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

Oct 2025

Project Reference Number

NIA_SPEN_0124

Project Registration

Project Title

IConn (Intelligent Connections Explorer) – Phase 3

Project Reference Number

NIA_SPEN_0124

Project Licensee(s)

SP Energy Networks Transmission

Project Start

October 2025

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Alana Cairns

Project Budget

£894,000.00

Summary

The process for new connections is overly reliant on manual interventions for engagement, leading to prolonged delays and inefficiencies. Customers face wait times for preliminary phases, connection details, and programmes due to the lack of a system for indicative views of the network they are looking to connect to.

IConn will integrate accurate estimation of substation capacity, new connections costs and timelines, and a route planner that identifies optimal solutions. Creating the ability for SPT to have clearly identifiable guidance on the best solution at the earliest stage in the connections process. This enables a holistic view of SPT's network area and assists transmission operators and developers to have a greater understanding of where would be most beneficial for all parties for a new connection.

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

The process for new connections is overly reliant on manual interventions for engagement, leading to prolonged delays and inefficiencies. Customers face wait times for preliminary phases, connection details, and programmes due to the lack of a system for indicative views of the network they are looking to connect to. This results in delayed responses, disjointed applications, and outdated information that hampers customer decision-making.

For SPT, the manual gathering and processing of data are time-consuming and open to human error, causing bottlenecks in the application process. The system's inability to interact with dynamic data prevents the visualisation of network capacities and the impact of ongoing projects. Ultimately, the inefficiencies of manual processes drive up operational costs, and the lack of integration creates data management complexities. We believe the proposed Intelligent Connection Explorer (IConn) would alleviate these pain

points in our process. In this phase we are looking to bring in increased power flow analysis, CP2030 limits and self-serve opportunities

Method(s)

IConn will integrate accurate estimation of substation capacity, accurate estimation of new connections costs and timelines, and a route planner that identifies optimal paths of Overhead Lines (OHL) for new connections to the transmission network. The project will develop and deploy a number of innovation methods.

- Holding a suitably abstracted graph model of the current, planned and proposed substation and OHL network. This graph model is used to run a power flow determining the feasibility of taking a new connection at a particular node.
- Using various geospatial layers and a graph-based optimisation algorithm to generate the likely route an OHL connection would take from a developer's site to a target substation. The constraints considered will include such things as avoiding built up areas, waterways, wind farms amongst others while minimising the length of a transmission line.
- Using historical connection costs and timelines to provide more accurate forecasts of the likely cost of a connection and the proposed energisation dates.
- Bringing in CP2030 limits to notify customers on the type of offer they are likely to receive due to the associated technology limits.
- Finally and crucially IConn brings together all the aspects described above into a single user-friendly view enabling all of them to be considered and discussed when embarking on a new connection.

Scope

The proposed Intelligent Connections Explorer (ICONN) project directly supports the UK's net-zero goals by streamlining the process for connecting renewable energy sources to the transmission grid. By optimising the connection process, it reduces delays, minimises speculative applications and supports the necessary scaling of the grid. This project addresses inefficiencies in manual data gathering, reduces the time and human error involved in assessing new connections to the grid. This speeds up new connections projects but also lowers operational costs, which can indirectly benefit consumers through more efficient and cost-effective grid management.

Staff time savings will be achieved through a reduction in time spent by staff in System Design, Engineering Design, Project Development and Commercial teams, as well as system analysis planners. High customer satisfaction scores are expected to be maintained (at a score of 9) or increased in Ofgem's Quality of Connection Survey score in Moments that Matter 1 (MTM1), due to key information being readily available and no wait time required. More informed decision-making at the project outset will be enabled through enhanced ability for faster selection of the most suitable connection points and routes, ultimately improving planning for the future of the system.

Project developers will gain a better understanding of new connection projects, with greater awareness of potential connection points, costs, programme timelines, and routing options, leading to more effective project planning. There will be a greater ability to assess connection options, increasing the likelihood of selecting the "optimal" option from the outset for the developer and managing expectations on the reality of one site in comparison to another. This allows developers to have an earlier ability to view the potential "best" location for their needs, with increased self-serve ability and understanding of the impact of CP2030. Early environmental consideration will be addressed by identifying environmental impact earlier in the route planning process, leading to better outcomes and potentially saving time, as issues may otherwise only become apparent after consultation with stakeholders.

IConn provides a new methodology that integrates accurate estimation of substation capacity, accurate estimation of new connections costs and timelines, and a route planner that identifies optimal paths of Overhead Lines (OHL) for these connections. This creates the ability for SPT to have clearly identifiable guidance on available capacity, routing, costs, and programme timelines at the earliest stage in the connections process. It enables a holistic view of SPT's network area and assists transmission operators and project developers to have a greater understanding of where would be most beneficial for all parties for a new connection.

The learning generated by the IConn project is highly transferable across all UK transmission operators, as they face similar challenges. Like SPT, these operators rely on manual processes for new connections, leading to delays, inefficiencies, and data management complexities. IConn addresses these pain points by automating substation capacity estimation, new connection cost and timeline calculations, and optimal route planning for Overhead Lines (OHL).

The IConn project is innovative because it addresses longstanding inefficiencies in the new connections process by uniquely integrating the automation of substation capacity, connection cost and timeline estimation, data centralisation, data visualisation, and advanced geospatial analysis. The dynamic route planner for optimal OHL selection provides a tool to address social and environmental impact earlier in the route planning process. By interacting with dynamic data and visualising network conditions, IConn provides a holistic view of grid capacities and project impacts, enabling informed decision-making at the earliest stage of the connection process—something that is currently unavailable.

We are unaware of any project being created that offers the same output and benefits as IConn. We have not put forward a project that produces anything that supports the ability to enhance our pre-application process for our customers.

Objective(s)

The Intelligent Connection Explorer integrates accurate estimation of substation capacity, accurate estimation of new connections costs and timelines, and a route planner that identifies optimal paths of Overhead Lines (OHL) for these connections. Creating the ability for SPT to have clearly identifiable guidance on available capacity, routing, costs, and programme timelines at the earliest stage in the connections process. This enables a holistic view of SPT's network area and assists transmission operators and project developers to have a greater understanding of where would be most beneficial for all parties for a new connection.

The project will be a continuation of the previous phase of the Intelligent Connections tool, looking at improving the customer facing elements of the tool, integrating the tool further into SPEN's systems, and further developing the network design elements, looking at load flows of assets impacted by potential new connections. It will also be bringing in the complexity surrounding Connections Reform and technology limits through the Clean Power 2030 Plan (CP30). The integration of the tool to self-serve on our website is a key focus of the scope of this phase of the project, looking at integration to not only our website, but our connections portal.

Key deliverables and works required:

Power Flow Analysis:

Power flow analysis is a way we measure the impact connections have on our network to ensure we prepare for future expansions and optimise the existing network. We aim to show these values both before and after adding a new connection, allowing SPT to assess and present its impact on the system. Each time the user adjusts the new connection inputs, a power flow analysis runs in the background to update the network impact in real time. Some of the benefits include:

- Rapid Impact Assessment – To rapidly evaluate how new connections affect the grid.
- Better Decision-Making – To identify potential overloads and help network planning by identifying need for reinforcements.
- Enhanced Visibility – Makes power system analysis accessible to non-specialists.
- Efficiency - increased efficiency of scarce and valuable Design and Planning resources.

A process to automatically flag the needed reinforcements could be implemented. Where loading is noted to be high for certain assets, i.e. Lines, Transformers etc, these could be indicators of required reinforcement, thus taking the onus off the relevant teams to do these investigations and creating a starting point for further design considerations. This will overall improve the experience for our customers ensuring at the pre-application stage they do not receive an indicative view of our network that could not be met.

Alignment with CP30:

The purpose of this addition to IConn is to facilitate a rapid assessment of a new connection request's viability, considering the connection's technology and the existing installed and contracted capacity for that technology within the zone of intended connection as defined by CP30.

To further align with CP30, and the ongoing Connections Reform, additional assessment criteria and constraints can be incorporated into the tool. These may include prioritisation rules, queue management logic, or locational signals based on network availability. By integrating such elements, IConn would not only support more efficient initial assessments but also help ensure that connection offers are made in a way that reflects the evolving principles and governance of the NESO connections process.

Self-serve tool:

The development of a self-serve tool, accessible through our website and integrated with our connections portal, is seen as the next logical step for the IConn tool and would be developed in two parts:

The first would include developing the specific external view suitable to customers. This would involve further modelling of the tool and the outputs it provides, design and development of the of the customer facing view with validation and verification sessions with various internal stakeholders to ensure the customer is provided only what is deemed as necessary information. The definition of 'necessary information' within this context would need to be determined first and foremost by the internal stakeholders providing data

and insight for the development of the tool.

The second part of the external view development would then involve integration of the application into SPEN internal architecture and onto our website. We would need collaboration with SPEN CoE teams for smooth integration to the website as well as further support from the Architecture Strategy teams for integration into Iberdrola's systems. Some parties of those relevant teams have been involved in the first NIA phase (Phase 2), so this should allow for a smoother transition.

Portal integration:

Customers can save a 'snapshot in time' of the solution for each project that can then be referred back to months later if the customer returns for another pre-app or an offer, to compare differences in network. These 'snapshots' will only be accessible through the portal, and the already existing portal functions, such as specific log-ins for each customers, and ability to projects through their process, will aid in this development. At this phase, the portal integration will be a Proof-of-Concept which we intend to iterate on in later stages.

AI Assisted Model and Data Maintenance:

To keep the SPT transmission network model used by IConn for power flow studies up to date following the approval of new reinforcements and connection agreements, SPT currently needs to manually triangulate and combine data from multiple disparate sources, such as PDFs, salesforce extracts, structured tables, and other unstructured documents. Recent advances in Artificial Intelligence (AI) offer an opportunity to streamline and significantly reduce the manual effort required for this process. The envisioned workflow would transform fragmented structured and unstructured inputs into a coherent and reliable dataset that can be used to keep the contracted network model up to date.

As part of the innovation project DScience Ltd will take a sample of future network data and develop a series of fine-tuned locally hosted models that are able to take the raw unstructured data and convert them into a format which can be used in IConn's power system model. The process will include human QA to ensure outputs are reliable. Models will not interact with external systems. Should the innovation be successful the project team will work with SPT IS and explore options for incorporating the agentic workflow on SPT's internal cloud.

Consumer Vulnerability Impact Assessment

Not applicable

Success Criteria

We have created milestones for the project to meet and a timeline to match this.

Project Partners and External Funding

The project will involve two key partners: SPT and DScience LTD.

SPT: SPT will provide the necessary network data, including information on historical costs and timelines. SPT will assist in communication between DScience Ltd and the necessary internal stakeholders, as well as guide and steer the development of the IConn platform, ensuring it meets the operational needs and the defined scope. SPT will also be responsible for highlighting key elements of Connections Reform and CP30 to improve the understanding of DScience Ltd.

DScience Ltd: Building on IConn's foundational capabilities for estimating connection parameters and planning routes, the initiative introduces a dynamic customer-facing view with pre-application insights, real-time visual impact analysis of new connections on the network, AI-driven automation for near real-time network model updates from diverse sources, and integrated Clean Power 2030 (CP30) criteria for strategic viability assessments. The aim is to deliver a more efficient, transparent, and responsive connection process for SP Transmission.

Potential for New Learning

Through this project we expect to have greater visual granularity of likely connection viability for developers looking to apply within the SPT region. We will be expecting to view how valuable a tool this would be across the various TOs and perhaps even adopting by the NESO. If successful, this could benefit all developers looking to make Transmission Connections.

Scale of Project

The project intends to build and develop a number of key innovations and then combine them in a uniquely effective manner. These are

described in 2.2 Method(s). Given the complexity of each of these innovations and that each must be developed to generate the “holistic” view required, the scope and investment are low.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

SPT’s license area

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project 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:

IConn has the ability to support customers going through a time of real change. Given Connections Reform, TM04+, has begun in 2025, customers will be looking for greater insight into our network with upcoming application windows. We believe understanding the reality of availability on the grid and how their projects could fit into the technology plans under CP2030 will be a real concern. Therefore, producing a tool that can take into account a variety of factors, to allow for pre-application detail prior to committing to an application would be welcomed by industry.

We also believe beyond the NIA phase we have the ability to develop this for the whole of the Transmission Network in GB. Supporting the need for specific technologies to be implemented into specific regions across the nation.

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

N/A

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

N/A

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

N/A

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

N/A

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

N/A

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

- Key Learnings about how a holistic connection exploration tool can effectively be used during the pre-connection application process will be documented and shared.
- Tested assumptions which enable simplified network capacity estimates, timelines and costs will be documented and shared.
- Both of these can be adopted by other Network Licenses either independently or with support from SPT or DScience LTD.

n/a

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.

We have engaged with the other TOs and the NESO to ensure another project like this isn't being carried out. We ensured this was clearly different from the Connections 360 tool as our proposal more focuses on producing an estimated quote rather than a network overview. We are continuing to engage and ask for feedback from the other TOs and the NESO to ensure they can take our learnings on board from this project.

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

n/a

Additional Governance And Document Upload

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

This project is innovative in several ways:

- Holding a suitably abstracted graph model of the current, planned and proposed substation and OHL network. This graph model is used to run a power flow determining the feasibility of taking a new connection at a particular node. In particular the addition of power flow analysis to improve the outputs at this early touchpoint in a connections journey.
- Using various geospatial layers and a graph-based optimisation algorithm to generate the likely route an OHL connection would take from a developer’s site to a target substation. The constraints considered will include such things as avoiding built up areas, waterways, wind farms amongst others while minimising the length of a transmission line. In this next phase there will be a continued investigation into any improvements that could be made to this.
- Bringing in CP2030 limits to understand technology viability for the region which will be the first time this is brought into pre-application meetings

- Finally and crucially IConn brings together all the aspects described above into a single user-friendly view and allow customers to self-serve. Removing the need to book in for calls and getting immediate answers to their connections queries.

Relevant Foreground IPR

The IConn project includes several key deliverables. First is the **NIA Compliant Completion and Progress Report**, which is a document owned by SP Energy Transmission (SPT) and classified under the FG IP class. Second is the **Data Dictionary**, provided in Excel format, also owned by SPT and classified as FG. The third deliverable is the IConn Web Application, which will be developed through multiple iterations as software (SW), again under the ownership of SPT and classified FG. Lastly, the Pre-Application Report will be delivered as both software and a document, with SPT as the IP owner and FG as the IP class.

Data Access Details

Several of our sources will be through the collation of public documents which we would happily point our customers to. However, we would not be able to divulge details of our customer contracts which will be used to enhance the tool. We will be able to share a redacted version of this to customers if requested.

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

This project is unable to be fufilled under BAU as it uses technology that SPT do not currently already use. The final and perhaps most important reason is howquickly this can be delivered. Customers within our area are about to undergo a massive change to the connections world with the implementation of TM04+. Therefore we need the ability and skills of an external party to produce this as quickly as possible. Something which we would not be able to do as BAU.

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

This project is required using the support of NIA funding given the huge changes coming to our industry. Doing nothing would mean customers not receiving the best detail of our network as possible given we wouldn't be able to pull all the data into the one tool. Additionally, the customer would suffer by increased wait times to speak with engineers, given they will be reassessing the whole queue under TM04+. Fundamentally, not funding this under NIA creates the risk of negative customer impact.

This project has been approved by a senior member of staff

☑ Yes