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Competition in Markets for Ancillary Services? The implications of rising distributed generation

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Ancillary services are electricity products relating to wholesale electricity other than those traded through traditional wholesale electrical energy markets. Roughly, they can be characterised as covering balancing energy, frequency regulation, voltage support, constraint management and reserves. They are related to power quality. These products have traditionally been supplied to system operators at fixed or negotiated prices usually related to the opportunity cost of them being provided by traditional fossil fuel and conventional hydro generators. Over time some of these products have been available from more formal markets in some jurisdictions (e.g. for balancing energy and frequency regulation, for congestion and for reserves in markets such as PJM or GB).

Rising amounts of intermittent distributed generation (wind and solar) on the electricity network creates the potential need for more ancillary services relative to total electrical energy supplied: greater fluctuation in system frequency, more potential for high volts export constrained areas, more local network congestion (because generation is more distributed) and higher reserve requirements. At the same time, distributed energy resources (DERs) can provide more ancillary services, both by distributed generation itself being incentivised to mitigate its impacts on the system or via new technologies (such as batteries or active demand management).

The focus of this paper however is on whether markets for ancillary services, usually run by system operators, can ever be as competitive as wholesale energy markets? Energy markets – where these have been allowed to develop - in general are characterised by increasingly deep market arrangements which make it difficult for them to be excessively monopolised in the absence of significant market power relating to incumbent generators. Good examples of these wide area markets are across PJM in the US, the increasingly integrated markets in Europe or the National Electricity Market (NEM) in Australia.

In this paper we discuss: the nature of markets for ancillary services; what we really mean by ancillary services; how they are impacted by the rise of distributed generation; how they are

currently procured; how they relate to the rest of the electricity system; the current state of evidence on ancillary services markets; whether these markets ever be as competitive as conventional wholesale energy markets, and offer some conclusions.

We offer a number of conclusions.

Ancillary service markets are currently small relative to markets for day-ahead and longer term wholesale energy. The rise of intermittent renewable energy would seem to increase the quantities of ancillary services required, however this is not quite the same as meaning that the value of ancillary services will become significantly larger in the future than it is now. Better wind and solar forecasting, combined with sharper real time energy price signals will offset the need for more frequency regulation, voltage support, constraint management and reserves. The presence of electric vehicles also offers significantly more potential for managing the electricity system relative to now and could provide a cheap source of ancillary services in the same way that fossil fuel power plants have done traditionally.

The overall optimisation of the electricity system involves the interaction of ancillary services, wholesale energy and networks and is not dependent on the nature of the market for ancillary services. Ancillary services trade off with wholesale energy and network operation and investment in ways that may mean that co-optimisation or internalisation is preferable to a stand-alone spot ancillary services market. The Coasian question of the optimal allocation of activity between in house and market transactions requires relatively more attention than Schweppian question of how to increase optimal decentralised price signals.

Ancillary services markets are limited by the overarching role of the system operator, whose monopoly purchaser position acts to create investment risk relative to wholesale energy markets.

Regulators need to carefully evaluate changes to ancillary services procurement, given the split incentives which exist for them to be acquired in a system optimal manner. The question of whether they are best acquired in the future by the transmission level system operator or the distribution system operator is an open one for voltage support and constraint management.

There is, however, considerable scope for innovation in the provision of ancillary services and the targeting payment for them. At this stage, there remains much room for experimentation globally as shares of distributed generation rise on the electricity system.

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