

Ofgem Strategic Innovation Fund Beta Round 1 - Annual Report	
Application Number 10067856	Project Title INCENTIVE
Date 22/07/2024	Author and Contact Details Ciara Ritson-Courtney Ciara.Ritson-Courtney@carbontrust.com Robert Keast Robert.Keast@carbontrust.com Adnan Mahmood adnan.mahmood@sse.com

Section 1 -	Beta Phase – Executive Summary
Project background <p>Inertia in the GB electricity network is falling. Without novel solutions, adding additional renewable generation capacity will become increasingly challenging, lead to significant instability events on the onshore networks (which are already occurring, but can be expected to get worse), and increase the operating cost of the GB network system and therefore consumer bills. Historically, renewable generators have not treated system inertia as their problem as it has been high due to the presence of (mostly fossil fuelled) synchronous generation. However, we are already seeing renewable generation curtailed due to low system inertia.</p> <p>INCENTIVE is investigating and demonstrating how offshore wind farms (OWF) can provide inertia to the onshore networks. This will provide grid stability and reliability at a lower cost and reduce the need for additional infrastructure by co-developing and co-locating inertia services with OWF developments. OWFs and their associated grid infrastructure providing inertia to the onshore network is not an incremental innovation, but a step-change in thinking that could be replicated globally.</p> <p>INCENTIVE is investigating OWFs with:</p> <ol style="list-style-type: none"> 1. STATCOM with supercapacitor energy storage and grid forming converter. 2. Battery energy storage system (BESS) with overrated grid forming converter. 3. Synchronous condenser with flywheel. <p>The Project brings together SSEN Transmission (SSENT), National Grid ESO (NGESO), the Carbon Trust, OWF developers, technology suppliers and Ofgem, to help build a cross-industry understanding of how offshore wind can provide inertia through the use of BESS with grid forming (GFM) converters and STATCOMS with grid forming converter and super capacitors.</p>	

Scope of the Project

The INCENTIVE project was scoped as a shorter Beta phase project, with the knowledge that an additional phase would be required to reach the level of completion that enables these technologies to reach full BAU.

The project originally consisted of 5 core work packages, after which a decision would be made to apply for further funding for the next project phase.

Following a decision not to proceed with a further funding application, an additional 6th work package was added to ensure the dissemination and successful close out of the project.

WP1	Project management
WP2	Business model development
WP3	Technical assessment
WP4	Site selection
WP5	Stage 2 scoping
WP6	Additional work: preparing for posterity

General progress of the Project

Project has progressed as outlined in application, additional work has been proposed (WP6), and some contingency budget allocated to cover the cost of this.

Overview of any delays or problems encountered

- Complex contracting structure took longer than expected
- Gaining technical models from OEMs and tuning these took longer than expected
- However, the majority of this time has been made up by accelerated delivery.

Main learning generated by the Project to date

- Feasible regulatory model for INCENTIVE solutions identified
- Simulation testing has shown INCENTIVE solutions will meet grid code
- CBA is positive for INCENTIVE solutions, but may need to be improved before INCENTIVE solutions can be invested in (see bullet point below)
- However, the current market and grid code requirements require an inertia response for 5 seconds, which is detrimental to the business case. This definition of inertia response may need to be updated in future iterations of market requirements and grid code.

Key metrics the Project has developed (e.g. a quantified cost reduction achieved for a particular asset, or an optimal market price signal, as examples).

- No key metric developed
- There are expected consumer benefits of inertia provided by INCENTIVE solutions through cheaper inertia provision. The project has shown that INCENTIVE STATCOM and INCENTIVE BESS are economically feasible alternatives to current business-as-usual inertia-providing technologies. With current technology costs, they have the potential to offer inertia at prices

comparable or lower costs with existing options bidding into long-term tenders.

Summary of any dissemination activities carried out

- Abstracts provided for IET ACDC conference
- Planned dissemination 5th September – NHVDCC webinar

Other useful links to key project documents

- <https://www.carbontrust.com/our-work-and-impact/impact-stories/large-scale-rd-projects-offshore-wind/innovative-control-and-energy-storage-for-ancillary-service-in-offshore-wind-incentive>
- <https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/energy-storage-for-offshore-wind-with-innovative-converter-control>

Section 2 - Beta Phase – Project Summary

Please provide a summary of the key findings from your Beta Phase Project.

INCENTIVE is addressing the Whole System Integration innovation challenge by investigating and demonstrating how offshore wind farms (OWFs) and their associated grid infrastructure can provide inertia to the onshore networks.

Aligned to the aims of the innovation challenge, INCENTIVE is:

- Improving the coordination between onshore transmission networks and offshore wind developers, with a view of introducing innovative solutions to the GB energy system.
- Reducing complexity and bureaucracy by developing optimal business models that will be applicable not just for the Beta Phase demonstration but for national roll-out following the completion of Beta Phase.
- Avoiding duplication by building a common understanding of the INCENTIVE solutions amongst a large consortium with all key stakeholders.
- Reducing barriers to market entry for OWFs to provide inertia.

The fall in inertia in the GB network is inherently a challenge that requires network innovation. INCENTIVE is focused on using OWFs to help stabilise the onshore network. Currently, no OWF is able to provide inertia to onshore networks globally. INCENTIVE will allow a step-change in capability for OWFs across the world, supporting the increase of renewable generation and delivering benefits to consumers.

Notable milestones or deliverables achieved

Milestones achieved in project:

Milestone	Overall objectives and key tasks	Summary of success criteria	Status
Milestone 1	Overall work package objectives: 1.1 Ensure timely, efficient and effective project delivery, with input from broad range of project partners. Key tasks: 1.2 Project management, including development of a dissemination strategy	M1.1: End of Stage 1: Successful completion of Beta Phase.	M1.1 In progress (on track)
Milestone 2	Overall work package objectives: 2.1 Devise non-site-specific business models for range of INCENTIVE solutions. Build on Alpha commercial assessment by developing	M2.1: Workable business model for INCENTIVE solutions	M2.1 Complete

	<p>comprehensive understanding of the commercial case for INCENTIVE solutions, in sufficient detail to enable site selection, technology selection and financial investment decision (FID) for a next phase or commercial implementation (depending on outcomes of Beta Phase). This, will be key to understanding the need for regulatory changes, grid code changes and revenue mechanisms to be trialled in next phase.</p> <p>2.2 Seek clarity on regulation, grid code and revenue mechanisms with Ofgem, NGESO and Project Champion(s), if needed.</p> <p>2.3 Devise business model for demonstration (site and technology-specific business model).</p> <p>Key tasks:</p> <p>2.1 Business model development (non-site-specific)</p> <p>2.2 Regulatory and market arrangements (non-site-specific)</p> <p>2.3 Business model development (site-specific)</p>	<p>M2.2: Clarity on regulation, grid code and revenue mechanisms.</p> <p>M2.3: Final business model for demonstration (technology and site-specific).</p>	<p>M2.2 Complete</p> <p>M2.3 Complete</p>	
Milestone 3	<p>Overall work package objectives:</p> <p>3.1 Obtain rights to use and validate models of sufficient detail to undertake technical assessments in tasks 3.2 and 3.3. Agree test to be undertaken in 3.2 and 3.3 to demonstrate stability, Grid Code compliance and stable operation.</p> <p>3.2 Build on Alpha technical assessment by developing comprehensive understanding of the technical performance of INCENTIVE solutions, in sufficient detail to demonstrate compliance against stability market/pathfinder specification, enable site selection, technology selection and financial investment decision (FID) for next phase or commercial implementation (depending on outcomes of Beta Phase). Understand how INCENTIVE solutions can meet the grid code requirements or whether grid code requirements need to change. Understand detailed interactions of INCENTIVE solutions and the offshore windfarms.</p> <p>3.3 Build on work in task 3.2, to build understanding of technology and site-specific INCENTIVE solution for demonstration. Highlight further work needed in next phase.</p> <p>Key tasks:</p> <p>3.1 Model selection</p> <p>3.2 INCENTIVE solution testing (non-site-specific)</p> <p>3.3 INCENTIVE solution testing (site-specific)</p>	<p>M3.1: Supplier-specific model(s) received.</p> <p>M3.2: Supplier-specific modelling completed (non-site-specific).</p> <p>M3.3: Supplier-specific modelling completed (site-specific).</p>	<p>M3.1 Complete</p> <p>M3.2 Complete</p> <p>M3.3 Complete</p>	
Milestone 4	<p>Overall work package objectives:</p> <p>4.1 Understand the practical benefits and issues of conducting demonstration at the various sites.</p> <p>4.2 Select site(s) for demonstration.</p>	<p>M4.1: Site(s) selection for Beta Phase: Site selected for</p>	<p>M4.1 Complete</p> <p>M4.2 Complete</p>	

	Key tasks: 4.1 Qualitative site assessment 4.2 Site selection	study in Beta Phase. M4.2: Site(s) selection for next phase: Site selected for demonstration.	
Milestone 5	Overall work package objectives: 5.1 Identify need for further work to be conducted in next phase 5.2 Select technology and demonstration methodology for demonstration in next phase. 5.3 Produce detailed scope for next phase. 5.4 Reach FID for next phase. Key tasks: 5.1 Identify need for further work in next phase 5.2 Detailed scoping of next phase 5.3 The Funding Party will undertake a financial investment decision (FID) for next phase (including application to SIF round 2 Beta Phase for INCENTIVE next phase)	M5.1: Next phase scope agreed. M5.2: Next phase financial investment decision.	M5.1 Complete M5.2 Complete (was positive decision from all partners except SSENT, so SIF Round 2 was not applied to for next phase funding)

Details on the Project's outputs and outcomes

All deliverables in WPs 1-5 have been drafted and are being iterated in response to consortium feedback. Once finalised, these will be listed in detail in the End of Phase Report.

How the Project is performing relative to its aims and objectives

Project is on track in terms of timeline and deliverables. However, the financial investment decision Milestone 5.2 was a negative decision: the consortium did not apply for SIF Round 2 for funding for a next phase due to a decision from SSENT not to proceed. The consortium is considering alternative approaches to financing the next phase, which will be highlighted in the End of Phase Report.

Improvements this innovation has made to new processes, products, or services.

- New Products: The INCENTIVE project is proving the case for these novel technologies being brought to market and is derisking investment.
- Services: The INCENTIVE project is proving the use of these novel technologies in conjunction with participating in the stability services market.

Any difficulties or delays encountered during the Project and how these challenges informed future thinking on undertaking innovation Projects effectively.

Some delays experienced in receiving technical models from OEMs due to time taken to agree necessary NDAs and for model tuning. While this has not affected the overall project timeline, we have shared this experience with UKRI to help enable other projects to mitigate for similar challenges.

How learning developed over the course of the Project.

The progress that has been made within the INCENTIVE projects can be divided into 3 main areas:

1) Vendor model validation

Working with vendors on validating their novel technology models has provided OWF developers and TOs with assurance in the technologies; while also ensuring all parties understand the offerings these technologies could provide in terms of inertia markets and how best to specify these technologies.

2) **Regulatory model**

The progress that has been made with DESNZ, Ofgem, NGESO and OFTOs has enabled viable regulatory models to be developed and a clear path for progression to market.

3) **CBA**

Significant work has been undertaken on the cost benefit analysis of these solutions. The CBA is now significantly more detailed than in Alpha Phase, and the additional analysis undertaken on this has uncovered an issue regarding inertia definition, which is leading to asset oversizing, and hence a damaging business case.

Section 3 -	Beta Phase – Knowledge creation and dissemination
	<p>Several lessons have been learnt thus far in the process of delivering INCENTIVE Beta Phase, namely:</p> <p>Contracting: Contracting a large consortium such as that of the INCENTIVE Beta phase, takes a large effort and can be difficult to align across such a broad spectrum of organisations.</p> <p>Lesson learnt: Start early and allow time. Although we got contracts signed in good time it was a big effort. In any future phase, we would plan to have an opening procurement phase to ensure procurement and contracting time is factored in.</p> <p>Next phase: INCENTIVE Beta phase project was scoped as a shorter Beta phase project, with the knowledge that an additional phase would be required to reach the level of completion that enables these technologies to reach full BAU. The next phase of INCENTIVE is a big commitment, and these conversations and commitments take significant time.</p> <p>Lesson learnt: Start conversations ASAP and be clear on required resources. Identify key delivery partners, and their resource requirements as early as possible. Ensure all key decision makers in those companies are aware of the need for a decision as early as possible and support them to make the necessary commitment decision.</p> <p>Model sharing: INCENTIVE Beta phase has used OEMs models in the process of the technical work undertaken. This process has been slower than anticipated due to additional tuning time requirements and coordination of several organisations.</p> <p>Lesson Learnt: Leave significantly more time than anticipated. OEMs can require additional time internally to get sign off and to fine tune their models for specific use cases, additionally coordinating multiple OEMs separately and confidentially takes more time than anticipated and it is important to ensure everyone has the time and ability to sign off on each stage.</p>

Section 4 - Beta Phase – Intellectual Property Rights Generation

The Relevant Foreground IPR is solely the INCENTIVE deliverables, which can be made available to other networks upon request. No other IPR has been generated.

Deliverables developed:

Deliverable	Title	Status
D1.1	End of Phase Report	In Progress
D1.2	Meeting minutes and materials	Ongoing
D1.3	Risk register	Ongoing
D1.4	IP register	Ongoing
D1.5	UKRI regular progress reports	Ongoing
D1.6	Annual Report	Complete
D2.1	Refined CBA for value chain for Stage 2 demonstration for specific INCENTIVE solution(s) at specific site(s)	Complete
D2.2	Business model(s) for Stage 2 demonstration of specific INCENTIVE solution(s) and specific site(s)	Complete
D2.3	Impact assessment of INCENTIVE solutions on roll-out of offshore wind	Complete
D2.4	Refined CBA for value chain for INCENTIVE solution(s) (non-site-specific)	Complete
D2.5	Business model(s) for commercial implementation INCENTIVE solutions (non-site-specific)	Complete
D2.6	Review of D2.1, D2.3 and D2.5	Complete
D3.1	Testing report on INCENTIVE solutions	Complete
D3.2	Testing report on INCENTIVE solutions with offshore wind farms	Complete
D3.3	Review of Stage 1 modelling work	Complete
D4.1	Qualitative site assessment report	Complete
D5.1	Stage 2 Project Plan	Complete
D6.1	CBA modelling approach	In Progress
D6.1	Recommended Further Work	In Progress

INCENTIVE has collaborated with NGET and SPT during the delivery of the Beta Phase and so all transmission networks in GB are aware of its outcomes.

Section 5 -	Beta Phase – Data Access Details
No data or insights from the project are ready yet for publication as these are being internally reviewed. All insights will be published via the dissemination routes mentioned in Section 1 .	

Section 6 -	Beta Phase – Route to Market / Business as usual
How is your Project working towards integration into business-as-usual practices within your network and across other networks following the successful completion of the Beta Phase? What strategy do your Project Partners have for commercialising the innovation?	
<p>Work in the INCENTIVE Beta phase has remained aligned with the Beta Phase application. It is currently too early to describe changes to the commercialisation readiness level (CRL).</p> <p>Any changes / updates to the plans to enable procurement and utilisation of the innovation across Great Britain and internationally No changes in terms of procurement. In utilisation of innovation, INCENTIVE Beta Phase is engaging all GB TOs and the vast majority of UK based offshore wind developers to ensure the utilisation of these technologies for inertia provision is widely understood.</p> <p>What considerations have the Project consortium made for the commercialisation of the proposed solution or innovation The project, as per project specific conditions, is ensuring that a commercialisation strategy is considered. In the case of INCENTIVE Beta Phase, the best route to commercialisation is dissemination at this point, and this has been a large consideration of the project up to this point.</p> <p>How the Project is providing support for non-network partners to move towards commercialisation The project consortium consists of 11 offshore wind developers and 5 OEMs in addition to networks. Through the modelling undertaken with OEMs and the specific site modelling with Offshore Wind Farm Developers, the project is providing support for these parties moving towards commercialisation by dissemination and through technical understanding.</p> <p>As discussed with monitoring officers, we plan on including a beta phase roadmap at the end of project report, to reduce replication of efforts.</p>	

Section 7 -	Beta Phase – Policy, Regulatory and Standard Barriers
	<p>Currently, Work Package 2 of the project is investigating the regulatory needs to enable the ownership/ operation of an INCENTIVE STATCOM (STATCOM with grid forming converter and supercapacitors). This work package will output a report discussing the potential asset ownership model, as well as necessary market adaptations to enable the new technology to participate in inertia provision. This report has been written with inputs from NGESO and Ofgem and discusses potential derogation routes. Further information can be found in this D2.5.</p> <p>In addition to this the work undertaken in INCENTIVE Beta phase has uncovered additional barriers to BAU deployment of these technologies, namely the '5 second rule' which is based on the capability to deliver inertia (or Active ROCOF Response Power) for 5 seconds. The design driver for this is a test defined in Grid Code Table PC.A.5.8.2 which requires energy to be provided for a 1Hz/s frequency ramp from 52 Hz to 47 Hz to be quantified. This storage duration also accommodates scenarios where inertia power is provided for successive frequency events without charging or discharging. This by definition, reduces the available provision of inertia at a market level, however the implications on a technical level can be disputed and proposed changes to this requirement would enable BAU uptake of grid forming STATCOMs with supercapacitors, and enable them to both provide these services and operate within the inertia market. Examining this definition may form the part of a next phase, should funding be allocated to a next phase.</p>

Section 8 -	Beta Phase – User Needs
Summarise who your prioritised users are for your project, outlining their specific needs and how the project is addressing these needs and issues.	
<p>The key users of these new technologies include offshore wind developers, onshore networks and electricity system operators.</p> <p>This project reduces the risk to OWF developers of installing these new technologies, which in turn will enable OWFs to provide necessary inertia to the onshore grid, and therefore will enable inertia market participation, widening the pool of potential inertia suppliers to NGESO, and enabling renewable generators to participate in this fossil fuel heavy market structure.</p> <p>All key users of these solutions are included on the consortium of the INCENTIVE project and their needs have been identified as:</p> <ul style="list-style-type: none"> • OWF developers and INCENTIVE solution suppliers need to demonstrate the INCENTIVE solutions before they can be rolled out commercially. • Networks need to understand their role in the implementation of INCENTIVE solutions, and whether they will be capable of owning and operating these assets in the future. • The ESO needs to understand the technical performance of the INCENTIVE solutions and how they will participate in future markets. • Consumers need low-cost inertia, and this need will increase in the future as more renewable generation is added to the network. <p>How your understanding of User Needs has been improved as a result of the Project</p> <p>As described in Section 7, the improved understanding of the ‘5 second rule’ has improved user need understanding and impacted upon all parties. Developers, TOs and OEMs may need this to be clarified or relaxed before some of these technologies become truly attractive. In addition to this, the project has undertaken significant work in understanding system strength and has found that local system strength could potentially be more important for developers and TOs when looking to invest in these technologies, rather than just the inertia market value.</p> <p>These are both subjects of interest for the next phase.</p> <p>How you are testing your own assumptions against the needs of your users</p> <p>We have ensured that user needs have been at the heart of the project and have shaped the project scope and delivery. This can be seen through our continuous engagement with Ofgem, ESO, offshore wind farm developers and OEMs and our pursuit of cost-beneficial inertia provision for the GB energy user.</p> <p>How the approach you are taking will minimise the burden on your future users and avoid duplication of effort through user journeys.</p> <p>We have a large consortium that has been built intentionally to avoid duplication of effort. To build alignment across the industry on the user needs and the solutions to those needs.</p>	

Section 9 - Beta Phase – Impacts and Benefits

Describe your expected net benefits to consumers and justify any changes in proposed impacts since the Application stage.

Progress towards benefits in application:

Benefit identified in application	Beta Phase progress
Improved access to/ creation of new revenues for users of network services	INCENTIVE Beta Phase progress to date has significantly de-risked the investment case of novel technologies in nascent inertia markets, therefore making progress towards creating new cost-beneficial market offerings.
Cost reductions in operating the networks and wider energy system	INCENTIVE Beta Phase is specifically investigating the use of offshore wind in conjunction with novel technologies for the provision of cost-beneficial inertia, the savings from which will be passed onto networks and therefore consumers.
Cost savings for users of network services and Cost savings to consumers	INCENTIVE Beta Phase is specifically investigating the use of offshore wind in conjunction with novel technologies for the provision of cost-beneficial inertia, the savings from which will be passed onto networks and therefore consumers.
Carbon reduction direct or indirect	INCENTIVE Beta Phase continues to investigate bringing novel technologies to BAU to enable offshore wind to provide necessary inertia to the onshore grid. By progressing this aim, the project is enabling a lower carbon system through roll out of renewables by maintaining lower carbon system inertia at safe levels at lower cost.
New to market products, processes and services	The derisking of novel technologies both as products through OEM model verification, and also for use in the inertia market for service provision, is accelerating bringing new technologies to BAU and using these to provide ancillary services.
UK remains global leader in offshore wind development and integration – Export opportunities	The INCENTIVE Beta Phase project has been a first of a kind investigation into inertia provision from offshore wind, as a UK network led project. International OWF developers and OEMs are involved in the project, and are looking to UK partners (SSENT, NHVDCC, ESO, University of Strathclyde, Carbon Trust and Frazer-Nash) for insights into these novel technologies. International dissemination is also planned.

Any developments or events which may affect the benefits gained from the Project and any additional impacts and benefits achieved over and above that predicted at the start of the Project. If the Project discovered significant problems with the approach and technique being trialled.

As mentioned in Section 7, the INCENTIVE Beta Phase has uncovered an additional barrier to BAU deployment of the grid forming STATCOM with supercapacitors namely the '5 second rule' which is based on the capability to deliver inertia (or Active ROCOF Response Power) for 5

seconds. Without change to the market design in relation to this, the business case for the INCENTIVE STATCOM may be reduced.

Should give an estimate of the future value to customers of the approach trialled.

System stability services are critical to supporting increasing volumes of non-synchronous renewable generation. The current provision is through redispatch of synchronous generation, which carries significant financial and environmental costs, and the development of new, standalone assets procured through Stability Pathfinder (SP). Published figures suggest that the £1.3bn contract cost from SP3 could deliver benefits of £14.9bn between 2025 and 2035.

INCENTIVE aims to deliver benefits over and above those achievable through SP by developing generation and network assets with in-built stability provision. Benefits include:

- Introducing design alterations to requisite/planned assets to enhance stability service provision for only marginal cost increases.
- Capturing co-development cost savings, e.g. in shared network, access, and planning considerations
- Potential acceleration in connection of renewable assets by proactively addressing stability at the outset.
- Creating a more liquid market for stability services, potentially driving down market prices in the long-term.

The CBA in Beta Phase is based on a 250MVA STATCOM, consistent with a 750MW offshore windfarm. The counterfactual is the cost of procuring similar levels of stability services via a SP tender. The benefits are the system-wide savings that would accrue to both the network operator and asset owner, with apportionment between these parties dependent on the nature and liquidity of future stability markets. Quantification of the potential benefit will be included in the End of Phase Report once the CBA is finalised.

Section 10 -	Beta Phase – Risks, issues, and constraints
Provide a summary outlining the risks and issues the Project is encountering, including impact, and mitigating actions to address these challenges.	
<p>A Risk Register has existed since Discovery Phase of the INCENTIVE project and has been provided to UKRI. This risk register manages, rates, and reviews all identified risks and assumptions, as of the writing of this report there are currently 8 live risks, the most notable of which are discussed below.</p> <p>Key Risks:</p> <ol style="list-style-type: none"> 1. The risk that INCENTIVE Beta Phase does not deliver a workable business model for an offshore wind farm developer or a transmission owner to own and operate INCENTIVE solutions. Mitigation: A workable regulatory model is on the way to being agreed with ESO and Ofgem. However, it is the stability market (the fact it is nascent and the fact that it asks for a 5 second duration requirement) that may mean the INCENTIVE STATCOM has a reduced business case. Innovation funding may be required for first mover of this technology. The nascent nature of the market also may inhibit INCENTIVE BESS. 2. Risk that Beta Phase finds that market and regulatory changes are required for a workable business model, and these are not agreed by Ofgem and NGESO, meaning the business case falls through. Mitigation: Continuous engagement with Ofgem and ESO has been achieved. It is likely market changes are required to enable INCENTIVE solutions to participate effectively. It is highly likely regulatory derogations are needed to enable INCENTIVE solutions. 3. Risk that INCENTIVE Beta Phase knowledge not well managed and disseminated, following negative FID for next phase. There is a strong need to ensure the work done has legacy. This means the work done must be left in a state such that a third party can pick it up without the support of the INCENTIVE project. Mitigation: WP6 is has been proposed and agreed upon by UKRI to address this risk. This will be funded through reassigning contingency to this work package. 	

Section 11 -	Beta Phase - Working in the open
	<p>How did are you ensuring transparency and stakeholder engagement during the Beta phase?</p> <p>In INCENTIVE Beta Phase we have developed and are executing a dissemination strategy, including public dissemination through submitting papers to international conferences and through a public webinar which will take place at the end of the project.</p> <p>How the Funding Party and Project Partners collaborate with stakeholders to promote and refine the project. The ways in which you invited challenges and external input on your project approach.</p> <p>The INCENTIVE Beta Phase project has continuously sought project partner input, through regular meetings with all parties involved in the project, and additional meetings with external stakeholders such as NGESO, Ofgem, DESNZ, OFTOs, and other TOs.</p> <p>Engagement with consortium members includes:</p> <ul style="list-style-type: none"> • Three biweekly calls with three OWF developer “Project Champions” who have offered in progress development projects as case studies to the project • Regular bilateral meetings with all key OEMs • Quarterly large consortium meetings, where we bridge the gap between this innovation project and the TO community, the OWF developer community (with 11 OWF developers present) and the OEM community (with 5 OEMs present) • Weekly delivery group meetings to coordinate between all work packages. <p>How you shared your learnings to avoid duplication of efforts and to accelerate industry progress on related initiative/ Sharing learnings to avoid duplication of efforts and to accelerate industry progress on related initiatives.</p> <p>The INCENTIVE project has engaged all industry stakeholders in order to transparently share learnings. Currently no additional research projects are investigating these technologies in the UK. The project has made efforts to engage with German TOs to more fully understand projects in Germany looking at similar technologies.</p> <p>Throughout the project we have also been in contact with other transmission companies in the UK, namely NGET and SPEN, to ensure we are not duplicating work and to disseminate learning, as well as the vast majority of the European offshore wind industry, who are present through the 11 developers and 5 OEMs in the INCENTIVE consortium.</p> <p>Dissemination and collaborative working are at the heart of the INCENTIVE project, which is reflected in its large and broad project consortium.</p> <ul style="list-style-type: none"> • The INCENTIVE project is engaging with a wide variety of OEMs throughout the project, notably the projects advisory board contains 5 OEMs • The project is also engaging with 11 Offshore wind developers in order to ensure the learnings of the project are disseminated and the industry is suitably upskilled to enable them to uptake these new technologies • The project is engaging with SSENT, NGESO and Ofgem to ensure all parties are part of the discussion of how to bring these technologies to BAU. • Additionally, the project has been engaging other TOs within the UK such as SPEN and NGET to ensure there is no duplication of work and that the project is being adequately disseminated. <p>How your team has been working openly and building relationships with organisations and teams responsible for other parts of the user journey, such as infrastructure/data owners, regulators, policymakers, investors, and others.</p>

Throughout the INCENTIVE Beta Phase, we have worked with DESNZ and Ofgem in order to discuss asset ownership and operation models which could exist within current regulations and what adjustments might be required to bring these technologies to market.

Any insights gained from stakeholder engagement that could be relevant for future projects.

We have understood that Transmission Operators also see a strong value in a physical demonstration of these technologies at onshore locations within their networks, and not just adjacent to offshore wind farms.

German TSOs are due to install a world first STATCOM with grid forming control and energy storage in 2025. The next phase of INCENTIVE (if funded) will seek to leverage the learnings there, and to share information between the UK and Germany, to continue to build consensus and expertise in this nascent area.

Challenges and external input

- The project has been open to all external parties to join or partake and continues to be.
- Challenges have been discussed in Section 2

Section 12 -	Beta Phase – Costs and value for money		
Provide a detailed account of how the Project funds are being spent, referencing the original forecasted budget.			
The budget of this project is managed through budget trackers held by SSENT on a joint SharePoint.			
The project has demonstrated value for money through the interim results in the existing milestones and deliverables as described in Section 2.			
Project Partner name	SIF funding requested	Total actual project spend	Total project contribution made
SCOTTISH HYDRO ELECTRIC TRANSMISSION PLC	£557,678	£399,645	£0
NATIONAL GRID ELECTRICITY SYSTEM OPERATOR	£37,902	£39,060	£3,906
UNIVERSITY OF STRATHCLYDE	£209,083	£191,118	£9,556
CARBON TRUST	£117,670	£292,422	£178,380

Section 13 - Beta Phase – Special Conditions		
Project Specific Conditions (PSCs) have been met by the following:		
PSC1	The Funding Party must not spend any SIF Funding until contracts are signed with the Project Partners named in Table 1 for the purpose of completing the Project.	All contracts signed and no spend was created before this point - Complete
PSC2	The Funding Party must report on the financial contributions made to the Project as set out in its application. Any financial contributions made over and above that stated in its application should also be reported and included within the Project costs template.	Ongoing financial reporting- Ongoing.
PSC3	The Funding Party must participate in all meetings related to the Project that they are invited to by Ofgem, UKRI and DESNZ during and after the Beta Phase.	Project has attended all meetings it has been invited to, to date. Ongoing.
PSC4	The Funding Party must, with support from Innovate UK/UKRI and, where applicable Ofgem, scope the requirements and success criteria for each stage gate within a Project at the quarterly reporting meetings ahead of any stage gate. These will be used to determine what criteria a Project must meet in order to pass a stage gate, and whether any additional information, such as a report, must be produced as part of the stage gate.	No stage gates in project – Complete
PSC5	Each of the annual progress reports that the Funding Party publishes in the Beta Phase must, at a minimum, be uploaded to the ENA's Smarter Networks Portal. We also strongly encourage wider dissemination of the annual progress report(s) and support from all Project Partners in ensuring it reaches a wide audience.	One annual report required – Complete
PSC6	As part of the end of Project Phase report, the Funding Party must produce a Project Impact Monitoring and Evaluation Plan. This plan must outline how the Project plans to monitor and evaluate the delivery of benefits outlined in the Beta Phase Application following the end of the Beta Phase. The plan must also include the methodology that will be utilised for quantifying and qualifying benefits realisation and how the Funding Party plans to report this to Ofgem 1, 3, 5 & 10 years post-Beta Phase completion. Further details on how to approach the development of this plan may be provided by Ofgem or IUK.	This will be provided in the end of phase report – Ongoing
PSC7	The Funding Party and all Project Partners must make reasonable attempts to attend, participate and/or contribute at SIF Community Forum events occurring during the Project delivery. We	The project attended the community forum, no other events are planned before project completion - Complete

	anticipate there being approximately one event per year.	
PSC8	The Funding Party must provide verbal updates at each quarterly meeting on any regulatory, policy and standards barriers and any change requirements which may impact delivery of the Beta Phase activities. The Funding Party must also include as an attachment to each of its annual progress report an update on any regulatory, policy and standards barriers which may require derogations and articulation of any proposed regulatory, policy and standards changes which would be necessary in deployment. The Funding Party must also provide an as an attachment to its end of Project Phase report a summary of the Project's findings on regulatory, policy and standards barriers, including any considerations for future work, and where applicable, where specific regulatory, policy and standards changes would be required for deployment.	Verbal updates provided at each QRM. Refer to Section 7 - Policy, Regulatory and Standard Barriers of Annual report for update. - Ongoing
PSC9	The Funding Party must provide within the first three months of the Project beginning (i.e. by 1 October 2023) an updated 60-second video. If the Project is greater than two years (longer than 24 months) in length, an updated video must also be provided at the Project's mid-point meeting. All Projects must also provide an updated 60-second video as part of their end of Project phase report. Innovate UK can share its guidance for 60-second videos with the Funding Party, if necessary.	Video updated and provided at project beginning. Updated video to be provided as part of end of project phase report – Ongoing
PSC10	The Funding Party must provide an update on consumer engagement plans at every second monitoring meeting (i.e. every six months). This must include an update on any activities which involve engagement and interaction with energy consumers, and any impact the Project may have on existing or future energy consumers and their premises.	Final update due at end of phase QRM – Ongoing
PSC11	The Funding Party must provide to the monitoring officer within six months of the Project beginning (i.e. by 1 January 2024) a roadmap for activities post-Beta Phase. This can build on the Project's Application question (question 11) and must focus on how and when the proposed solution will become business as usual within your network and across the other GB gas or electricity networks. As part of this, the Funding Party must include consideration for: I. any steps the Project will	Final update due at end of phase QRM – Ongoing

	<p>take to ensure its innovation has suitable business as usual adoption.</p> <p>II. the Funding Party's strategy for adoption of the innovation or proposed solution, giving consideration to potential investment, ongoing costs and third-party involvement and;</p> <p>III. any early indication of interest from other networks in adopting the innovation.</p> <p>The Funding Party must provide an update on all the above at every two quarterly monitoring meetings (i.e. every six months) and must include a final update of this roadmap as attachment to its end of Project Phase report.</p>	
PSC12	<p>The Funding Party must provide at every second quarterly monitoring meeting (i.e. every six months) an update on its commercialisation strategy. This can build on the Project's Application question (question 12) and must focus on what considerations have the Project consortium made for the commercialisation of the proposed solution or innovation, and how the Project provides support for non-network partners to move towards commercialisation. As part of this, the Funding Party may wish to include consideration for:</p> <p>I. who the primary customer segment is beyond the Funding Party; the customer value proposition;</p> <p>II. if identified, the outline of the route to market and potential new partnerships;</p> <p>III. any additional Project Partner capital requirements in order to commercialize the innovation and;</p> <p>IV. how this product, process or service could be scaled across the GB network and taken to new markets.</p> <p>The Funding Party must also include a final update of its strategy as an attachment to its end of Project Phase report. Ofgem and/or Innovate UK may issue a template for the final update as part of the end of Project Phase report.</p>	Final update to be provided at next QRM - Ongoing
PSC13	<p>Within the first six months of the Project formally beginning work on the Project, the Funding Party must provide a list of key criteria to the Project's monitoring officer that the offshore wind farm "champions" targeted by the Project would want to see developed from the Project in order for them to commit to hosting and co-funding a future demonstration.</p>	Complete, to be updated at end of project
PSC14	<p>The Funding Party must, by end of the Project, develop insights around potential interactions</p>	Ongoing

	between the proposed installations and the wind farms and any implications for the provision of system services. The Funding Party must provide these insights as part of or as an attachment to its end of Project Phase report and must publish these insights on the ENA's Smarter Networks Portal.	
PSC15	It is essential that the viability or otherwise of regulatory changes and the business models being developed is clear by the end of this Project. The Funding Party must therefore develop an on-going Project engagement strategy with key stakeholders within code bodies, standard institutions, Ofgem and DESNZ with support from Innovate UK and must submit this to the monitoring officer ahead of the Project formally beginning Projects works.	This has been included in the regulatory deliverable, 2.5 ongoing stakeholder engagement has been sought - Ongoing
PSC16	The Funding Party must include as an attachment to its first annual progress report a report which builds on the Project's regulatory review in Alpha which considers the assessment of the regulatory and code changes that may be required to align with the Project's emerging preferred technical and commercial delivery model. The report must include a plan for securing sectoral support for these changes, identifying the requisite stakeholders and code change groups to influence, and where possible any insights that have been received from Ofgem and code bodies. The Funding Party must also provide an updated version of this report as part of or as an attachment to its end of phase report.	We request that this attachment is included with the End of Phase Report rather than the Annual Report. At the time of writing, Ofgem is currently reviewing the proposed regulatory model and we don't want to publish something that may still change, as this could lead to confusion.

Section 14 -	Beta Phase – Material Changes
No material changes have been submitted.	