

Value of flexibility alternatives for real distribution networks in the context of the energy transition

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Abstract-

The distribution grid faces several challenges related to the decarbonisation of the economy, which require incorporating flexibility services alongside traditional grid reinforcement solutions to enable an efficient grid development. Flexibility services, as well as the needs that require them, are very diverse. Therefore, general estimations about the value of flexibility applicable to any given scenario are unfeasible or imprecise. This paper reviews the literature on the quantification of the value of flexibility and proposes a broad-spectrum methodology aligned with the actual challenges of the energy transition for the planning of distribution network as it includes a comprehensive analysis of the real costs and the type of needs. Based on it, four representative and realistic case studies compare the BAU (business as usual) solutions with flexibility services analysing the technical and economic perspectives. Results show that flexibility value depends on the case studies considered and that, under certain circumstances, BAU solutions can be more competitive than alternatives with flexibility services. Network reinforcements in the distribution network have a long lifespan and provide a reliable service to thousands of customers. However, flexibility services can be particularly useful for accelerating decarbonisation with flexible connections or short-term solutions to manage the distribution network operation.

Index Terms- Congestion management, flexibility evaluation, flexible connection, power distribution planning, systems operation

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