

Distribution network costs under different penetration levels of distributed generation

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Abstract— Nowadays, the amount of distributed generation (DG) connected to distribution networks is increasing significantly. In a European context, one of the main drivers for this growth is the support of electricity generation from renewable energy sources (RES) and combined heat and power (CHP) plants. Hence, these DG units mostly consist of non-controllable generation. Distribution is a regulated activity which is, at least, legally and functionally unbundled from the generation activity. These issues, together with the fact that distribution networks were not originally designed to accommodate generation, pose significant challenges on distribution network planning and operation. One of the major concerns of distribution system operators (DSOs) is the impact that large penetration levels of DG may have on distribution network costs. This paper presents a quantification of the impact of DG on distribution network costs in three real distribution areas. Different scenarios of demand and generation have been analysed for each region. Two possible situations are taken into account in each scenario: maximum net demand and maximum net generation. The computation of the distribution network costs was carried out by means of two large-scale distribution planning models called reference network models (RNMs).

Index Terms— Distribution network costs; Distributed generation; Reference network models; Distribution planning; Distribution regulation

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