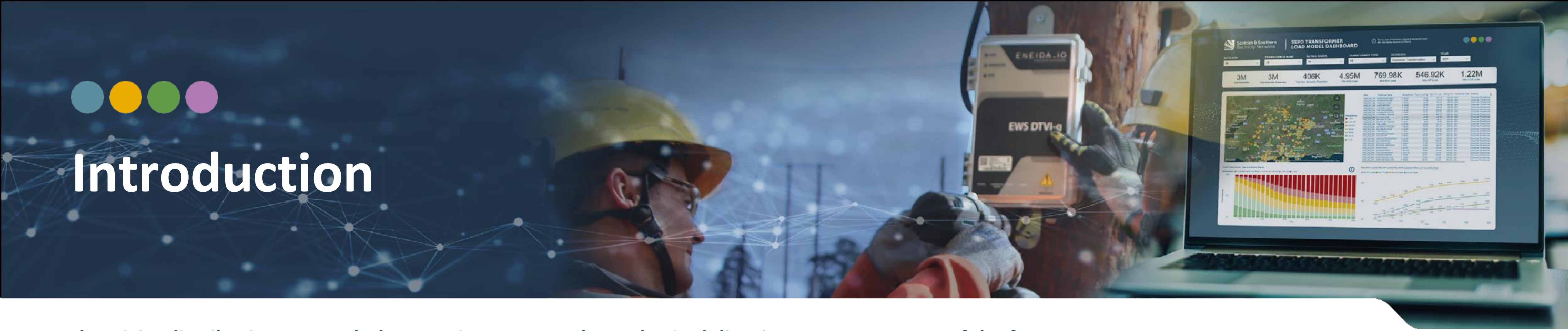
NETWORK VISIBILITY STRATEGY

February 2024

Scottish & Southern Electricity Networks

Contents



Introduction

Electricity distribution networks have an important role to play in delivering net zero as part of the future energy system. The increase in demand for electricity through the uptake of low carbon technologies (LCT's) such as electric vehicle and heat pumps along with the increase in renewable generation will have a significant impact on the electricity network infrastructure that supply power to homes and businesses.

Greater network visibility and monitoring, particularly of the Low Voltage (LV) network, is important to help us achieve our RIIO-ED2 business plan commitments by creating opportunities through a range of data sources such as direct measurement from physical monitoring devices, smart meter data, data analysis and modelling.

Data sources will include an array of real time, near-real time and historical data for planning and forecasting our network using techniques to visualise actual and forecasted demand.

Being able to establish visibility of the energy flows and power quality on our network at all voltage levels is a fundamental capability for the delivery of our RIIO-ED2 plan.

Our network visibility approach will give us 100% visibility of power flows from the higher voltages through to the low voltage assets across our network, through the installation of LV monitoring on 19% of our secondary ground-mounted substations, direct embedded measurement of selected plant, penetration of smart meters, modelling and analytics.

Visibility allows us to plan with more certainty, to manage our assets more effectively and to provide the data necessary to facilitate markets and allow the optimal utilisation of the network.

Just as importantly:

SSEN will seek to provide all the information that our customers need, in an open and accessible way and format they can use.

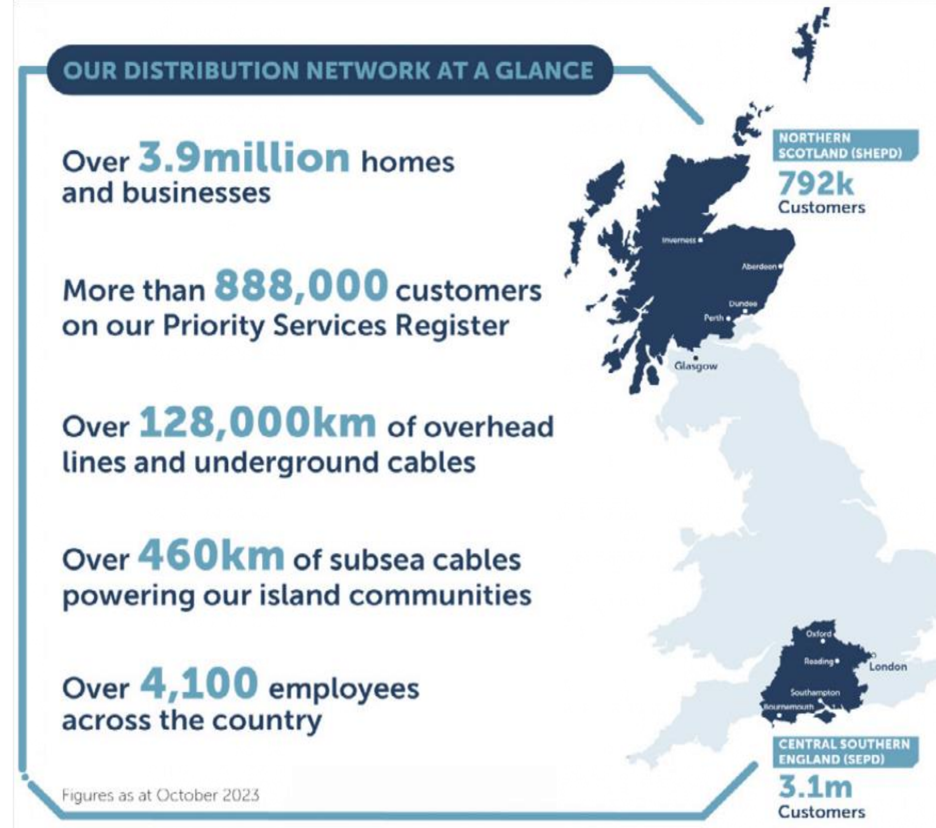
Improved visibility of our network allows us, and third parties, to offer new services and support to customers and stakeholders. Examples include:

- Open data portal enabling stakeholders to access network data in an open and accessible way, through API's and dashboards exposing near-real time, historical data and future demand forecasts at a granular level.
- Rapid Digital Self Service connection and additional load quotations.
- Tools to allow Domestic Customers to participate in the flexibility markets.
- Tools for stakeholders to identify the optimal location for public charging infrastructure.
- Local Community energy exchange markets Tools to predict faults and reduce interruptions.

What SSEN does today

Through our two licensed electricity distribution network areas, Scottish Hydro Electric Power Distribution (SHEPD) and Southern Electric Power Distribution (SEPD), we deliver power to over 3.9m homes and businesses.

- Our **core purpose** is to **power communities to thrive today and create a Net Zero tomorrow**. We have a responsibility to supply customers with safe and reliable power, allowing them to focus on the things that matter most, while we work hard to build a smarter, flexible, greener network that's fit for the future.
- Our **vision** is to **power change with every connection**. We need to make each and every connection that we have count and make it better; whether that's the connection we have with our customers and those we work with, our connections with each other and our teams, or connecting innovative low carbon technologies to take us to Net Zero.
- Our purpose and vision will be delivered through four clear priorities: **delivering a safe, resilient and responsive network**, **providing a valued and trusted service for customers and communities**, **accelerating progress towards a Net Zero world** and **making a positive impact on society**.



A LEADING ROLE IN A LEADING GROUP

SSEN is part of SSE, a UK-listed company that operates across the energy sector and its activities and investments contribute around £9bn to the UK economy every year. We are Fair Tax Mark and Living Wage accredited, showing our commitment to pay the right level of tax at the right time and to ensure fair pay through our supply chain.

SSE has set out four business goals to achieve by 2030, aligned to the UN's Sustainable Development Goals (SDGs), designed to drive faster decarbonisation across the next decade.

Cut carbon intensity by 80%	Increase renewable energy output fivefold	Enable low-carbon generation and demand	Champion a fair and just energy transition
Reduce Scope 1 carbon intensity by 80% by 2030, compared to 2017/18 levels, to 61gCO_2e/kWh.	Build a renewable energy portfolio that generates at least 50TWh of renewable electricity a year by 2030.	Enable at least 20GW of renewable generation and facilitate around 2 million EVs and 1 million heat pumps on SSEN's electricity networks by 2030.	Be a global leader for the just transition to net zero, with a guarantee of fair work and commitment to paying fair tax and sharing economic value.

RIIO-ED2 baseline expectations

The table below tracks how our Network Visibility Strategy delivers on Ofgem's DSO Baseline Expectations[1], sections 1.1.2, 2.1.1 and 2.1.2.

Ofgem baseline expectation	How we will deliver
1.1.2 and 2.1.2 : We expect DNOs to submit a network visibility strategy and this should cover the use of all sources of network data including direct measurement from monitoring roll-out, smart meter data, data analysis and modelling, and any other third-party data sources.	**This document** is our Network Visibility Strategy and forms part of our DSO Strategy for RIIO-ED2 **Page 6** explains the types of monitoring at all voltage levels and lists the sources of data used for LV visibility.
1.1.2 and 2.1.2 : The strategy should explain how network monitoring for planning and operational purposes will inform planning and operational decisions, including the use of flexibility and enabling the management and delivery of flexibility services;	**Pages 14-18** explains how improved network visibility can be used for the purposes of planning and operational decisions and support products and services, such as flexibility.
1.1.2 and 2.1.2 : Clear justifications for where and when monitoring is rolled-out, including explanations of any targeting for equipment deployment; and the specifications of equipment, including detail on the data captured, frequency of polling, and the mode of communicating data.	**Pages 10-13** explains the sites selection process, based on high loadings and other factors, and how we prioritise installations of LV monitors. We provide maps of current and future installs to demonstrate our targeted approach and the associated use cases to realise benefits.
2.1.1 : DNOs to improve network visibility and identification and sharing of operability constraints, including publishing this data to help avoid conflicting actions being taken by other network and system operators.	**Page 17** explains the benefits of our NeRDA portal, sharing operational boundary flow data. This shows our commitment to sharing data with customers and stakeholders, through an assumed open data approach, subject to data triage.
2.1.1 : DNOs must take reasonable steps to access and subsequently share, including by publishing, data and operability constraint information in a timely manner.	**Page 18** explains our Open Data Portal functions and types of data shared. Visit data.ssen. co.uk to view our datasets

1. Ofgem's Distributed System Operation Incentive Governance Document dated 17 February 2023

Network visibility lifecycle

To ensure Network Visibility is at the heart of what we do, in terms of accessing, utilising and sharing our network data, we follow our Network Visibility Lifecycle as shown in figure 3.

It's important we continue to understand the network data we have available to us. Including external sources of data, how it can be used by the wider energy sector and how we can maximise the benefits of improved visibility. Engaging stakeholders as to the data they want and how they want to access it is vital so we can focus efforts on what our stakeholders see value in.

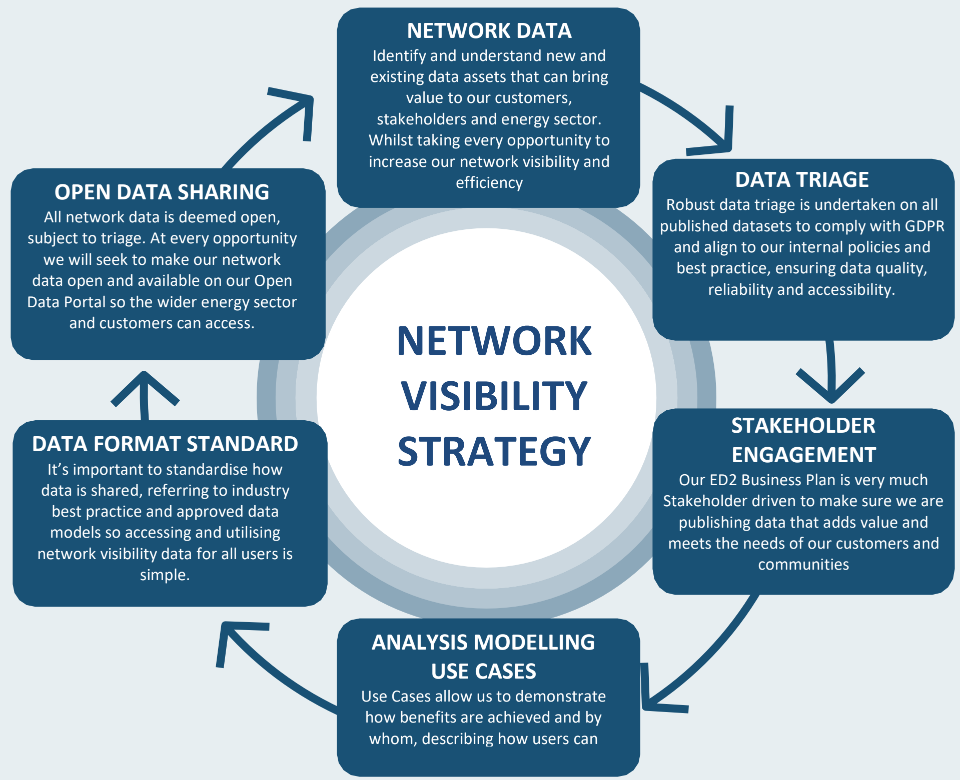


Figure 3 - Network Visibility Lifecycle

What is Network Visibility?

What visibility are we improving, what does this mean for our network, our customers and stakeholders.

1 Increasing measurement points on our network in near real-time and day after

- Measurements (power flows) from EHV and HV network and publishing as open data every 3 minutes
- Measurements (power flows) from Generation sites and publishing the aggregated values as open data
- Increasing LV monitoring at secondary substations and publishing as open data every 10 minutes
- Receiving smart meter data in near real- time (outage notifications, property supply checks and voltage quality)
- Collecting smart meter half hour consumption and voltage data each day and publishing aggregated subsets as open data the next day
- Installing LV fault prediction and location devices to enable proactive interventions, reducing power outages and durations

2 Use modelled measurements derived from analysis of several data sources to infer or estimate measurements to complete 100% visibility

- Max demand readings
- Smart meter data
- DFES* projections
- LCT uptake analysis
- Monitoring devices
- Power outage analysis

3 Forecasted and scenario-based views of half hour, day, month and annual demands

With increased measurement points and modelling, we'll improve our forecast and scenario-based views of future demands, thermal and voltage constraints and where interventions may be required. Based on customer usage behaviours, connections of LCT's and increases in renewable generation.

By publishing this information to our customers, stakeholders and communities through our open data portal we can support market flexibility services and connections to our network quickly and affordably.

4 What applications and choices we make from Network Visibility

Frequency and granularity of measurement data will inform the types of use cases that are applied, and the topology of our network determines where and the types of monitoring required.

- Rapid analysis to avoid situations of overload or reactive fault analysis. For example, this might require a quick and conservative approach by accessing near real-time data and making quick decisions.
- Longer term network planning or proactive fault analysis might require more in-depth analysis and robust outputs for determination using historical, forecasts and modelled datasets.
- Topology of the network, fewer EHV and HV measurement points allow for dedicated SCADA monitoring, whereas tens of thousands of substations might require choices to be made dependent on the frequency, granularity and accuracy of measurements data. Smart meter data may reduce the need for inferred or estimated measurements.

- A trusted and valued service to customers and communities
- A safe and resilient network for our customers and communities
- A smart, flexible and sustainable energy system (Net Zero)
- Positive impact on society

Our current network visibility

Throughout ED1 we have been increasing our network visibility. We already have good visibility of the power flows, power quality and voltage on the Extra High Voltage (EHV) and High Voltage (HV) networks to allow us to operate an efficient and economic network. As more Distributed Energy Resources (DER) are connected it is important we have visibility of the bi- directional power flows as well.

The primary focus is on the Low Voltage (LV) networks, we have laid the foundation for improved visibility through direct monitoring, modelling and smart meter data, not only to improve our network efficiency but also make the data we have visible to the wider energy sector and third parties in an open and accessible way.

Throughout RIIO-ED2, to achieve our governments' net zero ambitions, we will build on our existing capability and increase visibility:

VOLTAGE LEVEL	ED1	ED2
132/33kV Circuits and Substations	High resolution, real-time voltage and current plus directional power flow	High resolution, real-time voltage and current plus directional power flow. Power flow demand and utilisation data published on our Data Portal.
33/11kV Substations	High resolution, real-time voltage and current	
11kV Circuits		
11kV/LV Substations	Manual 6-month maximum demand (MD) reading	High resolution voltage and current on sites are at risk (19%), modelled profiles on remainder utilising 80% smart meter penetration. Power flow demand and utilisation data published on our Data Portal.
LV Circuits	None	Calibrated models providing Load profiles and maximum demand. Power flow demand and utilisation data published on our Data Portal.
Service cables	None	Aggregated and modelled smart meter data. Power flow demand and utilisation data published on our Data Portal.

Extra High Voltage and High Voltage visibility

At our EHV and HV substations we already have measurement transformers for current (CT's) and voltage (VT's) and telemetry installed to provide good visibility of power flows, however bi-directional power flow visibility is less common but will be required as more DER's are connected to our network.

As DER connections increase on our network it will be important to have visibility of the direction of power flows to help understand the true utilisation of the network.

Which in turn enables better load forecast modelling to ensure our network can support the connection of LCT's and growth in demand in an economic and efficient way.

Our current network visibility

Low Voltage network visibility

The LV network is the last mile of network connecting directly to our customers and is strategically important for achieving Net Zero which is why this is a key focus in our RIIO-ED2 plans and beyond.

Traditionally the LV network does not have the same level of monitoring or visibility as the EHV and HV network and were designed and built to conservative planning standards with predictable energy use and a fit-and- forget approach, therefore visibility and monitoring was not necessary or a priority at that time.

Secondary transformers are typically fitted with Maximum Demand Indicators (MDI) that record a single maximum demand reading since the last time the MDI was reset. Access to the MDI readings have to be manually collected from site.

The ongoing decarbonisation efforts of the energy industry will see, and already seeing, enormous changes on LV networks, particularly as organisations work together in a whole system way to electrify heat and transport down to the domestic level. We will see a shift in demand patterns with uptake of LCT’s and with small-scale generation being connected network visibility and monitoring has become increasingly important.

We continue to improve the visibility of the network through the installation of direct monitoring, smart meters, 3rd party sources, innovation technologies and consolidating the resulting data. The table below shows the current level of monitoring to date.

Numbers	Monitoring technology and data flow?	End users
2.1m Smart meters 1.7m SEPD 350k SHEPD	Smart Meter → DCC Adapter → Integration Layer → OMS → SSEN User	Fault Dispatch
2,400 Bidoyng auto power restore units (800 sets deployed)	Bidoyng → Third Party → Web Service → OMS → SSEN User	LV Performance
3,013 LV monitors installed so far	LV Monitoring → iHost → SSEN User	Asset Management
SYNAPS 2 fault locate innovation project	Fault Locate → Third Party → SSEN User	Connections

Approximately 3,000 LV monitoring devices installed in our secondary Substations as of November 2023, Figure 1 and Figure 2 shows the geographical locations of installed LV monitors in our SEPD and SHEPD regions.

Figure 1 - SHEPD LV Monitors

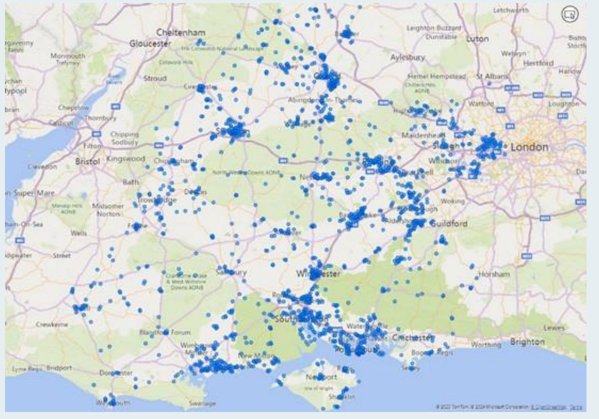


Figure 2 - SEPD LV Monitors

Increasing Low Voltage network visibility

In our visibility strategy we have consciously avoided proposing the installation of physical LV monitoring devices at 100% of our sites due to four main considerations, cost, deliverability, obsolescence, and speed of delivery.

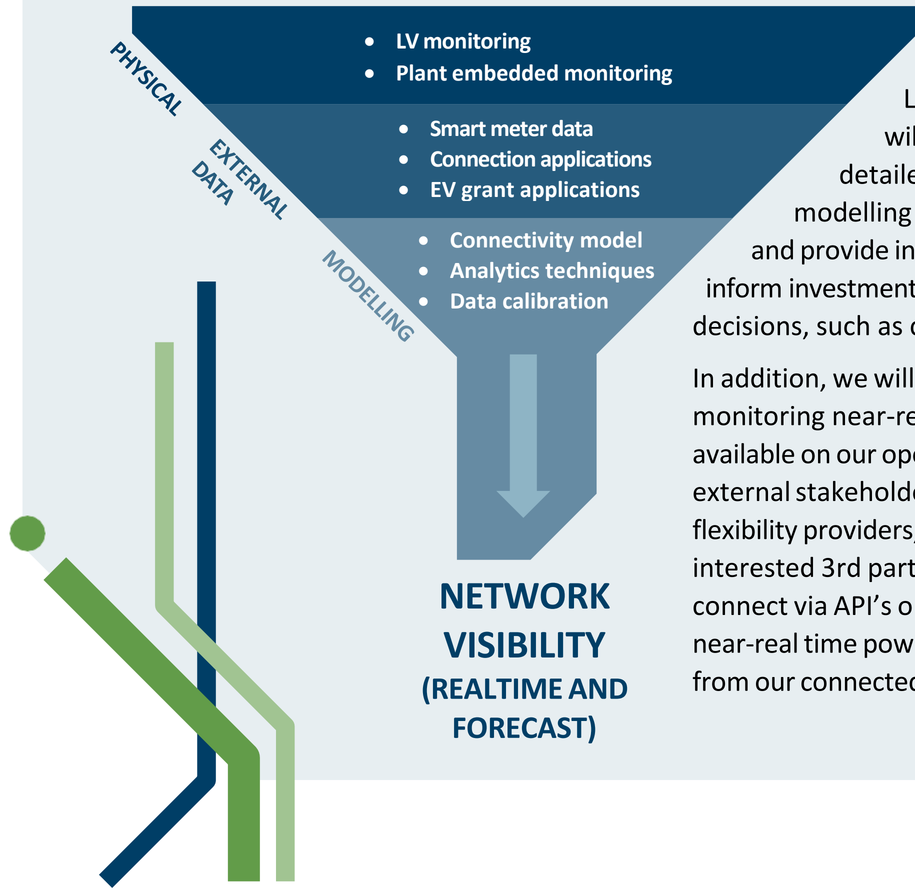
It is not efficient to spend customer's money installing monitoring on our entire network so a targeted approach that takes into account where constraints are more likely to arise, through load model forecasting analysis, is appropriate. In addition, the technology available to monitor networks is evolving rapidly and has a short life span and costs are reducing, so having an agile and flexible approach is key to avoid potential waste, early obsolescence, and unnecessary costs.

Instead, our adopted approach to achieve 100% visibility is to develop a platform that will blend direct measurement, modelling, other data sources and analytics. There are multiple sources of data available, our Network Visibility Strategy utilises direct measured data from the full range of sources, such as smart meters, dedicated network monitors and plant-based monitoring at all voltage levels.

We will then use a combination of analytics, modelling and connectivity data to provide calibrated load data on every one of our load bearing network assets, even down to an LV feeder phase allocation showing which phase each property is connected to, ensuring we have improved visibility of phase load balance helping to reduce power outages and facilitate the connection of additional LCT requests.

Low Voltage monitoring

In designing this approach, we have utilised analytics to identify the optimal volume of direct network LV monitoring to be installed in our secondary substations. This modelling has shown us that we require to monitor around 19,000 secondary substations (19% of our estate) in order to provide enhanced visibility of those assets at risk during RIIO-ED2 and early ED3 under our adopted load growth scenarios. Building on the LV monitors already installed we expect over 21,000 LV monitors to be installed and monitoring the key focus areas of our network in RIIO- ED2.



LV monitoring data will be used to develop our detailed load forecast modelling against every end point and provide information to inform investment and reinforcement decisions, such as connecting LCT's.

In addition, we will also make LV monitoring near-real time data available on our open data portal to external stakeholders, such as flexibility providers, local authorities and interested 3rd parties, who will be able to connect via API's or view dashboards of near-real time power flow data directly from our connected LV monitors.

Increasing Low Voltage network visibility

Identifying LV substations to be monitored

Using our machine learning Load Modelling tool, which takes in various sources of data, we can model and forecast the load on every transformer, LV feeder, phase and property level. This gives us visibility to model and respond where transformers or LV feeders are projected to be using >80% capacity, along with other identifiers to help prioritise and target monitoring, other than simply where there is >80% loading in isolation.

By focusing on these transformers and LV feeders we will provide the bulk of visibility necessary to target LV monitors for enhanced network management of circuits at risk of overload. We can then consider interventions needed to ensure we maintain an efficient network and facilitate future connections.

The data sources used to develop our Load Modelling and LV monitoring site selection process include.

- Distribution Future Energy Scenario (DFES) to understand and model how demands on our network will likely change over the coming years, incorporating low carbon technologies connections.
- Transformer Maximum Demand readings.
- Smart meter half hourly consumption data, aggregated from LV feeder level.
- LV monitoring data at installed transformers.
- Historical fault analysis, looking at the number and duration of interruptions.
- Number of customers on a circuit that could be impacted.
- Smart meter penetrations on each circuit to consider how the increasing number of installed smart meters can improve visibility, modelling and avoid the need for installing monitors at every location

When analysing and reviewing where LV monitors should be installed, all these datasets are incorporated into our site selection model to ensure we considers all aspects of our network impacts and make informed decision where best to install monitors. This process is a continuous cycle of review as load patterns and priorities can change over time. Therefore, we'll need to have the ability to react quickly where transformer or LV feeders may require immediate monitoring to support our operations teams.

The continuous cycle of review is to determine which transformers and LV feeders are most at risk on a regular basis, as demand can change. We refresh our load model with regular cycles, feeding in the latest data sources to update the model which allows us to target LV monitor installs more accurately and keep pace with changing demands.

We track the installation rate against our overall install plan to ensure we are on target to install our commitment of 19,000 monitors in ED2, or around 300 per month.

Once a new LV monitor is installed the near real-time data will feed into our load model so we can continually validate our modelling methods and techniques. LV monitoring data and model are available on our open data portal for stakeholders to access through visual dashboards or API direct access.

SSEN Load Modelling Tool

Increasing Low Voltage network visibility

LV monitoring site selection and prioritisation of transformers with >80% load

Our load modelling tool will produce breakdowns of the total numbers of secondary transformers with more than five customers connected which are expected to be close to overload (using 80-100% of capacity) or overloaded (exceeding 100% of capacity). In addition, we include transformers where at least one LV feeder is projected to be using >80% capacity (even if the transformer is not heavily loaded), split by licence area.

The short list of transformers to have an LV monitor installed is then prioritised, split into years, and provided to our field installations teams to commence their installation plans. The prioritised list is based on the following factors.

- Fault history (number of interruptions and duration), to prioritise where faults have occurred.
- Number of customers on the transformer (incl. Priority Service Registered), to prioritise where larger volumes of customers could be impacted.
- Percentage of smart meter penetration, to consider if smart meter data could provide required visibility.

	Prioritisation criteria	2023	2024	2025	2026	2027
SHEPD - Northern Scotland	Transformers utilising 80-100% capacity	998	1128	1334	1500	1569
	Transformers utilising >100% capacity	1286	1566	1951	2279	2653
	Transformers utilising <80 BUT have at least one LV feeder utilising 80-100% capacity	456	459	466	471	471
	Transformers utilising <80 BUT have at least one LV feeder utilising >100% capacity	826	863	938	966	988
	Cumulative SHEPD total	**3566**	**4016**	**4689**	**5216**	**5681**
SEPD - Southern England	Transformers utilising 80-100% capacity	3778	4061	4409	4786	4946
	Transformers utilising >100% capacity	4268	4910	5784	6719	7692
	Transformers utilising <80 BUT have at least one LV feeder utilising 80-100% capacity	1428	1468	1535	1554	1548
	Transformers utilising <80 BUT have at least one LV feeder utilising >100% capacity	1113	1149	1191	1225	1257
	Cumulative SEPD total	**10587**	**11588**	**12919**	**14284**	**15443**
	Cumulative SSEN total number of LV monitors needed	**14,153**	**15,604**	**17,608**	**19,500**	**21,124**

Increasing Low Voltage network visibility

LV monitor locations (installed and planned)

Figure 4 and 5 shows the location of transformers with LV monitors already installed and planned to be installed by the end of the ED2 period (2028). In our SEPD region to meet our 19,000 committed installations at transformers or LV feeders with greater than 80% loading we will install around 12,500 transformers, supporting 100% network visibility through monitors, smart meters and modelling.

In our SHEPD region to meet our 19,000 committed installations at transformers or LV feeders with greater than 80% loading we will install around 6,500, supporting 100% network visibility through monitors, smart meters and modelling.

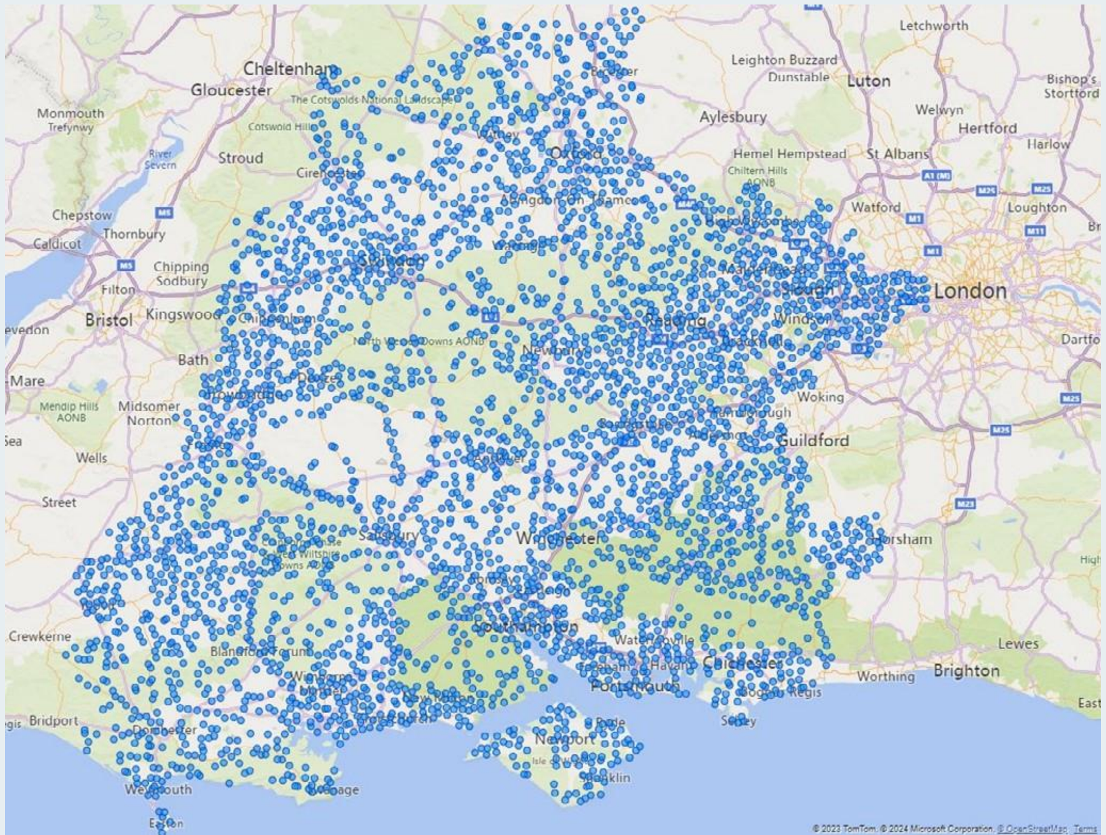
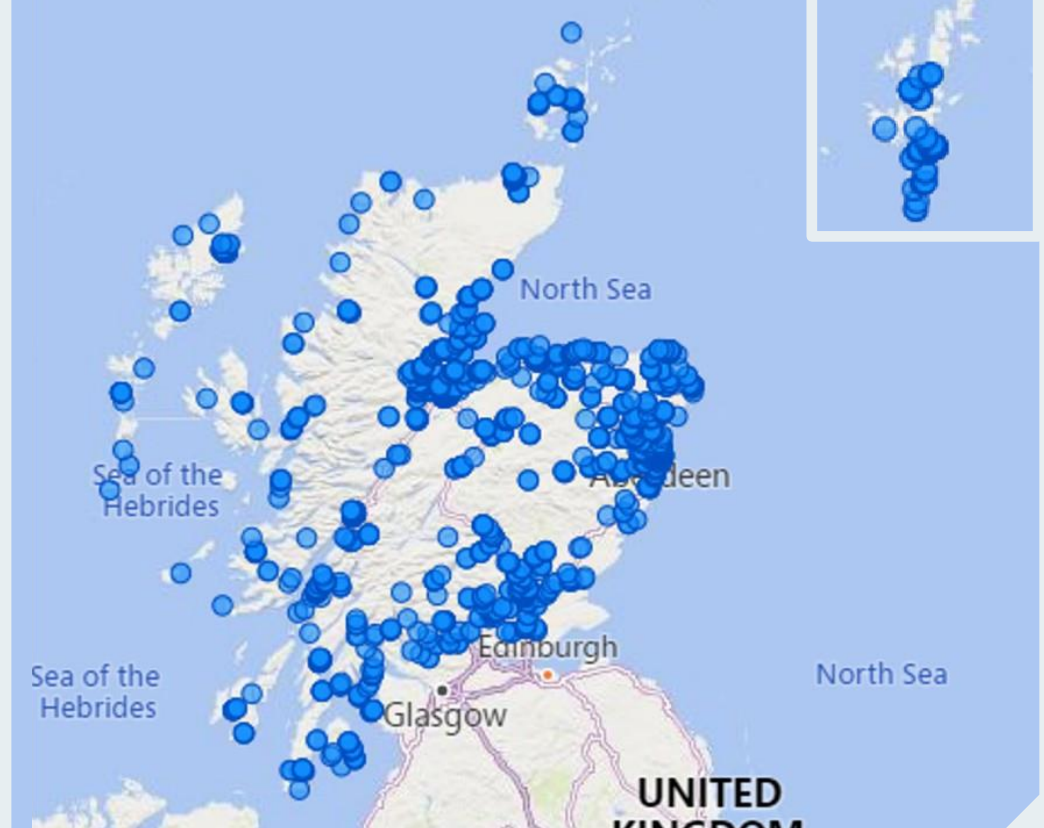


Figure 4 - Location of transformers with LV monitoring installed/planned in the SEPD region

Figure 5 - Location of transformers with LV monitoring installed/planned in the SHEPD region



Increasing Low Voltage network visibility

Targeted LV monitors

Recognising the benefits monitoring can bring, we use monitors to support trials, projects or where operational teams require quick and targeted monitoring.

LV monitors have been installed to support projects such as Project Leo and Green Recovery with great success. We are reviewing how LV monitors can assist in the release of designated load managed areas where changes in switched load is restricted.

We will install monitoring to respond and react to near real-time events on our network that require immediate monitoring to support our teams managing network faults or issues.

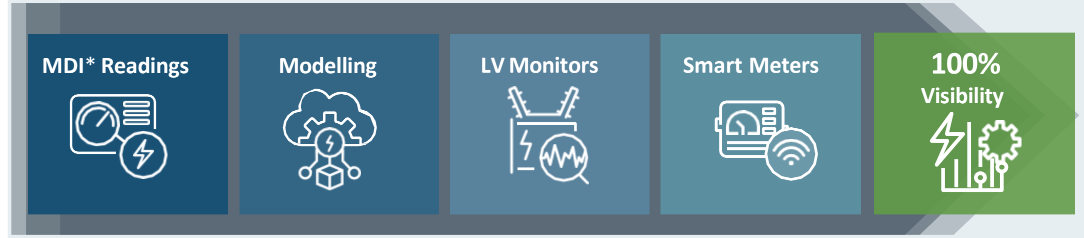
LV monitoring installation and management teams

We have dedicated teams that manage the end-to-end journey of LV monitoring, from procurement and installation to data access and benefits realisation.

- **Procurement and installation management** : Ensuring we have the required number of monitors procured and available to our operational teams for installation. That the units are installed and commissioned and the data is streaming to our downstream systems. Regular monitoring of each unit's health and connectivity is conducted.
- **Site selection, installation targets and benefits** : Site selection list is produced and approved any changes will follow the change control process. KPI's produced for monthly installation figures to ensure we are on track to deliver target of 19,000 installs and will monitor benefits and use cases.
- **Data analytics and visualisation :** Manage the large volumes of LV monitoring data streaming into our systems, incorporating with other datasets and analytics to enhance is effectiveness for our teams' making decisions. Making the data accessible and in a user-friendly format so our internal teams can unlock the benefits, and where appropriate publishing on our open data portal for the wider energy sector and customers.

Combined LV visibility

We will achieve 100% network visibility through a number of data sources and modelling. This will mean we have visibility of our current and future network demand down to LV feeder level and can model down to individual half hourly periods of each property end point.



***MDI:** Maximum Demand Indicators

LV monitor specifications

LV monitors record and communicate many types of data and measurements values on a near real-time basis. The data is streamed to our secure data storage platform for access by internal teams and presented on our open data portal for external stakeholders to access.

LV monitor specifications	
Meta Data	Current (Amps), Frequency (Hz), Phase Angle (Degrees), Voltage min/max/RMS (Volts), Active Power (kW), Reactive Power (kVAR), Apparent Power (kVA), Power Factor, Active Energy (kWh), Reactive Energy (kVARh)
Data Retrieval	One reading per second
Asset reading location	Each phase of a LV feeder
Communication	Cellular
Time Stamps	UTC
Remote Reading/Config	Yes
Data Storage	Direct to SSEN's cloud data storage

Coordinated whole system approach

Sharing network visibility data to support coordination

To support whole system development we work closely with the whole market to identify and share data in a coordinated way, in near-real time and scheduled.

Through the Energy Networks Association (ENA) Open Network workstreams we bring together whole system participants to consider the type, format and frequency of network data that can be shared to support all organisations drive forward their net zero strategies.

We are the first DNO to publish near-real network data across the whole of our distribution network. Whilst some of these services are new and developing, we continue to refine their design to drive better coordination.

Our NeRDA portal is a great example of an industry first exposing near-real time power flow data through an easy to use graphical dashboard and via API's to stream data directly to other systems.

Delivering our DSO strategy

Improve visibility | **Whole system view** | **Share & collaborate**

Network visibility strategy
How we gather information about our network

Open data
How we publish datasets

ICCP
Whole system data exchange

ENA open networks working groups
How we collaborate & agree data sharing across whole system

How we are delivering DSO visibility

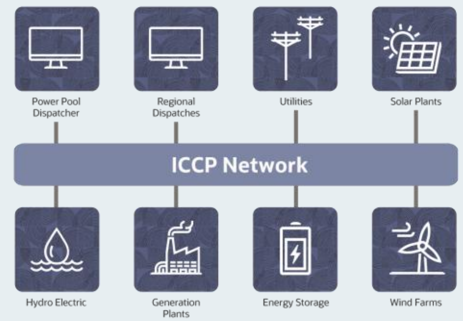
- Increased network measurement points
- Smart meter half hour consumption
- Smart meter voltage and connectivity
- LV monitoring (Power Quality/Fault Locate)
- Open data portal and ICCP link data sharing
- Whole system & stake-holder engagement

Inter-control centre coordination

Inter-Control Centre Communications Protocol (ICCP) enables data exchanges over wide area networks.

An ICCP is a communication link to exchange real-time data between system and network operators control centres in an interoperable format. We will use and ICCP links to share data between our DNO control centres and NESO control centre. We will share real-time information relating to ANM systems, Flexibility Service Dispatch, DER output, network outages and flows of electricity on our network.

ICCP data exchange continues to be developed internally, and through the ENA Open Network initiatives to determine the types of data that could be exchanged through ICCP.



Embedded Capacity Register (ECR)

Our published Embedded Capacity Register information follows the DCUSA standards for interoperability to give detailed information about each DER above 50kW connected and connecting to our network.

ECR has been developed to provide better information to electricity network stakeholders on connected resources and network requirements. Each DNO will host a register which will provide accessible information at a local and national level.

The register uses a format agreed through the Energy Networks Association's Open Networks project, an industry initiative aimed at transforming the operation of energy networks and delivering a smart grid.

Network visibility use cases and benefits

CI/CML* benefits

Monitoring can support significant reduction in CI/CML penalties by enabling accurate fault identification and pinpointing its location. This allows the timely dispatch of operational staff to investigate and restore the network. There is also potential to use distance to fault and predictive fault analytics to further improve.

By monitoring circuits at greater than 80% capacity, we will see load growth occurring, and be able to take action, before it causes faults due to overheating.

Facilitating transition to DSO and use of flexibility

Monitoring data can provide ourselves and third parties with visibility of demand (via much-sought-after LV capacity maps), power flows, voltage and other aspects of network operation. This is needed to operate the distribution networks effectively as more complexity and intelligence is introduced or required, with changing patterns and uses of energy.

It is essential for the Neutral Market Facilitator role to be performed, allowing the procurement and use of flexibility as well as peer-to-peer trading with almost real-time go/no-go decisions. By installing monitoring on networks which are, or anticipated to be, heavily loaded it will provide the granular and timely visibility necessary for proactive management of our networks.
Enabling the strategic investment and associated benefits proposed in in both Load-Related Plan Build and Strategy (Annex 10.1) and Appendix F, DSO Strategy (Annex 11.1) of our RIIO-ED2 Business Plan, along with BPDT CV2.

Monitoring complemented smart metering data

Suitable smart metering penetration levels give us demand and voltage data on individual LV feeders and improves our network connectivity model to provide maximum visibility. We are already incorporating smart meter data into our modelling and visibility strategy and will continue to do so as the penetration of smart meters continue.

We have already utilised machine learning and advanced analytics to develop a load model using customer, asset, smart meters and historic LV monitoring data, and expect to be able to further improve the forecasting of load on LV networks by incorporating more data from smart meters as the volumes increase (and LV monitoring in near real-time).

Work has already been completed to enable us to poll smart meters for key information at scale and created the pipelines for this data to feed into our Data and Analytics platform. This has enabled the incorporation of smart meter data into our load model and provide accurate and regularly updated views of load on every aspect of our network – in particular the local low voltage networks which we predict will be so susceptible to constraints as a result of LCT demand.

The load model underpins the network constraint tool which we have developed, which allows us to estimate where and when we will likely see overloads on our networks as a result of LCT uptake, and so as result smart meter data will refine our ability to observe and predict network constraints. Smart meter data, coupled with data and analytics, is being used now to build our understanding of our network and create the Network Visibility that we need to operate as a DSO. This work is well advanced and will be further developed through ED2.

Continued on next page

* CI/CML - Customers interrupted per year / Duration of interruptions to supply per year

Network visibility use cases and benefits

Monitoring complemented smart metering data

Continued from previous page

A key element of DSO operations (namely requesting and validating delivery of flexibility services) hinges upon near real-time visibility of demand on our networks. Smart meter data (in conjunction with the LCT uptake projections in our Distribution Future Energy Scenarios (DFES) can inform us where networks are going to require appropriate investment and interventions, LV monitors installs can then be targeted to provide us with additional data, with the added advantages of power quality monitoring, predictive fault analytics.

LV monitoring can further complement smart meter data in the creation of connectivity maps. Whilst LV monitoring provides us with visibility of loadings on each individual phase of an LV feeder, due to challenges with historic connections records it is not possible on many networks to determine which customers are connected to what phase, which limits our ability to determine the most effective means of supporting those networks and customers as more heat and transport are decarbonised.

Too improve our phase connectivity we have developed algorithms which allow us to use smart meter voltage data to build phase connectivity maps, which when automated will combine with LV monitoring to enhance network visibility and support connection of LCTs, balancing of networks and the smarter investments to deal with constraints (i.e. adjusting number of customers connected to phases, identifying network losses and highly targeted flexibility procurement, etc).

Thermal constraint management

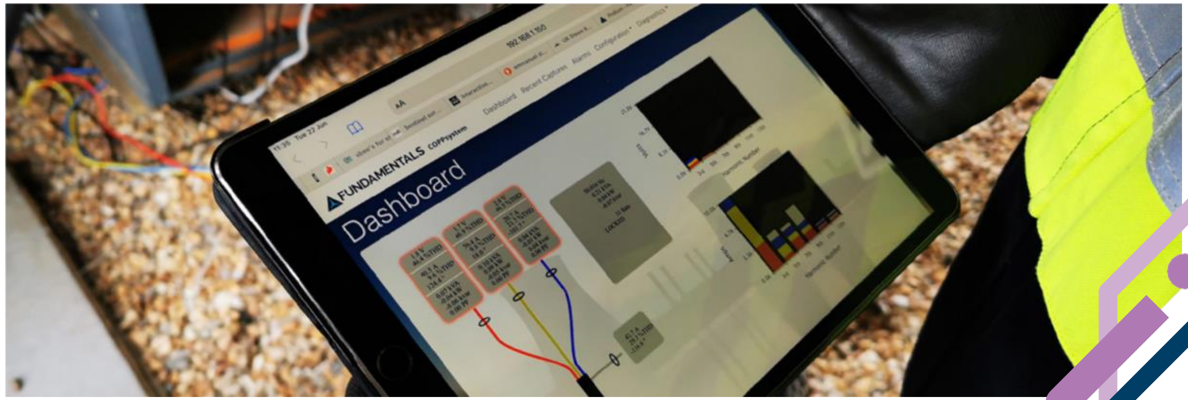
Constant updates on load levels can indicate which assets are experiencing thermal constraints, along with any trends of loading which will allow appropriate management of those constraints thanks to this granular data.

We need this granular level of detail to address changes in traditional cyclic loading patterns and avoid wide-scale load-related faults as electricity demand increases with the uptake of Low Carbon Technologies.

Network and power quality management

Monitoring data allows levels of imbalance to be known, which can be used to support phase balancing activities to maximise use of assets and avoid unnecessary load-related faults.

LV monitors also provide power quality alerts, identifying occurrences of high harmonic content (noise) on the LV network. This gives us the ability to investigate power quality complaints effectively and proactively. The use of power electronics in many Low Carbon Technologies can increase the harmonic content on our network.



Network visibility use cases and benefits

Connections and asset management improvements

The data from the monitors allows far greater accuracy and frequency of load readings to be recorded than Maximum Demand Indicators currently provide. This supports load and health indices analysis and asset management. The ability to immediately assess current and historic loadings supports investment plans and Connections and Commercial activities for new connections.

Having this data available will enable automated load checks, in turn supporting at least one quotation for connection per monitor per year, saving 30 minutes per quote which is a cashable benefit over ED2 of £0.32m. (RIIO-ED2 Investment Decision Pack - Connections+)

Managing Load Managed Areas (LMAs)

For many years, we have had Load Managed Areas (LMAs) with storage heating loads being controlled by radio signals. This radio service is now end of life. With the Radio Teleswitching (RTS) service being switched off, it is essential we are able to continue to define our Load Managed Areas and provide improved visibility of loading so that we can work with suppliers to optimise the load across these networks. Monitoring data will help to achieve this, and lift restrictions were possible.

Strategic investment

Data from monitoring can help manage the impact and use of strategic investment in networks, justifying decisions and providing more confidence in planning expenditure.

As part of our DFES we commissioned energy consultant Regen to produce high granularity projections for key LCT, taking the four National Grid Future Energy Scenarios (FES) and projecting these down to the 400,000 street-level LV feeders and over 100,000 distribution substations that are located in our Electricity Distribution licence areas. With existing EV and HP connections seeding the uptake model. The aim was to provide greater understanding of the potential impact of LCTs such as Electric Vehicles and Heat Pumps on our networks from now to 2050.

Using the Consumer Transformation scenario projections, we then utilised our Data & Analytics team to build a network constraint tool. This allowed us to build a connectivity model, as well as a load model with expected demands from LCT types and properties, and finally combine this with asset data such as transformer ratings, loading history (i.e. Maximum Demand Indicator (MDI) readings) to provide us with estimations for where and when we would likely see overloads on our networks as a result of LCT uptake. This allows us to invest strategically to maximise customer benefits and minimise disruption.

This combination of historic, existing and future datasets resulted in the outputs which form the argument for investing in the volumes of LV network monitoring in RIIO ED2 (21,000 LV network monitors).

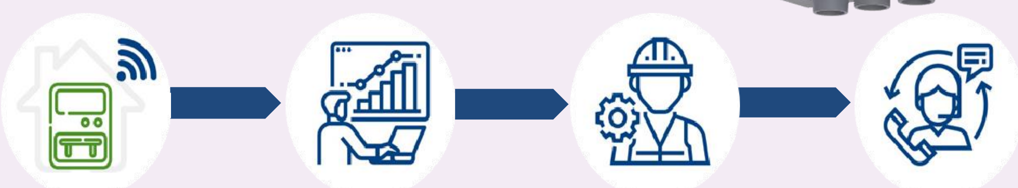
Smart meter data

There are currently just over 2 million smart meters installed in SSEN's regions that we communicate with and receive hundreds of thousands of data transactions a day, ramping up to millions a day. Use cases include.

We will continue to incorporate Smart Meter data into our Visibility Strategy, including the ability to:

- Identify which phase of the LV feeder cable customers are connected to, enabling us to identify phase load imbalance and improve our overall network connectivity model.
- Improve the accuracy of our load forecast model by obtaining anonymised half hourly consumption data to create aggregated LV feeder demand profiles, so we don't have to rely on LV monitoring to obtain 100% network visibility.
- Increase visibility of power quality issues through access to granular voltage data, enabling us to respond more quickly to customer voltage quality complaints, and visibility of voltage excursion impacting our network.
- Visibility of power cuts, fault location analysis and ability to remote supply status checks, through near real-time outage and restoration alerts and direct communication, avoiding the need to rely on customer contacts can reduce the duration of power cuts and better fault location techniques.

We recognise that smart meter data is not only valuable to SSEN, but also the wider energy sector and customers, which is why SSEN are making triaged smart meter data available on our open data portal and will classify as Open Data for customers and stakeholders to access.



Near-real time data access (NeRDA)

Near Real-time Data Access (NeRDA) platform is our tool to make power flow information visible from our network assets at the higher voltage levels down to our Lower voltage and LV feeders, open and available to anyone, updated dynamically every few minutes.

Users are able to access live visual dashboards and download data or connect to an API and stream live and historical data going back 2 years.

Making near real-time data accessible from DNO's is facilitating an economic and efficient development and operation in the transition to a low carbon economy. NeRDA is a key enabler for the delivery of Net Zero, by opening network data it is creating opportunities for the flexible markets, helping to identify the best locations to invest flexible resources and connect faster.

NeRDA is making available in near real-time data from nearly 900 Extra High Voltage (EHV) and High Voltage (HV) substations covering nearly the entire SEPD and SHEPD area, dynamically every 3 minutes, and providing load modelled data from over 90,000 secondary substations, in addition, where LV monitoring is installed, we provide the measurement values every 10 minutes.

Load forecast model

LV monitoring data and smart meter data are all feeding into our load forecast modelling tool, along with various other asset related information and future demand scenarios to improve our overall load forecasting capability to predict demand and utilisation.

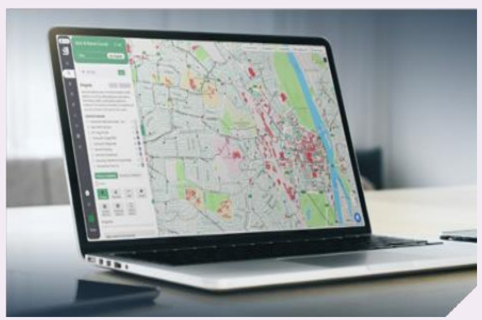
The load model identifies heavily loaded circuits which could become priorities for monitor installations. The model enhancements enable the most granular predictions of demand and better accuracy of future growth, especially on the LV network is important to achieve our Net Zero targets.

Network connectivity visibility

One of the key challenges on the LV network is visibility and understanding of the electrical Connectivity, where customers are connected and to which parts of the network.

Development is already underway which is building up the connectivity of our network across all voltage levels including LV, in addition we are building the customer connectivity model so we'll have visibility of where and how customers are connected to our LV feeders and phases, with the help of smart meter data, LV monitoring and data analytics and modelling.

We have already established the benefits of using smart metering voltage data and algorithms to map which phase each customer is allocated to and identify incorrect connectivity mapping, all helping to improve the granularity and accuracy of our connectivity model.



Publishing and sharing visibility data

There are many initiatives where we are either working with stakeholders to consider what data sharing should take place in the future or where we have already published datasets on our Open Data Portal.

Our Open Data portal catalogues the data that brings visibility to our network assets, their location, their usage, and their performance. We continue to engage our data consumers from local authorities, our supply chain, flexibility providers, energy suppliers and anyone with an interest in achieving net zero.

Some of the recently publish datasets include,

- Generation and network availability maps
- Transformer load model dashboards,
- Near Real-time Data Access (NeRDA)
- Smart meter data, aggregated consumption of LV feeders with sufficient penetration

We continue to work with industry parties through the ENA's Open Networks projects to consider additional datasets that could be shared between licensees, and the wider energy sector and consumers.

Network visibility approach

Our approach will provide a flexible and affordable level of visibility across our entire network, leveraging our RIIO-ED2 investments in analytics, data management, network connectivity mapping and network monitoring.

All of which combined will allow us and our customers to plan for and make better investment decisions to meet a variety of decarbonisation ambitions. In addition, this approach will support fault location and rapid dispatch of field staff, reducing CI and CML, and contribute to efficiency improvements accelerating the LCT connection process and improving our asset management.

The total cost of delivery is £64.28m, and is composed of a number of investments all of which have secondary benefits beyond network visibility:

Item
LCT analytics
Connectivity model
Data sharing
Smart meter+
LV monitoring (19,000 units)
Power quality monitoring and directional power flow
Data storage, analytics and visualisation
Incremental cost of monitoring-ready plant

The benefits of our Visibility Strategy are seen throughout our RIIO-ED2 plan as it provides data sets used in most aspects of our operation. The key benefits however are found in the ability to utilise LV flexibility as part of our DSO Strategy, Whole System data sharing, Reliability, Customer Service, Asset replacement and Load Related investment.

Enablers to our visibility approach

Key to delivery of our Network Visibility Strategy is a number of enabling initiatives, data sources and investments which can be found elsewhere in our RIIO-ED2 Business plan:

Enablers

- Smart meter data
- LV monitoring data
- Connectivity Model
- Data sharing platform
- Data Lake
- Smart meter plus
- Pre-fault detection algorithms
- Power quality monitoring

Visibility Strategy

A targeted led blend of LV monitoring, smart meter data and external data sets consolidated around a connectivity model.

Outputs

- Third party services
- Network operation improvements
- Customer interruption improvements
- Accelerated connection processes
- Cable health monitoring
- Just-in-time reinforcement
- Flexibility service operations
- Losses visibility

LCT analytics[2]

Our Data & Analytics capabilities have allowed us to build a network constraint tool. Which enables us to combine expected load demands from LCTs uptake with load estimations for every property, before integrating asset data such as transformer ratings and loading history (i.e., Maximum Demand Indicator (MDI) readings). This provides us with estimations for where and when we are likely to see constraints on our networks as a result of LCT uptake.

This has directly informed our strategy identifying the need, volume and location of our LV monitor programme in RIIO-ED2. We continue to develop the sophistication and granularity of this modelling capability in particular the forecasting aspect and LV network granularity. We actively pursue other data sets, this data could take the form of EV uptake, tariff trends, price sensitivity indices, customer surveys, etc. This provides an additional layer of insight to improve the accuracy of our forecasts reducing the risk of “just too late” investment in the network and flexibility services. With over 2 million smart meters, now being able to provide granular consumption data we can better predict load demand down to the LV feeder, improving our overall LCT analytics and future forecast capabilities.

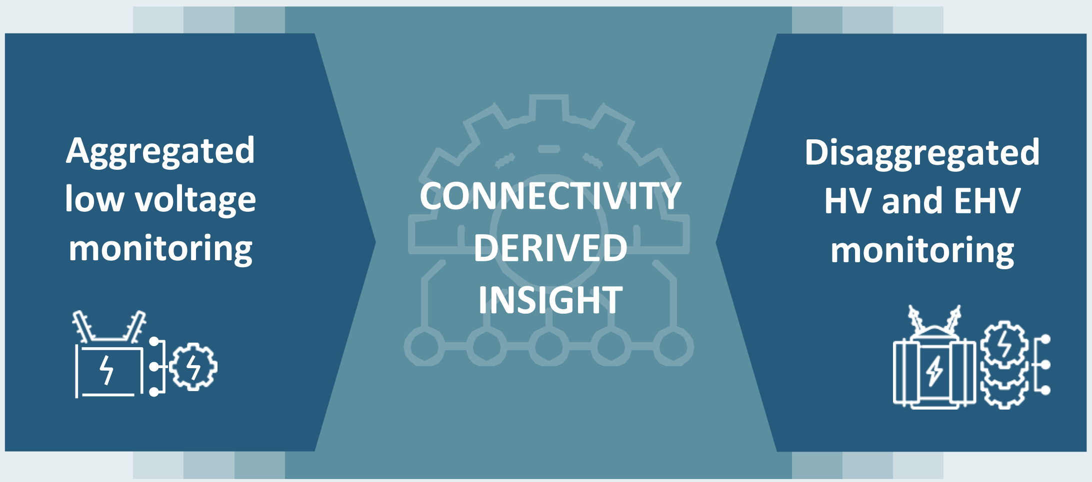
2 - Covered in **Section 11.9 LCT Analytics**, RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Enablers to our visibility approach

Connectivity model[3]

Creating a foundational electrical connectivity model that links customers to all levels of our network is a critical tool for us to make more informed and proactive decisions about the distribution system, our Connectivity model project is delivering this customer connectivity model.

The monitoring of individual points on a network or gathering data from smart metering is of limited value without the knowledge of which specific loads are contributing to each measurement and which assets they are flowing through right down to individual phases on low voltage cables.



Similarly, a connectivity model allows us to aggregate lower voltage measurements for calibration against the High voltage measurements we take from the system. The combination of the two provide mutual calibration and enhanced network insight including losses measurement, fault diagnosis and data quality checking.

Connectivity models are required in a number of temporal forms to achieve this including:

Real-time connectivity model	Forecast connectivity model	Planned connectivity model
This is the “Real-time” connectivity of the system and is required to allow the signaling of the appropriate Distributed Energy Resource (DER) and flexibility services in response to an anticipated overload and decision made on an Operational timeframe.	This is a short-term forecast of connectivity taking into account the planned routine switching of the network and allows constraint forecasting and market signaling.	This is medium-long term connectivity taking into account planned changes or options for change to the layout and capacity of a network and is required to allow connection, flexible connection, Constraint Managed zone and Network Capacity planning

Connectivity is fundamental to our visibility strategy and is the key feature that allows us to optimise the quantity of monitoring and gain visibility earlier than would otherwise be the case.

The maintenance and operation of our RIIO-ED2 Control Room functions as described in our Control Room Replacement Papers (*415 SEPD DSO Distribution System Control Room SEPD* and *416 SHEPD DSO Distribution System Control Room_ SHEPD*) are both dependent on network visibility (particularly at Low Voltage levels) and will also have a key and increasing role to play in the maintenance and operation of our visibility platforms, models and data.

3- Covered in **Section 11.3 Connectivity++**, RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Enablers to our visibility approach

Data Sharing [4]

Our visibility strategy is not only about our need for more granular information on the network but also the need for data sharing with third party organisations.

This project has continued to build the interfaces, portals, security and processes necessary to enable multilateral multidirectional data exchange and sharing.

We have heard strong messages from our stakeholders that visibility of the available capacity and constraints is key to a range of stakeholder use cases, for the purposes of market facilitation, Connection site selection and DER positioning for example.

Sharing our network data with third parties in a structured manner is essential for ensuring their experiences are relevant, unambiguous, timely, effortless and personal.

Our Data Sharing investment will provide a key gateway for the efficient exchange of data to and from our stakeholders and industry peers and provide us with an efficient, secure and scalable data sharing facility for a range of applications including network visibility.

Our Open Data Portal is live and already making many datasets open and available to our stakeholders, with many more to come.

4- Covered in **Section 9.5 Open Door** RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Smart Meter+ [5]

At this point Smart Metering penetration is just over 50% in our licence areas, and the forecast of supplier installation rates predict it will be 80% by late 2025.

Smart meter data, even partial, can be leveraged against LV monitoring data with the combination of the two sources providing a high level of visibility and accuracy, avoiding the need for extensive modelling and large numbers of LV monitors.

We have recently implemented a new cloud based, high performance, DCC adapter to manage the increasing penetrations of smart meters and associated data streams. We were the first DNO to receive Ofgem approval of our updated Data Privacy Plan to access and share smart meter half hourly consumption data and set us up for significant enhancements to network visibility and data sharing.

The Smart Meter+ project has implemented pipelines to feed data into our Data & Analytics platform and open data portal for sharing, including our load modelling tools providing accurate and regularly updated views of load on every aspect of our network.

Our Data & Analytics team have demonstrated how machine learning and advanced analytics can be used to develop the Load Model and smart meter data is a key component of this, with half hourly consumption, maximum demand and voltage data helping us to better understand the load profiles and load growth on individual assets on the LV network.

Smart meters can send voltage alerts if the voltage has exceeded the meters configured over or under voltage thresholds for a sustained period. We will be using voltage data to enhance the service to our customers when dealing with voltage enquiries.

We continue to engage with industry partners, such as the Data Communications Company (DCC), to ensure we are at the forefront of smart meter data initiatives, innovations and programmes to maximise the benefits to the UK that access, utilisation and sharing of smart meter data can bring.

5- Covered in **Section 11.12 Smart Meter+** RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Enablers to our visibility approach

LV monitoring [6]

LV Monitoring in this context consists of low-cost voltage and current sensors installed on each core of each feeder in a secondary substation Low Voltage cabinet.

The information is gathered and transmitted real time often with the option for capturing and transmitting data at very high resolutions when predefined events occur.

We have developed LV monitoring, in our Innovation funded project "Low-Cost LV Monitoring", through this we were able to bring the cost of monitoring down by 75% making it viable to install at scale.

The Value of LV Monitoring

The capabilities of LV monitoring are continuing to evolve and improve, generally the asset life of an LV monitor is short with many of the embedded features e.g. communications, batteries and processors having a limited life span due to degradation or obsolescence. As a result, although monitoring is low cost, we do not believe it should be ubiquitous during RIIO-ED2.

There is however a strong case for the installation of LV monitoring where accurate or high resolutions or real-time data is required.

Examples of this need are as follow:

1. Where an asset is approaching the limits of its capacity and factors like phase balance, harmonics and power quality become valuable in the management and ultimate replacement of the asset.
2. Where we are able to utilise flexibility services to manage a local constraint LV monitoring provides the data to define the service we require and to allow the service to be dispatched on a real-time basis.
3. Where other data sources such as smart meters are not yet sufficient volume
4. Where there is potential for rapid LCT uptake combined with limited spare network capacity
5. Where a circuits health is suspect, and monitoring can help provide an assessment tool and accelerate restoration.

On this basis we have focused our LV monitoring on locations where we have a predicted high uptake of LCT and limited remaining network capacity.

Scale of deployment

In our RIIO-ED2 plan we are proposing to install LV monitors in 19,000 Low voltage secondary substations building on the 700 installed.

Modelling the scale of LV network monitoring required has been carried out using granular projections of LCT uptake under the Consumer Transformation scenario in our Distribution Future Energy Scenarios (DFES).

This has been used in conjunction with existing LV network asset data as part of the Data & Analytics team's Load Model, which allowed us to produce a low-resolution plot of where and when we expect to see constraints. This was used to determine where we should install LV monitoring.

This analysis and modelling resulted in the decision to install monitoring on every LV transformer which is projected to use >80% of its capacity by the end of RIIO-ED2, and every transformer where at least one LV feeder is projected to use >80% its capacity by the end of RIIO-ED2 (even if the transformer is not heavily loaded). The remaining sites will be visible through a combination of our connectivity model, smart metering data, modelling and traditional Maximum Demand indicators.

We have considered the option of 100% roll out of LV monitoring however the benefit at sites that are lightly loaded is outweighed by cost, deliverability, obsolescence risk and speed of delivery.

Roll-out programme continuous review

By focusing on networks that reach this level of available capacity we will have the visibility necessary for the future management of circuits at risk of overload – this level of visibility and coverage will ensure sufficient time to facilitate the procurement of flexibility or local interventions.

With the continual refreshing of inputs from our DFES, asset data, smart meter data, LCT register and customer records we will continue to update our deployment plans by regularly re-running our analyses, indicating where changes in LCT uptake affect the volume and location of assets reaching the 80% capacity utilisation trigger.

By incorporating advance notification data from customer enquiries/orders of LCTs we will be able to run our analyses with sufficient lead time to stay ahead of LCT connections and deploy monitoring appropriately to all heavily loaded assets – facilitating strategic investment to provide a seamless customer experience.

6- Covered in **Section 12.2 LV Monitoring** RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Enablers to our Visibility Approach

Pre-fault detection data [7]

Another key component of our Visibility Strategy is the visibility of the health of our network, this is expected to come from monitoring devices that have pre-fault detection capability and a mixture of other datasets such smart meter data to support and increase confidence.

We are currently trialing devices which provide warning of imminent faults (pre-fault) and will incorporate this into our internal and potentially external systems, allowing proactive management of our networks and improved customer service through rapid fault repair and customer communications.

Within our Digitalisation Strategy we have described how Data Partnerships will allow third parties under restricted access to utilise data gathered from our monitoring and provide new service such as the pre-fault detection described above.

7- Covered in **Section 12.2 LV Monitoring** RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Power quality monitoring [8]

Many LCTs are based on power electronics. Such devices often have high switching frequency and can cause distortion on our system.

Such distortion is described as power quality and is measured as harmonic content. We have very limited harmonic analysis on our networks today, which makes it difficult to spot and resolve issues.

We propose a targeted approach to the deployment of Power Quality Monitoring in RIIO- ED2. The Power Quality Monitoring is integrated with protection equipment and therefore will be delivered in parallel with protection replacement whenever possible.

The harmonic analysis data requires much higher telecommunications bandwidth than other aspects of substation SCADA. It is therefore planned to install Power Quality Monitoring at sites where we understand there to be underlying issues, and sites where we anticipate high connection volumes and so having good quality Power Quality will be important.

We are also developing functionality within LV Monitors to provide harmonic information.

8- Covered in **Section 12.5 Substation SCADA** RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Data Lake [9]

We recognise that having a single source of truth for our data will be essential for maintaining confidence in using network visibility data internally and making that data available for use externally.

As a result, we are expanding our Data Lake as part of our Data & Analytics programme, which will be the central repository for all essential datasets.

9 - Covered in **Section 10.5 MDM, Data Lake** RIIO-ED2 BP Annex 5.1 Digital Investment Plan

Implementation

The enablers listed above, combined, allow the delivery of our Network Visibility Strategy and deliver a range of benefits, many of which are still to be discovered as new digital opportunities emerge to take advantage of this new valuable data set.

Some of the principal outputs and benefits are described below:

Network visibility platform

Visibility of historic, current and future utilisation of our network will be made possible, and whilst there will be no single product used as the platform for this, the coordinated capture, integration and sharing of data will enable all of our systems to become part of our network visibility platform – bringing all the inputs together and making sure the trends, patterns and key metrics are made available for all.

Our Open Data portal will bring together many of our datasets for sharing, and portals such as NeRDA will compliments the near real- time visibility and sharing of power flow data.

Continued on next page

Continued from previous page

Implementation

Enabling third party services

Through sharing our data externally, we will support customer and third party visibility of our network, enabling them to offer services back to ourselves and our Stakeholders, Transmission Network Operators, the Electricity System Operator, their peers and others in the industry.

Accurate and timely data sharing will have circular benefits promoting more informed stakeholder and customer engagement, Whole System proposition and investments opportunities using our data. By having greater visibility and more confidence in network data, customers will be able to benefit from services like self-service connections where they can carry out ad-hoc connection requests instantly.

Alerts, Analytics and Reporting

Alerts relating to peak demand, voltage drops, pre-faults and outages are a feature which is already being utilised from some sources of data (i.e., smart meters) and are being established for others (i.e., LV monitoring), with the integration of LV monitoring data into our Control Rooms to support rapid dispatch of fault restoration teams.

These alerts will also be used to automatically trigger the procurement and dispatch of flexibility in response to network needs, further advancing the management of our network and improving customer experience and continuity of supply.

Finally, the increase and improvement in network visibility will allow reporting to be produced and provided to internal teams and external stakeholders, supporting investment decisions and community/customer plans.
Self-service dashboards and reporting will also mean customers and third parties will be able to drill down into our network operation and have ability to carry out ad-hoc assessments to then drive their own plans.

Some additional examples benefits include:

- **Vulnerable Customer Support** - facilitate proactive assistance for vulnerable customers on circuits which have been identified as having symptoms of a pre-fault.
- **Network Operation Improvements** - provide new data sets to allow the streamlining of processes e.g., the scheduling of routine maintenance align to times of least load, reducing the need for Mobile diesel generation.
- **Accelerated Connection Processes** - providing Connections staff with accurate information to reduce the need for field investigations and reducing estimation errors.
- **Cable Health Monitoring** - providing a methodology for the prioritisation of Cable replacement programmes.
- **Just-in-time Reinforcement** - providing certainty on demand growth allowing upgrades to be carried out with the optimal timing with confidence that assets will remain within their capacity tolerances.
- **Losses Visibility** - provide data sets to allow the modelling of individual LV network losses presenting opportunities for losses reduction.

Future update

We recognise that advances in technologies, processes and systems are likely to take place during RIIO-ED2, and as such it will continue to evolve in the future to adapt to these changes, reflecting changes in the technological and digital landscape as well as changing customer requirements as they decarbonise and use energy in new and different ways.

Many of the initiatives underpinning the Network Visibility Strategy are being developed under our Digital Strategy and Action Plan (DSAP) which will also continually evolve, helping to ensure our Strategies continue to meet customer and industry needs.

Glossary

Term	Description
Aggregators	A new type of energy service provider which can increase or moderate the electricity consumption of a group of consumers according to total electricity demand on the grid.
BAU	Business As Usual.
CI and CMLs	Customer Interruptions and Customer Minutes Lost, is how we report number and durations of power cuts.
CMZ	Constraint Managed Zones . These zones make use of technologies providing flexibility to alleviate network constraints, deploying them as an alternative to traditional network reinforcement in the management of peak demand.
Consumer Transformation scenarios	Consumer Transformation scenarios, are projections of future demand growth.
Data triage	Systematically find issues which should inhibit open data, identify the 'least impact' mitigation technique(s) and make the process transparent.
Decarbonisation	Reducing the carbon intensity in terms of emissions per unit of electricity generated.
DER	Distributed Energy Resources. Any resource on the distribution system that produces or stores electricity. This can include distributed generation, storage, heat pumps and electric vehicles as well as other technologies.
Digital System Map/ Digital Twin	A digital representation of a real-world entity or system.
DNO	Distribution Network Operator
DSO	Distribution Systems Operator. The directorate within SSEN that supports a more flexible network operation. Uniquely placed to ensure simple and consistent access to new markets for our active customers through maximising the utilisation of our existing electrical and communication networks.
DSAP	Digital Strategy and Action Plan
ESO	Electricity System Operator. The electricity system operator for Great Britain, making sure that Great Britain has the essential energy it needs by ensuring supply meets demand.
EV	Electric Vehicle
FSO	Future System Operator. Ofgem intend to set up an expert, independent FSO with responsibilities across both the electricity and gas systems and the ability to expand its remit to additional energy vectors when needed. The FSO will be in the public sector, with operational independence from government.
GIS	Geographic Information System
GW	Gigawatt
HV	High Voltage

Term	Description
IDNO	Independent Distribution Network Operator
kWh	Kilowatt hour
LCT	Low Carbon Technologies
LENZA	Local Energy Net Zero Accelerator. SSEN's tool for supporting local authority LAEPs.
LEO(N)	Local Energy Oxfordshire (Neighbourhood)
LTDS	Long Term Development Statements. Designed to help to identify and evaluate opportunities for entering into arrangements with us relating to use of system or connection.
LV	Low Voltage
MW	Megawatt
NDP	Network Development Plan
Neutral Market Facilitator	Enables and develops flexibility services
NeRDA	Near Real-Time Data Access
NIA	Network Innovation Allowance
NMF	Neutral Market Facilitator will provide a market for trading use of Distributed Energy Resources (DERs).
OMS	Outage Management System, the system we use to manage network integrity.
Open Data	Data in a machine-readable format that can be freely used, shared and built on by anyone, anywhere, for any purpose.
PSR	Priority Services Register. Our register of vulnerable customers.
RIIO-ED2	Price control for Electricity Distribution (2023-2028)
RSP	Regional System Planner. Ofgem proposal for regional energy system planning bodies.
SDG	Sustainability Development Goals
SEPD	Southern Electric Power Distribution
SHEPD	Scottish Hydro Electric Power Distribution
SIF	Strategic Innovation Fund
SME	Small Medium Size Enterprise
SSEN	Scottish and Southern Electricity Networks
TO	Transmission Owner
TOM	Target Operating Model
VFES	Vulnerability Future Energy Scenarios

ENGAGE WITH US

For any queries or to request further information, please contact us on:

stakeholder.engagement@sse.com

www.ssen.co.uk

twitter.com/ssencommunity

facebook.com/ssencommunity

linkedin.com/company/ssencommunity

Sign up for our DSO newsletter

Scottish & Southern Electricity Networks