

NIA ENWL004

Combined Online Transformer Monitoring

NIA Progress Report

31 July 2017



VERSION HISTORY

Version	Date	Author	Status	Comments
v.1.0	1 April 2017	P Marshall	Final	

REVIEW

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

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

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1 PROJECT BASICS

Project title	Combined Online Transformer Monitoring
Project reference	NIA_ENWL004
Funding licensee(s)	Electricity North West Limited
Project start date	September 2014
Project duration	3 years
Nominated project contact(s)	Paul Marshall (paul.marshall@enwl.co.uk)

2 SCOPE

Previous research carried out under an IFI project defined an oil regeneration window for transformers at the end or near the end of their design life to extend it by approximately ten years. The First Tier project deployed online monitoring equipment at six sites where the oil regeneration technique will be used.

This NIA version of the First Tier project will validate the data from the monitoring equipment and calibrate the previous IFI research. These results have been fed into data visualisation software that has been developed to allow consistent comparison.

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

3 OBJECTIVES

This project is split into two distinct phases:

Phase 1: the development of a dashboard/decision tool to be used by Electricity North West. This phase was completed by April 2016.

Phase 2: the data validation of existing research into life extension by oil regeneration. This phase was due to be completed by September 2017.

4 SUCCESS CRITERIA

- Completion of dashboard and decision tool utilising the online results
- Validate and calibrate the actual end of life oil regeneration results against research.

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

The project uses the online DGA and PD monitoring equipment previously installed under

First Tier funding to continue to monitor the condition of six 132kV transformers.

The first phase of the project was the development of a dashboard/decision tool which has been successfully completed and a monthly report is produced on the condition of the six transformers. This report consists of a high level red, amber and green status management report. The data visualisation provides the ability to further analyse more in-depth data for each transformer for dissolved gas analysis, bushing monitoring and partial discharge which is trended over a suitable time period.

The monthly data visualisation and reporting has been extended to include all the DGA and PD monitoring equipment that Electricity North West has installed. Examples of the data visualisation and reporting tool are available in the full version of this report on the Electricity North West website.

Electricity North West plan to install the online monitoring equipment on the transformer which had its oil regenerated five years ago as part of initial IFI research. This transformer has the oldest oil condition following regeneration and would be valuable to the learning of the project.

Due to operational conditions Electricity North West has changed the transformers chosen for oil regeneration resulting in a delay in the implementation which has impacted the data validation phase. Two sites have had their oil regenerated and are currently in the data collection phase; the other three sites will undergo oil regeneration within the next six months.

The data collected will allow further academic research to develop an understanding of the effects of life extension on failure modes and maintenance requirements of assets. The actual data will calibrate the theoretical research data to prove that oil regeneration life extension is a safe, reliable and cost effective asset management technique.

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

Some delays have occurred in the planned oil regeneration dates which has impacted the data validation and project end dates. The new completion date will be updated on the Portal once finalised.

7 LESSONS LEARNED FOR FUTURE PROJECTS

The second stage of oil regeneration accelerates the migration of moisture from the papers into the oil and will 'clean' the papers resulting in longer-term benefits. This stage was conducted with the transformer on load but it was discovered that just being on load was not enough to maintain the required temperature of 65-85°C.

Electricity North West investigated methods to maintain the temperature and decided to apply thermal blankets to the transformer. The blankets cover the main tank and half of the radiators taking care not to enclose the tapchanger. The method of installation has been designed so that the blankets can be removed very quickly from ground level in the event of any issues.

8 THE OUTCOMES OF THE PROJECT

Not applicable.

9 PLANNED IMPLEMENTATION

Not applicable.

10 OTHER COMMENTS

Not applicable.

11 APPENDIX

This appendix detail is additional to the information provided on the Smarter Networks Portal.

Example screen shots and reports from the dashboard tool are shown below.

Figure 1: High level management report

TRANSFORMER FLEET CONDITION DETAILS

Transformer	DGA	OIL QUALITY	PD+BM	Models
Nelson T12	4			
Newton Heath T11	2	3		
Hindley Green T12	3			
Broadheath T11	2	3		
Hindley Green T11	3			
Bamber Bridge T11	3			
Bamber Bridge T12	3			
Droylsden GT2	2	2	2	
Nelson T11	2			
Bispham GT1	1	2	2	
Barton Dock Road T11	2	2		
Huncoat GT1	2			
Home Road T11	2			
Tardy Gate T11	2			
Barton Dock Road T12	2	2		
Wigan GT2	2	2		
Lower Darwin GT2	2			
Lower Darwin GT1	2			
Huncoat GT2	2			
Home Road T12	2			
Settle T11	1	2		
Sale Moor T11	1	2		
Peel GT1	1	1	1	
Chorley South T12	1	1		

Figure 2: Dissolved gas analysis



Figure 3: Bushing monitoring and partial discharge

