

Abstract

The National Electricity Market of Singapore (NEMS) has been studied by many market regulators and researchers and it is well-known for its distinguished maturity and structure. A demand response (DR) program was implemented in April 2016 to further improve its efficiency and competitiveness. With the liberalization and deregulation of the electricity market, it becomes more flexible for demand side to actively participate in the wholesale electricity market. This has changed the way how electricity is traded.

In this research, a software-based assessment tool is developed for participation of loads in demand response program of wholesale electricity market of NEMS

This work focuses on the study of Singapore demand response program featuring demand side bidding and incentive payments. The impact of demand side participation on the market is analyzed. The issues associated with the structure and operation of the electricity market are addressed in this research. In addition, DR can be employed in energy management to mitigate the difficulty brought by uncertain demand. Firstly, the current market clearing model (MCM) of Singapore, which is the assessment tool for the settlement of energy and ancillary services simultaneously, is introduced. The mechanism of transmission loss and nodal prices integrated in the MCM is presented as well. Secondly, the methodology of integration of demand side bidding with the newly introduced requirements is discussed. Finally, a two-stage stochastic market clearing for the coordinated operation of generating units and demand response (DR) is proposed.

In the future, the proposed modeling can be utilized for further evaluation on real time demand response (DR) and interruptible load (IL) strategies. The challenges to be addressed are also outlined while the solution is still under testing.