

NIA ENWL015 Tap Changer Monitoring

NIA Progress Report

31 July 2017



VERSION HISTORY

Version	Date	Author	Status	Comments
V0.1	5 June 2017	M Kayes	Final	

REVIEW

Name	Role	Date
L Eyquem	Innovation Programme Assistant	10 July 2017
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APPROVAL

Name	Role	Date
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1 PROJECT BASICS

Project title	Tap Changer Monitoring
Project reference	NIA_ENWL015
Funding licensee(s)	Electricity North West Limited
Project start date	February 2016
Project duration	4 years
Nominated project contact(s)	Paul Marshall (paul.marshall@enwl.co.uk)

2 SCOPE

Following previous research into tap changer monitoring carried out under an IFI project, it has been determined that the technique utilised was not sufficiently robust and that further monitoring is required. We will work closely with Camlin Power to develop and produce a retrofitable tap changer monitoring system to accurately monitor the tap changer performance, in turn determining the intervention/triggers points.

For this project it was proposed to install the system on 10 x 132kV tap changers and 30 x 33kV tap changers and understand the tap changer performance over a 24-month period to allow seasonal changes to be taken into account.

The project will allow Electricity North West to develop its understanding of the effects of tap changer failure modes and maintenance requirements and to identify the optimum window for monitoring in the life cycle of tap changers.

3 OBJECTIVES

This project is split into four distinct phases:

- **Phase 1** is to develop a retrofitable tap changer monitoring system. This phase to be completed by December 2016
- **Phase 2** is the onsite installation of 40 monitoring systems. This phase to be completed by August 2017
- **Phase 3** is the continuous data analysis and visualisation of the tap changer condition. This phase to be completed by August 2019.
- **Phase 4** is the implementation of identified trigger points into company policy and procedures. This phase to be completed by January 2020

4 SUCCESS CRITERIA

Production and trial of a condition monitor for tap changers.

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

The first challenge for the project was to design a system flexible enough to be installed across a range of tap changer and transformer types and ages. Once the project reaches the data gathering stage, the main challenge will be to ascertain whether data collected provides signs of tap changer mechanism condition (and deterioration); it is also crucial to identify which methods are required to capture usable data to achieve an optimised ultimate solution. Therefore, the prototype system design must facilitate collection of data from the maximum number of sources, while being sufficiently simple to be designed, tested and ready to install and commission for August 2017.

Prototype acquisition circuitry has been designed, built and tested both in-house and in the field through a small number of 'Alpha' prototype installations. The acquisition circuitry has been used to collect, process and communicate high- and low-speed data from a range of different sensors (such as accelerometers, temperature probes and current transformers), with data ultimately residing on a cloud-based server for long-term analysis.

Following the installation of these prototype systems onto different tap changer and transformer types, areas were identified where the installation could be streamlined to optimise efficiency. Data acquisition was seen to work effectively.

System components are being revised in preparation for ordering, building and testing before installation of 40 x 'Beta' systems by the end of August 2017.

The installation of 'Alpha' devices showed the innovative acoustic monitoring system will provide usable data. In addition, this installation identified challenges in regard to picking up tap position from across the range of tap changer and transformer types. Additional development is underway to enable the 'Beta' prototypes to capture tap position data from by using new conversion modules. This additional work should not impact delivery of the project.

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

There have been no changes to the planned approach.

7 LESSONS LEARNED FOR FUTURE PROJECTS

Not applicable.

8 THE OUTCOMES OF THE PROJECT

Not applicable.

9 PLANNED IMPLEMENTATION

Not applicable

10 OTHER COMMENTS

Not applicable.