



SOEF Advisory Council Meeting 2

Herbert Park Hotel,
Ballsbridge,
Dublin 4

Thursday 15 September 2022

@ 09:30 – 16:00



Delivering a cleaner
energy future

Agenda

Meeting Chair: Liam Ryan

Topic	Time	Speaker
Arrival Registration, Tea, Coffee	09:30	
Introduction & Welcome	10:00	Liam Ryan (EirGrid)
TSO / DSO	10:15	Ellen Diskin (ESB Networks) / Eoin Kennedy (EirGrid)
Bridging the Gap	10:45	Noel Cunniffe (Wind Energy Ireland)
Tea Break	11:05	
Long Duration Storage	11:20	Paul Blount (FuturEnergy Ireland)
Markets Programme Overview	11:40	Niamh Delaney (EirGrid) / Brendan O'Sullivan (EirGrid)
Networks Programme Overview	12:10	Matthew Staunton (EirGrid) / Paul Moran (EirGrid)
Engagement Programme Overview	12:40	Sinead Dooley (EirGrid)
Lunch in Suites	13:00	
Operations Programme Overview	13:45	Eoin Kennedy (EirGrid)
SOEF 1.1	15:00	Robbie Aherne (EirGrid)
Workshop kickoff	15:30	Workshops run concurrently, presenters listed below
Workshop 1 - Hydrogen		Robbie Aherne (EirGrid)
Workshop 2 - Emissions		David Carroll (EirGrid) / David McGowan (SONI)
Workshop 3 - Innovation		Eoin Kennedy (EirGrid) / Sam Matthews (SONI)
Wrap Up	15:50	David Carroll (EirGrid)
Close	15:55	Liam Ryan (EirGrid)

Scope of Advisory Council



Shaping Our Electricity Future
Advisory Council

Remit of Advisory Council



- The Advisory Council will not be a decision making or policy formulation body.
- The remit and purpose of the Advisory Council is to:
 - Discuss, review and ultimately help facilitate the progress of the Shaping Our Energy Future (SOEF) Programme
 - Share relevant information related to the implementation of the Programme
 - Communicate with stakeholders
 - Provide a forum to discuss stakeholder views and concerns on those issues which impact on the implementation of the Programme and;
 - Provide input, advice and assistance on matters related to the Programme and its implementation.

Operating Principles



- The Council shall operate in accordance with the need for a high level of transparency.
 - A draft agenda shall be drawn up by the Chair and circulated to the members of the Advisory Council no later than five business days before the meeting;
 - Documents that are necessary for the meetings shall be normally circulated to the members of the Council at least five business days before the meeting;
 - Subsequent to the meeting, and within ten business days, EirGrid and SONI will circulate draft minutes from the meeting to all advisory Council members by e-mail;
 - A summary of each meeting will be published and
 - The list of members of the Advisory Council shall be made public.
- All costs incurred by members of the SOEF Advisory Council associated with their participation will be at their own expense.



Schedule and Format

- The Advisory Council will meet every 4 months (three times a year)
- The meetings will be chaired by the EirGrid Group Chief Innovation and Planning Officer
- Minutes and actions will be recorded and kept under review. A summary of each meeting will be published
- Ad-hoc meetings outside the regular schedule will be held on an exceptional basis as required.

SOEF Advisory Council provisional meeting dates	
2	15 September 2022
3	18 January 2023
4	10 May 2023 (Hybrid)
5	13 September 2023
<i>Dates may be subject to change</i>	

Key:
*Welcome to New Member

SOEF Advisory Council Members



Members are appointed ad personam and primarily for their competences, no alternates as continuity is essential for success of the Council.



Intro and Welcome

All Island Summary (Jan – Jun 2022)

- All Island RES-E of 42%* approx.(percentage of demand) was achieved during Jan-Jun 2022 with 37% from wind generation.
- At times, RES-E provided up to 97% of All Island demand with the maximum output of 4,585 MW in February 2022.
- The Power System was operated between 25% and 50% SNSP for 31% of the time, and above 50% SNSP for 33% of the time, an increase of 8% from the first six months of 2021.
- Total System Demand (Jan-Jun) is 19,634 GWh – a increase of 466 GWh from the same reporting period in 2021
- System Peak Demand Level of 6,763 MW in January 2022.

TSO-DSO Programme

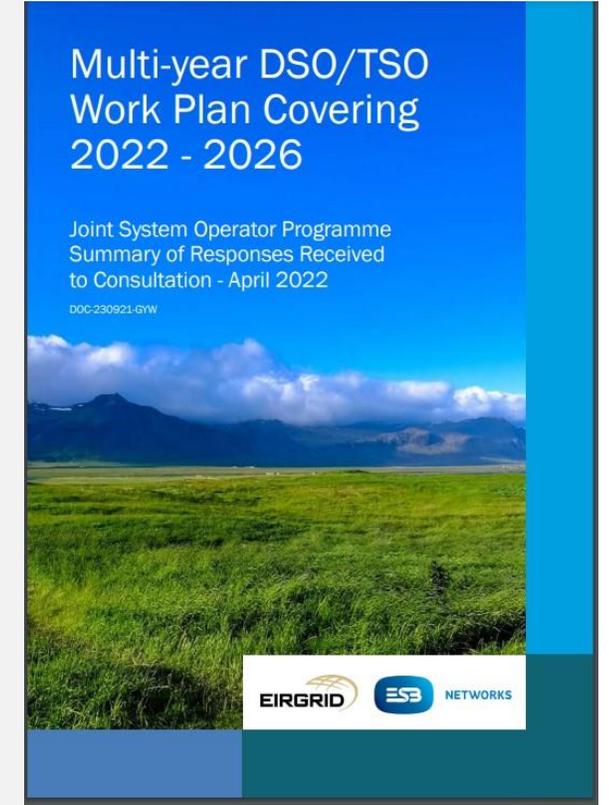
Presentation to SOEF Advisory Council
15 September 2022



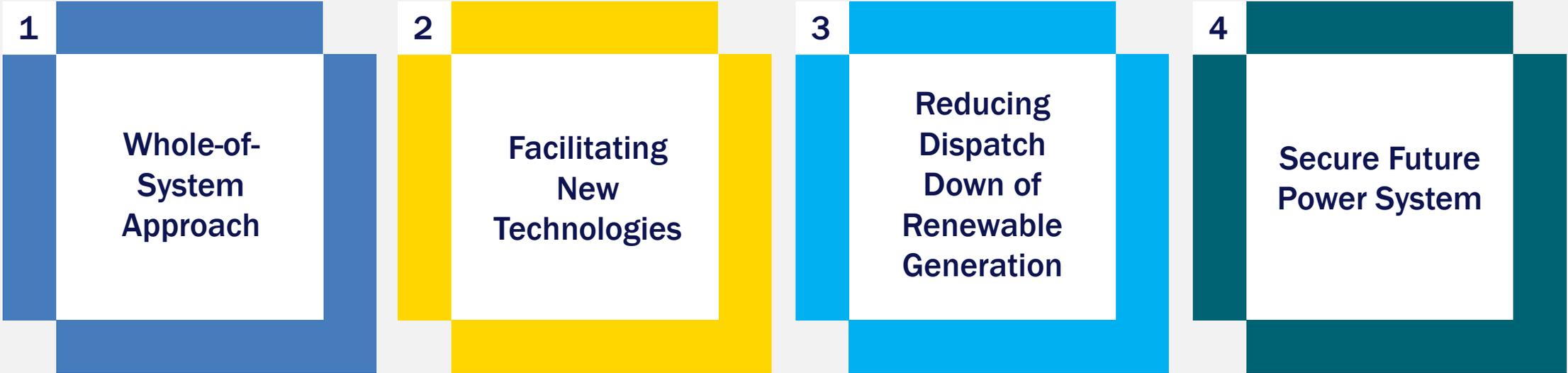
TSO-DSO Multi-Year Plan



- MYP 2022-2026 first published October 2021
- Responses to the consultation published April 2022
- Detailed multi-year plan for 2023-2025 and high-level plan for 2026-2027 now in development



Together we are working across four Pillars to support Ireland's 2030 and longer-term climate and energy policy objectives

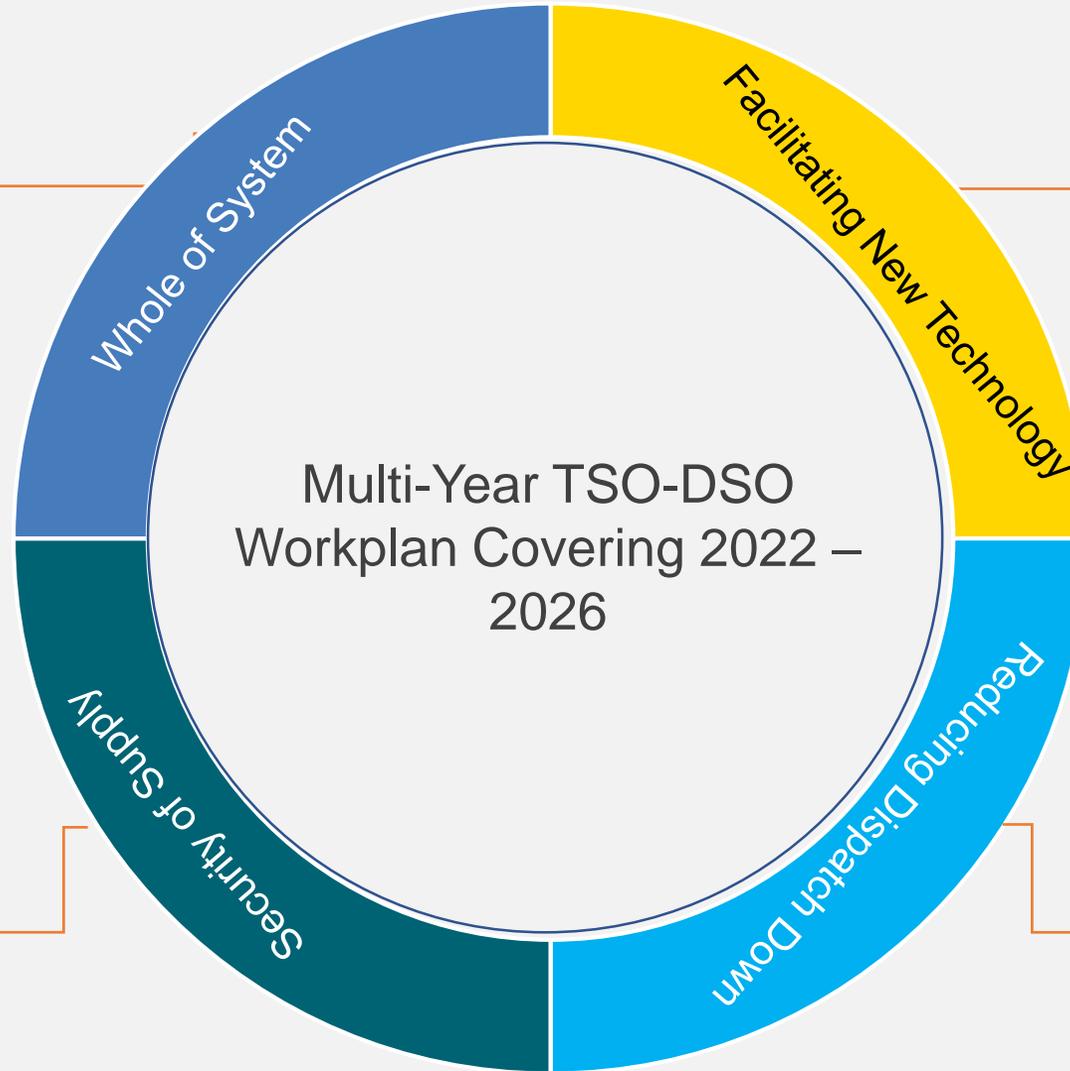


Detailed multi-year plan for 2023-2025
High-level plan for 2026-2027

Last Year's Multi-Year Plan (2022 – 2026)

- Agree future Operating Model vision and principles
- High level design on Operating Model
- Develop aggregation structure paper
- Apply the test rule-set for Pilot 1

- Procedures for coordination of protection settings of our largest customers
- TSO-DSO protocol for flexible demand.
- Implementation of outcome of CRU consultation centre connections
- Review of co-ordinated demand management approaches



- Agree contractual framework approach to accommodate MLEs behind a single connection point
- Recommendation on the over install policy
- Pilot 1 DSO /TSO process model
- Go live of first DSO pilot 1
- Maximum Export Capacity (MEC) trading approach
- Pilot 2 DSO /TSO operating model processes developed and published

- Nodal controller trial report
- DER visibility, forecasting and modelling
- Plan for next steps on reactive power co-ordination.
- Assessment of potential QTP projects to assist in reducing dispatch down of renewables.
- Wind and solar forecasting

Multi-Year Plan 2023 – 2027

- We are currently working together to update the plan for 2023-2027
- Proposed plan will be submitted to CRU by end September 2022
- Public consultation to follow CRU submission
- Today we are sharing a draft of the “Plans on a Page- POAP” with key milestones and activities for your feedback in advance of completing the proposed plan
- POAP shown here today are subject to change prior to start of official consultation
- Some tasks have external dependencies, such as key Regulatory Decisions.

Pillar 1 – Whole-of-System Approach

1

Whole-of-System Approach

- This pillar focuses on optimising the system as a whole rather than focusing on the transmission and distribution systems in isolation
- Key areas identified for co-ordination include:
 - Operational visibility and monitoring of respective network conditions
 - Co-operation on forecasting of generation and demand
 - Operational compatibility of respective local and system services in terms of planning, scheduling, dispatch and redispatch

Pillar 2 – Facilitating New Technologies

2

Facilitating New Technologies

- This pillar focuses on facilitating new technologies through actively progressing co-operative solutions via pilots/trials
- Key areas of focus include:
 - Hybrids
 - DSO flexibility services (Pilots)
 - Provision of system services from distribution-connected providers

Pillar 3 – Reducing Dispatch Down of Renewable Generation

3

Reducing Dispatch Down of Renewable Generation

- This pillar focuses on TSO-DSO co-ordination to minimise the dispatch down of renewable generation
- Key areas of focus include:
 - Developing DER visibility, forecasting and modelling
 - Improving wind and solar generation forecasts
 - Reactive power co-ordination
 - TSO-DSO co-ordination on constraints

Pillar 4 – Secure Future Power Systems

4

Secure Future Power System

- This pillar focuses on addressing **the long-term** challenges associated with, and leveraging the opportunities created by:
 - High renewables penetrations
 - High volumes of distributed energy resources (DER)
 - Widespread demand side flexibility
- We will identify and prepare to address the longer-term operational requirements for maintaining security of supply as the power system evolves

Next Steps

Any feedback received today will be considered when we finalise the plan

Consultation in October – you will be invited to formally “Have Your Say”

Plan will be updated by year end and advised to CRU

Consultation response document will issue in 2023

Bridging the Gap

Towards a zero-carbon power grid

Noel Cunniffe, CEO, Wind Energy Ireland

September 2022

windenergyireland.com





Our Vision



www.windenergyireland.com



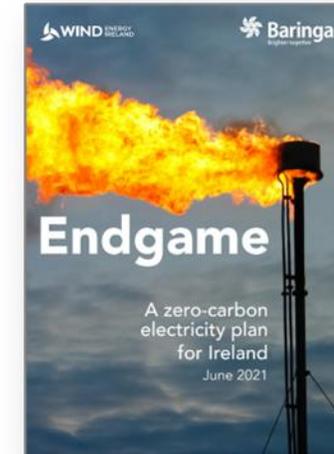
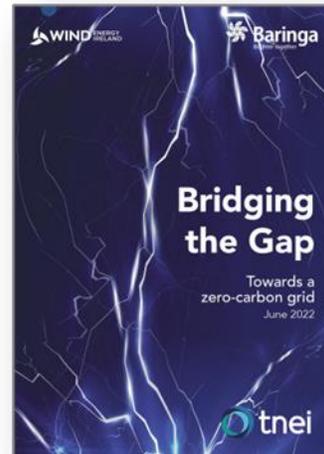
WIND ENERGY IRELAND

We will deliver a zero-carbon electricity system
in Ireland by 2035.

And to do that we must hit our carbon and
renewable electricity targets for 2030.

Bridging the gap from 70% RES-E to...

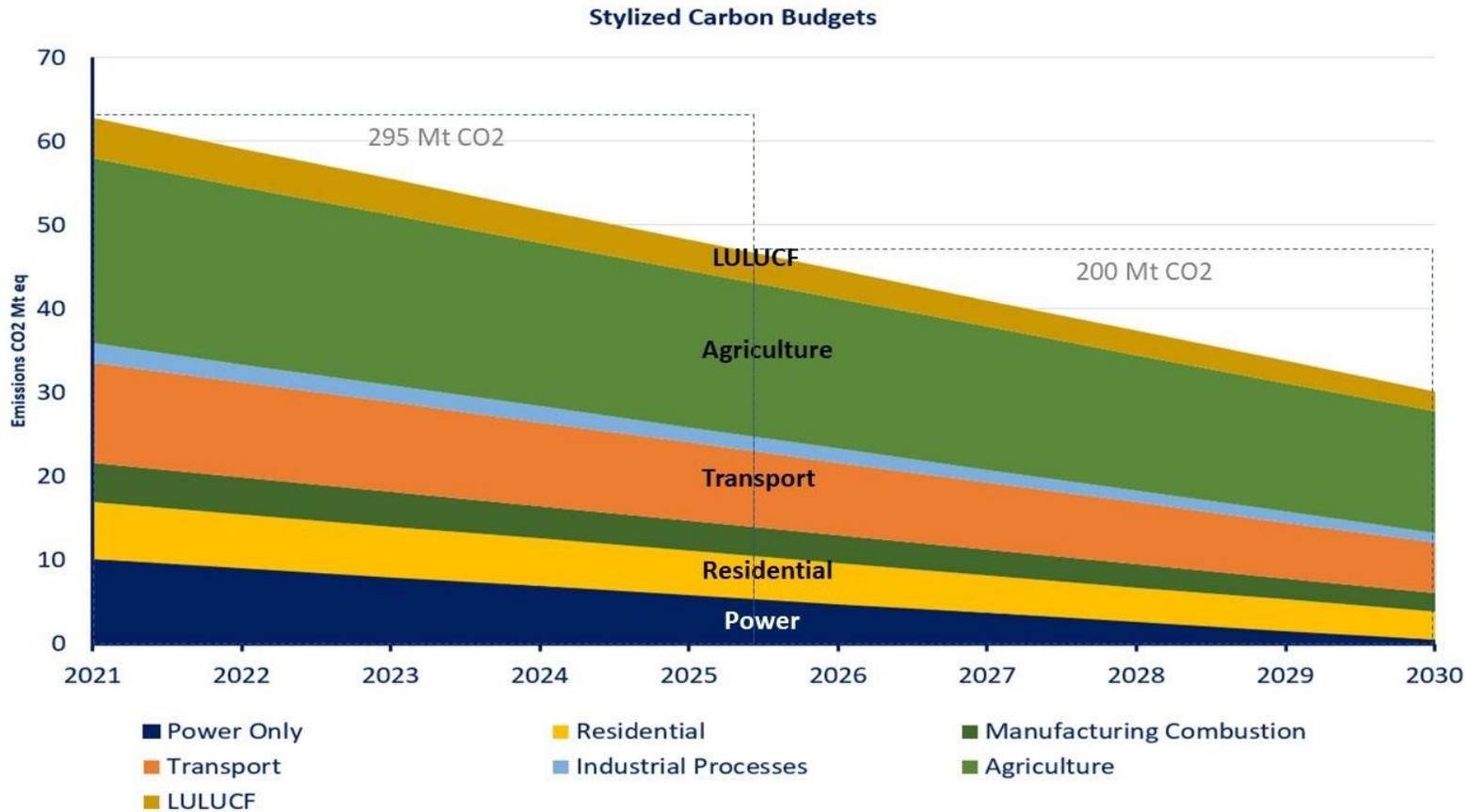
- ✔ 80% RES-E by 2030
- ✔ 2 (3) Mt CO₂ of power sector emissions by 2030
- ✔ Achieving 2021 - 2030 carbon budget



WEI commissioned Baringa and TNEI to assess how to achieve these objectives and consider options for creating more space on the grid for zero-carbon renewable energy

Carbon budget targets - what should they be?

In April the Government approved the overall carbon budgets for 2021 - 2030 and the sectorial emissions budgets are being set in July

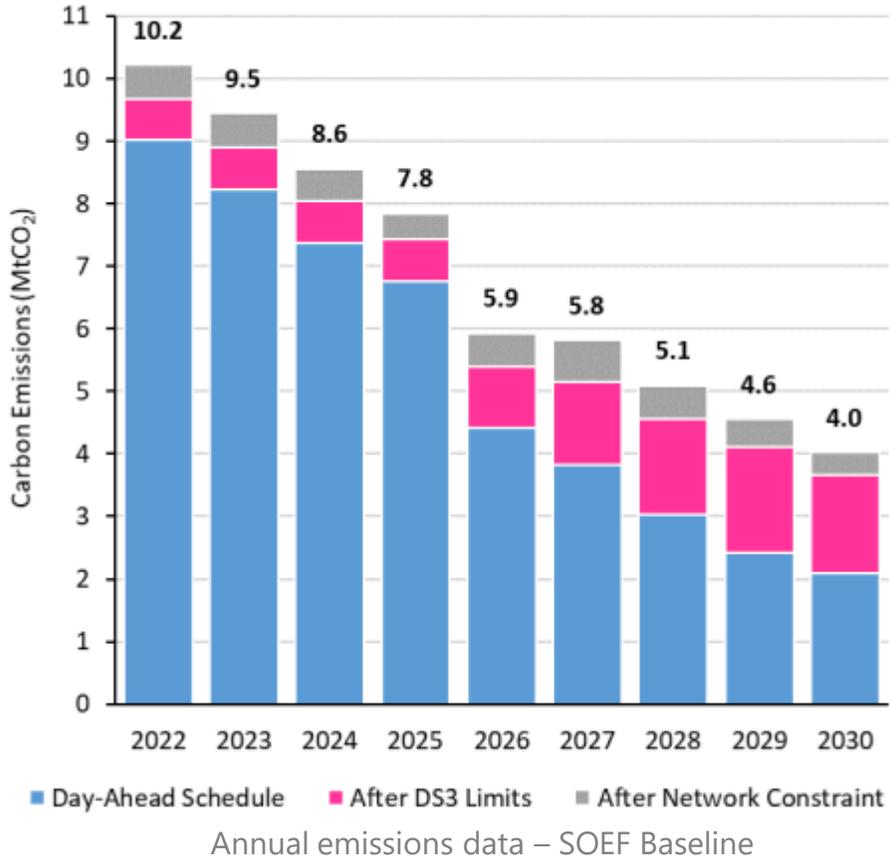


Paul Deane in UCC MaREI estimated power sector emissions should be **55 Mt from 2021 - 2030**

In **2021**, we've already used **10 Mt...**

...only **45 Mt left to get us from 2022 to 2030** - is it possible when we need to electrify other sectors to decarbonise them too?

SOEF v1 Baseline Carbon Emissions Results



Market Model

- 5.7 GW Onshore Wind
- 5 GW Offshore Wind
- 1.5 GW Solar
- 95% SNSP
- 4 Must Run Units by 2030

Network Model

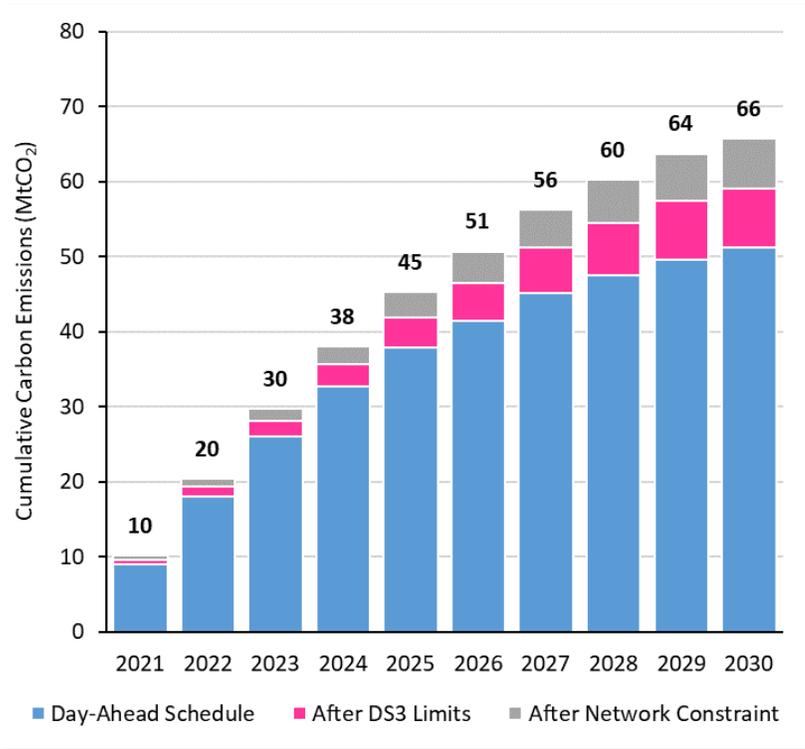
- All ATRs and SOEF reinforcements in place by 2030

Results

- Cumulative emissions of 72 Mt of CO₂ by 2030
- Does not meet ceiling of 2 (3) Mt CO₂ by 2030
- 74% RES-E (pre-network constraints)

Investigating numerous emissions pathways

Investigated three different pathways to 2030 and assessed cumulative emissions



Cumulative emission data – Accelerated Decarbonisation

Rapid Delivery - 5GW offshore, 7GW onshore, 3 GW solar

- ✓ 80% RES-E by 2030
- ✗ 2 Mt of CO₂ by 2030
- ✗ Less than 60 Mt of CO₂ by 2030

Delayed Delivery - 5GW offshore, 7GW onshore, 3 GW solar

- ✗ 80% RES-E by 2030
- ✗ 2 Mt of CO₂ by 2030
- ✗ Less than 60 Mt of CO₂ by 2030

Accelerated Decarbonisation - 5GW offshore, 8.2GW onshore + 3 GW solar

- ✓ 80% RES-E by 2030
- ✓ 2 Mt of CO₂ by 2030
- ✓ Less than 60 Mt of CO₂ by 2030

Accelerated Decarbonisation - We need speed

Baringa's modelling in **Bridging the Gap** shows we can achieve significant CO₂ savings, but we need to speed up every aspect of electricity sector decarbonisation

Accelerated Decarbonisation Scenario



5 GW offshore wind



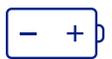
8.2 GW onshore wind



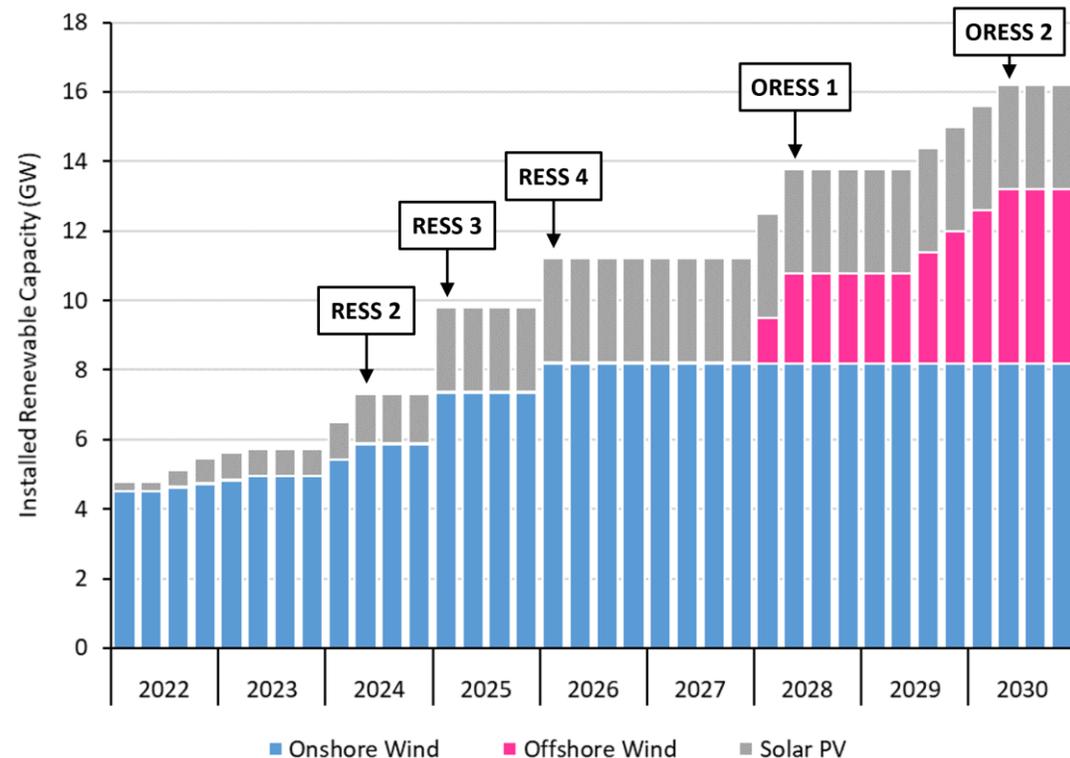
3 GW solar



Speedy renewable delivery



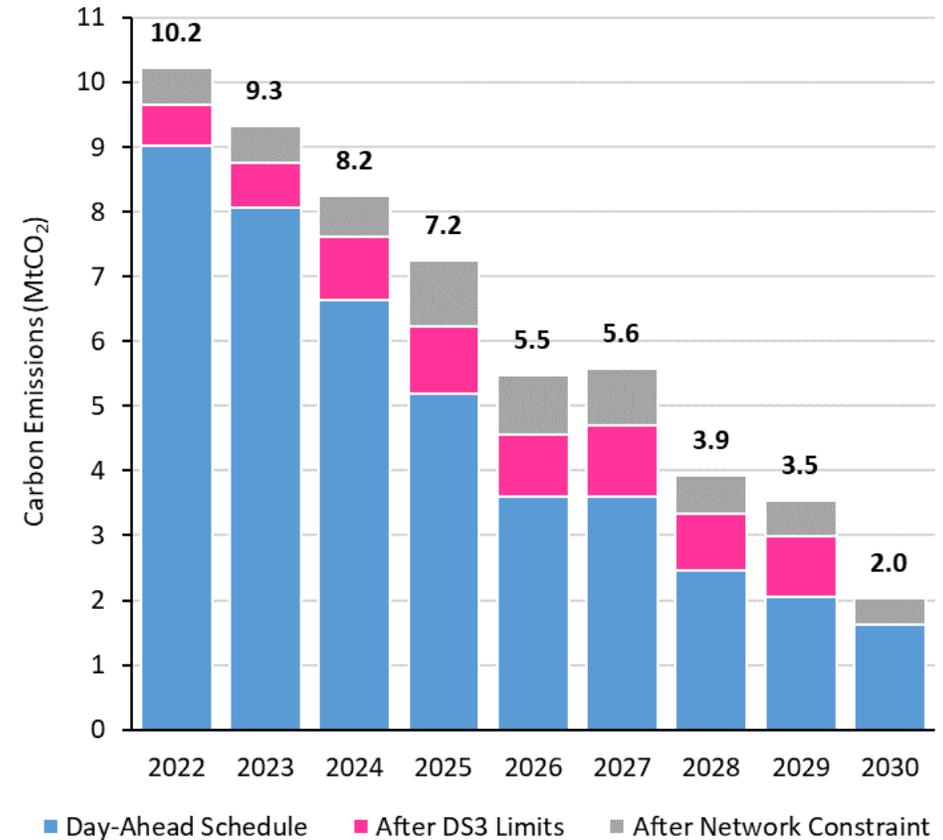
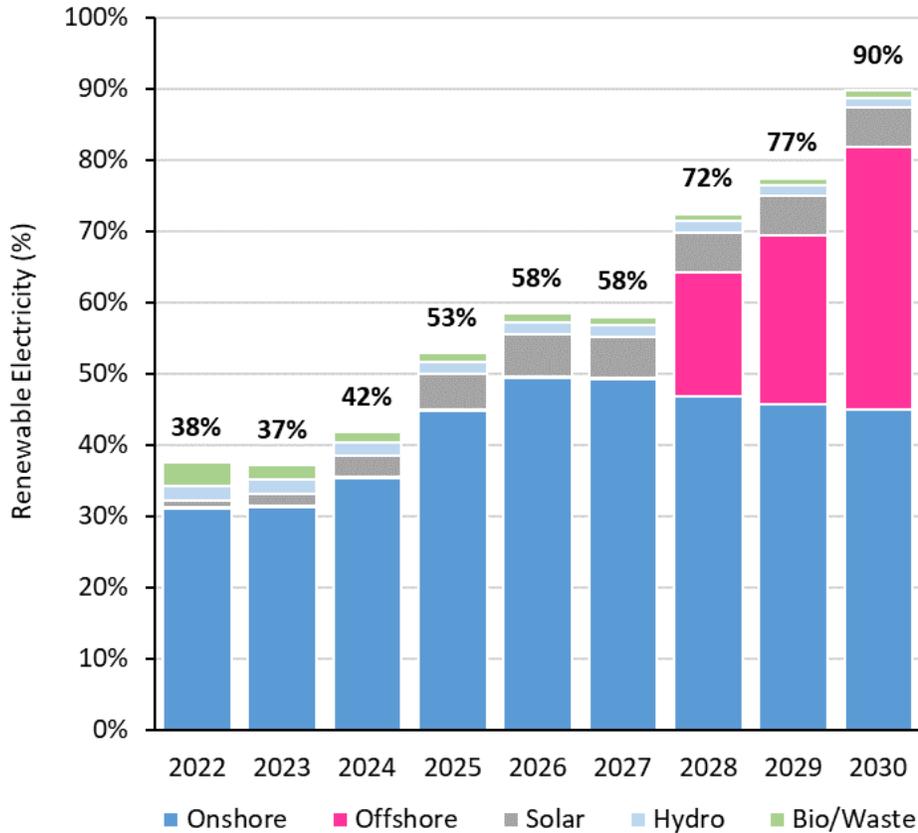
New technologies are vital



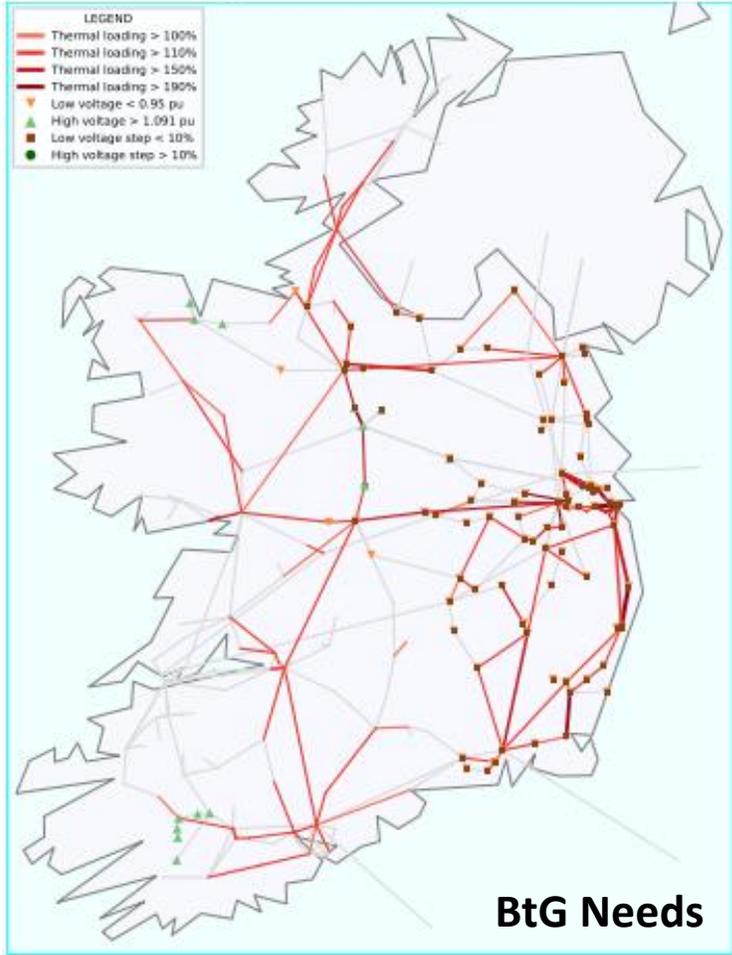
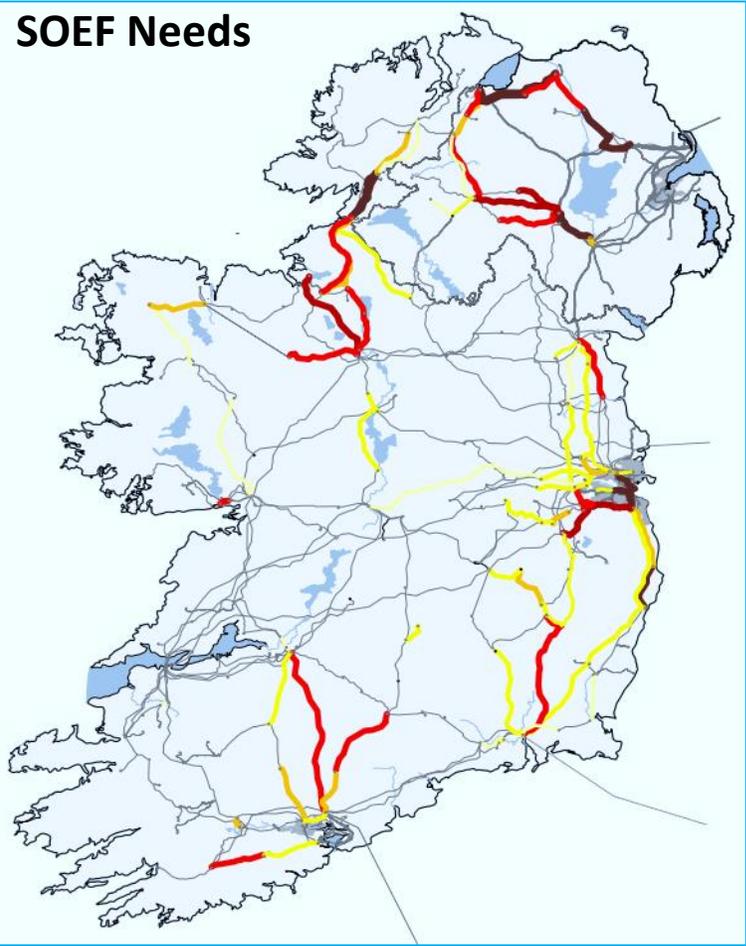
Assumes 100% Zero-Carbon System Services.
No must run units by 2030.

Accelerated Decarbonisation - We need speed

Baringa's modelling in **Bridging the Gap** shows we can achieve significant CO₂ savings, but we need to speed up every aspect of electricity sector decarbonisation

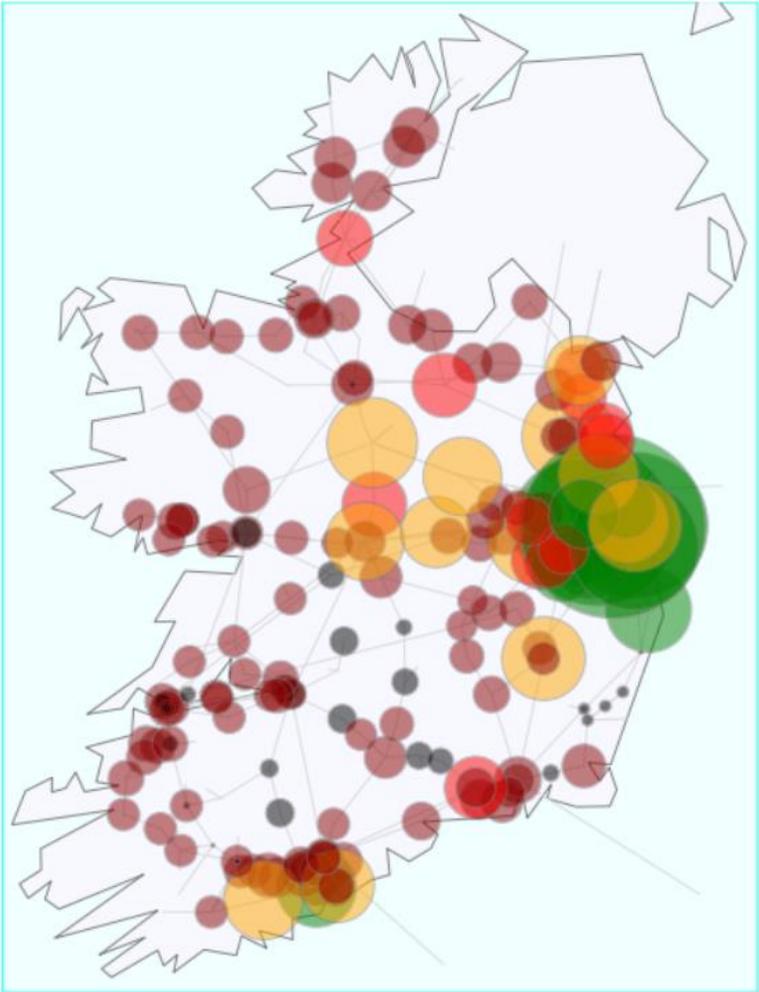


Network Analysis - Benchmarking against SOEF

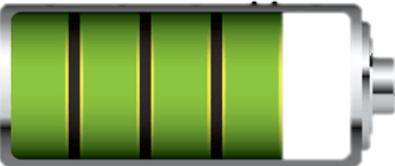


Generation Opportunity Analysis in 2030 – Accelerated Decarbonisation

Wind Energy Ireland - 2029 Relative Generation Opportunity Analysis



The Midlands: Utilising 220/400 kV



West, North-West & South-West:

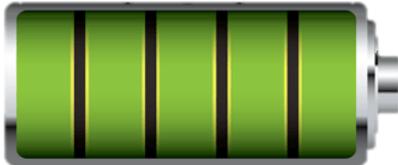
Do not perform as well



North-East: Encouraging

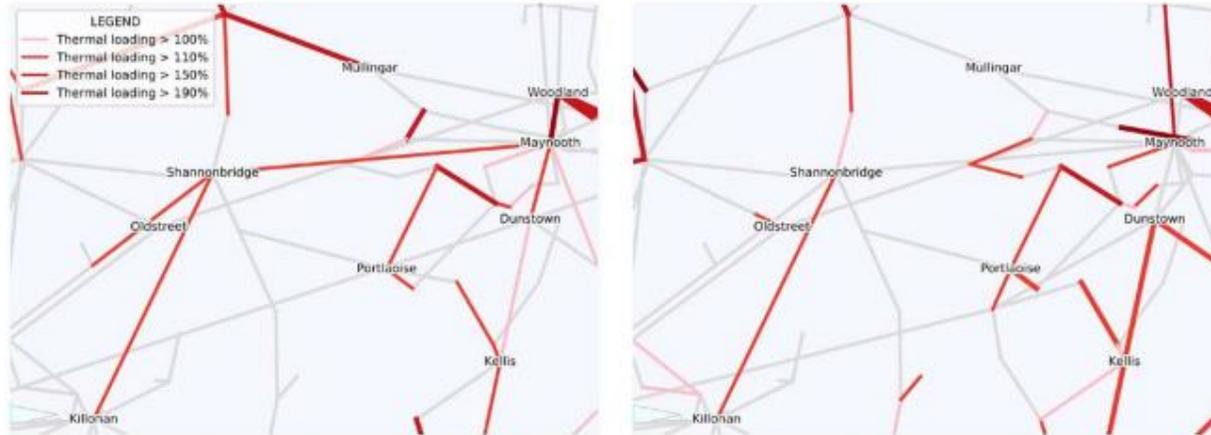


Dublin: A promising location for generation



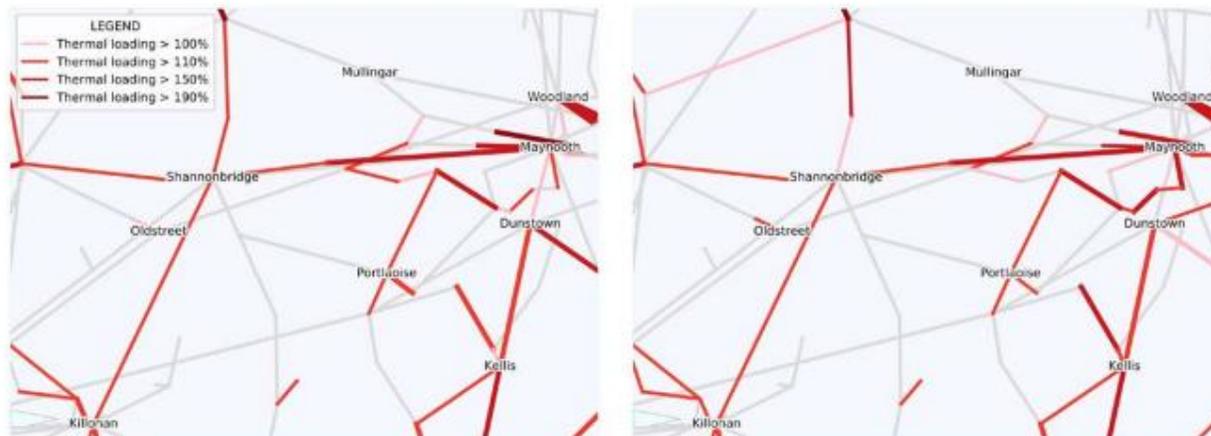
Regional Analysis Example – Midlands Region

Figure 48: Transmission network needs assessment of the Midlands, 2022 (left) and 2025 (right)



- Network analysis carried out for 2022 – 2030 on different regions of the network
- Needs identified and technologies which are deployable/deliverable by 2030 were assessed
- For example, Midlands region highlighted benefits from:

Figure 49: Transmission network needs assessment of the Midlands, 2027 (left) and 2030 (right)



- Network solutions
- Cluster stations
- Dynamic line rating
- Energy storage
- Power flow control
- Reactive/synchronous power compensation

Bridging the Gap – Key Findings

- ▲ **Cumulative CO₂ emissions** out to 2030 are sensitive to the **pathway taken to get there**
- ▲ The analysis suggests that **66 million tonnes of CO₂** between 2021 and 2030 represents the **minimum achievable for the Irish power sector under current policies**.
- ▲ **Major and fast interventions** are required to move the dial past this figure, including solutions to **phase out the usage of these carbon intensive fuels beyond current policy**
- ▲ The study suggests that **4 million tonnes of CO₂ can be saved** by faster delivery of renewables – **two years' worth of emissions** by 2030
- ▲ ... this is because the use of **carbon intensive fossil fuels** including **coal and peat** in the **first half of the decade** 'locks in' substantial emissions
- ▲ **Onshore renewables** must be deployed even more quickly, **coal displaced** from the generation mix, and **offshore wind deployment accelerated**

Shaping our Electricity Future v1.1 – Key Industry Messages

#1 Carbon Budgets: EirGrid must set out a trajectory for year-on-year electricity sector emissions reductions from 2021-2025 and 2026-2030 in line with sectoral cumulative emissions budgets and ensure the updated roadmap supports these. Key to this will be a roadmap to zero-carbon system services and reducing Minimum Generation Levels on the system.

#2 Connecting Onshore Renewables: Complying with carbon budgets necessitates earlier connection of more onshore renewables. Transmission capacity solutions in SOEF v1.1 need to align with the onshore wind and solar pipelines currently working their way through the planning system. We must identify solutions to support the 2030 8GW & 5.5GW targets for onshore wind and solar respectively. Onshore renewables will play a key role in reducing emissions from 2022 – 2027, in reducing wholesale energy costs in this timeframe, and in paybacks to consumers through the PSO Levy.

#3 Connecting Offshore Renewables: SOEF v1.0 proposed solutions for the east-coast Phase 1 offshore renewable projects. SOEF v1.1 must identify additional transmission capacity solutions to support the south and west coast projects and the new 7GW offshore target. Clarity on firm access policy will be crucial for both offshore and onshore renewables.

Shaping our Electricity Future v1.1 – Key Industry Messages

#4 Beyond 2030: A net-zero energy system requires a much larger net-zero power system. Development of the transmission & distribution solutions to support the full decarbonisation of the energy system in the period 2030 - 2050 need to start soon. **SOEF v1.1 should establish the groundwork for a net-zero power system by 2035 at the latest.**

#5 Market Reforms: SOEF v1.1 should support the introduction of a new “Long Duration Storage Procurement Framework” as set out in a recent ESI position paper. BEIS in GB have committed to having this in place by 2024. AEMO in Australia are running auctions for this today. This would be most effective if it is accompanied by appropriate risk allocations in RESS auctions.

SOEF Advisory Council – Suggested areas for consideration

Key asks from industry to consider for future SOEF Advisory Council meetings:

1. Agreed overall plan for SOEF Programme Delivery (similar to DS3 Programme Plan)
2. Agree measures to determine success of SOEF - KPIs (primary & secondary) to be agreed, considering:
 - i. Carbon emissions
 - ii. Min gen
 - iii. Reinforcements
 - iv. Dispatch down
 - v. SNSP
 - vi. RES-E
 - vii. Costs
3. Resourcing needs to deliver
4. Agreed reporting against targets/KPIs
5. Admin of meetings including tracking/progressing actions between meetings



Tea Break
11:05 – 11:20

A Storage Services Procurement Framework for Ireland

A solution to network constraints, renewables oversupply and clean peaking capacity provision



06.09.2022

Contents

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Recent International Developments – Great Britain

BEIS – Review of Electricity Market Arrangements (REMA)

“It is unlikely that the significant investment needed to decarbonise the power sector will be delivered cost-effectively by our market arrangements in their current form. **In particular, (current markets) are unlikely to bring forward low carbon flexibility at the pace required**”

“The most cost-effective route to a net zero power sector by 2035 will require changes to markets to optimise both investment and dispatch (where and when to produce and use electricity) as **current market arrangements are based on the needs of fossil fuel generation rather than renewables.**”

“Market design must drive the significant investment in low carbon technologies needed to deliver our objectives. **Risks will differ by technology type, but should be borne by those best able to manage it**”

BEIS – Call for Evidence on Incentivisation of Large-Scale Long Duration Storage

BEIS Conclusions following review of submissions:

- **LDES has an important role to play in achieving net zero**, helping to integrate renewables, maximising their use, contributing to security of supply, and **helping manage constraints** in certain areas;
- provides low carbon flexibility, **replacing some unabated gas generation**;
- diversifies our technology mix and **provides optionality** for meeting our ambitious 2035 power sector decarbonisation targets; and
- **faces significant barriers to deployment under the current market framework due to their high upfront costs and a lack of forecastable revenue streams.**

Considering these conclusions and as outlined in the British Energy Security Strategy, we will ensure the deployment of sufficient LDES to balance the overall system by **developing appropriate policy to enable investment by 2024.**”

International Developments - Australia

AEMO Services – 2021 Infrastructure Investment Objectives Report (NSW)

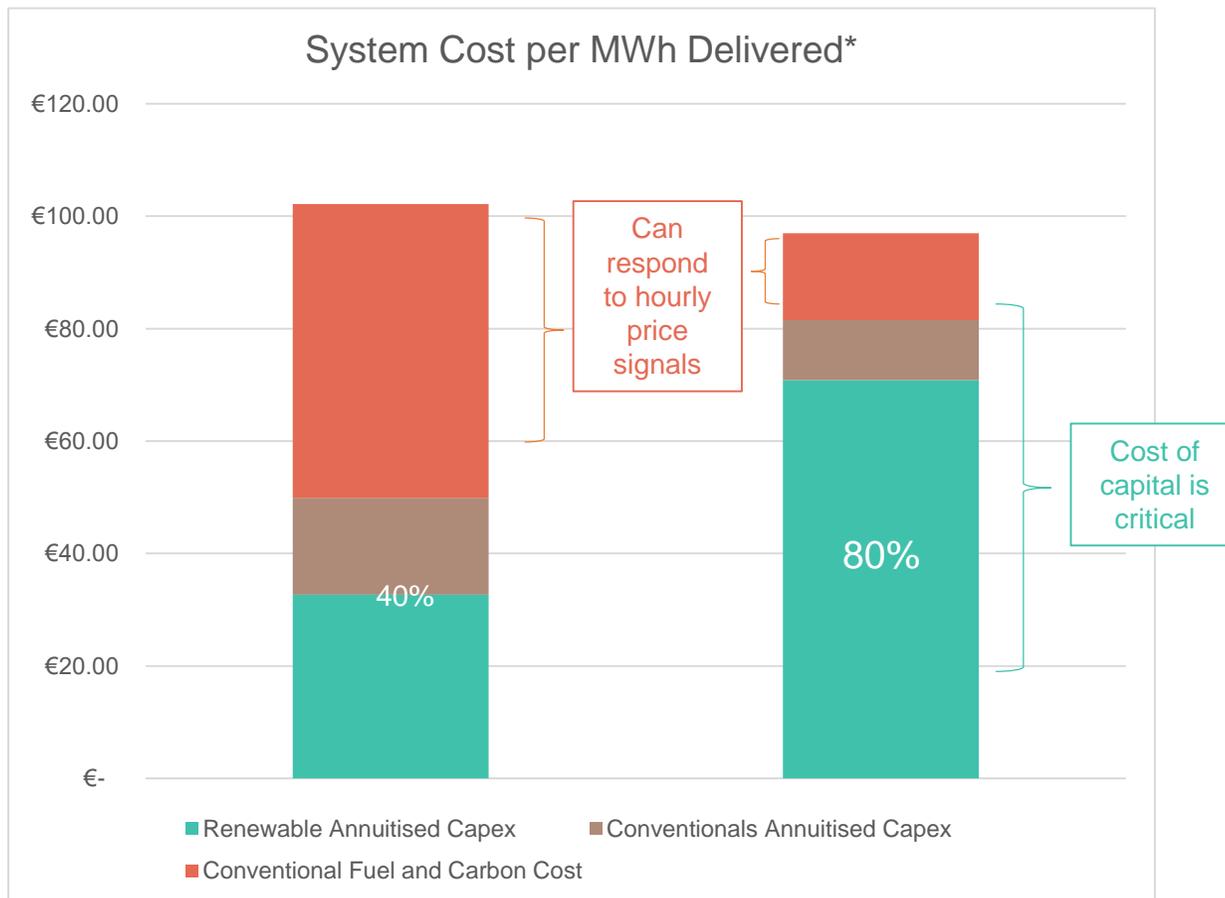
- Sets out a 10 year plan for competitive tenders for Long Term Energy Services agreements (LTES)
- Committed to 33.6GWh of new generation p.a. by 2029
- Supported by delivery of 2GW of Long Duration Storage by 2029

Note: Different systems require different renewable and storage mixes depending on the profiles of variable renewable generation in a region

AEMO Services – NSW Electricity Infrastructure Tenders

- Tender round 1 notice July 2022, bid closing date 28th Oct 22
- Generation LTES agreements for 2500GWh p.a.
- Long Duration storage LTES Agreements for 600MW (COD 1 Jan 27)
- 20 year generation contracts
- LDES contracts between 14 and 40years depending on technology type
- Award criteria includes consideration of holistic system value of technologies including locational aspects

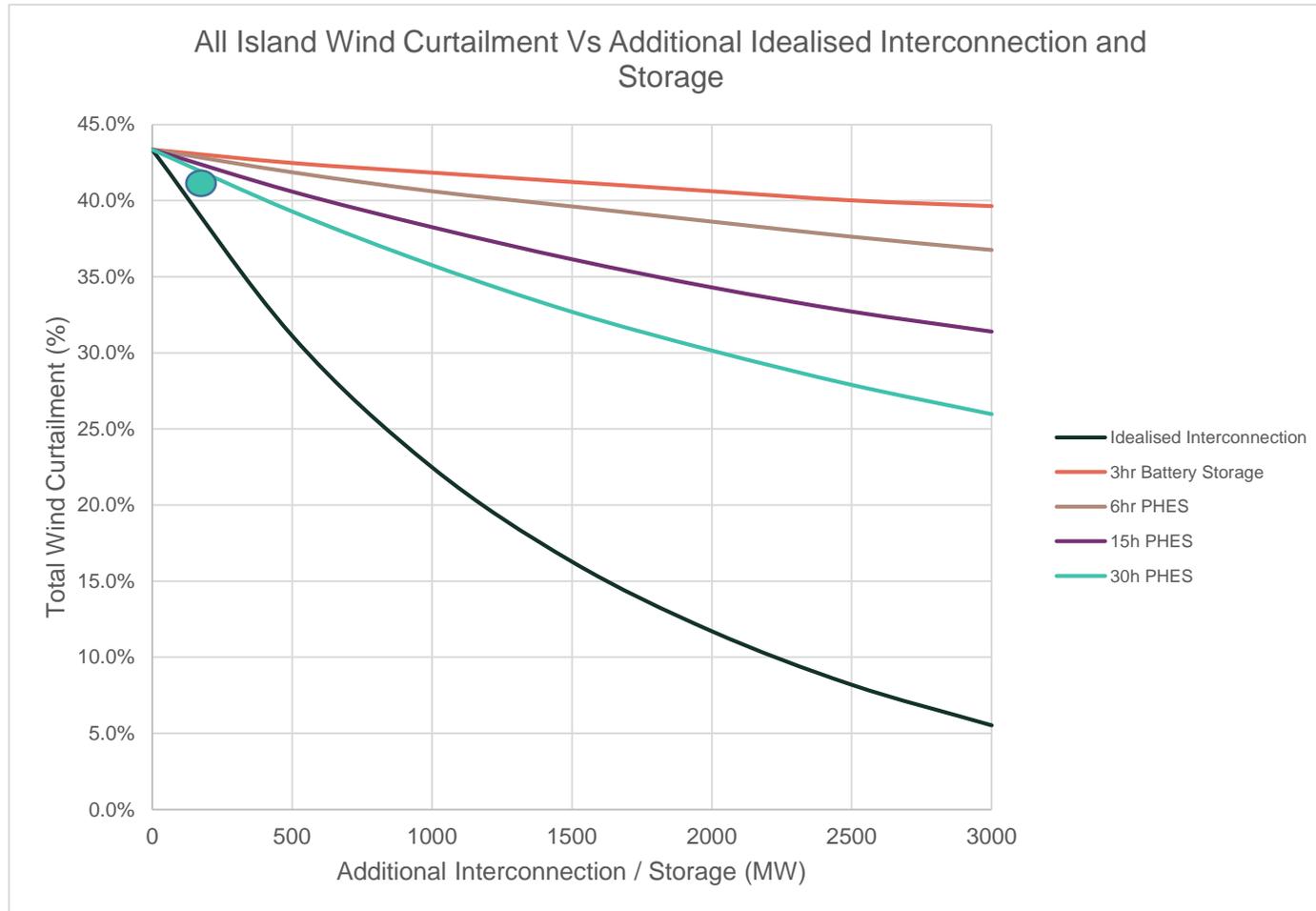
Why other markets are thinking differently



*Crude / For Illustration Purposes, using gas prices only slightly above historic norms

- Energy Markets are:
 - Good at matching supply and demand while minimising fuel cost
 - Generally, not good at incentivising new capital investment
- Fuel cost will be a much less significant component of overall system cost on an 80% RES-E system.
- We need much greater consideration of how to minimise cost of capital for new infrastructure.

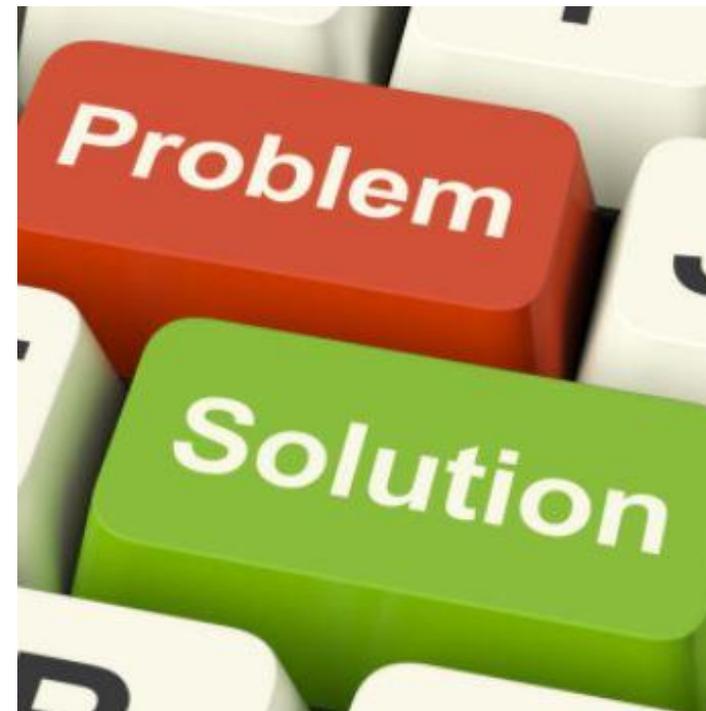
Why Duration Matters



- When seeking to use storage technologies to directly absorb surplus renewables on systems with very high levels of RES-E, energy capacity is critical
- Due to the very large volumes required it is equally critical that the storage capex per MWh is extremely low.
- Techno-economic optimizations carried out by FEI indicate that this tends to be more important than maximizing the return trip efficiency of the technology
- This point is further emphasized in the Baringa “Gamechanger” report

Storage Services Procurement Framework - Problem Statement

- Insufficient Revenue Certainty
- Remuneration Gaps
- Technology Variability
- Locational interactions
- Operational signals vs Investment signals
- Interactions with renewable procurement risk allocations
- Avoid remuneration in excess of the value being provided (e.g. is it cheaper to overbuild wind and take the constraints / oversupply costs?)



Storage Services Procurement Framework– Proposed Principles

- Technology agnostic: Don't pre-determine outcomes!
- Maximise long term revenue certainty = **Efficient Investment (a)**
- Based on projected overall system value vs cost taking account of any locational benefits = **Efficient Procurement (b)**
- Maintain exposure to short term markets = **Efficient Operation (c)**
- **(a) + (b) + (c) = Maximise System Benefits**
- **Implies clearing process should involve a full system and network model capable of recognising holistic value.**
- Process should recognise hedging value of renewables + storage = **Reduced Exposure to Fossil Fuel Price Volatility + Increased Energy Security & Independence**



Storage Services Procurement Framework– Proposed High Level Design

- **Revenue floor with shared upside**
 - Bidders bid in a revenue floor + technology parameters, MEC / MIC / MWh / RTE / degradation factors
 - Procurement Authority utilises a full system and network model to clear technologies based on largest delta's between floor revenues and system value. **This will almost certainly require EirGrid support, but such models exist.**
 - Deployed technologies participate in all other relevant market frameworks – Energy, Capacity, System services
 - Upside from revenue stack shared with consumers X:Y
- **New services to ensure revenue stack reflects full value**
 - E.g. Network Congestion Management – Receive a TUoS payment instead of paying a charge: XMW storage allows YMW new renewables to connect with no increase in constraints. The YMW TUoS payment should be passed through to the storage tech?
 - Others?
- **Introduce appropriate risk allocation in renewables procurement**
 - Today's RESS regime assigns constraint, curtailment, oversupply risk to generators.
 - They bid in very high prices, locked in for 15 years.
 - When solutions get deployed, RESS generators get higher revenue, consumers don't see the savings.
 - Generation and flexibility procurement needs to be complimentary

- We have RESS Auctions, Capacity Auctions, Why not a “Storage Services” Auction?
- If we procure “Storage Services” in this way, it becomes unnecessary to define “long” in LDES

We need a Roadmap to enable LDES Investment



- Can we get TSO / DSO / RA / DECC support for a Roadmap to an LDES procurement framework as is currently proposed in GB and Aus?

Final Takeaway

A conventional power system must be capable of providing enough energy, capacity and stability services to meet demand and reliability expectations

A fully renewable power system also needs to be able to time shift very significant energy volumes – this is the new service that low cost LDES technologies can provide

Thanks for Listening!



Paul Blount
Portfolio Director
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FuturEnergy Ireland

Markets Programme

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Pillar 1 – Scheduling & Dispatch



SDP Objective & Drivers

To enhance and improve the technology and capability of scheduling and dispatch in Northern Ireland and Ireland to meet EU Clean Energy Package mandates and support the broader goals of operational renewables and SNSP penetration targets.

- Clean Energy Package requirements.
- Ireland and NI Government renewables targets for the 80%/80% total renewable energy and 95+% system non-synchronous penetration (SNSP) on an instantaneous basis.



Scope of SDP



One component of the broader SOEF programme.

1. Operation of non-priority dispatch of renewables (Clean Energy Package requirements)
2. Energy Storage Power Station (ESPS) integration
3. Fast Frequency Response (FFR)
4. Wind dispatchability improvements
5. Reserve services scheduling and dispatch
6. Synchronous condenser scheduling and dispatch



SDP Solution Approach

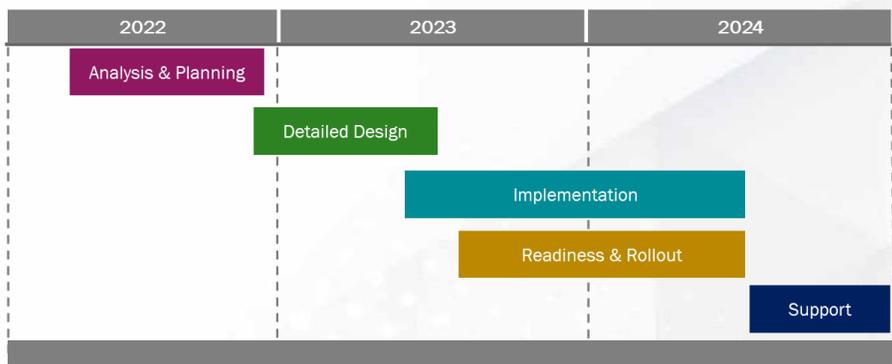
To enhance and improve the technology and capability of scheduling and dispatch in Ireland to meet EU Clean Energy Package mandates and support the broader goals of operational renewables and SNSP penetration targets.

1. **Be pragmatic** about solution pathways.
2. **Solve the immediate and urgent problems at hand.** Don't use the SDP to fulfill a wish list.
3. **Be an honest broker.** Don't allow perfect to be the enemy of good.
4. **Communicate** early and often – to all stakeholders. Bring them along the journey.
5. **Maintain credibility with industry.** Participant and industry support for and adoption of the SDP initiatives is critical.
6. **Actively manage delivery partners.** Clearly set expectations and demand excellence in delivery schedule and quality. Work collaboratively.

Achievable – Valuable – “Simple”



SDP Timelines



Industry Engagement

1. Bilateral outreach
2. Industry workshop (later in detailed design)
3. Ongoing user groups as part of broader SOEF – and will be optimized with other programmes (FASS, et al.)
4. Communicate early – and often.

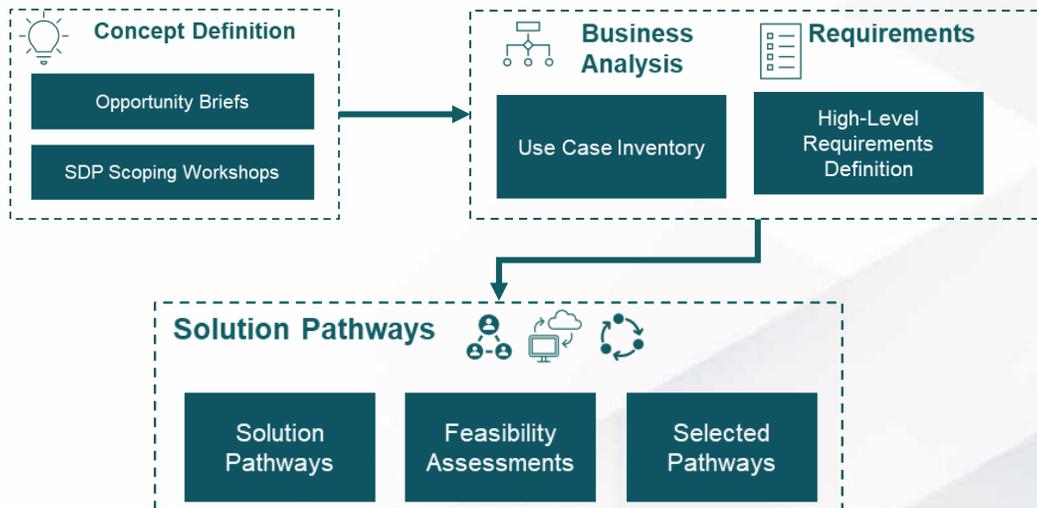
Pillar 1 – Scheduling & Dispatch

SDP Solution Development

The SDP is currently developing a set of “Solution Pathways” to achieve the SDP business objectives.

This work is ongoing and we plan to describe the proposed solution architecture once our Phase 1 is complete.

Our internal programme development approach for the Solution Pathways is:



Using this approach

SDP Solution Approach

To enhance and improve the technology and capability of scheduling and dispatch in Ireland to meet EU Clean Energy Package mandates and support the broader goals of operational renewables and SNSP penetration targets.

1. **Be pragmatic** about solution pathways.
2. **Solve the immediate and urgent problems at hand.** Don't use the SDP to fulfill a wish list.
3. **Be an honest broker.** Don't allow perfect to be the enemy of good.
4. **Communicate** early and often – to all stakeholders. Bring them along the journey.
5. **Maintain credibility with industry.** Participant and industry support for and adoption of the SDP initiatives is critical.
6. **Actively manage delivery partners.** Clearly set expectations and demand excellence in delivery schedule and quality. Work collaboratively.

Achievable – Valuable – “Simple”

Pillar 1 – Scheduling & Dispatch

Next Steps

- Ongoing bilateral engagement
 - *8 meetings held so far with participants and representative bodies*
 - *We welcome the feedback we're getting from these sessions*
 - *Further meetings are being scheduled for the coming weeks*
- Industry engagement
 - *Planning for full industry workshop, to be held in October*
 - *Further workshops being considered*
- SEMC submission
 - *Still working as per SEM-21-027 proposed decision*
 - *TSOs/MO to prepare submission to SEMC setting out proposed treatment of non-priority dispatch variable renewable generation in system operations*
 - *Drafting of submission to commence after industry engagement phase*

Pillar 1 – Future Arrangements System Services

Why FASS is needed



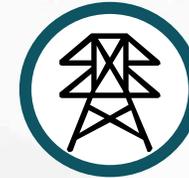
CONSUMER VALUE

Delivered through efficient and competitive auction-based solution via responsive pricing and volume regulation with payment to providers



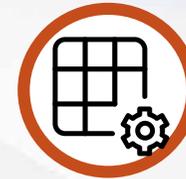
DELIVER AN “EVERGREEN” SOLUTION

Support operation of the power system of the future and signal long-term investment for technologies through the development of robust market mechanisms beyond 2030



CONTRIBUTE TO POWER SYSTEM RESILIENCE

Incentivise investment in the right technology in the necessary locations to support system resilience



ENHANCED OPERATIONAL CAPABILITIES

Renewable generation is maximised, supporting the ability to achieve 2030 targets while mitigating against curtailment



Pillar 1 – Future Arrangements System Services

Path to enhanced operational capabilities

DS3 SS Mechanism

FASS Transitional Phase

FASS Enduring Mechanism

Certainty of process is needed to incentivise investment
noting average asset development **approx. 5 - 8 years**

2022: 75% SNSP

~5GW Wind installed

~640MW Batteries

System Resiliency maintained primarily with **conventional generation**

2026: 85% SNSP

~8.4GW Wind & Solar assumed to be installed

>1GW Energy Storage assumed on the system

Higher levels of SNSP will require **increased low-carbon mechanisms**

2030: 95% SNSP

At least 14GW Wind & Solar

System resiliency is maintained with a **portfolio of low carbon solutions**

2030+ Targets

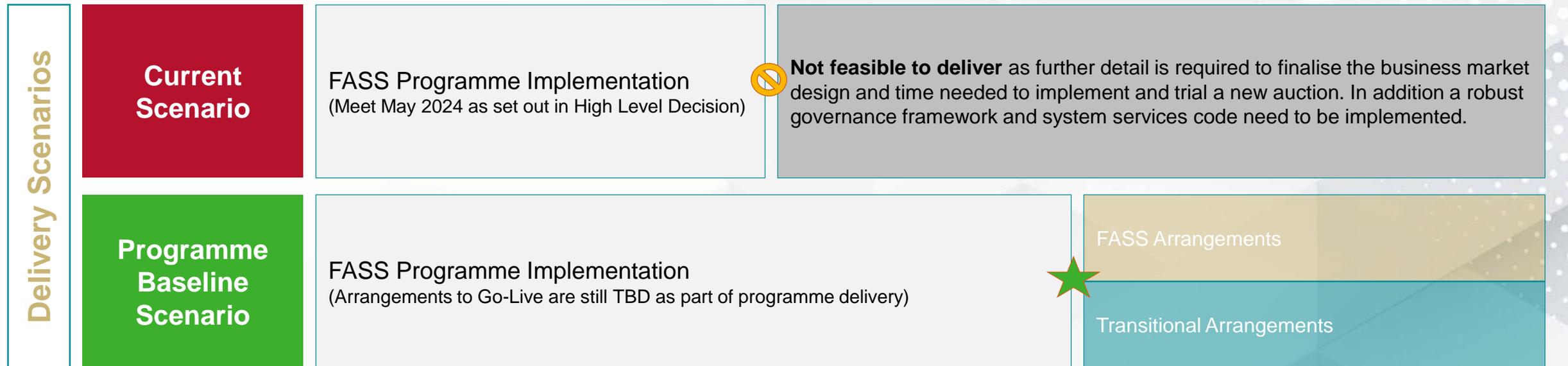
EIRGRID
GROUP

*Based on EirGrid Analysis February 2022

Pillar 1 – Future Arrangements System Services

FASS Programme – Delivery scenarios

In Phase 1 the FASS Programme team developed a delivery roadmap based on the SEMC High Level Design decision, it was clear from the scenarios reviewed that a new programme delivery timeline would be required, see below:



Pillar 1 – Future Arrangements System Services Programme Plan - Update

Phase 1 - Mobilisation: Complete

-  FASS Programme Team engaged including Auction Design experts
-  Mapped Programme implementation roadmap for the delivery of the FASS
-  Internal TSO HLD workshops
-  Establishment of governance arrangements and development of resource and cost estimation for the implementation of the new market
-  Joint RA/TSO Workshops on HLD/ Auction Design



Phase 2 – Establishment & Engagement: In Progress

-  Further joint RA/TSO engagement
-  Industry Workshops
-  Bi-lateral Engagement on Arrangements Design
-  Development of TSO Recommendation Paper, which will inform an RA consultation on business Market Design
-  Progressing the delivery including the establishment of a System Service Code Working Group for Industry participation
-  Commencement of implementation activities

Pillar 1 – Future Arrangements System Services

FASS Programme Plan – Implementation Phase

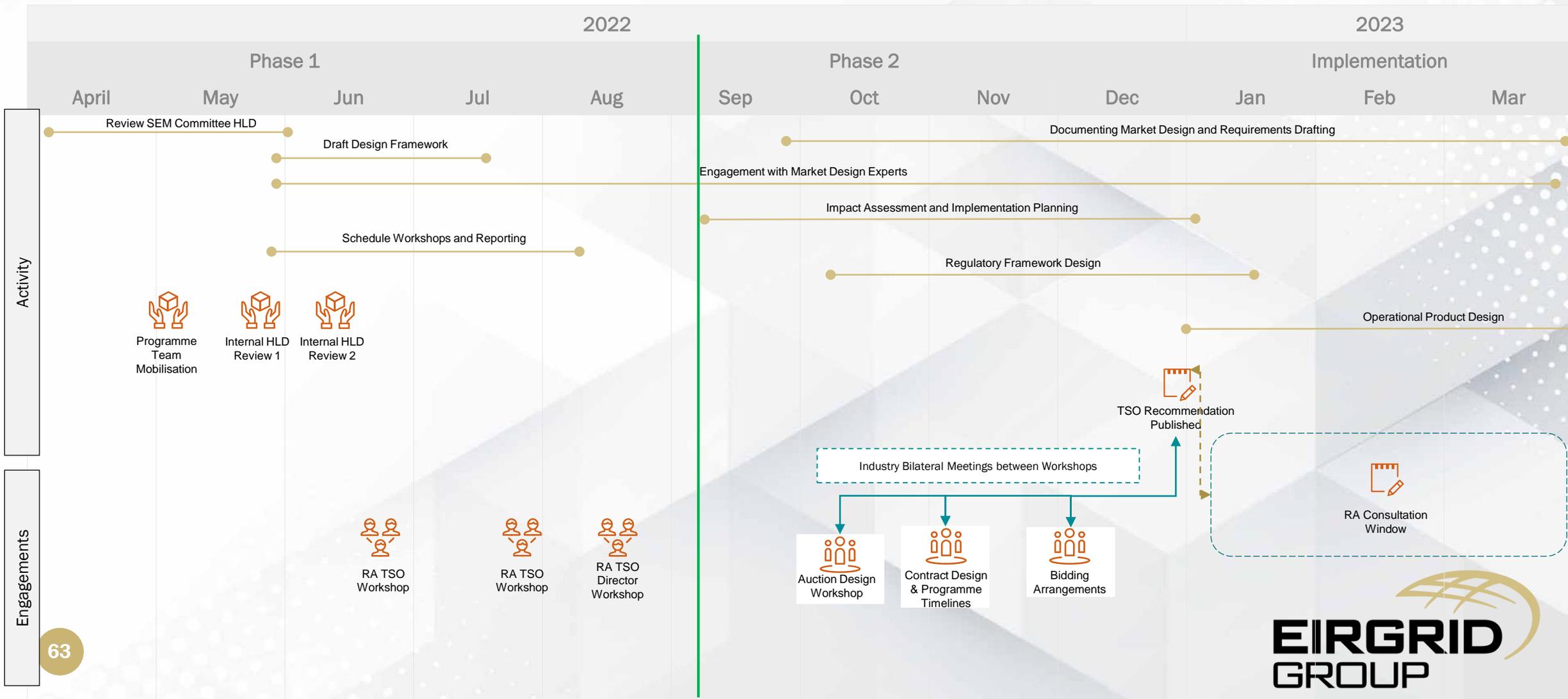
FASS will move into a **multi-year implementation phase** where industry engagement will be a key part of the delivery of this programme. Main activities will include:

-  System services code development and drafting
-  Licence and regulatory change
-  System build and development
-  Testing, market trial and service provider testing
-  Service provider registration and contracting

Pillar 1 – Future Arrangements System Services

High Level Design Phase Proposed Timeline

Future Arrangements for System Services Design



Networks Programme



Progress on Candidate Reinforcements

52 Shaping Our Electricity Future Candidate Solutions NI & ROI



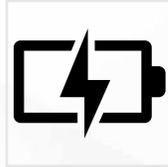
6 new circuits

Woodland-Finglas
 South Dublin
 Donegal Sligo
 Binbane - Clogher- Cathleen Falls
 Mid-Tyrone
 Mid-Antrim



32 upgrades of existing circuits

5 x Dublin cable replacements
 Upvoltage x 2
 Flagford – Srananagh
 Arklow-Ballybeg-Carrickmines
 Uprates x 17



1 new transformer

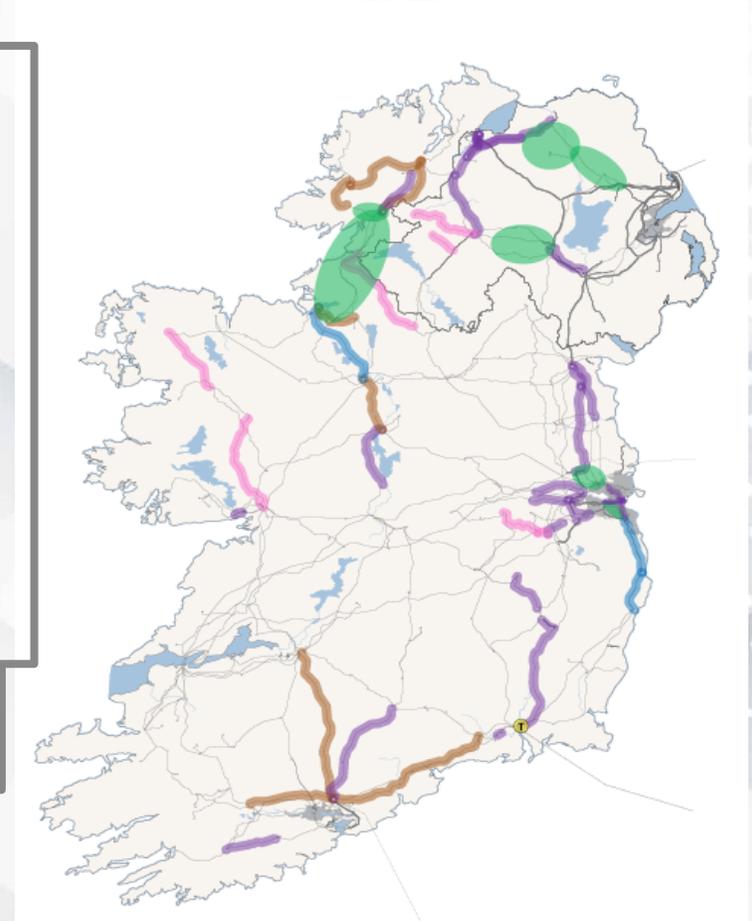
Great Island 220/110 kV
 Transformer



13 new technology projects

Power Flow Control x 6
 Dynamic Line Rating x 7

All candidate projects go through Framework for Grid Development for detailed analysis and are included in the Network Delivery Programme (NDP)



Step 1
 How do we identify the future needs of the electricity grid?

Step 2
 What technologies can meet these needs?

Step 3
 What's the best option and what area may be affected?

Step 4
 Where exactly should we build?

Step 5
 The planning process

Step 6
 Construction, energisation and benefit sharing



Grid Deliverability Challenges

Significant Volume
of works

Complexity of Work
e.g. congested
urban locations

Interaction with
other Utilities,
Works and Services

Challenging
Timelines

Secure Transition
e.g. managing
outages

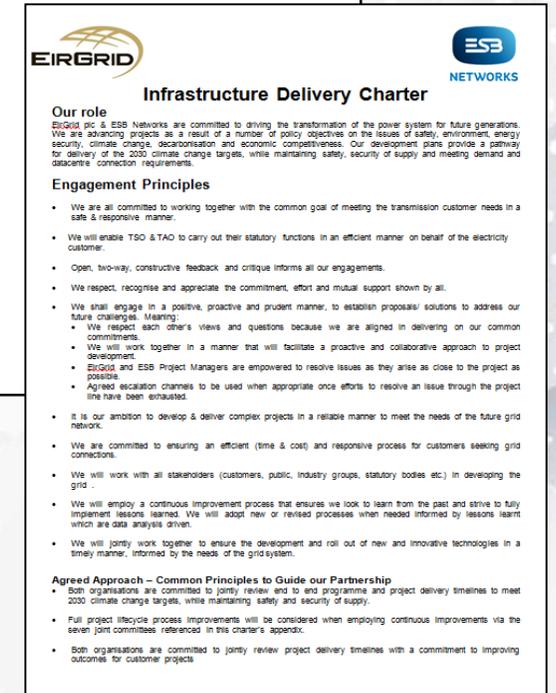
Supply Chain

Grid Delivery Enablers



Optimal Joint Programme Delivery

1. Joint Infrastructure Delivery Charter with agreed principles to optimise delivery.
2. Network Delivery Programme (NDP) for Transmission Capex programme which includes SOEF projects.
3. Approach is to mitigate the risks which can impact delivery e.g schedule, cost, third party issues or delays,
4. Improvements already implemented on early engagement & paralleling of activities.



SOEF Project List Progress	Process Step	
	Option Design & Optioneering Steps 1,2,3 Part 1	Project Implementation Steps 4,5,6 Parts 2, 3
Mid Antrim Upgrade		
Mid Tyrone Project		
North West of NI project		
Drumnakelly - Tamnamore 110 kV circuit		
Bandon - Dunmanway 110 kV circuit		
Drybridge - Louth 110 kV circuit		
Galway - Salthill 110 kV circuit		
-Galway area 110 kV network needs		
-Cashla - Salthill 110 kV circuit uprate		
Inchicore - Carrickmines 220 kV circuit		
-South Dublin Reinforcement		
Poolbeg - Carrickmines 220 kV circuit		
Finglas - North Wall 220 kV circuit		
Poolbeg South - Inchicore 220 kV circuit 1		
Poolbeg South - Inchicore 220 kV circuit 2		
North Wall - Poolbeg 220 kV circuit		
Louth - Oriel 220 kV circuit		
Woodland - Oriel 220 kV circuit		
Carrickmines - Great Island Corridor network corridor needs		
-Great Island - Kellis 220 kV circuit		
-Arklow - Ballybeg - Carrickmines 220 kV circuit		
Woodland - Finglas 400 kV cable cct		
-CP1021 East Meath to North Dublin Network Reinforcement		
Letterkenny – Tievebrack - Binbane 110kV lines		
Donegal - Srananagh Network Corridor Needs		
-Clogher - Srananagh 220 kV circuit		
-Drumkeen - Clogher 110 kV circuit		
-Binbane - Clogher - Cathaleen's Fall 110 kV Clogher tie-in		
Great Island 220/110 transformer No.3		
-Great Island Transformers Upgrade project		
Flagford - Sligo 110 kV Circuit Capacity Needs		
-Flagford - Srananagh 110 kV circuit		
-Sligo - Srananagh 110 kV circuit 3		

Progress on Key Candidate Solutions

In Project Implementation

- 5 x 220 kV Dublin cable replacement/uprate
- 3 x 110 kV circuit uprates
- 2 x 220 kV circuit uprates
- 1 x new 110 kV circuit
- 1 x Powerflow controller

In Design & Optioneering

- 1 x new 400 kV circuit
- 2 x new 220 kV circuits
- 2 x new 110 kV circuits
- 2 x circuit voltage upgrade
- 1 x 220 kV circuit uprate
- 4 x 110 kV uprates
- 1 x new 220/110 kV transformers

6.1.3 Multi-year plan

6.1.3.1 Ireland

Table 29: Networks - Ireland multi-year plan

Project Name	Description	Parties	Start Date	Finish Date
Incentivising Location	Government and regulatory policies in place to support locating generation and large energy users where electricity grid capacity is available or where it will be available in the future.	DECC, EirGrid, CRU	Q4 2021	Q2 2023
Planning Consents	Engagement with planning authorities at a strategic level to enable expeditious delivery of strategic electricity infrastructure, e.g. development of grid masterplans at regional and local authority levels and enhanced multi-level engagement by planning and environmental experts with consenting authorities, prescribed bodies and other relevant stakeholders.	EirGrid, DECC, DHPLG, local and regional authorities	Q4 2021	Q4 2022
Optimal Joint Programme Delivery (TSO/TAO)	Implementation of an end – end TSO/TAO joint approach to optimise programme delivery time of electricity infrastructure ¹⁵	EirGrid, ESBN, CRU	Q4 2021	Q4 2022
Transmission Outage Review and Transformation	Implementation of a transmission outage review and transformation programme	EirGrid, ESBN	Q4 2021	Q4 2023
Technology Toolbox	Deliver electricity grid Technology Toolbox solutions for enhanced flexible network operation ¹⁶ .	EirGrid, ESBN	Q4 2021	Q4 2026
Flexible Network Strategies	Develop flexible networks strategy for deployment of “non-wires” electricity grid technologies ¹⁷	EirGrid	Q4 2021	2023/24 /25/26

Future Dublin

Road N

Table 30: Networks - Northern Ireland multi-year plan

Project Name	Description	Parties	Start Date	Finish Date
End-End TSO/TO Approach to delivery	Work is underway to develop joint processes, and relevant amendments to subsidiary documents to support this. (i.e. Transmission Interface Arrangements). Moving into implementation.	UR, SONI, NIEN	Already commenced	Q1 2022
Technology Toolbox	Deliver electricity grid Technology Toolbox solutions for enhanced flexible network operation	SONI, NIEN	Q4 2021	Q4 2026
Flexible Network Strategy	Develop flexible network strategy for deployment of “non-wires” electricity grid technologies	SONI, NIEN	Q4 2021	2024/25/26

Network Pillar Strategic Enablers Multiyear plan

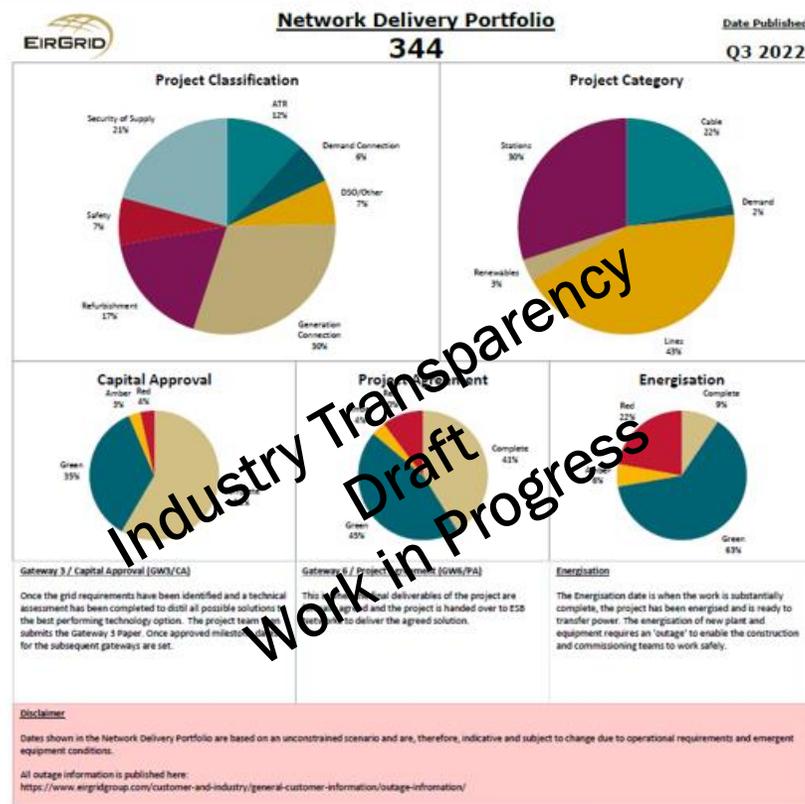
1. Delivery on List of 52 Candidate Solution projects is on track.
2. Progress being made on all of the strategic enablers identified in roadmap.
3. The candidate solutions are being delivered in partnership with TAO and we will continue to report on progress as part of our Joint Network Delivery Programme. (NDP).

Reference:

[Shaping Our Electricity Future Roadmap.pdf \(eirgridgroup.com\)](#)



Network Delivery Portfolio (Including SOEF Projects) Enhanced Quarterly Web Publication



Project Code	Project Name	GW3 (CA)	GW3 (PA)	Energization
CP1154	Belanna Land Acquisition	18/11/2021	01/01/2024	
CP1155	Greene - Moy 110 kV Line Upgrade	15/01/2022	27/01/2022	20/06/2025
CP1156	Sligo 110 kV Station - Shrananagh 1 & 2 Bay uprates	18/06/2021	19/04/2022	01/12/2023
CP1157	Inchicore - Popplebeg 1 220 kV Cable Replacement	16/12/2021	31/12/2025	11/12/2026
CP1158	Clonfad Solar	11/01/2021	04/12/2021	30/06/2024
CP1159	Culmoneg and connected stations protection upgrade	24/11/2021	04/12/2021	20/08/2025
CP1160	Coolree, Iniscarra & connected stations protection upgrade	04/12/2020	04/12/2021	20/08/2025
CP1161	Cathlamet Fall and connected stations 110 kV protection upgrade	04/12/2020	01/12/2021	20/08/2025
CP1162	Brinsford, Shellybanna and connected stations 220 kV protection upgrade	24/02/2021	04/12/2021	29/12/2023
CP1163	Butterstown, Kilsheeran & Waterford 110 kV protection upgrade	24/02/2021	04/12/2021	29/12/2023
CP1164	West Cork 110 kV protection upgrade	04/02/2021	04/12/2021	29/12/2023
CP1166	German - Platin 110 kV line uprate	18/03/2021	28/09/2022	26/09/2024
CP1167	Driveltie - Clonbeg - main 110 kV line uprate	18/03/2021	31/07/2022	26/09/2024
CP1168	Cashla-Cathal 110 kV Thermal Upgrade	18/03/2021	28/09/2022	26/09/2024
CP1169	Hydroston Battery Energy Storage	13/02/2021	08/09/2022	18/05/2022
CP1170	Reenahillye - Portlaoise 110 kV Partial Thermal Upgrade	05/08/2021	11/07/2022	31/10/2024
CP1172	Craze - Wexford 110 kV Circuit Thermal Capacity	17/06/2021	27/01/2023	31/10/2024
CP1173	Glencosnagh Phase 1 - Rotating Stabiliser	06/05/2021	05/06/2022	01/03/2023
CP1174	Aghlanaugh 110 kV Station	01/09/2021	01/07/2023	01/11/2025
CP1175	Kishoge 110 kV Station	30/04/2021	01/12/2022	29/03/2024
CP1176	Hydroston T2002 Customer Transformer connection	26/05/2021	31/07/2021	28/10/2021

Public Engagement

75



Shaping Our Electricity Future

14-week

Consultation and
Engagement Programme

Ireland and
Northern Ireland

100+ Virtual
Consultation Events

- Local Authorities
- Chambers of Commerce
- Rural Communities
- Agricultural Organisations
- Community and Voluntary Groups

500

Over 500
Consultation
Responses

2

Civil Society
Forums

2

Industry Forums

**TEDxStormont
Youth Event**

**National Youth
Assembly
in Ireland**

99

**Deliberate Dialogue
Participants in Ireland**

Shaping Our Electricity Future Engagement Roadmap

Policy and Politics

- Engage for Better Outcomes for All
- Local Authority Rollout
- AILG Future Energy Needs Conference
- EU Collaboration and Engagement Working Group
- COP26

Rural / Regional Communities

- Regional Citizen's Energy Assemblies
- Our Energy Future Project (RGI / FOE)
- Energy Advocates / Champions
- Collaborate with SEAI

Young People

- Activation programme delivered locally with youth partner.
- EirGrid Young Energy Citizen of the year awards.

Skills and Transition

- Collaborate with NGOs and stakeholders to identify skills gap in Renewable Development
- Support upskilling and apprenticeships at regional level.
- Energy Tourism Initiative

Landowners

- Landowner workshop series on (energy /climate) transition and Biodiversity Initiatives
- Explore expansion of Community Benefit to support transition projects.

Communications

- EirGrid Awareness Raising Campaign
- EirGrid Knowledge Hub
- Focus on Regional Media campaigns



EirGrid Energy Citizens Roadshow



Home energy grants and upgrades



Regional and social development



Microgeneration and community ownership

- 3 roadshows to date
- 5 event partners
- 10 roadshows to come in 2022.
- 15 exhibition partners
- 300+ attendees



Planning Engagement for better outcomes

Provide open and meaningful opportunities for engagement.

Build trust and new relationships.

Understand the needs (and aspirations) of stakeholders.

Utilise our networks and work with trusted partners to widen engagement.

Innovate with new technologies and deliberative processes.

Community Forums



Progress on engagement

Rollout of Community Forums

Laois Kilkenny	Green
Clashavoon Dunmanway	Green
Celtic Interconnector	Green
Kildare Meath	Green
North Connacht	Green
North Dublin East Meath	Yellow
Greater Dublin Area	Yellow

Strategic Partnerships



Deliberative Engagement

- Co-design of Routing Principles.
- Deliberative Dialogue



Progress on grid projects

Project	Step	Status
Celtic Interconnector	5	All consents achieved (Planning and Foreshore).
Kildare Meath	5	Non-statutory consultation processes complete – 286 consultation submissions considered. Preparation of planning application.
North Connacht	5	Planning application submitted. Awaiting outcome. <ul style="list-style-type: none"> No general public submissions to ABP.
East Meath North Dublin	4	Step 4 non-statutory consultation live.
Powering Up Dublin	4	30 stakeholder briefings completed (webinars, elected Reps, business, community, industry, statutory) Dublin Infrastructure Forum setup.
Laois Kilkenny	6 (4)	All 110 landowners along the route engaged with by the EirGrid ALO.
Uprate and refurbishment projects	N/A	Over 1000 landowners engaged across these projects over the last 12 months.



Thank you and
questions





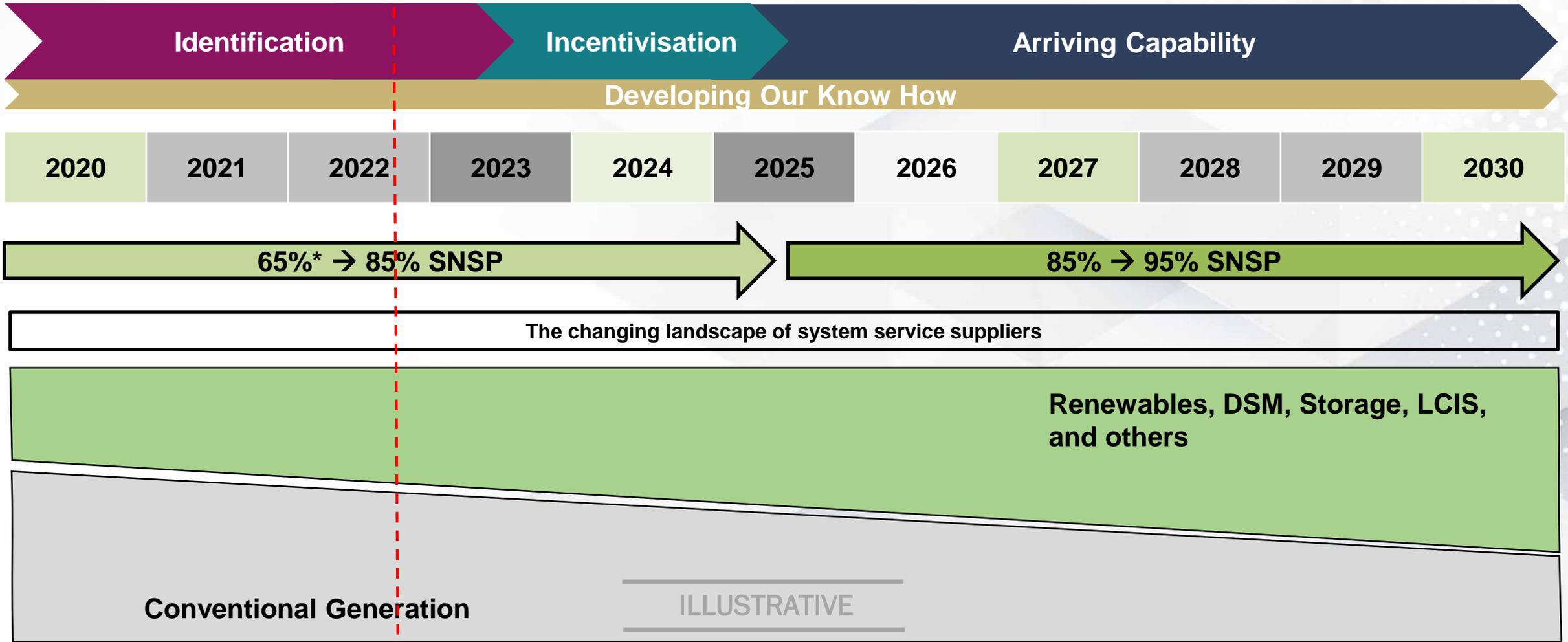
Lunch
13:00 – 13:45



Operations Programme



Operational Transition To 2030



Here



System Operations – Multi-Year Plan



Operational Policy

- Includes:
- Operational policy roadmap to 2030
 - Studies & analysis
 - Reduction in min gen
 - SNSP 75%→85%→95%
 - Probabilistic operations
 - New interconnector operational protocols

Standards & Services

- Includes:
- Procurement of low carbon inertia services
 - Future Arrangements for System Services
 - Grid Code evolution
 - Enhanced performance monitoring

Operational Tools

- Includes:
- Control Centre of the Future planning
 - Enhanced scheduling & dispatch
 - Integration of new grid technologies
 - Interconnector integration
 - European integration

Technology Enablement

- Includes:
- Demand Side strategy
 - Residential demand response trial
 - Treatment of hybrid connections
 - Code modifications
 - Qualification Trial Process (QTP)
 - I&R strategy

TSO-DSO Partnership

DS3 Close-out



- RoCoF
 - ✓ RoCoF +/- 1 Hz/s trial is expected to continue until the end of September
 - ✓ Trial analysis is ongoing ahead of expected close out of the trial and confirmation of operational policy of +/- 1 Hz/s.
- Nodal Controller
 - ✓ Ireland – pilot is now complete and SOs considering next steps
 - ✓ Northern Ireland – commissioning is ongoing
- Control Centre Tools
 - ✓ Look ahead Security Assessment tool operational
 - ✓ Ramping Margin tool operational
 - ✓ Voltage Trajectory tool IT delivery expected in Q4 2022

Operational Policy Roadmap

COMPLETED

Phase 1
(2023):

- Key trials to inform policy updates:
 - MUON
 - Inertia Floor
 - Negative Reserve (NI)

Phase 2
(2030):

- Review of current operational policies
- Develop short, medium, and long-term action plan
- Complete by end 2022

	Operational Policy Constraint	Current Requirements	2022		2023				Targets			
			Q3	Q4	Q1	Q2	Q3	Q4	2023	2030		
Stability	Minimum Number of Conventional Units	8									7	≤ 4
	Inertia Floor	23 GWs									20 GWs	17,5 GWs
	RoCoF ³	1 Hz/s									No change	No change
	SNSP	75%									No change	95 %
Frequency	Negative Reserve (NR)	50 MW on Conventional Units in NI									Reduced requirement for NR on NI Conventional Units	
	Positive Reserve	FFR POR SOR TOR1 TOR2 TBD 75 75 100 100 (%LSI)									No change	TBD
	Regulating Reserve	50(NI)/75(IE) MW									No change	TBD
	Ramping Margin	Explicitly Scheduled									No change	TBD
Plant Limits	Interconnector Ramping	10 MW/min across all-island									No change	TBD
	Voltage Management	Policy and OSS									No change	TBD
	Thermal Management	Policy and OSS									No change	TBD
	Short-circuit Management	Policy and OSS									No change	TBD
Legend												

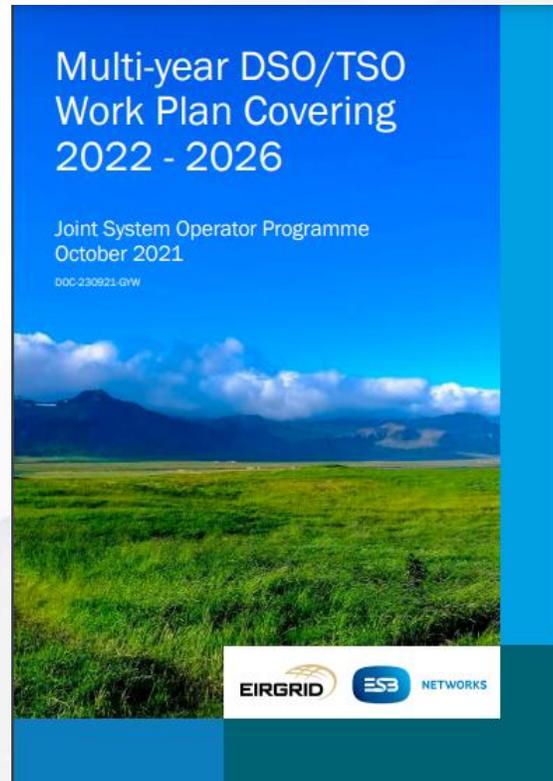
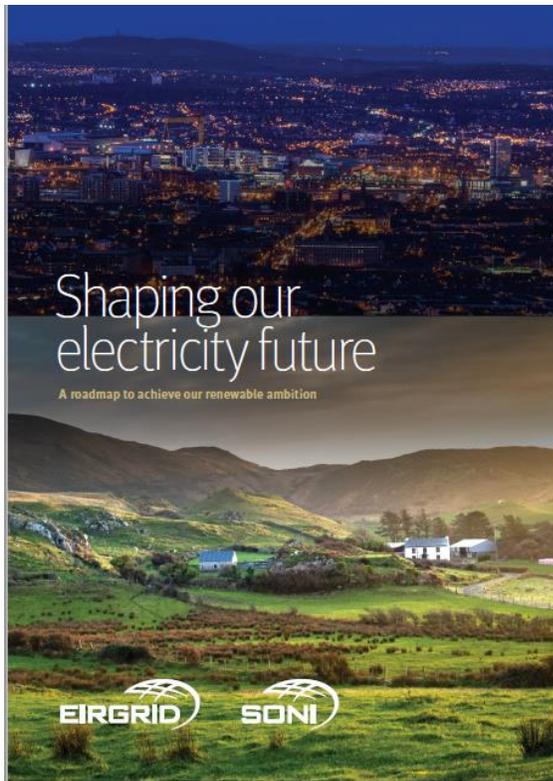
Low Carbon Inertia Services (LCIS)

- LCIS Requirements and Procurement Approach
 - Consultation ended on 12 August 2022
 - 23 responses received
 - The aim is to send the TSOs' Recommendations Paper to the RAs by the end of September to facilitate a SEMC decision
- Next steps*:
 - LCIS Contractual Arrangements consultation (November 22 to March 23)
 - Procurement (April 23 to September 23)



* Timeline for next steps is dependent on timing of SEMC decision on the LCIS Requirements & Procurement Approach

Protection Settings of Our Largest Customers



Protection Settings for Our Largest Customers	Formalise arrangements for coordination of the protection settings of our largest customers to ensure that system security is maintained. This will involve engagement with our customers.	TSOs / DSOs	Q4 2021	Q4 2022
<p>Note: In Northern Ireland, we will coordinate with NIE Networks for distribution-connected customers, where applicable, in the future.</p>	<p>Note: In Ireland, we will co-ordinate with ESB Networks for distribution-connected customers. For further information on our plans in Ireland, please see the Joint System Operator Programme plan.</p>			

Protection Settings of Our Largest Customers

Proposed Phased Approach agreed between TSO and DSO

Phase 1 (Short-Term)	Phase 2 (Long-Term)
<ul style="list-style-type: none">• Reconfirm protection settings of large demand customer sites• Review the settings and propose the application of interim protection settings where appropriate.	<ul style="list-style-type: none">• Consider updating the Transmission (and potentially Distribution) Codes to more comprehensively define standards including performance requirements (i.e., fault ride through), models and testing.

Grid Code changes

- RoCoF changes to Grid Code – targeting Q4 2022
- Work ongoing to incorporate Battery Implementation Note into Grid Codes – targeting GCRPs in October 2022
- Synchronous Condenser Implementation Note v1 to be published shortly



Hybrids

- EirGrid and ESBN submitted a proposed contractual approach to CRU for facilitating Multiple Legal Entities (MLE) in June 2022.
- System Operators in Ireland and Northern Ireland have completed an All-Island review of the 120% Over Install Policy. Separate recommendations papers will be submitted to CRU and UR.
- System Operators targeting Q4 2022 to complete a technical assessment for facilitating dynamic sharing of Maximum Export Capacity (MEC) behind a single connection point.



Other Items

- Control Centre of the Future delivery plan – targeting Q4 2022.
- Demand Side Strategy – aiming to finalise in the coming weeks.
- Qualification Trial Process – evolving the scope and process.
- Battery ESPS Interim Solution Guidance Note – expect to publish soon.
- System Services technical requirements and volumes – plan under development as part of wider Future Arrangements for System Services project.



Questions?

A young girl with long brown hair, wearing a grey sweater, stands in the foreground of a crowd. She is holding a large, hand-drawn globe on a wooden stick. The globe is blue with green and brown landmasses. In the background, other people are visible, some holding signs. One sign on the left has the words "ACT UP" and "NOW" visible. The overall scene suggests a climate change protest or rally.

Shaping our Electricity Future V1.1

Preparing 80% clean electricity by 2030



AOB

Closing

- Thanks for your time today
- For publication on the website early next week
 - Presentation
 - Minutes
- Dates for your diary >>>

SOEF Advisory Council provisional meeting dates	
3	18 January 2023
4	10 May 2023 (Hybrid)
5	13 September 2023
<i>Dates may be subject to change</i>	



Thank you,

Next meeting:

18 January 2023