national gas transmission

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

Jan 2014

Project Reference Number

NIA_NGGT0006

Project Registration

Project Title

Turbine and Ultrasonic Meter Uncertainty and Error Analysis Tool

Project Reference Number

NIA_NGGT0006

Project Licensee(s)

National Gas Transmission PLC

Project Start

July 2011

Project Duration

2 years and 7 months

Nominated Project Contact(s)

John Wilson (box.GT.innovation@nationalgrid.com)

Project Budget

£105,000.00

Summary

This project seeks to reduce the frequency of the above recalibration cost for installed ultrasonic meters and turbine meters, by increased confidence in the meter accuracy. Work is proposed that will develop an innovative approach to the calculation of uncertainty. The tool will include the automatic selection of the uncertainty values for instruments typically used by National Grid. Consideration shall be given to current transmitters as well as to the transmitters with HART technology. The tool will use a finite difference method to determine the uncertainty & error contributions of the measurements to the overall uncertainty and error in volume flow and the use of the full ISO 10723 approach for composition uncertainty. The tool will also separate the uncertainties associated with barriers and flow computer inputs.

Third Party Collaborators

DNV

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

The cost of springing, recalibrating off-site and re-instating a typical ultrasonic meter is £25-30k (including cranes, transport and calibration charge). This cost is getting close to the cost of a new ultrasonic meter, so the ‘fit and forget’ concept and associated cost benefit advantage of selecting an ultrasonic meter could easily disappear unless something is done to improve confidence in longer calibration intervals (e.g. 2 -4 years, instead of 12 months).

This project seeks to reduce the frequency of the above recalibration cost for installed ultrasonic meters and turbine meters, by increased confidence in the meter accuracy.

Initially a prototype model was developed for calculating the maximum permissible bias (MPB), maximum permissible error (MPE) and uncertainty in volume and energy of flange-tapped orifice plate meters. Work proposed under this project looks to develop the tool further for turbine and ultrasonic meter
technologies.

Method(s)

The method to develop the uncertainty & error calculation tool for turbine and ultrasonic meters is as follows:

- Develop uncertainty and error calculation tool for turbine and ultrasonic meters
- Draft functional design specification for turbine and ultrasonic meters
- Final functional design specification for turbine and ultrasonic meters
- Review by technical expert of turbine and ultrasonic meter tool
- User acceptance tests and training

By extending the improvement in the calculation of uncertainty, error and bias of volume and energy to cover turbine and ultrasonic meters (as well as orifice plate meters), the tool will allow National Grid to:

1. Identify, where necessary, where site improvements can be most effective
2. Demonstrate to Ofgem, third parties and external auditors that the metering is fit for purpose
3. Ensure compliance with contractual obligations
4. Separate uncertainties and errors as required by OIML (Organisation Internationale de Métrologie Légale)
5. Enable the updating of National Grid policy and procedure documents
6. Re-assess the tolerances of primary and secondary instrumentation during validation

Scope

This project seeks to reduce the frequency of the above recalibration cost for installed ultrasonic meters and turbine meters, by increased confidence in the meter accuracy. Work is proposed that will develop an innovative approach to the calculation of uncertainty. The tool will include the automatic selection of the uncertainty values for instruments typically used by National Grid. Consideration shall be given to current transmitters as well as to the transmitters with HART technology. The tool will use a finite difference method to determine the uncertainty & error contributions of the measurements to the overall uncertainty and error in volume flow and the use of the full ISO 10723 approach for composition uncertainty. The tool will also separate the uncertainties associated with barriers and flow computer inputs.

Objective(s)

This project aims deliver an uncertainty tool for turbine and ultrasonic meters.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

If successful, the technique will allow error and bias to be monitored against MPE (maximum permissible error) and MPB (maximum permissible bias), to avoid costly annual re-calibrations where these are demonstrated to be unnecessary.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project will deliver a tool suitable for use on all turbine and ultrasonic metering systems.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

Across the National Transmission System measurement assets and those of direct connections.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

IFI Gas Transmission and Gas Distribution – £67k
NIA Gas Transmission only - £27k

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)

Estimated £30k in avoided recalibration cost per meter - the cost of springing, recalibrating off-site and reinstating a typical ultrasonic meter is (including cranes, transport and calibration charge). This cost is getting close to the cost of a new ultrasonic meter, so it is necessary to improve confidence in longer calibration intervals.

Please provide a calculation of the expected benefits the Solution

Base cost £30k per year per meter. Extend calibration interval to every 4 yrs for 5 meters.
Method cost £7.5k per year per meter. Expected benefit - £112.5k.

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

The tool could be used at all metering installations with turbine and ultrasonic meters

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

The tool uses the GL Noble Denton software gas VLE, with associated license cost.

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 tool could be used by the relevant owners of turbine and ultrasonic metering systems to inform decisions on maintenance and re-calibration.

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 with Optimising Asset Management under the Reliability theme.

☑ 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