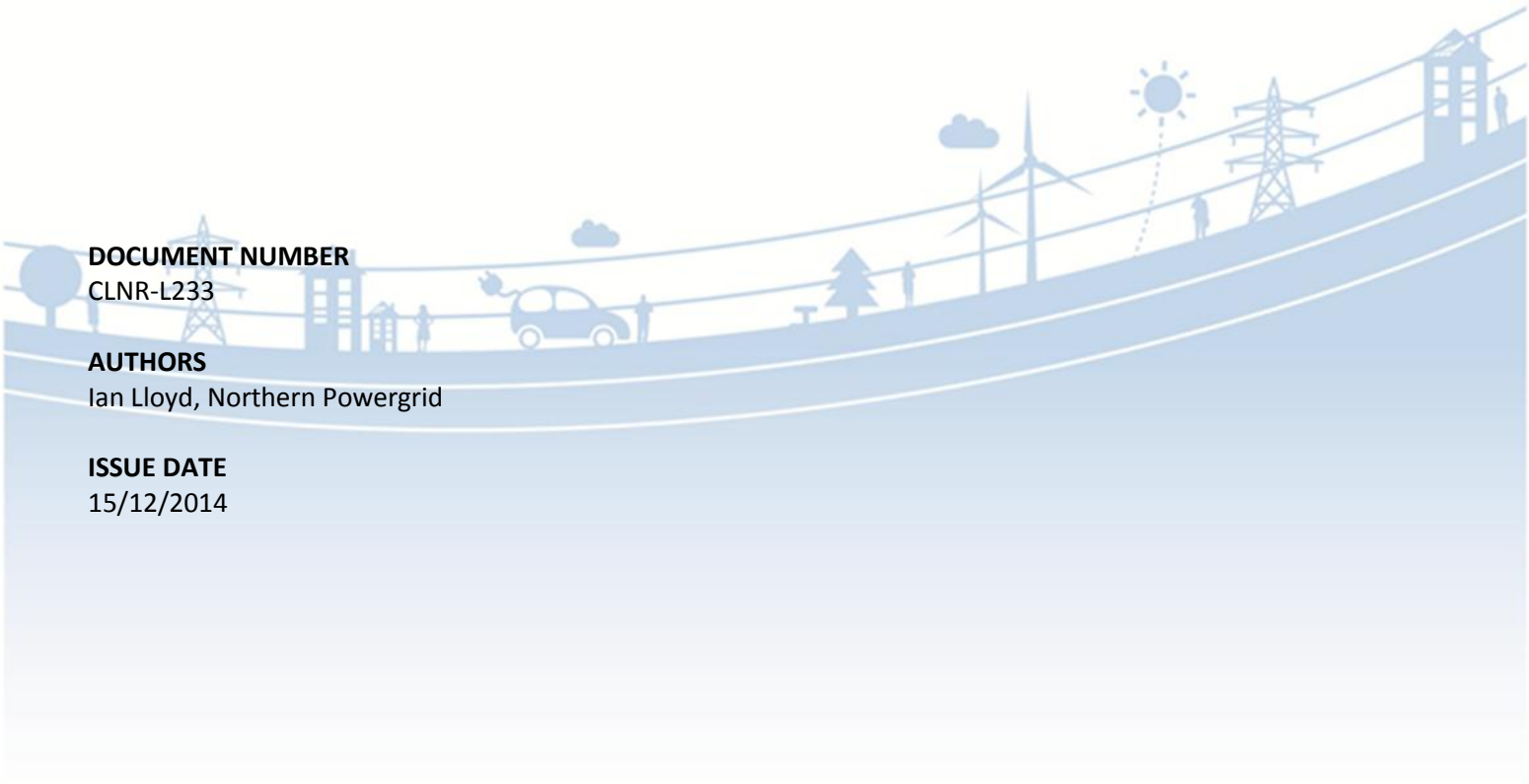
Customer-Led Network Revolution

A Guide to the CLNR Training Packages



DOCUMENT NUMBER
CLNR-L233

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ISSUE DATE
15/12/2014

LCN Fund Low Carbon Networks | NORTHERN POWERGRID | British Gas Looking after your world | Durham University | Newcastle University | ea technology

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1 Introduction

The Customer-Led Network Revolution (CLNR) project has successfully procured, commissioned and operated a number of selected network devices and incorporated them to operate with an advanced control system.

Throughout the CLNR project, an enormous amount of experience has been developed installing and operating the technologies. That valuable learning has been captured in a series of reports, and a suite of training documents have subsequently been produced to enable other DNO's and Independent system technology providers to ensure that the key issues around the practical application of the network devices are addressed, and an appropriate instructed level of competence and understanding of the current developments of smart grid components can be achieved.

The guidance document helps the reader to understand the structure of the training modules that are available from the CLNR project learning library.[1]

The network devices that are included in the training portfolio are:

- Electrical Energy Storage systems
- Enhanced Automatic Voltage Control at:
  - Primary substations
  - HV regulator substations
  - HV switched capacitor substations
  - Secondary substations
  - LV regulators
- Real time Thermal Rating Systems
  - Overhead line thermal rating
  - Underground cable thermal rating
  - Transformer thermal rating
- Active Network Management
- Demand Side Response

The training material is structured in a modular fashion that can be tailored by the presenter to suit their audience which enables appropriate training to be delivered in an effective manner. Each subject module has sub modules that are easily identified and apply across the full suite.

Each full module should demand a full working day to deliver and assess, multiple modules could be condensed as there is generic material that does not need to be repeated more than once.

[1] (http://www.networkrevolution.co.uk/project-library/)

Each module under each section has its own title and generally contains:

Module title	Description
Overview	A simplified overview of the module topic to enable a basic understanding of a subject
General	A detailed technical view of the module subject matter
Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
Ratings	Thermal rating specific, detailing the calculation of dynamic thermal rating over static ratings
SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment
Installations	Detail of the practical installation delivered in the CLNR project
Communications	Detail of the secure communication platforms required to enable each device and their link to a central control system
Network Planning	A view of how network planning and design can consider the learning of the project and potentially incorporate into Business as Usual
Case Study	A detailed view of the CLNR case study alongside other industry projects case learning
Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.

Table 1 - Module overview

2 Background

2.1 Customer-Led Network Revolution project

The Customer-Led Network Revolution (CLNR) Project is a four-year project, led by Northern Powergrid (NPg), trialling Smart Grid solutions within the NPg distribution network as well as creating smart-enabled homes to give customers more flexibility over the way they use and generate electricity. The results will help the industry to ensure the electricity networks can handle the mass introduction of solar PV panels, electric cars and other low-carbon technologies.

The objective of the CLNR project is to understand five Learning Outcomes, which were:

- Learning Outcome 1: What are the current, emerging and possible future customer (load and generation) characteristics?
- Learning Outcome 2: To what extent are customers flexible in their load and generation, and what is the cost of this flexibility?
- Learning Outcome 3: To what extent is the network flexible and what is the cost of this flexibility?
- Learning Outcome 4: What is the optimum solution to resolve network constraints driven by the transition to a low carbon economy?
- Learning Outcome 5: What are the most cost effective means to deliver optimal solutions between customer, supplier and distributor?

The CLNR project aims to understand the value of the different solutions in terms of being able to balance supply and demand while deferring investment in conventional reinforcement of the distribution network, and so facilitating the transition to a low-carbon economy while avoiding additional reinforcement costs.

The project has studied how this can be achieved by incorporating three network based technologies: Enhanced Automatic Voltage Control (EAVC), Real Time Thermal Ratings (RTTR) and Electrical Energy Storage (EES); in addition to customer flexibility solutions.

As part of our project bid, we set out our intention to capture the learning during the practical application and integration of the selected network technologies in learning outcome 3, and develop training material to ensure its effective dissemination to others.

2.2 Identification of training content requirement

During a series of training development sessions held with key technical stakeholders from within Northern Powergrid and EA Technology, our consultant engineer. Mind maps were created to capture the format, content and grouping required to generate the training packages identify their modular structure that eases module selection for each course attendee.

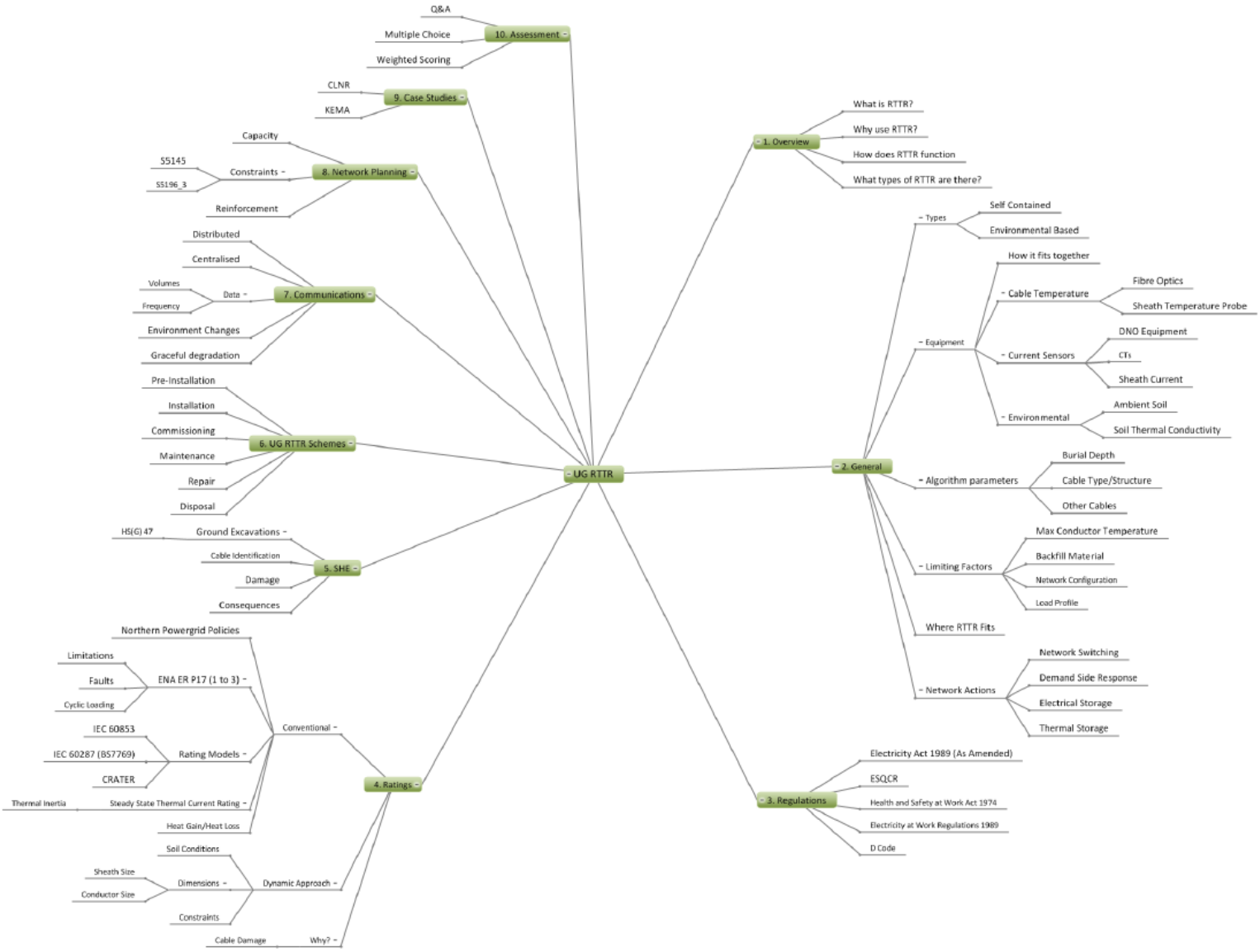

Figure 1. Underground cable training planning mind map

3 Training module development and creation

3.1 Overview

Each of the training modules development followed the same method of identification, which subsequently led to the structure of the training portfolio being produced as displayed in table 2 below for each network technology.

The content of each section was constructed from learning captured from the practical implementation and integration of the individual pieces of equipment and the control system. Each site and device generally had its very own unique feature, which fed the training material content throughout the course of the project.

3.2 Module structure and content

The training material is structured so that it can be tailored by the presenter to suit their audience, which enables appropriate training to be delivered in an effective manner. This tailoring will allow the training provider to deliver different packages ranging from basic appreciation to a much more comprehensive course of technical detail.

Training Package: RTTR OHL		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. General	A detailed technical view of the module subject matter
	3. Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
	4. Ratings	Thermal rating specific, detailing the calculation of dynamic thermal rating over static ratings
	5. SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment
	6. Installations	Detail of the practical installation delivered in the CLNR project
	7. Communications	Detail of the secure communication platforms required to enable each device and their link to a central control system
	8. Network Planning	A view of how network planning and design can consider the learning of the project and potentially incorporate into Business as Usual
	9. Case Study	A detailed view of the CLNR case study alongside other industry projects case learning
	10. Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.
Training Package: RTTR UGC		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. General	A detailed technical view of the module subject matter
	3. Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
	4. Ratings	Thermal rating specific, detailing the calculation of dynamic thermal rating over static ratings
	5. SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment

	6. Installations	Detail of the practical installation delivered in the CLNR project
	7. Communications	Detail of the secure communication platforms required to enable each device and their link to a central control system
	8. Network Planning	A view of how network planning and design can consider the learning of the project and potentially incorporate into Business as Usual
	9. Case Study	A detailed view of the CLNR case study alongside other industry projects case learning
	10. Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.
Training Package: RTTR TX		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. General	A detailed technical view of the module subject matter
	3. Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
	4. Ratings	Thermal rating specific, detailing the calculation of dynamic thermal rating over static ratings
	5. SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment
	6. Installations	Detail of the practical installation delivered in the CLNR project
	7. Communications	Detail of the secure communication platforms required to enable each device and their link to a central control system
	8. Network Planning	A view of how network planning and design can consider the learning of the project and potentially incorporate into Business as Usual
	9. Case Study	A detailed view of the CLNR case study alongside other industry projects case learning
	10. Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.
Training Package: EAVC		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. General	A detailed technical view of the module subject matter
	3. Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
	4. SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment
	5. Installations	Detail of the practical installation delivered in the CLNR project
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	9. Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.
Training Package: EES		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. General	A detailed technical view of the module subject matter
	3. EES in CLNR	Energy storage only, detailed content of the construction and

	4. Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
	5. SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment
	6. Installations	Detail of the practical installation delivered in the CLNR project
	7. Communications	Detail of the secure communication platforms required to enable each device and their link to a central control system
	8. Network Planning	A view of how network planning and design can consider the learning of the project and potentially incorporate into Business as Usual
	9. Case Study	A detailed view of the CLNR case study alongside other industry projects case learning
	10. Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.
Training Package: DSR		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. General	A detailed technical view of the module subject matter
	3. Standards and Regulation	Advises existing links to existing Standards, codes of practice and Regulations pertaining to the subject module
	4. SHE	Detail of the required measures developed to cater for process recommendations for Safety, Health and the Environment
	5. Installations	Detail of the practical installation delivered in the CLNR project
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	8. Case Study	A detailed view of the CLNR case study alongside other industry projects case learning
	9. Assessment	A module assessment that allows the training provider to assess the recipient for competency and understanding of content.
Training Package: ANM		
	1. Overview	A simplified overview of the module topic to enable a basic understanding of a subject
	2. Communications	Detail of the secure communication platforms required to enable each device and their link to a central control system
	3. Network Planning	A view of how network planning and design can consider the learning of the project and potentially incorporate into Business as Usual

Table 2 - Module content

For enquires about the project
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