SIF Alpha Round 2 Project Registration

Date of Submission

Project Reference Number

UKRI10084569

Initial Project Details

Project Title

SF6 Whole Life Strategy

Project Contact

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Challenge Area

Improving energy system resilience and robustness

Strategy Theme

Net zero and the energy system transition

Lead Sector

Electricity Transmission

Other Related Sectors

Electricity Transmission

Project Start Date

01/10/2023

Project Duration (Months)

6

Lead Funding Licensee

NGET - National Grid Electricity Transmission

Funding Licensee(s)

SSEN - Scottish Hydro Electric Transmission

Funding Mechanism

SIF Alpha - Round 2

Collaborating Networks

Scottish and Southern Electricity Networks Transmission

Technology Areas

Asset Management

High Voltage Technology

Carbon Emission Reduction Technologies

Electricity Transmission Networks

Substations

Green Gas

Project Summary

It will expand on the learnings from discovery phase which reviewed the current/future regulations developing future-proof recommendations for replacingSF6 by assessing the techno-economic performance of different intervention options.

SF6 leakage rates will be analysed to identify the most suitable interventions. Alternative low carbon SF6 disposal methods will be explored with laboratory-scale testing. Site handling of SF6-alternatives especially the gas-blends and complexity with mixture-ratio tolerance will be investigated.

The outcomes of the project will be to increase knowledge of the different intervention options, reduce any risks associated with the large-scale demonstration in the beta phase and key recommendations for industry.

Add Preceding Project(s)

11061098; NGET/SF6 Whole Life Strategy/SIFIESRR/Rd2_Discovery - SF6 Whole life strategy

Add Third Party Collaborator(s)

The University of Manchester

DNV

DILO Armaturen und Anlagen GmbH

Project Budget

£448,124.00

SIF Funding

£403,311.00

Project Approaches and Desired Outcomes

Problem statement

The project seeks to develop an economic, efficient, and holistic strategy for delivering an SF6-free electricity system that will support GB's ambition to deliver a net-zero, resilient energy system.

The potency of SF6 released into the earth's atmosphere has a significant effect on global warming. It is estimated that there are over 1500 tonnes of SF6 currently insulating gas insulated switchgear (GIS) apparatus in GB substations. The SF6 in GIS switchgear continuously leaks into the atmosphere throughout its lifecycle and requires periodic top-ups and cleansing to maintain satisfactory insulating properties.

The project addresses the UKRI SIF Innovation Challenge 3 on "improving energy system resilience and robustness". There is continued discussion underway as part of the new F-gas regulation proposal to place prohibition dates on new SF6switchgear to market. This introduces a significant risk that electricity utilities must bring forth expensive capital replacement schemes in a time-sensitive manner that could create uncertainty to the energy system's resilience.

The project addresses the need to "strengthen the UK's energy system robustness to support efficient roll out of new infrastructure". The installed volume of SF6 is expected to increase substantially in the coming years given the growth in renewable generation and uprating of existing electricity infrastructure with compact SF6-designed equipment. Some commercial installations utilising non-SF6 based solutions developed by manufacturers have been deployed, but user experience remains limited therefore this project is aimed at addressing increasing the technical understanding of these solutions.

This project will expand on the learnings from the discovery phase which reviewed current and future regulations and developed future-proof recommendations for replacing SF6 by assessing the techno-economic performance of different intervention options. The next stage focuses on specific topics that were identified as opportunities and barriers to the replacement of SF6 that will lead to cost reductions for consumers and positive benefits for the climate.

In order to realise these benefits the project seeks to answer the following questions:

1. What are the practical challenges associated with the different interventions available to reduce the impact of SF6?

2. What is the most efficient approach to handling non-SF6 gas mixtures in equipment where SF6 is no longer used?

3. How can we improve the quality and reliability of the leakage rate analysis to make better choices on what to do about assets that contain SF6?

4. What is the optimal way to dispose of SF6 that is removed from assets and can’t be reconditioned and reused?

5. How does an increased understanding of the opportunities and barriers to SF6replacement affect the results of the CBA conducted in the Discovery phase?

6. What is the most economically effective route to remove SF6 from networks during the most optimal time period?

The primary goals of the project are to enhance understanding of various intervention options identified during the discovery phase and minimize potential risks associated with the large-scale demonstration of these options in the Beta Phase. Each work package will produce a summary report that includes significant recommendations for the industry, specifically targeted towards TO's and DNOs in the next stage of the project.

The successful completion of the Alpha phase will result in a comprehensive strategy for deploying different interventions at various sites, incorporating lessons learned and instilling confidence in networks to implement these projects as part of their regular business operations. We will further refine our plan to disseminate project findings to other network owners and operators, increasing adoption rates and the impact of our project on networks of the future.

Innovation justification

UK targets of 50GW offshore wind by 2030, combined with growing electrification of heat and transport, will require a radical transformation of National Grid Electricity Transmission (NGET) electricity transmission system. An extensive reinforcement of existing networks is necessary, where compact-sized GIS play a crucial role. Sulphur hexafluoride (SF6) is widely used in GIS due to its excellent insulation performance, fault interruption capability and chemical stability. The significant global warming potential (GWP) of SF6, 24,300 times greater thanCO2, means that its ongoing use is a critical obstacle to the national need of achieving Net Zero by 2050. Environmentally friendlier alternatives are vital to facilitate an expediated the transition to sustainable electricity networks.

Despite industry-wide consensus that reduction/elimination of SF6 inventory is crucial to reach Net Zero, there is a glaring gap that no roadmap has been developed outlining the key steps to achieve 'SF6-free' by 2050. Recent development in SF6 replacement focused on new equipment optimised by manufacturers. However, replacing all existing assets worldwide with new-builds is time-intensive and impractical to achieve the environmental emission target.

This work is timely as the new EU F-gas draft regulation defined prohibition dates for new SF6 equipment in 2026-2031 covering all voltage levels. For equipment rated ≥145kV used in NGET's network, the proposed prohibition date for new SF6 equipment by the new EU F-gas draft regulation is 1st January 2031, which also proposed drastic restriction on alternatives with GWP ≥10. Furthermore, there is increasing spotlight and discussion for banning Per- and polyfluoroalkyl substance (PFAS) in Europe. This will affect the majority of current SF6 alternatives which signifies the importance of this project. It is recognised by policymakers that these drastic propositions may be impractical for equipment ≥145kV due to their technical requirements and safety critical functionality to the security of electricity supply. These risks provide opportunities for better management of existing SF6assets and recently installed substations using SF6-free solutions through identification of solutions that facilitate recycling and reusing existing gas inventory. Although not considered in the current F-gas regulation, the incineration and final disposal of fluorinated gases such as SF6 adopting an environmentally sound approach could be crucial to enable a 'circular economy approach' in the eventual phase-out of SF6.

Due to safety critical functionality of the electricity network, further technical unknowns must be addressed to de-risk solutions. The proposed project will develop new SF6 replacement interventions and de-risk the solutions through demonstration of the solutions using a representative test system at University of Manchester and in a substation environment at Deeside. Highlights of the novel within the proposal are:

1. The first holistic SF6 replacement strategy from new-build to SF6 end-of-life towards developing a UK 2050 SF6-free roadmap.

2. The first multi-partner investigation into the practical challenges of recycling and refilling aged gas mixture in the event of having incorrect mixture ratio.

3. Validate experimentally in a laboratory scale novel method for incinerating SF6that are significantly less carbon intensive than conventional thermal degradation process.

4. Develop a techno-economic analytical tool to be verified using two substations as case studies that can facilitate mass roll-out of SF6 replacement strategy.

These interventions will inform NGET's Responsible Business Charter that sets out their commitments to reduce SF6 emissions by 50% in 2030 and reach NetZero by 2050. This project will provide the necessary SF6 replacement expertise and innovative 'use-inspired' technological approaches to demonstrate the viability of different proposed solutions in the alpha phase. The implementation in subsequent Beta phase will also target technology translation down to lower voltages that will bring major environmental and technological development cost saving for GB distribution network operators.

Impact and benefits (not scored)

Financial - future reductions in the cost of operating the network

Financial - cost savings per annum for users of network services

Environmental - carbon reduction – direct CO2 savings per annum

Impacts and benefits description

The benefits already realised through the delivery of the Discovery Phase are a synthesis of work carried out in other innovation projects to gain an overall understanding of their importance in strategies to reduce the impact of SF6leakage in GB and described how upcoming F-gas regulations are likely to impact networks in the future. Based on our initial evaluation, alternative methods for disposing of SF6 have the potential to lower energy consumption. This finding calls for additional investigation and confirmation of the calculations. The techno-economic analysis also showed that the lowest cost options, once you factor in the societal and organisational cost of carbon, differ from substation to substation, depending on the profile of equipment. Consequently, there is a demonstrable need for an overarching strategy for reducing the impact of SF6 leakage from assets in GB.

Our pre-innovation baseline is that while networks are already putting in place strategies to remove SF6 from their network, there remains a need to build up the body of knowledge and evidence on leak mitigation measures and non-SF6alternatives to ensure networks recommend the optimal intervention at the optimal time for each asset. This will ensure that networks find the most economically effective route to remove SF6 on the most optimal timeline.

Financial - cost savings per annum on energy bills for consumers

Financial benefits to consumers manifest through savings in the long-term overall cost of removing SF6 up to 2050 over current strategies. Our strategy will lead to more optimal decisions on when and how to intervene to mitigate the impact ofSF6 emissions. Our Discovery Phase techno-economic analysis has calculated the NPV for the different intervention options available at two example substations owned by NGET. By comparing the difference in costs between the optimal solution and the second best solution we have estimated the potential saving associated with making better decisions on which intervention is best. Applying these savings across all SF6 GIS, of which NGET have approximately 100, gives a saving to the consumer of ~£33 million.

Environmental - carbon reduction - direct CO2 savings per annum

Direct environmental benefits can be tracked through the quantity of SF6 removed from assets and SF6 annual emission reductions. Our techno-economic analysis showed that *Interventions that lead to fewer SF6 emissions generally have a lower overall cost. Conversely, the more SF6 emissions generated, the higher the overall costs. Interventions at the two substations analysed were able to reduce lifetime emissions by 175,000 tonnes and 107,000 of CO2 equivalent compared with a base case, do nothing approach. This result shows the significant potential for interventions to reduce direct CO2 emissions, particularly if this is scaled up to include all SF6 GIS.

Financial - future reductions in the cost of operating the network

In Discovery, we estimated that the current method of high-temperature incineration of SF6 is approximately 10 times more energy intensive than a different low-carbon method of disposal. While this result demonstrates the potential for it to reduce energy consumption it also shows promise that alternative methods may also bring down cost. This topic will be explored further in the techno-economic analysis in the Alpha phase.

Finally, this project will bring significant whole system benefits. The UK government's target of 50 GW offshore wind by 2030 will require significantly more compact substations that would typically have used SF6 because offshore settings are typically heavily space constrained. Increasing the body of knowledge for non-SF6 alternatives in these settings is vital to ensure that these offshore wind targets are delivered in an environmentally sustainable way.

Teams and resources

Our Project team remains primarily unchanged as we move into Alpha except for the addition of two companies. The lead partner is National Grid Electricity Transmission (NGET) which brings significant existing knowledge about SF6 and its alternatives. This includes the retrofilling of Richborough substation in 2021,and the implementation of new-build SF6 free equipment at Sellindge substation in 2017. The Deeside Centre for Innovation, owned by NGET, also offers an opportunity for testing and will be used in Work Package (WP) 2 as a location to demonstrate different gas mixture handling methods. NGET will be leading Work Package 2 as well as supporting all other Work Packages and providing oversight and control over the project as a whole.

SSEN Transmission offers the perspective of a second transmission licensee. SSEN Transmission has externally accredited science-based targets that include reducing SF6 leakage, and a policy that mandates the use of SF6 alternatives wherever technically and commercially viable. SSEN Transmission is a leader in the adoption of SF6 alternatives and is continuing to work closely with manufacturers, other users and the wider industry on SF6 alternatives. SSEN Transmission will be supporting WP1, 2 4 and 6 with the provision of data on their assets, providing expert insights and reviewing outputs.

The University of Manchester is an academic partner and expert in HVAC switchgear technologies and alternative lower-carbon-footprint insulating gases. The University's capability in electricity transmission network assets revolves around its recently construction high voltage research laboratory (the largest in the UK). The current research portfolio includes projects focusing on the elimination ofSF6 in switchgear and gas-insulated lines for National Grid. The University of Manchester will be leading Work Packages 1, 3 and 4 as well as supporting WP2and WP5 and will conduct laboratory-scale testing of novel SF6 disposal methods at their facilities.

DNV will act as overall project manager and techno-economic assessment experts on the project. DNV are experts in providing strategic conceptual, implementation and operational advice on design, economics and regulation of energy markets, as well as advise on integration of new technologies into existing commercial environments. DNV have expertise across Europe who will be able to give insights from working with other European TSO such as Tennet and 50 Hertz Transmission. Therefore, they have the required capabilities to comprehensively assess the technical and economic aspects of the different SF6 replacement options and recommend the optimal one for each asset profile and explore the roadmap for implementation the interventions.

DILO will be joining the project team in Alpha as specialist in gas handling, including reconditioning, mixing and recovery of gases. As a technology leader, DILO offers everything for successful gas handling in the areas of SF6 gas, alternative gases, equipment for industrial gases and high-pressure pipe fittings. DILO will provide gas mixture analysis for Work Package 2 to validate the handling methods.

WIKA Instruments Limited is also new to Alpha consisting of electricity transmission industry experts with specialist knowledge of SF6 and non-SF6 solutions. WIKA offers a range of high-quality SF6 gas sensors, detectors, pressure gauges, analyzers, and emission monitors. WIKA will be carrying out gas analysis testing at their laboratory facility to determine the composition of gas mixtures and the determination of unknown components for WP2. They will also be providing detailed information for review and analysis in WP4 to inform the development of a new approach to analysing leakage rates.

Each project partner has an interest in driving innovation and supporting the efficient roll-out of new infrastructure and delivering a resilient energy system which is net-zero ready.

Project Plans and Milestones

Project management and delivery

The project will be delivered in three work packages (WPs):

WP1 SF6 Intervention FEED

Front end engineering design (FEED) of 2-3 case studies with different intervention approaches to better understand the practical challenges and inform the implementation plan required for the Beta phase.

Lead -- University of Manchester (UoM)

Support from NGET, SSEN Transmission

WP2 Site Handling of Non-SF6 Gas Mixtures

Establishing mixture ratio tolerance and guidelines for reuse and refill of SF6alternative mixtures. This will require gas assessment on site using commercial gas analysers from DILO/WIKA in an outdoor environment and further verification analysis in the laboratory using gas chromatography--mass spectrometry (GC-MS).

Lead - NGET

Support from UoM, DILO, WIKA, SSEN Transmission

WP3 Novel SF6 Disposal Testing

Trial of different techniques to destroy SF6 with minimal energy input and develop a low carbon disposal approach. Laboratory scale experiments will be performed in Manchester.

Lead -- UoM

Support from DILO

WP4 Data Analytical Approach of Leakage Rates

Developing a data analytical approach for SF6 leakage assessment and forecast. This is to improve the quality of data that is used and improve the reliability of the assessment that prioritises asset replacement and identifies the most suitable interventions. The objective is to develop an approach that would explore the concept of excess SF6 leakage, enable easier sharing of data across network and to more easily identify problem types, families and manufacturers of plant, and any correlation to the location of assets.

Lead -- UoM

Support from NGET, SSEN Transmission, WIKA

WP5 Roadmap for Implementation of Interventions

Develop a strategic roadmap to inform the intervention options leading to an SF6-free network across the GB. This will incorporate a forward looking view of the regulations and regulatory environment for the removal of SF6 (such as regulatory penalties and the concept of "excess SF6 leakage") optimal timing of interventions(using outputs from the model in WP6), and consideration of the effect of SF6works on network constraints due to the outages required.

Lead -- DNV

Support from UoM, NGET, SSEN Transmission

WP6 Techno-economic Analysis

The aim of WP6 is to provide a cost-benefit analysis of various SF6 interventions based on a greater understanding from the other work packages. In the discovery phase, substation analysis was confined to 400 kV GIS but in the alpha phase we will consider different voltage levels and equipment profiles.

Lead -- DNV

Support from NGET, UoM and SSEN Transmission

The project plan Gantt chart can be found in the appendix. It shows the 3 key milestones of the project, which are aligned to the 3 review meetings during which the project progress, risks and findings will be assessed against the plan. Regular progress meetings will be held between the core team every two weeks as a control on progress.

The project will be managed by DNV, who have extensive experience delivering innovation, research and development projects through network funding mechanisms, including strategic change, technology policy and systems roadmap

development. As Lead-Partner, NGET will be responsible for providing regular control and support to the day-to-day project management that DNV will deliver.

The success criteria for Alpha phase will be:

Quantification of the most economically effective route to remove SF6 from the network during the most optimal time period:

Validation of the low carbon approach to SF6 disposal through laboratory scale experiment.

Key outputs and dissemination

The primary objectives of the project are to enhance understanding of various intervention options identified during the discovery phase and minimize potential risks associated with the large-scale demonstration of these options in the Beta Phase. Each work package will produce a summary report that includes significant recommendations for the industry, specifically targeted towards TO's and DNOs in the next stage of the project. The production of these summary reports will be led by the relevant Work Package leads with support from the wider project team.

Overall reporting to the UKRI of the project's progress at the midpoint review and end of phase, along with all other ongoing reporting will be done by NGET and the project manager in collaboration.

The successful completion of the Alpha phase will result in a comprehensive strategy for deploying different interventions at various sites, incorporating lessons learned and instilling confidence in networks to implement these projects as part of their regular business operations.

A vital part of any alpha phase is the sharing of progress and dissemination of findings to industry. We plan on presenting updates about our project at various energy conferences, for example Energy Innovation Summit and Utility Week. As we near the end of the project, we also plan on holding a workshop with GB DNOs to discuss our findings and explore how they can be applied to other voltage levels, ultimately making our results more relevant to the industry as a whole. These activities will be led by the NGET with the support of the overall project manager.

The project team plans to conduct a "Lessons Learned" session at the end of the project phase to share their experience and insights. The outcomes of this session will be shared as part of the end of phase reporting including the "Show and Tell" event and will inform future proposals for the beta phase.

Commercials

Intellectual property rights, procurement and contracting (not scored)

Foreground IPR produced by the project, such as the findings from testing that iscarried out on SF6 replacement strategies at Deeside, will be communicated in the Discovery Phase reporting in sufficient detail to enable others to benefit appropriately from the learning delivered by this project. Confidential details of IPR will not be disclosed, however sufficient information will be provided to enable other licensees to understand the technology being developed and its applicability to their own networks. This is in the interests of all project partners as it is hoped that the solutions can be demonstrated to be technically and commercially viable so wider licensee understanding of the new technology could lead to additional network development activity and economic benefits for the supply chain, including project partners from industry.

Project compliance with the IPR arrangements as defined in Chapter 9 of the SIF governance document will be assured via the contractual arrangements which will be put in place between NGET and each of the project partners.

Commercialisation, route to market and business as usual

Project is divided into six WPs to ensure the proposed deliverables are relevant, effective, safe and cost-efficient. A multidisciplinary team including experts from network owners (NGET and SSEN Transmission), academic partner (UoM), consultancy (DNV) and gas analysis experts (DILO and WIKA) will be working together to provide answers to the following questions. At the later stages of the project, other stakeholders will be invited, viz. distribution network operator (DNO), gas measurement manufactures through workshops and dissemination activities.

What are the practical challenges posed by different intervention scenarios considering data analytics of leakage rate and techno-economic analysis with a strategy to implement the solution?

-- this will be useful for the utilities to make a decision on which option to opt for considering different challenges. The findings through this project will be fed to the asset management teams of network owners which will be helpful to update/develop the strategy documents and technical guidance for different scenarios. This will be useful for the DNOs too who are facing the similar challenges for the appropriate intervention. This can be implemented as BAU in few years depending on the results obtained in alpha and proved in beta phase of the project. Size of investment depends on the intervention scenario and top management has to take decision on this. NGET and SSEN transmission are looking for the solution provided backed with a sensible techno-economic solution which is also an objective of the project.

How the gas blends should be analysed for the functional requirement?

--Different absorption and permeation rates of different molecular sized components in gas blends (SF6 alternatives being trialled at NGET) leads to different leakage rate of different gases. The correct procedure and guidance need to be developed for the gas handling of gas blends on site with appropriate has measurement equipment. The results from this question can be implemented as BAU in few months as this is something that NGET is already looking for the solution as indicated in one of the technical documents. The document will be updated as soon as we have some sensible procedure in place through the project deliverable. There is not much investment required for this implementation.

How to dispose the SF6 appropriately?

-- the current method of the SF6disposal is direct incineration which is a very carbon intensive approach. The catalytic incineration of SF6 will be investigated in the project on a laboratory scale as a proof of concept for alternative low carbon method. This will be explored on large scale in beta phase. This is one of the important aspects for SF6 whole life strategy to investigate/develop a low carbon approach for SF6 disposal. The results obtained will be useful for the industries dealing with SF6 incineration and in-turn for utilities looking to dispose a large stock of SF6 aligned with Net Zero strategy. The implementation of this approach will take time to get adopted on large industrial scale depending on the maturity of technology and results obtained in the alpha phase. This will be a good first step towards the objective of getting away with SF6 in a carbon neutral manner.

This project will inform development of the commercial strategy and any relevant regulatory changes for SF6 management. The results will directly contribute to the NGET's SF6 Incentive through reduction of carbon footprint and ultimately feed into the roadmap to Net Zero. The consumer value proposition generated throughout this work, as well as the potential for knowledge sharing across the industry will create necessary conditions for investment.

Policy, standards and regulations (not scored)

The use of SF6, due to its extremely high environmental impact, is becoming increasingly restricted and regulated. Typically, there are a few kilograms in medium-voltage and tens of kilograms or more in high-voltage switchgear. In the current F-Gas Regulation 2014, any piece of switchgear with greater than 6kg ofSF6, a check is required every six months; and if that value is over 22kg, then the period between checks reduces to three months. Any switchgear installed after 1st January 2017 and greater than 22kg of SF6 must have a leak detection system fitted. As regulations continue to tighten, this is likely to be further enforced in the future, meaning that every new piece of switchgear could require leak detection technology and the associated management and control system in place.

In the new F-Gas regulation 2023 draft, there is a strong legislative push by the EU that defines the 'Placing on the Market' prohibitions of new SF6 switchgear over the period of 2026-2031. For \>145kV switchgear relevant to NGET and other transmission operators, the prohibition date for new SF6 switchgear is set for 1January 2031.

While there is reasonably clear indication on the prohibition dates for new SF6switchgear, the regulatory outlook for the SF6 replacement technology based on GWP limit is still to be finalised. The key differences in the political positions between the European Parliament and European Council during the current Trilogue negotiations can be broadly categorised as follows:

There is a key distinction in the definition of phase-out date with European Parliament refers this date as 'placing on the market' whereas the Council refers to 'putting into operation'. The latter further shortens the SF6-free technology transition period for transmission operators since a GIS installation could take several years before being put into operation.

While there are subtle differences in the exemptions, it is quite clear there is a consensus to not only replace SF6 but to restrict the use of fluorinated gases as replacement candidates. This is in line with the current discussion for banning per-and polyfluoroalkyl substance (PFAS) in Europe. However, this directly affects the two main SF6 alternatives in Novec 4710 for high-voltage and Novec 5110 for medium-voltage equipment. It is unclear whether such proposition is practical for equipment ≥145kV due to their technical requirements and safety critical functionality to the security of electricity supply.

The proposed ban on virgin SF6 from 2035 by the Council will inevitably increase the demand to recycle, recondition and reuse SF6 for sustaining installed legacySF6 asset fleet. It is noteworthy that both proposals emphasised the need for more regular leakage checks with higher accuracy or sensitivity. The SF6 leakage data analysis highlights the necessity of accurate leakage data as opposed to top-up in order to establish a better understanding on the asset leakage profile and develop the appropriate interventions.

Value for money

For an old Northfleet GIS substation with 8 bays, the lowest cost option is early replacement with NPV of -£25 million which can potentially prevent 54,011 tonnesCO2 emission compared to no intervention for the remaining asset life of 20 years. This reduction in CO2 with different options will save the carbon price, ultimately being levied to customers. For a single substation, this will also save estimated cost of ~150 million for new installation of 400 kV SF6 GIS other thanCO2 emissions for new-built and leakage across the operational life.

The benefits are not only in terms of financial but also in terms of environmental and societal as discussed where correct intervention can reduce harmful emission to a great extent. Energy system resilience is another benefit from the project outcomes where GB's ambition to SF6-free power network towards the fulfilment of Net Zero promise will be accelerated.

The project is costed for £448k in the alpha phase with a funding request of£403k. The lead network NGET will be contributing the 10% obligatory amount of£43k. The funding requested from NGET is £92k which includes all the labour cost which will be leading one WP out of total 6 and supporting the other WPs. The University of Manchester costed for £170k which will be leading 3 WPs and supporting in other WPs. DNV is costed for £104k which will be leading 2 WPs with overall project management support. Other partners supporting the project are (a) SSEN transmission -- a utility trying to solve similar problems to NGET costed for £18k, (b) WIKA -- a company providing gas measuring equipment helping with the gas analysis expertise costed for £70k (who will act as a subcontractor under NGET), (c) DILO -- company supporting with gas analysis with expertise in gas measurement equipment costed for £18k. Partners also agreed on inviting other stakeholders (e.g. other gas measuring equipment manufacturer, utilities) through workshops and dissemination events to have an understanding of different products available in the market and how these can help with the project objectives.

The project is costed mostly in terms of labour cost with UoM costing for some experimental rigs to deliver WP3. The project is not utilising funds from any other innovation projects. Existing lab facility at UoM and the gas handling facility of NGET and SSEN Transmission will be used for the experiments and proof of idea of the project deliverables. Existing gas measurement equipment from WIKA and DILO will be utilized for blend gas analysis and determining the gas ratios required for functional requirements in GIS.

This project demonstrates value for money for the following reasons:

*Daily rates are at UK industry norms for similar engineering or consulting services

*Significant scope is being attempted within the six-month project timeframe, addressing the most important aspects related to SF6 interventions

*The size of the benefits associated with better decisions on the optimal intervention, lower environmental impact of disposal and increased knowledge of non-Sf6 gas mixture handling procedures outweighs the cost of the project.

Associated Innovation Projects

- (•) Yes (Please remember to upload all required documentation)
- ( ) No

Supporting documents

File Upload

WP3 SF6 Disposal SF6 Whole Life Strategy SIF Alpha Report - 1.4 MB
Alpha SF6 Whole Life Strategy Risk Register.xlsx - 48.7 KB
Alpha SF6 Whole Life Strategy Project Management Book Template v3.xlsx - 428.1 KB
2024-04-23 FINAL SIF Alpha Show and Tell - SF6 Whole Life Strategy Rev1.pdf - 1.6 MB
10084569 - SF6 Whole Life Strategy- Project Direction Letter.pdf - 220.9 KB
WP6 Techno-Economic Analysis - SF6 Whole Life Strategy - SIF Alpha Report.pdf - 1.8 MB
WP5 Roadmap of Interventions - SF6 Whole Life Strategy - SIF Alpha Report.pdf - 1.4 MB
WP4 Leakage Rate Assessment - SF6 Whole Life Strategy - SIF Alpha Report.pdf - 1.1 MB
WP2 Gas Stability Assessment - SF6 Whole Life Strategy - SIF Alpha Report.pdf - 1.8 MB
WP1 FEED - SF6 Whole Life Strategy - SIF Alpha Report .pdf - 860.1 KB
Associated Innovation projects.pdf - 73.2 KB

Documents uploaded where applicable?

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