electricity north west

Bringing energy to your door

NIA ENWL019 Interface

Progress Report

31 July 2020

VERSION HISTORY

Version	Date	Author	Status	Comments
V1.0		Geraldine Paterson	Final	

REVIEW

Name	Role	Date
Lucy Eyquem	Innovation PMO Manager	23.07.20
Dan Randles	Head of Innovation	31.07.20

APPROVAL

Name	Role	Date
Steve Cox	Engineering & Technical Director	31.07.20

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
IoT	Internet of Things
MQTT	A messaging protocol for small sensors and mobile devices
REST	Representational State Transfer - architecture style for designing networked applications
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition

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)	Geraldine Paterson (innovation@enwl.co.uk)

2 PROJECT SCOPE

The project will be mainly an investigative piece into the various interfaces, communications mediums and protocols. Trials will be conducted to ensure all the different devices work together whilst maintaining data security.

3 OBJECTIVES

- Identify all communications mediums and protocols for monitoring and control of DNO and customers equipment.
- Trial interfaces to 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 the communications hub and interfaces and associated control methodologies

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

To enable a more thorough review of possible solutions for communications with distribution substations and the handling of the vast amount of data they can produce Electricity North West employed IBM to research the options.

IBM conducted several workshops with relevant Electricity North West to gain an understanding of the requirements and challenges.

The following architectural principles were adopted by IBM to ensure the recommendations were scalable, future-proof and used industry standard security guidelines. They were also used to guide the design and to assess each of the solution components.

1. Distributed Energy Resources/ Low Carbon Technologies would be controlled via native applications and be connected via a cloud environment and/ or proprietary solutions e.g. REST APIs.
2. The solution should be designed in a modular fashion to allow components to be brought together to best fit each geographical location and substation configuration. It is expected this shall include sensors, aggregation, local data store and compute capability, a communications hub, a cloud environment, and a gateway to Electricity North West environments.
3. The edge devices will be scaled to match the level of connectivity available.
4. The system should have appropriate levels of security, which will include device management and device registry. The system should also be capable of monitoring the edge devices for irregular transaction information.
5. Electricity North West will use Commercial Off The Shelf (COTS) products as much as possible to comply with the industry standard approach and utilise existing security standards.
6. Electricity North West will use a cloud first approach for data storage infrastructure.
7. The solution should be designed to be scalable where possible.

IBM researched different architectural, design and solution component options and the various connectivity options available, along with the edge computing and data analytics required to consolidate the relevant sensor data.

From the work they presented two recommended designs – one based on using a public communications network and one based on using a private communications network.

The work demonstrated that Electricity North West needs a combined solution that utilises different communication methods and different edge computing requirements dependent on the GSM signal strength within the substation. Therefore, two different RTUs or RTU module configurations are required to meet this design.

The design recommends using a cloud hosted IoT platform to manage the connected devices. The Cloud provider and IoT platform provider can be from different suppliers depending on the outcome of a procurement exercise.

MQTT was recommended as the protocol to be used to collect the data due to its integration with the IoT platform and IBM suggested that Electricity North West convert MQTT into our standard protocol, DNP3, within the DMZ. For control elements DNP3 sent directly from the SCADA system should continue to be used.

Following this work with IBM, Electricity North West have started to procure equipment to install in our test area to test the design. This will enable the end to end functionality to be assessed including the access to data by control systems, planning staff and third parties.

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

There have been no modifications to the planned approach so far in the project.

7 LESSONS LEARNED FOR FUTURE PROJECTS

There are no lessons learned at this stage in 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.