Supervised Learning based Demand Response Simulator with RTP and PTR in Context of Smart Grid

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Abstract

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Abstract:
Demand Response (DR) program empowers the dynamic prices to actively optimize the consumption. This optimized consumption plays a vital role in resolving the complex operation and reliability issues in the electricity market. The human behaviour aspect of consumers explained by several models that have been reported in the literature. These models depend on the classical utility factor. The effect of price on the consumer's decision in the field of energy efficiency and reduction of consumption based on behavioural characteristics are two important aspects of DR programs. In absence of such characteristics, results become non-viable. In this paper, the footprint of two time-based DR programs is explored on the peak reduction namely; Real Time Pricing (RTP) and Peak Time Rebate (PTR). Artificial Neural Network (ANN) based topologies for two DR programs are proposed. The proposed topologies employ variation in demand and price, subsequently for simulating an online DR simulator. Demand before and after the RTP and PTR were calculated and compared with four ANN based DR topologies namely; Radial Basis Function Neural Network-Demand Response (RBFN-DR), Feedforward Backprop-Demand Response (FFBP-DR), Layer Recurrent–Demand Response (LR-DR), and Generalized Regression-Demand Response (GR-DR). The proposed models are tested on hourly residential data of test smart grid. By assessing the results from test case, depicted that RBFN-DR proved its efficacy by giving better results for both price-based programs namely; RTP and PTR.

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