MERLIN

Modelling the Economic Reactions Linking Individual Networks

Milestone 8

Lessons Learned from the GridOS Transactive Energy Tool for Project Transition

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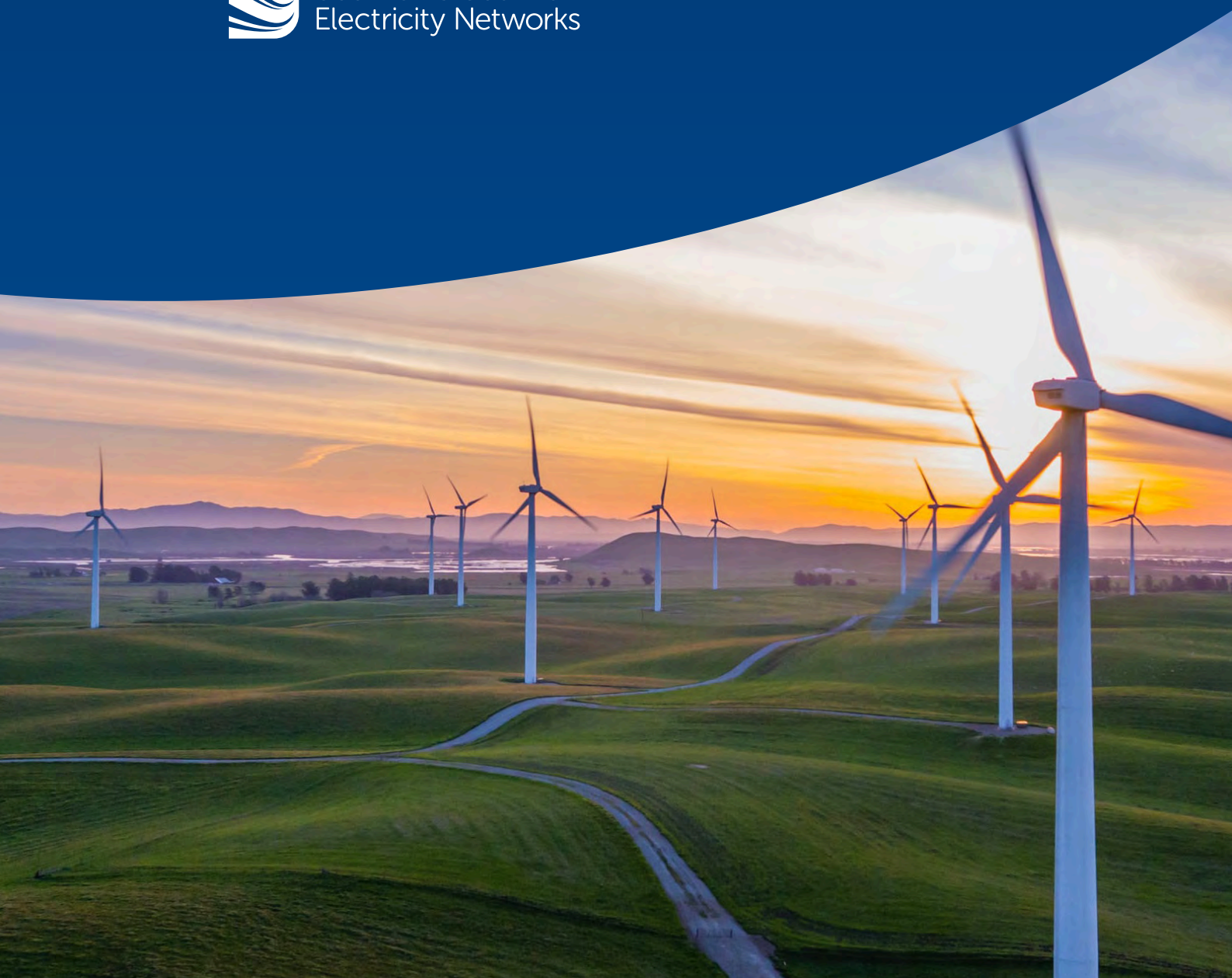

Contents

1 Introduction

1.1 Background

The MERLIN project is working towards improving SSEN's understanding on how Distribution Network Operators (DNOs) can effectively manage flexible services (for their own use or as neutral facilitators) such as those provided by generators, energy storage units and demand side response, among others. In this project, network planning studies were first performed with GridOS Integrated Distribution Planning (IDP) tool and then market simulations were performed with GridOS Transactive Energy (TE) tool. The learnings from these market simulations help SSEN prepare for their market trials for Project TRANSITION.

1.2 Aim

The aim of this report is to provide an overview of learnings from Project MERLIN that can be applied to Project TRANSITION. These learnings include identifying successful aspects of this project that should be repeated and limitations that can be improved upon.

2 Key Lessons Learned for Project TRANSITION

2.1 Retaining Successes from Project MERLIN

2.1.1 Market Clearing Mechanisms

The development of pay as bid and pay as clear mechanisms will be reused in Project TRANSITION. SSEN will procure flexibility and compensate resources based on these two models. Project MERLIN defined the expected market clearing behaviour and the simulations from the project verified the performance.

2.1.2 Market Dispatch Mechanisms

The congestion management simulation in Project MERLIN allowed SSEN to investigate network congestion solutions through flexibility procurement. For the sustain peak management service in Project TRANSITION, SSEN will procure flexibility to alleviate network congestion. In Project TRANSITION, flexibility resources will submit bids and offers in the form of flexibility responses to the flexibility request posted by SSEN.

In Project MERLIN, GridOS TE performed a cost-minimising optimal power flow to determine the required flexibility from resources on the network. The optimal power flow gives SSEN an informed decision on the most cost-effective way to safely operate the network. As a result, this methodology can also help inform procurement decisions in Project TRANSITION.

2.1.3 System Modelling

Within Project MERLIN, there was a lot of effort in building a network model for the Fort William and Oxfordshire regions from various SSEN data sources. This model was a key input into GridOS for SSEN to perform analyses. With this initiative, the value of centralised network data was understood and carried into Project TRANSITION. Project TRANSITION overlaps with the Oxfordshire region in Project MERLIN, which meant network models were created in MERLIN and used in TRANSITION.

The decision to build operational ready network models for TRANSITION meant MERLIN spent additional time developing these models so they were ready for TRANSITION.

The introduction of several new flexibility resources such as demand response, wind, and run of river hydro are transferrable to Project TRANSITION as these are all likely resources that may participate in the trials.

2.2 Improvements upon Project MERLIN

2.2.1 Load Forecasting

One challenge from Project MERLIN was the creation and ingestion of load and generation forecasts for the network and resources into GridOS. SSEN produced a couple of datasets to represent different future network scenarios. There was difficulty in amalgamating the granular datasets into a specific format that could be uploaded to GridOS. In Project TRANSITION, a project partner has been acquired to improve the data transfer process of forecasted data into GridOS. Load and generation forecasts will be uploaded and allocated directly to all loads and resources.

2.2.2 Peer to Peer Transactions

One objective of Project MERLIN was to simulate the economic and physical results of peer-to-peer (P2P) transactions such as offsetting and maximum import/export capacity. These transactions were modelled with bids and offers submitted to the DSO, rather than to another peer in the market. The impacts on the network were captured by using negative offer prices, as the DSP dispatch resources based on lowest offer price. This workaround produced the net dispatches and network conditions from a P2P transaction. For example, two synchronous generators partake in a Maximum Import Capacity / Maximum Export Capacity (MIC/MEC) transaction in a baseline simulation where they both originally dispatch 100kW. To simulate the MIC/MEC transaction, the two synchronous generators have their maximum capacities edited and submit different offers to 80kW and 120kW. The resulting simulation shows the impact on the network of the generators increasing and decreasing from their unique locations.

In order to facilitate P2P interactions for Project TRANSITION, modifications will be made to the way flexibility resources are modelled, interact with each other and submit bids and offers. Opus One is developing a flex resource type that not only facilitates peer-to-DNO services contracting, but also peer-to-peer contracting through deviations around a baseline. The baseline deviation capability allows for an experience that focuses on the market participation of the resource as an adder to any other obligations it may have. This resource enhancement will introduce a new workflow including flexibility requests, flexibility responses (containing bids and offers), and flexibility contracts.

2.2.3 Outage Management

The simulations performed in Project MERLIN were based on a static network model. In Project TRANSITION, the secure and dynamic peak management services will require the updating of network topology to represent changes in near real-time network conditions. This will require the need for integration with a Demand Management System or leverage SSEN's NeRDA innovation project that will share updated network data. With that data integration, flexibility for outage management scenarios can be more accurately procured.

3 Conclusion and Next Steps

The completion of Project MERLIN has provided several advancements and learning opportunities for SSEN to apply to Project Transition. These will help define necessary requirements for the market trials. Additionally, SSEN has learned more about the state of their network data and the resulting opportunities for and limitations on analyses that can be run for flexibility procurement within a market setting.

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