Energy Management for Optimal Renewable Energy Usage in an Apartment Building

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DECLARATION OF THE CANDIDATE & SUPERVISOR

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ABSTRACT

Common renewable energy plants with proper energy management for a selected community can bring immense benefits to its consumers compared to isolated/individual renewable energy (RE) systems. Optimal usage of RE within boundaries provide with less burden on transmission/distribution networks, reduced energy loss, improved power quality, and financial benefits for both investors and consumers. In this study, we recognize apartment buildings, housing schemes, zoning areas, universities and other such institutes as potential target sites to implement this concept.

Energy management of the proposed common renewable energy plant is done by considering shiftable loads. Shiftable loads/noncritical loads, such as washing machines, dryers, irons, thermal storage are able to provide scheduling flexibility to achieve a lower electricity bill under the integration of renewable energy. In Sri Lanka, under time of use tariff mechanism, electricity price vary thrice a day.. Since the amount of renewable energy generation is also varying throughout the day, based on the predictability of day-ahead weather conditions and with the cooperation of the consumers, an optimum load schedule can be identified for the shiftable loads.

This research proposes to develop an algorithm for day-ahead load scheduling in an apartment building with the aim of harvesting maximum renewable energy generation. The results show that the proposed algorithm schedules shiftable loads resulting in a significant reduction in the cost of electricity to the consumers. This concept will attract investors to the renewable energy industry by making immense extra revenues and quick payback periods. Moreover, this method adds an extra marketing point to sell apartments, which makes it beneficial for the building construction industry.

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