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 2022

Project Reference Number

NIA_NGGT0178

Project Registration

Project Title

Collaborative Visual Data Twin Phase 1

Project Reference Number

NIA_NGGT0178

Project Licensee(s)

National Gas Transmission PLC

Project Start

February 2022

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Sabia Sadiya box.GT.innovation@nationalgrid.com

Project Budget

£880,517.00

Summary

The transportation of hydrogen will be paramount to allowing the UK energy system to achieve the target of net-zero carbon emissions by 2050. The introduction of this alternate source of energy does pose many technical challenges and additional complexity which digital tools may enable us resolve - to look past the complexity of the system more easily and provide clear insights into how the NTS is behaving. This project will develop the interactive and collaborative data twin and will be made up of two parts. Phase 1 will build the virtual (visual) elements of the twin, build the data structure and begin data collection and design the planned approach for mapping the two together.

Third Party Collaborators

DNV

Durham University

Premtech Ltd

Centre for Modelling and Simulation

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

The roll of hydrogen will be paramount to allowing the UK energy system to achieve the target of net-zero carbon emissions by 2050. National Grid has transported, and continues to transport, methane through its National Transmission System (NTS) . The introduction

of an alternate source of energy to this system, hydrogen, poses many technical challenges and additional complexity that need to be addressed. Digital tools may allow us to look past the complexity of the system more easily and provide clear insights into how the NTS is behaving.

Maximizing the value of data and visibility of data making our data more widely available is one way that we can increase the benefits we deliver to society. National Grid have been developing tools and techniques to enable this and plan to further develop this in the RIIO-2 period. We have been to actively engaging with stakeholders to identify value opportunities for open data, particularly around datasets supporting innovation and decarbonisation and this project supports this ambition.

We have developed a digitalisation strategy that encompasses activities that we need to deliver in order to ensure consistent delivery of the NTS services. This project addresses and supports a number of the workstreams that eventually lead to the NTS Digital Twin to be deployed in the later stages of RIIO-2 and early RIIO-3. This project provides a base from which to accelerate the implementation of the digital twin across the NTS applications. The project links into the Digital Twin, Cloud based data lake, IoT, BIM, SCADA and Geospatial asset registry topic areas discussed below.

We will use the Future Grid site at Spadeadam as the test site for this project. Future Grid is a transmission hydrogen test facility which is being built to demonstrate how the NTS can transport hydrogen and how this will also interact with a distribution network. The use of this site to demonstrate novel technologies and ways of working when transporting Net Zero gases is important to enabling the efficient transition of the wider NTS assets. Modelling of assets and networks using combinations of BIM, simulation software and machine learning allows us to understand how an asset is behaving and will behave under certain conditions. A virtual and data twin is required to fully understand the intricacies of how these assets are affected by the introduction of hydrogen. This project will utilize knowledge from other industrial sectors and better determine our use cases and requirements.

This project will combine our ambitions in digitalisation and decarbonization to provide innovative solutions for the UK Net Zero Gas Network.

Method(s)

This project will develop the interactive and collaborative digital twin that will be made up of two parts:

· Phase 1 as described in this document will build the virtual (visual) elements of the twin, build the data structure and begin data collection and design the planned approach for mapping the two together.

· Phase 2 will then take the scoped system and build and test it using live data from the FutureGrid facility. This activity will be developed as a separate project when further knowledge of the required system have been developed

The Phase 1 project will form three key phases:

· Build and development of the Virtual Twin, which will develop the 3D model of the FutureGrid, H21 and HyStreet facilities at DNV Spadeadam and will be the basis on which the data twin can be geotagged to. This will build a model of the beach to burner facility at the FutureGrid site and demonstrate the interoperability of the digital twin system across various networks.

· Build and development of the data twin, which will identify and collate the data from the facility; both historic and live. The data twin will include data such as asset information (supplier, lifecycle, materials, history of use, history of repair), wider environmental context of the facility, current known asset defects (P11 assessments, 3D scan data, ILI data and images), risk assessment information, standards and safety information, external factors (weather, vegetations, land etc..), live data from the SCADA and control system, other live sensor information not directly linked to the control facility and determine if this provides a suitable data set to make predictive assessments of our assets future use. The NTS data sets are currently being migrated to our internal data lake, this data is varied in quality and requires much manual interaction, this project will look at data management and quality management of historic data to provide an optimum solution for ensuring we have the correct historic data in the correct format.

· Design of the Digital Twin which will collate the Virtual and Data twin activities into one system to enable insights into the running of the FutureGrid facility. This advanced and intelligent model will enable the project to visualise and understand asset changes due to the effect of Methane and Hydrogen flows and enable the project to accelerate time and predict future areas of concern. Other use cases that are to be investigated include the remote monitoring of the asset state and ongoing activities, improved analytics capability through structures and linked data sets, clear historic data logs that provide a clear timeline of the system and the opportunity to provide remote training and development opportunities on both pipelines and their use with hydrogen. The integration of data twin and virtual twin poses a challenge in enabling the user to find the right information and through connecting the data sets in a manner that allows clear insights to be made.

A collaborative approach will be required to deliver the project ensuring workshops with the partners, internal and external stakeholders through out the development of the requirements and use cases. Ensuring alignment of the activities with the internal digital systems approach will enable the project to be rolled out as business-as-usual and the internal IT and data teams have been engaged to ensure this is resourced throughout the project period. Regular project meetings and dissemination events will ensure progress of the project to time and cost.

Measurement Quality Statement

The measurement approach used to meet Data Quality objectives will be through the identification of high calibre project partners whom are experts in their given field and the use of real data from National Grid sites. In this instance the project will be limited to a desktop study and therefore will combine separate partner historic data sources to inform new insights into the use of Digital Twins.

Data Quality Statement

The project will ensure that data used is of sufficient quality to deliver project objectives by the inclusion of CFMS whom will provide alternative industry insights and methods which are ahead of the gas industry in the method of twinning. The relevant data and background information will be stored for future access within the National Grid Innovation Sharepoint site.

Scope

As part of our RIIO 2 business plan we published out digitalisation strategy that encompasses activities that we need to deliver in order to ensure consistent delivery of the NTS services. This project addresses and supports several of the workstreams that eventually lead to the NTS Digital Twin to be deployed in the later stages of RIIO-2 and early RIIO-3. This project provides a base from which to accelerate the implementation of the digital twin across the NTS applications. The project links into the Digital Twin, Cloud based data lake, IoT, BIM, SCADA and Geospatial asset registry topic areas discussed within the National grid digitalisation strategy. The project has been split into several work packages (WP) to enable the key partners to take a lead on the topics associated to their skill sets and to ensure roles and responsibilities are clear a detailed RACI has been developed.

WP1 – Base 3D Model

WP2 – Visualisation

WP3 - Data Gathering & Storage

WP4 - Digital Twin Scoping

WP5 – Maintenance & Updates

WP6 – Project Management

Maximizing the Value of Data and Visibility of Data Making our data more widely available is one way that we can increase the benefits we deliver to society. National Grid have been developing tools and techniques to enable this and plan to further develop this in the RIIO-2 period. National grid plan to continue to actively engage with stakeholders to identify value opportunities for data sharing, particularly around datasets supporting innovation and decarbonization and this project supports this ambition in the RIIO-2 period.

As mentioned above the NGGT digitalisation strategy that has been developed alongside the RIIO-2 Business Plan encompasses activities that we need to deliver in order to ensure consistent delivery of the NTS services. This project addresses and supports several the workstreams that eventually lead to the NTS Digital Twin to be deployed in the later stages of RIIO-2 and early RIIO-3. This project provides a base from which to accelerate the implementation of the digital twin across the NTS applications. The project links into the Digital Twin, Cloud based data lake, IoT, BIM, SCADA and Geospatial asset registry topic areas.

Digital Twin:

The increased utilisation of renewable energy and the associated growth in smaller generation sources make it increasingly challenging to understand the required level of network capability. In recent years we have also invested in monetised risk models of our networks that combine information about asset failure modes, condition assessments and location to estimate the monetised risk for our lead assets and inform replacement and maintenance activities. NGGT utilize Simone simulations to model different supply and demand scenarios and network configurations and also maintains a pipeline risk model that considers where pipelines are relative to things like housing, rail and motorways and uses this to inform what level of safety mitigation is required in the network (e.g. thickness of pipes). These models are limited by the data available and the relatively manual process associated.

In RIIO-2 NGGT will continue to improve these models and the data that supports them. Note that whilst these models are not currently

integrated with real-time data to inform shorter-term operational decisions, we are collecting data that would enable that. For example, we are collecting gas compressor data and intend to build a more detailed digital twin of our compressors that can be used to perform failure prediction on operational timescales.

The CVDT project will provide a robust solution for future digital twin models and look to bring the data from new IOT and cloud based systems together with the BIM models and Geospatial information.

Data Lake

In RIIO-1 we built our Data Lake around our core asset management processes and during RIIO-2 we will increase the number of connected systems to provide further detail on finance, project delivery and system operation. This will provide a richer end-to-end view of our processes and enable many of the use cases discussed under our Grid Management and Customer Journey focus areas. We intend to move our Data Lake onto cloud-based technology which will provide increased flexibility to meet growing stakeholder needs and support more efficient deployment of analytics and AI. Utilising new cloud-based technology will also increase our capability to extract value from different data types such as geospatial, images and video.

The CVDT project will utilize an azure platform very much like the insights platform being built in the RIIO-2 period to demonstrate the opportunities in certain data sets being connected and the links to the BIM assets.

Building Information Modelling (BIM)

One way that we can use digitalisation to deliver more efficiently for stakeholders is by using Building Information Modelling (BIM) to improve productivity and reduce rework. Using BIM during the Design and Construction phase of projects provides efficiency in data handover and reduces the overhead of entering and maintaining duplicate data in multiple models. It can also be used to rehearse projects with complex logistical and site implications and as a basis for data handover at project close.

The CVDT project will further develop our BIM strategy and procedures and identify any novel interactions with the data lake, IOT and geospatial data that can provide us efficiencies in the future.

Asset Condition and IOT

In order to deliver a safe and reliable network we need to understand the condition of our assets clearly so we can effectively prioritise investment in maintenance and replacement of them. Digitalisation presents an opportunity to increase the quantity and quality of data we have available on asset condition. We will implement Internet of Things sensor technology to monitor key asset variables such as vibration, temperature and pressure on selected assets. We will use analytics and AI to look for unusual patterns in the short-term and long-term trends in order to identify failures before they happen. More granular condition data will enable us to provide a more sophisticated understanding of asset risk across the country and use this to optimise our investment decisions further. In line with best practice, we will embed the use of asset condition data across our processes, aligning our asset data capture with our investment processes to ensure we effectively leverage the best data available to inform all our decisions. We will do this in a transparent way that enables Policy Influencers and other stakeholders to see that our decisions are the right ones to efficiently deliver a reliable network for society.

The CVDT project will assess the key sensing systems that are available and demonstrate the use of this data to gain insights through the digital twin.

Geospatial

In Great Britain, NGGT look after 7,630km of high-pressure underground pipeline. Understanding where our pipelines are is critical to providing a safe and reliable network. We have made a large investment in our geospatial systems and data, increasing the granularity of our pipeline records and removing legacy systems. This has enabled us to create a single source of data for pipelines, allowing us to align our monetised risk models and pipeline safety risk models with our core asset data. This ensures we’re using consistent pipeline data across all our decision-making processes.

The CVDT project will utilise this geospatial system and connect it to the data and virtual twins to enable improved access to data and further insights into the NTS state.

Risk Reduction

The later activities in RIIO-2 described in the business plan around digital twin and BIM are to be considered as part of the uncertainty mechanism (UM) and this project will drive the associated business case. There are several risks identified as part of the digitalization strategy that we hope to reduce the impact of through this activity and therefore supporting the delivery of the RIIO-2 activity and

decreasing the risk to the consumers:

· Risk A - The integration of data from different systems leads to unexpected cost and complexity (Complexity)
The CVDT project looks to drive efficiencies in the RIIO-2 digitalisation program by understanding the complexity and the optimum routes to deliver our RIIO-2 targets. This project looks to ensure we identify the most efficient solution for the follow on NTs activities.

· Risk B - Digital initiatives do not deliver the expected stakeholder benefits (Unknown processes, products and technology/Uncertainty)
The CVDT project looks to ensure we understand the requirements and use cases for the digital twin and ensure the benefits can be seen by the key stakeholders.

· Risk D - We don't realise the benefits from some investments (Uncertainty)
The CVDT project will provide improved insight into the costs associated with creating a digital twin of the NTS and integrating the relevant data through our systems. This will allow us to ensure business cases and plans submitted to the RIIO-2 reopeners and activities are as accurate as possible.

· Risk E - Stakeholder value is missed due to lack of collaboration or collaboration slows realisation of value (Complexity)
The CVDT project looks to understand the key use cases of the Digital twin and demonstrate the use of a remote twin for the FutureGrid project stakeholders. This can be proven then for the NTS applications.

· Risk F - Compliance obligations are breached if we are unable to accurately control and manage our data (Lack of methodology). Management of these key risks will enable compliance, assurance and enhanced decision-making, providing benefits by way of improvements in the efficiency of our data operations, effectiveness of tactics (change projects) and the strategy of the organisation.
The CVDT project looks to minimize this compliance risk by identifying the optimum solution for data management through an azure cloud system.

This research project will help NG reduce risk in the RIIO-2/3 digitalization activities and provide insight to other network licensees looking at similar technologies. Moving through to the future energy system a whole system approach with more visibility of data across the networks can be supported by the outputs of this project.

The use of digitalisation has already proven to improve the efficiency of investment programmes and asset management. This further development will assist in ensuring the transition to Net Zero can be done as quickly and cost effectively as possible, providing real data for decisions to be made upon.

Objective(s)

The following objectives are those that we will report against at the end of the project and will be considered throughout the development process:

· Realise the benefit of what Digital Systems and Twins can offer a flagship project such as Futuregrid, and to set the standard for NTS developments.

· Investigate how data can be integrated into a virtual models to achieve real insights into the current state and future state of our assets.

· Develop a model of the FutureGrid site in BIM & 4D systems, enabling its use for the project and the digital systems demonstration.

· Create an accurate, georeferenced and comprehensive virtual twin model of the whole H2 facility at DNV GL Spadeadam.

· Review and understand all NTS data sets and their potential for integration with 3D models.

· Consider, identify and design how to integrate asset information models such as the supplier, lifecycle, materials, history of use, history of repair/update.

· Consider, identify and design how to integrate historical 2D drawings and information about surrounding assets that could interact with the NTS (utilities/non NTS pipelines).

· Consider, identify and design how to integrate asset defect data sets into a 3D model to enable visualisation of the asset state – including ILI data, images, P11 assessments, 3D scan, PDF assessment reports.

- Consider, identify and design how to integrate risk assessment and demonstrate areas of risk (heat map).
- Consider, identify and design how to integrate standards and safety information.
- Consider, identify and design how to integrate external factor data (weather, temperature, vegetation, land movement etc).
- Consider, identify and design how to integrate live data from the SCADA and control system (sensors etc…)
- Collate all data sets for the FutureGrid data twin and structure as appropriate
- Provide a design for the FutureGrid digital twin
- Provide insights into how to develop the most efficient digital twins of the NTS later in RIIO-2/RIIO-3

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

Although this project does not directly affect vulnerable consumers the energy transition may and as such we must consider the effect of the work we are doing through the NIA funding. The National Transmission System (NTS) is a key UK infrastructure for the transport of Gas to consumers, including those considered vulnerable. In a scenario where hydrogen replaces methane as a household heat source, it is essential the vulnerable are not excluded by virtue of fuel inaccessibility. In cases where vulnerable consumers already utilise gas it is likely that in a net zero future the optimum option is to provide a consistent energy solution. The transition to hydrogen within the NTS provides continuity of access to the vulnerable of hydrogen as a replacement to methane, with ongoing benefits of efficiency and economy of scale within a closely regulated environment. This project supports the transition of the NTS to hydrogen which in turn supports the availability of gas to the vulnerable.

Success Criteria

The following success criteria will be assessed at the end of the project to determine the outcome

- Deliver a 3D BIM model of the hydrogen facility at DNV Spadeadam (Virtual Twin).
- Establish what advanced modelling and visualisation capabilities can applied to the virtual twin.
- Define and build the data storage architectures and requirements so multiple stakeholders can use and interrogate the data of the Hydrogen facility (Data Twin).
- Define the design of what the digital twin will look like and how it will operate.

Ensure the virtual twin and data twin models are error free and an accurate representation of the physical plant and fully utilised to support the build process. This will also ensure in the follow-on phases that the combined digital twin is a honest representation of the facility.

Project Partners and External Funding

Premtech

Premtech is an independent and innovative company who are customer focused and market aware with the ability to provide flexible and proactive service to our clients. Premtech have the expertise to undertake engineering consultancy and design management services to all clients involved in the development and ownership of infrastructure projects in the energy sector. Premtech have worked with us through the RIIO-1 period to develop our BIM standards and models for various sites, their understanding of our internal requirements and their work on projects such as Project-ARC make them a good choice to build our virtual model in the CVDT project.

DNV

DNV are the independent expert in assurance and risk management. Driven by their purpose, to safeguard life, property and the environment, they empower their customers and their stakeholders with facts and reliable insights so that critical decisions can be made with confidence. They are also a world-leading provider of digital solutions for managing risk and improving safety and asset performance for ships, pipelines, processing plants, offshore structures, electric grids, smart cities and more. Their open industry assurance platform Veracity, cyber security and software solutions support business-critical activities across many industries, including maritime, energy and healthcare. These capabilities make them an ideal partner to develop the data twin and support us in identifying the optimum solution for the digital twin. DNV are also the lead supplier in the build of the FutureGrid facility at the Spadeadam site of which this project will demonstrate the digital capabilities on.

CFMS

The Centre for Modelling and Simulation, Bristol. CFMS is an independent digital engineering research organisation, providing design & analysis services, consultancy and IT infrastructure to help organisations create better solutions to pioneer new product development. With a full portfolio of digital capabilities, CFMS brings greater insight into how a system will perform throughout its lifecycle, resulting in more efficient development and more effective solutions. CFMS collaborates across industry, academia and research organisations, including research projects funded through Aerospace Technology Institute (ATI), Advanced Propulsion Centre (APC), i3P, FlyZero and more. CFMS will bring a varied insight into how other industries manage digital systems and data which will ensure we develop the most cost effective and robust solution for the NTS digital twin.

University of Durham

The University of Durham is globally outstanding centre of teaching and research excellence, a collegiate community of extraordinary people in a unique and historic setting. Professor Roskilly leads a large research group at Durham University coordinating national research programmes on hydrogen combustion and CHP; novel engine development; thermal energy recovery, storage and utilisation; thermal management of industrial processes; thermo-chemical energy storage and heat pump development; energy networks; industrial CCUS and supply chains; fuel flexibility and energy systems integration. His research group currently leads the UKRI funded national networks for hydrogen-fuelled transportation and the decarbonisation of heating and cooling. Professor Roskilly ‘s team are currently working on digital twin opportunities for their industrial cluster activities and have a wide breadth of internal knowledge in the area of digitalisation that will bring an insight to the wider NTS implementation of these systems.

Potential for New Learning

The new learning that is foreseen to be developed from this project but not limited to is:

- The developed understanding of how to best use cloud data storage to collaborate with external parties
- The optimum platform for enabling our NTS data to be more easily viewed and understood
- The potential for further developments of our BIM and 3D modelling activities, including optimization of the NGGT BIM data storage area
- The method for data quality and security when managing NTS historic and live data in parallel
- Discovery of opportunities in predictive maintenance and predicative asset management for scenario and business planning
- The method for using digital technologies to improve our understanding of hydrogens impact on our assets
- The design of a combined virtual and data system that enables advanced analytics and improved understanding of the NTS current state and potential state
- Interoperability between transmission and distribution models and data sets
- Proposed methodologies for implementation of digital twins across the NTS assets
- Dissemination of learning

Scale of Project

The project scale has been scoped out to be relative to similar investment to be seen in digitalisation across the energy networks. The project has many collaborating parties to ensure that the outputs are not directed towards one parties capabilities and systems and will ensure that the future NTS digital twin provides the most benefit to the consumers and stakeholders.

This project will provide benefit to not only the gas transmission network but also the gas distribution networks and has the potential to be valid for all energy systems in the UK. The project uses the hydrogen development facility at Spadeadam made up of FutureGrid, H21 and HyStreet to demonstrate the key digitalisation technologies that could improve our live NTS asset management. This approach allows us to minimize the total project cost as we can focus on a bounded facility which covers both GTO and GSO elements

without external facility elements having an impact and allows us to develop the tools and techniques prior to the data systems being finalized for the wider business.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project will develop a digital twin that will be accessible from any location. The hydrogen facility at Spadeadam Cumbria including the FutureGrid facility will be utilised to deliver the demonstration of the digital twin incorporating both the virtual and data twin. The ongoing activities in this project by each partner will be carried out locally with some site visits to confirm various aspects and to gather required information. The DNV team are likely to spend an extended period of time at the Spadeadam site ensuring the infrastructure is correct for the data collection and dissemination.

Revenue Allowed for the RIIO Settlement

Not applicable to this R&D project

Indicative Total NIA Project Expenditure

£861,761.97

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:

This piece of work will support the energy transition through enabling the long-term transportation of hydrogen through the NTS pipeline network. The data and models from the FutureGrid digital twin will help us assess and understand some of the impacts of hydrogen on traditionally methane-based assets. The outputs from this project will help educate, inform and drive the journey towards adopting hydrogen within the UK gas network, which will in turn help contribute towards the UK's target of net-zero emissions by 2050.

Further to this the data twins will enable us to model our NTS assets more fully and enable us to ensure understanding of the asset state prior to hydrogen injection.

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)

RIIO-1 Question n/a

Please provide a calculation of the expected benefits the Solution

Due to the low TRL level of this project there is no expected benefits calculation at this stage. This research project will help NG achieve efficiencies and improved performance in digitalization activities and provide insight to other network licensees looking at similar technologies. In the longer term, moving through to the future energy system, this technology will give more visibility to asset condition in a more complex environment. data

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

This project will use the FutureGrid facility at DNV Spadeadam as the test site. Subject to achieving the success criteria This approach would be replicated across the whole NTS, creating a holistic digital twin that will give powerful insights into how the asset behaves under a multitude of different scenarios.

This approach can also be adopted at distribution level or other sectors. The combination of all of these models working in unison will have the potential to provide a full UK view of the gas networks.

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

The costs associated to the NTS digital twin are unknown and robust solutions will be developed as part of this project to allow the future activity to be undertaken at minimal cost to the consumer. The later activities in RIIO-2 described in the business plan around digital twin and BIM are to be considered as part of the uncertainty mechanism (UM) and this project will drive the associated business case.

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

Due to the collaborative nature of this project, Northern Gas Networks will be a part of this project throughout, and all of the other networks will be informed of the project progress throughout via the utilisation of the monthly Gas Innovation Governance Group (GIGG) meetings and joint EIM and GIGG meetings.

Upon project completion, a technical report will be produced outlining all the key findings from the project. If further, more sensitive information is required, other networks can request this information from National Grid who can share these results at their discretion. This information will aid other Network Licensees in their individual visual and data twin journeys, which will in turn form a piece of the whole network system puzzle.

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

RIIO-1 question n/a

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 platform we intend to build so that we can extrapolate data on to the NTS structure in a more visual and comprehensive manner, and how this structure reacts and behaves when introduced to hydrogen is unique in its approach. The NTS is solely owned by National Grid, therefore no other companies will have carried out a project of this nature.

The other gas distribution networks have been informed of this project and have raised no duplication concerns, and the ENA portal has also been checked for unnecessary duplication.

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

The use of Virtual Twins and BIM are not a new concept and even to some extent the data twins, however, their combined application in to the UK gas transmission industry to help model and predict how a hybrid methane and hydrogen system will behave is innovative. The robust combination of Virtual and Data twin in Digital twin is still in development across all industries with some further towards a true digital twin than others. This project utilise expertise from across multiple industries to provide an efficient solution for the energy sector.

Relevant Foreground IPR

The foreground IP being created as part of this project is relatively limited - the project will review several opportunity areas and provide guidance on the optimal manner to produce value add digital twins for the NTS. Background IP from past work may be introduced to the project and will be available for the partners to utilise in order to disseminate the foreground IP as per contracting requirements.

Data Access Details

The project will adhere to the data sharing policy as stated in 2.13-2.16 of the RIIO-2 NIA Governance Document - https://www.ofgem.gov.uk/publications-and-updates/riio-2-nia-governance-document.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

This digitally innovative approach to the future of the gas grid carries with it an element of risk and lots of questions that must be answered before the business will adopt it as its usual activities. By leveraging innovation funding to mitigate the technical challenges posed will position NG and the UK gas industry into a much stronger understanding of hydrogen and the networks of the future. The use of NIA will de-risk the Digital Twin activity and ensure delivery of the core RIIO-2 digitalisation workstream is done to time and cost.

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

The development of both virtual and data twin activities relating to the operation, management and analysis of a hydrogen facility to carry financial and technical risks due to the complexity of its nature, coupled with the fact this hasn't been carried out in the UK before.

There are significant technical challenges which must be addressed such as data flow and management, which will require utilising and combining real site conditions with the virtual world. The development of these tools and techniques will provide a holistic and innovative solution.

The NIA framework offers a robust, open framework for this work to be conducted under and the results will be fully articulated to all stakeholders which will help them implement such technologies cost effectively.

This project has been approved by a senior member of staff

☑ Yes