Shaping Our Electricity Future Advisory Council

Meeting #14

The Sandymount Hotel, Dublin

Thursday, 14th May 2026

EirGrid SONI

Welcome from our Moderator:

Nicola de Beer
Head of Strategic Enablement,
Change & Vendor Management, ***EirGrid***

Agenda: SOEF Advisory Council #14

The Sandymount Hotel, Dublin

Thursday, 14th May 2026

TIME	DURATION	TOPIC	DETAIL	PRESENTER/S
09:40	30 mins	Coffee & Networking		All
10:10	10 mins	Welcome & Agenda	Welcome all, introduce our agenda	Nicola de Beer, Liam Ryan & Gerard Carlin
10:20	10 mins	Member Refresh	Update on process for seeking new members	James Atkinson
10:30	60 mins	SOEF Strategic Workstreams Update with Q&A	Brief playback of workstream updates shared in advance from EirGrid and SONI workstream leads with Q&A	Workstream Leads
11:30	35 mins	Dispatch Down: Heat and Thermal Storage	Impact of Dispatchable Heat Load and Thermal Storage on Dispatch Down	Marc Senouci & Chittesh Chandran
12:05	35 mins	Operational Challenges of solar energy integration	The ongoing rise in solar generation. Discussing embedded solar PV and recent records as well as the work being done on forecasting, code changes and TSO-DSO cooperation	Amir Moshari
12:40	60 mins	Lunch	Served in Hotel	
13:40	60 mins	**Members Hour** 1. Hybrids - Industry perspective 2. The Role of Price in the Energy System	1. Considerations for TSOs in overcoming complexity challenges to unlock the opportunity of hybrid connections. 2. How pricing signals can drive efficient dispatch, investment, and consumer behaviour.	1. Margaret Nee (Statkraft), Kate Garth (RWE) & Bobby Smith (ESI) 2. David Graham (SSE)
14:40	15 mins	Reflection, Next Steps and Closing Messages		
15:00		Meeting End		

Meeting Chairs:

Liam Ryan

Gerard Carlin

Moderator: Nicola de Beer

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Welcome!

Opening message from our Meeting Chairs:

Liam Ryan
Chief Transformation & Technology Officer, ***EirGrid***

Gerard Carlin
Director of Networks & Innovation, ***SONI***

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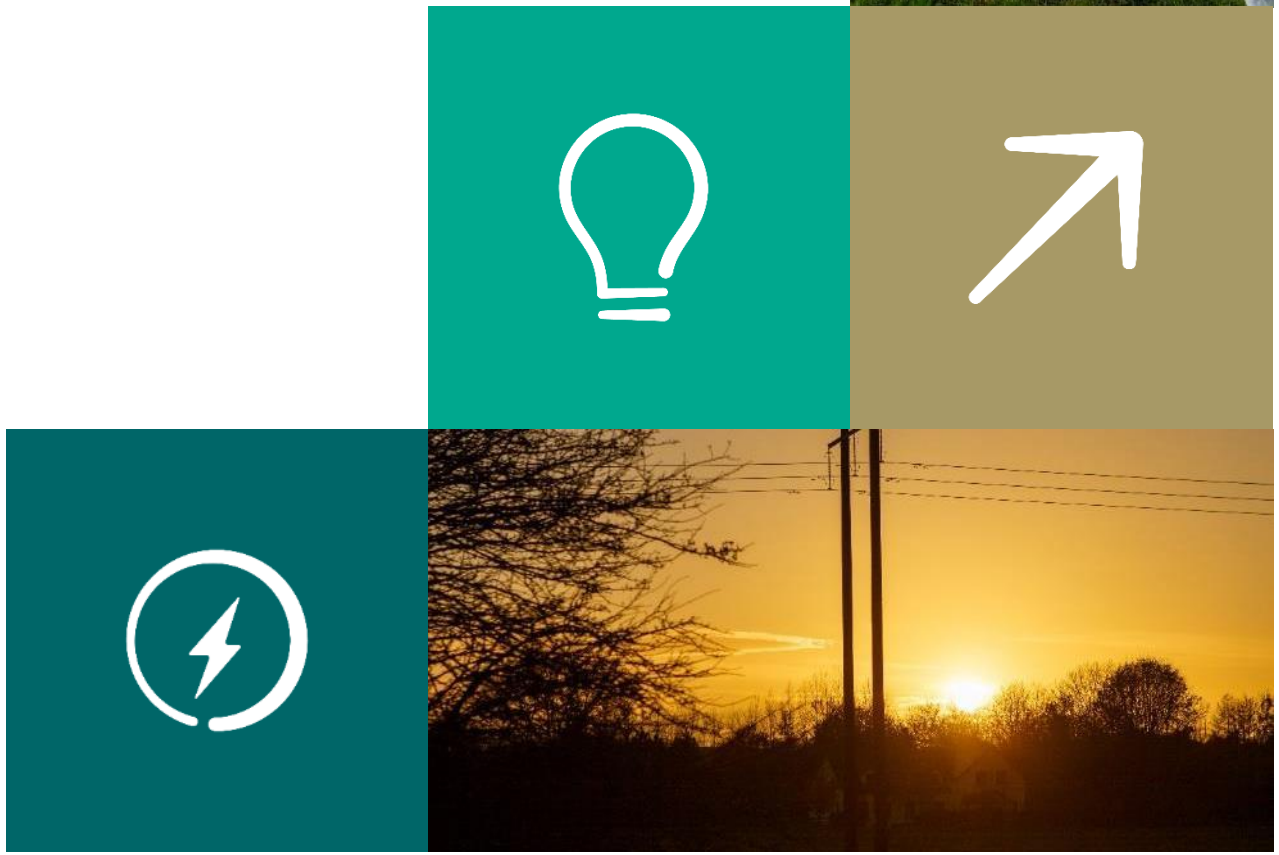
2026 Advisory Council Membership Refresh

James Atkinson
Stakeholder Engagement Manager, ***EirGrid***



2026 Advisory Council Membership Refresh

	April-May 2026 Expressions of Interest	May-June 2026 Review and Shorlist	July-August 2026 New Advisory Council
Action:			
Description:	Publicise the membership refresh amongst industry and external stakeholder channels. Expressions of interest sent to EirGrid and SONI SOEF mailboxes	Close the applications window and review applicant's profiles, reducing to a final shortlist.	Seek approval from senior TSO stakeholders, inform the successful applicants. Convene first meeting of new council September 2026.

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Shaping Our Electricity Future (SOEF) Workstream Panel

Michael Atcheson
Head of Future
Power Markets, **SONI**

David McGowan
Head of Future
Power Systems, **SONI**

Eimear Watson
Head of Networks,
SONI

Stephen Gannon
Head of Future Markets,
EirGrid

Maria Madders
Head of Future
Operations, **EirGrid**

Jason Kenna
Head of Network
Projects, **EirGrid**

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We will take questions via **Slido.**
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MARKETS

Overall Summary and Status

- **SDP (Scheduling and Dispatch Programme):** The programme is progressing test and readiness activity for the Tranche 2 initiatives with target go-live in June 2026. However, this test activity carries a significant degree of risk noting overlapping test delivery activities and compressed timelines. Tranche 1: Proposed Non-Priority Dispatch of Renewables (NPDR) modelling scope shared with RAs for consideration as part of their ongoing assessment of NPDR.
- **FASS (Future Arrangements for System Services):** The non-reserves consultation was published on 08/04 with a workshop held on the 6th May. Detailed assessment of programme plan (via PIRV4.0) underway following publication of the non-reserves consultation. Mobilisation of TSOs test environments ongoing.
- **LDES (Long Duration Energy Storage):** Work is ongoing on finalising a TSO procurement approach recommendation paper that will inform the CRU decision paper.
- **SMP (Strategic Markets Programme):** Regulatory approval will be sought for a number of methodologies relevant to EU legislation. 2026 will be a year of internal testing of relevant markets systems to make sure we are ready to begin external testing of these systems in 2027.

Key Highlights

SDP:

- SDP 03/05/06 Progressing through testing and readiness activity to be delivered in June. Individual workshops have been held with all impacted participants.

FASS:

- TSOs' non-reserves consultation paper published on 08/04.
- Credit Management Solution PQQ response period closed 10/04.
- Vendor IT re-assessment received with detailed engagement underway by the TSOs.

LDES:

- Recommendation paper is to be submitted shortly to CRU to inform its decision.

SMP:

- Detailed Design and Build is progressing for Single Day Ahead Coupling (SDAC) / Single Intraday Coupling (SIDC), Multi-NEMO Arrangements and CORE CCR.

Upcoming Milestones

SDP:

- Tranche 2 initiatives progressing towards delivery target of June '26. Initiatives will have limited impact on most market participants

FASS:

- Continued ongoing engagement with the RAs on the consultation schedule for 2026/2027. Readiness Workstream mobilised and progressing while System Services Code development and legal drafting activities ongoing.

LDES:

- Subject to receiving a decision from CRU on the procurement approach, the Contractual Consultation is planned to start in Q3 2026 prior to commencement of a procurement process in 2027.

SMP:

- Vendor delivery for Release 1 is progressing, and the baseline plan is being validated with stakeholders following the Celtic Interconnector impact assessment.

Key Risks or Issues

Multi Year Plan:

- Work is ongoing with RAs on developing a multiyear market plan, this will support longer term resource and system planning across the ecosystem. SEM-C workshop to be held with industry in next few months.

SDP:

- TSO and RA agreement required on NPDR TSC Modifications.
- Waiting on SEMC Approval of Mod 01-25 Synchronous Condensers

FASS:

- Workshops underway to progress critical path challenges to schedule. Procurement of Secondary Trading Credit Management solution ongoing. Resourcing remains challenging due to delays incurred by programme to date which are leading to overlapping workstream activities.

SMP:

- Due to the extended timeline for the Celtic Interconnector, there is an increased risk that EU and regulatory changes (e.g. CACM 2.0) may require updates to already designed and delivered systems and processes.

Where we need your help:

As we progress towards Technical Liaison Groups (TLG) for FASS…

- Is your organisation ready to engage in the TLGs?
- Where do you believe more clarity is required before you engage?
- Do you see any issues/risks that the TSO should be aware of?

OPERATIONS

Overall Summary and Status

- Good progress has been made across a range of areas, in particular the progression of tranche 1 projects under OTCE* and the 2025 QTP
- The Demand Facility FRT Grid Code Modification Recommendation and Compliance and Derogation Framework has been submitted to the CRU
- SONI continues to actively progress activities to ensure progress on relieving Northern Ireland specific constraints including the commencement of the Negative Ramping Reserve Trial commenced on 1 April 2026
- The overall SOEF Operations programme status is Amber. A number of key initiatives are delayed as we actively manage the Demand Facility Fault Ride Through (FRT) issue. Engagement ongoing.

Key Highlights

- The 2025 Qualification Trial Process (QTP) Request for Proposal (RfP) closed 09 March 2026.
- LCIS phase 2 procurement arrangements SEMC decision published on 6 March 2026. Written feedback on grid connection assumptions issued on 30 April 2026.
- FRT Grid Code Modification Recommendation and Compliance and Derogation Framework proposals submitted to the CRU on 01 April 2026
- SONI submission of the grid code modification for Demand Facility fault ride through submitted to the UR on 27 April 2026
- SONI 'Negative Ramping Reserve' trial on wind commenced on 1 April 2026; testing 20MW capability
- Flexibility Needs Assessment (FNA) workshops successfully held with RAs and DSOs 07 April and 27 April to review progress and ensure alignment.
- OTCE tranche one projects progressing including enhancements to Operational Forecasting and Modelling and Simulations
- Publication of SONI's latest updated Operational Security Standards 01 April 2026

Upcoming Milestones

- Grid Forming Grid Code clauses on HVDC and Power Park Module (PPM) to be presented in June Joint GCRP.
- LCIS procurement phase 2 process will commence shortly, led by EirGrid and SONI
- Two formal FNA dataset submissions to be sent to the CRU and the Utility Regulator on 25 May 2026.
- Recommendations paper on LDES Procurement Mechanism to be submitted to the CRU by end of May 2026.
- Decision from the CRU on submitted Demand Facility FRT Grid Code proposals.
- Decision from UR on large demand facility FRT proposals after their call for feedback closed on 06 May 2026
- Hybrids Sharing MEC Roadmap to be published at the end of May 2026

Key Risks or Issues

- Key initiatives remain delayed as we actively manage the Demand Facility Fault Ride Through issue.
- SONI completed its internal review of its innovation strategy to bring clarity to actions that should be progressed including Hybrids, a TSO-DSO multi-year plan, establishing a technology toolbox and other priorities.

** OTCE = Operational Tools & Capability Enhancement*

NETWORKS INFRASTRUCTURE (NI)

Overall Summary and Status

- **2nd North-South Interconnector:** NIE Networks is preparing for the second phase of construction in NI. SONI continues to work with the Department for the Economy on the required Necessary Wayleaves.
- **Mid Antrim Upgrade:** Preparations for planning applications in Q2 2026 underway. Awaiting approval from the Utility Regulator (UR) for the Transmission Network Pre-construction Project (TNPP) Uplift, primarily to cover additional cost of the enhanced overhead line compensation package. Landowner engagement continues relating to compensation for switching site at Terrygowan and cable routes.
- **Drumnakelly-Tamnamore:** Part 2 pre-construction activities continue, with full planning permission required, additional environmental assessments are necessary. Awaiting response from Mid Ulster Council to the Environmental Impact Assessment (EIA) screening request. Work to confirm construction access, progressing Overhead Line (OHL) and cable design is underway.
- **Connect West:** Preferred option is a 275 kV overhead line from Dromore to Turleenan and TNPP was submitted to the UR in March 2026.
- **North Sperrin Cluster:** Part 1 system planning activities continue with NIE Networks on options appraisal before TNPP submission to UR.
- **Coolkeeragh – Strabane upgrade:** Scope of Part 1 system planning activities expanded to include redevelopment of Strabane Main, working closely with NIE Networks on options appraisal.
- **North West NI 110 kV reinforcement:** Part 1 system planning activities options appraisal is progressing.

Key Highlights

- Draft Transmission Development Plan NI 2025-2034 submitted to the UR in March 2026, with UR consultation launched and now closed.
- Quarterly update of our Network Delivery Portfolio published from SONI and NIE Networks Joint Programme Management Office (JPMO) in May 2026.

Upcoming Milestones

- **Draft Transmission Development Plan NI 2025-2034** anticipated approval hopefully imminent by the UR such that it can be formally adopted by SONI.
- **Mid-Antrim Upgrade** planning applications in Q2 2026.

Key Risks or Issues

- **2nd North-South Interconnector:** Potential second Judicial Review challenging Department for Infrastructure's (DfI) July 2025 decision on pre-commencement planning condition previously subject to JR in 2025. Leave hearing held in March and to reconvene in May 2026.
- Elements of grid delivery are outside the control of SONI & NIE Networks so we will continue to engage with the relevant stakeholders on these elements of grid delivery.

NETWORKS INFRASTRUCTURE ROI

Overall Summary and Status

- Significant progress in terms of Planning / Project Agreements/ Capital Approvals/ Procurement for a number of SOEF projects.

Key Highlights

Planning Applications

- **Barrymore Cahir Knockraha 110kV Line Uprate** – Planning Grant Apr ‘26
- **Cushaling - Portlaoise 110 kV line uprate** – Planning Grant Mar ‘26
- **Castlebar Dalton 110kV Thermal Capacity Increase** – Planning Grant Feb ‘26
- **Rinawade - Dunfirth Tee - Kinnegad 110 kV Circuit Thermal Capacity** - Planning Grant Feb ‘26

Capital Approvals

- **Kildare Dublin Grid Reinforcement - Phase A: Hynestown to Maynooth, Substation & Circuit:** May ’26
- **Kildare Dublin Grid Reinforcement - Phase B: Hynestown to Steelstown, Substation & Circuit:** May ’26

Project Agreements

- **Cashla-Dalton 110kV Line Uprate (planning required) -** Apr ‘26
- **Agannygal - Ennis 110kV uprate -** Apr ’26

Project Energisations

- **Platin and Connected Stations 110 kV Protection Upgrade** - Mar ‘26

Project Updates

- **Fingal East Meath Grid Reinforcement:** Phased acceleration strategy progressing. Standard layouts completed to enable accelerated station tendering in Q2. Planning submission on track for Q4 2026.
- **Kildare Dublin Grid Reinforcement:** Phased acceleration strategy progressing. Capital Approvals for Phase A & B (Hynestown to Maynooth/ Steelstown substation & circuit) on track for May 2026.
- **Flagford-Sligo Capacity Needs:** Public Consultation report published in Q1 2026. Best Performing Option report now being finalized for publication in May 2026.
- **Kildare Meath:** EPC tender award on target for mid 2026. Landowner agreement progressing with high percentage of EOI forms received
- **East Meath North Dublin:** EPC tendering process to begin in Q1 2026 for award in Q4 2026.

Powering Up Dublin:

- **Dublin 220kV Cables:** EPC contractor to be appointed in July 2026 on **Finglas Northwall. Carrickmines/Poolbeg**: MARA issued Marine usage licence - marine surveys started. Planning application for Carrickmines-Blackrock Park section to be submitted in June 2026. **Poolbeg/ Northwall**: MAC for Liffey Crossing received. Progressing tunnel design and planning approach for this scheme and the larger **Inchicore/ Poolbeg** replacement circuits.
- **220kV stations.** Construction enabling works commenced in Jan 2026 for **Poolbeg 220kV station. Belcamp 220kV station:** Initial construction enabling works started in March 2026.
- **Dublin Central Bulk Supply Project:** Working towards Project Agreement with ESBN ahead of Sep 2026 target date. ESBN progressing the EPC contractor procurement

Upcoming Milestones

Upcoming Capital Approvals

- **Drumline 110kV Station Busbar Thermal Capacity Needs -** Jun ‘26

Upcoming Project Agreements

- **Castlebar - Dalton 110kV (planning required) -** May ‘26
- **Barrymore Cahir Knockraha 110kV Line Uprate -** Jun ‘26
- **Cushaling - Portlaoise 110 kV line refurbishment** – May ‘26
- **Maynooth - Turlough Hill 220 kV line refurbishment -** Jun ‘26

Key Risks or Issues

- Third party Land Acquisition.
- MARA/MAC application time.
- Outage availability and utilisation.

PUBLIC ENGAGEMENT

Overall Summary and Status

- The SOEF Roadmap underpins all Consultations, engagements and initiatives undertaken across the Public Engagement Team and is a key enabler to the delivery of an accelerated grid expansion programme.

Key Highlights

- **Offshore Survey Campaign** - Public information campaign in April in Cork/Wexford/Waterford with Fishery and Community Liaison Officers. Offshore Surveys are currently ongoing. Daily engagement with Fisheries with minimal interference.
- **North Connacht -** Community Benefit Fund opened with €612k available to community groups. Applications currently being evaluated.
- **EU Pact for Engagement:** EirGrid invited to present to European TSOs and DSOs on Schools Educational Programme and Energy Citizen Roadshows as best practice cases in citizen engagement.

Fingal East Meath Reinforcement Project - site purchased for substation in Fingal area and site investigations ongoing, Public Information campaign commenced 7th May.

Kildare Dublin Reinforcement Project - Site identification and negotiations on going. High level public information campaign in May in advance of public consultation on circuit routes later in 2026.

- **Flagford-Sligo Capacity Needs:** Public Consultation report published in Q1 2026. Best Performing Option report now being finalised for publication in May 2026. On-going community and landowner engagement.

Schools Programme
EirGrid have introduced an educational programme in schools in project areas. Since October '25 over 50 schools have been engaged.

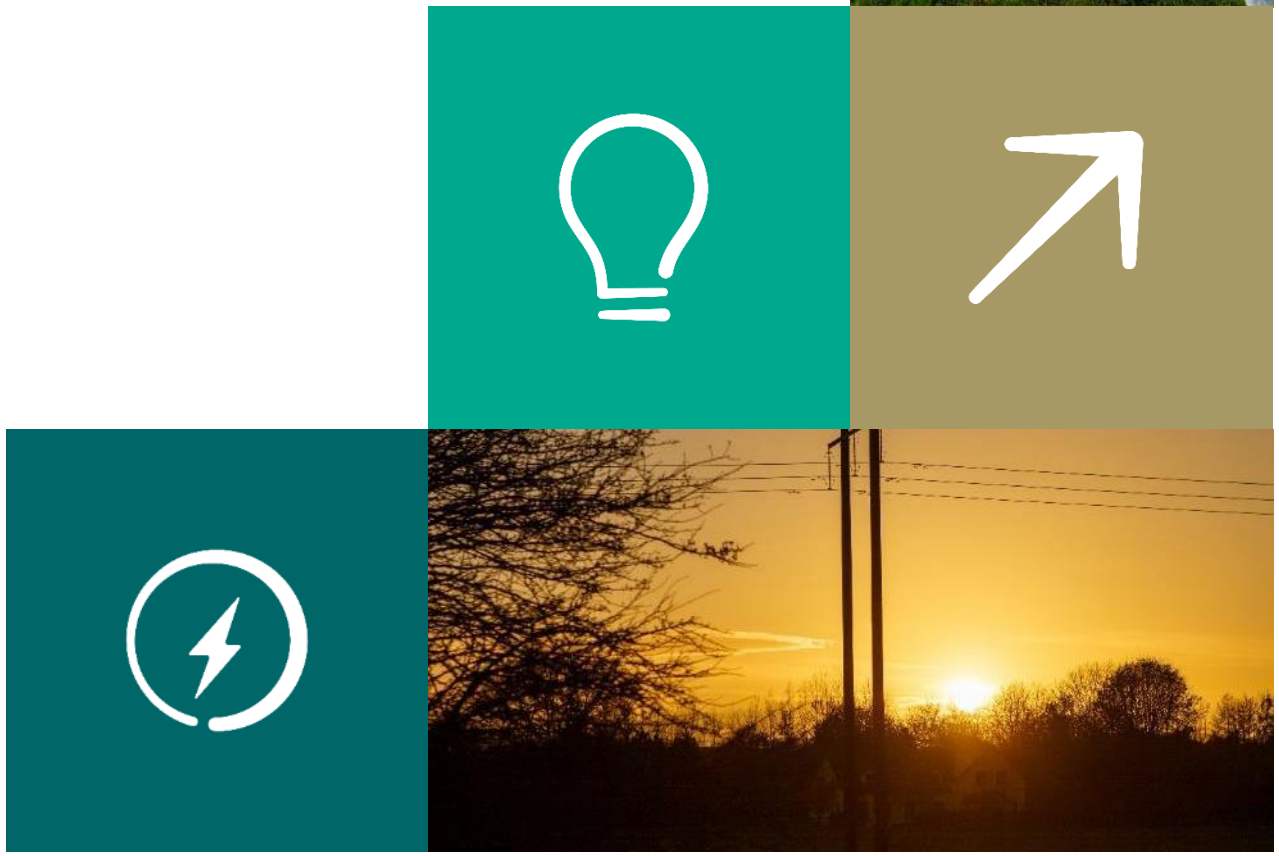
Upcoming Milestones

- Public information campaign across Fingal East Meath Reinforcement Project/ Kildare Dublin Reinforcement Project / Powering Up South Coast and Powering Up North West.

Key Risks or Issues

- Third party Land Access and availability.
- MARA/MAC application time.
- Scale and volume of projects out for consultation.
- Fisheries engagement on Powering Up Dublin and Offshore South Coast.

Dispatch Down:
Heat & Thermal Storage



Presenters:

Marc Senouci &
Chittesh Chandran

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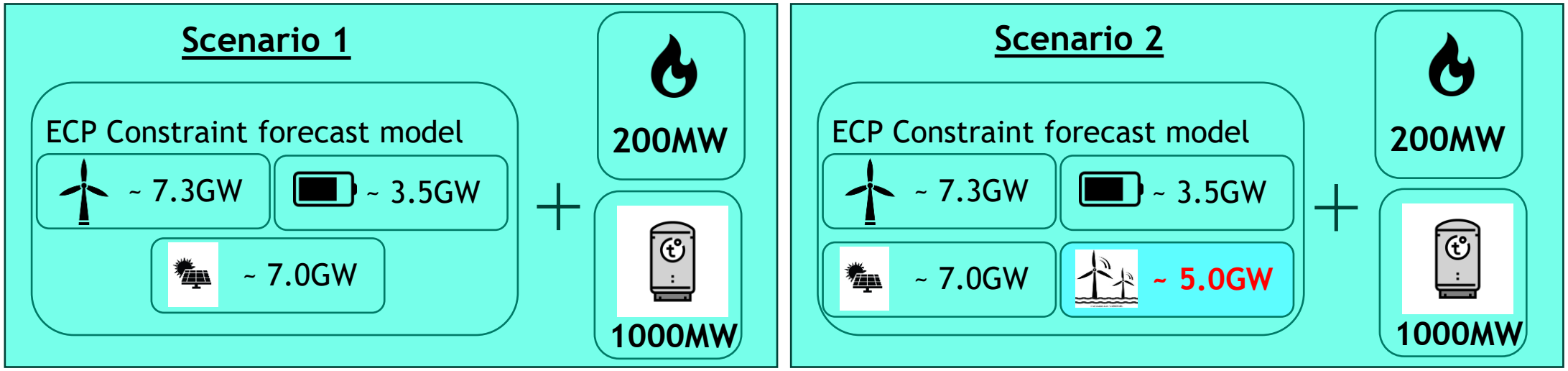
Caveats

1. This study utilizes the ECP-2.4 Surplus study model. All related assumptions applied in the ECP-2.4 study can be found here. This study doesn’t take in account any methodology changes used in ECP 2.5 constraint forecast onwards.
2. The assumptions around the operation and market rules for these new technology types (Dispatchable Load and Thermal Storages) were made specifically for the purpose of this study.

Objective and Modelling Scenarios

- To study the impact of Dispatchable load and Thermal Storage on Surplus dispatch down of renewables.
- Surplus dispatch down is the reduction of renewable generation when the total available renewable energy exceeds the system demand (including net interconnector exports).
- Model Scenario
    - Scenario 1 – 2027 100% ECP
    - Scenario 2 - 2030 100% ECP + 5GW Offshore
    - “100% ECP” contains all ECP applied generators including ECP 2.4



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Modelling Assumptions

- The study is based on ECP 2.4 constraint forecast and all modelling assumptions are from the same for all technology types.
- Dispatchable load is modelled as price responsive load in Plexos.
- Thermal Storage is modelled as storage unit.
    - Can import energy from SEM only.
- The dispatchable load and thermal storage respond to system price.
    - Load/thermal storage is supplied by SEM when price is less than 40€/MWh
    - Above 40€/MWh, load is supplied by either thermal storage or gas boiler
    - 40€/MWh was assumed based on SME level feedbacks.

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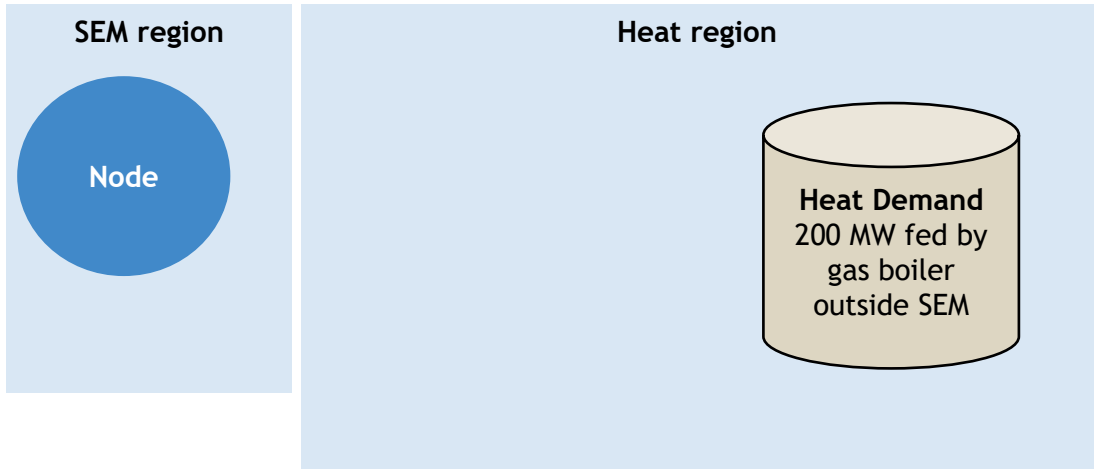
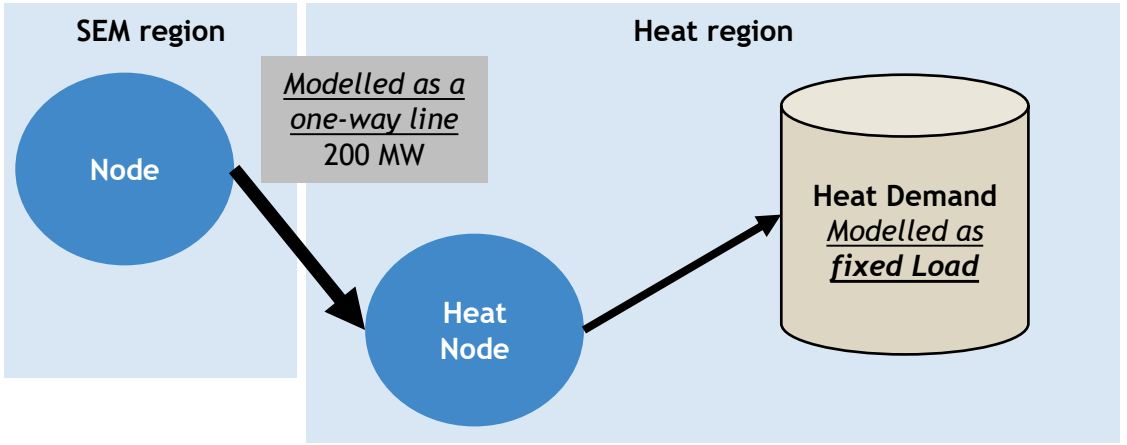
Modelling Approach

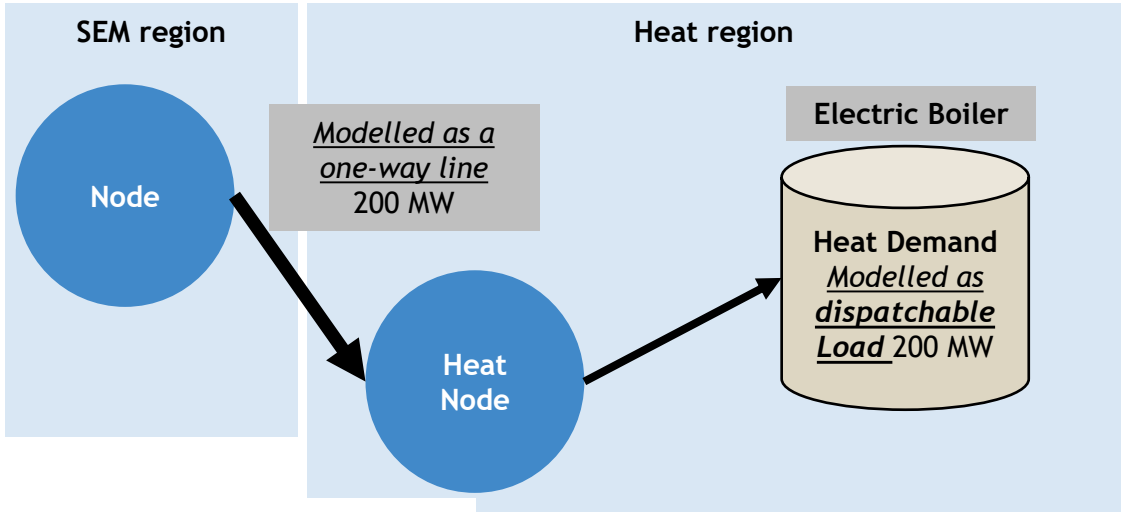
Base – 200 MW gas boiler



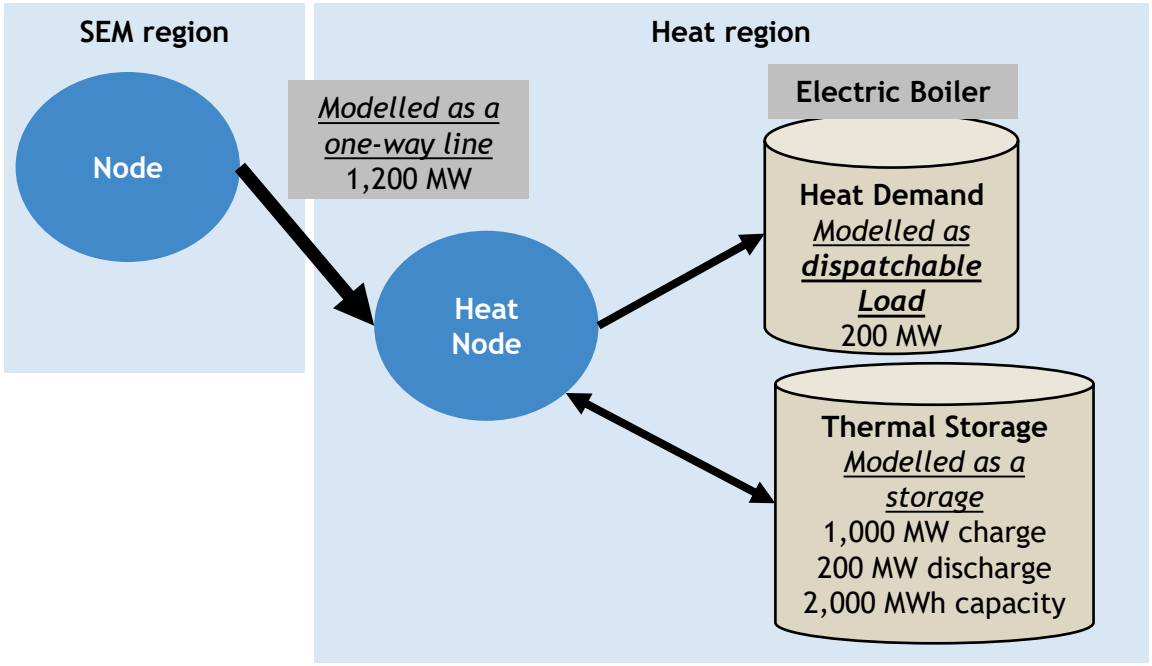
Approach 1 (A1) - 200 MW fixed load



Approach 2 (A2) - 200 MW dispatchable load



Approach 3 (A3) - 200 MW thermal storage



- 100% efficiency of thermal storage

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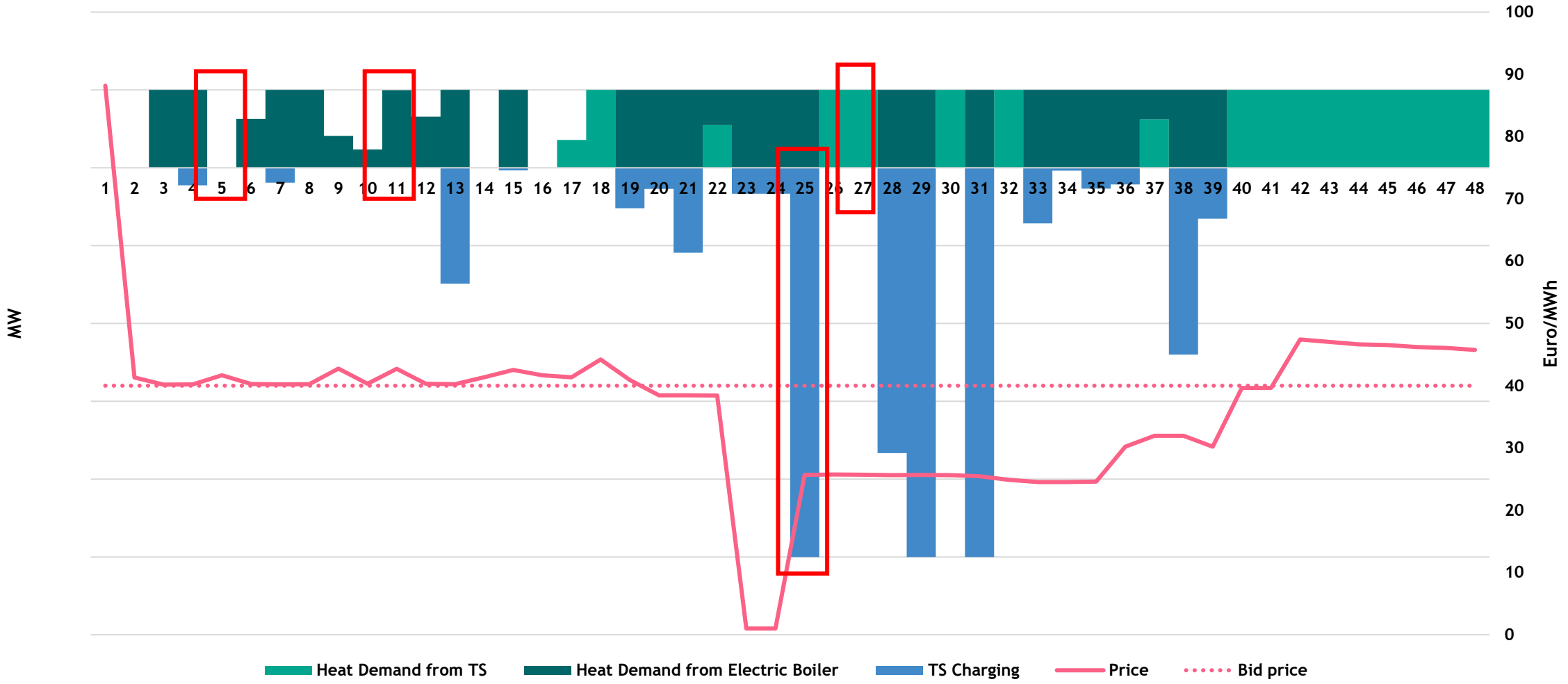
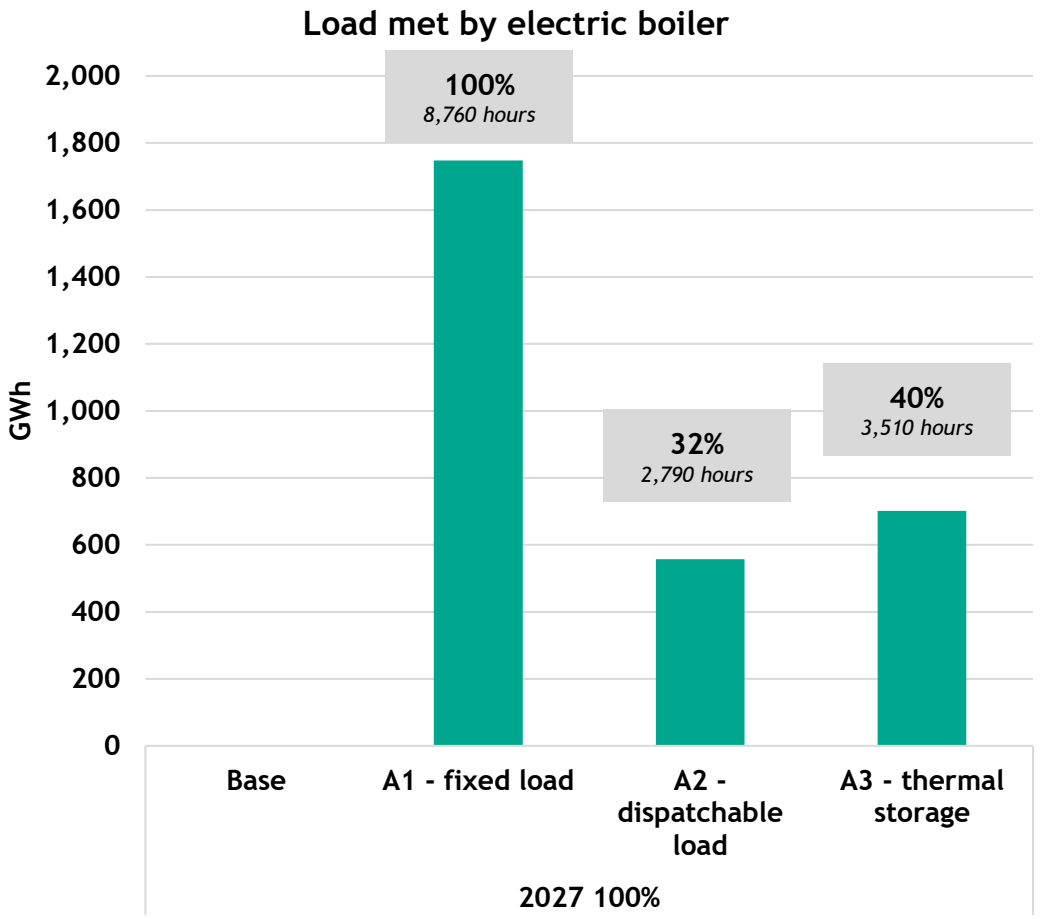
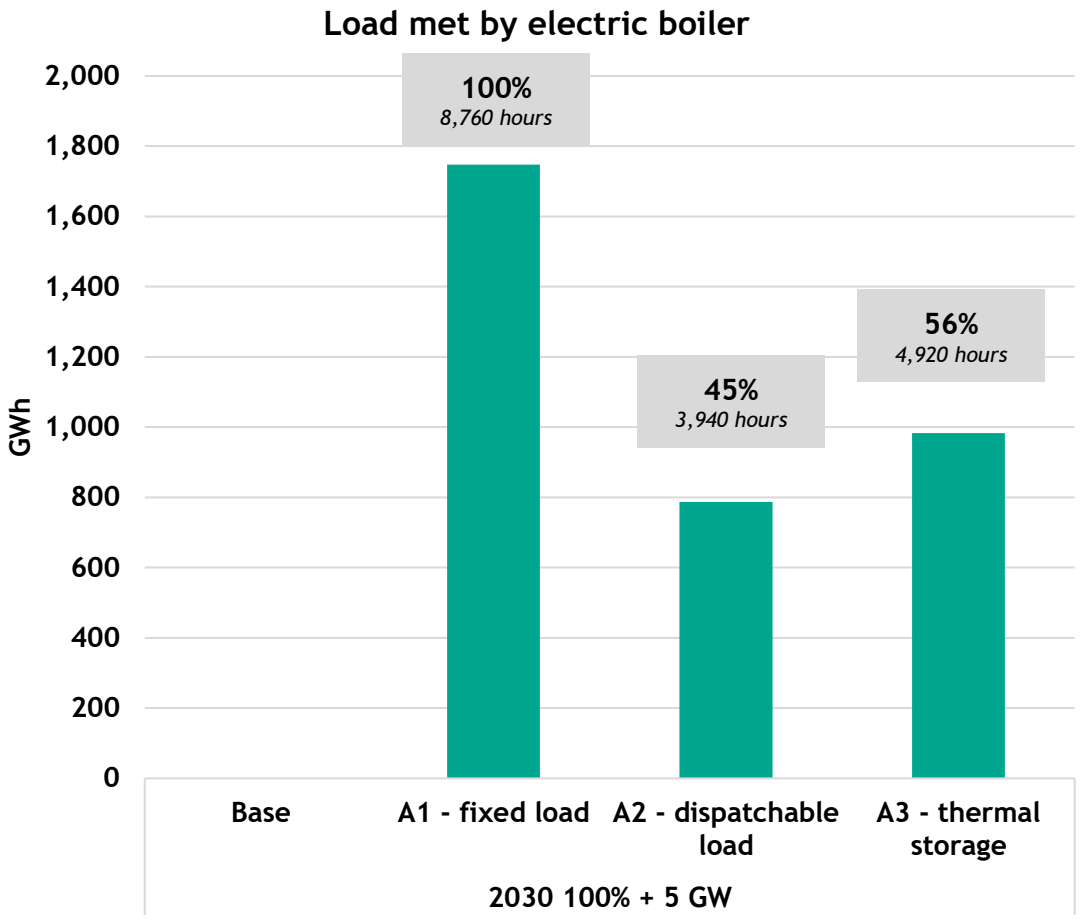
Model Behaviour – Sample Illustration for Approach 3 (A3)



Heat load supplied from SEM





Summary of results - 2027 100% ECP

	Base	A1 - fixed load	A2 - dispatchable load	A3 - thermal storage
	ECP 2.4 2027 100% ECP with 200 MW gas boiler meeting heat demand	*Base + 200 MW fixed load electric boiler*	*Base + 200 MW Price responsive electric boiler*	*Base + 200 MW Price responsive electric boiler + thermal storage*
Dispatch down (Surplus)	*2,060 GWh*	*1,750 GWh* **-300 GWh -15%**	*1,750 GWh* **-300 GWh -15%**	*1,550 GWh* **-500 GWh -24%**
Generation cost (power and heat)	*618 million EUR*	*599 million EUR* **-19 million EUR -3%**	*586 million EUR* **-33 million EUR -5%**	*580 million EUR* **-39 million EUR -6%**
Emissions	*2.16 MtCO2*	*2.07 MtCO2* **-0.09 MtCO2 -4%**	*2.04 MtCO2* **-0.13 MtCO2 -6%**	*2.01 MtCO2* **-0.15 MtCO2 -7%**

All results are compared to Base

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Summary of results -2030 100% ECP + 5GW Offshore

	Base	A1 - fixed load	A2 - dispatchable load	A3 - thermal storage
	ECP 2.4 2030 100% ECP + 5GW with 200 MW gas boiler meeting heat demand	*Base + 200 MW fixed load electric boiler*	*Base + 200 MW price-responsive electric boiler*	*Base + 200 MW price-responsive electric boiler + thermal storage*
Dispatch down	*8,300 GWh*	*7,680 GWh* **-620 GWh** **-7%**	*7,680 GWh* **-620 GWh** **-7%**	*7,290 GWh* **-1,010 GWh** **-12%**
Generation cost (power and heat)	*252 million EUR*	*190 million EUR* **-62 million EUR** **-25%**	*210 million EUR* **-42 million EUR** **-17%**	*200 million EUR* **-52 million EUR** **-21%**
Emissions	*0.85 MtCO2*	*0.60 MtCO2* **-0.25 MtCO2** **-29%**	*0.69 MtCO2* **-0.16 MtCO2** **-19%**	*0.65 MtCO2* **-0.20 MtCO2** **-24%**

All results are compared to Base

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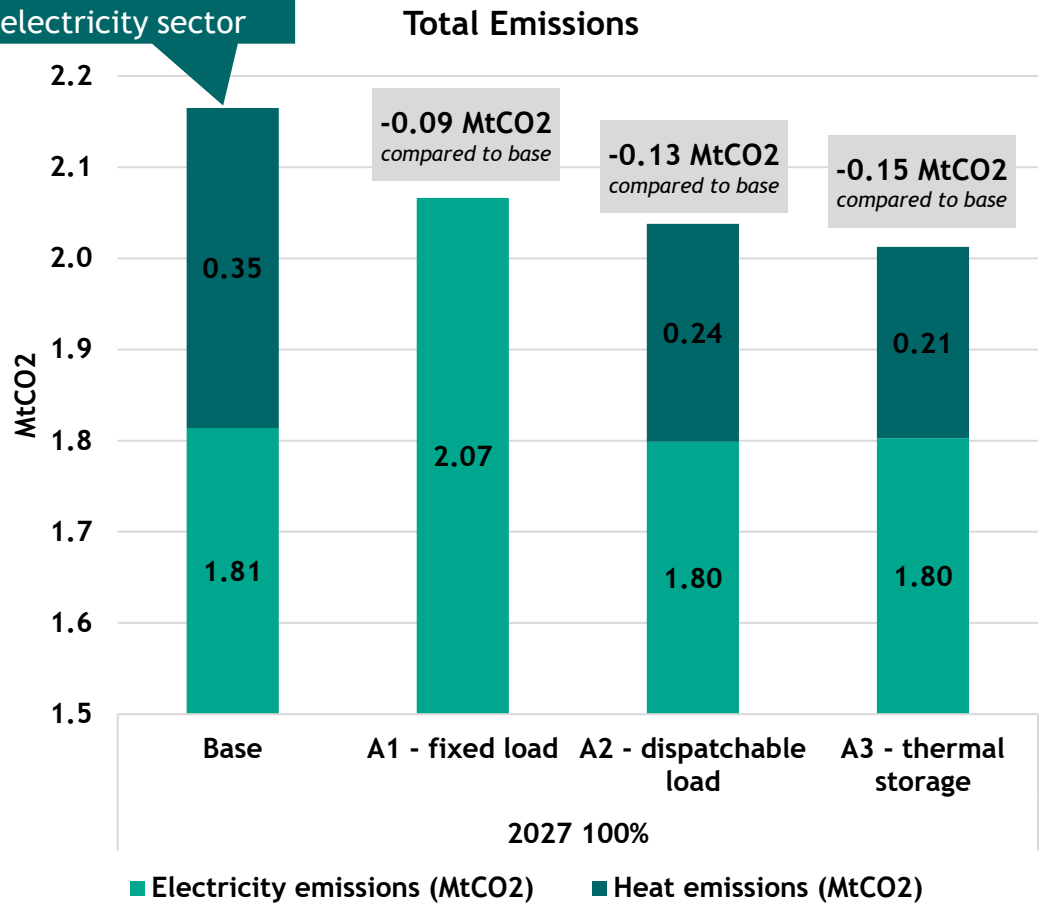
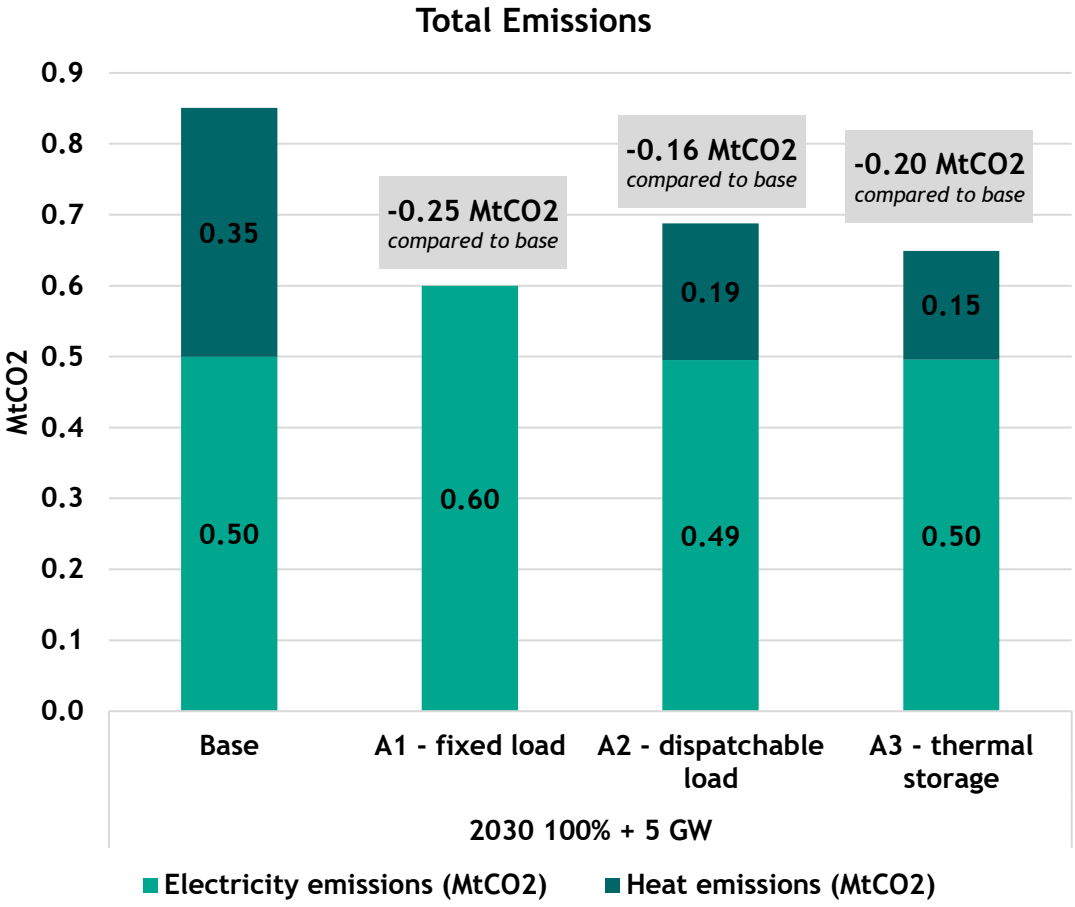
Additional information - Carbon emissions

Emissions from the gas boiler - outside electricity sector





Observations

- Dispatchable load and Thermal Storage has potential to reduce Surplus renewable dispatch down. With higher renewables connected to the system greater the impact.
- Overall cost and carbon emissions are reduced when the demand is met by cheaper renewable electricity as it is displacing the gas consumption.
    - The carbon emission is not eliminated as it moves form Gas sector to electricity sector, but can be further reduced with increase in renewable availability.
- Additional investigation is required to understand the benefits of Dispatchable load and Thermal storage in balancing market framework.
- A holistic view is considered for this study on the operation rules and bidding strategies.

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Operational Challenges of Solar Energy Integration

Presenter:

Amir Moshari

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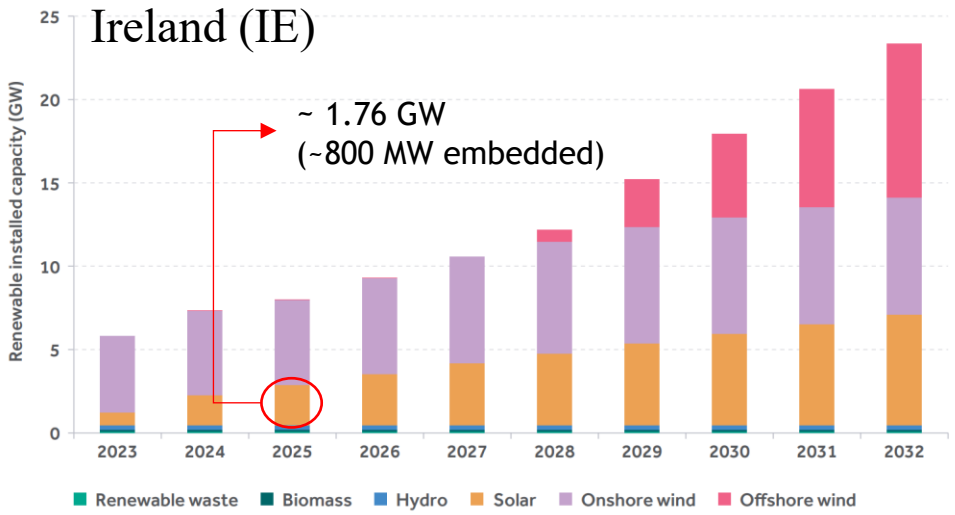
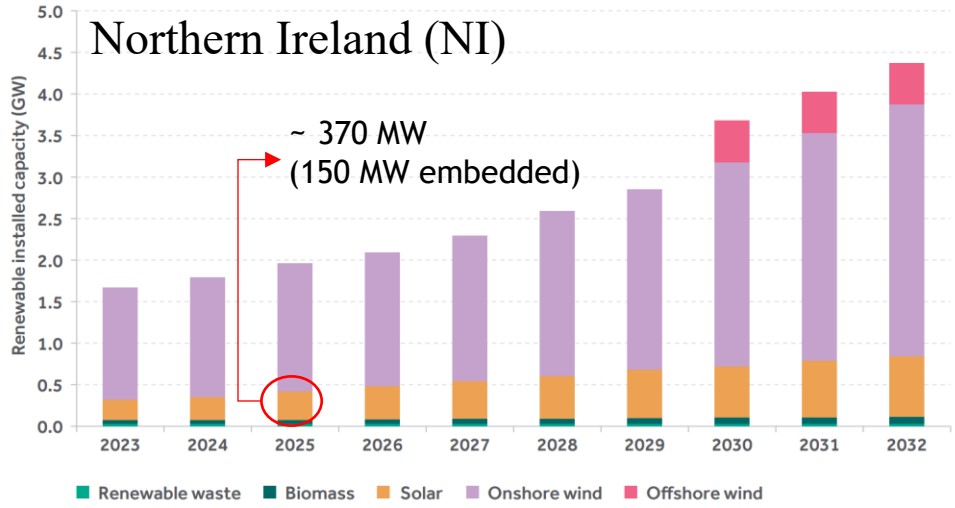
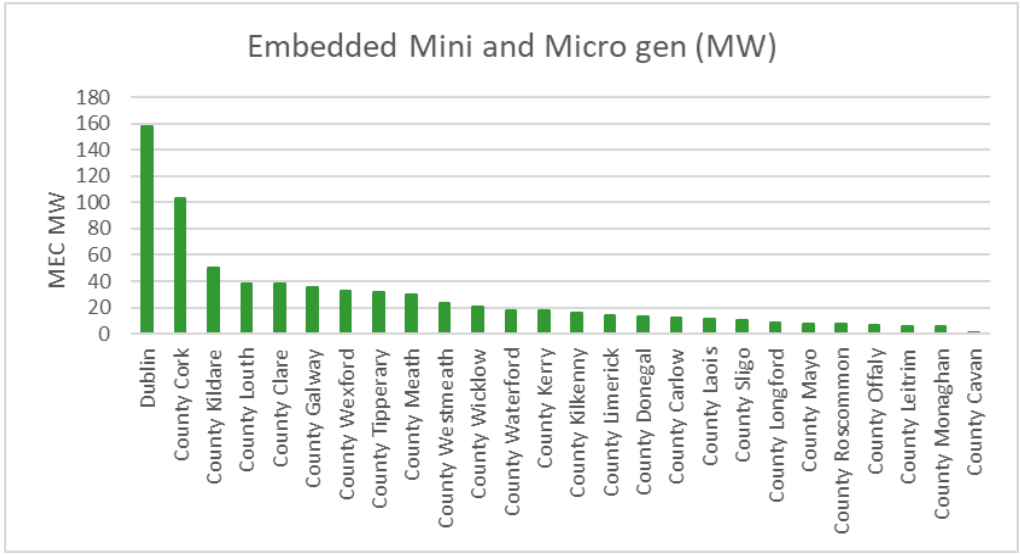
All-Island Solar Integration Outlook







Key Targets

Target	2025	2030
Renewable Electricity Share	50%	80%
Onshore Wind	6 GW	9 GW
Solar	Up to 5 GW	8 GW*
Offshore Wind	-	At least 5 GW
New Flexible Gas Plant	-	At least 2 GW
Demand Side Flexibility	15-20%	20-30%

*2.5 GW embedded PV

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Source: https://www.eirgrid.ie/site-files/library/EirGrid/Shaping-Our-Electricity-Future-Roadmap_Version-1.1_07.23.pdf
https://cms.eirgrid.ie/sites/default/files/publications/19035-EirGrid-Generation-Capacity-Statement-Combined-2023-V5-Jan-2024.pdf
https://assets.gov.ie/static/documents/c491032e/DECC_Climate_Action_Plan_2025_Main_Report_-_Final_Web.pdf
https://solarireland.ie/sites/default/files/content-files/SolarIreland_ScaleOfSolar2025.pdf

Solar Generation Challenges

Overview

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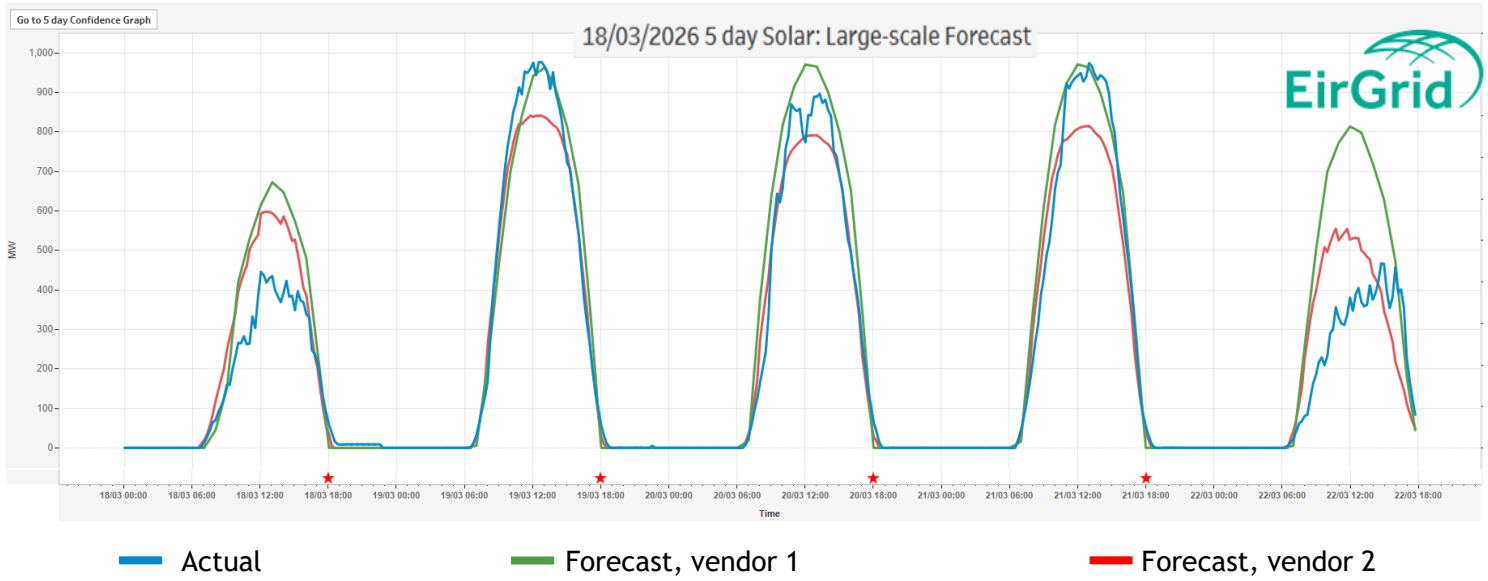
Current Status & Recent Records

- **Rapid growth in solar generation** across the island, with both grid-connected and embedded solar contributing materially to system operations.
- **Embedded solar now comparable in scale** to utility-scale solar in its impact on net system demand.
- These conditions are consistent with published solar connection figures and are expected to become more frequent through spring and summer.



- New grid-connected solar record:
  - 979 MW recorded at 12:35 on Thursday 19 March 2026, nearly matched again on the following weekend.

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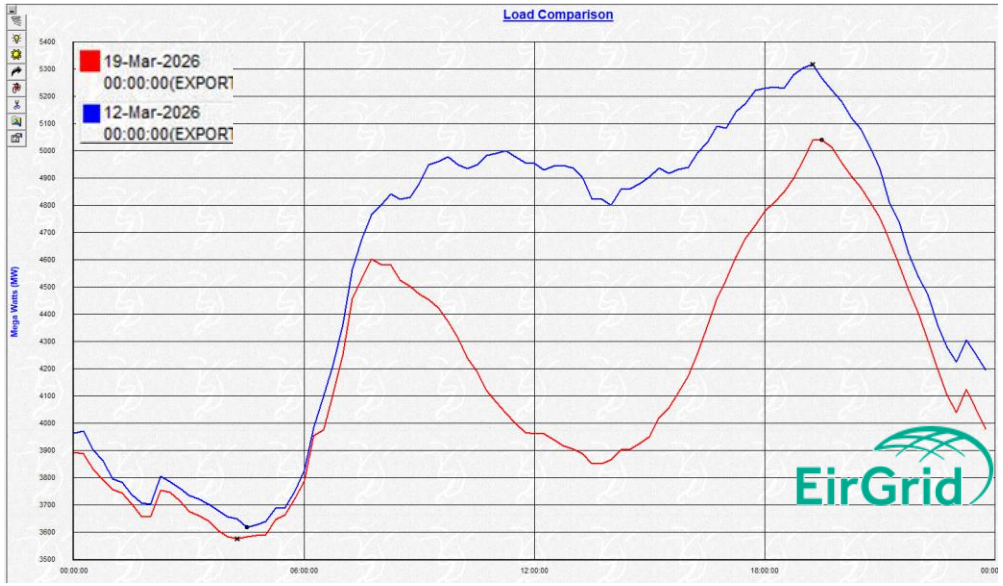
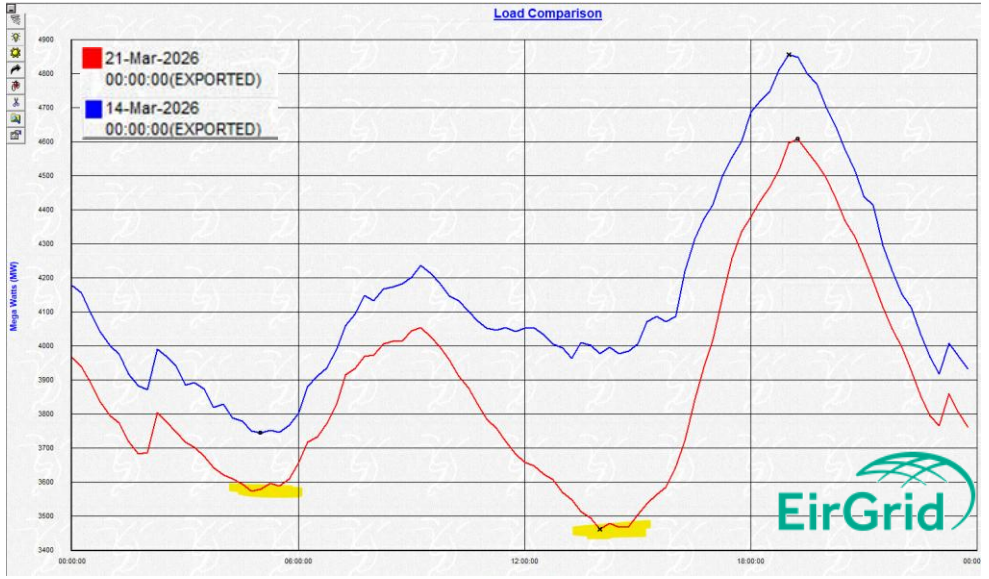
Embedded Solar – Changing the Demand Profile

- Significant reduction in daytime system demand observed during high solar output periods.
  - On Thursday 19 March, lunchtime demand was ~974 MW lower than the previous Thursday, largely attributable to embedded solar and favourable weather.
  - On Saturday 21 March, the system experienced its first-ever daytime demand valley:

    3,462 MW at 14:00 versus 3,574 MW overnight.
- This marks a structural shift in demand patterns, with **two daily peaks and two valleys** increasingly likely in summer operation.
- These trends directly underpin emerging challenges around **minimum operational demand**, **ramping**, **voltage control**, and **post-fault behaviour**.





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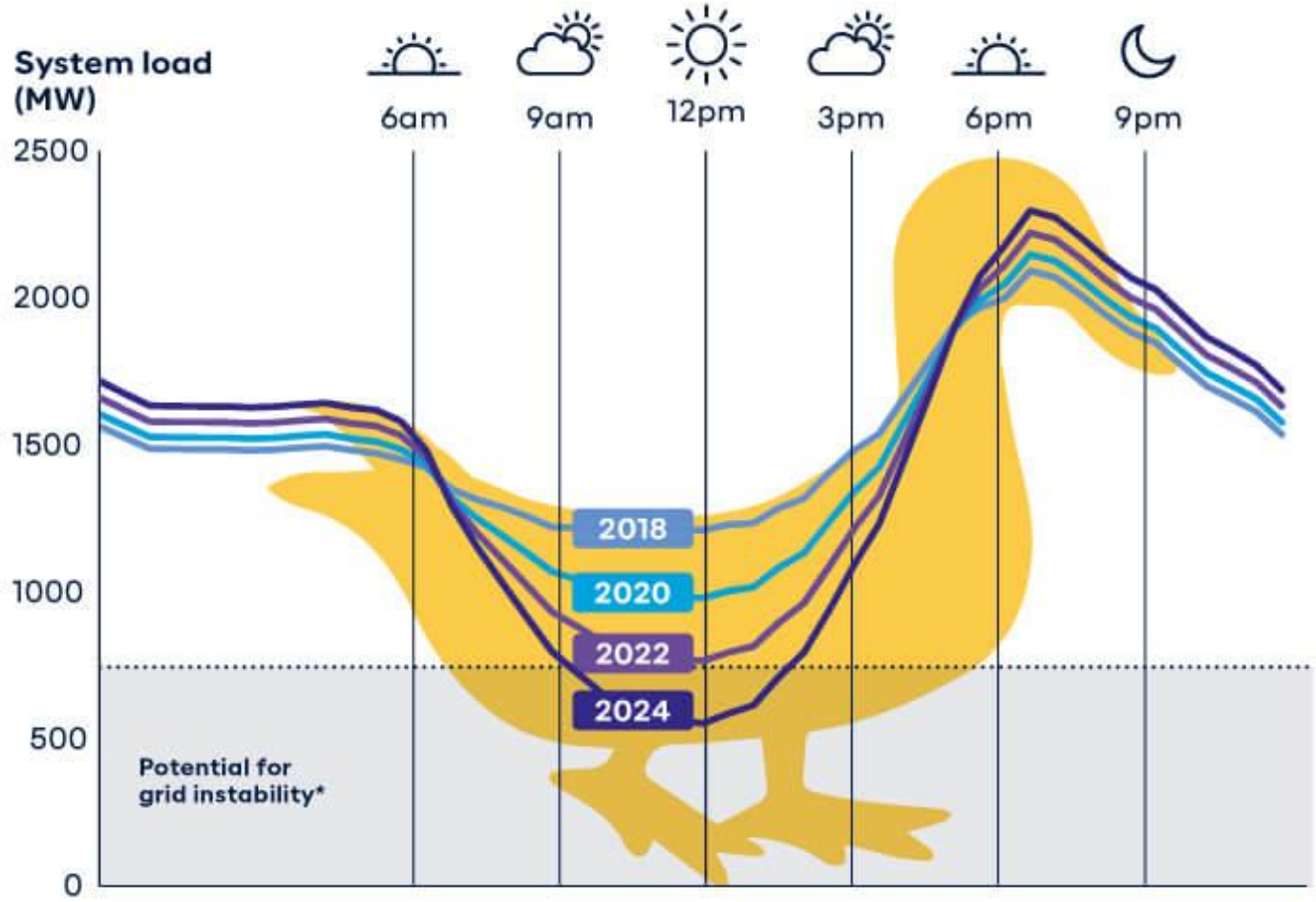
Solar Generation Challenges

Minimum Operational Demand

- Significant increases in small-scale/microgeneration can reduce overall system demand.
- If low system demand conditions are eroded, it could lead to system collapse and customer outages.
- To maintain security and stability, operational demand must stay high enough to keep essential generation units online, providing critical services like system strength, inertia, and frequency control.

* Illustrative Duck Curve example (conceptual - not real system data)




75% SNSP


7 MUON

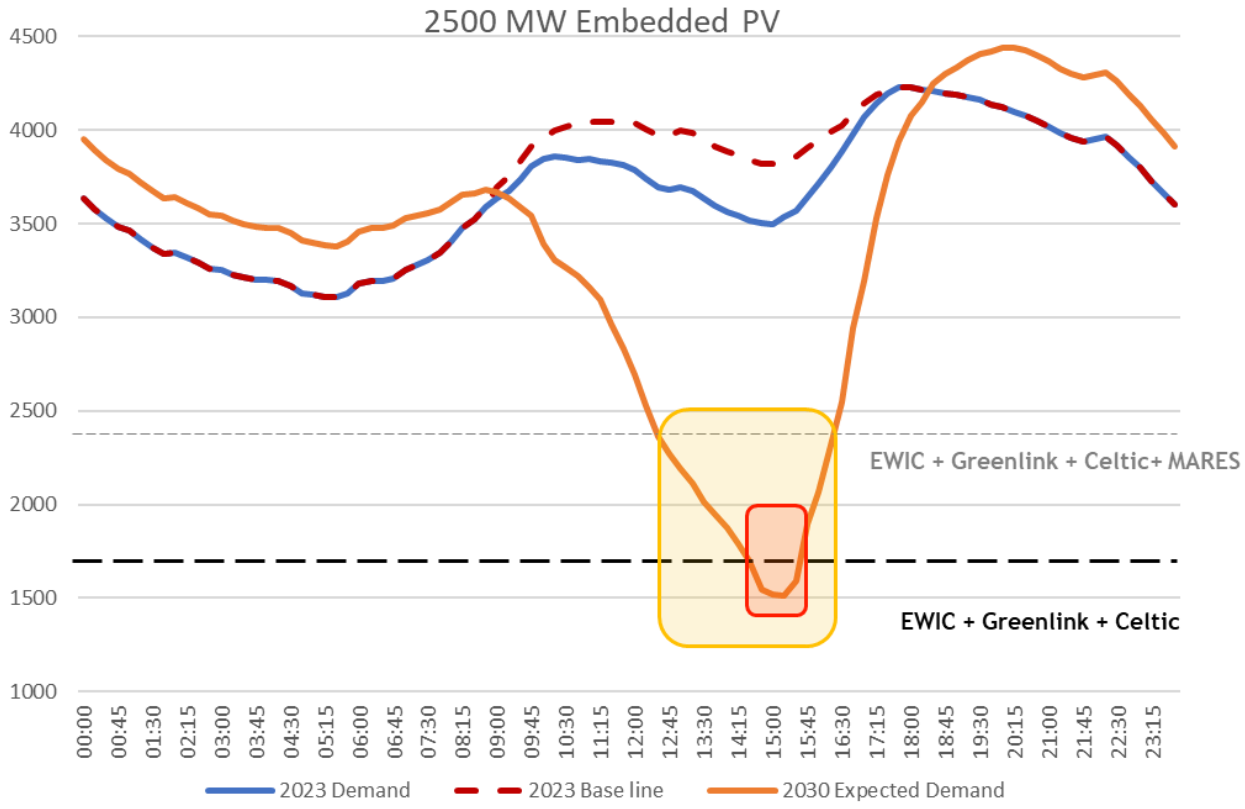

23,000 MVAs Inertia


System Strength

Solar Generation Challenges

Minimum Operational Demand

- MUON Constraint expected to be 3 units in the All-Island system by 2030.
- Even with maintaining 7 units as an operational constraint until 2030, minimum demand would not violate this constraint.
- Potential demand and generation mismatch with full import through interconnectors (EWIC, Greenlink, Celtic) if tie-line trips.
- Risk increased by MARES interconnector commissioning and similar risks in NI with Moyle and Liric*.
- Interconnector trades set in day-ahead and intra-day markets may not adjust easily to real-time changes.
- A second tie-line between IE and NI power systems planned to reduce islanding risk.



Operational policy constraints in the All-Island power system

Year	SNSP	MUON	Inertia Floor	RoCoF
2023	75%	7 units	23 GVAs	1 Hz/s
2030	95%	3 units	20 GVAs	1 Hz/s

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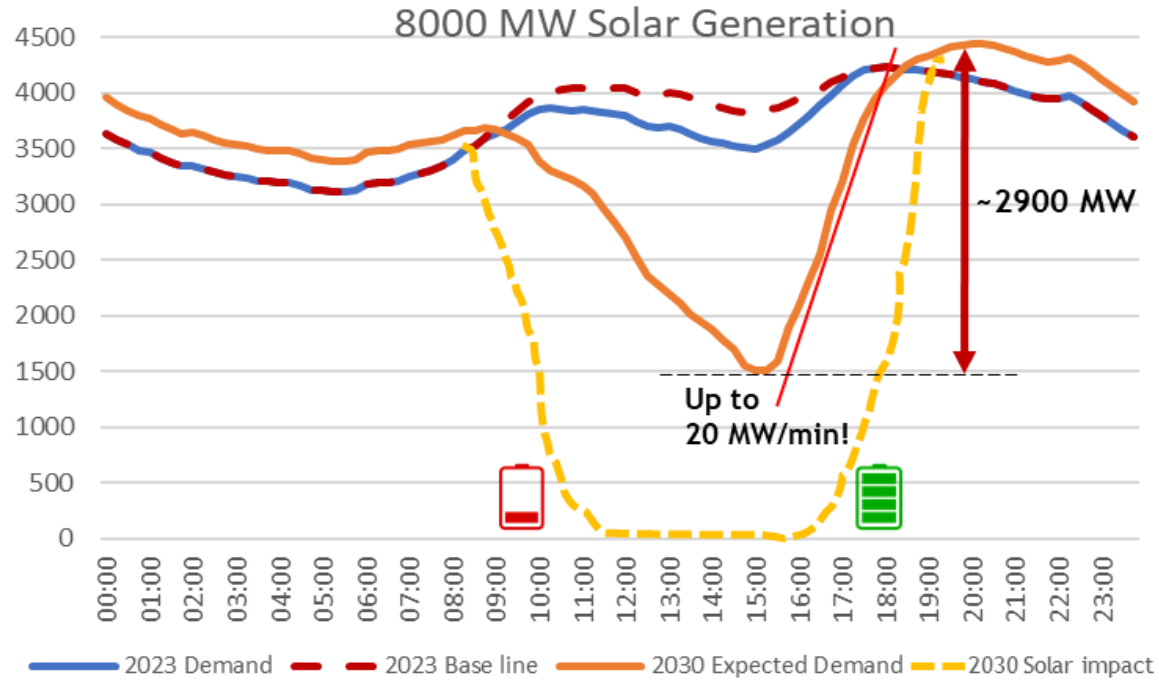
*Although the Liric interconnector connection is currently expected post-2030 (link).

Solar Generation Challenges

Ramping

- On very sunny days, embedded PV systems can impose significant ramping requirements on the bulk power system.
- As solar generation decreases in the evening, there may be insufficient ramping capability or flexible generation (e.g., energy storage, OCGTs, CCGTs) to meet demand.
- The system may require 3 GW of ramping over three hours, with ramping rates potentially exceeding 20 MW/min.
- Considering the entire 8 GW solar capacity, net demand could drop to zero, leading to even sharper ramping rates.
- Effective scheduling and dispatch of long-duration storage are crucial to manage these ramping requirements.



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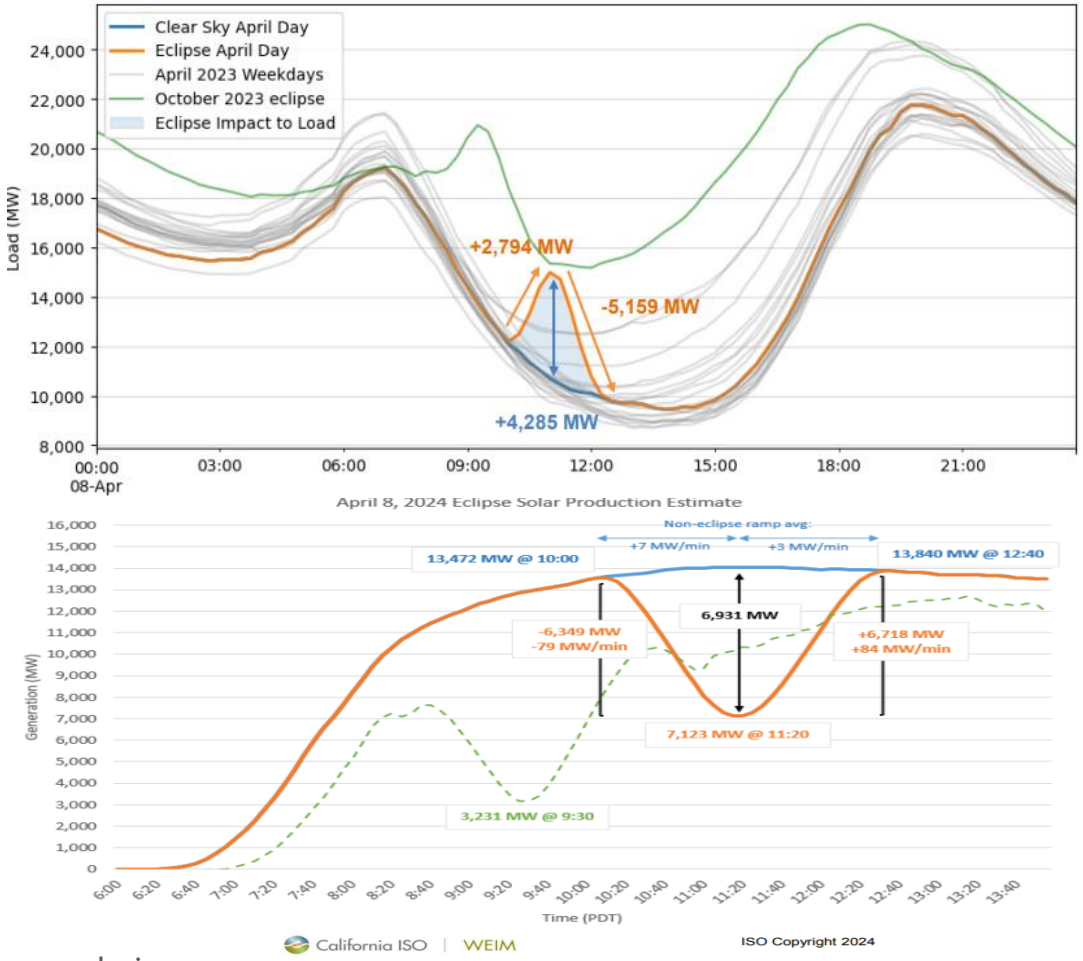
Solar Generation Challenges

Ramping

- High Impact Low Probability events like eclipses or extensive cloud cover can impose significant ramping requirements.
- During an eclipse, demand ramp rates may exceed daily trends due to rapid changes in solar production, especially in areas with high PV concentration (e.g., Dublin, Belfast, southern region).
- An eclipse can cause substantial decreases and increases in solar production within a short period, leading to high ramping rates and impacting net demand.
  - This highlights the need for higher ramping capabilities and flexible generation (ramping/reserve).
- Similar, though less severe, ramping challenges can occur when large clouds pass over areas with high PV installations.
  - This highlights the need for improved solar forecasting, underpinned by higher-resolution meteorological data, to anticipate rapid cloud-driven output changes*.

HILP Events



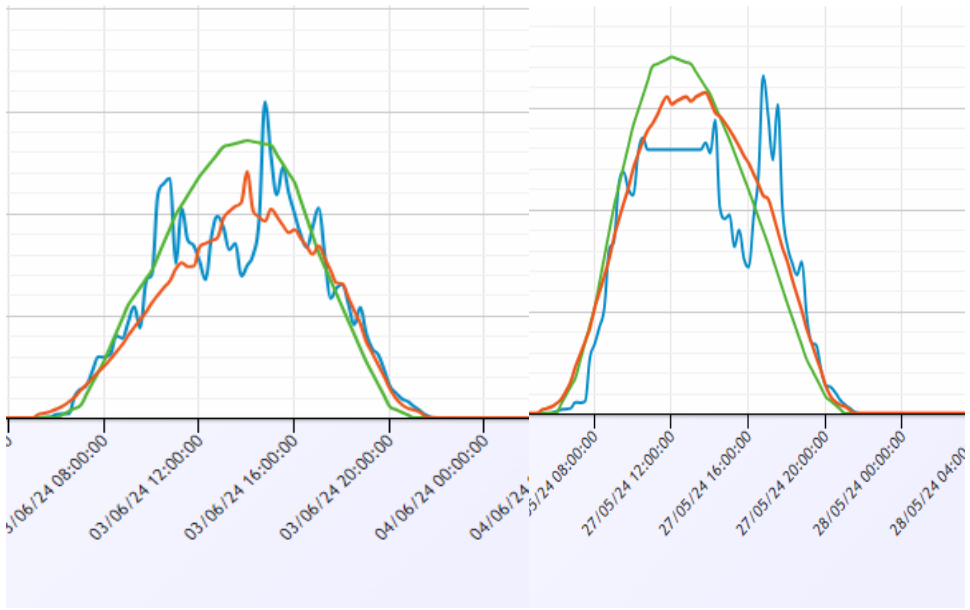
* Current meteorological data and solar forecast limitations are being addressed through OTCE workstreams (including the STORM project).

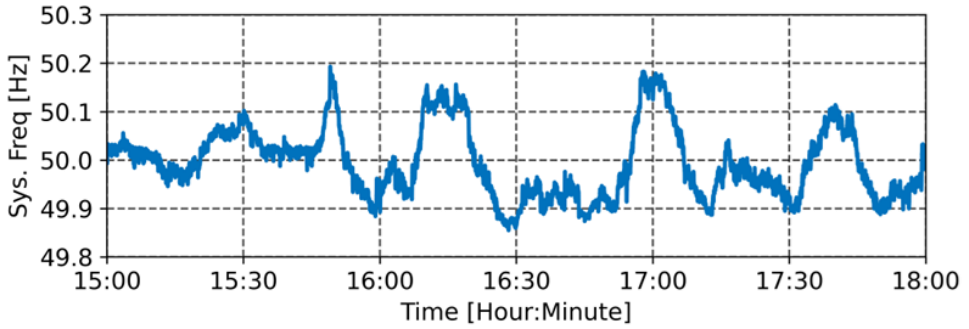
https://www.caiso.com/Documents/April-8-Solar-Eclipse-Technical-Bulletin-March-11-2024.pdf

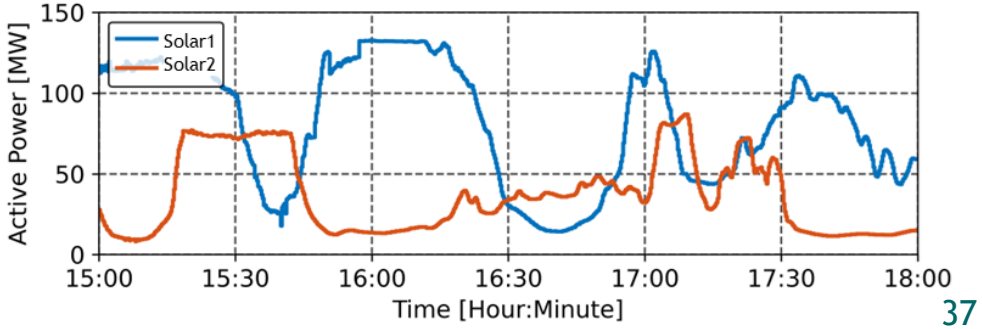
Solar Generation Challenges

Intra-Hour Variations (IVH)

- A cloud passing over one or more solar farms can cause rapid intra-hour variations in output, leading to significant fluctuations in system frequency.
- Convective cloud systems are a primary driver of IHV, causing sharp reductions in output followed by rapid recoveries.
- Associated weather conditions play an important role:
  - Strong showers can clean the air, increasing irradiance post-event.
  - Increased wind speeds cool PV panels, temporarily improving efficiency and contributing to sharper ramp-ups after cloud passage.
- As a result, frequency regulation challenges are most pronounced during rapid ramp-ups, where multiple weather-driven effects coincide.
  - ➢ Limited availability of site-level meteorological data (e.g. wind speed and precipitation) constrains the accurate forecasting and attribution of IHV events*.







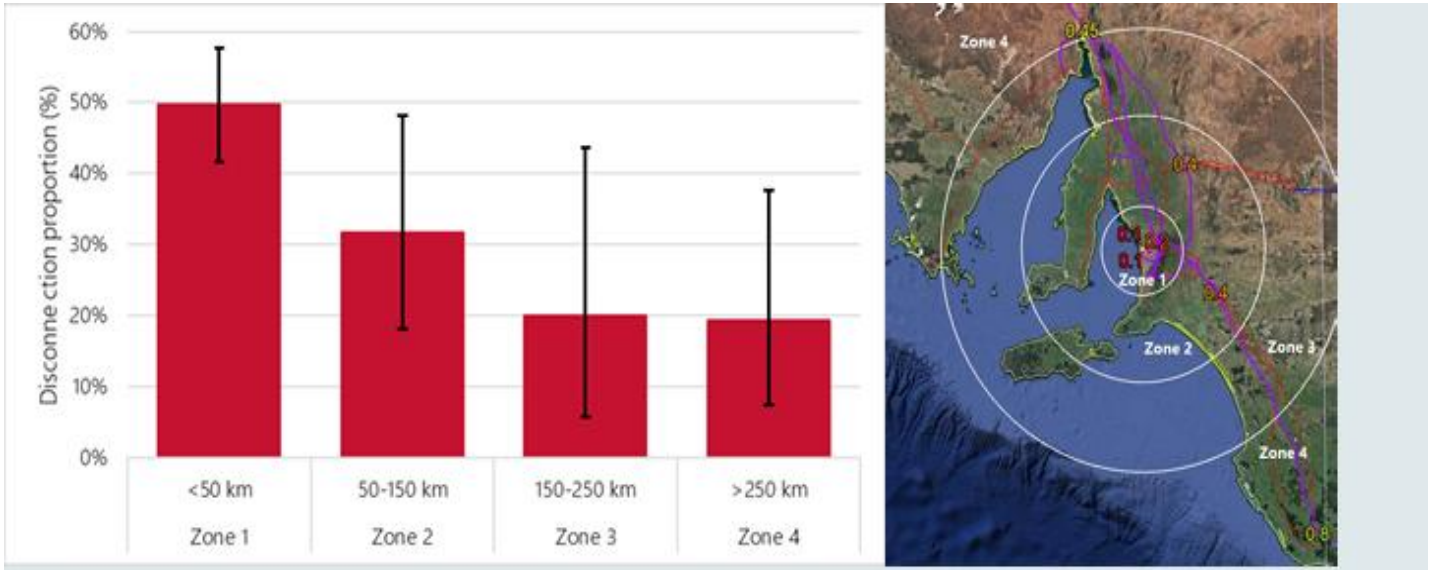
* At present, there is no requirement for PV sites to provide wind speed or precipitation data for SONI.

Solar Generation Challenges

Post-Fault Behaviour

- There is considerable evidence of extensive Distributed PV (DPV) disconnection in response to voltage disturbances.
- Voltage disconnection of a significant proportion of Distributed Energy Resources (DER) poses a risk to power system security. It can increase contingency sizes.
  - This primarily necessitates mandating appropriate fault-ride-through requirements for DPVs through relevant standards and codes.

DPV disconnections by distance from the fault location in South Australia



Numbers on map display minimum single phase voltage reached during disturbance recorded by HSM in the transmission network.

	Depth of voltage sag (p.u.)						
Duration of voltage sag (pu)	0.2 pu	0.3 pu	0.4 pu	0.5 pu	0.6 pu	0.7 pu	0.8 pu
80 ms duration	17%	31%	34%	38%	45%	48%	55%
120 ms duration	21%	31%	31%	38%	48%	48%	55%
220 ms duration	31%	41%	41%	52%	55%	55%	59%

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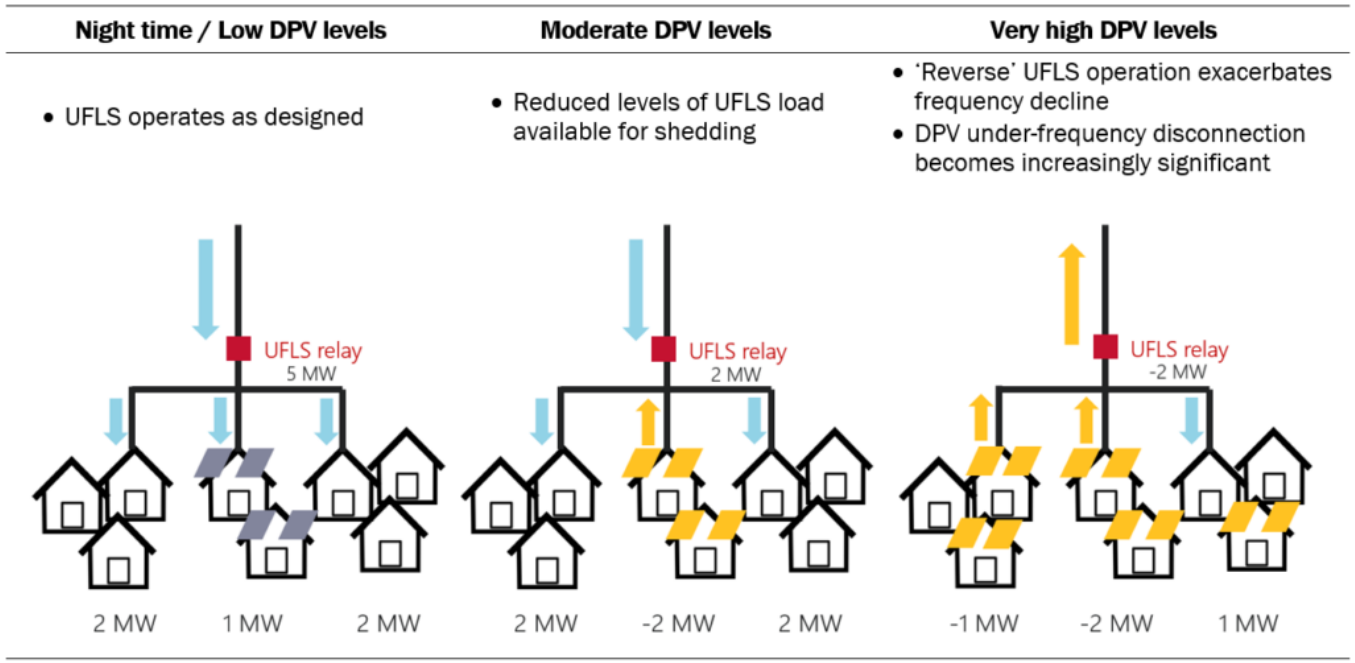
https://aemo.com.au/-/media/files/initiatives/der/2021/capstone-report.pdf?la=en&hash=BF184AC51804652E268B3117EC12327A

Solar Generation Challenges

Post-Fault Behaviour

❑ Under Frequency Load Shedding (UFLS)

- ➢ Critical safety net to stabilize balance between gen & load, for severe lack of generation
- ➢ Automatic disconnection of end-use loads, through tripping of pre-designated distribution circuits
- ➢ DER can compromise the efficacy of traditional UFLS by:
  - ○ Reduction in net load available for shedding.
  - ○ Reverse power flows on UFLS circuits:
  - ○ Under-frequency disconnection of DPVs



Solar Generation Challenges

What do we need?

- **Enhance Visibility of DPVs:** Ensure up-to-date visibility of installed DPV capacity, evolving towards real-time generation data to help system operators manage risks and activate solutions.
- **Improve Forecasting:** Enhance solar short-term and inter-hour forecasting, supported by continuous data exchange between TSO and DSO forecast systems and use of improved meteorological signals to better capture weather-driven variability.
- **Increase Controllability:** Develop the ability to perform emergency curtailment of DPVs in coordination with DSOs to manage extreme conditions (where feasible).
- **Update the Under-Frequency Load Shedding (UFLS)** scheme for effectiveness.
- **Enhance Modelling:** Start with steady-state models of aggregated DPVs at the BSP level for precise load flow and optimal power flow in real-time tools. Utilising generic dynamic models based on static data, improve through data gathering and validation, and facilitate model exchange and collaboration between TSO and DSO.
- **Enhance Fault-Ride-Through (FRT) Capability:** Develop or update standards and codes and enforce necessary tests.

How to Overcome the Challenges

Ongoing works

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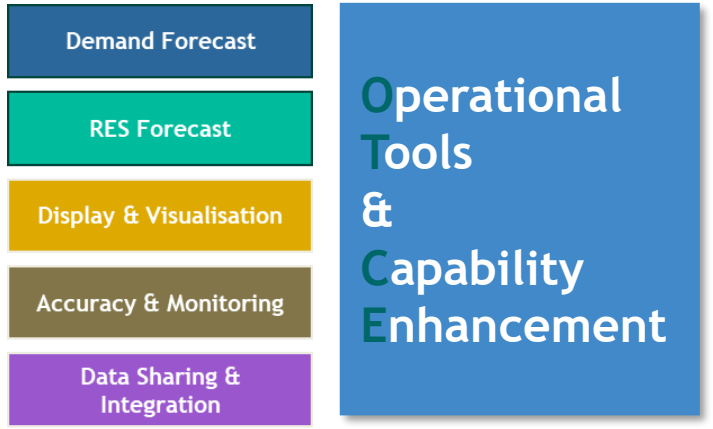
Operational Forecasting (ongoing works)



Embedded PV Nowcasting & Demand Forecast

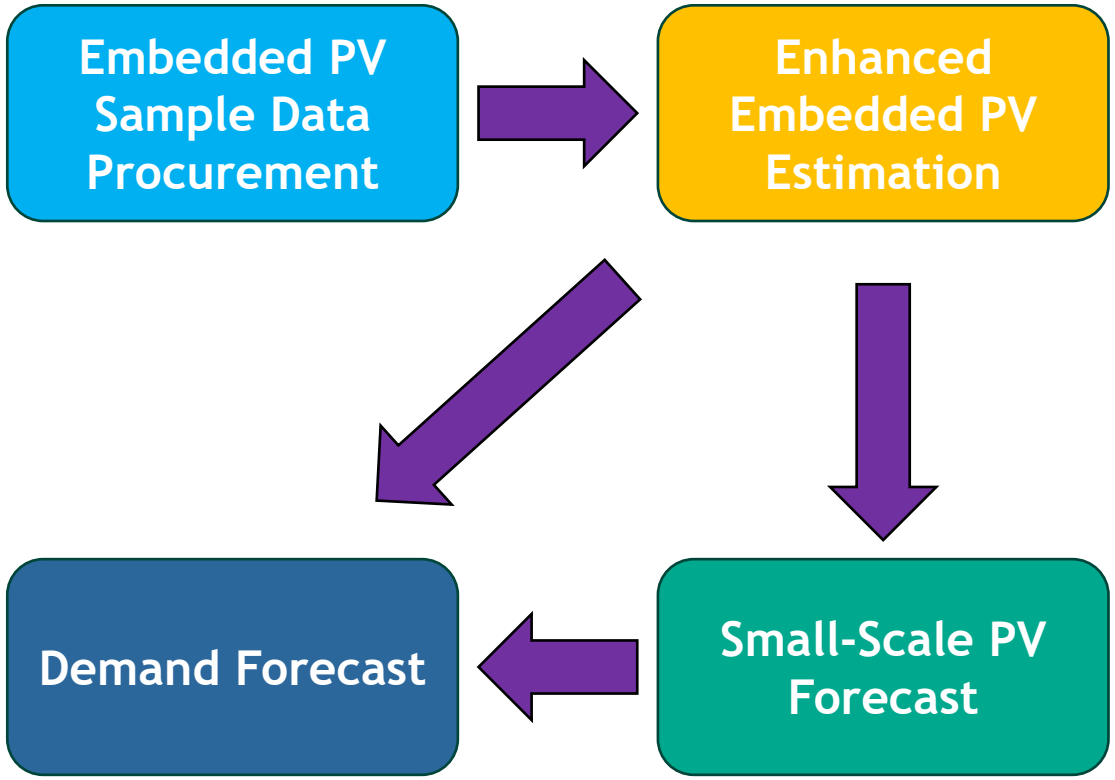
Embedded PV is estimated in the EMS* for each Jurisdiction (ROI & NI) using the following formula:

Embedded PV = Installed Capacity of Embedded PV * Ratio of Availability to Large Scale PV * Performance Factor

Where,

Ratio of Availability = Large Scale PV Availability / Installed capacity of Large Scale PV

The Ratio of availability calculation is used to apply the large scale PV output ratio to the installed capacity of the embedded PV. The performance factor (0.8) is then used to derate the Embedded PV estimation to account for non-optimal set ups.



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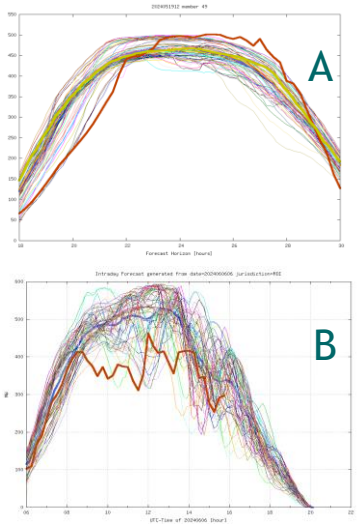
* This estimate currently is not included in the demand forecast tool in the EMS.

Operational Forecasting (ongoing works)

Solar Intra-Hour Variation (IHV) Forecast

- **Decision support tool:** Operational tool used to indicate when Solar Intra-Hour Variations (IHV) are likely to occur.
- **Operational value:** Supports Grid Controllers in assessing potential impacts and applying judgment in scheduling and dispatch decisions.
- **Methodology:** Based on solar PV ensemble forecasts, where ensemble spread provides an indicator of IHV likelihood (illustrated in A and B).
- **Current limitation:** Indicates IHV likelihood only, with no information on event magnitude, affected locations (PV farms), or timing/duration.



Demand Forecast

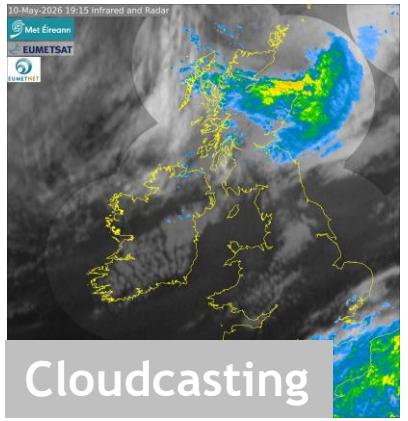
RES Forecast

Display & Visualisation

Accuracy & Monitoring

Data Sharing & Integration

Operational Tools & Capability Enhancement



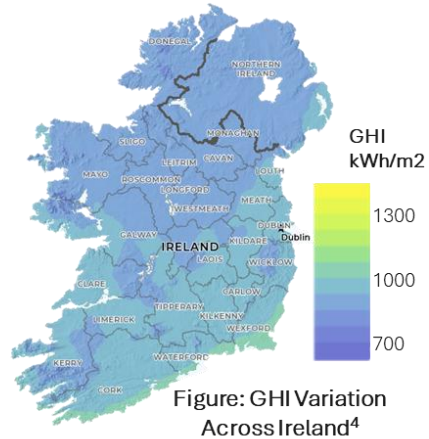


Figure: GHI Variation Across Ireland[4]

- Enhanced IHV capability depends on cloudcasting techniques and improved quality and consistency of meteorological inputs, enabling better anticipation of short-term, weather-driven variability.*

Enhanced IHV Forecast

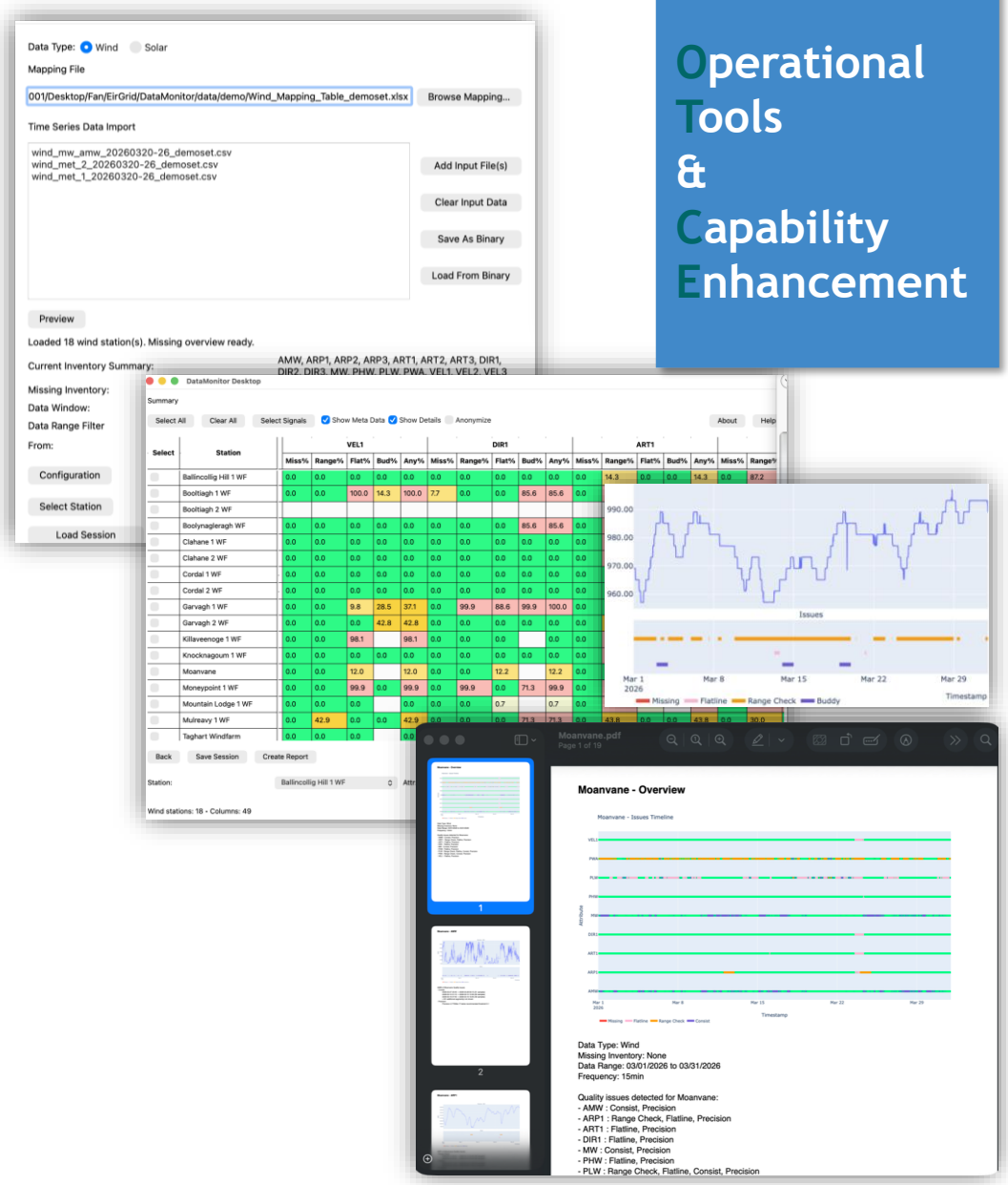
* Meteorological data and solar forecast input limitations are being addressed through OTCE workstreams.

Operational Forecasting (ongoing works)

Signal Tracking and Operational Reporting Monitor (STORM)

- **STORM is a standardised and automated tool** developed Operational Forecast workstreams to assess the quality of wind and solar meteorological and availability signals used in RES forecasts
- **Replaces manual and ad-hoc checks** with a consistent, repeatable process for identifying recurring data quality issues across RES sites
- **Automates signal quality assessment** including missing data detection, range checks, consistency checks, and comparative ("buddy") checks
- **Provides clear visualisation and reporting** through dashboards and configurable reports to highlight issues at site and signal level
- **Improves visibility of systemic data quality issues**, supporting engagement with asset owners and targeted signal improvements
- **Lays the groundwork for ongoing improvements** in signal management, data governance, and forecasting performance

Operational Tools & Capability Enhancement



Conceptual TSO-DSO Coordination Protocol for <1 MW DER Control

- EirGrid and ESB Networks have developed a conceptual TSO-DSO coordination protocol for the control of <1 MW distributed energy resources (DER).
- This protocol illustrates **a potential framework for coordinated operational control of distribution-connected DER**, defining roles, interactions, and information exchange between the TSO and DSO during system security events.
- The protocol is **conceptual only**, intended to demonstrate how coordinated control could operate in principle in the absence of established systems, processes, and interfaces.
- Practical implementation would require **significant development** of operational systems, data exchange, communication architectures, and coordinated operating procedures across both system operators.
- **Next step:** Further assessment and engagement to explore whether, and under what conditions, this conceptual approach could be developed beyond the illustrative stage.

For illustration only

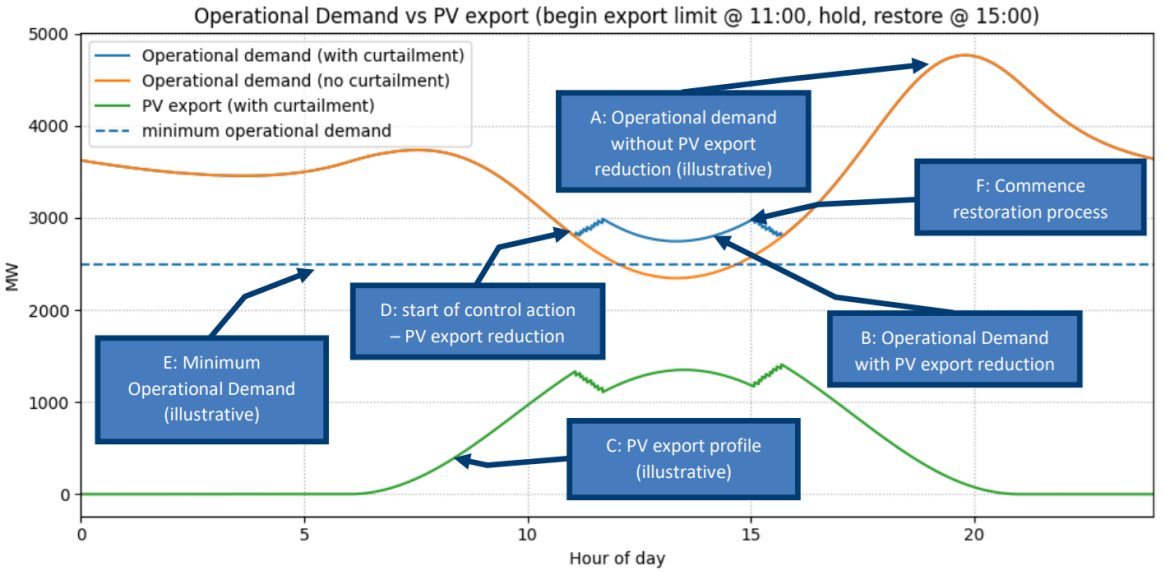


FIGURE 4: EXAMPLE OF PROTOCOL APPLICATION IN A MINIMUM OPERATIONAL DEMAND SCENARIO (WITH AND WITHOUT CURTAILMENT/POWER REDUCTION)

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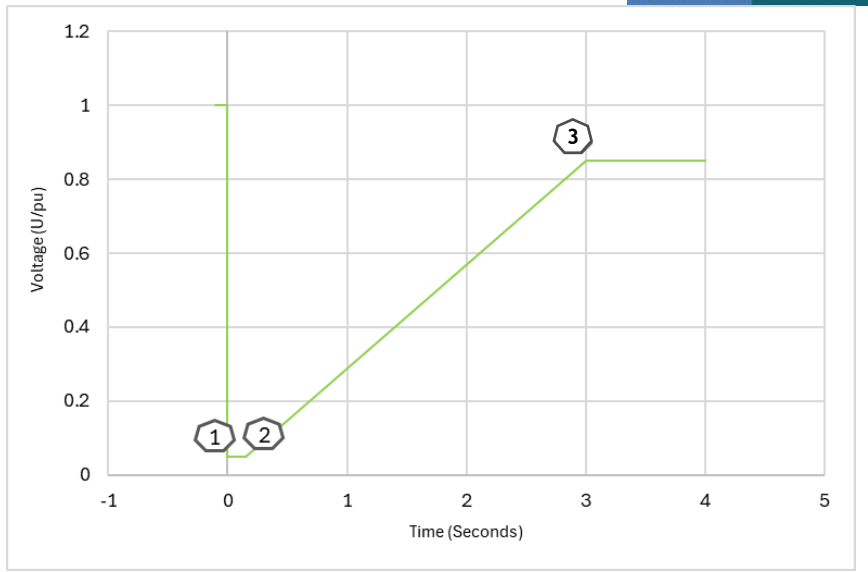
Under-Voltage Ride Through (UVRT) Characteristics of Type-A Generators

- **Type A generators:** Non-synchronous (IBR) generators from 0.8 kW to 100 kW, connected below 110 kV (Micro-generation and Mini-generation).
- **Issue identified:** TSO–DSO joint investigations found ambiguities in the applicability of UVRT requirements for Type-A generators*.
- **European context:** RfG 2.0 draft proposes extending UVRT to Type A PPMs, but timelines are uncertain.
- **TSO-DSO initiative:** EirGrid and ESB Networks progressing UVRT requirements independently due to operational urgency.
- **Technical outcome:** Mutually agreed UVRT characteristic curve for Type A non-synchronous generators.
- **Governance process:**
  - Distribution Code modification submitted to DCRP†;
  - stakeholder consultation underway;
  - proposal (with class derogation for existing units) to proceed to DCRP and CRU.
- **Derogation scope:** Existing Type A generators exempt unless materially modified (e.g. inverter replacement or increased MEC), in which case new UVRT requirements apply.

Proposed UVRT Characteristics



No. on Graph	Parameter	Value	Applicability
1	U_f	0.05 p.u.	Type A PPMs (Connected at <110kV)
2	U_{clear}	0.05 p.u.	
	t_{clear}	150ms	
3	$U_{recover}$	0.85 p.u.	
	$t_{recover}$	3.0 s	

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* UVRT requirements for non-Type-A (larger) generators are already defined in the Distribution Code, including those connected at MV above 100 kW.

† Governing documents: ESBN Conditions Governing Micro-generation (link), ESBN Conditions Governing Mini-generation (link), ESBN Conditions Governing Medium Voltage Connections (link), and Distribution Code (v8) (link).

SOEF Advisory Council - Members Hour

EirGrid SONI

Hybrids – Industry Perspective

Margaret Nee (Statkraft)
Kate Garth (RWE)
Bobby Smith (ESI)

14th May 2026

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Immediate Action - MEC sharing

- Publication of the CRU's decision is only the end of the beginning…
- Enabling co-located MEC-Share hybrid sites will enable faster connections, better grid utilisation, reduced capex and reduced dispatch down – but only if implemented fully, with industry input and support throughout the process
- Several areas of uncertainty need clarification (policy wise) first, but this needs to be in parallel with the implementation plan and roadmap to avoid further delay: (some examples):
  - How will the decision impact treatment of RESS and Capacity Market sites (those with existing contracts, and those looking to bid in 2027 onwards?
  - How will broader market issues (around scheduling and dispatch be managed / current operational constraints be managed)?
  - Will hybrid sites (with separate MECs) be able to "convert" to MEC sharing, thereby potentially freeing up capacity?
  - How will (in future) new, co-located hybrid sites be treated for firm capacity allocation?

History / Timeline of Hybrid Policy Evolution

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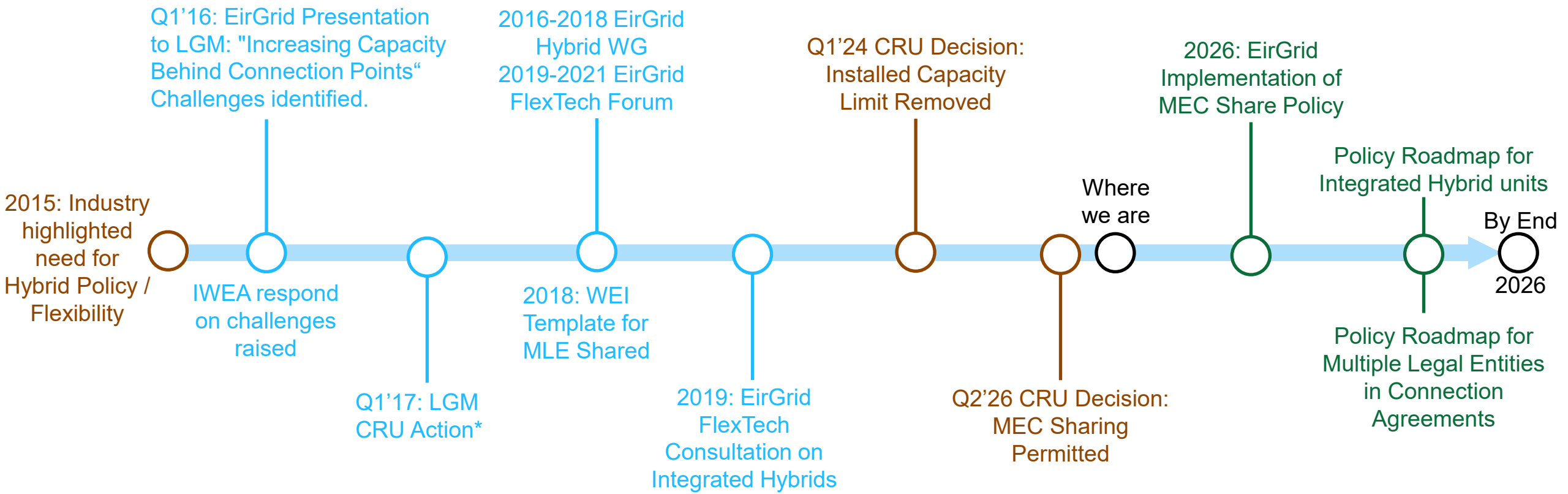
Timeline phases: Evaluation / Milestones & Next Steps



* Ref LGM Minutes for more details: https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CER17255-Generator-Connections-LG-Meeting-No-45-Minutes.pdf

Types of Hybrid Connections

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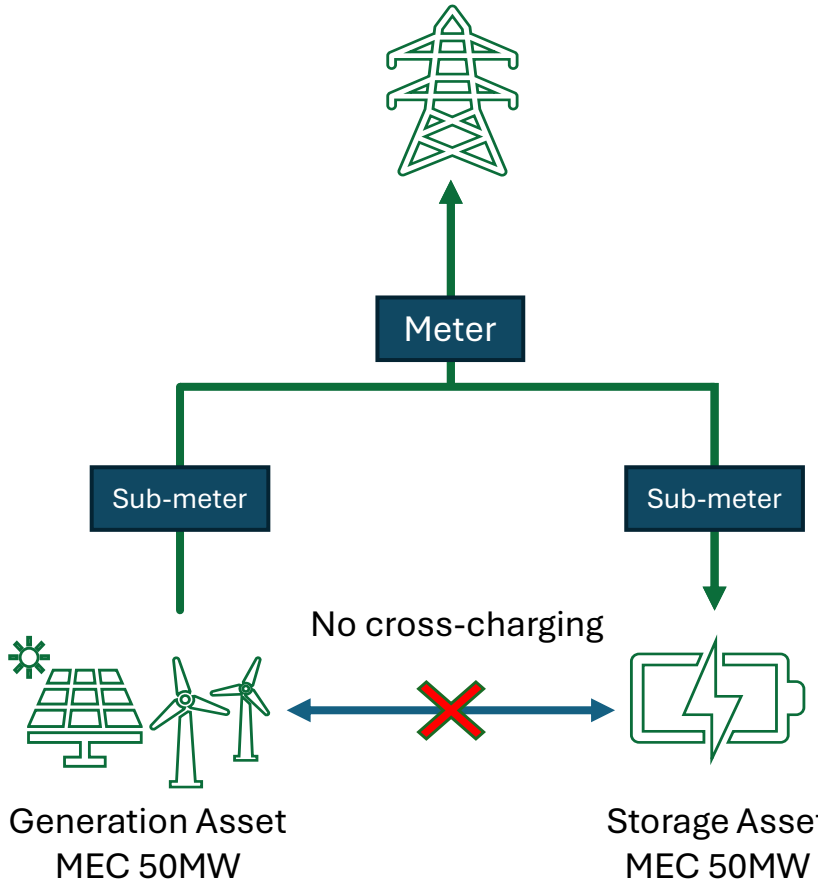
What is currently allowed

Co-Located Units

TSO/DSO
MEC 100MW



Hybrid Policy Progress

Over-install limit removed

Benefits of Co-Located:

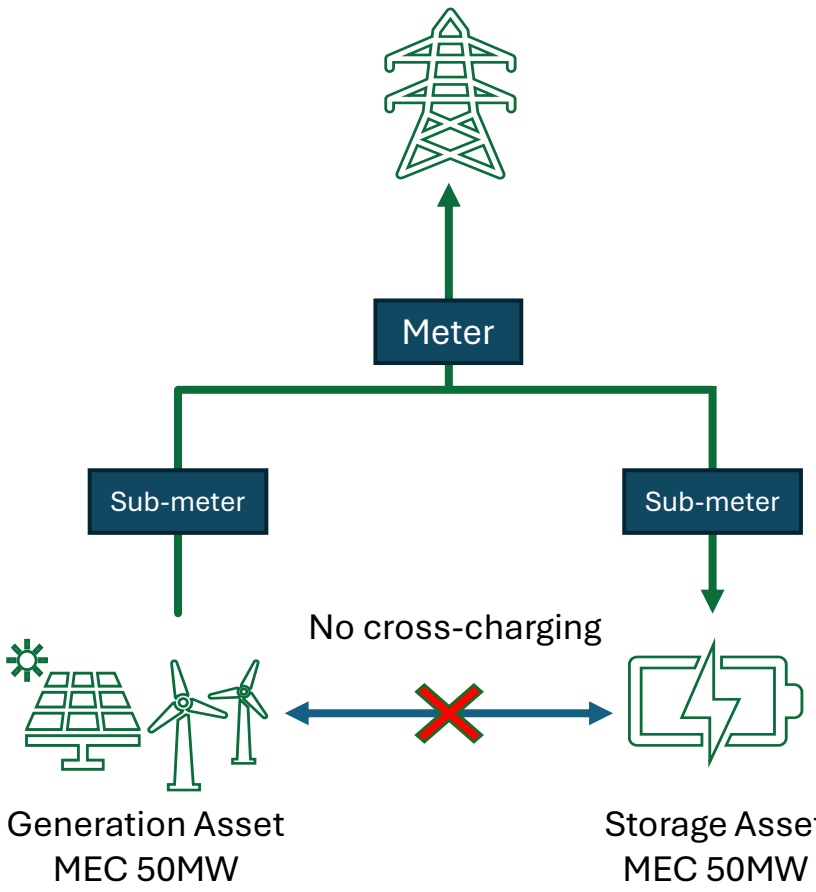
- Share Grid Connection infrastructure
- Reduce connection costs & timelines

Limitations of Co-located Units

- No MEC Sharing
- Separately Market Registered
- Separately Controlled
- Separately Metered
- Single Legal Entity

In Progress

MEC Share Units



Hybrid Policy Progress

MEC Sharing

Benefits of MEC Share:

- Optimises existing grid capacity & grid connection assets
- Reduce connection costs & timelines

Limitations of MEC Share Units

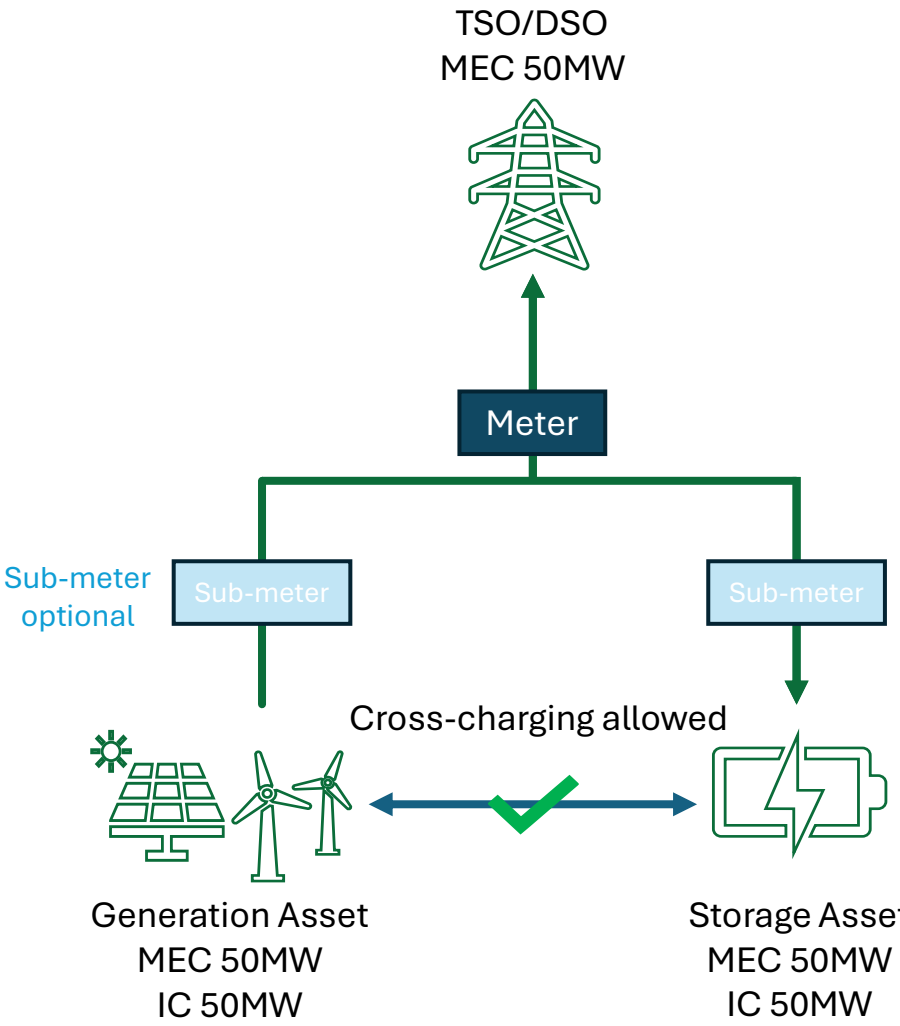
- Separately Market Registered
- Separately Controlled
- Separately Metered
- Single Legal Entity

Next steps:

EirGrid implement: (i) roadmap & (ii) policy to permit MEC Share units

To Be Considered

Fully Integrated Units



Hybrid Policy/Process Required

Combined Control / Cross-charging allowed (including for RESS units)

Option for Single Market unit / single meter

Multiple Legal Entities in Connection Agreement

Benefits of Fully Integrated:

- Full Grid Capacity, Connection & Operational optimisation
- Reduce connection costs & timelines
- Improve dispatch down

Suggested Next steps

EirGrid implement:

- Roadmap & policy to allow MLE's behind single connection point
- Roadmap & policy for fully "integrated" hybrid units

Evaluation of Challenges to MEC Share Units & Fully Integrated Hybrid Units

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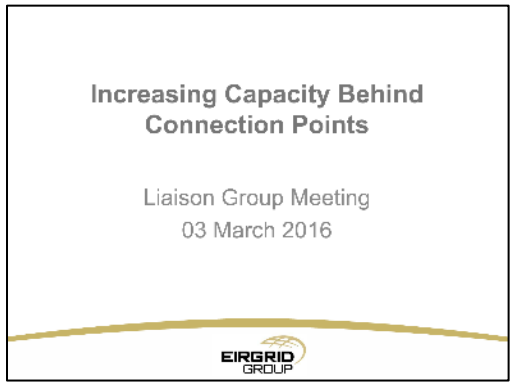
Evaluation of Challenges

Q1'16: EirGrid LGM Presentation

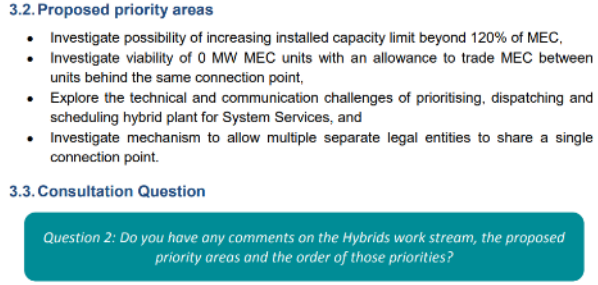


Identified:

- Existing policy framework to be reviewed
- Additional Issues to be considered
- SO's Current Working Arrangements

IWEA responded to queries raised in presentation

Q3'19: EirGrid FlexTech Consultation



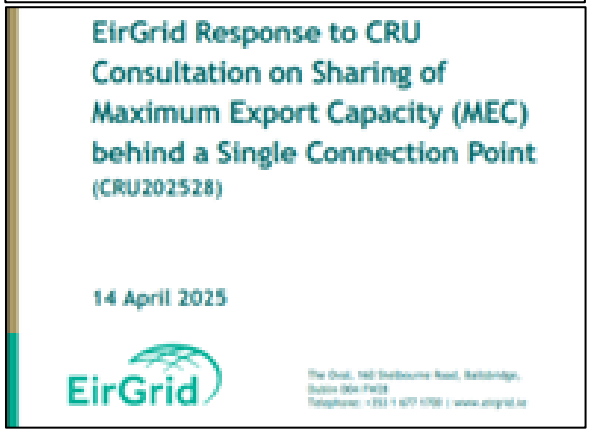
3.2. Proposed priority areas

- Investigate possibility of increasing installed capacity limit beyond 120% of MEC,
- Investigate viability of 0 MW MEC units with an allowance to trade MEC between units behind the same connection point,
- Explore the technical and communication challenges of prioritising, dispatching and scheduling hybrid plant for System Services, and
- Investigate mechanism to allow multiple separate legal entities to share a single connection point.

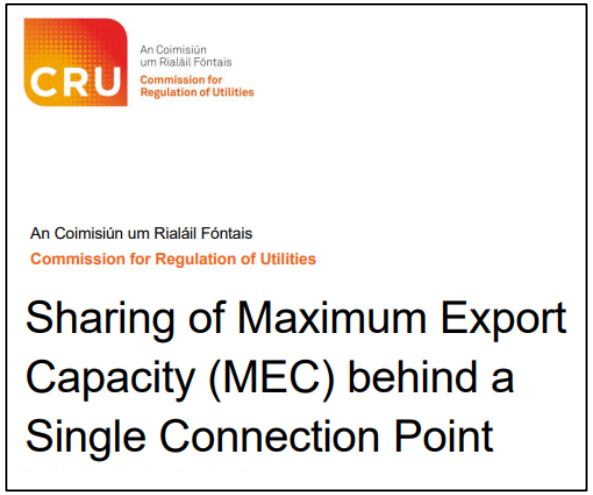
3.3. Consultation Question

Question 2: Do you have any comments on the Hybrids work stream, the proposed priority areas and the order of those priorities?

Q1'25 "appendices contain extracts from the proposal that was submitted by the System Operators (SOs) to the CRU on 12 January 2023 as part of the 2021 Climate Action Plan."



Q2'25 "EirGrid and ESB Networks, in our roles as TSO and DSO, are currently developing a roadmap for MEC sharing (the roadmap assumes that the CRU's final decision will materially align with the approach set out in the consultation paper)"



Q2'26 "This decision follows the submission of a technical assessment on this topic by the System Operators (SOs)"

Benefits of Integrated Hybrid Connections

energy storage IRELAND

SOLAR IRELAND

WIND ENERGY IRELAND

Benefits of Hybrid Projects

Efficient Use of Grid Infrastructure

Increased Capacity Factor at Grid Connection

Increased availability of Renewable Energy

Steadier profile of electricity

Getting the Most out of our Grid

Increased production of Renewable Energy

Climate Targets

Greater Flexibility

Storage systems

Multi-step modelling methodology to calculate system wide benefits

Step 1:
Model a range of archetypal site setups under two scenarios

Step 2:
Estimate the total MWh of additional renewable power that could be utilised under each scenario

Step 3:
Determine the overall benefits to the Island of Ireland

Market Scenarios

Base case scenario

- BESS can only charge from the grid
- No cross charging from the renewable asset
- Sharing of MEC is not allowed

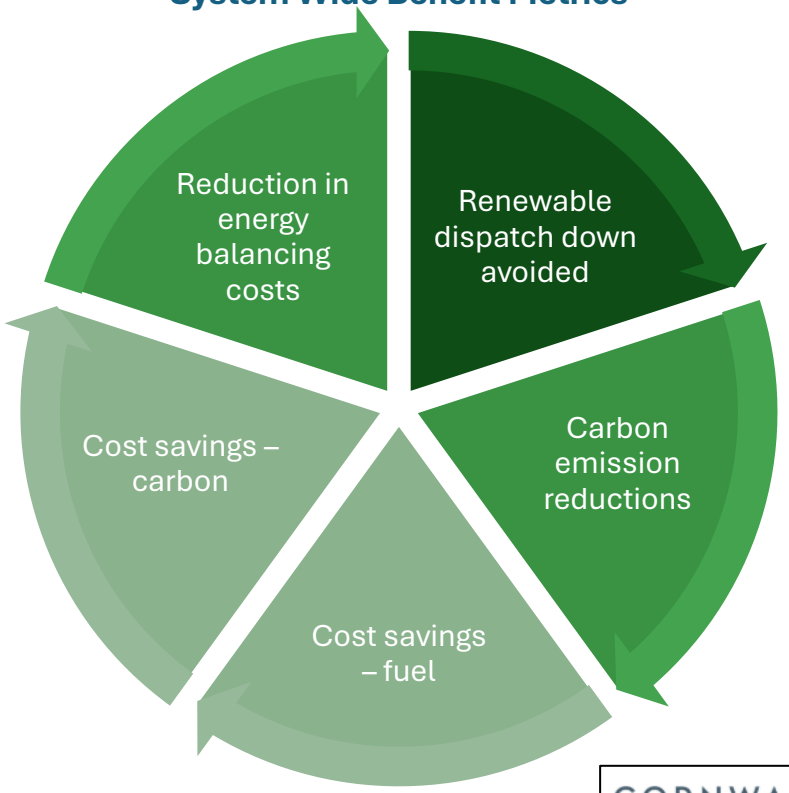
Unrestricted scenario

- BESS can charge from the grid
- Can cross charge from the renewable asset
- Sharing of MEC is allowed

Site Setup

- **Solar+2hr BESS (IE)**
- **Wind+2hr BESS (IE)**
- **Solar+2hr BESS (NI)**
- **Wind+2hr BESS (NI)**

System Wide Benefit Metrics



CORNWALL INSIGHT
CREATING CLARITY

Hybrid sites would help enable IE and NI to reach their net zero goals

Benefits of hybrids sites under our scenario analysis on a per annum basis

Scenarios	GWh of additional renewable power utilised	Kilo-tonnes of CO2 avoided	Volume of gas usage avoided (GWh)	Total cost savings for the overall SEM (€mn/year)	Avoided renewable dispatch down (%)
Scenario 1 – Base case scenario	167	64	351	20	2%
Scenario 4 – Unrestricted scenario	1,199	461	2,522	146	16%

Source: Cornwall Insight analysis

The unrestricted scenario carbon savings equate to:

Up to 10% of annual emissions reduction required to meet SEMs 2030 emissions target.

>100,000 cars

>400MW of CCGT capacity

- Additional benefits from longer duration batteries for e.g. 4hour at ~37% and ~47% of additional renewable power utilised
- If dispatch down levels outturn at 30% higher than the baseline considered, ~81% of additional wind is utilised or saved via the co-located BESS.

CORNWALL INSIGHT
CREATING CLARITY

Next Steps / Asks

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WIND ENERGY IRELAND

Industry Call to Action

1. Timely delivery of the Sharing MEC implementation plan & policy
2. Policy Roadmap for Multiple Legal Entities in Connection Agreements published by end of 2026
3. Policy Roadmap for Integrated Hybrid units published by end of 2026

How can we complete these actions?

Establish a new working group under SOEF to focus on hybrids & facilitate collaboration in delivering the above actions.

This needs to be established and meet regularly/before next SOEF meeting.

Thank you

Questions

The Role of Price in the Energy System

How pricing signals can drive efficient dispatch, investment, and consumer behaviour

David Graham (SSE Airtricity)

PRICE IS INFORMATION WRAPPED IN AN INCENTIVE

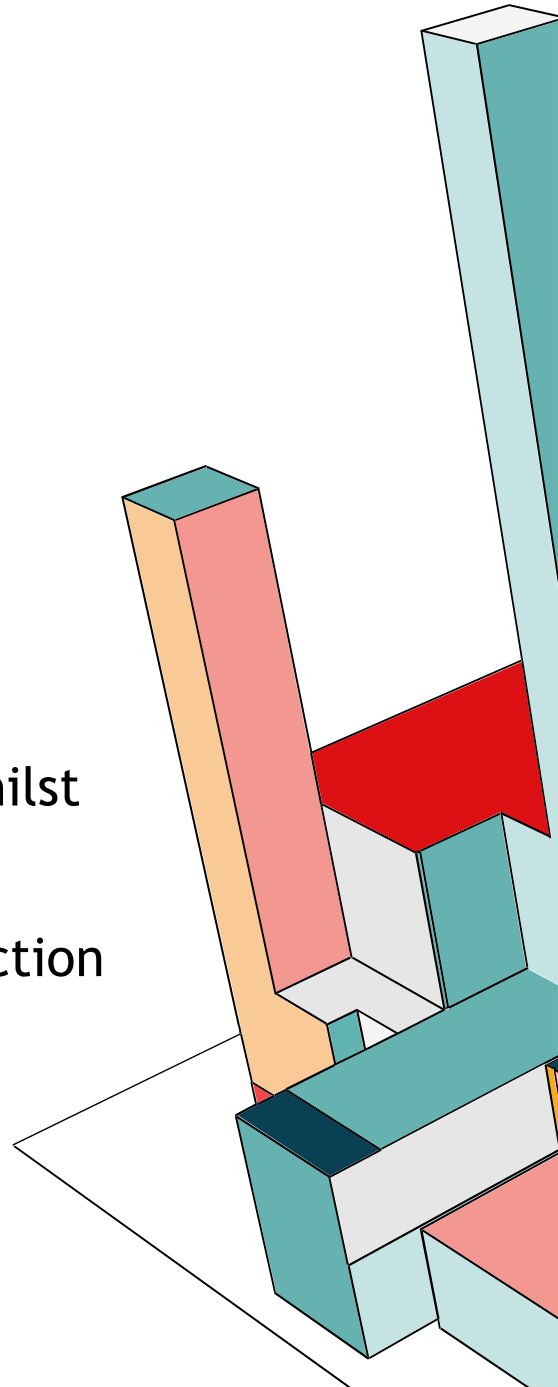
- Asset Dispatch – what runs, when and where
- Asset Investment – what gets built, refurbished or retired
- Customer Behaviour – when and how energy is consumed, exported or shifted

Whys should we care?

We need to build the right assets in the right order to maintain security whilst moving to a low carbon energy system

If we can't deliver this efficiently then there will be challenge on the direction

Price can demonstrate both value and show us areas of focus



THERE'S NOT JUST ONE PRICE……

- Electricity
- Fuels
- Carbon
- Capacity
- Networks
- Imperfections
- Green Certificates
- Renewable Subsidies
- Retail rates

These prices don't all do the same job:

Some are found by the **market**

Some are set by **auction**

Some are set by **cost recovery** methodology

There is nothing wrong with multiple price signals. The issue is whether they are coherent!

COST RECOVERY VS BEHAVIOUR CHANGE

- Wholesale price
- Imperfections charge
- RESS subsidy

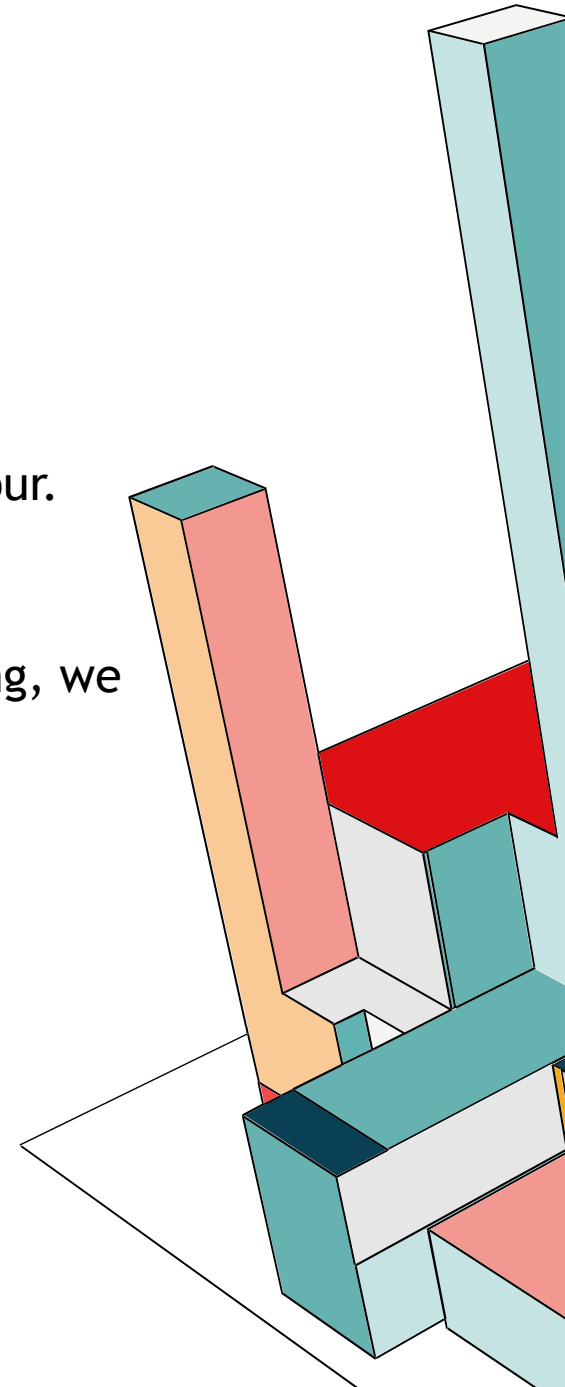
Some prices mainly recover cost.

Some prices mainly allocate risk.

Some prices are intended to change behaviour.

Some do all three.

If we are not clear which job a price is doing, we should not be surprised when the market response is unclear



Prices aren't a fundamental law of physics. They respond to rules and rules can be re-written.

We need to be clear that when we are creating a price, exactly what we are trying to achieve.

WHO SETS THE PRICE?

No single price setter so we all need to make sure all prices are pulling in the same direction to most effectively incentivise the intended behaviour and outcome

System Need → Price Rule → Incentive → Behaviour

The risk is that each price component may be rational in isolation but incoherent in aggregate

Suppliers are the final interface between system price signals and customer behaviour. But suppliers cannot create a coherent customer signal if the upstream price stack is fragmented or contradictory

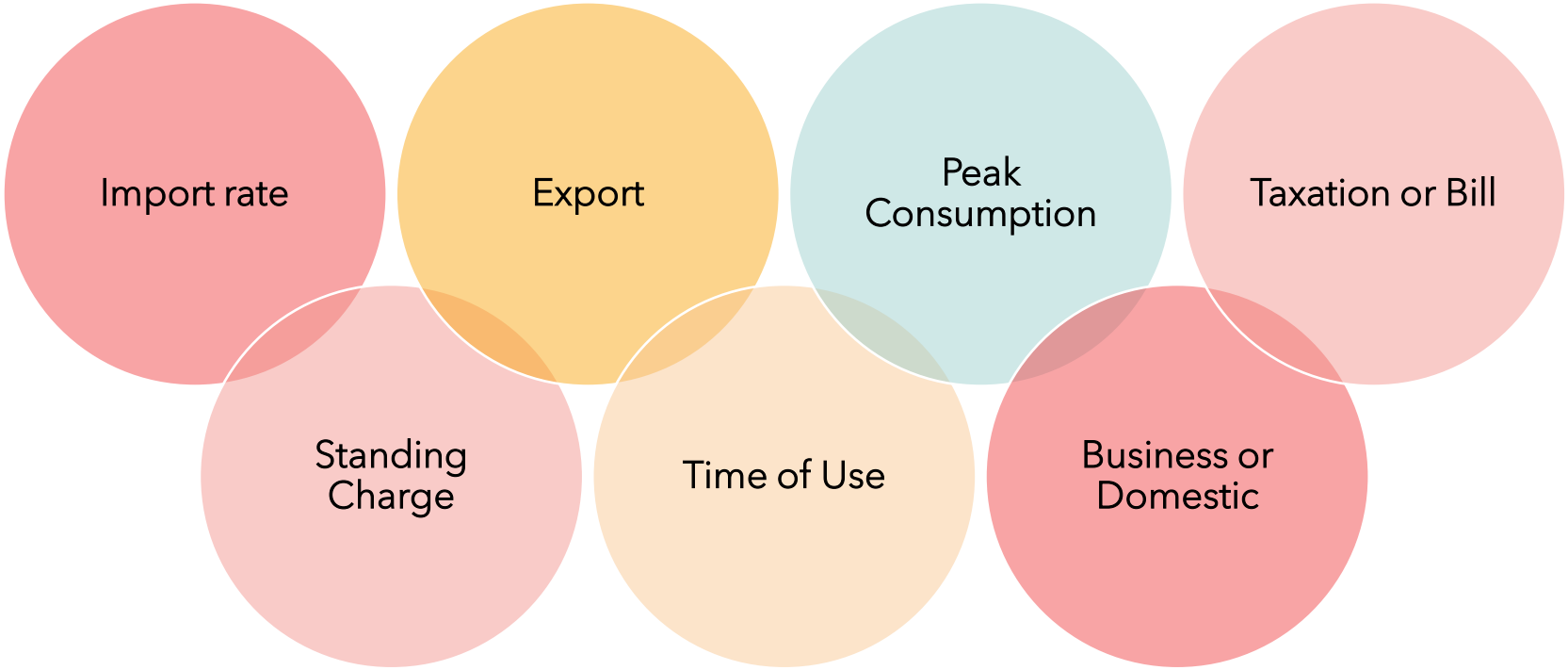
They must recover costs

They need to effectively influence behavior

ROLE OF SUPPLIERS

Can we transparently explain what is impacting the cost?

Can we maintain appropriate **price signals** to customer to respond optimally to minimise total system cost?

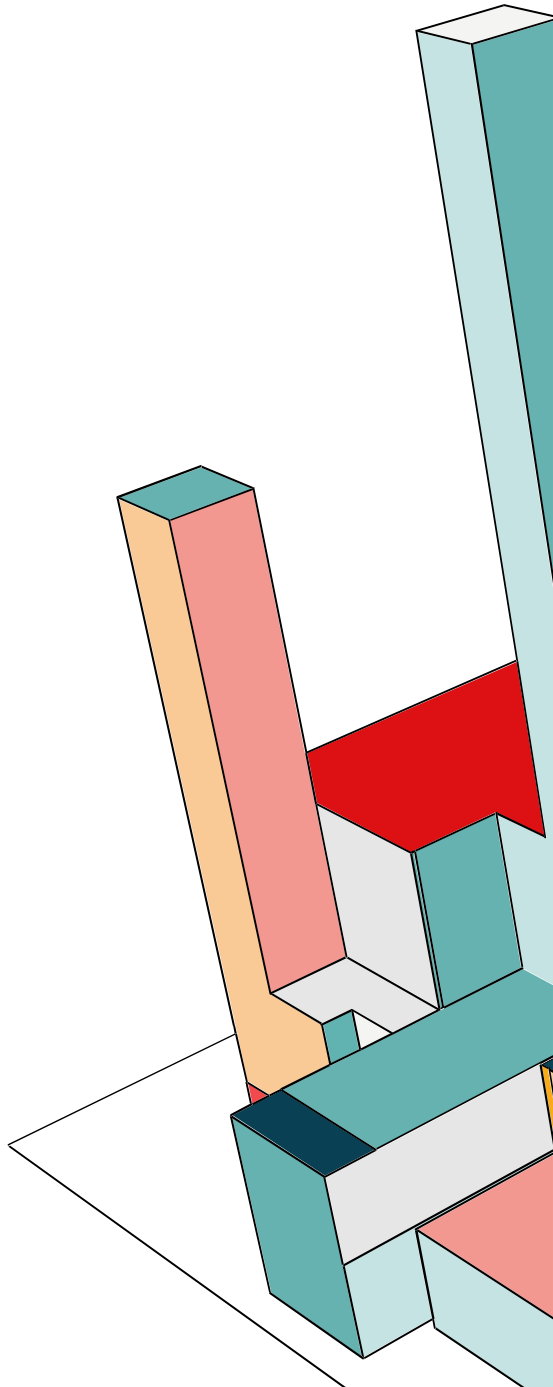


Cost does not have to equal price!

FOR EVERY PRICE, CHARGE OR TARIFF, WE SHOULD ASK FIVE QUESTIONS:

1. **Purpose:** Are we clear what this price is trying to do?
2. **Coherence:** Are all price signals pulling in the same direction?
3. **Visibility: C**an the signal be seen and understood?
4. **Response: C**an customers or investors realistically act on it?
5. **Recovery:** Can we recover cost equitably without blunting the response we need?

Price is information wrapped in an incentive. The task is to make the information clear, the incentive intentional, the price stack coherent, and the recovery fair



Thank you for your engagement & valuable contributions today

Reflections from Our Meeting Chairs:

Liam Ryan
Chief Transformation & Technology Officer, ***EirGrid***

Gerard Carlin
Director of Networks & Innovation, ***SONI***

Closing message from our Moderator:

Nicola de Beer
Head of Strategic Enablement,
Change & Vendor Management, ***EirGrid***

Your feedback would be appreciated.

Please scan the **QR code** below: