

Distributed Generation, Storage, Demand Response, and Energy Efficiency as Alternatives to Grid Capacity Enhancement

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The electricity distribution network operators (DNOs) are responsible for, expansion, reinforcement and maintaining the safety and reliability of the network to support power flows and ensure quality of supply. Integration of distributed resources¹ introduces new challenges and opportunities that require innovative technical, economic and regulatory solutions to overcome the barriers and utilise possibilities. This includes enabling distributed resources to compete with alternatives in providing network and non-network services to the DNOs. In the context of non-network solutions, there is an opportunity for replacing or deferring grid reinforcement by meeting demand locally through deployment of distributed generations (DGs), storage and reducing peak demand through demand response and energy efficiency.

From an economic viewpoint, a challenge is how to value these alternative energy resources. At present, there are no established methods to value the complex set of technical and financial opportunities (and challenges) arises from the integration of these resources. This stems from the lack of a market mechanism that supports this process. Moreover, adopting distributed resources to defer demand driven grid reinforcement requires extending the traditional business model of distribution utilities in a manner consistent with the unbundled sector. Thus, along with technical concerns, there is a need for innovative economic and regulatory solutions. For example, issues such as ownership model of resource facility, differentiating between costs of capacity and energy, dispatchable and non-dispatchable generation, possibility of trade in other markets, managing storage and demand response are important and need to be addressed. Moreover, the presence of uncertainties such as the sustainability of costs and possibility of demand reduction over time constitute some risk elements.

This paper proposes a new market-based model termed “contract for deferral scheme” (CDS) to integrate an economically efficient portfolio of distributed resources including distributed generations, storage technologies, demand response

¹ Throughout this paper we use the term “distributed resources” for distributed generation, storage facilities and demand response (and energy efficiency) that interact with distribution network.

and energy efficiency, as an alternative for demand driven network investment. The concept of CDS is consistent with an unbundled power sector paradigm, and lies within the wider context of an extended business model of distribution utilities. The details of the CDS procurement was discussed in three stages: pre-auction, auction and post-auction. Pre-auction stage explored the conditions for resource eligibility; the auction stage discussed the process of price discovery and market rules and finally post-auction stage addressed issues such as the length of contracts and compliance monitoring.

The CDS contracts present several potential advantages. Firstly, they protect the developers of distributed resources from market risks, decrease the financing cost and improve commercial bankability of investments. Secondly, they improve competition, encourage investments and hence; speed up the deployment of DGs, storage facilities and demand side participation. Thirdly, CDS auctions help with creating an integrated market for substitution of a resource portfolio as a virtual network capacity, at distribution level, and simplifying the process of valuing alternative solutions to grid reinforcements. Fourthly, CDS helps, to some extent, alleviating the gradual reduction of reserve margin problems which is currently a major issue in the post-liberalisation power sector.

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