DSO/TSO Multi-Year Plan 2025 - 2029

Joint System Operator Programme

September 2024

DOC-041024-IBK

EirGrid ESB NETWORKS

Contents

Executive Summary

The collaboration between the Transmission System Operator (TSO) and Distribution System Operator (DSO) in Ireland is essential for a successful energy transition and ensuring the long-term resilience of electricity supply. Since publication of our first DSO/TSO Multi- Year Plan in 2021, EirGrid and ESB Networks have worked in partnership to meet Ireland's targets for renewable electricity and support the path to decarbonisation.

This Multi-Year Plan details the key tasks and milestones that we will be working towards between 2025 and 2029 under the following pillars: Whole of System Approach, Facilitating New Technology and System Services, Reducing Dispatch Down, and Secure Future Power System. The proposals outlined in this document include a detailed plan for 2025-2027 and a high-level plan for 2028 and 2029.

These pillars have been drawn directly from the Commission for Regulation of Utilities (CRU) Decision Paper "PR5 Regulatory Framework Incentives and Reporting" (CRU/20/154), specifically the objectives set out in sections 7.9 and 8.12[1] . Furthermore, the milestones and activities have been shaped by the stakeholder feedback that was received following the PR5 DSO/TSO Call for Input Consultation Paper published on 28 June 2024. We would like to thank all parties who contributed to the development of this document by responding to this Call for Input Consultation and encourage you to continue to engage with the system operators through such opportunities.

[1] noting that the facilitation of new technologies was set out explicitly in section 8.12 only, whereas all other pillars were introduced in both sections 7.9 and 8.12.

Glossary

EirGrid

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Glossary

TERM	DEFINITION
ADMS	Advanced Distribution Management System
AGU	Aggregated Generator Unit
BAU	Business As Usual
CAP	Climate Action Plan
CRU	Commission for Regulation of Utilities
DASSA	Day-ahead System Services Auction
DD	Detailed Design
DECC	Department of the Environment, Climate & Communications
DER	Distributed Energy Resources
DERMS	Distributed Energy Resource Management System
DMSO	Distribution Market & System Operation
DSO	Distribution System Operator
DSU	Demand Side Unit
FNT	Facilitating New Technology
FRT	Faut Ride Through
HLD	High Level Design
JSOP	Joint System Operator Programme
LEU	Large Energy User
MEC	Maximum Export Capacity
MLE	Multiple Legal Entities
MUON	Minimum Number of Conventional Units On
MYP	Multi-year Plan
NCC	National Control Centre
NDCC	National Distribution Control Centre
NN,LC	National Network, Local Connections

TERM	DEFINITION
POAP	Plan On A Page
PR5	Price Review 5
QTP	Qualification Trial Process
RDD	Reducing Dispatch Down
RESS	Renewable Energy Support Scheme
RoCoF	Rate of Change of Frequency
SEM	Single Electricity Market
SFPS	Secure Future Power Systems
SNSP	System Non-Synchronous Penetration
SO	System Operator
SOEF	Shaping Our Electricity Future
TAO	Transmission Asset Owner
TSO	Transmission System Operator
UFLS	Underfrequency Load Shedding
UoS	Use of Systems
WOS	Whole of system

1. Introduction

TSO-DSO Joint System Operator Programme (JSOP)

The Joint System Operator Programme (JSOP) was established by the TSO and DSO in 2021 to ensure that the system operators are working together in a collaborative and effective manner to jointly address electricity system needs and deliver whole system solutions.

The CRU "PR5 Regulatory Framework, Incentives and Reporting" Decision Paper (CRU/20/154), published in December 2020, introduced a regulatory incentive on co-ordination of the DSO and TSO. The publishing of this DSO/TSO Multi-Year plan has been an annual requirement of EirGrid and ESB Networks in their roles as TSO and DSO, since 2021. In this document, we have set out our planned activities for the following workstreams from 2025 – 2029:

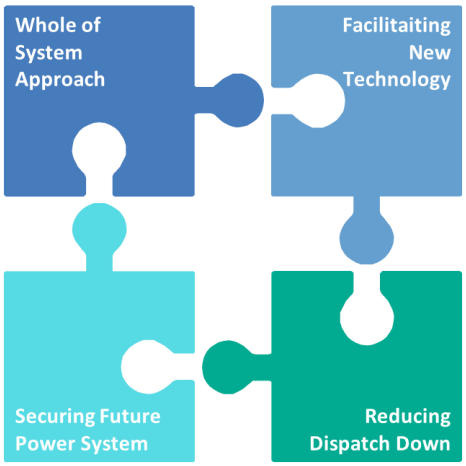
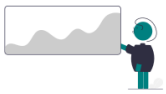


Figure 1: The four workstreams of the TSO-DSO Joint System Operator Programme

The Multi-Year Plan is submitted to CRU in September of each year to cover the upcoming five-year period. To provide for practical forecasting, the plan includes a detailed plan for the next three calendar years, with the fourth and fifth year accounted for at a high-level. Based on this submission, the CRU will decide by year-end on the milestones, deliverable targets and weightings for the next calendar year.

The programme objectives are detailed in below:



1. Support societal and economic growth in a sustainable and secure manner, consistent with our license obligations, through further development of the transmission and distribution systems.

2. Support the delivery of Ireland's 2025, 2030 and longer-term climate and energy policy objectives through collaboration between the TSO and DSO.

3. To address the CRU's objectives for TSO-DSO coordination:
   - The management of dispatch down and curtailment.
   - Addressing security of supply and constraint management, especially in the Dublin region.
   - A whole of system approach to the optimisation and meeting of system and customer needs.
   - Jointly developing effective processes for the deployment of new technology on the grid and in operations.

Figure 2: The objectives of the 2025 – 2029 DSO/TSO Joint System Operator Programme

2025 Ambition and Approach

Since our first Multi-Year Plan publication of the DSO/TSO 2022 – 2026 Multi-Year Plan, significant collaborative work has been carried out by EirGrid and ESB Networks to address the challenges and opportunities arising under the four workstream pillars. We have worked collaboratively through regular meetings, workshops, joint research, knowledge sharing and task delivery to meet the intended milestones and ensure our customers can expect a high quality, low carbon and reliable supply of electricity.

On an ongoing basis since 2021, our DSO/TSO Multi-Year Plan has been updated annually to consider policy updates, learnings from previous years, consultation responses and recommendations from the annual audit on the work programme.

Progress within 2024

The TSO and DSO have worked closely together in 2024 to deliver the Joint System Operator Programme. Activity has been progressed across all four workstreams, which will be outlined in detail in the Outturn Report for 2024, scheduled to be submitted to CRU in April 2025. Of note, significant work has been delivered by EirGrid and ESB Networks to finalise development of the TSO-DSO operating model high-level design and implementation plan. The system operators have also continued their coordination on Distributed Energy Resources (DER) visibility, forecasting, controllability, and modelling.

Both system operators continue to work in partnership through our robust governance structure, which is outlined below.

Furthermore, the system operators underwent an independent audit of the system operators' self-assessment of the performance against the 2023 work plan. The independent auditor found that there was either evidence or strong supporting evidence that the activities undertaken by the SOs supported the overall workstream score self-assessed by EirGrid and ESB Networks. The auditors also provided the system operators with recommendations for continued improvement, which have been considered. Where relevant, these recommendations have been addressed in this year's plan.

Programme Governance

The JSOP has a robust governance structure to ensure continuous engagement between the system operators and ensure that all challenges are addressed efficiently, to drive overall progress to meet Ireland's climate objectives. This governance structure includes weekly project management meetings, monthly management meetings and quarterly executive meetings, supplemented by ad-hoc arrangements, as required. All risks, assumptions, issues and dependencies are tracked on an ongoing basis using our programme RAID (Risks, Assumptions, Issues and Dependencies) tracker, ensuring proper programme governance throughout the year.

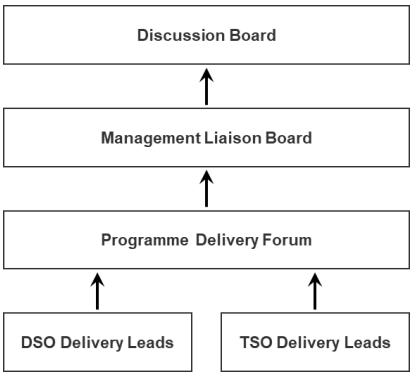


Figure 3: DSO/TSO Joint System Operator Programme Governance Structure

Progress, achievements, risks and issues are all outlined in detail in the annual Outturn Report which is submitted to CRU in April of each year. Furthermore, as outlined above, the system operators undergo an independent audit of the system operators' self-assessment (i.e., the Outturn Report). The independent auditor provides robust feedback on the Outturn Report through an Audit Report which is also shared with CRU in April annually. Any recommendations from the auditors, which aim to ensure continued improvement, have been considered and incorporated into this plan.

Our Approach to Developing the 2025-2029 TSO-DSO Multi-Year Plan

This Joint System Operator Programme, being ambitious in its nature, includes a broad spectrum of activities and tasks. The advanced level of coordination between the TSO and DSO required to meet the planned outcomes and address the needs of our customers, stakeholders, and society will facilitate the system operators in achieving government and regulatory policy and their respective objectives set out for 2025, 2030 and beyond. Operating with a unique power system and market arrangements means there is limited precedent or blueprints for us to follow and a degree of underlying risk which continues to be managed by our robust governance structures. However, given the level of uncertainty and change in particular areas of the industry there will likely be cases where the outcome of a task is different from that of the originally expected outcome.

The approaches being developed include co-ordination of services arrangements on a constrained system, coordinated management of pioneering levels of variable non-synchronous renewable generation and whole system approaches to ensuring we provide

capacity and security to support the uptake of low carbon technologies in homes and businesses.

The proposed approach within the plan is an iterative one, allowing us to learn what works and what needs to be adapted. We will adapt the Multi-Year Plan in response to changing customer needs, changes in technology maturity, stakeholder input and pilot learnings. This adaption occurs on an annual basis through our Multi-Year Plan, however, may also occur on an ad-hoc basis during the year when required.

As outlined previously in the DSO/TSO Multi-Year Plans, although many of the tasks will deliver benefits in terms of several of these objectives, we have structured them into a primary work stream based on the expected benefit to customers. We have also developed this plan to be outputs-driven, to ensure our decisions are centred around our customers.

The system operators collectively considered a range of inputs when developing this plan. These are outlined in figure 4.

Figure 4: Inputs to the DSO/TSO Multi-Year Plan 2025 – 2029

As outlined in the above, key inputs to the plan are:

- Stakeholder Input: Stakeholders were asked for input to this year's Multi-Year Plan through the Call for Input Consultation which ran for 6 weeks. Stakeholders provide input at a broader level at the EirGrid's Shaping Our Electricity Future (SOEF) and ESB Networks' National Network, Local Connections (NN,LC) Advisory Councils.
- Independent Audit: The independent audit conducted in 2024, of the programme's Outturn Report, provided valuable suggestions for future plans.
- Previous Learnings: This year's plan includes learnings from the development and implementation of previous Multi-Year Plans.
- Government's Climate Action Plan: The DSO and TSO consider the objectives and targets of the 2024 Climate Action Plan in devising tasks and milestones.

- TSO/DSO Operating Model: The development of the future TSO-DSO Operating Model is ongoing and its development serves as a dependency for numerous tasks in this Multi-Year Plan.

In November 2021, EirGrid launched the inaugural Shaping Our Electricity Future (SOEF) Roadmap (Version 1.0) which was prepared in consultation with stakeholders from across society, government, industry, market participants and electricity consumers. Version 1.0 reflected the climate change policies of Ireland at that time. Since its formation, things have progressed and EirGrid has prepared an updated Roadmap – Shaping Our Electricity Future V1.1. The roadmap provides guidance on the transmission network reinforcements, engagement plans, system operation enhancements and electricity market changes needed to achieve 80 % of electricity from renewable resources by 2030. Inherent in this roadmap is a secure transition to 2030 whereby we continue to maintain a safe, affordable, and reliable power system. The joint system operators' work programme is central to ensuring that the SOEF Roadmap is delivered in a coordinated and collaborative manner, working with the DSO.

In 2021, ESB Networks launched the National Network, Local Connections (NN,LC) Programme, in collaboration with stakeholders from the energy sector and the wider community. The programme enables and drives all customers' active participation in local and system wide services. The DSO/TSO Multi-Year Plan is central to ensuring that NN,LC is delivered in a coordinated and collaborative manner, working with the TSO.

Over the course of 2023, the NN,LC Programme has been integrated with other business areas to form the Distribution Market & System Operation (DMSO) function within ESB Networks. The DMSO represents a new organisational structure that consolidates the expertise and efforts of the NN,LC Programme, Smart Metering, Network Operations, and Retail Market Services. The DMSO is dedicated to continuing the advancement of enabling flexible services markets and facilitating customer engagement in the energy transition. Through this programme, ESB Networks has worked with and for customers to enable fundamental changes in the usage and storage of renewable energy, as required to decarbonise our society and meet the targets set out in ESB Networks' Networks for Net Zero Strategy and the Climate Action Plan.

Since publication of the 2024- 2028 Multi-Year Plan, based on stakeholder feedback and continuously evolving customer and industry needs, several additional pilots have been added to this programme. The DMSO programme has materially accelerated since the publication of ESB Networks "Networks for Net Zero Strategy[2]" document (DOC-030714-BUE) published in January 2023, Climate Action Plan 2024 and the recent CRU National Energy Demand Strategy (NEDS) Decision Paper[3] published in July 2024. The NEDS paper underscores the critical importance of collaboration between the TSO and DSO, to achieve the nation's ambitious energy flexibility and decarbonisation objectives.

[2] networks-for-net-zero-strategy-document.pdf (esbnetworks.ie)
[3] NEDS_Decision_Paper_and_Annex.pdf (divio-media.com)

How we are considering Climate Action Plan 2024

Both system operators are committed to working together collaboratively to reach our Climate Action Plan targets. The final Climate Action Plan 2024, published in May 2024 highlighted key areas of co-ordination between the system operators, notably:

- Significant investment is needed in the transmission and distribution systems to maximise the usage of renewable electricity and to reduce constraints and congestion on the system. System Operators and the CRU must ensure the timely investment in, and delivery of, the required electricity network infrastructure, including key priorities such as the North South Interconnector, to meet the targets set out in this, and subsequent, Climate Action Plans
- Deliver a streamlined electricity generation grid connection policy and process, and remove barriers, where possible, for the installation of renewables and flexible technologies reducing the need to build new grid, including hybrid (wind/solar/ storage) connections;
- System Operators to transform the flexibility of the electricity system through changes to policies, standards, services, and tools, funded and incentivised through regulatory price controls
- Undertake dispatch reform aimed at improving the efficiency of Transmission System Operators dispatch actions
- Deliver a demand side strategy that facilitates zero carbon demand, incentivises low carbon electricity consumption, and aligns with EU energy efficiency requirements, while facilitating electrification targets
- The demand side strategy should accelerate the rollout of local flexibility markets by the Distribution System Operator, as required to meet renewable electricity and carbon abatement targets, and contain measures to incentivise Large Energy Users to increase the flexibility in their electricity demand
- Enable and encourage domestic customers, businesses, and communities to participate in demand flexibility services;
- Enable and encourage customers to participate in wholesale and system services markets as a matter of urgency. Local balancing of flexible demand and renewable generation will contribute to an increase in renewable electricity usage and a reduction in carbon emissions.

These have been taken into consideration during the development of this document.

Dependencies

The nature of the DSO/TSOs Joint System Operator Programme lends itself to a number of dependencies. Many of these have been referenced in previous Multi-Year Plans, and are still relevant to the work that will continue to be progressed out to 2029. While we are committed to building enduring approaches, we acknowledge the programme's reliance on external parties and factors. Some high-level dependencies are listed below, with specific dependencies called out in the detailed plan where relevant. A number of key new dependencies for this 2025 – 2029 DSO/TSO Multi-Year plan will include:

- Climate Action Plan 2024 and future Climate Action Plans;
- Network Code on Demand Response (currently in drafting and consultation processes);
- CRU National Energy Demand Strategy and associated decision(s), including CRU202467 National Energy Demand Strategy Decision Paper;
- Forthcoming CRU consultations and associated decision(s) on hybrid connections;
- SEM-23-103 System Services Future Arrangements – Phase III: Detailed Design and Implementation – Phased Implementation Roadmap for the System Services High Level Design – Decision Paper;
- SEM-24-046 Demand Side Units: A Revised Phase 1 Solution for Energy Payments and Other Issues;
- EirGrid Future Arrangements for System Services consultation paper on the design of the day-ahead system services auction (DASSA) and subsequent response and decision;
- EirGrid Future Arrangements for System Services – DASSA Product Review & Locational Methodology Consultation Paper and subsequent response and decision;
- ESB Networks' Electricity Distribution Network Capacity Pathways (DOC-081223-HVK)
- ESB Networks' Expression of Interest for Flexible Demand Connections (DOC-111223-HVK)
- CRU202467 National Energy Demand Strategy Decision Paper;
- CRU202469 DSO Demand Flexibility Product Procurement Decision Paper, and further related follow-up consultations and decisions;
- CRU2024001 CRU Review of Large Energy Users Connection Policy consultation paper, and further related follow up decisions;
- CRU202402 CRU Installed Capacity Cap Decision Paper;
- The CRU's PR6 price review process is currently underway for the TSO and the DSO separately. Delivery of future initiatives, identified as part of the Joint System Operator Programme work, are subject to future funding requests and regulatory authority approval of same.

Other dependencies that were outlined in previous DSO/TSO Multi-Year Plans that are still relevant, include, but are not limited to:

- SEM-22-012 High Level Design System Services Future Arrangements;
- CRU/21/124 CRU Decision on Data Centre Grid Connections Process;
- SEM-21-027 Proposed Decision on Treatment of New Renewable Units in the SEM;
- SEM-21-016 Consultation on compliance of the SEM market arrangements with EU Electricity Balancing Guideline (EU Regulation 2017/2195);
- SEM-22-009 Decision Paper on Dispatch, Redispatch and Compensation Pursuant to Regulation (EU) 2019/943 and subsequent relevant communications;
- EU Regulation 2019/943, Directive 2019/944, and EU electricity market reform

proposals to this legislation;
- ESB Networks Flexibility Multi-year Plan and CRU target setting;
- CRU annual consultation on Electricity Network Tariffs;
- Regulatory decisions regarding the funding of local and system services. For example, if either the TSO or DSO seeks to pilot a service which is not currently funded within the existing Use of Systems (UoS) or market revenue streams, a funding model of the appropriate scale would be required to progress the pilot;
- Industry/customer readiness – for example, it will not be possible to progress a Qualification Trial Process (QTP) pilot or other pilot if potential participants do not bid proposals into the process.

Each work stream and initiative within that work stream has its own risks, assumptions, and dependencies. The intention of this document is to highlight the initiatives and indicative timings. These initiatives focus on the points where DSO/TSO coordination is vital. Each system operator has its own unique initiatives under the different licence obligations, which will be progressed in parallel with this programme and in many instances interact with it.

Industry Participation and Engagement

Customer participation and engagement will be a critical component to ensure that pilots and activities deliver enduring outcomes. We will engage actively with our customer, industry, and community stakeholders to ensure that we address barriers to entry and shape incentives to maximise participation within the limits of our funding.

Since the Joint System Operator Programme commenced in 2021, industry participation and engagement has been a key focus of the programme. The system operators understand the need to actively engage with our key stakeholders to ensure that we address barriers to entry and shape incentives to maximise participation with our programme. In 2024, the TSO and DSO organised a two-part webinar series; 'ESB Networks & EirGrid Joint System Operator Programme Virtual Briefing Webinar' and the 'Future Operating Model High Level Design Webinar'. The main objective of this webinar series was to provide an overview of the vision and principles of the TSO-DSO Operating Model High-Level Design. It included details on how the future operating model will impact industry stakeholders. The presentations from the series are available at our landing page[4].

A Call for Input Consultation on this 2025-2029 Multi-Year Plan was live from the 28 June until 09 August 2024. Feedback and responses received from the consultation have been incorporated into this Multi-Year Plan, with the specific details in Section 2.

The system operators propose the following engagement checkpoints for the DSO/TSO Multi-Year Plan 2025-2029:

[4] TSO/DSO Joint System Operator Programme (eirgrid.ie)

1. The progress of the DSO/TSO Multi-Year Plan 2025 – 2029 will be shared at a SOEF advisory council meeting and an NN,LC advisory council meeting during the year,
2. The system operators will conduct stakeholder engagement sessions if and when necessary;
3. The TSO and DSO will jointly engage in a Call for Input Consultation for the 2026 – 2030 Multi-Year Plan with industry to ensure that the updated Multi-Year Plan reflects industry feedback.

In addition to the above engagement on the Multi-Year Plan as a whole, the SOs plan to re-engage stakeholders on the future Operating Model more specifically. We expect this will include a webinar in Q4 2024/ Q1 2025 with an additional webinar hosted in Q2 2025. These webinars will offer industry stakeholder the opportunity to ask questions and provide feedback for consideration by the SOs in the Detailed Design work. As work on the Operating Model continues, the exact number, scope, and detailed agendas of these webinars will be developed.

Call for Input Consultation Response

EirGrid

ESB NETWORKS

2. Call for Input Consultation Response

In June 2024, ESB Networks and EirGrid published a joint Call for Input Consultation on the DSO/TSO Multi-Year Plan 2025 – 2029. The purpose of the Call for Input Consultation was to give stakeholders an opportunity to provide input and feedback on the planned activities for the coming five years.

Following the closure of the Call for Input Consultation on 09 August 2024, ESB Networks and EirGrid are jointly responding to the inputs received, after reflecting on the full range of respondents' feedback. The below response outlines the system operators' proposal to addressing the feedback that was within the scope of the DSO/TSO Multi-Year Plan. Some comments received were not relevant to the content of this Multi-Year Plan and as such have not been addressed in our response. Specifically, some comments were either related to the work of one single system operator, in a capacity outside of JSOP, or related to the TAO-TSO programme.

We would like to take this opportunity to thank and acknowledge the written input and constructive feedback received from the following respondents: (i) ESB Generation and Trading, (ii) EDF Renewables, (iii) Energia, (iv) Oracle and a fifth respondent who wishes their response to remain confidential. We welcome the positive feedback and engagement contained in the responses and note the specific points to be addressed.

Key themes emerged from the feedback received in the consultation, which include;

- The Multi-Year Plan should outline key actions to be undertaken by the SOs to achieve the Climate Action Plan targets and the 2030 renewable energy targets;
- Stakeholder engagement on the operating model should occur often and be openly available to the public, the importance of which should be reflected in the Multi-Year Plan milestones. Furthermore, stakeholders should be given opportunities to share feedback on the operating model and request further detail;
- There is a need for increased detail within the MYP and the CRU's balanced scorecard covering the co-ordination and implementation of storage and related support schemes;
- The Multi-Year Plan should outline an effective management plan that will reduce constraints and curtailment; and
- All workstreams and their associated activities in the Multi-Year Plan could be enhanced through increased stakeholder engagement.

Both ESB Networks and EirGrid have worked to ensure that the Multi-Year Plan reflects relevant feedback. Where relevant we have ensured the 2025 – 2029 Multi-Year Plan captures the suggested changes and constructive feedback received from stakeholders.

Table 1: Feedback received and system operator responses to TSO-DSO Call for Input Consultation

FEEDBACK RECEIVED	SYSTEM OPERATORS' RESPONSE
"(We have) already commented on the need to give more prominence to the BESS procurement schemes and their co-ordination in the MYP. Long and medium duration storage are likely to be the most significant new technologies that come on to the system over the MYP period, but they are not specifically referenced in the facilitating new technology section of the 2024-28 MYP". "When facilitating new technologies, the TSO-DSO must also co-ordinate to examine the impact on existing technologies and existing markets. One example of this is the work to facilitate DSU participation in all markets - this could have a substantial impact on future CRM auctions, as DSUs historically have a poor track record for availability, and the TSO-DSO need to be aware of and co-ordinate over potential implications such as this".	ESB Networks and EirGrid agree and acknowledge that Battery Storage has a significant role to play over the coming years as a means of meeting transmission and distribution network needs. Both SOs are working on products that battery storage assets (as well as other technologies) may be interested in contracting for. In terms of the facilitation of new technologies, both SOs are working towards understanding what the future looks like and what the impact of these new technologies are on existing systems and markets.
"The deployment of multiple GW of medium and long duration storage across the island of Ireland feeds into each of the four workstreams in the MYP. Actions 6 and 7 of the Department for Energy, Climate and Communications specifically identify the SO's support schemes as key enablers of this deployment to 2030. In the past twelve months, (we have) been separately engaged in detailed consultation responses covering both schemes. (We have) raised concern that the work on storage support schemes is not being sufficiently well co-ordinated between the SOs. As an investor in storage assets, (we) would hope to see a co-ordinated and consistent approach to the procurement of storage, as this would make it easier to assess the various procurement proposals, and to understand how assets procured through these schemes will interact with each other and with the rest of the market (i.e. with non-supported assets)." "(We note) that EirGrid's response to ESBN's consultation on the Demand Flexibility Product Procurement scheme raised similar points, and cited concerns regarding co-ordination and the need for further engagement. As set out in DECC's storage strategy, the period covered by this MYP will be the period during which at least 1GW of supported assets are expected to be procured and come into operation. However, the 2024-2028 MYP, upon which this year's MYP is to be based, only covers storage at a very high level. (We believe) there should be far more detail in the balanced scorecard proposals covering how the SOs will co-ordinate in the development and	Both EirGrid and ESB Networks acknowledge the importance of coordinating and planning in order to ensure the effectiveness of any future procurement proposals that may be aimed at battery storage developers. Both SOs are working towards ensuring that the approach is optimised from a whole system perspective. We would also like to note that there is a significant level of public engagement planned in order to improve the level of information available. An example of this will be the planned publication of a second consultation document for the Demand Flexibility Product owned by ESB Networks.

Feedback Received	System Operators' Response
implementation of these important storage support schemes".	
"(We) re-iterate the importance of the introduction and implementation of hybrid connection policy. Dynamic hybrid connections can play a very important role in facilitating the increase in renewables on the system. (We) urge the CRU to implement a facilitative policy as soon as possible, and pending this the phased implementation should be a priority for the TSO/DSO. (We) agree with the outcome of enabling sharing of MEC behind a single connection point".	The system operators appreciate the feedback. We will continue to work together as part of this programme, with the CRU, to progress the implementation of hybrid connections as part of this Joint System Operator Programme. In 2024, we published a joint paper on Installed Capacity Cap Decision Review and Implementation Timelines. Please refer to Section 9 which includes a detailed description for the tasks and projected timelines of tasks FNT 7, 8 and 9 – Hybrid Technologies.
"Since (we) responded to last year's MYP, Northern Ireland has been in the midst of a constraints crisis, with dispatch down levels of renewables consistently above 25% for over a year. In addition to the crisis in NI, there is a significant risk that the issue will spread into RoI during the MYP plan period as new interconnectors import more power from GB and France. Reducing dispatch down ultimately involves building the necessary grid to mitigate the constraints, which itself is linked to the full implementation of Article 12/13 of the EU's Clean Energy Package on dispatch down compensation. In addition, the roll out of flexible assets, increased electrification and new sources of demand have a role to play in the medium-term. In the short-term the TSO/DSOs should co-ordinate regularly to ensure that they are doing everything possible with the system as it is currently to minimise dispatch down. This should be reflected in the balanced scorecard proposal, with outcomes linked to maximising the efficiency of the current system." "(We) welcome the task to improve forecasting of wind and solar, particularly as more solar energy comes online in Ireland, but notes that the outcome in the MYP 2024 of "improved forecasts" is particularly vague and hard to measure against."	TSO and DSO collaborate to enhance data sharing and improve the forecasting and modelling of DERs and small-scale RES. A critical step in this process involves gaining better visibility into these resources to obtain more accurate and useful data. This data will be then fed into forecasting systems and models, contributing to improved accuracy and a deeper understanding of RES generation behaviour. However, addressing the diversity and massive number of DERs, especially within low-voltage distribution networks, requires significant effort and time. It's important to note that TSO continues to take necessary actions to reduce dispatch down at the whole system level, which falls outside the scope of this program.

Feedback Received	System Operators' Response
"Dispatch Down Management Plan - Constraint is a local system issue which can be alleviated by reinforcement of the Grid infrastructure. Constraint is a measure of a systems effectiveness and efficiency. Higher constraints result in a less effective system, and this leads to increased costs, to both the consumer and to non-firm generators. EirGrid and ESBN's ambition should be to strengthen the system and minimise local constraints. Specifically, the West and Northwest have long had network investment signals, with regards to the high level of constraints in these areas. A proactive plan is encouraged to increase the strength of the Grid Network in these areas, as a reactive approach only delays investment and economic development in the area. As constraint and curtailment continue to represent an issue for renewable generators, we welcome the development of an effective dispatch down management plan, to minimise dispatch down and to remove this risk for renewable units".	While ongoing reinforcement efforts in the distribution network continue wherever feasible, this program primarily focuses on managing the dispatch down of distribution-connected renewable energy sources and DERs. Our emphasis lies in gaining essential capabilities and tools to enhance visibility, forecasting, and modelling on both the TSO and DSO sides. Achieving these improvements can be accomplished more swiftly compared to physical network reinforcement. Additionally, there are ongoing pilot initiatives aimed at facilitating flexible connections and DSO flexibility services to address congestion within the distribution network. The transmission network reinforcement related to TSO and TAO fall outside the scope of this program.
"In the future Multi-Year Plan, (we) would welcome greater detail on all of the elements within the Multi-Year plan and updates from the last year. Considering the amount of work that has occurred on the Future Arrangements of System Services (FASS) in the last year and the most recent DASSA product consultation, greater detail on the DSO/TSO approach to the procurement of RDD4 "Development of reactive power management HLD in line with Operating Model" is needed and how it may impact on the FASS procurement mechanism for these services in the future. Page 33 of the 2024-2028 Plan identifies that H1 will include an "update DSO/TSO reactive power agreement" and H2 will have "Priority locations identified for reactive power". Has this been progressed and if so, will this information be made publicly available?"	TSO and DSO are collaborating to develop a high-level design of the reactive power agreement in line with the Operating Model. The locations, the reactive power coordination approach and the industry communications approach are subject to ongoing discussions between TSO and DSO.

Feedback Received	System Operators' Response
"(We) welcomed the opportunity to attend the high-level design webinar on the Future Operating Model. Proactive and timely communication on this project should be an important part of the MYP. (We) re-iterate that it is essential that all participants have an equal opportunity to be updated on this workstream, rather than updates going to forums where only some members can attend (e.g. the SOEF Advisory Council). While these schemes are technology neutral, it is generally recognised that the asset technical characteristic requirements tend towards the success of storage assets for both schemes. Where the roll-out of a Future Operating Model involves technology or system changes for participants, these changes need to be flagged and explained well in advance to minimise any potential disruption. With regards to the development of system services at both a transmission and distribution level, market participants are currently having to engage with and prepare for a vast amount of change with the roll-out of the Future Arrangements for System Services. Updates from the TSO/DSO in this area, particularly in terms of how markets for system services at a transmission and distribution level will work together in practice, need to include plenty of time for consultation and feedback".	We acknowledge your feedback on our webinars held in June 2024, where the TSO and DSO shared an open invitation with stakeholders to introduce them to the TSO-DSO Operating Model High-Level Design. Following these two successful webinars, the system operators plan to re-engage these stakeholders in 2025. The scope and detail of this webinar will be developed in line with the progress of the work underway by the TSO and DSO, however its aim will be to update industry stakeholders on further progress of the development of the Operating Model. We appreciate the need for stakeholders to be given advance notice to minimise any potential disruptions and endeavour to ensure our updates are clear, helpful and timely.
"Although there is a degree of acknowledgement in the Plan of each of the above issues, we believe that the Joint Multi-Year Plan needs to highlight these challenges more explicitly and identify the corresponding actions more clearly. Our overarching concern is that the scale and pace of change to Ireland's transmission system required to deliver climate objectives is not reflected in the Plan and we would welcome a step-change in approach. Further, we would welcome the opportunity to make a positive contribution to facilitating this".	The JSOP has a robust governance structure to ensure continuous engagement between the system operators and ensure that all challenges are addressed efficiently, to drive overall progress to meet Ireland's climate objectives. This governance structure includes weekly project management meetings, as well as monthly management meetings and quarterly executive meetings, as well as ad-hoc arrangements, as required. Progress, achievements, delays and issues are all outlined in detail in the annual Outturn Report which is submitted to CRU in April of each year. Furthermore, the System Operators undergo an independent audit of the system operator's self-assessment (i.e., the Outturn Report). The independent auditor provides robust feedback on the Outturn Report through an Audit Report which is also shared with CRU in April annually. Any recommendations from the auditors, which aim to ensure continued improvement, have been considered and incorporated into this plan. You can find out more about our governance structures in Section 1 under 'Programme Governance'.

Feedback Received	System Operators' Response
"At a high level, one of the primary considerations on the consultation is that this Call for Input is an unsuitable process for feedback to be requested on the Future Operating Model. The Call for Input paper takes the very high-level approach of directing stakeholders to last years' plan, and the two webinars held in June mentioned above, and inviting stakeholder inputs into the development of this year's five-year plan (from 2025 to 2029). There is no commentary in the Call for Input paper from the SOs on the progress made on the plan over the last year or what, in their opinion, will influence the shape and direction of the new plan. This direction was, however, somewhat discussed at a high level in the first webinar on the Joint System Operator Programme. The second webinar described the Future Operating Model High Level Design in terms of the rationale for the type of model chosen and the key scope areas of Optimisation & Scheduling, and Activation and Dispatch. An end-to-end flow diagram of the model was provided with some high-level notes on each part of the process. Whilst, (we welcome) that a number of day-in-the-life worked examples were provided a detailed consultation plan for the high-level design model has not been outlined in the webinar beyond stating that the concepts are still open to be discussed and developed further. Following that, the next step stated is for the SOs to develop the detailed design of the operating model, including settlement and market impacts, only after which industry will be engaged again. It is also noted from the webinar that the SOs "do not currently have a date or timeline for when the operating model will be operational, to be developed as part of the implementation plan". The Future Operating Model is of particular importance to the upcoming procurement by the DSO of Demand Flexibility for which the CRU published its decision on ESB Networks Product Proposal subsequent to the second webinar. Unfortunately, the information provided on the operating model via this call for input is not at a sufficiently detailed level to assess the viability of the DSO/TSO operating model".	The purpose of the Call for Input Consultation was to seek stakeholders' input into the content of the next iteration of the Joint DSO/TSO Multi- Year Plan (from 2025 to 2029) in advance of its drafting. It was not intended as a means of requesting feedback on the Operating Model itself. We endeavour to clarify this in future Call for Input Consultation Papers. We have begun work to collaboratively develop the detailed design of the future Operating Model. For details on plans for engagement, which will include communication on the progress of this work please see Section 3 – Whole of System Approach - below.
"The future operating model was described at a high level at the second industry webinar in June 2024. However, some of the fundamental market design questions raised by (us) in relation to the model in its response to the CRU consultation on ESB Networks' Demand Flexibility Product Proposal are not answered by the high-level design, nor by the CRU's decision on the procurement. Similar concerns are present for the upcoming TSO LDES procurement plan. In order to assess a DSO/TSO Future Operating Model, market participants need greater clarity on the procurement	Thank you for your feedback. The common theme in each of the queries is around a need for transparency and that is something that both SOs are in full support of. In relation to holistic market design, one of the key aims of the Operating model is to ensure that for a potential participant it is very clear what market interactions are available to them and what potential revenues they can earn as well as any potential restrictions. In terms of how the TSO-DSO Operating Model work is

Feedback Received	System Operators' Response
mechanisms and how they interact with the markets. These fundamental questions include: • Holistic market design. How will the considerable quantity of DSO flexibility procurement (500MW) and this future operating model affect the plans for incentivising: storage through the new TSO Long Duration Energy Storage mechanism; the procurement of system services through the Future Arrangements for System Services (FASS); other markets including RESS, the CRM and the Energy Market? This is a fundamental consideration that needs to be undertaken to ensure the markets as a whole are capable of working together while being able to create the independent investment signals and value to the customer. • Revenue stacking. If, under revenue stacking, a participant has a CRM contract and ESBN Demand Flexibility Product Proposal the interactions of the obligations of both of these contracts may need further consideration. For example, which contract should take priority if a Reliability Event occurs in Northern Ireland at the same time the DSO schedule is seeking to charge the asset. • Balancing Market Interaction. Considering all of the complications that are facing batteries and non-priority dispatch renewables due to the TSO IT issues, greater clarity on how these assets will be dispatched by the TSO/DSO could help alleviate investors' concerns and reduce the potential cost to the customer. • System Service Market Interaction. The DASSA obligation effectively removes volume from the ex-ante market whereas the ESBN Product is to include volumes in the ex-ante markets. (we acknowledge) that the CRU does outline some of the issues above in its DSO procurement decision and looks forward to participating in the future consultation paper."	considering the interactions between different markets and products, these have been considered in the Operating Model at this High Level Design (HLD) stage of the work in terms of the vision and principles. Work on the Demand Flexibility Product Proposal is separate to that of the TSO-DSO Operating Model, although there are a number of aspects which overlap as highlighted in the response. Long Duration Energy Storage is again separate to this and aims to meet a Transmission system rather than a Distribution system need. Both SOs acknowledge the importance of these products and markets being aligned in a way that provides clarity for market participants. The intent is for the Operating Model to provide this aligned approach for the relevant distribution-connected resources in the relevant markets and mechanisms. Discussions are currently taking place between EirGrid and ESB Networks on these kinds of questions specifically for the Demand Flexibility Product Proposal, to develop clarity on the potential for revenue stacking and the potential for conflicts between arrangements. The material for the TSO-DSO Operating Model High Level Design presented to date gives some insight as to how the different markets and products could interact, and outlines details for how different unit types would be dispatched under the model. More specific details require further discussion in the detailed design phase of the Operating Model. We intend to provide further clarity on these topics through additional industry engagement, including the specific points raised in this query, as well as clarifying impacts and interactions through the day-in-the-life examples. In addition, ESB Networks will be publishing a further consultation on the Demand Flexibility Product Proposal which will consider in more detail aspects related to market design and market interactions specific to that product. Improvements to IT systems for the dispatch of a number of different unit types are being progressed in central market system change programmes by the TSO, in particular the Scheduling and Dispatch Project and the Strategic Markets Programme. Further details on these improvements can be found from regular publications and workshops from the Future Power Markets team in EirGrid relating

Feedback Received	System Operators' Response
	to those programmes, information on which is available on the EirGrid website.
"A resilient electricity grid is essential to meeting our 2030 and beyond renewable electricity targets and longer-term decarbonisation goals. We believe that the Climate Action Plan (CAP) 2024 targets will only be achievable with the parallel development of the transmission system, to accommodate the large volumes of renewable generation that will be required. Coupled with increased electricity demand, particularly from Large Energy Users (LEUs), the existing transmission and distribution grids were not designed for the location and increased levels of power flows that are planned over the next few years. We would urge EirGrid and ESBN to align with the Government's CAP 2030 target of 80% renewable electricity generation and to also proactively plan beyond this to further the national net zero target. We would encourage EirGrid and ESBN to work closely with the CRU, DECC and Industry to facilitate this step-change in ambition".	The Government's Climate Action Plan (CAP) target of up to 80% renewable electricity by 2030 is a cornerstone of this programme. Meeting this objective, and others outlined in CAP, will see transformative changes in the electricity system operation and related markets and additional co-ordination between the system operators is an essential element of achieving this. EirGrid's Shaping Our Electricity Future V1.1 provides guidance on the transmission network reinforcements, engagement plans, system operation enhancements and electricity market changes needed to achieve 80% of electricity from renewable resources by 2030. Inherent in this roadmap is a secure transition to 2030 whereby we continue to maintain a safe, affordable, and reliable power system. The joint system operators' work programme is central to ensuring that the SOEF Roadmap is delivered in a coordinated and collaborative manner, working with the DSO. We also want to ensure you that we continue to work closely with CRU, DECC and industry as part of this programme. We hold meetings with CRU and DECC on structured and ad-hoc basis throughout the year, to ensure their approval and alignment with our progress on a variety of matters. We continue to appreciate and encourage feedback and engagement with industry. For the coming year we endeavour to engage industry through a number of opportunities; 1. The progress of the DSO/TSO Multi-Year Plan 2025 – 2029 will be shared at a SOEF advisory council meeting and an NN,LC advisory council meeting during the year, 2. The system operators plan to re-engage stakeholders in 2025 on the future Operating Model. The scope and detail of this webinar will be developed in line with the progress of the Working Group, however its aim will be to update industry stakeholders on further progress of the development of the Operating Model. 3. The system operators will conduct stakeholder engagement sessions when necessary;

Feedback Received	System Operators' Response
	4. The TSO and DSO will jointly engage in a Call for Input Consultation for the 2026 – 2030 Multi-Year Plan with industry to ensure that the updated Multi-Year Plan reflects industry feedback
"A secure future power system is an absolute priority for all participants in I-SEM. (We welcome) that this is a workstream in the MYP and is supportive of the scorecard proposed. Taken together, policies to protect the system focused on large energy users (particularly data centres) and new control room technology could have a significant positive impact. It is also welcome that there is a task specifically focused on the impact of distributed energy resources on power system security. (We) will work constructively with the SOs in responding to consultations and calls for input on such proposals".	Thank you for the feedback. As noted, a secure power system is in the interest of all parties in I-SEM but, in general, to of all society. The TSO and DSO have worked tirelessly together to address the data centre and DERs performance issues. Regarding data centres, after the TSO and DSO collected updated information (e.g., protection settings of their systems), they organized an industry webinar (30 April 2024) to present on the observed fault-ride through issue and the risks it presents to system security. Following the industry webinar, the TSO, DSO and data centre customers established a Task Force to look at this problem and explore ways to address it (e.g., developing fault-ride through standards). The Task Force is meeting regularly, and it is soon expected to propose concrete solutions and next steps to be implemented.
"We commend ESB Networks and EirGrid for their forward-looking approach in updating the Flexibility Multi-Year Plan by integrating the latest developments from EirGrid's Shaping Our Electricity Future and the new Distribution Markets and System Operation (DMSO) function. These initiatives, alongside the whole-of-system approach in the PR5 Joint Incentive Plan and the "Networks for Net Zero" Strategy, will play a critical role in enabling a flexible, responsive energy system capable of meeting Ireland's ambitious climate and energy targets".	We appreciate the feedback and intend to continue striving to meet Ireland's energy targets.
"For a Whole-of-System approach to work, efficient and dynamic forecasting across the whole value chain will be key to call upon the most economical/reliable and available resources to meet the capacity and demand for scheduled services as well as real time constraint management. The integrated system should also consider expectation that the actual predicted outcome may differ from the forecast as customers (behind the meter) reflect the cost of net-zero in their spending behaviour. A planning scenario around +/- 10% of the best case (along with an economic impact assessment) will assure stakeholders they are receiving best value for money and ESB and EirGrid are not overinvesting on capital projects".	Thank you for your feedback. We note the points on forecasting, as this is an area of relevance to operational co-ordination between the DSO and TSO being considered in this work. However, activities relating to grid infrastructure fall outside of the scope of the JSOP TSO-DSO Programme to which this document relates.

Feedback Received	System Operators' Response
"ESB and EirGrid need to work with all participating stakeholders to ensure that objectives are aligned, and expenditures are targeted to deliver maximum outcomes. Stakeholders should include local authorities, rural cooperatives, renewable energy associations and energy efficiency, demand management providers and prosumers in the future. Past projects in the GB region have demonstrated active involvement, consultation and feedback from stakeholders led to better engagement and outcome delivering the maximum value from these initiatives Use of Local Area Energy Planning teams will support these objectives and provide ESB and EirGrid a valuable source of intelligence on stakeholder and customer thinking and intended behaviours".	The TSO and DSO realise the importance of engaging a broad number of stakeholders in the delivery of the Joint System Operator Programme and deliver effective communication with relevant stakeholders when appropriate. For more information on how we have, and plan to continue engaging industry stakeholder, please see 'Industry Participation and Engagement' under Section 1 of this document.
"Support a Whole-of-System approach leveraging Composable System Architecture meaning leverage ESB's and EirGrid's existing investments they want to keep and leverage Data Exchange to support secure, scalable, and extensible data exchange as a DER Market Portal to combine DER, grid, and forecast data to make available to TSO, DSO, DER Aggregators, and Energy Markets to schedule and clear most cost-effective and available resources to mitigate energy and grid constraints. NMS/DERMS becomes the Whole-of-System to compile and evaluate the day-ahead network constraints to clears the lowest cost resources fully mitigates forecast constraints due to the DER market bids. Market selected bids that violate MV and LV distribution voltage and capacity constraints will be curtailed, and alternative resources will be identified. The Data Exchange can aggregate MV DER and load forecasts by Transmission Connections to update for HV system operations".	Thank you for your feedback. The most appropriate approaches to the conceptual model of how co-ordinated operations will take place, and the data exchange and systems to implement this, will be considered in the relevant workstreams of the programme.
"It will be essential for ESB and EirGrid to design and integrate the future grid management systems with resilience in mind. Integration of renewables should enhance grid resilience by providing a solution for system-wide optimisation and advanced analytics capabilities to better anticipate and respond to emerging challenges. A well designed DERMS can unlock the full potential of DERs by providing real-time visibility into DER performance and behaviour, enabling data-driven decision-making across multiple stakeholders across the TSO-DSO network, and facilitating more efficient resource allocation and prioritisation. This can create a more resilient, flexible, and customer-centric grid better equipped to handle the demands of an increasingly decentralised energy landscape. Whole-Of-System approaches are critical for efficient flexibility market design and execution. Network	Thank you for your feedback. The most appropriate approaches to the development of local flexibility market, the conceptual model of how co-ordinated operations will take place, the data exchange and systems to implement this, and pilots to trial aspects of such operation, will be considered in the relevant workstreams of the programme.

Feedback Received	System Operators' Response
analysis approaches that focus on individual constraints tend to result in sub-optimal solutions, as resources used to address one constraint may have positive or negative consequences on nearby constraints. Flexibility forecasts for individual devices or small groups of devices can be used as building blocks for the Whole-Of-System analysis, which should be configurable enough to consider multiple factors that ESB and EirGrid deem important, including but not limited to activation and run-time costs, avoided energy costs, customer fatigue, equity concerns, environmental impacts, and opportunity costs. Results of this analysis should be recorded and auditable to address concerns of why certain devices and providers were selected and others were not. Future Flexibility and Ancillary services can be managed effectively and to the full potential with full consideration of DERs at the grid edge, in combination with the ADMS DERM solution. Embracing technology that allows end-to-end management is crucial, due to the rapidly evolving generation mix and increasing penetration of non-synchronous technology. Orchestration of DERs (FTM and BTM) while managing constraints, demand and capacity requires a greater level of automation in managing, monitoring and controlling resources for scheduled services and acting upon emergency network conditions. Flexibility and demand management with DERs across the whole chain from Transmissions to distribution would require advanced technology, systems and processes that facilitates automation. EirGrid and ESB may consider a pilot project with a group of DERs that are managed and controlled through automation with configuration. A key element of reducing dispatch-down events is the proper implementation of a local flexibility market. As renewable generation grows beyond the available load, alternate means of putting excess generation to good use is paramount to avoid curtailment. The DERMS should be able to identify and dispatch flexible loads, EV charging and other energy storage either directly or through price signals. DERMS should also be able to forecast and model both capacity and rate limits of this flexibility".	

Feedback Received	System Operators' Response
"Facilitating new technologies and systems services requires advanced platforms that can enable seamless data sharing between different stakeholders of the transmission and distribution network in Ireland. To facilitate this innovation, it is essential to establish collaborative frameworks that bring together stakeholders from across the industry, to share knowledge, best practices, and innovative solutions. By fostering a culture of innovation and collaboration, system operators can accelerate the development and deployment of new technologies and systems services that support efficient energy distribution and benefits from outcomes that aligns with the regulatory objectives as well".	The TSO and DSO realise the importance of engaging with stakeholders across both the transmission and distribution networks in the delivery of the Join System Operator Programme. As a joint programme, we deliver effective communication with relevant stakeholders when appropriate. For more information on how we have, and plan to continue engaging with industry stakeholders, please see 'Industry Participation and Engagement' under Section 1 of this document. In addition, the TSO and DSO communicate with stakeholders through their respective advisory councils; EirGrid's SOEF and ESB Networks' NN,LC Advisory Councils.
"Recommend a pilot project with the right technologies to establish, implement and verify processes, information exchange, data exchange, awareness, visibility, monitoring and control of generations that are most likely candidates for dispatch down currently so that constraints leading to dispatch down can be managed with minimum curtailment of excess generation".	A number of pilots and trials have already been identified in the Joint System Operator Programme. As aspects such as the Operating Model are further developed then opportunities to include aspects of those developments into the identified trials and pilots, and opportunities to identify new trials and pilots, will be considered through the WOS workstream.
"To reduce dispatch down of renewable generation, enhanced control and modelling capabilities are essential, allowing ESB to remotely monitor and control DERs in real-time. Sophisticated modelling tools can simulate various energy scenarios, allowing operators to test and refine dispatch strategies proactively as well as plan both in the short and long term. This predictive approach helps identify and mitigate potential network issues before they manifest, reducing the likelihood of unnecessary dispatch-down events. Utilising sophisticated predictive analytics can significantly enhance the accuracy of energy demand forecasting. By analysing historical data and incorporating real-time inputs, predictive models can provide ESB and EirGrid with insights into future demand patterns, allowing for proactive management of supply fluctuations. This capability is critical for minimising the risk of power outages and maintaining grid stability in the face of unpredictable renewable generation".	Thank you for your feedback. The most appropriate approaches for systems and data to implement co-ordinated operations will be considered in the relevant workstreams of the programme.

Feedback Received	System Operators' Response
"Maximisation of system resilience, reduction in curtailment of generation and restoration of demand can be achieved by the adoption of higher levels of automation on the Distribution Network. This automation should consider the Network under the direct control of ESBN and a future view into how this can be integrated to DER devices that are engaged in providing network and market services. This will support the whole system approach and deliver higher availability and reliability to customers and confidence to the TSO on the provision of services from the Distribution Network in supporting Transmission operations".	Thank you for your feedback. The most appropriate approaches to implement co-ordinated operations will be considered in the relevant workstreams of the programme.
"The instantaneous penetration of renewables is increasing rapidly that could lead to unchartered operational conditions that may impact reliability and resilience. This change comes with risk off managing a network which may become harder to balance and run within acceptable operating conditions. ESB and EirGrid need to consider use of Operating Envelopes and Dynamic Operating Envelopes to orchestrate the integration and services from a wide range of renewable sources. Consider 'Flexibility First' approach and model. This will deliver faster connections, reduce the immediate demand for network reinforcement and buy time to recognise the impact of new connections, adoption of low carbon technologies and how customer behaviour will/can provide a range of network services. This approach may provide measurable investments deferment with clear metrics and indication when network reinforcement may be required in future years".	In the TSO-DSO Operating Model High Level Design work, an introduction to which was provided in industry webinars in July 2024, we outlined how Operating Envelope approaches are being considered. The programme relates to operational co-ordination activities between TSO and DSO, rather than the development of new approaches to manage flexible resources. Initiatives to manage flexible resources to meet particular system needs may be separately developed by the DSO and TSO as appropriate, and where they impact the whole-of-system operation those aspects of co-ordination will be considered in this programme.
"Business process must be established to support on-going information management life-cycle of all DER and Grid connections. These processes must establish the data of record needed to securely plan, operate, and cost-effectively manage ESB and EirGrid full customer and utility scale DER connected grid and share required data between other needed systems and users".	Thank you for your feedback. The intention of this programme is to establish elements of operational co-ordination between DSO and TSO, it is expected that once they are implemented that they would continue to be operated into the future.

Whole of System Approach

EirGrid

ESB NETWORKS

3. Whole of System Approach

One of the key objectives of the TSO-DSO Joint System Operator Programme is to develop a whole of system approach to system operation between the TSO and DSO. The whole of system workstream focuses on optimising the system as a whole rather than focusing on the transmission and distribution systems in isolation. Improved co-ordination between the DSO and TSO is important to deliver more efficient markets and a more resilient system.

Operating Model

A key initiative within the whole of system workstream is the development of a future TSO-DSO Operating Model. The TSO-DSO Operating Model aims to facilitate changes to electricity production and consumption by increasing co-ordination and cooperation between the system operators. There are significant changes to the scale and characteristics of electricity production and consumption on the distribution network, including the connection of non-firm generation, a high penetration of roof-top solar, and the electrification of heating and transport. DSO and TSO co-ordination is important to facilitate these changes, providing benefits including maximising the availability of distribution system flexibility, increasing efficiency and ensuring certainty for system security. Such co-ordination considers complex and fundamental aspects of operation of distribution system connected resources, including for scheduling and dispatch.

The TSO-DSO Operating Model will also provide shared solutions to existing and potential challenges which are facing the system operators:

- The TSO has a number of system challenges that must be considered when developing the TSO-DSO Operating Model. These include renewable generation, curtailment and constraint of renewable and non-synchronous generation for whole electricity system and local transmission network congestion reasons, system ramping, system balance, security of supply, system stability, service provision and decentralisation of resources. This is within a context of the system being a single synchronous area between Ireland and Northern Ireland, with a low level of non-synchronous direct current interconnection with other jurisdictions, operating the system using a central dispatching approach and accommodating world-leading levels of non-synchronous generation. The TSO requires access to, additional visibility of, and improved forecasting of, distribution system resources to ensure system security. A defined and agreed TSO-DSO Operating Model will be needed to facilitate this.
- Similarly, the DSO has several considerations when developing the TSO-DSO Operating Model. The role of the DSO in managing distributed demand and generation is changing to meet the needs of the rapidly evolving energy system and consumer expectations. The key challenges that the DSO must address include enabling the growth in distributed renewable generation, an increase in electric transport and heat connections, and ensuring the right infrastructure, products and services are in place. Flexibility mechanisms and market arrangements are being introduced to help manage these challenges and to help achieve the 2030 renewable energy and emissions targets as outlined in the

Climate Action Plan and European legislation. To ensure that these flexibility arrangements can grow and operate at the scale needed, the DSO must consider a number of factors, such as voltage support, congestion management of the distribution network, cost and capacity growth for electrification, the introduction of renewable energy communities, and active network management and the resultant carbon abatement. The TSO-DSO Operating Model will be critical to facilitate the development of these mechanisms, to help meet system needs and enable customer participation.

The TSO-DSO Operating Model must support the energy transition and associated Climate Action Plan targets, while ensuring that the needs of consumers are met through a reliable, efficient and affordable operation of the electricity system and market. In this context, the TSO-DSO Operating Model is being designed with the intent of providing the benefits listed below:

- Ensure effective utilisation of the current network, optimising the existing grid to reduce and minimise the requirement for additional infrastructure development and its associated costs, by using new technology or operational approaches where appropriate.
- Optimise demand side flexibility to enable high renewable penetrations on the system, and in particular reducing dispatch down of renewables.
- Maximise the level of flexibility available from all system users, in particular those on the distribution system to take part in both wholesale markets and local flexibility markets. Where this is relevant to resources considered as flexible demand under the definition outlined in the CRU's National Energy Demand Strategy, this can then help with meeting the Climate Action Plan's target of 20-30% demand flexibility by 2030.
- Assist with the affordability of the transition to 2030 for customers by providing opportunities to gain revenue or save costs through active participation in markets, maximising market liquidity, efficient resource allocation, and helping promote investment by reducing barriers to stacking and uncertainty.
- Facilitate the participation of new technologies, including storage and demand side response, in wholesale and local markets.
- Provide additional resources on the system which can help maintain system security and the safe operation of both distribution and transmission systems.
- Enable the provision of system services through new technology or remove barriers for existing technology to provide these services on the transmission and distribution systems.

In 2023, both system operators conducted a series of workshops to develop the vision, principles and High Level Design of the TSO-DSO Operating Model. The system operators developed the model taking into consideration four key areas for co-ordination between them, including Forecasting and Bid Management, Optimisation and Scheduling, Activation and Dispatch, and Settlement.

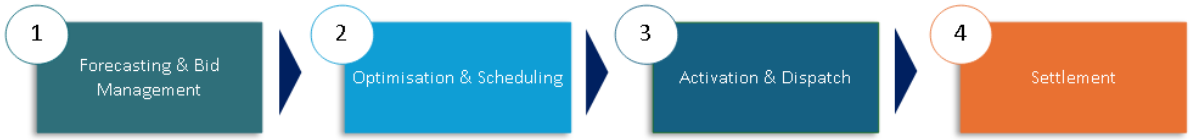


Figure 5: Areas of co-ordination of the TSO-DSO Operating Model

In 2024, the system operators focused on developing an implementation plan for the operating model to ensure we deliver these solutions for our customers. We have included tasks and pilots that will provide opportunities to develop our capabilities across each functional area of the Operating Model. The plan also considers a phased implementation approach to consider if the Operating Model could be accommodated earlier through implementation of aspects of the model prior to being able to implement the full enduring model.

For 2025, the system operators will be focussing on further developing the design of the operating model and considering the knock-on impacts this would have to the implementation of the operating model. This will include a series of workshops between the TSO and DSO to develop the proposals for key elements of the design related to operation and implementation. The system operators will be engaging with industry and CRU with the outcome of the proposed TSO-DSO Operating Model in due course.

Finally, it will be important to consider obligations for national TSO-DSO processes and the development of relevant national terms and conditions as specified in the future European Network Code on Demand Response. The draft code will likely undergo inter-EU institutional negotiations under the 'Comitology Process' throughout 2025 and enter into force in 2026 with the aim to align national frameworks in the future.

The TSO and DSO plan to ensure close engagement with stakeholders on the future Operating Model, as it develops in the coming years. We expect this will include a webinar in Q4 2024/ Q1 2025 with an additional webinar hosted in Q2 2025. These webinars will offer industry stakeholder the opportunity to ask questions and provide feedback , for consideration by the SOs in the Detailed Design work. As work on the Operating Model continues, the exact number, scope, and detailed agendas of these webinars will be developed in detail.

Alignment of Wholesale Market and Local Markets

Both system operators are working together to develop a TSO-DSO operating model to ensure the operational compatibility of wholesale markets and local markets. In particular, the continued evolution of system services by EirGrid and the introduction of local services by ESB Networks should provide a greater range of services to support customer needs. The evolution of system services is being progressed by EirGrid in alignment with the SEM-23-043 Phased Implementation Roadmap for the System Services High Level Design Consultation Paper published in June 2023. ESB Networks is also introducing local flexibility services on the distribution system to support Ireland's decarbonisation policy objectives, as outlined in ESB Networks' "Networks for Net Zero" Strategy document (DOC-030714-BUE) published in January 2023 as part of CRUs energy demand strategy.

The expanded range of services will improve our capability to manage security, congestion and renewables penetration at a local level, alleviate transmission

constraints, provide the capability of increased participation of distribution connected customers in the wider markets and provide a more efficient flexible market.

The development of transmission system services and local services on the distribution system in a manner which is operationally compatible will help service providers to participate and deliver services across all markets.

Visibility, monitoring and forecasting

One of the key focus areas to ensure the success of the whole of system approach is increased co-ordination in visibility, monitoring and forecasting.

Improved monitoring and visibility, through enhanced control centre capabilities in EirGrid's National Control Centre (NCC) and ESB Networks' National Distribution Control Centre (NDCC) will be necessary to manage the network securely in a cost-effective manner. It will be important to ensure that new and enhanced control centre capabilities are specified to account for both operators' needs and to avoid developing duplicate systems and additional costs for customers.

Cooperation on forecasting of demand and generation will enable better decision-support for the system operators. Over time this will contribute to greater supply reliability. This will continuously enable more cost-efficient decisions in system operation scheduling and dispatch.

Whole of Systems Plan on a Page (POAP)

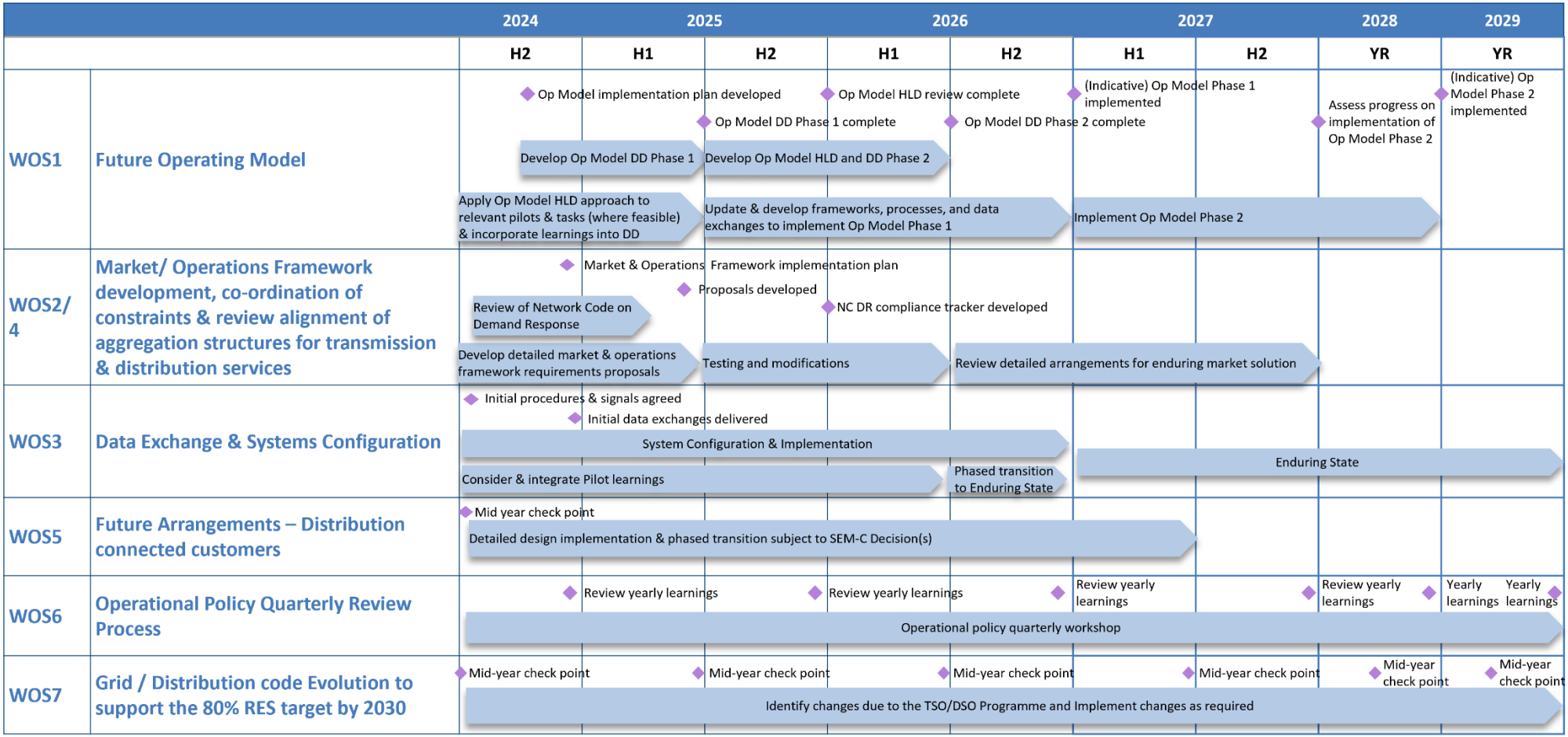


Figure 6: Whole of Systems POAP

Key milestones/dates:

2025:

- H1 – WOS1: Development and agreement of Phase 1 of Operating Model Detailed Design completed.
- H1 – WOS2/4: Proposals developed for Markets & Operations Framework by the end of H1.
- H2 – WOS1: Review of the operating model High Level Design to be completed by the end of H2.
- H2 – WOS2/4: Develop a draft compliance tracker for the TSO-DSO tasks specified under the future Network Code on Demand Response by the end of H2.
- H2 – WOS6: Review yearly learnings and any outputs from quarterly operational policy updates.

2026

- H1 – WOS1: Development and agreement of Phase 2 of Operating Model Detailed Design completed.
- H2 – WOS1: (Indicative date to be updated following completion of Detailed Design Phase 1) Phase 1 of the Operating Model to be implemented by the end of H2.
- H2 – WOS6: Review yearly learnings and any outputs from quarterly operational policy updates.

2027

- H2 – WOS1: Progress on implementation of Phase 2 of the Operating Model to be assessed by the end of H2.
- H2 – WOS6: Review yearly learnings and any outputs from quarterly operational policy updates.

2028 & 2029:

- 2028/29 – WOS1: (Indicative date to be updated following completion of Detailed Design Phase 2) Phase 2 of the Operating Model to be implemented by the end of 2028 / start of 2029.
- 2028/29 – WOS6: Review yearly learnings and any outputs from quarterly operational policy updates.

Identification of further potential tasks / milestones applicable in the longer term will be kept under review as this joint plan evolves.

Facilitating New Technology and System Services

EirGrid

ESB NETWORKS

4. Facilitating New Technology and System Services

The Government's Climate Action Plan, which was updated for 2024 in May of this year, sets out a target of up to 80% renewable electricity by 2030 and the decarbonisation of the heat and transport sectors through electrification.

Meeting these objectives will see transformative changes in the electricity system operation and related markets and additional co-ordination between the system operators. The widespread adoption of low carbon technologies in the coming 5-year period to 2029 will offer the potential for customers to become more engaged with the electricity system and highlights the importance of new technologies in meeting these targets. These technologies could play a role in providing the demand side flexibility needed to manage the distribution and transmission systems in a secure, reliable, and cost-effective manner into the future.

Additionally, coordination between different technologies such as batteries, wind and solar generation in hybrid arrangements has the potential to deliver greater value from existing network infrastructure. Hybrid systems combine two or more modes of electricity generation or storage together, often using renewable technologies such as solar PV and wind turbines. There may also be fossil fuelled generator and/or energy storage systems incorporated within the hybrid plants providing higher reliability and security of supply. Hybrid connections allow developers to increase the total installed capacity at a single connection point with technologies that complement each other by generating at different times. Developing this could allow for better use of the connection point and available network capacity, utilising both new and existing grid connections to maximise the potential of renewable technologies due to the different generation profiles of these technologies. This in turn provides an opportunity to reduce grid connection costs and make the best use of existing infrastructure.

To realise this potential, processes and systems to support the co-ordination of transmission and distribution operations and markets are needed. The DSO/TSO joint system operator programme will develop and build these processes and systems, including by actively progressing and testing cooperative solutions through the pilot programmes being led by the DSO or the TSO over the life of this programme. This includes:

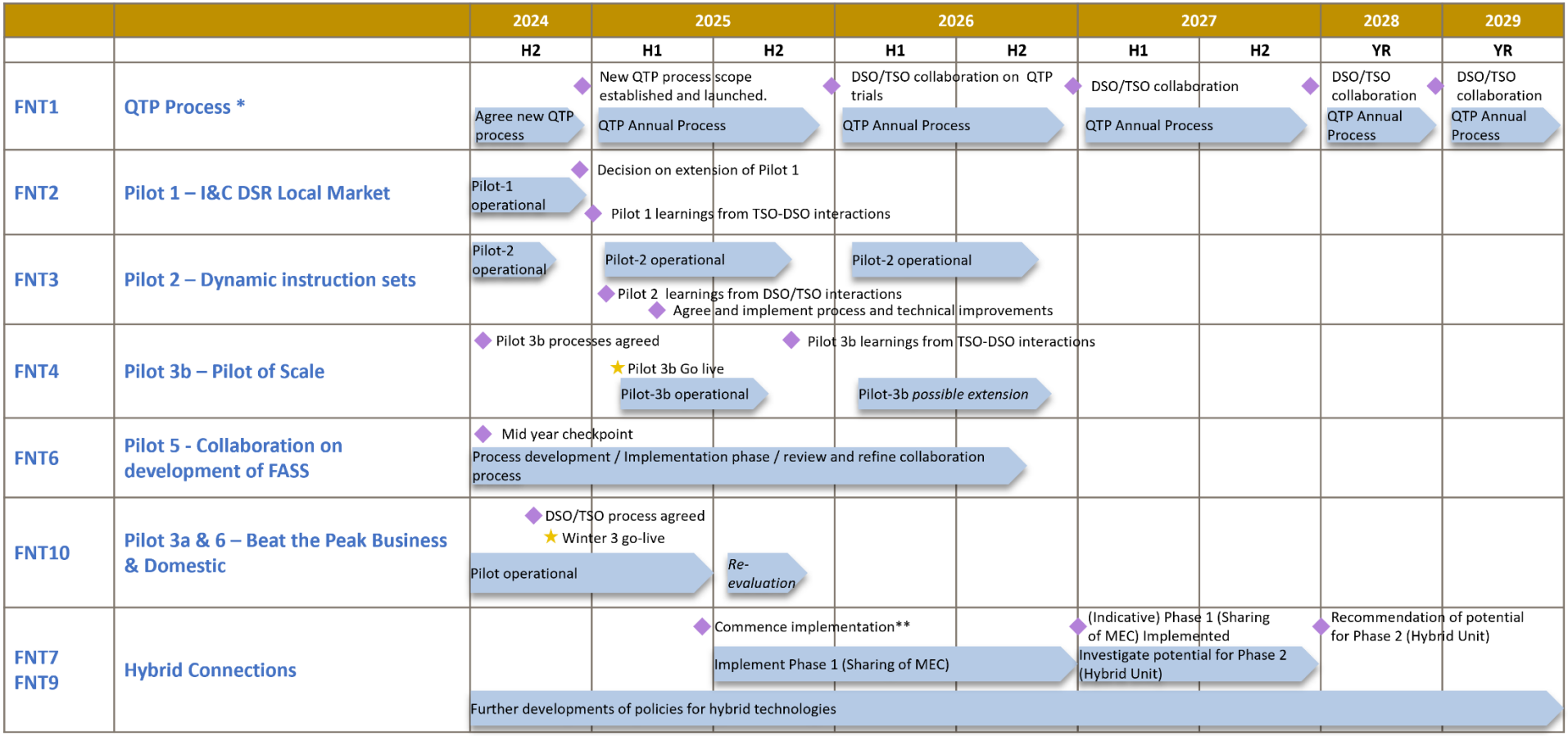
- Coordinated QTP activities;
- Progressively improving processes for DSUs' participation in all markets;
- Co-ordination on the technologies required to achieve 15-20% demand side flexibility by 2025 and 20-30% demand side flexibility by 2030 respectively;
- The DSO seeking to support transmission objectives as well as distribution objectives throughout the life of its flexibility piloting programme (which runs in parallel with this programme).

As required in Climate Action Plan 2024, the system operators will work together to enable hybrid connections and supporting arrangements to optimise the use of existing infrastructure. This will deliver a streamlined electricity generation grid connection policy

and process, and remove barriers, where possible, for the installation of renewables flexible technologies and flexibility products reducing the need to build new grid, including hybrid (wind/solar/ storage).

A number of milestones in the coming years, particularly QTP Process and Hybrid Connections, are highly dependent on CRU consultation and decision processes.

Facilitating New Technology Plan on a Page (POAP)



*planned progress and milestones dependant on RA approval

**dependent on regulatory decision in Q1 2025

Figure 7: Facilitating New Technology POAP

Key milestones/dates:

2025

- H1 – FNT3: Review of Pilot 2 learnings from DSO/TSO interactions
- H1 – FNT3: Agree and implement process and technical improvements to how Pilot 2 operates;
- H1 – FNT4: Implement and trial planning and operation process in Pilot 3b (Locational Summer Flex)
- H1 – FNT9: Commence implementation of Hybrids Sharing of MEC *
- H2 – FNT1: DSO/TSO collaboration on QTP trial(s) following annual QTP process.*
- H2 – FNT4: Review of Pilot 3b learnings from DSO/TSO Interactions.

2026

- H2 – FNT1: DSO/TSO collaboration on QTP trial(s) following annual QTP process
- H2 – FNT4: Possible extension of Pilot 3b (Locational Summer Flex). If it goes ahead, the process will be refined and trialled in line with the operating model
- H2 – FNT9: Phase 1 (Sharing of MEC) Implemented by the end of H2.**

2027

- H2 – FNT1: DSO/TSO collaboration on QTP trial(s) following annual QTP processes
- H2 – FNT9: Recommendation of potential for Phase 2 (Hybrid Unit) by end of H2

2028 & 2029:

- 2028 – FNT1: DSO/TSO collaboration on QTP trial(s) following annual QTP processes
- 2029 – FNT1: DSO/TSO collaboration on QTP trial(s) following annual QTP processes

**dependent on RA decision*

**Indicative date to be updated following completion of CRU consultation and decision process

Reducing Dispatch Down of Renewable Generation

EirGrid

ESB NETWORKS

5. Reducing Dispatch-Down of Renewable Generation

Renewable generation may be dispatched down at times to manage local transmission or distribution system constraints and/or curtailed at times to manage system wide limits. Over the coming years, there will be a growing risk of localised or system-wide surplus of renewable generation, which will lead to a growing need to dispatch down. Minimising this dispatch down of renewable generation will be increasingly important to ensuring the efficient use of renewable generation and achieving renewable energy targets in an economic manner. This and other changes to the electricity system including additional generation from the distribution system requires collaborative effort between the TSO and DSO to effectively manage the future power system. Through coordinated effort, the TSO and DSO continue to work to enable generators to connect to the system earlier, in a more cost-effective manner. This enables more generators to be connected to the system ensuring more availability on the system.

Ensuring the appropriate transmission and distribution infrastructure build-out to minimise constraints is a key planning activity for both the TSO and DSO. Evolving operational policies in areas such as System Non-Synchronous Penetration (SNSP) and Minimum Number of Units Online (MUON) are a focus for the TSO. These and other initiatives are ongoing activities for the TSO and DSO in seeking to reduce the dispatch down of renewable generation.

In terms of this joint DSO/TSO plan there are initiatives across workstreams that will contribute to reducing dispatch down of renewables. For example, in the Whole of System Approach workstream, the TSO and DSO will examine processes, interfaces and data exchange to enhance the communication between both control centres and thus reduce the overall need to dispatch down. Another example is in the work to enable hybrids and trial other generation sources as part of the Facilitating New Technology and System Services workstream, which should also contribute to reducing dispatch down of renewables.

The actions listed in the Reducing Dispatch-Down of Renewable Generation workstream are dependent on the finalisation of the Future Operating Model as to how the actions will roll-out in the future. The DSO/TSO Future Operating model aims to enable better management of the system and enhanced coordination between the system operators. Enhanced management and coordination will enable reduced constraints on the system.

Within this workstream we have focused on a number of additional tasks that build on these other activities in seeking to reduce the dispatch down of renewables by:

- Developing Distributed Energy Resources (DER) visibility, controllability, forecasting and modelling to deliver more efficient real-time operation and planning of the system leading to improved management of constraints and curtailment;
- Improving wind and solar generation forecasts - more accurate forecasting and coordination of constraint information will allow for lower error margins and thus more efficient scheduling and dispatch decisions.

- In collaboration with the system operators, the DSO Pilot 4 (Renewables Flexible Access) aims to introduce flexible access arrangements for distribution connected renewable generators.

Currently the system operators have limited visibility of DERs of less than 0.5MW (which are significantly connected to the LV network) . Throughout 2024, the system operators have collaborated across all tasks associated with the 'Reducing Dispatch Down' pillar. A report identifying the high-level requirements, gaps and capabilities needed to enhance forecasting, real-time visibility, and controllability was delivered in H1 2024. These identified requirements will enable the system operators to develop the capabilities to accurately develop and deliver on DER visibility, controllability, forecasting and modelling. The system operators anticipate that the future system will have increased variability of generation sources. This may require additional controllability of small scale DERs to ensure system stability. With this in mind, extensive collaboration took place throughout 2024 between the system operators to investigate the various use case scenarios where management of DER export could provide a whole of system benefit. Energisation of the first Flexible Access connection to the distribution system will take place in H2 allowing renewable energy sources to connect avoiding the initial need for deep connection works or significant shallow works avoiding the initial need for deep connection works or significant shallow works.

The DSO and TSO are working collaboratively to reduce dispatch down. However, both are aware that the actions set out in this workstream will have greater longer-term benefits than short term/ immediate advantage.

Reducing Dispatch Down of Renewable Generation Plan on a Page

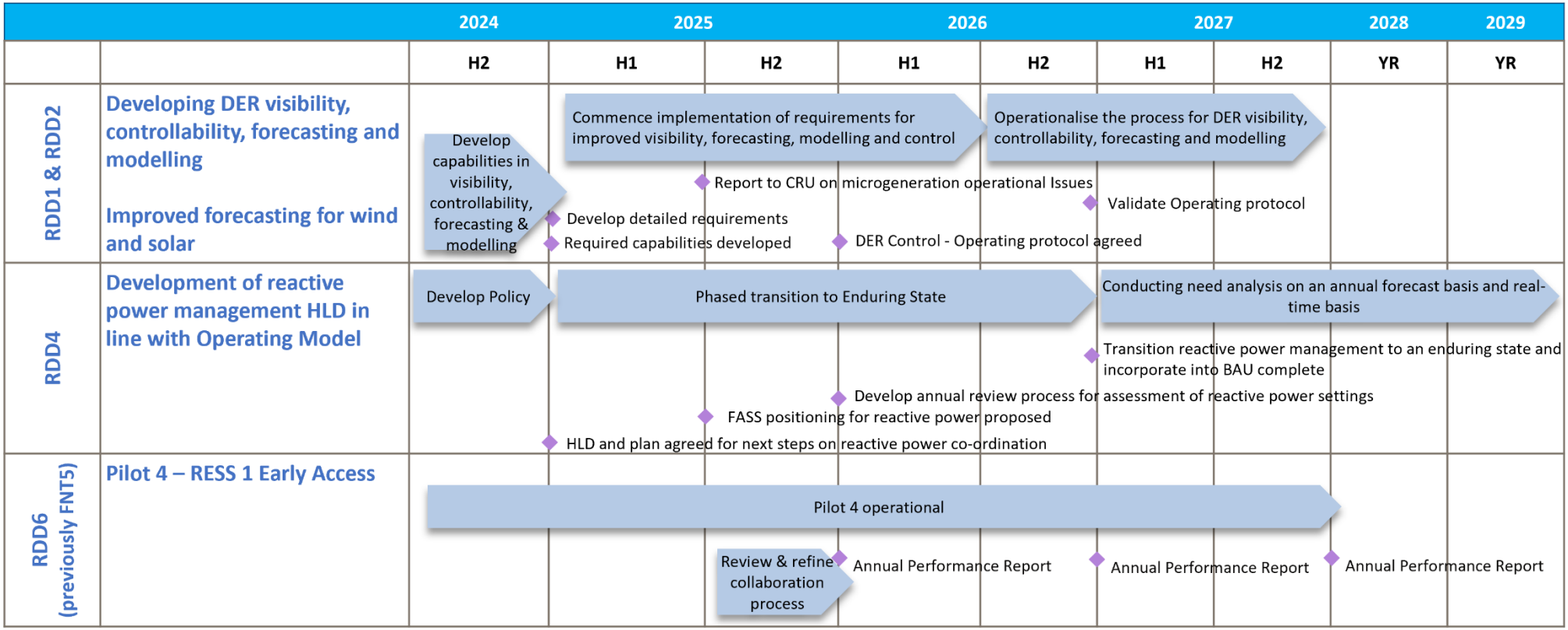


Figure 8: Reducing Dispatch Down of Renewable Generation Plan on a Page

Key milestones/dates:

2025

- H1 – RDD4: Assess the reactive power Op Model HLD with respect to the publication of the FASS positioning paper on reactive power and align/revise accordingly.
- H1 – RDD1 & RDD2: Review impact of operational challenges for System Operators associated with high levels of microgeneration and report to the CRU.
- H2 – RDD1 & RDD2: Agree on operating protocol for activation of DER (<1MW) control measures and development of use case scenarios.
- H2 – RDD4: Develop annual review process for assessment of reactive power settings
- H2 – RDD6: Annual Performance Report complete following review of collaboration process.

2026

- H2 – RDD1 & RDD2: Validate operating protocol for DER control in line with DSO/TSO operating model;
- H2 – RDD4: Transition reactive power management to an enduring state and incorporate into BAU complete
- H2 – RDD6: Annual Performance Report

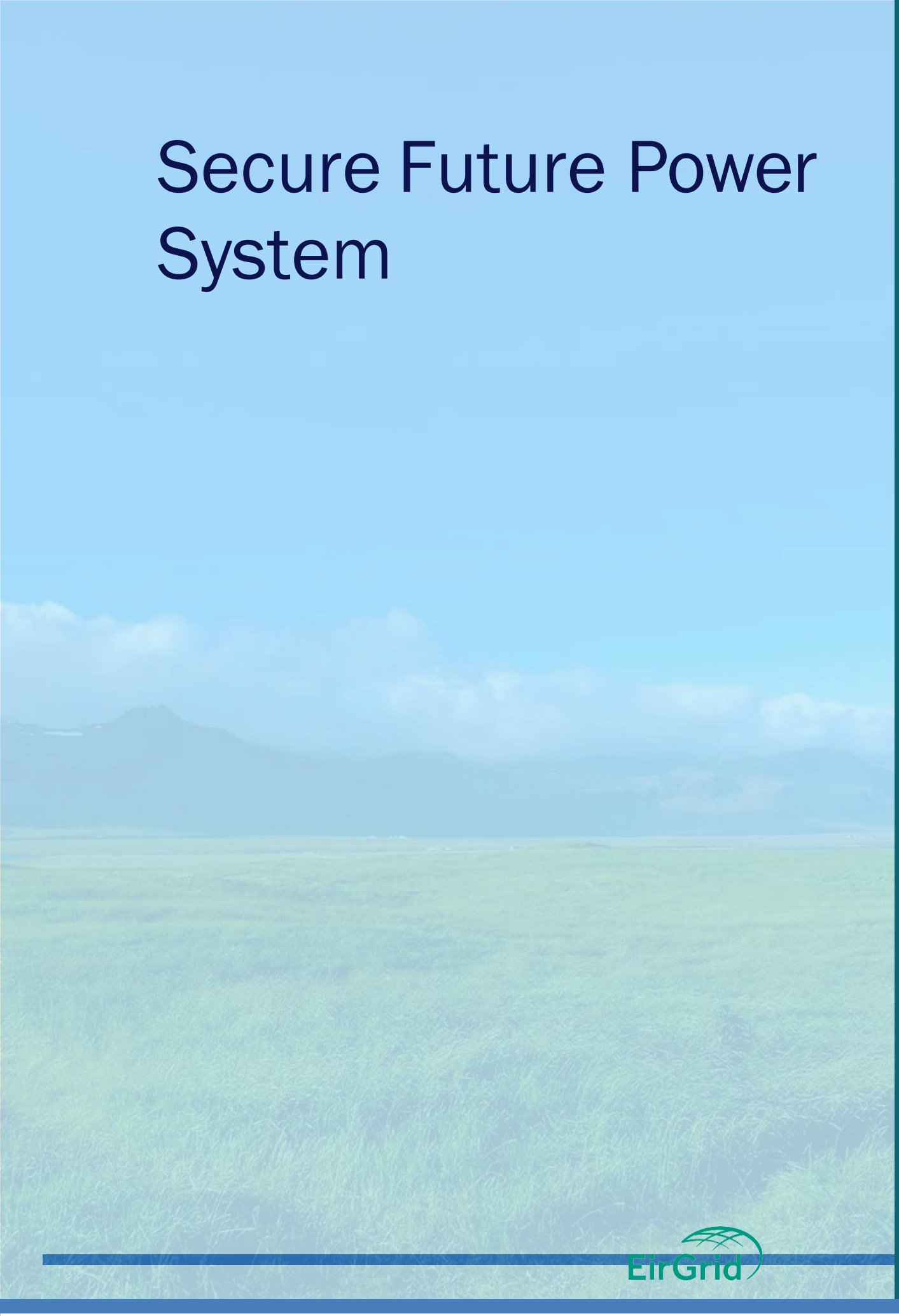
2027

- H2 – RDD6: Annual Performance Report

2028 & 2029:

- 2028 – RDD6: Annual Performance Report
- 2029 – RDD6: Annual Performance Report

Secure Future Power System



EirGrid

ESB NETWORKS

6. Secure Future Power System

This workstream's objective is to address the long-term challenges and leverage the opportunities created by high renewables penetrations, high volumes of distributed energy resources (DER) and widespread demand side flexibility.

This plan addresses the medium to longer term issues associated with secure future power system operations for the five-year period of PR5 and beyond. In the 2023 – 2027 Multi-Year Plan, EirGrid and ESB Networks updated the title of this section to "Secure Future Power System" to reflect the focus of both system operators on the long-term security of the power system and distinguish it from the CRU's Security of Electricity Supply Programme. This Multi-Year Plan also reflects that both EirGrid and ESB Networks will continue to work together to manage more acute and shorter terms security of supply needs. TSO and DSO will document the collaborative steps taken to improve the outcome for market participants for both long-term and short-term security of supply concerns.

The initial focus of the Secure Future Power System workstream has been to identify longer-term operational requirements to ensure that both system operators are prepared to address these requirements. This will ensure security of supply is maintained. The system operators anticipate that as renewable penetration continues to increase, the characteristics of the transmission-distribution interface and the demand supplied by the power system will change.

To ensure that we have the capability to securely manage the transition to increased renewable penetration, we need to fully understand the characteristic of how these technologies will interact with system operations. This includes the consideration of the technologies' protection, their dynamic response, and how they are embedded across the system. We also need to ensure that our mechanisms to manage and recover from security of supply events are adapted to these new demand characteristics and capabilities.

In the short to medium term, the system adequacy position in Ireland will be challenging. The system operators are working with CRU and Department of the Environment, Climate and Communications (DECC) on a wider security of supply programme across a range of areas to manage this nearer term challenge, whereas this Secure Future Power System work programme is focused on long term coordination for a secure system.

To enable Ireland's 2030 energy and climate goals while ensuring a secure transition, we will conduct a series of reviews of the technical characteristics and performance under system fault conditions of large electricity users and distributed energy resources. The outcome of this analysis will:

- Inform changes to our operational processes and potentially standards and settings that are applied;
- Allow us to work to enable market-based solutions, where we believe there to be potential for distributed energy resources to contribute to meeting system needs.

We will also work with large electricity users on the implementation of arrangements to manage their connections when impacted by local congestion issues and/or more widespread supply capacity issues. Large electricity users or large customers can have a significant impact on system operations. For example, sensitive equipment protection

settings that are applied by large industrial customers to protect their processes and equipment during faults on the power system can cause technical issues for the operation of the power system. We are working together with these customers to resolve these issues.

Work in 2024

In 2024, the system operators actively engaged on the CRU's Review of Large Energy Users Connection Policy Consultation, as well as the National Energy Demand Strategy Consultation. In doing so the system operators continue to analyse the impact of CRU consultations and decisions, and determine what changes are needed. The protocol for data centre flexible demand implementation is under review in line with impacts from the continued progress of the TSO-DSO Operating Model, particularly the Implementation Plan.

Ensuring secure future power systems

In the future, with high penetrations of embedded renewables and new technologies, it will be important to adapt our processes and systems for responding in the event of a security of supply issue arising.

It is important that our tools and processes allow for management of the event so that the minimum disruption occurs, and that the integrity of the overall power system is maintained. The actions being progressed in 2024 and outlined in this plan for 2025 (and onwards) aim to avoid undesirable behaviour on the system while further enhancing and ensuring overall system security reviews of the range of market and non-market-based actions available, the parameters of automatic response and the conditions under which different solutions are activated will be undertaken within this workstream to ensure that the changing characteristics of demand on the system are accounted for.

The system operators have continuously worked with the CRU and the Irish Government to facilitate the implementation of increased renewable energy generation and penetration into the system and distribution of the high levels of renewable energy, to successfully meet Ireland's renewable energy targets.

The system operators with the CRU have identified and continue to prioritise key tasks to increase overall system security and avoid undesirable system behaviour that may cause disruptions to the supply, while maintaining ongoing day to day operations. These tasks, as updated for 2025 and beyond, are outlined below.

Secure Future Power Systems Plan on a Page (POAP)

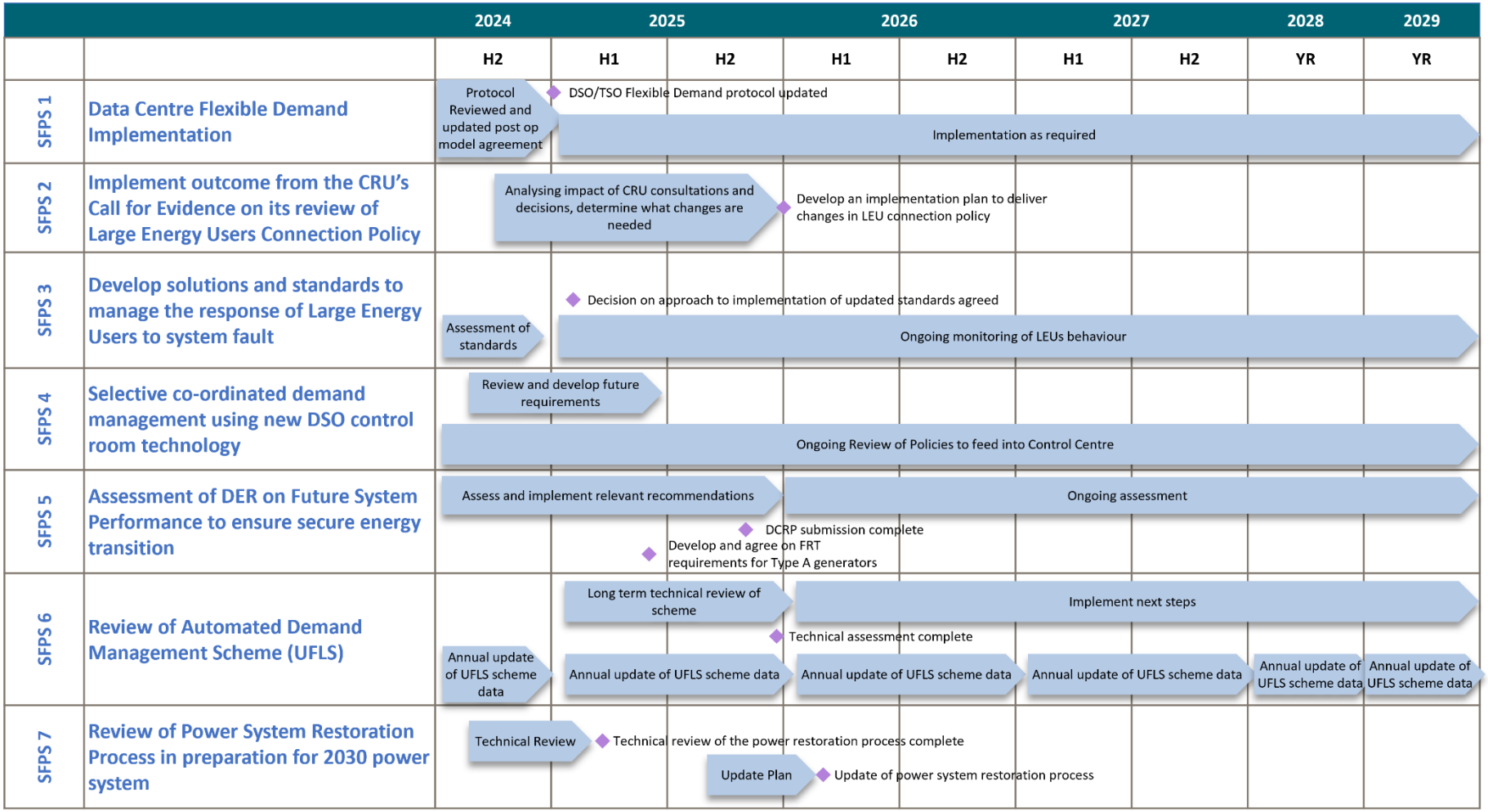


Figure 9: Secure Future Power System POAP

Key milestones/dates:

2025

- H1 – SFPS3: Decision on approach to implementation of updated standards agreed
- H1 – SFPS5: Develop and agree on Fault Ride-through (FRT) requirements for Type A generators, with initial focus on Under voltage ride through settings to be implemented.
- H1 – SFPS7: Technical review of the power system restoration process considering changing system characteristics and tool capability.
- H2 – SFPS2: Develop an implementation plan to deliver changes in LEU connection policy. *
- H2 – SFPS5: Submit suggested amendments for updating Undervoltage Ride Through requirements for Type A generators to the Distribution Code Review Panel.
- H2 – SFPS6: Technical assessment of automatic demand management scheme (UFLS) arrangements and recommendations on next steps.

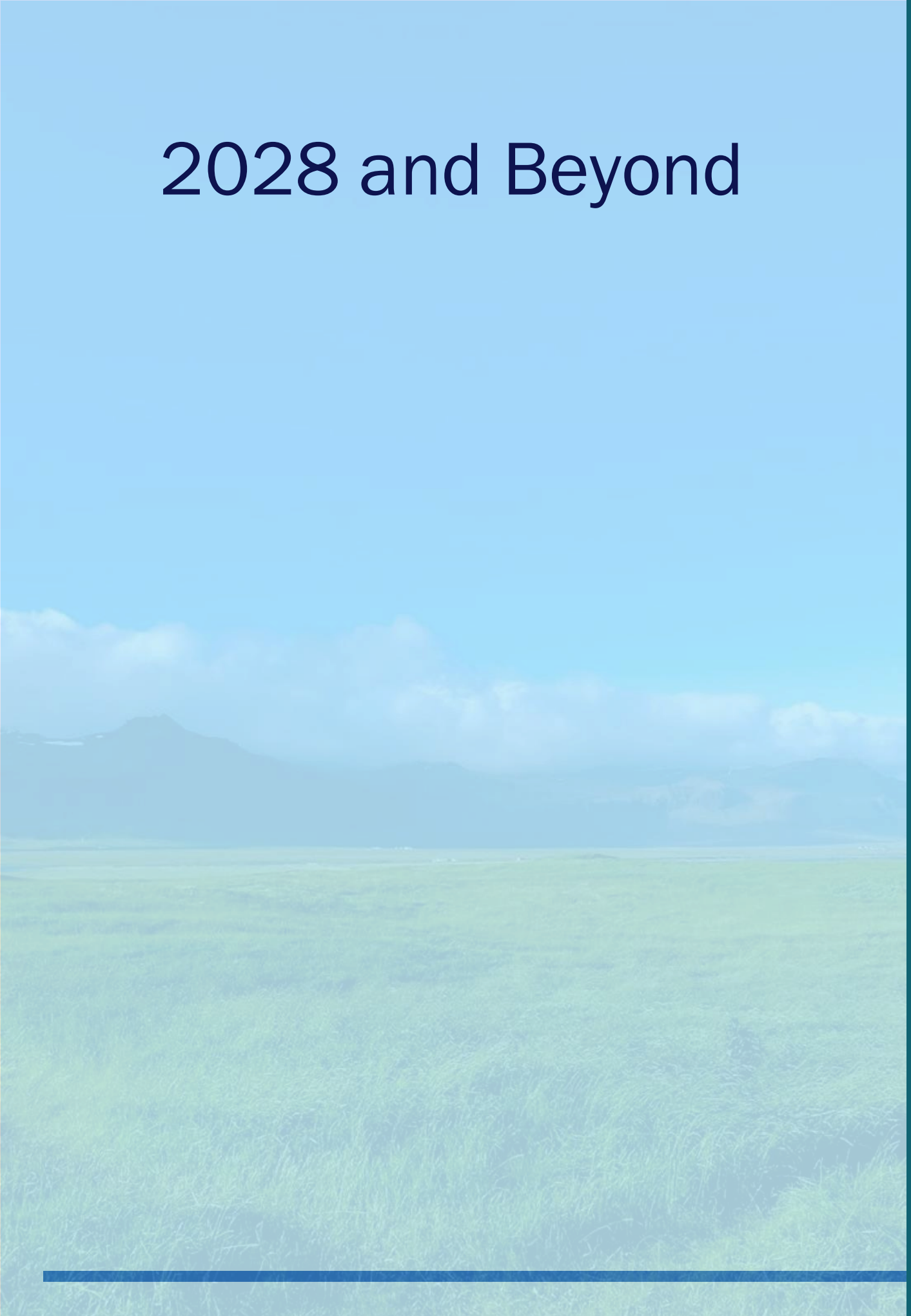
2026

- H1 – SFPS7: Update of the power system restoration process.

**dependent on RA decision*

Identification of further potential tasks / milestones applicable in the longer term will be kept under review as this joint plan evolves.

2028 and Beyond



EirGrid

ESB NETWORKS

7. 2028 and Beyond

The electricity industry and society are going through rapid changes due to the energy transition and the pace and scale of newly adopted technology. Where high level milestones for 2028/ 2029 are known, they have been outlined within each workstream.

For timescales three years from now and beyond it is more difficult to plan with certainty the key milestones that can be underpinned by guaranteed resources and finance. New capabilities and opportunities will emerge over the course of the next three years which will further inform the key activities for 2028/ 2029.

There are many different factors and considerations for potential future activities that will affect our planning. This includes but is not limited to the following:

- Targets and actions established in successive updates to the Climate Action Plan and the National Energy Demand Strategy, and in particular the move to post-2030 net-zero strategy;
- Requirements introduced in the new EU energy legislation, and in particular the development of the new Network Code for Demand Response and requirements for further harmonisation across the EU in future years that this may result in.;
- Compliance with clean energy emissions regulations that will affect generators and demand side participants;
- Operation of new interconnection including the Greenlink Interconnector to Great Britain and the Celtic Interconnector to France;
- Development of a new tie-line with Northern Ireland;
- Further development of the TSO's programmes on Future Arrangements for System Services (FASS), Scheduling and Dispatch Project (SDP), Strategic Markets Programme (SMP), and Operational Technology and Capability Enhancement programme (OTCE);
- Further development of the DSO's flexibility mechanisms and initiatives, including the Demand Flexibility Product, Flexible Connections, and Flexibility Markets;
- Outcomes of the process for the next price review, including development of TSO-DSO co-operation proposals, and Regulatory Authority decisions on funding requests required for the delivery of future initiatives;
- Gaining greater clarity on what will be required as the TSO-DSO Operating Model detailed design is developed, incorporating learnings from pilots after their completion, and also developing improvements from analysing the impacts and outcomes of business-as-usual enduring operation of the Operating Model;
- Changing power system operational constraints, including SNSP limits;
- Smart meter roll-out and enhanced capability;
- Further development of low voltage visibility;
- Implementation of the Renewable Energy Support Scheme (RESS) auctions;
- Pace of electrification of heat and transport;
- Gaining greater insights and improving understanding of the changes in customer behaviour from implicit demand side response signals, in particular the impact of smart tariffs;

- The technology maturity level and commercialization of different technology types, and adapting to technological change and the opportunities and challenges presented;
- The implementation of any new directives by the CRU;
- National Energy Security Framework proposals
- Transmission and Distribution Network Development Plans and further development of flexible network management capabilities.

As we monitor these events/progress and gain further clarity over time, the plan will be updated to reflect any changes in the years ahead.

Balanced Scorecard Proposal

EirGrid ESB NETWORKS

8. Balanced Scorecard Proposal

Incentives and Reporting Decision (CRU/20/154), the CRU has introduced an annual balanced scorecard on Joint DSO/TSO coordination. The system operators have also considered CRU Price Review Five: Balanced Scorecards regarding 2021 to 2024 in developing the proposed balanced scorecard for 2025 – 2029.

The Commission for the Regulation of Utilities (CRU) has mandated that system operators submit a detailed multi-year plan to the CRU, covering the three following years (and the two years after at high level) that is aligned with feedback received through the consultation with stakeholders.

In the Multi-Year plans, the system operators will set out their planned activities to address the objectives set out in CRU/20/154. Based on the submission, the CRU will decide, by year-end, on the milestones, deliverable targets, and weightings for the year. The previous multi-year plans covered 2024 to 2026 (as well as 2027 and 2028 at a high level) while this year's updated multi-year plan covers 2025 to 2027 (as well as 2028 and 2029 at a high level). Applying the timeline set out in CRU/20/154 but allowing for the lagged process this year to allow for CRU feedback,

In assessing the outcome of performance, the CRU will consider the following criteria:

- (20%) quality of the plan and defined actions;
- (40%) quality of implementation of the plan;
- (40%) effectiveness of the plan and demonstrable impacts.

The assessment will be informed by an independent audit to be procured by DSO/TSO as part of the overall process.

Quality of the Plan And Defined Actions

ESB Networks and EirGrid propose that the quality of the plan and defined actions are measured by:

1. Independent quality assurance audit of the Joint System Operator Programme.
    a. A report shall be shared with the CRU that will document the assessment and any associated actions;
2. Demonstrable adherence to the defined programme delivery methods / approach;
3. Demonstrable and robust risk, assumption, issue, and dependency management.

Quality of Implementation of the Plan

We propose that measurement of the quality of the implementation plan should be quantitatively through a mechanistic rule. This would determine the upside / downside amounts by comparing the percentage of tasks included in the plan that have been completed with thresholds for completion. i.e., if 80 % or more of the tasks have been completed, the DSO and TSO would benefit from the maximum amount. If 40% of the plan has been completed, no upside nor downside would be given. If 0% of the tasks have been completed, the maximum downside would be given. If between 40-80% or 0-40% of tasks have been completed, the upside would be computed based on linear interpolation.

Balanced Scorecard Proposal

	Milestones - 2025	Indicative timing
Whole of System Approach	Development and agreement of Phase 1 of Operating Model Detailed Design completed	H1
	Proposals developed for Markets & Operations Framework	H1
	Develop a compliance tracker for the TSO-DSO tasks specified under the future Network Code on Demand Response	H2
	Development of Operating Model High Level Design review completed	H2
Facilitating New Technology and System Services	Pilot 3b go live	H1
	Review Pilot 2 learnings from DSO/TSO interactions	H1
	Agree and implement process and technical improvements to how Pilot 2 operates	H1
	Commence implementation of Hybrids Sharing of MEC	H1
	Pilot 3b learnings from TSO-DSO interactions	H2
	DSO/TSO collaboration on QTP trials	H2
Reducing Dispatch Down	Review impact of operational challenges for System Operators associated with high levels of microgeneration and report to the CRU.	H1
	Assess the reactive power Op Model HLD with respect to the publication of the FASS positioning paper on reactive power and align/revise accordingly	H1
	Agree on operating protocol for activation of DER (<1MW) control measures and development of use case scenarios	H2
	Development of annual review process for assessment of reactive power settings	H2
	Annual Performance Report on Pilot 4	H2
Secure Future Power Systems	Decision on approach to implementation of updated standards for LEUs agreed	H1
	Develop and agree on FRT requirements for Type A generators, with initial focus on under voltage ride through settings to be implemented	H1

	Technical review of the power system restoration process considering changing system characteristics and tool capability	H1
	Submit suggested amendments for updating Undervoltage Ride Through requirements for Type A generators to the Distribution Code Review Panel	H2
	Develop an implementation plan to deliver changes in LEU connection policy	H2
	Technical assessment of automatic demand management scheme (UFLS) arrangements and recommendations on next steps	H2

The milestones have indicative targets so that the incentive supports progressive delivery and performance across the year. Subject to appropriate governance, the delivery of individual actions may vary to reflect efficient delivery of the overall incentive priorities. Therefore, it is intended that the dates are indicative and for information only, and that the incentive outturn assessment will be based on achieving the overall annual deliverables, rather than meeting half-yearly milestones.

Furthermore, it is important for customers and stakeholders that the system operators maintain a degree of adaptability, introducing new tasks (potentially at the expense of existing ones) subject to transparent and objective change control and prioritisation processes. This ensures that new information regarding customer, industry and regulatory is to be accounted for effectively. It also ensures that where an external dependency impacts the timeline of a task, resources can be deployed effectively on other tasks delivering customer or industry value.

Effectiveness of Implementation of The Plan

As the programme is focused on co-ordination between the system operators who are separately incentivised for agreed performance metrics in relation to system operation and performance, we propose that the effectiveness of plan implementation is best measured by the incremental capabilities delivered on a continuum from 0 – 40%. These capabilities are laid out within each workstream and summarised for 2025 in Table 2 These outcomes will be subject to an independent quality assurance audit of the Joint System Operator Programme. A report shall be shared with the CRU that will document the assessment and any associated actions:

Table 2: Capabilities delivered as part of TSO-DSO Joint System Operator Programme

Task Name	Capabilities delivered - 2025
Whole of System Approach	
Future Operating Model	Agreement between TSO and DSO following the workshops in the detailed design process on proposals for the key elements of the design required to enable the operation of Phase 1 of the Operating Model, e.g. agreement on elements related to

Task Name	Capabilities delivered - 2025
	the functionality of Forecasting and Bid Management, Scheduling and Optimisation, Activation and Dispatch, and Settlement, may not include elements related to implementation, and may not include the drafting of the final document to summarise the design. For high level design review, agreement on the key principles and vision of the areas agreed prior to the review as in scope for the high level design review process. Where a trial/pilot/task is intended to begin or enter a new phase within the year, and where it is considering an aspect of operation which is relevant to the Operating Model, there is a check against how agreed approaches/processes/protocols etc. reflect the vision and principles outlined in the High Level Design of the Operating Model.
Market / Operations Framework development, coordination of constraints and review alignment of aggregation structures for transmission and distribution services.	High level market and operations framework requirements assessed. Detailed market and operations framework requirements proposals delivered. Participating customers / service providers will be able to offer services to TSO and DSO on a pilot basis for additional services.
Facilitating New Technology and System Services	
QTP Process	System Operator collaboration with industry stakeholders to facilitate trials of new technologies on the system. A Call for Information launched by the TSO, following engagement with the DSO and regulatory authorities, where industry can provide input and feedback on emerging technologies. Potential services are tendered through this Qualification Trial Process. After thorough evaluation the services are awarded the opportunity to test their services on the grid for 12/18months. There will be continuous evaluation of the process to monitor progress of the trial and to develop a knowledge base from the learnings and outcome reports which will be prepared at the end of the trial.
Pilot 2 – Dynamic instruction sets	A portion of the restricted capacity of individual demand sites during summer time will be released, allowing them to participate in the electricity market and provide system services. Summary of the lessons to be learned from previous trialling, and process and technical improvements to how Pilot 2 operates will be agreed and implemented.
Pilot 3b – Pilot of scale	In 2025, Pilot 3b will go live, implementing the agreed communication and dispatch processes and enabling

Task Name	Capabilities delivered - 2025
	distribution-connected customers to offer their services to both the TSO and DSO as appropriate.
Hybrid Connections	Following a regulatory decision on the sharing of MEC which is expected in Q1 2025, implementation of Hybrids Sharing of MEC shall commence by H1 2025. Active implementation of Phase 1 shall begin following this milestone.
Reducing Dispatch Down of Renewable Generation	
Agree on operating protocol for activation of DER (<1MW) control measures and development of use case scenarios	Through a series of collaborative workshops, the system operators will develop use case scenarios to illustrate instances where activation of control measures for DER < 1MW may be necessary specifically as a measure for system defence. The use cases will inform the development of an operating protocol which will determine the allowable system states and system events for which activation of the yet to be defined control measures is permitted. Procedural steps to be implemented between system operators when activation is required will be developed.
Report to CRU on micro-generation operational Issues	Drawing on knowledge gained throughout 2023 and 2024, we are tasked to review the impact of operational challenges for System Operators associated with high levels of microgeneration, given the potential growth of installations, and report to the CRU. This report will be concise in identifying challenges specific to each system operator and our coordinated approach to addressing them.
Development of reactive power management HLD in line with Operating Model	Beginning transition to the enduring state, with development of an annual review process for reactive power settings. Revise operational policy on reactive power after FASS positioning for reactive power is clarified.
Secure Power Systems	
Implement outcome from the CRU's Call for Evidence on its review of Large Energy Users Connection Policy	Depending on the approach determined by the CRU on LEU connection policy, and the timelines within which this is consulted and decided on, have TSO and DSO discussions on aspects of the policy which jointly impact on both System Operators and developing an implementation plan to deliver changes required (there will also be impacts and changes required in aspects which relate to just TSO or DSO separately, and these would not be in scope).
Develop solutions and standards to manage the response of Large Energy Users to system fault	The TSO intends to develop fault ride through requirements for LEUs, with a recommendation on a Grid Code modification to be submitted to the CRU in Q4 2024The TSO and DSO will co-ordinate through correspondences and meetings in advance of this to agree the approach to this development which works

Task Name	Capabilities delivered - 2025
	for both System Operators, Additionally, we will arrange to incorporate these requirements into the Distribution Code, and to determine and agree if further work will be required in other potential areas for developing and ensuring compliance with requirements to maintain system security.
Assessment of DER on Future System Performance to ensure secure energy transition	Improved understanding of the impact of DER on the system and what tools and technologies are required to ensure a secure power system. Fault Ride-through (FRT) requirements for Type A generators, with initial focus on Under voltage ride through settings to be implemented, developed and agreed on. Suggested amendments for updating Undervoltage Ride Through requirements for Type A generators submitted to the Distribution Code Review Panel.
Review of Automated Demand Management Scheme (UFLS)	Report with a technical review of, and recommendations on changes for, the Automated Demand Management Scheme.
Review of Power System Restoration Process in preparation for 2030 power system	Report with a technical review of, and recommendations on changes for, the power system restoration process.

9. Detailed Descriptions

Whole of System

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
WOS1	Future Operating Model	Task to develop the agreed TSO-DSO Operating Model. This Operating Model is a description of the set of agreements, frameworks, rules, processes, protocols, and systems that enable safe and secure coordination between the TSO and DSO, ensuring they inform each other about actions that impact the other's operations and to agree on how to operate distribution-connected resources participating in both TSO and DSO arrangements. The work to develop the model includes the following: • Forecasting and Bid Management • Optimisation and Scheduling • Activation and Dispatch • Settlement It also includes planning the activities required to implement the model, such as regulatory impacts, change management, stakeholder engagement, developing the frameworks, processes, and data exchanges required, and developing systems where required. Note that aspects of this implementation work may be carried out in or	**Outcomes:** • Future TSO-DSO Operating Model agreed • Implementation Plan agreed and developed • Key interface requirements developed and piloted • Data exchange requirements developed and piloted. **Capabilities delivered 2025:** • Development of Operating Model Detailed Design Phase 1. • Development of Operating Model High Level Design Review. • Operating Model HLD approach applied to relevant pilots and tasks (where feasible). **Capabilities delivered 2026-2029:** • Enduring Operating Model defined following Phase 2 of High Level and Detailed Design. • Operating Model Phase 1 implemented earlier and enduring Phase 2 implemented later.	• SEM 22-012 Decision System Services Future Arrangement • SEM-21-027 Proposed Decision on Treatment of New Renewable Units in the SEM • SEM-22-009 Decision on Dispatch, Re-dispatch • SEM-21-016 RA Consultation on Compliance with Guideline on Electricity Balancing • CRU/21/060 Data Connections Policy Consultation Paper • CRU/21/124 CRU Decision on Data Centre Grid Connections Process; • CRU target setting for DSO • DSO Flexibility Multiyear Plan • CRU approval of relevant changes to enable the future operating model • Network code on demand response • CRU202467 National Energy Demand Strategy Decision Paper • CRU202469 DSO Demand Flexibility Product Procurement Decision Paper, and further related

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		alongside other workstreams. This will follow on from the TSO-DSO Operating Model High Level Design work carried out in 2022 and 2023, and the Implementation Plan work carried out in 2024. Based on this Implementation Plan, the Operating Model will be implemented in phases, starting with an earlier Phase 1 enabled by frameworks, processes, and data exchanges, while Phase 2 for the enduring Operating Model will be implemented later, enabled by other requirements to roll-out this model (e.g. if updated or new systems are required). The intent of the timing of the detailed design work is to be able to provide sufficient detail of how the operating model will work in advance of certain DSO Demand Flexibility Product procurement processes to enable resources who may be interested to understand how the operating model will work and impact on the interaction between this product and the wholesale markets before taking part in the procurement. The intent of the timing of Phase 1 implementation is also to have the operating model operational in time to enable the Demand Flexibility Product to be made operational. Phase 1 will also provide a		follow-up consultations and decisions • CRU2024001 CRU Review of Large Energy Users Connection Policy consultation paper, and further related follow up decisions • EU Regulation 2019/943, Directive 2019/944, and EU electricity market reform proposals to this legislation

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		vehicle under which DSO and TSO can collaborate on the introduction of Flexible Demand connections on the distribution system. Dates on items related to design can be more certain, while dates related to implementation can only be indicative until further clarification of requirements following design work.		
WOS2	Review alignment of aggregation structures for transmission and distribution services.	Task to consider the enhancement and alignment of transmission / SEM DSU / AGU structures with any new aggregation structures to be used for broadening aggregation participation in both transmission and distribution services.	**Outcomes:** • This task addresses potential barriers for customers to provide services to both TSO and DSO and allows service providers to aggregate assets in different combinations to support transmission or distribution needs. **Capabilities delivered 2025:** • Collectively bring preliminary proposals based on pilot learning to the CRU for consideration and decision • Pending regulatory approval, service providers with aggregated assets will have clear rules in relation to participating in multiple services markets which can be adapted and developed further.	• Appropriate regulatory approval (CRU or SEM-C) to make any proposed changes to rules covering aggregators. • CRU target setting for DSO Flexibility Multiyear Plan • TSO-DSO Operating Model Implementation Plan

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
WOS3	Data exchange and systems configuration	This task is a sub-task of the DSO/TSO operating model. New control technologies will facilitate active management of distributed resources, and greater data exchange between TSO and DSO. This task is to capture the necessary requirements in the development and design of operational technology systems for distributed energy resources management. From 2026, there will be a phased transition to the enduring state.	**Outcomes:** • The outcome of the task is the integration of operational technology interfaces and establishment of the data exchange requirements in the TSO and DSO control room technology and operational systems **Capabilities delivered 2025-2029:** • TSO and DSO will have improved ability to securely and efficiently manage the electricity system, as a result of enhanced information sharing (as per the operating model) and will have an improved capability to exchange relevant data via automated systems to agreed protocols.	• Appropriate funding for control room technologies and information exchange capabilities • CRU target setting for DSO • Flexibility Multiyear Plan
WOS4	Market Framework Development	This task is a sub-task of the DSO- TSO operating model. The aim of the task is to: • Develop the detailed framework for DSO-TSO markets & services coordination: • Registration processes and data exchange; • Provisions for value stacking; detailed rules, • Oversight and services prioritisation rules;	**Outcomes:** • Customers/Service providers will have clear framework for which services can be offered to both TSO and DSO to facilitate participation in multiple markets. • The development of coordinated solutions to enhance constraint management and highlight any inefficiencies	• Appropriate Regulatory decisions. • CRU target setting for DSO Flexibility Multiyear Plan • Implementation Plan of TSO-DSO Future Operating Model • Delivery of the draft Network Code on Demand Response by ACER

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		• Settlement rules for dual service providers. This task will also take into consideration DSO/TSO co- ordination of constraints. The DSO and TSO will work together to continue to ensure that dispatch down is coordinated in a manner that is equitably applied and does not overly constrain renewable sources of generation	**Capabilities delivered 2025:** • Design of how local and energy market will co-ordinate for customers. • A draft compliance tracker for the TSO-DSO tasks specified under the future Network Code on Demand Response by the end of H2. **Capabilities delivered 2025-2028:** • Where appropriate, participating customers/services providers will be able to offer services to TSO and DSO on a pilot basis for additional services 2025 • Customers will be able to offer services to TSO and DSO on a clear basis with agreed service prioritisation and service conflict rules agreed • Settlement arrangements under these rules developed 2026 – 2027 • Market arrangements developed and reviewed in line with enduring solution additional services. Improved coordination of the application of transmission and distribution constraints to minimise the impact	

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
			on renewable generation	
WOS5	Future Arrangements – Distribution connected customers	This task enables the participation of distribution connected resources in updated TSO system services market arrangements by implementing the provisions from tasks WOS1, WOS3 and WOS2 necessary to the EirGrid Future Arrangements for System Services initiative.	**Outcomes:** • Phased implementation of procedures and governance for distribution customers' participation in transmission system services **Capabilities delivered:** • Distribution customers will be able to participate in TSO system services to agreed registration, access, and operational procedures	• Outcome of System Services Future Arrangements – Phase III: Detailed Design and Implementation – Phased Implementation Roadmap for the System Services High Level Design – Decision Paper • Appropriate and timely regulatory decisions during the detailed design and implementation process
WOS6	Operational Policy Quarterly Review Process	On-going policy review process for future changes to operating policies. Addresses issues that will impact on existing policies e.g. 1. System Non-Synchronous Penetration (SNSP) 2. Minimum Number of Conventional Units On (MUON) 3. Rate of Change of Frequency (RoCoF) 4. Voltage Control 5. Priority Dispatch, Dispatch Balancing 6. Curtailments 7. Demand Side Management (DSUs and AGUs) 8. Congestion Management 9. Multiple Legal Entities (MLE)s 10. Over install policy Forum to explore	**Outcomes:** • SOs will have a forum to explore the technical impact of proposed changes to operational policy and consider the respective impacts on customers and system operations.	

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		technical impacts of any changes in policy.		
WOS7	Grid Code & Distribution Code evolution to support RES-E Targets by 2030	Review the Grid Code and Distribution Code in the context of the current and future needs of the power system and initiate a programme of change to deliver the necessary modifications.	**Outcomes:** • Each year arising from the DSO/TSO programme, required changes to Grid and Distribution Code will be necessary to codify changes arising from all workstreams • This task will ensure the requisite changes are brought to the appropriate panels for consideration and implementation	• CRU approval of Grid and Distribution Code changes brought forward by the Grid and Distribution Code Review Panels.

Facilitating New Technology

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT1	QTP Process (system operators Coordination)	QTP – annual call for potential projects; possible examples include hybrids, hydrogen, grid-forming. Over the next year and beyond both parties will agree on what should be trialled for the benefit of milestones in 2030.	**Outcomes**: • QTP learnings and outcomes. Annual call for potential projects, possible examples such as hybrids, hydrogen, grid-forming. **Capabilities delivered:** • Customers will be able to trial new technologies on the system or enable the use of existing technology in new applications SOs will be able to assess the impacts of integrating these technologies on their respective systems	• Conducting annual QTP trials is dependent on identification of relevant trial focus areas by the TSO and participation of service providers in the trials. • SEM-22-012 System Services Future Arrangements High Level Design Decision Paper sets out new arrangements for the QTP for which there will be a transition period.
FNT2	DSO Pilot 1 - I & C DSR Local Market (system operators Coordination)	This task delivers an ability to manage the required DSO/TSO interaction relating to the DSO flexibility pilot. The pilot provides for the DSO to use flexible services providers to manage local congestion and this task will ensure that any relevant impacts on the TSO are considered, the nature of which will vary dependent on the specific location and provider makeup. Pilot 1 was operational from 2022 – September 2024. Learnings from DSO/TSO interaction from this pilot will be used for other pilots, specifically pilot 3b.	**Outcomes**: • Learnings from the trial to address enduring solution for information exchange and service prioritisation for TSO/DSO. **Capabilities delivered:** TSO and DSO will work together to assess the impacts and begin to gather learnings of distribution customers providing services.	• Dependent on participation of flexible service providers in pilot. • SEM-22-009 Decision Paper on Dispatch, Redispatch and Compensation Pursuant to Regulation (EU) 2019/943.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT3	DSO Pilot 2 – Dynamic Instruction Sets (System Operators Coordination)	This task delivers an ability to manage the required DSO/TSO interaction relating to the DSO Dynamic Instruction Sets pilot. This pilot delivers an ability for the DSO to facilitate participation of DSUs in providing balancing and system services in congested areas where their operation would breach planning standards. Augmented DSO operational systems with an improved modelling granularity will facilitate a day ahead allocation process compared to the current process of offline annual studies.	**Outcomes**: • The outcome of this task will be the development and implementation of a set of joint business processes that manage the DSO/TSO interaction and form a pilot implementation for aspects of operating model. This will support the maximisation of DSO IDS participation in TSO system service arrangements. **Capabilities delivered:** • DSU customers will be able to participate more freely in the whole-sale markets and system services using a more granular and efficient capacity allocation process which will improve their network access in congested areas. The DSO will be able to provide day ahead allocation with hourly breakdowns and associated processes which will have other applications in DSO/ TSO coordination.	• Dependant on participation of DSUs in pilot. • SEM-22-009 Decision Paper on Dispatch, Redispatch and Compensation Pursuant to Regulation (EU) 2019/943 • The continued operation of this pilot beyond 2027 will be reliant on the implementation of the TSO-DSO Operating Model

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT4	DSO Pilot 3b – Pilot of Scale (System Operators Coordination)	This task delivers the ability to manage the required TSO-DSO interaction relating to the DSO Flexibility Pilot of Scale. This pilot builds on previous 2022 DSO flexibility pilot and delivers capability for additional products, more complex use cases and broader flexible service provider participation. The pilot will consider the requirements for facilitating distribution connected customers at residential level participating in TSO services/products or aggregated participation in wholesale markets such as balancing.	**Outcomes:** • Implementation of a set of joint business processes • Go-live of pilot 3b • Learnings from TSO-DSO interactions, before making a decision on pilot extension in 2026. • Deliver capability to utilise residential demand in the delivery of services to TSO **Capabilities delivered:** • Customers will be able to participate (via aggregation) in services to the TSO and DSO.	• Dependent on participation of flexible service providers in pilot.
FNT6	DSO Pilot 5 Future TSO/DSO Operating Model (System Operators Coordination)	This pilot tests the updated processes for relevant technical modalities (including registration, qualification, and dispatch arrangements) of distribution connected customers in TSO system services market.	**Outcomes:** The outcome of the pilot would be to test the processes for service participation from distribution connected customers in new auction- based services on an interim basis and inform the implementation of enduring DSO operational systems. **Capabilities delivered:** The DSO will be able to provide the following in coordination with the TSO and customers: • Improved registration processes for customers • Qualification processes • Allocation processes • Dispatch arrangements	• Progression of the Future Arrangements detailed design and implementation process and associated SEMC decisions. • Dependent on participation of flexible service providers in pilot. • TSO-DSO Operating Model Implementation Plan

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT10	Pilot 6 - Beat the Peak Domestic (System Operators Coordination)	Domestic behavioural demand response campaign, promoting and rewarding customers who reduce demand during peak demand events or who demand up when instructed when there is excess renewable generation available, testing a mixture of personal, community and broader pro-social incentives. This campaign will be supported by digital elements including the provision of targeted insights into customers' electricity demand.	**Outcomes:** • Domestic customers actively lower their demand during peak hours and demand up when there is excess renewables on the network. **Capabilities delivered:** • Demand is lowered on the network during peak hours, reducing the security of supply challenges during winter 2023, 2024 and 2025.	• CRU Consultation on Electricity Network Tariffs 2023 -2024
FNT10	Pilot 3a - Beat the Peak Business (System Operators Coordination)	Commercial demand response campaign, targeting large and multisite commercial customers to reduce demand during peak events, in return for financial incentives in the form of direct payments. Customers get financially incentivised to demand down during peak hours on any day they wish to participate, with additional payment for demand down when there is a system alert.	**Outcomes:** • Commercial customers actively lower their demand during peak hours. **Capabilities delivered:** • Demand is lowered on the network during peak hours, reducing the security of supply challenges during winter 2024 and 2025.	• CRU Consultation on Electricity Network Tariffs 2023 –2024 • Coordination between TSO and DSO ensuring that participants stop participating in this service when capacity is required by TSO.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT7	Hybrid Technology (MLE)	Given the potential for different technology types behind a single connection point to be owned by separate legal entities, the SOs are exploring a model whereby multiple legal entities might be permitted to connect behind a single connection point. The plan builds on prior work where EirGrid and ESB Networks published a joint Multiple Legal Entities Consultation in September 2020, published a joint Multiple Legal Entities Response to Consultation in April 2021, and submitted a joint Multiple Legal Entities Contractual Approach Status Update Paper in June 2022 to the CRU. This area will be monitored over time to consider if any further changes to policy should be considered.	**Outcomes:** • Develop a framework to accommodate MLEs behind a single connection point. **Capabilities delivered:** • Generators owned by different legal entities will be able to operate behind a single connection point.	• CRU reviewing whether legislative changes are required to enable this. Next steps will be determined through engagement with CRU following this review.
FNT8	Hybrid Technology (Over Install)	An over-installation policy of 120% has been in place in Ireland for the past number of years. In Northern Ireland, an over-installation policy of 120% was introduced in May 2016. However, the current generation mix on the system is evolving and as such, there is now a need to examine the current overinstall policy to establish if the current policy can be increased to allow for maximisation of existing connections points. The rationale for seeking to increase or remove the current	**Outcomes:** • Completion of review of the existing Over-Install Policy. **Capabilities delivered:** • Generation customers will be able to increase their capacity factor by connecting more generation behind their connection point	• Over install policy recommendations paper was submitted to CRU in October 2022. CRU published decision CRU202402 in January 2024. EirGrid and ESB Networks published a decision review and implementation timeline paper on 17th June 2024 which outlined that the decision had gone live from that date.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		installed capacity limit of MEC is to maximise the use of existing connections and transmission/ distribution infrastructure by increasing the capacity factor for conventional or renewable plant. This provides benefits to developers as there is a reduction in connection charges and lead times on connection offers/build out of infrastructure. There is also improved revenue streams associated with increased capacity factors. CRU published their decision on this, CRU202402, in January 2024. EirGrid and ESB Networks published a decision review and implementation timeline paper on 17th June 2024 which outlined that the decision had gone live from that date. This workstream is considered closed, and the area will be monitored over time to consider if any further changes to policy should be considered.		
FNT9	Hybrid Technology (Dynamic Sharing of MEC)	The roll out of hybrid projects is not straightforward and is complex both from a market and operational perspective. There is a need to address the challenges that will be faced across various business functions including market registration, settlements (e.g. changes to settlement calculations,	**Outcomes:** • The ultimate outcome is to optimise use of network infrastructure through enabling the sharing of MEC behind a single connection point. **Capabilities delivered:** • Implementation of Phase 1 (Sharing of	• A paper setting out the outcome of the technical assessment was submitted to CRU in January 2023. CRU are expected to publish and consultation paper and subsequent decision following their review of this assessment. While certain work can

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		metering and tariff arrangements), Central Dispatch and market operations, and Grid Code requirements. The SOs believe that there is merit in initially piloting Hybrid Co-Located Sites (where generation units within a project operate independently of one another for market, metering, settlement, and dispatch purposes) before proceeding to develop further the concept of Hybrid Units (where a project is registered in the market as one single market unit, operating as one single unit for the purpose of settlement and dispatch). This would allow for the operational and technical barriers to be addressed as the sector develops over the coming years. To address the issues that have been identified, the SOs proposed in their technical assessment that hybrid projects could be further facilitated through two phases of work: <u>Phase 1</u> Engagement with stakeholders to define and develop further the requirements associated with Hybrid Co-located Sites that are seeking to share the MEC at the point of connection. This will require the development of connection, market and operational policy, and the SOs implementing the changes required to enable this policy. <u>Phase 2</u>	MEC) • Investigation into potential for Phase 2 (Hybrid Unit)	continue prior to this, such as developing implementation plans, commencing implementation work would depend on the CRU publishing their decision. Next steps will be determined post CRU engagement.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		Depending on the outcomes of Phase 1, the SOs will investigate the potential for development of a new market unit type for Hybrids Units. This category would aim to be technology agnostic to facilitate the participation of Hybrid Units comprising multiple technologies in the market. The technologies would together act as one single market units for dispatch instructions. It is expected that the potential introduction of a Hybrid Unit type would require significant modification to current market and operation systems, and that many of the potential benefits may be realised following Phase 1, and therefore the extent to which Phase 2 may be beneficial or required would need investigation prior to developing policy or implementation.		

Reducing Dispatch Down

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
RDD1	Developing DER visibility, forecasting, and modelling	The growth of DER on the system will impact both distribution and transmission system operation and planning. DER will also have the capability to provide services to the TSO and DSO. This task builds on the DSO-TSO operating model (WOS1) and feeds into the associated data exchange (WOS3) by identifying : 1. The visibility of DER (real-time production/consumption, service availability and planning data) required by the TSO and DSO to allow for secure system operation and planning. This will include an assessment of what data is required at the bulk supply point (DSO- TSO interface) level. 2. The forecasting of DER consumption/ production levels and services capability to feed into planning and scheduling processes. 3. The modelling of DER in operational, market, planning and analysis tools to reflect their impact on the transmission and distribution systems and their market and services capability. This task delivers an ability for modelling DERs in a consistent manner ensuring that both SOs are assessing the same information re DER availability. This will be required for both the	**Outcomes**: • Solutions for the delivery of DER visibility, forecasts, and models as an input to WOS3. **Capabilities delivered 2025:** • DER accounted for in the TSO's and DSO's systems to allow for secure and efficient system planning, real-time operation, and market operation	• WOS1 and WOS3 • Regulated funding as appropriate to implement systems changes. • Regulatory approvals as required to implement operating model.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		RESS pilot and the pilot of scale. 4. This task includes flexible demand such as EVs, heat pumps and embedded generation. 5. This task will incorporate learnings from other jurisdictions on DER visibility forecasting and modelling where applicable.		
RDD2	Improved Forecasting of wind and solar	This task delivers a capability to share knowledge and exchange information so that the forecasting of renewables is aligned for the respective needs of the TSO and DSO. Improved forecast accuracy and constraint awareness will deliver a more efficient dispatch.	**Outcomes:** • Improved forecasts. **Capabilities delivered:** • More efficient operations – reduction of dispatch down of renewables due to forecast errors.	
RDD4	Development of reactive power management HLD in line with operating model	A more efficient dispatch can be achieved through improved utilisation of the reactive power capabilities on the distribution network and co-ordination of reactive power exchanges at the DSO/ TSO interface. This can assist in reducing the necessity to run conventional generation on the transmission system for voltage support thereby creating more 'headroom' for renewable generation. The TSO and DSO have respectively, and jointly, investigated solutions to utilise the reactive power capability of distributed generation. The outcomes of these investigations will inform the implementation of future technologies intended to	**Outcomes:** • Create roadmap for reactive power; next steps and application of learnings, more details of which will be available on the finalisation of the HLD in H2 2024. • In 2025, as part of the transition to the enduring state. SOs will develop an annual review process for reactive power settings. • Revise operational policy on reactive power after FASS positioning for reactive power is clarified. **Capabilities delivered:** Development of Operational Technology systems for delivery of	• WOS1 • Regulated funding as appropriate to implement systems changes. • Regulatory approvals as required to implement operating model. • FASS consultation paper on reactive power

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		achieve the same outcome in an integrated manner.	reactive power support from distribution connected DER's. Utilisation of the reactive power capabilities of generation on the distribution network to support the efficient operation of both distribution and transmission systems.	

Secure Future Power System

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
SFPS1	TSO/DSO Flexible Demand protocol update	Several planned large energy user demand sites are required (under the terms of their connection agreement) to facilitate reductions in their demand at times of system stress. A generic DSO/TSO operating protocol has been developed to implement flexible demand at these sites but further work is required to develop the DSO/TSO arrangements for its implementation.	**Outcomes:** Review of the joint System Operator's Flexible Demand Protocol to ensure that it caters to the requirements of the DSO and TSO while providing clarity on the arrangements for customers **Capabilities delivered:** Increased access to power system for large energy users demand sites by allowing increased import capacity outside of periods of system security issues. Mitigation of generation adequacy risk and challenges of delivering additional infrastructure	• The protocol has been developed and discussed between the TSO/DSO. While it is currently being used to effect flexible demand by the TSO, the DSO has not fully adopted it given that FDA is still at a pilot stage on the DSO side. Further revisions may be needed based on the DSO requirements.
SFPS2	Implement Outcome from CRU's Call for Evidence on its review of Large Energy Users Connection Policy	The CRU has consulted (CRU21060) on mitigation options to address the system security impact of data centre demand. This was followed in 2024 with a further consultation (CRU2024001) with a Review of Large Energy Users Connection Policy. It is expected that further related follow up decisions and consultations will be published by the CRU in 2024 and 2025, and therefore the TSO and DSO will need to work with the CRU to analyse the impacts of the decisions, determine what changes are needed, and develop an	**Outcomes:** • Implementation of a solution to manage connections of large energy users (in particular data centres). **Capabilities delivered:** • Implementation plan to deliver changes in LEU connection policy developed (exact capabilities and following implementation activities subject to the solution options determined by CRU).	• The CRU has consulted in 2021 (CRU/21/060) and 2024 (CRU2024001) on mitigation options to address the system security impact of LEUs (in particular data centre demand). The outcome of this decision may affect the plans. It is expected that further related follow up decisions and consultations will be published by the CRU in 2024 and 2025.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		implementation plan to deliver those changes.		
SFPS3	Develop Solutions and Standards to Manage the Response of Large Energy Users to System Faults	Develop solutions and standards regulating the behaviour of Large Energy Users following a system fault to ensure that system security is maintained. Following work in previous years on gaining a better understanding, the TSO intends to develop fault ride through requirements for LEUs, with a recommendation on a Grid Code modification to be submitted to the CRU in Q1 2025. Work will be required between the TSO and DSO to co-ordinate on this, and other potential avenues for developing and ensuring compliance with requirements to maintain system security.	**Outcomes:** • Engagement with our largest customers to develop solutions which ensure that system security is maintained following a system fault **Capabilities delivered:** • Improved coordination of protection settings and understanding of behaviour during system disturbances. • Decision on approach to implementation of updated standards. • Procedures implemented to ensure system security is maintained. • Customer compliance with the new fault ride through requirement.	• This task will require engagement with and input from our largest customers on their protection settings.
SFPS4	Selective co-ordinated demand management using new control room technology	This task delivers a capability to apply a more selective approach to rota and emergency system event preparation, prevention and response, taking into account the impacts of different customer sensitivities to load shedding, the impact of embedded small scale generation on load shedding maps. Augmented DSO control room technology such as Advanced Distribution	**Outcomes:** • Create a document describing a consistent systematic business process to co-ordinated demand management This will feed into the data transfer/interfaces between the DSO's ADMS and the TSO's scheduling system.	• CRU target setting for the DSO Flexibility Multi- year Plan

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
		Management System (ADMS) and Distributed Energy Resource Management System (DERMS) would support this task.	**Capabilities delivered:** • Updated processes and tools to allow the TSO and DSO effectively manage demand.	
SFPS 5	Assessment of DER on Future System Performance to ensure secure energy transition	Develop greater understanding of the performance of Distributed Energy Resources (DER) during system events (voltage and/or frequency deviations), and developing and implementing recommendations to ensure that system security and safety is maintained as the power system diversifies and decentralises. As part of the CRU's National Energy Demand Strategy, the TSO and DSO were also asked to review the impact of operational challenges for System Operators associated with high levels of microgeneration given the potential growth of installations and report this to the CRU.	**Outcomes:** • The output of this task is the technical assessment of the behaviour of DER during transient system events and recommendations for any follow-on work to address performance issues. **Capabilities delivered:** • Improved understanding of DER behaviour during system faults. • Fault Ride-through (FRT) requirements for Type A generators, with initial focus on Under voltage ride through settings to be implemented, developed and agreed on. • Suggested amendments for updating Undervoltage Ride Through requirements for Type A generators submitted to the Distribution Code Review Panel. • Report on microgeneration operational issues submitted to the CRU.	

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
SFPS 6	Review of Automated Demand Management Scheme	The Automated Demand Management arrangements currently in place were established decades ago to secure the overall integrity of the power system against multiple, co-incident, generation losses. Changes to the nature of demand (the impact of DER) will drive changes to the net quantity of demand disconnected by a system event so the scheme will need to be reviewed to ensure that it delivers sufficient response and meets System Defence requirements.	**Outcomes:** • The output of this task is a technical review of the demand management scheme to inform subsequent updates to the scheme. **Capabilities delivered:** • Recommendations on changes to the Automated Demand Management Scheme.	
SFPS 7	Review of Power System Restoration Process in preparation for 2030 power system	The characteristics of the power system in 2030 will result in changes to how we restore the system in the unlikely event of a black-out. New black-start sources and technologies will be used, and the restoration process will need to account for the impact of DER on the distribution network.	**Outcomes:** • The output of this task is a technical review of the power system restoration process to inform subsequent updates to the power system restoration process. **Capabilities delivered:** • Recommendations on changes to the power system restoration process.	