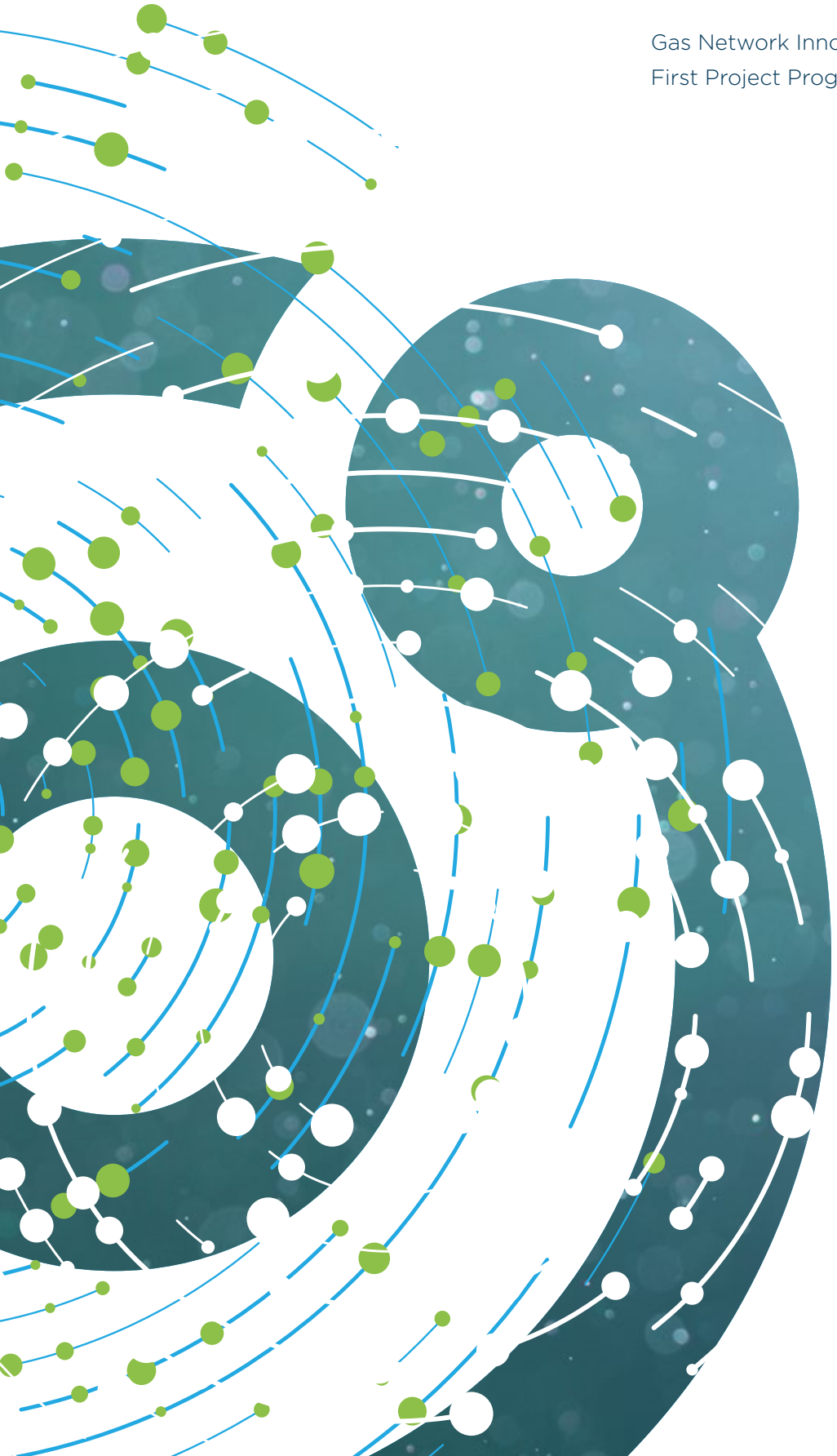
HyDeploy

HyDeploy Project

Gas Network Innovation Competition // Cadent

First Project Progress Report (PPR) // December 2017



HyDeploy

The HyDeploy Project seeks to address a key issue for UK customers: how to reduce the carbon they emit in heating their homes. The UK has a world class gas grid delivering heat conveniently and safely to over 83% of homes. Emissions could be reduced by lowering the carbon content of gas through blending with hydrogen. Compared with solutions such as heat pumps, this means that customers would not need disruptive and expensive changes in their homes.

This Network Innovation Competition (NIC) funded project seeks to establish the level of hydrogen that can be safely blended with natural gas for transport and use in a UK network.

Under its Smart Energy Network Demonstration innovation programme, Keele University is establishing its electricity and gas networks as facilities to drive forward innovation in the energy sector. The objective of HyDeploy is to trial natural gas blended with potentially up to 20% volume of hydrogen in a part of the Keele gas network.

Before any hydrogen can be blended with natural gas in the network, the percentage of hydrogen to be delivered must be approved by the Health and Safety Executive (HSE). It must be satisfied that the approved blended gas will be as safe to use as normal gas. Any approval will be given as an exemption to the Gas Safety (Management) Regulations. These regulations ensure the safe use and management of gas through the gas network in the UK.

The evidence presented to the HSE comprises critically appraised literature, combined with the results from a specifically commissioned experimental and testing programme. Based on engagement with all local customers, this includes detailed safety checks on the network, appliances and installations at Keele. Subject to approval by the HSE, the hydrogen production and grid injection units will be installed, and an extensive trial programme of blending will be undertaken.

If hydrogen were blended at 20% volume with natural gas across the UK, it would save around 6 million tonnes of carbon dioxide emissions every year, the equivalent of taking 2.5 million cars off the road.

Under its Smart Energy Network Demonstration innovation programme, Keele University is establishing its electricity and gas networks as facilities to drive forward innovation in the energy sector.

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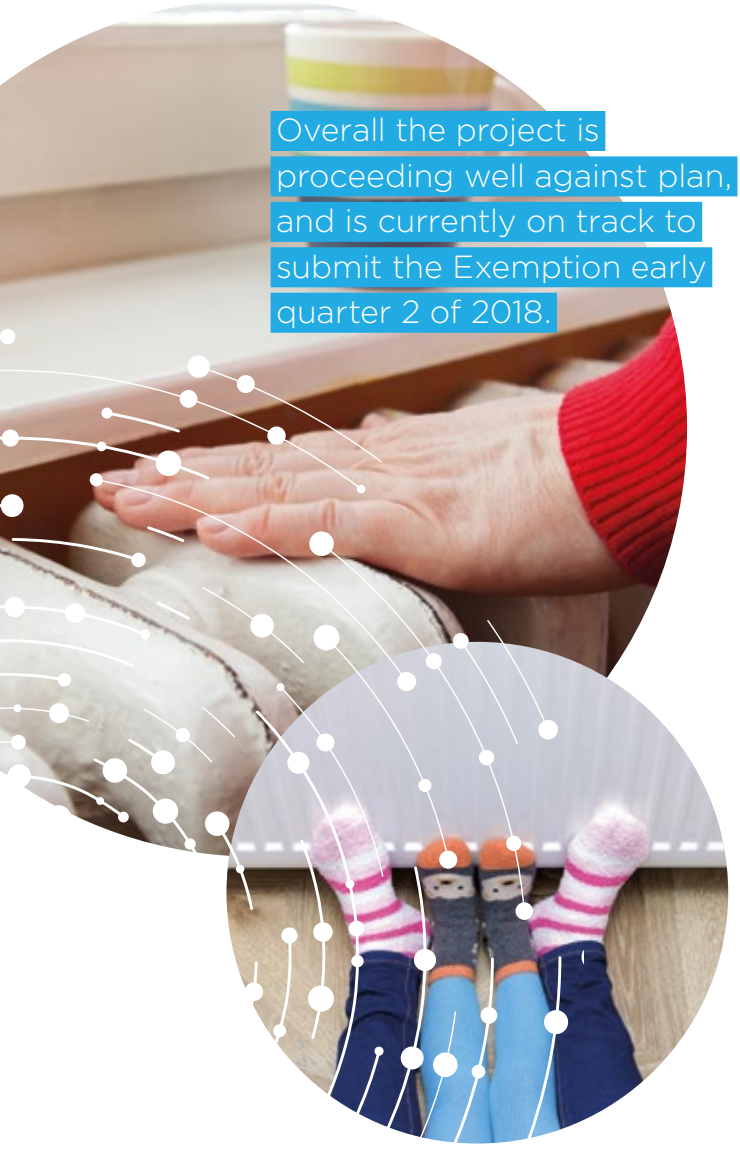
1.0 Executive summary

The HyDeploy project is well underway and excellent progress has been made across the programme. A well-developed communications plan has been drawn up to facilitate engagement with customers and stakeholders on the Keele campus. This has been reviewed by the appropriate university body and completes the first Successful Delivery Reward Criteria for the project. Extensive communications material, including a website have been developed based on this.



Overall the project is proceeding well against plan, and is currently on track to submit the Exemption early quarter 2 of 2018.

The core technical programme is on track, collating the necessary scientific evidence to support the application to the HSE for the Exemption to the Gas Safety Management Regulations (GS(M)R) to be made during the second quarter of 2018. This evidence is a combination of critically appraised literature, combined with commissioned experimental and testing activities relating to the use of a blend of hydrogen and natural gas. Extensive laboratory testing work has been undertaken, testing a range of representative appliances and a detailed plan has been developed to safety check all appliances and installations on the relevant network at Keele.

The functional specification for the hydrogen grid entry unit has been developed and an extensive tender process undertaken to identify and select an appropriate supplier. Similarly, the design basis for the electrolyser has been drawn up and detailed design is underway.

The HSE will only grant an Exemption, on the basis that using a hydrogen blend is as safe as natural gas. To support this a detailed fault tree and quantitative risk assessment is being developed. The project team has engaged closely with the HSE with regular meetings held with the project case officer with work packages presented as they are completed.

Wider site development activities are well underway, with detailed pipeline routing, network modifications and other services provisions being planned to prepare the site for the project.

The project has also engaged with the wider community. Cadent has produced a short film on the Future Role of Gas, and partners have presented overviews of the project at various events. The advisory board has been formed with strong support from key stakeholders.

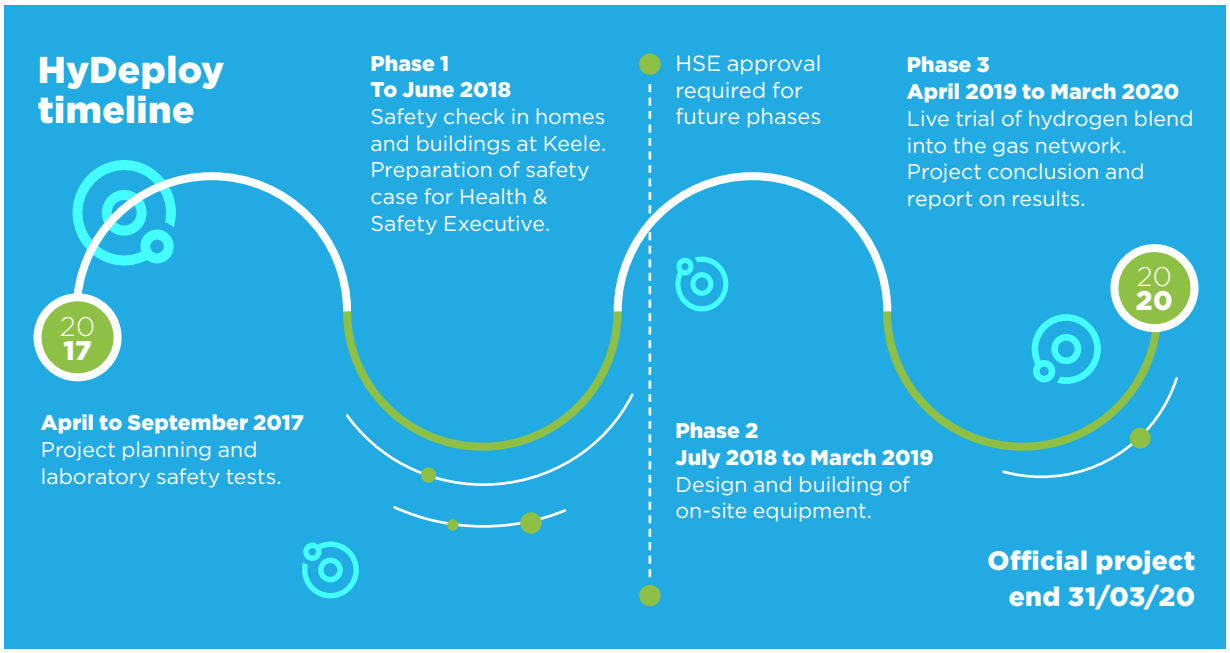
The key activities in the next period are the onsite appliance and installation checks, the completion of the extensive scientific evidence base, the detailed hydrogen production and grid injection equipment design and the submission of the Exemption application. In parallel, necessary permitting will be secured and appropriate site works undertaken. Subject to the evaluation by the HSE, as well as agreement by the partners, the project will commence fabrication of the hydrogen production and grid injection equipment.

The challenges over this period have been the time taken to go through governance processes at the university, the time taken to define and deliver the laboratory testing and the extensive work required to develop the functional specification and tender process for the grid entry unit.

Overall the project is proceeding well against plan, and is currently on track to submit the Exemption early in Quarter 2 of 2018. Slight delays arising from the governance processes onsite mean that this may be a few weeks later than original planned.

Subject to the necessary approvals, it is expected that the project will proceed to the equipment construction and installation phase at the start of Quarter 3, 2018. The programme is being managed for delivery within budget. Currently the spend is behind budget, as planned early mobilisation was not possible, although this is expected to realign over the next 6 months. It has become clear that the grid entry unit will be more expensive than anticipated, although the overall budget is being managed to accommodate this, but it will remain an area of focus.

Since the bid submission, there has been increased interest in the role for hydrogen to reduce carbon emissions from heat. All the Gas Network Distribution companies have hydrogen projects in development or underway and third party reports have also been published evaluating role for low carbon gas, including hydrogen. Internationally there has been continued focus on the role for blends. The business case remains strong, supported by positive progress on the parallel NIC funded Future Billing Methodology project.



2.0 Project Manager's report

The HyDeploy project has made very strong start to this ambitious programme, building on the careful planning and partner engagement during development of this bid.

Key achievements

The consortium and the supporting organisations have all mobilised quickly with all the necessary work streams under way in a timely fashion. The necessary governance processes have been established and required range of agreements put in place for project delivery.

This project relies on the support of gas customers and stakeholders on the Keele Campus. As such development of a detailed communications plan is critical in enabling them to make informed decisions. In its role as a research institution, the university has a strict ethics governance process to critically appraise proposed projects which are undertaken by its staff or in its site which have an impact on participants. The appropriate university body has reviewed the range of information developed by the project and the means by which the participants are engaged, how priority customers are cared for, as well as more practical aspects such as data protection. This has all been successfully approved for the first phase of the project, and evidence of completion of the first Successful Delivery Reward Criteria submitted to Ofgem.

Based on this, the communication material has been developed including hard copy materials, animations and development of the website. At this stage in the project, this is focused on the immediate needs of the local gas customers and stakeholders. As the project develops much of this material will be shared more widely and further material developed to communicate the project to others.

This project relies on the support of gas customers and stakeholders on the Keele Campus.

In parallel, the core technical programme is well underway, collating the necessary scientific evidence to support the application to the HSE for the Exemption to GS(M)R to be made during the second quarter of 2018. This aspect of the programme is being managed by the project partner the Health and Safety Laboratory (HSL). This evidence is a combination of existing, critically appraised literature, combined with commissioned experimental and testing activities.

Extensive laboratory testing work has been undertaken, testing a range of representative appliances at KIWA's facility in Cheltenham. This was based on a carefully developed test matrix, based on industry standard gas compositions with blended hydrogen which envelope the operational window with well-defined safety margins. This has been used to develop a detailed plan for undertaking a full test of appliances and installations at Keele.

The project team has engaged closely with the HSE since the project inception.

In parallel the collation of the core scientific evidence is well underway covering the key areas of: the effect of hydrogen on materials under the network conditions at Keele; the effect of hydrogen on gas leakage behaviour and detection; the effect on the risk of fire or explosion; and on how to ensure reliable blending of hydrogen and natural gas. This range of appraisal has included both literature review as well as testing of materials and detection equipment. It has also required extensive review of existing network operations and procedures to evaluate suitability for hydrogen operation. In parallel an early version of the network model has been developed.

The gas mixing assessment has been used as part of development of a functional specification for the hydrogen grid entry unit. An extensive tender process has been undertaken to identify and select an appropriate supplier for this equipment, in order to commence detailed design. Similarly, the electrolyser functional specification, basis of design and frontend engineering have been completed, with detailed design work underway.

The HSE will only grant an Exemption, on the basis that using a hydrogen blend is as safe as natural gas. This requires the development of a detailed fault tree and quantitative risk assessment for delivery of a hydrogen blend across the relevant part of the Keele network. The structure of this is well developed. This will be appropriately populated with quantitative data as the evidence from the testing activities during phase 1 is collected, the literature analysed and the design of the new equipment finalised.

The project team has engaged closely with the HSE since the project inception. Regular sessions are being held with the project case officer on a six weekly basis to present information as it is being developed. This provides an opportunity for challenge and review of the project programme during the early stages of the project, allowing any and all concerns to be encapsulated and mitigate. It also means that the HSE are well prepared to evaluate the final Exemption application.

Wider site development activities are well underway, with detailed pipeline routing, network modifications and other services provisions being planned, and where necessary executed, in order to prepare the site for the project. This is important to minimise installation delay in the next stages of the project and to minimise disruption to the Keele Site through co-ordinated work programmes.

Whilst the focus of this early stage of the project is on the onsite communications and the core collection and synthesis of data and evidence, the project has engaged with the wider community. Cadent has produced a short film on the Future Role of Gas which includes HyDeploy alongside other projects[1]. The advisory board has been formed with strong support from key stakeholders. Representatives all agreed to sit on the board from Department for Business, Energy and Industrial Strategy (BEIS), the Committee on Climate Change, Ofgem, key industry bodies including Institute of Gas Engineers & Managers (IGEM), the Energy and Utilities Alliance (EUA) incorporating the Heating and Hot Water Industry Council (HHIC), the European Gas Research Group (GERG), all the Gas Distribution Network companies (GDNs) including National Grid Transmission, as well as British Gas representing both shipper and supplier community. The first board met in November, and the project was well received. The project objectives and scope have been presented at conferences by senior staff in the partner organisations. As the project continues and more information becomes available, this activity will expand.

Wider site development activities are well underway, with detailed pipeline routing, network modifications and other services provisions being planned.

D Parkin, speaking about HyDeploy.

Outlook for next period

The key activities in the next period are the launching of the communication programme and onsite appliance and installation checks. The purpose of this work is to ensure that the equipment on the network is fundamentally gas safe, and to confirm that operation in the field is consistent with the tests in the laboratory. Tightness testing will be undertaken with the hydrogen blend but not 100% hydrogen. Along with the detailed hydrogen production and grid injection equipment, this will form a key part of the evidence base for the quantitative risk assessment and the Exemption application. This will be submitted early in Q2 2018. In parallel, necessary permitting will be secured and appropriate site works undertaken. Subject to the evaluation by the HSE, as well as agreement by the partners, the project will commence fabrication of the hydrogen production and grid injection equipment.

Key challenges

As with any project there have been some key challenges during the period. Probably the most significant of these has been the time taken to go through governance processes at the university. Although more protracted than in other environments, the university governance processes are recognised as fundamental and have provided a rigorous operational approval process. It is anticipated that the project will reap the benefits of this going forward, with the simplicity of operating on a closed private network.

It has put some pressure on the schedule in terms of launch of the engagement programme, and therefore onsite appliance and installation checks. Definition and delivery of the laboratory testing of the appliances has also taken longer than anticipated, but has not resulted in any additional delay beyond that from the governance processes.

The extensive work on the functional specification has resulted in a more sophisticated design basis for the grid entry unit, and therefore increased expected cost. This has put pressure on the budget, although at this stage it is anticipated that this can be accommodated within the overall programme with careful stewardship of resources.

Overall this has been a successful and productive 8 months of programme delivery by a competent and engaged project team.

The key activities in the next period are the launching of the communication programme and onsite appliance and installation checks.

[1]https://vimeo.com/218624799

3.0 Business case update

The UK is committed to a pathway to carbon reductions through the Climate Change Act and has adopted its ambitious and legally binding fifth carbon budget for the period 2027-2032 as part of this trajectory. Heat contributes around a third of the UK's carbon emissions. The Carbon Plan identifies that by 2030 there is a requirement for between 83-165 TWh of low carbon heat per annum. In 2015 the combined domestic and non-domestic RHI delivered less than 4.5 TWh, with an expectation by DECC in 2016 that by 2020/21 the Renewable Heat Incentive (RHI) could deliver 23.7 TWh of renewable heat. Therefore, a step change in low carbon heat is required.

The purpose of the project is to demonstrate that natural gas containing levels of hydrogen beyond those in the GS(M)R specification can be distributed and utilised safely & efficiently for the first time in a section of the UK distribution network. Successful demonstration has the potential to facilitate 29 TWh pa of decarbonised heat in the GB, and more by unlocking extensive hydrogen use.

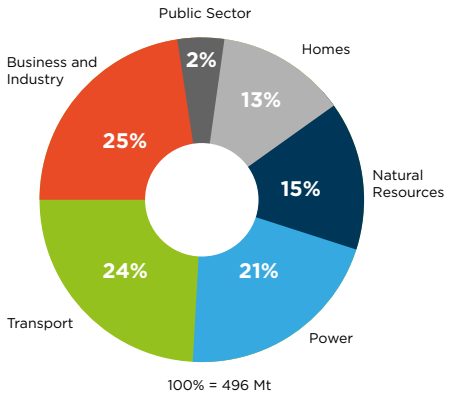
Since the submission of the bid, the need for solutions to this problem has been increasingly recognised, with a focus on the challenges of heat and identification of potential solutions.

The Clean Growth Strategy[2] was launched in October 2017, and emphasised the importance for solutions to reduce the carbon intensity of heat, and outlines the work it is doing to evaluate the role for hydrogen for heating.

BEIS is undertaking an extensive review of 'Strategic Options' for Heat. The role for gas based solutions and specifically hydrogen is being carefully assessed in this review.

UK emissions by sector 2015

Source: BEIS



Heating in buildings and industry creates around 32% of total emissions

Recently BEIS has commenced a £25M programme to evaluate the use of 100% hydrogen from the perspective of customers upstream of the meter[3]. Hydrogen blending has a significant role to play in delivering carbon reductions in the short term and without disruption to customers. HyDeploy is also a pathway to higher levels of hydrogen use by increasing the science base, addressing regulatory and operational barriers, developing the supply chain, and importantly understanding customer perceptions of hydrogen. The HyDeploy programme itself also provides a template for similar work on high hydrogen applications.

[2]www.gov.uk/government/publications/clean-growth-strategy

[3]BEIS (July 2017) Funding for innovative approaches to a low carbon built environment
www.gov.uk/government/publications/funding-for-innovative-approaches-to-using-hydrogen-gas-for-heating

In addition to governmental activities in relation to hydrogen, there has been continued work in the field by all the Gas Distribution Networks. A collaborative NIC application has been made by the four Gas Distribution Networks (GDNs) to assess the issues on the network upstream of the meter. There has also been continued work on other projects including work by NGN and Cadent on aspects of the H21 programme, Cadent in terms of the 'Liverpool Manchester Cluster' encompassing the role of hydrogen for industry combined with network blending, and SGN with its '100% hydrogen' project.

A number of third party reports have also been published over the last year evaluating the options for low carbon heat and the role of gas, including hydrogen. These include Policy Connect's 'Next Steps for the Gas Grid'[4], and the Energy Research Partnership's 'The Transition to Low-Carbon Heat'[5].

Internationally there has been continued focus on the role for blends. The HyDeploy team has engaged with those who undertook the Ameland trial in Holland, Eon with its German trial and Engie in terms of its Dunkirk project. This latter project is planning to inject hydrogen at 20% into part of the network, supplying a hospital and around 100 homes. The necessary regulatory permissions have already been secured, the production and blending equipment is being built and the trial is expected to go live early in 2018.

These activities evidence the national and international interest in establishing the role for hydrogen including as a blend in natural gas, and the premise for the project has strengthened.

The fundamentals which underpin the use of hydrogen as a blend have not changed since the bid submission. There remains only a limited set of alternative ways to deliver low carbon heat, and there has not been a step change in the perceived role, costs or adoption of heat pumps. Similarly, there has not been a notable change in the anticipated demand for gas. The need for appropriate billing methodologies for roll out remains important. The success of the 'Future Billing Methodology' project[6] in passing through its first stage will further underpin the business case for deployment of hydrogen blends.

Since the submission of the bid, the need for solutions to this problem has been increasingly recognised, with a focus on the challenges of heat and identification of potential solutions.

[4]www.policyconnect.org.uk/research/next-steps-gas-grid-future-gas-series-pt-1

[5]erpuk.org/project/low-carbon-heat

[6]futurebillingmethodology.com

4.0 Progress against plan

The project is proceeding well against plan, with progress against each programme elements summarised below.

The project is currently on track to submit the Exemption to the HSE early in Quarter 2 of 2018. Slight delays arising from the governance processes onsite mean that this may be a few weeks later than original planned. Based on the extensive early engagement with the HSE it may be possible to recover this potential delay during the period allowed for evaluation. On this basis it is expected that the project will proceed to the equipment construction and installation phase at the start of Quarter 3, 2018 as planned.

Programme element	Progress
1. Site communications and stakeholder engagement	An extensive communications and engagement plan has been developed, which has been submitted to Ofgem (first SDRC) and approved under the relevant University governance process. Communications material has been produced, and HyDeploy website designed, including the necessary booking processes and systems, ready to commence the stakeholder engagement process onsite in the latter part of Quarter 4 2018.
2. Pre-Exemption activities to develop the Exemption / safety case	This has been the most extensive element of the programme during the first 8 months, as it provides the detailed evidence base for the Exemption. This work draws on the national and international evidence base available, as well as detailed experimental and test work undertaken as part of the project. Work streams undertaken in this area include:
	(i) The effect of blended gas on how appliances operate. An extensive laboratory testing programme of appliances has been designed and executed. Based on this a detailed specification for site appliance and installation testing has been developed.
	(ii) How blended gas interacts with materials. This work is based on an extensive literature review, combined with an asset assessment at Keele. In the laboratory, exposure of materials to hydrogen environment is underway, in preparation for testing.
	(iii) The effect on gas leakage behaviour and detection. Models have been developed, drawing on existing data to understand the implications of hydrogen on leakage behaviour. Initial tests on detection equipment have been undertaken.

Programme element	Progress
	(iv) Risk of fire or explosion. Work is underway to understand the effect of blending hydrogen with natural gas on existing gas management processes, and make sure that risks are as effectively managed as they are today with just natural gas. During the onsite installation safety checks, all the pipework in the buildings will be leak tested.
	(v) Ensuring reliable blending of the hydrogen and natural gas. Computational modelling has been undertaken to understand the requirements to ensure reliable mixing, as well as to show that once mixed the two gases do not separate.
	It is expected that this evidence will be finalised and collated to support the Exemption application early in Quarter 2 2018.
3. Specification and design of hydrogen production and mixing units	A detailed functional specification has been developed for both units. An extensive tender process has been undertaken to identify and select a supplier for the grid entry, with the design phase ready commence. In parallel a basis of design and FEED has been undertaken for the electrolyser, with detailed design underway. Final detailed design packages are scheduled for completion in Quarter 1 2018.
4. Write safety case and apply for GS(M)R Exemption	The Structure and approach for the Exemption has been developed early in the project to ensure that the evidence base being developed is properly focused. This has been undertaken with close engagement with the HSE, with regular meetings since project inception. The Fault Tree has been developed to structure the Quantitative Risk Assessment, which is now being populated with data from the project as it is developed, along with information from the wider gas industry. Ahead of submission of the Exemption to the HSE, expected early in Quarter 2 2018, individual work packages have been presented to enable early engagement.
5. Regulatory and billing arrangements	Internal work has commenced on this activity, in line with the project schedule. The project team will be engaging with Ofgem on this work stream in early 2018.

Programme element	Progress
6. Predevelopment installation activities	The Basis of Design for the equipment and modifications to the network has been developed. Based on this, some early work on the network and services has been undertaken where they can be integrated into wider university schedules.
7. Secure project gateway clearances	Some preparatory work undertaken in developing the governance processes to assist in expediting this when the HSE have evaluated the Exemption. This gateway is expected to take place at the start of Quarter 3 2018.
8. Installation of Hydrogen Injection Equipment	Some limited preparatory activities are underway, but this programme element is primarily in 2018/19.
9. Installation of Network Monitoring equipment	Some limited preparatory activities are underway, but this programme element is primarily in 2018/19.
10. Pre-Injection processes	Not scheduled to commence until 2018/19.
11. Injection plant and equipment operation	Not scheduled to commence until 2019.
12. Data gathering during the trial	Not scheduled to commence until 2019.
13. Incremental Injection	Not scheduled to commence until 2019.
14. Plan follow-up project on public network	Not scheduled to commence until 2018/19, although the project team is maintaining a watching brief on other hydrogen related programmes.
15. Keele Site reinstatement/ Handover	Not scheduled to commence until 2020.
16. Dissemination and reporting	The project has been presented at a range of events during this period. Cadent has produced a short film on the Future Role of Gas which includes HyDeploy alongside other projects . The first Advisory Board has convened, which provides a forum for engaging key stakeholders in the project both nationally and internationally. Evidence to support the first SDRC has been submitted to Ofgem.
17. Project Management	Effective project management is necessary to mobilise a project with 6 partners and multiple work streams. The governance structure is provided by the Steering group which meets quarterly. A well-managed system of monthly project meetings with associated programme and budget reporting is in place, and a comprehensive project risk register developed. Subsidiary working groups monitor and progress individual work streams.

A well-managed system of monthly project meetings with associated programme and budget reporting is in place.

5.0 Progress against budget

The table below shows the progress against budget to the end of October 2017. Overall, the programme is being managed for delivery within budget. In drawing up the original programme, it had been anticipated that the project team could have mobilised more extensively ahead of April 2017. In practice this was more limited than expected, and so as a result the spend is behind budget, although this is expected to realign over the next 6 months.

Following detailed work on the grid entry functional design and engagement with the market, it has become clear that the Grid Entry Unit will be more expensive than anticipated. Currently, however, the overall budget is being managed to accommodate this, but will remain an area of focus.

Inevitably individual programme elements will vary compared with budget, but this is being actively managed with a process of monthly reporting and review, enabling proactive decisions to be made to deliver the project to plan.

Overall, the programme is being managed for delivery within budget.

Programme element	Spend to date	Budget to date	Total budget
1. Site Communications and stakeholder engagement	76,134	171,582	266,893
2. Pre-Exemption activities to develop the Exemption/safety case	665,104	1,037,000	1,470,340
3. Specification and design of hydrogen production and mixing units	186,552	174,707	231,912
4. Write safety case and apply for GS(M)R Exemption	19,612	40,814	117,081
5. Regulatory and billing arrangements	850	81,246	175,656
6. Predevelopment installation activities	3,456	35,251	125,501
7. Secure project gateway clearances	4,362	0	213,940
8. Installation of Hydrogen Injection Equipment	2,276	0	1,909,931
9. Installation of Network Monitoring equipment	15,167	0	462,045
10. Pre-Injection processes	1,146	0	67,264
11. Injection plant and equipment operation	0	0	362,776
12. Data gathering during the trial	0	0	285,330
13. Incremental Injection	0	0	219,724
14. Plan follow-up project on public network	0	0	95,428
15. Keele Site reinstatement/Handover	4,250	0	135,013
16. Dissemination and reporting	4,990	60,795	341,636
17. Project Management	250,541	271,300	781,117
Total	**1,234,440**	**1,872,695**	**7,261,587**

6.0 Project bank account

Bank statements have been provided to Ofgem. Due to the confidential nature of the project bank statements, they have not been included in this report.

7.0 Successful delivery reward criteria

Over this period, one Successful Delivery Reward Criteria (SDRC) was scheduled for completion; the development of a Communications Plan, encompassing customer engagement and data protection plans. This was successfully completed and evidenced to Ofgem by 24th November 2017 as required.

The SDRCs due for completion over the next period are: the completion of Laboratory Appliance tests; completion of the Onsite Survey programme; and SDRCs relating to completion of Exemption application, securing of approval and gateway to the next project phase. At this stage, these SDRCs remain on schedule for completion according to the project plan.

8.0 Data access details

No public network or consumption data has been collected on this project to date.

9.0 Learning outcomes

Over this period there have been key learning points which the team has identified and built upon during this phase of the project:

The importance of putting the customer first. The purpose of this project is to deliver a non-disruptive low carbon solution for customers. The delivery of the project relies on collection of data from customers. This requires scientists and engineers to see beyond the data itself to the necessary communications and stakeholder engagement required to understand customers' needs.

Importance of a strong and committed team. The extent of the project achievements to date are testament to a committed team of project partners and other project participants. The quality of the team has enabled significantly more progress on a complex project than would otherwise have been achieved.

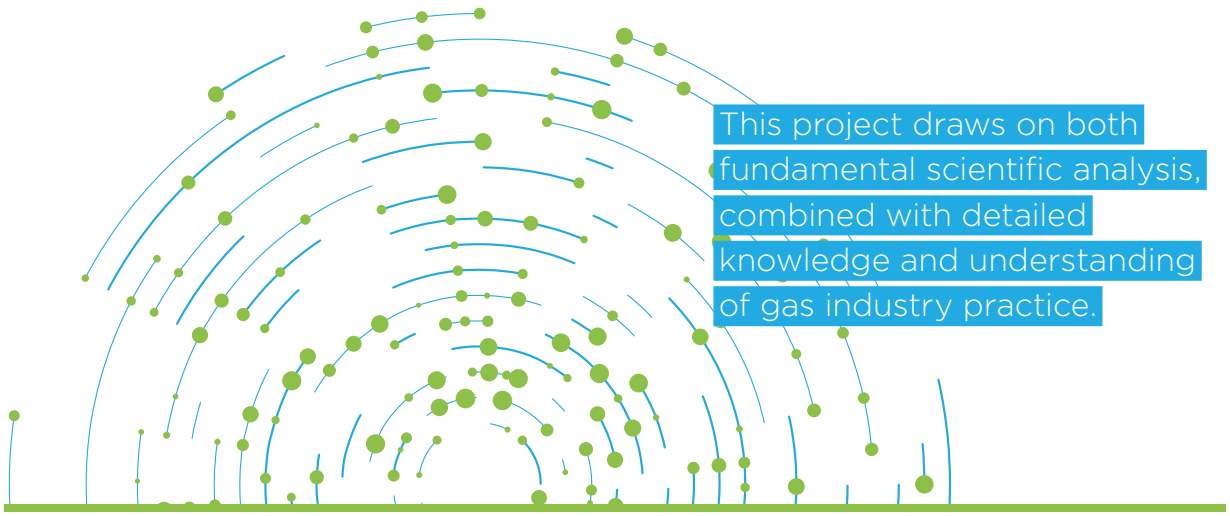
Importance of practitioners and scientists collaborating. This project draws on both fundamental scientific analysis, combined with detailed knowledge and understanding of gas industry practice. HyDeploy has benefited from the combination of skills within the team, particularly the scientific rigour of the Health and Safety Laboratory (HSL) and the experience of KIWA in terms of laboratory and field testing, as well as the operational knowledge from the Gas Distribution Network companies. This collaboration is delivering well-structured and honed work packages, and therefore higher quality evidence.

The time taken to navigate important governance processes in different institutions. Good governance is critical for projects. When different organisations collaborate, it can be challenging to understand and navigate through their different governance processes. Inevitably this places pressures on the programme. Based on this learning, a proactive approach is being taken to anticipate the time taken for such processes later in the programme.

The challenges associated with programmes combining research and engineering delivery. This type of project is grounded in scientific research, but which is delivered through practical deployment. Inevitably therefore the technical detailed necessary to engineer equipment to deliver the required outcome isn't known at the outset. Managing this uncertainty requires good processes to capture evolving information and balance tight definition with flexibility.

10.0 Intellectual property rights

No registrable IPR has arisen during the period.



11.0 Risk management

Effective risk management is critical for successful project delivery. A live risk register has been developed, building on the register formulated for the bid, and is being used as a project management tool.

At the core of this project is the development of a quantitative risk assessment associated with the safe use of hydrogen. This is being carefully collated in a measured and coherent way, and will be finalised as part of the Exemption process itself.

The key project delivery risks at this stage are:

Reliance on participation of householders on site. If householders are not well engaged, they are unable to make informed decision about their participation in the project, particularly the house to house checks. This data forms an important part of the evidence to be submitted to the HSE, and so a higher level of completeness increases the quality of the submission. The risks associated with this area are being mitigated by a well-developed communications plan and close engagement with the University.

The risk of appliance manufacturers not being supportive. A fundamental aspect of this project is to understand the impact of a hydrogen-natural gas blend on the operation of appliances. The appliance manufacturers are key stakeholders in this process, and without their support, delivery of the project would be challenging. To mitigate this, the project partners are engaged both with individual manufacturers, as well as their trade body, the Heating and Hot Water Industries Council, which is part of the Energy Utilities Alliance. Through this process good relationships have been developed and manufacturers are supportive.

The risk of pipeline producers not being supportive. The UK is undergoing an extensive programme of iron mains replacement, resulting in extensive use of polyethylene pipelines. The impact of a hydrogen blend on the pipes, and also on the suitability of jointing techniques is fundamental to the project. To manage this risk, the partners have been engaged with a key supplier who has been very supportive, and is even undertaking tests in their facilities to assist the project.

The risks associated with managing the hydrogen blending levels onto the network. It is critical that the bending unit can deliver the required blending robustly across the range of flow rates on the network, without exceeding the permitted levels. This risk is being managed through clear functional specifications, engagement with suppliers, an extensive tender process and commitment to a detailed design process integrated with expert project review of the design. The final approach will form part of Exemption for further scrutiny.

Business as usual risks. Whilst the project is focused on delivering a blend of natural gas and hydrogen into a UK network for the first time, much many of the activities are ‘business as usual’ for gas networks. It is important to ensure that these practices remain suitable for the blend, but equally it is vital that normal standards of good practice are maintained. To manage this, the project has engaged extensively with operators from Keele and GDNs. This enables good understanding of current practices and ensures that any changes are well designed for implementation.

12.0 Accuracy assurance statement

This report has been prepared in accordance with the Gas Network Innovation Competition Governance Document published by Ofgem. The project has been subject to review and challenge by the Cadent Project Manager and signed off by Damien Hawke, Safety & Network Strategy, who is Project Sponsor for this NIC project.

Damien Hawke has confirmed that the processes in place and steps taken to prepare this Project Progress Report are sufficiently robust, and that the information provided is accurate and complete.

Whilst the project is focused on delivering a blend of natural gas and hydrogen into a UK network for the first time, many of the activities are 'business as usual' for gas networks.

If hydrogen were blended at 20% volume with natural gas across the UK, it would save around 6 million tonnes of carbon dioxide emissions every year, the equivalent of taking 2.5 million cars off the road.

13.0 The project team

HyDeploy is being delivered by the HyDeploy consortium, which has technical expertise and practical experience. The partners are:

Cadent Gas (formerly National Grid Gas Distribution) is leading HyDeploy. They own and operate four of the eight gas distribution networks in the UK, including the West Midlands.

Keele University is hosting HyDeploy on its campus and the University's Materials Department are carrying out research on the impact of hydrogen on materials.

ITM Power manufacture integrated hydrogen energy solutions. They will be supplying the hydrogen production unit for HyDeploy.

Northern Gas Networks is partnered with Cadent to deliver HyDeploy. The project supports their other work exploring the future role of gas. They own and operate the gas network in the North East, Northern Cumbria and much of Yorkshire.

Health & Safety Laboratory is the scientific arm of the Health & Safety Executive. They will be providing the scientific evidence which will support the safety case for the trial.

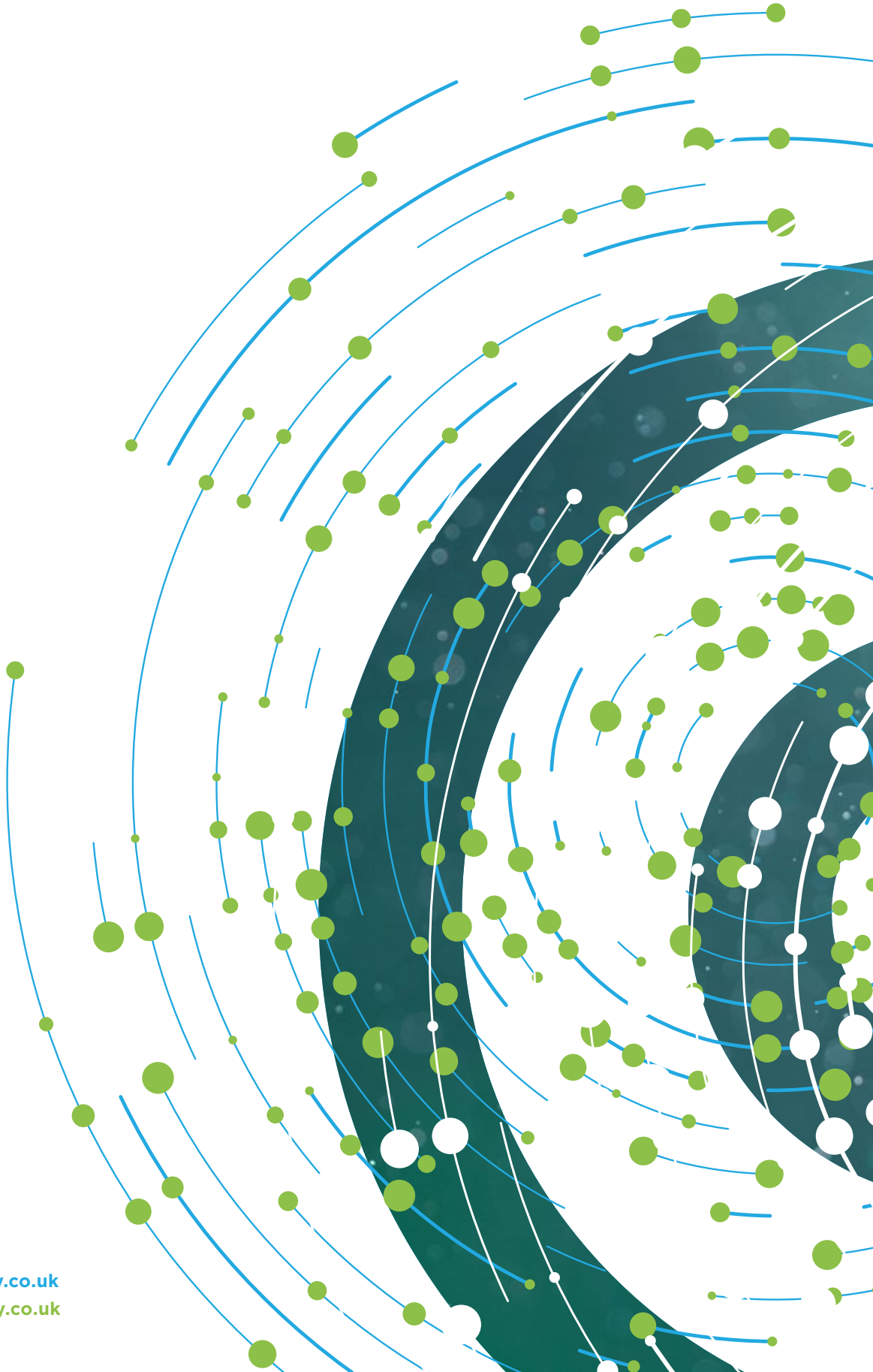
Progressive Energy is an independent UK clean energy company. It will be supporting the management of HyDeploy through development and implementation.

In addition to the core project partners the project is supported by a number of key companies:

Kiwa – whom specialise in gas testing. Kiwa are carrying out offsite testing on a range of common household appliances to inform the project, and will lead the gas safety appliance checks on the campus.

Dave Lander - is an internationally recognised expert in gas quality and safety and is co-ordinating the Exemption application to the HSE.

Otto Simon Limited – are an engineering consultancy and project delivery organisation, responsible for the installation of hydrogen equipment onsite.



HyDeploy

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