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## NIA Project Registration and PEA Document

### Date of Submission

Apr 2014

### Project Reference Number

NIA\_SPT\_1307

## Project Registration

### Project Title

Investigation into the development of an MVDC Demonstration Project

### Project Reference Number

NIA\_SPT\_1307

### Project Licensee(s)

SP Energy Networks Transmission

### Project Start

July 2013

### Project Duration

0 years and 10 months

### Nominated Project Contact(s)

James Yu (Future Networks Manager)

### Project Budget

£125,000.00

## Summary

The scope of the project is to understand what MVDC research and development initiatives are being conducted worldwide and to understand from an industrial perspective, the future direction of MVDC in the electricity transmission and distribution systems, and the potential impact of this technology on dependent equipment suppliers.

### Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

## Problem Being Solved

Today's power systems use alternating current (AC) for transmission of electrical energy but historically the first grids were based on direct current (DC). As a result of considerable technical progress in the field of high-power semiconductor devices and cable technology, high-voltage point-to-point direct current (HVDC) transmission has been incorporated into grid networks.

Due to the cost of HVDC power electronics, the physical demonstration, testing and development using high voltage levels can be prohibitive. Lower voltage level research and testing could, in certain instances, help understand the technology at higher voltages, by extrapolating the results based on the modular concept of the HVDC equipment.

This type of research and testing facility provides additional societal benefits such as the facilitation of more competition in the DC suppliers sector, de-risk the manufacturing constraints and help SME companies to develop technologies in this space. Such a facility could also support the development of supply chain companies.

## Method(s)

The approach being considered is the leveraging of the investment of the Power Networks Demonstration Centre (PNDC) at Cumbernauld by extending it to enable research, development and demonstration of MVDC technologies. The PNDC was established to de-risk technology innovation deployment prior to deployment on electricity networks. The objective of the PNDC is to help

accelerate technologies from their development stage through to commercialisation, an objective that would be shared by an MVDC extension to the Centre.

An alternative to this extension would be a standalone MVDC research centre which this project would also consider.

This work would be used to inform a Network Innovation Competition (NIC) funding application to Ofgem in March 2015 to support the development of MVDC research facilities.

## Scope

The scope of the project is to understand what MVDC research and development initiatives are being conducted worldwide and to understand from an industrial perspective, the future direction of MVDC in the electricity transmission and distribution systems, and the potential impact of this technology on dependent equipment suppliers.

## Objective(s)

Develop specifications/capabilities for a state of the art MVDC research centre capable of fulfilling the needs of both the renewable and the networks industry.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

The project will be considered a success if the project aims are realised. These are to gain an understanding of worldwide MVDC facilities and using this learning develop the requirements, capabilities and costs for a UK MVDC facility to allow for both research and training requirements to take place.

## Project Partners and External Funding

n/a

## Potential for New Learning

n/a

## Scale of Project

The scale of the project will be influenced by the scale of MVDC facilities worldwide and the physical space available at the PNDC.

## Technology Readiness at Start

TRL3 Proof of Concept

## Technology Readiness at End

TRL5 Pilot Scale

## Geographical Area

Initial consideration is to extend the PNDC at Cumbernauld in Scotland.

## Revenue Allowed for the RIIO Settlement

None

## Indicative Total NIA Project Expenditure

£25,000

## 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)

It is not possible at this stage to provide an estimate of savings. This research project will seek to gain a realistic understanding of the MVDC research capabilities and requirements from both an industrial and academic perspective in order to develop a worldwide leading centre.

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

N/A at this stage.

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

N/A at this stage.

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

One of the objectives of this work is to better understand the costs involved.

### 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

Through understanding of MVDC initiatives around the world and understanding of capabilities and associated costs for the development of an MVDC research centre as well as how best to develop such a Research, Development and Demonstration Centre.

### 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.

n/a

### 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

n/a

### 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

n/a

**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**

n/a

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

Yes