

A Novel Energy Storage Model to Improve National Electricity Load Profile of Sri Lanka

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Abstract

It is proposed to introduce a low-cost battery storage system which will get charged during off-peak hours & use this stored energy during peak demand time. This will be a low-cost option to level off the daily electricity demand cycle, by flattening the peak and filling the valley. It is revealed that two peaks in the daily load profile which had been caused due to the usage of the domestic sector and the significant high peak is observed in the evening from 6.30 pm to 10.30 pm. The concept of storing energy gathered from the main grid during the off-peak hours and reusing it during the peak hours is introduced. To develop the model three types of the household were selected based on the monthly consumption of 90 units, 150 units, and 180 units. Analysis of the household load profile of an average middle-class house utilizing 180 kWh, 150 kWh and 90 kWh per month shows that during peak hours, it will utilize around 3 kWh, 2 kWh and 1 kWh per day respectively. This can be stored in a low-cost battery by charging it during off-peak hours (say from 11.00 pm to 5.00 am) and can be utilized during peak demand time of 6.30 to 10.30 pm. As a storage device, a novel household battery technology will be introduced with 160 Ah (~2kWh) and 250 Ah (~3kWh) capacities. The model house that has been considered uses 3 kWh per day during the peak demand time, therefore proposed, 3 kWh storage battery to be installed with charging and inverter circuits. This house will not draw electricity from the national grid during peak hours. This energy saving option, even though it will not generate electrical energy by way of installation of a solar panel or any other renewable option, this will be a low-cost option to the household while saving a massive cost to the nation. This will also maximize the capacity utilization of all existing generation plants.