

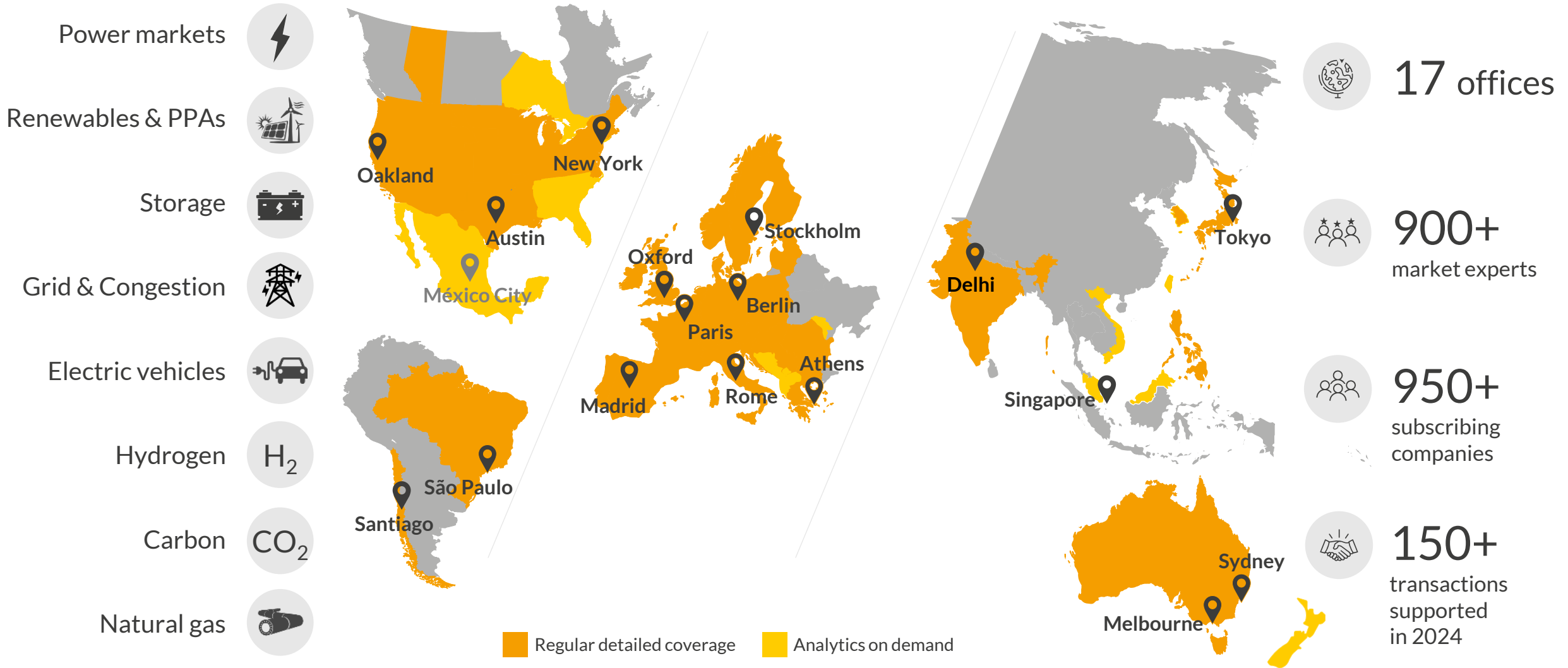
Wasted potential: Dispatch down of renewables in the I-SEM

16 June 2025



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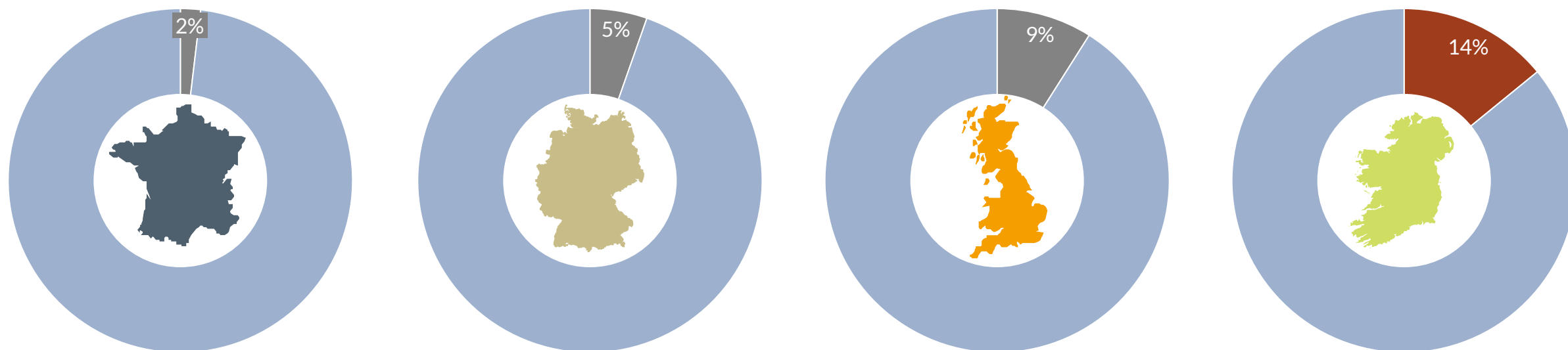


The I-SEM has some of the highest levels of dispatch down across Europe, with renewable investment cases at risk when this is unremunerated

▶ Dispatch down occurs when renewable generation is not exported to the grid even though the assets are physically able to generate power. Dispatch down is rising across Europe, hampering decarbonisation efforts and creating uncertainty in future renewables investments.

Wind dispatch down by country 2024

%



2024 saw the highest levels of dispatch down in the I-SEM on record, with levels expected to rise over the upcoming decade. Over half the current installed wind capacity in Northern Ireland is not compensated for these lost volumes, creating significant volume risk for these assets.



In this webinar, we'll explore why dispatch down reached record levels last year, what the impact was for renewable investment cases, and how Aurora is thinking about the future of dispatch down in the I-SEM.



The drivers of dispatch down

- What are the components of dispatch down?
- How have these components developed over time?
- Why did 2024 see record-breaking dispatch down?

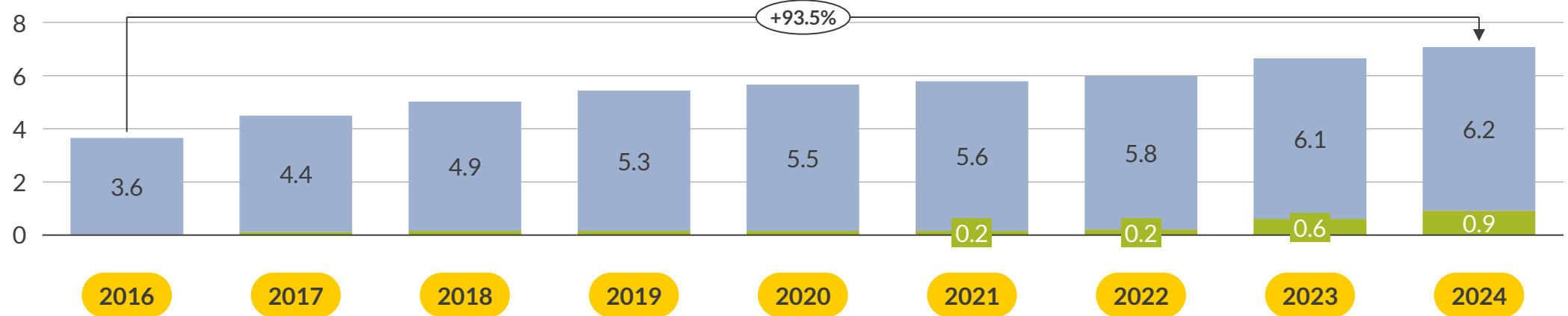
The impact of dispatch down

- How are renewables compensated for dispatch down?
- How did dispatch down impact renewable gross margins?
- How is Aurora viewing the future of constraints in the I-SEM?

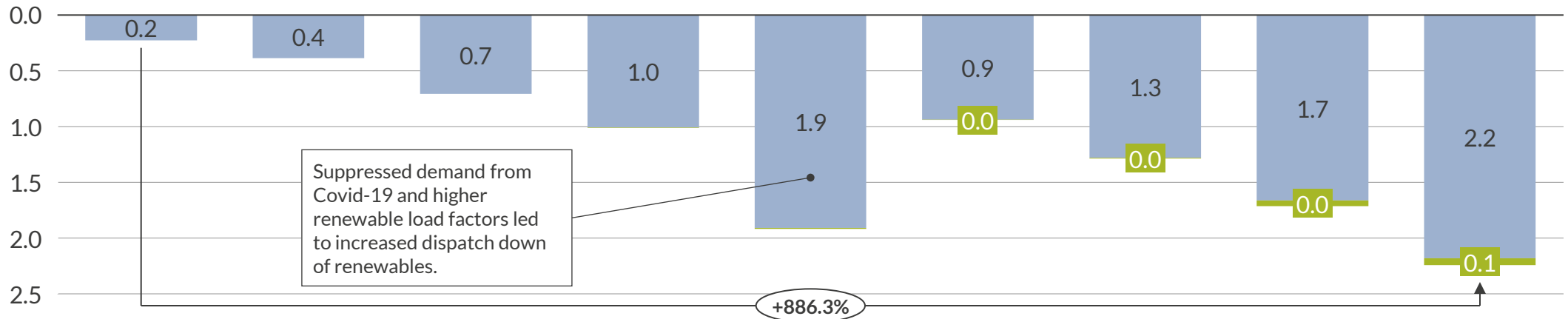
Whilst renewable capacity has increased by 93.5% since 2016, dispatch down has increased ninefold, with 2024 the worst year on record

A doubling in renewable capacity from 3.6 GW to 7.1 GW has been supported by subsidy schemes in both the Republic of Ireland and Northern Ireland. Dispatch down has increased significantly over the same time period, as the generation from these renewables increasingly exceeds the operational limits of the grid.

Installed Capacity
GW



Dispatch Down
TWh



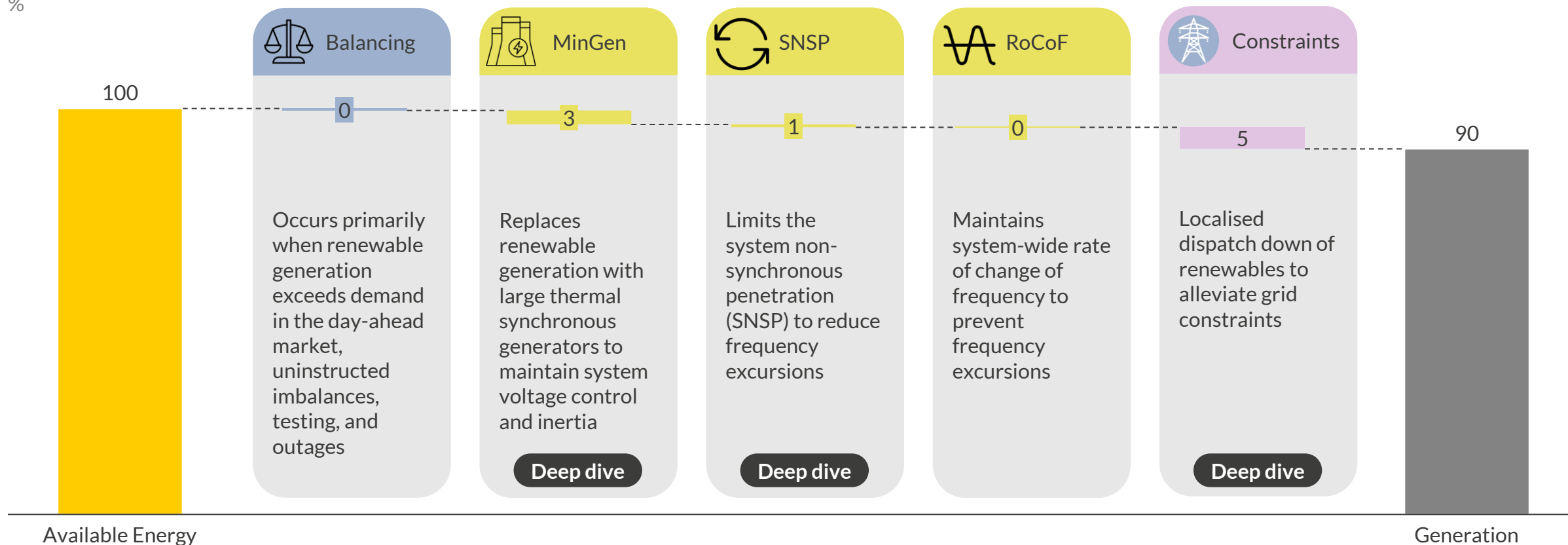
Wind Solar

Dispatch down is the umbrella term for curtailed and constrained volumes of renewable generation which cannot be exported to the grid

▶ Transmission constraints have been the leading cause of dispatch-down in the I-SEM, resulting in the loss of over 5% of total available energy between 2018 and 2024.

Wind dispatch down by reason (2018 – 2024 average)

%



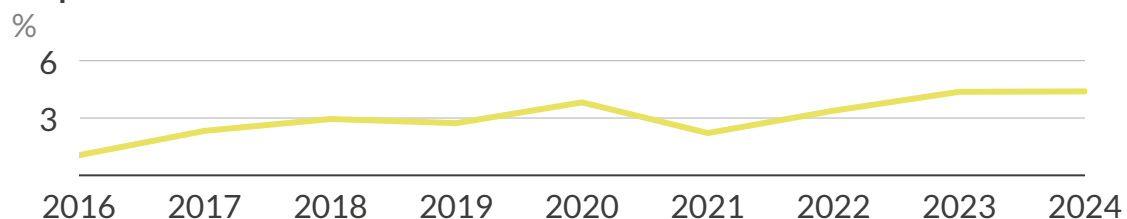
■ Balancing
 ■ Operational Curtailment
 ■ Constraints

The MinGen/MUON requirement mandates a minimum number of conventional units to run constantly for system stability

▶ **MinGen requirements in the I-SEM are currently met by large unabated synchronous thermal generators**

- The MinGen requirement was introduced to preserve voltage control capability and maintain a minimum level of system inertia.
- Inertia is essential in arresting frequency deviations caused by sudden changes to the balance of supply and demand, which if left unresolved can lead to voltage collapse and blackouts.

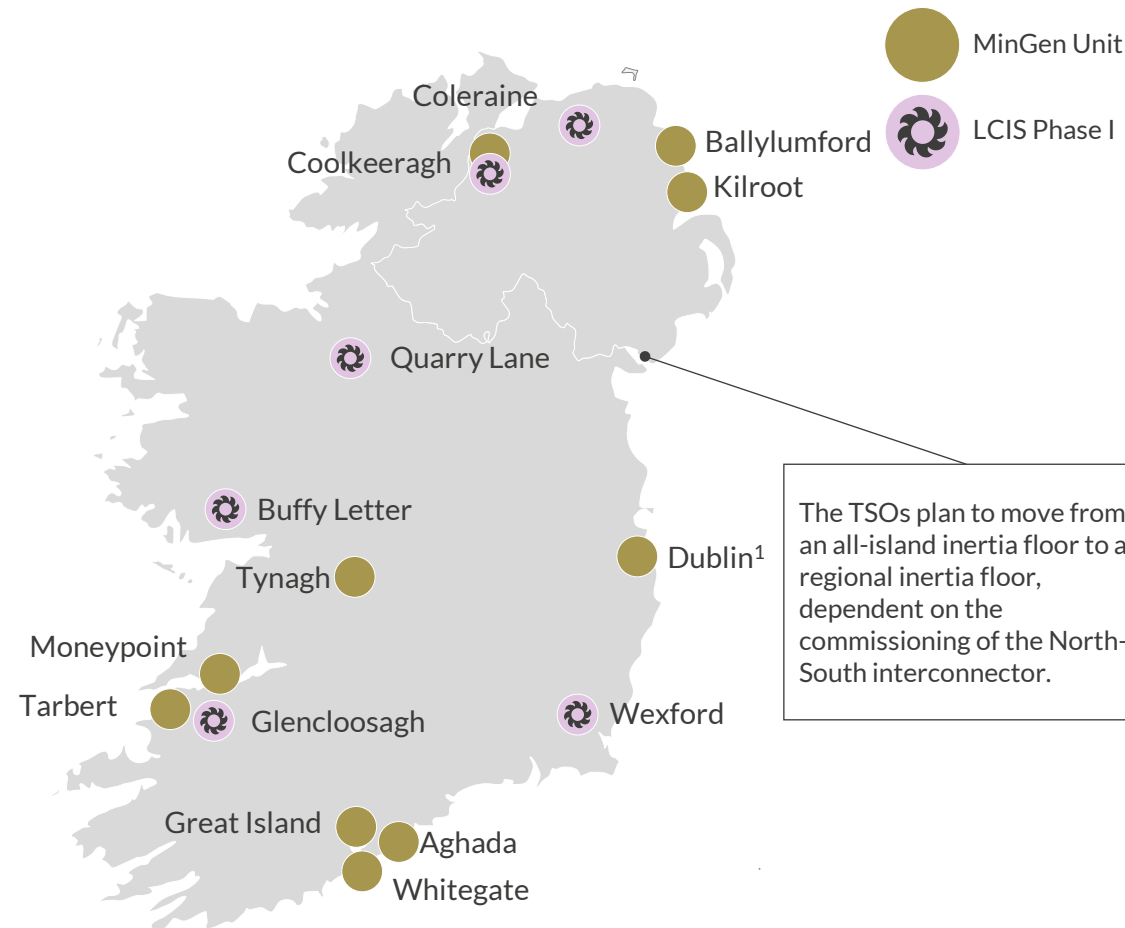
Dispatch down due to MinGen



▶ **How will the Low Carbon Inertia Service (LCIS) help to relax MinGen?**

- LCIS, delivered through synchronous condensers, will replace the inertia currently provided by unabated thermal assets, reducing carbon emissions.
- Scheduled for delivery by the end of 2027, LCIS I has successfully contracted 48% of the I-SEM's 23 GVA.s inertia floor, with further phases of LCIS aiming to procure the rest by 2035 dependent on system needs.

▶ **There are currently 7 MinGen units that must be online at any given time, and 6 LCIS units that have been procured in the I-SEM**



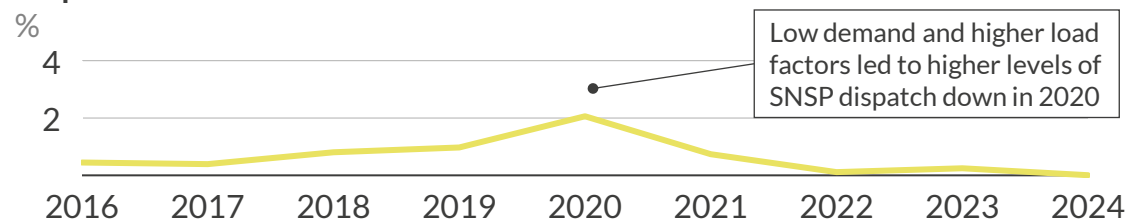
1) Dublin includes Dublin Bay, Huntstown, and Poolbeg.

The System Non-Synchronous Penetration (SNSP) limit controls the amount of renewable generation relative to demand and imports

The SNSP limit controls the amount of non-synchronous generation on the system to maintain system inertia and system stability

- Where MinGen places a lower bound on synchronous generation, SNSP places an upper bound on non-synchronous generation.
- The SNSP limit has increased from 50% to 75% over the past decade largely as a result of the DS3 programme bringing fast-acting dispatchable capacity onto the system to respond to the intermittent nature of renewables.

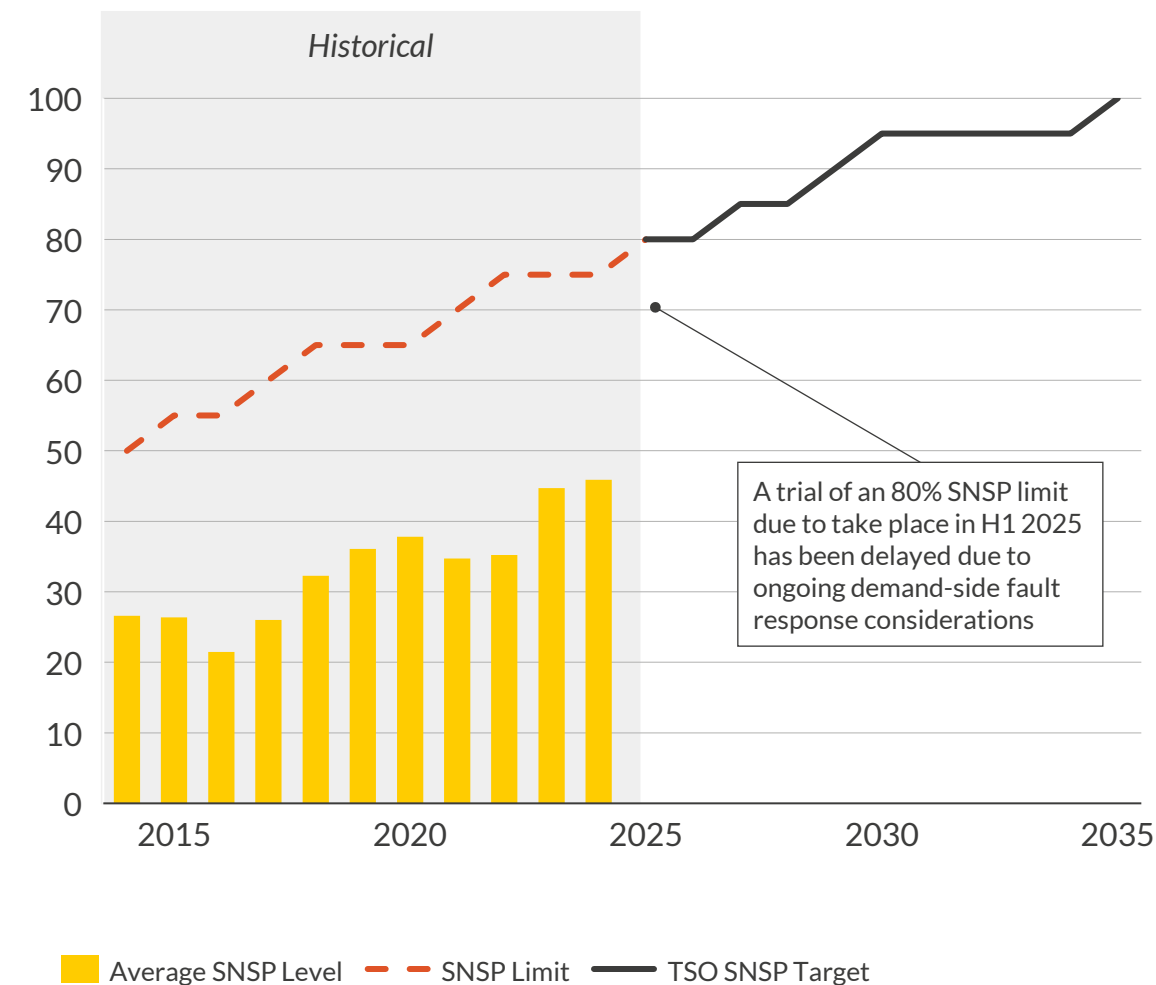
Dispatch down due to SNSP



Continued increases in the SNSP limit will become harder to achieve without the introduction of further measures to ensure safe operation

- The TSOs aim to relax and eventually remove SNSP as an operational limit, and continue to monitor the SNSP level as a key system metric
- Achieving this removal will require strengthened system operability through further deployment of batteries, mandated fault ride-through requirements for large energy users and the use of grid-forming inverters

System Non-Synchronous Penetration (SNSP) Limit and TSO Target

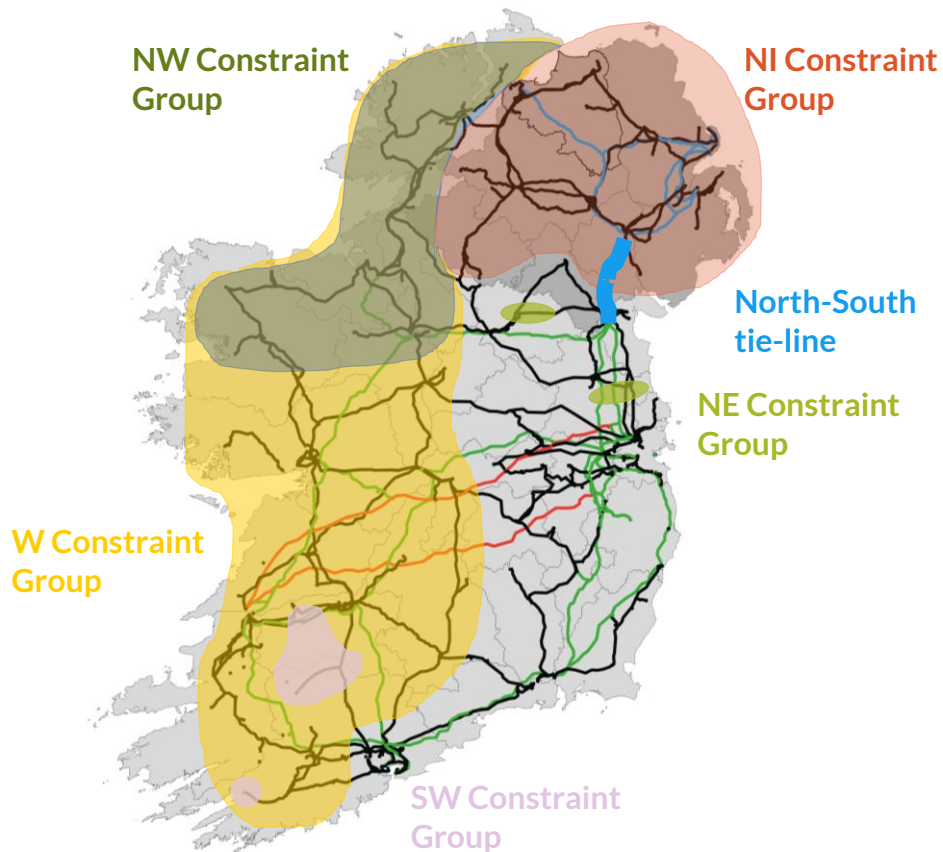




Constraints occur when localised network limits are breached, and renewables are dispatched down based on their constraint groups

▶ The I-SEM is split into constraint groups to isolate assets whose generation exceeds network limits, and instructing them to turn down

I-SEM electricity transmission map and constraint groups



— 110kV — 220kV — 275kV — 400kV

▶ The network limits exist to ensure the safe operation of the I-SEM under normal conditions and in case of sudden changes to the system



Thermal circuit ratings

- Each circuit in the I-SEM has a thermal rating related to the maximum power flow that it can transfer.
- If this rating is exceeded on any circuit, renewables are dispatched down within their constraint groups based on the overloaded circuit.



North-South tie-line

- This 275kV line connects Northern Ireland and the Republic of Ireland.
- Power flows across this tie-line are limited to ensure that in the case of a loss of synchronicity between the jurisdictions, each have enough reserves to cover the flows that could occur immediately post-fault.



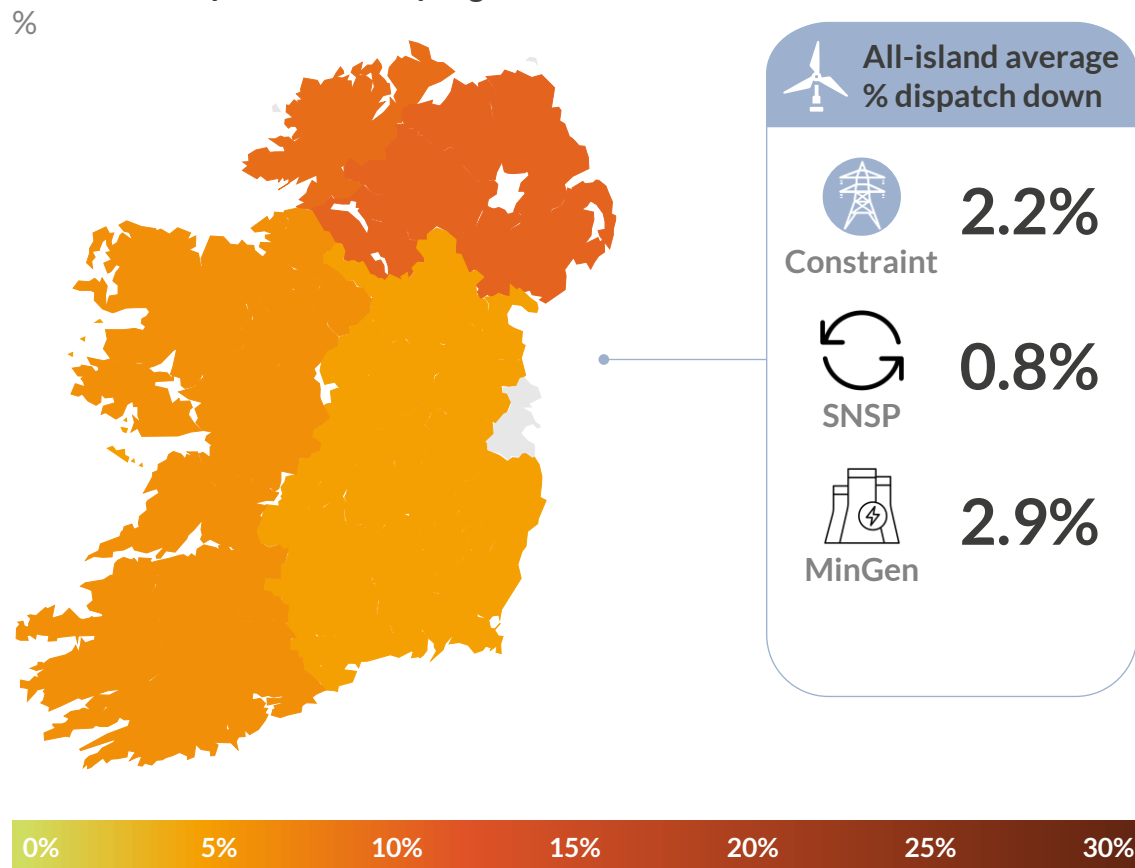
Single Contingency and planned outages

- Under “Single Contingency” (N-1), the TSOs model the impact of losing an element of the network to see if the resultant flows on other circuits exceed their thermal ratings, and dispatch down renewables accordingly.
- This analysis additionally includes elements with a planned outage (N-1-1).

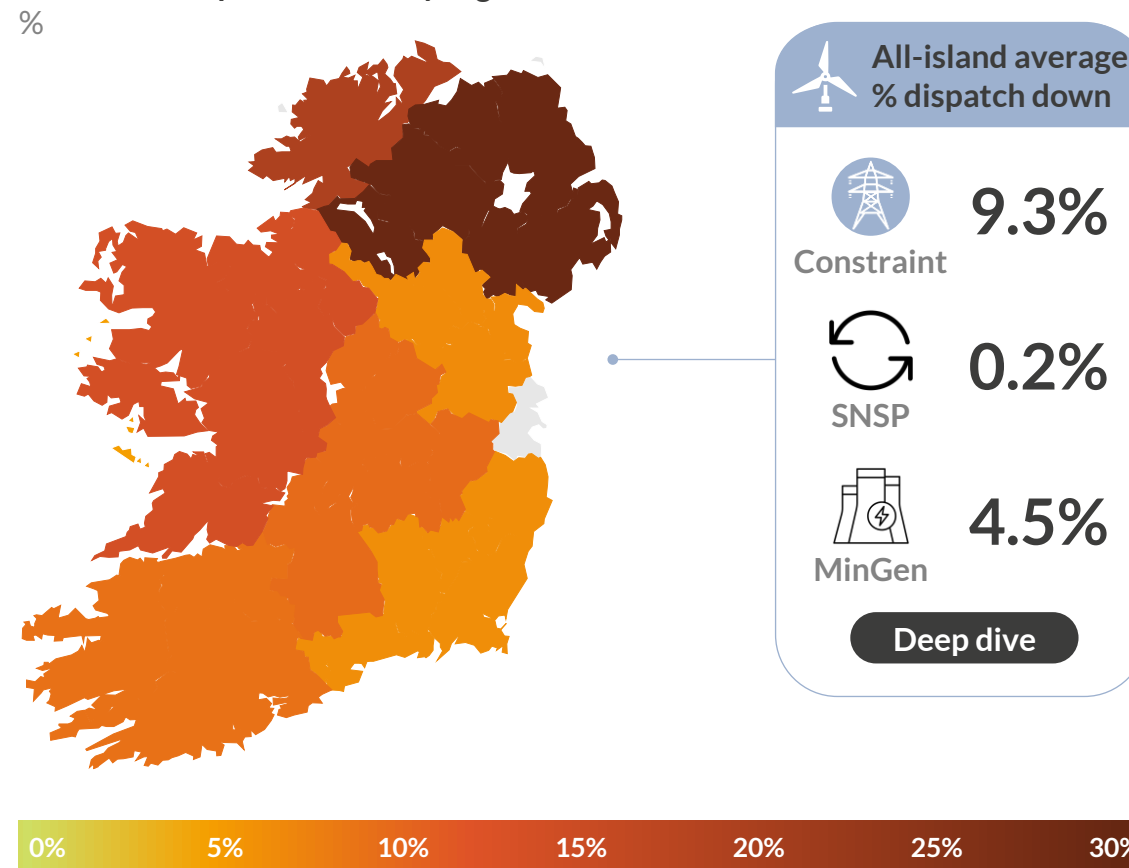
Levels of constraint have been rising faster than curtailment, reaching 9.3% on an all-island basis in 2024 and 26.4% for wind in Northern Ireland

Wind dispatch down due to constraints on an all-island basis have risen over three times faster than that due to curtailments. Key grid reinforcements such as the North-South Interconnector have been delayed, resulting in an increase in dispatch down due to grid constraints.

2018 wind dispatch down¹ by region



2024 wind dispatch down¹ by region



1) Controllable wind farms



Constraints in Northern Ireland were highest in 2024 as imports from Moyle competed with renewable generation for power flows



Northern Ireland renewables saw constraint levels of 22.8% on average in 2024, with some substations exceeding this value. Constraints were primarily caused by poor interconnection to the Republic of Ireland coupled with oversupply of imported power from Scotland at times of high indigenous renewable generation.

Illustrative power flows



1

The 500MW Moyle interconnector predominantly imports from GB

- Electricity prices in the I-SEM are more expensive than GB owing to higher running costs for thermal assets in the I-SEM.
- Moyle interconnector, which connects Northern Ireland to Scotland, imported 2.4TWh to the I-SEM in 2024 based on this price differential.

2

The North-South tie-line only allows 450 MW of power flow

- Available generation from both renewables in Northern Ireland and imports from Moyle exceeded Northern Irish demand 23% of the time in 2024
- This excess generation can only flow to the Republic of Ireland through the North-South tie-line, which is limited to 450MW.
- In 2024, Northern Ireland exported 2.4TWh through the tie-line.

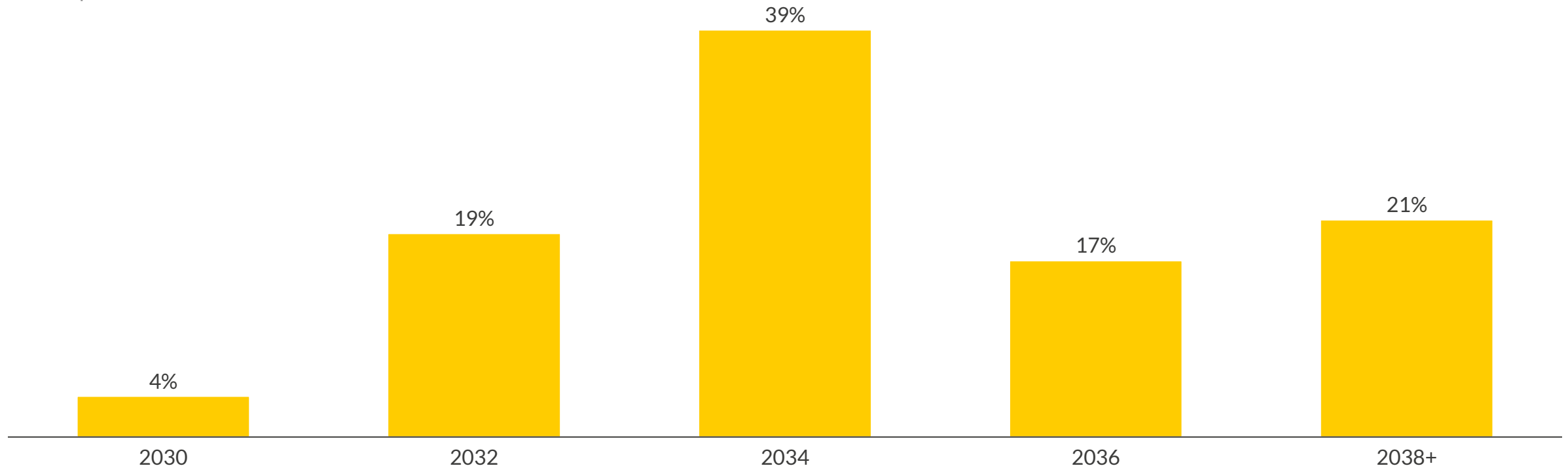
3

Renewables are dispatched down to ensure that Moyle can import

- Moyle imports must be accepted first from the TSO at the scheduling stage.
- Once the tie-line power limit is reached, renewables in Northern Ireland must be dispatched down such that supply and demand can be matched.

When will the North-South Interconnector be completed?

Webinar poll results
% of respondents





The drivers of dispatch down


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The impact of dispatch down

- How are renewables compensated for dispatch down?
- How did dispatch down impact renewable gross margins?
- How is Aurora viewing the future of constraints in the I-SEM?


Non-firm generators are unremunerated for constraints and curtailment, with firm access challenging to obtain


▶ Assets can be awarded firm access by the TSOs, which entitles them to remuneration when they are dispatched down due to TSO redispatch





 The TSOs in Northern Ireland and the Republic of Ireland award a Firm Access Quantity (FAQ) to assets corresponding to the level of output that can be safely exported from them to the transmission network .

 An asset may be awarded firm access for a future date coinciding with the estimated completion of requisite grid upgrades.

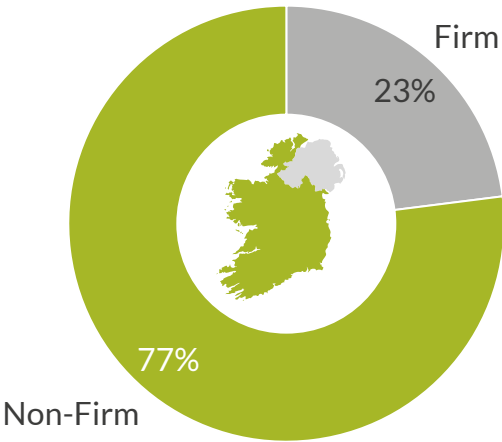
▶ Firm access is challenging to obtain and the level of remuneration that assets are entitled to is currently the subject of a legal challenge

 In the Republic of Ireland, assets are only awarded firm access if their constraint levels are less than 2% under the TSOs modelling

 A legal challenge to SEM 22-009, which was intended to align the I-SEM with EU remuneration requirements, has been escalated to the EU Court of Justice, who will rule on whether lost subsidies and PPA revenues due to redispatch should be compensated, and from when.

Renewable connection type	 I-SEM remuneration rules	
	Constraints	Curtailment
Firm connection	 Remunerated since the creation of the I-SEM in 2018	 Remuneration to be granted, pending High Court challenge
Non-firm connection	 No remuneration for constraints or curtailment	

2024 Republic of Ireland firm access allocation¹
% of projects offered a grid connection post-2020

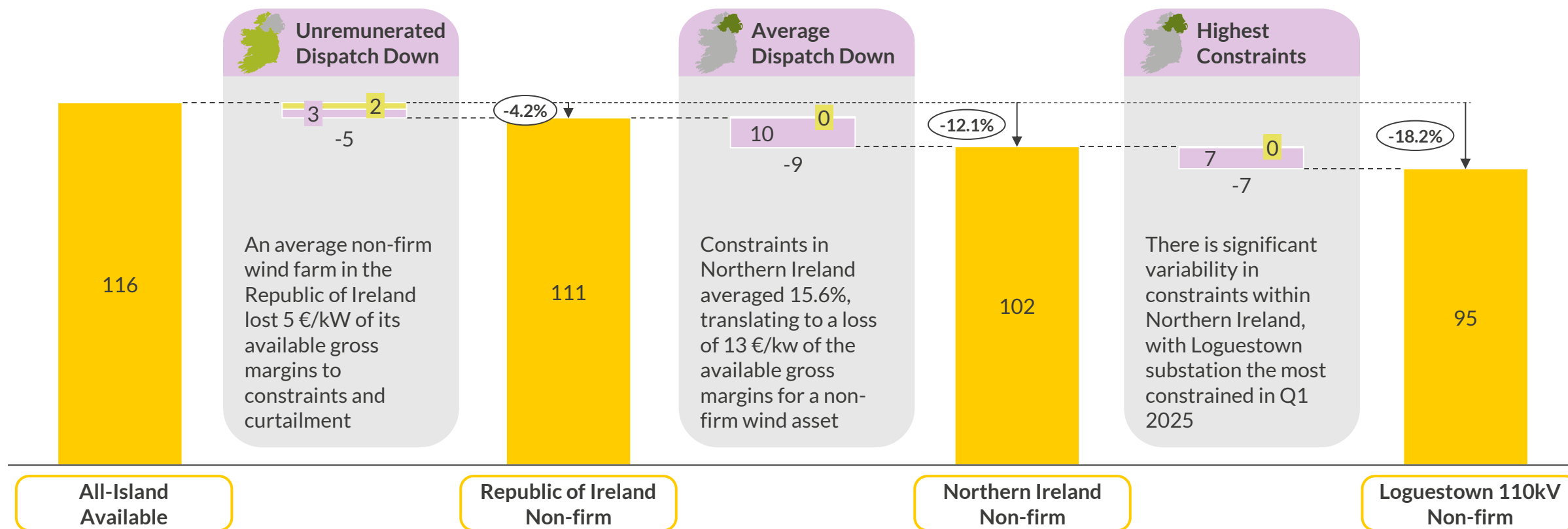


1) Renewable ECP projects which have been allocated firm access prior to EOY 2024.

In Q1 2025, assets saw losses in wholesale revenues of up to 21 €/kW, equating to 18.2% of the value of their generation

Constraints accounted for the largest reduction in available wholesale gross margins in both the Republic of Ireland and Northern Ireland. The localisation of constraints meant that some assets saw larger reductions than others, with those connected to Loguestown 110kV losing 18.2% of their available gross margins

Onshore Wind Q1 2025 wholesale gross margins¹
€/kW (nominal)



Legend: Gross Margin (Yellow), Curtailment (Green), Constraints (Purple)

1) Normalised for an onshore wind asset with a 41.2% load factor, assuming all available generation was sold in the wholesale market.

Dispatch down reductions in the future will require timely grid upgrades, but clarity on remuneration in the interim is vital for renewables



The timing of grid upgrades is vital to understanding future levels of constraints on the system...

- The timely delivery of grid upgrades are necessary to facilitate increased power flows from renewables to demand centres.
- Delays to their delivery coupled with increasing installed renewable capacity will lead to increased constraints on the system, hampering decarbonisation efforts.



...which, in conjunction with proposed market design changes, will inform the financial impact for renewables...

- Volume risk for renewable assets can be mitigated if an asset can obtain firm access for its installed capacity.
- However, obtaining firm access is a difficult process and can result in years of unremunerated dispatch down.
- Even with firm access, uncertainty over the level of remuneration for dispatch down remains a risk to renewable investors.



...with Aurora's new Grid Add-on able to bridge the gap between dispatch down and power price forecasts

- The evolution of dispatch down in the I-SEM will shape the investment landscape for renewables.
- Aurora's I-SEM Grid Add-on will apply our proprietary network modelling capabilities to our bankable power price forecasts to achieve integrated investment cases for renewable assets.



Grid Add-On for Ireland I-SEM

Unlock Critical Insights into Grid Constraints
and Renewable Revenues

What is the Grid Add-On?

Forecasts of constraint volumes, by technology in two scenarios.

Post-dispatch down capture prices, under multiple network build scenarios.

Comprehensive analysis of grid build-out impacts on curtailment and project revenues.



Key Benefits?

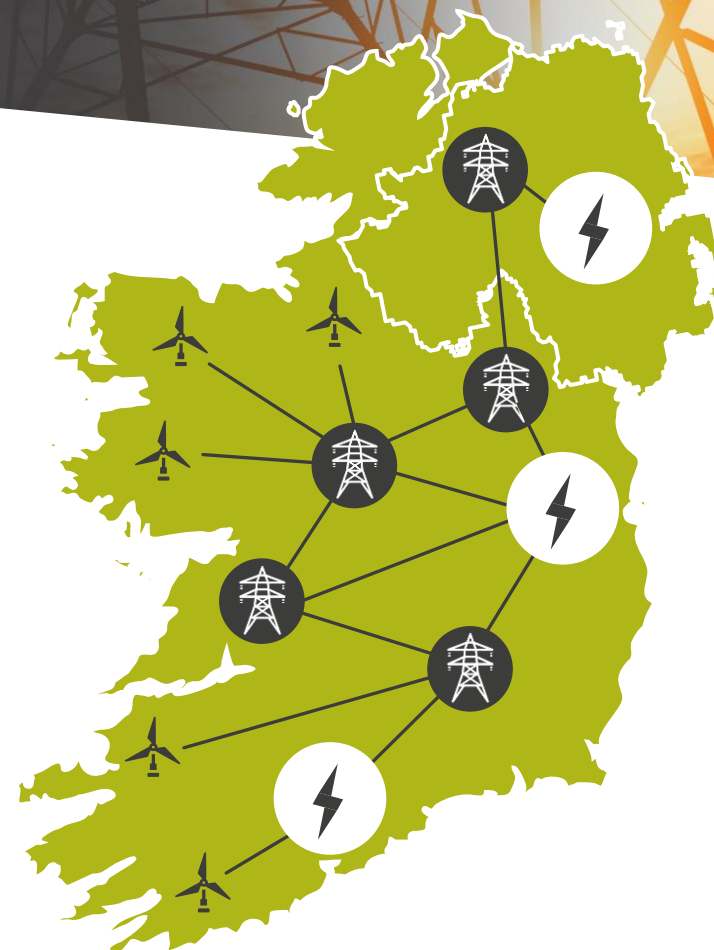
Understand Full Revenue Potential:
Gain a complete view of renewable project earnings, including dispatch down risks.



Manage Risks Effectively:
Evaluate how different grid scenarios (e.g. limited expansion) impact turn-down and financial outcomes.



Support Strategic Decision-Making:
Use our trusted forecasts to optimise your investments and navigate Ireland's evolving grid landscape.



The Grid Add-On launches **this September**. Reach out to Bea Dunlop at Bea.Dunlop@auroraer.com to discuss participating and secure your place!

Key takeaways

1

Dispatch down is necessary to ensure the safe operation of the grid, with levels rising steadily in the I-SEM since 2016 and reaching 12.1% in 2024 on average for renewables.

2

Dispatch down due to constraints has risen faster than curtailment, with renewables in Northern Ireland impacted the most by restrictions of power flow on the North-South tie-line.

3

For non-firm assets, location will play a pivotal role in the viability of renewable business cases, with wind assets in Northern Ireland unremunerated for 12.1% of their potential gross margins, rising to 18.2% for the most constrained substation.

Details and disclaimer

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