Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Aug 2026

Project Reference Number

NIA3_NGET0007

Project Registration

Project Title

Studying and Assessing the Benthic Response to Electrical Stimuli (SABRES)

Project Reference Number

NIA3_NGET0007

Project Licensee(s)

National Grid Electricity Transmission

Project Start

October 2026

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Muhammad Shaban
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Project Budget

£984,024.00

Summary

High Voltage Direct Current (HVDC) subsea cables are critical to the UK's Net Zero transition, connecting offshore renewables and interconnectors to the electricity network. However, stakeholders including The Crown Estate, Cefas, Marine Scotland and commercial fisheries have identified uncertainty around the ecological effects of cable-generated electromagnetic fields (EMF) on marine organisms. SABRES builds on National Grid's T2 NIA-funded BLUEFIN project, which investigated magnetic field impacts on benthic marine species. SABRES extends this research by examining electric fields and the combined effects of electric and magnetic fields under realistic operating conditions. The project will develop representative EMF exposure systems, assess behavioural and physiological responses, compare impacts against other environmental stressors, and provide evidence to support offshore consenting, environmental assessments and National Grid guidance on marine EMF impacts

Preceding Projects

NIA2_NGET0057 - Understanding the impact of Electromagnetic Fields from Interconnectors (BLUEFIN)

Nominated Contact Email Address(es)

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Problem Being Solved

The deployment of offshore transmission and interconnector infrastructure is accelerating to support decarbonisation of the UK energy system. Projects such as the Eastern Green Link programme alone represent approximately 1,800 km of subsea cable circuits. High-voltage submarine cable systems generate electromagnetic fields (EMF) as a result of current flowing through their conductors. While these fields diminish rapidly with distance from the cable, they can persist continuously along cable routes extending hundreds of kilometres across the seabed. As deployment increases, environmental stakeholders are seeking greater confidence that the ecological impacts of subsea cable systems are fully understood and appropriately assessed. Coastal and shelf-sea sediments host a

diverse and productive seafloor ecosystem in which species living in or on the seafloor play an essential role in modulating sequestration, transformation and storage of nutrients and carbon that underpins the entire food web. Many of these bottom living species are invertebrates that are sedentary or slow moving and therefore cannot avoid disturbance and we have very little understanding of the long-term sub-lethal effects of EMF on these animals.
Previous studies and National Grid's BLUEFIN project have improved understanding of magnetic field effects on benthic species. However, significant evidence gaps remain regarding:
The influence of cable-generated electric fields on benthic marine organisms.
The combined influence of electric and magnetic fields.
Long-term ecological responses to EMF exposure.
The relative significance of EMF compared with other anthropogenic and environmental pressures experienced by marine ecosystems.
These uncertainties can create challenges during project consenting and environmental assessment processes. SABRES will address these knowledge gaps and provide a scientific evidence base to support proportionate, evidence-led assessments for future offshore developments.

Method(s)

The project will be delivered in the following work packages:

Work Stream 1: Provision of Controllable EMF for Ecological Experiments
For ecological experiments to be undertaken it is necessary to produce controllable electromagnetic fields that marine organisms can be exposed to. As part of the BLUEFIN NIA project a device “Synthetic Cable for the Assessment of Marine Power Impacts (SCAMPI)” was developed which can produce magnetic fields comparable to that of HVDC submarine cable systems using a suitable low voltage high current DC supply. SCAMPI will induce both magnetic and electric fields to assess ecological impacts. Currently two options are under consideration for generating electric fields:
1. Water movement within aquaria inducing an electric field due to the magnetic field of SCAMPI
2. Low voltage electrode systems generating an electric field through a potential difference
While option 1 is the mechanism by which electric fields are produced “in the field” by submarine cable systems, there is no difference whatsoever in terms of the electric field from the perspective of organisms in the experiments. This work stream will look at both options and understand how can field relevant controllable electric fields be produced for ecological experiments? And what is suitable experimental plan that can replicate electric and magnetic pressures experienced by benthic organisms in the field?

Work Stream 2: Review of Current Understanding of Organism Response to Electrical Stressors
There are now significant number of papers in the literature that have investigated electro- and magnetoreception in marine organisms focussing mainly on how they use ambient electromagnetic fields for navigation, hunting and sensing of their environment. Most of current understanding is based on understanding the electro sensitivity or magnetic sensitivity in key species such as fish (including salmon), sharks and rays, sea turtles and some crustaceans. Whilst this has been vital for understanding how marine organisms use natural electromagnetic fields for essential life functions, there is still a gap in understanding the ecological consequences (if any) of the EMF produced. Therefore, the aim of this work stream is to conduct a literature review in which we will specifically assess the specific parameters used in EMF studies, focussing particularly on electric fields which are typically neglected compared to magnetic fields, within the context of their ecological relevance.
Key questions to be answered in WS2:
1) What are the electric fields used to assess the impact of EMF on marine organisms?
2) What is the effect of the electric versus the magnetic field on marine organisms?

Work Stream 3: Quantifying Marine Organism Responses to Combined EMF Stressors
A significant number of papers in the literature have investigated electro- and magnetoreception in a range of marine taxa, focussing on how organisms, such as fish, sharks and rays, sea turtles and some crustaceans, use ambient electromagnetic fields (EMFs) for navigation, foraging, and environmental perception. However, we still have relatively little understanding of the ecological effects of HV cable induced EMF for individuals or populations of a range of marine organisms living on or in the seabed. Whilst it is generally assumed that cable burial or protection reduces the effects of EMF it has been suggested that a reduction in EMF intensity may bring the EMF fields into ranges more perceivable by receptive species such as fish, but it is not understood whether the same holds true for benthic invertebrates nor what the relative effect of the electric field versus the magnetic field is. Research results from BLUEFIN has indicated that benthic organisms can show behavioural responses in terms of their burrowing behaviour to changes in the magnetic field even at very low levels, but these effects are species-dependent and sensitivity can vary with seasonal context. How benthic species may be affected sub-lethally by electric fields or the combined effects of the electric and magnetic fields has yet to be investigated. Even small sub-lethal changes in an individual's physiology and behaviour can affect the survival of a population with significant implications for food-web dynamics and benthic ecosystem functioning such as nutrient cycling or carbon storage.
This workstream will involve determination of benthic invertebrate behavioural and physiological responses to a range of electric and

electro-magnetic fields that are produced by HVDC cable systems. The experiments will be set-up to answer the following key questions:
1. What is the impact of different EMF strengths alone (electric) and in combination (electric + magnetic) produced by HVDC cables on the burrowing behaviour, physiology and/or distribution of sediment invertebrate species?
2. What is the impact of varying EMF strengths (alone and in combination) on the burrowing behaviour, physiology and/or distribution of sediment invertebrate species?
3. What are the implications of long-term exposure to cable EMF on population survival?

Work Stream 4: Comparative Assessment of Anthropogenic Pressures
Most assessments of the consequences of EMF exposure on marine organisms have been conducted in isolation of other environmental or anthropogenic pressures, but marine organisms are exposed to multiple environmental and human pressures across a range of spatial and temporal scales. BLUEFIN has also shown that marine organism responses may vary depending on the combination of pressures and the order in which they occur, but there is little understanding of how the effect of EMF varies within the context of other environmental and anthropogenic pressures.
This workstream will investigate how the effect of EMF on marine organisms and the wider ecosystem varies in relation to other environmental and human pressures. Specifically, answer the following question:
1) What is the impact of EMF on marine organisms and ecosystems relative to other environmental and human pressures?

Work Stream 5: Recommendations to National Grid
Key findings across all deliverables will be presented in a workshop.
A discussion on implications of combined electric and magnetic stresses on benthic organisms will be presented, motivated by the results of the experiments undertaken in work stream 3, and put into context of other stressors by the work undertaken in work stream 4. Consequences of project findings for future installations, e.g. Eastern Link and South-East HVDC, will be summarised.
The SABRES project will implement a comprehensive measurement quality framework to ensure that all experimental observations, measurements, analytical outputs and conclusions are scientifically robust, repeatable, traceable and suitable for use within future environmental assessment and consenting activities. The project will combine laboratory experimentation, ecological monitoring, electromagnetic modelling and data analysis, requiring consistent quality assurance procedures across all workstreams.
The project will be undertaken by the University of Southampton using established laboratory and research quality procedures. All project activities will follow documented experimental protocols, laboratory operating procedures and project governance arrangements. Prior to commencement of testing, experimental designs, measurement parameters, test procedures and acceptance criteria will be documented and reviewed by the project team to ensure consistency across all experimental campaigns. Regular project review meetings will be undertaken between National Grid and the research team to assess progress, review methodology and ensure that project objectives remain aligned with business requirements.
The SABRES project will implement a structured Data Quality Management Framework to ensure that all project data are accurate, complete, secure, consistent, traceable and accessible. The framework will cover the full data lifecycle, from creation and acquisition through analysis, storage, dissemination and long-term retention.
Project data will be managed in accordance with:
University of Southampton Research Data Management policies.
National Grid data governance requirements.
NIA Governance Document obligations.
Applicable data protection and information management requirements.
Roles and responsibilities for data ownership, maintenance and quality assurance will be clearly defined throughout the project.

Scope

SABRES is a two-year research project investigating the effects of cable-generated electromagnetic fields on marine benthic species associated with HVDC subsea cable infrastructure. The project builds directly on National Grid's BLUEFIN project and extends the scope from understanding magnetic field effects to understanding electric fields and the combined effects of electric and magnetic fields.

The project will comprise five work streams:

WS1: Provision of Controllable EMF for Ecological Experiments Development of methods and equipment capable of generating field-representative electric and magnetic fields suitable for ecological testing.
WS2: Review of Current Understanding of Organism Response to Electrical Stressors A comprehensive review of available literature relating to electric field and EMF impacts on marine organisms.
WS3: Quantifying Marine Organism Responses to Combined EMF Stressors Laboratory experiments assessing behavioural, physiological and population-level responses of benthic species to electric and magnetic fields.

WS4: Comparative Assessment of Anthropogenic Stressors Assessment of EMF impacts relative to other anthropogenic and environmental pressures, including sound, vibration and climate-related stressors.
WS5: Recommendations to National Grid Translation of project findings into practical recommendations supporting future offshore development, environmental assessments and stakeholder engagement.
The project outputs will contribute directly to National Grid's ongoing development of group-wide guidance relating to marine EMF impacts and support future offshore transmission and interconnector projects.

Objective(s)

The project objectives are to:

Develop and validate methods for reproducing field-representative electric and magnetic fields in ecological experiments.
Improve understanding of marine organism responses to electric fields and combined EMF exposure.
Quantify behavioural, physiological and population-scale effects on representative benthic species.
Assess the relative importance of cable-generated EMF compared with other environmental and anthropogenic pressures.
Provide evidence-based recommendations to support project consenting, environmental impact assessment and future offshore infrastructure design.
Support development of National Grid guidance relating to marine EMF impacts.

Consumer Vulnerability Impact Assessment

The transition to a low-carbon energy system requires significant deployment of offshore transmission infrastructure and interconnector projects. Regulatory and stakeholder concerns regarding the ecological impacts of subsea cable EMF have the potential to increase consenting uncertainty, create project delays and increase project delivery costs.

By improving understanding of the effects of electric and magnetic fields on marine ecosystems, SABRES will support more efficient and evidence-based consenting processes for future offshore infrastructure developments. Reduced uncertainty can help avoid unnecessary environmental mitigation measures, additional studies or consenting delays which may ultimately increase costs borne by consumers.

The project also helps ensure that National Grid can responsibly develop the infrastructure required to support Net Zero ambitions while maintaining high environmental standards. By reducing the risk of unnecessary consenting delays, additional environmental surveys and disproportionate mitigation measures, the project has potential to reduce future infrastructure delivery costs. Lower project costs ultimately support affordability for all consumers, including those in vulnerable situations who are disproportionately affected by increases in energy costs.

Technical impact: SABRES can help accelerate delivery of offshore infrastructure by reducing consenting uncertainty linked to cable-generated EMF impacts.

Financial impact: A stronger evidence base can reduce consenting, survey and mitigation costs by addressing stakeholder concerns in a proportionate and technically robust way.

Wellbeing impact: While there is no direct wellbeing impact, the project indirectly supports consumers by enabling a secure, affordable and environmentally responsible energy transition.

Success Criteria

The project will be considered successful if it delivers:
A validated approach for generating field-representative electric and magnetic fields suitable for ecological experimentation.
A comprehensive review of current understanding of electric field and EMF impacts on marine organisms.
Quantified evidence of behavioural and physiological responses of benthic species to electric and combined EMF exposure.
Improved understanding of the relative contribution of electric fields compared with magnetic fields in driving organism responses.
Improved understanding of the potential long-term ecological implications of EMF exposure on benthic ecosystems.
A comparative assessment of EMF against other environmental and anthropogenic marine stressors.
Evidence-based recommendations to support future environmental assessments and consenting activities.
Inputs into National Grid's group-wide marine EMF guidance.
Dissemination of learning through reports, presentations, workshops and public NIA outputs.
The ultimate measure of success will be the creation of a robust evidence base that improves industry understanding of marine EMF impacts and supports informed decision-making for future offshore transmission and interconnector developments.

Project Partners and External Funding

The following project partners will be supporting the project:

University of Southampton contribution: The University of Southampton will provide access to its laboratories and make use of existing resources and general laboratory facilities at no additional cost to the project. NGET role and funding: NGET will act as the lead project partner and will provide all project funding.

Potential for New Learning

SABRES will generate new learning that is not currently available within National Grid or the wider industry.
BLUEFIN established that benthic species could exhibit species-specific responses to magnetic fields generated by HVDC cables. However, the ecological significance of electric fields and combined EMF exposure remains largely unknown. SABRES will address this gap by generating experimental evidence on electric field effects, combined EMF effects, and their importance relative to other marine stressors.

The project will provide:
New methods for generating field-representative EMF environments.
New evidence on behavioural and physiological responses of benthic species.
Improved understanding of long-term ecological implications.
A framework for comparing EMF impacts with other marine pressures.
Recommendations that can be applied across future offshore transmission and interconnector projects.

Dissemination and adoption of learning: In addition to generating new scientific evidence, SABRES will include a structured dissemination approach to ensure that learning is accessible and capable of being adopted by National Grid, other Network Licensees, regulators and environmental stakeholders. Learning will be shared through final technical reports, interim updates, webinars, conference papers, ENA dissemination channels and stakeholder workshops during the project. Outputs will also be made publicly available through established NIA dissemination routes. This will ensure that the evidence, experimental methods and recommendations generated by SABRES can inform future environmental assessments, consenting discussions and offshore cable project development across Great Britain. The findings will also contribute to National Grid's marine EMF guidance, supporting a more consistent, proportionate and evidence-led approach to assessing cable-generated electric and magnetic field impacts on future offshore transmission and interconnector developments.

The learning generated through SABRES is intended not only to advance scientific understanding of electromagnetic field (EMF) impacts on marine organisms, but also to enable practical implementation within National Grid's project development, environmental assessment and consenting activities. The project outputs will be translated into actionable recommendations and incorporated into National Grid's emerging group-wide guidance on marine EMF impacts. This guidance will support a consistent and evidence-based approach to assessing EMF impacts across future offshore transmission and interconnector developments.

The project findings will provide future National Grid projects with a robust scientific evidence base that can be referenced during environmental impact assessments, stakeholder engagement and regulatory submissions. In particular, the outputs will help project teams better understand the significance of cable-generated electric and magnetic fields, identify where mitigation measures may or may not be justified, and improve the consistency of EMF-related assessments across offshore developments. The learning is expected to be directly applicable to future HVDC projects including offshore transmission systems, interconnectors and integrated offshore network developments.

The evidence generated by SABRES will also be relevant to external stakeholders involved in offshore infrastructure consenting, including regulators, environmental bodies and marine planning organisations. By improving understanding of the ecological significance of EMF relative to other environmental pressures, the project will help support proportionate and evidence-led decision making. The outputs may be used to inform future regulatory guidance, environmental assessment methodologies and stakeholder discussions relating to marine EMF impacts associated with offshore energy infrastructure.

To maximise impact across the sector, project findings will be disseminated through National Grid's innovation channels, NIA annual and completion reports, technical workshops, conference presentations and the ENA Smarter Networks Portal. This will enable transmission owners, interconnector developers, regulators, environmental stakeholders and researchers to utilise the project outputs and apply the learning to future offshore infrastructure projects across Great Britain.

Scale of Project

The project is appropriately scaled to address the identified evidence gap while minimising costs to consumers. Laboratory experimentation is required because there is currently no validated approach for assessing the impact of electric and combined electromagnetic fields on benthic organisms under controlled conditions. The project builds upon National Grid's previous BLUEFIN project, reusing existing knowledge, modelling capability and the SCAMPI platform to maximise value for money. Outcomes will have

relevance across National Grid's current and future offshore transmission and interconnector portfolio, including major HVDC developments such as Eastern Green Link and future offshore network infrastructure. The project also benefits from knowledge exchange with the University of Southampton's BOWIE project, accelerating delivery and improving efficiency.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

Laboratory studies to be performed at The University of Southampton, UK.

Revenue Allowed for the RIIO Settlement

No funding currently allowed within the RIIO-3 settlement is expected to become surplus to requirements as a result of this project. The value is therefore assessed as £0.

Indicative Total NIA Project Expenditure

The total project expenditure is **£984,024** (NIA contribution, 90%: **£885,621**). Costs are distributed across the work packages as follows:

WP1 - Provision of Controllable EMF for Ecological Experiments, including development and validation of field-representative electric and magnetic field generation systems

£180,000

WP2 - Review of Current Understanding of Organism Response to Electrical Stressors, including literature review and ecological relevance assessment

£90,000

WP3 - Quantifying Marine Organism Responses to Combined EMF Stressors, including laboratory experimentation, specimen collection, ecological and physiological analysis

£400,000

WP4 - Comparative Assessment of Anthropogenic Stressors and evaluation of EMF impact relative to other environmental pressures

£130,000

WP5 - Recommendations to National Grid, dissemination activities, stakeholder workshops, reporting and knowledge transfer

£95,867

Sub total:

External cost to be paid to the supplier - £895,867

Internal costs for NGET employee time - £36,000

Internal and external indirect costs for travel and others - £88,157

Total £984,024

The total NIA expenditure for SABRES is £984,024. The majority of expenditure is associated with Work package 3, which contains the experimental programme required to quantify behavioural, physiological and population-level responses of benthic organisms to electric and magnetic fields. Work Stream 1 includes development and validation of the controlled EMF generation systems required to conduct the ecological experiments. Work Streams 2 and 4 focus on evidence review and comparative assessment activities, while Work Stream 5 covers knowledge transfer, dissemination, stakeholder engagement and production of recommendations to support future offshore transmission and interconnector developments. The allocation of expenditure reflects the relative effort, resources and

technical complexity associated with each work package.

Project Eligibility Assessment Part 1

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

The project supports the energy system transition by addressing an important environmental evidence gap associated with the deployment of offshore HVDC infrastructure. Subsea cable systems are essential for connecting offshore renewable generation and enabling power transfer required to achieve Net Zero targets.

By improving understanding of the ecological effects of cable-generated EMF, SABRES will support more robust environmental assessments, reduce consenting uncertainty and enable informed decisions regarding future offshore transmission and interconnector developments. This will help facilitate the timely deployment of infrastructure required for the decarbonisation of the energy system while ensuring environmental impacts are appropriately understood and managed.

How the Project has potential to benefit consumer in vulnerable situations:

The project has the potential to deliver net benefits to consumers through reduced environmental consenting uncertainty, improved stakeholder confidence and avoidance of disproportionate mitigation requirements for future offshore transmission and interconnector projects. The project primarily delivers environmental, regulatory and system benefits which are expected to reduce future project costs and facilitate more efficient delivery of Net Zero infrastructure.

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved

n/a

Please provide a calculation and/or description of the expected benefits of the solution

As a research project, SABRES primarily delivers non-financial benefits that are expected to translate into significant future consumer value.

Environmental consenting and stakeholder engagement have emerged as key risks for offshore infrastructure projects. A lack of robust scientific evidence relating to marine EMF impacts can result in requests for additional surveys, modelling activities, environmental assessments and mitigation measures. In some cases, these can create delays to project consenting and construction programmes.

SABRES will provide a stronger scientific evidence base enabling:
More robust environmental impact assessments.
Reduced uncertainty during regulatory and stakeholder review.
Better targeted and proportionate mitigation measures.
Reduced risk of delays to offshore transmission and interconnector projects.
More efficient deployment of infrastructure necessary for Net Zero.

The project cost is approximately £0.9m. Avoidance of a single additional offshore environmental survey campaign, route redesign activity or prolonged consenting delay on a major HVDC project could save several millions of pounds, significantly exceeding the project investment. While the precise value cannot be quantified at this stage, the anticipated benefits substantially outweigh the project cost and will be realised across multiple future offshore projects and network licensees.

Case Study – Future Routing constraints or measures equivalent to NatureScot

The value of this research is best demonstrated through the potential cost implications of precautionary mitigation measures being introduced in the absence of a robust evidence base. Current regulatory discussions have focused on measures such as deeper cable burial, additional cable circuits to reduce EMF intensity, or route deviations to avoid areas where EMF-sensitive species may be present, such as those initiated by NatureScot. These measures could significantly increase project costs without clear evidence that they deliver meaningful environmental benefits.

The IET report A Comparison of Electricity Transmission Technologies: Costs and Characteristics estimates that a 180 km, 2 GW HVDC link costs approximately £968 million, equivalent to around £5.3 million per kilometre. Consequently, relatively small design changes can have significant cost implications. For example:
A 5 km route deviation to avoid an area identified as sensitive to EMF could increase project costs by approximately £26 million.
A 10 km route deviation could increase costs by approximately £53 million.
Requirements for deeper cable burial or additional cables would further increase capital expenditure and installation complexity.
This research reduces the risk of such measures being introduced unnecessarily by providing regulators with a stronger scientific evidence base on the actual significance of EMF impacts. By supporting proportionate, evidence-based policy and consenting decisions, the project can help avoid unnecessary expenditure, reduce project delivery costs and ultimately minimise the costs passed through to consumers.

Please provide an estimate of how replicable the Method is across GB

The learning generated through SABRES will be highly replicable across Great Britain and relevant to all electricity transmission owners, interconnector operators and developers of offshore HVDC infrastructure. The environmental and consenting challenges associated with submarine cable electromagnetic fields (EMF) are not unique to National Grid and are expected to become increasingly important as the scale of offshore transmission and interconnector development continues to grow in support of Net Zero objectives.

The project will develop methodologies, experimental evidence and assessment frameworks that can be applied to any future offshore HVDC cable project where EMF impacts require consideration during environmental assessment and consenting. This includes future interconnectors, offshore transmission networks, integrated offshore networks and multi-purpose interconnectors.

Specifically, SABRES will generate learning that can be replicated through:
Improved understanding of the ecological significance of electric fields, magnetic fields and combined EMF exposure associated with HVDC cable systems.
Experimental methodologies for assessing marine organism responses to EMF under field-representative conditions.
Evidence-based approaches for environmental impact assessments and stakeholder engagement activities.
Guidance and recommendations that can support consistent treatment of EMF impacts across GB infrastructure projects.
A scientific evidence base that can be referenced by developers, regulators and environmental stakeholders when assessing future offshore developments.

The outputs will be particularly valuable for transmission owners and offshore asset developers progressing major subsea cable programmes, including new interconnectors and offshore transmission links. In addition, the project findings will support National Grid's planned group-wide marine EMF guidance, helping establish a more consistent and proportionate approach to EMF assessment across the wider industry.

As the project focuses on generating transferable environmental evidence rather than asset-specific solutions, the learning is expected to be broadly applicable across GB and capable of delivering value over multiple future offshore projects, significantly increasing the return on investment from the research.

Given the scale of planned offshore transmission and interconnector deployment across Great Britain, the learning generated by SABRES has the potential to be adopted as industry good practice and inform environmental assessment, consenting and mitigation decisions across a wide range of future HVDC developments.

Please provide an outline of the costs of rolling out the Method across GB.

Since this is research study, there is no extra cost involved in adopting the methodology/learnings developed here.

Requirement 3 / 1

Involve Research, Development or Demonstration

Projects must have the potential to have a Direct Impact on a Network Licensee’s network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

Involve Research, Development or Demonstration - Please select all that apply

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☑ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

The learning will be used in the planning and designing of new projects and upgrading the existing infrastructure. It is the learning that may be directly applied to other networks with similar assets at similar voltages. The disseminated results will be shared with all licensees so that the reasons for the conclusions may be understood. It will be the responsibility of others to determine to what extent it applies to other equipment types and different voltages but the underlying work from this project is likely to help.

n/a

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed. Networks must explicitly mention similar projects that they have considered and how these differ.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

A review of the Smarter Networks Portal, current SIF portfolio and relevant UK marine EMF research initiatives has been undertaken and no projects were identified that address the specific evidence gap concerning combined electric and magnetic field impacts on benthic species. SABRES builds directly on the findings of National Grid's completed NIA project BLUEFIN (NIA2_NGET0057) but does not duplicate its scope.

BLUEFIN focused on understanding the response of benthic marine organisms to magnetic fields generated by HVDC cable systems. The project developed the SCAMPI test platform and demonstrated that responses to magnetic fields can be species-specific and influenced by environmental conditions.

SABRES extends this research into areas not addressed by BLUEFIN by:
Investigating cable-generated electric fields.
Assessing combined electric and magnetic field exposure.
Quantifying physiological as well as behavioural responses.
Evaluating population-level impacts.
Comparing EMF impacts with other environmental and anthropogenic stressors.

This project therefore represents the next stage of the research pathway established through BLUEFIN and provides new learning necessary to support future offshore project consenting and environmental assessment.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not applicable

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

While BLUEFIN investigated the effects of magnetic fields generated by HVDC cables on benthic species, there is currently very limited understanding of the ecological significance of cable-generated electric fields or the combined influence of electric and magnetic fields under realistic operating conditions. SABRES is the first National Grid innovation project specifically designed to address these knowledge gaps through integrated ecological experimentation, EMF modelling and comparative environmental assessment.

NGET previously explored impact of magnetic field on marine life and this project is the extension from that. There is significant knowledge gap about the impact of EMF on bottom living species that are sedentary and cannot avoid disturbance. We need to develop understanding of long-term sub-lethal effects of EMF on such species. As a responsible business, NG need to cover the knowledge gap to address the issue and optimise the busy seabed usage. The study will help us in addressing the recommendations provided by Offshore wind evidence + change programme set up by The Crown Estate. There is no overlapping between this work focusing on the impact of EMF and technical requirements and work currently under way in different trials and studies.

Relevant Foreground IPR

The foreground intellectual property generated by SABRES will primarily comprise scientific knowledge, experimental methodologies, modelling approaches and environmental assessment guidance relating to the ecological effects of cable-generated electromagnetic fields on marine organisms.

Expected foreground IPR includes:
Methods for generating field-representative electric and magnetic fields within ecological laboratory experiments.
Experimental protocols for evaluating behavioural, physiological and population-level responses of marine organisms to EMF exposure.
Datasets describing marine organism responses to electric fields and combined EMF exposure.
Comparative assessment methodologies for evaluating EMF alongside other environmental and anthropogenic stressors.
Recommendations and guidance material supporting environmental assessments and consenting activities for offshore transmission and interconnector projects.

The project is not expected to generate commercial products. The primary value of the foreground IPR will be the creation of a unique evidence base and decision-support capability that can be utilised by National Grid and other network licensees when assessing marine EMF impacts associated with future offshore infrastructure developments. Background IPR generated through the BLUEFIN project, including the SCAMPI experimental platform and associated modelling approaches, may be used to support development of the new foreground IPR.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

A request for information via the Smarter Networks Portal at: https://smarter.energynetworks.org , to contact select a project and click ‘Contact Lead Network’. National Grid already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
Via our Innovation website at: https://www.nationalgrid.com/uk/electricity-transmission/innovation.
Via our managed mailbox: box.NG.ETInnovation@nationalgrid.com

Please identify why the Network Licensees will not fund the project as a part of it's business and usual activities

No industry-accepted methodology currently exists for quantifying the ecological effects of combined electric and magnetic fields

generated by HVDC cable systems. The project therefore represents research to generate new knowledge rather than implementation of an established engineering solution, making it unsuitable for funding through business-as-usual activities. As relatively little is known about the technology and its low TRL level, this justifies the use of NIA.

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks (e.g. commercial, technical, operational or regulatory) associated with the project

Testing to date suggests that the work will be successful, but it cannot be guaranteed. If the laboratory and computational work prove unsuccessful, the project will not proceed to BAU, and technical specifications will not be changed. The project is anticipated to generate sufficient benefit to justify the expenditure over 10 years. So, the success of the project will only become truly apparent over a longer period. During that time alternative, currently unforeseeable, solutions may arise that provide greater benefit. There are technical risks associated with any innovation project as the proposed solution may not work. Therefore, considering the risks associated with the success of the project, NGET believes NIA funding is the best route for the project. It offers the most appropriate route for NGET to design experiments, review existing techniques, and perform well designs experiments on certain species. As relatively little is known about the technology and its low TRL level, this justifies the use of NIA.

This project has been approved by a senior member of staff

☑ Yes