Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Jan 2025

Project Reference Number

NIA_SHET_0053

Project Registration

Project Title

Virtual Energy System Data Sharing Infrastructure (DSI) Pilot - SSEN-T Component

Project Reference Number

NIA_SHET_0053

Project Licensee(s)

Scottish and Southern Electricity Networks Transmission

Project Start

January 2025

Project Duration

0 years and 8 months

Nominated Project Contact(s)

Brant Wilson – Innovation Portfolio Manager

Project Budget

£111,000.00

Summary

There is currently a lack of process and mechanism for data sharing amongst Transmission Operators and the National Energy System Operator (NESO). The Data Sharing Infrastructure (DSI) project aims to create a common data sharing infrastructure, in a secure, resilient and scalable way, to achieve an ecosystem of connected digital twins, as we transition to net zero.

Preceding Projects

NIA2_NGESO081 - Virtual Energy System Data Sharing Infrastructure (DSI) Pilot

Nominated Contact Email Address(es)

transmissioninnovation@sse.com

Problem Being Solved

There is currently a lack of process and mechanism for data sharing amongst Transmission Operators and the NESO. Currently, for Transmission Owner's, base network models are shared through the System Operator Transmission Owner Code Procedure (STCP) Grid Code Requirements with NESO. The current process has many challenges. Firstly, significant manual resource is required in validating and converting network planning data, for it to be exchanged between organisations. The base models then need to be converted from excel, to a format such as Common Information Model (CIM) which is compatible with internal power systems modelling tools. Secondly, the current formats used to exchange network planning data (Excel and PDF) limit the modelling of the base network to a Node Branch Model which generalises many aspects of the network.

Given the significant policy development around DSI and Ofgem's Flexibility Market Asset Registration work, and the expected inclusion of the DSI as a regulatory requirement for RIIO 3 - real demonstration and testing at scale is required in line with government

and regulator expectations for the development of the DSI.

Method(s)

Under the banner of the Virtual Energy System (VES) programme, the Data Sharing Infrastructure project aims to create a common data sharing infrastructure, in a secure, resilient and scalable way, to achieve an ecosystem of connected digital twins, as we transition to net zero. The programme is endorsed by DESNZ and Ofgem who have asked the Electricity System Operator (ESO) to take the lead in developing a pilot and minimum viable product (MVP). The Digital Spine Feasibility Study is a pre-cursor to this project. NGET and SSEND are also project partners in the wider NIA2_NGESO081 - Virtual Energy System Data Sharing Infrastructure (DSI) Pilot.

Data Quality Statement (DQS):

The project will be delivered under the NIA framework in line with OFGEM, ENA and SSEN Transmission internal policy. Data produced as part of this project will be subject to quality assurance to ensure that the information produced with each deliverable is accurate to the best of our knowledge and sources of information are appropriately documented. All deliverables and project outputs will be stored on our internal SharePoint platform ensuring access control, backup, and version management. Deliverables will be shared with other network licensees through the closedown reports on the Smarter Networks Portal.

Measurement Quality Statement (MQS):

The methodology used in this project will be subject to supplier's own quality assurance regime. Quality assurance processes and the source of data, measurement processes and equipment as well as data processing will be clearly documented and verifiable. The measurements, designs and economic assessments will also be clearly documented in the relevant deliverables and final project report and will be made available for review.

In line with ENA's ENIP document, the cumulative risk score is scored as 6 = **LOW** from the sum of the risk thresholds below:

TRL change – 1 TRL Step – Low (Score 1)
Cost – <£500,000 – Low (Score 1)
Number of suppliers – 0 – Low (Score 1)
Data – Assumptions unknown to be explored and validated within project – High (Score 3)

Scope

The pilot project (NIA2_NGESO081 - Virtual Energy System Data Sharing Infrastructure (DSI) Pilot) is a crucial step in advancing the development of the Virtual Energy System. Its primary objective is to deliver the initial implementation of the DSI. The NIA2_NGESO081 project aims to develop a pilot of the DSI to support the transition of the Virtual Energy System from a concept to reality. Our project is SSEN-Transmission's contribution to the overall pilot project and involves setting up infrastructure, preparing SSEN-T outage planning data, and carrying out a proof of concept in a sandbox environment.

Financial benefits can be found in section 3.2.2

Objective(s)

The aim of this project is to establish a platform that can be used by network operators and NESO for data sharing in a formal manner.

Consumer Vulnerability Impact Assessment

An assessment of distributional impacts (technical, financial, and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative, or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register. This project has been assessed as having a neutral impact, meaning that it does not have any effect on customers in vulnerable situations. This is because it is a Transmission project.

Success Criteria

The project will be deemed as successful if all items in the scope, objectives and learnings are achieved.

Project Partners and External Funding

The partners responsible for delivery of the DSI project NIA2_NGESO081 are NESO, Mesh-AI and Arup. Additional NIA2_NGESO081 project participants include the National Digital Twin Programme (NDTP), SSEN-D & NGET.

SSEN-T along with other network partners will fund their contributions to the project separately using their own funding, whether this be

innovation funding or other. As this PEA document outlines, SSEN-T will fund our contributions using our RIIO-T2 Network Innovation (NIA) allowance.

Potential for New Learning

The NIA2_NGESO081 project to which this SSEN-T project contributes will be delivered with ongoing cross-sector and in-sector collaboration, building on wider initiatives driving change in the energy sector. The development of the proposed 'data preparation nodes' and how they can be deployed, used, and scaled will be vitally important to future applications of the data sharing infrastructure and its wider use cases for other licensees in engaging with the DSI. All reports and outputs developed will be published on the ENA Smarter Networks Portal.

Learnings from the project will be disseminated via internal and external stakeholder events which will be conducted during the project. The learnings will also be shared within the annual project report and at relevant dissemination events such as the Energy Networks Innovation Summit.

Scale of Project

The NIA2_NGESO081 project to which this SSEN-T project contributes will rapidly and iteratively develop a prototype and lay the foundations for the Virtual Energy System. The pilot outage planning use case and other use cases being developed in the wider VirtualES programme, would individually and jointly deliver benefits to the energy system through greater system operability and resilience; reduced greenhouse gas emissions; reduced consumer bills; and other wider benefits. The ultimate and longer-term goal for this project is to allow for data exchange to support the development of digital twins of the GB energy system. This is estimated to not be available until approximately 10 years from now. SSEN-T contribution through this submitted project is smaller in scale and will provide data to the larger NIA2_NGESO081 project. Without the input from the SSEN-T project the NIA2-NGESO081 project would be limited in the data sharing reducing the potential for new learning.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will take place in the Scottish Hydro Electric Transmission license area in Scotland. Since this element of the collaboration will feed into the wider NESO DSO pilot the geographical scope is Great Britain wholly.

Revenue Allowed for the RIIO Settlement

No allowance has been made for this type of development within the RIIO-T2 settlement. No savings are expected during project implementation; future savings may be possible depending on the outcomes of the project and the future adoption of the learnings.

Indicative Total NIA Project Expenditure

The total NIA Expenditure for the project is £111,000, 90% (£99,900) is allowable NIA expenditure.

Project Eligibility Assessment Part 1

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

The pilot project run by NESO will help gain an understanding of how the partnering networks will deploy the Data Preparation Node (DPN). If successful, the pilot will validate the technical viability of data sharing and pave the way for a scalable DSI. DSI is fully aligned with the recommendations of the National Digital Twin programme and with the Energy Digitalisation Task Force (EDiT) recommendations for a digital spine and data sharing fabric.

The DSI will create a decentralised network where each actor, for example a Generator, Transmission or Distribution Network, could develop their own digital twins and then connect and share their data through the VirtualES. It will lay out the requirements, rules, and principles to which all constituent digital twins will need to conform so that they may connect and share data. The use case selected will enable an improved outage planning process in the medium term which in theory could support more expansive use of switches to enable generation to be utilised without passing through the transmission network.

Many benefits of the DSI will be delivered through use case implementations. It therefore delivers significant indirect benefits to economy and net zero with smaller direct benefits through Opex and Capex of future projects. SSEN-T contribution through this submitted project is smaller in scale and will provide data to the larger NIA2_NGESO081 project. Without the input from the SSEN-T project the NIA2-NGESO081 project would be limited and constrain the step to facilitating the energy system transition.

How the Project has potential to benefit consumer in vulnerable situations:

Not applicable.

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved

Not applicable.

Please provide a calculation and/or description of the expected benefits of the solution

The outputs of the wider project led by NESO, with contributions from SSEN-T, SSEN-D and NGET has the potential to deliver significant benefits to the economy and to net zero. Other more specific benefits include the following:

- Enables a seamless process for search, find and consumption of data that can be scaled, especially if more frequent base model sharing is required in the future.
- Improved safety and grid resilience through more effective and frequent modelling.
- Increased customer satisfaction through faster and less error-prone outage management process.
- Increased interoperability across different actors in the energy sector.
- Increased competition across power systems analysis software vendors due to increased interoperability of data.
- Reduces data redundancy as base network model is consistent across operators.
- Reduction of outage planning queues.
- Cost reduction in the whole process and efficient use of human resources time in engineering details rather than information gathering.
- Deliver open data and digital market enablement in our digitalisation strategy.

The following qualitative benefits for SSEN-Transmission are associated with the outputs of contributing to this project as a partner

alongside the other networks (NGET and SSEN-D):

• Contribution to T3 –There is value in our involvement in the development of this work, as in T3 this is due to become the industry standard.
• Potential to expand on capability allowing for support on multiple use cases.
• Ofgem's Data Best Practice is part of our license conditions and outlines 11 core principles that we must adhere to in order to be compliant. Many of the principles relate to interoperability and the standardisation of data across the industry to drive the agenda for net zero.
• The T3 Business Case planning overview refers to the investment required in Data & Digitalisation (in line with Data Best Practice (DBP) Guidance & Principles above). We are aware that Ofgem is driving this and have expectations on networks to deliver.
• The EDiT report is referenced by SSEN-T and industry widely and refers to the need for vast digitalisation to achieve net zero targets.
• Future Systems and Network Regulation (FSNR) is focused on creating an energy system for the future – this pilot and MVP aligns with this work.

Cost Benefit Analysis:

As this project is a pilot project, led and established by NESO, the internal development of a CBA is not required at this stage of the project. The associated qualitative benefits are listed in the section above.

Key Project Risks:

• Project being led by NESO, in collaboration with the other networks. We are therefore reliant on those partners for success of the project.

• The collaboration agreement not being in place and impacting the ability to contribute to the project with a significant effect on timescales.
• This is a pilot project, therefore there is not a detailed statement of requirements. Therefore, our contributions have been based on assumptions and cost estimations. There is a risk that if new information comes to light, then we may have to revise the budget and scope.

Please provide an estimate of how replicable the Method is across GB

This project considers a scaled common framework demonstrator in a confined geographical area, however the common framework developed will be applicable across GB. The learnings are not limited to Scottish Hydro Electric Transmission, all transmission and distribution network operators across GB could benefit from this pilot work.

Please provide an outline of the costs of rolling out the Method across GB.

At this stage the costs for rolling out the DSI beyond the pilot are unknown. This work will support the expectation from Ofgem for network licensees to roll out a DSI during the RIIO-3 period. The development of this work will support the creation of estimates for the MVP of the DSI as well as wider development during the RIIO-3 period.

Requirement 3 / 1

Involve Research, Development or Demonstration

Projects must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

Involve Research, Development or Demonstration - Please select all that apply

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☑ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

The NIA2_NGESO081 project will be delivered with ongoing cross-sector and in-sector collaboration, building on wider initiatives driving change in the energy sector. The development of the proposed 'data preparation nodes' and how they can be deployed, used, and scaled will be vitally important to future applications of the data sharing infrastructure and its wider use cases for other licensees in engaging with the DSI. All reports and outputs developed will be published on the ENA Smarter Networks Portal. The SSEN-T contribution to the NIA2_NGESO081 project will help to reach the outcomes and develop learnings that could be used by relevant Network Licensees.

Not applicable.

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed. Networks must explicitly mention similar projects that they have considered and how these differ.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

A review has been undertaken through the Smarter Networks Portal, Programme Advisory Groups and direct stakeholder engagement and confirmed there is no unnecessary duplication. The pilot builds on the previous NESO NIA phases (NIA2_NGESO065, NIA2_NGESO028) which led to the development of concepts of DSI as well as a standardised approach to benefit analysis for VirtualES use cases, considering improved system operability, resilience, reduced carbon emissions, lower consumer bills, and other broader benefits. The NIA2_NGESO081 project, to which this SSEN-T project contribute, helps to align development with National Digital Twin Programme and other initiatives which will help increase alignment in future phases by collaborating with the NDTP in the development of capabilities related to Pilot requirements.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not applicable.

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

Based on sector wide horizon scanning carried out by NESO by means of desktop research and international engagement, it can be concluded that Data Sharing infrastructure of this scale and scope has not been achieved before. There is a need to build in a way that is scalable and aligns explicitly to the principles of the National Digital Twin programme. Without a Pilot and later an MVP there will be no DSI consequently making it impossible to achieve NESO's ambition to maximise collaboration with other organisations in the energy sector to deliver transformational change via VirtualES. To manage this risk, the NIA2_NGESO081 project has been developed as a series of phases delivering knowledge and experience as it progresses. This project proposal forms the next step of these phases, moving from wireframing to a proof of concept of critical components to practical implementation of the VirtualES.

Relevant Foreground IPR

Any new intellectual property which are completed as part of the NIA project will be made available to other relevant networks licensees. No background IPR is required.

Data Access Details

For information on how to request data gathered in the course of this project, see Strategic Innovation Fund (SIF) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://www.ssen-transmission.co.uk/about-us/innovation/.

Additionally, data from this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the Strategic Innovation Fund (SIF) can be found or requested in the ways listed below:

• Via the Smarter Networks Portal at: https://smarter.energynetworks.org. To contact select a project and click 'Contact Lead Network'. SSEN Transmission already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
• Via our Innovation website at: Innovation - SSEN Transmission (ssen-transmission.co.uk)
• Via our managed mailbox: transmissioninnovation@sse.com

Please identify why the Network Licensees will not fund the project as a part of it's business and usual activities

NIA has been deemed the best method of supporting the delivery of this cross-sector project. Development projects funded by NIA give suitable financial support to investigate areas for potential development that could not be funded by BAU as no allowance was made in the RIIO-T2 settlement.

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks (e.g. commercial, technical, operational or regulatory) associated with the project

As noted in the NIA guidance, certain projects are speculative in nature and yield uncertain commercial returns. This is the case with this project as it has been scoped based on several assumptions given that this project contributes to a wider pilot project. More details will emerge as the project progresses and this breakdown may require reviewing and potential adjustments made.

This project has been approved by a senior member of staff

☑ Yes