Thesis Title: OPTIMAL DESIGN, ANALYSIS, POSITIONING OF DGs AND ENERGY MANAGEMENT OF MICROGRIDS

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ABSTRACT

The research introduces an innovative method for determining the most advantageous location and capacity of Distributed Generation (DG) units in a microgrid, with the main aim of reducing active power loss and overall expenditure. The presented work tackles the crucial problem of finding the best possible trade-off between system effectiveness and financial concerns. The suggested approach makes use of sophisticated optimization techniques to account for the intricate interactions between several elements, including DG unit characteristics, load demand profiles, and network topology. This technique dramatically lowers active power losses while also lowering the total cost of the system by carefully selecting the best locations and DG unit sizes in the microgrid. The present study advances sustainable energy systems by offering a holistic approach that strikes a balance between operational efficiency and economic feasibility, thereby improving microgrid performance.

Further to the above, another research that involves a novel approach to multi-party energy management of microgrids by integrating demand response mechanisms for both heat and electricity is investigated here. To meet the needs for heat and power simultaneously, the research takes a cooperative and coordinated strategy to maximize the use of energy resources in a microgrid context. Effective balancing between the production and consumption of heat and power by various microgrid participants is a feature of the suggested energy management system. Demand response techniques allow the microgrid to adjust to changing energy circumstances, improve total energy efficiency, and support sustainable energy methods.

In addition to the above, a concept of community microgrid has been investigated to optimize the cost of energy for the microgrid participants. A priority-based mutual power

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sharing between microgrids is investigated. The project aims to create a novel strategy that will enable microgrids in a community to share electricity more effectively. To dynamically distribute and share electric power among interlinked microgrids, the suggested system uses a priority-based framework that takes into account variables including load demand, system reliability, and emergency/ importance of the load. The community microgrid may thus improve overall resilience by prioritizing electricity distribution based on the criticality of the demand in real time.

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