SIF Round 4 Project Registration

Date of Submission

May 2025

Project Reference Number

NGET/DELLTA/FND/Rd4_Discovery/10145555

Initial Project Details

Project Title

DEsign for Live Line Technology Acceleration (DELLTA)

Project Contact

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Challenge Area

Faster network development

Strategy Theme

Net zero and the energy system transition

Lead Sector

Electricity Transmission

Other Related Sectors

Electricity Distribution

Electricity Transmission

Project Start Date

01/02/2025

Project Duration (Months)

3

Lead Funding Licensee

NGET - National Grid Electricity Transmission

Funding Mechanism

SIF Discovery - Round 4

Collaborating Networks

National Grid Electricity Transmission

Technology Areas

Active Network Management

Health and Safety

Maintenance & Inspections

Overhead Lines

Electricity Transmission Networks

Environmental

Substations

Project Summary

Electrical grid owners regularly perform complex repairs and maintenance tasks to make sure the network is reliable. However, many of the complex operations require outages, and this can put a pressure on the rest of the electrical networkand its future development. Live Line working can relieve this pressure, however electrical infrastructure is currently not built with Live Line working in mind, thus making it hard to deploy this service in most locations. Project DELLTA will look to understand if HV assets and infrastructure can be designed with Live Line workingas a key parameter from the outset.

Add Third Party Collaborator(s)

The University of Manchester

Frazer-Nash Consultancy

Project Budget

£119,766.00

SIF Funding

£107,787.00

Project Approaches and Desired Outcomes

Animal testing

- ○ Yes
- ◉ No

Problem statement

The electrical transmission network consists of several thousands of kilometres of cable and overhead line, along with thousands of high voltage substation assets. While the power transfer through these assets has historically been predictable, the transition to Net Zero will mean assets see higher average loadings. The increase in demand will make it difficult to access assets and critical electrical infrastructure for regular maintenance. Live Line working provides a means to access overhead line / substation assets without removing them from the system, without the need for an outage. This increases the efficiency of the network maintenance process due to the agile nature of being able to deploy this service.
Electrical infrastructure design rules and HV assets are inherently not designed for Live Line working or practices. For example, a high voltage lattice pylon does not provide tools that allow for easy access for any sort of Live Line maintenance or asset replacement when energised. Similarly, substations are built around standard clearances and footprint restrictions, rather than designed to ease access for live replacement of assets.
Project DELLTA will investigate whether design rules could be altered to allow Live Line working (especially when in combination with robotics), and through this it addresses "Innovation Challenge 1: Faster network development", by facilitating faster connection, upgrades, maintenance and replacement of assets. It will look to add Live Line as a critical parameter into infrastructure design, allowing for a strategic rethink of how we build key assets. It will look to understand if critical bottlenecks (corridors of power transmission where it is difficult to get an outage) can be designed to enable Live Line working, by developing unique designs and tooling. In cases where design changes are limited in scope (because of technical or planning constraints), the project will look towards innovative technologies, such as robotics to perform more complex asset maintenance replacement operations. Such techniques may not require the same high level of clearance that a human worker would.
The basis of the project is to identify innovative tools and designs to avoid downtime required for maintenance, thus providing cost savings and reliability to the UK billpayer. As such the tools and designs changes being considered within this project, will be applicable to all HV network operators (especially above 132kV).

Video Description

https://youtu.be/rMlUSdhY6HI

Innovation justification

Project DELLTA primarily addresses "Innovation Challenge 1: Faster network development", by facilitating faster connection, upgrades, maintenance and replacement of assets.
The project is of particular relevance to TOs within GB, and could offer benefits to GB electricity consumers, and is therefore within the remit of SIF funding.
The project seeks to develop novel designs and tooling approaches to facilitate live working. This may involve fundamental changes to legacy asset and infrastructure designs. For example, rethinking how substation designs can be changed to enable Live Line working, rather than retrospectively fitting live line work around legacy designs that inherently inhibit live line work. We will consider solutions with various technology and integration readiness levels, and would also seek to leverage innovations from other sectors, such as the use of robotics innuclear environments, to consider more live line and robotic inclusive designs.
The project is not designed to develop live line processes and policy (which is BaU for work involving human staff as opposed to autonomous systems, at present the justification process limits where live line working can be utilised). Instead, it is to rethink how we design the electrical infrastructure to enable Live Line working with better efficiency. This distinguishes it from BaU activities. There are currently no requirements to include Live Line Working within asset or system design. Whilst there are policies and working procedures for Live Line working itself, this does drive design of the assets that need to be maintained. Some projects that have focused on line compaction have actually resulted inincreased challenges in respect of live line work. This is where this project will differ from previous projects within the Live Line Work (which have been towards the policies and processes).
While there are already established standards for ensuring the safety of human workers, DELLTA will explore whether the design

of HV assets (for example, towers) could be adapted to better accommodate live line work, improving efficiency without compromising safety. It will also identify opportunities for new internal standards / technical specifications for activities that may be executed autonomously, and understanding the associated risk with such an approach (risk of causing an unplanned outage resulting in the need to grid balancing on thelocal system).

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

New to market – products

New to market - services

Impacts and benefits description

HV assets and infrastructure are not currently built to easily enable live line work, therefore Live line work is limited on GB transmission networks, and most maintenance is done via planned outages.
Network outages can lead to an increase in constraint costs. In 2018, NGET reported that from that around annual 8,000 planned outages, approximately 15% caused network constraints with an annual cost of £220m. Since then, the average cost of relieving constraints has risen from around £109/MWh to £215/MWh across 2023, implying that equivalent outage related constraint costs today would be in the order of £434m. As network utilisation increases, it is likely the volume of constraints and associated cost will also increase. Live line working could reduce constraint costs and offer significant value to the customer.
More broadly, outages are difficult to schedule and in some cases maintenance projects can see late postponements due to network availability. This can leave assets more vulnerable, increasing risks of failure and unplanned outages, and can reduce operational life.

Potential benefits
The aim of this project is to consider live line maintenance at the design and planning stage to enable safe and efficient live line working. This could offer various benefits including:
Targeted design changes to critical transmission corridors, purposefully built for live line access and maintenance, increasing system resilience
Faster and more efficient connection and maintenance.
Reducing network outages -- with associated network constraint cost reduction.
Better and more flexible network maintenance planning -- with subsequentbenefits for asset health, lifespan and reliability, with fewer post ponements of scheduled maintenance
Improve safety for critical live line maintenance activities.

We will develop a methodology for calculating benefits in Discovery. It will be developed with reference to Ofgem's SIF CBA Template. Project specific benefitswill include:

Financial - future reductions in the cost of operating the network
Reduced system operability costs -- relative to a counterfactual where network outages cause constraints and incur balancing costs.
Reduced maintenance costs through more efficient work planning and delivery, and reduced postponements.
Reduction in curtailment of low carbon generation.
New to market -- products and services

The project aims to identify new designs and tooling options which could be developed and employed on future networks. For the Discovery Phase, we anticipate being able to report financial benefits on a ROM basis, with a moregranular estimation of overall benefits and costs expected in later phases.

Teams and resources

NGET have chosen project partners with the required range of skills and experience, including:

NGET -- Transmission Owner (TO) and Network Licensee, NGET will lead the project. As HV transmission system asset owners, NGET are responsible for the whole lifecycle of assets that this project will consider and are therefore ideally placed to advise on the assets, maintenance activities, and novel design options that this project will consider. NGET will provide access to their expertise, asset data, and advice on overall strategic project direction. Within NGET, Christopher Land is a key technical sponsor of the project. Christopher is a specialist access and technology engineer in NGET's operations team. He is responsible for developing NGET's live line working strategy, including tool and process development.
University of Manchester (UoM) -- Experts in the design and maintenance of high voltage transmission systems, assets and components. UoM will lead the technical feasibility aspects of the project, including reviewing international best practice, safety requirements, identifying live line assets and activities, and novel design and tooling options.
Frazer-Nash Consultancy (FNC) -- Experienced SIF project managers, and experts in applied systems engineering, technology roadmapping, and cost-benefit assessment for novel solutions. Frazer-Nash will project manage the Discovery Phase, coordinating activities between the different partners to assure a coherent set of outputs. They will also be responsible for assessing the cost-benefit of the identified live line derisking opportunities and developing roadmaps to progress these through future project phases and into business asusual.
SPEN and SSEN Transmission comprise the other UK TOs. SSEN have already expressed interest in the project during discovery application. We will seek to engage with both TOs through discovery and explore greater engagement in future phases.
NGET, FNC and UoM have worked together on previous SIF projects and have well established working relationships and collaborative delivery practices. Theyare also aware of the likely need to add further partners in the Alpha and Beta stages and have strong experience achieving this.
Other than the skilled and experience personnel of the partners and stakeholders outlined above, no other resources, equipment or facilities will be required for the Discovery Phase, nor are other external parties, network users or consumers vital for the phase's success.

Project Plans and Milestones

Project management and delivery

PM Approach & Risk Management
FNC will project manage this Discovery phase. FNC are experienced in managing and delivering SIF projects, having delivered several successful Discovery and Alpha phase projects previously, and supported delivery of the INCENTIVE BETA project.
A kick-off meeting will be scheduled for the first week of the project, followed by an in-person workshop to identify key areas of focus. Weekly meetings will be held thereafter to bring all project partners together, ensure a common understanding of scope, update progress against the plan, review and update the risk registerand manage dependencies. These will be supported by ad-hoc meetings as required to deal with specific issues as they arise. Progress will be reported regularly as required to the Monitoring Officer.
Senior FNC staff will provide oversight of project performance beyond the direct project team. Following FNC's ISO9001 accredited Quality Management System, independent project auditor will also be appointed. We will take a waterfall approach to the project and will use a Gantt chart to track timescales and deliverables.
The PMT workbook captures initial project risks, and these risks will be proactively managed by the FNC PM. Additional risks will be captured, and mitigations established forming part of the project management approach. Weekly partner meetings will also include an agenda item for discussing and raising risks.
Links and Dependencies
Three delivery work packages (WP) are described in our project plan. WP2 and WP3 are partly dependent on WP1, as the technical options will be an input to the related analysis and future planning work. These dependencies are allowed for in the project plan. There is preparatory work which can be done on both WP2 and WP3 prior to receiving data from WP1, and WP1 does not need to be fully complete prior to WP2 and WP3 activities.
Policy and regulatory challenges
No policy or regulatory changes will be required for the work to progress. If the project were to progress to BaU, we envisage that TO working practices andinternal design and operating policies would change. However, this should not require any regulatory changes.
Supply Interruptions
This project will not result in any supply interruptions during the Discovery Phase, as it will comprise desk-based research and development.
Consumer Impact/Interaction
This project will not have any customer impact in the Discovery Phase. If envisaged benefits are realised, then the project could enable more efficient maintenance and connection activities.

Key outputs and dissemination

By the end of the discovery phase, the project consortium aims to:
Have a short list of maintenance activities which would be beneficial to carry outlive (if asset were designed to support this, or with appropriate tooling equipment).
Have identified novel design and tooling options, and completed an initial evaluation of their relative impact.
Have identified potential suppliers and other stakeholders to engage within an Alpha phase.
Have an estimate of the network and consumer benefits of facilitating the wider use of live line maintenance work (e.g. due to the envisaged reduction innetwork outages).
Project Dissemination
The project partners will collaborate on the dissemination of the project outputs. The outputs will be shared through the project 'show and tell' webinar, and end of phase report and through posts on forums such as LinkedIn. Opportunities to disseminate early project findings through academic/industrial publication or conference presentation will be assessed as the discovery phase progresses.
Reporting to UKRI will be undertaken by NGET. The project team plans to conductan end-of -phase "Progress and Lessons Learned" session sharing best practice and know-how to interested stakeholders. The project report will be publicly available through ENA smart network portal.

Commercials

Intellectual Property Rights (IPR), procurement and contracting (not scored)

All Project Partners will use the default IPR arrangement as set out in Chapter 9 of The SIF Governance Document. Compliance with the IPR arrangements as defined in the SIF Governance document will be ensured for each of the project partners via the contract that they will each sign with NGET to participate in the project.

Investment Needs

No related funding.

Value for money

Project costs
Total Project Cost: £119,766
SIF Funding Required: £107,787
Project Contribution: £11,979 (equivalent to 10% of project cost)
The balance of costs and SIF funding across partners reflects the effort required from each partner for delivery of the specified work packages. The contributions from partners equate to 10% of project costs, meeting the 10% minimum set out inproject guidance.
There are no subcontractors being used in the Discovery Phase -- all work will be completed by the project partners. No additional innovation funding from other sources is being used in this project.
Value for Money
The discovery phase is an opportunity to establish best practice in live line working, and understand how this can be used more effectively to support delivery of network upgrades and maintenance programmes.
The project will seek to establish the network maintenance activities whereadopting live line working would be most cost-effective. Whilst the project focusses on new design and tooling options, we expect that some options (e.g. to enable easier access for live maintenance) would only require modest investment and small design changes for the benefits to be realised. More substantial changes may be justifiable for large capacity strategic assets (e.g. substations with capacity higher than 1000MVA). In both cases, the benefits of these changes would be realised across the life of the assets.
Given the scale of network build over the coming decade, any changes to better enable live working would need to be identified and adopted soon in order for them to be reflected in planned network developments. Without a project focussed on this activity, these change to design and working practice are unlikely to be adopted, and related benefits not realised.
The route to realising benefits through transition to business as usual (BaU) will depend on the types of solutions identified through the project. Within the Discovery phase, engagement with NGET and other TOs design standards and operational teams will provide a test of solution practicality and usability. Future phase of the project would then seek to engage OEMs/suppliers for insight into how solutions could be adopted and integrated into products. This will be investigated and mapped as part of WP3 and as the project develops.

Supporting documents

File Upload

SIF Round 4 Project Registration 2025-05-19 4_15 - 58.9 KB
DELLTA_Project Management Book.xlsx - 555.1 KB
DELLTA_Disco_submitted application.pdf - 298.1 KB
10145555 Design for Live Line Technology Acceleration_project Direction letter_Discovery.pdf - 205.0 KB

Documents uploaded where applicable?

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