



Electricity Network Competition

SSEN005 TRANSITION

Project Progress Report

September 2022



**Scottish & Southern
Electricity Networks**

1) Executive Summary

Overview of TRANSITION

The GB network continues to evolve, and there is a clear need for networks to adapt, become more flexible, enhance operations and allow new technologies and new market models emerge. The transition to Distribution Systems Operator (DSO) has the potential to bring significant benefits to customers; however, it also brings a range of new complex challenges, unintended consequences and risks for market participants, new entrants and the network licensees themselves.

The Energy Networks Association (ENA) Open Networks Project (ON-P) is focussed on defining the Distribution Network Operator (DNO) transition to a DSO model and has been endorsed by the UK Government's Smart Systems and Flexibility Plan.

TRANSITION is an Ofgem Electricity Network Innovation Competition (NIC) funded project. Led by SSEN in conjunction with our project partners Electricity North West Ltd (ENWL), CGI, Origami and Atkins.

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 the concept of the systems by means of trials in Oxfordshire.

The TRANSITION NIC project gained Ofgem funding as part of a collaboration agreement between TRANSITION (SSEN project) and two other NIC projects; Electricity Flexibility and Forecasting System (EFFS) led by Western Power Distribution (WPD) and FUSION (SP Energy Networks project), all three collectively known in the industry as T.E.F.

In addition, the project is also an integral partner to the Local Energy Oxfordshire (LEO) project, a UK Industrial Strategy funded project. Both TRANSITION and LEO have objectives that are closely aligned and when combined, significantly, enhance the overall learning.

Progress within this Reporting Period

The first part of this reporting period focused on finalising the detailed design for IT systems including the NMF and WSC as well as the development of commercial arrangement for trial deployment. The second part of the reporting period focused on planning and delivery for trial period 1 (TP1) from November 2021 to February 2022 and trial period 2 (TP2) from May 2022 to September 2022.

Within this reporting period, the project has focused on setting up the trials which involved the deployment of two IT systems. Firstly, for the Neutral Market Facilitation platform to be market facing and advertise the need for flexibility. Secondly, the Whole System Coordinator which looks at bringing together the need for flexibility.

As part of the project there has been considerable learning from setting up and running flexible services during both trial periods. These services were divided into DSO-Procured and DSO-Enabled services.

The first set of trials ran for 17 weeks, with 69 events, 18 assets, over 3 Bulk Supply Points (BSPs). The second set of trials ran for 20 weeks, over 6 Bulk Supply Points, including both Week Ahead and Day Ahead procurement. The trials have predominately tested the ability of an asset to deliver a set amount of flexibility at a set time.

The trials involved various DSO Procured services - Sustain Peak Management, Sustain Export Peak Management, Secure Constraint Management and Dynamic Constraint Management, at a week ahead and day ahead time frame. The trials also tested various technologies including battery, Vehicle to Grid (V2G), PV and Demand Response. The time of the events spanned various dispatch service windows, which brings flexibility procurement closer to real time than current arrangements.

The week ahead and day ahead procurement markets are the ones that have been explored in these trials. Contracts for flexibility have been explored, with the Energy Network Associations (ENA)'s Flexibility Services Agreement (FSA) used as a starting point. There has been varying success with signing up participants within the consortium, with feedback commenting on the complexity of the agreements and that they are devised for larger players in the market focussed on aggregators and suppliers rather than individuals and smaller assets.

In Trial Period 2 external participants took part in the trials as well as 1 small aggregator, a major milestone for the

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project as this allows us to test the complexity and reliability through third party route to market. The prices paid for flexibility have been worked on a Willingness to Pay (WTP) and Willingness to Accept (WTA) basis, with a ceiling price split into an availability and utilization price. Testing different routes to market has been carried out using two platforms, Piclo and NMF directly. Market Reports were developed in partnership with LEO, during TP1 & TP2. This analysis including market indices for competition, liquidity, and reliability was shared in the Market Trials Report in April 2022. All market data from these trials is being collated by the University of Oxford in line with the open data ideals of the project.

The technological learnings from the project have been considerable including developments in key areas such as baselining, forecasting and settlement.

One key technical highlight during this reporting period has been the direct collaboration with the ENA Open Networks WS1a baseline product team; to design, develop and deliver a new software tool for the performance of Flexibility Baseline analysis. The baseline tool has: -

A front-end user interface for easy graphical understanding and processing of the baseline actions. Python installable script library, to allow automated use of the tool for effective scaling of baseline operations.

The tool now resides online for free and open use at the ENA website and [can be found here](#).

The first part of the trials has concentrated on the Market fundamentals of running a flexibility market; looking at asset recruitment, building relationships in Oxfordshire, and then how these assets and people behave within a market environment. To test these market relationships, the concept of scheduled and forecast events has been developed. Scheduled to test the behaviour of a market and forecast to test the integration of technical Power System Analysis into the project.

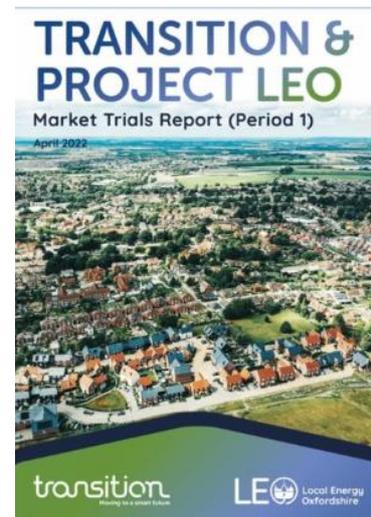
Progress within TP2 has been hampered by the challenge in getting the Power Systems Analysis (PSA) model to reliably converge when using the optimal power flow approach in the different stages of the flexibility procurement process (i.e., to calculate the flexibility requirements, selecting and dispatching contracts). We have developed significant learnings and experience on this topic which has driven a decision to implement more of a power flow model for later aspects of the TRANSITION programme, during a technical trial period which will run from March until May 2023.

Note that all the topics described above are covered in detail in Project Deliverable #6, details below.

Deliverables

The project has successfully completed the Project Deliverables due within this reporting period.

- The sixth deliverable, “WP8 Trials stage 1 Completion of one stage of trials”, was submitted on 29th April 2022. The report has been published on the TRANSITION website (see link at end of this section).



- The common project deliverable. #3 “Attendance and participation in the Annual Conference” – the project attended and participated at ENIC 2021.
- The next Deliverable, “WP8 Trials stage 2 Completion of second stage of trials”; is on schedule to be completed by 30th November 2022.

Dissemination

During this reporting period dissemination of information, project progress and learning has taken place through various events, including webinars and conferences with both internal and external stakeholders from inside and outside the industry. In addition the project has disseminated learnings internationally such as COP26, webinars with Ausgrid and Enel, and engagement with

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The International Community for Local Smart Grids (ICLSG).

This engagement has either been focused on TRANSITION alone or alongside Project LEO, with dissemination being jointly presented on both projects and demonstrating the unique collaboration of these two projects.

The most significant of these engagements was undoubtedly the COP26 summit in November 2021 where TRANSITION's work was represented at two seminars.

As we progress through the trials, these engagements have increasingly been focused on sharing our learning as opposed to talking more generally about TRANSITION or its aims.

In addition, the project is committed to supporting ENA Open Networks Project (ON-P) specifically WS1a "Flexibility Services", WS1b "Whole Energy Systems", and WS3 "DSO Transition", as well as several individual products therein (WS1a Service Primacy, WS3 Conflicts of Interests, WS1b Operational Data sharing, WS3 DSO Transition tool, WS1a Flexibility Services).

Further Details of our many dissemination activities are contained in section 2.

For more information, the TRANSITION project website address is: <https://ssen-transition.com/>

2) Project Manager's Report

Project Summary

The project is split into two distinct phases; Phase 1: Requirements phase, and Phase 2: Deployment and Trial phase. During this reporting period the project has been in Phase 2.

The first part of this reporting period focused on finalising the detailed design for the NMF and WSC systems, as well as the development of commercial arrangements for trial deployment. The second part of the reporting period focused on planning and delivery for trial period 1 and trial period 2. An update on progress made within the reporting period is detailed below.

As part of the project there has been considerable learning from setting up and running flexible services. These services were divided into DSO-Procured and DSO-Enabled services.

Within this reporting period the project has focused on setting up the trials which involved the development of two IT systems. Firstly, for the Neutral Market Facilitation platform to be market facing and advertise the need for flexibility. Secondly, the Whole System Coordinator which looks at bringing together the need for flexibility derived from Power System Analysis (PSA) tools and identify which participants can supply the correct level of flexibility on demand.

The first set of Trials ran for 17 weeks, with 69 events, 18 assets, over 3 Bulk Supply Points (BSPs). The second set of trials ran for 20 weeks, over 6 BSPs, including both Week Ahead and Day Ahead procurement. The trials have predominately tested the ability of an asset to deliver a set amount of flexibility at a set time.

The main technologies being tested were battery, Vehicle to Grid (V2G), PV and Demand Response in the Sustain Peak Management, Sustain Export Peak Management, Secure Constraint Management and Dynamic Constraint Management market, at a week ahead and day ahead time frame. The time of the events spanned various dispatch service windows with the end-to-end process being fully developed and represented. This includes developments in areas such as baselining, forecasting and settlement.

The TRANSITION project brings flexibility procurement closer to real time than has previously been achieved. The week ahead and day ahead procurement markets have been explored in these trials, with market orchestration set out to allow within day in subsequent trials. A route to market for all those who want to participate in flexibility markets is a key goal of the project. Contracts for flexibility have been explored through the trials, with the ENA Flexibility Services Agreement (FSA) a starting point for this. There has been varying success with signing up participants within the consortium, with feedback commenting on the complexity of the agreements and that they are devised for larger players in the market and aggregators and suppliers rather than individuals and smaller assets.

In Trial Period 2 participants external to Project LEO took part in the trials as well as one small aggregator, a major milestone for the project as this allows us to test the complexity and reliability of a third-party route to market. The prices paid for flexibility have been worked on a Willingness to Pay (WTP) and Willingness to Accept (WTA) basis with a ceiling price split into an availability and utilization price. Testing different routes to market has been carried out using two platforms Piclo and NMF directly. Liquidity indexes have been developed to enable a view of how much flex is available. This is key to giving confidence to embed flexible markets as an alternative to reinforcement at closer to real time, considering the amount of time it takes to build a new piece of network which is the only alternative open to a DNO.

Things to be discovered and linked to the liquidity index would be the percentage of procurement at different timescales such as Season, Week, and Day Ahead, depending on the DSO's risk appetite. Other indices include a reliability index where assets in a particular area would be assigned a value based on their historic ability to deliver, this would help the DSO to procure the right amount of flex to satisfy a constraint without having to over procure. The competition index is of less value until there are more assets participating in the trials but would eventually give an idea of the likelihood on an asset being successful in flex markets at a particular point. All market data from these trials is being collated by the University of Oxford in line with the open data ideals of the project. Market reports have been developed from outputs from

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the NMF, using Python and Power BI, to produce basic reports to communicate the market interactions.

The first part of the trials has concentrated on the market fundamentals of running a flexibility market; looking at asset recruitment, building relationships in Oxfordshire, and then how these assets and people behave within a market environment. To test these market relationships, the concept of scheduled (to test the behaviour of a market) and forecast (to test the integration of technical PSA) events has been developed.

Progress within TP2 has been hampered by the challenge in getting the optimal power flow PSA model to reliably converge. Based on these learnings and experience the project has decided to implement an alternate power flow model during a technical trial period which will run from March until May 2023.

Note that all the topics described above are covered in detail in Project Deliverable #6, details below.

Trial Periods

Trial Period	Ref	Dates
1	TP1	November 2021 to end February 2022
2	TP2	May 2022 to mid-September 2022
3	TP3	November 2022 to end February 2023
Technical Trials	n/a	March 2023 to end May 2023

Knowledge Dissemination

During this reporting period, dissemination of information, project progress and learning has taken place through various events, webinars and conferences with both internal and external stakeholders from inside and outside the industry.

This engagement has either been focused on TRANSITION alone, or alongside Project LEO with dissemination being jointly presented on both projects and demonstrating the unique collaboration of these two projects. The most significant of these engagements was undoubtedly the COP26 summit in November 2022 where TRANSITION's work was represented at two seminars. Here is a list of some of our other engagement highlights:

- Presentation at IEC CIM Week 2022 on the "Application of CIM for Power System Analysis (PSA) Model Inter-Operability in DSO Flexibility Markets"
- Presentation at Imperial College - The Flexibility Landscape
- Presentation EnergyX2022
- Presentation at ENA Baseline Webinar.
- Presence at House of Commons Event: Celebrating the Digitalisation of Energy
- Presentation to Users Technology Collaboration Programme Academy (Copper Alliance)
- Lecture to University of Oxford MSc in Energy Systems
- Panellist and presentation at Utility Week Conference (Heat and Future Networks)
- Presentation PFER Six in Sixty Webinar Series – Putting the smart into Smart Local Energy Systems
- Presentation at Enel Innovation Tour Webinar
- Presentation at the "III International Seminar on Distribution's and Commercialization Transformation of Electric Energy and its Regulation"

Our Social Media channels and messaging has continued to be focused on;

- Reaching out to potential participants in the Flexibility Market Trials
- Educating our various audiences on the importance of energy flexibility as one of the

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ways to address increasing demand and the UK's zero carbon targets

- Disseminating our various TRANSITION reports and event
- Sharing important milestones that we have achieved in the Project

We have taken a pragmatic approach to where we publish our reports and learning; either through the TRANSITION project website, or where more appropriate, and depending on the focus of the report, on the Project LEO website. These reports include:

- [Market Trials Report TP1](#)
- [Load Forecasting Dissemination Report](#)
- [Trial Plans](#)
- [Value Chain for Flexibility Providers](#)
- [Barriers and Opportunities to Market Trials Recruitment](#)
- [Vehicle to Grid \(V2G\) Barriers and Opportunities: a capability approach](#)
- [Assessment of Declarations, Baselineing Methodology and Settlement](#)

In addition to this we have published project news releases over the reporting period, primarily to industry media outlets. These have focused on recruitment to the trials but also in raising awareness of the project and what it is learning.

- [SSEN's innovation projects successfully trial unique Neutral Market Facilitator platform](#)
- [New flexibility measurement tool launched to help Britain's DNOs trade with more visibility and consistency](#)
- [Project LEO recruiting pioneers for flexibility markets in Oxfordshire](#)

- [Project LEO reaches another landmark through live flexibility trade with ev.energy](#)

This year we have created new content explaining the market trials to potential participants of the Flexibility Market Trials. Where we have received feedback on this from participants, we have also taken opportunities to improve on this and make it more accessible and user focused. Our aim continues to be in providing simply written content explaining the trials in an accessible way to encourage participation and assist understanding. In addition to this, the website also now includes various calculators and tools to support participation in the trials. These have also been developed and refined with the input of the users themselves.

Information specifically for participants, or potential participants can be found here.

www.ssen-transition.com/get-involved/flexibility-markettrials/

For more information, the TRANSITION project website address is: <https://ssen-transition.com/>

Deliverables

The project has successfully completed the Project Deliverables which were due within this reporting period.

- The sixth deliverable, "WP8 Trials stage 1 Completion of one stage of trials", was submitted on 29th April 2022. The report has been published on the TRANSITION website and provides a detailed view of market analysis, technical and commercial learnings and recommendations, as well as stakeholder feedback and user experience of market platforms.
- The common project deliverable. #3 "Attendance and participation in the Annual Conference" – the project attended and participated at ENIC 2021.

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- The next Deliverable, “WP8 Trials stage 2 Completion of second stage of trials”; is on schedule to be completed by 30th November 2022. Data analysis and stakeholder engagement for trial period 2 is underway, with output prepared by all TRANSITION/LEO partners.

Next Reporting Period

Looking ahead to the next reporting period the project will focus on;

- The analysis and dissemination of Trial Period 2 results, due to be summarised in Project Deliverable #7. The learnings will also be shared via participation at the ENIC Conference scheduled for the end of September 2022.
- The planning and delivery of trial period 3, and the subsequent analysis and dissemination of learnings produced.
- The planning and delivery of the technical trials.
- Broader project dissemination activities and both Project LEO and TRANSITION are due to complete within the next reporting period.
- Close Down report, due September 2023.

3) Business Case Update

No changes have been made to the Business Case for the TRANSITION project, as described in the NIC Full Submission document.

4) Progress Against Plan

Summary of Progress

The Project has made excellent progress over the last 12 months with the sixth Project Deliverable submitted on schedule, and works are progressing well towards the seventh “WP8 Trials stage 2 Completion of second stage of trials” due in November 2022.

The Project remains on target to deliver its remaining Project Deliverables on schedule.

Focus on this Reporting Period

The focus over this reporting period has been on:

- Completion and successful delivery of TP1&2. The summary of TP1 was captured in “WP8 Trials stage 1 - Completion of one stage of trials”. Delivery of both trial periods involved routine market operations including auction request for DSO services, bids from potential providers, contract selection, notification to dispatch Distributed Energy Resources (DERS), baselining, settlement reporting, payment to customers and customer interaction (cancellations and errors.)
- Developed and deployed the WSC and NMF systems for TP2 & TP3; including rules for market orchestration to ensure participants can maximise their revenue from DSO Flexibility services.
- Developed the DSO service; Sustain Peak Management, Sustain Export Peak Management, Secure Constraint Management and Dynamic Constraint Management into the NMF with procurement and stacking rules.
- Attended and participated at ENIC and UN Climate Change Conference - COP26 and other opportunities to disseminate learning and engage with potential trial participants.
- Designed, developed and delivered a new software tool for the performance of Flexibility Baseline analysis, in conjunction and direct collaboration with the ENA Open Networks WS1a baseline product team. The baseline tool has:
 - A front-end user interface for easy graphical understanding and processing of the baseline actions. Python installable script library, to allow automated use of the tool for effective scaling of baseline operations.
 - The tool now resides online for free and open use at the ENA website and [can be found here](#)
- Gathered and listened to stakeholder feedback during TP1 and TP2, and implemented multiple improvements as a result, including:
 - Updating the Flexibility Service Agreement; to simplify and remove terms that were deemed onerous by small businesses.
 - Improving NMF Platform terms and conditions v.1 provided for TP1 and TP2 services.
 - Supporting the participants of the trials, from their initial expression of interest in taking part, through to their participation in the auctions and Settlement.
 - Implementing a “Total Contract Value Calculator” to help participants during the auction process.
 - Increasing the ceiling prices for DSO Procured flexibility services to incentivise participation based on market analysis.
 - Further developing the market trials focused content on the website taking on and acting on feedback from those accessing it. This includes new infographics that support understanding.
- Market Reports were developed in partnership with LEO, during TP1. This analysis including market indices for competition, liquidity, and reliability was shared in the Market Trials Report in April 2022.
- Further improved the Common Information Model (CIM) compliant PSA models and datasets that are used to represent the HV and EHV system and network in the Oxfordshire region for the purposes of trials.
- Worked with Piclo to test the interface between the NMF and their platform. Participants were given an alternative route to the auction and could bid via the

4) Progress Against Plan

Piclo platform or the NMF. Specifically, three Application Programming Interfaces (APIs) were implemented and tested, covering:

- Posting of NMF Flexibility Request
- Industry actor bids and offers from Piclo
- Dissemination of contract selection
- Worked with Sia Partners to test API links between the WSC and their platform for short term operational forecasting.
- Operational testing of peer-to-peer processes both within SSEN and with LEO partners. This included a mapping of the end-to-end process and an improved understanding of changes required to develop peer to peer services in the future.
- Continued work with project and market participants to understand how best to model and display gated portfolios of assets in a trading and network modelling platform. A process was developed, tested, and implemented for the registration, onboarding and participation of aggregated portfolios of assets to the flexibility market
- Plan was to integrate the operational network model which in the WSC will take account of the most up to date status of the network topology (e.g. faults and switching operations) with the forecasting tool to support close to “real time” power flow and near term flexibility market decisions. However, due to data integration and time constraint limitations, a full integration between the WSC and live network topology information has not been possible in TP2, but a future activity of this nature is targeted towards the end of the TRANSITION project.
- Developed a fuller understanding of the applications of “power flow” and “optimal power flow” PSA within long term and short-term flexibility markets,
- Conducted PSA analysis on the network model that has been developed for TP1 & TP2, informing where the potential congestion/constraint points are on the Oxfordshire network in the real world. However, due to market liquidity challenges in the trials, the outputs of this analysis were not directly used to carry out a Season-Ahead procurement.
- Furthered the understanding of the accuracy of DNO data sets that relate to secondary substation monitoring, and related downscaling modelling assumptions in the PSA domain.
- Investigated the accuracy of the downscaling assumptions (based on kVA rating) made and identified key factors affecting this process such as: number and type of customers connected to certain substations.
- Investigated the complexities of modelling LV networks and documented potential issues that could arise when dealing with data unavailability or data protection issues. Furthered the application of automated data processing capabilities and the integration of different datasets to forecasting and PSA models, to enable analysis of PSA studies including development of automated workflows to run PSA studies across multiple BSPs with different demand/generation datapoints
- Assessed the accuracy of operational forecasting when the system is deployed in practice, with different technology types and time horizons. Within TP2 we have furthered the capability of the Operational Forecasting tool to take account of real time network data to improve the modelling.
 - For example, developed automatic/API connections between the forecasting system and (i) internal SSEN network data via the Near Real-time Data Access (NeRDA) innovation project (ii) an external connection to the industry specialist company Electralink’s settlement data.
- Considered the use case of probabilistic short-term forecasts in long-term flexibility assessments whilst understanding the potential extent and effects of short-term uncertainty in the operational forecasting tool, in particular the causes of model data variability from alternate weather data providers.
- Assessed the requirements and experiences of operational planning and control room colleagues when dealing with new systems, tools and user

4) Progress Against Plan

interfaces for forecasting, PSA and whole system coordination. Through regular engagement and peer review with Operational colleagues, we have furthered the understanding of the ideal design configurations of graphical user interfaces for tools in a Control/Operational context and are using those insights to guide the design of the TRANSITION tools.

- Further development of PSA models to enable a more accurate representation of LV connected flexibility assets. During TP2 we have expanded the scope of the PSA network modelling to include the details of LV modelling, in particular focussing on delivering a high-fidelity, three-phase model of all the LV feeders supplied by one of the secondary substations in Oxford. This forms part of Project LEO Smart and Fair Neighbourhood (SFN) trials which will demonstrate how flexibility services can sit at the heart of a smarter, low carbon, locally balanced energy system.
- Using new techniques for individual property level modelling, additional data sources for individual customer phase connectivity information and CIM compliant representations of LV network connectivity and better insight on specific locations of LCTs, this model has been developed and delivered within an advanced PSA tool called DigSILENT PowerFactory and presented to Community level energy stakeholders.

Further stakeholder engagement and dissemination of the project within the T.E.F. collaboration and the Energy Networks Association Open Networks Project (ENA ON-P). Successfully engaged the ENA ON-P through direct participation and sharing of project learnings to several of the Workstreams and individual Products, as well as sharing best practice and learnings within the TEF projects.

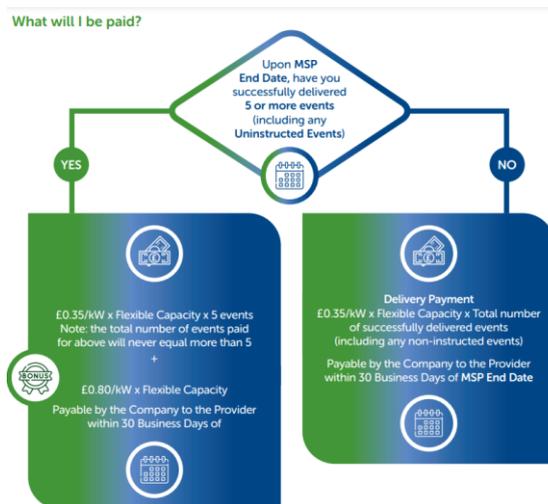
- Installed LV monitors in secondary substations for all locations associated with participation assets for TP1 and TP2, wherever physically and technically possible. To date 99 LV monitors have been installed. Data is available for all participants to view via a portal developed by the NeRDA NIA project.
- Developed a strategy with ENWL to simulate constraints on their Greater Manchester network to

enable trials where it would not be physically possible in Oxfordshire.

- Development of targeted communications and engagement material for stakeholders to increase project visibility, support participation in the trials and maximising our trial learning.

This has included an animation, produced working with the LEO project partner, and new infographics provided for the website.

- Supporting the journeys of our trial participants, from initial interest in the trials to their eventual bidding into the platform and provision of flexibility service. This has taken significant amounts of one-to-one targeted engagement.
- The TRANSITION website is the key source of information for external participants i.e., those not part of the LEO collaboration. We have spent time on developing content for the website, refining it as a result of feedback from those using it. We have also developed tools to support participation such as the Market Stimulation Package calculator and Total Contract Value Calculator.



4) Progress Against Plan

- Amongst our many engagements this year we have attended and capitalised on opportunities to share information and learnings from TRANSITION both at COP26 and the Electricity Networks Innovation Conference.



Oxfordshire Projects Programme Director Melanie Bryce (pictured centre) representing the TRANSITION and LEO projects at COP26

- As part of our reporting on Trial Period 1, all market participants were interviewed and given other opportunities to feedback on their experiences, identifying any barriers to participation they experienced. The results of these interviews can be found in our TP1 Market Trials Report - specifically sections 2.2, 2.3, 3.1 & 3.2.

<https://ssen-transition.com/wp-content/uploads/2022/04/Ofgem-Report-Trial-Period-1.pdf>

This feedback has led to numerous refinements and more significant changes to the trials, for example in simplifying the Flexibility Services Agreement and providing a Market Stimulation Package calculator.

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Key Activities in Next Reporting Period

- Dissemination of Trial Period 2, results of which will be captured in Project Deliverable #7 “WP8 Trials Stage 2”.
- Plan and deliver TP3, targeting the key learnings and objectives in conjunction with project LEO.
- Participation and attendance in further communication, engagement, and dissemination activities, both virtual and in-person including the Energy Innovation Summit 2022.
- Involve more external participants in the Market Trials. This will be focusing on those companies we have engaged with in this reporting period who have not yet completed their registration.
- Further understanding on how potential barriers to participation in the trial can be overcome including a further review of contractual requirements and data exchanges.
- Updating the website, particularly with reference to the market trials and in response to feedback from our participants.
- Test the ability of local DERs to support a range of DSO services, including those closer to real time dispatch. Allow DERs to stack revenue across a range of procurement timelines and services.
- Develop and implement a virtual DSO market to better understand the optimal market and payment structure for varying competition and liquidity levels.
- Apply more refined models to determine the reliability of DERs using multiple factors including weather data and time of use. Determine how these reliability factors are best implemented in the procurement stage of the Flexibility market.
- Obtaining feedback on the participant training process and materials and improving and refining this as a result.
- On the wider industry engagement side, as both project TRANSITION and LEO come to an end in the next 12 months, it will be critical to ensure suitable knowledge and learnings are (1) catalogued and (2) disseminated to a very wide range of stakeholders both, internally within SSEN and externally within industry forums such as the ENA Open Networks Project and T.E.F. as well as broader industry forums including market participants.
- Support TP3 and the Technical Trials with refinement and updating of the relevant PSA network models accordingly.
- Further refinement of LV modelling methods, tools and datasets, in the PSA domain, to better understand the needs of the network and facilitate small-scale DER participation in local DSO flexibility markets.
- Determine the degree to which the very different technical attributes of the LV network (where single-phase connections are more common, which then translates into a higher degree of phase imbalance) may require a standalone treatment as opposed to a multi-level network model.
- Development of a specific methodology and definition for “Sensitivity Factors” (a metric used to understand the relative impact of a DER flex asset on a network constraint location) to support decision making in the context of flexibility markets.
- Improve operational forecasting through additional experience with automatic connection to real time data sources such as historical SCADA data and Electralink settlement data.
- Quantify the accuracy of forecasting tools, for various network locations and generation type sources.
- Develop a fuller understanding on suitable weather forecasting data sets, and the complexities of same, for the purpose of locational forecasting on a distribution network.
- Implement and develop an understanding of the additional Peer to Peer Trading service Offsetting. Further development of the design, including the options in payment terms to ensure inclusivity of all potential trading scenarios will be established.

4) Progress Against Plan

- Work with Piclo to test API link between the NMF and their platform, specifically sending an “intents to dispatch” signal from NMF to Piclo.
- Collaborate with ENWL to simulate part of their network on WSC platform and test further limitations restricted by physical trials.
- Develop the regression baseline methodology for solar PV in collaboration with TNEI.
- Continuous engaging with ENA regarding the feedback from ENA baseline tool and seeking for further opportunities of development.
- Develop additional mechanisms for measuring flexibility for DER types that have shown significant potential errors in the current baseline options. This includes the use of regression baseline for weather dependent DERS such as PVs.
- Develop and test a standalone capability of Power Systems Analysis outside of the conventional deeply integrated solutions from existing third-party vendors. The implementation will be based around DigSILENT PowerFactory software and will perform load flow calculations to detect constraints on the network and hence output requirements for flexibility. These requirements for flexibility will be produced for two timeframes, week ahead and day ahead.
- Deploy “Select and Dispatch” Tool at the beginning of 2023, which will work in conjunction with the Power Systems Analysis and PowerFactory to support technical trials scheduled Spring 2023. The “Select and Dispatch” Tool will take data from the Power Systems analysis tool and create auctions required to meet the constraints. The tool will then take the offers and select the best contracts from the auction. The services to be assessed within the technical trials are:
 - Sustain Peak Management
 - Sustain Export Peak Management
 - Secure Constraint Management and Dynamic (if possible)

5) Progress Against Budget

The table below details the spend to date against the Project budget for each cost category.

Cost Category	Total Budget ¹	Spend to Date	Comment
Labour	£4,095,070.33	£3,876,687.76	Higher than planned ⁴
Equipment	£1,117,393.84	£261,340.49	Lower than planned ⁴
Contractors	£3,318,310.76	£3,009,017.45	Higher than planned ⁴
IT	£3,136,925.86	£1,045,393.22	Lower than planned ⁴
IPR costs	£0.00	£0.00	On plan
Travel & Expenses	£516,827.59	£25,987.75	Lower than planned ⁴
Payments to users	£385,562.33	£381.30	Lower than planned ⁴
Contingency	£0.00	£0.00	On plan
Decommissioning	£72,550.75	£0.00	On plan
Other	£0.00	£0.00	On plan
Total	£12,642,641.46³	£8,218,807.97²	

Notes:

- As per Ofgem NIC Governance v3 and inline with the Project Direction dated 28th September 2018 the Project Budget detailed above is nominal and has not been adjusted to consider inflation and/or interest.
- Up to 31st August 2022 the project spent £7,963,368.33 (which has been processed through the Project Bank Account, see Appendix 1 for details). In addition, the project has spent £255,439.64 which has yet to be processed through the Project Bank Account. The total Project spend to 31st August 2022 is therefore £8,218,807.97 (as detailed in the table above).
- The project submitted a revised financial forecast as part of the Stage Gate documentation in February 2020. The revised project budget reduced from £12,791,541.46 to £12,642,641.46.
- Projected variances in excess of five percent against each category are explained below: "Labour" and "Contractors" are projected to be higher than initially projected due to the resources required to produce the output and deliverables required for the project. "Equipment" and "IT" are less than expected due to lower costs for IT infrastructure and servers, and installation of protection, monitoring, automation equipment. "Travel & Expenses" is lower than expected primarily due to previous years Covid restrictions. "Payment to Users" is lower than expected due to market liquidity and the size of assets available for the trials.

6) Bank Account

A copy of the current project bank account statement is provided in Appendix 1 (Confidential).

7) Project Deliverables

Project's Deliverables update.

The TRANSITION Project identified seven deliverables which are strongly linked to the objectives and span the lifecycle of the project. In addition, "Common Project Deliverables" were identified in the Project Direction, dated 28th September 2018.

Project progress within the reporting period was delivered as planned with Project Deliverable #6 WP8 Trial Stage 1 submitted on schedule in April 2022.

Also, TRANSITION/LEO participated and presented at the 2021 ENIC Conference, highlight the key learning produced in the last year as well as engaging with stakeholders.

The next project deliverable, #7 WP8 Trial Stage 2 is due for submission in November 2022. During this reporting period the focus has been on the delivery of trial period 2, which ran from May to mid-September. The data produced, along with stakeholder feedback gathered during the trials, will be analysed and will form the content of project deliverable #7.

In addition, the overall project progress is on schedule.

Note:

1. As noted in the 2021 Annual Project Progress Report the project changed the date of delivery for both Project Deliverable # 6 and #7, as described below. In accordance with Electricity Network Innovation Competition Governance Document v3 the change in delivery date does not constitute a material change (ref 8.28 and 8.29) as the date of the Project Deliverables is delayed by less than one year.

The trial periods for the project are detailed in section 2 > "Trial Specification – WP6". To sufficiently capture the monitoring and analysis results from the trials and disseminate learnings with stakeholders the associated reports will be published after the end of each trial period.

Revised dates for Project Deliverable #6 and #7

Deliverable	Current Deliverable date	New Deliverable date	Trial Period dates
6	31/01/22	31/04/22	Trial Period 1 - November 2021 to end February 2022 Report published on the TRANSITION website
7	30/09/22	30/11/22	Trial Period 2 - May 2022 to end September 2022

The following table lists each deliverable in chronological order and details the project's progress towards their achievement.

7) Project Deliverables

Deliverable	Due	Description	Evidence	Status
1	31/03/19	<p>WP6 Trial specification</p> <p>Produce and apply the site selection methodology and select the Trial networks.</p>	<p>1. Publish on the TRANSITION website a report detailing the site selection methodology, and a map of Trial areas.</p> <p>2. Selection of networks to install monitoring (if required).</p>	<p>Completed – deliverable met.</p> <p>The following report was published on the TRANSITION project website on 29th March 2019.</p> <p>“TRANSITION Site Selection Methodology”</p>
2	31/05/19	<p>WP2 Requirements design development</p> <p>Data exchange requirements and updated data governance processes specified.</p>	<p>1. Publish report detailing learning from relevant international DSO experience relating to trial objectives.</p> <p>2. Functional specification for connectivity model, data exchange and governance requirements.</p>	<p>Completed – deliverable met.</p> <p>Reports published on the project website 31st May 2019.</p> <p>“Best Practice Report – Market Facilitation for DSO”</p> <p>And</p> <p>“Neutral Market Facilitator Data Exchange and Governance”</p>
3	29/02/20	<p>Stakeholder feedback event (Stage Gate)</p>	<p>1. Stakeholder feedback event to disseminate and gather feedback on outputs from WP 2-6</p>	<p>Completed – deliverable met.</p> <p>The “T.E.F. Stage Gate 2020 – Main Document v1.0” was submitted on schedule.</p> <p>Stage Gate approval letter was published on 4th May 2020.</p>
4	31/07/20	<p>WP7 Deployment</p> <p>Develop appropriate commercial arrangements and contract templates for flexibility services.</p> <p>Network adaptation for trial deployment.</p>	<p>1. Publish contract templates for flexibility services and commercial arrangements learning</p> <p>2. Publish equipment specifications and installation reports</p>	<p>Completed – deliverable met.</p> <p>Two reports published on the project website:</p> <p>“Network adaptation for trial deployment”</p> <p>“Oxfordshire Programme Commercial Arrangements”</p>

7) Project Deliverables

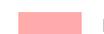
Deliverable	Due	Description	Evidence	Status
5	30/06/21	WP7 Deployment Platform Full Acceptance Testing completed	1. Publish interface and configuration specifications and commissioning reports.	<p>Completed – deliverable met.</p> <p>The following report was published on the TRANSITION project website on 25th June 2021.</p> <p>“Platform Acceptance Testing”</p>
6	31/01/22 31/04/22	WP8 Trials stage 1 Completion of one stage of trials	<p>1. Publish monitoring and analysis results for Trials on TRANSITION website.</p> <p>2. Stakeholder dissemination event showcasing learnings.</p>	<p>Completed – deliverable met.</p> <p>The following report was published on the TRANSITION project website on 29th April 2022.</p> <p>“TRANSITION and Project LEO Market Trials Report – Period 1”</p>
7	30/09/22 30/11/22	WP8 Trials stage 2 Completion of second stage of trials	<p>1. Publish monitoring and analysis results for Trials on TRANSITION website</p> <p>2. Stakeholder dissemination event showcasing learnings.</p>	<p>Trial Period 2 ran for 20 weeks from May until mid-September. Data analysis and dissemination activities are planned for the next reporting period.</p>

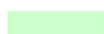
Common Project Deliverable

N/A	End of project	Comply with knowledge transfer requirements of the Governance Document.	<p>1. Annual Project Progress Reports which comply with the requirements of the Governance Document.</p> <p>2. Completed Close Down Report which complies with the requirements of the Governance Document.</p> <p>3. Evidence of attendance and participation in the Annual Conference as described in the Governance Document.</p>	<p>2022 Project Progress Report was submitted on schedule.</p> <p>No planned progress for the Close Down Report.</p> <p>TRANSITION/LEO presented at the 2021 ENIC Conference and is scheduled to present at the 2022 ENIC Summit Conference.</p>
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 Completed (Deliverable met)

 Emerging issue, remains on target

 Deliverable completed late

 On target

 Unresolved issue, off target

 Not completed and late

7) Project Deliverables

The main challenges expected in the next reporting period are as follows: -

- i) Resource prioritisation: The time available between the conclusion of trial period 2 and the beginning of trial period 3 is limited, approx. six weeks. During this time the project will be producing Project Deliverable #7 and planning Trial Period 3 which will require prioritisation of resources. To ease the possible resource constraint a clear plan for delivering Project Deliverable #7 has been produced, communicated and is in the process of being implemented. In addition, the planning for trial period 3 has already commenced.
- ii) Energy Crisis: The ongoing energy crisis has the possibility to affect participation in trial period 3, scheduled to run from November 2022 until February 2023. Firstly, the crisis may affect stakeholder's priorities over the winter 2022/23 period making it less appealing to take part in an innovation trial. Secondly, the price offered for flexibility service may not be sufficient and therefore deter involvement in the trials. The recruiting of flexibility assets within Oxfordshire is ongoing and will continue in the next reporting period to maximise the market liquidity available for future trials.

8) Data Access Details

Information gathered as part of this project can be provided to interested parties upon request. The form of the information will be in accordance with the SSEN Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure, reference PR-NET-ENG-020, Revision 2.00, published on the SSEN website which [can be read here](#).

Please email future.networks@sse.com for more information.

9) Learning Outcomes

The following learning objectives have been set for the TRANSITION project:

- a) **Identify the data requirements and data exchanges** for DSO functions, informed by Open Networks. Map this against current technology (service provider) capabilities and develop requirements for future technologies.
- b) **Using the outputs from Open Networks, 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.
- c) **Build on learnings from previous and ongoing projects, as well as collaboration opportunities such as T.E.F. 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.
- d) **Establish system processing and visualisation requirements, including data protection and information security.** This will ensure that cyber security risks are effectively identified and managed.
- e) **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.
- f) **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.
- g) **Understand and communicate the requirements of an NMF/WSC Platform and the commercial mechanisms** that will be required for market participation to trial ways in which energy markets can evolve. A detailed project End-to-End diagram [can be found here](#)
- h) **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.
- i) **Understand the network modelling and forecasting requirements needed by the WSC platform to calculate the flexibility needs for different timeframes.** This will also inform the dispatch of flexibility assets to relieve constraints in specific parts of the network for different timeframes (e.g., week-ahead, season-ahead).
- j) **Understand the additional functionality that can be provided by the NMF and WSC platforms with the use of integrations to outside partners and systems.** This will inform how we work with third parties for the purpose of integration both in best practice for internal design of the NMF and WSC, and in building a streamline methodology of collaboration with future integrations.

These learning objectives will be met as the TRANSITION Project progresses through Trial phase. Due to the nature of the project these objectives may not remain static and will be reviewed on a regular basis, and where applicable, revised.

9) Learning Outcomes

Learning during this reporting period

During this reporting period the TRANSITION project has produced several Deliverables, Reports, Shared Learnings and engaged with relevant groups. The specific learnings from these activities have been categorised against the project's learning objectives below.

a) Identify the data requirements and data exchanges.

- Monitoring Data Submission for DNO to verify the flexibility delivered and issue the settlement payment: NMF requires a specific format of data. To ensure the submitted monitoring data is aligned with project's convention, a data cleansing tool was developed for all participants to use before submitting the monitoring data to ensure the DNO receive the data it requires in a standard format to allow the market to operate effectively.
- One of the challenges when dealing with flexibility providers connected at the low-voltage network is the sensitivity around personal data and GDPR. While the DNO needs to know the precise location (e.g., via the full postcode) to get the correct network connectivity of the flexibility providers, this is not always possible. Hence, unless there is an agreement from the provider to share this data, the network connectivity must be estimated. This in turn decreases the accuracy of the power flow results and translates into a challenge when attempting to verify that the flexibility was delivered after a market event. A proposal to mitigate this is to make some of the network data open so that the flexibility providers can locate their assets and provide an accurate view of their network connectivity.
- Significant extensive learnings for data gathering and integration from a myriad of sources have been progressed within the technical PSA and Forecasting model development task. This includes:
 - o Good quality historical system data (stored in SSEN's PI Historian) being measured at the substations, which is key to train accurate forecasting models.
 - o To train accurate forecasting models, historical network connectivity data availability is just as important as historical net demand and generation measurements to adequately match consumption levels with connection arrangements.
 - o Good consistency and open availability of high-quality data, coming from, various sources and tools within the DNO business, is critical to scaling the development of integrated models across multiple voltage levels (e.g., EHV and HV combined), that traditionally may have been modelled separately.
 - o One particular focus of the PSA model development was around the use and processing of Common Information Model (CIM) input data PSA model interoperability between different systems and tools.
 - o While CIM enables interoperability between different PSA tools, the field is still developing and there is still work to be done. In particular, further development is required to make the CIM standard, which at present is biased towards transmission networks, suitable for distribution networks.
 - o Plenty of manual fixes and data pre- and post-processing were required as part of the CIM transformation to allow the development of an integrated network model.
 - o Tested CIM functionality for LV network modelling which uncovered data requirements (cable types, customer phasing, loading assumptions, etc.).
 - o The network is constantly evolving in the real world, with operational switching, as well as new developments happening at pace in an ongoing manner. Procedures and processes

9) Learning Outcomes

need to be further evolved to ensure models can stay up to date. Also, ongoing network model maintenance processes may need to be made more efficient, with less manual and more automated processing, to be scalable in future, beyond the relatively limited area Oxfordshire project model.

- Improved the pre- and post-processing workflow to convert CIM data and produce network models compatible with PowerFactory.
- Developed process flowcharts to capture the different stages of the network development process.
- Determined that to allow for efficient reporting of market information, further data exchanges and interaction points are needed on the platform including:
 - Route to market
 - Updates on DER availability
 - Changes to auctions, bids and contracts
 - Reasons for rejection of bids
- Concluded that the current arrangements for data exchange at the dispatch stage of the Flexibility market via the NMF platform, for more established Flexibility providers and aggregators, are not sufficient to integrate with their systems.

b) Using the outputs from Open Networks, test and validate the market model options being proposed.

The project is committed to supporting ENA Open Networks Project (ON-P), specifically WS1a “Flexibility Services”, WS1b “Whole Energy Systems”, and WS3 “DSO Transition”, as well as several individual products namely WS1a Service Primacy, WS3 Conflicts of Interests, WS1b Operational Data sharing, WS3 DSO Transition tool, WS1a Flexibility Services.

During the reporting period significant learnings have been generated on the back of using outputs from the ENA ON-P but also significant learnings

have been fed back in from the TRANSITION project to ON-P, for example some highlights are as follows:

- presented to Ws1b on the progress within the project on Operational Forecasting,
 - collaboration with ENA on Flexibility Baseline Tool development,
 - shared learnings on legal complexity in the use of the ENA’s Flexible Services Agreement (Contract) within the LEO/TRANSITION trials,
 - shared two reports on progress on DSO enabled Peer-Peer Trading services, as well as use of Baseline Methods within trials,
 - shared learning via the TP1 Progress report,
 - as part of TEF have also fed in ideas to the annual PID process.
- The lack of liquidity and competition in the market has been a defining factor in determining the relevance of market models based on business direction and industry thinking. This has further been exacerbated by high energy prices. Therefore, to incentivise more participants the price ceilings used in TP1 were analysed against the current market prices and raised for TP2.
- ### c) Build on learnings from previous and ongoing projects, as well as collaboration opportunities such as T.E.F. and LEO
- Note that most of the progress and learnings generated during this reporting period have been developed in collaboration with Project LEO, hence we have chosen not to call them out individually in this section as there would be too many cross references for learnings produced.
- Worked closely with NeRDA, SSEN led NIA project, to develop automatic/API connections between the forecasting system and internal SSEN network data. In addition, collaborated with NeRDA to surface LV monitoring data, which is available for all

9) Learning Outcomes

participants to view via a portal developed by the NeRDA NIA project.

d) Establish system processing and visualisation requirements, including data protection and information security.

- This includes developing and updating Terms and Conditions for the NMF platform including the use of data by other participants and the DSO.
- The project has investigated the importance and the benefits of having visualisation tools that can display CIM models in a geographical sense, including a user-friendly way to display the CIM objects, their hierarchy, and respective parameters.
- The CIM visualisation tool (Cimphony), developed in collaboration with a third-party (OGS) was used to inform the development of a detailed LV network model.
- The operational forecasting dashboard was designed to be simple, and user-friendly to ensure suitable adoption of operational forecasting to support decision-making processes in the context of flexibility markets.
- The operational forecasting tool incorporated an alerting system with 2 sets of limits for the BSP and Primary transformers, the intact condition (N-0) and a contingency condition (N-1). The alert was set to be triggered if the loading of the transformers were forecasted to go over 90% of the N-1 rating.
- As part of the forecasting development, a process was designed to “pseudo anonymise” customer names and MPANs (i.e., a representative name is used in lieu of the MPAN and real name) so that data security and confidentiality is always maintained.
- As a result of the LV network monitoring installation work, the data collected from the 99 installed units helped to develop our understanding for system processing and data protection, experience that was further fed back to the wider LEO project partners.

e) Develop and test DSO Use Cases that will be tested within the project

- The NMF platform has been developed with different roles, “Industry Actor”, “Admin” and “DSO” to allow the project to better test the competency needed by a DSO in facilitating and/or operating the local Flexibility markets.

f) Evaluate stakeholder experience of DSO trials.

- As part of Project LEO quarterly and annual interviews have been carried out with different individuals within the collaboration to capture stakeholder experience of the trials.
- Undertaken interviews with LEO participants and the project team to gather feedback on whole trial process. This piece, named “Stage on a Page” refers to the approach of stepping through the stages of the End-to-End process. The feedback gathering has been shared for TP1 and underway for TP2.

Engagement with potential trial participants, as well as with the LEO partners, has been used to influence the way we are communicating and engaging with these stakeholders. This has been a factor in:

- The TRANSITION website development and its content, specifically the “Get Involved” sections.
- The further expansion of the FAQ section of the website, built from the questions asked by the stakeholders.
- Changes made to the forms used for the onboarding of companies and their assets, for example the updating of the “Flexibility Services Agreement”, and the development of an infographic to explain the structure of the flexibility trials.
- Developed, tested and implemented a process for the registration, onboarding and participation of aggregated portfolios of assets to the flexibility market. This process has sought to balance the representation of technical requirements (e.g., grouping physical locations and technology types of individual DERs) with

9) Learning Outcomes

- the market/customer facilitation perspective (i.e., keeping in mind the need of the aggregator entity to have a suitable portfolio effect in the first place, and to have as administratively simple as possible a user journey).
- o Sharing of more detailed trial plans and market data with participants and platform provider to ensure successful delivery of upcoming events.
- Identify and provide relevant training to the LEO partners as part of the ongoing development of the NMF. A key learning for this reporting period has been to provide a recording of the training sessions to partners for easy reference at a later date.
- The end-to-end diagram has been constantly updated to reflect and share changes in the process and is now publicly available to all on [LEO website here](#). The work highlights the importance of sharing information in a simple way to enable anyone to grasp this complex subject, a key goal for the project. The end-to-end swim lane diagram is devoid of solution detail but gives an overview of the whole process. This allows the reader to understand from their own perspective where they engage in the process, or when their activity is required to take place. This diagram was used to onboard the LEO participants and continues to be used to ensure any third-party design solution also remains aligned to this defined process.
- g) Understand and communicate the requirements of an NMF/WSC Platform and the commercial mechanisms.**
 - Terminology – Different platform providers use different terminology for certain items. This can be confusing when implementing solutions. The project has learnt that it is critical that all parties understand the meaning of terms to prevent any confusion.
 - A deeper understanding of how the market needs to be structured on the NMF platform to optimise flexibility services for the DSO and ensure the maximum opportunity for participants. This includes the timing of auctions and the ability to stack services.
- h) Present the commercial interactions required for a DNO to transition to a DSO, develop and demonstrate NMF Platform tested on different network configurations**
 - The structure of the payment mechanism required the development of a calculator to allow providers to cost the potential contract value on the platform.
 - Baseline Feedback: Following the publication of ENA baselining tool, the TRANSITION team is keeping informed with the feedback from other DNOs and users, as well as holding monthly baseline working groups with a selection of trial participants, University of Oxford and consultancies (Baringa and TNEI), to discuss how to further develop the baselining tool.
 - Initial learnings during TP2 suggest that the combination of the level of aggregation (e.g., aggregation at BSP level), the individual capacity of the assets and the ceiling price has an implication on whether the economic and power flow optimisation converges for contract selection and dispatch.

9) Learning Outcomes

short-term support (i.e., Capex support) for cost-effective long-term operation.

- A better understanding of how to evaluate the cost of local LV flexibility versus the alternative of reinforcement to include supply feeders as well as the upgrade of transformers.
- The development of reporting market data and trial plan information to allow participants to make informed decisions.

i) Understand the network modelling and forecasting requirements needed by the WSC platform to calculate the flexibility needs for different timeframes

With respect to this learning objective, we have developed a much clearer understanding of:

- The complexities of modelling flexibility assets connected to the lower voltages of our network, where there is limited monitoring available, has been developed.
- The identification of generators connected to the network, at all levels, is key to operate an accurate disaggregation, thus developing good demand models.
- Forecasting of renewable energy generators is possible, and the use of reliable weather data is essential to drive the quality of forecasts. Probabilistic forecasting allows the representation of critical uncertainty in the operational time horizon.
- Forecasting of non-renewable dispatchable generators is more challenging when only considering weather data and temporal parameters. Other variables, such as price signals, would be required to improve the performance of the models.
- Identified that connection to real-time or near real-time data measurements is essential to validate the quality of the forecasts. It also provides an opportunity to improve demand forecasts, capturing deviations from historical behaviours. This is especially valid for 2021 data, as load in 2020

was heavily impacted by the Covid-19 pandemic. Integrating this functionality would form a real improvement to the Operational Forecasting solution.

- Learnings associated with automation of tasks, that might otherwise require human intervention, have been taken with respect to the potential scaling up of activities for the TRANSITION project to broader application more widely within the DNO to support DSO transition.
- A full integration between the WSC and the Operational Forecasting system has been delivered. The WSC is now able to automatically pull nodal demand and generation forecasts from the forecasting tool and populate those to a detailed power system analysis (PSA) model within the WSC, for the purposes of performing necessary flexibility Market constraint analytics.
- Develop a fuller understanding of the applications of “power flow” and “optimal power flow” power system analyses within long term and short-term flexibility markets. Key implications relate to the trade-off between Model solution time, which may be limited in real-time situations and optimality of decisions for total contract value cost minimisation.
- Progress within TP2 has been hampered by challenges in getting the Opus One optimal power flow PSA model to reliably converge. We have developed significant learnings and experience on this matter, which has driven a decision to implement more of a power flow model for later aspects of the TRANSITION programme.
- The time taken to converge can vary across different BSPs and depends on several factors, which include the magnitude of the network constraint and the amount of flexibility available.
- Even with the same CIM version and profile used, sometimes, the PSA tools give slightly different results initially because of the different modelling philosophies and power flow algorithms used. Corrections were needed to ensure consistency between the offline and the operational network models.

9) Learning Outcomes

- PowerFactory was used to develop a LV model of a single secondary substation, with the respective LV feeders to test PowerFactory capabilities to accurately represent customers connected to a single phase and perform imbalanced load flow calculation.

j) Understand the additional functionality that can be provided by the NMF and WSC platforms with the use of integrations to outside partners and systems.

This will inform how we work with third parties for the purpose of integration, both in best practice for internal design of the NMF and WSC, and in building a streamline methodology of collaboration with future integrations.

- During the integration with Piclo Flex to test Neutral Market Facilitation, the project has defined the requirements for a series of APIs between the NMF and Piclo. Following open discussion between SSEN, Opus One and Piclo, with the objective of identifying the technical integration requirements between Piclo Flex and the NMF, identifying the technical hurdles, in the way of meeting these requirements and providing technical solutions that ensured the integration, will be completed within budget and on time to meet the needs of both TRANSITION and LEO. The integration will be functioning in the next reporting period.

10) IPR

No relevant IPR has been generated or registered during this reporting period, and none is forecast to be generated or registered in the next reporting period.

11) Risk Management

Risk Management Plan

The Project risk register is regularly reviewed by the Project team and the key project risks are highlighted and discussed at project partner meetings, where mitigating actions are agreed.

Risk Register

The current Project Risk Register is provided in Appendix 2 (Confidential).

- There is a risk that we will not be able to test the contract selection and need analysis functionality required for the Dynamic, Secure and Sustain services due to the design of the optimal power flow power systems analysis solution employed so far. To mitigate the risk and ensure technical learnings are achieved as per our objectives, the project will deploy the Select and Dispatch Tool which will draw needs analysis from PowerFactory PSA. This will enable the project to test this functionality and trial the feasibility of the services in full early 2023.
- There is a risk that lower than expected liquidity in TP3 could impact the market dynamic learnings from the trials and project overall. The Project is in the process of onboarding a new Project LEO partner to assist in available liquidity to test the market dynamics in more detail.
- Demonstrating P2P capacity exchange is proving hard within current regulatory environment, due to the need for a Temporary Capacity Variation Notice (TCVN) in an area that is already constrained for new connections. The mitigation is to set up all the contracts and workshop the results with key stakeholders to test peer o-peer services in full. The project team continues to engage with the connections team, to understand if there are any improvements that can be made to the process to reduce the lead time for the TCVN process.
- The project was conceived around the original ENA 'Worlds' ONP model, and testing market models relating to these worlds. Current thinking has moved towards whole systems solutions, so the mitigation is to explore the interaction and investment required for each of the different actors in the whole electricity system and gather evidence from the market trials for investable business models such as; Private Equity (Trading Platforms, Aggregators), Bankable (Renewable Generation, DSR Investment) and Regulatory Investment (DSO/DNO/ESO) as part of the route to market for flexibility.

12) Accuracy Assurance Statement

Project Progress Report Preparation Steps

To ensure that the information contained in this report is accurate and complete, the following steps have been taken, the report has been:

- Prepared by the Project Manager;
- Reviewed by the Project Team;
- Reviewed by the Steering Group; and
- Approved by the Project Director and Regulation.

Sign-off

As the senior manager responsible for the TRANSITION Project, I confirm that the processes in place and steps taken to prepare this Project Progress Report are sufficiently robust and that the information provided is accurate and complete.

Melanie Bryce

Oxfordshire Programme Director



Scottish and Southern Electricity Networks

Date 22/09/22

13) Material Change Information

In reference to the Electricity Network Innovation Competition (NIC) Governance Document version 3.0, the project can confirm that no material change has occurred within the reporting period.

14) Appendices

Appendix 1

Project Bank Account Statement

Appendix 2

Risk Register

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