LEO

Local Energy Oxfordshire

February 2021 | Version 3

Trials Plan

Brian Wann & Rich Hampshire

"The most effective way to do it, is to do it"

Amelia Earhart

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Document Purpose

This document sets out the approach for the post-MVS+ trial periods of Project LEO (Local Energy Oxfordshire). It is intended to act as a reference guide for the delivery of the agreed learning objectives through the trial phases of Project LEO. This plan will enable the LEO partner organisations to understand their respective roles in successful delivery of the LEO trials and delivering insights about the future decarbonised energy system and markets.

This LEO Trial Plan is a living document and will evolve based on the emerging learning from each of the trial phases and related projects, both domestically and internationally.

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1   LEO and TRANSITION

The UK Government has legislated to reduce its carbon emissions to net zero by 2050. Meeting this target will require significant decarbonisation of the electricity system. This will lead to increased demands on the electricity network. Traditionally an increase in demand on the network would require network reinforcement. However, technology and the ability to flex demand on the system at different periods provides opportunities for new markets to be created, and new demand to be accommodated through a smarter, secure and more flexible network.

Satisfying energy needs through a decentralised energy system that supports local, distribution connected renewable energy sources and the adoption of no-and-low carbon technologies will require new markets that benefit everyone through the provision of flexibility services. To accommodate this change, Distribution Network Operators (DNOs) are changing to become Distribution System Operators (DSOs).

Project LEO (Local Energy Oxfordshire)[1] is an important step in understanding how new markets can work and improve customer engagement. It is part funded by Innovate UK under the Prospering from the Energy Revolution Programme (PFER) and will demonstrate a Smart Local Energy System (SLES), at county scale, to maximise economic, environmental and social prosperity for the region. LEO will establish a market platform that enables local flexibility providers to understand how their services can maximise utilisation of the electricity distribution network, at minimum cost, and provide best value for energy users, generators and Distributed Energy Resource (DER) owners alike. It is made up of ten project partners from across industry, academia, local authority and a community energy social enterprise.

TRANSITION[2] is an Ofgem Electricity Network Innovation Competition (NIC) funded project, led by SSEN. Based on the outputs of the Open Networks Project, which is defining the DNO transition to a DSO, TRANSITION will inform the design requirements of a Neutral Market Facilitator (NMF) and Whole System Coordinator (WSC), develop the roles and responsibilities within the marketplace, develop the market rules required for the trials, and implement and test these by means of a programme of trials. The TRANSITION project is also integral to the Project LEO. The objectives of TRANSITION and LEO are closely aligned and, when combined, significantly enhance the overall learning by enabling a whole electricity system approach.

Working together, Project LEO and the TRANSITION programme will deliver some of the most ambitious, wide-ranging, innovative energy trials ever conducted in the UK. They will improve our collective understanding of how opportunities can be maximised and unlocked from the transition to a smarter, more flexible electricity system and how households, businesses and communities can realise the benefits through participation in the markets for flexibility. The increase in small-scale renewables and low-carbon technologies is creating opportunities for homes and businesses to generate and sell electricity, to store electricity using batteries, and even for electric vehicles (EVs) to alleviate demand on the electricity system. To ensure the benefits of this are realised, Distribution Network Operators (DNO) like Scottish and Southern Electricity Networks (SSEN) are becoming Distribution System Operators (DSO).

This Trial Plan builds on the work of Project LEO during 2019-2021 and the development of the minimum viable system (MVS) framework, which represents the minimum set of participants and processes that are required to test the effects of a new process modification or asset use case on the whole flexibility delivery system.

The Full Trial Phase of Project LEO and the TRANSITION programme will go a step further and provide an evidence base on the market dynamics and will validate the requirements for DSO systems (specifically the

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[1] Project LEO website

[2] TRANSITION Programme website

Neutral Market Facilitator (NMF) and Whole System Coordination (WSC)) and management of commercial arrangements for the transaction of flexibility services by multiple market actors. The trials will also explore the willingness of flexibility service providers to make flexibility available and establish the value of services to both the DSO and market actors within a whole system context.

Project LEO and the TRANSITION Programme will demonstrate 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, responsive and flexible electricity network. They will inform how DSOs function in the future to support a decarbonised electricity system and Britain achieving its Net Zero goals.

2   Learning Objectives

This section sets out the learning objectives that the trials will inform.

2.1   Project LEO Learning Objectives

Project LEO will identify regulatory and policy impacts that enable those at the grid edge to support the energy system transformation in a way that benefits everyone and demonstrates a well-functioning Smart Local Energy System (SLES) that is replicable by fast followers. This will include identifying best practice, with specific emphasis on social, governance and ethical considerations for the energy transition.

As part of Project LEO's MVS framework, questions were identified to guide the objectives of the Trials and structure the learnings that arose. These questions were broken down at three different levels with each sub-level targeted towards service specific questions. At the highest market wide level, these were grouped into the following 6 questions:

1. How to minimise non-delivery risk while maximising flexibility utilisation?

2. Under what circumstances is flexibility a viable alternative to each type of network reinforcement?

3. How to ensure that flexibility is fairly rewarded?

4. What market dynamics enable the best flexibility provision and delivery?

5. How much flexibility is required to achieve Net Zero?

6. What is the impact of flexibility on energy equity?

2.2   LEO Workpack 4 Learning Outcomes

1. To strategically identify future local energy projects to accelerate identification of suitable sites and integration of existing and new Distributed Energy Resources.

2. Define the technical, security and privacy (inc. GDPR) protocols for time series datasets used throughout the project for collection on cloud-based services that will allow interoperability across all systems. Gather time series datasets generated by all distributed energy assets and utilised in the operation of the local marketplace to create a curated legacy of high-resolution data to be used by legitimate researchers and stakeholders to enhance value creation.

3. Synthesize Insights through collaboration with all project partners to identify and track key metrics to create fast learning loops to guide project and strategic planning.

2.3   LEO Workpack 5 (TRANSITION) Learning Outcomes

The programme aims defined in the TRANSITION bid submission document (known as an FSP) are to:

- accelerate and de-risk the transition from DNO to DSO, reducing uncertainty for customers and industry;

- provide a clear signal to the market that a new platform (or platforms) for market development will be in place and enable the growth of new potentially disruptive market models, products and services;

- inform the appropriateness of competency assumptions for different DSO functions over various timescales;

- develop and demonstrate how markets for flexibility can be neutrally facilitated including enabling infrastructure, data exchanges and commercial arrangements;

- demonstrate and test potential solutions to inform further development of Open Networks market model options;

- identify cost, risk, and benefits of the market models proposed; and

- consult with a range of stakeholders to ensure the analysis is undertaken from a whole-system perspective.

2.4   Programme deliverables:

These aims translate into a number of deliverables[3]:

- requirements for changes to industry data needs, exchanges and structures;

- an outline process for real-time monitoring and visibility of the network;

- learnings from the operation of the Neutral Market Facilitator (NMF) Platform as a commercial tool and the consequences of interactions between Market Actors;

- an outline requirement specification for a NMF Platform that is scalable and technology neutral;

- a comparison of market models under different network configurations and for different social and geographic contexts (such as Smart and Fair Neighbourhoods); and

- recommendations on required changes to existing market rules and codes (such as OC6[4] (Operating Code No.6) of the Grid Code[5] and the Balancing and Settlements Code[6] (BSC)).

2.5   LEO Workpack 5 (TRANSITION) Learning Outcomes[7]

In its first annual progress report, TRANSITION set out eight Learning Outcomes consistent with the programme's aims and committed deliverables. These were:

1. **Identify the data requirements and data exchanges** informed by Open Networks for DSO functions, map this against current technology (service provider) capabilities and develop requirements for future technologies.

2. **Using the outputs from Open Networks[8], test and validate the market model options being proposed**. Understand the requirements to create a sustainable market that can facilitate competition based on whole system needs.

3. **Build on learnings from previous and ongoing projects, as well as collaboration opportunities such as T.E.F.[9] and LEO.** This will help develop understanding of a range of areas where a collaborative approach will be beneficial, including monitoring and modelling requirements to provide network data, connectivity and constraint data in sufficient detail to let the market operate in different network types. It will

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[3] TRANSITION FSP, P9

[4] Grid Code Operating Code N0.6 – Demand Control

[5] Grid Code

[6] Balancing and Settlements Code

[7] TRANSITION Annual Progress Report 2019

[8] Open Networks Project

[9] TEF

also provide insights on the different roles of the actors in the markets for flexibility and about communication and engagement for effective recruitment and commercial relationships.

4. **Establish system processing and visualisation requirements, including data protection and information security**. This will ensure that cyber security risks are effectively identified and managed.

5. **Develop and test DSO Use Cases that will be tested within the project** on different network configurations as well as the market/trading rules and timeframes to allow a neutral market to develop. This will remove barriers to new technology and markets allowing the increased use of market-based solutions as alternatives to reinforcement.

6. **Evaluate stakeholder experience of DSO trials**. Comprehensive stakeholder consultation will include discussion with licensees, aggregators, statutory authorities, consumer groups, community energy groups and engagement with the supply chain.

7. **Understand and communicate the requirements of an NMF Platform and the commercial mechanisms** that will be required for market participation to trial ways in which energy markets can evolve.

8. **Present the commercial interactions required for a DNO to transition to a DSO, develop and demonstrate NMF Platform tested on different network configurations** that will accelerate the transition from DNO to DSO. This will demonstrate the true value or flexibility from a whole system perspective. Maximising access to existing markets alongside new markets and being able to stack revenue across them.

2.6   Translating to Learning Objectives

These aims and deliverables, although set out in 2017, remain relevant and will form the reference points for TRANSITION in what and how it delivers valuable learning that will help to inform some of the key decisions that need to be taken as the British electricity system becomes a 'smart, flexible energy system' and DNOs transition to become DSOs.

TRANSITION can be regarded as having two inter-related elements:

1. **Market:** Informing how to make markets work for flexibility[10] effectively and inform decisions on roles, responsibilities, structures and processes (including changes to industry codes, regulation and, where necessary, legislation).

2. **DSO:** Understanding the requirements for DSO processes, operational practices, data and systems. This includes the value of flexibility services based on a DSO's ability to access such services economically.

The Neutral Market Facilitator Platform delivers the bridge between these two elements and enables the three market models defined in the TRANSITION Bid Document[11] (FSP) and the Energy Networks Association's Open Networks Project's Future Worlds[12] scenarios to be trialled.

The DSO deliverables build on and will be informed by the dynamics observed during the trials.

The Market and DSO elements of TRANSITION can be broken down into a number of Learning Areas. Specific learning objectives are aligned to these Learning Areas. The Learning Areas will remain constant through the trials and be aligned to TRANSITION's aims and committed deliverables.

The learning objectives will evolve through the trials, building on emerging learning.

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[10] UPGRADING OUR ENERGY SYSTEM Smart Systems and Flexibility Plan: Progress Update, October 2018

[11] TRANSITION Bid Document (FSP), Section 2.3.1, P10-P11 and Appendix 7 P52-P59

[12] Open Network's Project Future Worlds Consultation, 2019

Learning Areas are referenced to the Open Networks Project DSO Functions and the related Competences[13] Functional and Systems Requirements (May 2018). The Functions covered by TRANSITION are:

- Service/Market Facilitation
- Service Optimisation
- Network Operation

TRANSITION addresses the following related Competences:

- Forecasting
- Power System Analysis
- Whole System Coordination
- Data Management
- Commercial Relationships and Whole System Pricing
- Contractual Arrangements and Service Compliance
- Regulatory Codes and Frameworks

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[13] Open Networks Workstream 3: Product 2 | Functional and System Requirements | 15 May 2018

3   Common Trial Approach

3.1   Trial Objectives

The LEO and TRANSITION trials will be used to provide an evidential base on the market dynamics associated with "contracted flexibility (where parties trade and directly contract with one another to procure flexibility)"[14], as defined in the Government's Smart Systems and Flexibility Plan[15].

In doing so, LEO work pack 5 (TRANSITION) will build upon previous innovation programmes funded by Ofgem, including New Thames Valley Vision[16] and Low Carbon London[17][18], to validate the requirements for DSO systems (specifically the NMF and Whole System Coordination (WSC)) and management of commercial arrangements for the transaction of flexibility services by multiple market actors.

The trials will explore the willingness of flexibility service providers to make flexibility available and establish the value of services in a whole system context. This includes the value to the DSO accruing from the use of services at different times and under different market models[19] as well as the value that can be accessed by LEO partners in the roles of different market actors. The trials will also provide insight about the data that needs to be exchanged to support effective operation of the markets for flexibility.

3.2   Trial Period Dimensions Comparison

Parameters	Trial Period 1	Trial Period 2	Trial Period 3
Name	**Frosty Winter**	**Long Hot Summer**	**Stormy Winter**
Time Frame	Nov-21 to Feb-22	May-22 to Sept-22	Nov-22 to Feb-23
Duration (Weeks)	17	20	17

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[14] Project TRANSITION Full Submission Proforma, 2017; Page 3 Section 2.1.1

[15] Upgrading Our Energy System Smart Systems and Flexibility Plan, July 2017 P17

[16] New Thames Valley Vision Website

[17] Low Carbon London Website

[18] Low Carbon London Learning Reports

[19] Project TRANSITION Full Submission Proforma, 2017; Page 10 Section 2.3 and Page 52 Appendix 7 A7.2

Networks tested	**BSP**	6 / 6	TBC	TBC
	Primary	3 / 13	TBC	TBC
	Secondary	No	No	TBC
Service Parameters	**DSO Service Window**	3 - 7 pm	TBC	Variable
	DSO Service Duration	0.5 - 2 hours	0.5 - 2 hours	Likely variable
Services Tested[20]	**Sustain Peak Management**	Yes	Yes	Yes
	Events Per Market	*30*	*TBC*	*TBC*
	Sustain Export Peak Management	No	Yes	No
	Events Per Market	*NA*	*TBC*	*TBC*
	Secure DSO Constraint Management	No	Yes	Yes
	Events Per Market	*NA*	*TBC*	*TBC*
	Dynamic DSO Constraint Management	No	Yes	Yes
	Events Per Market	*NA*	*TBC*	*TBC*
	MIC/MEC Trading	Simulated Test Environment	Yes	Yes
	Events Per Market	*TBC*	*TBC*	*TBC*
	Offsetting	No	Simulated Test Environment	Yes
	Events Per Market	*NA*	*TBC*	*TBC*
	ESO Service- STOR	No	No	Yes
	Events Per Market	*NA*	*NA*	*TBC*
Auction Time Horizons	**Season Ahead**	Yes	Yes	Informed by Liquidity and Competition
	Week Ahead	Yes	Yes	Informed by Liquidity and Competition
	Day Ahead	No	Yes	Informed by Liquidity and Competition
	Intra-day	No	TBC	Informed by Liquidity and Competition
Clearing Mechanism	**Pay-as-bid**	Yes	Yes	TBC
	Pay-as-clear	TBC	Yes	TBC
Power Demand Forecast	**Forecast used**	Yes	Yes	Yes
	% of pre-planned events	80%	50%	20%
Market stacking?		Minimal	Minimal	Yes
Asset Reliability indexes?		Not Used	Yes	Yes

[20] TRANSITION WP4.3 Use Cases and Services to be Trialled v 1.1

3.3 Trial Methodologies

Detailed Trial Methodologies will be developed for each group of trial events and disseminated two months ahead of the start of the trials. This will be based on the published Use Cases and Services document[21]. The methodologies will cover:

- roles and responsibilities for each market actor;

- data and information to be collected (both quantitative and qualitative);

- learning objectives addressed.

3.4 Trial Approach

A detailed schedule of trials has been produced specifying the number of trial events, number of BSPs (as proxy markets) involved, the daily window in which the services will be called and duration of each trial event is shown in Appendix A.

The services to be trialled in each market are detailed in Appendix A. The LEO assets have been mapped to each BSP group (and hence to each market), so the networks with suitable penetration of assets and assets with suitable characteristics to participate in each trial of a service or commercial arrangement can be identified. An example of the mapping of LEO assets within the network topology is given in Appendix B.

One to three trial events will be run in each market each week during the Trial Period.

Qualitative data will be collected from LEO partners participating in the trials before and after the trials. Areas covered will include

- experience of using the platforms,
- factors affecting their willingness to participate and make their flexibility available in the markets,
- suitability of contracting structures,
- ease of contracting and factors affecting their ability to deliver the flexibility services contracted,
- which of the available data items proved most useful and what additional data should be made available to facilitate the effectiveness of the markets,
- Experience of those operating/owning the assets (e.g. building managers) in delivering flexibility services.

Additionally, quantitative data will be collected from participating LEO partners on asset, meter point and price data.

Quantitative data will be collected from the LV network monitors and from SSEN's Pi data historian to determine the network outcomes resulting from the dispatch of flexible assets.

3.5 Analysis, Review and Planning for Next Trial Period

LEO and TRANSITION provide a platform for the LEO partners to deliver both their specific and the LEO collective learning objectives. Emerging learnings from a completed trial period will inform and be used to develop the detailed approach for and in advance of the subsequent trial period. This will include the analytical approaches to deliver the learning objectives.

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[21] TRANSITION WP4.3 Use Cases and Services to be Trialled v1.1, 9 October 2020

3.6   Stage Learning and Dissemination

The report deliverables on the findings from the analysis of each Trial Period will be published on the relevant website (the LEO website library[22] for LEO report deliverables and the TRANSITION website library[23] for the TRANSITION report deliverables).

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[22] https://project-leo.co.uk/library/

[23] https://ssen-transition.com/library/

4   Trial Period 1: Winter 2021/2022

4.1   Trial Dimensions

Parameters		Trial Period 1
Name		**Frosty Winter**
Time Frame		Nov-21 to Feb-22
Duration (Weeks)		17
Networks tested	**BSP**	6 / 6
	Primary	3 / 13
	Secondary	No
Service Parameters	**DSO Service Window**	3 - 7 pm
	DSO Service Duration	0.5 - 2 hours
Services Tested[24]	**Sustain Peak Management**	Yes
	Events Per Market	*30*
	Sustain Export Peak Management	No
	Events Per Market	*NA*
	Secure DSO Constraint Management	No
	Events Per Market	*NA*
	Dynamic DSO Constraint Management	No
	Events Per Market	*NA*
	MIC/MEC Trading	Simulated Test Environment
	Events Per Market	*TBC*
	Offsetting	No
	Events Per Market	*NA*
	ESO Service- STOR	No
	Events Per Market	*NA*
Auction Time Horizons	**Season Ahead**	Yes
	Week Ahead	Yes
	Day Ahead	No
	Intra-day	No
Clearing Mechanism	**Pay-as-bid**	Yes
	Pay-as-clear	TBC
Power Demand Forecast	**Forecast used**	Yes
	% of pre-planned events	80%
Market stacking?		Minimal
Asset Reliability indexes?		Not Used

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[24] TRANSITION WP4.3 Use Cases and Services to be Trialled v 1.1

4.2   Trial Approach

The services to be trialled in each market (BSP group and below from a network topology perspective) are detailed in Appendix A.

The "Frosty Winter" Trial Period will cover the period after MVS+ has been successfully completed by the EDF Batteries, the Sackler Library (subject to CoVid-19 restrictions), Rosehill Battery, Sandford Hydro, and the NUVVE Vehicle to Grid assets. Additional assets, such as Oxfordshire County Library (aka Westgate Library) and Ray Valley Solar will be able to participate as they are commissioned.

Auctions will cover the Year Ahead and Week-Ahead contracting time horizons. For the avoidance of doubt, this Trial Period will not cover day-ahead nor intra-day timeframes.

The specific quantitative and qualitative data collection requirements to deliver the learning objectives from the "Frosty Winter" Trial Period will be specified within the detailed trial methodologies to be developed by the LEO partners during the March to July 2021 period.

4.3   Analysis, Review and Planning for Next Window

Based on a review of the outcomes of the trials at the mid point of the Trial Period, the detailed plan for the second Trial Period ("Long, Hot Summer", Summer 2022) will be delivered and published one month after completion of the "Frosty Winter" Trial Period.

4.4   Stage Learning and Dissemination

The report deliverables on the findings from the analysis of the "Frosty Winter" Trial Period will be published on the relevant website (the LEO website library[25] for LEO report deliverables and the TRANSITION website library[26] for the TRANSITION report deliverables) by May 2022.

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[25] https://project-leo.co.uk/library/

[26] https://ssen-transition.com/library/

5   Trial Period 2: Summer 2022

5.1   Trial Dimensions

Parameters		Trial Period 2
Name		**Long Hot Summer**
Time Frame		May-22 to Sept-22
Duration (Weeks)		20
Networks tested	**BSP**	TBC
	Primary	TBC
	Secondary	No
Service Parameters	**DSO Service Window**	TBC
	DSO Service Duration	0.5 - 2 hours
Services Tested[27]	**Sustain Peak Management**	Yes
	Events Per Market	*TBC*
	Sustain Export Peak Management	Yes
	Events Per Market	*TBC*
	Secure DSO Constraint Management	Yes
	Events Per Market	*TBC*
	Dynamic DSO Constraint Management	Yes
	Events Per Market	*TBC*
	MIC/MEC Trading	Yes
	Events Per Market	*TBC*
	Offsetting	Simulated Test Environment
	Events Per Market	*TBC*
	ESO Service- STOR	No
	Events Per Market	*NA*
Auction Time Horizons	**Season Ahead**	Yes
	Week Ahead	Yes
	Day Ahead	Yes
	Intra-day	TBC
Clearing Mechanism	**Pay-as-bid**	Yes
	Pay-as-clear	Yes
Power Demand Forecast	**Forecast used**	Yes
	% of pre-planned events	50%
Market stacking?		Minimal
Asset Reliability indexes?		Yes

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[27] TRANSITION WP4.3 Use Cases and Services to be Trialled v 1.1

5.2   Trial Approach

The services to be trialled in each market (BSP group, Primary and below, from a network topology perspective) will be added to Appendix A when the detailed plan for Trial Period 2 is published one month after the completion of 'Frosty Winter'.

The time horizons for the auctions will be determined based on the emerging learning from the "Frosty Winter" Trial Period when the detailed plan for this Trial Period is published in one month after completion of "Frosty Winter" (milestone M50, DPPv5, 2020). Auctions will cover the Year Ahead and Week-Ahead time frames. This Trial Period may cover Day-Ahead or Intra-Day timeframes based on learning from "Frosty Winter".

The specific quantitative and qualitative data collection requirements to deliver the learning objectives from the "Long, Hot Summer" Trial Period will be specified within the detailed trial methodologies to be developed by the LEO partners during the February to April 2022 period.

5.3   Analysis, Review and Planning for Next Window

Based on a review of the emerging outcomes of the trials at the mid point of the Trial Period, the detailed plan for the final Trial Period ("Stormy Winter", Winter 2022/2023) will be delivered and published by the end of October 2022.

5.4   Stage Learning and Dissemination

The report deliverables on the findings from the analysis of the "Long, Hot Summer" Trial Period will be published on the relevant website (the LEO website library[28] for LEO report deliverables and the TRANSITION website library[29] for the TRANSITION report deliverables) by December 2022.

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[28] https://project-leo.co.uk/library/

[29] https://ssen-transition.com/library/

6   Trial Period 3: Winter 2022/2023

6.1   Trial Dimensions

Parameters		Trial Period 3
Name		**Stormy Winter**
Time Frame		Nov-22 to Feb-23
Duration (Weeks)		17
Networks tested	**BSP**	TBC
	Primary	TBC
	Secondary	TBC
Service Parameters	**DSO Service Window**	Variable
	DSO Service Duration	Likely variable
Services Tested[30]	**Sustain Peak Management**	Yes
	Events Per Market	*TBC*
	Sustain Export Peak Management	No
	Events Per Market	*TBC*
	Secure DSO Constraint Management	Yes
	Events Per Market	*TBC*
	Dynamic DSO Constraint Management	Yes
	Events Per Market	*TBC*
	MIC/MEC Trading	Yes
	Events Per Market	*TBC*
	Offsetting	Yes
	Events Per Market	*TBC*
	ESO Service- STOR	Yes
	Events Per Market	*TBC*
Auction Time Horizons	**Season Ahead**	Informed by Liquidity and Competition
	Week Ahead	Informed by Liquidity and Competition
	Day Ahead	Informed by Liquidity and Competition
	Intra-day	Informed by Liquidity and Competition
Clearing Mechanism	**Pay-as-bid**	TBC
	Pay-as-clear	TBC
Power Demand Forecast	**Forecast used**	Yes
	% of pre-planned events	20%
Market stacking?		Yes
Asset Reliability indexes?		Yes

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[30] TRANSITION WP4.3 Use Cases and Services to be Trialled v 1.1

6.2   Trial Approach

The detailed schedule of trials will be produced specifying the date, time and duration of each trial and added to Appendix A when the detailed plan for Trial Period 3 is published in October 2022.

The service to be trialled in each market (BSP group, Primary, Secondary and below, from a network topology perspective) and each Primary Substation is detailed. The LEO assets have been mapped to each BSP (and hence to each market), Primary, Secondary group and each LV circuit, so the assets with suitable characteristics to participate in each trial can be identified. An example of the mapping of LEO assets to BSP group and Primary is given in Appendix B.

This "Stormy Winter" Trial Period will include running trials in an 'Artificial National Market' where assets connected to networks below the different BSP Groups / Markets have the opportunity to participate in a simulated national market, such as the ESO or the wholesale market. This will enable the interaction between local and national markets to begin to be assessed.

Auctions will cover the Year Ahead and Week-Ahead, Day-Ahead and Intra-Day timeframes.

The specific quantitative and qualitative data collection requirements to deliver the learning objectives from the "Stormy Winter" Trial Period will be specified within the detailed trial methodologies to be developed by the LEO partners during the September to October 2022 period.

6.3   Analysis and Review

Learning from the trials will be collated and presented in the learning reports and final project report. The reports will be published on the relevant website (the LEO website library[31] for LEO report deliverables by March 2023 and the TRANSITION website library[32] for the TRANSITION report deliverables by June 2023).

6.4   Stage Learning and Dissemination

A report on the findings from the analysis of this Full Trials phase (Stormy Winter) will be published before March 2023 ahead of closure of the LEO project in March 2023.

The report deliverables on the findings from the analysis of the "Stormy Winter" Trial Period will be published on the relevant website (the LEO website library[33] for LEO report deliverables by March 2023 and the TRANSITION website library[34] for the TRANSITION report deliverables by June 2023).
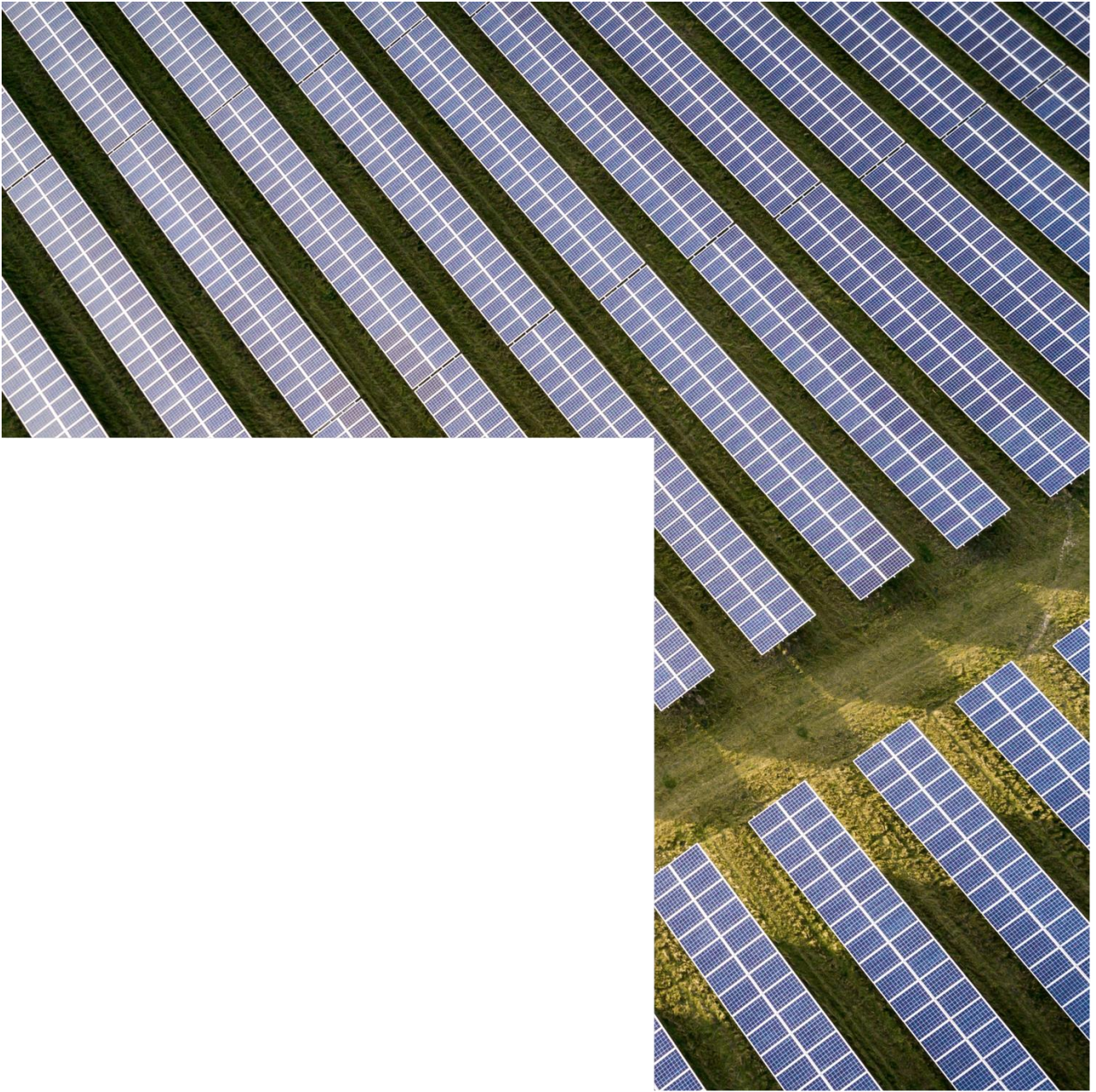
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[31] https://project-leo.co.uk/library/

[32] https://ssen-transition.com/library/

[33] https://project-leo.co.uk/library/

[34] https://ssen-transition.com/library/

Appendix

Appendix A Trial Schedule

The below Trial Schedule indicates the number of events across the different Bulk Supply Points (BSPs, acting as proxy markets for the trials) for the 'Smoke Test' period (aligned with entry into MVS+) and the Winter 21/21 trial period (aligned with what was referred to as Pre-Trials).

Month	Targeted Number of Events	BSPs Involved	Services	Trial Window	Duration (Hrs)	Notice	Assets Involved	Notes
Sep-21	6	6	Sustain Peak Management	1500 - 1900	0.5 – 2.0	1 Day	All available demand assets	
Oct-21	40	6	Sustain Peak Management	1500 - 1900	0.5 – 2.0	1 Day	All available demand assets	
	1	1	Simulated MIC/MEC Trading	TBC	TBC	TBC	TBC	Event details to be developed with LEO partners
Nov-21	50	6	Sustain Peak Management	1500 - 1900	0.5 – 2.0	>4 Hours	All available demand assets	
Dec-21	40	6	Sustain Peak Management	1500 - 1900	0.5 – 2.0	>4 Hours	All available demand assets	
Jan-22	45	6	Sustain Peak Management	1500 - 1900	0.5 – 2.0	>4 Hours	All available demand assets	
	4	2	Simulated MIC/MEC Trading	TBC	TBC	TBC	TBC	Event details to be developed with LEO partners

Feb-22	45	6	Sustain Peak Management	1500 - 1900	0.5 – 2.0	>4 Hours	All available demand assets	
	4	2	Simulated MIC/MEC Trading	TBC	TBC	TBC	TBC	Event details to be developed with LEO partners

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Appendix B   Assets

LEO Partner Assets						
Asset	**Partner**	**Substation Reference**	**BSP**	**Primary**	**Secondary**	**Trial Participation from:**
Battery Energy Storage 1	EDF	3A	HEADINGTON	BICESTER		Winter 21/22
Battery Energy Storage 2	EDF	3	HEADINGTON	UPPER HEYFORD*		Winter 21/22
Battery Energy Storage 3	EDF	3	HEADINGTON	WHEATLEY*		Winter 21/22
Battery Energy Storage 4	EDF	4	OXFORD	NORTH HINKSEY*		Winter 21/22
Low Carbon Hub Sandford Hydro Limited	LCH	5B	Cowley	Kennington		Winter 21/22
Rose Hill Primary School Battery	LCH	**5A**	Cowley	Rose Hill		Winter 21/22
Rose Hill Primary School PV	LCH	**5A**	Cowley	Rose Hill		Winter 21/22
Ray Valley Solar	LCH	3B	Headington	Arncott		Winter 21/22**
Oxford Bus Company	LCH	5	Cowley			Winter 21/22
Oxford Bus Company Cowley Batteries	LCH	5	Cowley			Winter 21/22
Thames Travel	LCH	6A	Drayton	Milton		Winter 21/22
West Witney Primary School	LCH		Witney***	Windrush Park***		Winter 21/22
Langford Village Community Primary School	LCH	3A	Headington	Bicester		Winter 21/22
Osney Lock Hydro Limited (IPS)	LCH	4A	Oxford	Osney		Winter 21/22
Rose Hill Advice Centre Flats	LCH	5A	Cowley	Rose Hill		Winter 21/22**

Rose Hill Community Centre Flats	LCH	5A	Cowley	Rose Hill		Winter 21/22**
OOF V2G 01	Nuvve	2A	BICESTER NORTH	BICESTER NORTH		Winter 21/22**
OOF V2G 02	Nuvve	2A	BICESTER NORTH	BICESTER NORTH		Winter 21/22**
OOF V2G 03	Nuvve	2A	BICESTER NORTH	BICESTER NORTH		Winter 21/22**
OBU V2G 01	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OBU V2G 02	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OBU V2G 03	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OBU V2G 04	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OBU V2G 05	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OBU V2G 06	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OBU V2G Res 01	Nuvve	5	COWLEY	UNION STREET*		Winter 21/22**
OCC V2G 01	Nuvve	4A	OXFORD	OSNEY		Winter 21/22**
Central Library (Westgate)	Oxfordshire County Council	4	Oxford	St Ebbes*		Winter 21/22
Sackler Library	University of Oxford	4A	Oxford	Osney		Winter 21/22 (subject to Covid)

(* - Located in one of the 6 designated BSPs but not within the 13 target primaries of the 33 primaries connected to the 6 BSPs)

(** - Subject to commissioning to schedule, as at Feb-21)

(*** - Located outside the 6 designated BSPs)

Appendix C   Network Topology

C.1   Substations

TRANSITION Sub Station Sites		
BSP	**Primary**	**Reference**
Yarnton	Yarnton	1A
	Eynsham	1B
	Deddington	1C
Bicester North	Bicester North	2A
Headington	Bicester Primary	3A
	Arncott	3B
Osney	Osney Primary	4A
	University Parks	4B
Cowley	Rosehill Primary	5A
	Kennington	5B
	Berinsfield	5C
	Wallingford	5D
Drayton	Milton	6A

C.2   Trial Area Map

Oxfordshire - 13 Primaries of interest within BSPs
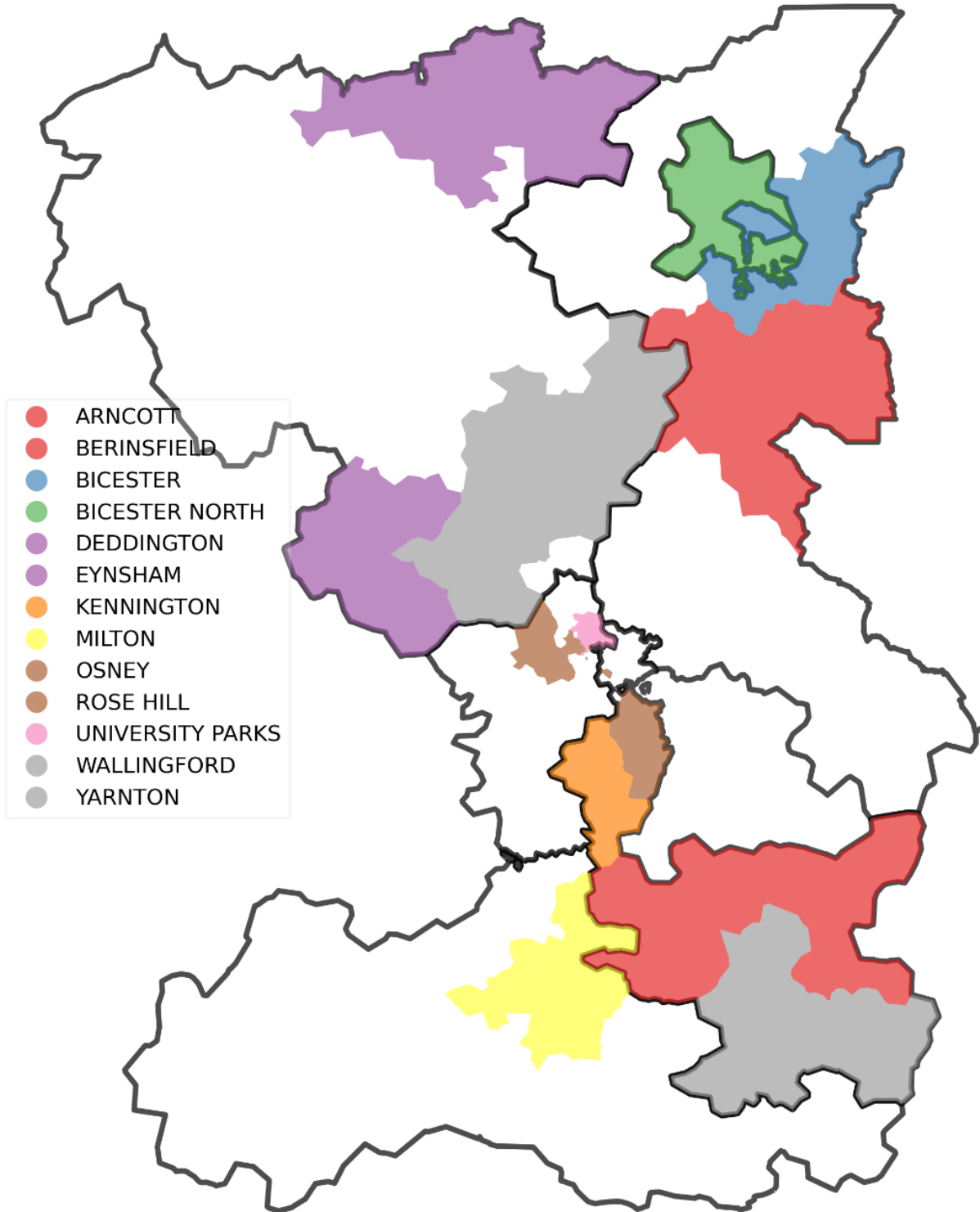
Appendix D   Glossary of Terms

The Glossary of Terms for the LEO project can be found here.

Additional Terms used by the TRANSITION project can be found here.

The Terms and Definitions produced by the Open Networks Project can be found here.

There are some terms used in this trial plan that do not yet appear in the Glossary of Terms. Working definitions are provided below:

Term	Definition
Market Reliability Index	An assessment of the anticipated reliability of different types of DER/DER Provider in a market to deliver the agreed amount of flexible energy. Where reliability is low this could justify over-procuring to compensate for the higher risk of the DER not supplying the full amount. For example, if the network needed 1MW, but the reliability was only 80% the DNO would aim to procure 1.2MW to ensure we secure the full supply.
Maximum Export Capacity Trading[35] (Peer-to-Peer Service)	There is a need for some customers to increase their export capacity above their authorised Maximum Export Capacity (MEC) for short periods that would not justify a long-term increase in the level of their authorised MEC. This service enables one Market Actor within a constrained area who has an excess of export capacity (the difference between capacity they are using to export to the distribution network and their authorised Maximum Export Capacity) to sell the excess (or a portion of it) to another Market Actor so that Market Actor can increase their level of export at an MPAN. This service supports the deferral or avoidance of conventional approaches to network reinforcement.
Offsetting Service[36] (Peer-to-Peer Service)	There is a need for some Market Actors within a constrained area to transact for an increase demand prior to an equal level of increase in generation such that there is zero net effect on the constraint but an overall increase in generation. This would involve exceeding the MEC for the generator and, in limited circumstances, an increase in MIC for the demand. This service supports the deferral or avoidance of conventional approaches to network reinforcement.
Peer-to-Peer (P2P) Services	Flexibility Services traded between Market Actors (but not the DNO, DSO or ESO although any one of these entities may facilitate the trade), e.g. Offsetting where Flexibility in a Zone is delivered from Demand ahead of the same level of increase of Generation that would exceed the MEC for that Site.
Power Demand Forecast	A forecast of the electricity demand at a particular time of day and time of year to enable potential constraints on the electricity infrastructure to be identified and managed.
Service Stacking	When a Market Actor with control over a Distributed Energy Resource (or energy asset) uses that asset to provide flexibility services in multiple markets (i.e. DSO services, P2P services, ESO services) as a means of maximising revenue streams.

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[35] Use Cases And Services To Be Trialled Phase 1, Use Case 5, P33-35

[36] Use Cases And Services To Be Trialled Phase 1, Use Case 6, P36-38

	This is possible when a DER has the ability to deliver more than one Flexibility Service within the same or adjacent Settlement Periods, provided it does not interfere with the delivery of the Flexibility Service.
Smoke Test	Smoke tests are a subset of test cases that cover the most important functionality of a system, used to aid assessment of whether main functions of the systems and processes work correctly. This approach will be employed to build confidence that systems and processes being used by LEO work as expected.
Sustain Peak Management Service[37]	There is a need to reduce the demand on a distribution network asset to keep that asset within its normal operational envelope. This could be as a result of a forecast capacity constraint on the asset at a particular time, e.g. to reduce the demand on a critical asset during winter tea-time peak, using a DSO planned service. This service supports the deferral or avoidance of conventional approaches to network reinforcement. The flexibility required can come from one of three actions that help to reduce demand at the MPAN; a reduction in demand, an increase in generation or discharging a battery.
Sustain Peak Export Management Service[38]	There is a need to reduce the reduce the generation exported onto a distribution network asset to keep that asset within its normal operational envelope. This could be as a result of a forecast generation export capacity constraint on the asset at a particular time, e.g. to reduce the generation exported onto a critical asset during summer day-time generation peak, using a DSO planned service. This service supports the deferral or avoidance of conventional approaches to network reinforcement. The flexibility required can come from one of three actions that help to reduce generation exported to the distribution network at the MPAN; an increase in demand, a decrease in generation or charging a battery (equivalent to an increase in demand).

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[37] Use Cases And Services To Be Trialled Phase 1, Use Case 2, P24-26

[38] Use Cases And Services To Be Trialled Phase 1, Adaptation of Use Case 2, P24-26, to apply to generation export

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