NOVA SCOTIA ENERGY
R&D CONFERENCE 2014
ENERGY FOR CHANGE

Abstract:

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Category: Alternative Energy & Sustainability

Residential battery energy storage modeling assessment

The depletion of fossil fuel resources, fluctuation in fossil fuel prices, and increase both global warming and energy demand has resulted in increased the demand for renewable energy resources. However, the intermittent and variable nature of renewable energy will necessitate the use of energy storage. The objective of this study is to reduce the maximum electricity demand from the grid. The concept is to use a residential battery energy storage system that stores energy during the off peak time and utilizing that stored energy during the peak demand time. The different modeling methods are used and compared. Maximum peak limit is calculated on the basis of percentile method. MATLAB is used to size the battery, inverter and peak limit. Maximum peak limit for a typical Atlantic Canadian home is calculated to be 5260 W at 98.5 percentile criteria. Without the integration of wind energy a 5 kWh storage capacity and 3800 W inverter size is required. However, with integration of wind energy only 3.2 kWh of storage capacity and 3200 W inverter size is required. HOMER is used to perform sensitivity analysis. TRNSYS will be used to verify the results from MATLAB and HOMER. The results and comparative analysis of this project will report capability and limitations of all three software packages used, and will be helpful in selecting the most appropriate modeling tool for future projects.