SIF Discovery Round 2 Project Registration

Date of Submission

May 2023

Project Reference Number

10061338

Project Registration

Project Title

Indus

Project Reference Number

10061338

Project Licensee(s)

UK Power Networks

Project Start

Apr 2023

Project Duration

3 Months

Nominated Project Contact(s)

innovation@ukpowernetworks.co.uk

Project Budget

£171,417.00

Funding Mechanism

SIF Discovery - Round 2

SIF Funding

£141,349.00

Strategy Theme

Net zero and the energy system transition

Challenge Area

Accelerating decarbonisation of major energy demands.

Lead Sector

Electricity Distribution

Other Related Sectors

Funding Licensees

Lead Funding Licensee

UKPN - Eastern Power Networks Plc

Collaborating Networks

UK Power Networks

Technology Areas

Demand Response, Distributed Generation, Energy Storage, Low Carbon Generation, LV & 11kV Networks

Equality, Diversity And InclusionSurvey

Yes

Project Summary

Indus addresses 'Challenge 4: Accelerating decarbonisation of major energy demands'. The project will demonstrate an innovative approach to facilitating decarbonisation of heat and energy for mid-sized industrial dispersed sites. It will do this by developing a commercial model to integrate multiple, diverse energy-intense manufacturing operations in grid-optimised industrial parks; procuring efficient and flexible energy infrastructure to form a local cluster.

This project requires strong network innovation as it brings multiple parties together to collaborate to embed new technologies, systems, and business models. The deployment of onsite generation and flexibility services impacts the network and its assets and therefore for this project, UK Power Networks will need to challenge their existing processes and work collaboratively with partners to develop new mechanisms that work for decarbonising manufacturing hubs. The process for developing an industrial park will be re-designed to start with energy infrastructure and net zero considerations first. Developing zero-carbon manufacturing hubs at identified locations will stimulate investment at other similar sites.

The Indus project draws on the experience of the current portfolio of national industrial cluster decarbonisation projects to develop an exemplar zero-carbon industrial hub in Peterborough. The developed commercial business model for industrial park development will be operationalised to demonstrate how the consolidation of industrial heat demands with flexibility, demand response, and storage services can minimise investment requirements for network operators and contribute to efficient grid operations.

UK Power Networks will lead the bid, supplying relevant data, engineering expertise, and advising on network regulatory compliance in the design process. The pre-existing industry clusters (Black Country and South Wales) are both engaged in this project to leverage their learnings and operational expertise. They will be joined by a global energy services company to support asset procurement. The consortium will be governed by Camirus who are leaders in managing complex projects at the forefront of innovation and market development. Peterborough Council will assist in site procurement and advise on socio-economic benefits for the community. The Discovery phase will include the identification of a suitable commercial development partner, who would become part of the project for the alpha and beta phases.

The intended users of this project are future operators and developers of industrial hubs and activities. It will offer a more robust approach to industrial development where energy is a critical input to business operations and ensure network companies are seen as facilitators rather than barriers to the net zero transition.

Project Description

55% of industrial energy demand is represented by over 130,000 manufacturing firms outside the UK's heavy industrial clusters. UK Power Networks' heat strategy states that by 2028, 9% of the heating mix stems from commercial and industrial customers in their region - demonstrating the scale of the problem. The UK government has substantive plans in place to deploy infrastructure solutions for the top 200 industrial sites in the UK (e.g., major steelworks, refineries) but no real interventions for the remaining 130,000 energy-dependent manufacturing sites. While low-carbon technologies may be economic for heavy industrial clusters, for smaller distributed sites, on-site renewables are often uneconomic in response to the intensity required for individual manufacturing operations. Electrification of process heat brings its string of challenges: requiring companies to invest in new plant to accommodate fuel switching; and demanding additional network investment to accommodate the increases in capacity and demand that results.

This project will accelerate the decarbonisation of industrial heat demand, specifically from distributed energy-intense manufacturers, by developing and demonstrating a network-led commercial business model for industrial park developments suitable for typical mid-sized manufacturing operations employing 10-500 people. This model will also maximise opportunities for industrial power users to contribute to grid stability and reduce costs to end consumers by integrating flexible, on-site generation, demand response, and energy storage services into operating models.

Innovations will arise from making the network impact and energy demand component front and centre of the business models that industrial hubs use. This will enable network companies to obtain greater visibility of the expended energy demand and provide a new route for developing large-scale flexibility services. If flexibility and energy infrastructure is built into the design of industrial parks, the connection load required will be lower and therefore investment required from DNOs will be reduced. Flexibility services will also reduce energy consumption at peak times and shift demand to cheaper, off-peak or low carbon times providing a saving for industrial users and operators of manufacturing hubs and therefore the end consumer.

The project builds on the experience of the UK Industrial Cluster decarbonisation Programme. Until now this has largely focused on the decarbonisation of concentrated coastal clusters, with only the Black Country and part of the South Wales project exploring the challenges of smaller and dispersed sites. Both these clusters are contributing partners to this project, and they're joined by a global energy services company and Peterborough City Council.

Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

Project Description And Benefits

Applicants Location (not scored)

UK Power Networks (03870728):

Newington House, 237 Southwark Bridge Road, London, SE1 6NP

AMERSCO (06614239):

Wesley House 5, Wesley Street, Castleford, West Yorkshire, WF10 1JG

CAMIRUS (11313074):

46 Northumberland Road, Leamington Spa, United Kingdom, CV32 6HB

CR Plus (05426066):

Unit 28 Baglan Bay Innovation Centre, Baglan Energy Park, Port Talbot, Wales, SA12 7AX

Guidehouse (11378449):

100 New Bridge Street, London, United Kingdom, EC4V 6JA

M3MAS (09118510):

63 Brighton Road, Worthing, West Sussex, BN11 2EU

Peterborough City Council:

Town Hall, Bridge St, Peterborough PE1 1HF

Project Short Description (not scored)

Indus builds on the successful concept development project in the Black Country and will develop and deploy a network-led commercial business model that optimises the energy use of mid-sized industrial parks, making electrification of industrial heat more economic and optimising the use of flexibility and onsite generation thus accelerating decarbonisation of this significant source of heat and energy demand.

Video description

https://www.youtube.com/watch?v=Y08SsoeY54A&list=PLrMOhOrmeR6ldr-EVoT8ABGhTCxgyBKqs&index=44

Innovation justification

Decarbonising industrial heat demand is challenging and expensive. 55% of industrial energy demand is represented by more than 130,000 manufacturing firms outside the heavy industrial clusters of Northern England, Scotland, and South Wales. The UK government has substantive plans in place to deploy infrastructure solutions for the top 200 industrial sites in the UK (e.g., major steelworks, refineries) but no real interventions for the remaining 130,000 energy-dependent manufacturing sites. While hydrogen and CCS may work at scale for the heavy industrial clusters, for smaller distributed sites, these are not economic.

Electrification of industrial heat, coupled with flexibility and demand-side solutions are effective and economic options for many smaller distributed sites but are considered too late in development processes, and there is rarely any effort to consider consolidating industrial heat demands in ways that make decarbonisation easier and offer more resilient energy supplies. Therefore, this project will make decarbonising these industrial hubs affordable and feasible.

This project is innovative as it will develop a comprehensive framework that facilitates strong cross-industry and cross-sector collaboration that is designed specifically for scaling to many small industrial sites and will have not been tested in this way before. The proposed approach builds on the learnings from the Repowering the Black Country project, by incorporating network and development

considerations at a much earlier stage to mitigate risks to delivery and ensure the developed solution aligns with local industrial strategy. The appendix summarises the proposed approach; how we envisage that the discovery phase will develop into an alpha and beta stage; and the key findings from the Black Country project.

The key economic and sustainability value of this project comes from reduced network costs in connecting industrial developments to the grid and from flexibility and onsite generation enabling demand to maximise use of cheaper, off-peak, low-carbon power. Without this framework and project, smaller industrial companies will not be able to decarbonise their energy and heat demand while remaining globally competitive.

The project requires the development and testing of an innovative and complex commercial model. Further work is required to understand the feasibility, scope, and outcomes that will be achieved from this project ahead of deployment. As the approach is novel and brings together partners from sectors that don't normally work together, this project would not be considered as part of business-as-usual (BAU) activities and is not suitable for other funding mechanisms within the price control framework.

Benefits Part 1

Environmental - carbon reduction – direct CO2 savings per annum against a business-as-usual counterfactual
Environmental - carbon reduction – indirect CO2 savings per annum against a business-as-usual counterfactual
Financial - cost savings per annum for users of network services
Financial - cost savings per annum on energy bills for consumers
Financial - future reductions in the cost of operating the network
New to market – products, processes, and services
Revenues - improved access to revenues for users of network services

Benefits Part 2

Financial - cost savings per annum for operating the network, users of network services and consumers

Counterfactual: Decarbonising industrial heat in UK Power Networks' license area in the current scenario will add a significant amount of GWh to annual electricity demand and increase peak power requirements in parts of the network. If UK Power Networks do nothing, this will require significant investment in the network assets and add cost to every consumer bill per year.

Output: The investment costs required by the DNO can be reduced per industrial park through collaborative park design and development, including flexibility mechanisms to reduce network impact and unlock cheaper off-peak pricing. Rolled out across the whole network over the next ten years, the savings of operating the network and of the users of the network services will be passed onto savings for the consumers on their energy bills.

Metrics:

- GWh of electricity consumed per annum
- £ per GWh of electricity
- The network capacity required for the zero carbon industrial park versus the default 'BAU' request for such a development.
- The value of flexibility and demand side services that can be designed into the park infrastructure

These metrics can be estimated at a high level as part of the Discovery phase; calculated for a specific design and development in the alpha phase and demonstrated and measured in practice during the beta phase.

Based on the Black Country experience and UK Power Networks figures, reinforcement and connection requirements for new industrial parks might be 5-50MVA lower (depending on industrial process) than the counterfactual per park. This suggests savings of around -£1 - 10 million per development.

Environmental - carbon reduction -- direct CO2 savings per annum against a business-as-usual counterfactual

Counterfactual: Decarbonising industrial heat in UK Power Networks' license area in the current scenario will add a significant amount of GWh to annual electricity demand (i.e. by switching around 10% of current gas demand to electricity) and increase peak power requirements in some parts of the network.

Output: Indus will demonstrate how a collaborative industrial development process and designing flexibility into industrial parks can reduce required network capacity, reduce industrial energy consumption and costs, and shift demand to off-peak times. Multiplying the amount of electricity by its associated carbon emission factor (in comparison to gas) will provide direct CO2 savings.

Metrics:

- GWh of electricity consumed per annum

Carbon emissions factor of the electricity consumed per annum

Project Plans And Milestones

Project Plan and Milestones

The project plan aims at developing the first zero carbon industrial hub within UK Power Network's area and ideally within Peterborough City Council's geography by the end of the Beta Phase. A high-level roadmap for this is provided (appendix II). The Discovery Phase aims to prove the concept within Peterborough by identifying a longlist of potential development sites considering:

- The local economy (i.e., industries that see benefit in investing)
- Local planning authorities
- Attitudes of commercial developers
- Available network capacity and optimal locations to add flexible and predictable industrial demand to the network

There are six work packages mapped out in the attached Gantt chart and broken down into detail in the project management template.

WP1 - £18,121

- Description: Identify viable hub location (M3MAS with Peterborough City Council and others).
- Success criteria: Identification of a pipeline of viable sites. Simultaneously, this WP will carry out a high-level review of the whole UK Power Networks license area to provide a preliminary assessment of potential for replicating the model more broadly.

WP2 - £10,929

- Description: Identify potential industrial foci -- e.g., food manufacturing, agritech, chemicals (Camirus with Peterborough City Council).
- Success criteria: Shortlist of industrial sectors which will be acceptable anchors for zero carbon hubs within the local geography.

WP3 - £15,928

- Description: Develop commercial offer and identify development partner (M3MAS).
- Success criteria: Publication of a credible commercial development pathway for the project.

WP4 - £46,137

- Description: Develop energy services offers (CR+ with Ameresco).
- Success criteria: Creation of an Indus 'pattern' book of energy infrastructure and system control options for decarbonised industrial hubs.

WP5 - £32,900

- Description: Identify potential regulatory barriers and quantify benefits case (Guidehouse with Camirus).
- Success criteria: Clarity on regulatory barriers and demonstrating that development of a theoretical hub will result in net benefits for UK Power Networks' customers.

WP6 - £17,334

- Description: Project management (Camirus).
- Success criteria: Delivery of the Discovery Phase on time and budget. Risk log updated.

Major risks are access suitable development sites in a timely manner and regulatory barriers preventing effective collaboration. These will be addressed by careful selection of sites and commercial development partner, and by working with UK Power Networks and regulatory specialists in Guidehouse to develop a suitable strategy for overcoming barriers.

Project risks will be actively managed through best practice project management. Camirus will provide an experienced project manager and the risk schedule will be reviewed weekly with the project team.

Regulatory Barriers (not scored)

The project has a focused WP (WP5) aiming at identifying and addressing any potential regulatory barriers in the Discovery phase. This will enable the most viable development model to be proposed for the Alpha and Beta phases and any future regulatory barriers encountered will be tackled through the project's risk management processes and continuous engagement with the relevant parties to resolve any issues. The breadth of partners involved in the collaboration should offer a variety of ways to manage regulatory

challenges, for example by allocating asset development, ownership, and operational responsibilities to different partners as necessary.

Commercials

Route To Market

The project will work with all the relevant stakeholders throughout the project lifecycle through design and testing to ensure solutions are based on real scenarios and achieve BAU adoption at the quickest opportunity. The project does not undermine the development of competitive markets as the offerings developed through this project will be available to all eligible market participants and outputs and learnings made accessible to all.

We will confirm the most effective routes to market as part of the Discovery Phase of the project (WP3). Based on previous experience we envisage strong local authority, DNO and energy services company interests in any exploitation vehicle. We also anticipate local authority engagement and participation being fundamental to success.

The primary customer segment for this project are companies that own or operate industrial centres or manufacturing hubs (i.e, commercial industrial facility developers). The outcome of this project will be applicable to dispersed industrial activities across the UK. A good starting point for deployment and replication will be to build on existing relationships with the six coastal industrial clusters to apply the model and develop zero-carbon hubs in their geographies. They understand the issues and opportunities, so although benefits are lower in these locations, it may be easier to progress initial deployments. Part of the South Wales and Solent Clusters have similar needs to East Anglia and the Southeast (alongside and distinct to their efforts to decarbonise the major steel and petrochemicals facilities respectively). The lead for the South Wales Cluster (CR+) is in our project team.

As part of Alpha Phase, we will also establish an Industrial and Commercial Advisory Board which will bring together further key potential facilitators of immediate routes to market and replication of project outcomes. We have already invited the SE Energy Hub and National Grid Energy Distribution to participate in this panel.

The customer value proposition is clear. If flexibility and low-carbon energy infrastructure is built into the design of industrial parks, grid impact should decrease and therefore investment required from DNOs should fall. Flexibility services should also reduce energy consumption and shift demand to cheaper, off-peak, low carbon times providing a saving for the operators of the park and end consumer.

Once proven effective, new services and development for consumers would be funded through BAU allowances of the relevant parties, given the increased confidence in delivering a return for customers, partners and shareholders.

Intellectual property rights (not scored)

The project will follow the standard approach to IPR management as set out in the SIF Governance Document Chapter 9. In short, this means:

Each Project Participant in the Project will retain all rights in and to its background IPR.

Each Project Participant shall own all Foreground IPR that it independently creates as part of the Project, or where it is created jointly then it shall be owned in shares that are in proportion to the work done in its creation. Where any Project Participant transfers any of its rights, title or interest in or to any Foreground IPR to any other person, for example, if the Project Participant is taken over by another legal entity, it shall only do so where the assignee/transferee agrees to comply with these default IPR conditions. A Funding Party can only transfer any of its rights, title or interest in or to any Foreground IPR to any other person, subject to having regard to the true commercial value of the IPR; and the assignee/transferee agreeing to comply with these default IPR conditions.

We will capture this approach and agreement to follow it in a project collaboration agreement following award of funding.

Costs and value for money

The total costs for this project are £171,417. The partners are contributing 18% of the total project costs showing value for money. The SIF funding request is therefore £141,349.

This is split as follows:

UK Power Networks: Total costs are £20,750; SIF funding request of £5,750

Camirus: Total cost are £34,872; SIF funding request of £31,384

M3MAS: Total costs are £24,960; SIF funding request of £22,464

CR+: Total costs are £24,986; SIF Funding request of £22,487

Ameresco: Total costs are £25,000; SIF funding request of £22,500

Peterborough Local Authority: Total costs are £10,849; SIF funding request of £9,764

Guidehouse: Total costs are £30,000; SIF funding request of £27,000

With the climate crisis, we cannot wait until both our industrial economy and networks are independently optimised for net zero -- resulting in missing opportunities that could accelerate decarbonisation, reduce need for reinforcement, and create a truly flexible and integrated energy system with improved energy security and industrial competitiveness.

Our project will facilitate the growth of industrial hubs (i.e., supporting UK economic growth) while minimising the impact on the energy system by co-locating and critically assessing the needs of the companies and the ability of the grid and energy technology to best serve them.

Viability without SIF funding: SIF funding is required to engage the partners at an early stage in the project lifecycle. If engaged later, it would be detrimental since the development team would be hampered by not having the right people involved from the start. This would in hand lessen the impact of the discussed benefits on the network and society.

SIF funding is required to enable the collaborative approach of the complementary partners, all of whom are taking a risk in investing in the project that goes beyond what would be commercially acceptable to their shareholders due to the unproven and innovative nature of the ultimate vision and high-degree of interdependency.

Taxpayer benefits: Indus offers significant opportunities to reduce the costs of delivering energy to the UK Taxpayer, by managing the generation, transportation, storage, and use as a community at each hub. It will provide more flexibility for the network and accelerate delivery of a net zero future.

Wider Benefits: This project will represent a significant business development opportunity for all the partners. This will expose their work to a much wider audience and very likely lead to additional commercial growth for all parties.

Document Upload

Documents Uploaded Where Applicable

Yes

Documents:

SIF Discovery Round 2 Project Registration 2023-05-30 10_26

SIF Round 2 Discovery - Indus End of Phase (for upload).pdf

SIF Round 2 Discovery - Indus Show and Tell (for upload).pdf

This project has been approved by a senior member of staff

☑ Yes