

Benefits of demand side response in regional and interconnected Integrated Single Electricity Market (I-SEM)

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The Single Electricity Market (SEM) project successfully combined the two separate wholesale electricity markets in Northern Ireland and Ireland. All electricity across the island is now bought and sold through the cross-jurisdictional and dual-currency (sterling and euro) single pool (or spot) market. The new Integrated Single Electricity Market (I-SEM) project, which went live in 1 October 2018, is a further step for the Irish market. Ireland has set the target of 40% of electricity to be produced by variable renewable energy (VRE) by 2020. This level of VRE integration, requiring instantaneous penetration of up to 75% non-synchronous power (mostly delivered by wind generation), will be the highest for any separate synchronous system anywhere.

While interconnectors both inside and outside the island can help to support the integrity and stability of the market, demand side response (DSR) is considered to be a promising and efficient way to solve technical network issues by promoting rational energy utilizations. Demand Side Units (DSUs) and associated Trading Site Supply Unit (TSSU) account for most of the DSR that is now available. DSUs and TSSUs must be registered in the I-SEM to process payments for capacity, energy and constraints as generators. The DSUs submit daily Technical Offer and Commercial Offer data to bid for demand reduction and availability. The System Operator (SO) provides dispatch instructions in real time to the DSU. Emerging technologies like smart grid and advanced metering systems are also important to the development of DSR.

The aim of this paper is to identify possible market services and arbitrage opportunities for DSR in the electricity market. I-SEM

data will be used to estimate economic profits for and further potential benefits.

Technical assumptions in the assessment are: the unit considered is a DSU with available capacity of 1MW in the I-SEM; it is assumed that political factors remain stable; the DSU is the marginal unit, which is last to be scheduled in the merit order.

The results show that the DSU is profitable in the I-SEM. Main profits come from capacity payments, supplier avoided market charges (SMP, Capacity Charge, Imperfections Charge, Variable Market Operation Charge), and constraint payments. According to the case study the overall savings for using the DSU (dispatched and not dispatched) will be 150.86 €/MW per day and 114.52 €/MW per day, respectively.

Results suggest that I-SEM policies have successfully guaranteed that DSUs are not disadvantaged in the new market. Furthermore, further steps should be taken to reflect the value of DSR better under future arrangements, including carbon savings, environmental benefits, ancillary services payments and DS3 services payments.

This study also addresses the idea of refining knowledge about regional and interconnected I-SEM policies for integrating a high penetration of VRE into the grid network.

Keywords

Demand Side Response, Integrated Single Electricity Market, electricity market, energy policy.