

Multi-year DSO/TSO Work Plan Covering 2022 - 2026

Joint System Operator Programme
October 2021

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NETWORKS

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Executive Summary

The decarbonisation of Irish society relies on fundamental changes to how energy is generated and consumed. Within this decade the transition to Ireland's ambitious targets for renewable electricity and electrification of heat and transport will drive fundamental changes to the electricity system, along a longer-term path to decarbonisation. ESB Networks in its role as Distribution System Operator (DSO) and EirGrid in its role as Transmission System Operator (TSO) have developed a joint programme of work to support the achievement of these aims while providing a secure and resilient electricity system for customers and consumers.

ESB Networks as DSO license holder is responsible for the operation, maintenance, and development of, a safe, secure, reliable, economical, and efficient electricity Distribution System.

EirGrid as TSO license holder is responsible for developing, managing, and operating the transmission grid in Ireland.

This document contains a multi-year plan we will deliver in partnership, to further develop the electricity system and its secure and reliable operation to support the aims and obligations above. Consistent with the decision paper from the CRU titled "PR5 Regulatory Framework Incentives and Reporting" (CRU/20/154). The proposals include a detailed 3-year plan for 2022-2024 and a high-level plan for 2025/2026. They have been prepared by the system operators for consideration of the Commission for Regulation of Utilities (CRU).

Our ongoing engagement with stakeholders has informed the development of the tasks and activities set out in this document, and we are now inviting views and inputs of our stakeholders on the specific proposals within.

Glossary

1

Multi-Year DSO/TSO Work Plan
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TERM	DEFINITION
AGU	Aggregated Generator Unit
CRU	Commission for Regulation of Utilities
DCRP	Distribution Code Review Panel
CRU	Commission for Regulation of Utilities
DER	Distributed Energy Resources
DSO	Distribution System Operator
DSU	Demand Side Unit
GC	Grid Code
GCRP	Grid Code Review Panel
I&C DSR	Industrial and Commercial? Demand Side Response
MEC	Maximum Export Capacity
MLE	Multiple Legal Entities
NCC	National Control Centre
NDCC	National Distribution Control Centre
NECP	National Energy Climate Plan
PR5	Price Review 5
QTP	Qualification Trial Process
RE	Renewable Electricity
RES	Renewable Energy Source
RESS	Renewable Energy Support Scheme
RoCoF	Rate of Change of Frequency
SNSP	System Non-Synchronous Penetration
SO	System Operator
TAO	Transmission Asset Owner
TSO	Transmission System Operator
UFLS	Under Frequency Load Shedding

Introduction

2

Multi-Year DSO/TSO Work Plan
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Introduction

The Joint System Operator's Programme has been established to reflect EirGrid, in its role as Transmission System Operator (TSO) and ESB Networks, in its role as Distribution System Operator (DSO) are jointly addressing electricity system and customer needs through whole of system solutions, in a collaborative and effective manner.

The programme objectives are:

- 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 2030 and longer term climate and energy policy objectives through collaboration between the TSO and DSO.
- 3 To address the Commission for Regulation of Utilities' (CRU) objectives for TSO/DSO coordination as set out below:
 - 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.
 - Optimisation of the existing grid to reduce the requirement for new build where possible.
 - Where the need for new infrastructure is identified, the collaborative development of same.
 - Enabling the provision of system services from new technology introduced on the transmission and distribution network.

This document sets out the Joint TSO-DSO detailed multi-year plan for 2022-2024 and the high-level plan for 2025-2026.

2.1 Progress within 2021

During 2021, we have progressed the work programme submitted to the CRU in January 2021, shortly following the conclusion of the PR5 (Price Review 5) process. Over the course of the year we have put in place the necessary programme management and governance structures to develop and deliver the joint SO work programme. Preliminary activity has been progressed across a range of different workstreams, which will be set out in detail in the end of year report for 2021 to be submitted to CRU in early 2022.

A key step in 2021 is the development of a framework for a future TSO-DSO operating model. An agreed direction for this is being delivered by the end of 2021, addressing coordinated system operation, operational interfaces, and data exchange. The operating model direction agreed in 2021 will be implemented over the life of the multiyear programme. This will be critical to enabling distributed flexibility to participate in all markets, including playing a central role in congestion management and System Services into the future.

Introduction

2.2 Background To Plan Development

To meet the ambition of the 2019 Climate Action Plan and any future increased ambition, the TSO and DSO will need to work in collaboration with market participants, overcome various challenges and develop new sources of system services on the transmission and distribution systems. This will help to ensure an efficient use of the network by maximising its utilisation while improving its resilience and robustness. To solve the challenges that will present themselves and secure the necessary services, both the TSO and the DSO are committed to working in partnership to ensure that the end customer will continue to receive a high quality and reliable supply of electricity.

This programme addresses the points where both organisations have identified that a whole-of-system or joint approach is needed to further enable the development of the electricity system through our respective work programmes, in our respective roles.

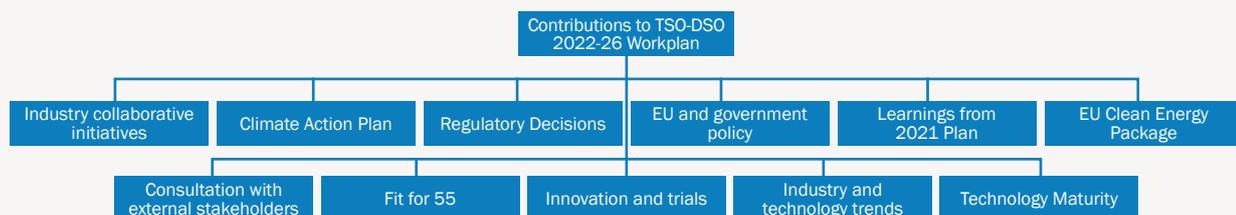
ESB Networks has recently launched the National Network, Local Connections Programme, in collaboration with stakeholders from across the energy sector and broader Irish society. The programme will enable and drive all customers’ active participation in local and system wide services. This will play a central role in the decarbonisation of Irish society in line with government policy and climate action goals. ESB Networks’ vision is that every Irish home, farm, community, business, and generator can participate in local marketplaces. These marketplaces will signal when it is a good time to use, to store or to save power, which will facilitate decarbonisation through electrification of heat and transport and accommodate further growth in renewable generation.

EirGrid will shortly launch the inaugural Shaping Our Electricity Future Roadmap which has been prepared in consultation with stakeholders from across society, government, industry, market participants and electricity consumers. The roadmap has been developed to provide guidance on the network reinforcements, engagement plans, system operation enhancements and market changes needed to achieve at least 70% of electricity from renewable resources by 2030. Inherent in this is a secure transition to 2030 whereby we continue to maintain a safe, affordable, and reliable power system.

This joint plan reflects areas where the TSO and DSO must work in partnership to enable new technology on the transmission and distribution systems participate in new solutions, apply whole of system approaches to resolving system needs, and work collaboratively to reduce dispatch down of renewable generation and improve security of supply.

A variety of components have fed into the development of the TSO-DSO 2022-2026 work plan. This includes the national Climate Action Plan 2019, the regulatory framework including as set out under PR5, the legal and policy framework at an EU and Irish level, and regular engagement with our stakeholders.

Figure 1: Contributions to the TSO-DSO 2022-2026 workplan



Introduction

Based on feedback, we have consolidated objectives set out by the CRU for TSO/DSO coordination into four work streams that are focused on four core outcomes.

The tasks and activities on the plan form the following four workstreams:

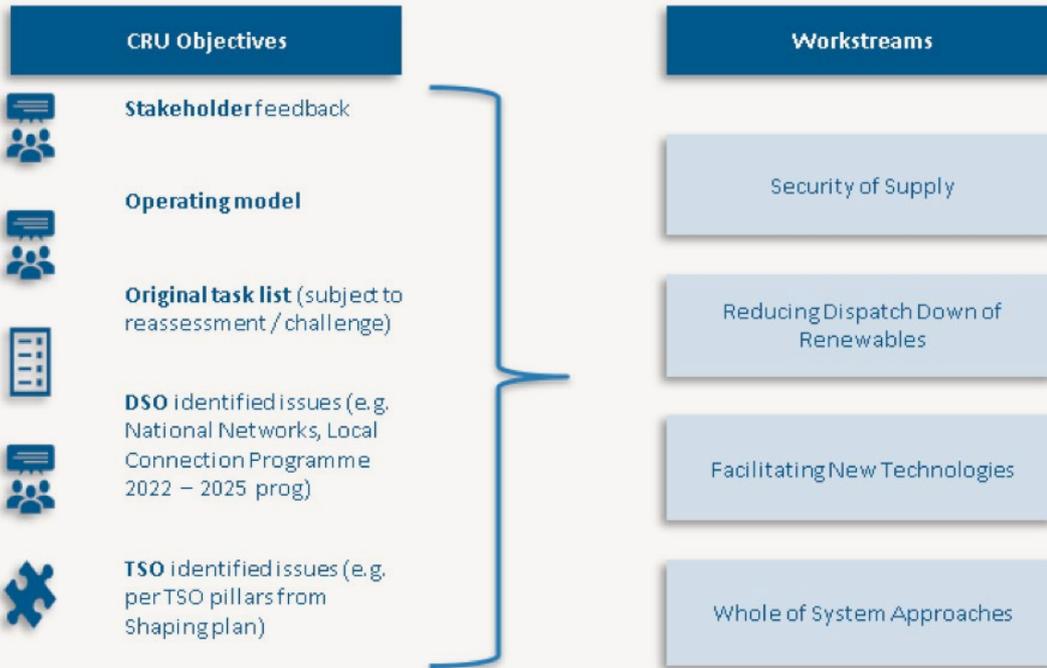


Figure 2: Outline of Tasks & Activities which relate to the four workstreams

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 primary expected benefit to customers.

Our respective regular stakeholder engagement has been considered in forming this preliminary plan and now we are seeking specific feedback on the activities and workstreams featured within -via public consultation.

2.3 Multi-Year Plan Ambition And Approach

Many of the tasks and activities proposed within this ambitious programme are inherently world leading. The approaches proposed, in terms of the level of coordination between the TSO and DSO in addressing the needs of our customers, consumers, and society will break new ground internationally. We are adopting this approach as we believe these are necessary to achieve the overall governmental and regulatory policy and objectives set out for 2030 and beyond. However, we do so knowing that in many instances there will be limited precedent or blueprints for us to follow. As such, there will be a degree of underlying risk which we must manage throughout the life of the programme, and there will likely be cases where the outcome of a task is different from what we expected at the outset.

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 of system approaches to ensuring we provide capacity and security to support the uptake of low carbon technologies in homes and businesses.

Introduction

The proposed approach within the plan is an iterative one, allowing us to learn what works and what needs to be adapted. We will endeavour to pilot activities with our customers, and communities early and often in the programme. We will adapt the multi-year plan in response to changing customer needs, changes in technology maturity, stakeholder input and pilot learnings.

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.

2.4 Dependencies

We will work towards building enduring approaches, but these will rely on other parties. These include key and timely decisions by the regulator. Where applicable we have called these out on the detailed plan, and some key high-level dependencies are listed below:

- 1 SEM 21-069 System Services Future Arrangements – High-Level Design Consultation;
- 2 SEM- 21-027 Proposed Decision on Treatment of New Renewable Units in the SEM ;
- 3 SEM-21-026 Consultation on Dispatch, Re-dispatch and Compensation Pursuant to Regulation (EU) 2019/943;
- 4 SEM-21-016 Consultation on compliance of the SEM market arrangements with EU Electricity Balancing Guideline (EU Regulation 2017/2195);
- 5 CRU/21/060 CRU proposed Direction to the System Operators related to Data Centre grid connection;
- 6 Regulatory decisions regarding the funding of local and system services (including as required to progress piloting activities). 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;
- 7 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 will have 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 TSO-DSO coordination is vital. Each company will have its own unique initiatives under the different licence obligations, which will progress in parallel with this programme and in many instances interact with it. For example, the piloting activities on the distribution system referenced in this programme are primarily initiatives within a DSO programme (the National Network, Local Connections Programme). However we include activities related to these pilots in this programme to ensure that these pilots include a dedicated focus on how best to implement TSO-DSO coordination with respect to the set of activities addressed in the proposed “TSO DSO Operating Model”.

Whole of System Approach

3

Multi-Year DSO/TSO Work Plan
Covering 2022 - 2026

As part of the Joint System Operator's work plan, one of the key objectives is the development of a whole of system approach to system operation between the TSO and DSO.

This Joint System Operator 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.

Key areas identified for co-ordination in this workstream include operational visibility and monitoring of respective network conditions, co-operation on forecasting of generation and demand, and operational compatibility of respective system services in terms of planning, scheduling, dispatch and re-dispatch.

Visibility and monitoring

Improved monitoring and visibility, though enhanced control centre tools 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 tools are specified to account for both operators' needs and to avoid developing duplicate systems and additional costs for customers.

Forecasting

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.

System Services and Local Services

The continued evolution of System Services (as per the Future Arrangements of System Services consultation SEM-21-069) and the planned introduction of local services on the distribution system should provide a greater range of services to support customers' needs on the distribution system and wider transmission system.

The expanded range of services should 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.

Joint System Operator – Operating Model

A key initiative within the Whole of System workstream is the development of a future TSO DSO Operating Model. Changes in system operation, including active network management at distribution level and other measures to enable pioneering levels of renewable generation and low carbon technology on the demand side will require changes to operating practices, interfaces and data exchange.

Changing customer technology and the adoption of advanced control room technology by both system operators will bring enhanced control and data exchange capabilities to manage the system under these conditions.

Within 2021, the DSO and TSO are developing and agreeing a future operating model direction, that sets out the vision and principles and an operating “straw man” for data exchange, operational interfaces, and protocols into the future. Further development and implementation of this future TSO/ DSO operating model will address the following functional areas, over the life of the multi-year plan:

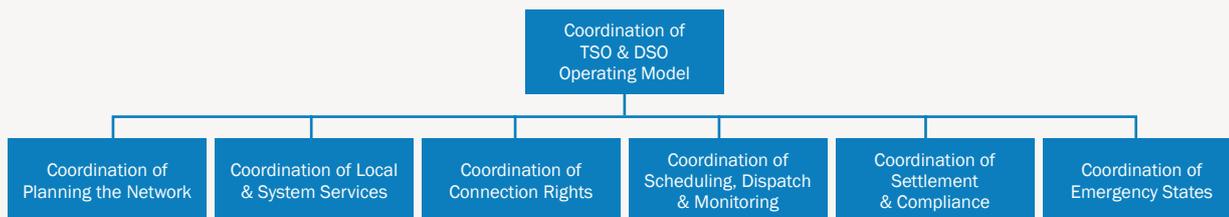


Figure 2: TSO-DSO Operating Model

Within the 2022 – 2026 workplan both DSO and TSO have included tasks and pilots that will provide opportunities to develop our capabilities across each functional area of the operating model. These activities will allow us to iteratively develop and operationally test elements of the operating model, acting as building blocks to progress and inform the enduring operating model.

The processes and protocols for cooperation at operational interfaces and data exchange developed throughout the multiyear plan, will form the basis for an enhanced operating model to support the goals of the Climate Action Plan in a manner consistent with the Clean Energy Package legal framework.

3.1 Whole Of System Approach Plan On A Page

	2021	2022		2023		2024		2025	2026
	H2	H1	H2	H1	H2	H1	H2	YR	YR
Agree Future Operating Model	Vision/Principles defined	Develop future operating model	Op Model HLD Apply to pilots & incorporate learnings	Update & define new processes and data exchange	Apply pilots & incorporate learnings	Update & define new processes and Data exchange		Enduring Op Defined	
Review alignment of aggregation structures for transmission and distribution services		Review aggregation structure & Develop Pilot proposals	Initial data exchanges interface	Aggregations structure paper	Proposals to regulator	Issue preliminary proposals to regulator			
Data Exchange & Systems Configuration (2022 – 26)		Requirements gathering tool	Develop data exchange and specification requirements	Procedures & signals agreed	System Configuration & Implementation (preliminary DSO systems)			Test specification document ready	Pilot 6 Go-Live
Market Framework development		Evaluate service coordination and Apply test ruleset to pilots	Test rules applied Develop data exchanges for market systems	Develop detailed market operations protocols	Market operations protocol ready	Review & refine process		E2E Testing	
Future Arrangements – Distribution connected customers		SEM-C decision	Detailed design phase	Implementation phase	Future Arrangements Go-Live date			Migrate users to Enduring system	
Operational Policy Quarterly Review Process		Op policy Quarterly Workshop							
Grid Distribution code Evolution to support the 70% RES target by 2030		Identify changes due to the TSO/DSO Program and Implement changes as required							
Review the Impacts on compliance testing process of (non-firm) Distribution Resources.		Impact assessment and amendments consideration	Implement changes	Operationalise					

◆ = Milestone
★ = Go-Live

Key milestones/dates:

2022

- H1 – Publish vision and principles and agreed direction for future operating model
- H2 – Develop operating model high level design
- H2 – Develop proposals for suitable aggregation structures for participants offering both TSO and DSO locational services.
- H2 – Agree initial data exchange principles and requirements gathering model for information exchange and interfaces
- H2 – Develop aggregation structure paper
- H2 – Apply the test rule-set for Pilot 1

2023

- H1 – Initial data exchange and specification requirements procedures and signals agreed
- H2 – Aggregation structure - Issue preliminary proposals to regulator
- H2 – Agree and develop initial market operations protocol

2024

- H1 – Future Arrangements go-live (pending SEMC decisions and process schedule)
- H2 – Test specification document ready for DSO national roll-out of local services (pending CRU targets for DSO Flexibility Multiyear Plan¹)

2025 & 2026

- 2025 – Enduring Operating Model defined
- 2025 – Complete end-to-end testing for DSO national roll-out of local services
- 2025 - 2026 – Enduring solution Operating Model rolled out

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

¹ For national roll-out to be feasible from end 2024 / early 2025, targets associated with “Release 3” in the DSO Flexibility Multiyear Plan would be required from 2022 onwards.

Whole Of System Approach Task Description And Outcomes:

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
WOS1	Agree Future Operating Model	<p>Task to develop the agreed Operating model including the following:</p> <ul style="list-style-type: none"> Monitoring & forecasting protocols Market operations protocols Operational planning protocols Dispatch & Re-dispatch protocols Compliance management protocols Outage Planning protocols 	<p>Outcomes:</p> <ul style="list-style-type: none"> Future Operating Model (To-be Model) agreed Key interface requirements developed and piloted Data exchange requirements developed and piloted <p>Capabilities delivered</p> <p>2022</p> <ul style="list-style-type: none"> Interim capabilities piloted (see enabling technology for details) <p>2023</p> <ul style="list-style-type: none"> Interim capabilities piloted (see enabling technology for details) <p>2024</p> <ul style="list-style-type: none"> Interim capabilities piloted (see enabling technology for details) <p>2025</p> <ul style="list-style-type: none"> TSO and DSO will be able to operate the respective systems with pioneering levels of variable renewable generation and low carbon technology Customers will be able to effectively participate in both local and system wide markets. 	<p>SEM 21-069 Future Arrangements.</p> <p>SEM- 21-027 Proposed Decision on Treatment of New Renewable Units in the SEM</p> <p>SEM-21-026 Consultation on Dispatch, Re-dispatch</p> <p>SEM-21-016 RA Consultation on Compliance with Guideline on Electricity Balancing</p> <p>CRU/21/060 Data Connections Policy</p> <p>CRU target setting for DSO Flexibility Multiyear Plan</p> <p>CRU Approval of relevant changes to enable the future operating model</p>
WOS2	Review alignment of aggregation structures for transmission and distribution services.	<p>This task will 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.</p>	<p>Outcomes:</p> <p>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.</p> <p>Capabilities delivered</p> <p>2022</p> <ul style="list-style-type: none"> Aggregated distribution customers will be able to offer services to both TSO on a system wide and DSO on a location specific basis for pilots. <p>2023</p> <ul style="list-style-type: none"> Collectively bring preliminary proposals based on pilot learning to the regulator for consideration and decision <p>2024</p> <ul style="list-style-type: none"> Service providers with aggregated assets will have clear rules in relation to participating in multiple services markets which can be adapted and developed further. 	<p>Appropriate Regulatory approval (CRU or SEM-C) to make any proposed changes to rules covering aggregators.</p> <p>CRU target setting for DSO Flexibility Multiyear Plan</p>
WOS3	Data exchange and systems configuration	<p>New control technologies will facilitate active management of distributed resources, and greater data exchange between TSO and DSO. This task sets out the capturing of the necessary requirements in the development and design of Operational Technology systems for Distributed Energy Resources management.</p>	<p>Outcomes:</p> <p>The outcome of the task is the integration of relevant interface and data exchange requirements in the TSO and DSO control room technology and operational systems.</p> <p>Capabilities delivered 2025</p> <ul style="list-style-type: none"> TSO and DSO will have improved access to data (as per the operating model) and will have an improved capability to exchange relevant data via automated systems to agreed protocols. 	<p>Appropriate funding for control room technologies and information exchange capabilities.</p> <p>CRU target setting for DSO Flexibility Multiyear Plan</p>

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
WOS4	Market Framework Development	Develop overall framework for DSO-TSO services coordination: registration processes and Data exchange; impact assessment on value stacking where services needs are aligned/conflicting and likelihood of same; agree prioritisation rules and settlement rules for dual service providers.	<p>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.</p> <p>Capabilities delivered 2022 Participating Customers/services providers will be able to offer services to TSO and DSO on a pilot basis. 2023, 2024 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.</p>	<p>Appropriate Regulatory decisions.</p> <p>CRU target setting for DSO Flexibility Multiyear Plan</p>
WOS5	Future Arrangements – Distribution connected customers	<p>This task delivers the participation of distributed connected resources in TSO system services market on enduring basis.</p> <p>Relevant areas include revised registration arrangements, capacity allocation and consideration of scheduling of day ahead processes, scheduling, and dispatch arrangements. Enduring solution will be informed by experience on DSU instruction sets pilots and Future Arrangements pilot.</p>	<p>Outcomes: Agreed set of procedures and governance for distribution customers' participation in Transmission System Services.</p> <p>Capabilities delivered 2022 Relevant SO Input to the detailed design process relevant for distribution customers. 2024 Distribution customers will be able to participate in TSO system services to agreed registration, access, and operational procedures.</p>	<p>SEM 21-069 Future Arrangements decision</p> <p>Future decisions and timings during the detailed design process.</p>
WOS6	Operational Policy Quarterly Review Process	<p>This task is the establishment of an on-going policy review process where future changes to operating policy and respective impacts are considered.</p> <p>The topics should cover areas that will impact on existing policies e.g.</p> <ol style="list-style-type: none"> 1. (System Non-Synchronous Penetration) SNSP 2. MinGen Units 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. Multiple Legal Entities (MLE)s 9. Over install policy <p>Share the potential impacts of any changes in policy that could affect both organisations and their customers.</p>	<p>Outcomes: SOs will have a forum to capture proposed changes to operational policy due to future operational needs and consider the respective impacts on customers and system operations.</p>	

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
WOS7	Grid Code & Distribution Code evolution to support RES-E Targets by 2030	Review the Grid Codes and Distribution Codes in the context of the current and future needs of the power system and initiate a programme of change to deliver the necessary modifications.	<p>Outcomes: Each year arising from the TSO-DSO programme required changes to Grid and Distribution Code will be necessary to codify enduring changes arising from all workstreams.</p> <p>This task will ensure the requisite changes are brought to the appropriate panels for consideration and implementation.</p>	CRU approval of Grid and Distribution code changes brought forward by the Grid and Distribution Code Review Panels.
WOS8	Review the Impacts on compliance testing process of (non-firm) Distribution Resources.	This task will examine any additional requirements, particularly in the areas of registration/signalling, resulting from a distribution generator connection being non-firm are considered and reflected in the TSO Grid Code compliance testing process	<p>Outcomes: Recommendation to be given to the respective Distribution and Grid Control Panels</p>	

Facilitating New Technology

4

Multi-Year DSO/TSO Work Plan
Covering 2022 - 2026



NETWORKS

The Climate Action Plan 2019 sets out a target of 70% renewable electricity by 2030, and the decarbonisation of the heat and transport sectors through the electrification of heat and transport. The objectives and measures set out in the Climate Action Plan were placed on a statutory footing with the adoption of Ireland's National Energy and Climate Plan (NECP) in 2020, meeting these objectives will see transformative changes in the electricity system operation and related markets.

Coupled with significantly increased renewable generation the NECP set goal for the adoption of approximately 1 million EVs and 600,000 heat pumps by 2030. The achievement of these goals brings both challenges and opportunities to the distribution and transmission system operators.

The widespread adoption of these low carbon technologies in the period to 2030 offers the potential for customers to become more engaged with the electricity system. 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, for example battery, wind, and solar generation in hybrid arrangements, has the potential to derive greater value of existing network infrastructure.

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

- Coordinated / joint QTP activities
- Progressively improving processes for DSUs' participation in all markets
- 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).

Both system operators are looking to pilot new technologies and process, facilitate the integration of new technologies (e.g. hydrogen-based technology and grid forming technology). Both system operators will work together to enable hybrid connections and supporting arrangements to optimise the use of existing infrastructure.

In addition, enabling new actively managed connection methods to greater utilise existing network capacity will allow more renewable energy on the system sooner.

4.1 Facilitating New Technology

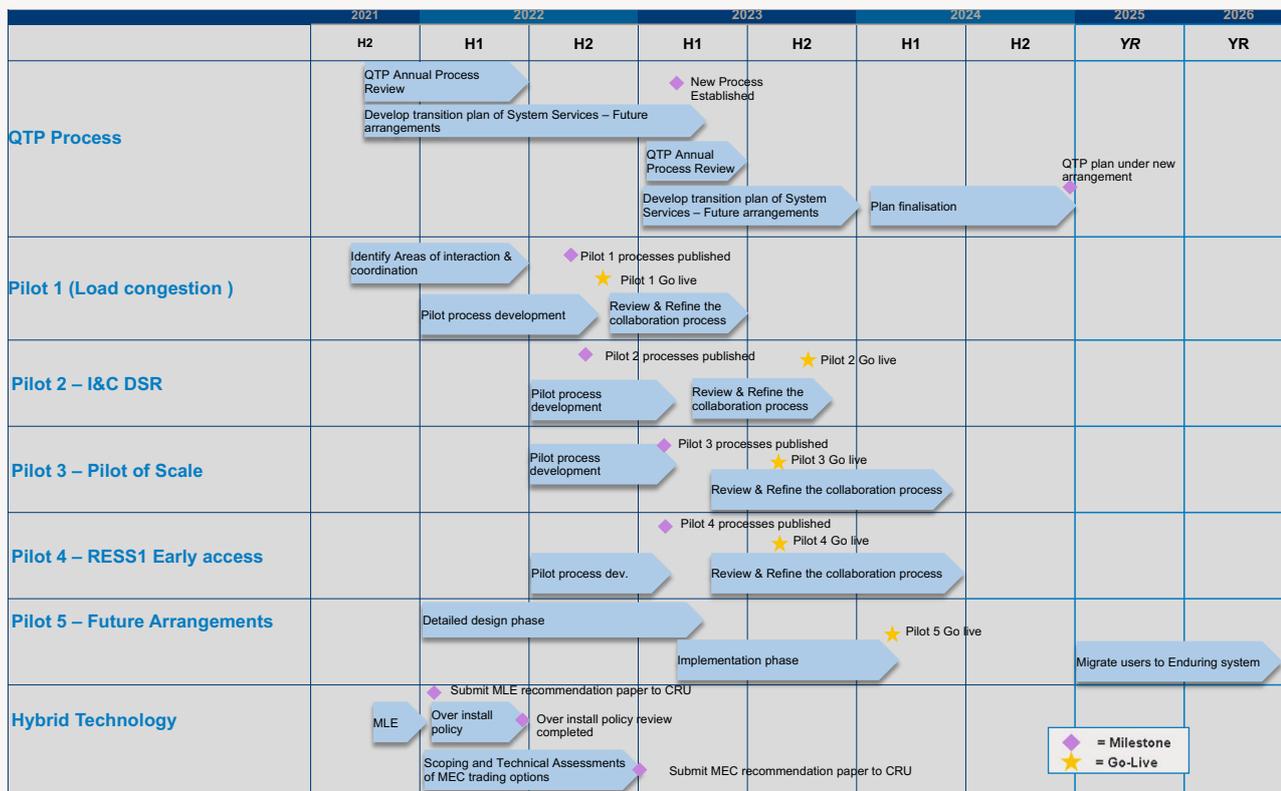


Figure 4: Embracing Technology Plan on a Page

Key milestones/dates:

2022

- H1 – Agree contractual framework approach to accommodate Multiple Legal Entities behind a single connection point²
- H2 – Recommendation on the over install policy
- H2 – Pilot DSO /TSO process model developed and published
- H2 – Go live of first DSO pilot with version 1 DSO-TSO operating model processes
- H2 – Proposals on the Maximum Export Capacity (MEC) trading approach
- H2 – Pilot 2 DSO /TSO operating model processes developed and published

2023

- H1 – Go live of 2nd DSO pilot with DSO-TSO operating model processes
- H2 – Pilot 3 processes developed and published
- H1 – Pilot 4 processes developed and published
- H2 – October Go live of 3rd DSO pilot with DSO-TSO operating model processes
- H2 – Go live of 4th DSO pilot with DSO-TSO operating model processes

2024

- H1 – Go live of 5th DSO pilot with DSO-TSO operating model processes
- H2 – QTP plan under new arrangements

2025 & 2026

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

² Note: This is dependent on a CRU decision post-submission of a recommendations paper to CRU by EirGrid and ESB Networks.

4.2 Technology Tasks And Outcomes

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT1	QTP Process	<p>QTP – annual call for potential projects, possible examples might include as hybrids, Hydrogen, grid-forming (EG)</p> <p>Over the next 2 years both parties will agree on what should be trialled for the benefit of milestones in 2030.</p>	<p>Outcomes: QTP learnings and outcomes (from the QTP in 2020); – Annual call for potential projects, possible examples such as hybrids, hydrogen, grid-forming.</p> <p>Capabilities delivered</p> <ul style="list-style-type: none"> • 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. 	<p>Conducting annual QTP trials is dependent on identification of relevant trial focus areas by the TSO and participation of service providers in the trials.</p> <p>The current QTP arrangements carry on until 2024 when the new arrangements are in place. The new arrangements are subject to the regulators decision (Dec 2021).</p>
FNT2	DSO Pilot 1 I&C DSR Local / DSO Market	<p>This task delivers an ability to manage the required TSO-DSO interaction relating to the DSO 2022 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.</p>	<p>Outcomes: The outcome of this task will be the development and implementation of a set of joint business process that manage the TSO-DSO interaction and form a pilot implementation for aspects of Op model. This will support learnings to address enduring solution for information exchange, service prioritisation for TSO/DSO.</p> <p>Capabilities delivered 2022 TSO and DSO will be able to assess the impacts of distribution customers providing services to both system operators.</p> <p>Customers may be able to stack the revenue that they are earning from both transmission and distribution system operators for industrial / commercial scale demand side flexibility.</p>	<p>Dependant on participation of flexible service providers in pilot.</p> <p>SEM-21-026 Consultation on Dispatch, Re-dispatch and Compensation Pursuant to Regulation (EU) 2019/943</p>
FNT3	DSO Pilot 2 2023 I&C DSR TSO Market (DSU Instruction Sets)	<p>This task delivers an ability to manage the required TSO-DSO interaction relating to the DSO 2023 Dynamic Instruction Set 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.</p>	<p>Outcomes: The outcome of this task will be the development and implementation of a set of joint business processes that manage the TSO-DSO interaction and form a pilot implementation for aspects of Op model. This will support the maximisation of DSO IDS participation in TSO system service arrangements.</p> <p>Capabilities delivered 2023</p> <ul style="list-style-type: none"> • DSU customers will be able to participate more freely in transmission markets 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 and associated processes which will have other applications in TSO/DSO coordination. 	<p>Dependant on participation of DSUs in pilot.</p> <p>Further progress on SEM-21-026 Consultation on Dispatch, Re-dispatch and Compensation Pursuant to Regulation (EU) 2019/943.</p>

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT4	DSO Pilot 3 2023 flexibility pilot of scale	<p>This task delivers an ability to manage the required TSO-DSO interaction relating to the DSO 2023 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.</p> <p>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.</p>	<p>Outcomes: The outcome of this task will be the development and implementation of a set of joint business process by building on the experience from the DSO 2022 Flexibility pilot that will manage the TSO-DSO interactions and form a revised pilot implementation of aspects of Operating model.</p> <p>Deliver capability to utilise residential demand in the delivery of services to TSO.</p> <p>Capabilities delivered 2023</p> <ul style="list-style-type: none"> • Distribution connected customers will be able to offer reactive power services to both TSO and DSO as appropriate to their network location and topology. • Residential customers will be able to participate (via aggregation) in services to the TSO and DSO. 	Dependant on participation of flexible service providers in pilot.
FNT5	DSO Pilot 4 RESS1 Early Access Pilot	<p>This task delivers an ability to manage the required TSO-DSO interaction relating to the DSO RESS-1 Early Access pilot. This pilot delivers the capability to offer actively managed connections for a fixed duration to facilitate early access for a limited set of RESS1 generators in advance of deep distribution works completion.</p>	<p>Outcomes: The outcome of this task will be the development and implementation of a set of joint business processes by building on the experience from the DSO 2022 Flexibility pilot that will manage the TSO-DSO interactions.</p> <p>Capabilities delivered 2023</p> <ul style="list-style-type: none"> • DSO will be able to offer for actively managed connections in locations where RESS1 generators are seeking early access, considering TSO impacts. • The SO's will be able to operationally test processes for distribution generators with an actively managed connection. 	CRU decision regarding funding model for RESS1 Early Access Pilot.
FNT6	DSO Pilot 5 2024 Future Arrangements	<p>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.</p>	<p>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.</p> <p>Capabilities delivered 2024</p> <p>The DSO will be able to provide the following in coordination with the TSO and customers:</p> <ul style="list-style-type: none"> • Improved registration processes for customers • Qualification processes • Allocation processes • Dispatch arrangements 	Progression of the Future Arrangements detailed design process and SEMC decisions.

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
FNT7	Hybrid Technology (MLE)	<p>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.</p> <p>The plan builds on the work from the FlexTech Hybrid Working Group³.</p>	<p>Outcomes: Submit a recommendations paper to CRU on Hybrids setting out a proposed contractual framework to accommodate MLEs behind a single connection point</p> <p>Capabilities delivered 2022</p> <ul style="list-style-type: none"> Generators owned by different legal entities will be able to operate behind a single connection point. 	CRU review and decision
FNT8	Hybrid Technology (Over Install)	<p>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 over-install policy to establish if the current policy can be increased to allow for maximisation of existing connections points.</p> <p>The rationale for seeking to increase or remove the current 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.</p>	<p>Outcomes: Completion of review of the existing Over-Install Policy. As appropriate, submission of recommendations paper to CRU on possible changes to the existing over-installation policy</p> <p>Capabilities delivered 2022 Generation customers will be able to increase their capacity factor by connecting more generation behind their connection point.</p>	CRU review and decision
FNT9	Hybrid Technology (Tradable MEC)	Determine policy for trading of Maximum Export Capacity (MEC) behind a single connection point that enables Hybrid connections sharing MEC.	<p>Outcomes: The outcome of this task will be a technical assessment report to CRU for the options regarding the trading of MEC behind a connection point.</p> <p>Capabilities delivered 2023 Subject to the solution option determined by CRU.</p>	CRU review and decision

³ Offshore projects will require further consideration.

Reducing Dispatch Down of Renewable Generation

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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. Minimising this dispatch down of renewable generation is critical to ensuring the efficient use of renewable generation and achieving renewable energy targets in an economic manner.

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 the System Non-Synchronous Penetration (SNSP) limit and Rate of Change of Frequency (RoCoF) limit to reduce curtailment are a focus for the TSO. These are ongoing activities for the TSO and DSO in seeking to reduce the dispatch down of renewable generation.

In terms of this joint TSO-DSO 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; enabling hybrids and trialling other generation as part of the Facilitating New Technology workstream should also facilitate reducing dispatch down of renewables.

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, 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 more efficient scheduling and dispatch decisions.
- Calling for potential projects that might assist in a reduction of the dispatch down of renewable generation as part of the QTP Process
- Reactive power co-ordination – 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 TSO-DSO interface.
- Assessing current TSO-DSO co-ordination on constraints.

5.1 Reducing Dispatch Down Of Renewable Generation Plan On A Page

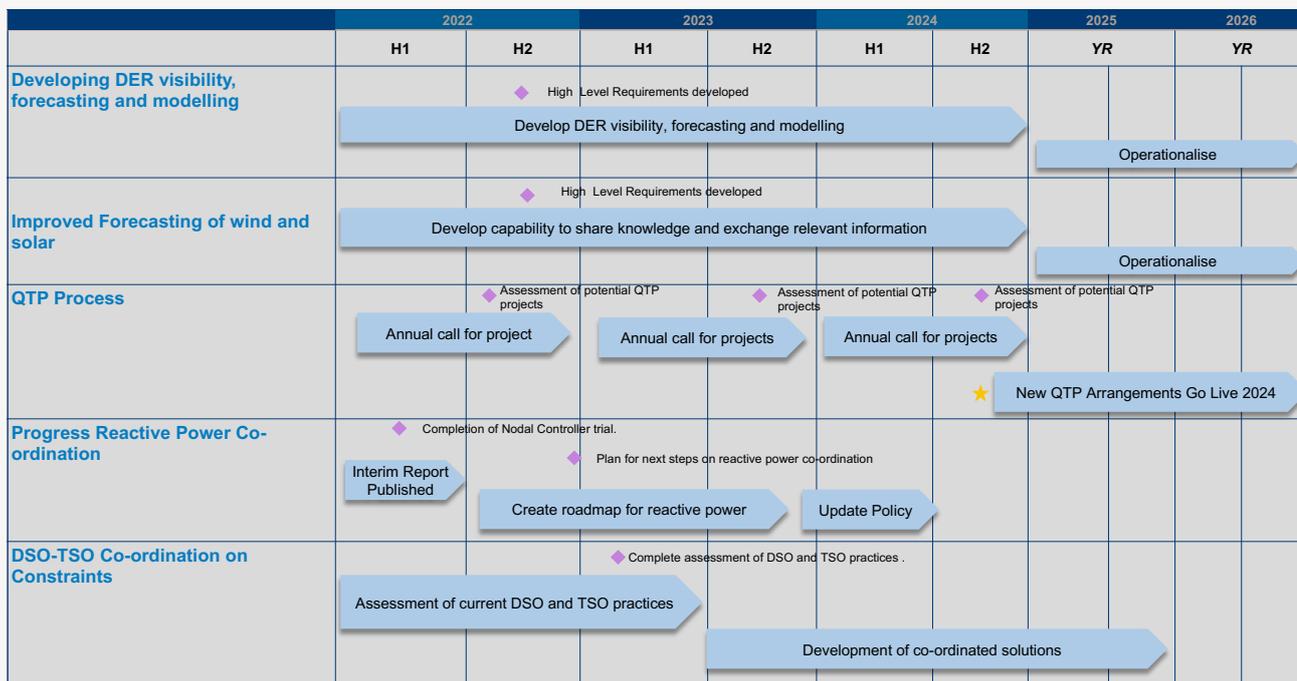


Figure 5: Reducing dispatch down of renewables Plan on a Page

◆ = Milestone
★ = Go-Live

Key milestones/dates:

2022

- H1 – Completion of nodal controller trial report.
- H1 – Development of requirements for DER visibility, forecasting and modelling.
- H1 – Plan for next steps on reactive power co-ordination.
- H2 – Assessment of potential QTP projects to assist in reducing dispatch down of renewables.
- H2 – High level requirements developed for wind and solar forecasting

2023

- H1 – Complete assessment of DSO and TSO practices to identify any inefficiency in the implementation of constraints on the transmission and distribution systems.
- H2 – Assessment of potential QTP projects to assist in reducing dispatch down of renewables.

2024

- H2 – Assessment of potential QTP projects to assist in reducing dispatch down of renewables.

2025 & 2026

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

5.2 Reducing Dispatch Down Of Renewable Generation Tasks And Outcomes

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
RDD1	Developing DER visibility, forecasting, and modelling	<p>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 will look to identify:</p> <ol style="list-style-type: none"> 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. <p>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 RESS pilot and the pilot of scale.</p>	<p>Outcomes: Solutions for the delivery of DER visibility, forecasts, and models.</p> <p>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.</p>	
RDD2	Improved Forecasting of wind and solar	<p>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</p> <p>Improved forecast accuracy and constraint awareness will deliver a more efficient dispatch.</p>	<p>Outcomes: Improved forecasts.</p> <p>Capabilities delivered 2025 More efficient operations – reduction of dispatch down of renewables due to forecast errors.</p>	
RDD3	QTP Process	<p>QTP – annual call for potential projects that might assist in a reduction of the dispatch down of renewable generation.</p>	<p>Outcomes: Annual call for potential projects.</p> <p>Capabilities delivered Annually 2022-2025</p> <ul style="list-style-type: none"> • The potential trialling of new technologies to reduce the dispatch down of renewable generation. • SOs will be able to assess the impacts of integrating these technologies on their respective systems. 	<p>Conducting annual QTP trials is dependent on identification of relevant trial focus areas by the TSO and participation of service providers in the trials.</p> <p>The current QTP arrangements carry on until 2024 when the new arrangements are in place.</p> <p>The new arrangements are subject to the Regulators Decision (December 2021)</p>

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
RDD4	Progress Reactive Power Co-ordination	<p>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 TSO-DSO 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.</p> <p>The TSO and DSO are trialling a 'Nodal Controller' that seeks to utilise a cluster of distribution connected wind farms to provide reactive power support to the transmission system. The outcomes of this trial will inform the implementation of future technologies intended to achieve the same outcome in an integrated manner.</p>	<p>Outcomes:</p> <ol style="list-style-type: none"> 1. Complete nodal controller trial and complete joint report 2. Create roadmap for reactive power; next steps and application of learnings 3. Revise operational policy on reactive power <p>Capabilities delivered Utilisation of the reactive power capabilities of generation on the distribution network to support the efficient operation of both distribution and transmission systems.</p>	CRU target setting for DSO Flexibility Multiyear Plan
RDD5	DSO-TSO Co-ordination on Constraints	<p>For system security reasons, renewable sources of generation may be dispatched down at times due to constraints on the distribution network, the transmission network or both.</p> <p>The DSO and TSO will work together to continue to ensure that this dispatch down is co-ordinated in a manner that is equitably applied and does not overly constrain renewable sources of generation. This task is related to the DSO-TSO Operating Model.</p>	<p>Outcomes:</p> <ol style="list-style-type: none"> 1. An assessment of current DSO and TSO practices to identify any inefficiencies in the implementation of constraints on the transmission and distribution systems and continue to ensure a fair and equal treatment of all parties 2. The development of co-ordinated solutions to enhance constraint management and manage any inefficiencies <p>Capabilities delivered 2026 Improved coordination of the application of transmission and distribution constraints to minimise the impact on renewable generation.</p>	<p>SEM- 21-027 Proposed Decision on Treatment of New Renewable Units in the SEM</p> <p>SEM-21-026 Consultation on Dispatch, Re-dispatch and Compensation Pursuant to Regulation (EU) 2019/943</p> <p>CRU target setting for DSO Flexibility Multiyear Plan</p>

Security of Supply

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This workstream's objective is to address the challenges associated with, and leveraging the opportunities created by high renewables penetrations, high volumes of distributed energy resources (DER) and widespread demand side flexibility. The focus initially will be to identify and prepare to address the longer-term operational requirements for maintaining security of supply given the changing characteristics of the transmission-distribution interface and the demand supplied by the power system.

To ensure that we have the capability to securely manage this transition, we need to fully understand the characteristic of how these technologies, including their protection, their dynamic response, and how they are embedded across the system, will interact with system operation. 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 TSO is working with CRU and DECC⁴ on a security of supply programme across a range of areas to manage this situation and mitigate the risks that controlled outages would have on homes and businesses. One aspect of the security of supply programme will see the TSO and DSO working together to enhance operational processes to manage supply shortfalls should they arise. This activity is being coordinated as part of TSO and DSO ongoing operational coordination activity, whereas this work programme is focused on long term coordination for a secure system.

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:

- 1 Inform changes to our operational processes and potentially standards and settings that are applied.
- 2 Allow us work to enable market-based solutions, where we believe that there is the potential for distributed 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.

Managing security of supply events: 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 amount of disruption occurs, and that the integrity of the overall power system is maintained. 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 required to ensure that the changing characteristics of demand on the system are accounted for.

Recovering the power system: our existing plans for the recovery of the power system post a major disturbance will be reviewed considering the changing characteristics of the system, with a view to leveraging future capabilities from distributed energy resources.

⁴ CRU Information Paper – Security of Supply Programme of Actions CRU21115

6.1 Security Of Supply Plan On A Page

	2022		2023		2024		2025		2026	
	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
Data Centre Flexible Demand Implementation	TSO-DSO Protocol Developed for 1 st Implementation		Protocol in place		Protocol Reviewed and updated as required for subsequent implementations		TSO-DSO Flexible Demand protocol updated			
Implement Outcome of CRU consultation on solutions for Data Centre Connections	Commmence Implementation of solution as directed by CRU									
Protection Settings for our Largest Customers	Review and Update of Procedures		Review Complete & Procedures updated							
Selective co-ordinated demand management using new control room technology	Review Existing Plans		Review Experiences from Pilots on Flex Services		Ongoing Review of Policies to feed into Control Centres					
Assessment of DER on Future System Performance to ensure secure energy transition			Technical assessment of distributed energy resources on system performance		Technical Assessment Complete					
Review of Automated Demand Management Scheme				Technical review of scheme		Technical assessment complete. Recommendations on next steps				
Review of Power System Restoration Process in preparation for 2030 power system					Technical Review		Technical review of the power system restoration process complete		Update Plans	

Figure 6: Security of Supply Plan on a Page

◆ = Milestone
★ = Go-Live

Key milestones/dates:

2022

- H2 – Review and update procedures for coordination of protection settings of our largest customers
- H2 – TSO-DSO protocol in place for implementation of flexible demand.
- H2 – Commence Implementation of outcome of CRU consultation on solutions for data centre connections (subject to CRU decision).
- H2 – Review of co-ordinated demand management approaches considering changing system characteristics and future tools capability.

2023

- H2 – Technical assessment of distributed energy resources on system performance during faults and recommendations on next steps.
- H2 – TSO-DSO protocol in place for implementation of Flexible Demand.

2024

- H1 – Technical assessment of automatic demand management arrangements and recommendations on next steps.
- H2 – TSO-DSO Flexible Demand protocol updated as required for subsequent implementations.
- H2 – Technical review of the power system restoration process considering changing system characteristics and tool capability.

2025 & 2026

- 2025 Update of power system restoration process.

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

6.2 Security Of Supply Tasks and Outcomes

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
SOS1	Data Centre Flexible Demand Implementation	A number of planned Data Centres are required (under the terms of their connection agreement) to facilitate reductions in their demand at times of system stress. A generic TSO/DSO operating protocol has been developed to implement Flexible Demand at data centre sites but further work is required to develop the TSO-DSO arrangements for its implementation.	<p>Outcomes: The output of this task is a TSO-DSO protocol on the implementation of Flexible Demand at Data Centre Sites.</p> <p>Capabilities delivered 2022 The TSO and DSO capability to coordinate and implement Flexible Demand to manage system security.</p>	The timelines for this task are dependent on the connection and demand ramp-up of the first distribution connected data centre at which Flexible Demand arrangements apply.
SOS2	Implement Outcome of CRU consultation on solutions for Data Centre Connections	<p>The CRU has consulted (CRU21060) on mitigation options to address the system security impact of Data Centre demand.</p> <p>Once that decision is made and an implementation period will follow.</p>	<p>Outcomes: Implementation of a solution to manage data centre connections.</p> <p>Capabilities delivered 2022 Subject to the solution option determined by CRU.</p>	The CRU has consulted (CRU/21/060) on mitigation options to address the system security impact of Data Centre demand. The consultation closed in July 2021. The timings and outcome of this decision may affect the plans.
SOS3	Protection Settings for Our Largest Customers	Formalise arrangements for coordination of the protection settings of our largest customers to ensure that system security is maintained. This will involve engagement with our customers.	<p>Outcomes: Engagement with our largest customers and updated procedures for the coordination of their protection settings.</p> <p>Capabilities delivered 2023 Improved coordination of protection settings and understanding of behaviour during system disturbances.</p>	This task will require engagement with our largest customers on their protection settings.
SOS4	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 Management System (ADMS) and Distributed Energy Resource Management System (DERMS) would support this task.	<p>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.</p> <p>Capabilities delivered 2024 Updated processes and tools to allow the TSO and DSO effectively manage demand.</p>	CRU target setting for the DSO Flexibility Multi-year Plan
SOS5	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) to ensure that system security and safety is maintained as the power system diversifies and decentralises.	<p>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.</p> <p>Capabilities delivered 2024 Improved understanding of DER behaviour during system faults.</p>	

Task ID	Task Name	Task Description	Outcomes / New Capabilities	Dependencies
SOS6	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.	<p>Outcomes: The output of this task is a technical review of the Demand Management scheme to inform subsequent updates to the scheme.</p> <p>Capabilities delivered 2024 Recommendations on changes to the Automated Demand Management Scheme.</p>	
SOS7	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.	<p>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.</p> <p>Capabilities delivered 2025 Recommendations on changes to the power system restoration process.</p>	

2025 and Beyond

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Multi-Year DSO/TSO Work Plan
Covering 2022 - 2026



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2025 and Beyond

The electricity industry and society are going through rapid change due to the energy transition and the pace and scale of new technology adoption. Where high level milestones for 2025/2026 are known they have been outlined within each workstream.

Three years from now it is more difficult to plan with certainty the key milestones that can be underpinned by guaranteed resources and finance.

There are many different factors that will affect our planning. Among them:

- 1 Compliance with clean energy emissions regulations that will affect generators and demand side participants (2024/2025)
- 2 Re-integration with EU through the new Celtic Interconnector (2026)
- 3 Availability of a new tie-line with Northern Ireland (2025)
- 4 SNSP Levels
- 5 Smart meter roll-out
- 6 Low voltage visibility
- 7 Implementation of the RESS auctions
- 8 Pace of electrification of heat and transport
- 9 The impact of new tariffs on customers behaviour
- 10 The technology maturity level and commercialisation of different technology types
- 11 The implementation of any new directives by the regulator

As we monitor these events/progress, the plan will be updated to reflect any changes in the years ahead.

New capabilities and opportunities will emerge over the course of the next 3 years which will further inform the key activities for 2025/2026.

Key considerations for activities in this period include:

- The development of Network Codes on demand side response, aggregation, and flexibility
- Develop cooperation proposals for the next price review period as part of the multi-year plan in 2024/2025.
- Refining the capabilities piloted in 2022->2024 and transitioning these into business as usual solutions for customers.
- Further development of flexible network management capabilities
- Adapting to technological change and the opportunities and challenges presented
- Broadening customer participation in markets through continued evolution of services and the application of new technology.

Have Your Say - Initiative

8

Multi-Year DSO/TSO Work Plan
Covering 2022 - 2026



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Have Your Say

These proposals have been informed by energy policy, regulation and customer and stakeholder input, and set out our proposed approach for the next five years. These plans will also be reviewed and updated on an annual basis.

Stakeholders' input is incredibly important to ESB Networks and EirGrid and we now seek your views on the tasks and activities set out, in this document. Consultation questions:

- Q1 What are stakeholders' views on the proposed joint activities within the proposed work programme for whole of system approach?**
- Q2 What are stakeholders' views on the proposed joint activities within the proposed work programme for facilitating new technology?**
- Q3 What are stakeholders' views on the proposed joint activities within the proposed work programme for reducing dispatch down of renewable generation?**
- Q4 What are stakeholders' views on the proposed joint activities within the proposed work programme for improving security of supply?**
- Q5 Are there other activities that stakeholders believe that the DSO and TSO should be jointly working together during the term of the multi-year plan?**
- Q6 What are the stakeholder's views on the proposed balanced scorecard for calendar year 2022?**

We welcome feedback on the questions posed above. Responses should be submitted to both info@eirgrid.com and engagement@esbnetworks.ie before 19 November 2021.

It would be helpful if answers to the questions addressed only the areas where the TSO and DSO must work in partnership. For responses to individual initiatives please refer to other TSO and DSO consultation processes. Further information can be found at www.eirgrid.com and www.esbnetworks.ie.

If you require your response to remain confidential you should clearly state this on the coversheet of the response. We intend to publish all non-confidential responses. Please note that, in any event, all responses will be shared with the CRU. This will inform the CRU's multiyear target setting process.

Balance Scorecard Proposal

Multi-Year DSO/TSO Work Plan
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Balance Scorecard Proposal

As part of the regulatory framework outlined in the CRU’s PR5 Regulatory Framework, Incentives and Reporting Decision (CRU/20/154), the CRU has introduced an annual balanced scorecard on Joint TSO/DSO coordination.

The Commission for the Regulation of Utilities has mandated that the SOs shall submit to the CRU in September each year, aligning with their consultation with stakeholders, a detailed multi-year plan covering the three following years (and the two years after at high level). In the multi-year plans, the SOs will set out their planned activities to enable deployment of new technology, which will account for technical scarcities or challenges identified by the DSO and/or TSO. Based on the submission, the CRU will decide, by year-end, on the milestones, deliverable targets, and weightings for the following year. The first multi-year plan will cover 2022 to 2024 (as well as 2025 and 2026 at high level).

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; and
 (40%) effectiveness of the plan and demonstrable impacts.

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

9.1 Quality Of The Plan And Defined Actions

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

- 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.
- Demonstrable adherence to the defined programme delivery method/approach
- Demonstrable and robust risk, assumption, issue, and dependency management

9.2 Quality Of Implementation Of The Plan

We propose that measurement of the quality of the implementation plan should be based on delivering the 2022 milestones set out in the following table. The criteria for measurement should be based on a continuum of achievement as highlighted in the figure below:

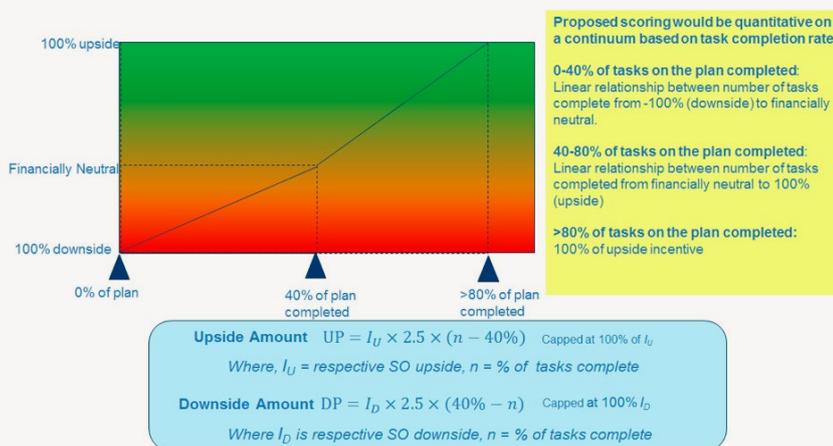


Figure 8 Scoring proposal for implementation

Workstream	Milestone	Indicative timing
Whole of System Approach	Publish vision and principles and agreed direction for future operating model	H1 2022
	Develop Operating Model High Level Design	H2 2022
	Develop pilot proposals for suitable aggregation structures for participants offering both TSO and DSO locational services.	H2 2022
	Agree data exchange principles and requirements gathering model for information exchange and interfaces	H2 2022
	Develop aggregation structure paper	H2 2022
	Test Rule-set for first pilot applied	H2 2022
Technology Enablement	Agree contractual framework approach to accommodate Multiple Legal Entities behind the connection point.	H1 2022
	Recommendation on the over install policy	H2 2022
	Pilot DSO /TSO process model developed and published	H2 2022
	Go live of first DSO pilot with version 1 DSO-TSO processes	H2 2022
	Proposals on the MEC trading approach	H2 2022
	Pilot 2 DSO /TSO Processes developed and published	H2 2022
Reducing Dispatch Down	Completion of nodal controller trial report	H1 2022
	Development of requirements for DER visibility, forecasting and modelling	H1 2022
	Plan for next steps on reactive power co-ordination	H2 2022
	High level requirements developed for wind and solar forecasting	H2 2022
	Assessment of potential QTP projects to assist in reducing dispatch down of renewables	H2 2022
Security of Supply	Review and update procedures for coordination of protection settings of our largest customers	H2 2022
	TSO-DSO protocol in place for implementation of flexible demand	H2 2022
	Commence Implementation of outcome of CRU consultation on solutions for data centre connections (subject to CRU decision).	H2 2022
	Review of co-ordinated demand management approaches considering changing system characteristics and future tool capability	H2 2022

Table A: Scoring Proposal (TSO/DSO Plan Implementation Metrics)

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

9.3 Effectiveness Of Implementation Of The Plan

As the programme is focused 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 proposed approach for measuring the effectiveness of plan implementation to enabling new technology and solutions 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 2022 in Table B. 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:

Task Name	Capabilities delivered - 2022
Whole of System Approach	
Agree Future Operating Model	Interim capabilities piloted (see Section 3 Facilitating New Technology for details)
Review alignment of aggregation structures for transmission and distribution services.	Aggregated distribution customers will be able to offer services to both TSO on a system wide and DSO on a location specific basis for pilots.
Market Framework Development	Participating Customers/services providers will be able to offer services to TSO and DSO on a pilot basis.
Future Arrangements – Distribution connected customers	Relevant SO Input to the detailed design process relevant for distribution customers.
Grid Code & Distribution Code evolution to support RES-E Targets by 2030	Each year arising from the TSO-DSO programme, required changes will be brought to the appropriate panels for consideration and implementation. This will provide clarity for all transmission and distribution system users.
Facilitating New Technology	
QTP Process	Technology providers will be able to trial new technologies on the system or enable the use of existing technology in new applications. Both SOs will be able to assess the impacts of integrating these technologies on their respective systems. ⁵
DSO Pilot 1 I&C DSR Local / DSO Market	TSO and DSO will be able to assess the impacts of distribution customers providing services to both system operators. Customers may be able to stack the revenue that they are earning from both transmission and distribution system operators for industrial / commercial scale demand side flexibility.
Hybrid Technology (MLE)	Generators owned by different legal entities will be able to connect behind a single connection point. ⁶
Hybrid Technology (Over Install)	Generation customers will be able to increase their capacity factor by connecting more generation behind their connection point. ⁶
Reducing Dispatch Down of Renewable Generation	
Developing DER visibility, forecasting, and modelling	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.
QTP Process	The potential trialing of new technologies to reduce the dispatch down of renewable generation. Both SOs will be able to assess the impacts of integrating these technologies on their respective systems. ⁵
Security of Supply	
Data Centre Flexible Demand Implementation	The TSO and DSO capability to coordinate and implement Flexible Demand to manage system security.
Implement Outcome of CRU consultation on solutions for Data Centre Connections	Capability delivered is subject to the solution option determined by CRU.

Table B Capabilities Delivered in 2022

⁵ This added capability will be dependent on the type of technology providers who enter the QTP in a given year.

⁶ Subject to review and decision by CRU