of technology and knowledge exchanges between Britain and India prior to this period see Lightman et. al. (2013) and Raj (2007, 2013). For a view comparable to Headrick's see Adas (2015). Synoptic views of the problematic encounter of technology, science and the British empire in India can be found in Baber (1996), Kumar (1997), Arnold (2005), Seth (2009), Raina (2010), Phalkey (2013) and Ramesh and Raveendranathan (2020).
[31] Arnold (2000).
[32] Prakash (1999), Chakrabarti (2004).

epistemic and practical conditions of comprehending the facts of colonial existence by the early decades of the twentieth century.[33]

In dealing more specifically with the larger technological systems of the colonial regime that were the railways, the irrigation canals and the telegraph, several historians have built upon the critique that these technologies remained key to performing imperial control and extraction. But many of them have also unraveled how the 'transfer' of such technological systems involved innovating newly in the different environmental and social conditions of the Indian subcontinent. To take the example of railways as developed in the work of Ian Kerr, 'innovation' in Indian conditions meant a broad range of things that overlapped the strict divide between technology and society.[34] He thus described newer legal regimes of governing construction labour, modified models of financing through the guarantee system and eventually altered technical processes of constructing the railways often egged on by the ingenuity of native worksmen and the contingent inventions of colonial engineers.[35] In his work on the imperial telegraph, Deep Kanta Lahiri Choudhury provides a comparable lesson in describing the setting up of the first telegraph lines in Bengal by the maverick colonial bureaucrat-inventor William O'Shaughnessy.[36] O'Shaughnessy both mobilized the skills of native assistants like Shib Chunder Nandy as well as tried different combinations of local natural products towards solving problems like that of insulating telegraph wires, amongst other things. The case of canals and dams in Madras Presidency has recently been studied in a similar fashion by Aditya Ramesh.[37]

Further, in marking a definite distance from the 'tools of empire' hypothesis, as well as from the binary lens of colonialism and nationalism, there has also been scholarly attempt to trace peculiar modalities of using larger technological systems in colonial India in ways that modified certain parameters and protocols of their technological functioning, at

[33] Prakash (1999, 201-226).
[34] Kerr (1995, 2007, 2018).
[35] In this relation also see Ahuja (2004), Hurd and Kerr (2012).
[36]Lahiri Choudhury (2000).
[37] Ramesh (2020).

times in relation to the consolidation or challenging of particular kinds of social power.[38] Lahiri Choudhury's example of a strike organized through the very medium of imperial control, that was the telegraph, again stands out in this regard.[39] Of late, the railways have emerged as another concrete site for historically tracing the practical modifications thwarting technological discipline, as in the work of scholars like Ritika Prasad and Aparajita Mukhopadhyay.[40] These scholars have explored native counters and challenges to issues of timeliness, commensality, ticketing and other subsidiary processes that emerged with train travel.[41] Canal and other irrigation systems established by colonial rule have actually been studied for quite some time as interconnected modalities of imperial revenue extraction and local and landed caste and class power formation. This has particularly been the case in Michael Lewis' account of the problems faced by colonial expertise in regulating canal use,[42] Elizabeth Whitcombe and Ian Stone's work on Uttar Pradesh,[43] David Gilmartin and Neeladri Bhattacharya's studies of Punjab,[44] Ramesh and Prasannan Parthasarathy's takes on the Tamil Nadu countryside[45] and finally, in Rohan D'Souza's remarkable environmental history of Orissa's waterlogged land.[46]

Finally, a somewhat distinctive trend that needs mention here has been to skirt the 'innovation-centric', 'large' and 'industrial' scale apparatus of colonial rule, in order to focus on the small, mobile and shareable devices of both colonial import as well as native invention.[47] Smriti Kumar Sarkar has thus recently elaborated on the changing status of carts, ploughs and small rice milling machines over the trajectory of Bengal's agrarian past, in order to highlight the enhancements in the entrepreneurial talents of the Bengali

[38] The case of roadways made by the colonial regime could also be relevant here. Cf. Ahuja (2009b), Sinha (2012, 2017).
[39]Lahiri Choudhury (2010, 157-178).
[40] Prasad (2016), Mukhopadhyay (2018).
[41] Comparable takes on the railways would be that of Bear (2007), Aguiar (2008) and Sinha (2008).
[42] Lewis (2007).
[43]Whitcome (1972), Stone (2002).
[44] Gilmartin (1994), Bhattacharya (2019).
[45] Ramesh (2018), Parthasarathy (2017).
[46] D'Souza (2006). More works on colonial irrigation speak to these issues. Cf. Rao (1988), Hardiman (1998), Agnihotri (1996) and Mosse (1999).
[47] Also see for examples of this trend of work, Pinney (1999), Mahadevan (2015) and Wickramasinghe (2014)

rural artisan class adapting to colonial conditions of political-economic transformation.[48] The foundational work with this kind of focus is Arnold's *Everyday Technology* that insists on connecting, not always convincingly, the essence of the quotidian in colonial-modern life to 'smaller' technological artifacts like sewing machines, typewriters and bicycles.[49] He suggests that the use of such devices were beyond the capacity of control by the colonial state. The 'technological watershed' for the proliferation of such technologies was the Swadeshi period of 1905-1914; and for Arnold, the relationships created between Indian users and simpler mechanical implements used since this period, demands a history not so much of the mechanical innovations and logics imbued in these machines, as much of the social and cultural entanglements within which they were used.

This thesis builds upon several insights developed in the histories of colonial technology transfer by assembling them in terms of an analytical focus on the law and regulation concerning electrical matters in India. It broadly confirms the view that the coming of electrical technology in cities like colonial Calcutta involved significant adaptive strategies beyond a unilinear process of 'transfer'. However it seeks to move beyond the bare fact of adaptation or innovation in colonial settings to delineate the politics that constituted such strategies. The field of colonial law and regulation is itself studied as a ground for strategising particular kinds of adaptive measures that would allow for the successful emplacement of electricity distribution networks in colonial India. The thesis contends that colonial law and regulation was not in any reactive relation to the 'arrival' of technology. The colonial state was certainly not at the helm of any well-directed extractive motive in facilitating the entry of electricity into India like as might have been the case with the railways or canals. However nonetheless, the thesis shows how colonial law and regulation actively sought to intervene and propose novel technical and economic conditions for the systematic development of private capital-led electrical supply in colonial India. It did so by differentiating the respective urban environment on both natural and social terms and more significantly, by repeatedly adopting characteristically flexible modes of governing the distribution of electricity in support of the commerce of electrical licensees and contractors in colonial cities like Calcutta.

[48] Sarkar (2014).
[49] Arnold (2013), also Arnold and DeWald (2012).

The thesis also studies the implications of such flexible governance of electricity in colonial settings. In doing so it brings into focus a range of practices of electricity consumers and intermediary electrical workers that consolidated in the space for negotiation offered by electrical regulation. Such practices could also be described as peculiar kinds of adaptation and innovation that marked a distinctive challenge to the systemic inclinations of private-capital led electricity supply. But the thesis shows how such everyday technical practices of comparatively smaller scale also connected with and aggravated the larger scale problems of technical and commercial discipline, danger and accidents as well as those of electrical learning and 'expertise'. Debates within the colonial state structure often offered correctives to the developing model of flexible governance by urging a return to metropolitan and other globally prevalent models and principles of ruling the technical conduct of electricity supply. Such corrective alternatives also proposed to engage with the actual inadequacy of electrical learning and the consequent problems of rule-bound and safe electrical practice in India, rather than letting them foster interminably. However these alternatives did not prevail in the urban centre of Calcutta (amongst other places) where the unruly 'innovations' of overhead wires and compromised insulation and wiring systems continued to be put in place by both licensee and consumer initiative and with the indispensable mediation of wiring contractors or electrical workers like *mistris.* The purportedly flexible character of colonial regulation eventually enabled such practices while also being overwhelmed by the uncertain outcomes of its adaptive strategies. The transfer of electrical technology since the late 19th century in colonial India thus remained a process riddled with constant regulatory negotiations and politics that refused to be 'solved' for once and for all.

4. Histories of electric supply

4.1 Law and regulation in histories of early electrification

The concerns of this thesis also obviously relate to a third broad field of study that is made up by existing histories of electricity supply.[50] This and the next two sections

[50] Histories of electricity of the western world are an important subfield of histories of technology. Notable works include, from a transregional perspective, Hausman et. al. (2008); for Europe, Lagendijk (2008); for the UK, Parsons (2015), Weightman (2011) and Kennedy and Delargy (2011); for USA, Marvin (2010),

delineate certain key methodological pointers set by this historiography. In the process we will also establish the actual historical settings of worldwide electrification within which the story of electrical law and regulation in colonial India can be located. We begin here with the phase of early electrification till the end of the nineteenth century when law and regulation started becoming a heated subject of debate within western contexts of the initial spread of electricity supply systems.

The coming of systems of current electricity production and distribution around the world since the late 1870s was hardly a simple transition from invention to practice. After the telegraph, the single most significant electrical invention that found relevance through popular use was the electric light. Prominent in street and factory lighting since the 1870s in many cities of the western world was the arc light - a particularly bright kind of illumination produced through the ignition of carbon rods via the medium of electricity.[51] In 1879, Thomas Edison invented the incandescent light bulb in which illumination resulted from a high resistance carbon filament being heated up through electric current to radiate light. This made for a more manageable and less bright substitute for the arc light that could be moved indoors.[52] However, as discussed by several historians, the field of the invention of the electric light was a hotbed of competing patent claims that had to be moderated through considerable legal push and pull.[53] One consequence of this was the merging of Edison's corporate interests with those of the other important patentee of the incandescent electric light that was Joseph Swan.[54]

Edison's ingenuity has also been related to him being able to cast his inventions in a *systemic* form. Lighting systems before him were marketed primarily as stand-alone installations capable of powering singular arenas/houses/street corners. As Thomas Hughes has detailed, Edison's invention of the incandescent light was not simply that of a

---

Jones (2014), French (2017); for Germany, Todd (1989) and Konig (1996); for Russia, Coopersmith (2016). A fascinating African subfield within histories of electricity has emerged but is of limited interest to the concerns of this thesis on count of its primary focus on hydroelectricity. Cf. Hoag (2013), Tischler (2013), McDonald (2009) and Showers (2011). Two new works have however made important arguments about the contribution of Zionist electrification projects to the Palestinian conflict. Cf. Shamir (2013) and Meiton (2019). Other than these cases, histories of electricity in (ex-)colonial regions remain sparse.

[51] Schiffer (2008, 255-270)

[52] On Edison and the incandescent electric light, see Friedel & Israel (2010)

[53] Araposthasis& Gooday (2013, 175-200)

[54] ibid.

stand-alone commodity/technical product - rather, it was part actually of a meticulously arranged *system* of central station-based urban electric lighting.[55] Through adoption of 'parallel circuits', Edison was interested in a more network-like character of electricity production and distribution.[56] This network was based upon certain more centrally arranged, higher capacity (copper) 'mains', that would in turn transmit current to thinner and branch-like 'feeders' through which the eventual point of consumption like houses, offices or street lamps would be served.

While legal formalities of patenting were one form of regulatory intervention that came to be involved with early electrification, the concerns of this thesis more directly intersect with a different corpus of legal measures, that was borne of the need to govern the more expansive central station form and its networks of wires. The most distinctive (and discussed) type within this genre of legal regulation that emerged since the early 1880s was that in England.[57] The first central station in England came up in 1882 not too long after Edison's first Pearl Street station in New York, at Holborn Viaduct in London. In the same year the English Parliament chose to legislate on the matter. At issue at first was the authority required by electric companies to break open streets to place wires under the ground (if necessary). Such authority in the US situation was conferred upon private companies by municipal agencies like New York aldermen. Alternatively, regulatory and legal authorities tolerated practices of overhead wiring to varying degrees. The matter however was made a topic of separate (Parliamentary) legislation in England with the Board of Trade (BOT) headed by Joseph Chamberlain writing up a bill and forming a set of generalized rules on the issue.

While leading the BOT between 1880 and 1885, Chamberlain drew upon several existing laws, like the 1870 Tramways Act, the 1875 Public Health Act and the extensive body of legislation regulating several private gas companies, to mount a series of controls over private enterprise. This body of legislation contemplated that given the great costs of putting down large scale infrastructure (like underground pipes for instance), it made

[55] Hughes (1983, 18-46)
[56] Bakke (2016, 35-38).
[57] The history of initiation of the legal regulation of electricity in England from the early 1880s that is narrated this and the next two paragraphs is summarised from a number of accounts viz., Hughes (1962; 1983, 55-66), Byatt (1962, 1-57), Hannah (1979, 1-35). More specific references are made separately.

sense to allot regionally delimited monopolies to particular private companies. Yet two particularly pointed forms of control of the same monopolies were adopted by such legislative enactments – firstly, the enterprise was to have a limited tenure after which the option would exist with a 'Local Authority'/municipality to purchase it with ratepayers' taxes and secondly, such enactments specifically encouraged a model of public ownership by way of Local Authorities and Municipalities running their own utilities like water supply, gas and urban transport.

The 1882 Electric Lighting Act in England distinctly embodied such prior legacies of monopoly control. In particular, it limited the period of ownership of an electrical concern under the Act to seven years, which after protest from private enterprises was extended to twenty-one years. But the purchase clause it proposed following the lapse of the tenure, fixed the price of the concern as 'scrap iron' value or as merely the value of the equipment owned by the concern (without any estimate of profits being included). Otherwise, the Act forbade companies from compelling consumers to use only a particular manufacturers' equipment; further, it practically made it impossible to use overhead lines on safety grounds. In spite of criticisms of such measures as too stringent and eventually serving to encourage 'municipal socialism' and municipal ownership, several applications for licenses for starting electrical concerns were eventually filed under the Act. Yet by 1885, out of the 64 odd concerns permitted by the British Government to start electrical central stations, only 4 remained in operation.

A Committee of the House of Lords was set up to look into the matter. In the course of the Committee's hearings representatives of private capital urged that regulation was stifling enterprise and stimulating municipal concerns instead. On the other hand, representatives of public bodies like municipalities pointed to the fact that electrical shares had become an object of pure speculation and the competition from gas was quite severe for electric lighting that was being marketed in the form of a luxury item. The view of the private companies in a way prevailed and as we shall see, the view travelled far beyond the national confines of England and became popular also in the colony. The Act was amended in 1888 by giving better terms (prices) of purchase and extending the minimum tenure of the companies to 42 years. Subsequently, other regulation in England

continued to pronounce technological measures geared towards the safety of electricity use through a body of Board of Trade Rules introduced and revised over the years starting in the last few years of the 19th century. More legislation since early 20th century also paved the way for greater freedom and scope of operation for private enterprise. A certain dominance of Local Authorities persisted in England however in the ownership of electrical concerns well into the twentieth century till at least the First World War, which ultimately incited the possibilities of nationalization through large regional interconnection that would supersede local control.

Hughes' pioneering analysis posed through his exhaustive and comparative history of electrification in the USA, UK and Europe between the 1880s and the 1930s has cast the question of early development of electricity primarily through the problematic of a 'large technical system'.[58] Such a system, in Hughes' reckoning, would tend to its 'largeness' on count of having to encompass a wide variety of historically shifting objects and relations including technical artifacts, legal compulsions, financial terms, organizational forms, and natural resources alongside the more obviously technical components.[59] However his understanding of the English case still insistently poses law and regulation as a particularly inhibitory component within the formation of such large technical systems. For him, England developed an obvious "lag" in the development of electrical network and technology owing to the legacy of the 1882 Act, especially as compared to other early urban electrical developments as in Berlin or in New York or Chicago.[60] One key reason for this was that "…no British engineer could design a central station system solely in terms of economic and technological considerations; instead, he had to design for an environment permeated by legislation."[61] For Hughes, the "frustrating influence" of the series of legislations in England also helped to buoy the "pervasively conservative

[58] Hughes (1983).
[59] For further exploration of the conceptual terrain of the 'large technical system', see Mayntz and Hughes (2019), van der Vleuten (2006) and Hess and Sovacool (2020). Hughes' stronger claim about electrification being a systemic process unfolding through political and social interruptions, and yet cohering nonetheless, has often demanded critical clarifications. Two more recent accounts of electricity development in the USA by Gretchen Bakke (2016) and Julie A. Cohn (2018), have instead found it more useful to analyse the large interconnected system of electricity provisioning that is the US 'grid', as a kind of a historically contingent agglomeration that has to be repeatedly performed on an everyday level of maintenance and regulation, and with varying systemic moralities relating to 'energy conservation', profits and uninterrupted access.
[60] Hughes (1962)
[61] ibid., pg. 32.

attitudes" of economic, political and technological interest groups primarily associated with Local Authorities/Municipalities.[62] Hughes thus seems in many ways to rearticulate the concerns of private capital as made in the early period of electrification in England.

On the other hand, Leslie Hannah who studied the English case in more detail argues that more than legislation, it was speculative investment wasted on paying useless patent fees and promoters' profits, that impeded the advancement of electrical concerns beyond a first push in 1880s England.[63] For Hannah, the critical problem of early public supply systems was also that they were not yet too reliable and for quite a while electric lighting remained much more expensive in England, where gas lighting was considerably cheaper than in the US. He also shows that as Local Authorities in England started developing their electricity systems, they often actively shouldered risks of innovation rather than acting 'conservatively' and drove the electrification of existing material means like trams; municipalities also produced more electricity and sold it more cheaply.[64] Hannah eventually though reads the scope of municipalities running utilities in this period as being rather limited, as they later came in the way of larger scale integration of electrical networks and systems.[65]

Here, two points are worth noting (and moving beyond) in relation to how historians like Hughes and Hannah have dealt with the question of the legal and regulatory intervention as they related to the evolution of early electrification. The first of this is a more general tendency to read historical trends in 'early' electrification in terms of the telos of particular ideals of the optimal development of electrical networks and institutions as fully interconnected, relatively generalized systems. While there is a primary problem with this methodology of trying to assimilate and evaluate historical facts of early electrification in terms of such obvious teleologies rather than on their own terms, such methods become even more unreliable in terms of understanding the history of electrification in post-colonies like India, which are still very unevenly electrified and have taken years to achieve some degree of systemic interconnection. For such cases as

[62] Hughes (1983, 66); also Cf. Hughes (1983, 227-261)
[63] Hannah (1979, 6). For a strong case made towards understanding British electrical 'lag' since 1882 as the consequence of financial immorality see Kennedy and Delargy (2020).
[64] ibid, pg. 22-23.
[65] ibid, pg. 51.

for instance the history of electricity coming to colonial Calcutta, as dealt with in this thesis, it is essential that we attach more weight to facts of contingencies instead of assuming a set of possible and optimal techno-scientific (and perhaps still unrealized) teloi against which the past can be evaluated or be made sense of.

A second point more apparent from Hughes' work is the possibly singular relation between techno-economic and legal-regulatory aspects of early electrification, that of the inhibition of the former by the latter. This inhibitory effect is of course complicated when considering some of Hughes' own examples, like that of the pioneering Alternating Current (AC) Transformer invented by Gaulard and Gibbs in England that was the forerunner of the technical innovations leading up to high voltage transmission and the setting up of interconnected AC systems. Gaulard and Gibbs' invention was specifically shaped as a response to the (anti-monopolistic) requirement in the 1882 English Act that a consumer of current electricity should be able to vary the kinds of equipment that he/she would want to plug in to the central station supply.[66]

Moreover, Hughes' characterization of the English case as subsumed under legal-regulatory concerns begs the question of how unique this really was. Regulation was a material fact of making electricity safely usable and saleable all over the world since the late 19th century. Early beginnings in American cities like New York and Chicago could have involved often a greasing of palms of aldermen and city council figures, and the use of personal connections by the likes of Edison, Lowrey and Westinghouse, in order to tide over legal questions of the proper and safe use by electrical infrastructure of publicly owned space.[67] Yet as Mark Essig has shown, it did not take much time in American cities like New York for deadly accidents to occur and push city authorities and judicial establishments towards taking a more proactive interest in the regulation of electrical concerns and their technical conduct.[68] Regulations were also of course courted specifically by private enterprises precisely to forward their techno-economic concerns

[66] Hughes (1983, 86-92)
[67] Hughes (1983, 30). Also see Granovetter& McGuire (1998) for an account of how Edison's business empire was shaped out several personal relationships that 'embedded' the economics of electricity provisioning in moral orders.
[68] Much of this regulation in American cities followed the tragic but spectacular death of a John Feeks, a lineman for Western Union on the morning of October 11, 1889 in New York City. Essig (2005, 219-230).

(rather than simply fearing them as inhibition). The case of Samuel Insull's electrical empire built in Chicago is impossible to miss as an example of this very reversal of Hughes' argumentative logic.

Insull's proposals towards creating state regulatory bodies since the 1890s in Chicago that would delimit spheres of operations of particular local monopolies, standardize issues of price and equipment and maintain other industrial protocols, was directly connected to the expansionary goals set for his Chicago Edison (company).[69] Thus how law and regulation would work in specific regional cases of electrical development, how it was thought to (and how it did actually) impact the course of electrical commerce and how it was to determine norms and practices of safety and thus more broadly those of electrical use and expertise, is perhaps best pursued on more empirical grounds, prior to the presumption of an ideal-typical developmental trajectory sans legal-regulatory pressure (as a Hughesian comparative model seems to presuppose). This is the basic premise that animates the concerns of this thesis in its study of legal and regulatory concerns about early electrification in colonial Calcutta and more broadly, colonial India.

4.2. New technical developments and regulatory intervention since the late 19th century

Since the last decade of the nineteenth century, the coming of Alternating Current (AC) systems became a new and critical technological development with which law and regulation sought to grapple in varying ways in major western urban centres of electrification. By the 1880s, DC systems as pioneered by Edison were faced with a common issue, which was to reduce cost of distribution, especially over distance greater than a mile from the central station or in less densely populated districts.[70] This was because such systems operated at a fixed and lower voltage (difference in electric potential between two points). Voltage (E) being inversely proportional to the losses resulting from transmission along the distributing line in question, lower voltages (often 100 or 110 V) at which Edisonion systems operated led to higher amounts of dissipation of electrical energy in transit. And even if a DC system produced and transmitted at a

[69] McDonald (1958). On Insull also see Hughes (1983, 201-226) and Platt (1989).
[70] Hughes (1983, 83).

higher voltage, there was no way in which the voltage could be reduced at the consumer's end in order to make it less risky and more amenable to electrical equipment, much of which, like incandescent lights or fans, worked at lower voltages. Consequently, to diminish 'line losses' for lower voltage DC distribution, thicker and much more expensive copper wires would be required in order to maintain a requisite amount of power transmission to the consumer's end and this could still be inadequate beyond a mile of transmission distance.

Two technical modalities – the three wire system of distribution and large batteries distributed across the supply area – aided the reduction of DC distribution costs by (respectively) reducing requisite copper volume for wiring and by allowing central station supply to reach beyond a mile of distribution through storage (of energy).[71] Such modalities of providing scale to DC systems were promoted by the likes of the British entrepreneur-expert Col. R.E.B. Crompton and under his direction they were imported to the colonial city of Calcutta while also functioning in other parts of the world. In such colonial contexts, as the thesis shows, a further measure of cost-cutting was introduced, which was the relatively unique yet rather controversial and dangerous use of overhead and uninsulated copper wires for both lower voltage/pressure (low-tension) as well as higher voltage/pressure (high-tension) electricity distribution.

The more significant episode in the transition to cheaper and more expansive distribution in the history of electricity turned out to be the development of AC technology. An AC source is one in which currents flow in one direction and then reverses, constantly cycling through peak values towards each end. Such a form of electric distribution can be varied in terms of its voltage through an instrument known as the transformer, originally based on Faraday's 1831 discovery of the principle of electromagnetic induction.[72] When AC is passed through the windings of the transformer, its voltage could thus be 'stepped up' to allow for transmission with much reduced 'line losses' over longer distances, and then 'stepped down' closer to the consumer end in order to make the power usable at lower voltages.

[71] ibid., pg. 5.
[72] Sulzberger (2003a, 66).

As mentioned already, inventors Gaulard and Gibbs first used the transformer for purposes of meeting the stipulation of electrical law in England that no utility could supply power in such a way as to allow only particular makes (thus voltages too) of lamps/equipment to be used instead of others.[73] Gaulard and Gibbs' instrument invited further interest from technicians around the world, firstly, from Sebastian Ferranti who was spearheading the largest central station in England at the time - the Grosvenor Gallery in London. It also interested three Hungarian engineers, Zipernowski, Deri and Blathy of Ganz. and Co., and William Stanley, associated with the George Westinghouse's electrical concerns in America. The Hungarians and Ferranti did away with the technical settings of Gaulard and Gibbs' transformer that allowed varying connection permutations across different voltages. Instead, with lamp voltages becoming more standardized, they could adapt the transformer to constant voltage generators that allowed them to become more self-regulating and practicable for more uniform systems of electric distribution.[74] Westinghouse, Edison's chief competitor in the US, had actually bought Gaulard and Gibbs' patent and Stanley who worked for him further developed the transformer design in similar fashion.[75]

It was in the USA that the more systemic expressions of the AC system first came to fruition on a considerable scale, where by October 1887 more than 30 Westinghouse AC electricity distribution schemes were already in place.[76] In 1891 the Frankfurt International Electrical Exhibition saw a successful AC experiment with a rather long distance transmission scheme running 25,000 volts between Lauffen and Frankfurt.[77] The rise of AC systems was further aided by the coming of the improved version of the polyphase AC induction motor in 1892 primarily through the initiatives of Nikola Tesla, also working with Westinghouse.[78] Between 1887 and 1892 raged the famous 'battle of the systems', marked by the brief but bitter fight between proponents of DC and AC over which system was safer and more practicable.[79] But after that, Hughes argues, a spirit of

[73] ibid.
[74] Hughes (1983, 96-98).
[75] ibid., pg. 100-102.
[76] Sulzberger (2003a, 67).
[77] Sulzberger (2003b, 72).
[78] ibid.
[79] Hughes (1983, 127)

compromise developed, involving the exchange of patents between Edison's DC system and Westinghouse's AC system in 1896.[80] The 'battle' was resolved, Hughes further suggests, not by the vanquishing of one side by the other but rather through the development of a 'universal system' aided by various converters and couplers but also organizational changes that allowed combination between the two kinds of distribution systems, with varying electrical equipment of lighting, traction and power (displayed first at the Chicago exposition of 1893).[81]

With its particular technical affordances, the supposed 'advantage' of AC systems over DC systems was the possibility of centralization of power production and longer distance distribution, both contributing to the development of larger electricity distribution setups. Such setups allowed interconnection between disparate points of power production and consumption and scaling beyond smaller municipality-oriented electrical supply to larger city-wide or eventually region-wide power systems, at times helmed by private electrical oligopolies or monopolies. In fact it is this techno-commercial potential of centralized production and longer-distance interconnection and expansion that has mostly been inherited from the otherwise quite messy history of early electrification, as the current 'universal system' the world over. Yet how the transition between a variegated past of electricity production and distribution to the relative uniformity of this 'universal system' happened in specific contexts could really be a matter of a more complicated historical progression than what certain existing narratives allow for.

Returning to Hughes' framework, the delayed nature of this transition in the English case is again narrated through the trope of 'backwardness', in particular of London's electrical development as compared to other contemporary metropolises like Chicago or Berlin.[82] This 'backwardness' is described as the 'failure' to have greater use of electricity for power purposes and to embrace anything like a large-scale AC electricity distribution system before the First World War in spite of two concrete proposals for the same.[83] The

[80] ibid., pg. 126. Edison's General Electric had in any case merged with another AC concern, Thomson-Houston in 1894.
[81] ibid., pg. 121-130.
[82] Hughes (1983, 227-261)
[83] By the end of the 19th century London had a lot more electric lighting than many other metropolises around the world as Hughes himself admits and thus hardly 'backward' on that count. It is the apparent

first of these proposals was made by Ferranti who sought to transmit high-voltage AC power (10,000 V) to London utilities and other consumers from a station at Deptford, outside the city. At the time of making this proposal the l888 Act in England provided significantly more felicitous conditions (for instance a 42 year purchase clause) to private enterprise compared to its predecessor (the 1882 Act). But the Board of Trade's (BOT) Marindin Committee's prioritisation of local authorities' (LAs) claims to start electricity schemes within their particular municipal jurisdictions (London was divided into several of them) still allowed such authorities to compete with or object to Ferranti's AC supply in their areas.[84] Refused the permission to run an outright monopoly, Ferranti attempted to execute a more truncated plan of supply in 1889. But a number of technical snags in the Deptford scheme, running on fairly unprecedented technological settings and without the support of a strong electrical manufacturing concern, eventually led to its failure. Ferranti resigned soon after and the scheme only survived as a rather scaled-down version of its original form.

Following this, a Joint Committee of the English Parliament (Cross' Committee) made explicit provisions for 'bulk' supply by utilities. This prompted another contender, Charles Merz of the Newcastle-upon-Tyne power company, to propose a new large scale power supply scheme for London. Merz's Newcastle company had expanded considerably by convincing Tyneside heavy industries to purchase electric power.[85] In 1904, based on the possibilities of the 'universal system' allowing wide-ranging adaptation, Merz proposed to supply high voltage power in 'bulk' to feed London's lighting and manufacturing power needs. Yet opposition to such supply was again articulated by LAs in London through the channels of parliamentary proceedings, even as commercial concerns and the BOT backed Merz's offer.[86] Interconnected, larger scale electrical systems in England then had to eventually wait till they were initiated mostly through the direct intervention of the British state, following the onset of the First World War in 1914.

---

limitation of power use in London city that qualifies London's 'backwardness' for Hughes (1983, 256-257).

[84] ibid., pg. 241-242.

[85] ibid., pg. 250.

[86] ibid., pg. 251-255.

Hughes' explanation seems to at times inflate the significance of legal and regulatory action in describing the supposed arresting of the development of larger scale supply systems in London in favour of the continuance of smaller-scale municipality-bound supply. Since the 1888 Electricity Act, the English legal framework had arguably become more flexible. This framework was also adapting to emerging techno-industrial demands through public consultation (as in case of Cross' Committee's decision to allow 'bulk' power supply). Other factors like the technical inadequacy of Ferranti's scheme and the electrical engineering knowledge it used are also curiously ignored in explaining why London could not adopt centralized, large-scale power supply. Moreover, Hughes also seems to underplay the specific character of the power demand of London's relatively (and largely) small-scale industrial and other kinds of power users, not quite analysing if such users had any immediate reason to switch to long-distance electric supply. Hannah on the other hand points out how stationary steam engines continued to have advantage in textile-related industries since they ran at constant speed for fixed hours and made use of by-product steam.[87] This was different from the case in shipbuilding industries fed by the Newcastle-upon-Tyne power company where electricity became more useful as it could be used for many other functions for which steam power was hardly amenable.[88] In case of traction, trams in England ran initially through specific power installations separate from central station-based schemes. But the traction load picked up with municipal ownership expanding the electrification of tramways significantly.[89] Notwithstanding such countervailing instances often indicated also in his own account, Hughes persists with explicating the 'backwardness' of the English case based on the apprehension of obstructive legislative interference and the influence of 'conservative political interests' of local and municipal inspiration.

This 'backwardness' is eventually posed as a contrast to the monopoly or oligopoly of large scale electric supply as developed in the case of the city of Chicago and Berlin since the late 19th century. But again going by Hughes' own rendition, it is really not clear how the electrical development of these two cities can be explained as an unhindered fruition

[87] Hannah (1979, 18)
[88] ibid.
[89] ibid., pg. 16.

of techno-economic logics sans the mediation of law, regulation or politics.[90] As David Nye emphasizes, even if London-type fragmentation was unsuitable to bigger system development, centralization in other cities of the western world took one or the other route of regulatory and/or political consolidation.[91] The monopoly in Berlin for instance was conceded after substantial concessions made to municipal authorities in terms of revenue-sharing between them and the concerned private enterprise. Conflicts and negotiations continued even after this between public authorities and the private company in terms of the terms and rights of purchasing the latter by the former.[92] In Chicago on the other hand, Samuel Insull's electric supply empire did manage to rise above municipal mediation, but only after actively courting state-level regulation since the 1890s, aimed at delimiting local monopolies and standardizing issues of industrial protocols, price and equipment.[93] Outside major cities of America, in the smaller towns, local and limited municipal ownership of electrical utilities continued for a longer time, till at least the First World War, when expanding power needs led to coordinated expansion of large-scale electric supply.[94]

In a recent analysis critical of Hughes' view, the historian of British urban infrastructure Christopher Otter reinterprets the absence of centralized control and the relative commitment to local autonomy in London's power supply as an example of how politics shapes technology rather than as politics "getting in the way" of it (as Hughes suggested).[95] Otter's argument is useful to think not only about the case of early coming of electric networks in England, but also through the worldwide implication of early electrification within schemas and contentions of local urban government in particular and contingent articulations of local power more generally. It helps us move beyond historicizing electricity supply against set technical ideals and teleologies to investigate the actual conditions of governmental and other kinds of negotiations that mediated the urban establishment of such supply.

[90] Hughes' discussion of Berlin and Chicago (1983, 175-200 & 201-226).
[91] Nye (1992, 139)
[92] Hughes (1983, 198-199)
[93] McDonald (1958). On Insull also see Hughes (1983, 201-226) and Platt (1989).
[94] Nye (1992, 179)
[95] Otter (2008, 251)

But in comparison to Otter's framework emphasizing local municipal control as one modality of broaching the politics of technology, the colonial context studied in this thesis makes for a somewhat different case. As shown in the thesis, colonial law successfully 'protected' electric supply from any measure of municipal control beginning quite early in the history of electric systems being set up in colonial cities like Calcutta. Thus while law and municipal interests could have had overlapping concerns in the case of England, they clearly diverged significantly in claiming their stakes in the colonial government of electricity. Did this excision of municipal interests from the government of electricity, somewhat unique in the contemporary world, mean that technology was finally liberated from the entanglements of politics in colonial India? As an alternative guiding force in early urban electrification, was colonial law then more of an enabler of the technical 'maturation' of electrical schemes, than its metropolitan counterpart?

Here, the peculiarity of colonial urban electrification pushes once again to explore the relationship between law and electrification beyond the ideals of any presumed technical 'maturity' or 'backwardness'. Bringing back a possible 'politics of technology' within the analytical frame the thesis tries to show that even as municipal views were disregarded, the very urge of colonial law to chart an innovative path in aiding technological development and private enterprise led to many a disagreement and negotiation between various layers of the state, but also with non-state actors interested in electrical matters. Colonial law separated technology and municipal politics for some time to come, but this did not immediately augur any exemplary technical or economic development. Instead colonial conditions ended up spawning a fertile terrain within which debates about electrical matters could multiply and eventually even challenge (and limit) the urge of law to create uniform control in the governance of electrical technology.

Here we can again take a cue from Otter's work. Otter argues that since the 19th century urban infrastructure remained both the object and medium of the emergence of a specifically British modality of liberal government that aimed at fostering a kind of controlled delivery of freedom.[96] Such controlled freedom involved the conduct of commerce and perception, habitation and movement, work and energy, beyond the

[96] This is a summary of the broader argument in Otter (2008).

purview of any obviously authoritative direction, yet practiced through modalities of self-regulatory directives and technology that needed correction from time to time by an inspection regime. This was not a prescription for technical, commercial and individualistic development unhindered by the exercise of power, but actually a very specific form in which British liberal power materialized through its subjects and their relationship with evolving technologies and techniques shaping contemporary urbanity.

The case of early electrification in colonial settings presents a critical terrain to map the workings of such power whereby law can be understood to *redouble* its inclination to create conditions for the liberal use of electricity. This doubling of regulatory intention was related to both the liberal motive to govern electrical infrastructure through controlled freedoms, but more importantly to the insistent urge to govern in strict distinction from supposed strictures of metropolitan origin. One way of doing this, as stated above, was to separate municipal authorities entirely from the domain of electricity governance. Otherwise, colonial law and regulation remained keen on devising a more technically flexible paradigm of governance that would not come in the way of the expansionary inclinations of private electrical enterprise. The colony in this sense became a site for active regulatory supersession of the limits posed by the conventional techno-scientific and globally evolving disciplines and standards of technical conduct.

The interests of private capital were paramount in this process of electrical governance. In view of the contrasting development of DC and AC systems that we have described, Calcutta's case in the early twentieth century could be something of an outlier. For over a decade since its initiation, the CESC ran a large-scale monopoly initiating electric supply over larger parts of the city and its outskirts, yet one which operated on DC supply. DC supply continued to the consumers' end on most occasions well into the 1920s and later, even as a centralized AC system commenced from the 1910s. Also, till the 1920s, the industrial demand for power from both small scale concerns as well as the major industrial units (like jute companies) around the city grew only moderately. The technical or techno-economic linkages sustaining the CESC's monopoly were then not very obviously self-sustaining. Such linkages in turn required a set of legal-regulatory allowances and flexibilities, made through the consideration of state-appointed electrical

'experts'. Colonial 'experts' did debate the allowances and rules to govern electricity supply and this shows that the obliteration of municipal control did not signal any end to the politics over technology and its control in colonial India. But more often than not, imperial power prevailed over dissenting technocratic and bureaucratic opinion to side with electric capital.

Even as this might have helped 'free' CESC's monopoly by replacing unnecessary regulatory interference with more necessary ones, how did the 'freedom' afforded by electrical law matter to users and non-users of electricity?[97] And how did efforts to duplicate and make uniform such legal-regulatory allowances fare in different contexts, as law also came to interact with the varying requirements of other Indian towns like that of high-voltage AC supply in Bombay? In the course of tracing how regulatory 'freedoms' materialised in the colonial governance of electricity, the thesis also plots the role of regulation and law in the governance of electricity through these particular questions. Thus along with trying to understand colonial law's primary inclination to distinguish itself from global and metropolitan strictures, the politics of governing technology also points to other issues more directly related to conditions of electricity use and consumption.

4.3 The questions of use/consumption and the 'expert' mediation of electricity

It is useful to highlight here that the strongest critics of the Hughesian history of electrification have been historians of electricity who have focussed on users and consumers of power. Important here is Nye's work on the 'coming' of electricity to America that has steadfastly maintained that it would be fundamentally mistaken to think of the 'home' or 'factory' or 'city' as passive objects undergoing an abstract transformation called electrification.[98] Instead he has pushed towards ascribing to American social and cultural individualism a strong role in determining how Americans consumed energy. He thus explains that while the coming of electricity had an overwhelming reception amongst Americans by virtue of its spectacular presence in urban public spaces, their

[97] Attending to this question also requires us to part ways with Otter's analysis that stops short of analysing the operations of infrastructural governance in actual practice.
[98] Nye (1992, 1999).

eventual reliance on private cars and personal appliances like washing machines reveal how individualist logics shaped energy consumption more than the scaling ambitions of massified electricity use in streetcars or public laundries. Yet Nye also cautions that this individualist choice-making regarding modes of energy consumption, remained relevant more in an earlier phase of electrical development - this was followed eventually by a more determinate logic of 'technological momentum' that incentivized mass electricity consumption in America.

Graeme Gooday's book *Domesticating Electricity* has perhaps offered the sharpest critique of the tendency towards understanding the development of electricity supply through systemic logics.[99] Gooday understands this preference for a systemic understanding emanating from the work of scholars like Hughes but also Nye and Wolfgang Schivelbusch (1995) as being a tendency to view electricity as more clean, beautiful and by implication an inexorably more 'modern' form of energy in comparison to existing agencies like gas, etc.[100] In quite successfully challenging the status of electricity as somehow a *more* rational and/or industrial form of energy, Gooday sticks close to the urban English household of the late 19th and the early 20th centuries. In the process he traces the various anxieties, disappointments and criticisms that were heaped on electricity primarily on count of its proclivity to stoppage and accidents vis-à-vis the other kinds of energy like gas. Importantly, such opinions are sourced by him from users as well as non-users of electricity, in order to show how direct exposure was not the only context of interacting with the novel energy form. Eventually, Gooday argues that the domestication of electricity was effected by the projection of electricity as an ornamental feature of aristocratic life, imbued with romantic and feminized notions of potency and beauty. In this 'taming' of electricity by the 1910s in England, a celebration by upper classes of their technological taste and its subsequent emulation by other groups remained most important.

Both Nye and Godday's accounts of how subjective choices and practices of consumers and users effectuated the large-scale social shift to electricity from other forms of energy

[99] Gooday (2015).
[100] See Schivelbusch (1995).

make for important remedies to the unidimensional view from a systems perspective as taken by the likes of Hughes. Primarily for reasons of space, this thesis does not directly engage with the question of how and why consumers shifted to the new form of energy that was electricity. However Gooday and Nye also do not necessarily go beyond the initial individual or collectivised act or orientation of choosing to consume or use electricity or being inadvertently affected by it in particular ways. They do not thus try to understand how users' or non-users' practices possibly continued to interact with the manifestations of electrical system-building beyond the initial shift to the new form of energy.[101] The lens of colonial law and regulation on the other hand reveal multifold interactions that consumers, users and non-users continued to have with electricity supply that cannot be grouped under acts or orientations involved with the novel, one-time shift to the new kind of technology. Rather such interactions remained for a long time and perhaps continue to sustain (in postcolonial settings) as forms of contesting certain systemic inclinations of electric supply and infrastructure. Colonial law and regulation are thus studied in this thesis as a critical sitefor exploring such forms of contestations and the renewed efforts to establish control over them.

One primary problematic through which the thesis attends to such questions is that of safety. Safety as read through regulatory concerns offers a key interface between production, supply and use to study the history of electrification. Other than the commercial and territorial aspects of electrification, securing safe supply and use of electric power was the main object of the operations of electrical law and in many ways is still so. However consumers and the intermediaries that they consulted could have different modes of engaging with the question of the safe use of electricity. Much of the historiography of electrification however relegates this critical question to the very beginnings of electrification or the coming of AC systems which by its nature posed greater danger to human beings coming in contact with it.

[101]A recent essay by Animesh Chatterjee (2018) argues that the reception of electricity in colonial urban Bengali middle-class households shifted between a cultural refusal by native middle-class society of the western and thus 'external' technology of electric lighting and the electric fan, to a more class-oriented acceptance of the same technology in terms of a matter of status as invoked repeatedly in promotional material. But Chatterjee too does not think of consumer practices and orientation beyond this inaugural shift to electricity.

Hughes brings up safety concerns in his account of the short 'battle of the systems' describing Edison's efforts to get AC systems outlawed. But he does not see much effect of safety issues on the outcome of the 'battle' and by implication, on the future evolution of electricity systems.[102] Nye too reduces safety concerns to an early history of 'anti-modernist' opinion that lost steam with the greater popularisation of the new energy form.[103] Essig goes into greater details of how safety issues played out in course of the 'battle'.[104] But he stops short of pursuing how they were worked at in later decades even as he leaves us with the suggestive lead that electric fatalities became more routinized in the twentieth century. Gooday's work on England deals with the danger posed by electricity in some detail, considering how accidents were cast through class conceptions, how accountability for death came to be distributed and how different technological alternatives were debated in order for making safer systems.[105] But he too concludes his account by the 1880s, leaving us with an Essig-like suggestion that safety issues persisted within electricity distribution well after the 'battle' was seemingly resolved.

More exceptionally, much of the chapter in Otter's book on electricity networks in England focuses on the how an infrastructural and inspection regime evolved in relation to each other, in response to contingent events like accidents and beyond the obvious significance that safety issues gathered in course of landmark developments like the 'battle of the systems'.[106] While like Otter's other formulations, this problematic too animates the chief concerns of this thesis, we will encounter a greater degree of disagreements and debates regarding how such infrastructure and its controlling regimes were to be effectuated, as carried out between various layers of the colonial state, private enterprise and eventually even critical user-perspectives.

In leaving out such debates, Otter makes short shrift of the specific *politics* surrounding issues of safety as a negotiation between varied groups, interests and ideas, focussing more on the making of liberal power. This thesis on the contrary pays specific attention to such negotiations and debates as they spanned various discussions and legal proceedings

[102] Hughes (1983, 107-109)
[103] Nye (1992, 145)
[104] Essig (2005)
[105] Gooday (2015, 61-90)
[106] Otter (2008, 214-252)

in colonial India and involved questions of aerial lines, wiring inside consumers' premises and the insulation and earthing of electrical equipment till well into the twentieth century. Additionally, it asks about the limits against which such techno-legal or other kinds of standards of safety unravelled, which in turn were posed as an aspect of colonial legal innovation. It shows how such limits were not necessarily problems of exclusively cultural or natural/climatic impossibilities, though colonial discoursing was prone to posit them as such. Colonial law-making did not merely face such limits as insuperable - it often posed them as frontiers against which legality and technicality had to fold up to make space for apparently productive possibilities of electric supply and commerce. Yet beyond the self-imposed 'innovations' of legal limit-setting appeared the frequent event of the electrical accident, accountability for which was increasingly lost to the intricacies of legal permissibility.

The thesis also ties up questions of rules and technical designs of safety through an essential connecting element - the conception, validation and function of expertise and electrical learning and practice more broadly, as it shaped up in colonial India. The evolution of expertise too appears within the historiography on electricity as a process that was in a way resolved within the early decades of the coming of electricity systems. As Carolyn Marvin has shown, electrical expertise since the last few decades of the nineteenth century was sourced from a variegated group divided roughly into scientists, engineers and also electricians of 'practical' and craft-based persuasion, all of whom worked through very different public formats in order to popularise the new technology.[107] Amongst them, a class of electrical engineers emerged through their self-definition as technical experts by the 1900s, through the formation of professional societies, through highly specific technical training and literature and by ridiculing and/or excluding other claimants to their knowledge as ineligible.[108] In the case of the US, as Nye points out, even till 1885, a self-trained man could pronounce himself electrical engineer; but within a generation, a number of universities such as MIT, Purdue, Cornell and Michigan made very definite kinds of such engineers with particular engineering

[107] Marvin (1988, 10-11)
[108] ibid., pgs. 12-62

degrees.[109] For Hughes, this was both part of and the outcome of electricity gaining 'technological momentum', as the evolution of polyphase AC necessitated greater mathematical sophistication from electrical 'experts', now disseminated at select technical high-education institutions around the world.[110]

England was perhaps somewhat delayed again in this initiation of a stricter and more delimited form of technical specialization through engineering institutions and degrees.[111] But British science too by the early 1890s had seen a firm victory of a theoretical and mathematical kind of electrical knowledge marked by Maxwellian propositions over more rule-of-thumb approaches of conducting electrical technicalities by 'practical men'.[112] Did the emergence of professional specialization then mark a uniform ascent of electrical expertise in the twentieth century? Two revisionist accounts of the English case by Gooday and Stathis Arapostathasis direct us towards a slightly different analysis of this problem. These historians argue that professionalization was not the only axis of performing expertise and such performance had to actually negotiate the tricky terrain of the expectations of both electrical consumers as well as those of local political contexts.[113]

Till the first two decades of the twentieth century and even later, a steady position and qualification of/as the 'electrical engineer' was yet to emerge in India through pedagogical initiative or professional societies. 'Civil Engineering' education was institutionalized by the late 19th century through the colleges in Roorkee, Pune, Guindy and Sibpur and there was also a certain degree of inter-imperial linkages (albeit primarily of European technicians) through professional associations like the Institution of Civil Engineers in England and new journals like *Indian Engineering*.[114] But these colleges as well as their students remained rather undecided in the early twentieth century about any

[109] Nye (1992, 159)
[110] Hughes (1983, 140-174).
[111] Kennedy and Delargy (2020, 319)
[112] Hunt (1983)
[113] Gooday (2004, 2007) and Arapostathis (2013). While remaining suggestive, such studies however do not attend to the twentieth century or the colonial context which forms the more direct object of interest in this thesis.
[114] See Ramnath (2017, 70-110)

definite investment in the specialisation of electrical engineering.[115] And while a Calcutta branch of the England-based Institution of Electrical Engineers (IEE) opened up with primarily European participation in 1901,[116] this professional society saw more interest from telegraph engineers and had hardly much to contribute to processes and issues of electricity supply networks being laid out in different parts of India.

Given this, the thesis remains more interested in the slim establishment of the colonial state's Electrical Inspectors who had expectedly emerged as the foremost experts within the colonial government and legal setup, in matters of electrical energy. These possibly overworked inspectors had the necessary task of mediating between the rule of the state, technical and economic matters of private enterprise and the wider world of colonial society. They were till the first two decades of the twentieth century sourced primarily from the technical fraternity in England, mostly due to the uncertainty about available expertise, both European and Indian, in the colonial context. But even when they met certain employment conditions of the colonial state, this thesis shows how their authority, learning and objectivity remained an issue of debate both within the bureaucracy in India as well as outside it. Yet strikingly, their personal judgment was summoned up again and again to suture the open ends of colonial legality as it sought to govern electrical matters with its distinctive style and degree of leniency. Given that a definite consensual formation of electrical engineering knowledge or professional societies to validate such knowledge was not immediately forthcoming in the colonial situation, the exercise of personal judgment by the Electrical Inspectors and Electrical Engineers of the state lent a certain double-edged character to electrical law. Such judgement served as both the basis of law's authority as well as the reason why it faced certain challenges to its claims of delivering an 'expert'-based techno-scientific command.

Moreover, the question of expertise and electrical learning (or the lack of it) was also complicated by the inspector's counterparts outside the state system, who took up the wiring of consumers' premises – the private wiring contractor or the wiring man, often possessing little or no formal training. This thesis explores electrical expertise over this

[115] For accounts of Guindy and Roorkee College of Engineering see Lourduswamy (2011) and Kumar (2011) respectively. See Sarkar (2020, 36-46) for an account of the Sibpur Engineering College.
[116] The IEE had started in England in early 1870s primarily as a society of telegraph technicians.

spectrum of varying degrees of skilled practice and in alignment with the contexts of electrical law-making. It will try to show that the colonial law's contribution to the making of electrical expertise is difficult to understand without its paradoxical validation of a more informal and apparently insufficiently learnt version of electrical practice, as performed by the often lower-in-class, native electrical professional, like the *mistri*. This professional figure in another sense cuts across the analysis of both expertise and consumption in relation to the history of electricity supply in places like colonial Calcutta. He after all held a necessary mediating role in both bringing the electrical supply of the licensee within the household or the consumer's premises as well as in enabling the consumer to overturn certain standards of legal and technical conduct of electricity. His existence was thus both celebrated as well as rued in deliberations over the colonial regulation of electricity, which invoked him as a constant concern.

5. The Chapters of the Thesis

The first chapter of the thesis develops a kind of pre-history of electricity supply by studying the organization of the continuous work and service of punkah-pulling in colonial India. When electricity first came to the city of Calcutta the use of electric fans provided the essential 'day load' that led to the prospering of electricity sales. This chapter tries to understand how this specific energy need was cultivated for over a century in colonial India through the use of manually-operated punkahs. Continuous use of the punkah was not a natural solution to the natural need for artifical ventilation and cooling felt by European bodies in the hotter 'tropical' conditions. Rather the chapter shows how certain modes of labour deployment in service of incessant punkah use both led to the manufacturing of this need as well as accomplished the regular enforcing of the form of service in question. The chapter elaborates on the specific character of colonial regulation of domestic work and other kinds of service labour and the legitimisation of everyday racial violence that enabled this. It also shows how the fatal consequences of colonial violence coupled with the organized opposition of punkah labour eventually led to the will to transition from manually-operated punkahs to electrified and mechanised alternatives.

The second chapter opens up the primary query of the thesis – to understand how law and regulation mediated the coming of electricity to colonial India. It shows that from the very beginning of regulatory interventions governing electricity supply in colonial cities there was an urge felt to diverge from metropolitan precedents. This was based upon the anxiety that British regulations and laws inhibited private electrical enterprise. The anxiety was coupled with a great suspicion of the role of local authorities/municipalities in the governance of electricity. Resultantly the earliest colonial legislations governing electricity supply steadfastly excluded such authorities/municipalities from any kind of control that they could exert over new schemes of electricity supply. This exclusionary endeavour was based on the logic that such authorities might not be able to access adequate expert participation required to understand and rule over the new technology. But the chapter shows that local authorities like the Calcutta Municipal Corporation were actually more disposed towards involving expert advice and technical innovations than the colonial state when it came to the introduction of electric supply within their local contexts. The colonial state on the other hand adopted a strategy of deferral when it came to fixing rules and standards for the technical conduct of the new form of energy. This became then a long-term pattern of the colonial governance of electricity.

The third chapter studies the career of J. W. Meares, colonial India's foremost authority in electrical matters till the first two decades of the twentieth century. In doing so it argues that the colonial designation of electrical expertise was based less on the 'expert's' ability to tend to a rule-bound and systematic pursuit of electrical technicalities. Instead colonial rule rewarded peculiarly risky actions and the associated ability to bend certain extant conventions of electrical practice. The chapter otherwise studies in detail the making of the 1903 Electricity Act in India. It shows that the Act continued to make wide allowances to the use of dangerous uninsulated overhead wiring in spite of contemporary techno-scientific apprehension regarding this. It also demonstrates how much of the rules devised under the Act eventually deferred the governance of technical conduct to the personalized decision-making of the Electric Inspector. The chapter also pursues how the 1903 Act remained particularly reluctant in developing a command over matters relating to consumer's installations. Through the analysis of a specific court case, the chapter illustrates how such installations had become a terrain of rather diverse technical practice

that did not necessarily conform to prevalent standards adopted elsewhere in the world or even to prescriptions of colonial electrical officials. The chapter also broaches the case of electric theft as one more domain that was difficult to control through the legal manifestations of the Act.

The fourth chapter studies how the 1903 Act came to be repealed since it did not prove too adequate to the cause of private electrical enterprise after all, especially in relation to larger scale 'bulk' supply and other electrical schemes proposed for catonments. The chapter also studies the making of the 1910 Electricity Act and its functioning. It shows how various kinds of opposition from provincial quarters blocked the centralization propositions that inhered in the first proposals to bring a new Act. The chapter traces how such oppositions, especially as those made from the Bombay province, came together to demand that metropolitan rules of the Board of Trade be imposed in India by replacing the Indian Electricity Rules. Bombay's proposals were specifically framed in view of the fact that the meagre nature of the technological learning/experience of intermediaries and lay users associated with electricity in India required that electricity be governed by the stricter paradigm of technical control and discipline as practiced in England. This was consistently over-ruled by the imperial tehnocracy that sought to preserve its sphere of influence. The chapter also studies how certain issues of consumers and their relationship with licensees came to be taken up in the course of the discussions surrounding the Act, its rules and their implementation. It shows that even as electrical law in colonial India weighed heavily in favour of suppliers, contractors and licensees, consumers' practices were gradually using the space of negotiation offered by the same law to appear increasingly unruly.

The fifth and the last chapter of the thesis studies a set of conferences of Electric Inspectors held since 1915 till 1928. These conferences figure as an important point of departure in terms of understanding the consolidation of long-term trends in the conduct of techical practice in the colony (and after). The conferences became sites for discussing a number of issues primarily related to the regulation of consumers' installations. Law and regulation could not any more ignore this terrain of electrical practice as it became increasingly difficult to control certain aspects of it. Primary amongst such issues was

that of employing intermediaries like *mistris* or contractors or wiring men who often practiced their craft beyond the supervision of expert authorities or a fixed body of standards or rules. This affected the durability of consumer's installations and also made them somewhat dangerous. The chapter also shows that this complicated status of consumer's installations had as much to do with the continuing reticence of the colonial regulatory establishment towards pronouncing fixed rules of its own with statutory effects that would control such intermediaries and their respective technical practices. The chapter also pursues how the issues of electricity theft and problems concerning electric meters similarly eluded the objective of attaining a fixed legal resolution. Finally the chapter broaches the issue of the earthing of electrical motors that became a new source of danger as AC came into wider use. It shows that in this case, in spite of fixed rules on the issue, technical discipline was hard to achieve due to the rather sparse number of Electric Inspectors that the colonial state deployed.

Chapter 1: A pre-history of Electricity: Punkah-pulling in colonial India

1. Introduction

Electricity was first introduced on a large scale in colonial Calcutta in 1899 by a private company, the CESC. The company commenced its distribution from a central generating plant to multiple consumers after a series of negotiations over the regulatory framework that would be put into place to govern this supply. The nitty-gritties of such regulatory negotiations will be taken up from the next chapter onwards. This first chapter of the thesis begins by trying to develop a kind of pre-history of electricity use in Calcutta.

When CESC finally turned on their supply on the 17th of April 1899, it had received applications for 2000 lights and "a considerable number of electric fans."[1] Lights drew an obvious amount of supply when electrical networks spread in cities of the late 19th century and early 20th century world. However since lights were mostly used in the evening, a major issue for early electrical supply companies was how to maintain a comparable demand through the day as well – called the 'day load' – that would allow an optimal use of the electrical plant.[2] The gradual uptake of electrical power for industrial or motor use or for traction was one way of resolving this problem. However in Calcutta the tramways had their own supply and the industrial use of power did not immediately follow the coming of electricity. What did actually drive the commercial success of electricity distribution in the colonial city was instead the relatively widespread use of electric fans that constitued a steady 'day load' for the CESC and also made this new form of energy rather popular. With respect to the CESC, in 1902 an Indian correspondent wrote in the journal *The Electrical Review* that "the lighting part of the company's load is very small"; thus "there is no doubt that if this company supplied lighting only it would not be possible to procure a paying load."[3] Lights were then more than supplemented by the use of fans. There were already by 1901 "at least 5,000"

[1] Anon., 'Calcutta Electric Supply Corporation, Limited', *The Electrical Engineer*, May 5, 1899, pg. 577.
[2]Hughes (1983, 110-112).
[3] An Indian Correspondent, 'India as a Field for Electrical Enterprise', August 15, 1902, *The Electrical Review*, Vol. 51. No. 1290,pg. 252-253.

electric fans "on the supply company's mains in Calcutta" with a considerable contribution to their "day load."[4]

The chapter will desribe and analyse the particular colonial past that yielded this specific driver of 'electrification' that was the need for artificial ventilation and cooling as eventually secured by the electric fan. The electric fans had "extensively substituted for the old system of punkah-pulling by coolies."[5] For many years prior to the coming of the electrical fan it was this labour-operated system that was a distinctive characteristic of colonial life. The punkah was a peculiar device that became a popular in European homes, offices and barracks in colonial India since the late 18th century. Also used elsewhere in the British Empire and in slave-serviced homes of antebellum America, the device took the same name as the commonly used hand-held fan. The 'punkah' was a wooden framework, sometimes with cloth extensions, hung from the ceiling with an attachment of rope/wire which was pulled at the other end by a human operator. The to-and-fro swinging of the device had the objectives of ventilation and cooling. Its use was a seasonal affair spanning six to nine months depending on the experience of the 'hot weather' across different locations in the subcontinent. The device began to face serious competition from electrical equipment towards the end of the nineteenth century, although mechanical substitutes had been invented much earlier. Eventually replaced by the rotating electrical fan, the punkah and its pullers disappeared, albeit gradually, over the twentieth century.

The pre-history of electricity supply leads us to a particular history of labour on colonial sites that effectuated the system of cooling and ventilating such spaces by continuous punkah-pulling. The unceasing demand for being cooled as met by the new technology of the electric fan was not any natural need of the Calcutta public emerging out of the warmer settings of the colonial city. In any case the punkah and its pullers had since long before been the primary modality of meeting this demand. Studying how the punkah system was consolidated and how it operated leads us beyond the obvious innovation claims of technology to the organisation of personal service in colonial settings.

[4] A Calcutta Electrician, 'The Use of Electricity in India', *The Electrical Engineer*, April 12, 1901, pg. 524.
[5] *ibid*.

Persistent cooling and ventilation was after all a service and form of work procured through particular kinds of labour management and not an inconsiderable degree of violence. Moreover legal-regulatory interventions also went a long way in maintaining the continuous swinging of the punkah in colonial India.

This chapter thus focuses upon such attributes of organizing the work of punkah-pulling in European establishments of British India beginning with the popularisation of the device in the late eighteenth century.[6] It concludes around the early twentieth century when European inhabitants in cities like Calcutta as well as state functionaries like Viceroy Curzon initiated a more decisive pursuit of technical substitutes. Studying the conduct of punkah-pulling points to the problem of how European masters gradually multiplied their claims over their domestic servants' labouring time and how such claims were mediated by the regulatory interventions of the colonial state. Existing and developing social and legal norms through the eighteenth and nineteenth centuries already endowed the master with fairly extensive control over their domestic servant's work time. But it is important to comprehend how this control actualised in material practice. The problem of punkah-pulling provides an apposite index to trace this, because it was a significant addition to the workload of domestic servants in European establishments. Since the late eighteenth century, as the punkah came to be used more and more, day and night, the task was often cast as a limiting condition of exactly how much and what kind of work could be demanded of certain kinds of native servants. Expectedly, considerable instances of violence but also recalcitrance, refusal and in some cases rebellion marked its distribution in both private and public sites. This in turn invited the direct and indirect mediation of the colonial state. It is this archive of oppositional instances and state mediation that this chapter assembles in order to analyse the materialisation of the European master's desire to be fanned continuously.

Mid-nineteenth century health-related concerns led to the personal service of punkah-pulling becoming necessary for up to all twenty-four hours of the day in urban European households and army barracks, where its costs came to be borne by the colonial state.

[6] The origins of the punkah did not coincide entirely with early British rule in India. See Temple (1914,742-744). Later commentators however agreed that its widespread use began in the last two-three decades of the eighteenth century in colonial Calcutta. Busteed (1888, 128); Dewar (1922, 104-111).

Consequently, there emerged a separate group of servants - ‘punkah wallahs’/‘punkah coolies’ - entirely dedicated to this task. Large groups of primarily male servants filled up these seasonally available positions in regions of British India. The emergence of this separate occupation was also concurrent with a de-domestication of punkah-pullers. De-domestication had an obviously physical dimension as the pullers were moved from the interiors of buildings onto their outsides. But more significantly, it involved new forms of employing temporary punkah wallahs/coolies separately from the existing coteries of house servants or army menials and on definite time-bound shifts covering portions of the night and day. De-domestication did not mean that punkah wallahs/coolies attained the status of institutionally-recognised public servants, even though they were hired in large numbers by the colonial state. Rather, this chapter explores de-domestication as a description of how punkah wallahs/coolies occupied simultaneously the margins of private work, where they ceased to belong to the social and affective order of the home, as well as the margins of public occupation, where the domestic expectation of constant work continued to be violently imposed on them.

Three implications emerge from this exploration. Firstly, even with the conception of a separate occupational category of the de-domesticated punkah wallah/coolie, the task of punkah-pulling continued to be assigned to other servants like bearers in both households and barracks. The master’s ownership of the entirety of the domestic servant’s labouring time was thus exerted in terms of getting ‘insiders’ to conduct the task as part of their expected duties, as a cheaper alternative to consigning the task entirely to ‘outsiders’. Yet this chapter also shows how more domesticated servants associated with European establishments often objected to taking up this work. This objection was however articulated not so much against temporal control, but more on grounds of customary and caste status. Thus a second implication of the de-domestication of punkah-pulling was that over the later decades of the nineteenth century, the task made a steady descent down the social hierarchy of service labour. Finally, newer forms of time-bound recruitment of de-domesticated punkah wallahs/coolies through altered kinds of social intermediation also led to conditions of greater exploitation. This was particularly the case with the night shift of punkah-pulling when the fixed hours intensified the urge to violently extract ceaseless work from the temporarily available servants. For barracks, the recurring

violence caused an increasing concern with recuperating the legitimacy of empire through curtailing racial cruelty. But for urban European households, it could be argued that personal violence was indicative of a pushback by the concerned servants against their masters. These masters, not unlike their de-domesticated punkah coolies, were no longer cushioned by the intimacy of domesticity or the moral control of intermediary attendants. Both the violence as well as the individual and eventually collectivised opposition by native menials, also hint at the limits of European masters' claims over their punkah-puller's time. Such limits then could perhaps only be overcome through mechanised substitutes.

Existing scholarship on the history of domestic service in colonial settings has offered the insight that the interaction between European masters and native servants was a significant medium of the emergence of colonial identity in its dominant/racialised, gendered and affective forms.[7] The constitutive role of racial violence in such contexts of domestic service has also received attention as both interrupting as well as being facilitated by the legality of the colonial order.[8] While the violence involved in the conduct of punkah-pulling acquired serious infamy in the late nineteenth century,[9] this chapter takes legally-enabled racial violence as one amongst other (interacting) modalities involved in the conduct of this never-ending task in colonial establishments. It then makes the case that the mediation of the colonial state and its legal agencies extended well beyond the allowance of the European master's quotidian or exceptional violence. It pursues the possibility that even the resolution of apparently minor 'domestic' issues such as who to get the punkah pulled by, could potentially draw upon other kinds of legal/regulatory affordances to supplement the configuration of privatised power and violence in the European household. In attending to the historical recurrence of such issues, this chapter poses domestic work as both the medium but also the *object* of socialisation between the European master and the native servant in a way in which it has perhaps remained relatively underspecified in existing scholarship. What was at stake

[7]Haskins and Lowrie, (2015, 1-19). On gendered dynamics of colonial domestic service see, Chaudhuri (1994), Sen (2009), Chakraborty (2018). The 'affective turn' in the study of colonial domestic service was pioneered by Stoler (2001). Also, Dussart (2015a).
[8]Dussart (2013, 2015b).
[9] An incisive account focussed solely on violence against punkah-pullers is Datta (2019).

in this objective realisation of master-servant terms was not only the production of a ruling identity, but also a very material quota of work that was assumed to be essential to the social reproduction of the coloniser.

In focussing upon the role of regulation and law, the chapter takes its cue from several histories of Indian labour which discuss colonial-legal enactments as creating definite asymmetries in favour of the employer.[10] Along with the criminalisation of the breach of contract by employees and the privatization of the enforcement of labour agreements, another characteristic feature of such asymmetry has been argued to have been the denial of more rule-driven work regimes with defined work descriptions.[11] Since the late eighteenth century, the legal framework concerning domestic service in Britain had begun recognising the master's unqualified ownership of the servant's time during the period of contract.[12] The modern regime of contract posited its formal differences, though also arguably its subtle equivalence with older regimes of work that allowed masters absolute possession of their slave's/hireling's personhood.[13] In comparison, how the master's ownership of the servant's time was legally claimed in European households of British India is a question that could be pursued in its colonial specificity. Particularly, this chapter explores how assertions of such ownership, possibly accompanying the greater regularisation of contractual regimes, came to contend with existing social norms and segmentations of housework in the region.[14] One way of tracing this could be to analyse how indigenous forms of slavery transitioned to different modern regimes of work.[15] This chapter instead takes up the case of punkah-pulling as performed primarily by waged servants and studies how colonial conceptions and administration of service expectations and agreements[16] dealt with questions of 'custom' or caste-based division of

[10] Anderson (2004); Mohapatra (2005); See Ahuja (2007).
[11] Ahuja (2009a, 16).
[12] Steedman (2004).
[13] Ahuja, 'A Freedom', (2013, 119-120).
[14] Historians describe a long precolonial lineage of domestic service in South Asia constituted by significant overlap between caste, slavery, debt-bondage and waged work. Moosvi (2003); Banerjee (2004a, 34-95).
[15] It has been argued that with abolitionist concerns, colonial-legal attempts at sorting indigenous social forms along modern distinctions of 'waged' service and 'customary'/'familial' slavery, ended up effectuating a liberal blend of waged service with 'unfree' work in both Anglo-Indian and native households. Chatterjee (2017); Finn (2009).
[16] See Mohapatra (2009).

work. Such issues came up not only in the private household but also in public barracks and thus this chapter additionally tries to comprehend how the respective work situations in these two contexts compared.

2. Punkah-pulling in the early-colonial household

In the early years of its popularisation in late-eighteenth century Calcutta, the punkah complemented the waving of hand-held fans during meals.[17] But by the 1840s, it was being described as an "indispensable" fixture in "all principal apartments" of European homes, the hand-held fan being "more for ornament".[18] The use of the hand-held punkah was not entirely superseded, but it fanned only "as much as your bearer can featly wave with both his hands".[19] The swing punkah had a more mechanical pendulum-like form with part of the swinging being conducted by force of gravity. It could be used for tending to more than one body and larger spaces like offices, churches and theatres. The difference in scale at which the respective punkahs could operate did not however imply any labour-saving. By the early nineteenth century, along with moving beyond the dining room to other apartments of European households, the punkah was also crossing over another threshold, that of the day into the night, as it came to be used during sleep. Thus whatever the mechanical advantage, the possibility of saving labour was offset by the novel tendency of being 'fanned' more indiscriminately, instead of for specific occasions (like during meal time).

This fairly labour-intensive enterprise of punkah-pulling was delegated to the 'lower' ranks of servants employed in wealthier European households, most often the palanquin bearers.[20] As historians of domestic servants have noted, employment in European households of early-colonial India followed certain hierarchical patterns, often taking after local nobility.[21] The hierarchy was more pronounced at the top, occupied by the literate class like the accountants and the bottom, occupied by the likes of sweepers,

[17]Hickey (1925, p.268). See D'Oyly's Plate VIII, XVI in Williamson (1813).
[18]Stocqueler (1848, 115).
[19]Editors. 'Editorial Notes', *Putnam's Monthly: A Magazine of Literature, Science and Art*, vol. VIII, No.XLIV, August, 1856, p. 221.
[20]Rendrag (1829, 65); Hockley (1841, 81).
[21]Banerjee (2004a, pp.38-43); Sinha (2021, 10-26).

whose work was hereditary and distinctly caste-marked. Between these two extremes, positions like 'khidmutgars' and 'hookahbardars' did not necessarily follow from a fixed caste function. Still, a more definite ranking by wage and status pertaining to work distribution remained even within this middling range.[22] It is somewhere on the 'lower' ranks of this middle range on which was located the palanquin bearers. Usually recruited and commanded by a 'sirdar-bearer' who acted as the head of household's personal attendant, these bearers were employed in numbers of five or more and were supposed to also make themselves useful for other sundry tasks, like cleaning the furniture, that were not performed by figures like 'khidmutgars'.

The occupational category of palanquin bearer extended beyond the household - hired palkis carried by thika bearers being the main public transport. In the second half of the eighteenth century, one group dominated the occupation in Calcutta. These were the "Balasore bearers" – Gwala caste men from Orissa, who had overtaken by far the lower caste Dulia or Bagdi bearers.[23] They were described as a migrant group of "seven thousand of the stoutest fellows" from Bhadrak.[24] Along with other Oriyas in Calcutta they were knit together as a "Commonwealth" – a powerful collective with its own council and chiefs, some Brahmins and others "old sirdars".[25] While the group seems to have *en masse* taken up an occupation performed by castes 'lower' to them, they were still not inclined to be slotted into tasks perceived to be inappropriate of their social/occupational roles. Thus Oriya domestic bearers, Solvyns observed, could not disobey rules set by their chiefs and "refuse to render services which do not appear to be at all out of their line", like lighting a tallow candle or handing a glass of water; yet they continued to be preferred in domestic service for being "much cleaner about their persons than other Carriers".[26]

The reluctance of Oriya bearers about performing certain kinds of tasks in European homes extended for some time to punkah-pulling. In the early nineteenth century, an

[22]Sinha (2021, 23-24).
[23]Solvyns, (1808,'Palanquin Carriers, Ooriah Cast'). See Mitra (1952, 171).
[24]Motte (1799, 55-56).
[25]*ibid*; Solvyns (1808, 'Ooriahs or Orissahs Brahmuns'); Gilchrist (1825¸ 166).
[26]Solvyns (1808, 'Palanquin Carriers, Ooriah Cast').

observation recurs about these bearers but also other Muslim servants, refusing to pull the punkah over a table on which meat of particular kinds is served.[27] Curiously, servants expressing similar reservations about fanning with a hand-punkah seem non-existent in writings about early-colonial Calcutta. The refusal may be deciphered as a strategy to avoid the new laborious assignment. But the refusal also seems consistent to an extent with communal sanctions ensuing from organisational control. The chiefs or "Paramanicks" of Oriya bearers had been reported to be making certain "Ooriya Mehal Collections" on as many as nine counts from natives of Orissa in Calcutta, for occasions ranging from finding work or a place to stay, or as fines when someone would marry outside caste or even when someone "quitting his own caste, eats in another".[28] It is likely that the order of the Paramanicks and the council were carried into individual households through the moral mediation of the sirdar-bearer "that no individual, however attached to his master…dared to disobey."[29]

While Oriya bearers thus remained choosy about assigned tasks, their masters also perceived considerable difference between their conceptions of appropriate duties following from the perceived rank of such 'lower' servants and what these servants eventually agreed to do. It then seems probable that even as European masters internalised the logic of distributing housework into 'customary'/caste brackets, a push towards a more unspecified ownership of the labouring time of certain categories of servants was becoming part of their expectations. Such expectations as enveloped in notions of contract were prevalent in Britain by 1765, when law allowed masters complete ownership over their servants' time for the contract period without a specific work description.[30] Peter Robb argues that while early-colonial law was "generalizing" its own categories alongside "indigenous titles", compromises based more on trust than contract were practiced between European masters and their servants.[31] The recurring

[27]Nugent's account in Nair (1989, 126); Wright (1854, p.278). One gentleman could make them pull punkahs on discovering that the bearers ate the same meat in the secrecy of the pantry. Statham (1832¸ 110).
[28] 'Notice, 5th August, 1790', Seton-Karr (1865, 27-28).
[29] Gilchrist (1825, 170); See Solvyns (1808, 'Palanquin Carriers, Ooriah Cast').
[30]Steedman (2004, 5-6). She shows that servants nevertheless surfaced with more delimited work-descriptions in court proceedings.
[31]Robb (2011, 82).

refusals of Oriya bearers to perform duties like punkah-pulling and frequent accusations about their "insolence" indicate that such trusting compromises had their boundaries. These boundaries were of course also drawn in relation to the master's suspicion of the 'commonwealth' of Oriya bearers whose intervention into domestic work was becoming a definite point of contention by the early nineteenth century. Alongside maintaining regular 'collections' and pronouncing communal rules, the 'commonwealth' also offered protections against personal violence. When "any offence be given to one or more of these bearers', as one observer described, the 'superiors…interdicted all *Ooreeahs* from engaging in the offender's service".[32] Additionally, the 'commonwealth' financially supported its members for getting legal advice and filing complaints about more serious injury.[33]

By the 1830s–1840s, punkah-pulling appears to have been more definitively appended to the bearer's list of chores alongside palanquin-carrying or furniture-cleaning. One contemporary explanation of the Oriya bearer's increasing pliability was the competition he faced from Kahars, recent entrants to Calcutta's labour market from Bihar, a caste associated with domestic service and palanquin-carrying.[34] But it is also salient that after 1857, making the Oriya servant fan over a table serving meat was being described as the "firm" way in which the Bengal Sepoy should have been conducted, "as necessity has obliged us to be with our domestics".[35] Did 'firmness' here indicate something more that went into the overcoming of the Oriya bearer's reluctance other than changes in Calcutta's labour market? Was it then a consistent exercise of personal command by European masters that enforced the pliability of the said servants?

Taking stock of certain interventions by the colonial state that were directed at the working conditions of Oriya labourers in Calcutta since the late eighteenth century, we might adopt a third axis of explaining how the Oriya domestic's persistent reluctance was tided over. While labour market changes and the individual command of European

[32]Gilchrist (1825, 167).
[33]*ibid*.
[34]*ibid.*, pp.169-170; Parks (1850, 33). Kahars of Bihar arriving in Calcutta in the late eighteenth century were in Buchanan's understanding recently freed from enslavement as their native masters could not afford to maintain them. Buchanan (1939, 286-288). See Prakash (1990, 143-144).
[35] Mead (1857, 11).

masters might have put significant pressure on the concerned workers, the everyday extraction of their acquiescence still needed a supplementary push of punitive and regulatory actions executed more directly by the Company state.

Following scholarship that describes an early interest taken by the Company state in framing significant legal interventions affecting the organisation of urban work,[36] one alternative here would be to view the case of Oriya bearers through the prism of the regulations introduced specifically for domestic servants in early-colonial Calcutta. Since 1759, these regulations sought to fix penal limits on servants' capacity to leave work and demand more wages and register them compulsorily.[37] However, as Nitin Sinha argues, these regulations were not necessarily very effective at the level of the household.[38] Sinha's broader point is that these interventions were rather anxious attempts at regulating urban workers whose mobility and bargaining power across intersecting labour markets, including that of domestic service, could complicate the Company state's sourcing of labour for its own core concerns of construction, military and transport.[39] As a converse to Sinha's argument, it would be useful to trace the fading of the Oriya's bearer's 'insolence' not so much in the state's direct policy concerning domestic servants, but rather by following the consistent regulatory encounters between the Company state and thika palanquin bearers of Calcutta, with whom the recalcitrant Oriya domestics shared a common social existence.[40] The regulation of domestic work and the regulation of transport labour could have had overlapping scope, as both needed 'freeing' from the collective mediation of the Oriya council and Paramanicks.

The concluding decades of the eighteenth century saw the Company state's dealings with this collective become a protracted conflict. By the 1770s, meetings convened by Oriya

[36] Ahuja (1999, 2002); Ahuja's work contrasts with the position in Anderson (1993), that extant social structures like caste and family were adequate for labour mobilization by the colonial regime without any remarkable state intervention.
[37] Long (1869, 181-183,209,446).
[38] Sinha (2019, 343).
[39] *ibid.*, pp.331-336. See Marshall (1987); Sengupta (2016).
[40] Historians have emphasised the early-colonial state's substantial investment in regulating service labour like dak-runners or boatmen, who as transporters of messages, goods and troops had immense significance to the early state-building processes of the Company. Joshi (2012); Sinha (2014a).

chiefs were being forbidden.[41] In 1790, the financial sustenance of the collective was challenged by suspending all monetary collections made by Paramanicks.[42] Simultaneously, wages of thika bearers were fixed.[43] But by 1803 these wages had to be fixed again amidst growing frustration at a thousand bearers becoming unavailable around the pilgrimage season.[44] In the ensuing tussles between the state and the Oriya collective, the highest orders of colonial rule came to deliver well-publicised, exemplary acts of discipline. In 1813, when faced with the refusal to pull the punkah, Governor-General Hastings threatened to discharge all his Oriya bearers. The bearers "discussed the matter for two or three days" before agreeing.[45] The conflict still continued. In 1819 thika bearers stopped work in protest against fixing of hiring rates by the number of miles covered.[46] In May 1827 a rigid measure of compulsory registration, wearing badges and payment by clock-time was enforced. This resulted in a general strike by Oriya bearers.[47] But by 4 June 1827, the opposition was "considerably diminished", the men having given in to the government's proposals.[48] It is worth noting here that at the time of the strike, a European in Calcutta introduced a palki converted into a cheap animal-drawn carriage called the "Brownberry", explicitly posing it as a substitute for palanquins.[49]

In the second decade of the nineteenth century the colonial state brought in another set of draconian laws targeting domestic servants with unilateral penal sanctions. The most significant of these was Regulation VII of 1819 that carried a one-month imprisonment clause for servants displaying "neglect to perform work" or wilfully quitting without fifteen days' notice.[50] These regulations further reinforced the individual command of masters. But it would still be difficult to understand the noticeable dissolution of supposed restrictions involved in pulling the punkah over European meals, without

[41] Marshall (1987, 24).
[42] 'Notice, 5th August 1790', Seton-Karr (1865, 27-28).
[43] 'Notice, 29th May 1794', *ibid*., pp. 117-118.
[44] 'Bearers', 12th May, 1803, Seton-Karr (1868, 130).
[45] Wylie (1854, 147).
[46] Mukherjee (1977, 28).
[47] 'Strike', May 28, 1827, Chaudhury and Mukhopadhyay (1975, 166).
[48] 'Strike', June 4, 1827, *ibid*., p.166. See Chakraborty (2017, 52-53).
[49] Mitra (1952, 173-174).
[50]Papers Relating to East-Indian Affairs viz. regulations passed by the Governments of Bengal, Fort St. George, and Bombay in the Year 1819, London, 1821, p.23.

accounting for the state-led offensive against the communal capacity of Oriya workers that we just described. Similar to what Ravi Ahuja discusses for Madras in the same period, the colonial state's policy towards these workers in Calcutta was one of "direct intervention in elementary aspects of social organization."[51] With the 'commonwealth' of bearers, it was thus not enough that they would be made to navigate new regulatory grounds - it was also essential that the very principles of intermediation through Paramanicks that constituted their pyramidal collective existence would be contested. What followed was a taming of the thika bearers, surely aided further by the concurrent diversification of the transport labour market in Calcutta. But a definite corollary to this was also the replacement of some of the real or strategic semantics of the work culture in European households by a (relatively) more decisive command of the master and the acquiescence of some more multi-tasked servants.

In his 1841 'Handbook', Parbury claimed that the employment of domestic servants had entered a new era as many instances were known in which natives had conceded to become "servants of all work".[52] He was describing a tendency at best. The lowest rungs of the service hierarchy continued to be populated by the lowest castes and the highest rungs continued to be out of the bounds for any other but the literate castes. Yet the negotiability afforded to the middling yet 'lower' attendants like bearers by way of the mediation of their communal collective in the employment relation, was now somewhat lost. The most obvious implication of this was their obedient participation in gradually increasing hours of punkah-pulling. It is also likely that they agreed to perform other aspects of housework like lighting candles, serving food and water, etc. which they earlier refused citing communally-issued restrictions.[53] Intermediation too need not have ceased entirely, but it no longer carried the weight of collective norms and was restricted to the individual role of sirdar-bearers within particular households. In any case, with the disempowering of extant collective forms of arbitration, the scope was created by the active intervention of the colonial state to *socially* install the master as the ultimate

[51] See Ahuja (1999, 187-191) for Police Regulations in Madras aimed at the indigenous intermediaries controlling labour groups.
[52]Parbury (1841, 473).
[53]Compare earlier account of Oriya bearers in Solvyns (1808, 'Palanquin Carriers, Ooriah Cast'), with the 1820s description in Gilchrist (1825, 169).

authority of what could constitute adequate work-descriptions of his servants. This social authority was, as will be seen, an important factor in future judicial deliberations over work contracts that did not have the benefit of penal clauses incriminating servants - those in Regulation VII being read down by the time of the First (1837) and Second (1847) Report on the Indian Penal Code,[54] and the regulation itself repealed in 1862.

Even as 'servants of all work' could then be handed the unforgiving task of punkah-pulling, a second, more divergent tendency could also be seen from the new conditions under which this work was being conducted. With the punkah in every apartment and the nocturnal extension of punkah-pulling, the puller was suddenly in certain places at certain times beyond his stipulated entry, for cleaning, etc. This did not necessarily sit well with masters' sensibilities.[55] He was consequently removed to a space outside immediate visibility – to the verandah or outside the building, by passing the cord (of the punkah) through a hole in the wall.[56] Since the early decades of the nineteenth century, the punkah was moved by "unseen hands" that did not have to stop for the sake of privacy, thus further strengthening the tendency of having it pulled for longer hours. Being thus extramurally confined to relative invisibility as well as somewhat sequestered from the domain of servant's sociability,[57] the puller of the punkah became liminal to the world of household work. Perhaps, the grounds were thus laid for his role becoming increasingly de-domesticated. But de-domestication was not simply an architectural shift. In tandem with the increasing tendency of having the punkah pulled continuously and across private and public establishments alike, de-domestication amounted to a separate occupation, that of 'punkah wallahs' or 'punkah coolies', hired temporarily every hot season and separate from the existing retinue of household retainers or barrack menials. And yet de-domestication was also not a total phenomenon, as masters continued to press their enlarged claims over their domestic servants' time by enjoining them to pull their punkahs whenever need emerged.

[54]For some exceptions like palanquin bearers, the provisions continued. 'Chapter XIX', IPC, 1860' in Morgan W. and Macpherson, A.G. The Indian Penal Code (Act XLV of 1860) with notes, Calcutta, 1863, pp.428-431.
[55] Johnson's account, Nair (1989, 820).
[56]The only known American swinging punkah designed to keep the slave outside the master's sight was imported from India. Byrd (2016, 33).
[57] Oriya bearers being specifically known for enjoying such sociability. Williamson (1810, 305).

3. The de-domestication of punkah-pulling

Over the first few decades of the nineteenth century, medical arguments had begun advocating the punkah as essential protection against the newly-classified 'tropical' climate of India.[58] Contrary opinions still existed that the punkah merely circulated hot air and the European was better off in the open.[59] And even as the Indian climate was construed as severe enough to require artificial remedy, technical alternatives like various thermantidotes and ventilators competed for favour alongside the punkah. If the use of punkahs in comparison started appearing as more necessary to European life in India, this could have had something to do with the dissolution of servants' quibbles about pulling them in European households. Manual punkah-pulling was also proving a more economic option compared to other alternatives as well as to automated forms of the device that had already come into existence. In sovereign Awadh, to take one example, palace punkahs were driven entirely by steam since 1819.[60] But as explained a later editorial, in India, "there is no power that could be purchased for punkah work at so moderate a price as that of the human muscle."[61]

Till the 1840s, European households did not employ servants to pull punkahs non-stop. Servants called 'punkah wallah' appear across European homes in this decade, yet much like bearers, they carried palanquins and performed "a housemaid's work".[62] Householders still warned against making a "habit" out of the limited "luxury" of the punkah.[63] The regularisation of a separate occupation solely dedicated to punkah-pulling then actually owed more to developments outside the household. The punkah's medical necessity was urgently pressed on in the case of European soldiers, as their dire health

[58]See Johnson (1818, 79, 409-410); 'Report on the meeting of the "Medical and Physical Society of India"', *The Asiatic Journal and Monthly Miscellany*, December 1828, pp.716-719. For different views on the understanding of European susceptibility to Indian climate see, Harrison (1999) and Arnold (2004).
[59]See Anon., 'Late Dinners', *The Bombay Times and Journal of Commerce*, May 25 1844; The view was also held by military observers for many years to come. Royal Commission on the Sanitary State of the Army in India. Vol. I. Report of the commissioners. Precis of Evidence. Minutes of Evidence. Addenda,London, 1863, p.206.
[60] Tann and Aitken (1992, 207).
[61]Anon., 'Editorial', *The Bombay Times and Journal of Commerce*, October 22 1856, p.675.
[62]Anon., 'A twelvemonth in Calcutta', *Chambers Edinburgh Journal*, new series, No.344, August 3, 1850, p. 66. See Ashmore (1841, 77).
[63] Grant (1849, 21).

situation became increasingly visible.[64] Consequently, the colonial state committed to undertake the expenses of punkah-pulling for European troops in 1848, and for *all twenty-four hours* of the day in many cantonments.[65] By then, the state had also begun paying for punkah-pulling in its offices and as part of residential provisions made to its higher officials. The 'punkah coolies', as servants solely hired for the purposes of punkah-pulling, first emerged as a separate occupation sometime around mid-nineteenth century to meet the demand for continuous cooling primarily in public offices and barracks.

Discomfort with an increasing scale of expenses was soon felt. The Civil Finance Commission initiated in 1860 was welcomed with the hope that it would diminish the "(T)he two armies of Locusts", those of the punkah pullers and the chuprasees.[66] In reaction, the appeal of the punkah emerged pointedly in a wider public consisting also of native claimants. The editor of *Hindoo Patriot* Girish Ghosh found it ridiculous that the Commission sought to deny native clerks state-sponsored access to punkah-pullers as they did not use the device at home. At home, he claimed, the native did not really need it since he was after all "unfettered by…the shirt and the neck-tie, the pantaloons and the dress coat".[67] It is useful to specify here that the punkah was certainly used in more elite native households. Yet, while this chapter does not offer a fuller analysis of the issue of punkah use by native elites, it does seem likely that this use was significantly more moderate compared to European wants. Part of this can be intuited from the continuing allusions to overhead fanning devices as luxurious indulgences made by Bengali commentators well after their popularisation in colonial Calcutta and till even the early decades of the twentieth century.[68] BankimchandraChattapadhyay in an 1872 essay thus mocked the borrowed tastes of Anglophile Bengali elites in possessing amongst other

[64]Anon., 'The Sick Room in India', *The Calcutta Review*, Vols. V-VIII, 1845, pp. 71-101.See Arnold (1993,61-72).
[65]Anon., Untitled, *The Friend of India* (FOI), March 2 1848, p.133. See 'Proceedings of a special committee assembled at Dum Dum', Military Department (Quarter Master General), October 28, 1853, Ref. O.261, National Archives of India (NAI).
[66]Anon., Untitled, *FOI*, November 8 1860, p.1057.
[67] Ghosh (1912, 82).
[68] Sharma (1877, 1); Ray (1932, 501).

things, "punkahs (fans) – seldom meant to be pulled."[69] The more urgent native demand for punkah services, like Ghosh's, were a concern of an emerging professional middle-class and continued to be directed at public establishments of the colonial state.[70]

The claim to the state's punkah allowances also gathered emotional volume in more expected quarters, across lines of social stratification amongst Europeans in British India that historians have identified as separating higher orders of civil servants, army-officers, planters and businessmen from a miscellaneous group encompassing soldiers, employees and intermediaries in government and private services.[71] While middle-class native claims were to the use of the punkah in public spaces for working hours, Europeans were interested in allowances that covered the whole day and their places of habitation.[72] For much of the second half of the nineteenth century, the colonial government ran a sustained campaign to reduce punkah-pulling expenditures in barracks and for lower-order officials. Going by the acrimonious reactions to this campaign,[73] continuous punkah use as a health necessity seemed to also have had added import as an aspirational ideal for Europeans.[74]

Clearly then, the habit/aspiration of being continually fanned had hardly stayed confined to public sites. Consequently, a separate category of servants dedicated to fulfilling this habit appears in accounts about urban European households not long after the state-enabled regularisation of day and night punkah-pulling in barracks and offices. A detailed description comes from journalist Thomas Knox:

> There is a certain class of servants, known as *pankha-wallahs* (punka-fellows), who work these fans and are hired for that

[69]Quoted in Chaudhuri (2015, 156).
[70]Anon., 'A Novel Method of effecting a saving', *The Amrita Bazar Patrika*(*ABP*)¸October 12 1900, p.5.
[71]Arnold (1979a, 1979b); these lower professional classes could be further differentiated from more marginal groups like European orphans, vagrants, prostitutes. Fischer-Tine (2009,57-61).
[72] See the exchange: Anon., 'Wanted to know', *The Times of India (TOI)*, October 11, 1871, p.2; Anon., 'Effective Replies', *TOI*, October 25, 1871, p.2; Anon., 'Thanks for the Information', *TOI*, November 14, 1871, p.2.
[73] For instance, Anon., 'Shall our Officers die?' *FOI*¸ June 12 1862, p.648.
[74] Arnold (1979a, p.105).

> purpose…they boarding themselves. They stand outside and work the punka by means of a cord passing through a hole in the wall…You have a punka over your bed, another over your bath-tub, another at your dressing-bureau, another over your dining-table, and another above your desk. Your body-servant calls out to your punkha-wallah, and has him shift from one cord to another as you go from one room to another. You have the punka in motion all day and all night somewhere, and for this purpose you must have two men to relieve each other…[75]

While this description perhaps applied to the very well-off, it nonetheless serves the purpose of parsing certain tendencies shaping a newly de-domesticated system of work that facilitated continuous punkah use in European homes over the second half of the nineteenth century. The system had at its core servants called 'punkah wallahs' who were solely dedicated to the (potentially) constant running of punkahs. They were to be hired in multiples in order to relieve each other and this even went up to three/four punkah wallahs per day, serving in shifts of eight/six hours.[76] They worked outside the direct perceptual domain of the master and also housed separately from the household.

Who were these punkah wallahs? In European establishments of Calcutta, the Gwalas of Orissa and Kahars of Bihar continued for some time to be the main migrant groups that took up punkah-pulling as a separate occupation.[77] As we have seen, the former group was previously associated with both palanquin-carrying and domestic service that had begun including punkah-pulling since the early decades of the nineteenth century. The 1876 Census of Calcutta had most of the nineteen-thousand-odd Oriyas in the city still working in the same professions of "house-bearers and punkah-pullers, and as palki-bearers."[78] Palanquins however were gradually being replaced in the city with a variety of

[75] Knox (1882, 298).
[76] Mattson (1891, 168).
[77] Bhattacharya (1896, p.314). See Ricketts, H. 'To the Editor of the "Calcutta Review"', *The Calcutta Review*, Issue, LXXXIX, 1867, p.233
[78]Beverley, H. Report on the Census of the town of Calcutta taken on the 6th April 1876, Calcutta, 1876. p.22.

horse-drawn carriages and horse-keepers and coachmen had begun substituting palanquin-bearers in households.[79] In the 1881 Census the number of registered "palki-bearers" was only 4085 compared to the 11,500 in 1850.[80] And by 1901, there were just about 1342 of these bearers in the town and its recently amalgamated suburbs.[81] It would then not be too off the mark to presume that many from the profession of palki-bearers made a not-too-radical shift by taking up the relatively new vocation of punkah wallahs, as palanquin transport gradually became limited in the city.[82]

The market for de-domesticated punkah labour extended beyond established migrant groups. Oriyas in Calcutta were themselves becoming more differentiated with the addition of castes like Bauris.[83] But a clearer indication of the diversification of this labour market could be the generic appellation 'coolie' becoming appended to the nomenclature of punkah labour, more often in barracks, but also not infrequently in households. The term 'coolie' broadly indicates the migratory lower strata of the non-landed agricultural labour population, in considerable supply in colonial India to be mobilized for public works, mines, plantations and also some forms of personal service.[84] The nomenclature 'punkah coolie' also makes sense when we learn that employment of such servants intersected with trajectories of plantation labour (coming from areas like Chota Nagpur) who were more typically referred to as coolies and some of whom at least preferred punkah work over plantation labour.[85] 'Punkah coolies' were also hired in Calcutta from "up-country" castes further down the social order like Dusadhs and Rajwars[86] and Muslims from eastern/lower Bengal.

---

[79] Mitra (1952, 171-175).

[80]Beverley, H. Report on the Census of the town of Calcutta taken on the 17th February 1881, Calcutta, 1881, p.45. 1850 figure from Mitra (1952, 172).

[81]Blackwood, J.R. *Census of India 1901, Vol. VII. Calcutta, Town and Suburbs. Part IV Report (Statistical)*, Calcutta, 1902, p.90.

[82] Some amongst Oriya palanquin-carriers also shifted to becoming porters at jetties and markets. Tagore (2016, 31).

[83]*ibid*.

[84]On 'coolies' see Breman and Daniel (1992).

[85]See Hunter (1872¸ 37); Varma (2017, 116-117).

[86]Considerable anxiety existed about their 'criminal' tendencies. Anonymous. 'Crimes known and unknown', *The Calcutta Review*, Issue CLXXV, January 1, 1889, p.8; Gouldsbury (1912, 51-52).

Over the last few decades of the nineteenth century, many such streams of migrant labour – old bearers and new 'coolies' – steadily assembled every 'hot weather' period in Calcutta, to earn the seasonal component of their subsistence incomes by pulling punkahs. One 1890 estimate of their number in Calcutta was 28,000.[87] Another 1902 description was of a 10,000-15,000 strong migrant population of 'punkah coolies' from Chota Nagpur and Orissa leaving from Howrah station in November, at the end of "hot season", a "remarkable (annual) exodus".[88] The large numbers mentioned could possibly be counting migrant labourers employed in a variety of occupations (including jute industry) not confined to punkah-pulling.[89] But there can still be little doubt that for an urban centre like Calcutta, the supply of punkah labour was large and of a gradually diversifying profile.

There might be parallels between de-domesticated punkah labour and the servant group of 'mehtars'/scavengers in Calcutta. As Tanika Sarkar points out, while Calcutta households always kept a strict distance from their mehtars based on untouchability, the mehtars did have some bargaining power in terms of the caste exclusivity of their profession.[90] After the 1860s, many new groups of North Indian migrant labourers joined the ranks of existing 'Dhangars' and other lower castes in the market for manual scavenging labour in Calcutta.[91] Around 1863, scavengers were also given compulsory public status as they came to be registered under the Calcutta Corporation. These developments, Sarkar contends, initially led to a loss of the scavengers' bargaining power, even as they still faced the most direct brunt of caste discrimination within contexts of private employment.[92] But in later decades, induction into public service also brought respectability and a capacity for political resistance.[93]

---

[87]Anon., 'Mechanical Punkah-Pulling', *The Electrical Engineer*, January 10, 1890, p.23.
[88]Anon., 'Calcutta Punkah Coolies: An Exodus', *TOI*, November 4 1902, p.5. It was also mentioned that many of them stayed together around Circular Road and Bhawanipur.
[89]The only Census of Calcutta, of April 1876, that counted punkah-pullers as a separate class, recorded 2118 males, far less than bigger numbers quoted above. Beverley, H. *Report on the Census of the town of Calcutta taken on the 6th April 1876*, Calcutta, 1876. pp.lxxxviii-lxxxix. But there could be undercounting as it took place right at the cusp of the hotter season in Calcutta.
[90]Sarkar (2017, 37).
[91]*ibid*., p.31.
[92]*ibid*., p.37.
[93]Sarkar (2019, 264).

Like scavengers, one consequence of a large and variegated supply of punkah labour could have been a downward pressure on the bargaining power of existing groups performing this work in Calcutta, due to which the wages for punkah-pulling remained almost stagnant in the city. An official survey showed that the monthly wages of punkah-pullers in Calcutta rose from Rs. 5 to Rs. 6 between 1890 and 1912.[94] Prior to this, in 1841 the monthly wage was Rs. 5-6, in 1877 Rs. 5 and an 1893 household guide mentioned that two "punkah coolies" could be hired in Calcutta for Rs. 9.[95] The 1841 account described the "punkah bearer" as assistant to the "Sirdar Bearer or the House and Furniture Domestic" (who himself received Rs. 6 to 8), which suggests that punkah-pulling was not the only duty of this servant. Taking this domesticated 'punkah bearer' as base, it could seem that the later, possibly de-domesticated 'punkah coolie's' wage in 1893 might have actually fallen a bit. Or, the 1893 household guide's estimate of the wage of a 'punkah coolie' might have corresponded to a cheaper category of labourers, than those who came within the ambit of the government survey covering the years 1890-1912. In any case, the wage figure does not seem to have risen much over the second half of the nineteenth century, a period when the separate occupation of the punkah wallah/coolie came up in Calcutta.[96]

To continue with the comparison between punkah labour and scavengers, the public hiring of punkah coolies in barracks hardly gave them socio-political recognition as public servants like the Corporation-employed scavengers, partly due to such coolies remaining seasonal and temporary hires. Instead, as we shall see in the next section, a new system of contractor-based employment led to more aggravated conditions of exploitation for such casualised labourers. On the other hand, the de-domestication of punkah work with respect to urban private households actually further distanced the

[94]Dutta, K.L. *Report on the Enquiry into the Rise of Prices in India, vol. III. Statistics of wages, Population, Agriculture, Rainfall, Rents, Communications and Freights*, Calcutta, 1914, pp.36-37. This shows a rise from Rs. 5 to Rs. 6 between 1890 and 1912.

[95] Respectively from Rushton (1841, 20); Riddell (1877, 4); Steel and Gardiner (1893, 45).

[96]The punkah-puller's wage otherwise lay somewhere between sweepers on the lowest wages and butlers earning much more The allied profession of palanquin-bearers were paid a comparable Rs. 5 a month around the 1850s, which helps add weight to the suggestion made before that as palanquins started becoming obsolete in Calcutta, many carriers might have shifted more exclusively to punkah-pulling (with similar wages). Mitra (1952, 172).

already (architecturally) marginalised punkah labour from the social and moral constitution of such households. While the scavenger occupied a particular kind of margin of the home in terms of untouchability practices, the household punkah wallahs'/coolies' marginality was made of certain changes in the forms of intermediation that structured their private employment. Such alterations amounted to violence outright dominating other means of disciplining punkah labour.

The 'higher' sirdar-bearer/'body servant' kind of figure appears to have continued to mediate the employment of de-domesticated punkah labour but with some critical differences. As mentioned in the previous section, till earlier in the nineteenth century, the supervisory sirdar bearer was also a moral agent of indigenous labouring collectives, executing their communal norms and protective functions within Calcutta households. By the middle of the century, with the state-enabled erosion of the relative importance of such collectives in the domestic employment relation, the sirdar-bearer was restricted to the hiring and disciplining of his subordinate bearers.[97] However with the diverse and possibly also wage-differentiated range of options now available for recruiting punkah labour, it is very likely that these de-domesticated subordinates were frequently hired from disparate communities over which the sirdar-bearer exercised no necessary moral authority. Sometimes the recruitment involved a corrupt brokerage imposed by the 'higher' intermediary of "one rupee out of every five" paid to the "punkah coolies".[98] Otherwise, the lack of moral authority translated into the sirdar-bearer having to discipline punkah coolies through violence and punitive action, especially those employed for the night shift, who were more likely to be de-domesticated menials hired separately from house servants and the communal kin of the intermediary.[99] Still more common was the master himself inflicting regular violence on the same punkah coolies, as he could no longer depend on the reproduction of obedience through the existing social or moral means of control that potentially applied to permanent retainers.[100]

[97]Stocqueler (1857, 61).
[98]Anon., 'A Punkah-Coolie Raid', *The Pioneer*, September 11, 1898, p.7.
[99]Buckland, C.T. 'Menservants in India', *Littell's Living Age*, vol. CXCII, 1892, p.672; Blanchard (1867, 59).
[100]Discussed later.

De-domestication also had implications for the ways in which existing household servants drew their 'customary' limits in relation to punkah work, now associated with outsider menials. Cases were filed by such native servants for recovery of wages from European masters, in which the designation of punkah-pulling seems to have been a sore point of contention. Such masters were possibly those who, irrespective of stagnant wages, did not find punkah-pulling expenses cheap enough, as the need of continuous punkah use peaked in the second half of the nineteenth century.[101] For them, one obvious possibility existed – to have 'servants of all work' fill in without extra expense. However, this was not necessarily an easy substitution. And yet it was effected time and again as the legal processing of contract enabled the European master to legitimately appropriate more of his domestic servant's work time, irrespective of other 'customary' considerations.

The concerned cases were amongst several other wage-recovery suits in Small Causes Courts likely occasioned by an 1865 judgement in Calcutta that a servant could not be denied due wages if he was dismissed or if he quit without notice before the contract period ended.[102] The frequency of resorting to legal appeal did not however correspond to the frequency of favourable judgment. Yet, resort to legal redress by native servants on principles of contractual reciprocity necessitates a reconsideration of the view that the colonial judiciary's allowance of personalized violent control trumped contract as "a mechanism of enforcement" in housework.[103] These cases on the other hand demonstrate somewhat ironically that contractual principles were often compelled into judicial deliberation irrespective of the allowance of informal 'privatized' control; if only so that judicial action could continuously make contract the medium of realising the European master's claims over the native servant's labouring time.

For instance, in April 1873, a coachman "Permall" in Madras sued his employer Captain Graham for recovering wages after being dismissed for refusing to pull the punkah.

[101] Griffin (1896, 128).
[102] Anon., 'Masters and Servants', *TOI*, August 18, 1865, p.3. For examples of such suits decided in favour of servants see, Anon., 'Small Cause Court, Calcutta, July 21', *TOI*, August 4, 1865, p.3; Anon., 'Small Cause Court, Calcutta', *TOI*, December 16, 1865, p.3.
[103] Sen (2018, 653).

Graham argued that while hiring the plaintiff "he distinctly made him understand" that punkah-pulling was part of his duties. Permall's witness, a horse-keeper, testified that the former had never pulled the punkah while in Graham's employ. Since the witness could not say anything about the initial agreement, the judge dismissed the suit by relying more on the defendant's statement that this was "wilful disobedience".[104] Notably similar is the suit brought by Captain Carmichael's bearer against him in October 1871 in Calcutta to recover wages on being sacked for refusing to pull the punkah. Identifying himself as "sirdar-bearer", the plaintiff argued that except having done it a few times before, he did not consider punkah-pulling his job for which one separate "punkah coolie" was already engaged. Supported by two European witnesses, the defendant argued that "it was the duty of a bearer to pull the punkah". Judge G.C. Sconce eventually dismissed the suit by deciding that the servant failed to perform his duties.[105]

It is important to understand that 'Master and Servant Law' in India did consider the duties of a servant to be those, as a guide to the law put it, "which are customarily held to apply to his particular form of service".[106] Judge Sconce himself wrote that "A bearer could not be lawfully called on to do the work of a Mehter, Khidmutgar, or Cook", though if he agreed to do such work, "he could not, in the absence of an agreement to that effect, claim additional wages for doing it".[107] But judicial practice resorted to the supposition of possible verbal or implied contracts when it came to ascertaining the actual expectation of service, mostly relying on the testimony of European masters. The notion of contract came to bridge the seeming dissonance between legal principle and equally legal practice as the work agreement was often comprehended as including more than what 'custom' specified. State interventions by the early nineteenth century had effectively established the master as the most significant social arbiter over the work-descriptions of particular servants by attacking the mediation of indigenous labouring collectives and by introducing penal measures for servants.[108] The repeal by the 1860s of

[104]Anon., 'Servant vs Master', *The Madras Mail* (*MM*), April 29, 1873, p.2.
[105]Anon., 'Servant vs Master', *TOI*, October 21, 1871, p.3.
[106] Wilson (1899, 73).
[107] Sconce (1870, 50).
[108]Intermediation by communal/caste collectives and their representatives featured in the employment of urban service groups since the earliest design of colonial state labour policies in the eighteenth century. As

such penal measures could have been the context in which civil suits problematising the expectations of domestic work were becoming more possible. But even in the absence of penal provisions, contractuality did not function to guarantee that work obligations and 'customs' mattered reciprocally for masters and servants;[109] contract remained rather a means of re-formalising the master's considerably broadened claim to the servant's time. Consequently, the day and night movement of the punkah could be maintained as a relatively affordable proposition for European households where the number of domestics had shrunk considerably, where for instance, the same servant bore functions of both 'sirdar-bearer' and 'bearer'.

Interestingly, wealthier native households of the time hardly seemed to have had a separate servant called 'punkah wallah', if we go by the examples given by the historian Swapna Mitra Banerjee.[110] This could have been due to the sparing use of the punkah in such households. Given the sparsity of evidence, a somewhat speculative suggestion could also be made here that in elite native servant-keeping practices, the moral control of employing family retainers was more effective, whereby existing servants could be made to pull the punkah without any additional compulsion.[111] Bengali officers at their work place, for example, made the same regular servant work as a punkah-puller, as a groom and as a personal attendant without much controversy.[112] On the other hand, as the cases discussed show, European households could have had to go through a formalisation of similar expectations by resorting to the force of law, in a household atmosphere where insider 'bearers' had firmed up an acute sense of 'customary' (caste?) distinction against a different category of temporary and perceptibly 'lower'-in-status 'coolies', who came in from outside to pull punkahs. Ethnographic observations from these times point to the possibility that those employed in punkah-pulling were socially attributed a lower status,

---

Ahuja argues for Madras city, the state's control of urban labour through such groups was however not "by way of alliance" but rather by "legal techniques of domination" [Ahuja (1999, 194)]. The erosion of the authority of the Paramanicks and the collective of Oriya workers in Calcutta by the colonial state as discussed in the previous section was a similar development.

[109] See Mohapatra (2009).

[110] Banerjee (2004a, 55-65).

[111] Histories of Bengali domestic servants affirm that moral/familial control predominated in their conduct. Banerjee (2004b). This need not however preclude exploitation and violence. Sarkar (2019).

[112] Anon., 'Vernacular Literature', *The Journal of the Royal Asiatic Society*, October, 1885, pg. xx.

unfit for intermarriage even within the same communal formation.[113] More pronounced refusal of punkah-pulling on caste considerations was encountered in the barracks that confirms the steady descent of punkah-pulling down the hierarchy of service labour. The next section discusses the organization of punkah-pulling in the colonial army in terms of such similarities but also the contrasts with household settings.

4. Punkah-pulling in the colonial army

After 1857, the army had become an expensive affair for the colonial state with the ratio of European soldiers being increased to one for every two native sepoys.[114] By the early 1860s, punkah-pulling expenses (granted only to European soldiers) had started appearing as "generally enormous".[115] Labour-saving by mechanical means was one regular proposal to reduce expenses. Complete automation remained a desideratum till the use of electricity, even though some automated arrangements proved effective previously. But certain other mechanical arrangements did come to be pursued more 'successfully', which involved a single puller operating several punkahs together. Military committees had by the 1870s submitted that making coolies tug at mechanical arrangements operating ten, twenty or thirty punkahs was expecting too much and a train of six punkahs was about the "average weight" that they could be "fairly expected to pull".[116] Yet by the 1880s, coolies were still pulling up to ten punkahs together.[117] Whatever might have been the thrift in these arrangements, they hardly quelled the state's continuing financial anxiety.[118] These anxieties were also increasingly being correlated with instances of corruption in the hiring of punkah coolies coming to public notice. To take one example, in 1868 in Allahabad, Hurre Ram, a contractor was found to be getting punkahs pulled for a particular regiment by less than half the number of coolies that he was paid for. When threatened with being reported, he apparently responded that the

[113]See Beveridge (1876, 227-228).
[114]Bhattacharya (2005, 161).
[115]East India. Statement exhibiting the Moral and Material Progress of India during the Year 1860-61, Part I, London, 1862, p.62. Estimates of punkah-pulling expenditure in the barracks of European troops in 1862-63 exceeded the estimates of 1861-62 by over two and a half lakh rupees. Papers relating to Military Finance, &c. (East India), London, 1866, p.21.
[116]Anon., Untitled, *TOI*, August 6, 1878, p.3.
[117] Patterson (1885, 104).
[118]SeeThird Report from the Select Committee on East India Finance; Together with the Proceedings of the Committee, Minutes of Evidence and Appendix, London, 1873. pp.548, 577.

contract he made "was to do the work of the regiment efficiently, and not to supply any particular number of coolies."[119]

The intermediary figure of the contractor could be a crucial point of comparison between regimes of punkah work in urban European households and army barracks. In urban homes of the second half of the nineteenth century, intermediaries like sirdar-bearers were one amongst other means of conducting such work, along with the routine violence of masters and a legal system of employment contracts practically weighted in favour of the employer. This role of civil law in the conduct of punkah-pulling in army barracks is less visible, though the military had its own punitive regulations specific to regimental followers and servants.[120] To the much larger seasonal enterprise of punkah-pulling in the colonial army, employing thousands of coolies across geographically dispersed cantonments, the contractor seemed to have afforded a more essential semblance of management and by implication, economy.[121]

In his analytical survey of labour intermediaries connected to major commercialised/industrialized economic activities in colonial India, Tirthankar Roy suggests that three roles could converge in such figures – a recruiter, a supervisory foreman and a village headman sort of communal representative.[122] The latter two roles are relatively difficult to detect in the functions of the punkah labour contractors of the army. With ample license to conduct unqualified personal violence, 'supervision', if any, was mostly the preserve of European occupants of the barracks who did not hesitate to discipline punkah coolies immediately in the harshest manner, without the contractor or military regulations intervening. And with a much larger pool of labour to source, the contractor perhaps had even less in common in terms of caste or communal identification with the punkah labour he hired, than sirdar-bearers in urban households. In this sense, he also had little similarity with village headmen of the early nineteenth century who, Roy explains, were "inseparable" from their village communities for whom they functioned as

[119]Anon., 'Law Report', *The Pioneer*, August 24, 1868, p.7. See Anon., 'Punkhas and Punkha Pulling', *FOI*, July 16, 1895, p.9.
[120]See Singha (2016); Roy (2006).
[121] In 1869, Bengal Presidency barracks aimed to employ 16,894 punkah coolies. Anon., Untitled, *FOI*¸ March 4, 1869, p.8.
[122] Roy (2008, 997). Roy deals with work sites like plantations, mining and the textile industries.

a non-market medium of interacting with the plantation or indentured labour market.[123] Rather, the punkah coolie contractor had more resemblance with intermediary recruiters of tea-garden workers in a later period, who had scant moral loyalty to any community and were more categorically oriented towards hiring large numbers of varying 'qualities' of labourers at least cost.[124] The contractor was after all the best instrument of economy for the colonial state whereby his recruiting skills formed his primary appeal. In 1888 in Punjab, when the government was finding it difficult to find punkah coolies at five rupees wages, contractors seemed to have engaged whole villages for four rupees a head, often pulling in younger boys to do the work.[125] In other contexts, it had become only too usual for them to employ the cheaper labour of "cripples, the halt, the maimed, and the blind, the old and infirm, and children."[126]

Administrative concern directed towards curtailing the corruption of the contractor thus never eroded his role completely but rather enfolded it within decreasing protocols of accountability. This is clearly evinced by the proceedings of the "Eden Commission" of 1879–80 constituted to re-organize the colonial army.[127] The commission heard several testimonies to the effect that "the manual labour is by the system of contract reduced to the utmost strength of the punkah coolies";[128] "vested interests" ensured that a lesser number or less able classes of coolies were hired; for them, the government paid full wage while the contractor paid "a mere nothing", thus "pocketing the difference".[129] When making its recommendations, the Commission sought to 'reform' the contract system by allotting an annually fixed allowance to regimental commanding officers for punkah-pulling, the expenditure of which was not to be subject to the audit of the Pay

[123] *ibid.*, p.980.
[124] *ibid.*, pp.990-991.
[125] Anon., 'Editorial Article 2', *TOI*, March 6, 1888, p.4.
[126] Appendices to the Report of the Special Commission appointed by His Excellency the Governor-General in Council to enquire into the Organization and Expenditure of the ARMY In India, vol. II, Simla, 1880, pp.357-358.
[127] Occasioned by the Second Afghan War. See Robson (1982).
[128] Appendices to the Report of the Special Commission appointed by His Excellency the Governor-General in Council to enquire into the Organization and Expenditure of the ARMY In India, vol. II, Simla, 1880, p.338.
[129] *ibid.*, pp.357-358.

Department.[130] The measure seems to have ensured that the corruption inherent in the 'economy' of punkah-pulling could continue sans the glaring visibility it had attained.

As another mode of economising, alongside seasonally hired punkah coolies, the military had been getting regimental punkahs pulled by a "moveable column" establishment, maintained throughout the year for miscellaneous duties.[131] This establishment included women who were also tasked with punkah-pulling.[132] The 'Eden Commission' also made contributions towards such supplementary measures of economising on punkah-pulling expenses. While recommending the creation of a more permanent 'dooly bearer' establishment as an "ambulance corps", to be "regularly enlisted, disciplined, and clothed", it further suggested that these bearers could be made to pull punkahs when not engaged in their primary purpose.[133] In an article that opens up the history of the colonial military to a consideration of the non-combatant labour crucial to its upkeep, Radhika Singha counts such "stretcher-bearers" amongst a set of "higher" native followers differentiated from a "lower" motley group of "menial" followers like sweepers, water-carriers and syces, by their gradually consolidating institutional recognition as public employees.[134] On the other hand, the 'lower' group was distinguished by their casual employment and their "meniality" as they included servants performing "polluting" tasks, but also by their being subject to "an indefinite requirement of being 'on call' which resembled the dependency of domestic service."[135] Singha builds upon the context of the First World War. In the second half of the nineteenth century though, the "indefinite requirement" to be on call could possibly be extendible across divisions of both 'higher' and 'lower' followers, pivoted as it might have been, on the question of the apportioning

[130]Copy of Correspondence between the Government of India and the Secretary State in Council respecting the Proposed Changes in the Indian Army System; and, Copies of Dissent, and of Despatches against the Changes proposed or ordered in the Indian Army System, London, 1880, p.82.

[131]"The moveable column,…is a fixed establishment maintained by the Commissariat for various duties...During the hot season they are employed in pulling punkahs…The natives forming this column lived within cantonment limits." Army Medical Department Report for the year 1866, London, 1868, p.374.

[132] Notwithstanding concerns about them being a "fruitful source of venereal disease". Report on Sanitary Measures in India in 1876-'77: Together with Miscellaneous Information up to June 1878, London, 1878, p.222.

[133]Copy of Correspondence between the Government of India and the Secretary State in Council respecting the Proposed Changes in the Indian Army System; and, Copies of Dissent, and of Despatches against the Changes proposed or ordered in the Indian Army System, London, 1880, pp.152-153.

[134] Singha (2010, 60-64).

[135] *ibid.*, p.72.

of incessant punkah-pulling work. Thus like the case of urban European households, in the barracks too, the requirement of bearers to pull punkahs comes across as the sustenance of a domesticated norm of claiming the maximum of existing servants' time, over and above an otherwise de-domesticated system of employing punkah coolies dedicated to the task.

Yet again like in household contexts, the refusal to pull the punkah also eventually became a distinguishing factor between the 'higher' and the 'lower' servant in the colonial army. Over the last two decades of the nineteenth century, it was becoming apparent that dooly bearers in barracks were largely avoiding the task of punkah-pulling as something beneath their caste/status. In 1905, soon after the setting up of a more formalised body of the Army Bearer Corps,[136] military authorities officially recognised this. It was conceded that though "in the eyes of a Hindu the work of punkah-pulling is in no way inferior to that of a dooly bearer", recruitment would be difficult if "Army Bearer Corps men who belong to higher castes" were going to be made to pull punkahs alongside "scavengers, tanners, and other degraded riff-raff…usually employed in punkah-pulling for troops".[137] This exemption came at a time when men of the Kahar caste, commonly associated with dooly/stretcher bearing (yet also no strangers to punkah-pulling), were seemingly qualifying their caste status on count of the higher castes accepting water from them and them being admissible into the interior of higher-caste homes.[138] In effect then, as domesticated labouring groups moved on to claim recognition as public servants, their distinction was carved out against de-domesticated punkah coolies who remained both excluded from the ambit of institutional recognition as well as cast(e) out of the social and affective terrain of the domestic.

Such refusals to pull the punkah of course also came at a time of the maximum incidence of punkah coolies suffering from fatal acts of violence by European soldiers, which would have undoubtedly made the profession quite unpopular. If these coolies were

[136] See A.M.C. Centre (1975).
[137] 'Letter from Principal Medical Officer', November 9, 1904 in 'Exemption of the men of the Army Bearer Corps from punkah-pulling', Military Department (Medical – Ambulance), July 1905, Part A, Os.1820-1832, NAI.
[138] M. E. Milner, 'The Army Bearer Corps', *Journal of the Royal Army Medical Corps*, Vol. 6(6), 1906, pp. 686-687; See Crooke (1896, p.92).

actually slacking or sleeping more at their job for which they were apparently being targeted, this could be understood to be the fairly direct implication of the military establishment searching out categories of lowly-paid labour, capable of the barest exertion and subjecting them to pull heavy sets of multiple punkahs in frequent shifts. More than any cost-cutting, the production of terribly overworked punkah coolies was then perhaps the most striking contribution of the colonial state's measures of bringing 'economy' in punkah-pulling. The racist violence that followed was then very much abetted by such measures.

5. Violence, colonial law and the limits to regimes of punkah-pulling

In the later decades of the nineteenth century fatal violence by 'unruly' Europeans unsettled the legitimacy of the colonial state, as the proto-nationalist criticism of this violence became voluminous. A kind of inaugural event in this was the 1876 'Fuller Minute' by Governor General Lytton criticising the acquittal of lawyer Robert Fuller, who kicked his groom Katwaroo to death when the latter came late to work.[139] The Fuller Minute and later, Curzon's censure of European soldiers' violent conduct,[140] became the most public manifestations of the tension created by 'white violence'. Colonial legal practice however continued to effectively aid the reproduction of such everyday violence by legitimising race privileges.[141] The puller of the punkah was squarely and rather precariously located at the intersection of the adversarial currents of interventions concerning the fatalities committed by Europeans. In the three decades following the Fuller Minute, twenty-one cases were reported from army barracks where punkah coolies died from violence inflicted by European soldiers.[142] Similar fatalities were also reported from civil contexts. The repetitive judicial exercise of decriminalising such violence might make the predicament of punkah-pullers the most representative case of the enabling of racial violence by colonial legality. But before making this classification, it is

[139] See Dussart (2015).
[140]Carrington (2013).
[141]Kolsky (2010); Bailkin (2006).
[142]Figure deduced from tallying newspaper reports from *TOI*, *FOI*, *ABP* and *The Pioneer*, *MM and* Sanyal (1896) and 'Curzon's letter to Hamilton', April 26, 1900 in Despatches to the Secretary of State (Military), June 1900, No.59, NAI. Colonial archives before the late nineteenth/early twentieth century did not categorise violence according to race but according to offense. Bailkin (2006, 470).

instructive to first understand how the colonial judiciary and its adversaries actually dealt with cases of fatal violence against them.

A precedent-setting example in such matters was the case against Mr. Fox, the Assistant Station-master of Tundla, accused of delivering a fatal blow leading to the death of his "punkah coolie" Tulsia on 30 August 1879. The matter came on the heels of the "Fuller Case" and Chief Justice Stuart at Allahabad High Court chose to take cognizance.[143] The similarities between the two cases extended to a diagnosis of the spleen of both victims being "enlarged" and both returning convictions of "voluntarily causing hurt" under Section 323 of the IPC. While the police already excluded the charge of murder, Stuart himself specifically ruled out the charge in the police report under Sec. 304, of "culpable homicide". He explained that it would "be unreasonable to hold that Fox was actuated by the reckless vindictiveness contemplated by Sec. 304" – rather Fox was evidently "dissatisfied and irritated by the lazy and inefficient manner in which the punkha cooly Tulsia was managing the punkha."[144] Thus notwithstanding the coolie's death, Fox's conviction had to be on the grounds of causing 'simple hurt' only.[145]

Jordana Bailkin studies Fuller's and Fox's judgments to show that along with the racialised conceptions of the vulnerability of native bodies, the judgments were also grounded in the scope in (British-)Indian law to identify acts like being late to work as "provocation" and the expectation of "correction" to follow, as mitigating circumstances.[146] She does not however develop the implications of this in her argument that is otherwise about the trivialisation of 'white violence' with the aid of the medico-jurisprudential notion of the enlarged spleen. What Fox's case shows is that the de-criminalisation of racial violence could be effected at different levels. Tulsia's supposedly 'enlarged spleen', as Bailkin would argue, made it impossible to murder him. On the other hand, his apparent neglect of duty practically emptied Fox's intention to hurt him of any further spite or "vindictiveness" that could make 'culpabale homicide'. In more than half the cases of fatalities suffered by punkah coolies in the barracks, the

[143]'Empress of India vs Fox', December 16, 1879, *The Indian Law Reports, Allahabad Series, vol. II,* Allahabad, 1880, p.523.
[144]*ibid*., p.524.
[145]*ibid*., p.527.
[146]Bailkin (2006, 479); by 1860 it was illegal to beat servants in England.

pathological frailty of the native was the main mitigating factor. But much like Fox's instance, most of these cases also yielded the minimal conviction of "simple hurt", with 'culpable homicide' being routinely ruled out.[147] "Annoyance" at being bereft of the services of the punkah-puller could legitimately 'provoke' violence – irrespective of whether the servant was ordinarily injured or extraordinarily hurt/dead, the character of the violence did not receive any different consideration.

A somewhat contrasting case was Curzon's campaign against what he in no uncertain terms considered the "racial prejudice" in the way European soldiers treated their native servants and how the colonial judiciary allowed this.[148] One significant step in this campaign was to compel the army to strictly implement a regulation that any misconduct between soldiers and natives was to be reported immediately to the Military Department of the Government of India.[149] This was already ruffling military feathers as in 1900 the Adjutant General wrote to the Viceroy to make a distinction between "serious" and "trivial" cases, with the regulation of reporting to the headquarters applied to the former only.[150] After this was disallowed, a similar application was made again which noted that "assaults by British soldiers on natives on the menial establishments attached to their corps" be considered "technical assaults" of "no political importance" and thus be exempted from reporting.[151] This time Curzon accepted that such "trivial reporting to which so much objection has been raised" was counter-productive. He then decreed that all "assaults of a positively insignificant character" need not be reported any more.[152]

If colonial judicial practice made the extraordinary out to be one version of the ordinary, Curzon's eventual strategy seems to have been to differentiate between ordinary and extraordinary forms of violence in order to keep up pressure on curbing the latter. The

[147]For examples, Anon., Untitled, *FOI*, October, 28, 1876, p.984; Anon., Untitled, *ABP*, June 1883, p.4.
[148]'Curzon's Note', July 26,1902, in 'Fatal Assault on a punkah coolie at Sialkot by Private Munton of the 9th Lancers', Home Department (Public), September, 1902, Part B, Nos.379-383, NAI.
[149] Regulation in, 'Decision that it is not desirable to stop the reporting of outrages, affrays, &c., to Army Head-Quarters and the Government of India', Military Department (Discipline-British Army), October 1900, Part B, Nos.1072-1073, NAI.
[150] 'Letter from the Adjutant-General in India', August 14,1900, *ibid.*
[151] 'Letter from Officiating Adjutant-General, Proposed Draft Circular', June 18, 1901 in 'Discontinuance of reports to the Government of India of certain classes of trivial cases of affrays, &c. between British or Native soldiers and Natives', Military Department (Discipline-British Army), March 1902, Part A, Nos.2433-2437, NAI.
[152] 'Curzon's Note', July 10, 1901, *ibid.*

native press too seemed to have partly shared in this stand. Its criticism of judicial practice, while stringent, remained concentrated upon establishing the extraordinary character of the soldiers' actions. An example is that of Private Rigby being accused of causing the death of the punkah coolie Menghee in 1893 at Benares and then being let off. *The Amrita Bazar Patrika* strongly attacked the Civil Surgeon's testimony that Menghee was so debilitated that even a single "rude shock" would cause his death. It argued that being in the profession that he was, Menghee must have been used to such 'rude shocks' now and then.[153] The implication was that Rigby had dealt repeated, deliberate blows to cause Menghee's death. Such criticism was aimed at bringing "adequate punishment upon the offenders" as the "surest and most natural way" of deterring violence.[154] But on the other hand, it seems to have left unconsidered the problem of the reproduction of everyday 'ordinary' violence in the work of punkah-pulling, in some degree of analogy with Curzon's interventions.

In repeatedly rendering the more extreme forms of such violence as having only ordinary import, the colonial judiciary certainly confirmed a racial right to 'white violence'. But by way of a paradox, the judiciary's manufactured equivalence between expected and fatal forms of violence can be understood to have been more attuned than its critics to deciphering the underlying continuity between the two. This continuity also becomes visible in the apparent inconsistency between Curzon's claim that assaults by soldiers on punkah coolies were reducing since the government had become "vigilant and alert",[155] and his recommendation of an expanded scale of military expenditure towards electrifying barrack punkahs to stop the same assaults.[156] While this certainly evinces the genuineness of Curzon's intent in pacifying the barracks, it nonetheless leaves open the more difficult question, as to why it was so ordinary to assume that Europeans could have their punkahs pulled only by some amount of violence.

---

[153]Anon., 'Private Rigby', *ABP*, September 3, 1893, p.3. The reporting also perhaps betrayed a sense that even amongst Indian elites beating a servant every now and then was quite possible.
[154] *ibid*. See Anon., 'The Plea of Insanity in Cases of Murder', *ABP*, August 14, 1898, p.3.
[155] 'Curzon's Note', July 26, 1902, in 'Fatal Assault on a punkah coolie at Sialkot by Private Munton of the 9th Lancers', Home Department (Public), September, 1902, Part B, Os.379-383, NAI. It is difficult to confirm Curzon's optimism in view of the number of assaults that recurred over the decade between 1900-1910. Anon., Untitled, *FOI*, November 15, 1900, p.2.
[156]'Curzon's letter to Hamilton, March 14, 1901' in Despatches to the Secretary of State (Military), March 1901, No.39, NAI.

One route following Elizabeth Kolsky, would be to understand 'ordinary' violence against punkah-pullers as continuous with a racist disposition to violence constitutive of the everyday colonial condition, and rendered generalizable by the colonial justice system.[157] Another modality would be to think the case of punkah-pulling alongside a set of work sites in colonial India like plantations or those of convict labour, historically studied for their specific conditions of coercion or systematic violence, in order to decipher the same in the case of punkah-pulling.[158] To take the case of Assam tea plantations, a legal allowance of privatized penal powers to white planters paved the way for intensely fatal outcomes, even as this allowance was justified time and again in terms of the limitations of labour recruitment /control in the region.[159] In thinking the case of punkah-pulling alongside such sites there is of course a risk of explaining these sites and forms of work as exceptional.[160] And yet, without asking after the specificity of these work forms and rendering all violence continuous with the generality of the racialised colonial condition, we lose sight of both how race relations were also work relations as well as why certain work relations bore a greater incidence of violence than others.

European masters spoke in highly affirmative tones about the use of everyday violence necessary in the conduct of punkah-pulling.[161] With the case of native households, such views are certainly not found with any comparable frequency.[162] Exceptions however did exist. For instance, the Raja of Burdwan, B.C. Mahtab, proclaimed that even those (natives) "who are more accustomed to heat" could very well lose their temper when the punkah stops at night.[163] This singular example of course does not void the racist character of the violence against punkah-pullers. Yet it invites us to consider how the affirmation of such violence had a very specific target, who was not any and every racialised other, but rather the sleeping or slacking punkah-puller interrupting the continuous cooling of his master. Alongside legally-sanctioned racial impunity, we then

[157]Kolsky (2010).
[158]On convict labour, Arnold (2015) and Joshi (2013).
[159]Behal& Mohapatra (1992).
[160]Sinha (2014b, 341-342).
[161]Mawson (1846, 175); Atkinson (1859, p.252).
[162]Again this could be explained through an informed speculation concerning different moral relationships determining the master's dominance in such households.
[163]Mahtab (1904, p.73).

need to think of how this target of racial violence was consistently reproduced, if we hope to undo the near naturalization of the role of 'ordinary' violence in punkah-pulling.

The systematic production of the exhaustion of the punkah coolie in the barracks of European troops was only very possible, given the contractor-mediated conditions of their work, of pulling heavy trains of punkahs over too-frequent shifts. To think of why punkah wallahs were tiring faster at their jobs in other sites, like European households of colonial Calcutta, might however yield other reasons. There was a point in the early decades of the nineteenth century when some could still exclaim that the punkah "hardly ever stops!"[164] It is still possible that even with the earliest uses of the punkah, the punkah-puller could be taken over by the soporific tendency generated by the repetitive routine of his work. And the wide allowance of personal violence was also available then to awaken him. It does however seem notable that complaints about the sleepy punkah-puller multiplied with the coming of the separate de-domesticated occupation of punkah wallahs/coolies towards the middle of the nineteenth century. With the need to be fanned through the whole day starting to peak since this period one option as already demonstrated in this chapter was to economise by designating punkah-pulling to servants other than punkah wallahs at least during day-time. But the night presented challenges of a more acute kind, of keeping punkah wallahs/coolies enjoined to their tasks in both households of lesser means as well as in those in which the practice of hiring 3-4 punkah wallahs for the whole day was more generalised.

To meet such challenges, since the 1860s a principle of requiring the night punkah wallahs to rest during the day so that they could pull the punkah uninterrupted at night was prescribed for European households in colonial Calcutta.[165] In some cases, the sirdar-bearer, unhindered by any moral or protectionist concerns for outsider 'punkah coolies', was specifically entrusted with overseeing the change in shifts and assigned the authority to conduct adequate violence, draw fines and issue threats in the course of his handling of night-time punkah-pulling.[166] But this nocturnal activation of the intermediary 'higher' servant was hardly a ubiquitous feature in the attempted management of night-time

[164]'Letter of March 16, 1834', Eden (1872, 106).
[165]Blanchard (1867, 59); Mitchell (1876, 72); Mattson (1891), p.168.
[166]Stocqueler (1857, 61); A.U. (1873, 31).

punkah wallahs/coolies, hired seasonally and separately from regularised servants. The more common practice seems to have become the direct dealing (in racial violence) between the European master and his night punkah wallahs. Such encounters lacked any pretence of intimacy of domestic service but still aimed at meeting a domesticated expectation of ceaseless work. Yet they also involved the exasperated master "rising six times in the night to kick his punkah-bearer awake."[167]

By the last two decades of the nineteenth century such scenarios became more frequent as the measure of compelling night punkah wallahs/coolies to rest during day-time seemed difficult to implement.[168] One gentleman in Calcutta wrote about moving up from three to four punkah wallahs in order to ensure a good night's sleep but to his surprise "found that the work was far worse done than when I (he) had only three."[169] His punkah wallahs did not hesitate to let him know that they were falling asleep at their jobs since "they had gone out and engaged themselves to pull punkahs for someone else" when they were off duty.[170] European masters detested this but could not stop it. An 1886 description of the enterprise of punkah-pulling in Calcutta understood it to be common practice that "large bodies of men" worked at the offices during the day and then proceeded "to the humble homes of the fatigued bread-winners…to add to their earnings by hauling for the further period of eight hours at the end of a rope."[171]

In the case of night punkah wallahs/coolies not obliging their masters with the privatised control over their time beyond designated work-hours, we do get a distinct sense that the various assertions -- violent or legal-contractual -- made by the master over the punkah-pulling servant's time, did not always prove successful. The refusals also were not necessarily sporadic opposition. Cases were being reported since the 1870s in which punkah wallahs took their masters to court on the charge of personal violence.[172] A few instances were also described in which they physically retaliated.[173] It is likely that the

---

[167]Trevelyan (1896, 192).
[168]Buckland, C.T. 'Menservants in India', *Littell's Living Age*, vol. CXCII, 1892, p.672; Israfel (1899, 124).
[169] Fife-Cookson (1887, 241).
[170] *ibid*., pp.241-242.
[171]Anon., 'Calcutta Letter' *TOI*, April 27, 1886, p.4.
[172]Anon., 'The Punkah-Coolie', *TOI*, July 4, 1881; Anon., 'The Litigious Punkha Coolie', *The Pioneer*, June 5, 1892, p.6.
[173]See Anon., Untitled, *ABP*, October 21, 1895, p.5.

"litigious punkha coolie" in Calcutta had as his new ally the 'Congress agitator'. But as S.M. Mitra lamented, in relation to punkah wallahs, the agitator thought "his duty as patriot is confined…to talk alone", with not a single instance being known "in which the Congress has paid for the prosecution of a European".[174] A definite collectivised orientation of the punkah wallahs of Calcutta is nonetheless evident from reports of May and June 1898, when they conducted strikes at various employment sites in Calcutta. Oriya punkah coolies contracted by private firms seem to have initiated this. The first wave subsided with "their services replaced by those of Mahomedans" or by female pullers.[175] But soon after, every punkah-puller struck work at the Municipal Office, and private houses too felt a sharp dearth of them.[176] The demand was the increase of wages, though it was also discussed whether this was a panicked defection at the height of the plague.[177] Eventually, replacements were reported to have been sought out. It is difficult to fathom whether such resources of collective mobilisation survived since an earlier time of Oriya Paramanicks and councils. But we do know that in the following decades a formal working-class body, the "Central Uriya Labour Union", had emerged in Calcutta.[178]

In any case, given that the strike was one among other acts of relative defiance over some time, it could be suggested that towards the end of the century, racial violence of the European master had much more to deal with than simply the waking up of his sleepy menial. Law helped with his impunity, but did not really make his sleep any more peaceful. The problem then was not simply that of the inevitability of racist violence in conducting punkah-pulling. Rather the problem was that violence, as also supplemented by the legal-regulatory compulsions facilitating despotic regimes of domestic work, was not really proving enough. And in this perhaps could be located the very real limits of the regimes of having the punkah pulled cheaply and continuously, that had consolidated over the long nineteenth century. Such limits then help to explain why a regime of mechanisation became more successful at the end of the century than it was before.

---

[174]Mitra (1908, 22).
[175]Anon., Untitled, *FOI*, May 12, 1898, p.14; Anon., 'Female Punkah-Pullers', *ABP*, June 9, 1898, p.6.
[176]Anon., 'Punkah-Pullers's Strike', *FOI*, June 9, 1898, p.18.
[177]Agarwal (2020) discusses the plague in Calcutta as a context of intense workers' mobilisation.
[178]Government of Bengal, *Report on the Administration of Bengal, 1921-22*, Calcutta, 1923, p.xii

6. Conclusion

In this chapter, the short-lived strike by Oriya bearers of Calcutta in the early nineteenth century served to describe the opposition that had to be overcome in order to inaugurate a regime of service work that bound certain domestic servants in European households to an oddly unforgiving task, that of punkah-pulling. The chapter concludes with another strike, of punkah wallahs in the same city, by the end of the same century, to mark the culmination of what this work regime was no longer being able to contain. Private establishments of Calcutta made a swift shift to electrical devices not long after this strike which roughly overlapped with the commencement of public electric supply in the city.[179] After years of trying out various mechanical substitutes, the strike then perhaps did more for the push towards electrical alternatives to the punkah, than any exclusively technical 'improvement' or 'innovation'. It is useful to note here that electrified alternatives to punkah-pulling in army barracks and colonial offices took considerably longer to adopt on a general scale after their experimental introduction in the early twentieth century by Curzon.[180] This was perhaps because the concerns of 'economy' as well as the investment in a corrupt system of hiring punkah coolies remained stronger in public establishments than private ones.

It is also worth emphasising here that the electrified alternative that eventually prevailed was the rotating ceiling fan, a device substantially different from the swinging punkah, whose electrified versions were repeatedly found inadequate since they missed the unique 'jerk' that a human puller would apparently render.[181] The punkah then remained a device that remained fated (on real or imaginary count) to be run by labour and not without it, by work rather than by energy. By way of a conclusion, we could sum up the observations made in this chapter towards attempting an explanation of this ineluctable association between the punkah and human labour. This will also draw to a close our attempt at offering a pre-history of the foremost medium of electricity adoption in colonial Calcutta that was the electric fan. The punkah and its pullers constitute the peculiarly colonial past

[179]Indian Correspondent. 'India as a field for Electrical Enterprise', *The Electrical Review*, vol. 51, August, 1902, pp.257-258.
[180]For an account of experimentation with electric punkahs in barracks see Summary of the Administration of Lord Curzon of Kedleston, Military Department 1899-1904, Simla, 1906, pp.42-44.
[181]See Chakraborty (2017).

of the electric fan that effectively created a ready market for the provision of ventilation and cooling facilities and simultaneously made for a useful 'day load' when electricity was being introduced in the city. Electricity sales in the early twentieth century and later then fed off a habit, though much interrupted, of being continuously serviced by a swinging punkah.

This chapter has tried to show that this habit was cultivated in combination with a despotic regime of work that facilitated the labour-intensive operation of the swinging punkah. Long before the advent of sleepless and fatigue-less "24/7" work, prophesied to be the hallmark of a "late capitalism",[182] the colonial order in India had devised such a regime as a not-so-extraordinary and not-really-illegal modality of bequeathing to the master increasingly greater portions of his/her servant's time over day and night. A large portion of this time came to be increasingly dedicated to working the punkah. Against frequent resistance, albeit often on grounds of caste and custom, this was facilitated through the active involvement of the colonial state in private and public establishments alike, at times through its executive power of crushing organized opposition, or at other times by judicial endorsement of employment contracts heavily weighted in favour of European masters.

As continuous punkah-pulling came to be externalized as a function to be carried out by de-domesticated servants, racist violence (with its legal legitimisation) assumed prominence as a mode of conducting this work. Such externalization of punkah work also served to create a hierarchical differentiation amongst the service class that mapped onto the caste distributions of Indian society. Sliding down this hierarchy, de-domesticated

[182]Crary (2013).

punkah-pullers, were in turn made to walk the tightrope of liminality and precarity as they remained excluded from both the moral order of the household as well as formal recognition as public servants. Notwithstanding the de-domestication, continuous service continued to be imposed on them. Meanwhile a parasitic agreement between the colonial state and labour contractors ensured that the seasonal hiring of punkah coolies continued in the most corrupt yet 'economic' fashion in the army. The respective systems in private and public establishments worked for decades and so did the punkah, beating any and every mechanised alternative that came its way.

Through much of the nineteenth century the punkah often appeared as something of a technical anachronism, hardly offering the comfort it promised. But at the end of this chapter, we can perhaps surmise that the question concerning the punkah was hardly a technical one of how well it worked, but rather how a certain regime of work could perform the requisite exactions from its pullers. And so the punkah started making way when its pullers eventually began unravelling this regime's control mechanisms; or when such exactions left too many of the pullers dead by the side of the punkah rope, by a violence that was as systemic as it was (so often) purely personal. The 'innovation' of the electric fan did not really offer any technical supersession of such conditions. It was actually more of a social relief to embittered European and native masters from the organized opposition being offered by punkah wallahs and from the gory spectacle of death that the punkah system was very often becoming.

Chapter 2: The beginnings of the colonial regulation of electricity and the legal excision of municipal control

1. Introduction

While beginning in the previous chapter with an account of the past of punkah-pulling as the pre-history of electricity supply, this second chapter onwards the thesis deals with the more direct conditions of introducing electricity in cities of colonial India. This chapter specifically studies how the anticipation of the coming of electricity supply led to a series of regulatory and legal enactments and discussions in late 19th century colonial India. As urged in the 'Introduction' to this thesis, it is useful to go beyond the (historiographic) misapprehension that regulation was either an obstacle or simply a neutral accompaniment to the early development of electrical technology. Instead, the history of the regulation of electricity can in many ways be a critical entry point into enquiring how the spread of current electricity took specific forms in different regional contexts. Not unlike other cities of the western world, the late 19th century entry of technologies of electric lighting and power into colonial cities too had to be carefully sieved through a legal-regulatory framework.

This second chapter explores the inauguration of such a framework in colonial India over the two decades of the 1880s and the 1890s. The chapter concludes at a point when two actual schemes - one for electric lighting and other uses and the other for electric tramways - eventually commenced operations in colonial Calcutta. Before the wires of such schemes were hung across the lanes and passed under the ground of the city, thick volumes of communications and discussions debated what kind of authority would be in charge of such wires and the energy that they carried and what rules would govern their existence. The chapter studies these debates to firstly explore how the colonial state in India sought to chart a different legal-regulatory trajectory from its metropolitan counterpart in the hope of being better attuned to the needs of private electrical capital in the colony. The chapter shows, how in this process, the state appropriated an authoritative position against urban local self-governing entities like municipal corporations who were developing their own means of expert-mediated governance of electricity systems. In tracing this excision of municipal authorities from the realm of electricity governance, the

chapter also demonstrates how the state's appropriation of authority in all matters electrical nonetheless remained a somewhat hollow exercise, as it chose to pursue an active policy of what is described as 'legislation by deferral'. This strategy, it is argued, entailed a continuous postponement of most concerns of electrical law and rule-making and expert consultation to a domain of future and provisional settlement.

Finally, as a counter-example, the chapter also tries to analyse how actual acts of regulatory mediation within the domain of the municipal corporation/'Local Authority' fared in terms of the objectives of governing electricity supply in these early decades, when such authorities had certain direct dealings with private actors seeking to produce and supply electricity within their urban jurisdictions. Amongst other things, the chapter will show how in colonial Calcutta, a push from rate-payers through native representatives in the Municipal Corporation actually functioned more as facilitation rather than obstruction of the electrification of the tramways in the city. The Corporation was also more of an active site than the colonial state in matters of courting expert advice to govern projects of urban electric lighting. With these early instances, the chapter will aim to establish that the politics of local urban government was hardly a 'conservative' element in the early governance of power systems being introduced in the cities of colonial India.

2. Colonial beginnings in the regulation of electricity: 1882-1887

The necessity for making some sort of rules for regulating electric lighting schemes was first felt in British India around the same time as the new Electric Lighting Bill was introduced in England in 1882. The immediate expression of this was in April that year when a rather worried Director General (D.G.) of Telegraphs, Col. R. Murray, initiated an appeal with the Government of India (GOI), to prohibit overhead wires in order to protect the imperial telegraph and telephone lines from disturbance by induction effects and to protect common members of the public from the danger of breaking wires.[1] The cause for this appeal was a concern named the "Eastern Electric Light and Power

[1] 'From Col. R. Murray, Director General of Telegraphs in India (D.G.Tel) to Secretary to the Government of India (GOI), P.W. Dept (PWD)', No. 412T, April 20, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, National Archives of India (NAI henceforth).

Company Limited" launching an ambitious project of introducing arc and incandescent lighting (using the "Brush" system) through overhead wiring systems in about ten cities in India (including major Presidency towns like Bombay, Calcutta and Madras). The D.G. was also aware of a second company going by the name of the "Indian Electric Light Company" - introducing electric arc lighting (Jablochkoff system) in Calcutta's Eden Gardens and a few other Bombay establishments - which was otherwise committed to using only underground wires.[2]

Having taken a look at the précis of the 1882 Bill in England, the D.G. noted that while it did not explicitly prohibit overhead wires, it throughout contemplated the use of pipes under streets.[3] Moreover, he was also informed by the Engineer-in-Chief of the British Postal Telegraphs that "Mr. Chamberlain's new Regulation Bill" required the local Municipal Authority's assent for any overhead construction and most of the companies who initiated sufficiently large schemes were primarily adopting the underground system. The Engineer also described the use of overhead wires for electric lighting in England being merely experimental and opined that these wires could lead to charges of manslaughter if they result in any electrical fatality.[4]

The imperial government certainly took this seriously as it instructed all provincial governments to compulsorily consult the D.G. Telegraphs when sanctioning electric schemes.[5] Eventually it also issued a circular explicitly instructing these governments to not permit overhead wiring systems for electric lighting and mandated that all the underground wiring for such schemes were to be maintained at a distance of 30 feet from telegraph and telephone wires.[6] But this decision hardly passed unprotested. The Government of Bombay wrote back to the GOI, complaining that this was "an

[2] 'From D.G.Tel to Secy, GOI PWD', No. 466 T, June 20, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.
[3] *ibid*.
[4] 'From E. Graves, Engineer-in-Chief, British Postal Telegraphs to D.G.Tel', June 8, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.
[5] 'From GOI, PWD, CIVIL WORKS, TELEGRAPH to all Local Governments', Nos. 172-183 T, April 28, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.
[6] 'From GOI, PWD, CIVIL WORKS, TELEGRAPH to all Local Governments', Nos. 347-360 T, July 12, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

unnecessary interference with Local Government" especially for a "city possessing a Municipal Government so well-established as Bombay". It also noted that electric lighting while novel in India, had its principles well-ascertained already and the municipal authority of the city and provincial government were equipped with "an abundance of good professional advice" so as to ensure the protection of imperial telegraph and telephone lines. A critical point of contention was that in the English bill, the Local Authority had to be satisfied with the works and there was thus no need in the Indian case for higher levels of government to get involved in "constant minute interference with Municipal affairs."[7] In the case of the recently started lighting scheme in Bombay, the Commissioner of the city had already impressed upon the Eastern Electric Light and Power Company that telegraph and telephone wires were not to be affected. He had also negotiated that much of the wiring would be underground, but he was not prepared to say that the Municipality should insist upon this absolutely in all cases, when the Company "is only beginning operations and stands in need of support".[8]

By August 1882, the imperial government was informed of two more lighting schemes in Surat[9] and Broach (contemporary Bharuch)[10] where overhead wiring was already in operation and where these wires supposedly ran quite close to telegraph and telephone cables. There were then in western India at least three schemes which were in ostensible violation of the instructions of the imperial government circular. These schemes were however staunchly defended by the respective municipal authorities who claimed to have a more definite sense of how the wiring was actually taking place compared to imperial telegraph authorities.[11] All these schemes in Bombay, Surat and Broach, were being run

[7] 'From Secretary to the Government of Bombay, PWD, to the Secy, GOI, PWD', No. 21 T-1235, July 10, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[8] 'From E.C.K. Ollivant, Municipal Commissioner for the City of Bombay to Secy to Government of Bombay, PWD", 4613 A, June 7, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[9] 'Letter from The Superintendent of Government Telegraphs, Bombay Division', No. 3355, August 15, 1882 in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[10] 'Letter from The Superintendent of Government Telegraphs, Bombay Division', No. 3355, August 21, 1882 in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[11] See for example the defense from Broach Municipality: 'Letter from G.W.Vidal, Acting Collector and President, City Municipality, Broach, to The Commissioner, Northern Division, Bombay', No. 2078,

by the aforementioned Eastern Electric Light and Power Company. Sensing a possible disruption, Major C.H. Strutt, The Managing Director of this company soon communicated directly with the highest level of the government, the Governor General. In the letter he ensured that his wires were all properly insulated and were thus least likely to harm any member of the public.[12] He also pleaded to be allowed to use overhead wires, since if ran underground, the expenses of the wiring, he claimed, would completely paralyse his company. Finally, he appealed to His Excellency's encouraging attitude towards private enterprise in the country and concern for shareholders back home and for a reconsideration of the instructions issued by the government.[13]

The Government of India finally relented by letting the overhead wiring remain in place in the western Indian towns. The chief consideration was of course the cause of private capital but also the compensatory expenses to be incurred in case the wires had to be shifted to more desired locations; no major incident of the disruption of telegraphic or telephonic messaging also seemed to have come up. The Government nonetheless cautioned that all future contracts of electric lighting made by public authorities were to ensure that wiring was entirely underground.[14] In making this assertion it pointed out even in America, where electric lighting had been adopted for a good two years with mostly overhead wiring, municipal authorities of New York and Chicago had now ordered the wires to be moved under the ground. In London, seven out of eight tenders for electric lighting had chosen to use underground wiring and the Calcutta installation at Eden Gardens too was running on the same mode - it was thus "possible to adhere to the underground system without undue strain on the Companies and without undue enhancement of the cost of lighting".[15]

August 22, 1882 in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[12] 'From C.H. Strutt, Managing Director, E.E.L. and P. Co., Ltd. to the Private Secretary to His Excellency, The Viceroy', August 17, 1882 in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[13] *ibid*.

[14] 'From GOI, PWD to Secy, Government of Bombay, PWD', No. 463 T, September 22, 1882, in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.

[15] *ibid*.

This brief phase of an observable spurt in commercial interest in electrifying Indian towns was probably part of the spilling over of the great rush to start up electrical companies that had engulfed the London share market around the early 1880s. With this rush subsiding not too long after, we do not really hear more about grand plans like that of electrifying ten Indian towns as proposed by the 'Eastern Electric Light and Power Company'.[16] But by 1883, "looking to the fact that several Electric Lighting Companies had already established themselves in India", the new D.G. Telegraphs, A.J. Leppoc Cappel had begun making more formal proposals about some sort of legislative enactment for such companies, to be laid out on the broad principles of the English Act - of securing the public, guaranteeing efficient supply, regulating monopolies and enabling the government to frame rules like that done by the BOT in England.[17]

However, by the time the D.G. submitted a draft Bill in May 1884, much seems to have changed in terms of his own estimation as well as that of the imperial administrative circle, about the English Act of 1882. The English Act, he now pointed out, "is said to have proved a complete failure, and to have effectually stopped the business it was intended to foster as well as regulate."[18] As an alternative, the D.G. hoped to reduce legislative interference of a restrictive character to a minimum so as to serve the limited purpose of protecting the public from danger and the telegraph and telephone lines from interference.[19] Interestingly, his draft Bill proposed to do this through an explicit kind of centralisation by empowering the Governor General of India as the license-awarding as well as the rule-making authority for electric enterprises. The consent of respective Local or Municipal Authorities would however have to be obtained before a license was issued within their jurisdictions, as would it be necessary for erecting overhead lines. The draft Act also required a written sanction from the D.G. Telegraphs prior to laying wires within

[16] The Brush Company, whose patented equipment was being used by the 'Eastern Electric Light and Power Company' was one of the main concerns with shares selling in great numbers in the bubble created by electrical equity in the London market. With their incandescent light patent becoming questionable, The Brush Company's value in the market began to fall rapidly. It is possible that its Indian subsidiary's fortunes too declined consequentially.
[17] 'From D.G. Tel to Secy, GOI, PWD', No. 469 T, August 4, 1883, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[18] 'From D.G. Tel to Secy, GOI, PWD', No. 425 T, May 23, 1884, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50 , NAI.
[19] *ibid*.

10 yards of telephone or telegraph lines. Further, it fixed the license period to seven years after which the undertaking could be purchased by public authorities on terms fixed on a case by case basis.[20]

As this draft Act passed through discussions within the imperial bureaucracy, much of its provisions were interpreted as not quite corresponding with the D.G.'s own minimalist agenda of averting the over-legislation of the 1882 English Act. One Public Works Department (PWD) official wondered why many of the clauses proposed by the D.G. could not simply be moved to the eventual conditions to be specified by the license.[21] Another official objected to the proposal of giving the Local or Municipal Authority an absolute power of veto in the issue of licenses, preferring to have them more in a consultative role.[22] The PWD eventually chose to redraft the whole Bill, retaining only those clauses that gave the Governor General exclusive powers to make rules for the granting of licenses and protecting telegraphs, telephones and the public. The particularities of how this would be done were made an object of future settlement in terms of the agreements to be made between government and licensee.[23] Thus the Department suggested deferring legislation on crucial issues like overhead wiring, consent of Local Authorities, purchase clauses and the power to break up streets to lay underground wires.[24] The D.G. himself agreed that the Bill needed to be simpler and that the period of the license needed to be extended to at least 21 years.[25] He also apparently conceded that the safe distance between telegraph and electric lines was difficult to calculate since this would vary considerably depending on the number of lamps being lit by the system.[26] Yet he was still unsure about PWD's drastic redrafting as for him, "the

[20] *ibid*.
[21] 'Note by R.B.B.', May 28, 1884, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[22] 'Note by D.F.P.', August 2, 1884, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[23] 'Note by G.F.L.M.', December 7, 1885, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[24] *ibid*.
[25] 'Note by A.J.L.C.', May 20, 1885, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[26] 'Note by S.H.J.', January 26, 1886, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.

difficulty which is laying down rules to regulate supply will not be lessened by relegating them to a license."[27]

When the redrafted Bill was sent out to solicit comments from other authorities, enterprises and individuals across India, one strand of opinion that emerged was that the Act should exempt existing suppliers of electricity. Some, like the representatives of the Indian Electric Light Company suggested that even in its minimal form, the draft bill seemed premature and "practically prohibitive" as it anticipated dangers which did not exist.[28] Otherwise, the diminution of the status of Local/Municipal Authorities in favour of a clear centralization did not go unnoticed. Expectedly, the Acting Municipal Commissioner of Bombay commented that any powers to set up wires, posts and other apparatus to private companies had to be approved by Municipal Authorities.[29] Similarly, the Commissioner of Police in Calcutta (who was also the Chairman of the Calcutta Corporation) thought it would be more convenient if the licensing authority would be the Local/Provincial Government and also asked for additional provisions protecting local/municipal authorities from being injuriously affected by licensees.[30] Finally on another count, some respondents like the Acting Advocate General of the Bombay High Court seemed to quite clearly echo the D.G. Telegraph's apprehensions about the inadvisability of relegating the matter of making rules to a future license instead of resolving some of this in the process of making the Act.[31] Notable in this regard was also the response of Messrs. Dey, Sil and Company, an electrical firm based in Calcutta. The firm's representation was that the government had to make a clearer definition of what they meant by a supply of electricity "so as to indicate the intensity and quantity of electricity" which was to be regulated. After this, the firm thought "it will be better to

[27] 'Note by A.J.L.C.', October 8, 1885, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[28] 'Precis of the opinions on the provisions of the Bill of the Honourable the Judges of the High Court and other Officers and persons consulted by the Government of Bombay', in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[29] *ibid*.
[30] 'From the Hon'ble H.L.Harrison, C.S. Commissioner of Police, Calcutta to The Secretary to the Government of Bengal (GOB), Municipal Department', No. 6712, December 27, 1886, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[31] 'Precis of the opinions on the provisions of the Bill of the Honourable the Judges of the High Court and other Officers and persons consulted by the Government of Bombay', in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.

embody the rules within the Act" and suggested starting an "appellate authority" to administer them, which would not limit the judgment to a single person's decision.[32] P.W. Fleury, another supplier of electric lighting in Calcutta, sought to embody one particular rule within the Act, that of providing a suitable safety fuse at the joint of "all large size electric conductors" and "small section branch wires" to avoid danger to the public.[33] The representations of these firms along with some others based their propositions on questions of technical specifications which actually received rather sparse discussion within the imperial government's own internal process of drafting the bill.

Eventually not much of such critical commentary was incorporated. When it was finally enacted in 1887, the Act was intended only to "Provide for the protection of person and property from the risks incident to the supply and use of electricity for lighting and other purposes."[34] In it, no specific rules were pronounced, though the Governor General was maintained as a rule-making authority. Even the requirement to take out a license was done away with. The concerned enterprise had to merely inform the Commissioner of Police or District Magistrate in the city or area concerned, a week prior to them commencing their operations. Moreover, the very protection of life, property and telegraph lines that the Act intended to offer was made an object of provisional settlement with the Governor General or the concerned authorities to whom he could delegate his rule-making powers in the specific area.[35]

The 1887 legislation helmed by the imperial government in India was soon followed by a proposal for a more elaborate Act introduced by the provincial Government of Bengal. This Act was eventually sanctioned in 1895 as a response to the increasing number of proposals for setting up central station systems in Calcutta to supply electricity for lighting and other purposes. It was this Act under which the supply company in Calcutta (the Calcutta Electric Supply Corporation, CESC) received its first license. But before beginning to elaborate on the specifics of this important legislation, it would be useful

[32] 'From Messrs. Dey, Sil and Company, to The Deputy Commissioner of Police, Calcutta', December 10, 1886, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[33] 'From P.W. Fleury, to The Officiating Deputy Commissioner of Police, Calcutta', December 2, 1886, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[34] 'Appendix A23, Act No. XIII of 1887' in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.
[35] *ibid*.

here to sum up the significant developments that marked the emergence of legal-regulatory concerns around the government of electricity in colonial India between 1882 and 1887.

Between these five years the one particularly strong tendency that seems to have taken shape amongst colonial lawmakers was to steer a different course from that of the 'failed' 1882 English Act. In 1882 the imperial government was strongly advocating a regulatory presence of imperial telegraph authorities and the compulsory use of underground wires. This of course did not really stop them from making regular exceptions to practices that violated government instructions, like those of the English Electric Light and Power Company in western India. But the adherence to such strictures was still proposed in view of the future and qualified explicitly in relationship to the English legislative norm. By 1887 however, the idea that the 1882 English Act had significantly obstructed rather than fostered electrical commerce and private capital seemed to have grown deep roots within the imperial bureaucracy. Some of this change is understandable given the ill-reputation of hindering private capital by supposedly being overzealous about technical and commercial regulations, as acquired by the 1882 Act. Moreover, there also seems to have developed a clearer understanding amongst some sections of interested parties (the suppliers of electricity for example) regarding certain safe limits within which electricity could be supplied without concern. As K. Hedges, one respondent to the 1887 draft bill specified, the innovation of incandescent lighting had enabled supply voltages to be brought down below 200 volts whereby they were rendered relatively harmless for persons, property and telegraph wires. But he also cautioned that this principle only applied to 'continuous current" systems (or direct current, more commonly used at the time). "Alternating current" or higher voltages on the other hand would require "special rules" to enable safe conduct and use.[36]

Even as the necessity to chart a different territory from the English case was urgently felt, the question remained as to how this was best done. The imperial bureaucracy pursued this firstly by actively contesting and eventually challenging the Local/Municipal

[36] 'From K. Hedges to Secy, GOI', Appendix A17, February 10, 1887, in 'Electricity Act, 1887', Civil Works (Telegraph), GOI, July, 1887, Part A, Nos. 15-50, NAI.

Authority as an agency of licensing as well as a rule-setting agency in the government of electricity. This was perhaps also in keeping with one prevalent strand of English opinion that castigated the 'socialist' regulation of electricity in that country as strengthening municipal government at the expense of private enterprise.

However, in the Indian case, the removal of such authorities from the sphere of electricity governance might have been somewhat ironic a measure, seeing that the municipal authorities who appear in the earliest discussions on electric rule-making in the colony, were obviously quite eager on private capital-led electrification schemes. These authorities also seemed to have been more in touch with practitioners and emerging 'experts' of electricity. Thus they often claimed to offer more considered opinions about the safe and economic conduct of electricity than imperial agencies like the Telegraph officials. Having usurped their place of preference through the enactment of the 1887 Act, the imperial government was now faced with an additional problem. This was that of drawing up suitable rules for general application for the government of electricity. The favoured instrument here became legislation *by deferral*. Thus the 1887 Act eventually enacted the license as the suitable medium of an anticipated consideration of rule-making. This was certainly an expression of law being open to future technical possibilities in order to aid the cause of innovative private enterprise. But the negotiation of this openness with the very nature of law to create fixity was not going to be a simple matter for future colonial legislation on the subject.

3. The 1895 Calcutta Electric Lighting Act

By the early 1890s, it must have become somewhat clear that the minimalist intent of the 1887 Act was not by itself effectively attracting much new capital in/to India in the form of private companies looking to set up central station systems to expand the business of electricity distribution. Thus when a certain 'Indian Electric Supply Syndicate' came to the Government of Bengal (GOB) with a proposal to be granted a monopoly of forty years for supplying electricity in Calcutta, the latter approached the imperial government to be permitted to quickly enact a legislation in the Bengal Council that would enable the issue of a suitable license to the said company. The GOB argued that while the 1887 Act allowed the government to contract with the undertakers and introduce provisions for the

public and telegraph/telephone wires, this would at best be "an unsatisfactory arrangement".[37] This was because the kind of concession demanded by the Syndicate was perhaps best delivered through the medium of a license if it was to "protect the undertakers from undue interference or restraint" and the public "from excessive charges and undue preferences." New legislation was then necessary to empower the provincial/Local Government to do more than simply protect telegraph lines and the public and allow a free run of private enterprise as envisaged by the 1887 Act. A more definite stimulus for capital was needed by way of the Government awarding legally mandated electrical licenses.[38]

As this proposal made its rounds within the imperial bureaucracy, similar issues cropped up as they had before. This time, members of the government of India's (GOI) Legislative Department suggested in unison that the Act should be a central and imperial enactment that could attend to similar schemes that might appear all over the empire. On the other hand, PWD officials continued to rule out without much substantiation, any intervening role of Local/Municipal Authorities in the matter, given that "many of these bodies in this country are obstructive."[39] It was also again stressed that since the all too elaborate English law of 1882 had supposedly stopped all action, the GOI's legislation had to be "a tentative one" that would "leave as much as possible to be provided for in the licenses granted and the rules issued."[40]

A somewhat new reasoning that came up was the need for central/imperial legislation in order that uniform rules could be brought about that would aid the cause of English companies by offering them similar technical and commercial conditions of operation throughout the colony.[41] Towards this end, the Secretary to the Legislative Department

[37] 'From GOB, PWD to the Secy, GOI, PWD', No. 631 MPI, March 6, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39 , NAI.
[38] *ibid*.
[39] 'Note by R.C.B.P.', August 28, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI. This was followed by a warning from a Legislative member that while the criticism might be "true enough…it better not be made officially." 'Note by L.P.', September 15, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI.
[40] 'Note by L.P.', April 4, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI.
[41] *ibid*.

Harvey James requested the PWD to advise "in as precise terms as possible, the respects in which, from the point of view of an Engineer and Electrician, the English Acts will require amendment in their application to India."[42] This however proved difficult. The D.G. Telegraphs responded to this proposal by asserting that this could not be handled by the Telegraph Department since it was "entirely outside its scope" and "not a single officer in the Department had the required technical knowledge."[43] He specified that electric lighting was a branch of technology quite distinct from the work of a telegraph engineer and thus to settle legal technicalities it was essential for the government to hire specialized "Electric Inspectors". He also thought that it was only with some such "special appointment" that the confidence of private capitalists could be gained by the government.[44]

The issue of this technical and expert mediation being again left unresolved, the decision of the imperial bureaucracy was to repeat the policy of empowering the Governor General as a rule-making authority and let the drafters in the Legislative Department figure out the rest.[45] Fifteen months however passed till Secretary Harvey James was able to again frame his opinions on the subject as he was on a visit to England with the concerned papers. This inordinate delay had however not seen any corresponding rise in interest in starting electrical schemes in any other part of India. Given that the only commercial proposal was still from Calcutta, James proposed to forego imperial legislation and allow the Bengal Council to have its own law.[46] As the Bengal Council went about drafting and passing this law, two particular and very much related issues came to be rearticulated in a manner somewhat distinct from the summary treatment that they received within the imperial bureaucracy's overwhelming consensus concerning the modes of governing electricity in the colony. These were firstly, the question of the vexed relationship between colonial lawmaking and the legacy of English regulations and

[42] 'Note by S.H.J.', April 5, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI.
[43] 'Note by W.R.B.', July 2, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI.
[44] *ibid*.
[45] 'Note by R.C.B.P.', August 28, 1891, in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI.
[46] 'Note by S.H.J.', in 'Electric Lighting Act: Proposed Introduction of Electricity into Calcutta', Civil Works (Telegraph), GOI, Part A, July, 1893, Nos. 33-39, NAI.

secondly, the place of the Local/Municipal Authority as an agency of governing electricity.

In introducing 'The Calcutta Electric Lighting Bill' in the Bengal Council, member Henry Cotton began by laying out its first principles which were basically to empower the Provincial/Local Government (in this case GOB) to award licenses for concerns seeking to supply electricity through central station systems and the passage of wires by breaking up streets or otherwise through public areas. With the (by then) standard disclaimer that it was necessary to diverge from precedents of English law as they had hindered electrical enterprise, Cotton discussed that while the corresponding English statute required the consent of Local/Municipal Authorities in the matter of awarding such licenses, some categories of 'provisional orders' for electricity supply in England could be awarded in spite of the Local Authority's objections if the Board of Trade (BOT) overruled them.[47] For Calcutta, the Bill intended to approximate such 'provisional orders' as licenses, with the role of the BOT taken over by the Local Government which could then overrule local or municipal objections.[48] Again, while the English Acts required the sanction of Local Authorities for overhead wires, Cotton explained that the Bill aimed to replace such authorities with the Local/Provincial Government as the agency for awarding this sanction.[49] The Local Government was also made the arbitrator in case conflicts arose over the positioning of wires relative to telegraph apparatus.[50] Most Council members did not seem to mind these provisions. The Bill also extended the license period to 21 years and made it impossible for the Local/Municipal Authority to purchase the concern after that (again contrary to English legislation). Representatives of the European commercial community in Calcutta welcomed such measures. They did so also because an absence of legislation on such subject had apparently been "a bar to enterprise."[51]

---

[47] 'Mr. Cotton's statement', July 6, 1895 in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 380.
[48] *ibid*.
[49] *ibid*, pg. 383.
[50] *ibid*. pg. 384.
[51] 'Mr. Smyth's (Bengal Chamber of Commerce representative) statement', July 27, 1895 in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 381.

The Bill however did face considerable criticism from Surendranath Banerjee who was at the time the representative of the Municipal Corporation of Calcutta on the Bengal Legislative Council. Banerjee's presence on this Council owed to the recent Indian Councils Act of 1892 which had been implemented by the GOB by expanding the Council to twenty members, with seven new nominees of the Lieut-Governor being specifically chosen from institutions like the Corporation of Calcutta (which had a fraction of its Commissioners popularly elected), other Municipalities and District Boards and the University of Calcutta. Banerjee was already a critical voice in the city, having been imprisoned some years back in 1883 for publications in his newspaper *The Bengalee* that were held by the government to be in contempt of court. In 1895, around the time when the Bill was being debated, Banerjee also became the president of the Indian National Congress. Given these circumstances, his presence and comments on the Bill could perhaps be read as a hint of the possible pressure of representative government and early nationalist sentiment as it applied against the intransigence of the colonial Executive.

Yet Banerjee's arguments also built against the background of recent events in Calcutta and worked by an exposition of the inconsistencies of how Cotton made the case for certain clauses in the Bengal Act in relation to English legal propositions.[52] On this count, Banerjee's points could be also read on a more literal register, as a specific engagement with colonial law-making that was interested in reinstating the Local/Municipal Authority within the administration of electricity, towards the objective of better managing the conduct of such systems. From a retrospective and analytical point of view, Banerjee's arguments of course also lead us to the question of how colonial lawmaking effected a certain kind of closure between the world of new electrical technology and possible contributions that local self government and perhaps a local sphere of expertise could have made in the technology's shaping or in its regulation. But postponing such questions for the following sections of this chapter, it will be more pertinent here to focus on his more immediate contributions to the legislative debate.

[52] Henry Cotton himself of course was not quite the typical colonialist. He welcomed principles of self-government introduced since the time of the Viceroy Lord Ripon in the 1880s and eventually opposed the (first) Partition of Bengal and even supported some version of Home Rule for India.

Banerjee at first raised the issue that the Local Authority be brought back in the Bill (section 13) as the authority that sanctions overhead lines, instead of this power being reserved solely for the Local/Provincial Government. This he thought would import "the substance of the English Act" whereby the BOT issues licenses, while Local/Municipal Authority gives sanction to more specific measures like those of wiring.[53] Banerjee also argued that recent deliberations over the question of overhead or underground wiring concerning the electric lighting of Harrison Road in the city confirmed that the Calcutta Municipal Corporation (CMC) was worthy of being such a sanctioning authority. Also, by conferring such administrative charge upon the Local Authority (in this case the Corporation), the Bill would be making adequate consideration for "popular feeling".[54]

Cotton retorted that issues like overhead wiring were very technical matters where "popular feeling" was best not entertained. The risks of overhead wiring in Calcutta could well be considerable and the difficulties of underground lines "in a soil as damp as that of Calcutta may or may not be serious."[55] But especially because it was difficult to adjudicate between the two options for the apparently inexperienced Corporation, such matters had to be best left with the Government who would be able to transcend "personal" interest(s) and "be guided by the advice of experts" in its decisions.[56] Banerjee still persisted that going by the example of gas supply in Calcutta, Calcutta Corporation was never averse to gathering more information and experience in the course of administering a novel object of interest. Moreover in this exercise of their authority the Municipality would certainly consult experts "and that is precisely what the Corporation did in regard to the system of electric lighting in Harrison Road."[57] For Banerjee, issues like that of overhead wiring were after all "a purely local question", and thus they were best "left to the decision of the Local Authority."[58]

---

[53] 'Babu Surendranath Banerjee's statement', July 27, 1895, in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 443.
[54] *ibid*.
[55] 'Mr. Cotton's statement', July 27, 1895, in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 443.
[56] *ibid*
[57] 'Babu Surendranath Banerjee's statement', July 27, 1895, in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 445.
[58] *ibid*.

Following Cotton's and other members' opposition, Banerjee's proposed change (in section 13) was overruled. But he persisted with a second proposal for amendment, this time of sec 14, the recommendation for which (he said) came directly from Chairman Ritchie of the Calcutta Corporation. This amendment was directed at compelling electrical concerns to move their wires at their own expense if the Corporation required them to do so, an agreement that worked fine between the Corporation and the Oriental Gas Company in Calcutta in case of the latter's supply pipes.[59] Cotton again vehemently opposed this amendment, this time citing a violation of principles of English law and the possibility that this would discourage future electrical enterprise in the city.[60] Banerjee now confessed to not being able to follow the sequence of Cotton's arguments. The Calcutta Corporation, he claimed, had hardly discouraged the growth of enterprise though it could expect some concession of its own on account of securing "public benefit."[61] Otherwise, the legal logic all seemed to him to be a "bewildering maze":

> "…When I move an amendment on the lines of the English Statute, I am told that the peculiar circumstances of the case are such that the English law must be departed from. When again I move an amendment adapted to particular circumstances of the case, I am told that the English Statute must be followed…"[62]

It might not seem surprising here that when 'The Calcutta Electric Lighting Bill' was passed it did not really undergo any change to the advantage of the Local Authority, as Banerjee would have wanted it. His was a case for 'popular will' to be made part of the law-making in electrical matters. But the case he was making was also not bereft of a concern for expertise. What he was challenging was the willful denial of the expertise and located knowledge available within the sphere of local urban self-government in such matters. The colonial state however had by then made a habit of such denial, influenced

[59] 'Babu Surendranath Banerjee's statement', July 27, 1895, in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 446.
[60] 'Mr. Cotton's statement', July 27, 1895, in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 447-448.
[61] 'Babu Surendranath Banerjee's statement', July 27, 1895, in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 448-449.
[62] *ibid*, pg. 448.

by the anxieties arising out of the metropolitan context of the coming of electricity and its legal governance. Banerjee's contribution to the Bill was thus limited eventually to a disappointed 'Note of Dissent' appended to the Report of the Select Committee deliberating the Bill, where amongst other things, he repeated his complaint that the legislation was completely unmoored from any consistent question of principle.

The defeat of Banerjee's suggested amendments towards empowering Local Authorities within the sphere of the government of electricity was heartily welcomed by the imperial bureaucracy who had the task now to approve the Bill as passed by the Bengal Council.[63] But not everything about the Bill was welcomed so obviously. In explaining the Bill in the Bengal Council, Cotton had drawn attention to the important section 5 which spoke about conditions to be inserted in the license "which will really control the working of the Law when it is passed."[64] The sub clause 'a' of this section reserved for the Local Government the right to make such regulations as required for the safety of the public, but also vary them within licenses "to meet cases as they arise".[65] This postponement (once again) of some minimum regulations to the provisional domain of licensing exempted the government from immediately drawing up rules under the Act.

Yet it was this very move which was not necessarily viewed very positively by the imperial Legislative and Public Works Department members. These members were now eager on some actual rules to accompany the Act for purposes of uniformity, rather than simply consigning such rule-making to a posterior occasion of licensing. As Legislative member Carnduff remarked, "The Legislature has indeed merely prepared the 'dry bones' and left it to the Executive to clothe with living Flesh."[66] This was "unsatisfactory" but the imperial technocracy also did not have much help to offer. The D.G. Telegraph once again expressed his inability to advise on an area outside his expertise.[67] The imperial PWD had also found it too premature to think of hiring a specially designated electrical

[63] 'Note by H.W.C. Carnduff', October 12, 1895 in 'The Calcutta Electric Lighting Act, 1895 (Bengal)', Legislative Department, GOI, Part A, January 1896, Nos. 1-15, NAI.
[64] 'Mr. Cotton's statement', July 27, 1895 in Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896, pg. 436.
[65] *ibid*., pg. 436-437,
[66] 'Note by H.W.C. Carnduff', October 12, 1895 in 'The Calcutta Electric Lighting Act, 1895 (Bengal)', Legislative Department, GOI, Part A, January 1896, Nos. 1-15, NAI.
[67] 'Note by W.B.Brooke', February 10, 1894 in 'The Calcutta Electric Lighting Act, 1895 (Bengal)', Legislative Department, GOI, Part A, January 1896, Nos. 1-15, NAI.

officer for the purpose, since the Act was primarily to serve local needs of Calcutta.[68] Thus unlike what Henry Cotton assumed while debating Banerjee in the Bengal Council, the colonial state, as opposed to the municipality, did not seem greatly more disposed towards drawing on expertise in this matter. Eventually when the Bill finally became an Act through some personal initiative of the Lieut-Governor of Bengal pushing the issue with the Governor General, the GOB reverted to English regulatory precedents after all. It thus made a vague commitment to follow the British BOT regulations "subject to such modifications as conditions of time and place may render necessary."[69]

At this point, considering the case of the making of the 1887 Calcutta Act together with that of the 1895 Act, a certain circularity of the colonial law-making procedure might just seem as obvious here as it might have seemed to Surendranath Banerjee. By the time of the new Act, specific legislation for electrical matters seemed imperative to the colonial government in order to attract private capital. The legislative inspiration to diverge from the English Bill had now for almost a decade of late 19th century, centred around a primary anxiety, that of ridding the regulation of electricity from the presumed 'obstructiveness' of the Local/Municipal Authority in British India. And yet having performed this legal excision, both the provincial as well as the imperial government were left with a certain vacuum in terms of principles, rules and particularly expertise, with which to administer the Act. Apathy and delay, perhaps of a specifically colonial kind, prevented the immediate procurement of expert mediation in spite of many pointing to the need for the same. Deferment of the question of rules, as pointed out in the last section, thus emerged as one primary option. The other option was a vague falling back on English regulations in spite of an acute uncertainty about the suitability of such regulations for Indian conditions.

In the next two sections we will follow a different course from the realm of imperial and provincial legislation and enter the terrain of the more local modalities of handling electrical installations in Calcutta within the domain of the Calcutta Municipal

[68] 'Note by C.B. Pritchard', February 24, 1894 in 'The Calcutta Electric Lighting Act, 1895 (Bengal)', Legislative Department, GOI, Part A, January 1896, Nos. 1-15, NAI.
[69] 'From H.J..S. Cotton, Chief Secy to the GOB to the Secy, GOI, Legislative Department'', No. 997J, November 2, 1895 in 'The Calcutta Electric Lighting Act, 1895 (Bengal)', Legislative Department, GOI, Part A, January 1896, Nos. 1-15, NAI.

Corporation. If in this and the preceding section, we have encountered a distinct vacuum in principles, rules and expertise within the more centralized processes of legislation, did this vacuum extend also to local affairs of setting up electrical installations in the city and in the realm of the city Corporation? Taking Banerjee's propositions in the Bengal Council as cue, we will show that this was not quite the case. Instead, we will firstly try to demonstrate how earliest electrical schemes in the city were already basing themselves on the availability of a native class of workers/mechanics who were inclined to learn skills of electrical intricacy fast enough. These mechanics also seemed to have occasionally worked out quite novel technical outcomes from their practice of such skills. Further, we will also pursue how the Calcutta Municipal Corporation as a 'Local Authority' in matters of electric lighting, seems to have been particularly attuned to the demand of techno-scientific discussions and negotiations and the expert mediation that this required. Imperial legislation glossed over this requirement but in the case of the 'Local Authority' this was neither possible nor desirable.

4. Schwendler, Sil and an underclasss of native electricians (?) in late 19th century Calcutta

Experimentation with technologies of current electricity had a significant past in Calcutta well before the CESC attained its license to supply electricity for lighting and other purposes in the city in 1896. Suvobrata Sarkar is right to count in this William O'Shaughnessy's (first Director-General and initiator of telegraphs in India) display of electric illumination via the igniting of charcoal lights by means of a battery in the 1830s.[70] The dynamo-operated steady delivery of electric lights however was first put to use in the city in the illumination of the East India Railway Company (EIR Co.) goods shed at Howrah Station by Carl Louis Schwendler, an Electrician of the Government Telegraphs in India. This section and the next one, will briefly try to give a sense of the particular resources, interests, knowledge and skills of engaging with the new technology of current electricity that was available in and around the colonial city, since Schwendler set up his lighting scheme at Howrah. This will help in providing essential context to

[70]Sarkar (2020, 119).

some of the points that were made in the Bengal Council and amongst the imperial bureaucracy that we encountered in the previous section.

Schwendler was one amongst many contemporaries of Edison whose aim was to bring about a steady electric arc light that did not continuously flicker and could be used for lighting up public places. His first experiments to this effect were conducted in 1878-'79 and published in the Proceedings of The Asiatic Society of Bengal in March, 1879.[71] With active support of the colonial government and in partnership with the EIR Co., he sought to give a more lasting form to these experiments on a goods-loading platform of the Howrah station which had trains passing from both sides. Schwendler wrote up a 'Report' on the successful completion of this project which he said was a bit delayed because he wanted to gain experience that the system he set up could be worked on and supervised with "ordinary Native skill".[72]

Since 1st July, 1880, Schwendler reported, the lighting arrangement was placed under the supervision of a Native, and it had worked perfectly well.[73] The system was worked by a pumping (steam) engine already under use at Howrah which ran the dynamos.[74] This was a crucial aspect of bringing costs down, as the engine was worked in the morning for pumping water and in the night for the dynamos. The lighting was via four intense arc lights pointed at the ceiling, that Schwendler claimed generated 9000 candle power of illumination, equivalent to the light of 750 gas burners used on streets of Calcutta.[75] He opined that electric light was more practical in open and breezy railway sheds than the gas flame and much less liable to set fire to inflammable goods. It also emitted less heat than gas that made it convenient for the warm Indian environment.[76] Finally Schwendler showed through a set of calculations that both the capital costs as well those of running these lights could be far less than that for a comparable use of gas light.[77] However in a repetition of the problems common to pre-Edisonian illumination systems, each of these

[71]Ghosh (1991, 236).
[72] 'Report by Louis Schwendler, Electrician of Government Telegraphs in India', February 1, 1881, in 'Report on the Electric Light at the East India Railway Company's Station Howrah (Calcutta)', PWD (Railway Construction), GOI, March, 1881, Part B, Nos. 129-134, NAI, pg. 1.
[73]*ibid*.
[74]*ibid*, pg. 3.
[75]*ibid*, pg. 13.
[76]*ibid*, pg. 2.
[77]*ibid*, pg. 13-14.

lights required a separate dynamo since Schwendler had not found out a way of subdividing the current.[78]

Schwendler mentioned in the report that the while the dynamos worked well, the belts that drove the dynamo from the engine had to be tightened from time to time and reflectors of the lights needed cleaning. These along with other "ordinary repairs" were the maintenance tasks that he assigned to his native workmen and supervisors.[79] But it "was most important", he emphasized, "that no easy means of adjustment of the Lamps be entrusted to them."[80] Incidentally, Captain R.E. Call in another report on the same lighting project, described a particular act of maintenance performed by the native in-charge, that could very well seem to be more complex than the limited tasks that Schwendler admittedly trusted them with. Call mostly found the lights functioning well enough for labels being read and goods being loaded on to the trains. But on the evening of his inspection, around 7 pm, one of the lights became a bit "uncertain in its action."[81] Call observed admiringly that over the next ten minutes, the native in-charge deftly replaced the carbons on the lamp. He also showed Call how a change could be made between the lamps and the machine and how the resistances were being measured.[82]

Schwendler's reliance on native supervision and workmanship in terms of maintenance and repair jobs on the new dynamo-run electrical systems of lighting was not unique. In the year following his Howrah station lighting scheme (1882), Major Strutt (whom we have met) had remarked in one of his communications that the "native mechanics" employed by his Eastern Electric Light and Power Company in western India had learned the operation of the machines and transmission apparatus better than European skilled electricians; thus he claimed to have left the Crawford Market installation in Bombay

[78] 'From the Agent EIR Co. to The Consulting Engineer, GOI', No. 122G, February 26, 1881, in 'Report on the Electric Light at the East India Railway Company's Station Howrah (Calcutta)', PWD (Railway Construction), GOI, March, 1881, Part B, Nos. 129-134, NAI.
[79] 'Report by Louis Schwendler, Electrician of Government Telegraphs in India', February 1, 1881, in 'Report on the Electric Light at the East India Railway Company's Station Howrah (Calcutta)', PWD (Railway Construction), GOI, March, 1881, Part B, Nos. 129-134, NAI, pg. 2.
[80] *ibid*.
[81] 'Report by Captain C.J. Call, R.E. of his inspection of Electric Lamps at Howrah' March 3, 1881, in 'Report on the Electric Light at the East India Railway Company's Station Howrah (Calcutta)', PWD (Railway Construction), GOI, March, 1881, Part B, Nos. 129-134, NAI.
[82] *ibid*.

entirely to the charge of three such natives.[83] This perhaps evinces that a kind of intermediary skill-bearing class of native workers (electricians?) had already emerged in relation to the very first schemes of electrical lighting being started in Indian towns. European promoters were actually positing the viability of such lighting schemes on the very basis of the availability of this class of workers and their swift learning. And the first-hand account of the 'native supervision' of Schwendler's electric lighting scheme, as narrated by Captain Call, suggests that maintenance training perhaps extended into the acquisition of a considerable degree of skill and knowledge concerning the running of specific electric machinery. While the archival trail left behind by such workers is rather thin, a particularly interesting finding by the historian Jitendranath Ray might allow us to push the significance of the rather minimal observations of Schwendler and Call about their native colleagues a little further.

According to Ray, one of Schwendler's native helpers/trainees was a young man called Sibdas Sil, who later in 1881 had again played an important part in lighting two other passenger platforms at Howrah station very successfully. It was also this Sibdas Sil who within a couple of years founded with other partners, the pioneering electric lighting concern Messrs. Dey, Sil and Co. in 1883-'84.[84] His knowledge and skill concerning electric arc lights had certainly evolved considerably. Ray points out a key change made to the arc lamp by Sil. As the carbon rods within the arc lamp were ignited by passing a current through them, the distance between them expanded as they gradually burnt out, thus diminishing the light emitted.[85] Sil had devised a mechanical arrangement which would bring the carbon rods closer to each other in tandem with them burning out. Thus the lighting span of an individual arc lamp was prolonged.

Dey, Sil and Co.'s electrical arrangements also eventually included a panoply of equipments which they sold in Calcutta over the 1880s and the 1890s - a portable electric bell with a rechargeable battery, portable electric lights again run on batteries that could be fixed to carriages, "Serrin Patent self-regulating focus keeping lamps of 1500 candle-

[83] 'From C.H. Strutt, Managing Director, E.E.L. and P. Co., Ltd. to J.C. Hope, Simla', September 1, 1882 in 'Introduction of Electric Lighting in India', Civil Works (Telegraph), GOI, October, 1882, Part A, Nos. 1-24, NAI.
[84] Ray (2005, 154)
[85] *ibid*., pg. 155

power", "Bunsen's batteries", wires, connectors and terminals. By 1888, Dey, Sil and Co. had also moved beyond lighting.[86] On the 27th of January that year, at the annual meeting of the 'Mahomeddan Literary Society' in Calcutta, along with their battery operated lights, the company also exhibited a sewing machine and a table-fan, both of which ran on electric energy.[87] The display drew wide praise including that from the Governor General Lord Dufferin. Such admiration for Dey, Sil and Co's devices was also expressed earlier by scientific authorities in the colonial city like Father Eugene Lafont and the Professor of Physics at Presidency College, Mr. Elliott.[88]

We have encountered Dey, Sil and Co. earlier as one of the technically-inclined commentators on the 1887 Act, along with P.W.Fleury, another electric lighting supplier in Calcutta. On count of Fleury, Dey, Sil and Co. and some other suppliers, Calcutta had also experienced many an instance of temporary public lighting organized for celebrations, occasions and other kinds of events in the last two decades of the 19th century. Gradually some of these were taking on expanded proportions. An obvious example here is that of the wedding fanfare organized for the Bengali businessman "Kanaye Lall Seal's" son in May 1882. This involved in the eyes of one observer, the "greatest display of electric lighting that has as yet been witnessed in India".[89] The Indian Electric Light Co. were contracted for this purpose and they were going to light up an entire mile of Calcutta streets for seven whole days with a bright array of multi-coloured electric lights which could enable the public "to judge the adaptability of electric light for street lighting."[90] Shortly after, in 1883, the same company got the contract to electrically light up the imperial Calcutta Exhibition.[91] This endeavour was however not the most successful one as the lighting went off at a critical moment, leaving two thousand attendees gathered at the Central Hall of the Exhibition along with the Governor General

[86] Ghosh (1991,118)
[87] *ibid*. Schwendler of course had already expanded the ambit of use of electrical energy by running a dynamo-powered tram inside the Alipore Zoo since 1880. Dey. Sil and Co.' was marketing more domestic and personal products.
[88] *ibid*.,pg. 117.
[89] Anon., "The Electric Light in Calcutta", *The Electrician*, May 13, 1882, pg. 419.
[90] *Ibid*. This article in *The Electrician* journal was borrowing the news item of an Indian journal which they did not name.
[91] Anon., No Title, *The Times of India* (henceforth *TOI*), September 15, 1883, pg. 5.

in total darkness.[92] Later enquiry ruled out sabotage on the basis of "personal malice". The ends of the wire that snapped were "examined under a microscope by experts, and it is certain that they were not cut."[93] In all probability "the failure", as was declared by the Superintendent of the Exhibition Works, "was caused by imperfect electrical arrangements causing the wires to heat and partly fuse."[94]

In accounting for the various arrangements of electric lighting supply in colonial Calcutta till the early 1880s, it perhaps seems clear that in the decades leading up to the coming of the CESC, considerable adaptation of the knowledge and skills of setting up current electricity systems was happening in the colonial city by both European initiative as well as native ingenuity. Following from the observations of Jitendranath Ray and Siddhartha Ghosh, the two foremost historians of technical skill-building in Calcutta, we can also surmise that this was more than a simple case of diffusion; there were also interesting instances of design and innovation in technical knowledge and implementation that seem evident from the cases we have considered. Electrical setups were not objects of direct and umediated transplantation from the metropole to the colony. Even in their basic stand-alone forms they required some amount of on-the-spot skilled and technical attention. The colonial cities where these objects and implements came to be tried out anew were not necessarily deficient in this matter. And the prime reason for this was obviously the early enough emergence of a set of skill-bearing native mechanics. This set of technicians/electricians (?) while not so visible under the archival layering, nonetheless can be claimed as the essential labour and craft that went into making early stand-alone, temporary schemes of electrification possible. The case of Sil and his company of course leads up to the possibility that some of them even learnt and practiced the craft well enough to also enable the pursuit of relatively more novel technical outcomes.[95]

---

[92] Anon., 'Editorial', *TOI*, December 10, 1883, pg. 4.
[93] Anon., No Title, *TOI*, December 11, 1883, pg. 3.
[94] *ibid*.
[95] Sarkar (2020, 203-224) also draws attention to the case of Dey, Sil & Co., and that of other native skilled technologists who did not acquire formal training and yet were astute at their craft, referring to them as 'subaltern technologists'. But it seems to me that beyond the example of Sil and his likes who are considered by Sarkar as a better known and more accomplished class of technologists, there was a group of 'electricians'/ '*mistris*' (?) in the city who worked as a the silent infrastructure of electrical maintenance and repair without necessarily rising to any entrepreneurial or other kind of prominence as innovators. Their history is more complicated to write due to the archival layering and perhaps their existence can only

Native mechanics and entrepreneurs of electricity however move still further out of focus as we encounter less temporary and larger installations of electric lighting in Calcutta. By the time of the 1895 Calcutta Act, various such schemes had emerged in the city including the electric lighting of Harrison Road managed by the Calcutta Municipal Corporation, electric lighting on the Hooghly bridge and at the docks at Kidderpore, an electric light installation at the Bengal United Service Club at Chowringhee and the ones in Eden Gardens and the Race Course, and finally electric lighting in certain hotels and at some factories in and around Calcutta. Around the time of the processing of the Bill, two other schemes were about to be initiated, that of the electric lighting of the Alipur Jail which was to share the power with the Lieut. Governor's residence, the Belvedre and the electric lighting of Sibpur Bengal Engineering College.

The setting up of these various schemes was through the medium of the biggest European managing agencies like Messrs. Octavius Steel & Co., Messrs. Martin and Co., Messrs F.C. Osler & Co. and Messrs. Kilburn & Co. These agencies often worked for various electric lighting companies or syndicates operating out of England. Given what we have discussed so far, it would be difficult to rule out a native-skill bearing set of mechanics supplementing the operation of also these later electrical schemes in Calcutta, at the level of maintenance or day-to-day running of the concerned apparatus. But these larger and more permanent operations were more definitely handled by Consulting Engineers employed or imported (from England) who sat the 'head' of design and installation. A newer level of expertise was however necessitated by one or two of these schemes, especially the lighting of the new Harrison Road in Calcutta. The extended use of public space required a definite mediation by public authorities like the Calcutta Corporation. This mediation had to be independent of the Consulting Engineers operating by the interests of Calcutta firms and thus it was delegated by the Corporation to certain other locally sourced experts. Since it is this expert mediation which was brought up by Surendranath Banerjee at the Bengal Council debate on the 1895 Calcutta Electric

surface through rather negatively valued references in the colonial archive. In this section I barely indicate the existence of this class of technical workers who seemed to have arisen almost simultaneously with the first electrical schemes in colonial cities.

Lighting Act, it is necessary to broach the topic of the electric lighting of the Harrison Road in more detail here.

5. The Electric Lighting of Harrison Road

The Harrison Road (currently Mahatma Gandhi Road in central Calcutta) was a new road that had been constructed by the Calcutta Municipal Corporation (CMC), opened for public use in 1891. The road hence became the first public thoroughfare in Calcutta that was lit by electricity. The tender was awarded to "The Laing Wharton, Dawn Construction Syndicate" that was to maintain the setup for an additional three months from construction, after which the CMC Engineer would take over. The lighting was via nineteen 1200 candle-power arc lamps run from the engine at the Halliday Street Pumping Station and the relatively high voltage wiring was to be placed under the ground. It is worth mentioning here that while the CMC had later hired a Mr. Wadell as "Electrical Engineer", two "tindals" (native workmen/mistries) were also appointed over the years as necessary maintenance staff to keep the "delicate" engine in good order as it required the attention of "skilled hands".[96] The idea of opting for electric lighting was not entirely unchallenged in the meetings of the Commissioners of the Corporation as it was to cost an excess amount of Rs 3000 every year over gas lighting expenses and an initial outlay of Rs. 10,080.[97] But the decision to go ahead with the installation was passed with the support of several Commissioners, both native and European, who were keen on the experiment to explore alternatives to the gas lighting monopoly in the town which was also soon up for renewal.[98]

By 1894 however, the electric lights on Harrison Road were found to be constantly flickering and also going out quite often.[99] Soon they had to be substituted by temporary kerosene oil lamps. Over the next couple of years it became clear that "the decay of

[96] 'Ref. No. 19 – Establishment for Electrican Engineer while not working", August 24, 1895, Progs. 20th Meeting of the General Committee of the Commissioners of Calcutta, Town Hall Archives (THA henceforth).
[97] 'Ref. No. 5 – Tenders for Electric Lighting of the Central Road', September, 26, 1891, Progs. 26th Meeting of the General Committee of the Commissioners of Calcutta, THA.
[98] Cf. 'Statements by Baboo Nolin Bhehary Sircar and Baboo Surendranath Banerjee', *ibid*.
[99] 'Ref No. 1 – Report for the Quarter ending 30th June, 1894, October 2, 1894, Progs. Special Meeting of the Commissioners of Calcutta, THA.

underground cables" had caused the lighting system to break down.[100] To reconsider the question of the electric lighting of Harrison Road, the CMC set up a committee of men who were known to have scientific as well as practical experience in the matters of current electricity. This committee of 'experts' delivered their suggestions not too long before Surendranath Banerjee was defending the CMC's role in matters of expert consultation for electric lighting schemes in the Bengal Council. It consisted of Father Eugene Lafont, a scientist associated with St. Xavier's College in Calcutta, a Mr. J. W. Hensley, Mr. George Duberne, Manager of the Crystal Ice Factory in Calcutta who had overseen the Eden Gardens electric lighting installation, Mr. Mitchell of Messrs. Osler and Co. who had previously had long experience with electric lighting in Birmingham and the Officiating Engineer of the CMC, Mr. Silk.

The general advice of the Committee weighed towards replacing the underground wires on Harrison Road with overhead lines. But this was not necessarily an overwhelmingly certain decision with clear technical conviction. Mitchell for instance recommended the use of underground wires laid in a cast-iron trough, filled with bitumen and covered over with cement as was successfully used in Birmingham.[101] Father Lafont and Duberne observed that while it was uncertain that any casing hitherto tried would prove effective in the Calcutta underground, it was nonetheless "extremely desirable" that the CMC could lead the way in solving the problem of devising an efficient underground cable capable of standing the climate and other natural conditions in India.[102] The Committee also had to consider the fact that the Government of Bengal in mid-1895 was actually itself not very keen on overhead lines on the busy central road in Calcutta for safety reasons. Eventually the additional cost of laying underground cables was the major factor in the Committee's decision to propose overhead wiring. It also thought the use of direct/'continuous current' (DC) for the lighting was going to minimize risk posed to the public.[103] But the Committee specified due protective measures to be observed for such

[100]Government of Bengal, Report on the Administration of Bengal, 1896-1897, Calcutta, 1898, pg. 76.
[101] 'Ref No. 5 – Electric Lighting of Harrison Road', June 22, 1895, Progs. 11th meeting of the General Committee of the Commissioners of Calcutta, THA.
[102] 'Ref No. 12 – Electric Lighting of Harrison Road', August 10, 1895, Progs. 18th meeting of the General Committee of the Commissioners of Calcutta, THA.
[103]*ibid*. The erstwhile defective systems had already burnt the pockets of the CMC. Cf. Government of Bengal, Report on the Administration of Bengal, 1894-1895, Calcutta, 1896, pg. 75.

overhead wiring: the cable carrying the current would have to be suspended at intervals, of 3 or 4 feet, from a galvanised steel wire cable stretched between poles 130-150 feet apart. It was presumed that this would diminish significantly the chances of the conducting cable collapsing.

Eventually when the tenders came in for relighting Harrison Road with electricity, the Commissioners chose to seek out more advice from a "special expert", Prof. Jagdis Chunder Bose of Presidency College, Calcutta. In this reconsideration of the Committee's decision, the issue of 'popular feeling' as Surendranath Banerjee had invoked, might have had a role to play, given the anticipation of risks from overhead wires that was already somewhat palpable, following from the fair amount of transnational publicity received over the years by the news of electrical accidents in America. It has been difficult to recover exactly what Bose's recommendations were in the matter of the electric lighting of Harrison Road. But a fair estimation can be made of this through a debate of sorts that it seems to have spurred in the technical journals of the time, especially via the Calcutta-based *Indian Engineering* (*IE*). This journal clearly had major stake in the question of the expertise involved in the lighting up of Harrison Road. In a previous September 1895 issue of the journal, decrying the 'expert' advice received by the CMC concerning erecting overhead wires, an editorial piece issued "a warning note":

> Who or which or where or when or what' can an 'Expert' be who could countenance such a monstrosity as aerial cables through the Calcutta thoroughfares, so heavy too that they should have to be carried by a special support cable?[104]

By July 1896 however, after Bose's suggestions had been delivered, the journal seems to have taken a very different turn on the subject while continuing to challenge the 'expert' consulted by the CMC. Bose's propositions were thus severely criticized by another editorial article. A significant part of the objections were directed at his ruling out the use

[104] Anon., 'Electric Lights in the City of Calcutta', *Indian Engineering* (*IE* henceforth), September 28, 1895, pg. 194.

of aerial cables for delivery of high tension electrical energy on count of safety. Much of this suspicion of overhead wires, the article contended, was based on the experience in New York from some years back where "their numbers had become enormous" and "they were both badly hung and badly insulated".[105] But times had changed. Now, there could "be no *practical objection* which could outweigh the enormous advantages" offered by "bare or lightly insulated primary overhead feeders" for traversing and distributing electrical energy over the "wide areas" to be covered in Indian cities, especially if they could be put "under the control of a skilled authority".[106]

The *IE* editorial also contended that such an overhead system overcame completely "the vital difficulty" of obtaining a modality of insulation which would withstand "every phase of the Indian climate". Bose's alternative - that of protecting underground wires from leakage or damage by vulcanized rubber insulation and by embedding them in culverts filled with a plastic composition - was rejected, as it had supposedly had no practical trial. So were the several precautionary measures that he had suggested as means of testing the suitability of electrical wiring installations. The first of this was the testing of high tension cables for insulation at 200 volts. This was considered unnecessary by the *IE* editorial primarily since the cables supposedly already came rated through tests run at 1.5 times their working pressure.[107] Bose's second precautionary suggestion was to ensure that leakage of current on an installation be tested to check that it was not exceeding one-thousandth of the supply current. For this, he also recommended that every high tension cable be continuously insulated with insulating material to a thickness of not less than $1/10^{th}$ of an inch.

The *IE* article thought that Bose was blindly following BOT regulations again in this case and the requirement was merely good quality insulation and not various testing measures to see how they are working by some strict standards.[108] As with certain other claims, the article based this latter conviction on the distrust of English rules being imported to India and the necessity of supporting nascent electrical enterprise in Calcutta, both of which

[105] Anon., 'Electric Cables, Etc.'. *IE*, July 11, 1896, Pg. 19.
[106] *ibid* (emphasis in original).
[107] *ibid*.
[108] *ibid*.

will be familiar here from the legal debates described earlier in this chapter. What was needed instead, the article argued, were a purely "provisional set of rules" - "local regulations" based upon "the best local experience". "On this experience, and this alone, can a satisfactory workable code of rules be based."[109]

A counter to this *IE* editorial piece came in the English journal *The Electrical Review* a couple of months later. This article defended Bose's preference for underground cables as "experience has emphatically proved that in populous districts overhead wires at high pressure are a standing menace to public safety".[110] Further, it claimed that it was precisely because insulating material in India was under constant attack by extremes of climate, temperature and rains that they were relatively safer under the ground. This would also save them the "trial of endurance" posed by the winds in the country.[111] While this article then challenged the *IE* piece on similar grounds of privileging 'local experience', it obviously proposed a very different evaluation for overhead wires. On the other hand, it defended Bose's suggested precautionary testing measures on a different and more rule-bound basis, congratulating them for being updated and in perfect alignment with BOT regulations. It argued that like Bose said, it was best to test actual leakages and specify the thickness of insulation on high pressure cables, "or else, local faults of a serious nature are to be put up with in blissful ignorance that what ought to be sought after is uniform insulation, even if it be not very high as measured."[112]

To make a quick summation of the debates in technical journals as provoked by Bose's suggestions, it could be stated at the outset that in this phase of early electrification, certain 'technical' and scientific positions in many ways mirrored their legal counterparts, in the way they turned electrical rule-making into an exercise of tentative coding and provisional/postponed application. The urge to devise rules specific to Indian conditions and 'local experience' and differently from English predecessors also exhibits via these positions, especially as articulated by the editorial piece in *IE*. At issue here was also the

[109] *ibid*.
[110] Anon., 'Experts and Critics', *The Electrical Review*, vol. 39, No. 979, August, 28, 1896, pg. 258.
[111] *ibid*.
[112] *ibid*.

designation of expertise that was repeatedly invoked by the same journal, as a kind of knowledgeable practice embedded in local conditions and experience.

Yet it is also worth emphasizing here that 'experience' could be interpreted to convey different meanings by different 'experts'. The immediate issue of 'experience' that came up in the deliberations over the overhead/underground wiring problem followed from the Harrison Road case, where the insulation of the previous underground wiring was damaged enough to disturb the lighting scheme entirely within three to four years of its commencement. Both for the local expert Bose as well as for the metropolitan interlocutor *The Electrical Review*, this 'experience' did not necessarily lead to the conclusion that the wires be moved overhead where, the latter opined, their insulation would come under greater attack from Indian climatic conditions. The problem of laying underground lines in terms of the deteriorating insulating material, was also a longer one that concerned the Imperial Telegraphs in India.[113] An 1893 Communication to an English journal by a telegraph engineer in India suggested that such wires when placed underground were regularly attacked by soil conditions and the grass and white ants which gnawed through the insulating material.[114] A slightly later discussion on the subject however had another telegraph engineer in India proclaiming that the degree of damage suffered by the insulation cover of underground wires varied under different soil conditions in India.[115] At the time of this discussion, lead-sheathing on these underground wires were apparently working quite well when provided with iron-wire armouring.[116] Incidentally, the *Indian Engineering* and *The Electrical Review* had both agreed that lead-sheathed armoured cables were one obvious option for protecting the insulation on underground electrical wires in India. Thus even as overhead high-tension wires as required for the Harrison Road scheme, were still not certified as safe, underground wiring meanwhile, was also not considered impossible.[117] And in fact it is remarkable

[113] For a discussion on early questions of insulation of telegraph wires in India see Lahiri Choudhury (2010, 32-34).
[114]'Letter from P.V. Luke, to the Secretary, Institution of Electrical Engineers', February 1, 1893, Proceedings of the Institution of Electrical Engineers (Progs. IEE henceforth), pg. 146-147.
[115] 'Statement by Mr. O. Burne in Scott-Moncrieff: Insulation of Conductors of Electricity in India: Discussion', 1901, Calcutta, Progs. IEE, pg. 384.
[116]*ibid*.
[117] The counter-example of a successful underground wiring scheme was available at this time in Calcutta by way of the Eden Gardens installation, running successfully for quite a few years (since 1881) in the city.

here that the tenders that came for the Harrison Road lighting scheme from private syndicates were themselves mostly designed to deliver underground wiring.[118]

The CMC eventually chose to try out an overhead system as a 'temporary' measure with government permission and the stipulation to follow BOT rules. A contract to this effect was made with Messrs. Kilburn & Co.[119] The concerns of both cost-effectiveness as well as haste drove this decision.[120] The plan was to replace this with a more permanent underground wiring arrangement; but this was delayed continuously owing to the inertia of having to stop lighting on the premier road once again to make the changes.[121] However, not long after in 1904, the CMC decided to get the electric lights replaced by cheaper gas lights. It also did so because most Commissioners found the former to be "very defective".[122]

The technically informed discussion and debate that was staged in view of the Harrison Road electric lighting scheme goes a significant way to help us confirm Surendranath Banerjee's assertion in the Bengal Council that Local or Municipal Authorities like CMC were actively drawing on available expertise in the matter of setting up public electric lighting schemes. We can now see that in over-ruling him, it is actually the provincial and imperial legislative process that was side-stepping the issue of technically-informed mediation. Late 19th century Calcutta was hardly devoid of the necessary human inputs of knowledge and skill on which were crucially stilted the processes of early electrification. On the one hand there was the domain of a native and relatively skilled class of workers who operated as the silent maintenance infrastructure of such processes. And on the other hand, and as shown by many historians, the public life of science in Calcutta had already by the 1870s thrown up figures like Father Eugene Lafont and Mahendra Lal Sircar and platforms like the 'Indian Association for the Cultivation of Science', who cultivated a

[118] 'Ref No. 19 – Tenders for Electric Lighting', January 25, 1896, Progs. 39th meeting of the General Committee of the Commissioners of Calcutta, THA.
[119] Government of Bengal, Report on the Administration of Bengal, 1896-1897, Calcutta, 1898, pg. 76.
[120] 'Ref No. 21 – Electric Lighting of Harrison Road', March 2, 1896, Progs. 44th meeting of the General Committee of the Commissioners of Calcutta, THA.
[121] 'Ref No. 7 – Lighting of Harrison Road', April 15, 1898, Progs. 3rd meeting of the General Committee of the Commissioners of Calcutta, THA.
[122] Anon., 'The Corporation of Calcutta: Lighting of Harrison Road", April 17, 1904, *The Amrita Bazar Patrika* (*ABP* henceforth), pg. 9.

relatively more theoretical interest in electrical principles on public platforms.[123] Lafont'sone time scion J. C. Bose was a product of this very milieu.[124] As he returned from Cambridge after his studies in the natural sciences, he had become an obvious choice for the Corporation to seek out advice on the Harrison Road lighting scheme. The contributions of the likes of Bose and Lafont to the technical discussions, the technical debates surrounding their propositions and the urge of such CMC-consulted experts to take up even an experimental (yet relatively safe) trajectory in opening up electrical schemes in Calcutta, show that it was very much possible to have a locally sourced yet trans-locally oriented techno-scientific opinion on matters electrical in late 19th century Calcutta. These issues did not then always have to be consigned to provisional settlement based on some presumed exceptionality of 'local experience'. In choosing this latter option, the colonial state opted for a hasty resort apparently favouring private capital. But its skipping of expert mediation in the process was however not going to be possible indefinitely, as later events immediately bear testimony to.

6. The beginning of CESC operations

The first license under the 1895 Calcutta Electric Lighting Act was eventually awarded for twenty-one years, by the GOB on 29th December 1896. The license went to Messrs. Kilburn and Co. who were the agents in India of one of the syndicates vying for the Calcutta concession. In February 1897, after receiving the license, this syndicate formally named itself the Calcutta Electric Supply Corporation (CESC). The relative vacuum in expert mediation within the colonial bureaucracy still continued in the early period of the award and the commencement of this CESC's operations. And the syndicate too expected certain liberal conditions of permissibility as it prepared to extend its distribution mains and service lines in the colonial city. In this section of this chapter, we will describe how such expectations of private enterprise were negotiated within the government of early electrification in the last few years of the 19th century in colonial Calcutta.

[123] On Sircar see Chakrabarti (2001). On Father Lafont see Biswas (1994). For a more general take on the emergence of scientific sensibilities in 19th and 20th century Bengal see Palit (2006) and Lourduswamy (2004).

[124] On Bose see Dasgupta (2009). For an excellent take that breaks down Bose's scientific practice and theory into its constituent parts to reveal amongst other things, the skills and labouring entities who lay behind Bose's instruments and execution of precision, see Dey (2017).

In April 1896, Kilburn and Co. was vying for the Calcutta concession under the 1895 Act. It had earmarked larger portions of the city for its supply than other applicants. But the more distinctive feature of its proposals was the electrification of the tramways of the Calcutta Tramways Company (CTC), till then run by horse-pulled carriages along tracks laid in various parts of the city. The firm was representing a syndicate in London which was working with the manufacturing concerns of Colonel Rookes Evelyn Bell (R.E.B.) Crompton. Crompton was a well-known personality in India, having served in the Indian Army two decades back. With his previous technical training in railways, he had made considerable improvements to the steam power-driven railways over the 1860s and the 1870s. This engagement with the steam engine in India seems to have also pushed him towards electrical work.[125] By 1878, he had formed his own company Crompton & Co. in England that began the supply of arc electric lighting systems, many of his own design. In the 1880s and the 1890s, Crompton and Co became one of the pioneering concerns for domestic electrification in England and supplied electrical equipment of every kind, but mostly of the Direct/Continuous Current (DC) type. Crompton himself had by then also emerged as one of the main faces and contributors to the emerging techno-science and commercial principles of electrical engineering.[126] In 1896 he took a special interest in the Calcutta case and had personally come down to oversee the proposals to be laid out by Kilburn & Co.

Kilburn and Crompton's proposals envisaged that out of the 2 million units of electricity that they planned to sell every year in Calcutta, the lighting needs of the town would only be able to absorb about half a million (the fan demand was yet to be anticipated). The remaining 1.5 million units were thus to be utilized by the electric running of the tramways, a deal that they had already struck with the CTC.[127] The first critical issue that

[125] Anon., 'Colonel REB Crompton in India', The Institution of Engineering and Technology Archives (henceforth IET), London. Material taken from their website: https://www.theiet.org/resources/library/archives/featured/crompton-india.cfm (last accessed: April 4, 2021)

[126] Anon., 'Archives Biographies: Colonel REB Crompton', IET. Material taken from their website: https://www.theiet.org/resources/library/archives/biographies/crompton.cfm (last accessed: April 5, 2021).

[127] 'From Messrs. Kilburn & Co. to The Secy, GOB, PWD', March 27, 1896, No. 2, in GOB, Public Works Department (Miscellaneous Public Improvements)(henceforth, PWD(MPI)), January, 1897, IOR/P/5159 (this is the India Office Records, Proceedings (P) Series and will be referred to by respective bound volume no. as IOR/P…following how they are maintained at the British Library, London).

had to be resolved here was again the wiring (underground/overhead). The firm planned to produce and distribute direct/continuous current through a spinally arranged system of 'mains' which were to be bare copper strips strained and supported in water-tight (and easily accessible) culverts under the ground. But branching out of this spine, much of the 'feeder' supply serving both lighting and trams was to be on an overhead basis – the tramways would be run on the bare (uninsulated) "trolly wire system" and the lighting units were to receive current from bare copper conductors encased in porcelain insulators. This overhead system was apparently designed to overcome

> the difficulties and uncertainties which undoubtedly exist in this climate in using conductors buried in the ground and which must therefore be insulated with materials such as India-rubber or lead covered, both of these materials having been found to be attacked when buried in the earth in India.[128]

It can be recalled here that the GOB had pledged to abide by the BOT regulations in the matter of technicalities such as those of wiring, when the 1895 Act was enacted. But now shortly after, faced with Kilburn's proposals, the Government claimed to have no recourse to any in-house expert to advise regarding this. It thus requested the GOI to contact the BOT in England directly for an opinion about the suitability of the proposals in terms of the safety of the public and telecommunication lines.

In May 1896, the current D.G. Telegraphs, C.H. Reynolds weighed in on the subject. Reynolds suggested that before the proposals are sent to the BOT, Kilburn should furnish drawings, maps and more information regarding how they were going to wire the streets of Calcutta and how much voltage they were going to supply through the respective kinds wiring, overhead and underground.[129] He also pointed to the particular problem in Calcutta of "nor'-westers and thunder-storms" that regularly felled trees on the streets of

[128] *ibid*.
[129] 'Note by the Director-General of Telegraphs in India', May 7, 1896, No. 20, in GOB, PWD(MPI), January, 1897, IOR/P/5159.

the city and how these would amplify the danger of breaking overhead wires.[130] Reynolds also suggested two alternatives – the first, again of lead covered u/g cables which could actually go on for years if given suitable coverings of saltpeter and the second, of using overhead wires, but properly insulated for protection against danger, as practiced in the electric lighting arrangements at the Docks in Calcutta. Corroborating his caution regarding overhead wires, another Telegraph officer P.V. Luke referred to the GOB decision at the time that overhead wiring did not suit crowded thoroughfares like the Harrison Road.[131] He also pointed to the recent experience in Madras where the wires of the electric tramways caused major disruption to the telegraph and telephone lines both by electrical induction as well as by physical contact when the wires frequently slipped off the overhead trolley, for which the tramways company had to pay significant compensation.

In a reply to this set of notes by the Telegraph Department, Kilburn & Co. admitted that communication wires might be disturbed by their current and stated that they were ready to pay legally mandated compensation for that.[132] But they did not show much keenness to provide too much more information on their scheme as they claimed that "it is, at this stage, impossible to give drawings of the lines…as the size of them will depend on the demand in various districts."[133] They did however specify that they wanted to carry lighting and tramway wires on the same poles, running at 500 volts and 600 volts 'pressure' respectively. Describing this as "low tension" (contrary to BOT specifications of the time which described voltage over 500 volts as 'high pressure'/tension, which had to be compulsorily covered with insulating material[134]) and pledging to carry the wires on strong enough posts that could withstand storms and cyclones, Kilburn posited that the security of the public would not be endangered by them; rather by cheapening costs of production and supply of current, it "will make electric tramways possible" and enable

[130] *ibid*.
[131] 'Electric Lighting and Transmission of Power by P.V. Luke', April 1, 1896, No. 21, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[132] 'From Messrs. Kilburn & Co., to Secy, GOB. PWD', July 13, 1896, No. 26, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[133] *ibid*.
[134] Like J.C. Bose too had suggested in view presented as the expert consulted for the Harrison Road electric lighting scheme.

the sale of "electricity at a rate which will make it a cheap illuminant."[135] According to the firm's information, lead-covered wires had "not proved satisfactory" in the Telegraph Department and it was just not justified, they argued, to bury "some 30,000 GBP worth of insulated conductors without being more or less certain that it would stand the climatic conditions."[136] Moreover, in justifying their "low tension" system, they pointed to how both the wires at the Docks as well as at Harrison Road of late, were carried on the same overhead system even as they ran "high tension" electricity without much known rules or regulations.[137] Finally, they requested the government to hasten the granting of the license as the delay was proving "long and expensive" by making it difficult for them to raise money on the London market.[138]

In the coming months, more such communications were addressed to the government by Kilburn & Co., urging them to expedite matters lest the London money market and bank rates rise in a way "which makes us (Kilburn) fear that the whole scheme may fall to the ground through lack of funds."[139] It was not so much the case that the GOB and the GOI were not keen on responding to such pleas. But having referred the case to the BOT in England for expert advice, their role in sanctioning the license had become somewhat limited to conveying the BOT's conditions to the firm. And the BOT much like the D.G. Telegraphs, at first found the scheme proposals deficient in the requisite information. I

The BOT did not have a problem with "overhead bare wires" per se, "if proper precautions are taken"; but it added that "the question is one of details."[140] By October 1896, the BOT had referred the scheme to its resident 'Electrical Adviser', Major Cardew. Meanwhile in lieu of more documented 'details', Cardew was referred by the GOI to Colonel Crompton who was back in London. But the "informality in the manner

---

[135] *ibid*. Higher tension/pressure/voltage of current transmitted means less loss of electrical energy in transit by dissipation and thus along with cheaper costs of overhead wiring (compared to underground), it would possibly diminish supply costs considerably (everything else remaining the same).
[136] *ibid*.
[137] *ibid*. The irony of the Harrison Road example could of course not be missed here: Kilburn & Co. were themselves the contractors for the relighting of the road by electricity and the CMC had agreed to follow BOT regulations in the wiring of the scheme, which made it their responsibility to do the same.
[138] *ibid*.
[139] 'From Messrs. Kilburn & Co., to Secy, GOB. PWD', September 30, 1896, No. 42, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[140] 'From Under-Secy, GOI, PWD to Secy, GOB, PWD', September 8, 1896, No. 36, in GOB, PWD(MPI), January, 1897, IOR/P/5159.

in which this matter has been referred" made Kilburn's "London friends" even more anxious.[141] While Crompton as promoter as well as an expert associated with scheme did manage to convince the BOT of its feasibility, this "evidently did not satisfy Major Cardew."[142] The latter expert continued to ask for the requisite drawings to judge the safety of the overhead scheme proposed.[143] It is difficult to figure out if Crompton actually managed to show Cardew these drawings, but he did go on to have "several interviews" with him.

The GOI eventually hired Cardew directly for a steep fee of 75 guineas in order that he draw up a report on the subject.[144] Finally when he submitted this report in early December, 1896, Cardew had apparently become convinced by Crompton's description of the deleterious effects of the Calcutta soil on insulated underground wires. He had further relented on other counts. But some details of Kilburn and Crompton's scheme also seem to have undergone changes. Cardew firstly summarized the system as one on which "continuous current" would be supplied at a "pressure not exceeding 500 volts" for tramways and a lower 225 to 450 volts for other supplies like lighting.[145] Some of the "mains" would be in underground culverts and some above ground, duly supported by posts and standard equipment of the Indian Telegraph Department; the 'feeders' for tramways and lighting would both be overhead.[146] He did not quite specify the kind of insulation to be used for the overhead wires. In his Report, Cardew broadly ruled out possibilities of electric shock or breakage of overhead wires if "works are executed and maintained in accordance with suitable regulations…and under proper supervision", noting that "an electric inspector" had to be appointed statutorily for this purpose.[147]

---

[141] 'From Messrs. Kilburn & Co., to Secy, GOB. PWD', October 12, 1896, No. 46, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[142] 'Note by T. Higham', October 13, 1896, in 'Supply of Electric Light and Power to Calcutta and working of the Calcutta Tramways by Electricity', Civil Works (Miscellaneous), GOI, Part B, November, 1896, Nos. 7-46, NAI.
[143] 'From Secy, GOB, PWD to Messrs. Kilburn & Co.' October 28, 1896, No. 55, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[144] 'Minute', October 30, 1896, in 'Electric Lighting of Calcutta', PWD, GOI, IOR/L/PWD/6/504.
[145] 'Report of the Proposed System of Electric Supply for CALCUTTA by Major P. Cardew', December 12, 1896, pg. 2, in 'Electric Lighting of Calcutta', PWD, GOI, IOR/L/PWD/6/504.
[146] 'Report of the Proposed System of Electric Supply for CALCUTTA by Major P. Cardew', December 12, 1896, pgs. 2-3, in 'Electric Lighting of Calcutta', PWD, GOI, IOR/L/PWD/6/504.
[147] 'Report of the Proposed System of Electric Supply for CALCUTTA by Major P. Cardew', December 12, 1896, pg. 3, in 'Electric Lighting of Calcutta', PWD, GOI, IOR/L/PWD/6/504.

Some of the necessary regulations he chose to specify himself but only in rather broad terms, like keeping the insulation of house wires in proper condition, keeping overhead tram wires out of reach, preventing their contact with telephone lines, etc. by means of guard wires and constructing them in a way to withstand strong winds.[148] More particularly, he claimed to have made Crompton accept the condition that overhead lines had to be replaced by underground ones if demand on any line exceeded 50 KiloWatts (KW) of power, in order that thicker overhead wires, more susceptible to collapsing, could be avoided.[149]

Cardew's Report in December 1896 obviously paved the way for the GOB allotting the license to Kilburn & Co. before the end of that year.[150] But it is really unclear if the Report made for any technical input to the eventual license conditions presented to the firm. The license continued in many ways with the legislative strategy of deferral with which we might have become rather familiar by now in our foray through the first two decades of electrical law-making in colonial India. Thus all it specified was that the firm was liable to supply electrical energy "by means of some system which shall be approved of by the Local Government...subject to such regulations and conditions for securing the safety of the public…as the Local Government may, from time to time impose."[151] By implication the undertakers could place any electric line above ground with the consent of the Local Government without any immediate specification of their technical conditions.[152] But even with this latitude, the indecision with what to do with technical specifications continued without the aid of any on-the-ground expert mediation. Thus even after a year and a half of their obtaining a rather permissive license and raising the necessary capital, the CESC conducted their first general meeting in London with the regret that great delay continued to mar their progress due to the irresolution of their

[148] 'Report of the Proposed System of Electric Supply for CALCUTTA by Major P. Cardew', December 12, 1896, pgs. 4-5, in 'Electric Lighting of Calcutta', PWD, GOI, IOR/L/PWD/6/504.
[149] 'Report of the Proposed System of Electric Supply for CALCUTTA by Major P. Cardew', December 12, 1896, pg. 11, in 'Electric Lighting of Calcutta', PWD, GOI, IOR/L/PWD/6/504.
[150] 'From Secy, GOB, PWD to Messrs. Kilburn & Co.' December 26, 1896, No. 71, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[151] 'Calcutta Electric Lighting License 1896, Clause 9: Nature and Mode of Supply' in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[152] 'Calcutta Electric Lighting License 1896, Clause 11: Overhead Lines' in GOB, PWD(MPI), January, 1897, IOR/P/5159.

negotiations with the government concerning "what mains should be laid underground and what wires fixed overhead".[153]

By awarding the CESC license, colonial law had then taken a decisive step in creating seemingly freer circumstances for private electrical capital and enterprise to flourish; and yet this 'freedom' was not immediately yielding correspondingly conducive conditions for the technical operations of the concerned enterprise. The conclusion of a long drawn process of seeking out metropolitan expertise for a colonial electrification project was after all (but perhaps only *expectedly*) yielding some dead letters. Techno-scientific facts and the (self-)evidence of 'details' and 'drawings' did not travel very well across the colonial-metropolitan divide. What fared better in such conditions were actually very personal connections. During the passing of the 1895 Act in the Bengal Council, Henry Cotton had attributed the realm of Local Authority with the motives of the 'personal' that disqualified it from becoming decisive in technical matters of electricity. And yet, it was the colonial state which possibly resorted to the fat rewards of expert guineas and the 'informal' machinations of Colonel Crompton, to secure a rather personalized execution of its electrical objectives. In the process, Kilburn & Co were majorly exempted from the somewhat more expensive, but very real alternative of running electrical lines in Calcutta via lead-sheathed underground cables, that was still within active consideration of many a local or not-so-local technical mind of the times. Yet cheaper overhead wiring - including the (internationally) uncommon option of erecting even the higher voltage and thus higher risk '*mains*' above the ground and within a well-populated town - still seems to have needed a considerable degree of personal mediation which was not quite available till at least some time later.

The tinge of the 'personal' rubbed off in other ways. P.V. Luke, who retired as the Director General of Telegraphs in India and had opposed the overhead wiring of the CESC, soon joined the board of the company in 1898.[154] And earlier that year in January, an employee of Crompton & Co. in India, John Willoughby Meares began his term with the Bengal government as Electric Inspector, becoming the first officer of the colonial

[153] Anon., 'Calcutta Electric Supply Corporation (Limited)', May 6, 1898, *The Electrician*, pg. 68.
[154] 'Advertisement of the Calcutta Electric Supply Corporation', April 1, 1898, *ABP*, pg. 7.

state dedicated to matters of electrical lighting and other uses of current electricity. Technical affairs in Calcutta and the fortunes of the CESC took a somewhat different turn after this. But before exploring that later in the thesis, it is necessary to take note of another development that stalled the CESC's fortunes, if only temporarily, in order to wrap up the discussion for this chapter.

7. The Calcutta Municipal Corporation and the electrification of the tramways

Kilburn and CESC never really got the go ahead to electrify the CTC tramways when they received their license, even though this was a key part of their original plans. When Kilburn withdrew from this plan, this was primarily due to the CMC still not having approved their take-over of the Calcutta Tramways Company (CTC) operations. This section will explore the case of the electrification proposals for the tramways in Calcutta more closely. In doing so, it will also revisit the domain of the Calcutta Municipal Corporation as it formed a third node in the triangular negotiations between private enterprise, the colonial state and the 'Local Authority'. While left bereft of any decisive powers in matters electrical on count of the 1895 Act, the CMC still had certain stakes of its own that intersected with Kilburn and CESC's early plans, especially as it retained certain contractual rights in relation to the tramways. By virtue of this, it had protracted negotiations with Kilburn and the CTC concerning the electrification of the Calcutta tramlines, part of which resulted in Kilburn's withdrawal.

Perhaps these negotiations can then be read as confirmation of the colonial state's apprehensions about 'Local Authorities' being 'obstructive' in matters of urban and technical 'improvement'.[155] Yet the CMC's counter concerns were also, as will be seen, heavily debated within its own constituencies. Attending to such debates reveal that the electrification of the Calcutta tramways was more of a multi-dimensional problem with a specific history, rather than simply being a question of technical advancement or urban 'improvement'. This section then will take stock of such concerns. In doing so, it will draw to a close our discussion of matters of institutional and legal mediation as they

[155] The best account of Calcutta's municipal politics and its relationship with the colonia state remains Ray (1979).

interacted with early propositions concerning electrification in British India till the end of the 19th century.

The setting up of public tramways in Calcutta was quite a complicated affair from its very inception in the early 1870s. Around this time, the Calcutta Corporation was coaxed by the Government of Bengal to start a tramway scheme primarily meant to connect the East Bengal Railway terminus at Sealdah station to the river bank in order to aid the circulation of commercial goods between these two sites. While the GOB had advanced some capital to the Corporation for this purpose, the Corporation was in charge of the day-to-day operations of the tramways. This horse-driven line which ran from Sealdah through Baithakkhana, Bowbazaar, Dalhousie Square and then along Strand Road down to the Armenian Ghat, was opened on 24th February 1873. However the GOI had shortly after reneged on its commitment to the municipal tramways and authorized the E.B. Railway Co. to extend its own line to the river and establish a terminal station at Chitpur. Resultantly, all the commercial traffic was diverted to this more powerful line, leaving the Corporation trams running heavy losses. The tramline was thus soon terminated on 20th November, 1873 within barely nine months of its opening, with the rails and the rolling stock being sold off.[156]

The second attempt at starting tramway lines in Calcutta, again horse-driven, was through a 'concession' made out to Messrs. Parish and Souttar by the CMC in 1878. This company however soon sold this license to the London-based Calcutta Tramways Company. The 1880 Calcutta Tramways Act formalized the agreement between the CMC and the CTC. Accordingly, the CTC had to pay track-rent to the CMC at the rate of Rs. 2000 per mile of single line and Rs. 3000 per mile of double line with periodic revisions. The term of its license was 21 years, after which in 1901 the Corporation had the right to buy out the tramways concern.[157] As brought up many a time in the CMC's later negotiations with the CTC, the purchase of Messrs. Parish and Souttar's license happened actually at a rather exorbitant price of 135,000 GBP. It was suggested that this heavy initial outlay had significantly contributed to the over-capitalization of the CTC, leading

[156] This early history of the tramways in Calcutta is summarized from Goode (1916, 322-326).
[157] *ibid*., pgs 326-327.

to the firm devoting too little of its finances towards the maintenance of its lines.[158] The lines were thus apparently "not well and solidly laid" leading to the Commissioner of Calcutta having to regularly remind the company of its obligation to keep them in proper order.[159] After an enquiry that found the rails in many places standing up to 2 inches above the roadway, the CMC also fined the CTC in September 1885. The tracks kept deteriorating in spite of this. In 1889, another legal notice was served on the CTC. Following this, the company set some of its lines in order, even though the complaint about their poor state continued over the next decade.[160] The company's finances too were not entirely in the best of shape, as it was still recovering from the hefty, initial license fee. When the track-rents were revised to slightly higher amounts in 1893 and formalized through a new legislative measure in 1894 (Act III of the Bengal Legislative Council, 1894), the CTC threatened to stop all their cars unless some of the rent was remitted.[161] The CMC was then compelled to remit Rs. 15,000 of their track rent for the next 5 years.

The tension between the CTC and CMC over the poor state of the Calcutta tramlines was hardly resolved when in 1896, Kilburn and CTC approached the Corporation regarding the former's joint scheme of electric traction and lighting. The conditions proposed to the CMC may seem somewhat ambitious given CTC's very immediate past record. The Corporation was asked to waive their purchase rights (exercisable in 1901) for another 21 years, revise the purchase price to 40% above the running cost of the concern and continue the remission of track rent by Rs. 15,000 every year for another 21 years. These measures were asked for in view of attracting fresh capital of 200,000 GBP in the London market. This scheme too was to be technically executed by Crompton & Co. Many Commissioners of the CMC initially remained expectedly apprehensive regarding how sound a business proposition this could be. Some of them like the Armenian lawyer J .G. Apcar convinced the Corporation to ask for a set of details concerning the foreseen costs of electrifying the tramways, the cost of repair, maintenance and depreciation and other

[158] 'Statement Mr. Baker, Ref No. 3 – Electric Traction', January 28, 1897, Progs. Adjourned Special Meeting of the Commissioners of Calcutta, THA.
[159] Goode (1916, 327).
[160] *ibid*.
[161] 'Report of Special Tramways Committee', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.

sundry expenses.[162] It is also useful to mention here that after the CTC experience, the CMC wished to ensure that the more general electric lighting license if obtained by Kilburn, would not be sold off to another concern right after.[163] Some of the Commissioners also remained anxious that a company as represented by Kilburn, that was entirely based out of England would be difficult to negotiate with; instead it should either be headquartered in Calcutta or have the CMC represented on its board or have some of its shares owned by the CMC.[164] Further, with one more application being in the fray (from Martin & Co - a Managing Agency firm based in Calcutta with part ownership of the maverick Bengali entrepreneur Rajendranath Mukherjee), the CMC also hoped that keeping the "the interests of the public" in mind, the government would not "give entire power" to any one company "to do what they liked with regard to the electric lighting."[165]

These latter demands of the CMC were overturned in the course of Kilburn's more direct negotiations with the legalised authority in the matter, the GOB. Unsurprisingly, given their parallel dealings with BOT, Kilburn also refused to supply any estimates and information regarding the proposed electric tramways. They reasoned that being agents only, such estimates were not yet made available to them by the investors.[166] Some such details were shared between the CTC and the Kilburn apparently but the latter did "not wish to disclose their estimates of working and profit at the present stage."[167] Moreover, Kilburn asked the CMC to accept as sufficient assurance that the investors were ready to spend nearly 300,000 GBP for the scheme without any guaranteed returns and that the scheme would have the "approval of the final authority of the Board of Trade."[168] As these assurances did not necessarily move the CMC and in the wake of the Corporation

[162] 'From Secy, Corporation of Calcutta to Messrs. Kilburn & Co', December 12, 1896, No. 67, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[163] 'Ref No. 1 – License to Supply Electricity', May 14, 1896, Progs. (Adjourned) Special Meeting of the Commissioners of Calcutta, THA.
[164] *ibid*.
[165] 'From Chairman of the Corporation to Secy, GOB, PWD', June 5, 1896, No. 5, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[166] 'From Messrs. Kilburn & Co. to Chairman of Corporation, Calcutta', December 17, 1897, No. 65, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[167] *ibid*.
[168] *ibid*.

forming a 'Special Committee' to further deliberate on the tramways question, Kilburn & Co withdrew their proposals to take over the CTC operations in February 1897.[169]

The CTC's negotiations with the CMC however went on for a good two more years after this. The tramways company was still contractually bound to the CMC in terms of delivering a functioning tramways service, while it also continued to remain extremely keen on raising the capital in London to electrify the Calcutta lines. One strand of these negotiations and the discussions that it spurred amongst the Commissioners of Calcutta centred upon the safety and appropriateness of the new technology of electricity. CTC made a passionate appeal towards the "humanitarian aspect" – "the mortality and sickness among the horses during the trying season of the year are truly appalling" and the "suffering animals" really needed replacement by "safe, reliable and speedy electric motors."[170]

The priority of mechanical over the current system of animal-drawn tramways was not necessarily an issue of debate amongst the Commissioners. But mechanical traction had not had the best trial in the city. In May 1882, steam-engines were experimentally run on the Chowringhee line of the tramways for a month, during which six accidents occurred. During Durga Puja, steam locomotives still ran down Chowringhee every year with special permission for transporting pilgrims to and from Kalighat.[171] But the doubt concerning mechanical traction remained amongst some. One Commissioner mentioned that even if electric cars could be stopped with the push of a button, they ran for five more yards before coming to a full stop.[172] The issue of a boy being recently run over by the electric tram in Madras was also raised.[173] The Commissioners also discussed an alternative proposal from the Calcutta firm Messrs. Heatly & Graham to run the tramcars

[169] 'Statement of Mr. Cheetham of Kilburn & Co.', February 1, 1897, Progs. First Meeting of the Special Committee set up for deciding on mechanical traction for tramways in Calcutta, THA.
[170] 'From J.R. Maples, Managing Agent, CTC Ltd., to Chairman and Commissioners of Calcutta Municipality", December 21, 1896, No. 69, in GOB, PWD(MPI), January, 1897, IOR/P/5159.
[171] Goode (1916, 328).
[172] 'Statement by Mr. Simmons, Ref no. 2 – Electric Traction', December 10, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[173] 'Ref No. 1 – Electric Tramways', August 27, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.

on gas engines.[174] This was said to be cheaper, and more amenable to a changeover, as all that was needed was apparently to fit each car with a gas cylinder.[175]

There was also however a fair amount of interest and curiosity around the new technology of electricity that was being adopted the world over. Commissioner Abdur Rahman for instance remarked that having personally seen the electric tramways in Glasgow, he was fully in favour of it.[176] Another Commissioner Norendronath Sen similarly supported the idea of electric tramways given the positive experience in English towns.[177] Interestingly, by January 1897, much before any definite resolution being reached, the CMC had supposedly already received several petitions from tramcar travelers as well as one from the "Suburban Rate-Payers' Association" requesting the introduction of electric traction.[178]

The discussion of electric tramways within the CMC however was also suffused by a second, less technical and more economic concern that gradually became the more determining one. This was about how the CTC was to balance its existing obligations with respect to the Corporation and the city tramways in relation to its new proposals to raise capital and introduce electricity. The matter stood out since the very first meeting of the Special Committee of the Corporation in February 1897 that deliberated the new proposals of the CTC. This meeting debated whether CTC should be allowed to raise additional capital to revamp their lines electrically, given that this capital would eventually add to the purchase price for the CMC.[179] It was also proposed to ask the CTC to under-write their capital in that case. And finally the Commissioners pressed the CTC

[174] 'Statement by Messrs. Heatly& Graham Co., Ref no. 1 – Electric Tramways', August 27, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[175] 'Statement by Mr. Simmons, Ref no. 2 – Electric Traction', December 10, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[176] 'Statement of Mr. Rahman, Ref No. 2 - Electric Tramways', August 13, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[177] 'Statement of Mr. Sen, Ref No. 2 - Electric Traction', December 10, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[178] 'Statement of Chairman, Ref No. 2 - Electric Traction', January 19, 1897, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[179] 'Statement by Mr. Sircar,' February 1, 1897, Progs. First Meeting of the Special Committee set up for deciding on mechanical traction for tramways in Calcutta, THA.

to fulfill its legal obligations of correcting the continuing poor conditions of their tracks.[180]

The CTC was apparently still using old-fashioned wood setting for their rails that got damp and deteriorated, the rails then sinking below the level of the road, causing carriage wheels to stick in the grooves, much to the detriment of both the wheels as well as the rails.[181] For some CMC Commissioners, like Babu Kali Nath Mitter and Apcar, the question of line repairs and electric traction had to be kept separate, with the former issue receiving priority.[182] The CTC however kept conflating the two issues, warning that they might have to go into liquidation if forced to repair all the lines within their present scheme.[183] Instead, they intended to relay the lines anew towards electrifying them. They insisted that if offered liberal terms of purchase and exemption of track-rent, and the permission to use overhead wiring and extend their lines into the suburbs, they would easily raise the necessary capital in England and the tramways would also be run fairly profitably.[184] The question of overhead wiring was often debated amongst the CMC Commissioners, who at times wondered whether the narrow streets of Calcutta would face extra risk on their count.[185] It was also recognized that overhead electric traction was becoming common in several places in the west.[186] In any case, the Commissioners had more or less agreed to delegate this concern to the domain of the GOB and the BOT regulations in the matter, as the government had itself wished.[187]

Gradually, many Commissioners of the Corporation softened their approach towards the CTC and its plans for electric tramways in Calcutta. One prominent reason for this could have been certain popular concerns now pushing their way up through the logics of

[180] 'Statement by Mr. Lambert', February 1, 1897, Progs. First Meeting of the Special Committee set up for deciding on mechanical traction for tramways in Calcutta, THA.
[181] 'Statement by Mr. Apcar, Ref No. 2 – Electric Traction', January 19, 1897, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[182] 'Statement by Mr. Mitter', April 15, 1897, Progs. Third Meeting of the Special Committee set up for deciding on mechanical traction for tramways in Calcutta, THA.
[183] 'Statement by Mr. Maples of CTC', February 1, 1897, Progs. First Meeting of the Special Committee set up for deciding on mechanical traction for tramways in Calcutta, THA.
[184] 'Statement by Mr. Maples of CTC', April 15, 1897, Progs. Third Meeting of the Special Committee set up for deciding on mechanical traction for tramways in Calcutta, THA.
[185] Cf. 'Ref. No. 1 – Electric Tramways', August 27, 1896, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[186] Cf. Progs. Second Meeting of Tramways Committee, April 20, 1898, THA.
[187] *ibid*.

negotiation. When the first Report of the Special Committee of the CMC was tabled by Commissioner E.N. Baker in June 1897, certain new purchase terms were proposed in order to aid the CTC to raise funds towards the electrification of their tram lines. The CTC's license was to be extended till 1939 for a further 42 years during which their track rent would also be remitted by Rs. 17,000 every year.[188] After this, the company would be purchasable at 25 times the average of annual profits made by them in the three years previous to the time of the buyout.[189] The purchase clause had always been a bone of contention, as additional capital raised by the CTC would invariably be seen as adding to the CMC's liability, if it ever chose to exert its rights of purchase. By indexing the future purchase price to the CTC's eventual profits rather than to their capital value, the Report sought to offer a solution that would allow the company to raise additional money without this necessarily affecting the CMC's interests.[190] The CTC however would also have to commit a fixed Rs. 25,000 every year towards repairs and renewals of their tram lines.[191]

These proposals caused a considerable rift within the CMC. Some Commissioners like Simmons and Apcar vehemently opposed it. The latter found the Report to be "a joke" and completely contrary to discussions preceding it.[192] Apcar quoted newspapers like 'Indian Mirror' and 'Capital' to argue that the present tramways was not worth this much consideration. The trams were never on time and always completely packed during office-hours. The shocking lapses in the maintenance of the rails caused many a private carriage to trip on them and destroy their wheels and injure their horses.[193] In short, for Apcar, the CTC's operations were then nothing short of a "daily public scandal" and he even accused Commissioners like Baker and Sen who were proposing to implement the

[188] 'Statement by Mr. Baker – Report of the Special Committee on Tramways', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.
[189] *ibid*.
[190] This was well appreciated by many Commissioners. Cf. 'Statement by Mr. Sarvadhikary – Report of the Special Committee on Tramways', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.
[191] 'Statement by Mr. Baker – Report of the Special Committee on Tramways', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.
[192] 'Statement by Mr. Apcar – Report of the Special Committee on Tramways', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.
[193] *ibid*.

Report, of being extremely duplicitous.[194] Apcar's views were directly opposed by Babu Priya Nath Mallik who found it unfair that Commissioners like Apcar, who after all rode their own carriages to their workplaces, should have such a decisive say in the matter rather than those who "would be greatly troubled if the tramways would be stopped" even for a day.[195] A compromise was initially found between such opposing views by way of the CMC serving a new notice to the CTC to get their tramlines in order.[196] But the urge to implement the new terms and begin the experiment with an expanded version of the tramways running on electricity had become somewhat irrepressible, especially amongst the native Commissioners of the Calcutta Corporation.

Over the next year or so the CTC did initiate some repair work and renewal of its rails. But it also periodically reminded the Commissioners that a decision on the electricity question had to be taken as their order for specific kinds of rails would naturally vary according to that.[197] A new Special Committee was then formed by the CMC to discuss the tramways issue. The Report of this Committee proposed to reduce the period of a new license to be offered to 30 years (from 42 years as was proposed earlier) and maintained the purchase price as a multiple of the eventual profits of the CTC rather than their capital value.[198] Commissioners Apcar and Mitter had partially given in to this proposition. But they still wanted the license period to be reduced further to 21 years and a monetary guarantee in terms the repairs and renewals to be given by the CTC, which the company had refused to provide shortly before.[199]

Commissioner Sen and now also Surendranath Banerjee opposed this imposition, as they thought it would make it more difficult for the CTC to run its affairs in Calcutta. And the brunt of this, it was argued, would have to be faced by "the thousands of middle-class

---

[194] *ibid*.
[195] 'Statement by Mr. Mallik – Report of the Special Committee on Tramways', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.
[196] 'Report of the Special Committee on Tramways', June 3, 1897, Progs. Fourth (Adjourned) Ordinary Meeting of the Commissioners of Calcutta, THA.
[197] 'Statement of Mr. Maples', April 2, 1898, Progs. First Meeting of the Tramways Special Committee, THA.
[198] 'Statement by Chairman, Ref No. 4 – Report of the Tramways Special Committee', August 15, 1898, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[199] 'Statement by Mr. Mitter, Ref No. 4 – Report of the Tramways Special Committee', August 15, 1898, Progs. Special Meeting of the Commissioners of Calcutta, THA.

people who used the tramways, however mismanaged."[200] Gradually more native Commissioners echoed this same line of argument. Amarendranath Chatterjee claimed that more than any other implement of municipal government for which the "common classes" in the city paid taxes, it was the tramways that benefited them most by placing within their reach, "the means of going long distances at reasonable rates".[201] Similarly, Mallik exclaimed how the tram fare was 5 pice from Kalighat to High Court, and no one had gone such a long way for such a small charge.[202] A number of people who did not possess carriages had thus apparently visited him requesting to keep the Company functioning.[203]

The CMC eventually resolved to offer these new terms to the CTC. But interestingly it was now the latter's turn to refuse and bargain for better terms.[204] This refusal set off another chain of events with the CMC legally prosecuting the CTC for not maintaining its lines, till eventually a final step towards the electrification of the tramways was taken by both the organizations via a new agreement in 1899. This agreement that was consolidated through the new The Calcutta Tramways (Electric Traction) Law (Bengal) in 1900, bound the CTC to introduce electric traction and keep its lines in good order and further extended its license till 1931, after which the CMC would have the option to purchase the tramways for 25 times the value of its average profits.[205] Electric tramways started in Calcutta within a year of this new agreement.

Such then was the somewhat delayed coming of the second scheme of public electrification in late 19th century Calcutta, that of the electric tramways to be run by the CTC. The prolonged two to three years of negotiation that made up this 'delay' might just lead us to be convinced by the charge of being 'obstructive', leveled against 'Local

[200] 'Statement by Mr. Sen,Ref No. 4 – Report of the Tramways Special Committee',, August 15, 1898, Progs. Special Meeting of the Commissioners of Calcutta, THA.
[201] 'Report of the Tramways Special Committee', August 26, 1898, Progs. Second (Adjourned) Special Meeting of the Commissioners of Calcutta, THA.
[202] 'Report of the Tramways Special Committee', August 26, 1898, Progs. Second (Adjourned) Special Meeting of the Commissioners of Calcutta, THA.
[203] *ibid*.
[204] Cf. 'Reply of CTC', November 2, 1898, Progs. Eighth Ordinary Monthly Meeting of the Commissioners of Calcutta, THA.
[205] Cf. 'The Calcutta Tramways (Electric Traction) Law, 1900 (Bengal)', Legislative, GOI, August 1900, Part A, Nos. 1-3.

Authorities'/Municipal Corporations by the colonial state. And yet going into the details of what made up the negotiations between the CMC, the CTC and Kilburn & Co., we could as easily perceive that obstruction was presented from both sides of the negotiation table.

A characteristic inflexibility towards making adequate information available about their schemes distinctly marked Kilburn abd Co.'s attitude. This both robbed the negotiations of a crucial medium of discussion that could have been the facts and figures in question. It also eventually cost Kilburn the electric tramways contract since a personal touch was not available like in the electric lighting case, to tide over the need of more empirical details. The CTC and the CMC of course were in the same historical fix. The class of carriage-owning Commissioners like Apcar within the Corporation were perhaps being both conservatively righteous as well as adequately cautious about giving too much of a leeway to the CTC given their history of slackening at essential maintenance tasks. And the CTC too would not relent on fishing for better terms in spite of knowing fully well of their enormous liabilities to the CMC. In turn, the way out of this deadlock primarily through a popular push towards expanding and electrifying the tramways service, tells us that there was more to elected institutions like the CMC, than 'conservative' attitudes. If such institutions were more likely than the colonial state to resort to expert advice in techno-scientific matters that apparently had to be dealt with an objectivity shorn of 'popular feeling'[206], such feeling in turn hardly seems to have been opposed to the principle of technical or other kind of improvement of public services.

8. Conclusion

This chapter has explored the first two decades of electrical law-making in colonial India to make the broad suggestion that the colonial state in many ways usurped certain functions and concerns of governing early schemes and proposals of electrification in colonial towns from 'Local Authorities' like the Calcutta Corporation. It did so under the impression that it would be able to steer a different course from metropolitan legislation in the matter, in order to better promote electric schemes in the colony. The chapter

[206] The reference here once again is to our previous discussion of Henry Cotton's statements in the Bengal Council at the time of debating the 1895 Calcutta Bill.

however also shows in some detail how such ‘Local Authorities’ like the CMC were actually quite well disposed towards the government of electrical schemes both by way of their resort to expert advice as well as, and ironically, on count of their implication within early kinds of popular politics. The colonial state was of course particularly immune to the latter influence. But to double the irony, it turned out to also be particularly reticent towards employing expert advice in matters of electricity. It also displayed a characteristic anxiety concerning setting rules for the new technological form too much in advance, lest it mar private enterprise. One result of this was that certain rather uncommon technical practices of such private players - like those of erecting risky and high-voltage overhead ‘mains’ within the well-populated town of Calcutta - had received sanction by the state well before any local expert had come to take a considered decision in the matter. The chapter also described how a skill-bearing class of native technicians (electricians?) emerged in early contexts of colonial electrification, who were significant contributors to the setting up of electric systems in colonial cities.

Chapter 3: Making the 1903 Electricity Act: Expertise, technical questions and the reticence to regulate

1. Introduction

This third chapter of the thesis explores three key issues that became increasingly entangled with the governance of electricity in colonial cities of India since the early twentieth century by analysing the making and working of the 1903 Electricity Act. The chapter will show that the Act augured a regulatory regime that remained implicated in a complicated conception of electrical expertise, a characteristic adoption of flexible conditions for the technical conduct of private electrical licensees and finally a distinct reluctance to regulate certain aspects of electricity supply and consumption.

In the previous chapter we encountered the possibility that the colonial state displaced urban municipal authorities in taking over the administration of the new technology of electricity supply. In doing so, the state in various ways deferred the pronouncement of definite rules to administer the technical conduct of current electricity technology. But by the end of the 19th century in early contexts of urban electrification like Calcutta it became amply clear that this latitude by itself was not enough. The state was compelled if only in a minimal way to resort to some form of expert advice in order to guide the wiring schemes of private licensees. In tracing how the role of the 'expert' was conceived, this chapter begins with the career of J. W. Meares who till his retirement in 1922 held the post of the Electrical Adviser to the Government of India and was thus the main technocrat who oversaw the governance of electricity supply in the colony. Through a discussion of Meares' early career in England and then in India this chapter demonstrates how colonial rule rewarded rather risky forms of practice in its designation of 'expertise', that worked against established norms of technical conduct in face of the challenging financial, natural and technological circumstances of the colony.

Continuing a theme broached already in the thesis, the chapter then goes on to explore in more detail the question of raising overhead lines for electricity distribution in Calcutta, using a relatively untried method of uninsulated bare copper wires. It shows that many an accident in the city made this a dangerous pursuit even as techno-scientific discussions

remained extremely ambivalent about this kind of wiring. The chapter then demonstrates how the question of wiring became a central preoccupation in the discussion surrounding the 1903 Electricity Act. The Act eventually supported the extant overhead wiring schemes in Calcutta and elsewhere based more on considerations of keeping cost down than on any technical or scientific rationale. The chapter analyses how the 1903 Act and its associated rules continued in some ways to replicate the colonial strategy of governing electricity supply systems by deferral of actual rules and standards of technical conduct. It shows how much of the decisive aspects of setting up wiring and insulation arrangements were thus eventually consigned to the provisional judgment of the Local/Provincial government's Electric Inspector. However, the actual force of such Inspectors employed in Calcutta and elsewhere remained rather thin. Even as the Act contemplated the setting up of this expert authority, it hardly made any hard and fast statutory requirement of hiring adequate numbers of them.

Finally the chapter traces the self-made limits of the 1903 Act in the way it left consumers' premises and the wiring and installation work within such premises outside its domain of direct interest. Diverse series of rules emanating from licensees and fire insurance interests and electric inspectors, borrowing often from some metropolitan precedents, existed in colonial Calcutta to govern the installations adopted by consumers through wiring contractors. The colonial state was also keen on supporting such contractors, often European firms, that connected consumers' homes and establishments with the licensee's supply. However the lack of statutory guidance worked to make it difficult to standardize any definite body of rules to discipline this domain of electrical practice. The chapter examines a judicial case about the faulty wiring of electric fans in Calcutta to show how consumer's electric installations were validated in spite of the government expert's objections to the existing kinds of wiring practices in Calcutta. This had future ramifications as colonial law later became rather concerned with matters of efficiency, maintenance and most importantly, the safety of such isntallations. This chapter closes with discussing another set of seemingly uncontrollable and extra-legal practices, those of the fraudulent use of electricity in Calcutta. It shows how judicial deliberation either found it difficult to convict in such cases, or it opted to target the

electrical intermediary or *mistri* figure who was often identified as the prime culprit in such cases.

2. The early career of J.W. Meares, British India's premier electrical 'expert'

This section examines the early career of J. W. Meares, British India's foremost electrical 'expert'. After being inducted as the Electrical Engineer to the Government of Bengal (GOB) to oversee the development of electrical networks in Calcutta (as mentioned in the last chapter), Meares was eventually appointed to the premier position of the Electrical Adviser to the Government of India in 1905 and held this post till 1922 when it was abolished on count of the devolution of power. He also lectured and wrote considerable volumes on the Electrical Acts in India and on electrical engineering that ran into multiple editions. He was obviously then (as he did not tire of claiming) a major 'expert' contributor to the making of electrical matters and electrical law in colonial India and these contributions are a key object of study in this thesis.

But it is useful to begin by going beyond the self-evidence of his official positions, his activities as well as his discoursing on the subject of electricity, in order to better analyse the contingent origins of electrical practice and 'expertise' in colonial India. Towards this objective, this section will discuss Meares' training and his first assignment in India - of starting a hydroelectric scheme for the hill-town and summer retreat of Darjeeling (in north Bengal).[1] In revisiting this early phase of Meares' career, our objective will be to decipher the specific terms on which his skill and learning was developed through his training in England and how this came to be deployed in his early years of work in India. One key guide in this would be his unpublished autobiography that is preserved by The Institute of Engineering and Technology (IET) Archives in London.

John Willoughby Meares was born on the 22nd of July, 1871 in Hadley and had his senior education at Winchester College. By 1889 at the end of his schooling, Meares was advised by his "science masters" to join the ranks of the many public-school educated young men who were led to the electricity supply industry by the "boom" that had come

[1] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, Institute of Engineering and Technology Archives (IET) Archives.

following the 1888 Act in England."[2] Consequently, he was "duly articled to Crompton and Co." after his schooling and after his father had an "interview" with R.E.B. Crompton himself.[3] How they got to know each other is not quite clear, but Meares was clearly born into a well-connected and relatively wealthy family with his father having headed a tea-importing firm and owned a tea estate in Ceylon.[4] Meares began at a branch of the Crompton firm at Llanelly where storage batteries or "accumulators" were manufactured. He was then in 1891 taken on at the company's main unit, the Arc Works at Chelmsford, paying "a hundred a year for the privilege of being in the works".[5] There he worked with "that admirable master, the British workman", being attached to a foreman and a fitter, but also the manager.[6] After this, Meares spent "a year's interlude from the works" in the "engineering schools" at University College, London. The course at the college was for two years, but Meares took both junior and senior classes in the same year. He passed in the senior course while failing the junior one, but performed very well in electrical engineering, coming third in class with 96% marks.[7] When reflecting on his training later in his autobiography, he clearly emphasized the greater significance of the practical part of it over college experience:

> The process of 'going through the shops' was everything to the young engineer in those days, and the possession of a degree in science or even a college diploma was looked upon by prospective employers with grave suspicion or actual hostility.[8]

It is useful to understand here that while all who aspired to learn the trade of electrical science in late nineteenth century England might have had to soak in a process of practical training, the process itself applied differentially to varying categories of trainees. Thus Meares spoke of his status as a "premium pupil" who had to pay his way through his articleship at Crompton and Co.'s industrial units and who could "see and

[2] *ibid.*, pg. 36
[3] *ibid.*
[4] *ibid.*, pg. 382
[5] *ibid.*, pg. 42
[6] *ibid.*
[7] *ibid.*, pg. 47
[8] *ibid.*, pg. 42. Meares also noted at the time of his writing that while classroom training was "nowadays…as essential as shop training", more practical men were still found to be occupying higher levels of administration in many cases.

take part in every process from the purely mechanical up to the design and management."[9] This was distinguished from the mere "apprentice" at the same units, who "was paid a small wage and made to keep strict hours, but had not always the same opportunity of transfer from one department to another."[10] Meares' status as a "premium pupil" was then clearly also of a different social class allowed to have some mobility between the various units of the works in order that he could attain a managerial view of things. This was also of course a status bought by the familial sponsorship of his technical education. At the end of his pupilage in 1894, Meares started work as an "assistant engineer" at the Hove Electric Lighting Co, a subsidiary of Crompton's. Even at this point he lived on remittances sent by his father as his salary was only a pound a week.[11]

Did the difference in social status marking Meares' trajectory from a 'premier pupil' to becoming an 'assistant engineer', guarantee any immediate and special recognition of his learning and/or 'expertise'? Meares' description of one of his assignments while working as 'assistant engineer' does not seem to make a very obvious affirmation of this. When sent to Oldbury to check some of the dynamos installed in Albright and Wilson's manufacturing concerns, his task consisted of watching the machinery for twelve hours with the remaining twelve hours' watch being conducted by "a trusty fitter" who was made to accompany him. Meares was also supposed to "to sit on the machines until they were in order".[12] But when he offered an analytical input in his report that the concerned dynamos were simply too faulty to be continued since they generated unwarranted induction effects, it was met by "complacent incredulity" by his higher-ups - they were not convinced otherwise till they later came down to the site and saw for themselves "what actually happened".[13]

Going by Meares' account as narrated in his autobiography we can surmise three significant points about the relationship between electrical technical practice, education and the designation of electrical 'expertise' as was being crafted in the last decade of the

[9] *ibid*., pg. 42
[10] *ibid*.
[11] *ibid*., pg. 54
[12] *ibid*., pg. 58
[13] *ibid*.

nineteenth century in England. We know from existing histories that this was a decade when English proponents of 'theory' and the mathematical study of electricity (and specifically electrical induction) scored a decisive victory over 'men of practice' in matters of electrical science and eventually this gave shape to institutionalized electrical engineering education.[14] However, Meares' experience describes a situation where a practical training was irreplaceable for entry into the profession of electrical engineering, even after the emergence of specific college courses tending to the same subject. This was a view that also largely influenced the employment of electrical experts in the colony till later decades. Secondly, within the world of electrical technicalities, practical men nonetheless were hierarchically differentiated into a social class who could pay their way up into technical and managerial education in the workshops and another class who had to settle for narrower versions of technical training and more subordinate roles. A final notable point in this regard is that in spite of this hierarchy, the analytical inputs of new 'assistant engineers' (of the higher social class) were not necessarily or immediately appreciated as expert opinion by men with seniority and thus with greater experience in the given technical field. Meares was perhaps amongst the first of the electrical engineers who had training in both practice in the workshops and theory in the college. But his techno-scientific reasoning regarding why the dynamos at Oldbury would not work still appeared as "vagaries" to his senior technicians and manager, who preferred to come down and test his opinion on its practical merit.[15]

In 1896 Meares took up appointment with Kilburn and Co. in Calcutta who functioned as Crompton's agents and set up the Darjeeling hydroelectric station, the first of its kind in British-ruled India. His appointment was on a three years' contract and he was paid 250 pounds a year (Rs. 350 at that point) that seemed "colossal" to him, given his earlier salary in England. Reading Meares' own account of his early work in Bengal, it is possible to detect certain elements of overlap that describe an early and uncertain world of electrical technicality and practice common to both the metropole and the colony. This primarily had to do with the reliance of the electrical engineer/'expert' again on a very

[14] See Hunt (1983), Hughes (1983, 140-174).
[15] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, Pg. 58 and 386. J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, IET Archives.

practical and relatively trial-and-error-oriented method of running rather unruly electrical machines, that were hardly always functioning in predictable ways in these early days of their relatively larger scale production and distribution. Not unlike Oldbury, Meares encountered one such unyielding dynamo on a bridge over the "Roopnarain River" where it had been set up to aid in the lighting of the construction of the Bengal-Nagpur Railway. While Meares had "designed scores of the same type" of the said dynamo, he could not quite make out the defect in this one at first.[16] Eventually one possible cause presented itself which was that the long journey from the factory in England had resulted in demagnetizing its field-magnets. But all of Meares' "usual shop-tricks" still failed to enliven the dynamo. Finally, he had to borrow some battery cells from the nearest Telegraph office to give "the necessary fillip" to its magnetic coils.[17]

Meares' account of how he went about setting up the Darjeeling scheme describes a similar trial-and-error orientation to his technical practice. But it also perhaps indicates the very distinctive character of colonial conditions within which Meares was operating, that both compelled as well as allowed him to attempt more experimental modes of functioning, some even bordering on the adventurous. Such conditions could be described by the fact that his employers (Crompton and Kilburn) had actually tendered to build a reservoir of 40,000 cubic feet capacity, a complete AC production system and transmission lines running for 3 miles, for one-fifth of the sum which a Public Works Department engineer said it would cost.[18] And in addition to the work being carried out for this "impossibly small sum", Meares also lacked any "help from some more experienced men".[19] This aggravated his challenge because he himself had no experience of setting up turbines or hydroelectric systems. Some local aid was available in the form of two Eurasian assistants, a European telegraph subordinate for overhead wire work and Lepcha contractors and coolies. But without "fellow practitioners to consult", Meares felt the lack of more specialized help. Resultantly, "every sort of mechanical conundrum had to be taken and dealt with as it turned up"and this went to the extent of Meares working

[16] *ibid*., pg. 66
[17] *ibid*., pg. 67
[18] It is worth noting here that Meares' training before this was mainly in DC systems as produced and operated by the Crompton and Co and its various subsidiaries.
[19] *ibid*., pg. 69

"as a fitter with my (his) own hands."[20] Moreover, his work was also interrupted by an earthquake in June, 1897 which greatly affected the construction of the reservoir.

Meares' heroic self-presentation in his memoirs seems to drown out any possibility of directly deciphering how his subordinate collaborators might have participated in the technical process. We do learn about Meares' European telegraph assistant doing good work on setting up the overhead electric lines in Darjeeling town while still being dismissed due to his tendency to commit fraudulent transactions. Somewhat inadvertently his Eurasian and Indian (?) assistants are mentioned as critical figures doing the necessary supervisory work. But by and large, and in clear distinction from early electrical innovators in colonial India like C.L. Schwendler, Meares' representation of his 'expertise' seems categorically shorn of any intermediary layer of technical skill that might have also contributed to making the Darjeeling scheme possible. In fact as a rather perverse display of his 'scientific' leanings, Meares also recounts an experiment that he set up to make his coolies dive into an electrically charged salt water basin to recover a copper coin, that was designed to detect "persons of weak intellect" who might be "able to stand much more severe electric shocks than normal folk", as "medical men" had apparently found out.[21] Given that this evolutionary fiction was unabashedly recorded in his recollections as late as 1934, it does seem likely that Meares' heroic claims to being a 'pioneer' expert were also bordered by an imagination of the possibly racially-marked incapacity of colonial subjects to participate in similar kinds of learning and practice that he had.

If the given limitations of resources and unexpected interruptions made for rather difficult conditions for his "pioneer work", Meares himself seems to have eventually made a rather risky venture out of the opening of the electrical scheme, being only too keen to bask in the glory of official recognition that came along with it. In the autumn of 1897, the Deputy Commissioner of Darjeeling asked Meares if the scheme could be opened before the acting Lieutenant-Governor of Bengal, Sir Charles Stevens, left the town for winter. While "much remained to be done", Meares agreed to this "premature

[20] *ibid*.
[21] *ibid*., pg. 70.

opening" as "the opportunity was not one to be lightly thrown away".[22] While he still telegrammed his firm for permission, he went about fixing the last pipes, sealing various leaks and doing trial runs of the turbines and the alternators without even having any "proper apparatus for testing".[23] For the opening he knew that his "proper place was in the power-house" near the reservoir, while someone else "did the honours" at the site of the inauguration of town lighting.[24] But he still risked being present at the site of inauguration in the town while leaving the power house (3 miles away) to Fleury, his assistant who had never handled "high-pressure alternating current" before, and the transformer stations to men "who had never seen an electric light!"[25] When he reached the spot he learnt that his firm had denied him the permission to conduct this hasty opening, but he still went along with it, seeking and obtaining official government support for his decision. The experiment eventually worked out - as the Lieutenant-Governor threw open the switch, within a few "breathless seconds of suspense", electric lights came on for the first time across the streets of Darjeeling. Meares later wrote that "the risks taken were justified…by success" even though he "was undoubtedly wrong in arranging for it."[26]

In January 1898, not long after Meares' somewhat reckless performance in Darjeeling in front of the powers-that-be, he was appointed to the post of Electrical Engineer to the Government of Bengal (GOB). To recount things, there was a great urgency for such personnel in Calcutta where the operations of the new licensees – CESC, represented by Kilburn and Co in India - were in a way held up till a suitable government official could be found to oversee the construction of their mains, happening under the aegis of Crompton and Co.[27] Meares' suitability was under question due to issues of potential conflict of interest given his association with Kilburn and Crompton.[28] A strong

[22] *ibid*., pg. 69
[23] *ibid*., pg. 84
[24] *ibid*.
[25] *ibid*.
[26] *ibid*., pg. 85
[27] The Board of Trade (BOT) also advised the prompt appointment of such an official for Calcutta and Bengal - 'From The Secretary of State for India (SS, Lord George Hamilton) to the Government of India (GOI)', No. 3 (No. 33 P.W.), November 11, 1897 in GOI, Public Works Department (Civil Works, Miscellaneous)(henceforth, PWD(CWM), March, 1898, Nos. 1-14, IOR/P/5448.
[28] Regarding such questions being raised see Verax, "The Electric Lighting Scheme: To The Editor", March 10, 1898, *The Friend of India* (*FOI* henceforth), pg. 10.

recommendation had also come from the (Board of Trade) (BOT) in England to appoint a Mr. William Rowan Wilson, trained at Lord Kelvin's laboratory and with work experience in Glasgow and Bombay.[29] When the GOB eventually selected Meares over Wilson, his having "satisfactorily completed an installation in Darjeeling" was cited as one prime reason.[30] In his autobiography, Meares confessed that it appeared quite unlikely that he would be appointed by the government to pass judgment on the work of the same firm of which he was a junior member.[31] But eventually this became possible as "fortune had favoured me (him) in enabling the acting Lieutenant-Governor to open my (his) small show" (in Darjeeling).[32] He also admitted that his firm "may not have been very sorry to get rid of so dangerous an assistant" as he had been.[33]

The episode in Darjeeling then clearly had much to do with Meares' entry into the colonial bureaucracy where he would take a central role in coordinating the governance of electricity schemes over the next two decades. This was due to the success of his experimental performance but also especially due to the personal connection that he actively sought to establish with the highest orders of the colonial executive through this performance. In late nineteenth century colonial India, personal connections thus clearly went a long way in validating electrical 'experts', as perhaps did class status in England.[34] For our purposes, the Darjeeling episode also reveals certain other categorical elements in the early making of electrical practice and 'expertise', in distinction from the parallel situation in Meares' home country. In this case, Meares' work was certainly made more challenging without the aid of a technical fraternity as existing in England or without adequate budget or technical apparatus or at times due to adverse natural circumstances. Such conditions further accentuated the practical and open-ended aspect of his electrical practice whereby he had to both helm an unprecedented and under-

[29] 'From T.H.W. Pelham, Esq. to the Under-Secy of State for India, India Office, Whitehall', No. 5, October 15, 1897 in GOI, PWD(CWM), March, 1898, Nos. 1-14, IOR/P/5448.
[30] 'From J.G.H. Glass., Secy to GOB, PWD to Secy to GOI, PWD', No. 9 (No. 214, MPI), January 13, 1898 in GOI, PWD(CWM), March, 1898, Nos. 1-14, IOR/P/5448.
[31] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, Pg. 90. J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, IET Archives.
[32] *ibid*., pg. 89.
[33] *ibid*.
[34] This was not unlike how they worked to facilitate the claims of private enterprise in setting up electrical schemes (as discussed in the previous chapter).

funded hydroelectric scheme from design to execution as well as get his hands dirty by working on even the minutest of mechanical glitches as and when they came up.

But more importantly, such conditions also seemed to have allowed the electrical 'expert' a certain degree of latitude regarding what could or could not be permissible within schemes of 'electrification'. One ironical feature of being a 'pioneer' under the conditions within which Meares functioned was that there was hardly any real or virtual order of pre-determined technical directives or other men of experience to discipline his practice. The Darjeeling scheme of course came up at a time when the GOB was undecided about what electricity rules to follow, but had still made a somewhat unsure commitment to BOT rules (prevalent since 1896) of metropolitan origin for safe electrical practice.[35] Yet without the mediation of technical seniority and the scrutiny that this could've involved, it was possible for Meares to look beyond issues of rule-bound practice or stricter concerns of safety. He could thus commence a relatively high-risk, high-voltage, AC operation running on overhead wires without offering personal supervision and without the due diligence of testing the concerned machinery. When the operation 'succeeded' it offered its own retrospective justification and Meares was actually rewarded for it rather than facing any kind of reprimand.

The issue of rules and technical scrutiny did however catch up with Meares not too long after. Meares' first critical interlocutor in India turned out to be W.F. Stuart-Menteth, the Municipal Engineer of Darjeeling, a job that Meares himself claimed to have secured for him.[36] Having worked previously with electrical tea-drying at the tea gardens of Darjeeling, Stuart-Menteth could have had some familiarity with electrical knowledge and practice, though we do not know if he was specifically trained in electrical engineering in the way that Meares was. But in his capacity as the engineer for the Darjeeling Municipality that had taken over Meares' scheme after its completion, Stuart-Menteth chose to still make an intervention concerning the way in which wiring was conducted in the town since electric lighting was commenced by the private contractors.

[35] As discussed in the previous chapter.
[36] *ibid*., pg. 89.

"Seeing that work done by the Contractors was of a very inferior quality," he advised a set of changes in accordance with extant rules of the BOT and the IEE (London).[37] Amongst other things, on the consumer's side, he suggested using higher quality of insulated wires than what the contractors had provided.[38] On the distribution side, Stuart-Menteth recommended earthing points in the transformers for additional safety.[39] He also drew attention to the state of high-tension overhead lines passing through "the most crowded part…the bazaar" which posed "great danger to life."[40] Further, he pointed out that there was "no means of cutting off the high tension current anywhere by means of even a switch" and that in lieu of a telephone, the instruction for disconnection in the case of an accident could take "some three of four hours" to reach the power-house.[41] While Meares was already by this time appointed as the GOB's Electrical Engineer, given his proximity to the private contractors in question, the case was referred by the Government to Major Cardew of the BOT (just like the Calcutta case).[42] Cardew supported most of Stuart-Menteth's contentions, even suggesting that given that uninsulated high-tension wires were disallowed by the BOT, they should be taken underground in Darjeeling.[43]

Meares had of course not found much merit in some of Stuart-Menteth's new stipulations.[44] And his firm found suggested changes like that of the earthing of transformers "practically useless".[45] Darjeeling continued to have overhead wires and it is not entirely clear how the government or the Municipality responded to Cardew's vindication of Stuart Menteth's criticisms. We do however know that Stuart-Menteth and

---

[37] 'Memorandum by Municipal Engineer', 11th December, 1898, No. 7, in GOI, PWD (CWM), March, 1899, IOR/P/5673.
[38] 'No 2, Darjeeling Municipality, Electric Lighting Rules', April, 19, 1898, No. 8, in GOI, PWD (CWM), March, 1899, IOR/P/5673.
[39] 'Memorandum by Municipal Engineer', 11th December, 1898, No. 7, in GOI, PWD (CWM), March, 1899, IOR/P/5673.
[40] *ibid*.
[41] *ibid*.
[42] 'From Secy, GOB, PWD to Secy, GOI, PWD', No. 1 (No.5683, MPI), November 30, 1898 in GOI, PWD(CWM), March, 1899, IOR/P/5673.
[43] 'Report on some points raised in a Despatch from the Government of India (No. 4 P.W. of 16th February, 1899) relative to the electric light installation in Darjeeling', No. 7, in GOI, PWD(CWM), July, 1899, Nos. 6-9, IOR/P/5673. This view interestingly seems different compared to his opinion regarding the feasibility of overhead wires (even uninsulated) in Calcutta that we have encountered in the last chapter.
[44] 'From Secy, GOB, PWD to Secy, GOI, PWD', No. 1 (No.5683, MPI), November 30, 1898 in GOI, PWD(CWM), March, 1899, IOR/P/5673.
[45] 'Memorandum by Municipal Engineer', 11th December, 1898, No. 7, in GOI, PWD (CWM), March, 1899, IOR/P/5673.

Meares continued to share different views concerning how electrical rules should be implemented in India, a difference that we will again encounter (in the next chapter).

In any case, the Darjeeling scheme was the last time that the colonial state deferred matters of electrical technicality to the BOT in England. In the coming decade, as the crucial authority figure who designed key legal directives governing electricity production and supply, first in Calcutta and then for the rest of India, Meares on many a occasion denounced existing British rules of the time as an impediment to the flourishing of electrical enterprise. This was invariably accompanied by the claim that if not anything else, electrical law in India had at least established reasonably more permissive conditions within which private electrical schemes could potentially thrive. How the specifics of such legal mandates worked out and to what effect will be the subject of the rest of the chapter. But looking back at Meares' early career, it can be seen that even before the formal pronunciation of any legal mandate, the earliest colonial programmes of 'electrification' were already fostering forms of electrical practice and 'expertise' that could accommodate financial and resource austerity and in turn bend certain already-obvious parameters of techno-scientific functioning according to the contingent conditions of particular situations and interests. Before having ascended to his position within the colonial bureaucracy, Meares seemed to have quite closely explored the potential of such open-ended practice through his risky, high-voltage AC experiment in Darjeeling. Irrespective of the criticism of such practice, perhaps the stage was thus set for his work in 'innovative' electrical lawmaking that was eventually aimed at exploring various conditions within which questions of safety and/or uniformity could be negotiated against the 'freedom' of electrical enterprise, a freedom considered lost to the strictures of English law. More than the municipality-run Darjeeling scheme, it was the private enterprise CESC's considerably larger operations in Calcutta that occasioned such negotiations in the years that followed.

3. The issue of overhead wiring and accidents

The CESC finally turned on their supply in Calcutta on the 17th of April 1899 by when it had already received applications for 2000 lights and "a considerable number of electric

fans."[46] The first generating station was located at a plot roughly central to the city's layout at the time – at Emambagh Lane near Sealdah Station, by the existing tramway yard.[47] CESC did not yet have any agreement regarding street lighting as the Calcutta Municipal Corporation (CMC) persisted with gas lamps entirely till at least a decade more, after which, only very gradually, some street lights began to be electrified. The CESC also drew no demand from the tramways, which was to be run on its own electric supply till the early 1920s. But nonetheless a particularly strong urge for electricity arose in the city on count of electric fans and it is perhaps on the back of this demand that within 1906, the CESC started 3 other generating stations in the city, at Alipore in 1902, and then in 1906 at Howrah and Ultadanga. In this section, the primary focus will be on the technical issues and accidents that occurred in the course of the first decade odd period of CESC's expansion, often related to overhead electric wires in the city. It will help to understand how these specific issues were problematised within various techno-scientific and other kinds of public discussion before more directly approaching (in the next section) how they were being cast within the legal governance of electricity, as it was developing in colonial India under the aegis of Meares and others.

CESC's first generating station was equipped with four sets of steam-run 'Crompton' dynamos capable of producing 1000 KW of power. This was accompanied by three large 'accumulators' or batteries that were spread out further away from the main generator and used to deliver lighting in the evening. The plant delivered DC on a three wire system at a highest 'pressure' of 450 volts and otherwise more ordinarily at 225 volts.[48] Initially the broader public understanding was that overhead wires would be allowed only "in a few of the outskirts" on iron poles.[49] But in May 1899, the firm was claiming that

[46] Anon., 'Calcutta Electric Supply Corporation, Limited', *The Electrical Engineer*, May 5, 1899, pg. 577.
[47] Bose (1974, 140)
[48] The adoption of DC had already been the subject of criticism in the electrical engineering press where it was opined that given the successful experiments of AC transmission in Lauffen and other places, it would be ideal for Kilburn to take up the AC system that would reduce line losses by at least 15% and would also be suitable for planning future supply to the industrial district across the river (Hugli). Anon., 'The Electric Lighting of Calcutta', *The Electrical Engineer*, September 11, 1896, pg. 297.
[49] Anon., 'The Electric Lighting of Calcutta', *The Electrical Engineer*, April 21, 1899, pg. 506.

they had sanction for over double the length of overground "mains" (17 miles) compared to that for underground ones (7.25 miles).[50]

Part of the reason that this trend continued was simply that overhead lines were easier and faster to erect. The CESC and their managing agents Kilburn and Co. had grossly underestimated the kind of demand for electricity that they would face from various parts of Calcutta. Within the first five years of their operation, CESC thus ended up applying for 3 more licenses – in 1900 for added area within Calcutta, in 1901 for the Howrah Bridge and in 1902 for the town of Howrah – to cover the requisite territory from which this demand arose. Meanwhile, an impatience for electrical energy was engulfing the town. A 1902 article in the periodical *Capital* thus went to the extent of demanding a new company to replace CESC's monopoly in Calcutta because it was being unable to supply the western part of the city – a large area bounded on the north by Canning Street, on the east by Chitpur Road, on the south by Esplanade East and West and on the west by Strand Road.[51] Along with fans and lights, a new demand for power for small motors had seemingly come up in this part of town. The article complained that "many new businesses" that were hoping for electric power were virtually "at a standstill", given that CESC's mains were "loaded to full capacity".[52] The new stations at Alipore, Howrah and Ultadanga took time to come up and in such a situation overhead lines would have certainly been useful for faster extension of the company's supply.

From the company side, the other rationale that was presented to justify the early preference shown for overhead wires was that "in a tropical climate, in a soil like Calcutta", the underground system was difficult to implement.[53] Through a letter to the editor of *The Englishman* newspaper, CESC and Kilburn and Co explained to the Calcutta public in October, 1901 that the English system of underground wiring as implemented in Calcutta was failing in the rainy season, thus causing frequent

[50] Anon., 'Calcutta Electric Supply Corporation, Limited', *The Electrical Engineer*, May 19, 1899, pg. 641.
[51] Anon., 'Electricity in Calcutta: Another Supply Company Needed', reprinted in *The Times of India* (*TOI* henceforth), July 1, 1902, pg. 5.
[52] *ibid*.
[53] 'Annexure I (A)', *ibid*., pg. 78.

interruptions in supply.[54] Calcutta consumers however were not so easily convinced. A man named Peter Swan wrote back to the same newspaper that the bigger problem with CESC current was that it was continually supplied at a lower voltage than the stipulated 215-225 volts, resulting in the situation that "instead of a bright white incandescent filament, the lamps contain a thing like a red hot wire, which gives practically no light."[55] Swan further claimed that CESC official Mr. Reynolds admitted to him that the reason for this could have been that the main wire supplying his apartment was "heavily overloaded".[56] Kilburn replied to Swan's letter reaffirming that the breakdowns to the mains were "in no way attributable to overload"; it was related rather to how "the peculiar climatic action" affected the underground system, compared to which, the overground system "had proved far less trouble".[57]

Even as mystified notions of Calcutta's subsoil and 'tropical climate' was thrown around as explanation in the face of consumer complaints about CESC's sloppy supply, various shades of techno-scientific opinion of the time were more undecided about the difficulty of underground wiring or the suitability of overhead systems in the city.[58] The topic of wiring was one of the only issues concerning the problems of electricity production and distribution that was discussed earnestly in the early meetings of the Calcutta Local Section of the Institute of Electric Engineers (IEE), opened up in March 1901.[59] In the first such meeting, the CESC engineer K.A. Scott-Moncrieff presented a paper on insulation where he claimed to describe "his own experience" in three modes of wiring

[54] The CESC and Kilburn and Co, Managing Agents, 'To the Editor of The "Englishman"', October 3, published October 10, 1901, *The Englishman*, Pg. 17.
[55] Peter Swan, 'To the Editor of The "Englishman"', October 3, published October 10, 1901, *The Englishman*, Pg. 17.
[56] *ibid*.
[57] The CESC and Kilburn and Co, Managing Agents, 'To the Editor of The "Englishman"', October 4, published October 10, 1901, *The Englishman*, Pg. 17.
[58] The issue - as we saw in the last chapter with debate concerning Bose's paper - was hardly resolved in favour of overhead wires in any decisive way amongst emerging 'experts' of electrical techno-science.
[59] In an address marked to inaugurate the Calcutta Local Section of the IEE, Chairman Maclean spoke mostly about the legacy of telegraphy in the colony but ended with an invocation of the various styles of wiring that were coming up with the beginning of electricity production and distribution systems. See, Maclean, F.G., 'Calcutta Local Section, Inaugural Address of The Chairman', delivered March 15, 1901, Proceedings of the Institution of Electrical Engineers (Progs. IEE henceforth), pgs. 984-985.

(amongst other things) prevalent in India, without making any pretence to have made "any novel theories or discoveries."[60]

The first amongst this was "Bare Conductors" that referred to uncovered copper strips carried on "ordinary telegraph pattern insulators" without the insulating component which was the oil.[61] In Darjeeling where 2300 volts AC was transmitted through such lines for 3 miles and then 13 more miles at 230 volts, Scott-Moncrieff claimed to have "no record of any trouble."[62] The same was claimed for Calcutta where 27 miles of the same kind of bare wire carried on oil-less brackets were used to distribute 450 volts DC. An additional concern in the city was the weight of the heavier lines of copper used to feed greater demand. But neither this heft nor the possibility of trees interfering with the wires and living creatures like crows, kites and flying foxes being electrocuted seemed to raise any major concern for Scott-Moncrieff.[63] In the case of a second type of wiring – that of "continuously insulated Aerial Lines" used for some "high-tension lines" in both Darjeeling and Calcutta - Scott-Moncrieff used "vulcanized indiarubber" following "Board of Trade requirements".[64] These too apparently remained in an "excellent condition" which surprised him when he thought of "the burning sun and pouring rain to which they have been exposed."[65] Lastly, the case of insulation used for underground conductors was discussed as having faced "specially trying conditions" in Calcutta consisting of "excessive damp", "heat", "the deleterious action of soil upon all lead pipes" and "want of skilled labour."[66] Scott-Moncrieff stated that of late, the "Callender's solid system" was being tried to sustain underground mains in the Calcutta subsoil in which "the cables insulated with vulcanized bitumen" were being laid in iron troughs.[67] The experiment still needed more time he thought, but it had already passed the test of "very severe floods" in the city.[68]

---

[60] Scott-Moncrieff, K.A., 'The Insulation of Conductors of Electricity in India', paper read at Meeting of Calcutta Local Section, March 29, 1901, Progs. IEE, pg. 371.
[61] *ibid*.
[62] *ibid*., pg. 372.
[63] *ibid*.
[64] *ibid*., pg. 373.
[65] *ibid*.
[66] *ibid*., pg. 374.
[67] *ibid*., pg. 375. A better choice was pinkado wooden troughs but the wood was proving difficult to procure.
[68] *ibid*.

Not unlike the late nineteenth century context of electrical techno-science evolving in tandem with the electricity supply industry as discussed before, Scott-Moncrieff's paper too seems to describe a largely practical knowledge-based system of functioning. And the contingent nature of such practice and experience-centred knowledge seems to have been particularly accentuated as the said industry expanded in different locations around the world, like for example through the peculiar conditions of the subsoil and climate of Calcutta. Yet especially as practical experience remained the determining instance, some of Scott-Moncrieff's points were countered by telegraph engineers who had observed the case of underground wires in India for a considerably longer period.

Thus in the ensuing discussion, contrary to Scott-Moncrieff's rejection of lead pipes for carrying underground wires in India, C.T. Williams commented that the wearing away of the lead sheathing on underground telegraph wires in Madras was actually caused by "electrolytic action on the sheathing when in the vicinity of the (new) electric tramways."[69] Another discussant W. Thom asserted that the "lead-covered and steel armoured system" of underground wires was the "longest lived cable in England" and it could also prove "to be the best for India."[70] The Telegraph Department official O. Burne commented that "the life of lead sheathing seems to depend very much upon the soil it is buried in" and described how some such lead-sheathed cables had actually survived intact in the Calcutta subsoil since "the Mutiny".[71] Scott-Moncrieff also received some contrary opinions against his advocacy of uninsulated bare overhead conductors. Thom pointed out that without oil there was risk of the insulation of the 'bare conductors' becoming "very low" with dust filling up the oil recess and "such a line might be the cause of hurt, or even of death."[72] Meares claimed that the current method of erecting such circuits were an "absurd form of construction" and suggested adding greater support to the heavier kind of such wires "which would render falling next to impossible."[73] The uncertainty regarding aerial wire support also comes out in another comment of Meares regarding how the work of erecting such wires for electric supply in India was done

[69] 'Scott-Moncrieff: Insulation of Conductors of Electricity in India: Discussion', paper read at Meeting of Calcutta Local Section, IEE, March 29, 1901, Progs. IEE, pgs. 379.
[70] *ibid*., pg. 383.
[71] *ibid*., pg. 384.
[72] *ibid*., pg. 383.
[73] *ibid*., pg. 385.

"more by rule of thumb", even though telegraph engineers had more sophisticated calculations to offer on the same subject.[74]

Reading these proceedings of the Calcutta section of the IEE it seems obvious that even as CESC was propagating the view that the Calcutta subsoil and climatic conditions presented a serious challenge to usual methods of underground wiring, the techno-scientific opinions of the time were not entirely congruent with this idea. In any case the proceedings indicate that other methods of underground wiring were more than feasible. Moreover, the proceedings also reveal that it was quite difficult to ignore the risks associated with the option of overhead wiring, especially those of entirely uninsulated types that seemed to have been in wide use in Calcutta and elsewhere. One major reason why this might have been so was because electrocution accidents from the collapse of overhead wires raised throughout the city to feed lights, fans, motors and trams were becoming quite common in the early years of the twentieth century.

In July 1900, it was being reported that "overhead bare copper wire" used by the CESC was leading to many accidents.[75] And by 1902, as CESC supply and tram lines began spreading more extensively, the risks foreseen in the discussion of Scott-Moncrieff's paper were being realized as fatalities on the city streets. Stormy evenings in Calcutta that year resulted in the electrocution of several horses that came in the way of broken and falling electric wires.[76] Apart from falling wires, native bystanders and workers who either touched electric lines by mistake or were working on them received sharp shocks that resulted in severe injuries and hospitalisation.[77] The first very vivid reporting of death by electrocution in Calcutta was that of CMC peon Shaik Bhikoo in June 1902, near Wellington Square, at the corner of Dhurrumtollah Street.[78] It was stated in the press that the accident resulted from a branch of a tree breaking during a storm and snapping an

[74] The comment was made in the discussion of another paper at the Calcutta section of the IEE on specific calculations of temperature, mass and wind pressure involved in the construction of overhead telegraph wires in India. 'Mr. Meares' comment, Burne: Some Hints on Overhead Construction: Discussion', paper read at Meeting of Calcutta Local Section, IEE, April 19, 1901, Progs. IEE Proceedings, pg. 428.
[75] R.W. Ashcroft, 'Electrical Calcutta', *Electrical World and Engineer*, July 1899, vol. XXXVI, No. I, pg. 14.
[76] See Anon. 'Storm in Calcutta', May, 1, 1902, *The Englishman*, pg. 15.
[77] See Anon. 'Accidents', May, 8, 1902, *The Englishman*, pg. 14 and Anon. 'Tramway Electric Wire Accident', May, 15, 1902, *The Englishman*, pg. 14.
[78] Anon. 'Electricity at Calcutta: The Death of a Native', June 18, 1902, *TOI*, pg. 5.

electric wire of the CESC which then fell hanging over the footpath.[79] While some passers-by ignored the wire, others had already received shocks when they tried to push it aside though they did not raise a warning immediately, perhaps unaware of what caused this intense but novel sensation.[80] The peon was however not so fortunate as he seemed to have brushed against the wire and then having received a shock, tried to instinctively remove it with his right hand.[81] This caused severe burns and led to his demise.

At the inquest various witnesses described "great confusion at the scene of occurrence".[82] It was also brought up that "the current in the broken wire was running fully for an hour" and that the "ground was wet near the broken wire" from rain.[83] The inquest produced the verdict that "sufficient precautions have not been taken by the Calcutta Electric Supply Corporation to have the current shut off promptly when breakages occur."[84] The verdict of course followed after two engineers of the company ended up describing how the broken wire might have retained current as it was not properly earthed and how they could not switch off the current from the Central station as it "would plunge the whole town into darkness".[85] They also suggested that chance of wires breaking would be lessened if the current span of posts at 180-200 feet was reduced and the wires supported by posts placed closer to each other.[86]

In the aftermath of these accidents in Calcutta the issue of dangers emerging from electric wires was discussed in some detail in the *Indian Engineering*. An article in a July 1902 issue of the journal pointed out how earlier estimates of the threshold of danger at 700 volts DC and 250 volts AC in England and at 1500 volts by American experts had proved "much too high."[87] On the contrary "a direct current of 250 volts only" could cause death

[79] Anon. 'Fatal Contact with Wire', June, 12, 1902, *The Indian Daily News, Overland Summary*, pg. 13.
[80]*ibid*.
[81]*ibid*.
[82] Anon. 'Dangers of Electric Wires: An Inquest at Calcutta', June 19, *The Englishman*, pg. 8.
[83]*ibid*.
[84]*ibid*.
[85]*ibid*. Earthing is a well-recognized safety process in electrical installations whereby an instantaneous discharge of electrical energy is effected by transferring charges directly to the earth (always situated at a higher electrical potential) through low resistance wire – thus the electrical charge does not travel through other conductors onto potential human contact in case of a short-circuit or some similar fault in the wiring. More discussion on this in the fifth chapter.
[86]*ibid*.
[87] Anon., 'The Dangers of Electric Wires', July 26, 1902. *Indian Engineering*, pg. 51.

under certain conditions.[88] Given this and the greater use of the (more dangerous) AC motors coming up throughout the world, electrical stations and factories were being brought under greater regulation through the English Factory Acts. In Calcutta on the other hand, it was "the dangers to the public in crowded streets" that needed greater attention given the overhead distribution of the "trolley wires of the tramway" and the "wires of the electric lighting company."[89] Trolley wires were "excluded from the leading cities of the world – London, New York, Paris, Vienna, etc."[90] But even if trolley wires carrying 500 volts could be allowed elsewhere, the article argued that the dangers of these as well as the lighting wires were "considerable" for Calcutta.[91] This was because "the ground may be wet, the man bare-footed" – "the native of India" was invariably devoid of the "protections" of "dry boots" and "dry clothing".[92] Thus electrical companies here had to be "doubly careful in regard to their overhead wires."[93]

In a later article in the same year, a somewhat different aspect of the problem was explored. In this article, it was claimed that the susceptibility of the human body to electric current was a problem of "extreme complexity".[94] This was because apparently "there is a remarkable difference between one person and another as to the number of milliamperes required to produce death" – in turn this seemingly depended on the "degree of humidity and thickness of skin" and also upon "the condition of the nervous and cardiacal systems."[95] If the previous article in the journal had urged electric companies to construct with a view of the particular difficulty of wetter conditions and bare-footed men and women on the streets of Calcutta, this article reminded that even as technical issues like "working voltage" were a matter of "public safety", they also eventually resolved into "the consideration of the cost of copper."[96]

---

[88] *ibid*.
[89] *ibid*.
[90] *ibid*.
[91] *ibid*.
[92] *ibid*. Common-sensically speaking, the issue here was that both the human body as well as water being good conductors of electricity made for greater chances of receiving shock.
[93] *ibid*.
[94] Anon., 'Electric Shocks', September, 13, 1902, *Indian Engineering*, pg. 164.
[95] *ibid*.
[96] *ibid*.

The technical press of the time then seemed to have eventually approached the issue of the danger from overhead electric wires with a certain degree of ambiguity. While it was clear that some amount of safety measures were essential to incorporate the specific social and local conditions in the city, such concerns were also tempered by the matter of how cost-sensitively this could be done. Certain precautionary steps were however being taken in the city to deal with the problem of broken wires. The Commissioner of Police invited representatives from the government and the electric, telephone and tramways companies to consult about the problems of electric accidents."[97] After the death of Shaik Bhikoo, the Commissioner also requested St. John's Ambulance Association to call a meeting with similar representatives and devise "some simple instructions" as to "what do in the case of broken electrical wires" and the rendering of "First Aid" after electrocution.[98] It was decided that the "thick trolley wires over the tramway lines and the electric light wires are the dangerous wires" and other (telephone or telegraph) wires "are harmless so long as they do not touch the above wires." Various safety directives were decided upon by this conference like not touching fallen wires, using a stick to push them aside or covering hands with dry cloth when handling them, etc. Treatment like artificial respiration for the electrocuted was also advised. All of this was to be made into a pamphlet and distributed amongst the police and electric and tramways company personnel.[99]

Some precautionary measures were also initiated by electricity suppliers even though they hardly compromised in matters of working voltage and overhead wiring. The tramways company thus started erecting extra wires along their existing overhead construction which were to "act as shields to the wires carrying current", were the latter to break.[100] The CESC too publicly demonstrated a similar protective instrument – a metal bracket to be fixed to their poles as "a 'short-circuiting' or 'earthing device'" - at their Alipore station "in the presence of several European men."[101] The device was demonstrated by making a native workman of the Company cut a stretch of wire that

[97] Anon., 'The Dangers of Broken Electric Wires', May 10, 1902, *Indian Engineering*, pg. 298.
[98] Anon., 'Accidents with Electric Wires: First Aid Instruction', June 19, 1902, *The Indian Daily News, Overland Summary*, pg. 9.
[99] Anon., Untitled, June 19, 1902, *The Englishman*, pg. 1.
[100] *ibid*.
[101] Anon., 'Electricity in Calcutta, Harmless Overhead Wire', July 3, 1902, *The Englishman*, pg. 16.

while falling on the device resulted in the current being routed through a fuse which blew up and effected disconnection. The company also aggressively defended itself against an allegation made in a letter from the Calcutta Municipal Corporation to the Landholders' Association that it "had not taken proper precautions…for the safety of the public" by threatening a libel suit against the Municipality.[102]

A few months after this, Calcutta saw a second very public case of death by electrocution.[103] Raja Mehter, a sweeper, accidentally came in contact with a wire that was broken by an evening storm that raged through the city. Witnesses, mostly durwans on Park Street, helplessly witnessed the painful death of the man from the shock that he received from the broken wire. When one of them tried to grip his outstretched hand, he was shocked too and quickly released his hold.[104] The broken wire was found hanging from the bracket on the wall and it lay in a coil "of some thirteen feet" across the whole of the footpath before someone pushed it to a side with an umbrella.[105] The inquest revealed that the deceased's clothes were wet.[106] This time the repair took place within twenty minutes of the incident, but was still obviously too late. The verdict suggested that the government insist on electric companies using "automatic disconnectors" on their wires and poles to prevent such incidents.[107]

Since December 1902, even as the GOB allowed the CESC to erect more "overhead mains" within the newly licensed 'added area' in Calcutta, it had also started insisting on such 'disconnectors' "in all important thoroughfares."[108] Through 1903 and 1904, the government was still prodding the company to fulfill this obligation or 'guarding' their wires.[109] Irrespective of how much such precautions were taken, accidents resulting from

---

[102] Anon., 'A Threat and Libel Suit', September 20, 1902, *The Amrita Bazar Patrika* (*ABP* henceforth), pg. 7.
[103] Anon., 'Monday's Storm in Calcutta, A Native Electrocuted', April 23, 1903, *The Englishman*, pg. 20.
[104] *ibid*.
[105] *ibid*.
[106] Anon., 'The Park Street Electric Wire Fatality, Inquest', April 30, 1903, *The Indian Daily News*, pg. 16.
[107] *ibid*.
[108] 'Index entry for File No. 5E/27 of 1902', November 20, 1902, Table B of the Proceedings of the GOB, PWD(MPI) for December 1902, IOR/P/6325. Being Category 'B' files, I have not yet been able to consult them.
[109] See 'Index entry for File No. 5E/8 of 1903', June 8, 1903, Table B of the Proceedings of the GOB, PWD(MPI) for June 1903, IOR/P/6554 and 'Index entry for File No. 5E/4 of 1903', October 26, 1903, Table B of the Proceedings of the GOB, PWD(MPI) for January 1904, IOR/P/6784.

electric apparatus in public conditions did not stop immediately. Overhead wires continued to snap during storms and shock horses and humans, even kill unsuspecting workers on the streets of Calcutta.[110] Such wires became dangerous in other ways as well. In September 1907 a young Bengali student Radha Benode Neogy, known to carry out "sundry electric experiments", decided to hoist a piece of copper wire over overhead tramway lines on Upper Chitpur Road.[111] While the resultant sparks scared him off, sometime later a native woman passing by got accidentally entangled in his wire that still dangled from the overhead lines and was shocked to death. A charge of causing death by a rash act was registered against Neogy.

No such charge was however ever made against the CESC or CTC notwithstanding the number of judicial admonitions that they faced. Through the first decade of the spread of electrical infrastructure in Calcutta the overground wires of these companies were near unique in the world at the time, given the expansive use of bare copper to transmit higher voltage electrical current (450 v and upwards).[112] Moreover, doubts were also expressed about the state of their overhead construction of pegging wires between widely spaced and inadequately supportive posts. This created a dangerous situation of uninsulated wires collapsing in the city leading to loss of lives and severe injuries, of native men and women mostly from a category of workers who traversed the rain-soaked urban geography bare-footed and untrained in the ways of the new electric power and thus remained more susceptible to the deadly effects of the current. Techno-scientific opinion of the time had in many ways foreseen such risks and suggested alternatives, even of switching entirely to the feasible though somewhat more expensive option of underground wiring (also more prevalent in other cities of the world). This option was only sparingly resorted to, often citing natural limits to what could be done with the Calcutta climate and subsoil. Instead, measures like attaching safety guards onto aerial lines was attempted to quell the anxieties of European denizens, who were in any case

[110] In 1904 another fatal accident of a cooly was taken cognizance of by the GOB. 'Index entry for File No. 5E/4 of 1903', June 26, 1903, Table B of the Proceedings of the GOB, PWD(MPI) for January, 1904, IOR/P/6784. For more reports of accidents see, Anon., Untitled, June 22, 1905, *The Indian Daily News*, pg. 10 and Anon., 'Injuries from Electric Wires', October 24, 1906, *ABP*, pg. 5.
[111] Anon., 'Fatal Electrical Experiment', September 19, 1907, *The Englishman*, pg . 17.
[112] The famous American experiment of overhead construction had died a famous death by then with the multiplication of accidents on American streets. See Essig (2005).

less at risk from electrical accidents. These devices however hardly worked out to be entirely full-proof. The primary reasons why the overhead system still continued then seem less related either to exclusively techno-scientific reasoning or to strictly technical solutions. Rather, it could be argued that overhead wiring scheme only flourished on count of the particular interpretation that was made of such technical allowances within an evolving genre of colonial legal discussions and actions. It is to this body of lawmaking that we will turn now.

4. The making of the 1903 Electricity Act

Towards the end of the last chapter, we saw how through a series of personally coordinated negotiations in London, R.E.B. Crompton, heading the firm that was to deliver and set up the material components for the Calcutta scheme, had convinced the BOT to allow a system of supplying DC at voltages of up to 500 volts via a mix of overhead and underground mains and feeders. On paper, the central 1887 Act and the provincial 1895 Calcutta Act under which the CESC license was awarded, recognized the safety protocols of existing English BOT regulations. But the specific design of the CESC license left enough room to thrash out the exact details of their wiring scheme with the government at a later point, irrespective of the law. These details began to be settled after the appointment of Meares as the GOB's Electrical Engineer in January 1898.

It was possibly owing to this position in the government that Meares was fast emerging as the most authoritative figure in electrical matters in Bengal. The Civil Engineering College at Sibpur had started some basic practical training in issues of electricity supply and had established an electric lighting installation within the college premises in 1896. In March, 1900 and March, 1902, Meares was invited to deliver a set of lectures on electrical engineering and electrical traction (respectively) to the students of the college. In these lectures Meares depicted how the regulations for electric supply in Calcutta while being taken "*verbatim* from those of the English Board of Trade", were still departing from them.[113] For instance, apropos rule 19 of these regulations that required

[113]Meares, J.W., Electrical Engineering with particular reference to Conditions in Bengal, Six Lectures delivered in March 1900 at Civil Engineering College, Sibpur, Bengal Secretariat Press, Calcutta, 1900, pg. 84 (italics in original).

any service line within 7 feet of any building to be "completely enclosed in stout India-rubber tubing", he considered it "far wiser to have no pretence of insulation on such lines, since the rubber tubing will assuredly perish within a year or so of its erection."[114] Even as the rules per se forbade uninsulated lines as "bare copper is in general prohibited" in England, Meares stated that the government in Bengal was consenting to them on a case-by-case basis as "they offer the greatest advantages of any system having regard to the peculiarities of the climate."[115] For electric traction too, Meares outlined the advantages of the overhead trolley system as "in climates such as India,…underground cables do not stand well."[116]

We have already encountered similar ideas advocating overhead wiring over underground systems in Calcutta based on the climatic peculiarity of the region. Echoed by Meares, such ideas perhaps achieved a certain degree of canonization as his Sibpur lectures were printed and distributed in the form of separate publications by the Bengal Secretariat Press and became the first primers of electrical engineering in India. We have also of course come across certain alternatives to such ideas. Given the somewhat unsettled nature of the techno-scientific question concerning overhead or underground wiring at the time, Meares endorsement of the said ideas perhaps reflected an element of personal judgment that actively excluded other options of thinking and working upon the problem of wiring up Calcutta.[117] Such judgment could have been in turn influenced by his experience of overhead construction in Darjeeling or his initial proximity to the commercial concerns running the Calcutta scheme that were also keen on the specific overhead system in question. However irrespective of the particular reason why such judgment was exercised, what is significant here is that with the imprimatur of the colonial state, Meares' opinions were clearly prevailing as the more authoritative view on the subject.

---

[114] *ibid*., pg. 85. Scott-Moncrieff's paper had however made quite the opposite point regarding India-rubber insulated overhead wires.
[115] *ibid*., pg. 71-72.
[116] Meares, J.W., 'Electric Traction, Six Lectures delivered in March 1902 at Civil Engineering College, Sibpur', Bengal Secretariat Press, Calcutta, 1902, pg. 23.
[117] Even Meares as we saw in the last section was not completely convinced about the nature of CESC's construction even though he broadly supported the idea of bare overhead wiring.

While Meares lent the critical element of personal judgment that enabled the primary validation necessary to start off the electrical scheme in Calcutta, his modality of sanctioning overhead construction on a case-by-case basis, still remained of "doubtful validity" on legal terms, till it could be formalized by the code of law.[118] By 1900, the imperial government became keen on such formalization "for the sake of uniformity", such that one singular body of rules would be deployed throughout the colony to conduct matters of electrical licensing and supply "in supersession of…existing regulations".[119] This demand of centralization of rules on a pan-India level was then to be met by a committee of the representatives of rather local interests from the capital city, that of the CMC, the CESC, the CTC and the Bengal Telephone Company in addition to the Electrician of the Telegraph Department and Meares, the Electrical Engineer of the GOB.[120]

The need for uniformity of electricity governance through a colony-wide legal measure also received push from private enterprise. By the end of 1899, yet again as an exercise of his personal connections, R.E.B. Crompton (representing Kilburn and CESC) met the Viceroy and proposed to him a new bill that would supposedly make it easier for promoters to initiate licenses for starting electrical schemes in colonial India.[121] More particularly, through the new proposed Act Crompton sought to effect certain changes in the current Calcutta license - to extend its term from 21 to 42 years and get better purchase terms should the license be bought afterwards by public authorities, to secure the guarantee that no other company would be allowed to supply in the same area as the CESC and finally to omit Section 13 of the existing 1895 Calcutta Act that restricted the construction of overhead wires.[122]

---

[118] Meares, J.W., The Law Relation Electrical Energy in India being The Indian Electricity Act, 1910, Act IX of 1910, Thacker, Spink& Co., Calcutta, Second Edition, 1922, pg. 8.

[119] 'Notes on draft regulations for electric lighting and traction framed under Act XIII of 1887 (India)', No. 6/2, Genl. No. 2798/2, February 13, 1900, in 'Proposed appointment of a Committee of experts to discuss the various clauses of the draft rules to be issued under the Electricity Act XIII of 1887, approved', Civil Works (Miscellaneous), GOI, April, 1900, Part A, Nos. 3-10, National Archives of India (NAI henceforth).

[120] 'Note by O.C. Lees', March 10, 1900, *ibid*.

[121] 'From R.E. Crompton, to The Private Secretary to His Excellency the Viceroy, Government House, Calcutta', December 15, 1899, in 'Proposed Electricity Act', Civil Works (Miscellaneous), GOI, May, 1900, Part A, Nos. 1-2, NAI.

[122] 'Note by T. Higham', January 26, 1900, in 'Proposed Electricity Act', Civil Works (Miscellaneous), GOI, May, 1900, Part A, Nos. 1-2, NAI. To remind once again, the option of purchasing utility concerns by

In the next couple of years discussions about uniform rules by the concerned Calcutta-based committee and those about a new Act by consultation across provinces went on simultaneously. The second set of discussions culminated in the making of the new 1903 Electricity Act for all of colonial India. One major issue that affected both the discussions was that of overhead lines. But before we approach this, it is useful to understand how the colonial state negotiated the host of other demands put forward by Crompton and subsequently by other interested parties. The GOB was already quite desirous "of introducing some, if not all, of the amendments proposed by Messrs. Crompton."[123] But as the Crompton bill made its way through various phases of discussion, some of its clauses appeared outlandish even to its most accommodative allies within the colonial bureaucracy.

In his notes on Crompton's proposed bill, the GOB's Electrical Engineer Meares appreciated how the bill reiterated the principle of restricting the sovereignty of the local authority (municipality, etc.) in matters of awarding electrical licenses.[124] He also stated that the draft bill's extension of the duration of the license (after which it could be purchased) to 42 years from 21 years was something that the GOB had already granted in principle. But Meares was less sure about the intention of the bill to completely obliterate any competition within the same area in which a prior license had been allotted as well as its intention to entirely debar municipalities and other local authorities from seeking licenses or opting to purchase a private electrical concern after due time.[125] He also rejected the purchase clause in the bill that required the government to buy up the licensee's work in case the latter became insolvent.[126] Meares' views were found to be

---

public bodies after a stated period of time was one of the key elements of the monopoly control measures prevalent in English law since the last few decades of the nineteenth century. This is what is referred to as the purchase clause.

[123] 'Note by T. Higham', April 21, 1900, in 'Proposed Electricity Act', Civil Works (Miscellaneous), GOI, May, 1900, Part A, Nos. 1-2, NAI.

[124] 'Note by the Electrical Engineer on new Draft Electricity Act, etc., forwarded for consideration of the Government of India with their letter No. 506 C.W.M. of 15th May 1900', July 4, 1900, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives. This was also congruent with the Lord Cross' Committee's recommendations in 1898 in England which still however had not been applied in that country.

[125] *ibid.*

[126] *ibid.*

agreeable by both the GOB as well as by officials of the imperial government.[127] Public Works Department (PWD) members also included a clause allowing the varying of terms of purchase by the discretion of the Local (provincial) Government even after the award of a license.[128]

As the new electricity bill went through a usual cycle of consultation with provincial bodies, it became clear that most Local Governments did not yet have enough stakes in the matter of 'electrification', nor did they have the requisite expertise at their disposal to suggest changes in the proposed imperial law. But several opinions nonetheless emerged that strongly reaffirmed the critical role that local bodies like municipalities could play in matters of electricity supply in India. The CMC expectedly led this charge and argued vociferously against the proposal to void its sovereignty in matters of electrical licensing.[129] The Rangoon and Bombay Municipalities made similar impassioned claims to greater empowerment of Local Authorities in matters of electrical licenses.[130] On the other hand, representatives of private capital hoped to effectively finish off any chance of municipalisation of electrical undertakings, posing this as legal innovation that could surpass the supposed obstacles posed by English law. The Calcutta Tramways Company thus expressed concern that "allowing a local authority to come in after a certain number of years and take over a concern,…where the terms of purchase can be varied," will make it rather difficult to source investment for newer companies.[131] Kilburn and Co. warned that "the suggested municipalisation of electrical undertakings" in the bill would "restrict electrical enterprises in India as it has done in England."[132] The Bengal Chamber of Commerce (BCC) similarly cautioned against giving any more scope to municipalities in

[127] For the Bengal decision endorsing Meares' views see 'Note by D.B. Horn', September 20, 1900 and 'Note by O.C. Lees', February 28, 1901, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[128] 'Note by O.C. Lees', February 28, 1901, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[129] 'Minutes of the Proceedings of the 3rd Meeting of the Special Committee appointed to watch the progress of the Electricity Bill', September 17, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[130] See 'General Remarks, Burma' and 'General Remarks, Paper No. 12' in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[131] 'From Martyn Wells, Managing Agent, Calcutta Tramways Company, Limited to The Officiating Secretary to the GOB, PWD', September 23, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[132] 'From Messrs. Kilburn and Co., Managing Agents, CESC to The Secretary to the GOB, PWD', September 24, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

matter of electrical licensing than merely seeking their opinion.[133] The BCC in fact created a Special Sub-Committee to deliberate on the new electricity bill that stated emphatically in its report that "(I)n the light of English legislation, India should be able to learn how not to legislate."[134] The Sub-Committee urged that even though the English Government had not acted upon the recommendations of the 1898 Cross' Committee, Indian legislation on electricity should adopt its principles and look to a future in which electrical schemes could be envisioned as "bulk" supply, neither constrained by the scale or consent of municipal government, nor amenable to purchase by municipalities at their own price at a later date.[135]

The likes of Meares and the PWD had to walk a tricky tightrope in relation to the oppositional views articulated by municipalities and private capital. Meares for instance eventually settled that a veto for local authorities in matters of electrical licensing "was not in the interests of the community generally", but still thought that the "power for the local authority to buy up after the 42 years should be retained."[136] The Select Committee considering the bill in the Legislative Assembly eventually mandated that local authorities need to be consulted, but removed any requirement for their outright consent to be necessary for granting of an electrical license by the Local (provincial) Government (clause 4(1)). On the other hand, it kept open a slim possibility of future municipalisation of electrical undertakings by allowing local authorities to purchase private concerns after the full 42 years of license but only after the Local Government allowed them to do so (clause 5). It also empowered the Local Government to vary the value and terms of the purchase after the said period (clause 10).[137] More broadly, the 1903 Act as it emerged after all these deliberations made for an imperial law with centralized rules to be

[133] 'From The Secretary, Bengal Chamber of Commerce to The Secretary to the GOB, PWD', September 11, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives. This was unlike the stipulations of the 'Provisional Orders' issued following from the 1888 Act in England requiring the local authority's approval before their issue.

[134] 'Bengal Chamber of Commerce, Report of the Special Sub-Committee on the Indian Electricity Bill, 1902', February 14, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

[135] *ibid*.

[136] 'Note by Mr. J.W. Meares, Electrical Engineer to the GOB, on the 'Draft Indian Electricity Bill' in view of the Reports of various Public Bodies, etc., on the same.', October, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

[137] 'Report of the Select Committee on Bill & Amended Draft', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

otherwise administered by Local (provincial) Governments except for certain sites like cantonments, etc., where electrical matters were consigned to the administration of the Governor-General.

While the local authority could not be entirely obliterated from the eventual distribution of power within the new Act, its control was fully eroded by the imperial and provincial executive in one important matter – that of the wiring of electrical concerns. From the very beginning of the deliberations on the new electricity bill, Meares had rearticulated his preference for bare overhead wires. Part of his contention was similar to that made in his Sibpur lecture that "corrosive salts" in Calcutta's soil, its "liability to subsidence" and its "unusually damp" condition "militates against all systems of underground mains."[138] But in repeating his preference for "overhead bare copper lines" Meares also admitted that there was significant danger from such lines collapsing in storms "due directly to the falling of a tree or branch."[139] Driving his opinion in favour of such overhead lines was however "another point"– "the *far* greater cost of all systems of underground mains."[140]

In directly emphasizing such cost concerns and thus perhaps letting go of the more "electrical side of the question", Meares expressed his absolute agreement with "the promoters" that "many a scheme would in India be rendered commercially impracticable if underground mains were insisted on or even insulated aerial lines."[141] Bare overhead lines were already allowed in places like Calcutta under his administrative watch on a case-by-case basis. In the course of the negotiations concerning the 1903 Act, Meares made it clear that this was "very cumbersome" and left scope for the local authority to "disapprove" of particular cases of overhead construction "if it chooses."[142] Instead, he proposed a system that was eventually drafted into section 18 of the Act whereby only at the start of license would the Local (provincial) Government have to approve of the system of overhead construction with necessary protective measures, after which the

[138] 'Note by the Electrical Engineer on new Draft Electricity Act, etc., forwarded for consideration of the Government of India with their letter No. 506 C.W.M. of 15th May 1900', July 4, 1900, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[139] *ibid*.
[140] *ibid*. (emphasis in original)
[141] *ibid*.
[142] 'Note by Mr. J.W. Meares, Electrical Engineer to the GOB, on the 'Draft Indian Electricity Bill' in view of the Reports of various Public Bodies, etc., on the same.', October, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

individual construction of overhead lines would not need separate sanction.[143] Moreover, the 1903 Act also eventually differed from the 1895 Calcutta Act in removing all necessity for licensees to inform or seek consent from local authorities even in case of underground line construction.[144]

Meares and the eventual 1903 Electricity Act then seemed to have explicitly incorporated matters of cost as a key consideration of how the wiring of present and future electrical schemes would be governed in colonial India, as distinct from concerns of techno-scientific reasoning and safety. The law also aimed at progressively reducing oversight over overhead constructions by exempting them from particular case-by-case verification. On these counts in particular colonial electrical lawmaking seemed to have remained true to the urge of 'innovating' beyond the strictures of metropolitan law.

But though much of this legal 'innovation' was aimed at freeing up scope for private capital, it is interesting to note here that not all representatives of private enterprise in Calcutta were necessarily very keen on the wide technical allowances that were being made. The BCC was acutely intent on preventing the municipal ownership of electrical undertakings. But it still criticised the "somewhat too liberal powers" given to the licensees in matters of laying wires.[145] Instead, it asked for rolling back the blanket permission given to them to alter the position of any pipes or wires and for stipulations that at least 48 hours' notice be given by licensees when they lay electric lines in order that the provisions could be "in conformity with the Bye-laws of the Municipal Corporation."[146] More strikingly, it asked for "the approval of the local authority" to be made necessary for sanctioning the overhead wiring system that a licensee proposed to adopt. It also asked that the general approval to overhead wires should only be issued with a further clause "setting forth the minimum temperature, maximum wind pressure, and the factor of safety, or margin of strength to be taken by licensee when calculating

[143] *ibid*.
[144] 'The Indian Electricity Bill, 1902 with Precis of Opinions thereon, Clause 12(1)', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[145] 'From The Secretary, Bengal Chamber of Commerce to The Secretary to the GOB, PWD', September 11, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[146] *ibid*.

the quality and weight of wire required."[147] In asking for this, the BCC made reference to the "two recent accidents in Calcutta" that were attributed to "contraction of wires caused by the sudden fall in temperature and a concurrent pressure of heavy wind."[148]

It is crucial to understand that the BCC was hardly against the proposition of overhead wires altogether. And similar to the likes of Meares, it was also otherwise arguing for greater flexibility in technical conditions than those obtaining in England at the time. The Sub-Committee report of the BCC thus approvingly repeated the argument in an article in the journal *Engineering* that electrical regulations had to be made with the assumption that "the man in the street must take some care of himself" and "if he cannot learn to refrain from touching electric wires when mischance brings them within his reach, he must be a greatly over-rated individual."[149] It is uncertain how much of this argument would hold for the accident cases in Calcutta where it could be difficult to pin the responsibility of voluntarily meddling with fallen wires on victims like Raja Mehter or Shaik Bhikoo, who encountered the 'live' bare copper collapsed across the entire stretch of wet footpaths that they traversed or worked on, unaware of the dangers they were to encounter. But even if it was not entirely sensitive to the actual reality of the Calcutta accidents, the BCC was otherwise trying to propose a middle ground in terms of having rules that "shall be reasonable and at the same time not be obstructive to the development of electrical industries."[150]

The major inspiration for this was the broader international context of electrical regulation outside England at the time. The BCC Sub-Committee report thus discussed how the Swiss Institute of Electrical Engineers, the German Institute of Electrical Engineers and a French Committee of industry representatives and electrical men framed more permissive but carefully considered rules for their respective governments and private enterprise to follow in matters of securing electrical construction. The report also brought up the case of America where the absence of any such state regulation left it to

[147] *ibid*.
[148] *ibid*.
[149] 'Bengal Chamber of Commerce, Report of the Special Sub-Committee on the Indian Electricity Bill, 1902', February 14, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[150] *ibid*.

undertakers' engineers to decide on such matters, who however still generally follow some rules of the 'National Board of Fire Underwriters.'[151] Eventually the report preferred the Swiss precedent of having rules drawn up by an advisory body like the Swiss Institute and executed by a "special department" – the 'Inspectorat Technique' – that also provided feedback to the Institute.[152] The rules resulting from this process were "very lengthy" but were thought to be "drawn with a keen eye to the safety of the public." These rules, the Sub-Committee pointed out, demanded every "reasonable precaution" - like considering the tensile strength of wires, at what height they would be fixed, the length of spans, etc. Further, "in populous places" notices were fixed on poles stating that "it is fatal to touch the wires."[153]

5. The fungible terrain of Electrical Rules and the deferral of legal resolution

Meares rejected BCC's proposition of bringing in the local authority as the agency sanctioning overhead construction citing his "experience of the system."[154] The 1903 Act required the local authority to be merely consulted by the Local Government before allowing a scheme of aerial lines.[155] On other matters like specifying the quality and nature of overhead wires, Meares intended that "details of this nature should never go into an Act" and should rather be deferred to be "dealt with by the rules" as they might need alteration over time.[156] As already mentioned, electrical rules that were to be drawn up alongside the Electricity Act were being deliberated by a committee made up of industry representatives from Calcutta and technicians of the government (rather than municipal representatives or existing professional organizations in the colony, like for instance, the Calcutta section of the IEE). There was some skepticism amongst the imperial bureaucracy regarding the composition of the committee and it was reasoned

[151] *ibid*.
[152] *ibid*.
[153] *ibid*.
[154] 'Note by Mr. J.W. Meares, Electrical Engineer to the GOB, on the 'Draft Indian Electricity Bill' in view of the Reports of various Public Bodies, etc., on the same.', October, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[155] 'The Indian Electricity Bill, 1903' in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[156] 'Note by Mr. J.W. Meares, Electrical Engineer to the GOB, on the 'Draft Indian Electricity Bill' in view of the Reports of various Public Bodies, etc., on the same.', October, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

that the government "should not be bound to accept the opinion of a majority composed probably of representatives of private firms."[157] But presumably this was tided over and the committee eventually set itself the agenda of "removing restrictions that might unnecessarily hamper the progress of the electrical industry in India."[158]

In the course of the discussions of the committee certain concerns about overhead wires came up in terms of how BOT directives could be imposed in Indian conditions. The BOT's Major Cardew had in his analyses of the cases in Calcutta and Darjeeling advised on two particular measures. The first of these was the prohibition of high pressure and low pressure lines being carried on the same posts. The contractors in Darjeeling had already strung their wires in the said fashion. The committee proposed to modify Cardew's instruction to allow such lines to pass each other on the same pole if it could be ensured that the wires do not touch even if they were to break.[159] This change was eventually passed even though it was recognized that this somewhat dangerous allowance was made with the sole objective of saving the Darjeeling undertakers the expense of 3000 rupees that would go into separating the two kinds of lines.[160] Cardew had also advised for Calcutta that not more than 50,000 watts of power should be carried on aerial lines. After the objection by the CESC representative Mr. Eustace that this "was too small", the Committee decided to change this rule.[161] It was decided instead that with "the express consent of the Local Government" this limit could exceed 50,000 watts.[162]

Relegating technical stipulations to the future judgment of the Local Government and its electrical officials was frequently used as a method of resolution within the proceedings

[157] 'Note by C.E. Pitman', March 15, 1900, in 'Proposed appointment of a Committee of experts to discuss the various clauses of the draft rules to be issued under the Electricity Act XIII of 1887, approved', Civil Works (Miscellaneous), GOI, April, 1900, Part A, Nos. 3-10, NAI.
[158] 'Report of a Committee appointed under the orders contained in the letter of the Government of India, No. 308 C.W.M. dated 17th March, 1900, to discuss the various clauses of the draft rules which it is proposed to issue in exercise of the powers conferred by section 4 of the Electricity Act, 1887…', May 9, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.
[159] 'Proceedings of Third Meeting of the Committee', held on May 2, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.
[160] 'Note by T. Higham', June 6, 1900 in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.
[161] 'Proceedings of First Meeting of the Committee', held on April 30, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.
[162] 'Proceedings of Second Meeting of the Committee', held on May 1, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.

of the rules committee. Notable in this regard could be Eustace's contention that the existing directive of covering high pressure mains by insulating material to a thickness of at least one-tenth of an inch was prohibiting their use all together by making them too heavy to be slung aerially.[163] The committee agreed that bare aerial wires were best suited "commercially" for high pressure transmission and thus they could be exempted from insulation requirements outside municipal limits.[164] When the GOB pointed out that uninsulated high pressure aerial mains could still be dangerous in suburbs of large towns immediately outside municipal limits where population was quite dense, it was again decided to not bar bare high pressure aerials through such localities altogether and instead let the Local Government take a final call.[165] Similarly while the committee fixed upon minimum distances between poles and minimum heights at which aerial lines could be erected, in the course of the deliberations it was decided that these could be varied according to requirements of "local conditions" after the approval of the Local Government.[166]

Additionally, the committee made specific allowances with respect to wires drawn from the mains to serve consumers' premises. Such "service-lines" were firstly exempted from insulation as it was thought that "to make the service-lines as inaccessible" might work better than "to trust the continued insulating properties of any material".[167] Secondly,

---

[163] 'Proceedings of First Meeting of the Committee', held on April 30, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.

[164] 'Rule 13, Report of a Committee appointed under the orders contained in the letter of the Government of India, No. 308 C.W.M. dated 17th March, 1900, to discuss the various clauses of the draft rules which it is proposed to issue in exercise of the powers conferred by section 4 of the Electricity Act, 1887…', May 9, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.

[165] 'From the GOB, No. 135 T.-M.P.I., Genl. No. 7351', May 18, 1900, No. 2, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.

[166] For regulation regarding varying minimum length between poles of aerial lines see, 'Appendix II to the Report of the Special Committee on Electric Rules - Draft of the Rules amended in accordance with Recommendations of the Committee', in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI. For regulations regarding varying minimum heights at which aerial lines can be out up see 'Subsidiary Report dated the 8th March 1901 of the Special Committee on Electric Rules in continuation of the Report, dated 9th May 1900', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

[167] 'Rule 24, Report of a Committee appointed under the orders contained in the letter of the Government of India, No. 308 C.W.M. dated 17th March, 1900, to discuss the various clauses of the draft rules which it is proposed to issue in exercise of the powers conferred by section 4 of the Electricity Act, 1887…', May 9,

such "service-lines" on "private premises" were also exempted from being fixed with guarding devices, in spite of there not being full consensus on this issue in the committee.[168] The question of guarding electrical wires from contact with each other and more generally from collapsing commanded specific attention. Such guarding was with "a view chiefly to the reduction of fire risk" as the CESC's lines were not considered to be a "danger to life" otherwise.[169] It was nonetheless recognized that the usual methods/devices of guarding wires in Calcutta were not proving too effective. However the committee found it hard to generalize on alternative methods of guarding as supposedly "many special cases arise" which had to be settled "on their merits, by arrangement or arbitration, no absolute rule being practicable."[170] Such settlement was then consigned to be made by "mutual agreement between the parties and to the satisfaction of the Government Electrical Engineer."[171]

The rules decided upon by the committee of industry representatives and government technicians in Calcutta were eventually also adopted as the Indian Electricity Rules under the 1903 Electricity Act.[172] Certain general facts present themselves clearly when looking at the protracted process that went into the making of this significant piece of legislation, in relation to the events of the overhead wiring of Calcutta and the accidents that resulted from it. Through an 'expert' figure like Meares the law seemed to confirm ideas about the climatic and geographical peculiarity of the city and more broadly colonial India in order to qualify its distinct preference for an uninsulated overhead system of wiring, even as these ideas at the time were not quite settled on techno-scientific grounds. The mobilization of such ideas were actually also tied to the fact that bare overhead wiring

---

1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.

[168] 'Report dated the 3rd May 1901, of the Committee appointed by the GOB to consider and report on the question of guarding aerial lines in Calcutta', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

[169] *ibid*.

[170] 'Appendix, The First Meeting of the Committee appointed by the GOB to consider and report on the question of guarding aerial lines in Calcutta held on March 29, 1901', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

[171] 'Report dated the 3rd May 1901, of the Committee appointed by the GOB to consider and report on the question of guarding aerial lines in Calcutta', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

[172] See 'Draft Rules, under Section 33 of The Indian Electricity Act, 1902 (Act III of 1903)', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

was considerably cheaper than underground systems or even insulated overhead systems. Alongside directly incorporating this cost concern beyond any obvious evidence of scientific experience, colonial lawmaking also aimed at insuring the freedom of private enterprise to erect overhead wires from other kinds of administrative 'interference' by systematically further removing local authorities from the ambit of the everyday governance of electricity. Additionally, such freedom was to be guaranteed by offering one-time permissions for wiring systems of private companies and by moving concerns of rule-setting for overhead wires away from the fixed word of law onto the potentially more fungible terrain of electrical rules. Internationally, such rules were set by professional organizations or by insurance agencies that had some stake in controlling the risk associated with electrical networks. Contrastingly, the development of electrical rules for colonial India was assigned to a group of technical men weighted heavily in favour of private enterprise. The group/committee had the express mandate of creating greater technical permissibility than that afforded within concurrent systems of governing electrical systems whether in the metropolitan English settings or otherwise.

Yet even if the process of making the 1903 Electricity Act distinctly facilitated conditions of expanding bare overhead wiring by gradually removing certain kinds of oversight, the accompanying rule-making procedure was at least in some ways more attuned to matters of safety surrounding the overhead system. This orientation was informed by the recent history of accidents in Calcutta as well as prevalent international norms that clearly influenced the concerns of several stakeholders including the representatives of private enterprise (like the BCC). The deliberations over electrical rules for the colony thus went into considerable details over issues of bare and higher pressure overhead wiring, the construction of service-lines and the question of guarding electric wires. But such issues were not entirely resolved by the concerned committee in the direction of making concrete and determinate interventions by way of rule-setting. Rather the rule-making discussions often subjected certain such issues to a future deliberative procedure that would involve the Local Government making an eventually contingent decision through its electrical officials. Thus if the very urge of making the 1903 Act was to move from the conditional nature of case-by-case allowance to a fixed arrangement of one-timely permission, the deliberations over rule-setting by the Calcutta committee seemed to have

partly effected a somewhat reverse movement. This was perhaps not very unlike an existing process of legislation by deferral that we have encountered in our earlier analysis of electrical lawmaking in the colony. In this case, techno-legal resolutions were eventually being deferred to the judgment of the electrical officials of the government. The personal and contingent judgment of the electrical 'expert' then continued to be valued on similar terms as the fixed body of rules that the law-making process originally set out to formalize.

Accidents resulting from overhead construction in Calcutta hardly stopped in the immediate aftermath of the new electrical rules and the 1903 Act. In the previous section we have seen how in spite of stipulations of the GOB and judicial push regarding fixing supports or guarding devices on aerial lines by the CTC and the CESC, the extent of their implementation remained questionable and the supports/devices themselves seem to have been of doubtful efficacy. By the opinion of one contemporary piece in the *Indian Engineering*, in leaving the "carrying out of the provisions of the Act mainly to the Local Governments", there was "a loophole left for the introduction of diversity of practice and laxity in enforcing regulations." Without immediately subscribing to the claim about 'laxity', we can otherwise attribute the recurring issues in adequately securing overhead lines in Calcutta to a different kind of shortcoming in the structure of the 1903 Act and its companion rules.

By settling some of the primary responsibility of deciding on certain technical specifics with the electrical officials of the Local Government, the law sought to open up the possibility of a more locally-attuned and accommodative kind of decision-making beyond any conventional regime of prohibitions. Yet at the same time the Act did not quite adequately mandate the creation of any definite agency for such opportune exercise of technical acumen, except for making a vague commitment to appointing Electric Inspectors "where there is sufficient work."[173] Meares himself had indicated there was a need for an entire troop of "regular inspectors…who would spend their time following up

[173] 'Recommendations as to the Establishment Necessary for the working of the Indian Electricity Act, 1903', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

the licensee's works in the streets."[174] He also recognized that the "local authority" could suitably employ such inspectors as his own establishment around October 1902 was still limited to two officials including him and a 'foreman'.[175] But having mostly left out bodies like municipalities from the administration of the Act, this possibility was not to be realized.

By 1904, Meares was promoted to become the Electrical Adviser of the imperial government. Till that time his establishment as Electrical Engineer to the GOB had expanded somewhat, with two technical subordinates appointed for internal laboratory work and four similar subordinates appointed as "outdoor staff".[176] But the workload of this establishment had also increased tremendously – between 1902 and 1903, the number of "official issues" and "unofficial issues" taken on by Meares' office increased from 290 and 900 to 850 and 1008 respectively.[177] And aerial lines in Calcutta was only one item on this establishment's list of increasing responsibilities that included amongst other things, extensive work on electrifying government buildings and also the task of supervising two other electrical schemes in Bengal, that of Dacca and Darjeeling.[178] It seems very likely then that beyond a primary level of approving general proposals concerning the construction of overhead lines, more specific details of safe practice - like the matter of supporting and guarding of wires - perhaps remained short shrifted within the administration of electrical rules by the Local Government, in absence of a more granular presence of electrical inspectors in the city.

Eventually reports of electrical accidents due to falling wires on the streets and elsewhere in Calcutta started tapering off, but not entirely disappearing.[179] A 1908 issue of *Indian Engineering* reasoned that the reduction of such mishaps "to a very low point" owed to

---

[174] 'Note by Mr. J.W. Meares, Electrical Engineer to the GOB, on the 'Draft Indian Electricity Bill' in view of the Reports of various Public Bodies, etc., on the same.', October, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[175] *ibid*.
[176] 'Note on points raised by Mr. Preston by J.W. Meares', February 3, 1904, in 'Proposal to create an appointment of Electrical Advisor to the GOI, and the appointment to be filled by Mr. J.W. Meares, the Electrical Engineer to the GOB and of an Electrical Inspector to the GOB in lieu of an Electrical Engineer', PWD (General), GOI, July, 1904, Part A, Nos. 33-39, NAI.
[177] *ibid*.
[178] *ibid*.
[179] See for instance a 1914 report of a death by electrocution from overhead wires after a storm in Calcutta: Anon., 'Remnants of the Storm', May 7, 19114, *The Englishman*, pg. 13.

the greater experience gained by the electricity operators in the city.[180] In June 1909, while attending to a proposal to strengthen the security of overhead lines Meares commented that "hundreds" of 'live' wires have fallen in Calcutta "and precautions are taken to prevent persons coming into contact" with them."[181] Nonetheless he did allude to the risk of death that these posed to "a man with bare feet…even in well-lit streets."[182] Meares statement could also be confirmed by the CMC raising concern in 1911 that they would want to initiate their own inspection of tramways wires in the city as again hundreds of overhead wires were collapsing every year.[183] While the Government of Bengal did not allow this, its own statistics showed that in 1908, 263 tram wires collapsed in the city (112 trolley wires + 152 guard wires), 176 in 1909 (84 trolley wires and 92 guard wires) and 226 in 1910 (138 trolley wires + 88 guard wires).[184] And falling overhead wires also otherwise brought death even inside consumers' premises.[185]

Given such a remarkable number of overhead wires collapsing in Calcutta it would be difficult to assign the cause for the reduction of electrical accidents to any definite progress made towards their prevention from the side of the electricity supplier. Instead, it would not be too mistaken to assume that a certain degree of electrical literacy resulting from the wide publicity that electrical accidents received in the city, enabled more active precautions to be taken voluntarily by walkers on the city's streets. In any case it would be much easier to attribute the fall in the number of overhead wire accidents in Calcutta to any such change in the attitudes of urban subjects than to any presumed efficiency of the 1903 Act or its attendant rules.

The overhead wire accidents in Calcutta would have also reduced due to the diminishing mileage of overhead lines in the city. In 1920 there were 313.5 miles of underground

---

[180] 'Overhead versus Conduit Electrification', August 15, 1908, *Indian Engineering,* pg. 105.
[181] 'Note by J.W. Meares', June 22, 1909, in 'Revision of Rule 45 of the Rules under the Indian Electricity Act, 1903 (III of 1903) in order to make a provision for the protection of high pressure aerial service lines', PWD (Electricity), Part A, Nos. 8-12, August, 1909, NAI.
[182] *ibid*.
[183] 'From R.J. Browne, Electric Inspector to Govt. of Bengal to Secy, Govt. of Bengal, PWD', November 23, 1911, No. 981, Pro. No. 53, Government of Bengal, PWD (MPI), for December, 1911, IOR/P/8689.
[184] *ibid*.
[185] Meares, J.W., Electrical Engineering Practice: A Practical Treatise for Civil, Mechanical and Electrical Engineers especially those in India and Tropics, Second Edition, Thacker, Spink& Co., Calcutta & London, 1916, pg. 463.

mains compared to 211.5 miles of overhead mains.[186] It is likely that the replacement of overhead lines by underground mains picked up pace after a cheaper modality of laying underground lines by armoured cables was tried out to complement the 'solid system' already in use.[187] In a later presentation of its history, CESC maintained the fiction that:

> Underground cables were laid in main streets and more thickly populated districts and overhead wires erected in the outskirts – the general idea being to replace the overhead lines by the more costly underground cables as the demand grew…moving the overhead wires further out.[188]

Looking into PWD proceedings from Bengal, which recorded the instances when CESC sought and (every time) got the permission to raise overhead mains, we hardly see this distinction in effect. The company was very obviously allowed to connect several residential areas through bare overhead mains and service-lines. Many of these lines were erected to wire up motors in some rice mills and flour mills and undoubtedly they then carried the higher and more dangerous 450-500 volts. For considerable time such construction went on relatively unabated by strictures of electrical law and governance, risky as this might have been. Colonial law was only too eager to facilitate this as amply demonstrated here. This tendency as we will see later was both debated but also continued in the course of future legal deliberations.

6. The legal reluctance to deal with consumers' installations

Overhead wiring was of course not the only prominent problem that emerged in the course of the early spread of electricity networks in colonial India. This section will deal with another issue that gathered significant import as a matter of electrical administration and yet remained situated somewhat beyond the pale of the 1903 Act, as this legislation was being scripted and then put to work in Calcutta and beyond. This issue was of the wiring and other electrical installations as conducted on consumers' premises. We will

[186] Government of Bengal (Commerce Department), 'Annexure I (B)', in Report of the Committee appointed to enquire into the charges for electrical energy levied by the Calcutta Electric Supply Corporation, 1936, Calcutta, IOR/V/26/740/2, pg. 84.
[187] *ibid*.
[188] *ibid*.

explore how this problem gradually constituted an extralegal terrain that was proving difficult to govern also by others means of regulation, even as it spawned its own divergent tendencies. Moreover, as we shall show, this terrain entertained diverse, non-standardized technical practice that did not immediately recognize any obvious authority of the electrical 'experts' that the state deployed. This exploration will in turn allow us to grasp the self-serving limits that colonial law posed to itself and what transpired in terms of electrical practice beyond these limits and with what specific implications in terms of the early adoption of electric energy in colonial Calcutta.

The major part of the deliberations around the 1903 Electricity Act were focused on issues of licensing, local authority jurisdiction, purchase clause and eventually technical issues related to the supply side of electricity distribution like the matter of overhead or underground wiring. Certain other problems that were related more to the consumption side of electricity were also broached, though with some skepticism that the government showed regarding intervening into the relationship between the consumer and the licensee.

One such problem was that of how much the pressure of electric supply to consumer premises might vary with respect to the stated voltage that the licensee pledged to supply. The BCC suggested that this variation should not exceed 2% below or above the stated voltage.[189] A provisional advisory board set up to review the rules under the 1903 Act however opined that "it is impossible to enforce the clause literally" as then "no licensee would lay down works."[190] The BCC's demand was presumably made in view of the fact that the undertakers in Calcutta "could not keep their pressure constant, within the limits allowable" that led to destabilization of the consumers' lighting and motor functioning.[191] Seemingly technically-informed consumers in the city blamed this on the CESC's wires not being "of proper section", the company's load distribution not being executed "with reasonable care" and the lack of "automatic regulators" on its lines as used in England to

[189] 'From The Secretary, Bengal Chamber of Commerce to The Secretary to the GOB, PWD', September 11, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[190] 'Report of the Provisional Advisory Board', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[191] 'Proceedings of First Meeting of the Committee', held on April 30, 1900, in 'Draft Revised Rules under the Electricity Act, XIII of 1887', Civil Works (Telegraph), GOI, September, 1900, Part A, Nos. 2-6, NAI.

control distribution.[192] Eventually under the 1903 Act up to 4% variation was be allowed.[193] Once again displaying a characteristic flexibility on the matter, there was a caveat appended to the rules that if the consumer and the licensee had a conflict on this point, the matter could be resolved either by the intervention of the Local Government or by arbitration.[194]

The intervention of the Local Government was otherwise mandated more particularly in another matter. The validity of the recordings of electric meters was not quite settled in favour of technological objectivity in the early days of 'electrification' as demonstrated by historians.[195] The issue of electric meters was similarly emerging as a topic of contention between the consumers and the licensee in Calcutta. In the course of the deliberations over the 1903 Act it was decided that if a dispute was raised by a consumer or licensee over whether the concerned meter was "correctly registering the value of the supply", the disputed meter would have to be tested by Local Government-appointed Electric Inspectors or "a competent person appointed by the Local Government", who would then issue a verdict on the dispute as well as classify meters as "duly certified"/"correct" and thus fit for use.[196] An electrical laboratory was set up by the GOB in association with the office of the Electrical Engineer to settle the correctness of meters that had the rather ambitious scope of attending to all disputed electrical instruments throughout the colony. It was understood that as "meters begin to age" disputes about them would increase.[197] By 1905 in view of rising "dissatisfaction among consumers recently regarding their meters", Meares' office published a set of rules specifically for

[192] R.W.C.D., 'To the Editor, Electric Darkness in Calcutta"', October 7, published October 10, 1901, *The Indian Daily News*, pg. 26.
[193] 'Rule 76, Draft Rules, under Section 33 of The Indian Electricity Act, 1902 (Act III of 1903)', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[194] 'Clause IX (2), The Schedule: Provisions to be deemed to be incorporated with, and to form part of. Every license granted under Part – II, The Indian Electricity Bill, 1903' in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[195] See for instance, Gooday (2004, 219-262).
[196] 'Section 30(7), The Indian Electricity Bill, 1903' in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[197] 'Note on points raised by Mr. Preston by J.W. Meares', February 3, 1904, in 'Proposal to create an appointment of Electrical Advisor to the GOI, and the appointment to be filled by Mr. J.W. Meares, the Electrical Engineer to the GOB and of an Electrical Inspector to the GOB in lieu of an Electrical Engineer', PWD (General), GOI, July, 1904, Part A, Nos. 33-39, NAI.

meter inspection.[198] Along with other things, the rules forbade the licensee from disconnecting the meter except in the presence of a deputed Electric Inspector of the government and allowed up to 2.5% error in meter readings. They also prescribed a steep minimum fee of Rs. 10 for the testing of the said meter to be paid by the party raising the dispute claim.[199]

Issues like the variation in supply voltage and disputes concerning electric meters were situated across the transactional space between consumers' expectations and the licensee's supply. The colonial state was in some ways hesitant to anoint itself as a sovereign overseer of this territory. This territory was also treated as not quite amenable to be governed through fixed rules that did not respond to technical variability. Consequently, the state's legal-regulatory interventions relating to this transactional space were designed to be invoked only if the consumer or the licensee voluntarily chose so. Very similar was the case of actual electrical installations within the consumer's premises.

In his Sibpur lectures, Meares described that the first electrical connections were being made by the nearest man "who ran bell wires…and he put up wires of the same sort and in the same way with (generally) most unsatisfactory results."[200] He also pointed out that the Darjeeling and Calcutta undertakings were supplying current at a higher voltage of 220 v compared to the earlier 110 or 100 volts and for this "the internal wiring work must be of a higher standard."[201] Before the 1903 Act there were still no statutory instructions concerning what such standards would be. A body of rules had been issued by the IEE in London. For Calcutta, Meares thought that "uniformity is very badly needed" as was "practical knowledge".[202] He had himself drawn up a set of rules for the Calcutta Fire Insurance Agents' Association "to suit local conditions".[203] Otherwise, the supply

[198] 'From J.W. Meares, Electrical Engineer, GOB to The Secy, GOB, PWD', in GOB, PWD(MPI), January, 1905, Nos. 1-3, IOR/P/7025.
[199] 'Conditions under which Electric Meters and other Instruments will be accepted for testing in the Government Electrical Laboratory Calcutta', in GOB, PWD(MPI), January, 1905, Nos. 1-3, IOR/P/7025.
[200] Meares, J.W., Electrical Engineering with particular reference to Conditions in Bengal, Six Lectures delivered in March 1900 at Civil Engineering College, Sibpur, Bengal Secretariat Press, Calcutta, 1900, pg. 18.
[201] *ibid*.
[202] *ibid*., pg. 47.
[203] *ibid*.

company too set certain conditions and tests for connecting its lines to the consumer's installation.[204] It is however uncertain as to what extent these rules and conditions were eventually followed.

In the course of the discussions around the 1903 Act, the BCC reasoned that the licensee should not present any "unreasonable obstruction" to installations put up by other wiring contractors.[205] The Select Committee on the Bill finally decided that if the licensee raised any dispute regarding "whether the electric wire, fittings and works in any premises to which the licensee has to supply energy are in good order," it would eventually fall upon the Electric Inspector to judge this claim should the concerned parties so desire.[206] Except for this provision, the Act continued to steer away from making statutory rules and directives governing consumer installations. During the making of the 1903 Act, the Municipal Engineer of Darjeeling Stuart-Menteth described a set of rules that he had made out for such installations within his jurisdiction. Some of these rules made for more stringent conditions than Meares' fire insurance directives in Calcutta, like having up to 2500 megohms of insulation resistance per mile of wiring as compared to Meares' requirement of 750 megohms for the same.[207] Meares found these rules for consumer installations "desirable" but doubted their viability.[208] His more general opinion was that while Government building installations could proceed on the basis of stricter specifications, "this should *not* be compulsory" for others as "many people cannot afford the very highest class of work and can nevertheless insist that their installations are to be

[204] *ibid*.
[205] 'From The Secretary, Bengal Chamber of Commerce to The Secretary to the GOB, PWD', September 11, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[206] 'Report of the Select Committee on Bill & Amended Draft', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[207] Compare 'Darjeeling Municipality, Electric Lighting Rules', in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives and 'Appendix III. Rules for Electric Light and Power Installations, Recommended for Acceptance by Members of The Calcutta Fire Assurance Agents' Association", in Meares, J.W., Electrical Engineering with particular reference to Conditions in Bengal, Six Lectures delivered in March 1900 at Civil Engineering College, Sibpur, Bengal Secretariat Press, Calcutta, 1900, pg.iii.
[208] 'Note by Mr. J.W. Meares, Electrical Engineer to the GOB, on the 'Draft Indian Electricity Bill' in view of the Reports of various Public Bodies, etc., on the same.', October, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

accepted by the undertakers."[209] He also observed that "wiring contractors resent the intrusion of undertakers in their preserves."[210]

The triangular relationship between consumer, his/her wiring contractor and the licensee/undertaker was thus purportedly placed outside the regulatory reach of the colonial state in the early years of the twentieth century in Calcutta both before and after the coming of the 1903 Electricity Act. A lively description of what this implied for early subscribers of electricity can be gleaned from a special article written in *The Englishman* in the first person presumably by a European man.[211] The writer attributed the decision of shifting to electricity from "oil, chimneys and punkah wallahs" to his wife's desire to compete with a former schoolmate who had made the same transition. While this perhaps made for an inadvertent admission as to the significant role played by women in European households of colonial Calcutta in making the shift to electrical energy, what followed is described as a rather expensive but wasteful process involving the "installers" running rampage inside the writer's house, smashing a hall lamp here and a vase there. If that was not enough, there were the subordinate *mistris* whose machinations resulted in the collapse of a corner of the bed-room wall followed by "a perfect inferno of hammering" for the next fortnight. The garden of the house was also dug up and utilized to fix various "unsightly" parts of the electric apparatus. After this the writer waited a fortnight longer during which the 'installers' said "they were waiting for the Supply Co.'s people and the Supply Co.'s people saying that they had not received the red, green, yellow and violet test forms from the contractors."

Eventually the lights and the fans (the 'whirligigs') did come on. But not long after, "the drawing-room fan was crawling round in a lazy go-as-you-please sort of style, shooting out little squibs of fire" and the "bedroom fan wobbled in an alarming manner." The diagnosis was that "the brushes and the 'communions'" (commutators of fan motors) were likely "getting worn down." The 'installer' took another week to fix this but after

[209] 'Report by Mr. J.W. Meares, F.R.A.S. Member of the Institution of Electrical Engineers, Electrical Engineer to the GOB, on Matters in connection with a Scheme for the Public Supply of Electrical Energy in Rangoon', September 3, 1902, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives (emphasis in original).
[210] *ibid*.
[211] Anon., 'How we installed the Electric Light and Whirligigs', April 25, 1901, *The Englishman,* pg. 9. The rest of the account is taken from this same article.

that the bedroom fan would not stop running even when it was switched off. Soon the lights would not come on as the writer and his wife were hosting a dinner party. The 'installer' came again and charged them some more for fixing new fuses. But still the writer and his wife had "several times been near electrocuted by shocks from walls, bath tubs, etc." The electrical woes of the family did not really stop here with several other complaints of malfunctioning even as their wiring contractor (the 'installer') blamed their bearer of tampering with their lights and fans.

This anonymous account presents a rather vivid picture of electrical installations on consumers' premises in the early days of the arrival of electricity in Calcutta homes. It is easy to spot certain elements of exaggeration built into it to deliver a narrative impact. The broader story however is unequivocal. From the very beginning, the development of such installations left much to be desired from wiring contractors – the 'installers' – in terms of both professional technical practice as well as issues of safety. The CESC had their own precautionary tests and regulations that they imposed on the concerned contractors in order to discipline their practices (thus "the red, green, yellow and violet test forms"). But this seemed to have hardly made the consumption of electricity any less problematic or safer. Neither was there any definite evidence of the contractors following any fire insurance rule. Some of this could be explained by the lack of experience and practice. But not unlike what we have seen in the course of the deliberations over the 1903 Electricity Act, colonial law in a way legitimated a less rigorous or lower standard of work citing considerations of expense. On this count it even implicitly favoured this kind of work of wiring contractors over the licensee's preferences by leaving them mostly outside the ambit of its regulation. As the above example shows, the 'installer's' work was not necessarily cheap. Moreover, such work on consumers' installations also continued for a while and even in defiance of the judgment of official 'expertise', when occasionally called in to mediate between the consumer and the contractor.

7. The electric fan case

A definitive instance of how this defiance of official electrical 'expertise' materialized through the practices of wiring contractors and otherwise could be made out from the widely publicized 1904 "electric fan case" in Calcutta. The case involved Meares himself

as a mediating figure and decades later in his memoirs he recounted it with considerable displeasure.[212] In contrast to his more lenient attitude in contemporary legal discussions, Meares' later autobiographical account unambiguously described that in the early days of electricity distribution in Calcutta, "various incompetent wiremen…had set up as contractors."[213] He further noted that "these unworthy folk scrambled to wire the houses of wealthy marwaris at cut prices."[214] Meares was allowed to take up some private work at the time and "one of the victims" of the wiring contractors, asked the government to permit him "to report on his installation for a fee."[215] Since then he took up several such jobs and condemned most of them for "being equally bad in both workmanship and materials."[216] The 'fan case' originated from one of these situations in which the consumer refused to pay the wiring contractor after Meares' inspection declared the installation to be faulty.

The customer in question was a European gentleman Mr. Ezra and the contractors were Messrs. Fleming and Co. The latter had for a sum of Rs. 400 set up four fans for the Ezras between January and March in 1903 and having received only Rs 50 from the customers, filed a suit in the court claiming the rest.[217] The Ezras on the other hand filed a counter-suit to recover the Rs. 50 payment that they had made to Fleming and an additional sum of Rs. 64 that they had paid as fees to Meares for having inspected the installation. The installation had been tested, inspected and passed by Kilburn and Co.'s (agents to CESC) officials in February, 1903. When in March the Ezras had made a formal complaint about the fans "emitting sparks", "making a noise" and being "wholly unsafe", a Bengali electrician Mr. T.D. Sil was deputed by the contractors "to put defects to right" and he claimed to have done so and left the fans "working well."[218] But they were still found unsatisfactory which led to the Ezras subscribing to the services of the

[212] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, Pg. 91. J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, IET Archives.
[213] *ibid*.
[214] *ibid*.
[215] *ibid*.
[216] *ibid*.
[217] Anon., 'Small Cause Court, March 24th, 1904. Before A.F.M. Abdur Rahman, Esq. Electric Fans Installation. Expert Opinion', March 31, 1904, *Indian Daily News, Overland Summary*, pg. 35.
[218] *ibid*.

"Government Engineer" Meares. In May 1903, Meares inspected the installation and condemned it down to the "minutest details" as being "an imminent source of danger."[219] Ultimately the inaction of the contractors led the Ezras to get another firm Messrs. Balmer Lawrie and Co. to dismantle the older installation and set up 3 new fans for a sum of Rs. 435.

In March 1904 the case was litigated in the Small Causes Court in Calcutta. The testimonies tendered offer evidence of a rather variegated conception and practice of expertise and technical rules that were prevalent in these early days of the adoption of electrical energy by Calcutta consumers. In his witness Meares claimed that wired up by "the usual method of the Flemings" - which he had observed in three earlier contexts of inspection - the installation was as "bad" and "dangerous from the point of view of risk of fire" as it could have possibly been.[220] He claimed that the fans sparked "in such a way that I could read a book by the light."[221] While he was carrying on the inspection, a part of the casing on the wiring supposedly collapsed since it was not affixed properly to the ceiling.[222] Meares also found the bending of the wires to be poorly done as they were only twisted and not soldered. He actually produced in court a piece of a hook from the installation which had broken off in his presence.[223] Finally he argued that any proper installation would cost about double the price of Rs 100 that Fleming and Co. had quoted for their work.[224]

Even as Meares painted this vivid picture, the court still remained interested in the standards and means that he employed in judging the installation. Meares stated that he was following the rules of the Institution of Electrical Engineers (London) in making his judgment.[225] These rules for him were "universal" while those of Kilburn (and CESC) were "local". The former more 'universal' directives, he opined, consisted of "additional rules" which were to be complied with by contractors when they made house

[219] *ibid*.
[220] *ibid*.
[221] *ibid*.
[222] *ibid*.
[223] *ibid*.
[224] *ibid*.
[225] *ibid*.

installations. Neither body of rules however had any "statutory value."[226] Meares also made it clear that government installations were judged by a higher standard than the "ordinary standard" of private installations.[227] Nonetheless, of the latter he had inspected at least fifteen in Calcutta, but passed only two.[228] When enquired about the instruments that he used in inspecting the installation at Ezra's, Meares replied that the question of testing by instruments would only arise if on inspection the construction was found to be satisfactory.[229]

In response to the aspersions cast on the quality of Fleming and Co.'s installation, one particular strategy of their lawyer Mr. Pugh was to demonstrate how the installation was nothing out of the ordinary given the standards of electrical work prevalent in Calcutta. Meares' testimony was supported by Mr. Hodgkinson, the electrician of Balmer and Lawrie who also criticized the poor workmanship in the making of the joints of the installation and how "nails were used in place of screws to secure the capping."[230] However from him, Pugh elicited the response that it was not absolutely necessary for contractors to follow every word of Kilburn's installation rules as long as there was no leakage detected by insulation tests performed by the licensee. Hodgkinson also admitted that "fans which make a noise and give out sparks can be put to rights."[231] A similar point was made by "an Assistant to Kilburn and Co." who otherwise had not found any problem in Fleming's fans and installations. He stated that "the very best fans sparked sometimes if there was dust or dirt between the commutator and the brush"; they also "made a noise if there was not sufficient lubrication."[232] This, the assistant, claimed, did not make them dangerous but rather pointed to the need for separate maintenance. While this witness was speaking, Pugh even pointed to some sparks being emitted from the regulator of the electric fans in the Court-room to point out the ordinariness of this phenomenon.[233]

---

[226]*ibid*.
[227]*ibid*.
[228]*ibid*. pg. 36.
[229]*ibid*.
[230]*ibid*.
[231]*ibid*.
[232]*ibid*.
[233]*ibid*.

It was also shown in Court that Fleming and Co had carried out certain maintenance works on Ezra's installation once they were informed of the defects in the fans. T.D. (Tara Das presumably) Sil introduced as a "practical Electrical Engineer" informed the Court that he had visited the installation "three or four times" and "his man" had reported that "the fans were working well" when they left the house.[234] He supervised the soldering of the joints himself and again "believed his man when said it was done well." He also countered Hodgkinson in a way by claiming that "nails were used in many installations" and "this was the only complaint he had received" amongst the hundred odd arrangements he had looked at.[235] His claims were broadly confirmed by Mr. Margrett, "Electrical Engineer" of the CESC, who also testified that "nails were often used for private installations."[236]

The Ezra defense carried out by their lawyer Mr. Mendes and Mr. Surita ultimately tried to emphasize a certain hierarchy of expertise within which they sought to situate the witnesses. Thus Mendes cross-examined the Kilburn assistant to get him to admit that he "was not a passed Electrical Engineer but only a practical man."[237] The assistant also confessed to not having studied the rules of the London-based IEE but only read them.[238] Surita also explicitly pitted Meares' word against that of Sil and Fleming. Meares' witness, he argued, "was the only evidence that could be relied on for quality of work" given that he was "quite disinterested" and of "high standing."[239] In retorting, Pugh asserted that "Mr. Meares, although a Government servant was a biased witness." He cited other law reports to show that experts need not always be trusted, as "they would naturally lean towards the person who employed them" which in this case was Ezra.[240]

Strikingly, Judge A. F. M. Abdur Rahman took a similar view of Meares' position when delivering his verdict. The judge opined that Meares "was prejudiced against Messrs.

[234] *ibid*. pg. 37.
[235] *ibid*.
[236] *ibid*.
[237] *ibid*.. pg. 36.
[238] *ibid*.
[239] *ibid*., pg. 37.
[240] *ibid*.

Fleming and Co."[241] For him, the primary evidence of this was that Meares condemned their work entirely "without the aid of electrical instruments for testing such works."[242] He also saw this prejudice in Meares' frank declaration that he did not think that any fan could be put up for a sum as less as Rs. 100 that Fleming managed to do.[243] Rahman also observed that Fleming had certainly not put up the installation according to the Government standard. But this he thought was not necessary, as in Calcutta the CESC's consent to supply current to an installation could be taken as sufficient vindication of the quality and safety of the installation.[244] In any case he found it amply evinced in the proceedings that "where a fan sparks or makes a noise it could be put right without much difficulty."[245] Since the Ezras had not exercised this option enough, Rahman found their obtaining an entirely new installation unjustified. After all, "even the best of fans" went out of order in Calcutta and consumers often resorted to separate technical aid in keeping them "in working order."[246] In intuiting why a new installation was opted for instead of mending the existing one, Rahman interpreted Ezra's testimony to be suggesting that his decision to replace the fans was ultimately influenced by the characteristic nervousness of his wife.[247] We have seen in our earlier discussion here that in European households the agency of the wife could eventually be a decisive factor in determining the shift to electrical energy. The judge in this case seems to have read this social fact as a distinctly negative attribute of the gendered distribution of technical choice-making. It was thus counted as one amongst other reasons for ruling in favour of Fleming and Co. who then won the suit in the Small Cause Court with costs.[248]

The judgment caused a sensation in the English language press, but not really for its gendered presuppositions. Rather, the suggestion that Meares' views – "presumably entitled to some respect on such subjects" - were bent by the 64 rupees that he received as

[241] Anon., 'Small Cause Court, 31st March, 1904. Electric Fan Installation. The Judgment', April 7, 1904, *The Indian Daily News*, pg. 21.
[242]*ibid*.
[243]*ibid*.
[244]*Ibid*., pg. 20.
[245]*ibid*., pg. 21.
[246]*ibid*., pg. 20.
[247]*ibid*., pg. 21.
[248]*ibid*.

legitimate fees from the Ezras was heavily criticized.[249] It was also argued that that logic of dismissing Meares' inspection since it was carried out without instruments was flawed as there was no necessary utility of such instruments under the conditions where the "bad fan" was visibly "smoking or sparking."[250] Moreover, even if Kilburn's representatives' tests were found to be more trustworthy by the Court since they used instruments, it was obvious that they had "no interest…in anything except seeing that there is no leakage."[251] The Judges of the Calcutta Small Causes Court too were exhorted to be "better educated in "the elements of physics" in order that they do justice in similar cases.[252]

The criticism in the press however did not manage to change the verdict when the full bench of the Calcutta Small Causes Court heard the appeal for retrial in June 1906. In the appeal, the Counsel for the Ezras tried to first argue that the installation had to be faulty as Fleming admitted to not knowing the IEE rules.[253] To this the Chief Judge responded that this knowledge was not necessary – "if he had done his work properly as he has been taught, it is sufficient."[254] Next the Counsel tried to establish the technical inadequacy of Fleming and Co.'s attempts to rectify the fans by claiming that Sil, the man they had sent for this task, was "only a sircar" employed by the firm at a meager wage. One of the judges pointed out in response that Sil was actually a member of the firm of Dey, Sil and Co. and even the CESC engineer Margrett knew of his work.[255] Once again Meares' "position, his status, his rank" was brought up with the assertion that "his scientific knowledge enabled him to examine certain points which a layman would not have thought of." The judges did not discredit Meares but still thought that he was shown to be prejudiced against Fleming and Co.[256] On such grounds the appeal was finally dismissed and the previous verdict upheld.[257]

---

[249] Anon., 'The Recent Electric Fan Case: A Professional View', 21 April, 1904, *The Indian Daily News*, pg. 24.
[250] *ibid*.
[251] *ibid*.
[252] *ibid*.
[253] Anon., 'The Electric Punkah Case', June 2, 1904, *The Englishman*, pg. 17.
[254] *ibid*.
[255] *ibid*.
[256] *ibid*.
[257] *ibid*.

Irrespective of how well the verdict responded to the actualities of the debacle, for our purposes, the 'electric fan case' presents a rather interesting view of the social and technical features of the early adoption of electricity by Calcutta consumers. Electrical law in the colony confined itself primarily to the realm of the street, outside the consumer's premises. The rule of electrical law as before and after the 1903 Act, was however fundamentally reluctant to pronounce its own fixtures and relied instead on a rather thin force of electric officials to deliver judgments as and when occasion demanded. The point of this form of electrical governance was to afford a certain flexibility to the operations of electrical enterprise.

On the other hand, by leaving consumers' installations out of its ambit, lawmakers were implicitly trying to induce this flexibility also into the private relationship between the consumer, the wiring contractor and the licensee. One consequence of this as can be surmised from our discussion till now is that the consumer – increasingly both native and European - was in many ways consigned to the technical whims of the contractor without any fixed rules to be followed in the wiring of his/her premise. To be certain, the realm of consumer's installations was not entirely lawless. The contractor had to abide by the licensee's tests and a body of other rules, whether of the IEE or from fire insurance agencies, were at least suggested. But without statutory force, much of this seemed to have been negotiable and the contractor's practices were not standardized in any obvious way. The broader implication of this was that often consumers' installations in places like colonial Calcutta consisted of precariously fixed wires, dimming lights and noisy fans emitting sparks. Such installations needed to be subjected to technical maintenance from time to time. It is likely that while most of the wiring contractors were European firms, the maintenance tasks were passed on to native electrical labour and concerns like Dey, Sil and Co. who received many a sub-contract on this count. A native-run firm like Dey. Sil and Co., as we saw in the last chapter, started off as innovators in the emerging field of electrical supply in the late 19th century, but by the early 20th century, it seems to have taken more to maintenance tasks. It also seems that the relatively more flexible standard of work adopted by wiring contractors initially came cheaper for the consumer; but it is still difficult to understand whether the sum total of expenses consisting also of maintenance charges was much less.

Ultimately, the arguments in the fan case, at least those made from the side of the contractors, represented the possibility that there was in colonial Calcutta some kind of equilibrium that was established between consumer's expectations, contractor's practices and the licensee's permissibility. This equilibrium was formed in spite of obvious deviations from metropolitan (IEE) norms and from any other recognisable standard of electrical practice. And it was poised upon the fact that with rather minimal regulatory control exercised by the licensee, many in Calcutta had actually adopted the new norm of somewhat uncertain but nonetheless cheaper form of electrical installation offered by contractors in the city. The installations were eyesore to the official 'expert' and they invariably embodied some amount of risk, but they still worked when paired with adequate technical maintenance. Eventually it was this bare fact of ordinary functionality that remained most emphasized in the court proceedings and was also posed against the veracity and status of 'expertise'. In judicial reasoning what *worked,* even if barely in some cases, was technically valid, even if it was a far cry from what *should have been* by the expert's standards.

Here it is essential to understand that the verdict of the case was not in any way opposed to technical objectivity. Rather, it was *because* functionality (of consumers' installations) was verifiable by technical standards of testing instruments (of the licensee or otherwise), that it eventually won the day against Meares' opinion, emerging from his presumed but unverifiable knowledge and impartiality. Common sense concerning electricity in colonial Calcutta still had not settled on a uniform recognition of expertise, based on status or qualifications. Judicial interventions stepped in to fill the gap created in the code of electrical law regarding the conduct and standard of electrical installations on consumers' premises. But in doing so it further complicated the conception of both electrical expertise and standard electrical practice in a context where a limited, yet critical and *practical* literacy of electrical technicalities seemed to have been gradually spreading across races and classes.

The verdict in the fan case also of course further legitimized the point of view and the kinds of electrical practice that it chose to uphold. In his autobiography, Meares recounted that the verdict went against the Ezras for the simple reason that the Court

Bench extended consideration to the contractor as the industry was "in its infancy".[258] After the verdict Meares also received another lawyer's letter from a European contractor in Calcutta threatening libel unless he withdrew "the imputations on his competency."[259] And in a way the verdict foresaw a state of affairs whereby "jerry wiring flourished for years." Contractors got away with any kind of work as long as the licensee's tests were fair and on the basis of these tests the licensee consented to make the connection "as was (and is) the custom."[260] Little wonder then that Meares' continued to lament decades later that "the engineering profession has so far not succeeded in closing its ranks against quacks and unqualified practitioners...and any plumber can blossom out as an electrical engineer without let or hindrance."[261]

While already by the early twentieth century a flourishing business of wiring contractors or firms had emerged in colonial Calcutta, the uncertainty in matters of recognizing the qualifications and capacities of professionals of electrical pursuit continued in the city, as elsewhere in India. And simultaneously, the question of specifying rules and standards for consumers' installations also persisted. Since both these issues remained imbricated with essential questions of safe and rule-bound electrical practice, they kept being re-introduced into proposals of revising electrical law in the colony, as will be shown in the next chapter.

8. The proliferation of electricity theft

In wrapping up this chapter on the making of the 1903 Electricity Act it is essential to discuss one more dimension of the reception and use of electricity by Calcutta consumers that too was proving difficult to frame within the evolving scope of legal regulation. This was the issue of electricity theft. In the late 19th century context of expanding electricity networks through major cities of the world, electricity theft was indeed a very novel 'crime' to deal with and it drew confused reactions from lawmakers and the judiciary. In most such cities, many early electrical users had found technical means themselves or

[258] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, Pg. 91. J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, IET Archives.
[259] *ibid.*
[260] *ibid.*
[261] *ibid,* pg. 67.

through certain more practiced intermediaries, to develop various "meter-cheating devices."[262] It was difficult for utility companies, as for instance in New Jersey, to explain to judges and legislators "how it was possible for anyone to steal such a 'subtle fluid' as electricity."[263] German courts too had apparently decided "on several occasions, that the theft of electrical energy was not punishable by law, as electric current or electrical energy could not be considered as a material object."[264] However British law in this matter had always offered full protection to undertakers owing to the legacy of the administration of gas works that identified gas as a possible subject of larceny (theft of personal property).[265] And even though electrical energy "cannot be measured in cubic feet", "a special provision as to its theft" was inserted in the 1882 (British) Electric Lighting Act.[266] Eventually utilities lobbied lawmakers around the world to outlaw electric theft and were in most cases successful.[267] However this did not necessarily mean that the problem of convicting electric theft was resolved for once and for all as a predictable outcome or that the laws in question had very uniform interpretations in different regional situations.[268]

Like elsewhere in the world, in colonial Calcutta the utility interests represented to the government the possibility that a person may "maliciously" or "fraudulently" draw electrical energy from the firm's supply.[269] In 1902, Kilburn, the Managing Agents of CESC also informed the government that they had "experienced instances of consumers connecting on their installations themselves, by breaking our seals and without our consent."[270] The 1903 Act took cognizance of such representations and eventually decreed by section 39, sub section 1 that "Whoever *dishonestly* abstracts, consumes or

[262] G. W. Harris, "Stealing Electricity", *Selling Electricity*, Vol II No. 4, October, 1907, pg. 18.
[263] *ibid*.
[264] Anonymous, 'Electrical Notes', *Scientific American*, Vol. LXXXII., No. 3, January 20, 1900, pg. 39.
[265] Note on Sec 39', in J. W. Meares, The Law Relation to Electrical Energy in India being The Indian Electricity Act, 1910 Act IX of 1910, Calcutta, 1933, pg. 266.
[266] *ibid*.
[267] See in this regard 'Report of the Committee on Legislation Concerning Theft of Current', National Electric Light Association. Twenty-First Convention. Chicago ILL. June 7th 8th, 9th, 1898, New York, 1898, pgs. 318-321.
[268] This point is confirmed by the excellent account of electricity theft in Mexico in the early 20th century in Montano (2021).
[269] 'From O. C. Lees, Under-Secy, GOI, PWD to Secy, GOB, PWD', May 15, 1900, No. 506 C.W. No. 2, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[270] 'From Messrs. Kilburn & Co., Managing Agents, CESC to The Secy, GOB, PWD', May 27, 1902, No. 68, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives

uses any energy shall be deemed to have committed theft within the meaning of the Indian Penal Code."[271] However from the very earliest cases of alleged electricity theft in the city, conviction became a difficult pursuit in the courts. Even though courts accepted the illegality of the act of availing electricity without the firm's (CESC) sanction, in many cases the *agent* of electricity theft invariably remained quite difficult to identify in a legally convincing manner.

In what was one of the earliest cases of prosecuting electricity theft in a court of law in Calcutta, a lengthy trial ensued. The charge was initially made out against Mr. Minck who occupied a room among the flats on 9, Middleton Street from 1st of June on 1905.[272] Prior to his occupation, the electric line to the room was disconnected. But on the 12th of June Mr. Wade of the CESC found an electric fan and electric lights running in the said room. Wade also apparently detected "two pins" that had been usd to effect "a connection between the main cable and the cable attached to Mr. Minck's room, whilst the current was in this manner prevented from passing through the metre."[273]Minck claimed to know nothing about the pins and he had apparently simply turned on the switches in his room and found the lights coming on. "A lengthy argument" followed regarding "the correct section of the Penal Code" under which the charge could be made – whether it would be Section 379 dealing with theft or Section 380 that dealt with "Theft in a dwelling-house" and made for a lighter penalty.[274] Minck's defence lawyer argued that there was no evidence against him of setting up the pins and purportedly committing theft except his own admission of using the light.[275] It was further pointed out that he was the son of a "well-known jeweller of Bombay" and "was new to Calcutta" otherwise.[276] Nonetheless, the case was decided against Minck and under Section 380 he was fined Rs. 200 and subjected to imprisonment for a day.

---

[271] 'Section 39(1), The Indian Electricity Bill. (Part IV. – General. – Section 34), in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives (emphasis in original).
[272] Anon., 'Electric Supply Case in Calcutta', June 29, 1905, *The Englishman*, pg. 18.
[273] *ibid*.
[274] *ibid*.
[275] *ibid*.
[276] *ibid*., pg. 19.

This was however only the beginning of the long-drawn-out courtroom proceedings. In August 1906 Minck got the Calcutta High Court to order a retrial.[277] Minck's basic claim was that previously he was "misled" by two other inhabitants of the building - Mrs. Ross and her son Mr. Ross - who had rented the room to him and had eventually induced him to take the blame in the matter.[278] Mrs. Ross denied the charge and stated that she owed nothing for electric lights in the concerned room as the lights were long disconnected and that her tenants usually made their own arrangements if they wanted lighting.[279] She did admit to making one connection in March earlier that year through "the metre" of another inhabitant of the building, Mr. Wilson, whom she paid separately for it. This connection was not made by CESC "but by an outside electrician."[280] When asked if this connection was made "without the Electrical Company's consent", Mrs. Ross showed "some reluctance" in replying and eventually admitted to not obtaining this consent.[281] But she did not admit to making any "pin connection" and also thought Minck had not done it either.[282] Another tenant in the building, Mr. Weatherall claimed in court that Mr. Ross had told him "that they had placed pins in the disconnected wires and thus got the current on" though he had not checked the pins himself.[283] It was Weatherall who had informed Kilburn & Co. of "the fraud" but he did not immediately tell them who had actually executed it. The Ross' lawyer implied that Weatherall's testimony was influenced by some conflict that he had with the Rosses and since he owed them some money.[284] Mr. Ross was examined next. He like his mother claimed to know nothing of the pins. He also said that he "was not an engineer or an electrician."[285]

Minck was eventually acquitted in the re-trial. The Chief Presidency Magistrate made this decision on the basis of some discrepancies that had surfaced in Mrs. Ross' account

---

[277] Anon., 'The Electric Supply Corporation Case", August 17, 1905, *The Indian Daily News, Overland Summary*, pg. 7.
[278] *ibid*.
[279] *ibid*.
[280] *ibid*.
[281] *ibid*.
[282] *ibid*.
[283] Anon., 'The Electric Supply Case. The Re-Trial', August 24, 1905, *The Englishman*, pg. 19.
[284] *ibid*.
[285] Anon., 'The Electric Supply Corporation Case. Re-Trial in the Police Court.' August 24, 1905, *The Indian Daily News, Overland Summary*, pg. 23

that rendered her and her son more likely to be guilty in the matter.[286] Amongst others, one such discrepancy was related to the earlier connection that Mrs. Ross spoke of making for one of her tenants through Mr. Wilson's meter. On examination of the meters and meter board by police inspector Mr. Straker and CESC officials, the connection in question was suspected to possibly have been "illicit", in that it could have been actually made by bypassing the meter, just like in the case of Minck's room. Mrs. Ross claimed that this earlier connection was made "by a mistri" and she knew nothing else about "who the mistri was, nor could she find him."[287] The Magistrate took note of this lapse and a case was filed against Mrs. Ross this time "for illicit abstraction of energy."

As the trial dragged on till 1906, Ross' lawyers sought to depict other tenants in the building like Weatherall, as more likely to be equipped with the practical knowledge to have effected the illegal connection. Weatherall was found to have some amount of technical training. He admitted that he had spent two years "in a mechanical shop at Gainsborough" and then "three years in the technical college, Dulwich."[288] In Calcutta too he had worked in "Machinery stores" but he denied having "been employed as an engineer."[289] He had also apparently worked for Messrs. Kilburn and Co. Weatherall also claimed to have no "definite idea of where the meters in the house are."[290] And in his turn he kept pointing at Mr. Ross to be "smart" enough to have devised the pin mechanism.[291] Another possible agent of the theft of electricity being alleged was a bearer in the employ of the Rosses. Ross' lawyers wondered why he was not presented as a witness by the prosecution since "he is supposed to have made the connection for thirteen days."[292] Inspector Straker in his witness said that he did intend to make this bearer "the third accused", but "he was merely acting under orders."[293]

In his witness in the case A. K. Taylor, the Electrical Engineer of the Bengal Government presented a rather uncertain picture concerning the pilferage of electricity in the building.

---

[286] Anon., 'The Electric Supply Case. Mr. Minck Acquitted.', August 31, 1905, *The Englishman*, pg. 17.
[287] *ibid*.
[288] Anon., 'Alleged Theft of Electric Current, Police Court Proceedings.', April 26, 1906, *The Englishman*, pg. 19.
[289] *ibid*.
[290] *ibid*.
[291] *ibid*.
[292] *ibid*. pg. 18.
[293] *ibid*.

He claimed to have "examined the meter board to see how it was connected."[294] But he did not ascertain whether "there was greater consumption of electricity in February and March."[295] He also was not certain about there being "any object scratching the wires" and stated that the wires could very well look "fresh" with sufficient passage of time even if they were tampered with.[296] Additionally, Taylor pointed out that given the nature of the connection between electric wires being investigated, "unless the *mistry* or whoever made the connection knew his business very well" there were high chances that a "wrong pair of wires" would be connected, leading up to a burning out of the electric wiring. Mr. Wade of the CESC however reasserted the incidence of theft.[297] He also stated that it was his job "to inspect meter cards" that he performed with the aid of "seven or eight" more men.[298]

In the course of the trial of the Rosses there seemed to be not much evidence to show that they had asked Minck to take the blame of their supposed misdemeanour on to him.[299] There was also some suggestion from a servant in the building that Minck was eventually through his bearer trying to bribe other servants to testify that they had seen Ross' bearer stick pins and make the illegal connection.[300] At the final hearing Ross' lawyers contested any charge of theft by continuing to claim that the older connection was actually made through a meter in the building.[301] Regarding the new charge of illegal abstraction of electric energy in relation to Minck's room, they discredited the witnesses who testified against the Rosses as interested parties (like Weatherall) or as disreputable (like Minck).[302] The evidence of CESC officers were also claimed to be "as uncertain and imaginary as electric current itself, being merely opinions" that could not be verified through "the meter card."[303] The judgment seemed to have concurred in this partly as it did not eventually find "any direct evidence to substantiate the charge against the

---

[294] Anon., 'The Ross Electricity Case. Witness for the Prosecution.', April, 26, 1906, *The Indian Daily News. Overland Summary*, pg. 22.
[295]*ibid*.
[296]*ibid*.
[297]*ibid*. pg. 23.
[298]*ibid*.
[299] Anon., 'The Ross Electricity Case', May 3, 1906, *The Indian Daily News. Overland Summary*, pg. 17.
[300]*ibid*.
[301]*ibid*.
[302]*ibid*.
[303]*ibid*.

accused."[304] The judge acknowledged that in a charge like this, "direct evidence" was difficult to produce, but he refused to "convict upon presumptions."[305] He could not convict Mrs. Ross' bearer as having committed the theft as "he could not be expected to know the law."[306] Moreover, "there were about 17 meters in the house" and it was thus "impossible to fix the guilt."[307] The Rosses too were of course not found guilty by this judgment under the 1903 Electricity Act or under the IPC.

This early court case in the history of electricity theft in colonial Calcutta, reported in some detail in the press, seemed to have set a type that electrical officials often complained about in future legal deliberations. This typology pertained to the difficulty of determining who had committed or was responsible for or stood to gain from the theft committed, in order to secure a conviction. To understand this conundrum it is useful to see how the case was eventually challenged at two levels. Firstly, the Ross defence seemed to have questioned if there was any theft at all. In case of the earlier connection made without CESC's knowledge, clearly the evidence of meter readings or the appearance of the wires in question could not confirm beyond doubt (as indicated by Taylor) whether the Rosses had secured some amount of electricity by bypassing the meter. Electricity had to be consumed when supplied and it could not be possessed per se, which made the theft of electrical energy difficult to prove. Also, in absence of the '*mistri*' who made the connection, there was no direct way of verifying how the connection was actually made. In the case of the connection made to Minck's room there was the more direct evidence of electrical lights and fan running and more importantly, that of the 'pin mechanism' that suggested a bypassing of the meter. But in this case a second challenge was successfully mounted by the Ross defence. The prosecution had to prove that there was someone capable enough to have physically made the connection in question, which again going by Taylor's testimony, required some amount of experience and working knowledge of electrical practice. Eventually neither the Rosses nor their bearer were thought to be capable enough in this respect, even though the former could have gained from such a connection.

---

[304] *ibid.*
[305] *ibid.*
[306] *ibid.*
[307] *ibid.*

This case also allows us to think of another characteristic of the early setting up of electricity connections in a colonial city like Calcutta. The obvious suspicion about the *mistri* or an equivalent intermediary figure as having performed the difficult work of illegal connection helped open up the case for retrial and redirect the accusation of theft towards the Rosses. The plausibility of this proposition and thus the emphasis on the *mistri* is useful to highlight in relation to the incidental mention of the same figure in the previous section as a kind of semi-skilled worker, performing though the essential task of connecting and maintaining household and other consumer connections wired up to the CESC's electrical network.

In following chapters of this thesis we will discuss more about how this figure became a constant concern for the legal regulation of electrical matters in the colony. For the time being the *mistri'*s existence is useful to note, especially as a shadowy yet critically necessary agent performing various kinds of 'illicit' connections for Europeans and natives alike in the city. Looking at Wade's testimony in the case that admitted to there being a separate branch of the CESC dedicated to the function of verifying consumer connections and meter cards, we can very well infer that the scope of electric theft and by implication the *mistri'*s domain of tinkering with electrical installations in Calcutta was expanding in various ways. In the early twentieth century, colonial Calcutta was seeing the rise to dominance of a set of European firms - like F. C. Osler and Co. or Henley Wiring Co. - conducting electrical installations and supplying electrical appliances and apparatus, over extant native enterprises like that of Dey, Sil and Co. But allegations of electricity theft demonstrate that native intermediaries nonetheless continued to be relevant to electrical trade and practice beyond the formal activities of such wiring firms. Such intermediaries could be the more humble *mistri* or they could be one-man wiring contractor firms.

In a 1902 case in Calcutta, a shop at No. 33 Armenian Street was accused of making fraudulent use of electricity.[308] It was found rather difficult to ascertain whether the person responsible for theft on the shop premises and thus to be charged, was a

[308] Anon., 'Fraudulent Use of Electricity', October 30, 1902, *The Indian Daily News. Overland Summary*, pg. 35.

CowasjeeBhoja or if it was a Gokul Dass. The former was seen "carrying on business in the shop in question."[309] The latter too was seen to "carry on business in the shop in question."[310] The contractor Mr. Zemin was however identified in this case as a co-accused throughout the trial proceedings. With the difficulty of identifying the first accused, Zemin was eventually acquitted without "sufficient evidence to offer in the case.[311] Such contractors, as being a one man firm, were also apprehended to be performing other kinds connections more complicated than the usual modality of meter skipping. In 1904, "two East Indians", C. S. D'Costa and H. S. George were charged with theft of electric energy at premises no. 125, Dhurrumtolla Street.[312] On D'Costa's application, George as contractor had arranged with the CESC to set up the connection. But after "the fixing of the necessary apparatus" nothing more was done.[313] Instead, it was alleged that holes were bored "through the rubber covering of the complainant's main" and two wires inserted to illegally draw current.[314] In this case conviction was secured and both the accused were fine Rs. 50 each.[315] A similar case was that of Rajani Kanto Pyne and his contractor Messrs. H. L. Dhur and Co. who set up "a board" at the former's premises on Bow Bazar Street to connect with CESC mains by applying to the licensee.[316] However no actual connection was apparently taken and the contractor helped Pyne to connect his installation to the mains of the CESC nonetheless.[317]

The cases described point to the practice of theft becoming gradually more popular amongst a variety of social groups interested in the consumption of the new form of energy in colonial Calcutta. They also illustrate the different techniques that had come to be adopted by a definite kind of skill and practical knowledge-bearing native intermediary agent like a contractor or *mistri* in order to secure the connection in

[309] Anon., 'Alleged Fraudulent Use of Electricity', November 6, 1902, *The Englishman,* pg. 20.
[310] Anon., 'Alleged Fraudulent Use of Electricity', November 6, 1902, *The Indian Daily News. Overland Summary,* pg. 21.
[311] *ibid*.
[312] Anon., 'Alleged Fraudulent Electric Supply', December 22, 1904, *The Indian Daily News, Overland Summary,* pg. 30.
[313] *ibid*.
[314] *ibid*.
[315] Anon., 'Cases Under Electricity. Accused Convicted', January 12, 1905, *The Indian Daily News, Overland Summary,* pg. 12.
[316] Anon., 'Another Electric Supply Case', May 29, 1906, *ABP,* pg. 6.
[317] *ibid*.

question. One interesting thing to note here is how the *mistri* as contrasted to both the contracting firm as well as their employers for whom they might have fixed the illegal connections, gradually became a more definite target of harsher conviction in cases alleging electricity theft. Some such cases were coming up in relation to flour mills in Calcutta that were emerging as a distinctive category of power users in the city. CESC also sought to incentivise their consumption in certain ways. Yet cases of electricity theft were still often being reported from these mills.

In late 1906 two men, one Momraj Bania and one Raja Ram, were accused by the CESC of making fraudulent use of electricity on 6, Burtolla Street.[318] Raja Ram was the "head mistry" at the mill and Momraj "the contractor of the mill."[319] Wade, the CESC officer was tipped off about such fraudulent use by a man named Sibram, "an informer in the employ of the Corporation."[320] Wade conducted an inspection one evening and found the seals on the meter-box broken and a connection again being made "below the metre" in order to use current "without being registered by the metre."[321] Raja Ram being present at the mill at the time was asked to stop the motor. CESC officials explained to the court that they had special rates for such mills which were two and a half annas in the day till 5 o'clock after which the charge in the evening became four annas.[322] This was to incentivise the use of electric power in the day in order to better the CESC's day load. It was alleged that "the wires of the night metres had been tampered with."[323] The case did yield a conviction. But it was Raja Ram who was found guilty and sentenced to pay a fine of Rs. 60 or face 6 weeks of imprisonment.[324] Momraj on the other hand was discharged "as he was not present when the theft was discovered."

In 1910 another such case of alleged fraudulent use of electricity came up in relation a flour mill in Howrah where the accused were Srilal Marwari, the owner and Ramrup his

---

[318] Anon., 'More Electric Thefts.', September 13, 1906, *The Indian Daily News, Overland Summary,* pg. 15.
[319] *ibid.*
[320] *ibid.*
[321] *ibid.*
[322] *ibid.*
[323] *ibid.*
[324] Anon., 'Theft of Electricity', November 2, 1906, *ABP*, pg. 5

servant.[325] The prosecution accused that electricity was consumed in the mill by "setting back the pointer on the dial of the meter."[326] While inspecting the connection, Wade again noticed the seal of the meter-box being broken. A search made of the premises also discovered "accessories used for tapping electric wires."[327] Here again while Srilal was only fined Rs. 100 on being convicted, Ramrup was subjected to "three months' hard labour."[328] This more direct penalisation of the *mistri* or subordinate who performed the illegal connection in question was also observable in other cases of more residential electrical connections like for "electrical mistry" Jabed Ali, who was prosecuted for unlawful use of electricity at the house of the late Rai Pasupati Nath Bose Bahadur on Bag Bazar Street in 1909.[329]

The theft or fraudulent or 'dishonest' use of electricity then invoked two kinds of legal responses. The option of targeting the lowly electrical mistri over and above his master or the wiring firm in question seemed to have gradually become more common in court cases. Perhaps this was aimed at reducing the incidence of theft by intervening at a very fundamental level. The objective might have been to deter the primary intermediary agent of electricity theft whose skill and practical knowledge, expanding manifold with the spread of the electricity network in colonial cities like Calcutta, seemed threatning to the operations of the electrical licensee and to the legal certainties of the colonial state. On the other hand, the second kind of legal reaction to the accusation and incidence of electricity theft in the colonial city remained confounded, to the extent that it repeatedly faced the difficulty of identifying and prosecuting the subject who stood to gain from the theft of electrical energy (though not physically making the illegal connection). In this sense, the curbing of electricity theft remained a complicated endeavour in terms of the limitations of the legal-judicial process in inhibiting the inclinations of such subjects who actually engaged *mistris* or contractors to conduct the fraudulent use of electricity. This second kind of legal issues with the problem of dealing with theft continued in the

[325] Anon., 'Tapping The Wire', September 28, 1910, *ABP*, pg. 12.
[326] *ibid*.
[327] *ibid*.
[328] *ibid*.
[329] Anon., 'Alleged Theft of Eletrricity", February 9, 1909, *ABP*, pg. 14.

coming years to bother the colonial bureaucracy. A strong need was thus felt to modify the legal premises to enable a more effective arresting of electricity theft.

9. Conclusion

The 1903 Electricity Act was foundational to the administration of electrical matters in the colony. Even after its repeal, most of its principles were carried over into the following 1910 Electricity Act. This chapter mainly studied how this Act inaugurated a certain model of regulatory allowance with respect to the governance of electricity supply in the colony. To begin with, it surveyed how the complicated issue of the wiring schemes adopted by private firms and licensees was articulated through the deliberations surrounding the Act. The chapter traced how the Act eventually continued to formalise a policy of deferring a more immediate enactment of strict rules in favour of a flexible and provisional settlement of issues of correct technical conduct by the electrical inspectors of the colonial state in the possible future. One consequence of this was already quite obvious in colonial Calcutta where the danger of overhead bare copper conductors carrying both high and low voltage electricity aggravated.

Otherwise the chapter also explored certain self-declared limits of the 1903 Act, limits that were scripted along the boundary between the licensee's supply and the consumer's installation. The colonial state remained hesitant about entering this terrain as a sovereign authority. This chapter described the implications of this hesitancy. A range of problems proliferated across the boundary of the consumer's premises in lieu of statutory guidance. These included the issue of the variable pressure of supply to consumers, the uncertainties concerning the metering of electric supply and finally and most importantly, the making of consumer's installations in contravention of standards of safe and standard practice as set by metropolitan rules and norms. Beyond these problems the law also found it difficult to contain another social practice gathering volume in places like colonial Calcutta, that of electricity theft.

The chapter also finally indicated how the negotiable space between law and everyday electrical practice as evacuated by regulatory indecision, was being gradually filled up with consumer's indiscipline, aided particularly by the critical figure of the electrical

mistri. Native electrical agency had been in a way ‘demoted’ from its early innovative role in the late nineteenth century to more maintenance-oriented functions by the early twentieth century. Nonetheless electrification in colonial Calcutta would be unthinkable without the tinkering of the electrical *mistri*. Whether fixing fire-emitting fans or rigging up an illegal connection, the electrical *mistri* had come to stay and eventually constituted a major concern for future electrical regulation.

Chapter 4: Making the 1910 Electricity Act: The problem of electrical learning and attention to consumer issues

1. Introduction

The 1903 Electricity Act did not have a very long career. Its promise was that of bringing optimal flexibility in the exercise of rules as a way of facilitating the operations of electric enterprise. As we have seen, in colonial Calcutta this amounted to particular technological configurations that skirted metropolitan standards and were instead subjected to a regime of legal governance that left wide scope for maneuvering any presumed uniformity of technical and safety protocols. However, in other contexts of colonial India where a number of new electrical schemes were proposed since the passing of the Act, the lawmakers within the imperial bureaucracy seemed to have increasingly found the deficit of uniformity to be more of a serious problem. In these disparate contexts, the legislation and its associated 'freedoms' also seemed to have often proved somewhat inadequate to the cause of promoting electrical enterprise. Some new schemes were considerably impeded at the licensing stage within the colonial legal environment. Some others did not manage to take off even after being licensed.

This fourth chapter will firstly analyse how two kinds of new schemes – those envisioning 'bulk' supply and those aiming to introduce electricity in military cantonments – related to the structure of governance devised under the 1903 Act. The attempt in this analysis will be to describe the specific limitations of the 1903 legislation (and its administration) in measuring up to its self-declared goals of facilitating the workings of private electrical enterprise, that eventually led to proposals for its amendment/repeal.

Otherwise, most of this chapter will delve into the making of the 1910 Electricity Act in India that came after the repeal of the 1903 Act. It will show how the makers of the Act identified the lack of centralisation as one of the main reasons for proposing a new legislation. For the imperial bureaucracy the lack of centralisation was primarily manifested in the way the provinces were either left devoid of any 'expert' advice in the matter of electrical administration or were straddled with electrical officials who were

deemed not capable or qualified enough to ensure an efficient governance of electrical matters. The chapter will show that while one definite inclination of the previous 1903 Act was to consign electrical administration to the personal judgment of provincial Electric Inspectors (EI) over and above the fixity of rules, the imperial bureaucracy could not let go of the anxiety concerning how well such EIs would be able to manage their domain of control.[1] Yet neither did the Government of India actually end up specifying a formal set of qualifications required to be appointed as EI in the colony. Under such circumstances, the position and the 'expertise' of the provincial Electric Inspector remained rather fraught.

Eventually the stronger proposals to centralise the entirety of electrical administration was protested by some provincial governments and over-ruled by the Secretary of State in London. The 1910 Act eventually retained the same structure of the 1903 Act that reserved rule-making powers with the Government of India while consigning licensing functions to the provincial governments. The chapter studies some of these counter-proposals made in the course of the deliberations around the design of the 1910 Act and its associated rules, especially by officials from Bombay. It discusses how Bombay's counter to the imperial plans of centralization was in part an argument for the administration of electricity to be attuned to local particularities. This argument was sharpened as suppliers in Bombay pioneered the large-scale use of the more dangerous high-tension Alternating Current (AC) in the city, relatively uniquely in India.

However Bombay also continuously proposed to impose uniform laws, standards and rules of governing electricity across metropole and colony by borrowing from the expert frameworks already prevalent in England. The chapter shows how the imperial technocracy led by Meares and the like zealously guarded their terrain of rule-making and in effect their 'expertise' from such proposals to introduce British strictures for the technical conduct of electricity in India. In doing so, they contested Bombay's suggestions that such stricter rules were more necessary for the colony where norms for technical conduct could not depend on any prior technological common sense or

[1] In the next chapter we will see how this paradoxical nature of the dependence on EIs became a long-term problem of the colonial regulation of electricity.

electrical learning or any intuitive grasp of the dangers of electrical technology by users and intermediaries handling the new form of energy. Imperial officials remained keener on the promise of flexible rules instrumentalised to facilitate private enterprise much more than devising rules for the purposes of instructing users in issues of safety, etc.

Finally the chapter also explores how the 1910 Act was compelled by a number of submissions from users and licensees alike to intervene into the domain of the installations on consumer's premises. Whether in articulating religious objection to the entry of licensee's officials into their premises or by seeking to make technical modifications in the conditions of electric supply, consumers actively entered the framework of electrical lawmaking in the colony by the time the 1910 Act was in the making. The chapter shows how such issues were more often than not resolved in favour of the licensee. But additional problems like those surrounding the intervention of intermediary workers like *mistris,* or problems concerning electrical meters or the aggravation of the issue of electric theft, all gradually came together to render the consumer's installation as an object of constant regulatory concern.

2. The limitations of the 1903 Electricity Act

The most immediate trigger for calls to amend the 1903 Act was certain new 'bulk' supply schemes being proposed in colonial India, notably those by Messrs. Killick, Nixon and Co. for Calcutta and its industrial surroundings, by the Tatas for Bombay and by Messrs. Hoare, Miller & Co. for the coalfields of Bengal. These schemes aimed to produce electricity in larger quantities and sell it to substantial users like factories or coal mines or to smaller licensees who would then sell this power to general consumers. The concept behind 'bulk supply' emerging throughout the world since the end of the 19th century involved the separation in principle, of the production of power from its distribution. Power produced in larger quantities on hydroelectric sites like the Niagra Falls or by much larger coal-fired plants was to be transported over high-voltage AC transmission lines, to be bought and sold by licensees in regions and towns situated further away from the power source.

While ‘bulk’ supply schemes came with the promise of cheapening the price paid for electricity by scaling up production, they also in turn demanded particular changes in the way electricity systems were licensed and administered. In the wake of larger schemes being proposed in England by the likes of Sebastian Ferranti and Charles Merz for London and Newcastle, the 1898 Cross’ Committee had recommended that such ‘bulk’ supply schemes that spanned an expansive area much exceeding the jurisdiction of singular municipalities, be altogether relieved from the bindings of future purchase by concerned local authorities. It was thus conceded that when such private undertakings operated at a big enough scale, it was not viable to foster the future possibility of the municipalisation of such undertakings as a means of control over them. In subsequent special acts passed for licensing such schemes in different parts of England the purchase clause was thus eliminated. But these acts also attached a relatively restrictive clause to such licenses that controlled the prices they charged in proportion to the dividend that they paid from their power sales.

Special consideration of ‘bulk’ supply schemes as those made by Cross’ Committee was a major reference point for the likes of the Bengal Chamber of Commerce (BCC) in the discussion preceding the enactment of the 1903 legislation. Yet the legislation seemed to have proved remarkably limited to the setting up of such schemes in colonial India. In March 1906, Messrs. Killick, Nixon and Co. applied for the Hooghly River Electric License to produce electricity in bulk by two large coal-powered stations and supply it through a large area surrounding both sides of the river bordering Calcutta and Howrah. The area included many factories, mills and most of the jute industry. The company was intent on selling power to these industrial units as well as to local licensees or “authorised distributors”, like that in Barrackpore for distribution to the general public.[2] It also sought to include the clause in their license that given that its supply area overlapped with the territory of 24 different ‘local authorities’, if any one of them sought to purchase the part of the undertaking within their jurisdiction after the due period, they would still have to

[2] ‘From Messrs. Killick, Nixon & Co. to Secy, GOB, PWD’, March 22, 1906, in GOB, PWD(MPI) for May 1907, IOR/P/7565.

pay for the whole scheme. This, they claimed, was only so that they are "adequately protected" from the interference of local authorities.[3]

While giving his views on Killick, Nixon's application, the Officiating Solicitor to the GOI, C.H. Kesteven rejected this suggested purchase clause as being disagreeable with the principles of the 1903 Act. He also thought the proposition of selling to 'authorised distributors' was "a new departure not contemplated by the Act" which authorised sale "to the public only."[4] In sum, Kesteven stated that while a lot of the provisions asked for in the Hooghly River Electric License would be sanctioned under recent special power acts in England, the colonial legal framework was not yet amenable to make the same allowances.[5] As these legal discussions were underway, CESC too joined the fray by expressly objecting to the grant of a new license in the areas overlapping with its own current and future terrain of supply, where it claimed to be very ready to supply power for industrial need.[6]

While the Government of Bengal was in two minds about the exclusion of the area of overlap between the CESC license and the Hooghly River license from the latter's ambit, the proposition was eventually discarded.[7] This was after a spirited attack on the CESC's objection as "most unconvincing" by imperial officials of the Commerce & Industry Department who welcomed Killick, Nixon's scheme of supplying cheap industrial power and argued for the virtues of greater competition in the supply area.[8] Meares too offered direct support to the scheme by arguing that the 1903 Act gave wide powers to the Local

[3] *ibid.*
[4] 'From C.H. Kesteven, Offg. Solicitor, GOI to Secy, GOB, PWD', May 9, 1906, in GOB, PWD(MPI) for May 1907, IOR/P/7565.
[5] *ibid*.
[6] 'From Messrs. Kilburn & Co., Agents, CESC to Secy, GOB, PWD', May 8, 1906, in GOB, PWD(MPI) for May 1907, IOR/P/7565.
[7] 'Note by C.L. Tupper', Septeber 16, 1906, in 'Proposed grant of a license to the Calcutta Electric Supply Corporation for the town & environs of Calcutta', Dept. of Commerce and Industry (Electricity), GOI, February, 1907, Part C, Nos. 2, NAI.
[8] 'Note by G. Rainy', September 4, 1906, in 'Proposed grant of a license to the Calcutta Electric Supply Corporation for the town & environs of Calcutta', Dept. of Commerce and Industry (Electricity), GOI, February, 1907, Part C, Nos. 2, NAI.

Government to interpret supply to 'the public' in an expansive sense to mean supply also to other distributors.[9]

However this was not enough to carry through the original version of the Hooghly River license given the government Solicitor's observations. Killick, Nixon expressed an urgency to obtain a license in order to source financing from the London money market and meet the pledges to buy their power secured from some mills in the given area.[10] They thus eventually submitted an altered version of the license for consideration that maintained the purchase clause originally included in the 1903 Act (of purchase as a 'going concern' after 42 years) and dropped all references to 'authorised distributors'.[11] The specific proposition of selling to such 'authorised distributors' also had to be eliminated from the other two licenses made out to 'bulk' supply schemes in this period, that of the Tatas in Bombay and Messrs. Hoare, Miller & Co.'s scheme for the coalfields of Bengal. And the question of the specific character of the purchase clause continued to be a thorny issue also for these schemes. Thus Hoare, Miller complained that in spite of being awarded The Coal Fields Electric License, 1907, they were not being able to source enough money in London to kick off their scheme, precisely because financiers felt uncertain about the future possibility of the compulsory purchase of the scheme by local authorities at a suitable price.[12] They requested to remove the purchase clause entirely as usual for 'bulk' supply schemes in England.[13] Meares responded sympathetically to the claim by pointing out that in England, capital was obtainable even from the smallest investors "for any purpose however visionary" and yet "London financiers will not guarantee capital for ventures in India unless they see a good return in prospect."[14] But

[9] 'From J.W. Meares to Mr. A.K. Taylor, EI, Bengal', July 19, 1906, in GOB, PWD(MPI) for May 1907, IOR/P/7565.
[10] 'From Messrs. Killick, Nixon & Co. to Secy, GOB, PWD', October 9, 1906, in GOB, PWD(MPI) for May 1907, IOR/P/7565.
[11] *ibid*.
[12] 'Note by H.M. Willmott', July 8, 1908, in 'Coal Fields Electric License, 1907, granted by the GOB to Messrs. Hoare, Miller & Co., Calcutta in respect of portions off the Burdwan and Manbhum Districts. Proposed modification of the purchase clause of the license so as to provide for the purchase of the undertaking as a "going concern."', in PWD(Electricity), GOI, December, 1908, Part A, Nos. 39-53, NAI.
[13] *ibid*.
[14] 'Note by J.W. Meares', July 22, 1908, in 'Coal Fields Electric License, 1907, granted by the GOB to Messrs. Hoare, Miller & Co., Calcutta in respect of portions off the Burdwan and Manbhum Districts. Proposed modification of the purchase clause of the license so as to provide for the purchase of the undertaking as a "going concern."', in PWD(Electricity), GOI, December, 1908, Part A, Nos. 39-53, NAI.

the necessary changes in the respective purchase clauses still could not be made within the scope of the 1903 Act.

In spite of the maximum of bureaucratic assistance, the law then proved remarkably intractable to the cause of 'bulk' supply schemes in colonial India. Both Killick, Nixon's and Hoare, Miller's schemes eventually fell apart. With the benefit of hindsight we can intuit that the root cause for this failure lay in the difficulty of attracting capital in the unyielding London money market given the insufficiency of the purchase clauses offered to these schemes as well as the denial of explicit permission to supply power to existing licensees ('authorised distributors'). Thus in spite of an acute ambition of facilitating private enterprise by skirting the strictures of English law, colonial legislation remained rather unsuccessful in its professed aims, even in a way contributing to the slow start of 'bulk' supply in India. Resultantly, the verdict was pronounced loud and clear in the course of the discussions around 'bulk' supply – the 1903 Act had to be immediately amended or even replaced by a new one.

The urge to amend the 1903 Act was also felt in the context of another recurring problem – of electricity supply in military cantonments - that reared its head as one more case of the law's somewhat unintended thwarting of the cause of private electrical enterprise. Cantonments were an attractive site for electrical capital in colonial India. One reason for this could be the plans of the colonial state since the early 1900s to replace punkah-pulling and oil lighting systems with electric arrangements in the hospitals and barracks for European troops. This was initially aimed at urgently curbing racist violence against punkah-pullers that reached a certain crescendo by the end of the 19th century and was causing a crisis of legitimacy for the colonial order felt acutely by its highest officials.[15] Over time, electric punkah-pulling and lighting was also urged as having enhanced sanitary effects for the European constituents of cantonment towns. Other than this, the military establishment had its own industrial and semi-industrial units like harness factories and ordinance factories that required power. Finally, cantonments also had transport requirements that could be met by electric traction.

[15] Discussed in the first chapter on punkahs.

To feed this series of energy needs several schemes to introduce electricity into cantonments were floated in colonial India in the first decade of the twentieth century by private enterprise. Such schemes were proposed for Cawnpore and Rangoon in 1905, for Barrackpore and Jubbulpore in 1906, for Lucknow in 1907, for Poona, Secunderabad, Dakhineswar (near Calcutta) and Madras in 1908 and for Rawalpindi and Mandalay in 1909.[16] In spite of this flourish of commercial interest, eventually the licenses for two of these schemes – for Lucknow and for Jubbulpore – had to be revoked and the scheme for Secunderabad and Poona too did not seem to have immediately attained maturity. This of course could be connected to the difficulty of attracting English capital for Indian schemes. But just like 'bulk' supply schemes, it is still crucial to understand how the prospects of such financing decomposed as cantonment schemes took very peculiar trajectories in relation to the colonial legal programme of awarding electric licenses and conducting electrical affairs.

As per section 40 of the 1903 Electricity Act, the powers of the "Local Government" in case of all military structures remained with the Governor General.[17] As lamented in later discussions about the amendment of the 1903 Act, this design of section 40 led to a structure of "dual control" of licensing and governing electrical schemes split between the imperial government and the provincial governments, the lamentation being related to the confusion and delay that this apparently caused.[18] But section 40 did more than introduce a duality. It could be argued that it allowed a kind of return of the repressed 'local' within the governance of electricity in colonial India. While municipalities as 'Local Authority' remained debarred from any significant sovereignty within the chain of order created by the 1903 Act, the 'local' made a comeback through the expanded role allotted to the military department and cantonment committees in the way in which section 40 was administered. If the signal colonial legal innovation was to depart from its metropolitan precedents by opting to reduce the role of local bodies, the colonial distinction applied equally though also paradoxically, in the way military authorities

[16] List prepared from PWD indices.
[17] 'Section 40, The Indian Electricity Bill', in in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[18] 'No. 6, Explanatory note regarding amendments proposed in the Indian Electricity Act, 1903', August 24, 1907, in GOI, PWD (Electricity), for September, 1908, Pro. No. 36, IOR/P/7907.

claimed their own exceptional stake in determining the conduct of power schemes within the jurisdiction of cantonments.

Around 1904 when the first proposals for cantonment 'electrification' were being floated, military authorities immediately proposed that for cantonment areas, the rights of the Military Department should not be prejudiced and that all supervision of electrical work be carried out by "an Inspector nominated by the Director General, Military Works."[19] The PWD and the Legislative Department could not assent to this as it would very literally go against the word of the law which allowed no such formal delegation of the Governor General's power of overseeing electrical affairs in the cantonment to the Military Department or its officials.[20] Nonetheless the department managed a concession that every license application for electric supply to cantonments and other military establishments had to be seen by the Director General, Military Works before approval and that the military would retain the rights to initiate its own electric supply notwithstanding the award of a license to other private companies within any such establishment.[21] This concession was made irrespective of the apprehension in the colonial bureaucracy that this could cause difficulty for private enterprise.[22]

In the following years with some cantonment licenses being issued, the question of how to execute necessary inspectorial functions within such sites was raised. The Acting Electric Adviser to the GOI, R.J. Browne (electrical official of the Government of Bengal stepping in for Meares who was away on a tour of Europe and America) argued that since in cantonments the military was itself the concerned consumer, it would hardly be fair for

[19] 'Note by H.W. Duperier, Director General, Military Works', September 1, 1904, in 'Question whether the powers of a Local Government under the Electricity Act, 1903, can be delegated to the Director General of Military Works in regard to electrical undertakings within a cantonment.', Dept. of Revenue and Agriculture (Civil Works), GOI, June, 1905, Part B, No. 1, NAI.

[20] 'Note by S. Preston', December 19, 1904 (PWD) and 'Note by Sheepshanks', January 5, 1905 (Legislative) in 'Question whether the powers of a Local Government under the Electricity Act, 1903, can be delegated to the Director General of Military Works in regard to electrical undertakings within a cantonment.', Dept. of Revenue and Agriculture (Civil Works), GOI, June, 1905, Part B, No. 1, NAI.

[21] 'Note by H.W. Duperier, Director General, Military Works', March 13, 1905, in 'Question whether the powers of a Local Government under the Electricity Act, 1903, can be delegated to the Director General of Military Works in regard to electrical undertakings within a cantonment.', Dept. of Revenue and Agriculture (Civil Works), GOI, June, 1905, Part B, No. 1, NAI.

[22] 'Note by H.E. Richards', January 10, 1905 in 'Question whether the powers of a Local Government under the Electricity Act, 1903, can be delegated to the Director General of Military Works in regard to electrical undertakings within a cantonment.', Dept. of Revenue and Agriculture (Civil Works), GOI, June, 1905, Part B, No. 1, NAI.

a Military Department official to function as an Electrical Inspector (EI) and decide upon "a dispute between his own departmental chief and a licensee."[23] While he acknowledged the Military Department's discomfort with "a Civilian interfering", he sought to assure that duties of an EI were only to "safeguard the interests of supplier and supplied, besides looking after the safety of the public and the telegraphs."[24] A little later it was proposed by the imperial PWD that in case of Calcutta, the EI for Government of Bengal could be also appointed as "Inspector for the Governor-General under section 40 of the Act."[25] But the Military Department protested and repeated its earlier suggestion that military officers would suffice for the inspection of electrical installations by both the military as well as private companies within cantonments and other army establishments.[26] The Legislative Department again found this illegal. Instead, it suggested that under section 33(2)(i) of the Act the Governor-General could appoint his own Inspector for cantonments.[27] This consideration was postponed in view of the possible amendment of the 1903 Act that was already being discussed. Meanwhile it was decided that the Local Government's EI could only inspect works of a licensee or a private owner in cantonment areas and he otherwise had no authority over "self-contained Military Works installations" and "distribution systems where the power is supplied by a licensee but the distribution system is maintained by the Military Works Services."[28]

This bifurcation of jurisdiction was not enough. Soon the Director General, Military Works refused to extend any "right of entry" whatsoever to the EI of the Local

---

[23] "Note by R.J. Browne", March 1, 1907, in PWD (Civil Works Electricity), GOI, April, 1907, Part A, Nos. 1-4, NAI.
[24] *ibid*.
[25] 'Note by R.F.G. Bond', June 25, 1906, in 'Appointment of Mr. R.J. Browne as Electrical Inspector, Bengal and Mr. A.K. Taylor in executive charge of the newly created Electrical Division, Bengal. Powers and functions of Electrical Inspector, Bengal.' PWD (Establishments), GOI, October, 1907, Part A, Nos. 28-43, NAI.
[26] *ibid.*
[27] 'Note by H.P. Tollinton', July 10, 1908, in 'Appointment of Mr. R.J. Browne as Electrical Inspector, Bengal and Mr. A.K. Taylor in executive charge of the newly created Electrical Division, Bengal. Powers and functions of Electrical Inspector, Bengal.' PWD (Establishments), GOI, October, 1907, Part A, Nos. 28-43, NAI.
[28] 'Note by J.W. Meares', July 21, 1908, in 'Appointment of Mr. R.J. Browne as Electrical Inspector, Bengal and Mr. A.K. Taylor in executive charge of the newly created Electrical Division, Bengal. Powers and functions of Electrical Inspector, Bengal.' PWD (Establishments), GOI, October, 1907, Part A, Nos. 28-43, NAI.

Government.[29] He also objected to bringing military electrical installations in line with the set of rules issued under the Act as it would be "needlessly irksome" and "unnecessarily costly."[30] Amongst these rules were the provisions to use a certain thickness of wiring and porcelain or earthenware tubing for service lines entering military buildings.[31] In reply Meares, who was back at his job by the time of this debacle, conceded that "a code of rules applicable to all conceivable circumstances is impossible of attainment and a certain amount of latitude is always necessary in the practical interpretation of rules."[32] But other PWD officials like Secretary L.M. Jacobs did not desire to yield immediately to the military's exertions. He thus steadfastly defended the EI's right of entry to adjudicate disputes between consumer and licensee while also defending the said rules that he asserted "should apply equally to all."[33] Once again however, action on these points was deferred till the amendment of the Act, thus extending an unsaid leeway to the military authorities.

A distinctive realm of flexibility of electrical rules was thus created within cantonments where the writ of the Local Government's Electrical Inspector was explicitly refused in favour of particular exemptions claimed by military authorities and perhaps in possible detriment to the interests of private licensees or applicants for licenses. This relative autonomy claimed by the military within the scope of 'dual' administration created by Section 40 of the 1903 Act also had other implications for the operations of private enterprise.

---

[29] 'Note by F.G. Bond', October 6, 1908, in 'Proposed issue of orders directing the observance in the case of all Government electrical installations of certain precautions enjoined by the rules under section 33 of the Indian Electricity Act, 1903, which are necessary for the protection of the public and of telegraph lines.', PWD (Electricity), GOI, April, 1909, Part B, No. 5, NAI.

[30] *ibid.*

[31] *ibid.*

[32] 'Note by J.W. Meares', February 23, 1909, in 'Proposed issue of orders directing the observance in the case of all Government electrical installations of certain precautions enjoined by the rules under section 33 of the Indian Electricity Act, 1903, which are necessary for the protection of the public and of telegraph lines.', PWD (Electricity), GOI, April, 1909, Part B, No. 5, NAI.

[33] 'Note by L.M. Jacobs', March 13, 1909, in 'Proposed issue of orders directing the observance in the case of all Government electrical installations of certain precautions enjoined by the rules under section 33 of the Indian Electricity Act, 1903, which are necessary for the protection of the public and of telegraph lines.', PWD (Electricity), GOI, April, 1909, Part B, No. 5, NAI.

In Cawnpore for instance, the licensee's application for supply to the Harness and Saddle Factory was refused by the Military Department for "strategical" reasons.[34] When the licensee protested this decision pointing out that this would be "at variance with the declared policy of the Government" and would also "prejudice the success of their experiment, which is being closely watched by capitalists at home", the GOI requested the military to reconsider, though without much success. The involvement of the military in electrical matters also came to be conducted through making cantonment committees party to the decision to award licenses. In Barrackpore and Cawnpore, the respective local cantonment committees made their own demands concerning modalities of inspection, fixing maximum prices and even the mode of wiring that had to be undertaken within their premises.[35] Additionally, in including military organizations in the list of active stakeholders to be consulted and persuaded, the time period of awarding an electrical license in cantonments stretched considerably, as often complained by license aspirants. Colonial lawmakers recognized that while in Great Britain the applicant was usually "the company intending to own the undertaking; in India the company will not be floated until the license has been granted." [36] Yet the gap between the longer temporality of licensing and the shorter time spans of interest sustained in the London money market continued to widen. And eventually, this prevented the capitalization of quite a few of the cantonment schemes. As the licensee for the Lucknow scheme complained:

> When the original application was made and approved…,the financial conditions in England were such that the necessary Capital were readily available, but

[34] 'Summary by B. Robertson', February 27, 1907, in 'Question of the employment of private agency for the supply of electric power to the Government Harness Factory at Cawnpore. Representation of Messrs. Kilburn, Brown & Co. for a modification of the decision of the GOI that on stratgeical grounds it was not considered advisable to employ private agency for the purpose', Commerce and Industry (Electricity), GOI, February, 1907, Part A, Nos. 1-3, NAI.

[35] For Barrackpore see, 'Note by S. Grant", June 16, 1905, in 'Grant to Messrs. Kilburn & Co. of a license to supply electrical energy in the Barrackpore Cantonment', PWD (CWE), GOI, February, 1906, Part A, Nos. 1-21, NAI. For Cawnpore see, 'Note by E.G. Stanley', June 15, 1906, in 'Cawnpore Cantonment Electric License. Modification of clause 7(e)', PWD (CWE), GOI, September, 1907, Part A, Nos. 1-5, NAI.

[36] 'Note by J.W. Meares', March 10, 1909, in 'Note by J.W. Meares Electrical Advisor to the GOI on certain rules regarding licenses viz. nos. 3 to 11 of the Rules under the Indian Electricity Act, 1903', PWD(Electricity), GOI, April, 1909, Part B. No 4, NAI.

> unfortunately the delays by the Government of India, in granting the final concession for the Cantonment section (an integral part of the proposed undertaking) were such that when the final license and order were granted in August 1907 the conditions of the money market were so changed that it has been found quite impossible up to the present to arrange to finance the undertaking.[37]

Needless to say the Lucknow license failed to mature into actual operations, just as the Jubbulpore, Pune or Secunderabad licenses also did not. Along with schemes of 'bulk' supply, the 1903 Act was then also burdened with this failure of a host of schemes for electricity supply in cantonments. The capital market in London definitely remained shy of the uncertainty of prospects beyond metropolitan centres in the colony. But certain modalities of administering colonial law - as it came to be encountered as a somewhat obstructive medium by private enterprise - also need emphasis here.

In lieu of extensive urban or industrial demand for power in the colony, military establishments were sought out by private enterprise as nodes of concentrated demand for electricity. But the military also remained characteristically obstinate in its claim to a relatively autonomous mode of functioning within the colonial order of governing electricity supply. This obstinacy was in turn enabled by the apparent 'dual control' that section 40 brought into play by re-designating the cantonment as a space whose administration exceeded the mandate of the provincial governments. The price paid for this exceptional spatial designation was in the currency of the time that elapsed between applications for electrical licenses and their eventual approval. The capital market very often proved too impatient to maintain its interest throughout this temporal lapse, even as the imperial bureaucracy hoped to hurry things with all possible sincerity. Since this negotiation did not attain a requisite measure of success, the law had to again take its share of the blame. Again then its amendment seemed absolutely imperative to the concerned bureaucrats.

[37] 'From C.H. Cordeaux to The Chairman, Municipal Board, Lucknow', October 17, 1908, in GOI, PWD(Eelectricity), for August, 1909, Pro. Nos. 1-7, IOR/P/8186.

3. The coming of the new 1910 Electricity Act and the fraught status of the provincial Electric Inspector

In 1908 a Committee was convened to look into the amendment of the 1903 Electricity Act that eventually drafted a detailed Bill to replace the Act and introduce new conditions for governing electricity supply in colonial India. It consisted of representatives of the imperial departments of Public Works and Telegraph, R. J. Browne (electrical official of the Government of Bengal substituting as the Acting Electrical Advisor, GOI), a representative of private enterprise and two legal officials. The Committee set about correcting some problems of the 1903 Act. It thus sought out an appropriate solution to the question of licensing 'bulk' supply for sale to existing distributors by including such distributors within the designated buyers of electricity as recognised by the Act.[38] It also made provision for "annulling the purchase clauses" for "undertakings covering large areas."[39] But with respect to a whole set of other issues, the Committee's major propositions veered in a more complicated direction that attracted definite opposition from certain provincial quarters as well as from higher authorities in London.

The case of cantonments as already indicated, was posed as a problem of 'dual control' that caused significant delays in the matter of licensing and led to 'absurd' situations like when a separate license had to be sought from the Governor General for even "the small supply" required by the Body Guard Lines in Ballygunge in Calcutta.[40] However the Committee considered cantonments as a particular case of the more general occurrence of delay that pervaded matters of electrical licensing since the 1903 Act. This delay, it was argued, was exemplified by how "it has hitherto been virtually impossible for a company to obtain a license under two or three years." This was "most detrimental to the attraction of capital…as the financial position may, and in fact frequently does, change completely between the date of application and the granting of the licensee."[41] The Committee

[38] 'Note by R.J. Browne', February 13, 1907, Enclosure No. 1 to Resolution No. 532 Elec., dated 22nd April, 1907, in GOI, PWD (Electricity), Pro. No. 36, for September, 1908, IOR/P/7907.
[39] 'Notes on Clauses, Clause 10', Enclosure No. 5 to Despatch No. 25 P.W. of 1908, in GOI, PWD (Electricity), Pro. No. 36, for September, 1908, IOR/P/7907.
[40] 'No. 6, Explanatory note regarding amendments proposed in the Indian Electricity Act, 1903', August 24, 1907, in GOI, PWD (Electricity), for September, 1908, Pro. No. 36, IOR/P/7907.
[41] 'Statement of Objects and Reasons", Enclosure No. 5 to Despatch No. 25 P.W. of 1908, in GOI, PWD (Electricity), Pro. No. 36, for September, 1908, IOR/P/7907.

strongly asserted that this general state of delay was the direct result of the 1903 Act's designation of licensing responsibilities to the Local (provincial) Governments. The very fundamental corrective that was then necessary in its view was a complete *centralization* of all of the governance of electricity supply in colonial India by means of the new Act - this would designate not only rule-making but also all execution of licensing procedures to the Government of India.[42] The Committee also argued that in not making such a centralized functioning the first principle, a "grave mistake" was made – that of deviating from ""the natural course of events – that is to say, centralization gradually broadening down from precedent to precedent into decentralization."[43]

The Committee claimed that the recurrence of delay was related to another basic shortcoming that most of the fourteen Local Governments in India did not have adequately knowledgeable technical personnel under them to deal with the subject of electricity that was "at once highly technical and as yet but little understood."[44] It was argued that this lack could lead to significant extensions of correspondences and references sought from the GOI's officials and its laboratory (in Calcutta) that furthers the delay. And if the provincial governments actually chose to appoint their own expert-officials and start their own laboratories, the expenditure in turn would be "considerable."[45] Further, even if provincial governments procured such expertise in the form of their own Electrical Inspectors, as they had already done in some cases, the Committee claimed that this was leading to rather divergent terms and standards within the administration of electricity. Apparently this was evident in the considerably different designs of licenses being issued across different provinces, some of them running counter to the law.[46] Also, contractors were finding it difficult to tally technical specifications

[42] 'Explanatory note regarding amendments proposed in the Indian Electricity Act, 1903', August 24, 1907, in GOI, PWD (Electricity), for September, 1908, Pro. No. 36, IOR/P/7907.
[43] *ibid.*
[44] 'Explanatory note regarding amendments proposed in the Indian Electricity Act, 1903', August 24, 1907, in GOI, PWD (Electricity), for September, 1908, Pro. No. 36, IOR/P/7907.
[45] *ibid*.
[46] 'Note by L.M. Jacob', September 3, 1907, in 'Draft Bill to amend the Indian Electricity Act (III of 1903', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.

across such varying provincial demands whereby for instance, guarding systems of high tension lines validated in one province were being rejected in another.[47]

Moreover, members of the imperial bureaucracy who endorsed the Committee's views also expressed the apprehension that Inspectors appointed by Local Governments have not in every case possessed "the qualifications we would desire."[48] Meares in fact suggested adding a specific clause to the amended Act that would authorize the Governor General to mark out fixed qualifications suited to future appointments of Electrical Inspectors.[49] He also hoped that while Electrical Inspectors would be available to advise provincial governments, they should eventually be subordinated to the central control of a new position in the imperial bureaucracy, that of the Chief Electrical Inspector, to be held by the Electrical Adviser alongside his other duties.[50]

The Committee's concern with respect to the Electrical Inspectors and the questions of technical expertise requires some contextualization here. In the previous chapter we have dealt with the historical settings of early 'electrification' whereby the question of electrical expertise pertaining to the kind of qualifications and/or practical experience that would constitute the terms of such expertise remained somewhat unsettled both in the metropole and in the colony. Also unlike in the metropole, the status of a colonial professional group like the Institute of Electrical Engineers (IEE) in Calcutta remained weak for a long time and its legitimacy as an authoritative body on techno-scientific matters was often challenged. In 1915 for instance, the engineer H. R. Speyer in course of a heated exchange on the efficacy of English equipment in India baldly rejected the view presented by members of IEE, Calcutta as "misleading."[51] In doing so he reasoned that the IEE in Calcutta "does not number amongst its members many engineers who by practical experience are entitled to express an opinion."[52]

---

[47] *ibid.*
[48] *ibid.*
[49] 'From J.W. Meares, Electrical Advisor, GOI to The Secy to GOI, PWD', December 21, 1907, in 'Draft Bill to amend the Indian Electricity Act (III of 1903', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.
[50] *ibid.*
[51] Speyer & Co., 'Electric Power in India', Calcutta August 18th, 1915, *The Electrical Review*, Vol. 77, No. 1973, September 17,19, pg. 365.
[52] *ibid*.

In lieu of other educational or professional/institutional sources of authorisation, we have seen how the recognition of electrical expertise in India developed a singular kind of authoritative basis that was the colonial state's endorsement (as in terms of Meares' career but also otherwise). This endorsement did not necessarily relate to the 'expert's' capacity to conform to or replicate a pan-imperial or any globally prevalent rule-bound design of electrical practice. The expert's function was rather conceived in intersection with the urge in colonial settings to carve out a distinctive dimension of technical opportunity and permissibility purportedly suited to creating greater scope for electrical enterprise. As we have seen with the case of cantonments and 'bulk' supply schemes, this urge often remained unfulfilled given certain other constraints of the colonial state and its legal setup.

The question of expertise as also previously described, continued to remain complicated as the state-appointed expert did not always attain the status of objective authority in the view of the judiciary and other parties interested in the everyday conduct of consumers' installations across sites of early 'electrification' like in colonial Calcutta. The Committee's views however represented another critical aspect of this complication - as more electricity schemes came up in colonial India away from the imperial centre of Calcutta, the question of electrical 'expertise' also appeared as fairly difficult to settle even *within* the structure and functions of government as inhering in the colonial state. This complicated status of the recognition of electrical expertise even within the structure the colonial state was actually hinted by Meares in his autobiography when he criticized the logic of seniority by which "hopeless incompetents" ascended the ladder of the PWD official hierarchy and at least on one occasion tried to override his decision in an electrical matter.[53] But this complication was more properly manifested in the way the imperial PWD bureaucrats and Meares himself related to provincial officials in charge of other regional schemes of electric supply. The case of Darjeeling was foremost in this regard.

[53] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, Pg. 102. J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, IET Archives.

Ever since the setting up of the Darjeeling supply by Messrs. Kilburn and Co. in 1897, its overhead line construction was doubted as unsafe, first by Major Cardew of the BOT and then again by Telegraph Department officials. Later, R.E.B. Crompton on behalf of Kilburn found the defects in the lines to be "only trifling" and argued that since they had been running for some years, it was obvious that "nothing very serious was amiss."[54] When the Darjeeling Municipality still called upon Kilburn to rectify its construction of the concerned lines, the company challenged this decision and referred it to arbitration in order to claim the charges that the municipality owed them for maintaining the scheme. At the end of the somewhat abstruse arbitration proceedings, the municipality entirely took over the scheme from Kilburn.[55]

It is after this that the Municipal Engineer, Stuart-Menteth, actually reversed his position and began arguing that the overhead lines now to be maintained by the Municipality, required none of the serious and rather expensive changes that Telegraph officials were suggesting.[56] On the other hand, Meares who had originally set up Kilburn's precarious overhead construction, actually returned as the most acute critic of the municipal engineer's reluctance in remedying this construction. Meares argued in a 1902 report for the overhead lines of electric supply in Darjeeling to be constructed by the stricter standards of telegraph authorities (though, as we have seen, these standards did not necessarily apply even to the Calcutta lines at the time).[57]

Meares and Stuart-Menteth's disagreements on techno-scientific points continued in the subsequent years. The latter engineer insisted that since the overhead lines had not collapsed even after the cyclone of September 1899, they did not require reconstruction on the basis of the 'factor of safety' calculated by Meares and other telegraph officials

[54] 'Section I-Historical, Report, dated the 20th November 1902, on the Darjeeling Electric-Light Installation', by W.P. Henderson, J.C. Shields and J.W. Meares, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.
[55] *ibid.*
[56] 'Section II-Current Proceedings, Report, dated the 20th November 1902, on the Darjeeling Electric-Light Installation', by W.P. Henderson, J.C. Shields and J.W. Meares, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives. We have alraeady encountered Stuart-Menteth as an early detractor of the overhead construction in the scheme (in the preceding chapter),
[57] 'Section IV-Conclusions and Recommendations, Report, dated the 20th November 1902, on the Darjeeling Electric-Light Installation', by W.P. Henderson, J.C. Shields and J.W. Meares, in Electrical Notes, Vol. 4, J.W. Meares Papers, Ref: SC MSS 74/1, IET Archives.

against variables like wind pressure, etc.[58] In another 1903 report, Meares accepted that "these things cannot be proved mathematically correct" but claimed that wind pressure calculations relied otherwise on "certain assumptions…acknowledged to be fairly near the mark."[59] To convince Stuart-Menteth he also held a physical demonstration of the pressure at which an "A B pole" would break. Given that the electric pole sustained a pressure of up to 503 lbs., Meares apprehension that it would break at less than 500 lbs. pull exerted at 15 feet from the ground seemed to have not been proved.[60]

After this, Meares gave up trying to convince the Municipal Engineer "with the primitive arrangements available."[61] Instead, with his push the Government of Bengal actually pressed harder on the Darjeeling Municipality to accept the statutory force of the 1903 Act and the rules issued under it.[62] The government also offered the incentive of paying for most of the construction though with the condition that the Municipality start charging higher rates for the power it sold.[63] Meares himself leveled some serious allegations against Stuart-Menteth's capacities, that he was only familiar with house installations and had no "central station experience"; that he thus ran the plant chiefly through an assistant or by *mistris* without personal involvement.[64] Stuart-Menteth, he claimed, also "cared nothing for the rules" thinking that the government could not after all enforce them. Finally Meares also alleged that Stuart-Menteth "for several years had a strong aversion" to him for no obvious reason.[65] The Darjeeling Municipality eventually obeyed the Government of Bengal and accepted its incentive of paying for the

[58] 'Section 3: Report on Estimates A(a) and A(b), Report with reference to Darjeeling Electric Installation, dated 31st August, 1903, called for in GOB letter No. 161.T-MPI, dated 30th May 1903' in GOB, PWD(MPI), for May, 1904, IOR/P/6785.
[59] *ibid.*
[60] *ibid.*
[61] *ibid.*
[62] 'Notes, dated 17th September 1903, by R.G. Kennedy, Chief Engineer of Bengal on Mr. Meares' Estimate and Report', in GOB, PWD(MPI), for May, 1904, IOR/P/6785.
[63] *ibid.*
[64] 'From J.W. Meares, Electrical Engineer to GOB, to Secy to GOB, PWD', September 1, 1903, in GOB, PWD(MPI), for May, 1904, IOR/P/6785.
[65] *ibid.*

corrections.[66] Stuart-Menteth resigned and was replaced by a new municipal engineer recommended by the government.[67]

Stuart-Menteth's career within electrical administration in colonial India did not quite end with this episode. He was eventually appointed as an electrical expert by the Government of Bombay and we will again have occasion to analyse his official role. For now, with some benefit of hindsight gained through discussions in the preceding chapter, we could perhaps very well understand Stuart-Menteth's apparent tendency to operate beyond a rule-bound dimension of electrical practice and more on the basis of personal judgment as analogous to his *bête noire* Meares' original sins of working electrical technology beyond a rule-bound framework as evident in his early involvement with the Darjeeling scheme.[68] In some way Stuart-Menteth's actions also do not seem to run counter to the way in which the administration of the 1903 Act was conceived as flexible adjustment to local and contingent conditions. But outside the proximal settings of the imperial centre of Calcutta, the willful exercise of such flexibility clearly provoked severe anxieties for the colonial bureaucracy about losing control over electrical matters. Yet this anxiety still did not always translate into the fixation of certain parameters to govern the conduct of professional expertise through the GOI's already centralized power of rule-making (within the 1903 Act).

For imperial PWD officials, the case of Burma stood out as another example of mismatch between the intent of law and the conduct of electrical schemes. While discussing the Committee's proposals the example of Rangoon's electrical undertaking taking a while to be licensed was held up again and again as an example of how the Local Government's limited resort to expert advice resulted in grave delay.[69] And even after the appointment of an Electrical Inspector (EI) by the same province, he was described as "unacquainted with the difficulties of the Act."[70] What is worth noting in this context is that when

[66] 'From C.R. Marindin, Commissioner, Rajshahi Division to Secy, GOB, Municipal Dept.', February 25, 1904, in GOB, PWD(MPI), for May, 1904, IOR/P/6785.
[67] *ibid.* The Darjeeling case is of course easily contrasted with the permissiveness concerning electrical technicalities allowed in cantonments under military administration.
[68] Discussed in the first section of the previous chapter.
[69] 'Note by L.M. Jacob', December 24, 1907, in 'Draft Bill to amend the Indian Electricity Act (III of 1903', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.
[70] *ibid.*

Bombay and Burma sought out general rules/qualifications from the imperial government for the appointment of Electrical Inspectors (EIs) earlier in 1906, both provinces were informed by the GOI that general rules were not being contemplated for such appointments.[71] Burma went ahead and appointed its own EI, Mr. B. Raikes and was only the third province in the colony after Bengal and the United Provinces to have done so. By the end of 1907, PWD officials expressed disappointment that "all our Electrical Inspectors have not been altogether a success."[72] Henceforth some requests for appointments of EIs to be made in England specified that the candidate needed to be trained before the age of 25 for not less than 3 years in an electrical or mechanical engineering workshop together with two years' experience working in a recognized firm of electrical contractors (along with the usual theoretical education).[73]

Yet given the possible expenses of sourcing and employing such personnel, it is uncertain how much such steep qualifications were enforced. Bengal had in R.J. Browne and A.K. Taylor, two electrical experts hired possibly from England for work as inspector and as engineer in the electrical laboratory of the government in Calcutta. But the government had also appointed its electrical overseer Mr. Mcintyre directly from the engineering cohort of the Sibpur Engineering College.[74] In 1907 Bengal sought to create an Electrical Executive division to oversee the work of electrifying government buildings previously conducted through the expensive option of private contractors or through the "unsystematic" methods of local "wiremen".[75] Following the creation of this Division more electrical officials were needed and they too were sourced locally. Babu Srish Chandra Basu was one amongst them, a notable native hire by the Division, who it was

[71] For Bombay see 'Enquiry as the framing of general rules on the subject of the appointment of an Inspector under the Indian Electricity Act (III of 1903)', PWD (Civil Works-Electricity), GOI, for May, 1906, Part B, Nos. 2-3, NAI. For Burma see 'Rule authorizing Local Governments to appoint Electric Inspectors for the purpose of the Electricity Act (III of 1903) and the rules made under it', PWD(Civil Works-Electricity), GOI, for September, 1906, Part A, Nos. 11-14, NAI.

[72]'Note by L.M. Jacob', October 9, 1907, in 'Proposed recruitment of an Electrical Engineer in Engalnd for Bombay Presidency', PWD(Establishments), GOI, November, 1907, Part, Nos. 22-23, NAI.

[73]*ibid*.

[74] 'Note by J.W. Meares', June 22, 1909, in 'Revision of Rule 45 of the Rules under the Indian Electricity Act, 1903 (III of 1903) in order to make a provision for the protection of high pressure aerial service lines', PWD (Electricity), Part A, Nos. 8-12, August, 1909, NAI.

[75] 'Note by L.M. Jacob', April 7, 1908, in 'Appointment of R.J. Browne as Electrical Inspector, Bengal and Mr. A.K. Taylor in executive charge of the newly created Electrical Division, Bengal. Powers and functions of the Electrical Inspector, Bengal.', PWD (Establishments), GOI, October, 1908, Part A, Nos. 28-43, NAI.

claimed "shows aptitude" as 'Electrical Supervisor'. In 1908 it was proposed to send Basu to the National Physical Laboratory in England for further training.[76]

Eventually then, the hiring of electrical officials with due qualifications for the proper management of electrical affairs could well have been accomplished even under the 1903 Act with the already-centralized rule-making powers of the imperial government. That this was not the outcome seemed to have less to do with decentralization or the control exercised by the Local Governments and more on account of the often characteristic austerity of the colonial order towards sourcing appropriate technical assistance or otherwise due to the increase in the local supply of men with some degree of electrical training. In this regard then, the Legislative Department's query as to how the problems faced in the course of governing electrical matters would be lessened "by transferring its administration from the Local Governments to the Government of India" seems apt.[77] More such contrarian positions emerged as the amendment Committee's proposals was sent around to officials of the imperial and provincial governments for their responses.

4. Overturning the amendment Committee's proposals

The Solicitor Kesteven who was already part of the amendment Committee stated the obvious in response to the amended bill – the precedent of the Bengal Government's administration of electrical matters that "has frequently been united with" that of the Government of India, has been "more studied and careful than elsewhere."[78] This prior experience he argued could be made applicable to other Local Governments through a centralized administration.[79] The Government of Bombay strongly opposed this line of reasoning emerging from Bengal, imperial officials and the amendment Committee more generally that by default was making a case for centralization as the superimposition of the regulatory lessons gained in Bengal or effectively in Calcutta, onto other provinces.

---

[76] 'Note by J.W. Meares', August 27, 1908, in 'Transfer of the Electrical Laboratory to the charge of the Electrical Inspector, Bengal, and discontinuance of the contribution of Rs. 150 a month from Imperial Revenues, towards Mr. Taylor's Pay', PWD(Establishments), GOI, January, 1909, Part A, Nos. 51-57, NAI.

[77] 'Note by R. Sheepshanks", February 26, 1908, in 'Draft Bill to amend the Indian Electricity Act (III of 1903)', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.

[78] 'From C.H. Kesteven, Solicitor to GOI to Secy, GOB, PWD', September 1, 1909, in PWD (MPI), Govt. of Bengal, for November, 1909, IOR/P/8128.

[79] *ibid.*

Against this it argued that "the conditions vary so much in different parts of India that any attempt to enforce rigid uniformity could only result in delaying and discouraging electrical enterprise."[80] Thus even a uniform license or a singular laboratory for all provinces was not helpful in administering electrical matters in the colony.[81] Referring provincial cases to the central laboratory in Calcutta, it was pointed out, would be inadvisable as the time and money "spent on the railway journey alone will be considerable."[82] Bombay was actually keen on having its own electrical laboratory for purposes of standardizing and correcting instruments like meters in the province.[83] The provincial authorities even proposed appointing their own Electrical Advisor from their existing engineering staff.[84] Finally, Bombay also argued that to tide over the problem of 'dual control' in cantonments, it was ideal that the Local Government was made the concerned authority for licensing also for military establishments within its geographical jurisdiction. The Bombay Chamber of Commerce too took a similar position arguing that the process of electrical licensing eventually "could only be settled by personal interviews" that would be difficult to mediate trough a central authority in Calcutta or Simla.[85] Burma echoed the oppositional stance taken by Bombay authorities, describing the proposed amendment as "retrograde".[86] Burma authorities harbored similar views regarding Local Governments administering electrical matters in cantonments and they also affirmed that "a qualified Electric Inspector" in the province was already meeting its requirement of "expert advice and assistance" rather satisfactorily.[87] Finally, they pointed out that apart from "purely technical matters", the administration of electrical affairs also

[80] 'From W.L. Cameron, Secy to Govt. of Bombay, PWD to Secy, GOI, PWD", in 'Draft Bill to amend the Indian Electricity Act (III of 1903', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.
[81] *ibid.*
[82] *ibid.*
[83] *ibid.*
[84] *ibid.*
[85] 'From A. Thole, Vice Chairman, Karachi Chamber of Commerce to Under Secy, to Government of Bombay, PWD', October 24, 1907, in 'Draft Bill to amend the Indian Electricity Act (III of 1903', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.
[86] 'From H.W.V. Colebrook, Secy to Govt. of Burma, PWD to Secy, GOI, PWD', in 'Draft Bill to amend the Indian Electricity Act (III of 1903', PWD(Electricity), GOI, September, 1908, Part A, Nos. 36-60, NAI.
[87] *ibid.*

"involves administrative questions and consideration of local conditions" that was best dealt with by the Local Government.[88]

In an anti-climax of the long discussions framing the amendment proposals, the move towards centralization was eventually blocked by the Secretary of State in London. His refusal was based upon the inadequacy of the reasoning provided for centralization and possibly due to the decisions taken not too long back towards decentralizing a number of PWD functions under the Royal Commission on Decentralization in India.[89] The Secretary suggested that while he had no objection to the GOI reserving sole powers for making rules under the Act, the Local Government had to be the authority disbursing electrical licenses.[90] Imperial officials obviously were not happy with this and suggested that the Secretary was "sacrificing a good deal of substance to the shadow of decentralization."[91] They continued to reason that since many provincial administrations did not have their own Electrical Inspectors but also possibly did "not wish to appoint Inspectors", the dependency on the GOI's expertise would remain and thus continue to delay electrical licensing.[92] Moreover, the question of licensing schemes across multiple provinces and for cantonments was again claimed to be difficult to resolve under the authority of Local Governments. And even though this could amount to delay, Meares actually suggested that "all draft licenses should be sent up for scrutiny" by the Local Governments to the GOI for some years to come.[93]

Meares' suggestion was however not incorporated in the revised bill sent back to London for approval that replaced some of the GOI's authority in matters of licensing with that of the Local Government. The Secretary of State was however still not satisfied with the degree of power as retained by the GOI in matters of electrical licensing and

---

[88] *ibid.*

[89] 'Telegram from Secy of State, to Viceroy', December 1, 1908, in GOI, PWD (Electricity), Pro. No. 19, February, 1909, IOR/P/8186. See, G. Rainy for the Government of India, Decentralization Committee for the Royal Commission on Decentralization, Note on the Organization of the Public Works Department in India,Simla, 1907.

[90] *ibid.*

[91] 'Note by L.M. Jacob and J.O. Miller', December 22, 1908, in 'Revised draft bill to amend the Indian Electricity Act (III of 1903)', PWD (Electricity), GOI, Part A, for February 1908, Nos. 19-25, NAI.

[92] Note by L.M. Jacob', December 11, 1908, in 'Revised draft bill to amend the Indian Electricity Act (III of 1903)', PWD (Electricity), GOI, Part A, for February 1908, Nos. 19-25, NAI.

[93] 'Note by Electrical Adviser', in 'Revised draft bill to amend the Indian Electricity Act (III of 1903)', PWD (Electricity), GOI, Part A, for February 1908, Nos. 19-25, NAI.

administration in the revised bill.[94] In particular he did not agree to "placing the Provincial Inspector under two masters", the proposed position of the Chief Electrical Inspector and that of the respective Local Government, insisting that the Provincial Inspector be subordinated only to the latter.[95] The Secretary also did not see enough reason to place the licensing of cantonments and schemes spanning more than one province under the GOI as proposed by the revised bill.[96] In response, Meares reasoned that the Decentralization Committee's proposals regarding irrigation officials was not a good analogy for electricity officials as for irrigation "there are invariably local officers of experience in the Provinces", whereas "for electricity there is not more than one Inspector to a province…with little experience."[97] Otherwise, the military kept insisting on its extant jurisdiction in matters of licensing electricity schemes in cantonments. Their view was eventually incorporated by retaining the right of respective cantonment committees to object to electricity licenses within their territories.[98] Yet licensing in general and the inspectorial administration had to be maintained as the exclusive domain of Local Governments in the final version of the electricity bill following the orders from London.

In view of the decisive interventions of the Secretary of State, summing up the discussion around the new Electricity Bill could lead us to certain specific observations regarding the historical trajectory of electrical lawmaking in colonial India and its relationship to electrical 'expertise'. The 1903 Act sought to create a field of administration where the conduct of electrical matters would be largely through permissive parameters of the Local Governments implemented through their Electric Inspectors over and above a strict and uniform rule-bound framework. Amongst other problems, the primary shortcoming in this intended schema was that it did not enforce the employment of inspectorial staff/electrical experts in adequate numbers. While this was a lack felt also in the colonial centre of Calcutta (as discussed in the previous chapter), it appeared as a more obvious

[94] 'From the Secy of State to Viceroy', May 7, 1909, Gen;l. No. 3452 Elec., No. 18 Public Works, in GOI PWD (Electricity), Pro No. 18, August, 1909, IOR/P/8186.
[95] *ibid.*
[96] *ibid.*
[97] 'Note by J.W. Meares', June 7, 1909, in 'Revised draft Bill to amend the Indian Electricity Act III of 1903', PWD (Electricity), GOI, Part A, August, 1908, Nos. 16-21, NAI.
[98] 'Note by J.W. Meares', June 23, 1909, in 'Revised draft Bill to amend the Indian Electricity Act III of 1903', PWD (Electricity), GOI, Part A, August, 1908, Nos. 16-21, NAI.

problem in other parts of India where new emerging electrical schemes awaited the intervention of informed technical and legal mediation for their timely implementation. In wanting to set up a new centralized framework of electrical administration through the fresh bill, it is this problem that the imperial bureaucracy sought to remedy.

However imperial officials' motivations also remained tinted by definite doubts about Electrical Inspectors hired independently by the provinces or other local administrations perhaps due to the more general uncertainty concerning the designation of electrical 'expertise' or due to the anxiety about instituting rule-bound electrical practice in colonial India at the time. The idea then was to establish effective control over electrical practice through a centrally appointed electrical technocracy that would also discipline any kind of personalized human mediation in the making of electrical licenses and technicalities in the provinces. But the way some provincial administrations with existing electricity schemes opposed this idea shows clearly that the alternate conception – that both technical and administrative dimensions of electrical matters could only have localized and even to a degree, personalized resolution in the colony – had also extended considerably, including to the imperial centre in London. Yet it is worth noting that on neither side was there any definite intent shown of enhancing the expert capacity of the colonial state by hiring greater numbers of inspectorial staff for overseeing electrical matters. Also, even as support for their respective EIs was shown by more Local Governments, this did not necessarily translate into an unequivocal affirmation of the personalised administration by the Electrical Inspector. Punjab officials for instance argued that with respect to certain matters like testing meters, the revised bill was creating the "danger of checking electrical enterprise by placing too much power in the hands of low paid technical experts."[99]

The question of even state-appointed electrical 'expertise' thus continued to remain fraught within the various views shaping the eventual 1910 Electricity Act that was henceforth the primary legislation that governed electrical matters in colonial India. In

[99] 'From H.P. Tollington, Offg. Secy to Government, Punjab and its Dependencies to The Secy, GOI, Legislative Dept.', November 10, 1909, No. 642 (Com. & Indy.) in 'Supply to the Legislative Dept of copies of the printed papers containing criticisms by local govts, etc. on the Indian Electricity Bill 1909', PWD (Electricity), GOI, Part B, January, 1910, Nos. 1-5, NAI.

many ways and after much ado the new Act after all preserved the structure of governance followed by its predecessor, the 1903 Act. Provincial governments were put in charge of licensing even as rules were to be pronounced by the GOI. Electrical Inspectors were to be appointed by the Local Governments as per their need and they would not be subordinated to any Chief Inspector at the imperial level, this latter position then only surviving as the dead letter of the law in time to come.[100] Electrical rules issued under the Act required such Inspectors to have about ten years' experience in various industrial and commercial activities associated with electrical engineering, but also stipulated that the Governor General or the Local Government may waive this requirement entirely.[101] During the passing of the bill in the imperial Legislative Assembly, the member Mr. Rawson could "only hope that…only competent men with practical experience and knowledge are appointed" as Electrical Inspectors.[102] He also wished that in their interpretation of rules, the Inspectors "rather seek to benefit the Companies and the public than be governed by the hard and fast letter of the rules."[103]

But it is worth repeating that this expectation of flexibility was not accompanied with any absolute faith that the colonial order had in its electrical 'experts'. Thus a new clause 36(3) was added to the 1910 Act that allowed a right of appeal against the Inspector's decisions to the Local Government.[104] The 1910 Act then opened up more avenues for the complication of expertise-oriented governance of electricity within the domain of the Local Governments. And as might be interpreted from the stark opposition to all centralization proposals, neither was the domain of rule-making under the imperial government, any more free of complications. Through the deliberations about the 1910 Act electrical rules were sustained as a proposed modality of central control and auguring uniformity in the governance of electricity in the colony. But challenges to the specific

[100]'Sec. 36, Appointment of Electric Inspectors, Act No. IX of 1910, The Indian Electricity Act, 1910', A Collection of the Acts of the Indian Legislature and of The Governor General for the year 1922, Calcutta, 1923, pg. 41.
[101] 'Chapter II, Qualifications of Electric Inspectors, Rule 3(a) and 3(b), Rules', PWD notification of December 23, 1910, in GOI, PWD (C.W.-ELEC.), Pro. No. -18, for January, 1911, IOR/P/8732.
[102] 'Mr. Rawson', March 18, 1910, Discussion on Indian Electricity Bill, Abstract of the Proceedings of the Council of the Governor General of India, Laws and Regulations. Vol. XLVIII, April 1909-March 1910, pg. 487.
[103]*ibid*.
[104] 'Note by J.W. Meares', January 14, 1910, in 'Criticisms of the revised draft Bill to amend the Indian Electricity Act III of 1903', PWD (Electricity), GOI, Part B, April, 1910, No. 1, NAI.

kind of uniformity proposed continued to be mounted by Local Governments both before and after the enactment of the 1910 legislation.

5. The technical inexperience of intermediaries and Bombay's advocacy of BOT rules

The Government of Bombay was not only a stiff critic of the centralization propositions contained in the early drafts of the 1910 Electricity Act. Its provincial officials had also in various ways described certain problems that they faced with the existing body of electrical rules designed by the imperial bureaucracy. This criticism was not necessarily aimed at developing a separate body of rules for Bombay. Rather Bombay repeatedly asserted for a different kind of pan-imperial uniformity to be introduced in terms of the governance of electricity in India by replacing the rules under the 1903 Act and then the 1910 Act with the Board of Trade (BOT) rules for electrical systems and other regulations existing in England at the time. In the course of making this claim, provincial authorities from Bombay also articulated a specific aspect of the problem of electrical learning in colonial India, not only on count of the doubt over available electrical 'expertise', but also in terms of the inexperience of the intermediaries who handled electrical equipment in both industrial as well as other kinds of setups. This section and the following one will explore this connection established in the critical views of Bombay officials between the nature of electrical learning and experience in India with the question of the rule-bound governance of electrical affairs.

Bombay's intervention in the matter of electrical rules gathered weight from around 1908 when the Bombay city licensee, the Bombay Electric Supply and Tramways Company (BEST), decided to introduce 400 volts Alternating Current (AC) on "a two-phase and three-phase system and owing to the particular conditions prevailing in Bombay requiring such supply in certain cases to be delivered by aerial lines."[105] While Calcutta had a multi-phase system of DC distribution (that entailed running different voltages on different wires in order to save copper volume), the CESC had still not embarked on AC

[105] From W.L. Cameron, Secy to the Govt. of Bombay to Secy, GOI, PWD', February 27, 1908, No. C.W. - 613 of 1908, in 'Draft Rules proposed by the Government of Bombay in connection with the supply of electrical energy', PWD (Civil Works-Electricity), GOI, Part A, May, 1908, Nos. 1-2, NAI.

supply by then. The Government of Bombay proposed certain new rules to the GOI for governing the AC distribution system of BEST, suggesting that the existing rules for higher voltage installations and for aerial lines issued under the 1903 Act were insufficient for this system.[106] In his reply Meares pointed out that Bombay officials had misunderstood part of rule 14 that actually allowed higher voltage installations as long as a difference of 250 volts or less was maintained between contiguous phases inside a consumer's premises.[107] Regarding aerial lines, he opined that Bombay's suggested new rules requiring all aerial lines to be fitted with a safety device to render them harmless when they break as well as to make a disconnection from the Company's mains again in the event of breakage, would both serve the same function.[108] Rather than endorse both strictures, Meares found the idea of fixing safety devices to be "sound in itself" but wanted this requirement "limited to aerial lines within Municipal limits,...and to high pressure lines."[109]

Bombay officials might not have been entirely convinced by Meares' more limited proposal or in general by the nature of electrical rules in India. Aerial lines ruled through myriad levels and dimensions of permissive functioning since the 1903 Act (as seen in the last chapter) again became the topic of contention. In 1909 when the GOI notified an amendment to rule 45 that if high-pressure aerial lines were taken into consumer's premises they had to be protected throughout by a safety device for rendering them harmless in case of breakage, the province wrote back to the GOI that instead of such piecemeal changes, "Board of Trade rules relating to High Tension Aerial lines should be made applicable in India."[110] In reply Meares again disagreed and asserted that apparently the Electrical Adviser to the BOT, Mr. Trotter had himself advised him "to

[106] *ibid.*
[107] 'Note by J.W. Meares', March 20, 1986, in 'Draft Rules proposed by the Government of Bombay in connection with the supply of electrical energy', PWD (Civil Works-Electricity), GOI, Part A, May, 1908, Nos. 1-2, NAI.
[108] *ibid.*
[109] *ibid.*
[110] 'From W.L. Cameron, Secy to Govt. of Bombay, PWD to Secy, GOI, PWD', June 29, 1909, No. C.W. 1609 M, No. 9, in 'Revision of Rule 45 of the Rules under the Indian Electricity Act, 1903 (III of 1903), in order to make a provision for the protection of high pressure aerial service lines', PWD (Electricity), GOI, August, 1909, Part A, Nos. 8-12, NAI.

have *as little as possible to do*" with the BOT rules.[111] Other than aerial lines, earlier that year the PWD of the Government of Bombay had raised a slightly different kind of issue, that of the inspection of lifts.

The Bombay Municipality's Executive Engineer raised the concern that while lifts in London and elsewhere were "inspected by arrangement with the manufacturers or under an insurance policy", such options were not available in the city.[112] The other alternative was to depend on the "voluntary system of inspection" by lift attendants; yet in case of India these attendants were claimed to be drawn from "an ignorant class".[113] Kept in charge of such a class of attendants, the safety gear of the lifts could very likely be "clogged with oil or set with rust and be inoperative when an accident occurs." In articulating this apprehension he argued that the government should arrange for "a specialist" for the inspection of the lifts every 6 months. When the matter reached the PWD of the GOI, the argument for inspecting lifts was summarily dismissed with the comment that "no provision for the inspection of particular classes of machinery will be made in the Indian Electricity Act" other than making rules to protect from the possibility of electrocution.

Following the enactment of the 1910 Electricity Act, the GOI invited comments on newly drafted rules to be issued under the legislation. The rules were devised by a Technical Committee once again composed mostly of officials and individuals drawn from the Calcutta context including representatives from the Calcutta Municipal Corporation, the Calcutta Port Trust, representatives of private firms like Kilburn and Co. and Octavius Steel and Co. and the Electrical Inspector of Bengal, Browne.[114] In responding to the proposed rules, Bombay's objections and concerns were collated into a full blown appeal to adopt the regulations of the BOT and other English stipulations for governing

[111] 'Note by J.W. Meares', July 8, 1909, in 'Revision of Rule 45 of the Rules under the Indian Electricity Act, 1903 (III of 1903), in order to make a provision for the protection of high pressure aerial service lines', PWD (Electricity), GOI, August, 1909, Part A, Nos. 8-12, NAI (emphasis in original).
[112] 'From J. Hall, Executive Engineer, Bombay Municipality to The Municipal Commissioner', September 19, 1908, No. G.-8066, in GOI, PWD (Elec.), Pro. No. 1, for March, 1909, IOR/P/8186.
[113] *ibid*.
[114] 'From R.J. Browne, Secy to the Technical Advising Committee appointed to frame Rules inder the Indian Electricity Act to Secy to the GOI, PWD', February 28, 1910, in 'Draft Rules under the Indian Electricity Act (IX of 1910)', PWD (Electricity), GOI, Part A, August, 1910, Nos. 7-11, NAI.

electrical matters *in their entirety* for colonial India.[115] It was argued that since the BOT rules were framed after "a public enquiry" with views taken of "representatives of Electrical and other institutions" amongst other commercial and official bodies, they had the advantage of being informed by the opinions of witnesses "who have established a world wide reputation as experts in electrical matters."[116] It was also claimed that "nothing of the kind is possible in India" as "the number of persons in India capable of giving an opinion on electrical matters is limited."[117]

Bombay's appeals were of course again denied by imperial officials. Meares doubted if "a single Electrical Engineer or Inspector elsewhere would agree that the Board of Trade rules should be adopted *en bloc*" since British undertakings were "saddled with far too many rules."[118] Moreover he claimed to have heard complaints by "Bombay firms and companies" about the province's "harsh and rigid insistence on the letter of the law."[119] The Indian Electricity Rules under the 1910 Act were eventually adopted in 1911 after some more consultation with provinces and other authorities.

Not unlike the Act itself, in certain key matters the spirit of the rules to be issued under the 1910 legislation resembled very much the spirit of the rules under the 1903 Act. The main analogy would be that of rules issued for aerial lines and service lines entering consumers' premises. An entirely different section under the name 'Relaxation of Rules' was introduced in the newly issued rules under the 1910 Act in order to effect certain exemptions from two of these rules in particular by the agency of the Electric Inspector of the Local Government if he saw fit.[120] The first of these was rule no. 38 that required all portions of a service line in the consumer's premises within a reachable height to be continuously insulated to protect against moisture and any exposed metal part of it to be

---

[115] 'From W.L. Cameron, Secy to the Govt. of Bombay, PWD to Secy, GOI, PWD', November 19, 1910, No. C.W.-2439, in GOI, PWD (C.W.-Elec.), Pro. No. 16, for January, 1911, IOR/P/8732.
[116] *ibid.*
[117] *ibid.*
[118] 'Note by J.W. Meares', November 29, 1910, in 'Declaration of the enforcement, with effect from the 1st January, 1911, of the Indian Electricity Act, IX of 1910; and publication of the rules made under the Act.', PWD (Civil Works-Electricity), GOI, Part A, January, 1911, Nos. 1-19, NAI.
[119] *ibid.*
[120] 'Relaxation of Rules, Rule 103, Rules', PWD notification of December 23, 1910, in GOI, PWD (C.W.-ELEC.), Pro. No. 18, for January, 1911, IOR/P/8732.

earthed to protect the user from electrocution by touch.[121] The second was rule no. 61 that required all aerial lines to be at a height of at least 20 feet from the ground outside and 15 feet from the ground inside consumers' premises.[122] If exemptions from these were not enough, the new section of relaxation actually allowed for general exemption from any and every rule for protection, etc. (rules 35-100) in case the Local Government so decided, with due permission sought from the Governor General.[123] With these powers of relaxation, the Rules under the 1910 Act then seemed to be again setting up rather open-ended terms and conditions for the administration of electrical matters in the colony, with a significant degree of power invested in personalized decision-making at the local, provincial level and through the Electrical Inspector.

In comparison to this, Bombay's insistence on the *en bloc* adoption of BOT rules is usefully analysed alongside its criticism of centralization proposals in the 1910 Act (as discussed in the previous section). Bombay's criticism of centralized administration of electricity could be read to be claiming that local conditions required uniquely localized electrical resolutions by locally situated technicians. On the other hand, in light of the advocacy of the pan-Indian adoption of BOT rules by provincial authorities it can possibly be seen that the critique of centralization put forward otherwise by the same authorities need not have been founded on any presupposition of the fundamental irreducibility of locality as a driving condition in the techno-scientific and legal governance of electricity supply. Rather as adduced by their later reasoning towards introducing BOT rules, the critique of centralized governance was perhaps more likely based upon a more general uncertainty regarding the character of expertise harbored within the colonial bureaucracy when it came to electrical matters. Unlike the GOI, for Bombay officials this uncertainty extended even to the core technical officials through whom the imperial government was mediating all matters electrical.

Bombay's apprehension could be otherwise explained by the very different character (with respect to Calcutta for instance) of electrical schemes introduced in the province whether the three-phase AC supply of BEST or the high-tension, long-distance and 'bulk'

[121] 'Precautions to be adopted by licensee, Rule 38, Rules', *ibid.*
[122] 'Aerial Lines, Rule 61, Rules', *ibid.*
[123] 'Relaxation of Rules, Rule 102, Rules' *ibid.*

AC supply of Tatas for industrial use that was already in preparation. With the lack of precedent for such schemes in the colony, Bombay's claims towards introducing BOT rules can then in turn be deciphered as the investment of greater trust in the abstract dimension of a body of rules that already mediated the administration of similar schemes in the context of England instead of depending upon the learning and 'expertise' of colonial officials who did not necessarily work within similar administrative and technical scope in pronouncing their dictums. This did not disregard the need for localized/personalized intervention by provincial Electrical Inspectors but rather sought control over such intervention through metropolitan BOT rules instead of the centralized colonial technocracy.

However as Bombay's questions regarding lift inspection and lift attendants evince, there was an even more critical connection being made by provincial officials, between the general state of electrical or mechanical learning and (in)experience of (relatively) lay intermediaries and how electrical rules in the colony had to specifically measure up to this state of things. As another instance of this we can take the series of communication between Bombay and GOI starting in 1911 with the province endorsing and forwarding a letter from the firm Crompton and Co. containing queries regarding rules 49(a) and 50 under the 1910 Electricity Act. The firm was interested in determining what would be acceptable to the Electrical Engineer and the Electrical Inspector in Bombay since there had been "regrettable friction" in the way Inspectors disagreed with contractors' interpretation of the letter of electrical rules.[124]

In forwarding the letter, Bombay PWD officials rendered their own criticisms of the concerned rules, again arguing for substitution by BOT directives. Rule 49(a) of the Indian Electricity Rules required that for medium and high pressure supply all live parts of the concerned apparatus should be given protective covering unless accessible by "an authorised person". Against this rule it was argued that a corresponding BOT rule stipulating that "all switches and cut-outs shall be so enclosed and protected that there shall be no danger of any shock being obtained in the ordinary handling thereof" actually

[124] 'From Messrs. Crompton & Co., Ltd., Bombay to The Electrical Engineer, Govt. of Bombay', January 16, 1911, in GOI, PWD (C.W.-Elec.), Pro. No.1, for September, 1911, IOR/P/8732.

made for safer electrical practice.[125] Such precautions followed in England were considered "doubly necessary in India where it may be difficult to make the mechanics working the switches realize that an apparently innocent conductor may be highly dangerous and where…there is nothing corresponding with the Employer's Liability Act and the Workmen's Compensation Act."[126] Similarly it was claimed that rule 50 governing multi-phase systems within consumers' premises too might lead to unprotected access to dangerous electrical apparatus for "authorised persons" who could be both "the occupier of the premises and his servants", either group "being ignorant of the danger they run" and thus requiring additional protection.[127] Based on these criticisms Bombay again argued for the extensive adoption of BOT rules and other electrical regulations as issued in England.[128]

In response to these criticisms, the Officiating Electrical Adviser Browne stated that Bombay misconceived the purport of the Indian Electricity Rules 1911 – none of these rules were meant to "instruct untrained persons."[129] Browne claimed that the Indian rules were backed by a stronger drive towards implementation as under them "supply shall not be commenced or continued" till certain provisions were complied with, whereas for BOT rules the consumer had to merely provide an undertaking to comply with required conditions.[130] He further argued that,

> ..the Indian Rule provides positively for the safety of the unauthorised person and to a certain extent leaves the authorised person to look after himself; while the Board of Trade Regulation merely forbids unauthorised persons to touch

[125] 'From W.L. Cameron, Secy, Govt. of Bombay, PWD to Secy GOI, PWD', April 8, 1911, No. C.W.-792, in GOI, PWD (C.W.-Elec.), Pro. No.1, for September, 1911, IOR/P/8732.
[126] *ibid.*
[127] *ibid.*
[128] *ibid.*
[129] 'Note by R.J. Browne', May 15, 1911, in 'Criticisms of certain rules under the Indian Electricity Act, IX of 1910, by Messrs. Crompton and Company, of Bombay, and the Government of Bombay, and the views of the Government of India thereon', PWD (Civil Works-Electricity), GOI, September, 1911, Part A, Nos. 1-2, NAI (emphasis in original).
[130] *ibid.*

> motors and apparatus and provides only indifferently, for the safety of authorised persons.[131]

Browne's logic was not necessarily very obvious to all imperial officials. PWD Secretary W.B. Gordon found it "hardly fair".[132] He wondered how under the Indian Rules, "authorised persons" had to "look after themselves less, or not more than they have to do under the Board of Trade regulations" as implied by Browne.[133] Under Secretary Willmott too failed to see "how the Indian rules protect" "authorised persons".[134] He also found the definition of such persons via rule 2(b) to "be defective, as it contains no provision regarding the competency of the authorised person" while admitting that there could be "practical difficulties" in specifying such competencies in India.[135]

Browne tried to assuage this growing doubt by claiming that it could be expected that the employer of an 'authorised person' "in charge of valuable plant" would ensure the latter's competency in his own interest.[136] And in low pressure domestic supplies with a 250 volts limit, the danger from shock would apparently not be so great as to require specialized 'authorised persons' to handle the relevant apparatus.[137] Eventually in GOI's reply to Bombay it was reasoned that BOT rules would not suffice by themselves and they would have to be made "suitable to Indian conditions," and it was still too early to reconsider the question of electrical rules.[138] It was however admitted that some Indian

---

[131] *ibid.*

[132] 'Note by W.B. Gordon', June 10, 1911, in 'Criticisms of certain rules under the Indian Electricity Act, IX of 1910, by Messrs. Crompton and Company, of Bombay, and the Government of Bombay, and the views of the Government of India thereon', PWD (Civil Works-Electricity), GOI, September, 1911, Part A, Nos. 1-2, NAI.

[133] 'Note by W.B. Gordon', June 12, 1911, in 'Criticisms of certain rules under the Indian Electricity Act, IX of 1910, by Messrs. Crompton and Company, of Bombay, and the Government of Bombay, and the views of the Government of India thereon', PWD (Civil Works-Electricity), GOI, September, 1911, Part A, Nos. 1-2, NAI.

[134] 'Note by H.M. Willmott', July 15, 1911, in 'Criticisms of certain rules under the Indian Electricity Act, IX of 1910, by Messrs. Crompton and Company, of Bombay, and the Government of Bombay, and the views of the Government of India thereon', PWD (Civil Works-Electricity), GOI, September, 1911, Part A, Nos. 1-2, NAI.

[135] *ibid.*

[136] 'Note by R.J. Browne', July 28, 1911, in 'Criticisms of certain rules under the Indian Electricity Act, IX of 1910, by Messrs. Crompton and Company, of Bombay, and the Government of Bombay, and the views of the Government of India thereon', PWD (Civil Works-Electricity), GOI, September, 1911, Part A, Nos. 1-2, NAI.

[137] *ibid.*

[138] 'From W.B. Gordon, Secy, GOI, PWD to Secy, Govt. of Bombay, PWD, in GOI, PWD (C.W.-Elec.), Pro. No.2, for September, 1911, IOR/P/8732.

Rules like those relating to 'authorised persons' in the context of high or medium voltage do not "compare favourably" with analogous English regulations. This mainly had to do with specifying the competencies of the 'authorised person', but GOI found itself unable to immediately explore the question of "the grant of corresponding certificates" to such persons "to suit varying conditions."[139] Thus Bombay was instructed to persist with the existing Indian Electricity Rules.

In 1914 Bombay yet again broached the topic of introducing BOT rules and other English regulations with the GOI. This time provincial authorities represented their concerns regarding four specific matters, some directly related to the industrial use of electric power. The first of these was relative to Rule 49(b) and (d) that allowed contractors to place the switch of a medium or high pressure motor at a considerable distance from it and even in a different room, leaving the motor attendant with no immediate control over it (in case of a probable emergency).[140] The BOT rule is this case insisted that the switch be placed close enough to be easily handled by the person in charge of the motor. On a second count, Rule 49 impressed upon the supplier to ensure that certain technical provisions are met by the licensee both prior to the supply and even after the supply has commenced. The Bombay licensee BEST urged that as per BOT rules, the post-supply observation of technical requirements had to be the liability of the consumer and not the supplier.[141] Thirdly, Bombay officials continued to protest that fact that unlike BOT parameters, the Indian Electricity Rules afforded no adequate protection to technical handlers – 'authorised persons' – in terms of encasing, etc. of the electrical equipment they would deal with. They continued to be apprehensive that such persons in India remained at danger since they "are frequently found to possess no technical knowledge at all of the apparatus" – a lift attendant for instance, while having only the bare information about how to start or stop a lift, would also face the danger of handling 'live' conductors

[139] *ibid.*
[140] 'From W.V. Scudamore, Joint Secy, Govt. of Bombay to Secy, GOI, PWD', March 17, 1914, No. C.W.-3134 OF 1914, in 'Suggestion of the Government of Bombay that the rules under the Indian Electricity Act of 1910 be superseded in favour of a set of rules adhering closely to the Board of Trade and Home Office Regulations, negatived. Decision to modify the wording of rule 49(d)', PWD (Civil Works-Electricity), GOI, September, 1914, Part A, Nos. 1-4, NAI.
[141] *ibid.*

connected to his lift gear which are left entirely unprotected by the rules of the Act.[142] Extending this point further, Bombay made a fourth complaint that existing Indian Electricity Rules had another "principal defect" - that they did not provide protection to factory employees that was becoming imperative with the supply of high-tension current to the Bombay mills by the Tata Hydro-Electric Company. Thus again taking after English norms, a dire need of implementing special protection for such employees was emphasized.[143]

In reacting to Bombay's renewed endorsement of BOT rules Meares recounted that since his early days in India, his vocation had been to improve rather than adopt BOT rules as they were. Over time many of the BOT's "useless and unworkable clauses" were eliminated.[144] The Indian Electricity Rules he thought have been working smoothly "except in Bombay". This he attributed not to the rules themselves but rather to the personal influence of Bombay's Electrical Engineer, Mr. Stuart-Menteth, about whom he had made his (fairly negative) opinion clear many a times before.[145]

Meares however did admit the merit in most of the matters raised by Bombay. He thus agreed that the BOT rule about locating the cut-off switches for motors close enough to motor operators was a better one and thus recommended amending rule 49(d) to that effect.[146] Regarding rule 49 more generally he expressed the view that in line with the corresponding BOT rule(s) it should not be a liability for the licensee but rather the consumer that technical stipulations for safe use of high and medium pressure are maintained after the commencement of supply.[147] In the context of Bombay's concern about insufficiently informed or untrained 'authorised persons' handling dangerous electrical equipment, Meares invoked the opinion of a colliery consultant that "as for electricity to be of any use, it must be able to be looked after by ignorant coolies, boys, etc." and if such a situation did not generally obtain, British rules would be better to

[142] *ibid.*
[143] *ibid.*
[144] 'Note by J.W. Meares', April 24, 1914, in 'Suggestion of the Government of Bombay that the rules under the Indian Electricity Act of 1910 be superseded in favour of a set of rules adhering closely to the Board of Trade and Home Office Regulations, negatived. Decision to modify the wording of rule 49(d)', PWD (Civil Works-Electricity), GOI, September, 1914, Part A, Nos. 1-4, NAI.
[145] *ibid.*
[146] *ibid.*
[147] *ibid.*

implement than the Indian ones.[148] Yet he still insisted on the experimental use of Indian rules till "there is some general demand for revision with actual and not hypothetical cases to back it up."[149] In GOI's final communication to the Government of Bombay, it was stated that "while it may seem advisable in theory to legislate so that no person other than a qualified electrician shall have access to electric apparatus, such a change may conceivably be inopportune under present industrial conditions in India".[150] More generally the revision of rules was postponed till "concrete cases" compel this.[151]

The disagreements between Bombay and the GOI and the former's continuous recommendation of BOT and other English regulations in place of the existing Indian Electricity Rules could in some sense have followed from the personal predilections of the Electrical Engineer to the Government of Bombay, Stuart-Menteth. Since possibly 1910, this appointment was maintained by Bombay over and above the statutory requirements of the 1910 Electricity Act of appointing Electrical Inspectors. In 1911 Stuart-Menteth's term was extended for five more years and he seemed to have enjoyed exceptional confidence with the provincial government and have been retained as their own Electrical Adviser of sorts.[152] We have discussed Meares and Stuart-Menteth's long rivalry in electrical matters since their involvement in Darjeeling. So it is possible to imagine that Stuart-Menteth's probable influence on the Bombay Government's particular take on electrical rules could have been motivated by this rivalry and aimed repeatedly at proving the inefficiency of the structure of electrical governance devised under the aegis of Meares. Of course the obverse of this condition would also imply a similar kind of personal investment made by imperial bureaucrats like Meares and Browne in the very permissive Indian Electricity Rules that they had designed, with which their own distinction as electrical 'experts' could have become closely entangled.

---

[148] *ibid.*
[149] *ibid.*
[150] 'From R.P. Russell, Secy, GOI, PWD to Joint Secy, Govt. of Bombay, PWD', August 17, 1914, No. 1180 Elecy. in 'Suggestion of the Government of Bombay that the rules under the Indian Electricity Act of 1910 be superseded in favour of a set of rules adhering closely to the Board of Trade and Home Office Regulations, negatived. Decision to modify the wording of rule 49(d)', PWD (Civil Works-Electricity), GOI, September, 1914, Part A, Nos. 1-4, NAI.
[151] *ibid.*
[152] See 'Sanction of the Secretary of State to the proposal to extend the period of employment of Mr. W.F. Stuart-Menteth, Temporary Electrical Engineer, Bombay, on a five years' agreement, on certain terms', PWD (Establishments), GOI, July, 1911, Part A, Nos. 17-18.

Other than this possible scenario of personalized preference reigning over more objective evaluation, Bombay's concern with electrical safety of 'authorised persons' and others could have also followed from the steady advocacy by provincial officials and experts of particular protections for workers on industrial premises. While the Workmen's Compensation Act was enacted in India only in 1923, since the late 19th century, Bombay mills came under the ambit of an inspectorial regime that was seriously concerned with more minimal but still significant kinds of protection like securing machinery and distributing industrial space in a way as to prevent work accidents and health related disorders, at least on paper.[153]

In interpreting the exchange between the Government of Bombay and GOI we could also broaden the canvas in another way to get beyond the more obvious explanatory index of the personal rivalry between colonial officials. Irrespective of such rivalry, the response of imperial technocrats like Meares and Browne and the general attitude of the GOI were not always fully adverse to the implementation of certain English regulations. But their reasoning often insisted on the deferral of the reconsideration of rules till more definite cases emerged that would illustrate the limitations of the Indian regulations in containing various possible risky outcomes following from actually existing electrical installations and practice. Here it is worth probing beyond the rationalization of the existing Indian Electricity Rules by imperial officials to see if such concrete cases had not emerged already in contexts like Calcutta and elsewhere where electricity production and supply for industrial, domestic and other needs was in operation for some years.

6. Regulatory gaps and the recurring problem of accidents

The case of power houses or power plants of electric supply companies could be a useful starting point for probing the limits to existing electrical regulations in terms of safety issues. Power houses had been exempted from regulation by the Factory Act and placed solely under the less stringent regime of the Electricity Act with its more relaxed administration under respective Electric Inspectors. In July 1906, the GOI asked provincial authorities if the Indian Factories Act (XV off 1881, amended by Act XI of

[153] Sarkar (2018).

1891) had to be amended further to make it applicable to power stations.[154] This was a complicated proposal as it would require changing the already contentious designation of 'factory' in the Act to include power stations which often employed less than twenty operatives at a time, that was below the minimum number of workers required to define a factory.[155]

It was also recognized that in terms of protection from the dangers of machinery, Section 2(f) of the Electricity Act (of 1903) provided for framing rules for protection of concerned employees in power stations.[156] But that Act contained "no provisions for the regulation of hours of work, employment of labour and various other matters included in the Indian Factories Act."[157] However it was conceded that it might be necessary to exempt power stations from provisions for mid-day stoppage of work as well as Sunday breaks.[158] In response to GOI's proposal a general opinion took shape that since most of the employees in power houses were adult men, and possibly skilled, the intervention of the state into their working conditions in terms of hours of work, etc. was unnecessary as they could very well negotiate such conditions on their own.[159]

But regarding whether the dangers of machinery in power stations required protections sourced from the Factory Act alongside those already in place owing to the Electricity Act, there was a more mixed opinion, especially from concerned functionaries in Calcutta where there were 10 power stations and sub-stations already operating, 7 of the CESC and 3 of the Calcutta Tramways Company.[160] The Commissioner of Police in Calcutta thus argued that "present power stations are large structures containing a great deal of

---

[154] 'From W.L. Harvey, Secy, GOI to Local Governments', July 11, 1906, No. 5350-5359-3, in GOI, Commerce and Industry (Factories), for August, 1906, IOR/P/7407.
[155] By the 1891 amendment the Local Government was given power to confer the designation of 'factory' upon establishments that employed between 20 to 50 men instead of the 1881 Act definition that associated the term 'factory' with at least 100 workers in the same premise. See J.C. Kydd (1920, 68).
[156] 'From W.L. Harvey, Secy, GOI to Local Governments', July 11, 1906, No. 5350-5359-3, in GOI, Commerce and Industry (Factories), for August, 1906, IOR/P/7407.
[157] *ibid.*
[158] *ibid.*
[159] See opinions of provinces in GOI, Department of Commerce and Industry (Factories), for April, 1907, IOR/P/7692. As Sarkar (2018) has discussed, the bargaining capacity of adult males was often used as an excuse to overrule the introduction of protections relating to working hours, etc. for them.
[160] For the numbers see 'Amended list of Public Electric-power Stations in Bengal with data as to the men employed by A.K. Taylor, Electrical Inspector, Govt. of Bengal', January 23, 1907, in GOI, Department of Commerce and Industry (Factories), for April, 1907, IOR/P/7692.

quite complicated machinery and the danger from accidents is distinctly as great here."[161] He also claimed that even if the number of workers was presently less than twenty in these stations, this number was soon "likely to increase as the stations became more extensive" and thus aggravate the dangers arising from machinery operations.[162] Likewise the native commercial association of the Bengal National Chamber of Commerce reasoned that power stations be brought within the scope of the Factory Act by considering that "the boiler-house forms part of the main generating station" which would also increase the number of workers counted for every power station.[163] On the other hand, C.A. Walsh, the Inspector of Factories in Bengal argued against the inclusion of power stations under the Factory Act on grounds that the machinery used in electrical power stations did not invite the similar dangers as associated with winding, softening, shafting, belting and other such operations in jute, cotton or wool mills.[164] He claimed that to make power stations safe, "insulations to prevent contact with live wires" would suffice and the Electrical Inspector could ensure this under the Electricity Act.[165] This line of reasoning was eventually more successful and the GOI ruled against amending the Factories Act to include power stations under it.

Actual events in Calcutta and elsewhere however seem to suggest that risks arising with industrial operations in general and issues of electrocution in particular were both quite distinctly observable in the functioning of power plants in these early days of their operations. On the 9th of September, 1906, a pipe attached to the boiler of the CESC's power house on Prinsep's Street in Calcutta burst and the steam that escaped scalded and caused "extensive bodily injuries" to five Indian workers.[166] One of them Sheik Sukawat passed away from his burns. At his inquest the Government Boiler Inspector "could give

[161] 'From The Commissioner of Police, Calcutta to The Secy, Govt. of Bengal, General Dept.', October 16, 1906, No. 12767, in GOI, Department of Commerce and Industry (Factories), for April, 1907, IOR/P/7692.
[162] *ibid.*
[163] 'From Sita Nath Ray, Hony. Secy. Bengal National Chamber of Commerce to The Secy, Govt, of Bengal, General Dept.', November 25, 1906, in GOI, Department of Commerce and Industry (Factories), for April, 1907, IOR/P/7692.
[164] 'From C.A. Walsh, Special Inspector of Factories to The Secy, Govt, of Bengal General Dept.', November 17, 1906, No. 403, in GOI, Department of Commerce and Industry (Factories), for April, 1907, IOR/P/7692.
[165] *ibid.*
[166] Anon., 'Explosion in an Electrical Power House', September 12, 1906, *The Amrita Bazar Patrika*, pg. 7.

no reason as to the bursting of the tube." The jury returned a verdict that the death was "due to misadventure."[167]

If this typically industrial accident was one aspect of the risks associated with power houses and power plants, another aspect was certainly the more specific problem highlighted by the province of Bombay that the insulation of electrical lines and apparatus only extended to parts of the plant or the power house premises that were accessible to 'unauthorised persons', while 'authorised persons' had to fend for themselves. Such 'authorised persons' more directly in charge of dangerous electrical machinery were not always protected simply by their probable training like how imperial electrical officials like Browne had hoped. In the newly electrified Jamalpur Railway Workshops two workmen employed specifically for the railway electric works died while attending to their duties – one of them had apparently "by his own fault, got hold of a live wire and was electrocuted."[168] Also the distinction between 'authorised' or 'unauthorised' persons in terms of both their learning as well as their level of access was not easy to conceive or maintain. In the course of their interactions with Bombay, GOI officials admitted that in establishments like "power houses", both 'authorised persons' as well as unauthorised individuals like 'untrained mechanics' or sweepers had "free access" to dangerous parts of electrical apparatus.[169]

In view of such incidents it could be argued that the terrain of power houses or power plants amplified the dangers posed by the machinery to workers both on count of usual industrial hazards like that of boilers bursting or due to the new risk of electrocution affecting both 'authorised' and 'unauthorised' persons. And by exempting power houses from the scope of factory regulation and limiting insulation requirements to more accessible parts of electrical apparatus (as under the Electricity Act), a redoubled kind of deregulation was performed by the colonial state that left these workers bereft of

[167] Anon., 'Electric Power Station Fatality', October 25, 1906, *The Indian Daily News, Overland Summary*, pg. 7.
[168] Anon., 'Riot at Jamalpur – Strike of Workshop Hands', September 6, 1906, *The Englishman*, pg. 13.
[169] 'Note by H.M. Willmott', June 10, 1911, in 'Criticisms of certain rules under the Indian Electricity Act, IX of 1910, by Messrs. Crompton and Company, of Bombay, and the Government of Bombay, and the views of the Government of India thereon', PWD (Civil Works-Electricity), GOI, September, 1911, Part A, Nos. 1-2, NAI.

significant protections that seemed to have been even more necessary in the Indian context.

The limitation of insulation requirements also likely affected the few industrial establishments other than power-houses that had already subscribed to high-tension electric power for running their machinery and lighting in places like Calcutta. In the 1906 report on the working of the Indian Factories Act (XV of 1881, amended by Act XI of 1891) in Bengal it was stated that "several accidents have occurred from touching high tension wires when electricity was used as motive power" though it was also mentioned that live wires were being carefully insulated to prevent this.[170] Amongst the fatalities described in the report was "a man found dead on the roof of the Hastings Mill due to touching high tension wires which drive the motors in the mail."[171] A kind of usual justification was also rendered that "some 70 per cent" of all accidents in Bengal factories occurred "due to want of care and intelligence on the part of the workers."[172] Even if we were to simply accept this justification, this would in any case be further reason to affirm Bombay's apprehensions that insulation protection had to be extended not simply to persons generally working in electrified workplaces but also to other authorised workers who were likely to come in direct contact with the more dangerous parts of the electric apparatus in these same workplaces.

The need for adequate protections as related to activities of intermediaries interacting with electrified environments could also be relevant to more domestic setups of the time. In 1911 the accidental death of Sibrai, a Nepalese "cooly" by electrocution was reported from Darjeeling. Sibrai along with Gobind a carpenter had climbed to the roof of Mr. Forstmann's rink to stop rain water leaks. While working Sibrai slipped and possibly for support held on to a pair of overhead "bare copper wires" carrying 220 volts current with both his hands that resulted in the fatal electric shock.[173] The Officiating Electric Inspector of Bengal, Mcintyre held an enquiry and found that "being ignorant of danger"

---

[170] 'From T.W. Richardson, Officiating Secy to Govt. of Bengal, General Dept. to Secy, GOI, Dept. of Commerce and Industry', June 21, 1906, No. 962 T.-G., in GOI, Department of Commerce and Industry (Factories), for November 1906, IOR/P/7407.
[171] *ibid.*
[172] *ibid.*
[173] 'Copy of a letter No. 240 dated 18th May, 1911, from the Municipal Engineer, Darjeeling, to the Electric Inspector to the Govt. of Bengal', No. 2, in Govt. of Bengal, PWD (MPI), for August, 1911, IOR/P/8689.

the deceased made contact with both the wires thus completing the circuit and delivering the shock. He still attributed the incident to the violation of rule 38 of the 1911 Indian Electricity Rules that required the overhead service wires to either be insulated if within reach or be positioned beyond reach of any one standing on the roof if uninsulated. The electric supplier in this case was the Darjeeling Municipality who were fined and asked to rectify this construction. This unfortunate incident then seemed to have followed both from the relative inexperience of the concerned worker in newly electrified domestic settings as well as the lax implementation of rule-bound construction of overhead service lines that was also actually quite possible in Indian circumstances.

In 1913 Bombay floated a proposal to bring Rule 38 closer to similar provisions in BOT regulations. Provincial officials asked that irrespective of whether a service line was at a reachable height ordinarily or not, it had to be insulated – moreover such insulation had to protect against the ingress of moisture "from any cause" whatsoever.[174] Bombay's concern came out of an incident at the Elphinstone College where a "menial" inadvertently dropped water onto the service lines inside the building resulting in the lines burning. It was reasoned that since "washing of floors as well as splashing of water in white-washing walls, and, in hospitals, the hosing of walls, are events which ordinarily occur", it would help to compel suppliers to provide more effective and sturdy insulation for all their service lines inside consumers' premises through the modification suggested in the rule.[175] For both its demands, the Government of Bombay received support amongst others from the CMC whose Chief Engineer reasoned that both 225 volts or 450 volts supply systems as prevalent in Calcutta premises were capable of resulting in serious electric shocks and causing fire if not made adequately water-tight in their insulation.[176] The debate ensuing from Bombay's proposal otherwise discussed if such water-proofing was even possible or how much more costly it would be for licensee and consumers or even if it was better to penalize the concerned servant for spilling water on

[174] 'From Lieut.-Col. W.V. Scudamore, Ag. Joint Secy to Govt. of Bombay to The Secy, GOI, PWD', August 30, 1913, No. C.W. – 8893 of 1913, in GOI, PWD (C.W.-Elecy.), Pro. No. 5, for September, 1914, IOR/P/9476.
[175] *ibid.*
[176] 'From The Chairman of the Corporation of Calcutta to The Govt. of Bengal, PWD', February 27, 1914, No. S. 4903, in GOI, PWD (C.W.-Elecy.), Pro. No. 5, for September, 1914, IOR/P/9476

to electric lines and apparatus.[177] Eventually the GOI again denied Bombay's demand and decided that licensees could not be burdened with the "unreasonably stringent" requirement of water-proofing all their supply equipment inside a consumer's premises irrespective of the height at which it was placed and to the extent of making them "impermeable to moisture".[178]

Even as the GOI repeatedly denied its proposals, the Government of Bombay's consistent advocacy of introducing BOT rules in India seemed to have been in many ways quite in tune with certain realities of the colonial context of the introduction of electricity. Bombay's reasoning in support of introducing the stricter paradigm of English rules in Indian settings was based on the fact that electricity was to be operated by an intermediary group of coolies, servants or even mechanics who were not expected by provincial officials to have an immediate and intuitive grasp of electrical matters, especially those concerning safety. And on this point there seemed to have been considerable agreement expressed from certain Calcutta and Bengal institutions and officials who could possibly tally Bombay's views with their own experiences of administering electricity.

The interventions by Bombay officials were also shaped both by a convention of delivering minimal protections in the workplace as well as on account of dealing with substantially different and dangerous AC electrical systems. On the other hand, the exemptions peculiar to Indian electricity law and rules as designed by imperial officials like Meares or Browne were aimed at reducing conditions imposed on electric supply systems in order to aid the cause of electrical enterprise in the colony. However some of these exemptions - like from the requirements of insulating service lines or from providing protective covering to electrical apparatus to be operated by 'authorised persons' - clearly demanded a particular kind of risk-taking from the native working class handlers of such equipment. The series of accidents that this section recounts demonstrates that such risks often amounted to the concerned intermediaries staking as

[177] See the various opinions in GOI, PWD (C.W.-Elecy.), Pro. No. 5, for September, 1914, IOR/P/9476.
[178] 'From Captain H. DEL. Pollard-Lowsley, Under Secy to GOI, PWD to Joint Secy, Govt. of Bombay, PWD', August 13, 1814, No. 1167 Elecy. in GOI, PWD (C.W.-Elecy.), Pro. No. 5, for September, 1914, IOR/P/9476.

much as their actual lives on the operation of electrical equipment and their work in early electrified environments. In recommending the uniform adoption of English rules and regulations, Bombay's objective was precisely to alleviate such risk. In denying the province's appeals, the imperial bureaucracy chose to continue to work by certain principles of flexibility that both made for more danger as well as opened up more grounds for contesting electrical standards and technicalities.

7. The Indian Electricity Rules and consumers' views

The framing of the Indian Electricity Rules, 1911 remained in one matter quite distinct from the drafting of the rules under the 1903 Act. The deliberations and debates involved in the making and functioning of these rules under the 1910 Act in many ways remained keener on issues that breached the boundary of the consumer's premises in comparison to the law and the rules preceding it. In the previous chapter we saw how consumer's installations were often cast under the operations of the 1903 legislation as an arena that was governed less by the stipulations of rules and regulations and more on terms of the working understanding reached through the triangular interaction of wiring contractors, the licensees and the electrical consumer. We also saw how often such understanding defied the conventional rule of electrical 'expertise' in charting its technical forms. By the 1910s, this had however become a definite problem and various issues associated with consumer connections and installations began commanding the direct attention of electrical rule makers in the colony. With respect to Bombay's proposals towards introducing BOT rules in India we encountered one such issue that was of the adequate protection of servants and other intermediaries handling relatively unprotected electric apparatus or working within electrified environments on consumers' premises. In this section and the following one, we take up a set of other such concerns involving electricity supply on the consumer's premises that were invoked with respect to the new rules under the 1910 Act. We firstly survey how certain consumer's demands were framed within the making of electrical rules. We follow that up by describing the various expectations that licensees imposed on the same rules around the time of their drafting.

One particular concern of a section of electrical consumers with respect to electrical rules revolved around the extent to which the rules would allow for electric supply operatives

or inspectors entry into their respective premises. In the course of the discussion in the imperial Legislative Assembly during the passing of the 1910 Act, member Bhupendranath Basu moved an amendment that while Clause 20 in the Act empowered licensees to enter into private premises for purposes of inspection or reading meters and the like, this should only be allowed with "due regard being had to the religious usages of such occupiers."[179]Basu was representing the will of "the Marwari community in Calcutta". He claimed that this "orthodox" group desired that when entry was sought by the CESC "in the case of rooms wherein household deities are located, the inspecting officer should go without boots or shoes on."[180] While the community had represented their will to the CESC, it had till date not complied. Basu reasoned that "even the highest amongst us, European or Indian, will not enter what is ordinarily known as the 'thakurbari' in Bengal without taking off his shoes." Thus it made sense to recognise the Marwari claim that adequate notice be given prior to entry in order that the idols or images of the thakur be removed or the inspecting officer remove his shoes when entering the concerned premises.[181] In response to Basu's proposition, the Assembly eventually resolved that the claim be deliberated along with the rules to be issued under the Act rather than make a change in the Act itself, to which Basu agreed.[182]

While discussing this matter as part of the drafting of rules under the 1910 Act, Meares mentioned that trouble between CESC and the Marwari Association arose out of a case of a man of the firm who effected a disconnection due to non-payment of bills and was then "seriously assaulted in doing his duty."[183] The Marwari Association then asked for Hindu meter readers to be appointed - to this the CESC objected "with good reason" as chances of fraud would increase which in any case "occur mainly among the Marwari community."[184] Meares described that often there is no place to fix the meter "except in

[179] 'Hon'ble Babu BhupendranathBasu', March 18, 1910, Discussion on Indian Electricity Bill, Abstract of the Proceedings of the Council of the Governor General of India, Laws and Regulations. Vol. XLVIII, April 1909-March 1910, Calcutta, 1910, pg. 478.
[180]*ibid.*
[181]*ibid.*, pg. 479
[182] 'Mr. Miller; the President', March 18, 1910, Discussion on Indian Electricity Bill, Abstract of the Proceedings of the Council of the Governor General of India, Laws and Regulations. Vol. XLVIII, April 1909-March 1910, pg.481.
[183] 'Note by J.W. Meares", March 22, 1910, Appendix I to Notes, in 'Draft Rules under the Indian Electricity Act (IX of 1910)', PWD (Electricity), GOI, Part A, August, 1910, Nos. 7-11, NAI.
[184]*ibid.*

the one room where the image is and roads too narrow to put the meter outside."[185] He otherwise suggested that rather than compelling the officer of the company to take off his boots - a requirement "almost certain to be used obstructively" - the rule could specify that the meter be more accessible.[186] On the other hand PWD official Jacob pointed out that while there was nothing extraordinary about European officials observing customs of religious sites, "this question was raised on no case of that kind," but by the Marwari community.[187] He then analysed that the Marwari opposition stemmed more from the fact that the inspector's visits interrupt their meetings with clients rather than from "any questions of boots or gods."[188] This was because Marwaris transact their business in the same single room in which are fixed idols or images of deities as well as the electrical meter; he also claimed that Meares' proposed stricture regarding making the meter more available might not be very useful in such a case.[189] Finally it was decided to make "a much more general rule" of paying due regard during entry to religious uses of the concerned premises as much as compatible with the purpose of making the entry.[190]

This incorporation of a religious parameter within the structure of the Indian Electricity Rules 1911, however minimally, then seemed to have been made on two counts – a not so extraordinary acknowledgment of apparently customary rites of native society as well as by recognizing that within the typical conditions of Marwaris transacting business, the act of electric meter-reading or inspection could prove to be an intrusion. What seems remarkable here is that this incorporation was made by the colonial bureaucracy both in spite of the fact that the licensee's staff had significant and even physical conflict with the said customers as well as after admitting that this might lead to more fraudulent practices by the Marwari community with respect to electric supply. In the final instance then, the question of the observance of religious rites of customers of electricity in the

[185] *ibid.*
[186] *ibid.*
[187] 'Note by L.M. Jacob', March 24, 1910, Appendix I to Notes, in 'Draft Rules under the Indian Electricity Act (IX of 1910)', PWD (Electricity), GOI, Part A, August, 1910, Nos. 7-11, NAI.
[188] *ibid*.
[189] *ibid.*
[190] 'Note by J.O. Miller, March, 24, 1910, Appendix I to Notes, in 'Draft Rules under the Indian Electricity Act (IX of 1910)', PWD (Electricity), GOI, Part A, August, 1910, Nos. 7-11, NAI. See eventual Rule: 'Chapter VI, Penalties and Miscellaneous, Rule 107, Rules', PWD notification of December 23, 1910, in GOI, PWD (C.W.-ELEC.), Pro. No. 18, for January, 1911, IOR/P/8732.

course of making inspectorial entries into their premises seemed to have been an index particularly of the very real socio-economic power of the Marwari community in Calcutta more than any general orthodoxy of native religious practices. What emphasizes this distinction of Marwaris is of course the reality that extending sympathetic consideration to the consumer's point of view was hardly a general feature of electrical lawmaking in colonial India.

Looking at the discussions around the framing of the Indian Electricity Rules 1911, we encounter one more critical (but less successful) consumer voice, that of "Consulting Engineer" James Cleghorn who made a series of submissions to the government when the draft of the rules had been proposed. Cleghorn was simultaneously engaged in an acrimonious tussle with the CESC concerning matters of electricity use, metering and billing and it would be useful to understand the particular matters raised by him in light of this tussle. In October 1910, Cleghorn wrote to the Government of Bengal about what he alleged was an "extraordinary procedure" adopted by the CESC of forcing him to pay "overcharges and double payment" with an ultimatum of disconnecting his supply "*within 24 hours* unless paid *within that time*."[191] He urged that this was extraordinary as existing legal procedure mandated that in cases of dispute between consumer and licensee the Local Government could step in or refer the matter to arbitration for resolution and in any case disconnection required at least 7 days' notice from the licensee.[192] He also hoped that arbitration could be conducted "*pro bono publico*" in his case as otherwise carrying on the legal proceedings against the powerful "monopolist" CESC would mean "financial ruin" for him.[193]

Cleghorn was of course also contesting the very grounds of CESC's decision to make him pay an enhanced electricity bill. As the facts of the matter were described, Cleghorn was using six "bare lamps" as regulators for his six fans for the past two and a half years

[191] 'From James Cleghorn to The Secy to the Government of Bengal, PWD', October 18, 1910, No. 1, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688 (emphasis in original).
[192] *ibid.*
[193] 'From James Cleghorn to The Secy to the Government of Bengal, PWD', December 15, 1910, No. 17, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.

for both night and day.[194] This meant that using the lamps that could be run at a lower voltage (unlike the fans), the units of power passing through his fans could be reduced. According to Cleghorn this was a frequently used modality of economizing on the consumption of power in Calcutta including at the Bank of Bengal and the Telegraph Department at Alipore.[195] The issue here was that the CESC charged a lower rate for fan connections compared to that for light connections. And the firm perceived that Cleghorn's use of lamps was not simply as regulators but also for its primary purpose of lighting in the evening that attracted a higher charge. In the course of his inspections of Cleghorn's premises, Mr. Wade, a CESC official had reported that several of the lamps claimed to be regulators by Cleghorn were positioned to light up his drawing room, dining room and bed room.[196] This design of the installation was an altered one compared to the original connection approved by the CESC.[197] Thus the CESC decided to charge Cleghorn at its higher lighting rates unless he had his light and fan fittings separated or he got the lights "boxed in" to the satisfaction of CESC's inspecting engineer.[198] In his defence Cleghorn offered to replace all his 6 lamp regulators by a single regulator to be provided by the CESC which would enable him to regulate current use "without having to pay for waste."[199] He refused to cover up the lamps stating that this would make them "red hot" and risk a fire incident.[200] He made these claims on the basis of his "private rights to use in any way I consider fit the surplus energy you wantonly force through my meter, which state would not be tolerated in any country."[201]

---

[194] 'From James Cleghorn to The Secy to the Government of Bengal, PWD', October 18, 1910, No. 1, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[195] 'From James Cleghorn to The Secy to the Agent and Manger, CESC, Ltd.', November 26, 1910, No. 13, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688 and 'From James Cleghorn to The Secy to the Government of Bengal, PWD', December 12, 1910, No. 16, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[196] 'From The Agent and Manager CESC, Ltd. to the Offg. Electric Inspector to Government of Bengal', March 3, 1911, No. 2280, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[197] *ibid*.
[198] 'From CESC, Ltd. to J. Cleghorn', February 24, 1909, Np. 1223/1321', in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[199] 'From James Cleghorn to The Secy to the Government of Bengal, PWD', October 18, 1910, No. 1, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[200] *ibid*.
[201] 'From J. Cleghorn to The Agent and Manager, CESC Ltd.', October 8, 1910, No. 3, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.

In December, 1910 the Officiating Electric Inspector in Bengal, Mcintyre conducted his own inspection of Cleghorn's flat at No. 57 Ballygunge Circular Road. McIntyre reported that CESC's allegation that Cleghorn was making "improper use" of their energy had "no bearing on…the use of lamps for regulating the speed of fans."[202] Thus "it is not surprising that Mr. Cleghorn should feel aggrieved at the action of the Supply Corporation, more especially as the latter had apparently overlooked or condoned the matter of the alleged "improper use" for a period of about two and-a-half years."[203] On the other hand McIntyre did find Cleghorn's way of installing his regulator lamps objectionable by another clause in the Act that forbid consumers from utilizing for one purpose, "the energy supplied to him at a lower rate for any other purpose."[204] McIntyre still advised that the matter be settled under the arbitration of the Electrical Adviser to the GOI.[205] Even as these deliberations were going on, the CESC wanted to change the "sluggish" meter on Cleghorn's premises claiming that it registered less consumption that it should.[206] Cleghorn alleged that on the contrary the CESC meter provided to him "registers too high" and he would have proved this already if the CESC had not a month and a half back changed the seal on his meter.[207] This "mutilated meter" made it difficult for him to take a reading and work out the charges.[208]

A little later after a new meeting with the Bengal Electric Inspector, Cleghorn expressed his disappointment to the government that the inspector "has changed the opinion he formed on his first visit" and was now working with the licensee to try and show him as a defaulter.[209] He also claimed that if the Inspector "is allowed to accept fees he cannot be considered a disinterested party."[210] In the final decision by the Government of Bengal,

---

[202] 'From A.N. McIntyre, Offg. Electric Inspector to the Govt. of Bengal to The Secy, Govt. of Bengal, PWD', December 2, 1910, No. 1163, No 14, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[203] *ibid.*
[204] *ibid.*
[205] *ibid.*
[206] 'From F. Rawson, Agent and Manager, CESC, Ltd. to J. Cleghorn', January 8, 1911, Np. 144, No. 21, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[207] 'From J. Cleghorn to The Agent and Manager, CESC Ltd.', January 9, 1911, No. 22, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[208] *ibid.*
[209] 'From James Cleghorn to The Secy to the Government of Bengal, PWD', January 25, 1911, No. 24, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[210] *ibid.*

Cleghorn was informed that he would have to settle the matter of CESC's manner of charging him by arbitration "in a Court of Law" and the government would not interfere in this.[211]

Given Cleghorn's admission that legal proceedings would be impossible for him to carry on due to the expenses involved, it is possible to see that the government's decision really went against the consumer in this case. The case otherwise illustrates certain key elements of the relationship between the consumer, the licensee and the mediating role of the government that framed the context of electricity consumption in early twentieth century Calcutta.

Cleghorn was not entirely unique in this context as a somewhat scientifically informed consumer who contested certain technical principles by which the licensee made its supply available. And his case was also not unique in the way in which the 'expertise' or impartiality of the inspectorial authority assigned by the government was also being interrogated.[212] It is possible that Cleghorn utilised the scope in law to deploy low-voltage lamps to regulate power on higher voltage fans to his advantage in having supplementary use of such lamps for the lighting of his apartments. Yet he was also seeking to outline a more fundamental principle that the consumer should have the option to not be compelled to use power at higher voltages than he needs to, that resulted in waste. In his submission on the draft Electrical Rules issued, he thus urged that the supply company should provide the consumer with a regulator at the point of the meter in order that consumer "regulate the supply according to his requirements."[213] In effect Cleghorn also sought to prevent "undue interference with the household arrangements and methods of the consumer."[214] In case of Electric Inspectors he wanted that the public should by rule be able to demand the intervention of the inspector "free of all charge" instead of the Rs. 10 fee that was usually levied.[215] He also made his doubt about

[211] 'From W.J. Kerr, Under-Secy to the Govt. off Bengal, PWD tp J. Cleghorn', April 27, 1911, No. 29 and No. 30, in Government of Bengal PWD (MPI), for May, 1911, IOR/P/8688.
[212] The elaborations in the previous chapter evince that Cleghorn's stances on both these counts was hardly singular amongst other customers in Calcutta.
[213] 'From James Cleghorn, Consulting Engineer, Calcutta to The Secy, GOI, PWD', October 26, 1910, No. 10, Genl. No. 5909 Elec. in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.
[214] *ibid.*
[215] *ibid.*

government-designated experts quite obvious by wanting "to know out of a percentage of cases investigated and decided by Electric Inspectors how many have met with the approval and confidence of the consumer."[216] Finally Cleghorn on count of his own experience also sought certain specifications to be followed in case of electric meters for the ease of reading them. He described that he has been supplied with a meter whose "armiture is recessed in darkness and is found with difficulty so that a leakage or short circuit very often goes undetected which waste is to the benefit of the Corporation or the supplier…and is greatly to the disadvantage and pecuniary loss of the consumer."[217] He also wanted the rule of paying a fee by the consumer to have his meter checked by the Electric Inspector rescinded.[218]

Unlike the Marwari community's appeal to consideration of their religious rites, none of Cleghorn's suggestions as an aggrieved consumer of electricity in Calcutta received much consideration. In his response to the criticisms sent in from various provinces in response to the draft Electricity Rules, Meares commented that "all the suggestions sent in, if Mr. Cleghorn's be excepted, are well thought out."[219] Yet even as the imperial bureaucracy performed this erasure of the critical consumer's voice in preference of not intervening in the consumer-licensee relation, looking at the other submissions received in relation to draft rules, it becomes clear that installations of the consumer's premises had emerged as quite a problematic area involving often an acute contest between the consumer and the licensee. Electrical rules then had to pay greater attention to this terrain than they did previously, but not of course always on the consumer's terms.

8. The licensees' emerging stakes in the regulation of consumer installations

An issue that was inherited by the discussion around the 1910 Act and its Rules from earlier deliberations surrounding the rules under the 1903 Act was how much pressure variation in voltage would be allowed in the supply over or below what was specified by the licensee to the consumer. During the discussion of the 1910 Act, the Bengal Chamber

[216] *ibid.*
[217] *ibid.*
[218] *ibid.*
[219] 'Note by J.W. Meares', November 29, 1910, in 'Declaration of the enforcement, with effect from the 1st January 1911, of the India Electricity Act, IX of 1910; and publication of the rules made under that Act', PWD (Civil Works-Electricity), GOI, Part A, January, 1911, Nos. 1-19, NAI.

of Commerce (BCC) reasoned that the proposed limit of 4% variation as specified in the existing rules was "too wide" and a limit of 2% variation above and below the pressure of supply stated by the licensee should be the most that should be allowed.[220] Moreover, BCC also argued that the consumer had to be protected by the intervention of the Electric Inspector if he declines to pay the charges on the ground that the pressure is below or above the permissible variation.[221]

In the course of the discussions over the 1911 Electricity Rules, the principle of variation was contested from an opposing angle by quite a few licensees - for instance, BEST wanted above 5% variation for low pressure and above 12.5% variation for high pressure to be allowed.[222] Eventually Meares found the BCC's suggestion "simply unworkable" and settled for the "happy mean" of 4% allowable variation for low or medium pressure and 12.5% variation for high pressure.[223] A similar issue was that of the permissible error in electric meters. Browne in the course of the discussion of the 1910 Act had ruled out the proposition that meters in use in Calcutta needed to be certified by the government electrical laboratory by stating that if all consumers in Calcutta demanded to be supplied with a "correct" meter, it would cost the CESC a half a lac rupees to get the meters tested at the laboratory and the laboratory would take up to two years to get through the work.[224] During the discussion of the rules under the 1910 Act, the licensees like Delhi Electric Tramways and Lighting Company and BEST urged that the percentage of error of meters under Indian condition was best increased to at least 5% from the stipulated 2.5% as apparently under varying loads and the varying climate of India this would be more appropriate.[225] Meares agreed that "under Indian conditions, it is not at all easy to

---

[220] 'From H.M. Haywood, Secy, BCC to The Secy, Govt. of Bengal, PWD', November, 12, 1909, No. 30, in Govt. of Bengal, PWD (MPI), for November, 1909, IOR/P/8128.
[221] *ibid*.
[222] 'From Mr. A.T. Cooper, Managing Engineer, Bombay Electric Supply and Tramways Company, Ltd. to The Secy to GOI, PWD', October 19, 1910, No. 4729, Genl. No. 5812 Elec., No. 6 in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.
[223] 'Note by J.W. Meares', November 29, 1910, in 'Declaration of the enforcement, with effect from the 1st January 1911, of the India Electricity Act, IX of 1910; and publication of the rules made under that Act', PWD (Civil Works-Electricity), GOI, Part A, January, 1911, Nos. 1-19, NAI.
[224] 'From R.J. Browne, Electric Inspector to the Govt. of Bengal to The Secy, Govt, of Bengal, PWD', August 31, 1909, No. 732, No. 12, in Govt. of Bengal, PWD (MPI), for November, 1909, IOR/P/8128.
[225] 'From the Resident Engineer and General Manager, Delhi Electric Tramways and Lighting Company, Ltd. to The Deputy Commissioner, Delhi', August 23, 1910, No. 038-9268, Genl. No. 5047/1 Elec., No. 2/1 and 'From Mr. A.T. Cooper, Managing Engineer, Bombay Electric Supply and Tramways Company,

keep within 2.5 per cent" and eventually settled for allowing up to 3% error in meter readings.

The discussion around variations of pressure and meter error levels evince that while electrical rule-makers in the colony were often logistically not equipped enough to issue standardization mandates for electrical supply, they substituted the possibility of such standardization with allowances that sided more with the urge of licensees than the interests of consumers. But there was still a set of more complicated problems to deal with by both rule-makers as well as licensees in terms of the difficulties of controlling the practices of electricity consumers. Interestingly, while the oppositional concerns like that of Bombay government were shaped around the relative inadequacy of the experience or the intuitive learning of primarily native intermediaries, licensees and other electrical firms seemed to present a different problem, that of the undesirable technical interventions of another kind of supposedly semi-learned group of native intermediaries, involved with the work of wiring up or maintaining the installations on consumers' premises.

Since the drafting of the Act the electrical engineering firm in Calcutta, F.C. Osler Ltd. had demanded that consumers' installations be wired up by "a competent and skilled firm of Electrical Engineers duly licensed by the Local Government."[226] They made this claim because it had apparently become a matter of concern in Calcutta that "so much bad workmanship and downright bad material" is allowed to pass.[227] The concern was echoed by the CESC who complained that "every year the cases of damaged wires, meters and apparatus increase greatly chiefly due to the fact that every year more electrical mistries are added to the trade."[228] CESC also demanded that additional clauses be attached to the legislation to allow licensees to disconnect services from private premises like theatres

---

Ltd. to The Secy to GOI, PWD', October 19, 1910, No. 4729, Genl. No. 5812 Elec., No. 6 in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.

[226] 'From F. & C. Osler, Ltd. to The Secy to the Govt. of Bengal, PWD', August 28, 1909, No. 6 in Govt. of Bengal, PWD (MPI), for November, 1909, IOR/P/8128.

[227] *ibid.*

[228] 'From R.E. Winkfield, Acting Agent and Manager, CESC to The Secy to the Govt. of Bengal, PWD', August 30, 1909, No. 10, in Govt. of Bengal, PWD (MPI), for November, 1909, IOR/P/8128.

that kept changing their wiring work without the licensee's knowledge and thus posed "a great danger on account of fire."[229]

In the course of the discussion of the Indian Electricity Rules under the 1910 Act arguments were made on similar lines that the licensee's liability in the case of accidents or fires on consumer's premises be diminished by the rules precisely because it was difficult to supervise the work of native intermediaries with respect to consumer's installations. Regarding the proposed Rule 23(1) the Delhi licensee thus suggested that a provision be added that at the time of installation the licensee be "reasonably satisfied" (rather than be held to be absolutely sanguine as specified by the rule) by tests conducted to check leakage and installation because it was becoming difficult to prevent "incompetent and irresponsible bazaar firms and mistrees" from conducting wiring work "with poor materials and workmanship."[230] The firm of course also claimed the alleviation of their responsibility in testing consumers' installations by the grafting of the words 'reasonably satisfied' since apparently "no ordinary or practicable inspection and test will show up all potential faults on an installation."[231]

The Delhi licensee also sought changes in Rule 36 in order to make the licensee responsible only for their own part of the installation on the consumer's premises and relieve them from being responsible for the wiring work conducted by consumers themselves through their wiring contractors.[232] This change was sought under the concern that irrespective of the cause, the "bazar consumer" would invariably try to hold the licensee responsible for any fire or accident resulting from the supply of electrical energy to make a claim against him.[233] The BEST and the Rangoon licensee too objected to placing "a heavy responsibility upon licensee in respect of the work of wiring contractors."[234] And finally the Electric Inspector of Bengal also concurred that rule 36

---

[229] *ibid.*
[230] 'From the Resident Engineer and General Manager, Delhi Electric Tramways and Lighting Company, Ltd. to The Deputy Commissioner, Delhi', August 23, 1910, Genl. No. 5047/2 Elec., No. 2/2, in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.
[231] *ibid.*
[232] *ibid.*
[233] *ibid.*
[234] 'From Mr. A.T. Cooper, Managing Engineer, Bombay Electric Supply and Tramways Company, Ltd. to The Secy to GOI, PWD', October 19, 1910, No. 4729, Genl. No. 5812 Elec., No. 6 in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732. For the Rangoon opinion, see 'From Messrs. J.W. Darwood& Co.,

should mandate that the licensee take precautions "only as regards his own (the licensee's) apparatus."[235] In his eventual decision Meares complied with the suggestions for changes in Rule 23 and Rule 36 and thereby significantly reduced the licensee's responsibility in the matter of consumer's installations.[236]

A second problem that was pointed out forcefully by electrical licensees and officials in relation to the consumer's installation and the intermediary agency of *mistris* was that of the security of the meter and the probability of fraud and electricity theft. As indicated in the previous chapter and theft and fraudulent use of electricity was becoming a complicated matter in terms of exactly how law could aid the cause of licensees in attaining conviction. At the time of the drafting of the 1910 Act this problem was articulated around two penal clauses - section 39 and 44. The Calcutta licensee CESC described that with section 39 that penalized the dishonest abstraction of electricity in the preceding legislation, they had found it impossible to obtain a conviction even though they had apparently come across a number of cases where current was being stolen and these cases were also "increasing in a very alarming manner."[237]

CESC also wanted the power to cut off the supply of a consumer on the suspicion of electricity theft since it supposedly was common occurrence that the consumer tap their wires illegally for a specific function "such as a wedding or puja" during which CESC's officials by force are not allowed into their premises.[238] The method of stealing electricity (also encountered in the previous chapter) was usually by "tapping the licensee's wires at a point where they enter a consumer's premises, joining a wire at this point and connecting the other end of this wire to the consumer's wire above the meter, thereby cutting the meter out of the circuit."[239] Conviction had been impossible because it was

---

Managing Agents, the Rangoon Electrical Tramways and Supply Co., Ltd. to The Secy, GOI, PWD', October 26, 1910, Genl. No. 06 Elec., No. 12, in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.

[235] 'From A.S. Thompson, Secy to Govt. of Bengal PWD to The Secy, GOI, PWD', Genl. No. 5601 Elec., No. 5, in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.

[236] 'Note by J.W. Meares', November 29, 1910, in 'Declaration of the enforcement, with effect from the 1st January 1911, of the India Electricity Act, IX of 1910; and publication of the rules made under that Act', PWD (Civil Works-Electricity), GOI, Part A, January, 1911, Nos. 1-19, NAI.

[237] 'From R.E. Winkfield, Acting Agent and Manager, CESC to The Secy to the Govt. of Bengal, PWD', August 30, 1909, No. 10, in Govt. of Bengal, PWD (MPI), for November, 1909, IOR/P/8128.

[238] *ibid.*

[239] *ibid.*

difficult to prove in a court of law that "the culprit who actually fixed the wire" had done so "for the purpose of dishonestly abstracting the energy" as opposed to some other purpose.[240] CESC also hoped to bring a change in section 44 which penalized the tampering of meters, wires and other electric apparatus of the licensee on the same grounds of finding it difficult to obtain conviction on the basis of the existing legal wording.[241] Similar points were also made by the Electric Inspector of Bengal and the Bombay licensee regarding the same sections.[242]

Meares' response in the final drafting of the 1910 Act was once again in total agreement with the points made by CESC and others. He claimed to have himself seen "a number of reports of prosecutions" and it was clear to him that "these clauses are at present useless."[243] He also observed that the British law in this matter fully protected the undertakers owing to certain provisions of the Gas Works Clauses Acts which were incorporated in the Electric Lighting Acts and similar protection was also offered by the 1899 Calcutta Municipal Act in case of water meters.[244] Based on this he made a new addition to section 39 that if any "artificial means" were to be found that led to the dishonest abstraction of electrical energy, the existence of such means "shall be *prima facie* evidence of such dishonest abstraction."[245] In the previous chapter we saw with the 1906 case of the Rosses that even the direct presence of a mechanism to bypass the meter on the consumer premises could not constitite evidence as to the fraudulent use of electrical energy. Meares' addition of the 'prima facie' clause to section 39 was presumably aimed at dealing with such situations. The same phrase was also attached to section 44 to indicate that any artificial tamper or implement found on meters, wiring or other such equipment used for electric supply would imply '*prima facie*' the guilt of "improper use" of the meter. In case of section 44 this guilt (not tantamounting to a charge of theft) would in turn be attributed to the concerned consumer for whose supply

[240] *ibid.*
[241] *ibid.*
[242] 'Clause 39 and 44, Precis of Opinions on the Indian Electricity Bill, 1909', in 'Supply by the Legislative Department of copies of the printed papers containing criticisms by Local Governments, etc. on the Indian Electricity Bill, 1909', PWD (Electricity), GOI, Part B, January, 1910, Nos. 1-5, NAI.
[243] 'Note by J.W. Meares', January 14, 1910, in 'Criticisms on the revised draft Bill to amend the Indian Electricity Act III of 1903', PWD (Electricity), GOI, Part B, April, 1910, No. 1, NAI.
[244] *ibid.*
[245] *ibid.*

such equipment is deployed.[246] The imperial Legislative Assembly passed these new phrasings in the concerned penal clauses while confirming the apprehension that "the number of unscrupulous mistries who can be found to circumvent the meter are,…increasing."[247]

The anxiety around theft however continued to be articulated by licensees even in the discussion on the Indian Electricity Rules 1911. It was Rule No. 29 that was in contention. The rule amongst other things, forbade a consumer to break the seal on his meter without giving the licensee 48 hours' notice. The Delhi licensee stated that this rule "did not go far enough" as "dozens of instances" could be found whereby seals on meters were found broken; the consumer in such cases declaimed that "some time ago his light failed and so he called a mistree…to put the light in order, and presumably,…this mistree…must have broken the seals."[248] Here too it was then difficult to pin the blame on the consumer. Meares eventually let this rule stand as it was. He thought that the changes in the Act under Clause 44 covered the issue raised.[249]

Summing up the discussions around questions of metering, installation work and theft, it is most obvious that the licensee's interest remained the primary object of electrical lawmaking in colonial India. Yet whether this amounted to a resolution of the relative indiscipline that the consumer was beginning to show, remained in many ways an open question. Electrical law in remaining flexible, sought to aid the licensee. But this flexibility was also gradually opening up some space for negotiation for the electrical consumer in India.

---

[246] *ibid.*

[247] 'Hon'ble Mr. Rawson, March 18, 1910, Discussion on Indian Electricity Bill, Abstract of the Proceedings of the Council of the Governor General of India, Laws and Regulations. Vol. XLVIII, April 1909-March 1910, Calcutta, 1910, pg. 487.

[248] 'From the Resident Engineer and General Manager, Delhi Electric Tramways and Lighting Company, Ltd. to The Deputy Commissioner, Delhi', August 23, 1910, Genl. No. 5047/2 Elec., No. 2/2, in GOI, PWD (C.W.-ELEC.), for January, 1911, IOR/P/8732.

[249] 'Note by J.W. Meares', November 29, 1910, in 'Declaration of the enforcement, with effect from the 1st January 1911, of the India Electricity Act, IX of 1910; and publication of the rules made under that Act', PWD (Civil Works-Electricity), GOI, Part A, January, 1911, Nos. 1-19, NAI.

9. Conclusion

This chapter discussed certain key elements of the development of electricity use and practice in colonial India by perusing discussions and debates around the 1910 Indian Electricity Act. The Act and its associated rules spent a long time on the statute book and has only recently been repealed in 2003. In revisiting its making, the chapter demonstrated how significant apprehension about the state's own experts marked the administration of electrical matters in India. The chapter also explored how many provincial suggestions ran counter to the eventual imperial design of the 1910 Act and rules. The Bombay authorities' concern about the relative lack of electrical learning of the intermediaries and users gradually associating with the new form of energy was after all quite real, as the regular incidence of accidents in homes and factories alike had begun to illustrate. Yet the imperial technocracy held on to its faith in the maintaining the distinctive character of colonial rule-making even as metropolitan standards and principles offered a stricter formulation of safety parameters.

The 1910 Act eventually retained the structure of its predecessor of devising centrally formulated rules without provincial mediation, even as provincial EIs helmed the administration in local contexts. Colonial legal administration of electrical matters also continued to remain fully committed to the objective of facilitating the operations of private electrical enterprise. When licensees raised the issue of the standard of wiring work by *mistris* on consumers' premises or the question of meter tamper and theft, they were offered substantial legal and regulatory concessions by the imperial technocracy through the design of the 1910 Electricity Act and the 1911 Indian Electricity Rules. Similar claims to modify the technical conduct of electricity by consumers did not elicit an equivalent response.

Yet in spite of concessions made out to licensees, the concerned issues were not immediately resolved in any definite way and unruly practices by electrical users and consumers in colonial India continued to proliferate, often exceeding the scope of legal and regulatory control. One probable reason for this could have been the reticence of extant legal decrees to formulate substantial standards in matters like that of the wiring of consumers' premises. The 1910 Act and its associated Rules did not really prove

adequate to systematically tiding over the flexibilities already engendered by their preceding legal pronouncements. Thus in the coming years these matters kept being raised again and again in continuing official deliberations on the ways and means of administering electrical rules. In the following chapter we will deal with such deliberations which compelled the electrical bureaucracy to consistently look within the consumer's premises as an active area of concern that posed recurring puzzles and challenges for the legal ordering of electricity supply in colonial India.

Chapter 5: The Conferences of Electrical Inspectors and the long-term evolution of electrical regulation and unruly electrical issues

1. Introduction

With some apprehension regarding how the legal governance of electricity continued to cause problems for consumers and private enterprise as well as led to certain risky conditions related to electric supply and use, the imperial bureaucracy again started pushing for a colony-wide discussion on matters of administering electricity within five odd years of the enactment of the 1910 Electricity Act and the associated Indian Electricity Rules, 1911. Meares kept wondering whether decentralization had not been pushed too far and in turn appealed for "an annual meeting" of electrical officers who otherwise would "seldom have any chance of exchanging views."[1] The GOI obliged and over the next four years (1915-1918), three Conferences of Electric Inspectors from all the provinces were organised successively in Calcutta to sort out some measure of agreement regarding the technicalities and legalities of the conduct of electricity in the colony. The government also made provision for local Chambers of Commerce and representatives of electrical engineering undertakings and supply companies to present their opinions at the Conferences. It also hoped that some views of members of the "general public" could be incorporated within the discussion.[2]

This fifth (and final) chapter of the thesis will study the manifold discussions that took place at the three Electrical Conferences, to continue to analyse the primary regulatory concerns of the legal administration of electrical matters in the colony. It will also briefly compare certain resolutions reached around specific themes in these Conferences to the discussions around the same themes at a fourth Conference of Electric Inspectors held in 1928 and also to certain developments from the following decade (1930s). The first three Conferences in many ways were major events of electrical rule-making in colonial India. The deliberations at these events led up to another round of amendment of the electrical legislation via The Electricity (Amendment) Act of 1922. After the devolution of powers

[1] 'From J.W. Meares, Electrical Adviser to GOI to The Secy, GOI, PWD', September 3, 1915, No. 245, No. 1 in GOI, PWD (C.W.-ELEC.), for August, 1916, IOR/P/9965.
[2] 'From D.G. Harris, Under Secy to GOI, PWD to Secy, PWD of various Local Governments', August 5, 1916, No. 545, No. 23, in GOI, PWD (C.W.-ELEC.), for August, 1916, IOR/P/9965.

resulting from the Government of India Act of 1919, electricity was made part of the 'concurrent' list, which in theory could be dealt with by both imperial and provincial governments. The 1920 Devolution Act took away some of the more critical powers of the Governor General in matters of electrical licensing and transferred them to the provincial governments. However rule-making and primary legislative functions of administering electrical matters beyond licensing were still under the powers of the Government of India and by effect its electrical technocracy.

The 1922 Electricity (Amendment) Act and the rules that came along with it was the last effective manifestation of this imperial power. The Act attempted to rationalise the administration of electricity in tune with the varying propositions that had emerged from provincial electrical officers, and these propositions were mostly sourced from the Conferences of Electric Inspectors (1915-1918). Concerns about further improvement of electrical administration and rules continued to be articulated even after the 1922 Act. These concerns coalesced around the Fourth Conference of provincial Electric Inspectors of 1928. The recommendations emerging from this Fourth Conference slowly ascended the list of the priorities of the colonial state and resulted in yet another attempt at amending the Electricity Act but only in 1938. But due to the conditions of the Second World War, the amendment was not actually carried out. It was only in 1954 that the 1910 Electricity Act was again amended.[3]

Given this trajectory of electrical legislation in colonial India and the significance of the first three Conferences of Electric Inspectors within this trajectory, this chapter will study the proceedings of these Conferences as a kind of fundamental point of departure for grasping the longer-term development of legal-regulatory concerns around electricity in the colony. The proceedings will also be analysed to understand how regulatory measures spawned a cycle of their own secondary effects that in turn recurred as matters of concern occupying the attention of electrical administration. By tracing the articulation of similar concerns through the proceedings of the Fourth Conference of 1928, the chapter will try to understand the continuity of the issues involved. The chapter in the following sections

[3] This trajectory of electrical legislation is described schematically in 'Introductory', Report of the Advisory Board Constituted by the Government of India under section 35 of the Indian Electricity Act, 1910 in connection with amendments to the Indian Electricity Act, 1910, New Delhi, 1954, pg. 2.

focusses upon five specific themes. These are the licensing of intermediary electrical workers like the wiring man or the *mistri* and the associated problem of introducing statutory wiring specifications, the issue of electric meters, the problem of electric theft and a relatively new concern around the earthing of electrical motors.

The chapter will show how the articulation of each of these concerns (mostly) inherited the inclination of colonial law of creating regulatory flexibilities in favour of the licensee and contractors. It will also demonstrate how this inclination was however accompanied by a distinctive sense that the administration of electrical matters in the colony was evolving by characteristically shunning the uniformity of standards and technical norms. This eschewal of rule-bound practice and the proliferation of the unruly exercise of electrical interests were in some ways a chronic anxiety for law and regulation but also in a way directly effectuated by its operations.

2. Locating the Conferences of Electric Inspectors

It is useful to locate the Conferences of Electric Inspectors (1915-1918) within the particular schematics of lawmaking that we have described so far in this thesis, in order to consolidate our analysis of the structure of intervention that exemplified the workings of colonial electrical regulation. As already indicated, in many ways the Conferences of Electric Inspectors sought to replicate the mandate that the Electricity Acts of 1903 and 1910 had created – that of designing significant flexibilities in the legal management of electricity distribution to afford expanded scope to electrical enterprise in the colony.

As an obvious example of this we can take the case of aerial lines. Perhaps unsurprisingly, aerial lines continued to demand greater conditions of permissibility even within the proceedings of these Conferences. From the very first Conference of Electric Inspectors held in 1915, there were proposals to entirely do away with the requirement of having safety devices for overhead wires though it was recounted how they became necessary "after a number of fatal accidents" in Calcutta.[4] By the Second Conference it was decided to dispense with them in all places except those where the relevant Electric

[4] 'Safety devices on overhead lines', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 11.

Inspector (EI) thought they were necessary.[5] As might be obvious, such technical relaxations once again came coupled with an increasing reliance on the personal judgment of the government's electrical officer and the scope of exercising this judgment was also extended to other issues. A similar discretionary power was extended to the EI in case of temporary installations or installations using less than 125 volts that had been allowed by the 1910 Act to supply without licenses, like those "for additional or temporary extensions of supply during festivals, etc., especially at Devali". For such installations the EI was provisioned with the authority to seek up to 7 days' notice from the users in order to perform adequate examination of the supply.[6]

Yet no amount of flexibility extended could necessarily satisfy the wants of electrical enterprise. At the Third Conference of 1918, the recently formed 'The Electric Supply and Traction Federation of India' – a group of electricity companies in India sans some bigger firms like CESC and Tatas – presented their view that "serious difficulties" were encountered by electrical licensees in India due to "onerous, unsuitable and restrictive laws."[7] The Federation urged that each Electrical Inspector (EI) had to "be given much more discretion and authority to relax rules" and a "Court of Appeal" constituted to contest the EI's judgment in case it went against the spirit of industry.[8] These views were also represented by the Federation to the Indian Industrial Commission (IIC, 1916-1918) where they argued that the typical tendency of the PWD of "enforcing cast-iron rules and specifications" would not work for "new industries needing flexibility in the application of rules."[9] They alleged that EIs behaved as "zealous policemen" and instead they should relax all rules within reasonable limits.[10] Many of the complaints of the Federation were

[5] 'Safety Devices on Overhead Lines (Rule 62)', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 25.
[6] 'Temporary installations', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 15-16.
[7] 'Public Sessions', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 10.
[8] *ibid*.
[9] 'Appendix A. Memorandum for Submission to the Industrial Commission. From the Committee of the Electric Supply and Traction Federation of India', Minutes of Evidence taken before the Indian Industrial Commission, 1916-1918. Vol. V. – Punjab, Assam, Burma and General, East India (Industrial Commission, 1916-1918), London, 1919,pg. 732.
[10] *ibid*.

directed at how particular constructions of aerial lines were at times denied by respective EIs.[11] In his defence to the Industrial Commission, Meares reasoned that such allegations were hardly borne out by the instances given, which dealt with matters of administration rather than law.[12] He claimed that electrical law in India through repeated revisions had moved towards ever-multiplying conditions of decreasing stringency in terms of technical and financial matters, apparently much in advance of its English counterpart.[13] He then pointed out that the scope to relax the present rules already existed with the EIs and if the "technical officers" were "of the right stamp", "complaints as to administration would be few and far between."[14]

The Conferences of Electric Inspectors in many ways reaffirmed the key status of these technical officers as a sort of last mile agency of the colonial state that worked over and above any fixed primacy of the law or rules. In electrical matters, the agenda of colonial law to pursue certain kinds of flexibilities and permissibilities more than procedures of standardisation was crucially anchored in the existence and functions of these EIs, however few they were in number. However electrical administration as it shaped up in colonial India bore the significant paradox that these very same functionaries were often in turn subjected to certain doubts concerning their capacity for governing electricity distribution systems in the manner desired by the imperial bureaucracy. Meares complained in his autobiography not only about Stuart-Menteth, but also about the United Provinces EI J.S. Pitkeathly and the Bengal EI McIntyre as posing significant problems to his vision and process as the main administrator of electricity in the colony.[15] In the previous chapter we have encountered the possibility that the position of the provincial EIs within the scope of colonial government remained fraught with respect to the status of their expertise and the extent to which they could be empowered. In perusing

[11] 'Public Sessions', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edired by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 9.
[12] 'Witness No. 472. Mr. J.W. Meares, M.I.C.E., M.I.E.E., Electrical Adviser to GOI. Written Evidence', Minutes of Evidence taken before the Indian Industrial Commission, 1916-1918. Vol. V. – Punjab, Assam, Burma and General, East India (Industrial Commission, 1916-1918), London, 1919,pg. 723.
[13] *ibid*.
[14] *ibid*, pg. 724.
[15] Meares, John Willoughby, At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant",Chicester, 1934. Unpublished Autobiography, Pg. 388. J.W. Meares Papers, Ref: UK0108 SC MSS 169/1, IET Archives.

the views of Meares and the Federation at the Third Conference and as articulated before the Industrial Commission we can perhaps see the continuation of such apprehensions concerning the role of the provincial EIs within the governance of electricity in the colony.

Colonial administration thus depended too much on the contingent, personal judgment of its 'experts', while also not being able to contain its doubt about their 'expertise'. Another effect of this was the repeated cycles of reformulating the text of law and regulation as a measure to contain this ever-present anxiety over electrical expertise, though hardly yielding the predicted outcomes. This effect becomes apparent when we notice that a reformulation of the laws and rules concerning aerial lines was demanded again over a decade later by the Chairman of the Fourth Conference of EIs in 1928. He proposed to have a set of new regulations with "statutory force" exclaiming that "there had been many accidents with overhead lines and the Indian Electricity Rules did not appear to be sufficient."[16] In effect the criticism was also perhaps directed at the judgment of existing EIs who held sway over the myriad modes of administering aerial lines based on significant exceptions. The Fourth Conference of EIs (1928) did not eventually yield any legislative outcome. But its proceedings could still serve as a useful counterpoint to confirm the structure of intervention of electrical regulation in the colony that is being described here.

True to the Chairman's words, the Fourth Conference posed a set of new rules for aerial lines that needed urgent intervention in the opinion of many of its participants. One such new rule (no. 60) required that metal standards on which aerial lines were fixed on roofs of buildings ought to be earthed.[17] Another new rule (no. 61-A) proposed to specify the character of the fuses that were to be attached to aerial lines.[18] The need for safety devices almost dispensed with in the previous Conferences was reasserted at the Fourth Conference. Electrical officials noted the number of "fatal accidents" occurring in their

[16] 'Proposed new rule 40-B', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 79.
[17] 'Rule 60', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 90.
[18] 'Rule 61-A', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 92.

absence, especially in Bengal, both in case of service lines as well as for "Extra High Pressure lines" that were spreading rapidly.[19] Some allowances were also made for licensees. The specifications of 'Factors of safety' for overhead lines were eased.[20] Also, noting the "needless expense to the licensees" of raising aerial lines to a minimum height of 20 feet, it was decided to reduce this requirement to 17 feet.[21]

Yet even as this bevy of new rules were being planned for aerial lines, what is remarkable was that the 1928 Conference also made a provision to make it easier for the EI to make particular relaxations to the rules by waiving the requirement for him to report such relaxations as that would make for "somewhat needless correspondence."[22] In effect then the cycle of making rules and simultaneously expanding the scope for their relaxation based on the personal judgment of the EI was again to be reset. The EI's regime of administering aerial lines on the basis of certain qualified permissibilities was being challenged by designating new rules at the Fourth Conference. But even while trying to discipline this rule by experts through enacting new statutory principles, colonial regulation also invariably had to leave open the scope for working beyond a strictly rule-bound framework. This cyclicality had then become the hallmark of colonial-lawmaking and administration of matters electrical. And the Conferences were a new and yet foundational episode in this.

3. The concern about the wiring man/electric mistri/wiring conductor

Beyond licencees' technical requirements like those concerning aerial lines, the Conferences of Electric Inspectors (1915-1918) also had much more to discuss about the question of consumer's installations that was fast emerging as the most important object of legal and administrative concern.[23] Once left out of the ambit of electrical law, this

[19] 'Rule 63', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 96.
[20] 'Rule 61', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 90.
[21] 'Rule 62(1), Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 93.
[22] 'Rule 104(3)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 96.
[23] This question being carried over from previous discussions held in course of the making of the 1910 Electricity Act and the rules under it.

question was hardly any more avoidable, even though its articulation remained tied up in complex considerations that proved immensely challenging for colonial legal regulation. During the making of the 1910 Act and its associated Rules, issues related to consumer premises were dealt with in terms of unburdening the licensees of some of their responsibilities with respect to the matters of safe and standard electrical practice on the consumer's premise. Within a few years' time this minimal resolution began to seem rather inadequate. The Conferences of Electric Inspectors had to instead deliberate on forms of direct interventions designed to discipline the conduct of the electrical consumer's installations. And again one major topic that commanded a significant share of attention in this regard was that of the qualifications or the lack of them amongst the intermediaries – *mistris*, wiring men or wiring contractors – who executed such installations and how such intermediary work could be improved.

Along with the difficulty of fully depending on the 'expertise' of the provincial EIs, the more pressing version of the problem of the possible inadequacy of electrical learning thus posed itself through the figure of this intermediary and disturbed the certainties of electrical legal administration in the colony. But this issue was also not always raised in isolation. Rather it remained entangled with consideration of the technical specifications, tests and rules as well as the quality of materials that could be standardized for consumers' installations. In this and the following two sections we will try to understand how this problem was raised within the deliberations of the Conferences.

At the very beginning of the First Conference of Electric Inspectors (1915), Meares raised in unison both the issues of the qualifications of wiring contractors who conducted consumers' installations as well as that of standard wiring specifications that could be issued for such installations. He remarked that "Electrical Installation work,…like the poor is always with us."[24] According to him this was due to the practice from the very beginning both in private houses as well as for government establishments, of accepting the lowest price or the lowest tender from wiring contractors.[25] Yet he did not think "it is possible, or even desirable, that there should be a rigid and uniform specification for

[24] 'Chairman's Speech', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 3.
[25] *ibid.*

electrical wiring all over India."[26] There was still an initiative announced for tallying wiring specifications across provinces specifically for the advantage of government installations and for ensuring that contractors did not have to deal with too much diversity of standards when connecting such installations.[27]

In the course of the First Conference the question of licensing wiring contractors was also raised. It was pointed out by the Bombay Electrical Engineer Stuart-Menteth that even as the matter had been discussed many a time in Great Britain, it had hitherto "proved impracticable."[28] Another option was considered that was to specify in each province a common approved pool of quality wiring contractors in consultation with licensees. But it was decided "to leave so important a question open for the time being."[29] McIntyre, the Electrical Inspector of Bengal also pointed out that statutory scope existed for making the licensee responsible for inspecting consumers' installations in a more effective way.[30] Other delegates however ruled this out stating that licensees could not be expected to "regularly inspect" all consumers' installations and in any case they "wait till a breakdown occurs; and they seldom go beyond an insulation test, which is of little value by itself."[31]

The problem of wiring specifications and wiring contractors in relation to consumers' premises returned with much greater urgency at the Second Conference of the Electric Inspectors (1916). Meares again opened the Conference with the problem of "jerry wiring". He claimed that "by enforcing our specifications", government buildings under the care of the various provincial electrical officials had been ensured of "good work".[32] But private installations were still falling prey to "unscrupulous contractors, who have

---

[26] *ibid.*
[27] 'Questions Regarding Wiring Installations: Wiring Systems', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 12.
[28] 'Questions Regarding Wiring Installations: The licensing of wiring contractors', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 13.
[29] *ibid.*
[30] *ibid.*
[31] *ibid.*
[32] 'Mr. Meares' Opening Speech. Licensing wiring Contractors and Wiremen.', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 4.

wired them with rubbish put up in defiance of every principle we stand for."[33] He also attributed this to "a most unfortunate legal decision many years ago, to the effect that a contractor was not to be held liable for defective work so long as his workmen did the work in the way they had been taught."[34]

The Second Conference saw some more success in terms of the formalisation of uniform wiring specifications for government installations and buildings. The Conference received a deputation from Institution of Electrical Engineers (IEE, Calcutta Local Centre) and Calcutta contractors that urged the adoption of such uniform specifications across the provinces.[35] The contractors predicted that "vast changes" would follow the ongoing Great War and a standardized wiring specification "for Government work in India" would allow them to maintain stocks and keep up with the changes.[36] Uniformity was also sought "in voltage" and for "tests by licensees"; for the latter, it was admitted that climatic conditions could influence the nature of testing in particular localities of the colony but still the government was appealed "to lay down certain general rules."[37] This proposal for bringing uniformity in wiring specifications was also supported by the IEE (London).[38] The Conference eventually resolved that "a uniform set of "General Conditions of Contract for Electrical Works" had to be drawn up.[39] However this was only "for the use of the Public Works Department all over India" and the wiring specifications were not to be immediately recommended or stipulated for private use.[40]

The Second Conference thus continued to virtually rule out standardizing wiring specifications for private consumers' premises even though such specifications were being drawn up for government installations. Alongside this, the Conference also saw a fair amount of discussion on the vexed topic of the competence and licensing of wiring

[33] *ibid.*
[34] *ibid.* The reference here possibly was to the 'electric fan case' in Calcutta that we described in the previous chapter.
[35] 'Deputation of Electric Engineers to the Conference', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 51.
[36] *ibid.*
[37] *ibid.*
[38] *ibid.* pg. 57.
[39] *ibid.*
[40] *ibid.*

contractors and other intermediaries. Mr. Mersh, the EI from Central Provinces raked up the existing issue of "authorised persons" like coolies conducting electrical work for private firms who did not ensure they were of "sufficient intelligence", thus leading up to accidents.[41] The Conference resolved that such firms should ensure "the competence of authorised persons generally" but did not specify what such competence could consist of.[42] More directly the concern about licensing wiring contractors or *mistris* or wiring men came up in relation to "a joint memorial" in 1916 from "Fire Insurance interests in Bombay, Calcutta and Madras" urging "electrical contractors and electricians in India" to be compulsorily registered.[43]

Stuart-Menteth of Bombay again weighed in on the subject. He pointed out that such practice of licensing had been adopted in some states in America "with the co-operation of the contractors themselves" and more unsatisfactorily in Manchester in England.[44] On the other hand in New Zealand "registering wiremen" had apparently proved "to be an unqualified success" and thus it was to be also tried in Australia.[45] However in the case of India, Stuart-Menteth considered licensing wiring men to be "exceptionally difficult" as there were "practically no trained labour for electrical work, owing to it being a comparatively new industry."[46] In India "being apprenticed to electrical firms" was apparently "not possible" and there were "no electrical manufacturing firms, and contracting firms do not retain permanent establishments for this work, but engage it from time to time in the open market, as required."[47]

Stuart-Menteth was then sanguine that the primary cause for problematic installation work in India was "unskilled labour".[48] While some European labour was engaged for "erection of plant", invariably most, even "larger firms" could not afford "European

[41]'Authorised persons [Rule 2(b)]', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 16.
[42]*ibid.*
[43] 'The licensing of electric wiring contractors', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 62.
[44]*ibid.*
[45]*ibid.*
[46]*ibid.*
[47]*ibid.*
[48]*ibid.* pg. 63.

labour" and got "men from the Bazar" who were "utterly and completely ignorant of the elementary principles of wiring work."[49] Moreover, "within recent years, as there are large profits to made in wiring work, numbers of men with absolutely no technical training or knowledge of installation work have set themselves up as wiring contractors."[50] Given these circumstances, Stuart-Menteth argued that rather than registering contracting firms, it was a better idea to license wiremen in order to secure "skilled labour."[51] He pointed out that such licenses could be allotted after the concerned labourer acquired some amount of experience in electrical firms and offices and importantly held a certificate after completing a course from institutes like the Technical Institute in Bombay (that held examinations for the City and Guilds Institute in London).[52]

Stuart-Menteth's opinions concerning the licensing of wiring men did not achieve complete unanimity at the Second Conference of Electric Inspectors. Mr. Eastgate, the EI from Punjab argued that rather than Local Governments, it would help to have Municipalities/'Local Authorities' issue licenses, as the Local Government should not "make itself responsible for practically guaranteeing" that a licensed contractor will do "first class work."[53] Otherwise the BCC representative at the Conference reasoned that "licensing was not of much value" as "a practical workman" could know his work well and yet be "quite incapable of passing any examination."[54] In any case he wanted the responsibility to be held by "the employer" and thus asked for the employers being licensed and not individual workmen. McIntyre, now working as the EI to Bihar and Orissa, wondered if the government should interfere at all "with the liberty of the private consumer to take any risks in his own house." In a public session of the Conference, Mr. Winkfield of the CESC asserted a different view that if it was only contractors that were to be licensed, this could exclude the "small contracting firms, generally consisting of a single man only" who did "70 per cent of all wiring work."[55] He pointed out that in

[49]*ibid.*
[50]*ibid.*
[51]*ibid.*
[52]*ibid.*
[53]*ibid.* pg. 64.
[54]*ibid.*
[55]*ibid.* pg. 65.

Calcutta "the single man mistry was responsible for a very large amount of the business introduced to the Supply Co." and urged that this 'single man mistry' not "be pushed out altogether" by licensing only larger firms.[56] The actual wiring contractors and electrical engineers who were representing their view to the Conference however continued to argue for only contracting firms to be licensed - while this could include "the small native contractor" or even "the one man firm", the contractors were strongly against the licensing of individual "foremen or wiremen."[57]

The Second Conference resolved that while it would be eventually more appropriate to license only firms, it would be better to begin by licensing individual foremen or wiremen "until a more competent body of men" came into existence.[58] Rather than through any institution, it was however decided to conduct the examination of such men through the Local Government's Electrical Engineer/Inspector. But to appear in such examination, the concerned men would have to go through a set number of years of practical experience as well as achieve certification from a recognized institution in India and also have adequate knowledge of IEE or Fire Insurance rules.[59] It was also decided that to make the system of licensing effective, the Electricity Act or Rules could "prescribe that a licensee shall not be bound to connect to his mains an installation carried out by unlicensed bodies", with a scope of appeal concerning this lying with the EI.[60] But it was also decided to apply such provisions in a phased manner and by empowering each Local Government to settle the exact details as some provinces "are not yet ripe for the proposals."[61]

Thus, even as it remained significantly interested in discussing the question, the Second Conference of Electric Inspectors still did not quite move towards a very definitive legislative resolution regarding the matter of licensing wiring men, mistris or wiring contractors. Instead, the Conference resorted to the well-practiced technique of moving the ball to the court of Local Governments, a strategy of deferral that we have already

[56] *ibid.* pg. 66.
[57] *ibid.*
[58] *ibid.* pg. 65.
[59] *ibid.*
[60] *ibid.*
[61] *ibid.* pg. 66.

encountered in the history of colonial electrical law that was otherwise quite intent on centralization. The Third Conference of Electric Inspectors too spoke of legislation to compel licensees "to refuse connection to work carried out by unlicensed persons."[62] But again it was preferred that action concerning this was taken only "by each Local Government on its own lines."[63] It was however suggested that technical classes for instruction of wiremen could well start in order to award certificates of competency to such men as had already been commenced in Madras.[64]

The proceedings of the Conferences of Electrical Inspectors (1915-1918) give us a particular kind of insight into the history of electrical work and workers consisting of figures like *mistris* and wiring men who crucially mediated the terrain of 'electrification' by situating themselves between consumer and licensee in early twentieth century colonial India. In lieu of more direct archival accounts of such work conducted mainly through private agreements, we seem to encounter this history only in a minor key, as deciphered through the views of regulatory functionaries of the state. Nonetheless, a kind of sheer dependence of early 'electrification' in India on this important intermediary class of workers becomes quite visible even when we look through the lens of their colonial critics (as also indicated earlier in this thesis). Part of the colonial criticism of the native *mistri* class came framed through a racialised preference for European electrical workers. Yet irrespective of how capable such workers might actually have been, it was admitted that they were not necessarily too available or affordable for the everyday work of wiring installations and maintenance in colonial cities. On the other hand, colonial critcism connected the unsystematic and un-standardized state of wiring on most Indian consumer installations to the 'unskilled' character of the work of the intermediary class of mostly native electrical workers/*mistris*/wiring men.

---

[62] 'Licensing or Registration of Wiremen', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 41.

[63] 'Chairman's Opening Speech', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 4.

[64] 'Licensing or Registration of Wiremen', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 41.

Here it might be worthwhile to take a detour through the historiography and history of technical education in colonial Bengal to get a better sense of this claim about 'skill' or the lack of it. By the third Conference there was a strong view towards establishing institutional training for the intermediary class of electrical workers conducting wiring work. But this was perhaps both a somewhat belated move as well as based on a mis-identification of the lack of 'skill'.

4. The wiring man/electric mistri as seen through the lens of technical education and 'skill'

By the second decade of the twentieth century and later in the context of the Great War, the character of technical education in colonial India was undergoing some change compared to earlier decades. The invocation of the electrical worker's requisite skill is better understood against the background of this change. In the case of Bengal, a specific kind of technical training in electrical engineering was instituted at Sibpur Engineering College since 1895 and an electric lighting plant put in operation to give practical basis to this training. As Suvobrata Sarkar has pointed out, much of this training was limited to a subordinate, apprentice stage and did not amount to a full engineering degree (still only offered in Civil Engineering) - students had to first undergo four years of Civil Engineering training that was geared towards employment in the ranks of PWD's overseers or sub-overseers and then (optionally) specialize in 15 months of electrical work.[65] In April 1912 a separate branch of the apprentice course catering mainly to aspirants training in mechanical and electrical engineering was opened at Sibpur.[66] In the following year, this course was modified by excluding merely civil engineering subjects like surveying and reducing its length from 4 to 3 years.[67] These changes finally allowed for a somewhat more specialised course of training in electrical engineering to come into being within the curriculum of the state institution.

Yet while tendering his witness to the Indian Industrial Commission in 1916, the Principal of the Sibpur Engineering College B. Heaton claimed that the number of

[65] Sarkar (2020, 45).
[66] Report on the Administration of Bengal, 1912-1913, Calcutta, 1914, pg. 115.
[67] Report on the Administration of Bengal, 1913-1914, Calcutta, 1915, pg. xxiii.

students appearing for "the sub-overseer examination" to seek entry into various courses at the College had actually fallen noticeably after the creation of separate electrical, mechanical and mining courses.[68] Heaton attributed this to "the want of industries in Bengal" and also to the desire of Bengali parents to secure a government job with a pension for their children.[69] On the latter count, mechanical and electrical engineering courses did not present any immediate incentive as civil engineering did and thus a marked preference of Bengali students was seen "for admission to the civil upper subordinate classes."[70]

Some of this apathy was however soon to dissolve with a changed policy and consequently greater scope becoming available to Bengali students of securing scholarships for foreign education in subjects like electrical engineering.[71] Scholarships for such foreign and specialised technical education were also offered by the local Association for the Advancement of Scientific and Industrial Education of Indians since 1904.[72] In 1916 there were five scholarship holders – J.C. Gossain, J.C. Maitra, S.C. Roy, K.P. Ghose and T.C. Mozumdar – who were reported to have taken the Association's aid and studied electrical engineering in Europe and America and then returned to India to take up engineering jobs, teach or start their own engineering firms.[73] A more effective cause for this change in attitude towards technical education was also the expanded opportunities created for subjects like electrical and mechanical engineering due to the First World War. The Annual Administration Report of Bengal for 1917-'18 described that in the context of the fillip to industrial development provided by the War, civil engineering intake at Sibpur reduced drastically while "Mining, Mechanical and Electrical Engineering classes" became "more popular" and attracted "students of a better type and greater promise."[74]

---

[68] 'Witness No. 116. Mr. B. Heaton, Principal, Civil Engineering College, Sibpur. Written Evidence', Minutes of Evidence taken before the Indian Industrial Commission, 1916-1918. Vol. II – Bengal and Central Provinces, East India (Industrial Commission, 1916-1918), London, 1919,pg. 249.
[69] *ibid*.
[70] *ibid*.
[71] Sarkar (2020, 44).
[72] Sarkar (2020, 197).
[73] Anonymous, 'The Association for the Advancement of Scientific and Industrial Education of Indians', *ABP*, June 115, 1916, pg. 8.
[74] *Report on the Administration of Bengal, 1917-1918*, Calcutta, 1919, pg. 118.

Moreover, as historians like Chittabrata Palit and Sarkar have explored in some detail, the drive towards technical education was also adopted by a group of Swadeshi-inspired Bengali educationists who led the National Council of Education (NCE) movement and the Society for the Promotion of Technical Education (SPTE). This drive towards technical education was initially riddled with contradictions between the NCE group - establishing the Bengal National College (BNC) - who wanted aesthetic and literary education to be part of technical education as a holistic model of training, and the SPTE group - establishing the Bengal Technical Institute (BTI) – who were more invested in a narrower version of more instrumentalist and industry-faced technical training.[75] The BTI survived this squabble as the more successful institution with BNC intake almost drying up by 1917.[76] BTI had since its opening in 1906 offered primary, intermediate (3 years) and secondary (4 years) courses in several technical subjects including mechanical and electrical engineering; it also had a manufacturing unit for some practical training.[77] Yet even till 1910 low student enrolment numbers at the institute were rued by commentators who noted that engineering was still not considered an attractive career by Bengalis who remained more interested in professions like law, clerical positions, police, etc.[78] In the second decade of the twentieth century the BTI experimented more with technical pedagogy with some Indian technicians trained in foreign universities taking up teaching positions at the institute.[79] In 1912 The City and Guilds of London Institute exempted students of electrical and mechanical engineering from BTI from their preliminary entrance examination.[80] Sarkar describes that "The BTI students of the second decade of the twentieth century were practically the first batch of young men looking for careers in mechanical, electrical, chemical and allied industries after a systematic technological training."[81] By 1919, buoyed by the War as well as fresh upsurge of nationalist inspiration, student intake remarkably improved at the BTI and soon it became a full-

[75]Palit (2011, 856-857); Sarkar (2020, 56-57).
[76]Palit (2011, 857).
[77] Sarkar (2020, 56-57).
[78]Palit (2011, 856).
[79]Palit (2011, 858).
[80] Sarkar (2020, 57).
[81] Sarkar (2020, 58).

fledged engineering college like the one in Sibpur and was renamed the College of Engineering and Technology (CET).[82]

In narrating this history of the change of attitude towards technical education, it is important to note, as Sarkar argues, that there was nothing inherently lacking or any natural disinclination of Indians towards taking up technical education, as colonial commentators often alleged.[83] But it is also worth emphasising here that the primary subject of this narrative remains the Bengali *bhadralok*, marked by his generally upper-caste and middle-to-upper class character, who could be relatively clearly distinguished from the class of *mistris*, or wiremen who became a key topic of discussion within regulatory concerns as articulated in the course of the Conferences of Electric Inspectors (1915-1918). At the Third Conference of Electric Inspectors (1918), Meares had noted the new preference for "higher grade training" amongst Indians who could afford it or who secured scholarships towards foreign education.[84] He hoped that these men "set a high standard among their fellows and their workmen out here."[85] But he also seemed to think that such men were not always content with starting "low down" and working up by their "own ability" without being propped up "high by influence."[86] The changing conditions and incentives of technical education in any case primarily affected such men who were clearly distinguished by Meares from the "vastly too many untrained" men who picked up their training in electrical work "in the traditional Indian way."[87]

In following Meares' comments and returning now to the invocation of the 'untrained' and 'unskilled' *mistri* in comparison to the *bhadralok* engineer gradually ascending the ladder of formal technical learning, we can begin by recounting that it is not that technical education in the colony was always entirely geared towards a higher strata of native society. As Ajantha Subramanian has pointed out, except the core and prestigious colonial concern of civil engineering that demonstrated a preference for European

[82]Palit (2011, 858); Sarkar (2020, 59).
[83] Sarkar (2020, 65-66).
[84] 'Chairman's Opening Speech', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 4.
[85]*ibid*.
[86]*ibid*.
[87]*ibid*.

engineers, other kinds of technical education were envisioned in colonial India as a response to the embattled status of artisanal castes and in order to develop them as a new labour pool for emerging new industries.[88] After the 1880s this brought about "industrial schooling" that targeted "not disaffected elites but dispossessed subalterns".[89] This developed also due to the persistence of the preference for "shopfloor learning" into the twentieth century even in the metropole where engineering was otherwise becoming "an academic discipline."[90] For such shopfloor or practice-based practical training, "maistries" were considered ideal.[91]

In Bengal, along with other smaller district-based schools, Sibpur Engineering College actively taught classes for artisans or "mechanics" through its workshops.[92] The BTI too initially through its "primary" course sought to produce "skilled artisans".[93] As Sarkar has shown, proto-nationalist discussions around technical education over the late 19th and the early 20th century also placed emphasis on the training of the artisan to prepare him for the modern technical environment and commercial conditions.[94] Further, as one colonial report on education stated, "individual bhadralog (uppercaste people) do not, in fact, wish their sons to be mistris."[95] Heaton explained to the IIC that "upper and lower subordinates all being trained together, and all joining the same mess" made the superior classes "very chary of sending their sons to the college at Sibpur."[96]

Subramanian argues that starting with the early 20th century the mutual disinterest shown by upper castes in seeking technical education and that of the colonial state in offering it to them started dissolving. What replaced this was an "emerging consensus over engineering as classroom learning and its link to the prestige of the state" that "made

[88] Subramanian (2019, 28).
[89] Subramanian (2019, 31).
[90] Subramanian (2019, 32).
[91] Subramanian (2019, 34).
[92] 'Civil Engineering College, Sibpur', Report on The Enquiry to bring Technical Institutions into closer touch and more practical relations with the Employers of Labour in India by Lieut-Colonel E.H. deV. Atkinson, R.E. and Tom. S. Dawson, Esq. Calcutta, 1912, pg. 22.
[93] Sarkar (2020, 56).
[94] Sarkar (2020, 53 & 192-193).
[95] Quoted in Subramanian (2019, 39).
[96] 'Witness No. 116. Mr. B. Heaton, Principal, Civil Engineering College, Sibpur. Oral Evidence, 7th December, 1916', Minutes of Evidence taken before the Indian Indistrial Commission, 1916-1918. Vol. II – Bengal and Central Provinces, East India (Industrial Commission, 1916-1918), London, 1919,pg. 262.

literate upper classes the principal targets of this new knowledge."[97] The colonial state was gradually beginning to recruit Indians for the PWD and they preferred to take in Indian elites for these jobs so as to "meet the need for technical expertise without rocking the boat socially."[98] Thus it was necessary to make engineering education attractive for the upper classes by cutting off the lower classes and other kinds of more practical technical training from it.[99] In the process technical education moved mostly to the classroom from the shopfloor, even though complaints about the lack of the practical orientation of Indian higher classes and castes remained. Colonial engineering education became an "elite persuasion associated with conceptual knowledge" imbued with "mathematical formulas" more than any "hands-on learning".[100] And state technical scholarships for foreign technical education became available only to students who had a prior formal education, thus again shaping technical education policy along lines of social stratification that already divided Indian society.[101]

It is possible to think through the case of the development of electrical education in Bengal through Subramanian's reasoning to a considerable extent. Of course the learning and practice of electricity did not immediately follow from any traditional artisanal pursuit or mechanical practice or from certain (caste) groups attached to such practice as already prevalent in India. But nonetheless we saw in the second chapter of this thesis how from the very beginning of setting up electric plants in places like colonial Calcutta in the late 19th century, a native underclass of electrical workers emerged as significant intermediaries who provided the crucial labour of installation and maintenance. The term 'unskilled' was not immediately applied to such workers. Instead, what comes into relief in accounts of early electrical innovators in colonial India was the ingenuity of such workers and their capacity to pick up the tricks of the new electrical trade. Some such workers also ascended the technical hierarchy to develop indigenous concerns like Dey, Sil and Co., that made their own inventive and innovative contributions to the development of current electricity equipment and networks in India.

[97] Subramanian (2019, 37).
[98] Subramanian (2019, 42).
[99] Subramanian (2019, 44).
[100] Subramanian (2019, 36).
[101] Subramanian (2019, 46).

By the first decade of the 19th century however, a clear dominance of European firms connecting up consumer and government installations is more visible. But as we saw in the third chapter, native contractors and individuals were still positioned as a crucial group of workers who continued in the electrical trade by executing an irreplaceable role as intermediary maintainers and installers who were sub-contracted to keep the uncertainty of early electrical systems and equipment under control through their very necessary tinkering. The 'fan case' in Calcutta made evident how the work of such intermediaries raised official eyebrows. Yet it also showed that these intermediaries certainly remained attuned to their tasks of keeping early electrical installations working in a reasonably satisfying manner for the electricity-using public in the city.

These intermediary electrical workers were still nowhere located within the concerns of the new colonial policy of electrical education. In the metropole, with the development of alternating current and theories of induction, mathematical and theoretical formulations of electricity took centre-stage even as electricity continued to remain an intensely practical exercise.[102] This took more time in the state institutions of the colony where engineering education beyond civil engineering was introduced as an apprentice-style teaching of electrical and mechanical technicalities, like at the Sibpur Engineering College. As Principal Heaton mentioned in the famed 1912 Atkinson-Dawson report on technical education in India, there was "no special recognised course of theoretical training in mechanical and electrical engineering at the college."[103] But nonetheless this education was not necessarily aimed at any lower classes or castes and the sharpening of their technical ingenuity and intuitiveness. Rather the idea was to train a class of electrical technicians as "Improvers", who could serve as foremen or overseers of wiring and installation work or as "superintendents and assistants in power stations" amongst other things.[104] The BTI too through its secondary course sought to "prepare students as…foremen and assistant engineers" and through its "higher level course" sought to

[102] See Hunt (1983), Hughes (1983, 140-174).
[103] 'Civil Engineering College, Sibpur', Report on The Enquiry to bring Technical Institutions into closer touch and more practical relations with the Employers of Labour in India by Lieut-Colonel E.H. deV. Atkinson, R.E. and Tom. S. Dawson, Esq. Calcutta, 1912, pg. 22.
[104] 'General Object off the Enquiry', Report on The Enquiry to bring Technical Institutions into closer touch and more practical relations with the Employers of Labour in India by Lieut-Colonel E.H. deV. Atkinson, R.E. and Tom. S. Dawson, Esq. Calcutta, 1912, pg. 3.

introduce theoretical principles of physics and mathematics within compulsory papers in mechanical and electrical training.[105] These changes in educational policy made the classroom the primary medium of electrical education and practically reserved this space for the Bengali middle and upper classes. Along with this, incentives like state employment and foreign education scholarships and the industrial impetus set by the Great War gradually brought the same classes to electrical engineering as both a respectable and a paying profession.

For Sarkar, a "shift of emphasis" from artisanal and practical training to the industrial and more conceptual training of the classroom was also evident in the early twentieth century nationalist thinking on technical education. But he argues that this was "inevitable" as there was a great disjunction created "between machine-based industry and the 'artistic hand industry'" due to "the application of steam and electricity on a stupendous scale to machinery."[106] However, the incidence and continuity of the intermediary group of wiring men and *mistris* that so troubled the colonial electrical technocracy urge us to go beyond this very obvious distinction that Sarkar maintains. Clearly as electricity and electrified industry expanded, the need for an intermediary class of labour doing manual, skill-based technical work also expanded simultaneously. And both colonial education and regulatory policy effectively devalued this work by gradually consigning it to the category of skill-less or 'unskilled', rather than perform an 'inevitable' ascent towards any obviously higher level of electrical knowledge and practice.[107]

The calls for instituting technical qualifications for wiring men and *mistris* sounded at the Conferences of the Electrical Inspectors (1915-1918) were thus perhaps already somewhat belated. By the time this need for technical education of such intermediary 'unskilled' workers was being expressed, electrical engineering was already being established as a classroom discipline that was only accessible to those with a definite formal kind of prior education. 'Skill' or the lack of it made sense in contrast to this system of education. On the other hand, given this institution of a formalised classsroom

[105] Sarkar (2020, 56).
[106] Sarkar (2020, 54).
[107] The same could be said of the shift in nationalist thinking around technical education that Sarkar finds to be an 'inevitable' change in view of changes in industrial setups in colonial India since the early twentieth century.

discipline, the practical training to be offered to wiring men and mistries would also not lead to any necessary upward mobility in the trajectory of their working careers, even if they were to adopt it. Thus it would seem hardly surprising that "youths" who had "joined as apprentices at Stuart-Menteth's "own office", had left within a few months to "set up as Electrical Engineers and contractors" without completing this apprenticeship, even though it was presumably a great opportunity.[108] Moreover, the calls for training such intermediary workers and *mistris* were belated also as electrification processes in a city like colonial Calcutta were already in motion for at least the two prior decades. In this time, as the representative of CESC pointed out at the Second Conference (1917), a considerable number of *mistris* and single man wiring firms had cropped up that critically mediated the relatively cost-effective expansion of electricity distribution into the homes, offices and mills of the city. They were thus very useful both for consumers and the licensee. These men of course did not have professional training and probably picked up their learning in the 'traditional Indian way'. Did this necessarily imply that they were unskilled?

Provisional probing of this point through newspaper accounts and the views of colonial commentators leads to more ambiguous answers. The native electrical *mistri* for instance was key to stopping many an accident in early twentieth century Calcutta, even having at times to teach European customers a thing or two about the new technology. Not always was such pedagogy appreciated. In June 1906, Jogessur, the "head *mistry*" of Messrs. Kilburn and Co was sent to check on the report of electrical wires being on fire within the premises of Mr. Sanford on 55 Park Street.[109] On his arrival Jogessur found Sanford and his servants throwing water on the burning wires. He asked them to stop the main switch and not to throw water. This "insolence" annoyed Sanford who assaulted the mistry.[110] In August 1913 another electric *mistri* again came to the rescue when he managed to stop a

[108] 'The licensing of electric wiring contractors', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 64.
[109] Anon. 'Alleged Assault', June, 7, 1906, *The Indian Daily News, Overland Summary,* pg. 10.
[110] *ibid*.

fire that broke out in the bar library of the Calcutta High Court due to the fusing of electric wires.[111]

Otherwise, the electric *mistri* does not necessarily come across as a fundamentally skill-less character. While giving his witness to the IIC Meares did not demonstrate a very high opinion of newly minted Indian engineers. But he described the "Indian workman, and especially the Sikh" to be "extraordinarily clever in learning the technicalities and practical difficulties of wiring work."[112] In a paper read at a March 1913 meeting of the Institution of Electrical Engineers in Calcutta F.J. Robins spoke of "the artizan class generally included under the comprehensive title 'mistry'."[113] Under this term he included men who had served as apprentices "in a workshop as a fitter, or turner or armature winder".[114] Such a man he described to be "an excellent worker, steady and painstaking and interested in his work."[115]

Otherwise Robins pointed to a second "class of handy man" included under the 'mistry' category, who worked "as coolie to a trained and recognized mistry, who picks up a very superficial knowledge of mechanical or electrical work and who by means, fair or foul, gets possession of a chit from a sahib,…which enables him to get a fresh start,…as an electrical or mechanical mistry."[116] We cannot necessarily make out from Robins' limited remarks at what threshold the practice of apprensticeship could lead to the production of a 'trained' *mistri* as opposed to a 'superficial' one. The recognition of the sahib's 'chit' seems to have been more determining in this. This informal mode of recognition of technical learning was however hardly limited to native *mistris*. In 1911 for instance, a European man, Mr. William Rogers, 24, was charged with having forged a letter from Jutice Stephen of the Calcutta High Court in order to get a job at CESC. This shows the more general prevalence of the practice of informal recommendation in sourcing

[111] Anon., 'Indian News in Brief. Yesterday's Telegrams.', *TOI*, August 23, 1914, pg. 9.
[112] 'Witness No. 472. Mr. J.W. Meares, M.I.C.E., M.I.E.E., Electrical Adviser to GOI. Written Evidence', Minutes of Evidence taken before the Indian Indistrial Commission, 1916-1918. Vol. V. – Punjab, Assam, Burma and General, East India (Industrial Commission, 1916-1918), London, 1919,pg. 722-723.
[113] F.J. Robins, 'Technical Education in India'. Paper read out at the March Meeting of the Institution of Electrical Engineers, Calcutta Local Section, *Indian Engineering*, April 5, 1913, pg. 193.
[114] *ibid*.
[115] *ibid*.
[116] *ibid*.

electrical employment.[117] Moreover (as Stuart-Menteth had also pointed out at the Second Conference), along with such informal modes of recognising *mistris*, the employment of inadequately trained men in wiring work in colonial cities also owed much to the laxity of electrical firms and licensees. As Meares explained to the IIC, there were enough competent men "to ensure that good work shall be done", especially "where the supervision is competent and honest."[118] However a "large number of firms" instead carry out such wiring work "at cut prices, with the worst material, incompetent labour and no supervision."[119]

Summing up the views discussed, it is possible to see that there was not necessarily a complete dearth of capable electrical workers who could do wiring work in early colonial contexts of electrification like in the city of Calcutta. Many such men were critical in fact in making sure that a safe, effective and working connection was established and maintained between the licensee's mains and the consumer's installations. And it is still possible that over time, many others might have joined this trade who were still inadequately practiced in electrical technicalities, perhaps learning more on the job, while also jumping into the ready market of electrical services to start making a quick earning from it.

The city of Calcutta, with an early start of the electricity distribution system as well as on count of being the primary experimental ground of the regulatory flexibilities formalised through colonial electrical law, could well have provided the most receptive terrain for a variety of such electrical workers and their patronage by European electrical firms. Thus the CESC representative vociferously argued to not push away the single man *mistri* in the city who seemed to have effected 70% of the connections made to the company's mains.[120] The combination of both 'trained' and 'untrained' *mistris* and wiring men must have continued to dictate the Calcutta market for electrical wiring, installation and

---

[117] Anonymous, "Chief Justice's Son", *TOI*, March 10, 1911, pg. 8.
[118] 'Witness No. 472. Mr. J.W. Meares, M.I.C.E., M.I.E.E., Electrical Adviser to GOI. Written Evidence', Minutes of Evidence taken before the Indian Indistrial Commission, 1916-1918. Vol. V. – Punjab, Assam, Burma and General, East India (Industrial Commission, 1916-1918), London, 1919,pg. 723.
[119] *ibid.*
[120] 'The licensing of electric wiring contractors', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 65.

maintenance work well after the Conferences of Electrical Inspectors. What perhaps also continued was the practice of picking up electrical 'skills' through apprenticeship and the practice of informally recognizing such learning through personal recommendations. Thus even after some years of the setting up of classes for wiring men in some institutes like the Calcutta Technical School and by the CMC, Bombay's regulations for licensing "all electric wire-men and electric wiring contractors" were still not executed in Bengal.[121]

5. The reluctance to regulate the quality and standard of wiring and electrical installations

In completing our discussion of the question of the electrical *mistri*'s skill a last point needs to be made. While the prevalence of untrained labour in electrical wiring work in colonial India could not be denied entirely, it would at the same time be quite difficult to place the entire responsibility of the unsystematic and un-standardized forms of wiring practiced on consumers' installations with the concerned workers who connected up these installations. We have seen in a previous chapter how an anxiety about inhibiting electrical enterprise caused colonial electrical officials to remain hesitant about providing statutory validation to any standard set of rules for consumer installations, like those originating from fire insurance companies or the IEE. We can see a similar hesitancy also in the proceedings of the Conferences of Electrical Inspectors.

To recount the resolutions of the Second Conference (1917), a set of wiring specifications were denoted for government buildings and installations but the same was not done for private installations. At the Third Conference (1918) it was recognized that "Fire Insurance Associations" have "a large pamphlet full of rules; most licensees have the same; hardly any two of them agree; and little endeavour appears to be made to enforce them."[122] A representative from Fire Insurance companies urged the Conference that

[121] Anon., 'Engineering in Bengal', *TOI*, September 19, 1929, pg. 14.
[122] 'Chairman's Opening Speech', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 4.

there "be uniform statutory rules or by-laws dealing with installation work."[123] Meares suggested to them that the Fire Insurance companies bring their rules in line with the government specifications issued for government buildings.[124] However he could not guarantee a legalized stautory imposition of these rules.[125] Rather he suggested that once the government specifications were printed and put on sale, the attention of "all Electric Supply undertakings and all Insurance Companies should be drawn to it, with a view to raising the standard of wiring in India."[126]

Since the Second Conference, the question of wiring specifications also got entangled with a new concern, that of the gradually deteriorating quality of electrical material that was entering the Indian market. At this Conference, it was resolved to use "British Standards" for "wall sockets and plugs, as in other accessories."[127] This preference for British equipment was being pushed by "the India Overseas Committee of the British Electrical and Allied Manufacturers' Association", whose secretary was generally trying to impress these British standards also upon "the representatives of wholesale houses in Calcutta."[128] The preference for British equipment was however also being articulated in the context of the entry into the Indian market of what were alleged to be an inferior kind of cables from manufactories in Japan and Europe.[129]

A letter to the Second Conference from Messrs. H.T. Henley's Telegraph Works Co. Ltd. accused that misleading branding was being used by Japanese makers to proxy the mark of the English "Cable Makers' Association" and deceive cable buyers in the process.[130] Moreover, certain agents and suppliers bought these cheaper Japanese cables and passed

---

[123] 'Fire Insurance Installation Rules', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 40.
[124] *ibid*.
[125] *ibid*.
[126] 'General Conditions of Contract for Electrical Works', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 39.
[127] 'Standardization of wall plugs and sockets', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 62.
[128] *ibid.* pg. 61-62.
[129] 'Use of C.M.A. label', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 60.
[130] *ibid.*

them under their own name with the assurance that these agents were themselves members of the said British association.[131] In view of these new apprehensions, the Conference resolved to include a clause in the model specifications for government installations to compel respective contractors to declare in the tender if non-British material was being used for their wiring schemes.[132] But once again the terrain of private installations remained unregulated in this regard. At the Third Conference a deputation from Fire Insurance companies from Bombay "urged that legislation should be introduced to enforce proper labelling of all coils of wire."[133] In the discussion it was admitted that the present position was unsatisfactory. But it was also apprehended that if any "special treatment" was accorded to cables in terms of their labelling, this could be demanded for "every other class of goods."[134] Instead the responsibility was again trasnferred to insurance companies who were suggested to refuse "inferior quality" material to deter other purchasers from buying them again.[135]

The Conferences of Electric Inspectors (1915-1918) were prodded on several instances to propose legislations on all three significant problems that contributed to the unsatisfactory and un-standardized state of wiring on consumers' installations in India. Firstly, there was the question of the licensing of wiring men or wiring contarctors which the Conferences. This was eventually designated to the jurisdiction of individual provinces in spite of a lurking sense that a vast pool of 'untrained' workers were setting up installations in ways that were both dangerous as well as lacking any systemic uniformity. With the 1922 Indian Electricity Rules, Rule 40-A was added to embody this option of seting up licensing systems to validate wiring contractors as left entirely to the discretion of particular provincial authorities.[136] Some provinces like Bombay set up such licensing systems but others like Bengal continued to avoid such licensing in favour of

---

[131] *ibid.*
[132] *ibid.* pg. 60-61.
[133] 'Labelling and Identification of Cables', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 40.
[134] *ibid.*
[135] *ibid.*
[136] '40-A. Precautions to be Adopted by Consumers and Owners, Electrical Contractors and Electrical Workmen,' Appendix I. The Indian Electricity Rules, 1922, in J. W. Meares, The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910 Act IX of 1910, Calcutta, 1933,pg. 328.

more informalised systems of learning and executing wiring work. Wiring men or *mistris* however could be controlled through other means, like statutory rules set for the wiring of consumer installations. On this second issue rules were pronounced by the Conferences for government buildings but not for private consumers' premises. In 1918, Fire Insurance Associations of Bombay, Calcutta and Madras together petitioned the government once again to make "enforceable by law" a single set of wiring rules and regulations for electric light and power installations in India. Replicating the verdict of the Conferences of its Electric Inspectors, the GOI expressed its inability to agree with this demand. As rationale for this, it declared that the main object of the Rules under the Indian Electricity Act was "never intended to be, the protection of property, but that they were framed with a view primarily to the protection of life."[137] It further stated that introduction of wiring rules with statutory force "would throw the onus of inspection on to the Government staff" and the government did not want to make itself responsible for ensuring that every electric installation in India "was carried out to a certain standard."[138] Thirdly, the Conferences or the government also did not take any definite measure to control the use of inferior quality material on consumer installations.

These problems concerning the unsystematised and potentially risky state of electrical installations in India of course continued to proliferate. Looking at the Fourth Conference proceedings of 1928, we can very well confirm that they had become distinctively structural features of electrical practice in the colony. The Fourth Conference discussed the persisting problem of the technical learning of intermediaries on several different counts. It was noticed that supply companies "often employed men in charge of their generating plant or power house who are not qualified Mechanical or Electrical Engineers."[139] Yet no action was recommended since the electrical officials of the government chose to "not interfere with licensees."[140] The Conference also noted somewhat helplessly that many "unauthorised persons" continued to work with minimum

[137] 'From D.G. Harris, Under Secy GOI, PWD to The Joint Secy, Government of Bombay, PWD', February 13, 1918, No. 47-Elec. in GOI, PWD (C.W.-Elec.), Pro. No. 6, for July, 1918, IOR/P/10385.
[138] *ibid*.
[139] 'Proposed Section 3(g)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 12.
[140] Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 13.

protections while working on electric lines and apparatus.[141] Additionally, it was again proposed to make an enforceable law that a licensee would not connect a consumer's premise unless the work of installation was carried out "*by a licensed eletrical conductor*."[142] Yet this stricture was ruled out considering many provinces like Bengal had no system of such licensing.[143] It was still proposed that for mills, installation work had to be conducted by "duly licensed and certified persons". But again the proposition was rejected with the reasoning that mills usually employ "their own staffs" or "firms of recogised standing" for such work.[144] Some of this regulatory indecision was also exhibited in case of specifying wiring standards. The Conference discussed how in Great Britain "as a result of numerous accidents" the ends of cables entering appartus like "generators, motors or transformers" were "entirely enclosed."[145] It was suggested to replicate this in India. But the Conference eventually decided against this.[146]

Otherwise the Conference sought stricter measures to control electrical installations in line often with contemporry British and international standards, though not pronouncing any exhaustive list of statutes or rules to discipline the wiring of consumer installations. The Conference thus decided to allow the licensee to refuse connection "in a case of unsafe wiring fittings or apparatus."[147] A recommedation was also made that the licensee should adopt the "the I.E.E. Rules for testing" while making its decision to connect consumer's premises.[148] The Conference also discussed whether if this matter was best "left to each Local Governments."[149] Eventually the Conference also took cognizance of

---

[141] 'Proposed New Rule 40-B', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 78-79.
[142] 'Rule 23(1)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 66 (emphasis in original).
[143] 'Rule 23(1)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 67.
[144] 'Rule 40-A. sub-rule (1)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 79.
[145] 'Rule 51(c)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 86.
[146] 'Rule 51 (c)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 87.
[147] 'Schedule, Clause VI(1)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 47.
[148] 'Rules 23, 24 & 25', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 66.
[149] 'Rule 23 and 24', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 67.

rising number of electrical accidents and recommended a number of precautionary measures at least for workers working on aerial lines or other kinds of electrical apparatus operated by the licensee.[150] However given that the Conference's proposals did not eventually yield any statutory measure, such proposals were not really legally enforced.

A perusal of the evidence recorded in 1931 during the enquiry of the Indian Tariff Board on the question of the grant of protection to the manufacture of electric wires and cables in India allow us to further grasp how the regulatory indecision in matters of wiring contractors and wiring standards had spawned certain long-standing and somewhat uncontrollable problems. The enquiry was conducted in response to the Indian Cable Company's petition to raise the import duty on "inferior and therefore low priced cables."[151] The company argued that such cables majorly imported from the "continent" (Europe), Japan and other places offer "a very unfair form of competition." But importantly, it also claimed that "the use of this cable is dangerous to life and property."[152] The company further asserted that in India the "average user" knew little of "respective qualities" of the cables and was instead being "attracted by a low price to his own detriment."[153] The increase in the import of such 'inferior' cables was shown to be "enormous" thus causing even greater cause for concern.[154]

The Indian Cable Company's allegations about the inferior quality of cable imports into India were broadly agreed upon by almost all witnesses invited by the Tariff Board. But its demand for a renewed import duty on imported cables was opposed by most British and Indian commercial interests. The Bengal National Chamber of Commerce pointed out that though the cable makers manufactured in India, they were "a purely European

[150] See for instance, 'Rule 51(c) and Rule 51 (e)', Proposed Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 87.
[151] 'From The Indian Cable Co. Ltd. to The Hon'ble Secy, Electrical Contractor's Association', July 8, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 273.
[152] *ibid.*, pg. 273-274.
[153] *ibid.*, pg. 274.
[154] 'Mr. Leake, The Indian Cable Company, Limited. B. Oral', August 21, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 62.

concern."[155] It thought that the imposition of a "protective tariff" to the benefit of this firm would harm the "future development of Indian firms" looking to manufacture electrical items.[156] The BNCC also argued that if the price of imported cables rose due to the tariff, "electrification schemes of mofussil districts" would be "seriously retarded".[157] The British Indian Electric Committee (an association of CESC and other British-owned supply companies in India) agreed with the Indian Cable Co. that "the ordinary Indian house-holder, the small Indian industrialist and the small retailer" needed more knowledge in terms the material required for the safe and reliable conduct of electricity.[158] But the organisation opposed the demand for import duty arguing that the removal of such duties would actually make higher grade British imports cheaper and thus more accessible to the small consumer in India.[159] On the other hand the electrical manufacturers Siemens Brothers & Co. argued that raising the import duty would actually result in "a tendency for manufacturers of inferior cables to still lower the quality in order to compete."[160]

It is useful to discuss the alternatives to raising import duties that were proposed by witnesses and the situation of wiring and electrical installations in India that demanded such measures. In the course of the proceedings of the Tariff Board the history of cable import into India was discussed by Mr. J. Parkinson of the CESC.[161] Till 1914 it was mostly British cables with the mark of the Cable Manufacturers' Association (C. M. A.) that were being imported whose quality "was good."[162] But right before the War various other firms mushroomed in England that started importing into India along with

[155] 'Bengal National Chamber of Commerce, Calcutta. Letter No. L. L./M. S.-31,' July 20, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 291.
[156] *ibid.*, pg. 292.
[157] *ibid.*, pg. 293.
[158] 'British Indian Electric Committee. A.-Written. Letter from Mr. J. Parkinson, Acting Agent, CESC, as representative of the British Indian Electric Committee', July 25, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 244.
[159] *ibid.*, pg. 245
[160] 'Messrs. Siemens Brothers & Company, Limited, Calcutta', Letter dated July 3, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 79.
[161] 'Mr. Parkinson, The British Indian Electric Committee. B. Oral', August 24, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 252.
[162] *ibid.*

"Japanese and Continental firms." After this, supposedly the quality of switches being imported dropped and then that of the cables.[163] On inspecting the wires made by some such manufacturers in a place like Calcutta after two to three years of their usage, it was invariably found that their insulation or rubber coating had "perished."[164] They had also apparently become "entirely inelastic and almost brittle" and were largely covered with "black deposits" of "copper sulphite."[165] This made them entirely "unsuitable for service."[166] Another witness pointed out that the kinds of tests that the licensee conducted on the consumer's installation before making a connection often were not sufficient to detect a "defective wire".[167] Even after passing such tests for leakage and insulation, "the inferior cable" would gradually deteriorate "much more rapidly."[168]

Such wires while requiring replacement too soon, were also thought to pose considerable dangers. As Mr. Bland of Henley's Telegraph Co. explained, in India with so many people walking "bare feet" the danger was much higher.[169] Also defective wires posed more dangers of electric shock in Indian houses with "stone or earth floors" instead of the wooden or carpet flooring common in England and Australia.[170] Also, with a lower standard of life, the smaller consumer in India was at greater risk since he tended to buy cheaper and thus a lower grade of electrical material. Such electrical material also made risky conditions on "bazar streets."[171] Another witness commented that in the Indian

[163] *ibid*.
[164] 'President of Tariff Board, The British Indian Electric Committee. B. Oral', August 24, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 252.
[165] *ibid.*
[166] *ibid.*
[167] 'Mr. O. M. Meares, The British Indian Electric Committee. B. Oral', August 24, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 256.
[168] *ibid*. pg. 257
[169] 'Mr. Bland. Messrs. W. T. Henley's Telegraph Works Co,…B.-Oral,' August 22, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 87.
[170] *ibid*. pg. 88
[171] *ibid*. pg. 101.

conditions of wiring with defective cables, danger was somewhat ubiquitous even if the immediate number of "actual accidents" formally counted were less.[172]

Instead of raising import duties, one alternative suggested to control the import of defective material and thus effectively control the proliferation of sub-standard installations and their attendant dangers was to introduce a "system of testing" imported cables at the "Port of entry."[173] However as Mr. Bland claimed, that would be "a laboratory test and nothing else."[174] Thus this test would require supplementary measures that would also govern electrical equipment even after their entry into the Indian market. One such measure was "prescribing standards" of wiring in consultation with electrical experts in India.[175] Another measure was to proceed with generalising Rule 40-A that would allow for contractors to be licensed. It was mentioned that there were "so many contractors…working without license."[176] The Bengal Chamber of Commerce strongly recommended implementing Rule 40-A in Bengal where such licensing was not in place.[177] Finally, the proceedings also raised repeatedly the question of having more rules to vest greater powers "in the hands of Local Governments and Electric Supply Corporations" in order that they can better test and inspect wiring installations.[178] There was even talk of creating an Inspection Department that would keep "a look-out for"

---

[172] 'Mr. O. M. Meares, The British Indian Electric Committee. B. Oral', August 24, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 258.

[173] 'Messrs. W. T. Henley's Telegraph Company, Ltd. Calcutta. A.-Witness', Letter dated July 20, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 81.

[174] 'Mr. Bland. Messrs. W. T. Henley's Telegraph Works Co,…B.-Oral,' August 22, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 91

[175] 'President of Tariff Board, The British Indian Electric Committee. B.-Oral', August 22, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 101.

[176] 'Mr. Sandwell, Messrs. J. C. Karaka and Co., Bombay, B.-Oral,' August 30, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 125.

[177] 'Bengal Chamber of Commerce, Calcutta. Letter No. 2866-1931, to the Secy, GOB, Commerce Dept. and copy fwded to the Secy, Tariff Board', August 18, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 296.

[178] 'Mr. Sandwell, Messrs. J. C. Karaka and Co., Bombay, B.-Oral,' August 30, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932, pg. 126.

particular cables that performed badly and "warn the importer that the quality must be improved."[179]

There is little evidence to suggest that any of these suggested correctives were eventually implemented in colonial India. It is also unlikely that till the Second World War there was any necessary change in the import of different kinds and grades of wires and cables into the colony. We could otherwise read the proceedings of the Tariff Board with a marked degree of familiarity in relation to our discussion of the Conferences of Electric Inspectors. Quite clearly, the reluctance in these Conferences to specify wiring standards and specifications for consumer installations coupled with the difficulty of formalising the status of wiring men or contractors through licensing in provinces like Bengal had translated into myriad problems. One obvious issue that the Tariff Board proceedings highlight was the deployment of sub-standard equipment in consumer installations. This in turn seems to have accentuated the effects of colonial regulatory indecision. Such effects consisted of the impossibility of making fixed standards with respect to electrical practice of both licensees and consumers and the increasing dangers of electricity use in colonial cities like Calcutta. In many ways this after all was the most significant legacy of colonial electrical administration.

6. Meter problems discussed at the Conferences

Another issue related to the consumer-licensee relationship that continued to affect the discussions at the Conferences of Electric Inspectors was that concerning electric meters. As discussed already in the previous chapter, like other things electrical, the colonial technocracy had also found it difficult to develop processes of standardizing meters in colonial India. The deliberations around the 1910 Electricty Act and its associated rules evinced that this situation developed due to the limited resources dedicated both in terms of personnel deputed towards electrical inspection as well as the inadequacy of the imperial laboratory in Calcutta of handling the legally-mandated task of testing and certifying meters as 'correct'.

[179] 'Mr. Leake, The Indian Cable Co., Ltd., B.-Oral,', August 21, 1931, in Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932,pg. 64

The situation was further complicated by the entry of a large number of cheaper "electrolytic meters" that had come to be commonly used for connecting "the large mass of small consumers".[180] At the First Conference (1915) J. S. Pitkeathly, Electric Inspector for Delhi raised the issue that BOT certifications of the meters being brought into India were "useless", "owing to climatic conditions and lack of jurisdiction."[181] He proposed that "all types of meters" be "investigated by a central body (Imperial) under the conditions actually obtaining" and only then approved for use.[182] He had been dissatisfied with the performance of electrolytic meters that tended to register a high amount of consumption even when disconnected, in tune with the temperature touching 110 degrees or more as it did in Delhi.[183] The Conference generally criticised the use of electrolytic meters in plains but rather than a concerted programme of imperial testing or standardization, it suggested that individual provinces develop their own laboratories or refer meters to the GOI standards maintained at the central laboratory in Calcutta when need arose.[184]

The topic of electrolytic meters was again broached at the Second Conference (1917). Mr. Eastgate, the Electric Inspector of Punjab claimed that while electrolytic meters need not be entirely inaccurate, the problem with them was that they had "to be frequently set to zero, which can be done at any time and by any person merely by tilting the meter."[185] This allowed the meter to be "fradulently reset by the consumer, or by the licensee." In case of the not-so-rare disputes arising between consumer and licensee regarding meter readings, the Electric Inspector (EI) was mandated by law to intervene and settle the dues based on meter recordings previous to the dispute being raised. Eastgate however wondered if the Act left too much to "the discretion of the Electric Inspector" regarding settling dues as he had to take a call on "how long the meter has been incorrect, or

[180] 'Meter rents and other miscellaneous charges of licensees', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 8.
[181] 'Approval of types of house meter, maximum deand indicator, etc.', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 9.
[182] *ibid*.
[183] *ibid*.
[184] *ibid*.
[185] 'Definition of a "correct meter" (Rule 2(d))', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 16.

whether it was ever correct."[186] In this context the Conference invoked and agreed with the opinion of the Advocate General of Bengal (from July 1915) that reconfirmed that the EI is compelled to wield the power designated to him under the Act to settle such disputes irrespective of what the status of the disputed meter had been prior to his intervention.[187] In effect this enlarged the scope of the personal judgment of the EI in settling meter disputes, that were clearly being rendered more acute by the coming of new kinds of electrolytic meters.

At the First Conference another issue was also raised that while these new electrolytic meters were cheap, the licensees nonetheless extracted a steep rent for them from consumers that at times even "exceeded the cost of the energy in small installations."[188] The Conference still decided against the possibility of abolishing or limiting meter rents as this would entail a major revision in the law.[189] A similar reluctance to go beyond the legal stipulation to allow all types of meters prevented the First Conference from endorsing the use of watt-hour meters over ampere-hour meters.[190] The watt-hour meter implied paying "only for energy actually supplied."[191] But the ampere-hour meter even under conditions of falling voltage - as was alleged to be the case in Calcutta – recorded similar consumption, thus making "a direct gain to the licensee of so much per cent over and above what he supplied."[192]

At the Second Conference, Eastgate urged some legislation on the subject of specifying types of meters as neither Local Government nor consumers under the current statutory limitations could "object to the use of any one type of meter."[193] Meares stated that deliberating on such "technical questions" would require "expert investigation if funds

---

[186] 'Meter Disputes', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 17.
[187] 'Opinion', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 17.
[188] 'Meter rents and other miscellaneous charges of licensees', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 8.
[189] *ibid*.
[190] 'Watt-hour an ampere-hour supply meters', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 9.
[191] *ibid.*
[192] *ibid*.
[193] 'Approval of tyoes of house meter, maximum demand indicator, etc.', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 67.

and facilities could be obtained."[194] In any case this would "take years of work."[195] Meanwhile he preferred to rely on the law's existing requirement of having the licensee supply a metter with a maximum rate of 3 per cent error, even if this meter was not certified by the Inspector and even when some EIs "have no laboratory, and therefore cannot either certify a meter or even settle a dispute as they are bound by law to do."[196]

The Conferences of Electric Inspectors thus again largely side-stepped the question of the standardization of meters at a time when it was being posed with renewed urgency. It instead wielded existing electrical law in colonial India to the advantage of electrical licensees who clearly benefitted from the new kinds of meters in operation. These meters often seemed to record larger consumption amounts and allowed a significant surplus to be collected in terms of meter rents. Reading the proceedings of the Conferences, we however get a sense that the legality of meter dispute was also increasingly being used by the consumer as a tool to contest the licensee's expanded powers. However the Conferences again largely sided with the licensee when deliberating on such matters.

In the First Conference Pitkeathly brought up the recurring problem that when a consumer refused to pay his bill and was about to be disconnected, he had resort under sec 34 of the 1910 Act to contest the meter reading with the EI and thus postpone disconnection "for a considerable period".[197] The Conference resolved that the EI and licensee in such cases could "demand a security deposit corresponding to the total sum involved."[198] The resolution was not uncontested with significant dissent presented by McIntyre, the EI of Bihar and Orissa and Mr. Greenwood, the EI of Madras "on the grounds that the licensee has power enough already to protect himself."[199] A second modality of contestation adopted by consumers that had emerged as a rather contentious problem for licensees was the use of rule 107 to refuse entry to his premises to the

[194] *ibid*.
[195] *ibid*.
[196] *ibid*.
[197] 'Disputed Meters', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 9.
[198] *ibid*.
[199] *ibid*.

licensee's meter readers or technicians "on the ground of religious observance or the presence of ladies."[200]

At the Second Conference, Winkfield of the CESC urged that the licensee should have the right "to cut off a consumer who wilfully refuses to allow his meter to be read" with the EI being empowered to sanction this.[201] Eastgate of Punjab found this objectionable as it would be "making a policeman of the Electric Inspector"; rather he preferred that the matter be subjected to arbitration by judicial courts if the consumer objected to his supply being cut off.[202] Eastgate also opposed the proposition that a consumer should have to deposit some fee with the licensee when challenging the meter. McIntrye on the other hand suggested that the licensee could pursue legal prosecution of the consumer by section 20 of the Act in order to get entry and he suggested this as the remedy rather than cutting off supply.[203] The Second Conference eventually resolved – with McIntrye again dissenting – that an amendment to section 24 of the Act be made in order to enable the licensee to cut off supply if the consumer disallowed entry to meter-readers or other technicians.[204]

At the Third Conference (1918), the Electric Supply and Traction Federation of India (introduced earlier) presented the renewed demand of securing a deposit from the consumer in case of a meter dispute being referred to the EI, which would be a sum of "the amount in dispute" and "subsequent charges for current until dispute should be settled."[205] Meares admitted the concern and found it reasonable that "a deposit should be

[200] 'Entry on premises', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 16.
[201] 'Disputed Meters. Entry on premises.', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 41.
[202] *ibid*.
[203] *ibid*., pg. 42.
[204] *ibid*.
[205] 'Meter Disputes and Disconnection of Consumers (sections 24 proviso and 26)', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 17.

made for the disputed consumption."[206] The Conference resolved to take this up during the amendment of the Act.[207]

Meter disputes in early twentieth century Indian cities were not simply those between the residential or small consumers (like Cleghorn whom we encountered earlier) and the licensee. It is possible though that it was with this class of consumers in mind that the Conferences made broad concessions to the licensees concerning the metering of electric supply. The licensees were thus allowed to have significant primacy within the consumer-licensee relationship of buying and selling power. This primacy of the licensee was confirmed even though the technical basis of the settlement of disputes concerning their exhange with consumers - that was the electrical meter - was hardly free of major doubts concerning its functioning. These doubts were amplified when the meter dispute occurred between a large industrial consumer and the licensee whereby irrespective of the law, the government and licensee were compelled to make special considerations.

In January 1915 one such dispute between the CESC and the Calcutta firm Messrs. Andrew, Yule & Co. and their consulting engineer H. R. Speyer was brought up with the Bengal government. The matter was about meters installed at Andrew Yule's industrial units at the City Flour Mill, the Chitpore Jute Press, the Central Jute Press and the Monarch Flour Mill. These meters were described as "different to the ordinary consumer's meter".[208] They were "for registering three phase current" and had to be "suitable for the size of motor to be installed."[209] At the time of installation CESC was unaware of the size of motors to be connected and thus they arranged with Speyer (who supplied the motors and switch gear) to also at the same time supply the meters. Later CESC bought the meters from Speyer.[210] But they still had no instruments for testing these meters and thus claimed to not be able to verify how well they functioned. At a later date, CESC acquired some testing instruments "from home" and after testing the meters

[206] *ibid*.
[207] *ibid*.
[208] 'From The Calcutta Electric Supply Corporation, Ld., to The Electric Inspector to the GOB', January 25, 1915, No. 939, in Proceedings of the Govt. of Bengal in the PWD (MPI), for July, 1915, IOR/P/9651.
[209] *ibid*.
[210] *ibid*.

with these instruments found them "to be reading incorrectly in all cases, except one."[211] About the City Flour Mills meter that was connected up by Speyer for CESC in August 2013, the licensee did not really complain about any misfunction; it was rather Speyer who tried to show through tests that meter "was running 40 per cent fast." For the other meters, CESC complained of the reverse problem.[212]

At the Chitpur Jute Press, a series of tests by CESC with both new and old instruments in their possession in January 1914 showed the meters to be running about 60 per cent slower.[213] Speyer, representing Messrs. Andrew Yule protested that "there must be something wrong with the method of the test."[214] When the CESC then asked to run their tests and inspection again, they were refused admission to the premises of the mills. After Andrew Yule's head office finally permitted CESC representatives to enter, they "were astonished to find that our seals had been broken and the connections altered."[215] Andrew, Yule continued to refuse CESC's figures though according to the latter, even Speyer's "check meter" showed similar test results like theirs.[216] The licensee then billed Andrew, Yule for the 60 per cent slowness though they "were quite prepared to adjust" some of their billing amount should some future resolution be reached about the meters.[217] A similar situation occurred at the Central Jute Press and at the Monarch Flour Mill where CESC through their eventual tests found the meters to be recording much less than the actual consumption. For the Central Jute Press, where meters were found to be running about 40 per cent slower, Andrew Yule again desisted from validating CESC's tests and asked for all the meter diagrams in order to tally with the continental (German) firm that had sold them their meters. With the Great War breaking out, this endeavour of checking with the German firm was held up.[218]

Andrew Yule complained to the Bengal Government that it was rather unfortunate that after four years of them running, CESC was raising doubts about what were practically

[211] *ibid*.
[212] *ibid*.
[213] *ibid*.
[214] *ibid*.
[215] *ibid*.
[216] *ibid*.
[217] *ibid*.
[218] *ibid*.

the company's own meters.[219] Meanwhile they had apparently installed extra electrical jute presses on the basis of the cheaper power costs taken from the earlier bills of the CESC. They claimed that "under the Electric Act" the Supply Co., was obliged to provide them with "an accurate meter" and the consumer was "to pay only according to the units registered on such meter."[220] "In the absence of proof of fraud" they claimed that under the Act "the actual readings on the meter" should be taken as correct.[221] They also claimed over-estimation by CESC for their units being metered now on the high-tension side of their supply unlike Messrs. Geo Henderson's connection, that was apparently metered on the low-tension side of the supply. Moreover, Andrew, Yule claimed that CESC had apparently now agreed to credit them with "the excess payment due to the added percentages until a report was obtained from the Electric Inspector to Government."[222]

Andrew, Yule's dispute with the CESC also arose from the fact that while CESC asked for the intervention of the Electric Inspector (EI) of Bengal in the matter, Andrew, Yule were advised that under section 26(6) of the Act (1910), "the Electric Inspector would be unable to decide all the questions at issue owing to some of the points of dispute,…being outside this official's range of jurisdiction."[223] The EI of Bengal too was not so sure if he could after all give an opinion on the issue since it involved the status of meters which he had not had the occasion to certify as 'correct' in the four odd years in which they were running.[224] And it was eventually in the context of this case that the Advocate General of Bengal gave the opinion that the concerned rule in the matter eventually designated to the EI the responsibility of checking whether the meter was within the permissible error range of 3 per cent irrespective of whether he had knowledge of the working of the meter on a prior occasion.[225]

---

[219] 'From Messrs. Andrew Yule & Co., to The Electric Inspector, to the GOB', March 10, 1914, in Proceedings of the Govt. of Bengal in the PWD (MPI), for July, 1915, IOR/P/9651.
[220] *ibid.*
[221] *ibid.*
[222] *ibid.*
[223] *ibid.*
[224] 'From R.J.Browne, Electric Inspector to GOB to The Secy, GOB, PWD', May 12, 1915, No. 584, in Proceedings of the Govt. of Bengal in the PWD (MPI), for July, 1915, IOR/P/9651.
[225] 'Opinion' by G.H.B. Kenrick, Advocate-General, Bengal, July 12, 1915, in Proceedings of the Govt. of Bengal in the PWD (MPI), for July, 1915, IOR/P/9651.

The row between CESC and Andrew, Yule confirms the impression of a rather confused state of metering that persisted in colonial India after even a decade and a half of 'electrification' processes being underway in the colonial city of Calcutta. The meter was a specific instrument in colonial India whose technical objectivity was far from unanimously acknowledged. The meter was of various types, working often very differently in terms of the climate, or the load or demand that it encountered, in terms of the motor that it was attached to and also in terms of the unit it measured (current/ampere or power/watt) The test of the meter was also clearly not an established procedure. In case of the Andrew, Yule meters, at least three kinds of testing procedures were described – a possible test by the EI using standards maintained at the Calcutta laboratory, through instruments CESC specially procured from England to run tests and by standards that could be provided by the German makers of the concerned meters.

When considering smaller consumers, the Conferences of Electric Inspectors had little hesitation is moving towards enabling the licensee to have the most advantageous terms of securing entry into their premises or of securing a sizeable deposit from them for the time period when meters were under dispute and investigation. Andrew, Yule's case was more complicated. The EI, Browne for one was not immediately ready to take the responsibility of validating one party's claims against the other even though the consumer could in effect be blamed for extralegal procedures like breaking the licensee's seals on the meter and barring the entry of the licensee's representatives. We do not know how the case was finally resolved. But clearly the licensee CESC was already ready to make certain concessions to the consumer Andrew, Yule in terms of its revenue demand in order to reach a solution that was reasonably agreeable to both parties.

Importantly, the case possibly had some bearing when a Committee of the Government of Bengal in 1920 opposed the amendment in sec 24 of the Act that required the consumer to deposit "the amount of the licensee's charges or other sums in dispute for the deposit of the licensee's further charges as they accrue" in case he had disputed the reading ofhis meter.[226] The Committee consisted of a representative from Andrew Yule and it argued

[226] 'Sec 24. Discontinuance of supply to consumer neglecting to pay charge. Sub Section 2', Act No. IX of 1910, Indian Electricity Act, 1910 in J. W. Meares, The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910 Act IX of 1910, Calcutta, 1933,pg. 236.

that if the proposed addition to section 24 was accepted, that would make an "unreasonable" demand on "a large body of consumers, the majority of whom may have honest intentions, to deposit what may, in some instances, amount to large sums in order to protect the supply company against the dishonest intentions of a few persons."[227] This objection however could not block the amendment. Irrespective of the informal negotiations that large customers like Andrew, Yule could have with the licensee and the government, for the majority of consumers of other categories, the 1922 Amendment Act designated clearly by a new sub-section 20(2) that the licensee could cut off supply when denied entry into the consumer's premises; and by the new sub-section 24(2), proviso, the consumer was compelled to make deposits of specified amounts with the EI towards the licensee's rates and due charges even when he was contesting the mandate of the licensee's meter.[228] In both these matters, the law eventually also chose to override any human mediation of the EI, intervening in a resolute way to facilitate the licensee's cause.

However in some ways the licensee hardly seemed to have scored a uniform victory in terms of meter negotiations with consumers. At the Fourth Conference in 1928, Bombay electrical interests again described how the licensee needed more authorisation "to remove his meters as becomes necessary in routine testing."[229] The consumer apparently was taking advantage of the 24 hours' notice required to remove the meter by raising dispute and "delaying the removal of the meter."[230] It was also demanded that if the decision to remove the meter was disputed by the consumer and the same meter was subsequently "found to be otherwise than correct", all the expenses of "inspecting, testing, taking off and removing" had to be recovered from the consumer.[231] Eventually the Conference suggested bringing back the EI to decide in such matters and arbitrate

---

[227] 'From C.P. Walsh, Secy, GOB, PWD to Secy, GOI, PWD' January 19, 1920, No. 98 MPI, in Proceedings of the Govt. of Bengal in the PWD (MPI), No. 3 for November, 1920, IOR/P/10773.
[228] 'Section 20(2) and Section 24(2), proviso', Act. No. I of 1922, Indian Electricity (Amendment Act), in A Collection of the Acts of the Indian Legislature and of The Governor General for the year 1922, Calcutta 1923, pgs. 3-5.
[229] 'Section 20(1)(c), Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 24.
[230] *ibid*.
[231] 'Section 26(4)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 32.

between the two parties.[232] This was pressed by Bengal officials who reasoned that meter-related disputes were proving hard to resolve. Such dispures had been "referred to the Electrical Inspector "but no decision could be given by him as he is not empowered by the Act to do so."[233] In colonial India, personalized judgment of the 'expert' thus continued to go a long way over claims of technical objectivity.

7. The discussion around electricity theft at the Conferences

Quite expectedly, theft or fradulent use of electricity too was a major topic of discussion at the Conference of Electric Inspectors. In the third chapter of this thesis we saw how the proliferation of electricity theft in Calcutta posed various issues in terms of the judicial or legal resolution of this problem. While theft of electricity was criminalized by the 1903 Electricity Act, the major onus of this was borne in court cases by intermediary *mistris* or wiring men associated with illegally wiring up particular consumer installations. This however left open the question of how to convict and inhibit those for whose benefit such wiring was executed. In the previous and fourth chapter we saw how the development of the 1910 Electricity Act adopted one kind of legislative response to this issue. Section 39 of the Act incorporated a clause that amounted to qualifying the existence of any 'artificial means' of extracting energy as '*prima facie*' evidence of dishonest abstraction of electrical energy. By the time of the First Conference it was however amply clear that this change too was not proving enough.[234] In this regard, the Conference discussed a judgment of the Punjab High Court in 1913 that had formed a problematic precedent for the purposes of securing conviction in matters of the theft or fraudulent use of electricity.

The case was that of Ram Richhpal and Ram Gopal, two brothers who resided jointly in a house in Delhi.[235] They were earlier in the Sessions Court successfully convicted of electricity theft. In August 1912 inspection by the Delhi supply company at the premises of the two brothers discovered that "insulation had been removed in three places" in the

[232] 'Section 20(1)(c)' and 'Section 26(4)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pgs. 24 and 32.
[233] 'Schedule, clause VI (3)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 52.
[234] 'Stealing Energy', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 16.
[235] 'Appendix', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 20.

wiring of the house.[236] One such "bare place" was "just in front of the point where the wire entered the meter"; two other "bare places" were on the other wire which connected with the company mains but "did not pass through the meter."[237] This suggested that a connection could have been made between the mains prior to them entering the meter and the other wires in the house thus enabling "electrical current" to be "abstracted by this means without it passing through the meter."[238] The evidence of the foreman, meter reader and engineer of the Delhi Company adducing this point convinced "both the Magistrate and the Sessions Judge" and resultantly the two brothers were convicted under the 1910 Electricity Act and the IPC of fraudulently using electrical energy.[239]

In the High Court the judge M. Shah Din overturned the judgment of the lower court. The judgment reasoned that there was no evidence to show that there was an actual connection made between "one of the bare places on the wire which did not pass through the meter and the bare place on the other wire which passed through it."[240] Thus it could not be "definitely said that artifical means for the abstraction of energy existed at any time at the house."[241] For the judge, the baring of the wires by removing insulation only amounted to "partial, incomplete means" for the abstraction of energy. He thought that section 39 of the Electricity Act would only deem as "*prima facie* evidence of dishonest abstraction" such artificial means which would be "complete" in their mechanism of making the illegal connection.[242]

There was another difficulty that the High Court judge saw "in the way of the Prosecution."[243] He pointed out that the two accused were brothers residing in same house and thus "presumably members of a joint Hindu family."[244] Though both of them had been convicted, it was not known "which of the two petitioners is the Manager of the family or…is the registered consumer of the electrical energy supplied to the house."[245]

---

[236]*ibid*.
[237]*ibid*.
[238]*ibid*.
[239]*ibid*.
[240]*ibid*., pg. 21.
[241]*ibid*.
[242]*ibid*.
[243]*ibid*.
[244]*ibid*.
[245]*ibid*.

So the judge could not make out "on what principle both have been convicted under section 379, Indian Penal Code."[246] The tampering took place on the wires located "on the top of the house"; they would "thus be accessible not only to petitioners but also to other members of the family and to their servants."[247] The judge argued that even if it was to be conceded that by section 39 of the Electricity Act, artifical means for illegally abstracting energy were presumably found at the house, it was still difficult to presume that it was only the two brothers who could be responsible for this as "the head of the family".[248] The judge wondered how the prosecution would have proceeded if there were "five or six male members of a family living jointly in one house" instead of the two male members as in this case – would all the male members then be convicted?[249] He opined that "it would clearly be wrong" to charge such members with "criminal liability" simply because "they were members of a joint family and resided in a house which was fitted with an electric installation."[250]

Finally the judge also offered a pointed critique of the way section 39 was worded in the Electricity Act. He showed that while the first part of the section identified the culpable person as "Whoever dishonestly abstracts, consumes or uses any energy", the second part of the same section referred only to "dishonest abstraction" by "artificial means" and "not to dishonest consumption or dishonest use."[251] The section also did not "explicitly say that the existence of artificial means for the abstraction of energy shall be *prima facie* evidence of dishonest abstraction against the *consumer* of the energy."[252] Thus while under the Act the person in possession of or the one who had set up such artifical means could be prosecuted as dishonestly abstracting energy, "such person may conceivably be different from the person who consumes or uses the energy."[253] The judge then decreed that "the mere existence of artifical means for the abstraction of energy in a particular house is not sufficient to charge the owner or the occupant of the house or the person who

[246] *ibid*.
[247] *ibid*.
[248] *ibid*., pg. 22.
[249] *ibid*.
[250] *ibid*.
[251] *ibid*.
[252] *ibid*. (emphasis added).
[253] *ibid*.

consumes or uses electric current in that house with criminal liability."[254] In this sense section 39 identified artificial means as *prima facie* evidence of dishonest abstraction without necessarily "indicating the person against whom such *prima facie* evidence shall be available."[255] The judge also contrasted the semantic import of section 39 with that of section 44 of the 1910 Electricity Act. This latter section penalised the tampering of electrical equipment like the meter or the mains of the licensee by directly holding the consumer responsible. It "explicitly laid down that where the meter, indicator or apparatus is under the custody or control of the consumer, whether it is his property or not, the existence of artificial means for facilitating improper use of energy shall be *prima facie* evidence that such improper use has been knowingly and willfully caused by *such consumer*."[256]

In view of the judgment in the Delhi case and its specific criticism that section 39 in the 1910 Act was hardly amenable to securing effective convictions against consumers who actually gained from electricity theft, the First Conference proposed that the section be brought closer to the wording of section 44 of the Act.[257] At the Second Conference this matter was discussed again. In terms of thinking through an effective legislative strategy to contain theft, Raikes the Electric Inspector of Burma brought up two cases of successfully convicting electricity theft in Burma.[258] In the first of these cases M. S. Shah - owner of two buildings on Dalhousie Street in Rangoon, one rented out - was accused of the fraudulent use of electrical energy.[259] In January 1915, an inspection revealed that Shah's buildings were lit by electric light even when the main switch was off and the meter "not registering" any consumption.[260] A new, nifty way of illegally abstracting electricity came to be discovered when investigating this situation. "A device" was found in one of Shah's buildings that allowed easy connection or disconnection from an "overhead service line" in the adjoining street that enabled energy to be "taken at will for

[254] *ibid*.
[255] *ibid*., pg. 23.
[256] *ibid*. (emphasis added).
[257] *ibid*.
[258] 'Theft of Electrical Energy', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 8.
[259] 'Appendix – I', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 79.
[260] *ibid*.

both premises independently of the Dalhousie Street underground main" and by skipping the meter.[261] Shah pleaded that "he had no electrical knowledge and that some person who had such knowledge and who also bore him ill-will must have made that device to get him into trouble."[262] But the judge thought that "the only person who could profit by that fraud was the accused, the owner of the premises and there was a very strong presumption that the device referred to was put in under his instructions." Consequently Shah was convicted and sentenced to a fine of Rs. 300.[263]

In the second case of electricity theft mentioned by Raikes, the accused was Chit Htow, the secretary of the Chinese gambling club again on Dalhousie Street in Rangoon.[264] In this case the allegation was that the meter of the supply company was "tampered with."[265] The judgment in the case observed that the meter tampering could have initially been effected between 1912 and 1913 by removing the "shunt wire" of the "Ferranti meter" measuring electricity consumption on the premises.[266] The judge was conviced by witnesses that "the shunt wire could easily be removed and replaced without detection."[267] The supply company had noticed unusually low consumption at the premises and this was represented later in the court with relevant figures of the use of electrical energy that were likely not recorded by the manipulated Ferranti meter.[268] The Ferranti meter was replaced with a "new Siemens Meter". This new meter was again allegedly byapssed by making a parallel connection between the mains and the consumers' wire.[269] Quite obviously, both these acts of meter tampering required some amount of practical knowledge of the apparatus and technical principles in question, as also confirmed by witnesses.[270] This, as was usual with theft cases by then, opened up the question of whether the accused had enough technical know-how to perform the act of tampering. The judge however was convinced that "this knowledge could be acquired by

[261] *ibid*.
[262] *ibid*.
[263] *ibid*.
[264] *ibid*.
[265] *ibid*., pg. 80.
[266] *ibid*.
[267] *ibid*.
[268] *ibid*.
[269] *ibid*.
[270] *ibid*.

experiment."[271] He stated that "any Chinaman or Burman would not take more than a few seconds" to understand the process "if explained to him."[272] On this basis he ruled out placing the entire blame of the theft on the "wiring contractor" Ibrahim. The judge also argued that it did not "really matter whether he did the tampering or not for whatever he did must have been done at the orders of someone interested in reducing the readings of the meter."[273] The judgment eventually placed the entire blame of the electricity theft on Htow. It identified him as "the only person interested in keeping the bills for electricity low" as he paid the bills without referring them to the higher management of the club.[274] He was convicted and fined Rs. 600.[275]

The Burma cases as mentioned in the Second Conference described a new array of theft mechanisms that were being developed in colonial India in tandem with the extension of the electricity network. In particular the manner of tapping the overhead line of the licensee seems remarkable here. The practice was perhaps becoming possible since electrical regulation in colonial India made out extensive permissions to licensees to erect bare copper wires without insulation as overhead lines (as discussed in the third chapter). In view of this, at the 1928 Conference, one proposal had come up to enclose all conductors compulsorily in "strong casing" for safety purposes but also "to prevent the conductor being tapped for lighting."[276]

Theft mechanisms also seem to have actively kept up with new kinds of meters that mediated the relationship between consumer and licensee. The cases also illustrated that somewhat irrespective of the wording of the law, judicial reasoning could possibly identify and penalise actual possible agents who stood to gain from the theft of electrical energy. The cases of Shah and Htow in Rangoon were somewhat different from the case presented of the brothers in Delhi living in a 'joint Hindu family' with multiple members or servants. But nonetheless there was no necessarily direct evidence that connected them

[271] *ibid*., pg. 81.
[272] *ibid*.
[273] *ibid*.
[274] *ibid*.
[275] *ibid*.
[276] 'Proposed New Rule 51(2)', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 86. Of course this proposal like the others made at the Fourth Conference never made it to any body of legislation.

to the act of illegal abstraction physically. Shah and Htow thus could and did also then attribute the fact of theft to a wider domain of social actors and subordinates. In the course of making their respective defences, they also represented that they were unaware of electrical know-how that would enable them to execute the complicated technicalities in question.

Yet the fact that they were convicted nonetheless, demonstrates two things. Firstly, that the knowledge of certain kinds of electrical practice was thought by the concerned courts as having become common enough for their experimental trial by relatively lay men. Secondly, and more importantly, the Burma courts convicted on the basis of attributing greater importance to the question of *motive* in electricity theft than the skill or practical kowledge involved in it. The judgments took a leap of faith in a way to assert that even in lieu of direct evidence which would also be difficult in such cases of stealing a rather immaterial object like electricity, the motive of benefitting from electricity theft could be strong enough reason to attach blame.

However, the Conferences of Electric Inspectors were not convinced that the Burma route to conviction would be generalisable. The Delhi case instead seems to have been thought to be more representative of the legal proeedings concerning electricity theft in the colony. At the Second Conference even after the mention of the Burma cases, there was near unanimity that the law in terms of section 39 of the 1910 Electricity Act needed to be amended. Winkfield of the CESC repeated the apprehension that in prosecution of cases involving fraudulent use of electricity in Calcutta, it was proving "generally impossible" to prove the "actual culprit."[277] He thus asserted that "the consumer ought to be held entirely responsible for any illegal connection."[278] The Second Conference seems to have heeded this and thus it resolved that it was desirable "to amend sections 39 and 44 of the Act" in order that in both cases "the onus of any tampering, whether by the addition of artifical means or the removal or discontinuation of the licensee's wires, shall be on the consumer who alone benefits by such tampering."[279] The resolution thus sought

[277] 'Theft of Electrical Energy', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 8.
[278] *ibid*.
[279] *ibid*., pg. 9.

to formally end the "discrepancy between the two sections" by following the commendation of the Chief Court of Punjab.[280] At the Third Conference, The Electric Supply and Traction Federation of India urged that the monetary fines prescribed as penalty by sections 39 and 44 were not enough and instead "imprisonment would act as a real deterrent."[281] The Third Conference agreed on the enahancement of monetary fine and addition of imprisonment as punishment for electricity theft or acts of meter tampering, etc.[282]

As the proposal to amend the 1910 Electricity Act came to be discussed, the issue of changing the wording of section 39 assumed centrestage as "by far the most important amendment suggested."[283] In presenting the case for this amendment to the government Meares pointed out that even if some convictions were secured as in the Burma case, in cities like Calcutta, Delhi, Bombay or Lahore acquittals were apparently more common.[284] Licensees had thus "to a great extent given up attempting to get legal redress."[285] Meares analysed the Burma case to explain that "the conviction was based on strong circumstential evidence and on the fact that the accused alone stood to benefit."[286] But he claimed that if the arguments put forward in the Delhi case were advanced in the Burma case, "they could equally have been applied here."[287] The Delhi ruling he said was "much more likely to be followed than the Burma one."[288] For Meares, the facts of the Burma judgment however led to a stronger argument for amendment of section 39 on the lines of the demands of the likes of Winkfield of the CESC.[289] He argued that that it was difficult "in most cases to catch the man who actually renders theft possible, by making illegal connections"; and even when caught, this man would "generally prove to be only

[280] *ibid*.
[281] 'Theft of Electrical Energy (Act, sections 39 and 44)', Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918, pg. 21.
[282] *ibid*.
[283] 'Fom J. W. Meares, Electrical Adviser to GOI, to Secy, GOI, PWD', April 27, 1918, No. 304, No. 1 in GOI, PWD (C.W.-ELEC.), for November, 1919, IOR/P/10610.
[284] *ibid*.
[285] *ibid*.
[286] *ibid*.
[287] *ibid*.
[288] *ibid*.
[289] *ibid*.

an agent of the real offender the man whose bills will be fraudulently reduced."[290] The remedy then was, as Winkfield had suggested, to make the "consumer" responsible.[291]

Despite the strong endorsement of colonial electrical officials the amendment to sec 39 as suggested by the 1921 Electricity (Amendment) Bill (that became the 1922 Electricity (Amendment Act) was eventually disallowed by the Select Committee constituted by the Imperial Legislative Assembly to deliberate upon the Bill.[292] The Committee, composed of a majority of Indians and many men of business, thought that the change in section 39 "goes too far."[293] In the Council of States, member C. A. Innes acknowledged that in cases of alleged electricity theft, it was "usually impossible to prove who actually made an illegal connection" and thus the government originally proposed to lay "the onus of proving that he was not guilty of dishonest abstraction" on the consumer "for whose benefit the illegal connection was proved to exist."[294] But he explained that "a majority of the Joint Committee" felt that the amendment "laid upon the consumer an obligation which for no fault of his own he might not be able to discharge and in short that it was a dangerous remedy." The decision was endorsed without any challenge by the House and "the Government do not propose to press their original suggestion." In all likelihood this significant omission by the Select Committee and the Legislative Assembly followed from a common social conception as adopted within electrical legislation since the Delhi case, that in residential premises containing 'joint Hindu families' or similar familial units, the charge of theft was difficult to pin on to a singular entity like the head of the family or the 'consumer'.

At the Fourth Conference of Electrical Inspectors in 1928, most electrical interests continued to press hard for an amendment of section 39, again citing the problem of getting convictions.[295] Licensees sought the right of entry without providing written

---

[290] *ibid*.
[291] *ibid*.
[292] 'Clause 19', Report of the Joint Committee on the Bill further to amend the Indian Electricty Act, 1910, dated 18th September, 1921, presented in the Legislative Assembly, 26.9.21, GOI, Legislative Department.
[293] *ibid*.
[294] 'Mr. C. A. Innes. Discussion on Indian Electricity (Amendment) Bill', January 23, 1922, The Council of State Debates (Official Report). Second Session of the Council of State, 1922, Simla, 1922, pg. 649.
[295] 'Sections 39 and 44', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 38.

notice to the consumer in order to detect theft.[296] It was also brought up that in some cases the guilt of theft was still being entirely designated to "a servant of the consumer" with the usual tactical argument that the consumer had no knowledge of it.[297] The theft or fraudulent use of electrical energy seemed to have continued and in fact expanded in scope owing mostly to the legislative hesitance in making the consumer responsible for the act. The legislative hesitancy could have in turn been based upon a social construction of Indian forms of habitation as allowing varying kinds of access of different social actors to the electrical connections of the concerned premises beyond their use by the direct consumer. But in actual court cases this did not necessarily bode well at times for intermediary electrical wiring men, *mistris* or servants and bearers, who had to often take the blame of theft from which their masters actually stood to gain.

8. The earthing of electrical motors[298]

The earthing of motors had become a fresh concern in colonial India with the increasing use of alternating current (AC) in the major cities of Calcutta and Bombay since the 1910s. Before motors, colonial law and regulation recommended the earthing of overhead wires and their metallic supports, in order that falling wires did not retain current. As discussed before, this was not always very succcessfully accomplished and collapsing aerial wires often carried their original charge resulting in electrocution accidents on the streets of colonial Calcutta and elsewhere. At the time of the Conferences of Electric Inspectors, AC motors posed a new problem for the safe use of electrical energy. They were becoming very popular in both households as well as on work sites for power use of various kinds. Even on lower voltages, such motors posed a definite danger of delvering

[296] 'Section 26(4), Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 32.
[297] 'Section 39', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 40.
[298] "'Earthed' or 'connected with earth' means connected with the general mass of earth in such manner as to ensure at all times an immediate discharge of energy without danger". 'Rule 2(n), The Indian Electricity Rules 1922', Appendix I in J. W. Meares, The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910 Act IX of 1910, Calcutta, 1933,pg. 236. Earthing as described before is a safety practice of connecting motors, wires, and generally the electricity distribiution system consisting of all its components with a low resistance wire to the earth (literally) that always possesses a higher potential than any possible voltage on the other end of the connection. Thus when earthed, any excess or leaked current on the system, motor or wire should safely 'discharge' into the earth by passing to it.

fatal shocks to users quite simply because direct contact with AC had been seen to be far more dangerous to the human body than DC.

From the very First Conference, it was thus broadly agreed that the existing rule (no. 53) under the 1910 Act that stipulated the earthing of motor frames only when the supply was above 450 volts, had to be modified to also include under this stipulation all "225-volt motors."[299] In fact the recommendation was to extend the rule "to cover all motors ordinarily accessible to persons, but not ceiling fan motors."[300] The Second Conference too endorsed this proposition. At the Second Conference, Taylor, the EI from Bengal pushed "to earth all motor frames if the pressure is greater than say 125 volts…as it is admitted that in damp localities a very severe shock may be caused by pressure as low as 150 volts or less; especially if the supply is an alternating one, and the attendant has, as is usual, bare feet."[301] The Conference also expressed concern that the ambit of such rules needed to be extended even to (low-voltage) "motor applications" in "small businesses", plantations, and even in "private property" if there was the chance of endangering others by use of such applications.[302] Finally, it was also resolved to keep strict vigil on high-tension motors through the EI who had to be informed every time the position of any such motor was altered.[303]

The issue of earthing frames of electric motors of almost every kind was then one matter in which the Conferences of Electric Inspectors were fairly keen on introducing certain fixed strictures aimed at safe use of such motors. Their recommendations were carried through to the amended draft of electricity rules to accompany the eventual 1922 Electricity (Amendment) Act. Rule 45 of the said draft rules thus made it compulsory "so far as is practicable" to earth all metallic parts of motors and other electric apparatus by

---

[299] 'Earthing frames of motors', Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915, pg. 10.
[300] *ibid*.
[301] 'Earthing frames of motors (Rule 53)', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 19.
[302] 'Low-voltage installations generally, particularly those in dangerous places; doubtful cases', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 8.
[303] 'Restriction of high pressure motors used in damp places or liable to be frequently moved', Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917, pg. 25.

"two separate and distinct earth connections."[304] This did not go unchallenged. Private capital interests in Bengal opposed the proposition to earth 220 volt motors and suggested that "one earth connection is sufficient."[305] However the draft rule was passed eventually in its original form (and incorporated as rule no. 46 in the amended Indian Electricity Rules, 1922.[306] Thus, unlike some of the technical issues that have been surveyed in this chapter, the rule in question actually for once measured up to the safety requirements specific to the issue at hand, even if this meant going against the desires of private capital.

However probing the issue of earthing electric motors somewhat further shows that even with the stricture of fixed rules, the legal-regulatory processes of the colonial state were plagued with a different kind of problem related to the actual administration of the rules. Ensuring that the earthing of electrical motors was conducted in the specified manner across multiple sites, or at least those of high-tension electricity use, necessitated a certain scale of inspection staff who could ascertain that the rule was properly communicated and implemented. However as has already been pointed out in this thesis, the colonial regulatory apparatus was after all rather thin. And it appeared even thinner when it came to the requisite expert manpower necessary to govern the gradually diffusing objects and instruments of electricity use, like for instance electric motors. The way in which a lethal accident in a mine in Bengal was dealt with, rather well illustrated this.

On 22nd September 1914, at the Bengal Coal Company's Sodepur colliery, three men died from electric shock received from the delivery pipe of an electric pump that was being repaired.[307] The deceased were Raman Bauri (age 25) who was the Fitter, Udoy

[304] 'Rule 45, Chapter V, Draft Indian Electricity Rules, From Rai Sahib S. N. Banerji, Asst Secy to GOI, Board of Industries and Munitions to The Secy, GOB, PWD', May 26, 1920, No. Eng.-73, No. 1 in Proceedings of the Govt. of Bengal for December, 1921, PWD, MPI, IOR/P/10990.
[305] 'From The Secy, GOB. PWD to The Secy, GOI, Board of Industries and Munitions', December 20, 1920, No. 1517 M.P.I., No. 4 in Proceedings of the Govt. of Bengal for December, 1921, PWD, MPI, IOR/P/10990.
[306] 'Rule 46, Chapter V, The Indian Electricity Rules, 1922', Appendix I, in J. W. Meares, The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910, Act IX of 1910, Thacker, Spink& Co., Calcutta, Second Edition, 1922, pg. 290.
[307] 'G. C. Leach, Department of Mines in India. Accident Report No. (1), From G.F. Adams, Chief Inspector of Mines in India to The Secy to GOI, Dept. of Commerce and Industry', January 9, 1915, No. 206-G. No. 1 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.

Bauri (age 25) who was the "Fitter's coolie" and Bhusan Bauri (age 35) who was the "Pump Khalasi."[308] The 20 H.P. pump was run "on A. C. current of 20 amps at 500 volts."[309] The pump worked fine till 9 am on the day of the accident and then the delivery pipe was being repaired since it stopped running. While the repair was being conducted a piece of coal fell upon one the three connecting cables "and brought it in contact with the earth wire."[310] This caused a short-circuit and the current ran through the pump and the pipe and electrocuted two of men at work, Bhusan and Udoy. When two other men tried to drag them away from the pipe, they too were electrocuted. One of these two men, Raman, passed away whereas the other was injured.[311]

The electrical engineer at the colliery looked into accident and discovered the short circuit but was still "unable to explain the reason of the earth wire's inability to fulfil its purpose."[312] The EI to the Government of Bengal, McIntyre conducted his own enquiry and opined that the fatality "was undoubtedly due to an infringement to rule 53" of the existing Indian Electricity Rules that required the earthing of the frames of all high or medium pressure motors with "two separate and distinct earth connections," that was foregone in this case.[313] G. C. Leach the Mines Inspector conducted his own enquiry and surmised that the earth wire in question was not "of ample sectional area and thus "inadequate", resulting in the current passing through the body of pump and the pipe onto the bodies of the deceased.[314] He held the electrical engineer at the colliery responsible for this who had "since been discharged."[315] This engineer H. L. Frankum admitted in his witness that he "made no calculations" in determining what kind of earth wire to put in the installation.[316] He stated that he had only two fitters to aid him in tending to the electric plant and "they do not make a daily inspection of all the electric system."[317] He

[308] *ibid.*
[309] *ibid.*
[310] *ibid.*
[311] *ibid.*
[312] *ibid.*
[313] *ibid.*
[314] *ibid.*
[315] *ibid.*
[316] 'Evidence, From G.F. Adams, Chief Inspector of Mines in India to The Secy to GOI, Dept. of Commerce and Industry', January 9, 1915, No. 206-G. No. 1 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.
[317] *ibid.*

also said that he had "no definite method of inspection" and did it only when his busy schedule permitted.[318] The mining inspector also blamed the manager of the colliery on whom he thought "the burden of responsibility for the accident rests."[319]

However no prosecution was made in this matter even after clear evidence of serious procedural and technical lapses on part of the engineer and the manager of the concerned mine had emerged. This decision was mainly taken by the EI. The reason given was that prosecution was unawarranted as "up to now little or no systematic inspection of collieries where electricity has been installed, has been undertaken by the Electric Inspectors in Bengal and Bihar alike."[320] Mine managers were made aware of rules under the Mines Act, but no steps had been taken "to bring the Electricity rules specially to their notice."[321] The EI who was working "practically single handed" also "could not afford the time which prosecution would have involved."[322] Work in Calcutta was too heavy and the Bengal Government was aware for some time that "the Electric Inspector's Department needed strengthening" with separate officials being required to look over mines and factories.[323] But the Government was still apparently "not yet in a position to strengthen the Electrical Department to the extent desirable."[324]

The Chief Inspector of Mines found this state of affairs to be highly unsatisfactory and was concerned with the gradually increasing number of electrical accidents in mines. He urged that "more systematic inspection of electrical installations in coal mines is very gravely needed".[325] Towards this he suggested that "the Chief Inspector of Mines, and the Inspectors and Junior Inspectors of Mines should be appointed Inspectors under the

---

[318] *ibid.*
[319] 'G. C. Leach, Department of Mines in India. Accident Report No. (1), From G.F. Adams, Chief Inspector of Mines in India to The Secy to GOI, Dept. of Commerce and Industry', January 9, 1915, No. 206-G. No. 1 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.
[320] 'From G.F. Adams, Chief Inspector of Mines in India to The Secy to GOI, Dept. of Commerce and Industry', January 9, 1915, No. 206-G. No. 1 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.
[321] *ibid.*
[322] 'Copy of a letter No. 59 T.-M.P.I., dated the 2nd June 1915, from the Secy to GOB, PWD to Secy, GOI, PWD', No. 4 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.
[323] *ibid.*
[324] *ibid.*
[325] 'From G.F. Adams, Chief Inspector of Mines in India to The Secy to GOI, Dept. of Commerce and Industry', January 9, 1915, No. 206-G. No. 1 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.

Electricity Act."[326] He also asked that "something much more akin to the English Home Office rules" be adopted to govern electrical affairs in mines as the Indian rules were perhaps not proving very effective.[327] Interestingly, the Government of Bengal, its electrical technocracy as well as the Indian Mining Association and the BCC opposed this proposition. They suggested that "what is required is not to invest mine officials with powers of Electric Inspectors, but to appoint an additional fully qualified Electric Inspector…who should be stationed at Dhanbad."[328]

The Government of India partly overruled this zealous guarding of the terrain of electrical administration by Bengal's electrical technocracy. In view of the "rapid extension in the use of high voltage power" in the mining districts that increased the risk of accidents, the GOI went ahead and allowed the Chief Inspector of Mines to assume the powers of an EI under the Electricity Act.[329] However in 1920 The Chief Inspector himself asked the GOI to appoint a separate EI for electric installations in mines.[330] The Government of Bengal again opposed this proposition. It expressed doubt about whether "a whole-time independent officer, and the establishment of a laboratory at an approximate initial cost of Rs. 60,000 with recurring charges" was really justified for the purpose of "testing, etc."[331] Moreover, the Bengal Government wanted the EI appointed specially for mines to be subordinated to the provincial EI in Bengal in order to avoid the "risk of friction."[332]

This series of governmental deliberations occasioned by the Sodepur Colliery accident quite obviously evince that strictures and rules to govern technical conduct while necessary, need not have been enough to discipline certain aspects of technical conduct,

---

[326] *ibid.*
[327] *ibid.*
[328] 'From H.H. Green, Secy, GOB, PWD to Secy, GOI, PWD', December 21, 1915, No. 1075-M.P.I., No. 8 in Proceedings of the GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.
[329] 'From D.G. Harris, Under Secy, GOI, PWD to The Secy, Government of Bihar and Orissa, PWD.', May 4, 1916, No. 403-Elec., No. 9 in GOI, PWD (C.W.-E.), for August, 1917, IOR/P/10186.
[330] 'From S.N. Banerji, Asst Secy, Board of Industries and Munitions, to The Secy to GOB, PWD', March 26, 1920, No. Min-93, File No. 1-E-17(1), No. 5 in Proceedings of the Government of Bengal, PWD (MPI) for July 1920, IOR/P/10773.
[331] 'From C.P. Walsh, Secy, GOB, PWD to Asst. Secy, Board of Industries and Munitions', June 2 (6th), 1920, No. 66 T.-M.P.I., File No. 1-E-17(2), No. 6, in Proceedings of the Government of Bengal, PWD (MPI) for July 1920, IOR/P/10773.
[332] *ibid.*

like those involving the dispersed presence of electrical apparatus like motors (running on alternating current). Rather the need clearly was to set up an adequate contingent of expert electrical officers, long overdue, to access and control the diffuse incidence of electrical anomalies. The government's reluctance to appoint such officers was mostly on grounds of financial austerity and to a certain extent inspired by the need to preserve the exclusivity of the domain of electrical officers. Electrical accidents however hardly waited for any overcoming of this reluctance. Mines in particular had become a more dangerous place since the use of high-tension electricity. In 1921 it was reported that accidents in mines were happening "even to persons fully acquainted with the danger" like the chief engineer of a mine power station or a mine manager in recent years.[333] But otherwise the risks were particularly high for those workers - perhaps like Udoy, Raman and Bhusan - who "wearing the minimum of clothing work in a moist atmosphere in isolated situations."[334] Rules meant little for the safety of such workers when they remain locked in paper without any concrete will of regulatory authorities and the colonial state to work them through an adequate force of electrical officers and experts.

Another rather unfortunate manifestation of the hollowness of rules concerning the earthing of electrical apparatus in absence of an inspectorial demonstration or communication of the same rules was evident in the case of what was perhaps the most deadly electrical accident in the first few decades of electrification in Calcutta. On July 15th of 1925, a number of "coolies" were deployed to push a crane on the rails at the Kidderpore Docks in Calcutta since it was not moving on its own due to some malfunction. The "head mistry" at the Docks had actually wanted to "to stop the crane to see what was wrong with it, but this could not be done, as in that case the entire work would have to be stopped."[335] The coolies then worked at the crane with crowbars to move it along the rails. Suddenly "a flash of light" was seen underneath the crane after it

[333] R. R. Simpson, "Regulations for the Prevention of Accidents in Indian Mines", *Journal of Indian Industries and Labour,* vol. 1 Part 3, August, 1921, pg. 290.
[334]*ibid*.
[335] 'H.C. Chatterji, "Copy of Report of the Enquiry held by the Additional District Magistrate, 24-Parganas Regarding Accident on an Electric Crane which took place at King George's Dock on the 15th July, 1925".', August 24, 1925, Reports referred to in the reply to starred question No. IV, February 16, 1926, CouncilProceedings Official Report Bengal Legislative Council Twentieth Session, 1926 16th to 19th and 22nd to 26th February, 1926, Calcutta, 1926, pg. 10.

had been moved some 3 or 4 feet.[336] The men on the rails immediately fell down after this, having received electric shocks. Seven of them (unnamed in official or newspaper reports) died on spot while eight more having received shock and three of them getting electric burns.[337] Incidentally, as it was raining, the ground and the bodies of the men were soaked with water.[338]

The natural conditions of wetness and the social conditions of bare feet workers could only go to some extent in explaining how this tragic incident occurred. Not unlike the case of the Sodepur Colliery, clear lapses concerning the observance of electrical rules were again noted by the three enquiries conducted into the accident. In their own internal enquiry the Port Commissioners concluded that the body of the crane had become 'live' thus causing the electrocution of the workers pushing it.[339] They had the crane examined by the foreman, the electrical consultant and their Chief Engineer (Construction). These examinations revealed that there were some anomalies in the way in which the crane wiring system and the feeder cable were wired. The "insulation resistance" of the complete installation was also low.[340] However this still could not explain how the body of the crane became charged.[341] The Commissioners eventually settled for the view that there was something wrong with the earthing of the crane. Firstly it was done with "galvanised steel wires" as copper earthing wires were "invariably stolen."[342] More importantly, there was a problem in the way the requirement of the earthing rule of having two separate earth connections was met with respect to the crane. The Commissioners opined that there was "bad workmanship" involved in how both earthing wires were made "dependent upon a single connection to crane body" thus not really

---

[336] *ibid.*
[337] *ibid.*
[338] 'Report submitted by Mr. N.C. Bhattacharji, Asst. Electric Inspector to the Govt. of Bengal on the Electrical Accident that took place on 15th July, 1925 at King George's Dock at Garden Reach', August 24, 1925, Reports referred to in the reply to starred question No. IV, February 16, 1926, CouncilProceedings Official Report Bengal Legislative Council Twentieth Session, 1926 16th to 19th and 22nd to 26th February, 1926, Calcutta, 1926, pg. 7.
[339] 'W.C. Ash, H. Burkinshaw, J.D. Pearson, W.F. Henry, "The Commissioners for the Port of Calcutta. Finding"', Reports referred to in the reply to starred question No. IV, February 16, 1926, CouncilProceedings Official Report Bengal Legislative Council Twentieth Session, 1926 16th to 19th and 22nd to 26th February, 1926, Calcutta, 1926, pg. 11.
[340] *ibid.*
[341] *ibid.*
[342] *ibid.*

making "two separate and distinct earth connections."[343] The Commissioners actually blamed the "Electrical Foreman" Mr. White for this. They also suggested that the earthing wires might actually have been out of place prior to the accident and White could have set them right after the accident to cover up the flaws.[344]

The Assistant EI of the Bengal Government, N. C. Bhattacharji had a different take on the accident. He confirmed by his tests after the accident the fact that the insulation resistance of the crane was fairly low ("noticed to come twice to zero").[345] But he opined that "a leakage current" through the crane still would not "kill so many men."[346] Bhattacharji also "found no reason to disbelieve" the statements of the foreman White, and the engineers of the Port that earthing of the crane was firmly in place at the time of the accident.[347] In view of this he decided that the cause for electrocution was actually the rails on which the crane was being moved becoming charged - this was the "natural inference" even though direct evidence for this could not be found.[348] For Bhattacharji, this however made "The Port Commissioners…guilty of not having complied with rule 43 of the Indian Electricity Rules, 1922," that would entail that the rails too had to be "properly earthed."[349] Yet he also finally concluded that while this lapse was eventually attributable "jointly" to the Foreman, the Consulting Engineer and the Port Commissioners as well, it was still "not possible to make any one directly responsible for the accident", as there was no "definite proof as to how the rail became alive."[350]

The judicial enquiry by the Additional District Magistrate H. C. Chatterji had a similar summation to make. Chatterji noted that White should have earthed the rails as well but did not do so since the Deputy Engineer of the Port "had not given any instruction on this

---

[343] *ibid*., pg. 12.
[344] *ibid*.
[345] 'Report submitted by Mr. N.C. Bhattacharji, Asst. Electric Inspector to the Govt. of Bengal on the Electrical Accident that took place on 15th July, 1925 at King George's Dock at Garden Reach', August 24, 1925, Reports referred to in the reply to starred question No. IV, February 16, 1926, CouncilProceedings Official Report Bengal Legislative Council Twentieth Session, 1926 16th to 19th and 22nd to 26th February, 1926, Calcutta, 1926, pg. 7.
[346] *ibid*.
[347] *ibid*.
[348] *ibid*.
[349] *ibid*., pg. 8.
[350] *ibid*.

point."[351] He also agreed that there was a breach of Rule 43 by not earthing the rails but apparently this "was never brought to the notice of the Port Commissioners and so the breach cannot come in within the penal provisions…of the Rules."[352] Finally, the judicial enquiry "disclosed no definite negligence on the part of any one that would justify a prosecution."[353]

A perusal of Rule 43 actually explains to some extent how the tragic death of the seven workers at the Calcutta Docks due to obvious technical lapses on part of multiple levels of the Port administration still did not invite any prosecution or even the bare invocation of penal measures. The rule required that "Where an electric supply-line crosses, or is in proximity to, any metallic substance, such precautions as an Electric Inspector may approve shall be taken by the licensee or the owner, as the case may be, against the possibility of the metallic substance getting charged."[354] Taking this rule into account, it can once again be seen that the onus of taking precautions, if there was any to be taken, would devolve upon 'owners' or 'licensees' only in the event of a prior communication, consultation or act of inspection by electrical officials of the colonial state. Since such inspection was expectedly not conducted, the Port Commissioners could not be blamed of any 'negligence' after all in not earthing the rails. By Rule 43, which was in violation, the state was located above the 'owner', atop the pyramidal structure of assuming responsibility for the safe conduct of electricity. Once the state absolved itself of this responsibility, agents lower down this pyramidal structure like the Port Commissioners, the engineer and eventually the foreman, were all successively relieved of their culpability. The accident then became pure contingency and the liability for it became so diffuse as to make it impossible for it to be actually attached to a concrete agent.

---

[351] 'H.C. Chatterji, "Copy of Report of the Enquiry held by the Additional District Magistrate, 24-Parganas Regarding Accident on an Electric Crane which took place at King George's Dock on the 15th July, 1925".', August 24, 1925, Reports referred to in the reply to starred question No. IV, February 16, 1926, CouncilProceedings Official Report Bengal Legislative Council Twentieth Session, 1926 16th to 19th and 22nd to 26th February, 1926, Calcutta, 1926, pg. 10.

[352] *ibid*.

[353] *ibid*.

[354] 'Rule 43', Chapter V, The Indian Electricity Rules, 1922', Appendix I, in J. W. Meares, The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910, Act IX of 1910, Thacker, Spink& Co., Calcutta, Second Edition, 1922, pg. 289.

In 1928 at the Fourth Conference of Electric Inspectors, a stricter rule was suggested to specifically deal with cases like that at the Calcutta Docks - that metal rails used in conjunction with travelling cranes and such like vehicles must be "connected with earth."[355] This was perhaps part of the resetting of the cycle of electrical administration in the colony. As contended in this chapter, colonial electrical regulation fell back on revising the word of law in an attempt to regain some control over its increasing dependence on the rather personalized and yet quite limited administration of electrical matters by state electrical officials. However the Conference also displayed immediate awareness that a stricter word of law was by itself inadequate in ensuring a stricter rule by the same law. Electrical officials of the state suggested that "Experience has shown that connexion with earth of the metallic frame of apparatus and line supports requires periodic testing."[356] It was also suggested to make licensees and 'owners' of certain kinds of high-tension electrical equipment responsible for this testing and the results had to be submitted to the EI.[357] This was because too much time of the "inspection staff was taken up in testing "earths"'.[358] The proposition was eventually modified to mandate that only "such owners as the Local Government may declare" would be required to submit test results related to the earthing of their motors and other equipment.[359] It was foreseen that given that "the majority of owners had not the necessary equipment or knowledge", there would be quite a bit of opposition to the requirement of submitting test results to the EI.[360] It is uncertain how even these limited requirements were brought into practice as the Conference's results did not bear any fruit at the level of legislation.

While high-tension motors formed the primary concern of earthing rules, gradually this concern was articulated also about lower tension motors. As described, by 1922 after the Electricity (Amendment) Act, a specific rule (no. 46) was put in place to ensure that most categories of motors be earthed with separate, distinct connections. Smaller motors but

[355] 'Rule 40', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 77.
[356] 'Rules 45 and 46', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 80.
[357] *ibid*.
[358] 'Rules 45 and 46', Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, pg. 81.
[359] *ibid.*
[360] *ibid.*

also the metal supports of aerial lines came within the domain of this rule but these were certainly very difficult to control as their ever-multiplying presence and use spanned much beyond the scope of small inspection departments maintained by the provincial governments. By the 1930s the risk of being shocked by smaller motors and aerial lines actually often led to a consistent demand to do away with the more dangerous alternating current (AC) altogether in India or reduce its maximum supply voltage to 110 volts for safe use. In particular, public writings of Bhim Chandra Chatterjee, the Head of Deaprtment of Electrial Engineering at Benares Hindu University went a long way in stirring up this anti-AC sentiment amongst both the lay public as well as in the Legislatures.[361] In many the 'current wars' thus continued for a much longer period in India as compared to western contexts of its 'resolution'.

Chatterjee's assertions led to a series of contemplations and communications between the electrical technocrats of respective provinces that revealed that many an electrical fatality could be related to how even lower tension motors like on portable fans, delivered powerful shocks to their human handlers when not earthed properly.[362] With respect to government installations, provisions to run "a continuous "earth wire"…throughout the installation was recommended."[363] But for the great majority of private installations subscribing to a variety of cheap equipment and agencies of installations it was difficult to enforce the rule in question. It was admitted that "it is quite impossible to frame rules which will cover every possible circumstances which may arise in electrical installations

[361] See in this regard, Bhim Chandra Chatterjee, 'Electric Supply in Calcutta &Elsehwere', November 21, 1931, *Liberty* and Bhim Chandra Chatterjee, 'Electic Power Supply in India Plea for Economy and Safety', February 25, 1932, *The Hindustan Times* in 'Question in the Legislative Assembly by Mr. Amarnath Dutt regarding supply of electricity by D.C. and A.C. systems in Calcutta and elsewhere', GOI, Dept. of Industries & Labour, Pros. Nos. 5-7, 15-20, File No. S-621, Collection No. (5), 1933.

[362] See for example the case discussed in, 'Copy of a letter No. 5252/III-39(10)-76, dated August 15, 1929, from the Electric Inspector to Government, United Provinces, to the Executive Engineer, Provincial Division, Benares.' In 'Question in the Legislative Assembly by Mr. Amarnath Dutt regarding supply of electricity by D.C. and A.C. systems in Calcutta and elsewhere', GOI, Dept. of Industries & Labour, Pros. Nos. 5-7, 15-20, File No. S-621, Collection No. (5), 1933.

[363] 'Copy of a note dated September 24, 1929, from the Electric Inspector to Government. United Provinces, to the Secy to Government, United Provinces, PWD, Buildings and Roads Branch.' In 'Question in the Legislative Assembly by Mr. Amarnath Dutt regarding supply of electricity by D.C. and A.C. systems in Calcutta and elsewhere', GOI, Dept. of Industries & Labour, Pros. Nos. 5-7, 15-20, File No. S-621, Collection No. (5), 1933.

throughout India."[364] Still the government would not go against existing private firms' modes of supply and reduce the maximum supply voltage (240 v) of AC connections.[365] Eventually then, both strict rules and their enforcing authorities proved inadequate as the problems of consumer installations multiplied.

9. Conclusion

This final chapter of the thesis studied a series of Conferences of the Electric Inspectors of the colonial government starting from 1915 till 1928 to make a set of observations about the long-term development of electrical governance in India and about the proliferation of certain characteristically and seemingly unresolvable issues that emerged in tandem with legal-regulatory processes. A rather general structure of the regulation of electrical matters in the colony was described in terms of how such regulation depended closely on the personal judgment and action of a rather thin force of electrical officers over and above fixed rules, even as doubts persisted concerning the limitations of this resort to human judgment over technical or rule-bound objectivity.

The chapter showed that the doubt about the nature of electrical learning and practice in the colony also extended to intermediary electrical workers/*mistris*/wiring contractors who were a crucial agency of connecting up consumers' installations to the licensee's supply in colonial cities like Calcutta. Proposals to train and create a licensing system for them were very often floated and yet the disturbance that this would create on the already existing market of electrical labour perhaps deterred the colonial state from being very decisive in this matter. The colonial electrical technocracy was also rather indecisive about introducing generalisable, standard rules for consumers' installations even as the quality of electrical material, commodities, instruments and apparatus that were being imported into the Indian market deteriorated considerably since the First World War. Taken together, these issues became very fundamental to the technical conduct of electricity in India and further deepened the unsystematic and un-standardized character

[364] 'Note by J.S. Pitkeathly, Chief Controller of Stores', March 30, 1933, in 'Question in the Legislative Assembly by Mr. Amarnath Dutt regarding supply of electricity by D.C. and A.C. systems in Calcutta and elsewhere', GOI, Dept. of Industries & Labour, Pros. Nos. 5-7, 15-20, File No. S-621, Collection No. (5), 1933.
[365] *ibid*.

of electrical installations and practice in colonial cities. The continuity of such issues also rendered a very fallible and unreliable character to electrical infrastructure in India while also aggravating the souces of danger emanating from such infrastructure. With the coming of alternating current, this danger was amplified as the colonial technocracy in spite of best intentions, struggled to enforce the stipulation to earth the frames and bodies of AC motors to control the risk of electrocution.

Finally this chapter also analysed how colonial law was variably deployed to control the illegalities of electrical theft and the complications of electrical meters. Even as law sought to largely side with the licensee's cause in its deliberations on such issues, the chapter tried to show that the consumer found ways of using the law to his/her benefit in particular ways. In a way, meter issues and the fraudulent use of electricity too were then long-term effects of the manner in which electrical law was administered in the colony.

Conclusion

This thesis has analysed the processes, the structure and the effects of colonial law-making and regulation in relation to the coming of systems of current electricity supply and use in colonial cities like Calcutta between the 1880s and the 1930s. This analysis has focussed on tussles between various strata of the colonial state, debates over uniformity of electrical rules, technical designs of safety and standards and issues of expert handling of electrical supply. The thesis broadly argues that the gradual consolidation of electrical supply and use under colonial conditions cannot be understood as a pre-determined coming of technological modernity. Rather this is better studied as the outcome of a specific encounter between colonial-legal statecraft, private capital-led enterprise, the skills and practices of local intermediaries and also the inclinations of users and consumers of electricity. This encounter did not have to wait till the more felicitous circumstances of postcolonial rule that had the state investing directly in Indian electrification. Rather, this thesis tentatively suggests that the interactions of law, regulation and technology and technical practices under colonial conditions created certain longer-term conditions that mediated the supply and the use of electricity in Indian cities. Through foregrounding such interactions, the thesis has explored particular kinds of political implications of technology transfer and utilisation in colonial India.

Colonial rule brought in innovations of electrical technology but also introduced certain 'innovations' of electrical law and regulation, which were crucial to the projects of implanting lines of copper through urban geographies of India. The eagerness of legal and regulatory innovation to supplement technical innovation evolved into a systematic expansion of various kinds of permissibilities purportedly directed at facilitating the operations of private capital and electrical firms and contractors. Such permissibilities amounted to creating rather flexible standards and rules of operation in relation to both the licensee's and the consumer's domains pertaining for instance to overhead lines, insulation of electrical apparatus, the earthing of motors, metering instruments, forms of installations adopted on consumers' premises, the quality of material used in such installations and also the qualifications of the intermediaries who wired up such installations. The imperial technocracy that centralized functions of electrical rule-

making sought to establish control over the realm of permissibilities that it fostered through the human mediation of provincially-appointed Electric Inspectors. However this personalized form of electricity governance left much to be desired in terms of the rather thin force of officials actually employed as well as due to continuous doubt regarding the actual capacities of the same officials.

Moreover, the scope created for the negotiation of rules and standards was eventually utilised by certain forms of informalized electrical practice and technicalities that flourished and in turn created additional issues for the colonial regulation of the new technology of electricity. At times such technicalities and practices unwittingly challenged the very structures of technological stability and innovation that law was meant to facilitate. The series of electrical accidents throughout colonial period of electrification (and beyond) bear a kind of tragic witness to such circumstances. Further, seen from the perspective of the decades of legal deliberations, the history of colonial electrification is difficult to be rendered as a simple story of the formalization of technical standards, the graduation to a uniform measure of electrical expertise and eventually the arrival of a safe and sound environment of electrical use once and for all. Instead, in spite of the best of intentions of colonial law to 'fix' things electrical, British India saw a proliferation of a fair amount of diversity of technical practice and outcomes, a lot of which was necessary yet sub-optimal, effective yet dangerous and technically specified yet uniquely contingent. The thesis surmises that this in a way is a distinctive inheritance that continues to accompany the electrical present in the postccolonial context of India. The thesis argues that that the early becoming of this diverse and at times unruly world of electrical existence was actually an *effect* of electrical law-making and regulation in the colony and not really any outcome of its failure.

In the broader field of the histories of electricity often concentrated on the western world a kind of uniformity of technological setups and practice is assumed as a necessary telos. When conceived in this way, history recounts how electricity systems around the western world all eventually arrived at similar conditions of optimal functioning, even while beginning from very different originary conditions and passing through the widely varying pressures of political and economic circumstances. However we hardly have

historical accounts of forms of suboptimal system and network-making that still persists in postcolonial situations. The Indian context of electricity supply and use still continues to be plagued by serious technical and commercial 'losses', even as electrical accidents continue to proliferate and unregistered intermediaries like *mistris* perform the necessary labour of everyday maintenance and installation. This thesis in a way begins to imagine the peculiar colonial history of such circumstances.

One aspect of colonial electrical law-making and regulation has however been left out of the thesis. This relates to how the field of colonial law-making and regulation became a terrain of organized opposition by nationalist and other kinds of politics. Such political action pushed towards creating certain different technological, social and economic outcomes than those that were obtaining in terms of the prevailing technical setup and commercial dimensions of electricity supply under colonial conditions. Colonial Calcutta saw definite collective opposition to the use of alternating current (AC) and to the pricing structure of the CESC. The opposition also eventually amounted to proposing a municipality-controlled, nationalised form of electricty supply scheme in the city. For reasons of space and time the thesis has not included any discussion on this. But the development of this research further will have to account for this opposition and the substantial changes that were suggested (not always successfully), in the structure and the governance of the new technology.

References and Bibliography

A note on Primary Sources:

The main body of the primary sources consulted in this thesis have come from the proceedings of various units of the colonial state. Firstly, I have consulted reports and proceedings of various departments of the imperial government, as sourced from the National Archives of India, the National Library and the Indian Office Records held at the British Library. The primary department that dealt with matters of electricity was the Public Works Department and it's Civil Works (Electricity) Branch, though certain files about early 'electrification' could also be found in branches like Civil Works (Misc.) and Civil Works (Telegraphs). I have consulted records of this Department between 1883 and 1920. Between 1906 and 1911, the Commerce and Industries Department handled electricity. In 1920 the Board of Munitions and Industries took over this subject. From 1921-1923 the Industries Department dealt with it. From 1923 onwards, the Department of Industries and Labour was entrusted with this subject till 1935. I have looked at proceedings and reports from these latter departments till the 1930s. A majority of the discussion concerning imperial law-making and early policies concerning electricity were found in the proceedings of the imperial government.

Other than records of the imperial government this study has also relied on records of the Government of Bengal (GOB) that have been sourced from the West Bengal State Archives and the India Office Records. The proceedings of the Miscellaneous Public Improvements (MPI) branch of the Public Works Department of the GOB have been invaluable in teasing out the details of the development of electricity supply systems in Calcutta between 1897 and 1935. Alongside this, the proceedings of the Meetings of the Municipal Commissioners of Calcutta for the period between 1880s and 1890s were consulted at the Town Hall Archive in Calcutta. Finally I have looked at the J. W. Meares papers at the Institute of Engineering and Technology Archives (IET Archives) in London.

I have looked in some detail at reports on electricity and related topics published in five English language newspapers – The Englishman (1900-1920s), Indian Daily News

(1900-1920s), the Amrita Bazar Patrika (1880s-1930s), The Times of India (1860s-1930s) and The Friend of India (1850s-1890s, later The Statesman). Other than this I have also sourced some of my evidence from many private accounts of European travellers and writers writing about Calcutta. Another important source for my thesis has been journals of engineering that particularly helped in helped taking informed calls on technical issues of historical importance, especially as debated between 'experts'. I have consulted issues of The Electrical Review (1880s-1920s), The Electrical Engineer (1890s-1920s), The Electrician (1880s-1920s) and Indian Engineering (1890s-1930s).

Primary Sources

Archival Documents:

National Archives of India, New Delhi

Proceedings of the Public Works Department, Branch: Telegraphs

Proceedings of the Public Works Department, Branch: Railway Construction

Proceedings of the Public Works Department, Branch: Miscellaneous

Proceedings of the Public Works Department, Branch: Electricity

Proceedings of the Commerce and Industry Department

Proceedings of the Board of Industries and Munitions

Proceedings of the Industries Department

Proceedings of the Industries and Labour Department

Proceedings of the Legislative Department.

Proceedings of the Military Department

Proceedings of Home Department, Branch: Public

Despatches to the Secretary of State (Military)

West Bengal State Archives, Kolkata

Proceedings of the Public Works Department. Branch: Miscellaneous Public Improvement

Town Hall Archives, Calcutta

Proceedings of the Meetings of the Commissioners of Calcutta Municipal Corporation

National Library of India, Calcutta

Various Reports and Treatises

India Office Records, British Library, London

Series: IOR/P

Proceedings and Reports related the Government of India's Public Works Department (Branches: Electricity, Telegraphs and Miscellaneous), Commerce and Industry Department and Board of Industries and Munitions.

Proceedings related to the Government of Bengal's Public Works (Branch: Miscellaneous Public Improvement).

Series: IOR/V

Reports of Conferences of Electric Inspectors and other reports (listed below).

IET Archives, London

Papers of J. W. Meares.

Periodicals:

The Englishman

Indian Daily News

Amrita Bazar Patrika

The Times of India

The Friend of India

The Electrical Engineer

The Electrical Review

The Electrician

Indian Engineering

Scattered issues of Scientific American, Putnam's Monthly: A Magazine of Literature, Science and Art, The Asiatic Journal and Monthly Miscellany, The Bombay Times and Journal of Commerce, Chambers Edinburgh Journal, The Calcutta Review, The Pioneer, Littell's Living Age, The Madras Mail, The Journal of the Royal Asiatic Society, Journal of the Royal Army Medical Corps, Electrical World and Engineer, Selling Electricity and Journal of Indian Industries and Labour.

Published Government Reports, Proceedings and Treatises:

A Collection of the Acts of the Indian Legislature and of The Governor General for the year 1922, Calcutta, 1923.

Abstract of the Proceedings of the Council of the Governor General of India, Laws and Regulations. Vol. XLVIII, April 1909-March, 1910, Calcutta, 1910.

Appendices to the Report of the Special Commission appointed by His Excellency the Governor-General in Council to enquire into the Organization and Expenditure of the ARMY In India, vol. II, Simla, 1880.

Army Medical Department, Report for the year 1866, London, 1868.

Atkinson, Lieut-Colonel E.H. deV. (R.E.) and Dawson, Tom. S. Report on The Enquiry to bring Technical Institutions into closer touch and more practical relations with the Employers of Labour in India, Calcutta, 1912.

Beveridge, H. The District of Bakarganj: its History and Statistics, London, 1876.

Beverley, H. Report on the Census of the town of Calcutta taken on the 6th April 1876, Calcutta, 1876.

Beverley, H. Report on the Census of the town of Calcutta taken on the 17th February 1881, Calcutta, 1881.

Blackwood, J.R. Census of India 1901, Vol. VII. Calcutta, Town and Suburbs. Part IV Report (Statistical), Calcutta, 1902.

Buchanan, F. An Account of the Districts of Bihar and Patna in 1811-1812, Calcutta, 1939.

Crooke, W. *The Tribes and Castes of the North-Western Provinces and Oudh, vol. III*, Calcutta, 1896.

Copy of Correspondence between the Government of India and the Secretary State in Council respecting the Proposed Changes in the Indian Army System; and, Copies of Dissent, and of Despatches against the Changes proposed or ordered in the Indian Army System, London, 1880.

Council Proceedings Official Report Bengal Legislative Council Twentieth Session, 1926 16th to 19th and 22nd to 26th February, 1926, Calcutta, 1926.

Dutta, K.L. Report on the Enquiry into the Rise of Prices in India, vol. III. Statistics of wages, Population, Agriculture, Rainfall, Rents, Communications and Freights, Calcutta, 1914.

East India. Statement exhibiting the Moral and Material Progress of India during the Year 1860-61, Part I, London, 1862.

Government of Bengal (Commerce Department), Report of the Committee appointed to enquire into the charges for electrical energy levied by the Calcutta Electric Supply Corporation, 1936, Calcutta, IOR/V/26/740/2.

Government of Bengal, Report on the Administration of Bengal, 1894-1895, Calcutta, 1896.

Government of Bengal, Report on the Administration of Bengal, 1896-1897, Calcutta, 1898.

Government of Bengal, Report on the Administration of Bengal, 1912-1913, Calcutta, 1914.

Government of Bengal, Report on the Administration of Bengal, 1913-1914, Calcutta, 1915.

Government of Bengal, Report on the Administration of Bengal, 1921-22, Calcutta, 1923.

Hunter, W.W. Orissa, Vol. II, London, 1872.

Indian Tariff Board. Evidence recorded during enquiry on the Grant of Protection to the Manufacture of Electric Wires and Cables, Calcutta, 1932.

Long, J. Selections from Unpublished Records of Government for the Years 1748 to 1767 inclusive: Relation Mainly to the Social Condition of Bengal with a Map of Calcutta in 1784, vol. 1¸ Calcutta, 1869.

Meares, J. W. The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910 Act IX of 1910, Calcutta, 1933.

Meares, J. W., 'Electric Traction, Six Lectures delivered in March 1902 at Civil Engineering College, Sibpur', Bengal Secretariat Press, Calcutta, 1902.

Meares, J. W., 'Electrical Engineering Practice: A Practical Treatise for Civil, Mechanical and Electrical Engineers especially those in India and Tropics', Second Edition, Thacker, Spink& Co., Calcutta & London, 1916.

Meares, J. W., 'Electrical Engineering with particular reference to Conditions in Bengal, Six Lectures delivered in March 1900 at Civil Engineering College, Sibpur', Bengal Secretariat Press, Calcutta, 1900.

Meares, J. W., The Law Relating to Electrical Energy in India being The Indian Electricity Act, 1910, Act IX of 1910, Thacker, Spink& Co., Calcutta, Second Edition, 1922.

Meares, J. W., At the Heels of Mighty being the Autobiography of "Your Obedient Humble Servant", Chicester, 1934. Unpublished Autobiography, Ref: UK0108 SC MSS 169/1, Institute of Engineering and Technology Archives (IET) Archives.

Minutes of Evidence taken before the Indian Industrial Commission, 1916-1918. Vol. V. – Punjab, Assam, Burma and General, East India (Industrial Commission, 1916-1918), London, 1919.

Minutes of Evidence taken before the Indian Industrial Commission, 1916-1918. Vol. II – Bengal and Central Provinces, East India (Industrial Commission, 1916-1918), London, 1919

Morgan W. and Macpherson, A.G. The Indian Penal Code (Act XLV of 1860) with notes, Calcutta, 1863.

Papers Relating to East-Indian Affairs viz. regulations passed by the Governments of Bengal, Fort St. George, and Bombay in the Year 1819, London, 1821.

Papers relating to Military Finance, &c. (East India), London, 1866.

Proceedings of the Conference of Electrical Inspectors. Held at New Delhi on the 17, 18, 19, 20 and 21st December 1928, Simla, 1933, IOR/V/25/740/14.

Proceedings of the Council of the Lieut-Governor of Bengal for purposes of making Laws and Regulations, v. XXVII, Calcutta, 1896,

Rainy, G. for the Government of India, Decentralization Committee for the Royal Commission on Decentralization, Note on the Organization of the Public Works Department in India, Simla, 1907.

Report on Sanitary Measures in India in 1876-'77: Together with Miscellaneous Information up to June 1878, London, 1878.

Report of the Advisory Board Constituted by the Government of India under section 35 of the Indian Electricity Act, 1910 in connection with amendments to the Indian Electricity Act, 1910, New Delhi, 1954.

Report of the Proceedings of a Conference of Electric Inspectors. Held in Calcutta, November, 1915, Calcutta, 1915.

Proceedings and Report of the Second Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, December, 1916, Calcutta, 1917.

Proceedings and Report. Third Conference of Electric Inspectors and Electrical Engineers to Government. Held in Calcutta, 7th to 15th January, 1918. Edited by J.W. Meares, Electrical Adviser to the GOI, Calcutta, 1918.

Royal Commission on the Sanitary State of the Army in India. Vol. I. Report of the commissioners. Precis of Evidence. Minutes of Evidence. Addenda. London, 1863.

Seton-Karr, Selections from Calcutta Gazettes of the Year 1789-1797, vol. 2, Calcutta, 1865.

Seton-Karr, Selections from Calcutta Gazettes of the Year 1798-1805, vol. 3, Calcutta, 1868.

Summary of the Administration of Lord Curzon of Kedleston, Military Department 1899-1904, Simla, 1906.

The Council of State Debates (Official Report). Second Session of the Council of State, 1922, Simla, 1922

The Indian Law Reports, Allahabad Series, vol. II, Allahabad, 1880.

Third Report from the Select Committee on East India Finance; Together with the Proceedings of the Committee, Minutes of Evidence and Appendix, London, 1873.

Other published sources:

A.U., *Overland, inland and upland. A lady's notes of personal observation and adventure*, London, 1873.

Ashmore. H. *Narrative of a three month's march in India*, London, 1841.

Atkinson, G.F. *"Curry and Rice," on forty plates; or, The Ingredients of social life at "our station" in India*, London, 1859.

Bhattacharya, J.N. *Hindu Castes and Sects: An Exposition of the Origin of the Hindu Caste System and the bearing of the sects towards each other and towards other religious systems*, Calcutta, 1896.

Blanchard, S.L. *Yesterday and to-day in India*, London, 1867.

Burne: Some Hints on Overhead Construction: Discussion', paper read at Meeting of Calcutta Local Section, IEE, April 19, 1901, Proceedings of the Institution of Electrical Engineers (IEE), pgs. 428-437.

Busteed, H.E. *Echoes from old Calcutta: being chiefly reminiscences of the days of Warren Hastings, Francis and Impey*, Calcutta, 1888.

Chaudhury, P. and Mukhopadhay, A. *Calcutta: People and Empire (Gleanings from Old Journals)*, Calcutta, 1975.

Dewar, Douglas. *Bygone Days in India: with eighteen illustrations*, Calcutta, 1922.

Eden, E. *Letters from India. Edited by her niece (Eleanor Eden)*, London, 1872.

Fife-Cookson, J.C. *Tiger-shooting in the Doon and Ulwar: with life in India*, London, 1887.

G. W. Harris, “Stealing Electricity”, *Selling Electricity*, Vol II No. 4, October, 1907.

Ghosh, G.C. ‘The Civil Finance Commission’, in Manmanath Ghosh ed., *Selections from The Writings of Grish Chunder Ghose*, Calcutta, 1912, pp.80-87.

Gilchrist, J.B. *The General East India Guide and Vade Mecum*, London, 1825.

Goode, S.W. *Municipal Calcutta: Its Institutions in their Origin and Growth*, Issued by The Corporation of Calcutta, T. and A. Constable, Printers to His Majesty, Edinburgh, 1916.

Gouldsbury, C.E. *Life in the Indian Police, with 24 Illustrations*, London, 1912.

Grant, C. *An Anglo-Indian Domestic Sketch: A letter from an artist in India to his mother in England*, Calcutta, 1849.

Griffin, Z.F. *India and daily life in Bengal*, New York, 1896.

Hickey, W. *Memoirs of William Hickey, Vol. III (1782-1790)*, Alfred Spencer ed., London, 1925.

Hockley, W.B. *The widow of Calcutta; The half-caste daughter; and other sketches*, London 1841.

Israfel. *Ivory apes and peacock*, New York, 1899.

J.C. Kydd, *A History of Factory Legislation in India*, Calcutta, 1920

Johnson J. *The Influence of Tropical Climates on European Constitutions: to which is added Tropical Hygiene or the Preservation of Health in all hot climates*, London, 1818.

Knox, T.W. *The Boy Travellers in the Far East, Part Third*, New York, 1882.

‘Letter from P.V. Luke, to the Secretary, Institution of Electrical Engineers’, February 1, 1893, Proceedings of the Institution of Electrical Engineers (IEE), pg. 146-147.

Maclean, F.G., ‘Calcutta Local Section, Inaugural Address of The Chairman’, delivered at Meeting of Calcutta Local Section, March 15, 1901, Proceedings of the Institution of Electrical Engineers (IEE),pgs. 979-985.

Mahtab, B.C. *Studies*, Calcutta, 1904.

Mattson, H. *Reminiscences: the story of an emigrant*, Saint Paul, 1891.

Mawson, J. *A few local sketches*, Calcutta, 1846.

Mead, H. *The Sepoy revolt; its causes and its consequences*¸ London, 1857.

Mitra, S.M. *Indian problems*, London, 1908.

Mitchell, M. *In India: sketches of Indian life and travel from letters and journals*, London, 1876.

Motte, T. ‘A Narrative of a Journey to the Diamond Mines at Sumbhulpoor, in the Provinces of Orissa’, *Asiatic Annual Register*, 1799, pp.50-85.

National Electric Light Association. Twenty-First Convention. Chicago ILL. June 7th 8th, 9th, 1898, New York, 1898.

Parbury, G. *Handbook for India and Egypt, Comprising the Narrative of a Journey from Calcutta to England*, London, 1841

Parks, F. *Wanderings of a Pilgrim in search of The Picturesque, Vol. I*, London, 1850.

Patterson, J.B. *Life In the ranks of the British Army in India and on board a Troopship*¸ London, 1885.

Ray, P.C. *Life and Experiences of a Bengali Chemist*, Calcutta, 1932.

Rendrag, Toby. *Poems, original, lyrical, and satirical, containing Indian reminiscences*, London, 1829.

Riddell, R. *Indian Domestic Economy and Receipt Book*, 8th edition. Calcutta. 1877.

Rushton, W. *The Bengal and Agra Guide and Gazetteer*, Calcutta, 1841.

Sanyal, R.G. *The record of criminal cases: as between Europeans and natives for the last hundred years*, Calcutta, 1896.

Sconce, G.C. *A Handy Book on the Law of Master and Servant: For the use of the Indian Public*, Calcutta, 1870.

Scott-Moncrief, K.A., 'The Insulation of Conductors of Electricity in India', paper read at Meeting of Calcutta Local Section, March 29, 1901, Proceedings of the Institution of Electrical Engineers (IEE), pgs. 371-379.

Scott-Moncrieff: Insulation of Conductors of Electricity in India: Discussion', paper read at Meeting of Calcutta Local Section, IEE, March 29, 1901, Proceedings of the Institution of Electrical Engineers (IEE),pgs. 379-387.

Sharma, R. *Bharat-Uddharothoba Chari Anna Matro (BhobishyoItihasher ek Prishtha*, Kolikata, 1877.

Solvyns, F. B. *Les Hindous*, *Vol 1*, Paris, 1808.

Statham, J. *Indian Recollections*, London, 1832.

Steel, F.A. and Gardiner, G. *The Complete Indian Housekeepr and Cook*, 3rd edition, Bombay, 1893.

Stocqueler, J.H. *India: its history, climate, productions; with a full account of the origin, progress, and development of the Bengal mutiny, and suggestions as to the future government of India*¸ London, 1857.

Stocqueler, J.H. *The oriental interpreter and treasury of East India knowledge. A companion to 'The hand-book of British India*, London, 1848.

Tagore, K. *KolikatayCholafera: ShekaleaarEkale*, Kolkata, 2016.

Temple, R.C. ed. *The travels of Peter Mundy in Europe and Asia, 1608-1667, Vol. II: Travels in Asia*, Cambridge, 1914.

Trevelyan, G.O. *The Competition-Wallah*, London, 1896.

Williamson, T. *The East-Indian Vade-Mecum, Vol. 1*, London, 1810.

Williamson, T. *The European in India: From a Collection of Drawings by Charles Doyley, Esq.*, London, 1813.

Wilson, J.A. *Our Indian Servants and how to treat them: with a sketch of the law of master and servant*, Calcutta, 1899.

Wright, C. *Life in India*, Boston, 1854.

Wylie, M. *Bengal as Field of Missions*, Calcutta, 1854.

Yule, H. and Burnell, A.C. *Hobson-Jobson: a glossary of colloquial Anglo-Indian words and phrases, and of kindred terms, etymological, historical geographical and discursive*, London, 1903.

Bibliography:

A.M.C. Centre, Lucknow. 'History of the Army Medical Corps', *Bulletin of Indian Inst. Hist. Med.*, vol 5(1), 1975, pp.19-23.

Adas, Michael. *Machines as the measure of men: Science, technology, and ideologies of Western dominance*. Cornell University Press, 2015.

Agarwal, P. "The Government Will Come to Its Sense": Calcutta Workers and the Plague of 1898, *The India-Forum: A Journal-Magazine on Contemporary Issues*, May 1, 2020.

Agnihotri, Indu. "Ecology, land use and colonisation: the canal colonies of Punjab." *The Indian Economic & Social History Review* 33.1 (1996): 37-58.

Aguiar, Marian. "Making modernity: inside the technological space of the railway." *Cultural Critique* 68 (2008): 66-85.

Ahuja, R. 'The Origins of Colonial Labour Policy in Late Eighteenth-Century Madras', *IRSH*, Vol. 44, 1999, pp.159-195

Ahuja, R. 'Labour Relations in an Early Colonial Context: Madras, c. 1750-1800', *Modern Asian Studies*¸ Vol. 36(4), 2002, pp.793-826.

Ahuja, R. '"The Bridge-Builders": Some Notes on Railways, Pilgrimage and the British "Civilizing Mission" in Colonial India.' in Harald Fischer-Tiné and Michael Mann eds. *Colonialism as Civilizing Mission: Cultural Ideology in British India.* Anthem Press, 2004: 79-130.

Ahuja, R. 'Making the Empire a Thinkable Whole: Master and Servant Law in Transterritorial Perspective', *IRSH,* Vol. 52, 2007, pp.287-294.

Ahuja, R. 'Networks of subordination—networks of the subordinated. The ordered spaces of South Asian maritime labour in an age of imperialism (c. 1890-1947)' in Ashwini Tambe and Harald Fischer-Tine,eds.,*The limits of British colonial control in South Asia*, New York, 2009a, pp.13-48.

Ahuja, R. *Pathways of Empire: Circulation, Public Works' and Social Space in Colonial Orissa, c. 1780–1914*. Orient Blackswan, 2009b.

Ahuja, R. 'A Freedom Still Enmeshed in Servitude: The Unruly 'Lascars' of the *SS City of Manila* or a Micro-History of the 'Free Labour' Problem' in Ravi Ahuja, ed., *Working Lives and Worker Militancy: The Politics of Labour in Colonial India*, Chennai, 2013, pp.97-133.

Anderson, M.R. 'Work Reconstructed: Ideological Origins of Labour Law in British India to 1918' in Peter Robb, ed., *Dalit Movements and the meaning of Labour in India*, New Delhi, 1993, pp.97-120.

Anderson, M.R. 'India, 1858-1930: The Illusion of Free Labour', in Douglay Hay and Paul Craven, eds., *Masters, Servants and Magistrates in Britain and the Empire, 1562-1955*, Chapel Hill, 2004, pp.422-454.

Apter, Andrew. "On imperial spectacle: the dialectics of seeing in colonial Nigeria." *Comparative Studies in Society and History* 44.3 (2002): 564-596.

Arapostathis, Stathis, and Graeme Gooday. *Patently contestable: Electrical technologies and inventor identities on trial in Britain*. MIT Press, 2013.

Arapostathis, Stathis. "Electrical innovations, authority and consulting expertise in late Victorian Britain." *Notes and Records of the Royal Society* 67.1 (2013): 59-76.

Arnold, D. 'European orphans and vagrants in India in the Nineteenth century', *The Journal of Imperial and Commonwealth History*, vol. 7(2), 1979a, pp.104-127.

Arnold, D. 'Poor Europeans in India, 1750-1947', *Current Anthropology*, vol. 20, 1979b, pp.454-455.

Arnold, D. *Colonizing the body: State medicine and epidemic disease in nineteenth-century India*, Berkeley, Los Angeles, 1993.

Arnold, D. *Science, technology and medicine in colonial India*. Vol. 5. Cambridge University Press, 2000.

Arnold, D. 'Race, place and bodily difference in early nineteenth-century India', *Historical Research*, vol. 77, No.196, 2004, pp.254-273.

Arnold, D. "Europe, technology, and colonialism in the 20th century." *History and Technology* 21.1 (2005): 85-106.

Arnold, D. and E. DeWald. "Everyday technology in South and Southeast Asia: an introduction." *Modern Asian Studies* 46.1 (2012): 1-17.

Arnold, D. *Everyday Technology: Machines and the Making of India's Modernity*. University of Chicago Press, 2013.

Arnold, D. 'Labouring for the Raj: Convict Work Regimes in Colonial India, 1836–1939' in Christian Giuseppe De Vito and Alex Lichtenstein eds., *Global Convict Labour*, Leiden, 2015, pg. 197-221.

Bailkin, J. ‘The Boot and the Spleen: When was Murder Possible in British India’, *Comparative Studies in Society and History*, vol. 48(2), 2006, pp.462-49.

Bakke G. The grid: the fraying wires between Americans and our energy future. Bloomsbury Publishing USA; 2016

Banerjee, S.M. *Men, Women and Domestics: Articulating Middle-Class Identity in Colonial Bengal*, New Delhi, 2004a.

Banerjee, S.M. ‘Down memory lane: representations of domestic workers in middle class personal narratives of colonial Bengal’, *Journal of Social History*, vol. 37.3, 2004b, pp.681-708.

Basalla, G. "The spread of western science." *Science* 156.3775 (1967): 611-622.

Bear, L. *Lines of the nation: Indian railway workers, bureaucracy, and the intimate historical self*. Columbia University Press, 2007.

Behal, R.P., and Mohapatra, P.P. ‘“Tea and money versus human life”: The rise and fall of the indenture system in the Assam tea plantations 1840–1908.’ *The Journal of Peasant Studies*, vol. 19.3-4, 1992, pp.142-172.

Bhattacharya, N. *The great agrarian conquest: The colonial reshaping of a rural world*. SUNY Press, 2019.

Bhattacharya, S. *The Financial Foundations of The British Raj: Ideas and Interests in the Reconstruction of India Public Finance 1858-1872*, Hyderabad, 2005 (1971).

Bijker, W. E. *Sociohistorical technology studies*. Sage, 1994.

Bijker, W. E., and J. Law, “General Introduction”, in Wiebe E. Bjiker and John Law eds., *Shaping technology/building society: Studies in sociotechnical change*. MIT press, 1994: 1-17.

Biswas, A. K. “Reverend Father Eugene Lafont and the Scientific Activity of St. Xaavier’s College.” *India Journal of History of Science* 29(1) (1994): 77-88.

Bose, K. K. 'History & growth of power supply in Calcutta area', *I.E.E.-I.E.R.E. Proceedings-India,* July-August (1974): 139-158.

Breman, J and Daniel, E.V. 'Conclusion: The making of a coolie', *The Journal of Peasant Studies,* vol. 19(3-4), 1992, pp.268-295.

Byatt, I. C. R. *The British electrical industry, 1875-1914.* Doctoral dissertation, University of Oxford, 1962.

Byrd, D. E. 'Motive Power: Fans, Punkahs, and Fly Brushes in the Antebellum South', *Buildings & Landscapes: Journal of the Vernacular Architecture Forum,* vol. 23(1), 2016, pp.29-51.

Carrington, M. 'Officers, Gentlemen, and Murderers: Lord Curzon's campaign against 'collisions between Indians and Europeans. 1899-1905', *Modern Asian Studies,* vol. 47(3), 2013, pp.780-819.

Chakrabarti, Pratik, and Uma Das Gupta. "Science and swadeshi: the establishment and growth of the Bengal Chemical and Pharmaceutical Works, 1893–1947" in Uma Dasgupta eds. *Science and Modern India: An Institutional History*. 2011.

Chakrabarti, Pratik. "Science, Morality and Nationalism: The Multifaceted Project of Mahendra Lal Sircar." *Studies in History* 17(2) (2001): 245-274.

Chakrabarti, Pratik. *Western science in modern India: Metropolitan methods, colonial practices*. Orient Blackswan, 2004.

Chakraborty, S. 'Criminalizing the Migrant: Street Carriers and the Colonial State in the 19th -20th Century Calcutta and Bengal', *Refugee Watch: A South Asian Journal of Forced Migration,* vol. 50, 2017, pp.44-57.

Chakraborty, S. 'Technologies of Domestic Labour', *Servants Past (Blog of European Research Council Funded Project, 2015-18),* October 16, 2017.

Chakraborty, S. ‘European Nurses and Governesses in Indian Princely Households: “Uplifting that impenetrable veil”?’ *Journal of Colonialism and Colonial History*¸ vol. 19(1), 2018, pp.1-25.

Chatterjee A. ‘New wine in new bottles’: class politics and the ‘uneven electrification’of colonial India. History of Retailing and Consumption. 2018 January 2;4(1):94-108.

Chatterjee, Elizabeth. “A Climate of Scarcity: Electricity in India, 1899–2016”, in John Brewer, Neil Fromer, Fredrik Albritton Jonsson, and Frank Trentmann, eds., *Scarcity in the Modern World: History, Politics, Society and Sustainability, 1800–2075*. Bloomsbury Academic, 2019: 211-228.

Chatterjee, Elizabeth. "The Asian anthropocene: Electricity and fossil developmentalism." *The Journal of Asian Studies* 79.1 (2020): 3-24.

Chatterjee, I. ‘British abolitionism from the vantage point of Pre-Colonial South Asian regimes’ in David Etis, Stanley L. Engerman, Seymour Drescher and David Richardson eds., *The Cambridge World History of Slavery, Vol. 4, AD 1804-AD 2016*, Cambridge, 2017, pp. 441-465.

Chaudhuri, N. ‘Memsahibs and their servants in nineteenth-century India’, *Women’s History Review*, vol. 3(4), 1994, pp.549-562.

Chaudhuri, R. *Freedom and Beef Steaks: Colonial Calcutta Culture*, New Delhi, 2015.

Chikowero, Moses. "Subalternating currents: Electrification and power politics in Bulawayo, colonial Zimbabwe, 1894–1939." *Journal of Southern African Studies* 33.2 (2007): 287-306.

Cohn J.A. *The Grid: Biography of an American Technology*. MIT Press; 2018.

Cohn, Bernard S. *An Anthropologist amongst Historians and Other Essays*, Oxford University Press, 1987.

Coleman, Leo. *A Moral Technology: Electrification as Political Ritual in New Delhi*. Cornell University Press, 2017.

Coopersmith, Jonathan. *The electrification of Russia, 1880–1926*. Cornell University Press, 2016.

Crary, J. *24/7: Late capitalism and the ends of sleep*, London, 2013.

D'Souza, Rohan. *Drowned and Damned: Colonial Capitalism and Flood Control in Eastern India.* New Delhi: Oxford University Press, 2006.

Dasgupta, Subrata. *Jagadish Chandra Bose and the Indian Response to Western Science*, Ranikhet: Permanent Black, 2009.

Datta, A. 'Keeping India Cool', *History Today*, September, 2019, pp.54-63.

Dey, Priyankar. "Jagadis Chunder Bose and his Spontaneous Machines: Devices, Demonstrations, and Discourses of Life." *Journal of The Asiatic Society of Bengal*, LIX(4) (2017): 31-82.

D'Souza, Rohan. "Damming the Mahanadi river: The emergence of multi-purpose river valley development in India (1943-46)." *The Indian Economic & Social History Review* 40.1, 2003, pp. 81-105.

Dussart, F. ''To glut a menial's grudge': domestic servants and the Ilbert bill controversy of 1883', *Journal of Colonialism and Colonial History*, vol. 14(1), 2013, pp.1-21.

Dussart, F. ''That unit of civilisation' and 'the talent peculiar to women': British employers and their servants in the nineteenth century Indian empire', *Identities: Global Studies in Culture and Power*, vol. 22(6), 2015a, pp.706-721.

Dussart, F. ''Strictly Legal Means': Assault, Abuse and the Limits of Acceptable Behaviour in the Servant- Employer Relationship in the Metropole and Colony 1850-1890' in Victoria K. Haskins and Claire Lowrie eds., *Colonization and Domestic Service: Historical and Contemporary Perspectives*, New York, 2015b, pp.153-171.

Edgerton, David. *The shock of the old: Technology and global history since 1900*. Profile Books, 2011.

Essig, Mark. *Edison and the electric chair: A story of light and death*. Bloomsbury Publishing USA, 2005.

Finn, M. 'Slaves out of Context: Domestic Slavery and the Anglo-Indian Family, c.1780-1830', *Transactions of the Royal Historical Society*, Sixth Series, vol. 19, 2009, pp.181-203.

Fischer-Tine, H. *Low and Licentious Europeans: Race, Class and 'White Subalternity' in India*, New Delhi, 2009.

French, Daniel. *When They Hid the Fire: A History of Electricity and Invisible Energy in America*. University of Pittsburgh Press, 2017.

Friedel, Robert and Paul B. Israel. *Edison's electric light: the art of invention*. JHU Press, 2010.

Ghosh, Siddartha. *KalerShohor Kolkata*, Ananda Publisher's Ltd., Kolkata, 1991.

Gilmartin, David. "Scientific empire and imperial science: colonialism and irrigation technology in the Indus basin." *The Journal of Asian Studies* (1994): 1127-1149.

Gooday, Graeme. *The morals of measurement: Accuracy, irony, and trust in late Victorian electrical practice*. Cambridge University Press, 2004.

Gooday, Graeme. 'Illuminating the Expert-Consumer Relationship in Domestic Electricity' in A. Fyfe and B. Lightman eds., *Science in the marketplace: nineteenth century sites and experiences*. University of Chicago Press, 2007: 231-268.

Gooday, Graeme. *Domesticating electricity: Technology, uncertainty and gender, 1880-1914*. Routledge, 2015.

Granovetter, Mark, and Patrick McGuire. "The making of an industry: electricity in the United States." *The Sociological Review* 46.1_suppl (1998): 147-173.

Gupta, Akhil. "An anthropology of electricity from the global south." *Cultural Anthropology* 30.4 (2015): 555-568.

Hannah Leslie. *Electricity before nationalisation. A study of the development of electricity supply industry in Britain to 1948.* London 1979.

Hardiman, David. "Well irrigation in Gujarat: Systems of use, hierarchies of control." *Economic and Political Weekly* (1998): 1533-1544.

Harrison, M. *Climates and Constitutions: Health, Race, Environment and British Imperialism in India, 1600-1850*. New Delhi, 1999.

Hasenöhrl, Ute. "Rural electrification in the British Empire." *History of Retailing and Consumption* 4.1 (2018): 10-27.

Hasenöhrl, Ute "Contested nightscapes: Illuminating colonial Bombay", *Journal of Energy History/Revue d'Histoire de l'Énergie [Online]*, published 20 June 2019 (https://energyhistory.eu/en/special-issue/contested-nightscapes-illuminating-colonial-bombay last accessed: 20/02/2021).

Haskins, V.K. and Lowrie, C. 'Introduction: Decolonizing Domestic Service: Introducing a New Agenda' in Victoria K. Haskins and Claire Lowrie eds., *Colonization and Domestic Service: Historical and Contemporary Perspectives*, New York, 2015, pp.1-19.

Hausman, William J., Peter Hertner, and Mira Wilkins. *Global Electrifcation: Multinational Enterprise and International Finance in the History of Light and Power,1878–2007*. Cambridge: Cambridge University Press, 2008.

Headrick, D. R. *The tools of empire: Technology and European imperialism in the nineteenth century*. Oxford University Press, 1981.

Headrick, D. R. *The tentacles of progress: Technology transfer in the age of imperialism, 1850-1940*. Oxford University Press, 1988.

Hess, D.J. Hess and Sovacool, B.K. Sociotechnical matters: Reviewing and integrating science and technology studies with energy social science, *Energy Research & Social Science*, 65 (2020), 101462: 1-17.

Hoag, Heather J. *Developing the rivers of East and West Africa: an environmental history*. A&C Black, 2013.

Hughes, Thomas Parke. "British electrical industry lag: 1882-1888." *Technology and Culture* 3.1 (1962): 27-44.

Hughes, Thomas P. *Networks of power: electrification in Western society, 1880-1930*. JHU Press, 1983.

Hunt, Bruce J. ""Practice vs. Theory": The British Electrical Debate, 1888-1891." *Isis* 74.3 (1983): 341-355.

Hurd II, John, and Ian J. Kerr. *India's railway history: a research handbook*. Vol. 27. Brill, 2012.

Jones, Christopher F. *Routes of Power: Energy and Modern America*. Harvard University Press, 2014.

Joshi, C. 'Dak Roads, Dak Runners, and the Reordering of Communication Networks, *IRSH*, vol. 57(2), August, 2012, pp.169-189.

Joshi, C. 'Public works and the question of unfree labour', in Alessandro Stanziani ed., *Labour, Coercion, and Economic Growth in Eurasia, 17th-20th Centuries*. Leiden, 2013. 273-287.

Kale, Sunila S. "Current reforms: the politics of policy change in India's electricity sector." *Pacific Affairs* (2004): 467-491.

Kale, Sunila S. *Electrifying India: Regional political economies of development*. Stanford University Press, 2014a.

Kale, Sunila S. "Structures of power: Electrification in colonial India." *Comparative Studies of South Asia, Africa and the Middle East* 34.3 (2014b): 454-475.

Kale, S.S., Dubash, N.K. and Bharvirkar R. eds. *Mapping power: The political economy of electricity in India's states*. Oxford University Press, New Delhi, 2018.

Kennedy, William P., and P. J. R. Delargy. "Shorting the Future? Capital Markets and the Launch of the British Electrical Industry, 1882–1892." *Business History Review* 94.2 (2020): 287-320.

Kerr, Ian J. "Colonialism and Technological Choice: The Case of the Railways of India." *Itinerario* 19.2 (1995): 91-111.

Kerr, Ian J. *Engines of change: the railroads that made India*. Greenwood Publishing Group, 2007.

Kerr, Ian J. "Technology, technology transfer and the British Indian Empire." *Revue dhistoire du XIXsupe/sup siecle* 1 (2018): 134-137.

Klingensmith, Daniel. *"One valley and a thousand": Dams, nationalism, and development*. Oxford University Press, USA, 2007.

Kolsky, E. *Colonial Justice in British India: White Violence and the Rule of Law*, Cambridge, 2010.

König, Wolfgang. "Science-based industry or industry-based science? Electrical engineering in Germany before World War I." *Technology and culture* 37.1 (1996): 70-101.

Kumar, A. 'Thomason College of Engineering, Roorkee, 1847-1947', in Uma Dasgupta ed., *Science and Modern India: An Institutional History, c. 1784-1947*. Pearson Longman, 2011: 453-476.

Krishnakanth, V. V. and Singh, A. ‘Electrical Accident Scenario in India: A Review’ in Faisal I. Khan, Nihal Anwar Siddiqui, S. M. Tauseef and B. P. Yadav eds., *Advances in Industrial Safety Select Proceedings of HSFEA 2018*, Springer, Singapore, 2020.

Kumar, Deepak. *Science and the Raj*. New Delhi: Oxford University Press, 1997.

Baber, Zaheer. *The science of empire: Scientific knowledge, civilization, and colonial rule in India*. SUNY Press, 1996.

Lagendijk, Vincent. *Electrifying Europe: The Power of Europe in the Construction of Electricity Networks*. Technische Universiteit Eindhoven, 2008

Lahiri Choudhury, Deep Kanta. "'Beyond the reach of monkeys and men'? O'Shaughnessy and the telegraph in India c. 1836-56." *The Indian Economic & Social History Review* 37.3 (2000): 331-359.

Lahiri Choudhury, Deep Kanta. *Telegraphic imperialism: Crisis and panic in the Indian Empire, c. 1830-1920*. Springer, 2010.

Lanthier, Pierre. “From the Raj to Independence: British Investment in the Indian Electricity Sector,” *Utilities Policy* 29 (2014): 44-53.

Lanthier, Pierre. “Les quatre phases de l’histoire de l’électricitéenInde, de 1890 à nosjours”, in Beltran A, Laborie L, Lanthier P, Le Gallic S. eds. *Electric Worlds / Mondesélectriques*, Peter Lang Press, 2016: 575-594.

Lewis, Michael. "The Personal Equation: Political Economy and Social Technology on India's Canals, 1850-1930." *Modern Asian Studies* (2007): 967-994.

Lightman, Bernard, Gordon McOuat, and Larry Stewart. *The circulation of knowledge between Britain, India and China: The early-modern world to the twentieth century*. Brill, 2013.

Lourdusamy, John. *Science and National Consciousness in Bengal: 1870-1930*. Orient Blackswan, 2004.

Lourduswamy, J.B. ‘College of Engineering, Guindy, 1794-1947’, in Uma Dasgupta ed., *Science and Modern India: An Institutional History, c. 1784-1947, vol. XV, part 4*. Pearson Longman, 2011: 429-452.

Ludden, David. "Development regimes in South Asia: history and the governance conundrum." *Economic and Political Weekly* 40.37 (2005): 4042-4051.

Mahadevan, Sudhir. *A very old machine: The many origins of the cinema in India*. SUNY Press, 2015.

Mahaluxmivala, Pestonji D. The History of the Bombay Electric Supply and Tramways Company, Limited: 1905–1935. Bombay: Times of India Press and BEST, 1936.

Malm, Andreas. *Fossil capital: The rise of steam power and the roots of global warming*. Verso Books, 2016.

Marshall, P.J. ‘The Company and The Coolies: Labour in Early Calcutta’ in Pradip Sinha ed., *The Urban Experience: Calcutta, Essays in Honour of Nisith R. Ray*, Calcutta, 1987, pp.23-38.

Marvin, Carolyn. "When Old Technologies Were New." *Cuadernos. info* 27 (2010): 138.

Mayntz, Renate, and Thomas Hughes. *The development of large technical systems*. Routledge, 2019.

McDonald, David A, ed. Electric Capitalism: Recolonising Africa on the Power Grid. London: earthscan and HSRC press, 2009.

McDonald, Forrest. "Samuel Insull and the movement for state utility regulatory commissions." *Business History Review* 32.3 (1958): 241-254.

McMahon, Darrin M. "Illuminating the Enlightenment: Public lighting practices in the siècle des Lumières." *Past and Present* 240.1 (2018): 119-159.

Meiton, Fredrik. *Electrical Palestine: capital and technology from empire to nation*. Univ of California Press, 2019.

Mitchell, Timothy. *Rule of experts: Egypt, techno-politics, modernity*. University of California Press, 2002.

Mitra, R. *Kolikata Darpan, Pratham Parba*, Calcutta, 1952.

Mohapatra, P.P. 'From Contract to Status? Or How Law Shaped Labour Relations in Colonial India, 1780-1880' in Jan Breman, Isabelle Guerin and Aseem Prakash eds., *India's Unfree Workforce: Of Bondage Old and New*, New Delhi, 2009, pp.96-125.

Mohapatra, P.P. 'Regulated: Legal Constructions of Labour Relations in Colonial India, 1814-1926' in Jan Lucasen and Sabyasachi Bhattacharya eds. *Workers in the Informal Sector: Studies in Labour History, 1800-2000*, New Delhi, 2005, pp.65-95.

Mohsin, Anto. "Lighting "Paradise": A Sociopolitical History of Electrification in Bali." *East Asian Science, Technology and Society: An International Journal* 11.1 (2017): 9-34.

Montaño, Diana J. "Ladrones de Luz: Policing Electricity in Mexico City, 1901–1918." *Hispanic American Historical Review* 101.1 (2021): 35-72.

Moore, Jason W. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. Verso Books, 2015.

Moosvi, S. 'Domestic Service in Precolonial India: Bondage, Caste and Market', *Proceedings of the Indian History Congress*, vol. 64, 2003, pp.560-582.

Mosse, David. "Colonial and contemporary ideologies of'community management': The case of tank irrigation development in South India." *Modern Asian Studies* (1999): 303-338.

Mukherjee, S.N. *Calcutta: Myths and History*, Calcutta, 1977.

Mukhopadhyay, Aparajita. *Imperial Technology and 'Native'Agency: A Social History of Railways in Colonial India, 1850–1920*. Taylor & Francis, 2018.

Nair, P.T. *Calcutta in the 19th Century (Company's Days)*, Calcutta, 1989.

Nye, David E. *Electrifying America: Social meanings of a new technology*. MIT Press. 1992.

Nye, David E. *Consuming power: A social history of American energies*. MIT Press, 1999.

Nye, David E. *American Illuminations: Urban Lighting, 1800–1920*. MIT Press, 2018.

Otter, C. The Victorian Eye: A Political History of Light and Vision in Britain, 1800–1910. University of Chicago Press, 2008.

Palit, Chittabrata. *Scientific Bengal: Science, Technology, Medicine, and Environment Under the Raj*. Gyan Publishing House, 2006.

Palit, Chittabrata. 'The National Council of Education and Its Progeny: The College of Engineering and Technology, 1906-47', in Uma Dasgupta ed., *Science and Modern India: An Institutional History, c. 1784-1947, vol. XV, part 4*. Pearson Longman, 2011: 849-870.

Parsons, Robert Hodson. *The early days of the power station industry*. Cambridge University Press, 2015.

Parthasarathi, Prasannan. "Water and agriculture in nineteenth-century Tamilnad." *Modern Asian Studies* 51.2 (2017): 485.

Phalkey, Jahnavi. "Focus: science, history, and modern India. Introduction." *Isis; an international review devoted to the history of science and its cultural influences* 104.2 (2013): 330-336.

Pinney, Christopher. *Camera Indica: The social life of Indian photographs*. University of Chicago Press, 1997.

Platt, Harold L. "The cost of energy: Technological change, rate structures, and public policy in Chicago, 1880-1920." *Urban Studies* 26.1 (1989): 32-44.

Prakash, G. *Bonded Histories: Genealogies of Labour Servitude in Colonial India*, Cambridge, 1990.

Prakash, Gyan. *Another reason: Science and the Imagination of Modern India*. Princeton University Press, 1999.

Prasad, Ritika. *Tracks of Change: Railways and everyday life in colonial India*. Cambridge University Press, 2016.

Protschky, Susie. "The Empire Illuminated: Electricity," ethical" colonialism and enlightened monarchy in photographs of Dutch royal celebrations, 1898-1948." *Journal of Colonialism and Colonial History* 13.3 (2012): 1-16.

Raina, Dhruv. "From west to non-west? Basalla's three-stage model revisited." *Science as culture* 8.4 (1999): 497-516.

Raina, Dhruv. *Images and contexts: The historiography of science and modernity in India*. Oxford University Press, 2010.

Raj, Kapil. "Relocating modern science." *Circulation and the construction of knowledge in South Asia and Europe* (2007): 1650-1900.

Ramesh, Aditya. "The value of tanks: maintenance, ecology and the colonial economy in nineteenth-century south India." *Water History* 10.4 (2018): 267-289.

Ramesh Aditya. "INDIAN RIVERS,'PRODUCTIVE WORKS', AND THE EMERGENCE OF LARGE DAMS IN NINETEENTH-CENTURY MADRAS." *The Historical Journal* (2020): 1-29.

Ramesh, Aditya, and Vidhya Raveendranathan. "Infrastructure and public works in colonial India: Towards a conceptual history." *History Compass* 18.6 (2020): e12614.

Ramnath, Aparajith. *The birth of an Indian profession: engineers, industry, and the state, 1900–47*. Oxford University Press, 2017.

Rao, G. N. "Canal irrigation and agrarian change in colonial Andhra: A study of Godavari district, c. 1850-1890." *The Indian Economic & Social History Review* 25.1 (1988): 25-60.

Rao, Yenda Srinivasa, and John Lourdusamy. “Colonialism and the Development of Electricity: The Case of Madras Presidency, 1900–47.” *Science, Technology, and Society* 15, no. 1 (2010): 27–54.

Rao, Yenda Srinivasa. “Electricity, Politics, and Regional Economic Imbalance in Madras Presidency, 1900–1947.” *Economic and Political Weekly* 45, no. 23 (2010): 59–66.

Ray, Jitendranath. *BanglarKalkarkhana o KarigariBidyarItihash*, Dey’s Publishing, Kolkata, 2005.

Ray, Rajat Kanta. *Urban roots of Indian nationalism: Pressure groups and conflict of interests in Calcutta city politics, 1875-1939*. New Delhi: Vikas, 1979.

Robb, P. *Sentiment and Self: Richard Blechynden’s Calcutta Diaries, 1791-1822*, Oxford, 2011.

Robson, B. ‘The Eden Commission and the Reform of the Indian Army – 1879-1895’, *Journal of the Society for Army Historical Research*, vol. 60, 1982, pp.4-13.

Roy, K. ‘Spare the rod, spoil the soldier? Crime and Punishment in the Army of India, 1860-1913’, *Journal of the Society for Army Historical Research*, vol. 84, 2006, pp.9-33.

Roy, T. ‘Sardars, jobbers, kanganies: the labour contractor and Indian economic history’, *Modern Asian Studies* vol. 42.5, 2008, pp.971-998.

Sarkar, Aditya. *Trouble at the Mill: Factory Law and the Emergence of the Labour Question in Late Nineteenth-Century Bombay*. Oxford University Press, 2018.

Sarkar, Smritikumar, *Technology and Rural Change in Eastern India, 1830-1980*, Oxg=ford University Press, 2014.

Sarkar Suvobrata. “Domesticating electric power: Growth of industry, utilities and research in colonial Calcutta.” *The Indian Economic & Social History Review.* 2015 July; 52(3):357-89.

Sarkar, Suvobrata. "The Electrification of Colonial Calcutta: Role of the Innovators, Bureaucrats and Foreign Business Organization, 1880–1940." *Studies in History* 34.1 (2018): 48-76.

Sarkar, Suvobrata. *Let There Be Light: Engineering, Entrepreneurship and Electricity in Colonial Bengal, 1880–1945: Engineering, Entrepreneurship and Electricity in Colonial Bengal, 1880–1945*. Cambridge University Press, 2020.

Sarkar, T. ‘Remaking Caste and Work: Calcutta Municipal Mehtars, and Their Strikes in 1928’, *Refugee Watch: A South Asian Journal on Forced Migration*, vol. 50, 2017,pp.30-43.

Sarkar, T. ‘Caste-ing Servants in Colonial Calcutta’, in Nitin Sinha, Nitin Varma and Pankaj Jha eds., *Servants’ Pasts: Sixteenth to Eighteenth Century, South Asia, Vol. 1*, Hyderabad, 2019, pp.311-344.

Schiffer, Michael B. *Power struggles: Scientific authority and the creation of practical electricity before Edison*. MIT Press, 2008.

Schivelbusch, Wolfgang. *Disenchanted night: The industrialization of light in the nineteenth century*. Univ of California Press, 1995.

Sen, I. ‘Colonial Domesticities, Contentious Interactions: Ayahs, Wet-Nurses and Memsahibs in Colonial India’, *Indian Journal of Gender Studies*, vol. 16(3), 2009, pp.299-328.

Sen, S. ‘Slaves, Servants and Concubines: Domestic Workers in Nineteenth-Century Bengal’ in Arun Bandopadhyay and Sanjukta Dasgupta eds., *In Quest of the Historian’s Craft: Essays in Honour of Professor B.B. Chaudhuri*, New Delhi, 2018, pp.641-676.

Sengupta, K.M. ‘The New Fort William and the Dockyard: Constructing Company’s Calcutta in the Late Eighteenth Century’, *Studies in History*, vol. 32(2), 2016, pp.231-256.

Seth, Suman. "Putting knowledge in its place: science, colonialism, and the postcolonial." *Postcolonial studies* 12.4 (2009): 373-388.

Shamir, Ronen. *Current flow: The electrification of Palestine*. Stanford University Press, 2013.

Shamir, Ronen. "Electricity and Empire in 1920s Palestine under British Rule." *NTM Zeitschrift für Geschichte der Wissenschaften, Technik und Medizin* 24.4 (2016): 451-480.

Showers, Kate B. "Electrifying Africa: An environmental history with policy implications." *GeografiskaAnnaler: Series B, Human Geography* 93.3 (2011): 193-221.

Singha, R. ‘Front Lines and Status Lines: Sepoy and ‘Menial’ in the Great War, 1916-1920’, in Heike Liebau, Katrin Bromber, Katharina Lange, Dyala Hamzah and Ravi Ahuja eds., *The World in World Wars: Experiences, Perceptions and Perspectives from Africa and Asia*, Leiden, 2010, pp.55-106.

Singha. R. ‘The ‘Rare Affliction’: the Abolition of Flogging in the Indian Army, circa 1835-1920’, *Law and History Review*, vol. 34(3), 2016, pp.783-818.

Sinha, N.. "The World of Workers' Politics: Some Issues of Railway Workers in Colonial India, 1918-1922." *Modern Asian Studies* (2008): 999-1033.

Sinha, N. *Communication and Colonialism in Eastern India: Bihar, 1760s1880s*. Anthem Press, 2012.

Sinha, N. ‘Contract, Work and Resistance: Boatmen in Early colonial Eastern India, 1760-1850s’, *IRSH*, vol. 59, 2014a, pp.11-43.

Sinha, N. ‘Opinion and Violence: Whiteness, Empire and State-Formation in Colonial India’, *South Asia Chronicle*, vol. 4, 2014b, pp.322-351.

Sinha, N. "Infrastructural governance and social history: roads in colonial and postcolonial India." *History Compass* 15.9 (2017): e12401.

Sinha, N. ‘‘Servant Problem’ and the ‘Social-Subaltern’ of Early Colonial Calcutta’, in Nitin Sinha, Nitin Varma and Pankaj Jha eds., *Servants’ Pasts: Sixteenth to Eighteenth Century, South Asia, Vol. 1*, Hyderabad, 2019, pp.311-344.

Sinha, N. "Who Is (Not) a Servant, Anyway? Domestic servants and service in early colonial India." *Modern Asian Studies*, vol. 55.1, 2021, pp.152-206.

Sonachalam, K. S. *Electricity and Economic Development of Madras State*. New Haven, CT: Human Relations Area Files, 1970.

Steedman, C. ‘The servant’s labour: The business of life, England, 1760-1820’, *Social History*, vol. 29(1), 2004, pp.1-29.

Stoler, A.L. ‘Tense and Tender Ties: The Politics of Comparison in North American History and (Post) Colonial Studies’, *Journal of American History*, vol. 88(3), 2001, pp.829-865.

Stone, Ian. *Canal irrigation in British India: Perspectives on technological change in a peasant economy*. Vol. 29. Cambridge University Press, 2002.

Subramanian, Ajantha. *The Caste of Merit. Engineering Education in India*. Harvard University Press, 2019.

Sulzberger, Carl L. "Triumph of ac- part 2, the battle of the currents” *IEEE Power and Energy Magazine* 1.4 (2003b): 70-73.

Sulzberger, Carl L. "Triumph of ac-from Pearl Street to Niagara." *IEEE Power and Energy Magazine* 1.3 (2003a): 64-67.

Tann, J. and Aitken, J. ‘The Diffusion of the stationary steam engine from Britain to India 1790-1830’, *IESHR*, vol. 29(2), 1992, pp.199-214.

Thomas, Nicola J. "Embodying imperial spectacle: dressing Lady Curzon, Vicereine of India 1899—1905." *cultural geographies* 14.3 (2007): 369-400.

Tischler, Julia. *Light and power for a multiracial nation: The Kariba Dam scheme in the Central African Federation*. Springer, 2013.

Todd, Edmund N. "Industry, State, and Electrical Technology in the Ruhr circa 1900." *Osiris* 5 (1989): 242-259.

van der Vleuten, Erik. ‘Understanding Network Societies: Two decades of large technical systems studies’, in Van der Vleuten and Kaijser (eds), *Networking Europe. Transnational infrastructures and the shaping of Europe, 1850-2000*, Science History Publications, 2006: 279-314.

Varma, N. *Coolies of Capitalism: Assam Tea and the Making of Coolie Labour*, Berlin, 2017.

Weightman, Gavin. *Children of light: How electricity changed Britain forever*. Atlantic Books Ltd, 2011.

Whitcombe, E. (1972). Agrarian conditions in northern India: No. HN683. W44, 1972.

Wickramasinghe, Nira. *Metallic Modern: Everyday Machines in Colonial Sri Lanka*. Berghahn Books, 2014.

Willis, Justin. "Tribal gatherings: Colonial spectacle, native administration and local government in Condominium Sudan." *Past and Present* 211.1 (2011): 243-268.

Wishnitzer, Avner. "Kerosene Nights: Light and Enlightenment in Late Ottoman Jerusalem." *Past & Present* 248.1 (2020): 165-207.

Wrigley, E. A. *Energy and the English Industrial Revolution*. N.p., Cambridge University Press, 2010.