

SIF Project Registration

Date of Submission

Jul 2023

Project Reference Number

10059404

Project Registration

Project Title

TEED (Tyseley Environmental Enterprise District)

Project Reference Number

10059404

Project Licensee(s)

National Grid Electricity Distribution

Project Start

April 2023

Project Duration

3 Months

Nominated Project Contact(s)

Laurence Hunter

Project Budget

£404,629.00

Project Summary

This project will explore how to deliver a mixed vector energy system with integrated energy storage across the TEED. It will use a Digital Twin to create plans that will decarbonise energy around Tyseley, provide local resilience and create replicable answers for similar communities across GB. It will also explore how to integrate the transition in transport systems (rail, trucks, lighter vehicles, city council fleets and logistics) can be integrated into the energy system.

This application fits with the following round-two Innovation Challenge (also several others):

- **Accelerating decarbonisation of major energy demands:** The decarbonisation of heating requires the integration of existing waste heat sources into the energy system in an optimal configuration. TEED currently has 2, but in the future 3, large scale generators of waste heat. At present, the simplest solution is to connect these sources into the city centre district heating system. However, this bypasses local residents and businesses. Exploring how to integrate a heat network into the development of the green energy system of the TEED will reduce energy losses through local exploitation of the heat. The project will also explore how a hydrogen grid can be integrated with a smart electricity and heat grid to produce an overarching energy system across an urban environment.

The innovation is to develop a local smart energy system with electricity, hydrogen, heat with energy storage which feeds a mixed community of business, industry and domestic consumers to accelerate a low carbon energy transition for local consumers, with good resilience and lower energy costs.

Experience: The project is led by NGED with experience of the management of the local grid, Tyseley Energy Park who have developed the 10 MW biomass plant and the 3 MW hydrogen electrolyser, Birmingham City Council who have oversight of the net zero transition of Birmingham and experience of developing the Birmingham District Energy Company and district heating, cooling and power system, University of Birmingham who have led innovation in energy systems including energy storage the digital twin of the TEED and the companies EQUANS, Pinnacle Power and SSE all who have considerable experience of developing energy systems at national and city scale.

End users and match to need: The end users are communities of fuel poor households and 250 local businesses. These both have

challenges around the decarbonization of energy, energy resilience and cost. This project will examine how local energy assets can support these communities.

Third Party Collaborators

Tyseley Energy Park

Birmingham City Council

University of Birmingham

Equans Services Limited

Pinnacle Power

Problem Being Solved

This project is an investigation of how a complex, multi-vector energy system with significant local generation and storage can be developed to be optimally resilient and deliver best value to a mixed local community of industry and domestic consumers, alongside ongoing regeneration of the area.

Project Approaches And Desired Outcomes

The Big Idea

Tyseley lies in East Birmingham and is an area of historic under investment and high levels of fuel poverty. Birmingham City Council identified East Birmingham as a development priority area through the East Birmingham Inclusive Growth Strategy. Tyseley Environmental Enterprise District, TEED, is an area that has a local development order which has allowed the build-up of 250 businesses mixed in with ~8,000 residents. Within TEED, the Tyseley Energy from Waste (EfW) plant and Tyseley Energy Park (TEP) have a combined output of 35 MW. The EfW plant is owned by Birmingham City Council, operated by Veolia, and consumes 350,000 tonnes of municipal waste per year. The plant produces 25 MW of electricity. TEP is a 10 MW biomass plant that processes, via gasification, wood waste. In addition, TEP possesses a 3MW electrolyser which produces 1 tonne/day of hydrogen and a hydrogen refuelling station capable of refuelling 50 hydrogen buses. At present, 20 buses refuel at the station.

Beyond the current infrastructure, there is planning permission for a further 25 MW EfW plant within the TEED and discussions about scaling up hydrogen production. These generation assets presently only deliver electricity. Generated heat is not utilised and the opportunities for this are significant. The waste heat could either be exploited locally where a demand in excess of 10 MW has been identified, and/or be connected to the Birmingham District Heat network which serves the city centre. There are obvious benefits to minimising the electrical grid infrastructure costs through exploiting the heat. Recently, Birmingham City Council have commissioned the development of a Master Plan for the TEED in which sets out a vision for a Green Innovation Quarter.

This SIF project will examine how to manage the development of the local multi-vector energy-infrastructure across the TEED most optimally. It recognises the opportunity for integrating electricity, heat, and hydrogen, and enables us to understand how these can overcome the challenges of the existing grid infrastructure. We will have the opportunity to learn: how to deliver greater value to the communities that host energy generation assets, how to integrate the city council's plan for the decarbonisation of fleet and transport, and develop a future waste strategy. In summary, it will examine the best way to balance and optimise investment between energy vectors, between local and national generation, and investigate the role of energy storage in a local energy system.

Innovation Justification

The problem addressed is the development of a local energy system in areas of high grid constraint, largescale energy generation and a mixed community of consumers. The project will consider 8,000 residents, 250 businesses and integrate current and future waste processing plans of BCC and a low carbon transport hub including the council fleets. A key focus will be ensuring that local energy assets deliver benefits to the local citizens.

The novelty of this project lies in the existence in an urban environment of up to 60 MW of electrical generation, >100 MW of thermal generation and the UK's leading production of green hydrogen via an offshore wind PPA. This collection of assets embedded in the TEED and with an established energy park provides a unique opportunity to develop an energy infrastructure, linked to the city district heat system, which becomes an exemplar for what is possible nationally. The nature of TEED makes it well matched to being able to explore not only opportunities to develop a local smart heat/power/hydrogen grid but to explore new business models and regulatory approaches. A Digital Twin approach will be integrated into the development to provide scenario planning.

Outputs/Knowledge:

- Demand for heat, electricity and hydrogen in the TEED area over the next two decades.
- Electricity grid and its constraints and most effective upgrades
- Heat grids across the TEED, with a link to the BDEC scheme
- Potential for short and medium term energy storage for demand management and grid balancing
- Impact of the City waste and transport strategy on energy requirements
- Potential for a low-temperature network recovering heat from bio and/or hydrogen electrolyser and integration of large-scale thermal storage
- Potential for a high-temperature heat network with heat from EfW
- Scope for technology integration alongside EV charging to manage demand side and integration of micro-mobility
- Hydrogen-grid for industrial and rail decarbonisation
- An understanding of regulatory, planning and system constraints

Economics and sustainability: This project brings together partners working with the City Net Zero team to develop the plans for the city, including the area of East Birmingham. The programme will create new jobs and training opportunities for a deprived region.

There are no other sources of funding which can support this development given the work cuts across energy vectors and is not yet at a commercial stage. A solution will unlock commercial investment into the Green Innovation Quarter - prioritized by the City for redevelopment.

Project Plans And Milestones

Project Plan And Milestones

The project is led by NGED with partners NGESO, Tyseley Energy Park, Birmingham City Council, University of Birmingham, EQUANS, SSE, Pinnacle Power.

The project is broken down into 5 work pages. WP1 is overall project management and WP2 to WP5 build from a baseline assessment of the TEED, through an options appraisal process, case study development through to a final report which sets out a Green Book based preferred options analysis and the cost benefit ratio. Work package 2-4 will produce reports which are aggregated into a final report, WP5. See appended spreadsheet for project deliverables and milestones.

Work package structure:

WP1: Project Management [£10k], led by NGED

- Responsibility for milestones, project reporting, budget and governance

WP2: Compilation of TEED Data and Establishing Baseline [£20k], led by UoB with NGED

- Compilation of existing available data on heat and electrical demand, establishing baseline CO2 emissions.
- Examination of the performance of existing energy generation assets and understanding the grid structure, bottlenecks and constraints.
- The geographic area of interest will primarily be the TEED area, but neighbouring areas will be considered due to their impacts on networks within the TEED area.
- Report produced.

WP3: Options Analysis [£20k], led by NGED with BCC and UoB

- Building on WP2
- Appraisal of a range of options for development of heat, hydrogen electricity, storage
- Appraisal of demand need of TEED in terms of electrification of transport and heating and power
- Consideration of future waste and circular economy strategy
- Based on workshop process
- Report produced with 2-3 options identified

WP4: Development of Designs/Options [£75k], 2-3 Designs developed by EQUANS, SSE, Pinnacle

- Builds on WP3
- Each option developed in WP3 is subject to a design analysis led by company examining feasibility and high level costs
- Each option would build options i) do nothing, ii) net zero compliant, iii) do maximum

WP5: Business Case Development [£25k], led by NGED, with UoB

- Builds on WP4
- Options assembled into final report and business case
- Uses Green Book principles

Risks:

The risks are set out on the risk register of the Project Management Book Template. The main risks are associated with the short time scales for delivering the programme of work, managing the number of partner organisations with competing priorities and the need to manage IP. These risks will be controlled through tight project management and hence a separate work-package, WP1 and a consortium agreement which sets out the expectations from partners.

Route To Market

The present project is to build an understanding of the market opportunities to inform investment associated with the development of the TEED area.

Birmingham City Council have worked closely with Tyseley Energy Park and the University of Birmingham to establish the concept of the TEED as the Green Innovation Quarter for Birmingham. This recognises the significant infrastructure in this area and the opportunities to build this out to support the creation of a low carbon energy system across TEED. The masterplan, which underpins the concept of the Green Innovation Zone, is being used to support the discussions as to the development of the right governance structure for the development of TEED and parallel discussions are being had with developer and investor groups. Birmingham City Council has land assets across the TEED which can be used as the first steps in supporting the development of the energy infrastructure. The present piece of work will be a key ingredient in informing the development plans for TEED and will be integrated into the governance discussions.

As noted, the aim of this SIF application is to further develop the understanding of the right investments in infrastructure for TEED. This will inform the investment plan for the development of TEED and will shape the procurement plans of the City Council and accelerate the TEED journey to market. The companies involved in this SIF application, and those more widely engaged, will then have clarity on an agreed plan and where elements of the plan are commercial in nature, and where there may be need for public investment to support. The plan will also help ensure that more lucrative parts of the development are not cherry picked and that a balanced approach is taken.

The aim of the present proposal is to co-create a solution, or set of solutions, with the companies that have the expertise to deliver. It is this expertise and the involvement of the City Council which will de-risk market investment. This de-risking will ensure that both public and private sectors can invest in solutions for consumers across GB. It is imperative the consortia feels that we prove solutions that can be made to work in the widest possible context.

Costs

Total Project Costs

404629

SIF Funding

145216

This project has been approved by a senior member of staff

Yes