Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Aug 2018

Project Reference Number

NIA_NGTO018

Project Registration

Project Title

Harmonic compliance management

Project Reference Number

NIA_NGTO018

Project Licensee(s)

National Grid Electricity Transmission

Project Start

September 2018

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Xiaolin DIng

Project Budget

£131,400.00

Summary

Harmonic compliance management is based on the “polluter” being responsible for “cleaning” or minimizing voltage distortion. This can lead to the consumer paying for large filters for each polluter on the network, while these are only required in very unlikely scenarios. The current approach also makes it difficult to maintain compliance in a rapidly changing energy environment, where it may be difficult to attribute responsibility to an individual.
The proposed method to solve this problem is to review and challenge the harmonic compliance management policy that has been adopted by the energy industry in the UK. This project will undertake a desktop based study to review the existing practices and propose new approaches to harmonic management. The value from the different approaches will be assessed based on the foreseen benefits to consumers and the wider industry.

Nominated Contact Email Address(es)

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Problem Being Solved

Harmonic compliance management is based on the “polluter” being responsible for “cleaning” or minimizing voltage distortion. This can lead to the consumer paying for large filters for each polluter on the network, while these are only required in very unlikely scenarios. The current approach also makes it difficult to maintain compliance in a rapidly changing energy environment, where it may be difficult to attribute responsibility to an individual.

Method(s)

The proposed method to solve this problem is to review and challenge the harmonic compliance management policy that has been adopted by the energy industry in the UK. This project will undertake a desktop based study to review the existing practices and propose new approaches to harmonic management. The value from the different approaches will be assessed based on the foreseen benefits to consumers and the wider industry.

Scope

The project has the following scope:

1. Harmonic Compliance Management Option Analysis and Consumer Benefits

1.1 Review the existing approach to managing harmonic compliance including a review of how risks and liabilities are allocated.

1.2 Review best practice from around the world in harmonic compliance management.

1.3 Explore and propose alternative options for managing harmonic compliance; including the identification of pros and cons for each option.

1.4 Assess benefits to consumers and connectees.

1.5 Propose risk and (liability) sharing mechanisms associated with the recommended option if different from the existing approach.

1.6 Provide typical harmonic filter unit costs for 400 kV, 275 kV and 132 kV voltage levels.

2. Evaluation of Funding Options

2.1 Propose funding options including the identification of risks to key stakeholders, commercial and regulatory issues.

3. Incentive Strategies

3.1 Develop and propose an incentive strategy for connectees to minimize their harmonic impact on transmission and distribution networks, whilst also benefiting consumers and enabling low carbon technologies.

4. Review Required Modifications to Existing Standards E.g. Grid Code

4.1 For the proposed harmonic management options, the associated standards and codes will be reviewed and areas which would require modification highlighted

Objective(s)

The objectives for this project are:

1. To evaluate other options for managing harmonic compliance and compare these to the existing arrangement(s) and to establish an understanding of the consumer benefits.

2. To propose a transparent, simple and consistent technical, commercial and regulatory framework for managing harmonic compliance that considers the changing energy environment and that facilitates low carbon connections.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be considered successful

- If the approaches for the coordinated management of harmonics are developed and the benefits they can provide to end consumers are estimated.

- If the project provides a clear understanding of changes required in the regulatory framework to deliver these benefits to consumers.

Project Partners and External Funding

N/A

Potential for New Learning

The learning will benefit other network licensees as well as National Grid Electricity Transmission (NGET). The benefits will come from a more coordinated approach to harmonic compliance management, reducing costs for consumers, and facilitate the faster connection of new customers.

Scale of Project

It is considered that a desk top study is adequate to meet the objectives of the project. The scope of work described above covers the main commercial, technical and regulatory issues to be considered when proposing a new harmonic management framework.

Technology Readiness at Start

Technology Readiness at End

TRL4 Bench Scale Research

TRL5 Pilot Scale

Geographical Area

This work is desk top based.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£131400.00

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)

Based on a review of the filters built over the last 10 years in certain parts of the network, if a coordinated approach had been adopted, there would have been an opportunity to install up to 50% fewer filters in England & Wales. However, the present methodology prohibits this collaborative management method from being exploited. As the consumer ultimately pays for each of these additional filters, changing the way we manage harmonics could allow this saving to be unlocked.

Please provide a calculation of the expected benefits the Solution

Harmonic filters typically cost in the range of £5m-£10m depending on type, size, voltage level and site specific factors. Being able to prevent the need for one or two filters (saving £10m to £20m), would provide significant savings to the consumer, and may allow customer connections to be facilitated sooner. While there is significant potential to save consumers money, it is difficult to predict how often the filters would not be needed under the new management framework.

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

This methodology will be applicable to all sites where there is need to install harmonic filters.

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

To adopt any new compliance management methodology, this needs to be embedded into the transmission and distribution licensees. The cost of this is difficult to quantify, without undertaking a review of the impact that this would have on the existing framework. Assuming the TOs/DNOs take on more of the construction elements in harmonic management, each licensee would need to invest in developing understanding about harmonic management and relevant software. It will also require updating codes, technical standards and policies.

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

The commercial, regulatory and process arrangements could be adopted by other licensees. Once approved by stakeholders and Ofgem, the proposed framework could be implemented into the Grid Code and therefore usable by all transmission licensees. Distribution licensees can also adopt similar approaches and learn directly from the outcomes of this project.

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

This project fits within the Service Delivery value area of the Electricity Innovation Strategy:
☑ 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.

To date no similar project has been undertaken in Great Britain. Scottish Power Transmission (SPT) has undertaken an NIA project in this area, which investigated the technical and financial benefits from a coordinated harmonic management approach in their network, but did not holistically review the commercial, regulatory and technical framework for harmonic compliance management; which is main the challenge on the road to exploiting the benefits from this area. This is what this project will be addressing.
Link to SPT project: http://www.smarternetworks.org/project/nia_spt_1610

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

This approach is novel as it will review and challenge the harmonic compliance management policy that has been adopted by the energy industry in the UK. . This has not been tried before as Harmonics have only become a larger issue to the network in the recent years due to the adoption of power electronics based connections and renewable energy generation sources such as wind-farm.

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 business will not fund this project as there are significant technical and commercial risks in the implementation of any novel framework. As any novel harmonic management framework has yet to be clearly outlined, it is difficult to know with a great deal of certainty that this investigation will yield benefits to the business and consumers

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

This project attempts to solve a wider problem not specific to an individual licensee, it involves engagement and agreement of industry stakeholders. Specific risks are: 1. Commercial Arrangements: The new framework may put too much risk on the consumer, which results in the benefit from the framework being reduced or removed. This could happen if the licensee is unable to act in a suitable time period to mitigate the constraints imposed by poor harmonic management. 2. Technical Risks: It may be that the benefits from an alternative framework only appear in a limited number of scenarios or the benefits are not as large as presently estimated. This makes the adoption of a new framework unnecessary and therefore this opportunity should not be exploited

This project has been approved by a senior member of staff

☑ Yes