Strategic behaviour in a capacity market? The new Irish electricity market design

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Executive summary

Following several waves of merger activity since the 1990s, it is not uncommon for restructured electricity markets to be dominated by a small number of large players. This has justified the use of regulatory price caps to protect consumers from the exercise of market power during periods of peak demand. Electricity markets now face the new challenge of responding to countries' ambitious decarbonization objectives. This means growing (intermittent) renewables generation while ensuring security of supply is maintained during the energy transition.

It has recently been questioned whether an "energy-only" market can guarantee adequate generation. Wholesale price caps that are set too low can lead to a "missing money" problem, weakening investment incentives. Growing wind and solar generation can exacerbate the adequacy problem by decreasing the run-time of fossil-fuel generation. Uncertainty around government policy—e.g., renewables support mechanisms and the trajectory of carbon prices—is difficult to hedge and can drive up the cost of capital.

Policymakers and economists increasingly see a market design that combines an energy market with a capacity market as a way to deal with these challenges. Capacity markets have in recent years been introduced in several European countries (e.g., Britain, France) and already exist in regional US markets (e.g., New England, PJM). They allow a government to procure its preferred level of resource adequacy at least cost via a competitive auction; winning generators commit to being available at a future date against an auction-determined capacity payment.

Our key observation is that the introduction of a capacity auction can give large incumbents an additional lever to exercise market power. Hence the outcome may depart from the least-cost solution—and be unfavourable for electricity consumers. Strategic behaviour can involve withholding capacity (to drive up the capacity payment received on remaining units) or predatory bidding (to induce rival exit from the electricity market). A firm's incentive to exert market power in the capacity auction depends on competition in the electricity market, so these need to be modelled jointly.

In this paper, we present a new modelling approach that captures such strategic behaviour together with a set of *ex ante* simulation results for the new Irish electricity market design (Integrated Single Electricity Market, I-SEM), which is due to be implemented in 2018. Our work extends the rich literature on "competitive benchmark analysis" in wholesale electricity markets to the study of market power in capacity markets.

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The Irish case is interesting for four main reasons. First, a single firm ESB controls 44% of generation capacity (excluding wind farms) so concerns about strategic behaviour are already present. Second, the need to comply with the EU's Third Energy Package means that the island of Ireland is moving from a system of administrative capacity payments to an auction; the committee responsible for the I-SEM's design noted that "The I-SEM capacity market is likely to exhibit structural market power, creating challenges for the design of the auction". Third, the Irish market is salient from a renewables perspective: fast-growing wind generation accounts for the bulk of new investment and over 20% of installed capacity in a system that has traditionally been dominated by ESB's gas-fired generation. Fourth, the I-SEM capacity market will be the first in Europe to feature a design based on reliability options (ROs).

We quantify the impacts of strategic behaviour by ESB in the capacity market on wholesale prices and buyers' costs of purchasing electricity across a range of scenarios (e.g., different volumes of procured capacity, different degrees of competitiveness in the wholesale electricity market, different degrees of new entry). We find significant costs of strategic behaviour, even with new entry and the design based on ROs: In our baseline scenarios, procurement costs in the capacity auction are around 150–400 million EUR (or 40–100%) above the competitive least-cost solution. This translates into an increase of around 10-25% in total buyer costs across the electricity market and capacity market. On balance, our analysis suggests that policymakers' concerns about market power in capacity markets are well-founded.

From a policy perspective, we then use the model to analyze the performance of well-known screening tools (e.g., the "Residual Supply Index", RSI) in measuring market power in the capacity auction, and also explore how auction design can help mitigate market power. We find that the RSI is an imperfect indicator in this application: a "high" RSI above 110% may not be a reliable signal for "low" market power, especially in conjunction with new entry. We also find that using a lower bid cap for incumbents in the capacity auction can partially mitigate market power—but this also shifts significant informational requirements back onto the regulator. Moreover, in a system with excess capacity, the lower bid cap will often bind, implying that the regulator effectively chooses the clearing price; this runs against the spirit of using a market mechanism in the first place.

We leave important issues to future research: (1) extending our model implementation to multiple strategic players in the capacity auction; (2) examining how the introduction of a capacity market interacts with firm behaviour in balancing and forward markets; (3) incorporating the increasing roles of battery storage and demand-side aggregation; (4) considering the overall welfare impacts of strategic behaviour, including its environmental impacts.

Keywords capacity market; strategic behaviour; competitive benchmark analysis; restructured electricity market; auction design