Strategic Innovation Fund (SIF)

2021 Round 1 Innovation Challenges – Discovery Phase

Expert Assessors' Recommendations Report

(unsuccessful projects redacted)

Contents

1. Introduction

Innovation will play a crucial role in delivering best value to energy consumers. Innovation will prepare the regulated energy network companies to deliver Net-Zero greenhouse gas emissions at lowest cost to consumers, while maintaining world-class levels of system reliability and customer service, and ensuring no consumer is left behind.

The Strategic Innovation Fund (SIF) has been introduced within the RIIO-2 price control for the Electricity System Operator, Electricity Transmission, Gas Transmission and Gas Distribution sectors and is open to the following network licence holders:

- Scottish Hydro Electric (SHE) Transmission Plc
- SP Transmission Plc (SPT)
- National Grid Electricity Transmission Plc (NGET)
- National Grid Electricity System Operator Limited (NGESO)
- National Grid Gas Plc (NGGT)
- Scotland Gas Networks Plc and Southern Gas Networks Plc (SGN)
- Northern Gas Networks Limited (NGN)
- Cadent Gas Limited (Cadent)
- Wales & West Utilities Limited (WWU)

The SIF seeks to support energy network innovation that contributes to the achievement of Net-Zero, while delivering real net benefits to network consumers. It is delivered in partnership with Innovate UK (part of UKRI), who will work with other funders of innovation so that activities appropriately funded by network consumers are coordinated with activities delivered through other funding providers. Specifically, Ofgem has appointed Innovate UK as an innovation partner in respect of the end to end process of delivering the SIF programme, including designing and running the competitive funding calls that generate the Project ideas to be funded and delivery of a transparent, consistent and proportionate assessment process (as detailed in section 3) of the ideas against the SIF Eligibility Criteria, leading to the preparation of this Recommendation Report.

All projects must meet the requirements of the SIF Governance Document.

In the published version of this report, some data presented will be redacted to protect the interests of projects that are not recommended for funding. For example, publication of unfunded proposals may prevent applicants from advancing their ideas independently and may threaten innovator's intellectual property rights. Unsuccessful applicants in this round of SIF may be able to resubmit their Project idea in future rounds of SIF.

2. Innovation Challenge Requirements

4 Innovation Challenges were launched in August 2021, namely, Whole system integration, Data and digitalisation, Heat, and Zero emission transport. The Challenges were opened to Discovery Phase Applications on 31st August 2021.

The Innovation Challenges were developed in collaboration with the networks and key stakeholders in network innovation and are based on a strategic need to achieve the multi-vector transition to Net-Zero across power, heat and transport. The Application process was designed, managed and delivered by Innovate UK using their Innovation Funding Service[1] (IFS) platform. Each of the eligible networks were required to submit their Project proposal by responding to 10 Application questions in IFS to demonstrate how their proposal met the overall SIF criteria as set out in Box 1, as well as the Innovation Challenge specific scope criteria as detailed in sections 4.1, 5.1, 6.1 and 7.1.

Box 1

The aims of the Innovation Challenges are to:

- decarbonise gas and electric energy distribution and transmission networks and benefit the consumer
- improve coordination between networks and other system participants
- reduce duplication and excessive variation of products, processes, or services
- reduce complexity, bureaucracy, and barriers to entry
- improve coordination of emerging innovations across networks, generators, market participants, investors, local & national policy makers, consumers, and other key stakeholders
- understand consumers' preferences to inform future market designs which will help to optimise across networks and infrastructures

Projects submitted to the funding calls must address the overarching requirements of the Strategic Innovation Fund (SIF), as stipulated in the SIF Governance Document. Proposals must focus on network innovation that can be deployed or applied to benefit GB energy networks' infrastructure, network consumers, operation, and utilisation, and take a novel approach to infrastructure investment.

Applicants must demonstrate that projects deliver a net benefit to network consumers through:

- energy bill cost reductions
- carbon emission reduction
- access to revenues for users of energy network services; and
- introduction of products, process and services that are new to the GB energy market

Projects must address:

- users and their context
- constraints affecting the problem or wider context
- opportunities for improvement
- environmental impacts

Project must start by 1 March 2022, end by 30 April 2022 and not request funding of more than £150,000, exclusive of VAT.

[1] The Innovation Funding Service is Innovate UK's web service used by networks to submit applications, and by Innovate UK to manage reporting and project delivery.

3. Assessment Process

For the Discovery Phase there is a maximum of 5 stages to assess eligible submitted Applications:

- Initial sift - completed by Innovate UK to confirm whether or not the Application complies with the funding call's (Innovation Challenge) requirements (detailed in the relevant sections of 4.1, 5.1, 6.1 and 7.1).

- Expert Assessor evaluation – Questions 2-9 of each assessed Application and the accompanying appendices (within the word count) is assessed by a minimum of five Expert Assessors. The mean score from all Expert Assessors is presented per Application question, per Project, within the Recommendation Report (this document) along with any comments made and a discussion of any outlier scores. This forms part of a qualitative assessment of how the Project meets the Eligibility Criteria set out in the SIF Governance Document, the methodology of which is detailed in section 3.2. Additionally, each Expert Assessor indicates whether they recommend that the Discovery Phase Project be funded or not.

- Expert Assessors' overall recommendation – This is made based on the count of recommended scores by the Expert Assessors, the average score achieved, and any outstanding feedback which highlights a serious risk or opportunity to funding a proposal. Typically, assessments which have a strong majority of Expert Assessors supporting it for funding will be recommended. The mean Expert Assessor scores achieved will also be taken into account and any specific feedback which make a strong and substantiated case for why the proposal should, or should not, be funded. Within the Recommendation Report (this document), a summary of the justification for the recommendation will be presented per Project along with any recommendations for any Project Project specific conditions to be imposed in the Project Direction. Sections 8 and 9 summarise which projects have and have not been recommended for funding in the 2021 round of Application.

- Clarification questions and discretionary interview – Ofgem, IUK and expert assessors reserve right to raise clarification questions about a Project or hold an online panel interview with applicants to aid evaluation against the Eligibility Criteria. If this is required, the results will be included as an Annex to the Recommendation Report.

- Recommended Project Project specific conditions – These are areas which assessors indicated that their recommendation for funding was requisite on information clarifications, slight adjustments to scope, or other extenuating circumstances. In many cases these conditions have been offered as ways of strengthening the proposal and project outcomes. They do not necessarily reflect a weakness in the application and should be viewed as opportunities to improve outcomes and the likelihood of success in future Phases.

- Final decision – is made by Ofgem after considering the Recommendation Report (this document).

3.1 Expert Assessors

Innovate UK has appointed Expert Assessors who collectively have knowledge, expertise and are able to demonstrate capability in more than one of the following areas: energy sector, energy network, energy regulatory and policy, challenge focused technical and engineering, cross-sectors, financial and commercial. Capabilities are verified through the provision of professional CVs which have been independently assessed by 3 representatives from the Innovate UK SIF Team as meeting the minimum required standards to be considered as an Expert Assessor.

Each Expert Assessor has undergone training on the SIF assessment process to ensure quality and consistency of the delivery of the assessment process. All Expert Assessors have confirmed that they have no conflicts of interest for each Application they have assessed. Expert Assessors are assigned to Applications for which they have the most relevant experience.

3.2 Meeting the SIF Eligibility Criteria

As required by the SIF Governance document, projects submitted must meet the Eligibility Criteria in order to receive SIF Funding. There are 8 specific Eligibility Criteria that the projects must evidence in their Applications and the assessors check the Applications for compatibility with the criteria. The overall funding recommendation presented in this report is based upon a balance of considerations taking in to account whether a Project has meet each of the SIF Eligibility Criteria, the mean score achieved for each of the Application questions, and consideration of other comments made by the Expert Assessors.

The following table outlines how the IFS Application (competition) questions and process corelate to the 8 Eligibility Criteria and how the requirements are met through the assessment process. Excerpts of the relevant competition questions are referenced. The full Application questions are available on the Ofgem website.

It should be noted that two of the SIF Elligibility Criterion are assessed against applicants response to a single question, the Project Summary.These are;

- Eligibility Criterion 3. Projects must involve network innovation &,
- Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

This is indicated in the application feedback summary tables outlined in this document, ahead of the Project Summary feeback for each application.

SIF Eligibility Criterion	**Discovery Round 1 Application requirement**	**Assessment for meeting requirement**
1. Projects must address the Innovation Challenge set by Ofgem.	Question 4. The big idea How does the networks proposal address the aims described in the competition scope?	Mean Expert Assessor score of 5 or more The proposed Project meets the scope of the competition.
2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).	Question 6. Impacts and benefits How will the networks idea deliver benefits to consumers?	Mean Expert Assessor score of 5 or more The applicant has given some description of benefits supported by referenced evidence, prior learning, and/or a credible explanation of how benefits might be realised.
3. Projects must involve network innovation.	Scope The networks proposal must: focus on network innovation that can be deployed or applied to benefit GB energy networks' infrastructure, network consumers, operation, and utilisation Question 3. Project summary	IUK initial sift Application focuses on network innovation.

	The networks are to provide a short summary of their Project. As well as describe or explain: how it meets the scope of the competition	Mean Expert Assessor score of 5 or more The proposed Project meets the scope of the competition.
4. Projects must not undermine the development of competitive markets.	Question 8. Route to market If the networks idea becomes viable after the Beta Phase of the Project, they must describe how they will enable procurement and utilisation of the innovation across the UK and internationally?	Mean Expert Assessor score of 5 or more The route to business as usual deployment is described but the value proposition to networks or other key stakeholders is unclear. There is some information about how profit, productivity or growth increases may be achieved at some point and the impact on competitive markets.
5. Projects must be innovative, novel and/or risky.	Question 5. Innovation justification The networks must clearly demonstrate how their idea is truly innovative and should not be funded elsewhere within the price control or considered as part of business-as-usual activities.	Mean Expert Assessor score of 5 or more The applicant has presented a reasonable, but incomplete knowledge of similar innovations. Justification of why SIF is the most appropriate avenue for funding has been given.
6. Projects must include participation from a range of stakeholders.	Who can apply? To lead a Project, the applicant must: Partner with at least one/ work with … (requirements vary between Innovation Challenges) Question 3. Project summary The network must provide a short summary of their Project, including • the experience and capability of each Project Partner or subcontractor to deliver their part of the Project • and why each Project Partner is best placed to develop the idea further	IUK initial sift The Application meet the partnership/ collaboration requirements of the competition. Mean Expert Assessor score of 5 or more The proposed Project meets the scope of the competition.
7. Projects must provide value for money and be costed competitively.	Question 9. Costs and value for money How much will the Project cost and how does it represent value for money for the consumer?	Mean Expert Assessor score of 5 or more The Project costs seem ok but the justifications are not clear. The balance of costs between Project Partners and assets is acceptable. Little information is offered about alternative approaches and the value for money this Project offers.
8. Projects must be well thought through and	Question 7. Project plan and milestones	Mean Expert Assessor score of 5 or more

have a robust methodology so that they are capable of progressing in a timely manner.	What is the networks Project plan? What are their milestones? An outline of Project approach must: • describe the main work packages of the Project for Phase 1, indicating the lead resource or subcontractor (where appropriate) assigned to each plus the relevant success criteria	All elements of the answer have been completed but some lack clarity. The plan, milestones, and risk register can mostly be followed but are inconsistent or unclear.

4. SIF 2021 Round 1 Discovery Phase – Whole System Integration

Achieving a Net-Zero economy by 2050 is a system transformation challenge consequent upon Government's Net-Zero strategy. As recently highlighted by the Council for Science and Technology, clearer understanding of the entirety of the system will enable the identification of multiple intervention points required to achieve this goal.

The energy system is made up of a complex range of activity across networks, markets, supply, and demand. A range of organisations play crucial roles in managing different parts of this system. Working across traditional boundaries can create opportunities for better integration of services to consumers, who typically experience the system as a whole. Innovative whole system solutions are required to optimise the system, reducing costs whilst enhancing the experience of consumers.

Taking a whole system approach to innovation means considering the full range of opportunities, risks, and interdependencies that exist across the full energy system to integrate and optimise them in a way that best serves the consumer. This can deliver greater benefits around cost, emissions, and services to consumers, whilst also maximising economic growth.

Networks can maximise outcomes by working collaboratively with each other and with a wide variety of system stakeholders to develop innovations that supports whole system approaches across energy supply, demand, markets and networks. Working in this way will enable new products, services, and processes to emerge and ensure satisfaction for a wide range of consumers.

This section covers the requirements and assessment of eligible Applications received into the Whole System Integration Innovation Challenge.

4.1 SIF 2021 Round 1 Discovery Phase – Whole System Integration – Scope

Project scope was described in the Innovation Challenge brief for the Whole System Integration Challenge as;

"To lead a Project, applicants must:

- be a licenced: gas distribution network, electricity/ gas transmission network operator, or electricity system operator
- work with at least one other energy network licensee holding a different category of network licence, for example: a gas transporter, electricity system operator, electricity transmission, electricity distribution or other energy network licensed company
- work with at least one generator, energy supplier, or consumer group.

Applications should consider all the points listed here, but as a minimum must directly address at least two as the primary focus of the proposed Project:

- current and future needs for energy provision for heat, power, and transport
- coordinating energy transmission, distribution and system operation across gas and electricity
- complementary and competing priorities between local, national, and international energy systems
- evaluating the costs and opportunities of repurposing or decommissioning existing infrastructure or assets
- assessment of the costs of potential energy demand reduction activities against alternative interventions

- utilisation of data and development of new approaches which harness greater value from data across organisations
- future policy and regulatory conditions as well as market designs, which support whole systems approaches for example integrated network planning and whole system operation

Projects should also consider as a primary focus, novel approaches to infrastructure investment, such as:

- maximising efficiency in large-scale network and system investments by taking a systems view across generation and demand side changes linked to decarbonisation
- coordinating approaches to siting assets to deliver more efficient capital investment on the system
- determining the economic investment required for network resilience and reliability through and beyond the transition."

4.2 SIF 2021 Round 1 Discovery Phase – Whole System Integration – Proposals

19 proposals were submitted to Innovate UK through the Innovation Funding Service (IFS) portal by the closing deadline of 11am 17th November 2021, of which 15 were deemed eligible for the Whole System Integration Innovation Challenge as per the scope outlined in section 4.1. The remaining 4 Applications were deemed ineligible for the following reason: projects not led by an eligible licensed distribution or transmission network. All projects submitted by an eligible licensed distribution or transmission network have been assessed by the Expert Assessors and are listed below.

Project ref	Project name	Funding licensee	Total eligible costs (£)	Total Project contribution (£)	Total SIF Funding requested (£)
10020383	Network-DC	SHE	150,588	8,300	142,288
10023216	Green Hydrogen Injection into the NTS	NGGT	114,652	0	114,652
10023632	HyNTS Compression	NGGT	155,332	8,673	146,659
10024392	Nuclear Net-Zero Opportunities (N-NZO)	NGGT	116,430	8,936	107,494
10024879	INCENTIVE - Innovative Control and Energy Storage for Ancillary Services in Offshore Wind	SHE	136,002	15,000	121,002
[REDACTED]					
10025653	Asset Reuse and Recovery Collaboration (ARRC)	SPT	99,279	23,316	75,963
10025660	Fast Flex	SPT	129,907	17,686	112,221
10027180	Crowdflex: Discovery	NGESO	206,830	136,773	70,057
[REDACTED]					

10027292	Excess gas turbine energy generation	NGN	141,902	7,741	134,161
10027503	SEGIL - Sustainable Electrical Gas Insulated Lines	NGET	133,814	0	133,814
[REDACTED]					
[REDACTED]					
10027601	SCADENT - SuperConductor Applications for Dense Energy Transmission	NGET	148,440	0	148,437

4.3 Evaluation of Whole Systems Integration submissions

4.3.1 10020383, Network-DC, Initial Net Funding Required £142,288

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Scottish Hydro Electric Transmission Plc	£124,300.01	£0.00	£124,300.01
National Grid Electricity System Operator Limited	£4,910.00	£0.00	£4,910.00
Renewable UK Association	£3,750.00	£3,750.00	£0.00
The Carbon Trust	£4,200.00	£0.00	£4,200.00
Transmission Investment Services Limited	£4,800.00	£0.00	£4,800.00
National Grid Interconnector Holdings Limited	£4,550.00	£4,550.00	£0.00
The University of Edinburgh	£4,077.86	£0.00	£4,077.86

Submitted Project description

To combat climate change, the UK needs clean energy. The UK is very well positioned to generate clean electricity because our coasts provide a large potential for offshore wind. The UK currently has an installed offshore wind capacity of 12GW and is targeting increasing the total capacity to 40GW by 2030. Given the scale of the developments proposed and their increasing distance from the onshore grid, the most efficient option is to connect these to the network using Direct Current (DC) cables. The electricity used by the consumer is alternating current (AC) and there is a need to convert the DC to AC at a convertor station, usually positioned on the coast and connected point-to-point to the wind farm via an offshore cable. The current method of connection is to connect each wind farm to an AC convertor station with an AC circuit breaker to protect the electricity grid from faults. However, as the number of wind farms increases, the number of AC convertor stations also increases in a point-to-point system. This has impacts on coastal communities through ever increasing number of convertor stations and cables. It is also costly to install and maintain many convertor stations, which will increase the cost of electricity to consumers.

The big idea is to create DC networks that can connect multiple wind farms into a DC substation, that then can connect to fewer convertor stations. This will reduce the impact on coastal communities, reduce costs and has the potential to deliver lower cost wind energy to consumers. It will also help us open new areas for developing windfarms. To do this we need to

use DC circuit breakers (DCCB), which are an innovative technology that is untested in the UK and European market. DCCB will allow us to bring multiple windfarms into a DC system, containing the impact of any single failure safely and securely. We will need to develop and test these DCCBs before we can develop a DC network. This Project will test and prove the use of DC breakers so that we can implement our big idea of DC networks that can deliver safe, reliable, and cost-effective energy to the consumer.		
Problem and opportunity	**Mean Expert Assessors' score**	8.4
Assessors acknowledged that the Problem has been well articulated. There is a good case made for significant carbon and cost savings to be achieved. Overall the use of DC networks to improve the efficiency of integrating offshore wind in to the electricity system at scale was viewed to have the potential to deliver considerable benefits.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	7.0
The Project has been assessed and complies with the Whole System Integration challenge requirements. The idea has been viewed as being ambitious with potential for considerable positive outcomes. Assessors observed that there has been similar work carried out in previous years considering the use of DC Circuit Breakers. The Project could deliver good additionality to this work by leading coordinating activities between the relevant industry Project Partners. Particularly in developing standards, a code of practice, and stimulating creation of a functioning market. Consideration of IP access, and (in later phases) equipment design with manufacturers should be made.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	6.4
The Application gives reasonable justification of achieving considerable cost savings by avoided investment in network assets to facilitate connecting offshore wind farms. A reasonable qualitative justification was given that this will achieve environmental benefits by improving the economic case for a low carbon electricity generation source. Higher scores may have been achieved with an estimation of the job creation, regional service, and improved resilience benefits. A fuller economic analysis of benefits should be developed in later phases, but this should draw from previous work conducted by industry rather than duplicating existing work.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.0
There is appreciable network innovation involved in the Project with regards to the focus on DC connections and equipment to improve the integration of offshore wind to the electricity transmission network. A diverse stakeholder team is described with linkages to the Project workplan. There has been some concerns raised that the Project should have representation from DC Circuit Breaker (DCCB) equipment manufacturers. A Partner from this industry should be brought into the Project in later stages to focus of the specification and design of equipment. The representation of Project Partners and stakeholders is however reasonable for the delivery of the Discovery Phase. The Project summary is very good. It could have better articulated the needs of the full range of users and should avoid duplicating past work carried out by NGET, the ESO, Ofgem and in other industry reports.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.4
The route to market including regulatory and standards changes are reasonably well explained. The dissemination of information and learning, and how this will be incorporated into BAU is also well explained. The Project Partner information is supplied and appropriate for the ongoing developments. Some further information on the future investment is needed, particularly for third		

party suppliers it would be beneficial to better establish the value of and route to the market. The development of standards and specifications for DCCB appears to be valuable. No assessors raised concerns regarding the Project undermining competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	7.4
Applicants intent is high risk for a risk adverse industry, with potential for substantial UK end-user, government, industry and environmental gains. Any strategic necessity for a European hardware source is not referenced, and some further description of how the learnings from parallel international studies would be incorporated in to the Project could have been given. The existing supply chain will not respond unless there is clear support and this Project could provide a way forward. Whilst there is focus on UK market requirements exploitation should be global.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	6.8
The Project team is appropriate for task and available timescale. There is good transparency on key staff and associated costs. Considering the potential considerable benefits of the Project, this appears to offer good value for money. More information could be provided to justify the full costs outside of the main subcontractor. A counter factual presenting the opportunity cost of not doing the Project, or delivering alternative options would have improved the assessment of value for money. There has been an additional contribution to the Project outside of the core SIF costs.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.6
The Project plan is realistic and well explained. Clear milestones have been identified and the delivery is clear. The risks are appropriate for this Project and the mitigations are appropriate and ongoing. The responsibilities are identified at a high level. The Project is likely to deliver based on this planning. It was noted by assessors that the time allocated to the production of a Vendor Specification looks ambitious, and should be managed closely. In general, given the size of the Project team, extremely effective Project management will be required to coordinate the work and keep to programme.		
Regulatory barriers	**Yes/ No**	No
No immediate regulatory barriers have been identified which are going to block the progress of the Discovery Phase of this Project. Longer term, there is work ongoing that may relate to this including energy network planning reviews, and operational requirements of Offshore Transmission Operators (OFTOs). Dissemination of learning and up to date knowledge of these pieces of work should be shown by the Project team.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
Overall assessors have viewed this Application positively. It is viewed as an important area of focus which merits consideration. The Problem is well described and there are considerable economic, environmental and cost benefits that could be achieved through successful delivery. The approach to planning and delivery is good. The main concern highlighted is that this should build on previous work nationally and internationally. There needs to be some refinement of the core focus of the Project to progress into the Alpha Phase, for instance whether a technical design for a DC interrupter or economic benefits of a Direct Current Circuit Breaker implementation as part of a DC mesh network is the target outcome. It has been viewed that the greatest benefit could be achieved by coordinating common specifications, developing standards, and creating a market for these solutions. Equipment manufacturers should be brought in to contribute directly in the Project in future phases.		

This is a valuable Project to pursue, which is appropriate to be funded through the SIF and which is not covered by other existing regulatory funding mechanisms or programmes. It does however need to explain in fuller detail how the outcomes will ultimately transition directly to a BAU rollout, rather than simply require further ongoing investigation beyond the Beta Phase.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

Condition 4
As part of its end of Project Phase report, the Funding Party must set out a clear plan of engagement for Alpha Phase with one or more DC Circuit Breaker equipment manufacturers. Additionally, the Funding Party must also evidence, in its end of Project Phase report, consideration for the role of a DC Circuit Breaker equipment manufacturer in the Project.

Condition 5
As part of its end of Project Phase report, the Funding Party must document a refined Project focus, showcasing how the Project will build on previous work completed internationally and nationally and what the Project's target outcome is.

4.3.2 10023216, Green Hydrogen Injection into the NTS, Initial Net Funding Required £114,652

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Gas Plc	£12,230.00	£0.00	£12,230.00
CNG Services Ltd	£48,123.82	£0.00	£48,123.82
Element Energy Ltd	£45,327.50	£0.00	£45,327.50
Centrica Plc	£4,800.00	£0.00	£4,800.00
Scottish and Southern Energy Power Distribution Limited	£4,170.00	£0.00	£4,170.00

Submitted Project description

This Project aims to establish a technical regime for injection of Green Hydrogen (made by electrolysis using renewable electricity) into the National Transmission System (NTS), displacing fossil gas. This process is a key 'whole system' development that reduces carbon emissions and helps on the journey to Net-Zero.

At present, there is no regime for injection of Hydrogen because of the specification allowed by Gas Safety Management Regulation (0.1%). Blending Hydrogen into the NTS avoids issues associated with calorific value that apply for Hydrogen injected into the gas distribution network

The team consists of CNG Services, National Grid Gas (NGG), Element Energy, Centrica and Scottish and Southern Electricity Networks (SSEN). The Project Partners have a wealth of experience relevant to Hydrogen injection into the NTS and the Project will be focused on three key workstreams:

1. To establish a technical regime for green Hydrogen injection into the NTS. This builds upon experience gained from the biomethane industry including the EMIB (Energy

Market Issues for Biomethane Projects) deliverables from 2012 and the Somerset Farm Biomethane NTS Project as part of NGG's CLoCC (Customer Low Cost Connection Innovation) Project.

2. Whole system integration- Develop models of potential system configurations, including RES-H2 (where RES is wind, solar and batteries) and Grid-H2. The Project will review an NTS feeder close to the SSEN electricity transmission grid in Scotland to establish scenarios of constrained and abundant electricity being converted into Hydrogen and blended in the NTS.

3. Review of the economics of green Hydrogen production and injection into the NTS to inform the development of appropriate financial incentives. The team will utilise their experience of modelling the costs of hydrogen production via electrolysis using electricity from directly connected renewables, as well as systems using grid electricity, including the availability of curtailed wind.

The initial pilot should help establish the technical regime and give confidence to the HSE and stakeholders that blending Green Hydrogen into the NTS is both feasible and deliverable. The Project will stimulate growth, so that further projects can be installed as business as usual, and will support balancing green Hydrogen, injected to supply a number of “difficult to electrify” industrial customers.

Once a number of projects are up and running, the whole system benefit will be realised, improving utilisation of excess electricity resulting from the successful offshore wind programme.

Problem and opportunity	**Mean Expert Assessors’ score**	8.4

The Problem relating to the lack of a technical regime for green Hydrogen injection into the NTS has been clearly articulated. The importance of the challenge and the positive outcomes that could be achieved by addressing it have been summarised concisely, and include meeting government net-zero targets and serving "hard-to-electrify" industrial consumers.

With regard to hydrogen innovation projects, the technical developments and innovations need to fit in to an over-arching whole system framework. This Project addresses the need for such a framework and the proposition here could be a critical piece of work. The applicants could have better articulated the end user benefits that might be realised

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors’ Score**	7.2

Broadly, Assessors consider that this idea is well described and aligns with the competition scope. It is clear that it involves network innovation and could lead to increased green hydrogen blends in the gas network. Additionally, it was viewed that this could help to inform other future hydrogen network decisions.

Some assessors noted that the applicant has described the expected outcomes and their benefit to supply-side organisations, but that the value to end-users/consumers has not been well defined. And additionally, others recognised that it could have been more ambitious given the capabilities of the Project consortia.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & Benefits	**Mean Expert Assessors’ score**	6.6

The applicant has clearly explained a range of potential benefits of blending H2 into the NTS. The applicant has considered a good range of positive impacts focussed primarily on carbon savings. The proposal focuses on the benefits at this system level and could do a better job of articulating the benefits to end consumers. Furthermore, although the proposed benefits are considerable there needs to be consideration of how a successful Project would further progress to full decarbonisation of the gas grid, in order to make the solution commensurate with Net-Zero

national and local policies. The financial benefits (or disbenefits) realised to the end user are lacking and should be improved upon if successful.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.8
The Project has been clearly explained based on 3 well-described workstreams and is clearly focussed on network innovation, namely injection of green hydrogen in to the gas transmission network. A wide range of suitable stakeholders have been described, including how they will interface with the Project. The skills appendix and video provide a clear explanation of the role each Project Partner would play in the wider Project and the Project summary and postcard outline the expected short and longer-term outcomes of the follow-on phases of the proposed Project. There were some questions raised about the timing of the Project, and whether delivering the Project now was in line with the evidence needs for BEIS and Ofgem policy decisions.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.6
The applicant has provided a clear description of the approach to ensuring the proposed solution becomes business as usual within their network and across the other networks. Route to market is well considered, with a vision for the progression through Alpha and Beta Phase Projects and pull through to implementation in the gas grid. Downstream benefits for various stakeholders are described, including informing future BEIS/ Ofgem considerations which mitigates any risks to the disruption of competitive markets, as they will be the gatekeepers to policy decisions.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	7.2
Assessors had split opinions on how innovative the Project was in comparison to past projects conducted in the UK and Germany. It was assessed that this was a significant Problem that needs addressing but could have been made more ambitious and far-reaching. However, the applicant's had sufficiently summarised why the Project is suitable for SIF funding, although this could have been done in a more compelling way rather than mainly focussing on the reasons it cannot be considered a business-as-usual activity within the price control framework. The Project could look at addressing some of the other issues to H2 deployment at scale in conjunction with injection, to take a more innovative whole systems perspective.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.2
The estimated costs were assessed to be appropriate for the work described by all assessors. The applicant has outlined concessions Project Partners have offered in terms of rates and the potential value to the environment and government targets as value for money arguments. Some assessors observed the response would have been strengthened with an indication of the value to consumers (such as energy bill reductions), and more granular breakdowns of cost profiles.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.2
Most assessors have indicated that the Project plan is well set out with a clear Project plan work packages, timeframes and risk register. Several highlighted slight areas of concern. These included that some smaller activities were missing bars in the Project plan, that there was a lack of explanation of why cost forecasts are expected to be consistent at the same level throughout the Project, and that the risk register could have been more detailed. However, on the whole assessors indicated a good response had been provided which is sufficient for successful delivery in a Discovery Phase.		
Regulatory barriers	**Yes/ No**	No

The applicants did not flag any regulatory barriers, despite earlier making a case that the Project would produce evidence to be provided to Ofgem and BEIS for regulatory policy consideration. Both Ofgem and BEIS should be treated as priority stakeholders within this Project and the appropriate teams engaged closely to demonstrate how the learnings differentiate and build upon previous and concurrently run H2 integration projects.
Recommendation to the Gas & Electricity Markets Authority **FUND**
Assessors identified that the Problem to be addressed has been well articulated and a reasonable articulation of how significant environmental and system benefits could be achieved through the delivery of the Project. It was broadly recognised that the proposed Project team was strong, but that the proposal conveyed limited enthusiasm and could aim to be more ambitious, perhaps by investigating how benefits will be realised to the end consumers and consumers of the network. Some concerns were raised about the Project presuming that the priority use of green hydrogen should be for blending in to the National Transmission System. A more holistic Project could provide a balanced evaluation of whether the economics of future hydrogen should prioritise alternative Applications of hydrogen. One Expert Assessor questioned whether the Project was timely to feed in to policy decisions to be made by Government and Ofgem, however it is considered that a Discovery Phase could develop a roadmap which better informs how evidence can be presented at appropriate times over the coming years. For this reason, it is important that the Project delivery engages closely with Ofgem as a key stakeholder. The Project should ensure that it is not duplicating and complements upon evidence presented through the BEIS Hydrogen Business Models consultation, as well as building past work completed by IGEM on gas quality and blending.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Phase Report, the Funding Party must evidence review of the work completed by IGEM on gas quality and blending and the evidence presented through the BEIS Hydrogen Business Models consultation. Condition 4 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

4.3.3 10023632, HyNTS Compression, Initial Net Funding Required £146,659

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Gas Plc	£38,389.00	£0.00	£38,389.00
Siemens Power Generation Ltd	£57,825.00	£8,673.75	£49,151.25
DNV Services UK Limited	£50,182.50	£0.00	£50,182.50
ITM Power Plc	£3,000.00	£0.00	£3,000.00
Scotia Gas Networks Ltd	£3,056.04	£0.00	£3,056.04
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00

Submitted Project description
The National Transmission System (NTS) is a network of high-pressure natural gas pipelines, that supply gas to about forty power stations and large industrial users, from natural gas terminals situated on the coast, to gas distribution companies that supply commercial and

domestic users. In order to move gas from producers to users, the system utilises several compressor systems located strategically across the country.

In order to achieve the UKs Net-Zero targets by 2050, the gas networks will play an important part through the delivery of Net-Zero gases such as hydrogen and biogas to users. These gases have different properties to natural gas and therefore need different control and management systems.

The HyNTS Compression Project investigates the key challenges associated with compression of hydrogen and hydrogen blends through the NTS assets. The Project aims to determine the technical and commercial feasibility, provide a technical demonstration and create a strategy for UK NTS Compression Systems. The Project will determine whether the use of current compression assets on a hydrogen gas network is feasible, this in turn will help reduce the cost of the energy transition by eliminating the need to replace the compression systems. The largest costs in the current assumptions for migrating the NTS to hydrogen, is the cost to replace the compression systems, if this Project determines that the current systems are unable to function with hydrogen, alternative cost-efficient options will be assessed and demonstrated.

The Project will utilise demand predictions for hydrogen across the NTS along with modelling undertaken by the internal National Grid team and as part of Hydrogen Grid Research & Development (HGR&D) to determine the likely compression requirements. This will be the basis for the compression strategy, Cost Benefit Analysis (CBA) and environmental assessment.

The technical demonstration is planned to be conducted at the FutureGrid site in Spadeadam, Cumbria and will provide a facility for any future work as an outcome of this Project, whilst enabling the facility to demonstrate further capability such as In-Line Inspection techniques and alternative metering systems.

Problem and opportunity	**Mean Expert Assessors' score**	8.2
The problems identified are well explained and are applicable to exploring the potential role of hydrogen in the whole energy system aimed to lead to carbon emission reductions. If the outputs are successful, this Project will provide valuable information on technical and economic issues, relating to compression, and to operating a sustainable NTS including hydrogen. Assessors felt that although the opportunity is implicit (a low carbon national gas transmission system) the applicants could have been more robust in describing the potential opportunities associated with successful Project outcomes.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	7.2
Assessors all described the main theme of the Project as being set out well. They were easily able to understand how the Project will could address the issues that the transition to hydrogen from natural gas might create for the operation of the gas networks. The core idea of the Project is well described, and ought to address the aims of the competition scope. Assessors highlighted that there were technical challenges that needed to be assessed in order to make clear decisions on the use of hydrogen within the NTS, although it was not entirely clear how comprehensively this Project would be able to answer the full range of outstanding policy problems.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	7.8
The benefits have been identified and are clearly described and supported by metrics. These are principally around enabling decarbonisation of the transmission gas network, but also in reducing the costs of transforming the network. Costs which would ultimately be bourne by the consumer. There is a good range of benefits presented and they appear potentially achievable. There are split opinions on how ambitious the stated targets are. It has been recommended that the benefit to end consumers should be evaluated in later phases, if successful.		

An additional benefit highlighted is the provision of evidence for policy decisions around use of hydrogen in the gas networks.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.2
Assessors felt that the Project summary had provided a clear and concise indication that this Project was focussed upon innovation for the energy networks. Furthermore, it was stated that the Application describes the elements of participation from the wide range of Project Partners/ sub-contractors and it is clear that this blend of stakeholders in the Project meets the requirements of the competition very well. The assessors' views were consistently that the right capabilities and stakeholders required to deliver the Project were represented.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.2
The value proposition to networks and other stakeholders in the UK and internationally has been outlined. Assessors generally felt that the consumer benefits could have been articulated better within the 'Route to market' question but have been described somewhat elsewhere in the proposal. There is an intention to progress towards commercialisation of the solution and none of the assessors felt that this might undermine the development of competitive markets. It has been commented that there was an inadequate response to the question around future investment needs, given the range of third parties participating and likely interested in the future commercialisation of this sector.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	6.6
A comprehensive understanding of similar innovations and alternative approaches is presented. There is a strong justification as to why this Project is innovative in comparison to similar Project, but the reasons for funding this work through the Strategic Innovation Fund, rather than alternative funding mechanisms could have been stronger.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.4
The Project costs have been evaluated to be reasonable by assessors and suitable for successful delivery of the Project. There is a view that they do present value for money. It is noted that a contribution in kind is made by one of the Project Partners, offering additional value for money. It was viewed that SIF funding would facilitate collaboration between relevant Project Partners with the required expertise and access to facilities, equipment and assets for a full multi-Phase Project and as such, the Project appears to represent value for money.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	8.0
All assessors have agreed that the Project plan, milestones and risks are well thought through and described. The methodology is clear and is likely to deliver successful Project outcomes. It has been commented that the inclusion of the Alpha and Beta Phases in the RASIC table is particularly helpful in giving foresight of longer term responsibilities between Project Partners.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers were flagged but this work should contribute evidence to Ofgem to support decisions around delivery of hydrogen in the National Transmission System.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**

Assessors felt that evaluating the suitability of existing natural gas compression systems for hydrogen duty was a suitably important issue to address and will provide evidence for the role of zero carbon gases in the transmission network and for system operation. There is an overarching view that the capabilities of the consortia are strong and the Project plan is robust. The proposal has been well constructed and gives confidence of a high standard of delivery.

The full range of opportunities could be better described and explored, and this could represent an opportunity to be more ambitious with the Project scope in later phases. There needs to be strong demonstration that this Project builds upon and does not duplicate past or ongoing work as part of Future Grid Phase 2.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI evidence that the Project does not duplicate any work included in the existing NIC project HyNTS FutureGrid Phase 1 – Transmission Test Facility (NGGTGN04)[2].

Condition 4
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

4.3.4 10024392, Nuclear Net-Zero Opportunities (N-NZO), Initial Net Funding Required £107,494

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Gas Plc	£9,039.00	£0.00	£9,039.00
National Grid Electricity Transmission Plc	£4,600.00	£0.00	£4,600.00
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00
Rolls Royce Plc	£3,298.82	£0.00	£3,298.82
URENCO Limited	£2,657.48	£0.00	£2,657.48
Frazer-Nash Consultancy Limited	£89,354.86	£8,934.49	£80,419.37
National Grid Electricity System Operator Limited	£4,600.00	£0.00	£4,600.00

Submitted Project description

Next generation nuclear reactors, Small Modular Reactors (SMRs) and Advanced Modular Reactors (AMRs), collectively known as Advanced Nuclear Technologies (ANTs), can play a critical role in meeting the Government's published ambitions around future low-carbon hydrogen production and use, in addition to their electrical power output.

Both the Government's "Ten Point Plan for a Green Industrial Revolution" (2020) and the Hydrogen Strategy (2021) identify the growth of low-carbon hydrogen as a key element in achieving net-zero. They also emphasise the role that next generation nuclear reactors could potentially play in unlocking efficient production of hydrogen.

The large quantities of hydrogen produced from future nuclear reactors will necessitate the use of pipelines to transport hydrogen to key industrial clusters, as well as more distributed end-users. This raises questions over how the existing National Transmission System (NTS) can be

[2] https://smarter.energynetworks.org/projects/nggtgn04/

used to transport this hydrogen, and how, in turn, it can enable the development of nuclear hydrogen production. Research & Development is being undertaken on the production of hydrogen from nuclear power, but there is a critical gap in knowledge around where best to site future nuclear-hydrogen production as well as the requirements on the NTS to transport this hydrogen to end-users. This Project will address this gap. Through scenario modelling, it will consider current and future siting options for future nuclear-hydrogen production and how these could interface with the NTS.

Initially, the Project will define a set of end-user scenarios for low carbon hydrogen demand (including industrial clusters and key transport hubs). We will determine how future nuclear-hydrogen siting options - under current regulatory frameworks - can service this demand using the NTS and the benefits and barriers of developing this. We will then consider new credible siting options for nuclear-hydrogen production and determine the additional benefits these may provide to transporting hydrogen to the end-users, along with the greater challenges and barriers these new sites may present. In each case we will consider the regulatory, operational, engineering, commercial, social and wider energy systems issues.

This Project will highlight how future nuclear-hydrogen production can be effectively interfaced with the NTS to deliver low carbon hydrogen to key end-users at scale. It will be key to the enabling and development of low carbon hydrogen production in the UK.

Problem and opportunity	**Mean Expert Assessors' score**	7.6
Applicants have identified and clearly described an opportunity to use future nuclear technologies in a way which maximises the value and use of existing energy network infrastructure, particularly the gas transmission network. Assessors viewed this as an interesting opportunity which may warrant some study, there were split opinions on the timeliness of the work. Some questioned whether the investment is or ahead of need whilst others felt that it is well timed to provide evidence on the future use of green hydrogen within the national energy system.		
7Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	7.2
Assessors acknowledged that the scope of the Project had done enough to meet the requirements of the innovation challenge, with a focus on the whole system benefits of considering ANTs alongside energy network opportunities. However, some assessors felt that the proposal Project lacked clarity at times. The focus is sometimes placed upon an analysis of future demand centres to be served by transmission networks and optimal siting from an energy networks perspective, whilst at other times focussing on the technical design of ANTs. The latter was considered less suitable for a Strategic Innovation Fund Project.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	6.2
The applicants have identified and outlined environmental benefits of the Project in facilitating an economic move to nuclear produced hydrogen as part of the energy supply. Assessors generally agreed that the benefits from the proposed Project will be to achieve a better understanding of optimal siting locations based on scenario modelling and existing infrastructure. However, they did feel that the impact on the energy networks, and consequently the benefits to consumers were unclear and should be of increased focus if successful in the Discovery Phase. Economic benefits including levelling-up opportunities and the develop of new products and services that create export opportunities were described.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.6
Assessors supported the whole system approach to considering energy network interfaces with an energy supply technology, and noted that the wholistic approach to the Project could assist planning for timely integration of advanced nuclear technologies, whilst minimising the of cost to		

end user, meeting energy demands and stepped capacity increases. A couple of the assessors questioned whether the target benefits were focussed on the generation assets rather than the energy network users, but noted that the benefits to intelligent siting might increase the usage of legacy infrastructure and avoid unnecessary investment in new build.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	5.6
Assessors felt that the appropriate partnerships were represented in the Project to evaluate the route to market and that value propositions to each of the Project Partners were understandable from the response. No assessors raised concerns regarding the Project undermining competitive markets. The broad observation was that this was an early stage feasibility study and pathway to enrolment as business as usual, particularly regarding the networks aspects, was unclear and needs more development if successful.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	7.4
The proposal is looking at the novel integration of an early stage technology (advanced nuclear technologies) that spans the electrical and gas sectors. This is viewed as an innovative area and a focus that has not previously been considered within the UK, although projects delivered internationally have been referenced by the applicants. Some assessors questioned whether the analysis of best places for the siting of units was in itself particularly innovative, given that network planning and modelling is common practice.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.0
Assessors generally viewed costs as being consistent with those expected in the market and that the Project represented sufficient value for money. Some questioned whether a greater proportion of costs could have been applied to the energy networks, to promote greater focus on the benefits to energy network users, whilst others viewed it as a positive that third parties were leading most activities, given the scope of the work.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	6.6
The Project plan and methodology is viewed as being consistent with the scope of the proposed work, although the scope of work is considered to be ambitious for the Project duration. Close and effective Project management will be required to keep the Project on projected timelines. The risk register is sufficient but could have provided more detail.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been flagged by the Project although there are obvious regulatory considerations related to the scope of work. The Project should engage at an early stage with the Office for Nuclear Regulation (ONR) and the appropriate BEIS/Ofgem policy teams. The observations of the ONR, BEIS and Ofgem should be presented as part of the outputs of the Discovery Phase. To understand if this Project represents value to consumers it will need to be understood if siting of nuclear assets near hydrogen infrastructure or demand centres is likely, given the highly regulated nature of nuclear sites.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
Assessors felt that there were reasonable opportunities for understanding siting options/constraints for future ANT deployment, and that these could be important to underpin their eventual optimal roll out from an energy networks perspective. Some assessors had significant concerns that the focus of the Project should be more orientated towards the energy networks, and that benefits of this investment must be realised for energy network users. This must be evidenced more strongly if the Project is to proceed to future stages. There are split opinions on whether this Project is timely, or would be more appropriate at a later time, closer to Advanced Modular Reactor deployment.		

The whole system approach to the Project is welcomed, but issues such as the use of waste heat for district heating, public acceptance, and electricity dispatch requirements may prove important in addition to those issues identified in the proposal.

There are significant regulatory challenges associated with the siting of nuclear assets which must be taken in to account. The Project must engage at an early stage with the Office for Nuclear Regulation, the appropriate BEIS/Ofgem policy teams and take on board learnings from the UKRI Low Cost Nuclear Challenge. Shared learnings should be disseminated, and activities coordinated with those of the UKRI Small Modular Reactor Programme, as well as the regional Energy Hubs that have previously undertaken analysis on the opportunities of SMR deployment.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
As part of its end of Project Phase report, the Funding Party must evidence it has reviewed and built upon the work completed under the UKRI Low Cost Nuclear Challenge to minimise duplication.

Condition 4
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

Condition 5
As part of its end of Project Phase report, the Funding Party must clearly demonstrate how benefits will be realised for energy network consumers/users.

Condition 6
As part of its end of Project Phase report, the Funding Party must evidence consideration for additional aspects around Advanced Nuclear Technologies deployment, such as use of waste heat for district heating, public acceptance and electricity system dispatch requirements.

4.3.5 10024879, INCENTIVE - Innovative Control and Energy Storage for Ancillary Services in Offshore Wind, Initial Net Funding Required £121,002

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Scottish Hydro Electric Transmission Plc	£32,904.85	£0.00	£32,904.85
The Carbon Trust	£87,555.00	£15,000.00	£72,555.00
National Grid Electricity System Operator Limited	£11,180.00	£0.00	£11,180.00
University of Strathclyde	£4,362.00	£0.00	£4,362.00

Submitted Project description

With the urgent need for decarbonisation, the capacity of offshore wind is expected to increase dramatically. However, innovation is required to facilitate the rapid roll-out of non-synchronous generation and prevent grid balancing and stability challenges. Without new solutions, the GB grid will become weaker, which will lead to issues in system operation. These issues include:

increasing the likelihood of severe instability events (such as the 9 August 2019 black-out event); increasing the need for imported electricity; maintaining reliance on synchronous fossil fuel generators on stand-by.

All of these will lead to price increases for GB energy consumers and will slow down the energy transition, with adverse impact to the environment.

This problem creates an opportunity for GB network companies, generators and ultimately consumers. Building on preliminary work, an opportunity has been identified to enable offshore wind farms to play a role in stabilising the GB network through the use of innovative technologies that provide voltage, current and frequency control to the grid. Establishing this will require simultaneous technical, regulatory, commercial and market innovation to enable these innovative technologies.

INCENTIVE aims to seize this opportunity by studying and demonstrating how these innovative technologies can allow offshore wind farms to provide stability services to the grid, with particular focus on the technical, regulatory, commercial and market innovations. The ultimate aim is to maintain the fast-paced roll-out of offshore wind in GB, and hence accelerate the energy transition, at best value to the consumer.

Problem and opportunity	**Mean Expert Assessors' score**	8.4

The applicants have clearly described the Problem of maintaining grid stability with increasing levels of non-synchronous generation connected to the system. There are significant opportunities described by addressing. Reliance of the grid for energy consumers, reduced costs of integrating renewables and therefore carbon savings are highlighted. Assessors agreed that these were valid problems and opportunities that had been well articulated.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' Score**	7.8

All assessors agreed that the Project has the potential to deliver to the SIF objectives. The justification of this has been well laid out and align to the scope of the whole system integration challenge. The Project has the potential to deliver significant changes and is ambitious in its approach.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & Benefits	**Mean Expert Assessors' score**	7.2

The potential benefits are in the three areas of reducing CO2, value for money, and energy network operational benefits. Assessors viewed the potential benefits as highly valuable. There was observation that these were described on a predominantly qualitative basis, which was deemed acceptable at the Discovery Phase with the expectation that more quantitative evaluations will be developed and presented if the Project progresses to later stages.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project Summary	**Mean Expert Assessors' score**	7.4

Assessors acknowledged that there were significant innovative components to the approach this Project is taking to solving the Problem of grid stability in a high renewable energy system. It was viewed that taking a blended approach of technical, market, regulatory, and commercial approaches was novel and offered potential for significant innovation. Some assessors felt that the proposal was a little vague about the specific innovations that might be trialled in later stages of the Project. There has been R&D effort invested in ways and means to have asynchronous generation emulate the inertia characteristics of conventional synchronous generation in recent years and more clarification will be needed going in to the Alpha Phase of how this Project will differentiate in its approaches.

Eligibility Criterion 4. Projects must not undermine the development of competitive markets

Route to market	**Mean Expert Assessors' score**	7.6

A prime purpose of the Project is to identify and resolve market, regulatory, commercial, and technical barriers on the route to market and ultimately prove the technology by a trial

installation (in the Beta Phase) at an offshore wind farm grid connection transformer station. This would provide a route to market in the UK and potentially world-wide. In particular, the route to market will be looking at the barriers to private sector investment in implementing the solution. It therefore meets this SIF Eligibility Criteria. Further development of the value proposition for the range of key stakeholders involved, as well as development of standardisation for OEMs, which assessors view as a valuable addition.
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.
Innovation justification | **Mean Expert Assessors Score** | 8.2
Excellent justification has been provided for pursuing and building upon the innovations discovered in other related projects. The applicant has described how the integration of multiple approaches provides significant innovation in developing a novel approach to solving system problems. All assessors felt that the applicants gave an excellent response, and was clear with the barriers that were needed to be overcome in delivery of the Project.
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.
Cost & value for money | **Mean Expert Assessors' score** | 8.0
The Project costs have been demonstrated to be fair and costed competitively for the scope of work described. The applicants have provided a comprehensive breakdown of costs, which could have only been further improved by offering supporting information on individual work packages or sub-contractor costs. Additional contributions have been committed from the Offshore Wind Accelerator which further adds value to the consumer.
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.
Project plan & milestones | **Mean Expert Assessors' score** | 8.0
A good Project plan has been provided with clear milestones. The work packages are logical. The risk register is appropriate and the Project approach is particularly good. The split of resource by Project Partner between and within the work packages could be more clearly defined. Assessors agree that the approach meets this SIF Eligibility Criteria.
Regulatory barriers | **Yes/ No** | No
No regulatory barriers have been flagged, despite reference to the need for taking innovative regulatory approaches to apply the full innovative systems approach to solutions, particularly regarding the ownership regime for stability models produced.
Recommendation to the Gas & Electricity Markets Authority | **FUND**
Assessors felt that this was an excellent proposal with the potential for real innovation. It is taking a well defined Problem, interruptible generation, and turning it into the potential solution. It is a strong team with a robust Project plan. It does not appear to address how (and at what cost) these resources may be provided in a low wind system. To strengthen the Project further it should also explore full system responses to maintain stability when wind resources cannot be provided, and the associated potential system costs of doing so. The methodology of taking a holistic approach to the relevant market, regulatory, commercial, and technical issues to provide a route to market was very welcomed.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase. Condition 4

As part of its end of Project Phase report, the Funding Party must set out its views on whether the Project's proposed solutions differ significantly from the current mechanisms and services that the Electricity System Operator (ESO) currently operates.

4.3.6 [REDACTED]

4.3.7 10025653, Asset Reuse and Recovery Collaboration (ARRC), Initial Net Funding Required £75,963

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
SP Transmission Plc	£7,429.80	£3,184.20	£4,245.60
Frazer-Nash Consultancy Limited	£73,950.30	£7,395.03	£66,555.27
SP Distribution Limited	£3,184.20	£3,184.20	£0.00
Scottish and Southern Energy Power Distribution Limited	£5,162.24	£0.00	£5,162.24
ScottishPower Renewable Energy Limited	£3,184.20	£3,184.20	£0.00
BEAMA Limited	£1,592.10	£1,592.10	£0.00
National Grid Electricity Transmission Plc	£1,592.10	£1,592.10	£0.00
SSE Renewables Ltd	£1,592.10	£1,592.10	£0.00
Network Rail Limited	£1,592.10	£1,592.10	£0.00
Submitted Project description			
Supported by all UK TOs, the aim of the ARRC Project is to develop and assess novel solutions to an industry wide problem of sustainably managing high value assets. The key Project output is to reduce the environmental impact of the energy industry through the life extension of assets, applying Circular Economy principles, utilising practices such as refurbishing, repairing, retrofitting, remanufacturing, repurposing and resource exchange.			
Problem and opportunity	**Mean Expert Assessors' score**	7.2	
The applicant has identified a challenge related to the full lifecycle environmental and financial costs of energy infrastructure assets. This is viewed as a somewhat neglected area for innovation by assessors, and that this could provide significant value as a result. There is a clear opportunity in the industry collaborating to reuse and recover assets, both in terms of costs and reduction in embodied carbon. It has been acknowledged by assessors that collaborative working and the Application of circular economy principles represents an opportunity to capture these benefits in novel ways. However, more description and detail could have been given to communicate the full extent of the Problem currently. Referencing of previous or current work on this, or methodologies that are currently used would have given a fuller understanding of the challenges and opportunities.			
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.			
The Big Idea	**Mean Expert Assessors' Score**	7.2	
Assessors agreed that this Project meets the scope of the innovation challenge. The idea has been well articulated and could have a considerable impact on the industry. Some commented that there could be greater awareness shown of similar initiatives in the UK or internationally, to ensure this is truly leading. Additionally, there appears to be an opportunity to look more widely at the whole system nature of this, including across other industries. Although within the time constraints of the Project there would need to be some management of this to ensure to Project remains focussed.			
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers			
Impacts & Benefits	**Mean Expert Assessors' score**	7.0	

Success metrics and a range of positive impacts on a range of stakeholders have been clearly and well described. Creating second life opportunities, recycling, and appropriately disposing of energy infrastructure assets could have a positive impact on business and the environment. There could be some more detail provided on the potential benefits, though it is appreciated that this will be developed over the course of the Discovery Phase. Better explanation of how these benefits would then be passed on to the consumer would have been valuable supplement to the response.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.0
Descriptions of participating organisations and team members have been provided and the relevant expertise and assets are represented. Good capabilities are shown. It is clear that this would involve network innovation, and there is opportunity to provide representation from other industries such as construction or non-energy utilities. The response would have benefited from an explanation of the type of assets that may be interchangeable across stakeholders in the energy supply chain to provide context for the potential for the whole system approach.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.2
The applicants have identified the various wider industry groups in which Project Partners are involved, providing opportunities to disseminate information on their proposed work and involve other European energy infrastructure asset owners/managers. Regulatory considerations have been mentioned briefly, only in recognising that they would have to be considered. The initiative is not viewed to be likely to undermine the development of any competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	6.4
The proposal references a number of related initiatives in other industry which can be learned from and built upon. This does appear to be a novel approach within the energy sector and is considered innovative by assessors. The level of innovation could be improved by inclusion of other stakeholders in the energy sector such as generators, and other manufacturers or distributors whom might be able to reuse assets in secondary markets.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	6.8
The Project budget and the grant request align with the competition guidance. Costs to appear to be costed at competitive rates and represent good value for money. The full available costs have not been requested whilst there are a number of organisations referenced to be engaging in the Project whom are not seeking costs. This brings in to question the extent of their meaningful contribution to the Project and whether value for money could have been achieved through improved outcomes by closer inclusion of those parties.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.4
The applicant has outlined a clear set of work packages and activities within a Project plan as well as a risk register for the Discovery Phase. Resource and responsibilities against the Project plan are not explicitly defined. Inclusion of Project advisory board with named representatives is helpful and welcomed.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This proposal has broadly been received positively by assessors, it is considered a novel approach to reuse and recovery of energy network assets. There is clear potential for environmental and economic benefits to implementing well-functioning circular economy principles and processes. Assessors felt that there were some areas which could have been		

described in more detail, such as the specific areas of innovation that might be explored and the value proposition to stakeholders and consumers. Overall, it has been viewed as a proposal worthy of exploration.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase. Condition 4 As part of its end of Project Phase report, the Funding Party must include a high-level assessment of the carbon risk and benefit of its proposed solution or solutions in the Discovery Phase.

4.3.8 10025660, Fast Flex, Initial Net Funding Required £112,221

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
SP Transmission Plc	£33,842.29	£6,768.46	£27,073.83
Imperial Consultants UK Limited	£55,597.73	£0.00	£55,597.73
GE Digital	£29,550.00	£0.00	£29,550.00
National Grid Electricity System Operator Limited	£6,672.00	£6,672.00	£0.00
Scottish Power Renewables (UK) Limited	£0.00	£0.00	£0.00
SP Distribution Plc	£2,122.82	£2,122.82	£0.00
SP MANWEB Plc	£2,122.82	£2,122.82	£0.00

Submitted Project description		
Fast Flex will establish a regional inertia capability comprising many distribution-connected devices combined to provide a predictable capability quickly. Building on previous learning, we will develop the methodologies to introduce a mechanism whereby distributed energy assets can participate and contribute to the stability services required in a low carbon network.		
Problem and opportunity	**Mean Expert Assessors' score**	8.6
The commentary provides a concise and clear picture of the issues and problems that the Project seeks to resolve. Maintaining system inertia of the grid within a renewables dominated grid is a significant Problem, posing a risk of instability. The Project therefore aims to address a major issue on the path to a Net-Zero energy grid which could realise carbon and costs benefits, as well as create new market opportunities. The role of demand management and flexibility has been explored in many projects with many market players entering the industry aiming to develop new services. The proposal to address this from a more centralised perspective is justified but should also look to develop inclusive opportunities for the full range of potential interested stakeholders.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	8.6
This section is the very effective in conveying the ambition, the likely benefits to whole system and users, and the specific contribution of the Discovery Phase to the overall proposition. There is no doubt at all that the innovation challenge being taken on here is well aligned to the competition scope.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	8.0

The presentation of impacts and benefits that could emerge from the Project is strong. The case for how these impacts will translate in to benefits to consumers is made very well and some quantification of those benefits is shown. Costs and benefits described are measurable and will be assessed during the Discovery Phase Project and beyond. One Expert Assessor advises that the Discovery Phase should also explore what the total benefit achievable from demand sources could be as inertia declines on the system, on a national as well as regional level.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.6
The applicants have provided a clear summary of participation in the Project, with helpful given detail on roles and expertise in the skills appendix. It is clear that the Project focuses upon network innovation. The Project team formed demonstrate extensive collaboration between relevant Project Partners. The Project Partners are well placed to deliver the piece of work described even though the limited time challenge may prove challenging for coordination of activities.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.8
The main purpose of the Project is to lead to the development of a market mechanism for demand side grid control. By focusing on a market mechanism, it will be instrumental in setting up competitive markets both within the technology concepts proposed and with other inertia adding or control technologies. The advanced state of the UK's transition to a Net-Zero grid means that technologies and markets could be developed in advance of other networks and result in a global competitive advantage. The commentary sets out a clear roadmap to adoption of the potential solution(s). The economic opportunities for prospective market service providers are unclear and should be considered as an integral part of the Project.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	8.8
The applicant provides a clear and concise overview of the history of research and innovation in this area in a number of countries and location. Some of the research has led to business-as-usual systems while other have yet to do so and some of the barriers to this have been described. The overwhelming view of assessors is that the proposition is innovative, novel and risky. It has been noted that there are many other examples of flexibility provision, and innovation projects in this area, which this Project should support and build upon to help energy networks move these approaches in to widespread business as usual activities.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.0
The Project funding request are viewed as reasonable for the most part. Applicants have agreed to provide resource in kind over and above their labour costs to provide added value for money. Project participants should ensure that resource costs are suitable for the activities carried out against the roles described, as some assessors observed that costs were a higher that should be expected against the required activities. The value for money proposition is seen as strongest against improvements to modelling capabilities that can effectively evidence avoided costs that can be achieved through predictable, fast flexibility market.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.6
Work plan and milestones appear well-structured, with mostly explicit allocation of responsibilities to Project Partners. The risk register is well-aligned with the plan; risk descriptions and owners are clear and appear reasonably comprehensive. This gives confidence in capacity of Project Partners to coordinate effective delivery. Some Project Partners appear to appear to have little or no direct participation in the delivery of work packages, raising some		

questions over the dependency on the Imperial College team to deliver the full scope of work on behalf of other Project Partners.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers flagged in Application the Application, but there are clear regulatory considerations that are needed to enable the rollout of new market approaches in the mid-term.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The Project is well structured, and mostly clearly explained and justified. The opportunity for, and benefits of, a predictable, fast flexibility market to respond to network instabilities are evident. The Project builds on the work of previous projects and adds a new heat vector, to the possible solutions. The potential benefits are significant. The delivery team are viewed as highly capable. The final outputs are not entirely clear to all assessors. The target outputs could be to develop new modelling capabilities, develop a flexibility participation platform, or creation of new market products. However, at this stage it is viewed unanimously as a valuable Project, with the scope and outputs of the Project expected to be refined in later phases.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase. Condition 4 As part of its end of Project Phase report, the Funding Party must demonstrate how they have taken onboard learnings from other similar and relevant projects. Condition 5 As part of its end of Project Phase report, the Funding Party must provide documentation showcasing how the monitoring and control development will be agnostic for flexibility providers, and that interoperability with other systems will be considered.		

4.3.9 10027180, Crowdflex: Discovery, Initial Net Funding Required £70,057

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Electricity System Operator Limited	£9,817.00	£0.00	£9,817.00
Octopus Energy Group Limited	£68,250.00	£68,250.00	£0.00
Ohme Technologies Limited	£68,250.00	£68,250.00	£0.00
Element Energy Ltd	£56,425.00	£0.00	£56,425.00
Western Power Distribution Plc	£2,728.00	£272.80	£2,455.20
Scottish and Southern Electricity Networks Distribution Limited	£1,360.00	£0.00	£1,360.00
Submitted Project description			
CrowdFlex aims to establish residential flexibility as a reliable energy and grid management resource, establishing it alongside business as usual solutions such as network reinforcement or new thermal capacity, using system operational principles to develop a new digital service. CrowdFlex builds on a significant first phase, https://smarter.energynetworks.org/projects/nia2_ngeso001/, which sized the market opportunity			

and the viability of consumer response. The CrowdFlex programme will be split into three distinct projects:

- CrowdFlex:Discovery (this Project) will capture the requirements of the ESO/DNOs; identify the technology and consumer behaviour parameters to explore in a trial; and understand how the statistical nature of flexibility translates into reliable modelling and robust commercial frameworks.
- CrowdFlex:Design and CrowdFlex:Trial will complete the scoping of and conduct large-scale trials to test domestic flexibility for use in system operations.

CrowdFlex meets the scope of Innovation Challenge 1: Whole system integration by:

- Predicting the current and future needs for domestic energy provision for heat, power, and transport, and how flexibility can reprofile these to support the power system. Building on CrowdFlex:NIA (which focused on residential loads and EV demand), this Project will also explore residential heat. CrowdFlex:Trial will assess how the impact of EV charging, heat pumps, and other emerging low carbon technologies on customers electricity bills can be reduced when consumers participate in domestic flexibility.
- Coordinating energy transmission, distribution, and system operation. CrowdFlex partners represent stakeholders across the power system. CrowdFlex aims to develop commercial frameworks to allow the ESO and DNOs to coordinate their needs and transmit them to consumers via effective tariffs.
- Planning future policy, regulatory conditions, and market designs to support whole system approaches. CrowdFlex will identify the market design of flexibility services that coordinate the needs of the ESO and DNOs, while lowering consumers' energy bills. CrowdFlex will align demand to variable renewable energy generation, reducing stress on the transmission and distribution networks.
- Maximising efficiency in large-scale network and system investments by taking a whole systems view across generation and demand side changes linked to decarbonisation. Domestic flexibility will improve the efficiency of existing investments, deferring or avoiding investment in new network and generation capacity. These savings can be transmitted to consumers, reducing energy bills.

The ESO, DNOs, and suppliers would be the primary users of this innovation, transmitting novel tariff mechanisms to domestic consumers to reduce their energy bills.

Problem and opportunity	**Mean Expert Assessors' score**	8.8
The applicant has clearly described the Problem, increased electrical demand due to electrification of transport and heat, and a potential solution in domestic load flexibility, particularly in EV charging and heat. The opportunity is described primarily as avoided costs through creation of a domestic sector flexibility market. The applicants could expand on how the Problem looking to be addressed is differentiated, or refined, beyond the previous NIA Project.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	8.8
The big idea, that domestic demand flexibility can become an integral part of the grid management and develop markets for flexible demand products, is a potentially large component for designing an electricity system of the future that accommodates ever greater renewable generation and electricity demand. It is well aligned with the scope of the innovation challenges and SIF more widely. It meets this SIF Eligibility Criteria. A greater focus on establishing the best ways to communicate price signals with consumers would be useful based on varied categorisations of user group.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	8.8

The fundamental benefit from demand flexibility is to reduce the need for investment in generation and distribution resources in the electricity systems. Significant benefits of the Project are clearly articulated in terms of potential revenue/savings for consumers and carbon benefits. The proposal is viewed as having described major potential system benefits. The Project should focus on how these can be passed back on to the consumer, and also consider the potential disbenefits of novel market approaches, in order to design mitigating actions.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.2
The Project summary has been fairly well described. It highlights the network innovation and system operator aspects of the Project well. A strong Project Partner team is described, though additional capabilities could be introduced with expertise on consumer behaviour and other prospective domestic sector flexibility providers.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.8
The route to market is clear as the Project Partners have a clear set of capabilities between them to deliver future business propositions. Since the Project is developing market conditions that allow for demand flexibility from a variety of providers in will have to demonstrate how commercial and technical inter-operability will be achieved to allow fair access. If this is done appropriately it can promote the development of competitive markets, but should be monitored closely through phases. The Project will have to demonstrate how the findings and IP will be made more widely available in later stages, given the range of potential utilities and third parties that would participate in a market under business as usual.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	7.8
A clear justification is given of the need for innovation in domestic flexibility markets to assist in managing network constraints, system balancing and costs. The applicant has provided a good summary of the key findings of previous research. Reference to relevant previous work is not comprehensive but provides a reasonable case for how this Project will investigate novel approaches to integrating reliable, predictable, automated flexibility response from domestic consumers using market structures for network services, including tariffs.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	9.2
The Project is viewed as providing very good value for money as it will unlock significant contribution in kind from two of the subcontractors, Octopus Energy and Ohme Technology. Costs are competitive and proportionate to the planned work.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.4
The structure of the Project plan, the work packages and the risks are appropriate and logical. It is not always clear which Project Partner is leading each work package or milestone but between Project Partners and additional contributions, it is expected that the Project can be progressed successfully in a timely manner. The availability of all Project Partners should be confirmed given other potential demands during the delivery period.		
Regulatory barriers	**Yes/ No**	No
Particularly novel market designs are likely to require regulatory review and approval. Regulators and policy makers should be viewed as an important stakeholder group and engaged with at an early stage. Evidence for new market propositions ought to be shared as the proposal develops to enable early consideration for any requisite regulatory or policy changes.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The proposal is viewed as innovative with the potential for significant system and consumer benefits. The Discovery Phase aims to develop the lessons from a previous NIA Project, with the		

same Project Partners, and to use the results to scope out the data, digital systems, automation and commercial frameworks for a viable domestic flexibility market. It is important that Crowdflex disseminates learning and involves other potential market participants, to ensure access to IP generated and the development of competitive markets. There are other notable projects which relate to this in scope. These include the recently approved 2021 NIC Projects, BiTradER and EQUINOX. Some Project Partners are participating across these projects.

There have been wide range of projects exploring the integration of demand side flexibility in markets. To avoid duplication, a priority objective of this Project should be to enable access to these types of assets and approaches under business as usual market arrangements. The arrangements for doing this should be made a priority for the projects, to be presented to Ofgem

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
The Funding Party must provide to Ofgem and UKRI prior to Project commencement a summary of how this Project, BiTraDER[3] and EQUINOX[4] differ, and a resource plan. The Funding Party must also share its end of Project Phase report with the Funding Party of BiTraDER (Electricity North West) and Equinox (Western Power Distribution) .

Condition 4
The Funding Party must review the outputs from similar funded projects which have explored the integration of demand side flexibility in markets, and include, as part of its end of Project Phase report, a plan for how different demand side flexibility assets would be accessed under business as usual market arrangements.

4.3.10 [REDACTED]

4.3.11 10027292, Excess gas turbine energy generation, Initial Net Funding Required £134,161

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00
Northern PowerGrid Limited	£1,800.00	£0.00	£1,800.00
Revolution Turbine Technologies Ltd	£77,411.23	£7,741.12	£69,670.11
Digital Catapult	£59,811.00	£0.00	£59,811.00
Stockton & District Advice & Information Service	£0.00	£0.00	£0.00

Submitted Project description

This whole system integration Project aims to decarbonise the gas distribution operation and reduce cost, with a benefit to the energy consumers in the way of reduced tariffs. We aim to investigate if the power generated from excess gas can be fed back into the grid or stored, improving the coordination between the gas and electric network, and assessing the cost of potential energy demand reduction activities. To design for scalability and harness value from data across organisations, we will determine the digital systems architecture to improve data collection, quality, interoperability and shareability.

[3] Electricity NIC Submission 2021: BiTraDER - Electricity North West Ltd | Ofgem
[4] Electricity NIC Submission 2021: EQUINOX - Western Power Distribution | Ofgem

We are evaluating the introduction of a new product and service that has been proven in the oil and gas sector but is new to the UK energy market. The main users will be gas distribution and transmission businesses. The Project entails evaluation of novel approaches to infrastructure investment by taking a systems view across generation and demand side, determining new financial viability for infrastructure expansion and modernisation.		
Problem and opportunity	**Mean Expert Assessors' score**	7.4
The applicants have identified a number of system issues relating to supply/demand profiles and network constraints across the gas and electricity sectors. This is a known Problem which could have been supplemented with more detail in the proposal, but a good case has been made for the opportunity to address this Problem through novel approaches to data integration to improve coordination between utilities. This Project looks to learn from and apply an approach that has been demonstrated previously in the oil and gas sector.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	6.8
The applicant has clearly described that the big idea is to generate electricity through the recovery of excess gas pressure in the distribution grid. Assessors acknowledge that the proposal meets the criteria of the innovation challenge through whole systems working across different network types.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	6.4
A reasonable summary of potential benefits include positive environmental, economic and social impacts. Benefits are expected to be realised by to consumers through reduced costs, although the scale and ambition of those benefits was unclear and should be better evidenced if successful in future phases.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.6
All elements of the Project summary have been presented well providing consistent information and summary of the Project. The organisations directly involved in Project delivery are appropriate and include consumer representation, which is welcomed. It is clear that the Project endeavours to apply new technical approaches to the energy networks, and therefore is focussed on network innovation.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	5.6
The potential solution would be adapted from the offshore oil and gas sector and investigated for gas networks use. Commercialisation and Application would be led through an industrial Project Partner and supported by the Digital Catapult. This provides a reasonably clear route to market. More description could have been provided to explain how learnings would be disseminated, supporting furthermore rollout. The Project is not viewed to have a risk to undermining competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	6.4
The locations where similar technology has been piloted in the oil and gas sector have been clearly outlined. There is clear acknowledgement that although a relatively mature technological approach this is clearly a new Application of the technology in a different environment. References to similar technologies and alternative approaches to the Problem have been referenced. Assessors are in agreement that this represents a novel approach which is innovative.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.6

The Project budget and grant request for each Project Partner align with the competition guidance. The balance of costs across Project Partners appears reasonable given their roles on the Project. An additional contribution is provided by a Project Partner which represents additional value for money to the consumer.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	5.4
The Discovery Phase work packages and milestones have been summarised and timeframes have been illustrated in a Project plan which is clear but simplistic. The methodology described indicates that the Project could progress in a timely manner, however it is noted that the risk register is very limited in detail and should be developed further during Project inception if successful.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
Assessors viewed this as an interesting Project that identifies some potential areas of innovation which could impact positively on the whole energy system. However, the extent of the benefits, particularly to the consumer, is unclear at this stage. Evaluation of potential benefits should be carried out in more detail during Discovery Phase. The Project planning and management was reasonable but could be more robust and detailed as it moves into delivery. Generally, the approach to learning and applying technology with successful use cases from different sectors was welcomed.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must evaluate and clearly demonstrate how the benefits from the Project will be realised for energy network consumers and users.		

4.3.12 10027503, SEGIL - Sustainable Electrical Gas Insulated Lines, Initial Net Funding Required £133,814

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Electricity Transmission Limited	£23,780.00	£0.00	£23,780.00
Ørsted Onshore UK Limited	£5,088.00	£0.00	£5,088.00
Scottish Power Transmission Limited	£4,914.90	£0.00	£4,914.90
National Grid Electricity System Operator Limited	£2,130.00	£0.00	£2,130.00
University of Manchester	£29,300.00	£0.00	£29,300.00
General Electric	£10,942.70	£0.00	£10,942.70
J.Murphy & Sons Limited	£10,600.00	£0.00	£10,600.00
Frazer-Nash Consultancy Limited	£47,058.42	£0.00	£47,058.42

Submitted Project description

The UK Government has committed to achieve Net-Zero by 2050 that leads to significant changes in GB energy system:

- An increase in renewable generation with UK government's commitment to deliver 40GW of offshore wind power by 2030 by large windfarms on the East Coast where the transmission network is underdeveloped for the expected connection capacity.

- Decarbonisation through electrification of heat and transport which will significantly increase the demand for electricity, especially in heavily populated areas.

Public opposition to the visual impact of overhead lines (OHL) and impacts on wildlife, lead to challenges with planning consents, design and build. Relying on conventional OHL leads to a risk of not delivering required capacity quickly enough to accommodate fast-growing demand in cities. Underground HV cable systems offer low visual impact and often receive consent much faster. However, they are more costly and require significant construction works. In addition lead to operational challenges, as in the case of an internal fault, a circuit stays out of service for significantly longer due to prolong time identifying faults, excavation and replacement.

A proposed sustainable GIL solution will help to connect offshore renewables to urban centres. This Project would begin early-stage R&D by exploring opportunities for a new alternative -- Gas Insulated Line (GIL), in certain way similar to a gas transmission, can transmit over 3000MVA, more power than a conventional OHL, and with less construction works than a cable system for the same power rating, hence reducing the cost and time to deliver capacity. However, to develop GIL at scale as a viable alternative, two key challenges must be resolved:

*Lack of experience with long-distance GIL construction and operation. Currently, the longest operating circuit is 17 km, 420 kV inside a substation.

*Current generation GIL are filled with a sulphur hexafluoride (SF6), a potent greenhouse gas which is 23,900 times more environmentally damaging than CO2.

The key aim of this Discovery Project is to evaluate these challenges and propose solutions to develop a viable, efficient long-distance GIL for high-capacity lines for the GB network.

Problem and opportunity	**Mean Expert Assessors' score**	8.6
The Problem of effectively integrating significant capacities of offshore wind, whilst minimising the costs and public opposition of new infrastructure build is recognised as a valid and well described Problem. The opportunity to facilitate greater use of renewables, improve efficiency of the electricity networks, and reduce costs to consumers is a valid one. Assessors acknowledged that the proposal has outlined this Problem and opportunity clearly, whilst noting that previous work exploring similar solutions has been carried out nationally and internationally.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	6.6
The Project proposal is viewed to meeting the whole system integration challenge of the Strategic Innovation Fund. Although the proposal is focussed upon gas insulated lines (a technical solution focussed upon the electricity transmission network) the Problem and opportunity have been considered from a systems perspective. Aspects such as commercial, regulatory and reputational factors are also likely to drive development and should be addressed by the Project also.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	7.2
A range of system benefits covering cost, time, resources, maintenance and potentially performance have been well described. These are predominantly qualitative assessments of benefits which there should be an attempt to quantify to some level during the Discovery Phase, including further development how they will affect consumers. One Expert Assessor noted that potential disbenefits do not appear to have been considered including the risk of enhanced maintenance requirements, and challenges associated with construction and manufacturing.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.6

The Project is focussed on electricity transmission network assets, with a concerted focus on network innovation. The Project Partners are judged to be suitable to support the Project although there could have been further justification as to why the selected Project Partners were chosen, rather than third parties with comparable capabilities. A strong response has been given to stakeholder participation and assessors would like to see an ongoing opportunity for interested stakeholders to engage with the Project.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.4
The route to market is explained at a high level, which is considered appropriate for the Discovery Phase but should be developed in further detail for future phases. The supply chain for alternatives to SF6 gases needs to be considered if a solution is to be successfully rolled out and scaled within business as usual operations. The Project is not viewed as undermining the competitivity of markets, if the knowledge and learning is disseminated properly across industry.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	6.8
A good understanding is demonstrated of current state of the art innovation in gas insulated lines and similar existing projects worldwide. The Project is viewed as innovative in its ambition to significantly expand the technical capabilities of gas insulated line deployments. However, there could be better articulation of the additional technical challenges faced when attempting deployment over greater distances. It has been noted by assessors that non-SF6 solutions have been tested and GIL approaches at higher MVAs also trialled. The Discovery Phase should provide further and clear differentiation on how this Project will build upon these with innovative, novel approaches.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.4
The response provides detailed cost breakdown, Project Partner contributions and justification for the costs which seem appropriate for the activities and Project deliverables. The potential benefits of improvements in integrating of offshore wind capacity offer good justification that this investment is value to money for the consumer. The delivery of the Project principally through consultancy based Project Partners is deemed appropriate for the Discovery Phase, although some assessors would like to see greater ownership of delivery from transmission operators by owning roles such as Project management.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.6
The response and the associated appendix are written clearly and transparently outlining the Project plan including stages, outputs, milestones risks. Assessors agreed that this was a comprehensive approach which gave confidence of delivery. It was observed that additional time should be built in to the Project plan to engage with additional OEMs developing potential solutions, as full market consideration should be given and equal access opportunities outside of the listed Project Partners given.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a strong proposal clearly centred on network innovation to enable a more rapid and cheaper integration of offshore renewable assets within the grid. It has identified a significant opportunity to accelerate decarbonisation of the electricity system at lower costs to consumers, and with reduced environmental impacts. Evaluation should be made of counter factual approaches and whether the economic costs will make this approach competitive for business as usual rollout. Assessors felt that the benefits will need to be refined and quantified in more detail as the Project progresses.		
Recommended Project specific conditions		

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI a revised Project plan which includes greater detail than provided in the Funding Party's Application on the energy network focussed activities and the expected outputs of these activities during the Project.

Condition 4
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

Condition 5
As part of its end of Project Phase report, the Funding Party must demonstrate how the Project differs from similar national and international initiatives, and whether it makes economic sense for the Project to progress to additional demonstration activities.

Condition 6
As part of its end of Project Phase report, the Funding Party must provide evidence of engagement with a gas network. This engagement should focus on gaining insights, best practice and lessons learned from buried high-pressure lines to incorporate into project delivery.

4.3.13 [REDACTED]

4.3.14 [REDACTED]

4.3.15 10027601, SCADENT - SuperConductor Applications for Dense Energy Transmission, Initial Net Funding Required £148,437

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Electricity Transmission Plc	£28,993.33	£0.00	£28,993.33
Ørsted Onshore UK Limited	£5,088.00	£0.00	£5,088.00
Western Power Distribution Plc	£4,692.00	£0.00	£4,692.00
SP Transmission Plc	£4,314.90	£0.00	£4,314.90
UK Power Networks (Operations) Limited	£5,331.73	£0.00	£5,331.73
University of Strathclyde	£29,990.50	£0.00	£29,990.50
Nexans France	£12,395.37	£0.00	£12,395.37
AMSC United Kingdom Limited	£10,873.33	£0.00	£10,873.33
Frazer-Nash Consultancy Limited	£46,758.42	£0.00	£46,758.42

Submitted Project description

Summary: This Discovery Phase Project, led by National Grid Electricity Transmission (NGET), will develop an understanding of the barriers, opportunities, and benefits of modernising existing electricity infrastructure by replacing conventional cables with High Temperature Superconductor (HTS) cables.

This will help meet the anticipated increase in demand for electricity, especially in highly populated urban areas, that will result from a shift towards electrification for heat and transport. The Project will aim at investigating and developing a technology that will allow more rapid

progress to be made towards decarbonisation whilst minimising costs and disruption to local consumers.

Scope: Our Project will investigate a number of key questions:

- Evaluation of the costs and benefits of using HTS cabling for urban electricity networks for consumers and stakeholders.
- Modelling the impact on other parts of the network infrastructure, such as potential replacement of existing high voltage substations with a medium voltage (MV) option.
- Assessing the benefits and technical issues of using HTS technology to provide additional capacity for 132kV Applications. As a 132kV HTS system has higher capacity than a 400kV conventional option, these Applications cover the majority of power delivery requirements in future cities.
- Opportunity to develop standardised designs and installation techniques for HTS technology to address current high installation costs. Standardisation is one of the most effective ways in helping network operators deliver power where it is needed in the most efficient way.

Results: The key results for the Discovery Phase would be a detailed suite of reports, and a technology roadmap identifying key opportunities, barriers, and further work required to mainstream HTS cabling solutions.

Problem and opportunity	**Mean Expert Assessors' score**	8.8
The Project has identified a well defined Problem of electricity transmission networks being equipped to accommodate increased electrical demand due to the uptake of low emission solutions for transport and heat, in particular. The opportunity is to increase electrical transmission network at lowest cost through standardised designs and use of high temperature superconductors. This has been well articulated and represents a significant opportunity.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' Score**	9.0
This idea has great ambition and is explained well in the context of the current energy system and the state of the art of HTS cables, making this proposal for 132kV cables novel but with promising options for addressing the network demand issues if successful. The Project addresses innovation challenge with intent to shape path for affordable/low-disruption upgrade to UK networks to support future requirement for zero carbon-footprint heat, power and transport. Consideration of potential disruption to local communities by widespread deployment should be considered if successful.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & Benefits	**Mean Expert Assessors' score**	8.0
The applicants have provided a strong response with qualitative justification of benefits in several areas. Widespread economic and environmental benefits are claimed which are assessed to be achievable and significant. These are sought to be evidenced through the delivery of the Project, but should be evaluated against counter factual approaches. The approach makes a case for realising cost benefits for the consumer, though more detail could be given on how these will be conferred on to consumer energy bills. The impact on vulnerable consumers and those in fuel poverty has not been separated from other consumer categorisations.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.6

An excellent summary of the Project and its objectives has been provided. The description refers to 132kV networks being given additional capacity by using high temperature superconductor technology. The Project proposal is clear, easy to understand. The scope appears very appropriate in order to investigate a technical and economic issues outlined. It is unclear whether some of the approaches being considered within this Project could also be applied to lower voltage assets in the distribution system, or if expansion of capacity via overhead lines with be tested as a counterfactual. These may constitute an opportunity for further investigation.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.4
The route to market has been described in the context of the progression of the Project through Discovery, Alpha and Beta Phases with outline indication of the investment required to prototype and demonstrate solutions. Most of the route to market process describes internal processes for testing, ratifying and introducing new asset types as business as usual within the network. More information could have been provided on development of procurement process, particularly across different networks, and developing of supply chains to enable efficient scaling.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors Score**	8.0
The applicants have provided a strong summary and understanding of related projects internationally and at lower voltage. Justification has been given for how this Project is differentiated from past research and innovation projects. It appears novel and worthy of further exploration through Strategic Innovation Funding.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.0
The costs outlined are deemed to be appropriate to meet this Eligibility Criteria. The distribution of costs against the Project plan seem appropriate, though it is questioned why a third part consultancy is leading Project management rather than having ownership of this within the lead energy network. Some resource rates are high, which may be justified as a strategic steering role within the Project but clarity should be sought on Project inception of the role in delivery of these roles.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	8.0
The Project plan is well set out and the work packages well defined with high level responsibilities. The risk register is assessed as being robust for Discovery Phase delivery. Further adoption of agile approaches could help the Project to be responsive to developments during the short Discovery Phase. One Expert Assessor has recommended that time be built in to the Project plan to consider the case for alternative solutions to HTS, including DC systems.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The applicants have proposed an innovative Project with the potential for considerable benefits to enabling increased capacity in high voltage transmission systems. Good justification has been given for how this could realise cost savings for consumers and facilitate the introduction of electrified transport and heating at scale. The Project plan is robust and correct stakeholders are involved. The early stages of the Project should seek to evaluate the counter factual options to addressing the Project of electricity network capacity, before settling on high temperature superconductors as the preferred solution.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;		

Condition 3 Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI evidence that costs are at competitive rates for the Project activities in the Discovery Phase.

4.3.16 [REDACTED]

5. SIF 2021 Round 1 Discovery Phase – Data and Digitalisation

The complexity and scale of achieving Net-Zero will require greater provision of reliable information across parties for system planning, operation and integration of technologies. The government's Energy White Paper emphasised the need for a modern digital infrastructure to underpin energy markets and optimise physical networks.

As the move towards a Net-Zero energy system accelerates, network consumers will require simplified and accessible digital products, processes and services that can improve their user experience. Data and digital initiatives are already beginning to show the potential to improve the efficiency of energy networks whilst making it easier for third parties to interact with and innovate for the energy system.

Digitalisation of energy network activities will contribute to better coordination, planning and network optimisation. These will be required for a smarter, more flexible energy system which is underpinned by a larger proportion of intermittent renewables, alongside low carbon fuels.

Greater quality, interoperability, and availability of information from across the energy system is increasingly needed to support digital innovation. Delivering the digital infrastructure which improves the provision of information across the energy system will act as a key enabler to delivering strategic outcomes posed in other challenges. These include, but are not limited to, decarbonising heat and transport and integrating a greater proportion of flexible demand and generation.

This section covers the requirements and assessment of Applications received to the Data and Digitalisation Innovation Challenge.

5.1 SIF 2021 Round 1 Discovery Phase – Data and Digitalisation – Scope

Project scope was described in the Innovation Challenge brief for the Data and Digitalisation Challenge as;

"To lead a Project applicants must:

- be a licenced: gas distribution network, transmission network operator, or electricity system operator
- Partner with at least one other energy network licensee holding a different category of network licence, for example a gas transporter, electricity system operator, electricity transmission, electricity distribution or other energy network licenced company
- work with researchers or private sector or organisations with technical capabilities in data and digital technologies
- work with relevant data owners and processors
- work with at least one other organisation as a subcontractor

Applicants should consider all the points listed here, but as a minimum must directly address at least one as the primary focus of the proposed Project:

- more transparent and effective pricing and allocation of reinforcement costs in relation to new connections
- how the applicant will work in the open and utilise open-source approaches wherever appropriate
- publication of searchable metadata of datasets produced through the Project
- enterprise and business processes to facilitate the flow of data within and between organisations

- enabling consumers to use their data to engage in energy system innovation whilst maintaining privacy and security
- how interconnected assets can help network consumers to interact with and support the energy networks
- how to improve the visibility of infrastructure and assets, for instance new digital infrastructure or novel uses of sensor and communications technologies
- the interoperability of software platforms and data with other infrastructure sectors how novel uses of data and digital platforms can significantly improve network planning, modelling, and forecasting capabilities"

5.2 SIF 2021 Round 1 Discovery Phase – Data and Digitalisation – Proposals

23 proposals were submitted to Innovate UK through the Innovation Funding Service (IFS) portal by the closing deadline of 11am 17th November 2021, all 23 were deemed eligible for the Data and Digitalisation Innovation Challenge as per the scope outlined in section 5.1. All projects submitted by an eligible licensed distribution or transmission network have been assessed by the Expert Assessors and are listed below.

Project ref	Project name	Funding licensee	Total eligible costs (£)	Total Project contribution (£)	Total SIF Funding requested (£)
10020514	NIMBUS - Network Innovation and Meteorology to BUild for Sustainability	SHE	148,476	0	148,476
10020620	Gas Networks Interoperable Digital Twin	NGGT	79,644	865	78,779
10020622	HyNTS Pipeline DataSet	NGGT	95,571	0	95,571
10021808	Gas Analyser Systems for Hydrogen Blends	NGGT	113,414	0	113,414
10022352	Hydrogen Metering	NGGT	86,378	0	86,378
[REDACTED]					
10025639	Digi-GIFT	SPT	141,356	5,120	136,236
10025651	EN-twin-e	SPT	161,043	17,563	143,480
10025656	Predict4Resilience	SPT	129,722	20,321	109,401
10025731	Digital Twins: Exploring the commercial, societal and operational benefits on green hydrogen projects	SGN	265,324	141,059	124,265
10026595	Virtual Energy System	NGESO	163,181	13,260	149,921
10027059	Digital Twin - Exploring the societal, operational, and cross industry whole system benefits on the Gas Distribution Network	SGN	300,322	181,195	119,127
[REDACTED]					
[REDACTED]					
10027183	Intelligent Gas Grid	SGN	116,401	0	116,401
[REDACTED]					

10027191	Predictive Safety Interventions	SGN	58,729	0	58,729
10027276	Thermal imagery analysis - Condition assessment fluid and pressure	NGN	86,138	7,956	78,182
[REDACTED]					
10027307	CEV: Critical factors for the adoption of smart homes for energy efficiency and implications for consumers and providers	NGN	55,395	0	55,395
[REDACTED]					
10027572	Digital Platform for Leakage Analytics	Cadent	125,328	10,752	114,576
10027585	Eye in the Sky - Utilising satellite data to improve grid resilience in emergency	NGET	119,105	0	119,105

5.3 Evaluation of Data and Digitalisation submissions

5.3.1 10020514, NIMBUS - Network Innovation and Meteorology to BUild for Sustainability, Initial Net Funding Required £148,476

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Scottish Hydro Electric Transmission Plc	£17,364.98	£0.00	£17,364.98
Scottish Hydro Electric Power Distribution Plc	£12,453.46	£0.00	£12,453.46
The Met Office	£85,947.12	£0.00	£85,947.12
Icebreaker One	£32,710.00	£0.00	£32,710.00

Submitted Project description

SSEN's electricity network assets run across some of GB's most challenging terrain and are subject to the extremes of the UK weather, from heavy snow and strong winds, to flooding and wildfires. With a life cycle of 40-60 years, assets built today will need to remain resilient during a period when climate change is predicted to extend both the duration and intensity of the weather extremes experienced.

However, the techniques used in building today's electricity networks use only basic locational data to generically model the effects and impacts of weather and climate at a regional level only. The data is not available in enough granular detail to predict, with any great degree of accuracy, the impact that weather events and climate change will have on the individual assets that make up our electricity networks.

NIMBUS aims to make meteorological data (such as rainfall, wind speeds, temperature etc) available, at an asset-specific level of detail, and usable by the energy networks to improve the ability to model and predict the impacts of weather and climate change across the whole life of a network asset.

The outcomes of NIMBUS will help to reduce costs to consumers by extending the life of network assets, avoiding the costs of replacing assets early, and minimising costs from unnecessary interventions for maintenance. The outputs could also extend to other infrastructure providers, such as transport and telecommunications, delivering similar benefits in those sectors. NIMBUS will be delivered by a consortium of Project Partners that are experts in their respective areas -- SSEN Transmission and SSEN Distribution (asset owning businesses and users of this innovation); The MetOffice (one of the leading meteorological organisations in the world); and Icebreaker One (developers of Open Energy infrastructure which will revolutionise the way energy data is shared in the UK).		
Problem and opportunity	**Mean Expert Assessors' score**	8.0
A clear Problem has been identified. The two problems of changing weather conditions due to climate change and the lack of granular data available to predict impacts has been well described. The opportunity to reduce financial costs, improve system resilience and achieve carbon reductions has been well justified.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.8
The Big Idea has been very clearly articulated and addressing the requirements of the Data and Digitalisation challenge. The approach to improving the visibility of infrastructure and assets will support network planning, modelling, and forecasting capabilities. The Application would have benefitted further by describing the constraints affecting the problem in terms of whether the spatial resolution of the data would be sufficient for producing valuable outputs.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	6.8
Explanation of how the proposed Project idea may achieve economic resilience and carbon benefits has been given. More information could have been provided on how shorter term capital costs for deploying asset monitoring equipment could impact consumers negatively, and for how those impacts might be mitigated. Assessors noted that qualitative benefits have been described with metrics for tracking these benefits identified. Quantification of benefits will be presented in Alpha/ Beta Phase Applications.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.2
The applicants have provided a strong Project summary which provides contextual background and a well defined scope for the Project. The Project involves a good level of network innovation, and in addition could offer benefits beyond the networks. The consortium members have strong experience and the skills to deliver the projects. There is good data management and metrology capability represented.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.2
The Project does not present risks to the development of compeititive markets. An outline description of a route to market has been provided, although assessors felt this could be strengthened. Methods for dissemination across other energy networks will be an important aspect of achieving business as usual, including gas networks. The Application would have benefitted from describing how future business as usual scenarios will make use of the technology outputs. The commercial delivery model in business as usual needs better articulation for future Alpha/ Beta Phase Applications.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	6.4

Good consideration of cross-sectoral applications and learning potential has been given. Assessors felt that the Project described how this Project builds upon previous work and will take novel and innovative approaches against the Problem use cases identified. There could have been better recognition of high profile national projects and initiatives around climate data-led asset management innovations, these include Open Climate Fix, the CrEDo Project, and ESA's cross-European Digital Twin Earth programme. Referencing these similar initiatives and explicitly stating how NIMBUS will build upon learnings elsewhere whilst exploring novel concepts would have achieved higher scores.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	6.4
The Project costs are reasonable and lie within industry expectations. The value for money case is sufficient for the activities and outputs described. However assessors noted that some cost rates are at the higher end of industry norms and have challenged the Project to ensure that resource costs for some Project Partners are proportionate to the activities to be carried out. The response reiterates benefits to consumers through avoidance of asset replacement and network resilience which if realised will be expected to provide value for money to consumers.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	8.0
The Project plan has been produced to a high standard which gives clarity of the delivery activities and methodology. The work-packages are clear with defined lead parties.The risk register approach is good with clear ratings and mitigations, the risk register should be developed and provide more granular detail during the Discovery Phase. Improvements could be made by demonstrating the dependencies between the work packages.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
NIMBUS has been assessed to provide a good fundamental scope of work and the Application provided was strong in most areas. Climate change resilience is a prime imperative for the energy sector, and the approach described in the Application appears to be credible and timely. In the Discovery Phase the Project Partners should take stock of other national and local projects are currently underway, some of which may provide additionality to this Project through sharing lessons, processes and evidence bases for underpinning any next steps. In future phases the consortia should be able to offer greater specificity on the digital products or services that will be developed, and how these will be commericialised under business as usual. Assessors would also like to see further development and evidence of the value proposition to network consumers in both the near and longer term timeframes.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI evidence that costs are at competitive rates for the Project activities in the Discovery Phase.		

5.3.2 10020620, Gas Networks Interoperable Digital Twin, Initial Net Funding Required £78,779

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Gas Plc	£9,427.00	£0.00	£9,427.00

RAVMAC Limited	£64,346.21	£0.00	£64,346.21
National Grid Electricity System Operator Limited	£865.66	£865.66	£0.00
Southern Gas Networks Plc	£2,125.00	£0.00	£2,125.00
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00

Submitted Project description

The transition to Net-Zero comes hand in hand with a level of complexity not managed by the gas networks to date. Digital technologies can enable solutions to manage multiple data sets much more quickly than manual intervention. Many networks are looking at digital twin technologies and advanced data lakes to support them, and it is important that at this stage we review the potential similarities and differences and determine how to ensure that they can work together through the transition and beyond.

Today there are many options for cloud platforms, analytics platforms, Application programming interface, IOT devices and visualisation systems. This Project will not restrict the networks to utilising one approach but will enable those systems to work together without some of the issues seen today such as data loss, time misalignment and incompatible data types, which are resource heavy and costly to rectify.

At this stage we will not look at specific technical solutions but initially consider the use cases, requirements and processes and where the interfaces are between the various networks; this we will call concept-in-the-loop. We will then consider a model of this interaction and process (model-in-the-loop), followed by a deeper consideration of the software supporting the Applications (software-in-the-loop). Finally we will look at hardware-in-the-loop which will determine the level of sensing required to meet our combined objectives. This should provide a robust and cost effective solution for our combined digitalisation platform. Human-in-the-loop will also be considered in terms of usability and ease of process throughout the Project.

This Project will work alongside the ESO led 'Virtual Energy System--Common Framework and Technical Parameters' SIF Project and the SGN led 'Common Information Model development' Project to bridge the gap between GDN asset information systems and the wider energy management systems.

RAVMAC have recently completed a piece of work for BSI looking at the interoperability of digital systems across multiple industries and countries. This work will provide a good foundation from which to develop an understanding for the gas networks in the UK.

Problem and opportunity	**Mean Expert Assessors' score**	5.6

The Problem that the applicant seeks to address has been articulated in outline with good context of other related initiatives. However, assessors felt that there was a lack of detail in the Problem statement. It is clear that improved use of data will be needed during the energy system transition but it is unclear what the current barriers to progress are. There are generic opportunities of utilising better data practices described.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	6.0

The proposal has been assessed to meet the criteria for Data and Digitalisation Innovation Challenge. The focus is clearly on developing use cases for which data and digital technologies could be applied, and has been done so in a clear manner. Some of the component technologies of digital twin technologies have been described, although the proposal is very broad in scope at this stage. Some assessors felt the proposal was ambitious as a result, whilst others felt that it lacked a focal area which pushed the boundaries of existing innovations.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	5.8

The benefits are described as being an outcome primarily of real time monitoring of the gas networks. This presents an opportunity to deliver operational efficiencies and more intelligent transition to low carbon gas use, which should then be passed onwards to gas network consumers. There could be greater awareness in the response of the other technologies and processes that relate to digital twin development. Benefits, or the expected costs of technology deployment, are not quantified at this stage but would be expected to be developed against particular use cases in later phases.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	6.2
The proposal has clear focus upon energy network associated data and innovation activities which relate to digital twin technologies. The proposal meets the requirement of involving participation from a range of stakeholders, with several networks involved and a business with suitable technical capabilities. The Project summary has been well described, however the boundaries of the Project scope are vague. Standardisation of communications protocols is most clearly understood, but other aspects of the proposal were less clear. For instance, the interoperability with other networks, unlocking opportunities to hydrogen deployment, development of a single digital twin, and reference to multiple digital twins was made. The proposal could have better described a clear prioritisation or idea development pathway of these ideas.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	5.8
The proposal is not viewed to undermine the development of competitive markets in any way. A description of the value proposition to gas networks has been described reasonably well. There do appear to be dependencies to realising benefits on the development of interoperable approaches by the other energy networks. This is implicit but should be highlighted as a core dependency. A credible narrative is given for how digital twins can support the transition to a Net-Zero energy system. Better explanation could be given for how these activities would transition to business as usual implementation.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	5.2
The applicants have given a reasonable overview of related activities in the UK energy sector, and comparisons with some other sectors. Better description of similar international activities could have been provided. Most assessors felt that the justification of the innovative components of the Project lacked depth. Although there are certainly innovative concepts being explored as part of the Project, there is a moderate case that this proposal offers a significant step forwards in terms of ambition or innovation.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	5.8
The Project costs are viewed as appropriate and costed competitively given the scope of work. The balance of costs towards the technical lead Project Partner is viewed positively. A greater granularity in the breakdown of costs demonstrating the time allocation to different Project activities would have strengthened the response. Some assessors considered the scope of work to be ambitious given the resources available for delivery.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	7.8
The Project plan and delivery methodology have been well described in this section. There is clarity on the work packages and deliverables provided. The risk register is clear and detailed to an appropriate level for the Discovery Phase. The approach described provides confidence to assessors in the capability of the team to deliver the plan.		
Regulatory barriers	**Yes/ No**	No

No regulatory barriers are identified for this Project. Although later consideration for how digital twin activities are transitioned to become part of gas networks delivery plans under business as usual will need to be considered at a later stage of development.

Recommendation to the Gas & Electricity Markets Authority	FUND

The applicants have presented a high-quality Project plan which offered clarity on the objectives, work packages and deliverables of the Project. However, the Application has could have been strengthened with more detail in several areas. The Problem statement and innovative outputs in particular will need further development during the Discovery phase. Overall, the assessors felt that the concept of the proposal has potential, and welcomes the approach of coordinating activities with other energy networks to ensure common approaches and interoperability across digital twins.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
As part of its end of Project Phase report, the Funding Party must engage with members of the teams behind other SIF Projects focussed on digital twins, including: "Digital Twins: Exploring the commercial, societal and operational benefits on green hydrogen projects", "Digital Twin - Exploring the societal, operational, and cross industry whole system benefits on the Gas Distribution Network", and "EN-twin-e" to identify common areas of scope and collaboration opportunities. Additionally, the Funding Party must share its end of Project Phase report with the three SIF Project teams listed above.

5.3.3 10020622, HyNTS Pipeline DataSet, Initial Net Funding Required £95,571

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Gas Plc	£10,819.00	£0.00	£10,819.00
Rosen (UK) Limited	£81,261.80	£0.00	£81,261.80
Cadent Gas Limited	£3,490.20	£0.00	£3,490.20

Submitted Project description

The aim of this Project is to develop the tools and processes to determine the state of National Transmission System and Local Transmission System pipelines, and their capability to carry Hydrogen.

When looking to repurpose methane pipelines for hydrogen there is a requirement for us to have improved understanding of our pipeline assets; material type and smaller defects such as cracks become critical for hydrogen embrittlement effects and need to be understood prior to hydrogen injection, and whilst in use.

This Discovery Project looks at the data that is required to conduct the necessary integrity assessments, to facilitate the safe repurposing of pipelines from natural gas to hydrogen operation, including the identification of any gaps in the currently available data.

Alongside this, the Project will address which additional datasets will be needed, the methods for inspecting the pipelines to obtain these datasets and the identification of ongoing requirements for hydrogen pipeline inspection activities.

Through the Project, we will be looking at defining the requirements for a data management system, to store, align and visualise the data required for integrity assessment, and establishing the requirements for dissemination and sharing of agreed datasets, to facilitate key asset management activities.

We will also outline a methodology that will allow National Grid and Cadent to rank the suitability of all their individual pipeline segments for potential repurposing to hydrogen.

Future phases of the Project, (Alpha/Beta) will look to demonstrate the assessment capability on both methane and hydrogen pipelines, online and at the FutureGrid site in Spadeadam, Cumbria respectively.

Problem and opportunity	**Mean Expert Assessors' score**	7.6
The Problem of understanding our pipelines and their suitability for transporting hydrogen has been well described. Taking a strategic approach to planning data capture and management to aid that understanding presents an opportunity to better understand this Problem and plan future network operations. This approach has the potential to enable better evaluation of lowest cost decarbonisation approaches.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.6
A strong case has been made for the alignment with the programme in regard to the needs of hydrogen transmission, and the impacts it might have in supporting national net zero targets. The proposal is considered to address the Innovation Challenge and wider SIF objectives. Improved marks may have been achieved by providing better description of current internal line inspection approaches, and how this proposal will significantly differentiate from these, particularly in regards to the data captured and analysis conducted.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.2
The potential benefits are clearly described and are considered to align with the SIF objectives. The principal benefits to consumers are enabling decarbonisation of gas supply at lower cost, as well as minimising the impact of gas conversion disruption on consumers. More detail in the form of metrics could be provided to support the qualitiative descriptions, but these are expected to be developed in more detail within the Discovery.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.2
The Project summary is clear and concisely explains the Project to a high standard. The phases of the Project have been clearly defined. The partners have strong relevant capabilities for delivery of the programme of work, with wider stakeholder engagement also planned. More details could have been provided on the role of Cadent in the delivery of the Project.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	5.6
The value proposition to gas networks is clear. There has been consideration of how operational efficiencies will be increased, by allowing existing infrastructure to be better utilised. How the proposal will create commercial opportunities for the partners is less clear. A route to market which enables the use of developed tools or approaches across all networks, whilst also creating opportunities for third parties to support delivery needs development. With better development and articulation of this, assessors believe the proposal has potential routes to market without undermining the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	8.0
A detailed review of the current state-of-the-art in regard to understanding the transmission challenges for hydrogen has provided. Most assessors consider this proposal to be innovative and novel. It is understood to be an iterative improvement on current data capture and analysis techniques, applied to the particular problem of understanding pipe systems and their integrity for transporting hydrogen through time. One assessor felt that greater explanation of how these		

approaches differentiated significantly from the Rosen hydrogen integrity framework currently used.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	6.8
The Project costs are appropriate and should be sufficient for Project completion. The balance of costs is weighted towards a single partner, which raised some questions from assessors about the degree of participation from other partners. The partner costs have been assessed as being within common industry ranges, although they lie at the higher end of those ranges. The applicants are challenged to demonstrate improved cost competitiveness in future phases with more granular breakdown of costs against specific work packages.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	8.0
The Project delivery methodology and risk assessment are completed to reasonable quality and give confidence for successful delivery. Risk ratings and rankings would have strengthened the proposal. The plan shows good alignment with the stated business opportunity.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified at this stage, although output tools and methodologies may need to be quality assured by regulators if ultimately used to determine the suitability of future pipeline use for hydrogen.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The proposal sets out a compelling case for why networks need to understand the suitability and condition of gas networks to be repurposed for hydrogen use. Potential carbon and cost benefits are outlined. The consortia has suitable capabilties for the delivery of the project. The proposal has been delivered to a high standard, although the route to market for the potential tools and approaches is underdeveloped. The Project partners will need to demonstrate how their proposal offers additionality to current approaches and frameworks.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must evidence a refined scope of work to clarify the Project's focus, as the Project's focus is currently diffused across several areas including network repurposing, inspection of hydrogen assets, new tools for inspection and data management associated with internal line inspection. Condition 4 Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI an outline for how activities differentiate from those of similar projects which have investigated gas conversion, such as National Grid's Project Union[5], Project Cavendish (NIA_NGGT0143)[6] and Aberdeen Vision (NIA_SGN0134)[7].		

5.3.4 10021808, Gas Analyser Systems for Hydrogen Blends, Initial Net Funding Required £113,414

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required

[5] https://www.nationalgrid.com/stories/journey-to-net-zero-stories/making-plans-hydrogen-backbone-across-britain
[6] https://smarter.energynetworks.org/projects/nia_nggt0143/
[7] https://smarter.energynetworks.org/projects/nia_sgn0134/

National Grid Gas Plc	£11,443.00	£0.00	£11,443.00
Cadent Gas Limited	£3,790.20	£0.00	£3,790.20
Des19ncor Limited	£98,181.33	£0.00	£98,181.33

Submitted Project description

The Gas Analyser Systems for Hydrogen Blends discovery Project looks to develop a solution to analyse National Transmission System (NTS) gas blends for the transition to Net-Zero. Gas Analyser systems today are capable of analysing 100% Natural Gas and 100% Hydrogen gas streams but there are no solutions for blended gas streams, especially when the blend could vary within the pipeline.

A fuel cell-based gas sensor (FCS), developed by Loughborough University and Des19ncor Ltd, recently completed its first concept demonstration against NTS chromatographs, with positive indications that this could be a solution for blended gas. The discovery phase we will further prove the capability of this technology and its ability to be networked to the 'Internet of Things', to meet the needs of the existing and future gas networks as they move towards Net-Zero.

The FCS will be examined in detail, to ascertain whether it is capable of sensing and calculating calorific values (CV) in natural gases, blended Hydrogen gases, pure Hydrogen gases and Biomethane in near real time, such that these can be used to control gas quality (e.g. Wobbe Index and relative gas densities) in a fully integrated IOT system. This Project will benchmark FCS capability against other gas analyser systems and will assess and test the technical and regulatory barriers and opportunities involved in the adoption of the new technology on the gas network.

The FCS technology has the potential to provide near real-time data, to gather rich data sources for controlling the needs of the transmission and distribution gas networks, something which systems today are unable to do. Hydrogen data from the sensor will enable embrittlement predictions for asset management and aid permeability management and control, allowing for predictive asset management on the high carbon steel network. The use of AI with machine learning and predictive analytics on the main FCS data sources, will help to identify efficiency and safety benefits. Alongside this, the FCS technology could gather CV data closer to the customer (e.g. at governor sites) and make the data available for customers to view via their smart metering systems.

Problem and opportunity	**Mean Expert Assessors' score**	8.6

The Project addresses a key element in the potential transition to hydrogen or mixed blend transportation in the gas networks. An opportunity to use data, metering, and digital analysis to identify gas blends, as well as for predictive asset management, has been well described. A valid rationale for how this could facilitate cost savings and carbon reduction has been given.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	8.6

The concept is well-defined and shows good alignment to the challenges in the competition. A successful product could be underpinning in the transition to hydrogen ready gas networks.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	7.2

A range of credible environmental, carbon, and cost reduction benefits have been discussed. The benefits are in line with the SIF objectives and this could be an enabling technology for transportation of hydrogen fuel. The counter factual of other approaches to cost reductions and further development of the quantitative value to consumers is expected to be developed as the project progresses.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project Summary	**Mean Expert Assessors' score**	8.2

The proposed Project has a clear focus on network innovation, investigating the use of novel sensors and data analysis techniques across the gas networks. There is a highly complementary consortium behind the Project, with an appropriate range of stakeholders and leading academic input. The supporting materials have been produced to a satisfactory standard and highlight the benefits and impacts of the proposed approach. The roles and skills of the parties involved should ensure a balanced and successful Project.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.8
The value proposition to transmission and distribution network operators and other stakeholders is well described. Better understanding of the quantitative benefits in later phases will enable greater consideration and articulation of how the value of those benefits will be realised by consumers. The Project will not undermine the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	8.8
A well-argued and evidenced case has been made for the proposed innovation, with appendices providing additional supporting information on the commercial differentiation of the proposed technology compared to other gas analyser solutions. Patents demonstrate the novelty and also provide grounding for the protection of IP.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	8.0
The costs are appropriate to the scope of the proposed work, and a good case has been made for the value proposition of the Project for the applicants, the UK economy, and consumers. There is a good balance of costs between the partners, although the response could have provided a more granular breakdown by cost categories and work activities. There are contributions in-kind offered which improve the value for money case to consumers.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	9.0
The Project plan is ambitious but well-structured to deliver the required results in the timeframe. The milestones and roles are clearly defined and a supporting Gantt chart is provided as appendix material. A risk analysis has been carried out and key risks outlined, with credible mitigation strategies. Some consideration has been given to major constraints on the outputs, although these would have benefited from more detailed discussion. This section has been completed to a very high standard.		
Regulatory barriers	**Yes/ No**	No
The Project will provide evidence for the consideration of regulator's decision making regarding the transportation of hydrogen at different gas blends across the gas networks.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a very well articulated proposal with a strong justification of innovative potential. The gas industry's need to analyse many different gases in real time is a significant problem that the Project aims to address. The potential benefits are well described, attractive and in line with the objectives of the SIF. The Project is costed competitively and represents good value for money compared with alternative approaches. The potential for exploitation of any successful outcomes is considered to be high. Enabling the existing gas network to play a role in the storage challenge that is inherent in the move to Net-Zero would be an important way to minimise costs to consumers. Having a cost effective way of monitoring an increasingly complex mix of gas feeds is an important step towards that. A strong proposal in a highly strategic area for the advancement of hydrogen transport in the UK gas networks. The Project outcomes would provide key knowledge in the wider discussion of		

hydrogen as a fuel option for net-zero targets. There is a strong consortium behind the proposal, with a good balance of stakeholder and academic input. Potential for exploitation of any successful outcomes is high.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to the Project commencement, the Funding Party must provide to Ofgem and UKRI clarification of the discrepancies between the Finances Overview and Finances Spreadsheet in the Project's Application. Condition 4 As part of its end of Project Phase report, the Funding Party must include a review of sensing and analyser solutions which are used in environments outside energy networks, and outline the benefits of the components under development in the Project compared to these available alternatives.

5.3.5 10022352, Hydrogen Metering, Initial Net Funding Required £86,378

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Gas Plc	£30,780.00	£0.00	£30,780.00
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00
DNV Services UK Limited	£47,917.50	£0.00	£47,917.50
IGEM House Ltd	£4,800.00	£0.00	£4,800.00

Submitted Project description		
The Future Metering Project will build metering installations from repurposed and new metering equipment to operate with hydrogen and hydrogen blends, fully replicating metering facilities across the whole gas transportation system; from transmission and distribution to last mile industrial metering connections. The Future Metering facility will provide valuable insights into how hydrogen affects fundamental metering calculations, and will provide an assessment of the risk and costs for the repurposing of metering and associated gas assets (including c890k industrial and commercial metering installations) Alongside this, it will also provide the UK gas industry with a valuable test facility to explore new technology and innovations. This will deliver the next generation of user driven digital products that will provide evidence to support the transition of the gas network to hydrogen and the UK to Net-Zero potentially supporting the reduction of 29% of UK CO2 emissions. This proposal will provide assurance from derived real world data from this facility to assure the safety, performance and accuracy of metering across the gas transportation system up to and including industrial last mile consumer-connected metering installations. This will ultimately give assurance and confidence that hydrogen metering can provide fair, transparent, and accurate measurements for effective network management whilst meeting the fiscal performance expectations of industrial end consumers.		
Problem and opportunity	**Mean Expert Assessors' score**	8.8
A potentially significant Problem has been identified, and the applicant has presented a compelling case for how they will address this Problem. The opportunity is well-defined and is strategically aligned with proposals for roll-outs of hydrogen as an alternative fuel source to address net-zero challenges. The Project addresses a key element in the repurposing of the network and in user-facing metering challenges for hydrogen or mixed blend metering.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		

The Big Idea	Mean Expert Assessors' score	8.4
The core idea of the Project is clearly described and it has been well established how it will address the problem and needs of its users. The Project has excellent alignment with the scope of the Innovation Challenge and provides a clear route to determining the challenges of metering hydrogen in current network systems.The range of meter types in scope is also a good representation of what will likely be required in a hydrogen economy.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	8.0
The quantified projected potential value to the environment in terms of a gas to hydrogen grid transition is considered realistic. The approach to modelling for revealing potential costs across the network and informing regulatory decisions shows promising prospects. Other targeted benefits such as opening up the market, skills development, new standards are well described. The Discovery Phase is ideal to building the benefits case supported by further quantification. The projection of cost savings for industrial users and consumers is appears ambitious and will require further assurance as the Project progresses. Assessors consider the benefits described to be achievable in principle.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.2
A comprehensive outline of the Project has been provided, and all supporting appendices and video have been completed to the required standard. The Project aligns with the competition criteria in addressing knowledge gaps that will contribute to the discussions around the feasibility of a move to hydrogen fuel. There is a strong consortium with good representation of stakeholders across the domain and roles are clearly defined. DNV provide expertise and access to test facilities that will underpin the study, although assessors encourage the Project to invite engagement and challenge from the wider industry that will be involved in the metering or use of hydrogen.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.8
A reasonable case has been made for the value proposition of the Project for the sector, and there is scope for wide impact and exploitation across the supply chain. The main outcomes are clearly defined and a key partner provides a route for technology transfer into the commercial market and supply chain. It would have been beneficial to have understood what investment IGEM may require for this after the Project completion and any longer term plans to maintain the test facility or governance of standards/technical specifications. More insight into the regulatory considerations required would have been welcomed.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	7.6
A comprehensive understanding of similar innovations is demonstrated, and a strong justification is presented as to why this Project is innovative. The Project will aim to tackle a unique challenge by advancing the state of the art in metering hydrogen, which accommodates a wide range of meters and scenarios across the existing gas network. The stated test approach shows promising prospects to show how existing assets would perform in a gas grid transition, together with the impact for customers. More information could have been provided on how novel digital technologies could be harnessed to achieve the Project's aims.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.2
The costs are appropriate to the scope and scale of the Project and there is a good balance of effort across the partners in line with the proposed programme of work. Detailed justifications for costs are not provided but a strong case has been made for the value for money and the		

potential impact across the industry. Some partner resource rates are assessed to be high but within expected industry ranges. The Project should ensure that resource allocation is proportionate to the work to be carried out and is challenged to improve value for money if taken forward in later phases. Costs could have been broken down in more detail against project activities, rather than assigned to the delivery of the single milestone.
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.

Project plan & milestones	**Mean Expert Assessors score**	7.6
The Project plan is presented well and appears realistic. Roles and dependencies are clearly stated and milestones are in place. Supply chain engagement at kick-off is welcomed. Overall, the plan inspires confidence in successful Project completion. The answers shows many of the elements to produce a very useful feasibility study underpinned by strong governance, buy-in and stakeholder engagement. However, the approach could have shown greater consideration of important technical and commercial risks as well as mitigating actions in this phase or in future phases.		
Regulatory barriers	**Yes/ No**	No
There are no regulatory barriers to the Project delivery, however final outputs may require industry or regulatory governance of standards or technical specification for hydrogen metering.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a well formulated feasibility study by a highly capable team for understanding the performance of metering hydrogen in a grid transition from gas. The Project shows promising prospects to achieve substantial positive impacts for the environment, consumers, to open up competition, together with informing the regulatory environment and contributing to standards. The proposal could have been improved by better articulation of the Intellectual Property Management approach, exploring the international market, and explaining in more detail the data management strategy. Overall this proposal has been assessed to be ambitious and well presented.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase. Condition 4 As part of its end of Project Phase report, the Funding Party must clarify whether the development of a test facility, rather than trialling in a real-world environment where assets will continue to be used, provides greater value for money to consumers.		

5.3.6 [REDACTED]

5.3.7 10025639, Digi-GIFT, Initial Net Funding Required £136,236

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
SP Transmission Plc	£51,201.60	£5,120.16	£46,081.44
National Grid Electricity Transmission Plc	£16,000.00	£0.00	£16,000.00
University of Manchester	£63,538.46	£0.00	£63,538.46
SP Distribution Limited	£10,615.38	£0.00	£10,615.38
Submitted Project description			

To realise Net-Zero, we need to digitise our network; this forms a core parts of our on-going innovation and business as usual activities. However, there are key barriers in how current practice achieves this in the electricity networks. Specifically, the lack of standardised data formats that we use within our organisations, supply chains, and even internally spans many different formats, protocols, and standards. Asset monitors currently either utilise connection to the RTU or the use of bespoke software -- often HTTP (unencrypted, internet transferred) to deliver analytics back to system analyst. This does not unlock the full benefits of the IEC 61850 standards used in the digital substations for communication.

In addition, as we digitise, our networks are a highly attractive target for cyber-attackers aimed at disrupting operations. The secure and seamless data exchange across parties is essential for system planning, operation, protection and automation, this has been reflected with over £100m of cyber security investment across the UK Electricity Network Operators.

This Project proposes to enhance substation security and data access by replacing the RTU connection with a direct connection to analytic servers removing the connection between the RTU and asset monitors.

We will design a holistic data connector (Digi-GIFT) to communicate directly to asset monitors pulling back real-time asset data, alerts and analytics to analysts. In addition to the direct benefits of real-time information and improved security, this would also act as an enabler to wider benefits from concepts such as the Digital Twin and unlock the benefits in line with the GB energy network digitalisation strategy priorities.

Through the Digi-GIFT Project, we will advance standardised secure data sharing in the energy system, and over build on over £500m investment in digitalisation projects, realising:

*Reduction in frequency and impact of cyber security events
*Improved energy system planning, optimised operation and improved Interoperability of platforms and data sharing with other infrastructure sectors

Problem and opportunity	**Mean Expert Assessors' score**	7.0
The problem of non-standardised data which is potentially insecure has been reasonably well described, with contextual information on why it is an important area to focus on as digitalisation of the energy system progresses.The opportunity for improved energy system planning and greater resilience from cyber security incidents is described in outline.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.6
The big idea is ambitious with a range of technical benefits succinctly articulated.There is good alignment with the scope of the Innovation Challenge, and the Project clearly addresses some of the specific areas mentioned in the Innovation Challenge brief.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	6.2
The applicants have made a good case for why the digitalisation of the energy networks and easy access to the data is real-time are key enablers for the transition to a low carbon and cost-effective energy system. This is widely accepted across the industry. Better scores would have been achieved with some explanation of why Digi-GIFT was the best approach to achieving those benefits, and why this additional project is necessary to realise the potential benefits identified through the FITNESS project referenced.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.4
The Project summary is clear and easy to follow. Project Partners are credible and well positioned with relevant historical project experience. The combination of organisations is strong		

and all have relevant experience within the organisation, although more detail could have been given on the capabilities of the delivery team, given the technical area of focus is not the core function of all organisations involved. Assessors were pleased to see the involvement of Distritbution Network Operators and Transmission System Operators.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.4
The exploitation of the Project and future dissemination have been outlined. Working with the Energy Networks Association and relevant working groups will be important, but Assessors have also highlighted that the Project will also have to ensure engagement with wider industry and digital technology providers. Cross industry buy-in will be crucial to successfully deliver project outputs. Investment needs have not been identified, although Assessors suspect that third party investment needs are likely to exist to generate a healthy digital supply chain. The Project is not viewed as undermining the development of competitive markets as long as an open and transparent procurement process is followed for the delivery of the agreed solutions.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	6.4
The innovative aspects of the Project have been clearly demonstrated with the Applicants showing a good understanding, although greater coverage of similar innovations would have benefited the application. In particular the Energy Data and Digitalisation Taskforce as well as the National Digital Twin programme should be reviewed to ensure alignment of activities. One Assessor had some concerns over whether the prosed scope of Digi-GIFT was to establish a competing data model and connector to CIM IEC 61970 standards, or whether the intention is to provide interoperability with such standards. This should be clarified during the Discovery Phase.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.0
The costs of this proposal, together with the split of costs across Project Partners seems reasonable. If successful, a comparison of costs for procuring a third party solution, rather than bespoke development should be offered for Alpha Phase application, which will provide stronger justification of the value for money case. Many of the benefits will accrue to the networks, consumers and network users so it would seem appropriate that this is funded by consumers.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	7.6
The Project plan is strong , work packages have been detailed and clear milestones outlined. The risk register covers most of the major potential risks and provides mitigating actions. More detail could have been provided on some of the key risks. Further definition of the interfaces of Project delivery with the advisory group and wider external iniaitives would have added value.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The fundamental idea focussed on within this proposal is seen as valuable and related outputs will certainly be necessary to realise full energy system benefits through the energy transition. Assessors have challenged whether this Project requires the SIF support or is a requisite activity which will need to be delivered at some stage under the networks business plans. However, at this nascent stage of development it is considered to be a valuable area to explore with innovative aspects. The Project should engage with and explore partnership with parallel initiatives including the Data and Digitalisation Taskforces, Open Energy, the Open Networks Project. and relevant industry bodies such as Electralink. This will help identify alignment opportunities and secure the widespread industry buy-in which will be necessary to achieve successful outcomes.		
Recommended Project specific conditions		

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
As part of its end of Project Phase report, the Funding Party must clarify if the Project aims to establish a competing data model and connector to Common Information Model IEC 61970 standards, or if the Project aims to provide interoperability with such standards. As part of this, the Funding Party must provide, in the its of Project Phase report, justification for why a particular approach was taken.

Condition 4
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

5.3.8 10025651, EN-twin-e, Initial Net Funding Required £143,480

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
SP Transmission Plc	£39,149.00	£7,829.80	£31,319.20
University of Strathclyde	£51,135.00	£0.00	£51,135.00
Digital Catapult	£56,780.00	£0.00	£56,780.00
National Grid Electricity System Operator Limited	£8,672.00	£8,672.00	£0.00
SP Distribution Limited	£5,307.00	£1,061.40	£4,245.60

Submitted Project description		
As a Transmission Owner, we are in the critical path and interface between the ESO and Distribution networks. Our idea is to develop a digital twin of the distribution system and use it to provide a service to NGESO that will aid in decision making when choosing which distributed energy resources and transmission asset availability to use when balancing the NETS so as not to adversely impact the operation of the transmission and distribution network.		
Problem and opportunity	**Mean Expert Assessors' score**	8.0
The increasing challenge of managing the electricity distribution networks as the measures to decarbonise radically and rapidly change both the supply and demand sides of the market is well described. This is a significant problem and one which the Applicants have articulated well. A range of credible opportunities have been identified ranging from financial cost efficiency, to carbon reductions, and improving consumer and customer asset participation.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	8.6
The ideas are bold and realistic in tackling the aims of the Innovation Challenge. A compelling vision has been given that describes a system collecting, organising and presenting information about the entire network to support better operational decision making. The Assessors found the approach described offers improvements in how networks manage an increasingly complex system more effectively.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.0
The impacts and benefits are wide ranging and are described for consumers, both in terms of cost and participation through incentives. These were viewed positively by Assessors with clear potential for delivering net benefits to network consumers. Some of these benefits were described at a very high level, more specificity on where the carbon or cost benefitsmight come from might have achieved higher scores. Quantified benefits are not required at this stage,		

however the Applicants could have provided indicative metrics to be captured and tracked for realising benefits.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.6
This is a very clear summary which has been convincingly formulated. It succinctly explains the strategy for developing a digital twin spanning transmission and distribution which will give greater transparency of network status than currently possible. The Partners represented offer a strong range of suitable abilities. Representation includes a transmission and network operator, an end user, a university and RTO .The answer could only have been strengthened by identifying the specific teams involved in delivery from each organisation, and their relevant experience.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.8
The pathway to business as usual is realistic for driving wider adoption of the Digital Twin platform with an appealing value proposition to stakeholders. The collaboration with the Electricity System Operator and other energy networks is vital to realise a successful route to market. Regulatory considerations have been made and are understood at an outline level, but Assessors felt that future commercial and technical dependencies (particularly for exploitation with third parties) may be more complicated than envisaged at this point.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	8.0
A good statement of the Project scope and how it builds upon the current state of the art has been provided. A very good understanding of other related projects and initiatives has been shown. Assessors felt that the 'live simulation of the distribution network in operational time and information exchange between the physical system and the twin' would constitute a highly innovative achievement, if realised.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.0
Overall project costs were assessed at lying within the range of being considered competitive at market rates. However, many of the labour cost rates were viewed as being high for the extent and scope of work to be carried out within the Project. The split of costs between partners is viewed as proportionate. An additional 11% funding contribution is provided by Project Partners to offer improvements to the value to consumers.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	7.2
The Project plan and milestones represent a sound structure as a feasibility study in the Discovery Phase. The structure is well aligned with the Project aims. Work packages are clear with an appropriate work package owner. The phasing of work is sensible. The risk register is good but could have been more comprehensive and also covered the commercial and regulatory risks/opportunities that have been mentioned elsewhere in the Application.		
Regulatory barriers	**Yes/ No**	No
At a later phase of development there may be consideration of the remit of different energy networks for the development, operation and development of different aspects of the digital twin.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The Project has been well articulated with a clear problem, solution and plan to get there. The consortium is appears to be very capable with suitable skills and expertise. The applicants makes a compelling case for both the imperatives of pursuing this initiative and of the benefits of digitising the energy networks to realise positive benefits for consumers, industry, and carbon reductions. Concerns have been raised about the cost rates quoted and the Project should reevaluate how they can maximise the value to consumers through competitive costs, both in this Discovery Phase and in future Phases.		

Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must engage with members of the teams behind other SIF Projects focussed on digital twins, including: "Digital Twins: Exploring the commercial, societal and operational benefits on green hydrogen projects", "Digital Twin - Exploring the societal, operational, and cross industry whole system benefits on the Gas Distribution Network", and "Gas Networks Interoperable Digital Twin" to identify common areas of scope and collaboration opportunities. Additionally, the Funding Party must share its end of Project Phase report with the three SIF Project teams listed above. Condition 4 Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI evidence that costs are at competitive rates for the Project activities in the Discovery Phase.

5.3.9 10025656, Predict4Resilience, Initial Net Funding Required £109,401

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
SP Transmission Plc	£31,842.29	£3,184.23	£28,658.06
Arup Limited	£72,099.44	£7,209.94	£64,889.50
University of Glasgow	£6,504.00	£650.40	£5,853.60
Met Office	£10,000.00	£0.00	£10,000.00
SP Distribution Limited	£4,245.64	£4,245.64	£0.00
National Grid Electricity Transmission Plc	£5,030.69	£5,030.69	£0.00

Submitted Project description		
As a result of climate change, the instances of severe and extreme weather instances are increasing. By combining state-of-the-art ensemble weather forecasting products with novel statistical post-processing, Predict4Resilience will produce actionable forecasts of extreme weather, specific network faults and risks up to two weeks ahead - doubling the current forecasting range, effectively saving the operational costs of network companies and reducing the potential outage time for customers.		
Problem and opportunity	**Mean assessor score**	7.2
The problem of increasing vulnerability of network assets to climate change is clearly articulated. Weather related fault events are explained to be an existing problem on the energy networks, but also one which may threaten resilience of the electricity networks even more so in future, threatening widespread network outages for significant periods of time. The opportunities of using novel digital approaches to predictive forecasting of extreme weather events are described in a rational manner.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean assessor score**	6.8
Justification of the Application's relevance to the Innovation Challenge scope is strong. The Project scope is clearly described, aiming to achieve a more reliable and resilient network through providing actionable decision-making capabilities to control room staff for predicting and handling extreme climate events that contribute to network faults. The potential benefits for network operators using data in innovative ways to ensure continued quality of service to consumers are evident and aligned to the objectives of the SIF. Greater consideration should be given to the interventions that networks will be able to take based on the insights developed, in order to assure that the outputs developed will realise benefits.		

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean assessor score**	6.8
A range of benefits is considered, addressing user needs and CO2 implications. User cost reductions are indicated, although not fully substantiated. The benefits for consumers for a more reliable service in all weather conditions should be quantifiable in more detail with relevant metrics if the project progresses to later Phases, as well as associated carbon reduction. Additional wider benefits are referenced including for health and safety and provision of services to other utilities, though the degree of impact in these areas is less well understood. Assessors have flagged that interventions will be required to realise some of the referenced benefits, and that the costs of those interventions should also be accounted for when considering benefits realisation.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean assessor score**	7.2
The focus of the Project is summarised clearly and is well specified in terms of the objectives of the Discovery Phase. The Project shows good alignment to the business opportunity and the supporting material has been developed to a good standard. There is a strong consortium behind the proposal with a good mix of stakeholders, academic input and the MET office. The balance of skills across the partners should deliver the required outcomes. The Project is assessed to be focussed on energy network innovation.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean assessor score**	7.0
There is a clear plan for any successful product roll-out within the lead applicant's organisation and the investment needs for this have been considered. User acceptance testing to ensure that the services developed are valuable to users, including within networks own organisations will also be needed. Other Transmission Operators and the Electricity System Operator are discussed, but the route to for exploiting the tool across these other networks and the value proposition to them have not been clearly defined. The application is not viewed to undermine the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean assessor score**	6.4
An extensive literature and Project review has been provided within the application. There is sufficient supporting information to suggest that the approach is novel and provides commercial differentiation. The proposal could have identified related initiatives used in other sectors, or some existing market solutions for predictive weather products (such as flood prediction software). Furthermore, there may be similar relevant work carried out internationally and the project should look to investigate any international initiatives during the project.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean assessor score**	7.0
The Project costs are assessed as being within expected market rates and the overall Project cost is suitable for the planned scope of work. Project costs are heavily weighted towards ARUP, and assessors have questioned whether some supporting resource from the energy network could be provided for some activities, rather than relying on higher consultancy costs. There is a contribution in kind from Project Partners which improves the value for money case.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean assessor score**	6.6
The Project plan shows a considered approach to aligning tasks, milestones and associated resourcing with the overall objectives of the proposal. Engagement with external stakeholders could be a more prominent part of the Project plan. The risk register has identified a good range		

of risks with some mitigating actions. Overall the Project methodology gives confidence of successful delivery, although assessors would like to see clearer explanation of how user needs will be captured.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
Overall, this proposal has been viewed as well prepared and planned. A credible Problem has been identified and the scope of work has been assessed as having potential for realising significant benefits for network customers and consumers by ensuring a more resilient network. Assessors felt that there was some assumption that benefits would be realised by improvements to predictive forecasting, without appreciation of whether impactful interventions be possible within the time constraints. Aspects such as topography and ground permeability are not explicitly being considered in this Project, and one assessor flagged these as important when assessing the impact of heavy rainfall events on critical assets.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of the end of Project Phase report, the Funding Party must provide evidence that the Project's tools and techniques are being designed in a way which will enable use by other networks. As part of this, the Funding Party must participate in any meeting related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase. Condition 4 As part of its end of Project Phase report, the Funding Party must engage with members of the team behind the Project "NIMBUS - Network Innovation and Meteorology to BUild for Sustainability" to identify common areas of scope and collaboration opportunities. Additionally, the Funding Party must share its end of Project Phase report with the members of the team behind the Project "NIMBUS - Network Innovation and Meteorology to BUild for Sustainability". Condition 5 Prior to Project commencement, the Funding Party must provide clarification on whether topography and ground permeability data are being considered within the Discovery Phase, and justification for why or why not these data sources are being examined.		

5.3.10 10025731, Digital Twins: Exploring the commercial, societal and operational benefits on green hydrogen projects, Initial Net Funding Required £124,265

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Southern Gas Networks Plc	£35,853.00	£10,625.00	£35,853.00
National Grid Gas Transmission Plc	£1,895.49	£0.00	£1,895.49
DNV Services UK Limited	£44,100.29	£10,898.00	£44,100.29
Amazon Web Services Limited	£42,417.00	£119,536.00	£42,417.00
Submitted Project description			
Digital Twins have long been heralded as the energy industry panacea. Millions of decisions concerning the design, construction and operation of real-world assets will be taken based on their digital twins. Some digital twins in the gas industry will represent a simple component. Others span entire facilities -- or systems.			

Green (or clean, low carbon) hydrogen is one of the key technologies on the road to decarbonization. In the coming decade we will see increasing cost competitiveness for green hydrogen from electrolysis by improving efficiency and decreasing capex. In areas with abundant renewable resources and low-priced electricity, the costs of green hydrogen will drop even further.

The unification of these two exciting concepts forms the basis of our Project, which for the purpose of the SIF "Discovery Phase" will explore the commercial, societal and operational benefits that could be derived from the deployment of a digital twin on a green hydrogen use case. We propose to connect our digital twin discovery work to the H100-Fife Project and develop a concrete use case that will provide key learnings that will be pivotal to the development of similar projects in the future.

H100-Fife is a world-first green hydrogen-to-homes network that will demonstrate 100% green hydrogen heating in homes for the first time. This demonstration network will be built in Fife, Scotland and delivered by SGN. H100-Fife will bring carbon-free heating and cooking to around 300 homes from the end of 2022 and the Project will aim to provide compelling evidence of hydrogen's performance in a real-world domestic setting as a zero-carbon energy source. The clean gas will be produced locally, by a dedicated electrolysis plant powered by a nearby offshore wind turbine. An on-site storage unit will hold enough hydrogen to ensure supply won't be disrupted during even the coldest weather conditions.

The scope supports broader energy industry objectives to build knowledge and competence in data; modernise energy data access; and ignite innovation across industry through innovation initiatives such as digital twins. Whilst supporting the data and digitalisation theme, it very much aligns with the whole systems approach that is fundamental to the success of our energy transition and pathway towards Net-Zero.

Problem and opportunity	**Mean Expert Assessors' score**	8.0

A digital twin of a simple hydrogen use case has the potential to offer a number of benefits to consumers and wider society at large. However, there were split opinions amongst assessors on how well this had been articulated as a problem statement. It can however be inferred that problems of decarbonsing heating and domestic gas usage are the fundamental problems. A hydrogen gas network digital twin is presented as a way to facilitate opportunities for the rollout of hydrogen as a low carbon fuel. The opportunities therefore, were more clear. The application to a real world test bed provides a compelling route to test whether those opportunities can be realised.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	7.2

The Big Idea has been reasonably well described but has been viewed as still being at the conceptual strages of development. National system level benefits of digital twins are communicated but less detail is provided for the necessity for supporting in flight H100-Fife. However, Assessors did view the Project in of itself as taking a constructive approach to good design practices, with the development of ideas being led by local business needs. More development will be needed to bring the Big Idea to a level of maturity where it is ready for demonstration, and more detail will be needed on the relevance and options for scalability beyond the H100 testbed in later phases.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	6.8

The range of potential benefits are described and are in line with the objectives of the SIF. Many of the potential benefits in this question of the Application are derived from the use of hydrogen itself, rather than the digital twin. Assessors have viewed this as suitable, since the digital twin is likely to be used principally as an enabling technology.

It is highlighted that since the impacts and benefits on consumers may be indirect , they should also be considered in relation to the costs of hydrogen rollout, so as not to overstate the net potential benefits. Furthermore, consideration needs to be given to counterfactual approaches. Some metrics for tracking benefits have been touched upon but will need to be better defined during the Discovery Phase.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.2
The Project is summarised well and the scope is clear on the whole. It is still a little unclear what the exact use cases that a digital twin will be used for within an operational hydrogen network. For instance, identyfing 'incidents of mechanical failure' has been mentioned but without explanation of what assets this refers to, or whether a problem currently exists. The organisations involved in delivery have appropriate roles and skills to achieve positive Project outcomes. The integration of hydrogen, electricity and water data in an interopable manner was viewed positively.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.2
Assessors felt that the route to market had been articulated only in outline terms. There is still ambiguity on how this specific piece of work will be applied within the Project's respective organisations. Sector wide benefits of digital twins are again referenced, but a clear commercialisation approach for either a product or service based proposition developed through this initiative is unclear. The coordination with the Centre for Digital Built Britain was viewed positively and could help to better define the value propositions. There are still outstanding policy decisions on the use of hydrogen in the gas distribution networks, which presents a risk to the existence of a market for these solutions in future. However, given these uncertainties assessors felt that there was a credible case for better defining the route to market in the Discovery Phase, and that preparation of digital twin innovation in advance of widespread hydrogen use was prudent.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	7.2
The applicant has demonstrated a good understanding of similar innovations. The application of digital twin technologies to hydrogen gas networks is novel, and the identification of use cases and user needs in relation to hydrogen transportation offers good prospects for innovation. It is clear that digital twin technologies have been researched and adopting CDBB methodologies will enable the Project to focus on novel areas of idea development, as well as boosting the opportunities of interopability with other networks or infrastructure types.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	6.8
The overall Project costs are high compared to other Discovery Phase Projects, but on balance costs are considered appropriate considering the novel application and complexity of the project scope. It should certainly represent a sufficient sum to complete the Project, but the Project may find it challenging to ramp up delivery of the Project within the 2 month period. The balance of costs seems reasonable between the partners. Significant contributions are offered by Project Partners on top of the SIF funding, which provides a case for added value to the consumer. The Project should clarify existing budgets provided to the H100-Fife project for data capture and digitalisation aspects, and how the budgets for this Project are clearly differentiated from the activities in that project.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	7.2

The Project plan is resasonably granular, with appropriate milestones identified. The risk register was of reasonable quality but was fairly generic, and could have offered more detail on mitigating actions. The Project methodology does reference using Agile methodologies which was received positively by assessors. Some commented that the scope of work was focussed on technical development, and expected more stakeholder engagement to understand use cases and user needs since this is at Discovery Phase. There is confidence that the Project plan will support successful Project delivery.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers are foreseen, however it is important that co-development of digital twin approaches is coordinated with other networks to ensure interopability of outputs. Furthmore, there may be future regulatory considerations over the roles and responsibilities of networks in relation to the operation and management of digital twin functions.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The Application is predicated on a good foundation, with digital twins potentially offering valuable new capabilities for networks and generators to achieve system-level improvements in efficiency, and deliver additional customer value. The route to market and commercialisation plan still requires further development, with the value proposition mainly referencing benefits to hydrogen delivery, rather than those unlocked directly by the digital twin. Some assessors raised questions around whether the overall Project costs were high considering the outputs of the Discovery Phase, and stressed that the Project delivery methodology would need to be managed well to keep all activities on track. The application of digital twin methodologies and technologies to a hydrogen gas network was viewed as novel, with the opportunity to test directly on a real world test environment compelling. On balance this was seen as an ambitious Project with the potential to deliver value to digital twin initiatives in the energy sector. Assessors would like to see the expansion of stakeholder engagement activities to refine use cases and ensure adherence to user needs.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI clarification of existing budgets provided to the H100-Fife[8] project for data capture and digitalisation aspects, and how the budget for this Project is clearly differentiated from that H100-Fife's activities.		

5.3.11 10026595, Virtual Energy System, Initial Net Funding Required £149,921

Project Partner name	Eligible costs	Project contribution	SIF Funding requested
National Grid Electricity Systems Operator Limited	£25,225.98	£25,225.98	£0.00
Arup Limited	£119,960.00	£119,960.00	£0.00
National Grid Gas Plc	£839.11	£0.00	£839.11
Western Power Distribution Plc	£5,456.00	£2,728.00	£2,728.00
Scottish Power Energy Networks Holdings Limited	£9,692.32	£0.00	£9,692.32
National Grid Electricity Transmission Plc	£2,004.91	£2,004.91	£0.00
Scottish and Southern Energy Power Distribution Limited	£1.00	£1.00	£0.00
Scottish Hydro Electric Transmission Plc	£1.00	£1.00	£0.00

[8] H100 Fife Phase 2 Village Pre-FEED | ENA Innovation Portal (energynetworks.org)

Northern Gas Networks Limited	£1.00	£1.00	£0.00

Submitted Project description

The ESO proposes to lead an industry-wide initiative to develop a digital twin of the entire GB energy system -- the VirtualES. This will be an enduring programme over a number of years, consisting of three interacting workstreams:

*Workstream 1 -- Stakeholder Engagement

*Workstream 2 -- Common Framework

*Workstream 3 -- Use Cases

This Discovery Phase Project supports the common framework workstream and will be used to understand what standards should be set out with participants to facilitate collaboration and compatibility. The common framework will provide a 'blueprint' so multiple parties can develop a wide range of digital twins which are interoperable and can interact using open data.

This Project will explore with our partners key areas such as, but not limited to, cyber security, data quality, metadata, data ownership/storage, common attributes of digital twins, interoperability, technology, legal and regulatory issues, risks and potential use cases. We seek to understand the most challenging and high-risk elements so that these can be explored first in the 'alpha' phase, and then solutions refined further in the 'beta' stage, including testing use cases.

We envisage that VirtualES users will include network companies (Transmission Owners, Distribution Network Owners/Distribution System Operators, Gas Distribution Networks); generation asset owners and operators (wind farms, solar parks, thermal generators, batteries, interconnectors); retail companies; traders; aggregators and ultimately GB consumers. The VirtualES will provide these users with access to data and integrated modelling capabilities, to improve data-driven decision making for investments and operations. The VirtualES should also prove useful to government departments, regulators, academics and think tanks to inform whole-system strategies, policies and regulatory decisions for the Net-Zero transition.

The ESO will lead the Project but since the VirtualES is whole-system, we have engaged Project partners who bring the perspectives of electricity network asset owners (NGET, SPEN, SSEN Transmission, SSEN Distribution, WPD) and gas network participants (NGGT, NGN). To deliver the Project we have also partnered with a technical consortium (Arup, Energy Systems Catapult, Icebreaker One) who bring considerable expertise in digital twins, systems-thinking and energy data.

The proposed Project aligns strongly with the spirit of the SIF Innovation Challenges issued for 2021. The VirtualES, underpinned by a common framework, supports an integrated whole energy system transition and explores the role of the energy sector within the wider economy.

Problem and opportunity	**Mean Expert Assessors' score**	7.2

The proposed Project is ambitious and seeks to address a system-wide challenge. The anticipated Problem is that siloed approaches to data capture, metadata standards, data management and analysis approaches will act as a blocker to an interopable virtual energy system, and the novel services that this will unlock for network customers and consumers. The approach to taking coordinated and common approach to this challenge across networks presents a range of opportunities for energy system planning, operation, and participation by third parties. This has been articulated fairly clearly and presents a credible problem and opportunity.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	8.2

The Big Idea is ambitious and well aligned with the requirements of the Innovation Challenge. The long term strategy of developing a full virtual energy system is likely to run in to a range of challenges and difficulties. Though the approach of commencing with a Discovery Phase Project and laying the foundations of the initiative through the Common Framework is seen as a sensible approach. Management of Intellectual Property will be important to ensure that licensing arrangements do not limit the scope of opportunity for third parties and smaller organisations in participating or interacting with a future virtual energy system.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.2
A range of potential impacts have been considered within the proposal, including economic, environmental, and service provision to consumers. An outline estimation of the financial benefit that could be realised is given of £13M per annum, which assessors view as achievable. Although this is acknowledged to be indicative and will need to be tested through more detailed analysis in later phases. Furthermore, there is outstanding work to be developed on how the Project will track and evidence benefits to consumers when moving to implementation. It is noted that the digital twin itself may help to do this more effectively.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.2
The Project has been reasonably well described. The consortium is viewed as being well constructed with an appropriate range of capabilities and skills represented. Furthermore biographies of the delivery team have been provided which give confidence in their ability to deliver. Consumers are mentioned as potential users, but it is unclear how their participation in the project will happen. Some assessors struggled to understand how the common framework activities would ultimately lead to improved products and services to the consumer, and the Applicants should work on better communicating that value. There is a clear energy network focus of the project, however one assessor questioned why other energy vectors including road and aviation fuels, or demand side loads are not also within the scope of the common framework.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.6
The output of the Project is clearly outlined and future potential costs and commercial value have been considered. Assessors acknowledged the complexity around ownership of outputs, Intellectual Property, and the balance between commercialisation and public good for such a product/service. However, the response lacked any vision as to how this may potentially develop over time. The Project is not viewed as undermining the development of competitive markets at this stage, however further consideration of how the outputs will be licensed, curated or governed will be necessary in later phases. This should include demonstration that they maintain or improve the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	7.8
The response demonstrates a comprehensive understanding of the landscape of existing and planned innovation around the subject matter, and seeks to collaborate with and integrate the outputs of these into the workstreams of the Virtual Eenergy System. There is good justification of how this project is novel to energy networks, and the scale of ambition is certainly risky. Overtime it is expected that some of these activities should transition in to business as usual operations, whilst other aspects of the virtual energy system might continue to offer opportunities for innovation. Further analysis of multi-party digital twin iniatives in other sectors or internationally would have further strengthened the response.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	6.6

The Project costs are appropriate and mostly used to cover the cost of the primary delivery Partner. All costs have been properly justified although the application would have benefitted by further breakdown of costs by subcontractor and against their activities. Some costs are high and it is viewed that more junior resource could be deployed to carry out some of the activities, which would also support the development of capabiltities.
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.

Project plan & milestones	**Mean Expert Assessors score**	7.6
The work plan and risk appendix attached have been completed to a quality which gives confidence in the delivery team's ability to successfully execute within the Project period. The risk matrix covers commercial, technical and regulatory aspects and have provided suitable mitigations. A breakdown of deliverables has been given, though an indication of interdependencies between workstreams would have added value.		
Regulatory barriers	**Yes/ No**	No
No regulatory barriers are foreseen, however it is important that co-development of digital twin approaches is coordinated with other networks to ensure interopability of outputs. Furthmore, there may be future regulatory considerations over the roles and responsibilities of networks in relation to the operation and management of digital twin functions.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The scope and ambition of the virtual energy system initiative is ambitious with the potential to provide the energy sector with a powerful tool for operation, collaboration and innovation. The Discovery Phase described in this application has been well scoped, and the Project provides a suitable first stepping stone towards achieving the wider strategic aspirations. The range of organisations involved in delivery have very relevant expertise and skills to develop successful project outcomes. Additional involvement from future users of the virtual energy system, such as organisations involved in scale data processing, would add value to the group. Some concerns have been raised about the resource costs required to deliver some of the Project activities, and the Project should challenge itself to be fully transparent with costs of subcontractors and to deliver best value for consumers.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must demonstrate how the Project's activities differentiate from other digital twin activities with cost-allocations under the price control mechanism, and how the SIF Funding is being used for higher risk, innovative components of development. Condition 4 As part of its end of Project Phase report, the Funding Party must outline how intellectual property and licensing arrangements will be managed throughout the Project delivery to ensure participation opportunities are maintained for all interested parties, and the risk of creating a technical monopoly over the virtual energy system is mitigated.		

5.3.12 10027059, Digital Twin - Exploring the societal, operational, and cross industry whole system benefits on the Gas Distribution Network, Initial Net Funding Required £119,127

Project Partner name	Eligible costs	Project contribution	SIF Funding requested
Southern Gas Networks Limited	£45,443.00	£10,625.00	£34,818.00

National Grid Gas Plc	£1,895.49	£0.00	£1,895.49
IBM UK Limited	£91,031.00	£51,034.00	£39,997.00
Amazon Web Services Limited	£161,953.00	£119,536.00	£42,417.00

Submitted Project description

The energy industry is changing at pace, both business and customers are facing unprecedented challenges.

Customers are being incentivised to move from fossil fuels to carbon free alternatives, consequently the gas industry needs to rapidly prepare for decarbonising the network and managing a business with fewer customers but a large, fixed cost component.

The gas distributors must optimise their operations to safely drive down costs and accommodate carbon neutral fuels, all within ever tightening regulatory constraints.

This requires a step change in enabling our energy transition that are not incremental. There are big choices to be made. The problem for Gas distributors will be having to model complex multi-vector scenarios to determine optimal solutions. This will not be cost effective nor timely enough using traditional approaches.

Other industries facing similar challenges have used Digital Twins to tackle this complexity. A Digital Twin is a dynamic, virtual representation of an asset and / or process. It uses real-world data combined with engineering, simulation, or machine learning models to enhance operations and support human decision making. Digital Twins rely on access to vast amounts of data that are ideally provided by a data fabric that encompasses the complete Digital Thread (asset lifecycle data).

We are proposing this Digital Twin Innovation Project with National Grid Gas Transmission and our technology partners IBM and AWS as it will enable us to transform how we model scenarios and make decisions. It is critical to keeping everyone warm during our coldest winters', supporting the transition of our customers to carbon free energy, migrating many of them to alternative methods of heating and making the network green, whilst keeping prices affordable.

We envision the Digital Twin to become the cornerstone of all key decisions ranging from strategic choices between scenarios to optimised operations. This will transform the gas network to a variable, renewables-based system and bring the benefits of new technologies and energy advances to our customers.

It will enable an open data foundation and framework that can be exploited across the UK energy ecosystem by key participants.

For Gas Networks a Digital Twin will guide decisions by its employees, customers, the public, suppliers, other energy suppliers and legislators.

This SIF innovation Project opportunity for SGN and its partners is to test and demonstrate the use of a Digital Twin to enhance decision making across a range of challenges driven by energy transition to a sustainable future.

Problem and opportunity	**Mean Expert Assessors' score**	8.0

The proposal has articulated the very significant challenges that the gas networks face as the energy tyransition continues to progress. The need to model complex multi-vector scenarios to determine optimal solutions is a significant problem that the proposed Project aims to address. With this framing there is a well justified case for how the use of digital twin methodologies will create opportunities to address these problems.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	6.0

The digital twin development and future deployment are reasonably described and have good prospects for addressing the aims of the Innovation Challenge. Better articulation of the use cases that could be served or energy system challenges that the digital twin would enable solutions for would have strengthened the response. Assessors felt that although the outline concept demonstrates promise, the Project proposal was let down by a lack of ambition or forward thinking on the applications of the digital twin.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	6.0
The applicants have described a concise set of valid benefits for a small range of stakeholders. Overall the benefits are in line with the SIF objectives, but they lack detail particularly regarding the scale of potential benefits. Although benefits are not expected to be fully quantified at this stage, there is neither description of the type of metrics that might be used to track benefits as the Project develops. The stated consumer benefits of improving quality of service, delivering timely interventions, reducing cost of service, and reducing CO2 emissions do seem achievable at some scale.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.4
A good summary of the project has been provided. The applicant has demonstrated a clear objective and has focussed on network innovation aspects of the digital twin development. Potential users and user needs are described at a high level. However, the application could have been stronger by explaining how the identified user needs might be addressed through the digital twin. The partners are well selected with suitable competencies, assessors consider the delivery partners as likely to deliver the necessary skills and experience to make the Project successful. It is unclear if there is a formal role or not for the Centre for Digital Built Britain.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	5.0
The route to business as usual deployment that is been outlined is fairly generic, with some explanation of how modelling techniques utilising the digital twin will be transitioned iteratively to business as usual activities. The value proposition to networks and other key stakeholders could be described much more clearly. Further exploration of the commercial opportunities for third parties to deliver enhanced services to the benefit of consumers would have added value to this response. The Project will not undermine the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	5.4
The applicant has provided good examples of similar solutions in other sectors from partners IBM and AWS. However there are other state of the art projects and initiatives from other parties that are not referenced here. The applicant has made a valid argument that this will be a first of a kind project in relation to UK gas networks. As the applicants have not acknowleded the range of leading initiatives in this area ,assessors raised some concerns that the degree of innovation is moderate in ambition. Assessors would also have provided better scores if the Project had articulated how the innovative components such as 'implementing sophisticed intelligent automated workflows' would ultimately impact consumers and other networks users. Overall the proposal was viewed as being sufficiently novel and innovative to proceed, but assessors would like to see improvements.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.0
The funding request is reasonable given the scope and timetable of work. IBM and AWS rates were viewed as being high against market standards, but as both Partners offer additional		

contributions in kind this has effectively improved the value for money to an acceptable level. The split of costs across partners and activities appear appropriate and competitive.

Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	6.2

The overall Project delivery methodology has been explained reasonably well. The Project plan is logical but further information on milestones and dependencies would have improved the response. The risk register identifies many valid risks but has been viewed as fairly generic and optimistic in its ratings.

The activities are viewed as being very internally focussed amongst the Project Partners, given the wide range of external stakeholders that would look to use or gain value from the digital twin, it would be expected that greater resources would be put towards engaging and understanding their needs. Broadly the Project plan and delivery methodology give sufficient confidence in the Partners to deliver to plan.

Regulatory barriers	**Yes/ No**	No

No regulatory barriers are foreseen, however it is important that co-development of digital twin approaches is coordinated with other networks to ensure interopability of outputs. Furthermore, there may be future regulatory considerations over the roles and responsibilities of networks in relation to the operation and management of digital twin functions.

Recommendation to the Gas & Electricity Markets Authority	**FUND**

The proposed Project addresses the important problem of modelling complex multi-vector scenarios to determine optimal solutions. The proposal presents a credible case for how digital twin approaches could unlock opportunities. There has been a good outline case made for the potential to deliver real benefits for stakeholders.

The choice of partners is good with AWS and IBM bringing suitable experience and skill to deliver innovation. The route to market needs to be given significant further consideration within the Discovery Phase, with better understanding of value propositions to key stakeholders, and explanation of how commercial delivery models could provide a route to realising benefits.

Assessors felt that their was strong innovative potential in the project, although the Project proposal only provided fairly generic explanations of digital twin technologies and methodologies. This left some to question how ambitious the innovation targeted was, or if it is simply looking to apply past research from IBM and AWS to the gas distribution network, without targeting spefic use cases.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
As part of its end of Project Phase report, the Funding Party must demonstrate how the Project's activities differentiate from other digital twin activities with cost-allocations under the price control mechanism, and how the SIF funding is being used for higher risk, innovative components of development.

Condition 4
As part of its end of Project Phase report, the Funding Party must provide evidence detailing how intellectual property and licensing arrangements associated with the Project will remain open for all interested parties. The end of Project Phase report must also include documentation of steps taken to avoid the creation of a technical monopoly in the energy system.

5.3.13 [REDACTED]

5.3.14 [REDACTED]

5.3.15 10027183, Intelligent Gas Grid, Initial Net Funding Required £116,401

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Southern Gas Networks Plc	£22,101.64	£0.00	£22,101.64
Utonomy Limited	£94,299.36	£0.00	£94,299.36

Submitted Project description

Following the successful collaboration on the NIA-funded Pressure Control and Management Project over the last three years, SGN and Utonomy now propose to continue to innovate towards a vision of the Intelligent Gas Grid.

Using Utonomy's remote control pressure system as the enabling technology, the Project idea is to collect and use network data alongside external data such as weather to develop machine-learning and AI Applications that optimise network pressures and provide insights on network performance.

The Applications developed under this Project will reduce methane leakage and increase the feed-in capacity of renewable gases including biomethane and hydrogen.

Components will be developed to provide autonomous early warning and diagnosis of network faults and dashboards will allow network operators to monitor KPIs and predictive alarms in near real time.

The Project vision is to autonomously and intelligently monitor and control networks, both in terms of pressure management and operational planning & maintenance, using data-driven algorithms and decision-making, and to support network digitalisation.

This will lower costs to consumers, and increase the resilience of the network, whilst also supporting the progress to Net-Zero.

Problem and opportunity	Mean Expert Assessors' score	8.0

The problem has been clearly and succinctly described. Alongside this a clearly presented opportunity has been provided, to use data-driven alogorithms and automated decision making for improved pressure management, operational planning, and maintenance.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	Mean Expert Assessors' score	6.6

The Project is proposing to leverage data to monitor, control and optimise networks which aligns with one of the challenges set by Ofgem and confirms this Project meets the SIF eligibility criteria. The Project explains the pressure control technology to be utilised well, but there is far less detail on the data processing and artificial intelligence techniques that have been vaguely referenced. The idea described is technically innovative but the main innovations mentioned seem to have already developed under other projects. Assessors view the scope of work as meeting the Innovation Challenge well.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	Mean Expert Assessors' score	7.4

The potential for emission reduction benefits have been described and are credible. There are implicit benefits to providing more efficient operations of networks, though the nature of these benefits have not been explicitly described. To realise the full benefits referenced the Project will need to help inform potential government and regulatory policy decisions regarding the transportation of hydrogen and biomethane. Further development and quanitification of how these benefits will be realised by the consumer is expected in future Phases.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	7.2
The Project will look at the conditions of the network and forecasting of energy demands with the use of the remote pressure control technology for current and future hybrid gases. This is viewed as a novel application of the previously developed work and has been assessed as innovative. It was more difficult for assessors to ascertain how innovative the data processing or artificial intelligence aspects of the Project were, since they have not been described in any technical detail. The Project has a clear focus on network innovation and the Partners have suitable skills for delivery of the Project. Assessors would like to see more engagement with a wider set of skateholders, including from relevant business areas with the gas network.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.4
The value of the innovation to the networks and customers is demonstrated. The route to market described is commercially relevant for Utonomy who will offer a new solution to its customers. Users of the products have been identified and an outline of how solution development will proceed through testing, trialling and deployment. The Project is not viewed as undermining the development of competitive markets and the solution will be made available for use by other gas networks on a commercial basis.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	7.2
The whole Project is concentrated on a patented pressure technology and the application of it to gas networks and the transportation of hydrogen and biomethane. There is extensive research of similar innovations with good justifaction of how both the technology and the approach are novel in the gas network environment. Related Projects have been described in extensive detail, both domestically and internationally.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.0
The Project team have a good split of work load with one Partner taking the lead on most activities. The costs appear to be reasonable for the scope of work and are costed competitively. The Project management resource allocation appears to be greater than the 2 month Project delivery period will allow, this will need clarification ahead of Project commencement. One assessor felt that stronger justification could be given for why further SIF funding was required given the Project Partners have received funding for the product development under alternative funding routes.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	6.4
The Project Plan is sufficient to give confidence in successful delivery of the Discovery Phase, although it lacks detail in some areas.The risks are very limited and miss some key risks such as the availability of the requisite data The work packages appear focussed upon the development of the pressure control technology and assessors have queried the extent of meaningful work put towards the data analysis and algorithm development. The breadth of work appears ambitious, but potentially achievable within the given timeframes.		
Regulatory barriers	**Yes/ No**	No

To realise the full benefits referenced the Project will need to help inform potential government and regulatory policy decisions regarding the transportation of hydrogen and biomethane.
Recommendation to the Gas & Electricity Markets Authority **FUND**
The Project team have demonstrated a good case for their innovation and they have undertaken extensive research across the UK and internationally to make a strong case for this being a novel and innovative proposal. Some assessors felt that the remote pressure control technology was the focal point of the Project and have raised concerns that there is not enough meaningful work on the data capture and artificial intelligence processing referenced. These areas should be expanded on within the Project ahead of Alpha Phase. The Project Plan and delivery methodology could be strengthened in some areas but overall the Project has been considered ambitious with the potential for considerable benefits. These areas should be expanded on within the Project.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must provide an estimate with justification for when the technologies under development within this Project will be sufficiently developed for incorporation into business-as-usual activities.

5.3.16 [REDACTED]

5.3.17 10027191, Predictive Safety Interventions, Initial Net Funding Required £58,729

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Southern Gas Networks Plc	£5,588.88	£0.00	£5,588.88
FYLD Limited	£53,140.00	£0.00	£53,140.00

Submitted Project description

A fundamental reshaping of the operation of gas distribution networks is underway. Several factors are driving the transformation, including the shift to a low carbon economy, regulatory license changes requiring improved operational efficiencies and customer satisfaction, and the need to enhance work practices for better safety and productivity. SGN is responding to these challenges by accelerating its journey towards a data-led operating model.

SGN needs high-quality data about operations as they actually take place in the field to facilitate this transformation. However, sourcing this data from a field workforce of 2,500 is a long-standing challenge for companies such as SGN. They have a wealth of anecdotal and tick box form data about field operations -- but, historically, very little of this data is truly insightful.

After a global scan of potential solutions identified no compelling options, SGN partnered with its shareholder Ontario Teachers' Pension Plan and consultancy BCG to build a new product, FYLD. FYLD captures unstructured data (voice, video, imagery, text) about fieldwork activities in real-time, enabling it to develop a digital twin of SGN's field operations. SGN first deployed FYLD to their repairs, replacements, and connections workstreams in April 2021 (750 operatives), where it rapidly delivered substantial productivity and safety gains. The FYLD product is now commercialised with expanded functionality and is owned by a separate company (FYLD Ltd).

This Project aims to expand the capability of FYLD into predictive analytics, primarily in respect of safety interventions. The two organisations wish to Partner on predicting worksites that may

pose a high risk to employee safety as the day's operations unfold and enable remote, proactive safety interventions.

The ability to intervene proactively (i.e., before risks eventuate and then cause harm) has two significant benefits:

- It ensures that SGN employees return home safely each and every day after working in hazardous environments; and
- Reducing incidents and injuries enables a much more predictable flow of work, delivering higher customer satisfaction and contributing to a lower cost structure.

The ability to achieve rapid and meaningful wins is a key enabler for building the organisational confidence of SGN in its transition to data-led operations. The same principle applies to other organisations too. With field workforce solutions being primarily paper based (or digital forms of paper) and reactive, there is substantial opportunity for this Project to be commercialised by FYLD, driving safer and more productive field force operations across the utilities sector.

Problem and opportunity	**Mean Expert Assessors' score**	7.4

A credible business opportunity is outlined, delivering potential for new products and services across the utilities sector. The challenges have been defined and the proposed approach is outlined with a discussion of the expected benefits it could realise. The case would have been strengthened by more detail on its alignment to SIF targets and an outline of other savings to the consumer as results of safer operations such as additional business benefits (cost, time efficiency). Focus should be given to the engagement (awareness and training) of field teams.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	7.2

The core idea is explained in good detail and shows strong potential for meeting the aims of the competition in developing new products and services for the utilities industry and addressing the needs of digitalisation of the sector. There are many fieldwork operations and HSE apps available in the market and it might be more cost-effective to use and potentially adapt an existing, proven, and commercialised app. The applicant noted that they did not find a suitable app in the market in 2019, however it would have been useful to outline the current SOA and the reasons the service orientated architecture (SOA) is unsuitable for the required purposes. Expanding this to provide quantitative expectations for the development would be useful. There is an established platform which provides the basis for the Project and which will de-risk the exploitation opportunity. User requirements are understood and at the core of the proposal.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	7.8

The applicant has provided a very good summary of the expected benefits to customers of improved operational and safety performance in the field. The impact projections are based on the deployment of the current version of the app, prior to the currently proposed improvements/progression, which provides an evidence base and indicators for future benefit tracking. Some quantitative metrics are presented, considering these further and providing more detail of the potential customer impact would be useful. The injuries data and recent improvements are great and reassuring. For full impact it would be useful to see evidence of helping other networks learn too.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project Summary	**Mean Expert Assessors' score**	8.0

The applicant has clearly summarised the Project, outlining the further development of the fieldwork management AI Application they developed and spun off to harness data for predictive analytics about safety and operational events, facilitating predictive action. The SGN skills summary is generalised and does not speak to skills and experience related to the Project. For

other Partners, their skills are appropriate to achieving the Project outcomes. The response would have been strengthened with a specific explanation of how gains in productivity and safety would translate to reduced customer costs. Consideration should be given to where the line in the sand is between business-as-usual expenditure and innovation. Clearer acknowledgement of sharing progress with other networks would be beneficial. The video and postcard are informative and of good standard.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.2
There is a viable route to market via an established platform and market presence in the sector, and there is a clear value proposition for the target market. The value proposition to other key stakeholders is clearly described and shows how the consortium can get the solution to a business as usual. There has been consideration on how the operations will create efficiencies and reduce accidents and down time and ultimately how they will increase productivity and offer a path to better customer satisfaction. Future funding has been considered and appears to be already secured at a sufficient level to deliver the full product. The response would be been strengthened with some commentary on how the SIF grant would be used in coordination with secured private investment. It would have been beneficial to have seen more indication of how the MVP deliverable will be moved to commercial readiness and how it will be used to develop the market opportunity. The topic of IP should form part of the Discovery research. No assessors raised concerns regarding the Project undermining competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	6.4
The applicant noted that they did not find a suitable app in the market in 2019, however it would have been useful to outline the current service orientated architecture (SOA) and the reasons the SOA is unsuitable. The response would have benefited from more detailed supporting evidence to substantiate this position and identify nearest competition to explain why this project is innovative.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	6.4
The Project costs demonstrate good value to the proposed scope of work, although the proposal provides no breakdown or justification for the spend areas. There is an appropriate balance of costs between the partners. The value proposition of the Project for the applicants has been demonstrated. The balance of costs between the partners is explained. There is a sense that one of the partners is already working in this space and there is limited justification for why this SIF funding is required with one assessor did note that the value for money for consumers is questionable based on the evidence of benefits.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	5.0
The applicant has provided a very brief outline of the Discovery phase work packages. The appended Gantt chart illustrates timeframes but provides little further detail on the activities planned and roles. It is not at all clear how Milestone 2 could be completed as part of the Discovery Phase and the applicant has not defined goals and/or an outline plan for the Alpha phase to demonstrate how the Discovery phase work would fit in to the wider context. A risk analysis has been carried out although the risk coverage is not extensive and some of this relates to operational risk rather than Project life cycle. Consideration has, however, been given to major constraints on the outcome and deployment of the product. Most Assessors expressed concern on the proposed team offering limited user research capabilities which would be more suitable for implementation rather than Discovery. The Project should consider best practice for digital delivery methods.		
Regulatory barriers	**Yes/ No**	No

No regulatory barriers have been identified in relation to this Project.
Recommendation to the Gas & Electricity Markets Authority **FUND**
The It was generally a well-presented Application and Project. The lack of consideration and detail in the response to the Project plan could be addressed to benefit the Project delivery particularly around the ways of working. The major areas of weakness in the proposal are the lack of supporting evidence for the innovation and the lack on detail regarding expected commercial exploitation outcomes. Despite most Assessors recommending this project for funding comments are divided as to the suitability with concern raised as it seems that FYLD is well funded and could develop the solution without SIF funding, and concerns IP rights will be exploited from Australia, not from a UK base. The proposal should be more transport in this regard. The Project does offer an opportunity to reduce downtime and injury at the whole system level and if successful is looking to deliver a predictive model which will be valuable. The consortium of partners is strong and capable to deliver this Project. Although there is insufficient detail as to the role that NGGT are to provide in the Project.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must include justification as to why the Project should continue with SIF funding rather than under business-as-usual activities. Condition 4 As part of its end of Project Phase report, the Funding Party must provide evidence detailing how intellectual property and licensing arrangements associated with the Project will remain open and transparent for all interested parties.

5.3.18 10027276, Thermal imagery analysis - Condition assessment fluid and pressure, Initial Net Funding Required £78,182

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00
National Grid Gas Plc	£3,700.00	£0.00	£3,700.00
Synovate Limited	£79,558.33	£7,955.83	£71,602.50

Submitted Project description

Our Vision is to support hydrogen transition at the lowest possible risk and cost to UK gas consumers as fast as possible to protect our climate. This Project will undertake discovery as a primary step to support our vision to provide a network tool and a UK assessment capability. The aim of this is to support a safe, environmental, and cost-effective transition by maximizing existing assets informing how much and where legacy PE assets need to be replaced and/or maintained.

We do this in a minimally invasive way, scheduled ahead of conversion programs minimising unplanned workloads and time off gas for consumers. The solution uses live access sensing to analyse the internal characteristics of a pipeline transporting natural gas, and simulate changes, typically in the form of deterioration or leakage that may occur through changing factors such as gas type or pressure. This captured data predominantly will give assurance and provide essential evidence to enable a greater understanding of risks associated with legacy assets. This Project would gather underpinning condition sensing data for conversion strategies and build confidence in a common approach between UK networks. The Project will aim to test and understand the viability of leakage sensing for conversion assessment to minimise uncertainty around pressure elevation to maximise the retention of current assets.

The Project supports the evaluation the costs, risks and opportunities of repurposing or decommissioning existing gas network infrastructure for use with hydrogen. This supports future energy provision for heating, power and transport, safely, at a low consumer cost and in a minimally carbon intensive way. We meet the scope by implementing novel sensor and digital assessment infrastructure to improve network planning, modelling and forecasting capabilities around conversion and replacement risk for legacy assets with field gathered datasets.

NGN developed and deployed robotics within the UK having operational expertise in solution deployment. Synovate has developed the sensor technology having research capability in thermography, vision, utilities and inspection. National Grid Transmission has developed and deployed robotics within the UKs Above Ground Infrastructure (AGIs) for non-destructive testing and inspection.

These Project partners are the best to continue this journey as the team holds knowledge and capabilities in sensing, pipeline inspection and hydrogen conversion where NGN have led many packages of work with the H21 and HyDeploy projects for Hydrogen. National Grid UKs Gas transmission operator with unparalleled access to and knowledge on the UKs AGIs.

Problem and opportunity	**Mean Expert Assessors' score**	8.2

The Problem has been adequately defined in terms of the potential limitations of the existing infrastructure in handling hydrogen. The opportunities for providing assurance in advance of the transition has also been sufficiently expressed and they are also realistic to achieve several SIF benefits. The response commences by setting out clearly that this Project will deliver reduction in carbon footprint. A further added value is that techniques could also improve understanding of the current PE assets for methane leaks.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	7.6

The Project has been assessed and complies with the Data and Digitalisation challenge requirements. The proposal sets out clearly what it intends to do and why this would be of use in the energy transition, from methane in the NG network to hydrogen. The novel leakage detection sensor is well described and has good prospects for addressing the aims of the competition scope. Higher scores may have been achieved if a brief description of alternatives was provided to strengthen the case.

One Expert Assessor noted that it will is also apparent that the same technology could be used for the assessment of the PE assets for transporting NG/methane. As such it is not clear whether the Project is primarily aimed at the latter (NG asset assessment) rather than the former (energy transition).

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	7.6

The Application identified a comprehensive range of benefits that are far reaching with significant potential for positive impact, spanning customers, network users, environmental and commercial, as well as for wider groups of stakeholders. Many of these benefits and impacts are measurable and quantifiable with the methods that the Consortium is putting in place. It would have been useful to give an indication of more quantification of the benefits.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project Summary	**Mean Expert Assessors' score**	7.8

The Project summary is clear, and the postcard, video and skills appendix have been completed to a good standard. The Applicant has added valuable supplementary information to the Project summary. The proposed Project addresses network innovation, as described in the competition scope, and includes participation from an appropriate range of stakeholders. The three partners comprising a gas grid operator and regional distributor, and industry experts in robotics and

sensing technologies applied to gas transmission represent an ideal consortium. It is unclear to what extent modelling is to be developed, mention is made but insufficient detail provided, and it is also not clear to what extent AGI experience has relevance to below ground PE assets.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.2
The routes to market are clearly defined and realistic based on high engagement planned. The value proposition of novel sensing for low pressure gas leakage detection has promising prospects to appeal to the identified target groups across the supply chain. The value proposition could have been clearer for other networks. The planned investment case and procurement strategy is appropriate to gaining market confidence in moving to hydrogen supply. The applicant also states that they will look at forming partnerships and licensing IP. It would be useful to include detail on end user requirements and key performance metrics, impact on efficiencies and productivity. No assessors raised concerns regarding the Project undermining competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	6.4
The response provides a good justification for Project funding under SIF although it could have provided more detail on other innovations which exist. If no other innovations exist, a clearer explanation of the steps taken to rule out other innovations would have strengthened the response. The innovation and its novelty are well described. Explicit justification for why the Project should be funded by SIF is not provided.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	6.8
The Project costs are appropriate and should be sufficient to complete the Project successfully. Synovate labour costs seem to be on the higher side of industry norms. The applicant has provided a convincing justification for the Project and why it is good value for customers. There has been an additional contribution to the Project outside of the core SIF costs.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	7.8
The Project plan comprising six work packages with well-defined objectives and deliverables is entirely appropriate for a feasibility study in the Discovery Phase. The addressing of the problem statements, defining the value proposition, estimating the costs, benefits and risks represent a well-defined programme of work. Stakeholder engagement and key meetings are extensive. This is a tight but achievable plan to assess viability and define subsequent steps The risk assessment is rigorous and detailed both for the Discovery Phase and the whole Project with solid mitigation and ownership. An area of concern is to what extent and how much of the Project can be undertaken in the two-month window, which is identified by the Project as a major risk. Any deviation from the plan or slow start will likely affect the Project negatively.		
Regulatory barriers	**Yes/ No**	No
No immediate regulatory barriers have been identified which are going to block the progress of the Discovery Phase of this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
All Assessors recommended this project for funding. This proposal provides high confidence. This is based on the quality of the partners, the rigorous Project and risk-based approach. The Discovery Phase is appropriately formulated to establish the justification, strategy, and roadmap. The answer could have been strengthened with more information about external projects exploring similar strategies and better integration between the milestones in the budget and the Project plan. Despite the gaps, the proposal is timely and positioned to inform important conversations around hydrogen.		

This Project solves an important problem by enabling potential gas networks with hydrogen. The Application was strong and has provided a compelling justification for funding, as reflected by scores to individual responses. Project has relevance to the assessment of the current network of PE for suitability for repurposing for hydrogen. It is also applicable to the assessment of current methane leaks in the network. It is thus in scope but could also be considered as applicable to business as usual.
Recommended Project specific conditions
None.

5.3.20 10027307, CEV: Critical factors for the adoption of smart homes for energy efficiency and implications for consumers and providers, Initial Net Funding Required £55,395

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Northern Gas Networks Limited	£2,880.00	£0.00	£2,880.00
Newcastle University	£29,842.18	£0.00	£29,842.18
National Energy Action	£22,672.65	£0.00	£22,672.65
Northern Powergrid Limited	£0.00	£0.00	£0.00

Submitted Project description

During the Discovery Project we will provide a state-of-the art review of the factors related to the use of data and ICTs/digital technologies, when it comes to energy management and reduction at the household level. The systematic review on smart-homes is expected to cover both academic and industry literature, synthesizing the findings. Our review will comprehensively cover the factors that affect user/consumer behaviour, paving the way for interventions that can result in the adoption and diffusion of data and digital technologies.

The review will be a stream-based systematic one producing robust and reliable results that synthesise and map the knowledge related to the data and digital technologies for smart-home energy management. The preliminary stage of the review will involve a discussion among the members of the review team to set the research protocol. We will then formulate the exact review question and facilitate the decision of the inclusion criteria. We expect to cover the relevant sources (in business, marketing, information systems and energy) published in academic and industry journals and Project reports over the past decade. We will review the abstract of each retrieved source to assess its relevance. Only documents that find agreement from most of the review members will be included for analysis.

Once the documents are selected, a cluster-based feature selection and document classification will be used to analyse them. Document classification is a text mining technique to group similar documents together according to a set of pre-defined categories. We will apply a quantitative content analysis to deduce statistically significant concepts and themes in the text corpus, thus increasing the replicability, objectivity, and generalisability of the research findings. The themes identified will guide the qualitative review that will be undertaken by the team. Each theme will be presented in turn. The analysis will aim to compare/contrast the two academic and industry perspectives, prioritising factors of importance and discussing the relationships among them. This will make it possible to create a framework for understanding the technology adoption and diffusion when it comes to smart-home technologies applied to energy management. The framework and its potential Application will aim to address four limitations of technology acceptance research when it comes to energy management (Technology Use Predictors, Task-Technology Impact, Implementation & Knowledge Gap, System Lifetime & Long-term Implications). In doing so, the framework will pave the way for the alpha (empirical validation) and beta (deployment and implementation) stages.

Problem and opportunity	Mean Expert Assessors' score	7.8
There is a recognised Problem described relating to the consumer decarbonisation journey and influencing uptake of measures. The applicant has a clear understanding of the nature and scale of the challenge. The application could have achieved higher scores by clearly articulating the link to benefits for the consumers and the energy networks and how this Project will add to the body of knowledge that already exists around barriers to adoption.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	6.6
The Big Idea has been clearly articulated and addresses the requirements of the Data and Digitalisation challenge. The idea is ambitious, and the applicant has a clear understanding of how it can potentially deliver real benefit within this project and follow-on projects. For an optimised energy system, non-digital solutions like building fabric changes may also have to be considered and so this Project would have benefitted from a wider focus than just digital and date driven solutions. However, it is welcoming to see an explicit intention to integrate work with an NIA Project, this coordination is valued. Whilst there is a lot of clarity about the proposed literature review for the Discovery phase. More detail on how these findings will be used, and by whom, to drive benefits to consumers and energy network companies would be valuable. The proposal needs to show how the research will be disseminated e.g., through NEA. One Assessor did express concern by the proposal having limited research on exactly who and the exact needs of the people who will use the service.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	5.6
The high-level benefits case is clear. The future use of the outputs has been thought though and described. The support of the Customer Engagement Village Project adds weight that this Project might integrate in a practical commercial environment. Higher scores could have been achieved by providing an indication of some quantitative benefits. Some Assessors would have liked more insights to the benefit benefits for customers, which would be expected to cover at least one of the following: energy affordability, wellbeing, security or quality of life. It also would have been useful to include a clear link between the Project described and the benefits claimed.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	6.8
The Project summary is clear and well thought out. The postcard does a good job of capturing what the main summary points. This answer would have benefitted from an explanation of the degree and nature of relative importance of energy networks to the questions being addressed in this Project. In addition, there is limited detail about follow-on phases and how they can translate the academic research into actionable insights and then into market interventions. One Assessor noted a gap in the summary around the intention to spend time identifying and understanding the actual intended users of the possible solution will be.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	5.2
The Project has the potential to facilitate greater levels of competition. Some thought has been given on the value proposition, but it would be useful to give more information on the value proposition to energy networks. An appropriate level of thought for dissemination has been given for this stage of the Project. The Project should consider how they will engage with other stakeholders such as representative organisations such as Energy Systems Catapult as well as Market Players.		

Consideration should be given to who do the applicants think will pay for this service to exist? Who will have the incentive to invest and keep information up to date? Some insight on the size of the potential benefits also could be given. No Assessors viewed this as a risk to undermining competitive markets at this stage.

Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	6.0

A very clear expression of the challenges for take up of energy reduction are outlined. The premise of introducing greater scientific rigour to investments is welcomed. The applicant has researched the area well and demonstrated their insight into the challenges. They have outlined why their approach is different. The overall solution is innovative. Although academically very strong the innovation driven through NEA should be clearer.

Thought should be given to related projects and how they may address similar issue and there for can be integrated with this innovation to develop a coordinate approach, for example, Energy Systems Catapult Smart Homes.

Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.0

Most Assessors agreed that the Project costs were appropriate. Clearer explanation of how benefits will be achieved and how they will justify the costs incurred would be useful. Assessors noted that some day rates are at the higher end of industry norms and have challenged the Project to ensure that resource costs for some Project Partners are proportionate to the activities to be carried out.

Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they can progress in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	6.4

The Project plan is clear, the work packages are logical and clear milestones have been provided. Some information on how the teams will work together should be provided and some provision for engaging with other organisations such as Energy Systems Catapult, BRE, Green Homes Alliance etc.

The risk high level but appropriate for this stage. Appropriate mitigation has been provided. Risks associated with establishing and researching end users' requirements should be managed to ensure effective learnings.

Regulatory barriers	**Yes/ No**	No

No regulatory barriers have been identified in relation to this Project.

Recommendation to the Gas & Electricity Markets Authority	**FUND**

This Application is split Assessor's feedback. Whilst most of them thought this was a good project, there was strong and experienced team, and they welcomed the smart home approach. There were areas where the application could be improved.

The route to market was the main concern with Assessors noting that the applicants appear to be ready to build 'their solution', not one that has been tested is needed by other players. As noted above the limited references to other up to date and evolving body of work by other organisations was also an issue.

Additional explanation of how the findings will be used in future phases and how the Project overall can achieve the goals and benefits sought for energy network companies and their consumers would be advantageous.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

Condition 4
Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI clarification of the role of the network operators in this Project.

Condition 5
As part of its end of Project Phase report, the Funding Party must outline its initial views for a route to market for the Project. This outline should consider identifying potential users of the framework and knowledge base, a dissemination strategy for Project findings, and opportunities to influence customer action via National Energy Action.

5.3.21 [REDACTED]

5.3.22 10027572, Digital Platform for Leakage Analytics, Initial Net Funding Required £114,576

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
Cadent Gas Ltd	£7,639.23	£7,639.23	£0.00
Southern Gas Networks Plc	£3,112.88	£3,112.88	£0.00
National Grid Gas Plc	£4,415.69	£0.00	£4,415.69
Guidehouse Inc.	£110,160.00	£0.00	£110,160.00

Submitted Project description

Cadent Gas Ltd, partnered with Guidehouse, National Grid PLC and SGN to determine how advancements in data and digital technology can be utilised to reduce gas network leakage. Reporting and capturing lost gas volumes in the UK is typically undertaken by the use of a static modelling tool based on scientifically ratified leakage rates that are applied to known asset bases. The volume of losses over an annual cycle are easy to calculate, however, limitations mean real-time intelligence and reactive decision making isn't possible using the current approach. The Project partners aim discover the cost and value of new data, technology, and digital platforms in reducing gas network leakage. This Project will unlock possibilities to further reduce our Business Carbon Footprint of which Shrinkage forms the majority. The reduction also reduces the socialised costs on customer bills.

Reducing emissions from leakage is paramount to achieving Net-Zero targets, and technological advances since the inception of our modelling tools opens opportunity for reform in the methodology. The improvements will also improve operational decision making, maintenance and asset replacement strategies and improve customer safety.

The current reporting mechanism (Distribution Network applicable) means all network operators report using the same universal method, so the expectation for this Project would be that any identified improvements to calculating emissions would be implemented throughout the UK, furthering widening the benefits of this Project.

The discovery phase of the Project will look to review available data and technology and will consider the following areas:

*Existing asset data from GIS systems and historic leak notifications

*Operational monitoring data, with the potential inclusion of smart metering data

*Light Detection and Ranging (LiDAR) technology using pulsed light waves emitted into the area of interest to form emissions pictures

*Satellite data giving locational information for leakage in real time

*Mobile emissions detection, either using handheld devices or drone mounted detection systems

A successful discovery phase could lead to the development of a digital platform for leakage analytics providing multiple data feeds together for the first time. The platform will provide insights and confidence that facilitate targeted proactive investment and a step change improvement in leakage reduction processes. Our emissions reduction pathways have historically been very good, for example, each Distribution Network outperformed regulators targets during the 2014 to 2021 price control period. This Project will build on our good track record in reducing emissions and expediate this into the future.

Problem and opportunity	**Mean Expert Assessors' score**	8.2

Assessors acknowledged that the Problem has been well described. The limitations of the current method are identified well in the answer and the use of data sets, new technologies, some identified to give meaning to this are succinctly expressed. The opportunities could be better referenced through network resilience benefits to improve the transition to a low carbon gas network. The application could justify the statement of 'the value of the lost gas will increase as gas networks move from natural gas to hydrogen.' There is potential for the Project to deliver real benefits. the use of supplementary use of visualising technologies such as LiDAR could further concrete the argument.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	7.2

The Project has been assessed and complies with the Data and Digitalisation challenge requirements. The idea has been viewed as ambitious, but detail is lacking about the datasets and how useful they are, and the requirements to scale the analytics to support the model described. The Project has the potential to develop a replicable innovative solution and deliver benefits.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	6.4

The Application gives reasonable justification of achieving considerable cost savings with the potential impacts to users are well described. Quantifying these will be a valuable outcome of this Project but it would have been useful to have some degree of quantification in this application. An Assessor has noted there is limited consideration of the investment and maintenance costs required to implement this modelling capability.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project Summary	**Mean Expert Assessors' score**	6.8

The Project aim is clear, and the Project Partners are strong and experienced. The role of Project partners is well described. Several Assessors commented on the helpfulness and high standard of the postcard, video and skills appendix.

Three Assessors expressed that the project summary was very high level to really understand if the innovation is achievable over and above current methods. Although the application noted that there is an existing process which is positive for implementing this innovation.

Eligibility Criterion 4. Projects must not undermine the development of competitive markets

Route to market	**Mean Expert Assessors' score**	6.4

The route to market of this project has been well thought through the challenges and rightly understood the global potential of a successful solution. It was positively noted that the international market has been considered by several assessors. The dissemination of information and learning, and work required with Ofgem to continue insights is useful.

Higher scores could have been achieved by giving more detail on the potential financial benefit to both the consortium and the user of innovation and the benefits for the consumer in the summary. Some further information is needed on the national modelling capability, the set-up costs, resourcing and maintenance requirements and changes to current investment models.

No assessors raised concerns regarding the Project undermining competitive markets.

Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	7.4

The application demonstrates a good understanding of existing leak detection technologies and justifies why the proposed technology is innovative. The innovation and its novelty are well described but could have been outlined more clearly. Good justification is provided for why the Project should be funded under SIF. There is the potential for good R&D to come out of this Project. Thought should be given to how this project interacts with digital twins and AI.

Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	5.2

Most Assessors acknowledged that the Project costs are appropriate and should be sufficient to complete the Project successfully. More information could be provided to justify the personnel costs such as higher subcontractors by showing costs against a detailed task view. The balance of costs among the partners seems reasonable. The team are strong and complimentary. There has been an additional contribution to the Project outside of the core SIF costs.

Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they can progress in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	6.4

The Project is likely to deliver based on this planning. The Project plan and milestones are well thought through and presented and have clear ownership. A robust methodology to ensure effective Project delivery is well described. It would be useful to include costs against work packages (either number of person hours or money), to help understand the relationship between resource and activity.

It was noted by assessors that the risk register was limited and would benefit from including a risk on the availability of datasets and should include achievable post-mitigation RAG ratings.

Regulatory barriers	**Yes/ No**	No

No immediate regulatory barriers have been identified which are going to block the progress of the Discovery Phase of this Project.

Recommendation to the Gas & Electricity Markets Authority	**FUND**

Overall Assessors have recommended this project for funding. The proposed Project addresses the important problem of leakage analytics in gas distribution pipework. The potential benefits to end users are well described. The Project has a high chance of delivering at the discovery stage. Consideration must be given to how this platform will integrated with digital twins to make a cohesive system. There is a very good understanding of the previous work and the potential to build upon this. The team is strong, and the supporting material is well thought through.

The main concerns highlighted for not recommending this project for funding is higher costs for third party contractor and more justification is needed, and inadequately addressing the barriers to developing and deploying a modelling capability.

The reduction of methane leakage is a high priority for Government and industry, and the project should interact with the appropriate workstreams to identify if this innovation could realise benefits sooner in the current system.

Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must provide clarification for how the innovation a part of this Project aims to reduce methane leakage, and how this Project differs from existing digital leakage analytics platforms used for calculating methane leakage. Condition 4 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

5.3.23 10027585, Eye in the Sky - Utilising satellite data to improve grid resilience in emergency, Initial Net Funding Required £119,105

Project Partner name	Eligible costs	Project contribution	Initial Net Funding Required
National Grid Electricity Transmission Plc	£66,358.66	£0.00	£66,358.66
National Grid Gas Plc	£4,664.00	£0.00	£4,664.00
Spottitt Ltd	£48,082.22	£0.00	£48,082.22
European Space Agency - ESRIN	£0.00	£0.00	£0.00

Submitted Project description
Energy infrastructure is vulnerable to natural hazards and extreme weather events that are becoming more frequent due to the impacts of climate change. In recent years Great Britain's (GB) electrical network companies reported the declining resiliency margins available to maintain the grid stability, hence the chances of prolonged power outages are continuously increasing. When extreme events like flash flooding, heavy rain, snowstorm, wildfire etc. occurs it is difficult to quickly assess the severity of damage using the existing manual inspection/surveying methods. Deploying specialised teams across large, affected areas, sometimes in remote locations, incurs significant costs and safety risks for the technical personnel and equipment. Due to these reasons electrical power networks are less resilient to disruptions, faults or damage caused by climate change events, that have not existed when most of the network infrastructure was designed and built. The advantages of using remote sensing satellite data for transmission networks can be significant. Firstly, during normal operational time satellite data can be used to aid regular maintenance such as detection of vegetation or bird nests on/around the transmission towers, unauthorised construction, damaged power assets etc. Secondly, during a natural disaster, access to data about the location and effects can allow better and quick resource allocation to increase the resiliency of the power network. Thirdly, satellite data can be used to make predictive models for events that are not considered in the existing models that are based on historic data from pre-climate change era. This Project is aimed to investigate new satellite data analytics solutions via remote sensing that can help GB networks to improve understanding of the asset conditions, better allocate resources, prepare, and respond to extreme weather events. The final solution should significantly reduce the requirements for manual ground and aerial based monitoring. This would allow the GB transmission network to be better informed about the network conditions and more reliable while lowering emissions and costs associated with Operation & Maintenance activities. This is closely aligned with the Data and Digitalisation challenge's aim to improve data monitoring, increase efficiency, reliability, security, and resiliency of networks.

Problem and opportunity	Mean Expert Assessors' score	8.8

Assessors acknowledged that the Problem has been well articulated. Some assessors noted the solution would have benefitted from a clearer description of the features and uses of the satellite sensing data and opportunities for other networks to adopt this solution. However, overall, this project presents a good description of the potential costs and new opportunities.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	9.0
The Project has been assessed and complies with the Data and Digitalisation challenge requirements. The idea has been broadly defined, whilst the solution may not be clearly defined yet the approach and benefits are clearly documented. Through Discovery Partners must identify quickly the area of focus where most value can be added. An assessor did note that the latency of least 2 hours may still be insufficient to adequately respond to emergencies.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.4
The Application benefits are clearly described for Economic and Regional impacts. Higher scores may have been achieved by presenting a quantitative assessment of the potential benefits.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project Summary	**Mean Expert Assessors' score**	8.2
The application involves reasonable network innovation, which is clearly articulated, the extent of the innovation will depend on how innovative the project is in use of data science and analytics to derive insight and forecasts from the satellite imagery. The representation of Project Partners and stakeholders is credible for the delivery of the Discovery Phase. With specific credit given from one Assessor for including the water sector mentioned It would be useful to understand the deliverables each partner is delivering. Particularly the intent to help scale the capability to other energy networks.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.6
The value to the lead network is well defined. For the discovery phase, it is overall a good plan for the lead network BAU implementation however, it would have been useful to consider how this innovation would transfer and impact operational efficiencies. For example, how will processes and systems transition to new approach. Particularly concern has been noted around the workforce changes being more complex than presented in plan. For example, staff awareness, training and skills, along with logistical implications of evolving one of the field work activities to a digital service. The Project could also consider assessment the procurement processes of other potential customers for the service, and the business model in which it would be offered (SaaS or bespoke service etc) with consideration being given to the value proposition to distributed generators. It is noted that partners involved not don't appear to depend on External Funding to complete this Project, but it would be useful to highlight any investment need of Spottitt. No assessors raised concerns regarding the Project undermining competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	8.0
The level of the innovation, in terms of Application, is clearly explained and supported with some evidence. There are alternative approaches not involving satellites that could have been explored for example GIS models, created by airplanes using LIDAR produce high resolution		

maps, or ground and asset located sensors. It would have been useful to justify why satellites are the right choice or complement these other solutions. There are various other projects / initiatives supporting networks to use satellite imagery and the project should continue to work closely with related initiatives to support better learnings.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors score**	7.4
The Project team is reasonable for task and available timescale. The balance of costs between the partners is generally justified. Expanding upon the cost justification for the Cranfield input would be useful. Some justification is needed for costs for deliverables 1 and 2 particularly Spottit's remit given this is an area of expertise. The project should also continuously consider if the ESA is the best value for money for consumers in future phrase. If there was an additional contribution to the Project outside of the core SIF costs for ESA this should have been noted.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they can progress in a timely manner.		
Project plan & milestones	**Mean Expert Assessors score**	7.6
The Project plan is well structured with clear work packages. The Gantt chart would benefit from offering a breakdown of the tasks involved in delivering the work packages. An Assessor has expressed concern relating to the lack of stakeholder research. It would be valuable to consider this task to derisk delivery associated with other projects or related technologies in the asset resilience space. A good assessment of the risks has been provided. Appropriate mitigation is presented, and the risks are re-scored post mitigation.		
Regulatory barriers	**Yes/ No**	No
No immediate regulatory barriers have been identified which are going to block the progress of the Discovery Phase of this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
All assessors have viewed this application positively. The problem is well described and there are considerable benefits associated with asset resilience and therefore savings to the end user. The main gap identified in previous innovations is using satellite imagery to support the response to extreme events. This gap should be considered in the discovery phase. To finesse the Project, the Project Partners should ensure that technology always remains in service of the business goals it is there to support, that greater attention is paid to stakeholders (raising their awareness and learning their needs, particularly field workers) and that the route to market develops a better plan for inclusive scalability.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must include justification as to why the Project should continue with SIF Funding rather than under business-as-usual activities		

6. SIF 2021 Round 1 Discovery Phase – Heat

Consumers need improved accessibility to low-carbon heating options which remains reliable and affordable in comparison to existing solutions. For many domestic, commercial, and industrial end consumers, heat represents a significant proportion of their energy bills.

Heating accounts for almost over a third of the UK's overall greenhouse gas emissions and to date has proved challenging to decarbonise. Presently most heating requirements are served by natural gas, or oil.

Heat networks, electric and hybrid heat pumps, hydrogen, biofuels, and other technologies have potential to contribute to the heat transformation necessary to meet national 2030 and 2050 emissions targets.

It is likely that the best low-carbon heat choices will be dependent on local characteristics such as local heat sources, or infrastructure capacity, and consumer preferences.

In all scenarios, the energy networks will play a crucial role in delivering the infrastructure required to support the decarbonisation of heat.

This section covers the requirements and assessment of Applications received to the Heat Innovation Challenge.

6.1 SIF 2021 Round 1 Discovery Phase – Heat – Scope

Project scope was described in the Innovation Challenge brief for the Heat Challenge as;

"To lead a Project applicant must:

- be a licenced: gas distribution network, transmission network operator, or electricity system operator
- work with a heat technology or infrastructure provider such as: heat network providers, heat pump manufacturers or waste to energy site developers as your subcontractors

Applicants should consider all the points listed here, but as a minimum must directly address at least one as the primary focus of the proposed Project:

- using smart approaches to manage large-scale electrified heat deployment in a local area, reducing the need for network reinforcement
- using smart meters with heat pumps to optimise usage and energy system flexibility
- the commercial and investment case for financing heating technologies alongside energy network innovation
- working with Project Partners on how deployment of low carbon heating solutions can be better coordinated to minimise gas and electricity network constraints at lowest economic cost"

6.2 SIF 2021 Round 1 Discovery Phase – Heat – Proposals

6 proposals were submitted to Innovate UK through the Innovation Funding Service (IFS) portal by the closing deadline of 11am 17th November 2021, all were deemed eligible for the Heat Innovation Challenge as per the scope outlined in section 6.1. All projects submitted by an eligible licensed distribution or transmission network have been assessed by the Expert Assessors and are listed below.

Project ref.	Project name	Funding licensee	Total eligible costs (£)	Total Project contribution (£)	Total SIF Funding requested (£)
10020609	Ch4rge - Emissions Capture	NGGT	144,782	0	144,782
10022648	Hydrogen Barrier Coatings for Gas Network Assets	NGGT	74,706	0	74,706
10025661	Flexible Heat	SPT	153,175	15,317	137,858
10025662	HEAT BALANCE	SPT	139,661	13,966	125,695
10027185	Velocity Design with Hydrogen	SGN	55,542	0	55,542
[REDACTED]					

6.3 Evaluation of Heat submissions

6.3.1 10020609, Ch4rge - Emissions Capture, Initial Net Funding Required £144,782

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
National Grid Gas Plc	£16,767.00	£0.00	£16,767.00
Project Environmental Solutions Ltd	£51,660.00	£0.00	£51,660.00
Mott Macdonald Limited	£76,355.00	£0.00	£76,355.00

Submitted Project description

Across the National Transmission System (NTS), gas losses occur for various reasons, including planned and emergency venting, or through unforeseen leaks. These losses are classified as fugitive or venting emissions. Reducing these emissions and paving the way for a carbon-free network is an important aspect of the work we're doing to help meet the UK's Net-Zero target.

Innovative technological solutions are becoming available for the first time which will allow this methane or hydrogen-based process gas releases to be captured, dramatically reducing overall emissions and facilitating the first key step in a network transition that will take the NTS towards Net-Zero.

Previous NIA projects have demonstrated that several of these technologies could provide viable and deployable solutions to process gas losses, specifically from rotating machinery seals and planned compressor venting.

These solutions are potentially suitable for installation as new build kit, or to be retrofitted to existing equipment. However, while in some cases these technologies are undergoing pilot trials, none are being conducted on the NTS or its associated assets.

SIF funding would support in the discovery of viable solutions for compressor machinery train (CMT) emissions reduction on the NTS and would help to demonstrate the real-life utilisation and success of such a solution.

Problem and opportunity	Mean Expert Assessors' score	9.0

A clear and compelling problem to reduce losses of particularly harmful gas emissions in the gas transmission system. A credible opportunity has been presented to apply technical solutions to this problem, with the opportunity to significantly reduce the environmental impact of gas networks and reduce network costs by minimising wasteful losses. The commentary sets out the issue being addressed and describes why this specific problem is a current and future barrier to achieving full Net-Zero gas transportation.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.6
The Big Idea is well articulated, together with a clear indication of the current state of technology development and IP arrangements. There could be a stronger case of prioritisation of solutions, and given the previous work already carried out it is unclear what the success criteria for the Discovery Phase is and how they differentiate from previous studies. On balance the proposal is assessed as meeting the Heat challenge requirements, although closer linkage of how this Project relates to the consumer heat end use would have strengthened the Application. As this is focussed upon the elimination of emissions involved in the transportation of fuels used primarily for heat then it does offer potential for delivering benefits associated with heat.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	8.8
The potential benefits are clearly defined, and appropriate metrics identified for tracking these benefits through Project development. These are primarily benefitting in emission reductions, although there is potential for some smaller financial benefits to consumers also. The assessment of potential benefits is comprehensive. The qualitative descriptions are appropriate for a Discovery Phase Application, although more quantified analysis will be necessary for progression in later phases. This question has clearly been fully considered by the applicant and the case made here is a good one.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	8.6
The commentary offers an excellent summary of the objectives in the Project and how they will overcome specific needs in the gas network(s) at a critical time nearing Net-Zero deadlines. The detail is concise and very clear. The organisations, personnel and skills have been clearly identified in the appendices. These provide confidence that the range of required competences are available with suitable stakeholders represented.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	8.6
The route to market plan is described very clearly and there is sound logic underpinning the structure of the planned roll out of this innovation when proven. The value proposition is clear and makes solid sense and the applicant has a clear appreciation of the participation of all other stakeholders in the roll out phase. The commentary also provides insight to the plans for dissemination and sharing of lessons learnt to peer organisations. This meets the requirements to ensure maintenance of fair competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation justification	**Mean Expert Assessors' score**	7.8
The commentary provides a strong case for the need for this innovation and references the positive impacts it can bring. It also presents a good case for the raised risk levels involved in this proposal. This is a strong response with the main concerns noting that the concepts considered here are well developed. These raise the questions of whether the innovations under assessment could be rolled out as business as usual at an earlier stage. This should be assessed and considered at the Alpha Phase Application.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & Value for Money	**Mean Expert Assessors' score**	8.0
The overall cost base for the Project seems fair and balanced. Individual cost items are reasonable and look to be costed competitively. The labour rates quoted are in line with expectations for industry standards. Given the potential reduction in the business carbon footprint, this would seem to deliver value for money. Better justification of why these costs is most appropriately provided via the SIF could have been given.		

Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	8.8
The Project plan and the risk management plan are aligned very well and both give confidence that the Project delivery will progress in a timely manner. There is good detail provided on the description of work packages and responsibilities are appropriate between the Project Partners. The attached appendix is simple with no timeline for deliverables.		
Regulatory barriers	**Yes/ No**	No
Cost-effectiveness of leakage reduction needs to be demonstrated with evidence provided to Ofgem for implementation under the regulatory price control.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
Methane release reduction has been identified as a key outcome targeted following COP26. The means to achieve this on the National Transmission System are described thoroughly here and the Project presents an opportunity to move forward government objectives. The proposal has been very well prepared, with emissions reduction benefits well understood and a very robust Project plan presented. Assessors unanimously agreed that this Project was worthy of funding, although raised questions about how much continued innovation support was necessary ahead of transitioning solutions into business as usual.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to the commencement of the Project, the Funding Party must provide to Ofgem and UKRI evidence that the Project does not duplicate any work included in the existing CH4RGE projects (NIA_NGGT0164[9] and NIA_NGGT0174[10]). Condition 4 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.		

6.3.2 10022648, Hydrogen Barrier Coatings for Gas Network Assets, £74,706

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
National Grid Gas Plc	£11,869.00	£0.00	£11,869.00
Ultima Forma Ltd	£35,843.74	£0.00	£35,843.74
University of Warwick (Warwick Manufacturing Group)	£26,993.00	£0.00	£26,993.00

Submitted Project description
The National Transmission System (NTS) is a network of high pressure natural gas pipelines, that supply gas to about forty power stations, large industrial users and gas distribution companies that supply commercial and domestic users. The natural gas is transported from the terminals situated on the coast to the end user. Around 23 million homes are heated by natural gas today, supplied through the NTS. In order to achieve the UK's Net-Zero targets by 2050, the gas networks will play an important part through the delivery of Net-Zero gases such as hydrogen. These gases have different properties to natural gas and therefore have different effects on the pipeline assets and systems. In 2026, BEIS are looking to define the heat strategy and conclude the role of hydrogen in heat

[9] https://smarter.energynetworks.org/projects/nia_nggt0164/
[10] https://smarter.energynetworks.org/projects/nia_nggt0174/

in the UK, and work is underway as part of the hydrogen grid research and development working group, to define the asset capability. Understanding the effects of hydrogen embrittlement and its impact on the NTS assets is a focus area. This Project looks at active prevention of hydrogen embrittlement through the use of coatings and novel materials, to increase the lifetime of the assets in a hydrogen environment and reduce the cost to the consumer in maintenance and replacement.

This Project will assess a variety of methods to line the interior of the pipes with thin barrier coatings, to enable hydrogen to be safely transported along the existing pipes, whilst also considering the potential impact on future pipeline materials such as composites. The Project will consider the opportunity to apply these coatings in situ via pipeline inspection gauges, robotics or gas dispersed systems, while also reviewing the opportunities and associated costs with undertaking the Application offline. The partners in the discovery Project are experts in coating techniques and composite materials. In later phases of work, further partners will be onboarded to cover topics such as the Application method and specific coating techniques.

The Project is being led by National Grid with Project partners Ultima Forma, an electroforming and materials science specialist, with proven technology for hydrogen permeability barriers, and Warwick Manufacturing Group, experts in composite materials and manufacturing processes.

The output of the discovery phase will be; detailed research into the feasibility of the technologies, an understanding of the opportunity for demonstration through the SIF process, and commercial viability for deployment on the NTS, post the Beta Phase.

Problem and opportunity	**Mean Expert Assessors' score**	8.2

Hydrogen embrittlement is a known Problem of high pressure steel pipes as in the NTS and if a cheap and effective solution could be found to remove that Problem, it would avoid the costly alternative of replicating parts of the network with hydrogen-compliant piping, if a decision is made by BEIS and Ofgem to proceed with widespread deployment of hydrogen transportation. This Problem has been well articulated, and the Project is exploring if technical solutions to overcoming hydrogen embrittlement can unlock opportunities associated with national adoption of low carbon fuels in the NTS.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	7.4

Since this Project is likely to develop evidence which will facilitate decision making on the use of hydrogen for heating, it has been assessed as meeting addressing some of the core criteria of the Heat Innovation Challenge. It is seen as a valuable Project. The idea is clearly and success metrics identified.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	7.8

This proposal would start to fill a knowledge gap that is essential to inform the decision making for a hydrogen strategy due in 2026. Although the full benefits of transitioning to a low carbon gas system could not be fully attributed to this Project, successful demonstration of feasibility would enable significant carbon emission savings for consumers. Further an economic assessment of the costs of this approach compared to alternative methodologies would be expected. This would provide evidence of whether cost saving and resilience benefits could also be realised.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project summary	**Mean Expert Assessors' score**	9.0

This is a technically challenging piece of work to deliver and this early stage study will be critical to the pathway to that delivery. The proposal is clearly focussed upon gas network orientated innovation. The Project team has excellent credentials and seems highly likely to deliver this study very well. Project Partners should ensure adequate engagement and participation from

policy makers and regulators throughout the Project. The response provided is considered, thoughtful and concise.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	9.0
The approach to the route to market plan for a developed solution is set out well here and the commentary describes how a network of stakeholders will become engaged in its delivery. The value proposition is clear and the potential positive impact from the Project could be significant. Greater detail on the investment needs of third parties to bring ideas to maturity, and to develop a supply chain of market ready products would be a valuable addition. There is applicability of solutions to gas distribution networks, for which the route to market could also be considered. There also appear to be potential international export opportunities by being early developers of these technologies.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	8.6
Past and related work in this area has been described comprehensively and gives confidence that this Project is novel and innovative in its scope. The utilisation and applicability of technical solutions proven in other sectors, and applied in novel environments or configurations is welcomed. Assessors would like to also see awareness and consideration of the challenges faced with scaling the deployment of the solution considered within the Project.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	9.4
Overall Project costs are entirely appropriate to the Project's objectives and the individual cost entries are highly competitive. The core benefits of a successful solution are likely to be applied principally to the operation of future gas networks, with the benefits delivering value directly to network consumers. Additional contributions are made outside of the funding request, presenting further value for money to consumers.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	8.2
The Project plan is clear, with accountability for the delivery of each work package assigned to Project Partners. The deliverables from each work package are identified in the attached Project plan and provide confidence that the Project will be managed competently. The level of detail provided deliverables and outputs is sufficient for Discovery Phase but will need to be developed in more granular detail for subsequent phases. The timetable is ambitious, but the capabilities offered by the Project team give confidence that delivery is achievable.		
Regulatory Barriers	**Yes/ No**	No
Regulatory barriers exist to the use of hydrogen is the NTS. However, this Project looks to provide evidence for consideration of those decisions and should involve direct engagement with the relevant BEIS and Ofgem teams.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The applicants have delivered a proposal that has defined a clear Problem, with potential solutions that could deliver significant emission reductions and potentially cost savings to the consumer. On the whole assessors considered this proposal to be extremely suitable for SIF funding due to the inherent uncertainty and risk associated with investment. The technical challenges to achieving the objectives of the study seem feasible given the expertise of the delivery team. It is important that consideration is also given to how a successful solution could be deployed at scale, and the costs associated with doing so. Furthermore, close working with policy makers and regulators considering the future use of hydrogen in regulated networks is essential. This Project should consider the development and dissemination of an evidence case as a core output of the Project.		

Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to the commencement of the Project, the Funding Party must provide to Ofgem and UKRI evidence that the Project does not duplicate any work included in the existing Network Innovation Competition HyNTS FutureGrid Phase 1 – Transmission Test Facility (NGGTGN04)[11].

6.3.3 10025661, Flexible Heat, Initial Net Funding Required £137,858

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
SP Transmission Plc	£10,614.00	£1,061.40	£9,552.60
Swansea University (Active Building Centre Research Programme)	£32,027.12	£3,202.71	£28,824.41
Connected Response Limited	£23,460.00	£2,346.00	£21,114.00
Delta Energy & Environment Ltd	£34,440.00	£3,444.00	£30,996.00
E.On Energy Solutions Limited	£12,675.00	£1,267.50	£11,407.50
University Of Glasgow	£27,284.16	£2,728.42	£24,555.74
Sunamp Limited	£12,675.00	£1,267.50	£11,407.50

Submitted Project description		
Flexible Heat will maximise the amount of flexibility available through domestic heat to reduce and smooth peak demand. It will demonstrate the technologies which may be deployed to achieve this including domestic thermal storage technologies and smart control solutions.		
Problem and opportunity	**Mean Expert Assessors' score**	9.2
The applicants reference a known Problem associated with managing peak electricity demand as energy use becomes increasingly electrified. The opportunity described will involve exploring the use of flexibility of low carbon heating assets to minimise the costs of network upgrades and deliver value to consumers. The response is well written and references previous studies which have examined the scale of the Problem and opportunity.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	8.0
The Project scope has been clearly described and addresses the Heat Innovation Challenge criteria well. The Project will investigate the potential value of thermal energy storage in providing flexibility to the electricity networks when deployed alongside electrified heating. Assessors would like to see inclusion of how benefits of avoided reinforcement can benefit all bill payers, and not just those with novel heating systems. Furthermore, barriers to consumer adoption of these assets, and counterfactual options should be considered.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	8.0
The response has provided in great detail, the qualitative benefits expected, and how they align with competition aims. Positive impacts on consumers have been outlined and the applicant has indicated that quantitative measures will arise from the Discovery Phase of the Project. Benefits include emissions reductions, cost savings, and improved system resilience. In later phases evidence must show that there is a positive and attractive business proposition for commercialisation of these approaches.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	8.4

[11] https://smarter.energynetworks.org/projects/nggtgn04/

Credible Project Partners are represented with complementary skills and knowledge suitable for the scope of activities proposed. It is clear that this proposal has good focus on network innovation. Inclusion of a vulnerable consumer advocate would strengthen outcomes and improve representation. Assessors commented that comparison of phase change materials in comparison to alternative technologies would improve the reliability of Project outputs.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.0
The route to market has been described to a reasonable level. An estimation of the market size has been offered, however the cost competitivity with other approaches such as large scale, long duration storage has not been explored in detail. The route to market focuses on the heat equipment manufacturers, a more developed explanation of how the network control and market aspects would be rolled out as business as usual would be expected for Alpha/ Beta Phase Applications. The Project is not viewed to create any risks to the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	8.2
A fairly extensive review of previous research and innovation projects has been provided. This focuses on studies conducted on the UK energy market and valuable learnings could be integrated from international work, particularly in countries with a high prevalence of heat pump usage. The applicant has justified how use of thermal energy storage for flexibility is novel and innovative as well highlighting what distinguishes this proposal from the other innovations. From the response, this Project appears innovative and may deliver services and products which are novel, hence it is deemed to meet the SIF Eligibility Criteria of being novel, innovative or risky.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	6.4
The Project costs presented seem appropriate to cover the Project activities with a reasonable balance of costs across the Project Partners. The response indicates that this Project's outputs would be complementary to business as usual activity. Some assessors challenged the value of contractor costs, which should be reviewed whilst conducting financial checks. However, Project Partners are providing a voluntary contribution in kind which improves the value for money case.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	6.8
The response has communicated the work breakdown very concisely with milestones and deliverables clearly stated. Greater detail could have been provided on work activities, timelines, and success criteria of deliverables. The risks identified appear appropriate with reasonable mitigation planned, although there is no quantification of risks in the assessment. The Project plan and methodology have been reasonably well thought through and give confidence that the Project team are capable of progressing the plan in a timely manner.		
Regulatory Barriers	**Yes/ No**	No
Commercial and regulatory agreement will need to be established for the involvement of thermal energy storage in wider flexibility markets. There may also be outstanding questions about how consumer protections are ensured when smart controls are operated at a regional level. Applicants are encouraged to proactively engaged with regulatory teams to identify regulatory constraints and agree a robust evidence base to be developed through Project delivery.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The Application is very well written and has good representation in the Project partnership from a range of organisations with suitable capabilities for delivering the Project scope. Responses were strong throughout the Application, with some improvements noted for the Project plan and delivery methodology.		

Greater focus must be given to the implementation of business as usual opportunities associated with domestic heat flexibility, and how these assets will be valued through network operation. This is viewed as paramount to the Project, which otherwise risks becoming another interesting study exploring the opportunities of novel heating systems but failing to establish a a credible route to market. To mitigate that risk there ought to be economic cost assessments at later phases to assess the alternative approaches to managing electricity demand alongside the heat needs of consumers.
Recommended Project specific conditions
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

6.3.4 10025662, HEAT BALANCE, Initial Net Funding Required £125,695

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
SP Transmission Plc	£10,614.00	£1,061.40	£9,552.60
University of Edinburgh	£30,670.00	£3,067.00	£27,603.00
University of Glasgow	£25,995.00	£2,599.50	£23,395.50
Vattenfall UK	£7,115.38	£711.54	£6,403.84
Erda Energy Limited	£4,182.69	£418.27	£3,764.42
Ramboll UK Limited	£25,450.38	£2,545.04	£22,905.34
Delta Energy & Environment Ltd	£32,800.00	£3,280.00	£29,520.00
Wales & West Utilities Limited	£2,834.18	£283.42	£2,550.76

Submitted Project description		
HEAT BALANCE will look at the international best practice and develop large-scale thermal storage as part of the overall UK energy systems landscape. It will investigate the deployment of large-scale thermal storage technologies (both short and long term) to understand how these will perform in the context of both physical considerations (such as the geology in the UK) and network technical characteristics, together with the regulatory and commercial framework. Due to being one of the lowest cost forms of energy storage, this will drive the overall cost of heat down to benefit the consumer		
Problem and opportunity	**Mean Expert Assessors' score**	7.6
A clear Problem summary has been provided, the need to decarbonise heating at best cost, whilst managing impact on the energy network. The opportunity of using large scale thermal energy storage to reduce heat costs to the consumer is outlined. The response would have been helped by reference to impact of large-scale thermal storage in other countries to justify intervention in the UK, alongside some reference of what 'scale' is being investigated.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.4
The big idea proposed has been reasonably well articulated. The applicant has identified that large thermal energy storage schemes show promise in areas with suitable geologically characteristics. Investigating the potential of the technical potential of this approach to heat storage, alongside the commercial and regulatory requirements has significant potential at this stage. The proposal clearly addresses the Heat Innovation Challenge.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	8.0
The applicants have clearly described and given justification for potential carbon and cost savings, providing some preliminary quantification. Deferral of network upgrades for heat		

demand has also been explained, but further articulation of how these benefits will be realised by consumers as business as usual could have been provided.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	7.8
The Project summary is very clear and there are a good balance of Project Partners, including representations from academic, utility and commercial organisations. This brings diversity of expertise and varied perspectives to the Project. However, it is not absolutely clear what some of the Project Partners experience or role is in the deployment of large scale thermal energy storage is. Additionally, assessors noted that community or consumer representation would have further benefited the Project.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.2
The proposal offers explanation of the value proposition to energy networks, investors and UK energy consumers. Although reasonable explanation has been given for how large scale thermal storage opportunities have the potential to deliver value to the parties referenced, better appreciation of the challenge of the multi-party investment and supply chain coordination to successfully bring these ideas to market in the UK would have strengthened the Application. The Project is not viewed as undermining the competitivity of markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	7.8
The case for developing this technology in support of mitigating electricity network management and resilience challenges is well made. There is a good understanding of similar innovations and with explanation of how this Project will build on past research. Thermal energy storage solutions currently do not exist as a flexibility tool for electricity transmission networks in the UK. Investigation of this and forming bettering understanding of how these solutions could be configured within the UK energy system is viewed as innovative and novel.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.6
The Project costs are justified and appear proportionate to the prosed delivery package in the Discovery Phase. The allocation of costs appears reasonable and contributions in kind have been offered by several of the Project Partners, strengthening the value for money case of funding this Project.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	8.4
The Project plan is very clear and the team is well divided between technical and commercial outcomes. The risk register could have been improved by an assessment of expected severity and likelihood to support the justification of mitigation actions. The scope of work appears ambitious for the timelines attributed to them, but the quality of the Project plan and methodology have given assessors sufficient confidence that the team can deliver.		
Regulatory Barriers	**Yes/ No**	No
New commercial and regulatory frameworks work inclusion of thermal energy storage participation in wider flexibility markets should be investigated. This includes a regulatory mechanism for payments from these different sources be delivered to network consumers. This proposal may inform aspects of the future system operator functions.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The evidence base for integrating large scale thermal storage in to flexibility markets is lacking for the UK. It is not expected that this will be supported under energy networks business as usual functions. Good arguments have been provided for the potential value of these approaches to consumers, network operation, and to create commercial opportunities for network consumers with suitable assets. The Project proposal was assessed as being robust with many of the		

suitable stakeholders directly involved. Further detail, particularly on justifying expected benefits will be required, but this was viewed as a strong Application for delivery of a Discovery Phase.

Recommended Project specific conditions

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3
As part of its end of Project Phase report, the Funding Party must evidence consideration and note details on adaption or changes to relevant regulatory and landuse planning legislation required for successful deployment of large scale thermal.

Condition 4
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

6.3.5 10027185, Velocity Design with Hydrogen, Initial Net Funding Required £55,542

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
Southern Gas Network Plc	£8,294.10	£0.00	£8,294.10
DNV Services UK Limited	£47,247.96	£0.00	£47,247.96

Submitted Project description

Hydrogen networks have the potential to contribute to the Challenge 4: Heat, through the transformation to meet national 2030 and 2050 emissions targets.

To demonstrate how the current gas networks can be intelligently and efficiently transitioned to provide low carbon heating, the gas velocity constraint(s) applied at the design stage need to be identified. The constraint determined will impact directly onto the levels of capital investment required in the transition of the system to accommodate blended and 100% hydrogen.

Hydrogen gas does not contain the same level of energy as in natural gas, so to deliver the same level of energy the volume of hydrogen flowing to consumers would have to increase a little over 3 times for an 100% hydrogen network, compared to natural gas. Without network reinforcement, this increase in flow could require a significant increase to the pressure and/or velocity of gas.

Currently, IGEM standards specify a nominal maximum velocity of 20 m/s is assumed in system design, mainly to avoid the risk of debris within the pipes being picked up by the gas stream and causing wear to pipe components resulting in early failure.

Debris may be present in the system, particularly in the lower pressure tiers, in the form of dust, mainly, as a product of the historic manufacture of towns gas. Whilst many metallic mains, particularly in the LP pressure tier, have been replaced in PE, it is anticipated that debris will still be present in the pipes that have not been replaced under the metallic mains replacement scheme, and may have already been transported into the plastic pipes. Other factors such a noise or vibration may also constrain the design velocity of gas in the system.

Hydrogen has different properties to natural gas, so it is not known if debris may be picked up to the same degree or if any other factor will limit velocity.

This Discovery Project phase will:

- Conduct a literature research into likely constraints to velocity (e.g. debris, noise, vibration)

- Document current GDN experience of debris.
- Investigate the requirements for testing to determine an updated gas velocity design limit(s) to be applied for 20% hydrogen blends and 100% hydrogen. Includes the definition of the "debris" to be used.
- Determine the work required to investigate the impact any limit would impose on design outcomes and the basis for any further stage required to investigate the presence of debris within systems.

Problem and opportunity	**Mean Expert Assessors' score**	6.2

Both a Problem and an opportunity have been identified by the team in this Application. The issue of debris within gas pipes and velocities has been the subject of numerous previous studies. However, the outcomes of the proposed study will better understand existing system constraints and limiting factors for hydrogen blends, and defining new design and operating standards.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	6.8

The Project aims to generate new knowledge to be openly disseminated to network operators through the development of new standards. These standards would be key enablers for the use of hydrogen in the gas networks for heating (pending policy decisions), therefore this proposal is seen as addressing the Heat Innovation Challenge with the potential for valuable outputs.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	6.8

The benefits to the network operators from this Project will arise from better planning and cost management. There is justification of benefits to the final consumers, who ultimately bear the costs of network upgrades. Mostly qualitative assessment of potential benefits has been given, however the metrics of success are clearly identified and the quantitative cost-benefit framework will be developed as part of the Project.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project summary	**Mean Expert Assessors' score**	7.0

A clear Project summary has been provided and the key Project Partner, DNV, have the required capabilities to provide the Project with a good chance of success. The Project is directly focussed on gas network innovation and the development of standards for gas network operation. The Project summary materials have been completed to a good standard. The applicants should incorporate active participation from wider relevant stakeholders including other gas networks, and future supply chain participants.

Eligibility Criterion 4. Projects must not undermine the development of competitive markets

Route to market	**Mean Expert Assessors' score**	7.2

The route to market has been explained based on the revision of existing industry standards, However, recognition of the support needed from all gas networks, as well as the Health and Safety Executive to drive industry adoption could be clearer. IGEM will be an important stakeholder. The Project is not viewed to undermine the development of competitive markets, though industry acceptance and demonstration that all parties views on standards have been accounted for will be required ahead of further implementation.

Eligibility Criterion 5. Projects must be innovative, novel and/or risky.

Innovation Justification	**Mean Expert Assessors' score**	5.8

The value of conducting this work is well justified. However, no evidence is provided about investigations into whether similar work has been, or is planned to be, carried out nationally and internationally. Due to this it is difficult to assess the extent of innovation within the Project. Based on existing knowledge of this area, assessors have deemed this to be a sufficiently novel proposal to meet this Eligibility Criteria. However, a more extensive literature review will be required for the Alpha Phase assessment. This should support justification of the innovative

aspects of this Project and that the planned activities should not be carried out as business as usual by networks.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.2
The Project costs are appropriate and should be sufficient to deliver the Project outcomes stated in the Project plan. There is a good balance of the costs between the Project Partners and clear evidence of skills and existing facilities to deliver the Project.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	6.6
The team have identified four work packages to be delivered in the two month duration of the Project. There is a good Project plan presented with good milestones explained and breakdown of the activities. The risk register is basic, more detail and mitigating actions could be provided. There do seem to be genuine risks associated with the collection of data, and the acceptance of Project finding by IGEM and other key stakeholders. The Project delivery methodology is simple but gives sufficient confidence that the Discovery Phase Project can be delivered to plan.		
Regulatory Barriers	**Yes/ No**	No
Key decisions on the transportation of hydrogen by gas networks are to be made by BEIS and Ofgem in coming years. This Project could develop valuable evidence to support those details and should make a concerted effort to disseminate findings to the relevant policy and regulatory teams in BEIS and Ofgem.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The need to probe the upper acceptable limits for flow velocity for hydrogen and blends is critical to determining the capacity available on the existing network and the extent to which upgrades will be needed for the delivery of low carbon gases. Policy decisions will be taken on the use and transportation of hydrogen in several years. This is likely to provide evidence for consideration of those decisions but it it could be challenged that the delivery of this Project is ahead of need. Whilst the Project would develop valuable insights and outputs, some assessors have questioned the degree of innovation involved in the Project and challenged whether this should be delivered through the SIF.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase. Condition 4 As part of its end of Project Phase report, the Funding Party must fully evaluate the most appropriate funding options to take forward the project. This must include consideration of continuation of the Project via the SIF Alpha and Beta phases, other re-openers within the RIIO-2 price control, and other possible funding streams such as BEIS innovation funding or private capital. Condition 5 As part of its end of Project Phase report, the Funding Party must provide evidence of its review of the Network Innovation Competition HyNTS FutureGrid Phase 1 – Transmission Test Facility's (NGGTGN04)[12] areas of focus and efforts to avoid duplication with that project.		

[12] https://smarter.energynetworks.org/projects/nggtgn04/

6.3.6 [REDACTED]

7. SIF 2021 Round 1 Discovery Phase – Zero Emission Transport

Consumers need reliable, cost-effective transportation that is readily available when demanded. Personal transportation preferences are shifting as new trends emerge in transport. These include e-mobility, new public transportation links, as well as national and international changes in supply chains for goods.

Strategic targets for deep decarbonisation of the transport sector also exist, which have significant implications for electricity networks and potential implications for gas.

The networks will need to be prepared to enable large scale deployment of battery electric vehicles (EVs) while keeping costs to consumers affordable and equitable.

The introduction of hydrogen-fuelled heavy goods vehicles is likely to create novel technical challenges across roads, rail, and ports, such as effectively managing integration of electrolysis across the electricity networks and hydrogen transportation infrastructure.

This section covers the requirements and assessment of Applications received to the Zero Emission Transport Innovation Challenge.

7.1 SIF 2021 Round 1 Discovery Phase – Zero Emission Transport – Scope

Project scope was described in the Innovation Challenge brief for the Zero Emission Transport Challenge as;

"To lead a Project applicants must:

- be a licenced: gas distribution network, transmission network operator, or electricity system operator
- work with a mobility technology or infrastructure provider, for example electric vehicle charge point providers, port authorities or network rail
- work with at least one other organisation as your subcontractor

Applicants should consider all the points listed here, but as a minimum must directly address at least one as the primary focus of the proposed Project:

- how the Project will directly support the growth of zero emission transport options
- how to maximise the opportunities that electric vehicles create to deliver a smarter energy system, whilst ensuring that energy networks are prepared for accelerating uptake
- how energy networks can support integrated multi-model transport services in local areas
- energy supply requirements for long haul aviation, shipping, or rail"

7.2 SIF 2021 Round 1 Discovery Phase – Zero Emission Transport – Proposals

11 proposals were submitted to Innovate UK through the Innovation Funding Service (IFS) portal by the closing deadline of 11am 17th November 2021, all were deemed eligible for the Zero Emission Transport Innovation Challenge as per the scope outlined in section 7.1. All projects submitted by an eligible licensed distribution or transmission network have been assessed by the Expert Assessors and are listed below.

Project ref.	Project name	Funding licensee	Total eligible costs (£)	Total Project contribution (£)	Total SIF Funding requested (£)
10020605	HyNTS Deblending	NGGT	148,141	0.00	148,141
10025479	Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility	SPT	151,938	33,158	118,780
10025738	A Holistic Hydrogen Approach to Heavy Duty Transport (H2H)	SPT	139,340	31,102	108,238
10026963	HyPark	WWU	150,000	0.00	150,000
[REDACTED]					
10027293	Multimodal Hydrogen Transport Refuelling Study	NGN	89,445	0.00	89,445
[REDACTED]					
[REDACTED]					
10027315	Rail Decarbonisation Planning	NGN	124,994	11,400	113,594
[REDACTED]					
10027575	NAVIGATION	SGN	149,724	0.00	149,724

7.3 Evaluation of Zero Emission Transport Submissions

7.3.1 10020605, HyNTS Deblending, Initial Net Funding Required £148,141

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
National Grid Gas Plc	£21,908.00	£0.00	£21,908.00
Element Energy Ltd	£66,725.00	£0.00	£66,725.00
HyET Hydrogen BV	£34,320.18	£0.00	£34,320.18
Element 2 Limited	£13,000.00	£0.00	£13,000.00
Jaguar Land Rover	£12,187.84	£0.00	£12,187.84

Submitted Project description

The UK has committed to Net-Zero Emissions by 2050 which will require a range of new energy and technical developments. National Grid Gas have been considering the role of the Gas Networks in this transition, and the associated potential use cases. Hydrogen is one of the solutions to achieving this target and in the transitional period, is likely to be blended with natural gas to provide energy to industry, heat and transport use cases. Each use case requires different gas quality and blends which will be managed through deblending and purification technologies.

In the transition period up to 2050 it is likely that there will be varying requirements from our customers ranging from 100% hydrogen to 100% methane, which is likely to change as our customers migrate to Net-Zero solutions. If this cannot be controlled with the blend coming into the network, then a system will be required at the end customer to ensure delivery of the correct gas mixture. This Project develops low cost skid mounted solutions for deblending and purification that can be migrated around the UK networks as we transition to 100% Hydrogen.

Without this technology, refuelling of transportation assets will be limited to the use of locally produced hydrogen, until the gas networks can transport 100% hydrogen. This will limit the speed of transition for the transport industry and limit the reliability and continuity of the

refuelling systems in the UK. The Project works with refuelling partners to explore the opportunity to utilise this technology to enable transport Applications, through refuelling stations directly connected to the NTS network. The discovery Project will determine the optimum technical options for taking the gases from the NTS assets through to delivering this to vehicle users. This will enable us to progress to detailed design in Alpha Phase and demonstration through Beta Phase of the planned approach.		
Problem and opportunity	**Mean Expert Assessors' score**	8.6
The applicants have provided a strong response which communicates the Problem clearly, and furthermore the scale of the potential Problem in achieving Net-Zero. It has been clearly articulated and linked to the government ambition. There appears to be a credible opportunity to facilitate an accelerated transition to low emission vehicles through use of deblending. More understanding of the opportunities of the full technical challenges that will need to be overcome will be explored as part of the Discovery Phase.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.2
The proposal is viewed as being extremely ambitious and well suited to addressing the Zero Emission Transport SIF challenge. Some assessors have flagged that assumptions against the outline design (for instance the use of skid mounted units) should be tested at the feasibility study stage, rather than presuming the optimal approach from the outset. Furthermore, the Project scope operates on the presumption that a policy decision will be made to use significant amounts of hydrogen in the gas grid. The Project should engage closely with Ofgem and government to track and provide evidence to inform these policy decisions.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.4
The use of the gas network to accommodate the distribution of hydrogen made from surplus renewables power and from carbon captured steam-methane reformation, coupled with the provision of separation facilities, offers a route to early adoption of hydrogen as a transport fuel. A qualitative justification of achievable benefits is provided. Realisation of benefits by consumers is requisite on the growth in demand of hydrogen fuelling from the high pressure gas network for transportation purposes.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	8.0
The Project summary has been assessed to be clear and informative. The applicants have outlined the network innovation aspects of the Project well. The Project team is composed of organisations from across the value chain. The participation from the partners is welcome and necessary to meet the challenges of the Project delivery. Additional value could be added by the participation of non-road transport end users.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.2
The Project is not viewed as directly undermining the development of competitive markets. The Project does have potential to bring a transport fuelling approach using hydrogen to market. This is likely to be in competition with other approaches to transportation fuelling, but does not undermine the development of alternative approaches. A route to market has been articulated but the Project will have to demonstrate commercial value and competitivity in comparison to alternatives.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	7.8
The commentary and appendix provide good insight in to relevant prior works that support the technical basis for the solution both nationally and internationally. The proposal offers novel approaches by using smaller, transportable units that can be deployed to end user sites rather		

than at gas network sites. Some elements of the innovation have not been made clear, such as compression. Proof of a commercial model for scaling at a national level beyond initial demonstration would also be regarded as an innovative addition to past work.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.0
Most assessors viewed the costs as being fair and reasonable in comparison to market rates, for the type and scope of work to be delivered. One Expert Assessor raised concerns that labour costs appeared high for some Project Partners. Additional contributions from commercially benefitting Project Partners would be expected in later phases.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.6
The Project has been planned through Discovery, Alpha and Beta Phases. Assessors have reasonable confidence that the Project plan is robust enough for Discovery Phase delivery. However, in an attempt to crowd long term planning in to the response, the Project plan for the Discovery Phase has become challenging to review. Furthermore, the Project is expected to take a responsive and flexible approach to Project planning, as learning and developments are made through each Phase. The risk register meets the minimum standards but could be more comprehensive.		
Regulatory Barriers	**Yes/ No**	No
The key regulatory barrier lies within a policy decision on the use significant amounts of hydrogen in the gas grid. The Project should engage closely with Ofgem and Government to track and provide evidence to inform these policy decisions.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The proposal has been assessed as ambitious and able to provide a good evidence base on the widespread use of hydrogen as an energy vector to meet transportation needs. A single assessor raised concerns around the costs for delivery, and highlighted that alternative approaches should be considered in the early phases. If successful, the Project could provide good demonstration of the technical and commercial feasibility of using hydrogen as a transportation fuel. It has potential to provide benefits back to network consumers and consumers through the emissions reductions and continued reliability of their energy supply.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to the commencement of the Project, the Funding Party must provide to Ofgem and UKRI evidence that the Project does not duplicate any work included in the existing Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) projects Hydrogen Deblending Feasibility Phase 2 (NIA_NGGT0177)[13] and included under phase 2 of HyNTS FutureGrid (NGGTGN04)[14].		

[13] https://smarter.energynetworks.org/projects/nia_nggt0177/
[14] https://smarter.energynetworks.org/projects/nggtgn04/

7.3.2 10025479, Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility, Initial Net Funding Required £118,780

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
SP Transmission Plc	£5,307.00	£5,307.00	£0.00
University of Leeds	£100,638.56	£10,063.86	£90,574.70
Network Rail Limited	£12,000.00	£12,000.00	£0.00
Ricardo-AEA Ltd	£31,338.79	£3,133.88	£28,204.91
SP Distribution Plc	£2,653.50	£2,653.50	£0.00

Submitted Project description		
This Project will develop multi-energy hubs around 2500 railway stations across over 10,000 miles of UK rail to improve energy efficiency with greater flexibility to support power grid operation, networking these hubs to enhance the overall traction power supply security and resilience, and the integration of renewable generation.		
Problem and opportunity	**Mean Expert Assessors' score**	8.0
The Problem identified is the decarbonisation of rail, and how coordination of approaches with other transport modes can provide opportunities to more efficiently decarbonise transportation and maintain network resilience. The opportunity of successful delivery is acknowledged to have the potential to provide carbon, cost, and resilience benefits to consumer whilst also introducing new services to the market.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	8.2
The proposal is viewed to address the Zero Emission Transport challenge. The ambition is to develop a solution to be deployed at scale nationally to support the decarbonisation of rail. System benefits and multi-modal interactions are also in scope and addresses notable focal areas of the challenge.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.2
A plausible range of benefits for rail operators and wider potential economic impacts are outlined. These are described at a qualitative level but the justification for potential benefits in carbon reductions and costs. These benefits will need to be qualitatively evidenced in more detail in future phases. In particular one Expert Assessor questioned the achievable extent of improved resilience or levelling up benefits referenced.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	7.0
The Project summary is clear, describing the assessment of feasibility for of a scheme to transform large train stations in urban areas into a multi-energy transportation hubs. The Project involves participation from some key stakeholders, notably Network Rail as the rail infrastructure owner. Direct Project participation from other technology providers and end users for other transport types would be a valuable addition.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.8
A broadly plausible progression from Project outcomes towards widespread implementation is outlined. The value proposition was described for direct Project participants but the buy-in and delivery of value to other stakeholders seems likely to be pivotal for a successful rollout and scaling commercially. A fuller analysis of the economic and commercial case for this approach would improve the case to progress the proposal in later stages. The proposal is not viewed as undermining the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		

Innovation Justification	Mean Expert Assessors' score	7.2
The applicants have provided a good overview of their relevant past experience. A reasonable range of related past projects has been given with justification that this proposal is an innovative iteration of previous work. The commercial aspect of innovation has been highlighted as particularly valuable. More depth of research including covering similar projects overseas would be a good addition during the Discovery Phase.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.2
The Project costs have been assessed to be reasonable and constitute value for money against the planned activities of the Project. An additional contribution of costs towards the Project has been given on top of the SIF cost allowance which enhances the value for money case. The Project costs are broadly appropriate and the balance of costs between Project Partners seems reasonable given the distribution of the work. More confidence in the value for money represented would be provided by a more detailed breakdown of the commercial consultant's budget showing the day rates used.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.8
The Project plan includes milestones, responsibilities and timings. It has been deemed suitable to give confidence of the ability to deliver in a timely manner, although greater granularity of activities and a more detailed risk register would have improved the Application.		
Regulatory Barriers	**Yes/ No**	No
There are no obvious regulatory barriers to the deliver of this Project, beyond policy decisions relating to the use of hydrogen in the gas networks.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a competent proposal for an initial study of the possibility of developing and networking multi-energy hubs based around railway stations to improve energy efficiency and provide more flexibility to support power grid operation. It is viewed as an innovative idea with sufficient prospects to deliver benefits to energy network consumer/user. The majority of assessors have recommended that this proposal is funded. Some assessors felt that the Project plan could have been more robust, providing more granular detail on the planned activities and outputs of Discovery Phase. Further work to define the expected outputs in more detail, and quantify the potential benefits should be carried out to be presented during assessment in later phases.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to commencement of the Project, the Funding Party must provide to Ofgem and UKRI details of expected outputs and specific activities under each work package. Condition 4 Prior to commencement of the Project, the Funding Party must engage with members of the team behind the Project ''A Holistic Hydrogen Approach to Heavy Duty Transport (H2H)" SIF Project to identify common areas of scope and collaboration opportunities. Additionally, the Funding Party must share its end of Project Phase report with the members of the team behind the Project "A Holistic Hydrogen Approach to Heavy Duty Transport (H2H)"'.		

7.3.3 10025738, A Holistic Hydrogen Approach to Heavy Duty Transport (H2H), Initial Net Funding Required £108,238

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
SP Transmission Plc	£2,653.50	£2,653.50	£0.00
Ricardo-AEA Ltd	£81,416.04	£8,141.60	£73,274.43
Network Rail Limited	£15,000.00	£15,000.00	£0.00
University of Leeds	£34,964.29	£0.00	£34,964.29
SP Distribution Plc	£2,653.50	£2,653.50	£0.00
Scottish Power Ltd	£2,653.50	£2,653.50	£0.00

Submitted Project description

The UK and Scottish Government both have targets of 5GW for hydrogen production capacity by 2030, and the UK government aims for 1GW by 2025. Hydrogen production assets have a potential role to play in balancing supply and demand for electricity by turning down or off in peak periods and turning up when supply of renewable energy is high, either in response to price signals or direction from the system operator. Furthermore, they could ease network constraints by responding to signals from TOs or DSOs in the future.

Transportation is a major polluter at 27% of UK greenhouse gases in 2019, with passenger and freight trains causing 1.6 MtCO2e pa. The rail industry has a target of removing all diesel passenger trains by 2040 (2035 in Scotland). With only 40% of the UK rail network electrified there is a challenge to decarbonise the remaining 60%.

This Project explores low carbon solutions by identifying the most efficient transition for the rail decarbonisation potentially using different low carbon solutions. The overall aim is to demonstrate at a specific site how electrification of rail using hydrogen, power electronics, energy storage and direct renewable generation connections can save costs, carbon and time for electricity and rail consumers.

Problem and opportunity	Mean Expert Assessors' score	8.2

The Problem statement is considered a valid challenge for energy networks, how to facilitated decarbonisation of rail in an optimal way. There is an opportunity to investigate the full range of opportunities across electricity transmission, distribution, rail infrastructure owner, and hydrogen transporter perspective. The outcomes could include lower cost pathways to rail decarbonisation and accelerated emission reductions.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	Mean Expert Assessors' score	7.8

All assessors consider this proposal to meet the Eligibility Criterion. To expand the holistic approach to rail decarbonisation, the applicants are encouraged to consider the full range of options and technologies that might be deployed during the Discovery Phase. Including the trackside battery or direct connection to local renewables options that are briefly mentioned.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	Mean Expert Assessors' score	8.0

The removal of diesel from rail operation provides an opportunity to reduce carbon emissions associated with transportation. Furthermore, there are benefits to the energy networks and network consumers, particularly rail network infrastructure owners and train operating companies. There is potential for cost saving benefits, that could be better quantified in subsequent phases. Demonstration of how these benefits will be realised with consumers should be sought during delivery.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project summary	Mean Expert Assessors' score	7.6

The Project is looking at the integration of networks, electricity, railways, and hydrogen and therefore will be addressing energy network innovation. It brings together a range of

stakeholders across energy networks and rail. The Project summary is well articulated and provides a clear statement of approach.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.8
The Project is not seen to undermine the development of competitive markets. The route to market has been described to a sufficient level of justification, primarily stating that demonstration of preferred solutions following analysis will provide a route to market. This could have been improved upon with better understanding of third party investment needs, and better understanding of methods to exploitation in international markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	7.4
The collaborative approach between a range of network partners and the rail sector is viewed as innovation. The Project has considerable potential for consideration of technological and commercial innovation that supports network innovation. This would be supported by the introduction of innovative technology providers as preferred solutions emerge and analysis of options matures.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.8
The Project costs are reasonable for the Discovery Phase activities and are costed at competitive rates. A contribution in kind of 26.2% of Project costs is being provided by Project Partners which represents additional value to the consumer.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.0
The applicant has provided a Project plan that is appropriate to the size of the Project. However, it does not split the resource requirements into the work packages, and the ambition of analysing the full extent of technological options and producing a business case within the period of the Discovery Phase will be challenging. Assessors have viewed the Project plan and methodology as good enough to give confidence of Project delivery. Ratings of risks in the risk register appear optimistic given the nascent stage of many of the innovations under consideration.		
Regulatory Barriers	**Yes/ No**	Yes
There are no prominent regulatory barriers. However there are two regulatory considerations that the Project outcomes may inform or support: Transmission Phase Imbalance: The Grid Code sets limits for imbalance which are lower for EHV circuits and higher for 11kV and 33kV circuits. The Project's solution assessment may result in fewer imbalanced rail traction loads connected to remote EHV circuits – but more balanced loads on rural 33kV and 11kV circuits. Railway Licence & ER P24/2 "AC supplies to railway systems". This recent update assumes that there is no significant export of electricity from the railway to licenced electricity networks. The use of energy storage in the solutions proposed will ensure this is the case.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The Project scope and objectives are viewed positively with all assessors recommending this proposal for funding. The holistic involvement of stakeholders and the analysis of a range of technological solutions. However it was noted that the fact that the hydrogen solution is referenced in the Project title suggests a bias toward Project outcomes. Assessors felt strongly that the analysis should be approached objectively with all potential solutions being considered on their respective merits. There is a clear driver and benefit opportunity to the decarbonisation of rail which this Project could make a valuable contribution towards.		
Recommended Project specific conditions		

To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project;

Condition 3: Prior to commencement of the Project, the Funding Party Project must engage with members of the team behind the Project "Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility" SIF Project to identify common areas of scope and collaboration opportunities. Additionally, the Funding Party must share its end of Project Phase report with with members of the team behind the Project "Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility".

7.3.4 10026963, HyPark, Initial Net Funding Required £150,000

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
Wales & West Utilties Limited	£38,582.62	£0.00	£38,582.62
PassivUK Limited	£86,729.28	£0.00	£86,729.28
Easee Ltd	£20,000.00	£0.00	£20,000.00
Scottish Power Energy Networks Holdings Limited	£1,592.10	£0.00	£1,592.10
Scottish & Southern Electric Plc	£1,020.00	£0.00	£1,020.00
Western Power Distribution Plc	£2,076.00	£0.00	£2,076.00

Submitted Project description

Our vision for Hy_Park is to develop a truly innovative, intelligently controlled, stationary fuel-cell and storage module to accelerate at-scale growth of zero-emission transport.

The Government's decision to decarbonise cars and vans by 2030 will radically disrupt the way in which energy for transport will be generated and distributed to consumers. Hy_Park will explore how to leverage benefits from both the gas and electricity networks and help to deploy rapid multiple EV charging stations in constrained urban locations.

There is significant uncertainty around the scale and pace of EV growth, consumer needs and charging preferences. Research suggests that there could be a requirement for over 100,000 rapid charging points in Britain, many of which will have to be located in urban areas. The costs associated with enabling and installing this infrastructure will be substantial. The availability of sites allowing multiple vehicles to charge quickly will increasingly become an important limiting factor for EV market development.

The need for rapid EV charging hubs will create near term commercial opportunities for the Hy_Park concept. This Project will investigate the most cost-effective modular technology combinations, smart control strategies and explore different business models. During the Project we will aim to discover:

- Which technology configurations for fuel-cell EV charging modules (battery storage, electrolysis, hydrogen refuelling, heat to buildings) will best enable at-scale growth of net-zero transport
- How intelligent controls can be used to evaluate and utilise the lowest carbon, lowest-cost source of power based on network generation mix, local storage and on-site generation
- How orchestrating energy flows between traditionally siloed sectors such as transport, power and heat can support the deployment of rapid EV charging infrastructure
- Hy_Park will offer a highly scalable, "plug and play" modular solution that can be rapidly deployed across the UK. It will be suitable for a range of locations such as urban areas where network reinforcement would be costly, and where the excess heat generated by the fuel-cell has a direct Application.

Hy_Park will use advanced machine-learning to evaluate and quantify the trade-offs between network power, storage and on-site generation using gas-grid connected fuel cells. The use of grid-aware fuel-cell and battery storage modules will not only help support the deployment of rapid EV charging infrastructure by reducing the need for costly reinforcement but will offer valuable flexibility services that support a smarter, more integrated energy system.

Problem and opportunity	**Mean Expert Assessors' score**	7.4

The proposal addresses issues with the recharging requirements of electric vehicles by providing a hub with locally generated electricity and storage. The Problem to be addressed is enabling rapid charging of electric vehicles in a user-friendly way whilst minimising costs and the associated impacts on the local energy networks. Assessors viewed the opportunity as being described in only board terms and more detailed explanation of the degree of carbon, cost, or consumer benefits could have been given. This should be developed if successful.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	8.0

The 'big idea' of producing electricity at the point of need for high density, rapid EV charging, combined with storage, heat use and analytics/smart connections, is well-described and addresses the problems and opportunities described earlier. It is considered ambitious and addresses the aims of the Zero Emission Challenge. Better articulation could have been provided on how the proposal would achieve the target benefits and objectives of the SIF more widely.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	6.8

The applicant has provided a good description of credible benefits arising from the innovation. Further quantification of benefits will be required in later stages to give confidence that these benefits can be realised by the consumer. Potential negative unintended consequences should also be considered, to mitigate the risk of scaling the innovations.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project summary	**Mean Expert Assessors' score**	8.0

The Project summary is brief but gives a reasonable understanding of the scope and aims of the Project. The sector-coupling approach to providing transportation fuelling solutions is viewed as innovative. Greater consideration could be given to the commercial innovation required to implement the technical solutions. There is good stakeholder representation in the projects with good skillsets to deliver the Project. There is a clear network innovation focus of this Project.

Eligibility Criterion 4. Projects must not undermine the development of competitive markets

Route to market	**Mean Expert Assessors' score**	6.6

The route to market is outlined to an acceptable level but remains vague in areas. There are no concerns that the Project might undermine the development of competitive markets but the energy network leads should endeavour to make available equal access to third party technology if the projects progresses to later stages. Economic assessments of counter factual approaches will be needed to assess the credibility of the solution reaching a commercial readiness level to enable market penetration.

Eligibility Criterion 5. Projects must be innovative, novel and/or risky.

Innovation Justification	**Mean Expert Assessors' score**	6.8

The Project is viewed as providing innovative components and is sufficiently risky to meet this SIF Eligibility Criteria. However, several assessors highlighted that there was little description of related innovations in the market, or previous projects. More information should have been provided on how this differentiates from similar projects. However, the Project has been judged to be a relatively novel area for networks to investigate.

Eligibility Criterion 7. Projects must provide value for money and be costed competitively.

Cost & value for money	Mean Expert Assessors' score	7.0
The costs have been assessed as reasonable for the scope of work in the Discovery Phase. However, some concerns are raised around the resource costs for some of the Project Partners. Justification of these costs against the expected deliverables should be given ahead of Project kick-off and improved value for money demonstrated if funded in later phases.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.2
The Project plan is reasonable to give confidence of successful deliver of the Project. Work packages and deliverables could have been described in better detail, including outlining the measurables that will demonstrate successful delivery. The risk analysis is good quality. It includes and quantifies expected major risks		
Regulatory Barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a strong proposal for a Discovery Phase Project which is suitable for funding. It appears to take an innovative approach to managing EV charging demand, although the literature review of alternative approaches should be expanded during the Discovery Phase. There is good representation from a range of relevant stakeholders. Quantification of the benefits, particularly against the counter factuals of grid reinforcement or alternative approaches will have to be developed.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 Prior to commencement of the Project, the Funding Party Project must engage with members of the team behind the Project "Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility" SIF Project to identify common areas of scope and collaboration opportunities. Additionally, the Funding Party must share its end of Project Phase report with members of the team behind the Project "Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility".		

7.3.5 [REDACTED]

7.3.6 10027293, Multimodal Hydrogen Transport Refuelling Study, Initial Net Funding Required £89,445

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
Northern Gas Networks Plc	£2,520.00	£0.00	£2,520.00
Element Energy Limited	£34,125.00	£0.00	£34,125.00
Transport for the North	£7,920.00	£0.00	£7,920.00
Durham University	£13,005.00	£0.00	£13,005.00
Herriot Watt University	£31,875.00	£0.00	£31,875.00
Eversholt Rail Limited	£0.00	£0.00	£0.00
Submitted Project description			
The Multimodal Hydrogen Transport Refuelling Network Study will evaluate the potential for hydrogen's use in heavy duty transport across the North of England. It will create a joined-up, regional strategy to cost-effectively, kick-start the hydrogen economy in the North and will directly support the growth of zero-emission transport, the decarbonisation of the electricity grid and the repurposing of the gas grid for a Net-Zero world.			

The Project contains three development work packages that focus on bringing together the major infrastructure pieces needed for a successful roll-out:

1.Hydrogen vehicles -- identifying which vehicles and use cases are the most suited to hydrogen, understanding their current costs and timelines for UK availability and production volumes in the short and medium term.

2.Hydrogen stations -- modelling optimal locations for large multi-modal hydrogen stations accounting for the specific traffic flows of vehicle types identified in WP 1 and understanding the potential expected hydrogen demand from each station.

3.Hydrogen supply -- a techno-economic analysis of hydrogen production technologies and analyse the ability of hydrogen production projects currently being developed in the north to meet the demands of the stations identified in WP 2. This will evaluate the potential of the gas grid to transport hydrogen from production sites to large-scale hydrogen station locations identified in WP2 and compare it to incumbent technologies to evaluate the potential of the gas grid to support the ongoing integration of the electricity and transport networks.

A fourth work package will focus on the Project's communication with a wide group of key stakeholders. Initially, it will coordinate input from a group of experts and key stakeholders in the hydrogen vehicle, station, supply and governance sectors.

The Project will integrate industry experience with pre-existing maps and models on transport, vehicle ownership and energy networks to create a publicly issued strategy document and accompanying models that provide clarity to fleet operators, local councils and other engaged third-parties on the immediate next steps and longer-term vision to develop a multimodal hydrogen mobility network in the UK.

The long-term aim of this Project is to evidence the cost and system benefits of hydrogen by building out several, high-capacity, multi-modal hydrogen stations which serve promising heavy-duty vehicle fleets with low-cost, low-carbon hydrogen and communicate this to other regions to accelerate the decarbonisation of the UK's transport system and creation of a hydrogen economy.

Problem and opportunity	**Mean Expert Assessors' score**	7.8

The applicants have identified the Problem of a lack of strategy for heavy transportation decarbonisation in the North of England. An opportunity has been identified to achieve benefits for networks users by developing an integrated, multimodal hydrogen vehicle and infrastructure deployment strategy. This will be based on detailed analysis of the preferred deployment options.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	8.0

The idea is explained with clarity and gives confidence of comprehensive evaluation of how hydrogen fuelled heavy road and rail vehicles can be serviced. The proposal is ambitious and aligns well with the requirements of the Zero Emission Transport challenge.

Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers

Impacts & benefits	**Mean Expert Assessors' score**	7.8

A clear set of benefits are identified for existing energy networks, as well as other stakeholders. The metrics to be used to quantitatively evaluate and demonstrate the benefits to the end consumer should be developed further within the Discovery Phase. The Discovery Phase Project should also consider dis-benefits and key risks and dependencies such as the availability of low cost renewable electricity which enables economic competitivity of solutions.

Eligibility Criterion 3. Projects must involve network innovation &
Eligibility Criterion 6. Projects must include participation from a range of stakeholders.

Project summary	Mean Expert Assessors' score	7.8
The scope of the Project is well presented and explains the aims and methods together with details of the personnel involved. There is a clear network innovation component and good representation from a range of stakeholders covering the North of England. Given the Project scope the additional inclusion of an electricity distribution network would be valuable. The Project should ensure engagement with major strategic projects in the area and offer access to third parties, given the wide ranging scope and potential impact of a strategy.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	6.4
Assessors have not raised concerns that the Project would undermine the development of competitive markets. However, they have commented that further information on the value proposition for both gas and electricity networks, the consumers and route to BAU could have been provided. The route to market additionally needs to consider wider requirements around supply chains, regulation and investment and could have provided more justification on the rationale for innovation funding.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	7.6
The proposal follows a series of funded collaborations exploring the various aspects of the drive to hydrogen as a transport fuel. A fairly comprehensive review of related projects and innovations in this area has been provided. The whole system approach and ambition to develop a coordinated strategy is viewed as a novel and potentially impactful to address market failures that have impeded progress in this area previously.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.0
Project costs are broadly viewed as providing value for money and costed competitively for the scope of work. The scope of work is viewed to be ambitious within the costs of the Discovery Phase and the applicants should demonstrate that consultancy costs deliver outputs which represent value for money to the consumer.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	6.8
The overall Project plan is logical with a clear methodology and outputs defined. The Discovery Phase activities are viewed as being ambitious and will need to be managed closely. The risk register lacks some detail and should be revisited ahead of Project inception.		
Regulatory Barriers	**Yes/ No**	No
There are likely to be regulatory barriers which need consideration as part of a wide ranging strategy development. These should be developed and articulated in more detail at the Alpha Phase Application stage.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
The applicants have presented an ambitious proposal which could have considerable impacts. Benefits realisation for consumers and the investment requirements to execute a strategy could be better quantified and will need to be built upon in future phases and for the Alpha Phase Application. There was strong support for funding the Project, but it was noted that stringent Project management and a focus on valuable outputs would be required. A high performing team has been presented which gives confidence that there is potential for successful delivery of the proposed scope.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3		

As part of its end of Project Phase report, the Funding Party must evidence its consideration of potential regulatory barriers as part of its overall deployment strategy.

Condition 4
As part of its end of Project Phase report, the Funding Party must document specific details on how the Project plans to realise benefits for consumers, and the investment requirements needed for the execution of its strategy.

Condition 5
The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.

7.3.7 [REDACTED]

7.3.8 [REDACTED]

7.3.9 10027315, Rail Decarbonisation Planning, Initial Net Funding Required £113,594

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
Northern Gas Networks Plc	£4,320.00	£0.00	£4,320.00
EA Technology Limited	£57,808.75	£0.00	£57,808.75
Frazer-Nash Consultancy Limted	£44,855.47	£0.00	£44,855.47
UK Power Networks (Operations) Limited	£6,610.04	£0.00	£6,610.04
Network Rail Limited	£6,650.00	£6,650.00	£0.00
Eversholt Rail Limited	£4,750.00	£4,750.00	£0.00

Submitted Project description

This Project will develop an overarching implementation strategy and a methodology to enable the ongoing deployment of the most effective, efficient, and appropriate technological solutions to decarbonise rail transport.

Our approach will lead to a shared implementation plan that will enable electricity and gas networks to factor in rail decarbonisation when they are planning their own infrastructure investments.

TDNS: Through the production of the TDNS, Network Rail already has a strong starting point. However, a key weakness of the current TDNS is that it does not consider the capacity or role of existing and emerging electricity and gas network infrastructure to deliver rail decarbonisation.

Our Project will address this. Our analysis will lead to a TDNS implementation strategy and methodology to support decision making on rail decarbonisation options. Our methodology would consider current constraints in the hydrogen and electricity systems and identify the steps needed to overcome these.

Rail Operator Use: Ultimately, our methodology will allow rail operators to identify the parameters, criteria, and recommendations for decarbonisation of specific parts of the rail network. This would identify whether electrification, hydrogen or a combination of the two, is the most effective way to deliver decarbonisation of different parts of the rail infrastructure.

Energy System Use: Our implementation plan will identify how the rail decarbonisation can better integrate as part of a wider energy systems approach. For instance, informing the location

of future hydrogen filling facilities in locations that intersect between rail transportation and road haulage or enabling energy balancing services through hybrid systems Project Partners and Supporters: Our Project consists of partners from a range of sectors, along with expert consulting organisations. This creates a strong consortium which will help operationalise the plan through using it within their decision-making processes. Impact: This innovation is essential for the successful decarbonisation of the rail sector. The Project will support the decision making of rail infrastructure owners and operators and electricity and gas networks. Ultimately it will benefit both consumers of rail services and energy services by enabling reliable, low carbon transport for all. Beta Phase: If progressed to the Beta Phase, our intention is to pool investments from within the rail sector to demonstrate the technology along a selected line -- potentially building a hybrid electric/hydrogen grid supply demonstration facility/Project.

Problem and opportunity	**Mean Expert Assessors' score**	8.8
The applicants make a strong and convincing case that the complete decarbonisation of rail represents a significant Problem with associated implications for energy networks. A compelling case has been made that there will be significant opportunities for both the rail and energy networks by taking a collboarative approach to developing rail decarbonisation strategies.		
Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.		
The Big Idea	**Mean Expert Assessors' score**	7.8
The idea shows ambition, seeking to provide a toolkit to tackle the harder to reach areas of the rail network to ensure that the whole system can be decarbonised. The Project addresses the scope of the Zero Emission Transport challenge well. The outputs could be used to develop more detailed plans for location specific decarbonisation and inform the optimal use of tehcnologies.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	7.0
A comprehensive list of qualitative benefits was submitted. The Discovery Phase will derive comparative metrics to guide further decision making. Benefits include a cost-efficient transition to low carbon rail, with benefits realised for both energy network customers and rail users. Emission reduction benefits are expected, as well as optimal use of energy network infrastructure including the potential of assets being used to manage network capacity or provide grid support functions.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	8.2
The Project summary is very clear and sets out the parameters for the toolkit to be developed. The consortium covers the key skills and players across the industry needed to deliver this enhanced methodology for the rail industry. There is good representation from a range of organisations within the Project, with further engagement with wider stakeholder planned both across the rail and energy sectors. There is clearly a strong energy network component. As the Project progresses the innovation requirements of the energy sector will need to be described in more detail, with mature activities being built in to business a usual operations at the earliest opportunity.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.2
The value proposition of this Discovery Phase to the consortium members is reasonably well described. Some assessors felt that the focus of the solution is primarily rail industry planning. Whilst it is reasonable to assume that the outputs will also help to inform energy network		

decisions more focus on how the energy stakeholders will be benefiting from and engaging with the Project outputs are needed. The proposal is not viewed as undermining the development of competitive markets.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	8.2
As might be expected the applicants show a good understanding of current approaches to rail electrification and has given a good explanation of how their idea is innovative in comparison. The approach of viewing rail decarbonisation plans on a more localised basis in conjunction with the challenges of the energy networks is novel and innovative. More information of how other countries' rail systems are tackling this challenge would however strengthen this aspect of the proposal.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	8.4
The Project budget and its distribution between the Project Partners are appropriate. It is convincingly explained why public funding and support is required for a process that creates collective investigation of the challenges and joint ownership of solutions between the rail, electricity and gas networks. A more detailed breakdown of Project Partner costs would strengthen future Applications. Contributions in kind are made by Project Partners which further enhances the value for money offered.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	7.4
The Project plan is clearly outlined with work packages and milestones established. More information about how the workshops outputs will be brought together into the tool kit and roadmap would strengthen the response. The response demonstrates competency to successfully deliver against the proposed plan. A good risk register has been returned outlining most key risks with mitigations		
Regulatory Barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a competent proposal involving the rail, gas and electricity networks for a Project to investigate alternate technologies to mainstream electrification to enable an optimal plan for the complete decarbonisation of rail transport. There would be positive benefits for all three networks in devising a toolkit for finding optimum solutions. There was unanimous agreement that this Project warranted funding and is in line with the objectoves of the SIF and the Zero Emission Transport challenge.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and BEIS during the Discovery Phase.		

7.3.10 [REDACTED]

7.3.11 10027575, NAVIGATION, Initial Net Funding Required £149,724

Project Partner Name	Eligible Costs	Project Contribution	SIF Requested
Southern Gas Network Plc	£0.00	£0.00	£0.00
Intelligent Power Generation Ltd	£49,997.35	£0.00	£49,997.35
Smart Power Networks Ltd	£49,896.55	£0.00	£49,896.55

Farad.ai (ALIAN Ltd)	£49,830.51	£0.00	£49,830.51

Submitted Project description

A key part of the UK's Zero Emission Transport strategy is the deployment of ultra-rapid (100-350 kW) EV charging network in high-utilisation locations to alleviate consumer range anxiety and accelerate the uptake of Electric Vehicles (EVs). As it stands, delivering this will considerably affect "business as usual" for consumers and network operators with considerable capital expenditure rendered imperative.

This Project brings together proven technologies and existing energy infrastructure to: introduce a direct alternative to capital-intensive network reinforcements; divert cost from consumers and create the technical framework for revenue streams to prosumers, and; scale EV uptake and contribute towards realising UK's Net-Zero targets.

The 'Planning and EV Charging Operation Utilising Low-Carbon Generators' (NAVIGATION) Project aims to demonstrate how predictive grid mapping AI, fuel-flexible, pollutant-free power generation, and real-time optimisation and control technology can enable the use of gas network, as it evolves to 100% renewable, as an alternative energy vector for the power provision for ultra-rapid EV charging infrastructure.

Our approach provides a direct solution to a present problem and creates future opportunities including the capability of utilising excess electricity to produce hydrogen and inject it within SGN's gas network, creating additional revenue streams. This multidisciplinary solution will support the uptake of EVs, while providing a long term approach to the transition away from natural gas.

- Farad.ai's predictive capabilities will enable estimations of future EV charging demand in a given area and the influence of charging infrastructure on these values, thus presenting a gateway to estimating the number of additional EVs on the road.
- SMPnet's Smart Network Controller can then be used to optimise power generation and control --in real time- IPG's Flameless Generator, EV chargers and other energy sources in order to satisfy all technical requirements and provide the means for the provision of G2V and V2G services.
- IPG's Flameless Generator product provides a roadmap for the decarbonisation of the gas network by ensuring new infrastructure assets can support, and even accelerate the integration renewable fuels (both Hydrogen and Biomethane) into the gas network, exchanging necessary 'tokens', to evaluate the real time CO2 reduction of the end-to-end solution.
- Success in this Project will result in a blueprint for utilising the gas network, as it transitions to 100% renewable, as an alternative to widescale, capital-intensive electricity network reinforcements to enable the deployment of ultra-rapid EV charging in cities and motorway service stations.

Problem and opportunity	**Mean Expert Assessors' score**	7.4

The Problem of capacity constraints on electricity networks due to increased demand from EV charging is a genuine challenge. The applicants have identified an opportunity of using low carbon fuels to manage demand to support peak demand for EV charging, which can in turn be injected in to in the existing gas network at alternative times to decarbonise the gas network supply. A reasonable opportunity has been articulated to reduce or eliminate the need for reinforcement of electricity distribution or transmission networks in high demand areas.

Eligibility Criterion 1. Projects must address the Innovation Challenge set by Ofgem.

The Big Idea	**Mean Expert Assessors' score**	6.8

The innovative step within the Project lies in bringing together three 'proven technologies' in a novel combination: an AI-powered model to identify optimal siting for ultra-rapid EV chargers; a fuel-flexible, pollutant-free power generator and a smart network controller (SNC) to ensure compliance with technical requirements and enable participation in balancing and flexibility

markets. The proposal is viewed as ambitious. However further detail will need to be developed on the proposed hydrogen supply approach, and more detailed description of the innovation components under development and the expected outputs.		
Eligibility Criterion 2. Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers		
Impacts & benefits	**Mean Expert Assessors' score**	6.6
It is convincingly explained in qualitative terms how the enhanced provision of ultra-rapid charging points in locations of main consumer demand will mitigate range anxiety and deliver economic and environmental benefits both to consumers and network operators. Some metrics for evaluating benefits are proposed and quantified analysis will need to be developed for future rounds. An economic analysis of the counter factual options including network reinforcement and or deployment of alternative technologies should also be presented in later phases.		
Eligibility Criterion 3. Projects must involve network innovation & Eligibility Criterion 6. Projects must include participation from a range of stakeholders.		
Project summary	**Mean Expert Assessors' score**	7.6
It is credibly explained how the Project aims to demonstrate how the gas network can provide an attractive and viable alternative energy vector to provide power for the ultra-rapid EV charging infrastructure. The energy network relevance of the Project is described concisely and clearly. There is good participation from a range of stakeholders, although the direct Project participation of an electricity distribution network would be expected given the integrated nature of approaches.		
Eligibility Criterion 4. Projects must not undermine the development of competitive markets		
Route to market	**Mean Expert Assessors' score**	7.0
The applicant has a good understanding of the potential market that could be served by this new offering, and intends to go to market through a joint venture with the Project Partners. The importance of electricity DNOs in the route to market is in contrast with the lack of an electricity network Project Partner in the Discovery Phase. There is no risk to the development of competitive markets, but energy networks should ensure equal access of third parties to procurements of technologies if the concepts progress to business as usual.		
Eligibility Criterion 5. Projects must be innovative, novel and/or risky.		
Innovation Justification	**Mean Expert Assessors' score**	6.4
The applicants provide a convincing explanation of the innovative aspects of their proposal. A more detailed analysis or comparison with other possible solutions, and in particular more consideration of global approaches to solving the challenges of provision of ultra-rapid EV charging infrastructure would however strengthen this aspect of the proposal.		
Eligibility Criterion 7. Projects must provide value for money and be costed competitively.		
Cost & value for money	**Mean Expert Assessors' score**	7.0
The costs appear reasonable against the scope of the proposed works. Resource costs are competitive and represent good value for money relative to standard market rates. The lack of costs assigned to the gas network lead bring in to question the extent of their involvement and sponsorship of the Project. Conversely, it is welcome to see the energy network give access to third parties to explore innovative ideas. In later phases some cost allocations to a gas and electricity distribution network would be expected to enable those organisations to govern the Project fully and put in place internal processes to ensure a swift route to market for successful innovations.		
Eligibility Criterion 8. Projects must be well thought through and have a robust methodology so that they are capable of progressing in a timely manner.		
Project plan & milestones	**Mean Expert Assessors' score**	8.2
The Project plan is defined to a good level of detail. The 5 core work packages are outlined with responsibilities assigned to each Project Partners.		

An outline outlined which gives sufficient confidence that the Project can be delivered in a timely manner. The initial risk register is competent but also brief. Key risks are highlighted for each work package.function, although the requisite capabilities to appear represented across the Project Partners. The risk register is good and identifies main risks with mitigations.		
Regulatory Barriers	**Yes/ No**	No
No regulatory barriers have been identified in relation to this Project.		
Recommendation to the Gas & Electricity Markets Authority		**FUND**
This is a competent Application that identifies a genuine Problem at has identified opportunities for addressing it. It brings together a very complementary consortium to develop a new integrated product offering to accelerate the transition to renewable EV charging and support the use of hydrogen in gas networks. The cost-competitivity of the proposal against alternative approaches is still to be proven. This should be assessed as part of progression into later phases. There is merit in exploring the innovation opportunity, but meaningful sponsorship of the Project and its outputs need to be shown by the gas network lead. Furthermore, the Project would benefit from the direct involvement of an electricity distribution network.		
Recommended Project specific conditions		
To mitigate issues and leverage opportunities identified during the project assessment, we recommend these Project specific conditions are attached to funding of this project; Condition 3 As part of its end of Project Phase report, the Funding Party must include an assessment of the cost-competitiveness of its proposed solution against other approaches to solving the challenges of providing ultra-rapid EV charging infrastructure. Condition 4 Prior to Project commencement, the Funding Party must provide to Ofgem and UKRI an updated Project plan to demonstrate specific roles, responsibilities and outputs for Southern Gas Networks (SGN) as the Funding Party. Condition 5 As part of its end of Project Phase report, the Project must demonstrate consideration of the future role of an Electricity Distribution Licensee with the Project.		

8. SIF 2021 Round 1 Discovery Phase portfolio Gas Projects - Summary

In summary, based on these assessments, the following tables present the gas projects that are recommended to Ofgem for funding under the SIF 2021 Round 1 Discovery Phase, subject to the various conditions outlined above, and the gas projects that are not recommended for funding.

8.1 Gas Projects recommended for SIF Funding

Project name	Funding licensee	Initial Net Funding Required (£)
Whole System Integration		
HyNTS Compression	NGGT	146,659
Excess gas turbine energy generation	NGN	134,161
Green Hydrogen Injection into the NTS	NGGT	114,652
Nuclear Net-Zero Opportunities (N-NZO)	NGGT	107,494
Data and Digitalisation		
Gas Analyser Systems for Hydrogen Blends	NGGT	113,414
Hydrogen Metering	NGGT	86,378
Thermal imagery analysis - Condition assessment fluid and pressure	NGN	78,182
HyNTS Pipeline DataSet	NGGT	95,571
Predictive Safety Interventions	SGN	58,729
Digital Platform for Leakage Analytics	Cadent	114,576
Digital Twin - Exploring the societal, operational, and cross industry whole system benefits on the Gas Distribution Network	SGN	119,127
Intelligent Gas Grid	SGN	116,401
Digital Twins: Exploring the commercial, societal and operational benefits on green hydrogen projects	SGN	124,265
CEV: Critical factors for the adoption of smart homes for energy efficiency and implications for consumers and providers	NGN	55,395
Gas Networks Interoperable Digital Twin	NGGT	78,779
Heat		
Ch4rge - Emissions Capture	NGGT	144,782
Hydrogen Barrier Coatings for Gas Network Assets	NGGT	74,706
Velocity Design with Hydrogen	SGN	55,542
Zero Emission Transport		
Rail Decarbonisation Planning	NGN	113,594
Multimodal Hydrogen Transport Refuelling Study	NGN	89,445
HyNTS Deblending	NGGT	148,141
HyPark	WWU	150,000
NAVIGATION	SGN	149,724

8.2 Gas Projects not recommended for SIF Funding

[REDACTED]

9. SIF 2021 Round 1 Discovery Phase Portfolio Electricity Projects - Summary

In summary, based on these assessments, the following tables present the electricity projects that are recommended to Ofgem for funding under the SIF 2021 Round 1 Discovery Phase, subject to the various conditions outlined above, and the electricity projects that are not recommended for funding.

9.1 Electricity Projects recommended for SIF Funding

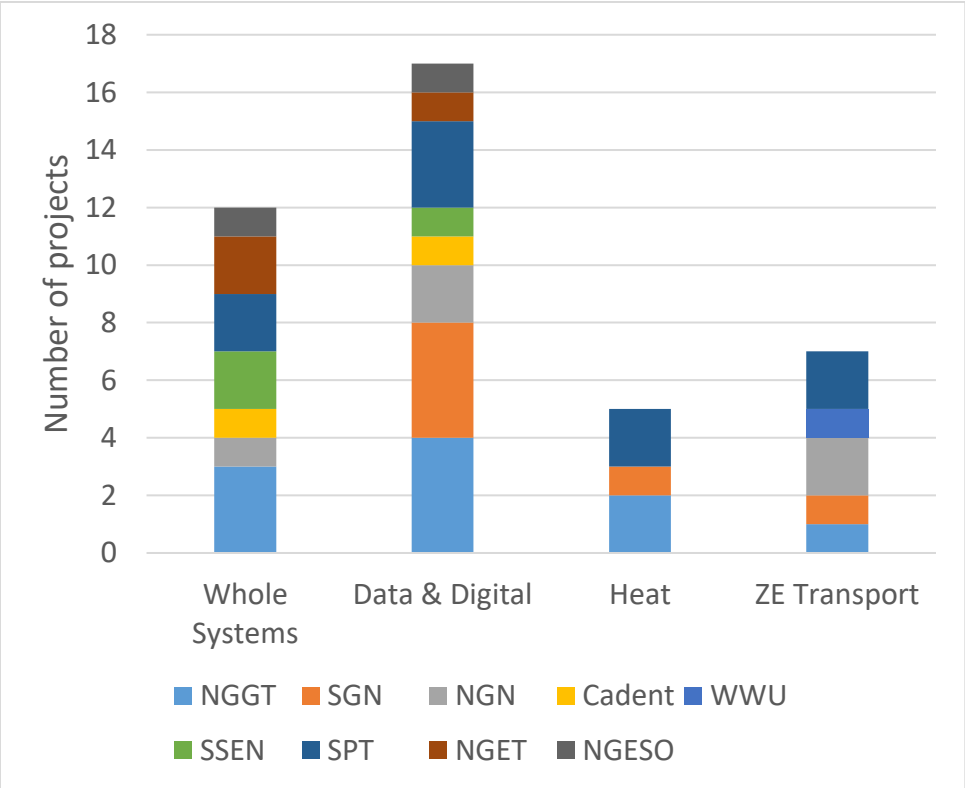
Project name	Funding licensee	Initial Net Funding Required (£)
Whole System Integration		
SCADENT - SuperConductor Applications for Dense Energy Transmission	NGET	148,437
Fast Flex	SPT	112,221
INCENTIVE - Innovative Control and Energy Storage for Ancillary Services in Offshore Wind	SHE	121,002
Crowdflex: Discovery	NGESO	70,057
SEGIL - Sustainable Electrical Gas Insulated Lines	NGET	133,814
Network-DC	SHE	142,288
Asset Reuse and Recovery Collaboration (ARRC)	SPT	75,963
Data and Digitalisation		
Eye in the Sky - Utilising satellite data to improve grid resilience in emergency	NGET	119,105
NIMBUS - Network Innovation and Meteorology to BUild for Sustainability	SHE	148,476
EN-twin-e	SPT	143,480
Virtual Energy System	NGESO	149,921
Predict4Resilience	SPT	109,401
Digi-GIFT	SPT	136,236
Heat		
Flexible Heat	SPT	137,858
HEAT BALANCE	SPT	125,695
Zero Emission Transport		
A Holistic Hydrogen Approach to Heavy Duty Transport (H2H)	SPT	108,238
Resilient and Flexible Railway Multi-Energy Hub Networks for Integrated Green Mobility	SPT	118,780

9.2 Electricity Projects not Recommended for funding

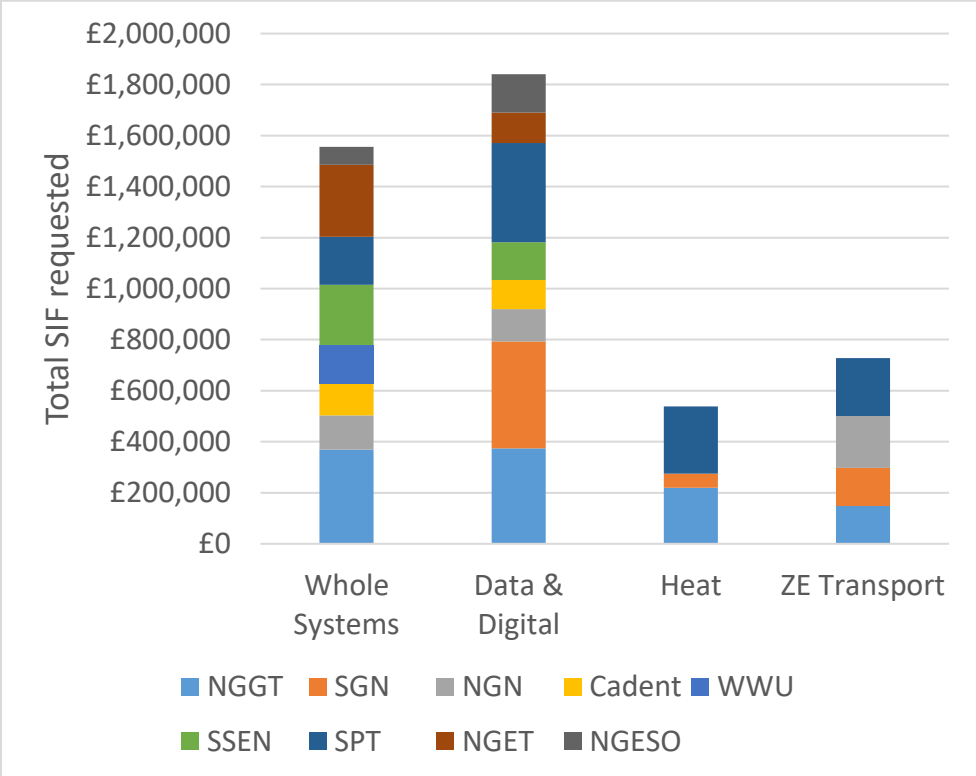
All electricity Projects have been recommended for funding.

10. Analysis of Recommended Portfolio

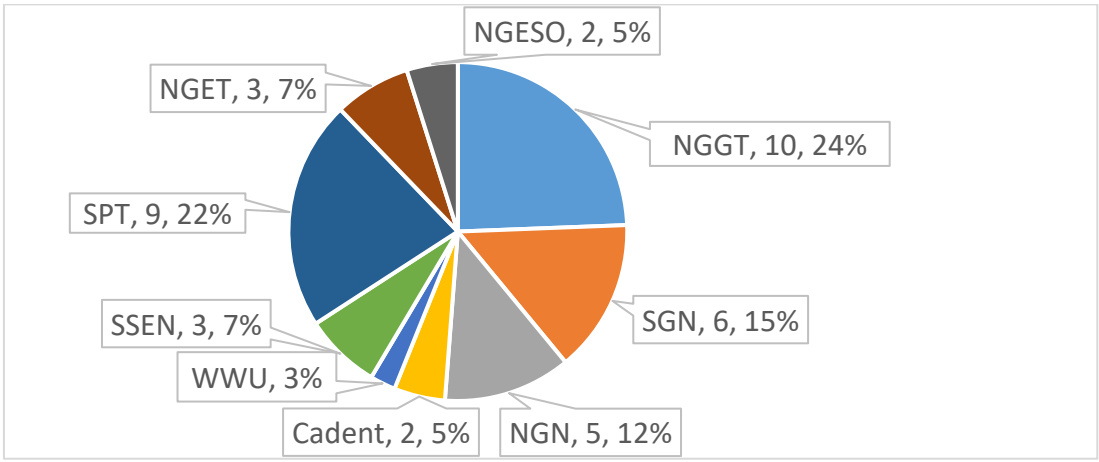
Number of Projects recommended for funding per Innovation Challenge by lead Applicant



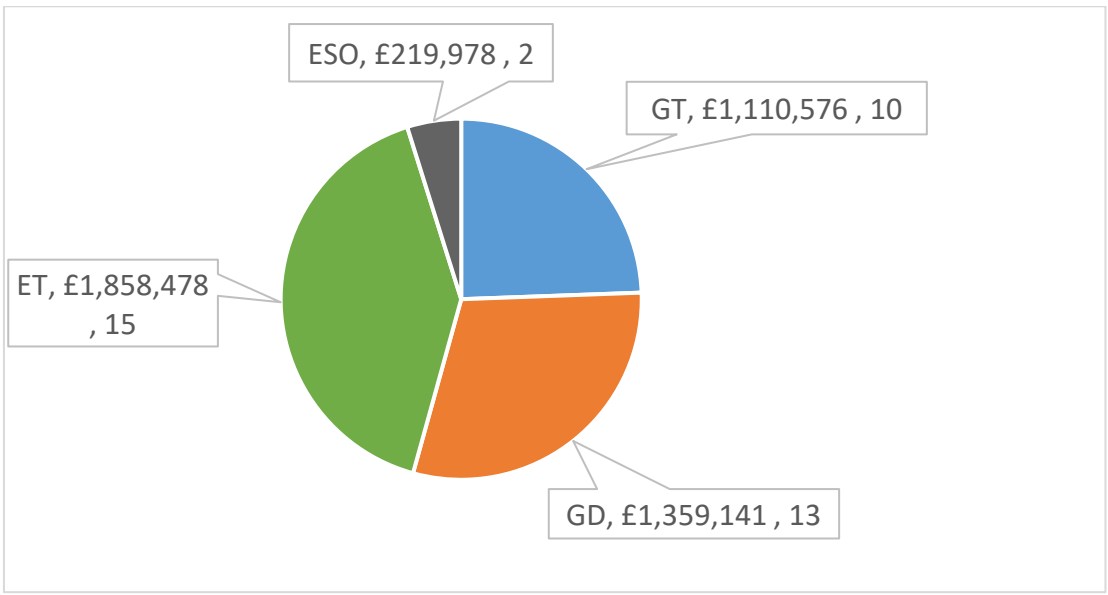
Value of Projects recommended for SIF funding per Innovation Challenge by lead Applicant



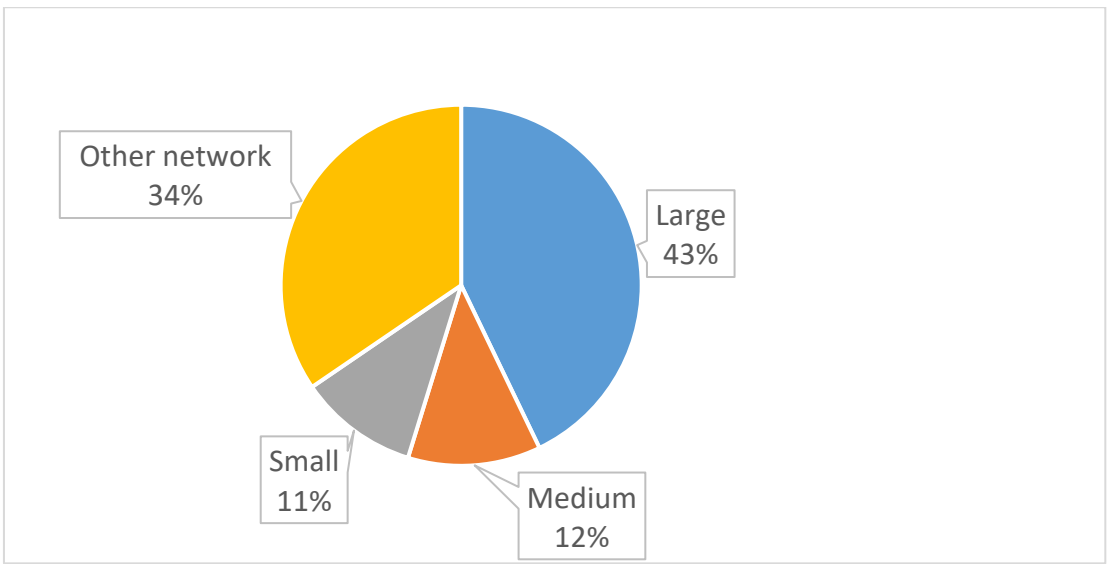
Total number & % of Projects recommended for funding by lead Applicant



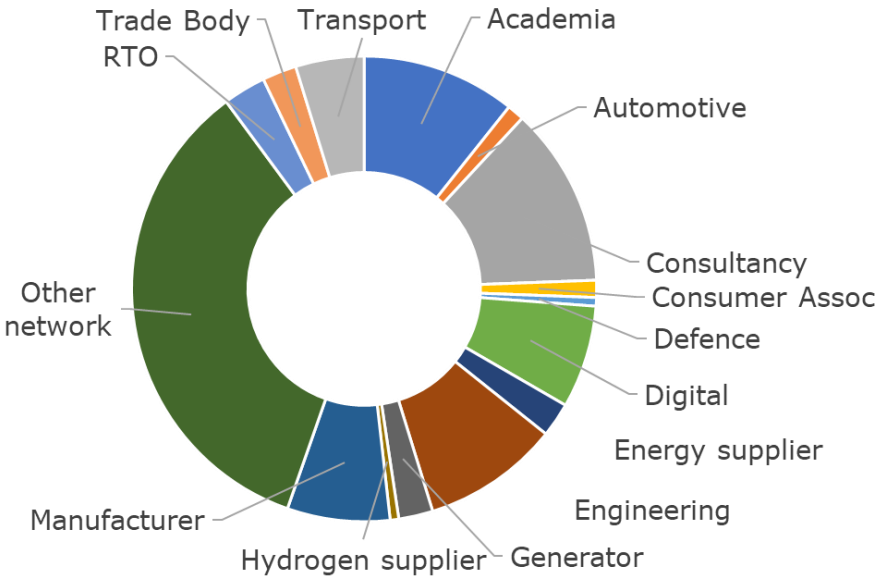
Value & number of Projects recommended for funding by network type



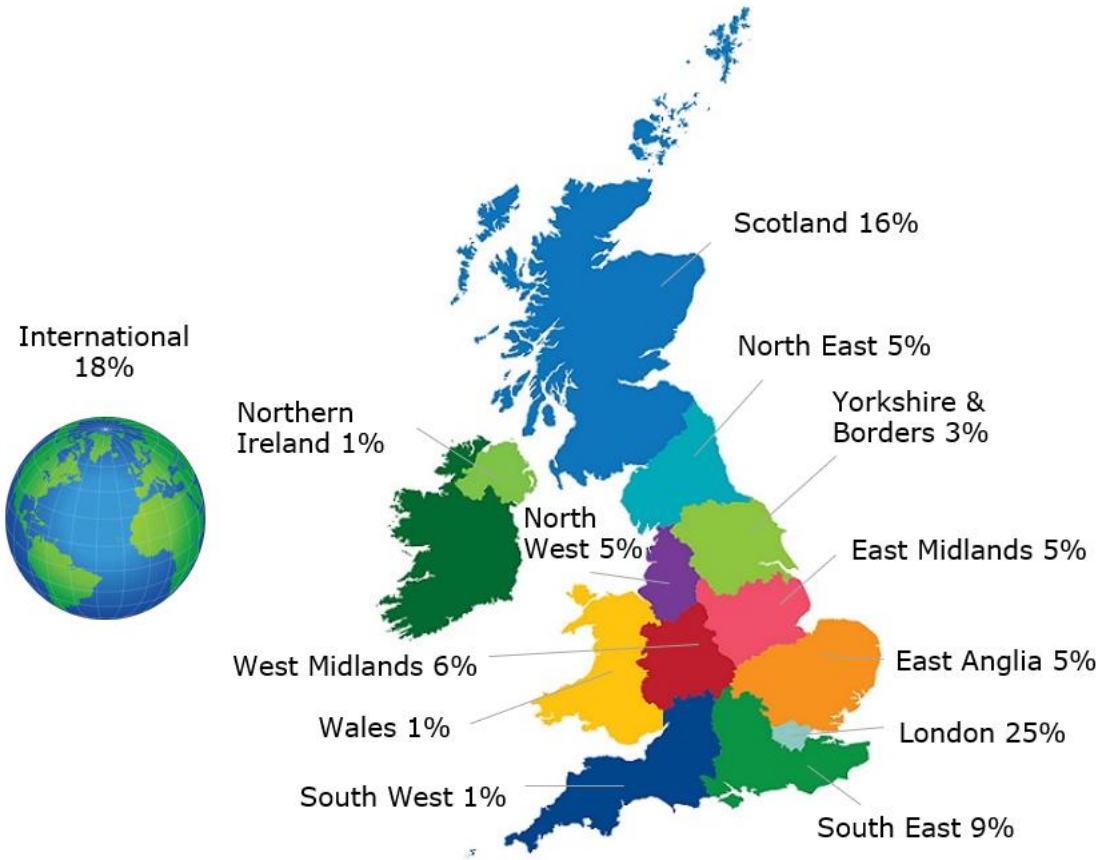
Type of Project Partners in portfolio recommended for funding by size



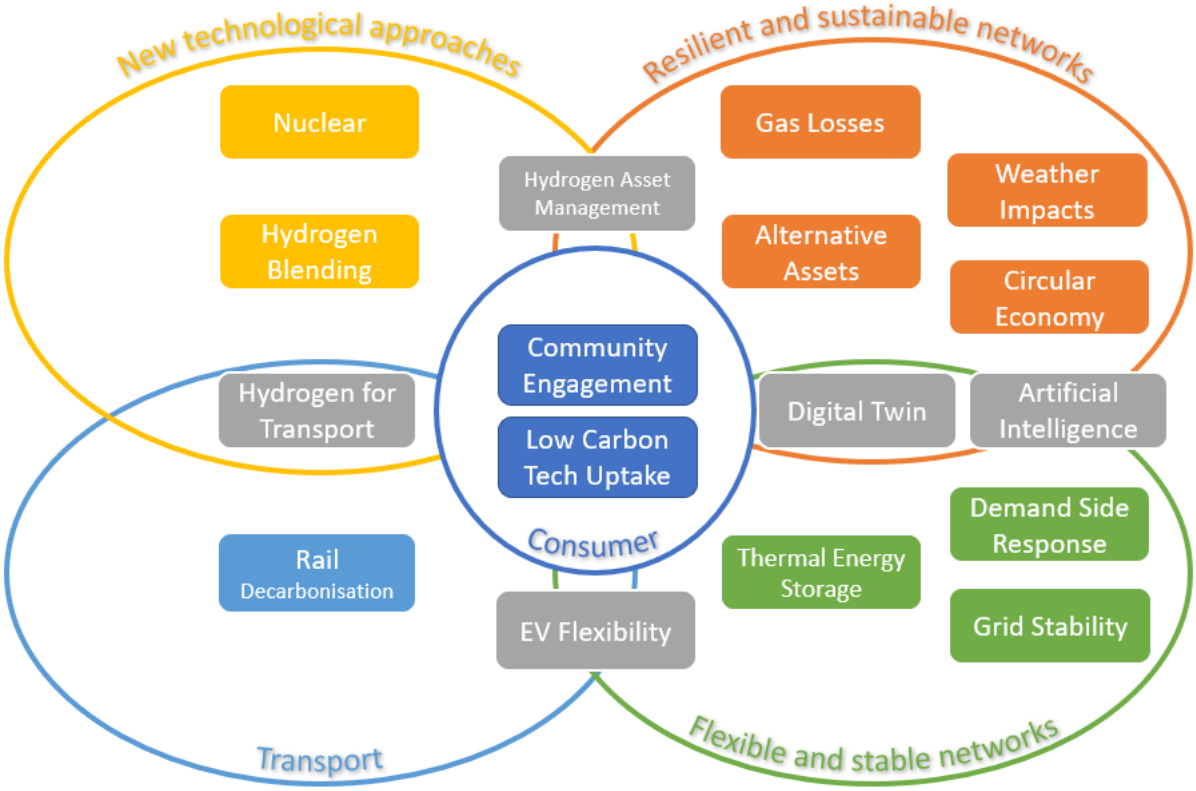
Type of Project Partners in portfolio recommended for funding by industry



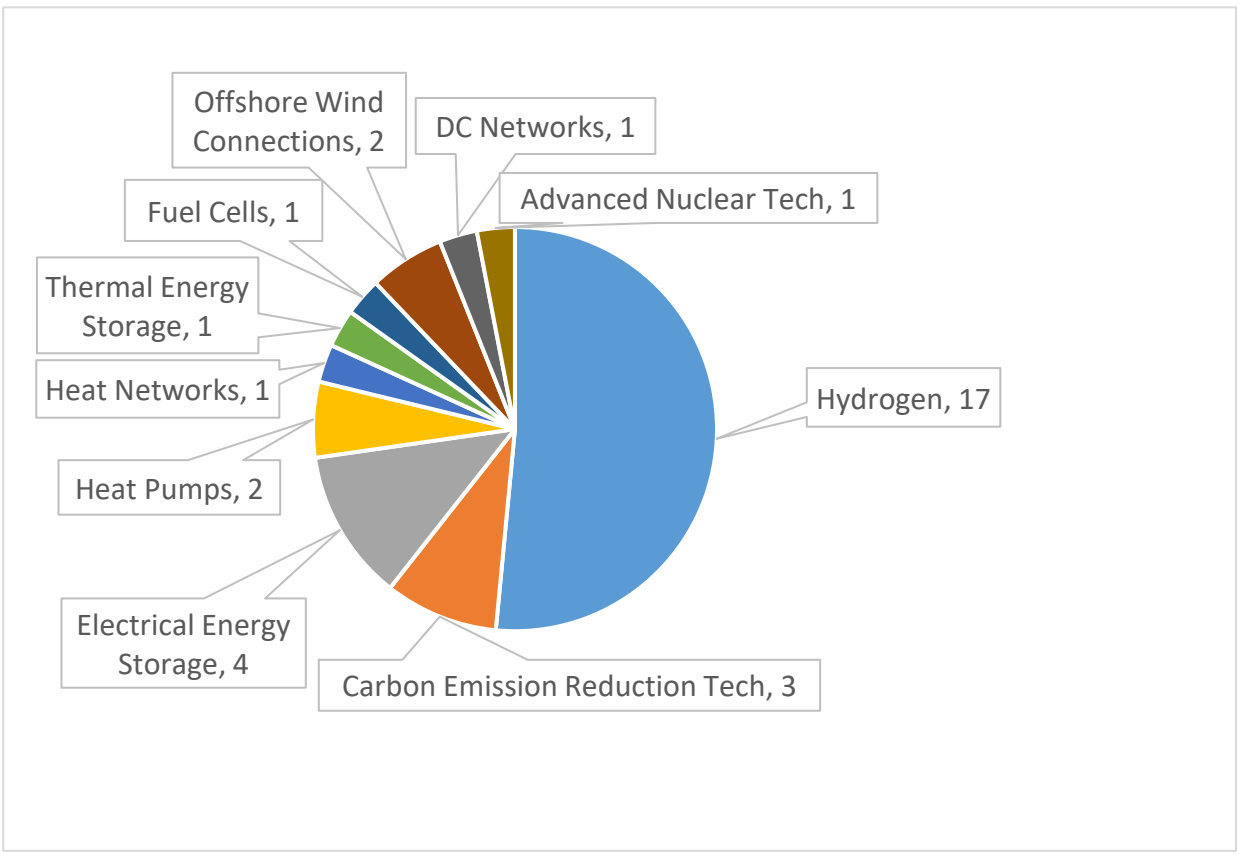
Location of Project Partners in portfolio recommended for funding



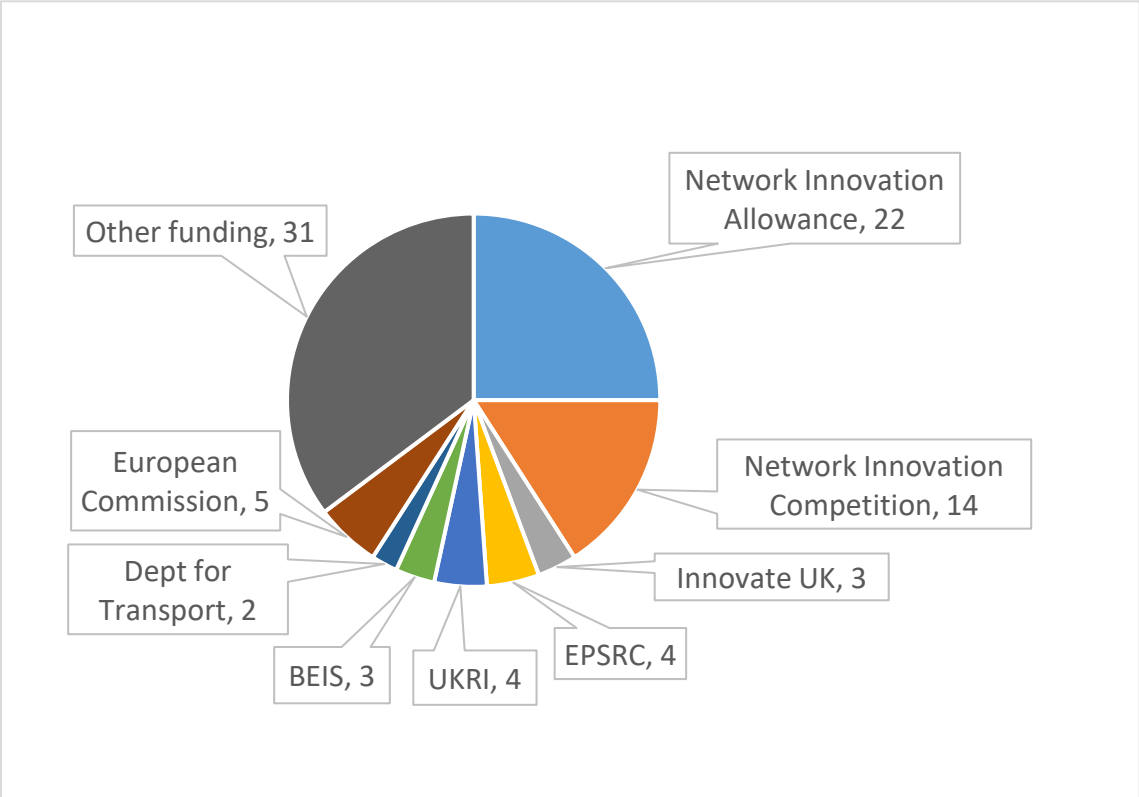
Recommended portfolio of Projects clustered by main theme



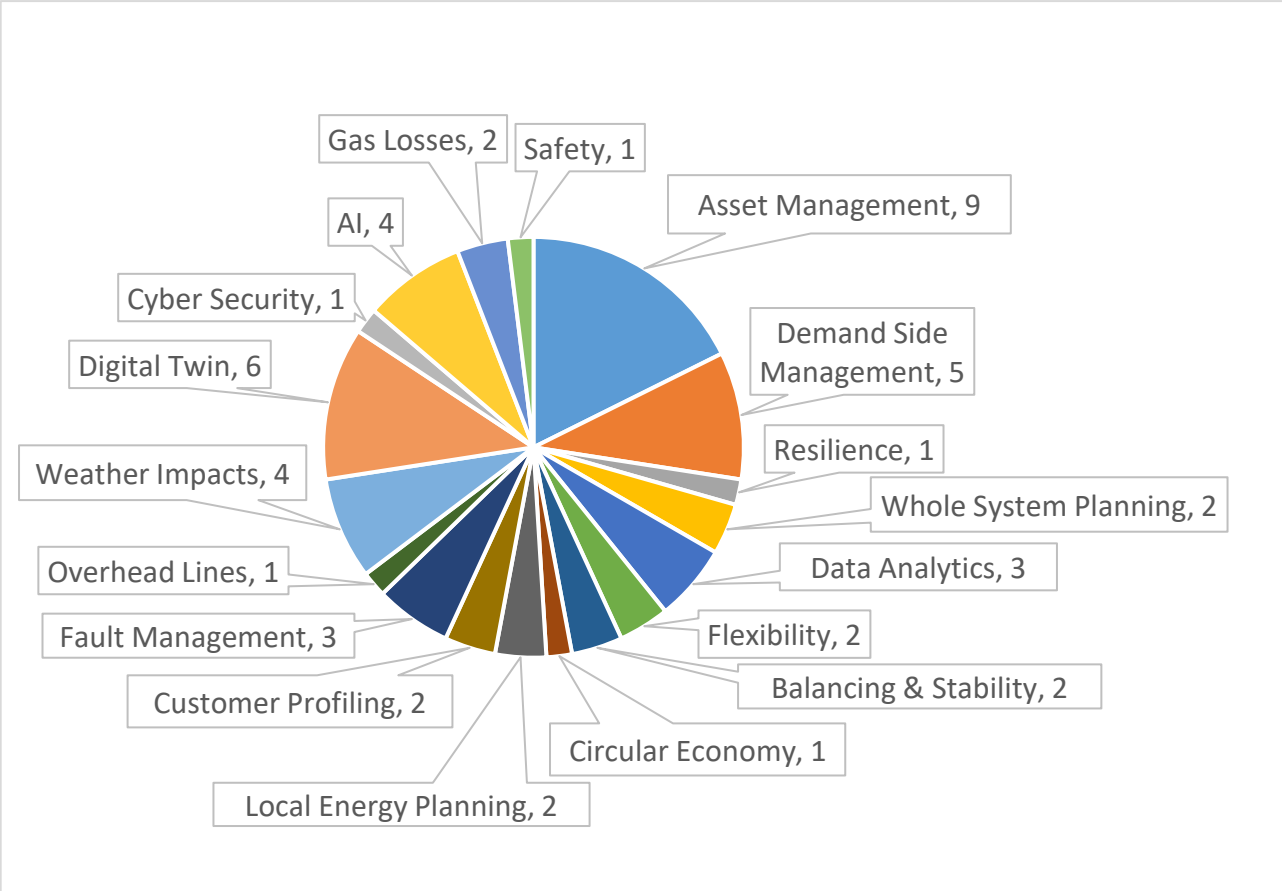
Types of low carbon technologies to be covered by recommended Projects (more than one technology may apply per project)



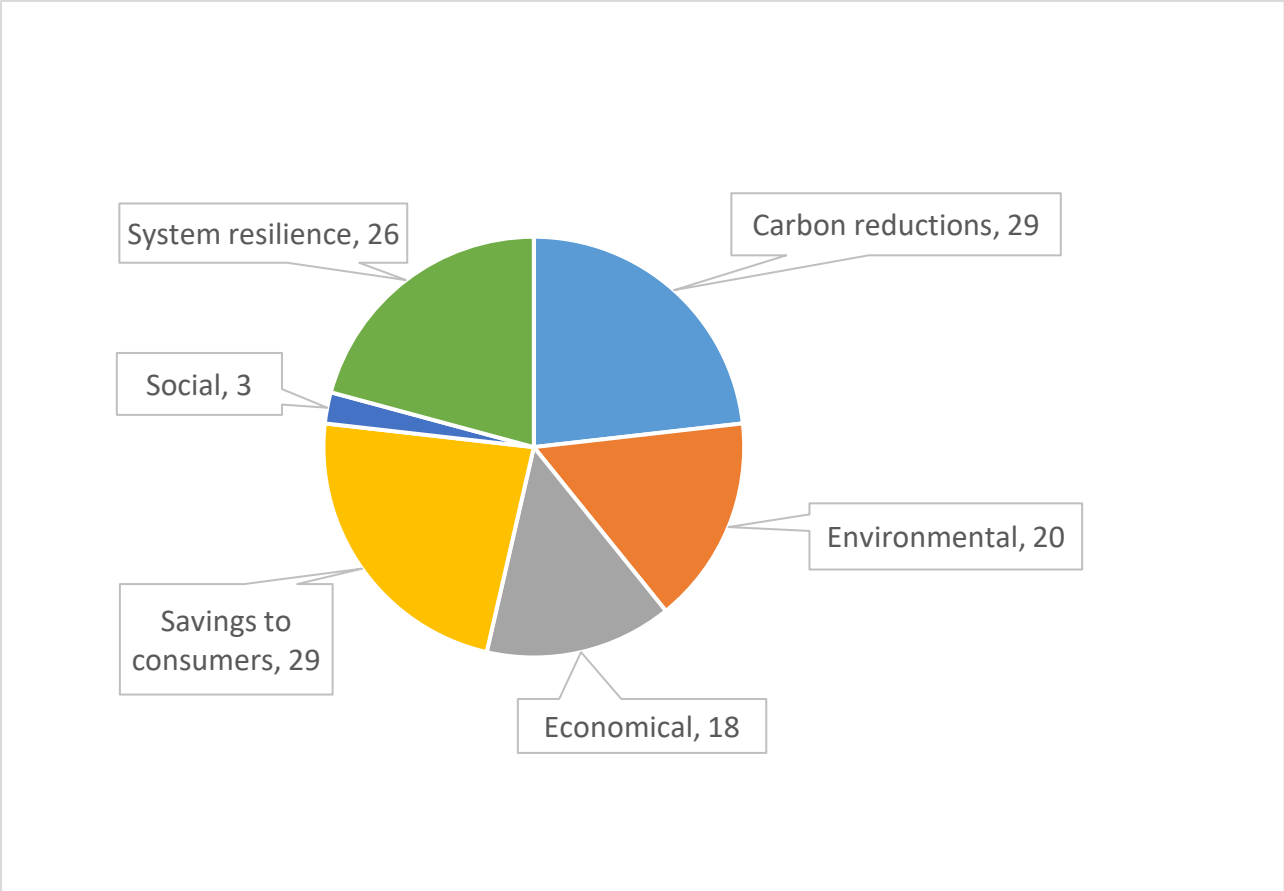
Other types of funded projects that led to the development of recommended Project proposals (more than one may apply per Project)



Types of network management and operation approaches to be covered by recommended Projects (more than one area may apply per Project



Early indicators of benefits to be realised by recommended Projects



11. Recommendation of Expert Assessor panel

Innovate UK recommends the following Expert Assessors to be convened for Innovation Challenge specific panels. These Expert Assessors collectively demonstrate a strong range of capability across the four Innovation Challenges and will be responsible for providing critical feedback to projects through delivery phases, as well as assessment and recommendations for future funding in the Alpha and Beta phases.

[REDACTED]

11. Closing remarks

The energy networks have responded positively and enthusiastically to the first set of Innovation Challenges under the SIF. The proposals submitted through the Discovery Phase applications represents a step-change in ambition and will hopefully kick-start the pace of innovation for the GB energy networks. Significantlly more proposals have been received than would typically be expected through previous network funding mechanisms. Many of the energy networks developed new partnerships and submitted proposals across all four of the Innovation Challenge areas. A constructive and open minded attitude has also been taken to adopting the new SIF model. This is something the networks should be commended for.

The SIF is designed to incentivise a high-throughput of innovative ideas in the early stages, attracting the most forward thinking proposals and taking a fail fast approach. This has been achieved with 40 Projects recommended for funding. The Projects range from the development of a national multi-vector Virtual Energy System, to utilising the growing power of offshore wind turbines to provide stability services to the UK power grid.

The data and digitalisation agenda continues to gain traction, with almost half of proposals submitted under this Innovation Challenge. It is acknowledged that we still need to go further and faster with some of the most challenging areas of decarbonisation that the energy sector serves, notably heat and transport. We will be looking for opportunities to drive the development of new solutions in these areas through future challenges.

A significantly higher level of funding is available for Alpha Phase projects, and therefore further strengthening of proposals, justifications and plans will be needed. We encourage the networks to seek and share new opportunities for innovation. They should also create opportunities for additional Partners to add value in future Project Phases. Innovate UK will work with the networks to disseminate learnings widely. Unexpected or unsuccessful outcomes must also be considered a valuable learning experience.

Innovate UK looks forward to working with the energy networks, Ofgem, Government, and the wider industry to ensure that the best of these ideas grow, scale and deliver value to consumers at the earliest opportunity.