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Bringing energy to your door

NIA ENWL016
Future Network Modelling Functions

Closedown Report

31 July 2017

CONTENTS

VERSION HISTORY

Version	Date	Author	Status	Comments
V0.1	1 June 2017	L Eyquem/ D Randles	Final	

REVIEW

Name	Role	Date
G Bryson	Innovation Engineer	10 July 2017
P Turner	Innovation Delivery Manager	16 July 2017

APPROVAL

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

1 EXECUTIVE SUMMARY

This section does not appear on the Smarter Networks portal.

1.1 Aims

The aim of this project is to inform the understanding of the future requirements for system modelling and devise a strategic approach to meet the requirements using both existing and new technologies. A report will be produced and published highlighting the relevant findings and including a strategy to meet the requirements found.

1.2 Methodology

There are two phases in the methodology of this project.

Phase 1 of the project will document the existing challenges/issues/uses around network modelling and identify the new requirements driven by the challenges caused by the introduction of low carbon technologies and the prospect of the role as a distribution system operator. The output of this phase will be an agreed documented set of as-is and to-be requirements.

Phase 2 will continue the development with a strategic assessment based on the findings from Phase 1 whilst recognising the capabilities of recent investments e.g. the new NMS and the general direction of other technologies in the market.

1.3 Outcomes and key learning

The project successfully delivered the above described report, see full explanation in sections 8 & 9 below.

1.4 Conclusions

Network planning tools are a key tool used by DNOs and the future of these tools will evolve significantly as stated in the outcome reports which are appended to this report. DNOs face important decisions regarding existing and future systems, how, what and when such functionality ought to be implemented. The integration of data used within these systems is considered to be a key determinant particularly given the increased complexity of planning networks in the context of DSO.

1.5 Closedown reporting

This project was compliant with the governance for Network Innovation Allowance (NIA) projects, and so this report has been structured to meet these governance requirements. The structure and headings in this report reflect these requirements.

A version of this report – including only sections 2-6, 7.1, 8.1, 9.1 and 10-12 – is available via the Energy Networks Association's Smarter Networks learning portal at www.smarternetworks.org.

This version of the report provides additional information that is useful in understanding the project.

2 PROJECT FUNDAMENTALS

Project title	Future Network Modelling Functions
Project reference	NIA_ENWL016
Funding licensee(s)	Electricity North West Limited
Project start date	March 2016
Project duration	18 months
Nominated project contact(s)	Dan Randles – (dan.randles@enwl.co.uk)

3 PROJECT BACKGROUND

Low carbon technologies and smart grids are asking new, more complex questions of network design and planning. Worst case static load analysis is no longer sufficient with embedded generation, reverse power-flow, time series data, and network solution optimisation now all becoming increasingly relevant.

Electricity North West uses models of varying complexity, such as IPSa, DINIS and LV AFFIRM, for planning on our network. These static models operate independently focusing on one voltage level only and individually provide only a limited range of functionality. Learning obtained from innovation projects both in ENW and elsewhere has shown the benefits of modelling across the whole network and has also demonstrated requirements for more advanced techniques, particularly on the LV network, such as 4 wire assessments or harmonic analysis.

This project is a research piece to better understand the forward requirements for system modelling, the expected functionality of tools, and the associated data and system architectures.

Phase 1 of the project will document the existing challenges/issues/uses around network modelling and identify the new requirements driven by the challenges caused by the introduction of low carbon technologies and the prospect of the role as a distribution system operator. These existing challenges/issues/uses and new requirements will be drawn from the different stakeholders within ENW and will include engineering, IT and business requirements. High level Use Cases will be identified and used to inform the requirements.

The output of this phase will be an agreed documented set of as-is and to-be requirements. Phase 2 will continue the development with a strategic assessment based on the findings from Phase 1 whilst recognising the capabilities of recent investments e.g. the new NMS and the general direction of other technologies in the market.

4 PROJECT SCOPE

This is a research piece to inform the understanding of the future requirements for system modelling and devise a strategic approach to meet the requirements using both existing and new technologies.

5 OBJECTIVES

To produce a report based on:

- Identified requirements
- Strategic assumptions
- Scenario modelling
- Summary analysis
- Key risks and dependencies.

6 SUCCESS CRITERIA

This project will be considered a success upon production and publication of a report on the future requirements for system modelling, including a strategy to meet the requirements using both existing and possibly new technologies.

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

This project was to inform the understanding of the future requirements for system modelling and devise a strategic approach to meet the requirements using both existing and new technologies. A report was produced and published highlighting the relevant findings and including a strategy to meet the requirements found.

The report covered:

- Identified requirements
- Strategic assumptions
- Scenario modelling
- A summary analysis
- Key risks and dependencies

These objectives were further broadened during the course of the project to include:

- Understanding the present business use of existing planning tools, and their limitations
- Defining future planning functionality and data requirements
- Enabling new functionality through flexible ICT and data architecture decision guidance
- Advising how maximum benefit can be obtained from existing ICT investment, and on that needed to deliver the enhanced planning functionality
- Reporting on strategic options and recommendations to deliver the required planning capabilities.

All success criteria have been met with two reports being produced, please see relevant appendices A and B.

8 THE OUTCOME OF THE PROJECT

The project successfully delivered:

- A detailed explanation of the existing planning landscape, data utilisation, functional coverage within the existing ICT landscape, and known system changes;
- Future functionality anticipated to be needed by a DNO was catalogued by use-case, functional matrix, and data requirements;
- Planning tool strategic options have been defined by solution type and evaluated, including potential delivery route-maps.
- An underpinning ICT architecture vision to support the planning functionality has been outlined.
- Options have been provided for mechanisms by which existing network topology data from the operational master systems can be made available to planning tools other than those hosted in an NMS system.
- Advice on facilities that could be provided to further automate the management and provision of historical and forecast load data for planning models, thus reducing the amount of manual effort required to manage this data and populate it into study datasets.

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

9.1 Summary for Smarter Networks Portal

No substantive modifications were made to the planned approach other than the broadening of the report objective.

9.2 Cost variance table

This section does not appear on the Smarter Networks Portal.

Item	Category	Estimated Costs £k	Final Costs £k rounded	Variance
1	Project management and dissemination	10	6	-4
2	Consultancy	115	78	-37
	Total	**125**	**84**	**-41**

10 LESSONS LEARNED FOR FUTURE PROJECTS

Planning capabilities are making a step change from worst case deterministic evaluation to a probabilistic time-series risk base approach in many cases.

The capability to provide load data topologically linked to a temporally indexed running arrangement will become more important so that historical switch states and running arrangements and their effects can be taken into account.

The planning capability at low voltage will need significant enhancement with disruptive low-carbon technologies driving the need for un-balanced four wire power-flow analysis and MPAN-level load and generation time series data.

Operational planning capabilities in relatively short time horizons will need to be delivered to support effective DSO enablement.

11 PLANNED IMPLEMENTATION

The information provided in the outcome reports will be used to help inform future decisions for network planning and modelling during the course of ED1 and further in to ED2.

12 FACILITATE REPLICATION

There is much commonality across DNOs for network planning. There are similar needs and requirements and DNOs share the same challenges. An assessment can be made by each licensee to determine the pros and cons of using the following:

- Planning functionality matrix
- Future planning functionality use-cases
- Planning tool strategic options by type and delivery route maps
- Data requirements and ICT architecture options
- Network topology provision approaches
- Load data provision approaches.

13 APPENDIX

The outcome report, Appendix A, can be found on the Electricity North West website.