MERLIN

Modelling the Economic Reactions Linking Individual Networks

Milestone 2

1.04 Mapping Open Networks Future World Impact Assessment and Least Regrets to MERLIN Activities

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Contents

1 Introduction

This report aims to outline how the MERLIN project aligns and supports the work undertaken in the Energy Networks Association (ENA) Open Networks Project's least regrets exercise and Baringa's Future World Impact Assessment (FWIA) to MERLIN project activities.

This report is organized into three chapters, these chapters cover the following aspects:

1. Background and Context
2. The MERLIN Project & The FWIA Transition Paths
3. The MERLIN Project & Least Regrets Functions

1.1 Background

This section will provide an overview of the key activities under consideration in this report. These activities are:

- The ENA's Open Networks Project and The Five Worlds
- The Baringa Future World Impact Assessment
- The ENA's Least Regrets
- The MERLIN project

The ENA's Open Networks Project & The Five Worlds

The Open Networks Project is an ENA industry initiative that is focused on underpinning the delivery of the smart grid in the United Kingdom (UK). As per the ENA, the Open Networks Project *"seeks to enable the uptake of new smart energy technologies by more and more homes, businesses, and communities in the UK. Allowing customers to take advantage of these new technologies to take control of their energy will lower costs and secure the energy we rely on every day"* [1].

Workstream 3 of the Open Networks Project focusses on the transition to a Distribution System Operator (DSO). The ENA describes a DSO as an entity that *"securely operates and develops an active distribution system comprising networks, demand, generation and other flexible DER. As a neutral facilitator of an open and accessible market, it will enable competitive access to markets and the optimal use of DER on distribution networks to deliver security, sustainability and affordability in the support of whole system optimisation"* [2].

The output of this workstream is five future worlds that model "*how future industry structures could best deliver flexibility markets providing services from DER for both national and regional (transmission and distribution) requirements*." The Five Worlds are best described by the ENA as visualized in Figure 1. The ENA does not identify these worlds as mutually exclusive or complete but instead as potential future market, organizational, and operational structures that could co-exist.

World A
DSO Coordinates – a World where the DSO acts as the neutral market facilitator for all DER and provides services on a locational basis to National Grid in its role as the Electricity System Operator (ESO).

World B
Coordinated DSO-ESO procurement and dispatch – a World where the DSO and ESO work together to efficiently manage networks through coordinated procurement and dispatch of flexibility resource.

World C
Price-Driven Flexibility – a World where changes developed through Ofgem's reform of electricity network access and forward-looking charges have improved access arrangements and forward-looking signals for Customers.

World D
ESO Coordinate(s) – a World where the ESO is the counterparty for DER with DSO's informing the ESO of their requirements.

World E
Flexibility Coordinator(s) – a World where a new national (or potentially regional) third-party acts as the neutral market facilitator for DER providing efficient services to the ESO and/or DSO as required.

Figure 1: The ENA's Five Future Worlds [2]

The Baringa Future World Impact Assessment

The ENA asked Baringa to undertake an independent impact assessment of the Future Worlds. The Future World Impact Assessment (FWIA) is intended to reflect on the relative strengths and weaknesses of the Future Worlds and the impacts they may have on network operators and users [3]. This was done though an assessment of the Future Worlds against over 30 criteria defined by the ENA and stakeholders. While the assessment did not recommend a specific world to pursue, it did deliver pathways by which the Future Worlds may be achieved and identified their objectives and trade-offs.

The FWIA identified four transition paths to the Future Worlds, as presented in Figure 2. Most importantly, FWIA identified Phase 1 where World B is pursued at least until 2023 and incorporates the constructs of World C across each of the transition paths.

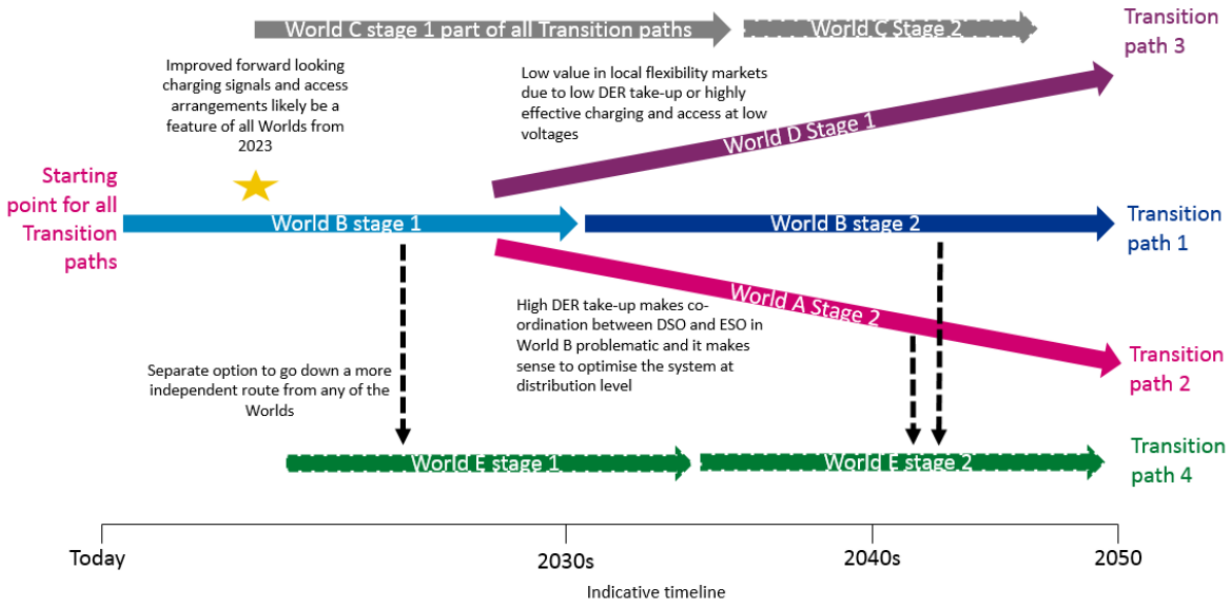

Figure 2: The FWIA Five Transition Paths [3]

Least Regrets

The ENA's Least Regrets assessment is the third product of the Open Networks Workstream 3 [4]. This builds on the five transition paths outlined by Baringa's FWIA and identifies World B, of DSO-ESA co-coordination as the least regrets path to pursue in the short- and medium- term [5].

Specifically, this product has identified areas of functionality that would be common to all Future worlds, presented in Figure 3 . Ordered by their relevancy across each of the Future worlds, these are:

- System Defence and Restoration
- Investment Planning
- Connections & Connection Rights
- Charging
- Service optimization
- Network operation
- Services and Market Facilitation
- System coordination

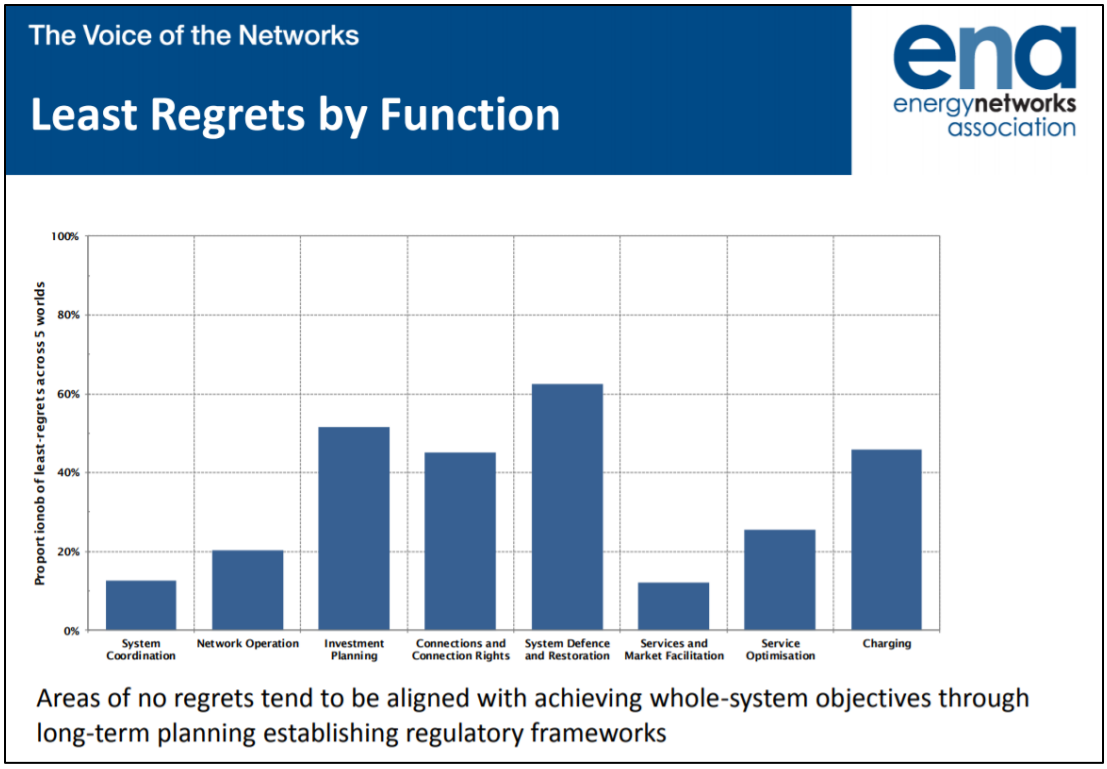

Figure 3: Least Regrets by Function as Presented in [4]

These functions are further detailed into activities that would be conducted by a variety of Future World entities including a DSO and an ESO for example (the entities differ by world). The ENA Workstream 3 recommends that these serve as a basis for building smart grid initiatives at present.

The MERLIN Project

The MERLIN project is a smart grid initiative that will investigate and demonstrate activities a DSO could conduct as a system operator, potentially in any of the Future worlds. Per the ENA's commentary of the FWIA, this positions the project to align well with the least regrets analysis.

The MERLIN project will investigate the ways in which a Future World DSO may valuate flexibility to support decision making. More specifically, the project will determine how smart solutions and DER flexibility service solutions can be assessed and compared to maintain the distribution network. This will be trialled in a jurisdiction of SSEN's network for this project and will be comprised of two software deployments that will contribute to one another but offer separate value-adds:

1. A planning tool that will compare various solutions to network constraints and reinforcement needs. Specifically, the comparisons will be based on financial and power systems metrics. This project will see the deployment of a tool that facilitates the comparison of how flexibility solutions compare to traditional network reinforcement solutions based on cost and ability to relieve network constraints. As a part of the MERLIN project, Opus One Solutions' GridOS Integration Distribution Planning software will serve as the planning tool.
2. A flexibility market simulator that will simulate various flexibility market scenarios for two different regions within SSEN's jurisdiction. Specifically, the simulator will utilise a DER valuation

model to generate simulated flexibility requests and will utilise smart solution financial and technical information to simulate a market deployed to service network needs through the utilization of flexibility. As a part of the MERLIN project, Opus One Solutions' GridOS Flexibility Markets Simulator software will serve as the flexibility market simulator.

The MERLIN project will develop case studies from the SSEN Future Energy Scenarios (FES) that reflect different potential future scenarios by simulating loading, network, flexibility, and pricing constructs. The planning tool and flexibility market simulator tools will then be deployed to assess how SSEN as a DSO would operate under said case studies, when there are more mature markets and the ongoing management of DSO and P2P services becomes economically vital for all actors.

This project will, in the long term, inform the Power Systems Economics Roadmap at SSEN. The purpose of the roadmap is to define where DNOs currently are with respect to the technical capabilities that help understand Power Systems Economics and to then define an end point of where they can be in a Future World. This will enable SSEN and other DNOs to perform a gap analysis to identify areas of research that will be needed to take the organization to where it needs to be in the Future Worlds.

2 The MERLIN Project & The Future World Impact Assessment Transition Paths

The ENA's World A focuses on flexibility coordination and dispatch met by the DSO while World B on DSO-ESO co-coordination (Figure 1). FWIA states that Worlds A and B produce the maximum benefits in the short-term while requiring the least effort from stakeholders. Each of the four transition paths assumes that World B will be pursued until 2023, at which point each of the pathways diverge to deliver one of the five future worlds.

A key objective of the MERLIN project is to support DSOs building out key planning and coordination functionality, which is a World B requirement and serves as the short-term future for each transition path.

Another objective of the MERLIN project is to address the techno-economic impacts of planning for flexibility through determining scenarios by which DER and local flexibility markets may defer reinforcements on the distribution network. This addresses some of the key factors that the FWIA identifies will occur in World A and will continue past 2023, namely:

- Development of frameworks in which flexibility providers can stack revenues and interact with different markets proves too complex for co-coordination
- High DER update
- Captured and quantified benefits to utilizing DER and local flexibility markets to defer reinforcements on low voltage distribution networks.

Additionally, the MERLIN project can offer learnings for the complexity of co-coordination with an ESO market given a pilot of coordination with only one layer of a flexibility market.

The FWIA report highlights the need for a trial to develop the economic concepts, tools and methodologies and identified the need for greater understanding of Power System Economics to ensure the best whole system solutions for GB networks can be determined. MERLIN proposes to close the gap identified by focusing on Power System Economics which will inform investment decisions and be significant to network customers looking to build business cases through the objective of supporting the transition to a smart grid for DER integration into the electricity distribution network and simulation of other markets. The FWIA identifies four areas for future work that can help to inform which transition path is most likely to be pursued beyond the 2023 World B. The MERLIN project addresses two of these directly:

1. What is the value of flexibility to network operators at low voltages?
   A MERLIN project focus is to understand the value flexibility markets can offer to DSOs and how this relates to traditional solutions to network operations. Specifically, the MERLIN project will entail activities that quantify the value a DER may offer in relieving network congestion. As per the FWIA, *"[…] further trials, to test the economic viability of these local flexibility markets will help inform the extent to which a transition to World A remains a credible pathway."*
   The results of the MERLIN project can support Baringa and the ENA in determining how viable flexibility markets are. For example, the MERLIN project will identify scenarios in which DER costs in a flexibility market are higher than traditional solution costs, shedding light in conditions under which flexibility markets may not be the most economic solution based on today's

assessment criteria which is being aligned through the ENA Open Networks Project. However, this alignment does not consider non-traditional assessment factors including some outside of the DNOs present remit. In a Future World, whole system factors potentially including social benefits may have a significant impact on the economic viability of the available options. Through MERLIN the industry will better understand the likely impact of each factor and the complexity associated with implementation. This can then form the base for longer term pre-procurement assessment processes.

Finally, the FWIA states *"A greater understanding of the economics of local flexibility markets will be crucial in understanding if Stage 2 of World A is likely to be required. Further information in this area would also help to reduce the range of uncertainties placed around our quantitative analysis."* The MERLIN project will close this gap by using power systems economics to evaluate the value of flexibility to system operators at the low voltage. In a future world, this will inform investment decisions and support business case development for both network operators and network customers.

2. How can industry arrangements facilitate a different pace of change across regions?

The FWIA assessment identified one of the key triggers for the transition paths as the uptake of DER, which can vary by geography. The MERLIN project will be developing case studies that showcase various combinations of DER uptake that can be modelled in different areas. This will include varying DER type, availability, contract structure, and penetration. Additionally, the MERLIN project will consider these case studies in two different areas, Fort Williams, and Oxfordshire. While the project will not comment directly on industry codes and regulations that can facilitate various transition paths, MERLIN will be able to comment on the impact of various DER distribution and uptake conditions within SSEN jurisdiction.

2.1 FWIA and Distribution-level DER Valuation

The FWIA illustrated benefits from Future Worlds as saving money across four categories: avoided transmission investment; avoided distribution investment; reduced balancing services costs; and avoided generation investments. Figure 4 visualizes the result of Baringa's evaluation across all Future Worlds, between two FES scenarios considered.

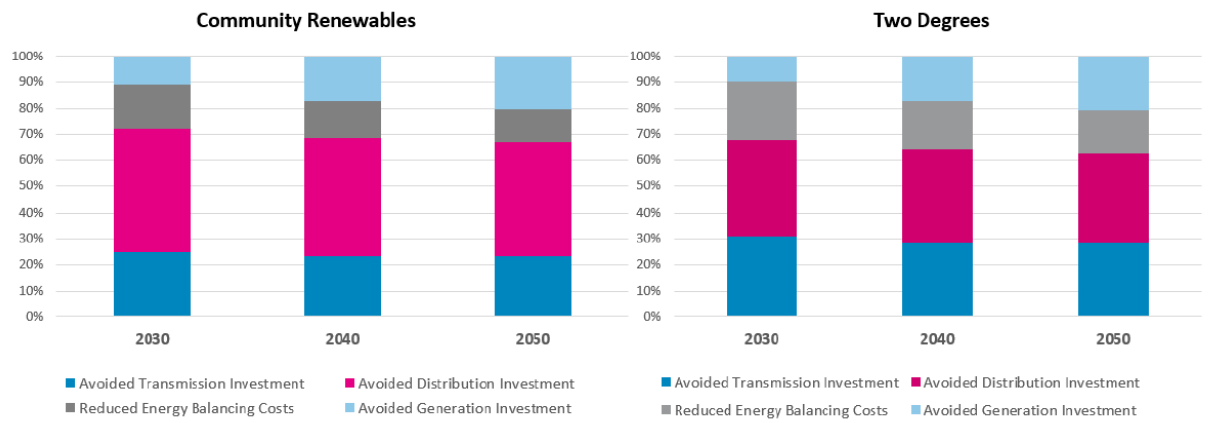

Figure 4: Proportionate Breakdown of Benefits by Category across Future Worlds [3]

In each scenario, avoided distribution investment costs play a large role in the benefits of a Future World. This is especially the case in scenarios with high DER uptake. This assessment took avoided distribution investment to be *"avoided reinforcement costs caused by locational constraints"*. The methodology used by Baringa to quantify avoided distribution investments were based on the (CDCM) which is based on generic incremental costs experienced on low voltage (LV) systems. The MERLIN project will align with Baringa's exercise in a number of ways:

- A DER valuation study as a part of the project will have the project team investigate different ways in which SSEN can quantify the benefits a flexibility service may offer to constraint relief. This will consider approaches including, similar to, and beyond those considered for the FWIA
- The MERLIN project will be able to account for more geographically specific benefits of a flexibility market. For example, both the planning tool and flexibility utilization simulator will account for MERLIN's LV network model and utilize metrics identified by SSEN to value flexibility services
- Finally, the FWIA considered the benefits of flexibility services at a high level and order of magnitude scale. The MERLIN project will be able to consider a more granular level, reporting on costs for specific network configurations as using the planning tool, and simulating flexibility market payments using the flexibility utilization simulator.

Finally, the concluding remarks of the FWIA recommends future work that shapes *"a greater understanding of how markets would interact and the commercial arrangements between parties would help to validate the operational viability of each Future World, and in turn the attractiveness to investors in flexibility."* The MERLIN project will work to develop this understanding by modelling flexibility services of different contract structures and values with the case studies developed reflecting flexibility services with both long-term and spot market constructs.

3 The MERLIN Project & Least Regrets Functions

The ENA's commentary on the FWIA addresses three key points with MERLIN project strategically supporting points 2 and 3:

1. That the least regrets path identified aligns well with the DSO-TSO cooperation approach throughout the UK
2. That incorporating price driven flexibility will enhance the readiness of all stakeholders in the DSO transition
3. That regional differences must be accounted for in activities to support the DSO transition

First, the MERLIN project will provide case studies that outline the ways in which flexibility services can be valuated and the ways in which flexibility markets may operate based on these valuations. Second, the MERLIN project will include an assessment of two key and different areas in SSEN's jurisdiction, providing commentary on the impact of region on the DSO functions at SSEN.

As per the ENA's assessment and Figure 3, the least regrets functions outlined are intended to align such that they achieve whole system objectives. This means that some of the functions can be worked towards by a DSO entity and others by other entities such as the ESO. Below, key activities attributed with each of the least regrets functions (with the exception of Charging as it is not the role of a DSO) are aligned with the planning and flexibility market simulation components of the MERLIN project. Specifically, functionality offered in either toolset are aligned with key least regrets activities. Additionally, the value-add of the MERLIN project relative to these activities is highlighted, across various Future Worlds. Finally, this is rolled up into Table 1: Alignment of MERLIN Activities to Least Regrets Functions, which identifies which of the least regrets functions the MERLIN project may support a DSO in building towards.

Table 1: Alignment of MERLIN Activities to Least Regrets Functions (Figure 3),

	To what extent may the MERLIN project contribute to developing this function at SSEN?
Investment Planning	High
Service Optimization	High
Services and Market Facilitation	Medium
Network Operation	Medium
System Coordination	Low
Connections and Connection Rights	Low
System Defence and Restoration	None
Charging	None

Table 2 outlines how each least regret function is facilitated by the project trial. This is separated by planning and flexibility market simulation tool to indicate specifically software functionality that will allow for the overall MERLIN project value-add to be realized.

Table 2: MERLIN contribution to each Least Regrets Function

		Planning Tool	Flexibility Market Simulator	MERLIN Project Value-Add
Investment Planning	Design Contracts and Terms & Conditions for procuring ancillary services (DER)	- Ability to capture contract structure per flexibility provider made available to optimize by the operator. This includes indicating availability and utilization costs per DER - Ability to report on overall network operations costs as well as costs payed out per DER to operate a network given dispatch of flexibility for constraint management power flow objectives	- Ability to capture bid and offer curves from flexibility providers and optimize flexibility requests for market services while respecting bids and offers - Ability to report on recommended settlement per DER based on market simulation	- This project will borrow contract structures for flexibility providers from the TRANSITION and LEO projects. These are themselves built on the Open Networks contract template for today's Active Power Services. These will be captured in analyses performed by both the planning and flexibility tools. Specifically, the project trials will vary contract payment structures and values between availability and utilization. This will allow DSOs to better understand how different contract and payment structures for flexibility shape the overall cost to operate network operations and/or flexibility markets. This will allow later work under TRANSTION and LEO to be directed by MERLIN learning. It also facilitates greater economic analysis, verification and validation, increasing the weight of overall Oxfordshire learning.
	Create a visible measure of flexibility on the networks	- Ability to provide a GIS view of the network, identifying asset locations	- Ability to report on total flexibility service requests generated	- The MERLIN project will visualize the impacts of flexibility operations to support

		- Ability to view market participating DER based on location - Ability to visualize network conditions (powerflow, voltage, constraints, and loading) on the network given network conditions and DER operations - Ability to quantify the number of times a flexibility service would be dispatch to support constraint minimization on the network - Ability to report on flexibility dispatch and costs of dispatch - Ability to export all reporting	and simulated market participant responses - Ability to export all reporting and filter by flexibility provider	constraint minimization visually using the planning tool and by numbers via the simulator.
	Present customer information of opportunities in a consistent way – heatmaps etc.		- Ability to provide both operator and market participant interfaces, allowing the various actors to better understand the economic viability of a service. Aids investment and reduces the risk of stranded investment. This includes presenting flexibility requests and clearances to market participants and overall system costs and flexibility dispatch to operators.	- The MERLIN project will deliver a platform that provides flexibility providers as well as system operators visibility to simulated market operations such that customer information is accessible and can be reported on. This is important in future platform deployments to engage and inform flexibility providers.
Service Optimisation	Universal Contract for Flexibility Providers	- Ability to capture contract structure per flexibility provider made available to optimize by the operator. This includes indicating	- Ability to capture bid and offer curves from flexibility providers and optimize flexibility requests for market services while respecting bids and offers	- This project will borrow contract structures for flexibility providers from the TRANSITION and LEO projects. These will be captured in analyses performed

		availability and utilization costs per DER		by both the planning and flexibility tools. Specifically the project trials will vary contract payment structures and values between availability and utilization. This will allow DSOs to better understand how different contract and payment structures for flexibility shape the overall cost to operate network operations and/or flexibility markets
		- Ability to report on overall network operations costs as well as costs payed out per DER to operate a network given dispatch of flexibility for constraint management power flow objectives	- Ability to report on recommended settlement per DER based on market simulation	
	Contract Process		- Ability for flexibility providers to submit bids and offers to flexibility market that will be respected in market operations	- The MERLIN project will engage customer groups in Oxfordshire and have them providing some of the market simulation inputs, including bids and offers. This addresses a development of the 2019 Market Rules Simulation session led by TRANSITION. This could draw out areas where a more traditional process would act as a barrier to entry for some actors. Similarly, the simulations aim to better understand the impact of contract durations and whether the most economic for the DSO stimulates markets.
			- Ability for flexibility providers to interact with market platform in real-time	
	Activation, dispatch and settlement	- Ability to simulate dispatch of flexibility such that power flow is optimized to minimize system constraints		- The MERLIN Project will identify the optimal activation or dispatch of assets for each project trial scenario. These can

		- Ability to report on dispatch of flexibility simulating their complete availability to constraint minimization dispatch		be compared across trial scenarios to investigate how forecasted loading may impact flexibility utilization.
	Review and rate flexibility service provider	- Ability to allocate flexibility providers as completely available for dispatch to support system constraint minimization objectives or to associate operating schedules to flexibility providers - Ability to report on dispatch of flexibility simulating their complete availability to constraint minimization dispatch - Ability to report on overall network operation costs given flexibility provider behaviour and costs		- The MERLIN project trial scenarios will explore the techno-economic impact of non or part delivery of flexibility. This will include comparing the network constraints and network operation costs associated with scenarios in which flexibility is fully available or optimisation and others in which flexibility does not always respond to optimal dispatch. This will outline the risk DSOs should account for in flexibility delivery and will quantify the extent to which flexibility under-delivery may impact network operations ad costs - Direct engagement with flexibility service providers in Oxfordshire will allow SSEN to better understand the market structures that would promote and/or incentivize acceptable flexibility service provider behaviour

Services & Market Facilitation	Develop consistent best practice for end to end process of procurement, activation, dispatch and settlement of D-network connected flexibility		- Ability to provide operators and flexibility service providers with interfaces to enrol flexibility providers in a market and visualize flexibility services requested and delivered - Ability to engage market participants in an interactive simulation in which flexibility providers submit and update bids and offers - Ability to request flexibility services based on power flow driven system services, namely: constraint management; voltage management; and peak reactive	- This project will provide an opportunity for flexibility services to be utilized to relive D-network constraints in addition to voltage management and peak reactive services. This will involve the activation of these services with live participants and reporting on settlement recommendations. This will explore how a flexibility platform deployed can serve the end to end process of procurement, activation, dispatch, and settlement in future worlds. potential dispatch
	Develop good practice and consistency for post-event evaluation – review service provision		- Ability to generate reporting that documents flexibility dispatch, bids and offers, and calculated settlements at per flexibility provider and aggregate levels	- This project will build out DER penetration and flexibility market scenarios that vary DER types and locations as well as contract structures and values. Following, the overall costs to operate various market simulations can be reported and compared to one another and/or traditional solutions. This allows DSOs to explore the financial management of flexibility for network services

System Coordination	Define guaranteed standards of performance between DSO and ESO for utilising flexibility on the distribution network	- Ability to model the distribution network from the 33kV HV substation level to the 11kV LV level - Ability to ensure that flexibility services connected to the network do not constrain the network at any level - Ability to perform sub-transmission and distribution level power flows		- Modelling the 11kV and 33kV networks in the same system is unique and tests the level of power flow visibility that might be needed by the ESO and/or DSO in future coordination
	Design a consistent and effective feedback loop for those providing services –e.g. ratings/penalties?			- While the MERLIN project may not impose direct penalties on market participants for their behaviour in a market as the performance of a market will be simulated, case studies will allow SSEN to consider potential times in which flexibility providers do not deliver committed services and the impact this may have on the grid. - Engagement with flexibility service providers and Oxfordshire will allow SSEN to better understand the market structures that would promote and/or incentivize acceptable flexibility service provider behaviour. Further, the LEO project will investigate this in Oxfordshire, thus MERLIN will support.

Network Operation	Unified approach to LV system monitoring and visibility of data	- Ability to reflect LV networks data aggregated at 11kV network level - Ability to perform timeseries power flow based on forecasted load & generation data on both 11kV and 33kV networks - Ability to update network model configuration and asset properties to determine their impact on flexibility market simulations	- Ability to account for network model based powerflow in simulating the market ensuring that no flexibility services are generate that may compromise the 11kV or 33kV networks	- This project will translate two SSEN network models into Common Information Model (CIM) format that can be easily transferred across systems within SSE which is useful as it creates one source of truth for SSEN network model data - Regardless of the Future World pursued, network model consideration will be necessary to consider the power systems impact of flexibility markets. This project will offer lessons learned on deploying a simulation of a flexibility market on such a network model - This project will also generate load profiles that will model a number of future case studies, which will be useful to consider as they reflect conditions within which SSEN may transition towards a DSO role
	Consistent methodology/approach for the management of constraints	- Ability to report on and compare constraints on the network across a period of time for various future load scenarios and network configurations - Ability to model flexibility dispatched to relieve network constraints and report on associated costs	- Ability to house request flexibility from providers such that network constraints are resolved, at the lowest overall cost to the operator	- This project will involve defining a DER valuation methodology that will determine how traditional solutions to constraint management can be compared in cost to smart solutions for constraint management

				- Multiple load and network scenarios and conditions will be compared as a part of the MERLIN project. This comparison will be technoeconomic and will include the frequency of network constraints over any time period. In this way, the trial scenarios will allow DSOs to investigate the ways in which different traditional solutions and/or placements of DER may impact network constraints experienced.
Connection & Connection Rights	Design a common Connection Agreement & Flexibility Agreement	- Ability to capture contract structure per flexibility provider made available to optimize by the operator. This includes indicating availability and utilization costs per DER - Ability to report on overall network operations costs as well as costs payed out per DER to operate a network given dispatch of flexibility for constraint management power flow objectives	- Ability to capture bid and offer curves from flexibility providers and optimize flexibility requests for market services while respecting bids and offers - Ability to report on recommended settlement per DER based on market simulation	- This project will borrow contract structures for flexibility providers from the TRANSITION and LEO projects. These will be captured in analyses performed by both the planning and flexibility tools. Specifically, the project trials will vary contract payment structures and values between availability and utilization. This will allow DSOs to better understand how different contract and payment structures for flexibility shape the overall cost to operate network operations and/or flexibility markets

4 Beyond the MERLIN Project

The MERLIN project is an initiative at SSEN that will eventually feed into the Power Systems Economics Roadmap and transition SSEN to perform DSO roles in any Future World and in the meantime as a part of any of the FWIA transition paths. Based on the least regrets analysis, there are a number of initiatives that can prepare SSEN to build out even more of the DSO functions common across all transition paths. These are:

- Investigating the ways in which the D-network flexibility market can be aggregated to respond to ESO market requests. This will position SSEN to communicate all necessary data to and from the ESO and model Future Worlds in which co-coordination exists
- Trialling various contract structures and formats with flexibility service providers. This will allow SSEN to determine the most cost-effective and efficient way to contract for flexibility services
- Deployment of a market that serves as operational in real-time and cannot be reconfigured to simulate various configurations. This will provide learnings on the participation and dispatch of flexibility service providers
- Facilitating the linkage of a flexibility market to operational and outage data through an advanced distribution management tool. This will further increase visibility of flexibility market activities on the LV network. It will also allow SSEN to understand how the market would react to emergency situations

5 Glossary

CDCM	Common Distribution Charging Methodology
DER	Distributed Energy Resource, synonymous with flexibility service provider for the purpose of this report
DNO	Distribution Network Operator
DSO	Distribution System Operator
ENA	Energy Networks Association
ESO	Energy System Operator
FES	Future Energy Scenarios
FMT	Financial Management Tool
FWIA	Future World Impact Assessment conducted by Baringa
GridOS	Opus One Solutions' software, deployed to meet MERLIN project objectives
GridOS IDP	GridOS Integrated Distribution Planning Module
GridOS FMS	GridOS Flexibility Market Simulator
LV	Low Voltage
NMF	Neutral Market Facilitator
UK	United Kingdom

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MERLIN
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