SIF Alpha Project Registration

Date of Submission

Dec 2022

Project Reference Number

10037467

Project Registration

Project Title

Heat Balance - Alpha

Project Reference Number

10037467

Project Licensee(s)

SP Energy Networks Distribution

Project Start

Aug 2022

Project Duration

6 Months

Nominated Project Contact(s)

John Allen

Project Budget

£554,712.00

Funding Mechanism

SIF Alpha - Round 1

SIF Funding

£499,116.00

Strategy Theme

Net zero and the energy system transition

Challenge Area

Heat

Project Summary

Displacing fossil fuel, primarily natural gas, for heating represents a major challenge for the electricity system due to the huge peak demand for heat and the huge seasonal variation heat demand, requiring network reinforcement.

A further challenge arises from the increasing levels of intermittent renewable generation required to support the demand. There are periods during the year when renewable (wind) generation is insufficient to meet demand, and others when it is curtailed at considerable cost to customers and loss of a valuable low carbon energy resource.

The main objective of project Heat Balance is to demonstrate the application of large-scale thermal energy storage (LTES) to exploit curtailed wind and support inter-seasonal alignment of wind generation and thermal demand.

Challenge Aims

Heat Balance meets the aims of the challenge: -

- *'Develop innovative products, processes and services .....'*

LTES is an innovative solution to help address transmission constraints and help mitigate network reinforcement that is not currently part of BaU flexibility solutions for GB networks.

- *'Produce insights and findings ....'*

The Discovery phase findings have shown that LTES is a practicable technology in large areas of GB. The project has demonstrated a positive CBA based on network benefits alone.

- *'Demonstrate howlowcarbon heating can be intelligently managed ......'*

The project has demonstrated that LTES in conjunction with intelligent management systems can reduce costs across the energy system, in the heat sector in addition to several parts of the electricity sector.

Alpha Phase

The Discovery phase found that LTES can significantly help with decarbonisation reductions to net zero, improve energy and heat security, reduce curtailed energy costs, and offset investment costs.

The study found that all of these benefits can be realised through appropriate deployment of LTES. In the Alpha phase, we will develop the technical and commercial readiness level of the solution, enabling a pathway to realise the potential benefits.

The required deliverables will be developed through the technical and commercial work packages listed in the project description and explained in the project plan.

Project Partners

SP Transmission is the lead organisation. We want to help electricity customers transition to low carbon heat at the most efficient cost and enable a quicker transition.

Academic Partners

The University of Edinburgh will leverage their experience of LTES/transmission system modelling in the INTEGRATE project.

The University of Glasgow will be a major contributor to the Technical WPs bringing their extensive experience in geological thermal energy storage.

Technical & Commercial Expertise

Ramboll will lead one Technical WP bringing their experience in the rapid development of the thermal pit storage technology in Denmark.

DELTA-EE will primarily contribute to the Commercial WP building on learnings from their research into large-scale TES undertaken for BEIS and others.

Heat Network Providers

Vattenfall bring their practical experience as one of Europe's largest producers and retailers of electricity and heat.

Erda Energy bring expertise from their innovative solutions for low-carbon heating, cooling and geo-exchange technology.

Partner capability is explained in the Skills and Expertise Appendix.

User Needs

We identified user needs from the experience of our heat networks partners, Vattenfall and Erda, and from recent experience of grid scale battery developers. We consider two broad categories of user:-

- Those who will deploy heat networks with LTES such as commercial heat service providers, housing developers, local authorities, housing associations, and institutional investors. These users need a clear pathway to de-risk any investment into LTES.
- Network licensees who can use the flexibility available from LTES including the ESO, TOs, and DNOs.

These users need to understand how they can help facilitate this low cost form of energy storage for network benefit.

Project Description

Decarbonisation will profoundly change the way we heat our buildings, both commercial and domestic. This proposal forms part of the blueprint required for that transition and supports government objectives.

Both inter-seasonal and short-term thermal energy storage (TES) will be essential to balance the demand and supply for the future net zero heating system.

Large-scale TES (LTES) is one of the lowest cost forms of energy storage. It is innovative in the UK where there is a lack of deployment to date and it is not currently considered as a BaU solution by networks.

Credible pathways for decarbonising heat result in a large increase in electricity demand as gas and other fossil fuel fired boilers are replaced by heat pumps. Displacing fossil fuel, primarily natural gas, for heating results in one of the major challenges for the electricity system in managing the huge seasonal variation in the demand for heat.

In addition to the challenges raised by electrification of demand, there is a challenge arising from the increasing levels of intermittent renewable generation required to support the demand. Renewable generation is connected predominantly in the north of the UK and load is predominantly in the south. The interconnectors in the transmission system are already constrained in their ability to export renewable electricity at times.

Heat Balance aims to develop demand flexibility from large-scale TES to:-

- Better match heat demand to the output of renewable generation that would otherwise be constrained at significant cost to electricity consumers
- Reduce peak demand on the transmission and distribution networks over multiple timescales, reducing the need for network reinforcement.
- Enable heat network operators to benefit from low cost electricity by making their load flexible.
- Reduce the investment required in electricity generation by reducing the capacity required to meet peak demand

The Alpha phase project will build capability for LTES deployment by delivering the following work packages: -

- Commercial and Regulatory
- Environmental and Social
- Case Study Development
- Archetype solutions guidance

Preceding Projects

10025662 - HEAT BALANCE

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Project Approaches And Desired Outcomes

Innovation Justification

Credible pathways for decarbonising heat result in a large increase in electricity demand as gas and other fossil fuel fired boilers are replaced by heat pumps. One of the major challenges for the electricity system is the huge seasonal variation in the demand for heat. In addition, there are extreme intra-day fluctuations in heat demand with rapid ramp rates.

Problem statements:

- The current trajectory of the electrification of heat risks overloading the transmission and distribution networks, requiring major investment.
- Heat demand doesn't align with the output from non-dispatchable renewable generation. Forecast transmission renewable constraint payments could exceed £1bn per year through to 2040.
- Around 30% increase in generation capacity is required for peak heat, if not mitigated, requiring major investment in generation and connection capacity.

Therefore, if we do nothing, these will result in an increase in consumer bills.

All forms of large scale energy storage will be essential to address these problems.

LTES is one of the lowest cost methods of energy storage and one of the most flexible. Under smart control it can shift electricity demand over timescales between a few hours to inter-seasonally. There is a huge potential for LTES in conjunction with heat networks.

The number of heat networks is set to rapidly increase as part of the government's energy and environmental plans and legislation. There is an opportunity to ensure that appropriate LTES is incorporated with heat networks to assist with an efficient transition to low carbon heat and optimal development of the whole energy system.

However, LTES has not been commercialised in GB to date and innovation is therefore required to overcome the technical and commercial risks.

The current knowledge missing is both on the technical application at scale in GB, and the regulatory and commercial framework which will make it attractive to investors.

There are very few documented examples of TES at the required scale in the United Kingdom. BEIS, Evidence Gathering: Thermal Energy Storage (TES) Technologies, 2016 commented 'For interseasonal heat storage, developments in the UK are far behind those advancements made in other northern and central European countries.'

The key findings of the Discovery phase project arising from the two work packages are:-

Technical

- In conjunction with heat production units, LTES can provide Electricity network services
- GB has a significant proportion of high-quality aquifers suitable for LTES
- Flooded mines also provide a significant opportunity for LTES

- Easter Bush campus modelled as a case study

Commercial

LTES can:-

- Use otherwise curtailed renewable generation
- Reduce distribution system reinforcement
- Reduce size of heat provision systems by smoothing demand
- Shift energy purchase to low cost electricity periods

The Alpha phase project will build on these learnings, generating a roadmap that supports both heat networks and electricity networks users of the solution.

In addition to progressing plans for a specific case study, the Alpha phase will:-

- Create a matrix of archetype solutions and an evaluation matrix to help developers identify appropriate solutions including Population, Geological, Scale, Local Generation, and engineering considerations.
- Report on environmental and social considerations around large schemes.
- Address the commercial/regulatory requirements to facilitate LTES, drawing on relevant stakeholder knowledge and experience through a commercial working group.

Not completing the project could prevent or delay the implementation of a particularly cost effective method of decarbonising energy generation and consumption within GB.

Deployment of flexibility from LTES is not currently a BaU solution in GB networks and there is no funding under the price controls for this. The scale of ambition needs SIF funding to fully realise a tangible solution which can enable decarbonised heat at the lowest cost to the consumer.

Benefits

The Electricity System Operator (ESO) estimates that over 13GW of energy storage is required by 2030 and 40GW by 2050 (2021 FES). LTES is one of the lowest cost forms of energy storage (Lund et al. -- 2016 Energy Storage and Smart Energy Systems). Converting 'excess' electricity into stored heat provides flexibility, and both short-term and long-term (inter-seasonal) energy storage.

LTES provides benefits to the whole energy system including the heat and electricity sectors. Electricity consumers and heat consumers will ultimately be the recipients of these benefits.

- Reduced overall energy costs for heat networks providers
- Reduced network constraint payments to wind farms
- Reduced need for reinforcement of the Scotland- England transmission capacity
- Reduced investment in peak electricity generation capacity

Heat Networks Benefits

If LTES is to be installed in conjunction with heat networks, there needs to be a business case for the heat network operator to make this additional investment. The Discovery phase Cost Benefit Analysis (CBA), included in the appendix, shows that adding LTES, supplied with otherwise curtailed wind energy, to heat networks can have a positive Internal Rate of Return (IRR) of up to 14.5% for the heat network provider, while providing significant benefits for the wider energy system. The positive CBA requires that some of the benefit accruing to electricity networks is transferred to the heat network provider to make the inclusion of LTES economically feasible. We included this in our modelling by considering that ESO savings in constraint payments could subsidise the cost to the heat network provider of otherwise constrained wind energy.

Transmission Network Benefits

There are two main economic benefits:-

Avoiding Renewables Curtailment: Allow renewables to operate instead of reducing or curtailing their output. In its Modelled Constraint Costs - NOA 2020/21, the ESO has estimated that constraint costs could peak at over £2bn per year by 2026 and remain above £1bn per year to 2040.

Network Investment Deferral: Reduce the need for investment in the electricity network for reinforcement. The capacity of the B6 boundary between Scotland and England is currently 6.6GW. According to the ESO Future Energy Scenarios, the required boundary flow could be up to 20GW by 2030. As an indicator of costs, the two Eastern HVDC links are providing additional 4GW capacity at a cost of £3.2bn (Ofgem Consultation document, March 2022). By storing energy as heat and using this at times of winter system maximum demand, the required boundary flow and therefore reinforcement requirement can be reduced.

Our estimate of benefits included within the appendix shows that the cumulative net benefit of the above to electricity consumers to 2040 could be £444.7m.

Carbon Benefits

LTES has significant potential to reduce CO2 by enabling low carbon renewable energy that would otherwise be constrained. In our case study, using curtailed wind energy from Kilgallioch windfarm saved over 50 tons of CO2 per year.

LTES can potentially displace 5GWh of peak CCGT generation each day during the heating season, equating to ~ 439,000 Tonnes of CO2 annually.

Carbon reduction will also be achieved by reducing reinforcement works on the network.

Regional and wider energy supply resilience benefits

Areas where renewable generation is constrained coincide in many cases with areas experiencing high levels of fuel poverty. An example is the East Ayrshire region where we estimate that 120GWh of electrical energy is constrained annually. This energy could potentially be used to benefit these communities.

The solution increases the security and resilience of the GB energy system due to the reduced reliance on imported fossil fuels. It would provide benefits through lower heating costs, protected from price increases on the global commodities market.

Risks And Issues

Identification and Assessment of Risks

The technical, political, commercial, managerial, and environmental risks and issues have been assessed, evaluated and recorded onto a risk matrix . The risk register has a scoring matrix to help evaluate each risk considering: Probability; Financial Impact; Programme Impact; and Overall Risk.

Early Identification of Risks

The regular meeting forum and email circulation provides effective update on key actions to address risks as well as monitor and drive progress across the partnership. Project constraints and deliverables are discussed at the project meetings to ensure that their significance on the work packages can be understood and actioned specifically if required.

Monitoring and Changes to Risk Assessment

The scoring will be adjusted on an ongoing basis to highlight any risks which may be of increasing concern or require further action as well as reduced if their potential likelihood or impact has become less significant. Regular project meetings are held with direct contribution from the project partnerships. Any further ongoing risks to project progress and delivery are identified, captured and recorded on to the risk register which is treated as a live document.

Related projects across the SIF portfolio, such as Flexible Heat, are also monitored by SPEN to ensure that any operational experience and relevant risks identified can be transferred over if appropriate.

Present Risk and Mitigation Summary

The technical risks identified have been evaluated for probability and impact with the mitigations built into WP2 and WP3. The breakdown of the tasks, deliverables and milestones have been considered with strategic intent to address these potential risks as well as reduce their probability and severity. The same approach has been adopted to address political, commercial, regulatory and environmental risks under WP4 and WP5. WP1 seeks to protect against the managerial risks in the same way. The risks and mitigations identified across the project have been detailed on the risk matrix. E.g.: Risk 7 provides a clear: Risk, Impact & Mitigation scenario where the premature selection of a single trial site could have a significant impact on cost and programme. This is being mitigated by exploring the viability of two sites initially.
Note: Risks 1-3 in the matrix, which were identified for the Discovery phase, have been greyed and struck-through to show that they're no longer relevant.

Intellectual Property

The project partnership has been structured in such a way, with adequate agreements sought, so that IP issues are expected to be minimal. Subcontractors' operational IP arrangements are covered under the partnership agreements and the liabilities can be initiated if required. This is expected to enable open and productive working with the use of the right sub-contract contribution to the project. There is also scope within the partnership to specify further IP arrangements between the relevant organisations as required.

Stakeholder Awareness

Stakeholder engagement is very important to the success of any project with the array of factors present in this Heat Balance project. This is because the stakeholders have a broad range of varying interests in the implementation of the project. To facilitate awareness, the work packages have areas of their scope which look to engage and assess the application of the project across the different stakeholders as a matter of course, as the project progresses.

The partnership has also begun a wider consultation with potential stakeholders and interested parties with an online community following a successful and well attended webinar. This presents the project with an opportunity to access international experience for a broad range of direct and indirect stakeholders as well as feed their input into the project.

Project Plans And Milestones

Project Plans And Milestones

Successful completion of Heat Balance Alpha Phase will provide a roadmap for the implementation of LTES in GB. This will be achieved through the deliverables from the work packages outlined below. The outcome will be validated by feedback from key stakeholders including BEIS and Scottish local authorities who can use the roadmap to support their Local Heat and Energy Efficiency Strategies (LHEES).

The resources to meet the technical challenges of this project will be provided by our project partners who will augment the skills already deployed successfully at Discovery phase:-

- Ramboll will utilise additional engineering expertise in design of heat networks and TES from their international resources.
- University of Glasgow are introducing expertise from the School of Interdisciplinary Studies to lead the socio-environmental activities.
- University of Edinburgh are adding resources from their School of Social and Political Science with expert knowledge on electricity system integration.
- Delta-EE have recently recruited a specialist in markets and regulation.
- SP Energy Networks will engage expertise in developing demand side flexibility markets from innovation project FUSION.

The required outputs will be delivered through four work packages, WP2 - WP4. WP1 is the project management work package. Further details of each work package timescale, deliverables, milestones, and dependencies are provided in the project plan and WP Templates in the appendix.

WP2: The development of LTES archetype solutions for GB, led by the University of Edinburgh.

- Key deliverable: Guidance and an evaluation matrix to assist stakeholders in planning LTES schemes

The key aim is to define the LTES archetypes relevant for expected future electricity and heating demand. A matrix will be developed for screening of the LTES potential at a given location, considering the site-specific variables.

WP3: Trial site development, led by Ramboll, supported by University of Edinburgh, University of Glasgow, and Delta EE.

- Key Deliverable: A strategy to de-risk future LTES schemes by implementing a demonstration project

This work package has four objectives:

- Define the technical requirements for the installation of a subsurface, LTES system linked to a heat network
- Estimate the demonstration costs
- Establish suitable regulatory and contractual structures to govern the interactions between the different stakeholders
- Define monitoring requirements to maximise the benefits of this project for the further rollout of the technology

WP4: The Socio-environmental feasibility of LTES in GB, led by University of Glasgow.

- Key deliverable: Identify potential socio-environmental barriers to the implementation of LTES in GB.

The key aim is to explain the mitigations that are necessary.

WP5: Commercial and Regulatory work package, led by SPEN, supported by Delta-EE and University of Edinburgh.

- Key Deliverable: Proposed commercial and regulatory mechanisms that recognize the value of LTES to the whole system and incentivise investment

The overall aim of the work package is to develop a road map for the GB-level roll of LTES and deliver a set of recommendations which will address the commercial and regulatory barriers to widescale deployment. The other partners will support this WP, bringing knowledge of the commercial and regulatory factors that impact their objectives.

We will adopt the same Project Management approach that has proved successful in delivering the Discovery phase project on time and budget. Delta EE will lead overall project management, including:

- Facilitate regular and effective project team meetings and disseminate information to the full project team.
- Identify the critical path and track the plan closely on a bi-weekly basis to ensure timely deliverables and appropriate allocation of resource.
- Identify/review key risks and ensure effective mitigation actions agreed
- Monitor and where required escalate issues

Our required payment Schedule by month:

M1 £56.3k

M2 £65.1k

M3 £69.5k

M4 £55.5k

M5 £118k

M6 £135.6k

Regulatory Barriers (Not scored)

Regulation of the heat available from land is undeveloped and so the use of heat is often judged on a case-by-case basis. In large metropolitan cities with wellestablished underground infrastructure such as London, Glasgow or Newcastle the local authority has been established as owner of land beneath the footprint of a property and any earth around it that is used for the purposes of heat. This often leads to an increase in local taxes or restrictions on capacity or permission to install. In less densely developed areas, the rules on ownership are ill defined, as is the extent at which an individual property is restricted or governed and so approval again relies heavily on the judgement of the local authority.

The idea and theory of heat ownership has recently been investigated and written about in a joint research paper by Newcastle and Aarhus University.

Given that Large Scale Thermal Energy Storage typically utilises water as the storage media, surface and shallow depth storage options above 25,000m3 are subject to the SEPA Reservoirs Act 2011. There were reports and considerations before 2020 that this volume is decrease to 11,000m3 which would significantly impact the regulatory and cost impact for small to mid-scale potential for Pit and tank Thermal Storage.

The Beta and Alpha phases of the project will focus on the identification of installation sites, the development of design and engagement with the property owners, land owners and local authority to set out heads of terms and any limitations on capacity that would be deemed on an existing site. We would aim to forge a head of terms that is fair and mutually beneficial for relevant parties and that can be transplanted between projects both on the existing property and within the local authority as a means of guiding safe and fair practice for future projects. The intention being that successful proving of the terms could potentially guide the development of wider legislation and regulation by continuing to interface and feedback any shortcomings or successes to BEIS.

Electricity Networks Regulation

We do not consider that there are any regulatory barriers to implementation of the Alpha or Beta phase projects.

In considering longer term deployment we are not aware of any specific regulatory barriers. LTES can be included in demand side management arrangements by the ESO and DSOs. However, we see potential challenges in making LTES commercially attractive to the service providers. LTES can provide benefits to multiple parts of the energy system. How can these benefits be stacked and monetised for the providers to justify investment? For example, flexibility contracts issued by DNOs at the moment are normally for a maximum of the 5-year duration of a price control period. This may not provide the certainty of income required by the party financing the LTES.

In the Alpha phase we will consider alternative funding models such as those that have resulted in the rapid expansion in renewable generation and make recommendations for any regulatory or policy changes required.

Business As Usual

The Heat Balance Discovery phase project has found that the demand flexibility available from LTES has significant benefits for the whole energy system including the electricity and heat sectors. LTES has not been developed to any great extent in GB and the necessary route to commercialisation is considered in Question 8. As part of this route, networks have an important role to play in facilitating LTES as a BaU solution.

Associated with networks, the most significant financial benefits are:-

- ESO -- reduction of transmission constraint payments to renewable generators.
- TOs -- reduction in transmission network reinforcement requirements for the electrification of heat
- DNOs -- reduction in distribution network reinforcement requirements for the electrification of heat.

As LTES schemes will be connected to the distribution network, the DSO is likely to be the most appropriate party to manage the flexibility, addressing the needs of the wider energy system while ensuring the continued safe, reliable, and efficient operation of the distribution network.

Ofgem have defined DSO roles, activities, and baseline expectations we must deliver in RIIO-ED2.

In common with other DNOs, SP Energy Networks has set out its DSO strategy as part of our RIIO-ED2 business plan. We have worked alongside industry, government, and our customers, through the Open Networks project and other routes, to progress this evolution in the GB energy system.

Our deliverables within RIIO-ED2 which will support flexibility services, including those from LTES include:-

- We will create a Decision-Making Framework for when distributed energy resources (DER) including LTES are instructed. The Framework will include rules for coordinating dispatch between us and the ESO.
- We will roll-out 22 constraint managed zones (CMZ) and a scalable flexibility platform.
- We are working closely with the ESO through the ENA to standardise processes and contracts across the industry to support the co-ordination of DER providing flexibility.
- We are leading the industry with several significant trials focused on facilitating flexibility trading, including data provision. This will continue throughout RIIOED2, with the intention to continue to test secondary trading arrangements. Our leadership has also included the development of Products within the ENA Open Networks project -- supporting the development of standardised approaches for flexibility.

These deliverables support our fundamental objective to support simple and costeffective participation in distribution flexibility markets.

Through Heat Balance and other innovation projects we will develop the DSO systems required to manage flexibility from heat, building on our existing systems.

Our evolving DSO function is responsible for overall delivery of the processes and systems required. The Innovation team have supported and will continue to support the development of the systems required. Examples of these include; our NAVI platform which is a full connectivity model with analytical capability; and our centralised ANM platform for managing distribution connected renewables. These developments are also supported by our Operational Technology (OT) and IT functions.

These required deliverables are funded through funding for DSO, IT, OT, and innovation within our business plan.

Timescales for delivery align with the RIIO-ED2 period from 2023 to 2028.

We will share learning with the ESO and other network operators through the ENA Open Networks project and other forums.

Commercials

Commercialisation

Discovery phase demonstrated that LTES can deliver commercial benefits to heat network developers/operators, as well as benefits to electricity networks. It brings benefits to the wider energy system and supports government plans to roll out heat networks as part of the strategy to decarbonise heat.

The Alpha phase will help de-risk and accelerate the provision of LTES in GB.

LTES is a demand-side solution requiring significant investment from commercial customers in behind-the-meter assets. Recent learning from the grid-scale battery energy storage sector shows the enablers needed to facilitate this. Customers and institutional investors need to understand the technology, its benefits and risks. They need confidence in the return that they will receive on their investment. HEAT BALANCE supports both of these enablers, implementing a roadmap through the SIF project phases and subsequently business as usual (BaU).

Technical

Our technical workstreams will build on the learning from Discovery phase to develop the GB knowledge base by: - ,

- Planning and specifying a Beta phase demonstration project to de-risk future schemes. Potential trial locations include Easter Bush Campus, and the Shawfair development, both in East Lothian.
- Publishing guidance to assist in the development of LTES projects. It will define a number of archetype solutions with an assessment matrix and schedule of relevant engineering considerations to help guide developers. It will include Socio-environmental factors that must be considered.
- This will be reinforced by a comprehensive dissemination programme among stakeholders.

Commercial

In the Discovery commercial workstream we found that LTES investment can provide an acceptable internal rate of return to the LTES developer whilst delivering net financial benefit to electricity consumers from transmission network benefits in Scotland alone of £444.7m by 2040. Our model requires that some of the gross benefits of LTES in reducing reinforcement and constraint payments are passed on to the LTES providers to make the schemes financially viable. In our model we represented this as a subsidy on the cost of constrained energy. The mechanism for releasing this value together with other benefits, associated with system balancing for example, will be further developed in Alpha phase. Network operators are already able to pay for demand side flexibility through Totex as an alternative to conventional reinforcement. However, in this case the network benefits arise in both the transmission and distribution networks including reduced constraint payments by the Electricity System Operator (ESO). We will develop a regulatory mechanism for payments from these different sources to LTES providers. As LTES will likely be connected to the distribution system, it may be appropriate for the distribution system operator (DSO) to make the overall payment and recover the relevant contribution from the other parties. The model developed can then be emulated and evaluated in a subsequent Beta phase in preparation for BaU adoption.

Building from our experience in developing flexibility markets in BaU and in our innovation project FUSION, we will develop the market by helping commercial customers and institutional investors to understand and have confidence in the technical solutions and the commercial/market arrangements.

Project partners Ramboll and Vattenfall are international leaders in the design and construction of heat networks and TES. Their in-depth understanding of the project solution will assist clients in BaU develop LTES solutions.

Intellectual Property Rights (Not scored)

All project partners will comply with Chapter 9 of the SIF Governance Document, with written agreement forming part of each partner collaboration agreement. The details of the background IPR and proposed foreground IPR will be defined and mutually agreed in the project collaboration agreement and NDA

Intellectual Property: relevant foreground IP of the project will be freely shared to provide stakeholders with information that they need to make informed decisions.

Costs and Value for Money

The Alpha phase eligible cost is £554,712 and funding required is £499,116. Each partner is making a 10% contribution as the project supports their strategic objectives. No subcontractor costs are envisaged.

To provide excellent value for money to customers we will:-

- Optimise the use of Post-Doctoral Research Assistants in the project plan as a value for money resource.
- Exploit synergies in the delivery of this project and the proposed Flexible Heat

project.

- Leverage existing knowledge from the industry-leading partners

Balance of costs and SIF funding across the project partners

Costs and funding are relatively evenly balanced across the four main delivery partners. Each of these partners is leading a work package.

University of Edinburgh will lead the WP on archetype LTES solutions that will deliver an evaluation matrix to assist in planning LTES schemes. This WP will receive significant support from both University of Glasgow in respect of subsurface considerations, and Ramboll in respect of engineering considerations.

Ramboll, who have provided consulting services to more than 200 district heating systems worldwide, are leading the trial site development WP. University of Edinburgh will provide comprehensive support. Two potential projects have been identified, during Discovery which are the University of Edinburgh Easter Bush campus and the Shawfair development.

University of Glasgow will lead the socio-environmental feasibility study, introducing expertise from the School of Interdisciplinary Studies. The University can call on European expertise through membership of the European Geothermal Energy Council (EGEC), whose members participated in a successful Heat Balance webinar in Discovery phase.

SP Energy Networks will lead the commercial and regulatory work package. Specialist resource will be deployed from Delta-EE, including a Regulation & Markets specialist, and University of Edinburgh, who are adding expertise from their School of Social and Political Science, bringing their learning from leading the INTEGRATE WP on Whole System Modelling and Policy, Markets & Regulation.

Delta-EE are leading the project management WP and making significant contributions to other work packages above.

Our two heating solution partners, Vattenfall and Erda Energy, will use their extensive experience in delivering innovative heating solutions to contribute to all work packages. This will validate and enhance the deliverables.

Wales & West Utilities are no longer partners in Alpha phase. Discovery phase has focussed the solution on electricity networks.

The day rates for all partners are competitive with normal industry/academic rates.

This project provides a very high value proposition over BaU as it uniquely provides an opportunity for the partner organisations to collaborate, taking cognisance of the whole energy system with prioritisation of decarbonisation. As well as the extensive environmental and efficiency benefits, it offers greater value in the longer term by enabling significantly better utilisation of existing assets, reducing costs to the sector and ultimately consumers.

The Heat Balance Alpha project will assess the value of LTES to electricity and heat networks, with respect to a specific pilot example, as well as to wider archetype solutions. We will develop a methodology to optimise value and potential, simplifying and enabling the required investment in LTES.

HEAT BALANCE is complementary-to and provides additional value over our existing activity.

SPEN are developing smarter, more flexible network solutions to help mitigate the need for traditional reinforcement and reduce costs for our customers. These include tendering for flexibility services, and project FUSION, trialling commoditised local demand-side flexibility through a structured and competitive market.

Heat Balance will build on these activities, realising the capability of decarbonised heat networks incorporating LTES to become a major provider of flexibility. It will reduce the need for conventional network reinforcement, reducing costs for electricity customers.

Supporting Documents

Documents Uploaded Where Applicable

Yes

Documents:

SIF Alpha Heat Balance Business Case.pdf

SIF Alpha Heat Balance Skills and Expertise Appendix.pdf

SIF Alpha Project Registration 2022-12-06 4_19

Heat Balance Show and Tell - Alpha - Pres Sent 17-02-23.pptx

SIF Alpha Project Registration 2024-02-20 11_12

This project has been approved by a senior member of staff

☑ Yes