

## NIA Project Registration and PEA Document

### Date of Submission

Feb 2019

### Project Reference Number

NIA\_NGGT0142

## Project Registration

### Project Title

Valve Care Toolbox 2

### Project Reference Number

NIA\_NGGT0142

### Project Licensee(s)

National Gas Transmission PLC

### Project Start

February 2019

### Project Duration

1 year and 4 months

### Nominated Project Contact(s)

Mick Jarvis and Josh Eades (PMC)

### Project Budget

£432,500.00

## Summary

To develop the Valve Care concepts following the completion of Stage 1 of the VCT programme

### Nominated Contact Email Address(es)

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## Problem Being Solved

National Grid is seeking to respond to a set of valve related problems, initially thought to be caused by the widespread ingress of water into valve stem extension assemblies. This water ingress can lead to:

- Internal corrosion of the torque tube and of the valve stem.
- Corrosion debris fouling the lower quadrant mechanism.
- Internal seal/flange damage.

These effects can lead to failure of the valve to operate on demand having serious implications on the safe management of the National Transmission System (NTS).

The initial Valve Care Toolbox programme aimed to develop innovative solutions to address these challenges work over the valve without excavating and without stripping down the actuator, torque tube and stem extension to expose and clean the end stops at the base of the stem extension.

This work highlighted a series of prototype processes and techniques to:

- Inform the assets owners through a specific valve maintenance database which will dovetail with National Grid's operational data collection activities,
- Assess the condition of existing valves stem extensions and valve stops,

- Clean out the annulus, removing liquid, corrosion products and debris from within the torque tube, and
- Protect the valve stem assemblies from future degradation to provide assurance going forward.

A follow on Valve Care Toolbox programme is proposed to complete the testing and prototyping to provide NGGT with a comprehensive set of techniques and processes to remediate valve stem issues effectively.

#### Change Control - February 2020

The project was originally due to end at the end of February 2020. This change in Time is primarily due to operational restrictions to obtain entry to sites, the availability of operational staff to allow entry to sites, the preparation of Risk Assessments and Method Statements (RAMS), not originally incorporated into the original proposal/sanction, the availability of operational staff to review RAMS and the availability of Safe Control of Operations (SCO) competent people being supplied by the Pipeline Maintenance Centre (PMC).

These issues have been captured and added to a project Lessons Learnt log for future projects.

This change control will:

Extend project date until 30th May 2020. Considering the completion of the final phase of site trials. Allow the 'Protect' phase to be completed at PMC and allow the final report to be completed and reviewed.

### Method(s)

Following the completion of the Valve Care Toolbox programme (hereafter referred to as Stage 1), National Grid have reviewed the candidate valve care options developed. Those solutions that require further development or analysis will be formulated into other work packages for consideration to provide the best set of options to meet future business needs.

The aim of Stage 2 is to take specific items from the Stage 1 work to produce a 'Working Toolbox' which will be used in field trials by Steer to carry out tests on each prototyped toolbox item. The Working Toolbox will adapt as different items are under test.

Field trials and site visits will continue to be used as extensively as possible to provide the basis upon which to refine the specifications for the Valve Care Toolbox items. Engineering partners will be used to turn the specification into prototype items.

By the end of the Valve Care Toolbox 2 programme up to five system toolboxes will be delivered to the to National Grid Operations engineers for use in the field. In field training and field support for valve investigations, and training for use of the first iteration of the toolboxes will be rolled out to all the Operations teams to streamline deployment of the techniques. Each of the toolbox items will be supplied with full instructions and associated hazard identifications and method statements.

### Scope

National Grid is seeking to respond to a set of valve related problems, initially thought to be caused by the widespread ingress of water into valve stem extension assemblies. This water ingress can lead to:

- Internal corrosion of the torque tube and of the valve stem.
- Corrosion debris fouling the lower quadrant mechanism.
- Internal seal/flange damage.

These effects can lead to failure of the valve to operate on demand having serious implications on the safe management of the National Transmission System (NTS).

This water ingress is likely to come from one or more of:

- Weather seal failure on the actuator or stem.
- Rain water entry through the breather / vent cap or vent hole (where the vent plug has been removed or damaged).
- Condensation inside the valve stem accumulating in the bottom until it fills up.
- Through a combination of a high water table and a leaking bottom flange.

The annulus between the stem and the torque tubing, with a ready supply of water, oxygen and untreated metal, is therefore an ideal environment for corrosion to occur.

Periodic inspection is carried out on the valves every 12 months (critical infrastructure) or 24 months (noncritical). This work usually starts with closure of the valves and a vent down of the system; if the valves are passing and the pressure cannot be bled off this indicates that a valve is passing. This may be due to incomplete valve closure.

The full spectrum of valve failure scenarios that could be caused by corrosion in torque tubes is very broad. It is extremely unlikely that a single solution will be appropriate for all cases, and inconceivable that any such solution will be universally applicable. With the Valve Care Toolbox approach, there will be a number of engineering solutions available thus improving the effectiveness of the remedial actions taken.

### Objective(s)

The key objectives from this feasibility and evaluation phase will be:

1. The development the of technical valve care toolbox concepts.
2. Feasibility assessments of concepts, likely to include some prototyping and testing.
3. Validation exercise, including physical testing of key ideas/concepts/technologies.
4. Interim Reports outlining:

- Technical Requirements of any solution to be developed.
- Concepts hierarchy and descriptions of the individual concepts.
- The process behind the development of the shortlist of concepts.
- An initial assessment of the feasibility of these concepts and the technical challenges.

5. Final Report outlining:

- Overview of full project
- Learnings from Validation Exercise
- Recommended ways forward and technology developments to be proposed for future phases.

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

n/a

## Success Criteria

The programme has been structured (via a Work Package (WP) Stage Gates) to ensure the respective benefits outlined below are demonstrated:

WP1: Outlining of necessary Valve Care Toolbox concepts from Stage 1.

WP2: Development and refinement of Inform concepts.

WP3: Development and refinement of Access concepts

WP4: Development and refinement of Clean concepts.

WP5: Development and refinement of Protect concepts.

WP6: Additional Activities – defined as necessary during the course of Stage 2.

WP7: Business as Usual (BAU) implementation.

## Project Partners and External Funding

Project Partners – Steer Energy Solutions Ltd.

External Funding – (nil)

## Potential for New Learning

The programme will provide a structured approach to the evaluation of appropriate methods to address valve stem issues across National Grid Gas Transmission. The fundamental toolbox concepts will provide a range of solutions to implement effective valve remedial actions.

## Scale of Project

The programme will provide a toolbox of options and field trial an initial set of potential solutions.

## Technology Readiness at Start

TRL6 Large Scale

## Technology Readiness at End

TRL8 Active Commissioning

## Geographical Area

All work will be conducted in the UK and only involve Gas Transmission (valve) assets.

## Revenue Allowed for the RIIO Settlement

None

## Indicative Total NIA Project Expenditure

£432,500

## 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)

Projected cost savings: £265,000/valve where the Valve Care Toolbox provides a remediation solution negating the need for total valve replacement.

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

Total number of NTS valves which could exhibit valve stem issues during working life: 9,988

Projected valves to be replaced in 2017/18: 143

Average Unit cost of valve replacement: £300,000 (Base cost)

Projected percentage of effective valve stem remediation due to Valve Care Toolbox, negating valve replacement: 15%

Projected average cost of Valve Care Toolbox remediation: £35,000/valve.

Potential projected average cost saving due to Valve Care Toolbox: £265,000/valve.

Potential cost savings due to Valve Care Toolbox: £6.3M (Base) – £750k = £5.55M (for case presented above)

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

The development of a robust Valve Care Toolbox capability, with the approach incorporated within the respective National Grid standards set would make the techniques portable to other Network Licensees. The value issues experienced between Licensees are likely to be compatible.

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

Full implementation of the Valve Care Toolbox 2 is projected to be via webinars, and standard update briefings with some provision for the development of appropriate training material and modules. Projected roll out cost across the NTS is considered to be ~ £20,000/toolbox. This reflects the impact of the refinements made to the techniques and processes in Stage 2.

### 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 trialed 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 programme will offer insight into the potential utilising a range of valve stem redial options. While the work will concentrate on NTS valve assets, it is envisaged that the concepts and solutions around valve stem repair will be applicable to all gas network Licensees.

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

The programme will address the issues around valve stem and provide a toolbox of options to assist with effective repair.

- 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.

The current NIA portfolio of other gas distribution networks does not indicate similar type of programme. All networks will be fully informed of the progress of the current initiative.

### 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

National Grid's National Transmission System (NTS) consists of over 9,500 valves which are vital in the control and maintenance of the network. The Valve Care initiative is developing a series of innovative solutions to improve on-going valve maintenance leading to improved life extension and minimising unnecessary replacement reducing costs and increasing efficiency. The programme is defining and delivering a set of tools and techniques that will offer effective valve husbandry. By offering a dedicated range of tools, National Grid will be able to readily address valve related issues expediently and effectively.

### 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**

Currently valve remediation techniques are available on an as need basis, usually from a range of suppliers. The Valve Care Toolbox is developing a range of techniques, that will be applicable to all network operators, which will provide a holistic valve maintenance from one source of tools. This approach still requires modification and development and hence requires trial and error to fully verify the individual tools/techniques. To provide the framework around which this development can progress, it is considered that this approach a natural fit with the NIA funding objectives.

### **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**

High pressure valves require specialist attention to ensure their maintenance and operation is performed safely and effectively. To ensure that all the necessary avenues and techniques are explored to deliver a comprehensive and wide ranging set of techniques will involve experimentation and evaluation both in the workshop but in the field. This testing comes with technical risk and the use of NIA funding provides a valuable opportunity to mitigate these (risks) whilst also ensuring all the learning is widely disseminated to all network operators.

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

Yes