SIF Project Registration

Date of Submission

Mar 2022

Project Reference Number

10025653

Project Registration

Project Title

Asset Reuse and Recovery Collaboration (ARRC)

Project Reference Number

10025653

Project Licensee(s)

SP Energy Networks Transmission

Project Start

March 2022

Project Duration

2 Months

Nominated Project Contact(s)

Michael Eves

Project Budget

£99,279.00

Project Summary

Our Discovery project will :

· Evaluate the environmental and cost impacts of both high value and high volume assets across electricity generation, transmission and distribution, consider current procurement, commissioning, use, and disposal practices.

· Evaluate the applicability of different methodologies/ techniques for extending asset life using circular economy principles.

· Recommend aligned assets which have the identified potential to extend asset life for experimental testing in an Alpha phase.

This will reduce duplication and improve coordination around three competition themes:

· "Evaluating the costs and opportunities of repurposing or decommissioning existing assets" Our project focuses on the barriers, costs, and opportunities for assets to be repurposed, repaired, refurbished, remanufactured, or decommissioned.

· "Future policy and regulatory conditions as well as market designs to support whole systems approaches". Regulatory commitments and government policy focus on achieving net-zero carbon at least cost. Reducing carbon across the whole life of infrastructure assets will be essential in achieving this.

· "Utilisation of data and development of new approaches which harness greater value from data across organisations". This project will develop strategies for the digital mapping of assets, failure points, and circular opportunities. It will also lead to shared tools to potentially facilitate exchange mechanisms within the wider energy sector.

Our project partners provides the necessary direct access to the wider energy and international markets: This project brings together transmission and distribution network operators, and electricity generation companies, namely SP Transmission, SSE Transmission, SP Distribution and SP Renewables. These core project partners will be the initial users of the innovation, implementing the identified

opportunities for extending the life of assets and providing a clear route to market.

Frazer-Nash consultancy are the expert delivery partner. Frazer-Nash is a leading systems and engineering technology company with extensive expertise in energy infrastructure asset management.

BEAMA (the UK trade association for manufacturers and providers of energy infrastructure technologies and systems) are the final partner, providing expertise on the design and manufacture of assets.

This is the first UK user-led innovation to apply Circular Economy principles in the Energy Sector: NG Transmission and Network Rail will also be key contributors to the project and have been engaged in the proposal development phase. These organisations have been identified due to similar value chains, electrical infrastructure, and assets; each of them are providing significant in-kind support to de-risk the delivery. This collaboration will make it easier to innovate and accelerate identified solutions into BAU.

Third Party Collaborators

Frazer-Nash Consultancy

Nominated Contact Email Address(es)

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Problem Being Solved

Context: The UK Energy system infrastructure consists of thousands of high-value assets at varying stages in their useful lifetime. To transition to meet future energy demands and net zero carbon, record levels of investment in new energy infrastructure continue to be required.

Problem: At every stage of the infrastructure life cycle, there are significant environmental and financial costs, from the embodied carbon in manufacturing and transport to the impacts of operational use and end of life disposal. These impacts are not always well-understood by infrastructure owners resulting in investment decisions being made without cognisence of whole life costs. This results in avoidable carbon emissions, due to the scale of this infrastructure across the UK, and indeed across the globe, this is a significant contributory factor to climate change.

Design and commissioning: There is limited understanding of whole life carbon of major energy assets. This leads to an overuse of virgin materials in manufacture and makes it difficult for the industry to consider strategies for recycled/reused/remanufactured content, lifespan and repairability. It also means that procurement processes for infrastructure assets are not always designed to encourage circular approaches that would have a positive environmental impact, and reduce costs for consumers.

· Operational use: A clearer understanding of the way assets are managed in use will allow networks to explore options around repair, improving the availability of spares, retrofitting failing parts, and sharing assets through mutual exchange mechanisms.

· End of first life disposal: When assets are decommissioned, they are treated as end-of-life waste and disposed of as such. The current focus is on meeting legislative requirements for recycling of waste electrical and electronic equipment. Due to a lack of data at earlier stages (around procurement, manufacturing, and use), there may be missed opportunities to work across the value chain to refurbish / remanufacture or pursue higher value recycling options.

Opportunity:

Using a whole system approach to asset management in order to implement innovative circular solutions (to fulfill the criteria of the funding call as detailed in Q3), this project aims to extend the life of assets, keeping resources in use for as long as possible, providing significant environmental, economic and network resilience benefits. There is a clear opportunity to ensure that spend on new infrastructure assets are informed by a robust understanding of environmental and cost data around manufacture, transport, use, and disposal.

Project Approaches And Desired Outcomes

The Big Idea

The ARRC project will develop novel solutions to an industry wide problem of sustainably managing high value assets. Opportunities and challenges will be identified to extend the lifespan of infrastructure assets creating a paradigm shift from linear asset management to circular solutions, resulting in cost and carbon saving across the life cycle of major energy infrastructure which will result in a net saving to the consumer.

The project aligns with the Whole System Integration SIF scope in the following areas:

· Improve coordination between networks and other system participants.

· Reduce duplication and excessive variation of assets.

· Improve coordination of emerging innovations in the circularity of priority assets across networks, generators, and market participants.

Description of Idea

The end result will look like a suite of evaluated and proven methodologies and standards to be adopted across the energy industry and beyond. This will see a reduction in the environmental impact of the energy industry through the life extension of assets, utilising practices such as refurbishing, repairing, retrofitting, remanufacturing, repurposing, and resource exchange.

By considering whole life use, our approach will ultimately reduce duplication and excessive variation of assets. This will reduce carbon and cost for generators, reduce costs to consumers, and positively impact on wider targets around net-zero transition.

Current State of Development

This project has emerged from ongoing discussions between network transmission operators, the Energy Innovation Centre, and Frazer-Nash Consultancy. Despite Circular Economy being widely discussed, no application for the Energy sector has been implemented. This proposal will fulfill the innovation gap into Business as Usual.

SP Transmission had also been approached by the renewable generation industry regarding the potential for repurposing of windfarm assets providing an opportunity to look at innovative approaches to gain value from a whole system approach to assets that still have significant useful life.

Discussions have also taken place with DNOs who, particularly at higher voltage levels, will have similar priority assets and value chains. We have identified a clear market need and industry appetite for this approach. Due to the state of development, all relevant foreground IP will be shared in line with SIF Governance and accessible. We do not currently see any reliance on background IP and will report on this as part of the discovery outputs.

Innovation Justification

Innovation: This project aims to change the way that the energy infrastructure sector designs, procures, commissions, uses, and disposes of assets. The scope of ambition means we cannot take a business as usual (BAU), silo approach.

Value chain stakeholder feedback consistently highlights that businesses are not empowered to innovate and make business change unless they are receiving clear messages from customers. A project with the scale of partners across the electricity generation and networks industry in the UK is innovative in providing a joined up, whole systems approach and strong messaging to our common value chain, necessary in the step change required.

Without this innovation, the energy sector and the value chain will continue to apply a linear, BAU approach to asset disposal and not realise the benefits of economies of scale, innovation, and collaboration. It is anticipated that the lessons learned, and resources generated by this project will have implications and uses for infrastructure in other parts of the UK and globally.

Research: As part of our project development, we have reviewed published results from UK and international projects. This review included the ENA smarter networks portal, the UKRI portal, and a wider review based on internet search engines and the relevant project knowledge of our project partners.

The most closely aligned previous project was the 2016 Network Innovation Allowance (NIA) funded project 'Resource and Asset Reuse Toolkit', which developed an internal resource sharing tool within an Electricity Transmission company. Our assessment of this project has identified that impact was limited due to several key factors, such as a lack of whole-system participation, and policy and regulatory adaptations.

WPD recently proposed a NIA to develop a whole life carbon management framework for built assets. Learnings may provide an opportunity for future ARRC phases where methodologies and tools identified could be utilised as part of the impacts and benefits assessment of circular solutions.

Learning: Research has informed our project design, leading to the prioritisation of developing a broad sector-wide alliance, and the engagement of key industry umbrella bodies like BEAMA to provide a route to the value chain. It has also led to identification of potential barriers e.g. quality of remanufactured assets. These have been built into our project design, for instance, the Beta phase of this project will be experimental including testing of assets when circular solutions are employed to ensure they meet required standards.

Project Plans And Milestones

Project Plan And Milestones

The discovery phase will be split into three key work packages (WP) with three milestones (MS), delivered by Frazer-Nash consultancy, agreed and signed off by the Project Advisory Board. The ARRC Project Plan illustrates the timelines and deliverables of each milestone. The Frazer-Nash project team will demonstrate flexibility by carrying out preparatory work prior to WP1 to establish quantitative asset data requirements and a set of qualitative questions to establish current practices. This will be communicated to the participating energy industry asset users.

WP1: Baseline Assessment: Assess current practice in asset manufacturing, procurement, management and end of life treatment to identify opportunities for collaborative action and to support prioritisation. We will explore financial and environmental implications to develop a clear baseline to measure impact. Investigation topics will include:

- Partners strategic assets
- Areas of commonality/difference
- Embodied carbon of assets and resources
- Failure point of assets and obsolescence
- Availability of spares
- Asset waste and destinations

MS1: The delivery of a technical report detailing the baseline assessment of industry assets

WP2: Industry Trends: We will assess best practice, alternative solutions and emerging technology trends in developing a circular economy.

MS2: The delivery of a trends map and technology options paper.

WP3: Concept Development: Using the data gathered from WP 1&2, several potential solutions will be explored in detail and assessed for their potential costs/savings and environmental impact.

MS3: Final Deliverable: The key project output will be a business case and roadmap exploring the potential to reduce the environmental impact of the energy industry through the life extension of assets, alongside more effective recovery, and reuse of assets at the end of life. This will incorporate baseline assessment, industry trends, and concept development. Findings will inform the specific topics to be investigated and delivered in the Alpha and Beta phases.

Governance: A Project Advisory Board, chaired by SP Energy Networks, comprising of the project partners and the Energy Innovation Centre will be established pre-discovery phase to oversee project development and implementation.

Project Management: Frazer-Nash will provide project management and coordination support for the discovery phase. To ensure regulatory compliance (via business separation) and provide a consistent, coordinated approach Frazer-Nash will liaise individually with the network operators and generators, and will ensure the information is protected and secure.

Route To Market

The organisations that are involved in the project collectively represent a significant share of the UK energy market. We will work together to develop and agree specifications and standards that allow us to extend asset life. We will also begin to inform the procurement strategies of new assets to embed Circular Economy solutions.

Identified circular solutions will be adopted by project users through establishing agreed methodologies and processes across operational business, driving the uptake of new practices. This includes the need to consider how to integrate the logistics of defined solutions within digital and asset management systems and how to define re-purposed assets within our asset health risk registers. These businesses will be the initial adopters of the innovation, their commitment to the principles and outcomes of the project provides

a clear route to market.

The roadmap and circular economy solutions generated by this project will potentially have uses beyond the energy sector. Other major infrastructure users (major engineering companies, Network Rail, manufacturers) face similar challenges of reducing embodied carbon in infrastructure. We will work with infrastructure collaboration bodies such as MIROG (Major Infrastructure Resource Optimisation Group) and SICEF (Scottish Infrastructure Circular Economy Forum) to develop a strategy to build awareness of this work and share learnings via case studies, presentations, publications, and websites and share the tools to deliver savings with other interested organisations. Where tools are developed to aid impact assessment or the exchange of resources these will be made available for others to use.

We will also look to integrate these solutions with infrastructure asset owners globally. SP Energy Networks, as part of the Global Iberdrola group are well placed to deliver wider implementation of the established solutions through our global organisation. Where such learning is discussed global practice groupd and best practice adopted across the wider business. This can help position the UK as a global leader in supporting the sustainability of energy infrastructure assets.

In addition, SPEN has strong relationships with other EU TOs, collaborating through Horizon 2020 initiatives. We will leverage these relationships to identify other TOs and third parties to participate in the circular economy solutions.

We will need to consider challenges such as the regulatory and economic impact of re-deploying Assets which were within their predicted life cycle (as they perform part of conventional network revenue); these regulatory issues will form part of the criteria for Discovery assessment.

Costs

Total Project Costs

99279

SIF Funding

75963

This project has been approved by a senior member of staff

☑ Yes