Gas Network Innovation Competition 2020 Report and Recommendations

Prepared for
The Gas & Electricity Markets Authority

By

Gas Network Innovation Competition Expert Panel

October 2020

1 Introduction

1.1 This report is prepared by the Gas Network Innovation Competition (NIC) Expert Panel (the Panel) and sets out the Panel's recommendations to the Gas and Electricity Markets Authority on the projects to be funded in the 2020 funding round. The members of the Panel are as follows:

- **Ron Chapman**
- **Miriam Greenwood OBE DL (Chair)**
- **Trisha McAuley OBE**
- **Prof. David Newbery**
- **Sean Sutcliffe**

1.2 We received two submissions, full details of which will be available on the Ofgem website and linked sites. The amounts requested from the Gas NIC are as follows (the value in brackets shows the total cost of the project).

- **H100 Fife – Scottish Gas Networks and Southern Gas Networks (SGN) - £18,101k requested (£27,786k in total)**
- **HyNTS FutureGrid Phase 1 – National Grid Gas Transmission (NGGT) - £9,074k requested (£12,700k in total)**

It should be noted that the amount of NIC funding requested exceeds the annual award amount of £20m.

1.3 The Panel followed the evaluation process set out in the Gas NIC Governance Document version 3.0 (30th June, 2017). The initial submissions were received by Ofgem and were screened for compliance with the requirements set out for the Initial Screening Process. Consultants were not appointed by Ofgem to review the submissions given the benefit of Ofgem's own technical expertise. The Panel met the Network Licensees (NLs) early in the evaluation process to allow the

project teams to present their submissions. Prior to the second bilateral meeting, the Panel sent the NLs a number of questions designed to clarify the submissions and to highlight areas for further explanation or concern. All meetings were held by video conference using Microsoft Teams due to the COVID 19 restrictions.

Following those meetings, the Panel met to review the submissions in the context of the criteria set out in the Governance Document. In evaluating the submissions, the Panel carefully considered all the documents which had been provided and which included, the submissions, their appendices and all the additional information (including the answers to further questions) submitted to Ofgem by the NLs. The Panel also took account of information from the meetings which were held with the NLs and materials provided during those meetings. The Panel, as it is obliged to do, carefully reviewed the project against the NIC Governance criteria.

1.4 This report, which should be read together with the NLs' submissions and the other information published concurrently on the Ofgem website, sets out the results of the Panel's deliberations and its recommendations to the Authority. As such it reflects the considered views of the Panel.

2 Evaluation Criteria

2.1 The Gas NIC Governance Document sets out the criteria which the Panel is required to take into account in the evaluation process. These criteria are:

2.2 (a) Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and /or existing customers.

(b) Provides value for money to gas customers.

(c) Generates knowledge that can be shared amongst all relevant NLs.

(d) Is innovative (i.e. not business as usual) and has an unproven business case where the innovation risk warrants a limited development or demonstration project to demonstrate its effectiveness.

(e) Involvement of other project partners and external funding.

(f) Relevance and timing.

(g) Demonstration of a robust methodology and that the project is ready to implement.

3 Evaluation of the submissions

3.1 H100 Fife – Scottish Gas Networks and Southern Gas Networks (SGN) - £18,101k requested (£27,786k in total)

It is widely recognised that to combat climate change all stakeholders have to play their part, including government, regulatory bodies, the energy industry and its customers. Hydrogen has been identified as a credible energy carrier that can be an important potential component of a net zero UK. Given this and given the relatively short timescales in the context of the changes required, there is an urgent need to evidence the role that hydrogen could play across sectors. While much focus has been on 'bulk hydrogen supply', production and transport, where hydrogen is seen as essential to decarbonisation efforts, assessment of its role in providing low carbon domestic heat has arguably lagged behind.

The UK Government has legally committed to substantial reductions in greenhouse gas emissions in order to achieve net zero by 2050. Decarbonising heat is a key part of the policy that is required to meet these targets. The Scottish Government has set out its ambition to become a net zero economy by 2045 and this includes a new target to reduce emissions by 75% by 2030. The UK Government Department of Business, Energy and Industrial Strategy (BEIS) has stated that heat policy decisions will be made in the first half of the 2020s, widely expected to be in 2023 or 2024. A live demonstration of the role hydrogen can play in delivering low carbon heat to customers has not been evidenced. This is a gap in the knowledge and understanding of future energy systems that needs to be addressed and validated prior to any heat policy decisions on the energy transition.

To date, previous H100 NIA and wider industry hydrogen projects have followed good scientific methods through recognised technology readiness levels. We are now at the critical stage where consumer acceptability has to be

tested and where a credible evidence base of the consumer experience forms a central part of an end-to-end system. H100 Fife is seeking to deliver a 'first of a kind' 100% hydrogen network, supplying around 300 domestic properties initially, via an opt-in process. This number has been determined to ensure statistical representativeness of the project for the UK, particularly the demand profile. H100 Fife will be a purpose-built generation and storage solution, supplying a new distribution network, comprising of fully tested common natural gas components and fittings, laid in parallel to the existing gas network delivering an end-to-end hydrogen system. This method allows the demonstration to be undertaken without derogation from GS(M)R, affording gas customers the ability to refuse to take part in the project, while still enabling informed customer choice. The hydrogen production method proposed for the project is electrolysis with electricity coming from an offshore wind turbine.

Low carbon and /or environmental and financial benefits.

H100 Fife will enable the decarbonisation of 300 homes (an average UK domestic property uses 12,000 kWh of natural gas per year, at 0.184 kg CO_2/kwh), saving 662 t CO_2/annum.

The work proposed in this bid and in Phase 2 of the project will be completed before 2030, Expansion Opportunities 3 and 4 are projected to be complete before 2040. A hydrogen economy in Fife, catalysed by this project, is expected to be fully established in advance of 2045 with half of the rollout of hydrogen to gas customers, around 70,000 customers. in in place by 2040. The successful completion of this full programme would save some 430,000 t of CO_2.

The main financial benefit to customers and the UK taxpayer of H100 Fife is the tangible saving afforded by evolving the gas networks to low carbon energy and thereby avoiding widespread electrification. The estimated cost saving to each customer through the conversion to hydrogen thereby avoiding the costs of

electrification is between £8,000 and £17,000. It has been assumed that by 2030, 1000 customers (in Fife) will have been converted to hydrogen, by 2040, a further 69,000 converted and by 2045 (2050 in the table), the remaining 74,100 would have been converted. This would equate to an NPV of £1.6 bn.

Value for Money.

H100's main value, to gas customers, is in testing consumer acceptability of switching 300 households to 100% hydrogen. It is generally agreed that repurposing the gas network to carry hydrogen is one route to our 2050 climate targets, with electrification the other route. To make an informed decision, evidence is needed on the costs and benefits of each route, and consumer acceptance is clearly key to the feasibility of the hydrogen route. It is agreed that a trial that starts to supply households by 2023 is on the critical pathway to testing the feasibility of the hydrogen route. Other elements such as testing the capability of the NTS to carry hydrogen are undergoing parallel trials. The Panel recognised that the project would also have value to the local area as a regeneration project.

Against the NIC criterion, the Panel has needed to assess whether this project represents value for money for gas customers. In particular, whether this is the most cost effective and feasible way to deliver hydrogen to the 300 households. It has proven difficult to get a sufficiently detailed breakdown of the various elements of the overall project cost to reach any firm conclusion about the cost of producing the hydrogen up to the point of injection into the new gas distribution system. Despite repeated requests from the Panel a clear cost-allocated budget was not provided, with significant costs ascribed to an overarching category. The best the Panel could do, in these circumstances, is make a tentative estimate.

The most recent data supplied by SGN are:

- The costs of providing and servicing the appliances in the homes is £3.2 million or £10,667/household (hh)
- The demonstration building will cost £772,000 or £2,600/hh (of which £12,000 is from SGN)
- The pipeline and storage to deliver hydrogen from source to houses will cost £6,100,000 or £20,000/hh (of which £1.6m comes from Scottish Govt.)
- electrolyser and balancing costs: £8.9 m (of which £4.4 m from Scottish Govt.) or £30,000/hh. The budget includes £4.2 m. for balancing costs (i.e. the extra cost of using mains electricity rather than the wind turbine) but it could be as low as £0.8m.
- "overarching costs" of £8.778m (of which the NIC share is £7.4m) or £29,260/hh. The first three items are presumably necessary for any trial. Some part of the "overarching costs" would appear to be allocable to the first three items. If they are allocated in proportion to the sums above, the first three grossed up add to £14.7m or a little under £49,000/hh. The cost of the hydrogen (the remainder) is then £13.1 m or £44,000/hh. Very broadly, if over the 4 years of operation each household takes 16 MWh/yr (Ofgem's high figure) then the total hydrogen delivered would be 19,200 MWh at an average total cost of nearly £682/MWh. To put this in perspective, natural gas would have a wholesale price of about £18/MWh. The cost of hydrogen produced by Steam Methane Reforming (SMR), with carbon capture, was estimated in the H21 Leeds City Gate report to be £76/MWH.
- At the other extreme, the cost of hydrogen borne by the NIC alone under the most favourable assumptions on commodity balancing costs would be reduced to £2.0 m , or, allocated to the 19,200 MWh, £104/MWh, only 15% as high as the maximum cost estimate of £682/MWh, but still 37% higher than the estimated alternative SMR costs.

Given the information available to the Panel, it was unable to conclude that the project, or least the hydrogen supply, represented value for money for gas customers as defined by the Governance value for money criterion. The cost of

the hydrogen production to the NIC would need to be capped at around £100/MWh to represent value for money to gas customers.

Generates knowledge for the NLs.

If successful, this project will validate the technical, social and operational ability to deliver 100% hydrogen to homes, offering a route for decarbonisation of the gas network. Constructed using materials currently deployed in the natural gas networks today, the H100 Fife Network will demonstrate the role the gas networks can play in the future of heat. With the project programme offering a fully operational system by 2023, vital learning and validation of the hydrogen evidence base will be available to support both Scottish and UK Government decarbonisation policy, including UK Government heat policy decisions.

The primary knowledge generated by this project will be in relation to the customer level introduction and running of hydrogen homes. The project also covers a range of other benefits from the end -to -end aspect of the project. While , in general, these other aspects are likely to bring some additional knowledge, the scope and design of the project, together with the fact that future hydrogen sources are unlikely to rely on a single wind turbine connected to a single electrolyser, mean that these upstream elements are of relatively limited value. Running an entirely green hydrogen system clearly has merit, at least in terms of public awareness and encouragement to policymakers however, the use of a single, aged, turbine and a dedicated electrolyser offers relatively little scope for significant additional learning.

The Panel felt that the project dissemination has been well designed. The project could provide critical evidence for the decarbonisation of heat, but also

detailed validation of the safety and technical aspects specific to network operation.

The Panel was confident that the knowledge generated would be widely shared.

Innovation.

H100 Fife is both technically and commercially innovative. Electrolyser technologies are not new but have never before been used to supply 100% hydrogen for heating. The gas network infrastructure to be constructed as part of H100 Fife will be the world's first 100% hydrogen gas network. Hydrogen boilers and appliances operate in the same way as natural gas equivalents but have not been offered or available to customers before. This project will provide the first test bed for hydrogen appliances and network operation in ordinary occupied houses.

H100 Fife is also innovative at the consumer level. Gas customers have for decades relied upon the gas networks for their heat supply in a low disruption and reliable way. Transitioning to hydrogen potentially enables these benefits to be retained with only the fuel changing and appliances being replaced.

H100 Fife will enable customers to experience hydrogen appliances and the process of conversion in the home. By laying a new network parallel to the existing network, the process of transferring customers to hydrogen will be voluntary and hence less disruptive than transitioning the existing network. As a first trial, this is critical in understanding and learning what is needed to gain consumer acceptability, ensuring a positive customer experience and gaining wider support from customers to convert to hydrogen across the gas networks. The importance of customer acceptance is second only to safety in developing a hydrogen economy; this project will demonstrate both.

This is clearly not business as usual.

Partners and funding.

The Project Partners under H100 Fife are split into the Network Licensees and the Non-Network Licensees who are financially contributing to the project cost. The Network Licensees Partners are Cadent, NGN and WWU who, along with SGN, are contributing £2.5m under this bid. The Scottish Government will commit £7m of the total cost, if the project goes ahead.

The Non-Network Licensees who are also contributing to the project as Partners includes Baxi, Bosch, HyCookers Consortium and HyFires Consortium as the key developers and suppliers of hydrogen appliances under the Hy4Heat programme. The appliance manufacturers have been encouraged to play an active role in the engagement and marketing activities of the Hydrogen Demonstration Facility so that customers will have the ability to meet with appliance experts. Partnerships have been agreed, in principle, with Baxi and Bosch as the hydrogen boiler manufacturers. As part of the Hydrogen Demonstration Facility, each has been offered a show home space in which to complete the interior design. This will gift a space to both manufacturers to demonstrate and market their hydrogen appliances to potential customers of H100 Fife and to their wider clientele , global markets and industry. Both Baxi and Bosch have agreed to dress and design the interior of these spaces at their own cost as a contribution to the project. Partnerships, in principle, with the HyCookers and HyFires consortiums and will be equipping each show home with the relevant hydrogen gas fires and cooking appliances.

Relevance and timing.

Enabling the energy system transition to a hydrogen economy and the realisation of all its benefits to customers, stakeholders and the wider UK economy will require the collaborative completion of the full technical and safety case by the UK gas industry and the successful execution of various demonstrations.

H100 Fife aims to test consumer acceptability of hydrogen in the home and is therefore a key enabler in unlocking the hydrogen economy. Construction of a new hydrogen network , in parallel, with the existing gas network, allows full customer choice and control in this 'first of a kind' trial which if successfully completed, will be the world's very first customer use of 100% hydrogen gas for heating and cooking in the home.

H100 Fife is shovel ready and is a critical step and requirement in the national hydrogen programme and evidence base feeding into heat policy decisions by BEIS anticipated in the mid-2020s. The commencement and success of H100 Fife is therefore time critical in evidencing consumer acceptability of hydrogen in time to provide decarbonisation options for heat policy decisions. The Panel were also persuaded that, although it might have been desirable to find cheaper sources of reliable hydrogen supply, this would have required a completely different project. There were no such alternatives offered that might have allowed a cheaper solution to consumer testing, nor would delaying until one such were prepared by consistent with the critical path needed for the delivering this part of the evidence base.

Methodology.

The Panel was pleased to hear the strength of commitment of SGN to consumer safety and noted the full engagement of the HSE and that a similar approach was

being taken as to the Hy4Heat programme. A derogation from HSE should be in place before any significant commitment of project funds.

The importance of the electrolyser to the security of supply is a major risk. The Panel expects that more detailed contingency plans will be in place before the final decisions on electrolyser choice are made. Another stage gate could be used to ensure this happens before significant funds are committed.

Normally the Panel would expect all regulatory issues to be settled before a project commences. However, hydrogen presents new regulatory challenges and it is important that the long term consequences are properly considered. The Panel accepted that, in this case, a stage gate around the regulatory issues at an early stage in the project would be an acceptable solution.

The project must sign up a representative number of customers to use hydrogen or the project should be stopped.

Initially, the Panel had concerns about the scope of the preparatory local consumer engagement done to date which appeared to be focused on the wider stakeholder base in the Fife area as opposed to paying gas customers. We asked SGN to provide more detailed information on the demographic customer base for H100 and we questioned SGN on the concept of informed consumer choice, given that a large part of the trial sample were consumers living in properties owned by Fife Council. "Engagement" is a two-way dialogue and the initial presentation of the customer engagement plan seemed to overly focus on awareness-raising and a one-way top-down information sharing approach. After requesting, and seeing, a more detailed customer engagement plan, we were satisfied that our concerns had been addressed and we were pleased to note a commitment from SGN to incorporate the learnings of the H21 social science research into the ongoing customer engagement plan.

The concerns we note above regarding the settlement of the regulatory issues will be important for the developing engagement with customers who will have questions around safety, billing and engagement with their energy supplier.

The Gas NIC governance means that projects come fully finalised and the Panel must judge the project as submitted and has no scope to mandate changes to improve acceptability versus the criteria. It would be an improvement if the future Strategic Innovation Fund allowed projects to be examined at an earlier stage so that feedback could be given to bidders to improve their proposals.

Panel Conclusions.

The evidence on the customer acceptance and safety around using hydrogen appliances is needed in time for the BEIS review in the first half of the 2020s. The short timescales imposed by BEIS has meant that options for providing the evidence are limited. The Panel has had to accept that only one option for providing this evidence has come before the Panel and believe that, with more time, a more cost-effective solution could have been identified.

Based on the evidence provided to the Panel, and within the NIC criteria, the project, or at least the hydrogen supply, does not represent value for money for gas customers. However, the Panel recognise the importance of the consumer trials being completed in time for the BEIS review in the first part of the 2020s. The Panel also recognises the potential wider regeneration and creation of a hydrogen hub in the Methil area of Scotland.

The Panel would have been pleased to approve the project if other funds could be found to limit the cost of the hydrogen supply to the NIC to a more competitive level.

3.2 HyNTS FutureGrid Phase 1 – National Grid Gas Transmission (NGGT) - £9,074k requested (£12,700k in total)

Achieving the UK's Net Zero targets will require decarbonisation across the whole energy system. Sectors such as heat are difficult to decarbonise and given the importance of the National Transmission System (NTS) to the UK's current energy supply for heating we need to consider how to reliably and safely deliver low carbon energy to consumers. Existing research suggests hydrogen could be an alternative to natural gas, but there are several knowledge gaps that need addressing which will require physical trials.

The project will involve building a hydrogen test facility from a representative range of decommissioned NTS assets. Flows of hydrogen and natural gas blends (up to 100% hydrogen) will then be tested at NTS pressures, to understand better how hydrogen interacts with the assets. The data gathered will be used to assess the impact that a hydrogen conversion of NTS assets would have. Using a hydrogen test facility that remains separate from the NTS will allow for testing to be undertaken in a controlled environment, with no risk to the safety and reliability of the existing NTS.

The project will build on existing work under the HyNTS programme and increase understanding of the potential impact of hydrogen on the NTS. This learning will inform decisions on how best to decarbonise power and heat and to deliver a safe supply of low-carbon energy to all customers. FutureGrid provides a significant opportunity to increase collaboration across the gas networks, help share learning and increase hydrogen knowledge within the gas industry.

Low carbon and /or environmental and financial benefits.

Hydrogen is beneficial to a whole energy system transformation and FutureGrid is a key enabler for this transformation. In the RIIO-1 period, NGGT gas turbines used methane, taken from the NTS, and produced a total of 2,121,949 tonnes CO_2. An equivalent of 444,726 tonnes CO_2 was also vented. Transporting 100% hydrogen through the NTS could have avoided over 2.5 MT of CO_2 during the RIIO-1 period.

The NTS delivers nearly 900 TWh of energy to Great Britain (including GDNs, industry, power generation and exports) each year, which equates to 165.6 million tonnes of carbon dioxide. If this natural gas were replaced with green hydrogen, generated from renewable energy, all carbon dioxide emissions would be avoided. Similarly, if the natural gas were replaced with blue hydrogen (produced via steam reforming) 153.18 million tonnes of carbon dioxide emissions would be avoided. This assumes a current 92.5% capture, although plants such as Cadent's Low Carbon Hydrogen (LCH) plant are expecting capture rates of 97%, which would improve carbon savings further. Even as the ENA's 'Pathways to Net Zero' report predicts 2050 gas demand to drop to 440 TWh, this still equates to 81 million tonnes of carbon dioxide for 2050.

Currently, the most likely scenario for the first stage of the hydrogen transition and adoption will be at industrial clusters. The NTS could be used to join several clusters together by 2040. To facilitate this, safety critical assets such as valves would need to be replaced for hydrogen operation. Conversely, if the project proves that existing assets are proven to operate safely in hydrogen blends up to 100%, then a proportion of these valves will not need replacing. This would save £47m in NPV. The extent to which hydrogen will be used in the future is currently unclear but if it were to more widely replace methane then re-

purposing the NTS would save customers at least £4bn compared to a new hydrogen transmission system.

The Panel were impressed by the rollout scenarios presented by the team which included several credible alternative uses for the existing NTS.

Value for Money.

The Panel challenged the rates being charged by the specialist consultants DNV-GL and HSE-SD. NGGT provided evidence that the rates were consistent with those used in similar projects and the Panel accepted that they represented fair value for access to unique facilities and expertise.

The Panel was also concerned about the significant levels of resource being employed by NGGT but were reassured that this was designed to ensure that the specialist knowledge being developed was effectively transferred to the relevant technical specialists.

Generates knowledge for the NLs.

NGGT plan to share updates and learning with a wide range of stakeholders through a variety of channels and methods, to cater to a wide-reaching audience and different participation styles. Use will be made of social media, industry specific events, conferences and other fora.

The Panel was confident that the knowledge generated would be widely shared.

Innovation.

There is currently no precedent for converting a high pressure gas transmission system to 100% hydrogen. To do this will require comprehensive testing and trialling of the impacts that hydrogen has on the NTS. There is a clear and compelling need for an offline transmission test facility that provides this capability and helps accelerate the deployment of online trials of hydrogen injection on the NTS. The transmission test facility must be able to replicate a range of conditions and be fully representative of existing assets to provide compelling results. This meets the needs of customers who also have ambitious plans to transition their operations to low-carbon gas alternatives, with hydrogen being a significant option.

This is clearly not business as usual.

Partners and funding.

The FutureGrid project will be based at Spadeadam, alongside the H21 facility and therefore linking a transmission and distribution demonstration system. As Northern Gas Network (NGN) and DNV-GL already partners on H21 delivering the distribution facility, they became natural partners. The NLs have all provided letters of support and will be a key part of future work using the facility to ensure that hydrogen development is not undertaken in silo activities. The HSE-SD are contracted to the project to ensure that the build and testing is representative of the NTS and give us assurance that the data produced can be extrapolated to allow for our future online activities.

Internationally, transmission system operators (TSO) are also progressing hydrogen technologies, with some more advanced than the UK. Fluxys the Belgium TSO has committed to providing in kind data and resource to the

project. Fluxys have taken an academic route to hydrogen development which marries well to the FutureGrid application-based approach.

The project has academic partners who can provide technical insights and maximise the value of the platform through research and teaching our future workforce. Durham and Edinburgh universities are geographically well placed to make the most out of the facility and are partners in the project.

A number of the project partners are making contributions 'in kind'. These are DNV-GL (£380k), NGN (£205k), Fluxys (£1.8m) and Durham University (£100k).

Relevance and timing.

There are challenges to overcome in implementing hydrogen to help meet the UK's Net Zero targets. The Hydrogen Programme Development Group (HPDG) was set up to inform heat policy and needs to build an evidence base that shows whether hydrogen is safe, technically feasible and economically viable. The FutureGrid project satisfies the needs of the HPDG by building an evidence base for these criteria.

In the 'Energy Innovation Needs Assessment' published by BEIS, it is stated that action is needed now if the UK is to be competitive in a hydrogen economy. Therefore, it is imperative that the FutureGrid project, which assesses the UK's ability to transmit hydrogen on a national level, is completed now and is not delayed. BEIS will also be starting to make big decisions on the future of hydrogen, around 2023. The current FutureGrid timeline will enable NGGT to have built an evidence base and to start informing those BEIS decisions.

Methodology.

The FutureGrid project detailed in this submission is Phase 1 of the HyNTS Programme and will test flows of hydrogen/natural gas blends and, for the first time in GB, 100% hydrogen at NTS pressures. The HyNTS FutureGrid programme consists of three key phases and will culminate in an online trial on the NTS. Phase 1 is the basis for future validation work on hydrogen technologies that will enable the use of hydrogen in our current NTS system and will allow collaboration of many key stakeholders. The transmission test facility will connect upstream of the H21 gas distribution system currently under construction. By doing this, it will create a complete beach-to-meter gas network test system for hydrogen. This supports the HPDG ambition for a comprehensive programme of evidence ahead of a UK policy decision on converting the UK gas networks to hydrogen. Phases 2 and 3 will focus on deblending, compression and in-line inspection.

Phase 1 will build a hydrogen test facility at DNV GL Spadeadam. This will be used to test the compatibility and integrity of NTS assets with hydrogen blends up to 100% hydrogen. The results will be used to update the NTS Quantitative Risk Assessment (QRA). The safety case and the NGGT procedures and standards will also be reviewed. This will highlight the procedures and standards affected by a change from natural gas to hydrogen or a hydrogen blend.

The Panel was concerned that any delays in obtaining the appropriate decommissioned assets could be critical. The project team were able to reassure the Panel by demonstrating that most of the assets were already available and that well developed contingency plans were in place for the others.

The team has worked closely with the H21 project and this gives additional credibility to the bid.

Panel Conclusions.

The Panel was impressed by the project and with the team's presentations and the constructive and engaged manner in which they responded to the questions in the bilateral meetings. The project is timely, well thought through, draws on all the previous knowledge and offers a significant step towards an option for decarbonising the UK heat load at lower cost to the customer. It meets all of the evaluation criteria.

4 Recommendations to the Authority

4.1 We set out below our recommendations to the Authority on the funding of the 2020 projects.

4.2 The Panel is unable to recommend that the Authority funds the following project as it does not meet the value for money criterion under the Gas NIC Governance. However, the Panel does recognise the importance of timely consumer trials to the broader hydrogen programme and the Panel would have been happy to approve the project if other funds could be found to limit the cost to the NIC of the hydrogen supply to a more competitive level.

- H100 Fife – Scottish Gas Networks and Southern Gas Networks (SGN) - £18,101k requested (£27,786k in total)

4.3 The Panel recommends that the Authority funds the following project.

- HyNTS FutureGrid Phase 1 – National Grid Gas Transmission (NGGT) - £9,074k requested (£12,700k in total)

The bid that was received was comprehensive, detailed and readable and was clearly cross-referenced to the Gas NIC criteria. The bid team presented their project in a well thought through, dynamic and enthusiastic manner.

4.4 The Panel wish to note that given the commencement of a new RIIO price control in 2021 (except for ED), 2020 is the final year of the Gas NIC as it is currently structured. It is also possible that there will be a time gap between the final Gas NIC project(s) and innovation funding under RIIO 2. The Panel would urge that this time period be kept as short as possible or that interim measures be considered to minimise what may well be a critical 2-3 years in the continued development of innovative projects e.g. those relating to hydrogen.

As this is the final year of the competition it is appropriate for the Panel to reflect on the achievements and on some of the lessons learned since 2013.

When the Gas NIC was established, it was very much in the shadow of the Electricity and Low Carbon Networks. Over the last 7 years, a substantial body of innovative work has been funded and , in particular , with the aim of proving out hydrogen as means of decarbonising the heat network which has the potential to contribute significantly to the achievement of carbon net zero in the UK by 2050. Year by year projects have been funded that have built on the knowledge of prior years' projects.

The Panel would like to thank and compliment the innovation teams, both successful and unsuccessful, for their contributions to the success of the Gas NIC Competition. Our thanks also go to Ofgem for their continued and valuable support.

Incentivising and funding innovation is key to meeting the challenges of transitioning to a cost-effective Net zero by 2050. The Panel are proud to have been associated, in some part, with its delivery.