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Decision

Decision on the 2020 Gas and Electricity Network Innovation Competition

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The RIIO-1 Network Innovation Competition (NIC) is designed to stimulate innovation in the energy networks. This document explains which projects have been selected for funding in 2020.

We have decided to award up to £57.62 million across two gas and three electricity projects. Licensees awarded NIC funding must make at least a ten per cent contribution to the total cost of projects. This year successful licensees and their partners will contribute £19.5 million to projects.

Our decision is informed by the recommendations of independent Expert Panels[1], in their assessment of project performance against the NIC Evaluation Criteria.[2] We expect the outcomes of these NIC projects will help network licensees and industry to better address customers' changing requirements as Great Britain moves towards a smarter, more flexible, low carbon energy system.

[1] The Expert Panels are referred to interchangeably throughout this document as 'the Expert Panels', 'the Panels', and, in sector specific chapters, 'the Expert Panel' or 'the Panel'
[2] The Evaluation Criteria are set out in the NIC Governance Documents which are accessible here; https://www.ofgem.gov.uk/publications-and-updates/version-30-network-innovation-competition-governance-documents.

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Executive summary

The Competition

The Network Innovation Competition (NIC) encourages network companies to innovate in the design, development and operation of their networks and, in doing so, to engage with one another and third parties in and beyond the industry.

Over the course of RIIO-1, up to £20 million funding has been made available each year through the gas NIC, and funding up to £70 million funding has been available through the electricity NIC, for large-scale innovation projects that move the GB energy networks towards a low carbon future each year.

This was the eighth and final year of the NIC for gas distribution, gas transmission, and electricity transmission sectors. We will introduce further innovation funding as part of the RIIO-2 price control framework.

There will be a further two years of the competition for electricity distribution network licensees. As set out in the Electricity NIC Governance[3], the annual funding available in 2021 and 2022 will be £40 million each year.

2020 submissions

This year, we received twelve bids (ten electricity and two gas) to the Initial Screening Process (ISP) in April. Of these proposals, we allowed six electricity bids and both gas bids to proceed to the Full Submission Process (FSP).

By 31 July, we had received seven Full Submissions (one electricity bid was withdrawn), requesting in total £62.9 million. The seven submissions were as follows:

- HyNTS FutureGrid Phase 1 from National Grid requesting £9.07m of gas NIC funding
- H100 from Scottish and Southern Gas Networks requesting £18.10m of gas NIC funding
- Constellation from UK Power Networks requesting £14.38 million from the electricity NIC

[3] Paragraph 1.6 of the Electricity NIC Governance.

- Flexr from Northern Powergrid, requesting £9.27 million from the electricity NIC
- Proteus from National Grid Electricity Transmission, requesting £25.03 million from the electricity NIC
- QUEST from Electricity North West, requesting £7.95 million from the electricity NIC
- RICA from National Grid Electricity Transmission, requesting £8.12 million from the electricity NIC

Our decision

Of the seven Full Submissions, we have decided to award funding to two gas projects and three electricity projects. The tables below summarise the aims of the successful projects and the maximum amount of NIC funding available for each project.

2020 Gas NIC Projects	**NIC Funding Awarded**
HyNTS FutureGrid The proposed project intends to build a hydrogen test facility from a representative range of decommissioned National Transmission System (NTS) assets. Flows of hydrogen and natural gas blends (up to 100%) will then be tested at NTS pressures to better understand how hydrogen interacts with the assets. The data gathered will be used to assess the impact of the hydrogen conversion of NTS assets. *Proposed by National Grid Gas Transmission (NGGT)*	£9.07m
H100 Fife The proposed project aims to deliver a 'first of a kind' 100% end-to-end hydrogen network, supplying around 300 domestic properties initially via an opt-in process. The project will comprise a hydrogen generation and storage solution supplying a new distribution network, laid in parallel to the existing gas network, in addition to three demonstration homes. The hydrogen production method proposed for the project is electrolysis with electricity fed from an offshore wind turbine. *Proposed by Scottish and Southern Gas Networks (SGN)*	£18.10m* **Subject to satisfaction of outstanding conditions*

2020 Electricity NIC Projects	NIC Funding Awarded
Constellation The project aims to enable the transition to Net Zero by transforming the existing network management and control systems, through the introduction of local intelligence at a substation level. It is a simplified and focused evolution of a proposal which was brought forward to the 2019 NIC. *Proposed by UK Power Networks (UKPN)*	£14.38m
Quest The project aims to integrate standalone discrete voltage control schemes into a single scheme using ENWL's Network Management System (NMS). It will develop a novel distribution network-wide, fully co-ordinated, overarching system to manage voltages and balance centralised and decentralised control hierarchies. This should reduce cumulative design margins and free up network capacity. *Proposed by Electricity North West (ENWL)*	£7.95m
RICA The project aims to develop a method of using insulated crossarms (ICA) to increase the voltage rating on existing 275kV overhead line towers to 400kV. This will allow increased power to be transmitted on existing routes without replacing the towers. *Proposed by National Grid Electricity Transmission (NGET)*	£8.12m

1. Introduction

Context and related publications

1.1. Our energy system is undergoing a radical transformation as the process of decarbonisation, digitisation and decentralisation continues to accelerate in the context of Net Zero targets set by Government. The energy networks sit at the heart of the energy system and the network companies have a fundamental role in supporting pathways to Net Zero and achieving decarbonisation at lowest cost to consumers. Innovation is crucial to increasing the pace of change, and protecting consumers in the transition to a smarter data-driven, more flexible and low carbon energy system.

1.2. Network companies will need to innovate in the way they design, plan, and operate their networks, while delivering the high quality, value for money services that customers want. The NIC is designed to help stimulate this innovation. The NIC provides funding to encourage network licensees to run trials of new technology and different commercial and network operating arrangements.

1.3. In October 2020, we published a gas NIC Governance statutory consultation, through which we proposed to increase the annual funding available through the gas NIC in its final year, in the event that we decided to award projects in excess of the £20 million annual limit. This consultation is now complete, and our decision to increase the gas NIC funding allowance to £28m has been published alongside the amended gas NIC Governance, linked in paragraph 1.6. This amendment allows us to award both Full Submissions received under the gas NIC this year.

1.4. Network customers fund NIC projects. Therefore, a key feature of the NIC is the requirement that project learning is disseminated, in order for customers to gain a significant return on their funding through the broad rollout of successful projects, and the subsequent delivery of network savings and/or carbon and environmental benefits. Even where projects are implemented and deemed unsuccessful, network licensees will gain valuable knowledge that could result in future savings in network costs.

1.5. Electricity NIC Governance version 3.0: https://www.ofgem.gov.uk/publications-and-updates/version-30-network-innovation-competition-governance-documents

1.6. Gas NIC Governance version 3.1: https://www.ofgem.gov.uk/publications-and-updates/version-31-gas-network-innovation-competition-governance-document

Purpose of this document

1.7. This document sets out our decisions on the applications we received in the 2020 NIC.

1.8. Alongside this decision, we have published:

- Recommendation reports from both of the independent gas and electricity Expert Panels
- Network companies' answers to supplementary questions raised during the evaluation process by Ofgem, the independent technical consultants (who evaluated parts of the projects) and the Expert Panels.
- The Full Submissions for each successful project, produced by the network companies, and with commercially sensitive information redacted or removed

How the NIC works

1.9. The NIC Governance Documents set out the scheme's governance and administration.

Initial Screening Process

1.10. The annual Competition starts with the Initial Screening Process (ISP), through which ten page project proposals are submitted for assessment by Ofgem. Ofgem typically receive bids in late March or April, and announces details of the submission process two calendar months ahead of the deadline set. The gas NIC is open to applications from gas distribution networks (GDNs), the gas transmission licensee National Grid Gas Plc (National Transmission System) (NGG NTS) and independent gas transporters. The electricity NIC is open to applications from fourteen electricity distribution licensees (DNOs), onshore electricity transmission licensees (TOs/SO), offshore transmission owners (OFTOs) and independent distribution network operators (iDNOs).

1.11. During the ISP, we consider projects against the ISP Eligibility Criteria set out in the NIC Governance. Only projects considered eligible may progress to the Full Submission stage.

Full Submission stage

1.12. At the Full Submission stage, we appoint an independent Expert Panel to each Competition, to consider the relevant submissions and provide us with an independent recommendation on whether we should award NIC funding. The Panels consist of persons independent of both Ofgem and the companies with specific expertise in energy networks, environmental policy, technical and engineering issues, economics and finance, and consumer issues.[4] Ofgem considers the independent Expert Panels' view in reaching its decisions.

1.13. The Panels assess each project against the Evaluation Criteria set out in the NIC Governance Documents. These are summarised below.[5]

a) accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers.
b) provides value for money to electricity/gas customers.
c) generates knowledge that can be shared among all relevant Network Licensees.
d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness.
e) involvement of other Project Partners and External Funding.
f) relevance and timing.
g) demonstration of a robust methodology and that the Project is ready to implement.

1.14. After it has completed its evaluation, each Expert Panel produces a report (published alongside this decision) on which projects it recommends for funding. Ofgem considers

[4] Details of the Gas NIC Expert Panel are available here: https://www.ofgem.gov.uk/network-regulation-riio-model/network-innovation/gas-network-innovation-competition/gas-nic-expert-panel Electricity NIC Expert Panel: https://www.ofgem.gov.uk/network-regulation-riio-model/current-network-price-controls-riio-1/network-innovation/electricity-network-innovation-competition/electricity-nic-expert-panel
[5] The full Evaluation Criteria are set out in paras 5.41-5.62 of Governance Documents

these reports in reaching its decisions along with consideration of the impact of the project with regards to the wider network innovation portfolio. The final funding decision is taken by the Authority and, where appropriate, may differ from the Expert Panels' recommendations.

1.15. The Expert Panels met each of the bidding project teams twice. Where aspects of the submissions required clarification, the network companies had an opportunity to provide such clarification through meetings, via a written question-and-answer process, and finally, through their formal resubmission[6]. The bidding project team were asked as many supplementary questions as were considered necessary to clarify aspects of the Full Submissions provided by the network companies.

1.16. The Expert Panels made their recommendations based on the final submissions received, taking into account any clarifications provided. The network companies' written responses to the supplementary questions have been published alongside this decision and have been considered by Ofgem in full before arriving at this decision.

1.17. In line with NIC Governance, Ofgem's engineers provided assistance to the Expert Panels. We appointed AECOM as technical consultants to provide additional support within this year's electricity competition. The Panel directed the consultants to advise it on technical issues and challenge the companies on specific technical aspects of each project.

1.18. We assessed the projects, taking into account the NIC Evaluation Criteria and the Expert Panels' recommendations, to decide which projects should receive funding. Our decisions on the gas NIC are contained in Chapter 2. Our decisions on the electricity NIC are contained in Chapter 3.

[6] The resubmission process is set out in paragraph 5.39. of the Governance Documents.

2. Decisions on the Gas Network Innovation Competition

Section summary

We have decided to offer funding to two projects for which we received a Full Submission. The projects are HyNTS Phase 1 (National Grid Gas Transmission, awarded £9.07 million) and H100 Fife (Scottish and Sourthern Gas Networks, conditionally awarded dependent on the revision of project costs). In total, subject to the fulfilment of conditions, we are provisionally allowing for £27.17 million towards Gas NIC projects in 2020.

Projects selected for funding

HyNTS FutureGrid Phase 1 – National Grid Gas Transmission, NIC funding awarded £9.07 million, compulsory contribution £1.02 million, other funding £2.56 million

Overview

2.1. HyNTS FutureGrid aims to build on existing work under the HyNTS programme to understand the potential impact of hydrogen on the NTS. The transmission test facility will connect upstream of the H21 project, a series of NIC projects awarded funding in 2017 and 2019, at DNV GL Spadeadam to test the compatibility and integrity of NTS assets with various hydrogen blends. The learning gathered will be critical to inform future decisions on how best to decarbonise heat. The project provides a significant opportunity to increase collaboration across the gas networks and help share learnings to increase hydrogen knowledge within the gas industry.

2.2. The aim of this project is to test whether the NTS can safely transport flows of hydrogen in blends up to 100%.

Summary of Expert Panel's recommendation

2.3. The Panel were pleased that the project would build on the H21 facility at Spadeadam to connect upstream of the H21 gas distribution system currently under construction. Additionally, the Panel welcomed the international collaboration with Fluxys, the Belgium transmission system operator (TSO) that has committed to providing in kind support through provision of data and resource to the project.

2.4. The Panel believed that the project is timely and well thought through. As there is currently no precedent for converting the NTS to 100% hydrogen, the Panel considered the project to be innovative, as well as representing a significant step towards creating the evidence base to inform policy decisions on how to decarbonise heat.

2.5. The Panel raised some concerns, specifically relating to labour and consultancy costs, as well as noting that delays in obtaining decommissioned assets for trials could be critical to project delivery. These concerns were allayed by clarifications provided by NGGT in the course of the assessment process.

2.6. Overall, the Panel considered that the project satisfies all of the Evaluation Criteria. The Panel therefore recommended that we fund the project.

Ofgem's assessment and decision

2.7. We agree with the Expert Panel's recommendation and consider that HyNTS FutureGrid Phase 1 performs well across the Evaluation Criteria. Our assessment of the project against each of the Evaluation Criteria is set out below.

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

2.8. NGGT were able to demonstrate the potential environmental and financial benefits of the project well. NGGT estimates that, if rolled out across the whole of GB, the use of blue hydrogen (produced via steam reforming) as an alternative to natural gas in the NTS may be able to save an estimated 153.18 million tonnes of CO2 each year. If successful, the project could help support clearer pathways to Net Zero through the decarbonisation of heat.

2.9. The Panel were impressed by the rollout scenarios presented by NGGT which included a number of credible alternative uses for the NTS.

b) provides value for money to gas customers

2.10. HyNTS represents financial benefits through the avoided costs of decommissioning the NTS, and progressing the feasibility of transporting hydrogen blends up to 100% through the existing transmission network. Repurposing the NTS would save customers at least £4 billion. The project's environmental benefits pertain to the carbon emissions reductions from enabling the switch from natural and methane gases to hydrogen. Although not directly arising from the project, we are satisfied that HyNTS is a necessary step towards the achievement of these benefits.

2.11. The Panel challenged the rates being charged for the specialist services of project partners DNV-GL and HSE-SD. Evidence provided by NGGT in response to this challenge demonstrated that rates were consistent with similar projects, and we are happy to accept that the costs are representative of the unique facility available through DNV-GL, and the expertise offered by both project partners.

2.12. The significant NGGT resource committed to the project raised further questions from the Panel around the value for money of the project. We are however convinced that the marginal cost increase is justifiable to allow for a crossover of specialist and operational expertise, that could accelerate the achievement of network customer benefits from hydrogen conversion.

c) generates knowledge that can be shared among all relevant Network Licensees

2.13. Knowledge sharing is a key component of this project. In its submission, NGGT has demonstrated the involvement of all GDNs and wide range of stakeholders. The Panel were pleased with NGGT's intention to employ differing participation styles to cater for different stakeholder groups. We expect this will improve the sharing of knowledge from the project.

2.14. In addition, stakeholders involved in the production, delivery and utilisation of hydrogen could benefit from project learnings. We believe HyNTS will generate knowledge necessary to determine the feasibility of transporting hydrogen within existing network infrastructure, including the interfaces between the transmission and distribution systems.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

2.15. The project is unprecedented and represents risk above levels that would be acceptable in the normal course of networks business. The Panel notes that comprehensive testing of the impacts of hydrogen on the NTS assets at transmission pressures must be undertaken before this pathway can be further progressed.

2.16. The risk of learning duplication is mitigated by the involvement of industry-leading expertise in DNV-GL, and review of the project by the industry group LTS Futures. NGGT also notes its intentions to engage with international stakeholders as part of the project.

2.17. We believe that HyNTS could not be carried out without the support of innovation funding.

e) involvement of other Project Partners and External Funding

2.18. The project will be based at Spadeadam to connect the transmission testing facility with the H21 distribution testing facility. NGGT have therefore utilised the H21 project teams of Northern Gas Network (NGN) and DNV-GL as partners. This is a logical step, ensuring that learning from H21 is captured and brought into HyNTS.

2.19. All other GDNs have provided letters of support for the project and NGGT will continue to work with Fluxys, the Belgium TSO, to share learnings. The project also has academic partners to provide technical insights, including Durham University, that is proximate to the facility.

2.20. Project partners making financial contributions to the project are DNV-GL (£380k), NGN (£205k), Fluxys (£1.8m) and Durham University (£100k). We consider NGGT's choice of project partners sensible and believe that they will bring clear benefit to the project as a whole.

f) relevance and timing

2.21. We consider that HyNTS is both relevant and timely considering the UK's commitment to net zero carbon emissions by 2050. The project will provide a knowledge

base for a decarbonisation option that could repurpose existing assets and, if successful, could minimise cost and disruption for consumers.

2.22. The Panel believed it to be imperative that the project be completed without delay in order to inform crucial early 2020s decisions on the future of hydrogen.

g) *demonstration of a robust methodology and that the Project is ready to implement.*

2.23. We consider that the project deliverables are appropriate to achieve the overall aims of the project and that these can be delivered within the suggested timescales. We recognise the efforts made by the bid team to consider the learning from H21 as well as international efforts to explore hydrogen technologies.

2.24. We consider the phases of the project to be robust in gathering the required evidence to take this work further in the future and are ready to implement.

2.25. For the above reasons, we have decided to award the project the full £9.07 million funding requested.

H100 Fife – Scottish and Southern Gas Networks, NIC funding award to be confirmed following submission of SGN's revised project costings. Total project cost at time of submission £27.5 million, compulsory contribution £2 million, other funding £7.4 million

Overview

2.26. H100 Fife is seeking to deliver a 'first of a kind' 100% hydrogen network in Levenmouth, Fife, in Scotland. The project aims to build on previous H100 NIA and wider hydrogen projects to deliver an integrated end-to-end system including hydrogen production and storage, distribution and customer supply. The learning gathered could be critical to inform future decisions on decarbonising heat, accelerating development of the hydrogen market, and customer acceptance of hydrogen in GB. The project provides a significant opportunity to increase collaboration across the gas networks and progress hydrogen within the gas industry.

2.27. The aim of this project is to prove the technical viability of a 100% hydrogen network and to develop customer acceptance of hydrogen gas.

Summary of Expert Panel's recommendation

2.28. The Panel recognised the value of H100 Fife as a crucial means of testing consumer acceptability of hydrogen in homes. The Panel considered that, if successful, the project could serve to accelerate the hydrogen pathway for decarbonisation. The Panel also acknowledged that the project represented wider value to the local Fife area as a regeneration project.

2.29. The Panel noted that there is currently no precedent for using electrolyser technologies to supply 100% hydrogen for use in buildings, and H100 Fife would be the world's first 100% hydrogen gas network, for which reason the project is entirely innovative. The Panel also noted that, for the first time in GB, customers will be able to use hydrogen appliances in their homes.

2.30. The Panel's main concern was around detailed cost allocations within the project, particularly those attributed to the hydrogen supply. The Panel challenged the bid team to provide a detailed breakdown of these costs, but was not convinced by responses that ascribed significant costs to an 'overarching' category in the budget. The Panel's concerns were not sufficiently mitigated to conclude that the project represents value for money for gas customers. The Panel believed that the cost of hydrogen supply, or its reliance on NIC funding, would need to be limited if the project were to deliver value for money.

2.31. The Panel thought the project was timely in the development of the national evidence base on hydrogen for heat policy decisions by BEIS, which the Panel anticipate in the mid-2020s. The Panel believed that there are currently no comparable projects as advanced as H100, to deliver the learnings consistent with the critical path needed for such decisions to be made. The Panel also considered that the learning dissemination has been well designed, as well as the detailed validation of the safety and technical aspects specific to network operation.

2.32. The Panel was pleased to hear the strength of commitment of SGN to consumer safety and its engagement with HSE in the development of the project's safety case, but noted that confirmation of no objections from the HSE will be required before commencement of in-home demonstrations.

2.33. The Panel noted that the electrolyser could represent a risk to security of supply in the project and expected that more detailed contingency plans should be in place before the final decisions on the electrolyser were made. They advised a stage gate could be used to ensure this happens before significant funds are committed.

2.34. The Panel recognised the new regulatory challenges presented by a first of a kind, end-to-end hydrogen network and thought it was important that long term consequences should be properly considered. They therefore accepted that, in this case, an early stage gate around the regulatory issues would be an acceptable solution to mitigating concerns in this area. The Panel noted that these will be of significant importance to customers with questions around safety, billing and engagement with their energy supplier.

2.35. The Panel initially had concerns about the level of preparatory work undertaken to engage with paying gas consumers to date, as opposed to the wider stakeholder base in the Fife area. During the course of the bilateral meetings, the Panel's concerns were mitigated by responses from the bid team that clarified the detail of their customer engagement plan. The Panel were also pleased by SGN's commitment to incorporate social science research from another NIC funded project, H21 Phase 2.

2.36. The Panel considered that the project satisfies the majority of Evaluation Criteria but, based on the evidence provided and within the NIC criteria, could not conclude that the project represented value for money for gas consumers. The Panel was unable to recommend on this basis, but also did not recommend its rejection, noting their willingness to approve the project if its cost to the NIC could be limited.

Ofgem's assessment and decision

2.37. We agree with the Panel's assessment of H100 Fife's performance on the value for money criterion, and therefore consider that H100 Fife does not satisfy all of the NIC Evaluation Criteria without mitigation. We do however believe that the project is of strategic importance in the development of the hydrogen agenda and that we do not have immediate comparators proposing to supply 100% hydrogen to consumer homes by 2022. The urgency of heat decarbonisation also lends weight to our decision, and therefore we have come to the decision that the project merits one further opportunity to satisfy the outstanding criterion.

2.38. We will also require SGN to work with Ofgem and the relevant regulatory bodies and code administrators in the development of its regulatory plan, the most recent version of which was received by the Authority on 19th October 2020.

2.39. For this reason, we provisionally award funding to H100 Fife on the condition that:

(1) the Authority approves SGN's regulatory model for the trial, or a revised version of this model as appropriate
(2) the Authority approves revised NIC project costings submitted by SGN, reducing the overall project cost to network customers.

2.40. If approved, the level of funding for this project will be specified in the Authority's decision relating to SGN's revised NIC project costings. Further details of the conditions of the provisional funding will be set out in the Project Direction. Our assessment of the project against each of the Evaluation Criteria is set out below.

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

2.41. We consider that the bid team demonstrated the potential environmental and financial benefits of the project. SGN noted that H100 Fife will enable the decarbonisation of 300 homes saving an estimated 662t CO2 each year over the course of the project.

2.42. While the project intends to supply green hydrogen, it is the learning gained from the hydrogen system and its use in homes, regardless of the source, that serve as a key enabler to the future decarbonisation of gas. We are therefore satisfied with both the immediate project benefits and its potential to drive forward the hydrogen grid research and development programme.

2.43. The Panel notes that the main financial benefit to customers and the UK taxpayer of H100 Fife is the avoided cost of widespread electrification where hydrogen is the preferable option. SGN's estimated cost saving is between £8,000 and £17,000 per customer.

b) provides value for money to gas customers

2.44. We share the Panel's concern on the value represented by the project for gas customers under the NIC. We recognise that the project has considerable value as the

world's first live demonstration of an end-to-end 100% hydrogen network, allowing GB consumers to use 100% hydrogen in their homes for the first time. The bid team was able to demonstrate the wider benefits of an end-to-end project and additional knowledge this will bring on the technical viability of a hydrogen system, including the interfaces between hydrogen production, storage, distribution and consumption in the home. We were therefore satisfied that the project, though not restricted to network operations, delivered sufficient learning and benefits to networks in order to be considered eligible under the NIC Governance project requirements.

2.45. We do not currently have other comparators proposing the level of ambition of H100 Fife. While there are other projects working towards 100% hydrogen demonstrations, as network conversion trials they require changes to legislation and regulation, which H100 Fife intends to avoid by running a parallel hydrogen network, giving consumers the choice between natural gas and hydrogen, and therefore accelerating the testing of in-home hydrogen supply.

2.46. We were however disappointed that information requested during the assessment process, namely detailed cost allocations, was not provided in full by SGN. The information that was provided, including the hydrogen production cost from electrolysis, using power from the wind turbine, appears to represent poor value for money when compared with other hydrogen innovation projects through the NIC. The Panel proposed that the cost of hydrogen production recovered through NIC funding might be capped in order to achieve better value for gas network customers.

2.47. We cannot allow the project to proceed without satisfying this outstanding criterion. We therefore offer provisional funding subject to the Authority's approval of revised project costings, including a revision of the NIC funding required, and a well-evidenced justification. This condition will permit long-lead items to be secured, where they are to be funded through Scottish Government contributions. It is our expectation that the costs to network consumers will be reduced in SGN's revised project costings. If approved, we will specify the level of funding for this project in our decision relating to the revised project costings. Further details of this condition will be included in the Project Direction.

c) generates knowledge that can be shared among all relevant Network Licensees

2.48. SGN demonstrated the involvement of all GDNs and wide range of stakeholders in the energy industry, thereby facilitating dissemination of project knowledge.

2.49. We believe that H100 will generate knowledge that will inform decisions on the future role of gas networks in GB, and on how net zero targets can be achieved.

2.50. The project is however designed to allow customers to opt in and in this way cannot guarantee their buy-in. Whilst SGN envisage sufficient participation, this is a clear requirement to achieve robust learnings.

2.51. The Panel note that the most valuable learning from the project will arise from the introduction and running of hydrogen into homes. We therefore agree with the Panel that the project should not proceed if customer participation is insufficient to produce meaningful learning. We intend to implement a funding condition to this effect.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

2.52. The Panel found the project to be both technically and commercially innovative. The project aims to provide the world's first end-to-end 100% hydrogen network and will allow customers to experience hydrogen appliances in their homes.

2.53. If successful, the project will provide learning on hydrogen gas usage and system requirements, as well as providing evidence of readiness for hydrogen transition through live consumer testing of appliances.

2.54. The project is unprecedented and presents sufficient risk to justify recourse to innovation funding. We are satisfied that the project would not be carried out as part of the licensee's business as usual activities.

e) involvement of other Project Partners and External Funding

2.55. The project will be based at Energy Park Fife for the H100 Fife site development, in Levenmouth. The plot is owned by Scottish Enterprise and is development land for energy activities. SGN note that they have already engaged with Fife Council Planning and Scottish Enterprise as the landowners, and we understand that they are at an advanced stage to deliver the agreements and consents necessary for construction.

2.56. It is positive that the project is supported by numerous key stakeholders including BEIS through their Hy4Heat programme, and the Scottish Government, who are the project's main external funders, with a contribution of £7 million. All other GDNs are project partners, who together with SGN are contributing £2.5 million, alongside hydrogen appliance manufacturers Baxi, Bosch, HyCookers and HyFires. We believe that the involvement of these partners is of great value to the project.

2.57. One crucial stakeholder group which was absent from the project's list were those in the retail space. We are aware that direct engagement with suppliers has been limited thus far and this creates a risk to the project. We are keen to understand how SGN will ensure consumer protection standards are upheld, how it will engage with participating consumers' relevant suppliers, and how SGN will ensure customers are charged for hydrogen at the same rate of natural gas. We will therefore implement a stage gate for SGN to confirm this information to mitigate this risk. Prior to this, we will expect SGN to work closely with Ofgem to understand regulatory issues in more detail.

f) relevance and timing

2.58. The project will inform the potential for conversion of the gas networks through testing consumer acceptability of hydrogen in the home and operation of a hydrogen network, which the Panel describe as a key enabler to unlocking the hydrogen economy.

2.59. The capture of this learning is time critical to inform policy options for the decarbonisation of heat at least cost to consumers. Based on the potential benefits described above, we consider that this project is both relevant and timely considering the UK Government's commitment to develop the evidence base for hydrogen and deliver net zero carbon emissions by 2050.

g) *demonstration of a robust methodology and that the Project is ready to implement.*

2.60. The Panel were pleased with the strength of commitment SGN demonstrated to ensuring consumer safety in its trial design, and believed the approach to follow established and proven methods.

2.61. We recognise the efforts made by the bid team to consider the learning from previous hydrogen projects to combine these into an unprecedented integrated system and the challenges associated with this. We intend to implement stage gates to mitigate concerns around these challenges, which are further explained below.

2.62. One such challenge is the regulatory framework under which a new 100% hydrogen network can operate. SGN did provide us with their proposed approach and expected regulatory hurdles in the course of the assessment process, with the latest materials provided on 19 October, however we require further assurance that the regulatory interactions are comprehensive, given the unprecedented and end-to-end nature of this demonstration. We therefore intend to fund the project on condition that it submit to Ofgem a revised or enhanced regulatory model for approval. We expect that SGN will support and inform the development of this model through regular engagement with the Authority, code administrators, and other relevant bodies. Further information, will be provided in the Project Direction.

2.63. The Panel highlighted a significant concern regarding the security of supply of hydrogen from the electrolyser, and required that more detailed contingency plans be in place prior to final decisions on the electrolyser. We intend to address this risk with a further condition placed upon project funding.

2.64. Additionally, a Safety Management Framework (SMF) is in place for the project and continues to be developed with the HSE's involvement. While a stage gate is included in the project plan to allow for HSE to raise objections to the SMF, we intend to bolster this requirement in our funding conditions, to prevent hydrogen supply to homes prior to the SMF receiving notification of no objections from HSE for the purposes of the trial.

2.65. We believe that the above challenges are not insurmountable for SGN to address, and our concerns are reflective of the high level of customer interaction the project will require.

2.66. For the reasons identified above, we have decided to provisionally approve funding for H100 Fife.

Summary of feedback from this year's Gas NIC

2.67. In its report, the Panel provided feedback and reflections upon the process and bids received over the course of the past seven years, as well as some recommendations for our progression to the RIIO-2 price controls starting in 2021, and the NIC's successor. Full details of feedback and recommendations can be found in the report published alongside this paper.

3. Decision on the Electricity Network Innovation Competition

Section summary

We have decided to offer funding to three of the five projects for which we received Full Submissions. The three projects that will be funded are Constellation (£14.38m), QUEST (7.95m) and RICA (£8.12m). In total, subject to fulfilment of conditions, we are approving £30.45 million towards electricity NIC projects in 2020.

We have decided not to fund two projects: Flexr (£9.27m) and Proteus (£25.03).

3.1. We received five Full Submissions to this year's electricity NIC requesting a total of £64.75 million in NIC funding:

- UK Power Networks requested £14.38 million for Constellation, a project proposing to develop and deploy local intelligence at the substation level. This is a focused evolution of a proposal which was brought forward under the 2019 NIC.
- Northern Powergrid requested £9.27 million for Flexr to create a platform for sharing DNO and Distributed Energy Resources (DER) data to improve the efficiency with which flexibility markets are managed.
- National Grid Electricity Transmission requested £25.03 million for Proteus, which intends to develop, design and build a transmission-connected 50MVA VSM STATCOM.
- Electricity North West requested £7.95 million for QUEST, a project proposing a holistic voltage control methodology to co-ordinate voltage control and active network management technologies.
- National Grid Electricity Transmission requested £8.12 million for RICA to develop a method of retrofitting insulated crossarms to existing overhead line towers to increase the voltage rating from 275kV to 400kV.

3.2. Based on the evidence provided by the network companies and the Expert Panel's recommendations, we have decided to fund three projects (Constellation, QUEST and RICA) and not to fund two projects (Flexr and Proteus). We provide the reasons for our decisions below.

Projects selected for funding

Constellation from UKPN. NIC funding awarded £14.38 million, compulsory contribution £1.63 million, other funding £1.56 million

Overview

3.3. The project seeks to develop and deploy a decentralised intelligence and control system at a substation level. This will include the ability for substations to communicate directly with each other, via 5G. This control architecture is in contrast to the centralised control and communication systems currently used by DNOs. The arrangement that the project proposes can be used for a number of use cases and UKPN has chosen to demonstrate two methods in the course of the project.

Summary of Expert Panel's recommendation

3.4. The Panel were of the view that development of a distributed system management approach as undertaken by the project is highly innovative, and that Constellation could be a route to significant valuable new knowledge in relation to how the control of GB distribution systems needs to evolve to cope with a transformed energy system.

3.5. The Panel found the project to have significant potential for wider benefits than captured in the use cases examined through the project. The project involves appropriate project partners and has the potential to deliver financial and capacity benefits at achievable levels of deployment.

3.6. The Panel were also pleased with the changes made to the proposal from the 2019 submission, namely addressing former concerns around breadth of expertise, clarity of scope and project readiness. The Panel wered satisfied that, while funds requested were notably higher than in 2020, these costs were well justified by increased scope and scale of the project.

3.7. For the reasons above, the Panel has recommended Constellation to be funded in full.

Ofgem's evaluation and decision

3.8. We agree with the Expert Panel's recommendation and consider that Constellation performs well across the Evaluation Criteria. We consider that Constellation proposed a highly innovative approach to network system management, and presents considerable potential benefits for current and future network users. We have therefore decided to fund this project. Our assessment of the project against each of the Evaluation Criteria below:

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

3.9. The use cases explored are local intelligent control and wide area adaptive protection, some of the benefits arising from which are carbon benefits from facilitation of increased renewables, cost benefits of virtualisation of hardware, financial benefits of flexibility, capacity release, and reduced curtailments and their associated costs for DER owners. The novel architecture proposed presents further opportunities through wider applications.

3.10. We are equally satisfied that the projects potential to deliver capacity benefits is high, given forecast increases in DER, and that the project will benefit the DER sector in reducing revenue losses, and increasing connections.

3.11. The Panel's concerns regarding an absence of support from the DER sector in UKPN's submission are noted, however we are satisfied that this concern does not pose a insurmountable risk to the achievement of the project aims.

b) provides value for money to electricity customers

3.12. The project is larger in scale and broader in scope than its 2019 NIC predecessor, which is reflected in increased project costs. We consider that this scale is appropriate in order to achieve the expected learnings.

3.13. Value for money also arises from the the potential benefits specifically accruing to network customers upon rollout of this technology, and the likely achievement of those benefits.

3.14. We are satisfied that the project will be delivered at competitive cost, with competitively tendered suppliers and project partners offering discounted day rates.

c) generates knowledge that can be shared among all relevant Network Licensees

3.15. We agree with the Panel that Constellation could be a route to significant valuable new knowledge in relation to how the control of GB distribution systems needs to evolve to cope with a transformed energy system

3.16. The Panel's concerns of possible limitations of the development of traditional distribution network control systems using large scale facilities are noted. However, we are content that this project would seem to have some inherent advantages over the current centralised model in that it is far less susceptible to a single point of failure – specifically, in relation to communications.

3.17. We are convinced that the Constellation approach could be a foundation for the development of other system management and control functions that rely on or benefit from autonomous real time actions based on local conditions.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

3.18. We understand that the development of a distributed system management approach as proposed by Constellation has not been undertaken in GB. We believe that the project trials represent a higher risk than would be acceptable as part of UKPN's core business as usual activities.

3.19. Neither the Panel nor Ofgem were aware of any such development in a distribution system either in GB or internationally; as such, we consider the project to be highly innovative and without precedent.

e) involvement of other Project Partners and External Funding

3.20. We consider that the project is well-developed, with key partners identified for developing the hardware and software. In addition to UKPN's £1.627 million, other partners making a financial contribution to the project costs are ABB (£228k), GE (£344k), Siemens (£658k), Vodafone (£145k) and the University of Strathclyde

PNDC (£175k). Two other DNOs, SSEN and SPEN, are involved and contributing through their participation in the PNDC.

3.21. The Panel noted the lack of early engagement with DER but we are satisfied this will be addressed in the course of the project, as the live trials necessitate the presence of a willing DER participant. We believe there are sufficient risk mitigations in place should DER participation prove difficult to secure.

f) relevance and timing

3.22. Constellation would be the first practical implementation of a distributed, as opposed to a centralised, control system in a distribution system, opening up the opportunity for more effective and efficient distribution network control. The Panel found the project to be timely given the considerable development of control systems currently underway, therefore suggesting a clear needs case, while taking a novel approach to the problem.

3.23. If the project methods prove to be successful, the project could have a significant impact on distribution network licensees future business planning. We are therefore satisfied that the project is relevant and timely.

g) demonstration of a robust methodology and that the Project is ready to implement

3.24. The project methodology includes measures to derisk the project prior to live trials, and additional means of capturing project learning beyond the base requirements of the NIC Governance. Constellation appears to follow best practice for project management and is appropriate to achieve its intended outcomes. For these reasons we believe the methodolodogy to be robust.

3.25. We note the Panel's concern regarding the availability of 5G communications was explored, following the Government's decision to ban communication providers from buying Huawei equipment from 2021. However, we are satisfied that UKPN can manage this risk within the appropriate timing, and with regards to Vodafone's revised 5G rollout plan. We note that UKPN have requested contingency funding to ward against unforeseeable challenges.

3.26. For the above reasons, we have decided to award Constellation the full £14.38 million requested.

QUEST from Electricity North West. NIC funding awarded £7.95 million, compulsory contribution £0.9 million, other funding £1.5 million

Overview

3.27. QUEST will integrate standalone discrete voltage technologies into a single scheme using ENWL's Network Management System (NMS). It will develop a novel, fully co-ordinated, overarching system to manage voltages and balance centralised and decentralised control hierarchies. This should reduce cumulative design margins and free up network capacity. The role of voltage self-regulation by demand and generation will be investigated, noting that many embedded generators are currently run with fixed output voltages.

Summary of Expert Panel's recommendation

3.28. The Panel recognises that QUEST develops distribution network voltage control in ways that have not been attempted before, and foresee the solution having potential to support the management of increasingly complex distribution networks.

3.29. The project benefits case, though based on a number of assumptions, were sufficiently likely to be achieved at modest levels of rollout. The Panel were further reassured by ENWL's inclusion of additional research into the uncertain relationship between voltage and demand as part of the project. For these reasons the Panel found the project could justify its exploration of increased coordination of innovative network management technologies.

3.30. The project makes use of pre-existing hardware in its trials, which the Panel were pleased to see as a measure of value for money, and considered the coordination of numerous technologies, many themselves the product of innovation funding support, to be innovative.

3.31. Therefore, the Panel recommends QUEST to be funded in full.

Ofgem's evaluation and decision

3.32. We agree with the Expert Panel's recommendation and consider that QUEST performs well across the Evaluation Criteria. Our assessment of the project against each of the Evaluation Criteria is set out below.

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

3.33. The financial benefits of the project arise from released capacity of circa 2200MVA by 2050, and a reduction in losses. ENWL propose that together this would represent £51 million NPV benefits by 2030, and £266 million by 2050. Capacity released by the QUEST solution would enable more low carbon technology (LCT) devices to connect to the network, and would do so more quickly than through network reinforcement, where this is required. In this way, the project facilitates progress towards net zero.

3.34. The Panel noted there was uncertainty in the scale of these benefits arising as they are dependent on a number of assumptions, notably the efficacy of the solution. Following discussions with the Panel, ENWL did however take measures to test their assumptions, introducing research into the voltage:demand relationship. We are satisfied that the uncertainty in scale of benefits do not cast doubt on the project's potential for benefits, and believe that clarification of this relationship will serve as a further learning outcome of the project.

3.35. We are content that ENWL's chosen counterfactual of network reinforcement and flexibility services was appropriate, and that project costs could be recouped at a modest number of roll outs – 23 deployments.

b) provides value for money to electricity/gas customers

3.36. Project costs were well justified and, while not solely reliant on new hardware for its trials, do include the purchase of some readily available technologies. We are satisfied that for the purposes of the trials these costs are reasonable.

3.37. The Panel were overall convinced of the project's value for money, but also noted the potential for QUEST to lead to increased CLASS revenues for ENWL. This concern

is in part mitigated by current arrangements which require any net CLASS revenues to be shared with customers through reduced charges[7].

3.38. The addition of further research on the voltage:demand relationship funded by ENWL enhances the value for money of the proposal as a whole.

c) *generates knowledge that can be shared among all relevant Network Licensees*

3.39. We agree with the Panel that optimisation of voltage profiles across networks operating at different voltages is novel, and would generate new knowledge applicable to network licensees facing similar challenges across GB. We believe that the opportunity to maximise the use of existing assets and the accompanying financial benefits will be of interest to a wider group.

3.40. Specific new learning from the project, as identified by the Panel, pertains to the ability and extent to which voltage optimisation can be achieved within other technological constraints, rather than voltage optimisation in and of itself.

3.41. ENWL have a different network management system than other DNOs in GB. For this reason, the Panel had concerns around the transferability of learning from the project to other network licence areas. Through the course of the assessment process and bilateral meetings with the ENWL team, both Ofgem and the Panel are satisfied that the wider learning from the project would be applicable across GB, even if the specific technology outputs would not.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

3.42. We agree with the Panel that the project is innovative, proposing a novel approach to defined voltage control parameters and assumptions. We consider that QUEST has the potential to optimise the overall voltage profile of the network in real time.

[7] Direction setting out the treatment of CLASS revenue https://www.ofgem.gov.uk/publications-and-updates/direction-distribution-network-voltage-control-services-nget-so-residual-balancing

3.43. We are satisfied that the project is unproven and carries a level of risk that ENWL would not be able to justify through their normal course of business.

e) involvement of other Project Partners and External Funding

3.44. Partners making a financial contribution to the project are National Grid ESO (8.7k), Schneider Electric (330k), Fundamentals Ltd (£127.5k), Smarter Grid Solutions (£201.3k) and Impact Research (£7.6k).

3.45. While we recognise that software provider Schneider Electric will gain some competitive advantage in the course of this project, we are comfortable that the scale of their financial contribution reflects and mitigates this risk.

3.46. We do share the Panel's disappointment that the project does not have a DNO partner, which would have readily addressed concerns regarding the transferability of the solutions developed.

f) relevance and timing

3.47. We consider this project to be relevant and timely. If successful, the solution developed could be used to help minimise or delay DNOs' investment in upgraded network assets.

3.48. The Panel had some concerns regarding the likelihood that other DNOs, who are committed to different network management systems, will be able to implement the specific method outside of a Schneider Electric system. However, we are satisfied that the experience and wider learning from the project will have general applicability, notably the optimisation of voltage profiles across networks operating at different voltages.

g) demonstration of a robust methodology and that the Project is ready to implement

3.49. The Panel found the implementation plan for the project to be appropriate and robust. ENWL intend to develop their algorithm before proceeding to field trials. in comparison to similar developments, delivery risks appear to be manageable, and are sufficiently well reflected in the project's strategy for risk management.

3.50. For the above reasons, we have decided to award the project the full reward of £7.95million.

RICA from National Grid Electricity Transmission. NIC funding awarded £8.12 million, compulsory contribution £0.91 million, other funding N/A

Overview

3.51. This project aims to develop a method of retrofitting insulated crossarms (ICA) to increase the voltage rating on existing 275kV overhead line towers to 400kV. This will allow increased power to be transmitted over existing routes without replacing towers. The method proposed involves replacing existing metallic cross-arms with insulated composite cross arms. If successful, the project could progress the development of ICAs for three different tower models, close to readiness for deployment as a business as usual solution on transmission networks.

Summary of Expert Panel's recommendation

3.52. The Panel found RICA to be a useful approach to solving network problems presented by the challenge of decarbonising the UK's energy systems, notably delays to implementation, higher costs and increased CO2 emissions.

3.53. The Panel also welcomes the potential for avoiding community disturbance that would arise from the construction of new lines. While the Panel had some concerns regarding the absence of project partners, they were satisfied with the financial and carbon benefits that the project was aiming to reach.

3.54. The Panel was content that the project will generate new knowledge through safe installation and were pleased with the competitive procurement taking place for supplier selection to ensure value for money.

3.55. The Panel therefore recommends RICA to be funded in full.

Ofgem's evaluation and decision

3.56. We agree with the Expert Panel's recommendation and consider that RICA performs to a sufficient level across the Evaluation Criteria. Our assessment of the project against each of these Criteria is set out below.

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

3.57. The project's financial benefits stem from the expedited removal of network constraints, for which the Electricity System Operator would no longer have to pay compensation. Benefits were presented on the basis of rollout to six transmission routes across GB.

3.58. The Panel questions the use of building new overhead lines (OHL) as the counterfactual, but were satisfied that no alternative solution would deliver comparable levels of network capacity.

3.59. NGET stated that a reduction in losses, in comparison with the counterfactual of a new OHL, will generate a saving of 39,500 tonnes CO_2e by 2050. They have assumed that the carbon cost of RICAs is equal to that of a new OHLs, which the Panel believed to be a conservative figure. We are satisfied that the project has the potential to deliver direct carbon benefits, while facilitating further benefits through increased network capacity.

3.60. It is highly likely that the uprating of an existing line using RICAs would result in less community disturbance, minimise land-use, and reduce biodiversity impacts than a new OHL, for which reason it is likely to be a preferable approach to the counterfactual if it can be proven.

3.61. The Panel did raise some concerns about stakeholder views differing on exisiting lines, particularly if uprating is perceived to rule-out the possibility of a line being rerouted. We are satisfied that this consideration would not be sufficient to derail the limited innovation project proposed, and pleased that early and frequent community group engagement and consultation are included as part of its delivery.

b) provides value for money to electricity customers

3.62. We consider that the project has the potential to deliver value for money for network customers. We are pleased that NGET will include additional governance measures to ensure that customers will not fund costs that have been allowed for through NGET's totex allowance as part of the project.

3.63. We are pleased that NGET intends to competitively tender for the services of a project supplier, as this will achieve best value for consumers.

3.64. The Panel noted that financial and carbon benefits quoted by NGET are conservative estimates – on the basis of the estimates provided we are satisfied of the project's potential to provide value for money, and the Panel's suggestion of its conservative estimates strengthens this position. We are satisfied that the majority of the benefits arising from RICA would accrue to network customers.

c) generates knowledge that can be shared among all relevant Network Licensees

3.65. We are satisfied that the new knowledge generated will be primarily operational, including safe installation of the equipment on one arm of the tower while the other remains live. The project will also test the technology on a wider range of tower types than has been done previously and will monitor in service performance.

3.66. The Panel initially had concerns that the project would not generate sufficient new knowledge, given previous work undertaken through the Network Innovation Allowance and the Innovation Funding Incentive. These concerns were allayed by clarification of the additional learning gained beyond the previous projects. We are satisfied that this criteria has been met by the expanded scope and scale of trials undertaken through this project and those of its predecessors.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

3.67. While the Panel acknowledged that there have been technical trials of retrofit ICAs both in GB and overseas, we agree that the scale of the project means it meets the criterion of being a limited demonstration project.

3.68. We consider that, given the unproven nature of this project, NGET is unlikely to develop this project without innovation funding, nor would it be able to propose it in a NOA process in order to secure funding under the RIIO mechanism. We are therefore satisfied that the project carries sufficient risk to warrant consideration for innovation funding.

e) involvement of other Project Partners and External Funding

3.69. The Panel expressed concern that no other partners were willing to make a financial contribution to the project. However, we consider the membership of ESO, SPEN and SSE (alongside academics) on the proposed Technical Advisory Board as going some way to mitigate this concern, and will allow for their continued influence in the project.

f) relevance and timing

3.70. We agree with the Panel that, given the significant growth projections in electricity demand associated with decarbonisation, the ability to quickly and cost effectively increase capacity on transmission routes is relevant and timely.

g) demonstration of a robust methodology and that the Project is ready to implement

3.71. We consider that the project has a robust implementation plan, building on previous experience.

3.72. The project's reliance on the Deeside testing facility for some of its trials, was a cause for some concern, given that Deeside itself is an ongoing NIC project, subject to its own project risks and timeline. However, we are satisfied with NGET's proposed contingency plan, which should not prevent the project from proceeding.

3.73. For the above reasons, we have decided to award the project the full reward of £8.12 million.

Projects not selected for funding

3.75. We have decided not to fund two electricity projects that were assessed at the Full Submission stage. Our decisions are supported by the Panel's recommendations, and reflect our assessment that the projects did not perform sufficiently well against the Evaluation Criteria set out in the NIC Governance. We describe the projects and the reasons for our decisions below.

FLEXR and Northern Powergrid. NIC funding requested, £9.27 million, compulsory contribution £1.05 million, other funding £0.21 million.

Overview

3.76. This project proposed to create a platform for sharing DNO and Distributed Energy Resources (DER) data to facilitate and improve the efficiency of flexibility markets. The project also aimed to allow for better analysis of investment opportunities for distributed resources, greater whole system coordination, and enhancement of the connections process. These aims were to be achieved by standardising the way in which DNO data, and data relating to the DERs connected to them is made available, and by having it available in a single location.

Summary of Expert Panel's recommendation

3.77. The Panel welcomed collaboration across the DNOs on this project, and agreed that significant customer benefits are likely to arise from the surfacing of LV network data and its users, making this a timely project.. The Panel was however wholly unconvinced that the NIC is the appropriate route to funding the work proposed in this project, considering it to be a justifiable business as usual activity.

3.78. The key concerns raised by the Panel were limited innovation, the fact that the project is not a limited demonstration but instead an enduring product, its marginal benefit case, and an inappropriate counterfactual.

3.79. The Panel expressed an lack of confidence with the projected benefits case, in particular noting that the projected financial benefits were less than the value of the project and only slightly higher than its NIC funding request.

3.80. Consequently, the Panel has not recommended Flexr to be funded by the Authority.

Ofgem's evaluation and decision

3.81. We agree with the Expert Panel's recommendation and consider that Flexr fails to meet a number of the Evaluation Criteria. Our assessment of the project against each of these Criteria is set out below.

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

3.82. The stated financial benefits arising from Flexr by 2030 if employed across GB are less than the total cost of the NIC project, and only marginally more than the NIC funding requested. While we consider the wider benefits from data access to be underestimated by the project, we share the Panel's concerns that the project overstates its potential to deliver these beneifts. The proposed counterfactual (network invesment) does not properly reflect current and emerging developments in flexibility markets, nor the increasing provision of data by DNOs outside of the influence of the project.

3.83. In response to the Panel's challenge, the Flexr team did produce an alternative counterfactual, which stated that the project would accelerate data sharing by three years, while acknowledging these benefits would indeed still be realised in the absence of NIC funding. While the Panel considered this to be more reasonable comparator, we agree with its view that this acceleration may also be an overstatement. The Panel cited the development of regulatory requirements around data access as one way in which a similar benefits might be achieved.

3.84. We consider that Flexr's proposed carbon benefits of 138,000 tonnes CO_2e by 2050 if rolled out across GB will likewise be achieved regardless of the flexibility pathway, and are not specific to the Flexr proposal. We therefore find that the project offers limited benefits to network customers above and beyond what is likely to be achieved in the absence of innovation funding.

b) provides value for money to electricity customers

3.85. ElectraLink's unique position in the management of GB energy market data would give it a significant cost advantage in the delivery of the Flexr project, and the continued involvement of established project partners and suppliers from its proof of concept could represent value for money to network customers.

3.86. We consider the selection of the proposed contributors to this project via competitive tender process to be positive as a means of achieving best value for network customers.

3.87. As set out in relation to the project benefits above, we do not believe that the project costs are appropriate for the learning that is expected to be captured in this project.

c) generates knowledge that can be shared among all relevant Network Licensees

3.88. The sharing and standardisation data from different DNO data systems does constitute new knowledge, in addition to any knowledge arising from the data itself. The beneficiaries of this new learning would not be limited to DNOs, but also DER owners and service providers.

3.89. The Panel did however raise some concerns regarding limited coordination with the projects shortlisted through the Modernising Energy Data Access competition, funded by InnovateUK. We agree with the Panel that there are significant overlaps and potential synergies with the MEDA projects and we consider that this would have the potential to result in duplication of learning. Flexr did however mitigate these concerns to some degree with ongoing and proposed engagement with the MEDA competition finalists.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

3.90. We share the Panel's disappointment that DNOs considered it necessary to request financial incentive to collaborate on something that may be considered relatively commonplace to businesses across other sectors. We believe that the project could be undertaken without the support of the NIC, and therefore does not satisfy this

criterion. We encourage the DNOs to engage with Ofgem on how best to bring these benefits forward outside of the NIC.

3.91. While we recognise the requirement for collaborative work to be carried out, we are unconvinced that data standardisation, sharing and integration between other DNOs over cloud-based platforms, and the associated governance, constitutes innovation. Data sharing is prevalent in other sectors, and we do not believe the proposal represents sufficient risk to warrant innovation funding.

3.92. Likewise, we are also not convinced that this could be viewed as a limited demonstration, ie pertaining to a technology readiness level (TRL) of less than 9; the enduring nature of the outputs suggest the rollout of a complete solution. The solution is proposed for rollout across five of the six DNOs in GB.

3.93. The Panel noted that the project does not appear to be a limited demonstration, but instead the development of a comprehensive solution for five out of six of the GB DNOs. We agree with this interpretation of the proposal.

e) involvement of other Project Partners and External Funding

3.94. The Flexr project's core premise, namely standardisation of data, would require the collaboration of DNOs in order to be successful. The four DNO project partners, in addition to Funding Licensee Northern Powergrid, reflects this requirement.

3.95. The project lead is ElectraLink, the DNOs' data provision and service partner. Electralink proposed to be make a financial contribution of £211k. We consider this level of contribution to be appropriate given the opportunity for ElectraLink to leverage the platform for commercial gain, as stated in the course of the assessment process. We would however repeat our concerns regarding the competitiveness of financing an enduring service for Electralink to deliver.

3.96. We agree with the Panel's concerns regarding the absence of formal DER participants, given Flexr's stated intention to surface DER data. The Panel was also concerned about the omission of the ESO, given the significant weight placed on whole system co-ordination.

3.97. We believe that narrow project participation could contribute to an undue focus on the needs and requirements of DNOs over other market participants, making the project output suboptimal for those participants excluded from its development.

f) relevance and timing

3.98. The project is relevant, noting the anticipated role of data in the achievement of decarbonisation. The need for open access to DNO data is high on the agenda for RIIO-2. There are also potential market-led solutions being explored through pathways such as the MEDA competition. The project is therefore one approach of many, and must be considered in that context.

3.99. We do not, however, consider the project to be timely. As acknowledged by the Flexr team itself, we are not more than three years off the achievement of the project outputs, regardless of its completion. We therefore consider that the project may have found itself better able to claim itself as an innovative solution, and to strengthen its benefits case, if it were to have been proposed some years earlier.

g) demonstration of a robust methodology and that the Project is ready to implement

3.100. The project timing and methodology built upon the experience and results of the proof of concept project, and does seek input from users on what data should be prioritised.

3.101. We share the Panel's concerns regarding the robustness of the proposed Definition, Discovery and Agile-based Software Delivery approach and its absence of clear stage gates to protect customer funding in the event of project failure.

3.102. The Panel were displeased by the proposed development of an enduring monopoly service, proposed from a strategically advantageous position in the case of Electralink, and for the stated purpose of leveraging possible further business opportunities. We take on board the Panel's concerns in this regard, and believe it to constitute a failure to consider the enduring project impacts upon network customers.

3.103. For the reasons outlined above, we have decided not to fund Flexr.

Proteus and National Grid Electricity Transmission. NIC funding requested, £25.03 million, compulsory contribution £2.8 million, other funding N/A

Overview

3.104. The project aims to develop, design, build and test a full-scale virtual synchronous machine (VSM) by applying controls that have been developed to imitate a new synchronous condenser. It is proposed that this project would replace rotating synchronous generators from a power system stability perspective, but with lower internal losses and fewer installations needed to achieve a similar level of performance.

Summary of Expert Panel's recommendation

3.105. The Panel was unconvinced of the project benefits given the lack of evidence presented in relation to its primary needs case; namely, vector shift becoming a major network issue.

3.106. The Panel was also uncomfortable that NGET has not demonstrated a firmer connection between their proposal and the Electricity System Operator's (ESO) current work on a VSM specification for the GB Grid Code. The ESO, though a key beneficiary of the expected project output, is not a project partner.

3.107. Futher concerns arose from the high upfront capital cost, which contributed to doubts surrounding the project's ability to deliver financial benefits in the presence of alternative solutions.

3.108. Finally, the Panel was unconvinced that the NGET approach would ensure value for money for network customers, and failed to allocate risk to the appropriate parties.

3.109. Consequently, the Panel is not recommending that Proteus be funded by the Authority.

Ofgem's evaluation and decision

3.110. We agree with the Expert Panel's recommendation and consider that Proteus fails to satisfy a number of the Evaluation Criteria. Our assessment of the project against each of these Criteria is set out below.

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

3.111. We agree with the Panel's view that the the significant upfront capital costs of any roll out configuration proposed do not provide sufficient confidence of financial benefits to network customers.

3.112. While the financial and carbon benefits estimated by NGET are sizeable, its required deployment levels to achieve such benefits are primarily dependent upon vector shift becoming a major network issue. As noted by the Panel, long-term system operability outlooks do not highlight vector shift as a major network issue. The benefits were also considered to be constant and did not take into account the developing VSM capabilities of other providers which might have diminished the requirement for a Proteus solution. For these reasons, we agree with the Panel's conclusion that NGET's stated benefits are unlikely to come to fruition.

3.113. Although NGET have referred to wider benefits to the renewable generation sector arising from greater confidence in the technology, we are not convinced such a benefit would be exclusive to this project, and are likely to see similar benefits as a result of the ESO's current development of VSM device specifications.

b) *provides value for money to electricity customers*

3.114. The Proteus project would fund a manufacturer to develop a product for the global market. We are unconvinced of the appropriateness of innovation funding being used to procure a product to allow NGET to provide stability services itself, rather than procuring the services from the market directly. While NGET claimed that it will procure the statcom development competitively in order to recoup some of these costs for customers, it is doubtful that enduring cost benefit would accrue to network customers from the commercialisation of such a product.

3.115. NGET's procurement and ownership of the VSM also places the investment risk squarely on network customers, as opposed to manufacturers. We do not believe this to represent value for money for network customers.

c) *generates knowledge that can be shared among all relevant Network Licensees*

3.116. We are satisfied that the project would generate new knowledge, specifically arising from the detailed specification of the device, its manufacture and installation at scale.

3.117. The Panel notes the ESO's Stability Pathfinder provides an existing development path which could allow system stability services to be delivered from a range of market participants. We agree with the Panel that learning gained from Proteus could be of use in the specification and procurement of subsequent VSM statcoms, and in turn provide a practical demonstration against which to test and inform the ESO's Grid Code VSM specification.

d) is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development and/or Demonstration Project to demonstrate its effectiveness

3.118. We consider that the project is a limited demonstration of an unproven concept. We consider that the project presents sufficient risk that NGET would be unlikely to carry it forward through its normal course of business. For these reasons we consider the project to be innovative.

e) involvement of other Project Partners and External Funding

3.119. Proteus has neither project partners nor external funding. While the benefits case as stated by NGET is sizeable, it does not appear to have attracted or convinced other potential project beneficiaries.

3.120. We share the Panel's disappointment that the ESO is not involved, given the synergies with their own work across the Stability Pathfinder and the Grid Code Working Group, as well as joint responsibilities around ensuring system stability. We do not consider it appropriate for the project to proceed without involvement from the ESO.

f) relevance and timing

3.121. While there is a demonstrable need to develop VSM technology, the project appears poorly timed, having little interaction with the ESO's ongoing work in this space, and proposing a project at a scale that does not respond to current need in GB.

3.122. The project relies upon vector shift becoming a problem for the achievement of its stated benefits. As noted by the Panel, there is currently limited understanding of the nature of the vector shift problem. It is important to note that the ESO has not identified this specifically as an emerging issue in its system operability outlooks.

3.123. We cannot therefore conclude that the project is timely or relevant.

g) demonstration of a robust methodology and that the Project is ready to implement

3.124. The overall project appears to be well designed; however, the methodology proposed relies entirely upon the success of a tender process to design and build the statcom. The Panel notes that, despite the international manufacturing market's engagement thus far in the development of VSM technology, it is still uncertain how the market would respond to NGET's tender, and whether a manufacturer would be likely to come forward with a satisfactory proposal. We share the Panel's concern in this regard.

3.125. Therefore, for the reasons outline above, we have decided not to fund Proteus.

Feedback from this year's Electricity NIC

3.126. In their report, the Panel thanked the bid teams for their active engagement throughout the course of the assessment process, and offered some reflections on the successes and shortcomings of the NIC for consideration in Ofgem's design of the incentive's successor. Full details of feedback and recommendations can be found in the report published alongside this paper.

4. Next steps

Funding of selected projects

4.1. Before funding a NIC project, we issue a Project Direction explaining the terms that the funded network company has to comply with as a condition of receiving NIC funding. If the network company agrees to comply with its Project Direction, we will issue a Funding Direction to specify the amount of money to be recovered from network customers next year, through their network charges, to fund the successful NIC Projects. We will issue both the Project Direction and the Funding Direction shortly.

4.2. We expect the funded Projects to start as soon as possible, each according to the terms in its Project Direction and the applicable NIC Governance Document. Projects will be able to access funding from April 2021.

Monitoring of projects and dissemination of learning

4.3. We will monitor each project to ensure that it is implemented in line with its Project Direction. Each project will provide us with progress reports in line with the requirements of the NIC Governance document. These reports will be published on the companies' websites to make project learning available to all interested parties. Learning from the projects should also be made readily available and shared according to the projects' plans.

4.4. The Energy Networks Association (ENA) has a portal which holds information and learning from innovation projects, including those funded under the Low Carbon Networks Fund (LCNF) and the Gas and Electricity NICs.[8] We expect learning from this year's projects to be made available through this portal.

4.5. Network companies have a licence obligation to ensure dissemination of the knowledge generated from their projects (including previously funded NIC projects). These requirements are set out within the NIC governance documents.

[8] http://www.energynetworks.org/electricity/futures/innovation-portals.html

Future Network Innovation Competitions

4.6. We will publish dates for next year's NIC, which is applicable to the electricity distribution sector only, in early 2021.