NIA Progress Report

NIA_ENWL002
Distribution Asset Thermal Modelling

22 July 2016

VERSION HISTORY

Version	Date	Author	Status	Comments
v.1.0	20/07/2016	G Bryson	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

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1   PROJECT BASICS

Project Title	Distribution Asset Thermal Modelling
Project Reference	NIA_ENWL002
Funding Licensee(s)	Electricity North West
Project Start Date	July 2015
Project Duration	18 months
Nominated Project Contact(s)	Geraldine Bryson (geraldine.bryson@enwl.co.uk)

2   SCOPE

The project will cover all common types of distribution (11kV or 6.6kV to 415V) transformers and low voltage (415V) cables installed by Electricity North West.

3   OBJECTIVES

- To develop a Thermal Failure Model for distribution transformers

- To develop an LV cable network design tool based on thermal models of typical installation scenarios.

4   SUCCESS CRITERIA

- A database which describes a distribution transformer's thermal performance and probability of failure under different loading scenarios which can be used to project future investment plans

- An Excel-based network design tool for LV cables which will use predefined inputs and FEA models to produce a maximum and minimum operating temperature envelope which can be used to demonstrate whether the cable can accept new LCTs.

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

The project is ahead of plan against the original aims, objectives and criteria. It is anticipated the project will complete in September 2016, four months ahead of the registered plan.

The University of Manchester has produced an Excel-based model to assess the probability of failure for a range of distribution transformers. The detailed calculation uses known/default heat run results, load profile, age and known/default moisture level to produce data for hotspot temperature, loss of life, expected life and probability of failure.

The model also simulates EV charging to assess its impact on the transformer's life and covers the following three scenarios:

- BAU EV penetration level of 0%

- High EV penetration level of 32%

- Extreme EV penetration level of 59%.

The model and associated user guide are in the final stages of production.

The University of Manchester has developed an LV network design tool for cables. The tool uses Finite Element Analysis to determine the thermal capacity of the cable. The planner can then assign domestic properties and PV installations to the cable to determine if reinforcement is required. If the thermal capacity is not breached, the tool will also provide information on the number of PV installations which can be applied before the capacity is breached. The tool and associated user guide are in the final stages of production.

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

There have been no modifications to the planned approach during the project.

7 LESSONS LEARNT FOR FUTURE PROJECTS

This project is research focussed and primarily concerned with the production of models which can be used as part of network planning. When available, these models and user guides will be published on the project website along with the full closedown report for use by other network operators.

Electricity North West plans to use the models as part of, and in addition to, the tools to be produced as part of the NIC project Celsius. By the end of Celsius a suite of tools will exist to provide better assessment of distribution transformers and LV cables for business planning purposes.

All of the developed tools will be used in Electricity North West for network and business planning.

8 THE OUTCOMES OF THE PROJECT

Not applicable.

9 PLANNED IMPLEMENTATION

Not applicable.

10 OTHER COMMENTS

Not applicable.