

## NIA Project Registration and PEA Document

### Date of Submission

Sep 2018

### Project Reference Number

NIA\_NPG\_030

## Project Registration

### Project Title

Switchgear Enhanced Rating

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NIA\_NPG\_030

### Project Licensee(s)

Northern Powergrid

### Project Start

September 2018

### Project Duration

2 years and 1 month

### Nominated Project Contact(s)

Dave Blackledge

### Project Budget

£30,000.00

### Summary

Switchgear Enhanced Rating

### Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

### Problem Being Solved

Electrical switchgear is assigned a normal rated current by the manufacturer. This equates to the maximum load current that the manufacturer states the switchgear can carry continuously. Switchgear does not normally have a certified overload rating. However, indoor 11 and 33 kV primary and distribution switchgear can in theory be temporarily operated higher than its normal load current rating, providing it does not compromise the thermal time constant, which is captured in the temperature rise test for that particular switchgear. There is currently no guidance on how this should be assessed and what should be taken into account. Being able to occasionally exceed the normal rated current of the switchgear for short-periods would benefit network operators.

### Method(s)

It is believed there is no currently published National/International Standards for this problem or simple tool for justifying the operation of switchgear at higher than normal rated current for short periods. The development of a methodology and calculator tool to assess what overload capacity, if any, a particular type of switchgear has, based on its temperature rise type test results, would be a novel solution. It is envisaged that switchgear, particularly older switchgear, installed on distribution networks could have a higher thermal capacity than the assigned rating which, if known, could be exploited for short-term overloading. The solution will ensure DNOs use a consistent and proven approach when applying temporary overloading to HV switchgear that is operating close to the rated values.

### Scope

The scope of the proposal is to produce a short-term overload rating methodology for common 11 kV and 33 kV switchgear used by the UK DNOs. It is anticipated that up to 5 types of commonly used primary HV switchgear and distribution switchgear would be reviewed in the project. A basic spreadsheet model will be developed that uses the thermal time constant from actual temperature rise type test results to calculate the thermal margin and to provide limits on what is, or what is not achievable for certain switchgear types.

involving the maximum rated load current that could flow safely. A guidance document that captures the methodology and how to use the spreadsheet model will be provided.

Objective(s)

The project consists of four separate stages, each with a set of objectives.

Stage 1 Objectives – Data gather common types of HV switchgear  
Carry out desktop research to identify common HV switchgear that are suitable applying short term dynamic ratings (previous EATL STP projects have population counts that may be suitable). It is proposed to base the project on 5 primary types of switchgear and 5 secondary type switchgear. This will need prior agreement with ENA Member Companies. Review CIGRE and other appropriate reference material that may be referenced in the report in Stage 4.

Stage 2 Objectives – Gather temperature rise type test results  
Gather temperature rise type test results, and data to allow thermal time constant to be calculated for the identified switchgear from the Original Equipment Manufacturer (OEM) or DNOs. Prepare the information ready to input into the model in Stage 3.

Stage 3 Objectives – Basic model build  
Build basic model in Microsoft Excel with easy to use front end and functionality to prevent incorrect entry and warnings. It is anticipated that the model will have a drop down selection for known types and will also allow the input of new equipment types. The model will show for how long and what load current may be applied.

Stage 4 Objectives – Report results and rules and guidance for operating model  
Produce a Report, which will include guidance for using the model and will document the results for the types of switchgear selected and modelled in Stage 3. Reference will be made to appropriate CIGRE and other technical reports made available.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The following are aspects of the projects outputs or delivery will be used to assess or measure whether the project has been a success, and whether the performance of the innovation is a desired.  
\*Network operators start to use the model to defer asset replacement. Using the tool in the control room will be a good indicator if the output is being utilised.  
\*Use of thermal constraints tool to justify reinforcement of network, as part of business case.

Project Partners and External Funding

N/A

Potential for New Learning

this small-scale project provides new laerning with respect to switchgear as follows:  
  
Determine the short-term overload capacity, if any, of HV switchgear.  
Determine the thermal capacity that HV switchgear could have for overloads.  
Understand the cost benefits of deploying this overload rating methodology.

Scale of Project

Proeject is a small-scale sesktop activity. The output will initially ber applied to 5 types of 11kV switchgear.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

N/A

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure



## Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

### Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

#### How the Project has the potential to facilitate the energy system transition:

n/a

#### How the Project has potential to benefit consumer in vulnerable situations:

n/a

### Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

#### Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

n/a

#### Please provide a calculation of the expected benefits the Solution

n/a

#### Please provide an estimate of how replicable the Method is across GB

It is anticipated that the method will be applicable to all GB networks for the re-rating of HV sites.

#### Please provide an outline of the costs of rolling out the Method across GB.

Roll-out costs are minimal. The methodology requires the application of a simple spreadsheet based tool which will be made available to other DNOs.

### Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

- ☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).
- ☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)
- ☒ A specific novel operational practice directly related to the operation of the Network Licensees system
- ☐ A specific novel commercial arrangement

RIIO-2 Projects

- ☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

- ☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven
- ☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)
- ☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology
- ☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution
- ☐ A specific novel commercial arrangement

## Specific Requirements 4 / 2a

### Please explain how the learning that will be generated could be used by the relevant Network Licensees

If successful, this project will be able to be used by all network operators with similar equipment. It is likely that the process developed during the project could then be applied to other genres of switchgear with similar results.

### Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

- ☒ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

### Is the default IPR position being applied?

- ☒ Yes

## Project Eligibility Assessment Part 2

### Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

### Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

This type of assessment is not available for the equipment used on the NPg or more generally, GB network.

### If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

## Additional Governance And Document Upload

### Please identify why the project is innovative and has not been tried before

The reasons for the lack of previous application of this type of methodology is unclear. The current need to extract the maximum performance from the network by re-examining how equipment is used is the driver for this activity. The

### Relevant Foreground IPR

n/a

### Data Access Details

n/a

### Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The project has low TRL and therefore a high likelihood of failure and absence of economic return.

### Please identify why the project can only be undertaken with the support of the NIA, including reference to

**the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project**

The key risk is that a methodology to re-rate the switchgear under consideration indicates that it is not economically sensible to undertake such a re-rating. This is the key commercial risk and would mean that the output would not be adopted as BAU. Further the methodology may indicate the the switchgear is being used at a rating at which it is not technically possible to re-rate without exposing the network to an unacceptable level of risk of asset failure. This is the key technical risk of this project.

**This project has been approved by a senior member of staff**

☒ Yes