

NIA Project Registration and PEA Document

Date of Submission

Oct 2021

Project Reference Number

NIA_NGGT0179

Project Registration

Project Title

HGR&D ST - Assessment Methodologies

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NIA_NGGT0179

Project Licensee(s)

National Gas Transmission PLC

Project Start

July 2021

Project Duration

0 years and 9 months

Nominated Project Contact(s)

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Project Budget

£388,671.75

Summary

This programme of work will assess the key strategic gas system options, impacts, barriers and opportunities in order to support policy decisions on whether to proceed with a transition to hydrogen to produce heat across domestic, commercial and industrial sectors.

This project will recommend and develop a standardised methodology (or set of increasingly advanced methodologies) to support repeated and consistent appraisal for a set of credible and compatible ends states, pathways and scenarios (test cases) used in the System Transformation programme. The outputs will allow comparison of the benefits and challenges associated within each test case to provide the practical evidence required to inform future policy on heat.

Nominated Contact Email Address(es)

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Problem Being Solved

The UK has mandated that it shall reach Net Zero emissions no later than 2050. The UK was the first major world economy to set this target and it shows the UK's commitment to tackling climate change for future generations. This mandate has put the UK on an accelerated programme to reduce emissions across our entire society whether this is industry, transport, agriculture or the way we create our power and heat our homes. To achieve Net Zero by 2050 will require a co-ordinated effort across the whole of the economy and by individuals who will be required to make technology choices and potentially change habits and behaviours to live more sustainable lives.

The Prime Minister's Ten Point Plan for a Green Industrial Revolution set out the government's intent to explore the option of hydrogen

to be used within the current gas network infrastructure. To support this the Gas Networks Operators are working with BEIS on the Hydrogen Grid R&D programme, which is split into 4 programmes of which System Transformation is one. The System Transformation programme objective is to identify the key gas system design options and make an assessment of their feasibility and attractiveness to iteratively identify, test and establish the technical, physical and economic viability of transitioning all or substantial parts of the gas grid infrastructure to 100% hydrogen as an option for decarbonising heat in accordance with HMG net zero targets.

This programme of work will assess the key strategic gas system options, impacts, barriers and opportunities in order to support policy decisions on whether to proceed with a transition to hydrogen to produce heat across domestic, commercial and industrial sectors. It will build this assessment via several projects.

The aim of this project is to develop and recommend a standardised methodology (or set of methodologies) for appraising a set of end states, pathways and scenarios (known collectively as “test cases”), developed through the BEIS priority project Common Future End States and Transition Pathways, led by Cadent, that will be used in the System Transformation programme.

Method(s)

The project is looking to address the problem by utilising the following steps:

1 - Kick-off activities

The first stage will agree approach to take for stakeholder engagement, form the groups, key dates put in place. A second important kick-off activity will be to obtain a baseline understanding of the “test cases”. Test cases are defined as a set of compatible pathways, end states and scenarios that can be taken forward for use in the System Transformation programme.

2 - Assessment Criteria

Stage two requires the identification of potential assessment criteria that will allow a comparison of different test cases’ contribution to meeting the objectives.

3 - Data Identification

Stage three of the project will involve determining what data could be used to assess the test cases against each of the criteria defined above. An important input into the decision on the appraisal methodology, which will depend on the extent to which the criteria can be quantified.

4 - Appraisal Methodology Selection

Stage four is to develop the appraisal methodology. This will define how the scoring of each test case against the criteria will be aggregated into an overall decision. Some criteria may require significant effort to fully quantify, and so it is possible that a range of methodologies will be recommended, from more qualitative approaches that can be used immediately in phase 1, to more intensively quantified methods that could be applied in future phases before decisions are committed to.

5 - First Cut Assessment

The previous phases of work will have resulted in a proposed set of criteria and methodology being developed, and the relevant data identified. In building this up prior to making recommendations, we will have been applying it to the test cases to assess its performance, as such we will already have pulled together the building blocks for a first-cut assessment of those test cases using the proposed methodology. This phase will essentially draw this together to make an assessment of the output of the current CBA tools (or alternative assessment tools). This will include a systematic sensitivity analysis focuses on answering the following set of questions that will inform the next phases of work (including a decision of whether they are required)

6 - Stage Gate Decision

There are a number of outputs that will need to be pulled together to inform the Stage Gate decision. A report will be produced on the potential tools / techniques to support the decision on the need for follow-on phases. Where there is currently no satisfactory method or tool to undertake an assessment, options will be provided to fill the gaps that have been assess. This will very much be developed in tandem with the other workstreams given the inter-relationships between them all and the need to see this work as part of a larger over-arching programme. To inform this a review of the criteria that were identified in the early stage of work to establish if there are benefits to adding further criteria to the overall assessment methodology as part of the next phase. This will include a “blank page” review of all possible criteria and a review of whether any of the “secondary” criteria should be promoted to become “primary” criteria.

Data Quality Statement (DQS):

The project will be delivered under the NIA framework in line with the agreed Energy Networks Innovation Process document NGGT internal policies. Data produced as part of this project will be subject to quality assurance to ensure that the information produced with each deliverable is accurate to the best of our knowledge and sources of information are appropriately documented. All deliverables and project outputs will be stored on our internal SharePoint platform ensuring backup and version management. Relevant project documentation and reports will also be made available on the ENA Smarter Networks Portal and dissemination material will be shared with the relevant stakeholders.

Measurement Quality Statement (MQS):

The project is rated low in the common assessment framework detailed in the ENIP document after assessing the total project value, the progression through the TRL levels, the number of project delivery partners and the medium level of data assumptions. No additional peer review is required for this project.

Scope

The main output of this project is to define a full list of common assessment criteria, with the key [primary and secondary] criteria identified. For the key criteria the following steps will be carried out, the data required will be identified, how it will be used and the output that each criterion will have.

Once this is complete for the key criteria the project will look for the best methodology to characterise the test cases. This methodology will take into account that some criteria may be easier to quantify robustly than others, and that some elements of the assessment may be qualitative and involve some judgement. Our intention is that the methodology used can be applied to other pathways such as electrification, so this must be accounted for when developing and presenting progress and the methodologies created.

Output expectations

1. Engagement plan to set expectations of who, when and how using the test cases from the Common Future End States and Pathways project
2. A full list of potential common assessment criteria is produced, and key criteria identified.
3. An appraisal methodology, defining how each transition pathway and end state will be assessed, ready to be applied.
4. Selection of the best assessment methodology tool if available or required (this could be a CBA or Multi Criteria Analysis).
5. Identification of the benefits of developing additional criteria.

The work is of benefit to the Hydrogen Grid R&D programme to set the parameters that the other projects will use to deliver sufficient insight into the options for hydrogen in 2050 and the route to it are robustly understood. This is key to a government decision on hydrogen in the mid 2020's.

As a desktop study there is currently no financial benefits to be listed at this stage. This is a research project so there is no calculation of the expected benefits however a benefit of the project and System Transformation programme is to provide evidence for a wider rollout of hydrogen in gas networks, enabling the repurposing of existing natural gas networks and the design, construction, testing, operation and maintenance of new assets for the transportation of H2 and Natural Gas/H2 mixtures.

Objective(s)

This project will contribute to the System Transformation programme, which will develop a set of appraised options for transitioning the gas networks to supply 100% hydrogen to homes and businesses. These appraised options, along with outputs from the other subprogrammes, will inform future policy decisions on heat. This is the development of a standardised methodology which will be applied to the outputs of the Common Future End States and Pathways project work and will remain applicable over time and as new thinking emerges. Once developed it must also fit with network use rather than further reliance on external expertise.

The project is broken down into potentially three phases – addressing the critical areas first so we can make a first pass assessment within six months of beginning the project. With the subsequent phases expanding the assessment criteria. The option to develop a tool will sit within the final phase if there is considered value in developing such. This project will also draw information from other projects to further understand behavioural change and impacts alongside network purging and its implications, again to provide detail on those specific areas. This is most likely to be within the second phase.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The insight this work supports will help to establish a clearer view of the impacts of the transition to Net Zero one of these will be cost and the impact on the customer. The assessment methodology priority project which is being delivered alongside this project will develop criteria in this area.

We conclude that this project will have a low impact on consumers in vulnerable situations. This is because the project methodology is within the development phase (TRL 5-6) and the solution will not deliver outputs that will impact the financial or well-being of any consumers. It is envisaged that this project will enable a future low carbon safe, secure and reliable energy supply.

Success Criteria

The success criteria for the project is the delivery of the following;

1. Compile a full list of potential common assessment criteria.
2. Challenge and review the full list of criteria with the networks and BEIS, along with first pass of the key criteria.
3. An agreed list of the key criteria is shared with the networks and BEIS for sign off. Taking into consideration the first test case outputs from the Common future end states and transition pathways project.
4. With the criteria set, the project partner will develop the appraisal methodology in conjunction with feedback from the networks and BEIS. Defining the process to be applied and the appropriateness of weighting the criteria.
5. The data required and how it will be used will be defined for each assessment criteria.
6. A final appraisal method will be shared with the networks and BEIS for sign off.
7. Whilst defining the appraisal method the delivery partner will review available tools / techniques to support the application of the methodology.
8. A report on the potential tools / techniques will be delivered to the networks to support the decision on the need for follow on phase.
9. A review of the remaining assessment criteria is required to identify the benefits of adding further criteria to the overall assessment methodology.

The final output will be usable by networks to avoid future external support to run the process.

Project Partners and External Funding

The project will be delivered by Frontier Economics

Potential for New Learning

The learning from this project will compile a list of common assessment criteria, that has a defined process of applying the assessment criteria, to characterise the test cases from the Common Future End States and Transition Pathways project and provide a consistent view that will create the envelope that the networks and BEIS believe is credible to support the understanding of the structure of the future gas network. This learning will then be shared with the other priority projects within the System Transformation programme. The work will be disseminated and shared with stakeholders via workshops within the project.

Scale of Project

As a desktop exercise the scale is appropriate as it considers mainland UK – this parameter has been set within the overall Hydrogen Grid R&D programme. Smaller scale would create insufficient information to support the understanding of the National Transmission System.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL6 Large Scale

Geographical Area

Desktop based project covering the mainland UK geography

Revenue Allowed for the RIIO Settlement

Not applicable to this R&D project

Indicative Total NIA Project Expenditure

£388,671.75

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:

The project will support the evidence building on conversion of the gas grid to hydrogen. It is the initial project that defines the parameters for the priority projects for the System Transformation programme. The project will provide evidence for a wider rollout of hydrogen in gas networks, enabling the repurposing of existing natural gas networks and the design, construction, testing, operation and maintenance of new assets for the transportation of H2 and Natural Gas/H2 mixtures.

How the Project has potential to benefit consumer in vulnerable situations:

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.

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

This is a research project so there is no calculation of the expected benefits however a benefit of the project and System Transformation programme is to provide evidence for a wider rollout of hydrogen in gas networks, enabling the repurposing of existing natural gas networks and the design, construction, testing, operation and maintenance of new assets for the transportation of H2 and Natural Gas/H2 mixtures.

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

This is a research study and it is not possible to provide indicative implementation costs before this work has concluded.

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

This is a research study and it is not possible to provide indicative implementation costs before this work has concluded.

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

This programme of work will assess the key strategic gas system options, impacts, barriers and opportunities in order to support policy decisions on whether to proceed with a transition to hydrogen to produce heat across domestic, commercial and industrial sectors. It will build this assessment via several projects which explore the network implications of the configurations. This extends the current work to include the network in the application of the scenarios.

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.

There is no previous work that is duplicated by this project it builds on work already published and develops it for the System Transformation programme needs.

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

This project will recommend and develop a methodology (or set of increasingly advanced methodologies) for appraising a set of credible and compatible ends states, pathways and scenarios (test cases) used in the System Transformation programme. The outputs will allow comparison of the benefits and challenges associated within each test case to provide the practical evidence

required to inform future policy on heat.

The consideration of the network in this type of work can only be done with the knowledge the networks have. This is not BAU as these are networks that transport a new gas.

Relevant Foreground IPR

The foreground IP created in this project are the methodologies to determine the consistent view and a defined process of applying the assessment methodologies.

Data Access Details

Current expectation is that all data used in this project will be sourced from published documentation, the test cases will be available upon request. Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

- A request for information via the Smarter Networks Portal at <https://smarter.energynetworks.org>, to contact select a project and click 'Contact Lead Network'. National Grid already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
- Via our managed mailbox box.GT.Innovation@nationalgrid.com

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

The current work in this area is sufficient for natural gas networks, to understand hydrogen is not a BAU activity and is currently wholly funded via innovation mechanisms.

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

There is a risk that if hydrogen is not accepted as a means to heat homes in 2050 that this work is no longer valid. The technical, operational and regulatory risks around hydrogen are elements being explored across the Hydrogen Grid R&D programme.

This project has been approved by a senior member of staff

Yes