SSEN DISTRIBUTION RIIO-ED2

DISTRIBUTION SYSTEM OPERATION (DSO) STRATEGY

RIIO-ED2 Business Plan Annex 11.1

Scottish & Southern Electricity Networks

Contents

EXECUTIVE SUMMARY

The GB electricity system and its interactions with consumers are changing…

The increase in small-scale renewables and low-carbon technologies is creating opportunities for consumers to generate and sell electricity, store electricity using batteries, and even for electric vehicles (**EVs**) to alleviate demand on the electricity system by charging at periods of low demand. These Distributed Energy Resources (**DER**) allow customers and communities to provide network flexibility services and support decarbonisation. The local distribution network is key to unlocking the benefits of this low carbon transition which is crucial to cost effectively delivering net zero at pace.[1] In RIIO-ED2, we will deliver additional data, monitoring and systems at the local network level to enable energy to flow in all directions creating an active network or 'smart grid'. These 'smart grid' functions, collectively known as Distribution System Operation (**DSO**) will enable our customers to connect and provide flexibility services at a time to meet their needs and allow us to share data on our forecast network requirements for flexibility services and investments. This is important because the electricity network will need to be capable of delivering at least twice the amount of energy by 2035 to meet the government net zero plan. Our RIIO-ED2 plan puts us on a trajectory to do this at the most efficient cost for customers by investing once at the right time in the right part of the whole system. DSO functions will enable customers to connect DER, EVs and heat pumps at a time to suit them and SSEN to optimise the timing and combination of investments.

[1] UK Government has committed to reaching **net zero by 2050** and accepted the advice of its independent Climate Change Committee (CCC) to adopt an emissions cut of **78% by 2035** compared with a 1990 baseline. The Scottish Government has committed to reaching **net zero by 2045** and reduce emissions by **75% by 2030** compared with a 1990 baseline.

Our strategy for delivering DSO is summarised as follows:

In **RIIO-ED1** SSEN:

- Set up a separate DSO Directorate to focus on developing DSO functions and manage network capacity development investment decisions
- Built foundational systems, such as asset data mapping systems and active network management at grid substation level to enable provision of data for analysis and automation of DSO functions
- Adopted a ***Learning by doing*** approach, working with stakeholders to implement flexible connections for customers and testing flexibility service procurement and product development

In **RIIO-ED2** our stakeholders expect SSEN to deliver the following primary DSO roles:

- Demonstrate a robust approach to **planning and network development** which incorporates potential non-network solutions such as **flexibility**
- Efficient and effective **network operation** that accommodates the increasing role of Distributed Energy Resources
- Neutral facilitation of **the market** with simple, efficient processes to encourage its **development**.

SSEN's investments in our DSO capability during RIIO-ED2 are one of the clearest examples in our Business Plan of how our strategic outcomes combine to deliver a positive impact on society. Delivering our DSO Strategy will be achieved through the development of three core DSO capabilities that each encapsulate a range of functions, and the successful mitigation of potential conflicts of interest:

Forecasting Network Requirements and Evaluating Network Solutions

We will be investing in new Power Systems Analysis and Low Carbon Technology Analysis tools and supporting connectivity data improvements. Additional System Planners (Network Designers) will be required to implement and operate these systems, considering the increase in forecasting and reporting requirements to meet growth in demand and to enable sharing and coordination at whole system level with customers and stakeholders. This will enable customers and stakeholders such as local planners to have improved visibility of network constraints, LCT opportunities and to allow local network plans and whole system solutions to be implemented.

Securing Flexibility

To scale up capability to stimulate the market and contract at scale we need to invest in IT/OT systems for DSO Orchestration and optimisation and flexibility contracting. Additional commercial skills will be required to implement and operate these functions. This will allow us to allow customers to easily interact with the market to provide services; enable us to secure flexibility to defer and coordinate reinforcement investments and allow customers to connect flexibly to suit their needs.

Operating Flexibility

To scale up our flexibility operation we will need to invest in additional Active Network Management and commercial optimisation IT systems and control staff to implement the flexibility schemes onto the system and operate a more complex network down to low voltage and dispatch flexibility. This will ensure that we maintain security of supplies for customers, maintaining network performance at efficient cost for ancillary (flexibility) services to keep bills affordable.

Mitigating Potential Conflicts of Interest

Stakeholder confidence in SSEN as a neutral facilitator of the transition to a smart grid in support of net zero is fundamental to progress in RIIO-ED2. We will continue to operate a separate DSO function from DNO Asset Management, Connections and Delivery. We will invest in further transparency of our capacity-related network investment decisions and further enhance stakeholder engagement (through the stakeholder board) and independent auditing in this area.

1.1 OUTLINE OF THE DSO STRATEGY ANNEX

This document details how SSEN will grow investment in its DSO capability by £73.1m in RIIO-ED2, deliver customer benefit through facilitating customers to connect DER and provide DER services, keep bills lower by allowing efficient timing and delivery of reinforcement expenditure in the right places and support the significant societal benefits through meeting net zero efficiently and effectively.

In **section 3** of our DSO Strategy, we outline how we have worked closely and collaboratively with the Department for Business, Energy & Industrial Strategy (**BEIS**), Ofgem, other DNOs, the Electricity System Operator (**ESO**) and stakeholders to develop and start to build the foundation for DSO in **RIIO-ED1**. Our latest update *Delivering DSO: A Progress Update* sets out the substantial progress we have made in building DSO capabilities during this period. Our focus has been on modernising our core systems to enable the move to open data sharing, digitalisation and the DSO function. This will ensure we are ready for the step change we expect to see in RIIO-ED2 as we transition to net zero.

Section 4 outlines how we will deliver on these in RIIO-ED2 with an incremental investment of **£73.1m** to deliver these DSO capabilities and meet the minimum requirements laid out by Ofgem:

- We will invest **£45.0m** in targeted Information Technology (**IT**) and Operational Technology (**OT**) projects that will underpin our ability to deliver the primary DSO roles. These projects and associated spend are discussed in our **IT and Digitalisation Chapter (Chapter 5)**.
- We will invest a further **£27.1m** to scale up our workforce capabilities.
- We will also spend **£1.0m** to extend our layered approach to mitigating conflicts of interest and our role as a neutral market facilitator.

This is a significant programme of change and delivering these outputs will require investment in people, systems, data and external relationships. Our **DSO Operating Model** (see **section 4.3.1**) and our **DSO Action Plan** (see **section 4.4.1**) provide further information on implementation of these capabilities during RIIO-ED2.

This investment will deliver significant benefits in RIIO-ED2 by reinforcing our '**Flexibility First**' commitment as a network solution deferring the need for reinforcement of our networks allowing schemes to be delivered in a coordinated and efficient manner to meet overall local network plans. In RIIO-ED2 we plan to secure **5GW** of **flexibility services** with the combined expenditure savings from deferring or avoiding

reinforcement in RIIO-ED2 ranging from **£18.3m** to **£46.3m** (dependent on market liquidity[2]) under our assumed Consumer Transformation scenario. This scenario tends towards reinforcement because of the rapid uptake of low carbon technology, indicating this range of benefits could be at the lowest end of the potential benefits for flexibility in RIIO-ED2. In addition, we plan to grow our **flexible connections** to **3.7GW** of capacity across **35** zones helping customers avoid **£417.6m** of reinforcement cost and offsetting **1.8mtCO2**.

Section 4 also sets out the high-level design of our DSO SDI (**section 4.3.2**) which will enable stakeholders and Ofgem to evaluate our progress on delivering our DSO Strategy throughout RIIO-ED2. This SDI forms part of a wider SDI for which full details, including the granularity on the DSO SDI, can be seen in **Supplementary Annex 04 – Strategy Delivery Incentives Proposals**. In addition, **section 4.3.3** outlines our DSO Consumer Value Propositions (CVPs) which are focused on supporting emerging aspects of the smart grid that will deliver benefits to the network and customers – energy efficiency and flexibility market participation. SSEN intends to invest **£36.8m** in these CVPs generating customer benefit by stimulating local markets to actively engage in the provision of network services and utilising energy efficiency as a network solution that can reduce capital expenditure and provide wider societal benefits to vulnerable communities.

Finally, **section 5** summarises the stakeholder engagement that has informed our approach to forming our DSO capability and that has been absolutely key in building a strategy that addresses potential conflicts of interest and ensures our role as a neutral facilitator of the emerging smart grid and flexibility market.

[2] These figures assume a flexibility services availability payment of £300 and £75 respectively. Our current payment of £150 delivers **£32.0m** of savings in RIIO-ED2.

1.2 OUTPUTS

Output	Type	Ambition level	Cost for baseline plan	Consumer benefit
DSO Strategy				
DSO Strategy	LO/ ODI-F	Define a DSO strategy that will be reviewed and refreshed annually with an action plan to deliver against it, including changes to IT systems, process and people.	**£73.1m**	Our DSO strategy will provide significant benefits across our plan through flexible connections saving **£417.6m** in reinforcement costs, offsetting **1.8mtCO2;** and deferred reinforcement and avoided capital expenditure saving customers up to **£46.3m.**
Facilitating participation in flexibility markets	LO/ ODI-F	Set up an annual flexibility providers forum and survey enabling regular feedback.		
Transparency of information	LO/ ODI-F	Provide timely, accurate and accessible DSO data across all DSO roles.		
Improving provision of forecasting information	LO/ ODI-F	Continually improve the provision of forecast information for both new and existing flexibility markets.		
Deploying flexible solutions	SSEN Aim	Target 5GW of Constraint Managed Zones across multiple service types and grow our flexible connections to 3.7GW of capacity across 35 zones by 2028.		
CVPs				
Energy Efficiency Support for Smarter Networks	CVP	Proactively work with Local Authorities and partners to identify and implement energy efficiency measures across our customer base that can release network capacity.	**£36.8m**	**£7.1m** net positive value and **£0.21** benefit delivered in excess of every £ spent. Supporting all our customers in the energy transition. Our blended CVP approach will actively promote a localised, balanced energy system, with wider societal benefits (e.g., carbon savings).
Local and Community Flexibility Market Stimulation		Partner with local organisations, aggregators and energy suppliers and other relevant organisations to actively promote recruitment of flexibility in areas of low Market growth with a focus on fuel poor customers and those in vulnerable circumstances.		Communities will be empowered to participate in flexibility markets, benefiting from the energy system transition, and resulting in lower customer bills through the reduced need for reinforcement and energy efficiency. Support the fair distribution of benefits from smart technology.

LO: licence obligation; PCD: price control deliverable; ODI: output delivery incentive (F: Financial, R: Reputational), CVP: Consumer Value Proposition, SSEN Aim: company aim

2. THE STRATEGIC CASE FOR DSO

2.1 VISION FOR DSO

Our VISION for DSO is to make the best use of our electricity networks, data and emerging technology to facilitate the decarbonisation of transport and heat at maximum pace, and at minimal cost to GB consumers.

Our desired strategic outcomes for DSO in RIIO-ED2 are to:

1. Facilitate the delivery of the UK's net zero ambitions and provide strong value to consumers with a coordinated, efficient and cost-effective DSO Operating Model
2. Comprehensively deliver against stakeholder expectations for DSO whilst meeting the minimum requirements outlined by Ofgem:
    - Demonstrate a robust approach to **planning and network development** that utilises standardised, coordinated and transparent insights from a range of sources: e.g., Distribution Future Energy Scenarios (**DFES**), Network Development Plans (**NDPs**), Long-term Development Statements (**LTDS**) and Regional Development Plans (**RDPs**), and incorporates the growing list of potential solutions (flexibility services, smart grid technologies)
    - Deliver efficient and effective **network operation** that resiliently accommodates the increasing proportion of Distributed Energy Resources (**DER**) in the energy mix and reduces the potential for conflict through network visibility and coordination with the ESO
    - As a neutral facilitator of the market SSEN will encourage vigorous **market development** with simple, efficient processes and transparent decisions, improving access for participants, stimulating engagement and fostering liquidity
3. Lead the way in the following key DSO metrics which we have prioritised based on stakeholder feedback and customer value:
    - **Data accuracy, accessibility and timeliness** - this metric will evaluate our performance in sharing DSO data that is accurate, accessible and shared in a timely manner.
    - **Facilitating Participation** - this metric is designed to evaluate our performance in facilitating the customer journey. This metric will give an indication of our performance in promoting market awareness, stakeholder's experience of participating in the market, how likely they are to participate again and what barriers there are to participation.
    - **Forecasting** - this metric will drive improvement in our week-ahead operational forecasting.

2.2 AMBITION FOR DSO

In RIIO-ED2 our ambition for DSO is to provide customers simple and standardised access to flexibility markets across GB, provide leading data and digital capabilities aligned with operational technology, coordinated local planning and people capabilities. This is to enable customers to connect renewables and DER at a time to suit their requirements and stakeholders including communities and local authorities to deliver their decarbonisation plans and contribute to the overall UK net zero plan.

In RIIO-ED2 SSEN will:

- Enable customers to participate in the flexibility market and access the network in line with their requirements by scaling up processes, systems and people to secure flexibility and whole system services
- Build on our RIIO-ED1 foundations and scale up systems for forecasting network requirements and solutions
- Optimise investments and capacity at whole system level by utilising 'flexibility first' to ensure that required network reinforcements can be delivered as efficiently as possible
- Continue to provide a safe resilient and responsive network by developing appropriate people resources and systems to operate flexibility in a safe and commercially optimum manner and manage ancillary services costs
- Ensure potential conflicts of interests are mitigated at the least overall cost to customers by operating in a transparent manner, enabling competition and providing appropriate separation so benefits enable delivery of net zero at pace and outweigh costs in a nascent market
- Provide DSO incentives and monitoring that drive behaviours that are in the interest of customers and achieving net zero at pace; delivering enabling IT investments and people capabilities in line with plan, supporting local communities to participate in new markets and helping the development of local network plans to include cost-effective whole system solutions.

Our strategy for developing our DSO capabilities in RIIO-ED2 is based on our experience to-date through co-creation within our innovation programme and direct stakeholder engagement. Over the last 10 years we have been co-creatively learning and innovating with communities and partners across our network area. Through this we have honed the skills, understood the risks and identified the opportunities of DSO functionality. Our 'learning by doing' approach in RIIO-ED1 has clearly demonstrated that we can achieve our vision for DSO in RIIO-ED2 and our '**Flexibility First'** principle has shown that we can deliver significant customer value with those capabilities.

We are active participants in the ENA's Open Networks project which has undertaken over **35** hours of stakeholder engagement across **15** wide-reaching events and published **123** papers in **2020 alone** to ensure that the DSO functions are carried out in a manner that works for all. We have also asked our own stakeholders if we should follow the conclusions of the **Open Networks** project and its independent **Advisory Board** (consisting of 53 people and 48 organisations) or explore alternative options as part of our RIIO-ED2 consultation process. Through our own direct engagement, our stakeholders said they want us to deliver Ofgem's baseline expectations for DSO in RIIO-ED2 in line with the Open Networks approach. These baseline expectations, or minimum requirements, are captured within the 3 DSO activities that Ofgem wants DNOs to focus on in RIIO-ED2 – **planning and network development**, **network operation** and **market development**. The process by which we have aligned those inputs (policy, stakeholder feedback, '*learning by doing*', **'Flexibility First'**), and ensured our DSO Operating Model for RIIO-ED2 delivers against those minimum requirements, will be outlined in **section 4.3.1**.

The provision of open data and continued innovation will be catalysts for change in the transition to a smarter gird, empowering the customers and service providers who will be instrumental in the development of flexibility markets. Our **Digital Investment Plan** and **Innovation Strategy** are aligned with our **DSO Strategy** in order to provide a key enabler for these markets, providing essential information about our network operation and supporting new market developments. Full details of our **Digital Investment Plan** can be found in our **IT and Digitalisation Chapter (Chapter 5)** and further information on our **Innovation Strategy** can be found in our **Innovation Chapter (Chapter 14)**.

2.3 VALUE OF DSO

2.3.1 VALUE TO CUSTOMERS

DSO delivers value for our customers. It offers the promise of lower bills, the creation of new markets, viable local energy solutions and additional value streams for stakeholders.

We are confident that Ofgem's baseline expectations for DSO will deliver value to customers by:

- accelerating connections
- accelerating decarbonisation
- reducing the relative cost of the network
- facilitating new markets with resulting economic stimulation
- facilitating the creation of new products and services for consumers

Nevertheless, in RIIO-ED2, we intend to go above and beyond these baseline expectations to help build public confidence in the ability of the network to provide smart grid flexibility, resilience and efficiency. Utilising learning from some of our flagship innovation projects (‘*Smart **and** Fair?*’, SAVE and NINES) we intend to offer a number of leading customer value propositions in RIIO-ED2:

These customer value propositions are focused on stimulating the market, improving accessibility, exploring the widest range of cost-effective cross-vector network solutions and making sure nobody is left behind. For more information on our proposed Customer Value Propositions see **section 4.3.3** and **Appendix C.**

2.3.2 VALUE TO GB

Findings from a new, ground-breaking analysis of the future net zero energy system in Great Britain are expected to have profound implications for policymakers, households and the wider energy sector across Great Britain.

The analysis was led by the Carbon Trust and Imperial College London, supported by a cross-sector group comprising: Bryt Energy, EDF, Greater London Authority, IGEM, Kiwi Power, Low Carbon Contracts Company, SBM Offshore, SP Energy Networks, Statera Energy, SSE Networks, UK Power Networks and WPD. BEIS, Ofgem, the Climate Change Committee and others were also consulted. The project found that there is a need to embed flexibility across all energy sectors – power, heat and transport – to cut the cost of decarbonisation. Embedding flexibility in low carbon heat and transport solutions now will help to reduce their system impact and costs, making the decarbonisation of these sectors more economically feasible. The headline finding is investing in flexibility is a no-regrets decision as it has the potential to deliver material net savings of up to **£16.7bn per annum** across all scenarios analysed in 2050.

Across all the heating scenarios analysed in the report, flexibility always delivers a net saving ranging between £9.6-16.7bn per annum and supports a cost-effective decarbonisation of the energy system. This value is delivered by a portfolio of flexibility technologies including battery storage, thermal storage (in homes and integrated with heat networks), interconnectors and a range of demand side response technologies across domestic, non-domestic and EV demands. The savings predominantly come from

avoidance of gas generation (capital expenditure and operational expenditure), reduced reliance on carbon negative technologies and reduced network reinforcement.

The deployment of flexibility, which is at the heart of the DSO functions that we will perform in RIIO-RIIO-ED2, is a key aspect of this cost-effective approach. Increased flexibility, derived from DER, ancillary services and peer to peer trading of constraints, capacity and energy, is a key driver of reduced total system costs.

This includes its ability to mitigate peak electricity demand, reduce the cost of investing in and operating low-carbon generation and avoiding reinforcement of local distribution networks in a context of uncertainty. The following diagram highlights a number of further reports that detail some of the potential savings from deploying flexibility as part of a smart grid approach:

Publication	Benefits
"Value of Flexibility in a Decarbonised Grid and System Externalities of Low-Carbon Generation Technologies" Report for the Committee on Climate Change Imperial College London October 2015	More than **£3bn/Year** for 100g/kWh scenario, **c£8bn/ year by 2030** for a 50g/kWh scenario, from a flexible energy system
"An Analysis of Electricity System Flexibility for GB" Carbon Trust with Imperial College London, November 2016	**£17-40bn over the period to 2050** from a flexible energy system that support electrification of transport
"Smart Power" National Infrastructure Commission published its report Smart Power, May 2016	A smart system, built principally around interconnection, storage and DSR could deliver **£8bn of savings per year by 2030**
"Roadmap for Flexibility Services to 2030" Report for the Committee on Climate Change, Imperial College London with Poyry, May 2017	**£3.2bn – £4.7bn/ year in 2030** From a flexible energy system that met a carbon reductions target of 100g/kWh
"Value of Baseload Capacity in a Low-carbon GB Electricity" Imperial College London report for Ofgem, August 2018	**£10.4bn - £13.6bn/ year** from a flexible energy system that met a carbon reductions target of 25g/kWh
"Early Insights into System Impacts of Smart Local Energy Systems (SLES)" EnergyREV, Aunedi, M., Green, T, C., June 2020	**£1.2bn/ year to £2.8bn/ year total cost saving by 2030** (assuming 10% and 50% SLES penetration respectively and emissions limit of 100g CO2/kWh in 2030) **£2.9bn/ year - £8.7bn/ year total cost saving by 2040** (assuming 10% and 50% SLES penetration respectively and emissions limit of 100g CO2/kWh in 2040)

2.3.3 VALUE TO ELECTRICITY SYSTEM

At the conclusion of RIIO-ED2 the UK will be less than 24 months from 2030 when many key national, regional, and local policy deadlines for carbon reduction will be reached. Our distribution network needs to be ready in advance to facilitate those (often legally binding) aspirations.

By utilising flexibility as a cost-effective alternative to costly reinforcement we plan to realise significant savings during the price control period that will contribute to the development of DSO functionality and offer increased optionality on the network. The following table highlights some of the key outcomes forecast in our licence areas (under the scenarios that meet net zero) by 2030 and it is clear there will be a significant impact on our network:

SHEPD	
	Collectively distribution network connected solar, wind, hydro and marine generation capacity in the licence area increases by 69% from just over 3 GW in 2019 to **c.5.2 GW** in 2030 in **Consumer Transformation**. This is predominantly onshore wind generation, which accounts for c.3.7 GW of connected capacity in 2030.
	The capacity of distribution network waste-driven electricity generation in North Scotland moderately changes by 2030. With the 20 MW of landfill gas generation continuing to operate across the decade and **c.25 MW** of anaerobic digestion (from various feedstocks) is in operation by 2030 under the **Leading the Way** scenario, from a 10 MW baseline in 2019.
	Excluding the diesel generation located on the Scottish islands, commercial diesel generation sees a small increase from zero in 2019 to **21 MW** by 2030 under **Steady Progression** Under the three net zero compliance scenarios this only increases to 1 MW by 2030. From a baseline of 53 MW in 2019, total capacity of natural gas generation sees a range of outcomes by 2030, reducing to **38 MW** under **Leading the Way** and increasing to **116 MW** under **Steady Progression**. All new projects are reciprocating engines
	Battery storage projects connecting to the distribution network notably increases in all scenarios by 2030, reaching **c.611 MW** in the **Leading the Way** scenario, from a small baseline of 1.2 MW.
	A significant increase in the number of electric vehicles will be on the road in the North of Scotland licence, with between **100,000** in **Steady Progression** to **325,000** in **Leading the Way** by 2030. Under the **Leading the Way** scenario this equates to **c.1.5 GW** of electric vehicle charging capacity by 2030.
	A notable number of domestic properties switch their heating technologies to low carbon alternatives by 2030. With **c.295,000 domestic properties** and **c.30,000 non-domestic properties** operating a type of heat pump under the **Consumer Transformation** scenario.
H_2	Under the **Consumer Transformation** scenario, the capacity of hydrogen electrolysers connected to the distribution network in the North of Scotland licence area reaches **13 MW**.
	c.50,000 new houses could be built and **8.0 million m²** of non-domestic floorspace could be developed by 2030 in all scenarios.
	Energy efficiency measures in homes and businesses reduces baseload electricity consumption by **c.18%** by 2030 under the **Consumer Transformation** scenario compared to the baseline, mitigating the increased demand from electric vehicles and heat pumps across the same period. This is driven mainly by cuts in non-domestic sectors and high energy efficiency standards for domestic appliances and lighting.

SEPD

Collectively, distribution network connected solar and wind generation capacity in the licence area increases by over 65% from c.2.4 GW in 2019 to **c.3.9 GW** in 2030 in **Consumer Transformation**.

The capacity of distribution network waste-driven electricity generation in Southern England changes notably by 2030. Landfill gas generation capacity moderately increases from **33 MW** to **45 MW.** In addition to this, **106 MW** of anaerobic digestion (from various renewable feedstocks) is in operation by 2030 under the **Leading the Way** scenario, from a baseline of **68 MW**.

Distribution network diesel capacity in Southern England reduces in all scenarios by 2030, from a baseline capacity of **169 MW** in 2019 to 21 MW in all three net zero compliance scenarios and to **72 MW** under **Steady Progression**.

From a baseline of **481 MW** in 2019, total capacity of natural gas generation sees a notable evolution and range of scenario outcomes by 2030, with an increase to **874 MW** operating under **Steady Progression** and a decrease to **356 MW** under **Leading the Way**.

The total capacity of battery storage projects connecting to the distribution network notably increases in all scenarios by 2030, reaching just under **770 MW** in the **Leading the Way** scenario, from a small baseline of 3.2 MW.

A significant number of electric vehicles will be on the road in the Southern England licence, with between **533,000** under **Steady Progression** to over **1.6million** under **Leading the Way** by 2030.

Under the **Leading the Way** scenario this equates to **c.8.7 GW** of electric vehicle charging capacity by 2030.

A notable number of properties switch their heating technologies to low carbon alternatives by 2030, with **c.700,000 domestic properties** and **c.56,000 non-domestic properties** operating a type of heat pump under the **Consumer Transformation** scenario.

Under the **System Transformation** scenario, the capacity of hydrogen electrolysers connected to the distribution network in the Southern England licence area reaches **36 MW**.

A little over **660 MW** of known new data centre sites come online in all scenarios by the mid-2020s.

c.246,000 new houses could be built and **7.2 million m²** of non-domestic floorspace could be developed by 2030 in all scenarios.

Energy efficiency measures in homes and businesses reduce baseload electricity consumption by **c.19%** by 2030 under the **Consumer Transformation** scenario compared to the baseline, mitigating the increased demand from electric vehicles and heat pumps across the same period. This is driven mainly by cuts in non-domestic sector and high energy efficiency standards for domestic appliances and lighting.

The tables above also highlight the very different nature of our two distinct licence areas and their unique requirements. Throughout SSEN's Business Plan these geographical considerations are a fundamental factor in influencing our ambitions for RIIO-ED2. In our DSO Strategy these differences are accommodated through:

- **Distribution Future Energy Scenarios** – these detail demand growth and the uptake of low carbon technology and renewables at a substation or even LV busbar level reflecting local environmental influences, the existing network infrastructure, and societal influences. These are the basis for our network development plans in RIIO-ED2 ensuring our approach is tailored not only to our licence areas but often the local community.
- **Local Area Energy Plans** – these reflect local policy ambitions where they can be supported by clear evidence of achievability. A clear example is the aggregated approach for Scotland which reflects the Scottish Government's more ambitious climate targets for 2030 and net zero. In addition, we are working with local authorities and Local Enterprise Partnerships to help inform their net zero strategies.
- **Innovation** – our innovation portfolio is managed to ensure our ***learning by doing*** approach addresses the entire topology of our network and local insights can be utilised in similar areas. For example, our ANM experience in the Scottish islands is currently being utilised on the Isle of Wight, our Solent SAVE project has informed our Energy Efficiency CVP for RIIO-ED2, and Project LEO is providing insights for other urban metropolitan zones in our licence areas.
- **Regional Development Plans** – we are working with the ESO and our Transmission business in Scotland to identify parts of our licence areas where solutions on the distribution network can support transmission constraints now and into RIIO-ED2. This is particularly relevant in our Scottish licence area due to existing constraints, the unique topology and the different voltage control boundaries compared to England. We currently have three live projects that we are pursuing each with unique local characteristics.

3. RIIO-ED1 LEARNING

3.1 DELIVERY

We have made substantial progress transitioning to a DSO during RIIO-ED1, whilst maintaining a safe and reliable grid, facilitating the customer conversion to a low-carbon future at the lowest cost and identifying the most cost-effective solutions for energy customers. Throughout RIIO-ED1, SSEN has and will continue to:

- **Invest** to make the grid robust, resilient and intelligent to better understand how we can support DER, EV-charging infrastructure, electrification of heat and other low-carbon modifications. In addition, we have embraced flexible connections which has facilitated the connection of more renewable generation and boosted overall capacity.
- **Invest** in digital solutions and technology to automate and control the network, which includes valuing flexibility from different generation and demand sources, as well as offering frameworks for ancillary services to encourage participation from DER owners and aggregators.
- **Invest** in optimised systems and network solutions that enable the energy transition, ensure grid stability, and provide advanced grid intelligence and control systems by embedding active network management capabilities in our network.

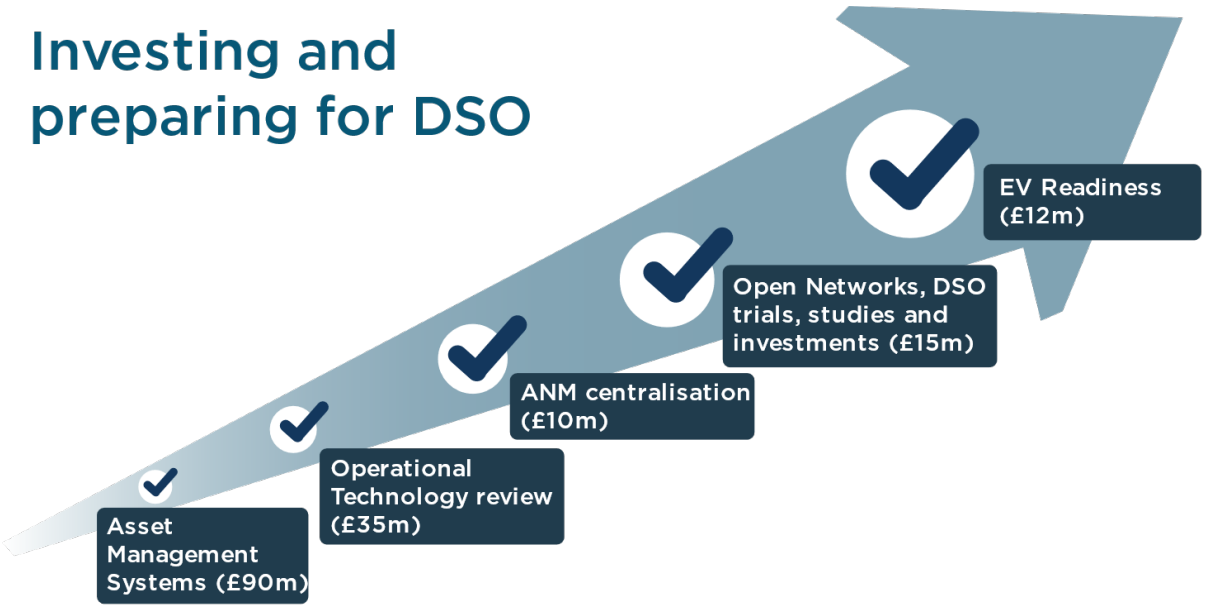
Through these activities and our collaborative working with BEIS, Ofgem, other DNOs, the ESO and stakeholders we have developed and built the foundation for DSO in RIIO-ED1. In RIIO-ED2 our stakeholders expect us to go further and deliver the primary DSO roles. We will build on this foundation by investing to scale up our capabilities and improve our IT and OT infrastructure.

3.2 EXPENDITURE

At the end of RIIO-ED1 we will have almost a third of our planned RIIO-ED2 workforce in place for DSO. This workforce is already utilising legacy and innovation systems to realise commercial, environmental and network resilience benefits as part of our commitment to **'Flexibility First'**. Prioritising this approach ensures our customers and service providers see the benefit of a secure, sustainable and economically viable flexibility services market. Through the transition to RIIO-ED2 and beyond we intend to use flexibility intelligently to both manage uncertainty and enable efficient programmes of network investment, building our capability accordingly as the opportunities to defer or avoid reinforcement increase with a developing flexibility market.

This focus on **'Flexibility First'** is hugely valuable in growing experience and credibility within the business but we will need to modernise our systems in RIIO-ED2 to accelerate the scale of flexibility procurement,

accommodate the uptake of low carbon technology uptake and support *open data* and digitalisation.[3] In RIIO-ED1 we have been investing in the core framework that these new systems will build on to scale the benefits in RIIO-ED2.



By the end of RIIO-ED1, we will have already invested over £160m in the pre-requisite foundational systems on which we will build scalable RIIO-ED2 DSO capabilities. New business functions have been established and collaborative platforms launched:

- Our new **Asset Management System** will act as a base asset register in RIIO-ED2, it will provide a single source of information on our assets
- Our **Operational Technology** investment means that all core systems will be largely integrated by the start of RIIO-ED2
- We have long been an advocate of developing flexibility options to move beyond traditional reinforcement of the network. **Active Network Management (ANM) centralisation** has enabled projects like our Southwest Active Network Management (SWAN) system which will facilitate the connection of **1.4GW** of generation flexibly by the end of RIIO-ED1. This centralisation has provided the functionality to support up to 15 additional ANM systems like the SWAN project and reduce the customer cost of an ANM connection
- Our **Open Networks, DSO trials and Studies** include Project LEO (Local Energy Oxfordshire) which is one of the most innovative and wide-ranging smart-grid trials ever conducted in the UK. Project LEO, via the Open Networks project, is informing how DSOs will function in the future

[3] Analysts at Cornwall Insight predict that more than 1.3GW of flexibility may be required across the UK's electricity distribution grid in 2021 as the country accelerates the transition to renewable energy, according to new research (Solar Media December 2020).

- Investing in **EV readiness** included amongst other things our programme of deploying low-cost LV substation monitors to support connection requests

Finally, in addition to these network-wide investments, we have also explored the potential of flexibility options to improve the tool-set available to DNOs and address some of the issues presented by our diverse context:

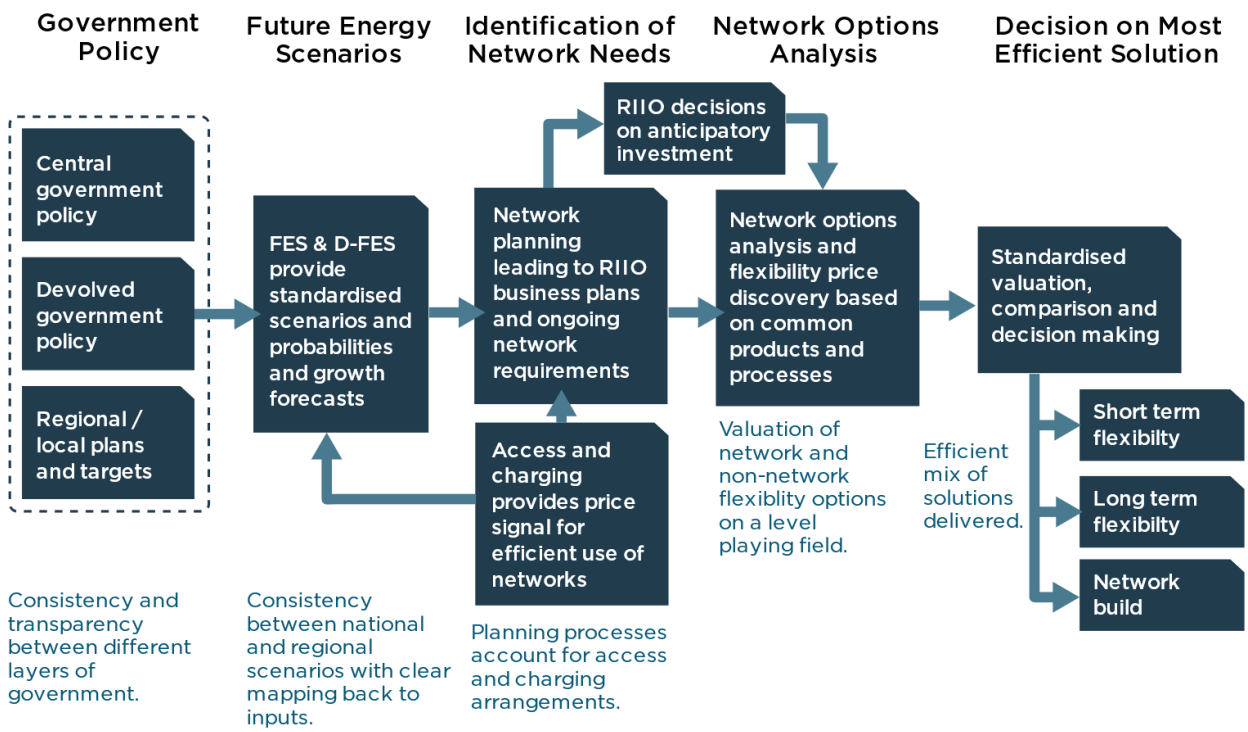
- In Shetland we are actively integrating the stability needs of our Diesel Power station and local network constraints allowing the connection of **14MW** of flexibly connected generation and total renewable energy output from those generators of **22,634MWhs** in 2020.
- In Orkney we are extending the capabilities of our ANM system to enable third-party peer to peer trading behind a network constraint.

3.3 FLEXIBILITY IN RIIO-ED1

Throughout RIIO-ED1 we have been a key contributor to the Flexibility Services Workstream (1A) of the ENA's Open Networks Project, leading on the development of an industry standard flexibility contract and the facilitation of peer-to-peer trades. We have demonstrated how the procurement and use of flexibility services, to manage areas on our network that are subject to constraint, is a key tool in deferring or avoiding the need for expensive and time-consuming network reinforcement. In addition, by stimulating these markets for service provision, we have found we can drive a wider range of more economic, efficient and smarter approaches. This is reflected in our commitment to BEIS to openly test the market for all project of significant value. Furthermore, our **'Flexibility First'** approach has brought significant benefits in deferring or avoiding reinforcement, but we have also utilised it to support planned maintenance works and ease post fault management or restoration activities, whilst meeting our obligation of maintaining a safe and reliable network that works for all our customers.

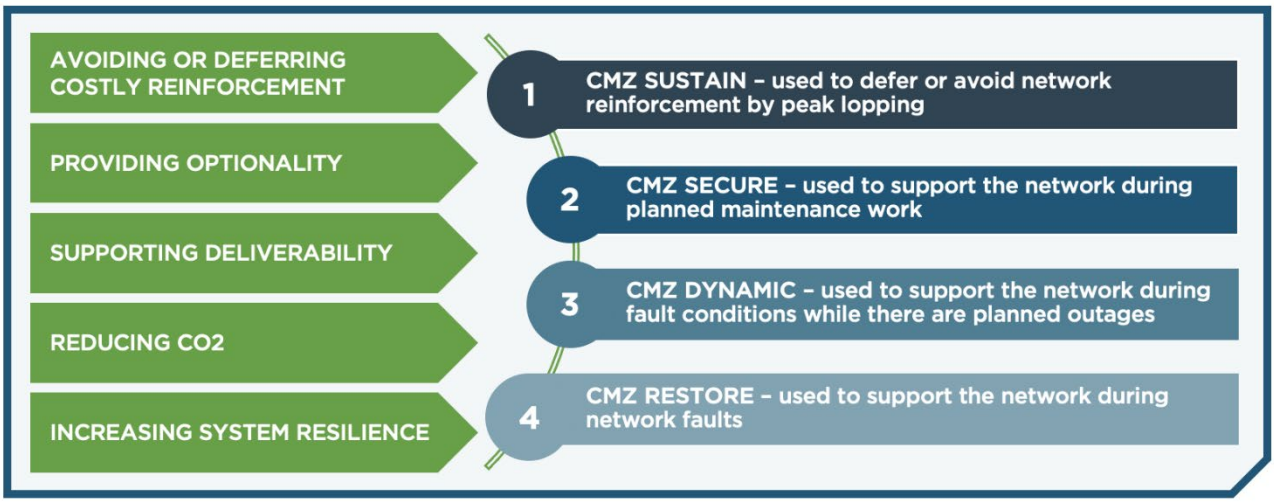
3.3.1 APPROACH

The following diagram outlines Ofgem's flexibility lifecycle which has informed our approach to procuring **Flexibility Services** during RIIO-ED1, in the form of Constraint Managed Zones, and will define our capabilities in RIIO-ED2 as part of our DSO Operating Model:



Constraint Managed Zones (CMZs) are locations in which we have commercially secured power response services provided by third-party DER connected to our networks. In response to network conditions such as outages, or to avoid reinforcement on a longer-term basis, we instruct these service providers to reduce demand on, or inject power onto our networks, reducing network loading primarily at peak times or times of outage.

SSEN currently procures 4 different CMZ services, and a number of services are in development either by our Flexible Solutions Team (FST) or through innovation funding.



For CMZ Sustain, requirements are identified at point of reinforcement technical reporting and prices set against the annualised value of deferred reinforcement investment.

Service Providers are paid a fixed availability year on year (regardless of use) but only receive utilisation payments should the service be required.

CMZ Secure, CMZ Dynamic and CMZ Restore are paid on an 'as needs basis', combining both utilisation and availability payments for the provided services only when required, reflecting the nature of faults/maintenance works. Further details on how we will use these products to support the delivery of our overall plan and minimise disruption to customers can be found in our **Deliverability Strategy (Annex 16.1)**. SSEN seeks prices lower than the equivalent traditional solution, for example the cost of Mobile Diesel Generation or Customer Interruption/Customer Minutes Lost (CI/CML) cost avoidance.

We actively procure across all four of the different flexibility services and our approach is characterised by:

- using an EU compliant tender process and contract for both 1-year rolling or 4-year contract terms
- maintaining technology-agnostic across Distributed Generation, Storage Devices and Demand Side Response at all Distribution voltage levels.
- seeking total expenditure, carbon and reputational benefits against traditional solutions
- aligning with ENA Open Networks parameters
- a collaborative approach that includes System Planning, the Distribution Control Centre, Procurement and the FST.

3.3.2 EXISTING CONTRACTS & BENEFITS

We have actively sought to collaborate with other DNOs in the deployment of many aspects of DSO during RIIO-ED1 to provide an aligned flexibility process and drive efficiency, and we intend to continue with this approach in RIIO-ED2.

The intelligent use of flexibility in RIIO-ED1 has already shown us what is possible. Developing these DSO capabilities to allow operation at scale will allow us to utilise more flexibility to operate and manage our network more efficiently, either in terms of investment planning or optionality as we deliver the capacity necessary to decarbonise the energy system. In RIIO-ED1, we have contracted in excess of **603MW** of **flexibility services** for the management of network constraints and fault support. Our current CMZ contracts have been used to support our networks during extended fault scenarios, reducing the need for embedded or mobile diesel generation and across these services SSEN has secured **8GWhs** of renewable energy which has delivered an operational cost saving of **£251k** and avoided **4,500tCO2**. **Flexible connections** have also contributed significant benefits to customers in RIIO-ED1, already avoiding **90.6** years of connections delays and **£60m** of reinforcement spend, across **412MW** of capacity.

These positive outcomes during RIIO-ED1 have demonstrated that the development of a DSO capability is essential if the UK is to cost-effectively meet net zero and maintain a safe, reliable and affordable network. We are confident that by performing our DSO functions efficiently and effectively in RIIO-ED2 we will ensure the neutral facilitation of emerging markets that are key to driving these efficiencies.

3.3.3 CURRENT DEVELOPMENT & PLANNED RIIO-ED1 IMPROVEMENTS

Our recent **C31E Flexibility Procurement Statement**, which has been approved by Ofgem, details our plans for this year. Following the success of our CMZ at Inver Hydro, efforts to place more CMZs have secured a **further 468MW** of contracted services across 12 zones in both the SHEPD and SEPD licence areas, with a further 40 zones being released this year. New systems and processes, such as the five-DNO collaboration on the ***Flexible Power*** CMZ management system (originally developed by WPD), Dynamic Purchasing System and our Active Network Management (ANM) Centralisation Project will deliver further efficiency and scalability to SSEN's CMZ portfolio in 2021. These systems will also improve customers experience and support new developments in flexibility.

3.4 STAKEHOLDER EXPERIENCE

PURPOSE OF EVIDENCE GATHERING AND A SNAPSHOT OF THE EVIDENCE

A SNAPSHOT OF THE EVIDENCE

- **14** Stakeholder events
- **129** Pieces of stakeholder Evidence
  - Business Representatives
  - Local Council authorities
  - Connections & Development Representatives
  - Infrastructure & Engineering Representatives

HEADLINES OUR STAKEHOLDERS CARE ABOUT

- Local Solutions
- Connections
- Understanding how flexibility markets will operate

In 2017, SSEN published, and subsequently consulted on, ***Supporting a Smarter Electricity System*** which outlined the following DSO priorities that we would adopt right from the outset:

- Maintaining a safe, reliable and secure grid
- Enabling the equitable low-carbon transition
- Identifying cost-effective solutions for energy customers

The below table sets out the DSO stakeholder events we've hosted after publishing the Supporting a Smarter Electricity System in 2017.

2017	▪ *Supporting a Smarter Electricity System*
2018	▪ Supporting a Smarter Electricity System Consultation ▪ DFES Consultation
2019	▪ ***Delivering DSO: A Progress Update*** ▪ DFES Consultation
2020	▪ CEG ▪ DFES Consultation ▪ Customer Vulnerability Workshop ▪ Stakeholder Advisory Panel ▪ SSEN Constraint Managed Zones (CMZ), Flexibility services now and future opportunities - webinar
2021	▪ CEG ▪ Measuring DSO ▪ DFES Consultation ▪ Islands DFES Consultation

To date we have held **14** stakeholder events and published **9** documents relating specifically to the implementation of DSO functions reaching **496** stakeholders. The majority feedback from this engagement was:

- SSEN need to take the lead on delivering DSO
- Distribution networks need to be ready in advance of net zero targets
- Flexibility and whole system solutions should be a priority
- Distribution networks should be neutral facilitators of the market
- No one should be left behind

In addition, we have engaged widely on DSO at Connections, Incentive on Connections Engagement and Innovation stakeholder events as well as presenting at local authority meetings and industry events. Further detail on our DSO related stakeholder feedback can be found in **section 5 and Appendix E.**

3.5 INNOVATION

As we progress to a world where active management of the distribution system is a prerequisite, there is the understanding that many of the different areas of the traditionally segmented Supply, Generation, Transmission and Distribution and the governance that runs these relationships are becoming increasingly interwoven and interdependent.

Our innovation in this space is focused on identifying the unintended consequences and conflicts of interest that are likely to arise as DNOs develop DSO functions. The Wholesale Markets and ancillary services at Transmission level are well understood and developed in this rationale, but the DSO market is embryonic with codes and rules in the process of being defined.

The industry is often keen to delve into topics such as DNO/DSO separation before understanding how the end-to-end process might work in DSO and what services and benefits will be provided. Innovation allows us to inform the debate.

3.5.1 PROJECT TRANSITION

The distribution network continues to evolve, and there is a clear need for networks to become more flexible. In addition, the energy trilemma (affordability, security of supply, sustainability) and the voice of our stakeholders point to the need to adapt and enhance network operations to allow new market models such as peer-to-peer trading to emerge. The 'fit-and forget' approach of traditional network operation relied on predictable energy use and production that matched that use; this paradigm is no longer relevant. The transition to a DSO has the potential to bring significant benefits to customers; it also brings a range of new complex challenges, the potential for unintended consequences and risks for market participants, new entrants and the network licensees.

TRANSITION is designing, developing, demonstrating and assessing the common tools, data and system architecture required to implement DSO functionality. This includes:

- Developing roles and responsibilities for market participants, and market rules to allow participants to transact services
- Clarifying the requirements and implement a Neutral Market Facilitation platform for trials
- Engaging and consulting with stakeholders
- Identifying network learnings from the above
- Providing direct validation and incremental development of differing market models.

3.5.2 PROJECT LEO

Project Local Energy Oxfordshire (LEO) is one of the most ambitious, wide-ranging, innovative, and holistic smart grid trials ever conducted in the UK. LEO will improve our understanding of how opportunities can be maximised and unlocked from the transition to a smarter, flexible electricity system and how households, businesses and communities can realise its benefits.

In partnership with Project TRANSITION, Project LEO seeks to create the conditions that replicate the electricity system of the future to better understand these relationships and grow an evidence base that can inform how we manage the transition to a smarter electricity system. It will inform how DSOs function in the future, show how markets can be unlocked and supported, create new investment models for community engagement, and support the development of a skilled community positioned to thrive and benefit from a smarter, more responsive and flexible electricity network.

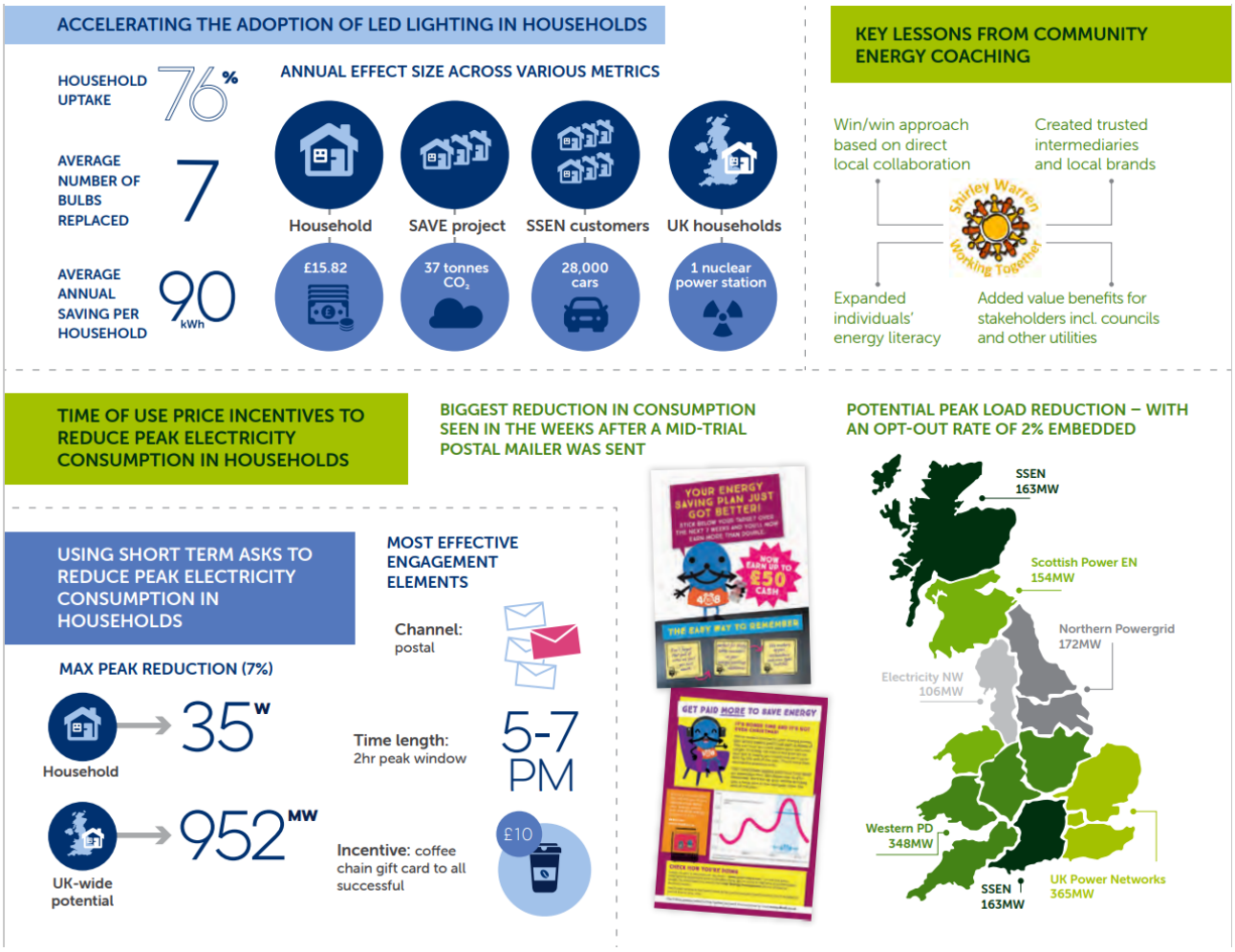
The outputs from the project have already informed the ENA's Open Networks project and guided how SSEN procures flexibility and engages with new market participants. Over the next eighteen months, LEO's focus on peer-to-peer trading of capacity, constraints and energy will provide insight on how networks facilitate these transactions through the availability of appropriate data.

3.5.3 SAVE

Solent Achieving Value from Efficiency (SAVE) was an Ofgem funded project run by us and partnered by the University of Southampton, engineering consultancy DNV GL and Neighbourhood Economics.[4] This innovative programme evaluated the potential for domestic customers to actively participate in improving the resilience of electricity distribution networks and thereby defer the need for traditional reinforcement. The government has forecast an increase in electricity demand of 60% by 2050 meaning peak demand is likely to grow to six times higher than what the network was designed for.

SAVE sought to establish to what extent energy efficiency measures can be considered as a cost effective, predictable and sustainable tool for managing peak demand as an alternative to network reinforcement. SAVE tested and compared the impact of four different interventions with 8,000 Solent customers: Energy efficiency; Education; Monetary incentives; and Community engagement. By fusing smart technologies with customer interaction, SSEN developed a model for investment that minimises electricity costs for customers, maximises social benefits, including those to the fuel poor and vulnerable, and reduces carbon emissions. The project clearly demonstrated that these measures could effectively reduce peak network load, save customers money on bills and reduce carbon emissions. The outputs from the project form the basis for our Energy Efficiency CVP (See **section 4.3.3**).

[4] Neighbourhood Economics is the 'go to' destination for large companies and institutions seeking to engage more effectively with local communities across the UK



Throughout the SAVE Project the team engaged a variety of local and national stakeholders; you can see some key quotes from different organisations here.

3.6 WORKING WITH THE ESO

The advancement of decentralised local markets for flexibility services is critical to the decarbonisation of the energy sector. These markets will only be enabled through the development of smart electricity distribution networks. The transition to DSO will significantly affect traditional roles and responsibilities within the industry. This includes both the local DNOs as well as DER service providers who are critical to the development of flexibility markets. The transition will also impact the ESO, and we need to ensure that our roles and responsibilities develop in co-ordination with theirs.

Through the development of our RIIO-ED2 plan and our existing RIIO-ED1 activity we have a number of engagement points with the ESO. The following list, although not exhaustive, provides examples of the range of engagement. We have been operating at 2 levels; key strategic engagement has been carried out predominantly through collaboration with the ESO and other DNOs to ensure alignment and efficiency across the UK.

Secondly, we have been engaging with the ESO on a number of tactical deployments of whole system solutions (these are also further detailed in our **Whole Systems Annex 12.1**:

- **Strategic interactions**
  - We are active participants in a Joint Forum with the ESO and all other DNOs meeting quarterly to manage overall process alignment and relationship.
  - We are collaborating with the ESO, TOs and other DNOs through the Open Networks WS4 (Whole System)
  - We have been supporting the development of a whole system CBA with the ESO, TOs and DNOs
  - Through the ENA Data and Digitalisation Steering group we are aligning data exchange needs with the ESO in support of whole electricity system coordination
- **Working together to find creative network solutions**
  - We meet with the ESO monthly to assess options for establishing Regional Development Plans (RDP) across our licence areas and to learn from RDP development elsewhere on the UK systems. RDPs are collaborative solutions to network issues.
  - We are currently working with both Scottish Hydro Electric Transmission and the ESO to explore a specific RDP solution for the North of Scotland.
  - In the South of England, we have jointly developed the SWAN and Minety scheme with the ESO which will facilitate the connection of **1.4GW** of transmission-constrained generation to our network during the remainder of RIIO-ED1
  - We are collaborating directly with the ESO on a number of innovation projects. Of particular relevance to the whole electricity system is the collaboration between the ESOs **Black Start** project and our **Resilience as a Service** (RaaS) project. In addition, our work on the **4D Heat** project explores the use of demand turn-up on the distribution network to alleviate transmission constraints. The ESO is also on the board of Project LEO.

4. RIIO-ED2 OPPORTUNITIES

In RIIO-ED2 we will:

- **Implement** a DSO Operating Model that delivers the functions, capabilities and governance necessary to facilitate net zero
- **Increase** visibility of our network, signposting the potential for flexibility as a network solution and making it easy for new and existing market participants to deliver it in the most cost- effective way possible
- **Engage** with stakeholders and endeavour to exceed their expectations for DSO and obtain strong, ongoing, stakeholder support for our proposed activities as a neutral market facilitator
- **Collaborate** with the ESO and other DNOs to ensure whole system coordination

SSEN's strategic direction for DSO is based on our experience to date with innovation and stakeholder engagement. We have established the following:

- Our 'learning by doing' approach in RIIO-ED1 has demonstrated that our strategic outcome for DSO will make a **positive impact on society** and deliver on all our wider strategic themes of **facilitating progress to net zero**; **delivering safe, resilient and responsive networks**; and **providing a trusted and valued service to customers and communities**
- From extensive feedback, gathered by direct engagement with stakeholders and through the ENA's Open Networks project, we have established that the majority of stakeholders want us to deliver the functions outlined in Ofgem's Baseline Expectations for DSO in RIIO-ED2
- Delivering DSO functions helps support the realisation of wider benefits and customer value in other key business plans such as Vulnerability, Innovation, Whole System, Sustainability, Connections, Load/Non-Load Related Investment
- DSO functions supplement and enhance the core functionality of our network, building on our expertise and contributing to cost-effective planning, development and operation of both our network assets and wider network solutions

This has given us good visibility of the functions we need in place to deliver DSO operationally in RIIO-ED2. The functions can be separated in to three key areas that we will test in our innovation projects (Projects LEO and TRANSITION) during the remainder of RIIO-ED1. **Section 4.3.1** outlines how we have developed these functions into an **Operating Model** that delivers the minimum requirements for DSO in RIIO-ED2.

4.1 DSO BUSINESS CASE SUMMARY

The DSO capabilities we build in RIIO-ED2 will enable us to utilise flexibility to operate and expand our network more efficiently, either in terms of investment programming or optionality as we deliver the capacity necessary to decarbonise the UK energy systems irrespective of the pathway the transition takes. As we have demonstrated in RIIO-ED1, flexibility has a direct benefit in helping manage load flows and optimise investment in network capacity.

In addition to the benefits of deferring or displacing reinforcement for load-related or non-load-related issues, there are wider benefits from building a DSO capability and utilising flexibility. Improved market liquidity for the ESO is an obvious benefit but energy provision is also no longer a centralised top-down service. Recent years have seen an increasing demand for DSO capabilities that are necessary to support third-party initiatives that deliver a wide range of community, economic, societal and environmental benefits. Our proposals for DSO implementation in RIIO-ED2 will deliver value for SSEN's consumers (and their intermediaries) by providing the necessary infrastructure for these initiatives and offering whole system benefits for all.

In RIIO-ED2 SSEN is planning to invest **£73.1m** to deliver the DSO capabilities that will deliver this flexibility and meet the minimum requirements laid out by Ofgem:

- We will invest a further **£45.0m**[5] in 7 key IT and OT projects that will underpin our ability to deliver the primary DSO roles. These projects and associated spend are detailed in the diagram below and discussed in detail in our **IT and Digitalisation Chapter (Chapter 5)**.
- We will invest **£27.1m**[6] to scale up our workforce capabilities
- We will spend **£1.0m** to further develop our layered approach to mitigating conflicts of interest and our role as a neutral market facilitator
- *In addition, we also plan to procure up to **£6.5m** of flexibility services across all voltage levels in RIIO-ED2 (under our Consumer Transformation scenario), which is captured in the* **Load related Plan build & strategy (Annex 10.1)**.

[5] £45.0m is the incremental total expenditure investment we expect to make in the ED2 period. This amount includes £43.3m of capital expenditure and £1.7m of operational expenditure.
[6] £27.1m is the incremental capital expenditure investment we expect to make in the ED2 period.

A summary of our incremental base level spend in ED2 along with spend that will continue from ED1 is shown in the following table:

ED2 Incremental Spend on DSO Workforce Capability	*DSO Strategy Annex – Section 4.3*	£27.1m
ED2 Incremental Spend on IT/OT (incl.Opex)	*See Digital Investment Plan – Annex 5.1*	£45.0m
ED2 Incremental Spend on Mitigating Conflicts of Interest	*DSO Strategy Annex – Section 4.6*	£1.0m
Total Incremental Spend on DSO in ED2		***£73.1m***
ED2 Flex Costs	*See Load related plan - Annex 10.1*	£3.2m
Spend continuing from ED1 on existing resource	*See M19 BPDT*	£17.2m
Total ED2 DSO Spend		**£93.5m**

Our DSO IT/OT projects are focused on facilitating the market, forecasting, managing load risk, coordinating the market, managing contracts, making payments, extending ANM as a flexibility tool and providing insights on the market to stakeholders. A key deliverable for these projects is network visibility both for us and our stakeholders. In **Appendix H** you can view our **Network Visibility Strategy** which details our work to ensure that we have the data we need to manage our network and make data open and understandable to all market participants. Network visibility entails monitoring power flows, voltage levels, power quality, available capacity and utilisation factors so both SSEN and market participants have the data with which to make efficient and effective operational and investment decisions.

These IT/OT projects will enable our DSO functions to facilitate and grow flexibility markets ensuring we meet the demands of net zero, deliver Ofgem's baseline expectations for DSO in RIIO-ED2 and provide the DSO CVPs that go above and beyond stakeholder expectations. The **DSO Investment Decision Pack (2_SSEPD_DSO_Workforce_Capability)** is focused on the workforce capability (and associated business costs) that will deploy the IT/OT investment outlined in the **IT and Digitalisation Chapter (Chapter 5)** that we are making for RIIO-ED2.

DSO Investment Decision			
DSO Workforce Capability – Chapter 11	DSO Operating Model Resource	The resource and business support costs required to deliver the DSO capabilities in RIIO-ED2 with the corresponding investment in IT/OT as detailed below	£28.1m
IT & Digitalisation – Chapter 5	*DSO ANM*	*At the stage when markets are no longer operating effectively due to extraordinary events (such as storms for example), the ability to take direct control to ensure the network integrity is critical for all our consumers as a whole*	*£5.1m*
	DSO Enablement (Orchestrator)	*An effective marketplace is absolutely necessary to enable a liquid market for flexibility*	*£7.5m*
	DSO Management (Optimiser)	*Being able to coordinate and use flexibility in the most effective way will bring the most benefits from flexibility and keep flexibility contract costs to a minimum*	*£10.6m*
	Flexibility Contracting	*Effective contact management and payment is a core part of any market, without an effective solution the market will not run smoothly and will not scale up to meet needs*	*£8.2m*
	PSA+	*Without an up-to-date system model to inform decisions, the accuracy and value from these decisions will be compromised and thus increasing risk to the system*	*£1.5m*
	Commercial Optimisation	*To ensure that the appropriate costs and value of our network solutions are effectively considered, we need to use the appropriate financial modelling to optimise our costs profiles*	*£6.4m*
	Investment Optimisation (Efficiency)	*By effectively planning and choose the most appropriate investment solutions this enables flexibility, an Ofgem obligation, but also point to the most cost-effective solutions*	*£3.6m*
	LCT Analytics	*Understanding the impact and requirements of the growth of LCT on our network, consumption, flexibility, customers and workforce, across a variety of use cases.*	*£0.4m*
	(IT Opex)	*(Ongoing licence costs etc. throughout the RIIO-ED2 period)*	*(£1.7m)*

These costs have been calculated using the **Consumer Transformation** scenario (see **section 4.2.1**) in alignment with our plans for Load-Related expenditure in RIIO-ED2. The associated IDP that we are building for the DSO Workforce Capability will also consider costings for a **System Transformation** outturn and a **Leading the Way** outturn. This allows for plans to be reviewed as we approach RIIO-ED2 as certainty about the likely outturn in the period increases.

This investment will deliver significant benefits in RIIO-ED2 by reinforcing our '**Flexibility First**' commitment as a network solution and mitigating the need for costly reinforcement of our networks.

The combined savings from deferring reinforcement and avoiding capital expenditure in RIIO-ED2 range from **£18.3m** to **£46.3m** (dependent on market liquidity) [7] under our assumed Consumer Transformation scenario. This scenario tends towards reinforcement because of the rapid uptake of low carbon technology, indicating this range of benefits could be at the lowest end of the potential benefits for flexibility in RIIO-ED2.

The procurement and use of flexibility services to manage areas on our network that are subject to constraint, is a key tool to avoiding the need for expensive and time-consuming network reinforcement and promoting markets for service provision, which should drive more economic, efficient, and smarter approaches. However, of equal importance is the greater use of flexibility across our distribution business to reduce faults and outages on our networks (together with the resultant CI's and CML's), to help us restore faults more quickly when they occur and avoid the use of Mobile Diesel Generation. Deploying flexibility in this manner will be an important strand in efforts to decarbonise the energy sector and enable the strategic delivery of net zero while maintaining a safe and resilient network.

Incidentally, delivering our DSO capabilities will also drive developments in Digitalisation and Data. The move to a flexible, decentralised system represents a fundamental shift for network operators and one that would not be possible without increasing digitalisation of systems and processes, underpinned by rich, local and accessible data.

- Our DSO Operating Model (**Appendix A**) details the need to foster new partnerships and the collaborations required to deliver system-wide change and support the wider economy. Many of these relationships will demand data provided in the right channels and format to empower this ecosystem utilising digitalisation such as the ICCP link with the ESO and the provision of flexibility requirements to 3rd party platforms.
- Our Customer Value Propositions (**Appendix C**) are all about empowering customers and service providers and enabling economic whole system decision making across the energy ecosystem and beyond. They are both based on the availability of open data as a catalyst to change.
- In our DSO Action Plan (**Appendix B**) you can view how system planning, customer choice and, most critically, system reliability are improved by open access to the data that exists across transmission, distribution and the system operator. Over time you can see this data set being further enriched with infrastructure planning data and input from other utilities.

[7] These figures assume a flexibility services availability payment of £300 and £75 respectively. Our current payment of £150 delivers **£32.0m** of savings in RIIO-ED2.

- The development of flexibility markets across Oxford through our LEO and Transition projects has been supported by our in-house analytics capability which has enabled us to realise the value of data insight during RIIO-ED1 supporting. We will continue to mature that capability during RIIO-ED2.

More detail on our **Digital Investment Plan** and **Digitalisation Action Plan** can be found in our ***IT and Digitalisation Chapter (Chapter 5)***.

4.2 JUSTIFICATION

The UK's electricity system is experiencing an unprecedented period of change as we rapidly decarbonise the economy and transition to net zero. While the end goal is certain the specific pathway to it is not. The scenarios and sensitivities in **section 4.2.1** highlight this uncertainty that SSEN will need to operate within during RIIO-ED2. At the same time, SSEN's 'Flexibility First' commitment is a core principle of our DSO Operating Plan, described in **section 4.3.1**, where we will deploy flexibility services and flexible connections to defer or displace traditional network solutions. Our RIIO-ED2 business case in **section 4.1** sets out the investments in the DSO capabilities we need to make to be able to apply our 'Flexibility First' approach in an environment where the pathway to net zero is uncertain.

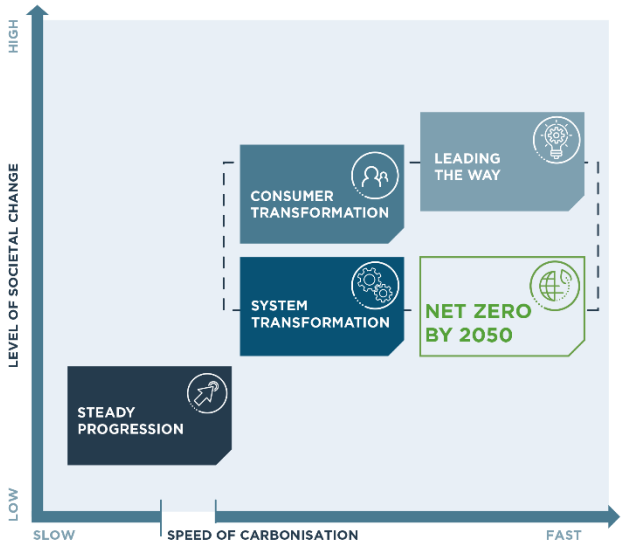
4.2.1 SCENARIOS & SENSITIVITIES

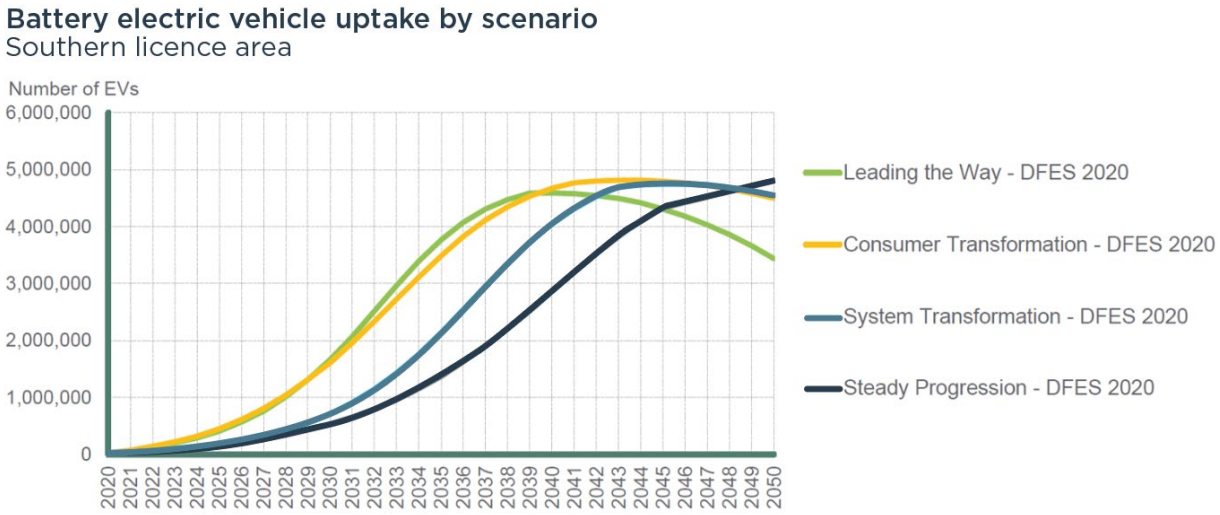
Section 2.3.3 outlines the range of outcomes that we might experience in RIIO-ED2. The '**Future Energy Scenarios**' (FES), developed by National Grid, outline four credible pathways for the future of energy to 2050. Each scenario considers how much energy we might need, where it could come from, and the changing nature of demand.

In 2020 the FES was updated to reflect the UK's net zero target. The diagram below shows how three of the four scenarios reach net zero in the UK by 2050 (or sooner) but with different technologies, levels of societal change and decentralisation, and trajectories.[8]

[8] Available at: How we develop scenarios | National Grid ESO

We have produced Distribution Future Energy Scenarios for our network since 2018 and the latest analysis shows that those scenarios that meet or exceed net zero by 2050, with the highest levels of societal change (**Consumer Transformation** and **Leading the Way**), will have significant implications on demand in RIIO-ED2 as can be illustrated by the following graph showing scenarios of battery electric vehicle uptake in our southern licence area:





Over the near term (to the end of RIIO-ED1) the DFES projections are heavily influenced by the pipeline of projects and new developments that can be identified in; the UK's Planning System, SSEN's connection database and by direct discussion with developers and stakeholders. Over the medium and longer term the projections reflect the underlying scenario assumptions and degrees of certainty supported by regional and national policies.

Developing such a granular approach to the scenarios at both a macro and micro level means we can plan for a range of eventualities and possible outturns. This ensures that cost-effective decisions are made about infrastructure and workforce resource that can be reviewed as required. IT and OT solutions are a fundamental driver here removing the necessity for significant workforce expansion and providing scalable DSO capability – See our ***IT and Digitalisation Chapter (Chapter 5)***.

4.2.2 OUR FLEXIBILITY FIRST COMMITMENT

A key distinguishing feature of RIIO-ED2, as outlined in **section 2.3.3 and 4.2.1**, is one of marked uncertainty in terms of low carbon technology uptake, national policy decisions, local government aspirations, innovation and consumer engagement. Within this context the value of flexibility is directly proportional to the level of uncertainty. Clearly DNOs should seriously consider investing in network assets if they are confident about enduring levels of future demand growth, but there are significant uncertainties as outlined in **section 4.2**.

In RIIO-ED2 we will remain committed to a '**Flexibility First**' approach and this forms a core principle of the **DSO Operating Plan** that we are building for RIIO-ED2. Using Ofgem's flexibility lifecycle, we will look for the potential of flexibility to offer an optionality value to our network decisions ensuring that we are not investing in costly network assets that may not be required in the future. These decisions will encompass issues pertaining to network capacity, network resilience and network access.

The use of flexibility services and flexible connections will play a major role in our DSO Strategy, delivering exceptional customer service and continued growth in benefits. In RIIO-ED2 we intend to contract **5GW** of **flexibility services** across all our voltages including the Low Voltage (LV) network. The combined savings from deferring reinforcement and avoiding capital expenditure in RIIO-ED2 range from **£18.3m** to **£46.3m** (dependent on market liquidity[9]) under our assumed Consumer Transformation scenario. This scenario tends towards reinforcement because of the rapid uptake of low carbon technology, indicating this range of benefits could be at the lowest end of the potential benefits for flexibility in RIIO-ED2. In addition, we plan to grow our **flexible connections** to **3.7GW** of capacity across **35** zones helping customers avoid **£417.6m** of reinforcement cost and offsetting **1.8mtCO2**.

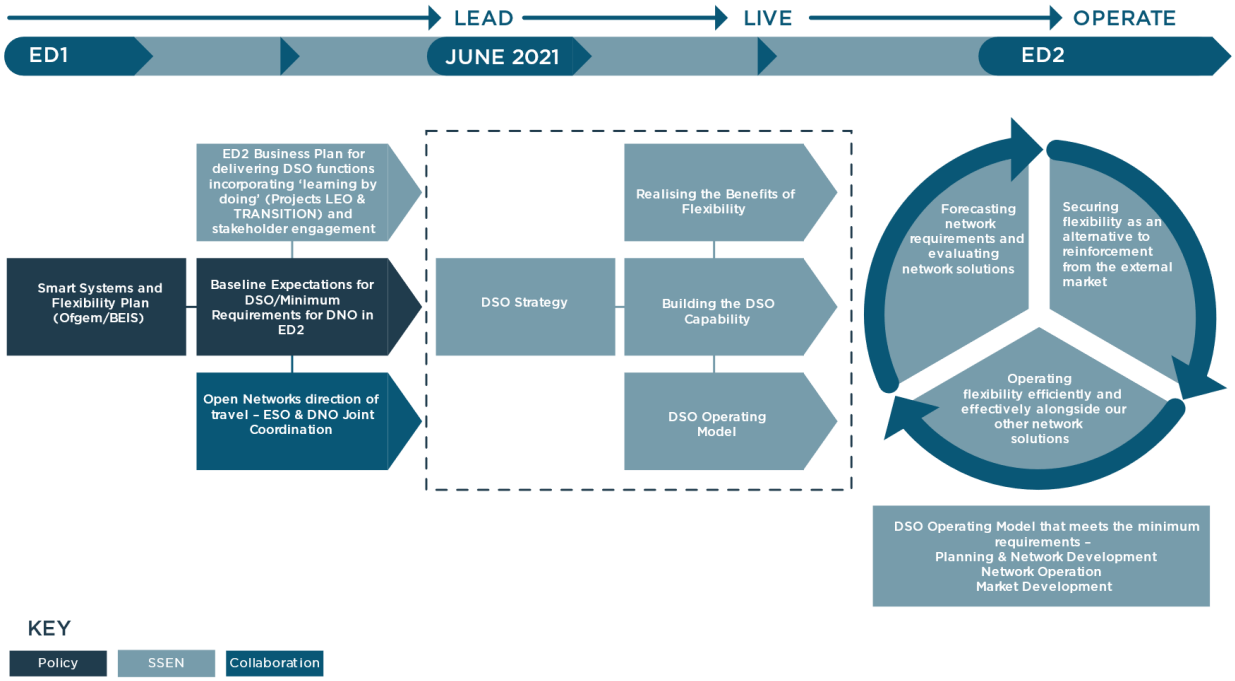
[9] These figures assume a flexibility services availability payment of £300 and £75 respectively. Our current payment of £150 delivers **£32.0m** of savings in ED2.

4.3 OUTPUTS

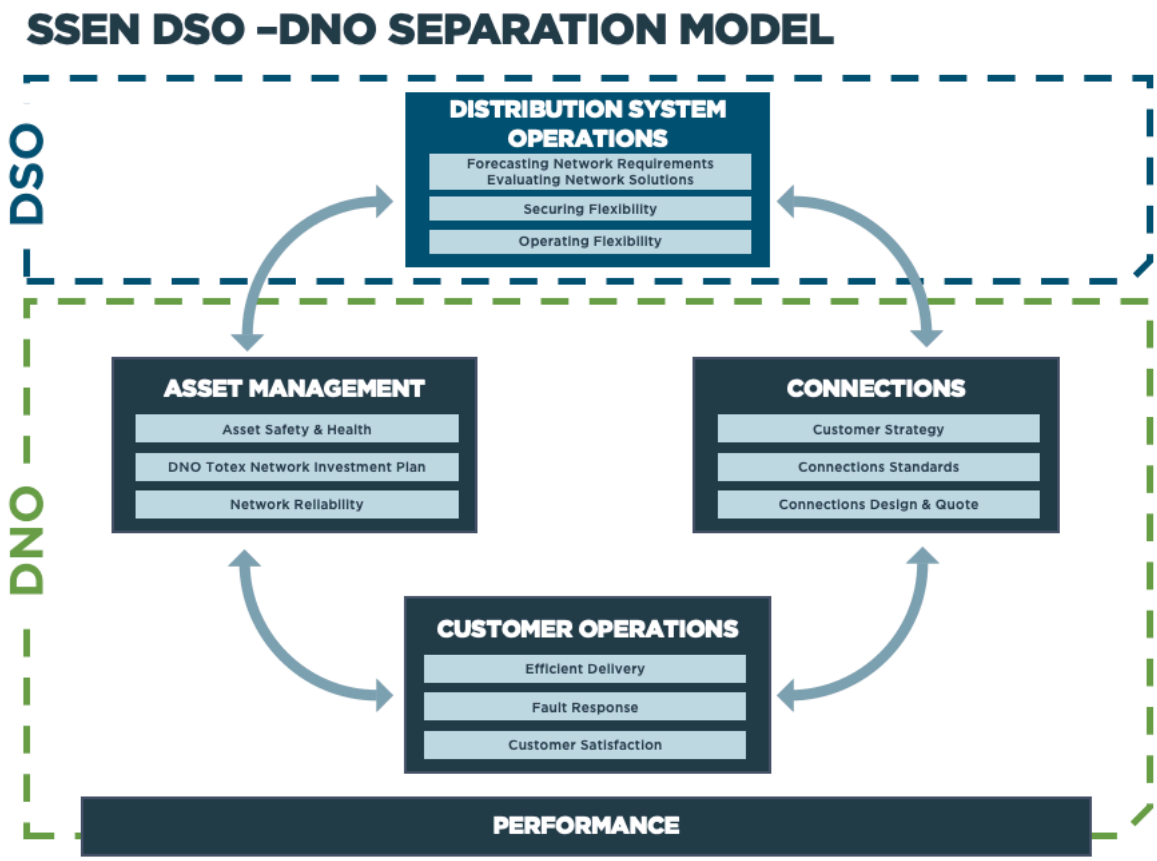
Our DSO outputs for RIIO-ED2 were summarised at the start of the document. This section provides more detail on what we plan to deliver.

4.3.1 OPERATING MODEL

Our DSO Operating Model aligns with Ofgem's Flexibility Lifecycle and incorporates its Baseline Expectations for DSO in the form of objectives for the DSO functions that we will build in RIIO-ED2. The following diagram illustrates how policy and direction from Ofgem (in the form of their DSO baseline expectations), our innovation and stakeholder engagement, and collaboration with the other networks has informed the design of our DSO Strategy and our DSO Operating Model for RIIO-ED2.



How these functions will sit in reference to our existing DNO business is illustrated in the diagram below and reflects the business separation that we will maintain in ED2 to mitigate potential conflicts of interest as detailed in **section 4.3**:



The capabilities we will continue to develop under DSO as part of the Operating Model are summarised in the following table and **Appendix A** details how these functions deliver against Ofgem's minimum requirements for DSO as part of their Baseline Expectations (**Appendix J**):

Forecasting Network Requirements and Evaluating Network Solutions	
Forecasting Function - focused on forecasting network requirements over the short, medium and long-term: ▪ Focused on forecasting accuracy ▪ Collating a wide range of inputs to enhance the forecast value ▪ Converting the forecast into usable formats ▪ Maintaining the underlying network models and load sets that underpin the forecast ▪ Delivering LTDS, NDPs and Scenarios	**Solution Evaluation Function** – evaluating network solutions: ▪ Identifying and defining our constraints from the forecasts ▪ Assessing our potential flexibility requirements and publishing a Distribution Network Options Assessment (DNOA) ▪ Assessing the most efficient and cost-effective solutions from flexibility, asset build or smart solutions

Securing Flexibility	
Flexibility Stakeholder Function - focused on communicating externally around flexibility: ▪ Signposting our flexibility requirements ▪ Engaging with the market and encouraging participation ▪ Coordinating with platforms or intermediaries to promote our requirements ▪ Supporting our flexibility providers, helping with process and dealing with enquiries	**Flexibility Data Function** - recording data on our flexibility services (important for audit purposes): ▪ Reviewing external information ▪ Responsible for logging the flexibility provider's performance ▪ Rectifying any identified data issues ▪ Audit processes
Flexibility Commercial Function - leading on the commercial elements of flexibility: ▪ Oversight of the Dynamic Purchasing System (DPS) ▪ Responsibility for the flexibility contracts ▪ Securing flexibility at a cost-effective price ▪ Responsible for paying/billing flexibility providers	**Flexibility Development Function** - focused on the technical requirements and policy needs for flexibility: ▪ designing new services ready for commercial assessment ▪ coordinating collaboration across internal teams (Billing, Policy, Legal), ▪ building work instructions, policy documents and process to embed improvements
Operating Flexibility	
Operational Flexibility Function - managing and scheduling the dispatch of flexibility alongside our other network solutions: ▪ Identifying the best options for our short-term requirements ▪ Defining the priority of the options ▪ Instigating the CMZs Responsible for dealing with N-1 events and dispatching flex for real-time issues ▪ Lead coordination with the ESO (and other parties)	

4.3.2 DSO OUTPUT DELIVERY INCENTIVE

Ofgem has proposed three ex-post Strategy Delivery Incentives as part of the overall RIIO-ED2 Output Delivery Incentive (ODI) framework, designed to encourage networks to deliver and exceed their strategies in delivering positive outcomes in three areas including DSO. Unlike other aspects of the ODI framework, these have not been developed and will only be set by Ofgem after the submission of final business plans, with them being finalised before Draft Determinations. As such, there is a risk that the incentive is not joined-up and is inconsistent with the strategy, business plan and allowed funding.

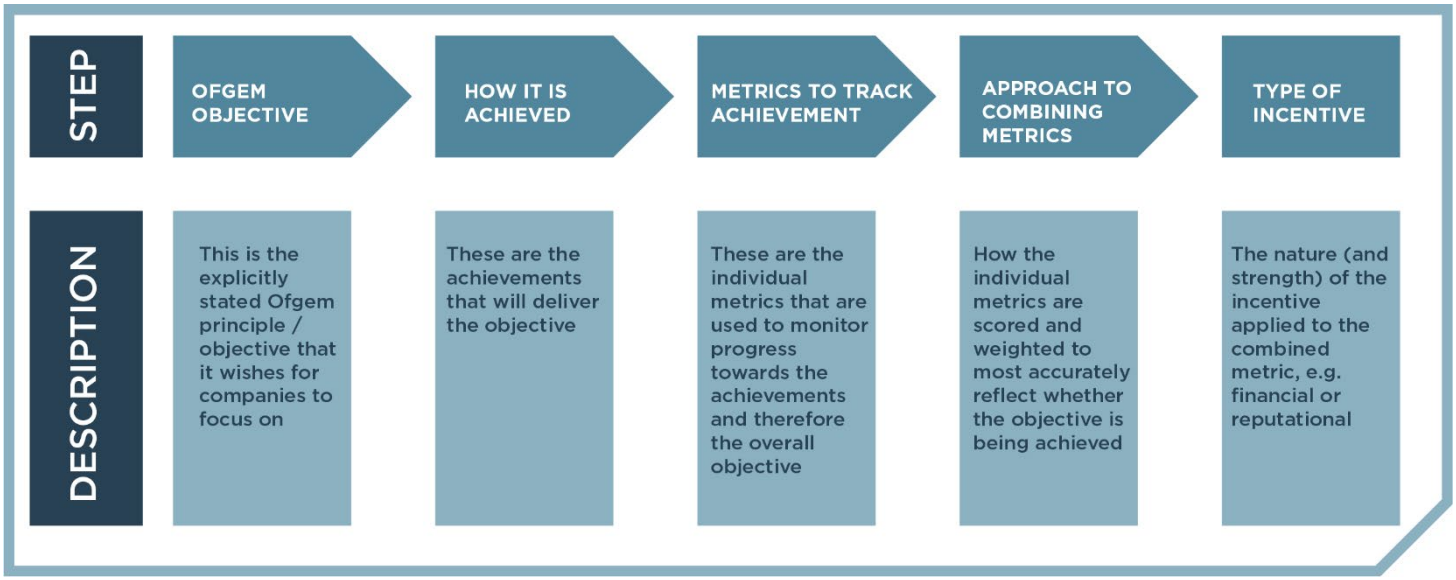
To mitigate the risk of having an SDI Framework that is inconsistent with stakeholder priorities and the rest of our business plan, we have developed clear well-evidenced proposed SDIs for these areas which we believe can successfully incentivise performance in each area.

We have designed our SDI proposals to reflect the complex nature of incentivising delivery of broad strategies. Our proposals reflect our stakeholders' priorities, good practice on the design of incentives and a practical operational view of how to track and measure performance. These proposals have been tested with our Customer Engagement Group, and we believe that they could be adopted as a common incentive framework for all DNOs.

Best Practice Principles

This work has been underpinned by a set of principles for best practice in incentive design. Incentives are an important part of the RIIO framework but need careful design to ensure they incentivise the right behaviours, do not create an unfair regulatory settlement for either customers or companies, nor create any unintended consequences.

We have been explicit in setting out the principles which underlie each set of decisions and the process of developing these SDIs, including: the choice of metrics included in the assessment; the target levels set for the metrics; the scoring system; and the overall combination and calibration of the incentive:



Summary of SDI Design

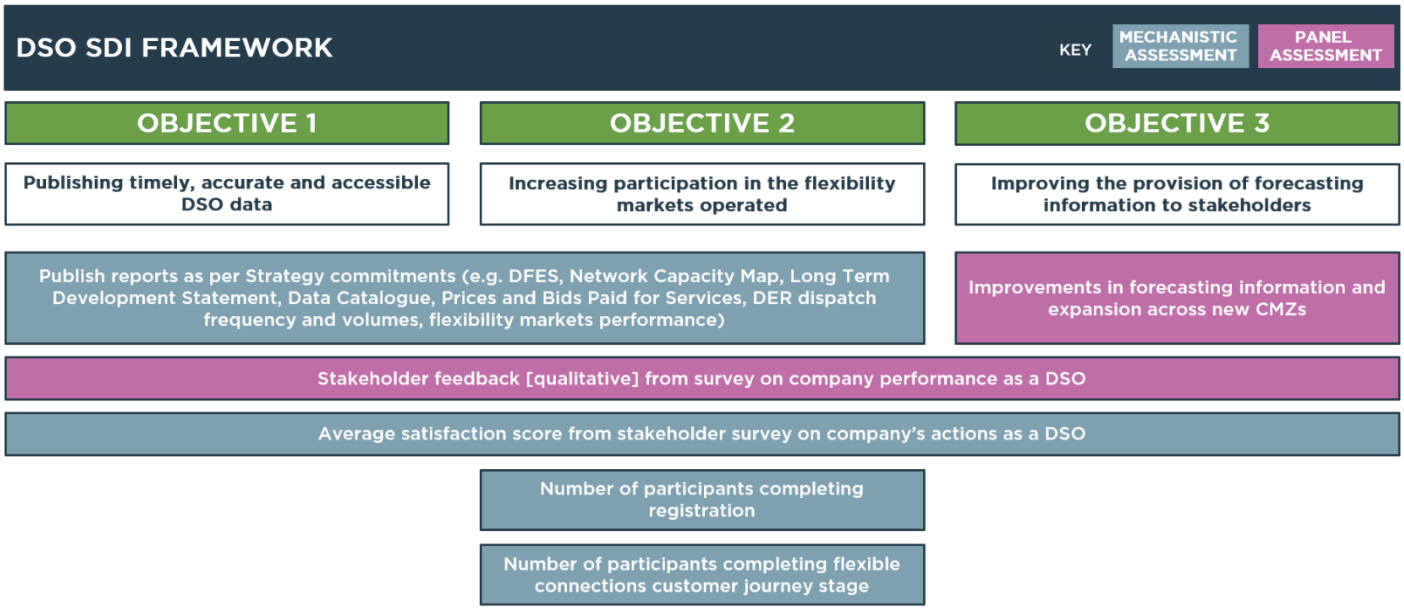
Each of the three Strategies set out actions and plans targeting overall objectives and cover a broad range of activities and focusses. In our RIIO-ED2 Business Plan, we propose a wide range of specific, measurable and performance measures, justified with reference to the priorities of our customers. These measures should be reflected in the metrics used to assess performance under the SDI, but as the Strategies are also "living documents" the SDI should also allow scope for flexibility and evolution around what DNOs are incentivised to deliver for their customers. As a result, we propose SDIs which are assessed both through 'mechanistic' assessment against quantitative targets and through an expert panel review.

Where there are appropriate quantitative metrics that can be used to assess the delivery of the strategy promises these can be subject to a mechanistic assessment to determine how the DNO has performed on these specific and measurable deliverables. All metrics for mechanistic assessment have clear, quantitative targets. Where there are no metrics that meet the conditions to be mechanistically assessed, a panel is used to assess a broader range of performance evidence. We propose that a panel of informed members, who are also familiar with the strategies of all the DNOs, is formed to make an assessment of performance

in each area, based on a set of clear terms of reference and decision-making criteria. The panel will be provided with appropriate quantitative and qualitative information relating to strategy delivery by DNOs and have a clear term of reference and decision-making framework for their assessment. The mechanistic and panel assessments are then combined, and the resulting final score determines the outcome of the incentive. This gives the possibility for reward in the case of strong outperformance, penalty for stark underperformance, or a neutral (neither penalty or reward) outcome if the DNO performs within a reasonable range of meeting its targets and delivering a good strategy.

Outline of the DSO ODI

SSEN's DSO Strategy is designed to build the capabilities and market liquidity of local flexibility markets, to realise the benefits of the transition to the net zero economy by enabling an increase in small-scale renewables and low-carbon technologies. Successful implementation of DSO capabilities will enable consumers to realise the benefits of the transition. In order to manage the increasingly complex flows of energy, we will develop our ability to manage and forecast for the system and provide the data and processes which will enable other parties to play their role in meeting greenhouse gas emissions targets and support the achievement of net zero. The SDI will enable us to deliver our DSO Strategy and support us to go above and beyond this to build further capabilities for the benefit of energy consumers, where this is supported by our customers, our stakeholders, and the regulator.



The design of the DSO SDI is structured to deliver against the areas which Ofgem and our stakeholders have told us are most important to them in the provision of DSO services. By structuring assessment metrics around both mechanistic elements - the data we provide for the benefit of other parties engaging with DSO services and the feedback provided to us from stakeholders in that market - and input from an expert panel, we are held accountable for delivery of our DSO Strategy.

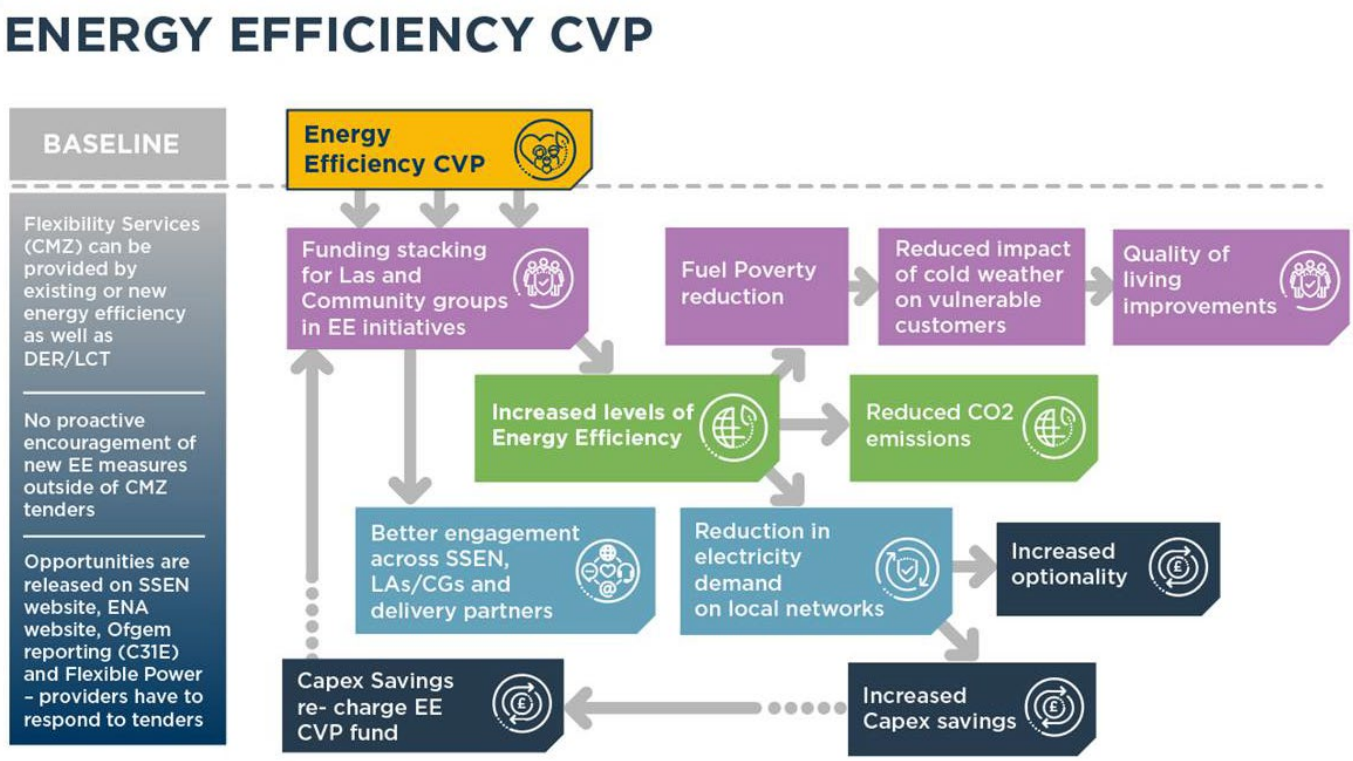
We are also incentivised to deliver improvements against this plan in a flexible manner, where it is appropriate to do so. DSO is, to a greater extent than Vulnerability or Major Connections, an evolving area and as such, the incentive concentrates more heavily on the flexibility of the panel incentive, weighting 60-40 between mechanistic and panel elements. The incentive also looks for review at the end of the 5-year price control, giving time for companies to build their services and develop markets.

In **Supplemental Annex 04: Strategic Delivery Incentive Proposals** you can view the detail of SSEN's proposed SDI for DSO which consists of ODIs that include selected metrics associated with targets and incentive structures.

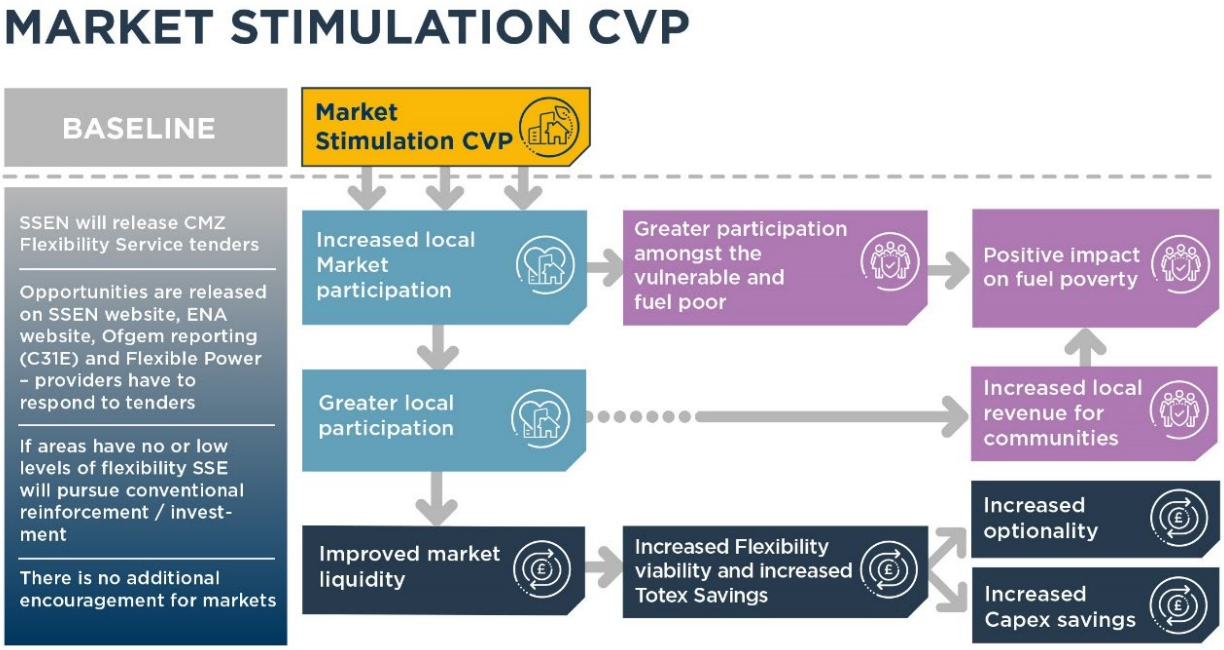
4.3.3 CONSUMER VALUE PROPOSITIONS

Our Consumer Value Propositions are focused on supporting emerging aspects of the smart grid that will deliver benefits to the network and customers – energy efficiency, flexibility market participation and whole system thinking:

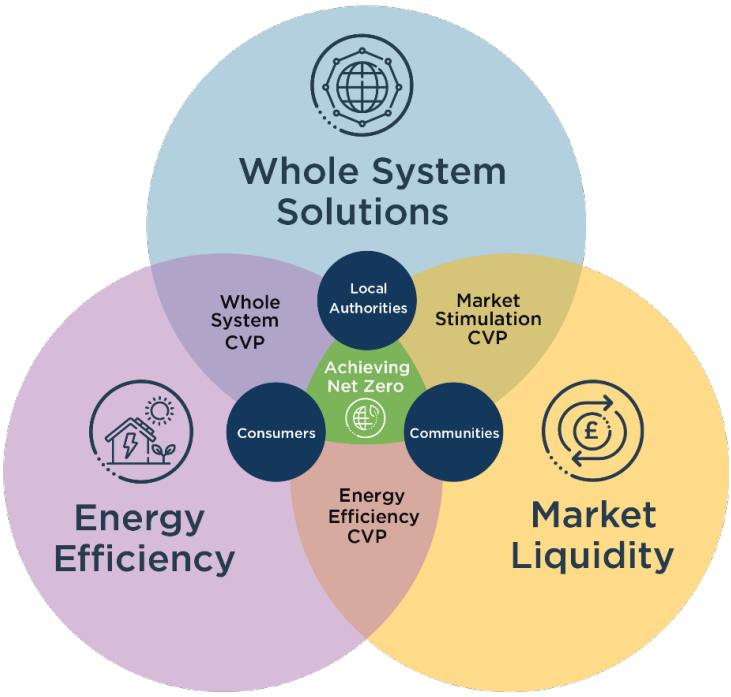
- **Energy Efficiency Support for Smarter Networks** – we propose to utilise energy efficiency as a network solution that can reduce capital expenditure and provide wider societal benefits to vulnerable communities



- **Local & Community Flexibility Market Stimulation** - we propose to stimulate local markets to actively engage in the provision of network services through engagement, support and the incentivisation in flexibility technologies in target areas based on our assessment of the liquidity of flexibility markets in RIIO-ED2



More detail on our DSO Consumer Value Propositions can be found in **Appendix C**. The following diagram shows their dynamic relationship with our **Whole System CVP** in addressing the fundamental drivers that will support the achievement of net zero:



Please find full details of all our CVPs in **Consumer Value Propositions Annex S 3**.

4.4 DELIVERABILITY

4.4.1 DSO ACTION PLAN

Our DSO Operating Model **(Appendix A)** addresses the scale, skills and capabilities that we will require to perform our DSO functions in RIIO-ED2. This in turn is supported by a DSO Action Plan that is an input to the ENA's Open Networks Implementation Plan. The development of DSO capabilities is a significant programme of change, requiring investment in people, processes, systems, data and external relationships. This will require us to design and implement the organisational structure and supporting culture that will provide neutrality in decision making and optimise the use of flexibility, asset and whole system solutions.

In developing and delivering our Action Plan we have taken the following approach:

- The processes and organisational structure required to demonstrate neutrality in decision making is our primary consideration
- The opportunities for collaboration in the provision of each capability will be assessed systematically, considering efficiency benefits, alignment of stakeholder experience, compatibility with legacy systems and any needs unique to our network and stakeholders
- We will minimise the cost of business separation between our DNO and DSO capabilities, so customers aren't disadvantaged if the planned Ofgem consultation on institutional arrangements results in a revised structure
- Capabilities will be ramped up through RIIO-ED2 and beyond to reflect the volume and complexity of activity expected to minimise the potential of stranded investment in capabilities.
- (Unless otherwise directed by Ofgem) We are not building capabilities to sell services to the ESO but will contribute services as part of whole system solutions where justified or as part of our licence obligations
- We will form a **Flexibility Providers Forum** and meet twice per annum to augment the work of the Open Networks project and provide feedback more specific to our stakeholder's experience

More detail on the DSO Action Plan and Open Networks Implementation Plan can be viewed in **Appendix B**.

4.4.2 DELIVERING FLEXIBILITY

Between our draft and final business plan, we have evaluated the risk and complexity associated with each of our named schemes and considered the specific lead and delivery timelines. For our named load schemes, we have carried out flexibility assessments at all voltage levels to understand when we can defer or avoid reinforcement through paying for flexibility services, therefore ensuring our investment profile is deliverable and at the lowest cost to consumers (see **Appendix F**).

Through its innovative Constraint Managed Zone (CMZ) initiative in 2016, SSEN Distribution was the first GB Distribution Network Operator (DNO) to introduce flexibility services and it continues to lead in the delivery of flexibility across the GB Distribution networks. Thanks to our ongoing commitment to 'flexibility first', our improving systems and supporting processes, and the evolving Local Energy Markets, we now field over **600 MW** of flexibility service contracts across our two distribution licence areas. Strong progress has been made in RIIO-ED1 to reduce the risks of utilising flexibility services to defer or avoid network investment and our RIIO-ED2 plan builds upon that progress, learning and experience. Examples of this are:

- **Forecasting and Data** – The ability to forecast when flexibility will be needed and what value it has compared to traditional alternatives is essential in managing risk. Utilising the ENA Common Evaluation Methodology (CEM), which has been designed specifically to assess optimum deployment of flexibility and reinforcement, gives greater confidence in the value and applicability of flexibility services against a broad range of growth scenarios. Should forecasts be lower confidence, the ability to model incremental blocks of 'over procurement' to avoid network risk while maintaining commercial viability can also be undertaken. Lastly, our LEO project is also exploring how combining interactions in advanced, week ahead and real-time markets when forecasting confidence is low, medium and high, could offer the right balance in managing network risk and providing adequate market incentives while avoiding the need to over procure services. Our Connectivity+, Connectivity ++ and Advanced Distribution Management System (ADMS) IDPs will enable more advanced network visibility and modelling to support greater Flexibility service opportunities in RIIO-ED2.
- **Commercial and Contracts** - SSEN have led on the development and implementation of an industry Common Agreement for flexibility services through the ENA Open Networks project WS1A P4. The Common Agreement, informed by all GB DNOs and the ESO, is now in its third revision since inception and will now be utilised by both DNOs and the ESO, meaning all flexibility providers across the UK will experience the same contract and clauses regardless of their geographical location, the services they provide and the Network Owner or Operator they provide them to. Further to this, SSEN has applied a Dynamic Purchasing System to support more efficient procurement and contract management processes to its flexible services suite of products. Our RIIO-ED2 IDPs on LCT Analytics, Market Half Hourly Settlement (MHHS) and Commercial Optimisation will enable advanced commercial interaction, advanced market interaction and visibility in RIIO-ED2.

- **Systems** – Acknowledging that the scaling up of flexibility poses a significant challenge, SSEN entered a collaboration to onboard and develop the **Flexible Power** system. The system, originally produced by WPD is now being developed by five DNOs (Western Power Distribution, Scottish Power Energy Networks, Northern Power Grid and Energy North West Limited). The system is designed to improve efficiency and scalability of flexibility service implementation, providing greater visibility of and interaction with flexibility service providers, as well as offering an improved customer experience, contract management and settlement functions. Our RIIO-ED2 IDPs on DSO Management, DSO Enablement and DSO Flexibility will further support growth in the management and delivery of flexibility services in RIIO-ED2.

4.4.3 DEPENDENCIES

Our **DSO Investment Decision Pack (2_SSEPD_DSO_Workforce_Capability)** outlines in detail the workforce capability and associated support costs that are required to deliver our DSO capability and enable baseline expectations in RIIO-ED2. In addition, in our **IT and Digitalisation Chapter (Chapter 5)** you will see detailed the IT investments for RIIO-ED2 that will deliver the requisite network visibility and system coordination required by DSO:

IT/OT System	DSO Share	Capex	Opex
DSO ANM	100%	5.1	0.2
DSO Enablement (Orchestrator)	100%	7.5	0.1
DSO Management (Optimiser)	100%	10.6	0.5
Flexibility Contracting	100%	8.2	0.5
PSA+	100%	1.5	0.1
Commercial Optimisation	100%	6.4	0.1
LCT Analytics	25%	0.4	0.0
Investment Optimisation	50%	3.6	0.1
	SUBTOTAL	**£43.3m**	**£1.7m**

We are also clear on the positive relationship that DSO will have on other areas of our RIIO-ED2 Business Plan:

- Within our **IT and Digitalisation Chapter (Chapter 5)** you will see the wider road map of IT investments for RIIO-ED2 that build on our RIIO-ED1 foundational investments and extend the requisite network visibility and system coordination driven by DSO
- In our **Ensuring Deliverability and a Resilient Workforce (Chapter 16)** you will see the new skills we will be bringing into the business and how we intend to attract and develop the right people from the diverse labour market

- In **Our Network as a Net Zero Enabler (Chapter 10)** you will see the impact that flexibility levels and market liquidity will have on expenditure
- In our **Whole Systems Chapter (Chapter 12)** you will see how DSO capabilities (interaction with ESO and other vectors) enable whole system benefits
- In our **Ensuring Deliverability and a Resilient Workforce (Chapter 16)** you will see the use of flexibility for emergency response (e.g., alternative to diesel generation) and to minimise disruption to consumers.
- In our **Enhanced Engagement (Chapter 3)** you will see our commitment to facilitating net zero and energy efficiency and ensuring nobody is left behind (links with Energy Efficiency CVP)
- In **Network as a Net Zero Enabler (Chapter 10)** you will see the interaction between data visibility and flexible/DER connections
- In our **Digital Investment Plan (Annex 5.1)** you will see the way in which we will access new, and open up existing, data sets to facilitate our role and provide the raw material for the development of new markets and whole system opportunities.
- In our **Competition Chapter (Chapter 18)** you will see how we intend to develop existing partnerships and form new types of partnerships to help us deliver our DSO and Open Data commitments efficiently.

4.5 DECARBONISATION & WHOLE SYSTEM

The Government's recent Ten Point Plan for climate action and subsequent White Paper was the most significant policy intervention for the energy industry in nearly ten years, and the UK's energy networks will be the foundation on which it is delivered. This has been given even more impetus by the announcement of a new emissions reduction target, the Climate Change Committee's Sixth Budget and even more ambitious policies in Scotland – a route map to net zero emissions that will need to be facilitated by distribution networks.

Efficient and effective application of the full range of DSO functions during RIIO-ED2 and beyond is a critical factor for us in meeting stakeholder aspirations for net zero, the rapid deployment of low carbon technologies, and a smarter electricity grid that meets the unique challenges of our licence areas. Ofgem's baseline expectations for DSO are welcome in setting out the minimum requirements but we will need to go above and beyond these expectations to, by way of example, deliver the requisite electrification of heat and deployment of wind generation in the north of Scotland and accommodate the rapid uptake of EVs and continuing deployment of solar energy in the south of England.

In addition, we have already described how the deployment of flexibility services is core to the delivery of our RIIO-ED2 strategic outcomes. We are aware that this flexibility can be supplied from a number of sources ranging from renewable generation, demand flex to embedded diesel generation. As a consequence, we commit to considering the carbon intensity/environmental cost of the service as part of our assessment criteria for contracting and dispatching flexibility services in support of decarbonisation.

4.5.1 OVERVIEW OF WHOLE SYSTEM WORKING

As the UK transitions to net zero, boundaries are being blurred and interdependencies created between different sectors such as electricity, gas, heat and transport. This transition is necessitating a coordinated, or "Whole System" approach to manage the energy system effectively at an efficient cost for consumers.

Working in a Whole System way requires local communities and authorities to collaborate with organisations in the energy, transport, telecoms, water and other sectors. For example, the decarbonisation of heat, with a range of alternative solutions (hydrogen, electric heat pumps and district heating) requires cross sector collaboration and Whole System thinking to optimise costs and investment while meeting environmental commitments. Similarly, the uptake of EVs requires electricity companies to collaborate with local authorities, original equipment manufacturers and transportation agencies (including Highways England and Transport Scotland) to ensure sufficient charging infrastructure is available across the country.

Whole System thinking requires a collaborative culture and way of working to be embedded right across our business that embraces opportunities to work collaboratively with others. The aim of embedding a Whole System approach into our business is to enhance consumer benefits and societal outcomes such as:

- increased efficiency in delivery of our services (leading to savings for customers)
- enabling effective and efficient roll-out of low carbon technologies (meeting expectations and avoiding unnecessary customer and societal costs)
- increased system resilience through a more holistic understanding of future impacts and a wider toolset of smart solutions across vectors (e.g., energy efficiency reducing demand through the improvement of housing stock)
- gaining a better understanding of what our customers and stakeholders need from us as part of the wider system (i.e., breaking down silos)
- improving wider societal outcomes through improved support for our customers beyond net zero (e.g., Priority Service Register data sharing with water companies).

While Whole System working is critical to supporting our customers and stakeholders realise their net zero ambitions, there are also minimum regulatory requirements for **coordination or cooperation between energy sectors and other vectors, with the aim of an overall enhancement in quantifiable consumer benefits and/or societal outcome.**

We a have strong track record of working in this way across a number of discrete initiatives in the RIIO-ED1 period. We have developed a strategy for the RIIO-ED2 period that will embed the new ways of working across our business. The types of Whole System initiatives we will undertake in RIIO-ED2 include:

- Delivering projects jointly with one or more third parties. For example, our work with SSEN Transmission and Shetland renewable power generators to develop a Shetland shared transmission/distribution connection.
- Sharing our data to help other parties to deliver projects and meet their objectives in line with our Digital Strategy. For example, working with water companies to share information on Priority Services Register (PSR) customers to enable more effective targeting of support across sectors
- Coordinating projects with third parties to provide benefits (or minimise negative impacts) to customers. For example, co-ordinated asset management programmes with water companies for underground assets.

Our **Whole Systems Chapter (Chapter 12)** and the supporting **Whole System (Annex 12.1)** detail how we are building on our experience working on Whole System projects in RIIO-ED1 to embed a Whole System approach across our business from now and into RIIO-ED2 and beyond.

4.5.2 ADOPTING WHOLE SYSTEM WORKING IN OUR DSO STRATEGY

For our DSO Strategy, Whole System working presents significant opportunities in RIIO-ED2 to deliver our plan and support the transition to net zero. Key elements of our DSO Strategy enabled through Whole System working include:

- **DNO/ESO Coordination** – as **section 3.6** has outlined we already co-ordinate with the ESO across many of our functions. We believe that to enable the DSO transition, we will need to extend these relationships and create new co-ordinating functions with the ESO. Ofgem's baseline expectations for DSO introduced three principal roles which are broadly aligned with the three ESO roles in the areas of development, markets, and operations. We believe that co-ordination will be needed across all three areas and that there will be multiple interactions which are captured in our Operational Plan.
- **Whole System Flexibility** – flexibility on the electricity system does not have to come solely from electrical solutions.

Other vectors could contribute significant benefits to the network in the form of district heating schemes, hydrogen networks, energy efficiency, building quality, and integrated transport approaches for example. On that basis our flexibility first approach is open to whole system flexibility solutions and energy efficiency. In turn, DER on the network may be able to support other vectors. Our CVP promoting energy efficiency is outlined in **section 4.3.3** and **Appendix C**. Our CVP supporting local authorities to explore whole system solutions is covered in **Our Whole Systems Chapter (Chapter 12**) and the supporting **Whole System (Annex 12.1)**. Please find full details of all of our CVPs in our **Consumer Value Propositions** (**Annex S 3)**.

4.6 MANAGING POTENTIAL CONFLICTS OF INTEREST

DSO will be a core part of our activities in RIIO-ED2, affecting many other areas of our wider business as shown by the handshakes and dependencies evident in our Business Plan. The prospect of a DSO re-opener in RIIO-ED2 to address where these functions should sit in the future (DNOs or elsewhere) has led to discussion about 'narrow' or 'wide' DSO within the DNO community. We are adopting a 'third way' which is to focus on what our full range of stakeholders are telling us and build the range of functions that best satisfies their requirements; from being ready for net zero and accommodating the growth in low carbon technology down to rewarding flexibility with new income streams and providing cost effective local energy solutions. This approach is focused on ensuring we provide the best outcome for customers irrespective of a future re-opener. Nevertheless, this approach is reliant on our stakeholders having confidence in SSEN as neutral facilitators of the transition to a smart, flexible grid so we need to address potential conflicts of interest.

4.6.1 CURRENT MEASURES

In 2019 SSEN (and the wider electricity industry) made the 'Flexibility First' commitment to government to openly test the market for provision of flexibility services as an alternative to significant reinforcement and to implement them where they are economically efficient. To provide a level playing field for services, SSEN's DSO Strategy set out to act as a neutral market facilitator and to not compete in the market for provision of ancillary (flexibility) services to avoid conflicts of interest.

To ensure that SSEN focusses on delivering smart networks at pace and gives equal consideration to flexible and traditional reinforcement; a separate DSO function was established in 2019 with the DSO Director reporting to the Distribution Executive Committee. The DSO Directorate includes the following functions: (1) forecasting requirements and evaluating network capacity solutions, (2) securing flexibility and (3) operating flexibility. Asset Management and Delivery are in separate Directorates to DSO.

DSO also provides point of connection capacity services to the internal DNO connections business and connections competitors. This level of separation of DNO and DSO capabilities is encouraged in the baseline requirements for DSO in Ofgem's Business Plan Guidance as well as the Smart Systems and Flexibility Plan jointly issued by BEIS and Ofgem.

As a licensed network operator within the SSE Group, SSEN is fully aware of the requirements and importance of business separation. We have extended these familiar principles to DSO separation, which are currently limited to internal interfaces cross-directorate, to limit the complexity and duplication that could lead to increased costs. The mitigation measures already in place include:

- Education – e.g., what potential conflicts are and the need for neutrality and reducing decision-making bias
- Directorate business separation for DSO functions
- Processes including CBA assessment of different solutions
- Transparency e.g., publishing processes and outcomes from flexibility contracts

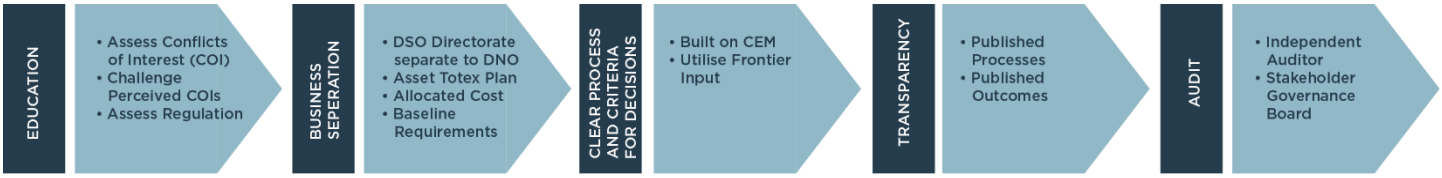
4.6.2 STRENGTHENING OUR MEASURES FOR RIIO-ED2

In considering how SSEN can improve potential mitigation of conflicts of interest and to act as a neutral market facilitator, we have considered the recent Ofgem Review of GB Energy System Operation,[10] where three potential biases were given as: a lack of independent advice; bias in network development (capacity provision) and bias in facilitating competition. Our interpretation of how that potentially applies to the DSO are:

- Lack of independent advice
  - Asymmetrical availability of data
  - Operating in a silo – e.g., only considering networks driven whole system solutions and not sharing data with others such as transport operators, local planners etc.
- Bias in network development (capacity provision)
  - Favouring DNO reinforcement over flexible, whole system solutions
  - Favouring DNO smart solutions e.g., voltage control over other services
- Bias in facilitating competition
  - Bias in procurement/dispatch
  - Discouraging 3rd party involvement

[10] Review of GB Energy System Operation

In order to address these areas as we move into RIIO-ED2 our existing layers of mitigation will be supplemented by audit functions and stakeholder governance board to provide input on evolving requirements and review our progress:



We have also identified the opportunity to strengthen conflict mitigation measures by separating out flexible (whole system solutions); traditional network solutions from the team driving the long-term strategy and CBA decisions within DSO. This ensures independence of strategy and solution choice for provision of capacity from those providing different solution options (whole system/ flex/ traditional assets). We have included additional costs in our RIIO-ED2 submission to cover audit costs and separate whole system / CBA teams to mitigate conflict of interest issues. How each layer mitigates each potential conflict of interest in detail can be viewed in **Appendix I** along with the additional layers we will be adding in RIIO-ED2 to ensure additional rigor and independent oversight.

4.6.3 CLASS (VOLTAGE CONTROL TO REDUCE DEMAND)

CLASS (Customer Load Active System Services) is a system developed through DNO innovation to manage load by regulating voltage to reduce or increase effective demand and absorb reactive power. This is delivered through smart technology applied to transformers at higher voltage levels. We believe CLASS has clear benefits and can be deployed in SSEN with value to consumers; these are network assets which have been funded by customers and should therefore be utilised with maximum efficiency and effectiveness. Nevertheless, the provision of such services by DNOs could compete with other services available in the market which gives rise to a potential conflict with SSEN's position as a neutral facilitator of the market. The absence of a decision on CLASS makes any robust proposal difficult until there is a clear regulatory framework to avoid this conflict. Irrespective of these uncertainties we recognise the benefits of CLASS and its potential to reduce costs for the ESO and therefore customer bills. We will consider the deployment of CLASS to provide ESO services but have not included it in our baseline plan until clarity is provided on its regulatory treatment.

We expect Ofgem to allow an adjustment to plans at determination stage or introduce an uncertainty mechanism for further allowance adjustments, should this become necessary. See **Appendix D**.[11]

4.6.4 EMERGING THINKING ON ENDURING GOVERNANCE MODELS

SSEN has considered different governance models for mitigating these potential conflicts of interest at a qualitative level. This evaluation has considered the level of functions contained within DSO and the degree of business separation. A single model of DSO provision across GB that imposes higher costs on some networks due to their unique topology would not be beneficial for customers and creating new legal entities introduces additional cost and risk especially if the untested regulatory model is not sustainable. Given the need to deliver net zero at pace and the learning from project LEO that there is limited understanding of commercial complexity and unintended consequences in a nascent flexibility market, our current view is that there is more cost/risk than benefit to customers of legally splitting DSO and DNO in the RIIO-ED2 period. In addition, limited availability of network monitoring, data and systems to support active network management at lower voltages requires new capabilities to be developed in a period of wider electrical and heat infrastructure growth. This is supported by a recent Regen/ENA joint study which found, ***'A majority of stakeholders see DNOs as the best placed organisations to develop and deliver the emerging DSO roles that are critical to net zero'*** [12]).

Since 2019 the DSO Directorate has been **learning by doing**; through provision of data such as network capacity heat maps, stimulating the market by placement of CMZ flexibility contracts, offering flexible connections and testing dispatch and markets through the LEO project. This has allowed us to test conflict of mitigation measures and understand the DSO interfaces with the DNO Asset Management business. For example, as the amount of load related work increases the separation of System Planning and Asset Planning, requires the Asset Portfolio team to put in place additional processes to co-ordinate and efficiently deliver load and non-load works. Similar internal processes are required to co-ordinate outages and fault resourcing with control centres as well as setting merit order for flexibility (ancillary services) dispatch. Unlike at the existing ESO-TO interface these codes have not been required previously for DSO and will need to be developed at cross industry working groups.

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[11] CLASS is separate to our programme for installation of low voltage control of our local distribution transformers included in our base plan. LV on-load tap changers (OLTC) can respond automatically in real time to changes in demand and generation across the 11kV and LV network. This will allow us to implement a technique known as Conservation Voltage Reduction (CVR) to reduce the energy consumed by the customers fed by each HV/LV transformer. This energy efficiency measure is focused on optimising the voltage to customers connected to our LV network.

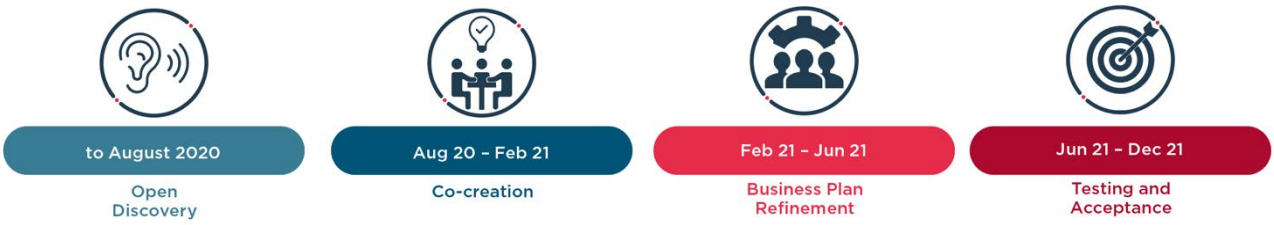
[12] Regen, *Enabling Net Zero through DSO; Results of Survey and Interviews*, 7/10/21.

Independent work has been commissioned by SSEN to support the BEIS and Ofgem DSO institutional arrangements consultation due in 2022 to provide quantitative evidence to support different DSO governance models. Whilst stakeholders are cautious about the cost and risk of creating a new legally separate DSO entity, they have fed back to SSEN that they would like to see clear lines between these capabilities within our networks business. As a consequence, SSEN will continue to build a clear governance framework between our DNO business and our DSO capabilities that addresses conflicts of interest as part of a multi-layered approach. In addition, SSEN will continue to work with BEIS and Ofgem on enduring institutional arrangements through the parallel consultation in 2022 and continue to build a clear governance framework between our DNO business and our DSO capabilities. This will continue to address conflicts of interest as part of a multi-layered approach based on the following principles:

- An absolute commitment to neutral decision-making
- A clear focus on delivering net zero
- Supporting regulatory/policy decisions that deliver the greatest consumer benefit

In this manner SSEN can provide confidence to stakeholders that decisions are being made in the best interests of consumers and net zero.

5. ENHANCED ENGAGEMENT



Our DSO strategy has been informed by our Enhanced Engagement programme, full details of which are set out in Annex 3.1. Our draft plan was underpinned by three phases of stakeholder and customer engagement (illustrated in the diagram above). The details of this engagement and insights are set out in Appendix E to this Annex and provide a clear line of sight between what stakeholders told to our DSO strategy and outputs.

5.1 FINAL DSO STRATEGY TESTING AND ACCEPTANCE

We have refined our final DSO strategy and outputs based on Phase 4 of our Enhanced Engagement, which involved direct testing of the strategy, outputs and costs with 3,205 stakeholders through 13 events. The table below sets out the clear line of sight of the changes between our draft and final DSO strategy and outputs based on this engagement.

5.2 EVIDENCE ENGAGEMENT TRIANGULATION AND CHANGES BETWEEN DRAFT AND FINAL PLAN

The table below provides a clear line of sight summary between stakeholder and consumer insights and our DSO strategy and outputs. For our draft DSO strategy and outputs, based on phases 1 to 3 of our enhanced engagement program we demonstrated how engagement insights had informed our outputs using these keys:

Findings converge to support proposals.

Findings generate new insights that lead to further refinement of proposal.

The proposed approach diverges from the findings.

To demonstrate the line of sight between the scope of change between draft and final, based on testing our draft proposals with stakeholders and consumers, we use theses keys:

Strategy/Output	Phases 1-3 Enhanced Engagement	Phase 4 Outputs and Cost Testing	Acceptability
Overall DSO strategy **REFINED** **Output:** Define a DSO strategy that will be reviewed and refreshed annually with an action plan to deliver against it, including changes to IT systems, processes and people	**Stakeholders said** They supported our proposed DSO principles and metrics **Our response** We used these to underpin our DSO strategy. **Stakeholders said** Consumers need to understand the opportunities in order to participate in flexibility. **Our response** We need to include more practical advice for consumers in our Operational Plan for DSO.	**Stakeholders said** As part of testing the business plan strategy, outputs and costs stakeholders suggested improvements to the proposed metrics to measure DSO effectiveness and performance, including: use of data sharing and flexibility service contracts; and collaboration with other DNOs and wider industry. **Our response** We have added a range of DSO metrics in an ODI which includes a mix of mechanistic and stakeholder quantitative/qualitative performance assessments. Performance will drive DSO strategy.	79% for *Accelerated Progress Towards a Net Zero World* strategic outcome

Strategy/Output	Phases 1-3 Enhanced Engagement	Phase 4 Outputs and Cost Testing	Acceptability
REFINED **Output:** Set up an annual flexibility providers forum and survey enabling regular feedback		**Stakeholders said** Communication on flexibility is key to facilitate customer interactions with the flexibility market. Communicating and educating vulnerable and fuel poor customers would be key to ensure they are not left behind. Also mentioned was gaining a Membership to Flex Assure consumer protection scheme. **Our response** To further ensure the effectiveness of the forum aimed at addressing customer barriers to participation, the DSO ODI contains metrics related to the visibility of data and processes to facilitate stakeholder participation. This will supplement our 'Securing Flexibility function' in the Operational Plan which provides resources dedicated to stakeholder engagement and responsibility to increase participation through demonstration of benefits and process. Outputs from the forum will be submitted to the Stakeholder Board monitoring Conflicts of Interest. We will also publish a data catalogue to further address barriers. SSEN has also joined the Flex Assure Oversight Committee as the networks UK representative.	Not tested
REFINED **Output:** Provide timely, accurate and accessible DSO data across all DSO roles	**Stakeholders said** We need to make data transparent and available to stakeholders and consumers. **Our response** We need to work on how to deliver this and identify what data systems should be created and made available in the IT plan and communicate with stakeholders and consumers.	**Stakeholders said** Stakeholders urged further ambition around data transparency, especially around sharing with DNOs, Local Authorities and others in the industry. **Our response** We have now included a 'Network Visibility Strategy" as part of our Data and Digitalisation plan that will support DSO with visibility of the network. Visibility of the network through monitoring and analytics will form part of the DSO metrics, see section 4.3.2.	Not tested

Strategy/Output	Phases 1-3 Enhanced Engagement	Phase 4 Outputs and Cost Testing	Acceptability
REFINED **Output:** Continually improve the provision of forecast information for both new and existing flexibility markets	-	**Stakeholders said** Stakeholders proposed an accurate flexibility requirement forecast to be a key metric in DSO evaluation. Some questions were raised about our neutrality as a facilitator and how incentives would be balanced internally. **Our response** A flexibility requirement forecasts has been added as a key metric to the DSO ODI in addition to publication of an annual data catalogue, see section 4.3.2.	Not tested
REFINED **Output:** Target 5GW of Constraint Managed Zone services across multiple service types and plan to grow our flexible connections to 3.7GW of capacity across 35 zones by 2028	-	**Stakeholders said** Stakeholders urged further ambition on flexible connections. **Our response** We have refined our approach to increase the GW capacity target for flexible connections and benefit to customers without additional cost.	79%

5.3 STAKEHOLDER FEEDBACK, OFGEM ROLES FOR DSO AND OUR STRATEGY

In addition to ensuring that we reflect our stakeholders' aspirations for the distribution system, we are establishing a strategy which will align with Ofgem's DSO roles for DNOs in RIIO-ED2. The three roles, with their associated principles and baseline expectations, illustrate the DSO functions which DNOs will have the responsibility of carrying out during the price control period. The process for devising our DSO strategy has involved considering both stakeholder feedback and the actions necessary to meet, or exceed where appropriate, the baseline expectations for DSO in RIIO-ED2.

6. APPENDICES

6.1 APPENDIX A – DSO OPERATING PLAN

The DSO Operating Plan aligns with Ofgem's Flexibility Lifecycle and incorporates their Baseline Expectations for DSO in the form of objectives for the DSO functions that we will build in RIIO-ED2.

Forecasting Requirements and Evaluating Network Solutions	
Forecasting Function - focused on forecasting network requirements over the short, medium and long term: ▪ Focused on forecasting accuracy ▪ Collating a wide range of inputs to enhance the forecast value ▪ Converting the forecast into usable formats ▪ Maintaining the underlying network models and load sets that underpin the forecast ▪ Delivering LTDS, NDPs and Scenarios	DNOs to define and develop enhanced forecasting, simulation and network modelling capabilities, with processes in place to drive continual improvement. We expect increased monitoring equipment to be rolled out across their network where it has demonstrable net value for the DNOs or network users. DNOs should also explore all reasonable options to use data from third parties, including smart meter data, to improve their simulated forecasting. ***(Planning & Network Development)***
Solution Evaluation Function – evaluating network solutions: ▪ Identifying and defining our constraints from the forecasts	DNOs to introduce other measures, developed with robust stakeholder engagement, to address potential conflicts between its market development and network roles or other business interests. This might include ring-fencing of particular teams and external auditing of objectivity in addition to measures that promote transparency and enable scrutiny. ***(Market Development)***

▪ Assessing our potential flexibility requirements and publishing a Distribution Network Options Assessment (DNOA) ▪ Assessing the most efficient and cost-effective solutions from flexibility, asset build or smart solutions	DNOs to have in place transparent and robust processes for identifying and assessing options to resolve network needs and using competition where cost effective. This should include engaging with other network companies, current and prospective network users to support identification of solutions. DNOs should explore smart network control options including network reconfiguration and voltage control where these do not have detrimental impacts on network users' electricity supply quality. Options must be fairly compared against one another, with flexibility used where it is economic and efficient over the long term compared to investing in traditional reinforcement or technological solutions. We expect a consistent approach for valuing flexibility, taking into account the option value it provides in the context of uncertainty. DNOs must ensure transparency in their approach to allow scrutiny of decision-making. ***(Planning & Network Development)***

Securing Flexibility

Flexibility Stakeholder Function - focused on communicating externally around flexibility: ▪ Signposting our flexibility requirements ▪ Engaging with the market and encouraging participation ▪ Coordinating with platforms or intermediaries to promote our requirements ▪ Supporting our flexibility providers, helping with process and dealing with enquiries	DNOs collate and publish as much relevant data and information as reasonable that will help market participants identify and value opportunities to provide network services to DNOs and take market actions that support efficient whole electricity system outcomes. Relevant data and information includes planning and operational data (such as that set out in principle 1.1 and 2.1). This should be provided with sufficient lead times to enable wider participation in DSO ancillary service markets. It also includes information on historic and future DSO ancillary service market actions. This should include tender results, prices bid and paid, the carbon content of aggregated units, how often DER is dispatched (and volumes) and other actions taken by the DNO (with anonymisation of DER as required), including curtailment as part of non-firm connection agreements. The information should support DER to identify revenue opportunities. DNOs should develop robust strategies for how they will collate and publish more helpful information, wherever possible consistent and in coordination with other network licence holders, and communicate this clearly. ***(Market Development)***
	DNOs to introduce clear processes for the design, development and communication of the decision-making framework. These should include transparent and participatory processes for stakeholder input. ***(Network Operation)***
	DNOs have in place standard and effective processes for sharing network planning information: to other network licensees, including the ESO; to network users and also beyond network users, for example to enable innovation and support the development of local government plans for decarbonisation. As part of this, we expect DNOs to publish comprehensive heat maps that provide network users high value information about where to connect and to inform their operations. These geographic information system datasets should be available for download or for access independently of DNO websites (for example, via Web Map Service server connections). ***(Planning & Network Development)***

Flexibility Data Function - recording data on our flexibility services (important for audit purposes): ▪ Reviewing external information ▪ Responsible for logging the flexibility provider's performance ▪ Rectifying any identified data issues ▪ Audit processes	DNOs should regularly and actively engage with market participants to understand what data and information is helpful, and the most effective format and frequency of publishing that data to ensure it is user-friendly. The information must be easily accessible and navigable. We expect this includes publishing data in machine-readable formats. DNOs should tailor both their information provision and engagement approaches, reflecting different needs of market participants. Where appropriate, collaboration across DNOs in engagement is expected to reduce duplication and avoid stakeholder fatigue. ***(Market Development)***
	DNOs should seek continuous improvement to ensure the information they publish is accurate and unbiased (i.e., correct at time of publication, as close as possible to the actual value and not skewed in any direction). ***(Market Development)***
Flexibility Commercial Function - leading on the commercial elements of flexibility: ▪ Oversight of the Dynamic Purchasing System (DPS) ▪ Responsibility for the flexibility contracts ▪ Securing flexibility at a cost-effective price ▪ Responsible for paying/billing flexibility providers	Clear, comprehensive and transparent mechanisms and associated commercial structures for coordinating DSO and ESO ancillary services procurement. DNOs shall not act as the commercial route for DER accessing ESO ancillary services, but transparent (and possibly tripartite) commercial agreements may be required to reflect potential effects of DER dispatch on distribution system operability and the role of DNOs in setting dispatch parameters (as set out in Principles 2.1 and 2.2). These agreements should remove exclusivity clauses as far as possible. Coordination on dispatch parameters should enable a closer to real-time understanding of what DER needs to be armed and available for a particular service, and what can be available to provide other services. Meanwhile, arrangements should enable remuneration for providing flexibility that fulfils an ESO and DNO need that effectively incentivises such whole system efficiencies. ***(Market Development)***
	Market support services, such as pre-qualification, credit-checking and settlement must enable simple and cost-efficient participation in markets. DNOs should enable, and never prevent, the opportunity for third parties to provide these services where they could do so more efficiently. Qualification criteria should be standard across DNOs, and with ESO markets where practicable, and share IT infrastructure where efficient. ***(Market Development)***
Flexibility Development Function - focused on the technical requirements and policy needs for flexibility: ▪ designing new services ready for commercial assessment ▪ coordinating collaboration across internal teams (Billing, Policy, Legal),	DNOs to develop efficient, scalable dispatch instruction infrastructure. We expect standard application protocol interfaces or otherwise avoidance of proprietary systems so that third parties can operate dispatch infrastructure, for example for the ESO instructing dispatch for an ESO ancillary service, and so DER can simply interface with multiple DNOs' systems without having to invest in multiple dispatch systems. ***(Network Operation)***
	We expect clear definitions of different types of dispatch instruction for DSO ancillary services and transparent rules about when and in which markets they should be used. DNOs should not directly dispatch (have 'hard control' on) customer assets, except potentially in clearly defined and justified exceptional circumstances. Definitions of these circumstances should be developed with input and cooperation from network users. The application of hard dispatch

▪ building work instructions, policy documents and process to embed improvements	controls shall be to the improved reliance on market-based mechanisms, not to the detriment of their development. ***(Network Operation)***
	Capabilities in network operations, for example in dispatch instructions and associated system architectures shall not be hard coded to the DNO. These must be developed so that they can be cost effectively assigned to another party in future, if this is needed. ***(Network Operation)***
	DNOs to have rolled out standardised DSO ancillary service products, processes and related contracts that align with network needs and promote ease of participation for providers. Any DNO area specific products should be sufficiently aligned with the principles and governance arrangements for standardised products, i.e., so that they are simple to engage with. ***(Market Development)***
	DNOs should identify the optimum combination of longer- and shorter-term lengths of markets and contract lengths reflecting the network need, different characteristics of DER, and liquidity and the opportunities for innovation and dynamic competition. Individual decisions and frameworks for deciding market timeframes and contract lengths should be transparent, informed by stakeholders and justified as promoting economic and efficient markets. ***(Market Development)***
	Clear governance arrangements for how products and contracts are developed and amended on an ongoing basis as appropriate. These must ensure flexibility providers and other relevant stakeholders input into their development and decisions must be transparent and justifiable, with an objective to enable as wide participation in DSO ancillary service markets as possible. They should be adaptive to reflect prevailing system needs, type and availability of flexible resources. ***(Market Development)***
	DNOs to have and regularly review a decision-making framework for when DER are instructed to dispatch in real-time to provide DSO ancillary services. This shall be to promote coordination across services (including curtailment as part of non-firm connection agreements) to maximise liquidity, avoid market fragmentation and ensure dispatch results in the best outcome for the whole system. ***(Network Operation)***
	DNOs should enable secondary trading, for example capacity and other peer-to-peer trading. Enabling includes defining, communicating and justifying the parameters in which these trades can take place for operability purposes. ***(Market Development)***
	The DNOs shall facilitate secondary trading of DSO ancillary services and curtailment obligations (pending the outcome of the Access SCR). In this context, facilitate means provide the relevant operational data, ensure the DNO has processes in place to collect the relevant data about the trade, and make the operational parameters clear (and justified in the context of network reliability and efficiency). Facilitating does not mean communicating bids and offers about these trades to enable commercial agreement, make decisions about matching

	bids and offers, or dispatching these trades – third parties skilled in this area should be better placed to more efficiently deliver this. ***(Network Operation)***
	Third party platform providers can add value to flexibility providers in offering new routes to market. DNOs must not prevent the emergence of this sector but should promote coordination of DSO ancillary services and interoperability across these platforms in order to avoid market fragmentation. This might include through standard APIs, clear decision-making rules and data standards, so that multiple platform providers can 'plug-in' to DNOs' flexibility procurement processes and offer new commercial routes to market. ***(Market Development)***

Operating Flexibility	
Operational Flexibility Function - managing and scheduling the dispatch of flexibility alongside our other network solutions: ▪ Identifying the best options for our short-term requirements ▪ Defining the priority of the options ▪ Instigating the CMZs Responsible for dealing with N-1 events and dispatching flex for real-time issues ▪ Lead coordination with the ESO (and other parties)	DNOs to improve network visibility, and identification and sharing of operability constraints, including to enable avoidance of conflicts, for example where the ESO can avoid procuring services from an asset connected to an already congested part of the distribution network. ***(Network Operation)***
	DNOs to make available operational data that supports network users and other relevant stakeholders to make better decisions about how to use the network. ***(Network Operation)***
	DNOs to provide the ESO with information across timescales about the DER it is planning to instruct to dispatch. Sharing this information closer to real-time should enable the ESO to identify which DER are available for its own needs, and ultimately improve the ability of DER to stack value across markets. ***(Network Operation)***
	DNOs to gather sufficient information on DER availability to aid securing against DER losses. ***(Network Operation)***
	As part of this decision-making framework, there must be rules in place for coordinating dispatch instructions for DSO and ESO ancillary services. This could be through primacy rules or more comprehensive optimisation processes that better enable stacking of revenues for DER. The rules should be transparent and objective, with an intention to promote whole system efficiencies. ***(Network Operation)***

6.2 APPENDIX B – DSO ACTION PLAN

Our DSO Operating Model addresses the scale, skills and capabilities that we will require to perform our DSO functions in RIIO-ED2. This in turn is supported by our DSO Action Plan that is an input to the ENA's Open Networks Implementation Plan. The development of DSO capabilities is a significant programme of change, requiring investment in people, processes, systems, data and external relationships. This will require us to design and implement the organisational structure and supporting culture that will provide neutrality in decision making and optimise the use of flexibility, asset and whole system solutions. In developing and delivering our Action Plan we have applied the following principles:

- The processes and organisational structure required to demonstrate neutrality in decision-making is our first consideration
- The opportunities for collaboration in the provision of each capability will be assessed systematically, considering efficiency benefits, alignment of stakeholder experience, compatibility with legacy systems and any needs unique to our network and stakeholders.
- Through implementation we will identify natural "fault lines" in the capabilities to ensure that the costs associated with any future break up of DSO and DNO capabilities is kept to a minimum.
- Capabilities will be ramped up through RIIO-ED2 and beyond to reflect the volume and complexity of activity expected to minimise the potential of stranded investment in capabilities.
- (Unless otherwise directed by Ofgem) We are not building capabilities to sell services to the ESO but will contribute services as part of whole system solutions where justified or as part of our license obligations.
- We will form a **Flexibility Providers Forum** and meet twice per annum to augment the work of the Open Networks project and provide feedback more specific to our stakeholder's experience.

Our DSO Action Plan focuses on those aspects of DSO that will be delivered during the remainder of RIIO-ED1 and into RIIO-ED2. This document provides a timeline of outcomes that demonstrates a clear pathway to the implementation of DSO functionality in the short, medium and longer term and providing transparency on our progress to stakeholders. This DSO Action plan is an input in to the ENA Open Networks project's wider DSO Roadmap and Implementation Plan that reflects the relevant activities being carried out by the other distribution and transmission networks and the ESO. This also serves as a tool to monitor progress and identify gaps to delivering DSO functionality in comparison with the other networks.

Appendix J provides an overview of our anticipated delivery of DSO, by reference to the baseline expectations under the DSO Roles and activities Ofgem set out in Appendix 1 to the RIIO-ED2 methodology decision,[13] and cross-referring to specific steps set out in the ENA DSO Roadmap. The tables refer to the Functions, Activities, and underlying Steps used in the ENA roadmap, so that, for instance, a reference 2A11 refers to Step 11, under Activity A, in Function 2, of the roadmap.

[13] Ofgem, RIIO-ED2 Methodology Decision: Overview – Appendix 1, 17 December 2020, available at: RIIO-ED2 Methodology Decision: Overview (ofgem.gov.uk)

6.3 APPENDIX C – CONSUMER VALUE PROPOSITIONS

In response to stakeholder feedback, we have explored the benefits of merging both our DSO CVPs together and have calculated the benefits to consumers of this combined approach in our final plan. We believe both have individual merit and remain strongly supported, but we acknowledge that there are elements of crossover, and this could help reduce duplication. We have in our final plan applied an efficiency saving to the joint approach, of 25%, if they were to be jointly accepted.

As a consequence, our CVPs will require an investment of **£36.8m** and will generate **£7.1m** of benefits, giving an SROI of **£0.21** benefit delivered in excess of every £ spent.

6.3.1 ENERGY EFFICIENCY SUPPORT FOR SMARTER NETWORKS

Overview

- We propose to **proactively work with Local Authorities and local organisations to identify and implement energy efficiency measures across our customer base**, making sure that no-one gets left behind in the energy transition. We will triangulate our approach in three ways:
    - Customer mapping
    - Demand reduction potential: working with Regen to identify the potential for energy efficiency interventions to reduce demand in our licence areas. This allows us to target energy efficiency initiatives to the areas where they will have the largest impact.
    - Partnerships: based on the success of SAVE, with groups such as local organisations and community groups to build trust with communities and maximise uptake.

Consumer and Network Benefit

- A reduction in household energy bills due to greater energy efficiency measures and reduced need for traditional reinforcement
- Fair distribution of benefits from smart technology, ensuring vulnerable customers are not left behind
- Investment savings for Local Authorities
- Ecosystem benefits (including carbon savings) from a more flexible network

Comparison to baseline activities/ minimum requirements

- Our commitment to Flexibility First includes utilising Energy Efficiency alongside active or responsive LCT/DER across RIIO-ED2 as part of flexibility service tenders. However, the general view from Ofgem and other stakeholders that RIIO-RIIO-ED2 framework could go further.

Stakeholder engagement/ co-creation

- Community energy charities (e.g., members of Community Energy England and Community Energy Scotland), organisations (e.g. Citizens Advice, Regen), domestic customers.
- Sustainability First have highlighted the need for 'beacon' schemes to encourage energy efficiency.
- This CVP has received significant support across engagement sessions with a high proportion of Local Authorities and community groups wishing to take advantage of the opportunity if approved.

Initial assessment/ Key considerations

- Genuine opportunity here to show leadership and “test” the wider potential of energy efficiency in RIIO-ED2.
- The CVP can administer Energy Efficiency support in a simpler way than other industry driven EE schemes such as ECO funding and also helps strengthen industry relationships with end users. Our knowledge can ensure that energy efficiency initiatives are implemented with the greatest whole system benefit in relation to network investment.

6.3.2 LOCAL & COMMUNITY FLEXIBILITY MARKET STIMULATION

Overview

- We will increase **local flexibility market participation by empowering communities** we serve – including those in vulnerable circumstances – to **participate in the provision of system services**. We will do so through the following key activities:
- **Educating & Knowledge Sharing** - The target communities and organisations for participants will likely be new entrants to local flexibility markets, or to the energy sector altogether. To successfully unlock the potential of flexibility, support throughout the engagement will be necessary. This engagement, once planned with Local Authorities and key local organisations could include publications and information drops, walk in centres and RTB sessions with key industry partners and technical experts.

- **Incentivising and Support** - We will partner with local partners, suppliers and consultancies to provide financial incentives for the installation of LCTs that could participate in flexibility markets. We will focus on incentivising particularly difficult activities (e.g., energy demand management for buildings). Incentivisation could also extend to the systems needed to encourage, manage and evolve local markets, again delivered through supporting partners SSEN can engage to support local organisations.

Consumer and Network Benefit

- Broadly, the benefits from Local Market Stimulation are: (i) a localised, balanced energy system, ecosystem benefits from a more flexible network, (iii) reduced inequalities from affordable energy to meet the needs of all consumers

Comparison to baseline activities/ minimum requirements

- We are required to act as a neutral market facilitator. Minimum requirements also include the provision of accurate/ user-friendly/ comprehensive market information and embedding simple fair and transparent rules and processes for procuring distribution flexibility services.

Stakeholder engagement/ co-creation:

- Community energy charities (e.g., members of Community Energy England and Community Energy Scotland), community engagement groups, domestic customers.
- SSEN is building on specific experience gained from projects such as NTVV and LEO where coordinated engagement and funding through Local Authorities and Community Groups has been successful in supporting LCT growth and market opportunities.

Initial assessment/ Key considerations

- Potential interactions with baseline requirements under the DSO Strategy and associated Output Delivery Incentive (ODI) need to be worked through, with clear articulation required of why/ how this proposal provides additional value.
- DNO's are best placed to support Local Market evolution as in the majority of cases these markets will impact distribution assets. Increased DNO support will enable rapid growth in local markets, identify market synergies with network investment needs and provide valuable advice in navigating ESO and DNO flexibility service opportunities.

6.4 APPENDIX D – CLASS

6.4.1 BACKGROUND

Our approach to innovation has focussed on building a strong portfolio of projects and the active assessment of innovations from a range of other sources, including DNOs. We do this with the aim of deploying innovations that are a good fit with the needs of our stakeholders, customers and our Network and bring benefits.

Within RIIO-ED1 we have deployed solutions such as LiDAR, fault finding technologies and Flex Power, within our RIIO-ED2 plan we have included more examples including LV Secondary on-line tap changers all of which are innovations pioneered within other DNOs.

The Customer Load Active System Services (CLASS) project, funded through the Low Carbon Network Fund was an Electricity North West Limited (ENWL) innovation project. The project demonstrated that by remotely managing transformer tap changers and circuit breakers at primary substations to regulate voltage, DNOs can reduce or increase effective demand and absorb reactive power. The changes in voltage were shown to be unperceivable to consumers but could be used to provide a degree of control to help manage peak demand constraints on the DNO's network and provide the ESO with balancing services. ENWL installed CLASS in up to 260 of their Primary Substations and used this to provide balancing services in the market which were directly remunerated by the ESO.

6.4.2 OUR POSITION ON CLASS

We believe CLASS (Customer Load Active System Services) has clear benefits and can be deployed in SSEN with value to consumers. However, until there is a regulatory remuneration/ commercial framework decision the absence of a decision on CLASS makes any robust proposal difficult and will be subject to a number of variables including:

- The volume and geographical distribution of flexibility that the ESO would seek to procure/request.
- The extent to which the full costs of CLASS would be assigned to the ESO service vs local constraints (where applicable).
- Advanced funding for the detailed studies required to quantify the level of response expected from any specific circuit including identification and consultation with voltage sensitive customers such as embedded generators and industrial plant.

- Alignment of CLASS deployment with our proposed RIIO-ED2 Reinforcement and Refurbishment programme.
- Unit cost uncertainty as a result of a new product and potentially a sellers' market.
- Ongoing deliberations on statutory voltage range (ENA ETR140) and the resulting impact +/- of the circuit-by-circuit application of CLASS

Irrespective of these uncertainties we recognise the benefits of CLASS and its potential to reduce costs for the ESO and subsequently Customers bills. We are minded to deploy CLASS to provide ESO services but will not be putting it into our baseline plan until clarity is provided on regulatory treatment. We therefore request Ofgem provides DNOs with the ability to retrospectively update plans post decision on treatment or introduces an uncertainty mechanism at the determination stage to allow for further allowance adjustments, should this become necessary.

With regard to utilising CLASS to manage Network constraints On Primary Substations which are not already providing a CLASS service to the ESO, we do not intend to utilise CLASS without first calling on the marketplace for flexible solutions to allow a comparison against our stated costs for CLASS deployment.

Due to the diverse nature of our network, there are many locations where existing limitations will prevent CLASS from being effective e.g., high volumes of embedded generation, long rural feeders currently utilising the full available voltage range, voltage sensitive industrial customers, Embedded voltage regulatory devices etc. As a result, in the interest of cost and the other uncertainties listed earlier, we do not intend to undertake a comprehensive study until Ofgem have made their determination on CLASS.

For this submission we have prepared a high level and heavily caveated estimate of a CLASS ESO service deployment scenario.

6.4.3 CLASS DEPLOYMENT IN SSEN – DEPLOYMENT POTENTIAL

Utilising the information available from the CLASS Close Down[2] report and initial engagement with ENWL, the basic technical requirements for a CLASS deployment are outlined below

- The bulk of the cost is for the investment in new Tap Change Relays for the primary transformers selected for deployment. Central dashboard software required to predict level of CLASS demand available across SSN portfolio

- Integration with Power On / Link to from NMC to ESO to allow for scheduling / dispatch of assets to deliver services –
- From ENWL experience – CLASS works best in sites which have over 5-7MW of gross demand available. Initial analysis based on average demand identified around 300 Primary Substations with 680 transformers across SSEN which may be appropriate for CLASS deployment.
- A more detailed study will be required to determine which sites are most appropriate and the extent of the flexibility at each site.

6.4.4 CLASS DEPLOYMENT IN SSEN – DEPLOYMENT COST – INITIAL ESTIMATE

Based on initial engagement with ENWL, approximate cost estimates for SSEN are estimated below

Average Demand	No of Sites	No of Transformers	CLASS Deployment Cost assume £22k/transformer	
Set Up cost / Central System			£	1,000k
greater than 20MVA	11	33	£	726k
between 15- 20 MVA	15	40	£	880k
between 10-15MVA	74	177	£	3,894k
Between 7.5-10MVA	88	190	£	4,180k
between 5-7.5MVA	121	246	£	5,412k
Total Cost	**309**	**686**	**£**	**16,092k**

From Ofgem consultation paper[3], ENWL have deployed CLASS in up to 260 primary substations across there licensed area which translates to a technical capacity of 40MW (summer minimum) to 110MW (winter maximum). NB Capacity varies depending upon the underlying load.

6.4.5 CLASS DELIVERY CONSIDERATIONS FOLLOWING OFGEM CLASS DETERMINATION

The delivery and phasing of any CLASS deployment will need careful consideration,

- Detailed analysis of each site to determine:
  - Flexibility resource available to determine optimum location for CLASS deployment
  - Engagement with voltage sensitive industrial customers
  - Network voltage range utilisation margin studies and reactive power flow interactions (For long radial and heavily loaded circuits)

    - Embedded Voltage Regulator interactions
- to ensure availability of resources especially protection and control engineers
- detailed consideration of integration with OT/Power On and Control Room functions
- detailed design is required on a site-by-site basis to consider legacy system interactions
- Assessment of Tap Changer maintenance and inspection impact.
- detailed procurement exercise to develop cost certainty of deployment proposal
- Work programme to be developed to achieve efficiencies with other related RIIO-ED2 works at Primary Substations such as TASS roll out programme (link to EJP), Primary Transformer replacement or reinforcement works. Coordinating works will offer potential to improve efficiency of the CLASS Roll out.

6.5 APPENDIX E – ENHANCED ENGAGEMENT

- Overview: **We will accelerate progress towards net zero by transitioning to DSO**
- Total cost: **£73.1m (baseline plan)**
- Contribution to annual customer bills: **£1.71 (South), £2.56 (North)**

RIIO-1 context

Although the transition from DNO to DSO is new for RIIO-ED2 and beyond, we have been investing in our network throughout ED1 to facilitate low-carbon technology connections and test flexibility services, as well as collaborating with other DNOs to build a consistent approach.

Our stakeholder consultation process on DSO started in 2017 when we published ***Supporting a Smarter Electricity System.*** The majority of stakeholder feedback from our engagement during ED1 has shown:

- We need to take the lead on delivering DSO
- Distribution networks need to be ready in advance of **net zero** targets
- **Flexibility** and **whole system** solutions should be a priority
- Distribution networks should be neutral facilitators of the market
- DNOs are the right entities to deliver DSO functions.

No one should be left behind in the energy transition.

ENGAGEMENT SYNTHESIS

Stakeholder engagement

Engagement details	Insights derived
Consultants, Local Authorities, Community Energy Schemes, domestic customers and other segments These stakeholders were engaged by Regen through a ***survey and depth interviews*** to understand the ***issues and challenges*** that the electricity system faces - both in the ***transition to DSO*** and in ***enabling rapid decarbonisation*** to achieve net zero	• An appropriate role for a DSO to deliver energy efficiency were identified as: 'identifying areas where energy efficiency could be used to address network constraints' and 'innovation projects to explore this issue' (79%). [E180] • When assessing the current local flexibility markets and services EV Charging stakeholders urged improved performance by DNOs commenting they promote "overly prescriptive requirements and lack of risk-sharing". [E180] • The following factors were identified to promote more engagement with local flexibility services: higher prices, greater locational coverage and clearer tender and market information. [E180] • "Flexibility: Unlocking open, efficient flexibility markets" was ranked as the most important area of focus for DNO/DSOs in the transition to net zero by aggregators. [E180]

Non-consumer stakeholders We tested our **DSO strategy, outputs and costs** with a broad range of non-consumer stakeholders to understand their views on the **acceptability and bill impacts** of our Draft Business Plan via an online consultation event and surveys	• Stakeholders suggested a number of measures to improve SSEN's DSO outputs: synergies with other DNOs, the potential of battery farms, and greater engagement with the DSO industry beyond the UK to maximise its position in the market. [E151] • DSO performance could be measured by closer collaboration with suppliers to optimise the network, using data flows to influence customer behaviour, and greater engagement with end users and local authorities, building knowledge and uptake of flexibility tariffs and LCTs. [E151] • Local authorities wanted to see a separate DSO engagement package that supports educated analysis of data, and greater access to city capacity maps and data from the localised LV network. [E151] • One stakeholder felt one way to measure DSO performance would be comparing flexibility service contracts between DNOs and transparency on CEM tool. [E155] • Support from storage and renewables stakeholder on energy efficiency measures to alleviate constraints and boost flexibility [E155] • Storage and renewables stakeholder said sharing better forecasting of flexibility needs will be essential in allowing flexibility providers to recruit assets in areas likely to be constrained. [E155] • One storage and renewables stakeholder said DNOs have a responsibility to fuel poor and CIVS to ensure the reputation of flexibility providers and suppliers that these customers are signposted to. Therefore, membership of the Flex Assure consumer protection scheme, including a future domestic iteration, should be a prerequisite for participation in order to protect customers. [E155] • One storage and renewables stakeholder urged more ambition on flexible connections. [E155]
National Government We engaged MPs and MSPs about our Draft Business Plan via Bilaterals	• MSP for Dundee City West mentioned Dundee is in a good position to tap into the 'local and community flexibility market stimulation' CVP. [E166]
Vulnerable customer representatives Citizens Advice provided their views on all DNOs draft Business plans via a published report	• Citizens Advice were concerned about the conflict of interest in forecasting, flexibility contracting or dispatch without an independent DSO, and called for us to show how we will balance incentives across different parts of the organisation. [E176]

Business representatives Engaged online via annual stakeholder workshops in the north and south to co-create our sustainability strategy	Progressing Open Network Project • Stakeholders suggested that more engagement and involvement of different stakeholders would provide more evidence for decision making, to help encourage uptake of flexibility services, and build trust [E071] [E072] • Stakeholders advised us to consider working and engaging more with SMEs, charities, and small businesses [E071]. Market Stimulation Fund • Stakeholders suggested that we should use funding to encourage and stimulate innovation throughout supply chain and to create an open-access whole systems service, resulting in economic benefits for the UK as a world leader in energy and help it to achieve net zero. [E071] Facilitating the DSO market • Stakeholders told us that we need to communicate the benefits of the flexibility market to bill payers as a neutral market facilitator. However, they can also influence the market through investment in charities and small businesses [E072]
Charity Organisations Engaged online via annual stakeholder workshops in the north and south to co-create our sustainability strategy	Progressing Open Network Project • Stakeholders wanted consistent and unified DSO approach to engage with flexibility services and for the move towards localisation and the changing role of DNOs, calling for focussed spending, particularly with district heating [E071] • A charity/NGO representative in Scotland advised that local communities are becoming more important (e.g. Local Electricity Bill) and local solutions are becoming more viable. Stakeholder championed working at local level and engaging on particular issues and how to support them. [E072] Market Stimulation fund • Stakeholders suggested that funding should be used to reduce risks and upfront costs faced by early adopters of LCT. Considering RIIO-ED2 pricing signals in relation to future flexibility services would also help community groups invest individuals' money in the long term. [E071] • They advised us to work with academia to help groups benefit from the funds to drive innovation, and to test different approaches to achieve social and economic fairness. [E072]
Community energy groups Engaged online via annual stakeholder workshops in the north and south to co-create our sustainability strategy	Progressing Open Network Project • A community energy group representative in the south recommended upgrading the grid to accommodate flexible connections, instead of turning sources 'on and off'. [E071] • Stakeholders encouraged us to have more communication and engagement with local authorities and parish councils. [E071]

Consumers and their representatives
 	
We engaged consumers Insights derived from Citizens Advice Scotland research on the Future of the Gas and Electricity Distribution Networks in Scotland and Impact's research on consumer appetite for EVs and HPs
	Demand management and Time of Use Tariffs
	• If domestic consumers are to play a key role in in providing flexibility, much work is still required to educate them as to the requirement for and benefits of such an approach [E081][E118].
	• 15% of respondents to the Impact survey claimed to be on a ToU/EV tariff, most commonly (47%) on British Gas' Electric Vehicle Drivers Plan. [E089]
	• 66% respondents from the Impact survey claimed to own a smart meter, which increased to 92% of EV and heat pump owners. Only 26% of the smart meters owned by respondents were SMETS 2. [E089]
	• The most popular of the flexibility services presented was the expansion in the use of smart Time of Use (ToU) tariffs, with interest particularly strong among consumers who already benefit from the use of a smart meter (67% vs. 55% among consumers with a traditional meter [E081]
	• Reasons given by stakeholders for not signing up to a ToU/EV tariff comprise a lack of awareness, savings not being enough, and the effort involved in switching [E089]
	• Consumers typically found ToU pricing to be a relatively straightforward concept to understand and an accessible means by which they could directly influence their household's energy costs [E081]
	• Many consumers are concerned about the impact of smart TOU tariffs on consumers who are unable to modify their energy consumption profile to avoid periods of peak or super-peak energy pricing. [E081]
	• Some consumers highlighted that TOU tariffs may lead to an increase in 'unhelpful or antisocial' energy behaviours (e.g. the overnight use of washing machines in buildings the noise/vibration could disturb neighbours) [E081].
	EVs and HPs as last resort mechanisms
	• 69% of respondents found last resort mechanisms acceptable. This figure was higher amongst those living in the south east, those in higher socio-economic groups, those aged between 18-35, and EV and heat pump owners [E089]
	• When asked what improvements could be made to the scheme, respondents most commonly said they would like to see compensation available (41%) and to reduce the frequency of potential use (33%). [E089]
	• The biggest concerns for customers on last resort mechanisms were:
	  ○ Risk of vehicles not being fully charged when expected
	  ○ Not being told when this is happening
	  ○ Being restricted or disrupted/inconvenienced [E089]

	• 52% heat pump owners said they would override the mechanism if it resulted in reduced power to heat pump which lasted longer than two hours [E089] • Half of consumers would accept £30 compensation for an interruption in electricity supply to their EV or heat pump up to four times a month, up to two hours each time, or £20 when further reassurances are made. [E089] • It was found that EV owners are less accepting of compensation than heat pump owners. [E089] • It was concluded that the concerns of respondents about the impacts of the last resort mechanism could be addressed through clear communication from DNO or supplier. [E089]
Developers/ Connections representatives Engaged online via annual stakeholder workshops in the north and south to co-create our sustainability strategy	Progressing Open Network Project • Collaboration and sharing ideas across networks and different sectors, as well as community groups, could help achieve aims and educate consumers on the importance of flexible usage and localised energy. [E071][E072] • A developer/connections representative stated the need for us to provide a network which provides flexible connections to increase business investment in areas, particularly in areas where fuel poverty is high. [E071] Market Stimulation fund • It was advised that funding should cover flexibility, allowing for collective energy demand (such as with district heating in Scandinavia), as well as providing opportunities for households to participate in the market and choose how they interact with the grid. [E071]
Infrastructure/ engineering representatives Engaged online via annual stakeholder workshops in the north and south to co-create our sustainability strategy	Progressing the Open Networks Project • Stakeholders advised us to provide greater education of customers in the south to help them understand purpose of smart grid [E071] • A majority of stakeholders at our Annual Stakeholder Workshops in 2020 agreed that we should follow the recommendations of the Open Networks Project (which incorporate Ofgem's baseline expectations for DSO in RIIO-ED2), with many recognising the importance of using an evidence-based approach with regard to creating a smart, flexible network. [E071][E072]
Local Authorities Engaged online via annual stakeholder workshops in the north and south to co-	Progressing the Open Networks Project • Stakeholders encouraged us to consider more international engagement, referencing Norwegian collaboration, and more engagement with commercial end users. [E071]

create our sustainability strategy	Facilitating the DSO market • Stakeholders told us we need to be able to demonstrate consumer/community benefits of DSO functions. [**E080**]

Consultants, local authorities, regulations, utilities generators and supply chain stakeholders
We engaged via a workshop and survey to co-create DSO metrics and an incentive framework
	DSO Framework
	• 65% stakeholders agreed and 15% strongly agreed with our DSO principles framework [**E080**]:
	  • Principle 1: A DSO must work for all customers.
	  • Principle 2: Learning by doing will give the best outcomes for customers
	  • Principle 3: Our transition to DSO must be coordinated and cost efficient.
	  • Principle 4: Neutral facilitation is paramount.
	  • Principle 5: A DSO should unlock local solutions.
	• Stakeholders advised us to work with other DSO/ESOs on reducing the overall system operation cost [**E080**]
	• Framework needs to recognize the wider role of DSO as delivering net zero is not entirely within our control [**E080**]
	• It was suggested to look at other industries such as retail and air traffic control, as well as the EIC, EU DSO Entity and community energy projects in Germany for lessons on DSO principles [**E080**]
	DSO metric
	• Stakeholders advised us to consider the following additional in our DSO metrics:
	  ○ Whole system cost reductions and reduction in household bills
	  ○ Volumes of flexibility by customer category
	  ○ Timelines
	  ○ Volume of renewable output
	  ○ Carbon reduction or carbon intensity of delivering flexibility
	  ○ Outage and constraint measurements
	  ○ Qualitative feedback from stakeholders [**E080**]
	• 'Data transparency and accuracy' and 'facilitating participation/market making' were most commonly places as most valuable metrics among stakeholders [**E080**]

Engagement statistics

ED2 ENGAGEMENT EVENTS	INSIGHTS	STAKEHOLDERS ENGAGED
22	218	5,250

Stakeholder segments engaged

CONSUMERS	DOMESTIC CUSTOMERS	CUSTOMERS IN VULNERABLE SITUATIONS	TRANSIENT CUSTOMERS	NEXT GENERATION BILL PAYERS	SMES	MAJOR ENERGY USERS	
CUSTOMERS	DISTRIBUTED GENERATION CUSTOMERS	BUILDERS AND DEVELOPERS	COMMUNITY ENERGY SCHEMES	LANDOWNERS/ FARMERS			
POLICY MAKERS AND INFLUENCERS	GOVERNMENT	RESEARCH BODIES, POLICY FORUMS AND THINK TANKS	MEDIA	CONSUMER GROUPS	REGULATORS		
COMMUNITIES AND LOCAL DECISION MAKERS	LOCAL AUTHORITIES	CHARITIES	ACADEMIC INSTITUTIONS	HOUSING ASSOCIATIONS			
	VULNERABLE CUSTOMER REPRESENTATIVES	LEPS	EMERGENCY RESPONSE	HEALTHCARE	COMMUNITY INTEREST BODIES		
WIDER INDUSTRY AND VALUE CHAIN	DNOS	TRANSMISSION	GDNS	WATER	TELECOMS	IDNOS	
	ICPS	CONSULTANTS	ENERGY SUPPLIERS	EV CHARGING	OTHER SUPPLY CHAIN	STORAGE AND RENEWABLE PROVIDERS/ INSTALLERS	TRANSPORT AND HIGHWAYS AGENCIES
PARTNERS AND ENABLERS	CURRENT AND FUTURE EMPLOYEES	CONTRACTORS	SERVICE PARTNERS	SHAREHOLDERS	INVESTORS	BUSINESS ADVISERS	TRADE UNIONS

EVIDENCE ASSESSMENT

Key to engagement scores

The engagement score assigns a weight to each source accounting for the robustness of the engagement event and the relevance of the feedback to the topic.

Score	Description
1-1.66	Limited evidence of good event planning, methodology or data collection. Feedback provided is high level with tangential relevance to the topic.
1.67-2.33	Good evidence of engagement planning and discussion of data collection methods, but limited depth of feedback and range of opinions. Feedback not necessarily fully aligned to the topic and only provides a limited insight and thus moderately useful.
2.34-3.0	Well-conducted, trustworthy event with highly relevant feedback. Specific, clear and relevant information with clear link to the topic discussed and high value added.

Phase	Date	Event ID	Event name	Key stakeholder groups	Number of stakeholders engaged	Engagement score
Phase 4: Testing and Acceptability	Oct-21	E180	Regen study: *Enabling DSO Through Net Zero*	Consultants, Contractors, Domestic customers, Local Authorities, Storage and renewables providers/installers, Major Energy Users, Community energy schemes, Community interest groups, Vulnerable customer representatives, EV Charging Installers and manufacturers and Trade Unions	203	3.0
	Oct-21	E153	Employee Consultation Document Engagement on Draft Plan	Current and future employees	3	1.8
	Oct-21	E155	Stakeholder Consultation Document Engagement on Draft Plan	Community interest groups, storage and renewables suppliers, emergency response, healthcare and highways agencies	19	2.8

Phase	Date	Event ID	Event name	Key stakeholder groups	Number of stakeholders engaged	Engagement score
	Sep-21	E151	Consolidated Outputs and Costings Event	Contractors, Consultants, Local Authorities, National Government, Storage and Renewables suppliers, Supply Chain	106	3.0
	Sep-21	E152	Academic Panel	Academic Institutions	7	2.0
	Sep-21	E170	Microsite survey on Costed outputs	Domestic Customers, Vulnerable Customers and Future Customers	1,298	1.7
	Sep-21	E175	Flexibility CVP Expert Event	Community Energy Schemes, Charities, Local Authorities	31	3.0
	Sep-21	E176	Citizens Advice report on DNO Draft ED2 Business Plans	Consumer groups	1	2.5
	Sep-21	E150	Energy Efficiency survey	Domestic Customers, Vulnerable Customers and Future Customers	1,427	3.0
	Sep-21	E158	Future Consumers Event	Future Customers	26	2.0
	Aug-21	E162	Digital Strategy Action Plan workshop	Academic institutions, consultants, community energy schemes, contractors, local authorities, Supply chain, storage and renewables suppliers, energy suppliers, vulnerable customer representatives	25	1.8
	Aug-21	E166	Corporate Affairs General Bilateral	Government, Storage and renewables providers	25	2.0
	Jul-21	E149	Citizens' Jury	Domestic Customers	34	3.0
Phase 2: Co-creation	Mar-21	E080	DSO Metrics	Consultants, distributed generation customers	60	2.5
	Nov-20	E065	Supply chain engagement launch event	Contractors, consultants, other supply chain, service partners	90	1.5
	Oct-20	E073	SSEN Stakeholder Advisory Panel	Business advisors	6	1.5
	Oct-20	E118	ED2 Customer Priorities Survey	Domestic customers, customers in vulnerable situations, next generation bill payers, SMEs	39	2.0
	Sep-20	E047	Consumer vulnerability expert workshop	Local authorities, housing associations, charities, consumer groups	50	2.0
	Sep-20	E081	Citizens Advice Scotland: Consumer Insights on the Future of the Gas and Electricity Distribution Networks in Scotland	Domestic customers, customers in vulnerable situations, SMEs	1,507	3.0

Phase	Date	Event ID	Event name	Key stakeholder groups	Number of stakeholders engaged	Engagement score
	Sep-20	E089	Last resort mechanism research	Domestic customers	100	3.0
	Sep-20	E071	Annual Stakeholder Workshops - South	Local authorities, housing associations, water, vulnerable customer representatives	109	2.5
	Sep-20	E072	Annual Stakeholder Workshops - North	Local authorities, vulnerable customer representatives, housing associations	84	2.5

MEASUREMENT OF SUCCESS

The table below sets out the benefits that the DSO strategy and the outputs within it will deliver to customers.

Output	Northern Target	Southern Target	Comparison to RIIO-1	Cost in baseline plan	Consumer benefits
Define a DSO strategy that will be reviewed and refreshed annually with an action plan to deliver against it, including changes to IT systems, process and people	Operating model implemented	Operating model implemented	N/A	£73.1m	Our DSO strategy will provide significant benefits across our plan: Through flexible connections saving £417.6m in reinforcement costs, offsetting 1.8mtCO_2. Deferred reinforcement and avoided capital expenditure saving customers up to £46.3m.
Set up an annual flexibility providers forum and survey enabling regular feedback	Form and survey set up	Forum and survey set up	New for ED2		
Provide timely, accurate and accessible DSO data across all DSO roles	N/A	N/A	New for ED2		
Continually improve the provision of forecast information for both new and existing flexibility markets	N/A	N/A	New for ED2		
Target 5GW of Constraint Managed Zones across multiple service types and grow our flexible connections to 3.7GW of capacity across 35 zones by 2028	5GW of flexibility services and 3.7GW of flexible connections across both Licence Areas	5GW of flexibility services and 3.7GW of flexible connections across both Licence Areas	New for ED2		

Output	Northern Target	Southern Target	Comparison to RIIO-1	Cost in baseline plan	Consumer benefits
Proactively work with Local Authorities and partners to identify and implement energy efficiency measures across our customer base that can release network capacity	Demonstrable acceleration of energy efficiency deployment and flexibility market participation in targeted areas	Demonstrable acceleration of energy efficiency deployment and flexibility market participation in targeted areas	New for ED2	£36.8m (CVP)	£7.1m net positive value and an SROI of £0.21 net benefit delivered in excess of every £1 spent. Supporting all our customers in the energy transition. Our blended CVP approach will actively promote a localised, balanced energy system, with wider societal benefits (e.g. carbon savings). Communities will be empowered to participate in flexibility markets, benefiting from the energy system transition, and resulting in lower customer bills through the reduced need for reinforcement and energy efficiency. Support the fair distribution of benefits from smart technology.
Partner with local organisations, aggregators and energy suppliers and other relevant organisations to actively promote recruitment of flexibility in areas of low Market growth with a focus on fuel poor customers and those in vulnerable circumstances.					

6.6 APPENDIX F – DELIVERING VALUE THROUGH FLEXIBILITY

6.6.1 FLEXIBILITY OVERVIEW

Flexibility involves the deployment of **flexible connections** and the use of **flexibility services**. It plays a critical role, facilitating the connection of Low Carbon Technologies (LCT) and offers optionality when it comes to capital expenditure investment. In addition, flexibility brings value to the wider energy system through wholesale markets and national system services for the ESO.

The potential value to distribution networks from flexibility comes from the following:

- deferral or avoidance of capital expenditure
- delaying network investment decisions where the level of uncertainty associated with future demand is comparatively high and where a more certain view is likely to emerge over time (the value of 'waiting' and the potential avoided cost of stranded assets)
- increasing utilisation of new and existing network assets (increased efficiency)
- realising supply chain and internal efficiencies through adjustment (levelling) of delivered capital work volumes
- reduced operational costs and lower carbon emissions associated with the use of mobile and static diesel generation
- increased network reliability and resilience provided by flex services for planned and unplanned outage conditions, enhanced customer-minutes lost (CML) performance derived from flexibility service-based restoration options
- broader societal and community benefits associated with not constructing capital works (e.g., traffic disruption)
- flexible connection provides DER stakeholder options to connect; potentially faster and/or cheaper
- flexibility connected assets can choose their level of firmness; and
- defer or avoid connection driven reinforcement, reducing costs/timescales for our DER stakeholders

In our RIIO-ED2 plan we realise these value streams in the following ways.

- to address imminent constraint (compliance) issues on our networks *[**Load Strategy**]*
- to enable LCT and others to connect (e.g., though a flexible connection, or through local flex procurement to enable new firm connections) *[**Connections Strategy**]*
- to slow down peak demand growth in high growth areas across our licence areas at all voltage levels in order to help manage uncertainty more efficiently (i.e., delay making long-run capital investment decision and reduce the risk of stranded assets and multistage reinforcements) *[**DSO Strategy**]*
- to drive efficiency and reduce carbon emissions [***Sustainability Strategy*** & ***Diesel Strategy***]

6.6.2 FLEXIBILITY SERVICES AND DEMAND GROWTH

The value of flexibility services as an intervention for demand growth is influenced by three key factors:

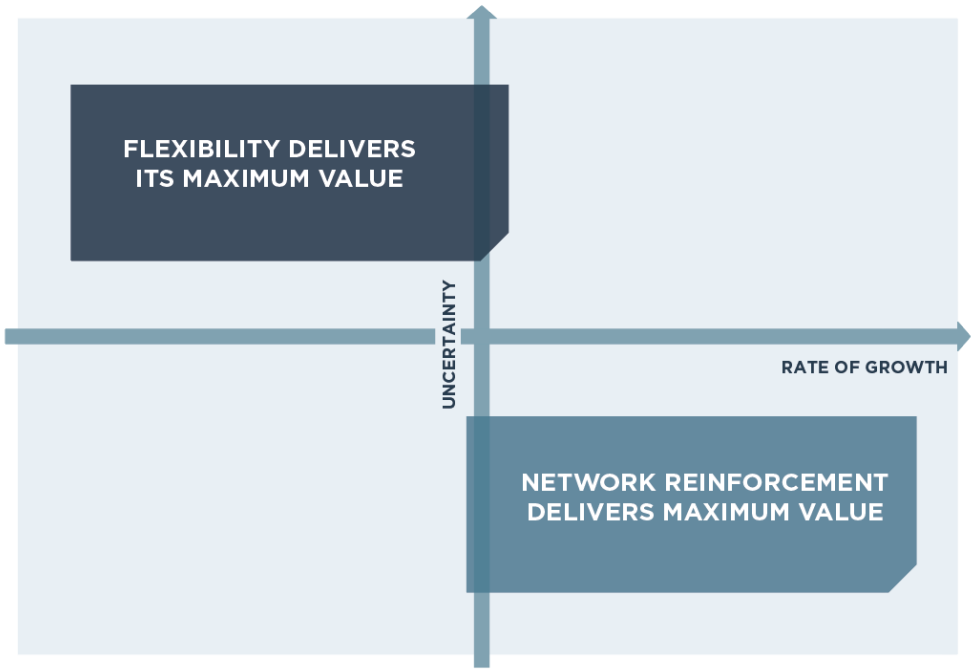
- rate of demand growth – determines the duration of opportunity for a flex solution
- level of uncertainty – determines the value of avoiding a long-run investment decision (option value)
- the cost and availability of flexibility services – flexibility supply (market development and liquidity)

Where **demand-growth is higher**, excess network capacity will be used more quickly, conventional reinforcement would be required relatively soon, and so (NPV) **deferral value is high**. In the near-term uncertainty is lower, the option value offered by a flex solution is lower, and the **value offered by a conventional (constructed) solution is higher.** The main value of flex in this situation is to defer the capital expenditure (*time value of money*)

Where **demand-growth is lower**, excess network capacity will be available for longer, conventional reinforcement isn't required for some time, and so (NPV) **deferral value is low**. With a view to longer-term outcomes, uncertainty is higher and so the option **value offered by a flexibility service is higher**, and a conventional (constructed) solution is of lower value. The main value of flexibility services in this situation is to delay making a capital investment decision (the value of 'waiting').

Under all scenarios, flexibility services have the potential to provide value to the overall electricity sector, including national system operation.

This is shown pictorially below:



For our baseline scenario of Consumer Transformation (CT), capacity requirement is driven by a rapid uptake of LCT, and demand growth is comparatively high in RIIO-ED2. This results in the selection of the

more conventional and hybridised flexibility services/conventional interventions. Our LRE strategy and proposed investment plan has been developed, predominantly, on the basis of the CT scenario.

Compared to the lower net zero LCT uptake DFES scenario – System Transformation (ST) – the use of CT as the basis for our load-related expenditure strategy provides a comparatively lower value for flex services, and is the minimum expected in RIIO-ED2 for all cases other than extremely low uptake scenarios such as DFES Steady Progression (non-net zero compliant).

We intend to contract for **5GW** of flexibility services in RIIO-ED2. This is **16 times** the level needed when only considering flexibility services for economic deferral under the higher CT demand growth assumptions – where capital expenditure is the predominant solution for delivery of optimal customer value. This will enable us to capture significant option value in the event that a low demand growth scenario outturns rather than CT. This strategy will allow for the rapid deployment of flexibility services irrespective of which scenario outturns in RIIO-ED2.

6.6.3 THE MARKET FOR THE SUPPLY OF FLEXIBILITY SERVICES (LIQUIDITY)

Through its innovative Constraint Managed Zone (CMZ) initiative in 2016, SSEN Distribution was the first UK Distribution Network Operator (DNO) to introduce **flexibility services** and it continues to lead in the delivery of flexibility across the GB Distribution networks. Thanks to our ongoing commitment to 'flexibility first', our improving systems and supporting processes, and the evolving Local Energy Markets, we now field over **600 MW** of flexibility service contracts across our two Distribution licence areas.

We feel it is critical to support the development and facilitation of a competitive, liquid market for the supply flexibility services. To facilitate competition, SSEN publishes annually the SLC31e procurement statement to provide early indication to potential services providers what flexibility services SSEN are going to procure in the coming year. In addition, we signpost on our website and the **Flexible Power** system the locations and requirements for our upcoming flexibility service procurement exercises. SSEN engages in a process of pre-tender market engagement, including a formal webinar to explain to interested providers the principles of flexibility services and the full end-to-end process. All SSEN CMZ services are technology-agnostic. As such, providers of storage, generation, demand-side response or energy efficiency services can respond to any tenders. Our commitment to a competitive, liquid market is reflected in our Market Stimulation CVP which seeks to target market development in key areas and key sectors.

We are also using our insights on how we think flexibility service markets will develop to inform our assumptions on how the cost of those services will evolve over time. This is important in our investment decision-making processes, where SSEN utilises the Common Evaluation Methodology (CEM). This is a product of the Open Networks Project, designed specifically to assess optimum deployment of flexibility and reinforcement. In addition to the CEM, in 2020, SSEN engaged Frontier Economics Ltd to develop a Flexibility Services Pricing Model to support our CMZ processes. This model enables us to allocate optimum price levels to service requirements taking in a wide range of variables, for example, the costs of deploying and running mobile diesel generation, having customers off supply and the traditional Net Present Value (NPV) of deferring investment. By using this model to evaluate flexibility service benefits alongside the CEM, SSEN can confidently commit to releasing service tenders that provide benefit to our networks, the customers that our networks serve and providers of flexibility services.

We have planned our RIIO-ED2 submission taking account of the full range of potential futures from one of high demand growth, which economically favours conventional reinforcement solutions, to a lower demand growth, uncertain, future which economically favours flexibility services.

We have done this by proposing conventional reinforcement solutions where there is a high degree of certainty that the capacity is required and where flexibility services only defer by a small number of years but in the near-term. We have also ensured that we have a full set of flexible options and contracts available to us from the outset to provide for unexpected rates of demand growth across the network, by delivering a broad range of flexibility service use cases.

The procurement and use of flexibility services to manage areas on our network that are subject to constraint, is a key tool to avoiding the need for expensive and time-consuming network reinforcement and promoting markets for service provision, which should drive more economic, efficient, and smarter approaches. However, of equal importance is the greater use of flexibility across our distribution business to reduce faults and outages on our networks (together with the resultant CI's and CML's), to help us restore faults more quickly when they occur and avoid the use of Mobile Diesel Generation. Deploying flexibility in this manner will be an important strand in efforts to decarbonise the energy sector and enable the strategic delivery of net zero while maintaining a safe and resilient network.

6.6.4 FLEXIBLE CONNECTIONS

During RIIO-ED1, SSEN's market leading **flexible connections** offerings have already enabled 412MW of new generation connections, saving connecting customers over 90 years of associated connection delays and deferred in excess of £60m of network reinforcement.

Through stakeholder engagement we expect the demand for flexible connections to grow in RIIO-ED2 and expect to offer more than 200 new connections, totalling 2GW. This will take our overall total of flexibly connected generation capacity to around **3.7GW** by the end of the RIIO-ED2 period.

Where customers chose not to opt for a flexible connection, we expect to enable the connection of standard access LCT capacity by procuring flexibility services from existing connected customers. The volume of flexibility procured will be determined by the specific requirements of each connection and the choices made by customers. Irrespective of the volumes, our stakeholders are looking for fast connections and as a result we need to minimise the time to recruit flexibility in response to all connection applications. This is especially important when considering the possible impacts of the Access SCR 'minded-to' position, where an influx of new connection requests are likely, the ability to offer temporary flexibility to support quicker connections or the use of flexibility services to support those connections will be essential. SSEN considers that the outputs of the Access SCR minded to position could reduce the amount of enduring flexible connections across our networks, however we are confident that the supporting systems and learning generated from flexible connections will be essential for the transition to DSO.

Our Southwest Active Network (SWAN) Project has installed Active Network Management (ANM) systems across 60% of our southern licence area to manage a constraint on the NG Transmission network. This ANM system once completed will manage over 60 current generation connections flexibly, currently over 1.1GW of generation which could not have connected to the network without this system. The project has also installed new interfaces with the ESO, enabling real-time data exchanges to ensure system stability and operational collaboration pursuant to DSO whole system operations. We are also working closely with SHET (transmission) to identify the opportunity for flexible connections at EHV to minimise capital investment cost at the distribution-transmission network interface. In addition to SWAN, we are implementing ANM functionality at Minety GSP to monitor reverse power flow onto the transmission network controlling in the region of 326MW of additional generation.

6.6.5 OUR FLEXIBILITY SERVICES RECRUITMENT STRATEGY

With a view to minimising the delays associated with contracting flexibility, through RIIO-ED2 we will seek to recruit flexibility service providers across our entire network at all voltage levels. We will select and use both availability-based, and utilisation payment-dominant contracts as appropriate. This advanced recruitment and procurement will ensure that the opportunity to use flexibility services in all its use cases are maximised and delays minimised.

SSEN has developed a Dynamic Purchasing System (DPS) which allows potential service providers to complete tender pre-qualify for future tenders and allows SSEN to invite providers to tender for the latest constraint managed zones where SSEN require flexibility services.

At the low voltage level, we anticipate that flexibility services will be predominantly recruited via intermediaries such as aggregators, energy suppliers, and other aggregating parties including suitably equipped community groups. SSEN is designing and delivering an API interface for our ANM systems. This interface will allow SSEN to interact - dispatch and monitor - aggregator service providers. For connected Distributed Energy Resources of greater than 1MW (including energy storage and distributed generation) we will extend this to include the option of direct contracting.

For every new procurement and in addition to the formal requirement to publish Contract Notices, SSEN will release details on forthcoming opportunities on both its website and its **Flexible Power** system, as well as through updating the **ENA Flexibility Timeline** and SLC31e procurement statement. Furthermore, we host dedicated flexible service webinar sessions each year which allows SSEN to educate service providers on how to register and participate in future tender exercises, and provides us with an opportunity to reinforce the range of possible solutions that can be utilised to provide flexibility such as whole system solutions and energy efficiency. Our DSO-related CVPs are focused on supporting these emerging areas and stimulating flexibility from new providers (**see Annex 32**).

Flexible Power is a collaborative system developed across five DNOs (SSEN, Western Power Distribution, Scottish Power Energy Networks, Northern Power Grid and Energy North West Limited) and is designed to improve efficiency and scalability of flexibility service implementation, as well as offering an improved and standardised customer platform, contract management and settlement functions.

SSEN Flexibility Pages –

https://www.ssen.co.uk/ConnectionsInformation/GenerationAndStorage/FlexibleConnections/CurrentCallsForFlexibility/

SSEN Flexible Power –

https://www.flexiblepower.co.uk/scottish-and-southern-electricity-networks

6.6.6 USING FLEXIBILITY TO ADDRESS SHORT-TERM CONSTRAINTS

Flexibility services plays a major role in our DSO Strategy. Deploying flexibility services, across all voltage levels, can defer or avoid conventional reinforcement and associated capital expenditure.

This section estimates the potential savings from using flexibility services to address short-term constraints in the business plan.

- All EHV (primary) identified constraints in base-case scenario subject to full CBA flex assessment[14] to ascertain if flexibility services can help defer a number of years (typically 1-6 years)
- For load related expenditure at HV and LV, **Appendix G** details the methodology applied by SSEN

Our planned application of flexibility services for **EHV, HV and LV** schemes instead of conventional network reinforcement is estimated to realise **£18.3-£46.3m** of savings in RIIO-ED2. These savings include **£15.2-£41.9m** capital expenditure deferred to the RIIO-ED3 time horizon, and **£3.1-£4.4m** from deferring capital expenditure spend by 2 years within the RIIO-ED2 period. The cost of deploying flexibility services (Flex Costs) is based on our CMZ experience. We have also run two sensitivities on the assumed cost of deploying flexibility.

- At EHV we estimated high, medium and low flex costs at £300/MWh, £150/MWh and £75/MWh**.**
- At HV and LV the high sensitivity flexibility cost uses a fixed price of £48/kw/year in each year of RIIO-ED2. The flex cost in the medium and low sensitivities use a declining profile in each year of ED2. The medium sensitivity starts at £48/kw/year decreasing to £36/kw/year while the low sensitivity also starts at £48/kw/year and decreases to £24/kw/year.

[14] Using the Energy Networks Association (ENA) Common Evaluation Methodology (CEM).

Benefits	Flex Costs - Low	Flex Costs - Medium	Flex Costs - High
Capex deferred beyond ED2	41.9	27.6	15.2
Capex deferral savings in ED2	4.4	4.3	3.1
Reduction in ED2 TOTEX from Flex	**46.3**	**32.0**	**18.3**
Costs			
Flex Costs	5.1	5.8	6.5
Total Costs	**5.1**	**5.8**	**6.5**
Net ED2 Benefits	**41.2**	**26.1**	**11.8**
Flexibility Services Deployed			
Flex Capacity considered MVA	649	649	649
Flex Capacity used MVA	208	190	176

DEFINITIONS:

- *Capex Deferred beyond ED2: capital expenditure for all projects where deferral recommendation would mean flex works to end of RIIO-ED2 period*
- *Capex Deferral Savings in RIIO-ED2: Time value of money saving (NPV from CEM tool) - roughly 3.5% of capital expenditure- where deferrals would still result in conventional reinforcement within ED2*
- *Flex Costs: Money required to be spent on availability and utilisation of flexibility services to defer capital expenditure*
- *Flex Capacity Considered: sum of magnitude of the overloads for which a flex solution was considered (choosing the largest single overload out of the 5 RIIO-ED2 years for each scheme)*
- *Flex Capacity Used: sum of magnitude of overloads that flex solutions were deployed to resolve- selecting largest overload out of the RIIO-ED2 years*

6.6.7 LOAD MANAGED AREAS

Load Managed Areas (**LMAs**) served an important role enabling and supporting the connection of large amounts of space and water heating without triggering costly network reinforcement in the SHEPD licence area – allowing off-gas customers on to electric storage heating and off costly oil, peat and coal. LMAs in SHEPD cover approximately 93,000 customers, spread right across the geographic licence area, including the islands and many densely populated towns and cities.

The shift towards low carbon technologies for generation and the electrification heat and transport is increasing the requirement for electricity network capacity and customer reliance on all electric solutions in day-to-day living reflects the strong support for resilient network arrangements. The desire for greater customer choice on tariffs, supplier switching and the continual drive to alleviate fuel poverty and customers in vulnerable situations, all contribute to provide compelling arguments for the removal of LMAs.

LMAs were introduced as an alternative to traditional reinforcement as a form of market-based solution for the provision of capacity and therefore we believe that market solutions should continue to be the first choice for enabling the lifting of customer LMA restrictions and the promotion of market-based flexibility services. Removal of LMA constraints through conventional constructed solutions (iron and copper) should be a last resort.

Our short-term (RIIO-ED1) approach is to maintain switching patterns using smart metering via suppliers, as per current DCUSA obligation. Our approach in RIIO-ED2 will be to use market flexibility services to replace LMA mandated switching patterns – including activities to define, develop and stimulate the market – alongside, and in accordance with, development and facilitation of flexibility markets to support DSO. Solutions to provide additional capacity to support the uptake of LCT will be co-optimised with those to remove LMA restrictions – using the principle of 'flexibility first'. We will also ensure that all/any other reinforcement or flexibility procurement for other (non-LCT) needs or requirements provides for LMA removal, as a matter of course. Finally, the end of ED3 will mark the time backstop for complete removal of all (imposed) LMA constraints across SHEPD licence area.

Further details on our approach to LMAs can be found in **Chapter 10 – Our Network as a Net Zero Enabler**.

6.6.8 CONCLUSION

We have prepared our RIIO-ED2 Business Plan to deal with the full range of high and low uptake scenarios and the associated variation in network impact. We have prepared well-justified plans for conventional network investment where peak demand growth uncertainty is low and the customer cost of failure to meet LCT demand is high. At the same time, we are fully equipping ourselves with the capability to make effective use of flexible connections and flexibility services to enable us to deal efficiently with unexpected outcomes through full and supportive engagement in the developing marketplace.

6.7 APPENDIX G - HV AND LV FLEXIBILITY METHODOLOGY

6.7.1 SUMMARY

Flexibility services play a major role in our DSO Strategy. Deploying flexibility services at LV and HV has numerous advantages. It can defer conventional reinforcement and avoid capital expenditure and deliver benefits for customers in terms of both lower costs and more feasible and assured delivery of the reinforcement programme. In particular, flexibility at LV can significantly reduce the winter peak demand growth that is driven by the uptake of LCTs.

The forecasting of benefits from flexibility is far more complex at LV and HV than the equivalent process at EHV level, which relies on the individual use of the Common Evaluation Methodology (CEM) on a scheme-by-scheme basis, due to the number of schemes which are included over the RIIO-ED2 period. As such we worked with an independent external consultant to develop a new methodology to provide more accurate modelling across the range of assets below EHV.

Our methodology to calculate the benefits of flexibility at HV and LV analyses the LCT and consequent peak demand growth from each DFES scenario:

1) **Network assets**. For each network area we took DFES 2020 site specific information for three asset categories: HV feeders, LV feeders and secondary substations.

2) **Network utilisation**. At each site we calculate the utilisation of the asset in each year, noting that LCT uptake drives winter peak demand growth. This identifies the point where network assets become overloaded and requires reinforcement. Applying the appropriate unit costs for each asset type we can determine a "Without Flexibility" reinforcement profile.

3) **Potential peak demand reduction from LV and HV Flexibility**. Next, we examined the potential reductions to winter peak demand from a variety of flexibility sources.

    a. At LV our analysis included five different sources of flexibility: Domestic SMART Charging; Domestic Vehicle to Grid; Flexible Heat from Domestic Heat Pumps; Time of Use Tariffs uptake arising from Ofgem's Access and Charging Significant Code Review; and a variety of Energy Efficiency interventions. We referenced a range of published studies such as SmartCar, Project Shift and those in our Energy Efficiency CVP. For LV we also took account of behavioural and technical diversity and participation rates.

    b. At HV our analysis examined generation, storage, and demand-side sources in each network area. These are set out in the table in **section 6.7.6**. The intention is to defer reinforcement at specific (congested) locations for a few years for cost and / or deliverability reasons. HV Flexibility is considered applied to overutilised assets by 5% loading bands until they become a priority for reinforcement (at 115% loaded without HV Flexibility) and where the costs of HV Flexibility are at the market procurement availability and utilisation price.

4) **Creating "After Flexibility" peak demand profiles**. Applying the LV and HV flexibility sources to our 2020 DFES peak demand profile produces a new after flexibility peak demand profile for each DFES scenario. We examine LV flexibility first and then LV and HV flexibility together.

    a. We create a new "After LV Flexibility" winter peak demand profile by apply the LV flexibility demand reductions to each of the 2020 DEFS scenario (using step 1 and 3a). We then rerun step 2 to calculate the timing, volume and cost of the new reinforcement profile. This "After LV Flexibility" profile is lower than the "Without Flexibility" profile due to slower peak demand growth.

    b. We create a new "After LV and HV Flexibility" winter peak demand profile by applying LV and HV flexibility demand reductions to each of the 2020 DFES scenarios (using step 1 and 3b). We then rerun step 2 including the timing, volume and cost of the new reinforcement profile. This "After LV and HV Flexibility" profile is lower than the "After LV Flexibility" and "Without Flexibility" profiles due to slower peak demand growth.

5) **Apply business decision criteria**. We then examined the resulting reinforcement profiles and overlay various internal policies that we use to construct and maintain our network. The minimum GMT rating being installed is 500kVA and 50kVA for PMT to minimise system losses, according to our losses strategy. The maximum transformer rating supplying more than one customer is 1000 kVA, unless a single LV customer (1500 kVA). This is to maintain P2 compliance (SSEN Network Planning Standards). Finally, for RIIO-ED2, we decided to reinforce LV mains whether cable or OHL with 300mm2 Wavecon cable.

6) **The cost of flexibility**. Next for the sights where will deploy flexibility we calculate the costs of remunerating LV and HV flexibility providers. Here we assume the market procurement of 'dynamic' LV and HV flexibility sources are paid a £48/kW/year utilisation price. The costs of developing the SSEN central systems infrastructure to support e.g., network visibility and analysis, network data exchange with third parties, and active system management are required for multiple other purposes and are fully covered in other areas of the business plan.

7) **Cost and volume outputs**. Bringing the reinforcement profiles together with the cost of flexibility profiles provides, annual costs "Without Flexibility", "After LV Flexibility" and "After LV and HV Flexibility". We also calculate various supporting information such as the number of interventions to make in each given year, the kilometers of OHL / Cable and the number of transformers to be reinforced and volume of Flex deployed. All of which are inputs to CBA models.

8) **CBA**. We take the resulting cost outputs and conduct a CBA to calculate the net benefits of deploying LV and HV flexibility compared to the "Without Flexibility" counterfactual. This CBA then confirms the optimum route for investment vs flexibility and generates the outputs used in our Engineering Justification Papers (EJPs) for HV, LV and Secondary substations.

6.7.2 ANALYSIS METHODOLOGY

The different voltage level and license area Analysis Modules import and store the 2020 DFES network asset data (as appropriately reduced to required fields and manageable numbers of rows) with peak demand and other data for each asset / year combination in a data row and enable alternative views of the data:

- **Asset Summary** worksheet – a view of each asset with its unique identifiers (e.g., NRN) and technical data (e.g. rating) and showing calculations of utilisation and timings, volumes (e.g. km), and costs of reinforcement before and after interventions;
- **Year Summary** worksheet – a view by years showing annual totals across assets of reinforcement volumes and costs as well as flex interventions applied (by type).

A full description of the different sheets within the Analysis modules is given in the 'Structure' worksheet (first tab in each workbook).

6.7.3 ASSET UTILISATION ANALYSIS TO DETERMINE REQUIRED REINFORCEMENT

The approach employed looks at the asset utilisation in each year in order determine when each asset will require reinforcement. We do not model the reinforced asset but assume that the reinforcement policy of 'maximum upgrade' and replacement of LV OHLs with Cables will result in not having to touch the network again before 2050.

The detailed steps are:

- in each year compare forecast peak demand at each network asset to the asset rating (or in the case of transformers, the emergency rating)
- for each year record where this loading ratio exceeds the LDNG Threshold (a parameter set at 100%) and save the first year where reinforcement is required (i.e., the asset becomes overloaded) in the Asset Summary sheet
- against each asset, and separately for each asset type (e.g., PMT / GMT transformers or OHL / Cable feeders), record the volume (in the case of feeders, the km length) and calculate the reinforcement cost by applying official reinforcement costs to volumes by asset type
- calculate the aggregation across all assets by year for volumes and costs and so creating a reinforcement programme identifying the required reinforcements in each year
- calculate summary information including the utilisation of assets by year split in 20% loading bands and display as a chart

This process is repeated a number of times:

- the 'before' picture of the network asset portfolio before any flex interventions
- the 'after LV Flexibility' picture of the network asset portfolio subject to reduced demand growth resulting from LV flexibility interventions
- the 'after HV & LV Flexibility' picture of the network asset portfolio subject to reduced demand growth resulting from LV flexibility interventions followed by the application of HV flexibility

6.7.4 ASSET UTILISATION ANALYSIS TO DETERMINE REQUIRED REINFORCEMENT

We have considered the impact of the following LV flexibility initiatives:

- Domestic SMART Charging
- Domestic Vehicle to Grid (V2G)
- Flexible Heat from Domestic Heat Pumps
- Time of Use Tariffs uptake arising from OFGEM's review of DUoS charging
- Energy Efficiency interventions

Each of these LV flexibility interventions operate by shifting demand away from the winter teatime peak or reducing the peak (in the case of Energy Efficiency) and so we have modelled their impact by means of a reduction in the peak demand (drawn from published studies). However, given that the LCTs are driving demand growth and will account for around 50% of LV network load by the end of ED3, in future studies proper account needs to be taken of how the load is shifted within the day so that we understand how the maximum load on the asset (across the whole day) is reduced and not just shifted away from the teatime peak. This will be an important consideration when designing any promotion and enablement of SMART Charging together with aggregator(s): avoiding a fixed overnight charging window which simply shifts the peak.

We focused only on domestic off-street Smart Charging and V2G initiatives although we acknowledge that there is significant further potential for these interventions to be applied to fleet users or bus and coach operators. However, the business models and the studies of charging behaviour are not as yet sufficiently mature to provide estimates of the peak demand impact so that non-domestic uses and domestic on-street uses have been excluded from this analysis.

We have drawn from public studies and the Energy Efficiency CVP to determine the peak demand reductions arising from LV flexibility interventions. We have adjusted for demand profile diversity, both behavioral and technical, in our modelling by adjusting the average demand reduction by following the relationship established in WPD's Electric Nation study. Essentially, 1 EV owner with a 7kW SMART charger could shift 7kW away from the teatime peak but 100 such participants may only shift an average of 2kW away from the peak. Such diversity considerations are understood to be incorporated in the DFES peak demands so that it is appropriate to also apply diversity adjustments to the peak reductions. The average kW reductions are shown in the following table and are typically based on studies with over 300 participants.

LV Flexibility	Assumptions
Smart Charging	• Method: Average kW reduction (-0.76kW) per EV charger • Rollout: Starting 2023, increasing SC participation over time [20-50%] • Source: Project SHIFT Notes: • 1. Participation refers to the % of EV owners participating
Vehicle to Grid	• Method: Average kW reduction (-0.73kW) per EV charger • Rollout: starting 2025, increasing V2G participation over time [5-15%] • Source: Project SHIFT Notes: • 1. Participation rates apply to EV owners - together 65% of EV owners are assumed to eventually sign up to SC or V2G
Flexible Heat	• Method: Average kW reduction (-0.3kW) per HP • Rollout: starting 2025, increasing Flexible Heat participation over time [5-15%] • Source: Heat pumps in SMART Grids (Danish Study) Notes: • 1. Participation refers to the % of consumers with HP participating
DUoS ToU Tariffs	• Method: Average kW reduction (-1.1kW) per domestic consumer • Rollout: starting 2023, increasing participation over time [6.5-39%] • Source: Project SHIFT (Octopus AGILE) Notes: • 1. only available to customers with SMART meters, rollout follows BEIS SMART meter rollout; • 2. suppliers will want to pass through DUoS ToU rates but significant customers may still choose the simplicity of a flat rate tariff; • 3. participation here means the % of domestic consumers signing up for a supplier ToU tariff; • 4. consumers may schedule all household demand away from high price periods (e.g. dishwashers and washing machines as well as EV charging)
Energy Efficiency	• Method: Average kW reduction (-0.09kW) per residential consumer - weighted average of 20k LED, 400 SMART storage heating, 1k insulation, and 1k SMART controls installations • Rollout: starting 2023 for 5 years • Source: RIIO-ED2 BP Energy Efficiency CVP Notes: • 1. Total of 22,400 installations across SSEN's two License Areas; 2. LEDs and insulation will reduce demand more broadly than just at the peak

The aggregate volumes of LV flexibility are driven by the growing numbers of LCTs over time together with the assumed participation rates. The ToU volumes are driven by the assumed uptake of supplier ToU offers. The total number of Energy Efficiency installations is finite and implemented over 5 years, but the demand reduction benefits accumulate over the 5 years and persist.

The volume impact of LV flexibility can be clearly seen in the following chart which shows demand growth (driven by LCTs) over the period to 2050 for the SEPD License Area for LV Feeders.

LV flexibility produces a substantial reduction in the overall demand and also the utilisation of network assets. The demand growth (driven by the growth in LCTs) is significantly slowed so that in turn required reinforcement is deferred saving costs for customers and improving deliverability by spreading out effort to reinforce the network. This also highlights the need to clarify the level of e.g., SMART Charging assumptions already embedded in the DFES.

Similar but diluted impacts of LV flexibility apply to secondary substations and HV feeders (due to unabated non-domestic sources of demand growth). Consequently, establishing the full benefits of LV flexibility requires the stacking of reinforcement deferral benefits from each of the voltage levels.

In calculating the impacts at higher network voltage levels, we have applied loss multiplier factors to the peak kW reductions as measured at the customer gate. Although we are not aware of any explicit electrical loss factors being used in the development of the DFES these may be implicitly reflected by the reconciliation of both top-down and bottom-up methods of allocating demands to individual network assets.

6.7.5 LV FLEXIBILITY COSTS

There are several categories of the costs of providing LV flexibility that can be considered:

- the capital expenditure costs of developing central DNO / DSO systems e.g., to provide network visibility and analysis, load forecasting of network status and utilisation, exchange of dynamic network data with third parties, and active management of dynamic flex resources
- the fixed operational expenditure cost of supporting flex initiatives including e.g. customer service, tenant liaison, and IT support for connection of LCTs and the operation of comms networks for dynamic LV flexibility (this will also include LV monitoring at substations and on LV feeders)
- the variable costs of installation including marketing incentives or contributions to consumer IT / comms installation costs, and the investment costs in the case of Energy Efficiency equipment installed
- the market costs of procurement by SSEN from e.g., aggregators of dynamic flex incorporating both availability and utilisation payments

Appropriate allocation of these costs is important, and it has been decided that all the fixed capital expenditure and operational expenditure costs are already covered elsewhere within the Business Plan and would be double counted if also included here. Broadly speaking, such upgrades to, and operation of, central systems are required for much wider purposes including DER management, management of CMZs, Active Network Management, and to facilitate other DSO activities.

It may be appropriate to include the variable costs (potentially including incentive payments) driven by incremental numbers of LCTs connecting each year as well as the market flex procurement costs. The variable costs are given in the table below. What is unclear however, is what proportion of these costs a DNO would bare outside of any CVP interventions. Our assumption was that suppliers, aggregators or customers would face these costs and they would not be attributable to SSEN outside of any specific CVP.

	Variable Cost / Installation (£)	Variable Cost / Substation (£k)
SMART Charging	100 (Contribution to marketing / installation / configuration costs)	Cost not included but volumes reported (monitoring required after substation utilisation exceeds 80% or a downstream LV feeder exceeds 80% loading)
V2G	200 (contribution to marketing / installation / configuration / comms costs)	
Flexible Heat	200 (contribution to marketing / installation / configuration / comms costs)	
DUoS TOU Tariffs	n/a	n/a
Energy Efficiency	180 (installed client equipment / comms, IT support) rolled out to 22,400 recipients	n/a

The market procurement costs are based on a previous analysis of activity on flex platforms. The values used are:

- **Availability price:** £0 / kW / year
- **Utilisation price:** £48 / kW / year

We have made the additional assumption that dynamic LV flexibility would be paid a utilisation price. Sensitivities on these prices will be undertaken due to the emerging nature of the flex markets and the potential volatility in prices.

In the case of DUoS ToU, it is assumed that the outcome of the OFGEM review of DUoS Tariffs will result in a mandatory change from 2023, so DNOs should be able to recover the costs of tariff development and billing system changes via other routes and so it is not appropriate to additionally include such costs against LV flexibility initiatives.

The Energy Efficiency initiative is the subject of a separate CVP which will include all relevant costs.

6.7.6 HV FLEXIBILITY VOLUMES & COSTS

HV flexibility is modelled as being applied to HV Feeders after the (upstream) impact of LV flexibility although it is likely to be developed in parallel. The intention of HV flexibility is to provide intervention to support the network until such time as reinforcement is feasible. So HV flexibility is applied to successive 5% utilisation bands for overloaded assets until they would be 115% loaded (without HV flexibility) when it assumed they are a priority for reinforcement. This has the effect of applying HV flexibility for a few years at specified locations after which the assets are reinforced and likely reflects realistic reinforcement cycles.

SEPD HV Flexibility sources	SHEPD HV Flexibility sources
• Co-located Battery Storage • Standalone Battery Storage • Behind the Meter Battery Storage • Data Centres • Gas / Diesel Generation	• Co-located Battery Storage • Standalone Battery Storage • Behind the Meter Battery Storage • Hydro

HV flexibility is not assumed to be always available but the volume of HV flexibility is capped in each License Area by a broad assessment of availability from DER and other sources including battery storage (co-located, standalone, and behind-the-meter), hydro, peaker generation, and data centres. These generation, storage, and demand-side sources have a series of factors applied to determine what Flex is available to be deployed:

- **voltage connection level** – to determine what proportion is available at the HV rather than the EHV level
- **locational match with likely network congestion** – to reflect the likelihood that Flex is available in the right location to address specific areas of network congestion e.g., hydro is given a lower likelihood while data centre demand side response is given a high likelihood
- **participation level** – to reflect whether e.g., peaker generation is providing other services which reduces the ability to provide flex or alternatively what proportion of a data centre's demand is covered by back-up generation

Together these factors provide a broad estimate of the HV flexibility capacity that is likely to be available. More rigorous analyses of matching of sources to network need would be possible (e.g., down to primary substation level). This availability cap is applied sequentially to the 5% utilisation bands until availability is consumed.

The cost of HV flexibility is calculated using the same market procurement price, a utilisation price of £48/kW/year, as for LV flexibility but with price sensitivities to examine a range of outcomes.

6.8 APPENDIX H – NETWORK VISIBILITY STRATEGY

6.8.1 INTRODUCTION

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 visibility approach will give us 100% visibility of power flows (on all asset levels of our network) through the installation of LV monitoring on 19% of our secondary ground-mounted substations, direct embedded measurement of selected plant, 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:

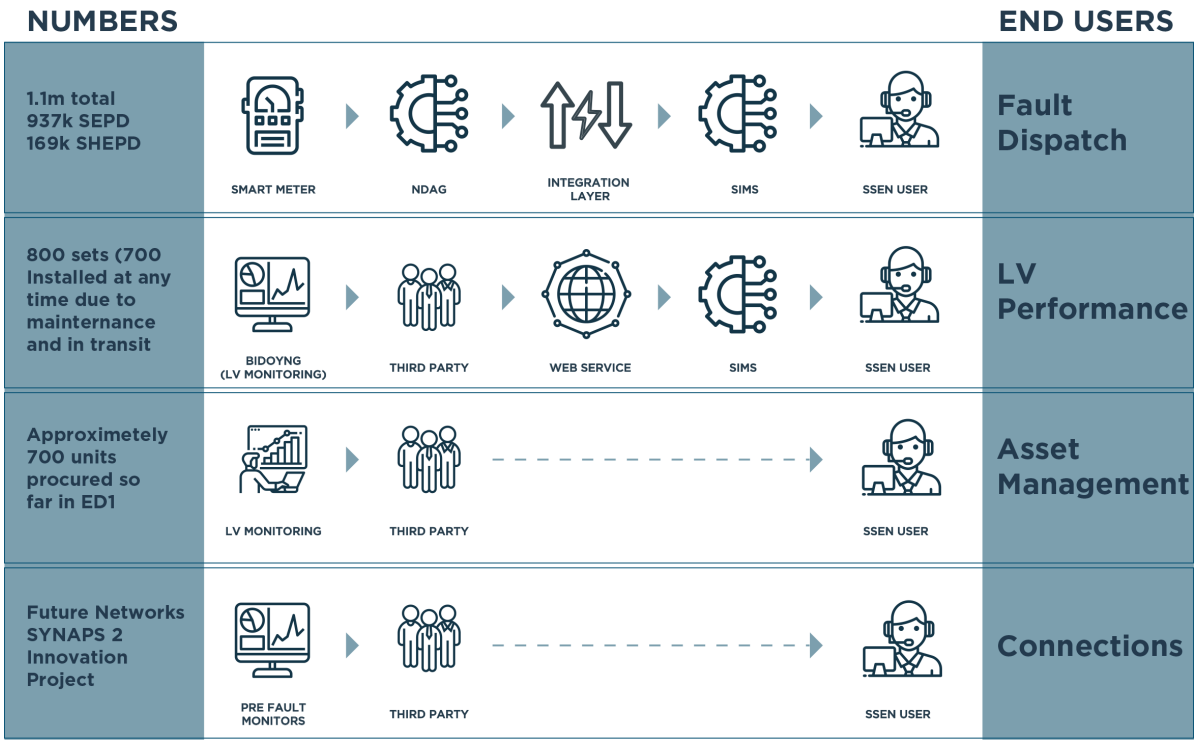
SSEN will seek to provide all the information that our customers need, in a format they can use.

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

- Rapid Digital Self Service connection and additional load quotations.
- Tools to allow Domestic Customers to participate in the flexibility Services Market
- Tools for stakeholders to identify the optimal location for public charging infrastructure
- Local Community energy exchange markets
- Tools to predict faults and reduce interruptions

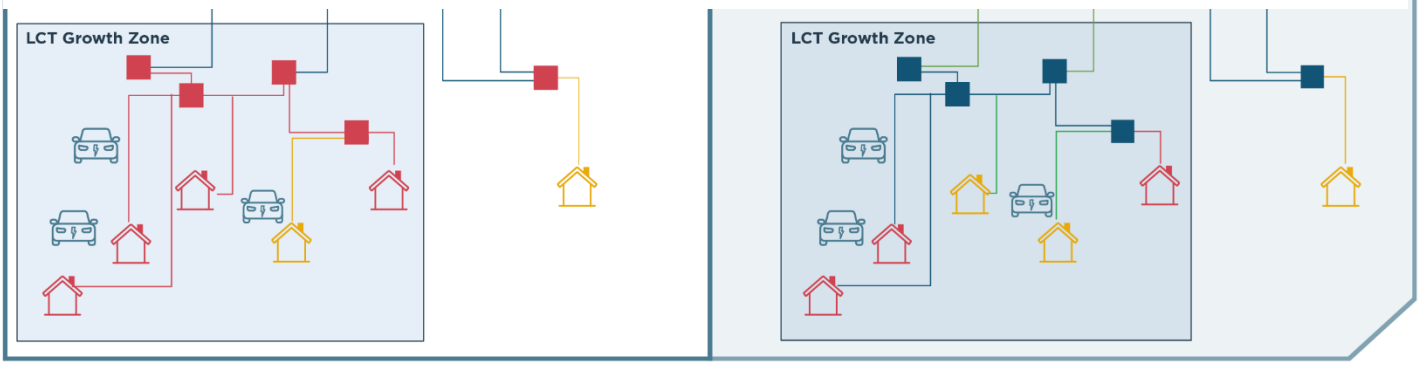
In RIIO-ED1 we have already started to improve the visibility of the network through the installation of monitoring and consolidating the resulting data.

CURRENT MONITORING ON THE LV NETWORK



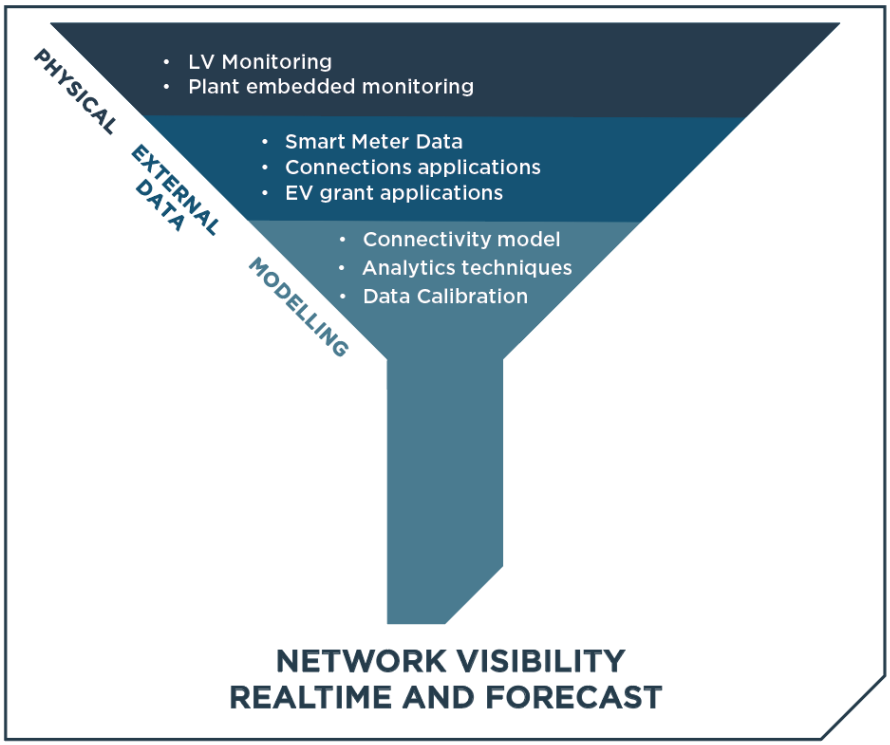
As we transition to RIIO-ED2 and with the challenge of delivering on our governments' net zero ambitions, we will need to build on our existing capability and increase visibility:

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 Direction Power Flow
33/11KV SUBSTATIONS	High Resolution, Real time Voltage and Current	High Resolution, Real time Voltage and Current plus Direction Power Flow
11KV CIRCUITS	High Resolution, Real time Voltage and Current	High Resolution of Voltage and Current plus Direction Power Flow
11KV/LV SUBSTATIONS	Manual 6 month MD reading	High Resolution Voltage and Current on sites are risk (19%) Modelled profiles on remainder utilising 80% Smart meter penetration
LV CIRCUITS	None	Calibrated models providing Load profiles and maximum demand
SERVICE CABLES	None	Aggregated and modelled Smart Meter data.



In our RIIO-ED2 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 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 is to develop a platform that will blend direct measurement, modelling 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. It 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.



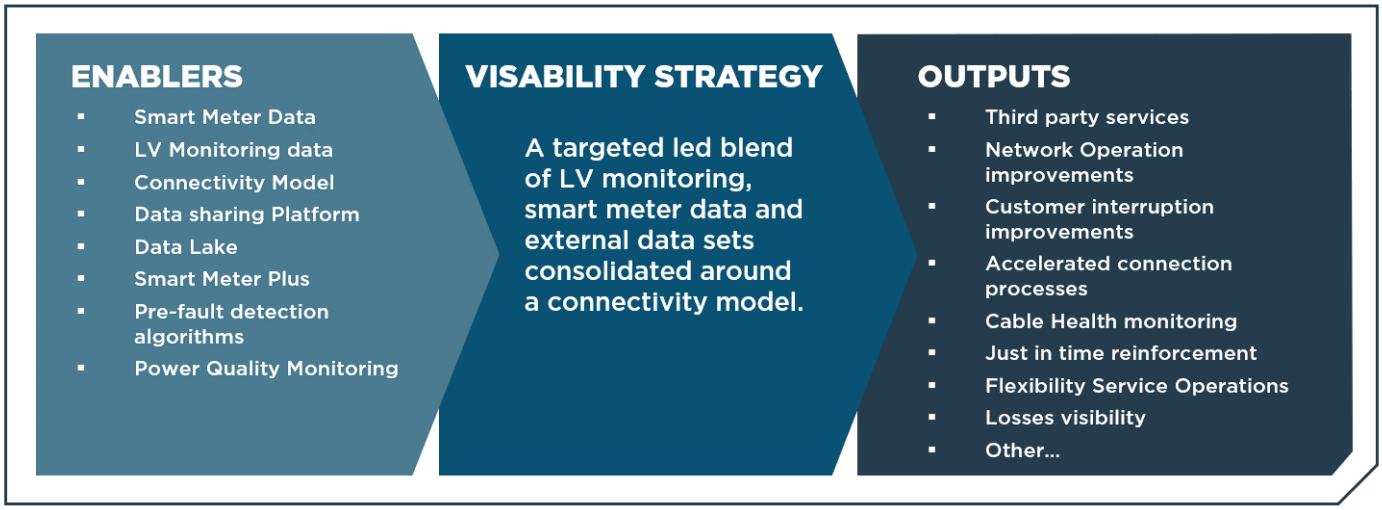
In designing this approach, we have utilised analytics to identify the optimal volume of direct network LV monitoring, this modelling has shown us that we require to monitor 19,000 Secondary Substations (19% of our fleet) in order provide enhanced visibility of those assets at risk during RIIO-ED2 and early ED3 under our adopted load growth scenarios.

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 delivering this strategy is composed of a number of investments all of which have secondary benefits beyond network visibility:

Item	Cost (£m)
LCT Analytics	1.54
Connectivity++	9.77
Open Door (Data Sharing)	5.31
Smart Meter+ (Smart Meter system obsolescence)	4.41
LV Monitoring (19,000 units)	27.84
Power Quality Monitoring and Directional Power Flow	1.97
MDM, Data Lake and Analytics	13.44
Incremental Cost of Monitoring-ready Plant	Negligible

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. We have not attempted an arbitrary apportionment of the benefits from these areas to our investment in Visibility within this document.



6.8.2 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:

LCT Analytics (covered in Section 11.9 LCT Analytics, Annex 5 Digital Investment Plan)

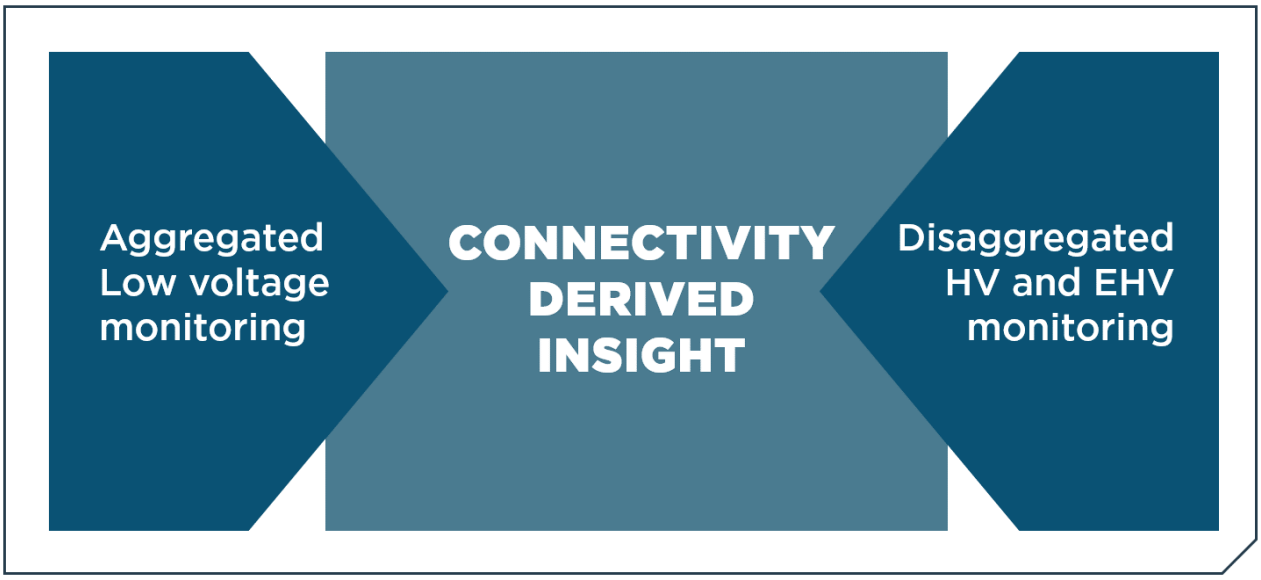
In the preparation of our Submission our Data & Analytics capabilities have allowed us to build a network constraint tool. This allowed us to combine expected load demands from LCTs uptake (as part of our Distribution Future Energy Scenarios) with load estimations for every property, before integrating asset data such as transformer ratings and loading history (i.e., Maximum Demand Indicator (MDI) readings). This provided us with estimations for where and when we would likely 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 installation programme both in RIIO-ED1 and into RIIO-ED2.

During RIIO-ED2 we intend to continue to develop the sophistication and granularity of this modelling capability in particular the forecasting aspect and LV network granularity. We will actively pursue other data sets, this data could take the form of EV uptake, tariff trends, price sensitivity indices, customer surveys, etc. and would provide an additional layer of insight that can be utilised to improve the accuracy of our forecasts reducing the risk of "just too late" investment in the network and flexibility services.

Connectivity++ project (Section 11.3 Annex 5 Digital Investment Plan)

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++ 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:

Realtime connectivity model:

This is the "Real-time" connectivity of the system and is required to allow the signalling of the appropriate Distributed Energy Resource (DER) and flexibility services in response to an anticipated overload and decision made on an Operational timeframe.

Forecast Connectivity model:

This is a short-term forecast of connectivity taking into account the planned routine switching of the network and allows constraint forecasting and market signalling.

Planned Connectivity model:

This is med-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.

Data Sharing /Open Door/ Tailored Insight (Section 9.5 Annex 5 Digital Investment Plan)

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 will build the interfaces, portals, security and processes necessary to enable multilateral multidirectional data exchange and sharing.

The value of data sharing is something we have been exploring and developing in RIIO-ED1

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.

We will be providing an open data "shop-front" to make it easy for third parties to access our data and services, including the relevant network visibility. We are also supporting the development of the ENA's National Energy System Map (NESM) to provide third parties with a single source of data for many network assets, this will be dependent on a robust Network Visibility approach.

Using our innovation funds, we have established the NeRDA (Near Real-time Data Access) tool to go beyond existing data sharing methods by examining how near real-time data can be best used by stakeholders to meet these requirements.

We have also considered the recommendations of both the EV Energy Taskforce and Energy Data Taskforce and started innovating through projects such as the NIA-funded *Skyline* which aims to demonstrate that early-notifications of customer enquiries and/or orders can support timely investment in our network, with the aim of this becoming a standard feature to support network visibility. Finally, we have worked with OZEV and DfT to secure data sharing agreements for DNOs to get anonymised locational data on registered keepers of EVs and locations of customers who took advantage of the EVHS and WCS grant schemes for EV chargers, which are helping to inform the targeted investment initiatives via our Data & Analytics Load Model.

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.

Smart Meter+ (Section 11.2 Annex 5 Digital Investment Plan)

At this point Smart Metering penetration is 29% in our licence areas, and the forecast of supplier installation ratesedict it will be 80% by early 2024.

Smart meter data, (even partial as demonstrated in the New Thames Valley Vision (NTVV) project), can be leveraged against LV monitoring data with the combination of the two sources providing a level of visibility and accuracy greater than the sum of the parts through statistical techniques such as Buddying.

The current penetration of smart meters in our regions are relatively small compared to the number of customers we serve, therefore some benefits can be realised from certain scenarios in the short term, but others will require a fuller penetration of meters to enable effective use, for example data to assist with load profile modelling on our low voltage network and making better informed decision on network investment will require approximately 80% penetration of smart meters.

We expect to be able to further improve the forecasting of load on LV networks by incorporating data from smart meters and an enlarged LV monitoring fleet. 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. These alerts can be used in real-time to respond to network issues or analysed as part of a customer voltage enquiry. We will be using voltage data to enhance the service to our customers when dealing with voltage enquires and integration into our OMS so we can respond 24/7 to genuine network voltage issues. Smart Meter Voltage Monitoring will have a key role to play in the implementation of CLASS (should it proceed) ensuring that customers remain within the statutory voltage limits.

Work is already underway in our *Smart Phase 2* project to enable us to poll smart meters for key information at scale and create the pipelines for this data to feed into our Data & Analytics platform.

Once complete, this will allow the incorporation of regularly updated 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 forecast will be most susceptible to early constraints as a result of LCT growth and clustering.

The Smart Meter+ project deals with obsolete aspects of our IT estate and will ensure that we can continue to secure maximum value from the smart metering data available to us.

LV Monitoring (Section 12.2 Annex 5 Digital Investment Plan)

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.

During RIIO-ED1 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 Metering are sparse
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 focussed 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 in RIIO-ED1. 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 also 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 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.

The Visibility Role of Smart Metering

It is worth noting the limitations of Smart Metering (SM) as a definitive source of Network visibility at this point in its development. A key element of DSO operations, namely requesting/validating delivery of flexibility services, hinges upon near real-time visibility of demand on our networks.

Whilst smart metering consumption data will be captured at half-hourly intervals and aggregated at LV feeder level to inform load levels, it will not be possible to gather it in near real-time nor with the time resolutions necessary to manage constraints due to a combination of Data Privacy and processing delays, irrespective of SM penetration. Typically processed Smart Metering data is available to is 2-4 weeks in arrears an overloaded circuit could require an intervention within a matter of minutes.

While smart meter data at suitable penetration levels can provide us with visibility of Capacity at low resolution, the addition of LV monitoring provides us with aggregated load readings in near real-time high resolution and time resolution. They also allow us to view more subtle constraint parameters such as phase balance, Neutral Current, Harmonics, power Factor, loss and Transformer temperature.

LV monitoring can further complement smart meter data through the use of analytics to build and subsequently maintain our Connectivity model. On many older networks connectivity down to the individual phase connection at domestic properties is not recorded. This data is a key requirement for the accurate dispatch of LV connected flexibility and to allow phase balancing on LV networks, a technique that can release up to 30% more capacity in extreme cases.

Roll-out Programme Continuous Review

By focussing 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, 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 (being demonstrated in project *Skyline*) 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.

Pre-fault Detection Data (Section 12.2 Annex 5 Digital Investment Plan)

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. We are currently trialling 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.

Power Quality Monitoring (Section 12.5 Annex 5 Digital Investment Plan)

Many LCTs are based on power electronics. Such devices often have a 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 are establishing high-bandwidth communications as part of the rollout of our Operational Technology Network (OTN).

Where we install the OTN, Power Quality Monitors will be deployed on all transformer (LV side) circuit breakers at each grid substation in SEPD and on the transformer (LV side) circuit breakers at all primary substations with embedded generation in their associated HV networks (in the SHEPD area, EHV transformer incomer circuit breakers are owned by SSEN Transmission).

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

Data Lake (Section 10.5 Annex 5 Digital Investment Plan)

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.

6.8.3 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.

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.

Network Operation Improvements

Our **DSO Strategy Annex 11.1** and **Control Room Replacement Papers (415_SEPD_DSO_Distribution_System_Control_Room_SEPD and 416_SHEPD_DSO_Distribution_System_Control_Room_SHEPD)** make clear the need for increased active management of our Low Voltage network. By making real-time data available to our Control Rooms, we will be able to support efficiencies and reduced customer interruptions. This will apply across our HV and LV networks through proactive or rapid reactive network reconfiguration, and similar for dispatching colleagues skilled at dealing with faults. There are also benefits relating to asset management, facilitating DSO, enabling flexibility, and supporting new connections through visibility of capacity and other network parameters.

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 to align with times of least load thereby 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.

6.8.4 FUTURE UPDATES

We recognise that advances in technologies, processes and systems are likely to take place during RIIO-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) will also continually evolve, helping to ensure our Strategies continue to meet customer and industry needs.

Despite the uncertainty in RIIO-ED2 we are not requesting an uncertainty mechanism for Network Visibility in RIIO-ED2 as we believe that our Network Visibility Strategy provides the flexibility and responsiveness necessary to deal with higher levels of uptake.

6.9 APPENDIX I – MANAGING CONFLICTS OF INTEREST

6.9.1 BUSINESS SEPARATION IN PRACTICE

The intent of this appendix is to inform stakeholders of the business separation arrangements, in relation to the operation of Distribution Network Operator (DNO) and Distribution System Operation (DSO) capabilities within SSEN Distribution. This is achieved through setting out and clarifying the following key elements for business separation:

- What is meant by business separation?
- Why we are applying business separation within SSEN
- Where the obligation to maintain business separation compliance lies
- How business separation will apply in practice
- How compliance with business separation requirements is assured
- Recognising and reporting breaches of business separation compliance
- Business separation training requirements
- Consequences of business separation non-compliance

While the concept of business separation is simple in theory, the practical application is often less clear cut. This document aims to address that situation and sets out an overarching approach and principles that will be applied by SSEN.

6.9.2 WHAT IS MEANT BY BUSINESS SEPARATION?

Throughout the remainder of RIIO-ED1 and in RIIO-ED2 SSEN will continue to put in place specific institutional arrangements to separate the managerial and operational aspects of the functions that deliver DNO and DSO capabilities. The purpose is to ensure that decisions on network development and operation are cost-effective, efficient, and made in the best interests of our customers. This necessitates a robust approach to the treatment of:

- Decision-making
- Data
- Systems
- Locations
- Subsidies

6.9.3 WHY WE ARE APPLYING BUSINESS SEPARATION WITHIN SSEN

Distribution Network Operators are natural monopolies and as such they are faced with the risk of potential conflicts of interest in providing DSO capabilities (from both stakeholders and Ofgem). Those conflicts of interest can be summarized as:

- Lack of independent advice
  - Asymmetrical availability of data
  - Operating in a silo
- Bias in network development (capacity provision)
  - Favouring DNO reinforcement
  - Favouring DNO smart solutions
- Bias in facilitating competition
  - Bias in procurement/dispatch
  - Discouraging 3rd party involvement

SSEN is implementing Business Separation to prohibit such activity and ensure no conflicts of interest arise. This separation of DNO and DSO capabilities is encouraged in the baseline requirements for DSO in Ofgem's Business Plan Guidance as well as the Smart Systems and Flexibility Plan jointly issued by BEIS and Ofgem. In addition, whilst stakeholders are (quite rightly) cautious about the cost and risk of creating a new legally separate DSO entity, they have fed back to SSEN that they would like to see clear lines between these capabilities within our networks business.

6.9.4 WHERE THE OBLIGATION TO MAINTAIN BUSINESS SEPARATION COMPLIANCE LIES

The ultimate responsibility for ensuring that the controls, separating our DNO and DSO capabilities, are implemented effectively sits with the SSEPD Board. Detailing them within our RIIO-ED2 Business Plan ensures our business separation provisions will sit within legislation and become part of SSEN's licence conditions, hence compliance is required. Consequently, this business separation framework is fundamental to ensure compliance with our legal and regulatory obligations in the next price control period. It will be used in the practical application of business separation within our Distribution business. In simple terms, the components to ensuring effective business separation are:

- A company structure that supports managerial and operational separation controls
- A suite of processes that appropriately direct and guide staff on the required controls to comply with business separation requirements

- Staff awareness, buy-in, and training to ensure that the controls are understood and adhered to
- An oversight mechanism to ensure that controls remain fit for purpose, there is provision of business support, issues can be effectively identified, and remediated, and continual improvements are coordinated and implemented

It is ultimately the responsibility of the SSEPD Board to ensure that these components are supported and that an annual status report / plan guaranteeing operational independence and financial ring-fencing is provided for scrutiny.

6.9.5 HOW BUSINESS SEPARATION WILL APPLY IN PRACTICE

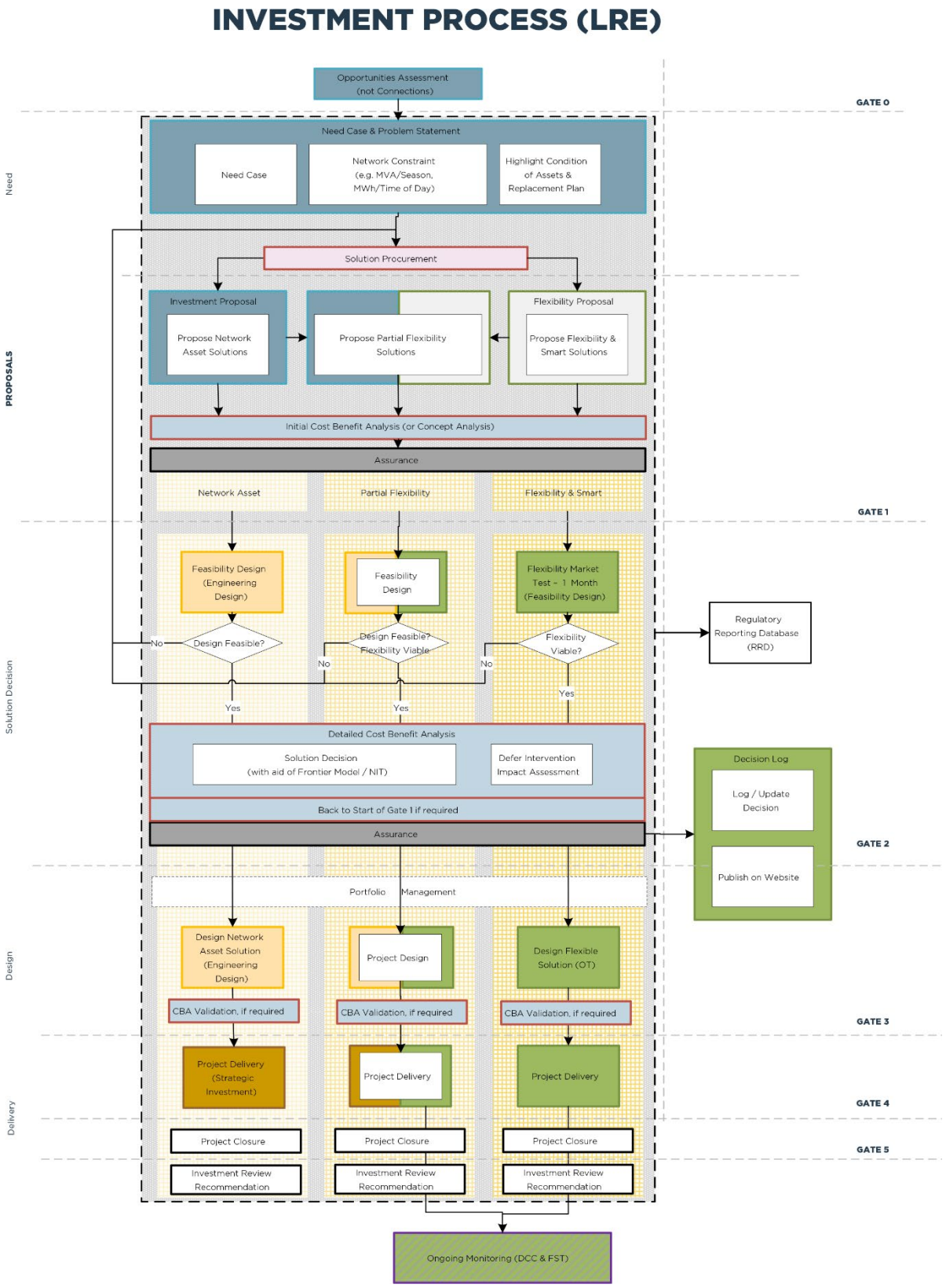
As stated in the introduction, the concept of business separation is simple in theory, the practical application is often not. No document can hope to address all potential scenarios. Nevertheless, the matrix below illustrates how business separation is part of a much wider layered approach to address conflicts of interest:

ADDRESSING CONFLICTS OF INTEREST

IMPLEMENTED IN ED1 | TO BE IMPLEMENTED IN ED2

POTENTIAL COIS FOR SYSTEM OPERATORS	WHAT DOES THAT MEAN FOR DSOS?	LAYERS IN PLACE TO ADDRESS CONFLICTS OF INTEREST…					
		Education & Culture	Governance	Clarity of Decision-Making	Transparency	Independent Audit	Stakeholder Feedback
		Internal and external awareness	DSO Business separation* ensures independent decisions	Clear criteria and robust processes	Of governance, decisions, processes, & outcomes	Ensuring rigour and accountability	Stakeholder board to challenge & improve
LACK OF INDEPENDENT ADVICE	Asymmetrical Availability of Data	Compulsory GDPR training for all staff	Availability of data unaffected by business separation	Adopting recommendations of Data Task Force including data triage	Open data with universal access ('I see what the DNO sees') https://www.ssen.co.uk/NetworkCapacityInformation/	Data will be audited for content and accessibility	Data review part of remit
	Operating in a silo	Fostering links with stakeholders from other vectors	DNO just one of a range of potential vector solutions	Whole system approach part of the decision-making process	Decisions published and can be evaluated for whole system https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=20368	Auditor will check for whole system considerations	Will include stakeholders from other vectors
BIAS IN NETWORK DEVELOPMENT (CAPACITY PROVISION)	Favouring DNO Reinforcement	Challenging misperceptions with clear regulation & internal processes	Asset v flex decision separate from DNO capital expenditure plan (within DSO)	Rationale for decisions clearly laid out – Common Evaluation Methodology utilised https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=17884	Decisions published https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=20368	Auditor checks decisions	Audit published and made available to group in advance
	Favouring DNO Smart Solutions	Challenging misperceptions with clear regulation & internal processes	Smart grid solution part of asset v flex decision separate from DNO	Rationale for decisions clearly laid out – Common Evaluation Methodology utilised https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=17884	Decisions published https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=20368	Auditor checks decisions	Audit published and made available to group in advance
BIAS IN FACILITATING COMPETITION	Bias in Procurement/ Dispatch	Compulsory competition law training for all staff	Regulated/non-regulated separation in place - secure building access in place for SSEN relative to SSE. Dispatch Rules set by DSO	Procurement and dispatch processes align with Open Networks https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=17880	Network requirements published along with procurement and dispatch outcomes https://www.ssen.co.uk/FlexibleConnections/	Outcomes checked by auditor	Audit published and made available to group in advance
	Discouraging 3rd Party Involvement	Compulsory competition law training for all staff	Regulated/non-regulated separation in place - secure building access in place for SSEN relative to SSE	Clear parameters for 3rd parties to view and submit solutions - approaches formally documented and assessed	DFES and NDP provide advanced insight to network requirements allowing for innovative 3rd party solutions https://www.ssen.co.uk/ConnectionsInformation/GenerationAndStorage/FlexibleConnections/CurrentCallsForFlexibility/	Formal approaches outside of standard flexibility procurement recorded and evaluated by auditor	Spectrum of representatives will be able to challenge lack of diversity in network solutions

In the remainder of RIIO-ED1, business separation will be supported by staff education, clear decision-making criteria, robust processes, and transparent outcomes. The flow chart below illustrates the clear framework that is already in place to bring rigour and transparency to our decisions between reinforcement and flexibility:



In addition, in RIIO-ED2, all these areas will be subjected to independent audit and scrutiny by an independent stakeholder board.

6.9.6 HOW COMPLIANCE WITH BUSINESS SEPARATION REQUIREMENTS IS ASSURED

By enshrining its detailed approach to business separation in our Business Plan for RIIO-ED2 SSEN is placing a regulatory requirement on itself to demonstrate compliance with its stated obligations. To provide comfort and assurance that SSEN does indeed remain compliant a variety of measures will be utilised. At base level, also known as the first line of defence, these measures sit within the SSEN business units' 'business as usual' activities, where processes and procedures must document the appropriate checks and controls necessary to ensure activities have accounted for business separation considerations. Specifically, these should provide effective controls for:

- Clear areas of responsibility and accountability
- Defined hand-offs and decision-making process
- Business separation staff training and awareness
- Avoidance of cross-subsidies

As a second line of defence, in RIIO-ED2, an independent auditor will be appointed to conduct an annual review of processes, practices and outcomes, adding value through the identification of improvements. This auditor will operate independently of the SSEN business and will submit its findings to an independent stakeholder board. The stakeholder board is a third line of defence that will review SSEN's compliance and report annually their findings to the SSEPD Board in accordance with the structure laid out in our Business Plan. The findings of the independent auditor and the stakeholder board will be published annually on our website.

6.9.7 RECOGNISING AND REPORTING BREACHES OF BUSINESS SEPARATION COMPLIANCE

It is the responsibility of all SSEN staff to raise concerns they have regarding compliance with these rules within their own business area. In the first instance staff will speak with their line manager (or Regulation) for advice. Any material concerns or reports will then be reported to the DSO Transition Manager. In the event of any SSEN Networks Business Separation complaints being logged, these will be handled in accordance with Business Separation Complaints logging procedures within SSEN Distribution and ultimately must be passed to the DSO Transition Manager for review. The DSO Transition Manager is responsible for:

- recording and investigating reported breaches of SSEN business separation obligations
- reviewing and determining on SSEN business separation exemption applications (in conjunction with a relevant SSEN Business Director)
- monitoring the completion status of SSEN business separation mandatory training
- reviewing business separation compliance
- advising the external auditor of business separation matters where appropriate, and supporting the stakeholder board in the course of their duties and annual review
- delivering and publishing the annual business separation reports from the auditor and stakeholder board

The independent auditor is responsible for providing independent oversight to all business separation matters and is advised of progress on a regular basis through ad hoc and formal meetings. They are also responsible for producing the annual report for the stakeholder board.

6.9.8 BUSINESS SEPARATION TRAINING REQUIREMENTS

SSEN Business separation training will be made available via an internally developed interactive e-learning module, administered through the SSE Learning & Development training suite and will complement existing competition law training. For SSEN staff business separation training will be a mandatory annual exercise, while remaining optionally available for all other SSE staff. The training is planned to raise and test practical awareness of likely business separation scenarios, and in conjunction with knowledge of this procedure provides the staff member with a good general grounding to apply compliant business separation practices as pertinent within their business area. A record of staff having successfully completed the training will be maintained by the SSEN Training Development and Leadership Support Team and reported to the DSO Transition Manager.

6.9.9 CONSEQUENCES OF BUSINESS SEPARATION NON-COMPLIANCE

Through the application of business separation as part of a layered approach SSEN is endeavouring to remove the risk of potential conflicts of interest. We are very aware that the consequences for not complying with our requirements for business separation could result in:

- Significant reputational risk
- A lack of market confidence
- Legal challenges

6.9.10 STAKEHOLDER CHALLENGE GROUP

The transition to providing a DSO capability will enable more cost-effective decisions about network investment through the deployment of flexibility services purchased from the market. It is fundamental to the success of this ***Flexibility First*** approach that stakeholders have confidence in SSEN as a neutral facilitator of the market and the decisions that are made between reinforcement and flexibility. This stakeholder challenge group has been established to monitor the rigor of our decision-making process and recommend improvements.

Terms of Reference

The Stakeholder Challenge Group is responsible for the following:

1) Taking input from the independent audit that is published annually
2) Reviewing the activity of the DSO Transition team
   a) Monitoring results
   b) Breaches
   c) Complaints
3) Assessing the impact on our customers and stakeholders of the key decisions in the investment methodology
4) Identifying gaps or improvements in the decision-making process
5) Assessing the transparency of SSEN decisions
6) Publishing an annual report summarizing the outcomes of 1-5

Frequency

The group will meet annually.

Outputs

The Stakeholder Challenge Group will publish an annual report (alongside the independent audit) that will detail its findings and recommendations.

Membership

The group will consist of a cross-section of SSEN stakeholders that are actively involved or have a vested interest in the flexibility market.

- Members may send a deputy in their absence with the approval of the Chair.
- The quorum necessary for the transaction of business must be at least 50% of the core group.
- At least one member must be the Chair or Deputy Chair.

Chair Responsibilities

The chair has the following responsibilities:

1) Leadership of the group, ensuring its effectiveness and competency on all aspects of its role.
2) Ensure effective communication with the DSO transition team and independent auditor
3) At the start of every meeting clarify the agenda and purpose of the meeting to members in attendance.
4) Clarify and summarise what is happening throughout the meeting.
5) Ensure the meeting is running to the timescale agreed for each agenda item and keep the duration of the meeting within two hours.
6) Close each meeting with a summary of decisions reached and agreed actions.
7) Ensure draft agenda is distributed to the group at least 3 weeks before the meeting.

Member Responsibilities

Individual members shall:

1) Commit personally to fulfilling the purpose of the meeting
2) Work together as a team to ensure the collective efforts of the meeting are aligned to deliver improvements to the investment methodology and decision-making process
3) Prepare fully for each scheduled meeting by reading the independent audit and raise any issues in advance of the meeting with the Chair
4) Actively participate in meetings through attendance, discussion and review of the independent audit.
5) Support open discussion and debate and encourage fellow members to voice their insights and opinions.

DSO Team Responsibilities

The DSO Team will:

1) Convene each meeting at the request of the Chair. Notice of meetings shall confirm the venue, time and date, specify agenda items to be discussed and attach all supporting papers
2) Minute the actions of all meetings of the meeting, including recording the names of those present and in attendance
3) Plan the schedule of the annual programme with the Chair
4) Ensure the minutes of the meetings are recorded to high standards of accuracy, reflecting the actions from the meetings and decisions reached
5) Distribute decisions and actions of all meetings promptly to the Chair for approval and, once agreed, to all members
6) Expedite that the actions agreed are completed by the membership
7) Support the publication of the annual report

6.10 APPENDIX J – BUSINESS PLAN GUIDANCE & MINIMUM REQUIREMENTS FOR DSO

The following table provides detail of the relevant business plan guidance and where we have addressed this within this document:

	Ofgem Business Plan Guidance [15]	Where and how this is addressed in narrative
4.19	Submitting a DSO Strategy is a minimum requirement under Stage 1 of the BPI. A DSO Strategy in the Business Plan must set out the company's proposed approach to delivering DSO capabilities in RIIO-ED2. As a minimum requirement under Stage 1 of the BPI, DNOs' strategies must:	
(a)	include an assessment of the DSO transition issues prevalent in the company's region and evidence of how this informs its proposed approach.	Section 2.3.3 highlights the value to the electricity system and details the impact within our licence area of LCT uptake. The following paragraphs highlights our DFES, LAEPs, Innovation and RDPs as examples of where we cater for the unique nature of our licence areas.
(b)	set out a clearly articulated vision for addressing DSO transition issues identified, identifying links between the proposed deliverables and the outcomes and the benefits these will deliver.	Sections 1 and 2 of our DSO Strategy highlight our proposed deliverables in ED2 and the outcomes and benefits they deliver for our stakeholders as well as the wider socital benefit.
(c)	demonstrate how the company will deliver the standard of service outlined in the activities and baseline expectations in Appendix 4.	Section 4 of our DSO Strategy Annex highlights our planned outputs for ED2 and outlines our operational plan for the period.
(d)	include deliverables which are specific, time bound and relevant. 26 A company must indicate if in their view a deliverable exceeds the baseline expectations and whether it will require additional funding. Whether the DNO is funded for a deliverable will be relevant for the ex post assessment under the ODI.	This final appendix details specific time-bound and relevant deliverables. In addition our proposed SDI (Section 4.3.2) measures our performance against these and rewards exceedance. Our CVPs (Section 4.3.3) also deliver over-performance in areas that stakeholders have asked for additional support such as energy efficiency and stimulating the flexibility market.
(e)	propose relevant performance measures which will enable stakeholders and Ofgem to evaluate the DNO's progress in delivering its DSO Strategy and associated outcomes. A performance measure could be attributed to a	Our DSO Strategy sets out actions and plans targeting overall objectives and covering a broad range of activities and focusses. Our proposed SDI (Section 4.3.2) proposes a wide range of specific, measurable and performance measures, justified with reference to

[15] Ofgem, RIIO-ED2 Business Plan Guidance, 30 September 2021.

	Ofgem Business Plan Guidance [15]	Where and how this is addressed in narrative
	specific baseline expectation or more broadly to an activity or area of a DNO's strategy. Performance measures could be quantifiable metrics, including those which may be common to all DNOs, or other performance measures such as qualitative assessment, or a combination of performance measures. We would expect the DNO to make it clear how the measure is relevant to the baseline expectation(s), how the performance measure is calculated and why it is the appropriate measure of success.	the priorities of our customers. These measures should be reflected in the metrics used to assess performance under the SDI but should also allow scope for flexibility and evolution around what DNOs are incentivised to deliver for their customers. As a result, we propose SDIs which are assessed both through 'mechanistic' assessment against quantitative targets and through an expert panel review. Further detail can be viewed in the **SDI Annex**.
(f)	where a DNO indicates the relevant performance measure is a quantifiable metric, it must include a baseline performance benchmark with justification to support this. This performance benchmark may be a single value or a range.	*See above – Section 4.3.2.*
(g)	be developed with stakeholder and CEG input and developed in line with the company's wider business planning processes and decisions.	*See above – Section 4.3.2.*
(h)	include a specific network visibility strategy in order to meet the baseline expectations on network visibility and monitoring. This strategy may be published as an associated document.	Our Network Visibility Stragey can be viewed in Appendix H of the DSO Strategy Annex
4.23	We are still considering the regulatory treatment of Customer Load Active System Services (CLASS) as a balancing service in RIIO-ED2. We expect to consult again on our minded-to position in early 2022. To facilitate this process, and aid our review of the Business Plans, companies should set out as appropriate:	Section 4.6.3 and Appendix D details our position on CLASS.
(a)	Specific deliverables associated with CLASS, e.g. number of primary substations and total MW of available response	Section 4.6.3 and Appendix D details our position on CLASS.
(b)	Costs of investing in CLASS, i.e. both capex and opex	Section 4.6.3 and Appendix D details our position on CLASS.
(c)	Intended use(s) of CLASS, e.g. managing peak demand on a DNO's own network or supporting the ESO to manage frequency and system security	Section 4.6.3 and Appendix D details our position on CLASS.
(d)	Assumptions on how CLASS is expected to be remunerated in RIIO-ED2, e.g.	Section 4.6.3 and Appendix D details our position on CLASS.

	Ofgem Business Plan Guidance [15]	Where and how this is addressed in narrative
	through directly remunerated services (DRS) category 8	
4.24	Activity 1.1 Plan efficiently in the context of uncertainty, taking account of whole system outcomes, and promote planning data availability	See section 6.10.1 below
4.25	Activity 2.1 Promote operational network visibility and data availability	See section 6.10.2 below
4.26	Activity 2.2 Facilitate efficient dispatch of distribution flexibility services	See section 6.10.2 below
4.27	Activity 3.1 Provide accurate, user-friendly and comprehensive market information	See section 6.10.3 below
4.28	Activity 3.2 Embed simple, fair and transparent rules and processes for procuring distribution flexibility services	See section 6.10.3 below

The following sections provide the detail of how we have addressed the Minimum Requirements in Appendix 4 of Ofgem's Business Plan Guidance:

Activity 1.1: Plan efficiently in the context of uncertainty, taking account of whole system outcomes, and promote planning data availability.

6.10.1 ROLE 1: PLANNING AND NETWORK DEVELOPMENT

As defined by Ofgem, the purpose of this activity is to ensure that DNOs' planning processes are clear, that high quality, data driven decisions are made, and that DNOs provide stakeholders with relevant information to inform their own decision-making. The following table explains what actions SSEN has undertaken, or plans to undertake, to deliver on the three baseline expectations Ofgem has set out under this activity – in the ENA DSO Roadmap, this involves predominantly steps under the Network Operation, Investment Planning, and Service & Market Facilitation functions, most of which are currently planned to be completed by the start of RIIO-ED2.

We have taken note of the RIIO-ED2 Business Plan Guidance (BPG)[16] which sets out Ofgem's minimum requirements for this activity in paragraph 4.24, which asks companies to explain how they plan to achieve the baseline expectations under this activity and offers suggestions for the types of information to be provided. The table below explains for each baseline expectation what we do and how we do it.

Baseline Expectation (Ofgem Business Plan Guidance, Annex 4)	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
1.1.1 DNOs to define and develop **enhanced forecasting, simulation and network modelling capabilitie**s, with processes in place to drive continual improvement to meet network and user needs.	The DSO Operating Model ensures these baseline expectations are a core part of the Forecasting Network Requirements and Evaluating Solutions functions and specific activities (with dates) around **Investment Planning** and **Service Optimisation** can be seen in our DSO Action Plan which is an input to the DSO Roadmap and Implementation Plan Our DFES has informed our Forecasting Capability since 2018. This activity is ongoing, and we will continue in RIIO-ED2 (3A06). We have already enhanced our existing load models with DFES information, which is highly granular and adheres to the Ofgem "building blocks" as well as including Energy Efficiency. Stakeholder engagement permeates the process throughout, and we have a common platform with the local authorities in our licence areas for them to share and verify data. Under ENA Open Networks we collaborate with other DNOs to facilitate network-data alignment and coordinate gathering of regional data (1D19)	1D19: to be completed (tbc) 2023 2F02: tbc 2022 2H04: tbc 2021 3A06: Operational 3A07: tbc 2021 3A08: tbc 2023

[16] Ofgem, RIIO-ED2 Business Plan Guidance, 30 September 2021.

Baseline Expectation (Ofgem Business Plan Guidance, Annex 4)	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	We are also implementing improvements in the development of DFES, in order to align our DFES, with our approach on Best View Forecast and with other publications, e.g., LTDS, NDP (3A14). The LTDS is the core view on which the DFES is mapped providing load profiles for our network that form the basis of our NDP. Stakeholder input is a key aspect of the process with engagement across all of our local authorities and the Scottish Government. The choice of scenario for the Business Plan is outlined in our ***Network as a Net Zero Enabler (Chapter 10).*** In addition, stakeholder engagement and evidence inform our best view as an input to the NDP. We are improving our forecasting and scenario data and increase granularity of out models by investing in low voltage monitoring and using increased granularity from alternative to date sources such as datasets from smart meters, the Centre for Sustainable Energy and Scottish and LV monitoring data (3A07). In order to address the investment need driven by new connections, we are refining our methodology to forecast the costs driven by new connections, adapting in time for RIIO-ED2 plan submission (3A08). In order to further upgrade our network modelling and analysis capability, we are rolling-out new tools, improving quality of data and introducing processes with increased functionality for network design and (new) operational purposes (2F02). Acknowledging that sufficient planning data and lead times will enable our used to develop their capabilities and provide solutions that meet network requirements, we are enhancing out planning and visibility of outages using data analytics and contingency analysis (2H04).	3A14: tbc 2022
1.1.2 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.	Appendix H of this document contains SSEN's Network Visibility Strategy which is being addressed through our Digital Investment Plan. SSEN is aware there are many aspects to Network Visibility. We have to ensure that we have the data we need to manage our network and we also need to make data open and understandable to all market participants. Network visibility entails monitoring power flows, voltage levels, power quality, available capacity and utilisation factors. Equally there are differing requirements to the provision of the information, depending on the use case for the data. Asset management decisions require data updated each month or year whilst the provision of flexibility services can require data updated in seconds. Currently our control centres have good visibility of power flows and voltage levels across our EHV and 132kV networks, but our priority is to increase the visibility of our HV and LV network using the range of tools available that enable monitoring.	2A1- 2A2: tbc 2022 2A10: tbc 2023 2H04: tbc 2021 3A07: tbc 2021

Baseline Expectation (Ofgem Business Plan Guidance, Annex 4)	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
1.1.3 DNOs to have in place standard and effective processes **for sharing network planning information** with other network licensees, including the ESO, network users and other interested parties, for example to enable innovation and support the development of local government plans for decarbonisation.	Our Network Capacity Portal will be the repository for all relevant data and outputs including the NOA, Network Development Plan and annual Flexibility Statement alongside the existing heat maps and LTDS, which we have also reflected in the DSO plan (3A13, 3C09). We are continuously improving this repository and seeking to improve granularity. Standards will be aligned with Open Networks and CEP licence obligations. It will be managed and improved by the Forecasting Function within our DSO Operating Model in RIIO-ED2. In addition, our Digital Strategy provides a clear plan how we will comply with the Data Best Practice guidance and our use of the triage process to improve transparency and visibility. To enhance the planning data exchange, we collaborate with the ESO and other DNOs on the Implementation of Electronic Exchange of Network Planning Data and potentially the use of the Common Information Model (CIM) (steps on DSO roadmap, 3B9/ 3B21 – 23) We support the ENA Open Networks Flexibility Commitment to provide regular, consistent and transparent reporting, to provide confidence to the public and ensure all parties learn from what flexibility is used, why and how this contributes to running energy networks in a smarter, more efficient way (6C03, 6C05). Under ENA Open Networks we are continuously working with the ESO and other DNOs to standardise the planning data exchange and establish a clearer link between national and regional FES (3A03), whilst we continue to support the development of whole energy system FES and whole energy system Cost Benefit Analysis (3B36, EB37, 3B38). In line with CEP and licence condition on Procurement and Use of distribution flexibility services, we are improving and streamlining our tools and processes to generate timely and relevant information on availability of contracted flexibility (3C04, 7B08). Our Flexible Connections webpage publishes the latest calls for flexibility - https://www.ssen.co.uk/FlexibleConnections/. In addition, we are making proactive calls for flexibility services which are published our website, in order to enable existing and new providers to develop capability to provide solutions to meet network requirements. (https://www.ssen.co.uk/SmarterElectricity/Flex/), whilst recently our annual flexibility statement was approved by Ofgem.	3A13: tbc 2023 3C09: tbc 2022 3B09: tbc 2021 3B21 – 3B23: tbc 2023 6C03 & 6C05: Operational 6D08, 6D09: Operational 3A03: Operational 3B36 – 3B38: tbc 2022 3B09: tbc 2021 3C04: Operational 2H07: tbc 2021 7B08: tbc 2021

Baseline Expectation (Ofgem Business Plan Guidance, Annex 4)	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	We are also improving the provision of curtailment information to deliver accurate and timely curtailment information that is more granular, provided more frequently, and available at individual asset level (2H07).	
1.1.4 DNOs to have in place transparent and robust processes for identifying and assessing options to resolve network needs, using competition where efficient. This should include demonstrable cross-sector engagement, optioneering, and planning with sectors or vectors other than their own. DNOs should consider flexibility and promoting energy efficiency in addition to innovative use of existing network assets and traditional reinforcement. The process of identifying options should include engaging with other network licence holders and current and prospective network users. Options must be fairly compared against one another, with flexibility used where it is economic and efficient compared to	Our Commercial Evaluation team already uses the Open Networks Common Evaluation Methodology (and is planning to use the Whole System CBA once fully developed (3B36, EB37, 3B38). To add on that, that we have led on the construction of rigorous, auditable methodologies for evaluating network solutions. Particularly, our work with Frontier Economics was the driver behind Open Networks development of the Common Evaluation Methodology which has been used for our Business Plan. The decisions from this model will be outlined in our NDPs. In 2022 we will continue to support the Open Networks continued development of the Common Evaluation Methodology to include optionality. Reflecting recent changes in investment planning processes, we are developing robust commercial decision-making processes, using time-series data and new tools, whilst aligning investment planning with other internal processes, such as Operations, Asset Management, Policy and Procurement (3C01). This will continue in RIIO-ED2 under the DSO Operating Model. Decisions will be published in our annual Distribution Networks Option Assessment (NOA), in order to facilitate whole system options for resolving regional constraints for distribution and transmission networks (3B18). In addition, we will continue to collaborate with the ESO to develop DNO solutions that will feed into ESO's NOA and pathfinder processes (3B17) and to consider Regional Development Plans consider Regional Development Plans to resolve network needs which utilise flexibility services and smart asset solutions (6G9). As part of our commitment to ENA Flexibility Next Step 3 (Conduct procurement in Open and Transparent Manner), we will be open and transparent when deciding how and why services have been sourced from different solutions in order to meet network needs, such as flexibility services from the market, smart grid solutions and traditional network reinforcement (7B1). This commitment also requires us to always choose the solution that is the most cost-effective for consumers, while meeting the needs of all customers, the system and the networks (7B4). **Section 4.3.3** and **Appendix C** outlines how our CVPs (for more detail see **Consumer Value Propositions Annex S 3**) plan to support the development of energy efficiency and cross-vector as cost-effective solutions, and alternatives to reinforcement, in the flexibility market.	3B06 & 3B07: tbc 2021 3B43: tbc 2022 3B36 – 3B38: tbc 2022 3B17 & 3b18: tbc 3C01: Dec 2021 7B01/7B04: Operational 6G9: tbc 2023 6C1-6C3: Operational

Baseline Expectation (Ofgem Business Plan Guidance, Annex 4)	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
investing in traditional reinforcement or technological solutions. We expect a consistent approach for valuing flexibility, taking into account the option value it provides in the context of uncertainty. DNOs must ensure transparency in their approach to allow scrutiny of decision-making.	As part of our commitment to the ENA Flexibility Next Step 2 (Visibility and Accessibility), we will highlight where and when opportunities exist for flexibility services to play a role in ensuring a secure, consistent energy supply via electricity networks. We will (as per ENA DSO steps 6C1 to 6C3) undertake consistent review of where and when opportunities exist for flex. services and share data with flexibility service providers to develop transparent markets. In order to promote efficient solutions for network needs, in 2020 we completed the delivery of the ANM Centralisation project, an IT infrastructure project which enables more efficient, cost effective ANM implementation on a scalable basis. Centralisation provides an average 30% reduction in the cost of new ANM systems, as well as operational nonfits during the ongoing operation of systems. It also reduces cyber and IT security risks by removing the need for remotely installed servers and systems. This is now operational.	

6.10.2 ROLE 2: NETWORK OPERATION

Activity 2.1: Promote operational network visibility and data availability.

This activity is to ensure that DNOs share relevant data on network operations with stakeholders, and to ensure that DNOs have sufficient network knowledge to operate their network under safe and reliable conditions. The activity involves four baseline expectations, covering a large number of steps from the System Coordination, Network Operation, and Service & Market Facilitation functions in the ENA DSO Roadmap, planned to be completed by late 2023.

The table below explains for each baseline expectation what we do and how we do it, in accordance with Ofgem's minimum requirement for this activity as set out in BPG paragraph 4.25.

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
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. DNOs must take reasonable steps to access and subsequently share, including publishing, data and operability constraint	Responsibility for these data outputs is shared across all three key functional areas of the DSO Operating Model. The DSO Action Plan details key activities under System Coordination, Network Operation and Service and Market Facilitation, that will support and improve these outputs prior to RIIO-ED2. Development of this will also be informed by our Flexibility Providers Forum. We are already working with the ESO to develop and trial conflict management actions through RDPs, and other flexibility market case studies (6G9). This action is also informed by work under ENA Open Networks (Workstream 1A Product 5). In alignment with WS1A we will collaborate with the DNOs and the ESO to develop a full roll out programme to accommodate the Primacy Rule (6F6) In addition, we are working with the ESO and other DNOs, to facilitate operational data exchange and develop mature processes and IT infrastructure that serve this purpose, in alignment with ENA Open Networks Workstream 1B (1A09). In the same context, we are developing mature processes and ICT infrastructure to enhance real-time data exchange and increased system visibility and control. These processes will be capable of facilitating the management of service conflicts and the optimisation on distribution networks (1A22). We will also implement good practices identified by ENA Open Networks Workstream 1B related to areas such as cyber security aspects and OTS components availability and planned outages.	6G9: tbc 2023 1A09: tbc 2021 1A19: tbc 2021 1A22: tbc 2023 1A31: tbc 2022 1A34: tbc 2021 1A40: tbc 2023 2A1- 2A2: tbc 2022 2A10: tbc 2023 2F1: tbc 2022 6F6: tbc 2023 1B03: tbc 2023

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
information in a timely manner.	To improve operations data sharing we are working with the DNOs and the ESO to implement processes changes that facilitate data sharing (1A40) and improve operational DER visibility and monitoring (2A10). This step will be informed by upcoming licence condition and ENA Open Networks' development under 2021 Workstream 1B Product 6 and 7). We also developing process to improve LV system monitoring and visibility of LV data, to enhance monitoring at all voltage levels, and improve losses monitoring through smart meter and LV data (2A1, 2A2, 2F1) Additional actions under this step include the adoption of informed and standardised procurement processes, conforming to SLA. This step is also informed by existing Open Networks' work (e.g., final report of ENA ONP 2019 Workstream 1A Product 4) and current work (2021 workstream 1A, product 5) (1A34). More indirectly, we are collaborating with other networks to develop processes for publicly signposting potential network capacity requirements (1A19) and we are considering the developments of appropriate communication link between DNO-IDNO and DNO-DNO to optimise commercial decision making by networks regarding network and non-network solutions (1B03)	
2.1.2 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.	Appendix H of this document contains SSEN's Network Visibility Strategy which is being addressed through our Digital Investment Plan. SSEN is aware there are many aspects to Network Visibility. We have to ensure that we have the data we need to manage our network and we also need to make data open and understandable to all market participants. Network visibility entails monitoring power flows, voltage levels, power quality, available capacity and utilisation factors. Equally there are differing requirements to the provision of the information, depending on the use case for the data. Asset management decisions require data updated each month or year whilst the provision of flexibility services can require data updated in seconds. Currently our control centres have good visibility of power flows and voltage levels across our EHV and 132kV networks, but our priority is to increase the visibility of our HV and LV network using the range of tools available that enable monitoring.	2A1- 2A2: tbc 2022 2A10: tbc 2023 2H04: tbc 2021 3A07: tbc 2021

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
2.1.3. DNOs to provide the ESO with information across timescales about the DER it is planning to instruct to dispatch.	As discussed in 2.1.1 we are working with the DNOs and the ESO to implement processes changes that facilitate data sharing (1A40) and improve operational DER visibility and monitoring (2A10). We are also coordinating with the ESO in building and implementing appropriate communication links (ICCP) between DNO-ESO control centres (1A23). In alignment with work undertaken by ENA Open Networks under workstream 1B (Product 4, 2019), we are developing processes to enhance the data exchange with the ESO through the implementation of the Implementation of Electronic Exchange of Network Planning Data and potentially the use of the Common Information Model (CIM). Indirectly we are developing technical processes to deliver co-ordinated (with the ESO) operational DER tripping schemes for transmission system needs (1A02).	1A40: tbc 2023 1A23: tbc 2021 2A4 to 2A6: tbc 2022 2A10: tbc 2023 1A2: tbc 2021
2.1.4. DNOs to gather sufficient information on DER characteristics and parameters to provide information and inform decisions to secure against events that could lead to disconnection of DER.	As discussed in 2.1.1 we are working with the DNOs and the ESO to implement processes changes that facilitate data sharing (1A40) and improve operational DER visibility and monitoring (2A10). We are also coordinating with the ESO in building and implementing appropriate communication links (ICCP) between DNO-ESO control centres (1A23). Acknowledging that sufficient planning data and lead times will enable our used to develop their capabilities and provide solutions that meet network requirements, we are enhancing out planning and visibility of outages using data analytics and contingency analysis (2H04). As part of the System Defence and Restoration activity of the DSO Action Plan, we are developing use cases for when small scale DER can be constrained or disconnected temporarily during emergency events. The EVTF recommended that DNOs should be given a capability to constrain or disconnect EV charge points temporarily for emergency situations. If given this power DNOs will need to determine which this facility can and cannot be utilised.	1A40: tbc 2023 2A10: tbc 2023 2H4: tbc 2021 5B2: tbc 2023
2.1.5. DNOs to make available operational data that supports network users and other relevant stakeholders to make better decisions	Ofgem has approved our first Flexibility Statement - https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=20662 which points toward future flexibility requirements. This is published on our Flexibility Page. This will be enhanced going forward by our Network Options Assessment as detailed in our DSO Action Plan which is an input to the DSO Roadmap and Implementation Plan – System Coordination using outputs from ENA ONP Workstream 1B Product 5 (2020) which details how to improve how DNO network capacity shortfalls and forecast network requirements are described and publicised to the wider market (1A19).	1A19: tbc 2021 1A40: tbc 2021 2A10: tbc 2023 1B03: tbc 2023 2H4: tbc 2021

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
about how to use the network.	As discussed in 2.1.1 we are working with the DNOs and the ESO to implement processes changes that facilitate data sharing (1A40) and improve operational DER visibility and monitoring (2A10). More indirectly, we are considering the developments of appropriate communication link between DNO-IDNO and DNO-DNO to optimise commercial decision making by networks regarding network and non-network solutions (1B03) We also developing process to improve LV system monitoring and visibility of LV data, to enhance monitoring at all voltage levels, and improve losses monitoring through smart meter and LV data (2A1, 2A2, 2F1, 2G1). These activities will contribute to more effective investment and operational decision making, using data from detailed, accurate system monitoring and will support decision making not only for network owners but also for customers, community and service providers. Acknowledging that sufficient planning data and lead times will enable our used to develop their capabilities and provide solutions that meet network requirements, we are enhancing out planning and visibility of outages using data analytics and contingency analysis (2H04). We support the ENA Open Networks Flexibility Commitment to provide regular, consistent and transparent reporting, to provide confidence to the public and ensure all parties learn from what flexibility is used, why and how this contributes to running energy networks in a smarter, more efficient way (6C03, 6C05). We also publish information on operational constraint, network topology and configuration data for our ANM areas - https://www.ssen.co.uk/anm/ but we are working to improve this through Open Networks through the actions that we reported earlier. Finally, we adhere to our Digital Strategy that provides a clear plan how we will comply with the Data Best Practice guidance and our use of the triage process to improve transparency and visibility.	2A1- 2A2: tbc 2022 2F1: tbc 2022 2G1: tbc 2022 6C03 & 6C05: Operational

Activity 2.2: Facilitate efficient dispatch of distribution flexibility services.

As defined by Ofgem, this activity is about defining and developing system operability capabilities and the actions network companies take to operate the distribution system safely, to ensure DNOs facilitate economic and efficient dispatch of DER. This means (i) applying a transparent, economic and efficient framework for sending dispatch instructions to the relevant controller, and (ii) that the underpinning IT and OT infrastructure is scalable and allows cost-efficient participation. The activity involves eight baseline expectations, covering a mostly steps from the System Coordination, Service & Market Facilitation, and Service Optimisation functions in the ENA DSO Roadmap, planned to be completed early 2024.

The table below explains for each baseline expectation what we do and how we do it, in accordance with Ofgem's minimum requirement for this activity as set out in BPG paragraph 4.26.

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
2.2.1 (a) DNOs to have and regularly review a decision-making framework for when DER are instructed to dispatch in real-time.	We support the ENA Open Networks Flexibility Commitment on Fairness and Clarity in Dispatch. DNOs produced Good Practice flow charts for the dispatch process as part of the ENA ONP Workstream 1A Product 3 (2019). We adhere to the process defined in the flow chart in relation to dispatch. The Flexibility Stakeholder function within the DSO Operating Model has a remit that includes stakeholder engagement to review these processes. We are currently working on enhancing our infrastructure to enable better decision-making around real-time dispatch of DERs. Our work on an ICCP link is already underway and is captured in our DSO Action Plan under System Coordination (1A20) along with other measures to ensure coordination between the ESO and other DNOs. More generally, in alignment with the ENA ONP paper on Real time exchange & forecasting, we are developing mature processes and ICT infrastructure for data exchange and increased system visibility and control, capable of facilitating the management of service conflicts and optimisation on distribution networks (1A22). We are currently validating the ongoing reform of our commercial decision-making process, which is being enhanced with time-series data and other new tools, as well as being aligned with internal processes such as Operations, Asset Management, Policy and Procurement (3C1). This process is planned to be complete by the end of 2021. We have adopted ENA ONP Good Practice flow charts for the dispatch process as part of the ENA ONP Workstream 1A Product 3 (6G8) and are in the process of developing a fully automated dispatch system by the end of 2021 (6G10).	1A23: tbc 2021 1A22: tbc 2023 3C1: tbc 2021 6G8: Operational 6G10: tbc 2021 6G11: Operational 6G12: Operational 6G13: tbc 2021 6G17: Operational 6G18: Operational 7C1: Operational

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	We also follow ENA ONP Workstream 1A Product 3 (2019) good practice, which requires that where multiple flexibility providers could provide a service in excess of the requirement, a DNO should adopt consistent and fair criteria to assess which flexibility providers will be secured for capacity availability and/or utilisation. The ENA product team has developed Guiding Principles for the application of decision criteria (6G11) and as market participation grows we will ensure visibility of these decisions on our Flexibility Page. We have adopted ENA ONP Good Practice flow charts for the settlement process as part of the ENA ONP Workstream 1A Product 3 (6G12) and also per Good Practice have in place a system for automated performance verification to underpin the settlement process (6G14). We are also in the process of fully automating the settlement process by the end of 2021 (6G13). In line with 2019 ENA ONP Workstream 3 Product 1, we have shared learning on Dispatch & Settlement from developing and operating flexibility with other DNOs in 2020 (6G18). Furthermore, we are committed to be open and transparent when deciding how and why services have been procured from different solutions in order to meet network needs, such as flexibility services from the market, smart grid solutions and traditional network reinforcement (7C1). This includes taking a fair and clear approach to the dispatch of flexibility services to meet electricity system or network needs by setting out the terms and methodology adopted (7C3), as well as providing transparency on dispatch decision-making criteria (7C4).	7C3: Operational 7C4: Operational
2.2.1 (b) As part of this decision-making framework, there must be rules in place for coordinating dispatch instructions for DSO and ESO flexibility services.	Most of these rules are delivered through the steps set out for Baseline Expectation 2.2.1. above. Over and above these steps, we are currently working with other DNOs under the ENA ONP to develop a draft set of principles and primacy rules for addressing T-D flexibility service conflicts (6F3). These rules will look to balance: the local networks' technical requirements; the risks to the overall operability of the whole system; the value for Flexibility Service Providers through the facilitation of market / price driven actions; the needs of emerging market-based platform developers; and ultimately the end consumer. ENA ONP will subsequently trial the draft Primacy Rules / concepts and review impacts in 2022 (6F4) and in early 2023 will update principles and primacy rules for addressing flexibility service conflicts (T-D) based on trial learnings and will publish a roll-out implementation plan for network companies (6F5). We will then work with other DNOs and ESO to develop and sign off a full roll out programme to accommodate the Primacy Rules, agree change process and governance of Primacy Rules in RIIO-ED2 (6F6).	6F3: tbc 2021 6F4: tbc 2022 6F5: tbc 2023 6F6: tbc 2023
2.2.2 The DNOs shall facilitate secondary	We led ENA ONP Workstream 1A Product 6 (2020) which tested the principles/rules of engagement for market participants to trade energy locally or exchange capacity and curtailment obligations within the context of the TEF	1C4: tbc 2023

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
trading of distribution flexibility services and curtailment obligations.	projects and the BEIS Flexibility exchange demonstration competition (FleX) and Power Forward projects. It also tested the data sets that were identified by 2019 WS1A P6 to enable neutral facilitation of these new markets both pre & post transaction to ensure there is no detrimental impact on the network. Over the course of RIIO-ED1, we have been monitoring and facilitating the development of new non-DSO services as required and implement outcomes from ENA ONP Workstream 1A Product 6 (2020) to facilitate local energy trading or exchange capacity and curtailment obligations. We are planning to implement outcomes from ENA ONP Workstream 1A Product 6 (2020) to facilitate local energy trading or exchange capacity and curtailment obligations by 2023. As part of this, we will investigate what IT/infrastructure changes may be required to provide data to facilitate new markets and identification and management of potential conflicts (1C4). Based on outcomes of the work that will be delivered by ENA ONP through WS1A P6 (in 2021 and 2022), we will adopt a common approach to sharing and trading capacity (e.g., rules and requisite datasets that enable facilitation of these markets by DNOs) (1C12). In respect of curtailment obligations, we are currently working on the implementation of various enhancements of our curtailment process, as part of our adherence to Good Practice developed under ENA ONP WS1 P7 (2018). These enhancements include providing generators with detailed information of the stack and principles of access (4A4), ensuring that calculations for curtailment assessment are based on consistent, clear and open assumptions (4A5), appropriate use of load flow based and spreadsheet based approaches (4A6), ensuring the use of accurate and representative demand data (4A7), optimising the use historical data to give the customer the most representative results (4A8), and specific requirements to the use of volume data in curtailment assessments (4A9). We will also cover secondary trading as part of the ENA good practice of signposting anticipated procurement requirements for flexibility services, using a broad spectrum of outlets to reach the greatest numbers of service providers (ENA DSO step 6A4). For instance, we have set out in our ***DSO Chapter (Chapter 11)*** that we are committed to setting up an annual flexibility providers forum for engagement, enabling regular feedback.	1C12: tbc 2023 4A4-4A9: tbc 2021 6A4: Operational
2.2.3 DNOs to introduce clear	ENA ONP Workstream 1A Product 3 (2019) reviewed current activation, dispatch and settlement processes and developed good practice for activation and dispatch and identified what DNO capabilities are required to support this.	

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
processes for the design, development, and communication of the decision-making framework.	This good practice includes alignment of DSO and NG ESO services in terms of procurement, timescales, service windows and contract terms as much as possible. These areas are currently being developed within Open Networks with our input. We support the ENA Open Networks Flexibility Commitment on Fairness and Clarity in Dispatch. DNOs produced Good Practice flow charts for the dispatch process as part of the ENA ONP Workstream 1A Product 3 (2019). We adhere to the process defined in the flow chart in relation to dispatch. The Flexibility Stakeholder function within the DSO Operating Model has a remit that includes stakeholder engagement to review these processes. The processes for this Baseline Expectation are delivered through the steps set out for Baseline Expectations 2.2.1. and 2.2.2. above.	
2.2.4 (a) DNOs to develop efficient, scalable dispatch instruction infrastructure and avoid proprietary systems.	Through our Project LEO we collaborate with many industry partners to develop market models based on a series of different platforms as part of our ***learning by doing*** principle. This includes the following: • WSC – Detailing the forecasting and PSA aspects of the project, ultimately identifying constraints and authorizing P2P trades. • NMF – A market platform, where requests for flexibility for DSO services are advertised, (and ESO to test one of the options) with transparent and neutral decision making on auction outcomes and requests for P2P energy exchanges are made visible at a price and presented as a separate function. Elements of settlement and baselining performed outside the system with option to be straight to WSC from a 3rd party. • Piclo Platform – Another Market Platform with similar functionality to the NMF. Trading capability for P2P and auction capability. • EdF Powershift – An Aggregation platform • Nuvve V2G – An Aggregation platform • Low Carbon Hub – People's power station – a technical aggregation platform In work with, and developing, these solutions and platforms we strictly observe adherence to the Flexibility Commitments and Good Practice referred to Baseline Expectations 2.2.1. and 2.2.2. above, to ensure we deliver fair	2I12: completed

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	and transparent outcomes for flexibility service providers and our customers, as well as generating learnings to continually improve the efficiency of procuring and dispatching flexibility services and settling flexibility transactions. In addition to Project LEO, we have just completed our ANM Centralisation project, an IT infrastructure project which enables more efficient, cost-effective active network management (ANM) implementation on a scalable basis. Centralisation provides an average 30% reduction in the cost of new ANM systems, as well as operational nonfits during the ongoing operation of systems. It also reduces cyber and IT security risks by removing the need for remotely installed servers and systems (2I12). As a principle in our innovation activities, although currently focused on stimulating and enabling a nascent market, we avoid proprietary software and allow for the fact that third parties may be providing these functions in future.	
2.2.4 (b) Clear definitions of different types of dispatch instruction for distribution flexibility services and transparent rules about when and in which markets they should be used.	ENA ONP Workstream 1A Product 3 (2019) reviews current activation, dispatch and settlement processes and develops good practice for activation and dispatch and identify what DNO capabilities are required to support this. As part of ENA Flexibility Next Step 4 (Provide Clarity on the dispatch of services), we will adopt a fair and clear approach to the dispatch of flexibility services to meet electricity system or network needs by setting out the terms and methodology adopted. We also follow ENA ONP Workstream 1A Product 3 (2019) good practice: Where multiple flexibility providers could provide a service in excess of the requirement, a DNO should adopt consistent and fair criteria to assess which flexibility providers will be secured for capacity availability and/or utilisation. The ENA product team has developed Guiding Principles for the application of decision criteria. We are currently working with Flexible Power to develop dispatch infrastructure and coordinate dispatch instructions, although this will be superseded by the DSO Management (Optimiser) System that is currently being trialled by Project TRANSITION. The definitions and principles for dispatch instructions for this Baseline Expectation are otherwise delivered through the steps set out for Baseline Expectations 2.2.1. and 2.2.2. above.	

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
2.2.4 (c) The application of hard dispatch controls shall be for the improved reliance on market-based mechanisms, not to the detriment of their development.	We are working with 4 other DNOs to explore this through Flexible Power to develop dispatch infrastructure and coordinate dispatch instructions, although this will be superseded by the DSO Management (Optimiser) System that is currently being trialled by Project TRANSITION. Our ongoing objective is to be a neutral facilitator of a vibrant, liquid market that can provide a full range of network solutions. System resilience must always be a priority, but we are committed to ensuring system controls support that market development rather than hinder it.	This principle applies to the steps in 1A, 6G, & 7C
2.2.4 (d) Capabilities in network operations, for example in dispatch instructions and associated system architectures shall not be hard coded to the DNO.	Our work on an ICCP link is already underway and is captured in our DSO Action Plan under **System Coordination** (1A20) along with other measures to ensure coordination between the ESO and other DNOs. More generally, in alignment with the ENA ONP paper on Real time exchange & forecasting, we are developing mature processes and ICT infrastructure for data exchange and increased system visibility and control, capable of facilitating the management of service conflicts and optimisation on distribution networks (1A22). The regional development plan (RDP) Forum that is already meeting supports and coordinates these activities in line with the ENA ONP. SSEN and four other DNOs are using Flexible Power which was built on the back of innovation IP from WPD - this system is based on APIs and is designed to readily interface with other platforms, DER or Aggregators. As a principle in our innovation activities, although currently focused on stimulating and enabling a nascent market, we avoid proprietary software and allow for the fact that third parties may be providing these functions in future.	1A20: tbc 2021 1A22: tbc 2023

6.10.3 ROLE 3: MARKET DEVELOPMENT

The purpose of this activity is to ensure that DNOs sufficiently inform stakeholders of information that will assist them in participating in, managing or

Activity 3.1: Provide accurate, user-friendly, and comprehensive market information.

otherwise engaging with markets in the long and short term. The activity involves three baseline expectations, covering steps from the System Coordination, Investment Planning, and Service & Market Facilitation functions in the ENA DSO Roadmap, planned to be completed between late 2023 and late 2025.

BPG paragraph 4.27 requires companies to explain how they plan to achieve the baseline expectations under this activity. The table below set out our plans for each baseline expectation.

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
3.1.1: DNOs collate and publish as much relevant data and information as reasonable that will help market participants identify and value opportunities to provide network services to DNOs and take market actions that support efficient whole system outcomes.	We have set up dedicate webpages for Flexible Connections and Flexibility Services that publish all relevant information for stakeholders. As part of our commitment to the ENA Flexibility Next Step 2 (Visibility and Accessibility), we will highlight where and when opportunities exist for flexibility services to play a role in ensuring a secure, consistent energy supply via electricity networks. We will (as per ENA DSO steps 6C1 and 6C2) undertake consistent review of where and when opportunities exist for flex. services and share data with flexibility service providers to develop transparent markets. As part of our commitment to the ENA Flexibility Next Step 5 (6C3) to provide regular, consistent and transparent reporting) we will provide regular, consistent and transparent monitoring and reporting to provide confidence to the public and ensure all parties learn from what flexibility is used, why and how this contributes to running energy networks in a smarter, more efficient way and share best practice across the wider industry. All of the above is part of our stated commitment to maintain a level playing field in the procurement and operation of flexibility (6D10). We will continue to collaborate with the other DNOs through the Open Networks project to improve and align the information we make available, including through the following: In addition to our adherence to ENA Flexibility Commitments, we have already adopted the ENA good practice of signposting anticipated procurement requirements for flexibility services, using a broad spectrum of outlets to reach the greatest numbers of service providers (ENA DSO step 6A4). For instance, we have set out in our	1B2: tbc 2021 3A5: Completed 3C8: tbc 2022 6A4: Operational 6C1-6C3: Operational 6D10: Operational 6E4: Operational 6E5-6E9: Operational 6G16: Operational

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	Business Plan that we are committed to setting up an annual flexibility providers forum for engagement, enabling regular feedback. We have also adopted ENA good practice around sharing information with market participant on the procurement of flexibility, including service drivers (short-term and long-term), technical/operational requirements, details and timing of the procurement approach, time and locational information, payment and contract details, and service level agreements (6E5-6E9). We also follow ENA dispatch guiding principles in publishing decision criteria for near real-time dispatch of flexibility services (6G16). More indirectly, we are collaborating with other networks to develop the Embedded Capacity Register (ECR), where we have started to report on reinforcement works and publish reinforcement tables (6E4), as well as the development of whole system FES by publicly signposting potential network capacity requirements (1B2). Since March 2020 we publish our Distribution Future Energy Scenarios (DFES) which provide a range of outlooks of generation and demand in their licensed according to technological, economic and political factors (3A5). We are also currently working on its Network Development Plan, tbc April 2022, which will define network plans over a five to ten-year window, including the use of flexibility services, as well as defining the expected uptake of LCTs (3C8).	
3.1.2 DNOs should, with stakeholder input, develop robust strategies for how they will collate and publish more helpful information, wherever possible consistently and in coordination with other network licence holders, and communicate this clearly.	We have published our Digital Strategy and Digitalisation Strategy Action Plan (DSAP) in preparation for it to be a new licence obligation in RIIO-ED2. During RIIO-ED1 we started investing in the modernisation of our core systems, particularly focusing on asset data. We held internal workshops and engaged with stakeholders to help with our digital strategy and DSAP development. Our initial strategy was published in December 2019, with further feedback informing updates to our strategy during 2020. Our Digitalisation Strategy and IT/OT investments have been shaped by the extensive enhanced engagement we carried out across key areas of our plan. In addition, we held seven dedicated events on our digitalisation strategy, reaching over 140 stakeholders. Section 2 of our Digital Strategy explains the methodologies we employed to identify and engage with stakeholders to understand their data and digitalisation needs, such as developing customer personas. These methodologies will continue to be used and developed as we engage stakeholders and refine our DSAP and RIIO-ED2 plans.	See our Digital Strategy Action Plan
3.1.3: DNOs should regularly and actively engage with market participants to	Our first Flexibility Statement, which has been approved by Ofgem, points toward future flexibility requirements and is part of an approved internal process that includes stakeholder engagement. We hold live webinars to support all new Zones and those which may be re-tendered. These webinars are recorded and uploaded to our	3C2: Operational

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
understand what data and information is helpful to support market development.	website and, as such, remain a resource for potential future providers. Through these sessions, which include live Q&A sessions, these webinars are a regular opportunity for our staff to engage, help and listen to stakeholders. Much of our stakeholder engagement is delivered through the steps set out for Baseline Expectation 3.1.1. above. However, over and above these steps, SSEN, alongside other DNOs, is setting up Customer Engagement Groups (CEGs) to enable stakeholder engagement as well as ensure transparency in the investment decision process, through which we enhance our planning processes for alternative solutions to traditional asset-based investment including ANM systems to manage areas of constraint, DER contracts and despatch (3C2).	
3.1.4 DNOs should, where reasonable, tailor both their information provision and engagement approaches to reflect different needs of potential market participants, including groups in vulnerable situations. In many instances, collaboration across DNOs in engagement is expected to reduce duplication, make it easier for stakeholders to engage and avoid stakeholder fatigue.	As part of our IT/OT Investment for RIIO-ED2 we have included a **Tailored Insights** deliverable. This project delivers on our information commitments in our Digital Strategy. Many stakeholder groups, such as vulnerable customers, flexibility providers, other planning partners and manufacturers, have particular information requirements unique to them, and those requirements will be delivered through this project, giving them the information, they need, when they need it, and in the form that they want to receive it. It will also allow them to update their own information. This work is also fundamental to facilitate the ability relevant share information to underpin whole system planning processes. The information delivered through Tailored Insights will be sourced from other RIIO-ED2 projects, in particular Master Data Management, Data Lake & Analytics (our core data and analytical capability, near real time information and efficiency provided through Business Automation, and the general provision of information to all stakeholders, both external and internal, through Open Door (which enables data to be shared with third parties). In addition, we will continue to collaborate with Open Networks to ensure we can align our approaches with other DNOs and provide consistency for stakeholders. This will reduce the volume of engagement required with stakeholders as the same message be applicable for all DNOs.	See our Digital Strategy Action Plan
3.1.5 DNOs should seek to ensure the information they publish is as accurate and unbiased as reasonable.	Through our ongoing stakeholder engagement and flexibility webinars, we will seek to collect feedback from attendees and act on this going forward to drive continual improvements in the service we offer and the uptake of flexibility services across our networks. See our first Flexibility Statement. Moreover, we will safeguard the accuracy and objectivity as part of commitment to ENA good practice guidelines in sharing market information (6E6-6E10) and more broadly our commitment to maintaining a level playing field in procuring and operating flexibility. SSEN, like other DNOs, procures flexibility services in a way that creates a level playing field for all energy technologies and services (6D10). ENA's electricity network members (i.e., all	6D10: Operational 6E5-6E10: Operational

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	DNOs, TOs, the ESO) will facilitate and provide convergence and standardisation for customers in order to support this.	

Activity 3.2: Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services.

The purpose of this activity is to ensure distribution flexibility service market design leads to good competitive outcomes, including downward pressure on prices and innovative services. The activity involves six baseline expectations, covering steps from the System Coordination, Investment Planning, Service & Market Facilitation, and Service Optimisation functions in the ENA DSO Roadmap, planned to be completed by early 2024.

The following table sets out our plans to achieve each baseline expectation, in line with minimum requirements set out in paragraph BPG 4.28.

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
3.2.1 (a) DNOs to have clear processes in place for developing and amending distribution flexibility services products, contracts, and qualification criteria, that are, wherever possible, standardised.	ENA ONP Workstream 1A Product 5 (2020) ensures flexibility products are developed consistently across DNOs. This activity covers new flexibility products only, and seeks to ensure that all operational, commercial and technical parameters are aligned across DNOs, insofar as practicable. Over the course of RIIO-ED1, the ENA ONP has been monitoring and broadening the suite of new services as required. We will procure and operate new DSO flexibility services in line with outcomes from ENA ONP Workstream 1A Product 5 (2020). We have adopted the standardised Flexibility Services Standard Agreement that was developed by ENA ONP in 2020 (1A4). This agreement is common across all DNOs and used for all flexibility services, including future modifications, as well adopted by the ESO, to provide alignment between the Standard DNO Contracts and ESO general Terms and Conditions (1A34). There are no exclusivity clauses in any of our contracts. We utilise the active power product definitions developed by ONP (6A1). Following further work by ENA ONP Workstream 1A, DNOs have now standardised the branding and titles for all of the services. We provide updates on services and supporting processes on our Flexibility Services website. In 2020 DNOs jointly (under the ENA ONP) consulted stakeholders on the benefits of converging on procurement windows. By the end of 2021, we will implement processes to align the assessment stages and milestones in the flexibility procurement cycle (6A18). Through further work undertaken under the ENA ONP, we are currently aligned with other DNOs on pre-qualification questionnaires. Over the course of 2022 we will continue to work with other DNOs to align on the pre-qualification process and requirements, which we will implement by the end of 2022 (6A20).	1A4: Operational 1A34: tbc 2021 6A1: Operational 6A18: tbc 2021 6A20: tbc 2022

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
3.2.1 (b) DNOs should also coordinate and engage with third party platform providers, who can offer system value by providing new routes to market and driving whole system outcomes. DNOs should not prevent the emergence of this sector and should enable third party platforms to 'plug-in' to DNOs' flexibility procurement processes.	SSEN facilitates the ability of third-party platform providers to participate in the flexibility market as part of its commitment to ENA good practice guidelines in sharing market information (6E6-6E10) and more broadly our commitment to maintaining a level playing field in procuring and operating flexibility. SSEN was one of the first DNOs to promote its flexibility on a third-party platform (PICLO) and is now collaborating with other DNOs on the Flexible Power platform. In addition, Project TRANSITION is trialling new IT/infrastructure changes that will support the participation of new market platforms and identification and mitigation of potential conflicts to support increased liquidity and whole system outcomes. SSEN, like other DNOs, procures flexibility services in a way that creates a level playing field for all energy technologies and services (6D10). ENA's electricity network members (i.e., all DNOs, TOs, the ESO) will facilitate and provide convergence and standardisation for customers in order to support this.	6D10: Operational 6E5-6E10: Operational
3.2.2 (a) DNOs should identify the optimum combination of longer- and shorter-term lengths of markets and contract lengths reflecting the network need.	2021 WS1A P7 of the ENA ONP will provide an implementation plan and governance strategy for DNOs to adopt common baseline methodologies for flexibility services. We will implement associated changes and processes to adopt this methodology, captured under the **Service and Market Facilitation** function in the ENA ONP DSO roadmap. Under ENA ONP WS1B P1, we have developed a common methodology for DNOs to assess the merits of flexibility versus ANM versus traditional reinforcement. Within RIIO ED2, we will implement the resulting recommendations and methodology, which will enable us to optimise the length of flexibility services alongside other options and develop associated contracts lengths (3B8/3B9. We have adopted ENA ONP good practice on flexibility procurement in relation to the payment approach, contract structure and possible contract lengths, including (a) Types of payments the provider can expect to receive for being on standby and delivering a service, (b) Whether the prices paid are set or can be specified by potential providers, (c) Behaviour that would constitute an Event of Default and the associated penalty (6D3). We have also adopted ENA good practice around sharing information with market participant on the procurement of flexibility, including service drivers (short-term and long-term), technical/operational	3B8: completed 3B9: completed 6D3: Operational 6E5-6E9: Operational G16: Operational

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	requirements, details and timing of the procurement approach, time and locational information, payment and contract details, and service level agreements (6E5-6E9). We also follow ENA dispatch guiding principles in publishing decision criteria for near real-time dispatch of flexibility services (6G16).	
3.2.2 (b) DNOs should have clear, comprehensive and transparent mechanisms and associated commercial structures for coordinating distribution flexibility services and ESO flexibility services procurement. 3.2.2 (c) DNOs should consider arrangements to support DERs to provide services that meet both DNO and ESO needs.	2021 WS1A 07 of the ENA ONP will develop a common baseline methodology for adoption by all DNOs. This product is a continuation of the 2020 WS1A P7 product which sought to assess existing UK and international baselining methodologies and recommend suitable methodologies for adoption by the UK distribution flexibility market. This product will seek to further consult with stakeholders to refine and agree baseline approaches which will be adopted by DNOs for their operation of flexibility products, following which a robust implementation and governance plan with be defined and support tools developed. We are in the process of building and implementing a communication link (ICCP) between DNO-ESO control centres to facilitate coordination and conflict management (1A20). More generally, in alignment with the ENA ONP paper on Real time exchange & forecasting, we are developing mature processes and ICT infrastructure for data exchange and increased system visibility and control, capable of facilitating the management of service conflicts and optimisation on distribution networks (1A22). Jointly with other DNOs under ENA ONP WS1A P5, we will develop a draft set of principles and primacy rules for addressing flexibility service conflicts (T-D). These rules will look to balance: the local networks' technical requirements; the risks to the overall operability of the whole system; the value for flexibility service providers through the facilitation of market / price driven actions; the needs of emerging market-based platform developers; and ultimately the end consumer (1A35). These principles are currently in development and expected to be completed in 2021, after which we will commence implementation. Alongside other DNOs we are working with ESO to implement changes to align with the ESO on procurement timescales, which will be completed by late 2022 (6A19). Informed by outcomes from ENA ONP WS1 P13 (2018), we are in the process of rolling out architecture of control/comms systems between transmission and distribution to achieve whole system coordination that allows managing conflicts of services, N-3 (operational tripping scheme) and Connect & Manage. (6F1). We have developed and adhere to Good Practice flow charts for the dispatch process as part of the ENA ONP Workstream 1A Product 3 (6G8).	1A20: tbc 2021 1A22: tbc 2023 1A35: tbc 2021 6A19: tbc 2022 6F1: tbc 2021 6G8: Operational 7D2: tbc 2022

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
	Alongside other DNOs we are working with ESO to develop and trial conflict management actions through regional development plans and other flexibility market case studies, to be completed late 2022. Actions will include the provision of Service Conflict identification, adoption of informed procurement processes, conforming to SLA (7D2)	
3.2.3 DNOs should make available the necessary data to enable secondary trading, for example capacity and other peer-to-peer trading.	We led ENA ONP Workstream 1A Product 6 (2020) which tested the principles/rules of engagement for market participants to trade energy locally or exchange capacity and curtailment obligations within the context of the TEF projects and the BEIS Flexibility exchange demonstration competition (FleX) and Power Forward projects. It also tested the data sets that were identified by 2019 WS1A P6 to enable neutral facilitation of these new markets both pre & post transaction to ensure there is no detrimental impact on the network. Over the course of RIIO-ED1, we have been monitoring and facilitating the development of new non-DSO services as required and implement outcomes from ENA ONP Workstream 1A Product 6 (2020) to facilitate local energy trading or exchange capacity and curtailment obligations. IT/infrastructure changes will be required to provide data for the facilitation of new markets and identification and management of potential conflicts, and these are being trialled in Project TRANSITION. We have already adopted the ENA good practice of signposting anticipated procurement requirements for flexibility services, using a broad spectrum of outlets to reach the greatest numbers of service providers (ENA DSO step 6A4). For instance, we have set out in our Business Plan that we are committed to setting up an annual flexibility providers forum for engagement, enabling regular feedback. We are planning to implement outcomes from ENA ONP Workstream 1A Product 6 (2020) to facilitate local energy trading or exchange capacity and curtailment obligations by 2023. As part of this, we will investigate what IT/infrastructure changes may be required to provide data to facilitate new markets and identification and management of potential conflicts (1C4). Based on outcomes of the work that will be delivered by ENA ONP through WS1A P6 (in 2021 and 2022), we will adopt a common approach to sharing and trading capacity (e.g., rules and requisite datasets that enable facilitation of these markets by DNOs) (1C12).	1C4: tbc 2023 1C12: tbc 2023 6A4: Operational
3.2.4 Market support services, such as pre-qualification, credit-	Based on work done in 2020, DNOs are now aligned on the use and timing stages of Pre-Qualification Questionnaires. Building on this work the product will undertake further work to deliver alignment on the prequalification requirements across both T & D and simplify them where possible. We will implement pre-	1A4: Operational 1A34: tbc 2021

Baseline Expectation	SSEN Delivery Plan	ENA DSO Step & Timing (Function/Activity/Step)
checking and settlement must enable simple and cost-efficient participation in markets. DNOs should enable, and never prevent, the opportunity for third parties to provide these services where they could do so more efficiently.	qualification process and requirements as per deliverables of ENA ONP's work which will take place in 2022 (6A20). 2021 WS1A 07 of Open Networks will develop a common baseline methodology for adoption by all DNOs. This product is a continuation of the 2020 WS1A P7 product which sought to assess existing UK and international baselining methodologies and recommend suitable methodologies for adoption by the UK distribution flexibility market. This product will seek to further consult with stakeholders to refine and agree baseline approaches which will be adopted by DNOs for their operation of flexibility products, following which a robust implementation and governance plan with be defined and support tools developed. We have adopted the standardised Flexibility Services Standard Agreement that was developed by ENA ONP in 2020 (1A4). This agreement is common across all DNOs and used for all flexibility services, including future modifications, as well adopted by the ESO, to provide alignment between the Standard DNO Contracts and ESO general Terms and Conditions (1A34). There are no exclusivity clauses in any of our contracts. We have adopted ENA ONP good practice on flexibility procurement in relation to the payment approach, contract structure and possible contract lengths, including (a) Types of payments the provider can expect to receive for being on standby and delivering a service, (b) Whether the prices paid are set or can be specified by potential providers, (c) Behaviour that would constitute an Event of Default and the associated penalty (6D3). We have adopted ENA ONP Good Practice flow charts for the settlement process as part of the ENA ONP Workstream 1A Product 3 (6G12) and also per Good Practice have in place a system for automated performance verification to underpin the settlement process (6G14). We are also in the process of fully automating the settlement process by the end of 2021 (6G13). In line with 2019 ENA ONP Workstream 3 Product 1, we have shared learning on Dispatch & Settlement from developing and operating flexibility with other DNOs in 2020 (6G18). SSEN was one of the first DNOs to utilise a third-party platform (PICLO) to provide market support services and is now collaborating with other DNOs on the Flexible Power platform. In addition, Project TRANSITION is trialling new IT/infrastructure changes that will support third-party participation in the flexibility lifecycle and allow for the provision of market support services.	6A2: tbc 2022 6D3: Operational 6G12: Operational 6G13: tbc 2021 6G14: Operational 6G18: Completed

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	SSEN is committed to the most cost-effective market solutions and we welcome third-parties playing a clear role in their provision.	
3.2.5 DNOs to introduce other proportionate measures, developed with robust stakeholder engagement, to identify and address potential conflicts between its market development and network ownership roles or other business interests. The introduction of such measures should enable DNOs to efficiently plan, develop and use their network, taking into account and using flexible alternatives to network reinforcement where efficient for the system, in a visibly neutral way. At a minimum, this should include demonstrable executive-level accountability and board-level visibility of key DSO decisions across the planning, operation and market facilitation	We are clear on our role as a neutral market facilitator and our role in the market is simply as a procurer of services for distribution network solutions. Solutions related to the smarter use of assets or coordination activities will not be offered commercially. As part of our commitment to ENA Flexibility Next Step 3 (Conduct procurement in Open and Transparent Manner), we will be open and transparent when deciding how and why services have been sourced from different solutions in order to meet network needs, such as flexibility services from the market, smart grid solutions and traditional network reinforcement (7B1). This commitment also requires us to always choose the solution that is the most cost-effective for consumers, while meeting the needs of all customers, the system and the networks (7B4). As market participation grows we will ensure visibility of these decisions on our Flexibility Page. Furthermore, we are committed to be open and transparent when deciding how and why services have been procured from different solutions in order to meet network needs, such as flexibility services from the market, smart grid solutions and traditional network reinforcement (7C1). This includes taking a fair and clear approach to the dispatch of flexibility services to meet electricity system or network needs by setting out the terms and methodology adopted (7C3), as well as providing transparency on dispatch decision-making criteria (7C4). We also follow ENA ONP Workstream 1A Product 3 (2019) good practice, which requires that where multiple flexibility providers could provide a service in excess of the requirement, a DNO should adopt consistent and fair criteria to assess which flexibility providers will be secured for capacity availability and/or utilisation. The ENA product team has developed Guiding Principles for the application of decision criteria (7C20). In **Section 4.6** and **Appendix I** we detail our layered approach to managing conflicts of interest, which includes independent oversight and external auditing, and we outline our approach to institutional arrangements for DSO within the SSEN business. In addition, we have commissioned an independent report by NEERA to examine the available supporting information on the likely costs, timings and implications of alternative options and a narration of initial views which will inform SSENs response to the imminent Ofgem RFI on institutional arrangements for DSO.	7B1: Operational 7B4: Operational 7C1: Operational 7C3: Operational 7C4: Operational 7C20: Operational

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functions. This should also include clear and separate decision-making frameworks, supported by independent oversight, such as external auditing, to promote transparency and enable scrutiny.		