SIF Alpha Project Registration

Date of Submission

Nov 2022

Project Reference Number

10036950

Project Registration

Project Title

HyNTS Deblending for Transport Applications

Project Reference Number

10036950

Project Licensee(s)

National Gas Transmission PLC

Project Start

Aug 2022

Project Duration

6 Months

Nominated Project Contact(s)

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Project Budget

£389,298.00

Funding Mechanism

SIF Alpha - Round 1

SIF Funding

£313,398.00

Strategy Theme

Net zero and the energy system transition

Challenge Area

Zero emission transport

Project Summary

HyNTS Deblending aims to develop and demonstrate technologies that separate hydrogen from natural gas/hydrogen blends for National Transmission System (NTS) transport applications. The solution will be mobile allowing it to be relocated on the network as it transitions to 100% hydrogen.

This Alpha application will take the learnings from Discovery and through a competitive tendering process will engage with manufacturers for both deblending and refuelling equipment to design the innovative solutions needed to demonstrate deblending, purification and refuelling directly from a transmission network.

Through the Discovery Phase, a technology review was completed and a functional specification for a deblending system was agreed. Early engagement with equipment suppliers and stakeholders was also carried out.

Through the Alpha phase, the potential for the deblending system to control the blend of hydrogen/natural gas for other users who require a very precise blend and remove hydrogen from natural gas for sensitive users to a level of <0.1% will be considered to maximise the deblending opportunity.

Addressing barriers to large scale hydrogen refuelling station roll out (Zero Emissions Transport theme)

This project directly addresses all of the scope challenges under the Zero Emissions Transport Theme. Successfully demonstrating NTS deblending technology enables large scale hydrogen distribution through the NTS for hydrogen refuelling stations (HRS). The successful roll out of the technology will accelerate hydrogen mobility roll-out by enabling HRS to access a secure hydrogen supply from low-cost, large scale, production facilities before 100% hydrogen NTS. Refuelling from the NTS is particularly well suited to hydrogen refuelling for heavy haulage, trains, buses and shipping, where large hydrogen demands can present challenges for hydrogen distribution by road.

The NTS deblending technology could also facilitate the early introduction of hydrogen to decarbonise the NTS connected industrial gas users and local gas networks. The system will be mobile to enable movement along the NTS as sections transition from natural gas, to blended hydrogen and then to carrying pure hydrogen. This will allow customers to transition to 'pure' hydrogen use ahead of other NTS connected users, while also protecting users who are not ready to accept a hydrogen blend or have very specific blend requirements. The flexibility provided by this technology will be vital for allowing the introduction of hydrogen into the NTS and the ability to separate hydrogen suitable for multiple applications will enable a cost optimisation of blending plans into the NTS to reduce costs of decarbonisation to all NTS connected users.

A team well placed to deliver this innovative project

The HyNTS Deblending project is led by a team with complementary skill sets needed to develop and deliver a deblending project in realistic operation conditions:

National Grid Gas PLC (GT&M), the NTS system operator, provide the depth of understanding of the requirements of NTS gas users and blending challenges from their existing blending and deblending studies.
Element Energy (EE), are a consultancy practice with extensive expertise in the hydrogen energy sector and project development and management. EE will manage the project and provide an understanding of the economics of the hydrogen supply chain.
Element 2 (E2) are a developer of hydrogen refuelling stations, who will provide insights into the hydrogen supply requirements for vehicles and the needs of the vehicle owner/operators.
The equipment supplier best placed to develop the designs for the system will be selected by competitive tender. The Discovery Phase has found that multiple experienced suppliers are available for the project.
Gas Networks - Cadent and NGN join the project to ensure alignment between the mobility development projects as seen in the additional project plan appendix.

Project Description

The UK has committed to Net Zero Emissions by 2050 which will require a range of new energy and technical developments. National Grid Gas PLC have been considering the role of the Gas Networks in this transition, and the associated potential use cases. Hydrogen is one of the solutions to achieving this target and in the transitional period, is likely to be blended with natural gas to provide energy to industry, heat and transport use cases. Each use case requires different gas quality and blends which will be managed through deblending and purification technologies. The HyNTS Deblending project focuses on the deblending of gases from the high pressure national transmission system (NTS) to enable delivery to transport applications. The project is aligned to Cadent's Hy4Transport project (purification from distribution networks) and NGNs Pipeline Hydrogen for Multimodal Mobility for the North project (refuelling infrastructure design for the north); together these projects provide a comprehensive landscape for hydrogen mobility applications.

In the transition period up to 2050 it is likely that there will be varying requirements from our customers ranging from 100% hydrogen to 100% methane, which is likely to change as our customers migrate to net zero solutions. If this cannot be controlled with the blend coming into the network, then a system will be required at the end customer to ensure delivery of the correct gas mixture. This project develops low cost mobile solutions for deblending and purification that can be migrated around the UK networks as we transition to 100% Hydrogen. Without this technology, refuelling of transportation assets will be limited to the use of locally produced hydrogen, until the gas networks can transport 100% hydrogen.

Without this technology, refuelling of hydrogen transportation assets will be limited to the use of locally produced electrolytic hydrogen or road transported tankers until the gas networks can transport 100% hydrogen. This will limit hydrogen infrastructure availability and therefore the speed of transition for the transport industry. The project works with refuelling partners to explore the opportunity to utilise this technology to enable transport applications, through refuelling stations directly connected to the NTS network. The Alpha Phase will select the optimum technical option for taking gases from the NTS assets, and develop designs for a deblending and refuelling system tailored to the NTS and hydrogen transport user needs. This will enable progression to a demonstration in Beta in coordination with Cadent and NGN.

Preceding Projects

10020605 - HyNTS Deblending

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Project Approaches And Desired Outcomes

Innovation Justification

Hydrogen is a zero-emission transport option that is well suited to heavy duty cycle and long range applications where battery electrification has limitations, for example heavy duty vehicles, shipping, trains and buses. However, hydrogen refuelling stations will face problems using current hydrocarbon supply methods as the scale of stations increases on key road corridors to multiple tonnes per day (e.g. supplying 100s of trucks and bus, multiple trains/ferries):

Hydrogen delivered compressed in trailers will face logistics challenges for multiple trailer deliveries (each carrying c. 1 t hydrogen) approximately x10 current fuel supply deliveries
Hydrogen production on-site is not appropriate in all locations due to space limitations and production capacity limitation, the high cost of electricity from the electricity network, regular maintenance costs and the reliability challenges of a single production source.
National Grid Gas PLC (GT&M) also faces challenges in quickly transitioning the National Transmission System (NTS) to carry hydrogen in place of natural gas as although some connected users will be ready to accept '100%' hydrogen others may be slower to adopt hydrogen or only accept a blend. The HyNTS deblending project will develop a solution that can separate hydrogen from a blend in the NTS, to supply pure hydrogen to those ready to transition to hydrogen ahead of other users and to support the protection of customers who require precise blends of hydrogen. The solution will be able to supply hydrogen at large scale to hydrogen refuelling stations, accelerating the uptake of hydrogen for transport.

In absence of the HyNTS deblending solution being developed, the supply of NTS connected users with hydrogen will be delayed until every connected user is ready for '100%' hydrogen or a specific blend. All the while, the roll-out of zero emission transport will be delayed due to limited refuelling infrastructure.

Innovating and filling knowledge gaps on previous deblending work

The technologies required for gas separation, compression and purification have been developed for industrial processes and are in use today. However, the scale of these systems is much larger than expected for the gas network applications and therefore costly to deploy. This project, will develop the first of a kind deblending facility that applies to the NTS's specific challenges, building on existing technologies:

Being able to separate hydrogen and natural gas to the two purities required by targeted users.
Being developed to handle the input flow and blend variation experienced in the NTS, while still maintaining product purity.
Providing a mobile cost-effective solution that can be migrated around the NTS as it transitions to hydrogen.
A project only fundable through Strategic Innovation Fund

The project will develop and demonstrate NTS deblending systems for transport applications on the FutureGrid test site. The system cannot be adopted into business as usual until there are significant hydrogen blends in the NTS. First use of the system in BAU is in-line with Project Union which is due to begin construction in 2026, waiting to develop the system will delay the ability for refuelling applications to link to the gas networks and delay the transition.

The demonstration facility, while demonstrating the full supply chain to hydrogen vehicles, will be built at a suitable scale to enable technology demonstration whilst minimising cost to the consumer through SIF. Enabling implementation post project with minimal additional work required.

Benefits

What are the most significant expected benefits of your project?HyNTS Deblending will develop, demonstrate and test a facility to 'deblend' hydrogen from a blended network and supply that hydrogen for purification and onwards to a hydrogen refuelling station.

Facilitating the UK governments targets

The technology developed in the HyNTS Deblending project will allow large volumes of hydrogen to be transported to power, industrial, heat and mobility users through a blend in the National Transmission System (NTS), before all users are ready to accept 100% hydrogen. A customer who may not be ready for higher levels of hydrogen initially can be protected allowing the others to transition before them. This enables hydrogen and natural gas to be transported from producers to users in parallel, which will accelerate the UK transition to hydrogen and support the UK Government's target of 10 GW of low carbon hydrogen production by 2030.

Providing a low cost, reliable hydrogen supply to transport applications and industry

The supply of large scale hydrogen for transport demand requires either delivery by liquid hydrogen (which is expensive) or the local production of hydrogen at the point of use. Deblending from the NTS will enable a number of benefits to connected system users:

A more reliable hydrogen supply is provided, by utilising storage within the network, users are connected to multiple large scale production projects, reducing dependency on supply from local facilities and accessing hydrogen production economies of scale.
The ability to distribute via the NTS will enable production facilities to be sited in a location optimised for hydrogen production. This particularly suits hydrogen production by electrolysis, which can be positioned where there is sufficient space and large quantities of renewable energy available.
Accelerated hydrogen refuelling infrastructure across the UK due to ease of access to a hydrogen supply and so promoting the hydrogen transport economy.
The reliability of hydrogen supply also reduces the need for costly compressed hydrogen storage at refuelling stations.
These benefits will be quantified through an economic assessment, that compares the potential cost savings (per kg H2) available from large scale hydrogen production and transportation via the NTS, to the cost of local smaller scale hydrogen supply with storage.

Providing further distribution cost benefits and avoiding logistics challenges

Large scale refuelling stations, e.g. for the marine sector or HGVs at motorway hubs, would require multiple compressed hydrogen trailer deliveries daily, presenting a logistics challenge and requiring a large quantity of on-site hydrogen storage (which will require special consenting). Removing these trailer deliveries would also remove any additional traffic issues caused by that many deliveries. In addition, work in the Discovery Phase, has found distribution by blending/de-blending to be cost competitive with delivery by tube trailer for distribution distances of over 200km.

These benefits will be quantified through the cost of hydrogen supply by deblending compared to compressed hydrogen tube trailers and number of refuelling stations supplied by the NTS.

Providing CO2 savings to other NTS users (industrial, power & heat)

The deployment of deblending facilities will enable the supply of hydrogen and hydrogen blends to other NTS connected industrial users whilst protecting those users that cannot transition. For example, a single de-blending facility used to supply the median industrial gas user on the NTS with hydrogen to replace natural gas would supply 10.9 MW of H2 and provide emissions savings of 17.4 ktCO2 per year, and 1t per day of hydrogen taken for mobility to replace diesel use will provide a saving of 3.7 ktCO2 per year. These emissions savings will be quantified through the alpha phase by considering the energy use of the deblending facility and emissions savings from 100% hydrogen use.

Risks And Issues

Approach to identifying and managing risks

The HyNTS Deblending system will develop across the alpha and beta phases, before the technology can be rolled out commercially and provide benefits for GT&M. Risks will therefore be identified and tracked for the alpha design and beta demonstration phases, whilst considering risks associated to commercial roll-out, to support the direction of the project work. A live risk register will be monitored throughout the project , which identifies the highest impact risks to each phase and potential mitigations. This will be updated at each monthly consortium call based upon feedback from the leaders of each work package and the risks that they have identified to date. The risks currently identified are attached in the appendix. Key risks are highlighted below.

Risks to the Alpha phase and Beta Phase of the project

The Alpha phase of this project will design, and select suppliers for, de-blending and refuelling equipment to supply hydrogen from blends in the National Transmission System (NTS) to transport users and the beta phase will then build and test the equipment at the FutureGrid facility where hydrogen blends and 100% hydrogen are being tested in de-commissioned NTS assets in a closed system. There are therefore limited environmental, managerial, commercial and political risks to these phases (see risk register). The major (highest scoring against likelihood and impact) risks are:

The lack of availability of Original Equipment Manufacturers (OEMs) to engage with the alpha design or beta demonstration, due to time constraints.
The lack of ability to OEMs to meet the required functional specification with a mobile solution, to be able to respond to the required flexibility required for connection to the NTS.
The ability to carry out the alpha and beta phases within the project budget.
A lack of demand for hydrogen vehicles at the demonstration site.
Capacity issues at the FutureGrid facility
These risks have been mitigated by early engagement with OEMs and stakeholders that could be involved to confirm willingness to

engage with the project and the viability of the functional specification. In addition, HyET (one potential supplier) developed high level concept designs that meet the functional specification in the discovery phase. The beta phase plan will be developed in the alpha phase and scoped to be within a viable budget.

Handling of IP issues and working with IP of subcontractors

The IP terms with equipment suppliers will be agreed upon signing the sub contracts for the alpha phase. These are not envisaged to present a barrier to the project, due the proposed deblending system to be developed using background IP, integrated into a new application. The equipment suppliers will therefore be able to maintain their background IP for the project and keep their freedom to operate. If any issues do arise within the project, they will be resolved in collaboration with GT&Ms dedicated legal team, who are experienced in solving IP issues relating to SIF projects. Additionally this will be mitigated by engagement with procurement teams and contract negotiations during the selection of supplier process.

Project Plans And Milestones

Project Plans And Milestones

Overall accountability of the project will lie with National Grid Gas PLC (GT&M) with overall responsibility for each of the work packages given to the project partners. The project will be manged through several work packages (WP) enabling elements to be run in parallel as appropriate.

WPO - Project Management (Element Energy): Element Energy (EE) will track and monitor progress against the project plan, deliverables and budget, maintain a live risk register and identify and address issues as they arrive.

WP1 - Equipment Suppliers Selection (*Element Energy)*: The team will lead the finalisation of the equipment selection criteria for the deblending system, issue a request for proposals and analyse responses to recommend supplier(s) of equipment for the deblending system.

WP2 - H2 mobility demand engagement and refuelling sizing (Element 2): E2 will engage with local fleet operators to define a viable deployment of hydrogen vehicles for the demonstration, and use these discussions to specify the requirements of the hydrogen refuelling station.

WP3 - FutureGrid integration and H2 supply (GT&M): Integrate the plans for the NTS Deblending project with other projects developing at the FutureGrid facility. GT&M will also liaise with other UK gas network hydrogen projects, such as Cadent's Hy4Transport project examining purification for mobility.

WP4 - Test profiles and demonstration system requirements (Element Energy): EE will develop example profiles of hydrogen and natural gas blend composition, pressures and flow rates through the demonstration de-blending facility, to inform the development of system designs and to be tested in the Beta facility.

WP5 - Deblending + refuelling system sizing and costing (GT&M with subcontractor): The selected deblending equipment supplier and Element 2 will work to optimize the deblending and refuelling system to meet the hydrogen supply and demand profiles developed in earlier WPs.

WP6 - Basic design, de-blending equipment (GT&M with subcontractor) The selected supplier will develop FEED designs for the NTS appropriate deblending system sized in WP 5 and to be developed in the Beta demonstration.

WP7 - Basic design refuelling station equipment (Element 2 with subcontractor): Element 2 will lead the process to select a supplier of refuelling station equipment to the project, and work with them to develop FEED designs for the Beta demonstration refuelling station.

WP8 - Further roll-out: Demonstration plan, business case and regulatory barriers (Element Energy) EE will assess the feasibility of further roll-out of the deblending facility, through updating the deblending business case and assessing any potential regulatory barriers.

Success criteria for the Alpha phase of the project

Successful contracting of an equipment supplier able to meet the proposed deblending functional specification
Designs developed for a deblending/refuelling system that can meet the NTS blend requirements and end user hydrogen purity and flow requirements. These will be validated by a design deliverable.
Clear plans developed for a beta demonstration at a cost effective budget and integrated with other FutureGrid plans , this will be validated by the Beta demonstration plan output of WP8 and WP3.
Clear conclusions on the business case for deblending and regulation of blending/deblending needed to enable the proposed deblending technology to be rolled out, this will be validated by the deliverable of WP8.
Changes to the consortium since the discovery phase To enable an unbiased selection of the best deblending equipment for the project, HyET are no longer included in the project team. The rest of the project team remains unchanged to allow continuity between the phases. The additional subcontract of deblending suppliers will be managed by GT&M. Cadent and Northern Gas Networks have joined the alpha application to ensure tie in with their own hydrogen transport projects, see appendix.

Regulatory Barriers (Not scored)

There are no regulatory barriers that prevent the delivery of the project through Alpha or Beta. These phases will enable the delivery of knowledge and systems for future application on our hydrogen investment activities such as Project Union. Uncertainty in the RIIO-2

funding mechanisms requirements and timelines could lead to projects not progressing in the assumed funding route or timescales proposed, however, discussions are ongoing to ensure we are approaching the activities in the correct manner with Ofgem and BEIS to reduce this risk.

Our network supplies natural gas to industrial, power and heat applications today and has a fantastic opportunity to support transport applications with net zero gases. The National Transmissions Systems (NTS) first application of hydrogen in the UK will be through Project Union, repurposing 2400km of pipeline to enable interconnectivity between the industrial clusters and strategic UK locations such as St Fergus and Bacton. Through this work we have commissioned a project with Frontier Economics to consider the options for regulation of 100% hydrogen networks.

There are several policy and regulatory systems in review around the introduction of hydrogen considering both 100% hydrogen and blended hydrogen. Primary and secondary legislation will need to be updated to enable blends of hydrogen within the network and allow for the development of a 100% hydrogen NTS. Alongside this, rules will need to be agreed, such as the uniform network code (UNC) and Gas Safety Management Regulation (GSMR) to incorporate hydrogen blending and if required adapted for hydrogen transportation.

Engagement with our stakeholders and customers in the deployment of hydrogen and the timelines associated is vital to the success of future hydrogen deployment to ensure Network exit and entry agreements (NEXA/NEA) are aligned to the network approach in the vicinity of these customers. We have already begun these discussions with the majority of our key stakeholders through Project Union, these interactions have been very positive with an agreement that a hydrogen backbone in the UK is a requirement.

The policy landscape is already beginning to enable the deployment of hydrogen and through the continuation of the policies on hydrogen in industry, transport and power we will be enabled to deploy the findings of the SIF projects. The announcement of the industrial cluster decarbonization plans has been key to our hydrogen backbone proposal and with further progress of the later track clusters and introduction of further clusters we can support further decarbonization in the UK. Business model and regulatory regimes alongside these policies will ensure the robust and accelerated transition of the hydrogen infrastructure in the UK.

Consideration of interconnectors with Europe and their route to hydrogen deployment in their systems has already begun with the European hydrogen backbone proposal incorporating the NTS. Europe have accelerated their transition to having a blend of hydrogen in the network to 5% by 2024, in order to maintain interconnection with our counterparts we must be enabled to blend gas into our gas networks, protecting customers that cannot accept this with deblending technologies.

We continue to support Government and Ofgem in gathering the evidence required to deliver policy and regulation that will enable the energy transition through working groups such as Hydrogen Grid Research and Development (HGR&D) and Gas Goes Green (GGG). Evidence of our networks capability to support the transition is beginning the be reviewed by the HSE and development of approaches to blending both commercial and technical are underway through these collaborative working groups.

Business As Usual

User requirement at the heart of the deblending technology will ensure the innovation is suitable for business as usual adoption

The deblending technology functional specification proposed in this project has been developed to meet the needs of National Grid Gas PLC (GT&M) and National Transmission System (NTS) connected users as they transition to hydrogen and the requirements for hydrogen supply to transport applications. The specification was developed based upon engagement with stakeholders and drawing on Element Energy's significant experience in working with potential industrial and transport hydrogen users and Element 2's in depth requirements of the requirements for hydrogen in transport.

The technology options considered for the project have been filtered so they are at a viable Technology Readiness Level (TRL) for commercial roll-out after the beta demonstration, and the functional specification tested with equipment suppliers to ensure viability. The consortium will continue to engage with stakeholders of the blending/deblending supply chain, including hydrogen suppliers and other GT&M teams working on hydrogen, to ensure the technology is suitable for business as usual.

Support within GT&M to implement the innovation

The technology solution in development through this project has been incorporated into the GT&M hydrogen strategy and is a key requirement to enable an accelerated transition to net zero. Without this technology the NTS will be limited to transition at the rate of its slowest adopter. This technology will enable transport application to access hydrogen far earlier than previously considered and should accelerate the ability for transport users to convert to hydrogen more quickly. The implementation of this system will be managed by the hydrogen team at GT&M whom are currently managing Project Union activities (hydrogen backbone project within the Transmission network) with support from all the core business as usual teams. Hydrogen is considered a vital opportunity for the NTS as we

progress to Net Zero and is supported by the entire leadership team.

It is envisaged that in the future GT&M will manage applications to connect to the NTS for the purpose of building a nearby refuelling station, this will be handled the same as any application to connect and will continue to show the benefit of the NTS.

The project team as key knowledge holders will support the first application of the system ensuring all standards and policies are in place to drive the technology into business as usual.

Sharing learnings with other licensees and supporting business as usual uptake at the quickest opportunity

Workshops with gas distribution networks towards the end of the project.
Close alignment with other Gas network compression and purification projects.
Sharing learnings with potential users workshop (industry and mobility) to raise awareness of technology
Funding strategy for the adoption of the innovation

The users of this technology could be the NTS operators providing a particular blend to their customers, other gas network operators or end users whom may accept a blend of gas and deblend at their own cost. The Network Exit Agreement or NEXA and funding strategy will depend on the users' requirements to utilise the blend in the network:

Once the technology is demonstrated and H2 blends are in the network -- the system will be rolled out on a commercially competitive basis.
3rd parties will develop the equipment for mobility supply and 100% hydrogen offtake, relying on existing funding available to incentivise hydrogen production and use. Deblending will compete with distribution models on a business case basis.
The funding strategy for further roll-out of protecting NG users will be developed in alpha and beta phases.

Commercials

Commercialisation

Deblending technology provides value to National Grid Gas and connected customers by facilitating a transition to net zero compatible hydrogen

The technology developed in the HyNTS Deblending project will enable National Grid Gas PLC (GT&M) to actively participate in the UK's transition to net zero and support the targets of 10 GW of low carbon hydrogen by 2030. The technology will allow the large scale distribution of low carbon hydrogen by blending in the national transmission system (NTS) to early adopters in heat, industry and transport, before all users on the NTS are ready for 100% hydrogen. This enables the NTS to meet the varied needs of customers, who will be ready for blended and 100% hydrogen at different times, and will accelerate the timelines on which the NTS can transition to carrying net-zero compatible 100% hydrogen by providing flexibility to customers transition to hydrogen.

A strong hydrogen distribution value proposition to early hydrogen producers/consumers

Distribution to customers by deblending/blending through the NTS provides value to early adopters of hydrogen production and consumption:

Users can be connected to multiple large scale producers and the NTS can provide a reliable hydrogen supply, reducing dependency on supply from local facilities and the requirement for high cost compressed hydrogen at point of use.
Accessing large scale hydrogen production provides cost savings through the economies scale to users.
Hydrogen producers distributing through the NTS can access many large NTS connected industrial users and future large scale refuelling stations.
Large scale hydrogen refuelling stations connected to the NTS can avoid the need for multiple daily compressed hydrogen trailer deliveries (a significant logistics challenge) for their supply.
A technology that will be used by hydrogen suppliers to transport and early mobility applications

The deblending technology could be owned and operated by either gas networks or companies with hydrogen supply contracts for transport and industrial applications on the NTS. Ownership of the deblending system will be dependant on the network exit agreement and whether the NTS customer chooses to remove a blend or a particular gas from the network.

Gas networks may look to operate the deblending facility to enable blend components not used to be easily reinjected into the network and provided to other users.
Some connections may have dual users, such as industrial users located near a refuelling facility that could utilise the full blend without off gas.

The technology could ultimately be used by hydrogen suppliers in countries with hydrogen blends in their transmission networks across Europe and globally.
We have engaged many of our users through our Project Union activities and been provided key requirements. Further analysis in the alpha phase will assess the cost of supply to industrial users and the regulatory framework of who will pay for the deblending facility used to protect users requiring precise or no hydrogen blends.

Once hydrogen blends of up to 20% are allowed in the NTS, GT&M will need work with customers to determine the optimum deployment of the technology. This will be done through network exit agreements and will vary based on user requirements.

Supporting the development of competitive market for hydrogen

A competitive market for deblending and refuelling will be encouraged throughout this project through the tendering process in the alpha phase. Whilst the demonstration will be through the selected supplier(s) there will be no guarantee of work in rolling the technology out so a competitive market will be created for implementation onto the NTS.

Intellectual Property Rights (Not scored)

What are the Intellectual Property Rights (IPR) arrangements for your project?

For SIF projects, each Project Partner shall own all Foreground IPR that it independently creates as part of the Project, or where it is created jointly then it shall be owned in shares that are in proportion to the work done in its creation. The exact allocation of Foreground IPR ownership will be determined during the contractual negotiations with the Project Partners on the agreement for the project.

Also if the party appoints a sub-contractor, the agreement with that sub-contractor should have similar IP provisions to those in this agreement and which at least achieve the same aims as the agreement regarding IP.

Once the Project is completed, Relevant Background IPR will be licensed for use by the Project Partners in connection with another Project Partners' Foreground IPR solely to the extent necessary to use that Foreground IPR, upon terms to be agreed.

Describe how each Project Partners complies with Chapter 9 SIF Governance Document.

We intend to ensure each Project Partner will comply with Chapter 9 SIF Governance Document through the contractual terms governing the project. However, precisely how this is done will be subject to contractual negotiations with the Project Partners on the agreement for the project.

Costs and Value for Money

How much will the project cost for Alpha and how does it represent value for money for the consumer?

The total project cost is £389,298 and we request funding of £313,398. Our partner contribution to the project is 19% of the total project costs.

Providing key information for the net-zero future of the National Transmission System, beyond business as usual

This project's alpha phase provides vital information to inform decisions relating to the future of the National Transmission System, that are not carried out in National Grid Gas' (GT&M's) business as usual activities. The designs developed in the alpha phase for deblending systems that meets the needs of NTS users, will further refine cost estimates for the system and improve our understanding of potential limitations of the equipment. This will enable GT&M and the UK government to make informed decisions on a roadmap to 100% hydrogen in the NTS, and in particular the role that blending/deblending can play in facilitating this transition.

An expert team that provides value for money

The team delivering the HyNTS Deblending project delivers value for money by drawing on significant existing expertise within the Consortium. Each partner brings critical expertise to the project:

National Grid provide expertise on gas transmission and a suite of projects that are exploring the role of hydrogen within the NTS, including projects considering blending/deblending.
Element Energy provide in depth knowledge of hydrogen supply, use and distribution technologies and business cases from supporting the leading early hydrogen projects. EE also provide experience in innovative technology procurement and project

management and have a detailed understanding of blending/deblending technologies and good existing relationships with potential equipment suppliers

Element 2 understand the requirement of hydrogen transport users and bring expertise on hydrogen refuelling equipment design, which will inform the refuelling/deblending system optimisation and are experienced in the procurement of refuelling station equipment.

Supporting Documents

Documents Uploaded Where Applicable

Yes

Documents:

Alpha Skills and Expertise HyNTS Deblending Combined.pdf

HyNTS Deblending Alpha Project Plan.pdf

SIF Alpha Project Registration 2022-11-03 2_55

10036950 HyNTS Deblending SIF Alpha Final Technical Reports redacted.pdf

Alpha Show and Tell Slides - HyNTS Deblending.pdf

SIF Alpha Project Registration 2024-02-20 10_28

This project has been approved by a senior member of staff

☑ Yes