Energy Networks Innovation Process
NIA Project Registration and PEA Document

Date of Submission: 18/07/2022

NIA Project Registration and PEA Document

Notes on Completion: Please refer to the NIA Governance Document to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 12 pages in total.

1. Project Registration

Project Title (*This cannot be changed once registered*)	Project Reference
VFES - Vulnerability Future Energy Scenarios	NIA_SSEN_0063

Funding Licensee(s)	Project Start Date
Scottish Hydro Electric Power Distribution Plc ("SHEPD") and Southern Electric Power Distribution Plc ("SEPD")	August 2022

Nominated Project Contact(s)	Project Duration
Tim Sammon	Eight months

Contact Email Address	Project Budget
fnp.pmo@sse.com	£144,000

Project Summary (125 words limit)

The move to net zero will make customers ever more dependent on a secure, affordable, and reliable electrical supply. There is greater potential to impact customers in vulnerable situations as well as to inadvertently create new forms of vulnerability. Current Distribution Future Energy Scenarios (DFES) don't effectively take consumer vulnerability into account. Vulnerability Future Energy Scenarios (VFES) aims to better understand potential changes and impacts. VFES will explore a triangulated method using innovative forecasting techniques which, if successful, could better inform operational practises. It may also allow better informed investment planning which takes vulnerability into account and won't leave vulnerable customers and communities behind.

Lead Sector

Electricity Distribution	x	Gas Distribution	
Electricity Transmission		Gas Transmission	

Other Sectors

Electricity Distribution		Gas Distribution	
Electricity Transmission		Gas Transmission	

Research Area

Net zero and the energy system transition	x	Optimised assets and practices	
Flexibility and Commercial Evolution		Whole Energy System	
Consumer Vulnerability	x	Energy System Transition	

Development steps

Technology Readiness Level (TRL) at Start	2	TRL at Completion	4

2. Project Details

2.1. Problem(s)

This should outline the Problem(s) which is/are being addressed by the Project. This cannot be changed once registered.

The energy landscape is changing quickly, with an increase in low-carbon distributed generation, electric vehicles, demand side response, low carbon heat, flexibility and energy storage transforming how networks need to serve customers. The GB distribution networks are also broadly aligned with the data used to produce their future energy scenarios.

Across the board, these DNO DFES forecasts are however lacking credible data, research and foresighting on potentially vulnerable customers and communities, and how this will change and evolve as we move to net zero. Without taking factors into account which relate to vulnerability, fuel poverty, medical care at home and other major lifestyle shifts, fairness in the transition to net zero is at risk.

All the DNOs have stated ambitions "not to leave people behind" in the transition to a low carbon future. To do this effectively we must strive to know what makes our customers and communities more or less resilient, where vulnerability and fuel poverty are most prevalent and which factors will drive change in the coming years.

2.2. Method(s)

This section should set out the Method or Methods that will be used in order to provide a Solution to the Problem. The type of Method should be identified where possible, eg technical or commercial.

For RIIO-2 projects, apart from projects involving specific novel commercial arrangement(s), this section should also include a Measurement Quality Statement and Data Quality Statement.

Ensuring a fair, inclusive and safe transition to net zero requires forethought and strategic planning.

Project VFES will bring together academia, data, and expert knowledge, triangulating these three approaches to develop a robust methodology. The project will test for the first time if combining them will give a clearer, and more reliable, forecast of Vulnerability Future Energy Scenarios which can be used to provide insights to allow for appropriate solutions to be developed.

The three methods are:
- **Foresighting –** Provided by Imperial College London (ICL)
- **Machine Learning –** Provided by The Smith Institute
- **Expert Validation** - Provided by policy experts at National Energy Action

Further detail is below in 2.3, Scope.

2.3. Scope

The scope and objectives of the Project should be clearly defined including the net benefits for consumers (eg financial, environmental, etc). This section should also detail the financial benefits which would directly accrue to the GB Gas Transportation System and/or electricity transmission or distribution.

VFES statistics, foresight and predictions will be modelled within both SSEN regions. The findings will be shared in a format which can be replicated by other DNOs. As the findings will relate to people, communities, and lifestyle changes, as opposed to network assets and distribution equipment, the methodology and principles for VFES should be replicable for other industries.

In scope will be:

- working with academia to use tried and tested foresighting techniques for assessing potential changes to communities and the lifestyles of consumers which could affect their energy usage patterns and potentially greater reliance on electricity giving rise to new forms of vulnerability

- partnering with data analytics, mathematicians, and machine learning experts to spot trends in consumer vulnerability data and PSR statistics using innovative machine learning technology to better forecast where vulnerability is likely to occur

- reviewing of the findings and suggestions uncovered during the project and validating reportable outcomes

- a report detailing the learnings and opportunities for further insight to enable more robust vulnerability forecasting

2.4. Objectives

This cannot be changed once registered.

The objectives of the VFES project are to explore how the use of new foresighting techniques, along with data analytics and expert validation can be used to identify and forecast consumers in vulnerable situations as we move toward net zero.

The project will produce a report detailing how far, and how accurately, foresighting and machine learning can predict network requirements based on customer, community, and wider societal factors.

2.5. Consumer Vulnerability Impact Assessment (RIIO-2 projects only)

Details of the expected effects of the Method(s) and Solution(s) upon consumers in vulnerable situations. This must include an assessment of distributional impacts (technical, financial and wellbeing-related). For RIIO-1 projects please add "Not Applicable"

VFES is a research project in RIIO-ED1, but the whole basis for VFES is to provide better services for vulnerable customers and communities in the future.

2.6. Success Criteria

Details of how the Funding Licensee will evaluate whether the Project has been successful. This cannot be changed once registered.

VFES will be a success if the partners produce:

- a combined report detailing how far, and how accurately, foresighting, machine learning, and expert validation/stakeholder engagement can predict network requirements based on customer and community factors

2.7. Project Partners and External Funding

Details of actual or potential Project Partners and external funding support as appropriate.

The core project partners are:
- ➢ ICL
- ➢ The Smith Institute
- ➢ National Energy Action

2.8. Potential for New Learning

Details of what the parties expect to learn and how the learning will be disseminated.

The partners will learn which aspects of academic foresighting, machine learning, and expert validation work best for predicting future vulnerability energy scenarios. VFES project will assess if these three methods can combine to produce the best results and if not, suggest alternatives.

This new learning will be disseminated in a report.

2.9. Scale of Project

The Funding Licensee should justify the scale of the Project – including the scale of the investment relative to the potential benefits. In particular, it should explain why there would be less potential for new learning if the Project were of a smaller scale.

The project builds on an initial first phase of academic foresighting undertaken by SSEN and Imperial College London (ICL). The scale of this project is the minimum viable next step.

2.10. Geographical Area

Details of where the Project will take place. If the Project is a collaboration, the Funding Licensee area(s) in which the Project will take place should be identified.

The project based with partners all working in England and/or Scotland. Data will relate to SEPD and/or SHEPD regions.

2.11. Relevant Foreground IPR

Details of expected Relevant Foreground IPR which will be generated in the Project. If applicable, this must also explain if Background IPR will be required to use the Relevant Foreground IPR.

N/A

2.12. Data Access Details

A description of how any data (de-sensitised where necessary) that are expected to be gathered in the course of the project can be requested by interested parties, and, if applicable, reasons why such data cannot be released to interested parties. This requirement may be met by including a link to the publicly available data sharing policy, which is required by virtue of paragraphs 2.13-2.16 of the RIIO-2 NIA Governance Document.

Default intellectual Property Rights (IPR) position will be applied

2.13. Revenue allowed for in the current RIIO settlement

An indication of the funding provided to the network licensee within the current RIIO settlement that is likely to be surplus to requirements as a result of the Project.

No funding has been included for the work in the current RIIO Settlement

2.14. Indicative Total NIA Project Expenditure

An indication of the total Allowable NIA Expenditure that the Funding Licensee expects to reclaim for the whole of the Project (RIIO1).

An indication of the Total NIA Expenditure that the Funding Licensee expects to reclaim for the whole of the Project (RIIO2).

Total expenditure is £144,000 of which 90% (£129,600) is allowable NIA expenditure.

3. <u>Project Eligibility Assessment</u>

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).

3.1. 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:

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

The potential to leave customers behind in the transition to Net Zero is real and we need better visibility of which communities or consumer demographics are likely to be left behind or not accounted for using current methods.

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

VFES is a vulnerability-based project with aims of benefiting consumers in vulnerable situations by predicting the scale and location of such situations as well as what new situations may cause vulnerability.

3.2.   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.

3.2.1.   Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

This is a research project to assess the initial viability of the approach

3.2.2.   Please provide a calculation of the expected benefits the Solution

This is for Development or Demonstration Projects, not required for Research Projects. It should be (Base Cost – Method Cost, Against Agreed Baseline) and include a description of the recipients of the benefits.

N/A

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

This must be in terms of the number of sites, the sort of site the Method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

If VFES proves to be a robust way of forecasting the future vulnerability the findings from this project will be presented in a way that will be usable by all GB DNOs. This is an initial assessment and will require further development to ensure that validity of the approach.

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

Not available at this stage – may be included in further follow-on work if this initial project provides a positive outcome.

3.3.   Requirement 3 / 1 – involve Research, Development or Demonstration

3.3.1.   RIIO-1 Projects

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 systems and 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 GB electricity transmission or distribution systems	☑
A specific novel commercial arrangement	☐

3.3.2.   RIIO-2 Projects

A RIIO-2 Project must involve the Research, Development or Demonstration of at least one of the following:

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	☐

3.4. Requirement 4 / 2a – develop new learning

licensees. For RIIO-1 Network Licensees may wish to address challenges specific to their network.

Please answer one of the following:

3.4.1. Please explain how the learning that will be generated could be used by relevant Network Licenses

The learnings from VFES will be disseminated and the project outcomes will be able to be used by all relevant DNOs to better inform their approach to more proactively identifying consumers in vulnerable situations.

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

N/A

3.4.3. Is the default intellectual Property Rights (IPR) position being applied?

This cannot be changed once registered.

Yes	x	No	☐

If "no", the following questions must be answered:

3.4.4. Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties:

We will be reporting on the project and able to deliver the following learning to other DNOs:

1. The extent, usefulness, and perceived accuracy of academic foresighting in predicting future vulnerability scenarios
2. The extent, usefulness and perceived accuracy of mathematics and machine learning in predicting future vulnerability scenarios and the expansion of PSR requirements
3. How well foresighting, machine learning and expert validation work together
4. A suggestion for timescales at which social data and PSR trend should be refreshed

3.4.5. Describe how any potential constraints or costs caused, or resulting from, the imposed IPR arrangements:

N/A - VFES will use standard NIA IPR arrangements

3.4.6. Justify why the proposed IPR arrangements provide value for money for customers:

N/A

3.5. Requirement 5 / 2c – be innovative

A Project must be innovative (ie not a business as usual activity) and have an unproven business case entailing a degree of risk warranting a limited Research, Development or Demonstration Project to demonstrate its effectiveness. This could include Projects which are untested at scale, or in relation to which there are risks, which might prevent the widespread deployment of the equipment, technology or methodology.

3.5.1. Why is the project innovative?

This approach of utilising foresighting techniques, machine learning and expert validation to proactively identify consumers in vulnerable situation has never been undertaken by a GB DNO before.

Why is the Network Licensee not funding the Project as part of its business as usual activities?

This proposal is a trial technique to test innovative methods of forecasting future vulnerability scenarios. If successful, this work could progress to benefit other DNOs or industries who need to predict consumer vulnerabilities in the future.

3.5.2. Why can the Project can only be undertaken with the support of NIA?

This is a research project which has yet to be proven, therefore requires NIA support to proceed.

3.6. Requirement 6 / 2d – 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.

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

The project builds on earlier work undertaken by ICL and SSEN, it will also utilise the learning from other consumer vulnerability related projects such as WPDs VENICE project. However, the three-pronged approach of foresighting, machine learning and expert validation to produce more robust and longer-term forecasts has yet to be attempted.

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

N/A

4. PEA approval

The senior person (RIIO-1) or senior network manager (RIIO-2) responsible for implementing RIIO-2 NIA Projects must approve the PEA. It must then be published on the Project Registration page of the Smarter Networks Portal.

Please confirm this project has been approved by a senior member of staff	X