

Demand response with locational dynamic pricing to support the integration of renewables

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Abstract— Electricity production from centralised and decentralised renewable energy resources in Europe is gaining significance, resulting in operational challenges in the electricity system. Although these challenges add to the locational and time dependency of the underlying cost of operating the system, this variability in time and location is not reflected in residential tariff schemes. Consequently, residential users are not incentivised to react to varying system conditions and to help the integration of renewable energy resources. Therefore, this paper provides a theoretical framework for designing a locational dynamic pricing scheme. This can be used to assess existing tariff structures for consumption and injection, and can serve as a theoretical background for developing new tariff schemes. Starting from the underlying costs, this paper shows that the potential for locational dynamic pricing depends on the locational and time dependency of its cost drivers. When converting costs into tariffs, the tariff design should be determined. This includes the advance notice of sending tariffs to users, and the length of price blocks and price patterns. This tariff design should find a balance between tariff principles related to costs, practicality and social acceptability on the one hand, and the resulting demand response incentive on the other.

Index Terms— Demand response; Renewables integration; Tariff design

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