

Electricity Distribution Networks: Investment and Regulation, and Uncertain Demand

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Electricity distribution networks are capital intensive systems and timely investments are crucial for long-term reliability and expansion of their service. In coming years, in the UK, and elsewhere in Europe, many distribution networks are in need of extensive investments in their aging assets. At the same time, aspects of energy policy concerning climate change, renewable energy sources, energy efficiency, demand side management (DSM), network energy loss reduction, quality of service standards, and even security of supply require active, flexible, and smart networks that can be achieved through significant investments.

The main difficulty in incentivising investments is in the discrepancy between the long economic life and the cyclical nature of network assets on the one hand and the considerably shorter (five years in the UK) distribution price controls. Capital investments are not an integrated part of the cost benchmarking exercise and utility investment plans need to be approved by the regulator. Also, assessing the effectiveness of investment efficiency incentives remains a difficult task due to the long time-horizons involved in network investments, information asymmetry between the regulator and the utility, and the five-year focus of price control reviews.

The investments needs of the different parts of a network can vary greatly due to differences such as in asset age and load growth. At the same time, the investment needs of meeting some of active and flexible networks can have localised effects on the networks. For example, increase in distributed or micro generation in parts of the network or interest in power generation activities by councils and communities can lead to such local network effects. Therefore, there is a need for models that can be used to assess and regulate investments at sub-network level.



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This paper is a chapter in the forthcoming book "Jamash T. and Pollitt, M. G. (2011) Eds., The Future of Electricity Demand: Customers, Citizens and Loads, Cambridge University Press: Cambridge" and describes a network investment assessment model developed as a practical tool to identify and assess the investment requirements of distribution networks. A broadening of the scope of network investments to include demand-related measures such as micro-generation, distributed generation, and energy efficiency can reduce the need for investments. However, the regulatory framework needs adapt in accordance with the changing role of the future networks and in order to harness the benefit of a wider range of investment possibilities.

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