Energy Networks Innovation Process

Project Closedown Report Document

Date of Submission: 05/07/2021

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Project Title (*This cannot be changed once registered*)	Project Reference
Future Fiscal Forecasting	NIA_SSEN_0045
Funding Licensee(s)	**Project Start Date**
Southern Electric Power Distribution	March 2020
Project Duration	**Year**
9 months	2021

Nominated Project Contact(s)
SSEN NIA Programme Delivery Manager – Colin Mathieson

1. Scope

This project will use GB Settlements sourced 'fiscal' metering in combination with SCADA data and weather data to;

1) forecast energy consumption for a Distribution Service Area (DSA) and disaggregate this into the corresponding Grid Supply Points (GSP)s i.e. the SEPD DSA and 18 GSPs.

2) forecast energy consumption for a sample of HV feeders with a high uptake of demand or generation (two generation dominated, and two demand dominated).

Project findings will be communicated in a written report and shared amongst GB DNO experts via a face to face workshop.

2. Objective(s)

The project objectives include:

•assessment of the availability and suitability of current and future data sources which could provide more detailed fiscal forecasting of energy volumes;
• an assessment of methodology to be used; and
• a quantitative evaluation of the level of accuracy of the new forecasting model

3. Success Criteria

If the project delivers the anticipated learning (whether the new forecasting model in trial provides accurate forecasting) to GB stakeholders, then it is deemed successful.

4. Performance compared to the original project aims, objectives and success criteria

Details of how the Project is investigating/solving the issue described in the NIA Project Registration Pro-forma.
Details of how the Project is performing/performed relative to its aims, objectives and success criteria.

Project background

It is anticipated that the increase in flexibility services and the uptake of Low Carbon Technologies (LCTs) such as Electric Vehicles (EVs) etc. will make demand forecasting more challenging. As well as this, established demand patterns will no longer be relevant. The timing and detection of this increased uptake may be particularly hard to identify through conventional techniques.

This project aimed to address this by trialling a new forecasting model developed by Innowatts. SSEN undertook due diligence investigations into the demand forecasts provided by Innowatts. To conclude the project Innowatts summarised their output (available on request) and participated in a workshop. The workshop was well attended by representatives from the other DNOs.

Project progress

Below are the details of the project's achievements measured by the original objectives;

Assessment of the availability and suitability of current and future data sources which could provide more detailed fiscal forecasting of energy volumes;

The data sources that are currently used by the energy industry to forecast 'fiscal' metering are:

- Metering sourced by the GB settlements
- SCADA data
- Weather forecasts

The data sources currently used by SSEN are deemed sufficient and suitable for the current forecasting level of accuracy. However, with the predicted increase in flexibility services and the uptake of LCTs, there will be a need for a higher level of forecasting accuracy. This would ensure that future setting of DUoS charges remains as accurate as it currently is. To achieve this, the DNOs would need to access real-time and more disaggregated data, such as real-time power flow information sourced by customers' meters. The real-time power flow information should be more readily available with the roll-out of the second-generation smart meters. For 2016-19, both SSEN and Innowatts had forecasts of similar granularity to compare, however, for 2019-20, SSEN did not hold half-hourly consumption data, hence that year's forecasts were produced as monthly aggregates. This is because half-hourly data for 2019-20 was not available at the time of the project for SSEN.

An assessment of methodology to be used;

The forecasting methodology that was used by Innowatts throughout the trial was the following;

- Historical meter reading data for all the energy tariffs in the selected SEPD area,
- SCADA-sourced historical consumption data for four feeders located in the same area,
- Weather forecasts covering the duration of the metered information from publicly available sources.

Innowatts then fed all of this data into their in-house forecasting model. The model used Machine Learning (ML) and it produced both short-term and long-term trends for all the tariff components and the feeders. SSEN reviewed the material and found the above methodology to be deemed suitable for the years that SSEN had data of similar granularity as Innowatts, as the forecasting outputs were within the range of accuracy that was anticipated. For forecasts in the future, the methodology would need to be enhanced with the half-hourly data, as mentioned in the previous section.

A quantitative evaluation of the level of accuracy of the new forecasting model;

A full evaluation of the level of accuracy of the new forecasting model was only possible when the trends of Innowatts and SSEN's followed the same format and could be easily compared.

Based on the above, the main evaluation that was carried out by SSEN was on the forecasts of the meter readings for all the tariffs. Innowatts provided Half-Hourly (HH) forecasts, and for 2019-20 these were aggregated by SSEN into monthly trends. The aggregation information into monthly trends was due to the fact that SSEN currently use monthly aggregates to produce future trends rather than HH data. The evaluation showed a minor deviation between the trends of Innowatts' and SSEN's, indicating a few inaccuracies of the forecasting outputs. Although it's difficult to identify the exact causes for this deviation due to the complicated nature of the model, it is believed that the main causes were the complicacy of SSEN's input data and the fact that the model had not analysed this type of network data in the past.

It was not possible to fully evaluate the trends in the feeders' consumption as SSEN did not hold any trends for these feeders, however the Innowatts' results showed a sensible trend up to March 2023. These forecasts incorporated both data sourced by SSEN's SCADA

system and weather forecasts.

5. Required modifications to the planned approach during the course of the project

The Network Licensee should state any changes to its planned methodology and describe why the planned approach proved to be inappropriate. Please confirm if no changes were required

N/A

6. Lessons learnt for future projects

Describe how the project (methodology, stakeholder engagement etc.) changed, or provided opportunities, from your expectation at the start of the project and therefore could be useful for a future project. In addition, please discuss the effectiveness of the research development or demonstration undertaken.

The project produced the following learnings:

- It became apparent that Innowatts' forecasting process capabilities exceeded the SSEN's internal forecasting processes that are currently in place. The data granularity that Innowatts required included data such as the exact number of solar panels, or LCT-related consumption. SSEN do not presently hold that level of detail, therefore, a more extensive evaluation of the forecasts was not possible by SSEN. This issue will be resolved once the roll-out of the second-generation smart meters has reached a suitable level of penetration. As soon as such data becomes available to the DNOs, the technology could be trialled further and potentially adopted on a larger scale. However, further deployment and adoption of the technology will not take place at this stage.
- The area of 'fiscal' forecasting and terminology that is used in the relevant documentation is considered niche. A sufficient level of knowledge and familiarisation is required in order for external parties to be able to interpret the data correctly. Therefore, it would be advantageous for the energy industry to produce a guidance document or reference material to streamline the approach and help other suppliers fully understand and accurately analyse the data. In this project, Innowatts managed to understand the data provided by SSEN, after a few initial sessions between the two parties.
- When the fields of forecasting and ML are combined, the trial highlighted the importance of providing the largest volume of data when possible. Historical data is key for ML models to learn, improve and produce more accurate results. Similar projects in the future need to be able utilise as much input data as possible for better results.
- The General Data Protection Regulation (GDPR) rules have been considered throughout this trial. As some of the data held by SSEN involved sensitive information by default, such as Meter Point Administration Numbers (MPANs), which are unique ID numbers associated with the locations of the customers' meters. To protect the customers' sensitive information, the SSEN's data protection team were consulted and all the relevant data masked appropriately before data sharing took place. Such actions are also advised for any projects that handle similar data, so that compliance with GDPR is ensured.

7. The outcomes of the project

When available, comprehensive details of the Project's outcomes are to be reported. Where quantitative data is available to describe these outcomes it should be included in the report. Wherever possible, the performance improvement attributable to the Project should be described. If the TRL of the Method has changed as a result of the Project this should be reported. The Network Licensee should highlight any opportunities for future Projects to develop learning further.

For 2016-19 and 2019-20, the forecasts provided by Innowatts, showed minor deviations from SSEN's forecasts. It must be highlighted that Innowatts' 2019-20 forecasts were aggregated from half-hourly figures into a monthly total, in order to make it comparable with SSEN's data. This resulted in a comparison of two datasets of unequal granularity, hence not a clear evaluation of that year's forecast was possible. The half-hourly forecasts produced by Innowatts provided a level of granularity which was not possible to evaluate and certainly highlighted the need for SSEN to collect more detailed information much closer to the customer interface.

Due to covid19 restrictions, the face-to-face dissemination workshop was converted to a virtually hosted session with participation of representatives from the other GB DNOs.

The original aim was to move the TRL of the method from 8 to 9. However, as the solution will not be progressed any further by SSEN at this stage, no work has been done in order to adopt the technology as a Business as Usual operation.

8. Data Access & Quality Details

A description of how any network or consumption data (anonymised where necessary) gathered in the course of the Project can be requested by interested parties. Please include a link to the publicly available data policy.

See Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://www.ssen.co.uk/InnovationLibrary/Distribution/

9. Foreground IPR

A description of any foreground IPR that have been developed by the project and how this will be owned.

N/A - Developing a software product (e.g. algorithm) was out of scope and also not possible due to insufficient data about energy usage at the customer level, hence there was no foreground IPR developed in the project.

10. Planned implementation, recommendations or next steps

Please describe the next steps to implement this innovation project. What policies and standards need to be updated or created as part of this implementation.

Following the completion of the trial, it was decided not to presently proceed into Business as Usual with the Innowatts' forecasting model. This was due to SSEN (and possibly other DNOs) not presently being in a position to provide the level of detail in the network data necessary to fully review the Innowatts' forecasting model.

It is envisaged that this level of data granularity will become available to the majority of the DNOs with the introduction of the next generation's smart meters, at which point a more comprehensive evaluation of the forecasting model can be undertaken.

11. Other comments

N/A

12. Standards Documents

Identify any industry standards that may require updating due to the outcomes or understanding developed from this innovation project. If no standards will need to be updated, please state - not applicable

N/A