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

Jul 2025

Project Reference Number

NIA2_NGET0090

Project Registration

Project Title

Engineering Automation with IEC61850 BAPs

Project Reference Number

NIA2_NGET0090

Project Licensee(s)

National Grid Electricity Transmission

Project Start

July 2025

Project Duration

0 years and 9 months

Nominated Project Contact(s)

Ibukunolu Oladunjoye

Project Budget

£60,350.00

Summary

The project addresses National Grid's challenges in efficiently engineering substations due to the absence of standardized templates aligned with IEC61850 technical reports 90-30 and 7-6, along with limited experience with Basic Application Profiles (BAPs). By exploring and testing BAP concepts, the project aims to develop machine-readable BAP templates in SCL format, enhancing substation engineering efficiency and reliability while integrating advanced technologies. A key innovation is a smart interface that enables users to select appropriate BAPs for specific substation designs. Utilizing the Helinks STS tool, the project will automate the creation and integration of these templates, modernizing energy infrastructure and supporting a more resilient and sustainable energy system. Successful execution could set a benchmark for future engineering practices within National Grid and the industry.

Third Party Collaborators

Condis

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

National Grid is currently facing challenges in efficiently engineering substations due to the absence of standardized templates that align with the new IEC61850 technical reports 90-30 and 7-6. The lack of experience with Basic Application Profiles (BAP) limits the ability to implement top-down engineering approaches effectively. This project aims to address these issues by exploring and testing BAP concepts, ultimately developing machine-readable BAP templates in SCL format. By doing so, National Grid seeks to enhance the efficiency and reliability of substation engineering, facilitating the integration of advanced technologies and supporting the transition to a modernized energy system.

Method(s)

Basic Application Profiles (BAPs) have been released into the IEC61850 standard in the last couple of years. (First as a technical report, and now as a part of the norm.) Their goal is to be able to specify the workings of a substation in more detail. Up to now, they have only been defined with text and logical elements. Translating the BAPs into the machine readable SCL language would allow for a higher degree of automation. The method selected for this project is to use the Helinks STS tool, that is able to efficiently build and combine SCL files and to define different BAPs in the tool. The resulting SCD files shall be tested on a proprietary software for compatibility. Additionally further automation is introduced by creating the capability to automatically select the BAP templates for specific substation designs based on a smart tool implementing engineering policy and standards.

Data Quality Statement (DQS):
The project will be delivered under the NIA framework in line with OFGEM, ENA and NGGT / NGET 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. Relevant project documentation and reports will also be made available on the ENA Smarter Networks Portal and dissemination material will be shared with the relevant stakeholders.

Measurement Quality Statement (MQS):
The methodology used in this project will be subject to our 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.
Add any certifications or other processes if known

In line with the ENA's ENIP document, the risk rating is scored low/medium/high (delete as appropriate).
TRL Steps = 1 (2 TRL steps)
Cost = 1 (£60,350k)
Suppliers = 1 (1 supplier)
Data Assumption = 1 (data supplied by suppliers for analysis)

Scope

The scope of the project focuses on addressing the challenges faced by National Grid in efficiently engineering substations due to the absence of standardized templates that align with the new IEC61850 technical reports 90-30 and 7-6. The project aims to explore and test Basic Application Profiles (BAPs) to enhance the specification of substation operations. This will involve developing machine-readable BAP templates in SCL (Substation Configuration Language) format, which will facilitate a higher degree of automation in the engineering process.

Additionally, the project will implement the Helinks STS tool to efficiently build and combine SCL files while defining different BAPs. The resulting SCD (Substation Configuration Description) files will undergo compatibility testing with proprietary software to ensure they meet operational requirements. Further automation will be added to the engineering process as part of smart tools to select the required BAPs for any given substation design based on engineering policy and standards.
Throughout the project, documentation of methodologies, learnings, and outcomes will be essential for future reference, and the project will ensure compliance with relevant regulatory standards while promoting collaboration among engineering teams and stakeholders.

Objective(s)

- Standardization and Automation: Develop standardized engineering templates aligned with IEC61850 technical reports and translate Basic Application Profiles (BAPs) into machine-readable SCL format to enhance automation in substation engineering.
- Tool Implementation and Testing: Utilize the Helinks STS tool to efficiently build and manage SCL files, and conduct compatibility testing of the resulting SCD files on proprietary software to ensure seamless integration. Trial of smart tools that will provide further automation and reduce engineering work.
- Knowledge Sharing and Compliance: Capture and document learnings throughout the project to inform future initiatives, while ensuring alignment with regulatory requirements and promoting collaboration among engineering teams and stakeholders.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

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 on customers in vulnerable situations.

Success Criteria

- Data Integrity and Standardization: Achieve a fully normalised database structure that eliminates inconsistent dependencies and develop standardized, machine-readable templates for Basic Application Profiles (BAPs) in line with the IEC61850 standard.
- Automation and Interoperability: Successfully translate BAPs into machine-readable SCL language to enhance automation and improve interoperability among substation systems and components.
- Smart Interface Innovation: Introduce a smart interface to select the appropriate BAPs for any given substation design, positioning this feature as a key innovation factor that sets the project apart from existing solutions in the industry.
- Efficiency and Compatibility: Utilize the Helinks STS tool to streamline substation design processes and ensure that resulting SCD files are tested for compatibility with proprietary software.

Project Partners and External Funding

Condis are the project supplier

Potential for New Learning

- Standardization Benefits: The project will highlight the advantages of using standardized templates for substation engineering aligned with IEC61850 standards.
- BAP Understanding: National Grid will gain a deeper understanding of Basic Application Profiles (BAPs) and their application in substation specifications.
- Automation Opportunities: The translation of BAPs into machine-readable SCL format will demonstrate the potential for increased automation in engineering processes.
- Tool Efficiency: The use of the Helinks STS tool will showcase how effective software can streamline the creation and management of SCL files. Validation of the deployment of new upstream engineering and specification tools that can interface to Helinks.
- Interoperability Challenges: Testing SCD files will provide insights into interoperability issues and the importance of compatibility with existing systems.
- Enhanced Collaboration: The project will reinforce the value of collaboration among teams and stakeholders in achieving project goals.
- Regulatory Alignment: National Grid will learn the importance of aligning engineering practices with regulatory requirements and industry standards.
- Continuous Improvement: The project will foster a culture of continuous improvement by capturing lessons learned for future initiatives.
- Knowledge Sharing: The exploration of BAP concepts will encourage knowledge sharing and professional development within the organization.
- Future-Proofing: The project will help National Grid prepare for future technological advancements and changes in the energy landscape.

The learnings will be disseminated across the business through presentation sessions, seminars and externally through conferences and related activities.

Scale of Project

This project not only aims to develop standardized, machine-readable templates but also seeks to enhance interoperability and efficiency in substation design. Given the complexity of integrating advanced technologies and the potential impact on the overall energy infrastructure, this project represents a crucial step towards modernizing the grid and supporting the transition to a more resilient and sustainable energy system. The successful execution of this project could set a benchmark for future engineering practices within National Grid and across the industry.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will take place at the supplier's site

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£54,315

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

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

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

The project has the potential to facilitate the energy system transition by developing standardized engineering templates and machine-readable Basic Application Profiles (BAPs) that enhance the efficiency and reliability of substation engineering. By aligning with the IEC61850 standards, the project enables the integration of advanced technologies, such as smart grid solutions and renewable energy sources, into the existing infrastructure. This modernization of substations will support the deployment of innovative energy management systems, improve operational flexibility, and ultimately contribute to a more resilient and sustainable energy network that can adapt to the evolving demands of a decarbonized energy future.

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

The project has the potential to benefit consumers in vulnerable situations by enhancing the reliability and efficiency of substation engineering, which is crucial for maintaining consistent energy supply. Improved engineering practices can lead to fewer outages and quicker restoration times, directly impacting consumers who may rely heavily on stable electricity for essential services, such as heating, cooling, and medical equipment. Additionally, by integrating advanced technologies and smart grid solutions, the project can facilitate better demand response programs that offer tailored energy solutions and financial incentives for vulnerable consumers, helping them manage their energy usage and costs more effectively. Ultimately, the project's focus on modernization and efficiency can contribute to a more equitable energy system that prioritizes the needs of all consumers, particularly those in vulnerable situations.

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 (RIIO-1 projects only)

N/A

Please provide a calculation of the expected benefits the Solution

The project delivers net benefits to consumers by improving the overall efficiency and reliability of the electricity transmission system, which can lead to lower energy costs and enhanced service quality. By developing standardized engineering templates and machine-readable Basic Application Profiles (BAPs), the project streamlines substation engineering processes, reducing the time and resources required for construction and maintenance. This increased efficiency can translate into cost savings that are passed on to consumers through reduced energy prices. Furthermore, the integration of advanced technologies enables better management of energy resources, facilitating the incorporation of renewable energy sources and enhancing grid resilience. As a result, consumers benefit from a more reliable energy supply, lower costs, and a transition towards a sustainable energy future that aligns with their needs and preferences.

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

This is applicable to Electricity Distribution and Transmission.

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

There is an on-going plan within National Grid to roll out a significant number of new substations in a short time. There is an opportunity

to deliver savings from standardised design which reduces external design cost, internal design assurance cost, benefits from faster commissioning through use of digital substation technology etc.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project 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

RIIO-2 Projects

☑ 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 learning generated from this project could be invaluable for relevant Network Licensees as it provides insights into the effective implementation of standardized engineering practices and the use of Basic Application Profiles (BAPs) within the IEC61850 framework. By documenting best practices, methodologies, and the outcomes of testing machine-readable SCL templates, Network Licensees can adopt these learnings to enhance their own engineering processes, leading to improved efficiency and reliability in substation operations. Additionally, the project's findings can inform the development of training programs and resources that equip engineers and technical staff with the necessary skills to implement advanced technologies and automation in their networks. Sharing these learnings across the industry can foster collaboration and innovation, ultimately contributing to a more resilient and modernized energy system that benefits all stakeholders involved.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

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.

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

This idea is a growing focus and limited work is being undertaken in this area, hence National Grid intends to gain useful outputs and

learnings. The introduction of a smart interface to select the appropriate Basic Application Profiles (BAPs) for any given substation design is a key innovation, and there is no awareness of this being undertaken across the industry. This project enhances efficiency and customization in substation design ensuring that the project addresses specific industry needs without duplicating efforts.

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 because it addresses the current challenges in substation engineering by integrating advanced technologies and standardized practices that align with the latest IEC61850 technical reports. The development of machine-readable Basic Application Profiles (BAPs) in SCL format represents a significant shift from traditional engineering methods, enabling greater automation and efficiency in the design and operation of substations. By utilizing the Helinks STS tool, the project streamlines the creation and management of SCL files, facilitating a more agile and responsive engineering process. Furthermore, the project promotes the adoption of smart grid solutions, which are essential for integrating renewable energy sources and enhancing grid resilience. This forward-thinking approach not only improves operational practices but also supports the transition to a modernized energy system, making it a key innovation in the energy sector.

Relevant Foreground IPR

The introduction of a smart interface designed to select the appropriate Basic Application Profiles (BAPs) for various substation designs constitutes a significant innovation within this project. This unique capability positions National Grid at the forefront of substation engineering technology. The foreground IPR will include: software code, user interface design, data models, methodologies, technical documentation, patents, trade secrets, research findings.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

- A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click ‘Contact Lead Network’. National Grid 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 https://www.nationalgrid.com/uk/electricity-transmission/innovation
- Via our managed mailbox box.NG.ETInnovation@nationalgrid.com

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

The project involves considerable research, development, and proof of concept, making it fit well as an innovation project.

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

The project involves considerable research with the potential for new learning, which will result in a higher Technology Readiness Level (TRL) and ultimately offer significant benefits to the business. It aligns with the relevant NIA criteria.

This project has been approved by a senior member of staff

☑ Yes