

Investment in technology and system services can help TSOs operate the power grid in a stable, secure manner while boosting renewable generation for a greener future. That's the key finding from new research conducted by energy data analyst EnAppSys on the Irish power market.

Blowing Away Limitations on Wind Farms in the Irish Power Market

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The Transmission System Operators (TSO's) in Ireland, EirGrid and Soni, are leading through the Eirgrid Group a pioneering programme to increase the amount of renewable energy in the country's power system safely and securely in response to binding national and European targets. The Irish electricity market covers both Ireland and Northern Ireland through the All Ireland Electricity Market. The All Ireland EU target is for 16% of the country's total energy consumption to come from renewable energy sources by 2020 and to achieve this, the aim is to produce 40% of electricity from renewables by 2020.

The programme – “Delivering a Secure, Sustainable Electricity System” or “DS3” for short – has brought together a wide range of stakeholders to review how best to ensure policies, incentives, standards and tools are fit for purpose in a system with world-leading levels of renewables. One of the most pressing challenges is to increase renewable generation in a safe manner.

Currently the Irish power market has a set limit on the amount of wind generation/ solar generation that can be managed on the system. Wind and solar is typically non-synchronous generation. This means it does not generate at grid frequency but uses electronics to convert the power generated to the correct grid frequency for export. Large thermal generators run at grid frequency (synchronous) and due to their size also provide inertia in the system which acts to resist frequency disturbances and provides grid stability, ultimately keeping the lights on. The power cut that significantly impacted the GB system in August of this year's shows what happens when the grid becomes unstable requiring load shedding.

As renewables (and interconnector imports) displace large thermal generation, inertia and synchronous generation reduces, causing stability control issues. The Irish market's DS3 programme seeks to procure specialist grid services to allow solar and wind renewables to increase the proportion of supply into the market at any point in time from the current limit of ~50% up to meeting 65% of demand. With a further ambition as the programme develops to increase this to around 75%.



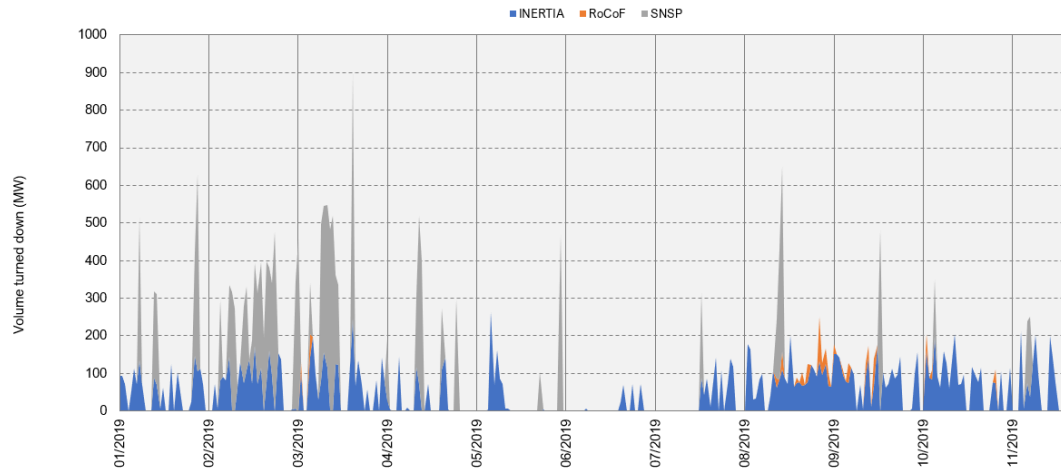


Figure 1: System Stability and Non-Synchronous related constrains – 2019 YTD.

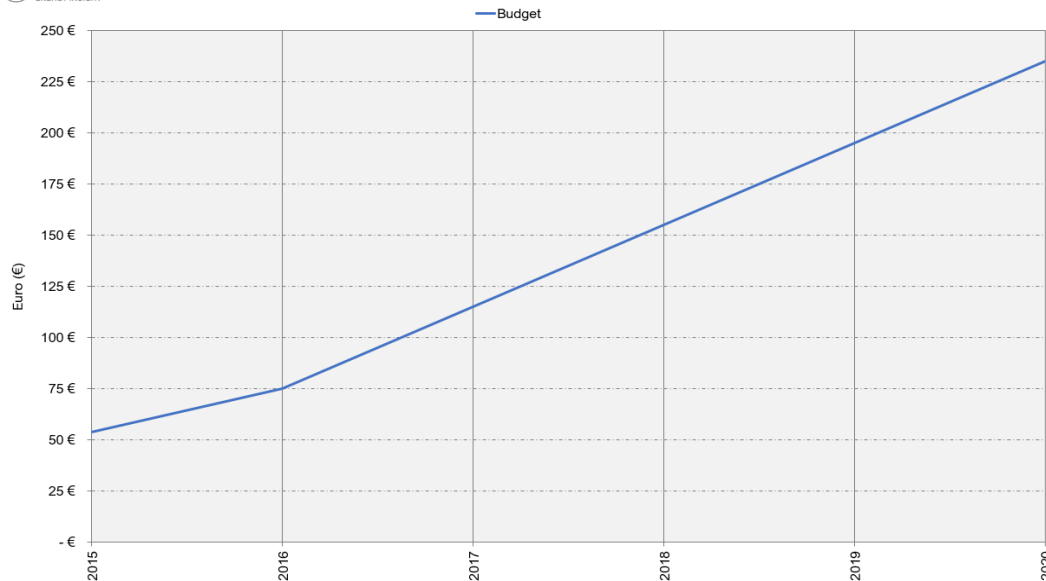


Figure 2: DS3 System Services annual cap.

To date when the System Non-Synchronous Generation Penetration (SNSP) relative to the system demand rises above ~50%, the additional wind generation levels above this point cannot be accommodated by the system and so wind generation must be curtailed or must be exported to preserve the safe and reliable operation of the system. Following curtailment or export thermal generation from coal and gas is used to make up the shortfall therefore impacting the TSO's ability to meet to 2020 target.

Paul Verrill, director of EnAppSys, said: "This poses a difficult challenge for the Irish TSO's as it aims to hit the 40% renewables target next year, operate the system at a SNSP level of 75% by Q1 2021 (70% by Q4 2020), and introduce new services and technologies to achieve such goals. In a market where demand over the past 12 months has averaged 4.2GW, wind generation capacity is set to rise to 4.9GW in 2020.

"During overnight periods the Irish market sees reduced levels of power demand, dropping to an average of 3.4GW over the past 12 months. This means that peak levels of wind generation as it stands cannot be accommodated by the market, even with total export potential of around 1GW to the UK grid. "To counter this, EirGrid and its supporting partners have been working in recent years to develop DS3 to meet the 40% renewables target while operating the power grid in a stable and secure manner.

"As part of this program the country can raise the limit on wind generation from 55% to 65%, helping to accommodate more wind generation than ever before, but they want to go further. EirGrid wants to increase investment in system services to accommodate as much renewable generation as possible. In the GB market generation of non-synchronous sources account for ~50% of demand in peak non-synchronous generation periods and a similar level in the German market indicates how the Irish TSO's are leading the way.

GB's TSO, National grid, is at the first stages of procuring similar services under its stability pathfinder initiative and this should allow GB to push past this 50% limit in the future"

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Next to providing a pan-European energy data platform, flexible configurable screens and automated data feeds, EnAppSys offers consultancy services and incredibly detailed market insights for companies in the energy industry.

This increased investment involves the procurement of fourteen system services designed under the DS3 programme, eleven of which were introduced following an initial trial phase (with subsequent trial phases to introduce the new technologies and the remaining services). Such services have allowed current and new entrant market participants such as wind, demand side management, battery storage and others to provide such services, diversifying the matrix of providers.

Furthermore, this project has seen 110MW of solid-state battery storage schemes contracted. These schemes are expected to go live in 2021 and in total are worth around €38 million for the lifetime of the contracts. This project will provide services related to Fast Frequency Response and Tertiary Operating Reserves.

Additionally, €146.1 million was contracted in service agreements running from October 1st, 2019 to September 30th, 2020 in twelve different services. The remaining two services are expected to be contracted at a later stage following initial trials and after the SNSP operating levels reach the 70% mark.

Paul Verrill said: “The steady growth in wind capacity and the continuous support and procurement of these services is expected to nurture a highly competitive market and bring the development of new technologies and new providers to the market.

“Studies are being carried out to go beyond the initial limits set out and fully embrace renewable energy integration. Such scenarios up to 2030 are under discussion both in academia and industry, with other relevant European projects taking place. These include EU-SysFlex, a pan-European system that is being developed to accommodate 50% renewable generation on the grid.



“It’s clear that DS3 is a trailblazing project from which other countries including the UK (in the GB Electricity market) can learn valuable lessons. The world is on a mission to create a greener future and the challenge is to increase renewable generation while ensuring that power systems are operated securely.”

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