

NIA ENWL014

Optimising Oil Regeneration for Transformers

NIA Progress Report

31 July 2017



VERSION HISTORY

| Version | Date | Author | Status | Comments |
|---------|--------------|-------------------------------|--------|----------|
| V1 | 1 April 2017 | P Marshall Project Manager | | |

REVIEW

| Name | Role | Date |
|----------|--------------------------------|--------------|
| L Eyquem | Innovation Programme Assistant | 10 July 2017 |
| G Bryson | Innovation Engineer | 10 July 2017 |
| P Turner | Innovation Manager | 16 July 2017 |

APPROVAL

| Name | Role | Date |
|-----------|----------------------------------|--------------|
| Steve Cox | Engineering & Technical Director | 20 July 2017 |

CONTENTS

| | | |
|-----------|---|----------|
| 1 | PROJECT BASICS | 4 |
| 2 | SCOPE | 4 |
| 3 | OBJECTIVES | 4 |
| 4 | SUCCESS CRITERIA | 5 |
| 5 | PERFORMANCE COMPARED TO THE ORIGINAL PROJECT AIMS, OBJECTIVES AND SUCCESS CRITERIA | 5 |
| 6 | REQUIRED MODIFICATIONS TO THE PLANNED APPROACH DURING THE COURSE OF THE PROJECT | 5 |
| 7 | LESSONS LEARNED FOR FUTURE PROJECTS | 5 |
| 8 | THE OUTCOMES OF THE PROJECT | 5 |
| 9 | PLANNED IMPLEMENTATION | 5 |
| 10 | OTHER COMMENTS | 5 |

1 PROJECT BASICS

| | |
|------------------------------|--|
| Project title | Optimising Oil Regeneration for Transformers |
| Project reference | NIA_ENWL014 |
| Funding licensee(s) | Electricity North West Limited |
| Project start date | February 2016 |
| Project duration | 6 years |
| Nominated project contact(s) | Paul Marshall (paul.marshall@enwl.co.uk) |

2 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 project deployed online monitoring equipment at five 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 – research into and design/sourcing of an oil regeneration unit to carry out the oil regeneration at the 13 sites. This phase to be completed by September 2016

- Phase 2 – implement oil regeneration at 13 mid-life transformer sites and install condition monitoring equipment. This phase to be completed by August 2017
- Phase 3 – the data analysis and optimisation of the oil regeneration practice. This phase to be completed by February 2022.

4 SUCCESS CRITERIA

- Specification and sourcing of oil regeneration unit capable of delivering the required oil quality in a controlled manner
- Complete oil regeneration and condition monitoring equipment at 13 transformer sites at mid-life
- Data acquisition, analysis and validation to identify the optimum point of oil regeneration in a transformer life cycle.

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

Site selection has been completed and 13 sites have been chosen. The condition monitoring equipment for these sites have now been procured. Nine of the 13 sites have had the condition monitoring equipment installed with the remaining to be installed in the next few months.

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

Delays to the implementation of oil regeneration has caused a delay by a few months. Once the final completion date has been determined the portal will be updated.

7 LESSONS LEARNED FOR FUTURE PROJECTS

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

8 THE OUTCOMES OF THE PROJECT

Not applicable.

9 PLANNED IMPLEMENTATION

Not applicable.

10 OTHER COMMENTS

Not applicable.