

# **NIA ENWL015**

## **Tap Changer Monitoring**

### **Progress Report**

**31 July 2022**



## VERSION HISTORY

Version	Date	Author	Status	Comments
V1.0	15.05.22	Kieran Bailey	Final	

## REVIEW

Name	Role	Date
Lucy Eyquem	Innovation PMO Manager	29.07.22
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## APPROVAL

Name	Role	Date
Steve Cox	DSO Director	29.07.22

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# 1 PROJECT FUNDAMENTALS

Title	Tap Changer Monitoring
Project reference	NIA_ENWL0015
Funding licensee(s)	Electricity North West Limited
Project start date	February 2016
Project duration	6 years
Nominated project contact(s)	Kieran Bailey (Kieran.bailey@enwl.co.uk)

## 2 PROJECT SCOPE

Following previous research into tap changer monitoring carried out under an Innovation Funding Incentive project, it has been determined that the technique utilised was not sufficiently robust and that further monitoring is required. Therefore, we will work closely with Camlin Power to develop and produce a retrofittable tap changer monitoring system to accurately monitor the tap changer performance and consequently determine the intervention/trigger points.

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

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 retrofittable tap changer monitoring system. This phase was completed in December 2016.
- **Phase 2** is the onsite installation of 40 monitoring systems. This phase was completed by August 2018.
- **Phase 3** is the continuous data analysis and visualisation of the tap changer condition. This phase to be completed by August 2021.
- **Phase 4** is the implementation of identified trigger points into company policy and procedures. This phase to be completed by February 2022

## 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**

Over the last twelve months the monitoring has continued alongside the analysis of the collected data. The main objective of this project is to develop an Anomaly Detection System (ADS). Development of the ADS is based on having sufficient data available to set trigger levels.

The developed and deployed system monitors and collects operational data, including vibration, motor currents, tap position and temperature readings. The triggered high speed data like vibrational information is concentrated on the individual tap operations. This is then fed into a trained Anomaly Detection System. This is designed and trained to detect when something different from the standard operation pattern is happening. For example, a change in the vibration traces, in motor current patterns, a sudden change in load patterns or loss of load, a change in tap pattern or range use, and other types of anomalous behaviour.

When attention is focused onto a particular installation due to an anomaly, it means that something unusual is happening at that individual installation, and we are able to give that installation expedient attention to understand better why there are changes happening. Any anomalies that occurred have been investigated in line with previous years. As reported previously part of the work in this final phase of the project is to look at the outputs and refine the specification for more enhanced monitoring units in the future. This would allow issues to be detected earlier allowing for preventative action to be scheduled more efficiently.

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

No modifications have been made

## **7 LESSONS LEARNED FOR FUTURE PROJECTS**

Not applicable.

## **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.

## **10 FOREGROUND IPR**

The project will develop and bring to pre-production and trial a tap changer condition monitoring system. Camlin Power have developed and productionised the retrofittable tap changer monitoring system and own the IPR for the development of that system. The system will be made available for purchase from Camlin Power and the method used for the trials will be made available via Electricity North West for others to replicate the project.

## **11 PLANNED IMPLEMENTATION**

Not applicable.

## **12 OTHER COMMENTS**

None.