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

Nov 2021

Project Reference Number

NIA_WPD_061

Project Registration

Project Title

Active Creosote Extraction (ACE)

Project Reference Number

NIA_WPD_061

Project Licensee(s)

National Grid Electricity Distribution

Project Start

November 2021

Project Duration

2 years and 5 months

Nominated Project Contact(s)

Jacob Lynch

Project Budget

£1,469,758.00

Summary

Active Creosote Extraction (ACE) is an environmental based innovation project aligning with decarbonisation and net zero. Disposal of creosote impregnated wood poles is a significant hazardous waste stream that is only going to escalate in the coming years, due to more stringent legislation likely to be put in place and the disposal method through landowners inevitably becoming unviable. Leaving high temperature incineration the only option, this method is a deterrent for DNOs needing to reduce their carbon emissions. By creating a method, where creosote can be extracted from redundant wood poles to such levels they are deemed non-hazardous waste, high temperature incineration can be avoided resulting in significant carbon emissions savings and taking a significant step to net zero.

Third Party Collaborators

GPT Environmental

Problem Being Solved

Decarbonisation is a fundamental and complex challenge for any business looking to achieve a goal of net zero, a goal WPD have set to achieve by 2028. Creosote, a preservative used in wood poles that support overhead lines on WPDs, other DNOs and BTs network, is a carbonaceous material which when disposed of can only be done in a facility in South Yorkshire, through an incendiary process as the poles are treated as hazardous waste. This accounts for roughly 10% of WPDs' redundant poles. The other 90% is left on landowners' property. However, environmental restrictions and legislation is beginning to become more stringent and 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.

Method(s)

The project will compromise of 4 Work Packages.

- The first work package will involve procurement of the extraction system, test equipment and preparation of the test area before the

extraction methods can be tested.

- The 2nd Work Package will involve testing the extraction system on a wood pole cut to 2.5 metres in length. This work package will test multiple methods of extracting the creosote. The best method identified will be taken on in work package 3.
- Work package 3 will involve modification to the extraction unit so that it can be used for a 5 metre wood pole.
- Work package 4 will aim to test methods of recycling the generated CO2. This will be after a go/no go stage due to possible high financial costs associated that can only be confirmed closer to the time. Upon closure of the project, an assessment will be made to deduce its commercial validity.

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.

Objective(s)

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.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

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.

Project Partners and External Funding

The project partners for this project are GPT Environmental, with their contribution to the project being £50,000.

GPT Environmental are a consultant that have a background in environmental management services, contaminated land services and flood defence services.

Minton, Treharne and Davies will be involved to assess the generated test results from the project. There is currently a potential for Natural Resources Wales (NRW) to be involved and act in an advisory type role.

The environmental team at WPD will also provide a service to the WPD Project manager.

Potential for New Learning

The learning from the project will be contained in work package reports, capturing all relevant details about the work undertaken in the corresponding work stream. It is also expected that dissemination will be carried out through presenting learning at the environment committee, the first of which will be in Q1 of 2022. The expectations on the learning will be details of how exactly the extraction system works.

Scale of Project

The Proof of principle that creosote can be extracted from wood poles has already been undertaken by GPT Environmental. This proof of principle was on chipped poles and will only be a viable disposal route if the creosote can be extracted from full diameter poles.

The smallest scale we can trial this on would be a small section (2.5 metre) of full diameter pole, utilising an extraction vessel capable of withstanding the extraction conditions required to ensure supercritical conditions. We would test a range of methodologies for extracting the creosote from a 2.5 metre pole to research the most effective method for extraction.

Once the proof of concept is proven (that we can extract creosote from a full diameter pole) and the most effective methodology is identified, we would then scale this up to a 5 metre pole. The second test will prove the scalability and research the energy and carbon usage needed in a scaling up process.

For the project to be successful we would need to prove we can extract creosote from a 5 metre length of pole at full width. This could then be commercialised by scaling up the extraction vessel so that multiple lengths can be treated at the same time. This method should have substantial carbon emission savings, however as a gate review we would also hope to prove the carbon dioxide needed in this process can be recovered to give a significantly higher carbon reduction.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The trial and extraction facility will be based at a site deemed operationally appropriate by GPT Environmental of Pyle, South Wales. The results will be shared with Natural Resources Wales and the Environment Agency to formally ascertain the classification of the wood as either hazardous or non-hazardous following the extraction process.

Revenue Allowed for the RIIO Settlement

The project ends at the tail end of RIIO ED1 meaning no revenue savings are to be expected within the settlement period.

Indicative Total NIA Project Expenditure

Partner contribution: £50,000

WPD contribution: £151,975

Funding from NIA: £1,317,782

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 focuses primarily on decarbonisation, a challenge that is at the forefront of any business within this industry. Creosote, a preservative used in wood poles that support overhead lines on WPDs' and other DNOs' network, is a carbonaceous material which when disposed of can only be done in a facility in Doncaster, South Yorkshire, through an incendiary process as the poles are treated as hazardous waste. This accounts for roughly 10% of WPDs' redundant poles. The other 90% are left on landowners' property. However, environmental restrictions and legislation is beginning to become more stringent and 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.

Integrating innovation with wood pole disposal has the potential to create a method that could significantly reduce the carbon emissions that are generated from the disposal method of wood pole incineration. If this method could be approved and further commercialised, the environmental benefits would be crucial, especially when trying to achieve net zero.

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

N/A

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)

The proposed carbon friendly method has been estimated to cost £2.4m annually based on 21,600 poles being treated. This averages £113.46 per pole. Given an average weight of a pole roughly 250kg, this comes out at a price of £453.84 per tonne. The south Yorkshire facility temporary closed in 2018 due to the Environment Agency becoming more stringent in their legislation and forcing Trackworks to make their facility more compliant. During that time, WPD consulted with other companies for an alternative disposal method as a back log was beginning to take place at local WPD depots. One option was to deliver and incinerate the poles to the Veolia incinerator in Ellesmere Port. Transporting to the facility was quoted at a price of £115 per tonne with incineration costs quoted at £350 per tonne. A total of £465 per tonne. Another option was sending the waste to Europe. This was quoted at £350 per tonne including transport costs. These prices are likely to have increased due to inflation and Brexit taking place since the quotes were given.

Please provide a calculation of the expected benefits the Solution

The potential environmental benefits that this project could bring are monumental. This proposed method could significantly reduce the carbon emissions compared to the traditional incineration process. This method will create a new pathway for wood pole disposal and will also avoid any impact on network licensees 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 and donated. If successful, this project will make a major contribution in decarbonising DNO networks.

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

Due to all other DNOs and other utilities utilising wood poles as assets, this method would be entirely applicable to the aforementioned parties across GB.

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

It is anticipated that this method can be scaled and commercialised so that it can be rolled out into BaU. The costs explained in section 3.2.1 indicate a very early estimate of the cost per pole for disposal. This will more than likely reduce in price as the disposal method is scaled up and more understanding is generated from the project.

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

All other network licensees and a few other industries would be able to adopt this method of wood pole disposal, if the method is to be proven, approved and commercialised. Many DNO Innovation strategies have decarbonisation and/or reducing environmental impacts within their documents. By sharing the learning during and after the project with relevant network licenses, they will have the opportunity to adopt the method as their primary disposal route for wood poles. This would only further reduce carbon emissions across the UK for all network licenses.

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.

No other projects are currently looking at alternative disposal methods for wood poles. Creosote extraction, is a highly specialised area with very few experts able to show such knowledge. The project will aim to be disseminated through showcase events and the environment committee where multiple stakeholders and DNOs will have the chance to see how the project is progressing.

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

Decarbonisation is a topic of discussion that surfaces daily within innovation. Trialling a method that has never been carried out before in an area that needs addressing in terms of its own carbon footprint is not only meaningful but also innovative. A project was undertaken by the same project partners on extracting creosote from small wood chippings. This project will build on the learning developed from that project and aim to generate significant outputs that changes the way of disposing of wood poles.

Relevant 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.

Data Access Details

N/A

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

The proposal is a significant change to the current disposal method. The project will initially test whether the extraction/disposal method is commercially viable. Therefore, it is not ready for business as usual.

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 can only be undertaken with the support of the NIA due to:

- The proposed method is unproven at this scale and is a world first. It has only been tested on wood chippings.
- To establish whether the method is commercial, compliant and achievable, a trial needs to be undertaken outside of BaU.

This project has been approved by a senior member of staff

☑ Yes