NIA ENWL014
Optimising Oil Regeneration

Progress Report

31 July 2018

VERSION HISTORY

Version	Date	Author	Status	Comments
V1.0	1 June 2018	Paul Marshall Project Manager	Final	Final version following internal review and comment

REVIEW

Name	Role	Date
Lucy Eyquem	Innovation PMO Manager	3 July 2018
Paul Turner	Innovation Manager	25 July 2018

APPROVAL

Name	Role	Date
Steve Cox	Engineering & Technical Director	31 July 2018

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GLOSSARY

Term	Description
DGA	Dissolved gas analysis
IFI	Innovation Funding Incentive
LCN Fund	Low Carbon Networks Fund
NIA	Network Innovation Allowance
PD	Partial discharge

1 PROJECT FUNDAMENTALS

Title	Optimising Oil Regeneration
Project reference	NIA_ENWL0014
Funding licensee(s)	Electricity North West Limited
Project start date	February 2016
Project duration	6 years
Nominated project contact(s)	Paul Marshall (innovation@enwl.co.uk)

2 PROJECT SCOPE

Previous research carried out under an IFI project suggested that oil regeneration carried out in a window at the end or near the end of a transformer's nominal life would extend life by approximately ten years. The First Tier LCN Fund project deployed online monitoring equipment at six sites where the oil regeneration technique was used.

The NIA project will build on this research by exploring the optimum point to apply oil regeneration to a transformer fleet. It is acknowledged that the life of oil impregnated paper insulation determines the maximum potential life of a transformer, although other factors may cause it to fail earlier. This project scope will aim to determine if mid-life oil regeneration can reduce the rate of paper degradation, and thereby further extend the lifespan of the transformer compared to oil regeneration at end of life.

For this project, ten 33kV paired transformers and three 132kV paired transformers (13 sites, 26 transformers) which are at various stages of their design life will be identified. At each site, only one of the transformers will undergo oil regeneration.

Online monitoring equipment will be installed on both transformers at each site to allow comparison of their oil condition and to determine the theoretical life extension over time. These results will be fed into the previously funded data visualisation software to allow consistent comparison.

Electricity North West will work closely with industry experts to validate the data and calibrate the life extension results. The project will allow Electricity North West to develop its understanding of the effects of life extension on transformer failure modes and maintenance requirements and to identify the optimum window for oil regeneration in the life cycle of transformers.

3 OBJECTIVES

This project is split into three distinct phases:

- Phase 1 is research into and design/sourcing of an oil regeneration unit to carry out the oil regeneration at the 13 sites. This phase was completed in September 2016.

- Phase 2 implements oil regeneration at 13 mid-life transformer sites and installs condition monitoring equipment. This phase will be completed in 2018.

- Phase 3 is the data analysis and optimisation of the oil regeneration practice. This phase is to be completed by February 2022.

4 SUCCESS CRITERIA

- Specification and sourcing of an oil regeneration unit capable of delivering the required oil quality in a controlled manner. Completed.

- Complete the implementation of oil regeneration and condition monitoring equipment at 13 transformer sites at mid life. Ongoing but will be completed in 2018.

- Data acquisition, analysis and validation to identify the optimum point of oil regeneration in a transformer life cycle. Ongoing data collection.

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

The project is currently on target to deliver the original aims, objectives and criteria for optimising oil regeneration.

Electricity North West has built upon its experience from previous oil regeneration projects to specify and procure a unit suitable for this project's requirements.

Site selection to confirm the 13 sites has been completed and the condition monitoring equipment installed on both transformers at each site.

Half of the sites have had the oil regenerated in one of the transformers while the other one has been left. The remaining sites are scheduled to have oil regeneration completed by December 2018. Each transformer has been fitted with identical DGA monitoring,

As with the Combined Online Transformer Monitoring project, the chemical degradation process within oil is very complex and a slow process. The oil acts as the coolant and part of the insulation, together with oil-impregnated paper and board. Both types of material are affected by several different ageing processes, and both materials are affected by each other. Therefore the project will run for several years to allow the chemical ageing and degradation process to occur.

Electricity North West will work closely with an academic resource to validate the data and calibrate the optimum life extension results once online data has been recorded for a significant time period to allow the results to be reliable and consistent.

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

The project is in its early stages and at this point there are no lessons to share.

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

Not applicable.

11   PLANNED IMPLEMENTATION

Not applicable.

12   OTHER COMMENTS