

Demand Response Scheduling to Alleviate Stresses in Power Distribution System

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Abstract—*Electric power distribution is aimed to provide reliable and quality supply of electric power to the consumers, in lieu of which consumers follow a pre-decided monthly payment plan which in general includes fixed and variable costs of electric power supplied to them. An economically efficient system is built up when both the parties gain maximum benefits with minimum inputs. In this context efficient electric system may be defined as a system in which electric utility revenue is maximized with minimum utility cost and consumer bills are minimized with maximum reliability. This situation is possible with demand management contracts / schemes designed with thorough economic analysis of the system with respect to the consumption pattern of the consumers as a whole. Electricity price may be seen as the function of demand in real-time pricing system. The whole idea is basically referred to as demand response wherein customers change their electric usage in response to the price signals received from electric utility to relieve the transformer overloads and feeder congestion or avoid undue circuit faults. With the upcoming Smart Grid technologies, Demand Response (DR) implementation is possible for optimal utilization of resources and better electrical services. The paper discusses the concept of DR with reference to the commercial and residential sector and presents a case study of demand response in Indian household and commercial complex altogether with different major loads. An average Indian house with four typical loads, i.e., a washing machine, bore-well water pump, hot water heater and lighting loads and a typical commercial complex with lift load, AC (heating) load and computer system loads are chosen for the study. A demand response algorithm is designed to schedule the operation of the responsive loads to lower down the peak load of the system during peak pricing hours to alleviate stresses in distribution circuit for efficient distribution system operation. Scenario of real time pricing is assumed for the study. The results reveal that there is a great potential for demand response in this sector of power distribution and also the demand response participation from residential and commercial customers may play a crucial role in reducing peak loads and ultimately the reduce the cost of electricity for the consumers.*