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

Nov 2024

Project Reference Number

NIA_WWU_02_62

Project Registration

Project Title

Lessons Learnt: Phase Two

Project Reference Number

NIA_WWU_02_62

Project Licensee(s)

Wales & West Utilities

Project Start

November 2024

Project Duration

0 years and 10 months

Nominated Project Contact(s)

Lewis Garvey

Project Budget

£186,580.00

Summary

The industry has undertaken many projects to look at the potential implications of an energy transition whereby the gas distribution networks transport hydrogen rather than natural gas. Wales & West Utilities (WWU), together with Northern Gas Networks (NGN) and WSP, have previously undertaken a project to examine past energy transitions made by the gas industry, with a particular focus on the conversion program where the British Gas Industry transitioned from Town Gas to natural gas, and the important decisions that led to this (NIA_WWU_2_17).

The Lessons Learnt: Phase Two project will build on the findings of the previous project involving research and reporting on industrial and commercial conversions, network conversions, previous decommissions, and timelines for all aspects, by developing on the findings of the first project in greater depth and detail.

Preceding Projects

NIA_WWU_2_17 - Lessons from the Past: What can we learn from past energy transitions in the Gas Industry

Third Party Collaborators

WSP UK Limited

Nominated Contact Email Address(es)

innovation@wwutilities.co.uk

Problem Being Solved

The UK Government has committed to reducing greenhouse gas emissions to net zero by 2050. All future energy modelling identifies a key role for hydrogen in providing decarbonised energy for heat, transport, industry and power generation. Significant decisions on

the future of UK heat policy are expected from the UK government in 2026 so the need for further evidence to influence these decisions is of critical importance.

The industry has undertaken many projects to look at the potential implications of an energy transition whereby the gas distribution networks transport hydrogen rather than natural gas. Wales & West Utilities (WWU), together with NGN and WSP, have previously undertaken a project to examine past energy transitions made by the gas industry, with a particular focus on the conversion program where the British Gas Industry transitioned from Town Gas to natural gas, and the important decisions that led to this (NIA_WWU_2_17).

The Lessons Learnt: Phase Two project will build on the findings of the previous project involving research and reporting on industrial and commercial conversions, network conversions, previous decommissions, and timelines for all aspects, by developing on the findings of the first project in greater depth and detail.

Method(s)

The project is a direct follow-on from the previous project completed by WSP, WWU and NGN: Lessons from the Past (NIA_WWU_2_17). Lessons Learnt: Phase 2 will explore aspects of previous and current transitions in the gas and energy industries in more detail to help inform future transitions of the gas industry in the UK. This in-depth desktop-based study is designed to help inform gas networks (transmission and distribution), Ofgem, DESNZ, as well as industrial and commercial end users.

WSP has developed a scope consisting of four work packages, each with dedicated research and reporting phases. The first work package will undertake a detailed review of industrial and commercial conversions. This was covered in the first phase of the project; given, however, the expansive nature of the report, the information presented was a precis of that obtained, which included some more detailed description of specific industrial conversions undertaken. The development of standards for industrial gas conversion and new natural gas equipment will be discussed where information is available, as will the involvement of testing and safety regulations developed for sites. Public opposition to any new infrastructure built, how this was documented and how the industry managed this process will be a key area of focus. The drivers of conversion will be highlighted and a comparison to today's industrial clusters will be made.

Most accounts of commercial conversion were included in the wider conversion of domestic customers, though accounts of central London (where large numbers of commercial customers were located) are known to be particularly useful.

Work packages two and three, looking at energy network conversion and previous decommission respectively, are similar in that they will both examine significant changes to communities where customers have become dependent on a single energy vector. Finally, the fourth work package will help WWU to understand the implications of industrial and commercial conversion on overall conversion timescales, noting that these are generally bespoke and were built into the wider natural gas conversion programme with as much balance across sectors as possible. WWU and Xoserve will support WSP with collating and interpreting available data on industrial and commercial customers to develop a feasible estimate on timescales for a future energy conversion to hydrogen.

All of the project findings will be collated into a final report, with 30-page work package reports summarised into single-page summaries and infographics. WSP will also provide support to produce a short film for dissemination, given the success of short film produced for the first phase of the project.

Measurement Quality & Data Quality Statement

Upon review of this project's method and scope, it has been concluded that data will not be used to inform any of the project's outputs. As such, the brevity of the following data quality statement has been deemed adequately proportionate to the risk (or lack thereof) associated with the measurement and quality control of data that this project requires.

WSP will observe the Good Data Management Practices as agreed in the first phase of the "Lessons Learnt" project, where research data was generated using sound scientific techniques and processes. The research data would again be accurately recorded within the document and in accordance with good scientific practices, using the Havard referencing system. The research data being analysed appropriately, without bias and in accordance with Good Industry Practice.

Research data and the Foreground Intellectual Property would be stored securely and was easily retrievable. Data trails will be kept allowing people to demonstrate and reconstruct key decisions made during the conduct of the research with presentations made and conclusions reached in respect of the research.

Data milestones would be planned for the end of WP1a&b, WP2, WP3 and WP4. Data sources documents would be referenced at the end of each section, so that the sources could be traced for future research. Any data sources, where further information could be identified, will be recorded and if possible obtained.

A precis of contents of each significant data source will be made available in appendices.

There is no intent to collect personal data from this project; any surveys undertaken would be done so anonymously in line with GPDR regulations. There is not expected to be any Intellectual Property developed as part of this project.

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 high level of data assumptions. No additional peer review is required for this project.

Scope

WSP will deliver the outputs required by WWU and SGN; these include:

- Final report for public use - All work packages combined.
- Executive / high level summary for each work package (preferably 1 page).
- Summary PowerPoint presentation and clear recommendations of findings.
- Training material where applicable (assumed eight examples by WSP).
- Supporting evidence (in report appendices).
- Media friendly graphics / summary of findings by work package.

In addition to the extensive research element proposed to be undertaken, WSP will also call on the knowledge of individuals involved in the Conversion Programme in Great Britain and abroad through the involvement of John Bowers and members of the gas history panel. WSP will also use the Newspaper archives, not used in Phase 1, to provide a view from the media at the time of conversion.

The Project will be split into four main work packages (WPs). The first of these (WP1) being split into 3 subtasks. The project will be initiated by a kick off meeting between the WSP, the WWU teams and SGN. This will allow WWU and SGN to initiate the delivery plan and track progress and manage delivery. All work packages will conclude with a Digital, Graphics and Stakeholder Phase where the findings of the work packages will be condensed into a one-page high level summary developed in coordination with the WSP Digital Graphic and WSP Stakeholder Management Teams.

WORK PACKAGE 1

Work Package 1a: Industrial Conversion

This work package will undertake a detailed look at industrial conversion. This was covered in the first phase of the project, however, given the expansive nature of the report, the information presented was a precis of that obtained, which include some more detailed description of specific industrial conversions undertaken. The work will be split into phases, as described below.

Research Phase – The research phase will review the primary information sources, including those key reports identified in the first phase of this project. As WSP have logged the records and are familiar with the gas archives, records for the existing resources from the first phase of the project can be rapidly accessed and reviewed. Technical publications from IGEM and similar organisations will be reviewed for helpful content. This phase will collate a wide range of evidence from the physical aspects, financial aspects, and impact of conversion, including industrial customer journey and experience of conversion. To provide a social context, the online Newspapers archives will be searched to find reporting on conversion from a media perspective. The practical experience of John Bowers and members of the IGEM history panel who engaged in the conversion of gas networks and industrial customers will provide insight.

Reporting Phase – Some key aspects covered will explain the drivers of those original industries converted to natural gas, and whether this was done with the provision of additional infrastructure or whether additional infrastructure was required as a result of demand changes afterwards. The Identification of sites suitable for conversion will be discussed as will the assessment of how easy they were to convert; this would consider both existing gas customers and new gas customers. The types of plant converted will be discussed as will the process of conversion undertaken on certain examples; however, it should be highlighted, that industrial plant using gas covered a large variety of often bespoke equipment. Given the changes in British Industry since the conversion in the 1960-70's this may mean that this is only a very rough guide to potential future changes. The development of standards for industrial gas conversion and new natural gas equipment will be discussed where information is available, as will the involvement of testing and safety regulations developed for sites. Health and Safety considerations from the conversion programme will be covered (King and Morton Report, Gas Safety Regulations 1972). Another important element is whether there was public opposition to any new infrastructure built and how was this was documented and how the industry managed this process. The key drivers of conversion will be highlighted and a comparison to today's industrial clusters will be made. Likewise, the limitations and benefits of conversion will be highlighted, however, these may not be applicable to a future conversion to hydrogen. This work package will be reported as a succinct

30-page Industrial Conversion chapter in the overall final report which answers the questions set out in the project specification. It will provide suggestions that could benefit future conversion based on lessons learnt from this project.

Work Package 1b: Commercial Conversion

The second work package focusses on Commercial Conversion, which was covered in the first phase of the project. This was presented as a precis of the information reviewed. Typically, commercial conversion was reported often at the same time as domestic conversion, so few commercial only accounts are available. The work will be split into phases, as described below.

Research Phase – The research phase which will review the primary information sources, including those key reports identified in the bibliography of the first phase of this project. For commercial conversion, most accounts were included in the wider conversion of domestic customers. The accounts of central London being particularly useful, where a large number of commercial customers were found. As WSP have logged the records and are familiar with the gas archives, records for existing resources from the first phase of this project can be rapidly accessed and reviewed. Technical publications from IGEM and the regional groups of the IGE will be reviewed. In addition to this and to provide a social context, the online Newspapers archives will be searched to find reporting on the events from a media perspective. The practical experience of John Bowers and members of the IGEM history panel who engaged in the conversion of gas networks and industrial customers will also provide insight.

Reporting Phase – This work package will be reported as a commercial conversion chapter in the overall final report. This report will condense the information obtained into a succinct chapter of 30 pages. Collating a wide range of specific evidence from the physical aspect of conversion, financial aspect and impact of conversion, the commercial customer journey and experience of conversion and benefits of conversion to the consumer. The research will attempt to identify answers to as many of the questions posed by WWU in the project specification as the surviving evidence will allow. Some key points which will be highlighted would be the scale of the operation, how it was managed, whether conversion may have changed the types of appliances used, what were the key challenges encountered, regulatory issues such as conversion standards and sign off. A description of the customer journey through conversion from both the gas industry and customer perspective and issues such as time off gas, financial support and what happened when plant could not be converted. It will provide suggestions that could benefit future conversion based on lessons learnt from this project.

Work Package 1c: Industrial and Commercial (I&C) Summary

This work package will summarise the findings from Work Packages 1a and 1b to identify any synergies or similarities in their findings and comparing that to the situation today. This work will be split into two phases. The findings will be presented as a short summary report and one-page high level summary providing suggestions that could benefit future conversions.

WORK PACKAGE 2: ENERGY NETWORK CONVERSION

Work Package 2 has some overlap with Work Package 3, in that they are both looking at significant changes to communities where customers have become dependent on a single energy vector.

Research Phase - The research phase of the project will look to identify occasions where networks have already completed transition to run off a single energy vector. Historical examples will be examined through desk-based research of reports produced at the time. We also believe there will be merit in looking at the social experiment undertaken in the 1970's when Britain developed some large electric only developments following on the from the Ronan Point disaster. The example of Orkney provided by WWU in the specification is certainly the key example. We would co-ordinate with the Orkney Renewable Energy Forum (OREF) to get their input and provide their experience of their electricity only network. Undertaking a question-and answer session with OREF to see what the outcomes were. Another useful example will be the closure of the gas network in Northern Ireland (covered in WP4) and the reintroduction of natural gas in Northern Ireland through Phoenix Natural Gas. All these examples will show the impact of switching to or from a single energy source. The practical experience of John Bowers and members of the IGEM history panel who engaged in the conversion of gas networks and industrial customers will also provide insight.

Reporting Phase – The report will investigate how single energy networks such as Orkney are managed locally and what the positive and negative aspects of this approach are. Understanding the reliability and resilience of the network, how peak demand is met, how energy storage is provided and whether other forms of energy are used to supplement this will be explored. It will provide suggestions that could benefit future conversion based on lessons learnt from this project.

WORK PACKAGE 3: DECOMMISSION PREVIOUSLY

As highlighted in the work undertaken by WSP in the first phase of this project, there were cases in the UK where the gas network was decommissioned (e.g. Millport). The impacts of these closures were quite significant on places which had previously had gas supplies for over 50 years. This work will be split into three phases, as described below.

Research Phase - WSP will focus its research activities on the closure of gas networks in the UK, notably Scotland and Northern Ireland. These have the greatest parallels to the potential situation the gas industry may find itself in the coming years. The impacts of these closures will be researched from written reports already identified by WSP, some of these have been obtained and the location of others identified. They will also be reviewed from articles which featured in gas publications and also within the Newspaper Archives to provide a view from how it was perceived in the media and by the public. We believe Northern Ireland will provide the best information and our efforts would predominantly be focussed there.

Reporting Phase – The report will discuss examples of gas network closures in Scotland and the more significant example of Northern Ireland's gas industry. Unlike the rest of the United Kingdom, the gas industry in Northern Ireland was not nationalised and it remained fragmented with isolated networks, under a mixture of public and private ownership. With this structure, the networks only partially integrated through the expansion of the municipally owned Belfast Gas Department, which supplied many of its neighbouring areas. Following conversion to natural gas in Great Britain, the Northern Irish gas network which was still operating on Town Gas, but struggled, was subsidised by the UK government and networks in Northern Ireland were gradually closed and decommissioned. John Bowers was involved in one network closure. Any suggestions or guidance that was felt of value to benefit future conversion based on lessons learnt would be recorded and used to inform high level summaries and concluding reports.

WORK PACKAGE 4: TIMESCALES

Based on the findings delivered for the first phase of the project, WWU and SGN would like to understand the implications of Industrial and Commercial Conversion on overall conversion timescales. Based on our experience of the first phase of this project, we do foresee that this may be challenging as Industrial and Commercial conversions are generally bespoke and were built into the wider programme with as much balance across sectors as possible in the natural gas conversion programme. The work will be split into two phases, as described below.

Research Phase- The recording of case studies for industrial conversion were better than those for commercial conversion, and the latter may be more challenging for finding accurate data. Industrial conversions varied massively from several huge steel furnaces at one site to a few blow torches at another, so making any generalising data is difficult. Bringing real world experience to our delivery team through John Bowers and the Gas History Panel will aid the completion of this task. The data available on Industrial and Commercial conversions from the natural gas conversion programme will be collated and examined to see how it could best be interpreted for today and incorporation into the required table. This will involve the input of WWU, SGN and Xoserve who handle such customer data today and who WSP have worked with before and to whom we presented to as part of the first phase of the project.

Reporting Phase – We will summarise the research findings in a clearly understandable format which could be based on a range of factors into a table that could be helpful to aid prediction of potential future conversions. The number of industrial and commercial gas customers at the time of conversion to natural gas, as compared to today, are broadly similar and likewise most (by number) are to be found on the lower pressure tiers. Pre-conversion was also used more extensively in Industrial conversion, so that the pressure and downtime was reduced as far as possible at the time of conversion. With the large amounts of North Sea Gas discovered, the early conversion of industrial areas to secure premium loads on natural gas was promoted; this however involved taking industrial users from other fuels as well as town gas, which led to a massive increase in demand. A future switch to hydrogen or other green gases will likely see a different scenario in term of fuel availability and economics, so this would have to be considered.

There is a lot of ongoing work to identify the most effective route to meet net zero in the UK and this project is one of many projects which will assist in this area. Repurposing the UK gas networks with hydrogen to support the challenge of the climate change act has the potential to save millions of pounds with minimal gas customer disruption verses alternative decarbonisation solutions. The findings of this project support the transition to hydrogen by undertaking a study of previous conversions with the aim of applying these learnings to a future network conversion.

Objective(s)

To produce a report on the learnings researched and reported under all work packages, a summary PowerPoint presentation, training materials (where applicable), supporting evidence (in report appendices), media-friendly graphics/summaries of findings for each work package, and a short film for dissemination on previous industrial and commercial conversions, network conversions, previous decommissions, and timescales for all aspects of the project's scope. The project aims to inform the transition strategies of UK energy networks in the event of a future energy system transition, such as a network-wide conversion to hydrogen. Particular focus will be placed on the learnings we can take from the conversion of I&C consumers from towns gas to natural gas and how these can be applied to the hydrogen transition.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative or neutral effect on consumers in vulnerable

situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register.

This project has been assessed as having a neutral impact on customers in vulnerable situations.

Success Criteria

A successful project will build on the learnings from the previous project (NIA_WWU_2_17) by undertaking more detailed, in-depth research and reporting on industrial and commercial conversions, network conversions, previous network decommissioning, and timescales for all aspects of the project's scope.

Project Partners and External Funding

The supplier for this project is WSP UK. The project will be wholly funded via NIA, with WWU as lead network in partnership with SGN.

Potential for New Learning

The project learnings will build on the findings of the previous phase (NIA_WWU_2_17) and will help networks to understand what lessons can be learnt from previous industrial and commercial conversions, network conversions, network decommissioning, and the timescales required. These learnings from previous conversions are intended to assist networks with the future network conversion to hydrogen.

Scale of Project

This will be a desktop study, which is the appropriate scale for this project as it will build on the previous desktop study undertaken as part of NIA_WWU_02_17.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project will cover the entire GB network.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External Cost

- WWU: £46,645
- SGN: £93,290
- Total: £139,935

Internal Cost

- WWU: £15,548
- SGN: £31,097
- Total: £46,645

Total cost:

- WWU: £62,193
- SGN: £124,387
- Total: £186,580

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 industry has undertaken many projects to look at the potential implications from a switch to hydrogen to the gas infrastructure. WWU, together with NGN and WSP, have previously undertaken a project to examine past energy transitions made by the gas industry, with a particular focus on the conversion program where the British Gas Industry transitioned from Town Gas to natural gas, and the important decisions which led to this (NIA_WWU_2_17). This project intends to build on this work, covering industrial and commercial conversion, as well as energy network conversion, decommissioning, and overall timescales, in more depth than in the previous project phase.

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)

N/A

Please provide a calculation of the expected benefits the Solution

This is a research project. There is a lot of ongoing work to identify the most effective route to meet net zero in the UK and this project is one of many projects which will assist in this area. Repurposing the UK gas networks with hydrogen to support the challenge of the climate change act has the potential to save millions of pounds with minimal gas customer disruption verses alternative decarbonisation solutions. The findings of this project support the transition to hydrogen by undertaking a study of previous conversions with the aim of applying these learnings to a future network conversion.

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

The learnings will be applicable to all networks.

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

There are no rollout costs as this is a research project.

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

All networks are looking to decarbonise their energy sources. This project will provide valuable insight to networks on lessons that can be learnt from previous industrial and commercial conversions, network conversions, network decommissioning, and timescales for conversion, and apply these learnings to a future transition to hydrogen.

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

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.

All networks have been made aware of this project and no concerns of duplication have been raised.

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 industry has undertaken many projects to look at the potential implications from a switch to hydrogen to the gas infrastructure. WWU, together with NGN and WSP, have previously undertaken a project to examine past energy transitions made by the gas industry, with a particular focus on the conversion program where the British Gas Industry transitioned from Town Gas to natural gas, and the important decisions which led to this (NIA_WWU_2_17). This project intends to build on this work, covering industrial and commercial conversion, as well as energy network conversion, decommissioning, and overall timescales, in more dept than in the previous project phase.

Relevant Foreground IPR

The project report and other deliverables will form the foreground IPR.

Data Access Details

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'. WWU 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 Innovation website here
- Via our managed mailbox innovation@wwutilities.co.uk
- Details on the terms on which such data will be made available by Wales & West Utilities can be found in our publicly available "Data sharing policy relating to NIC/NIA projects" here

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

This project seeks to build on the previous project phase and undertake a more in-depth analysis of previous industrial and commercial conversions, energy network conversions, previous network decommissioning, and overall timescales for conversion, with the aim that these learnings will benefit a future energy system transition. This not a BAU activity for networks.

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 project would only be undertaken with support from NIA funding, it is in the interests of gas customers, the regulator and the UK government and the realisation of any benefits are outside the control of the gas networks. There is no allowance in BAU business plans for this type of work and there is a risk that if hydrogen is not accepted as a means for transport in 2050 that this work is no longer valid.

This project has been approved by a senior member of staff

☑ Yes