Committee and Date

Council
21st September 2023

Item

Biochar from Pyrolysis Project

Responsible Officer:	Mark Barrow		
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Cabinet Member (Portfolio Holder):	Cllr Ian Nellins and Cllr Dean Carroll		

1. Synopsis

This report seeks approval for the procurement, installation, and operation of a pyrolysis demonstration unit which will process Council green waste and other residual biomass into biochar, renewable energy, and associated carbon credits.

2. Executive Summary

2.1. The Shropshire Plan's Healthy Environment priority highlights the importance of investment and joint working to tackle climate change and maintain, protect, and enhance our outstanding natural environment.

2.2. Our estate requires the removal of thousands of tonnes of biomass (renewable organic material from plants) each year which is currently a financial burden. In some cases, this results in some areas not being managed as effectively as they could be for the best biodiversity results. Unmanaged woodland being one example. This is exacerbated by ash die-back disease which is leading to thousands of ash trees alongside our roads or in public spaces needing to be felled for safety reasons. Low grade biomass is increasing in value as alternative uses are being found and aspects of the circular economy are being developed. (an economic system based on the reuse and regeneration of materials or products, especially as a means of continuing production in a sustainable or environmentally friendly way)

2.3. Our Climate Change Strategy has a target of net zero carbon emissions by 2030. Without the 'negative emissions' provided by the Veolia waste contract, Shropshire Council's carbon emissions in 2021 to 2022 were around 33,565 tonnes of CO_2e.

Emission reduction alone is not sufficient. We also need to consider Greenhouse Gas Removal methods that actively remove carbon dioxide from the atmosphere.

2.4. Greenhouse Gas Removal methods like tree planting can help reduce net emissions but trees are slow growing and are at risk from disease, fire, and extreme weather events. Alternative forms of carbon removal such as pyrolysis and Enhanced Rock Weathering diversify our portfolio of removal methods and have considerable economic and environmental co-benefits.

2.5. Pyrolysis is the thermal breakdown of materials (in our case plant matter) in the absence of oxygen. The heat drives off gasses and oil and what is left is mostly carbon in the form of char. If this char is burnt again as fuel, it's known as Charcoal. If it's kept as char and used in other ways, it is often called biochar; sometimes also activated charcoal. The primary difference from charcoal is the higher temperatures used and typically smaller particle size of the charred material.

2.6. The combustible gasses and oils driven off are burnt in a generator to produce clean renewable electricity, around 35% of which is used to power the unit. The rest can be sold to nearby businesses and residences, or to the grid. Residual heat could also be used in district heat networks where available.

2.7. Biochar can remain in soils or materials for hundreds, and even thousands of years without degrading. Charcoal in archaeological excavations of fire pits provide a good demonstration of this. Biochar is typically between 60% and 80% pure carbon. We measure carbon emissions in weight of 'Carbon Dioxide equivalent'. From pure carbon this requires multiplication by 3.67 to add the weight of the two oxygen atoms. This means that 1 tonne of biochar effectively stores between 2 to 3 tonnes of Carbon Dioxide. This is a Greenhouse Gas Removal method with the carbon almost permanently removed from the atmosphere.

2.8. Biochar has a fast developing and potentially profitable market with a multitude of uses in a wide range of sectors including, agriculture, horticulture, arboriculture, industrial production and construction. Biochar is increasing in use as a soil improver and a means of retaining nutrients on farmland. This is partly driven by increasing fertiliser costs and is being seen as a greener alternative. Sales for horticultural use are forecast to increase as a result of the upcoming ban on the sale of bagged peat compost coming into force in 2024. Biochar stores water in the soils as well as nutrients.

2.9. Other innovative 'non-carbon' uses of biochar include "preventing agricultural run-off of nutrients and pesticides that can degrade water quality, reducing nitrogen losses during composting, preventing ammonia release from poultry farm buildings and increasing methane yields during anaerobic digestion (AD)" (Ref: ongoing Nottingham University research).

2.10. The acquisition of a pyrolysis plant has been assessed and it has been determined that it will assist the Council in meeting its sustainability and carbon reduction targets as well as being commercially viable.

2.11. This project seeks to promote and research the benefits of utilising pyrolysis technology as a way of tackling climate change. Through the acquisition and operation of a demonstrator plant, valuable firsthand knowledge will be obtained which will help formulate the strategy for possible future expansion.

2.12. Three possible locations have been identified for the demonstrator project which are currently being considered by the project team.

3. Recommendations

It is recommended that Council:

3.1. Approves an investment in pyrolysis technology for the purpose of producing and selling biochar, renewable and sustainable electricity, and Carbon Dioxide Removal Certificates (CORCs) issued as a result of physically removing CO2 from the atmosphere.

3.2. Approves capital funding of £2.000m to be financed from the commercial investment fund to fund the acquisition, installation and commissioning of a fully operational plant capable of producing a minimum 500 tonnes biochar per annum.

3.3. Delegates authority to the Executive Director of Place in consultation with the Portfolio Holder for Climate Change, Environment and Transport and the Portfolio Holder for Housing & Assets, to determine which of the possible locations is best suited to host the demonstrator project and to make a final decision on the site after the site options analysis and consultation with the local members has been finalised.

3.4. Delegates authority to the Executive Director of Place in consultation with the Portfolio Holder for Climate Change, Environment and Transport and the Portfolio Holder for Housing & Assets, to negotiate and agree the terms of any and all agreements necessary for the implementation and ongoing operation of the project.

Report

4. Risk Assessment and Opportunities Appraisal

4.1. Risk Assessment

i. **Feedstock Availability.** The project will process residual biomass targeting feedstock from Shropshire Council's own resources. However, in order to guarantee a consistent supply of feedstock all year round, the financial projections are initially assuming that all feedstock is obtained from Veolia.

ii. **Technology and Equipment**. The risk associated with technology and equipment will be mitigated by ensuring that approved repair and maintenance contractors are available within less than half a day's travel time. Shropshire Council staff will be trained to operate the equipment by the manufacturer.

iii. **Environmental Impact.** A specialist environmental consultant has been commissioned to advise on the project and is specifically engaged to advise on waste permitting and planning considerations. An initial environmental assessment has been completed which advises that a Part B waste permit is required to be applied for from the Council's Environmental Protection for the plant to be able to process green garden waste. If the feedstock is restricted to virgin whole tree residual biomass, no environmental permit is required, and the plant could still operate whilst a Part B permit is being applied for or if a Part B permit is refused. A fully operating pilot plant located in Wales has been inspected by members of the Council's planning and environmental teams and although initial views are favourable the full permitting process will be followed to ensure the proposed plant fully complies with all relevant regulations.

iv. **Planning Permission**. The demonstrator plant will require planning permission to be obtained within the "Sui Generis" category which will attract public scrutiny. The site will be located in an industrial area which is considered to be the best location for a successful application, however obtaining planning permission is a risk to the project that needs to be taken into consideration.

v. **Market Demand and Pricing.** At present market demand for biochar is growing and appears to be consistently higher than the supply available. Average pricing per tonne of biochar is currently in the region of £400 - £1000 per tonne, however this is likely to change and as a result the revenue projections from the sale of the biochar assume sales values considerably less than the current average. In order to de-risk the project as much as possible, offtake agreements for a significant percentage of the expected biochar production will be negotiated prior to commencing production.

vi. **Carbon credit value.** There is considerable variation in the price of carbon credits. Some of the cheaper carbon offsetting schemes have been discredited recently in the press. These tend to involve tree planting schemes in developing countries where audit trails are difficult to maintain, and the health of planted trees can't be assured. Biochar is a sought-after Greenhouse Gas Removal method due to the ease with which the carbon sequestered can be measured and the length of time the carbon lasts in soils or materials. The global market for carbon credits was US$978.56 billion in 2022. It is predicted to reach US$1.16 trillion this year and US$2.68 trillion by 2028. This is an 18.2% compound annual growth rate (CAGR). Source: https://www.researchandmarkets.com/reports/5774731/global-carbon-credit-market-analysis-traded

vii. **Electricity price fall.** This is the most likely risk due to the volatility of the energy market and as a result of cheaper renewable energy production. The advantage of pyrolysis is that it can generate renewable energy during dark and/or windless periods without the need for a battery.

viii. The risk of **not taking a lead with pyrolysis** is that the process gets picked up by large scale operators who could grow crops specifically for pyrolysis. This can have detrimental impacts on the wider countryside as has been seen in some areas with biofuel crops. We believe smaller scale is better so that individual farms and estates could use pyrolysis to make use of crop and hedge or woodland residues to reduce their energy costs, lower their carbon footprint, and produce a product that improves their own soils or could be sold. This unit will provide that demonstrator.

ix. Should the demonstrator plant prove to be unfeasible for some unexpected reason, the operation can be discontinued at any time and the plant and equipment could be sold off recovering the majority of the capital expended, which would be expected to recover capital sums in the region of £1.25m-£1.5m.

4.2. Opportunities Appraisal

i. **Carbon Sequestration and Climate Change Mitigation.** Biochar sequesters carbon for hundreds if not thousands of years. Pyrolysis also generates renewable energy. This demonstrator pyrolysis unit will help assess:

A. the opportunities for carbon credit generation and participation in carbon offset programmes.

B. the various revenue streams generated using this climate change mitigation initiative.

ii. **Soil Improvement and Agricultural Applications**. Join existing University led evaluations of biochar's ability to improve soil fertility, increase water retention, and nutrient availability. All key aspects for climate resilience.

iii. **Horticulture and gardening**. The market demand for biochar as a soil amendment is significantly increasing with price per tonne of biochar / compost mix being around £3,500 per tonne or £3,800 per tonne as a raw soil additive (online research). Harper Adams has significant research interest in this area and there are potential partnerships with a range of agricultural stakeholders. The upcoming ban on peat will significantly increase the demand for biochar and biochar enhanced compost

iv. **Waste Management and Circular Economy**. Biochar can provide a sustainable solution for organic waste management.

v. **Biochar in materials**. Biochar is used as an additive in asphalt and plastic alternatives. Following our introduction to the potential of biochar, Miles Macadam, one of our own highways sub-contractors, has started trials of what might become a carbon neutral road surface dressing. Further work is being undertaken by Miles Macadam which will provide for the use of biochar in tarmac to be used on Shropshire's road network which will reduce Shropshire's overall carbon footprint.

vi. **Research and Innovation.** Explore opportunities for research collaboration and innovation within the biochar field. Assess the potential for grants, funding and research-based incentives.

5. Financial Implications

5.1. The project is targeting 8,500 tonnes of carbon removal through the medium term. To achieve this requires a budget of £2.000m. The intention is to set up the initial unit as a 'demonstrator'. Assuming this is successful (as all modelling is indicating) the scheme could then be scaled up (which would require a separate decision). A key element in the financial model is the benefit arising from the carbon off-set certificates, itself derived from the focus on carbon removal. The current proposal includes acquisition and installation of the pyrolysis unit, connection to a local energy off-taker, an energy generation unit (an Organic Rankine Cycle or ORC), building repairs and contingency (14.3%).

Capital expenditure (estimated)		
Pyrolisis Unit	£ 1,200m	
Includes: Fuel Storage		
150m3 Hopper		
Eco T2 Woodchip Dryer		
Rotary Agitator		
Flue gas filtration		
Flue Stack		
Control Panel		
Plant commissioning		
H&S and PM		
Design & Schematics		
Installation		

energy generation unit (ORC)	**£ 1,200m**	
CEM's Pack	£ 0.165m	
Ozone Gen: NOX reduction	£ 0.065m	
TOTAL	**£ 1,430m**	
Building Refurb	£ 0.170m	
Forklift/Telehandler	£ 0.050m	
Shredder	£ 0.100m	
Estimated Total Costs	**£ 1,750m**	
Contingency	**£ 0.250m**	
	£ 2,000m	

5.2. This expenditure will utilise the unallocated investment fund which is already built into the capital programme. Current default funding is external borrowing, but this may change as the project develops and different funding sources potentially become available. This fund has £5.480m available that has not been allocated to other projects, and so there would still be £3.480m available for other projects after this.

5.3. Assuming external borrowing, the revenue cost of that financing is expected to be an interest rate of 5.0% over 25 years. This creates an annual repayment (principal and interest) of £0.142m.

5.4. Based on current project assumptions, the project is projected to deliver healthy annual returns. The core case has a projected first year yield of 18.07% and a 25 year average yield of 21.29%. The £2.000m capital expenditure is estimated to be repaid by the 6th year of operation (i.e. within the medium term horizon), with projected longer term annual returns in excess of £0.360m. These receipts will have a positive impact on the forward profile of the MTFS. It will, more importantly, deliver circa 8,500 tonnes of physical carbon removal over the MTFS period.

Cashflow	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**Medium Term Outlook**
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	
Expenditure							
Financing costs (assumes 100% borrowing)		-0.142m	-0.142m	-0.142m	-0.142m	-0.142m	**-0.710m**
Feedstock		0.150m	0.152m	0.153m	0.154m	0.156m	**0.765m**
Operating expenditure		-0.040m	-0.040m	-0.041m	-0.041m	-0.042m	**-0.204m**
Maintenance		-0.040m	-0.040m	-0.041m	-0.041m	-0.042m	**-0.204m**
Income							
Sales		0.193m	0.195m	0.197m	0.199m	0.201m	**0.985m**
Carbon Offset Certificates		0.254m	0.257m	0.259m	0.262m	0.264m	**1,296m**
Net Revenues	**0**	**0.375m**	**0.382m**	**0.385m**	**0.391m**	**0.395m**	**1,928m**

5.5. The greatest ongoing costs are for system maintenance and plant operation, projected between £0.080m and £0.102m.

5.6. The unit has four primary sources of income: sale of biochar, sale of carbon credits, electricity exports and the gate fee from Veolia for the supply of the green waste feedstock. The lead-in time for purchase of the electricity generator is longer than the

pyrolysis unit so the figures are based on the first few months not producing electricity. To claim carbon credits the biochar requires testing and a few months operation is recommended before tests are made. Credits can be back dated but the income would most likely be delayed by several months.

5.7. The current financial model does not include utilisation of residual heat, or any income derived from this source, the potential for a local heat network or direct heat off-taker will be investigated. The financial modelling for future years has assumed current rates for all variables such as biochar sale price, feedstock income, and electricity rate. However, there are greater uncertainties than usual with this project given the emerging nature of this market and the context of the climate emergency. But as per 5.4 and 4.1.4 the project has healthy expected returns and can reasonably be expected to make a positive contribution to the council's revenue position.

5.8. There could be a further indirect revenue benefit to the council in terms of using our own sources of feedstock. Dying ash trees that are being removed from roadside are a clear example of a source of biomass that is currently costing many tens of thousands of pounds to remove. Keir currently sub-contract tree removal work and add 10% costs for doing so. The arboricultural sub-contractors then sell on this biomass for between £25 and £40 per tonne without delivery. Three recent / current tree removal schemes on roadsides total around 350 trees which would provide 10% of the biomass needs of a pyrolysis system for 1 year. A detailed assessment of biomass availability has not yet been completed.

5.9. All components being purchased would have high a resale value – particularly given the long lead-in times for much of the equipment.

6. Climate Change Appraisal

Energy and fuel consumption

6.1. Net positive effect, since the 'embodied carbon' in the manufacture of the pyrolysis unit will take a little time to be compensated for. Initial estimates by consultancy Anthesis suggest it would take around 6 months of unit operation before the stored carbon compensates for the embodied carbon. A full 'Life Cycle Assessment' will be commissioned to examine the carbon performance of the unit over its lifetime. Such an assessment would, in any case, be a requirement of any carbon trading. Over time pyrolysis units have been found to be carbon net negative and allow carbon trading. Here are some examples: https://puro.earth/CORC-co2-removal-certificate/?carbon_removal_method%5B0%5D=7363

Renewable energy generation

6.2. Positive effect, since the pyrolysis of biomass releases oils and gasses which can be burnt in a generator to create heat and electricity. This renewable heat and electricity displaces grid energy that is still largely produced from fossil fuels. Around 80% of what is left is stable carbon in the form of biochar.

Carbon offsetting or mitigation

6.3. Significant positive effect since pyrolysis is a means of partially stopping the carbon cycle. Atmospheric carbon dioxide is temporarily stored in biomass; including plant tissues like wood and leaves. Typically, this carbon released over a relatively short time period when plants rot (sometimes via composting) or are burnt. Open burns or composting without good air supply can also produce methane which is a far more potent greenhouse gas.

6.4. Net carbon budgets will be dependent on what type of feedstock is used, how far it is transported, and how this is processed prior to being fed into the system.

Climate change adaptation

6.5. Positive effect, since the pyrolysis plant will be designed and operated in a way which takes into account the challenges which may arise from more extreme weather events associated with climate change.

7. Background

7.1. Shropshire Council is seeking to take a leading role in preventing climate change with our Climate Change Strategy which has a target of net zero carbon emissions by 2030. The establishment of circular technologies which assists the local community in a sustainable and environmentally friendly way through the production of biochar from residual biomass (forestry residues and garden waste) using pyrolysis, can have several positive impacts on the local community and the environment including, waste management, carbon sequestration, sustainable and renewable energy production, soil health and agricultural productivity, local economic development, community engagement and education, and environmental stewardship.

7.2. By promoting circular technologies and sustainable practices, Shropshire Council demonstrates its commitment to environmental stewardship. The production of biochar from residual biomass and green waste aligns with the principles of a circular economy, where waste or low value materials are transformed into valuable resources, reducing dependence on finite resources and minimizing environmental impacts.

7.3. The establishment of a local biochar production facility in Shropshire will serve as a tangible demonstration of the benefits associated with biochar production. This will create awareness and understanding among the local community, businesses and farmers about the value and potential applications of biochar. Demonstrating the benefits of biochar can encourage its adoption and pave the way for further utilisation in different sectors.

7.4. As a result of increased energy costs, increasing demand for biochar and the obligation to be carbon net zero by 2030, biochar production is both environmentally and financially sustainable. Pyrolysis, the process used to produce biochar, generates surplus energy in the form of heat and gas which can be converted into electrical energy. This energy is used to power the biochar production process itself and the surplus energy can provide heat, light and power to the wider community.

7.5. With the increasing focus on sustainability and the environment, there is a growing demand for sustainable soil improvements like biochar. As awareness about its benefits spreads and its adoption increases, the demand for biochar is likely to continue to rise. By establishing a local biochar production facility, Shropshire Council can position itself to meet the growing demand and contribute to regional self-sufficiency in biochar production.

7.6. The obligation to achieve carbon neutrality by 2030 necessitates the implementation of sustainable practices and the reduction of carbon emissions. Biochar production offers a means to contribute to this goal. The carbon sequestration of biochar production along with its use as a soil amendment and alternative to traditional fertilisers, can help Shropshire Council and the local community move towards carbon neutrality while improving agricultural practices and soil health in the region.

7.7. Biochar production can play a significant role in paving the way to a sustainable future for Shropshire. By efficiently utilising residual biomass, reducing waste, sequestering

carbon, improving agricultural practices, biochar production could play a significant role in supporting the transition to a low carbon economy.

7.8. The process of biochar production physically removes CO2 from the atmosphere and stabilizes it in a form which can be stored for 100's or 1000's of years. Puro.earth (Nasdaq owned) certifies suppliers and issues CO2 removal certificates (CORCs) through the Puro Registry. CORCs can either be retained by the Council to offset carbon emissions or sold to other climate conscious organisations who need to offset positive carbon emissions. The sale of CORC's will generate a steady income stream providing a financial return on capital invested.

7.9. A number of equipment suppliers have been identified who are capable of supplying pyrolysis equipment for the Council's demonstrator plant. UK procurement regulations will apply, and officers will ensure that proper procurement procedures are adhered to ensuring compliance and best practice.

7.10. Once a preferred supplier is selected, officers with the support of professional advisors will complete contract negotiations ensuring all the relevant terms and conditions, warranties and performance guarantees are adequately addressed. This will help protect the Council's interests and ensure that the procurement contract aligns with the desired outcomes and requirements of the project.

7.11. Throughout the procurement process, all relevant documentation, records, and reports will be appropriately maintained to demonstrate compliance with UK procurement regulations. This includes maintaining transparency, fairness, and accountability in the procurement process.

7.12. The proposed Pyrolysis plant will be a facility specifically designed to convert organic waste or biomass materials into biochar through the process of pyrolysis and will incorporate the following key components and functions:

i. **Feedstock Handling.** The plant will be equipped with systems to handle and prepare (dry) the residual biomass. This includes shredders, conveyors and storage systems (hoppers) to ensure a consistent and automated supply of biomass to the pyrolysis process.

ii. **Pyrolysis Reactor.** The heart of the plant is the pyrolysis reactor where the conversion of biomass to biochar takes place. The reactor operates under controlled temperature and oxygen conditions heating the biomass in absence of oxygen causing it to undergo thermal decomposition, or pyrolysis, resulting in the production of biochar, gases, and bio-oil.

iii. **Heating System.** The pyrolysis reactor requires a heating system to reach and maintain the desired temperature for the pyrolysis process. Common heating methods include biomass boilers, indirect heating through the use of heat transfer fluids or electric heating elements.

iv. **Gas and Vapour treatments**. The gases and vapours generated during the pyrolysis process, also known as syngas, contain combustible gases, volatile organic compounds (VOCs) and other by-products. These need to be properly treated to remove impurities and harmful substances before being released into the atmosphere. Treatment systems may include condensers, scrubbers, filters, and other gas cleaning technologies.

v. **Biochar Collection and Cooling**. automated collection, cooling and bagging of biochar for sale and distribution.

vi. **Emissions Control.** The plant must comply with environmental regulations and maintain low emissions. It may need to be fitted with emission control

devices such as baghouses, electrostatic precipitators, or activated carbon filters to capture and remove particulate matter, volatile organic compounds, and other pollutants from the process exhaust gases.

vii. **Energy Recovery.** Systems must be incorporated to capture and utilise the heat generated during the pyrolysis process. This heat will be used for drying the biomass feedstock as well as for the generation of electricity.

viii. **Monitoring and Control Systems**. To ensure safe and efficient operation the plant will be equipped with monitoring and control systems including remote monitoring systems. These systems will continuously monitor process parameters, such as temperature, pressure and flow rates enabling operators to make adjustments to optimise the process and ensure consistent production of high-quality biochar.

7.13. **Proposed Locations – to be determined** as per recommendation 3.3 after conducting further options analysis of the possible locations and having completed consultations with the local members.

7.14. **1) The Bridgnorth ex Highways salt depot**, on Old Worcester Rd has been identified as a potentially suitable location for the demonstrator project for the following reasons:

i. The existing Long Leasehold building, although in need of repair, is capable of housing the equipment and the size of the site and external areas are large enough to house the feedstock to be processed and the stocks of biochar that will be produced.

ii. The site is in an industrial area, has direct access from a major road and sits within Employment land allocation W039 within the adopted local plan which includes a provision for recycling and environmental industries.

iii. Feedstock can be obtained from Veolia, Stanmore Country Park, and from nearby Severn Valley Country Park.

iv. Proximity to nearby businesses as a potential off-taker for the electricity produced.

v. The building is in need of major repairs due to corrosion caused by its previous use as a salt store. The repairs are required under the terms of the head lease whether the building is used for the pyrolysis project or not and this project provides the ability to absorb the cost of the repairs, estimated to be £0.170m, as part of the project establishment/capital costs.

vi. Under the terms of the headlease, the tenant is obliged to seek the landlord's permission for a change of use which is not B1 or B8. As the use class for pyrolysis is sue generis, permission for a change of use will be required from the landlord. This is not considered to be a major risk as the landlord has already verbally agreed to provide the change of use required.

7.15. **2) The Ludlow ex Biodigester plant, Coder Rd Ludlow.**

i. The existing freehold building is currently vacant and was previously used as an anaerobic digester.

ii. The building and yard area is of a sufficient size to accommodate the pyrolysis operation and store supplies of feedstock and biochar on site. The site already has an existing connection to the grid which was in use when the site was previously in operation.

iii. The site previously held a Part B environmental permit.

7.16. **3) Land adjacent the ERF in Battlefield, Shrewsbury**

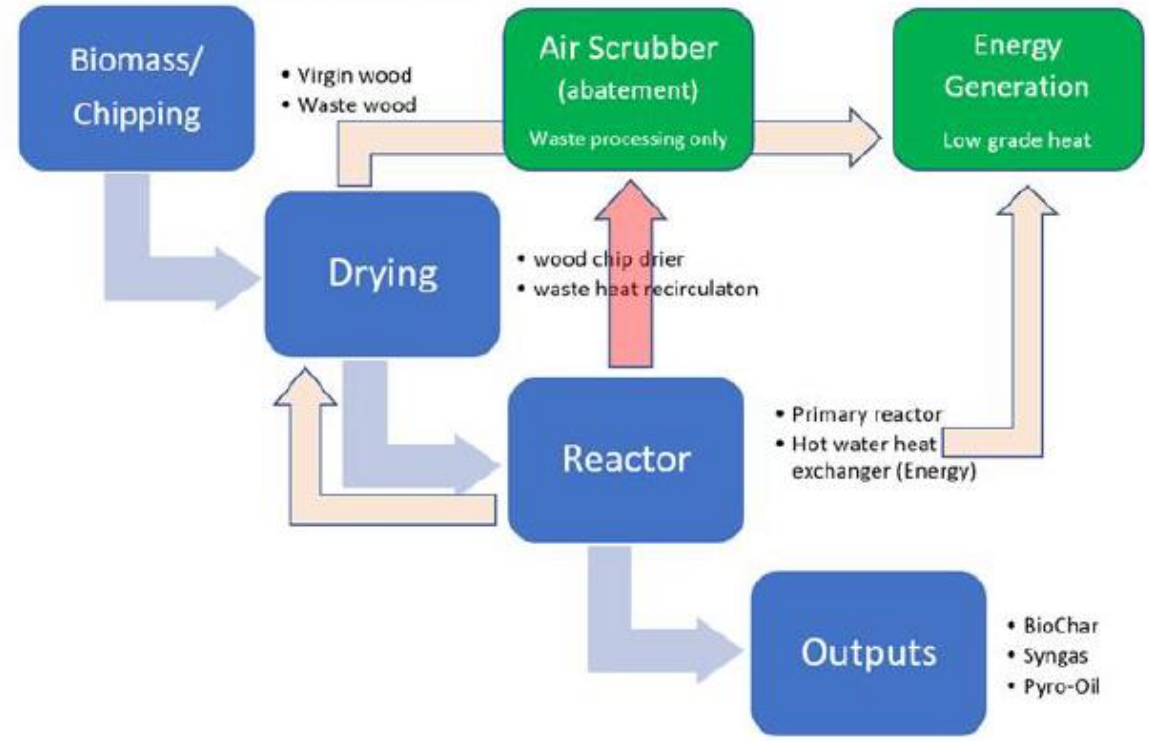
i. Council owned freehold plot of undeveloped land

ii. Conveniently located next to Veolia providing easy access to the feedstock supply.

iii. Some site constraints from flooding, Great Crested Newts and access issues that need to be agreed with neighbouring land owners.

iv. Located in an industrial location and should be relatively straightforward for planning purposes.

Fig.2 Simple pyrolysis schematic



8. Additional Information

8.1. Pyrolysis units are available at a wide range of scales. We have already invested £3,500 in a small flame kiln (AKA Kon Tiki Kiln) at Severn Valley Country Park. This kiln processes relatively small amounts of biomass and doesn't make use of the energy produced by the process. It is proving a popular means of dealing with brash collected by volunteers helping the site managers and should help sequester around 8 tonnes of CO2 per year.

8.2. Other pyrolysis systems of interest are medium to small, enclosed kilns that can be moved around on a tractor towed trailer. In Ireland they have systems that use cut rushes (very common in damp pastures there and in upland Shropshire) as the feedstock and as well as producing biochar they capture the gasses produced for use on the farm for heating and cooking. We hope our medium sized operation can serve to inspire a wider range of systems and establish Shropshire even further as a lead producer of carbon negative biochar.

8.3. Expert external Legal advice has been obtained which confirms that the Council has the statutory power to undertake this project under section 1 of the Localism Act 2011. The overall purpose of this investment is to help reduce Shropshire's carbon emissions and to positively reduce the effects of climate change with a view to reaching net zero by 2030. Notwithstanding the fact that the project is hoped to generate a commercial return, in line with current guidance from the Courts, the project is not being undertaken for a commercial purpose such that the Council would need to form a company to pursue it.

8.4. The primary purpose for investing and operating a demonstrator pyrolysis plant to process biomass waste is to further reduce and improve the council's carbon reduction performance in accordance with objectives stated in our climate change policy and in accordance with our healthy environment priority in the Shropshire Plan. The first strategic objective under the healthy environment priority states "We will deliver the council's Corporate Climate Change Strategy and Action Plan, promoting the means to tackle climate change and reduce our carbon footprint, including the adoption of low-carbon energy for our assets and for communities."

8.5. This project is entirely consistent with the above strategic objective. Furthermore, KPI HEn8 states "Key to the corporate climate change strategy. Reducing CO2 emissions will improve air quality and help mitigate the impact of global warming". This project assists with the delivery of this KPI given its effectiveness as a carbon capture process as stated in the report.

9. Conclusions

9.1. Approval for officers to procure the best fit pyrolysis technology for our area will enable Shropshire to become the first Local Authority to fully lead on a pyrolysis system. Several Local Authorities are working on pyrolysis initiatives with others, like Veolia, who have a large stake in, or will entirely run their systems. Full ownership would provide greater financial returns and provide greater flexibility when it comes to feedstock supply and sale of biochar and energy. This will add resilience and lower risks.

9.2. Learning from this unit will help inform further installations by Shropshire Council and other land managers.

List of Background Papers (This MUST be completed for all reports, but does not include items containing exempt or confidential information)

Local Members:	***Kirsty Hurst-Knight, Christian Lee (Bridgnorth East and Astley Abbotts)*** ***Vivienne Parry (Ludlow South)*** ***Jeff Anderson (Harlescott)***

Appendices

Appendix 1 UK Biochar Market Analysis Report (Fortune Business Insights).