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Decision

Decision on the Strategic Innovation Fund: round 1 Beta Phase

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The Strategic Innovation Fund (SIF) supports network innovation that contributes to the achievement of Net Zero, while delivering net benefits to energy consumers. It facilitates collaboration and coordination with other public funders of innovation and activities funded by Government to ensure funding gaps are avoided.

In July 2021, we[1] launched 4 Innovation Challenges to target innovation funding at strategic issues facing networks – whole system integration, data and digitalisation, zero emissions transport, and heat. In March 2022, we awarded over £4.5m to 40 Projects for the round 1 Discovery Phase[2]. In July 2022, we awarded over £8m to 18 Projects for the round 1 Alpha Phase[3]. We have now decided to fund 10 Projects for round 1 Beta Phase, all of which have completed a Discovery and Alpha Phase.

We operate the SIF in partnership with Innovate UK, which is part of UK Research & Innovation (UKRI). Ofgem is the decision maker in relation to Project Funding and its decisions on which Projects to fund are informed by the recommendations of Expert Assessors, who have assessed Projects against Eligibility Criteria set out in the SIF Governance Document.

[1] The terms 'we', 'us', 'our' refer to the Gas and Electricity Markets Authority. Ofgem is the office of the Authority.
[2] For more information on the round 1 Discovery Phase Projects please see: https://www.ofgem.gov.uk/publications/strategic-innovation-fund-discovery-projects-approved-funding
[3] For more information on the round 1 Alpha Phase, please see: https://www.ofgem.gov.uk/publications/strategic-innovation-fund-discovery-projects-approved-funding

Contents

Introduction

The Strategic Innovation Fund (SIF) is a funding mechanism within Ofgem's RIIO-2 network price control[4]. For round 1 of the SIF, it was open to Applications from for the Electricity System Operator, Electricity Transmission, Gas Transmission and Gas Distribution sectors. Round 2 and any subsequent rounds of the SIF are open to all the network licensees from round 1 and Electricity Distribution.

The SIF focuses on finding and funding ambitious, innovative Projects with the potential to accelerate the transition to Net Zero[5] while delivering net benefits to energy consumers[6]. In order to mitigate the risk associated with the innovation process, the default approach is that innovation will be funded in three Project Phases (Discovery Phase, Alpha Phase and Beta Phase).

Each of the Phases focuses on different aspect of the innovation process. The Discovery phase focuses on feasibility, defining the problem the Project is trying to solve, and the value in solving it. The Alpha Phase focuses on experimental development, preparing and testing the different solutions to the Problem identified during the Discovery Phase, ahead of any future large-scale demonstrations. The Beta Phase focuses on building, operation and/or demonstration through the deployment of the solution to the Problem.

At the July 2021 launch of the SIF, four Innovation Challenges were launched focusing on strategic issues currently facing networks – whole system integration, data and digitalisation, zero emissions transport and heat. In March 2022 we awarded over £4.5m in funding for 40 Projects for the Discovery Phase of round 1. For the round 1 Discovery Phase, Projects had two months to focus on feasibility and could not request SIF Funding of more than £150,000 exclusive of VAT. As part of the Discovery Phase SIF Funding, we released a SIF Funding Decision[7] outlining which Projects were being awarded SIF Funding for the Discovery Phase.

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[4] Further detail regarding the RIIO-2 network price control can be found here: Network price controls 2021-2028 (RIIO-2) | Ofgem

[5] The UK Government and Welsh Government have both committed to reach net zero carbon emissions by 2050, while the Scottish Government has set a target date for net zero emissions by 2045.

[6] Full details about the SIF can be found here: https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/network-price-controls-2021-2028-riio-2/network-price-controls-2021-2028-riio-2-riio-2-network-innovation-funding/strategic-innovation-fund-sif

[7] For more information on the round 1 Discovery Phase, please see: https://www.ofgem.gov.uk/publications/strategic-innovation-fund-discovery-projects-approved-funding

Upon completion of the Discovery Phase, Projects had the choice of submitting an Application for the Alpha Phase, merging with another similar Project and submitting an Application, or not submitting an Alpha Phase Application. In July 2022 we awarded over £8m in funding for 18 Projects for the Alphas Phase of round 1. For the Alpha Phase, Projects had six months to focus on experimental development and could not request funding of more than £500,000 exclusive of VAT. As part of the Alpha Phase SIF Funding, we released a SIF Funding Decision outlining which Projects were being awarded SIF Funding for the Alphas Phase[8].

Upon completion of the Alpha Phase, Projects had the choice of submitting an Application for the Beta Phase, merging with another similar Project and submitting an Application, further developing their Project outside of the SIF, or not submitting a Beta Phase Application. This Funding Decision is for the Beta Phase of the first round of the SIF, as a continuation of the four Innovation Challenges launched in 2021 following the completion of the Alpha Phase. Projects in the Beta Phase start on July 1 2023, end by June 30 2028 and can request funding of more than £500,000. Additionally, as set out in the Innovation Challenge Documentation, prospective Beta Applications seeking more than £10,000,000 were requested to provide justification to Innovate UK and Ofgem prior to the Beta Phase Application period close of 22 March 2023.

This document sets out our decisions on the Applications we received for the round 1 Beta Phase. As part of the decision on Projects approved for SIF Funding, Project-specific conditions have been considered for some of the Projects below, taking into consideration the recommendations from the Expert Assessors. These have been included in circumstances where we believe greater clarity or additional information could be provided by a Funding Party to help mitigate potential issues identified in an Application[9]. Our decision on each Project contained within this document indicates our intent regarding Project-specific conditions. These will be set out separately in the Project Directions for each successful Project.

Alongside this document we are publishing the recommendations report from the Expert Assessors and a copy of each of the accepted Project Directions. As a result, the total

[8] For more information on the round 1 Alpha Phase, please see: https://www.ofgem.gov.uk/publications/strategic-innovation-fund-discovery-projects-approved-funding

[9] Project-specific conditions are implemented in the SIF Project Directions. Note that project-specific conditions within SIF Project Directions start as condition number 3. Project-specific condition 1 and 2 are common in all SIF Project Directions

number of accepted Project Directions may differ from those below which have been approved for SIF Funding.

The SIF Governance Document includes information and details on the SIF, the role of UKRI, the purpose of this document, and how the SIF works[10]. Consistent with the SIF Governance Document, Applications were assessed based on the Eligibility Criteria in chapter 2 of the SIF Governance Document, the show and tell presentations referred to in paragraph 6.11 of the SIF Governance Document, and taking into consideration any additional and relevant information available. The Expert Assessors' assessment of the Applications formed the basis of the recommendations set out separately in the recommendations report, which we took into account in deciding which projects should receive funding.

Beta Phase round 1 submissions

We received 14 Applications across the four challenges of this Beta Phase by the closing deadline of 22 March 2023.

Of the 14 Applications received, we have approved the funding of 10 Beta Phase Projects for a total of £95,322,302.00. The 10 approved Projects are outlined in Table 1 below.

Summary of Projects approved for Beta Phase SIF Funding

Table 1: Whole System Integration Projects Approved for Beta Phase SIF Funding

Network type	Project title[11]	Lead applicant	SIF Funding Requested (£)
Gas	HyNTS Compression	National Gas Transmission Plc	£33,303,556.00

[10] https://www.ofgem.gov.uk/sites/default/files/2021-08/SIF%20Governance%20Document.pdf
[11] Full Project descriptions are available below in Annex 1.

Electricity	Network-DC	Scottish Hydro Electric Transmission Plc	£5,486,794.00
Electricity	Incentive	Scottish Hydro Electric Transmission Plc	£922,333.00
Electricity	Crowdflex	National Grid Electricity System Operator Limited	£18,610,355.00

Table 2: Data and Digitalisation Projects Approved for Beta Phase SIF Funding

Network type	**Project title[12]**	**Lead applicant**	**SIF Funding Requested (£)**
Gas	Digital Platform for Leakage Analytics	Cadent Gas Limited	£9,496,476
Gas	Intelligent Gas Grid	Southern Gas Networks Plc	£6,072,524
Electricity	Predict4Resilience	SP Transmission Plc	£4,518,605
Gas	Predictive Safety Interventions	Southern Gas Networks Plc	£1,078,258.00

[12] Full Project descriptions are available below in Annex 2.

Table 3: Zero Emission Transport Projects Approved for Beta Phase SIF Funding

Network type	Project title[13]	Lead applicant	SIF Funding Requested (£)
Gas	HyNTS Deblending for Transport Applications	National Gas Transmission Plc	£9,921,257

Table 4: Heat Projects Approved for Beta Phase SIF Funding

Network type	Project title[14]	Lead applicant	SIF Funding Requested (£)
Gas	Velocity Design with Hydrogen	Southern Gas Networks Plc	£5,912,144

[13] Full Project descriptions are available below in Annex 3.
[14] Full Project descriptions are available below in Annex 4.

1. Decision on Innovation Challenge: whole system integration

Section Summary

This chapter contains Ofgem's decision on Applications in response to the whole system integration Innovation Challenge. We have decided to fund 4 Projects, with a total of £58,323,038 of SIF Funding being distributed. This consists of one gas Project and three electricity Projects.

Update on the Innovation Challenge

1.1. This Beta Phase for round 1 is a continuation of the whole system integration Innovation Challenge launched in July 2021 and for which round 1 Discovery Phase Projects were completed at the end of April 2022 and round 1 Alpha Phase Projects were completed at the end of January 2023. This Innovation Challenge focuses on whole system solutions and the full range of opportunities, risks and interdependencies that exist across the full energy system and are required to optimise the system and reduce costs, whilst enhancing the experience of consumers.

1.2. A total of five proposals were submitted to UKRI through the IFS portal in relation to this challenge for the Beta Phase by the closing deadline of 22 March 2023.

1.3. Further information on the whole system integration Innovation Challenge for the Beta Phase of round 1 can be found on the IFS portal.[15]

Summary of our decisions

1.4. We have decided to fund four Projects under the whole system integration Innovation Challenge.

[15] For more info on the whole system integration Innovation Challenge please see: https://apply-for-innovation-funding.service.gov.uk/management/competition/1385

1.5. In total, subject to the fulfilment of Project conditions, we are awarding £58,323,038 of SIF Funding to gas and electricity SIF Projects under the whole system integration – Beta Phase Round 1 Innovation Challenge.

1.6. These funded Projects are:

- HyNTS Compression
- Network-DC
- Incentive
- Crowdflex

Table 3: Summary of funded Projects - Innovation Challenge: whole system integration

Total number of Projects funded:	4
Gas Projects funded:	1
Gas Projects total funding:	£33,303,556.00
Electricity Projects funded:	3
Electricity Projects total funding:	£25,019,482.00
Total SIF Funding awarded (£):	£58,323,038.00
Total value of partner contributions, excluding in-kind contributions (£):	£8,430,754.00

1.7. We have set out our assessment of individual Projects and our decisions in Annex 1.

2. Decision on Innovation Challenge: data and digitalisation

Section Summary

This chapter contains Ofgem's decision on Applications in response to the data and digitalisation Innovation Challenge. We have decided to fund four Projects, with a total of £21,165,863 of SIF Funding being distributed. This consists of three gas Projects and one electricity Project.

Update on the Innovation Challenge

2.1. This Beta Phase for round 1 is a continuation of the data and digitalisation Innovation Challenge launched in July 2021 and for which round 1 Discovery Phase Projects were completed at the end of April 2022 and round 1 Alpha Phase Projects were completed at the end of January 2023. This Innovation Challenge focuses on the digitalisation of energy network activities to support better coordination, planning and network optimisation.

2.2. A total of six proposals were submitted to UKRI through the IFS portal in relation to this challenge for the Beta Phase by the closing deadline of 22 March 2023.

2.3. Further information on the whole system integration Innovation Challenge for the Beta Phase of round 1 can be found on the IFS portal.[16]

Summary of our decisions

2.4. We have decided to fund four Projects under the Data and Digitalisation Innovation Challenge.

2.5. In total, subject to the fulfilment of Project conditions, we are awarding £21,165,863 of SIF Funding to gas and electricity SIF Projects under the Data and Digitalisation – Beta Phase Round 1 Innovation Challenge.

[16] For more information on the data and digitalisation Innovation Challenge please see: https://apply-for-innovation-funding.service.gov.uk/management/competition/1386

2.6. These funded Projects are:

- Predict4Resilience
- Digital Platform for Leakage Analytics
- Intelligent Gas Grid
- Predictive Safety Interventions

Table 4: Summary of funded Projects - Innovation Challenge: data and digitalisation

Total number of Projects funded:	4
Gas Projects funded:	3
Gas Projects total funding:	£16,647,258.00
Electricity Projects funded:	1
Electricity Projects total funding:	£4,518,605.00
Total SIF Funding awarded (£):	£21,165,863
Total value of partner contributions, excluding in-kind contributions (£):	£3,417,142

2.7. We have set out our assessment of individual Projects and our decisions in Annex 2.

3. Decision on Innovation Challenge: zero emission transport

Section Summary

This chapter contains Ofgem's decision on Applications in response to the zero emission transport Innovation Challenge. We have decided to fund one Project, with a total of £9,921,257 of SIF Funding being distributed. This consists of zero gas Projects and one electricity Project.

Update on the Innovation Challenge

3.1. This Beta Phase for round 1 is a continuation of the zero emission transport Innovation Challenge launched in July 2021 and for which round 1 Discovery Phase Projects were completed at the end of April 2022 and round 1 Alpha Phase Projects were completed at the end of January 2023. This Innovation Challenge focuses on supporting a reliable, cost-effective transition in the transport sector whilst maintaining readily available access, as new trends such as e-mobility, new public transport links, and opportunities for electrification and gas emerge.

3.2. A total of two proposals were submitted to UKRI through the IFS portal in relation to this challenge for the Beta Phase by the closing deadline of 22 March 2023.

3.3. Further information on the whole system integration Innovation Challenge for the Beta Phase of round 1 can be found on the IFS portal.[17]

Summary of our decisions

3.4. We have decided to fund one Project under the zero emission transport Innovation Challenge.

[17] For more information on the zero emission transport Innovation Challenge please see: https://apply-for-innovation-funding.service.gov.uk/management/competition/1384

3.5. In total, subject to the fulfilment of Project conditions, we are awarding £9,921,257 of SIF Funding to gas and electricity SIF Projects under the zero emission transport – Beta Phase Round 1 Innovation Challenge.

3.6. These funded Project is:

- HyNTS Deblending for Transport Applications

Table 5: Summary of funded Projects - Innovation Challenge: zero emission transport

Total number of Projects funded:	1
Gas Projects funded:	0
Gas Projects total funding:	0
Electricity Projects funded:	1
Electricity Projects total funding:	£9,921,257
Total SIF Funding awarded (£):	£9,921,257
Total value of partner contributions, excluding in-kind contributions (£):	£1,100,000

3.7. We have set out our assessment of individual Projects and our decisions in Annex 3.

4. Decision on Innovation Challenge: heat

Section Summary

This chapter contains Ofgem's decision on Applications in response to the heat Innovation Challenge. We have decided to fund one Project, with a total of £5,912,144 of SIF Funding being distributed. This consists of one gas Project and zero electricity Projects.

Update on the Innovation Challenge

4.1. This Beta Phase for round 1 is a continuation of the heat Innovation Challenge launched in July 2021 and for which round 1 Discovery Phase Projects were completed at the end of April 2022 and round 1 Alpha Phase Projects were completed at the end of January 2023. This Innovation Challenge focuses on improving consumer access to low-carbon heating options, reducing overall UK greenhouse gas emissions, and developing the technologies which have the potential to contribute to the heat transformation necessary to meet national 2030 and 2050 emissions targets.

4.2. A total of one proposal was submitted to UKRI through the IFS portal in relation to this challenge for the Alpha Phase by the closing deadline on 22 March 2023.

4.3. Further information on the whole system integration Innovation Challenge for the Beta Phase of round 1 can be found on the IFS portal.[18]

Summary of our decisions

4.4. We have decided to fund one Project under the heat Innovation Challenge.

4.5. In total, subject to the fulfilment of Project conditions, we are awarding £5,912,144 of SIF Funding to gas and electricity SIF Projects under the heat – Beta Phase Round 1 Innovation Challenge.

4.6. These funded Projects are:

- Velocity Design with Hydrogen

[18] For more information on the heat Innovation Challenge please see: https://apply-for-innovation-funding.service.gov.uk/management/competition/1387

Table 6 Summary of funded Projects - Innovation Challenge: Heat

Total number of Projects funded:	1
Gas Projects funded:	1
Gas Projects total funding:	£5,912,144
Electricity Projects funded:	0
Electricity Projects total funding:	0
Total SIF Funding awarded (£):	£5,912,144
Total value of partner contributions, excluding in-kind contributions (£):	£642,846

4.7. We have set out our assessment of individual Projects and our decisions in Annex 4.

5. Next steps

Funding of selected Projects

5.1. Ofgem is publishing alongside this document, a copy of each Project Direction accepted by a Project selected for SIF Funding and a copy of the Expert Assessors' recommendations report.

5.2. Following publication of this document, Ofgem will look to issue a SIF Funding Direction to specify the amount of money to be recovered from network customers, through their network charges, to fund the Eligible SIF Projects.

5.3. The expectation is for funded Projects to start from 1 July 2023, in accordance with the Funding Party's Licence conditions, the SIF Governance Document, its SIF Project Direction, and Innovation Challenge-specific requirements.

Monitoring and evaluation of Projects

5.4. All Projects receiving SIF Funding will be subject to review and, for this purpose, be allocated a monitoring officer who will be employed by UKRI.

5.5. During Project delivery, Ofgem, with the assistance of information gathered by the monitoring officer, will monitor Projects. The monitoring officer will review each Project's progress against the scope, timeline, deliverables, milestones, and budget agreed in the SIF Project Direction. Monitoring will support the identification of potential problems, and the assessment of whether Projects have met the conditions attached. As set out in paragraph 6.4 of the SIF Governance Document, monitoring in the Beta Phase will occur on an ad-hoc basis, as required by Ofgem.

5.6. As set out in paragraph 6.5, conditions agreed in the SIF Project Direction (such as stage gates) will determine the timing of the assessment of compliance with those conditions, based on Project Deliverables and milestones. All Beta Phase Project must also submit an end of Phase report.

5.7. Additionally, as set out in paragraph 6.10, the Funding Party for each successful Beta Phase Project is required to publish an annual progress report on its Project. The progress report must outline the progress made by the Project to date, the main findings and learning, and the future direction/scope of the Project.

5.8. For further details on Project monitoring, see chapter 6 of the SIF Governance Document.

Annex 1: Application assessment - Innovation Challenge: whole system integration

Chapter 1 of this document provides detail about the scope of the Innovation Challenge: whole system integration, as well as summarising the total number of Projects funded and total value of SIF Funding awarded for the Alpha Phase of round 1.

This annex details our assessment and decisions on Applications submitted in response to that Innovation Challenge. Our assessment of each Project is set out within:

- Pages 20 – 27 set out our assessment of each gas Project that has been selected for funding, together with our decision.

- All gas Projects which submitted an Application to this Innovation Challenge for the Beta Phase were successful.

- Pages 28 – 53 set out our assessment of each electricity Project that has been selected for funding, together with our decision.

- Pages 54 – 60 set out our assessment of each electricity Project that has not been selected for funding, together with our decision.

Gas Projects selected for funding

HyNTS Compression

Table 7: Project Costs

Cost type	Cost
Total eligible costs (£)	37,003,556
Total contributions (£)	3,700,000
Total contributions in-kind (£)	6,685,300
Total SIF Funding requested (£)	33,303,556

Project description

The National Transmission System (NTS) is a network of high pressure natural gas pipelines, that supply gas to power stations, large industrial and domestic users, from natural gas terminals situated on the coast, to gas distribution companies and direct connects. In order to move gas from supply to demand, the system utilises several compressor stations located strategically across the country.

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 and biogas to users. These gases have different properties to natural gas and therefore need different control and management systems. Modelling of the energy system and interaction with our network through Discovery and Alpha has shown the need for compression and that our current systems are capable of meeting the current future scenarios, this work will continue in the Beta Phase.

The HyNTS Compression project directly impacts the cost of transitioning the NTS to Hydrogen by targeting our highest cost asset and providing technical and commercial feasibility for repurposing vs replacement. The associated costs for replacement are ~£60m per unit which can be dramatically decreased by upgrading key components. The project will provide the technical and safety evidence for our first transition activity; Project Union. This project is creating an 100% hydrogen backbone linking industrial clusters and terminals, which will commence construction in 2026. If this project proves that the current compression systems are able to function with hydrogen, we plan to implement the solutions into the project delivery.

The HyNTS Compression project will provide a technical demonstration and create a strategy for UK NTS Compression System transition linked to our implementation projects and wider business plan. The technical demonstration will be conducted initially on an offline facility, to enable gas turbine modifications in a clean room environment whilst gathering evidence on hydrogen capability, followed by the full compression system test at the DNV Spadeadam site as part of the FutureGrid facility.

The demonstration will provide the technical and safety evidence for the re-purposing ~65% of the NTS compressor units and provide insight into repurposing others on the network. The project will modify an existing unit to run on hydrogen and then test it at both blends of hydrogen and 100% hydrogen. Demonstrating not only the rotating machinery package capability but how the full system would operate on a hydrogen network.

Summary of Expert Assessors' feedback

The Project overall was considered to be a well put together project with a strong consortium consistent with delivering the proposed scope of work. It was also considered to be clearly an innovative project focussing on retrofitting NTS assets (compressor system) to enable them to run on blended and pure hydrogen. This has not been analysed and demonstrated elsewhere globally.

If approved, the Expert Assessors considered the Project and its proposed scope of work to require significant funding. The Expert Assessors, however, had several areas of concern regarding the uncertainties relating to the expected benefits and the strength of the argument to undertake this work now, ahead of clearer policy drivers on the use cases for hydrogen. It was noted that Project Union will be the first step on this potential path for the use cases of hydrogen, but at the moment, the future role of hydrogen within the NTS is unclear.

As such, it is currently unclear the extent to which (low carbon) high hydrogen blends will be required in the NTS, at what concentrations, to which end uses and over what time frame. The widespread production, transportation of 100% hydrogen blends nationally was considered by the Expert Assessors to have a longer time horizon. The early phases of Project Union are likely to be the

pathfinder for 100% hydrogen transportation and the first phase of it does not require compression.

Nonetheless, against this challenging policy context and interdependency with Project Union, the Expert Assessors recognised the potential option value of high hydrogen blends and 100% hydrogen to future energy system policy decisions. Coping with these high hydrogen levels will certainly require investment to upgrade or replace compression equipment. The value offered from elements of this Project, specifically its ability to inform early decision points in Project Union and wider hydrogen policy decisions, is recognised and it is therefore recommended that the Project proactively identify opportunities to reprofile costs at or prior to reaching stage gate 1 and that the Project provide an update on how its overall costs can be reduced or contributions adjusted, while also taking into consideration any wider and relevant hydrogen decisions.

Furthermore, the Expert Assessors considered that the potential benefits to the Project Partners warranted a higher funding contribution than proposed in the Application as the benefits to gas consumers from the initial Project Union use case will be limited to industrial and power users.

As such, the Expert Assessors in consultation with hydrogen subject matter experts at Ofgem have recommended the Project be approved for SIF Funding, but that the Project proactively identify opportunities to reprofile costs ahead of reaching or as part of stage gate 1 and that it provide as part of this an update on how the Project's overall costs can be reduced or contributions adjusted, while also taking into consideration any wider and relevant hydrogen decisions.

Ofgem funding decision: approved

Ofgem assessment of Application

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

The Project addresses the Innovation Challenge set by Ofgem because it directly aligns with one of the aims of the Innovation Challenge, which is to improve

coordination of emerging innovations (such as hydrogen) across networks, generators and other key stakeholders. The Project's examination of the compression of various blends of hydrogen and natural gas, and 100% hydrogen, with a focus on the National Transmission System (NTS) is relevant from a whole system perspective because there could be a wide range of end users for the gas and gas blends in the NTS in the future. The Project has the potential to build evidence on possible means of reducing costs of the potential transition to carrying hydrogen in the NTS, by evaluating the prospect of using existing compressor infrastructure. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

We note the feedback from the Expert Assessors that, while they consider that the Project meets the Eligibility Criteria, they also recommended that it examine opportunities for reducing costs and increasing contributions ahead of reaching or as part of stage gate 1. We agree with the Expert Assessors that there are opportunities for the Project to reduce overall costs and increase partner contributions. However, we consider that the Project has identified potential to deliver net benefit to gas consumers.

In our view the Project has the potential to deliver insights on the use of hydrogen and hydrogen blends in the NTS, and in particular to the opportunity to retrofit and repurpose existing compressors for use with hydrogen. We therefore consider that the Project could deliver net benefits to consumers through the development of new approaches to compressor retrofits, which could reduce the costs associated with use of hydrogen in the NTS, and we also acknowledge the potential emissions savings identified by the Project. As a result, in our view, the Project has clearly identified the potential to deliver a net benefit to gas consumers through financial benefits via a greater understanding of compressor retrofits for hydrogen use in the NTS and, if successful, in environmental benefits through emissions reduction.

Recognising that there is uncertainty regarding the extent of the role for hydrogen in the future energy system, we also note and agree with the recommendations

from the Expert Assessors that the Project's overall value, benefits and applicability should be reviewed at each stage gate.

We have also included in the Project Direction a Project-specific condition for the Project to reprofile its costs and find opportunities to reduce its costs as part of stage gate 1 and all subsequent stage gates, and to examine opportunities for increased contributions to reflect a changing commercial or risk environment, to ensure benefits can be delivered to consumers. In summary and with the Project-specific condition, we consider the Project to have met this Eligibility Criteria because it has the potential to deliver benefits to consumers through insights into hydrogen which could result in financial benefits and environmental benefits.

Eligibility Criterion 3: Projects must involve network innovation.

The Project involves network innovation because it is examining the opportunities for the refurbishment and upgrading of the existing compressors, as an integral component of the NTS, for hydrogen and hydrogen blends. We note that this proposes a first of its kind examination and demonstration and that there are currently no tried and tested options available globally for the refurbishment of existing natural gas infrastructures.

Additionally, because this Project proposes a first of its kind examination and demonstration into the refurbishment and upgrading of compressors, the Project would also need to test and proven any developments which could come out of the Project to ensure they are safe and reliable prior to deployment. We consider this aspect of this Project to also demonstrate and involve network innovation because it would involve the development of testing new standards and safety measures.

As a result, we consider the Project to have met this Eligibility Criteria.

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

We note the feedback and recommended Project-specific conditions from the Expert Assessors that the Project examine as part of or ahead of stage gate 1, the opportunities to reprofile its costs and contributions. However, in our view, we consider the Project to have the potential to stimulate the development of competitive markets through the delivery of additional insights on how compressor

retrofits could be developed for the use of hydrogen and hydrogen blends within the NTS. For example, we note in the Application that the Project has shared insights with OEMs not involved in the Project and that this has caused them to reconsider their approach to the repurposing of legacy equipment.

While we note the feedback from the Expert Assessors that the OEM Project Partner already has a fairly dominant position in the compressor market, we consider the Project's focus to be an important aspect for potential future use of hydrogen and one which could provide the necessary signals to industry and supply chains for the development of new technology. We also do not consider the Project's proposed solution to likely result in competitive markets being undermined but also agree with the Expert Assessors that the OEM Project Partner should look to reprofile its contribution to reflect the potential commercial value from its position in the Project. As such, we have included a Project-specific condition for the Funding Party to provide this information. Overall, and when combined with the Project-specific conditions, we consider the Project to have met this Eligibility Criteria and encourage the Project to share its learnings with the other OEMs to ensure industry and supply chains can be stimulated and developed.

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

The Project is proposing a first of its kind trial examining the refurbishment and upgrading opportunities for the compressors and the use of hydrogen and hydrogen blends. We consider this approach to be innovative, novel and risky. It is innovative and novel because it proposes a trial which could deliver first of its kind findings for compressors to run on hydrogen and hydrogen blends. We also considered it risky because the Project's proposed solution relies on assumptions for hydrogen and hydrogen blends to be used in the NTS and, should it be successful, would involve the development, trialling and testing of new standards and technologies. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

We agree with the Expert Assessors and consider the Project to have participation from a sufficient range of stakeholders of this Eligibility Criteria for it to be

considered to have been met. For the designing and trialling of the proposed solution, we viewed the participation of an OEM, academia, DNV and subject-matter expert consultancies to be sufficient for the Beta activities set out. We also noted positively the involvement and engagement with gas distribution companies and the Health and Safety Executive to help ensure end users and key stakeholders are involved in the development of a potential solution.

While we consider the Project to have met this Eligibility Criteria, we also note that involvement from additional OEMs in the Project would have strengthened the Application. However, as set above in Eligibility Criteria 4, we note positively the Project's engagement with OEMs outside of the Project consortium and encourage them to continue sharing their learnings with the industry.

As such, we consider the Project to have met this Eligibility Criteria.

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

We note the feedback from the Expert Assessors that they have identified several potential concerns relating to the Project's value for money and underlying costs. We note specifically their feedback that the Project should proactively identify opportunities to reprofile costs and for the Project to provide updates at each stage gate on opportunities to reduce its costs, taking into consideration any wider and relevant hydrogen decisions which change the risk profile and commercial opportunities arising from the Project. As previously stated, we have included a Project-specific condition in the Project Direction for it to identify opportunities for reducing costs throughout its delivery and to increase contributions. We consider this approach to be sufficient in mitigating risks associated with the Project having higher than anticipated costs, also recognising the Project's novelty and the risks taken by the Funding Party and the Project Partners for the Project. Overall, we consider the Project to have the potential to help inform the development of hydrogen transport infrastructure in GB and to inform policy and regulatory decisions related to hydrogen, which could lead to greater overall value for money from the Project being provided. As a result, and in combination with the Project-specific condition, we consider the Project to have met this Eligibility Criteria.

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.

We considered the Project to have a robust methodology which gives confidence that it will be capable of progressing in a timely manner. The Project Plan was considered sufficient as it is support by detailed milestones and stage gates throughout the Project with a sensible timeline. The Project was also considered to have taken a sensible approach to dividing up the responsibilities between the Project Partners to align with their area of technical expertise. The risk register was considered robust with clearly articulated and reasonable risk mitigation options set out.

Overall, the Project was considered to have a clear Project plan, with sufficient detail on its milestones and stage gates, involvement from the Project Partners in their area of expertise, and a clear risk register. As a result, we consider the Project to have met this Eligibility Criteria.

Electricity Projects selected for funding

Network-DC

Table 8: Project Costs

Cost type	Cost
Total eligible costs (£)	6,097,127
Total contributions (£)	610,333
Total contributions in-kind (£)	0
Total SIF Funding requested (£)	5,486,794

Project description

The UK government has set targets to increase offshore wind to 50GW by 2030. The method for connecting offshore wind farms to the grid is to connect each wind farm to an alternating current (AC) converter station with an AC circuit breaker between the converter station and the rest of the onshore AC network, to protect the electricity grid from faults on the offshore direct current (DC) network. This method results in stand-alone assets connected directly to the transmission grid, increasing the total number of required AC converter stations. As the number of wind farms increases, the number of AC convertor stations increases. Without innovative solutions, the growing network of High Voltage Direct Current (HVDC) connections around GB will be less flexible and responsive, resulting in higher assets and system operating costs.

DC circuit breakers (DCCBs) are more than likely to be required to deliver a multi-terminal HVDC hub serving multiple offshore wind generation sites, GB transmission links, and international interconnectors.

Solution

Network-DC will investigate and demonstrate the use of DCCB, an innovative technology untested in the UK and European markets. DCCBs will allow us to bring multiple wind farms into a DC system, containing the impact of any single failure safely and securely.

This Project brings together international partners to accelerate the readiness of DCCBs for installation into the design of the UK HVDC Network, and outline a clear pathway for the installation of the UK's first DCCB.

The use-case selected for DCCBs is based on a DC switching station (DCSS) proposed at Peterhead, that could support HVDC links connecting electricity transmission in NE Scotland to locations in England and international interconnectors. The addition of a DCCB could provide capacity for additional power generation to be connected at the DCSS.

Approach

Our approach uses the state-of-the-art HVDC centre to simulate DCCBs, avoiding overreliance on live fault testing and field trials, that have a high risk for other users of the system.

The Project will use Hardware Testing in the Loop (HIL) and Software Testing in the Loop (SIL) to establish performance standards for DCCBs. Testing and consultation with key stakeholders will establish and demonstrate DCCB performance, resulting in approved specifications that can be used for procurement.

Benefits

A DCCB hub will reduce the need for AC infrastructure and effectively isolate faults in offshore network components. This project will build confidence in DCCBs allowing utilisation across the network.

Summary of Expert Assessors' feedback

Network DC was considered to be an important Project addressing the whole systems challenge by enabling the development of high voltage direct current (HVDC) circuit breakers specifications. This has the potential to de-risk and enable the supply chain to deliver effectively and specifically to GB system needs. This scope of work is considered to go beyond incremental innovation as DCCBs have not been used commercially in GB or for this specific use case (under sea and faster fault rise times) anywhere globally.

The availability of DCCBs to network designers include potentially lower network costs and faster network connections for new offshore generators post 2030, which

supports the wider Net-Zero transition. The project is also recognised for its potential to enhance coordination between offshore wind generators and the transmission network by isolating faults, thereby reducing their network-wide impact and improving resilience. This approach could lead to a more cost-effective grid topology and an optimised whole system design-space in the future. The Project has identified a robust business case of c. £350m over a 35 year lifespan, which has been scaled down since the previous phases owing to more granular analysis and pragmatism.

Overall, the Expert Panel felt the Project offered a route to providing an important proposed solution for system designers to consider when planning for a high offshore wind future. It also noted that, there is no certainty that this proposed solution would actually be taken up given the significant additional dependency of the development of HVDC networks and DCCBs on wider policy and regulatory direction, which is beyond the control of the Project. Thus, the Project needs to continuously monitor ongoing and future developments in this sector and reassess the risks to having an enabling environment to roll this technology out commercially. Additionally, it is critical that this Project engages and primes the supply chain to be ready and willing to move forward to deployment, including securing commitment to carry out a real life demonstration on the back of this Project.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

We considered this Project to be directly aligned with the Innovation Challenge as it proposes an innovative use of DC circuit breakers (DCCBs) with offshore wind generators. This Project demonstrates a potential improvement on the coordination of new innovations across key stakeholders, which is one of the key focus areas of the Innovation Challenge.

We agree with the Expert Assessors that the Project has the potential to simplify high voltage direct current networks while preserving their resilience. With 50GW of offshore wind generation targeted by 2030, the Project could help to ensure that energy generated by offshore wind can be brought to shore efficiently. The Project's proposed activities could also help support the wider net zero transition while lowering network costs for consumers, facilitate faster network connections for offshore generators, and provide a more resilient approach to dealing with network faults. Additionally, the proposed approach could support greater development of DCCBs and the associated codes without disrupting the existing network. This could lead to greater adoption and utilisation of DCCBs, should the solution be successful.

We therefore considered the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has identified a clear benefit for electricity consumers should DCCB's be deployed as widely as anticipated as it would primarily result in less need for transmission and ancillary infrastructure. It was also noted that, should the Project result in specifications which can be adopted by multiple vendors, it has the potential to deliver benefits for the entire industry, which would then result in a benefits to electricity consumers. We also note the feedback from the Expert Assessors on the Project's potential to deliver financial benefits in the form of maintaining network flexibility, fault tolerance and faster grid connections for generators, and environmental benefits through reduced coastal impacts.

However, we note two potential barriers which could limit the overall net benefits to electricity consumers. First, the Project has identified in its cost benefit analysis that the majority of its potential benefits would occur beyond the timeline of the proposed Project (£350 million over 35 years but only £3.5m over 10 years). We consider this to be largely due to the uncertainty for the full deployment of the proposed solution (along with the policy, regulatory and commercial considerations) which need be further explored and developed as part of this Project for widescale deployment to occur. Second, we also note that the nature

Project is in demonstrating option value, rather than a solution which could then proceed to business as usual. Similarly to the first reason, we recognise that this is largely due to the 'first of its kind' nature of the Project.

Overall, however, we consider the Project to have clearly identified potential to deliver a net benefit for electricity consumers through cost savings by potentially requiring less network infrastructure and facilitating efficient use of the grid and environmental benefits through reduced coastal impacts. It was also recognised that the Project has the potential to take a proactive approach examining some of the policy and regulatory challenges, which could help realize some of the benefits identified by the Project at a sooner date and could result in a widespread industry approach being taken, which would lead to greater benefits for electricity consumers.

Eligibility Criterion 3: Projects must involve network innovation.

The Project clearly involves network innovation because it is proposing the development and testing of a new technology and approach for connecting offshore wind generators with the electricity transmission network. While we recognise that China has deployed DC circuit breaker for overhead lines, the Project's proposed approach of using them in GB for offshore subsea cabling has not yet been attempted elsewhere. We consider this approach by the Project to clearly demonstrate network innovation because it has not yet been trialled elsewhere and, as a result, also involves development and testing of new standards and codes. This could help to support de-risking of the proposed solution, greater data collection, and foster additional innovation for the proposed solution.

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

Overall, we did not consider this Project to undermine the development of competitive markets and consider the Project to have met this Eligibility Criteria. This is because the Project does not preclude other technology solutions from being developed (i.e. from the owning of specific IPR) nor does it inhibit other OEMs from participating in the marketplace, should DCCBs be deployed. Additionally, we consider the Project to have the potential to deliver learnings and benefits from

being a first of its kind project which could ultimately result in more competition and solutions being developed.

We do however note that, should DCCBs be deployed, the Project will need to ensure that the solution is usable and deployable with multiple OEMs as well as networks to ensure operability. While the Project has stated in its Application that it plans to actively engage with other OEMS, this area of the Application could have been clearer. We strongly encourage the Project to actively engage with other OEMs and networks throughout the Project to ultimately ensure competitive markets can be developed should DCCBs be deployed. We therefore have included a Project-specific condition for the Project do undertake these activities during the Beta Phase.

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

The Project's proposal for a 'first of its kind' solution with connecting offshore generators with the electricity transmission network was considered to be clearly innovative, novel and risky. The nature of the Project and its proposed solution was considered to be novel as it has not yet been trialled globally and has the potential to result in a novel and innovative approach to network design. The novelty of this Project also has the potential to deliver new analysis and data which could help inform and support further innovation within the sector and ultimately result in benefits for GB electricity consumers. Furthermore, we recognise the risks associated with the proposed solution. The Project's proposal involves the review and development of potential new policy and regulations, as well commercial decision which need to be considered before DCCBs can be deployed. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project involves participation from a wide array of stakeholders for the activities proposed. The inclusion of the stakeholders and their participation in the Project was considered sufficient for the Beta Phase and we consider the Project to have met this Eligibility Criteria. We agree with the Expert Assessors that the composition and structure of the participation in the Project from the stakeholders gives confidence that it includes sufficient participation for the activities proposed.

We note positively the inclusion of academia, engineering and HVDC expertise, and National Gird ESO in the Project, which gives confidence that the Project Partners will be able to effectively use the learnings from the Project.

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

The Project has outlined potential significant benefits to electricity consumers should wide-scale deployment of DCCBs occur. While we recognise these potential benefits of the proposed solution, we also note several caveats which could limit the overall value for money that the Project demonstrates. First, the Project's main focus will be on evidence building rather than immediate deployment following its conclusion. While this could be an important step in the deployment of DCCBs, it limits the potential benefits the Project could realize. Second, the Project's main focus is on simulation and modelling, rather than demonstration. While we recognise the challenges of demonstration given the newness of the potential solution, we consider this to limit the potential value for money from the Project. Additionally, we also considered some of the costs of the Project Partners were higher than anticipated, although still within reason for the activities proposed.

Overall, however, we recognise the potential benefits offered by the Project and the value it could provide. While we noted several caveats to the benefits quantified by the Project, we also recognise that the Project's proposal for simulation and modelling will likely result in a more cost-effective first step for the proposed solution. We also consider the Project Partner's and the Project's overall costs to be appropriate for the activities set out, although greater justification for some of the higher than anticipated costs would have strengthened the Application. As a result, we consider the Project to have met this Eligibility Criteria.

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.

We agree with the Expert Assessors and consider the Project to have put forward a robust methodology which gives confidence that it will be capable of progressing in a timely manner. The Project put forward a clearly defined plan with clear resource allocation between the Project Partners and stakeholders, and the iterative risk register from the Alpha Phase demonstrates a clear understanding of the Project in

the Beta Phase. We note a key component for success in the Beta Phase will be the Project's engagement and involvement from other OEMS to ensure that learnings are disseminated and there is interoperability should DCCBs be deployed. While the Project's use of simulation and modelling in the Beta Phase could limit the overall benefits put forward by the Project in the Beta Phase, it was also considered to provide a more secure testing environment in the Beta Phase compared to an in person demonstration Project.

Additionally, while this may be outside the proposed activities for the Beta Phase, we also recognise the regulatory and policy barriers which would inhibit the Project from progressing to deployment following the Beta Phase. The Project has identified the need for ongoing engagement with Ofgem and policymakers and we recognise the opportunity presented by the Project. The Project's Application provides confidence that it will be capable of progressing in the Beta Phase and should deliver insights into how DCCBs can be integrated into the electricity transmission network. As a result, we consider the Project to have met this Eligibility Criteria.

Incentive

Table 9: Project Costs

Cost type	Cost
Total eligible costs (£)	1,122,973
Total contributions (£)	200,640
Total contributions in-kind (£)	365,710
Total SIF Funding requested (£)	922,333

Project description

Problem

The energy contained in generators at power stations and industrial facilities provides inertia as they rotate at the same frequency as the electricity grid.

Inertia in the GB electricity network is falling. Without novel solutions, adding additional renewable generation capacity will become increasingly challenging and could increase the operating cost of the GB network system and consumer bills. Historically, renewable generators have not treated system inertia as their problem as it has been high. However, we are already seeing renewable generation curtailed due to low system inertia.

Solution

INCENTIVE will investigate and demonstrate how offshore wind farms (OWF) can provide inertia to the onshore networks. This will provide grid stability and reliability at a lower cost, and reduce the need for additional infrastructure by co-developing and co-locating inertia services with OWFs. OWFs providing inertia to the onshore network is not an incremental innovation, but a step-change in thinking that could be replicated globally.

INCENTIVE will investigate OWFs with:

1. STATCOM with supercapacitor energy storage and grid forming converter.
2. Battery energy storage system (BESS) with overrated grid forming converter.

3. Synchronous condenser with flywheel.

These solutions have never been trialled in conjunction with an offshore wind farm before, making this a first-of-its-kind project.

The Project brings together OWF developers, technology suppliers, NGESO, and Ofgem, to help build a cross-industry understanding of the INCENTIVE solutions.

Approach

As agreed with UKRI, INCENTIVE will be delivered over two stages:

- Stage 1 (this application) - build on the Alpha Phase to deliver concept selection and a site selection for the installation of a pilot project.
- Stage 2 (subject to site and technology selection) - take the project through Front End Engineering Design and the Financial Investment Decision to install the pilot project. Stage 2 will be applied for under Beta Round 2.

This approach will deliver better value for GB consumers by reducing the potential of project failure and ensuring consumers' money is spent confidently.

Benefits

INCENTIVE will deliver benefits over and above those achievable through existing programmes (i.e. The Stability Pathfinder). These include:

Introduction of design alterations to requisite or already-planned assets to provide inertia.

Capturing cost savings by building inertia provision alongside building OWFs. For example, sharing network, access, and planning considerations.

Accelerating the connection of renewable assets by proactively addressing inertia at the outset.

Driving down market prices by creating a liquid market for inertia services.

Summary of Expert Assessors' feedback

The INCENTIVE project focuses on what the Expert Assessors consider to be a key issue in the net zero transition, which is provision of reliable, low cost and low carbon system stability services. The Project approach is to target relatively low cost upgrades of technology solutions that are likely to be installed with offshore wind farms. This Project and its proposed solution were considered highly aligned to the SIF's focal area and has evidenced its technical and commercial novelty and associated risks. The Expert Assessors considered it to be directly aligned with the Innovation Challenge's aims and scope and considered it to have the potential to unlock large cost savings for system operation and subsequently to the GB electricity consumers.

The Project was considered to have demonstrated a good understanding of the technical, regulatory and commercial risks, and has a robust plan to address and manage these. To ensure ongoing viability and inform any future demonstration application, the Expert Assessors noted the importance for Ofgem and DESNZ to stay engaged throughout the Project, if funded.

The Expert Assessors considered the Project to have brought together a strong consortium and to include participation from sufficient range of stakeholders with the right range of skills sets and agency to be able to deliver the Project and the activities set out, and ultimately progress the proposed solution into business as usual deployment in the future.

The Project was also considered to have taken a pragmatic approach to staging its Application to enable greater certainty, confidence and support to move to a demonstration phase which may seek future funding or be funded privately as appropriate. This approach combined with offshore wind developer support and contribution, resulted in the Expert Assessors considering the Project to provide value for money relative to the funding requested from SIF and to be costed competitively overall.

As a result, the Expert Assessors have recommended this Project be considered for SIF Funding.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

We agree with the Expert Assessors and consider the Project to have addressed the whole system integration Innovation Challenge because it aligns with the challenge's aim of improving coordination of emerging innovations across networks, generators and other key stakeholders. The Project's focus on improving the coordination between transmission network operators and offshore wind developers to maintain and provide inertia to the grid represents the potential for greater grid resiliency in the future. With the potential for an increasingly electrified energy system in the future, ensuring there is sufficient availability of inertia services and short-circuit services to the grid will be key.

We consider the Project to have addressed the Innovation Challenge and its aims and therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has clearly identified the potential to deliver a net benefit to electricity consumers, primarily through a reduction in electricity bills and greater electricity system resilience. The Project's proposal to use offshore windfarms to provide inertia and short circuit services represents a new approach which would compete alongside balancing solutions and could thereby reduce balancing costs. While the Project sets out capital expenditure at onshore connection points, the Project represents overall savings when compared to the counterfactual of procuring inertia services via the Stability Pathfinder programme. We note the significant potential savings that the Project has clearly identified of up to £1bn over 30 years to deliver 5% of GB inertia, some of which could be realized in the next 10 to 20 years. While not a central focus of the Project's activities, we also note that, should the Project be successful in its Beta Phase activities, it could result in greater deployment of low carbon generation and reduced connection times for offshore windfarms.

Overall, we consider the Project to have clearly identified the potential to deliver a net benefit to electricity consumers through reduced electricity system bills and greater electricity system resiliency. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

We agree with the Expert Assessors and consider the Project to involve network innovation because it is proposing a new approach which does not currently exist to providing and maintaining network inertia through offshore windfarms. Inertia services are generally provided by gas turbine generators but an increasing amount of renewable generation has the potential to decrease the amount of inertia available on the electricity network, thereby causing instability and additional operational costs.

This Project demonstrates network innovation because its proposed approach would result in network inertia being provided by offshore windfarms. This has the potential to enable a more cost-effective and streamlined integration of offshore wind with the electricity network. With a forecasted increase in electricity generation as part of the transition to net zero, this proposed approach could help to introduce opportunities for maintain grid stability while transitioning to net zero.

As a result, we consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to undermine the development of competitive markets for two reasons. First, the Project is proposing an approach to the provision of inertia which would result in an increase in the potential sources for inertia services, thereby representing an increase in competition and development of competitive markets. Second, we note that one Project Partner, the Carbon Trust, is working with 10 wind farm developers via the Offshore Wind Accelerator. This helps provide confidence that there won't be any single entity which will own any developments from the Project, and also that there will be dissemination and sharing of learnings from the Project. As this Project proposes a new approach with technologies that are currently not used, this approach provides confidence that,

should the proposed solution be successful, there will be further development of competitive markets. We therefore consider the Project to have met this Eligibility Criteria.

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

The Project is innovative, novel and risky because it proposes a new approach to the provision of inertia services by offshore windfarms. We considered this to be innovative and novel because it is an approach that is currently not in use anywhere and which involves new technologies. The proposed approach also involves potential significant cost savings for users and has the potential to be an impactful innovation in the transition to net zero, where increased generation could come from renewable sources instead of from gas sources. The Project was also considered risky because of its novel and innovative approach, where the Beta Phase activities will play a key role in determining the potential commercial, regulatory and policy implications of the proposed solution. We also note that a rise in renewable generation could pose a risk to certain grid forming technologies. While we note there are regulatory and policy uncertainties with a novel approach, we note positively the Project's plans to work with stakeholders and policymakers during the Beta Phase to address these. Overall, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

We agree with the Expert Assessors and consider the Project to include participation from a sufficient range of stakeholders for the Beta Phase activities set out. We consider the roles and responsibilities of the Funding Party and each of the Project Partners to have been clearly set out in the Application. As stated above in response to Eligibility Criteria 4, we also note positively the representation from multiple offshore windfarms through the Carbon Trust. This helps provide confidence that solutions and learnings from the Project can be applied beyond the stakeholders included in the Project. We therefore consider the Project to have met this Eligibility Criteria.

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

We consider the Project to provide value for money because it puts forward an efficient and effective approach which supports the refinement of technical and commercial options before examining the possibility for future demonstrations. We note positively the Project's use of a review at the end of the design/site selection phase to review finances and construction plans. We agree with the Expert Assessors that this approach provides confidence that a cost-effective approach to the Beta Phase is being taken by the Project, thereby helping to provide value for money because it provides an incremental approach to deployment of new technologies and approaches. We also note the significant potential financial benefits the Project puts forward should the solution be successful and consider this to also provide value for money against the costs of the Beta Phase.

The Project is also costed competitively because we considered the day-rates, costs of the Project Partners and for the activities set out are appropriate compared to industry norms. We also note that the Project Partners are providing significant contributions towards the total costs of the Project, which lowers the amount of SIF Funding requested.

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.

The Project is well thought through and has a robust methodology which gives confidence that it will be capable of progressing in a timely manner because of its tiered approach, the role of the Project Partners and the work packages set out. We viewed positively and agree with the Expert Assessors that the tiered approach to the Project allows the Project to refine its approach and demonstration activities prior to progressing to that stage.

The Project Partners also have key roles and accountabilities set out which gives confidence that the Project will progress in a timely manner. SSEN is the lead partner managing the technical assessments, National Grid ESO is providing the grid code and market expertise, the University of Strathclyde is designing and testing the control solutions; Fraser Nash is providing the business model and economic analysis; and the Carbon Trust is representing end users.

We agree with the Expert Assessors and consider the Project to have included the major tasks required for the testing of this new approach, and consider the

milestones and deliverables to have been clearly set out and communicated. The Project also includes a risk management approach which is well thought through and provides confidence that any remaining or new issues which arise will be managed well.

We do however recognise the Project's need for close involvement with Ofgem and policymakers in the Beta Phase to ensure the Project's learnings inform potential policy and regulation development. While not considered a material risk to the Project, a lack of participation from these stakeholders could represent a delay in the Project's activities or limited benefits being realized.

However, overall, we consider the Project to have met this Eligibility Criteria.

Crowdflex

Table 10: Project Costs

Cost type	Cost
Total eligible costs (£)	22,530,137.00
Total contributions (£)	3,919,781.00
Total contributions in-kind (£)	0
Total SIF Funding requested (£)	18,610,355.00

Project description

CrowdFlex aims to establish domestic flexibility as a novel, reliable flexibility resource of national significance, competing alongside BAU alternatives and accelerating decarbonisation. As more Variable Renewable Energy (VRE) and Low Carbon Technologies (LCTs) are added to the network, it will become increasingly difficult to balance supply and demand. Domestic flexibility provides a huge opportunity during this transition to build a smart flexible energy system by enabling consumers to act as a new source of flexibility.

CrowdFlex explores how domestic flexibility can be utilised to align demand to generation, improve coordination across the network and reduce stress on the system, while reducing consumer energy bills via incentives. The objective of Beta is to build a forecasting model of domestic demand and flexibility, informed by large-scale consumer trials, to establish domestic flexibility as a firm resource and inform new product design. CrowdFlex is the first use case for the ESO's Virtual Energy System (VirtualES). The VirtualES aims to develop an ecosystem of interoperable digital twins representing the entire GB energy system, for a flexible energy system with increased visibility and more accurate forecasting, and ultimately optimising costs for the end user.

Domestic flexibility is inherently statistical in nature. To fully understand and reliably quantify domestic flexibility, CrowdFlex: Beta will:

- Develop probabilistic modelling of domestic demand and flexibility to improve forecasting of baseline domestic demand and flexibility.

- Conduct large-scale consumer trials to enable the model development and a greater understanding of domestic flexibility's potential and technical capabilities.
- Establish a pathway to rapidly accelerate domestic flexibility to Business as Usual (BAU), following the project's completion.

If successful, CrowdFlex has the potential to deliver value across the energy system. Enabling ESO and DSOs to utilise domestic flexibility to reduce operational costs (namely constraints and energy balancing) and capacity and network reinforcement investments. This will lower consumer bills and support the deployment of VRE and uptake of LCTs, accelerating whole system decarbonisation.

Summary of Expert Assessors' feedback

All Expert Assessors have recommended this Project be considered for SIF Funding because it has met all the Eligibility Criteria. The Project was considered to have addressed the Innovation Challenge by taking a holistic whole systems approach to assessing the potential value of probabilistic demand flexibility informed by real trial data from many thousands of consumers. This Project was considered to have the potential to underpin the model for future flexibility markets. It is acknowledged that this project compliments other work in this space such as Local Constraint Managed Zones or the Demand Flexibility Service.

The Expert Assessors agreed that this Project has demonstrated a potential value for money to electricity consumers should the open data from the trials be made available at a suitable level of granularity that could support future innovation and supports the future FSP market. The Expert Assessors did note that the level of benefit versus value for money of the Project would be limited if the data collected from trials is not made openly available to support future innovations, and have recommended Project-specific conditions to avoid such a situation. As a minimum, the trial data, especially the anonymised time sequence data of the flexibility requests and responses (from the MPAN) should be made openly available. It is understood that the project must comply with GDPR and Ofgem's data best practices and the Expert Assessors have recommend a Project specific-condition for the Project develop a data sharing plan early in the Project delivery phase.

The Expert Assessors also recommended the Project also consider all consumer segments and the equitability of the offering to all consumers rather than just users of EVs and heat pumps. The Expert Assessors noted that it was unclear how the levels of rewards will be tested in the trials and how these relate to the value unlocked by the flexibility created. It is crucial that the Project offer just and fair offerings to embed equitable long-term consumer participation.

The Project is not considered to undermine the development of competitive markets as it seeks to introduce an alternative source of flexibility services to compete alongside existing methods.

The Expert Assessors liked the agile approach to project management although the Project management costs were considered on the higher end of what was anticipated. Overall, however, the Project delivery was considered reasonable with a large amount of the cost going towards customer incentives. The Project plan, workstreams and associated work packages appear appropriate in terms of technical focus to provide confidence in delivering the Project's outcomes.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

The Project addresses the Innovation Challenge because of its focus on harnessing the benefits of small-scale flexibility. The Project is focusing on the matching of variable renewable generation with electrified demand, which could be a valuable tool in electricity balancing while also aiding network operators with thermal constraint management. Its proposed Beta Phase activities could enhance the knowledge of, and probabilistic forecasting for, demand-side flexibility to assist with system balancing. Given the likely increasing importance of demand-side balancing with the rise of electrification, the Project could help to deliver strategic value in the transition to net zero.

The Project offers three potential deliverables: the development of probabilistic modelling to enhance forecasting, execution of consumer trials, and the illustration of a potential pathway to Business as Usual (BAU). This aligns with one of the Innovation Challenges' key aims, which is to understand consumers' preferences to inform future market designs which will help to optimise across networks and infrastructures. Furthermore, the Project's approach on low voltage flexibility was considered to be key component in any holistic 'whole system' integration. As a result, CrowdFlex was considered to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has clearly identified a potential to deliver a net benefit for electricity consumers as it has the potential to offer both direct and indirect benefits to consumers. Directly, participating consumers stand to benefit from domestic flexibility, while indirectly, it was recognised that the trials could reduce network costs and prices for all consumers if the flexibility is competitively priced compared to other provisions. The Project has also identified a potential to reduce the capital expenditure for the Electricity System Operator (ESO) and Distribution Network Operators, which could ultimately be reflected in consumer bills. Therefore, the primary benefits to electricity consumers would be financial savings via a reduction in overall bills.

However, there are aspects of the Application which could have been stronger or more clearly set out. Firstly, the benefits outlined through avoiding network reinforcement lack detailed information in the Cost-Benefit Analysis (CBA). This resulted in a lack of certainty about how the value of these savings will be realised by consumers, considering that network planners must take into account reasonable worst-case scenarios where intraday flexibility may not limit maximum demand.

Additionally, the Application could have more clearly set out the potential key limitations of its proposed solution and how these would impact the Project's overall potential benefits. For example, as not all consumers will be able to participate in its consumer trials, greater clarity on how this would impact the

overall consumer benefit would have been welcomed. Moreover, the fact that consumers participating will be able to override the automated action could limit the Project's identified benefits as it could impact planning requirements and the Project's proposed benefit of a deferral of asset replacement.

As a result, we agree with the Expert Assessors' recommendation to include Project-specific conditions for the Funding Party to provide details against these remaining questions. Overall, however, the Project was considered to have clearly identified a net potential benefit for electricity consumers via a financial benefit and we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

The Project was considered to largely demonstrate network innovation in the context of network operations and its overall focus but we did note that greater clarity on why it cannot be funded under the RIIO-2 price control framework would have further benefited the Application.

The primary area of network innovation was in the Project's proposal to improve the ability of network operators to forecast domestic flexibility, which can potentially provide valuable insights for system and network management. This was considered to involve network innovation as it could provide a solution different to the business as usual approach of demand flexibility service. However, we did note that the Application and Project could have provided more clarity on its interaction with DFS and how it distinctly varies from it.

While there was some consideration given the Project's potential alignment with the RIIO-2 price control, as distribution network operators have committed to explore flexibility on high and low voltage networks as part of their planned network upgrades or reinforcements, we do recognise the element of risk and network innovation within the Project are consistent with the aims of the SIF. We also note that the Project's proposed activities could help to disseminate valuable learnings beyond the Project consortium, such as with other distribution network operators and suppliers. This could help to improve the ability of network operators to forecast domestic flexibility and provide services for system and network management.

Overall, however, we consider the Project's focus and the activities set out for the Beta Phase were considered to involve network innovation. The Project could deliver insights on the use and forecasting of domestic flexibility which could provide an alternative to existing business as usual practices and deliver insights which would benefit the electricity sector and its stakeholders. As a result, we consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to undermine, or represent the potential to undermine, the development of competitive markets. The Project has involvement from two flexibility service providers and one non-supplier flexibility provider which gives confidence that the Project's activities will be replicable by other stakeholders in the industry, thereby demonstrating the potential to stimulate the development of new competitive markets. The involvement of two suppliers in the Project will also likely further stimulate competition between suppliers while also supporting consumer choice. We also note the Expert Assessor's feedback that the Project has included as part of its Beta Phase activities a plan to engagement with other flexibility service providers. This provides us with confidence that the Project is not undermining the development of competitive markets.

While greater clarity on how the Project's proposed activities would interact with the existing markets and market offerings would have strengthened the Application, we do not consider the Project's activities to undermine the development of competitive markets. We also agree with the recommendations from the Expert Assessors and will include a Project-specific condition in the Project Direction for it to clearly set out how its activities will interact with other market offerings both during the Beta Phase and in potential deployment to mitigate any potential uncertainty around these activities. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project is innovative, novel, and carries a certain level of risk. It is innovative as it extends beyond the current domestic flexibility services provided, primarily the Demand Side Flexibility (DFS) which is focused on reducing demand during

times of scarcity. It seeks to expand on this offering by providing domestic flexibility on the balancing market and assisting with constraint management, which could lead to a new approach for consumers and network operators. Further, the Project demonstrates network innovation, as incorporating low voltage flexibility is not a typical business as usual practice.

The novelty lies in its approach of combining live trials to test consumer behaviour and subsequently inform the development of probabilistic methodologies. These methodologies aim to improve the forecasting and application of domestic flexibility in Business as Usual (BAU) balancing activities. The Project was considered an extension of existing research and insight, and could lead to greater insights on challenges which have not yet been fully explored. It has the potential to lead to a new approach to managing domestic flexibility and was considered novel in its proposed approach.

We also recognise that there’s inherent risk in its proposed activities because it represents the first attempt at launching a series of domestic flexibility trials. The uncertainty around these trials' outcomes introduces an element of risk that is characteristic of innovation.

Therefore, the Project was considered to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project was considered to include participation from a sufficient range of stakeholders for the activities set out. It includes participation from various stakeholders important to its Beta Phase activities, including DNOs, suppliers, consultant SMEs, and an electric vehicle (EV) technology provider. We also viewed the engagement from Equinox and Powerloop positively, as well as the feedback from the Expert Assessors that the Project plans to engage with additional suppliers and stakeholders during the Beta Phase.

While we consider the participation and inclusion of the stakeholders to be sufficient for the Beta Phase activities set out, we also consider that involvement from additional DNOs and trade bodies would have better strengthened the Application. This would be to primarily ensure that the learnings are disseminated

and that trade bodies' viewpoints can be incorporated into the Project's design and delivery. We do, however, recognise that the Project has set out its plan to disseminate its learnings and to engage with other stakeholders, which helps to mitigate this concern.

Overall, the Project exhibits a sufficient level of participation from various stakeholders for the activities set out and has clearly set out its plan to engage with a wider mix of stakeholders during the Base. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project was considered to provide value for money because we recognise the potentially valuable insights which the Project could deliver on consumer behaviours towards domestic flexibility and how domestic flexibility could operate across the electricity sector. We also note that domestic flexibility is an area which requires further investigation as part of a whole systems transition to net zero and that the Project, as a result, could directly lead to benefits for consumers and networks. Additionally, even though the Project's overall costs were considered on the higher end of what was expected, it was also recognised that the Project is attempting to examine an area which has not yet been examined on this scale, which could result in potentially significant benefits for consumers. Furthermore, it was noted positively that the Project has included an appropriate use and timing of stage gates, with the option for potentially additional trials to help support the certainty of the data collected by the Project.

While we consider the Project to have met this Eligibility Criteria, the overall presentation of its costs and the overall value for money presented by the Project could have been much more clearly articulated in several key areas of its Application. This is an important consideration given the Project's total SIF Funding requested is the second most of the round 1 Beta Phase Applications, and the potential uncertainty of the statistical certainty of the Project's activities to inform future domestic flexibility.

First, it was not clear what the scale of the consumer trials will be and whether they will be sufficient to ensure statistical certainty in the data collected. More

clarity in this respect would help assess the true value of the proposed funding and its potential effectiveness in facilitating the desired outcomes. Second, greater clarity on how the Project will assess the relative value for money of this domestic flexibility solution compared to other sources that address balancing and constraints would have strengthened the Application. Finally, the Project should have more clearly set out how the Project will engage with and inform DESNZ's Flexibility Innovation Programme. This would've provided greater confidence that the Project's insights and learnings could be used in the Programme. We note and agree with the feedback from the Expert Assessors that Project-specific conditions should be included in the Project Direction to ensure the risks identified are mitigated.

Overall, we consider the Project to have met this Eligibility Criteria.

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.

We consider the Project to be well thought through and to have a robust methodology which gives confidence that it will be capable of progressing in a timely manner.

The Project has implemented a number of risk management strategies and processes which suggest a robust and well-planned approach. The use of stage gates within the Project plan helps to manage the potential large costs of the Project. This approach allows for regular check-ins and evaluations, ensuring that the Project continues to provide value and remains on track. We also note positively that the Project seems to have appropriately considered and mitigated the risk of potentially requiring a derogation in the Beta Phase. While there remains some uncertainty around this, the involvement of the Project team and the clear risk register provides confidence that the project will be able to progress effectively and handle any issues that may arise. Additionally, should the Project require a derogation to allow non-half hourly settled assets to be used in the balancing mechanism (as most domestic households are not settled half-hourly), we note that it is not likely to occur until mid-2024, which gives confidence that there is sufficient time for it to be explored.

Additionally, the Project's workstream is well articulated, featuring a detailed gantt chart that provides a clear timeline of activities and milestones. The risk register was also considered to be clearly articulated. This helps to give confidence that the level of planning is sufficient and should reduce the risk of delays, thereby enabling timely progression in the Beta Phase.

Overall, the Project was considered to demonstrate a well thought through plan and robust methodology. The risk register and Gantt chart give confidence in the Project's capacity to progress in a timely manner and to successfully manage and mitigate potential risks. We therefore consider the Project to have met this Eligibility Criteria.

Electricity Projects not selected for funding

SCADENT - Super Conductor Applications for Dense Energy Transmission

Table 11: Project Costs

Cost type	Cost
Total eligible costs (£)	9,374,218
Total contributions (£)	972,999
Total contributions in-kind (£)	73,999
Total SIF Funding requested (£)	8,327,220

Project description

The SCADENT project proposes the innovative deployment of High Temperature Superconductor (HTS) cable technology in urban environments, to provide the increased network capacity required to allow widescale electrification of heat and transport.

HTS cables can have 3-10 times the power density of equivalent conventional cables, meaning they deliver higher capacity at lower voltage levels and via fewer cable routes. Deploying them enables faster network capacity increase, delivering time, cost, and carbon savings.

The Scadent Beta project intends to build a demonstrator 275kV HTS cable to prove the technology to be ready for use on the GB transmission network.

Summary of Expert Assessors' feedback

All Expert Assessors did not recommend this Project be considered for SIF Funding, as they did not consider the Project to have met all the Eligibility Criteria.

The Project was considered innovative and to have addressed the aims of the Innovation Challenge as it proposes developing and demonstrating a novel high temperature semiconductor (HTS) cabling option which would be particularly relevant for increasing network capacity in dense urban areas. This was considered to be a novel technology which has not be demonstrated in the GB transmission network to date. The Expert Assessors also did not consider this Project to undermine the development of competitive markets because there is currently no

market for this technology in the GB network industry and the proposed activities did not undermine the development of competitive markets.

Whilst the Expert Assessors acknowledged that the Project represents a potential benefit to electricity consumers through the reduction of future costs of transmission cable installations and network reinforcement when compared to current approaches and technologies, they did not consider the Project to have demonstrated a clear pathway to incorporation beyond the Beta Phase and considered the potential application or target market for its proposed approach to be limited. Therefore, the Expert Assessors did not consider this Project to have identified a clear benefit for electricity consumers or to provide good value for money.

The Expert Assessors also did not consider this Project to include participation from a sufficient range of stakeholders for the activities set out in the Beta Phase but noted that participation from transmission operators would have strengthened the application. The Expert Assessors considered the role of transmission operators to be key in supporting scalability in GB. The Expert Assessors that either participation in the Project or in an advisory group from transmission operators would have strengthened the Application through more informed scoping of the proposed trials as well as dissemination. Additionally, although the Project acknowledged it had interacted with some distribution network operators, their lack of participations in the Project was also considered to limit the potential scalability of the innovation.

Additionally, the Expert Assessors also noted that the Project would have benefitted from exploring other use cases in the Beta Phase. The Expert Assessors considered the use cases to be limited and therefore did not consider the Project to have sufficiently identified a net potential deliver for electricity consumers.

Ofgem funding decision: SIF Funding not approved

Ofgem assessment of Application

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

We agree with the Expert Assessors and consider the Project to have met this Innovation Challenge because its focus on the development of high temperature semiconductor cabling option aligns with one of the Innovation Challenge's aim of improving coordination of emerging innovations across networks, generators, and market participants. Furthermore, the Project is aligned with several of the Innovation Challenge's scope areas, such as current and future needs of energy provision, coordinating energy transmission and distribution, and novel approaches of infrastructure investment. The Project's proposed development of high temperature semiconductor cabling is innovative in being a first of its kind trial and presents the opportunity to reduce network constraints in dense urban areas and reduce the costs of installation against the existing alternative.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

We do not consider the Project to have clearly identified potential to deliver a net benefit to electricity consumers. While the Project sets out that it could reduce the future costs of transmission cable installations and the frequency of constraints, the Project has not sufficiently demonstrated how the activities in the Beta Phase will progress to business as usual. The Project sets out that additional activities would be required beyond the Project's proposed Beta Phase activities before it could potentially be incorporated into business as usual. We considered this to limit the potential of the Project to deliver a net benefit to electricity consumers.

Additionally, the Project presents limited use cases for the technology in GB's electricity networks as the market size for the innovation was not sufficiently clear. We also note that the proposed use of the cabling would only be useable in certain circumstances and the potential for uptake by the transmission operators in the UK is unclear, further limiting the potential use cases and the potential to deliver a net benefit to electricity consumers. As such, we do not consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

This Project involves network innovation because it proposes a first of its kind trial for AC transmission with high temperature semiconductor cabling transmission and

installation for the distances and voltages set out in the Beta Phase. The Project's proposed innovation could support greater electrification with fewer cable routes over the existing approaches to increasing network capacity.

Furthermore, we considered the Project to involve network innovation because the proposed project will require investigation, development and demonstration of the technology for integration. For example, the Project will require testing of the cable and its cooling technologies, and for integration with the electricity grid, and will require the development and testing of new standards for installation, operation and maintenance. While we recognise that additional activities of investigation and demonstration will likely be required beyond the Beta Phase, the Project's proposed activities for the Beta Phase demonstrate network innovation with its first of a kind trial.

The Project's proposed use case also involves network innovation over existing approaches as it could reduce the emissions, disruptions and constraints in dense urban areas. The Project's proposed use of the cabling could therefore support greater electrification in dense urban areas within GB.

We therefore considered the Project to have met this Eligibility Criteria.

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

We do not consider the Project to undermine the development of competitive markets because the Project sets out a first of its kind in GB trial and, as a result, there is currently no market for this technology in the GB electricity network. The Project also states in its Application that any GB transmission procurement of HTS technology would be subject to competition, which gives confidence that the Project would not undermine the development of new competitive markets should the Project be successful.

We therefore consider the Project's proposed activities to have the potential to develop and stimulate additional competitive markets for high temperature semiconductor cables, including their supply chain for development and producing the cabling, and for the installation and monitoring activities associated with the cabling.

We consider the Project to have met this Eligibility Criteria.

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

The Project sets out an innovative, novel and risky approach to the Beta Phase because it is testing a novel first of its kind trial in GB for AC transmission with high temperature semiconductor cabling, which have not yet been proven for use in GB's transmission network. Additionally, the Project's focus on testing the technology as well as the aging of it was considered innovative as it could support a better understanding for how the proposed technology will function if deployed.

Like the Expert Assessors, we would have welcomed additional use cases and research and development activities in the Beta Phase. We note that the use cases the Project proposes testing are limited and therefore additional use cases would have strengthened the potential innovation, novelty and risk in the project. Furthermore, the Project has noted that the proposed technology will require additional testing and development beyond the scope of the Beta Phase, which limits the potential innovation in the Project as additional activities will be required for it to be incorporated in GB's transmission network. However, we note that the findings and learnings from this Project could help inform additional projects.

Overall, we considered the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

While the Project brings together a wide group of stakeholders for the Beta Phase activities, we do not consider the Project to have participation from a sufficient range of stakeholders for the Beta Phase. A central focus of the Beta Phase is on the building, operation and/or deployment of the solution to the Problem the Project has identified. While the Project has brought stakeholders for the Beta Phase activities set out, we considered the Project to be missing participation in the Project from other GB transmission operators.

We agree with the Expert Assessors that, without the participation of other transmission networks in the Project, the demonstration potential of the Project is limited and is a risk to the Project's activities. This is because it does not provide confidence that the Project's solution to the Problem will be easily replicable or

incorporated into transmission networks operated by other transmission networks operators beyond the Beta Phase's activities. Additionally, the combination of the Project's specific use case and the lack of participation from other transmission network operators, further limits the potential use cases of the Project activities.

We also agree with the Expert Assessors that participation from distribution network operators would have strengthened the Application as it would have provided the Project with a wider group of stakeholders which could inform the Project's developments, its use cases, and the potential scalability of the solution.

Overall, we did not consider the Project to have met this Eligibility Criteria.

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

We did not consider the Project to have met this Eligibility Criteria as the Project did not provide sufficient details on the solution's potential use cases and costs for us to have confidence that the Project is providing value for money and is costed competitively.

On the Project's value for money, it did not sufficiently set out what the potential market size or scalability for the proposed solution to the Problem would be. We also note that the Project will require additional activities beyond the Beta Phase for the proposed solution to be incorporated into business as usual by the Funding Party and other network users. A central focus of the Beta Phase is on deployment of the solution, but without a clear understanding of the potential deployment opportunities or scalability, we did not consider the Project to be providing value for money. Additionally, the Project did not provide sufficient clarity on the wider whole system benefits its proposed solution could bring, which limited the evaluation of the potential value for money from the Project.

On the Project's costs, we did not consider it to have provided sufficient justification for some of its costs to have confidence that it is costed competitively. We note that some of the costs set out where higher than the industry norms, for example around labour costs, and did not consider the Project to have provided sufficient justification for these costs. While costs higher than industry norms does not automatically exclude a Project from meeting part of this Eligibility Criteria,

without sufficient justification for the higher costs Projects are likely to be considered to not be costed competitively.

We therefore do not consider the Project to have met this Eligibility Criteria.

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.

While we considered the Project to have provided a gantt chart with a sufficient level of detail and the use of stage-gating to be appropriate to mitigate certain risks, we did not consider the Project to have provided sufficient detail in certain key areas of its Application for us to have confidence that it was well thought through and that it would be capable or progressing in a timely manner.

We considered the Project plan to lack sufficient detail in several key areas. The work packages and milestones set out for the Beta Phase were considered limited in their scope and detail. Furthermore, there was a lack of clarity on if the Funding Party was accountable for sign-offs at specific stages of the Project, or which Project Partner was accountable for specific milestones, and the resourcing requirements from each Project Partner for milestones. We considered the Project to lack detail in its overall planning and to be in need of additional planning and development prior to it reaching demonstration.

Additionally, we considered the Project's risk register to be missing key risks to the Project, such as integration of the solution into GB's transmission network. A more developed and clearer risk register and mitigation options would have strengthened the Project's Application.

Overall, we did not consider this Project to be sufficiently well thought through and to have a sufficiently robust methodology for us to have confidence that it would be capable of progressing in a timely manner in the Beta Phase. As a result, we did not consider the Project to have met this Eligibility Criteria.

Annex 2: Application assessment - Innovation Challenge: data and digitalisation

Chapter 2 of this document provides detail about the scope of the Innovation Challenge: data and digitalisation, as well as summarising the total number of Projects funded and total value of SIF Funding awarded for the Alpha Phase of round 1.

This annex details our assessment and decisions on Applications submitted in response to that Innovation Challenge. Our assessment of each Project is set out within:

- Pages 62 – 83 set out our assessment of each gas Project that has been selected for funding, together with our decision.

- Pages 84 – 97 set out our assessment of each gas Project that has not been selected for funding, together with our decision.

- Pages 98 – 104 set out our assessment of each electricity Project that has been selected for funding, together with our decision.

- All electricity Projects which Applied to this Innovation Challenge for the Beta Phase were successful.

Gas Projects selected for funding

Digital Platform for Leakage Analytics

Table 12: Project Costs

Cost type	Cost
Total eligible costs (£)	12,068,514
Total contributions (£)	2,572,038
Total contributions in-kind (£)	3,380,000
Total SIF Funding requested (£)	9,496,476

Project description

The Digital Platform for Leakage Analytics (DPLA) Project aims to develop and demonstrate a Prototype for how data, analytics and models can be used to identify and locate gas leaks in the gas distribution network. The core functionality of the DPLA is data-driven leakage modelling, unlocking proactive leak detection capabilities, combined with testing the application of novel gas sensor technologies. Thus, creating opportunities to reduce the reliance on and cost of in-field specialised sensors. Shaping the future network, the DPLA's mission is to reduce carbon emissions, realise customer benefits and improve safety in a cost-effective way. The overarching DPLA deliverable is the demonstration of the viability of the completed system of models, combining upgraded modelling capabilities with innovative leak sensor technologies to detect, localise and characterise gas leaks.

DPLA's innovative nature consists of enhanced network coordination, reduced operational complexities, and improved user experiences, all evidenced via a key project output: the user interface. The user interface will enable Cadent's workforce to view and interact with leakage data quickly, easily, and effectively. Outputs will include real-time alerts of critical leaks, visual heatmaps, reports of calculated leakage emissions by period, region, and asset, and more.

Bringing together all of Great Britain's distribution networks, National Gas Transmission, regulatory bodies, governing bodies (such as the Health and Safety Executive) and more will realise cross industry collaboration as they work towards a common mission. By combining upgraded modelling capabilities, the project will deliver the next generation of user driven digital processes accelerating progress in

methane leakage detection, as well as unlock opportunities across hydrogen leakage detection. The DPLA will directly improve data monitoring and insights improving efficiency and resilience of the networks.

Summary of Expert Assessors' feedback

All Expert Assessors have recommended this Project be considered for SIF Funding as it was considered to have met all the Eligibility Criteria. The Project is considered to have addressed the Innovation Challenge by improving data monitoring for gas networks, enhancing efficiency, safety, and resilience. It has the potential to replace the current shrinkage and leakage model, contributing to the transition towards net zero. The reduction of gas leaks, particularly focusing on 'super emitters,' offers cost savings to consumers via financial benefits and environmental benefits. The Expert Assessors considered the cost benefit analysis to be robust and to have clearly identified the potential to deliver a net benefit to gas consumers.

The Project is recognised as network innovation, employing new techniques to model the gas network and track leakages. The Project is acknowledged as novel and innovative, presenting risks associated with live network testing and the need for regulatory and operational changes. The proposal to replace the current Shrinkage and Leakage Model was viewed favourably by the assessors, and there is a recommendation for ongoing governance, collaboration, and agreement across networks as well as alignment with regulatory support from Ofgem to avoid fragmentation and ensure a successful transition.

The Project is not seen as undermining competitive markets but rather creating new opportunities for technology developers in leak detection and mitigation.

The Project Partners are considered sufficient, combining gas network and digital expertise, and the engagement with other networks, consumers, and regulators is noted favourably. Improvement in communication materials is suggested. The project is deemed to deliver value for money and to be costed competitively but noted that the Project could have more clearly justified its overall costs.

Finally, the Expert Assessors considered the Project's methodology robust, with a clear explanation of risks and appropriate stage gates in the delivery plan. Regular

engagement with Ofgem is recommended by the Expert Assessors as a condition of receiving funding, to ensure regulatory support is available and to overcome potential barriers.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

The Expert Assessors considered this Project to have addressed the Innovation Challenge because it aims to leverage data and machine learning to improve the management of gas escapes. This innovative approach not only targets the enhancement of system efficiency but also considers wider safety and environmental benefits from gas escapes. This directly aligns with one of the main aims of the Innovation Challenge, which is to improve data monitoring, availability, quality, collection, interoperability to increase consumer choices and improve the efficiency, security and resilience of networks. Additionally, the Project directly aligns with several of the key scopes of the challenge, such as how to improve the visibility of infrastructure and assets, and novel uses of data and digital platforms to improve network planning, modelling and forecasting capabilities. As a result, the Project met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project was considered to have clearly identified potential to deliver a net benefit to gas consumers primarily through a reduction in emissions and payments related to constraints and an increase in network efficiency and reliability due to less time likely being required to identify and fix gas leaks on the network. With 7% of the UK's greenhouse gas emissions coming from methane, the Project presents a proposed solution for reducing these environmental impacts while reducing costs to consumers. We considered these to represent both environmental

benefits and financial benefits to consumers and these contribute to demonstrate a clearly identified net benefit to gas consumers.

However, we do note that the presentation of these benefits could have been more clearly communicated. The Application could have provided greater clarity, as it is unclear how it takes into account any decline in usage of the gas network and whether the cost estimates are based only on a roll out across Cadent's network or all of GB.

Despite these uncertainties, the Expert Assessors concluded that the Project does demonstrate a clear potential to deliver a net benefit to gas consumers, meeting this Eligibility Criteria. However, they recommend a more thorough and clear articulation of these potential benefits in future stages of the Project.

Eligibility Criterion 3: Projects must involve network innovation.

This Project shows clear network innovation. The proposed data-driven approach to detect and locate gas leaks represents a new approach from the current practice of the Shrinkage and Leakage Model (SLM). It showcases a more proactive and nuanced approach compared to the broader measures currently employed under the SLM.

While the individual components of the Project, namely the data analysis and sensor tools, might not be considered innovative on their own, the combined use of these elements in this context is indeed innovative. Their integration creates a unique approach to measure gas shrinkage and leakage which has the potential to enhances the efficiency and effectiveness of managing gas leaks. If the Project's proposed solution is successful in the Beta Phase, it could redefine current methodologies and establish a new standard for how these shrinkages and leakages are approached.

Given these points, we considers this Project to have demonstrated network innovation, thus fulfilling this Eligibility Criteria.

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

The Project does not represent the undermining nor the potential to undermine the development of competitive markets. Notably, all Gas Distribution Networks (GDNs) are Project Partners in the Project, which is a positive sign for its potential future implementation should the Project's Beta Phase activities be successful. The broad involvement of GDNs also indicates strong buy-in and collaborative engagement.

Additionally, as the Project is focused on the development a new standard for measuring gas shrinkage and leakage in the gas networks, the broad involvement from all GDNs demonstrates that the potential benefits which could go beyond just the Funding Party and instead improve practices across the sector.

Therefore, we consider this Project to meet this Eligibility Criteria. It does not undermine the development of competitive markets but instead brings together the GDNs for the potential development of a new standard which could result in benefits for consumers and gas networks.

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

We agree with the Expert Assessors and consider this Project to be innovative and novel. The Project is innovation because it proposes development of a new approach to how shrinkage and leakage are reported on by gas networks. Its proposed approach, if successful, could result in a benefits for consumers and gas networks through reduced disruptions to the network, a reduction in methane emissions and greater overall network efficiency and resiliency. This approach was also considered novel but it proposes a data-driven approach to solving its identified Problem. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project includes participation from all Gas Distribution Networks (GDNs), which is a significant factor in meeting this Eligibility Criteria. This wide involvement indicates a broad acceptance and commitment to the project within the industry, which we considered to strengthen its potential for success. It's also notable that the Project has set out its plans to engage with Ofgem throughout the Beta Phase.

This will help to ensure that the learnings from the Project can be captured and can inform future regulatory developments, such as those proposed by the Project's proposed solution. However, we did note that participation and engagement from smaller industry stakeholders, such as independent GDNs would have strengthened the Application by potentially adding additional perspectives. Overall, however, Ofgem considers the Project's stakeholders and their participation to be sufficient for the Beta Phase activities set out and considers the Project to have met this Eligibility Criteria.

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

The Project demonstrates value for money and is costed competitively because overall costs of the activities set out are appropriate and the costs of the Project Partners were considered appropriate. We note positively that the Project's proposed focus on changing how shrinkage and leakage is monitored and calculated could result in a more proactive approach which could lead to efficiency gains and cost savings over time. We also note positively the contributions from all the GDNs involved in the Project, which demonstrates a commitment to the Project and its proposed solution.

We did note several areas where the Application would have been strengthened with additional clarity. For example, the Project could have more clearly set out its estimated costs of a roll-out of its proposed solution across GB networks. Additionally, we note the comment from the Expert Assessors that the Project could have more clearly articulated its overall anticipated costs for the Beta Phase activities. While the costs set out in the Application were considered to represent value for money and to be costed competitively, the Project could have more clearly set out what its actual expected costs for the Beta Phase activities are, recognising that the SIF format does not allow for additional contingency spending should it be required.

Overall, however, we consider the Project to demonstrate value for money and to be costed competitively. The overall costs of the Project, the work packages and the SIF Funding requested by the Projects, combined with the contributions, were considered to provide value for money and to be costed competitively.

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.

The Project has illustrated a well thought-through plan and robust methodology that gives confidence it will be capable of progressing in a timely manner, thereby meeting this Eligibility Criteria. The Project provides a clear Project plan, which is supported by detailed milestones and stage-gates. Each stage is costed and there is a thorough assessment of risks incorporated, providing confidence that the Project's approach is robust and will be able to mitigate potential challenges. We noted positively the use of stage-gates to review model development and sensor deployment following trials. This provides confidence in the robustness of the Project's methodology and will support periodic review and adjustment opportunities, we consider to contribute to its capacity to progress in a timely manner in the Beta Phase.

While we have confidence in the Project's approach to the Beta Phase, the Application could have been strengthened by including greater details on what will be required following the Beta Phase, should the Project be successful, to ensure deployment and incorporation in business as usual activities. We are confident, though, that the Project's approach to its plan, milestones and stage gating will enable it to progress in a timely manner in the Beta Phase. We therefore consider the Project to have met this Eligibility Criteria.

Intelligent Gas Grid

Table 13: Project Costs

Cost type	Cost
Total eligible costs (£)	6,304,121
Total contributions (£)	231,597
Total contributions in-kind (£)	438,387
Total SIF Funding requested (£)	6,072,524

Project description

Gas distribution networks (GDNs) are facing massive change as they develop strategies for net-zero. At the same time, they aim to reduce methane emissions and to improve operational efficiency and customer service still further. This project will develop and bring to market new digital technologies to address these challenges.

The current level of technology in the network, which includes significant manual intervention, is no longer sufficient to deliver the changes needed. Pressure management is critical to lower methane emissions. Pressures are being managed as low as possible with current technology, but new solutions are needed to bring pressures down still further minimising emissions.

The way the network is operated is also changing. In the past there were a small number of entry points for North Sea gas. But now there are multiple entry points for biomethane into lower pressure tiers in the network. The current manual pressure control of these networks can lead to biomethane plants being unable to feed in during certain times of the year. This can lead to wasteful flaring of the biomethane. Automated control of these networks is required to maximise the feed-in potential of these plants.

This project develops new applications using the data collected by the pressure management systems together with machine learning and AI to detect anomalies in the network such as water ingress, gas escapes, low pressure events, malfunctioning governors etc. Currently, these anomalies require manual

intervention to diagnose and to resolve. Faster diagnosis and remote or automated resolution of the problem will lower operating costs and improve customer service.

The increased ability to intelligently monitor and control the networks will be an essential enabler for the conversion of the networks to hydrogen.

This project builds on the successful NIA project carried out by SGN and Utonomy to develop new pressure management and control systems. These systems are now being rolled out in SGN's Southern network.

Using Utonomy's remote control pressure management system as the enabling technology, the project will collect and use network data alongside external data such as weather to develop machine-learning and artificial intelligence applications that optimise network pressures for methane emissions reduction, increase biomethane injection capacity and diagnose and remotely resolve network anomalies. The project is highly innovative because the use of machine-learning, in conjunction with low-cost, scalable computing power enables a step-change in the monitoring and optimisation that is possible in the operation of gas distribution networks.

Summary of Expert Assessors' feedback

All Expert Assessors have recommended this Project be considered for SIF Funding and considered the Project to have met all the Eligibility Criteria.

The Expert Assessors consider the Project to have successfully addressed the Innovation Challenge by utilising machine learning technology to predict changes in network demand response using external predictive factors. The Project offers various routes to save carbon and cost, targeting methane leakage reduction, biogas injection optimisation, overall network operational cost reduction, and carbon emissions reduction. The Expert Assessors all considered this approach to have the potential to lead to a more efficient gas network and a decreased carbon impact.

The Expert Assessors acknowledge that the Project involves network innovation, as it aims to develop a distributed AI solution that does not exist commercially. They believe that the use of Internet of Things (IoT) and AI technologies in load balancing and pressure regulation across the network is innovative and will enable

the participating networks to make better use of data and machine learning techniques.

The Expert Assessors have considered the impact on competitive markets and did not consider the Project to undermine their development. The Project's Application states that relevant network data can be made available to potential new market entrants, fostering the development of competitive solutions. However, they suggest providing more details on potential duplication between the Intelligent Gas Grid and other initiatives to ensure value for consumer funding. There are concerns regarding the funding primarily benefiting the project's developer, Utonomy.

The involvement of stakeholders is considered sufficient, with meaningful contributions from Utonomy, Faculty, DNV, and the sponsor organisations. However, the Expert Assessors noted that greater involvement from internal stakeholders within SGN and other GDNs, and consideration for the perspective of a telecom's operator for resilience issues would have strengthened the Application. While greater involvement from other GDNs was not considered to be crucial in the Project, the Expert Assessors recognised an importance for the Project to share and disseminate its findings with other GDNs and in telecom formats. As such, a Project-specific condition has been added to its Project Direction to around engagement with telecoms and dissemination.

Overall costs of the Project were considered reasonable and were considered to provide value for money and be costed competitively, although the assessors noted greater justifications, such as for the higher than anticipated costs for some of DNV's costs and Utonomy's subcontractor rates, would have strengthened the Application. The Expert Assessors also recommend providing more information on alternative approaches and cost advantages of an open procurement model. However, the Expert Assessors did consider the Project to be delivering value for money and to be costed competitively, with demonstrated benefits to customers and financial savings to the gas distribution networks.

The methodology of the Project was considered robust, with a well-thought-out Project plan, milestones, and expertise. The assessors did note that establishing data availability earlier and breaking down aspects of the Project into manageable

milestones would have strengthened the Application and made it easier to understand.

The Expert Assessors did raise some concerns about the concentration of commercial IPR by one technology provider but were reassured that the Application states that relevant network data can be made available to potential new market entrants, which they considered to foster the development of competitive markets. The Expert Assessors have also recommended a Project-specific condition for the publishing of data from the Project to further support the development of competitive markets.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

We consider the Project to have addressed the Innovation Challenge through its exploration of automated pressure management and enhanced potential for biomethane injection. The Project aligns with the Innovation Challenge by presenting solutions for more efficient, environmentally friendly network operations, and increased integration of renewable energy sources, such as biomethane, into the network. This is directly aligned with one of the aims of the Innovation Challenge, which is to improve the data monitoring, availability, quality, collection, interoperability, access and insights to improve the efficiency, security and resilience of networks. Additionally, the Project's focus on reducing methane leakage corresponds directly with the strategic objectives of the SIF, one of which is to accelerate the transition to Net-Zero. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

This Project presents a clearly identified potential to deliver both environmental and financial net benefits to gas consumers. The Project’s proposed solution has the potential to reduce methane emissions and increase network efficiency. By

focusing on gas escapes, this Project has the potential to contribute to a reduction in greenhouse gas emissions, directly translating into environmental benefits for customers.

The Project has also clearly identified potential to deliver a net benefit to gas consumers through cost savings. The cost savings could be realized in the proposed reduction of costly and time consuming manual interventions. This not only provides a direct financial saving but also has the potential to enhance network efficiency by reducing downtime associated with these interventions. This has the potential to reduce the costliness of interventions, thereby resulting in cost savings for gas consumers. Furthermore, the potential network efficiency improvements have the potential of decreasing maintenance costs in the long term, a saving that could be passed onto consumers.

Additionally, it was recognised that the Project could also benefit biomethane producers. Currently, biomethane injection is curtailed and gas flared when pressure in the network is too high. The Project has the potential to reduce this flaring and lead to a more consistent use of biomethane in the network.

Therefore, overall, this Project meets Eligibility Criterion 2, as it identifies clear potential to deliver net benefits, both environmental and financial, to gas consumers.

Eligibility Criterion 3: Projects must involve network innovation.

The Project clearly involves network innovation, as demonstrated by its unique approach and potential impact on the network system. The Project's proposed solution demonstrates network innovation by potentially transforming how network pressure management is approached. The proposal to shift from a largely manual approach to a dynamic, data-driven one represents a distinct change in network operations. This change could lead to efficiency gains and strategic advancements within the network infrastructure.

Currently, the system in use depends heavily on manual intervention. The Project proposes a forward-thinking solution that leverages a machine learning environment. The Project's proposed solution demonstrates network innovation in

its approach and also carries potential benefits for the gas network in terms of efficiency, accuracy, and reliability.

Furthermore, we noted that the Project's proposed solution does not overlap with other RIIO-2 activities, providing confidence that its focus goes beyond business as usual activities and is not duplicating existing activities.

As a result, we consider the Project to have met this Eligibility Criteria because it is demonstrating network innovation which would change to how network pressure management is approached and does not overlap with RIIO-2 activities.

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

We do not consider the Project to undermine the development of competitive markets. Firstly, we do not consider the Project to undermine the competitiveness of the market because it proposes a new approach to monitoring the gas system with the inclusion of AI. This has the potential to create opportunities to develop competition in how network pressure management is approached.

We also note positively the Project's commitment to making data available to potential new market entrants, which we consider an important aspect of ensuring that the Project does not undermine the development of competitive markets. By sharing its insights and findings, the Project could encourage further innovation and encourage new entrants to enter the market.

Furthermore, we acknowledge the comments made by the Expert Assessors regarding Utonomy's Intellectual Property Rights (IPR), which includes both hardware and software components of the Project. We agree with their recommendation that the Project should publish and disseminate its insights, and will include a Project-specific condition for the Project to publicly disseminate its findings, learnings and overall approach.

Overall, however, the Project does not undermine the development of competitive markets. It has the potential to enhance competitiveness by providing beneficial data and promoting efficiency within the network. The sharing and dissemination of the Project's activities will be key in ensuring that new entrants can enter the market. As such, the Project was considered to have met this Eligibility Criterion.

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

The project has met this Eligibility Criterion as its approach was considered to be innovative and novel.

The Project's proposed solution sets out a novel approach by integrating network data and external data, such as weather data, with AI to predict load requirements and control the system accordingly. This proposed unique blend of AI and meteorological data in a network management context is a potential departure from existing methods and qualifies as innovation. The application of machine learning to anticipate changes in network response based on external data, such as weather, exemplifies the innovative nature of this Project. Leveraging predictive analytics in such a way holds the potential to increase efficiency and accuracy in network pressure management. Furthermore, the Project's focus on digital monitoring of the gas network with an incorporation of AI could also support a shift to a future hydrogen network, which relates to one of the aims of the SIF, supporting the transition to net zero.

For biomethane injection, the current system depends on manual seasonal adjustments. The Project's proposed solution has the potential to result in remote pressure control and machine learning capabilities for multiple entry points. This could increase the efficiency and reliability of biomethane injection.

As such, the Project was considered to have met this Eligibility Criterion

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

We consider the Project to demonstrate an appropriate and varied range of stakeholder involvement for the activities set out at the Beta Phase.

We agree with the Expert Assessors that the Project includes participation from a wide range of gas networks and subject matter experts. The Project includes a wide mix of GB GDNs and includes DNV for the trial and Utonomy for development of the tools and software. This gives confidence that the stakeholder mix and activities have been appropriately scoped for the Beta Phase activities set out.

While we note the involvement of the GDNs in the Project, we also recognise that Project is primarily being delivered by DNV Services and Utonomy. We agree with the Expert Assessors that greater involvement from the Funding Party and the GDNs in leading the Project would have strengthened the Application. We also agree with the Expert Assessors that, given the cloud-based nature of the Project, involvement from telecommunications operator would have strengthened the mix of stakeholders in the Project by providing insights into the proposed solution. To help mitigate this risk, we will include a Project-specific condition in the Project Direction for the Project to engage with telecommunications operators and forums.

Overall, however, we consider the Project to have met this Eligibility Criteria as the mix of stakeholders in the Project aligns with the activities set outs.

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

We agree with the Expert Assessors and consider the Project's overall costs to demonstrate value for money and that the Project's costs have been costed competitively. We note positively the discounted purchase prices for the use of equipment in the Beta Phase, which we considered to be providing value for money. The Project's proposed solution was also considered to represent the potential to deliver benefits to consumers and gas networks, and gas networks users, which helps support the value being provided by the Project. Additionally, the Project's overall costs and the costs of the Project Partners were considered sufficient for this Eligibility Criteria to have been met because they were considered aligned with industry norms.

However, we noted several instances where the Project's Application could have been stronger. Firstly, the Project could have provided greater clarity and justification on some of the costs which were higher than anticipated while still being aligned with industry norms. Additionally, greater contribution from Utonomy towards the Project would have strengthened the Application as the Project represents an opportunity for it to further its learnings and offerings in this area. However, overall, we consider the Project to have met this Eligibility Criteria.

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.

The Project demonstrates a well thought through, detailed, and clear methodology, which gives confidence to its timely progression in the Beta Phase.

The Project methodology was considered sound with a clearly set out plan, which is further reinforced by detailed milestones and stage-gates. Each stage-gate is costed and provides a sufficient level of detail. The Project also provides an in-depth assessment of risks, providing confidence that the Project should be able to mitigate risks which may arise in its Beta Phase activities. We also noted positively that the Project has provided clear success criteria, which provides further confidence that the Project will be capable of progressing in a timely manner. However, we do note that the Project could have more clearly articulated its implementation timescales and the assumptions included it, but we note that this is beyond the scope of the Beta Phase. Overall, however, we consider the Project to have provided sufficient details in its Project plan and risk register to have confidence that it will be capable of progressing in a timely manner for the Project to be considered to have met this Eligibility Criteria.

Predictive Safety Interventions

Table 14: Project Costs

Cost type	Cost
Total eligible costs (£)	1,189,696
Total contributions (£)	111,438
Total contributions in-kind (£)	7,532
Total SIF Funding requested (£)	1,078,258

Project description

According to HSE annually released statistics, at least 10,000 working days were lost to injury in the wider utility sector in the 21/22 financial year, with the estimated cost of fatal and non-fatal injuries more than £160m. The Predictive Safety Interventions project (PSI) has a clear and direct target to prevent the occurrences of fatal and non-fatal injuries, which will reduce the cost of operating energy networks, a direct objective and aim of the SIF challenge for Data and Digitalisation.

Through the Discovery and Alpha phases, FYLD Limited and Southern Gas Networks (SGN) partnered to produce an artificial intelligence model to enable Predictive Safety Interventions. The predictive model is trained on safety indicator event data, and previous near-miss and injury occurrences, to accurately forecast the likelihood of an injury occurring to a fieldworker.

The Beta project phase will develop this model further, increasing data inputs into the model to include human behaviour factors. We will integrate fatigue levels into the predictions, and test and research the ability to detect changes in voice tone or pitch as an indicator of how human behaviours impact safety events. We will also integrate live network data, such as traffic and roadworks, alongside further development of the object-recognition model, including pioneering research to detect non-compliant control measures.

The project will build the capability to deliver an AI powered personalised intervention pushed directly into the hands of field teams and their remote managers at the point of starting work, and dynamically doing so as the workday

progresses. This will enable the near-automation of sharing of learning from previous safety indicator events, including near misses and injuries, directly to the front-line on high-risk activities. The project will then progress to deploying the prediction model to all of SGN field operations to successfully reduce safety incidents.

Successful delivery of this project will see a market-leading AI model to predict on site incidents before they happen and power an intervention to prevent them occurring. This will deliver a reduction in fatal and non-fatal injuries in the sector and will reduce the cost of operating energy networks from eliminating the associated cost of injuring and killing our workforce.

Summary of Expert Assessors' feedback

All Expert Assessors have recommended this Project be considered for SIF Funding as they considered it to have met all eight Eligibility Criteria. The summary of the Project was well presented and effectively highlighted the main points and key areas of innovation within the proposed solution. The Application effectively captured how the innovation justification was satisfied, emphasising that the proposed solution represents a move towards utilisation of AI and machine learning, replacing traditional manual methods of information capture with new technology to enhance safety and efficiency. The main benefits derived from the project being reduced disruption, savings for end user and safety for employees were well articulated. The speed these benefits would be realised was recognised as one of the positive aspects of this project.

The Project plan was well received, with clear planning and methodology. The expert assessors suggested the incorporation of a stage gate in January 2024 (between Human behaviours & voice research and scaled planning for demonstration on the Project's gantt chart) with a deliverable for an outline data ethics employee contents and due diligence 'report'. The stage gate panel should include representation from internal employees and unions representation from SGN and other networks. The new deliverable and project specific condition was considered to help mitigate against any concerns in relation to data ethics and ensure ongoing employee involvement, which the Expert Assessors identified as important. A special condition in relation to convening an internal working group

(within SGN) to hear concerns and directly receive feedback from user operatives would be able to supplement the report in the deliverable.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

The Project directly aligns with the Innovation Challenge set by Ofgem. It addresses the challenge by utilising advanced analytics, including artificial intelligence and machine learning methodologies, to improve field processes and enhance overall safety measures in the sector. The Project's proposed solution is to use these innovative technologies to predict potential safety incidents and consequently prevent them, which could lead to increased network efficiencies through the use of data. This relates directly with one of the aims of the Innovation Challenge, which is to deliver the next generation of user driven digital products, services and process which span across networks and other organisations. As a result, we consider the Project to have addressed the Innovation Challenge through its use of advanced analytics and of data and digital technologies. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has clearly identified potential deliver a net benefit to gas consumers, as well as electricity consumers, through increased network efficiencies which could lead to a reduction in time lost due to incidents and thereby result in a financial benefits to consumers. We also note the potential for large benefits to gas and electricity networks and field operators through increased safety measures.

The Project has identified that its proposed solution could result in a 20% reduction in safety incidents. This would result in a significant reduction in lost time due to safety incidents and instances where consumers are off supply, which would result

in potential increases to the efficiency and overall operations across sector, directly translating into tangible benefits for consumers. By reducing the incidence of these events, the Project has not only identified its potential to support a safer working environment for field operatives but also a potential to contribute to the overall efficiency of service delivery. However, we do note that the overall presentation and articulation of the benefits of the proposed solution to consumers could have more clearly set out in its Application. However, overall, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

The Project involves network innovation in its approach to leveraging real-time data and advanced machine learning algorithms to predict safety risks and enhance workforce protection. Its proposed solution represents network innovation in its use of data analytics for operational health and safety. It goes beyond conventional health and safety management practices by not only modelling and predicting risk but also proactively communicating these findings to on-site staff. This focus on real-time, personalised risk communication represents network innovation in health and safety management. The use of AI in risk reduction was considered an innovative approach towards enhancing safety, and its application could set result in new health and safety management benchmarks.

While we note that within the electricity sector there may be work underway under RIIO-ED2 to improve field operator safety, the PSI project has a distinct focus on the gas sector, which operates under unique systems and constraints. The sector's different safety challenges and risk factors to those in the electricity sector mean that this Project involves network innovation within the gas sector.

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

The Project represents the potential to build and enhance the UK's expertise in advanced analytics for the gas sector and the wider utilities sectors. By refining and implementing machine learning techniques to predict safety incidents in real-time, the project was considered to have an innovative approach that has the potential to be deployable throughout GB and internally. Furthermore, the cross-sectoral applicability of the Project's insights and learnings was considered to

represent an opportunity to develop competitive markets. While the current project is specifically targeted towards the gas sector, the principles and methods being developed could readily be translated to the electricity sector, for example, and beyond. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project offers an innovative and novel approach in the application of Artificial Intelligence (AI) to safety risk prediction within the gas sector. While there are already models which leverage AI to predict safety risks based on historical accident data, this project goes beyond this by integrating machine learning methodologies to real-time field data. This was considered to be an innovative and novel approach to use AI capabilities. We also noted that, while this project may not appear to involve 'network innovation' in a traditional sense, the application of AI to improve real-time safety measures is indeed a novel and innovative approach in network operations. Through the effective use of AI and machine learning, the Project has the potential to materially reduce safety risks within the field. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The mix of stakeholders and their participation in the Project was considered sufficient for the activities set out. We note positively that all partners are involved in the project planning and deployment stages of the Project and the work packages align with skills and expertise of the partners. Furthermore, the participation and engagement of the Health and Safety Executive (HSE) is also noted positively as they are considered to be a key stakeholder in any future deployment of the proposed solution. The Project's engagement with other interested organisations was also noted positively. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project was considered to provide value for money and to be costed competitively. Its overall costs are reasonable as well as the breakdown by Project Partner. Especially when considering the potential benefits the Project puts forward. We note that the Project examined and set out at the Alpha Phase its overall potential benefits, and the deployment at the Beta Phase would support realization of these benefits through greater cost savings and consumer benefits. However, we did note several areas where the Application could have been stronger. First, the Project could have more clearly articulated how any existing learnings from DNOs will be incorporated in its Beta Phase activities. Additionally, the Project has forecast only 30% uptake despite all gas networks being Project Partners. Greater clarification on the potential uptake and barriers to more widespread adoption across the networks would have strengthened the Application. However, overall, we consider the Project to have met this Eligibility Criteria.

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.

The Project presents a clearly articulated and well thought through Project methodology which gives confidence that it will be capable of progressing in a timely manner in the Beta Phase. It has identified key risks and mitigation options, and includes well-defined milestones and stage-gates. These give confidence of a robust Project framework that offers confidence in its capacity to manage and mitigate risks effectively. The detailed costing of each stage gate, combined with a comprehensive risk assessment, reflects a thorough and accountable approach. Lastly, its short, medium, and long-term visions are appropriately scaled, providing a clear path through the Beta Phase. We therefore consider the Project to have met this Eligibility Criteria.

Gas Projects not selected for funding

Energy System of the Future Digital Twin

Table 15: Project Costs

Cost type	Cost
Total eligible costs (£)	14,827,339
Total contributions (£)	2,947,093
Total contributions in-kind (£)	16,236
Total SIF Funding requested (£)	11,880,338

Project description

Our proposed Beta phase aims to explore the benefits that digital twins can deliver in addressing a cross vector energy system of the future. This includes extending the reach of the digital twin(s) to bring in and model data from other energy sources, and to enabling the data and the digital twin itself to be used by and developed on by other Gas Distribution Networks as well as the rest of the utilities space, local and central government.

If this work isn't done, then the Gas, Electricity and other players in the utility sector will continue to develop more isolated, siloed solutions which address their needs but don't necessarily reflect a holistic view of UK Energy Plc. We believe that were this to happen, then the value to the consumer would be very low and more innovation money would ultimately end up being spent over a longer period without the strategic outcomes we believe our project will deliver.

This is what makes this project innovative: bringing together and exploring technology solutions with a focus on enabling and sharing findings and real-world standards. We'll share approaches to sharing data and expanding the Digital Twin system(s) to incorporate or contribute to a more holistic solution for the UK as a whole. Using the Strategic Innovation Fund to drive this activity forward will also accelerate the digital advancement of the smart energy system of the future -- something we don't believe will be funded via BAU. Our project will connect networks and key stakeholders in a way not previously seen and will invite those "difficult conversations" within a safe space -- that is, outside of the daily

operations yet involving those actors critical to the realisation of change across industry.

The measures of success for this project will be around the savings the system can enable for the networks and CO2 emissions perspective. Also, in how the initiative is taken up by other GDNs and other energy sector players to incorporate the ideas, technology approaches, data sharing and combined findings to move the UK towards a comprehensive energy system of the future. Our solution must be multi-network, multi-vector and use connected digital backbones such as the Virtual Energy System to be successful. Embracing other innovations -- some funded through other means -- is essential, not just for our project, but for industry as a whole and at the forefront of our activity.

Summary of Expert Assessors' feedback

The Expert Assessors did not recommend this Project for SIF Funding because the development of enterprise data architecture was considered to be an activity which should be funded under BAU activities to comply with Ofgem's license conditions. Although it was acknowledged as an interesting Project, which was considered to have addressed the Innovation Challenge by applying data and digital technologies in the energy sector which enables a first of a kind development of a complete energy system digital twin. Overall, whilst the Project demonstrates innovative elements and potential benefits, there are areas that require further clarification and improvement to meet all the Eligibility Criteria.

Concerns were raised by the Expert Assessors about the ambiguity of spend for areas such as strategic architecture requirements. In many aspects of the Project these are considered to be BAU activities which should be delivered under the existing price control framework, and there is a need for more clearly articulated use cases and the benefits associated with each. The Expert Assessors recognised that the tools that would be developed as part of this Project, additional to the enterprise data architecture, would be eligible for SIF Funding, and the Project should consider how to seek SIF Funding in future rounds to develop these aspects of the Project.

The Expert Assessors also emphasised the importance of interoperability and collaboration with other initiatives in the energy sector. Stakeholder engagement

and involvement in the Project was considered sufficient, but the Expert Assessors did note that the Project would have benefited from enhanced engagement with other energy networks and improving communication materials. Cost competitiveness and clarity of deliverables were also identified as areas of concern, along with the need for a more robust methodology and governance structure.

Ofgem funding decision: SIF Funding not approved

Ofgem assessment of Application

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

The Project addresses the Innovation Challenge as it is directly aligned with one of the key aims of the Innovation Challenge, delivering the enabling digital technologies required to accelerate progress in other challenge areas. The Project's proposed solution could result in enhanced data accessibility for a more reliable and affordable energy supply. The Project positions itself to potentially bring strategic value to both policy and regulatory perspectives. Furthermore, the focus on interoperability between energy network data aligns well with Ofgem's strategic objectives. We also note that the Project's proposed solution seeks to address multiple challenges in the energy sector and the adoption of a whole system approach to planning and management through digital development aligns with the aim of the Innovation Challenge mentioned previously. As a result, we consider the Project to have addressed the Innovation Challenge.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

We did not consider the Project to have clearly identified potential to deliver a net benefit to gas consumers. While we note the feedback from the Expert Assessors that the Project has identified a benefit to deliver net benefits to both gas and electricity consumers, we do not consider these benefits to have been sufficiently clearly communicated. The Project has clearly set out the benefits to network operations; however, the specific benefits to consumers seem less evident. There

are also likely clear benefits for hydrogen producers and hard-to-abate industries. However, these benefits must be balanced with the interests of all stakeholders, including domestic consumers. We agree with the Expert Assessors and consider that some of the assumptions included could have been more clearly set out, for example, how the benefits calculated on a 'customer minutes lost' basis would result in benefits to consumers. Additionally, the Project's business case would have been stronger with more defined descriptions of how transformational benefits will be achieved. Finally, the projected benefits in the first year of implementation, amounting to £30.7m, were considered on the upper end of optimistic. Greater details on the pathway to realization of these benefits would have benefited the Application. As a result, we did not consider the Application to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

We do not consider the Project to have met this Eligibility Criteria for several reasons. First, the Project has not sufficiently set out that this Project would not be funded under business as usual, thereby demonstrating a potential limitation to network innovation. We also note that there has been significant work undertaken in recent years on digital twins and the Project has not sufficiently set out how this Project separates itself or demonstrates network innovation over those existing Projects. Second, we also note that the Project's proposed solution may overlap with the Common Information Model being developed by the ENA. While the Application did not provide sufficient clarity on how it will inform or not overlap with these activities, the potential for overlap was considered to limit the potential network innovation in the Project. Finally, the Project's proposed solution seems to be more focused on facilitating the transition to future energy systems, rather than on improving network operating efficiencies or informing the development of new technologies and policies. As a result, we did not consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to undermine the development of competitive markets. The Project sets out it goal of developing open standards, which would

support the development of competitive markets should the Project be successful. However, we note the feedback that much of the development would come from enhancing regulatory effectiveness, there are questions which remain on if the Project involves network innovation. However, the development of these standards and the proposed solution would support competition between vendors during the implementation. As a result, we consider the Project to have met this Eligibility Criteria.

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

While we note that the Project was not considered to involve network innovation, we do recognise that the Project does have innovative elements in its approach. The Project's proposed activities could support the activities of the Future System Operator and the Project is proposing the development of a digital twin for gas distribution networks, which could help to optimise hydrogen production and storage activities. However, we agree with the Expert Assessors that further justification and clarification was needed in the Application to truly demonstrate its innovative and novel solution, and how the Project would be incorporated into the Funding Party's overall strategy. We note and agree with the Expert Assessors that there are elements of the Project which should be addressed as part of business as usual activities before the Project's solution can be examined. As a result, we did not consider the Project to be innovative, novel and/or risky.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project involves participation from a range of stakeholders with a suitable set of diverse skills, including stakeholders who represent vulnerable consumers and policymakers. We agree with the Expert Assessors that the stakeholders and Project Partners bring a diverse set of skills which are aligned with the Project's set out activities.

However, we also agree with the Expert Assessors that the Application could have been stronger in this regard. First, the project board currently only comprises SGN staff. While we recognise the verbal commitment from other Gas Distribution Networks (GDNs), a wider range of stakeholders, including entities like the Electricity System Operator (ESO), would have strengthened the Application.

Additionally, we also noted that IBM are leading the majority of the work packages, which raises concerns about the balance of leadership within the project. Furthermore, the lack of involvement from an industry stakeholder with expertise in manufacturing and design was considered to have likely led to higher costs for the Project. It was noted that greater involvement of a stakeholder with specific design and deployment expertise could have help reduce some of the Project's costs, particularly around the development of new outputs for the Beta Phase.

In summary, while we note there are positive aspects of stakeholder involvement in this project, there are concerns about the wider gas networks involvement and the lack of industry design and manufacturing expertise. Therefore, we did not consider the Project to have met this Eligibility Criteria.

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

We agree with the feedback from the Expert Assessors and do not consider the Project to provide value for money or be costed competitively. The overall Project costs were above what was expected, especially around specific work packages, and were considered to exceed what would be considered costed competitively.

We considered the overall costs of implementing the Project to be quite high and considered there to be opportunities for the Project to potentially be split into smaller, more manageable work packages, although this would likely require a significant upfront investment. Additionally, the cost of several work packages were considered to be higher than anticipated and without sufficient justification and was therefore considered to exceed what would be considered costed competitively or delivering value for money. This includes, for example the beginning (WP0) and end work packages (WP10). Furthermore, as mentioned previously, the lack of involvement from an energy sector design and manufacturing stakeholder was considered to have resulted in overall costs which were not considered to be delivering value for money or costed competitively. As a result, we did not consider the Project to have met this Eligibility Criteria.

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.

We agree with the Expert Assessors' feedback and do not consider the Project to have met this Eligibility Criteria. We considered the Project scope for its Beta Phase activities to be too large, appearing to extend beyond the creation of a digital twin for the gas network infrastructure and encompassing the entire energy system. This broad focus could potentially detract from the development of a solution for the gas network in the Beta Phase. This resulted in broad consensus that the overall Project plan does not seem well justified, while the work packages are loosely defined and high-level, which led to a lack of confidence that the Project would be capable of progressing in a timely manner. However, we do note that the Project adequately considered the risks involved. As a result, while there are positive aspects in terms of risk consideration, concerns were raised regarding the Project's broad scope, the lack of detailed work package descriptions, and the feasibility of tackling multiple sector-wide problems.

Thermal Imagery Analysis

Table 16: Project Costs

Cost type	Cost
Total eligible costs (£)	11,108,045
Total contributions (£)	1,166,000
Total contributions in-kind (£)	50,500
Total SIF Funding requested (£)	9,942,045

Project description

As the UK, and the world, moves towards achieving net-zero emissions, Gas Distribution Networks (GDNs) are faced with the challenge of transitioning their operations to low-carbon fuels while also managing changing workforce demographics and potential skills shortages. To ensure that the transition is successful, scalable new technologies and approaches are needed to increase productivity, minimise future workloads, and avoid costs.

One important issue is managing leaks in existing gas pipelines and possibly abandoning assets as we transition to low-carbon fuels. Currently, methods for Escape, Locate and Repair (ELR) are reactive and rely on public reports of gas escapes. These techniques can be slow and imprecise, as workers use above ground monitoring and digging to locate leaks. This can lead to higher operational costs and disruptions for gas consumers and the public. Additionally, information about the condition of assets is not always easily accessible to the industry, which could help reduce costs and assess risk. As we transition to low-carbon fuels, new methods will be needed to manage and mitigate leaks, such as in-pipe verification, pinpointing and remediation, which could offer many benefits over traditional replacement.

Our solution is a comprehensive approach to addressing leakage in gas distribution that leverages cutting-edge digital technologies and robotics to improve performance and enable a cost-effective transition to net zero with minimal cost to the energy consumer. At the heart of our solution is a novel sensing methodology that can accurately detect low pressure gas leaks from within gas pipes for the first time. This technology is complimented by a digital recording platform that captures

and collates detailed asset data and interventions, allowing for optimised future interventions. Our solution utilises live access sensing to maximise leakage intervention productivity per excavation and can be used to treat leakage directly, effectively, and efficiently.

Within the Beta phase, we aim to pilot our solutions for wide scale ELR to demonstrate how robotics and advanced sensing can be used to improve leakage performance within gas distribution. To achieve this, the leak sensing technology leverages live access robotics to efficiently treat the leakage and minimise the time and cost of interventions. Combining these technologies aims to streamline the entire process of detecting and repairing gas leaks, from identification of the problem to remediation of the leak. This will provide an overall body of evidence to enable a transition away from manual ELR methodologies towards the future digital ELR approach.

Summary of Expert Assessors' feedback

The Expert Assessors have recommended this Project not be considered for SIF Funding and did not consider it to have met all the Eligibility Criteria.

This Project was considered to have addressed the Innovation Challenge by utilising the technology and data and digitalisation techniques to increase awareness of gas network leakage with an aim to reduce methane leakage and develop a digital representation of the networks to facilitate the transition to either hydrogen or decommissioning gas networks. All Expert Assessors agreed that this approach was innovative and had the potential to deliver benefits to gas consumers. All Expert Assessors agreed that the Project involved sufficient participation from a range of stakeholders for the activities set out.

The main concern identified by the Expert Assessors was that they did not find the Project to deliver value for money or to be competitively costed. They believed that the overall benefits had not been proven to constitute a strong business case, and limited evidence was provided to demonstrate the timely realisation of these benefits. The Expert Assessors also noted that the Project could offer value for money if it achieved greater use of data and digitalisation across the organisations, while simultaneously reducing leakage. It was noted that the interview gave more confidence than the written Application.

The Expert Assessors felt that the lack of clarity regarding the Project's success criteria and how the proposed technologies would function in practice and scale to other networks was limiting for the Project. The Expert Assessors expressed concerns about the differing views on the use case amongst the different GDNs and the limited information provided about intellectual property (IP) and scalability during the interview. It would have been useful to have a default position outlined and a commitment to further exploration during the Beta Phase as the current approach did not provide the assessors with confidence that competitive markets would not be undermined. It was also highlighted the importance of leveraging the Alpha Phase to solidify capabilities and use cases and it was pointed out that it was unclear what would be delivered in the Beta Phase. This concern was heightened due to the level of discrepancies and lack of clarity in the Application. These concerns led the Expert Assessors to believe that the Project's methodology to be insufficiently robust and lacking in detail, which raised concerns about its ability to progress in a timely manner.

Ofgem funding decision: SIF Funding not approved

Ofgem assessment of Application

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

The Project has addressed the Innovation Challenge through its focus on the challenge of optimising physical networks which could reduce shrinkage within the UK's gas distribution network. The Project’s proposed solution of utilising a novel application of thermal imagery sensors to detect gas leaks was considered to be innovative and to indicate a potential solution for advancing current practices for network monitoring, leak detection and repair, all of which could enhance network efficiency. This was considered to be aligned with one of the Innovation Challenge’s key aims, which is to improve data monitoring, availability, quality, collection, interoperability, access and insights in order to improve the efficiency, security and resilience of networks. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project was considered to have clearly identified potential to deliver a net benefit to gas consumers, but we do note that this and the potential risks to the Project realizing these benefits could have been more clearly articulated in the Application.

The Project was considered to have clearly identified potential to deliver a net benefit to gas consumers primarily the reduction in emissions from gas escapes. This was considered to deliver an environmental benefit for consumers and cost savings from a reduction in shrinkage payments. We also note that the Project has identified a net positive benefit to consumers, but that these benefits would only occur 10 years after deployment. Therefore, the Project could have more clearly articulated how it plans for its proposed solution to be deployed between the Beta Phase and when net benefits would occur to ensure net benefits would be realized. While not directly benefitting gas consumers, it was also noted that the Project could result in greater overall safety in gas networks, which could lead to increased network efficiency, and that the Project could help ensure assets are suitable for continued biomethane use. Overall, however, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

The Project's proposed solution for managing leaks in gas distribution networks represents a unique initiative that wasn't considered to overlap with existing efforts under the RIIO-2 price control. We therefore consider the Project to have met this Eligibility Criteria. Furthermore, it is foreseeable that this initiative could help to inform the next price control period.

One of the key outcomes of the Project's proposed solution is the potential for improved accuracy in gas escape reporting and identification through the use of robotics and data management. This approach was considered to involve network as it could enhance both the operation of the gas distribution networks and how the existing Escape, Locate and Repair approach is set out. As the proposed

solution is more precise, it could lead to greater overall gas network efficiency. We therefore consider the Project to have met this Eligibility Criteria.

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

While we note that the Project's overall focus and goals do not undermine the development of competitive markets, we note that the Project's approach to its proposed solution has the potential to undermine them. The project's focus is primarily on enhancing the efficiency and safety of gas distribution networks through advanced leak detection and management techniques. This could lead to greater monitoring techniques, which in itself we do not consider to represent the potential to undermine the development of competitive markets.

However, we are aligned with the feedback from the Expert Assessors, who did not consider the Project to have met this Eligibility Criteria. The Project lacks clarity around whether the technology developer would not hold exclusive rights to the solution proposed, which could result in the undermining of competitive markets should the monitoring technique be adopted more widely. This was noted for both during the Beta Phase activities and any activities beyond it. Additionally, the Project would have been strengthened if it have more clearly set out how it approach having open data and data sharing and dissemination. Altogether, these did not give confidence that the Project would not undermine the development of competitive markets. As such, we agree do not consider the Project to have met this Eligibility Criteria.

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

We considered the Project to be innovative and novel. The application of thermal imagery sensors for detecting gas leaks is not entirely novel or innovative as it has been used in other industries before. However, the development of artificial intelligence (AI) for predicting potential failures was considered to be innovative and novel, with the potential to significantly enhance the safety and efficiency of gas networks. It was this combination of existing technologies with new data approaches and tools to detect gas leakages which was considered to be innovative and novel. However, we do note that the Application could have more clearly set out whether it plans to test its proposed solution in the Beta Phase, as this has the

potential to limit the overall innovation. Overall, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project was considered to include participation from a sufficient range of stakeholders for the Beta Phase. The Project includes three out of the four GB gas distribution networks, which was viewed positively for the potential development of new monitoring techniques. This was also viewed positively for the proposed solution's potential deployment, should the Project be successful. Additionally, the inclusion of academia as a Project Partner was viewed positively as it represents involvement from subject matter experts for the development and deployment of the proposed solution. We consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to be providing value for money or to be costed competitively. We agree with the feedback from the Expert Assessors that the overall value and benefits from the Project were considered modest and the Project provided limited clarity on how the Project would realize these benefits. The Application could have included greater details on how the proposed solution could be implemented at scale across the gas networks, for example. Furthermore, the overall Project costs were considered high when compared with the potential benefits for consumers. Greater clarity on assumptions taken by the Project, such as the assumed repairs and maintenance costs, would have helped to support any value for money the Project was demonstrating. As a result, we do not consider the Project to have met this Eligibility Criteria.

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.

The Project provided some positive elements within its Application which helped provide some confidence that the Project would be capable of progressing in a timely manner, but overall we agree with the Expert Assessors and do not consider the Project to have met this Eligibility Criteria. While the Project presented a clear

progression plan for its Beta Phase activities, the overall costings of the work packages and success criteria were not sufficiently clear. This did not provide confidence that the Project would be sufficiently able to deliver its proposed solution within the Beta Phase. The Project also did not include sufficient information on how the Project would progress following the Beta Phase to become business-as-usual, and if the Project planned to test its solution with the integration of AI with fault prediction during the Beta Phase. Additionally, as questions remained around the ownership of the Project's IPR generated, as noted above in relation to Eligibility Criteria 3, and how this would relate to deployment of the proposed solution or potential uses cases. Overall, these did not give confidence that the Project would be capable of progressing in a timely manner during the Beta Phase. As a result, we did not consider the Project to have met this Eligibility Criteria.

Electricity Projects selected for funding

Predict4Resilience

Table 17: Project Costs

Cost type	Cost
Total eligible costs (£)	5,020,674
Total contributions (£)	502,069
Total contributions in-kind (£)	0
Total SIF Funding requested (£)	4,518,605

Project description

Severe and extreme weather events can have a major impact on the electricity network, resulting in widespread, extended network outages. These cause significant inconvenience to individuals and businesses who are increasingly dependable on their power supply, and renewable generators who need a reliant connection to the network. Evidence has also shown that a changing climate is contributing to longer and hotter heatwaves, more persistent droughts, more frequent wildfire, and more extreme storms and rainfall.

Today, network operators have developed extensive response plans to react to faults caused by severe weather events, using their experience to manage and deploy resources to restore customers as quickly as possible. However, with more severe events, network operators now need a step change in how they prepare and respond to those events. So, while we cannot control the weather, we can predict it more accurately, with greater visibility and anticipate its impact on the network, in order to protect customers' supply.

Predict 4 Resilience (P4R) will provide accurate fault insights and forecasts for its users during adverse weather events. It utilises probabilistic fault prediction and related decision-support for the first time in a GB innovation project, transforming human-centric decision-making and leading to an improved response to faults on the electricity network.

By utilising hourly data from state-of-the-art weather forecasts and overlaying this onto historic network fault data, LIDAR data and land cover data, P4R will provide

Control Room operatives short-term predictions regarding the expected level of faults in each district across the licence area, up to 7 days in advance.

Through this advanced indication of where inclement weather will affect the network and a better prediction of expected fault numbers, P4R will enable resources (engineers, mobile generation, welfare provisions, customer liaison staff, mobile catering for consumers etc) to be proactively placed in those areas most likely to be impacted, something that can be especially important in remote locations where travel distances are significant.

This proactive response will enable power supply to be restored sooner than is currently possible, creating a more resilient network and minimising disruption and stress for customers, particularly for the vulnerable. It will bring about a range of significant financial, social and environmental benefits to the networks and their customers. The ambition and expectation is that the end software solution will be fit for all GB and international DNOs, as well as any adjacent sectors who suffer weather-related interruptions.

Summary of Expert Assessors' feedback

All Expert Assessors have recommended this Project be considered for SIF Funding. The Project has met all eight Eligibility Criteria. The summary of the Project was well presented and effectively highlighted key points. It acknowledged the relevance and timeliness of the problem and described the technical feasibility of the solution. The innovation justification was satisfied, emphasising that the proposed solution represents a significant step change. However, there was a suggestion to include information on comparable products in the market and how the proposed solution surpasses existing capabilities. The benefits of the Project were considered achievable but modest. The delivery plan was deemed clear and concise, but some areas lacked detail, such as sharing project insights/data and engagement plans. The Project costs were well considered, and the response showed attention to reducing overall costs. Intellectual property rights (IPR) requirements were met, with Expert Assessors welcoming the creation of an IP register.

The main concern for the Expert Assessors relates to the Project being submitted under the SP transmission licence and the benefits will primarily be SP Distribution.

Whilst it is understood to benefit the same end users there was concern from the Expert Assessors that this Project should have waited until DNOs were eligible. This point led to dialogue around SP's position as a dual licence holder, and whether this left other similar projects lead by DNO's at a disadvantage. The Expert Assessors questioned where this Project should be delayed a year to assess alongside other DNO projects. However, the assessors also recognised that it was only during the Alpha Phase that the Project identified that its main benefits would related more closely to the distribution network than the transmission network and, as such, did not consider to represent an unfair advantage to the Project.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

The Project has addressed the Innovation Challenge because it directly aligns with one its key aims, improving data monitoring, availability, quality, collection, interoperability, access and insights to improve the efficiency, security and resilience of networks. The Project's focus on bringing a variety of both historic and modelled datasets together to provide probabilistic data on faults ahead of storms and adverse weather is a clear improvement of data monitoring, collection and quality to improve the resilience of networks in the event of storms. The proposed solution would move away from a human reliance on weather interpretation to a data-based solution, thereby addressing the Innovation Challenge. This proposed solution could be of help in the event of a more effective response to adverse weather events, reducing the potential impacts from storms like Storm Arwen. It could also help to develop interoperability across licencees, should the proposed solution be successful, which also aligns with the Innovation Challenge. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has clearly identified potential to deliver a net benefit to electricity consumers through increased network resiliency and a reduction of consumer bills. The increased network resiliency was considered to be due to the Project's focus on utilising probabilistic fault detection ahead of storms and adverse weather conditions. Its combining of hourly forecasts with historical data could lead to a better prediction on the number and location of faults, leading to proactive action which could help to mitigate the overall impact of disruptions to the network. This was considered to have the potential to lead to greater prioritisation of resources to proactively prepare for potential faults, reducing the potential restoration time and Customer Minutes Lost. As costs incurred from severe and adverse weather are passed through to consumers, greater network resiliency could therefore lead to financial benefits for consumers. We also noted positively that the Application details a relatively quick payback period for consumers, which gives confidence that, should the Project be successful, consumers would begin to realize a net benefit soon, with potential for greater net benefits further down the line. We do however note that the Application could have provided greater details and justification on the data provided to substantiate savings and how they would relate to consumers. Overall, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

While there was much consideration on the extent of network innovation demonstrated by the Project's proposed solution, we consider it to involve network innovation because of how the Project is proposing using the various inputs and probabilistic data to inform fault prediction. However, we do note that this could have been much more clearly set out in the Application.

The Project was considered to involve network innovation because it is bringing both historic data and new modelling data to provide probabilistic data on faults. While we note aspects of this approach are currently in use, we did not consider them to be brought together and used in this manner (i.e. the use of probabilistic data), which we therefore considered to represent network innovation. We also note the proposed solution would likely support quick decision making ahead of adverse weather and storms. This was also considered to involve network

innovation because it could support action ahead of events exceeding key threshold, therefore informing proactive preparation.

However, we do note that the Project could have set out much more clearly in its Application how the proposed solution fits with and goes beyond the RIIO-ED2 price control. While we recognise that the Project is being led by a Transmission Operator (TO), with Distribution Network Operators as Project Partners, it was recognised that the benefits of the solution could relate more to DNOs more than TOs. A clearer explanation of the Project's proposed solution and its interaction with existing measures by DNOs to reduce Customer Minutes Lost would have better strengthened the Application.

Overall, we consider the Project's focus on using probabilistic data in this manner to involve network innovation.

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

We did not consider the Project to undermine the development of competitive markets. While we recognise that similar solutions to the one proposed by the Project exist abroad, we note that these are different networks and consumer base, focusing on different weather events. This was considered to represent a gap for a UK-focused solution as the Project has identified that there is currently no UK solution and we agree that the Project. Should it be successful with its proposed solution, it would represent the stimulation of competitive markets and the potential for additional solutions to be developed, as well as the stimulating the potential demand for peripheral technologies. We also note the potential for solution to be applicable to other sectors and use cases (such as rail), which could result in further development of competitive markets. We therefore consider the Project to have met this Eligibility Criteria.

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

The Project is innovative and novel. The Project was considered innovative because it is bringing together historical data and modelling data in a way which would generate probabilistic data to assess potential adverse weather conditions. As mentioned in relation to Eligibility Criteria 3, the combination of this data is

innovative and its potential solution was considered novel. However, as also mentioned in Eligibility Criteria 3, the Application would have been strengthened with further clarification of what efforts are currently underway by DNOs and how the Project goes beyond them. Overall, we consider the Project to be innovative and novel.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project includes a sufficient range of stakeholders for the activities set out at the Beta Phase and for the potential deployment following the Beta Phase. We noted positively the involvement of multiple Scotland-based DNOs and plans for engagement with GB-based DNOs, though more concrete engagement from the GB-based DNOs would have strengthened the Application. This is to support the deployment of the proposed solution, given the different design standards in use between the two jurisdictions. We have included a Project-specific condition for the Project to demonstrate engagement with a GB-based DNO early in the Project's Beta Phase.

Additionally, inclusion of or engagement with Independent Distribution Network Operators would have also strengthened the Application by providing greater possibility of incorporation and deployment. We also note the potential for deployment of the proposed solution beyond electricity networks, such as with rail, and encourage the Project to engage with additional sectors during the Beta Phase. Overall, however, we consider the Project to have met this Eligibility Criteria.

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

The Project was considered to provide value for money and to be costed competitively. The Project's overall costs were considered relatively low, with the majority of the costs centred around implementation and live trials. This was considered appropriate for the Project design and to demonstrate that the Project is costed competitively. While we considered the overall potential value of the Project to be lower than anticipated, we also considered the Project to not have fully investigated all of the potential application opportunities of the proposed solution. We therefore consider the Project to have the potential to provide greater

overall potential value through greater implementation opportunities. Overall, we consider the Project's costs to be reasonable for the activities set out and the format and costs of the Beta Phase activities to demonstrate that the Project is costed competitively. As a result, we consider the Project to have met this Eligibility Criteria.

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.

The Project has provided a sufficiently robust methodology for us to have confidence that the Project will be capable of progressing in a timely manner. The gantt chart provided is sufficient and there are sufficient details throughout the Project's plan and risk register. We agree with the Expert Assessors and consider the Project's use of stage gates to be a sufficient approach to mitigate risks in the Beta Phase. We also note positively the breakdown of activities which identify specific action owners and which present plausible mitigation strategies for any risks identified. The Project has also identified that trialling is dependent on adverse weather events occurring, and has provided sufficient detail on the risks and mitigation opportunities related to this for us to have confidence that a lack of adverse weather events should not materially impact delivery of the Project. As a result, we consider the Project to have met this Eligibility Criteria.

Annex 3: Application assessment - Innovation Challenge: zero emission transport

Chapter 3 of this document provides detail about the scope of the Innovation Challenge: zero emission transport, as well as summarising the total number of Projects funded and total value of SIF Funding awarded for the Alpha Phase of round 1.

This annex details our assessment and decisions on Applications submitted in response to that Innovation Challenge. Our assessment of each Project is set out within:

- Pages 106 – 113 set out our assessment of each gas Project that has been selected for funding, together with our decision.

- All gas Projects which submitted an Application to this Innovation Challenge for the Beta Phase were successful.

- Pages 113 – 118 set out our assessment of each electricity Project that has not been selected for funding, together with our decision. No electricity Project which submitted an Application to this Innovation Challenge for the Beta Phase was successful.

Gas Projects selected for funding

HyNTS Deblending for Transport Applications

Table 18: Project Costs

Cost type	Cost
Total eligible costs (£)	11,012,257
Total contributions (£)	1,100,000
Total contributions in-kind (£)	1,374,127
Total SIF Funding requested (£)	9,921,257

Project description

National Gas have been considering the role of the gas networks in the energy 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. The HyNTS Deblending project focuses on the deblending of gases from the high-pressure national transmission system (NTS) to enable delivery to transport applications. 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 large scale hydrogen infrastructure availability and therefore the speed of transition for the transport industry.
This project has been developed through to a Beta demonstration of gas separation technology, showcasing the full process from taking blended transmission gas, through separation, purification, compression and culminating in a refuelling pump. Our vision is that in the future a business could apply to connect to the NTS with the sole purpose of extracting the hydrogen for a refuelling station connected to a large-scale road, rail, bus depot or even the marine / aviation sector.

Innovation is key to this project as gas separation technology has historically only been used in specific chemical industrial processes and has never been trialled on a variable gas network. We need to demonstrate that the technology can operate with fluctuations in the gas inlet of temperature, flow, pressure and composition. Additionally, the electrochemical gas separation technology proposed has not been

scaled to the planned level in terms of the quantity produced per day, and finally this level of extraction technology has not been connected to a refuelling pump.

Alongside the transport application this technology can also be used to remove hydrogen from a blend with natural gas. 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. 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 mobile solutions for deblending and purification that can be migrated around the UK networks as we transition to 100% Hydrogen.

Summary of Expert Assessors' feedback

The Expert Assessors have recommended this Project be considered for SIF Funding and consider it to have met all the Eligibility Criteria. The Expert Assessors considered it to have met several key aims of the Innovation Challenge, such as need for constraint management and optimisation. The Expert Assessors also recognised the Project's potential to sectors and industries beyond zero emission transport.

The Expert Assessors considered the Project to have clearly identified a net benefit to electricity consumers as they considered it to have the potential to lower the cost of grid connection, lead to a reduction in the need for network reinforcement, and could more cost-effectively manage curtailed wind production. As mentioned above, the assessors also recognised the Project's potential to deliver a wider net benefit to energy system, which could result in benefits for both gas and electricity consumers.

They also noted that the Project clearly involves network innovation, as well as innovative, novelty and risks, because it puts forward the introduction of a novel method for deblending hydrogen on a scale which has never been used in the UK. This was considered to inherently involves risks because the demonstration proposed has not yet been scaled. The Project was also not considered to

undermine the development of competitive markets because if the Project is successful, it could enable a competitive supply and use of gas via the NTS, which is a market not yet established.

The Expert Assessors considered there to be participation from a sufficient range of stakeholders that span the full value chain from distribution to end user. The Project also clearly outlined its strategy for stakeholder engagement support by the whole Project group, which the Expert Assessors viewed positively.
The Project was considered to demonstrate value for money and to be costed competitively as the Expert Assessors recognised that the scale of benefits proposed by the Project and considered the Project's overall costs, while higher than anticipated, to be within a sufficient range for the activities proposed.
Finally, the Expert Assessors had confidence in the Project's approach and methodology, as it was well considered, clearly articulated and robust. The Expert Assessors noted positively the Project's progression that had already been made through the Discovery Phase and Alpha Phase. The Project plan and gantt chart were considered clear and robust, with individual responsibilities set out and assigned to each of the parties involved.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

The Project was considered to have addressed the Innovation Challenge because it aligns directly with one if its key aims, maximising the opportunities of integrating zero emission transport energy provision with the energy sector. The Project's focus on electrochemical separation technology was considered to have the potential to alleviate costs by enabling a hydrogen demand scenario in the form of transport. This could have the potential to coordinate strategic energy networks with end users, thereby enabling a wider options to decarbonise transport. The potential for a wider range of options being available to consumers (i.e. both hydrogen and electricity options) for the decarbonisation of transport was

considered a key aspect of the Project and how it addresses the Innovation Challenge. We also recognised that the Project's focus on hydrogen deblending could result in benefits beyond the transport sector, such as with heavy industry and large chemical plants. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has identified a potential to deliver a net benefit to gas consumers through greater potential availability of hydrogen and overall reduced costs for consumers. However, we do note that the overall potential benefits to gas consumers could have been more clearly articulated.

The Project's proposed solution was considered to have the potential to deliver key insights on the use of hydrogen by the transport sector and beyond, which could result in greater availability of hydrogen in a variety of scenarios for consumers. We agree with the Expert Assessors that this could result in financial benefits through a reduction in the need for electricity network reinforcement and increased consumer choice and in the potential use cases for hydrogen, which could lead to greater options being available for consumer. However, we do recognise that future policy and regulatory decisions would be needed to support greater deployment and use of hydrogen and hydrogen blends and that reliance on this decision limits the potential net benefits and the timeline of their delivery.

It was also noted that the Project plans to use curtailed wind generation for the generation of hydrogen in the Beta Phase, which could lead to financial benefits for consumers via lower constraint payments being required, although these would likely be minimal in the short-term.

Overall, we consider the Project to have met this Eligibility Criteria because it has identified a potential to deliver a net benefit to gas consumers through increased examination of the use cases for hydrogen, which could support increased consumer choice for zero emission vehicles.

Eligibility Criterion 3: Projects must involve network innovation.

The Project's main network innovation is the use of electrochemical separation technology at the scale set out in the Beta Phase. While deblending is already in use in the petrochemical sector, the scale of the Beta Phase and the state of the art hydrogen extraction technology combined with the use case of transport was considered to involve network innovation. Furthermore, the Project's focus on matching conditions similar to the National Transmission System (NTS) was noted positively because it could support development of insights on the deployment of hydrogen in the NTS. It was noted that the Project, if successful, has the potential to enable a new approach to deblending gas, which would have use cases in the transport sector and beyond. As a result, we consider it to have met this Eligibility Criteria.

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

We did not consider the Project to undermine the development of competitive markets. We agree with the Expert Assessors that the Project has the potential to enable competitive supply and use of gas in the NTS, which would result in the development of competitive markets. We also agree with them that the market for the solution proposed is not yet established and the Project does not represent any undermining of the development of that market. This could result in development of competitive markets not only for the solution proposed, but in the supply, chains supporting it. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project is innovative, novel and risky. The Project was considered innovative and novel because it is using state of the art technology to examine hydrogen deblending and how it could function within the NTS. The scale of the activities set out in the Beta Phase and the use of this technology was therefore considered innovative and novel. It was also considered innovative because it would be delivering insights on deblending and the possible use cases for the gas sector and beyond. Additionally, because of the scale of the Project proposed in the Beta Phase, it was recognised that there would inherently be risks with its first of a kind approach. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

We agree with the Expert Assessors and consider the Project to have included participation from a sufficient range of stakeholders for the Beta Phase activities set out. The Project has included stakeholders which span the value chain, including stakeholders focused on distribution and end users. We note positively the use of a multi-stakeholder consortium that plans on interacting with additional stakeholders in the Beta Phase, such as international gas grid operators, and its plans to establish an advisory group. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project provides both value for money and is costed competitively. The overall Project costs were considered reasonable and aligned with expectations, as were the individual Project Partner costs. We also noted positively the contributions from across the Project consortium. Together, these provide confidence that the Project is costed competitively.

It was noted that the Project's main value will be on delivering insights on the feasibility of using hydrogen and deblending at scale in the NTS. This could result in findings which would be beneficial for the transport sector as well as wider sectors which could use the in-situ deblending technology being proposed. While the overall value of the Project may be dependent on a future policy and regulatory decision, the Project was also recognised to have the potential to deliver insights which could help inform this future decision. As a result, and taking into consideration its overall costs, we considered the Project to provide 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.

The Project has a well thought through and robust methodology which gives confidence that it will be capable of progressing in a timely manner. The details

provided through the gantt chart and Project plan were completed to a satisfactory level, and there was sufficient detail in the timescales, costs and milestones set out. The Project plan was supported by detailed milestones and stage gates, which also gives confidence that risks can be mitigated during the phase should unforeseen situations arise. Overall, we consider the Project to have met this Eligibility Criteria.

Electricity Projects not selected for funding

A Holistic Hydrogen Approach to Heavy Duty Transport (H2H)

Table 19: Project Costs

Cost type	Cost
Total eligible costs (£)	5,599,966
Total contributions (£)	735,479
Total contributions in-kind (£)	0
Total SIF Funding requested (£)	4,864,487

Project description

The solutions developed within A Holistic Approach to Hydrogen for Heavy Duty Transport (H2H) Beta are essential for a reliable and cost-effective roll-out of grid-connected hydrogen production, which is required to decarbonise the heavy transport sector. Using a conventional approach, such developments are susceptible to connection delays and prohibitive costs, which will hinder the adoption of this critical technology. Conversely, by fully leveraging the benefits of flexible connection and operational solutions, together with data-driven decision-making, H2H will deliver tangible benefits to:

- Power sector and its customers.
- Hydrogen producers.
- Hydrogen transport users.

H2H presents a de-risked innovation investment case with significant impacts in the order of £2.7bn for existing and future electricity customers up to 2070, and saving 5.7MtCO2e in direct carbon emissions.

Specifically, H2H Beta will develop first-of-a-kind, cross-sector and multi-vector modelling using AI-powered optimisation algorithms to recommend new connection and operational modalities. This holistic and quantitative approach will consider benefits and impacts across electricity, hydrogen production and hydrogen heavy-duty transport systems.

The project will undertake live trials, modelling and stakeholder engagement to develop and validate BAU-ready network solutions for electrolysis, and explore the implementation of these solutions in the hydrogen and transport sectors.

Summary of Expert Assessors' feedback

The Project was considered by the Expert Assessors to focus on an important area of reducing renewable energy curtailment and accelerating the connection of a potentially large and flexible demand on the grid, i.e., electrolysers. While this aspect is clear and evidenced to a reasonable extent in the Application, the Project has shifted its focus away from understanding and addressing the challenges in integrating zero emissions transport to the energy system.
The shift away from a rail-specific use case in the Alpha Phase to a wider heavy-duty transport for the Beta Phase was considered to have been hurried and without sufficient evidence building and stakeholder engagement. While such a shift in focus is understandable in an innovation project, the Expert Assessors considered this to have led to the Application not being fully formed and ready to move into a multi-million-pound, large scale Beta Phase demonstration.
The Expert Assessors were in agreement that while the H2GO's HyAI system was a good addition to the consortium for the Beta Phase, there was a lack of clear problem statement in the heavy-duty transport sector that the Project was trying to solve. This resulted in the Project being considered as an interesting solution to trying to find an application or problem to solve. The Expert Assessors noted that greater clarification and details on the exact application for the Project's proposed solution proposed by HyAI would have strengthened the Application.

Ofgem funding decision: SIF Funding not approved

Ofgem assessment of Application

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

We do not consider the Project to have met the Innovation Challenge. While it was recognised that the Project's proposed solution could help to support the use of hydrogen for transport at a high level, it was not considered to have provided

sufficient scope or details for it to be considered to have aligned with the Innovation Challenge. While we note that the Project underwent a significant shift and pivot away from hydrogen for rail use following its Alpha Phase findings, its shifted proposed focus area was not sufficiently clear. Additionally, the Application more clearly articulated a focus on improving hydrogen supply through optimising electrolyser deployment rather than primarily focusing on zero emission transport focus areas set out in the Innovation Challenge. We therefore do not consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

We do not consider the Project to have clearly identified potential to deliver a net benefit to gas consumers. We ultimately considered the Project to have identified limited net potential benefit for consumers, which would potentially come from avoided connection costs and avoided curtailment of renewable energy. However, this was considered to be dependent on two separate variables or assumptions: future policy and regulatory decisions on hydrogen, and further scoping of the Project's overall proposed solution, as the proposed solution's application was not sufficiently clear. We agree with the Expert Assessors that the Project's Application could have more clearly set out the Project's potential benefits to consumers and the pathway for how they could be realized.

Eligibility Criterion 3: Projects must involve network innovation.

We consider the Project to involve network innovation. The primary area of network innovation was considered to be in the proposed development of the Project's algorithm, as it could go beyond peak shaving AI algorithms and could stimulate hydrogen production sites interaction with the power networks and flexible solutions. This involves network innovation because it could introduce a new way of optimisation across both transmission and distribution networks, thereby going beyond business as usual network activities. As a result, we consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to undermine the development of competitive markets because the Project's proposed solution involving connection and flexible operation could result in additional solutions being developed, should the Project be successful. This therefore has the potential to stimulate the development of new competitive markets.

We also note the feedback from the Expert Assessors that the algorithms which underpin the proposed solution will be proprietary to H2GO, but that this would not inhibit or prevent the development of other solutions. As a result, we consider the Project to have met this Eligibility Criteria.

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

The Project was considered to be innovative and novel because it proposes developing a cross-sector and multi-vector AI-based optimisation platform to demonstrate flexible connection and operation of electrolysis for the wider heavy duty transport sector. We note and agree with the feedback from the Expert Assessors that the Project's combination of connection processes underpinned by an AI system to optimise the overall hydrogen value chain has not been demonstrated in GB to date, thereby demonstrating innovation and novelty. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

We note positively that the Project has added H2GO in its Beta Phase and consider them to play an important role in demonstrating the Project's proposed solution at scale and in developing a commercially functional product from the Project. We also note positively the Project's inclusion on electricity networks, renewable and electrolyser developers, transport sector consultations, and subject matter experts from academia on hydrogen. We do note however that inclusion of Distribution Network Operators and Gas Distribution Networks (GDNs) would have strengthened the mix, as this Project has the potential to relate to both these energy areas. For example, a GDN Project Partner would bring valuable insight into the operation of green electrolysers and crossovers with the gas network. However, the mix of stakeholders and their participation was considered suitable

for Beta Phase activities set out and we therefore consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to be providing value for money and to be costed competitively. We do not consider the Project to have sufficiently articulated where the potential value from the Project would be. We also agree that the overall SIF Funding requested for the activities set out are not aligned with the scope of work and deliverables, resulting in the Project not being costed competitively.

We note the significant shift in focus from rail in the Alpha Phase to potential wider transport applications in the Beta Phase. We consider the Beta Phase activities have not been sufficiently scoped or prepped and recognise the potential for duplication of work in the Beta Phase. We also note that the similar projects have been funded under the BEIS Energy Entrepreneurs Fund, and as a result, did not consider the Project to have sufficiently articulated how would offer value beyond these Projects and would incorporate their learnings to date.

We also note that a significant portion of the Project's overall costs have been dedicated to Project management costs, which was higher than anticipated and did not give confidence that the Project was costed competitively.

As a result, we do not consider the Project to have met this Eligibility Criteria.

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.

The Project puts forward a detailed Project plan for the activities set out and has sufficiently accounted for many of the risks the Project faces. However, as our feedback in relation to Eligibility Criteria 7 states, we did not consider the Project's Beta Phase activities to have sufficiently scoped to have confidence that they will be capable of progressing in a timely manner. We also note and agree with the comment from the Expert Assessors that some of the Project's activities, such as those in work package 1 and 2 ahead of stage gate 1, more closely align with activities which should have occurred in the Alpha Phase rather than in the Beta

Phase. As a result, we did not consider the Project to have met this Eligibility Criteria.

Annex 4: Application assessment - Innovation Challenge: heat

Chapter 4 of this document provides detail about the scope of the Innovation Challenge: heat, as well as summarising the total number of Projects funded and total value of SIF Funding awarded for the Alpha Phase of round 1.

This annex details our assessment and decisions on Applications submitted in response to that Innovation Challenge. Our assessment of each Project is set out within:

- Pages 120 – 126 set out our assessment of each gas Project that has been selected for funding, together with our decision. All gas Projects which submitted an Application to this Innovation Challenge for the Beta Phase were successful.

- No electricity Projects submitted an Application to this Innovation Challenge for the Beta Phase.

Gas Projects selected for funding

Velocity Design with Hydrogen

Table 20: Project Costs

Cost type	Cost
Total eligible costs (£)	6,554,990
Total contributions (£)	642,846
Total contributions in-kind (£)	574,286
Total SIF Funding requested (£)	5,912,144

Project description

The project will establish safe design gas velocity limits for the UK industry to use in re-purposing gas networks in the UK to safely deliver 100% hydrogen.

Hydrogen carries approximately one-third of the energy per unit than delivered by natural gas. Therefore, an increase in mass flow can be expected to deliver the same heat energy to consumers using hydrogen.

Design gas velocity limits are used by network designers to ensure there is no integrity risk to pipe components caused by erosion, noise, or vibration from excessive gas velocity in the pipes.

While current design codes use gas velocity limits proven to be safe in designing networks carrying natural gas by long standing practice, no suitably valid and representative data has been gathered to establish safe limits while carrying hydrogen in UK gas distribution networks.

If hydraulic modelling of gas networks shows gas velocities in the networks that exceed the safe velocity limits, additional pipe must be installed (network reinforcement).

This project will deliver a test campaign, on a full-scale test rig, to produce data that will be accepted by the industry and the professional body representing gas engineers in the UK as valid to amend the design codes to ensure the safe transport of hydrogen in UK gas distribution infrastructure.

Analysis completed in previous phases of the project show significant network reinforcement costs can be avoided during the energy transition if the gas design velocities can be safely increased from current limits.

Summary of Expert Assessors' feedback

All Expert Assessors have recommended this Project be considered for SIF Funding as it was considered to have met all eight Eligibility Criteria. The summary of the Project was well presented and effectively highlighted key points. It acknowledged the relevance and timeliness of the problem, namely that a clear evidence-led view on hydrogen velocity limits in typical GB pipeline designs is an important piece of evidence in making a strategic decision on the future role of the gas networks in delivering hydrogen. The benefits of the Project were considered achievable but modest. The delivery plan was deemed clear and concise, but some areas could have been further articulated such as the source (and type) of hydrogen being used for the trial. The Project costs were adequately considered, and the interview further articulated why the type test model was chosen. IP requirements provided confidence that the Project would not undermine the development of competitive markets.

The main concern for the Expert Assessors related to the need for highlighting of synergies with other hydrogen projects being carried out at the test site Spadeadam and the linkages to the Hydrogen Programme and Network Safety Impact Board (NSIB) projects. The Expert Assessors commented on the level of planning for the supply of hydrogen to be used in the trial, in addition to the lack of information available as to type of hydrogen (blue, green or grey). Public perception around the type of hydrogen was noted as being a potential consideration.

Ofgem funding decision: SIF Funding approved

Ofgem assessment of Application

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

The Project was considered to have addressed the Innovation Challenge because it directly aligns with one of its key aims of producing insights and findings which facilitate decision making for low carbon heating by energy networks, industry and government. The Project was considered to have addressed the Innovation Challenge because its proposed Beta Phase activities focus on the use of hydrogen in natural gas pipelines, which has the potential to deliver research and insights on the possibility of using hydrogen for hydrogen. This research has the potential to support and inform future policy and government decisions, thereby aligning with the Innovation Challenge. As a result, we consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 2: Projects must have clearly identified potential to deliver a net benefit to gas or electricity consumers (whomever is paying for the innovation).

The Project has clearly identified potential to deliver a net benefit to gas consumers through potentially enabling and delivering insights on the use of hydrogen. This could result in financial benefits from the repurposing of the National Transmission System and reduced need for network reinforcement, environmental benefits from less natural gas being used for heating, and indirect benefits from examining potential future uses of hydrogen. We also note the feedback from the Expert Assessors, that the Project has identified positive lifetime net present value should gas velocities be increased. However, while we note that much of the Project's clearly identified potential to deliver a net benefit to gas consumers relates to future policy and regulatory decisions on the use of hydrogen, we do consider the Project to have clearly identified potential to deliver a net benefit to gas consumers through potential uses for hydrogen and through informing hydrogen policy. We therefore consider the Project to have met this Eligibility Criteria.

Eligibility Criterion 3: Projects must involve network innovation.

While there was some divide on whether the Project involves network innovation, we do, overall, consider the Project to involve network innovation. There was some uncertainty on whether the Project involves network innovation because the examination of hydrogen velocity will be required ahead of any hydrogen use in the NTS and there are also plenty of hydrogen pipelines globally. However, we have

also considered the feedback from the Expert Assessors and agree with them that the Project has to potential to inform and provide insights on hydrogen uses cases in the future in GB. Furthermore, the Project's Beta Phase activities could demonstrate how hydrogen will behave and function in the NTS, which, although it could have been more clearly stated in the Application, could impact hydrogen's use case for heating. Therefore, this potential outcome of delivering insights into hydrogen use cases was therefore considered to involve network innovation and we consider the Project to have met this Eligibility Criteria.

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

We do not consider the Project to undermine the development of competitive markets. The Project is primarily investigating the use case for hydrogen in heating (and beyond), and as a result of there being no market developed currently, we did not consider it have the potential undermine the development of competitive markets. Additionally, the Project's activities and Application give confidence that any of learnings will not be shared with the gas industry, which could therefore lead to the development of the market and the fostering of competition. We therefore consider the Project to have met this Eligibility Criteria.

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

We agree with the feedback from the Expert Assessors and consider the Project to be innovative and novel, with elements of risk. The Project was considered innovative and novel because it is investigating the use of hydrogen in the network and how it could be used for heating, a field that has not previously been tested extensively. This could help to inform and deliver insights on future policy and regulatory decisions and on the role of hydrogen for heating. Furthermore, the Project was considered to have elements of risk because the future of hydrogen in heating is not yet certain but that the Project could inform future decisions for its use in heating in GB. As a result, we consider the Project to be innovative and novel, with elements of risk, thereby meeting this Eligibility Criteria.

Eligibility Criterion 6: Projects must include participation from a range of stakeholders.

The Project includes participation from a suitable range of stakeholders for the activities set out in the Beta Phase. We note that the Project has involvement from other gas distribution networks, which gives assurance that the Project's design and activities have been considered for a range of potential applications. Like the Expert Assessors, we consider the inclusion of the Institute of Gas Engineers & Managers to be key for development of a proposed solution. While we consider the Project to have met this Eligibility Criteria, it was noted that inclusion or involvement of Independent Gas Distribution Networks would have strengthened the Application because it would have allowed for perspective different to GDNs be incorporated.

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

The Project is considered to provide value for money and be costed competitively. The overall costs were considered reasonable and SIF Funding requested by Funding Party and the Project Partners is reasonable. It was also recognised that the Project has the potential to deliver key insights into the use of hydrogen in the NTS and for heating, which could support future policy and regulatory decisions. We also noted positively the contributions from the Project Partners, which provides greater confidence that the Project is providing value for money.

However, it was noted that the Application could have been stronger in several areas, particularly around the higher than anticipated labours costs and greater clarity on how the Project fits in with the wider hydrogen project landscape.

Overall, the Project was considered to provide value for money and to be costed competitively.

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.

The Project materials and design are well thought through and have a robust methodology which gives confidence that the Project is capable of progressing in a timely manner. The Project plan is sufficiently clear with five work packages outlined which are supported by detailed milestones and stage gates. Each stage

gate is costed which provides a clear outline and breakdown of the Project's overall costs. The risk register was considered thorough and clearly articulated.

While we consider the Project to have met this Eligibility Criteria, we note several areas where it could have been stronger. First, some of the success criteria in the work packages did not provide sufficient detail on how they would be met. For example, in work package 6, a more detailed articulation of how industry needs would be met by the Project would have strengthened the Application. Second, greater details or justification on the Project's decision to undertake physical testing in the Beta Phase, rather than an engineering design model, would have strengthened the Application. However, overall, we consider the Project to have met this Eligibility Criteria.