



NETWORKS

Innovation 2025 Innovation To Deliver Networks For Net Zero

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Foreword



Ireland's electricity distribution network is crucial for supporting population growth, economic development, and the transition to a net zero future. As the backbone of the energy transition, the network must be capable of meeting the immediate needs of customers and supporting longer term policy outcomes relating to housing, jobs, infrastructure and climate change.

In recent years we have seen very large increases in the requirements of the electricity network to support and enable housing, electrification of heat, transport and industry, and continued connection of renewable electricity generation.

Under the Climate Action Plan, millions of new devices will connect to the electricity distribution network before the end of the decade, including heat pumps, EVs, smart meters and renewables. As customers increasingly rely on electricity to meet their energy needs, significant and sustained investment will be needed to enhance network resilience, build additional capacity and handle complex flows of electricity and data across the network.

In this rapidly changing landscape, innovation will be critical in overcoming challenges and enabling new opportunities.

Innovation is not just about identifying new technologies; it is about adopting a mindset that embraces change and seeks new ways of working. It is about building the structures to facilitate change and working with others to share insights and co-create solutions.

This consultation report outlines our plans for innovation in ESB Networks, detailing the challenges to be addressed and the proposed

focus of our innovation programme. It demonstrates our commitment to ensuring that innovation is effective, inclusive and aligned with the expectations of those who depend on us daily. We are committed to collaborating with customers, industry colleagues, suppliers, research bodies and other stakeholders to deliver a net zero ready distribution network by 2040 to enable Ireland's clean electric future. This collaborative approach ensures that we can harness the best ideas and technologies to meet future challenges and find solutions that benefit the network and society.

We invite you to review and provide feedback on our proposed innovation approach. Your contributions will help to shape an innovation programme within ESB Networks that meets the needs of the energy system, our customers and our collective future. We appreciate your continued support and engagement and look forward to your responses.

A handwritten signature in black ink that reads "Nicholas Tarrant".

Nicholas Tarrant
Managing Director, ESB Networks

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1. Innovation In ESB Networks

1.1 ESB Networks – who we are

ESB Networks is the electricity distribution system operator (DSO), distribution asset owner (DAO), and onshore transmission asset owner (TAO) in the Republic of Ireland, licensed by the Commission for the Regulation of Utilities. We work to meet the needs of all electricity customers in Ireland, regardless of supplier, connecting them to Ireland’s clean electric future.

For almost 100 years, ESB Networks has been at the forefront of delivering reliable, high-quality power to homes and businesses across Ireland, helping to meet the needs of customers and support wider social and economic development. We invest in the electricity network on behalf of all electricity customers, with average annual investments of €0.8 billion over the past five years across all of our work programmes.

As distribution asset owner and operator, we carry out all functions relating to the electricity distribution system, including asset management, planning, construction, maintenance, and operation of the high, medium, and low voltage distribution network. As onshore TAO, we are also responsible for building and maintaining the high voltage transmission system in line with requirements set out by EirGrid, the transmission system operator (TSO).

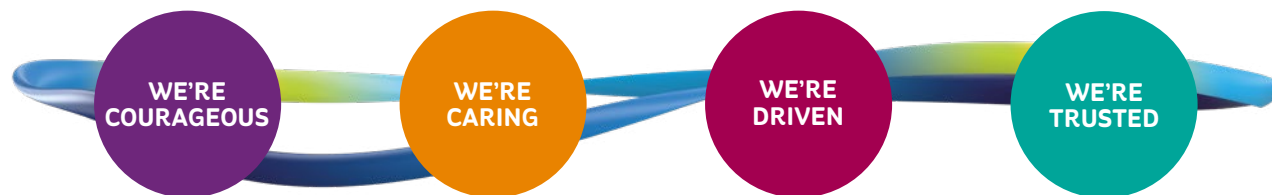
Our role includes managing all of the physical assets including power lines, substations, and transformers that deliver electricity from generation sources to end-user. The electricity transmission and distribution networks comprise circa 160,000km of overhead networks, 28,000km of underground cables, and over 800 high voltage substations, serving more than 2.5 million demand customers.

In addition to providing reliable and resilient network infrastructure, ESB Networks supports the electricity retail market through the ringfenced meter registration system operator (MRSO) and retail market design service (RMDS)

and underpins the wholesale single electricity market through the provision of aggregated electricity meter data. This is a key role in enabling a competitive electricity market in Ireland.

Customer service is at the heart of our operations. Our staff and contractors nationwide strive for excellence in serving all electricity customers, regardless of their supplier, while supporting them in participating in the energy market and adopting low-carbon technologies.

Our Values



Each of us is prepared to challenge the way we’ve always done things, stand up for what we feel is right and try better ways of working.

We’re putting customers’ current and future needs at the heart of what we do and we keep ourselves and others safe and healthy.

We bring passion and persistence to what we do every day, innovating and collaborating to meet the challenges and opportunities ahead.

We each play our part, taking ownership of our responsibilities, seeing the job through and protecting our own health and safety, as well as others’.

1.2 Our Networks for Net Zero Strategy

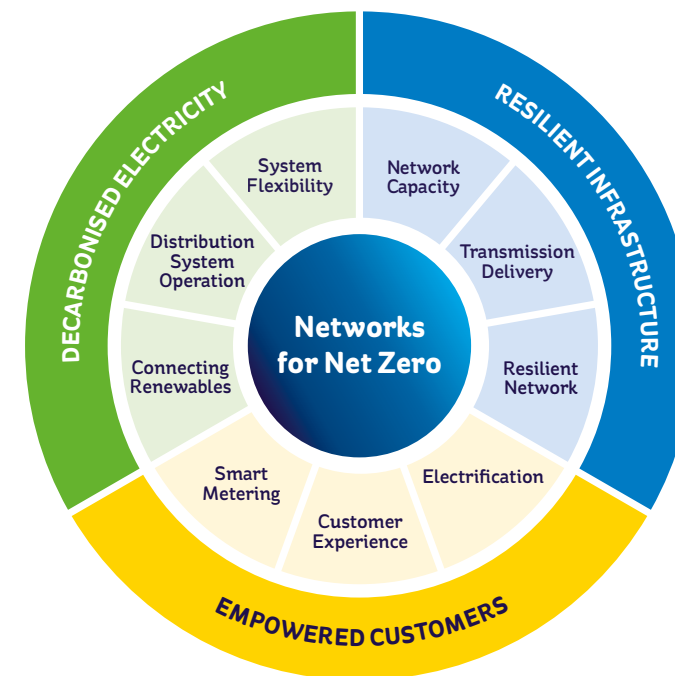
Our Networks for Net Zero strategy sets out ESB Networks' commitment to achieving a Net Zero-ready electricity network by 2040. It also describes our role in supporting national policy targets relating to economic growth, housing development and the Climate Action Plan. The strategy aims to develop a flexible and smart electricity network that will serve as a foundation for a clean electric future.

ESB Networks has identified three strategic objectives which are core to the delivery of our Net Zero strategy: Decarbonised Electricity, Resilient Infrastructure, and Empowered Customers. Each of the strategic objectives can be broken down into three key areas of focus, as illustrated in the diagram below. Implementing this strategy relies on ESB Networks' four foundational capabilities: Our People, Digital and Data, Financially Strength, and being Sustainable and Socially Responsible.

ESB Networks is committed to connecting and distributing electricity safely, securely, and affordably while playing a crucial role in climate action by electrifying heat, transport, and industry, and integrating renewable generation. This will require significant changes to create a smarter, more flexible electricity system where customers are empowered and incentivised to contribute to network efficiency.

This transformation will require collaboration with stakeholders, customers, and industry partners, and is guided by our values of being Courageous, Caring, Driven, and Trusted.

To accelerate this transformation, ESB Networks has established new structures and programmes to drive change, including the Distribution Markets System Operator, which is driving an integrated design across distribution markets (retail and flexibility) and system operations, and Powering Ahead, which builds digital and data capability and advanced use cases. Our innovation team works closely with colleagues to support these programmes using innovative technologies and approaches.



1.3 Driving Innovation at ESB Networks

The rapidly evolving energy landscape, shaped by accelerated decarbonisation targets, population growth and the growing impact of climate change, requires a bold, refreshed approach to innovation.

Our innovation team plays a crucial role in enabling ESB Networks to deliver on its strategy. By focusing on four key areas – discovering new solutions, delivering breakthrough projects, disseminating learnings and developing innovation culture & capability – the team drives the development and implementation of innovative solutions that support organisational objectives.

ESB Networks enhances its innovation expertise and capacity through ongoing initiatives such as design-thinking workshops, innovation forums and training programmes. We also foster a culture of creativity from within through initiatives such as the Innovation Ideas Hub and X_Potential and we connect with global energy leaders and innovators through the Free Electrons Programme and through participation in industry forums and working groups including CIRED, the Energy Networks Association (ENA), E.DSO and others.

We manage a portfolio of innovation projects where we identify, trial, evaluate and where appropriate, adopt new technologies and solutions that are aligned with our strategic ambition.

Over the course of Price Review 5 (PR5), we have successfully advanced circa 50 projects, with almost 50% of these transitioning to Business as Usual (BAU), delivering tangible benefits for the network and our customers. Our commitment to shared learning is underscored by over 450 engagements through webinars, conferences, publications, papers and fostering knowledge exchange and collaboration with industry leaders globally.

In 2024



1.4 Innovation Strategy and Governance

Effective governance is core to managing innovation in ESB Networks. This is provided by the Senior Management Team (SMT) and the Innovation Steering Group (ISG). The SMT ensures that projects align with strategic goals, while the ISG, which includes managers and external advisors, evaluates and prioritises projects based on their strategic fit, customer needs, impact potential, and alignment with PR5/PR6 deliverables.

The project identification process involves several key stages. Initially, innovation ideas are reviewed to ensure they go beyond Business As Usual (BAU) or offer significant business impact. Ideas are then assessed against a range of factors including lifecycle savings potential, complexity, core competencies, strategic fit, and customer need. The potential impacts are evaluated to ensure alignment with our strategy. Projects that pass early reviews are scoped and investment appraisals are developed. Viable projects are proposed to the ISG for approval to proceed. Innovation ideas and projects are validated through engagement and collaboration with stakeholders and third parties.

This structured approach ensures that projects with high cost-benefit ratios and long-term benefits are delivered.

ESB Networks also takes a 'Fast Follower' approach which involves reviewing new solutions or technologies trialed by other utilities and where appropriate, accelerating implementation. This approach builds on existing learnings from other organisations while acknowledging the unique characteristics of the Irish electricity network, including our extensive rural overhead network and significant non-synchronous generation on an islanded system with limited interconnection. By fast following successful innovations from other utilities, ESB Networks can speed up adoption of innovative solutions to deliver enduring benefits to customers.

During Q2 2025, ESB Networks plans to launch a new innovation strategy. This will be informed by a review conducted in 2024 by external consultants into innovation best practices across UK Distribution Network Operators (DNOs), as well as ESB Networks' own insights and lessons from other jurisdictions. The new strategy will incorporate a balanced approach to innovation governance, addressing both short term incremental and longer-term innovation projects. Governance will be refined to match project risk, with fostering and enabling collaboration with external partners as a key objective.



1.5 Looking ahead

Building on learnings from PR5, we plan to enhance the impact and pace of innovation in ESB Networks by incorporating the following features into our revised innovation plan:

- **Balanced Portfolio:**
We propose to include both internal and externally facing innovations, with a focus on different timeframes for development. This ensures a comprehensive approach to addressing various challenges and opportunities.
- **Strategy and Governance Process:**
The strategy and governance processes will be reviewed so that they align with the scale of risk. This includes a more structured approach to managing innovation projects and ensuring they are consistent with national policy objectives and industry trends.
- **Focused Span of Control:**
There will be an emphasis on project ownership across the full lifecycle of innovation projects to ensure that projects are managed seamlessly from inception to completion.

- **Ongoing Horizon Scanning:**
We plan to undertake' continuous monitoring of the external landscape to identify new challenges and opportunities. This will help in adapting the strategy to changing circumstances and emerging trends.
- **New Approach to Collaboration:**
We recognise the importance of collaboration with external stakeholders to deliver whole-of-system benefits. We will work with other organisations, communities, and customers to achieve common goals.
- **Outcome-Focused Innovation:**
We will focus' on delivering tangible outcomes that contribute to ESB Networks' strategic objectives. This includes improving network resilience, empowering customers, delivering capacity, enhancing customer engagement, and supporting the energy transition.

We intend for our revised innovation strategy to be dynamic and adaptive, ensuring that ESB Networks remains at the forefront of the energy transition. By focusing on a balanced portfolio, robust governance, continuous horizon scanning and collaborative efforts, we aim to be well positioned to meet the challenges and seize the opportunities ahead. As we look to the future, our vision is clear: to drive innovation that not only benefits our network and customers but also supports broader societal goals.



2. Our Vision

Since the development of ESB Networks' current innovation strategy in 2017, there have been significant changes in our external environment. New national policies have been developed to support population growth, economic development and climate action, and climate targets have accelerated considerably with the publication and subsequent revisions of the Climate Action Plan. Meanwhile, climate change is impacting significantly on the electricity network through more extreme weather events, faster vegetation growth, more prolonged growing seasons and the emergence of invasive species such as woodpeckers.

ESB Networks recently submitted our proposed investment plans for Price Review 6 (PR6) to the CRU, covering the period 2026-2030. These recognise our central role in delivering on national policy outcomes and identify the need for a step change in investment to optimise reliability and resilience, increase the availability of network capacity, connect renewable generation and empower customers

to take a more active and flexible role in the electricity system. This means ramping up to deliver at a much greater pace and scale, while simultaneously adopting new technologies and approaches to transform the electricity system. Innovation will be a key enabler of change.

Our vision is for an innovation programme that not only directly benefits the network and our customers, but through collaboration, will support wider societal outcomes, including a fair and inclusive pathway to Net Zero for all. We will build on existing innovation projects and progress others, taking into consideration our Networks for Net Zero Strategy, industry developments and trends, national policy objectives, and the outcomes and objectives set out by CRU in its PR6 strategy paper.



Our proposed areas of focus include:

- **Electrification:**
We are exploring the potential of vehicle-to-grid (V2G) technology and optimising electric vehicle (EV) charging, including for heavy goods vehicles. We are also investigating the flexibility potential of electric heating (eHeat).
- **Network Capacity and Flexibility:**
Through our flexible demand connections pilot we are exploring smart and flexible solutions to maximize existing network capacity. We are also assessing the feasibility of upgrading the 38 kV network to 110 kV to develop additional capacity.
- **Network Resilience, Reliability and Safety:**
We are undertaking projects to improve continuity, enhance resilience, and mitigate climate risk. These include wildlife protection, flood risk mitigation, fault identification and repair, low voltage (LV) planning, and cyber security.
- **Decarbonised Electricity:**
We are replacing carbon-intensive fuels in the operation of our network, including in fleet vehicles, mobile generators, and across island communities. We are also facilitating long-term energy storage and understanding the network impacts of technologies employed, including hydrogen electrolyzers.
- **Environmental Sustainability:**
We are exploring opportunities to enhance circularity, biodiversity, and regeneration in our network operations and across our sites.
- **Digital, Data and AI:**
We are enabling customer-focused solutions using an open and shared data approach and leveraging digital twin technologies, artificial intelligence (AI), and augmented and virtual reality (AR/VR).
- **Empowering and Protecting Customers:**
We are developing self-service tools for customers and collaborating with external partners to support energy communities, medically vulnerable customers, and those at risk of being left behind in the energy transition.



2.1 2025 Objectives, Challenges and Opportunities

In 2025, ESB Networks will focus attention on finding innovative solutions to support our vision for a sustainable, secure and resilient electricity network. These align with our objectives to enhance network capacity and flexibility, improve resilience and reliability, advance electrification, and promote environmental sustainability.

By leveraging digital technologies and fostering collaboration with external partners, we aim to deliver solutions that meet the evolving needs of our customers and stakeholders. Our 2025 objectives are designed to tackle the challenges posed by climate change, population growth, and the transition to a decarbonised energy system, ensuring that we continue to provide reliable and efficient services while supporting Ireland's energy transition goals.

What	Why
Leveraging smart and flexible solutions to increase the availability of network capacity.	To maximize existing capacity, accelerate connection times, and manage increasing electricity demand.
Enhancing network resilience and reliability.	To mitigate the risks associated with extreme weather events and ensure a reliable electricity supply. To reduce the frequency and duration of power outages.
Electrification of Heat & Transport.	To support the increasing adoption of electric vehicles and optimise charging solutions including V2G.
Implementing digital, data, and AI solutions (including enhancing digital self-serve tools).	To improve network efficiency, customer experience, and decision-making processes.
Supporting vulnerable customers and energy communities.	To ensure that all customers can participate in and benefit from the energy transition.
Development of innovative approaches to vegetation management.	To address accelerated vegetation growth caused by climate change to reduce network faults.
Exploration of renewable alternatives for our temporary, mobile and island generation.	To enhance the sustainability of our operations, improve overall efficiency and resilience, and reduce our reliance on carbon-intensive fuels.

2.2 Planned Flagship Project: ElectriCITY

The ElectriCITY Project is envisioned as a flagship innovation initiative, building on the success of ESB Networks' Dingle Project. This ambitious project aims to address several challenges in an urban context, focusing on electrification, whole-of-system innovations, and supporting customers in the energy transition, including vulnerable customers.

The primary objective of the ElectriCITY Project is to explore solutions that enable the intelligent electrification of urban communities. By leveraging information and operation technologies, the project seeks to determine the role that the electricity network and its data can play in the transition to a low-carbon future. The project will develop a blueprint for whole energy system planning, demonstrating the benefits of collective sharing by organisations to support the energy transition and low-carbon transformation across urban areas.

One of the key goals is to ensure that no one is left behind in the energy transition. The project will demonstrate low-carbon technology solutions and energy-sharing business models for residents in urban communities who may face restrictions in adopting low-carbon technologies. This may include exploring innovative approaches such as solar fences, balcony solar PV solutions, and zero-emissions electricity boilers.

Supporting vulnerable customers will be central to the ElectriCITY Project. ESB Networks will work with relevant stakeholders to understand the role of the Distribution System Operator (DSO) in supporting these customers. This may involve the roll-out of battery energy storage solutions to provide limited power backup during outages.

The project will also focus on developing data-driven self-service tools to support electrification and low-carbon transition across urban communities. By leveraging multiple geospatial data sets and collaborating with third parties, ESB Networks aims to create digital tools

and services that inform and energise citizens and community-based organisations on low-carbon transformation.

To ensure the success of the ElectriCITY Project, ESB Networks is seeking external partners and stakeholders who are interested in collaborating with us or engaging with this project. This includes urban-based local authorities, social housing organisations, telecommunications infrastructure companies and research centres. Active participation and collaboration with these partners will be crucial in achieving the project's objectives and delivering societal benefits.



3. Innovation Portfolio

3.1 Projects Overview

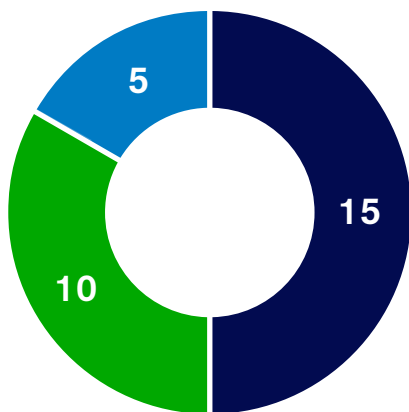
ESB Networks' innovation portfolio highlights our commitment to sustainable, resilient, and customer-focused innovation. Our innovation portfolio includes projects at various stages including: In Development, In Progress, and Completed.

Projects in the "In Development" stage are being conceptualised, evaluated and planned. "In Progress" projects are actively being implemented, transforming ideas into tangible outcomes. Completed projects from 2024 showcase our achievements and the benefits of our innovation efforts.

Details on each of the projects are available in the appendix document [here](#). The following sections provide a spotlight on a small number of projects.

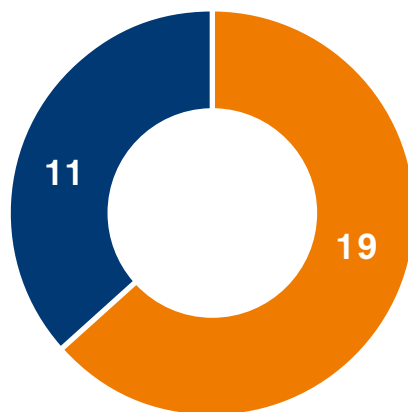
We invite stakeholders to review our portfolio and provide feedback on our approach to innovation. Your insights are important in helping us refine our strategies and ensuring that we continue to deliver solutions that meet the needs of our customers and stakeholders.

Networks for Net Zero Strategic Objective



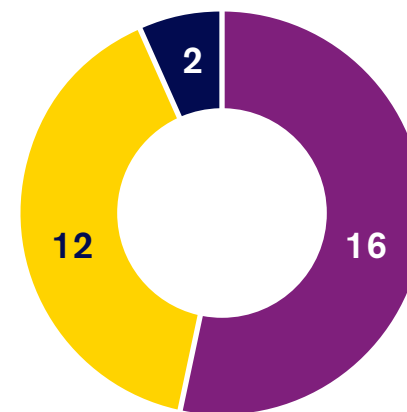
- Resilient Infrastructure
- Empowering Customers
- Decarbonised Electricity

Impact Status



- Incremental
- Breakthrough

Project Status



- In Progress
- Completed
- In Development

This table provides an overview of ESB Networks’ innovation project portfolio, categorising projects by their stage of development, the degree of innovation from incremental to breakthrough to radical, and their alignment with the strategic objectives in our Networks for Net Zero strategy.

	Name	Impact Status	Networks for Net Zero Strategic Objective
In Development			
1.	Sustainable Backup Power Solutions	Breakthrough	Decarbonised Electricity
2.	Island Decarbonisation	Breakthrough	Decarbonised Electricity
In Progress			
1.	Plexigrid	Breakthrough	Decarbonised Electricity
2.	Development of Dynamic Line Ratings (DLR)	Incremental	Resilient Infrastructure
3.	Sidewalk Transformers	Incremental	Resilient Infrastructure
4.	Introduction of Alternatives to Creosote Wood Poles	Incremental	Resilient Infrastructure
5.	GridVision AI for Condition Assessment of Tower Corrosion	Breakthrough	Resilient Infrastructure
6.	Composite Street Light	Incremental	Empowering Customers
7.	Low Carbon Technologies Register	Incremental	Empowering Customers
8.	Neara MV/LV Pilot	Breakthrough	Resilient Infrastructure
9.	Gridguard AI -Woodpecker Mitigation	Incremental	Resilient Infrastructure
10.	Composite Core Conductors	Breakthrough	Resilient Infrastructure
11.	Flexible Demand Connections - Timed Connections	Incremental	Empowering Customers
12.	Compact 110 kV Line Design	Incremental	Resilient Infrastructure
13.	Industrial Heat Pump Network Impacts	Incremental	Empowering Customers
14.	Advanced Infrastructure Self-Serve Pilot	Incremental	Empowering Customers
15.	HV Distribution Network Development Study	Breakthrough	Resilient Infrastructure
16.	IFT (Interface Transformers) Units Refurbishment Pilot	Incremental	Decarbonised Electricity

Name		Impact Status	Networks for Net Zero Strategic Objective
Completed			
1.	E-fleet – Decarbonisation of the Fleet	Incremental	Empowering Customers
2.	MV Planning Assist Tool	Incremental	Empowering Customers
3.	Developing 400MHz Spectrum Use for Smart Grid Applications	Breakthrough	Resilient Infrastructure
4.	AI in Smart Metering Applications	Breakthrough	Empowering Customers
5.	Innovation Feasibility Study for Uprating of Existing 38 kV Overhead Lines to 110 kV	Breakthrough	Resilient Infrastructure
6.	CSS Voltage Quality Dashboard	Incremental	Empowering Customers
7.	International Community for Local Smart Grid	Incremental	Empowering Customers
8.	Wildlife OHL Contact Prevention	Incremental	Resilient Infrastructure
9.	AI Synthetic Analyses of 110 kV Composite Insulators	Breakthrough	Resilient Infrastructure
10.	Novel Use of Drones and AI for Line Patrolling and Fault Location	Incremental	Resilient Infrastructure
11.	Inspection of OHLs Using Drones and Image Processing Analytics	Incremental	Resilient Infrastructure
12.	Investigate Statistical Contributions from Distribution Generation: F-Factors	Incremental	Decarbonised Electricity

3.2 Spotlight: Flexible Demand Connections – Timed Connections Pilot

As part of ESB Networks' commitment to delivering a Net Zero-ready electricity network by 2040, the Flexible Demand Connections - Timed Connections initiative is breaking new ground in providing innovative solutions for demand connections.

What are Timed Connections?

Timed connections are designed to shorten the amount of time it takes for customers to be connected to the electricity network, including in areas where capacity is currently constrained. Instead of waiting for full network upgrades, customers can receive a connection with time restrictions based on the results of planning studies on the demand profile of the network in their area. This solution remains in place until the necessary network reinforcement works are completed. This approach makes better use of existing network capacity.

Why Timed Connections?

Timed connections aim to maximise existing network capacity, leveraging flexibility to enable customers to get connected to the electricity network more quickly in constrained areas.

It is hoped that flexible demand connections, including timed connections, will enable and accelerate the decarbonisation of heat, transport and wider industry.

Pilot Progress and Next Steps

Following a call for expressions of interest (EOI) in mid-2024, ESB Networks is in discussions with eligible respondents to assess potential pilot sites and undertake relevant planning studies in parallel with work to finalise processes and procedures for the operation and monitoring of the pilot.

Meanwhile, work has commenced on phase two of the flexible demand connection pilot, looking at more dynamic flexible connections that will build on the learnings from phase 1 (timed connections).

Policy Context

Timed connections are more than a technical solution; they represent a shift towards a flexible, customer-focused approach to network management. This initiative aligns with broader policy goals and the bigger picture of energy transition in Ireland. By introducing non-firm demand connections, ESB Networks is paving the way for future innovations in demand-side management and helping Ireland to take critical steps towards achieving its Net Zero targets. These pilots will inform an enduring solution for flexible demand connections, enabling more optimal use of existing capacity on the network.



3.3 Spotlight: Neara MV/LV Pilot

The Neara MV/LV Pilot is an innovative trial leveraging a digital twin—a 3D digital representation of approximately 400 km of the overhead low-voltage (LV) and medium-voltage (MV) network. Building on the success of a previous trial for the high-voltage (HV) network, this pilot explores the transformative potential of digital twin technology across various use cases.

About Neara

Neara is a cloud-based enterprise software platform that enables utilities to process, classify, visualise, analyse, share, and report on network data such as LiDAR, GIS, and engineering data, providing highly accurate engineering-grade 3D models of utility networks.

Pilot Objective

The primary objective of the Neara MV/LV Pilot is to evaluate the platform's capability in performing analysis for various use cases. This includes optimising vegetation management by prioritising areas based on proximity to the network and predicting future vegetation growth, which helps prevent potential hazards. It also involves improving asset management by correcting asset locations in Geographic Information Systems (GIS) and reconciling asset and GIS data for unified, accurate records.

Additionally, the pilot assesses network resilience by evaluating overhead network

performance under storm conditions and identifying immediate risks like leaning poles or inadequate clearance. It increases efficiency by digitally completing manual processes like phase tracing and identifying capacity opportunities through thermal rating analysis. Furthermore, it streamlines network design by enabling data-driven decisions for designing new or upgraded overhead lines, enhancing the network's adaptability. By leveraging digital twin technology, the pilot seeks to enhance operational efficiency and ensure network readiness for future challenges.

Key Benefits

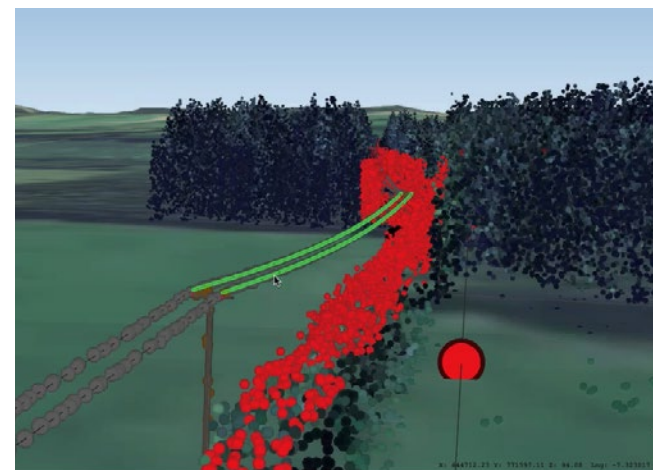
The potential benefits of the Neara MV/LV Pilot include enhanced safety and reliability by identifying hazards such as vegetation risks and conductor clashes, which improves overall network continuity. The pilot delivers operational excellence through actionable data for vegetation management, asset reconciliation, and hazard detection. Assessing network capacity and resilience ensures the network is future-ready for growing demand and adverse weather conditions. Additionally, the pilot achieves efficiency gains by automating traditionally manual processes like GIS corrections and phase tracing. It also enables data-driven decisions for designing new or upgraded overhead lines, enhancing the network's adaptability and performance.

Pilot Progress and Status

LiDAR and aerial imagery have been captured for the trial area, and the classification of LiDAR data is complete, with the digital twin model under construction. The expected outputs include a full engineering grade digital twin of the 400 km trial area, actionable insights across multiple areas such as vegetation management, hazard identification, and data reconciliation, and a comprehensive report documenting the trial findings, evaluating each use case, and assessing the viability of scaling the technology.

Next Steps

The next steps involve the evaluation of use case performance based on pre-defined success criteria, and preparation of final reports. The outputs will inform future business decisions to leverage digital twin technology.



3.4 Spotlight: Gridvision AI

As part of ESB Networks’ commitment to leveraging innovation to deliver a resilient and efficient electricity network, the GridVision AI for Condition Assessment of Tower Corrosion project explores cutting-edge machine learning solutions from eSmart Systems to enhance asset management.

About eSmart Systems

eSmart Systems is a company that provides the Grid Vision AI software, designed to enhance inspection and asset management processes for utilities by leveraging advanced AI models to identify components and recommend potential defects.

What is GridVision?

GridVision is an AI-powered tool developed to automate condition assessment for steel transmission towers. Using advanced machine learning models, it identifies and quantifies corrosion on lattice steel tower members, significantly reducing time-consuming manual processes. This project, conducted as a Proof of Concept (POC) under the Free Electrons programme, aims to transform how ESB Networks evaluates the health of its steel towers.

Project Impact

Automated image capture and AI-driven analysis provide a fast, repeatable method for assessing tower corrosion, saving valuable time and resources. By identifying towers with significant

corrosion (Grade 4+ on the UK NG Scale*), the tool prioritises those requiring detailed manual inspections or repairs, enabling focused resource allocation. Regular, repeatable assessments using AI help monitor corrosion development over time, contributing to proactive maintenance and the long-term resilience of the network.

Pilot Progress and Results

The project demonstrated the success of GridVision’s corrosion detection tool, achieving 93% accuracy in identifying corrosion on ESB Networks’ towers. Outputs included a percentage-based measure of corrosion on each tower, enabling prioritisation for further inspection. This AI solution has proven effective as a triage tool, determining which structures require detailed assessments or immediate interventions.

*Further details [here](#)



Next Steps

The next phase of the project involves applying the GridVision tool to prioritise steelwork assessments. Key activities include conducting expert-led conditional assessments to generate automated corrosion scores for each tower, aggregating reports to rank and visualise tower conditions, and undertaking detailed steelwork assessments or initiating repairs and replacements for heavily corroded towers based on AI prioritisation.

The Bigger Picture

This project represents a significant step towards integrating AI and machine learning into ESB Networks’ asset management processes. By adopting innovative tools like GridVision, ESB Networks is enhancing the efficiency and sustainability of its operations, ensuring the resilience of Ireland’s electricity network as part of the broader Networks for Net Zero Strategy.



3.5 Spotlight: Plexigrid LV Digital Twin Pilot

ESB Networks is working with Plexigrid to trial an innovative software solution for advanced low voltage (LV) grid management and planning.

About Plexigrid

Plexigrid provides software solutions that enable Distribution System Operators (DSOs) to manage and operate their networks more efficiently. The Plexigrid platform includes tools for advanced analytics and simulation of the distribution network.

What is the Pilot?

The pilot, running from 2023 to 2025, involves a small-scale implementation of Plexigrid's solutions to test feasibility and benefits to the LV planning team. The pilot is divided into two stages: Stage 1 focuses on network planning and analytics, assessing network capacity, impact of new connections, and future scenario simulations. Stage 2 will build on this with advanced analytics, incorporating smart meter data and secondary substation LV monitoring data.

Why it Matters

The project aims to improve LV data quality, optimise capital investments, reduce connection request lead times and increase hosting capacity for distributed energy resources.

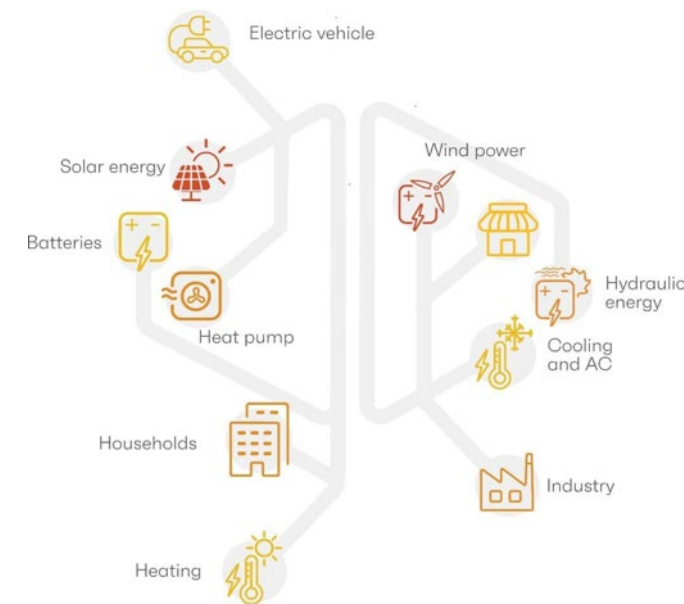
The platform's ability to simulate future scenarios and model power flows ensures that the LV distribution network can accommodate increasing demand and new technologies.

Pilot Progress and Next Steps

The Plexigrid project has successfully completed its initial phase, which involved integrating GIS data of all low voltage assets for two planner groups into a comprehensive digital electrical model. This allows ESB Networks to run simulations of the LV network based on known load profiles to identify capacity and voltage constraints. ESB Networks can also run simulations and estimate the impact of Low Carbon Technology (LCT) uptake on the LV network. The next phase will focus on integrating MV/LV substation monitoring data and smart meter event data to enhance scenario modelling.

The Bigger Picture

The Plexigrid pilot represents a flexible, customer-centric and data driven approach to LV network management. By utilising advanced analytics and real-time data, the project offers an opportunity to enhance LV system planning to support Ireland's journey towards its Net Zero targets.



4. Collaboration, Engagement, and Dissemination

Collaboration is central to the success of ESB Networks' innovation programme. Engaging with stakeholders ensures projects address real-world challenges and incorporate diverse perspectives. To meet the needs of customers and support national policy objectives, including the delivery of the Climate Action Plan (CAP) targets for 2030 –we work closely with a wide range of stakeholders, including academic institutions, government bodies, customers, industry trade associations, energy suppliers, and newer industry participants such as demand-side units and battery storage providers.

Guided by the methodology outlined in ESB Networks' Stakeholder Engagement Strategy & Plan for 2025, we will continue to actively engage and collaborate with innovation stakeholders to ensure that their input informs our innovation programmes, decision-making and project design.

Our engagement activities extend nationally and internationally. Over the past year, we have collaborated with a wide range of industry bodies and research institutions, contributing to their programmes of work and integrating insights from other organisations into our own operations. Collaborative programmes, such as the Free Electrons global accelerator

programme, allow us to explore technology offerings and services from over one thousand start-ups around the world, and identify new opportunities to trial and implement solutions within ESB Networks.

We regularly host events and webinars to share learnings from our innovation programme. For example, in November 2024, we hosted the "Innovation for Net Zero" Forum. (see below)

which was attended by over 100 stakeholders. We will continue to seek opportunities to host or participate in external events as sponsors or speakers and publish findings and outcomes from our pilot projects. These initiatives will allow us to interact with stakeholders from industry, policy, and academia to share insights and shape our strategic direction and co-create solutions to shared challenges.



4.1 Spotlight: Innovation Conference

In November 2024, ESB Networks' Innovation & Electrification teams hosted a stakeholder forum on the theme 'Innovation for Net Zero'. This brought together stakeholders from diverse backgrounds, including industry representatives, governmental departments, policymakers, and academics. The event was part of our broader strategic consultation process aimed at delivering Ireland's clean electric future.

The conference began with a welcome from Nicholas Tarrant, Managing Director of ESB Networks, who highlighted the critical role of innovation in addressing key challenges in the transition to a net zero future. This was followed by a keynote address from Dr Lollie Mancey of UCD, who spoke on 'Engaging Communities in the Innovation Challenge', emphasising the importance of involving customers in the energy transition process.

Journalist Jess Kelly hosted the event and conducted an insightful interview with an expert panel of stakeholders. The panel included John Finnegan, Principal Officer, Department of the Environment, Climate and Communications (DECC); Jacinta Ryan, Transformation Director, ESB Networks; Declan Meally, Director of Business, Sustainable Energy Authority of Ireland (SEAI); and Aoife O'Grady, Head of Zero Emission Vehicles Ireland (ZEVI). The discussion focused on collaboration to deliver innovation.

Throughout the day, the theme of collaboration and engagement was prevalent. The conference addressed the scale and complexity of the challenges faced and gathered views and potential solutions from established industry experts as well as newer startups and small businesses. We heard presentations from three companies who are currently working with ESB Networks on pilots under the Free Electrons programme to address issues such as network resilience and network capacity constraints on the medium and low voltage networks.

Stakeholders had the opportunity to raise specific issues from their areas of interest and suggest solutions or technologies for further investigation by ESB Networks. In the afternoon, Dan Clarke from the Energy Networks Association and Rhys Thomas from Threepwood Consulting presented on registering and connecting Low Carbon Technologies to mitigate the challenges that are emerging from the proliferation of EV chargers, solar panels, heat pumps, and other technologies on the network.

The conference concluded with an optimistic outlook on the future. Presentations covered the 'network of the future', scientific research and development, and ESB's 'Technology Radar', highlighting technologies that can benefit our customers.

Innovation, innovation partnerships, and collaboration are crucial to achieving the government policy targets outlined in the Climate Action Plan. ESB Networks has a pivotal role to play in enabling this by decarbonising the electricity system by 2040, as set out in our Networks for Net Zero strategy. Further collaboration with our stakeholders is essential to deliver on these ambitious goals and ensure a sustainable and clean energy future for Ireland.



4.2 Engage With Us

The electricity network has a critical role to play in enabling Ireland’s journey to net zero and the impact of ESB Networks’ innovation strategy extends far beyond our own organisation.

By revising our innovation strategy, focusing on key challenges, and delivering flagship projects, we aim to support Ireland’s energy transition while fostering collaboration across the ecosystem. We are committed to accelerating the connection of renewable generation, supporting the electrification of heat and transport, and enhancing network resilience. Implementing innovative ideas and technologies will deliver

benefits for our customers, and this report provides a summary of the innovation activities ongoing or in development across ESB Networks.

We invite you, our stakeholders, to help shape our new innovation strategy by sharing their insights on priorities, new approaches, and opportunities for collaboration. Together we can build a resilient, sustainable, and inclusive energy system and

deliver a clean electric future. Your feedback will help us in developing our new strategy and refining future innovation activities to help connect Ireland to a clean electric future.

Engagement and Feedback

To help us shape a robust and effective innovation strategy we would appreciate your thoughts on the questions below:

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1. **What emerging trends, technologies, or innovation areas do you see as opportunities for collaboration with ESB Networks to support Ireland’s Net Zero goals?**
 2. **Are there flagship projects or large-scale initiatives you would like to collaborate on with ESB Networks to drive innovation and deliver transformative outcomes?**
 3. **How can we implement innovative solutions together to build a more resilient and adaptive electricity network, addressing challenges such as climate change and electrification?**
 4. **In what ways can digitalisation, AI, and open data be utilised to drive efficiency and innovation across the energy ecosystem?**
 5. **Are you open to collaborating with ESB Networks and in what context would you like to collaborate? If not, are their obstacles preventing you from collaborating with us?**

These questions are designed to prompt thoughtful consideration when preparing your response, however it is not necessary to answer these questions directly and we are happy to receive your feedback in any format. We appreciate your time and input in helping us shape the future of our innovation efforts.

Please submit your consultation responses via email to innovationfeedback@esbnetworks.ie by close of business on **Tuesday 4th March**.

For further information on innovation at ESB Networks, please visit our new website: www.esbnetworks.ie/about-us/projects/innovation-projects





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