



The future

NIA Progress Report

**NIA_ENWL004
Combined Online Transformer Monitoring**

22 July 2016



VERSION HISTORY

Version	Date	Author	Status	Comments
v.1.0	20/07/2016	P Marshall	Final	Final version following internal review and comment

REVIEW

Name	Role	Date
A Howard	Programme Manager	21/07/2016
D Randles	Network Performance and Innovation Manager	21/07/2016
P Turner	Future Networks Delivery Manager	21/07/2016

APPROVAL

Name	Role	Date
Steve Cox	Head of Network Engineering	22/07/2016

CONTENTS

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

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 10 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 will be fed into data visualisation software that will be 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.

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 is to be completed by April 2016.

Phase 2: the data validation of existing research into life extension by oil regeneration. This phase is 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 is currently on plan against the original aims, objectives and criteria; however delays in implementing oil regeneration may impact on the data validation phase.

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 to be used by Electricity North West. This phase 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 reporting. All the transformers and monitoring techniques are based on international measurement standards. The data visualisation also 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 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

No modification to the planned approach is required at this time, some delay in the planned oil regeneration dates is anticipated which will impact on the data validation and project end dates.

7 LESSONS LEARNT FOR FUTURE PROJECTS

The life extension oil regeneration approach will be deployed as part of Electricity North West's RIIO investment plans.

Examples of the dashboard tool are available in the project report at www.enwl.co.uk/future-nia.

Further opportunities related to oil regeneration have been identified and project ENWL0014 Optimising Oil Regeneration has been registered to investigate the effects of oil regeneration throughout a transformer lifecycle to identify the optimum policy for oil regeneration.

8 THE OUTCOMES OF THE PROJECT

Not applicable.

9 PLANNED IMPLEMENTATION

Not applicable.

10 OTHER COMMENTS

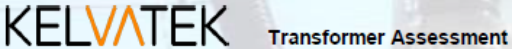
Not applicable.


11 APPENDIX

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

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

Figure 1: High level management report





Ranking Summary

ENW	Rank	DGA (on-line)	Moisture (on-line)	Bushing Monitoring & PD	Oil Quality (Aging)	What to Do
Lancaster GT1	3	Moisture Sensor Malfunction	Normal condition	Device is off-line	Signs of oil aging	Oil regeneration, bushing phase A investigation
Lancaster GT2	3	Stable trends	Normal condition	Capacitance variations, phase B and C	Signs of oil aging	Oil regeneration, bushing B and C investigation
Bispham GT1	3	High Acetylene but stable	Normal condition	Normal condition main tank and bushings	Signs of oil aging	Oil regeneration
Bredbury GT4	4	Stable trends	Normal condition	Uncertain changes in bushing capacitance, TanDelta, phase B	Signs of oil aging	Oil regeneration, deep investigation and off-line test phase B bushing
Peel GT1	3	Stable trends	High Moisture Contents in cellulose insulation	Normal condition main tank and bushings	Signs of oil aging	Oil sample for moisture, oil regeneration
Droylsden GT2	3	Stable trends	High Moisture Contents in cellulose insulation	Normal condition main tank and bushings	Signs of oil aging	Oil sample for moisture, oil regeneration

* - Devices are temporarily off-line due to the weather conditions in Manchester region (flood). Transformers ranked in accordance with the recommendations published for GIGRE TB 227.

Category Ranking: 1 Good condition 2 Normal for service
3 Defective 4 Faulty 5 Failure

Figure 2: Dissolved gas analysis

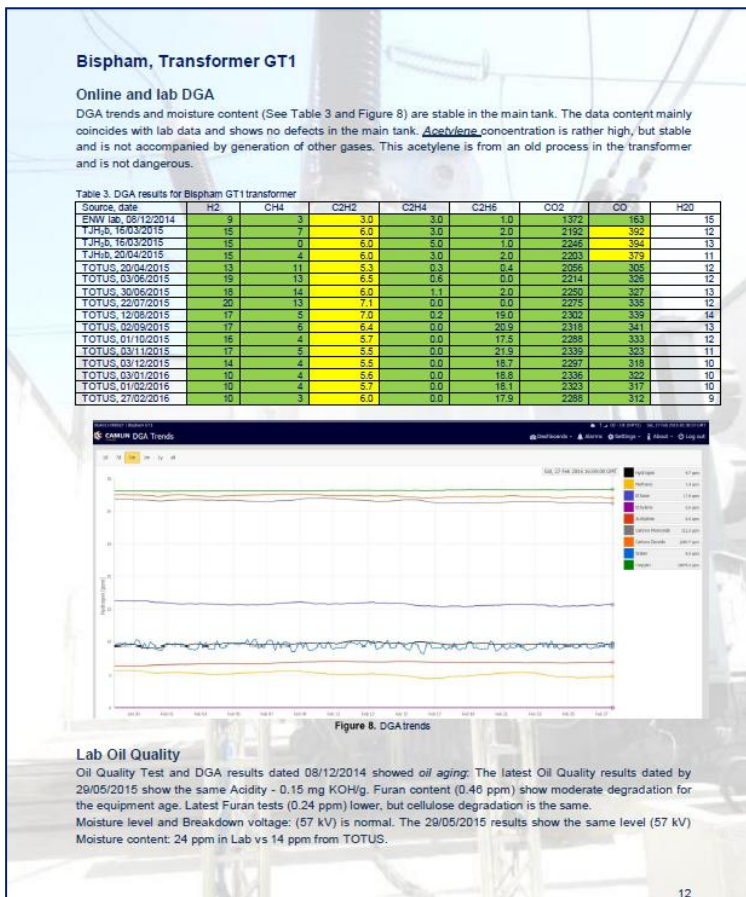


Figure 3: Bushing monitoring and partial discharge

