

## Date of Submission

May 2021

# NIA Project Registration and PEA Document

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.

## Project Registration

### Project Title

Smart Hammer

### Project Reference

NIA\_SSEN\_0044

### Project Licensee(s)

Scottish Hydro Electric Power Distribution and Southern Electric Power Distribution

### Project Start Date

February 2020

### Project Duration

1 year and 8 months

### Nominated Project Contact(s)

Joe McNeil

### Project Budget

£498,200.00

### Nominated Contact Email Address(es)

Fnp.pmo@sse.com

### Problem(s)

Wood poles are typically used as a structure support on electricity distribution overhead line networks in the UK. Like other assets, there is a statutory requirement to inspect their integrity on a regular basis and this is usually addressed through simple visual inspection and hammer testing. Achieving consistent accurate data is a challenge, which can lead to inefficiencies with follow on works.

The Hammer test is used to identify the presence of internal or external wood decay through the feel of the hammer striking the wood and the sound this produces. Overhead Linesmen test poles as a safety check, before attempting to climb poles to carry out their duties. Asset Teams use overhead line assessor operatives to test wood poles as part of their daily duties capturing and recording the status of our network for Asset replacement planners.

The method of testing a wood pole is to use a standard hammer to strike the pole and for the operative to assess the audible response as an indication of the quality of the asset. However, the outcome of this assessment only provides basic information such as pass, fail, suspect. This is then used by the linesman to determine whether the pole is safe enough to climb or not. In parallel, the Asset assessment team has been trained to interpret the sound of the hammer strike into a score in the range of one to five. This information enables subsequent decisions regarding pole replacement.

The challenge when using a standard hammer to assess the pole condition is sound perception of an individual and associating it to the correct asset health score. A standard hammer is also unable to provide granular detail of a pole condition or automate the same data directly into an asset database. These sounds can be perceived differently depending on the operator, therefore providing inconsistent data.

Results from initial inspections, referred to as Health Classifications, are collected and form part of the asset database. When an operative identifies a suspect pole classification there will be a requirement for a secondary more detailed, time consuming and costly assessment of the wood pole to specifically identify the extent of decay or damage.

The secondary test would be carried out by a different and more experienced operative who would be competent in using secondary pole testing equipment.

### Method(s)

1. Development of Smart Hammer. This will be carried out within 6 stages, including factory testing and small sample field tests.
2. Trials will take place across all SSEN Operational Regions to test and prove the Smart Hammer on poles within the networks. I.T implementation will also be carried out during these trials

### Scope

STAGE 1 - SMART HAMMER DEVELOPMENT - X-Models

X Model Development  
Define Hammer Evaluation Test strategy  
Evaluate Accelerometer sensors  
Make Sensor Selection

**STAGE 2 - SMART HAMMER DEVELOPMENT - A-Models**

A Model Development  
Create automated testing environment  
Determine Utilization Parameters  
Develop Data extraction  
Field Trial Smart Hammer to Identify the Sensor Selection.  
Create Draft Training Material

**STAGE 3 - SMART HAMMER DEVELOPMENT- B-Models**

B Model Development. Refine & Build Prototype Hammer with finalised Sensor Selection  
SSE Evaluate IT System for Maximo Integration  
Refined Automated Swing Test for operational improvement  
Prototype Field Trials & Evaluation

**STAGE 4 - SMART HAMMER DEVELOPMENT - Pre- Pod-Models**

Build Pre-Production of finalized Hammer  
I.T – Maximo integration  
Data Analytics Trial  
Pre-Prod Models Field Test & Evaluation  
Policy & Procedure to approve network testing.  
Create Training Material

**STAGE 5 - Field Trials**

Undertake Field Trials  
Capture Trial Data  
Field Trial Evaluation  
Compare Baseline & Field Trials  
Recommendations for BAU

**STAGE 6 - Closure**

Finalize Policies & Procedures  
Finalize Training Material

**Objectives(s)**

By the end of the project

1. To have established the technical and commercial viability of using a Smart Hammer with accurate and repeatable results.
2. Conduct consistent and reliable initial wood pole inspections as an alternative to the traditional hammer test method.
3. The ability to capture pole data and integrate with asset databases
4. To have disseminated the learning from the project through annual or exceptional events for the benefit of GB customers.

**Success Criteria**

1. Early identification of equipment not to take through development phases and field trials.
2. Ability to test poles within asset health scoring matrix.
3. Ability to detect pole replacements without the need for secondary invasive techniques.
4. Ability to notify systems that secondary testing is required with more advanced technical equipment.
5. Low cost Smart Hammer which is affordable to issue to all overhead line assessors and linesmen.
6. Efficient consistent pole test scores no matter who uses the hammer.
7. Ability to capture the information from the Smart Hammer in the asset database via a Smart Phone application.
8. Ability to capture granular detail of pole condition to enable desktop assessments for efficient planning.
9. Ability to demonstrate wood pole asset health with accuracy – Data assurance and improve accuracies in reporting.
10. Opportunity to improve and make internal processes more efficient adopting Smart Hammer as a front-line tool and a create a response matrix.

**Technology Readiness Level at Start**

TRL 5

**Technology Readiness Level at Completion**

TRL 8

**Project Partners and External Funding**

n/a

## Potential for New Learning

All licensees which use wooden poles will benefit from the development of a Smart Hammer that can assess the condition of wooden poles that is both accurate and efficient in application. This will allow for a significant improvement in the quality of the asset condition data for these assets.

## Scale of Project

Operational staff from seven SSEN Distribution Regions will conduct trials using Smart Hammer on their network. These methods will also be used in conjunction with other equipment already being used on the network.

Within the duration of the project, product development, factory tests and field trials will be carried out to assess Smart Hammer output. A project of lesser scale would be inadequate for the anticipated level of field activities.

## Geographical Area

Trials will be conducted in SEPD and SHEPD licence areas.

## Revenue Allowed for in the RIIO Settlement

None

## Indicative Total NIA Project Expenditure

The total expenditure is £498,200, of which 90% (£448,380) is allowable NIA expenditure

## Project Eligibility Assessment

### Specific Requirements 1

**1a. A 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 the 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 Network Licensee's System

A specific novel commercial arrangement

### Specific Requirements 2

**2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees**

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

This technology could standardise the inspection protocol for overhead line wood poles in the industry throughout the UK.

**Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.**

1.1 Asset health and Productivity (Service, Safety); Specifically:

- Cost-effective asset monitoring and accurate knowledge of the state of our assets
- New methods of asset health assessment

**2b. Is the default IPR position being applied?**

Yes

X

## 2c. Has the Potential to Deliver Net Financial Benefits to Customers?

Yes

X

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

Base Costs (per year):

Secondary Inspection cost = £286,747

Total cost = £286,747

Method Costs (per year): Breakeven

Smart Hammer costs = £60,360

Secondary Inspection cost = £225,383 (@ 21.4% reduction in secondary inspections)

Total cost = £285,743

Increased benefits will be achieved with higher reduction in secondary inspections

30% Reduction in secondary inspections = £86,024

40% Reduction in secondary inspections = £114,699

50% Reduction in secondary inspections = £143,374

60% Reduction in secondary inspections = £172,048

70% Reduction in secondary inspections = £200,723

### Please provide a calculation of the expected financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost - Method Cost, Against Agreed Baseline).

Base cost – Method cost = £286,747 – £285,743 = £1,004 benefit per year for 21.4% reduction in secondary inspections. Additionally, there will be a £28,675 benefit per year for each 10% additional reduction in secondary inspection. Benefits from IIS reduction are excluded.

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

Developed methods will be based on the development of the Smart Hammer and will be fully transferable to all DNOs who want to acquire them. The method would have the potential to be deployed to all applicable field teams.

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

Costs and the associated benefits can be extrapolated out to include other GB networks if the technology is taken up. These will depend on the region-specific requirements, i.e. number of units required, number of poles on the network etc.

## 2d. Does not Lead to Unnecessary Duplication

Yes

X

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

There are existing solutions and a current NIA project which investigates pole testing equipment. However, these new tested solutions are only for secondary, more in-depth assessments, and not the initial testing done every day. Secondary equipment is too expensive, complex and not practical to be used as a front-line tool to test poles. Smart Hammer is a low-cost instrument used as an everyday tool that will reduce the need for use of secondary testing equipment.

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

We are not aware of any similar projects being carried out.

## Additional Governance Requirements

**Please identify**

that the project is innovative (ie not business as usual) and has an unproven business case where the risk warrants a limited Research and Development or Demonstration Project to demonstrate its effectiveness

X

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

The project is innovative as it is developing and trialling a novel solution that has not been done in the UK before now.

**ii) Please identify why the Network Licensee will not fund such a Project as part of its business as usual activities**

There are no funds available within the RII0-ED1 settlement to carry out this type of project. The TRL of the tool being developed is also too low to be funded by BaU and as such requires additional resources to be spent on it before it can reach BaU readiness.

**iii) Please identify why the Project can only be undertaken with the support of the NIA, including reference to the specific risks (eg commercial, technical, operational or regulatory) associated with the Project**

The technology within this project is unproven with a high level of cost uncertainty in the finalised product, placing the business case in the high-risk category. It would therefore not attract BaU funding from the business. The method developed by the project will be replicable across all network areas, therefore it requires NIA support.

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

