

NIA Project Registration and PEA Document

Date of Submission

Nov 2020

Project Reference

NIA_NGGT0168

Project Registration

Project Title

Valve Care Toolbox 3

Project Reference

NIA_NGGT0168

Project Licensee(s)

National Grid Gas Transmission

Project Start

November 2020

Project Duration

0 years and 5 months

Nominated Project Contact(s)

Josh Eades

Project Budget

£160,700.00

Summary

This final phase of ValveCare will further develop the inform, clean and protect toolkits and aims to build on the previous phases in order to deliver "Field Ready and Tested" tools that dovetail into National Grid's Maintenance systems, as well as widen the range of specific conditions that can be addressed by the system.

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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 first and second Valve Care Toolbox stages (NIA_NGGT0115 and NIA_NGGT0142 respectively) were aimed at developing innovative solutions to address these challenges, to 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.

This follow-on Valve Care Toolbox stage 3 is proposed to complete all the engineering work to provide NGGT with a comprehensive set of techniques and processes to remediate valve stem issues effectively.

Method(s)

During Stages 1 and 2, the development of each toolbox item proceeded at a different pace. A number have already begun field trials whilst others required more information to sufficiently define the problem prior to concept development.

- Stage 1 "NIA_NGGT0115 - Concept Development" predominantly saw concept development, with elements of development engineering.
- Stage 2 "NIA_NGGT0142 - Engineering" was predominantly development engineering with elements of concept development and field trials of prototypes. The first prototype toolboxes are held at Steer Energy's workshop, so that Stage 3 field work can be delivered.

Stage 3 now seeks to take the learnings and work to date from these two previous stages, and deliver "Field Ready and Tested" tools.

Critical to the work is the ability to complete a "Build, Lab test, Field Test Design" loop known as "Operationally Driven Design". This design methodology has the added advantage of utilising field staff in order to leverage "collective intelligence" and thereby building stronger, more capable technology. It's also significant in minimising the barriers to "Business as Usual" at the appropriate times as a number of field teams will be already comfortable with the tools and systems, having been involved in the development.

Scope

Currently National Grid have approx. 9,500 Valves (8" and above), many of which are over 40 years old and in varied degrees of repair. These buried valves have stem extensions which were manufactured locally, and without internal protective coating. Water ingress causes corrosion inside the valve stems. This corrosion can block end stops and compromise valve performance, as well as shortening "valve life". It is understood that there is a limited current maintenance programme for valve stems on buried valves.

Currently, valves are inspected yearly or every 2 years, and failure requires the valve to be replaced. The challenge valve care aims to meet is to work over the valve without excavating. Through the previous two stages, with assistance from National Grid, Steer Energy have created the ValveCare Toolbox which, through an "Inform, Assess, Clean and Protect" methodology gives:

- Assessment of the reasons for valve failure
- Remediation and repair, reducing the need for replacement
- Protection to arrest corrosion and extend asset life.

Once field ready, this work therefore will provide the following benefits:

- Assess and measure the condition of assets (valves) in the network
- Captures data on the condition of network
- Allows valves to be repaired instead of replaced
- Enables Targeted, planned maintenance via a risk-based approach, increase efficiency of resources
- Life extension of the network

The current toolkit as completed at the end of Stage 2 allows the operator to assess the condition of the valves, prior to undertaking any actions to remediate or protect. It became apparent during Stage 2 is that the Assess phase was of greatest significance - the ability to understand current status of each valve is immense, providing key information for Engineering and Operational decisions.

The current "field Ready" kit comprises of Pump Skid, Borescope, Steering device/Control Lines, Insertion Device, Agile Dipsticks, and Measurement Tools.

By the end of Stage 2, the toolkit had been developed and tested in the field on a small number of Valves over 7 sites. These trials have shown how the valves differ in terms of geometries, design, and conditions, and each of the field trials has led to the significant refinement and improvement of the tools.

However, the number of valves addressed ~30 is a small sample size of the ~9,500 valves in the system, and therefore there are challenges remaining to ensure that the tools are optimised for the majority of valve types and conditions. Stage 3 will further develop the clean and protect toolkits.

Stage 3 therefore aims to build on the work in Stage 2 in order to deliver “Field Ready and Tested” tools that dovetail into National Grid’s Maintenance and condition assessment systems, as well as widen the range of specific conditions that can be addressed by the system.

Objective(s)

The key deliverables will be:

Tools / Equipment / Documentation

The following will be delivered:

- Additional Cleaning options and process will be delivered.
- Completed Protect equipment and process will be delivered.
- As per Stage 2, 4 kits will be supplied with a 5th kit of critical spares.

In addition to this, updated Risk Assessment and Method Statements will be provided.

Reporting will be provided periodically as indicated by Steering Group meetings throughout the project. These are likely to tie in (as with Stage 2) as Summary Reports on field visits which use the Working Toolbox, alongside the additional engineering work carried out.

A final report will be issued outlining an overview of full project, recommended ways forward and additional work will be highlighted.

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: Further Development of “Clean” Concepts
- WP2: Further Development of “Protect” Concepts
- WP3: Field Development Work
- WP4: Project Management and Reporting

Project Partners and External Funding

Project Partner – Steer Energy Solutions Limited
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

TRL7 Inactive Commissioning

Technology Readiness at End

TRL9 Operations

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

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)

The cost saving calculations presented in this section are applicable across the three combined phases of the valve care toolbox projects.

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 3 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, procedures and processes in Stage 3.

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

n/a

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 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