

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

Feb 2015

### Project Reference Number

NIA\_NGGD0047

## Project Registration

### Project Title

Joining Techniques for PE Gas Pipelines up to 10 bar

### Project Reference Number

NIA\_NGGD0047

### Project Licensee(s)

Cadent

### Project Start

February 2015

### Project Duration

1 year and 0 months

### Nominated Project Contact(s)

National Grid Gas Distribution – Sharon Harrison

### Project Budget

£87,933.00

## Summary

The following scope will be undertaken:

- Desk-based market analysis to identify state of art (conception, innovative research and commercialised) plastic pipe mechanical joining systems (inclusive of tapping tees, end caps, couplers, elbows, equal tees, reducers and transition fittings). A summary report will be produced.
- A feasibility review and gap analysis of the potential products and systems will be undertaken.
- A final report will be produced recommending which technologies should be developed and progressed to field trial.

### Nominated Contact Email Address(es)

Innovation@cadentgas.com

## Problem Being Solved

A major threat to the integrity of Polyethylene (PE) pipelines is poor fusion joining that can result in failure of the joint and hence leakage. Fusion joints which are formed on site during construction are a potential weak point in the pipeline, which when subject to axial or bending stresses caused by thermal expansion or contraction, or movement will increase the risk of failure and hence escape of gas.

There are three main types of joint that all have specific potential modes of failure:

- Butt fusion, the faces of the two pipe ends are heated before being forced together and held together under pressure, to allow a fully circumferential fusion joint to form. Butt fusion joints may fail due to construction defects.
- Electro fusion Pipe Coupler, the two pipe ends are inserted in opposite ends of a PE socket containing an integral heating element, which is energised to melt PE material in the coupler/pipe interface, causing a fusion joint around the outer wall of the pipe upon cooling. Failures of electro fusion couplers typically occur due to poor pipe end preparation (scraping, trimming and cleaning),

contamination at the joint interface, excessive pipe ovality or poor alignment of pipe ends in the couplers.

- Electro fusion (EF) saddle joint. A saddle containing a heating element is held on the exterior of the pipe and energised, fusing the saddle to the parent pipe. A hole is then drilled to allow a connection onto the main. Electro fusion saddle joints typically fail due to poor pipe surface preparation or inadequate clamping/restraint during the fusion cycle

## Method(s)

A technology research study will be undertaken with the objective of identifying alternate innovative plastic pipe jointing technologies for jointing PE pipelines.

A study will be undertaken to gather key market intelligence through technology surveys in order to compile a global wide inventory of innovative alternative plastic mechanical jointing techniques. Identified candidate jointing techniques will then be screened and those with design attributes suitable for PE piping gas distribution up to and including 10 bar will be subjected to a technology assessment and ranked against current fusion technology.

Progression to developing a field trial with product providers will be reviewed as part of the final report.

## Scope

The following scope will be undertaken:

- Desk-based market analysis to identify state of art (conception, innovative research and commercialised) plastic pipe mechanical jointing systems (inclusive of tapping tees, end caps, couplers, elbows, equal tees, reducers and transition fittings). A summary report will be produced.
- A feasibility review and gap analysis of the potential products and systems will be undertaken.
- A final report will be produced recommending which technologies should be developed and progressed to field trial.

## Objective(s)

The objective of the project is to identify state of art (conception, innovative research and commercialised) plastic pipe mechanical jointing methods that could be utilized in the UK gas network to improve pipeline performance.

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

n/a

## Success Criteria

A report that captures any suitable products or jointing systems that could be developed, evaluated and implemented to give improved joint performance on  $\geq 63$ mm PE pipelines in the UK.

## Project Partners and External Funding

n/a

## Potential for New Learning

n/a

## Scale of Project

The project is a desk based study, looking at all industrial sectors worldwide.

## Technology Readiness at Start

TRL2 Invention and Research

## Technology Readiness at End

TRL3 Proof of Concept

## Geographical Area

The study will be undertaken by DNV GL in Loughborough.

## Revenue Allowed for the RIIO Settlement

There could be a future benefit in the reduction of pipe joint failure and leakage. The value cannot be determined at this point in time.

## Indicative Total NIA Project Expenditure

National Grid Gas Distribution - Total External Expenditure £35,200, Total Internal Expenditure £11,733

Liander £13,667 (external funding)

Enexis £13,667(external funding)

Stedin £13,667 (external funding)

## 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)

Not applicable as TRL level below 4

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

Not Applicable

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

Not Applicable

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

Not Applicable

### 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

A new method of jointing would be applicable to the entire UK network.

### 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