Scottish & Southern Electricity Networks
TRANSMISSION

SIF Round 4 Project Registration

Date of Submission

Jul 2025

Project Reference Number

SHET/FND/RAPID/ Rd4_Discovery

Initial Project Details

Project Title

RAPID – Automated Routing Infrastructure

Project Contact

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Challenge Area

Faster network development

Strategy Theme

Optimised assets and practices

Lead Sector

Electricity Transmission

Project Start Date

01/06/2025

Project Duration (Months)

3

Lead Funding Licensee

SSEN - Scottish Hydro Electric Transmission

Funding Mechanism

SIF Discovery - Round 4

Collaborating Networks

National Grid Electricity Transmission

SP Energy Networks Transmission

National Energy System Operator

Technology Areas

Active Network Management

Asset Management

High Voltage Technology

HVDC

Comms and IT

Condition Monitoring

Measurement

Control Systems

Cyber Security

Modelling

Network Automation

Network Monitoring

Digital Network

Offshore Transmission

Electricity Transmission Networks

Energy Storage

Environmental

Fault Management

Substation Monitoring

Substations

System Security

Voltage Control

Project Summary

The Winser report makes recommendations concerning faster delivery of new transmission infrastructure including standardisation and automation of route design for new transmission lines. This Project, in direct alignment with the Winser report, will examine the problems that need to be solved to address the recommendations concerning the process of route design and the automation of route design, accelerating the pace of network development to meet net zero goals. The Discovery Phase of this Project will identify and prioritise innovations for route design.

Add Third Party Collaborator(s)

Ove Arup & Partners Ltd

Voltquant Limited

Project Budget

£167,343.00

SIF Funding

£139,663.00

Project Approaches and Desired Outcomes

Animal testing

- ○ Yes
- ◉ No

Problem statement

The Nick Winser Report set out recommendations for improving the efficiency of routing design for transmission infrastructure.

AR1: An automated corridor routing process should be adopted as standard practice. This will allow more corridor routing options to be considered than is possible without automation. A landscape architect would oversee the automated process and use the output to make a final decision on the corridor route. Regulatory and planning approval processes will need to recognise and accept the use of this approach and supporting tools.

AR2: A route design process that uses the Electricity Transmission Design Principles (ETDP) should be adopted. A new tool should be developed that supports this process by supporting design of the location within the corridor route and selection of the type of asset (e.g., overhead line, tower, cable, etc.) that should be used. A design engineer would oversee the automated process and use the output to make a final decision on the proposed route design. Regulatory and planning approval processes will need to recognise and accept the use of this approach and supporting tools.

Identifying corridor routes during the design stage can take time and resources to investigate multiple options with many data sources interpreted to find the most suitable corridor routes.

A consistent methodology and toolset across networks could save time and increase confidence in the planning process.

The current situation:

- There is limited evidence that a consistent method for route planning is employed across all the transmission networks.
- Planners and stakeholder groups lack confidence that the plan is optimal.
- The rework of plans and routes might cause delays in project execution.
- Route planning processes, methods, and tools may benefit from a review to ensure efficiency in applying the network guidelines.

This collaborative Project, involving all TOs, NESO and external partners (ARUP, VOLTQUANT) will aim to identify and explore efficiency improvements in the route design process that will benefit from a standardised framework, reduce route planning time and delays, enhance efficiency, and increase consumer and stakeholder confidence and transparency in network expansion decision-making process. There is an opportunity to standardise tools or develop new tools and methods for transmission planning and leverage modern computing methods (machine learning and artificial intelligence) and optimising transmission infrastructure and better network integration will increase the grid's ability to host renewables and electrified demand.

Video Description

https://www.youtube.com/watch?v=0uv_SxtMf1Q

Innovation justification

We introduced this problem at the Energy Networks Association (ENA) base camp in 2023 and have spent time consulting with various stakeholders. The networks are using state-of-the-art routing software, and there have been recent improvements in the efficiency of new route designs. However, each network approaches the problem differently and uses different tools and technologies.

The consultation revealed that we should expand on the problem described to reflect the overall complexity of the issue. We have determined the key questions to answer in Discovery Phase:

- What is the current practice in the three networks?
- What state-of-the-art tools and software are used and developed by UK networks and other networks worldwide?
- Where are the inefficiencies in the route design process?
- What gaps are there, and what new processes, methods and tools are needed to fill these gaps?
- What would be a best practice approach to the problem?
- What activities (if any) should be prioritised to address the recommendations of the Winser Report?
- How should we innovate to address the gaps?

A Discovery Phase is required to understand the challenges and how innovation could address the gaps.

In Discovery we will:

- Survey the understanding of current practices and related problems across networks.
- Conduct a Market Survey, reviewing state-of-the-art local and international automated route-finding tools & methodologies.
- Identify the transformative innovations required in the Alpha Phase to develop the solutions to the problems.

This Discovery Phase could spin off one or more Alpha projects. The Alpha Phase project(s) would then develop detailed statement(s) of requirements for developing innovative methods, processes or tools for development in subsequent Beta Phase(s). TRL/CRL will be assessed at the end of Discovery.

This Project is best funded through an initial Discovery Phase, which will describe the problem and thoroughly explore the AR1 and AR2 recommendations of the Winser report. This approach aligns well with the stage-gate structure of the Strategic Innovation Fund (SIF), which supports collaborative efforts across all three Transmission Owners and NESO. In contrast, NIA projects or BAU-type funding would not facilitate the level of collaboration needed at this stage.

The counterfactual is that the networks continue with current practices, processes, and methods and that we are too slow to address gaps. This leads to delays in the planning of new infrastructure, further delaying the delivery of a net-zero energy system.

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

New to market – processes

Impacts and benefits description

As the Winser report sets out, “National Grid Electricity System Operator (NESO) estimates that even with optimal reinforcement of the grid, annual constraint costs could rise from around £0.5-1 billion per year in 2022 to a peak of £2-4 billion per year around 2030”. Avoiding constraint costs requires the electricity grid to rapidly expand to accommodate new energy developments. A key aspect necessary to accelerate the build-out of new infrastructure is streamlining planning consent and encouraging community acceptability of new infrastructure. Identifying corridor routes during the design stage can take time and resources as multiple options need to be investigated and many data sources interpreted to find the most suitable corridor routes. Tools that can automate this process have started to be used by Transmission Owners (TOs) in the design process.

Standardising the route design process across all of the TOs and NESO, using Electricity Transmission Design Principles (ETDP), could improve community confidence that the best route has been selected. Therefore, the value is significant even if this Project can contribute only a part of the solution to reducing constraint costs.

Since the Discovery Phase will explore the problem landscape, it is not possible to quantify the benefits. Part of the purpose of SIF Discovery is to understand and better quantify the benefits. Qualitatively, the benefits that this Project could deliver are:

1. An evidence-based approach to addressing the critical key recommendations in the Winser Report.
2. Increased efficiency of route planning – reducing the costs to customers and consumers in the design, planning and consenting of new infrastructure.
3. Improved confidence in the route planning process for key stakeholders, including customers and community stakeholders.
4. Reduce the time taken for public consultation and consenting new routes, thereby reducing the cost and speeding up the ability to utilise wind generation, rather than manage constraints via carbon-intensive replacement such as gas power stations.

Overall, these benefits could combine to reduce the risk of delays to consenting and associated risk with delayed construction of new infrastructure, thereby reducing the risk of delaying the delivery of a net-zero energy system for the UK. The benefits are likely to be:

1. Reduced CO2 emissions through the early connection of green energy.
2. Reduced constraint costs.
3. Improve stakeholder confidence in route design.

A cost-benefit analysis will be set out in any Alpha Phase application for relevant innovation project(s) identified during the Discovery Phase.

Teams and resources

Project Team

The Project team brings together the Transmission Owners and the National Energy System Operator to coordinate the effort to address the Winser recommendations by elucidating the ideas to address efficiencies in route design, planning and consenting. The other partners, Arup and Voltquant, have digitalising and automating infrastructure planning expertise. We have included a mature player in the market, Arup, and an emerging innovative startup company, Voltquant. The partnership is best placed to unpack and understand the challenges associated with route design and planning and understand the gaps and identify potential innovations.

SSEN-Transmission; SP Transmission Plc (SPT) and National Grid Electricity Transmission (NGET) own the transmission network in Scotland, England and Wales. The three networks are the key customers for solving the problem and bring different perspectives to the problem and different ideas to address the Winser recommendations.

Arup is an independent global engineering consultancy with an international reputation for pushing the boundaries, innovating, and solving the world's most complex engineering challenges. As market leader in the Geospatial and Earth Observation field, Arup will provide technical consultancy services to the Project and lead work packages (WPs) 3 and 4. It will run industry engagement through the demonstrator to ensure the potential solution responds to the industry's needs.

VoltQuant brings a diverse and highly relevant skill set to this Project, combining deep expertise in both energy and technology. The team includes geospatial developers skilled in mapping and infrastructure routing, front-end and back-end developers adept at building user-centric and robust platforms, and AI specialists proficient in traditional machine learning and cutting-edge generative AI. Voltquant will be lead WP 2 and be an essential contributor to all other WPs.

The National Energy System Operator (NESO) has been charged with taking a strategic long-term approach to planning, identifying whole energy system needs and ensuring that the system can be designed and built accordingly. NESO's role is to help guide the shape of the future energy system, considering what society and communities value and safeguarding the environment. Therefore, the approach to route design is strategically important to NESO.

Subcontractors

Ordnance Survey will be subcontracted by Arup and play a critical role as Data & Geographic Information System (GIS) Subject Matter Experts

The Discovery Phase is a 'desk-top' and consultation exercise to understand the gaps and needs in addressing the problem. At this stage, it requires minimum resources.

Project Plans and Milestones

Project management and delivery

Project Management Approach

SSEN-T will follow its well established robust and proven Project Management processes successfully applied to all previous SIF Projects as well as other Innovation Projects. Discovery Phase Projects will be run by applying an agile, flexible and adaptable approach throughout the Project. This process is audited and compliant with the SIF Governance document. We have a dedicated SSEN-T SIF process document (Internal reference: PR-NET-GOV-532) that has been refined by the results of a recent internal audit conducted by the SSE Group Audit Team and will be followed throughout SIF Projects.

The Project is divided into 4 Work Packages (WPs) as detailed in the (RAPID Project Management Template) uploaded to the application portal.

WP1: Project Management

Lead: SSEN-T

WP2: Review of Available Policy Documents

Lead: Voltquant

WP3: Review of Current Practices

Lead: Arup

WP4: Solution Development

Lead: Arup

Links and Dependencies between WPs and Milestones are represented in the Project Plan Tab within the Project Management Template.

Risk Management

A list of technical. Management and commercial risks have been compiled by the Project Partners. Regular reviews will be held to track and update the Risk Register. The risks cover technical, management, and commercial aspects of the Project. The main risks and associated mitigation are:

- **Delivery delays** - Discovery Phase is a very compressed timeline with a lot of work to cover. To mitigate this, all partners will ensure they are ready to start work immediately, and they are clear on what tasks need to be conducted.
- **Stakeholder availability** - All partners will identify the crucial roles and individuals via a stakeholder engagement plan prior to commencement and ensure they are available ahead of time.

Planned or unplanned supply interruptions

The Project will not lead to any planned or unplanned supply interruptions for consumers and therefore will not have a detrimental effect on the consumer and will not require access to the electricity or gas network.

Energy Consumer Interactions

No direct Consumer contact is anticipated, as part of this Project.

Key outputs and dissemination

End of Discovery Phase

The end of the Discovery Phase will address the recommendations of the Winser report with a comprehensive report on current

practice, methods, tools and future state-of-art. A gap analysis and recommendations report will be published and a plan set out for the Alpha and Beta Phases. Depending on the findings of the Discovery Phase there could be more than one emergent Alpha Project.

Responsibilities

ARUP will be responsible the core deliverables with technical input from Voltquant. The other partners will provide insights into current practices and help identify the gaps. The networks will also attend workshops and review the key deliverables.

We will publish our findings and key recommendations on the Energy Networks Association (ENA) website. In addition, we will draft a formal response to recommendations AR1 and AR2 of the Winsor report and discuss our findings and recommendations with Ofgem, DESNZ and other interested stakeholders.

This Project aims to create and publish a Statement of Requirement (SOR) for processes, methods, and tools. The SOR is expected to stimulate market innovation by encouraging vendors to create and enhance their tools. Rather than limiting competition, this Project seeks to foster a dynamic marketplace where multiple vendors can develop new and improved products that align with industry needs.

Dissemination Opportunities

The methods for dissemination of the key outputs, shared as summary versions that respect commercial sensitivities, are:

- Each organisation has its own corporate website which is a platform for sharing the outputs of the Project.
- SSEN-T and the project partners will publish reports and data compliant with SIF Governance Clauses 9.1 to 9.33, which set out SIF Governance for IPR. We will make data and reports available according to how IPR is treated within the SIF Governance document.
- In addition, SSEN-T will signpost all reports and data generated that can be requested subject to appropriate confidentiality and commercial agreements being in place with the requesting party consistent with IPR set out in the Project funding application and subsequent collaboration agreements.
- Energy Innovation Summit Autumn 2025: All networks plan to attend this unique UK event and potentially present RAPID's findings.
- Attendance at industry and research conferences such as IET and CIGRE conferences.
- Discovery ‘Show and Tell’ Webinar, expected to take place August 2025.

Commercials

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

The Project will employ an IP register to capture the Project Background IP and any Foreground IP generated during the Discovery Phase of the Project; however, it is anticipated that no IP will be generated during this phase of the Project.

For the purposes of the Discovery Phase, this Project will use the default arrangements for intellectual property as set out in Chapter 9 of the latest SIF Governance Document and published on the Ofgem website (currently Version 2.1).

We do not expect specific IP to emerge in the Discovery Phase of this Project.

Investment Needs

Not applicable.

Value for money

Project Costs

The total Project cost for the Discovery Phase is £167,343, requesting £139,663 funding (83% of the total cost), with the remaining £27,680 (17%) being provided by internal and in-kind contributions from the networks, demonstrating commitment to this innovation Project.

SSEN-T costs are £9,743 to lead this Project and manage the delivery of work. SSEN-T will provide a 100% contribution. SSEN-T will lead (WP1) Project Management.

Arup costs are £84,900 (100% SIF funded) for the delivery of technical content and project management of research activities associated with WP 3 & 4.

Voltquant costs are £50,600 (100% SIF funded) for leading WP2 and contributing to WP3 & WP4, focusing on policy assessment, market benchmarking, and developing innovative methodologies.

SPEN costs are £4,815 to provide transmission planning SMEs to provide commentary on Project outputs as well as supporting the SIF governance criteria. SPEN will provide a 100% contribution.

NGET costs are £10,125 to provide an Innovation Engineer to provide commentary on Project outputs as well as supporting the SIF governance criteria. NGET will provide a 100% contribution.

NESO costs are £7,160 and will provide access to Subject Matter Experts from the Strategic Planning teams. This includes access to Network Planning and the Centralised Strategic Network Plan (CSNP) teams, among others. NESO will provide a £3000 contribution (42%).

Subcontractors

Ordnance Survey costs are £4,500 and will be subcontracted by Arup. They will provide Business analysts to help identify data and technology requirements to support the corridor-routing data model development and automation.

Key partners Arup and Voltquant, will deliver the Discovery Phase to provide a degree of independence to the review and gap analysis of current tools and methods used by the incumbent networks. Arup provides expertise in energy consultancy, while Voltquant has deep experience in the agile development of new network planning tools.

Value for Money

The spread of costs across the Project Partners is proportionate to the amount of work delivered. All rates are competitive and consistent with previous SIF Innovation Projects and in full accordance with the UKRI costs guidance. Therefore, these are cost rates without profit that offer more competitive rates than standard industry rates that the Partners would apply to commercial

work.

Commercialisation

The Discovery Phase is designed to better define the problem and address the gaps. The outcome of the Discovery Phase and future phases of the Project will determine any plans for implementing business as usual.

Supporting documents

File Upload

Show & Tell_RAPID_Industry_181125 1.pdf - 680.2 KB
RAPID_Discovery_End of Phase Meeting_16September2025.pdf - 1.0 MB
RAPID Pathways Report - 2.1 MB
SIF Round 4 Project Registration 2025-07-25 4_32 - 66.1 KB

Documents uploaded where applicable?

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