Shaping Our Electricity Future Advisory Council

Herbert Park Hotel, Dublin, Ireland

24th September 2024

Meeting 9

Agenda

Meeting Chairs: Liam Ryan & Alan Campbell

DURATION	START TIME	TOPIC	PRESENTER/S
30 min	10:00	Introduction and Welcome to new AC Members	Liam Ryan Alan Campbell
45 min	10:30	SOEF v1.1 Q&A	Workstream Leads
25 min	11:15	Joint RA Markets Update	Marie-Therese Campbell (UREGNI) Robert O'Rourke (CRU)
50 min	11:40	Key Dependencies and Capabilities Needed for Future Operational Policy Changes	Eoin Kennedy
50 min	12:30	Lunch	
30 min	13:20	Market Drivers for IC Imports and Dispatch down	Michael Atcheson
20 min	13:50	ECP 2.4 Constraint Reporting – Process and Timelines Update	Marc Senouci David McGowan
15 min	14:10	Coffee Break	
45 min	14:25	Discussion Topic: Energy Storage Policy Framework	John Finnegan (DECC)
30 min	15:10	Renewable Hubs	Elin Ahlund
15 min	15:40	EirGrid Greenlink Readiness Project	Maria Madders
5 min	15:55	Closing Messages	Liam Ryan Alan Campbell
	16:00	***Meeting End***	

SOEF v1.1 Q&A

All SOEF v1.1 updates are provided as pre-read material.

The 45 minutes of meeting time will be used for Member Q&A.

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Introduction, Welcome and Housekeeping

<u>Meeting Chairs</u>

Liam Ryan

Alan Campbell

SOEF Advisory Council

Terms of Reference

Remit and Purpose

- Provide a forum to communicate and share relevant information and to discuss stakeholder views and concerns on those issues which impact progress of the implementation of the roadmap;
- Discuss, review and ultimately help facilitate the progress of the SOEF roadmap;
- Provide input, advice and assistance on matters related to the roadmap and its implementation;
- Highlight areas of concern that this forum can help to address;
- Actively contribute to agenda preparation and identification of potential issues facing the industry in the energy transition.

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Schedule and Format

- The Advisory Council will meet three times a year, with every 4th Advisory Council in Belfast;
- The meetings will be chaired by the EirGrid Chief Transformation and Technology Officer and the SONI Director of Networks and Innovation;
- Meeting minutes and presentations will be published on the EirGrid and SONI websites after each meeting;
- Ad-hoc meetings outside the regular schedule will be held on an exceptional basis as required;
- Attendance in person is considered mandatory.

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To be taken as read

SOEF Roadmap: Recent Achievements

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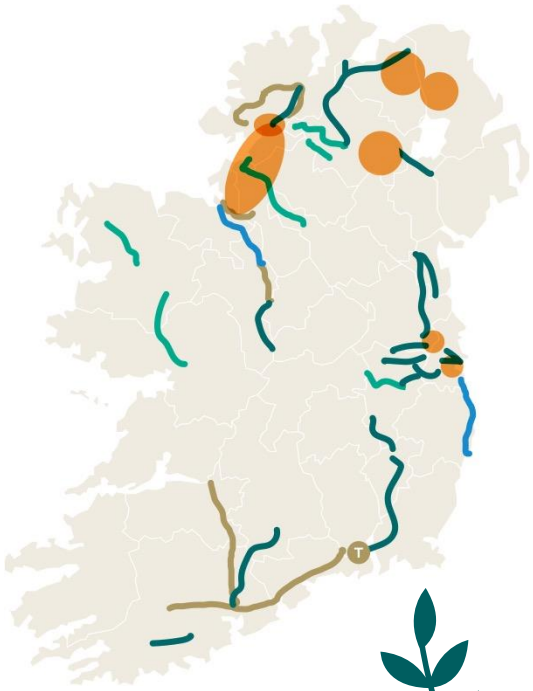
Shaping Our Electricity Future Roadmap - Recent Achievements



SOEF v1.1: May - August '24

Continuing to engage with our LEUs on protection settings; first task force meeting held on 24th June, second on 27th August

The Interconnector Ramping Trial successfully concluded resulting in an increase in the all-island ramp rate from 10 MW/min to 15 MW/min

Publication of final contract award notice for Phase 1 Low Carbon Inertia Services (LCIS) in Ireland on 11th July closing the procurement process for phase 1

Markets

- Scheduling and Dispatch (SDP)- Technical Specification for Tranche 1 and detailed requirements for Tranche 2 were published in July. Industry workshop held on 20th of August (153 attendees at peak)
- Future Arrangements System Services (FASS). The DASSA Recommendations Paper was sent to the RA for the August SEMC meeting. A system services charge consultation paper was published on July 31*st*.

Network Infra Enablers & Engagement

The Department for the Economy (DfE) issued 28 Necessary Wayleaves for 2nd North-South Interconnector in August bringing consented landowners to ~70%

Engaged with representative groups WEI and ISEA regarding the Customer & Industry workstream of the Joint Outage Transformation Programme. 3 individual working groups assigned owners from EirGrid, ESBN, WEI & ISEA in August 2024.

SOEF v1.1 Workstreams

Advisory Council Q&A

Workstream Leads

MARKETS

Overall Summary and Status

- **SDP** - The Scheduling and Dispatch Programme (SDP) status has moved to Red as the system build is complete, but the Tranche 1 T&SC Modifications have not yet been approved. We are working with the RAs to resolve this.
- **FASS** – The Future Arrangements for System Services (FASS) Programme continues at pace; however amber programme status reflect delays against baseline plan (PIR V1). SEM Committee (SEMC) decision on DASSA design will inform later programme design activities and publication of PIR V2 due September 2024.
- **LDES** – Procurement timeline, based around DECC's request for an accelerated procurement, agreed between EirGrid and the Commissions for Regulation of Utilities (CRU) and has been proposed to SONI and the Utility Regulator (UR).

Key Highlights

- **SDP**
  - **August/September 2024:** Tranche 1 Vendor System Build completed & system test commenced and tracking to plan for completion in December 2024.
  - SDP Bidding Training course delivered at Future Power Markets Industry Workshop.
- **FASS**
  - **August 2024:** DASSA Design Recommendations Paper submitted at SEMC meeting. DASSA Product Review & Locational Methodology Recommendations Paper submitted to RAs end of August on schedule.
  - **September 2024:** TSOs to publish second iteration of the Phased Implementation Roadmap (PIR), which will be informed by the SEMC DASSA design decision.
- **LDES**
  - The publication of DECC's Electricity Storage Policy Framework has brought an impetus to planning discussions between ourselves and DECC allowing for agreement to be reached on a procurement timeline.

Upcoming Milestones

- **SDP**
  - **September 2024**: Publication of milestones for SDP Tranche 2 Initiatives.
  - **December 2024**: Tranche 1 Vendor System Build and Test Complete.
- **FASS**
  - **September 2024:** SEMC Decisions on DASSA Design, Product Review & Locational Methodology Recommendations Paper and Layered Procurement Annual Assessment. FASS – TSOs to publish Volume Forecasting Methodology Consultation Paper.
- **LDES**
  - To produce a paper for the RAs where the four procurement options in last year's Call for Evidence paper are presented in more detail.

Key Risks or Issues

- **SDP**
  - The SDP target milestone of June 2024 for RA Approval of the TS&C and Grid Codes modifications has not yet been achieved and indications based on RAs feedback is that it won't be approved within the required timelines.
- **FASS**
  - TSOs notified that programme funding has been approved. Formal approval and details pending.
- **LDES**
  - Challenging timelines and predominately resourcing via Business-As-Usual activities.

CELTIC: STRATEGIC MARKETS PROGRAMME

Overall Summary and Status

- Programme progressing through requirements gathering and planning activities – with key critical path items identified.
- High Level and Detailed requirements gathering underway for changes to systems and processes required to implement scope of programme.
- Detailed programme planning underway with key resources being onboarded and vendor engagement commencing.
- High Level delivery planning for Phase 2 scope items (e.g., non-Celtic Day 1 items)

Key Highlights

- Primary Legal Contract signed between EirGrid in the Core Capacity Calculation Region (CCR) – the Core TSOs Cooperation Agreement (CoA) effective 1st July 2024
- Engagement with EU market operators and regulators ongoing;
- Engagement between RTE and EirGrid ongoing;
- High Level Requirements for SDAC/SIDC, Multi-NEMO Arrangements and CORE CCR finalised and detailed requirements gathering and documentation commenced;
- Assessment of processes on end-to-end basis under development to map impact on TSOs and MOs.

Upcoming Milestones

- EirGrid and RTE Business Requirements finalised for Celtic Joint Operations
- SDAC/SIDC Detailed Requirements Signoff
- Core CCR Detailed Requirements Signoff
- FTR Requirements Validation Signoff
- BMR Initiatives Requirements and Planning Signoff

Key Risks or Issues

- Vendor Dependency: Key vendors have conflicting priorities or too high a workload risk being unable to deliver on the required changes for SMP, which could result in programme delays.
- Availability of SMEs: There is a risk that if Key Subject Matter Experts (SME's) are not available to contribute to key programme design and delivery, that the programme could be delayed and lead to potential rework and delays in later stages.

SYSTEM OPERATIONS

Overall Summary and Status

- Good progress has been made across a range of areas.
- 80% SNSP studies are nearing completion and will inform a decision to begin an 80% SNSP operational trial before the end of the year.
- The Low Carbon Inertia Service (LCIS) Phase 1 procurement processes in Ireland and Northern Ireland have concluded.
- The Interconnector Ramping Trial successfully concluded resulting in an increase in the all-island ramp rate from 10 MW/min to 15 MW/min
- A Data Centre Task Force has been established to address the ongoing issues with data centres' response to power system faults.

Key Highlights

- Interconnector Ramping Trial successfully concluded resulting in an increase in the all-island ramp rate from 10 MW/min to 15 MW/min.
- LCIS Phase 1 procurement in Ireland has concluded, with the Contract Award Notice published on 11 July.
- A System Strength industry webinar took place on 17 July with over 200 participants. Planning for next steps is underway.
- A Data Centre Task Force was established in June following an industry workshop; its aim is to address the ongoing issues with data centres' response to power system faults.
- Installed Capacity Cap Decision Review and Implementation Timelines paper published jointly by EirGrid / ESBN on 17 June.
- Two EirGrid / ESBN industry webinars held to share progress on development of the TSO-DSO future operating model.

Upcoming Milestones

- Decision as to whether to commence an 80% SNSP trial will be taken in Q4 2024.
- The Operational Policy Roadmap will be reviewed and updated.
- LCIS Phase 2 studies will be completed in Q4 2024 and a consultation on the Phase 2 approach will commence.
- The TSO Demand Side White Paper will be published shortly.
- A Grid Code modification setting out proposed fault ride-through requirements for Large Energy Users is being developed and will be presented to the JGCRP.

Key Risks or Issues

- Large Energy User (LEU) response to power system faults: The demand response of multiple data centres to a fault on the power system continues to present challenges to the resilience and stability of the power system. EirGrid held a data centre industry webinar on 30 April to ensure industry awareness of the issues, subsequently established an industry task force and will soon present proposals for a Grid Code modification setting out fault ride-through requirements to the JGCRP.

PUBLIC ENGAGEMENT

Overall Summary and Status

- Overall SOEF project pipeline, and progression of projects through the framework remains on schedule.
- Engagement and Consultation strategies continue to evolve and adapt to support the project pipeline and timeline.

Key Highlights

- Laois-Kilkenny Reinforcement Project – Phase 2 Community Benefit Fund approved for allocation. Positive participation from organisations and groups in opposition area.
- Dublin – Central BSP public consultation and public representative briefings – June ’24
- North Connacht 110kv project – Information campaign as part of advanced cabling in Swinford in conjunction with Mayo CoCo and ESBN August ‘24

Upcoming Milestones

- Fingal East Meath Grid Reinforcement (BSP) Public Consultation – October ‘24
- Arklow-Ballybeg-Carrickmines – Landowner engagement August/September ‘24
- Offshore Phase 2 Public Consultation October/November ’24
- Kildare-Dublin Grid Reinforcement – Landowner engagement and public information campaign November ‘24
- Dublin Central BSP – public engagement and information October ‘24

Key Risks or Issues

- Delay in Oireachtas approval of DMAPs will impact proposed OS consultation.
- Third Party Land Acquisition
- Public acceptance of grid and renewable energy projects

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NETWORKS INFRASTRUCTURE ROI

Overall Summary and Status

- 5 Additional Candidate Reinforcements listed in SOEF 1.0 & 1.1 have progressed into Framework for Grid Development in the last quarter
- Overall SOEF project pipeline, and progression of projects through the framework remains on schedule.

Key Highlights

- **Composite pole construction trial completed: August '24**
- **Planning Applications**
  - **Kildare Meath:** Following EIAR lodgement to ABP **March '24**, responses to ABP on observations by Statutory bodies **July '24**
  - **East Meath North Dublin: Following** Planning lodgement to ABP **March '24**, responses to ABP on observations by Statutory bodies **July '24**
  - **Maynooth GIS:** Notice of grant received from Kildare CC: **August '24.**
  - **Bandon-Dunmanway 110kV:** Planning Grant received from Cork CC: **June '24.**
- **Capital Approvals**
  - **Athy-Carlow 110kV Uprate:** April '24
  - **Gorman-Maynooth 220kV Uprate:** May '24
  - **Arklow-Ballybeg-Carrickmines 110kV:** June '24
  - **Baroda-Monread 110kV DLR:** July '24
  - **Baroda-Newbridge 110kV DLR:** July '24
  - **Lisdrum-Louth 110kV DLR:** July '24
  - **Meath Hill-Louth 110kV DLR:** July '24
- **Project Agreements**
  - **Cathaleen's Fall-Coraclassy 110 kV Uprate:** August '24
  - **Bandon-Dunmanway 110kV Uprate:** August '24

Upcoming Milestones

- **POWERING UP DUBLIN**
  - Progressing 1st of five 220kV cable replacement projects to Project Agreement by end of 2024.
  - Plan to submit to two MARA consent applications in September 2024 to offshore cable sections
  - Committed to achieving Project Agreement for both Belcamp and Poolbeg 220kV station projects by end of 2024
- Next phase of major Grid Reinforcement and Bulk Supply Projects (BSP) in Greater Dublin Area progressing through Step 3 with public consultation on Fingal / East Meath due to launch in early October 2024 and Dublin Central BSP due to secure Capital Approval in September 2024
- **North Connacht** –Procure contractor, continue construction.
- **Upcoming Capital Approvals**
  - **Maynooth-Castlelost 220kV Uprate:** Jan '25
  - **Letterkenny-Golagh T 110kV Uprate:** Jan '25
  - **Corduff-Blundelstown-Mullingar 110 kV Uprate:** Jan '25
  - **Drumkeen-Clogher 110 kV Uprate:** Jan '25

Key Risks or Issues

- Third party Land Acquisition
- MARA/ MAC application timelines
- Outage availability – OTP
- Acceptance of Roads Authorities of UG Cable infrastructure within existing roads

Dynamic Line Rating – Rollout Status

Active DLR Projects

		Capital Approval	Project Agreement	Energisation Instruction
CP1314	Baroda - Monread 110 kV Circuit DLR	3/7/24	4/6/25	22/9/28
CP1315	Baroda - Newbridge 110 kV Circuit DLR	3/7/24	4/6/25	6/7/28
CP1321	Cashla - Dalton 110 kV circuit 1 DLR	23/3/23	28/6/24	28/11/25
CP1322	Cathaleens Fall - Coraclassy 110 kV circuit 1 DLR	5/4/23	20/12/24	6/1/26
CP1435	Drumline - Ennis DLR & Drumline Busbar DLR	4/3/24	11/9/25	29/9/28
CP1436	Ardnacrusha - Ennis 110kV Circuit DLR	4/3/24	31/3/25	20/12/27
CP1450	Ardnacrusha - Drumline 110 kV circuit DLR	4/3/24	30/6/25	30/6/28
CP1471	Lisdrum Louth 110 kV Circuit & Lisdrum 110 kV Busbar DLR	3/7/24	3/9/25	25/9/28
CP1473	Louth - Meath Hill 110 kV Circuit DLR	3/7/24	6/8/25	28/8/28

NETWORKS INFRASTRUCTURE (NI)

Overall Summary and Status

- DfE issued 28 Necessary Wayleaves for 2nd North-South Interconnector bringing consented landowners to ~70% (key enabler for 2030).
- Mid-Antrim Upgrade optimum substation site location and overhead line route determined & landowner engagement well advanced (CR1) with ECD 2029.
- Tamnamore-Drumnakelly Reinforcement: In Part 2 of SONI's Grid Development Framework with programme and underground cable route agreed with ECD 2027(CR6&52).
- Cam Cluster Extension TNPP approval received and progressing in Part 2 with ECD 2030 (building block for CR4,7&47).
- Tamnamore Land Purchase TNPP approval received and progressing in Part 2 (building block for CR8).
- Mid-Tyrone Upgrade TNPP submission delayed to revisit Needs/Options and ensure solution addresses significant increase in RES generation pipeline (CR8).
- SONI & NIE Networks Line Rating Working Group established (CR45).

Key Highlights

- The DfE issued 28 Necessary Wayleaves for 2nd North-South Interconnector bringing consented landowners to ~70%.
- SONI's "Grid Acceleration Project" completed with a set of actionable recommendations.
- Joint SONI-NIE Networks Programme Management Office established for all transmission projects.
- SONI's proposal to shift our default approach for land access from wayleave to easements has been agreed in principle with the UR and a model for easements in under development.
- Transmission Development Plan NI 2023-31 submitted to the UR in May-24 and UR consultation closed.

Upcoming Milestones

- Mid-Tyrone Upgrade TNPP to be submitted to the UR for approval May-24 (addresses SOEF No. 8).
- 2nd North-South Interconnector target for issuing TPI to NIEN is September 2024.
- Collaboration with industry is on the proposed Transmission Cluster policy.

Key Risks or Issues

- Business as usual on Grid Delivery is not enough to support 80x30 and we are participating in the DfE's 80x30 Working Group and will work to implement the recommendations from our "Grid Acceleration Project".

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SOEF - Joint Regulatory Authority update

24 September 2024

Marie-Therese Campbell – Head of Market Operations UR

Robert O'Rourke – Senior Manager CRU

Context

- Drivers of change include policy in Ireland (DECC) and Northern Ireland (DfE), GB Review of Electricity Market Arrangements (REMA), recoupling with EU Markets, EU Market reform, technology driven drivers

- Policy landscape in which we operate is complex and evolving at pace!

- Challenges for regulation across the island, supporting consumers through transition

- Enablers of market change, TSOs/MO, Market Participants, Industry, Regulators, SEM Committee decisions are key to all island market success

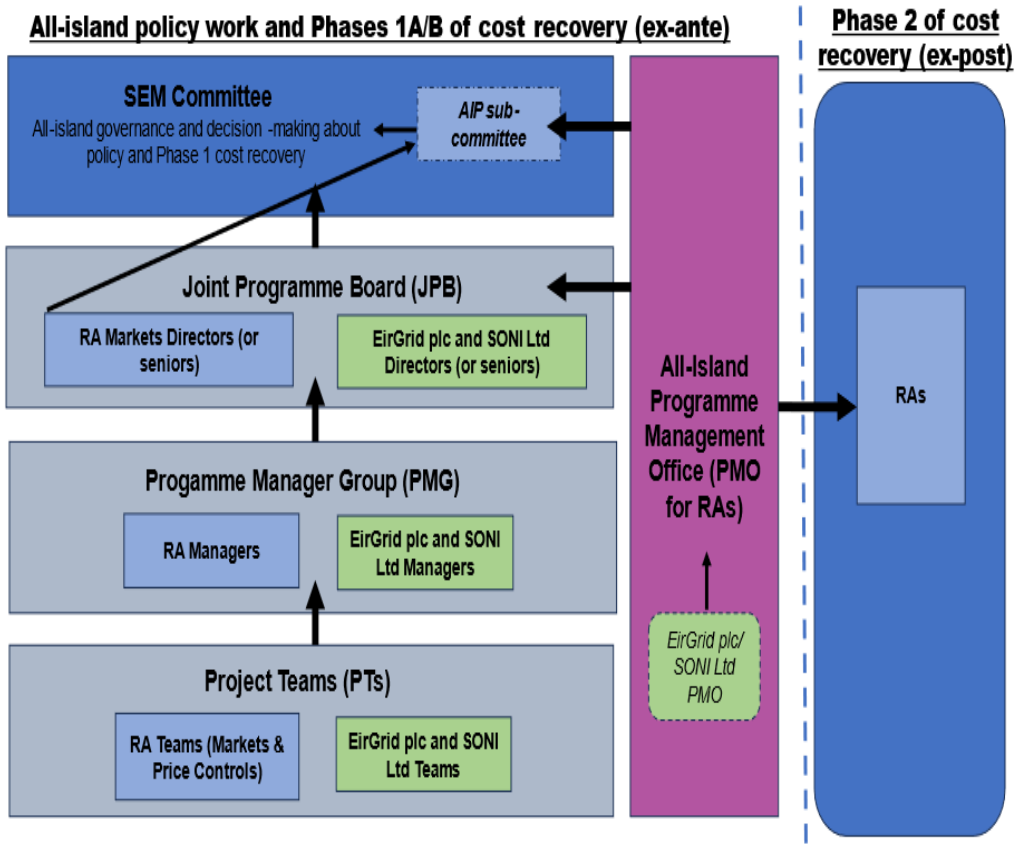
Challenges

- Departmental drivers, Climate Action Plan (CAP) in Ireland, Energy Strategy in Northern Ireland evolving differently and at different pace, shapes policy and market impacts, hugely ambitious agendas
- Reacting to the change in a timely fashion, pace of change unparalleled and more impactful than previous market projects such as SEM / ISEM
- Appetite for levels of change, Industry and Market participants understanding of market change across multiple areas
- Resources and subject matter experts' constraints across Regulation, TSOs and wider consultant pool
- Systems changes and approach (lead times, impact assessments, dependencies on vendors etc), acknowledgement of industry systems changes
- Delays/impacts, derailers under tight project timelines
- Stakeholder relationships / having buy in important

All Island Market Programmes

- Governance:
  - Procedures to enable robust regulatory oversight of programme progress and a co-ordinated regulator consideration of expected costs to ensure timely implementation
  - Stage 1: Ex-ante programme cost estimate review and decision / change requests considered by exemption
  - Stage 2: Ex-post efficiency assessment within respective price control regimes

- Current All-Island Programmes:
  - Scheduling & Dispatch Programme
  - Future Arrangements for System Services
  - Strategic Markets Programme



https://www.semcommittee.com/files/semcommittee/2024-09/AIP_Approach%20to%20Governance%20and%20Revenue%20Recovery%20Arrangements.pdf

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All Island Projects in Progress

- Future Arrangements for System Services
- Scheduling and Dispatch Programme
- Strategic Markets Programme

- All-Island governance arrangements in place to streamline TSO funding requests; funding approved for each programme
- AIP PMO is being put in place

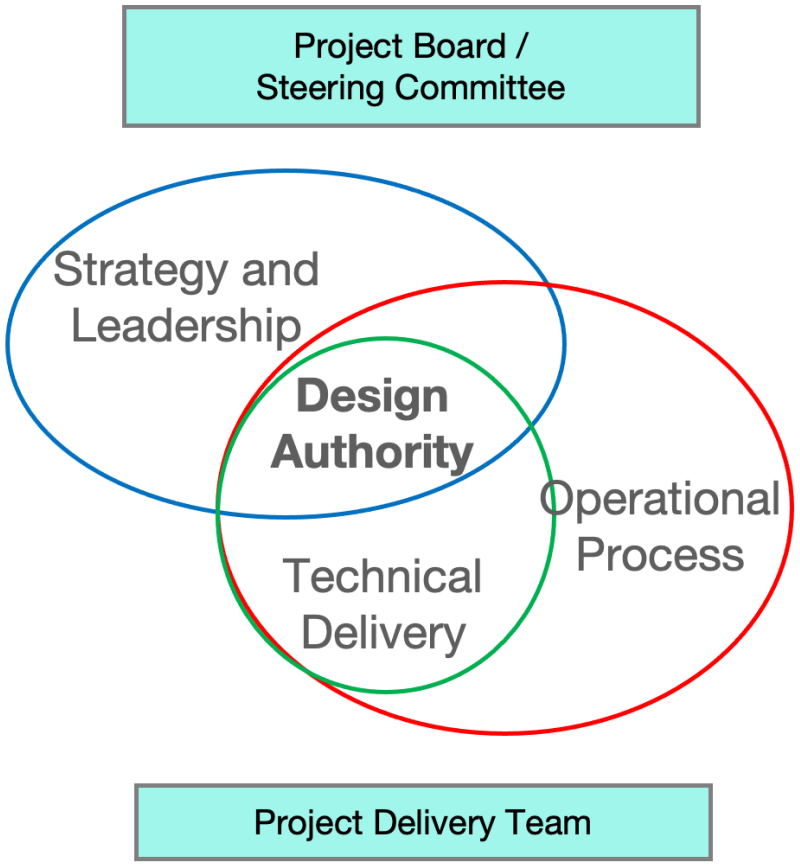
- Each Programme is a significant area of work with significant interactions and impact on the wider SEM arrangements

Markets – potential projects

1. Capacity Remuneration Mechanism 2027+
2. Long Duration Energy Storage
3. REMA (Review of Electricity Market Arrangements in GB), especially likely move to zonal pricing
4. Multi Region Loose Volume Coupling SEM-GB
5. ACER Co-optimisation of Reserves at Day Ahead
6. Impact Assessments of Electricity Market Design Reform Regulations 2024
7. New Network Codes (FCA, EGBL, CACM)
8. Cross Border Cost Allocation
9. Redesign of Capacity Calculation Region
10. Flow Based Coupling:
11. Bidding Zone Re-design
12. Offshore Bidding Zone Design
13. Review of EC2010:838 including Generator Tariff and Inter TSO Compensation

Solutions

- Funding approach (through AIP)
- Strategy and plan on multiple market workstreams
- Prioritisation and impact assessment of projects
- TSOs/MO systems forward look on implementation plan
- Industry feedback on multiple market projects, impact matrix
- Working together on a wider programme including multiple projects
- Market signals, investment clarity, industry involvement
- **Need for coordination, PMO dedicated to Markets**



With acknowledgement to unknown source

SEM Strategy Development

- UR Strategy 2024-2029 published
- CRU Strategy 2022-2024; CRU Strategy 2025-2027 under development
- SEM Strategy under development

Discussion

1. What are industry views on what the SEM Committee strategic priorities should be?

2. How best to co-ordinate and ensure alignment with the wide range of ongoing and upcoming projects?

3. Industry engagement & consultation processes

Next Steps

- SEM Committee 26th September (TSO present on multi year plan)
- Senior Teams meeting 17th October (Design and implementation)
- Joint Programme Board (All Island Project Governance) October
- Dedicated PMO roll out (procurement phase)
- Industry feedback through representation, fora, consultation
- SEM Committee (last Thursday of every month)

Useful Information

- All Island Governance (AIP): https://www.semcommittee.com/publications/sem-24-034-all-island-programmes-approach-governance-and-revenue-recovery-arrangements
- SEM Committee: https://www.semcommittee.com/
- SEM Committee Publications: https://www.semcommittee.com/publications
- Utility Regulator: https://www.uregni.gov.uk/
- UR Corporate Strategy: https://www.uregni.gov.uk/files/uregni/documents/2024-04/Corporate%20Strategy%20final%20published.pdf
- CRU: https://www.cru.ie/
- CRU Strategic Plan: https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRUsStrategic_Plan_2022-24.pdf
- https://www.consilium.europa.eu/en/press/press-releases/2024/05/21/electricity-market-reform-council-signs-off-on-updated-rules/

24 September 2024

Key dependencies and capabilities needed for future operational policy changes

Presentation to SOEF Advisory Council

Presenter

Eoin Kennedy

EirGrid SONI

Key Messages

Background

- Collectively, the Shaping Our Electricity Future (SOEF) Roadmap and the Operational Policy Roadmap chart a pathway to delivery of 2030 climate targets.
- As we progress towards 2030, it is timely that we review our current position and focus on key enablers to help us achieve our system operational policy ambitions.

Purpose of the Presentation

- To inform Advisory Council members of:
  - The key focus areas of the System Operations programme which will have the greatest impact on our ability to evolve operational policy in the period to 2030;
  - The key dependencies and risks.

Key Enablers

- While the SOEF Programme covers a wide range of important work areas which need to be progressed, particular focus is needed on delivering in the following areas:
  - Operational capability enhancements
  - Delivery of System Services
  - Transmission constraint removal
  - Resolving customer performance issues

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What is Operational Policy?

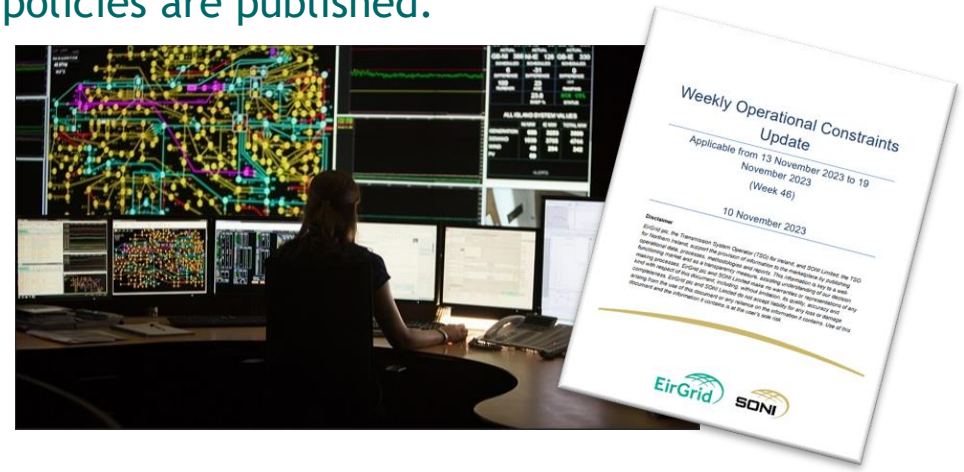
Operational policy sets the technical limits which we apply to the operation of power producers (such as generators and windfarms) **to maintain the secure operation of the power system.**

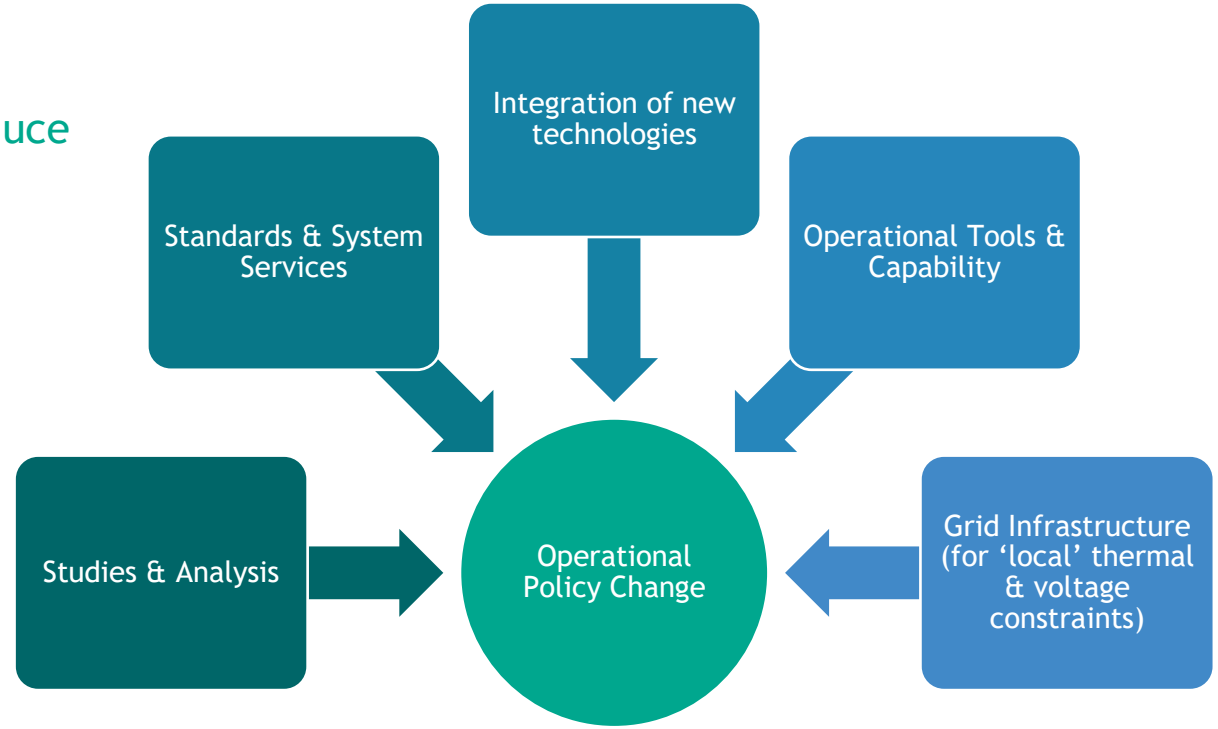
These policies can result in the application of:

- **Constraints,** e.g. Generator X or Y must run, and
- **Curtailment,** e.g. the output of all windfarms must reduce

These policies are applied and monitored in real-time.

The policies are published.





Ultimate aim of the System Operations work programme is to evolve operational policy while maintaining security of supply → holistic approach required.

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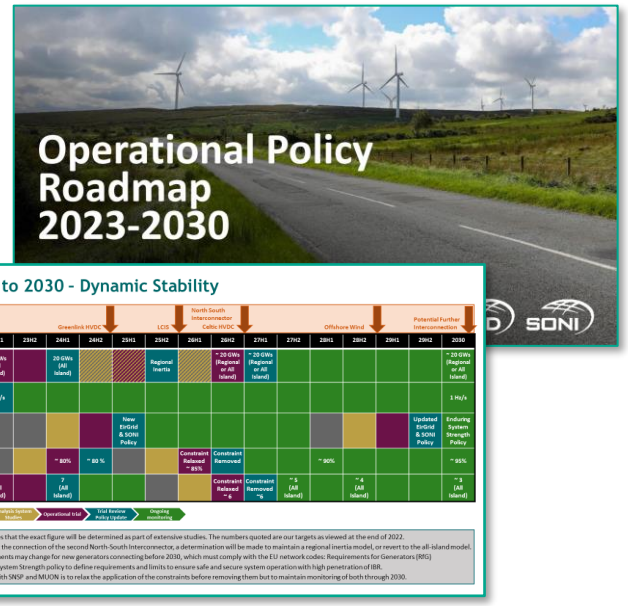
Operational Policy Evolution

The Operational Policy Roadmap sets out a milestone plan for evolution of operational policy in the three main areas:

- Dynamic Stability, Reserves and Ramping, and Operational Security.



Key Messages:
SNSP needs to increase from 75% to 95%
Minimum number of conventional units needs to reduce from 7 to 3 or less

Key Changes since 2020

Global Constraints

- March 2021: 70% SNSP
- March 2022: 75% SNSP
- May 2023: 1 Hz/s RoCoF
- April 2024: 7 min units (4 IE, 3 NI)
- June 2024: 15 MW Interconnector Ramping

Local Constraints

- Dec 2023: South / South-West Must-Run Constraints Relaxed
- March 2022: MP5 added to 400 kV constraint

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Current Operational Policy Considerations

Global Constraints

80% SNSP

- Pre-trial analysis underway.
- Targeting trial in Q4 2024.
- Likely to be limited opportunities to operate above 75% SNSP given other constraints.

System Strength Policy

- First phase of the system strength work looking at potential metrics recently completed.

Relax Min Units to 3 units or less

- Timing of future relaxation of 'minimum number of large units' constraint is linked to timing of the delivery of LCIS projects.

Current system studies indicate that there are likely to be limited opportunities to operate above 75% SNSP unless other constraints are relaxed

Local Constraints

South TCG

- Review is underway.
- Expected completion September 2024.

Dublin TCG

- Review is underway.
- Expected completion December 2024.

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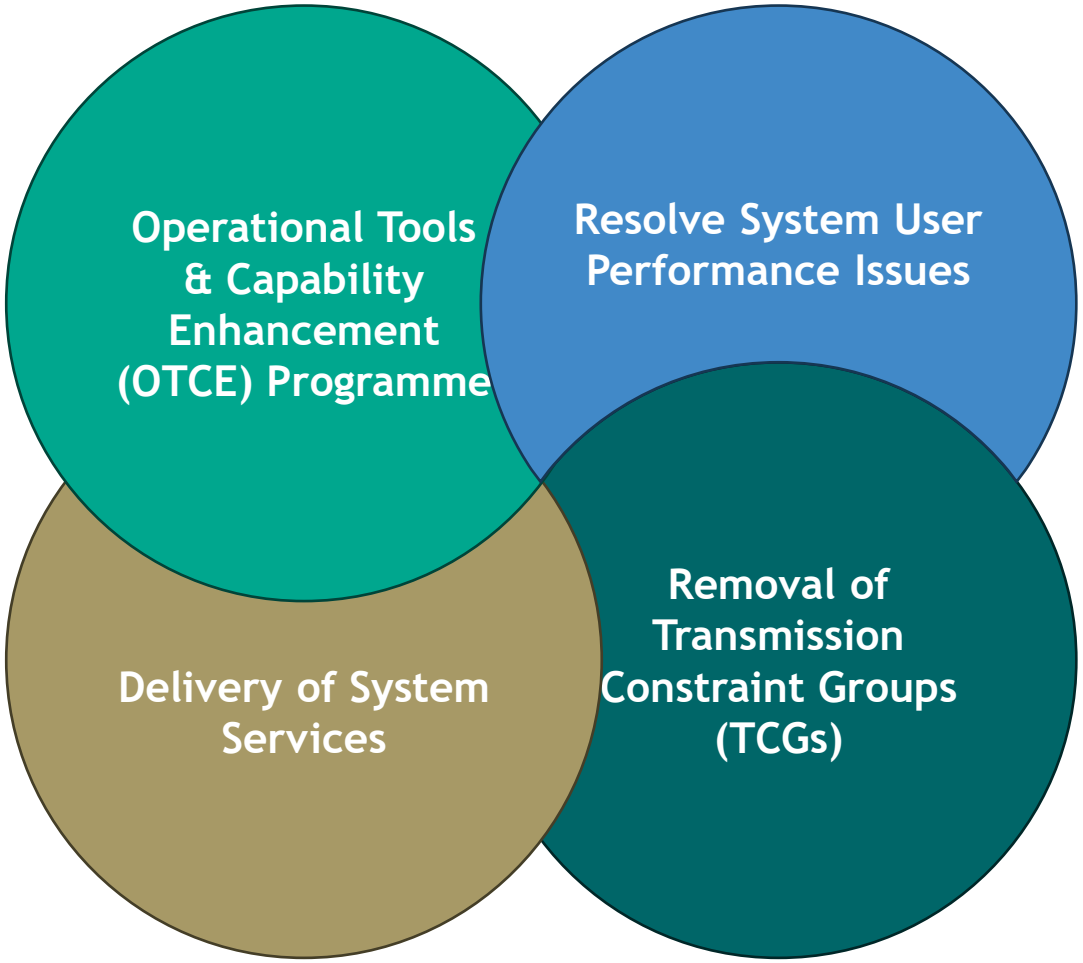
Key Enablers to deliver future Operational Policy Changes

…to support the development of the operational capabilities needed



e.g. data centres and Distributed Energy Resources (DER) response to system disturbances

…including LCIS and FASS, to meet system requirements

…that require the running of conventional fossil-fuelled generation

Some of the key enablers to support future policy changes

Operational Tools and Capability Enhancement (OTCE) Programme

Initial Focus Areas

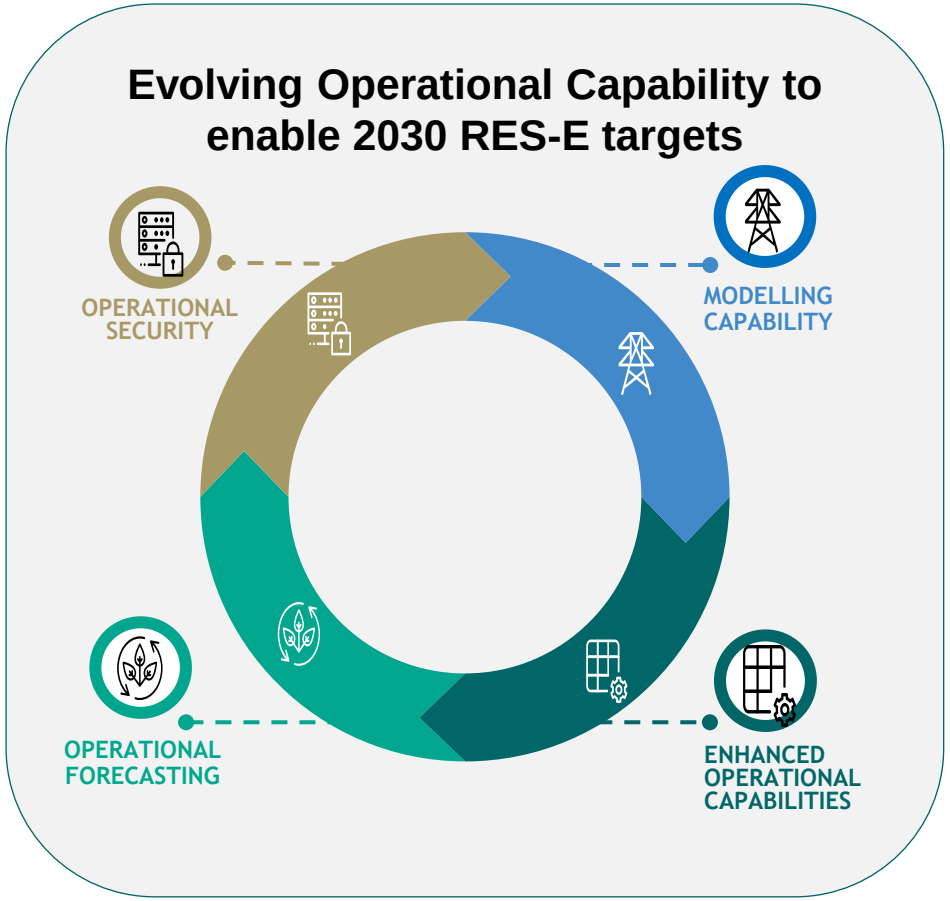
Operational capability (Resources, Tools, Processes and Facilities) will need to be uplifted in a phased approach to align with the new challenges and requirements introduced by the increased complexity of system operations

OPERATIONAL DATA & OBSERVABILITY

Enhance the situational awareness and decision support capability for operators of new network phenomena by improving the network monitoring and observability capability using high resolution monitoring capability. Enable automatic dynamic model validation using high speed monitoring devices.

OPERATIONAL FORECASTING

Develop an enhanced, more accurate, and comprehensive short term regional, geographic, and nodal operational forecast. The forecast will include higher resolution demand and RES information to enable EirGrid to make accurate operational assumptions regarding network reliability and market operations.



OPERATIONAL MODELLING & SIMULATION

Develop enhanced modelling capability (e.g. Electromagnetic Transients) to support operations and planning simulation requirements so more detailed models of the network and resources can be established. Enhanced modeling can be achieved by ensuring all tools are aligned across all domains and an automated validation process is established for the models relative to the asset's performance for real events.

OPERATIONAL STUDY CAPABILITY

Enhance the operational study capability in EirGrid for new operational policies and time horizons. Enhanced study capability will utilize the existing study toolkit and process streamlining to make the most efficient use of engineering resources.

FUTURE DISPATCH CAPABILITY

Development of capability to manage the dispatch and control of the evolving generation, interconnection and demand resource portfolio on the power system.

Delivery of System Services
Including LCIS and FASS, to meet system requirements

Low Carbon Inertia Services (LCIS) Phase 1

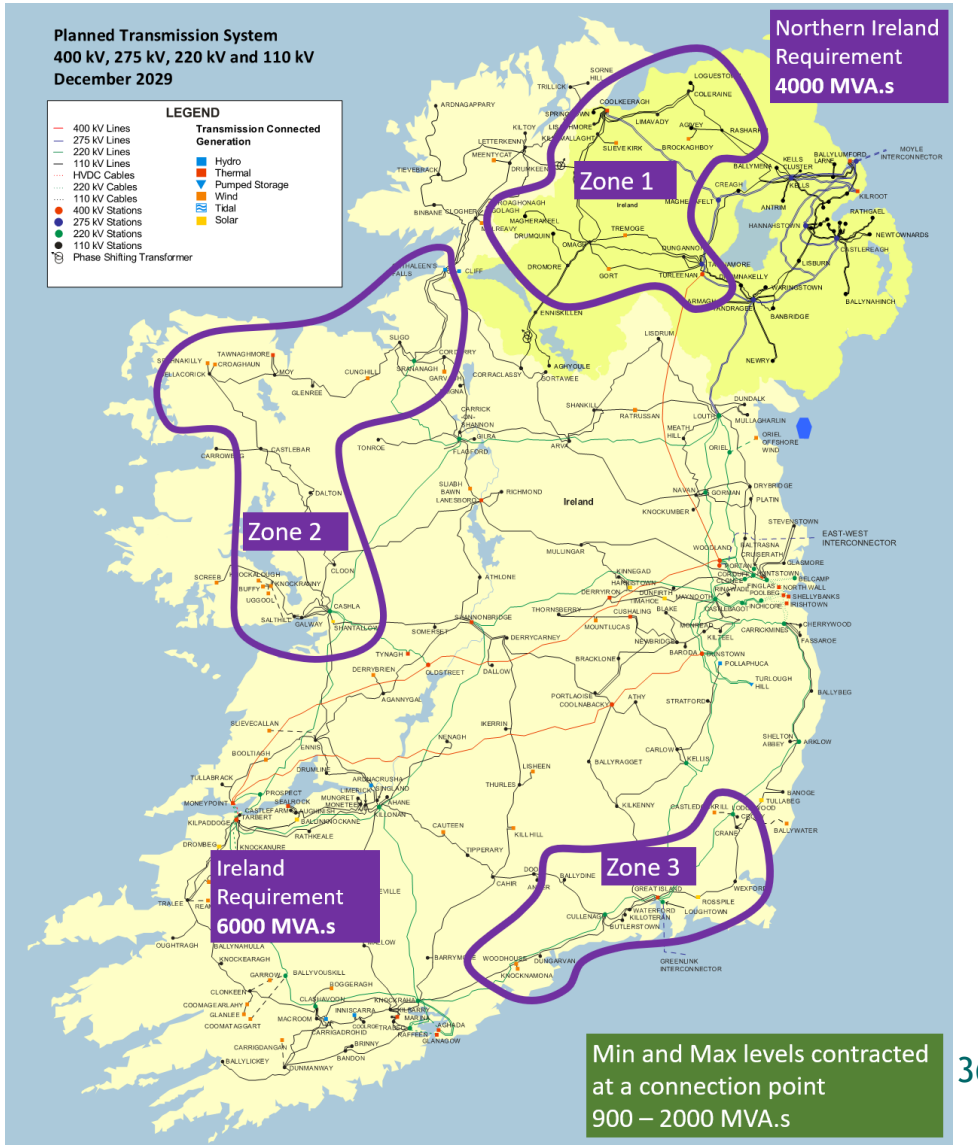
- SONI and EirGrid procurement processes are now complete.
- Focus is now turning to development and connection of the successful projects.

LCIS Phase 2

- Studies nearing completion
- Targeting procurement process commencing in Q2/Q3 2025

The timely connection of the LCIS projects (all Synchronous Condenser technology) is critical as they are needed to operate the power system at higher SNSP / renewable generation levels and deliver significant cost savings to consumers.

It will be challenging to make further reductions in the 'minimum number of large units' constraints prior to delivery of these LCIS projects.



Delivery of System Services
Including LCIS and FASS, to meet system requirements

Future Arrangements System Services (FASS)

Analysis has indicated that new reserve products and increased reserve volumes will be required to meet the future needs of the power system.

New Reserve Products are required, in particular 'downward' response capability to complement existing 'upward' capability. In addition to the procurement of these services, this will drive:

- Additional service provider testing
- Changes to operational systems and processes to reflect the new services

Additional Volumes of Reserves are required in order to:

- Manage an increase in the largest system infeed/outfeed from 500 MW to 700 MW (driven by Celtic Interconnector)
- Address increasingly binding jurisdictional requirements pre second N-S Tie-line.
- Manage consequential loss of Data Centre demand and Distributed Energy Resources (DER)

Other, non-reserve, system service requirements will be reviewed in 2025.

The new FASS arrangements are expected to go-live towards the end of 2026.

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Resolve System User Performance Issues

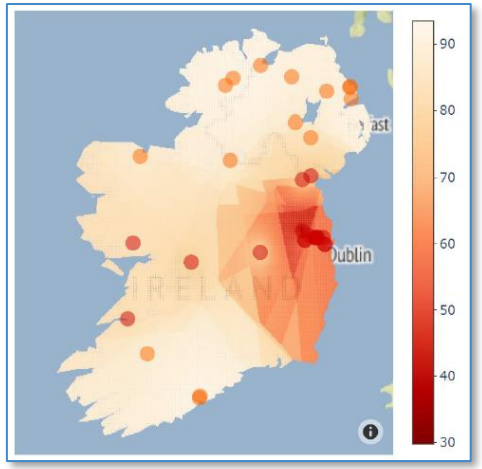
e.g. data centres and Distributed Energy Resources (DER) response to system disturbances

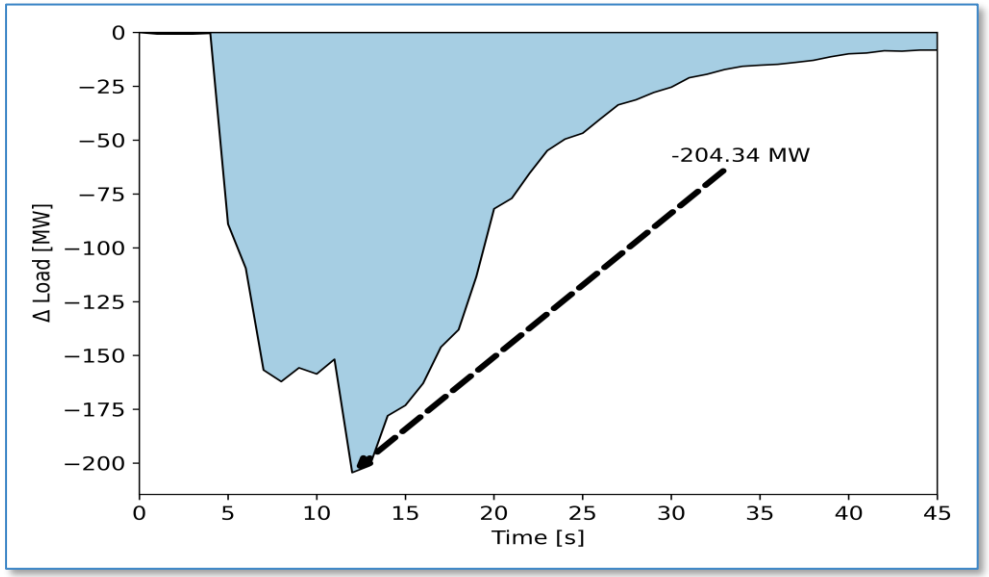
- Data centres reduce their power consumption from the grid in response to significant disturbances on the power system.
- They then automatically restore their consumption after the disturbance has been cleared.
- This is done to protect their sensitive IT systems and processes.
- Similar data centre performance issues have been observed by other TSOs in Europe and the USA.

Data centre demand today is approx. 700 MW, **10 % of peak demand.**

By 2030, data centre demand could account for **30 % of peak demand.**

Disturbance propagation (contour map) and collective Data Centre Response (13 Dec. 2022, 220 kV fault in Dublin)





Resolve System User Performance Issues

e.g. data centres and Distributed Energy Resources (DER) response to system disturbances

Impact

- Additional inertia and reserves may be required in the short term to manage this increased risk. This could incur significant costs for consumers but is unlikely to be a technically feasible long-term solution given data centre growth projections.
- Our ability to evolve operational policy to accommodate additional renewable generation on the power system, by increasing SNSP and reducing requirements for conventional generation, will also be challenged. This risks our ability to achieve RES-E targets.

Operational Actions

- Actively monitoring and simulating the response of data centres using our real-time tools to flag potential issues.
- Maintaining minimum system inertia level above what we had previously planned.
- We can use contingency measures, in the form of automated disconnection of wind generation, to mitigate some of the impact of an event.

EirGrid SONI

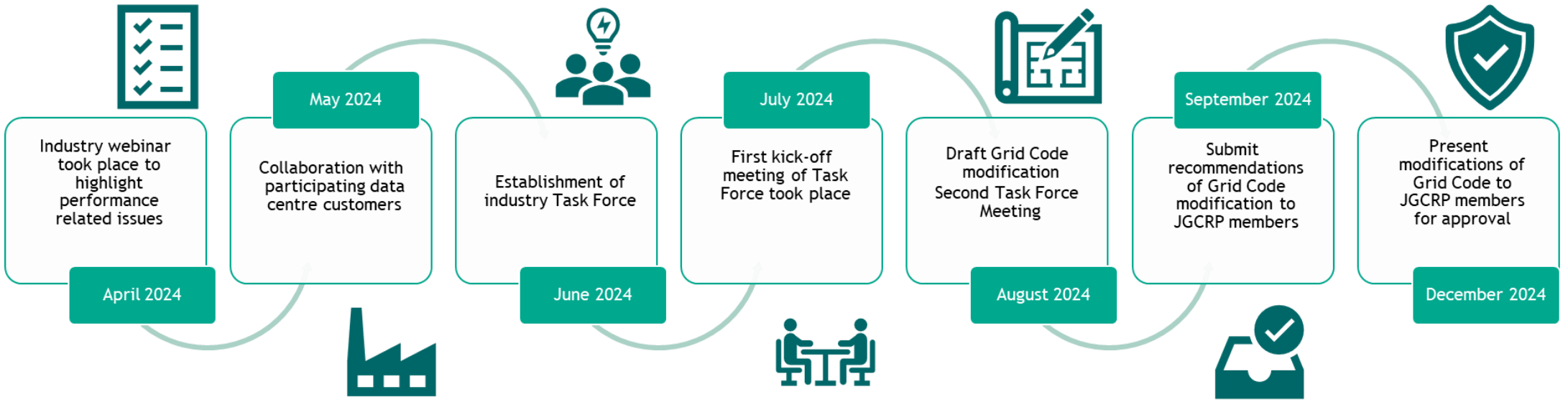
Resolve System User Performance Issues

e.g. data centres and Distributed Energy Resources (DER) response to system disturbances

Industry Engagement:

We have established an industry Task Force to provide a forum for engagement with the data centre companies.

We are developing Grid Code Modification for 'fault ride-through' capability that would apply to all large demand users.

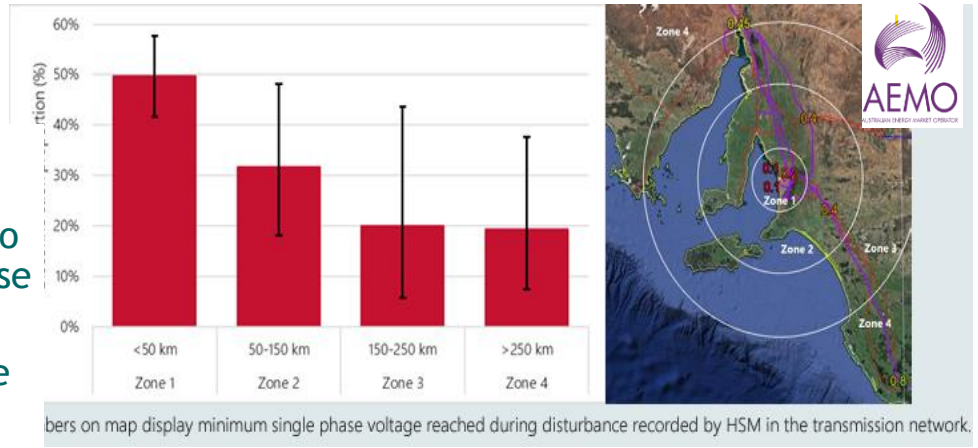


EirGrid SONI

Resolve System User Performance Issues

e.g. data centres and Distributed Energy Resources (DER) response to system disturbances

DER today is approx. 500 MW installed capacity.
By 2030, DER installed capacity could rise to 2.5 GW.



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

Challenges

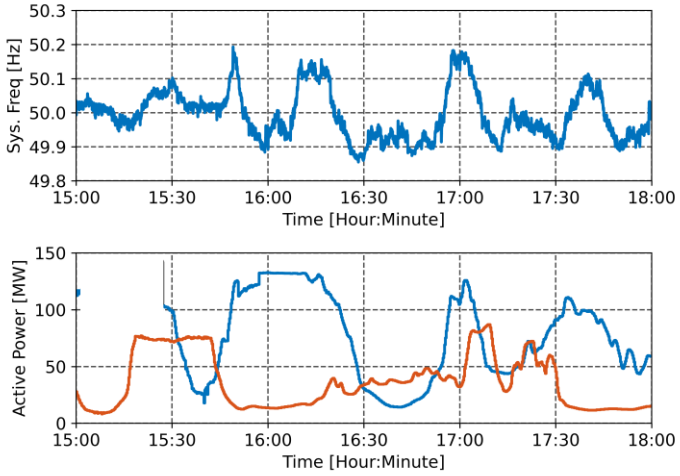
- Considerable evidence of extensive distributed PV disconnection in response to voltage disturbances has been reported by AEMO. This can significantly increase contingency sizes.
- The intermittency of solar generation is becoming evident in Ireland as we see more incidents of frequency fluctuations due to solar variations.
- We will need to be able to manage higher ramps on the system (e.g. solar generation drop-off in the evening aligned with demand increases).

Operational Actions (*TSO-DSO collaboration will be critical*)

- Gain better visibility, forecasting and controllability in collaboration with DSOs.
- Develop required models for DER and integrate into control centre tools.
- Enhance Fault-Ride-Through capability by developing/updating required standards/codes and enforcing necessary performance.
- Enhance grid support capability of distributed PVs by mandating voltage support requirements through relevant standards/codes.

Control Centre Log 16/04/2024:

Solar unit fluctuating up and down by 100 MW causing frequency to hit high and low limits.
This is presumably due to passing clouds.



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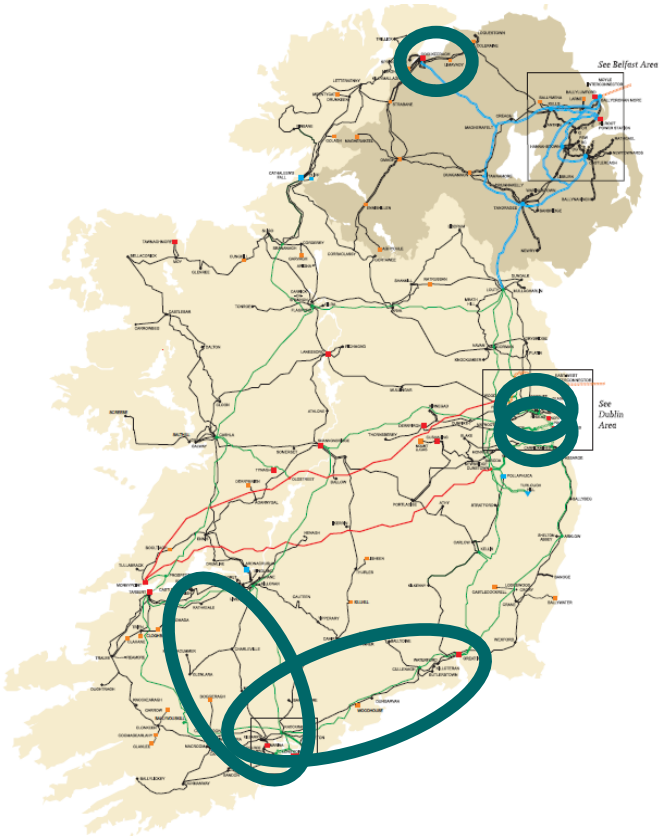
Removal of Transmission Constraint Groups (TCGs)
that require the running of conventional fossil-fuelled generation

TCGs are applied to maintain power-flows on transmission circuits and substation voltages within equipment ratings. Examples include:

- ‘Must Run’ constraint applied to generation in the Northwest for voltage control.
- ‘Must Run’ constraints applied to generation in Dublin for thermal and voltage management.
- ‘Must Run’ constraints applied to generation in South for voltage management.



TCGs are separate to ‘global’ **Dynamic Stability** requirements which apply across the system. Examples include:

- Limit SNSP to 75%
- Maintain Inertia Floor of 23,000 MW.s
- Ensure minimum number of large conventional generator units is 7 (4 in IE, 3 in NI)

The benefits from relaxing ‘global’ constraints will not be achieved unless ‘local’ TCGs are also relaxed / removed in parallel.

Delivery of transmission infrastructure is a key enabler for the removal of TCGs.

EirGrid SONI

System Level Overarching Dependencies and Risks

Security of Supply	Operational trials will be dependent on system and operational conditions.
Operational Capability	Operational capability must be uplifted to align with the new challenges and requirements introduced by the increased complexity of system operations (e.g. forecasting, observability).
Operational Studies	Analysis will be a key factor to determining the precise constraint values and policy direction. The capability to perform advanced analysis must be further developed, while we will also need to be able to adequately model the performance of new and emerging technologies.
Network and System Services Development	Timely delivery of new system services market arrangements, system services providers, new flexible generation, the 2nd North-South Interconnector and other transmission reinforcements (e.g. in Dublin) are required to assist with future challenges and meet the decarbonisation targets.
Collaboration	Implementing the operational changes will evolve in light of UR SONI Licence Condition 42 and will require new ways of collaboration between the TSOs. Extensive collaboration will also be required with a range of other stakeholders, including ESB Networks, NIE Networks, CRU, UR, DECC, DfE and Industry.

EirGrid SONI

Summary

- While the SOEF Programme covers a wide range of important work areas which need to be progressed, particular focus is needed on delivering in the areas shown below.

Operational Tools & Capability Enhancement (OTCE) Programme	Resolve System User Performance Issues	Delivery of System Services	Removal of Transmission Constraint Groups (TCGs)

• Need to deliver on key aspects of the OTCE programme. Initial focus areas include:
  • Operational Forecasting
  • Operational Data & Observability
  • Operational Modelling & Simulation
  • Operational Study Capability
  • Future Dispatch Capability
	• Vital to progress a Grid code modification for Large Energy User Fault Ride Through performance – failure to do so will challenge our ability to evolve operational policy further
	• Need to ensure the performance of Distributed Energy Resources supports power system needs
		• Timely delivery of LCIS projects needed
		• New / modified system services need to be delivered through the FASS arrangements
		• Ahead of delivery of the LCIS projects and new FASS-procured system services, it will be challenging to evolve operational policy further (beyond 80% SNSP).
			• The benefits from relaxing ‘global’ constraints will not be achieved unless ‘local’ TCGs are also relaxed / removed in parallel
			• Timely delivery of transmission infrastructure is a key enabler for the removal of TCGs.

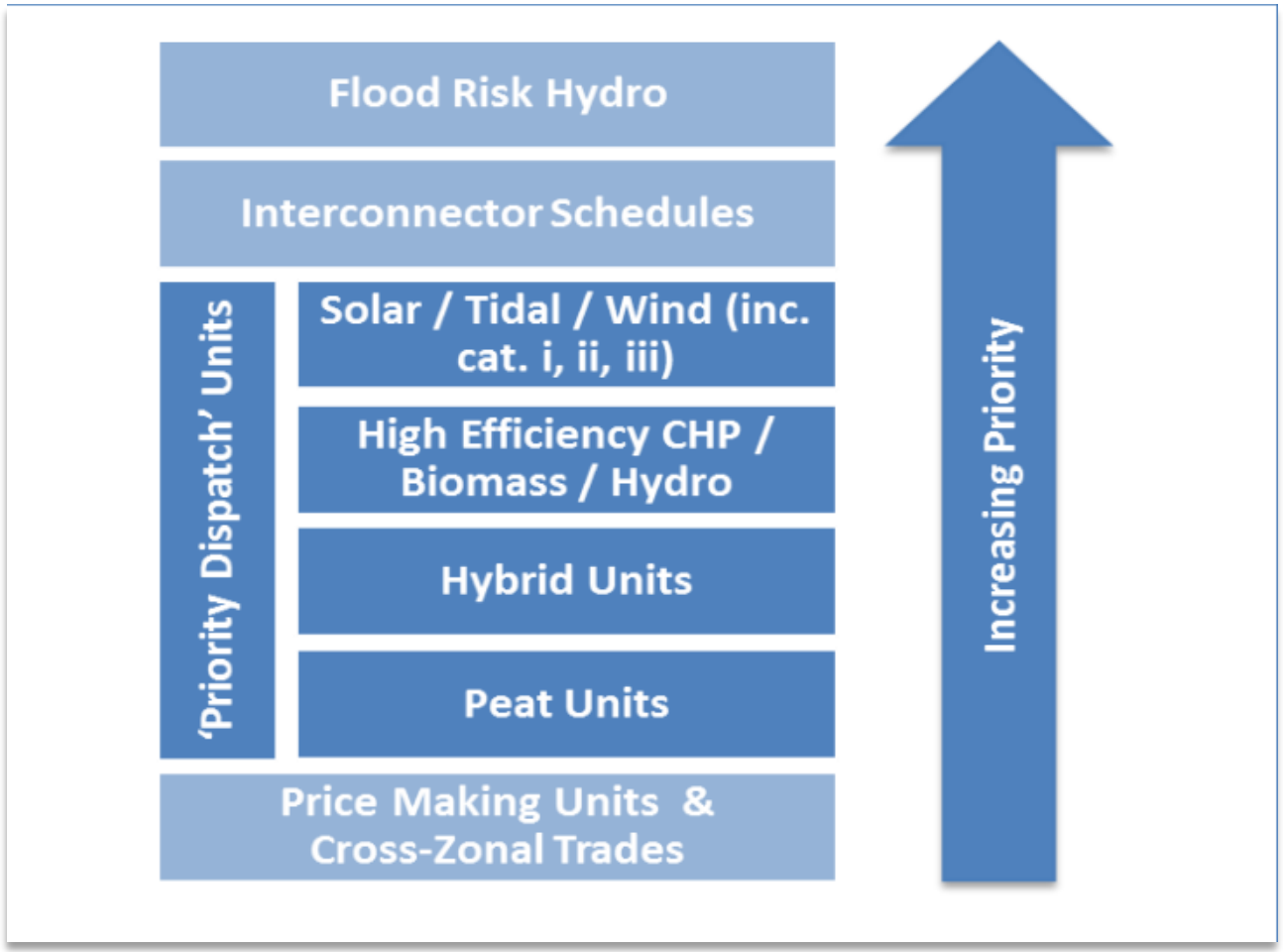
EirGrid SONI

Market Drivers for IC Imports and Dispatch down

Presenter

Michael Atcheson

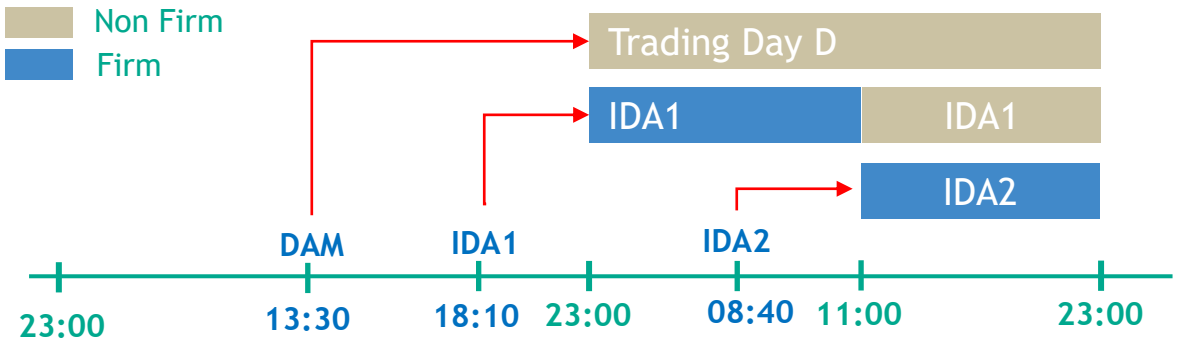
Market Design and Dispatch Priority



- We give priority to the dispatch of certain generation types as required by European, Ireland and Northern Ireland legislation (Appendix 1.3 in BMPS*)
- The output is maximised as far as technically feasible.
- System Security first priority
- Unconstrained in the Ex-ante and heavily constrained in real time Balancing Markets

* BMPS V 8.0

Interconnector Trading



Trade Type	Description
Co-Ordinated Third Party	Carried out using a third party trading partner, trade volume pre-agreed with National Grid.
Cross Boarder Balancing	Prices are exchanged daily between EirGrid/SONI and National Grid, trade agreed on a two hour rolling window.
Emergency Assistance	Requested Increase/Decrease in active energy if its foreseen there will be a difficulty in meeting system demand or maintaining transmission system security.
Emergency Instruction	For system security/safety reasons in real time, can only be rejected by either TSO on grounds of safety. Flow can only be reduced towards ZERO.

	Driver	Description	I-SEM
Agreed Cross Zonal Actions	1. System Security	The requirement to limit IC flows to manage power system security issues. Assumes that there is no other re-dispatch option (or that other options have already been utilised) and that management of the IC schedule is the only solution available. E.g. to manage thermal loading on an IC associated transmission asset or to limit largest outfeed for system stability.	✓
	2. Priority Dispatch	Trading to limit imports or to maximise exports to reduce priority dispatch curtailment.	✓
Non Agreed Cross Zonal Actions	3. Constraint Cost Management	Trading to adjust IC schedules to reduce constraint costs / production costs. Example: to reduce largest system infeed(LSI)/outfeed(LSO) (and hence reduce reserve requirements) or to provide reserve headroom on the ICs so that they can contribute towards reserve provision. Could also apply to wheeling of power between ICs to manage constraints within either system.	✗
	4. Energy Balancing	Trading for energy balancing purposes.	✗
	5. Market Schedule Imbalance	This issue is driven by differences between the IC market schedule (30/60 min blocks) and the IC reference programme (a point to point profile) and/or actual metered flow. The resulting gaps give rise to scheduled imbalances. Imbalances can also arise as a result of an IC trip (caused by the interconnector itself or a transmission system event).	✗

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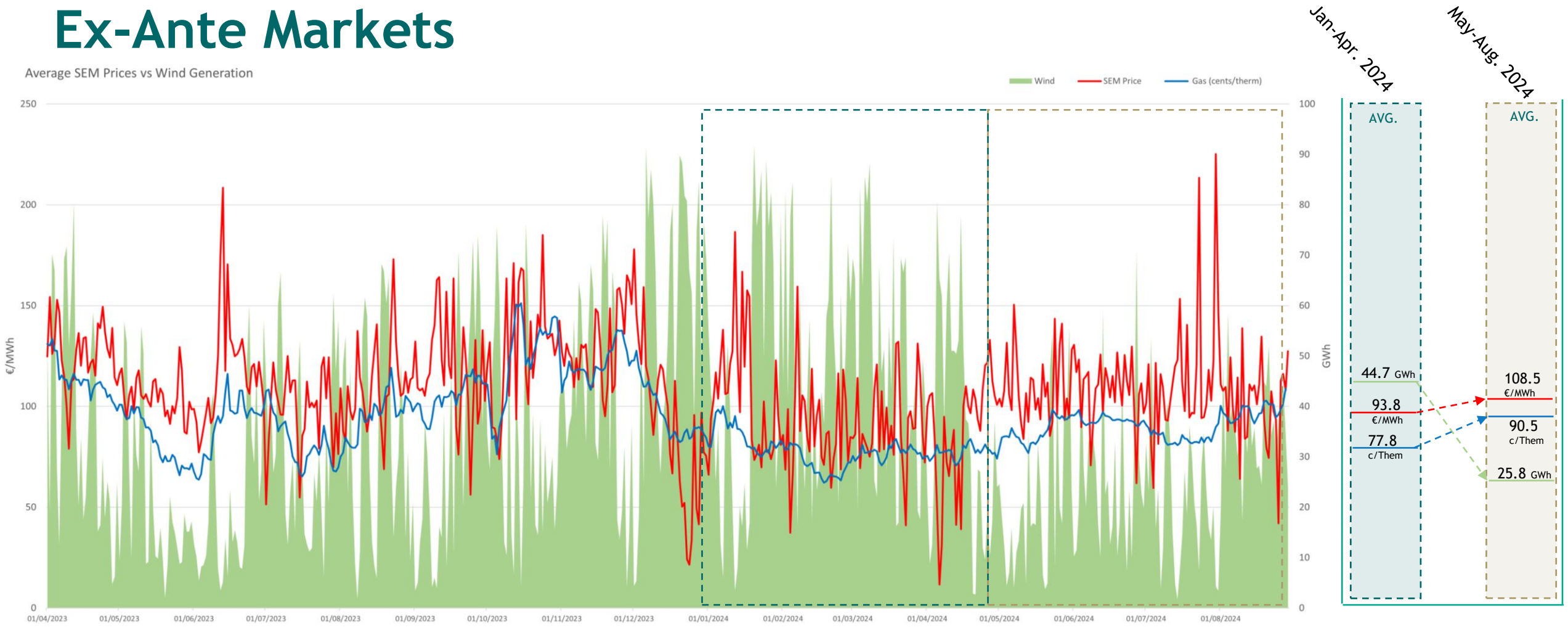
Ex-Ante Markets



- From the beginning of May to the end of August, there was a 42% drop in wind power generation within the SEM. From May to August wind has dropped off whilst prices have increased, driving more imports across the ICs

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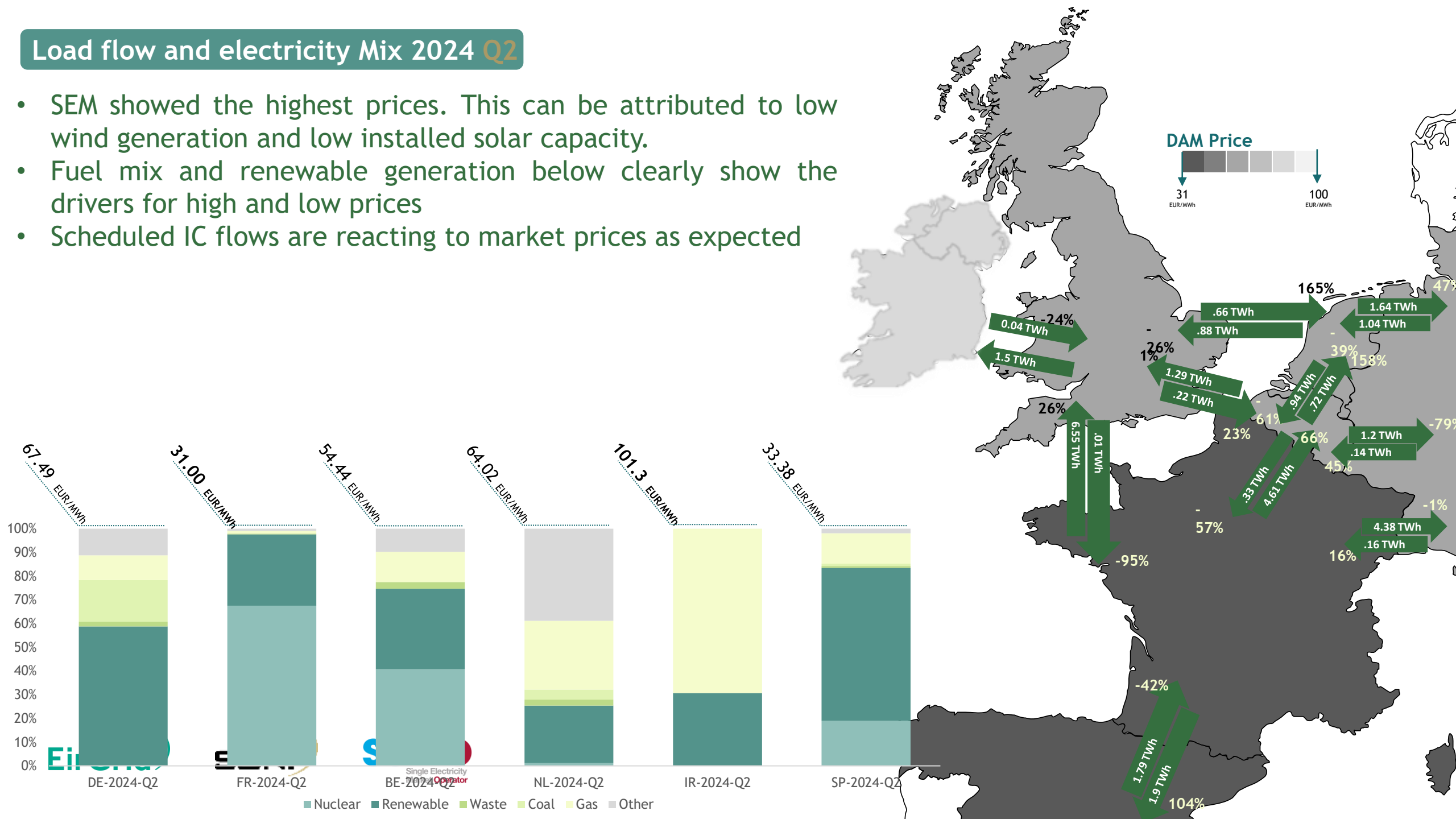
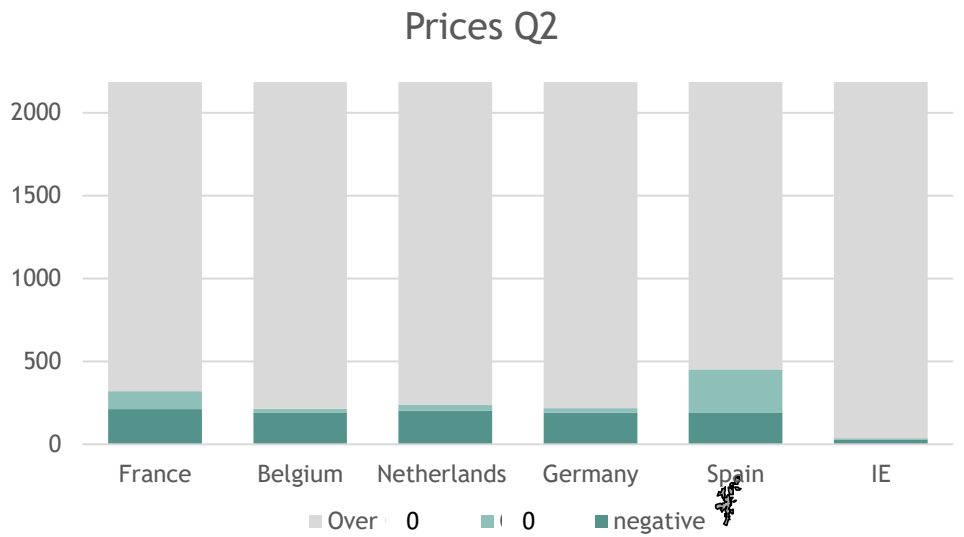
Load flow and electricity Mix 2024 Q2

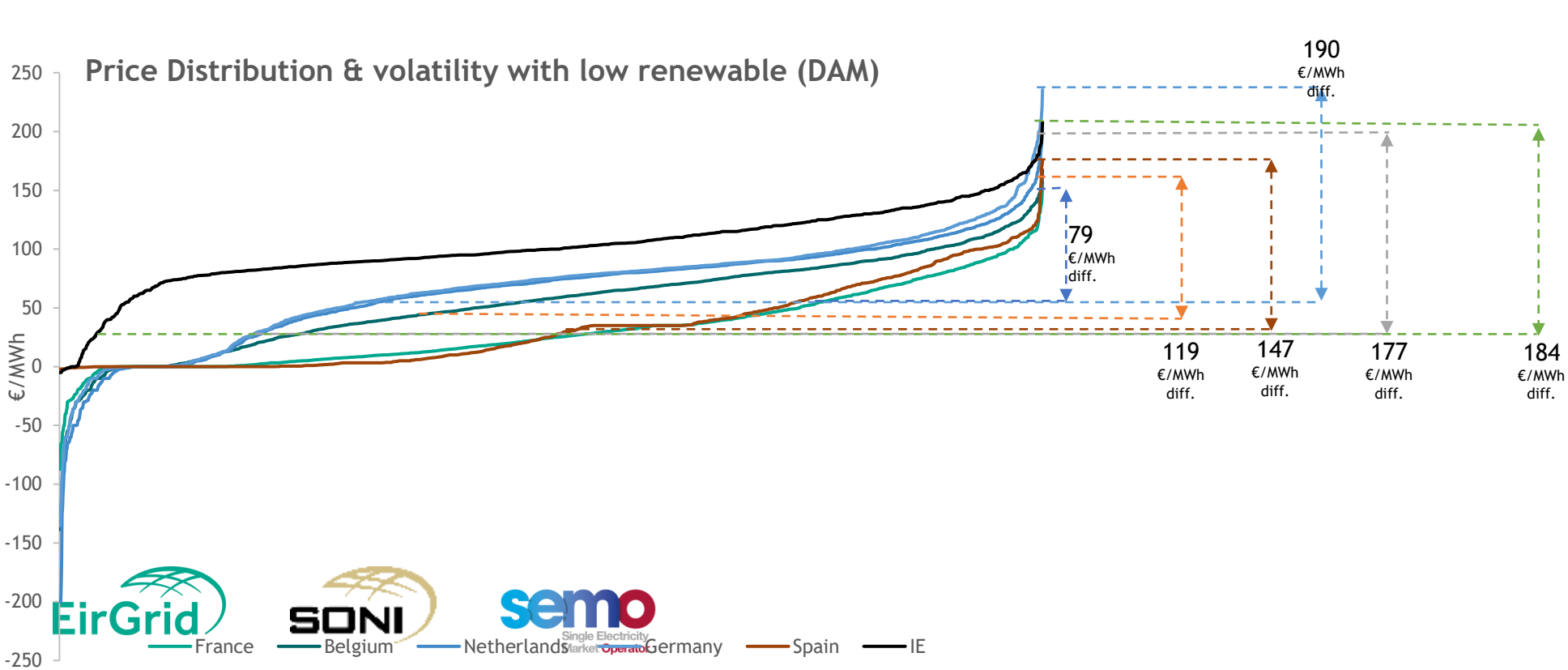
- SEM showed the highest prices. This can be attributed to low wind generation and low installed solar capacity.
- Fuel mix and renewable generation below clearly show the drivers for high and low prices
- Scheduled IC flows are reacting to market prices as expected

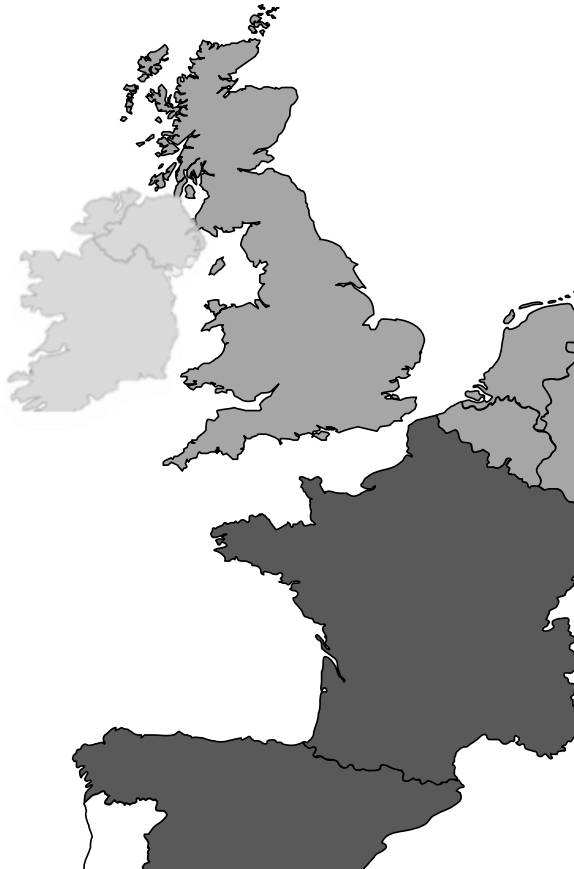


Negative Prices Europe Q2

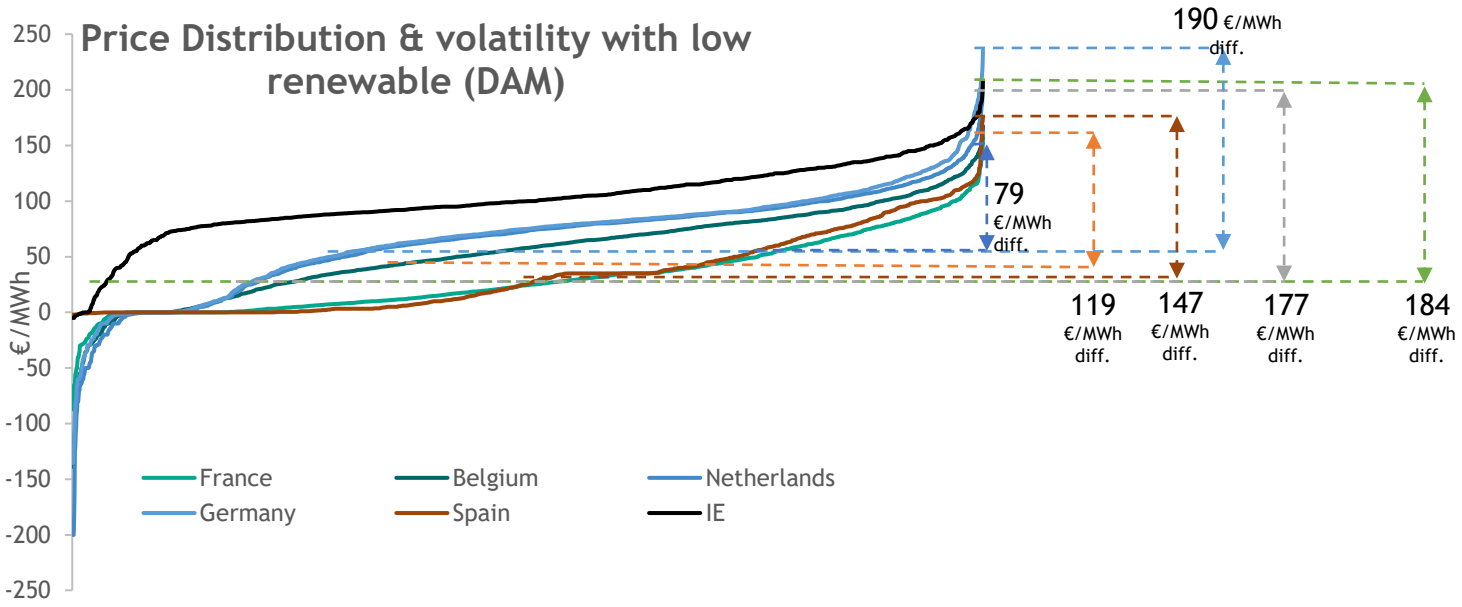
- The SEM is one of the most volatile markets with low renewables
- Days with low renewables, SEM and Germany are the countries with more "volatility".
- By comparing the previous graph with the one shown below, France is the system that can maintain more stable prices between periods and days.







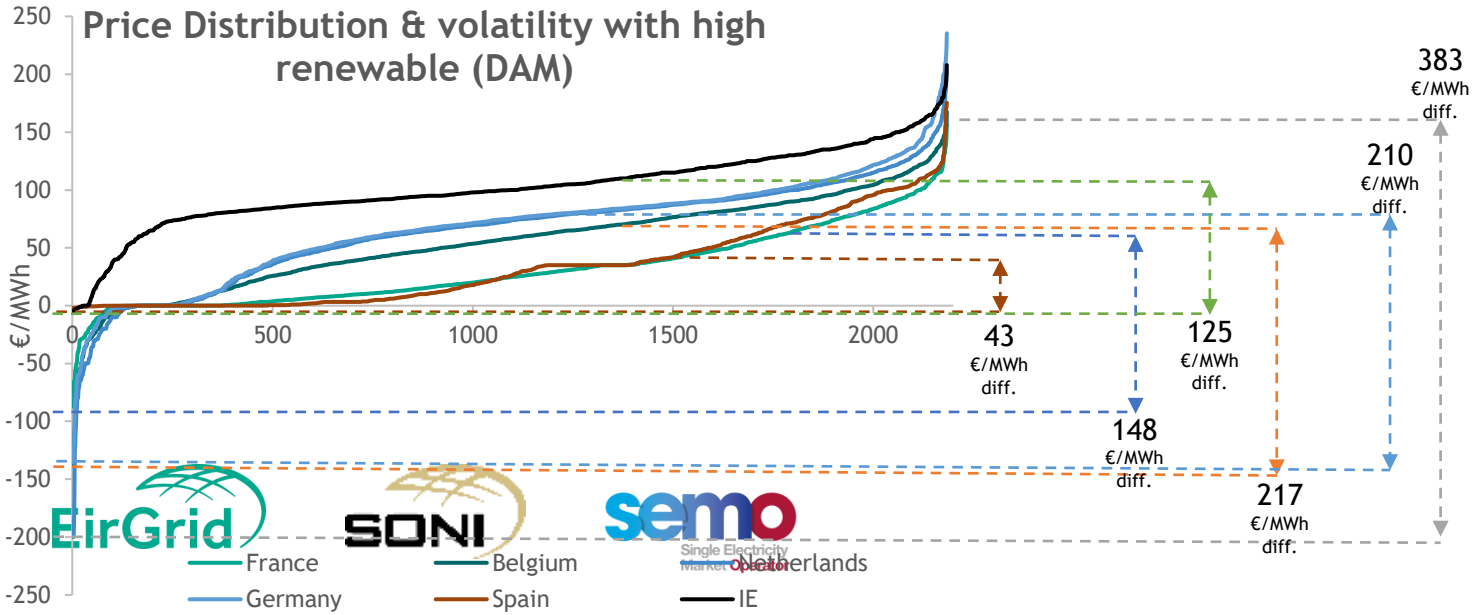
Flows and price distribution SEM vs Europe



Lowest price	Highest price
SEM	FR
NL	BE
SP	SP
BE	NL
FR	*SEM*
GER	GER

Flow direction tendency

SEM has shown a tendency to import on 3 out 4 examples showed.



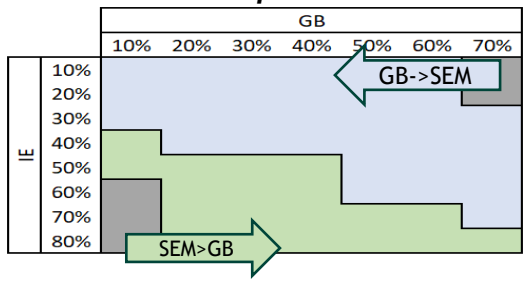
Lowest price	Highest price
NL	SP
BE	FR
GER	BE
FR	GER
SP	*SEM*
SEM	NL

Flow direction tendency

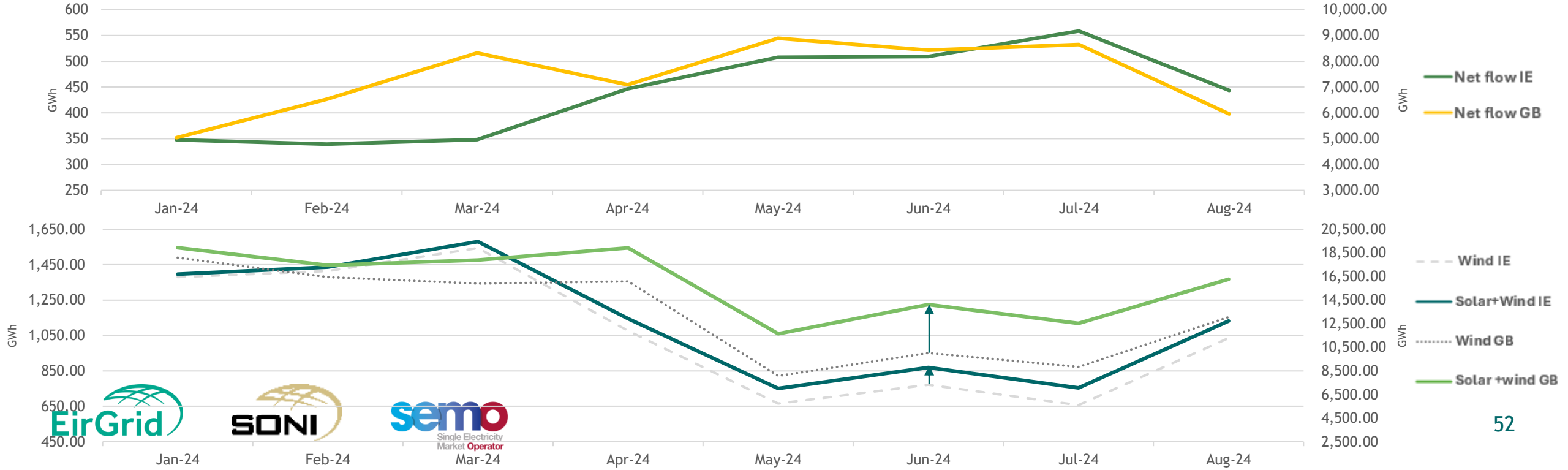
Ex-Ante Markets

- The summer saw a high predominance of import flows from Great Britain to SEM. (July saw the highest import record.)
- At the same time, Great Britain also showed a predominant flow of imports from Europe and Nordic countries.
- Solar share within the Ex-Ante markets increased significantly this summer, reaching 3% during daylight hours

Renewable penetration.



\+ Europe & Nordic Inflow.



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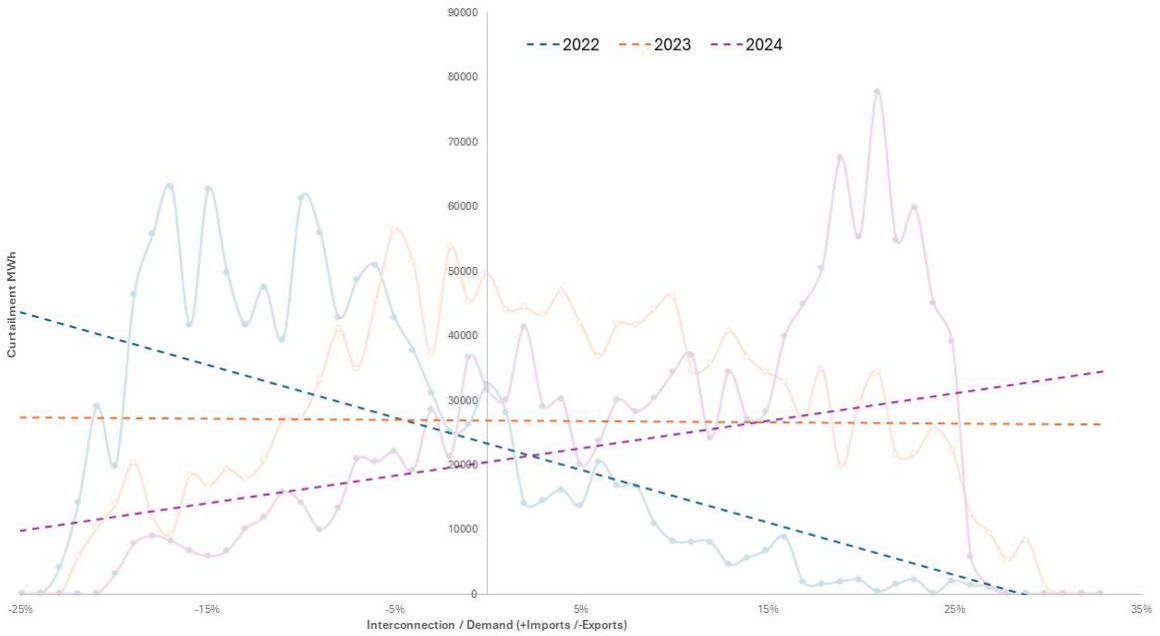
Dispatch Down Context SEM

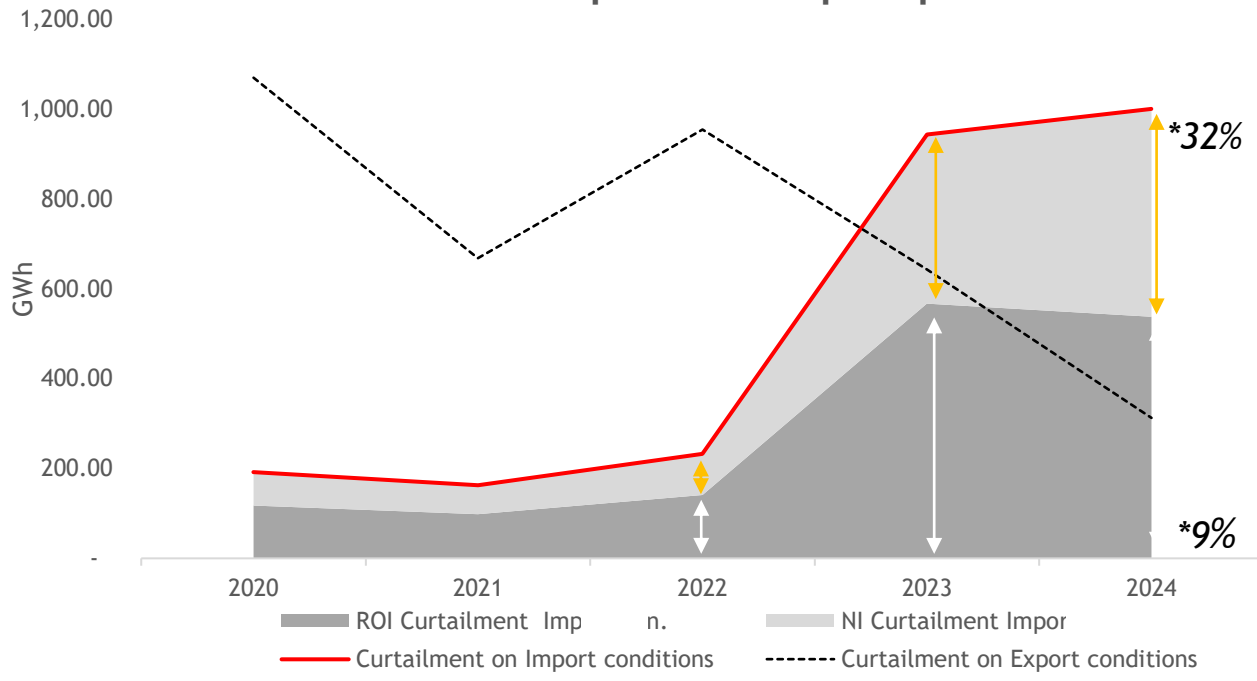
- A significant increase in Dispatch Down has been observed during 2023 and into 2024.
- High levels of Imports exacerbating Constraints
- Import flows within the SNSP control count as part of the system's asynchronous generation. Therefore, imports can generate curtailment

$$SNSP = \frac{\text{Wind + Solar + HVDC Imports}}{\text{Demand + HVDC Exports}}$$

Curtailment tendency vs interconnection penetration



Curtailment on import and export periods



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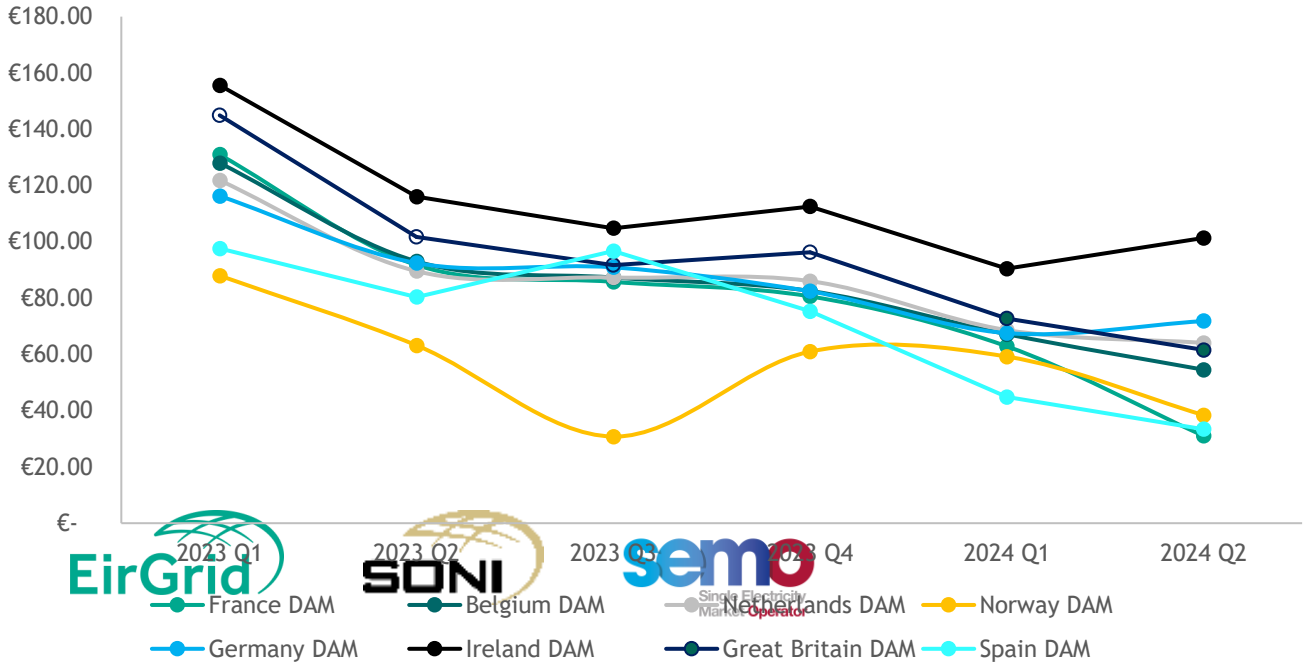
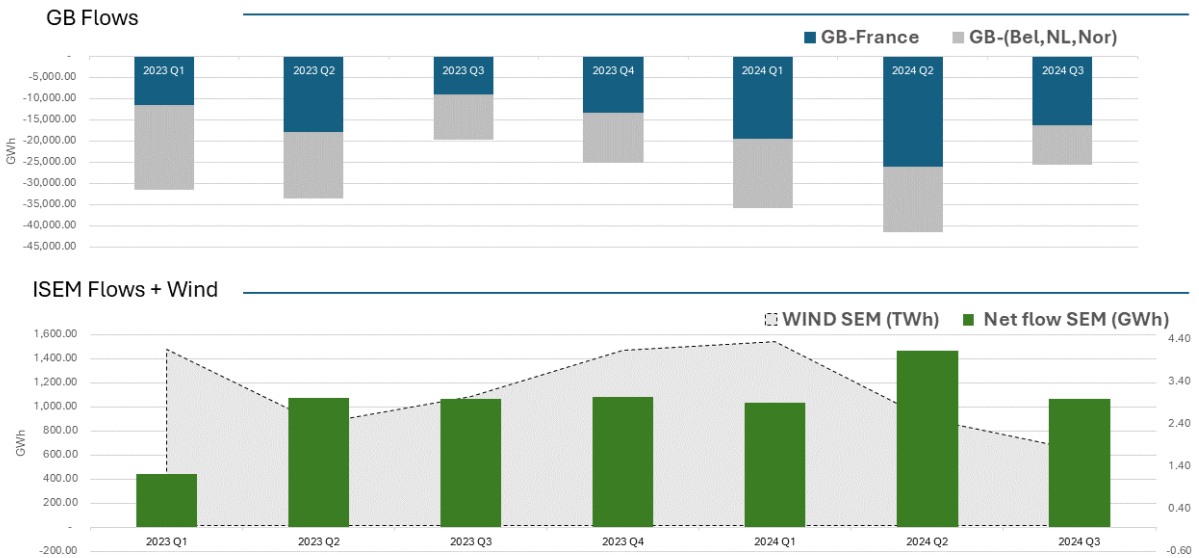
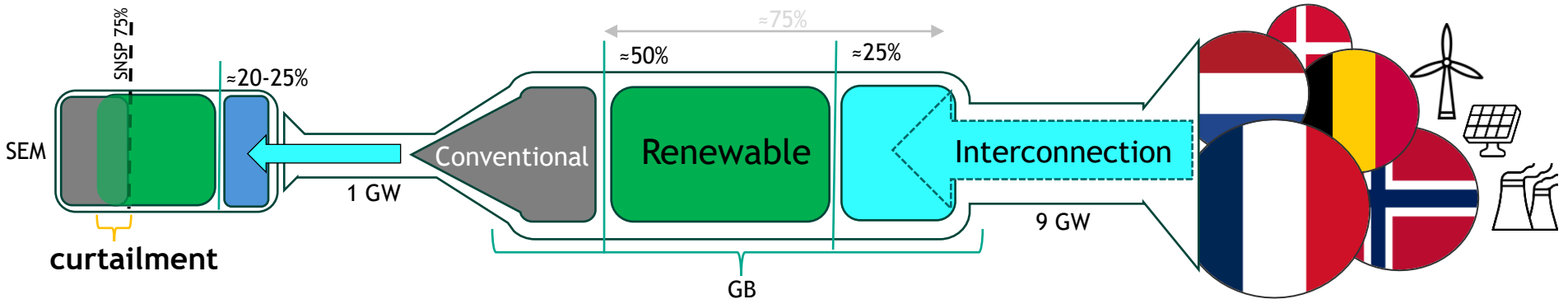
Context 2023-2024

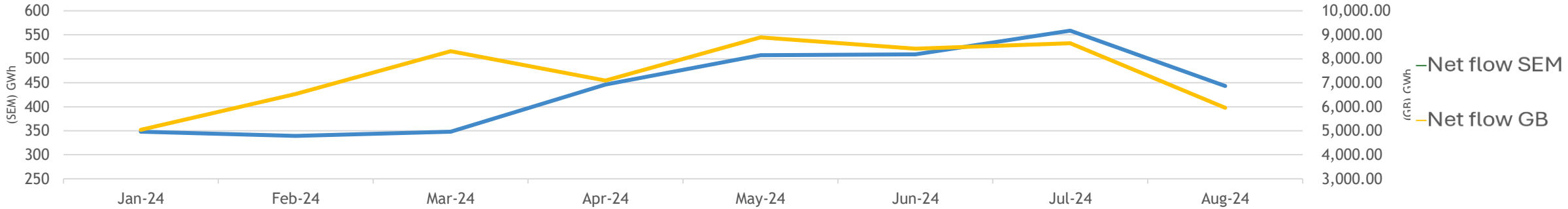
- Installed solar capacity increases - (Spain:27%, France:11%, Bel; 35%, Netherlands ≈50%, Germany 9%), Wind capacity on the other hand showed an increase in some countries due to supply chain problems
- The gas market stabilized due to EU and GB storage and the mild winter temperatures.
- 2024 has shown itself to be the year of overgeneration, as the continued increase in renewable capacity in Europe and the absence of increased energy demand from industry has placed the system in a state of overgeneration where interconnection has served as a form of relief the renewable overgeneration.

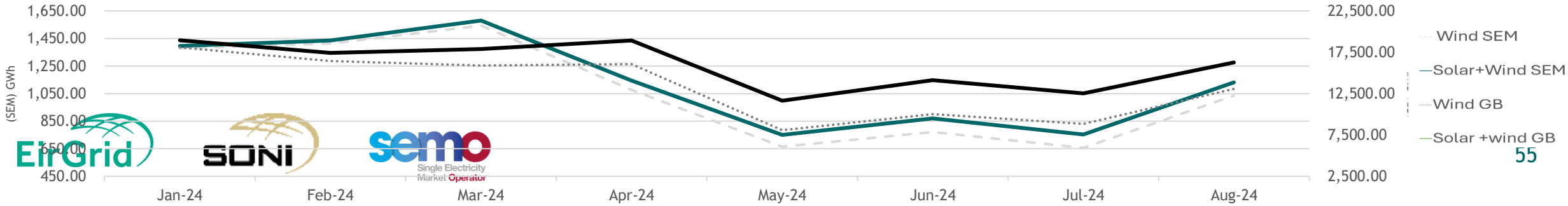




GB the flow intermediary







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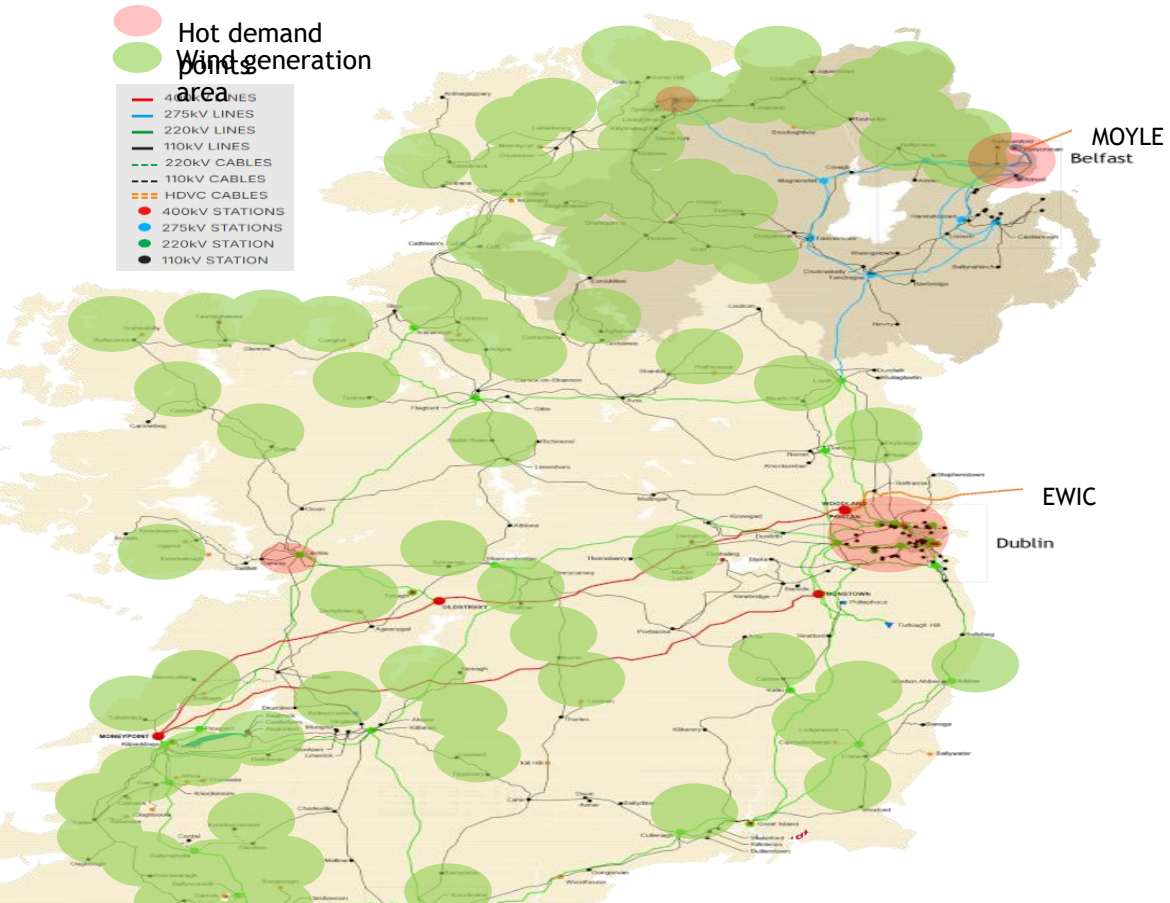
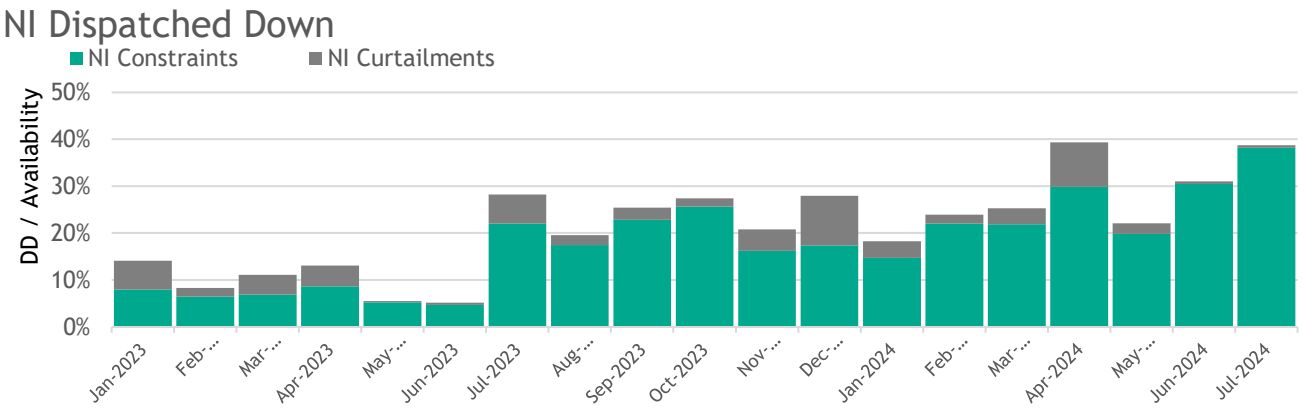
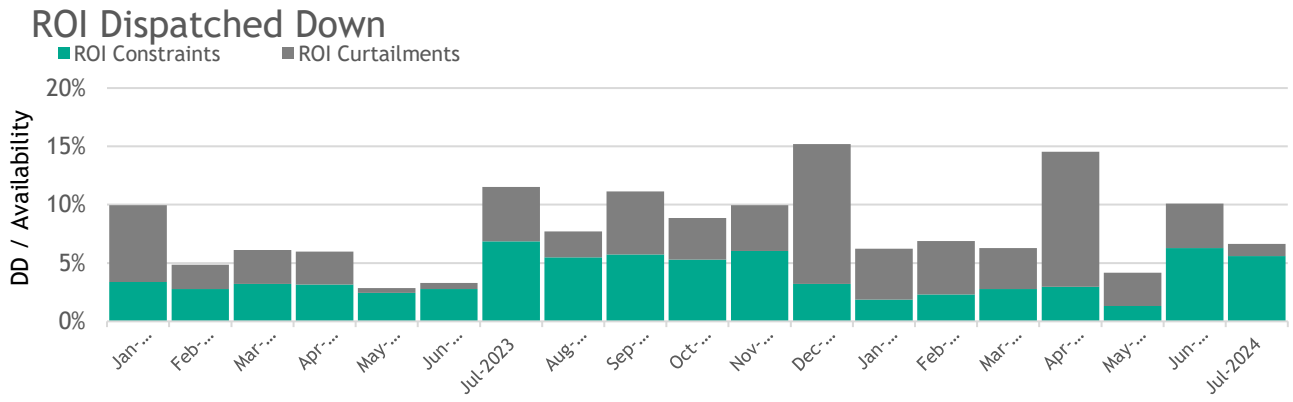
Constraints and Dispatch Down

- The North-South Tie line is critical in distributing the constraints were are currently seeing
- Recoupling of the DAM with GB could lead to more efficient outcomes with the low-cost renewables competing with GB and with more liquidity
- Building a more flexible and robust network
- Storage and low carbon Inertia also vital
- NI has a total of 23% of the island's intermittent renewable capacity and 18% of the island's total demand, so in periods of low demand we observe higher levels of this type of dispatch down.







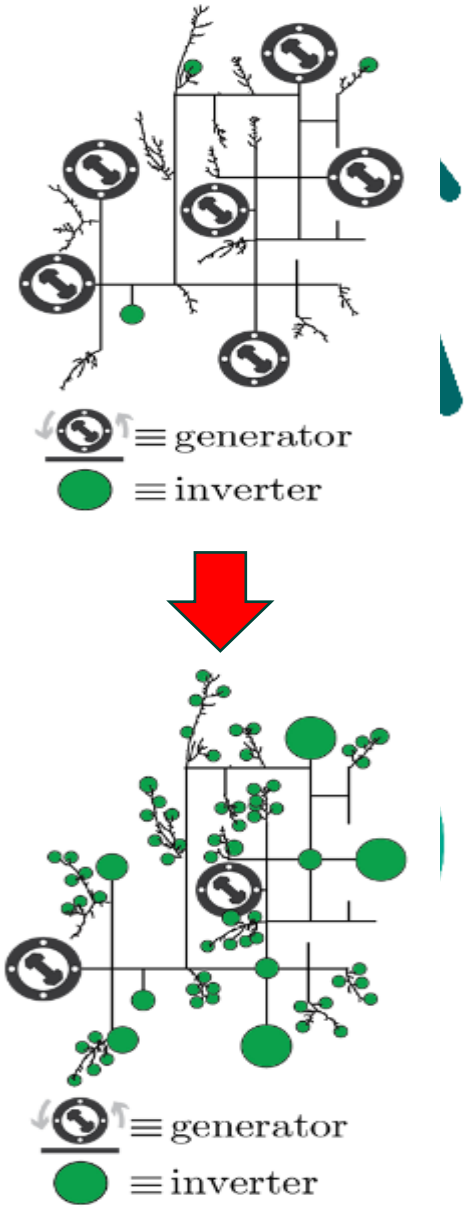
Minimum Number of Units Constraint

Currently a minimum of 7 large generators on the island

Unit IE
AD2
DB1
GI4
HNC
HN2
MP1
MP2
MP3
PBA
PBB
TYC
WG1
MP5

Minimum of 4 large generators in IE + MP5 Sync Comp and 3 large generators in NI.

Unit NI
B10
B31
B32
C30
KGT6
KGT7



ECP 2.4 Constraint Reporting
Process and Timelines

Presenters

David McGowan

Marc Senouci

Agenda

Background

Key Metric - Total Dispatch Down

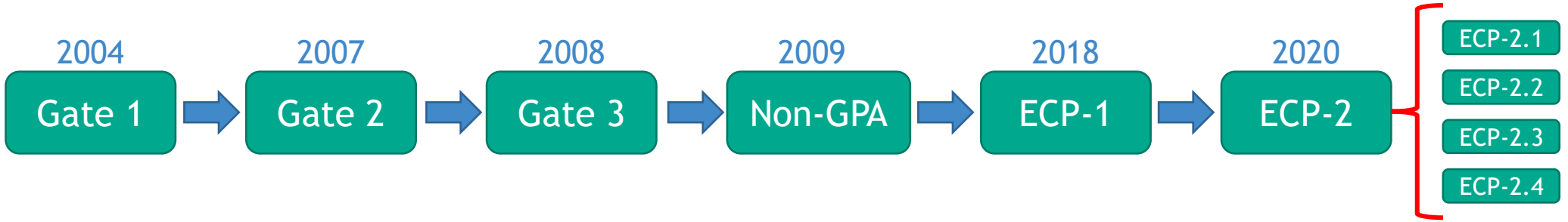
Analysis Process

Study Scenarios

Timeline and Engagement Plan

EirGrid

Background



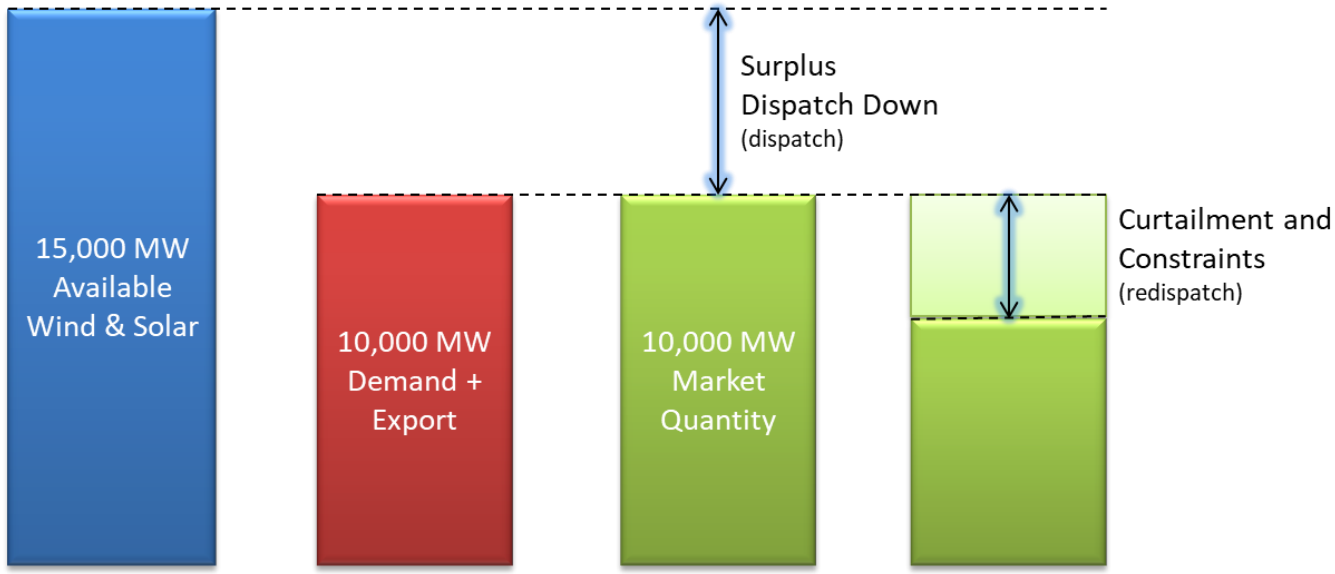
- The Enduring Connection Policy (ECP) 2-4 is the fourth batch of connection offers for Renewable Energy Sources (RES) planned under ECP 2 by the Commission for Regulation of Utilities (CRU).
- The ECP 2-4 Constraints Analysis is carried out by EirGrid (as per CRU/20/060 decision on ECP 2) to forecast dispatch down levels for ECP 2-4 wind and solar projects.
- EirGrid plans to publish 12 regional constraints reports that will provide ECP 2-4 customers with information on potential dispatch down levels in each region.
- Timeframe for completion of this work is Q4 2024.

EirGrid

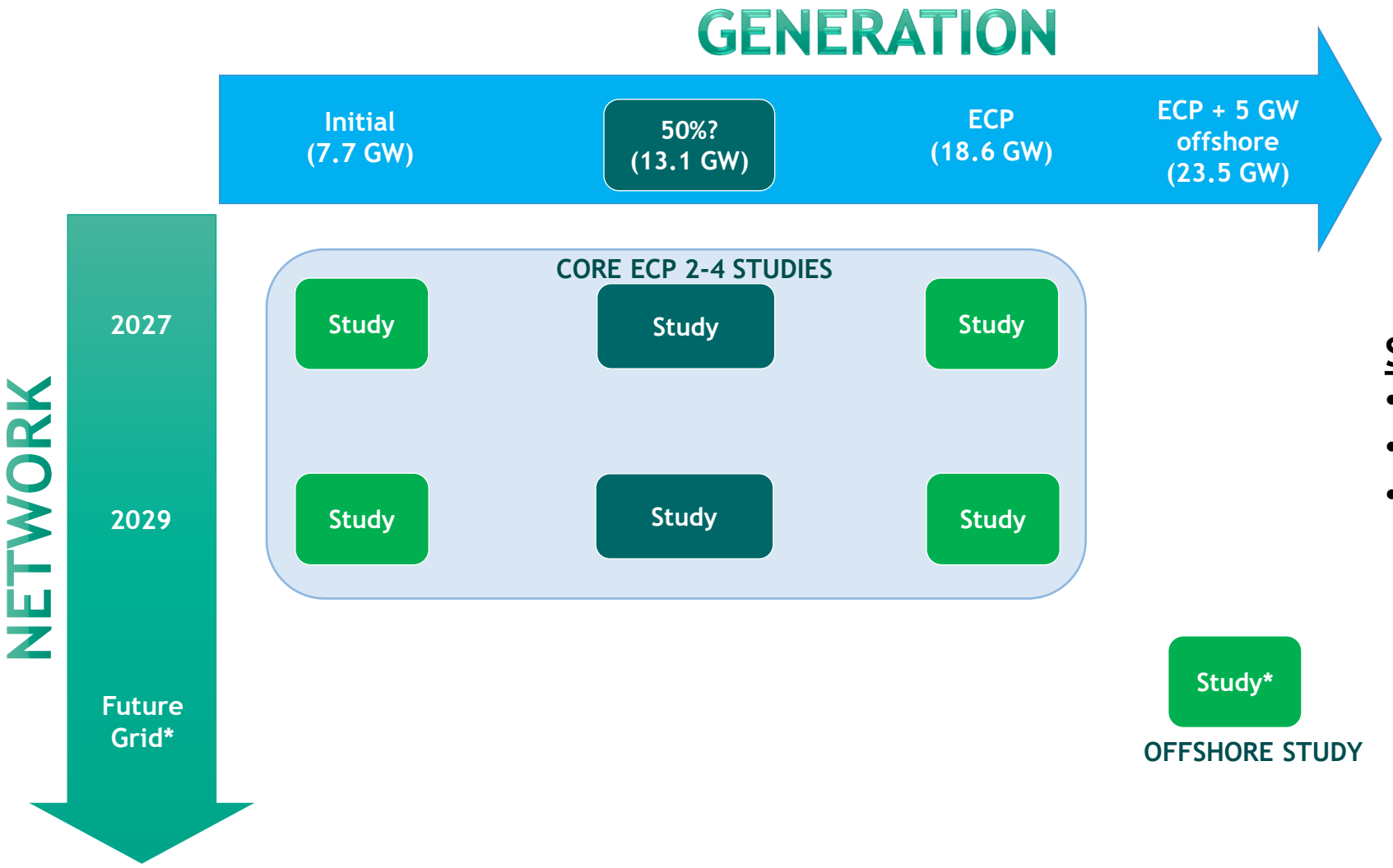
Key Metric: Total Dispatch Down

Total Dispatch Down
- Sum of Surplus, Curtailment & Constraint

Type of Dispatch Down	Definition
Surplus	Dispatch down applied for energy balancing when generation exceeds demand + interconnector export.
Curtailment	Dispatch Down applied to ensure operational limits are met.
Constraint	Dispatch Down applied to manage network constraints.



Study Scenarios – Draft proposal for ECP 2.4



Scenario / Study Selection Criteria

- Total – 13
- Core scenarios – 5
- Flexible scenarios/sensitivities – 8 (seeking industry input)

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* SOEF 1.1 based network

Study - Core Scenarios

Study - Optional Scenarios

Timeline

Jun - Jul ‘24	Aug - Sept ‘24	Sept – Nov ’24	Nov - Dec‘24

Engagement Plan and Status

- First industry stakeholder engagement webinar – Mid July 2024 [Completed]
- Industry scenario proposal - End of August 2024 [Received]
- Engagement with industry representative – September 2024
- Second industry stakeholder engagement webinar – Early October 2024
- Final assumptions publication – October 2024
- Draft results webinar – December 2024
- 12 area reports published – December 2024
- Final area results webinar – January 2025

EirGrid

Questions

EirGrid

Discussion Topic: Energy Storage Policy Framework

Presenter

John Finnegan, DECC

Rialtas na hÉireann
Government of Ireland

Electricity Storage Policy Framework for Ireland

- Published 04/07/2024

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Government of Ireland

Overview

- The goal of the Policy Framework is to support Ireland in achieving its 2030 climate action targets and address the electricity grids immediate and near-term needs, by incorporating the optimum amount of electricity storage required up to 2040.
- The Policy Framework outlines the present roles, technical processes, market positions and regulatory structures of electricity storage in Ireland.
- The Policy Framework also presents 10 Government actions to support the role of electricity storage system in Irelands energy transition up to 2040.
- The Policy Framework was developed and reviewed with the assistance of the Commission for Regulation of Utilities (CRU) and the System Operators, EirGrid and ESB Networks, through the Storage and System Services working group, as part of the Accelerating Renewable Electricity Taskforce.

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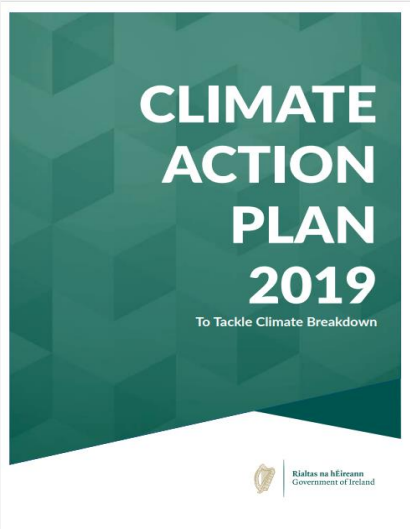
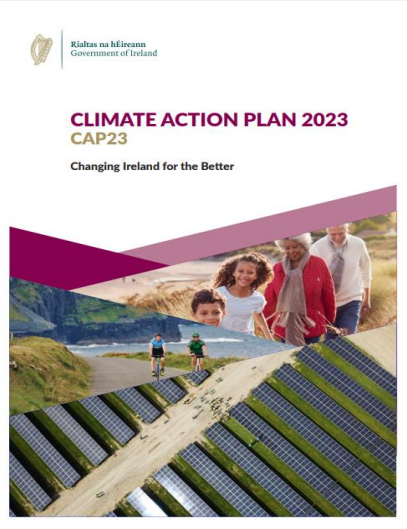
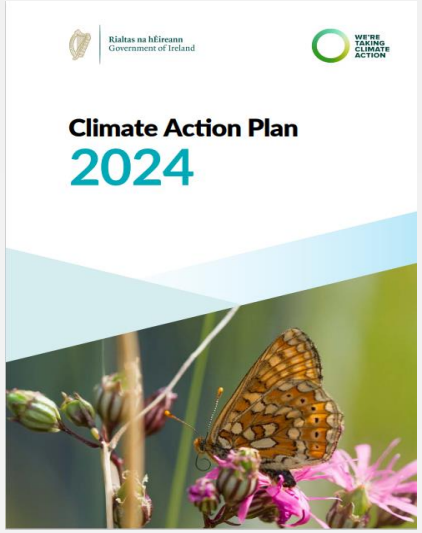
Background







- Climate Action Plan (CAP) 2019: Strengthening policy to incentivise electricity storage.
- CAP 23 action EL/23/22: Publish a policy framework for electricity storage based on electricity system needs.
- CAP 24 action EL/24/16: Adopt an Electricity Storage Policy Framework.

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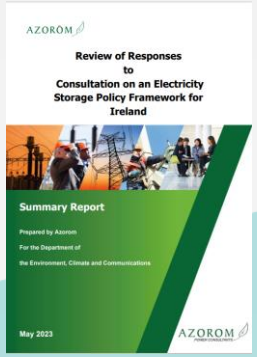
Consultation

- As part of the policy development process the Department ran a public ‘Consultation on Developing an Electricity Storage Policy Framework for Ireland’.
- November 2022 to January 2023
- The Consultation received 68 responses subsequently published on the Department website.
- A review of responses, developed by Azorom, was published on the Department website in May 2023.



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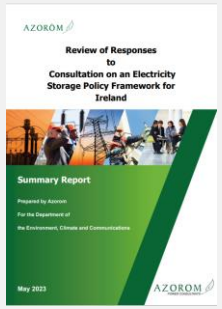
Consultation responses - Key learnings



- Greater alignment between key stakeholders and Government.
- ‘Missing Money’: Existing market structures and arrangements do not provide a sufficient revenue stream for investment in (longer term) storage.

- Action #1-4: Technology neutral, Stakeholder engagement and Sandbox project.
- Action #5: Support of multiple revenue streams.
- Action #6: Immediate procurement of 1GW via System Operator procurement schemes.
- Action #7-10: Ensure continued investment into Electricity storage systems up to 2040 in line with system needs.

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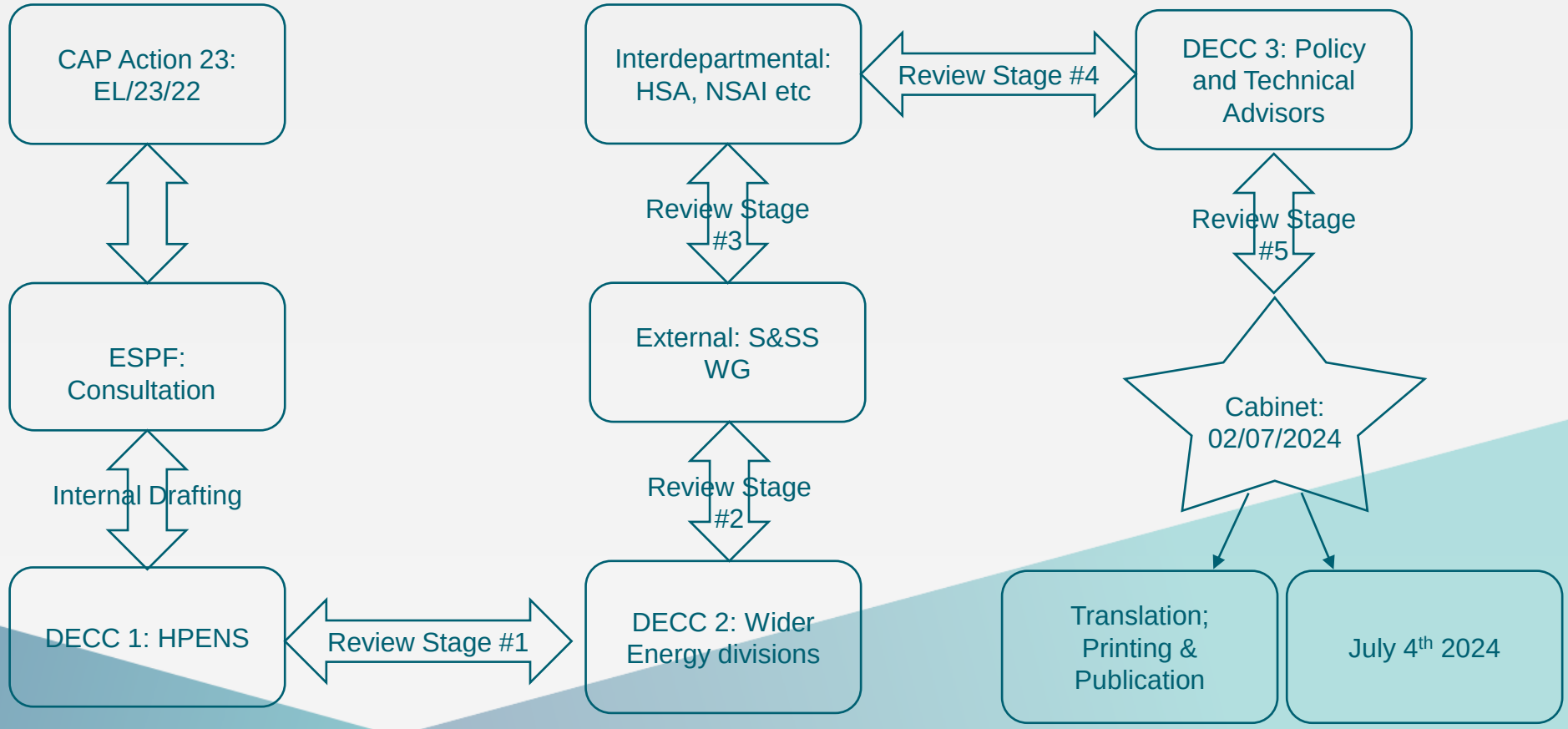
Development Process



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Chapter 1: Electricity Storage Overview

- Chapter 1 outlines the scope of the policy (Front of Meter) and this Governments ambitions and commitments to assist electricity storage in meeting Irelands climate targets for 2030 and beyond.
- Chapter 1 sets the precedence of the policy, including definitions, and the relevant stakeholders.
- Chapter 1 sets out Actions #1-#4.
- These 4 actions relate to the technology agnostic approach of the policy, research into emerging electricity storage technologies and two stakeholder engagements regarding electricity storage.

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Chapter 2: The Role of Electricity Storage

- Outlines the background, role and benefits of electricity storage across the Irish electricity system.
- Explains the three principal functions of Electricity storage systems in assisting the effective and efficient functioning of the electricity grid network incorporating greater amounts of renewable generation:
    - Demand Flexibility of dispatchable electricity.
    - Strategic Grid Build-out.
    - System Services.
- The Enduring Connection Policy (ECP).
- References residential battery energy storage (R-BESS), EV flexibility and Aggregated storage
    - European directives
    - The present position
    - Future workstreams

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Chapter 3: Markets

- Chapter 3 outlines the present market access and finance streams for electricity storage.
- The EU Electricity Market Design (EMD) framework and Renewable Energy Directive (RED III).
- Single Electricity Markets (SEM)
- Action #5: Revenue stacking and arbitrage.
- Current financial mechanism for electricity storage
    - The Capacity Remuneration Mechanism (CRM)
    - Renewable Electricity Support Scheme (RESS)
    - The DS3 programme and new System Services Future Arrangements (SSFA) and daily (DASSA) auctions.
- ESB Networks' Demand Flexibility Product
- EirGrid's Long Duration Energy Storage Product
- Action #6: The Immediate procurement of 1 GW
- Actions #7-#10: Address the grid networks electricity storage requirements up to 2040.

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Chapter 4: Safety and Regulation

- Chapter 4 provides an overview of the existing safety regulation in place for electricity storage systems both Internationally and in the European context.
    - EU Directive (2023/1542)
    - The International Electrotechnical Commission (IEC)
    - European Norm (EN) Standards
    - CE Marking
    - Underwriters Laboratories (UL)
    - National Fire Protection Association (NFPA)
- Roles and remits of various regulatory authorities and organisations in relation to standards, planning, construction, licencing and safety in the Irish context.
    - Dept. Housing, Local Government & Heritage
        - *Planning (Local authorities & An Bord Pleanála) / National Directorate of Fire & Emergency Management*
    - Dept. Enterprise, Trade and Employment
        - *National Standards Authority of Ireland / Health & Safety Authority*
    - Environmental Protection Agency

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Annexes

- The Annexes provide additional granular detail in relation to the content included in the chapters.
- 9 annexes:
  - Annex A: 18 Battery Electricity Storage Systems (BESS) in Ireland.
  - Annex B: Electricity Storage System Technologies
  - Annex C: EN Specific Standards
  - Annex D: EU Regulation
  - Annex E: IEC Standards
  - Annex F: National Regulation
  - Annex G: Silvermines Pumped-hydro Electricity Storage System
  - Annex H: UL & NFPA Specific Standards
  - List of Abbreviations

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Action implementation timelines

Action #	Action	Stakeholders	Timeline				
			2024	2025	2026	2027	2028
1	Maintain a technology neutral approach to all electricity storage systems.	DECC					
2	Creation of a ‘sandbox’ project to advance both System Operators’ technological knowledge of emerging electricity storage technologies.	DECC, EirGrid, ESB Networks					
3	Convene an electricity storage and system services working group as part of the Accelerating Renewable Electricity Taskforce	DECC, CRU, EirGrid, ESB Networks					
4	Convene a forum for an expanded group of stakeholders including statutory bodies, leading industry representatives and academic / interest groups.	DECC & Wider Stakeholders					
5	Support access to the wholesale electricity markets, arbitrage and revenue stacking for electricity storage systems.	CRU, SEMO, DECC with the assistance of System Operators					

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Policy Actions Implementation

Action #	Action	Stakeholders	Timeline				
			2024	2025	2026	2027	2028
6	Support the Immediate Procurement of Demand Flexibility products and of (long duration) electricity storage to meet specific network needs, in the Distribution and Transmission systems, respectively.	CRU, EirGrid, ESB Networks	→	★			
7	Initiate a 'Quantity' consultation to establish the optimal (long duration) electricity storage requirements to meet climate targets and electricity grid network expansion between 2030-2040.	DECC	→	→	→	→	→
8	Initiate a 'Financial' consultation to establish if the expected market mechanisms due between 2025-2028 will provide sufficient service provider certainty to meet the optimum (long duration) electricity storage systems requirements of 2030-2040.	DECC	→	→	→	→	→
9	If required and pending the outcome of the 'Financial' consultation, develop a market framework to further incentivise the incorporation of (long duration) electricity storage system technologies to the grid to meet projected 2030-2040 requirements.	DECC with assistance from CRU	→	→	→	→	→
10	To ensure a route to market for the identified optimum (long duration) electricity storage requirements for 2030-2040 is in	CRU with assistance from DECC					

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Questions & Answers

Transmission Renewable Hubs

Presenter

Elin Ahlund

Aim of today's presentation

- Explain concept of Transmission Renewable HUBs
- Delivery approach
- Elaborate on progress of Transmission Renewable HUBs

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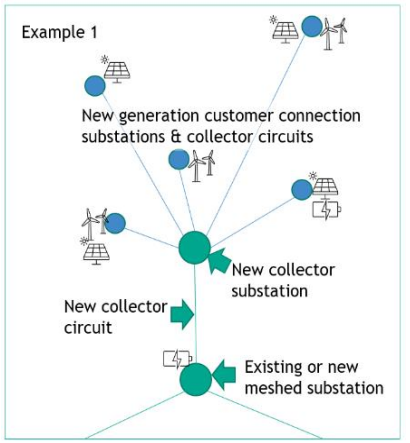
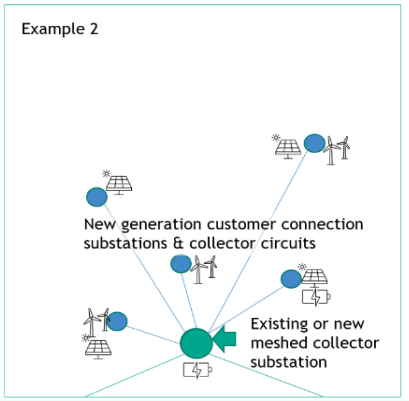
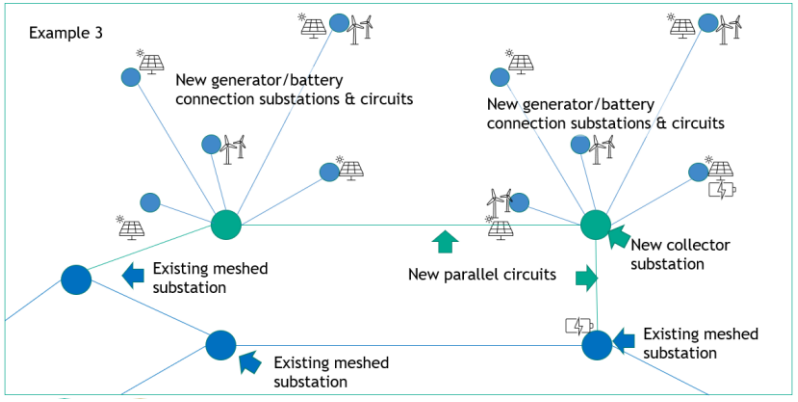
Concept of transmission renewable HUBs

- Substations where multiple energy projects connect
  - Each HUB solution is individually designed to suit the area and its needs
  - Will include new high voltage circuits (110, 220, 400kV) to connect back to transmission system
  - Concept previously used in South-west
- Principles used to design Transmission HUBs
  - HUB tailed back to network (Ex 1)
  - HUB looped-in (Ex 2)
  - HUB connected to other HUBs via new circuits then back to network (Ex 3)



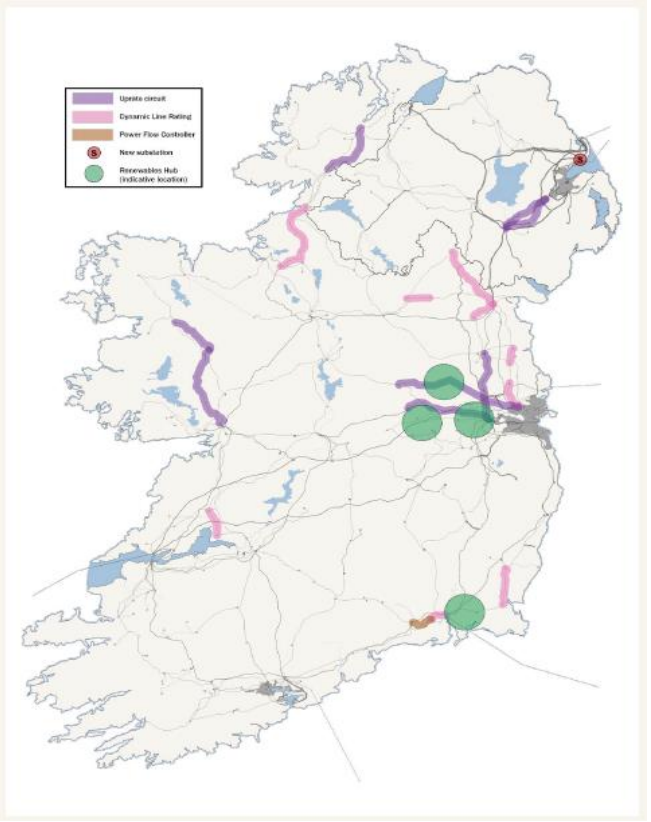




Concept of transmission renewable HUBs (continued)

- Four (4) renewable hubs indicated in SOEF 1.1
  - 1 x 400 kV loop-in
  - 1 x 220 kV loop-in
  - 2 x 220 kV tailed hubs

- Further enhancement of approach
  - Introduced future proofing concepts to enable acceleration of connection of renewables and resolve network constraints
    - Station Level HUBs
    - Regional HUB Networks



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Delivery approach

- A combined plan-led and developer-led approach has been adapted
  - Renewable hubs need to be developed in collaboration with the industry
  - Using the best aspects of both will make us achieve our targets quicker

- The approach will be considered individually for each HUB project
  - The pace of delivery will be a key driver for determining the delivery approach
  - Developers are sometimes able to deliver faster than EirGrid/ESBN
    - They may have commenced the process and may already have carried out part of the lengthy steps such as site & route selection and land acquisition
  - Where it is quicker for EirGrid/ESBN to develop the HUB projects - we will do so
  - Where appropriate we may use risk mitigations such as develop solutions in parallel up to a certain point

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Progress of transmission renewable HUBs
- Station level HUBs

- Future proofing stations to facilitate connection of more generation and minimize outages
  - Investments in advanced build
    - Additional land acquisition to allow expansion, additional bays installed, enhancement of station layouts, oversizing of circuit connections
  - Similar to DSO approach
  - Applied to both Customer Connections and TSO substations

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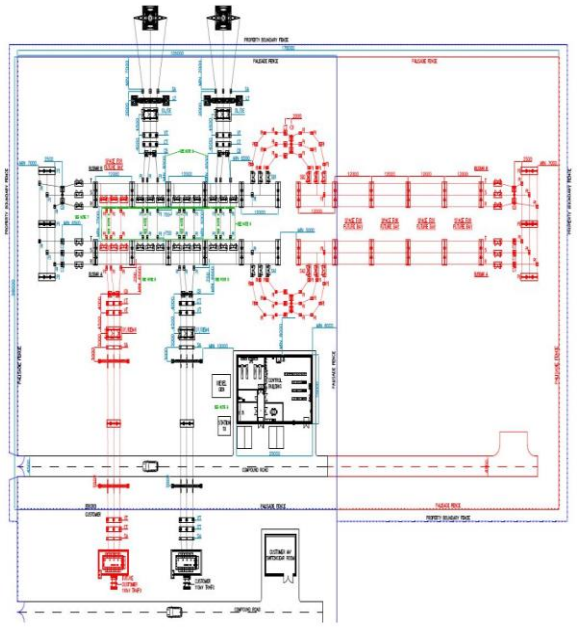
Progress of transmission renewable HUBs
- Station level HUBs



- Additional land acquisitions
  - From ECP 2.3, TSO procuring additional land adjacent to new substation sites to allow for expandable stations - 12 customer connections
- Additional bays installed in stations
  - Substations are planned with additional bays allowing for opportunities for new connections
  - 6 connections in ECP2.3 & 11 projects, totalling over 800 MW took advantage of additional capability included in the designs of earlier grid connections
- Oversizing of connections
  - Oversizing cables and proposing new stations – 2 particular projects
- Enhancement of station layouts
  - Minimize outages (overall cost savings) and improve the opportunities for new connections

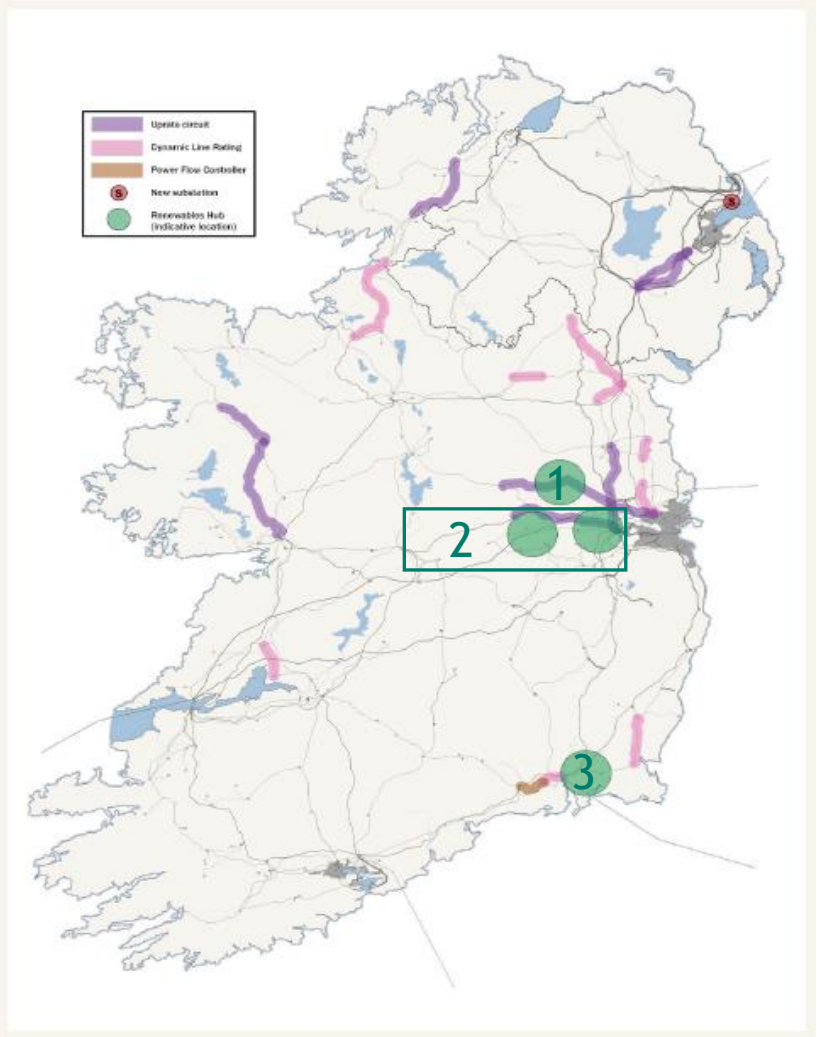
Proposals how to communicate this information to industry is being established

EirGrid

Progress of transmission renewable HUBs - Regional HUBs Network

- Three (3) identified HUB solutions

1. North Dublin/East Meath HUB
2. Midlands HUB
3. Southeast HUB
   - ➢ Analysis is ongoing to determine optimum solution.
   - ➢ Will not form part of this update.



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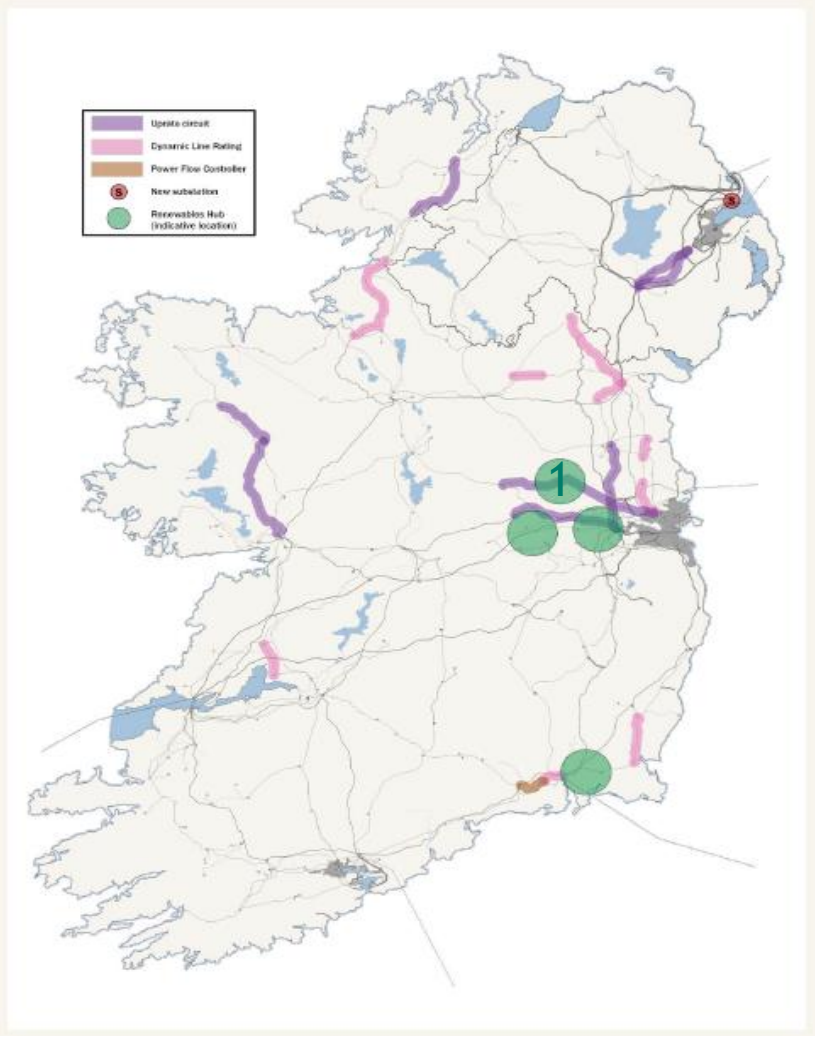
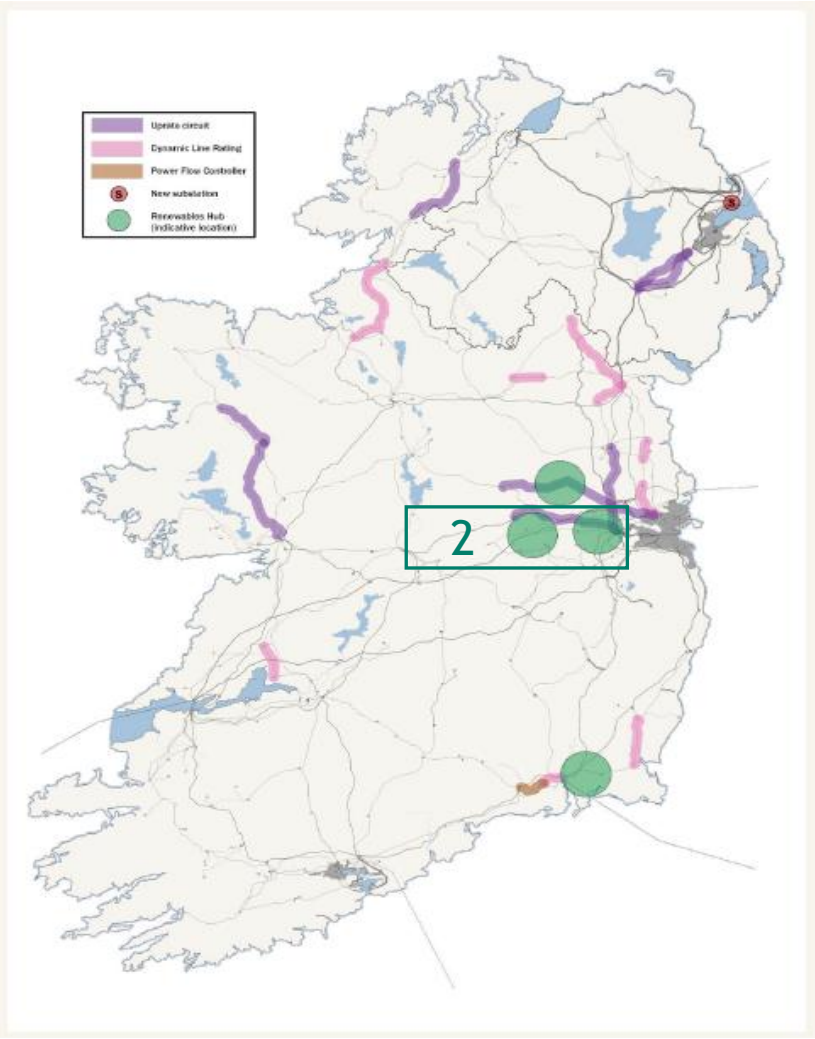
Regional HUB Network concept - Meath/North Dublin

- HUB is located slightly to the east compared to SOEF 1.1
- Multiple of new stations and circuits in the Meath/North Dublin region (400 kV & 220 kV). Merging with already planned projects in North Dublin.
- Incorporates a DSO request for a new BSP in North County Dublin
- Solution is initiated, currently in Step 3 of our Framework for Grid Development
- Majority of this development will be done by the EirGrid/ESBN
- Finalising part of an option where a developer would partake in some of the development.



Regional HUB Network concept - Midlands

- Two indicated HUBS in SOEF 1.1 have been merged to provide a more holistic plan for the area. Connecting various HUBS with new circuits to achieve a new high voltage pathway.
- This major strategic development covers a vast area of the Midlands
- Developments will consist of:
  - 1x new 400 kV station
  - 4x 220 kV stations and associated circuits
  - 2x 110 kV stations and associated circuits
- Development will assist with relieving constraints and facilitate further renewable generation projects in the area
- Majority of developments expected to be done by a developer as part of specific connection methods with additional works by EirGrid/ESBN



Thank You!

Any Questions?

EirGrid

Greenlink

Presenter

Maria Madders

Overview

1. Greenlink Interconnector Overview
2. Key Milestones
3. Programme Success to Date
4. Ramping Trial and Consultation

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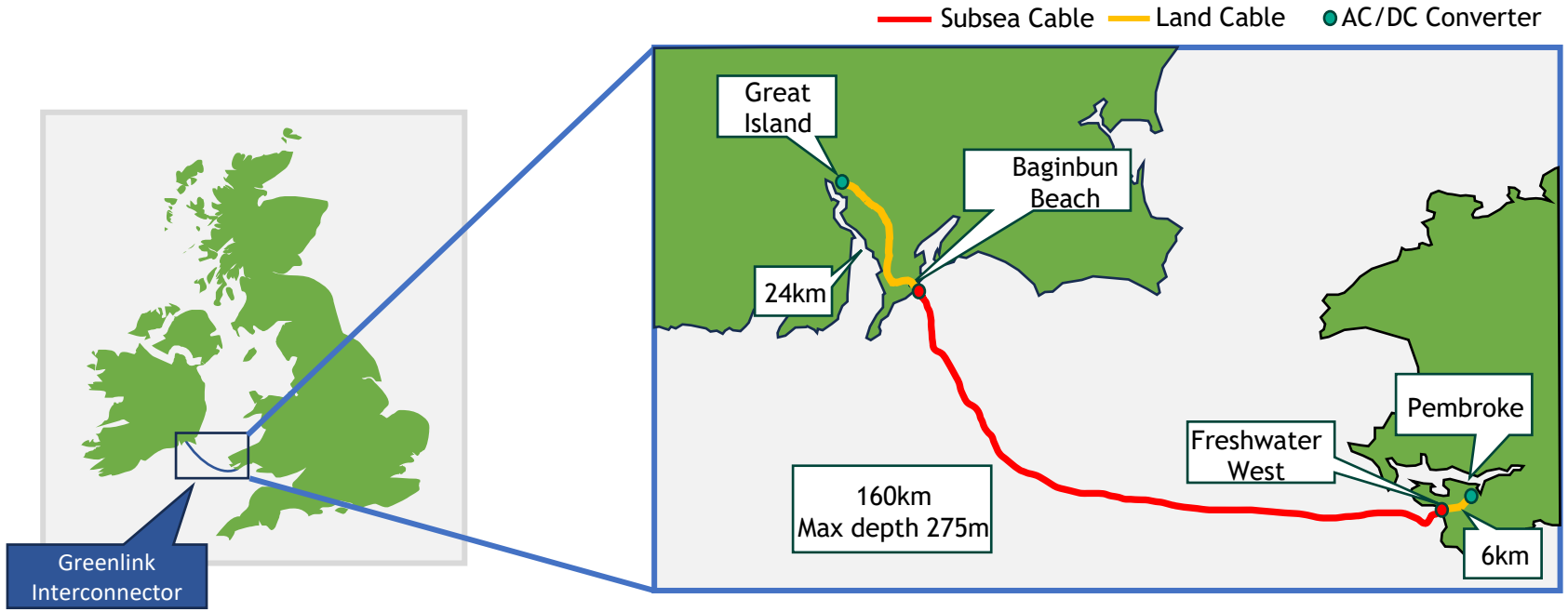
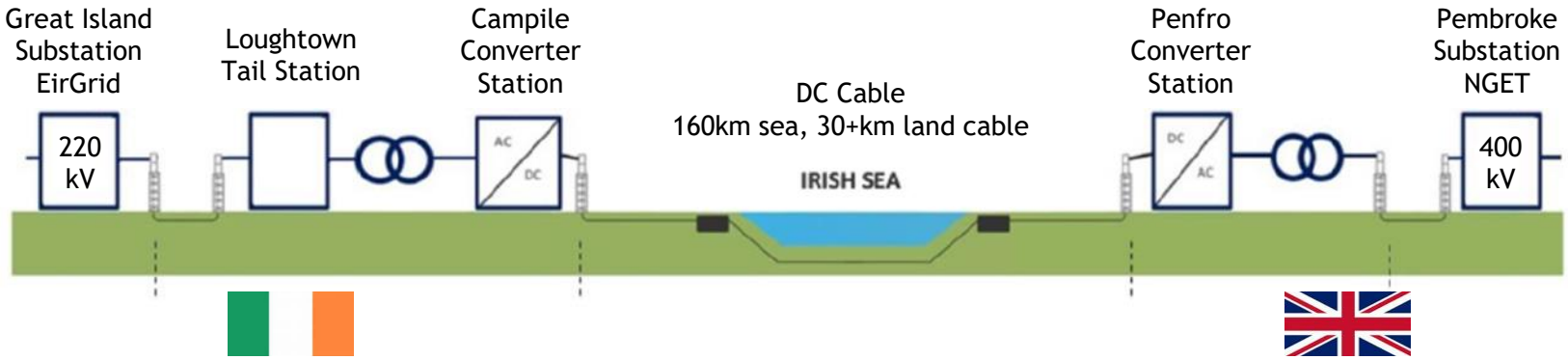
Greenlink Interconnector

Location, Geography and Scale

- HVDC cable connecting the electricity grids of Ireland and the UK
- 500 MW link
- HVDC VSC
  - 160km marine cable
  - 30km land cable
  - 1km HVAC cable





Greenlink Capacity and Operating Model

Capabilities / Features	
Feature	**Detail**
Max Capacity	504MW
DC Voltage	±320kV

Operating Model		
Model	**Asset management**	**Remote Operation**
Cap and Floor IC	Greenlink Interconnector Limited (GIL)	EirGrid (NCC Dublin via IOP)

- GIL belongs to “Partners Group”, a global private markets firm

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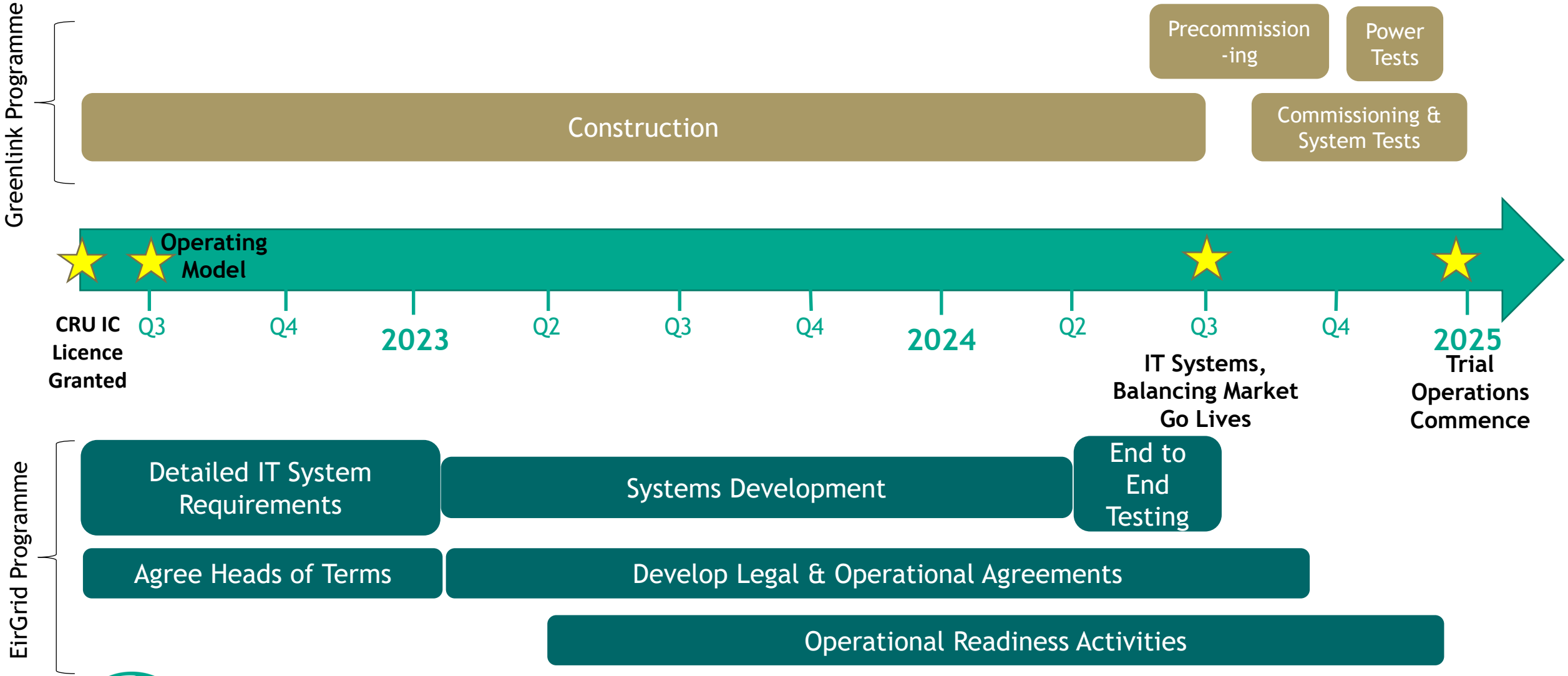
Key Milestones

High Level Programme Schedule



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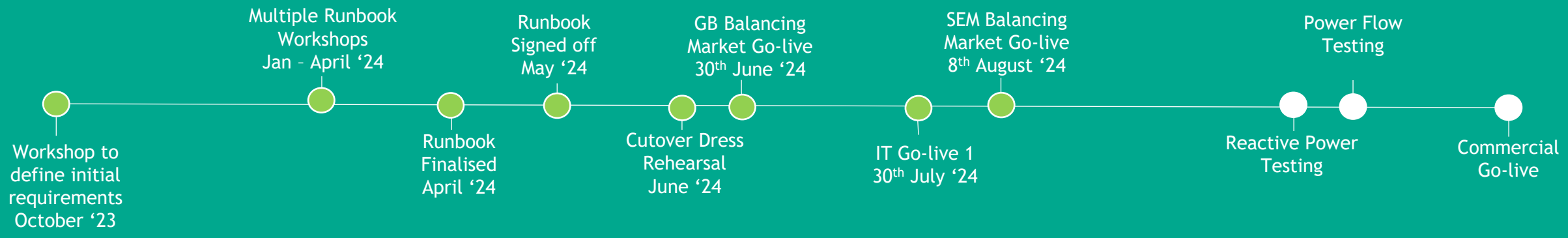
Programme Success to Date

Greenlink Programme - Achieving Technical Go-live

EirGrid GROUP

The Journey



The Details

Key strategic programme for All Ireland Security of Supply

- One team approach across Trading, Markets, Settlement, Registrations, System Operations, System Integrity, Future Operations, IT, Legal & Regulation.
- Coordination & Collaboration across all SEM-GB parties to enable go live (National Grid, Greenlink, SEMOpx, Elexon, EPEX, ECC)
- Greenlink can be traded, scheduled, dispatched, operated and settled in the SEM. Ready for MW flows.
- People, processes and arrangements in place to deliver Greenlink as Business As Usual.

Statistics

3 Major Cutover Milestones Completed

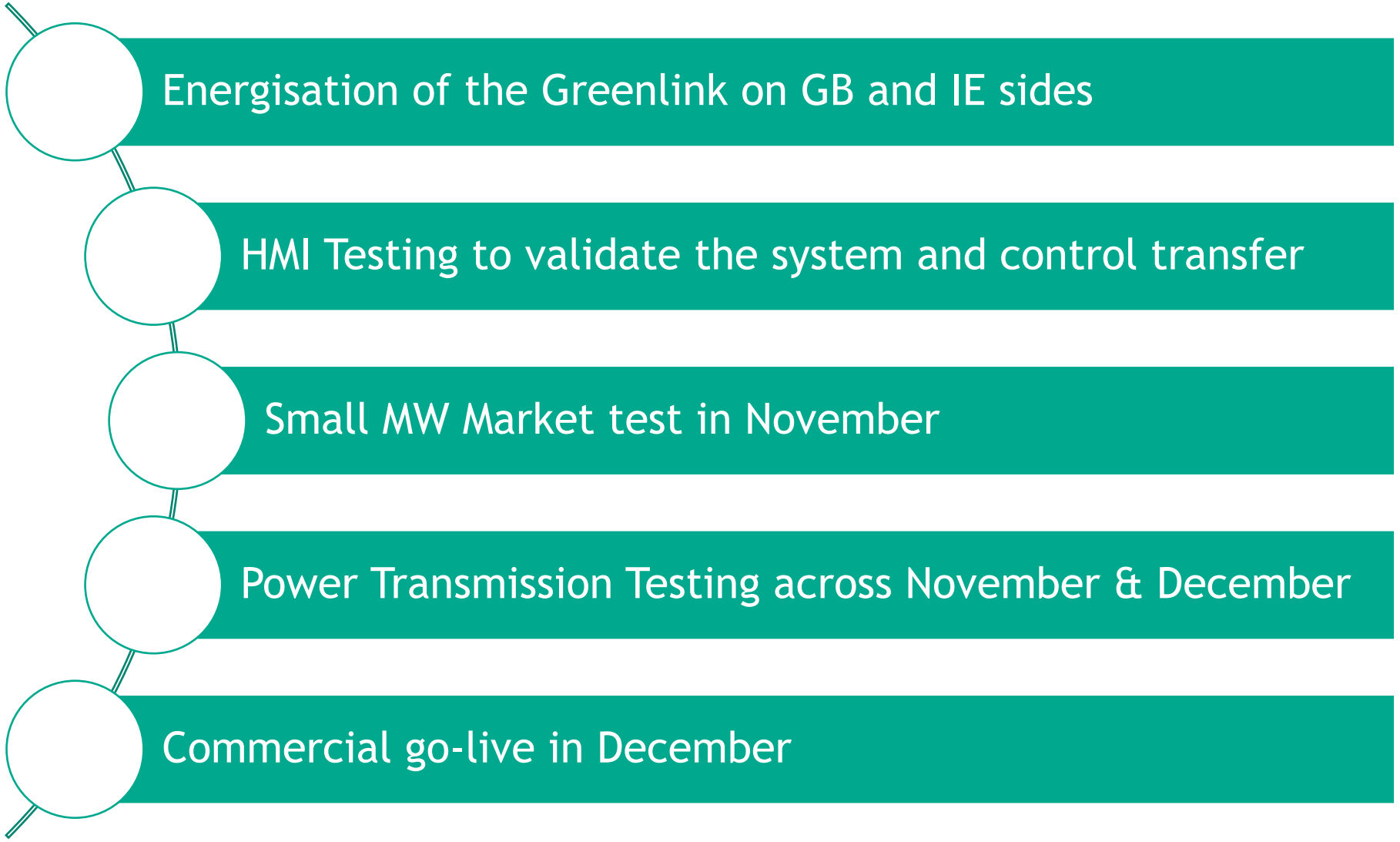
12 IT Systems go-lives

~80 Resources impacted and/or involved in Cutover

9 External Parties Involved

~500 Runbook Tasks to be completed across all go-lives

What's Next?



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Ramping Trial & Consultation

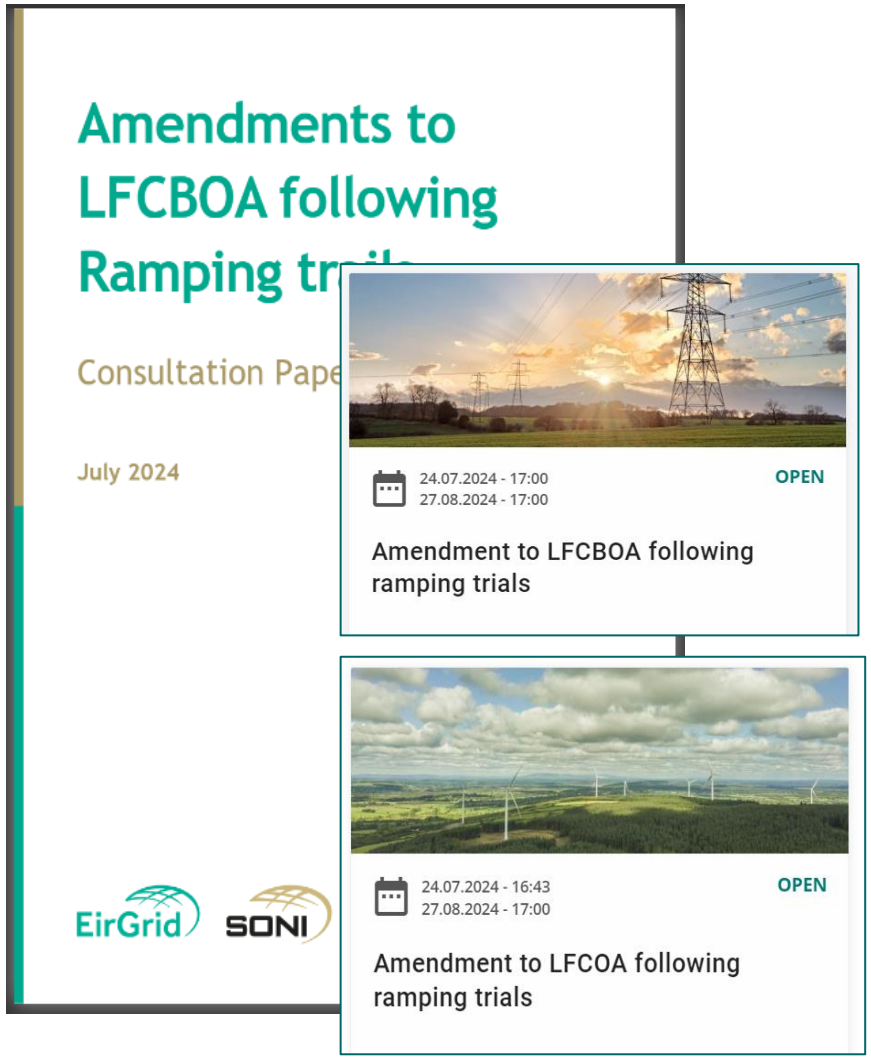
Interconnector Ramping

System Trials
Phase I: 05 Mar- 07 May
Phase II: 14 May- 27 May

Post Trial Analysis
27 May - 20 June

OPRC approval
27 June

Public Consultation
25 July - 27 Aug



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Interconnector Ramping - LFCBOA Consultation

Main amendments	Administrative changes
• **Article 3**: Change in ramping rate from 10 MW/min to 15 MW/min. Distribution of ramping among the remaining in-service interconnectors, if one or more interconnectors are on outage • **Article 17:** Paragraph on arming and disarming of Greenlink Frequency Control added	• Links updated • Version control • Typos • Numbering references

Next Steps

Consultation remains open

25 July – 27 Aug

Submit amendment LFCBOA to CRU & UR for approval:

2nd week of Sept

Draft of Response paper incl.

CRU & UR approval process

Sept -Nov 2024

Publish approved LFCBOA and response paper

Nov 2024

Greenlink Commercial Go-LIVE

Dec 2024

EirGrid

Meeting Close

Liam Ryan,
Alan Campbell

Next Meeting

February 2025

EirGrid SONI