



NETWORKS

NETWORKS FOR NET ZERO

Delivering the Electricity Network
for Ireland's Clean Electric Future

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Foreword

Ireland's electricity system has been significantly decarbonised over the last decade, with accelerating progress now needed to continue to build momentum towards achieving a net zero society. We are at a critical point in the fight against climate change.

ESB Networks will continue to play a leading role in delivering the Government's Climate Action Plan². Our Networks for Net Zero Strategy commits us to deliver on our part to achieve the targets set out for 2025 and 2030. We will develop the distribution network and supporting systems to meet the changing needs of our customers as we enable decarbonisation of the Irish economy and society. In addition, we will enable the development of the transmission network through delivery of a significant portfolio of transmission projects.

Beyond 2030, our Strategy commits ESB Networks to continue investing to deliver a Net Zero Ready Distribution Network by 2040 that will enable Ireland's achievement of net zero no later than 2050. This will accommodate high levels of renewable generation to provide clean electricity which will be used to replace fossil fuels wherever possible and enable Ireland's Clean Electric Future. It includes actions that we will take between now and 2030 to deliver on this.

Progress can only be achieved through continued collaboration with our customers, stakeholders and business partners so that we can deliver a clean electric future together. We will continue to engage with stakeholders on our plans, responsive to the needs of government, the Commission for the Regulation of Utilities, and customers at a time of huge change in our industry. We welcome your ongoing feedback on our strategy. You can expect to see further publications and engagement during 2023 as we continue to produce updates and further information on different elements of this Strategy that support the achievement of the 2030 targets and beyond this to net zero.

ESB Networks is also committed to the corporate aim of achieving net zero internally for our business by 2040. We've included information on our sustainability targets and the actions we will take over the years ahead.

The current global energy crisis has an impact on every household and business in Ireland. We are committed to deliver on the climate action targets set by the Government and to provide value for money for customers while delivering an electricity network that supports clean and affordable energy.

In 2027, ESB Networks will be celebrating 100 years of serving the people of Ireland, through the provision of the electricity infrastructure on which our society and economy has developed. As we approach that significant milestone with great pride, we embrace the role we now play in the transformational changes taking place to address climate change and to support a vibrant modern Ireland for generations to come.

A handwritten signature in black ink that reads "Nicholas Tarrant". The signature is written in a cursive style and is positioned above a horizontal line.

Nicholas Tarrant
Managing Director
ESB Networks

January 2023

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1

INTRODUCTION



1

INTRODUCTION

Delivering the Electricity Network
for Ireland's Clean Electric Future

Climate change is one of the greatest challenges facing humanity and it is widely accepted that rapid and unprecedented action is required to limit greenhouse gas (GHG) emissions to avert the worst consequences of climate change and protect both current and future generations.

The 17 UN Sustainable Development Goals (SDGs)¹ provide a global and widely accepted blueprint to achieve a better and more sustainable future for all by 2030. They act as a call to action for countries, NGOs, companies, and individuals to align their actions around common goals that matter to people and the planet. Our Strategy is focused on three of the SDGs where ESB Networks can make a lasting and tangible difference, namely:



ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL



BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION



TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

Our purpose is to deliver a clean electric future, and make Ireland's net zero goal a reality.

The delivery of this Strategy is underpinned by **Our Values** of being Courageous, Caring, Driven and Trusted.

**WE'RE
COURAGEOUS**

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
CARING**

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'RE
DRIVEN**

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

**WE'RE
TRUSTED**

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'.

Our Networks for Net Zero Strategy sets out ESB Networks' role in enabling the delivery of the Government's Climate Action Plan 2023² and supports the decarbonisation of electricity by 2040, which will enable the achieving of Ireland's net zero ambition no later than 2050. It is based on our role in transforming the electricity distribution network to empower customers to decarbonise their energy consumption; and in our role as onshore Transmission Asset Owner in delivering the electricity transmission programme. As we implement this Strategy we will ensure that we have a safe, reliable and efficient network with the required capacity, flexibility and resilience for the electricity system for 2040.

We have identified three strategic objectives, which are core to delivery of our Strategy:

Decarbonised electricity

This objective reflects our commitment to support Ireland in achieving net zero through enabling the connection of renewable generation to decarbonise electricity. At ESB Networks, distribution system operation at all voltage levels, is core to what we do today. The energy transition and the roll out of new technologies means that the way we manage the network will change materially in the future. Thus as the electricity system transitions towards a smarter, sustainable model, the operation and management of these new resources will require a digital network that is flexible and smart.

Resilient infrastructure

This objective recognises that the transition to a low-carbon future powered by clean electricity requires a network that is resilient to the impacts of climate change and disruptive events such as storms and cyber threats. It also recognises we need to build capacity to connect the renewable generation to our network that will generate the clean electricity. In addition, we need to provide network capacity for the demand associated with significant population growth, new housing developments, economic growth, as well as a significant increase in demand due to electrification of heat, transport and industry.

Empowered customers

This objective reflects our commitment to working alongside customers and communities, supporting them to achieve net zero. We will use data and digital technologies to deliver convenient and personalised customer experiences. We will also develop insight-driven services to meet diverse and evolving customer needs. ESB Networks will put in place solutions for our networks customers to enable the electrification of heat and transport. We will make it easy for customers and communities to participate in markets for flexibility and make active choices in their use of energy.

Foundational capabilities

Our Strategy is based on four foundational capabilities of:

- **Our People**
- **Digital and Data Driven**
- **Financially Strong**
- **Sustainable and Socially Responsible.**

In the chapters that follow we cover the role of ESB Networks, provide an overview of our Strategy and then include a chapter on each of the three strategic objectives and the four foundational capabilities that underpin the Strategy.

2

ESB NETWORKS



2

ESB NETWORKS

ESB Networks is a key enabler for the delivery of Ireland's clean electric future.

Our Role

ESB Networks is the electricity Distribution System Operator (DSO), Distribution Asset Owner (DAO), and onshore Transmission Asset Owner (TAO). We work to meet the needs of all Irish electricity customers, delivering the electricity network for Ireland's clean electric future. The network comprises 157,000 km of overhead networks, 26,000 km of underground cables, over 800 high voltage substations, and 2.4 million demand customers.

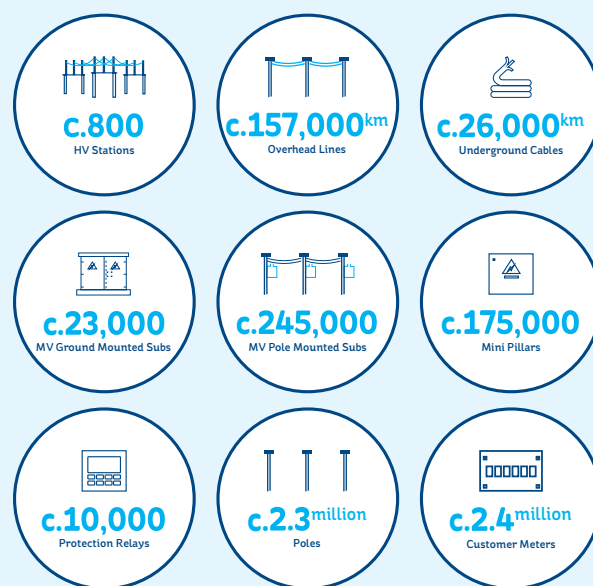
ESB Networks supports the electricity retail market through the ring-fenced Meter Registration System Operator (MRSO)³ and Retail Market Design Service (RMDS)⁴ and supports the wholesale Single Electricity Market through the provision of aggregated electricity meter data.

We invest approximately €800m per annum, which is due to grow over the years ahead. We have 3,500 employees working in all parts of the country delivering a safe and resilient network.

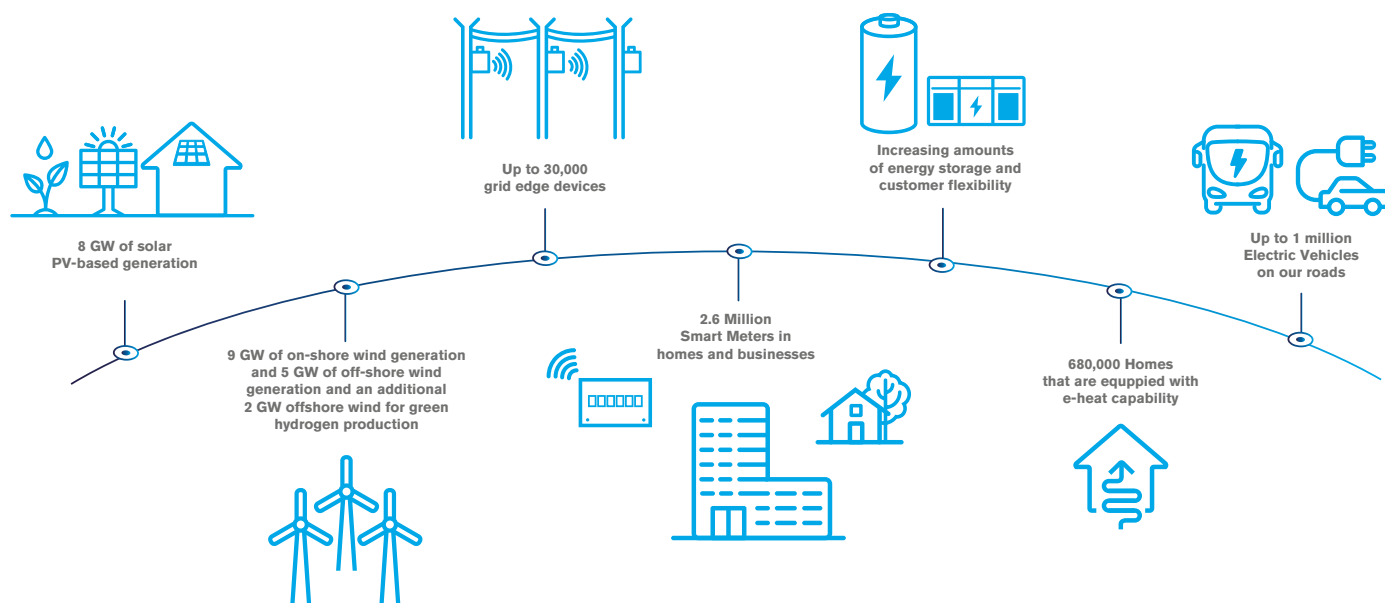
Customer service is at the heart of everything we do at ESB Networks. We provide services to every electricity customer irrespective of their electricity supplier. We are committed to facilitating the move towards low-carbon technologies, supporting all customers to enable them to participate in the energy market.

Our operating environment is changing rapidly, driven by new policy and regulation measures, by the advancement of technology, and by the changing needs and expectations of our customers and stakeholders. This means the role of electricity is changing, bringing an opportunity to decarbonise society and enable all customers to take control of their energy consumption, participate in the energy markets, and adopt innovative energy products and services.

Our Network



Electricity network by 2030



Policy Context

In 2019, the Irish Government published the first Climate Action Plan (CAP)⁵, which sets out Ireland's strategy to meet its 2030 climate and energy targets. This plan was revised in 2021⁶ and the target for decarbonised electricity has increased from 70 to 80%. The Climate Action and Low-carbon Development (Amendment) Act 2021⁷ put Ireland on a legally binding course to transition to net zero no later than 2050 and to a 51% reduction in emissions by the end of 2030. Ireland's CAP will continue to be evolved to deliver on these commitments and we will work closely with our stakeholders to enable accelerated progress as the CAP is updated.

In late 2022, the Climate Action Plan was revised (CAP23)², and it contains further accelerated targets. At ESB Networks, we welcome the commitments and updates made in CAP23² and we look forward to the opportunity to collaborate with government, industry, our customers, and wider stakeholders to help deliver these ambitious actions.

The EU is also accelerating its decarbonisation plans.

In July 2021, the European Commission adopted a package of legislative proposals called “Fit for 55”⁸ that outline the EU's goal to reduce emissions by at least 55% by 2030 and for the EU to be climate neutral by 2050. This has updated and increased the targets from the Clean Energy Package⁹. **Fit for 55**⁸ includes the Alternative Fuels Infrastructure Regulation (AFIR)¹⁰ which aims to accelerate the recharging/refuelling infrastructure with alternative fuels options, and in the case of electricity to provide alternative power supply for ships in port and stationary aircraft. It also includes the Energy Efficiency Directive¹¹ which proposes increasing the current EU-level target for energy efficiency from 32.5% to 36% for final consumption, with 39% for primary energy consumption.

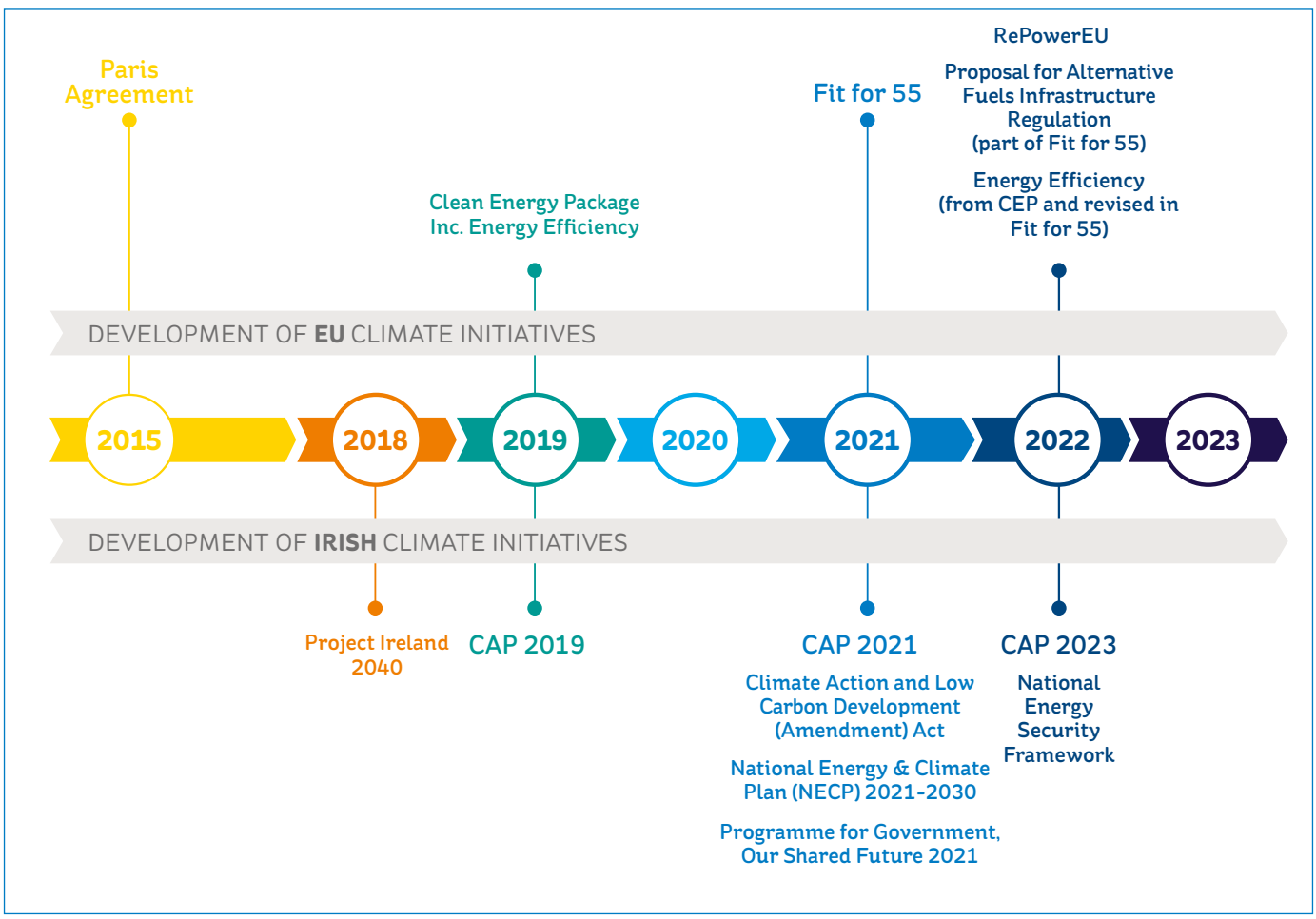
The Irish Government launched the response to Ireland's energy security needs in the context of the Russian invasion of Ukraine through the **National Energy Security Framework (NESF)**¹² in April 2022. In May 2022, the EU published the **REPowerEU**¹³ plan. This plan responds to the disruption to the global energy market caused by Russia's invasion of Ukraine and accelerates

the reduction in use of fossil fuels. Market costs for many utility materials and services have continued to increase, due to the rapid increase in raw commodity, electricity, and gas prices. This has led to a greater focus on improving our supply chain resilience.

The policy context remains dynamic but with an overall theme of accelerating the transition to renewable electricity generation, electrification of industry, heat and transport, energy efficiency, affordability, and energy security.



Infographic: how the EU delivers the green transition - Consilium (europa.eu)



Regulation

ESB Networks is a commercial semi-state company regulated by the Commission for the Regulation of Utilities (CRU) since 1999. ESB Networks develops investment programmes through a process called "Price Reviews"¹⁴ that are overseen by the CRU. Price Reviews¹⁴ set the revenue that ESB Networks can recover from electricity customers and are agreed every five years. The CRU price review¹⁴ periods clearly mandate what is expected of ESB Networks as Distribution System Operator (DSO), Distribution Asset Owner (DAO), and onshore Transmission Asset Owner (TAO). The current Price Review (PR5)¹⁴ determination was finalised in 2020 and runs from 2021 to 2025. When developing this five year programme, both ESB Networks and the CRU considered the development and investment required to support economic growth, network resilience and delivery of national decarbonisation targets.

This Strategy identifies high level actions out to 2030 with PR6 (2026 to 2030) being of critical importance

to continued momentum to achieve net zero. The specific investment in both the distribution network, the transmission network (proposed by EirGrid) and other investment such as in IT, digital technology and customer service will be assessed by the CRU through the Price Review process during 2024 and 2025. Our Networks for Net Zero Strategy sets out our ambition for the period to 2030 and our commitments in what is a fast-changing environment. These will be revised and updated in time for the PR6 Business Plan submission and will be subject to regulatory review and stakeholder engagement in advance of 2026.

Numerous external factors have impacted on the energy landscape since the determination of PR5 in 2020 such as Fit for 55⁸, REPowerEU¹³, National Energy Security Framework¹², CAP21⁶ and CAP23². The scale of work has increased, driven by the high levels of wind, solar and storage required to connect to the network together with accelerating electrification.



3

ESB NETWORKS' STRATEGY



3

ESB NETWORKS' STRATEGY

Our Strategy in ESB Networks until 2030 is framed by the Climate Action Plan. It is driven by ESB Networks' central role in leading the transition to a secure and affordable low-carbon future, using clean electricity. The transition to a net zero society no later than 2050 will be enabled by a Net Zero Ready Distribution Network by 2040.

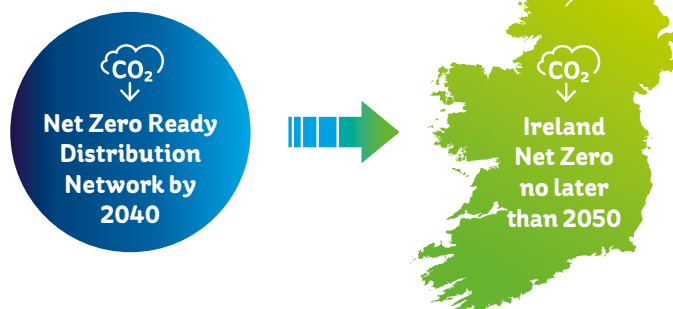
Our purpose in ESB Networks has always been to connect and distribute electricity - safely, securely, and affordably. Acknowledging the central role that electricity plays in climate action, our purpose has evolved to deliver a clean electric future through the electrification of heat, transport and industry, as well as connecting renewable generation at scale to the electricity network. Delivering this is going to require a challenging transformation of our network, our systems, and our approach. The sustainable social and economic development of communities, businesses, Ireland's climate action response and transition to net zero are all dependent on ESB Networks delivering our purpose through to 2030 and beyond. Our Strategy sets out to deliver the targets defined in CAP23² for 2025 and 2030.

In this Strategy we are also setting out a clear objective to develop a digital electricity network that is flexible and smart and will provide a foundation for a clean electric future in Ireland by 2040. This means having a Net Zero Ready Distribution Network by 2040 to enable Ireland's achievement of net zero no later than 2050. This will be an important milestone on the journey to Ireland being net zero no later than 2050. The work we do under our primary roles of Distribution System Operation (DSO), Distribution Asset Owner (DAO) and onshore Transmission Asset Owner (TAO) is essential and on the critical path to achieve this objective. In our future engagements we will strive to lead, engage with Industry and Society, and put forward proposals consistent with this ambition.

For our customers, electricity will continue to provide a safe, secure, and reliable energy source and it will also present new opportunities to take part in the energy transition through self-generation and storage, demand

management, energy efficiency opportunities, and selling electricity by exporting back on to the electricity network. As customers engage with new opportunities, and as renewable energy connections increase, managing the network will become more complex. Through delivering our Strategy in collaboration with all our stakeholders, we will ensure that the network is prepared to meet the changing and evolving needs of our customers in a clean electric future.

We plan to introduce a 'Build Once for 2040' concept that will ensure that the distribution network and supporting services such as demand management are designed and developed to meet the anticipated needs of customers in 2040 and to deliver a clean electric future. This will eliminate the need for repeated, costly and resource intensive interventions on the network. Essentially, where possible, we will deploy solutions today which are scalable to meet the needs of customers and stakeholders in 2040.

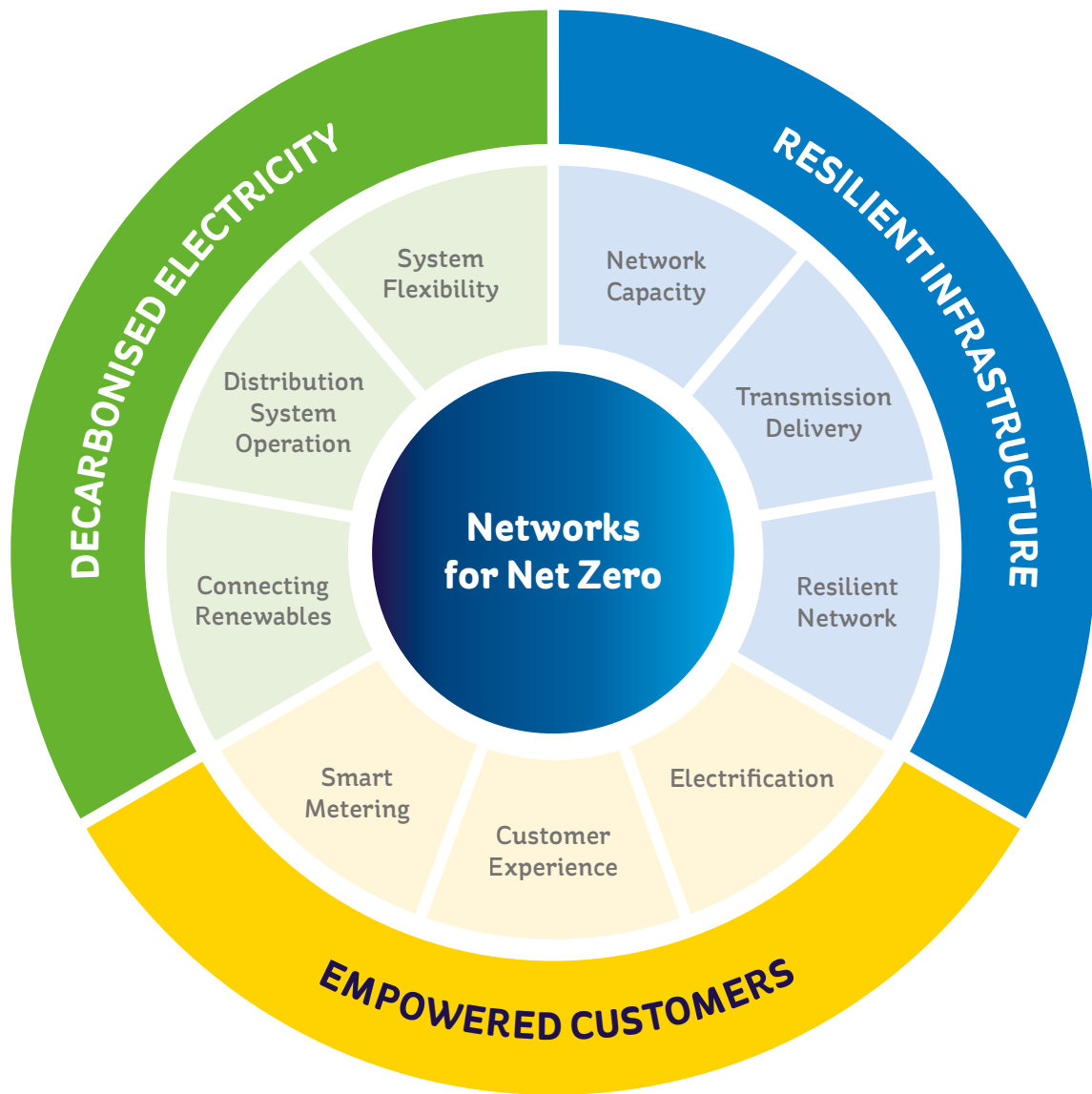


In ESB Networks we are also putting plans in place to ensure that we will be a net zero business by 2040. To achieve this, we will continue the work already underway in our business examining everything we do from procurement, to how we utilise, maintain, and will

ultimately convert our fleet of vehicles and equipment, to how we manage waste and how we upgrade, maintain, and use our facilities through a sustainability lens. We have set clear targets in this strategy as to how we will deliver on this ambition where solutions exist today.

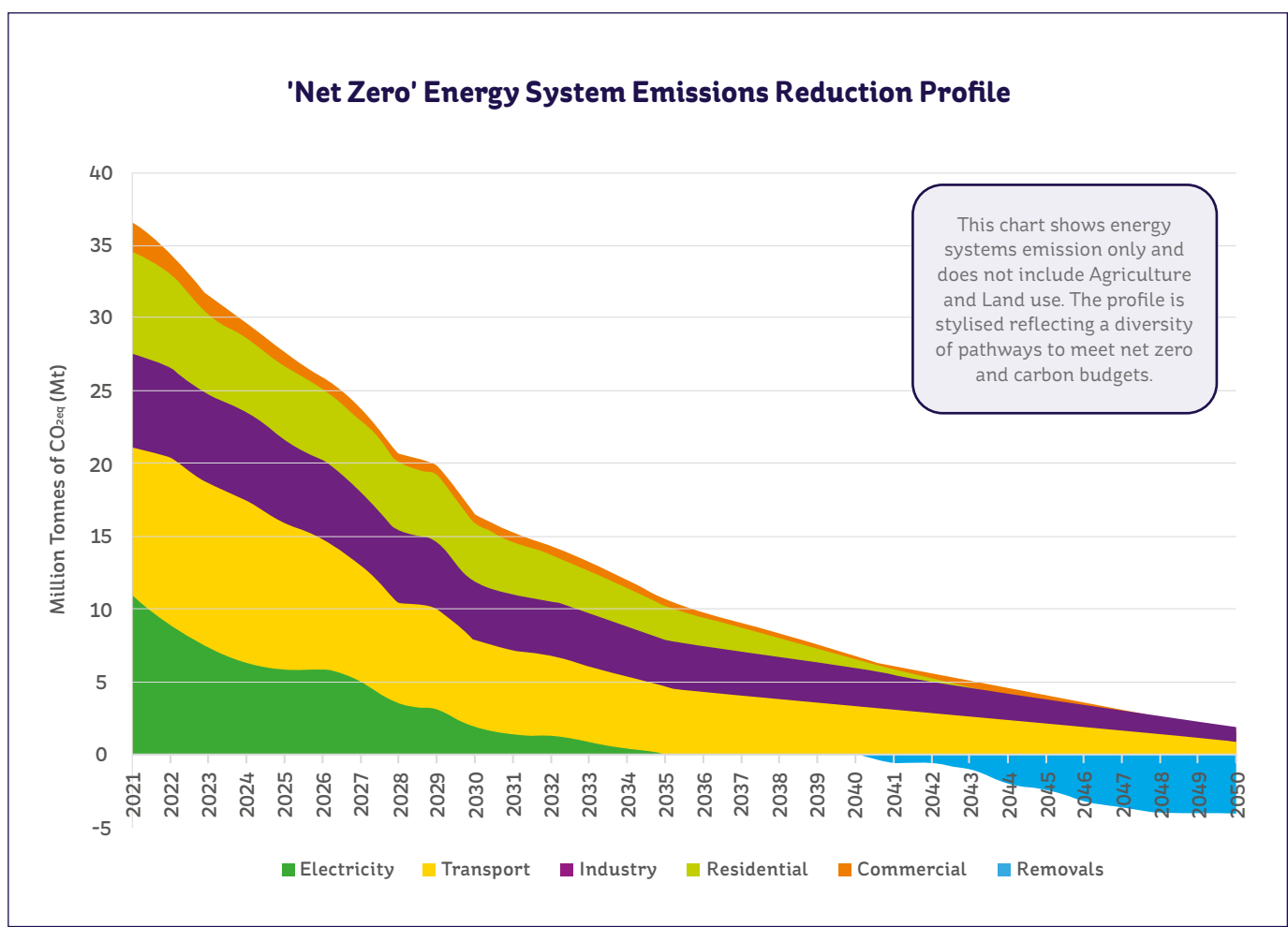
We know that change is happening at pace, and we are evolving our business processes, systems, and ways of working in anticipation of future network requirements.

In anticipation of the changes ahead, and informed by the inputs above, we have structured our Strategy around three key strategic objectives on which we will focus our efforts. Our Strategy is further underpinned by a suite of four foundational capabilities which will be critical to ensuring we are positioned to execute and deliver on our ambition. These objectives and capabilities are illustrated in the graphic below and described in detail in the following chapters.



The objective to provide a Net Zero Ready Distribution Network by 2040 is core to our strategy. The graphic below from University College Cork (UCC) / Marine and Renewables Energy Ireland (MaREI) shows the evolution of emissions reduction in Ireland on a pathway to a net zero energy system. The glidepath set out is in line with Ireland's statutory Carbon Budgets.

Climate legislation in Ireland is based on limiting cumulative emissions over time through the carbon budgets. This means that early intervention and action are key to meeting the future budgets. Decarbonisation of the electricity sector coupled with the replacement of fossil fuels with clean electricity in other sectors is a fundamental component of the climate strategies being adapted across global economies. This is also at the core of Ireland's Climate Action Plan² and requires that Ireland decarbonise electricity at source with renewables and increase the supply of this clean electricity throughout the economy. It is particularly important for electrifying areas that currently use fossil fuel like transport, heat and industry. This path is widely accepted as the least cost way to achieve emissions reduction and is at the core of Climate Action Plan 2023². The development of a smart distribution network is a critical enabler of this transition.

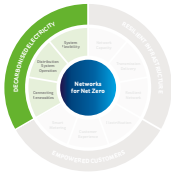


In the decade ahead, all customers, from renewable generators to large energy users, to home, farm and business customers will adopt new technologies, products and services changing how they generate, store, or consume electricity. As the electricity system transitions to net zero, our role is to deliver a smart and sustainable distribution system, enabling smarter planning, operations, and flexibility markets, as well as providing network capacity.

For 2030, this means connecting and accommodating 9 GW of onshore wind, reinforcing the network to connect at least 5 GW of offshore wind (excludes green hydrogen production), and adapting the network for up to 8 GW of solar connections while providing security of supply and a continued reliable and resilient network. To support the intermittent nature of high penetrations of non-synchronous renewable generation we need to connect high volumes of energy storage to the electricity system as well as deliver projects that enable more interconnection to other grids. By 2030, we need to provide capacity for new housing developments, demand growth driven by the economy and increase in demand due to electrification of heat, transport, and industry.



DECARBONISED ELECTRICITY



Connecting renewables:

ESB Networks will facilitate the connection in the region of 22 GW of renewable generation by 2030. In line with CAP there should be 9 GW of onshore wind, and at least 5 GW of offshore wind (and an additional 2 GW offshore wind for green hydrogen production) and 8 GW of solar connected to the electricity system by 2030. As part of our 'Build Once for 2040' concept, we are proposing to develop renewable hubs and explore advance build network reinforcements so that increased wind, solar, and batteries (including community projects and smaller scale generation customers) can connect safely to the electricity network. To deliver on this target, we will significantly increase our customer engagement to provide guidance on different pathways for connecting renewables. We will also implement smart technologies to enable customers to take part in the energy transition through self-generation and storage, demand management, energy efficiency opportunities, and selling electricity back to the network.

Distribution System Operation:

Our purpose in our role as Distribution System Operator (DSO) is to deliver a clean electric future through the electrification of heat, transport and industry, as well as connecting renewable generation at scale to the electricity network. As the electricity system transitions towards a smarter, sustainable model, the operation and management of intermittent and renewable generation coupled with new types of demand will require a digital network that is both flexible and smart. Historically, electricity network companies have designed and managed the distribution network through a top-down approach and extensive management and monitoring tools were not required to analyse predictable electricity flows. As increasing numbers of active customers and Distributed Energy Resources (DER) connect to the network, this will result in more unpredictable power flows, greater variations in voltage and different reactive power characteristics making the system more challenging to manage. In 2020, we established the **National Network, Local Connections Programme**¹⁵. It is putting in place the systems, processes, and capabilities needed to allow industry,

customers, and communities to participate actively and securely in transmission, distribution, and market activities. This will facilitate and enable us to maximise the use of renewable energy up to 80% of overall usage and beyond. The NN,LC Programme¹⁵ is also supporting the reduction in peak electricity demand and putting measures in place to improve electricity demand management in line with CAP23².

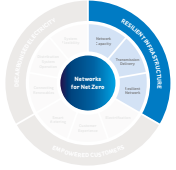
System Flexibility:

System flexibility means a portfolio of practices and technologies (e.g., flexible demand, generation, and storage) that increase network efficiency, resilience, and ability to integrate variable renewable energy sources. ESB Networks is enabling flexibility through the National Network, Local Connections (NN,LC)¹⁵ Programme and we will put systems in place to meet the system flexibility targets set out in CAP23² for 2025 and 2030.

The benefits of flexibility include:

- Reducing the need for new infrastructure.
- Efficient integration of renewable energy sources.
- Enabling customers to participate in markets.
- Enabling faster electrification and therefore reduction in carbon emissions.
- Reducing dependency on imported fossil fuels.
- Minimising deployment of non-renewable sources at peak times.





RESILIENT INFRASTRUCTURE:

Network Capacity:

We are ensuring that our network has the capacity to connect and accommodate renewables, as well as the demand growth driven by population growth, new housing developments, the economy, and the significant increase in demand due to electrification of heat, transport, and industry. Major investments in network infrastructure at all voltage levels, from low voltage to high voltage, such as overhead lines, cables, transformers, and substations are needed to deliver the energy transition. We have developed and will continue to develop new tools and procedures to enable the use of new innovative technologies and concepts to solve constraints on the distribution network. Our aim is to optimise the investment by maximising the use of the existing distribution network and smart solutions.

Transmission Delivery:

ESB Networks, in our role as onshore Transmission Asset Owner, is responsible for transmission network construction and maintenance works defined by the Transmission System Operator (TSO).

The investment in the transmission system is projected to rise to meet the climate challenge in line with the Government targets. The rapid transition to a low-carbon future requires new Bulk Supply Points (BSPs) to meet growing demand due to significant electrification, the connection of large volumes of renewable generation, high-capacity storage solutions and further interconnection with other transmission networks.

As society increasingly relies on electricity for its energy needs, interoperability of the Transmission and Distribution systems is required including new 'Smart' solutions and technologies involving all connected customers. ESB Networks' strategy is to deliver an optimal whole-of-system solution for Ireland, our economy and society for 2030 and beyond. ESB Networks is working with EirGrid, customers and all other interested parties to innovate and deliver these objectives.

Resilient Network:

As decarbonisation of society develops through electrification, and the dependence on the electricity network increases, the quality, condition and performance of the network will become increasingly important. We will continue to adapt and strengthen our network so that we can collectively transform our energy future and lessen the risk of extreme weather events and cyber-attacks. This will be achieved by using data insights to target continual improvement in the performance of the network.



EMPOWERED CUSTOMERS



Electrification:

We will support and facilitate our customers to connect up to 1 million electric vehicles and 680,000 heat pumps to the distribution system by 2030. We will provide network capacity for public charging infrastructure in line with the Alternative Fuel Infrastructure Regulation¹⁰. ESB Networks are ensuring that our network has capacity to accommodate electrified heat and transport and microgeneration by reinforcing and adopting new processes, systems and technologies and thus ensuring network readiness.

Customer Experience:

Our commitment is to connect our customers with a great experience through proactive engagement and by consciously placing their needs at the centre of everything we do. We will support all customers on their journey to the clean electric future through electrification of industry, heat, and transport and by facilitating them to participate in the markets, adopt innovative products and services and take control of their energy consumption. This will be achieved by embedding a customer centric culture across the organisation, transforming the customer experience, improving our customer engagement, being transparent,

and delivering excellent network performance, particularly in relation to reliability of electricity supply. We will continue to deliver new electricity connections for business and for new homes, and are committed to ensuring that we play our part in delivering the Housing for All - A New Housing Plan for Ireland¹⁶.

Smart Metering:

As part of the National Smart Metering Programme¹⁷, new smart meters are being offered to every home in Ireland. By the end of 2022, there were more than 1.1 million smart meters successfully installed and this will continue with the final commitment to have 2.4 million smart meters installed across Ireland by the end of 2024. Smart meters provide more accurate information on energy usage and reduce the need for estimated bills as well as enabling payment to customers for exporting their microgeneration to the grid. Smart metering will also enable the provision of new smart products and services to be made available by electricity supply companies. These could provide significant value and advantage for customers. Furthermore, these new products and services could, in time, enable solutions that can support the development of a digital network that is flexible and smart.



Our People:

Our people are crucial to what we deliver as a company. Over the coming five years we will recruit 1,500 people to both sustain and grow our capabilities across a range of areas. We will ensure we have the resource capacity and flexible deployment capability to deliver this Strategy, supporting Ireland’s Climate Action Plan² and our net zero future.

An important part of ensuring the deployment capability is the work we do with our partners and suppliers to deliver our projected work programmes. We value this relationship with our Suppliers and Contract Partners, and today we have €4bn of Framework Contracts in place. Our strategic approach to procurement and our delivery strategy position ESB Networks to increase the Framework Contracts to ramp up and deliver at pace if and when required. In 2021 ESB Networks’ contribution to the Irish Economy was approximately €1.2bn.

Digital and Data Driven:

Digital is the integration of technology and new ways of working into all aspects of the business, driving change in how we operate, serve our customers, and deliver value to society. Transforming operations and systems with data and digital technologies and new ways of working can create substantial value and improve performance in areas such as safety, reliability, customer satisfaction, predictable and efficient delivery, and enabling the active customer.

To Deliver Networks for Net Zero Strategy by 2030



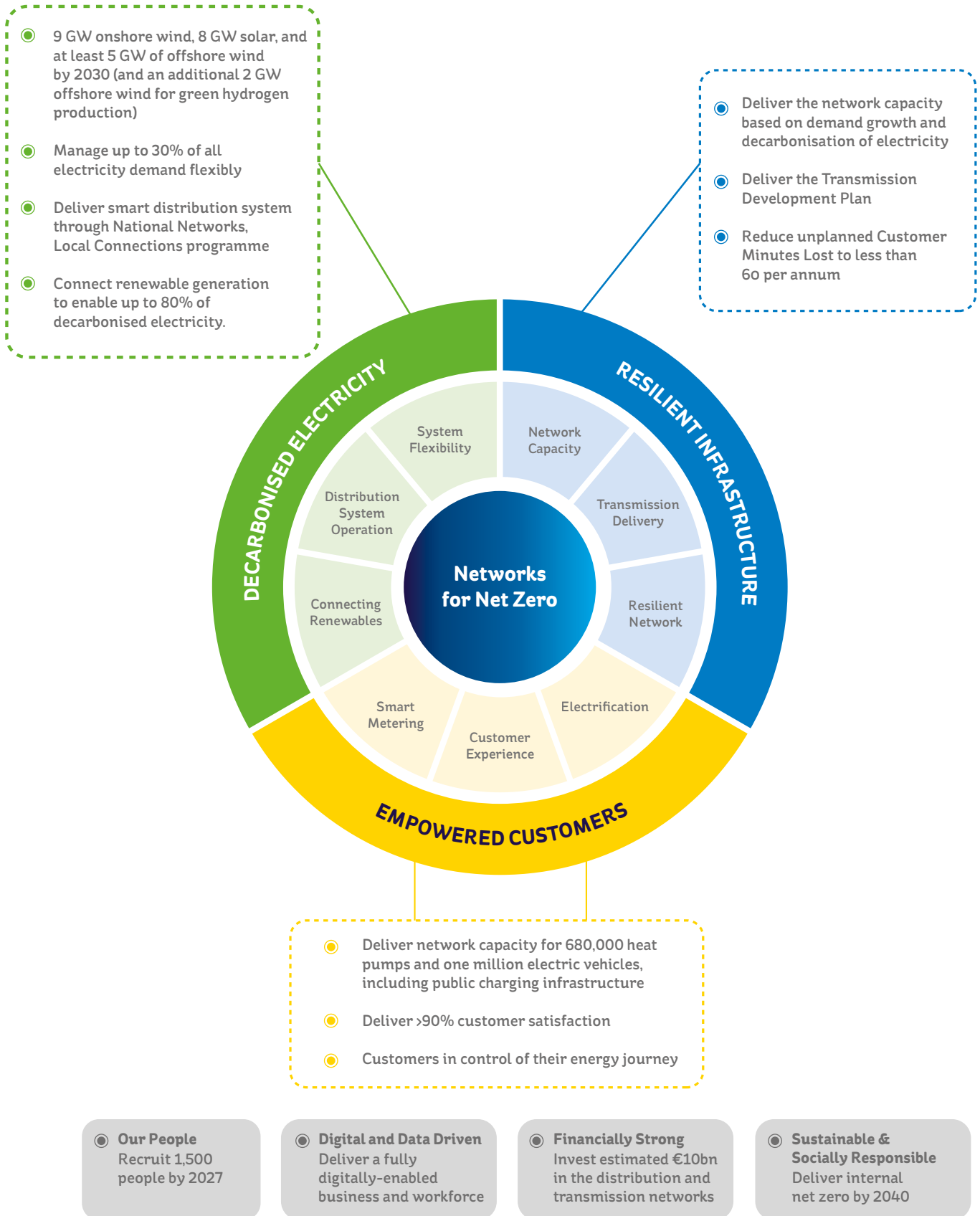
Financially Strong:

Maintaining ESB Networks’ financial strength is critical to ensure we can fund the continued development of the electricity infrastructure and for the activities necessary to deliver Networks for Net Zero Strategy. We expect to invest in the region of €10bn by 2030. We will continue to balance the need to invest to provide a resilient network and essential infrastructure to support economic growth (e.g. provide connections for new housing) and to provide a smart network to enable a decarbonised economy with maintaining affordability for customers by focussing on operating as efficiently as possible.

Sustainable and Socially Responsible:

ESB Networks believes in the role of electricity infrastructure as an enabler of social, environmental, and economic growth. We will work to reduce the carbon footprint of our business. As the electricity network is embedded in every community right across the country, the safety of the public is fundamental to how we design, operate, and manage the system today and into the future. Our Public Safety Strategy¹⁸, including public safety awareness campaigns will continue to be developed as people become more reliant on electricity. While ESB Networks has made large strides in the carbon reduction area over the past few years, we are committed to accelerating our progress on the trajectory to net zero by 2040. We will integrate Carbon Emission Assessment as part of all infrastructure capital investments by 2025. We will reduce our impact on the environment by applying similar principles to those in Green Public Procurement (GPP)¹⁹. All our procurement activities will be green-compliant by 2025.

ESB Networks for Net Zero 2030 Targets



Collaboration with our stakeholders

At ESB Networks, we understand that we have been entrusted with the responsibility to play a vital role in Ireland's energy future, and we know we cannot do this alone. Collaboration with our customers and all our stakeholders will be critical to achieving our vision for an electric future and meeting Ireland's climate targets.

Our annual stakeholder publications, such as 'ESB Networks Stakeholder Engagement Strategy & Plan 2023'²⁰ set out our approach to stakeholder engagement, our engagement priorities and activities and provides stakeholders with pathways to engage with us.

We greatly encourage all our stakeholders to continue to engage with us through these pathways.

Collaborative action over the last decade has already positioned Ireland as a leader in global wind energy penetration on the electricity system. We are confident that through this same spirit of collaboration, and through openly adopting new and innovative ways of working and pioneering smart technologies, we will deliver on our vision and strategy; and deliver enduring benefits for current and future generations.

Innovation

A key enabler of our Strategy is to continuously innovate towards a sustainable low-carbon energy

future for our customers and for Ireland. Our definition of innovation is to implement new ideas for the enduring benefit of our customers and business. Our 'Innovation Strategy Framework' (as detailed in our 'Innovation to Connect Clean Electric Future'²¹ consultation) has been designed to be flexible enough to cater for the changing requirements of our business and society. Delivering on this Strategy will require us to continue to innovate across every aspect of our business. Our 'Innovation Strategy Framework'²¹ underpins our approach to innovation, and it has been applied to a balanced portfolio of projects reflecting the overall ESB Networks Strategy.

Collaboration is central to our innovation strategy, and we have partnered with over 80 companies to date in the delivery of our innovation projects including academia, energy providers, community agencies and international research organisations. These collaborative partnerships will continue to be core to the delivery of our Strategy. A process driven approach underpins our innovation strategy. This is illustrated by our Innovation Strategy Framework²¹ which manages every stage of the development and implementation of our strategic initiatives, from setting the vision to establishing Business-As-Usual (BAU).



Our Commitment

We have developed a roadmap through 2030 to 2040 to illustrate how we will progress towards our targets and objectives. Aligned to our Strategy, this roadmap sets out key milestones to ensure we deliver on our commitments set out in this document. We will continually monitor progress, implementing interventions as needed, to ensure we are advancing on track to deliver, and we will share our progress in a transparent manner over the years ahead.

To meet the climate and decarbonisation challenges, we will ensure we have the resource capacity and flexible deployment capability to deliver and support Ireland's Climate Action Plan. We are working to ensure we have the right capabilities and the capacity to deliver. Maintaining ESB Networks' financial strength is critical to ensure we can fund the continued development of the electricity infrastructure and for the activities necessary to deliver our licence obligations and objectives.

Our values underpin everything we do in ESB Networks, and they will continue to guide our decisions and actions as we connect our customers to a clean electric future together. We have consistently referred to them in the formulation of this Strategy and the actions which give life to it.



Please see our commitments to deliver Networks for Net Zero presented in the table below.

		2025 Targets	2030 Targets	2040 Targets	Outcome
DECARBONISED ELECTRICITY	Connecting Renewables	Connect additional renewable generation to decarbonise up to 50% of electricity. Deliver up to 5 GW of solar and 6 GW of onshore wind connections.	Connect additional renewable generation to decarbonise up to 80% of electricity. Deliver 8 GW of solar, 9 GW of onshore wind and at least 5 GW of offshore wind connections.	Deliver the connections for all renewable generation needed to fully decarbonise electricity.	ESB Networks enabling net zero electricity.
	Distribution System Operation	Deliver the operation tools and systems to operate the distribution network with 85% SNSP.	Deliver Smart Distribution System (through NN,LCP) ¹⁵ , the operation tools and systems to operate a distribution network with 95-100% SNSP.	Continuously improve and innovate the operation of a flexible, smart distribution network.	ESB Networks enabling a smart and sustainable distribution system.
	System Flexibility	Manage 15-20% of all electricity demand flexibly.	Manage 20-30% of all electricity demand flexibly.	Extend and optimise the use of electricity demand to deliver a Net Zero Ready Distribution Network.	Well-informed customers using flexibility to deliver their climate action.
RESILIENT INFRASTRUCTURE	Network Capacity	Deliver the network capacity for 2025 AFIR ¹⁰ , DART+ and public transport charging, demand growth and renewables connection according to CAP ² .	Adopt 'Build Once for 2040' concept and deliver the network capacity based on demand growth and decarbonisation of electricity.	Deliver the full network capacity required for net zero Ireland.	Electricity network ready for electrified demand and renewables needed to decarbonise electricity.
	Transmission Delivery	Work with the Transmission System Operator to develop and deliver the Transmission Development Plan ²² .	Deliver Transmission Development Plan ²² as agreed with the Transmission System Operator.	Deliver the transmission projects to enable the connection of offshore renewables at scale.	ESB Networks enabling 100% renewable electricity and supporting security of supply.
	Resilient Network	Reduce unplanned CML<76.6 per annum. Reduce unplanned Ck<109.6 per annum.	Reduce unplanned CML<60 per annum. Reduce unplanned Ck<80 per annum.	Continuously improve network performance as opportunities arise.	ESB Networks providing a smart resilient network that customers can rely on when they need it.
EMPOWERED CUSTOMERS	Electrification	Deliver network capacity for 215,000 HPs, 196,000 EVs and 180 MW of public charging infrastructure capacity.	Deliver network capacity for 680,000 HPs, up to one million EVs and 800 MW of public charging infrastructure capacity.	We will have a network that enables full decarbonisation of industry, heat and transport.	ESB Networks enabling net zero Ireland.
	Customer Experience	Deliver >83% customer satisfaction.	Deliver >90% customer satisfaction.	Continuous improvements in all aspects of customer engagements.	ESB Networks providing customer experience excellence.
	Smart Metering	Replace 95% of electricity meters with smart meters.	Deliver and scale the enhanced retail market capabilities set out in Industry High Level Design ²³ of the smart metering programme.	Customers in control of their energy journey.	ESB Networks enabling customers to control their energy journey.

		2025 Targets	2030 Targets	2040 Targets	Outcome
FOUNDATIONAL CAPABILITIES	Our People	Recruit and ensure safety competence of 900 people to support net zero delivery.	Deliver 40% gender diversity target for all new joiners.	Truly diverse and inclusive organisation with high levels of employee engagement and retaining a top quartile position in employment market.	Safe and empowered employees working in an inclusive, customer-centric and values-led culture.
	Digital & Data Driven	Build the foundational IT systems and capabilities. Upgrade core telecommunications infrastructure by 2026 (SmartGrid Spectrum).	Transform ESB Networks to a data-driven digital utility.	A fully digitally-enabled business and workforce.	ESB Networks a Digital Utility.
	Financially Strong	Total capital investment of -€4.4bn in PR5 ¹⁴ (2021-2025). A minimum BBB+ credit rating on a standalone basis.	Capital investment of -€10bn on the transmission and distribution infrastructure 2023-2030.	Efficiently delivered, sustainable and affordable electricity network supporting the Irish economy.	ESB Networks delivering an affordable electricity network for net zero Ireland.
	Sustainable and Socially Responsible	50% of our buildings to be at BER B rating. Integrate Carbon Emission Assessment as part of all infrastructure capital investments.	Deliver absolute CO ₂ reduction of 50%. 80% of Light Duty Vehicles will be electric.	Fully decarbonised fleet. Replace all Fluid Filled Cables by 2035. ESB Networks fully decarbonised as a business.	ESB Networks at net zero as a Business.





4

DECARBONISED ELECTRICITY



4

DECARBONISED ELECTRICITY

4.1 CONNECTING RENEWABLES



4.1.1 INTRODUCTION

Connecting Renewables is a core part of this Strategy. It is built on the achievements to date and a recognition that we need to significantly accelerate progress while working with all industry stakeholders.

Connecting further renewable generation, together with supporting technologies such as battery storage, with increased demand flexibility, is a fundamental requirement for Ireland to achieve net zero. We believe our work must target Ireland being net zero (or net zero ready) by 2040, and that we together can make Ireland a beacon of progress throughout the world as we deliver a clean electric future.

A key part of our role at ESB Networks is to facilitate the physical electrical connection between new renewable generators and our network to help decarbonise the electricity network.

Every renewable energy generation technology from domestic roof top solar to large offshore wind installations will be required to meet our net zero targets. This renewable generation, connected at all voltage levels to our networks, from low voltage (230 V and 400 V), medium voltage (10 kV and 20 kV) to high voltage (38 kV and 110 kV), will impact on how our customers in every home and business in Ireland, are interacting with our networks, and how they are using renewable electricity produced locally on their net zero journey.

Renewable Generators

Renewable generators can choose how much of the physical electrical connection, outside of the live network, that they wish to construct themselves. The self-build process is known as “contestability”, or alternatively renewable generators can elect that ESB Networks build the entire connection “non-contestably.” With safety and system risks associated with working on a live network, new connection works inside our live ESB Networks substations and any other non-contestable works are designed, installed and project managed by ESB Networks.

We facilitate contestable projects for both EirGrid and ESB Networks customers by providing assistance in the form of detailed functional specifications, our supplier lists, guidance documentation and design reviews. We are heavily involved in all connections to the network, whether built non-contestably or contestably.

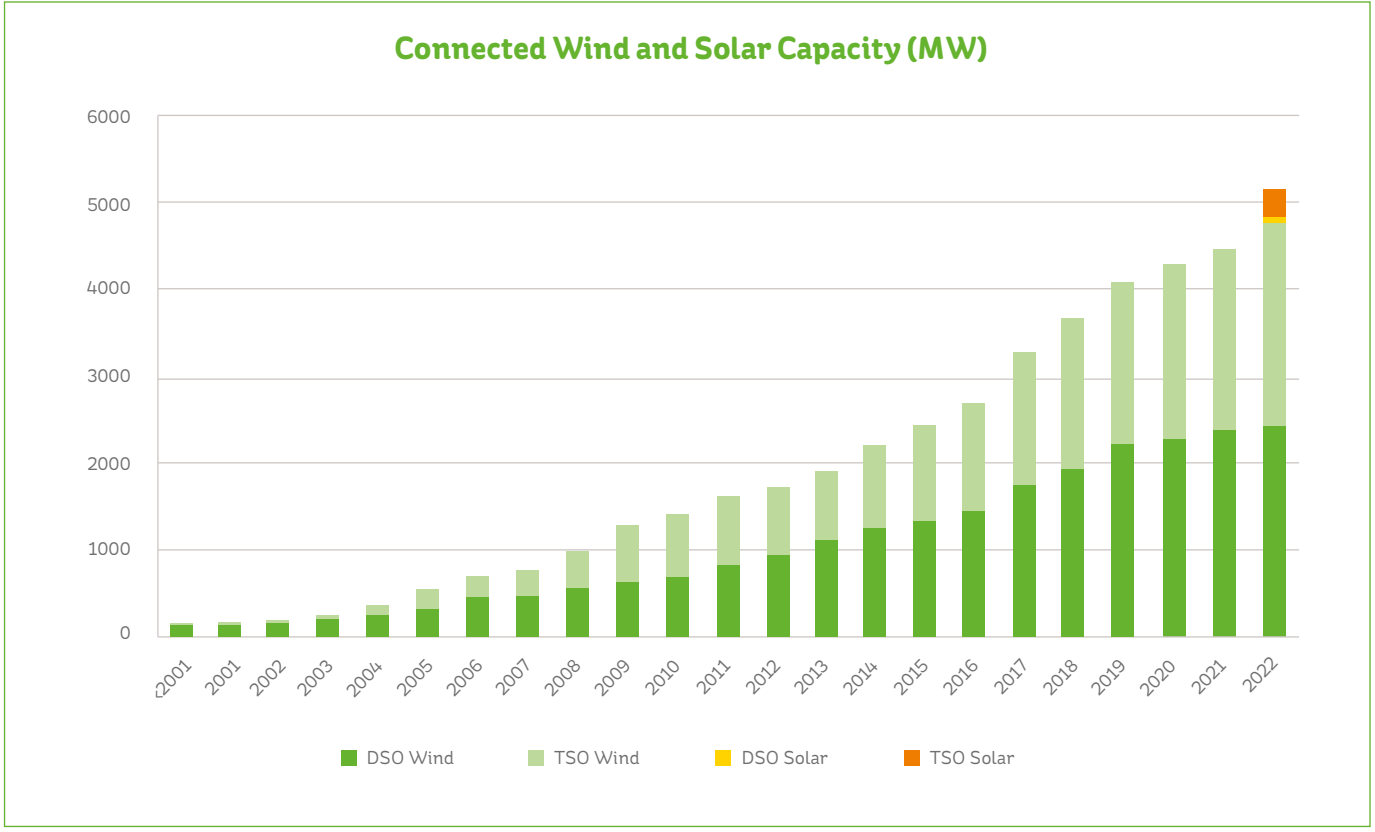
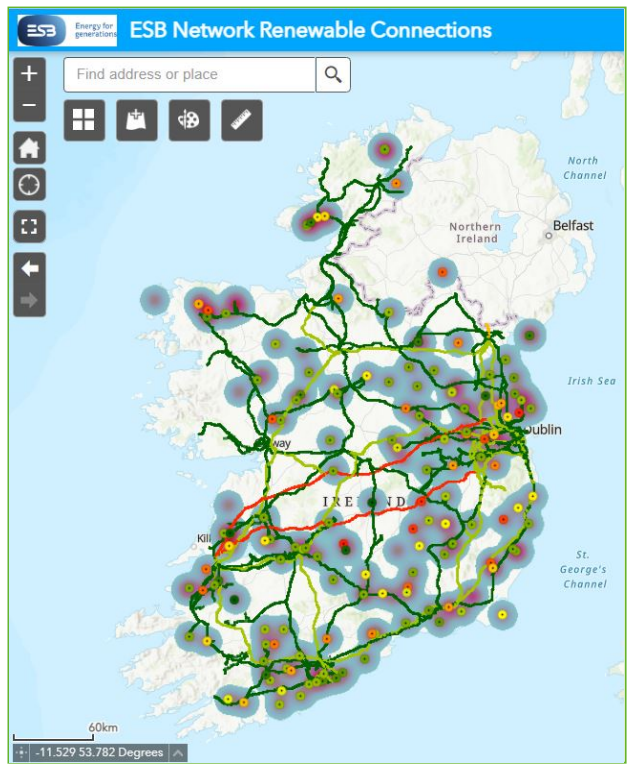


4.1.2 WHERE WE ARE TODAY

Significant progress has been made in connecting renewables to the electricity networks. Today there are circa 5.4 GW of renewable generation capacity connected to the networks. About 4.6 GW of that renewable generation is produced by wind. About half of that wind generation is connected to the distribution system.

The map on the right shows energised wind and solar projects and the renewable generation producer heat map overlaid on the high voltage network (110 kV and above). This indicates that there is significant onshore renewable generation connected at most nodes on the 110 kV network and above.

Ireland generated 9,720 GWh from wind in 2021 (29.4% of demand in 2021) and 11,224 GWh in 2022 (c. 35% of demand). This places Ireland in the top five globally for installed wind power capacity per capita. ESB Networks' journey to date to connect wind and solar generation is shown in the graph below.

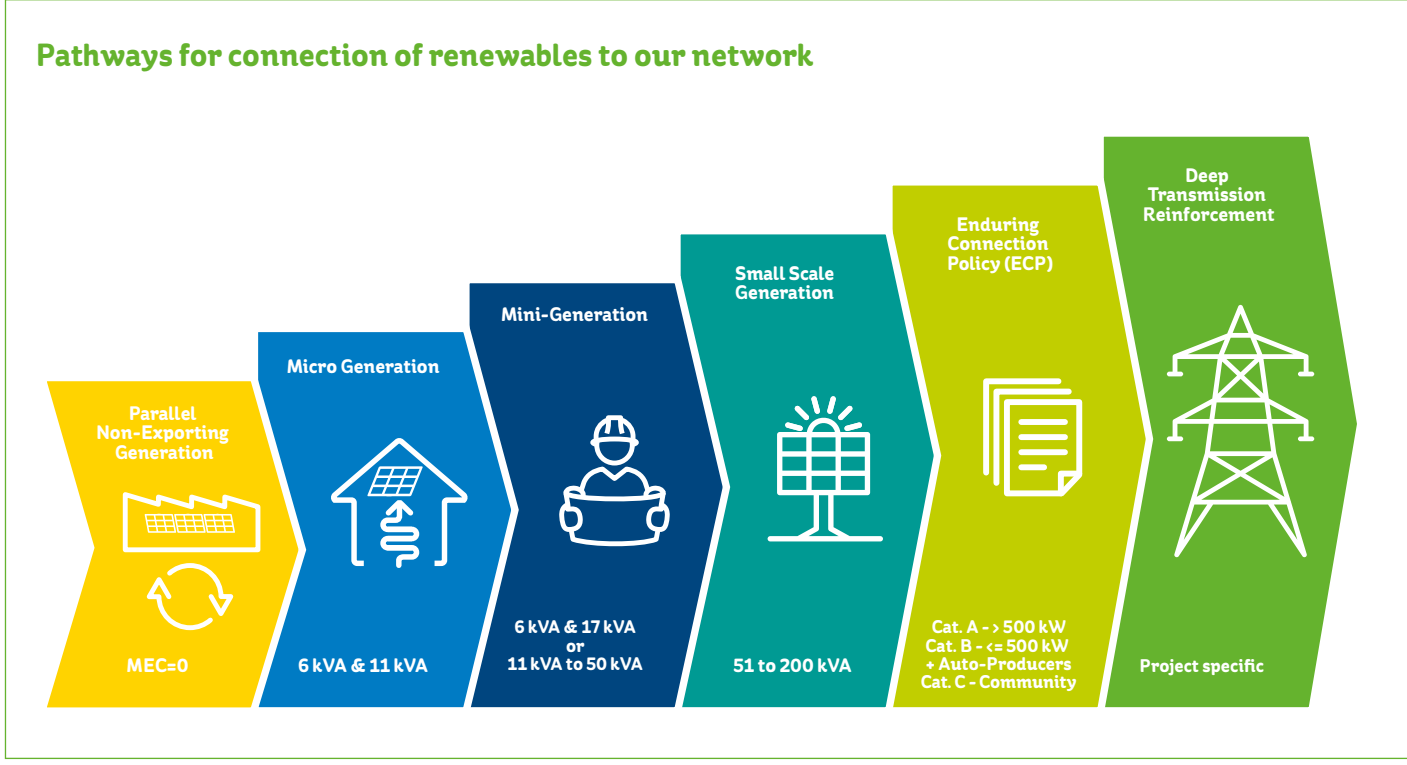
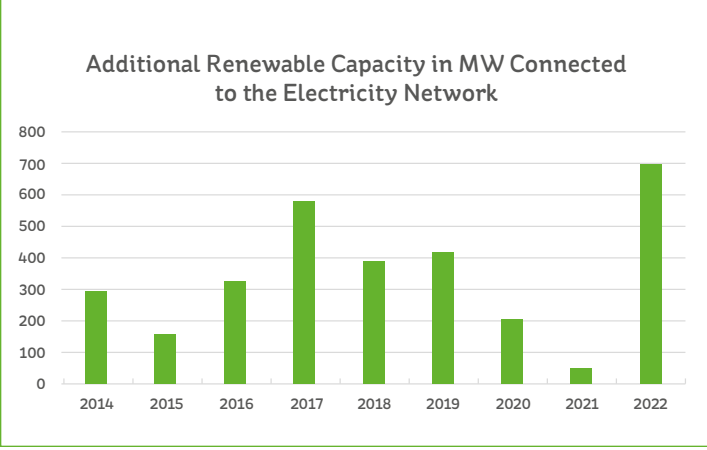


The first commercial solar farm project connected in May 2022 and the first Renewable Energy Support Scheme (RESS-1)²⁴ community energy led project connected in October 2022. By the end of 2022 there was 360 MW of grid scale solar power connected to the electricity system. 2022 was a landmark year that established solar power as an important and growing asset class on the network.

The year 2022 was a major milestone for connection of renewables to the electricity system with 23 renewable generation projects totalling 688 MW. This represents the most renewable generation installed in a single year to date and builds on work done through the Enduring Connection Policy (ECP)²⁵ offer process and working with developers with planning permission to connect their projects to the electricity system.

Permitting has been identified across Europe as a universal issue for connection of renewables to the grid (Eurelectric, PowerBarometer22)²⁶. A review of planning permission in Ireland is currently underway and the outcomes and subsequent timely implementation of

the findings are important to delivering a clean electric future and the network capacity growth required to support this. The development of renewable projects and associated grid infrastructure can be a lengthy process. With an increasing volume of renewable generation projects due to connect to the electricity network, the time needed to achieve the required consents will be an important factor in accelerating progress to achieve the 2030 CAP targets.

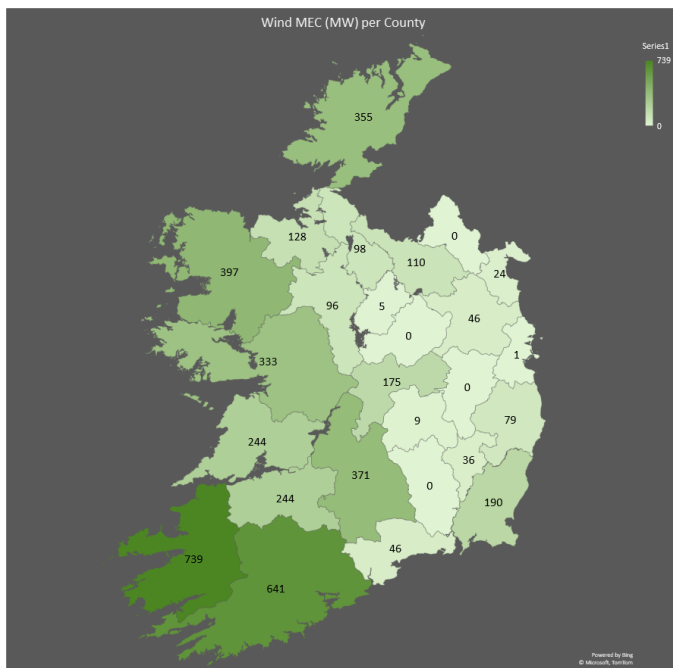


Onshore Grid Scale Renewable Projects

Over the past 30 years, more than 300 grid scale renewable generators have been connected to the electricity network, with a total capacity of greater than 5.4 GW. Grid scale renewable projects are installed from 10 kV to 110 kV on the distribution system and from 110 kV to 220 kV on the transmission system. The projects are geographically distributed throughout the country but can cluster dependent on weather patterns. Approximately 75% of distribution connected wind generation is connected to our 38 kV system. ESB Networks processes approximately 90 grid-scale renewable electricity generation applications every year under the regulated Enduring Connection Policy (ECP)²⁵. These include commercial solar and wind projects, community projects and auto-producers. The table on the right demonstrates that circa. 80% of projects providing approximately 50% of wind generation capacity is connected to the distribution network (10 kV -110 kV DSO). The remaining 20% of projects are connected to the transmission network.

Voltage level (kV)	Wind Capacity (MW)	Number of Projects
10	63	30
20	580	118
38	1574	95
110 DSO	39	2
>=110 TSO	2328	58

Maximum Export Capacity (MEC) of wind generation currently connected to both the transmission and distribution system per county is shown on the map on the right.



Community Energy Projects²⁷

We continue to support Community Energy projects through the Enduring Connection Policy (ECP)²⁵ process via our dedicated community project liaison panel. We have a dedicated community project section on our website which includes a guide to connecting community projects to the distribution system and a frequently asked questions section. We have listened to our customers and are providing dedicated support through single points of contact, working to assist community projects through the connection offer and delivery process. Community renewable projects have a dedicated channel through ECP²⁵ with less onerous application requirements. Currently approximately one quarter of all ECP²⁵ applications we are processing are community projects.



The first community energy project under the Renewable Energy Support Scheme (RESS-1)²⁴ was energised at Davidstown Solar Farm in Co. Wexford in October 2022. The RESS-1²⁴ assists communities to develop renewable electricity projects that provide wide economic, environmental, social, and cultural well-being for the local community.

Supporting Offshore Development

Offshore wind is now a proven and mature technology. Ireland is blessed with both a large seabed on which to develop this technology – both fixed and floating wind farms – and some of the best wind generation resources in the world. ESB Networks as the onshore Transmission Asset Owner (TAO), continues to work proactively with EirGrid, in their role both as Transmission System Operator (TSO) and offshore Transmission Asset Owner (TAO), together with a broad range of stakeholders, to plan for and implement the necessary onshore reinforcements required to facilitate offshore generation. ESB Networks is responsible for the delivery of the onshore reinforcement projects to enable offshore wind once these projects are finalised and consented by EirGrid. The initial tranche of projects is focused

on the East Coast with a very significant amount of work in the Greater Dublin Area. The current focus is to support EirGrid with the development of an integrated programme which optimises the utilisation of valuable resources such as placing infrastructure in roads and the availability of network outages to enable this work. Whilst this is happening, we are addressing the availability of material, specialist contractors and other requirements to support detailed design, construction, and commissioning activities.

ESB Networks is committed to delivering the required onshore transmission infrastructure to enable the growth of offshore wind.



Microgeneration, Mini-Generation, Small-Scale Generation and Non-Exporting Generation (MECO)

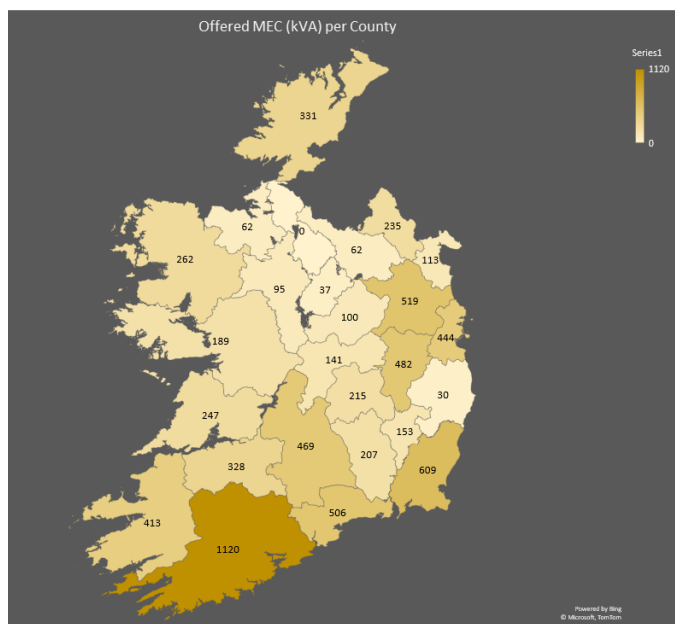
Throughout 2021 and 2022, ESB Networks has completed a considerable body of work to enable the connection of microgeneration to the network at scale. It plays an important role as it creates active customers whose personal choices in terms of how they use electricity will work to support decarbonisation, optimise use of the existing networks and contribute to a more reliable and resilient network. In 2022 we received ~17,000 new registrations for microgeneration increasing the total customer connections to 46,000. In total, if one assumes that each installation is 2.4 kW, then this represents approximately 110 MW of generation capacity. There is a significant potential for rooftop solar PV in Ireland which is discussed in Our Future Plans section below. ESB Networks through its Retail Market Services⁴ business has put in place systems to allow the owners of microgeneration to benefit by receiving payment when exporting excess power to the network.

Throughout the course of 2022 we have also been actively engaging with customers through our very successful mini-generation pilot scheme (11 kW to 50 kW). During 2022 we received over 600 applications as part of this pilot, representing more than 18 MW of renewable connections. We are currently working to enable these to safely connect to the electricity network. The map on the right shows offered capacity for mini-generation in kVA per county. There has been a significant interest in these pilots to date and we are now at the stage where we are transitioning the pilots to Business As Usual (BAU).

In September 2022 we launched a further connections pilot for Small Scale Generation (SSG). This is a new application process for demand customers looking to install exporting generation of up to 200 kW, which will enable a further 15 MW of connections in early 2023 and will continue to drive forward real change in this area while also offering customers more streamlined processes for connecting their renewable generation.

The non-exporting or MECO process is an opportunity for demand customers to reduce their exposure to energy costs and meet sustainable targets by generating

their own on-site generation. This application pathway has been available to our customers for over a decade.



Battery Energy Storage Systems and Synchronous Compensators

Energy storage is a key technology for dealing with the intermittent nature of renewable generation.

ESB Networks, together with EirGrid, has been connecting the pipeline of energy storage projects to the electricity system. To date, 476.5 MW of Battery Energy Storage Systems (BESS) has been connected and energised, of a predicted total of 900 MW of BESS that is expected before the end of 2024. Depending on their capacity, these energy storage projects may be connected at either transmission or distribution level.

Four battery energy storage projects have connected to the electricity network in 2022, totalling 79 MW.

Synchronous compensators (flywheels) are a key technology for connecting more renewables to the system as they control the reactive power and provide resilience to faults. 2022 saw the first synchronous compensator connected to the electricity network in Ireland and we expect more to be connected in the coming years.

2022 has also been a landmark year as the first synchronous compensator (flywheel) was connected to our network at Moneypoint. It is currently the largest synchronous compensator in the world, that will enable more renewables to be connected to the system by providing system services that allow higher SNSP (system non-synchronous penetration). The Moneypoint flywheel provides 4000 MW of inertia and is the first of several units needed in Ireland for full decarbonisation of electricity.



4.1.3 OUR FUTURE PLANS

Looking forward to 2030 the challenge is clear. It is articulated in Climate Action Plan 2023² and the table shown here to the right.

It is expected there will be more than 22 GW of renewable generation connected to electricity system in Ireland by 2030, a mix of solar and wind, both onshore and offshore. ESB Networks will work with all stakeholders to adapt our plans, systems, and processes to meet any updated Government targets. At least 5 GW of additional renewable generation is planned in CAP² to come from offshore wind (and an additional 2 GW offshore wind for green hydrogen production). The offshore wind industry has a phased development approach with onshore transmission connection points and system reinforcements identified as part of the National Development Plan 2030 (NDP2030)²⁸.

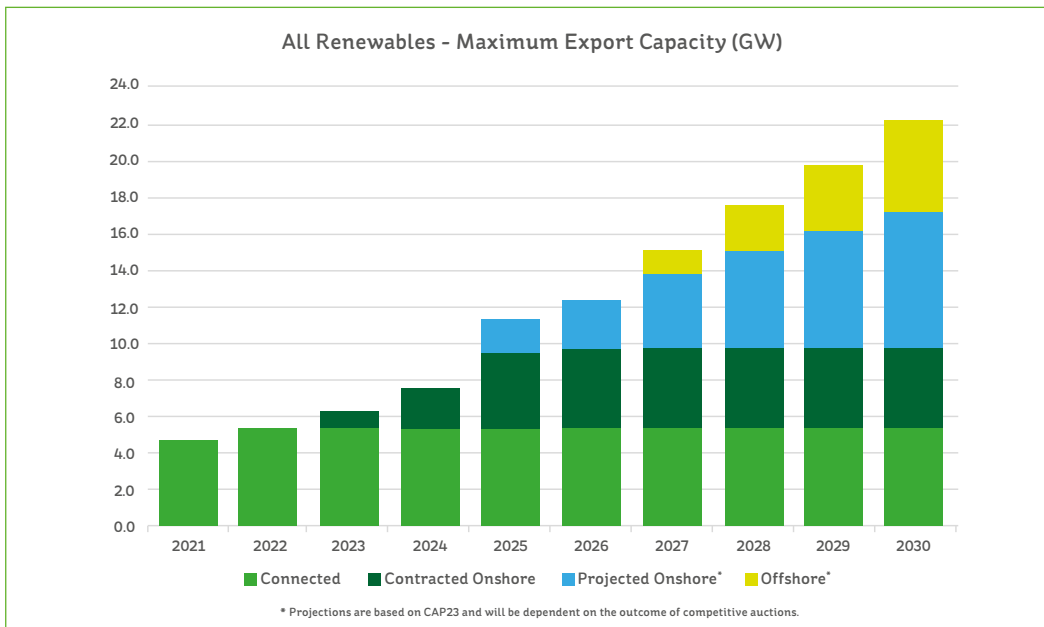
NDP2030²⁸ represents a huge challenge for the electricity system, in particular the development of the Dublin transmission infrastructure which is seen as a key enabler to offshore wind transmission connections. ESB Networks in our role as onshore Transmission Asset Owner (TAO) is committed to working with key national and local stakeholders to enable delivery of the Dublin and wider NDP2030²⁸ programmes.

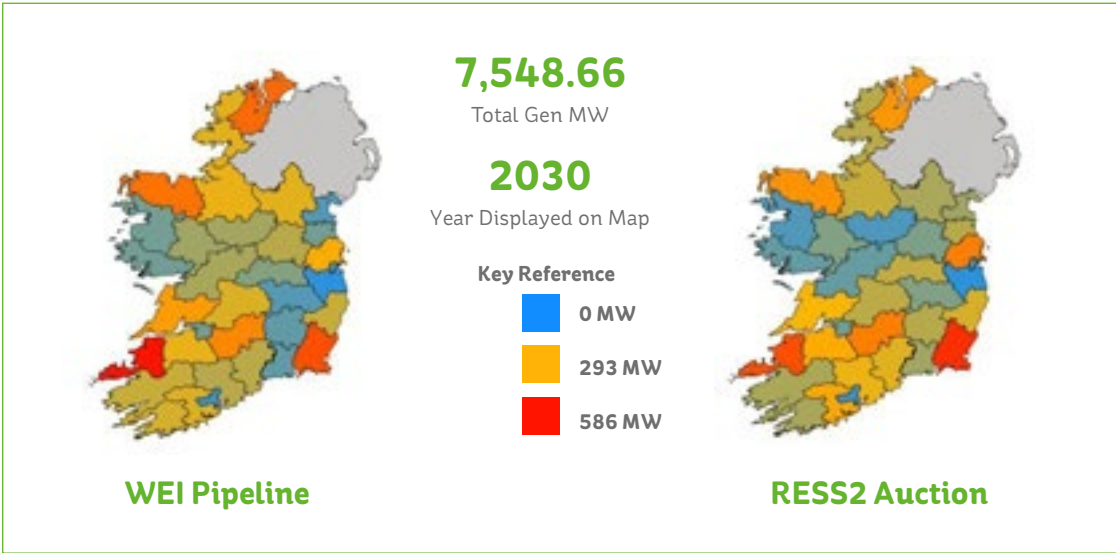
Onshore transmission and offshore transmission projects must align to ensure renewable energy gains

Type of renewable generation connected to electricity system	Capacity (MW) by 2030
Onshore Wind	9,000 MW
Offshore wind (excludes green hydrogen production)	At least 5,000 MW
Solar	8,000 MW

access to the transmission system in a timeline and at a cost that serves the needs of customers. To achieve this ambition ESB Networks is working very closely with EirGrid (in their dual onshore and offshore roles) to ensure the necessary technical and process frameworks are in place.

We can predict the following volume of projects (see graph below) through the work completed and underway in the ECP²⁵ and RESS²⁴ Auction Process. We are confident that this will increase the capacity of onshore renewable generation to more than 10 GW by 2025. Based on the current pipeline, we estimate between RESS 1, 2 and 3,²⁴ there could be 3-4 GW of solar and about 6 GW of onshore wind generation connected to the electricity system by 2025. In line with CAP² this has the potential to increase further and in addition there is a potential for increased renewable generation to be connected through Corporate Power Purchase Agreements (CPPA). We have also included actions to enhance the likelihood of further onshore renewable capacity being built out to 2030 and beyond to 2040.





The map above shows our prediction of the onshore renewable generation that might connect to the distribution system by 2030. It is based on generation already connected, generation already contracted, ECP2.2²⁵ offers issued and pipeline information from Wind Energy Ireland (WEI) and others.

There is potential to further harvest renewable resources to provide for our energy needs securely and sustainably into the future. For example, a recent study²⁹ funded by ISEA (Irish Solar Energy Association) and conducted by MaREI (SFI Research Centre for Energy, Climate and Marine research and innovation), established a view on the potential for rooftop solar in Ireland. In this study they proposed that, if just 6 solar PV panels are installed on 1 million homes (every suitable home, approximately 50% of homes in Ireland), this could lead to up to 2.5 GW capacity and production of 1.8 TWh per year (approximately 22% of the residential electricity demand in 2021). ESB Networks is continuing to make it easier for customers applying to install microgeneration, primarily for self-consumption, by developing a simple inform and fit process and the development of online application portals where customers can track their application through the networks connection process.

Customer interest in these new simplified connection processes is expected to continue to increase significantly in the coming years and this is likely to be further

accelerated should the Government introduce a support scheme for Small-Scale Generation. Our current expectation is that these individual connections of under 200 kW will ensure well over 1 GW of smaller scale renewable generation will be connected to the electricity system by 2030. Learnings to date have shown that the electricity network is strong. However, increased penetration of localised renewable generation will lead to the future requirement for electricity grid reinforcement works. ESB Networks supports government policy that enables the development of appropriately sized installations to maximise the societal benefits while minimising the cost of these installations in the short term. ESB Networks are preparing for this increase in renewable penetration by actively developing new visibility and control systems, while also engaging in advance infrastructure planning to ensure these increases can be accommodated when required.

The Government is currently designing a support mechanism for Small-Scale Generation projects including renewable community projects and we anticipate that this will lead to a significant rise in the number of community projects²⁷ being developed. Our Small-Scale Generation pilot, along with solutions such as renewable hubs and advance build (more on this topic can be found in Network Capacity section of this Strategy) will be a key enabler, supporting communities to play their role in the decarbonisation of the electricity sector.

As part of our 'Build Once for 2040' concept, we are proposing the development of renewable hubs and exploring advance build network reinforcements so that increased wind, solar, batteries including community projects and smaller scale generation customers can connect safely to the electricity network. More on renewable hubs can be found in the Network Capacity section of this Strategy.

It is crucial that there is a steady drumbeat of renewable projects such that every year between now and 2030 is fully utilised. The carbon budgets and sectoral emissions ceilings which have been agreed by the Government strengthen this need further. Renewable energy auctions will need to be structured such that capacity is brought on in the frequency and at the scale needed from the early years. RESS²⁴ auctions and regulated connection policy will be important so that there is a steady flow of contracted projects bidding into a competitive RESS²⁴ auction process. Delivery of grid connections for projects with Corporate Power Purchase Agreements and projects successful in capacity auctions in a timely manner will also be important to meeting CAP² targets.

We are forward planning both for internal and external resources based on the expected significant increase in project volumes.

We are working with our contract partners to ensure that we have the capacity in place to deliver the growing pipeline of renewable projects to 2030.

We are also working with our materials suppliers to manage supply chain risk for key long lead time materials.

We have significantly increased our customer engagement over the past number of years, actively guiding customers through the ECP²⁵ process. The survey we carried out in 2021 of our renewable energy stakeholders has shown that this engagement is considered key both prior to and during the application process to assist renewable developers to target their offers. We have listened to this feedback and are acting to build on the customer clinics in advance of application window openings, enabling customers to make more informed decisions, optimise their maximum export capacity, choosing customer preferred

connections, including the option to contestably build their grid connection, avoiding modifications later.



To date energy storage has not played a large part in the management of load on the distribution system. However, the vision for 2030 and beyond ensures that storage will be more significant. In terms of how we would use services provided by batteries (both commercial and domestic) to support the distribution system, there are two main drivers:

- Minimising dispatch down of renewable energy. In terms of storage this means charging batteries at times of high wind and solar.
- Support of existing network infrastructure at times of high demand i.e., discharging batteries at times of high load. To support this use, key locations would be where peak load is high, but there are periods of low load where batteries can recharge.

Where we have both elevated levels of local renewable generation and high load, storage can allow us in effect to 'shift' the demand to better utilise the available renewable resource. Storage at these locations is optimal in terms of environmental benefits.

In parallel with planning network reinforcements ESB Networks will be implementing smart technologies which will help to transform how we operate the network. These smart technologies will present new opportunities for customers to take part in the energy transition through self-generation and storage, demand management, energy efficiency opportunities (referred to as flexible services) and selling electricity back to the network. We have several pilots, currently in progress, which

are aimed at sourcing and utilising flexible services provided by our customers to address congestion on the distribution system. Our first pilot (Pilot 1 – Role of Early Adopters in Local Markets) is live and has contracted capacity in Dublin and Carlow. Pilot 3b – Pilot of Scale – initially focussed in Mullingar – is at the early stage of procurement and will be live in Q4 2023. We plan to expand this pilot to other parts of the country in 2024 and 2025. In parallel with this market focussed work, we are developing the operational technology with a view to aligning the availability of both market and technology at an early stage.

We are working on enhancing the number of smart grid solutions to enable more renewable connections to the electricity system. This has been a key request from renewables developers, consultants working in the field and representative bodies such as Wind Energy Ireland and the Irish Solar Energy Association. One example is facilitating the use of the battery energy storage solutions to relieve constraints on the network and increase renewable energy production in areas where network capacity is limited. Another one is the introduction of private wires and multiple legal entities behind the single meter for renewable generation. We are currently engaging with customers with a view to piloting flexible connections for generators. This would mean generation connections which would require less infrastructure – thereby reducing cost and build time – but whose output may be reduced under certain scenarios. Part of the pilot learnings will be how often and by how much the generation may need to be reduced.

MV Standard EGIP Modular Substation

We developed the MV Standard EGIP (Embedded Generation Interface Protection) Modular Substation, a prefabricated substation module that can be deployed readymade to site, to support the connection of further renewable generation to the network by facilitating a faster connection of embedded generation, including solar, to the distribution system. This solution allows for generation connections of between 1 and 20 MVA (subject to local system capacity) to ESB Networks' MV System.

MV Standard EGIP Modular Substations are under construction by our manufacturing project partner and will be held in stock for customers who choose this option for their connection agreement.



4.1.4 ACTIONS

Our actions to deliver on renewable generation targets to 2030 and beyond to net zero include:

- Continue to connect renewable generation customers to our networks in a safe, timely and cost-efficient manner to meet the 2030 CAP² renewable targets and any revised targets for 2025. Provide technical support and guidance to customers that choose to build the grid connections contestably.
- Develop renewable hub pilots with the objective of embedding into our 'Build Once for 2040' concept. The renewable hub pilots should assess the impact of increasing capacity at existing substations, new renewable hub substations and connecting community projects to these hubs.
- Review our Generation Connection Policy.
 - Develop a policy proposal to launch renewable hub substations (including both existing /new substations).
 - Develop a per megawatt standard charging policy for connections to new renewable hub substations.
 - Update network planning standards to accommodate an increase in flexible connections.
 - Examine and inform whether Battery Energy Storage Solutions could be used to relieve constraints and increase renewable energy production in areas where network capacity is limited.
- Support the introduction of private wires and hybrid solutions for renewable energy projects.
- Collaborate with the CRU and EirGrid to accelerate frontend design and onshore network development work to support the development of offshore renewable energy.
- Build engineering capability and continue to competitively procure the materials and contractors required to enable the steady drumbeat of grid connections to 2030 and beyond a Net Zero Ready Distribution Network by 2040.
- Implement EU regulations targeted to accelerate the connection of renewables, including the Renewable Energy Directive II (RED II)³⁰ Article 16 which includes requirements for faster connection offer processing for new projects connecting, including projects repowering.
- Implement smart technologies to enable customers to take part in the energy transition through self-generation and storage, demand management, energy efficiency opportunities, and selling electricity back to the network.
- Share network insights with customers and enhance engagement through digitalisation of systems and processes.



4.2 DISTRIBUTION SYSTEM OPERATION

4.2.1 INTRODUCTION

At ESB Networks, operating the distribution system at all voltage levels, from high (110 kV and 38 kV) to medium (20 kV and 10 kV) and low voltage (400 V and 230 V) is core to what we do today.

The energy transition and the roll out of new technologies means that the way we manage the network will change materially in the future.

Historically, we have designed and managed our distribution network based on predictable demand and generation patterns. Full network capacity could be provided to meet customers' needs under all likely conditions – generation was connected to the transmission system and fed down into the distribution system as needed. Complex management and monitoring tools were not required to forecast and analyse electricity flows on the distribution system, as they were holistically predictable.

In the decade ahead, all customers, from renewable generators to large energy users, to home, farm and business customers will adopt a range of new

technologies, including electric vehicles, heat pumps, and localised/home batteries. They will pursue new opportunities to connect local renewable generation, from microgeneration through to community or developer scale solar and wind farms. These new technologies enable and give all customers a stake and active role in meeting Ireland's ambitious climate targets. These new technologies create the opportunity for customers to benefit from new products and services which change how they generate, store, or consume electricity. As increasing numbers of customers adopt these new technologies and behaviours and connect their own renewable energy sources, the electricity system will become more decentralised and unpredictable, making the system more challenging to manage.



Our purpose as Distribution System Operator (DSO) is to deliver a clean electric future through the electrification of heat, transport and industry, as well as connecting renewable generation at scale to the electricity network.. As the electricity system transitions towards a smarter, sustainable model, the operation and management of these new resources will require a digital network that is flexible and smart.

What is a DSO?

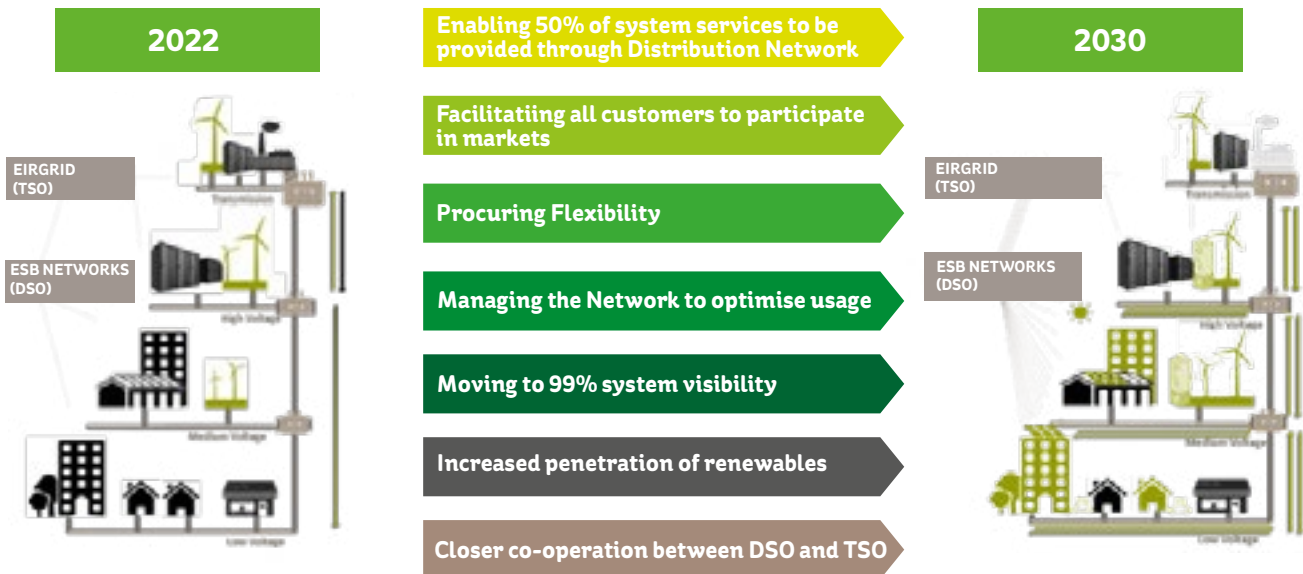
ESB Networks is transforming from a traditional distribution network company to a Distribution System Operator or “DSO”. This DSO transition is about two things:

1. **Managing a very large increase in connections (of renewable generation and low-carbon technologies) as efficiently, securely and effectively as possible; and**
2. **Empowering and incentivising a complete shift in the way customers want to use electricity.**

ESB Networks' strategy is to do this by investing in 'smart network solutions', including demand flexibility, storage services, sensors, forecasting and analytical tools, network automation, and other new technologies, and then adapting how we manage network investment to maximise the value that these new solutions deliver.

We will be much more active in the way we manage the network. This will provide opportunities for customers and businesses, as we will be rolling out new products and services that allow customer participation (refer to section 4.3 on System Flexibility).

ESB Networks will deliver a smart and sustainable electricity system, enabling smarter planning, operations, and flexibility markets.



Into the future, as our DSO role evolves, we will:

- Introduce **local flexibility markets** where we locally balance and optimise demand and renewable generation (more on this in the 'System Flexibility' section of this Strategy).
- Optimise **long-term planning** so that we deliver capacity where it is needed, using all available solutions (flexibility, storage, new technologies and traditional reinforcement where it delivers value).
- Enhance **real-time operations** by introducing enhanced forecasting, simulation, and network analysis and optimisation, to manage capacity and reliability on the network
- Improve resilience and efficiency by rolling out widespread **advanced automation and self-healing networks**
- Enable **all customers to participate in all markets**, directly or via aggregators. This includes local flexibility markets, the Single Electricity Market and markets operated by the transmission system operator.

- Deliver **99%+ visibility** of the distribution system by rolling out sensors and analytical capabilities, so we can use data to optimise the network and provide customers with high quality, timely electricity system information.

At ESB Networks we recognise that it is essential that we remain as a neutral market facilitator for these new products and services. We are taking a customer centric approach to provide support to all our customers as they adopt new and innovative technologies on their decarbonisation journey. We are continuing to work with EirGrid to ensure that as electricity demand is balanced more at local level, that we support the TSO in maintaining a secure and reliable system.



4.2.2 WHERE WE ARE TODAY

Anticipating these changes, in 2020, we established the **National Network, Local Connections Programme** (NN,LCP)¹⁵. ESB Networks' National Network, Local Connections Programme is a multi-year project that will transform how energy on Ireland's electricity distribution network is managed.

The **National Network, Local Connections Programme**¹⁵ will ensure that the distribution system can monitor, forecast, and manage power at a local level. In this new energy landscape, customers and communities across the country will become more active in managing and controlling their electricity usage. Through active participation by all in the process, we can develop a distribution system that is safe and secure, introducing new localised marketplaces which are responsive to new local and regional needs, and make a positive impact in the fight against climate change.

Phase 1 of the National Network, Local Connections Programme¹⁵, delivered in 2020 - 2021, involved:

- Planning and scoping development and roadmap activities across workstreams addressing power system management, market design, TSO coordination, signalling and data exchange, and operational systems capabilities.
- High-level design, with a focus on the phased introduction of individual active management services and their scaling and integration over time. Introducing active local and regional system services markets, in coordination with the TSO.
- Preparing and commencing the delivery of detailed multi-year implementation plans, addressing consultation, design, building and testing of control systems delivery, market development, the rollout of system monitoring right down to a local level, and the introduction of new operational policies, standards, and specifications for customer technologies to be "active management ready".

Flexibility Markets and a Smart Electricity System

A new and central part of our role is to manage and incentivise demand flexibility, empowering and rewarding customers to adopt new behaviours and invest in smart technologies (see System Flexibility for a detailed explanation). We are working to achieve Ireland's target of 15-20% of electricity demand to be flexible by 2025 and 20-30% of electricity demand to be flexible by 2030, as set out in the Climate Action Plan 2023.

Customer Focus

For a smart electricity system that delivers for customers, we are investing heavily in understanding customer behaviours, in order to provide customers with the information and supports they need, as well as the right financial incentives. We are also investing in the standardisation and promotion of smart consumer technologies like smart chargers and smart inverters, that make it easier by automating when they use or store electricity.

Market Focus

For a smart electricity system that stimulates customer flexibility, we will be introducing "local flexibility markets". Energy companies will be able to secure contracts, to enable them to invest in either storage facilities, or in recruiting households/ businesses and equipping them with the technology to manage their electricity demand.

Technology Focus

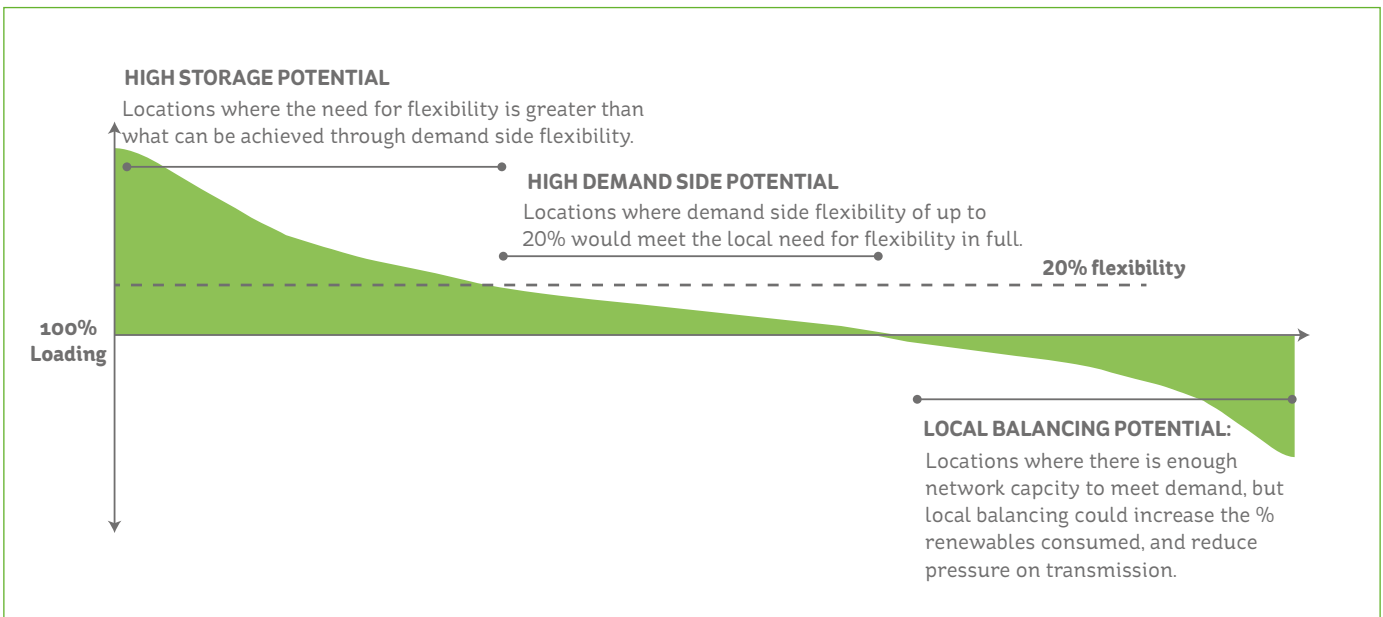
Progressively, as we roll out a smart network, we have the live monitoring and forecasting needed to predict electricity flows on the network, to predict renewable generation and to share that information with our customers. As our customers adopt smart technologies (smart EV chargers, smart inverters for batteries and solar panels, smart heating systems) their devices can receive this information, respond to signals and be rewarded for managing their electricity demand.

Balancing Flexibility and Long-Term Investment

As DSO, we are responsible for managing a complex balance between long term infrastructure and the use of flexibility. As our customers adopt electric vehicles and heating, driving down their carbon footprints, peak electricity demand will increase by about 50% or more over the coming decade. To keep pace with this and ensure customers have the capacity they need, when they need it, we will need to use the full suite of solutions, including demand flexibility and other smart grid solutions, storage, and network upgrades.

Flexibility can quickly and efficiently provide capacity to support low-carbon demand and renewable generation, however we also need to ensure that the network remains secure and reliable as our assets age and are exposed to a changing climate.

The diagram below shows the relationship between products and services that can provide the highest benefit to the electricity system depending on the loading of the electricity infrastructure.



Locations with healthy infrastructure

With renewable generation rapidly connecting, and continuous growth in the electrification of heat and transport, we need to quickly deliver the right balance of flexibility, storage and traditional network reinforcement.

Demand flexibility requires customer behavioural change and choosing smart technologies – if customers are engaged, then it offers a quick and effective solution. However, at a certain point, customers' ability to get on with their day-to-day activities and business is affected, so the potential for flexibility is limited. Current estimates indicate by the time we achieve 20 - 30% flexibility, all larger domestic loads (for example EV chargers) would already be flexible, and there would be a growing need for customers' other devices (heating, cooking, wet appliances) to be used to deliver more flexibility.

In contrast, storage can be developed on a commercial basis to meet the total amount of flexibility needed in a location. It is not limited by customer behaviours. However, storage takes time to manufacture and construct and requires adequate space and charging infrastructure. In locations where there is certainty of a long-term need for high volumes of flexibility, we can provide storage developers with the certainty they need to develop storage as a high value flexibility solution.

All of this means that (as per the graph on the previous page), in locations where the network infrastructure is expected to require up to 20-30% extra capacity in the future, then demand flexibility may deliver an efficient solution. In locations where greater than 20-30% flexibility is needed, commercial investment in local storage will need to be considered. However in many locations, network upgrades will prove a more efficient long term solution for customers. Over the coming years we will build the evidence base informing which option is deployed, when and where, to optimally meet customers' long and short term needs.

Whilst ESB Networks has a track record of delivering network upgrades, demand flexibility and multi-hour duration storage are immature solutions in the Irish market. To ensure that these solutions are adopted at the pace needed, ESB Networks is:

- Since 2021 we have been piloting and scaling new products and services,

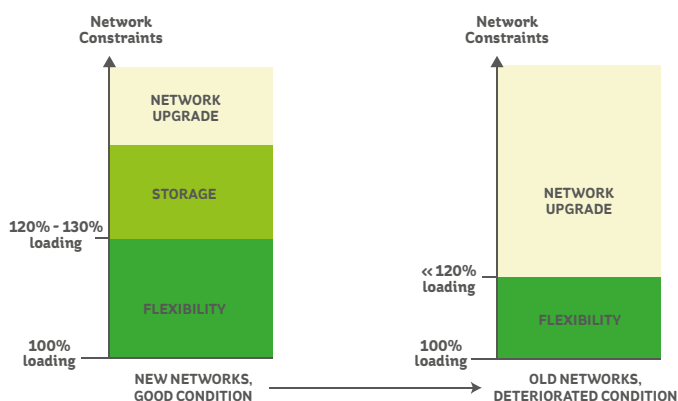
- Sharing network insights and product roadmaps, to give the emerging flexibility industries line of sight of the potential revenue stream.
- Publishing the potential for flexibility services and storage nationwide from 2023, to inform the developing storage and demand side flexibility markets of the investment potential.

Locations with ageing infrastructure

Like any infrastructure, network infrastructure degrades over time. As this happens, it becomes less reliable, and more vulnerable to damage, especially during challenging conditions (such as climate change and cyber-attacks). When this happens, customers could experience prolonged outages.

One of the challenges of flexibility (including the flexibility provided by storage) is that it increases the pressure on the network infrastructure. Flexibility means that the ageing infrastructure that was originally designed based on day-night cycle periods, can potentially be used continuously. Therefore, flexibility can reduce the lifetime of the network infrastructure as the designed cooling cycles of the equipment are not sufficient. This means that in locations where the network infrastructure is older, or more vulnerable to a changing climate, flexibility could undermine customers' local security of supply (instigating prolonged outages due to equipment failure).

We account for these interactions in our long-term network planning by targeting flexibility and storage more intensively in locations where we have healthy infrastructure and targeting upgrades to locations where network assets are older.



What Are We Doing Today

To drive out the new services for customers and develop our new role as DSO, ESB Networks has begun to adapt and advance our activities right across long term planning, real time operations, and flexibility markets.

Our National Networks Local Connections Programme¹⁵ was launched in 2021 and will continue into PR6 (up to 2030). This is a multiyear multidisciplinary investment programme, which is delivering:

- **DSO Readiness**, where we have mobilised a large-scale programme of investment in advanced operational technologies for forecasting and optimising demand flexibility, data analytics and automation, sensors and telecommunications integration, and engineering analysis and design.
- **Market Readiness** where we have established a fully resourced new function who are responsible for designing and introducing new products and services for domestic, commercial and community customers, and renewables and storage developers. In 2021 we launched the first new local flexibility markets which went live on the ground in 2022. In these markets, different customers can trade and be rewarded for changing behaviours and adopting smart technologies. As a result, new solution options can be incorporated into our long-term network planning.
- **Customer Readiness**: we have introduced an evidence-based approach to customer awareness, education, and involvement, including through research, behavioural studies, consultation and emphasising customer participation in pilots and new product rollouts. As part of this, the initial customer flexibility research we commissioned in 2021 has grown into a national programme of work in 2022, with a stakeholder steering group being established so that stakeholders from across society can shape the questions we ask and benefit from the behavioural insights we gather.

ESB Networks launched the National Network, Local Connections programme¹⁵ in 2021. Through this programme and other industry leading investment programmes, ESB Networks is investing in:

- **Smart control room technologies** like forecasting and optimisation, going live in the control room in 2022 and expanded and enhanced from 2023–2030.
- **Smart consumer technology standards** from 2021, so customers can access smart, interoperable technologies enabling them to participate in local flexibility markets.
- **Customer education and awareness programs** from 2022, informed by our national customer flexibility research programme. The Beat the Peak³¹ initiatives launched in 2022 are the first examples of this happening on the ground.
- **Community and local energy dashboards** from 2023 so that customers have local energy insights and opportunities to engage with local balancing and rewards for adopting new technologies and behaviours.
- **Smart technology pilots** from 2023, including of smart charging, smart inverters, DSO-aggregator-customer communications, and interoperability.
- **New flexible connection products from 2023** for new wind and solar farms, as well as small customers connecting mini generation in homes and farms across the country.
- **New flexibility products for renewable generators** including our new reactive power product (from 2022) and products for local balancing to reduce dispatch down (from 2024)
- **Smart grid LTE telecommunications network** enabling Ireland to introduce world leading local balancing and flexibility optimisation via a robust LTE smart grid communications network connecting the customer to the network to the control room from 2023.
- **Local network sensing and monitoring** enabling us to locally optimise demand and generation down to the most local, low voltage networks from 2023.

4.2.3 OUR FUTURE PLANS

In early 2022 the **National Network, Local Connections programme**¹⁵ launched a range of policy and plans to deliver the smart solutions, optimised planning and local markets we will need into the future. Our Strategy to deliver these investments is based on:

- A discovery led approach, with pilot rollouts of flexibility services used to drive DSO and customer readiness, and inform the evolution of new policies, products, services, and technologies that enable and leverage flexibility in long term system planning and operation.
- Continuous investment in foundational advanced operational technologies needed to support a national flexibility services rollout from the DSO control room, throughout PR5.

As we enter a period when unprecedented pace of change is needed, we are committing to ambitious targets for delivering a smart network and a transformed role as DSO. Focusing on DSO readiness and customer readiness, our targets are:

	DSO READINESS	CUSTOMER READINESS
Objective	As DSO, we need to further develop our engineering, markets, technology and data capabilities, to forecast, analyse, predict and optimise our assets and operations	Our customers and the electricity industry need to build confidence and capability to participate and co-create flexibility markets with us over the coming years
Investments	<ul style="list-style-type: none"> • Engineering • Market design • Data analytics • IT & OT • Sensors & Telecoms 	<ul style="list-style-type: none"> • Customer research • Behavioural insights • Awareness • Education • Engagement
By 2025	Local flexibility markets have been introduced and can go live in any location where flexibility is needed, nationwide	<ul style="list-style-type: none"> • 10% of all households and businesses participating in flexibility • Commercial investment in distributed storage progressing • 15-20% demand side flexibility nationally
By 2030	Highly specialised DSO across <ul style="list-style-type: none"> • LT planning • RT operations • Flexibility markets 	<ul style="list-style-type: none"> • 75% of all households and businesses participating in flexibility • Commercial storage providing flexibility in all DSO regions • 20-30% demand side flexibility nationally

4.2.4 ACTIONS

Our actions to deliver the smart and flexible electricity system by 2030 include:

- Share localised emissions and electricity systems insights and product roadmaps to give customers and emerging flexibility line of sight of the potential to reduce carbon and earn revenue.
- Introduce a localised emissions reporting framework and new products for electricity emissions reduction.
- Deploy the DSO tools and capabilities to manage and scale flexibility services.
- Manage local electricity markets.
- Collaborate with emerging energy companies that reward customers for providing demand flexibility.
- Coordinate with the TSO and the wholesale market in a new TSO/DSO operating model.
- Deliver 99% of distribution system visibility by 2030.



4.3 SYSTEM FLEXIBILITY

4.3.1 INTRODUCTION

Following on from the distribution system operation discussion, in this section we are taking a closer look at electricity system flexibility, considering its importance and the Government’s Climate Action Plan target for demand flexibility.

Flexibility is the ability to use or store renewable electricity when and where it is available. There are different ways that we can become flexible in how we use electricity in Ireland, for example managing our electricity demand, or using electricity storage. If we use the flexibility available to us effectively, we can reduce or delay the need for new infrastructure, by adapting demand patterns to make greater use of the infrastructure already available, and we can integrate variable renewable energy sources more efficiently.

The Clean Energy Package⁹ is a body of EU energy legislation introduced over the period 2018–2019 to introduce more ambitious renewable energy targets across Europe and mandate approaches to achieving these targets through greater citizen participation, empowerment and engagement. The introduction of local flexibility markets which all customers can participate in is central to this, and in Ireland we are taking a leading position in this regard. ESB Networks launched local flexibility pilots in 2022 and committed to their widespread rollout from 2023 onwards, with flexibility becoming part of our business as usual before the end of PR5¹⁴.

Approximately 40% of Ireland’s carbon emissions today come from heating and transport. To empower our customers to move to a low-carbon society, we must enable them to choose electric heating and transport and ensure that our customers can run their homes and businesses on renewable electricity.

However, to do this, we need to meet several challenges:

- Provide customers with network access so that they can charge their cars, heat their homes, and power their businesses.
- Connect and manage high volumes of renewable electricity generation and store renewable electricity when customers don’t need it.

- Enable and incentivise customers to use renewable electricity when it is available.

What Is Demand Flexibility?

“Demand flexibility” means the ability to use or store renewable electricity when and where it is available. Flexibility depends on having accurate information about the availability of local renewable generation and local network capacity.

Customers can be “flexible” for example by charging their electric vehicle when their neighbours’ solar panels are generating, by choosing to run their wet appliances during off-peak or high-wind times of day, or by connecting a range of in-home devices to a home energy management system that coordinates smart devices (like smart EV chargers, smart heating systems, and smart solar panel inverters).

Business customers can be “flexible” by managing their production schedules to align with low price/off peak/high wind periods, by temporarily reducing cooling or heating loads, by transferring data processing to alternative facilities, or by putting in place smart energy management systems in their offices and other facilities.

ESB Networks’ Strategy is to invest significantly in flexibility, as a solution to help actively manage the network and to provide opportunities for all customers and businesses to participate in climate action.

Like so many of the goods that we buy day to day, “buy local” is an important message when it comes to electricity. The electricity that we generate right across Ireland, in wind and solar farms, as well as from micro and mini generators, is 100% renewable. This means that using (or storing) electricity generated from renewables, when it is available, drives down our carbon footprints.

Buying and storing renewable electricity generated in Ireland reduces our dependency on imported fossil fuels and imported electricity. If there is renewable generation available locally in the distribution system, and local customer demand can be increased to use

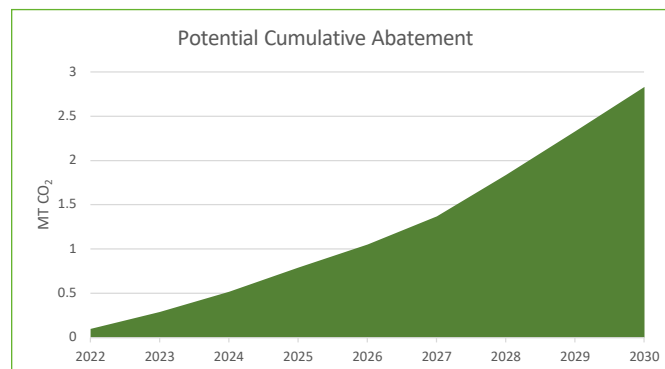
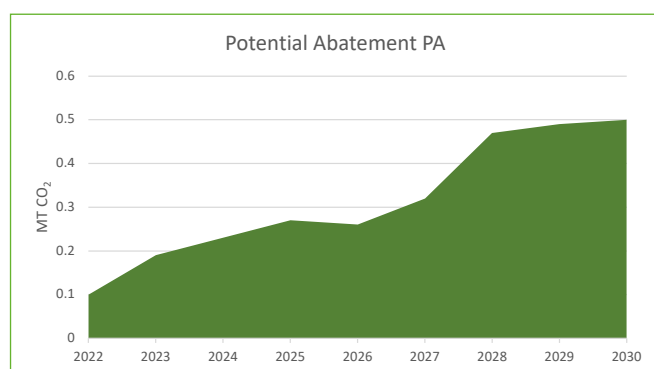
it, utilising that generation locally will minimise the transfer of energy onto the transmission system so that it can be used at distant/remote locations. When balancing this local renewable generation and demand, managing local network capacity and congestion becomes increasingly important. Finally, the TSO will become increasingly dependent on flexibility to deliver system services. As set out in the Distribution System Operation section, we have a growing responsibility to enable this through local optimisation and coordination with the TSO throughout the procurement, scheduling, and activation of flexibility to meet whole of system needs.

	What?	2030 Flexibility potential	Flexibility Duration
	Household devices	200 MW	Minutes - Hours
	Smart heating	200 MW	Minutes - Hours
	Electric Vehicles	500 MW	Hours
	Energy Storage	1.7 GW	Hours
	Commercial Demand	1 GW	Minutes - Hours
	Industrial Heating & Cooling	2 GW	Hours

By choosing to use renewable electricity when it is available, we will minimise deployment of non-renewable sources at peak times (which are carbon intensive). When we do this together, right across Irish society, we can reduce our overall carbon footprint by millions of tonnes of CO₂, as illustrated in graphs below. To deliver these carbon savings, we have a national target for 15-20% of all electricity demand to be flexible by 2025, with an increase to 20-30% by 2030. Over the coming decades, as new technologies emerge and

consumer behaviours change, it may be possible to achieve higher levels of flexibility.

However, to make it possible for our customers to “buy local” in this way, ESB Networks’ will need to deliver a smarter electricity system and begin to actively balance flexible demand and renewable generation as we describe in the Distribution System Operation section of this Strategy.



4.3.2 WHERE WE ARE TODAY

Flexibility and a Smart Electricity System

To enable customers to become flexible with their electricity demand, customers must have options as to when they use electricity, and this must in turn be enabled by new technologies such as smart car chargers, smart heating controls, or even smart fridges, washing machines or other in-home devices. People can choose new and different behaviours, to manage the use and cost of electricity while they transition to a net zero, provided that they have the right technology and support.

A “smart electricity system” will give customers information like the price, origins (local or remote generation) and carbon intensity (renewable or non-renewable) of the electricity available to them.

While a smart electricity system is important, customers also need new products and services using this smart electricity information, to help them save money, and reward them for choosing to be flexible. Therefore, ESB Networks is introducing new products and services to provide customers with these rewards. So once a customer chooses to become flexible, and sign up for a new service, the smart electricity system will let customers know (on their phone, tablet, or computer) when they can potentially earn money by being flexible. For example, in some jurisdictions customers are getting paid to charge their cars on the signal from their supplier or local aggregator (aggregators are enablers of small load customers to participate in wholesale and balancing markets). This is to avoid paying local renewable generators for constraining output during high wind/solar generation and local congestion/capacity limits.

In 2021 we launched our new services roadmap, with a range of local, community, business and personal

dashboards announced to provide customers with trustworthy, tangible information about their carbon footprint, and how they can take control.

In 2021 we also began launching a range of new products designed to reward customers for taking control of their electricity demand and becoming flexible. The products and services we introduced so far are set out in the table below.

Wherever you are across Ireland, there are alternative routes on our network to ensure continuous supply of electricity. This means that when an electricity circuit is damaged or out of service for maintenance, we can continue to supply you with power. However, there are stronger and weaker routes along the network.

‘Secure’ is a product we launched in 2021 to manage demand when we need to use some of those weaker routes. This can happen when we need to take a stronger circuit out of service to connect a new customer, or when a stronger circuit is damaged by weather, wildlife or local construction works. When there is a network fault, or a planned outage in their area, ‘secure’ customers are notified of the demand reduction (or in some cases generation) they need to provide, and when. These customers are paid for being available, and for the reduction in demand or increase in generation they provide.

‘Sustain’ is a product we launched in 2022 and is used to manage known network capacity/congestion issues in a particular zone until the necessary upgrades on electricity network are completed. The ‘sustain’ customers are required to agree to reduce their demand regularly (for example every weekday at a pre-defined local peak time) to ensure that network capacity is not exceeded.

	Product	Purpose	Usage	Launch	Target Market by 2030
	Secure	Enabling electrification Enabling growth Security of Supply	Pre-fault Service	2021	2,000+ MW
	Dynamic		Post-fault Service	2021	
	Sustain		Planned Service	2022	
	Beat the Peak - Domestic	Reducing carbon Reducing costs Security of supply	During Peak Events	2022	0.5 GW
	Beat the Peak - Active		During high renewable times	2022	0.25 GW
	Reactive power	Enabling renewables	Local voltage support	2022	1.5 GVar

Beating the Peak with Behavioural Insights

In 2022, ESB Networks introduced the “Beat the Peak” pilot, where we worked with domestic customers to become flexible, and shift their demand away from peak times. The pilot built on insights we had gathered from behavioural initiatives internationally and from our Dingle project.

For example, one of the innovations in this pilot was that we introduced pro-social incentives (an option for customers to allocate their financial rewards for flexibility to a charity, and highlighting the environmental benefit of beating the peak) because behavioural research has shown that adopting a pro-social approach can lead to more lasting behavioural effects when the financial stakes are low to the individual customer, compared to messages around cost savings.

Then, to ensure we understand the impact of this (and other) innovations in the Beat the Peak pilot, we commissioned extensive measurement throughout the campaign, including surveys, panel profiling, focus groups, web analytics, social media analytics, and energy usage analysis.

ESB Networks is delivering a programme of customer research, awareness, education, behavioural initiatives and partnerships through the National Network, Local Connections Programme¹⁵. Our purpose in doing this is to make flexibility a reality for all our customers, by understanding where they are and what they need today, applying these insights and setting targets for increased awareness and participation year on year.

All these initiatives are underpinned by our national customer research programme, which is being delivered by ESB Networks. The objective of this research programme, which combines qualitative and quantitative customer research is to ensure that we – and other organisations across our sector, have a clear evidence basis for designing our demand side flexibility services and programmes.






Throughout the early phases of delivering the National Network, Local Connections programme¹⁵, we have learned that there is no “one size fits all” and no “standard customer” when it comes to empowering customers to become flexible. Through extensive stakeholder engagement and consultation (see below) we have learned that we need to adopt a hands-on approach to building customer participation, through piloting and partnership.



4.3.3 OUR FUTURE PLANS





New Products and Services

ESB Networks is introducing a range of new products and services that will enable and empower our customers to become more flexible. New services like community energy dashboards, personal or local renewable energy notifications, or renewable energy dashboards for businesses, will give our customers accurate real-time and forecast information about their energy. This information can be communicated directly to their smart devices, to their electricity supplier, or to customers themselves on their smart phone, tablet, or computer. Our new services and their timelines are listed in the table below.

Service	Purpose	Launch
 Community Energy Dashboards	Providing communities with insights into their community energy system, including live renewable generation insights, demand insights, and community flexibility schemes which reward the community for balancing their local demand and generation.	2023
 Flexibility Market Transparency	Provide market participants (e.g. electricity suppliers, aggregators, energy tech companies, developers) with market information, for example volumes and locations of flexibility services, pricing information, and in-market or out-of-market use of flexibility.	2023
 Local Energy Dashboards	Provide customers with insights into their local electricity system including live and forecast renewable energy, when local electricity demand is high (and expensive) or low (and low-carbon). Share information with customers about local services providers	2024
 Local Business Energy Dashboards	Provide customers with insights into their local electricity system including live and forecast renewable energy, when local electricity demand is high (and expensive) or low (and low-carbon). Share information with customers about local services providers.	2024
 Personal Energy Insights	Provide customers with insights into their electricity demand and how they could earn by becoming flexible. Provide electricity suppliers and other energy companies with information about where there is the potential to support customers and increase awareness of flexible demand.	2025-2027

We will introduce a range of new flexibility products over the next decade, for example, our “Green premium” product is designed to reward customers for acting flexibly, paying customers for shifting their electricity demand based on the local energy information we provide.

The products and services we introduce over the coming years are designed to reach a wide range of different customers, and achieve different objectives, as set out in the table below.

Product	Purpose	Usage	Launch	Target Market by 2030
 Green premium	Reducing carbon Enabling renewables	Reducing dispatch down Local optimisation	2023	0.8+ GW
 Restore	Enabling electrification Enabling growth Security of Supply	Restoration Support	2023	2,000+ MW
 Beat the Peak - Daily	Reducing carbon	During Peak Events	2023	0.25 GW
	Reducing costs Security of supply	During high renewables times	2023	0.8+ GW
 Islanding	Security of supply	Post-fault Service	Post 2025	0.8+ GW

Flexibility and Storage

In locations where there is a high penetration of wind or solar generation, or where there is very high demand for electricity (for example in cities), it is likely that the scale and duration of response required could not be provided by demand side flexibility alone. In these locations, we want to stimulate longer term investment in the technologies needed to support our local electricity system management, for example electricity storage. Storage can provide the flexibility needed to store excess renewable electricity, and then provide that renewable electricity to customers to use at more convenient times.

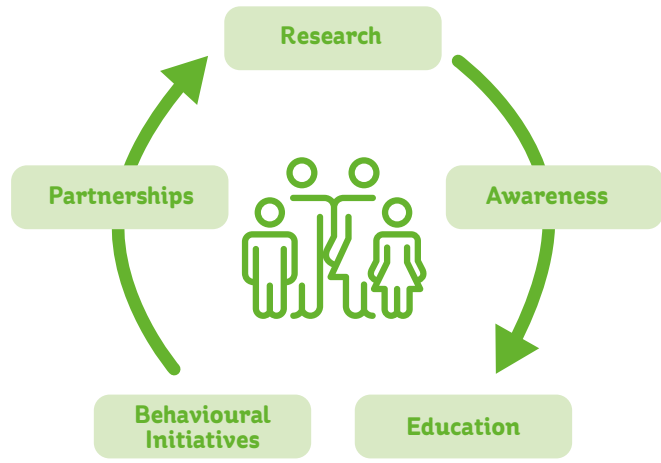
The highest potential storage locations for local storage to deliver a benefit to the system and earn sustainable revenues into the future, are the locations with the darkest blue renewable generation (wind or solar), and red (high demand) colour on the map here.

Over the past year, we have engaged with a range of innovative storage companies who are developing new technologies and business models, but who need a strong investment signal and confidence of a revenue stream to progress with investment. To stimulate this investment, we are considering offering longer term contracts to providers of larger scale, suitable flexibility services.



Enabling Our Customers to Benefit

Meeting Ireland's flexibility targets will depend on our customers choosing to become flexible customers, by changing our behaviours around when we use electricity, and adopting smart technologies in our homes and businesses. It will also mean changes for ESB Networks, as we enable and incentivise our customers to adopt these changes and managing storage and demand flexibility which will become a growing part of our everyday role. Refer to the 'Beating the Peak with Behavioural Insights' story box in the previous section.



4.3.4 ACTIONS

Our actions to deliver flexibility, to meet Ireland's Climate Action targets of managing 15-20% of electricity system demand flexibly by 2025 and increasing to 20-30% by 2030, include:

- Introduce community energy dashboards.
- Launch Beat the Peak Carbon Reduction product suite, initially targeting domestic customer, large energy user and storage investors.
- Commence nationwide rollout of local flexibility markets, with first go-live targeting early adopters and local business.
- Grow customer participation in local flexibility markets, including through industry partnerships, collaboratively building and sharing learnings/insights.
- Collaborate on the adoption of proposed smart consumer energy technology standards (e.g. smart inverters and smart chargers) at a national level.
- In 2025, launch roadmap to scale flexibility targets to 2030, in collaboration with customer representative bodies and energy industry stakeholders.
- Enable distribution customers to participate in wholesale electricity markets by 2030.





5

RESILIENT INFRASTRUCTURE



5

RESILIENT INFRASTRUCTURE



5.1 NETWORK CAPACITY

5.1.1 INTRODUCTION

Our ambition over the next decade and beyond is to build capacity to connect renewables to our network that will generate the clean electricity to enable decarbonisation of Irish society.

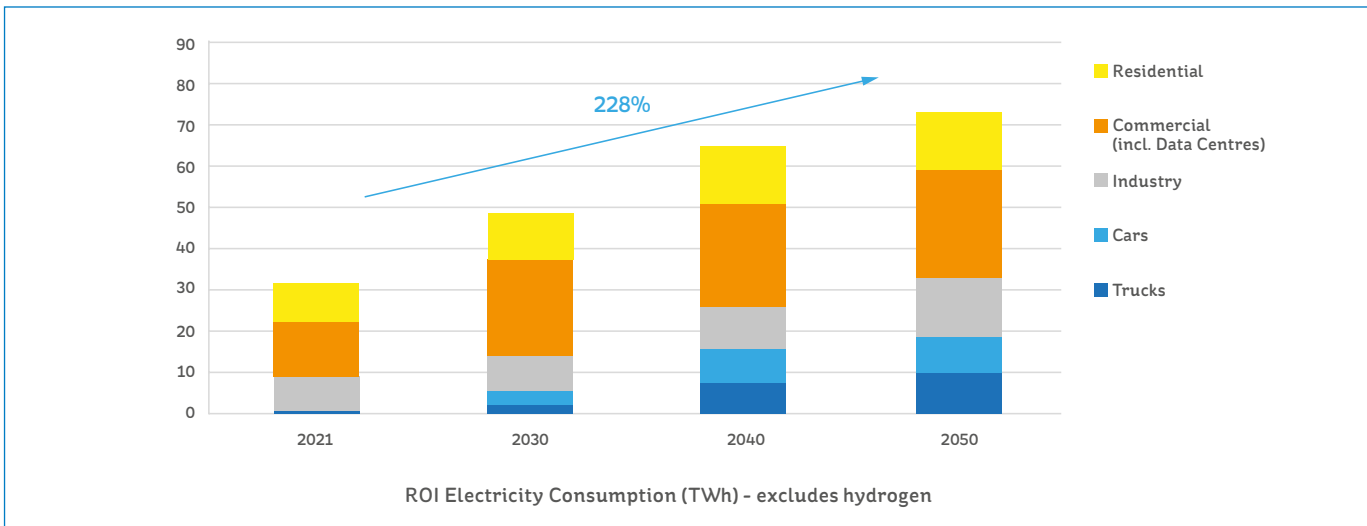
ESB Networks builds and maintains the high voltage transmission system and carries out all the functions relating to the electricity distribution system.

As the transmission system becomes reliant on the distribution system for essential system services and flexibility, future network development will require the whole of system perspective to planning and significant collaboration between EirGrid and ESB Networks.

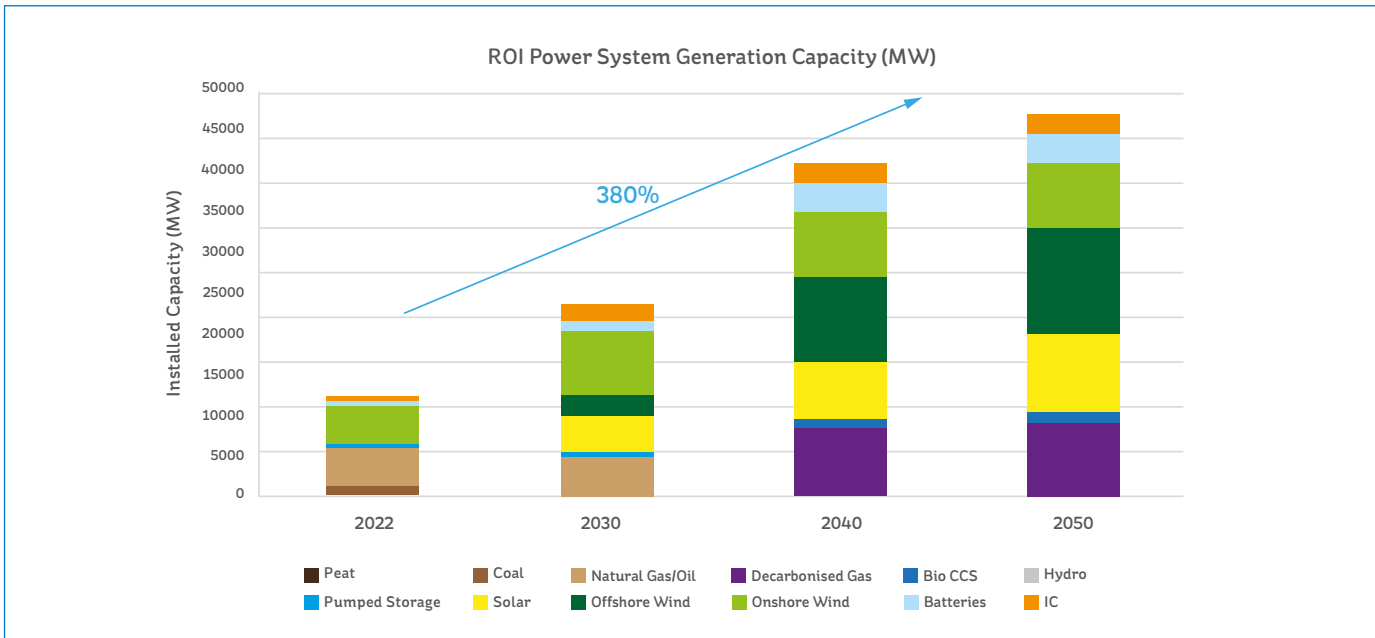
A major investment in network capacity/infrastructure across the distribution network is needed to deliver a Net Zero Ready Distribution Network by 2040. This is a key requirement to deliver on this Strategy. These investments include the development of new transmission and distribution lines and cables, electricity substations and transformers, as well as increasing the network capacity of the existing infrastructure. We have developed and will continue to develop new tools and procedures to enable the use

of new innovative technologies and concepts to solve constraints on the distribution network. Our aim is to optimise the investment by maximising the use of existing distribution network and smart solutions.

Initial results of a study carried out by MaREI (SFI Research Centre for Energy, Climate and Marine research and innovation) on behalf of ESB, estimate an increase in energy consumption to 49 TWh in 2030 (53% increase from 2021) and 73 TWh in 2050 (228% increase from 2021), utilised as shown in the graph below. This result for 2030 is between EirGrid’s median and high scenario (46.1 TWh median and 51.2 TWh high, EirGrid, Generation Capacity Statement 2022)³² and shows good alignment between the two studies. Whilst smart solutions such as flexibility will help to unlock some network capacity (refer to System Flexibility section of this Strategy), there will be a need for major investment in the electricity network capacity to deliver the transition to a net zero future.



The above-mentioned study also looked at how this energy could be provided by known and advanced technologies, and what mix of technologies would be required to decarbonise Ireland no later than 2050. The graph below shows one possible scenario of generation capacity mix needed for a net zero electricity system no later than 2050. Whilst the increase in consumption by 2050 is estimated to be more than twice today’s electricity demand, the increase in generation capacity needed to supply the load in 2050 is almost 4 times today’s generation capacity (from the graph below). This is mainly due to the capacity factors of renewable generation and the need to provide storage solutions. This clearly shows that there is a need for significant increase in network capacity, for a system whereby most (almost all) of our electricity is generated by renewables.



5.1.2 WHERE WE ARE TODAY

Shifting away from centralised thermal power plants as the main providers of electricity makes power systems more complex. Multiple services are needed to maintain secure electricity supply. In addition to supplying enough energy, these include meeting peak capacity requirements, keeping the power system stable during short-term disturbances, and having enough flexibility to ramp up and down in response to changes in supply or demand. The major change for the distribution networks will be a significant increase of power flowing through our networks at all voltage levels and in all directions (from one domestic customer to another, from a domestic customer to grid, from large renewable producer to any customer and so on). Solutions will have to be developed to deal with intermittency of renewable generation. In all scenarios, significant investment in network capacity will be a key component to deliver a Net Zero Ready Distribution Network by 2040. Long term network planning is a fundamental and essential process of an electric utility with the aim to determine the location, capacity, and time of new network investments to meet the future load demand with minimum cost, in an optimised timeframe and all the while continuing to ensure the reliable and safe operation of the distribution network. We are currently working on a comprehensive network development plan to guide our investments and as part of our submission for PR6.

Main Drivers for Capacity

The main drivers of the need for significant additional network capacity (described in detail in other sections of this Strategy: Connecting Renewables, Electrification and Customer Experience) are listed below:

- Enabling the connection of an additional more than 15 GW of renewable generation to the system at all voltage levels by 2030 (in alignment with CAP targets). Today there is circa 5.4 GW of renewable generation capacity connected to the electricity system in Ireland.
 - 75% of distribution connected wind generation (~1.5 GW) is connected to the 38 kV system. Today there are areas where the connection of renewable generation to the network has substantially used the available 38 kV network capacity.
 - Microgeneration, Mini-generation, Small-Scale Generation (SSG) and Non-Exporting generation (MECO). This generation is connected at our low voltage and medium voltage network. Microgeneration that is not consumed on the low voltage network when generated, creates a generation capacity requirement on the MV/LV transformers as it 'exports' onto the MV (10 kV and 20 kV) network. The minigeneration and SSG pilots have already created some generation capacity constraints on 38 kV/MV transformers and on our 38 kV network.
- The National Energy Security Framework¹² highlights the work required in strengthening the electricity network to ensure **security of supply** and reduce dependency on fossil fuels. Developing interconnections to other countries and delivering 2 GW of new flexible gas-fired power stations in support of a highly variable renewable-based electricity system will involve mainly large transmission projects that require significant investment, resources and considerable time to develop (2-10 years for transmission projects).
- **Demographics and development pattern** changes are driving increased need for capacity in already constrained areas. Co-location of residential developments with industry and commercial developments, already seen in West Dublin, is creating large spot loads and significant network capacity needs on both transmission and distribution systems.
- **New housing developments** that require higher capacity due to **electrification of heat and transport** requirements at the domestic level.
- **Upgrading the existing** low voltage network to accommodate **electrification of heat and transport at a domestic level**.
- Large scale **public charging infrastructure** requirements driven by AFIR (Alternative Fuel Infrastructure Regulation)¹⁰ to support electrification of transport, demand additional capacity at all voltage levels from LV to HV (motorway forecourts charging points and along National Road Network, fishing fleets and ports, both inland waterway ports and seaports, towns, tourist locations).
- **Electrification of public transport** such as DART extensions, Metro North, LUAS extensions, as well as fast charging facilities for the public transport fleet, all create significant demand for capacity on the 38 kV electricity network.
- **Electrification of heat in industry and commercial** will require significant increase in network capacity for these customers. This impact will be at the same size or even larger than total electrification of heat and transport at the domestic level, and is expected to be more concentrated in spot locations, given the current footprint of industry in Ireland.
- **New technology loads** such as data centres as well as the increase in industrial and commercial demand driven by growth of the **economy**.

Current Network Developments

There are a number of existing constraints on the distribution network that impact the available capacity for both renewable and demand connections.

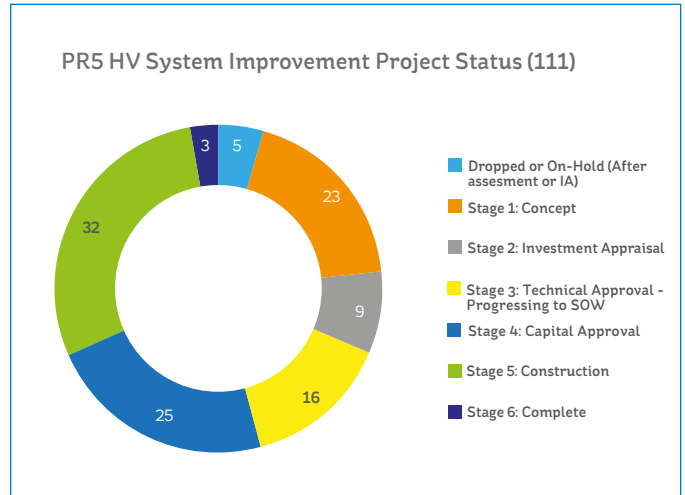
There is a high volume of 110 kV nodes (both on the transmission system and on the distribution system) where investment is required to ensure adequate capacity is available to facilitate connections out to 2030 and beyond. These nodes are in areas with existing high volumes of connected and contracted generation and customer applications. For example the west of the country (where there is a high density of wind) and southeast of the country (where there is a high density of solar applications). In urban areas such as Dublin, additional capacity is needed due to already significant electrification of transport, in both public and private spheres, alongside high demand for new housing and new technology loads.

To meet the increased demand in Dublin by 2030, additional transmission infrastructure is required to supply distribution electricity demand. This includes additional transformer capacity at existing Bulk Supply Points and new Bulk Supply Points with associated additional cables. The provision of flexibility services and storage to move demand from peak times and carefully located generation plant will also play a role in meeting this demand. ESB Networks is working with EirGrid to ensure that this essential requirement is fully integrated and forms part of future network development considerations.

Significant investment has been approved in PR5¹⁴ to start to address several existing challenges as shown in the table below.

PR5 ¹⁴ Investment	€ million
HV Distribution System Improvement	243.0
20kV Network Conversion	130.0
MV System Improvement	36.0
LV System Improvement	134.0
Innovation/R&D	20.5

The graph below shows the status of HV (38 kV and 110 kV) distribution system improvement projects so far in PR5¹⁴ (two years into a five-year programme). These are all large projects that take several years to complete, and the graph below demonstrates significant progress in delivery of these projects. More than 30% of projects are either in construction or complete.



Year	BEV	PHEV	Total EV's	Total Charge Point Capacity Required [kW]
2022	35,104	32,392	67,496	56,483
2025	101,920	94,080	196,000	164,013
2030	491,400	453,600	945,000	790,776
2040	1,040,000	960,000	2,000,000	1,673,600

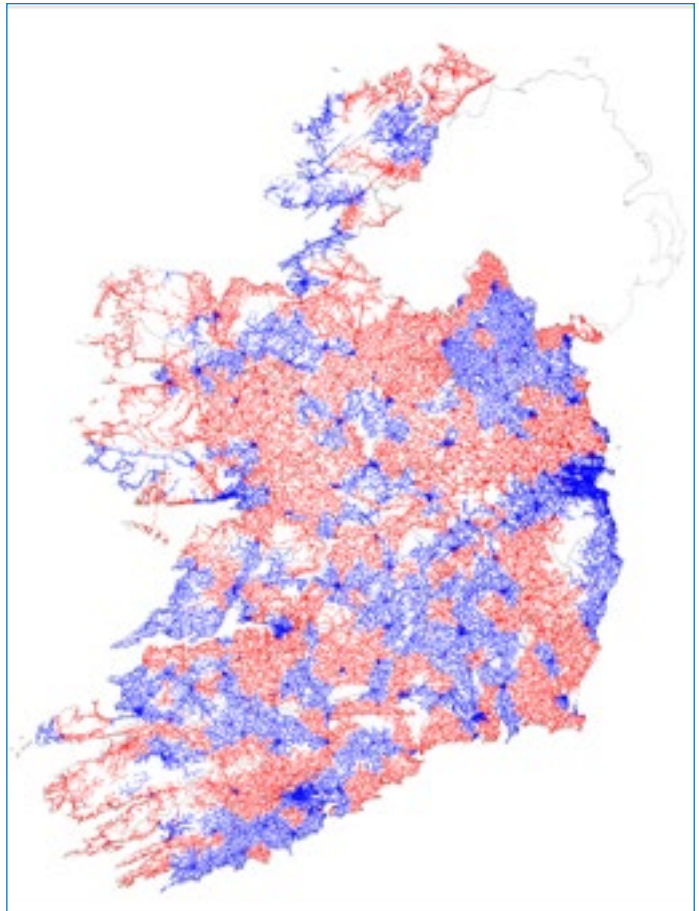
Significant requirements for network capacity at MV come from the electrification of transport. There is currently 51 MW of charging capacity installed on our distribution system. The early indications show that an additional 115 MW of charging capacity will be needed by 2025, and another 635 MW (this is the equivalent of adding more than 115,000 new electrified homes to the system) by 2030. The charging capacity will need to double from 2030 to 2040 to comply with AFIR¹⁰. These requirements are shown in the table above.

ESB Networks is currently upgrading the 10 kV medium voltage (MV) network to 20 kV. This provides a number of advantages such as, four times more capacity on the MV network and reduction of losses. Currently approximately 53% of the MV network is now rated to 20 kV, as shown on the map (right).

Whilst upgrading the remaining 47% of the MV network to 20 kV will create additional capacity at MV, the capability of the MV system is completely dependent on the upstream HV/MV network and so further work on the MV system will not obviate the requirement for extra capacity infeed from the high voltage (HV) system (38 kV and 110 kV), as already described at the start of this section.

Up to 2019, we designed our LV network for an after diversity maximum demand (ADMD) of 2.5 kW for each domestic customer to support domestic load. In consideration of electrification of heat and transport, we have now revised our LV standard design, more than doubling the allocated capacity in all new-build housing developments. Approximately 50,000 of new homes since 2019 have been designed to accommodate this new and additional load anticipated for electrified heat and transport.

Additionally, through our proactive low voltage system improvement work programme, we are progressively increasing capacity for our existing domestic customers who are now adopting low-carbon technologies in their homes. This is described in more detail in the Electrification section of this Strategy.



Map of 20 kV status April 2022 (20 kV is RED and 10 kV BLUE)

5.1.3 OUR FUTURE PLANS

To support all our customers on their net zero journey, we will design our 'Build Once for 2040' concept, to provide optimal strategic investment.

To provide adequate capacity for connection of renewable generation at all voltage levels, as part of our 'Build Once for 2040' concept, we are proposing to develop renewable hubs. Renewable hubs will be 110/38 kV and 110/MV substations where clusters of renewable generation will be connected. This should allow more microgeneration, mini-generation, and small-scale generation to be connected to the distribution system. Connection charging policy changes will need to be considered in conjunction with the development of renewable hubs.

To enable this, we are finalising our 'Advance Infrastructure Policy' that will inform network planning studies and investment appraisals about standardisation options and minimum equipment ratings to create additional capacity quickly and ahead of time, for both generation and demand customers. This will

require coordination across the distribution and the transmission system, working closely with EirGrid. We expect to publish a consultation on this in the coming year.

We will develop a 'network growth development assessment tool' to determine what capacity headroom is required to enable decarbonisation of Irish society no later than 2050, where this capacity headroom is required, when it is required and at what cost. The quickest way to scale planning and delivery is to standardise and modularise designs. A green field standardised solution approach will be rolled out to create additional capacity required to that of the existing population of substations. The current population of substations approaching end of life must also be refurbished and maintained.

We will progress our 'Greenfield Site Policy', where a full station capacity is built to allow for future growth (both generation and demand).



Our ‘Greenfield Site Policy’ will include:

- Upgrading of existing substations, particularly in modern substations (<20 years old) that are ‘ready’ for upgrade (from 5 MVA to 10 MVA transformers for example).
- Upgrading of older legacy 38 kV substations (-40-60yrs) is not preferred due to the combined issues that arise such as, but not limited to:
 - inefficiency of creating bespoke designs and layouts for each station,
 - difficulty to achieve network outages to construct given tight network capacity,
 - more capacity is added to the network with a new build than with an upgrade (for example, an upgrade of an existing 2x5 MVA to 2x10 MVA station adds 10 MVA installed capacity, whilst a retention of an existing station, and construction of a new 2x10 MVA station will add 20 MVA capacity to the area) and,
 - local security of supply and continuity performance is significantly improved with a scenario where the new substation is added and existing retained.
- It is assumed the existing asset base of approximately four hundred 38 kV substations will remain in service until their end of life. Life extension will be explored by asset managers to preserve the capacity where needed. Life extension may involve rebuilding the station using standardised modular designs.
- If life extension of an existing station is recommended by the asset manager, this could be facilitated much more easily once the new station has been built to enable load transfers during construction.

We will adopt an approach whereby the provision of uncommitted HV transformer capacity is allocated to the expected future demand growth due to electrification of heat and transport for any connection or station uprate. A similar approach is already adopted for mini-generation and microgeneration.

We will carry out a macro national assessment of sites requirements for 2040 to support the capacity needs. We will identify at a county level, the number of new substations needed for 2040 and create a prioritised list of sites required to ensure we have sites available 5-10 years before energisation.

There are many technical challenges to overcome and new technologies to incorporate into both, the distribution and transmission systems, to deliver a reliable low-carbon energy system. ESB Networks is putting considerable effort into this for both the distribution and transmission systems. ESB Networks, in our role as onshore Transmission Asset Owner (TAO), is working collaboratively with the TSO EirGrid to review new technologies for use in their Technology Toolbox for future transmission network planning and development. Identifying these technologies and then working out how to successfully implement them on our network is a complex process particularly as our network, due to its small island nature, tends to offer challenges not often found on other networks deploying the same technologies. The emergent nature and maturity of the technologies also means that answers are not always readily available as to how they might impact on the network. Applying appropriate engineering rigour to protect the system while exploring ways to make the system amenable to more renewable generation is a major challenge which ESB Networks is embracing with our TSO colleagues.

We will utilise the existing potential extra capacity that may be available by adapting new technology approaches such as battery energy storage solutions to relieve constraints, multiple legal entities behind the single meter for renewable generators and flexible connections (designed to provide maximum capacity during specific times in the day and constrain capacity at peak times).

5.1.4 ACTIONS

Our actions to deliver network capacity needed to achieve CAP² targets by 2030 and beyond to a net zero no later than 2050 include:

- Publish our capacity paper in 2023 that will address current plans to absorb electrification of the system, connect renewables to decarbonise electricity and provide capacity for new demand driven by increase in population and the growth of the economy.
- Adopt 'Build Once for 2040' concept to provide adequate capacity for decarbonised society, and develop Advance Infrastructure Policy.
- Publish the Network Development Plan as required by the EU Electricity Directive³³, by the end of 2024.
- Engage with our contractors to increase the pace at which the remaining 10 kV network is converted to 20 kV. This will result in a 60% increased capacity on our MV network from current levels.
- Work closely with EirGrid to plan and deliver a large programme of transmission works for 2030, especially the work required for delivery of onshore facilities to connect offshore wind generation.



5.2 TRANSMISSION DELIVERY

5.2.1 INTRODUCTION

ESB Networks strategy for the transmission network builds on the recent success of managing and funding the efficient delivery of €750m of new and upgraded transmission infrastructure in the period 2017-2021.

The required investment is projected to rise further over this decade to meet the climate action challenge as detailed in EirGrid's Shaping our Electricity Future³⁴ publication. We commit to working with EirGrid, the CRU, the electricity industry, customers, stakeholders, and society to transform our electricity infrastructure, and deliver Ireland's clean electric future.

As the licenced onshore Transmission Asset Owner (TAO) in Ireland, ESB Networks is responsible for managing and delivering the detailed design construction and maintenance of the transmission network. ESB Networks funds the large-scale investments and arranges procurement of materials and specialist skills for construction, maintenance, repair, operator attendance, telecommunication services, and emergency response for the transmission network.

These works are delivered in collaboration with EirGrid, who is the licenced Transmission System Operator (TSO) and responsible for planning the development and operation of the transmission system.



ESB Networks and EirGrid work in partnership to fulfil our respective roles to ensure that all steps in the development, construction, connection, operation, and maintenance of grid infrastructure are carried out efficiently and cost effectively. The CRU (Commission for Regulation of Utilities) regulates the TAO and TSO activities and approves the revenues for each five-year funding period. The current joint PR5¹⁴ (Price Review five) period runs from 2021-2025. The CRU monitors performance and applies incentives and penalty arrangements for key activities which are independently audited. ESB Networks will:

- Carry out all transmission works and activities safely for the public and workers
- Collaborate with our strategic partners, industry, and customers
- Deliver on-going system security, reliability, resilience, and 24/7 operations, storm and emergency response
- Support new customers and renewable generators to connect to the Transmission network including via the contestable connections process to build their own network connection.

- Deliver the Transmission Development Plan²² by implementing robust multiyear planning, strategic procurement, and enhanced delivery mechanisms and resources
- Maintain affordability and efficiency for the transmission electricity customer
- Embrace innovation and leverage digital and technology solutions
- Fulfil our environmental and sustainability obligations
- Engage co-operatively with landowners and all statutory agencies

The Electrical Transmission System

The nationwide electricity transmission system carries high volumes of electricity at high voltages from large generators and storage facilities to bulk supply points near our main towns and cities. From these, it connects with the distribution system, as well as to the transmission systems in Northern Ireland, Britain and directly with some large industrial customers. The Transmission Network consists of overhead wood pole and steel tower lines, underground cables, electricity substations, with voltages of 400 kV, 220 kV and 110 kV.



Circuit length 7,122 km	
400 kV OH lines	438
400 kV cables	3
220/275 kV lines	1824
220/275 kV cables	173
110 kV OH lines	4352
110 kV cables	332
Total	7122



Transformer Substations 165	
400 kV substations	5
220 kV substations	27
220 kV switching substations	11
110 kV switching substations	52
400/220 kV transformers	9
275/220kV transformers	3
220/110 kV transformers	56
110 kV transformers	2
Total	165

5.2.2 WHERE WE ARE TODAY

Project Development and Delivery

ESB Networks designs, procures, manages, and delivers the transmission projects, contained in EirGrid's Transmission Development Plan²², to support the electricity customer, the Government's Climate Action Plan² and the Irish economy. ESB Networks has grown its transmission project development and delivery capabilities, to meet these needs, and continues to build on and enhance its processes and collaboration with strategic partners and stakeholders. Transmission capital projects are complex, extending over several years depending on the nature and scale of the work.

ESB Networks has resources dedicated to Transmission project design and delivery distributed in offices nationally, as well as framework agreements with panels of national and international contractors and suppliers. A dedicated delivery team for major transmission projects has also been established, and ESB Networks employs industry leading project management methodologies, training, systems, and tools to enhance the predictability and certainty of project delivery and to de-risk and accelerate the critical construction stage of transmission projects. EirGrid secures the Planning and Environmental permits for new or upgraded transmission infrastructure and also secures the landowner access required to design and build the projects. ESB Networks provides design and methodologies to mitigate the impacts of construction activities and ensures appropriate discharge of all permit conditions to comply with planning, environmental, and sustainability requirements. These requirements continually evolve, and our Strategy commits to keeping up with, and leading, on these developments and engaging co-operatively with landowners.

Looking ahead this team are constantly innovating in the areas such as identification of new technologies, new construction materials and new methods of working. Proactive procurement strategies are also being deployed to ensure the materials are available, (in our disrupted international economies) to meet the project demands.

Maintenance

On-going maintenance and repair are crucial to ensuring the resilience of the transmission network

and this is carried out by ESB Networks, utilising teams of highly skilled technicians and specialists distributed nationally. ESB Networks delivers transmission maintenance efficiently and to a high standard contributing to the health, performance, lifespan, safety, and security of the transmission system. ESB Networks teams are on standby 24/7 all over the country to support the transmission network in storms and emergency situations. ESB Networks conducts all the necessary patrols, assessments and equipment checks according to the policies and standards set by EirGrid (as TSO) and work with them to manage the assets and identify and deliver the optimum servicing and corrective works in a timely manner to maintain a resilient network.

The Scale of the Transmission Challenge

The transmission network is evolving in new ways and at unprecedented pace. The rapid transition to a low-carbon future necessitates the connection of large volumes of onshore wind and solar, high-capacity storage solutions, offshore wind, and further interconnection with other transmission networks. Where possible, recent technologies are being deployed to maximise the capacity of the existing transmission network. However, the strategy also requires significant upgrade works on existing circuits and the build out of new substations, lines, and cables.



Low-carbon Future

The transmission network must support up to 80% of electricity generated from renewables by 2030.

The delivery of a low-carbon energy system presents a range of challenges such as:

- A significant increase in the number of renewable generators in-feed points on the system.
- The development of large offshore wind generation sites and the requirement for multiple significant grid reinforcements to accommodate this. The alignment of the offshore and onshore development projects is a particular challenge with both programmes needing to complete their scope of work within the same period.
- There will also be an increased requirement to further integrate new systems of electricity storage and other flexible system supports for periods when the wind and solar are not available.
- Increasing renewable generation on the distribution network will bring additional demands onto the transmission network. We will continue to work with EirGrid to have an integrated “whole of system approach” to optimise investment across distribution and transmission.

ESB Networks is investing in our organisation to ensure we have the essential skills, competency, and structures to deliver these ambitious challenges in a cost-effective manner. ESB Networks is also working actively with suppliers, contractors, customers, landowners, and stakeholders to ensure the necessary frameworks are in place to deliver.



5.2.3 OUR FUTURE PLANS

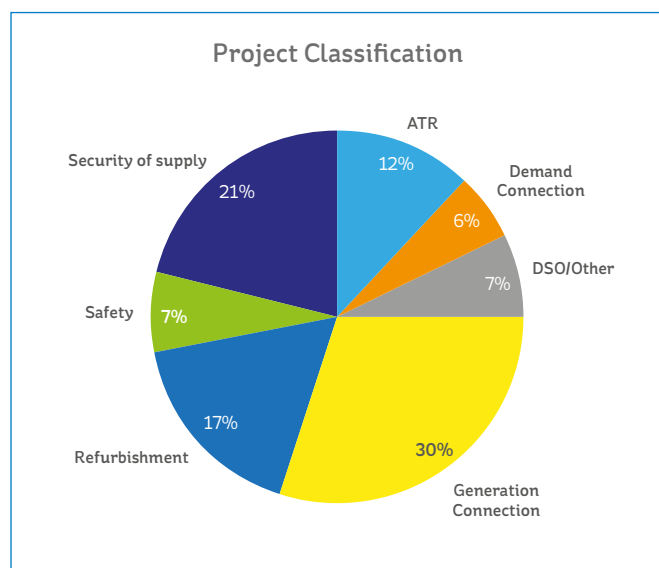
ESB Networks transmission delivery and associated work programmes support delivery of EirGrid’s Shaping Our Electricity Future³⁴ roadmap to meet the targets in the Government’s Climate Action Plan². The integrated work programme includes up to 350 individual transmission projects, which will require very significant investment to deliver a low-carbon future, energy independence and security of supply. As this plan is further developed by EirGrid, ESB Networks will respond with agility to changing circumstances and will build this flexibility into our organisation and resourcing. Success will be measured by connecting large volumes of onshore wind and solar renewable connections, grid scale storage solutions and enabling the development and connection of Ireland’s offshore wind potential. ESB Networks is working actively and collaboratively with its strategic partners and stakeholders to deliver the transmission challenge and convert it to defined and implementable annual and multi-annual business plans and targets. Almost half of the investment is required in the eastern/greater Dublin region of the country presenting an ambitious programme to be delivered in a relatively short period of time.

Interconnection and Security of Supply

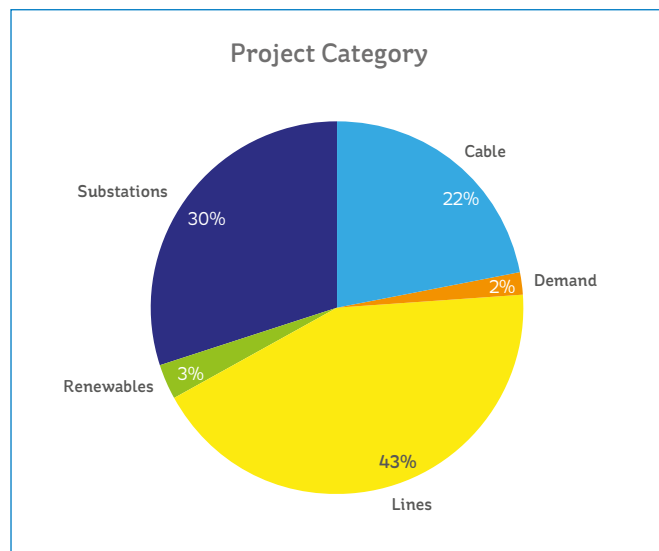
In addition to the existing interconnectors with Northern Ireland and Great Britain, a new interconnector with Northern Ireland is commencing shortly and works are planned to facilitate two further large interconnectors with the European Transmission system. Increased interconnection improves system resilience and ability to operate with 80% renewables. In addition, due to the current system capacity and security of supply challenges, ESB Networks will be accelerating projects to connect emergency generation plant until newer, more flexible generators and storage solutions come on stream for system stability and for back-up during low wind periods.

Summary of Transmission Projects to 2030

Total Number of Identified Projects = 348



Note: ATR (Associated Transmission Reinforcement)



Bulk Supply Points and the Dublin Distribution Network

System studies by ESB Networks, in its role as DSO, have identified a requirement to upgrade the Dublin electrical infrastructure to meet future electricity demand requirements on the distribution system. ESB Networks has identified the need for three new 220 kV bulk supply points in Dublin. Additional transmission work is also required including the upgrade of existing substations, construction of new infrastructure, replacement of existing fluid filled cables and new ducting to pave the way for offshore wind connection. These planned infrastructure upgrades are essential to meet current demand growth, and to accommodate capacity requirements to meet sustainability goals relating to:

- Demand growth due to customer retrofit of heat and transport using heat pumps, home charging and solar panels
- Electrification of public transport (Dart/Metrolink), transit hubs (ports and airports) and public EV charging stations
- New residential housing & commercial developments to higher electrical specifications
- New industrial developments in business parks
- New electricity market aggregation models for electricity demand and supply to provide system support services and developments of peer-to-peer or site-specific arrangements.

ESB Networks and EirGrid are working together to develop and deliver these projects to meet Dublin's future capacity needs. New large energy user data centre sites are separate to these projections for Dublin's load growth and are assessed individually by EirGrid for connection and will be catered for under the CRU's new data centre guidelines on a project specific basis.

Innovation

ESB Networks, is working collaboratively with EirGrid to review recent technologies to add to the 'Technology Toolbox' for future transmission network planning and development. Some of the recent examples from Technology Toolbox to Business as Usual are:

- Deployment of 220 kV reactors to alleviate overvoltage for renewable generation connections.

- Overhead line Dynamic Line Rating technology to enable additional load on circuits using dynamic ratings rather than seasonal ones,
- Higher capacity high voltage cables utilising standard trench.

A joint working group is identifying these innovative technologies and then working out how to successfully implement them on the transmission network. Joint process improvements and enhancements to Asset and Programme Data exchange are ongoing. Data and digital first strategies are an essential part of ESB Networks strategy to leverage technology and share information and data to the greatest extent possible with its strategic partners and key stakeholders to develop solutions.

ESB Networks will continue to innovate its processes, systems, and technologies to reach the 2030 strategic goals. We will secure our systems from cyber threats and attacks in line with best practice appropriate to critical electrical infrastructures and the associated and evolving risks.

Distribution System Operator (DSO) – TSO Interoperability

As society increasingly relies on electricity for its energy needs, interoperability of the Transmission and Distribution systems is required including new 'smart' solutions and technologies involving all connected customers. ESB Networks' Strategy is to deliver an optimal whole-of-system solution for Ireland, its economy and society for 2030 and beyond. This will be a key enabler in Ireland meeting its 2030 decarbonisation targets and the goal of carbon neutrality no later than 2050. ESB Networks is working with EirGrid, customers and all other interested parties to innovate and deliver in achieving these objectives.

5.2.4 ACTIONS

Our actions to deliver the transmission network needed for Ireland's clean electric future include:

- Deliver the Transmission Development Plan²² and the pipeline of projects in collaboration with EirGrid.
- Work with EirGrid to both maximise availability of transmission outages and utilise available outage time efficiently to complete the required construction works.
- Deliver the transmission projects on the east coast, to enable the development of offshore wind projects and to provide the additional network capacity in Dublin.
- Supporting new customers and renewable generators to connect to the transmission network including via the contestable connections process to build their own network connection.
- Delivering the Network Delivery Portfolio by implementing robust multiyear planning, strategic procurement, and enhanced delivery mechanisms and resources.
- Deliver the additional Bulk Supply Point capacity in Dublin area to support the forecasted demand growth.
- Assess and deliver new technologies to facilitate the increase in renewable generation connections and enhance security of supply.



5.3 RESILIENT NETWORK

5.3.1 INTRODUCTION

At ESB Networks, we are leading the transition to a low-carbon future powered by clean electricity. This means developing, operating, and maintaining a network that supports the secure and affordable distribution of sustainable low-carbon electricity.

Our electricity system is currently undergoing major change, driven by Ireland's commitment to source 80% of electricity requirements from renewable sources by 2030 and facilitation of our customers to reach a net zero no later than 2050. The electricity networks are being adapted to meet this challenge.

As decarbonisation of society develops through electrification, and the dependence on the electricity network increases, the quality, condition and performance of the network will become increasingly important.

We are experiencing an increased number of exceptional weather events. Increased wind speeds and more frequent storms are causing damage to the overhead network. Wind in particular creates network reliability challenges, as overhead network damage is caused by fallen trees, debris and branches. Climate change is leading to longer growing seasons, increased rainfall, and rising temperatures all of which increase vegetation growth. Climate expertise on patterns and severity of climate change, will further inform

our understanding of the impact of such change on our electrical networks and how we adapt electricity networks to be more resilient to any increased frequency and severity of disruptive events such as storms and floods.

The impact of climate change and the increasing threat of cyber security, both risk prolonged outages for customers.

We are committing to adapting our network to ensure it is more resilient to the impacts of climate change and reduce its physical vulnerability to the increased frequency and severity of disruptive climate events such as storms and floods.

This will be achieved through proactively managing our assets, ensuring targeted work programmes are developed based on asset risk and criticality, continuously reviewing our cyber security approach and infrastructure and ensuring continuous improvement in how we manage network assets.



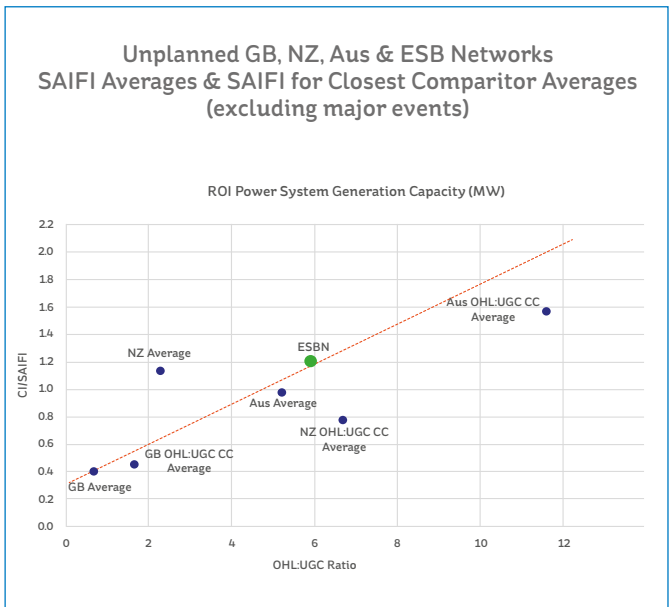
5.3.2 WHERE WE ARE TODAY

Network Reliability and Availability

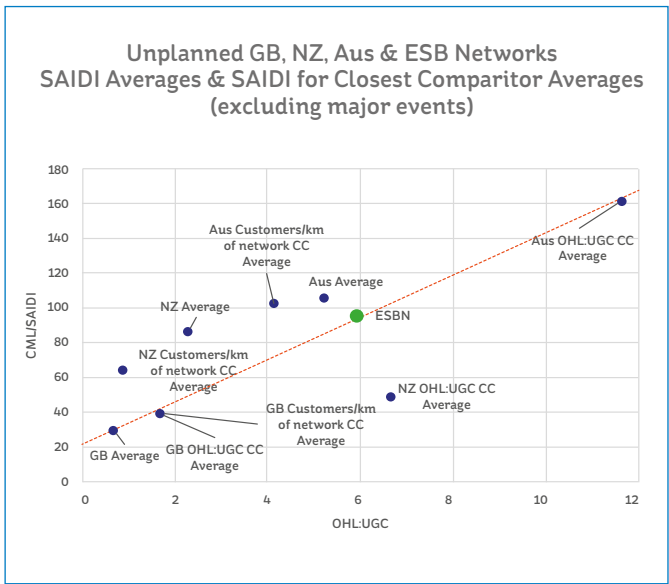
Having a high performing network is central to achieving net zero as a society. To achieve reliability and availability there is a need for planned interruptions which impact our customers. These are necessary for the installation of new infrastructure, maintenance, meter work orders, new connections, and follow-on repairs.

Our customers also experience unplanned interruptions. Distributed electrical infrastructure has an inherent risk of some of degree of fault resulting in customer interruptions due to weather, third party activities and equipment failure. This is particularly true for overhead exposed network. The distribution network in Ireland has up to six times more exposure to overhead network when compared with UK DNO's due to the rural dispersion of our population. Please see graphs to the right (WSP, International Performance Comparison Report, 2022) that show the relationship between ratio of overhead lines to underground network and unplanned outages (CI and CML).

Consequently, people in Ireland experience more interruptions due to the exposure of overhead network. Improving the performance of the network will give our customers confidence to make the transition to low-carbon alternatives. We recognise that we have a significant role to innovate and create a step change to reduce the level of interruption experience for our customers.



Customer Interruptions (CI) and ratio of overhead network to underground cables international comparison



Customer minutes lost (CML) and ratio of overhead network to underground cables international comparison

We are committed to ensuring that we can restore power safely and provide accurate and real-time information to our customers during unplanned outages. We have developed a customer portal that gives all customers access to their smart meter load consumption profile and includes PowerCheck³⁶ website (see map on the right) where our customers can get real-time information on the location of outages on our network and estimated restoration time.

At the core of the climate action plan is the intention to increase society's reliance on electricity. In addition, ESB Networks and EirGrid aim to intensify the utilisation of the existing transmission and distribution networks as part of this transformational use of Ireland's electricity system. Essentially, as system operators, ESB Networks and EirGrid must ensure that the system resilience and design is adequate to accommodate the outage opportunities needed for maintenance, refurbishment and end-of-life asset replacement as well as integrating reinforcements and new developments onto the Networks without undue impact on existing customers. Any solution must be tested for its ability to provide adequate opportunity to carry out all the necessary work maintaining security of supply throughout the transformation and beyond.

Network Lifecycle Management

ESB Networks' Resilient Network Strategy, outlines our advanced asset management approach which continues to strengthen our resilient network. By optimising and adapting our existing assets and implementing innovations to deliver a network which meets climate challenges and provides a safer, more resilient network, for our customers and enable the transition to a clean electric future. We are an industry leader in managing our network demonstrated by our ISO55001 accreditation for Asset Management since 2008. A key element of ISO55001 is continuous improvement and we are committed to ensuring we develop and enhance our lifecycle management techniques with the overall objective of further improving our resilient network.

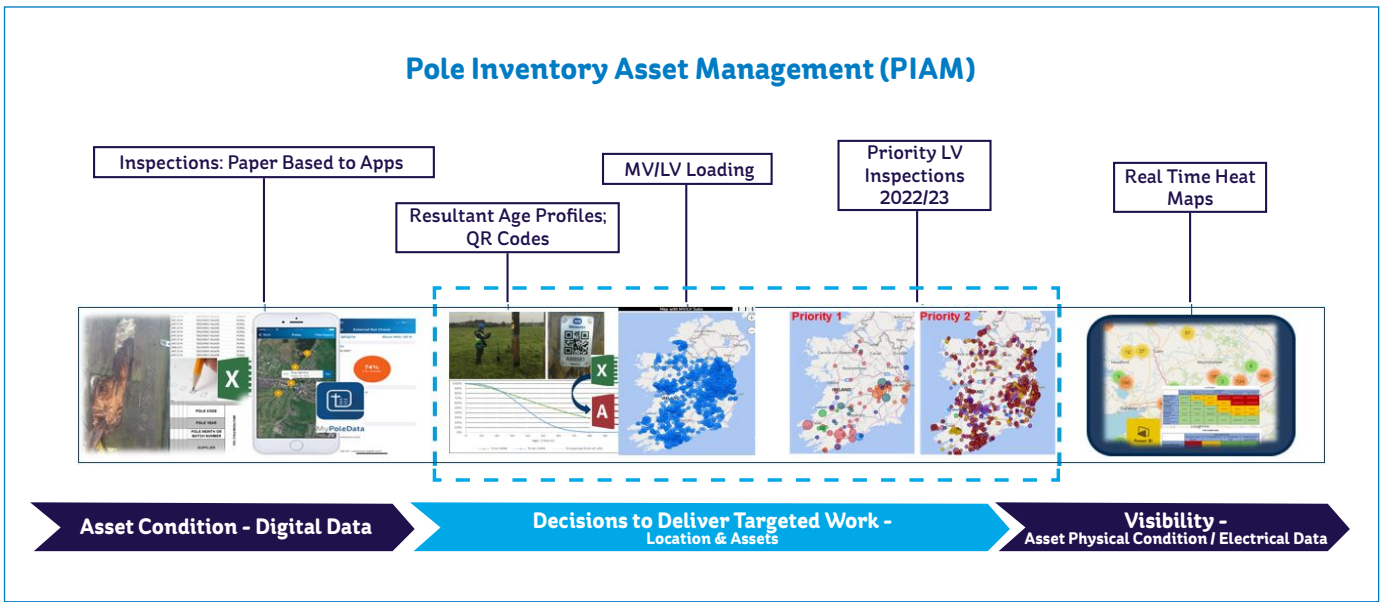
ESB Networks is further developing and embedding asset health and criticality approach (health, load & continuity) into our risk-based investment decisions



on the network. This involves leveraging our data to develop and evolve insights to ensure we are reducing and prioritising asset risk through our investment programmes.

We are prioritising and delivering timely investments to maintain the health of our assets through targeted maintenance and asset replacement programmes.

Over time, renewal of network assets is needed to manage the impact that their age and condition has on the network risk profile. In PR5¹⁴, ESB Networks has moved to an increasingly asset health and condition-based approach to managing this risk. ESB Networks' end-to-end asset management approach focuses on managing assets and risks by using data to inform decisions, define and deliver this targeted work. Our Pole Inventory Asset Management (PIAM) approach for our Overhead Network (outlined in figure on the next page) is founded on planned condition-based inspections, which capture the health and condition of the poles and network. This informs the decision, what work to do and when.



Our commitment to reducing the asset health related risk on the Irish distribution system will address identified condition, reliability, environmental, safety and operational cost risks associated with a large and distributed population of assets which have enabled social and economic development in Ireland over the past century.

Climate Adaptability

Physical effects of climate change create an increased risk of damage to ESB Networks assets and disruption to operations.

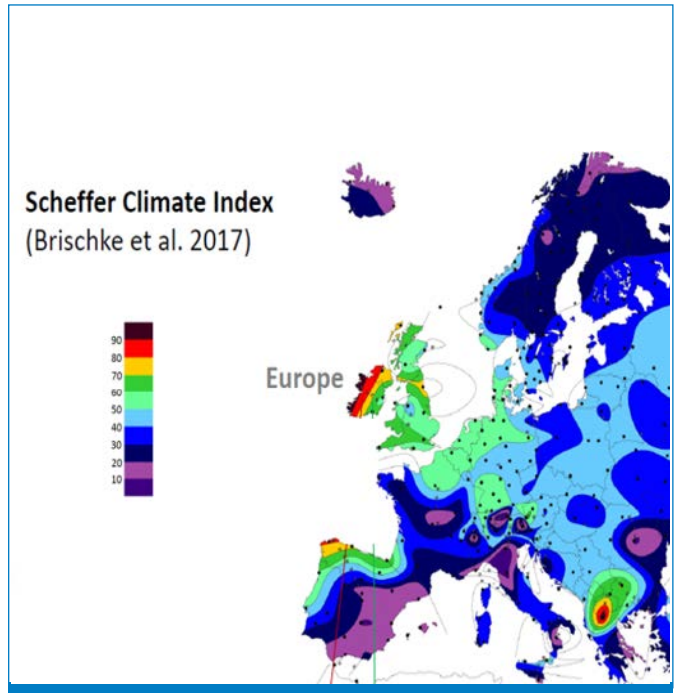
Having a resilient network and adapting it to meet these challenges form an important part of each Price Review¹⁴ period when we look out and plan the work and investment for the subsequent 5 years. Our climate adaptability and mitigating plans form part of our Price Review programmes¹⁴ approved by the CRU.

ESB Networks ISO55001 Asset Management approach is founded on a Risk Based approach which includes physical asset risks.

Our Strategic Asset Management Plan outlines our commitment to ensure the safety and resilience of our networks in the context of climate change and weather events such as storms and floods.

In addition to this ongoing risk management, we continue to evolve and adapt based on the findings of

longer-term climate scenarios. Our climate adaptability programmes are based on expert groups with evidence-based data. For Ireland, this includes findings from data and modelling undertaken by Met Eireann and the Environmental Protection Agency (EPA). International Indexes, e.g. The Scheffer Climate index, provide further understanding of the impact of climate change and Ireland’s specific exposure to certain elements (see below).



Increased storm impact requires greater investment in automation and control, as well as increased investment in vegetation management.

We continue to adapt our networks to reduce its vulnerability to climate events. **Key mitigating measures delivered so far as part of our climate adaptability programmes include:**

- Storm Recovery Plan based on weather warning level.
- Company standards and procedures such as 'Working with the Risk of Lightning' and 'Wildfire Alerts'.
- Protection policy to mitigate against the risk of wildfires and aligns with international utilities' best practice.
- Flood mitigating measures for specific High Voltage Substations identified as part of our modelling and aligning with expert data.

- Updated Timber Policy with increased clearances by cutting lower and with increased frequency.
- Innovative ways of working, including use of LIDAR (Light Detection and Ranging) devices for our helicopter patrols of our High Voltage overhead lines.
- Ongoing delivery of our MV Pole Inventory Asset Management Programme (PIAM), now extended to our LV Overhead Line network.

In addition, ESB Networks works in partnerships with other utilities, DNOs, Original Equipment Manufacturers (OEMs) and expert groups including CEATI / ENA / EPRI. Such partnerships foster shared learning and experiences as we build on proven solutions for selected works, and partner for new solutions.



Cybersecurity

ESB Networks' cybersecurity requirements are defined by the increased automation and smart grid technologies, growth in the use of electric vehicles (including smart charging technology), growth in small-scale generation (and future needs for controllability and system services), growth in the number of active customers (selling power produced by their micro-generation back to the grid) and more widespread deployment and use of smart meters (to enhance network performance and customer experience).

ESB Networks has utility-specific telecommunications requirements which cannot be delivered on commercially available telecommunications networks. ESB Networks requires a telecommunications network with high availability and coverage in rural areas where electrical assets are located. The network needs to meet

and comply with stringent cybersecurity performance and standards. We have conducted a strategic analysis on all telecommunications solutions available to deliver on the existing and future business needs. The only solution which successfully met all key criteria was the deployment of a private wireless network purpose built for ESB Networks.

Our cybersecurity strategy has the following objectives:

- Protect the network & assets, customer data and ensure the resilient operation of the network through the continued implementation of our information technology / operational technology (IT/OT) cyber improvement plans.
- Demonstrate resilience of our National Critical Infrastructure through compliance to the Network Information Systems Directive (NISD)³⁷.
- Demonstrate resilience, stability and security of our Electrical Network through compliance to the EU Network Code for Cybersecurity (NCCS)³⁸.



5.3.3 OUR FUTURE PLANS

Network Reliability and Availability

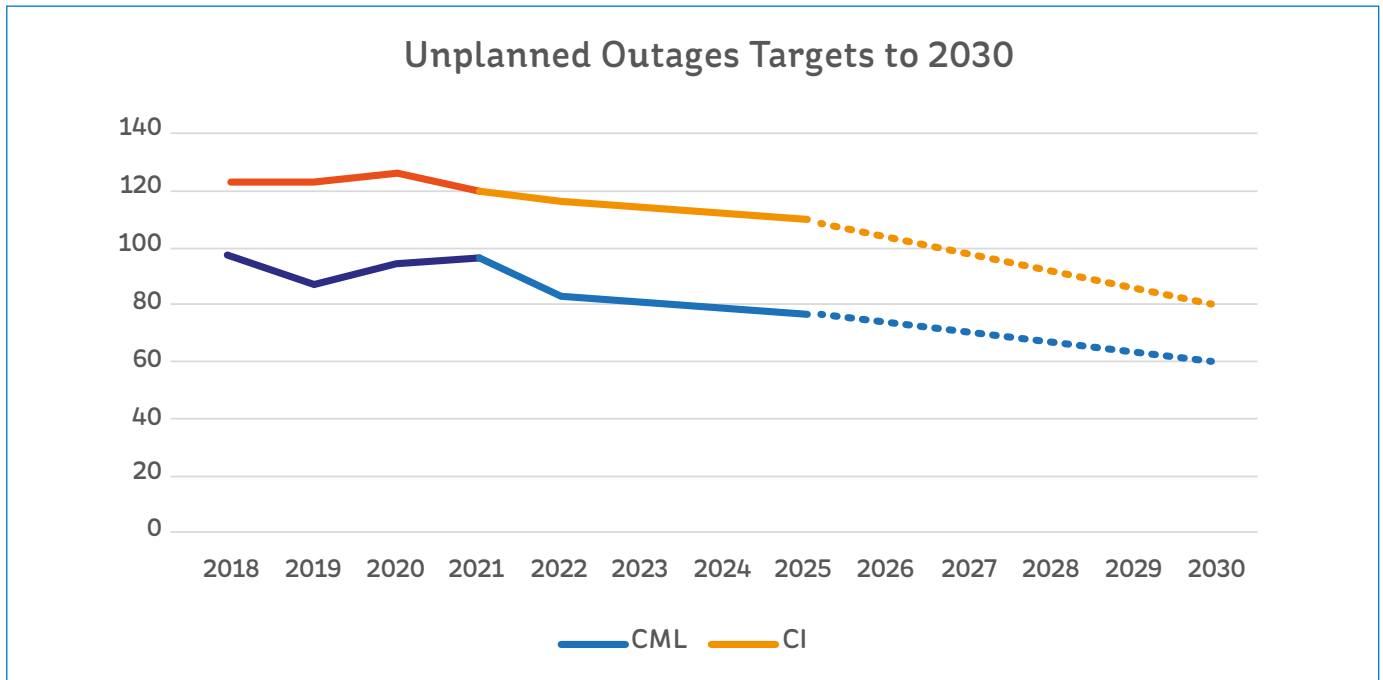
Through a comprehensive process of engagement and customer research via bilateral meetings, focus groups and quantitative surveys, ESB Networks has identified that reliability is crucial to business and industrial needs, and although domestic customers are happy with reliability today, they are willing to pay to keep this reliability as the climate becomes more volatile.

We will deliver more value for our customers, through increased utilisation of our existing assets, safely and reliably. Meeting this challenge will demand innovation, best in class asset management and delivery, as the electrification of heat and transport, variable renewables, and distributed services and flexibility drive higher demand, higher duty cycles, higher capacity factors, and lower cooling periods for our assets.

ESB Networks has an ambition to transform the experience of our customers by committing to significant reductions in unplanned interruptions. ESB Networks commits to achieving more than 25% reduction in the number of fault incidences and a further reduction of 20% in the duration of each fault from 2025 to 2030. Please see the table and graph below that shows our historical performance, our PR5¹⁴ targets, and targets to 2030 for reduction in unplanned outages (Customer Minutes Lost and Customer Interruptions). To achieve the ambitious reduction of Customer Interruptions from 118 to 80 by 2030 will require mass replacement campaigns using data and analytics to continually target customers impacted by the performance of the network. We will deliver at scale significant infrastructure investment to upgrade and replace end of life assets.

PR5 network performance targets and proposed targets for 2030

	2021	2022	2023	2024	2025	Proposed Target 2030
CML	85	82.9	80.2	78.7	76.6	60.0
CI	118	115.9	113.8	111.7	109.6	80.0



To achieve the ambitious reduction of Customer Minutes Lost will require accelerated implementation of innovation, automation and self-healing network. These provide benefits such as dealing with transient faults to avoid sustained customer interruptions, provides centralised fault hunting information and remotely operable switching points which help to reduce outage durations.

We will innovate by automating and using sensors to achieve this ambitious improvement for our customers. For example, the types of automation central to the future operation of the network, include:

- High Voltage Substation Automation
- Smart fault passage indicators (FPI) for underground network, enable faster decision making for remote fault isolation, crew deployment and restoration.
- Using downline reclosers and associated self-healing schemes to automatically isolate of the unhealthy section of network and provide remote diagnostics to enable faster decision making for crew deployment and fault finding.

Inevitably when faults do occur, what is most important is how quickly we restore electricity to our customers. We are investing in an optimised scheduler to enable us to dispatch our field staff. This digitally-enabled dispatch will minimise the time our customers are interrupted. It is when our customers experience interruptions that the transparency provided by self-service options and PowerCheck³⁶ come into their own. We are committed to continue to evolve and personalise that experience using Smart Metering¹⁷ and National Network, Local Connections¹⁵.

CML performance today is averaging over 90 CML over recent years. There is a very significant programme of work to reduce this to 76.6 by 2025, and then 60 by 2030. Given the predominance of overhead line network, more extensive cutting back of trees on both the medium voltage and low voltage network will be required to help achieve these targets.

Climate Adaptability and Network Assets

Reliability and availability of the network is affected by more frequent and extreme weather events due to climate change.

These extreme events have wide ranging impacts on communities and on our customers. Understanding the impact of these extreme events on the resilience and design of the network allows us to strategically plan how to minimise the interruptions during these times. We have a strategic initiative to review the network configuration and how we are organised to respond.

We are in the process of converting our medium voltage network from 10 kV to 20 kV. More information on this is provided in Network Capacity section of this Strategy. Converting from 10 kV to 20 kV reduces the carbon footprint of a converted network by a factor of four and increases the capacity of the network by a factor of 2-4 facilitating the uptake of electric heating and transport in a low-cost manner on the network. The design of our 20 kV network is different to 10 kV. The increase in unplanned outages for the 20 kV system will be mitigated by self-healing networks. Therefore, there is a balance to be achieved in creating capacity for our customers, reducing our carbon footprint, having a safe network, and minimising customer interruptions

Cybersecurity and Network Operation and Performance

Over the period to 2030, our network will see unprecedented change as exponentially more endpoint devices are connected as part of network monitoring, increase in grid edge activity / distributed energy resources and digital enablement of flexibility services.

Given the rapidly changing cyber threats, changing climate patterns and uncertainties that will arise from our transformed relationship with our customers as we approach a net zero, there will be ever increasing risks to the cybersecurity of our network which will need to be managed and mitigated.

ESB Networks will continue the transition to a more proactive approach to cybersecurity – from technical systems, cultural and governance perspectives. This will be underpinned and delivered through the current Governance and Operational model and will be expanded as the breadth of technologies and assets increase with the decarbonisation of society.

There will be consistent approach and management of cybersecurity activities across technologies to enable risk-based decisions to security investments.

ESB Networks will continue to comply to the Network Information Systems Directive (NISD)³⁷ and in the future comply with the EU Network Code for Cybersecurity (NCCS)³⁸. These will be achieved through alignment to the ISO 27001 standard.

ESB Networks Telecoms owns, develops and maintains a Utility Specific Telecommunications Network. To meet the ever-increasing and complex demands of a modern and evolving DSO, ESB Networks requires a resilient telecommunications network which meets and complies with stringent operational, performance and cybersecurity standards.

ESB Networks Telecoms are implementing a major cybersecurity strategy to deliver an enhanced operational security and cyber security posture to ensure the ongoing resilience of ESB Networks, Telecoms Network.

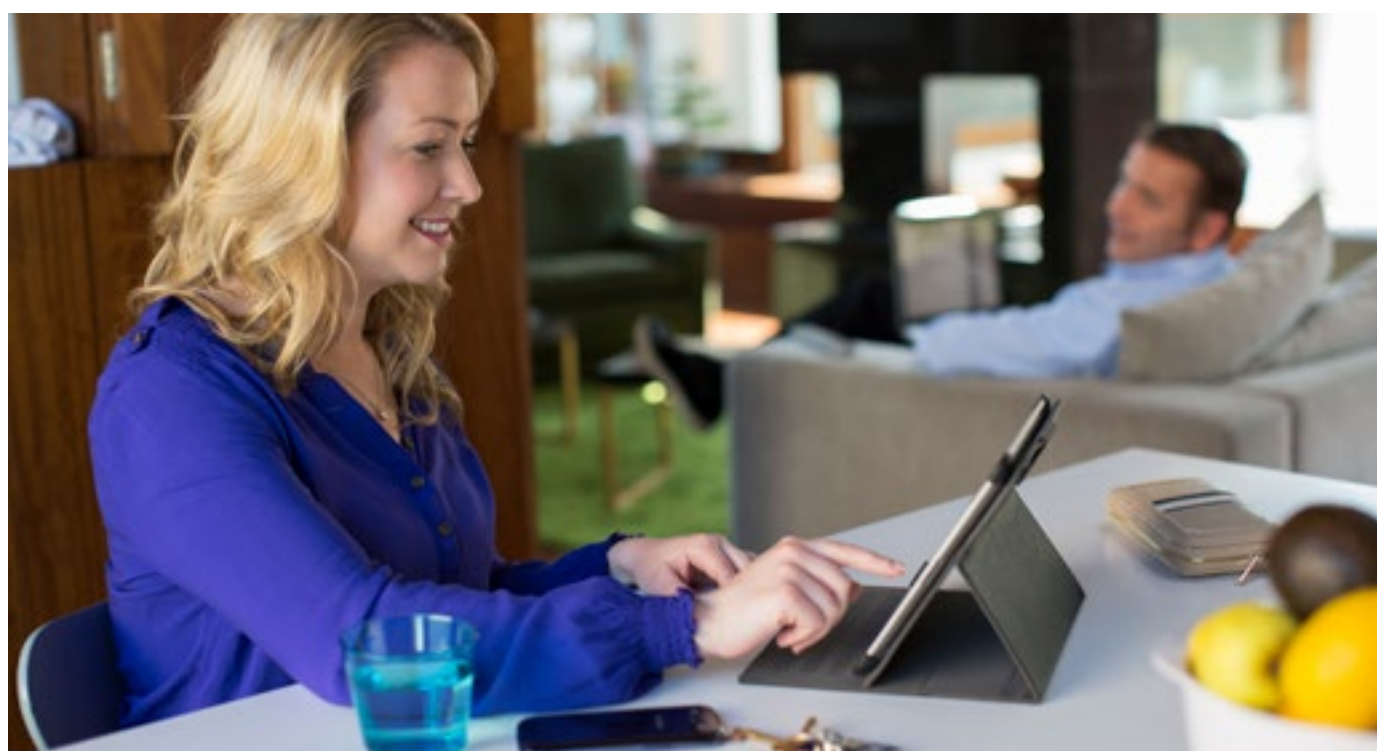
This will also ensure Improved Regulatory Compliance with the obligations of the EU NIS (Network and Information Security)³⁷ Directive and will also enable a more centralised approach to operations, a critical step towards the realisation of our Networks for Net Zero Strategy.

ESB Networks' purpose-built telecommunications network will be fully rolled out by the end of 2026.

Use of 'smart' technology and data analytics will provide more visibility and control of our network and result in the increased continuity and network performance. For example, smart meters will be rolled out to all customers by 2026 and will be able to send an alert on loss of supply to ESB Networks.

In the short to medium term (2022–2025), we are developing our operating control architecture and online analytics and control capabilities to enable a transition to 'self-healing' network capabilities. The concept of a self-healing network is a development of coordinated distribution automation schemes where a network can remotely reconfigure and adapt itself without any operator intervention in the event of a fault, isolating the faulty section and restoring supply.

In the longer term (2025–2030), we will design and implement technological capabilities and services which will allow us to integrate the resource availability of distributed storage, generation, and demand flexibility in a locality into how we maintain or restore supply under fault and storm conditions.



5.3.4 ACTIONS

Our actions to deliver a 'smart' resilient network of the future include:

- Reduce unplanned Customer Minutes Lost below 60 per annum by 2030. Reduce Customer Interruptions below 80 per annum by 2030.
- Develop operating control architecture through Advanced Distribution System Management (ADMS) that will deliver automatic re-configuration of the system in the fault conditions to restore supply.
- Enhance our Climate Adaptability Framework and harden the network to be more resilient to the extreme weather events.
- Deliver purpose-built telecommunications network by the end of 2026 to provide resilience, stability, and security of our electrical networks.
- Further develop an asset health approach for assets that supports investment decisions, targeting assets to deliver a future network (capacity challenge and electrification) and enhance security of supply.





6

EMPOWERED CUSTOMERS



6

EMPOWERED CUSTOMERS



6.1 ELECTRIFICATION

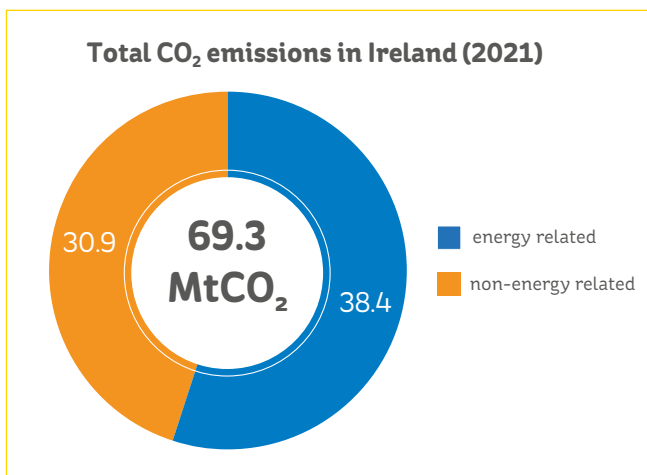
6.1.1 INTRODUCTION

In ESB Networks, we are committed to developing a cost effective, smart, sustainable, and resilient distribution system that will enable our customers' transition to a clean electric future.

Electrification is central to our Networks for Net Zero Strategy. We are committed to enable our customers to use clean renewable electricity as their energy of choice to heat homes, power transport, heat water, power farms and businesses. This will enable up to two thirds of carbon emissions to be removed from Irish society (38.4 MtCO₂ per year as per chart on the right).

Globally, and at a European level, it is widely recognised that electrification has yet to fully take off across the entire breadth of the economy. However, in specific sectors such as road transport and heating, uptake is happening and electrification is now visibly growing.

That said, the wider context of electrification of society is worth calling into focus. Electrification is at the centre of a decarbonised energy future, where we can enable customers to readily use clean renewable electricity not just at home, but also to power businesses and to electrify industrial and commercial load. All this implies a radical and complex transition. In the Network Capacity section of this Strategy, we discuss the main drivers of how we develop our network to cater for and cope with these changes, which include mass electrification. The combination of all these changes leads to the requirement for significant additional network capacity and our plans are built for this.



In the very near-term, transition to mass electrification currently pivots around transport and heat. In this section we further outline the principal requirements represented by the electrification of these two sectors.

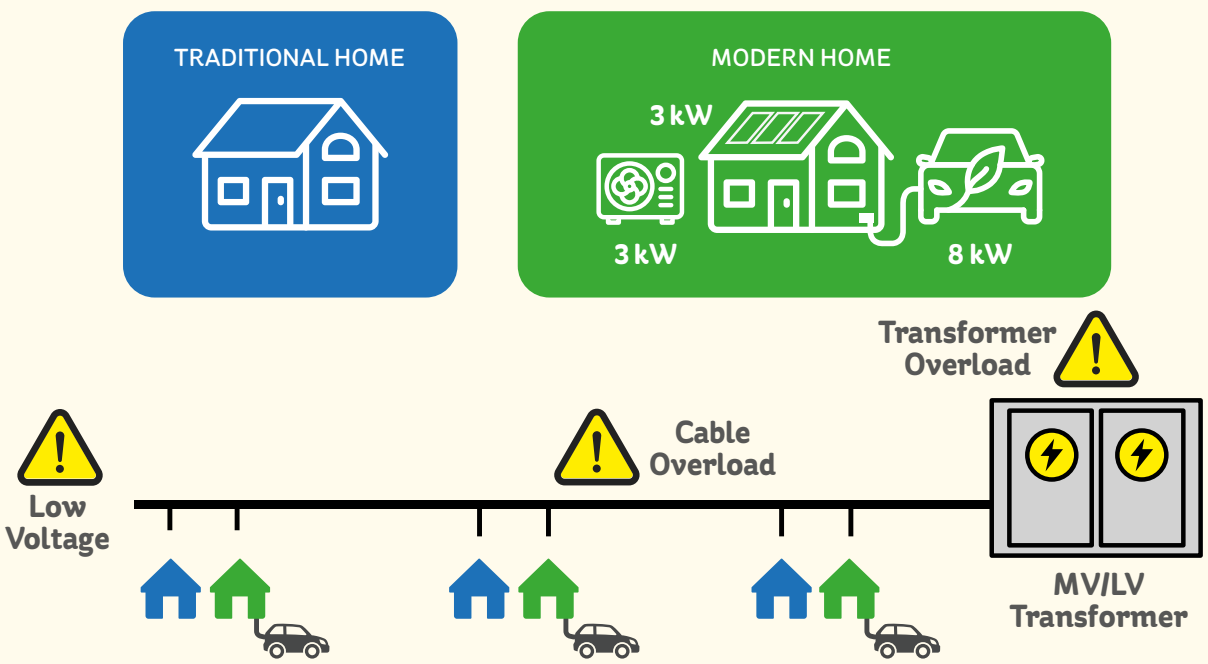
In line with the European Green Deal³⁹, Ireland has committed to a net zero target no later than 2050. With the release of the Climate Action Plan CAP23², the Irish Government set out ambitious targets for low-carbon technologies for 2030 to aid in the reduction of greenhouse gas emissions:

- Up to 1 million EVs (i.e. one in three private cars will be electric).
- 680,000 HPs (i.e. one home in four has electric heating).

We expect Government targets to change and evolve between now and 2030 as the Climate Action Plan² is updated. We are committed to being agile, giving due consideration to the range of future scenarios, and developing the electricity distribution network to meet updated targets in future years.

Low-Carbon Technology (LCT) Impact on LV Network

According to SEAI, the average car spends 22 hrs per day parked and 80% of charging is done at home. Electric cars will need to charge only 2-3 times a week as the typical EV ranges go from 100 km to 500 km (SEAI) and the average car journey in Ireland is 16 km (Central Statistics Office, 2016). Introducing smart solutions for charging, such as flexibility through controlled overnight charging and smart tariffs would reduce the investment in low voltage networks. The electrification of heat though will create a permanent network capacity requirement as during the cold weather the heating will most 'likely' be on for most of the day, every day. The electrification of both, heat and transport, will more than double the load demand of individual houses. We plan to develop the electricity distribution network to meet this large increase in electricity demand, while increasing the use of tools to balance renewable generation and demand at local level and enabling greater flexibility as to when customers use electricity.



6.1.2 WHERE WE ARE TODAY

Electrification of Transport

Meeting the net zero target no later than 2050 requires transformative changes in the transport sector as highlighted by the latest Intergovernmental Panel for Climate Change (IPCC)⁴¹ report. The objective of these changes is to deliver a 'radical shift' to reduce the demand for all transport services and supports for more energy efficient transport modes.

Transport is one of the largest contributors to carbon emissions, accounting for 15.7% of all emissions in Ireland in 2021. The absolute abatement by 2030, from the electrification of transport according to current CAP23² targets would result in the reduction of about 4.74 MtCO₂eq, which represents a 78% of share of the carbon abatement potential of 2030 transport emissions (please see table below).

Modelled Growth/ Reduction in Emissions	Car	HGV	LGV	PT	Other	Total (MtCO ₂ eq)
Demographic Growth	0.62	0.73	0.01	-0.01	0.48	1.83
Sustainable Transport and Behavioural Change	-1.06	-0.27	-0.08	-	-0.68	-2.09
Electrification and Vehicle Technology	-2.99	-0.29	-0.22	-0.38	-0.86	-4.74
Biofuels	-0.36	-0.36	-0.11	-0.02	-0.24	-1.09
Total	-3.79	-0.19	-0.40	-0.41	-1.30	-6.09

Source: Climate Action Plan 2023²

In reference to the report 'Redesigning Ireland's Transport for Net Zero'⁴¹, published by OECD (Organisation for Economic Co-operation and Development) that has identified that current mobility patterns in Ireland are incompatible with the Government greenhouse gas reduction targets for transport, CAP23² has applied Avoid-Shift-Improve framework to categorise all actions for transport sustainability. It has identified key policies and strategies that should support transformation of our car-dependant transport system. The focus is shifting from the number of EVs as a key metric to instead, reducing people's need to travel, switching technology (to EVs) and changes in policies and road space reallocation that will support more sustainable and healthy transport modes (including public transport, cycling, and walking).

Some of the key challenges associated with electrification of transport in Ireland are:

- **Private cars home charging:** This will involve the development of the low voltage network across the country in tandem with the growth of EVs to allow widespread home charging. There is a second associated challenge to this, which is the number of homes in urban areas with no access to home charging.
- **General publicly accessible charging:** availability of re-charging infrastructure at specific locations such as heritage sites, hotels, towns.
- **Motorway and national road network charging:** to enable long distance journeys.
- **Electrification of public transport:** buses, rail network, extension of light rail.
- **Electrification of fishing fleets and ports.**

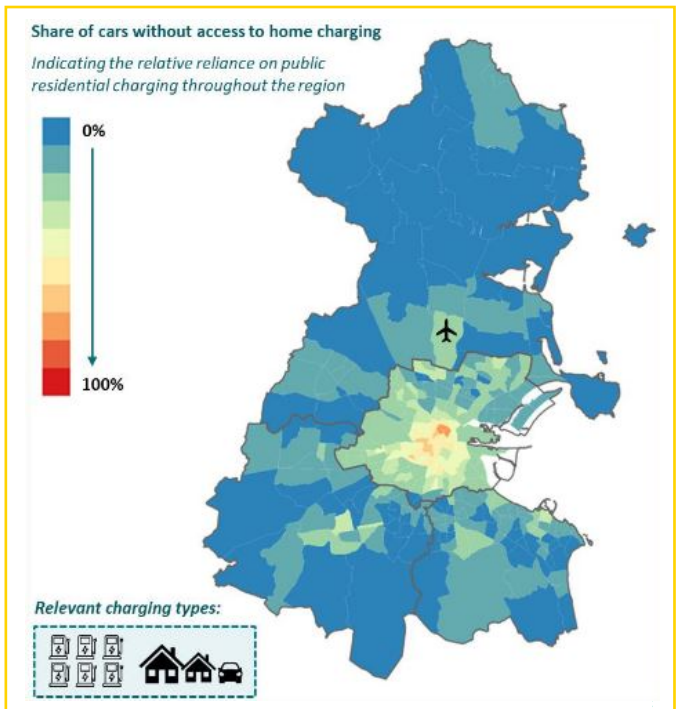
Based on data from SEAI, by the end of 2022, there were more than 67,000 electric vehicles on the roads in Ireland, with sales continuing to rise and representing 17.3% of the new car market in 2022. Our role is to make sure that the electricity network is ready for large-scale and mass transition to electric transport.

It has been identified that one of the key challenges associated with transition to EVs is providing charging infrastructure for domestic customers without access to home charging. These customers will rely on public charging infrastructure (mainly on-street, hub charging and work-place charging) and they should not be left behind on the path to a net zero. While off-street/hub charging is a viable solution in many countries, it could present significant challenges in many city centres in Ireland due to the lack of space for this purpose.

The mass electrification of transport will not just impact on increased electrical usage at our homes, it will also require the installation and increased power flows in the domestic environment, i.e., our homes. It will also require the installation of large-scale, high-powered charging infrastructure at motorway forecourts, for both public and freight services and private vehicles.

The Alternative Fuels Infrastructure Directive (AFID) is currently being recast as AFIR¹⁰, with binding targets in this soon-to-be Regulation, to ensure that adequate re-charging infrastructure is provided at EU sea and inland ports by all EU Member States. The current CAP² targets for electrification of transport by 2030 and AFIR¹⁰ requirements indicate that the total re-charging capacity on our networks will have to increase about sixteen times by 2030, from current circa 50 MW to about 800 MW. The capacity of the specific charge point locations will vary from local on-street with 22 kW AC charger to electric forecourts with ranges of 1-10 MW capacity. Apart from the fleet-based targets that define the minimum charging power output per vehicle, in AFIR¹⁰ there are additional distance-based targets for the rollout of EV re-charging infrastructure for LDV and HGV for both core and comprehensive TEN-T⁴² network.

Furthermore, the electrification of bus depots, rail networks and fishing fleets while in harbours will add significant demand onto our network.



Source: Dublin Local Authority Electric Vehicle Charging Strategy



Currently, most forecourts and fishing fleets connect onto rural electrical networks designed for different times and do not currently have capacity headroom to enable these large new connection requirements, the deployment of which is now moving from directive to regulation by Europe, via the transition to AFIR¹⁰.

Part of AFIR¹⁰ is the obligation for docked ships to use shore-side electricity, applicable to inland waterway ports and seaports. A ship, for example, from an electrical standpoint can be considered as a mini city that will require a lot of energy to continue operating while docked in port.

The DART+ Programme in the Greater Dublin Area will see the DART Network grow three times its current level, bringing DART travel with all its benefits to new and existing communities. An additional 100 km of DART network will require significant new electricity infrastructure to provide the required capacity. There will be 300 new fully electric buses on our roads starting from 2023 through to the end of 2025, with this fleet increasing to 1,500 by 2030. The electrification of the bus fleet will require significant charging infrastructure at bus depots.

In collaboration with key stakeholders, we will develop a no regret, 'Build Once for 2040' concept, that will ensure adequate electricity infrastructure is provided, to underpin mass electrification that will support and

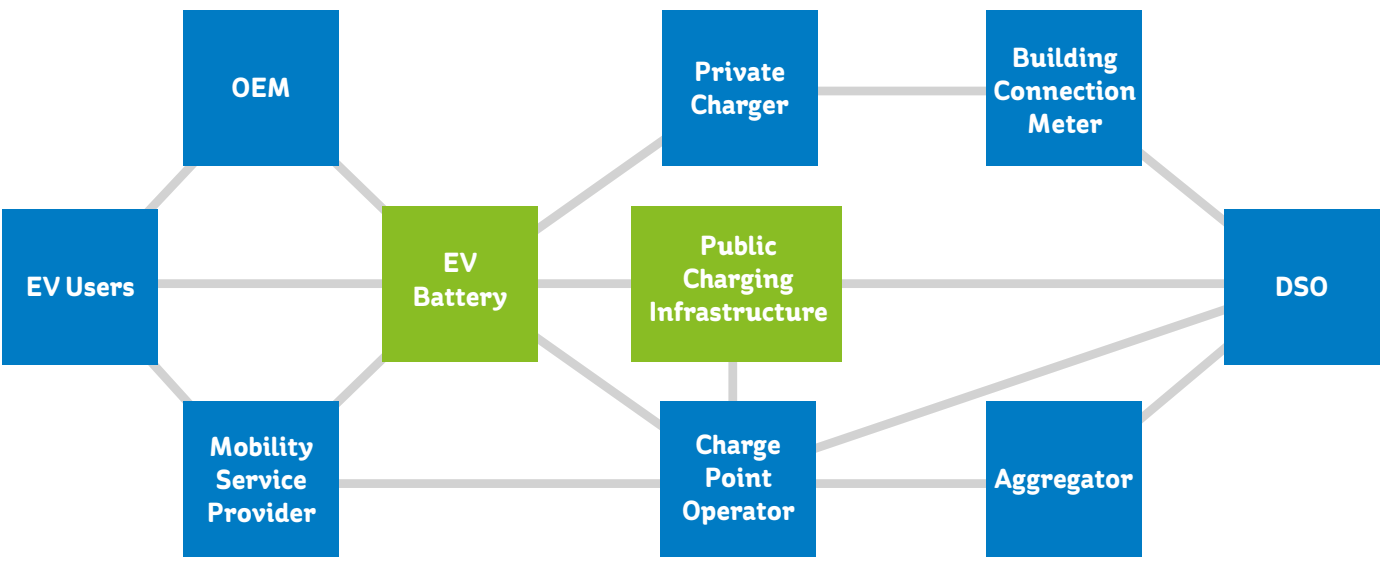
promote all aspects of decarbonisation of society. The diagram below shows different interactions between ESB Networks in our DSO role with the key stakeholders in delivering electrification of transport.

The Department of Transport has established a new Office, Zero Emission Vehicles Ireland (ZEV¹¹), which now plays a leading role in Ireland's transition to zero emission vehicles. With the policy and delivery functions now in one organisation with a single identity, the focus is to enable the delivery of the ambitious transport targets under CAP², drawing on the combined 4 organisations (DoT, SEAI, NTA & TII), along with close involvement of identified key stakeholders that includes ESB Networks, EirGrid and DECC.



Source: Dublin Bus website

The different actors involved and their interactions for smart charging



Electrification of Heat

Heat-related carbon emissions account for a quarter of our annual carbon emissions in Ireland according to the National Heat Study⁴⁴.

Electrification of heat is increasing at slower rate than initially forecasted in Ireland. The Government target is to have 680,000 heat pumps connected to the electricity network by 2030 and similarly to decarbonising the transport sector, our electricity network must also be ready for decarbonisation of heat.

In Ireland, by the end of 2022, there were circa 42,000 heat pumps installed by domestic customers. To encourage the electrification of heat, the Government has set a target in CAP23² for all new dwellings to be designed and constructed to Nearly Zero Energy Building (NZEB) standard by 2025, and Zero Emission Building (ZEB) standard by 2030.

The current policy for residential decarbonisation links fabric upgrades with heat pump deployment. Retrofitting has been recognised as the biggest component of the bill associated with fitting heat pumps to homes. The National Heat Study⁴⁴ estimated that 78% of residential

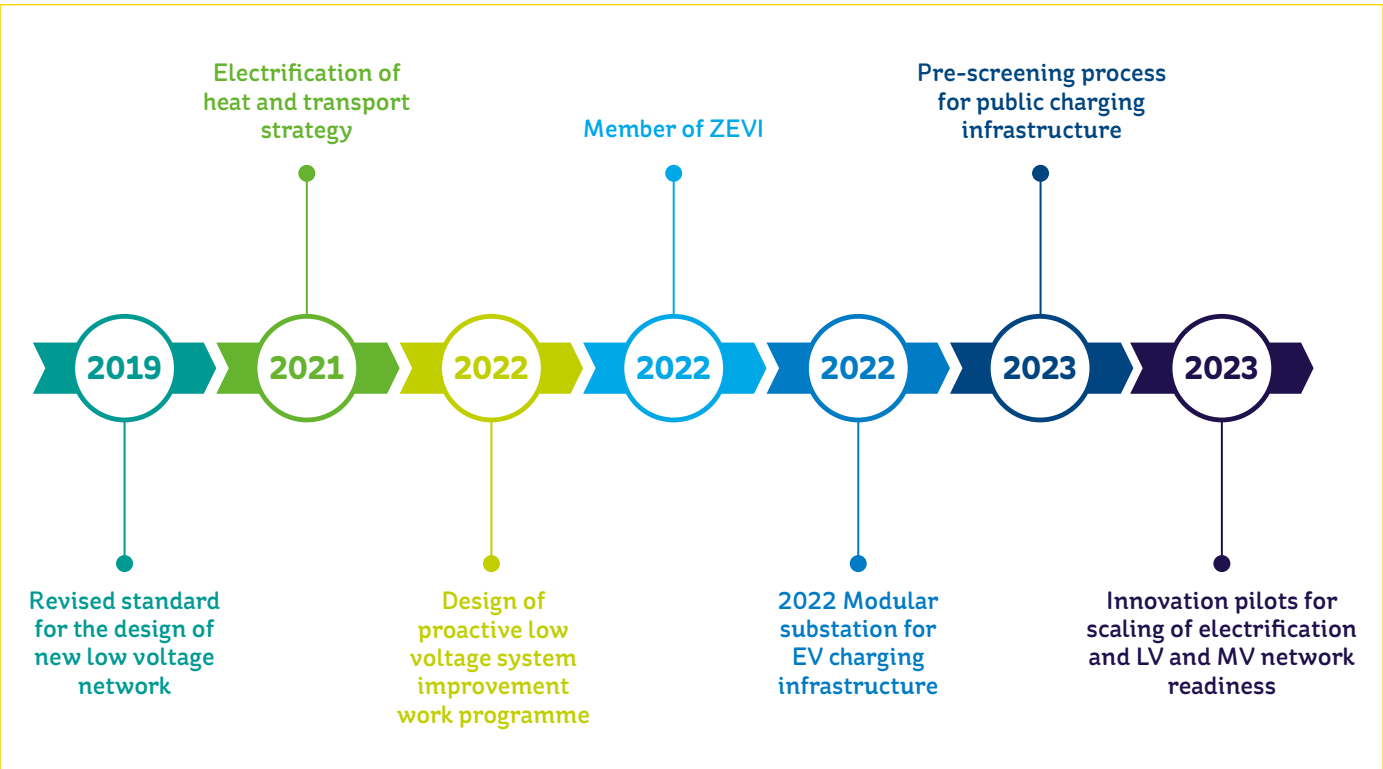
stock would be technically suitable for an air source heat pump without additional insulation. The relaxation of the retrofitting rule would require higher power heat pumps to be installed in homes, and therefore increase the demand for electrical energy to provide heating. As 80% of electricity will be provided by renewables by 2030, this would result in significant decarbonisation of the residential heating sector in Ireland. This policy change would result in a significant increase in residential demand on our LV network and thus we need to plan for this capacity to be available going forwards. More investment will be needed for electricity infrastructure in anticipation of these significant new demands.

In ESB Networks, we have developed a Vulnerable Customer Register⁴⁵ based on information from all electricity suppliers to ensure we can look after these customers if a power outage occurs in their area. With the electrification of heat, identifying the right actions to support vulnerable customers will become increasingly important as they may rely on electric heating in the future.



ESB Networks Journey to enable electrification of heat and transport

At the start of 2021 we published our Electrification of Heat and Transport Strategy⁴⁶ committing to growing and supporting electrification



We have already introduced revised standards for the design of new Low Voltage (LV) networks, more than doubling the allocated capacity in new-build housing developments, to accommodate the requirements of these customers with respect to electrification. Approximately 50,000 of new homes since 2019 have been designed to take account of and accommodate electrified heat and transport. We continue to revise our design standards to ensure that LCT load can be accommodated during any works that take place on our existing LV network, alongside developing and ensuring system improvements take place as this market grows and the momentum towards mass electrification continues.

In PR5¹⁴ (our current Price Review period of 2021-2025), we have an investment budget of €134 million for low voltage system improvements. This budget is additionally covered by an agreed uncertainty mechanism, whereby if the uptake of LCT were to take off at an accelerated pace, or clustering of LCTs in specific

areas is more concentrated, we can seek additional funds as interventions are being delivered to ensure system readiness.

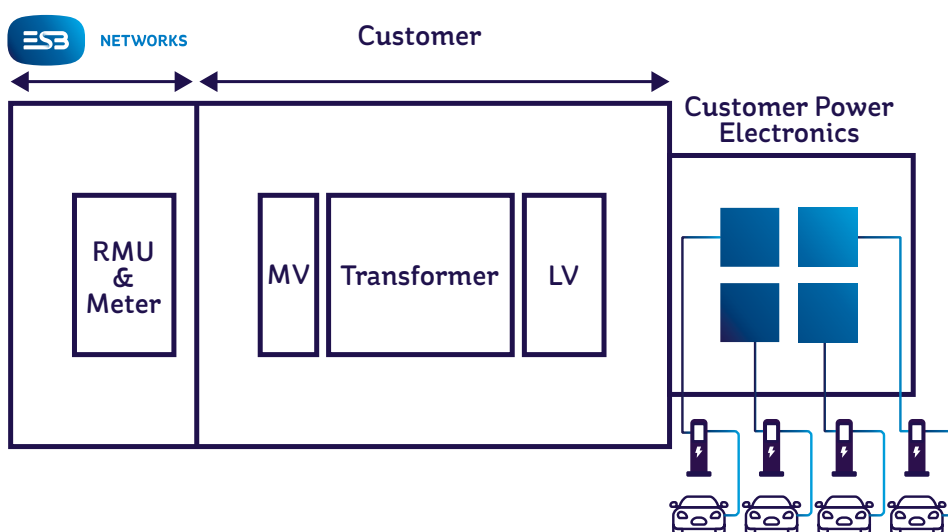
We have developed a collaboration framework with SEAI for future technology trials and initiatives, and through this as one specific example, we have provided clear guidance to the market on EV charging infrastructure connection requirements for apartment developments.

We are basing our approach to network readiness and the advancement and development of the distribution network on what we refer to as the **FIMSS** methodology: **Forecast, Identify, Monitor, Smart toolkit and Strengthen the network**. Further details on this approach is in the Our Future Plans section below.

To cater for the increased capacity requirement on our LV network, we have developed a new innovative 630+ kVA compact transformer which retrofits into the existing footprint of our standard 400 kVA or 630 kVA

transformer it is replacing. The use of FR3 natural ester oil and thermally upgraded insulation paper means that the new transformer can be overloaded safely in existing substation housings and operate at an uprating to 630+ kVA. This means the transformer can safely operate for extended periods up to 1 MVA.

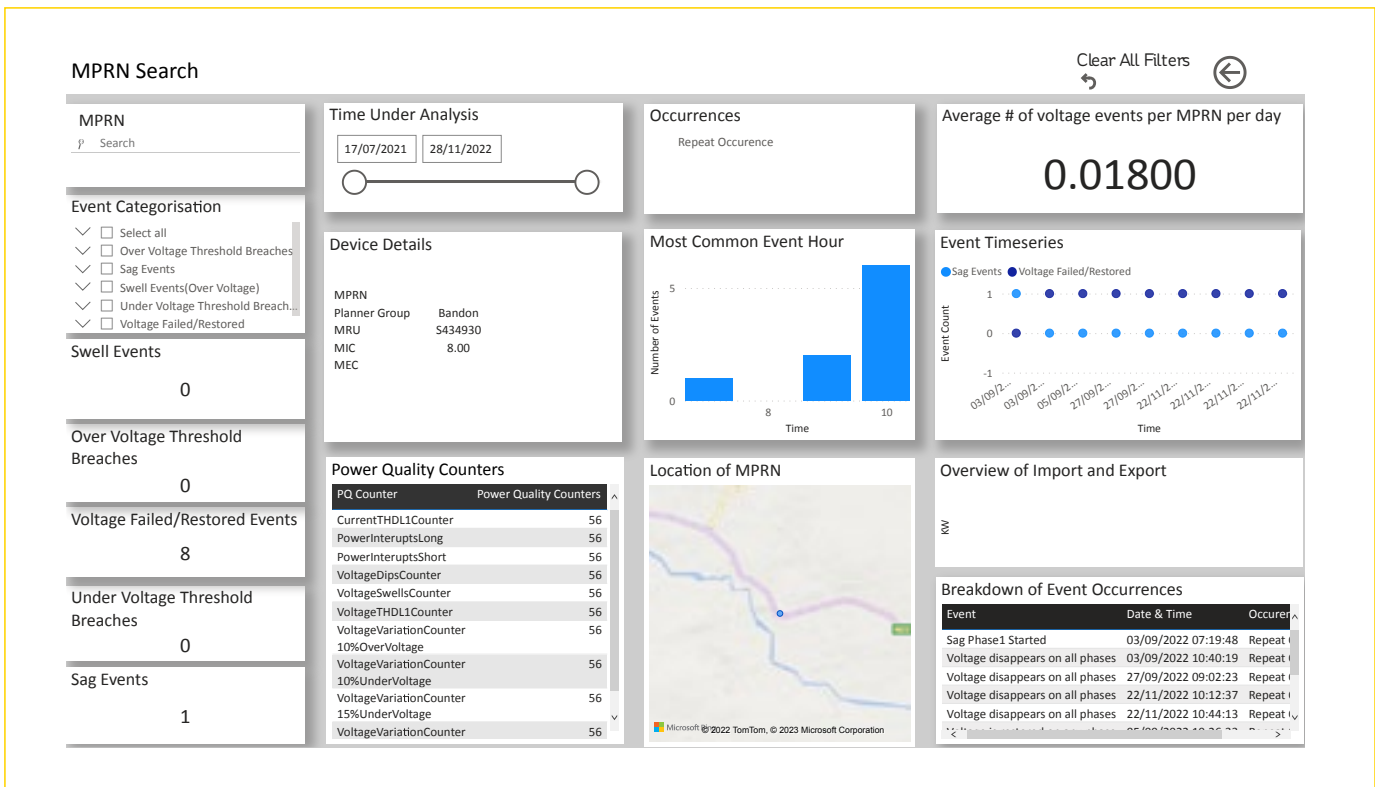
Our ESB Networks engineers have developed a solution to futureproof EV charging hubs, which once successfully piloted can for example, be utilised in forecourt type locations. For this, we developed a standardised modular design, and the module will be owned and maintained by the EV charging supplier. This solution is currently being trialed in several differing locations across the country, to assess and refine the solution.



6.1.3 OUR FUTURE PLANS

In ESB Networks, we have commenced a significant programme of work with a dedicated team to focus on assessing the impact of electrified heat and transport and appropriately delivering to accommodate this new and additional load.

We are actively engaging with various stakeholders from the transport and heat sector as well as Government departments and other state agencies to anticipate where the large new electrification loads will be connected to our network. We're working together with our stakeholders, such as Irish Rail, DART and Dublin Bus to address the capacity bottlenecks through both traditional reinforcements and piloting smart solutions such as smart charging hubs and flexible connections. These can limit the capacity during the day whilst allowing full capacity at night-time to enable recharging of busses overnight and in certain cases minimising significant upfront investment costs. Charging at night can more easily be accommodated at the networks as overall demand is lower than during the day.

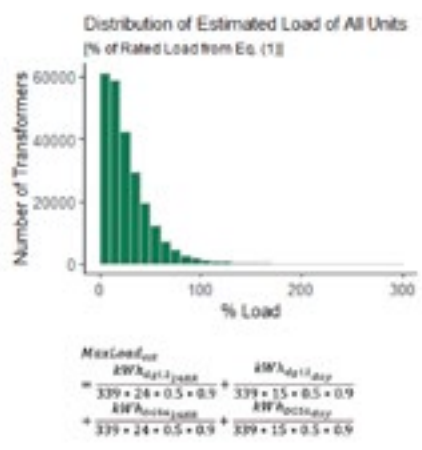


As a key component of our FIMSS methodology, we are using novel forecasting techniques based on innovative data analytics to help reduce the uncertainty about the locations and uptake rates for the electrification of heat and transport.

We use these forecasts to help us identify appropriate locations for enhanced network monitoring to confirm the need and allow us to plan a programme of activity to address the network challenges (please see the figure above). We then, where possible, seek to use our smart solutions toolkit (for example flexibility as explained more in the System Flexibility section of this Strategy) to provide the additional capability within the distribution system. We have developed and will continue to develop new tools and procedures to enable the use of new innovative technologies and concepts to solve constraints on the network.

FORECASTING

MV/LV Transformer load is estimated, and analysis of demographic data identifies high risk areas



Smart networks and conventional reinforcement options will be examined and assessed against a number of criteria to determine which option is to be chosen.

Furthermore, as our innovation project portfolio and learnings develop, alongside active participation in CIRED (International Conference on Electricity Distribution) and other international bodies, we will continue to explore relevant non-wires alternatives that might be possible to defer or even replace conventional reinforcement. This approach will see new solutions added to our smart toolkit and portfolio, as advances in our sector are made, and will ensure ESB Networks plays a leadership role in utility best practice in the context of electrification and societal decarbonisation. Despite the uncertainty that remains regarding potential uptake rates and crucially the associated timing of electrification and its impact across the national electricity distribution system, the FIMMS methodology allows us to adopt a clear and consistent approach to ensure proactive network readiness in a timely, optimal investment strategy and cost-effective manner.

In ESB Networks, we are committed to developing a cost effective, smart, sustainable, and resilient distribution system that will enable our customers' transition to electrified heat and transport.

On a more interactive and operational level – which has the potential to deliver a more sustainable solution and optimise the carbon reduction value of electric vehicles and heat pumps – flexibility can allow local generation to be better aligned with local demand. The result is low-carbon/low-emission vehicle is being powered by renewable and low-carbon energy.

The adoption of new materials, technologies and concepts, digitalisation and big data analytics have the potential to create greater efficiencies. While electrifying the heat and transport sectors will offer a range of new opportunities for our customers to engage with the energy system. For example, the use of 'non-wires solutions', where feasible, could reduce the time and cost of providing increased effective capability on the distribution system for load and generation. Also, the facilitation of 'non-traditional market arrangements' such as peer-to-peer trading, microgrids, etc. may be able to deliver better value for our customers. Comprehensively understanding the capabilities and limitations of these new technologies and concepts through a combination of trials and analysis will ensure that ESB Networks will be able to deliver an energy system which will enable Ireland's transition to a low-carbon society.

6.1.4 ACTIONS

Our actions to deliver on electrification targets to 2030 and beyond to a Net Zero Ready Distribution Network by 2040 include:

- Develop 'Build Once for 2040' concept to strengthen our network to accommodate electrification of heat and transport, and to accommodate public charging infrastructure at LV, MV and HV level.
- Support our customers and stakeholders with clear information and guidance in relation to the installation and connection of heat pumps and charging infrastructure to the distribution system.
- Review our connection agreements and terms and conditions to ensure their suitability for customers adopting electrified heat and transport and to seek opportunity to provide cost savings to customers. We will investigate the potential for new connection arrangements such as flexibly managed or timed connections, which are used in other jurisdictions, to provide additional capability to the distribution system.
- Develop processes, systems, and designs to streamline the connection process of low-carbon technologies to the distribution system. For example, for electric charging infrastructure by introducing improvements such as pre-screening for charging infrastructure; publishing a current charging infrastructure capacity map and delivering faster connections enabling quicker decarbonisation of transport sector. This will also allow us to develop a Low-Carbon Technologies (LCT) register to empower us to adequately look after all our customers as they decarbonise energy in their homes.
- Work with key stakeholders including DoT, ZEVI, the CRU and Industry to develop policy, guidelines, plans and customer clinics that will deliver on electrification targets.
- Collaborate with our stakeholders to ensure a whole of system approach is used to optimally develop national heat, transport and energy infrastructure.



6.2 CUSTOMER EXPERIENCE

6.2.1 INTRODUCTION

ESB Networks' Strategy places customers at the centre of everything we do, empowering and supporting customers as they transition to net zero.

We are supporting customers with a best-in-class customer service, tools and tips as well as making every interaction as easy and convenient as possible. Our goal is to empower our 2.4 million customers every day with choice and flexibility around how they consume, generate, trade and store electricity. Key components of our customer strategy are outlined below:

Elevate voice of the customer via insights sharing, action plans and senior forums.

Streamline customer journeys so they are easy to navigate, keep customers updated and drive efficiencies.

Offer choice of channel so customers can interact online or via personal contact.

Anticipate future customer needs & motivations to inform service portfolio/customer portal.

Embed a customer-centric culture through the Customer Experience Excellence Programme.

Increase Customer Satisfaction to 90% in 2030.



6.2.2 WHERE WE ARE TODAY

Empowering Customers to Transition to Net Zero

Customers value a reliable and resilient supply of electricity, and this is core to our purpose. As customers transition to net zero there will be a major change in lifestyles in how we power our cars, heat our homes/buildings, and use energy more wisely. Customers will increasingly be more dependent on a secure and safe supply of energy. We're improving network reliability by investing in automation technologies and reinforcing our network assets. More information on network reliability performance can be found in the Resilient Network section of this Strategy.

We're already creating opportunities for customer participation and bringing everyone along as we make Ireland's net zero goal a reality:

- We've installed over 1.1 million smart meters so that customers have greater awareness and control of their consumption.
- We're developing a smart network to facilitate the electrification of heat in homes, industry and commercial enterprise, as well as electric cars on our roads.
- We're connecting low-carbon technologies for customers and facilitating export back to the grid through micro/mini generation.
- Our recently launched "Beat the Peak³¹" initiatives are driving awareness and supporting customers, both domestic and commercial to better manage and control their electricity usage.

Delivering a Best-in-Class Experience to our Customers

Working together with customers and our employees, we have developed a roadmap of initiatives to deliver an exceptional customer experience from 2021-2024. Our goal is to increase our customer satisfaction score from 82% in 2021 to 86% by 2025 and reach 90% by 2030.

We collect and analyse feedback by integrating data from the field, customer satisfaction surveys, call driver analysis and customer operations data. We derive and share the insights from this aggregated data and implement solutions that will drive an enhanced

customer experience. A sample of customers comments that provide us with the insights to identify key customer pain points are shown below:

"Please follow up and stay in contact to say what is going on, the lads came and we were not told they were coming to look at our voltage issue were looking to work at our property."

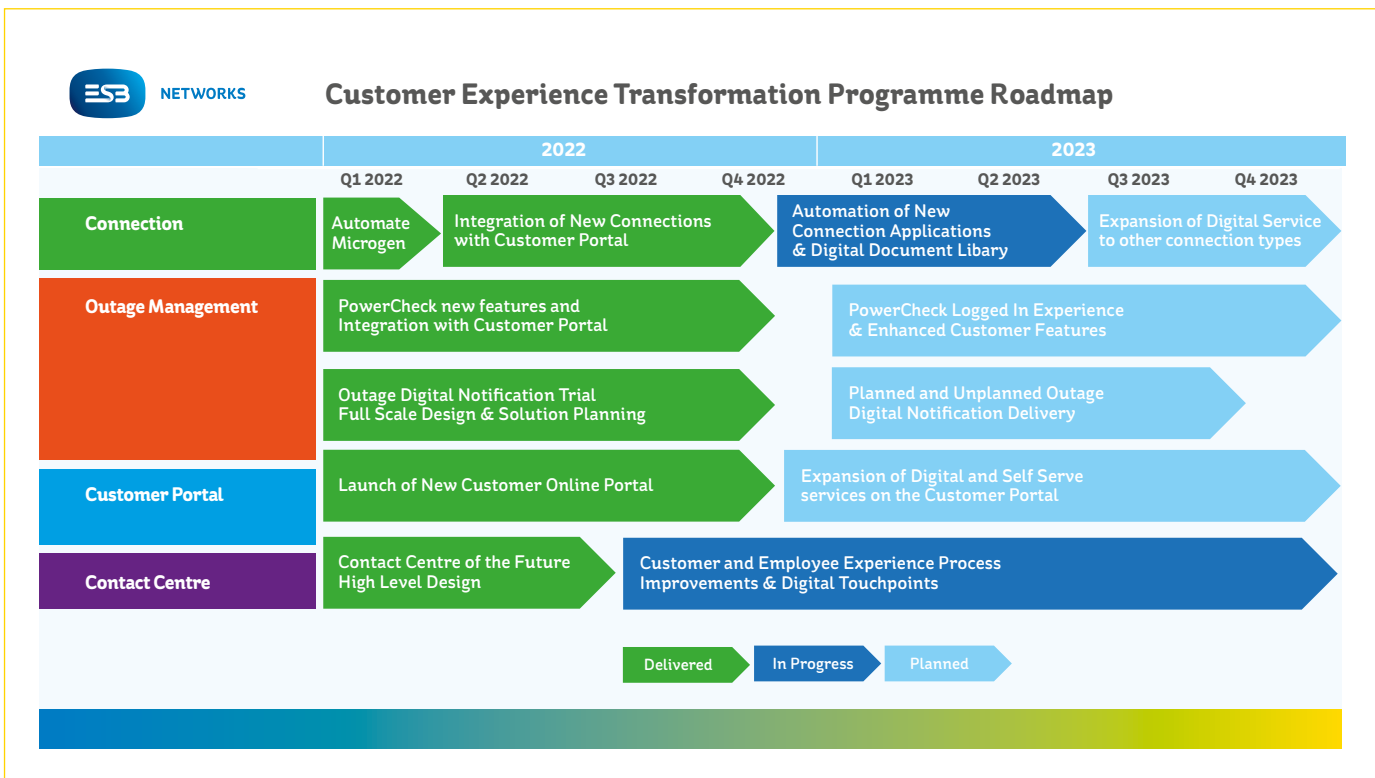
"Have more teams of engineers to do the new connection, cost me a lot of money because I was given different dates for the connection."

"Lack of communication on when re-connection was to happen, on the date given no one turned up and had to rebook."

"A text message would be good to remind me of the outage as I have electric gates and forgot about the outage so was locked in."

"I should be contacted once a fault is identified, I'd like a notification as soon as it is reported"

We provide an essential customer service, answering queries and providing relevant and timely information on the first point of contact. All interactions with us should be easy, convenient and suit the customer's choice of communication channel - phone, email, online or face-to-face. We are implementing an extensive Customer Transformation Programme to embrace the use of digital technology to continuously improve our service. Our 2023 roadmap is shown below.



In 2022 we launched a personalised online portal for customers⁴⁷. A range of digital services are provided on one portal to empower customers with self-serve options to apply/track a new connection, find out about power outages, submit a meter reading, and gain insights about their energy consumption. This is a foundational step in delivering a best-in-class experience and we are expanding our online services in 2023 and beyond.

- Access and download energy consumption data from your electricity meter
- Submit a Meter Reading
- View power outage status and estimated resolution times at your property

- Find my MPRN (personal electricity meter code)
- Integrate existing New Connections Online Portal
- The new customer portal is the platform for all new digital services launched in Q4 2022 and other services in 2023.

Connecting Homes and Businesses

Providing a home, farm or business connection to the electricity network is one of our core services. In 2022, we provided circa 39,000 new connections to our network with 85% of these connections for homes. This included a significant increase of 50% in the volume of new G1 connections (apartments and housing schemes) compared to 2021. Forecasts indicate that 40% of the domestic new connections will take place in the greater Dublin area, consistent with current connections and data relating to planning permissions. Efficiently connecting large volumes of new connections is a challenge we have successfully dealt with in the past when we completed 105,000 connections in 2006. We are investing in both the electrical infrastructure and our people to cater for the forecasted increase in the volume of new connections.

We are developing a simple and easy path for our customers by designing an enhanced digital experience that is hosted on the Customer Portal⁴⁷, reducing the time from application to connection and proactively communicating to our customers. A total of 88% of customers are now using our online connection tool.

Our Commitment to Delivering New Connections on Time

ESB Networks Customer Charter⁴⁸ sets out our guarantees and commitment to timelines across the range of services that we provide. For New Connections there are two timelines we commit to:

- 1. Time to Quote** - ESB Networks local design teams and national new connections team provide customer quotations for new connections. These quotation charges are standard charges, regulated and approved by the Regulator. ESB Networks' customer charter commitment is to provide a mixed development quotation within 90 days and a single one-off domestic connection quotation within 15 days (7 days where no site visit is necessary). Large mixed developments with multiple connections can vary in complexity from a quotation and design perspective so we work in accordance with the developer's timelines.



- 2. Time to Final Connection** - Following the customer's confirmation of connection paperwork and supplier registration, ESB Networks' typical connection times are 10 days for a single one-off domestic connection and 15 days for connections in a mixed development (10 days guarantee providing customer actions are complete, i.e., duct, certificate, registration). In the case of a developer a new connection is completed in line with their construction schedule. On large mixed developments, construction and connection can take place in phases as determined by the developer.

Collaborating with Housing related Stakeholders

ESB Networks has strong engagement with housing related stakeholders. We are fully supporting the “Housing for All¹⁶” Government initiative which plans to ensure 300,000 new social, affordable, cost rental and private homes are built by 2030. We are also working closely with OPW on the Refugee Housing Project which consists of modular homes being delivered on an emergency basis to accommodate recently arrived refugees.

We have regular meetings with both the Construction Industry Federation (CIF) and its associated organisation, the Irish Home Builders Association (IHBA). In this context, ESB Networks meets with both the Executive and the Council of the IHBA to exchange views and work on any enhancements that may be required to improve the delivery of new connections.

ESB Networks also greatly values its relationship with Local Authority stakeholders including County Chief Executives and relevant Directors of Service. ESB Networks’ Area Managers liaise regularly with their counterparts in Local Authorities on any issues of collective concern.

SIRO, an ESB/Vodafone joint venture, is a high-speed gigabit 100% fibre-optic network, built using the ESB Networks overhead and underground infrastructure. In October 2021, SIRO announced the second phase of the rollout, passing 770,000 homes and businesses and reaching 154 towns across Ireland. This €620 million investment in high-speed broadband facilitates people living and working outside Ireland’s major urban centres, thereby reducing pressure in high demand, new connection areas.



National Public Lighting Energy Efficiency Project

Twenty-one local authorities are taking part in the National Public Lighting Energy Efficiency Project to upgrade their public lights to LED. The project will upgrade approximately 205,000 public lights through an investment of €150 million. These lights currently consume 123 million kWh of energy annually. Once complete, the project will avoid emitting 20,000 tonnes of CO₂ each year and save 68 million kWh in energy. ESB Networks has an important role in supporting this project over the coming years.

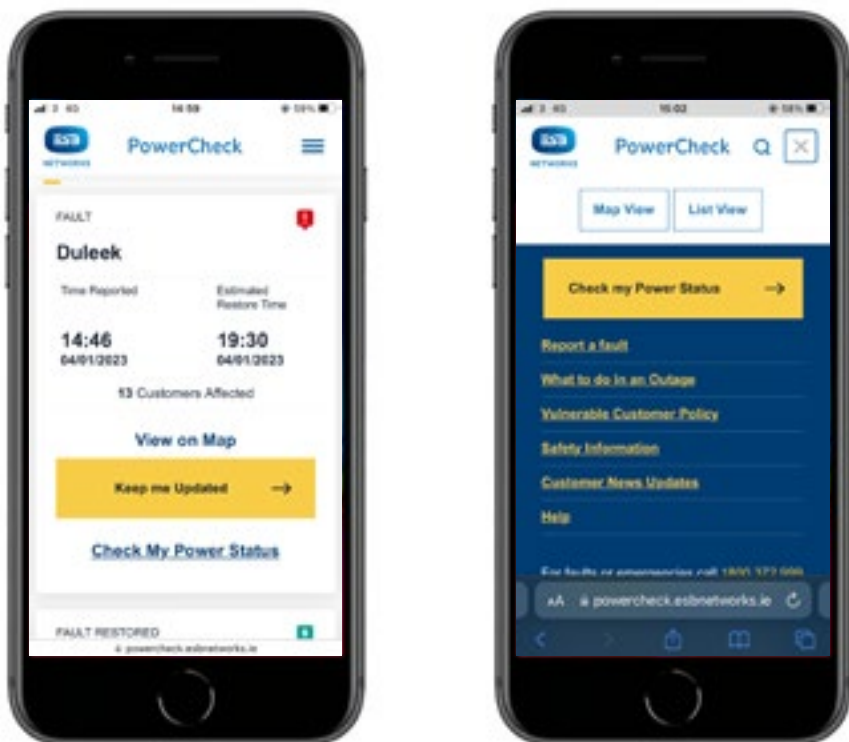
National Residential Retrofit Plan

There is a target to complete 500,000 residential retrofits to achieve B2 BER / cost optimal or carbon equivalent, installed in existing buildings as part of the National Residential Retrofit Plan by 2030. ESB Networks has an important role in enabling this programme through the disconnection and reconnection of electrical services, where required, and the overall investment in the distribution network capacity for electrification.

Keeping Customers Updated during Power Outages

When outages occur, either planned or unplanned it is vital that customers can easily find out if they are part of a known outage, when power will be restored and have a facility to report a fault. Powercheck.ie³⁶ is an interactive online tool showing outage locations and power restoration times with over 4.3 million views annually. The outage service information is personalised and localised to customers who are registered on the Customer Portal⁴⁷.

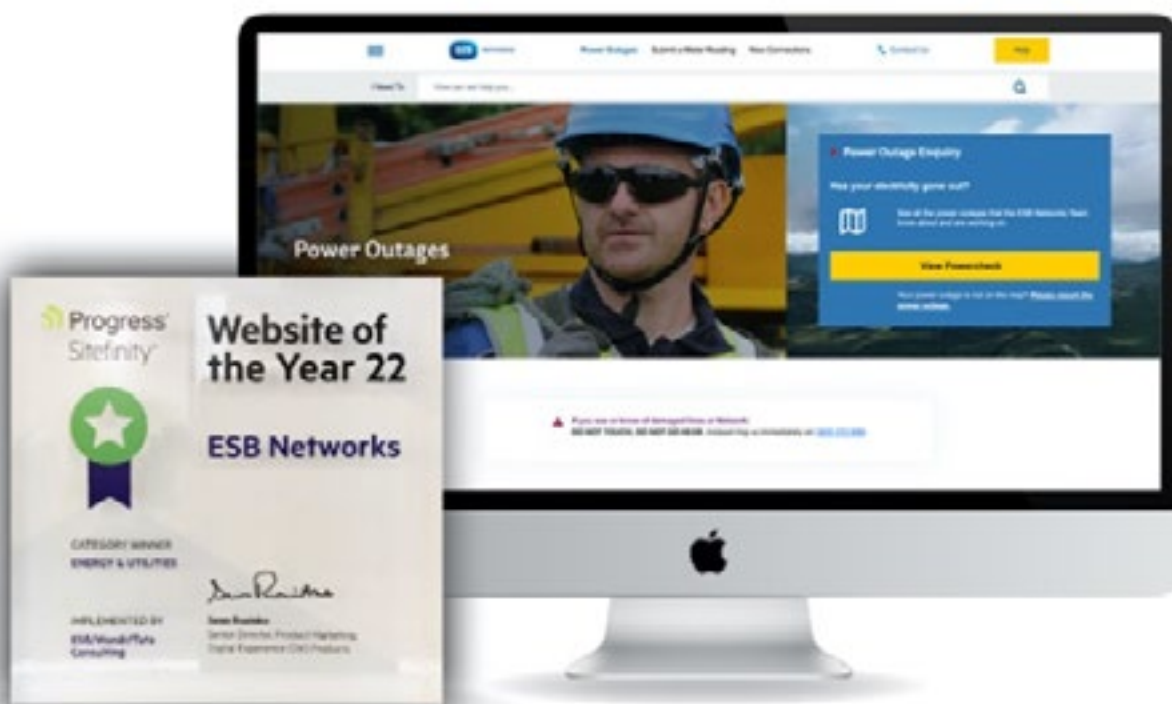
We are continuously adding new features, informed by customer feedback, personas and customer journey mapping. An example of a Customer Persona and Outage Journey Map is shown below. We are enhancing our SMS notification service to customers so they will be proactively informed of any power outage affecting their home or business.



Vulnerable Customers⁴⁵

Supporting the needs of customers most vulnerable to the loss of electricity supply continues to be a key priority for ESB Networks. Vulnerable customers⁴⁵ include those who need vital electrical medical equipment on a daily basis and those particularly vulnerable to disconnection during winter months. At ESB Networks, we have developed a **Vulnerable Customer Register**⁴⁵ based on information provided from all electricity suppliers to ensure we can look after these customers if a power outage occurs in their area. Such customers receive prioritised and targeted communication regarding planned and fault-based outages. With the electrification of heat, identifying the right actions to support vulnerable customers⁴⁵ will become increasingly important as they may rely on electric heating in the future.

Different customer segments face different consequences on the journey to a net zero. Adoption of low-carbon technologies like EVs and solar will not be possible for all customers in the near term. We will work collaboratively to develop joined-up services that are focused on those customers that are at risk of being excluded from the energy transition. We are currently working with SEAI (Sustainable Energy Authority of Ireland) on the Better Energy Warmer Homes Scheme⁴⁹ that provides low-income households with free energy efficiency upgrades. ESB Networks established a Customer and Society Panel to enable open discussion with a broad range of customers and stakeholders from many areas of society. This forum meets twice yearly, providing a two-way dialogue and an external perspective on our business strategy, plans and activities. The panel includes representation from St Vincent de Paul, and Disability Federation Ireland.



6.2.3 OUR FUTURE PLANS

Deliver 90% Customer Satisfaction by 2030

We are developing workforce solutions and streamlined processes so that our delivery teams who design, plan and connect customers to the network provide a best-in-class connection service to our customers.

The Customer Transformation Programme will continue to capitalise on digital technology to bring more services online and improve our quality of service. We are implementing a range of initiatives to ensure consistency and best practice across all customer channels, be it phone, online, social or email. We will continue to work on streamlining current and new Customer Journeys providing 100% digital end-to-end processes which will drive operational efficiencies and increase our customer satisfaction scores to **86% by 2024** and to **90% by 2030**.

Significantly Improve our Customer Timelines and Key Performance Indicators

Single Domestic Connections

- Full automation of all standard applications and quotes so customers receive their quote in one day.
- Time to Connect reduce from 10 to 7 days (where an outage is not required).
- Support customers as they navigate the connection process with digital tools/tips, webinars and clinics.

Business Connections

Efficiently delivering business connections is a high priority for ESB Networks and also critical for Ireland's economic growth. We are continuously working to enhance the customer experience for our business customers by focusing on improved delivery timelines and enhanced relationship management. The nature of these connections is that they vary in scale and technical complexity and therefore timelines are based on the particulars of each customer's individual project. Our goal is to engage closely with customers to guide them through the connection process and deliver in line with their construction and project schedules.

The initiatives listed here are already in progress with the aim of delivering an efficient and streamlined service to our business customers.

- Enhance customer engagement with a single point of contact and proactive communication throughout the connection process.
- Strengthen customer engagement with local delivery teams for pre-planning discussions and rapid resolution of queries.
- Additional resourcing deployed to complete the customer's connection in a transparent, timely and cost-effective manner.
- Enhance our Design and Planning process to maximise business connection throughput and cost transparency.
- Deliver digital end-to-end processes and digital tools to provide a more convenient and simplified experience to pre-screen, apply and track the connection journey.

Outage Performance

- Reduce Customer Minutes Lost to below **60 per annum by 2030**.
- Provide accurate and personalised information about planned work and estimated restoration times targeting **80% digital notifications to all customers by 2030**.

Customer Support Target

- Customer Contact Centre Performance across all customer service touchpoints targeted to achieve **92% by 2030**.

Complaint Management Target

- We aim to reduce our complaints from approx. **4000 per year to 2500 per year by 2030**.

Supporting Customers as they Transition to Net Zero

We also know that new customer demands and requirements will increase over the coming years, such as customers who wish to generate renewable energy at a small-scale and sell this energy back to the network. Providing our customers with information and support to help them work out the best options for low-carbon technologies and to be energy efficient is also a key deliverable for ESB Networks. Our focus will be to support, enable and collaborate with Ireland's energy customers.

We are building an integrated communications/activation framework to drive awareness and educate customers about energy efficiency, reducing consumption around peak times and to encourage participation in customer pilots and community energy schemes. We are also increasing our face-to-face interactions with customers via support clinics as well as at local and national events.

Supporting Customers to Participate in Flexibility Services

ESB Networks' is delivering a smarter electricity system to actively balance flexible demand and renewable generation at a local level. This will require domestic and business customers to participate in flexible services whereby they will receive digital notifications about when is the best time to consume energy.

There is a range of new products and services being



introduced to enable and empower our customers to become more flexible including:

- Awareness campaigns and behavioural initiatives to drive understanding about the benefits of flexible services for customers and support for their participation.
- In 2022, the **“Beat the Peak”**³¹ pilot initiative was introduced, targeting domestic customers to become flexible, and shift their demand away from peak times. The pilot was built on insights we had gathered from behavioural initiatives internationally.
- Developing smart consumer technology standards, so customers can access smart, interoperable technologies enabling them to participate in local flexibility markets.
- Customised local renewable energy notifications.
- Provision of community energy dashboards for domestic and business customers to give accurate real-time and energy forecast data.
- Incentivise customers with financial rewards for acting flexibly to shift electricity usage based on the local energy information provided.

Embedding a Customer-Centric Culture

ESB Networks is implementing a Customer-Experience Excellence initiative to embed a customer-centric culture that spans all teams, partners and contractors that delivers benefits for our customers and our business.

Our goal is to embed a “Customer First” culture and create an environment of empowerment and accountability across our business. This will be an enduring initiative and part of our long-term strategy to foster a customer-led mindset that informs how we work and how we make strategic and investment decisions.

6.2.4 ACTIONS

Our actions to deliver the Best-In-Class Customer Experience for all our Customers include:

- Streamline Connections/Outage customer journeys to increase Customer Satisfaction rating above 90% by 2030.
- Improve our customer operational KPIs and customer service targets with improved digital processes and single points of contact for business customers.
- Support our customers on their journey to net zero through awareness campaigns and participation in pilots and low-carbon schemes.
- Enable 10% of all households and businesses participating in flexibility services by 2025 and 75% by 2030.
- Implement an enduring Customer Experience Excellence initiative that will foster a customer-led mindset and culture across ESB Networks.



6.3 SMART METERING

6.3.1 INTRODUCTION

The Commission for the Regulation of Utilities (CRU), working closely with The Department of the Environment, Climate and Communications (DECC), established the National Smart Metering Programme (NSMP)¹⁷ in late 2007.

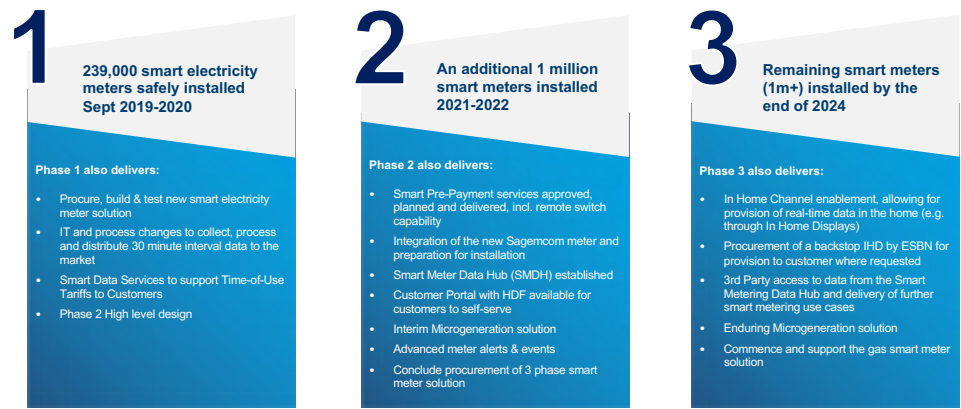
Since its commencement in 2007, the NSMP¹⁷ completed several different stages of work (including a Cost-Benefit Analysis) to help understand what other jurisdictions were doing with respect to smart metering, how this could be adopted for Ireland and what approach and high-level design should be implemented to maximise benefits to both customers and the Irish Energy industry.

In October 2014, the CRU published its decision regarding the industry high level design (IHLD) (CRU/14/046)²³. This provided details on how the introduction of smart meters would be managed and the scope of the programme delivery for customers and the market.



6.3.2 WHERE WE ARE TODAY

In 2017, the CRU announced that the scope of programme would be delivered over three phases, each with its own set of objectives aimed at incremental delivery of the Industry High-Level Design (IHL)⁴⁶. This became known as the ‘Phased Approach’ across the industry.



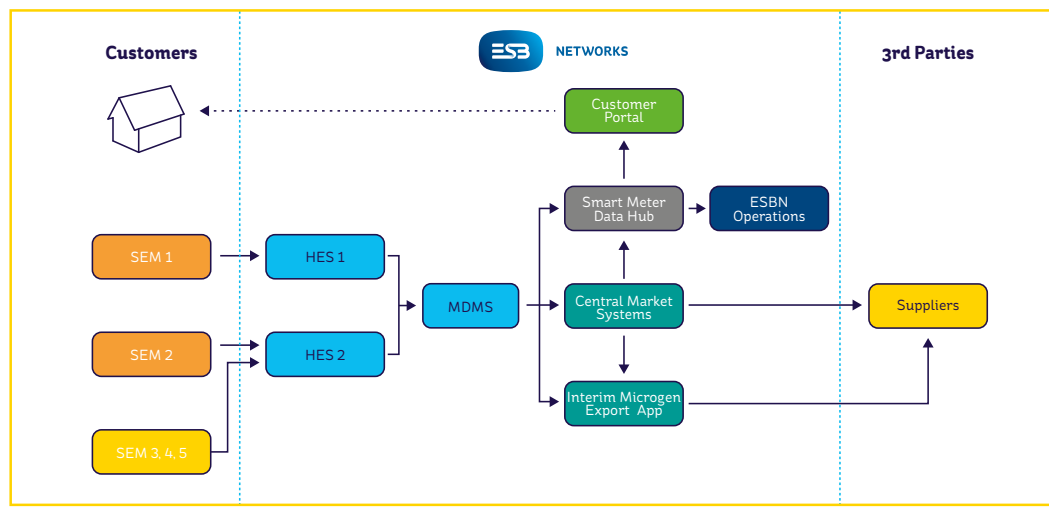
CRU Approved NSMP Phased Approach

Key capabilities delivered by ESB Networks to date:

- The installation of over 1 million smart meters supporting the daily collection and processing of 30-minute Interval data and 24-hour Cumulative Register data (both import and export energy flows).
- Support for new billing capability by Suppliers in offering innovative products e.g., Time-of-Use (ToU) Tariffs.
- Delivery of an Interim Microgen Solution to support payment to customers who install Microgeneration solutions such as solar

photovoltaic or wind turbines at their premises and who subsequently export energy to the grid.

- Delivery of a Smart Meter Data Hub, which stores data received from smart meters and makes it available in a format which can support Customer and DSO access to smart meter data.
- Delivery of a metering component in the ESB Networks Customer Portal⁴⁷ that provides access to Smart Meter Data for all customers who have a communicating smart meter installed and have registered for online access to their data.



As-Is Smart Metering Technology Landscape

Future capabilities to be delivered by ESB Networks through Phases 2 and 3 of the NSMP¹⁷:

- Enablement of the remote switch that is required to support Smart Pay As You Go services.
- Facilitation of near real-time access to data by the customer in the home via the In-Home Channel (IHC).
- Offer of an In-Home Display (IHD) device to customers (primarily from Suppliers, but backstop device must be available from ESB Networks).
- Facilitation of 3rd Party access to smart meter data from the Smart Meter Data Hub (pending outcome and direction from the CRU's Smart Meter Data Access Code as per the recently introduced S.I. 37/2022)⁵⁰.

European Context:

The “Benchmarking smart metering deployment in the EU-28 Final Report” (2019) by Tractabel for the European Commission⁵¹ provides a point in time view on the progress of smart metering across the EU Member States.

Table below, extracted from this report, highlights the estimated penetration rate of smart meters at an EU level, providing estimates for 2024 and 2030. These estimates allow us to recognise the significant deployment rate with which ESB Networks has rolled out smart meters in Ireland. Commencing our deployment journey in 2019, the national rollout of 2.4 million smart meters is due to complete at the end of 2024. This will surpass the estimated 2024 state of play at an EU level outlined in this report, which is anticipating a 77% penetration rate across households and SMEs.

Smart Metering Deployment for Electricity at an EU Level

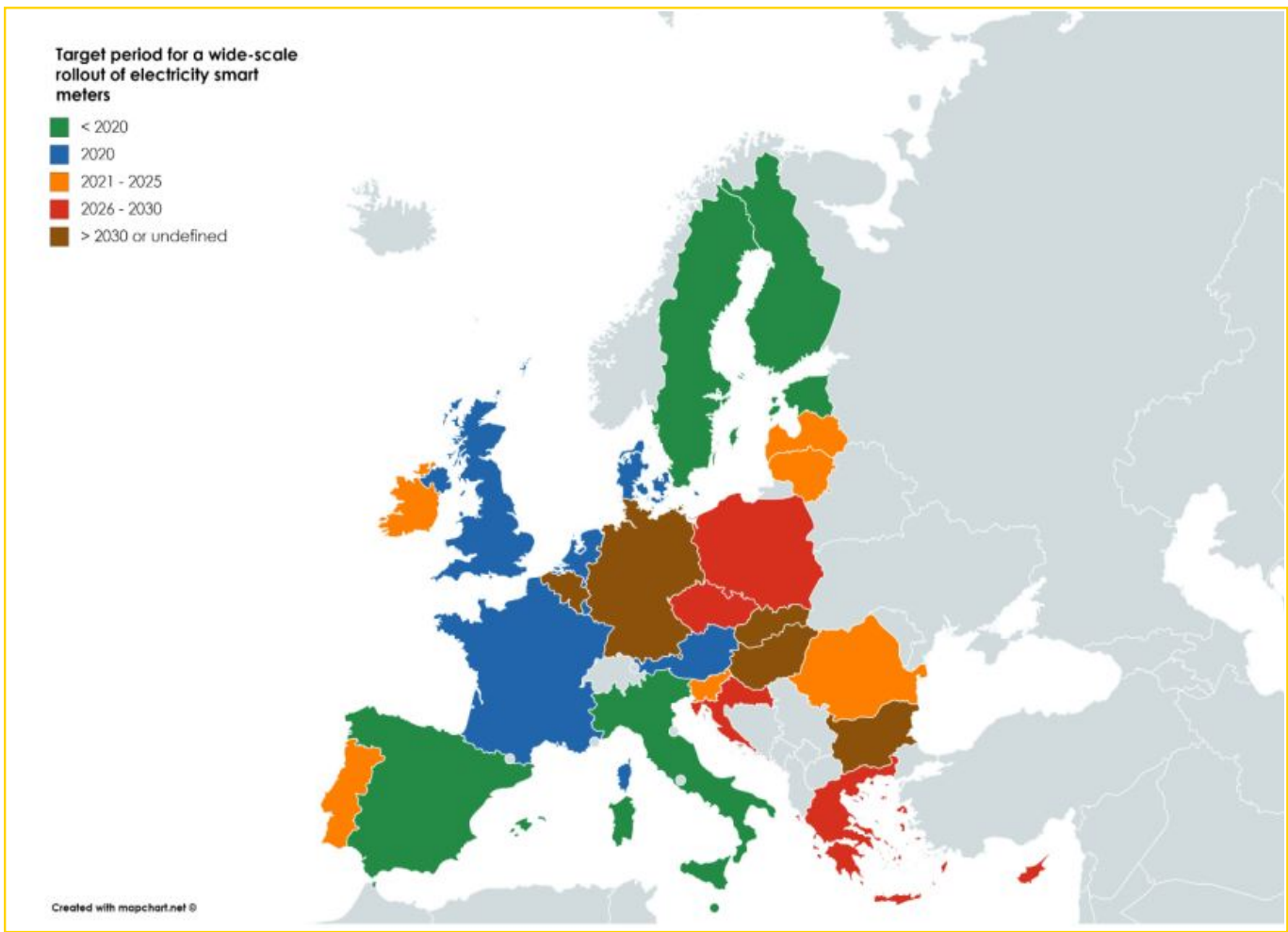
	Number of electricity smart meters installed (in million)	Penetration rate at EU level (%)	Induced overall investment (€ billion)
2020 original target in households (ref. COM (2014) 156)	- 200 million	- 72% in households	€45 billion based on original costing
Estimated 2020 State of play (households & SMEs)	123	43	21
Estimated 2024 State of play (households & SMEs)	223	77	38
Estimated 2030 State of play (households & SMEs)	266	92	46

In addition to a view on penetration rates, The map below, also extracted from this report, provides an overview of the target period for the wide-scale rollout of smart meters for each Member State.

Retail Market Services (RMS)

Retail Market Services (RMS) is a function which resides within ESB Networks and delivers a range of services to the RoI Retail Electricity Market. The function services close to 2.4 million end customers and operates under licence from the CRU to strict service levels. It manages relationships with Market Participants and the CRU. It provides data in a timely and accurate fashion daily. It

supports the wider RoI market through the ring-fenced Meter Registration System Operator (www.mrso.ie)³ and Retail Market Design Service (www.rmdservice.ie)⁴. It also supports the wholesale Single Electricity Market through the provision of aggregated meter data. Data Collection (Smart, Non Smart and Quarterly Hour) is a key service provided by the function and the integrity of same is aided by a Revenue Protection and Database team. The Retail Market Systems and Regulation team is central to the success of Retail Market Services. This function (which also includes the DUoS Billing activity) provides a suite of specialist functions that help to maintain the integrity of Retail Market Services.



Overview of Target Periods for Smart Meter Rollouts in EU Member States

6.3.3 OUR FUTURE PLANS

With the rollout of smart meters and the establishment of the Smart Meter Data Hub, the opportunity exists for ESB Networks to enhance existing services and deliver new services for both the customer and the DSO by realising the value of smart meter data.

You can find more information on this in the Customer Experience and Digital and Data Driven sections of this Strategy.

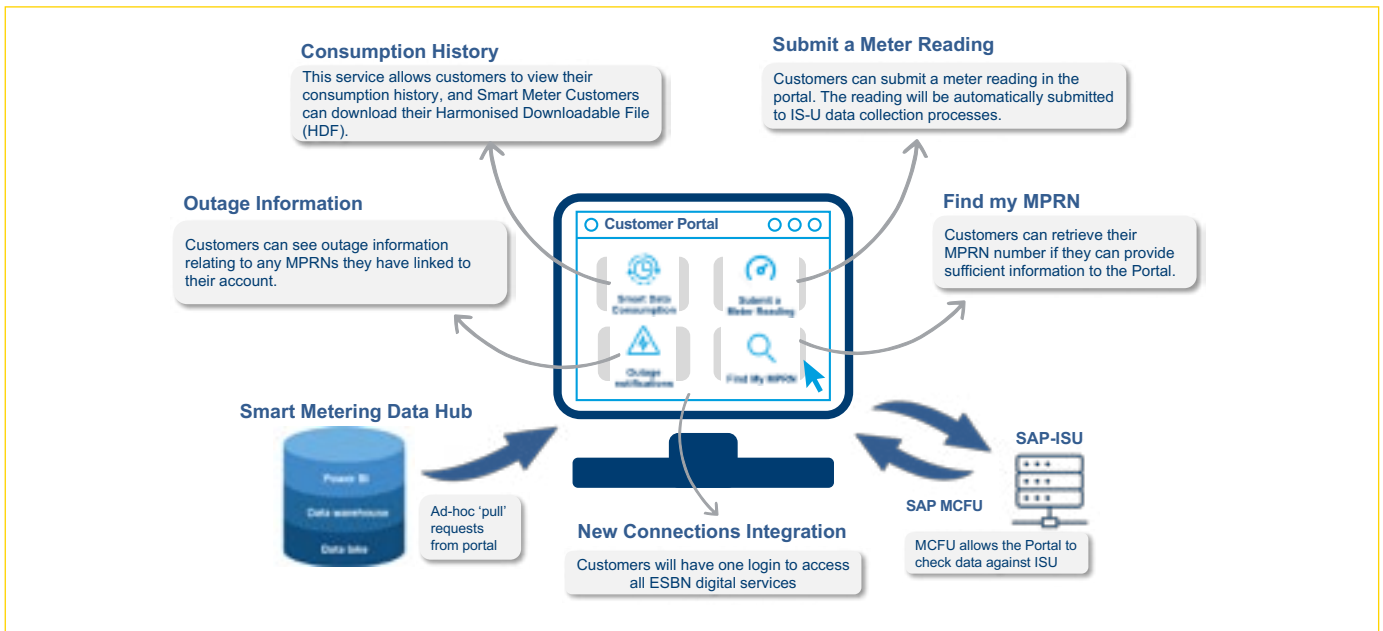
Customer

- We have delivered the ESB Networks Customer Portal which provides customers with access to their smart meter data. Opportunity exists to further enhance this service to the customer/energy citizen by providing power consumption and export insights underpinned by their smart meter data.
- Data driven insights are available to enable customers to reduce consumption, participate in energy markets, reduce electricity bills, supporting switching to new suppliers and adopt innovative energy products and services.
- In addition to the provision of data driven insights, as part of Phase 3, ESB Networks will facilitate

near real-time access to data by the customer via the In-Home Channel (IHC). ESB Networks will also offer a backstop In Home Display (IHD) on request that will enable the customer to visualise this data.

- We are delivering and scoping several DSO use cases that utilise the smart meter data present in the Smart Meter Data Hub (e.g., Poor Voltage Report, Revenue Protection and Meter Asset Management).
- We plan to support the use of smart meter data across the areas of:
 - Network electrical investment planning (e.g., Meter mapping / LV visibility/LV grid capacity),
 - Near Real Time Operations and Flexibility Markets (e.g., Outage information, Demand Reduction and Distributed Energy Resource Management (DERMS)),
 - Information provision (e.g., Asset Management & Revenue Protection).

You can find more information on this in the Distribution System Operation and System Flexibility sections above.



As-Is Customer Portal Overview

6.3.4 ACTIONS

Key actions for the ESB Networks Smart Metering Programme:

- Enable the Advanced Metering Infrastructure to underpin demand reduction and flexibility services.
- Complete the national rollout of 2.4 million smart meters by the end of 2024.
- Deliver the remaining capabilities set out in Industry High Level Design of the Smart Metering Programme²³.
- Develop the use of smart meter data across the areas of network visibility, LV grid capacity, near real time operations and flexibility markets, Demand Reduction and Distributed Energy Resource Management (DERMS).



7

FOUNDATIONAL CAPABILITIES



7

FOUNDATIONAL CAPABILITIES

7.1 OUR PEOPLE

ESB Networks relies on the skills, capabilities, and customer focused behaviours of our workforce of 3,500 people to support the service we provide to our 2.4m customers in the Republic of Ireland, 24 hours a day, every day.

As technologies and skills have evolved over 95 years, our focus on customer and community is as relevant now as it has ever been. Today, our employees along with our contractor partners, are delivering the network investment needed to support mass electrification, through a total workforce capability.

Investment in our people capability and culture are key components of our strategy. Empowering our employees in an inclusive values-led culture is key to ensuring we attract and retain the talent we need to enable and grow our business.

Technical Capability and Capacity

Technical excellence is at the core of ESB Networks' business. Our trusted position in managing the network on behalf of the nation means our people need to be highly skilled to meet the growing demands on the system. These increasing demands and changing technologies require a continuous investment in the technical training and development of our people to ensure the future capabilities needed to serve our customers in an increasingly digital world.

ESB Networks established, and continues to invest in, our world class Networks Training Centre (NTC) in Portlaoise. The NTC is the centre of excellence for technical training of Networks Technicians, Apprentices and Contractors and will continue its role in providing key capabilities for the organisation in line with our strategic needs.

A sustainable recruitment programme aimed at recruiting on average 300 people per year, across a range of disciplines, along with our partnerships

with contractor organisations, will ensure we have the ongoing capacity to meet our obligations to 2030 and beyond. Robust succession planning and talent management processes ensure skills and capabilities are constantly reviewed providing future resource assurance to the business.



People Experience, Customer Experience and ESB Networks Culture



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'.

Creating an excellent experience for our people so that they feel empowered, challenged, and valued in the work they do, leads to better outcomes for our employees, the business, and our customers. We want to attract and retain people who are motivated by our purpose and who have the skills and capabilities to meet our Networks for Net Zero Strategy.

Our culture in ESB Networks is driven by our values – being courageous, caring, driven and trusted. We believe that this culture is at the centre of the positive people experience we offer. Continuing to invest in and develop our culture is an important aspect of our Strategy. In line with our values, we expect the highest level of integrity from our people, guided by ESB's business code of ethics known as Our Code.

Understanding the important role that managers play in setting the culture and how their people experience the organisation has led to our development programme for first-time managers, helping to shape their approach and their impact as leaders.

Our customers and their needs are always central to everything we do. By listening to their feedback and to that of our employees, we will continue to embrace positive changes to our ways of working to bring about the highest levels of performance. By working in partnership with our trade union representatives we continually ensure an employee relations framework and model of representation that works for our employees, their representatives, and the business.



Smart Working

We have an inclusive and flexible approach to how we work in ESB Networks thanks to Smart Working, which matured quickly during the Covid-19 pandemic. Smart Working has become a normal part of how we work and how we interact with our customers. We will continue to be flexible, empowering our people to decide how to work best for them. We will plan time together to get the most from our interaction and ensure collaboration and knowledge sharing takes place while maintaining the culture of working in ESB Networks.

We will use digital technology to offer better communication and more inclusive events to our site based and remote employees so they can connect better with colleagues and the organisation, regardless of physical location. We recognise that Smart Working is still evolving and are learning by listening to our people and our customers. We will adapt our approach as we learn more so that our people have the best of both worlds; flexibility in how they work but also connectedness to their colleagues, customers and the culture of ESB Networks.

Diversity, Equity, Inclusion and Belonging (DEIB)

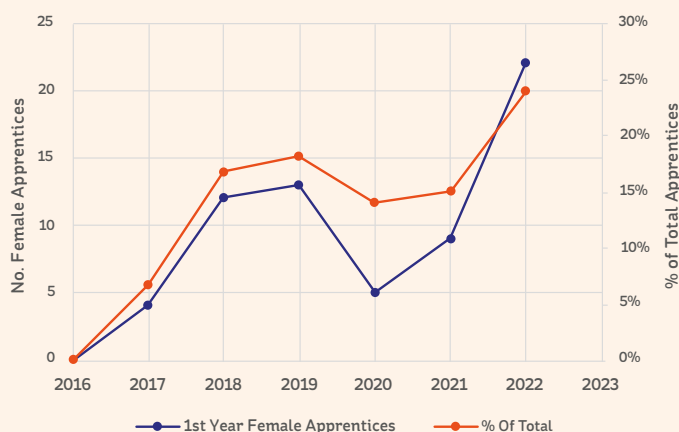
We are committed to an inclusive working culture and increased diversity in all its forms. The benefits and positive impacts of increased diversity in our workforce are obvious in terms of decision making, innovation and overall performance, and we continue to prioritise this across all areas of our business.

Increased diversity in traditionally non-diverse roles in our business has been very positive for ESB Networks. Building on this, we actively seek to recruit people from more diverse backgrounds ensuring greater diversity across technical roles and progressing this through to management levels.

ESB Networks is committed to being an LGBT+ inclusive workplace. Using the Corporate BeMe@ESB initiative as our guidance, we are creating a culture where each person can bring their whole self to work, fully contribute and feel valued, respected and equal in the workplace.

Gender Diversity in Network Technician Apprenticeship Programme

Female participation in some roles in ESB Networks, such as Network Technician (NT), has traditionally been low. In 2016 there were no women recruited into our apprentice NT programme. Recognising the barriers that exist to recruiting women into this role, a strategy was put in place to increase the number of female apprentices. Through targeted recruitment campaigns, increased visibility of women in the role and creating positive experiences for female applicants, the number of female apprentice NTs recruited in 2022 was 22. We have found that the more women we recruit, the easier it is to recruit women. ESB Networks has the highest participation of women in craft electrical work of any employer in Ireland.



7.1.2 ACTIONS

- Over the coming 5 years, we will recruit 1,500 people across a range of capabilities.
- Robust succession planning and talent management processes in place to ensure skills and capabilities are constantly reviewed providing future resource assurance to the business.
- The Networks Training Centre in Portlaoise will continue to be the centre of excellence in providing technical training for the organisation and will expand capacity to meet the increased requirements for training and onboarding of Networks Technicians and Apprentices.
- A continuous focus on our culture and ways of working to ensure the people experience we offer drives measurable increases in levels of employee engagement.
- Embed Smart Working across ESB Networks and continue to exceed the home and remote working target set out in the Government's Climate Action Plan 2023.
- We will maintain a strategic focus on attracting, retaining and developing a more diverse workforce and specifically target increased recruitment of women and minorities into traditionally non-diverse roles.
- Across all capability areas, we have introduced a target of 40% of both male and female in the recruitment intake, by 2030. This includes through our craft apprenticeship programme, demonstrating clear industry leadership in this area of STEM.
- We will continue to work in partnership with the ESB Group of Unions to ensure best outcomes for employees and the company.



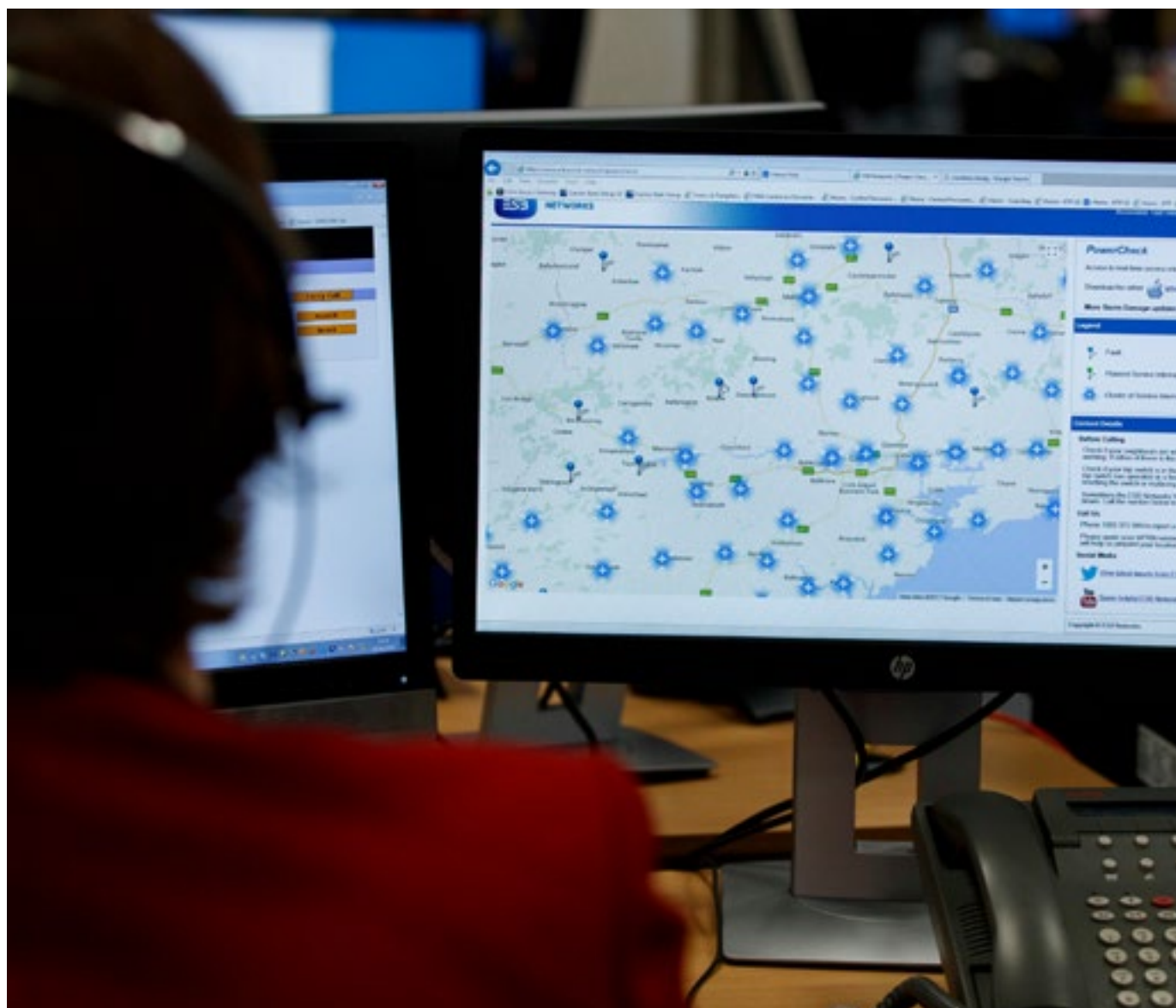
7.2 DIGITAL AND DATA DRIVEN

7.2.1 INTRODUCTION

Digital is the integration of technology and new ways of working into all aspects of the business, driving change in how we operate, serve our customers, and deliver value to society.

The next 10 years will be an era of fundamental change for the energy sector as utilities leverage digitisation with the potential to shift from building asset-heavy infrastructures that provide stable and predictable electricity supply to managing flexible, decentralised energy solutions.

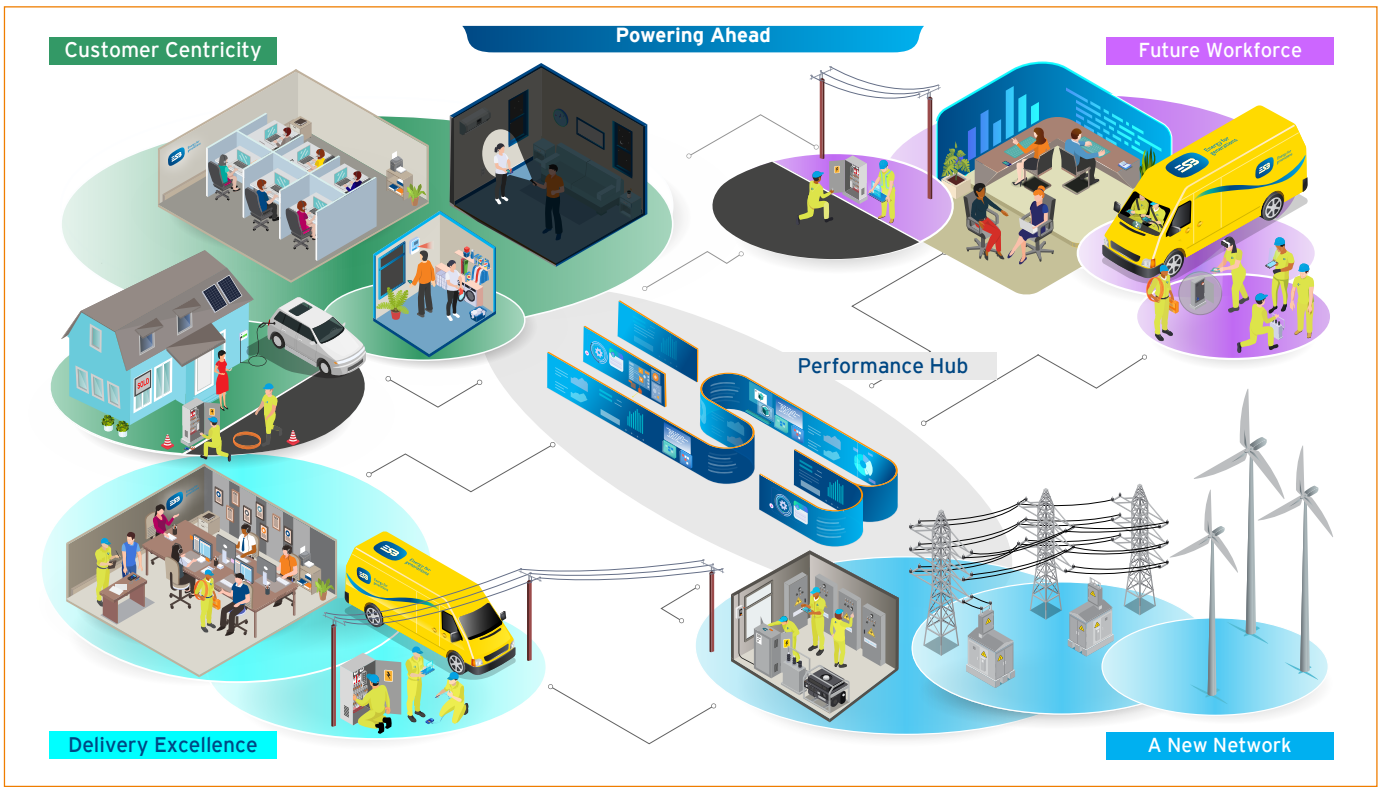
Transforming operations and systems with digital technologies and new ways of working can create substantial value and improve performance in areas such as safety, reliability, customer satisfaction and regulatory compliance. Business led, value focused change can be driven by multi-disciplinary, persistent teams focusing on customer and employee experience using agile delivery methods.



7.2.2 WHERE WE ARE TODAY

To keep pace with the changing environment, we have redefined our Business Strategy, and developed a supporting Digital & IT Strategy.

In addition, we have recently developed a Data Strategy which will accelerate digital initiatives by treating data as an asset across business functions, support customer centricity, inform decision making about the network and to drive efficiency in the field.



The Digital & IT and Data Strategies are multi-year programmes tailored for the challenges and opportunities we are presented with today and in the future, and will include a digital transformation for our entire business through four core business pillars: Customer; Employee; Assets; and Operations:

Customer: The Digital & IT and Data Strategy implementation will transform the Customer Experience and ensure through the digitalisation of all key processes, customers will be able to access ESB Networks products and services at their convenience.

With the transition to net zero, domestic customers will have real time sight of all electricity issues and supports available. They will be incentivised to optimise their

energy management and empowered to adopt flexibility services and Low-Carbon Technologies through digital technologies. ESB Networks customer engagement will be 'digital first' while ensuring that no customers are left behind. Consumption, generation, and storage information will be readily accessible.

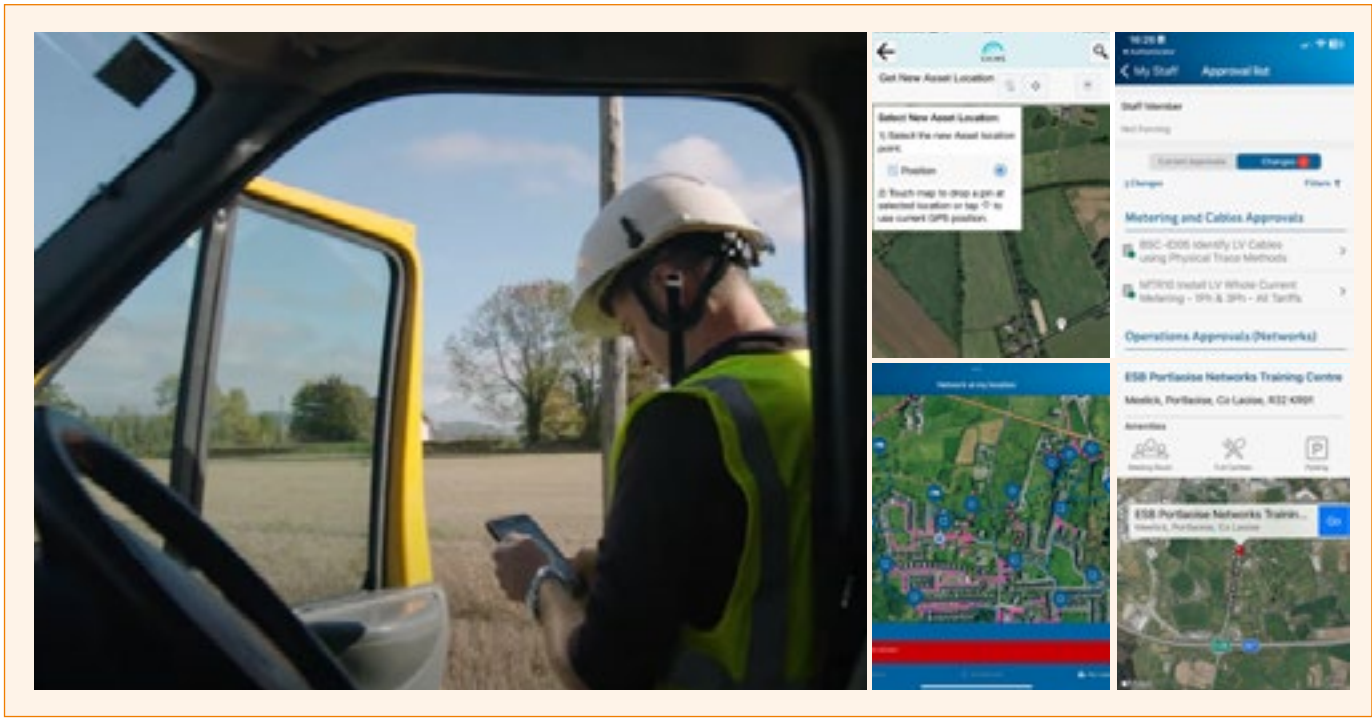
Larger customers will also benefit from having simple, digital engagement channels and will be empowered to participate in DSO markets. Flexibility Low-carbon Technologies will optimise energy management and associated costs, potentially providing business revenue stream. There will be transparency on status and timeline on all ESB Networks services and real-time information and support on electricity supply issues.

Employee: Implementation of the Digital & IT and Data Strategies will transform the employee experience using technology and data insights to improve connectivity, productivity, and safety on site. Multi-disciplinary delivery teams will be empowered by digital ways of working to drive incremental changes and business value.

Employee Safety will be enhanced through the availability of all required data and procedures in the field. Data analytics will further enhance staff safety through analysis of safety events, root cause analysis and associated mitigations.

Employees and partners will be connected in the field and will have all necessary systems, data, and collaboration tools available on mobile devices.

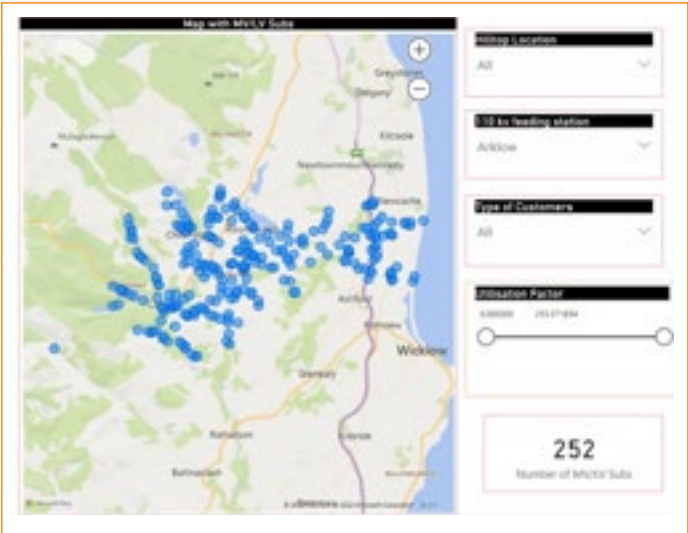
High performance work execution and productivity will be enabled by using digital technologies, including optimised scheduling, automation of repetitive tasks and streamlined processes. Tools will be built around employees needs and roles to ensure exceptional people experience. Training and support material will be available to all users in all locations.



"Networks Technician using Mobile Applications at the asset."

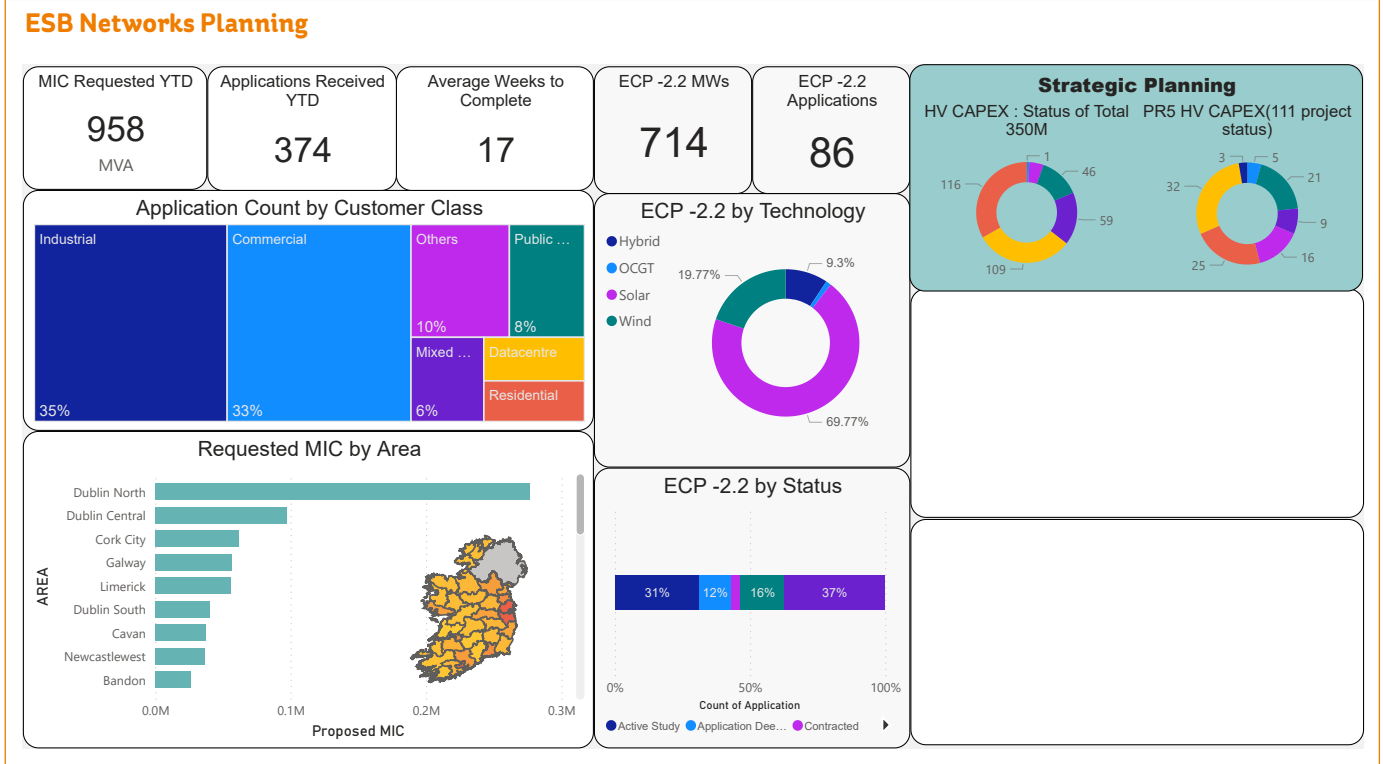
Operations and Assets:

Asset performance and lifecycle management will be underpinned by informed decisions based on asset data. This in turn, will inform asset maintenance and determination of optimal investment strategies. The integration of our asset programmes, together with the digital enablement of our employees, will optimise asset management and the delivery of all associated work programmes. The automation and digitalisation of programme management is foundational for optimised material management and will drive efficiencies in our sourcing and procurement. New modelling tools and data analytics will give much better information on the status of the electricity system and will form the basis for our Network planning.



Future Planning Tool

The introduction of system flexibility through renewable generation and energy storage at all voltage levels on the system will require digital and data led transformation of our Network Operations. Digital and Data tools, processes and ways of working will be required to better understand the operation of the Network and support the markets necessary to ensure stability of a more distributed, active system.



7.2.3 OUR FUTURE PLANS

Digital first, Information and Innovation Strategies

The transition to a clean electric future is challenging and all the elements to make it happen have yet to be fully scoped, agreed and adopted. New business focused, agile ways of working, supported by digital and data technologies will be implemented to work through uncertainty and deliver required business objectives. ESB Networks will be taking a digital first approach – using new and innovative tools and delivery techniques to deliver business and market outcomes. Using artificial intelligence to optimise the audit process for the installation of new smart meters is a recent successful example of this in action.

As the part of the transition to net zero, collaboration and data exchange between ESB Networks, market participants and other stakeholders will be critical for system operations and management of the associated markets. Information exchange with the Transmission System Operator (TSO) will be essential for facilitation of flexibility. Energy aggregators will require access to usage information across their client base and customers will require close to real time information to optimise their usage and associated costs. The implementation of our Data Strategy will be critical to enable data and information sharing across the market, while continuing to protect customer information in line with all obligations and customer preferences.

Cyber security

We will continue to enhance and constantly improve the resilience of our Information Technology & Operational Technology Infrastructure to withstand the evolving and sophisticated cyber-attacks. ESB Networks will comply with the Network and Information Systems Regulations through the National Cyber Security Centre (NCSC) Cyber Assessment Framework; to protect our network, secure our customer data, and keep the public safe. We have invested in substantial cyber assessments and remediation programmes, however given its ever evolving nature, we recognise the need to continue significant investment in this critical area.

Over the period to 2030, our network will see unprecedented change as exponentially more endpoint devices are connected as part of network monitoring and following an increase in grid edge activity/ distributed energy resources and digital enablement of flexibility services. Given the rapidly changing cyber threats, changing climate patterns and the uncertainties that will arise from our transformed relationship with our customers as we approach net zero, there will be ever increasing risks to the cybersecurity of our network which will need to be managed and mitigated.

Our cyber security objectives are:

- Protect the network & assets, customer data and ensure the resilient operation of the network through the continued implementation of our IT/ OT cyber improvement plans.
- Demonstrate resilience of our National Critical Infrastructure through compliance to the Network Information Systems Directive (NISD)³⁷.
- Demonstrate resilience, stability, and security of our Electrical Network through compliance to the EU Network Code for Cybersecurity (NCCS)³⁸.

Due to the disperse nature of our locations and workforce, we will implement a holistic approach to security, where cyber security will be fully integrated with ESB Networks physical and personal security under a single business council.

Our Networks for Net Zero Strategy requires greater visibility and control of the electricity network. The business has identified a requirement for enhanced visibility of grid assets at the MV and LV voltage levels to be provided while continuing to support and improve connectivity to HV and Transmission assets.

To meet this requirement, ESB Networks has commenced evolving the current operational telecoms network and enhancing it through the deployment of a private wireless network that can scale up to meet the ever-increasing data demands of a modern and digital DSO.

ESB Networks' purpose-built telecommunications network will act as a key enabler for data and digital activities such as the transition to net zero, greater use of flexibility, enablement of near real time operations and the integration of renewables and demand side resources.

Information and Transparency

ESB Networks will be clear and open with our customers about the data we collect regarding their energy usage and guarantee that any data will only be used for its intended purpose, will not be retained beyond the necessary, defined period and will comply with GDPR regulations.

ESB Networks is committed to empowering customers to take control of their own data through the digital engagement channels which are currently in development and facilitating customers sharing that information as they so wish. We are committed to being transparent with our customers in all our actions and provide real-time updates and friction free customer journeys.

Innovation and working with others

It is important to note that, while we have great capability within the organisation, we are always looking to leverage experience and knowledge from people and organisations that can support and assist ESB Networks in meeting our business objectives.

By participating with external collaboration events, such as the annual Free Electrons programme (<https://freeelectrons.org>), we will continue to gain access to start-up companies with new ideas and products in the market.

In the delivery of our IT and Digital products, we will continue to engage companies with international experience and contacts to fast track the delivery of our business needs.

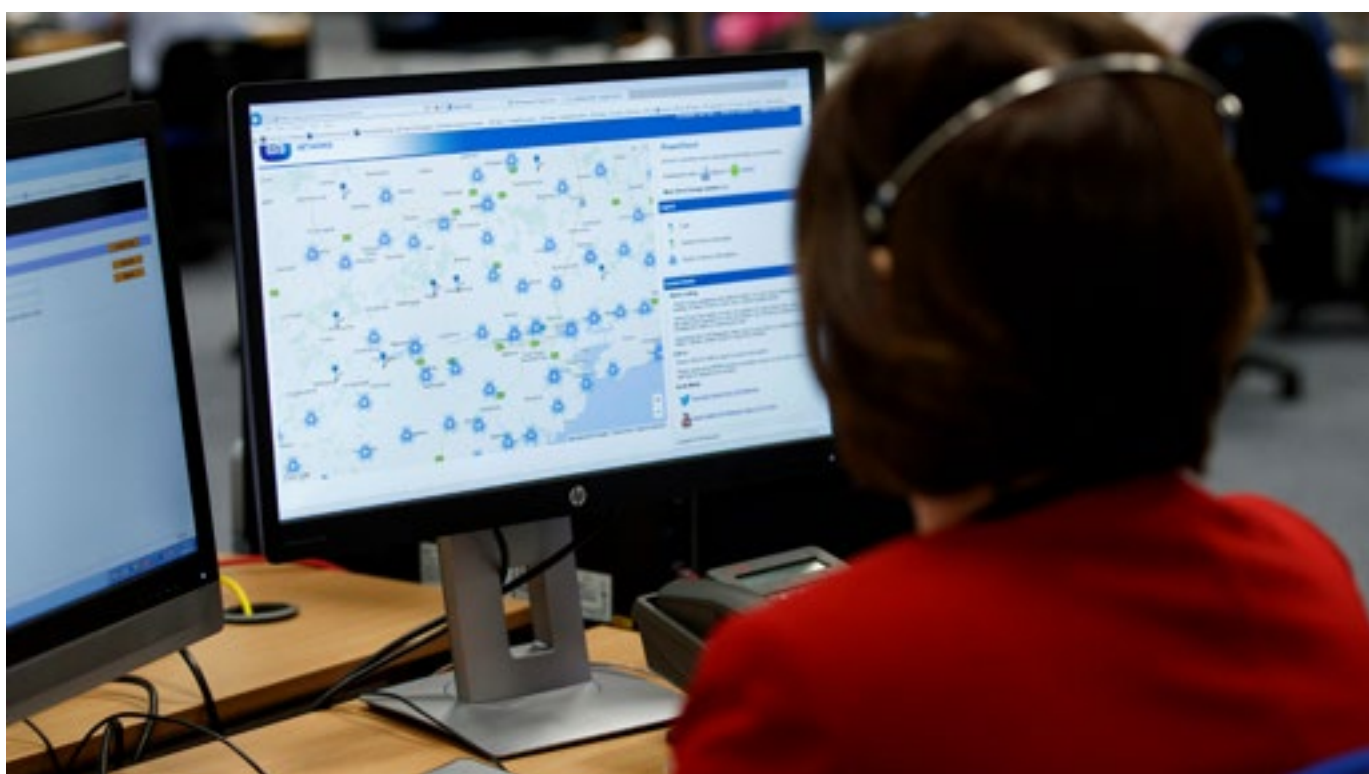
ESB Networks will leverage our recently established 'EcoSystem' – which has over 60 companies and 230 members to post challenges, assess capability and ultimately collaborate and deliver in partnership with external members.



7.2.4 ACTIONS

Our actions to deliver our Business Strategy by transforming our operations and systems through utilisation of digital technologies and data include:

- >60% of all customer interactions will be digital by the end of 2025.
- >80% of all customer interactions will be digital by 2030.
- Embed and support digital ways of working and technologies in our transformation programmes.
- Implementation of the Data Strategy to ensure integration of data sources, enablement of business decision making through analytics and sharing of data.
- Definition and implementation of required digital and data platforms to support business transformation.
- Regular assessment in digital maturity to ensure that necessary components of a Digital Utility are in place.
- Implementation of revised cyber security governance structures to measure and manage associated risk and protect ESB Networks assets.
- Ensure the integration of systems, data, and processes through the effective operation of architecture governance structures.



7.3 FINANCIALLY STRONG

7.3.1 INTRODUCTION

Energy impacts all aspects of our daily lives, underpins all sectors of the Irish economy and is a key part of national infrastructure.

ESB Networks already works with a range of companies, industries, city and county councils, academia, government departments and the Commission for the Regulation of Utilities (CRU) to support growth and development of the economy. As such, we are a key enabler for Climate Action as Government makes policy and legislative decisions which will act as a catalyst to drive forward economic and green opportunities in Ireland to the benefit of all citizens as we transition to a net zero economy.

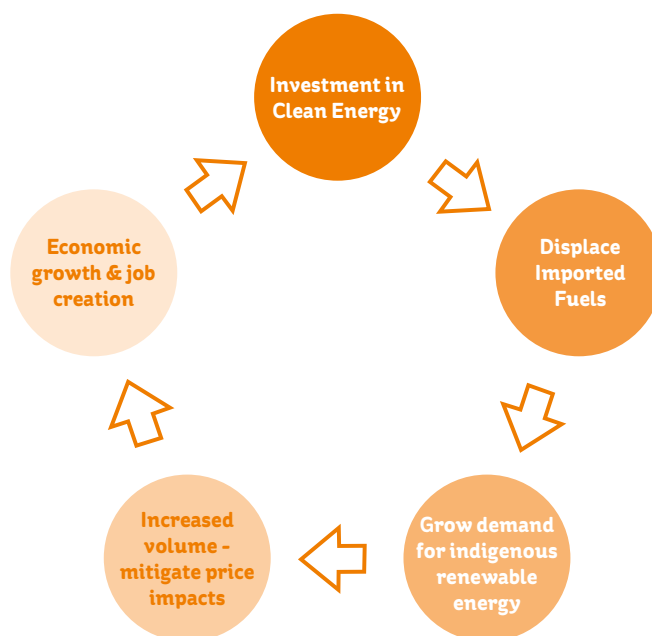
ESB Networks is fully supportive of Government policy and are committed to working collaboratively with the CRU, EirGrid and other stakeholders to deliver on policy objectives. With the right policy and regulatory framework, attracting private sector investment, in clean energy can drive economic growth and job creation in Ireland while maintaining affordability for customers – a virtuous cycle.

The scale of ESB Networks operations reaches all parts of Ireland and in 2021 ESB Networks made an economic contribution to the Irish Economy of c. €1.2bn.

ESB Networks' Strategy recognises the need to take an ambitious and innovative approach to future-proof our electricity network and address the climate challenge.

We are also very aware that this is a very difficult economic time for all customers considering the Russian invasion of Ukraine and the high wholesale and retail electricity prices.

ESB Networks will always seek to strike a balance in the provision of a safe, secure, and high performing network, balancing the cost paid by all electricity customers with the need to invest to provide a resilient network that enables decarbonisation. We will continue to manage our cost base and apply downward pressure on costs where we can, by focussing continually on operating as efficiently as possible.



ESB Networks Investment Programme 2023- 2030

ESB Networks investment programmes and operating costs are paid for by our customers. These investment programmes are reviewed, challenged, consulted on, and approved by the CRU on behalf of all electricity customers. The investment targets for PR5¹⁴ out to 2025 were agreed in 2020 and the investment programme for PR6 (2026 to 2030) will be subject to a similar oversight by the CRU over the coming years.

In the period 2023–2030 our current estimate is that ESB Networks will need to invest in the region of €10bn on programmes to replace older network assets, improve safety and to accelerate the transition to a net zero future.

For Ireland to achieve the targets in the Government Climate Action Plan, major changes to the electricity network will be required to enable to this happen. A significant increase in the scale of ESB Networks capital investment will be required to enable increased renewable electricity generation, further reinforcement for the electrification of industry, heat and transport, increased participation rates from more active consumers (micro-generation, demand response etc.).

As discussed in the Distribution System Operator section, we will be seeking to maximise the use of our distribution network to facilitate renewable energy, electrification of heat and transport, and demand flexibility through innovative technologies. Significant capital investment in new substations, overhead line and cables will be required to deliver for 2030 and beyond. We will continue to develop systems that will help to avoid or defer traditional capital investment and use emerging solutions to maximise the use of the network to the benefit of customers. The scale of investment in Price Review 5 (PR5)¹⁴ is €4.4bn and covering the period 2021–2025 which is an increase of c.60% on PR4 and it is anticipated there will be further considerable increases in the investment programmes in PR6 (2026–2030). ESB Networks anticipates that a total capital investment of c€10bn will be required between 2023 and 2030.

ESB Networks will continue to operate efficiently

We will continue to drive efficiencies in our business by delivering savings through:

- improvements to business processes supported by investment in new IT systems
- improvements to operational working practices
- effective procurement strategies
- continued use of in-house resource to undertake core activities
- design of the right engineering solutions to network problems and
- learning from other distribution network operators (DNOs), utilities and large asset-based organisations

How ESB Networks will finance our Strategy

ESB Networks will fund our network investments through operating cash flows from revenue receipts, raising of new debt and retention of earnings as required. We estimate that our RAB will increase from circa €9.5bn at the end of 2021 to circa €15bn by the end of 2030 and a significant portion of this increase will be financed via the raising of new debt.

The Regulatory Framework provides sufficient revenues to ensure that the ESB Networks regulated business remains financeable which supports ESB's overall credit rating and allows ESB Group to access debt funding for ESB Networks capex at competitive rates.

Impact on customers' bills

ESB Networks investment programmes and operations derives its revenue principally through charges for use of the distribution system levied on electricity suppliers and charges for use of the transmission system levied on EirGrid.

Based on data sent by suppliers to the CRU during 2021, the transmission and distribution network tariffs, which recover the costs of operating and investing in each network, combined represented approximately 31% of a

typical domestic end user electricity bill (23% relates to distribution network costs, 8% relates to transmission network costs).

Wholesale electricity prices have risen dramatically since this data was provided, which has been driven by a substantial increase in gas prices. The material increase in wholesale electricity costs has resulted in increases to the end user bill of a domestic customer. Consequentially, the proportion of Distribution Use of System (DUoS) charges in a customer bill is decreasing as the magnitude of the overall customer bill is increasing, due to increasing wholesale prices.

This percentage will vary each year depending on electricity wholesale prices and other costs which make up the final bill. Network Charges will also make up a lower percentage of the final electricity bill for business customers.

The costs associated with network investment are typically paid for by customers over 45-50 years reflecting the long-term value of network assets. Our tariff forecasts reflect the cost of ongoing investment in the network and significant new programmes to improve safety, manage the increasing level of renewables connections and the uptake of Low-Carbon Technologies. So, while the overall scale of investment outlined in the period 2023 to 2030 is significant, the recovery of the required upfront investment costs via customer tariffs is done over a long period. This means that the annual costs recovered via customer tariffs will be much smaller than the upfront investment costs incurred by ESB Networks.

Supply Chain Management

The 2022 Russian invasion of Ukraine had a substantial impact on global supply chains, exacerbating the disruptions of 2020 and 2021 stemming from the uneven world economic recovery from the Covid pandemic. Market costs for many utility materials and services have continued to increase, due to the rapid increase in raw commodity, electricity, and gas prices. This has led to a greater focus on improving our supply chain resilience.

Our supply chain is crucial to the successful delivery of our Strategy. Our objective is to deliver best value solutions in support of our customers' needs through robust engagement and management of our suppliers.

We are committed to monitoring and mitigating emerging enterprise-wide supply chain risks and disruptions that may impact successful delivery to Networks PR5 programme. ESB Networks is committed to identifying innovative ways to engage and work more effectively with our supply chain partners to create enhanced long-term relationships with suppliers and contractors. The management of supply chain risk includes identification of large projects early so that long lead time high value equipment can be procured as early as possible.

Networks Strategic Procurement

Networks Procurement's role is to ensure that procurement is always aligned with and supports the delivery of Networks overall business objectives through timely procurement planning, active procurement category management and effective supplier relationship management. Networks provides a substantial contribution to the Irish economy through its procurement activities as summarised in the table below.

	Value
Our contribution to Irish Economy per year	€1.2 billion
Forecast Growth in Spend 2021-2025	60%
Networks frameworks current value	€4 billion
No. of Irish vendors	1,127

Tendering Activity

It is ESB Networks' policy to ensure that contracts are awarded to companies who have the capacity and experience to meet ESB Networks' requirements over the term of the contract. ESB Networks monitors market conditions to effectively negotiate price increases or to seek reduced prices as markets fluctuate.

Competitive tendering is central to the delivery of our key procurement strategy objectives to:

- provide value for money for our customers
- meet customer requirements sustainably
- comply with all legal and governance requirements

Contracting Strategy

ESB Networks deploys a range of procurement methodologies to manage our suppliers and contracts to deliver value and efficiency. Longterm multi-party frameworks are in place for many key materials and contractor requirements and there is a multi-year replacement plan. ESB Networks will establish new and replacement frameworks of €4bn in value, or greater if required, to enable on-going delivery of our investment programmes. We have many key long-term relationships with suppliers and contractors that play a very important role in delivering our investment plans.



Sustainable Procurement and Net Zero Delivery

Procurement will play a pivotal role ESB Networks' drive to a net zero future, through purpose-led sustainable procurement strategies and practices that deliver value for money and socially responsible outcomes for our customers and the internal Networks business.

Sustainable procurement seeks to have the most positive environmental, social and economic impacts possible on a whole life cycle basis.

ESB Networks has developed with ESB Group a long term sustainable procurement roadmap. This roadmap demonstrates how ESB Networks can use the procurement process to achieve its sustainability goals, while highlighting how we will collaborate within our organisation to deliver these goals.

Socially responsible procurement aims to address the full impact on society of the goods, services and works purchased. Environmental, Social & Governance (ESG)¹ investing is becoming more and more influential as a socially responsible investment management approach that considers companies' impact on their communities and the planet at large.

ESG¹ is therefore a key component of delivering sustainable procurement. This is achieved by considering what ESB Networks buys, who we buy from and how we buy as detailed in the diagram below.



7.3.4 ACTIONS

- Continue to manage the financial performance of the business to enable the raising of debt at competitive rates to fund investment.
- Operate the business with a continuous focus on operating efficiency to ensure value for money for customers.
- Deliver procurement and contract management plans to scale the delivery of the capital investment programme to deliver a resilient electricity network for net zero.
- Manage Supply Chain Risk in the short term volatile environment and over the longer term during the life of the Strategy.



7.4 SUSTAINABLE AND SOCIALLY RESPONSIBLE

7.4.1 INTRODUCTION

ESB Networks believes in the role of electricity infrastructure as an enabler of social, environmental, and economic regeneration.

ESB Networks will support this by:

- Building the resilient electricity network of the future, connecting renewable electricity generation that will displace carbon emissions in electricity and in buildings and transport.
- Adapting our low voltage networks to enable customers to electrify transport and heating in their transition to net zero.
- Working to a biodiversity net gain on our sites, the reduction and ultimate elimination of any pollution and working closely with our host communities.
- Placing sustainability at the core of everything we do and collaborating to support sustainability.

Sustainability is often defined as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs.' In ESB Networks, we have a long track record of meeting the needs of our customers. Increasingly, we are looking forward to establishing how we can address the needs of future generations.

Community is very important to us in ESB Networks. We work closely with communities across the country and our staff are closely entwined within those same communities. It is clear to us that the success of local communities, economies and natural ecosystems are integral to the success of ESB Networks itself.

As a result, we are committed to putting sustainability at the core of everything we do at ESB Networks by ensuring that it is part of our culture and processes as detailed in other sections of this Strategy.

Electricity is essential for sustainable, social and economic development. Renewable electricity and electrification are cornerstones of Ireland's Climate Action Plan.

ESB Networks' purpose has evolved as we acknowledge the central role that electricity plays in climate action as

we accommodate and connect high levels of renewable generation so that clean energy can drive the carbon out of heat, transport, and our economy.

Ireland's national policy and that of the EU 'Fit for 55'⁸ package is broadly aligned with this. ESB Networks are committed to meeting and exceeding these requirements and will achieve net zero by 2040. This is consistent with the ESB ambition to achieve net zero by 2040 across the entire Group.

Delivering this is going to require a challenging transformation of our network, our systems, and our approach. The sustainable social and economic development of communities and businesses, Ireland's climate action response and transition to zero carbon are all dependant on ESB Networks delivering our purpose through to 2030 and beyond.

We recognise our leadership role in Ireland in relation to climate action and understand that we have an important part to play in contributing to the achievement of the Government's 2030² climate action targets.

ESB Networks will set science-based targets aligned to the 1.5C limit of the Paris Agreement⁵² to plot the trajectory to net zero emissions. We commit to a reduction of approximately 50% in carbon emissions by 2030 and to achieve net zero by 2040.

Our Strategy is focused on three UN Sustainable Development Goals (SDGs)¹ where we can make a difference.



ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL



BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION



TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

Through electrification, ESB Networks is at the centre of a decarbonised energy future, as we enable customers to consume the clean renewable electricity to heat homes, power transport, heat water, power farms and businesses. This will enable up to two thirds of carbon emissions to be removed from Irish society.

ESB Networks has committed to be a sustainable Distribution System Operator by signing up to the E.DSO sustainable grid charter³⁵.

E.DSO Sustainable Grid Charter

The Sustainable Distribution System Operator:

- 1** commits to facilitating the energy transition by optimally enabling the use of clean energy resources and the options of energy conversion, while making its own operations optimally carbon neutral also.
- 2** takes responsibility for the safe and reliable distribution of electricity, engineering the network for a world of increasingly extreme weather patterns.
- 3** operates with the minimum of materials necessary to conduct business operations safely and takes the life cycle of materials into account.
- 4** takes the necessary preventive measures to minimize pollution risks arising from its business operations.
- 5** develops and operates the grid, respectful of biodiversity and without harming eco-systems.
- 6** provides access to electricity for all and facilitates an inclusive clean energy transition
- 7** ensures the safety of the neighborhoods it services by taking preventative safety measures to protect all consumers in the operation and maintenance of the grid.
- 8** cultivates a healthy and safe working environment based on a culture of prevention and targets zero accidents in the workplace.
- 9** acknowledges the value of individual difference and supports equal opportunities for all, regardless of sex, nationality, age, religion, disabilities and educational background.
- 10** commits to taking the necessary measures to safeguard individual privacy and a secure data environment.
- 11** seeks the same environmental, social and governance standards from suppliers and other partner organizations as it has set itself.
- 12** invests in the grid, subject to financial due diligence with due regard for the consumer and the environment.
- 13** manages the grid in a transparent, fair and lawful manner.

7.4.2 WHERE WE ARE TODAY

ESB Networks has made substantial progress over the past number of years in reducing its carbon output under several headings. The progress in reducing our carbon footprint is set out below. In summary, over the last four years, we have reduced our carbon footprint by 55%.

Public Safety¹⁸

The safety of the public is a key input to our designs and how we operate and manage the electricity network. This means;

- We continually patrol and monitor aspects of our networks, with which the public may come in contact with such as poles, overhead conductors, mini-pillars and substations.
- We run public safety print and media campaigns to inform members of the public of the dangers of coming into contact with any of our infrastructure.
- We will continue this work through new and ongoing initiatives.



7.4.3 OUR FUTURE PLANS

While ESB Networks has made large strides in the carbon reduction area over the past few years, we are committed to accelerating our progress on the trajectory to net zero by 2040.

We will integrate Carbon Emission Assessment as part of all infrastructure capital investments by 2025, five years ahead of the requirement under CAP19. We will calculate and value GHG emissions as part of this economic appraisal of major projects that we undertake where these emissions are material, using a shadow price of carbon.

If a proposed investment results in a reduction in carbon emissions, these values are considered as benefits in an economic appraisal. If a proposed investment results in an increase in carbon emissions, these values are considered as costs in the economic appraisal.

The Climate Action Plan 2023 lists "Emission valuation in investment appraisal" as one of the five key commitments that each commercial semi-state body should adopt.

We will continue to ensure that climate-related processes and risks are incorporated in the company's overall risk management framework and included in risk reporting.

We will reduce our impact on the environment by applying similar principles to those in **Green Public Procurement (GPP)**¹⁹. All procurement will be green-compliant by 2025.

GPP¹⁹ is a process of choosing goods, services, works and utilities that have a reduced impact on the environment throughout their lifecycle, as compared to alternative products/solutions. It requires buyers and suppliers to consider not just the up-front purchase costs of a given solution, but its total economic and environmental cost from cradle to grave.

CASE STUDY: St Margaret's Road, Finglas, ESB Networks Main Administration Building

PROBLEM: Historically the highest energy consuming building in ESB, with monthly electricity consumption reaching 150 MWh on occasion.

SOLUTION: ESB Networks undertook a deep retrofit project focused on the upgrade of the building heating, lighting, and ventilation systems to more energy efficient options. Inefficient electric boilers and the temporary chiller were replaced. A new high-efficiency direct expansion air conditioning system utilising heat pump technology was installed. The air handling units (AHU) were replaced with newer versions with higher efficiency fans, heat recovery and utilising heat pump technology to provide heating or cooling to the incoming supply air. New and improved heating and cooling controls were also installed. The existing luminaires were replaced with new, more energy efficient LED lighting.

TIMELINE: Works commenced on site in Q4 2020

and were completed in Q4 2021.

TARGET: A more comfortable office space and energy savings have already been achieved. Further monitoring will be carried out to ensure that the 50% energy efficiency improvement targeted by the project continues to be achieved.



Energy efficient LED lighting replaced existing luminaires

We will meet our obligations to:

- Reduce our building CO2 emissions by at least 51% by 2030.
- Increase our improvement in energy efficiency for our buildings and transport fleet from the 33% target in 2020 to 50% by 2030.
- 50% of all buildings will be at least at a BER B rating by 2025 and the balance will be brought up to at least a BER B by 2030.
- We further aim to have 40% of the buildings at a **BER A** standard by 2030.
- Implement smart working practices that will reduce travel to the office for work by 20%

We will fully transition our fleet of approx. 2,000 vehicles away from fossil fuels by 2040. We have adopted the following 2030 milestones, for vehicles that we tender for in this timeframe, as part of this journey towards 2040.

Light Duty Vehicles Targets (<3,500kg) – By 2030 at least 80% of the vehicles purchased will be electric. We expect that all two wheel drive vehicles will be electric.

Heavy Goods Vehicles – By 2030 15% of the vehicles purchased will be low emission. If carbon free HGV becomes technically available, our aim is to replace all of our fleet.

ESB Networks has already replaced 50% of our diesel powered forklifts with electric forklifts and will replace the balance by 2030.

Where possible, we've been replacing petrol powered equipment such as chainsaws, augers etc., with **battery powered options** and we will continue to extend our range of battery powered tools. Our aim is to replace all petrol powered equipment by 2030 where technically possible.

In addition, we plan to uprate our charging infrastructure across the country to cope with this increased electric vehicle demand.



We will ensure that we have a net biodiversity gain from our operations by 2025. We will produce a comprehensive biodiversity plan for our operations to support this by end of 2023. We will also plan to have a 10% biodiversity gain for individual major projects on our work programme.

CASE STUDY: Pollinator Actions at the ESB Networks Training Centre, Portlaoise

As a key partner of the All-Ireland Pollinator Plan (AIPP), ESB has committed to take up opportunities for more pollinator-friendly management of landscapes within its property portfolio, where this fits with the needs of safety, business operations and property management. ESB has been reviewing its landholdings to identify parts of sites suitable for supporting pollinators, through various actions such as minor changes in mowing regimes or new habitat creation.

During 2021, the ESB Networks Training Centre (NTC) in Portlaoise was identified as a pilot site for trialling a suite of measures which may be applicable to other ESB Networks sites such as

the outer compounds of HV substations. A trial grass management regime has been designed, where zones of the overall training areas will be subject to reduced mowing frequency in accordance with AIPP guidance; both short-flowering and long-flowering areas of meadow will be trialled and monitored over subsequent years. Other complementary actions at the NTC are also being considered, including planting of native flowering trees and shrubs, rollout of informative signage and the inclusion of biodiversity action in the training curriculum for ESB Networks apprentices.



Section of ESB Training Centre grounds



Map of planned grass management regime

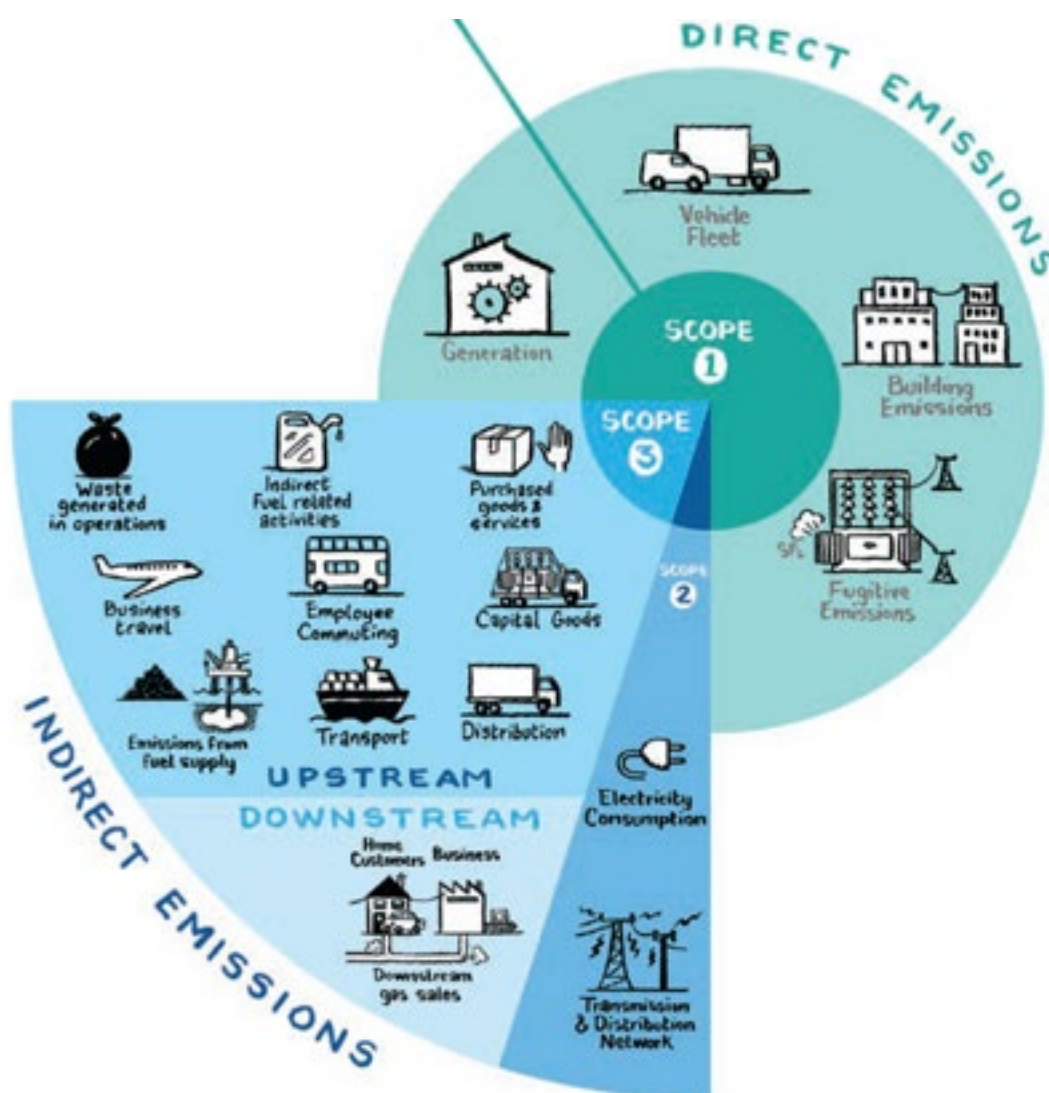
We will estimate our carbon footprint, including SCOPE 3 emissions and report on it by the end of 2023.

CO2 emissions are defined as below. The supply chain element of SCOPE 3 emissions are generally difficult to quantify exactly. Standard emission factors will be used as a starting point. Improving accuracy over time will involve close collaboration with suppliers and service providers.

We will Investigate and adopt new technologies with less climate impact when replacing SF6 equipment as soon as they are proven to be viable. We will exclusively install non SF6 technologies at medium voltage (<24 kV) by 2030 or earlier if technology is more readily available.

We will retain the ISO 14001 environmental accreditation into the future. ESB Networks is proud to hold ISO14001 environmental accreditation and is regularly audited by external auditors in relation to this.

We will replace all our Fluid Filled Cables by 2035.



Staff and Contractor safety

We are committed to the safety of the staff and contractors who work on our network. We will continue to ensure that safety is integrated into our work processes and procedures and those of our contractors and sub-contractors. We will develop new e-tools and new technology both for training and for safely managing the work. As part of our process of continuous improvement we are committed to completing a process of safety culture transformation through the safe and sound programme.

Our Safety, Health and Environment Strategy is based on five commitments:

- Safe People,
- Safe Workplace,
- Safe Tools & Equipment,
- Safe Systems of Work,
- Safe Behaviours.

Safe and sound is a transformational change programme through which working groups in ESB Networks are collectively transforming our safety culture so that everyone in ESB Networks, those working on our network and the public are safe whoever they are, whatever their role and whenever they are working

- Ensuring everyone feels valued, trusted and recognised for their contribution
- Creating a workplace where everyone insists on doing things safely because people matter
- Creating a workplace where managers, supervisors, staff and contractors feel supported and valued at work.



7.4.4 ACTIONS

Our actions to deliver net zero by 2040 include:

- Reduce our building CO2 emissions at least 51% by 2030 (in comparison to 2018 values).
- 50% of all buildings will be at least at a BER B rating by 2025 and the balance will be brought up to at least a BER B rating by 2030. We further aim to have 40% of the buildings at a BER A standard by 2030.
- Replace all our Fluid Filled Cables by 2035.
- 80% of LDV vehicles (<3,500 kg) purchased will be electric by 2030. We expect that all two-wheel drive vehicles will be electric by 2030.
- Our fleet of 2000 vehicles will be fully decarbonised by 2040.
- Integrate Carbon Emission Assessment as part of all infrastructure capital investments by 2025.





JOIN US ON
THE NET ZERO
JOURNEY



8

JOIN US ON THE NET ZERO JOURNEY

In ESB Networks we have a central role in leading the transition to a secure and affordable low-carbon future, using clean electricity to drive carbon, in the form of fossil fuels, out of heat, transport and the economy. We have discussed our vision to enable the clean electric future together with you, our customers, who will be at the heart of this transformation.

In this Strategy we have acknowledged the central role electricity plays in climate action. Our purpose is to deliver a clean electric future through the electrification of heat, transport and industry, as well as connecting renewable generation at scale to the electricity network.

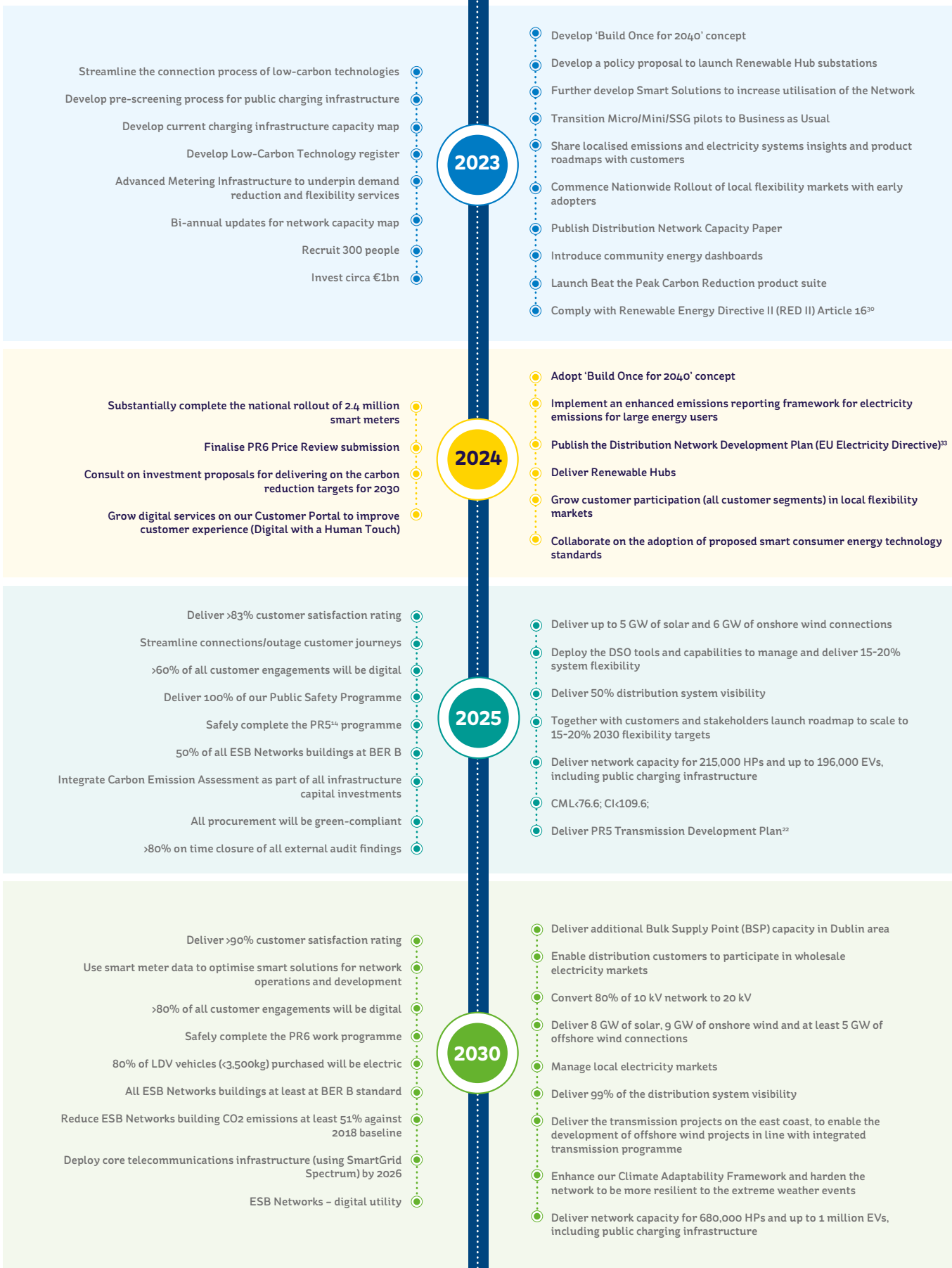
At ESB Networks, we're delivering an electricity network to empower our 2.4 million customers every day with choice and flexibility around how they consume, generate, trade and store electricity. By investing in our technical capability and collaborating with our partners, we're developing a smart and resilient electricity network of the future.

Delivering on our Strategy will require a challenging transformation of our network, our systems, and our approach. Throughout this Strategy document we have made clear commitments which will allow us to deliver on our purpose. We have outlined our planned actions which will enable meeting the Climate Action Plan goals as well as putting society on a path to achieve net zero. We are committed to being transparent as we deliver on our commitments. Below is the detailed action roadmap of the key areas we will relentlessly focus our efforts on over the coming decades. We will share our progress against these actions with you.

Join us on the journey, in delivering the electricity network for Ireland's clean electric future, by sharing with us your ideas, challenge our approach and continue to hold us to account. We want to hear your views on how ESB Networks delivers net zero, and whether we are focusing on the right challenges to connect our customers to a clean electric future. Please send your comments and feedback to ESBNetworksStrategy@esb.ie.



NETWORKS FOR NET ZERO - ACTION PLAN TO 2030



9

GLOSSARY



9

GLOSSARY

Abbreviation	Meaning
AC	Alternating Current
ADMS	Advanced Distribution Management System
AFID	Alternative Fuel Infrastructure Directive
AFIR	Alternative Fuels Infrastructure Regulation
BAU	Business-As-Usual
BESS	Battery Energy Storage System
bn	billion
BSP	Bulk Supply Point
CAP	Climate Action Plan
CEATI	Center for Energy Advancement through Technological Innovation
CI	Customer Interruptions
CIRED	International Agency for Research on the Environment and Development
CMI	Customer Minutes Lost
CO2	Carbon dioxide
CRU	Commission for the Regulation of Utilities
DAO	Distribution Asset Owner
DECC	Department of the Environment, Climate and Communications
DER	Distributed Energy Resources
DERMS	Distributed Energy Resource Management
DNO	Distribution Network Operator
DoT	Department of Transport
DSO	Distribution System Operator
DUoS	Distribution Use-of-System
E.DSO	European Distribution System Operators
ECP	Enduring Connection Policy
EGIP	Embedded Generation Interface Protection
ENA	Energy Networks Association
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EU	European Union
EV	Electric Vehicle
FIMSS	Forecast, Identify, Monitor, Smart toolkit and Strengthen
FPI	Fault passage indicator
GHG	Green House Gas
GPP	Green Public Procurement

Abbreviation	Meaning
GW	gigawatt (1GW = 1,000,000,000 watts)
GWh	gigawatt-hour
HGV	Heavy Goods Vehicle
HP	heat pump
HV	high voltage
ICE	Internal combustion engine
IHBA	Irish Home Builders Association
IHC	In-Home Channel
IHD	In-Home Display
IHLD	Industry High-Level Design
IPCC	Intergovernmental Panel on Climate Change
ISEA	Irish Solar Energy Association
IT	Information Technology
KPI	Key Performance Indicator
kV	kilovolt
kVA	kilovolt-amperes
kWh	kilowatt-hour
LCT	Low-carbon Technology
LDV	Light Duty Vehicle
LIDAR	Light Detection and Ranging
LT	long term
LV	low voltage
MEC	Maximum Export Capacity
MECO	Maximum Export Capacity Zero
MRSO	Meter Registration System Operator
MtCO ₂	Metric tons of carbon dioxide equivalent
MV	medium voltage
MVA	megavolt-amperes
MW	megawatt (1MW = 1,000,000 watts)
NCCS	Network Code for Cybersecurity
NDP	National Development Plan
NESF	National Energy Security Framework
NGO	Non-Governmental Organisation
NIS	Network and Information Security
NISD	Network Information Systems Directive
NN,LC	National Network, Local Connections
NSMP	National Smart Metering Programme
NTA	National Transport Authority
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OPW	Office of Public Works

Abbreviation	Meaning
PIAM	Pole Inventory Asset Management
PR5	Price Review 5
PR6	Price Review 6
PV	Photovoltaic
RAB	Regulatory Asset Base
RES	Renewable Energy Sources
RESS	Renewable Energy Support Scheme
RMDS	Retail Market Design Service
RMS	Retail Market Services
RT	real time
SDG	Sustainable Development Goal
SEAI	Sustainable Energy Authority of Ireland
SEM	All-island Single Electricity Market
SME	Small and Medium-Sized Enterprises
SMS	Short Message Service
SNSP	System Non-Synchronous Penetration
SSG	Small-Scale Generation
TAO	Transmission Asset Owner
TDP	Transmission Development Plan
TEN-T	Trans European Transport Network
TII	Transport Infrastructure Ireland
ToU	Time-of-Use
TSO	Transmission System Operator
TWh	terawatt-hour
UK	United Kingdom
UN	United Nations
V	volt
V2G	Vehicle to Grid
WEI	Wind Energy Ireland
ZEVI	Zero Emission Vehicles Ireland

10

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