Electricity north west

Bringing energy to your door

NIA ENWL019 Interface

Progress Report

31 July 2022

VERSION HISTORY

Version	Date	Author	Status	Comments
V1.0	25/07/2022	Steve Davenport	Final	

REVIEW

Name	Role	Date
Ben Ingham	Innovation Technical Manager	29.07.22
Lucy Eyquem	Innovation PMO Manager	29.07.22
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APPROVAL

Name	Role	Date
Steve Cox	DSO Director	29.07.22

CONTENTS

GLOSSARY

Term	Description
API	Application Programming Interface - computing interface which defines interactions between multiple software intermediaries
CoTS	Commercial off The Shelf
DNP3	Distribution Network Protocol 3 - communications protocols used between components in process automation systems
DMZ	Demilitarised Zone
HV	High Voltage
GRP	Glass Reinforced Plastic
IoT	Internet of Things
LoRaWAN	Long Range Wide Area Network – radio based low power communication protocol generally used in IoT applications
LV	Low Voltage
MQTT	A messaging protocol for small sensors and mobile devices
NMS	Network Management System
OT	Operational Technology
REST	Representational State Transfer - architecture style for designing networked applications
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SDWAN	Software Defined Wide Area Network
SIM	Subscriber Identity Module

1 PROJECT FUNDAMENTALS

Title	Interface
Project reference	NIA_ENWL019
Funding licensee(s)	Electricity North West Limited
Project start date	October 2018
Project duration	3 years
Nominated project contact(s)	Steve Davenport (innovation@enwl.co.uk)

2 PROJECT SCOPE

The project will investigate the various interfaces, communications mediums and protocols needed to support the transition to a future network. Trials will be conducted to ensure all the different devices work together whilst maintaining security.

3 OBJECTIVES

- Identify all existing and planned communications mediums and protocols for the monitoring and control of the DNO and customer's equipment.
- Trial interfaces between the DNO and customer equipment.
- Develop control methodologies for managing customers' and DNOs' equipment to resolve local constraints.

4 SUCCESS CRITERIA

- Production of functional specification for a communications hub to transfer monitoring data and controls between the NMS and DNO / customer owned equipment.
- Production of control methodologies for managing customers' equipment.
- Successful trial of a communications hub, its various interfaces and associated control methodologies.

5 PERFORMANCE COMPARED TO THE ORIGINAL PROJECT AIMS, OBJECTIVES AND SUCCESS CRITERIA

Building on the work carried out with IBM earlier in the project ENWL's network team further developed the proposed solution to ensure it would mesh with our existing architecture and systems. As part of this work the project team engaged with a third-party supplier to modify an existing substation monitor to allow ethernet based communications in addition to the existing SIM based ability. The data generated by this unit was tagged as either analytical or command/ control to prove that the variable routing was functioning. This allows for data to

be directed as required, i.e. control data back the NMS and analytical data to a storage platform where it could be retrieved by ENWL staff and third parties.

2022 Progress

- A 12-month extension was requested and granted due to the challenges COVID presented on personal availability due to self-isolating measures and or additional work installing remote supply restoration of medical installations relating to the COVID response.

- Progress has been made to configure a SDWAN solution and install in the ENW data estate. This is new technology for ENW OT infrastructure hence caution has been exercised and heavily reviewed considering current cyber threats.

- An off the shelf LV Substation monitor has been commission locally to prove data is flowing into the OT network. This data would be tagged as analytical data to demonstrate the data separation between command-and-control data and analytical data for the addressable network and routing aspects of the project. The next stage is to swap out the traditional comms in the substation and move to LoRaWan connectivity with the LV Substation monitor transmitting over LoRaWan comms to a base station in the distribution substation. This will determine if sensors local to a distribution substation could transmit back to the LV networks feeding substation. This should give some indication of signal quality for asset below the surface under link box lids etc.

- An area that needs to be explored is bandwidth and if Real Time operational command signals and controls can be reliability transmitted over LoRaWan. Our partners will be assisting us with their own findings and practicalities of using this wireless technology.

- Rules around the use of LoRaWan technology and bandwidth may be a limiting factor to real time control aspects.

- Started to look at the “Data Lake” solutions. One of our partners is assisting with establish a hosting platform within our data estate with a view to allow 3rd party read only access. This will initially be held internally on ENW data estate.

- The use of other technologies such as power line carrier have been reviewed and or discounted as these have been tested in other NIA projects and proven to be unsuitable in some situation so will not be tested as a communication option for the Interface Project

- Edge computing – this technology seems to be established with sensor vendors where data is collected, analysed and any results that need reporting are transmitted to the SCADA system to make a final decision, therefore reducing traffic on lower bandwidth data communications

- Cyber Security is at the top of the RTU requirement stack, which limits some of the lower cost RTU devices that directly connect to the OT systems.

- Triple validation & cheaper field instruments and sensors. Low-cost sensors <~£5 are available, but this need to be evaluated against reliability & accuracy. Software “Triple validation” techniques could be used, taking multiple low-cost sensors, and averaging these results, and excluding any suspect sensors compared to the average.

- Where this triple validation data is not used operationally this also allows lower cost micro computers to the utilised such as the Raspberry Pi as a data collection device.

- RTU Selection criteria, the marketplace has many quality RTU solutions of which the majority can support the majority of “IoT” devices, comms protocols are available in many

forms, the decision purchase additional RTU, didn't seem cost effective for the project, so possible future IoT integration is being trialled on ENW's own fleet of RTU suppliers.

- Working with our RTU partners, we are looking at the challenges, solution options, and reliable integration of IoT devices.

6 REQUIRED MODIFICATIONS TO THE PLANNED APPROACH DURING THE COURSE OF THE PROJECT

- ENW are approaching the end of a full Network Management & SCADA application change, and the delivery of this project has a dependency on this.

7 LESSONS LEARNED FOR FUTURE PROJECTS

Due to the changing cyber security landscape a review was carried out of Electricity North Wests requirements. The learning from Interface will feed into this in terms of potential future developments and needs. However, for future project where there is a large communications and data element closer liaison with the relevant teams would ensure that this learning is captured over the life of the project

8 THE OUTCOME OF THE PROJECT

Not applicable.

9 DATA ACCESS

Electricity North West's innovation data sharing policy can be found on our website.

There has been no data gathered so far during the project.

10 FOREGROUND IPR

None

11 PLANNED IMPLEMENTATION

Not applicable.

12 OTHER COMMENTS

Not applicable.