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.

Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

NIA Project Annual Progress Report Document

Date of Submission

Jun 2022

Project Reference

NIA_WPD_061

Project Progress

Project Title

Active Creosote Extraction (ACE)

Project Reference

NIA_WPD_061

Funding Licensee(s)

WPD - Western Power Distribution (East Midlands) Plc

Project Start Date

November 2021

Project Duration

1 year and 5 months

Nominated Project Contact(s)

Jacob Lynch

Scope

Across all four license areas WPD currently has 1,377,000 treated wood poles facilitating the electricity distribution network. Annually 27,000 of these poles are replaced with redundant poles either being left for landowners or returned back to the local depot site. Poles which are returned to depot account for approximately 10% of the total poles replaced, therefore currently 90% are being left on site for landowners. As environmental restrictions and legislation become more stringent it is apparent that the activity of leaving poles for landowners is becoming less feasible and a restrictive method of disposing of redundant wood poles.

Due to their creosote content, all returned redundant poles must be disposed of as hazardous waste and historically have been disposed of to landfill. The redundant poles cannot be reused nor can they be ‘donated’ in bulk to other organisations. Since 2014, and in line with the waste hierarchy, the poles have been taken to a waste to energy incinerator facility in South Yorkshire for disposal, the only facility in the UK licensed to incinerate treated wood.

In 2016/17 WPD spent £253,320 on the disposal of returned poles at the South Yorkshire facility, and the most current disposal figures, between November 2019 and October 2020, shows 840 tonnes of treated poles were sent for incineration at a cost of £185k. WPD is reliant on the continued operation of the South Yorkshire site to accept and dispose of all treated waste poles (currently only approximately 10% of all replaced wood poles), the volume of which is likely to increase in the near future as stated above.

The project’s main non-financial benefit will be creating a new and commercial method of disposing of creosote impregnated wood poles. This new method will significantly reduce the carbon emissions compared to the current incineration process. This method will create a new pathway for wood pole disposal and will also avoid any impact on the business if changes in legislation are made in the

future. If the wood poles are deemed non-hazardous waste, they will be able to be re purposed, such as being donated to charities and being used for playgrounds and parks. This project will make a major contribution in meeting WPDs target of a net zero business by 2028.

Objectives

The objectives of the project are to;

- Develop an extraction method that can extract creosote from wood poles at a length of 2.5m.
- To determine the best type of extraction method that can be used for creosote extraction.
- To develop an extraction method that can extract creosote from wood poles at a length of 5.0m.
- To determine the best type of extraction method that can be used for creosote extraction.
- To develop the extraction method further to enable a carbon recovery unit within the extraction loop.
- To create a disposal method where wood poles can be deemed as non-hazardous waste.
- To assess the commercial validity of the extraction method.

Success Criteria

- Extraction tests carried out for a 2.5m pole.
- Identification of best extraction method.
- Extraction tests carried out for a 5m pole.
- An assessment will be carried out on the commercial validity of the system.
- Creating a method that can deem poles that have had creosote extracted from them as non-hazardous waste.

Performance Compared to the Original Project Aims, Objectives and Success Criteria

The original objectives listed in section 2 are all relevant to work that will be undertaken in later work streams. In effect, no direct comparisons can be made to the objectives and the success criteria. The work undergone thus far has centred on equipment procurement that will be the foundations to meeting the objectives and success criteria.
Therefore, some indirect contributions towards the objectives have been made so far but will not materialise until later in the year.

Required Modifications to the Planned Approach During the Course of the Project

A change request has had to be submitted as per our Innovation guidelines due to the delay in some of the equipment be procured related to the extraction equipment. Because of this delay, the overall delivery has had to be re-scoped. This has resulted in future milestones being pushed back to later dates. However, the project delivery is still within the original timescales.

Lessons Learnt for Future Projects

The key learnings that have been generated from the project are summarised below.

- For wood poles to be accepted (and retracted) in the extraction tank a pressure seal has to be opened and closed. To handle the pressure of 1400 psi, the seal is constructed using domed caps attached with 20 bolts. Due to safety concerns, every time the seals are removed, they would have to be re pressure tested by the manufacturer. To counter this, a quick release opening mechanism is being designed, only requiring pressure testing once.
- For Poles to be deemed as non-hazardous waste, all measured creosote components within the wood must be at or below 0.1%.
- The basis of this trial is the extraction of creosote from redundant wood poles using SFCO2 (Supercritical Fluid Carbon Dioxide), using CO2 that is above its critical temperature and pressure of 31°C and 1078 psi respectively. Under these conditions, permeability is increased into the wood creating an increase in creosote extracted from the wood.
- Procured wood poles, when cut up, must be marked to ensure coherent data is generated when undertaking baseline analysis.
- High Pressure gasses must be stored outside and due to the size and weight, have to be mounted on concrete plinths.
- When handling hazardous waste, regulatory permissions must be in place before any related activity can take place. Plenty of time must be set aside to carry out the application process and time for review & approval from the regulatory body.
- Trialling a variety of wood poles will be key – different sizes, age demographic, geographic will determine whether the extraction method can work for a whole range of poles that are out on the network.
- Fourier Transform Infrared spectroscopy, Gas Chromatography / Mass Spectrometry (GCMS) and High Pressure Liquid Chromatography (HPLC) are quantitative chemical analysis techniques that will measure the extraction success. Firstly, during extraction by monitoring the creosote present in the CO2 in a highpressure flow cell. Secondly, post extraction by taking representative samples from different depths of the wood.

Further learning will now take place over the next few months when the first of the extraction tests begin, scheduled for late summer

2022. It is anticipated that the first set of data will give an indication to the performance of the system.

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

The Outcomes of the Project

The project is currently progressing towards work packages two and three, which look at extraction of creosote from wood poles for 2.5m and 5.0m sizes respectively.
So far, during the equipment procurement stage of the project, the list below gives a summary of the outcomes thus far:

- Detailed report completed that describes the analytical equipment and the procedures required to measure the success of the extraction process.
- Application submitted and accepted by Natural Resources Wales (NRW) allowing handling of creosote impregnated wood poles on the trial site.
- Sampling, Analytical and extraction equipment, fully specified and purchased.

Data Access

To date, no data has been generated from the project so far.

Foreground IPR

ACE will generate the following relevant IPR:

- Based on existing background, some relevant foreground IPR is likely to be generated. However, such relevant IP is not expected to be of a material nature.
- Creosote extraction from impregnated wood using pulsed Supercritical fluid carbon dioxide.
- Creosote extraction from impregnated wood using solvent modified Supercritical fluid carbon dioxide.
- Design and implementation of a system capable of extracting creosote from impregnated end of life wooden utility poles by Supercritical fluid carbon dioxide.
- Design and implementation of a system capable of recovering an recycling carbon dioxide from a Supercritical fluid carbon dioxide extraction system.
- Work Package reports.