

NIA Project Registration and PEA Document

Date of Submission

Jan 2018

Project Reference Number

NIA_NGGT0125

Project Registration

Project Title

Generation of Intelligent P&IDs from Plant3D models

Project Reference Number

NIA_NGGT0125

Project Licensee(s)

National Gas Transmission PLC

Project Start

January 2018

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Joseph Olatunbosun -
Box.GT.Innovation@nationalgrid.com

Project Budget

£461,000.00

Summary

National Grid has over 500 high pressure gas sites on the National Transmission System (NTS) which require accurate Piping and Instrumentation Diagrams/Drawings (P&IDs). There is an opportunity to improve the accuracy of these P&IDs to drive efficient and effective maintenance activities and capital projects.

Third Party Collaborators

Cadline Ltd

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

National Grid has over 500 high pressure gas sites on the National Transmission System (NTS) which require accurate Piping and Instrumentation Diagrams/Drawings (P&IDs). There is an opportunity to improve the accuracy of these P&IDs to drive efficient and effective maintenance activities and capital projects.

A lack of, and inaccurate, P&IDs can result in additional work and significant costs;

- Site Surveys to update inaccurate P&IDs
- Manual drafting of intelligent P&IDs
- Risk of Project design and maintenance errors and subsequent costs
- Safety implications due to inaccurate, misleading or missing data

- Claims due to lack of accurate process data

Method(s)

Currently a number of NG site assets are being laser scanned to produce data-rich 3D models. This project will assess the feasibility of generating 'intelligent' P&IDs from these 3D models to include underground assets and meet recognised industry standards, e.g. British Standards.

The programme will be delivered in three stage gated Phases:

Phase 1: Project feasibility & investigation

- Analysis of current workflow and data exchange including 2D/3D modelling, laser scanning, asset identification and logging, industry standards, skillsets etc.
- Formal design and technical workshops
- Identification of potential options for solutions
- Establish the risks, costs, skills and resources required
- Develop a proposed design/project for the Proof of Concept (POC) stage
- A deliverable of this phase is a scoping and analysis document which will include a project plan with timeline and resource requirement breakdown.
- **Stage Gate:** Review of the project plan for the Proof of Concept phase including timeline, resource requirement, risks, costs and benefits.

Phase 2: Proof of Concept and Project Content

- Clarification
- Detailed requirements scoping
- Functional analysis regarding degree of automation and manual input
- Validation of workflow
- Deliverables for this phase will be a proof of concept of producing an 'intelligent' P&ID from a 3D model and an outline project design.
- **Stage Gate:** If the Proof of Concept is successful, assess whether Phase 3, as currently scope out, is appropriately scaled for testing and business acceptance.

Phase 3: Product development and testing

- Detailed project design
- Data standards definition
- Workflow and process definitions
- Acceptance testing
- Business readiness
- Delivery of training workshops.

Deliverables for this phase will be a detailed project design and business ready process for the production of P&IDs from 3D models.

Scope

A P&ID is a detailed diagram which shows the piping and vessels in the process flow, together with the instrumentation and control devices. The accuracy of P&IDs can erode as modifications are made to the asset over time.

P&IDs and their associated data contain pertinent engineering data which is used for a variety of purposes such as:

- Safety: Hazardous areas and High pressure pipework;
- Maintenance; Equipment type and specification;
- Asset health; Tracking of item repairs or replacement; and
- Conformance for regulatory compliance.

Objective(s)

To automatically generate accurate an intelligent 2D schematic line diagram from a 3D model.

To provide a mechanism to validate and ensure data accuracy and consistency between data stored in the Ellipse asset database, the 3D model and within the P&ID.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Create an accurate and intelligent 2D schematic as derived from the associated 3D model in accordance with industry standards.

Compare and report data accuracy and consistency within the 3D model, P&ID and the Ellipse database. This will include quality assurance functionality, e.g. check number and type of asset for a site identified in Ellipse database to that detailed in the 3D model and/or the P&ID to identify differences, missing assets etc.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Desk based.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

NGGT and Cadline premises.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

£461,000

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 annual costs of maintaining the existing P&ID drawing suite are approximately £100k. Creating P&IDs from 3D models is expected to reduce these costs significantly, improve the overall accuracy levels of the drawings and reduce the number of inaccurate or missing drawings.

Where unexpected issues occur due to inaccurate drawings on large projects, there can be additional costs such as resurvey work, rework of project plans and compensation. Additional costs incurred on a recent NGGT project resulted in an increase of £500k in project costs. The frequency of this type of event is expected to decrease through improvements in the accuracy of the drawing suite and increased confidence in the data contained within the drawings.

The development of a mechanism to compare the accuracy of data within 3D models, P&IDs and the Ellipse database will enable improvements in the consistency of records and increase confidence in asset management decision making.

Greater accuracy in the drawing suite is expected to reduce risk and improve safety on site due to the correct identification of process equipment and true representation of the process plant e.g. complete network of pipes and equipment components, essential for equipment planning and maintenance activities.

Please provide a calculation of the expected benefits the Solution

Whilst the method cost is currently unknown, it is expected to consist largely of training costs for AutoCAD Plant3D. With many National Grid site assets are being laser scanned and 3D models being produced, it is expected these could be used for the purpose of generating P&IDs for little to no additional cost. The extent of expected financial benefits will be better understood on completion of Phase 2.

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

Due to the widespread use of P&IDs, the techniques developed as part of this project would be replicable on all NGGT GB sites (525 sites) and all other Network Licenses sites.

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

Due to the widespread use of P&IDs, the techniques developed as part of this project would be replicable on all NGGT GB sites (525 sites) and all other Network Licenses sites.

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

It is understood that all Gas Distribution Networks experience similar challenges in ensuring P&IDs, and associated data, are up-to-date and accurate. It is anticipated that the techniques developed in the course of this project could be applied by, and significantly benefit, other pipeline operators.

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