

Demand response cost analysis and its effect on system planning

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Abstract-

Demand response (DR) is an ideal option for development and deployment in electricity systems, especially in a high-renewable production context. This paper tries to identify the costs of implementing DR to have a fair comparison with other options, such as storage, since the current literature neglects the costs, obtaining over estimated savings for DR. However, determining the allocation of these DR costs remains challenging due to the lack of literature. This work uses an enhanced model capable of optimizing DR from various sources within the residential and commercial sectors. Through multiple iterations, which account for different investment, operating, and maintenance costs, the model identifies a range of fixed and variable costs that ensure the profitability of DR implementation. The analysis demonstrates that DR is profitable when the levelized cost of electricity (LCOE) for each DR technology is below 100 €/MWh. The findings indicate that heating and cooling is the most cost-sensitive DR technology, requiring lower costs to achieve profitability, followed by domestic hot water. In contrast, electric vehicles provide greater flexibility, allowing for a 40% wider cost range while remaining profitable. Moreover, the comparison between accounting for DR costs and ignoring them highlights their crucial role in making optimal investment and operational decisions.

Index Terms- Demand response cost; Electricity system planning; LCOE; Buildings flexibility; Profitability analysis

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