SIF Round 3 Project Registration

Date of Submission

Mar 2024

Project Reference Number

10102277

Initial Project Details

Project Title

Road to Power

Project Contact

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Challenge Area

Whole system network planning and utilisation to facilitate faster and cheaper network transformation and asset rollout

Strategy Theme

Optimised assets and practices

Lead Sector

Electricity Distribution

Project Start Date

01/03/2024

Project Duration (Months)

3

Lead Funding Licensee

NGED - National Grid Electricity Distribution

Funding Licensee(s)

NGED - National Grid Electricity Distribution

Funding Mechanism

SIF Discovery - Round 3

Collaborating Networks

National Grid Electricity Distribution

Technology Areas

Demand Side Management

Electric Vehicles

Project Summary

The street and road works sector faces a pivotal transition to net zero by 2030, decarbonising 7.8TWh of energy demand across 700,000 major works, annually. The challenges presented by this transition are uncertain and unique; the energy demands are high, temporary, non-static and have inflexible charging times.

Road to Power will forecast future consumption and consider the infrastructural needs for this transformation. In Discovery, it will specify tools to facilitate obtaining temporary grid connections and predicting the infrastructural impact of works. Additionally, it will investigate alternative methods for providing temporary grid connections.

Add Third Party Collaborator(s)

EA Technology

Highways Authority and Utilities Committee UK

Project Budget

£157,127.00

SIF Funding

£141,229.00

Project Approaches and Desired Outcomes

Problem statement

In an era of rapid transition, the street and road works sector faces a pivotal shift towards net zero, amidst significant uncertainty and a massive energy demand of 7.8TWh across 700,000 major works annually. This transformation, exemplified by National Highways' ambitious 2030 target, is fast-paced whilst simultaneously unpredictable in terms of future fuel technologies. The potential mix of battery electric, hydrogen powered, biofuels, or other yet-to-emerge technologies poses a considerable challenge, especially in its impact on energy networks.

Our project tackles these uncertainties head-on, aligning with the Innovation Challenge of Facilitating faster and cheaper network transformation through whole-system network planning. We aim to comprehensively assess and forecast the sector's energy demands, exploring various technological scenarios and their implications on network infrastructure.

The initiative's key focus is the development of tools to navigate this uncharted territory. These tools will facilitate obtaining temporary grid connections and predicting the infrastructural impact of works. Additionally, we are committed to investigating alternative methods for providing temporary grid connections, drawing on insights from projects like Take Charge. This proactive approach is vital for informed strategic planning, ensuring cost-effective decisions are made to deliver the telecoms, water, energy and road networks consumers need for a decarbonised future.

Video Description

https://www.youtube.com/watch?v:yD4yNsAhMMs

Innovation justification

While extensive planning has been carried out by utility and highway authorities to achieve the transition to net zero, little attention has been paid to repercussions on electricity networks. The future power source of plant machinery remains uncertain—whether it be hydrogen or electricity is yet to be determined, and may be dependent on use case and availability of ‘green hydrogen’. Ambitious decarbonisation goals set by corporations, regulators, and governments, risk creating considerable pressure on the electricity grid due to increased demands from the sector.

This uncertainty is well-suited for the Discovery phase of the Strategic Innovation Fund (SIF). Although various potential solutions exist, pinpointing the most effective one is challenging without a comprehensive understanding of the problems and obstacles that the sector presents.

This project aims to augment ongoing research in the sector, particularly studies exploring the emissions from street and road works and their routes to achieving net zero (as part of the Road to Net Zero project). This work will focus specifically on the challenges posed to the energy networks.

The innovative aspect of this project lies in its endeavour to understand and quantify the yet-unknown scale of the issue, identify potential pathways that the sector could follow, (including least, or no-regret investment opportunities) and develop tools to assist end-users and the network when the transition to large-scale electrified projects commences. Having processes in place at the start will make this evolution more efficient.

Existing self-service connection tools (e.g. Connect tools developed by EA Technology for various DNOs) could be expanded on in an Alpha or Beta phase to understand the impact on the network of the upcoming technology shift, or to enable assessment of temporary grid connections for the street and road works sector. This proposal (Discovery phase) is to specify the proposed tool rather than develop it. As such, its TRL is 3, however as it will likely be built as an extension of existing tools, development time will be reduced compared to a completely unique development.

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

Financial - cost savings per annum for users of network services

Environmental - carbon reduction – indirect CO2 savings per annum

New to market – processes

New to market - services

Impacts and benefits description

Financial - future reductions in the cost of operating the network

1. Forecasting Load – This allows network operators to efficiently allocate resources and manage required reinforcement, avoiding costly emergency implementations. Large planned temporary connections could bring forward future investment
2. Reduced Reinforcement – A detailed understanding of when and where temporary connections will be required allows network operators to schedule connections utilizing existing capacity.
3. Easier Temporary Connections – A tool to allow the streamlining of temporary connections can significantly reduce time required from specialised expertise and cost associated for network connections.
4. Network Decarbonisation – Expediting electrification reduces the carbon footprint of street works. This is especially important as the volume of works by network operators is likely to increase as more LCTs are added.

Financial - cost savings per annum for users of network services

1. Reduced Reinforcement: Improved understanding network capacity reduces need for ad-hoc reinforcements.
2. Easier Temporary Connections: Quicker network planning processes (in particular budget estimates and quoting) decreases the time and cost of temporary connections for street and road works. This may benefit other users of temporary grid connections i.e. building construction.
3. Flexible Scheduling and Optioneering: Users can make informed choices based on network loading and capacity versus cost to connect.

- Informed choice of temporary connections/energy storage/hybrid solutions.
- Optimal location of charging facilities to minimise costs.
- Scheduling energy-intensive operations to off-peak hours or reduced demand seasons to reduce costs.

4. Reduced Machinery Ownership Cost: Electrified plant machinery should have a lower total cost of ownership.

5. Reduced Reliance on Portable Storage/Batteries: Improved network planning and visibility of capacity will reduce the need for expensive storage solutions or on-site hydrogen storage.

Financial - cost savings per annum on energy bills for consumers

This project streamlines the electrification of machinery and supports improved planning and capacity utilization, minimizing network reinforcement, reducing socialised costs and contributing to lower energy bills for customers.

Environmental - carbon reduction – indirect CO2 savings per annum

Between 10-40 MTCO2e is estimated to be produced by the sector annually, accounting for up to 10% of the UK's emissions. A significant portion originates from vehicles and machinery. This project aims to expedite the electrification transition contributing significantly to carbon savings.

New to market – processes & services

The project could bring forward processes for scheduling and optioneering works and provide a self-service tool for managing temporary connections for major infrastructure works.

Teams and resources

National Grid Electricity Distribution

NGED will be providing expertise to the project from two different perspectives. Oli Spink is the Project Sponsor who manages the process to create long term predictions of electricity requirements using the Distribution Future Energy Scenarios. He will provide advice on how our existing planning systems operate so that the output of the analysis is in a format that can be used for

longer term planning.

Sam Brothwell, NGED's street works policy manager, understands the systems to plan and manage street works and the information available to predict upcoming temporary supply requirements.

Gary Lambert has experience from the field and has an understanding of the issues around providing temporary supplies.

EA Technology

EA Technology will be responsible for the overall project management.

EA Technology has substantial experience developing software tools specifically designed to assess network capacity, notably Connect/LV and ConnectLite for
NGED. This expertise is supplemented by our work on various scenario analysis projects (such as SILVERSMITH), which has provided a comprehensive understanding of the unique challenges that NGED's and other DNO's face.

EA Technology are a pivotal partner in the 'Road to Net Zero' project. This has provided an in-depth understanding of the complexities of the street and road works sector and provided a clear picture of the nature, scale, and emerging trends in the sector's operations. It has also enabled us to establish a broad network of stakeholder relationships. These relationships encompass all four major utilities (water, gas, electricity, and telecoms), highway authorities, contractors, and other organisations of note such as 'Highways Authority and Utilities Committee UK', the Greater London Authority, Transport for London, and the Scottish Road Works Commission.

The combination of these two areas of expertise—grid management and street and road works---positions EA Technology uniquely to address the projects challenges; not just having the right tools or the right contacts but also having a holistic understanding that can be translated into actionable solutions.

Highways Authority and Utilities Committee UK

To ensure that our approach addresses the sector's requirements, we have enlisted the support of a key industry expert. David Capon, Co-Chair of HAUC(UK), will bring his extensive knowledge and experience to help guide the project and validate that the solutions developed ensuring they address the sector's requirements. Additionally, we will utilise the extensive network of stakeholder contacts established during the Road to Net Zero project via stakeholder engagement throughout the project's duration.

Project Plans and Milestones

Project management and delivery

EA Technology will manage project delivery, appointing an experienced project manager with substantial expertise in Agile methodology. This ensures the project aligns with the bid proposal, leveraging Agile practices for flexibility and efficiency. Regular online meetings via Microsoft Teams among project partners and sponsors will guarantee relevance and alignment with set objectives.

The work packages are intricately connected. The initial two packages, focusing on problem definition, seamlessly lead into the third package centred on solution definition. A consistent project team across these packages ensures aligned outputs and cohesive progress.

Our project risk management strategy encompasses a comprehensive RAID log, maintained and regularly updated. Accessible to all project partners, this log facilitates transparent communication, with critical and emerging risks reviewed the project delivery board. Active risk management strategies will be employed to pre-emptively address or mitigate potential issues.

The project comprises four main work packages:

Modelling future demand:

Projection of the likely demand based on various technology adoption scenarios (EV vs Hydrogen vs combustion), planned major works, and currently available datasets. Comparisons will be made with existing projections, such as the Distribution Future Energy Scenarios (DFES) and the 6th Carbon Budget.

Problem assessment:

Investigating unique sector challenges to the grid, this package explores issues like inflexible charging times and varied, non-static charging locations. The impact on the current temporary grid connection process will be assessed. An interim report detailing initial findings will be produced at the end of the first month.

Solution definition:

Focused on developing specifications and business cases for software tools to address grid challenges, this package will involve multiple stakeholder workshops and in-depth sessions with in-house developers. Solutions will be presented to stakeholders to ensure alignment with end-user requirements.

A separate investigation into the existing approaches for providing temporary connections will be performed and an investigation into opportunities that may be adopted to increase supply capacity. This will explore whether some of the solutions developed to support rapid growth in EV charging sites such as package substations could be utilised as a solution. Previous innovation projects such as Take Charge will be reviewed and a gap analysis performed to determine barriers to them being applicable for temporary road works connections.

Alpha phase preparation:

The preparation of the proposal for the next phase of the project. This can be refined with feedback from the show and tell at the end of the project.

Key outputs and dissemination

Understanding of Future Network Loads: A comprehensive analysis will forecast temporary street works loads added to the network over the upcoming years. NGEDs region will be used as a case study but this could be applied to any DNO. A detailed review of the existing temporary connections process will also be undertaken to understand if it is suitable for this use-case.

Problem Assessment: Two areas will be explored . First, analysis of the charging and usage profiles for machinery used in street and road works, identifying potential issues. Second, understand the geographic problems unique to this sector, including varying non-static locations where network access may be limited or challenging.

Technological Solutions: The project will identify feasible technological solutions that can be developed in Alpha and Beta phases. This could include a tool for enabling temporary grid connections specific to works and a tool designed for scheduling and optioneering based on network conditions. The scheduling may be based on seasonal or daily loading based on the forecasted loads. The optioneering element could be used to decide where along the works charging station(s) are located, assess the need for local storage vs a temporary connection, or identifying whether any flexibility services/peer to peer agreements could be made with local businesses.

Dissemination Plan: To ensure that the deliverables fulfil the requirements of the sector, stakeholder engagement will be utilised throughout all phases of the project. The project team will organise two stakeholder workshops during the project Discovery phase. These will be convened online to maximise attendance and will include key players from the street workers sector, known to the project team via the 'Road to Net Zero' project . The first workshop will be used to test, verify and receive feedback on the phase 1 'Understanding of Future Network Loads'. The second workshop will be used to receive feedback on the inputs and outputs specified in the 'Technological Solutions' phase.

The project will have two major milestones.

- After month 1: Understanding the problem: Modelling of potential future loads as well as a detailed review of the problems that will arise
- After month 2: Understanding the solution: Detailed specification of the potential tool(s) which will be required help the sector.

Competitive Markets: EA technology are not the only provider of self-service tools so this project will not undermine the development of competitive markets.

Commercials

Intellectual Property Rights (IPR) (not scored)

At this stage, all Project Partners are happy to comply with the default IPR requirements of the SIF Governance Document.

Should the Discovery phase identify value from the further development of a software tool it would be designed such that it could offer value to any DNO. As a result, the IP would be embedded within a Commercial Product and made available for sale. As such it will be Foreground IP and not Relevant Foreground IP as per the SIF governance with the specific commercial terms being agreed during the Alpha / Beta submission process.

Value for money

The total cost associated with the delivery of the project is £157,127 with partners making contribution as follows:

EA Technology: £13,872

NGED: £2,026

This total SIF funding requested is therefore £141,229.

HAUC(UK) will actively participate as a key stakeholder, committing to attend stakeholder sessions. This involvement represents a significant in-kind contribution to the project, underscoring their integral role even though they are not formally listed as project partners.

Value for money for the consumer

This project offers cost-effective solutions to an inevitable problem. Whilst the tools will certainly provide end user cost savings, the unknown impact that this transition will have on the network will need to be understood. Leveraging the knowledge and connections from the Road to Net Zero project will streamline the task, reducing the workload compared to an alternative approach. All customers are also affected by street and road works in some way so improving this process will provide benefits.

Commercialisation of the proposed innovation and how the project can be moved into business as usual

If at the end of the Discovery phase, the business case for the suggested tools or processes highlight their benefit, the tools could be developed further through proto-type and deployment phases. The exact process for this will depend on the findings from the Discovery phase but would integrate into existing self-service toolsets in development by NGED. The challenges highlighted by this project are expected to be replicated across GB and therefore offering an approach or process to all DNOs and of course applicability in other countries.

Additional Funding

This project builds upon learning from a previous project being delivered by EA Technology investigating the challenges and opportunities associated with decarbonising the street and road works sector. Several of the Project Partners are involved in the delivery of that project and will therefore bring expertise and knowledge along with strong relationships with street and road works stakeholders to this project. This ensures that the stakeholder engagement and datasets required can be obtained efficiently to maximise project value.

No additional funding will be required from other innovation funds.

Supporting documents

File Upload

EA25920 - TR03 V1.0 - Road to Power - Substation and Supply Issues.pdf - 1.3 MB
EA25920 - TR02 V1.0 - Road to Power - Solution Definition.pdf - 956.0 KB
EA25920 - TR01 V1.1 - Road to Power - Problem Definition.pdf - 1.9 MB
EA25920 - Road to Power - End of Phase Meeting Discovery.pdf - 1.2 MB
EA25920 - Road to Power - Show and Tell.pptx - 8.7 MB
SIF Round 3 Project Registration 2024-03-26 8_04 - 60.9 KB

Documents uploaded where applicable?

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