Transition to a Capacity Auction: a Case Study of Ireland

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Introduction

Modern electricity markets are characterized by increasing shares of intermittent production which has almost zero marginal costs. The effect of introducing large amounts of cheap power into the system is known as the merit order effect – a shift of a supply curve to the right which delivers lower equilibrium prices. The lower prices and the fact that fossil-fuel generators are used less often exacerbate adequacy problems – there is a threat that not enough generating capacity will be available in the system since generators´ revenues are low and investment needs are not met. This and the fact that energy markets are often capped in order to prevent market power leads to the so called "missing money problem" (Teirila and Ritz, 2018, Bublitz et al., 2019). One possible remedy is to supplement the energy only markets with capacity markets (Newbery, 2016; Cramton et al, 2013; Joskow, 2007).

Recently the electricity market on the island of Ireland has been completely restructured, a change that affected also the capacity mechanism, transforming it from an administrative decision-based to a market-based mechanism, an auction. The move however has not been a smooth one, with a supply of Dublin put at risk as one of the main suppliers in the area wanted to withdraw from the market as a result of not being able to successfully secure the operation of its two units. Since Irish electricity demand is forecast to grow by between 15% and 47% over the next ten years, with over a quarter of all electricity consumed by data centres, many of which will be in the Dublin region (EirGrid, 2018a), the threat of losing one of the suppliers become even more serious.

In this case study we show how even with considerable analysis and preparation, the introduction of an auction system is not without risk.

Capacity mechanism in EU

The first explicitly designed capacity market in EU was established in 2015 in the UK (Newbery, 2016).[1] While capacity markets were relatively common in the U.S. and part of the original market design in many states, they are more recent in Europe. The EU Single Electricity Market is designed as an energy-only market but increasingly European countries are including capacity payment schemes into their power systems in response to the rising penetration of renewable generation and the impact of this on system reliability (Bublitz et al., 2019; CRU, 2015). Ireland had long argued in the previous electricity market design (the Single Electricity Market or SEM) that a capacity payment mechanism was needed due to the small size of the all-island electricity market, the relatively high share of intermittent renewables, and the limited amount of interconnector capacity, leading to a vulnerability to outages.

The European Commission (2016) distinguishes between two types of Capacity Remuneration Mechanisms: volume- and price-based. Bublitz et al. (2019) provide a description of generic types of CRM and give an overview which solutions are used around the world. They distinguish six types of mechanisms: tender for new capacity, strategic reserve, targeted capacity payment, central buyer, de-central obligation and market-wide capacity payment. The reliability option design with a central buyer format was chosen as the design of the new Irish capacity remuneration mechanism after a consultation process in 2014 and 2015.

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See footnotes at end of text.

From capacity payments to reliability options

The Irish Single Electricity Market (SEM) was established in 2007 as a mandatory, centrally dispatched pool where the system operator[2] calculated a marginal system price for each trading period (Teirila and Ritz, 2018). From its inception, the energy-only market was accompanied by the Capacity Payment Mechanism (CPM) – payments that were centrally distributed by the regulator among all generating units. The CPM was a system of fixed revenue payments for participants offering generation capacity in the SEM. A pot of money was calculated annually by the Commission for Energy Regulation and the System Operators, as a function of the volume or capacity needed to service market demand and the annualized fixed costs of a best performing entrant peaking plant. The fund was collected through capacity charges levied on market participants who purchase electricity through the pool.[3] It was paid out to market participants who provided generation capacity to the market and the average total value was approximately €550 million in the last years of the scheme (EirGrid, 2018b).

In October 2018, the SEM was transformed to become compatible with the EU Third Energy Package which aimed to create an integrated electricity market based on market principles (Teirila and Ritz, 2018). The new Integrated Single Electricity Market (I-SEM) consists of several markets of different time horizons: forward, day-ahead, intraday and balancing markets. In order to calculate day-ahead interconnector flows and market

prices, a new algorithm, EUPHEMIA, is used to couple the I-SEM and UK and hence European electricity markets. [4] [5]

In the early consultation on the design of the new integrated single electricity market (the I-SEM), the option to discontinue the capacity payments was considered. The SEM committee decided that to avoid the risk of generation shortfall some form of capacity payment should remain. However, in line with the EU integrated market, a more competitive process should be put in place and capacity payments would be made through an auction (SEMC, 2019).

The capacity mechanism has been transformed into a mandatory Capacity Remuneration Mechanism (CRM)[6]. It uses reliability options (ROs) which are purchased in an annual uniform auction with two types of auctions planned: T-4 and T-1 when auction is held four and one year before delivery, respectively. As a preparation for the auctions EirGrid has issued Capacity Market Codes with detailed instructions for CRM participants. One of the concepts discussed in this document are locational capacity constraints (LCC) which may be introduced by the system operator and which determine geographical areas that require that a minimum capacity is cleared in the area for the purpose of system security (SEM, 2017). To date, three capacity auctions have taken place and they all made use of the locational constraints. The first T-1 auction was run on 15 Dec 2017 with Level 1 LCC Areas of Ireland and Northern Ireland; and a single Level 2 LCC Area of Dublin. The same LCCAs were present in the second T-1 (on 13 Dec 18) and the first T-4 auction which was run recently (28 March).

Reliability Options

A Reliability Option (RO) is a financial instrument that entitles the System Operator (the buyer) to "receive a difference payment from a generator if the price in the electricity market exceeds a pre-defined strike price" (Teirila and Ritz, 2018). Therefore, the load is hedged against high prices in the spot market.[7] As a first step EirGrid establishes how much capacity is needed to secure the supply of electricity in the market, then in an auction it purchases the requisite amount of ROs to cover that capacity. The auction clears at the minimum price that is needed to procure the desired amount of RO capacity (Teirila, 2016).

First RO auctions

The first Irish capacity auction took place in December 2017[8] for delivery in May 2018 - September 2019[9] [10]. The second capacity auction took place in December 2018 for delivery 2019-2020[11] [12]. 105 generating units were qualified to participate in the auction, out of these 100 submitted offers and 95 were successful. A third auction for delivery 2022 – 2023 is planned in March 2019 (SEM, 2018).[13]

In the first (T-1) auction, 100 generating units participated in the auction and 93 were successful with 7774MW of capacity auctioned for €333 million in total. The second T-1 auction a year later secured 8266MW of capacity for a total cost of €345 million. This compares with the annual capacity payment sum in 2016 of €515 million for a capacity requirement of 7070MW under the old capacity payment mechanism and shows a significant saving for electricity customers. The clearing price was €40.65 per kW per year, which dropped from the first auction clearing price of €41.80 per kW last year. In the old Capacity Payment mechanism, the price was set by the best new Entrant price and was €72.82/kW/year in 2016 (which was already lower than in previous years) (EirGrid, 2018a, 2018b).

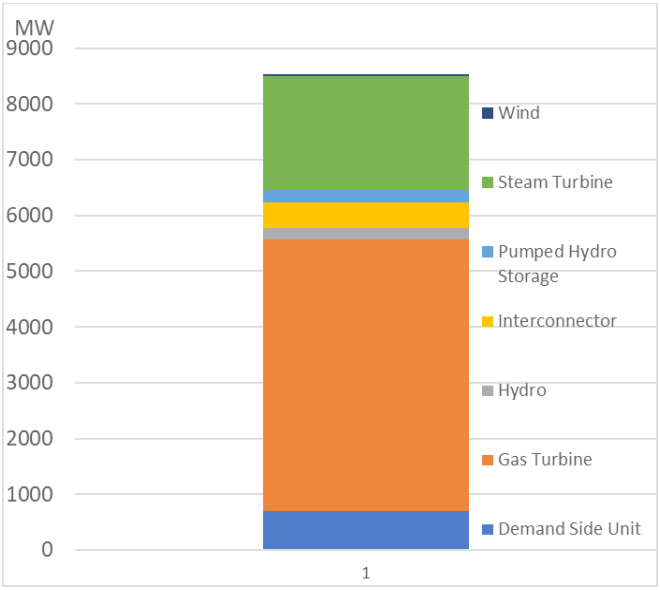

Figure 1. The range of technologies and energy sources bid in the second T-1 auction (EirGrid 2018b)

The range of technologies and energy sources bid in the auctions was diverse, as illustrated in Figure 1. As expected, most capacity was bid by gas and steam turbine generators. Of the new capacity qualified for auction (400 MW), the majority was offered by Demand Side Units (397 MW).

In the 2018 T-1 auction, capacity was secured across the three locational zones (Table 1). However, notwithstanding the LCC rules, no new capacity was bid

	Total Capacity (MW)			
	Northern Ireland	**Ireland**	**Greater Dublin**	**Total**
De-Rated Quantity Offered	1999.5	6397.0	1492.4	**8396.5**
De-Rated Quantity Successful	1997.4	6268.5	1492.4	**8266.0**
De-Rated Quantity Unsuccessful	2.062	128.5	0	**130.6**

Table 1. Total accepted capacity in MW
EirGrid (2018b)

When the results of the first capacity auction were announced on 26th January 2018, it was found that only one of two Viridian plants in Huntstown was awarded a reliability option. Viridian immediately indicated that it wished to exit the Irish electricity market as soon as possible and informed their shareholders that they would place "relevant Huntstown staff on protective notice of redundancy for an initial period of eight weeks".[14] The company Viridian Power and Energy Holdings is a 747MW gas-fired power station with 2 units located in Huntstown, north Dublin. When only one of the two plants was successful in the first (T-1) auction, they stated that without the reliability option the I-SEM market would not adequately remunerate the Huntstown plants and were therefore not viable. They subsequently applied for a derogation of the Grid Code requirement of 3 years notice to close.[15] This outcome then initiated a significant amount of further analysis by the SEM Committee and EirGrid/Soni to determine whether the generating units were viable without a reliability option; whether the derogation could be granted; and the operational viability of the Dublin LCCA should they close. This was also tested in court via a separate dispute that Viridian raised with the Commission for Regulation of Utilities (CRU). The final outcome has been an agreement between the CRU and Viridian outside the market for the next 3 years to secure both their units.

Box 1. Capacity market participation and the firm business model – the case of Viridian

in the Greater Dublin area.

The Viridian situation and lack of new capacity in Dublin has led the CRU to issue a note in October 201816 calling for more generation in the Dublin LCCA saying that should any new generator be successful in the T-4 auction they would be guaranteed a connection. This has led to a large amount of new generation in Dublin qualifying for the T-4 auction. The CRU decision to "issue a connection offer to any generator located within the Dublin region Level 2 Locational Capacity Constraint area that is successful in the T-4 capacity auction for 2022/23" (CRU, October 2018) is unprecedented - especially from a network planning and development perspective.

Conclusions

The Irish capacity auction results to date demonstrates the complexity of operating a competitive capacity market in such a small market where there are few market participants. The additional problem of transmission constraints which divide the market into subareas makes the situation even more difficult and highlights the necessity to include locational capacity constraints into the market setup. Nonetheless, the capacity auction In Ireland today has secured more capacity and at lower cost than the previous capacity payment scheme in which all market participants received payment regardless of whether they were run.

The Irish case has shown that even though the transition to an auction scheme has been largely successful, the failure of an individual participant can cause instability in the market. Capacity markets will likely remain a necessity in isolated, small systems like the Irish case, where additional supply must be secured nationally and participants may not cover their costs through energy-only markets alone. As this case demonstrates, good design of capacity markets is needed to ensure that market stability is increased rather than the converse.

Footnotes

[1] However, the capacity market has been paused since November 2018 and the scheme mechanism is currently under investigation by the EU Commission for compatibility with EU state aid rules. In 2018, the General Court annulled the 2014 decision in favour of the scheme, as it considered that the Commission should have opened an in-depth investigation to gather more information on certain elements of the scheme relating to the participation of energy consumers offering to reduce their electricity consumption in times of supply disequilibrium in the electricity market http://europa.eu/rapid/press-release_IP-19-1348_en.htm

[2] SEM was operated by the Single Electricity Market Operator (SEMO) which was a joint venture between the TSO in the Republic of Ireland – EirGrid and SONI, the TSO in Northern Irealnd (Teirila, 2016).

[3] https://www.semcommittee.com/capacity-payments

[4] http://www.eirgridgroup.com/__uuid/f110639e-9e21-4d28-b193-ed56ee372362/EirGrid-Group-I-SEM-Quick-Guide.pdf. See also https://www.nordpoolgroup.com/message-center-container/newsroom/feature/2018/10/nord-pool-welcomes-power-coupling-with-ireland/

[5] The development of a single price coupling algorithm, which adopts the name of EUPHEMIA (acronym of Pan-European Hybrid Electricity Market Integration Algorithm) is one of the key elements of the European Power Exchanges project Price Coupling of Regions. It is used to calculate energy allocation, net positions and electricity prices across Europe, maximising the overall welfare and increasing the transparency of the computation of prices and power flows resulting in net positions.

[6] https://www.semcommittee.com/capacity-remuneration-mechanism

[7] https://www.sem-o.com/markets/capacity-market-overview/

[8] https://www.semcommittee.com/sites/semc/files/media-files/SEM-18-176%20CRM%20supported%20capacity%20mandatory%20participation%20consultation.pdf

[9] https://www.viridiangroup.co.uk/CommunitySite/media/Resources/Investor%20Relations%20Announcements/Viridian-SSN-ISEM-Capacity-Auction-outcome-announcememt-26Jan18.pdf

[10] https://www.semcommittee.com/publication/publication-201819-t-1-capacity-auction-timetable-reviewable-decisions-and-qualification

[11] http://www.eirgridgroup.com/newsroom/dec-18-capacity-auction/index.xml

[12] https://www.sem-o.com/documents/CAT1920T-1-2019-2020-T-1-Capacity-Auction-Timetable.pdf

[13] https://www.semcommittee.com/sites/semc/files/media-files/SEM-18-176%20CRM%20supported%20capacity%20mandatory%20participation%20consultation.pdf

[14] https://www.viridiangroup.co.uk/CommunitySite/media/Resources/Investor%20Relations%20Announcements/Viridian-SSN-ISEM-Capacity-Auction-outcome-announcememt-26Jan18.pdf

[15] http://www.eirgridgroup.com/newsroom/capacity-market-auction/

[16] https://www.cru.ie/document_group/dublin-region-level-2-locational-capacity-constraints-for-the-upcoming-t-4-capacity-auction/

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