Active Creosote Extraction (ACE)

Six Monthly Progress Report

November 2021 – April 2022

Electricity Distribution

nationalgrid

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1. Executive Summary

Active Creosote Extraction (ACE) is funded through Ofgem's Network Innovation Allowance (NIA) and has a budget of £1,470,000. ACE was registered in November 2021 and after completing a mobilisation period, the project started in January 2022 and will be completed by March 2023.

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 other current 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.

This report details progress of the project, focusing on the last six months, October 2021 – March 2022. It should be mentioned for the context of this report that between November 2021 and January 2022, the mobilisation of project took place, so not much content can be covered in this report due to the sensitivity of the activities that took place over that period. This report will aim its focus on when the project work commenced, which was mid-January 2022.

1.1. Business Case

NGED have identified the disposal of end of life poles as one of the biggest environmental challenges the company faces. As mentioned in the previous section, incinerating one tonne of wood is equivalent to the emissions produced of a Ford transit van driving 17,500km. NGED sent 840 tonnes of wood poles for incineration between October 2019 and November 2020. That yields an equivalent emissions output of a Ford transit van driving 8,540,000km, the equivalent of driving to the moon and back 11 times.

NGED replace 27,000 poles annually, there is currently an exemption, which allows NGED to leave end of life poles for the landowners to use. 90% of NGED's end of life poles are currently left on site, however if this exemption is revoked, NGED will have to dispose of an additional >24,000 poles every year. There is only one disposal site in the UK able to process creosote impregnated poles which is already running at capacity, so if this exemption were to be revoked NGED would have no option but to dispose of poles overseas or at a different location, methods that will not only increase the overall cost but also increase the carbon emissions output due to increased transport such as shipping. The proposed carbon friendly method, has been calculated to cost £2.4m annually with

21,600 poles being treated. This averages £113.46 per pole. Given an average weight of a pole is 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, NGED consulted with other companies for an alternative disposal method as a backlog was beginning to take place at local NGED 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 increase due to inflation and Brexit taking place since the quotes were given.

Creosote was banned for public sale back in 2003. NGED are exempt from the ban which means the use of creosote can continue within the business. Still, the trend is that this exemption will not last for much longer. The business must act now to avoid any significant congestion in wood pole disposal, significant fines resulting in creosote usage from the exemptions possibly expiring and to be the leader in reducing carbon emissions with regards to wood poles.

This will be a big contributor in taking a step towards achieving NGEDs target of a net zero organisation by 2028. The current disposal method relies on incinerating the poles which creates a significant amount of carbon, which is at present, unavoidable.

The aim of this project would be to prove that the creosote can be extracted and the poles reused for other applications, allowing an alternate route for end of life poles at a significantly lower carbon creation/usage. This would potentially create an opportunity to re-use the re-purposed wood in a positive way. Such opportunities would be fencing, playground furniture or donating to woodland areas.

It is likely that the commercialised product generated from the project is to be more costly than current disposal methods. However, it is possible it can deliver a financial benefit when compared alternative disposal methods to Trackworks, as stated above. The most important part to this project, is bringing to light the environmental benefits. Not only will this project reduce the carbon emissions

during the disposal process, but it will also trial a way of recycling the carbon generated during the extraction process.

1.2. Project Progress

This is the ACE's first progress report. It covers progress from initial registration in November 2021 to the end of March 2022 with the bulk of the content covering January 2022 – March 2022. Throughout this reporting period, the progress has centred on:

- Project mobilisation.
- Procurement of the equipment to be used in future Work Packages.
- Obtaining an exemption to handle creosote on their test site from Natural Resources Wales (NRW).
- Electrical installation and upgrades to GPT's site.

Mobilisation of the project took approximately 2.5 months running from November 2021 – January 2022. From there on, progress could be made against the project plan and objectives. Throughout this period, progress has been made against the first Work Package (four in total).

Work Package One includes the procurement, servicing and installation of all the equipment that is to be used for the project. In addition to this, the site that will be subject to carrying out the tests has had electrical upgrades so that it is fit for the purpose of this project.
Within Work Package One, a range of equipment has been purchased. The equipment that has been ordered can be broken down into 3 categories:

- Sampling Equipment – utilised to take specimens of the wood poles to undertake a baseline, pre extraction analysis of the wood poles. Essentially this will determine a standard for the condition of the poles pre extraction.
- Analytical Equipment – to enable early analysis of samples in house to assist in directing the success of the project.
- Extraction Equipment – pumps and pressure vessel to enable the extraction of creosote from the poles.

1.3. Project Delivery Structure

1.3.1. Project Review Group

The ACE Project Review Group meets on a bi-annual basis. The role of the Project Review Group is to:

- Ensure the project is aligned with organisational strategy.
- Ensure the project makes good use of assets.
- Assist with resolving strategic level issues and risks.
- Approve or reject changes to the project with a high impact on timelines and budget.
- Assess project progress and report on project to senior management and higher authorities.
- Provide advice and guidance on business issues facing the project.
- Use influence and authority to assist the project in achieving its outcomes.
- Review and approve final project deliverables.
- Perform reviews at agreed stage boundaries.

The first of such meetings is due to be held at the beginning of May 2022.

1.3.2. Project Resource

Project Partner	Name	Role
NGED	Jacob Lynch	Project Manager
	Paul Woodward	Safety & Environment Manager (Project Sponsor)
	Yiango Mavrocostanti	Innovation Manager
	Jill Russell	Company Environment Manager
	Andy Martyr-Icke	Environment Team-Member
GPT	Ian McDonald	Managing Director
	Dan Evans	Director
	Brian Minty	Technical specialist
	Sam Chick	Assistant

1.4. Procurement

The following table details the current status of procurement for this project.

Table 1-1: Procurement Details

Provider	Services/Goods	Area of project applicable to	Anticipated Delivery Dates
Midas	Horizontal & Vertical band saw	WP1	Mid March 2022
Midas	Sample grinders	WP1	Mid March 2022
BM/Agilent	HPLC & GCMS	WP1	End March 2022
BM/Agilent	Infra red spectrometer	WP1	End March 2022
Vesco	Pressure Vessel	WP1	Mid May 2022
Marshall Pumps	Pumps	WP1	Mid April 2022

All of the equipment associated with a mid-march delivery date has been delivered according to plan.

1.5. Project Risks

A proactive role in ensuring effective risk management for ACE is taken and reviewed on a weekly basis. This ensures that processes have been put in place to review whether risks still exist, whether new risks have arisen, whether the likelihood and impact of risks have changed, reporting of significant changes that will affect risk priorities and deliver assurance of the effectiveness of control.

Contained within Section 7 of this report are the current top risks associated with successfully delivering ACE as captured in our Risk Register. Section 7 provides an update on the most prominent risks identified at the project bid phase.

1.6. Project Learning and Dissemination

Project lessons learned and what worked well are captured throughout the project lifecycle. These are captured through a series of on-going reviews with stakeholders and project team members, and will be shared in lessons learned workshops at the end of the project. These are reported in Section 5 of this report.

The first dissemination event this project held was during December 2021, where ACE was exhibited at the NGED Innovation Showcase where it centred on one of the Innovation Strategies' priority areas, Decarbonisation. Here, the breakdown of the project was discussed to a varied audience in addition to the progress and future plans.

As this project is still in its infancy of getting started, it is expected that more opportunities will arise for dissemination events.

2. Project Manager's Report

2.1. Project Background

Decarbonisation is a fundamental and complex challenge for any business looking to achieve a goal of net zero, a goal NGED have set to achieve by 2028. Creosote, a preservative used in wood poles that support overhead lines on NGEDs, 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 NGEDs' 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.

The project consists of four 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 second 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 Three. Work package Three will involve modification to the extraction unit so that it can be used for a five metre wood pole. Work package Four 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. By including this piece of equipment within the whole extraction system, this will limit the amount of CO2 produced due to its high efficiency of over 90%.

2.2. Project Progress

2.2.1. Work Package One: Equipment Procurement, Servicing & Installation

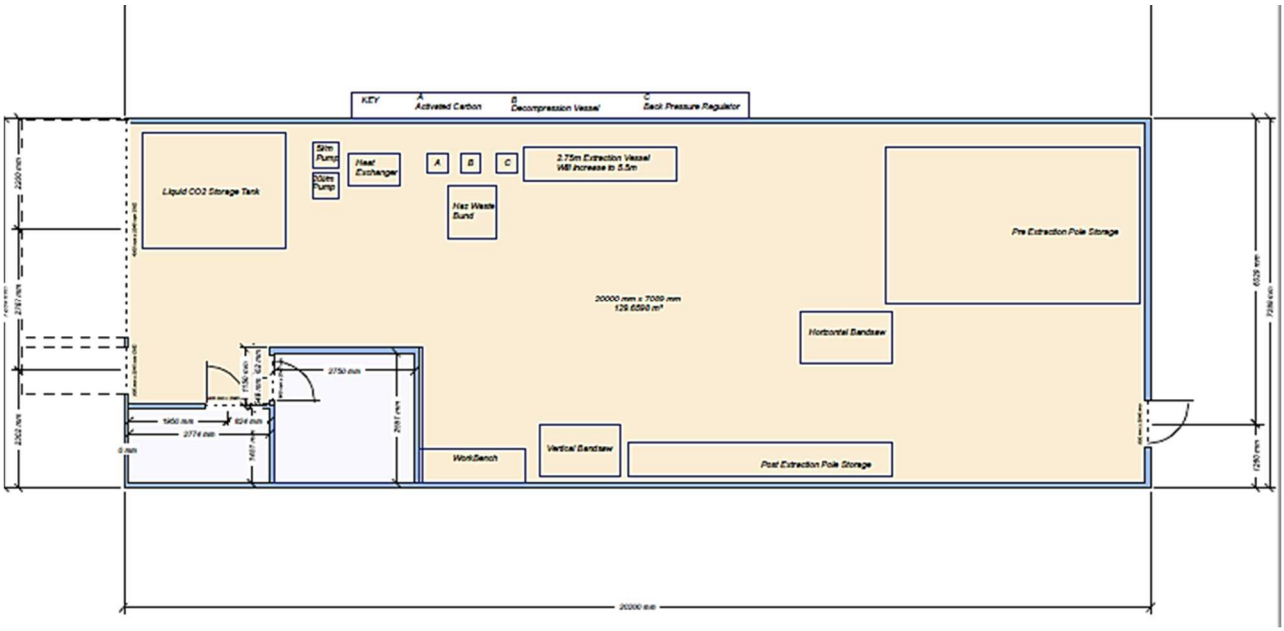
Work Package One comprises of sourcing, ordering and taking delivery of the vast array of equipment used that will be critical to the tests carried out in future Work Packages Two, Three and Four. The equipment that has been procurement is categorised below:

- Sample preparation equipment
    - Horizontal band saw, to take slices of wood from various height positions on the pole.
    - Vertical band saw, these slices are then further cut into smaller pieces, this will allow samples from various depths to be examined.
    - Grinder, these samples, which were sub divided on the vertical band saw can be ground up into powder, this will allow homogeneous samples to be prepared.
- Extraction equipment
    - Pre-weighed samples, prepared above, then undergo solvent extraction before analysis.

- Analytical equipment
    - The solvent extracted samples are then analysed using Gas chromatography - mass spectrometry (GCMS) and also High pressure liquid chromatography (HPLC) which will allow both characterisation and quantitation of the components extracted.
    - Extraction of the components by Supercritical fluid carbon dioxide will be followed quantitatively by Infra red spectroscopy which will allow modelling of the extraction efficiency.

Electrical upgrades have been made to the site to ensure the equipment to be installed can be operated correctly and without issues. This has included a fuse upgrade to 63A single phase as well as a 3-phase supply. This work is currently ongoing and is expected to be completed before the equipment has been delivered. Figure 2.1 shows the intended site layout when all equipment is installed.

Figure 2.1 Site Layout



In addition to this, an application has been submitted to Natural Resources Wales (NRW) to obtain an exemption on handling creosote impregnated wood poles on site. This application was submitted by the project partners to NRW in the middle of February 2022. Within the application, details were given around the proposed operation, its purpose and intended outcome of the trial. For the application to be successful, it had to through two sector groups before a board meeting scheduled for March 16th 2022 decides whether to grant the exemption. After some additional questions were answered, a decision is expected to be made early April 2022.

3. Project against Budget

Table 3-1: Progress against Budget

Spend Area	Budget(£k)	Expected Spend to Date (£k)	Actual Spend to Date (£k)	Variance to expected (£k)	Variance to expected %
NGED Project Management	98.13	23.52	5.89	17.63	- 75.0
NGED Network Services	4.96	0.81	0.00	0.81	- 100
GPT Environmental	1,336.00	127.00	85.09	41.91	- 33.0

Currently, all costs associated with the project are less than the original project budget. Network services costs will begin to be utilised, pending the application to NRW being granted. This will be used for the procurement of the poles. Although there is a discrepancy between expected and actual spend for GPT Environmental, this difference in cost is currently being processed by their recent invoice.

4. Progress towards Success Criteria

The project has made the following progress towards the Success Criteria:

- Extraction tests carried out for a 2.5m pole.
    - This success criteria is subject to the output of work Package Two. This Work Package is set to begin May 2022 and conclude December 2022. Within this time frame a more detailed analysis on its success will be able to be made.
- Identification of best extraction method.
    - Similar to the criteria above, the best identification method will aim to be realised throughout Work Package One. More detailed knowledge will be able to be shared on this criteria once Work Package 2 is concluded.
- Extraction tests carried out for a 5m pole.
    - This success criteria is linked to Work Package Three so no in depth commentary as of yet. Work Package Thee will begin December 2022 and conclude February 2023.
- An assessment will be carried out on the commercial validity of the system.
    - This will begin to be assessed throughout Work Packages Two and Three when the project will hold more understanding centred at how effective the extraction methods are.
- Creating a method that can deem poles that have had creosote extracted from them as non-hazardous waste.
    - Similar to the criteria above, this will be assessed throughout Work Packages Two and Three.

5. Learning Outcomes

The following section lists some of the key learning outcomes that resulted from activities during this reporting period:

- Creosote impregnated poles planted after the 2003 creosote ban will be unable to be disposed of through land ownership. With the lifespan of poles being in the region of ~30 years, in just over 15 years' time, the primary disposal route will be redundant leaving high temperature incineration the only current disposal method (as things stand). What could expedite this process is legislation becoming more stringent earlier than initially thought meaning a new disposal route to supplant incineration has never been more important.
- Hazard waste notes will not be needed when transporting poles from NGED local depots to GPT's site. This is because the poles will be deemed as reused, therefore not requiring the standard transport documentation.
- To be able to store and use the poles in question on GPT's site, an exemption is required from local authorities; in this case, NRW request an application to be submitted to them before granting an exemption. This application goes through their two sector groups before a final decision is made.
- Gas that is to be used in the project must be stored outside rather than inside due to safety reasons. This requires a concrete plinth to be installed to secure the gas tank outside for the duration of the project.

6. Intellectual Property Rights

A complete list of all background IPR from all project partners has been compiled. The IPR register is reviewed on a quarterly basis. No new foreground IPR has been generated by ACE yet but is expected to in later Work Packages.

7. Risk Management

Our risk management objectives are to:

- Ensure that risk management is clearly and consistently integrated into the project management activities and evidenced through the project documentation.
- Comply with NGEDs risk management processes and any governance requirements as specified by Ofgem.
- Anticipate and respond to changing project requirements.

These objectives will be achieved by:

- Defining the roles, responsibilities and reporting lines within the Project Delivery Team for risk management.
- Including risk management issues when writing reports and considering decisions.
- Maintaining a risk register.
- Communicating risks and ensuring suitable training and supervision is provided.
- Preparing mitigation action plans.
- Preparing contingency action plans.
- Monitoring and updating of risks and the risk controls.

7.1. Current Risks

The ACE risk register is a live document and is updated regularly. There are currently 15 live project related risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. In Table 7.1, we give details of our top five current risks by category. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported.

Table 7-1: Top five current risks (by rating)

Details of the Risk	Rating	Mitigation Action plan	Progress
Key personnel that become unavailable could result in the project being put on hold.	50	It is expected that during the extraction tests, a GPT employee will learn the methodology around carrying out the tests. Therefore, if key personnel do become unavailable, the project can still progress.	Currently, extraction tests are not taking place so shadow personnel have not been put in place.
Increase in lead times and costs for equipment.	48	Confirm lead times as soon as possible. Monitor any changes to the current climate and reserve contingency fund for this area.	Lead times as expected and costs are to the plan.
Extraction method may not work.	32	A number of extraction methods are to be tested. Therefore, it is hoped that If one does not function then the other proposed methods will.	Extraction tests to take place beginning of May 2022.
Delays in obtaining regulatory permissions from NRW to treat poles on site.	32	Plans have been put in place to continue the pace of the project if the exemptions isn't granted. We have found out the next possible date where could obtain one if the first attempt fails.	Exemption application currently under review.
Project may become undeliverable due to equipment availability and economic changes.	24	Suppliers have assured equipment will be available throughout the project. Possibly source second supplier if necessary.	Equipment has been available thus far.

Table 7-2 provides a snapshot of the risk register, details graphically, to provide an on-going understanding of the projects' risks.

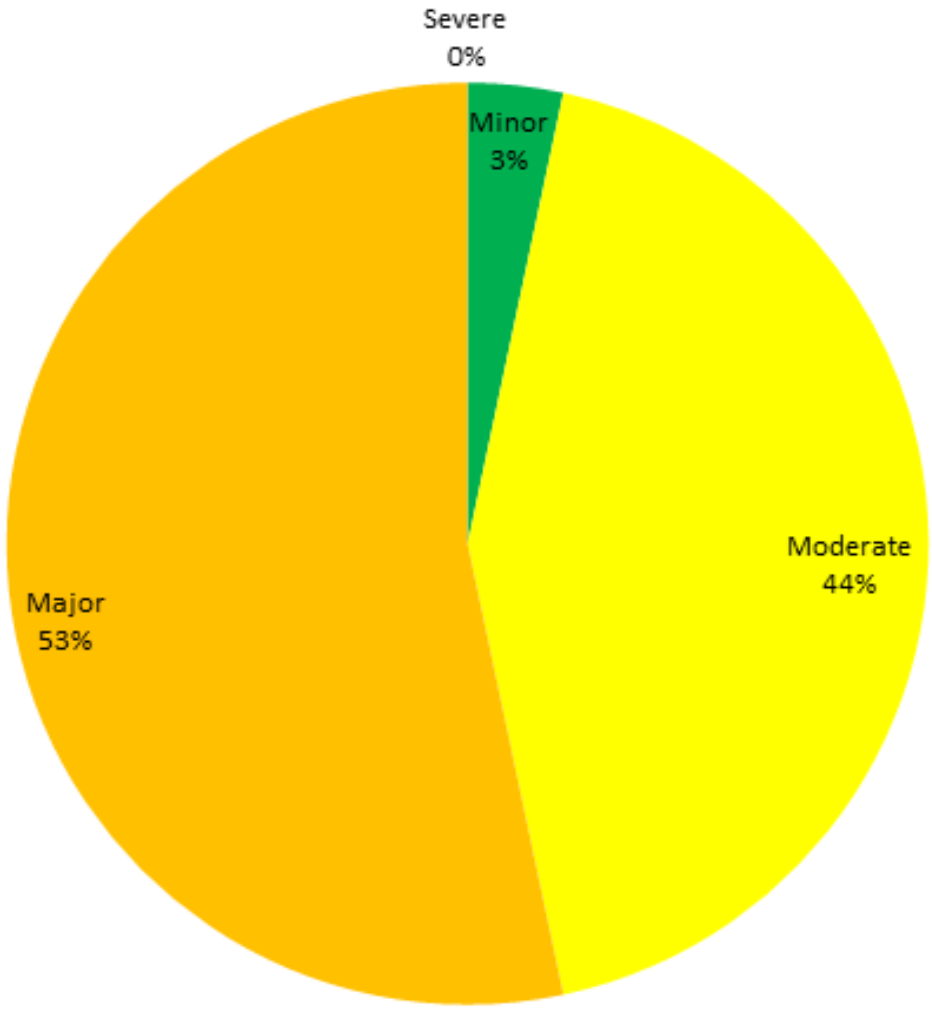
Table 7-2: Graphical view of risk register

Likelihood = Probability x Proximity	1. Insignificant changes, re-planning may be required	2. Small Delay, small increased cost but absorbable	3. Delay, increased cost in excess of tolerance	4. Substantial Delay, key deliverables not met, significant increase in time/cost	5. Inability to deliver, business case/objective not viable
Certain/Imminent (21-25)	0	0	0	0	0
More likely to occur than not/Likely to be near future (16-20)	0	0	0	0	0
50/50 chance of occuring/ Mid to short term (11-15)	0	0	2	9	0
Less likely to occur/Mid to long term (6-10)	0	0	7	14	7
Very unlikely to occur/Far in the future (1-5)	0	0	2	10	9
	Impact				

	Minor	Moderate	Major	Severe	
Legend	2	26	32	0	**No of instances**
Total	60				No of live risks

Table 7-3 provides an overview of the risks by category, minor, moderate, major and severe. This information is used to understand the complete risk level of the project.

Table 7-3: Percentage of risk by category



7.2. Update for risks previously identified

As this is the project's first report, any difference in risks between the present and that captured at the PEA stage is identified in table 7.4

Table 7-4: Risks identified in the previous progress report

Details of the Risk	Previous risk rating	Current risk rating	Mitigation Action plan	Progress
Delays in obtaining regulatory permissions from NRW to treat poles on site.	18	32	Plans have been put in place to continue the pace of the project if the exemptions isn't granted. We have found out the next possible date where could obtain one if the first attempt fails.	Exemption application currently under review.
Increase in lead times and costs for equipment	27	48	Confirm lead times as soon as possible. Monitor any changes to the current climate and reserve contingency fund for this area.	Lead times as expected and costs are to the plan.

Consistency with Project Registration Document (PEA)

The scale, cost and timeframe of the project has remained consistent with the registration document, a copy of which can be found here National Grid - Active Creosote Extraction (ACE)

Accuracy assurance statement.

This report has been prepared by the ACE Project Manager (Jacob Lynch), reviewed and approved by the NGED Innovation Manager (Yiango Mavrocostanti).

All efforts have been made to ensure that the information contained within this report is accurate. NGED confirms that this report has been produced, reviewed and approved following our quality assurance process for external documents and reports.

Glossary

Abbreviation	Term
ACE	Active Creosote Extraction
NIA	Network Innovation Allowance
NRW	Natural Resources Wales

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