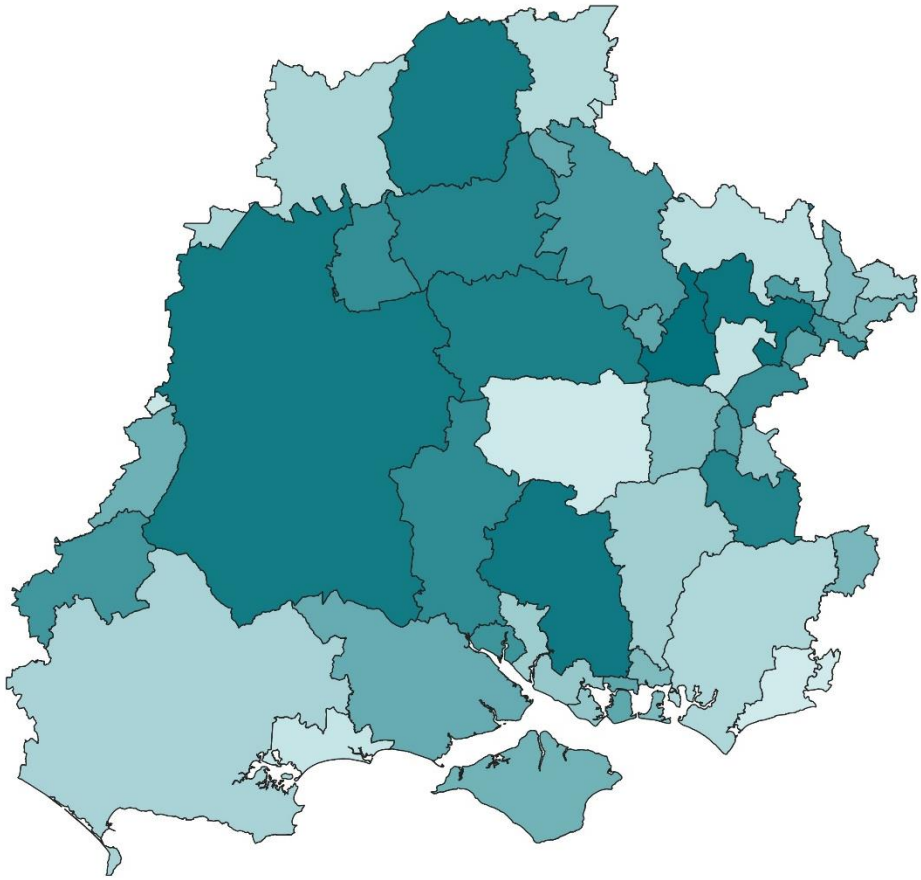
SSEN DISTRIBUTION FUTURE ENERGY SCENARIOS 2023

A user guide for Local Authorities in SSEN's Southern England licence area

April 2024



About Regen

Regen is an independent centre of energy expertise with a mission to accelerate the transition to a zero-carbon energy system. We have nearly 20 years of experience in transforming the energy system for net zero, delivering expert advice and market insight on the systemic challenges of decarbonising power, heat and transport.

Regen is also a membership organisation, managing the Regen members network and the Electricity Storage Network (ESN) – the voice of the UK storage industry. We have over 150 members who share our mission, including clean energy developers, businesses, Local Authorities, community energy groups, academic institutions and research organisations across the energy sector.

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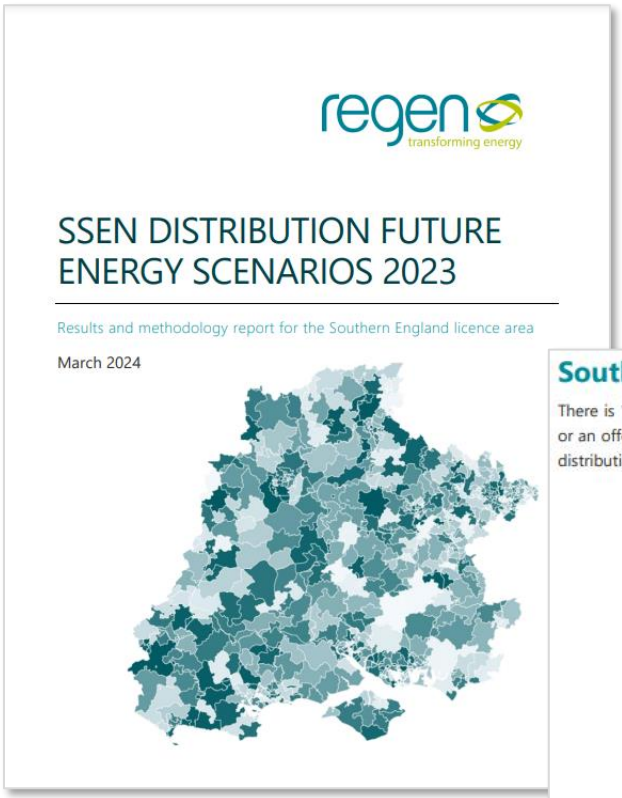
Contents

Purpose of this guide

This guide has been developed by Regen, in conjunction with Scottish and Southern Electricity Networks (SSEN), and gives further information about the 2023 Distribution Future Energy Scenario (DFES) process and results for Local Authorities. It summarises the purpose of DFES, highlights how DFES data can be useful for Local Authority planning processes and provides instructions for Local Authorities to access and use the latest DFES data. The full DFES 2023 report for SSEN's Southern England licence area can be found here.



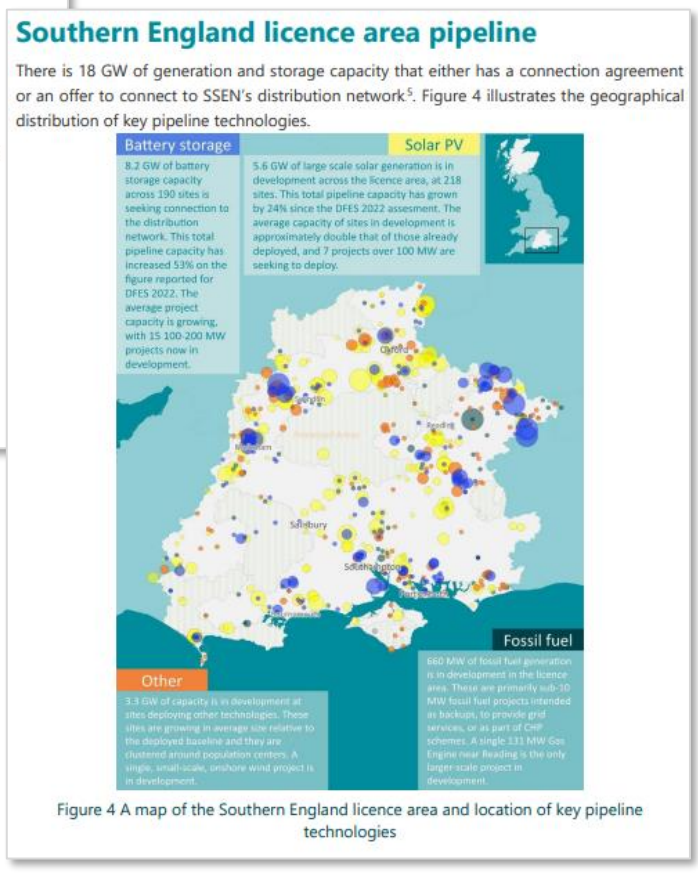


Figure 4 A map of the Southern England licence area and location of key pipeline technologies

Introduction to DFES

What is the DFES?

The Distribution Future Energy Scenarios (DFES) is an annual exercise undertaken by Distribution Network Operators (DNOs), such as SSEN, to feed wider processes that forecast how future energy systems could evolve in specific regions. Energy scenario forecasting is a statutory obligation for electricity networks as part of their requirement to produce forward-looking Network Development Plans.

As a key part of SSEN's load forecasting, network planning and investment planning processes, the DFES plays a key role in guiding future investment for the distribution electricity network infrastructure in the North of Scotland and Southern England licence areas. SSEN uses the DFES analysis as part of an integrated network planning and investment appraisal process. The DFES forecasts enable SSEN to better understand how the demands on its network are likely to change over time and this facilitates the network planning teams to model and analyse future electricity demand. This feeds into SSEN's Net Zero Strategic Planning process, the aim of which is to "provide the capacity on the network to deliver net zero by 2050 while retaining a clear focus on safety and reliability" [1].

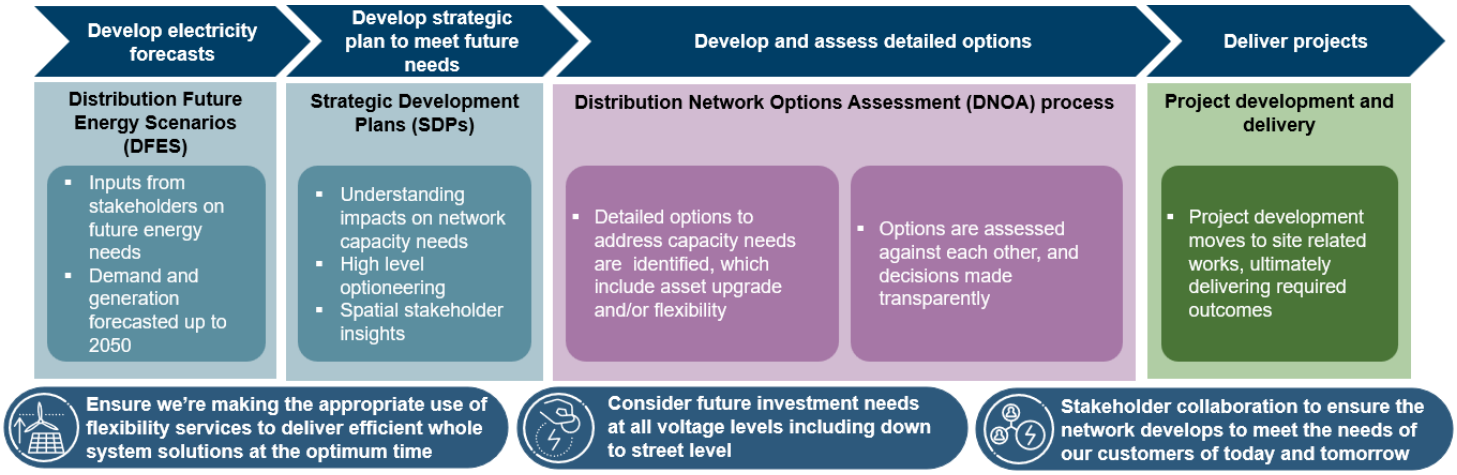


Figure 1 SSEN's high-level network planning process

[1] SSEN 2023, Distribution Network Options Assessment (DNOA) Methodology
https://www.ssen.co.uk/globalassets/about-us/dso/consultation-library/dnoa-methodology.pdf

Regen has been pioneering the DFES methodology and process for almost 10 years and has worked with SSEN to produce annual DFES assessments since 2017/18. The DFES provides a set of scenario projections for key sources of electricity load (generation, demand and storage) that may connect to the distribution network across a licence area, out to 2050. It provides future projections (either as power capacity or number of installations) for the growth or reduction of:

- Energy generation technologies like solar panels, wind turbines or hydropower plants.
- Energy storage technologies like batteries.
- Low-carbon electricity demand technologies like electric vehicles (EVs) and heat pumps.

The DFES also provides projections of new housing developments and new commercial and industrial developments like hospitals, office spaces and data centres based on direct engagement with Local Authorities.

The DFES asks five critical questions about each of these technology sectors:

1. What technologies are currently operating on the distribution network in SSEN's licence areas?
2. What additional technologies will connect or disconnect from the network out to 2050?
3. How much installed capacity from each technology will connect and why?
4. When will this capacity come online and begin supplying or consuming electricity?
5. Where across SSEN's licence areas might these technologies connect, and at what voltage tier?

By answering these key questions and providing high-granularity future projections (some down to street level), the DFES can help SSEN to build a picture of what the future network may look like. This enables SSEN to plan how they might need to invest in and develop the network to meet those future needs. The picture of the future energy system is not absolutely defined. There are several routes that could deliver net zero by 2050, each of them distinct, credible (given effective policy reform and market evolutions) and impacting the electricity distribution network in different ways. To accommodate for this uncertainty, the DFES

assesses four potential future scenarios for each technology sector. This enables SSEN to consider different outcomes and develop adaptable plans that reflect specific localities across its network. The DFES is also updated every year to account for new projects coming online, an ever-changing pipeline of new connections and new policies and regulations that impact the deployment of different technologies in different regions.

The scenario framework

The four scenarios in the DFES are based on the overarching scenario framework from National Grid ESO's annual Future Energy Scenarios (FES) publication. The DFES makes use of the scenario framework and high-level assumptions, but seeks to develop bottom-up, local evidence-led projections that reflect the unique characteristics of SSEN's network regions. Each DFES scenario assumes that the three main energy sectors – power, transport and heating – will decarbonise either in different ways and/or on different timescales.

Use of these national scenarios provides a common framework of future 'worlds' to draw from and an overarching set of national societal, economic and technological assumptions. Part of the DFES process also includes the reconciliation of the DFES projections and equivalent FES projections at licence area level, for each technology. By aligning and reconciling with this national framework, the scenarios across SSEN's licence areas can be compared to other regions in the UK to build an increasingly consistent picture and enable national network planning to be more cohesive across a regional and national level.

In addition, the DFES develops a more detailed set of regional scenarios that are produced through a bottom-up process of local data gathering, investigation of prospective project pipelines, regional energy system and resource analysis and a broad range of local stakeholder engagement. By ensuring that we reflect local evidence and ambition, we can ensure that our projections and the subsequent network planning meet the needs of SSEN's customers and stakeholders.

The FES 2023 scenario framework is based on two axes: speed of **decarbonisation** and level of **societal change**.

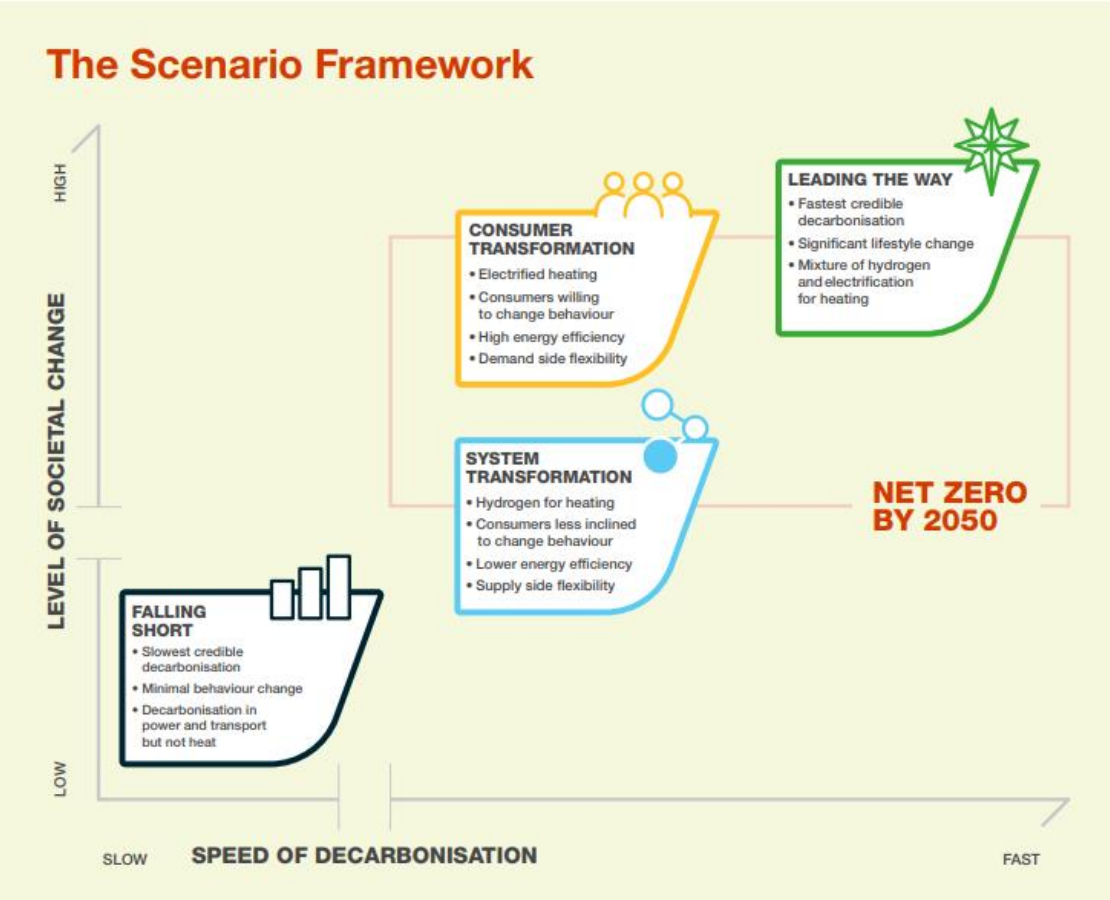


Figure 2 FES 2023 scenario framework (source: National Grid ESO)

Each of the scenarios within this framework can be summarised as follows:

Falling Short

This scenario does not meet the net zero by 2050 target. There is still progress on decarbonisation compared to today, however it is slower than in the other scenarios. While home insulation improves, there is still heavy reliance on natural gas, particularly for domestic heating. Electric Vehicle take-up grows more slowly, displacing petrol and diesel vehicles for domestic use. Decarbonisation of other vehicles is slower still with continued reliance on diesel for Heavy Goods Vehicles (HGVs). In 2050 this scenario still has significant annual carbon emissions, short of the 2050 net zero target.

Figure 3 National Grid ESO FES 2023 Falling Short description (source: National Grid ESO)

Falling Short does not meet net zero by 2050. It assumes that the slowest credible route to decarbonisation is taken, which involves minimal behaviour change across the UK. In this scenario, power and transport decarbonise at a moderate pace, with power becoming increasingly decarbonised through uptake of solar and wind generation and transport decarbonising through uptake of EVs. However, heat decarbonisation – through uptake of heat pumps both at a domestic and commercial level – is much slower and fossil fuel technologies like gas boilers remain hard to remove from the energy system.

It is worth noting, however, that this years' **Falling Short** scenario is more ambitious than in previous years and is closer to the 2050 net zero target than historic versions of this scenario. In the DFES, it is also the scenario that directly reflects current connection timeframes for generation and storage projects that have longer lead time connection offers with SSEN.

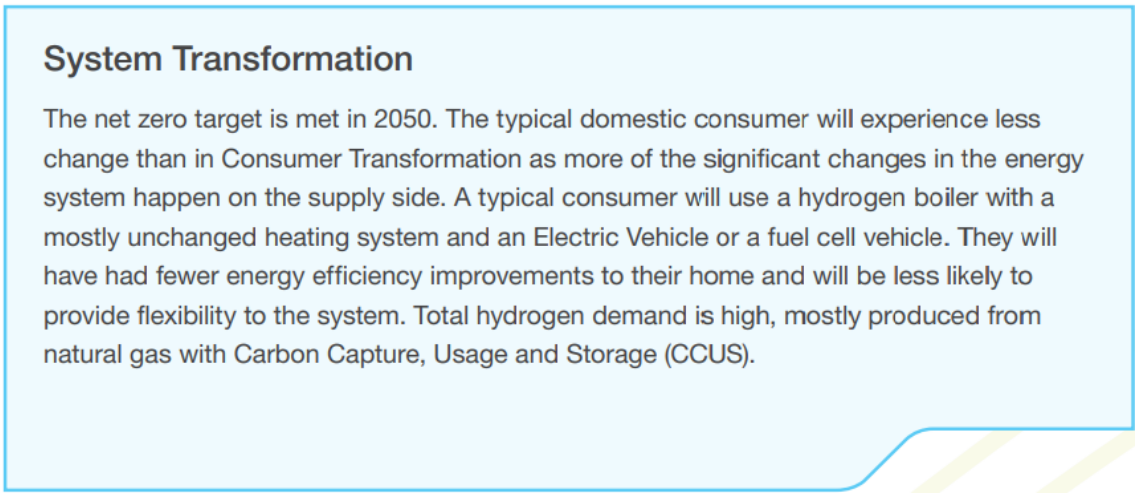


Figure 4 National Grid ESO FES 2023 System Transformation description (source: National Grid ESO)

The **System Transformation** scenario is compliant with UK net zero targets. It assumes earlier maturation and scaling of low-carbon hydrogen-based technologies to deliver net zero by 2050. This scenario involves the lowest level of consumer behaviour change of the three scenarios that meet net zero.

System Transformation aims to minimise disruption to consumers, by decarbonising the power system through a more centralised deployment of solar and wind generation. It

assumes that low-carbon hydrogen could become a fuel to replace natural gas in our home heating systems and industrial processes, as well as being a fuel for flexible electricity generation. This scenario also assumes the uptake of new technologies like hybrid hydrogen/electric heat pumps and that hydrogen production can increase at a scale to meet industrial needs – including high-temperature processes such as steel manufacturing or furnaces. Because of this, electrically-driven flexibility technologies like battery storage are lower than in other scenarios. Electrically-driven space heating (predominantly through heat pumps) and adoption of energy efficiency measures in buildings to enable them are assumed to be lower than in other scenarios.

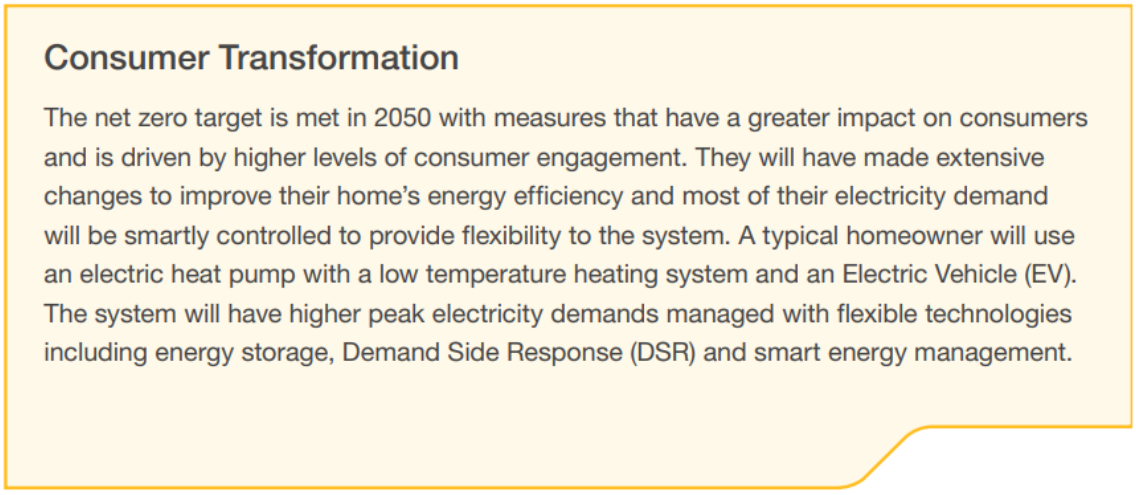


Figure 5 National Grid ESO FES 2023 Consumer Transformation description (source: National Grid ESO)

Consumer Transformation achieves net zero energy through more consumer-driven low-carbon technologies and approaches. This includes:

- A much higher uptake of decentralised renewable generation.
- A significant and rapid adoption of EVs and EV chargers to decarbonise road transport.
- High levels of domestic solar panels and batteries installed in homes.
- An adoption of heat pumps (alongside significant levels of energy efficiency) as the primary route to decarbonising space heating in homes and businesses.

This scenario assumes higher levels of flexibility in energy use from domestic and business consumers, to manage the large increase in electricity capacity needed to power all these

technologies. At a commercial and industry level, **Consumer Transformation** assumes early maturation of industrial-scale electric technologies to power heavy industry rather than early maturation of hydrogen gas to power the currently fossil fuel-based systems. SSEN currently use the **Consumer Transformation** scenario as the one that best represents the future needs of the system. This is reviewed annually.

Both **Consumer Transformation** and **System Transformation** are assumed to reach net zero at a similar time, but via different pathways.

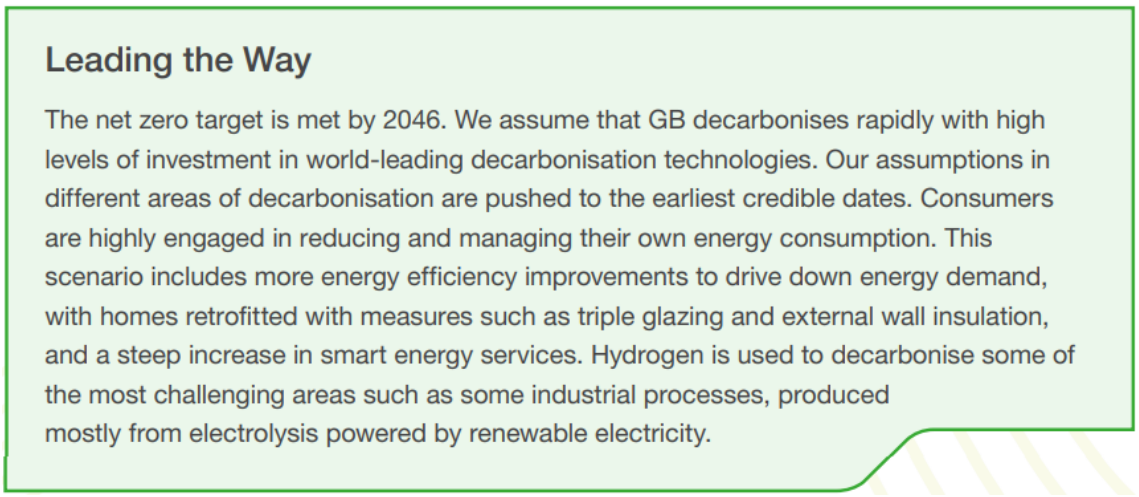


Figure 6 National Grid ESO FES 2023 Leading the Way description (source: National Grid ESO)

The **Leading the Way** scenario is the fastest credible route to net zero. It assumes that there will be significant behaviour and lifestyle changes that will result in the rapid uptake of renewable technologies at all scales, including solar and wind to decarbonise power, alongside a rapid adoption of EVs and a combination of electric and hydrogen technologies to decarbonise heating and heavy industry.

Leading the Way meets net zero targets sooner than 2050.

DFES and Local Planning Processes

Producing the DFES

The DFES 2023 projections are made up of 20 separate technology sector analyses which are categorised into **distributed electricity generation, electricity storage** and **future sources of disruptive electricity demand,** as shown in Table 1. Regen analyses the potential uptake of these technologies and projects how this uptake might increase and/or decrease out to 2050 in the licence area, across the four scenarios.

Technology category	Technology/sector
Distributed electricity generation	Onshore wind
	Large-scale solar PV
	Small-scale solar PV
	Hydropower
	Marine generation
	Biomass generation
	Renewable engines
	Waste-fuelled generation
	Diesel generation
	Fossil gas-fired generation
	Hydrogen-fuelled electricity generation
	Other generation
Electricity storage	Battery storage
	Liquid Air Energy Storage (LAES)
Future sources of disruptive electricity demand	Electric vehicles
	Electric vehicle chargers
	Heat pumps and resistive electric heating
	Domestic air conditioning
	Hydrogen electrolysis
	Data centres
	New property developments

Table 1 Categorisation of DFES 2023 technologies

For each technology it calculates:

1. **The existing baseline of the technology** – or ***how much is already connected to SSEN's network, based on historic deployment*** – e.g. how many solar farms are operational or how many EVs have been registered.

2. **The near-term development pipeline of the technology** – or ***how much uptake of the technology that SSEN can expect to see in the next 5-10 years***. This is produced by gathering information about projects with network connection offers and/or planning applications. Where technologies have a strong pipeline of evidence, e.g. a recent connection agreement, planning approval or a successful Capacity Market contract, the range of outcomes across the different scenarios may be quite narrow. This is because SSEN knows broadly how much capacity may seek to connect in the near term due to this pipeline of evidence, regardless of whether it follows the assumptions in the scenarios. For pipeline sites where less evidence is found, the assumptions under each of the scenarios are applied to model more or less of the known pipeline capacity to connect. We engage project developers, local/regional representatives and sector experts to gather site-specific research that informs the pipeline projection.

3. **Medium- and long-term projections for the technology** – or ***beyond the known pipeline, what levels of future uptake of the technology might SSEN see within each scenario, out to 2050***. Depending on the technology, a much higher variation can be seen across the four scenario projections over the 2030s and 2040s. This sees the DFES trend towards the national scenario worlds and assumptions and result in a wider range of potential outcomes for each technology, by 2050.

4. **Geographical distribution of the technology** – for each technology, the DFES models a licence area total capacity by year and by scenario. We then model how that total capacity might be geographically spread across the licence area, based on a wide range of spatial factors such as renewable energy resources, land classification, population density, social demographics and local ambition. For example, more large-scale solar farms might be expected to be geographically focused in areas that receive more sunshine, have lower urban populations, more open space and where Local

Authorities have signalled ambition to develop renewable energy projects. Similarly, domestic off-street EV chargers will be focused in areas with higher levels of properties with driveways. The granularity of this geographical distribution also varies depending on the technology and the voltage network that projects are more likely to connect to.

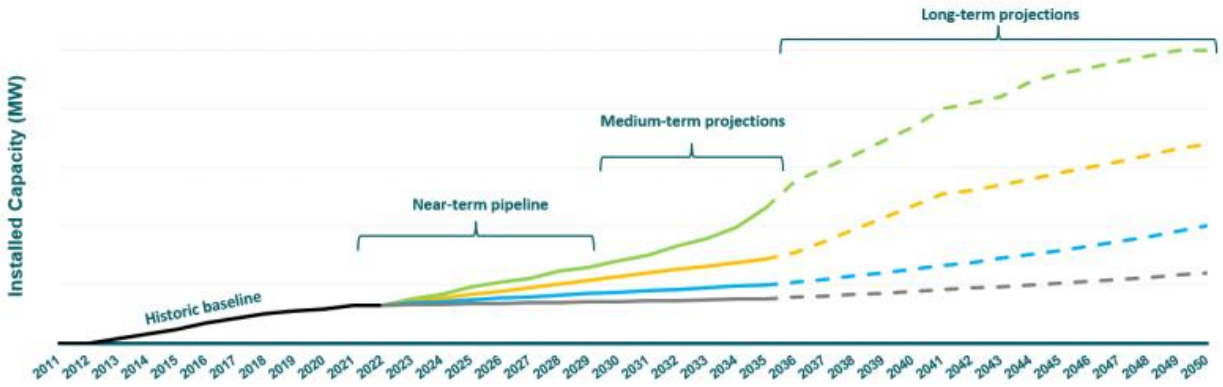


Figure 7 Illustrative stages of DFES scenario analysis (Source: Regen)

How DFES impacts, and is impacted by, local planning processes

For each technology, this four-stage modelling process is updated each year. A crucial aspect of the analysis includes understanding local net zero plans and ambitions. Understanding what technologies Local Authorities are planning to develop, where they plan to develop them and when they plan to do so impacts our DFES modelling. Knowing about new housing developments, plans for regional renewable energy zoning or targets or plans to develop EV charging hubs will impact our DFES analysis and subsequently how SSEN seek to invest in the distribution network.

The DFES makes use of information and data from Local Authorities in a number of ways:

- Through an **online document exchange**, the DFES seeks to engage spatial planning teams in each Local Authority, to update registers of new housing and commercial developments. This data is used directly in the DFES to produce scenario projections for 'domestic developments' (as a number of households) and 'non-domestic developments' (as square metres of floorspace, by a number of development types).

- Regen issues an online **Local Energy Strategy Survey**, where climate change, environmental and energy teams in each Local Authority are asked a number of questions about their strategies, targets and plans for renewable energy, transport, heat, waste collection, hydrogen and local area energy planning. The responses to this survey are used to inform the uptake and geographical distribution of the DFES projections, for equivalent technologies in each Local Authority area (i.e. low emissions zones impact EV uptake and renewable energy targets impact solar and wind capacity projections).

- Several technology projections, such as wind and solar, are distributed across the licence area using a Local Authority Ambition Factor, which utilises **Council Climate Action Scorecard** data combined with indicators from the aforementioned Local Energy Strategy Survey to determine where near-term uptake is likely to take place. In this way, local council ambition is reflected in our projected technology uptake and Local Authorities with policy actions to support sector-specific developments are allocated more projections in the near term. This ambition factor is modelled alongside other technology-specific spatial factors.

- As part of the project pipeline research, **local planning application databases** are interrogated to capture the planning application status of energy projects in particular areas. Planning status is one of the main milestones for new generation and battery storage projects. Planning is one of the prime points of evidence for the DFES pipeline modelling.

The DFES informs how SSEN invest in the distribution network and therefore it can directly impact local spatial and energy planning processes. Knowing how many EVs the DFES has projected to be on the road every year between now and 2050 can help inform Local Authority strategies and plans to deploy EV chargers. On the other hand, planned Local Authority rollout of EVs and EV chargers could be shared with SSEN and Regen to inform the spatial distribution of the next DFES assessment, integrating Local Authority planning into the network planning process. In this way, local energy planning and network planning should be a bi-directional feedback loop with one informing the other to arrive at a consensus for joined-up energy planning.

Use cases of the DFES data for the purposes of Local Authority energy planning could include:

- Using the results of onshore wind and solar projections to inform renewable energy planning areas.
- Accessing more granular-level projections for heat pump uptake to see where new heating technologies could be supported in specific local areas.
- Using EV and EV charger projections to inform public EV charge point rollout planning.

SSEN and Regen are continuing to work closely together to understand how DFES analysis can support and feed into local energy planning and, vice versa, how Local Authority plans and strategies can be more directly used to inform future rounds of DFES analysis.

Local Area Energy Planning

Many Local Authorities across the UK are looking to produce Local Area Energy Plans (LAEPs). LAEPs detail how a region will achieve its net zero targets via the uptake or rollout of low-carbon technologies and decarbonisation of key industries like transport and heating. As LAEPs are a relatively new phenomenon and not a statutory duty in England or Scotland, few Local Authorities across the country – and fewer still in SSEN's licence areas – have produced a full LAEP at this juncture. That said, many have started the process or have produced related publications that can serve as a foundation for LAEPs, such as Climate Action Plans.

The development of LAEPs, and the technology pathways within them, help signify that a council may have high ambitions for net zero. This can subsequently impact how the DFES analysis may model some technology projections in certain council areas. Regen is continually developing and improving the tools, processes and methods of engagement with SSEN to develop the DFES projections. Receiving and making use of LAEPs is a key area of development in the DFES process, considering how specific technology pathways can be reflected in the envelope of the four DFES scenarios in specific areas.

SSEN's LAEP support

SSEN is building capability to ensure that strategic network planning reflects the evolving landscape of local decarbonisation planning. A central component of the strategic planning process is the data gathering to shape DFES forecasts, done in collaboration with Regen. The below sections detail how SSEN is expanding the scope and depth of the data and insight gathering process to inform load forecasts. More information on how DFES fits into SSEN's strategic planning process is available in the Distribution Network Options Assessment (DNOA) methodology.[2]

LAEP support

SSEN has committed to providing support to Local Authorities in its licence areas on net zero and whole system initiatives that interact with the distribution network. As more Local Authorities look to create and deliver LAEPs, SSEN recognises the importance of supporting these endeavours via data provision, network insight and collaboration.

To that end, SSEN's new team of Net Zero Engagement Specialists is collaborating with Local Authorities and other stakeholders to understand their long-term net zero and wider infrastructure planning[3]. Collaboration is carried out through various means, including one-to-one meetings, data sharing, in-person events and the rollout of SSEN's LENZA tool (see section below). Through this collaboration, SSEN aims to support local planners in understanding the role of the electricity network in achieving their net zero ambitions and to channel local insight back into the network planning process.

Through the team's engagement to date, it has become clear that not all Local Authorities have the resources or buy-in to produce a fully-fledged LAEP. SSEN's Engagement Specialists are available to support on more targeted strategic energy projects that stakeholders may be looking to develop, whether in the realms of transport, heating or other sectors.

[2] See: Publications & Reports - SSEN

[3] See: Local Area Energy Planning - SSEN

Local Energy Net Zero Accelerator (LENZA)

A further component of SSEN's Local Authority support is via the rollout of the Local Energy Net Zero Accelerator, or LENZA. This is a geospatial planning software designed to support Local Authorities in their LAEP endeavours. Powered by Advanced Infrastructure Technology Ltd's (AITL) LAEP+ platform, LENZA provides access to data that are crucial to making energy planning decisions – including on the electricity network – and supports users across different stages of Energy Systems Catapult's LAEP guide. LENZA is in its BETA phase and improvements to data and functionality are ongoing.

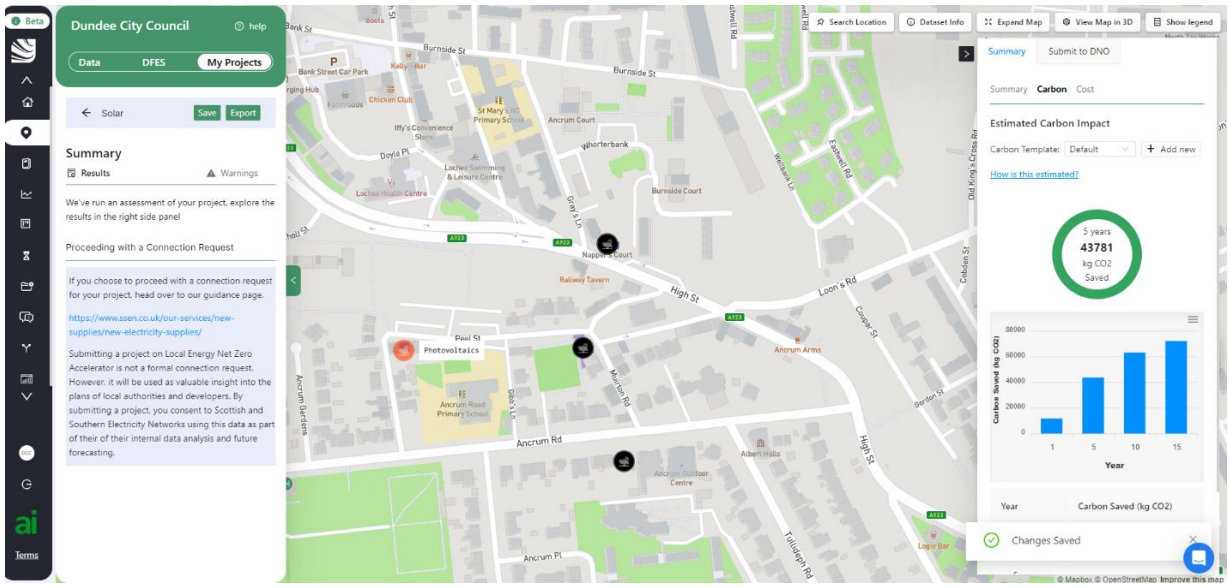


Figure 8: The LENZA platform (https://www.ssen.co.uk/our-services/tools-and-maps/lenza/)

SSEN began a phased rollout of the BETA version of LENZA in December 2023. As of April 2024, SSEN and AITL are making LENZA available to Local Authorities across both of SSEN's licence areas, as software developments continue. LENZA provides benefits to users that ultimately support SSEN's longer-term strategic planning process. For Local Authorities, the platform aims to lower barriers to entry for strategic energy planning, streamline the creation process and help to produce data-driven, digitalised end-products. In turn, these projects and plans should provide SSEN and Regen with more detailed insight into how load on the electricity network may evolve in a local area. Incorporating the LAEPs produced and shared in LENZA into the DFES data pipeline is a key area of focus moving forward for Regen and SSEN. The Engagement Specialists' ongoing collaboration with Local Authorities and other stakeholders will help to shape this process.

Introduction to Regional Energy Strategic Planners (RESP)

To support the alignment of local net zero planning and network planning, Ofgem has announced the creation of Regional Energy Strategic Planners (RESPs). RESPs will be responsible for developing a regional whole system strategic plan that is coherent with national and local net zero ambitions and energy security priorities. The RESP is also tasked to ensure the strategic plan supports achieving the most cost-effective decarbonisation outcomes derived from, and informing, the individual plans of local stakeholders. One of the primary roles of the RESP would be to support Local Authorities to develop local energy plans.

Within this, the key functions RESPs will be responsible for delivering would be:

- **Cross-vector strategic planning** (e.g. planning across energy, transport, heat and industry, and how these previously separate vectors might interface).
- **Technical coordination activities** (e.g. energy demand modelling, whole system optioneering, conflict resolution).
- **Place-based engagement and coordination.**
- **Support to local stakeholders.**

Whilst the definition of the RESP role is still to be solidified, there could be between 10-13 RESPs across the UK. The boundaries proposed currently align with the national transport boards, but this might change. Currently the proposed RESP plan issued by Ofgem suggests that there will be:

- Two RESPs in Scotland.
- One RESP in Wales.
- Between eight and ten RESPs in England.

National Grid ESO – which is currently transitioning to become a public body called the National Energy System Operator (NESO) – will be the governance and delivery body for the RESPs and Ofgem is currently undertaking detailed design to explore options for how the RESP might function, the governance structures it should operate and the boundaries for each individual RESP area. While the RESP may be in its early stages of development, it is important to consider the impact it could have on coordinating local energy and net zero planning. The existing research and regional engagement activities undertaken to inform the DFES and wider network planning will need to coordinate and interface with the proposed roles and

activities of the RESPs. This will further ensure that the ambitions of Local Authorities continue to be reflected in regional strategic plans and shape the direction of network and infrastructure planning even further. We do not know what the remit and activities of the RESP will yet look like – whether it will be more planning and advisory focused, or if it will have a stronger delivery role and more actively work with Local Authorities and networks to shape investment in a region. SSEN and Regen are currently engaging extensively with Ofgem, National Grid ESO, the Energy Networks Association, other energy network companies and several Local Authorities within our regions to contribute to the development of the RESP.

Currently proposed RESP boundaries

The current boundaries proposed by Ofgem that are in regions where SSEN operates are summarised below in Table 2 and Figure 9.

RESP area	Local Authorities in this area served by SSEN network
Highlands and Islands (Scotland)	Aberdeen City, Aberdeenshire, Angus, Argyll and Bute, Clackmannanshire, Dundee City, Highlands, Moray, Na h-Eileanan Siar, North Ayrshire, Orkney Islands, Perth and Kinross, Shetland Islands, Stirling, West Dunbartonshire.
England's Economic Heartland	Buckinghamshire, Cherwell, Oxford City, Oxfordshire County, South Oxfordshire, Swindon, Vale of White Horse, West Oxfordshire.
Western Gateway	Bournemouth, Christchurch and Poole, Dorset, Cotswold, Gloucestershire, Wiltshire.
Peninsula Transport	Somerset.
Transport for the South	Arun, Basingstoke and Deane, Bracknell Forest, Chichester, East Hampshire, Eastleigh, Fareham, Gosport, Guildford, Hampshire County, Hart, Havant, Horsham, Isle of Wight, New Forest, Portsmouth, Reading, Runnymede, Rushmoor, Slough, Spelthorne, Southampton, Surrey Heath, Surrey County, Test Valley, Waverley, West Berkshire, West Sussex County, Winchester, Windsor and Maidenhead, Wokingham.
Greater London	Ealing, Hillingdon, Hounslow, Greater London Authority.

Table 2 Proposed RESP areas and the Local Authorities in the area (Source: UKERC)

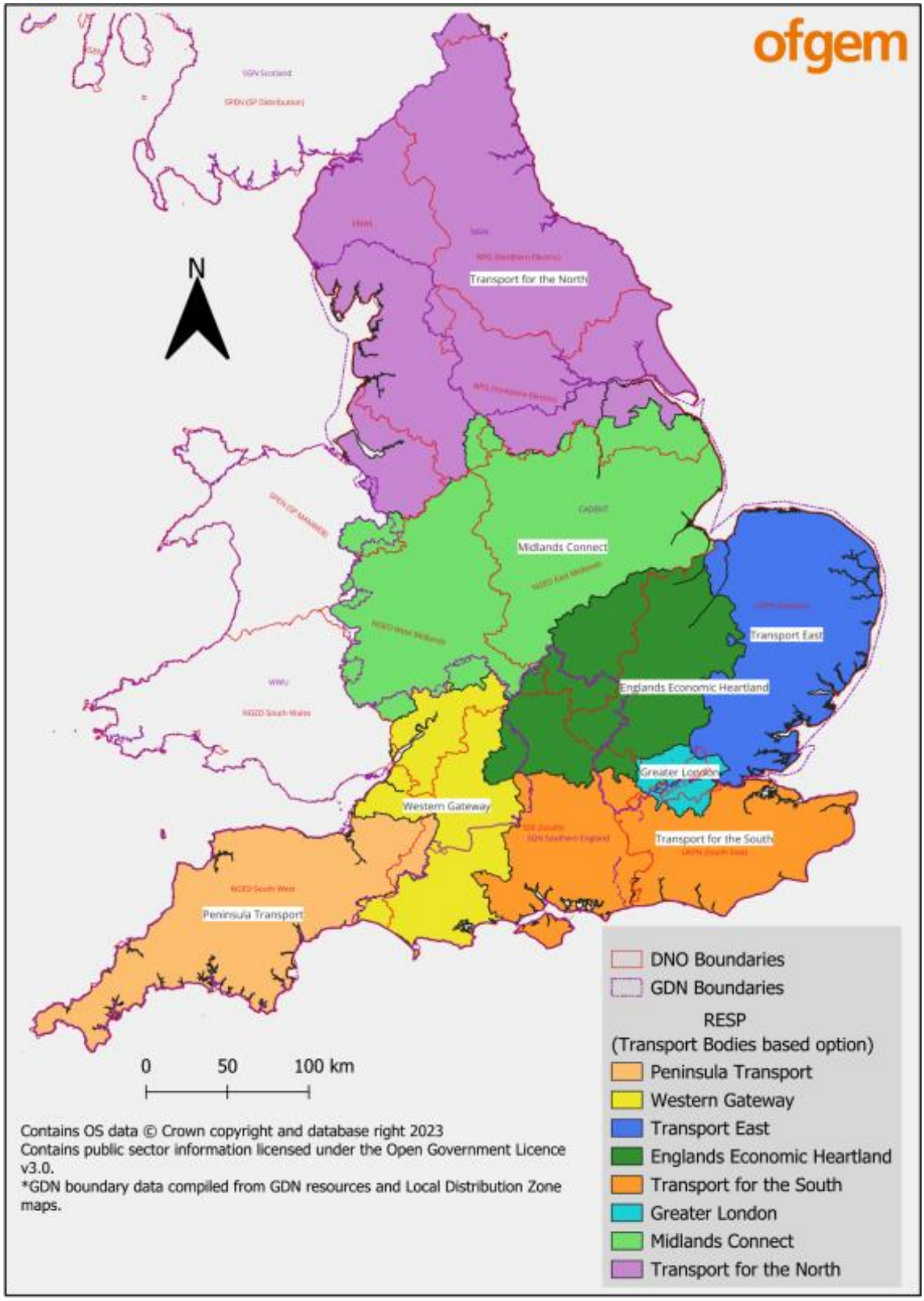


Figure 9 Current proposed RESP boundaries in England (Source: Ofgem)

Examples of DFES data for Local Authorities

The DFES analysis provides future scenario projections across several different generation, storage and demand technologies. Engagement with Local Authorities in SSEN's regions highlighted that the most useful DFES technology projections for Local Authorities might include:

- EVs and EV charger capacity.
- Heat pumps.
- Large-scale renewable generation technologies (e.g. solar PV and onshore wind).
- Small-scale renewable energy generation technologies (e.g. rooftop solar on homes).
- Large and small storage technologies (e.g. grid-scale storage projects or domestic batteries).

The maps below are examples of the type of granular DFES data that SSEN holds. This map includes projections for Wiltshire as an example Local Authority area in 2050 under the **Consumer Transformation** scenario for:

- Public EV charger demand.
- Large-scale battery storage capacity.
- Large-scale solar PV capacity.
- The number of domestic heat pumps.

The DFES geographically distributes licence area projections to **Electricity Supply Areas** (ESAs). An ESA is a geographical zone representing a block of demand or generation sharing upstream network infrastructure. These maps display DFES projections at 11 kV primary substation ESA granularity as an illustration of the type of data that is available for Local Authorities to use.

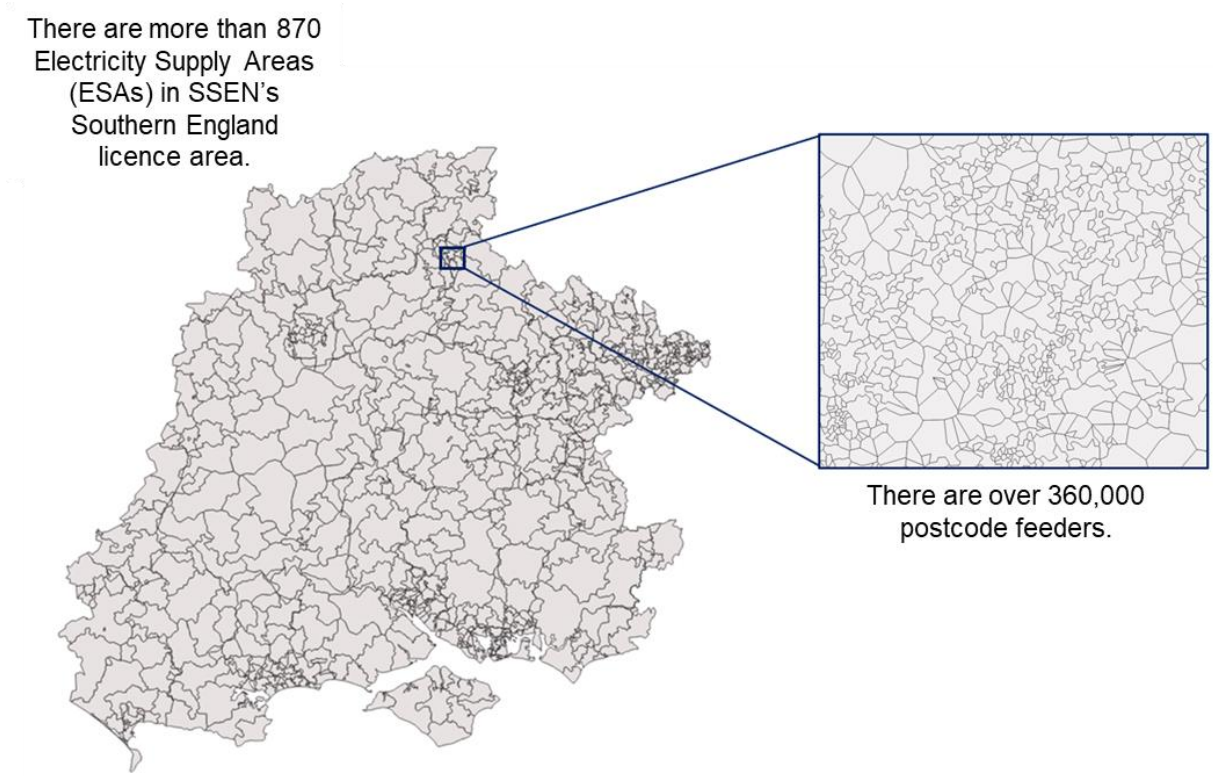


Figure 10 Map of 11 kV and feeder ESAs in the Southern England licence area

In the Southern England licence area, for large generation and storage technologies, projections are distributed to 876 individual 11 kV primary ESAs. ESAs are smaller in size in areas of high population density. Therefore, ESAs falling within urban areas might equate to the size of a small urban borough, whereas ESAs situated in rural areas will cover a larger geography.

A summary of each technology building block is provided below.

Large-scale renewable electricity generation

All major large-scale electricity generation technologies connected to the distribution network are projected across the four DFES scenarios. This includes separate analysis for onshore wind, solar PV, hydropower, tidal/wave generation and waste/bioenergy generation. Large-scale is defined as projects with over 1 MW capacity. In the North of Scotland licence area we anticipate a significant increase in onshore wind generation and in Southern England we anticipate significant expansion of large-scale solar farms – due to the favourable wind and solar resources in each geography, respectively.

Large-scale battery storage capacity

Across the UK there is a significant pipeline of grid-scale battery storage projects. The pipeline is especially significant in the Southern England licence area. Battery storage is a key low-carbon flexibility technology that can mitigate the variable nature of generating electricity from solar and wind. There are a number of lucrative national balancing services that battery storage developers are targeting and many sites have submitted planning applications as well as accepting connection offers with SSEN.

Public EV Charger demand

EVs and EV chargers are key low-carbon technologies assessed in the DFES – the growth in numbers of EVs and subsequent charging needs will have a significant impact on the electricity network. We provide projections across a number of vehicle types (EV cars, motorbikes, LGVs, buses and HGVs) and EV charger capacity is projected across a number of charger archetypes (including public on-street, domestic off-street, office and depot and destination).

Domestic heat pumps

The DFES provides scenario projections for types of electrical domestic and non-domestic heating technologies, this includes both hybrid and non-hybrid heat pump variants, resistive and night storage heating. In all scenarios heat pumps are expected to increase in number across the region. Understanding this potential uptake is a crucial area for SSEN's network planning. It is important for us to understand Local Authority plans for large heat pump retrofit programmes or energy efficiency initiatives, so that we can adapt our scenario analysis each year.

For further information, please refer to the 'How to access the DFES data' section of this report.

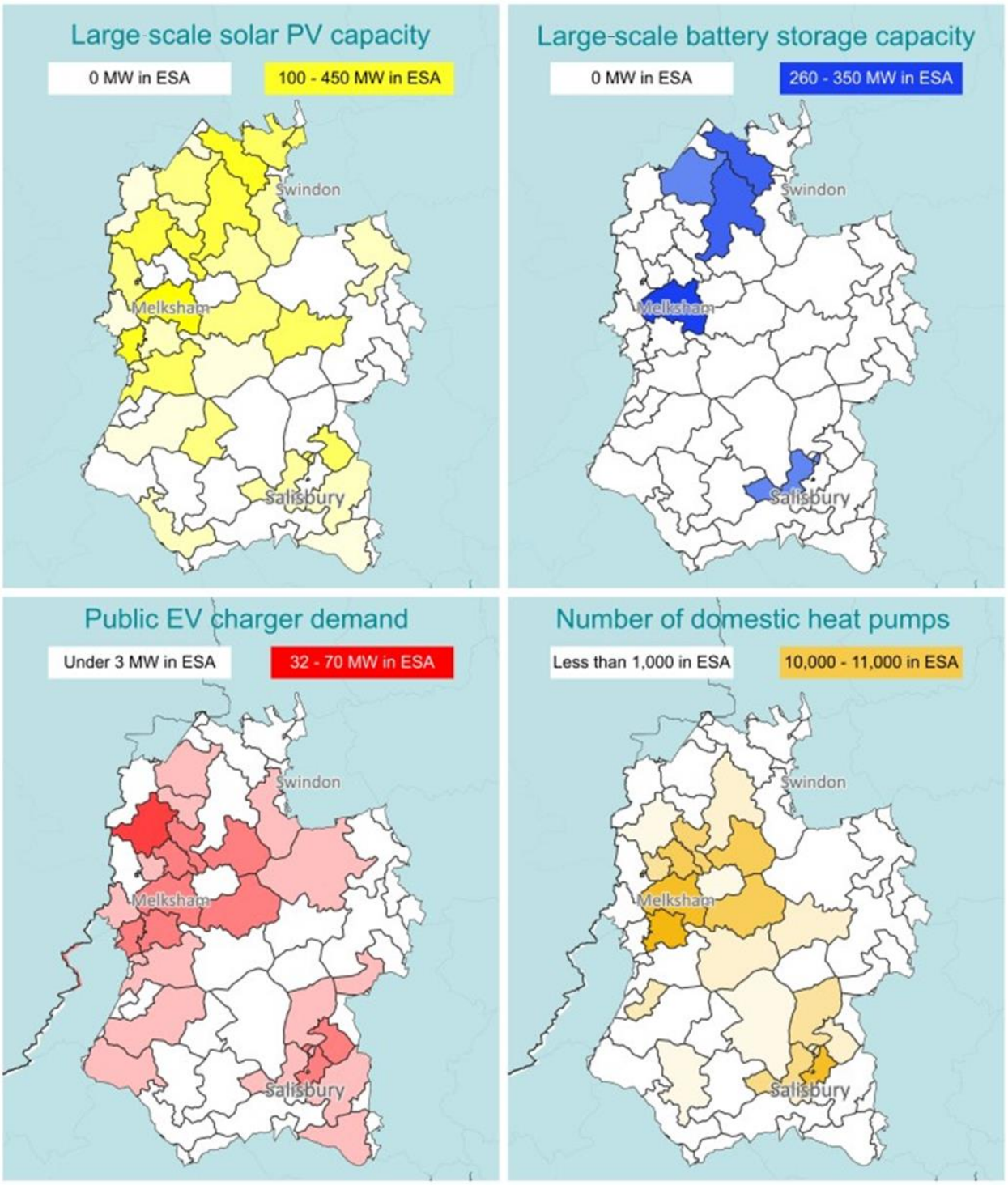


Figure 11 Results of DFES under Consumer Transformation by 2050 for various technologies in Wiltshire (as an example), geographically distributed across 11 kV ESAs

Case Studies

DFES can provide useful information to support local planning processes. By understanding the predictions and projections for SSEN's future network needs, Local Authorities can tailor their net zero plans accordingly or can update SSEN and share where their plans do not align with our own. Here is how some of the Local Authorities in SSEN's Southern England licence area have used DFES data to support local net zero planning.

Dorset Council

In Dorset, the 2021 DFES helped inform the development of the Council's EV strategy and delivery programme. The annual DFES data forecasts the number of EVs expected in Local Authority areas every year between now and 2050. This gave Dorset Council a starting point when it came to understanding how many EV chargers may be needed across the region, which helped to inform strategies and delivery plans. In January 2024, Dorset Council's Place and Resources Scrutiny Committee completed a Grid Capacity Review, which relied heavily on DFES projections for the area, and was used to raise the profile of grid capacity as an issue with elected members and support buy-in for the development of a LAEP. The DFES also informed the development of Dorset's emerging climate strategy monitoring framework.

Isle of Wight Council

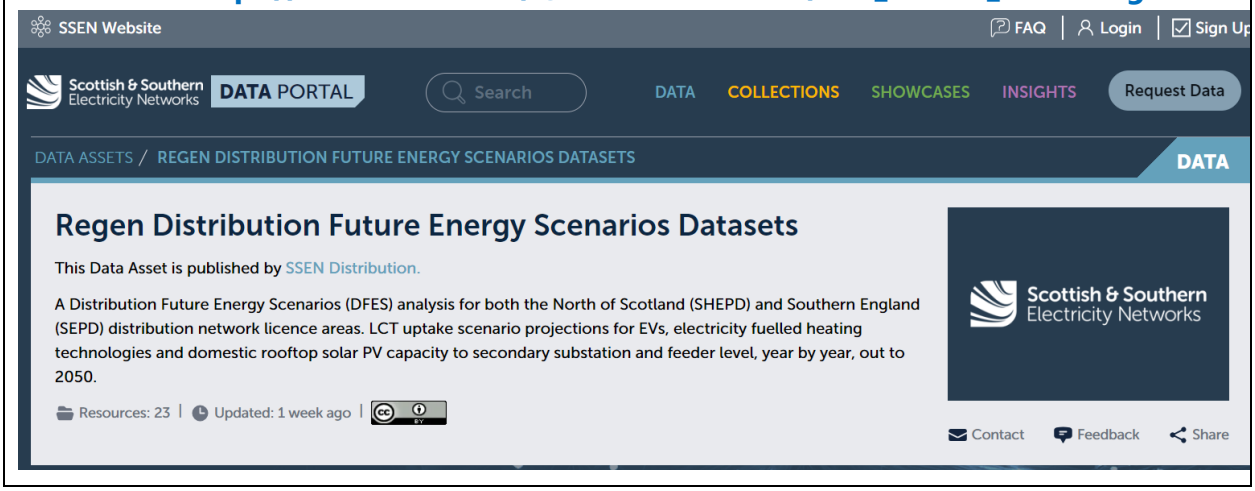
The Isle of Wight Council has used DFES data and engagement with SSEN to quantify the scale of future electricity load growth on the island. Regen and SSEN worked with a number of island stakeholders and developers across 2022 and 2023 to build an evidence case for future load, drawing from DFES data, developer appetite and a high-level view of other sources of electrification not included in the core DFES (i.e. ferry electrification).

By doing this, the council and SSEN have opened dialogue with Ofgem about the potential development of a fourth subsea cable between the Island and the mainland to facilitate this load growth. The DFES has also provided the Isle of Wight with a reference point to act as a benchmark for commitments made by the Isle of Wight Council through its Mission Zero net zero strategy.

How to access DFES data

Alongside the publication of SSEN's DFES 2023 reports, SSEN has also made the DFES projection data available via the **SSEN Data Portal**.

Follow link: https://data.ssen.co.uk/@ssen-distribution/low_carbon_technologies



Through this data portal users can access various data sources, including:

- The DFES methodology and results reports.
- The full 11 kV DFES projection datasets.
- A specific Local Authority DFES data dashboard, where users can filter scenario projections by technology and by Local Authority.

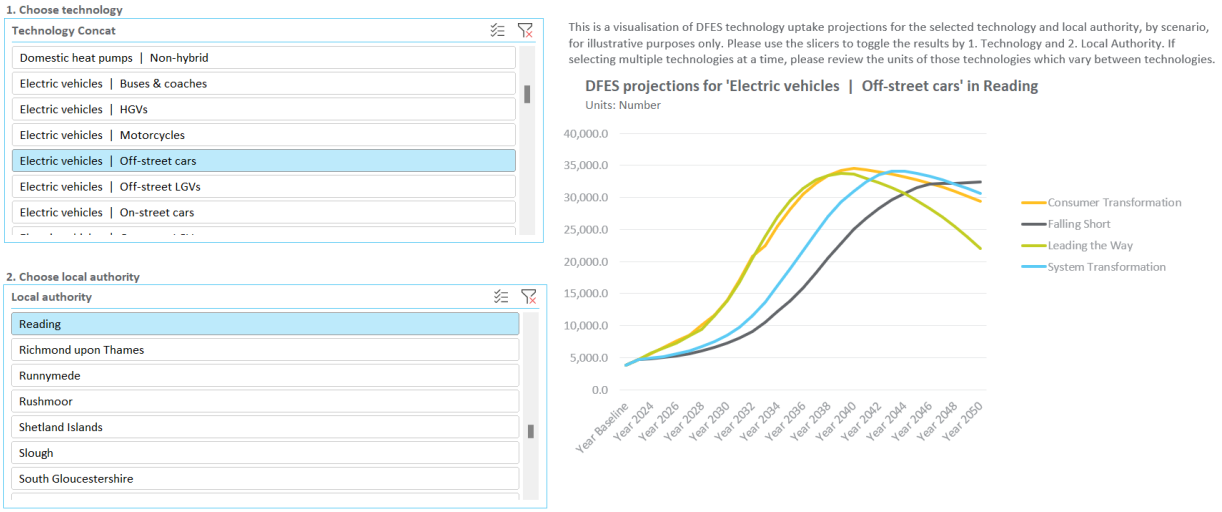


Figure 12: Example of Regen DFES Local Authority data dashboard

Other relevant data sources

Data	Source / Link
DFES 2023 methodology and results report for Southern England	https://www.ssen.co.uk/globalassets/about-us/dso/dfes/ssen-dfes-2023-southern-england.pdf
DFES 2023 stakeholder engagement webinars	https://www.regen.co.uk/event/ssen-distribution-future-energy-scenarios-2022-stakeholder-consultation-webinars-2023/
SSEN LENZA tool for Local Authorities	https://www.ssen.co.uk/our-services/tools-and-maps/lenza/ https://ssen.lenza.advanced-infrastructure.co.uk/auth/login
SSEN DSO Capabilities Roadmap	https://www.ssen.co.uk/globalassets/about-us/dso/publication--reports/dso-capabilities-roadmap-final-report.pdf
SSEN network maps	https://network-maps.ssen.co.uk/
SSEN Just Transition Progress Report	https://www.sse.com/media/zzxoyms2/just-transition-measuring-progress-report-2023.pdf