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# NIA Project Registration and PEA Document

### Date of Submission

Sep 2023

### Project Reference Number

NIA_SSEN_0071

## Project Registration

### Project Title

Regional Energy System Optimisation Planning (RESOP)

### Project Reference Number

NIA_SSEN_0071

### Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

### Project Start

October 2023

### Project Duration

2 years and 1 month

### Nominated Project Contact(s)

Tim Sammon, Innovation Programme Delivery Manager at SSEN

### Project Budget

£2,894,576.00

### Summary

The RESOP project is a continuation of NIA Whole Systems Growth Scenario Modelling Phase 2 (WSGSM2). It will continue to develop digital tools necessary to create Local Area Energy Plans (LAEPs) and Local Heat and Energy Efficiency Strategies (LHEES). It aims to bring together a wider range of subject matter experts (SMEs), including Distribution Network Operators (DNOs), Gas Distribution Networks (GDNs), Heat Network Specialists, Water Networks and LCT specialists, for the purpose of building LAEPs.

### Preceding Projects

NIA_SSEN_0043 - Whole System Growth Scenario Modelling Phase 2

NIA_SSEN_0030 - Whole-System Growth Scenario Modelling

### Third Party Collaborators

Advanced Infrastructure

DNV

Field Dynamics

Landmark

Regen

Centre for Sustainable Energy

Urban Tide

Faculty Science Ltd

WSP UK Limited

## Nominated Contact Email Address(es)

fnp.pmo@sse.com

## Problem Being Solved

Regional bodies including Local Authorities (LAs) are increasing their focus on developing net zero plans, including Local Area Energy Plans (LAEPs), through collaboration with utilities, private industry and other energy stakeholders. In order to create LAEPs, LAs either require in house energy modelling expertise and energy modelling tools, which most do not have, or they need to pay consultants to do the work on their behalf. The modelling tools and the outputs created in accordance with Energy Systems Catapult (ESC) LAEP best practice are often not granular enough to be used for delivering projects, due to their long term strategic nature. The outputs are also made available via pdf and are unable to account for the latest network conditions, which means the plans become outdated quickly. LAs have been advised by consultants that these plans have to be refreshed, every four years approximately. This represents an ongoing high cost to LAs, which many may not be able to fund and due to the rapidly evolving nature of the energy grid the plans are likely to become outdated in months rather than years. The question of how to optimally decarbonise heat is ongoing with no industry consensus, making it challenging for policy makers to implement effective strategies. Heat Policy decisions will likely cause a large impact on both DNOs and GDNs, and a lack of evidence to inform these decisions is likely to lead to sub-optimal outputs such as inflated costs of energy being passed onto customers.

Novel digital tools are in the process of being developed to help Las with LAEPs, including LAEP+ which is being developed though NIA funded project Whole Systems Growth Scenario Modelling Phase 2 (WSGSM2). These tools can resolve the problems mentioned above by providing data sets to Las to create their own LAEPs on easily accessible and easy to use web GIS platforms. However, there is still significant development required before they can be used for the purpose of LAEP creation. There is a need to develop these tools further to include both gas and electricity data to assist Las in forecasting Net Zero futures. Some core missing features include the ability to take into account the latest network data, changing cost estimates, collaborative working processes across utilities, societal impacts, consumer vulnerability prioritisation, environmental impacts, wider cost implications on Whole Sale prices, and generation requirements to meet forecast demand growth.

## Method(s)

This project builds upon the learnings from the development work done through NIC project LEO and NIA project WSGSM2. It will also run in parallel with UK Power Networks (UKPN) Project CLEO, to leverage learnings and development requirements that arise through LA engagement and use of LAEP tools. The work packages set out below detail what is necessary to move development of LAEP+ forward to create Digital LAEPs i.e. a LAEP built and accessed by users via a web GIS tool. Development of other systems and processes will also be required to make this work, as detailed below.

**Work Package 1: LAEP+ Development**

1.1 LAEP+ Reporting Functionality

LAEP+ must be able to report outputs of LAEP in acceptable formats for GDNs/DNOs/LAs. For GDNs and DNOs reporting must be useable to inform investment planning and follow Ofgem requirements. For LAs reporting must follow government requirements.

1.2 LAEP+ Forecasting Rules Agreement

LAEP+ must be able to forecast potential futures based on agreed upon rules by both DNOs and GDNs. GDN rules need to account for WP 3.1 findings so the logic can be built into LAEP+.

1.3 Whole System Impact Assessment

LAEP+ needs to consider the Whole System Impact of finalised LAEPs. This includes additional generation requirements by LCTs and Hydrogen, as well as the potential impact this has on customer costs for installing new equipment and cost of bills by choosing one technology over the other. It should also consider decommissioning costs.

1.4 District Heating Forecasts

LAEP+ must be able to forecast optimal locations for district heating schemes and take into account their layout and costs within a LAEP plan. District heating rules need to be agreed upon and built into WP 1.2.

1.5 Digitise LAEPs on Pdf

LAEPs that have been created and are available via Pdf that have not been imported into LAEP+ via Cleo will be digitised and made

available on LAEP+.

1.6 Continuation of LAEP/LHEES work from NIA WSGSM2
Arup has been procured to deliver the LAEP and LHEES as part of NIA WSGSM2. this work will transfer over to NIA RESOP.

1.7 Cross Utility LAEP functionality
LAEP+ must be able to support LAs where multiple utilities exist.

1.8 LHEES functionality
LAEP+ must be developed to follow the 8 LHEES steps for Scottish LAs.

1.9 LAEP+ Roll out
LAEP+ to be rolled out to all LAs in SSENs areas for a minimum of one year.

1.10 AI LAEP Consulting
AI will perform LAEP consulting work for a selected LA i.e. take them through the entire LAEP process and provide support in order to learn from the process and develop LAEP+ with new requirements that arise. A digital LAEP methodology will also be created.

1.11 Water data
LAEP+ must make use of sewage data to assist with LAEP forecasting e.g. pipe diameter, flow rate, etc. This assists with LCT forecasts.

1.12 ESO / FSO Requirements
LAEP+ needs to take into account ESO / FSO requirements, which are yet to be determined.

1.13 Flexibility Services
LAEP+ needs to be able to identify when flexible services might be a suitable option to traditional reinforcement or capital expenditure.

1.14 Business Case Functionality
LAEP+ needs to be able to take into account business case functionality determined by LAs.

**Work Package 2: DNO Power Flow Software Development**
2.1 Power Flow Software Reporting Functionality
DNO Power Flow Software must be able to ingest new connection data from LAEP+ and produce automated reports that meet investment planning requirements.

2.2 Enhance self-serve functionality
Self-serve functionality wizard needs to be improved in accuracy. More effort is required to test and develop this and link it with internal SSEN systems

2.3 Develop Power Flow software to provide LV to GSP support
Power flow software must be able to analyse network changes from LV all the way up to GSP and provide feedback directly to LAEP+ via API

2.4 Evaluate Power Flow Systems performance
Power Flow systems will be compared and tested for the purpose of deciding which tool to take forward.

2.5 Flexibility Service Assessment
Power flow software must be able to assess whether a flexible service is applicable or not e.g. where reinforcement timelines prohibit connections, a flexible service offering could be an option

2.6 Asset sizing and cost estimation
Powerflow tools need to be able to size assets so they are Net Zero ready and provide costs of these assets. Tools also need to cost new connection costs from LV to GSP.

**Work Package 3: GDN: Pressure Management Software Development**
3.1 Net Zero gas forecast modelling
Forecasting needs to be improved to determine what a future gas grid would look like e.g. Hydrogen clusters, minimum viable pressure requirements, etc.

**Work Package 4: Collaborative Distribution Future Energy Scenarios (DFES) Development**
4.1 DFES Baseline Data Collection

DFES data collection needs to be automated by pulling data directly from LAEP+

4.2 DFES Forecasting LAEP Alignment
DFES forecasting needs to make use of LAEPs created in LAEP+ to improve forecast accuracy.

4.3 DFES Forecasting DNO / GDN Alignment
DFES forecasting methodology needs to be agreed upon by DNOs and GDNs, so they can be used to assist with investment planning activities to provide united paths forward.

4.4 DFES Automation
DFES forecasting needs to be automated so that it updates whenever a LAEP is updated within LAEP+ to provide the most up to date forecast possible.

4.5 VFES Integration
Vulnerability Forecast Energy Scenarios (VFES) need to be included WP 4.1 - 4.4.

4.6 Consumer Vulnerability Counterfactual Case Study
Pros and cons evaluation of targeting customers in vulnerable circumstances first for network upgrade study to understand the costs and benefits.

**Work Package 5: District Heating Forecasting**
5.1 District Heat Network Modelling
An understanding of different heat networks and how they could operate within an LA need to be modelled.

**Work Package 6: Digital LAEP Governance**
6.1 Whole System Collaboration Methodology for Digital LAEPs. A methodology document for creating digital LAEPs need to be created building on WP 1.5 to make it clear what is required for Utilities and Las.

Data Quality Statement (DQS):
The project will be delivered under the NIA Governance in line with Ofgem, ENA and SSEN internal policies. 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 in our internal systems with appropriate 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 supplier quality assurance regimes and the source of data, measurement process and equipment as well as data processing will be clearly documented and verifiable. The measurements, designs and assessments will also be clearly documented in the relevant deliverables and final project report made available for review.

## Scope

• Further development of the LAEP+ platform and connected tools, building on work by the preceeding Whole System Growth Scenario Modelling NIA projects, to provide LAEP and LHEES functionality that meets LA, DNO and GDN requirements i.e. Create Net Zero plans, and any emerging requirements resulting from the proposed creation of the Future System Operator.
• Integration of Gas and Electricity forecasts into LAEP / LHEES forecasting and DFES to improve forecast confidence.
• Onboarding of District Heating SME to assist with optimal location of District Heating projects within LAEP+.
• Further development of automated modelling by tools that feed in or connect to LAEP+ to reduce human resource requirements.
• Expand LAEP+ testing to a wider variety of Local Authorities to assist with development.

We expect the true savings of the project to be determined once LAEP+ is being utilised to determine optimum pathways to reach Net Zero. However, a high-level estimate of LAEP+ savings vs present day consultant costs to create LAEPs is estimated to be £3.17m per annum.

## Objective(s)

The project aims to meet the following objectives:
1. Develop Power Flow Software so that it can perform low voltage (LV) to grid supply point (GSP) modelling for integration with LAEP+.
2. Develop LAEP+ so that it can improve the forecast accuracy of LAEP functionality developed by project CLEO.
3. Improve gas forecast accuracy of LAEP+ through further development led by Gas Distribution Network Operators

4. Improve District Heating Forecast accuracy of LAEP+ through further development led by a District Heating SME(s).
5. Develop DFES methodology to include GDN, DNO and LA forecasts and integrate with LAEP+ to improve data flows.
6. Develop standardised reporting functionality on LAEP+/Power Flow Software to assist with investment planning and reporting.
7. Develop guidance methodology for creating digital LAEPs.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The RESOP project is expected to have a positive impact on consumers as shown below. This is mainly due to the collaborative nature of the project designed to improve Net Zero forecasting to create an optimal investment pathway.

See figure 1

## Success Criteria

The project will be a success if:
1. The Power Flow Software tool is able to perform LV to GSP load modelling studies to assist with self-serve connection functionality. The power flow outputs from Power Flow Software must be within sufficient error margins when tested against Power Factory, so that a decision can be made on what tool to use moving forward.
2. LAEP+ improves upon the current methodology of creating LAEPs through increased granularity and accuracy of forecasting, as well as stakeholder acceptance by all parties i.e. LAs, DNOs and GDNs.
3. GDNs must sign off on the methodology and accuracy of LAEP+ when determining where gas solutions are appropriate within digital LAEPs.
4. District Heating SME(s) must sign off on the methodology and accuracy of LAEP+ when determining where district heating solutions are appropriate within digital LAEPs.
4. DFES methodology needs to be expanded so that it considers the views of DNOs / GDNs / LAs and utilise LAEP+ to assist with obtaining baseline and forecast data. A new methodology needs to be created and signed off by all parties.
5. LAEP+ and Power Flow Software must have reporting functionality that meets DNO / GDN / LA requirements so they can report in a standardised way. The reporting functionality needs to be signed off by all parties.
6. Guidance documentation needs to be created on creating digital LAEPs.

## Project Partners and External Funding

See table 1

## Potential for New Learning

Key learning from this project will include:
1. How modelling the entire network from LV – GSP can assist with connections decisions and what tools are optimal for making these decisions.
2. How LAEP+ can be improved so that it creates more accurate LAEP forecasts vs current best practice.
3. How LAEP+ accounts for gas forecasting within LAEPs and the methodology / rules that are needed for this forecasting to take place.
4. How LAEP+ accounts for district heating forecasting within LAEPs and the methodology / rules that are needed for this forecasting to take place.
5. How the DFES/GFES methodology can be developed to include GDN, DNO and LA forecasts and be integrated with LAEP+ to improve data flows and inform wider forecasting by the ESO / FSO.
6. Standardised reporting functionality on LAEP+/Power Flow Software to assist with investment planning and reporting.
7. Creation of a digital LAEP methodology to be shared with other industry stakeholders.

## Scale of Project

The project is fairly large in scale due to the number of collaborators and the amount of development work that is required. The project will engage with all LAs in SSEN's network areas. A smaller scale project has already been conducted i.e. WSGSM2, which has demonstrated the benefit of the method with two of these LAs and enabled the addition of other energy vector partners to further develop the tools and working practices necessary to collaboratively meet Net Zero targets.

## Technology Readiness at Start

TRL4 Bench Scale Research

## Technology Readiness at End

TRL6 Large Scale

## Geographical Area

The project will take place across the following licence areas:
Scottish Hydro Electric Power Distribution
Southern Electric Power Distribution
Scotland and Southern Gas Networks
Cadent Gas

## Revenue Allowed for the RIIO Settlement

N/A – Funding has been made available to DNOs to assist with Whole Systems work but not specifically for developing the tools required to facilitate Whole Systems working practice.

## Indicative Total NIA Project Expenditure

RIIO2
The expected Total NIA Expenditure is £2,894,575.45m

# 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:

This project aims to develop tools that will assist with collaborative long term strategic Net Zero planning as well as short-term project implementation.

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

The tools developed in this project embody vulnerability datasets to allow specific consideration of their needs. Accordingly, the project would be able to assist Local Authorities in targeting customers in vulnerable situations for investment if appropriate.

## 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 expected financial benefits of this solution are not known yet. This will be one of the main outcomes of the project as the tools developed through RESOP will aim to provide Local Authorities with greater insight on how to create and deliver Net Zero plans. These plans/LAEPs will provide different cost options, which can provide savings to customers through lower investment costs or lower customers' bills by choosing one solution over the other. For example, investment options for domestic heating will be compared across different technologies (Heat pumps, district heating, hydrogen, etc.) and the cost implications of adopting these technologies will be made visible to the LA. The LA can then select the cheapest cost option, which may have cost savings, or societal benefits.

Below we have included an indication of some expected benefits, illustrating some direct benefits of digitising LAEPs.

Presently, the main way of creating a LAEP is by paying for a contractor to carry out the work, which typically takes about nine months and costs in the hundreds of thousands of pounds. The outputs of these LAEPs is a pdf document that quickly becomes outdated and as such is suggested to be renewed every four years. This represents a significant ongoing cost to Local Authorities that have to pay for these plans and due to the fast moving nature of the energy industry the plans can become outdated quickly and represent a challenge to turn the plans into delivery work.

Digital tools such as LAEP+ are being developed to create 'living LAEPS' that can be updated monthly/daily/hourly, depending on data availability. This makes the LAEPs more resilient to change i.e. they can be re-run more frequently and as such offer more value for turning plans into delivery. Costs are also reduced vs the contractor approach, which means cost savings can also be realised. A high level view of cost savings is presented below.

Base Cost
Average cost of paying consultants to carry out a LAEP per LA - £100k every 4 years, or £25k per annum

Method Cost
Average cost of using LAEP+ tool to create a LAEP per LA per annum is £15k

Savings per LA = £25k - £15k = £10k
Savings across 317 LAs in the UK = £7.925m -£4.755m = £3.17m per annum

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

This solution is designed to be replicable across the whole of the UK for all Local Authorities and Utilities.

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

This will be dependent on the final solution and the number of linked tools that need to be developed. A high-level estimate would be about £15k per Local Authority per year. Costs may significantly reduce with economies of scale. The total cost of rolling out the solution across GB would be £4.755m (see 3.2.2 for details).

### 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

Learning from this project will not just be reports on how to methodologies. It will develop the tools required for Whole System collaboration to be successful that can be implemented across any Local Authority for any utility to feed into.

### 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 project is building upon the work of the preceding Whole System Growth Scenario Modelling NIA projects and working in parallel with the CLEO NIA project to ensure no duplication occurs and that we continue to improve the capability of Net Zero tools.

### 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

The project is innovative as it seeks to assist a new working arrangement between Utilities and Local Authorities that has not been done before i.e. the collaboration between electricity and gas network operators to assist Local Authorities with planning for Net Zero.

### Relevant Foreground IPR

Background IPR will be required in order to utilise software tools such as LAEP+, Power Flow Software, Powerfactory, etc.

Foreground IPR that is likely to be developed includes methodologies on how DNO and GDN data sets can be combined to create forecasts of future energy systems as well as new ways of working across Utilities and Local Authorities, which will be made available through reports. The developed tools can be made available to all Local Authorities and Utilities through engagement with their providers.

### Data Access Details

For information how to request data gathered in the course of this project, see Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://ssen-innovation.co.uk/innovation-strategy/.

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

There is no funding available for this type of innovation development work. However, it will specifically assist Whole Systems teams that utilities are beginning to set up.

### 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

NIA is the best method available to facilitate collaboration across both gas and electricity networks for innovation projects. Due to the novel nature of these tools and working practices they are yet to be integrated into BaU and as such require development funding to make them BaU ready to ensure we have reduced risk in a number of areas. Without sufficient development and testing of these tools, the risk of inaccurate forecasting could have significant impacts on identifying decarbonisaiton zones in terms of what technology to apply and when to apply it.

### This project has been approved by a senior member of staff

☑ Yes