SCALABLE ENERGY MANAGEMENT INFRASTRUCTURE FOR AGGREGATION OF HOUSEHOLDS

The Smart Grid represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability and efficiency that will contribute to our economic and environmental health. The Smart Grid will consist of controls, computers, new technologies and equipment working together and with the electrical grid to respond to our quickly changing electric demands. Besides, demand response provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage during peak periods in response to time-based prices. This project aims to achieve technological and scientific successes by developing a novel ICT infrastructure for the implementation of Demand Response in households. This infrastructure enables the shifting of energy consumption from high energy-consuming loads to off-peak periods with high generation of electricity from Renewable Energy Sources. The chief purpose of this project is trying to develop a novel, comprehensive and optimal scheduling strategy for varied-specific households, where the aggregator system will simultaneously optimize and manage a large number of partial loads according to the generation of electricity from Renewable Energy Sources, to shift the households' demands to off-peak hours. Furthermore, the scheduling strategy needs to take into account constraints from household comfort, grid stability, market mechanisms and etc. Besides, trying to optimize miscellaneous conflictive objectives of households and aggregator simultaneously makes a multi-objective optimization problem. As a result, the main question is how much and when the power consumption should be shifted regarding the inclusion of scalable and diverse-characteristic householders, different appliance types and dynamic energy price strategies. Answering this ques-

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tion helps the householders to benefit financially and the aggregator to balance the system optimally regarding a specific time period.

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