

SIF Alpha Round 2 Project Registration

Date of Submission

Nov 2023

Project Reference Number

10053641

Initial Project Details

Project Title

SIF Black Start Demonstrator from offshore wind (SIF BLADE)

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 Distribution

Project Start Date

01/10/2023

Project Duration (Months)

6

Lead Funding Licensee

SPEN - SP Transmission Plc

Funding Licensee(s)

Funding Mechanism

SIF Alpha - Round 2

Collaborating Networks

Scottish and Southern Electricity Networks Transmission

Technology Areas

Low Carbon Generation

Control Systems

Offshore Transmission

Electricity Transmission Networks

System Security

Project Summary

SIF BLADE meets the aim of SIF Round 2 Challenge 3 – improving system resilience and robustness. SIF BLADE will increase the UK's energy system robustness supporting efficient roll out of new infrastructure, by investigating and demonstrating how novel lowcost, low-carbon technologies can allow offshore wind farms (OWFs) to restore the onshore grid following a black out. Proving this concept will enable accelerated roll out of OWFs to replace existing fossil fuel generators, whilst reducing any resilience issues that this may cause.

Doing so requires significant network innovation. Innovation is required to:

- investigate and develop the ability of technology suppliers to provide the necessary novel equipment, by defining intelligent requirements for the equipment from the network perspective;
- develop a black start methodology of restoring the onshore network from offshore wind, including how the OWF can be energised; how in turn the energised OWF can be used to energise the onshore network; and how the restoration can be spread throughout the onshore network, all whilst maintaining robustness of the newly energised system;
- understand the business case and market needs for black start services from OWFs;
- understand the roles and responsibilities of a wide, cross-industry range of stakeholders, from transmission system operators (TSOs) to transmission owners (TOs) to OWF operators to technology suppliers.

Due to this cross-industry nature of the network innovation, SIF BLADE needs cooperation between network companies, generators (OWF operators) and technical experts. The partnership brings together all these necessary stakeholders through SPEN, SSEN, NHVDCC, Strathclyde and Carbon Trust (representing the nine OWA developers, EnBW, Equinor, Ørsted, RWE, ScottishPower Renewables, Shell, SSE Renewables, TotalEnergies and Vattenfall), with NationGrid ESO (NGESO), Siemens Gamesa Renewable Energy (SGRE), Siemens Energy (SE) and EDF Renewables (EDFR) as project advisers. These leading organisations will provide an unparalleled consortium for the development of black start services from offshore wind.

Regarding users of the solutions developed in SIF BLADE:

- TOs will use the solutions to ensure their networks remain resilient whilst decarbonising, by being able to restore their networks from offshore wind;
- TSOs will use the solutions developed in SIF BLADE to create markets and procure restoration services in the future;

- OWF operators will use the solutions to provide restoration services to the offshore and onshore network, and hence enable more wind capacity onto the network;
- ultimately, consumers will benefit from the solutions by having a more resilient, low-cost, low-carbon grid serving their needs.

Add Preceding Project(s)

NIA2_NGESO047 - Distributed ReStart – Redhouse Live Trial

Add Third Party Collaborator(s)

The Carbon Trust

University of Strathclyde

WSP UK Limited

Project Budget

£576,720.00

SIF Funding

£499,920.00

Project Approaches and Desired Outcomes

Problem statement

As the UK transitions to a higher penetration of low carbon generation, there is a growing need for new sources of restoration services to be developed, as conventional high carbon sources of this capability will no longer be available.

SIF BLADE continues to meet the aim of SIF Round 2 Challenge 3 – improving system resilience and robustness. SIF BLADE will increase the UK's energy system robustness supporting efficient roll out of new infrastructure, by investigating and demonstrating how novel low-cost, low-carbon technologies can allow offshore wind farms (OWFs) to restore the onshore grid following a blackout. Proving this concept will enable accelerated roll out of OWFs to replace existing fossil fuel generators, whilst reducing any resilience issues that this may cause.

In the Discovery Phase, our understanding of the problem has developed. Fundamentally, there is a classic "chicken-and-egg" problem, due to the restoration market for (offshore) wind being immature. This impacts the key users of the innovation as follows:

1.

OWF developers -- a lack of clarity regarding potential revenues from restoration services is inhibiting their investment in restoration capabilities.

2.

Technology suppliers -- point 1 means that the technology suppliers are not being pushed by their customers (OWF developers) to invest in and develop restoration technologies.

3.

Transmission owners (TOs) -- point 2 means that the technical capability of OWFs is unclear, bringing uncertainty as to how to ensure onshore networks remain resilient in a net-zero electricity system, and inhibiting investment in suitable complementary upgrades to the onshore network to support restoration from OWFs.

4.

System operators (SOs) -- point 2 also means that system operators (SOs) are not yet able to set clear requirements and market signals to OWF developers to provide restoration services.

5.

Point 4 means that OWF developers do not have a clear business case to invest (returning to point 1 above).

SIF BLADE will break this vicious cycle in a collaborative manner, giving clarity to all necessary parties (SOs, TOs, OWF developers, technology suppliers) on the technical and commercial requirements for restoration services from OWFs. This in turn will ensure the GB consumer (the ultimate user of this innovation) will have a low-cost, low-carbon solution to ensure system resiliency in the future.

Through Discovery, the project has evolved by identifying the most promising technical restoration methodologies from OWFs. These will be assessed further in Alpha, with a view of demonstrating in Beta. These include solutions that can be retrofitted to OWFs, and solutions that must be designed-in before construction.

The project has also evolved by identifying the key commercial uncertainties. Restoration services are not binary: there are various ways OWFs can support system restoration, of varying cost and capability. In Alpha, the project will investigate the cost to an OWF developer of providing varying levels of restoration services and the benefit those various services will give to the energy system (i.e. SO and consumer).

Discovery has also identified the OFTO regime as a potential issue making the business case for OWF developers unclear. Assets traditionally owned by an OFTO will need to be part of the restoration methodology, and it is currently unclear whether existing regulation will incentivise or allow OFTO assets to play such a role.

The project has also evolved by the addition of new partners. Ocean Winds is joining as an additional OWF developer. TenneT is joining as an international SO to ensure the results of SIF BLADE have international applicability, which will help technology suppliers and OWF developers (which are global companies) to provide restoration services in GB and abroad.

Other relevant network innovation projects:

INCENTIVE

Distributed Restart

Innovation justification

SIF BLADE is applying to Innovation Challenge 3: Improving energy system resilience and robustness, with a specific scope of strengthening UK's energy system robustness to support efficient roll out of new infrastructure. SIF BLADE will do so by investigating and demonstrating how novel low-cost, low-carbon technologies can allow OWFs to restore the onshore grid

following a black out. Proving this concept will enable accelerated roll out of OWFs to replace existing fossil fuel generators, whilst reducing any resilience issues that this may cause.

Discovery Phase has highlighted the scale of the challenge in bringing restoration services from OWFs to commercial reality. This challenge is not an incremental innovation; it is a step change in thinking and capability for OWFs, TOs and SOs. SIF BLADE needs to assess and demonstrate:

the technical requirements and capabilities of OWFs to provide restoration services

the cost of providing these capabilities and the benefit they bring to the system

the business model (including market arrangements and how to work with the OFTO regime)

Alpha Phase will work towards addressing all of these aspects.

SIF BLADE is intentionally a large, collaborative, cross-industry initiative. We have worked in the open by having a large consortium consisting of 10 OWF developers, 2 networks, 2 technology suppliers and 1 SO. We have been contacting potential additional partners in parallel and we have 1 additional OWF developer and 1 additional SO joining for Alpha.

Regarding the technical state of the art, in 2020, a demonstration of black start was carried out at Dersalloch onshore windfarm. In comparison to this SIF BLADE, is focused on offshore windfarms, which have different technical challenges (but also benefits) due to their size, location and voltage level. Further, Dersalloch trial relied on diesel generators, and SIF BLADE shall be investigating alternatives to diesel generators.

Regarding the commercial state of the art, in 2022, ESO launched an electricity service restoration tender for wind (including offshore). This is a commercially sensitive tender, and the work ongoing is not available to share by ESO. From Discovery, we know some OWF developers have shown interest in this tender, and some have not. But all OWF developers are suffering from a lack of clarity in the tender process: what are the requirements on OWFs and what will their revenues be. Without clarity, OWF developers are struggling to engage. SIF BLADE sits independent of and parallel to this tender process, to complement it by building industry-wide understanding on the capabilities and potential costs-and-benefits of OWFs providing restoration services.

Currently, the solutions we are investigating are TRL 4; IRL 2; CRL 2. By the end of Alpha, we are aiming for TRL 5; IRL 2; CRL 4. By the end of Beta, we are aiming for TRL: 7; IRL 7; CRL 7.

The scale and ambition of this project is large. This is reflected by the ambitious aims to enable a step change in capability of OWFs and onshore networks. It is also reflected by the large cross-industry consortium. For these reasons, the work cannot be conducted elsewhere in the price control. It is a highly strategic, highly innovative project that fits well within SIF's structure.

Details on counterfactuals will be developed further in Alpha. However, other possible solutions to low-carbon restoration include smaller scale distribution system renewables (e.g. onshore wind and hydro). These have been studied in Distributed Restart and show potential, but suffer from not connecting to the transmission system and only having small capacities. Offshore wind has the benefit of large capacity and being transmission system connected.

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 – indirect CO2 savings per annum

Revenues - improved access to revenues for users of network services

Revenues - creation of new revenue streams

New to market – products

New to market – processes

New to market - services

Impacts and benefits description

Financial - future reductions in the cost of operating the network AND cost savings per annum on energy bills for consumers
Baseline: high-carbon assets dominate restoration market, but will need to be retired to meet net-zero goals, leaving a hole to be

filled by low-carbon assets. Some feasibility has been shown for small-scale distributed renewable sources to provide restoration services, but these suffer from being small capacity. ESO expects that OWFs may need to provide ~24% of restoration services by 2050.

Benefit: The high-level CBA in the PMT indicates an NPV of ~£200M at a cost of ~£144M to have 24% of GB system restoration services provided by OWFs. At this stage, there are several assumptions behind these figures, and more detailed CBA will be conducted in Alpha. SIF BLADE will accelerate and enable OWFs to provide restoration services, thus allowing ESO's future restoration predictions to be met. If SIF BLADE proves OWFs cannot provide restoration services, then this is a key data point to ESO to make other resiliency plans urgently. See Appendix Q3 for more information in this regard.

Metrics: quantify (£) costs and benefits of OWFs providing restoration services.

Environmental - carbon reduction -- direct CO2 savings per annum

Baseline: high-carbon assets dominate restoration market.

Benefit: SIF BLADE will accelerate and enable OWFs to provide restoration services, thus offering ESO an alternative source of restoration that is low-carbon, which will allow ESO to cease procuring high-carbon assets for restoration.

Metrics: quantify (weight of CO2) benefits of OWFs providing restoration services.

Revenues - improved access to revenues for users of network services AND creation of new revenue streams

Baseline: Currently zero windfarms (onshore or offshore) provide restoration services, and hence zero windfarms gain revenues from restoration service contracts with ESO. ESO has launched an electricity system restoration tender for wind. However, from consultations in Discovery, many OWF developers do not feel able to participate due to lack of clarity around technical requirements and potential revenues. It is unclear how successful that tender will be due to market and technology immaturity.

Benefit: SIF BLADE will create industry-wide understanding on the technical requirements for windfarms to provide black start, the technology specifications that will enable OWFs to meet those requirements, the cost of those technology specifications, and the potential revenue achievable by providing restoration services. This in turn will give clarity to all parties. It will allow ESO to set suitable markets and allow OWF developers to gain revenues from ESO for restoration services.

Metrics: increased number of participants in future ESO restoration wind tenders; (world) first restoration contract awarded to one or more OWFs.

New to market -- products

Baseline: Currently commercially implemented wind turbines do not self-start (they are started by energy from the grid). Also, they are not able to support or grow an energy island (they rely on exporting energy to a strong, already existing grid).

Benefit: SIF BLADE is seeking to accelerate self-starting wind turbines to market. These can start without external energy sources, by having batteries within them. SIF BLADE is also seeking to accelerate wind turbines to market that can create and support small energy islands in the energy network ("grid-forming" turbines), which do not need to rely on a strong national grid.

Metrics: first self-starting and grid-forming turbines installed offshore.

New to market -- services

Baseline: OWFs do not provide restoration services.

Benefit: SIF BLADE is seeking to demonstrate the world's first OWF providing restoration services, which will allow for such capability to become BAU.

Metrics: first OWF with restoration capability, followed by BAU roll-out nationally and internationally.

Teams and resources

The core project partnership will remain the same as Discovery Phase:

SP Transmission (SPEN) -- has a strong need for novel restoration solutions from renewables, and has been involved in the Dersalloch and Distributed Restart projects. SPEN will be responsible for the overall delivery of Alpha, and contribute in particular to the network restoration modelling studies.

SHE Transmission (SEEN) -- has strong interest in learning the potential of OWFs to provide restoration services. SEEN will be reviewing the outputs of Alpha to see how OWF restoration services would impact its Local Joint Restoration Plan.

National HVDC Centre (NHVDCC) -- has the need to understand how OWFs can restore the future coordinated offshore network under the Holistic Network Design. In Alpha, NHVDCC will be using its modelling expertise and understanding of the coordinated offshore network to investigate the opportunities the coordinated offshore network may bring to onshore system restoration.

University of Strathclyde (Strathclyde) -- has conducted a large body of previous studies in the field of restoration services and has close relationships with SPEN and wind technology suppliers. In Alpha, Strathclyde will be leading the modelling and testing of OWF design scenarios that are capable of system restoration.

Carbon Trust -- through its Offshore Wind Accelerator (OWA) programme, has conducted numerous previous studies on restoration from OWFs. Carbon Trust will manage the project, particularly the engagement with the OWF developers and Advisory Panel, and will lead on the commercial assessment.

Through Carbon Trust's role as coordinator of the (OWA) programme, Carbon Trust is bringing into the partnership a group of OWF developers that represent the majority of UK and global offshore wind developments (excluding China). These are EDF,

EnBW, Equinor, Ocean Winds, Ørsted, RWE, ScottishPowerRenewables, Shell, SSE Renewables (SSER), TotalEnergies, Vattenfall.

Ocean Winds is an additional OWF developer compared to the DiscoveryPhase, indicating the growing interest in this project from the industry.

Of these OWF developers, Ørsted, Shell and SSER will be "Project Champions".

Project Champions will contribute greater resources to the project and activelyseek demonstration sites. They will work with Strathclyde and SPEN to build theOWF design scenarios for modelling.

SSER is an additional Project Champion compared to the Discovery Phase,indicating the growing interest in this project from the industry.

The project also has an Advisory Panel consisting of technology suppliers(Siemens Energy and Siemens Gamesa) and SOs (National Grid (NGESO) andTenneT).

The Advisory Panel will provide input (e.g. on future technical capabilities ormarket arrangements) and review the outputs of the project.

TenneT is an additional member of the Advisory Panel compared to theDiscovery Phase, indicating the growing interest in this project from the industry.SIF BLADE is keen to include international SOs to ensure SO requirements onOWFs are aligned internationally, to prevent additional costs which would becaused by varying requirements internationally.

In addition to the Discovery Phase, Carbon Trust will subcontract work to aTechnical Delivery Contractor to assist with the Alpha cost-benefit analysis (CBA),as none of the project partners is best suited to do so. We have identified andspoken with possible contractors. They will be formally selected before Alpha kickoff.

Regarding equipment, in Alpha, modelling studies will take place. The partnershiphas all equipment needed to perform this work.

Regarding necessary external parties, in Alpha Phase, it will be key to engagewith and receive input from DESNZ, Ofgem and OFTOs regarding the OFTOregime and how OFTOs will be impacted by OWFs providing restoration services.This engagement is included in the Alpha scope.

Project Plans and Milestones

Project management and delivery

SIF BLADE Alpha phase has been designed as a feasibility study (both technical and commercial) for an OWF to provide restoration services. Details can be found in the attached Project Management Template.

The main work packages (WP) of the project include:

WP1: Technical assessment of onshore system restoration from offshore wind

Leads: Strathclyde and SPEN

This WP aims to understand the feasibility of various restoration methodologies for OWFs to restore the onshore network. As part of this, the WP will investigate the needs of the onshore network; the requirements for the OWF to meet these needs; the OWF design scenarios able to meet these requirements; and the performance of the OWF design scenarios to restore the network.

WP2: Commercial assessment of onshore system restoration from offshore wind

Leads: Carbon Trust

This WP will investigate the economic benefit to the energy system (and hence consumer) of restoration services from OWFs. This will give a signal to developers regarding the potential commercial value of restoration services from OWFs. This WP will identify specific regulatory or market barriers that inhibit or prevent the business case (such as the OFTO regime).

This WP is dependent on WP1 -- the OWF design scenarios developed in WP1 will feed into WP2 to assess the cost and benefits of the OWF design scenarios.

WP3: Technical assessment of onshore system restoration from coordinated offshore network

Lead: NHVDCC

This WP will investigate the concept of restoring the onshore system from OWFs via the future coordinated offshore network.

This WP is dependent on WP1 -- the restoration capabilities of the OWF design scenarios of WP1 need to be fed into WP3 such that they can be studied in the context of the coordinated offshore network.

WP4: Beta Phase scoping

Leads: SPEN and Carbon Trust

This WP will define what further work is needed to bring restoration services from OWFs to commercial reality and should understand what further work is practically feasible and the best mechanisms for achieving that work.

The key output of this WP is the development of a scope for the Beta Phase.

This WP is dependent on the outputs of WP1, 2 and 3. In the project plan, there is therefore a key stage gate (or milestone) to complete WP1, 2 and 3 prior to completing WP4.

WP5: Project

coordination and management

Leads: SPEN and Carbon Trust

A large consortium has been formed to deliver the work over a short timeframe. WP5 will ensure the effective and efficient running of the Alpha phase. This WP will enable the delivery of the project on time and budget. In line with best practice for innovation projects

an agile approach to project management will be taken, to ensure that the project continuously adapts based on live outputs from the WPs to best meet its overall aims

a risk assessment will be continuously updated -- risks will be identified, assessed and mitigated

a background IP register will be implemented to ensure clarity around what has been shared with the project and under what conditions

The risk assessment is part of the PMT. SIF BLADE is taking a proactive approach to risk management and has included regular risk reviews within its plan.

In Alpha, the technical work will all be conducted through simulations. So in Alpha, there are no plans to demonstrate the feasibility of this technology on the physical network, therefore no interruptions should be expected for customers. However, this issue shall be considered in Alpha when scoping Beta, which may have some temporary impact on consumer supplies local to the demonstration site.

Key outputs and dissemination

The overall aim of the SIF BLADE project is to enable OWFs to support the restoration of the onshore networks, by building understanding and consensus on the changes required to OWF and onshore network technical specification, and the changes required to SO procurement strategies for restoration services.

Regarding the Alpha Phase in particular, the key outputs are:

WP1 -- an understanding of the technical feasibility of various OWF design scenarios to provide restoration services: what level of service can various OWF design scenarios provide; how does this service improve onshore grid restoration time; what are the implications on OWF and onshore network design? Responsible: SPEN and Strathclyde

WP2 -- an understanding the future commercial landscape for OWFs providing restoration services: what are the cost implications of the various OWF design scenarios of WP1 (vs a BAU OWF); what benefits do the various OWF design scenarios of WP1 provide the system (vs a suitable system counterfactual, with no restoration from OWFs); how do the costs compare with the benefits; are there any regulatory barriers to address (e.g. OFTO regime) and how should they be addressed? Responsible: Carbon Trust

WP3 -- an understanding of the technical feasibility of restoring the onshore system from OWFs via the coordinated offshore network. Responsible: NHVDCC

WP4 -- an understanding of what further work is required, and a scope of such further work. Responsible: SPEN and Carbon Trust

Regarding dissemination, the large (20-strong) consortium already contains many of the key stakeholders in the industry, who will be reviewing and inputting into the project. All of these parties have shown excellent engagement in the Discovery Phase. They will all get access to the Alpha Phase deliverables. Most notably, the OWF developers, the technology suppliers and the SOs in the project are key stakeholders to achieve industry-wide dissemination, and we will continue to seek additional OWF developers, technology suppliers and international SOs to the consortium.

In the project plan, as part of WP5, a dissemination strategy will be developed to share the relevant outcomes more widely than the consortium. This will involve attending all SIF dissemination events, but also seeking additional opportunities such as relevant industry conferences and papers once we have findings to disseminate (toward the end of Alpha is most likely). We will also host a project webpage on the Carbon Trust website and make online press release / social media posts to publicise the Alpha Phase if funded.

Commercials

Intellectual property rights, procurement and contracting (not scored)

At the time of drafting this application we are unable to provide specific pieces of Background IPR and Foreground IPR that we would request to be exempt from the default treatment as we are still in talks with third parties. However, an explanation of the situation is provided below.

SIF-BLADE will greatly benefit from input from technology suppliers and OWF developers. This input could involve provision of models, data, or other information. Due to the innovative nature of the technologies in question, and commercial sensitivities in relation to their operation, it is likely that at least some of the inputs and outputs will be necessarily confidential, meaning that these inputs and outputs cannot be fully shared with all project partners or anyone outside the SIF BLADE project.

We will continue to work with technology suppliers and OWF developers prior to Alpha kick-off and during Alpha to set up these arrangements in good time to enable receipt of their inputs when required.

SIF BLADE Alpha Phase will use an IP register to track the Background IPR, the Foreground IPR, and the use and access rights to all this IP. The main contract governing the project (the Consortium Agreement) will include detailed, mutually agreed terms governing IP that are in line with the SIF Governance Document.

As with Discovery Phase, it is proposed that, for expediency, Carbon Trust will sign the project's Consortium Agreement as the representative of the OWA programme to bind the 11 OWF developers to SIF BLADE. With this contracting arrangement, we would expect the OWF developers to have access to Background and Foreground IPR like any other project partner.

As with Discovery Phase, Alpha will also include an Advisory Panel of key stakeholders (NGESO, TenneT, Siemens Energy, Siemens Gamesa) who may wish to become Project Partners in future. We intend to make all FIP available to the Advisory Panel. SIF BLADE may benefit from information exchange with a few additional projects, such as RWTH Aachen's "HVDC BLADE" project. We may seek a collaboration agreement to share FIP between SIF BLADE and HVDC BLADE under NDA.

For the role of Technical Delivery Contractor (who will assist Carbon Trust with WP2), we will formalise who the subcontractor will be prior to kick off. Two candidates have been identified in the Discovery Phase as having suitable experience to conduct the CBA of WP2. Carbon Trust has contacted both of these parties in the Discovery Phase and will procure one of these two as its subcontractor prior to Alpha kick-off.

Commercialisation, route to market and business as usual

Commercialisation is at the core of the SIF BLADE project. In particular, SIF BLADE aims to ensure a healthy, competitive restoration market for ESO to procure future low-carbon restoration services.

Regarding the commercial readiness of the project partners, the OWF developers are highly interested and motivated to participate in system restoration, provided there are suitable and clear markets available. Currently, however, such markets are not available.

Discovery Phase has shown that the adoption of restoration services from OWFs as BAU will be reliant on appropriate market creation to incentivise OWF developers and technology suppliers to invest in technology with suitable capabilities to provide restoration services.

To achieve this, ESO must set achievable requirements on OWFs providing restoration services. And OWF developers need to know how to meet those requirements with technical OWF upgrades, how much it will cost to do so, and whether the market value of their restoration services will outweigh those costs.

However, none of these aspects is presently known. This uncertainty is hindering commercialisation currently. SIF BLADE is absolutely focussed on addressing these key aspects and to drive restoration from OWFs to market.

Commercialisation plan

Alpha Phase - demonstrate technical feasibility; understand commercial feasibility (CBA); understand outstanding risks and barriers (technical and commercial). If Alpha Phase finds no feasibility, cease work (unlikely). If Alpha Phase finds feasibility with no further barriers, cease work (solutions will become BAU without SIF BLADE) (unlikely). If Alpha Phase finds feasibility, but with outstanding risks and barriers, then continue to Beta Phase.

Beta Phase - conduct further technical de-risking (e.g. scaled / real-scale demonstration); create suitable business models (including recommendations to markets and regulations); present evidence to ESO and Ofgem to make any recommended changes in approach.

After SIF BLADE -- once market and regulations have been informed by what is technically feasible, rely on ESO and Ofgem to make the necessary changes to allow OWFs to participate fully in restoration markets.

SIF BLADE is also engaging international SOs to make sure market requirements are aligned internationally, which will reduce

costs for OWF developers and technology suppliers, and hence reduce costs for all SOs and hence all consumers (including GB consumers).

SIF BLADE will not undermine competitive markets; rather, it will promote new competitive markets for restoration services. Upskilling the broad consortium of OWF developers will enable more participants in future system restoration markets, which will increase competitiveness of those markets.

SPEN has involved a senior sponsor, the Head of Transmission, in this project. This shows SPEN's commitment and strong interest in this project. SPEN has an obligation to its customers to run a resilient and robust network and sees SIF BLADE as a project of key strategic importance, with an unparalleled consortium of OWF developers, to unlock restoration services from offshore wind.

Policy, standards and regulations (not scored)

We currently do not consider there to be any definitive regulatory barrier to implementing restoration service provision from offshore wind. However, Discovery Phase has found that there are potential issues in market requirements and regulation that may require clarification or derogation. These will be explored further in Alpha.

Regarding market requirements, it is likely that new market requirements for restoration services will need to be set by ESO to enable the uptake of restoration services from OWFs. This is due to the long-term contracts for restoration service provision, with high availability of service (90%). The Discovery Phase has found that these requirements may not be achievable for OWFs, and therefore shorter-term contracts may be required, potentially with lower availability expectations, to account for the inherent variability of wind power depending on meteorological conditions. Our aim is for SIF BLADE to be an evidence base for ESO to set appropriate market requirements. WP1 will be investigating the technical capability of OWFs to provide restoration services, and hence provide evidence as to what suitable ESO market requirements might be.

Regarding regulation, the role of the OFTO in the restoration methodology, and whether current regulation allows for such a role, needs to be examined. This will form part of WP2 of the Alpha Phase. For instance, the restoration methodology may (or may not) require assets that typically belong to an OFTO to contain storage, which would not be allowed by current regulation.

An additional potential future market barrier is that international SOs may create varying (non-standard) requirements for restoration services from OWFs. This would mean OWF developers and technology suppliers would need to provide different capabilities (underpinned by different technologies) per country. This would increase the technology suppliers' costs and hence increase the costs to OWF developers, and hence the cost to SOs (and ultimately consumers) for procuring restoration services. SIF BLADE is addressing this through engagement with international SOs to ensure that requirements on technologies are kept as streamlined as possible across borders. This will ultimately help to reduce the cost for GB consumers.

In terms of HSE, GSMR and ESMR standards, none of these have been identified as of concern to Alpha Phase and compliance with these will not be a barrier to the project.

At the current stage, SPEN does not consider there to be a possibility that any future Project Phase will require a derogation or exemption from any Project related regulatory requirements, either as a known requirement or as a contingency.

Value for money

The total project cost for Alpha phase is £576,720.

The project is requesting £499,920 of funding (87% of the total cost), with the remaining £76,800 (13% of the total cost) being provided by project partners. In addition to this, there is £134,300 of in-kind contribution. Including the in-kind contribution, the SIF Contribution is 70%.

This level of funding will lead to outcomes that provide value to the consumer. Alpha Phase will prove the feasibility of restoration from OWFs. Further, Alpha Phase will financially define the benefits of restoration from OWFs to the GB consumer.

The high-level CBA in the PMT shows positive NPV for offshore wind restoration services. Further, from the Discovery Phase, it was postulated that the further investigation into restoration services from OWFs in SIF BLADE Alpha Phase should provide a "no regret" investment from Ofgem / the GB consumer. Please see the appendix to Q3 for more detail. However, in essence, if SIF BLADE Alpha Phase shows technical and commercial feasibility, and shows that restoration from OWFs is necessary for a net-zero electricity system, then the return to the GB consumer will be significant. However, even if we show there is currently no feasibility or that restoration from OWFs is not required, then this is highly valuable information to the GB consumer as alternative restoration sources will be urgently required.

The SIF programme is the ideal mechanism to bring together the necessary stakeholders (TOs, SOs, OWF developers, and technology suppliers) to collaboratively innovate in this space, with the required expertise to ensure the most successful project possible.

The £76,800 (13%) of the total cost that is being contributed to the project is more than the minimum 10% compulsory contribution giving excellent leverage of SIF funds.

The Carbon Trust is contributing £66,000 to the project. This comes from the Carbon Trust's Offshore Wind Accelerator

programme.

SPEN is contributing £10,800 to the project.

Regarding in-kind contributions of human resource, Ørsted, Shell and SSER as Project Champions are each contributing £20,000 of time.

The other OWF developer partners are contributing £50,000 in total.

The Advisory Panel is contributing £24,300 in total.

This allocation of technical expertise reflects the commitment to SIF BLADE and highlights the importance of the research subject.

Regarding facilities, all work will be carried out pre-existing facilities (i.e. SPEN, Strathclyde and NHVDCC's simulation software and hardware).

Prior to kick off, Carbon Trust will procure a subcontractor to assist the delivery of WP2, in particular to perform the detailed CBA work of WP2. The cost of this will be £50,000. This is critical to the project as none of the project partners is best placed to perform this important work. Two possible subcontractors have been identified in the Discovery Phase who have strong experience in this field.

Carbon Trust will pay Siemens Gamesa £10,000 and Siemens Energy £15,300 for their role on the Advisory Panel. (The other Advisory Panel members are contributing their time in-kind.) As leading wind and grid technology manufacturers, their input in the project is critical to understanding the future technologies available for restoration services.

It should be noted that the OWF developers and technology suppliers present in the consortium are multinational organisations.

Their experts, who will work on SIFBLADE, sit in many different locations globally and may be employed by non-UK entities.

However, all such partners have a strong interest in developing restoration services and OWFs in the UK.

Associated Innovation Projects

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

Supporting documents

File Upload

SIF_BLADE_Show&Tell_v1(f)_20240423.pdf - 1.2 MB
SIF Alpha Round 2 Project Registration 2023-11-13 10_20 - 80.5 KB

Documents uploaded where applicable?

