

STROUD DISTRICT COUNCIL
STRATEGY AND RESOURCES COMMITTEE

**AGENDA
ITEM NO**

9 JULY 2020

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Report Title	WATER-SOURCE HEAT PUMPS – EBLEY MILL AND BRIMSCOMBE PORT MILL
Purpose of Report	To present the business case for the installation of water-source heat pumps at Ebley Mill, Cainscross and Brimscombe Port Mill, Thrupp
Decision(s)	<p>That Strategy and Resources Committee RECOMMENDS to Council to allocate capital funding in 2020/2021 to invest in water source heat pumps as follows;</p> <ul style="list-style-type: none"> a. the sum of £1.05m at Ebley Mill and b. the sum of £382k at Brimscombe Port Mill and c. that, in consultation with the Leader, the Head of Property Services is given delegated authority to proceed with the procurement and installation of the heat pumps subject to the receipt of the necessary consents from the Environment Agency and a successful application to the Non-Domestic Renewable Heat Incentive Scheme.
Consultation and Feedback	Head of Community Services Carbon Neutral Officer – see Environmental Implications
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Options	<p><u>Ebley Mill</u> – if the option of a water-source heat pump is not supported, the main gas boilers are likely to need replacing within the next few years. This may be replacement with modern gas boilers or alternatively a biomass system.</p> <p><u>Brimscombe Port Mill</u> – if the option of a water-source heat pump is not supported, the current gas boilers will be relocated into the Mill to continue providing heating and to facilitate the demolition of the Port House as part of the redevelopment proposals for the site. A biomass system could also be considered.</p>

Options	<p><u>Both sites</u> There are a number of factors which would affect the choice of a replacement system including space for a silo to store the biomass wood pellets if biomass is used.</p> <p>The use of modern gas fired boilers and controls represents a significant reduction in capital cost compared with water source heat pumps or biomass systems but are expected to be phased out for non-domestic properties.</p> <p>Modern gas boilers are about 97% efficient but biomass is regarded as more sustainable, although there are concerns over the reliability of fuel supply chains.</p>			
Background Papers	None			
Appendices	<p>Appendix A – Feasibility report, Brimscombe Port Mill (Issue 4)</p> <p>Appendix B – Feasibility report, Ebley Mill (Issue 3)</p>			
Implications (further details at the end of the report)	Financial	Legal	Equality	Environmental
	Yes	Yes	No	Yes

1. INTRODUCTION

- 1.1 Ebley Mill and Brimscombe Port Mill are currently heated by mains gas, resulting in a large carbon footprint for both properties. Bearing in mind the Council's commitment to Carbon Neutral 2030, a more renewable heating system would ideally replace the existing gas system within the next few years. As both properties are adjacent to water, the feasibility of using water-source heat pumps was considered as a possible replacement heating system.
- 1.2 The Council commissioned Renewables First (an engineering consultancy specialising in hydropower and water-source heat pumps), to undertake initial feasibility studies for the installation of water-source heat pumps at both properties and to carry out further tests to check their projections. Their feasibility reports are appended to this report.
- 1.3 The feasibility studies were then reviewed by Withycombe Design (WDS), consulting mechanical engineers. They confirmed that a series of comments and technical queries they raised have had satisfactory answers and they also met with Renewables First to discuss the scheme in more detail.
- 1.4 The (Non-Domestic) RHI is a UK Government environmental scheme which aims to encourage uptake of renewable heat technologies amongst householders, communities and businesses through financial incentives, and contribute towards the 2020 ambition of 12% of heating coming from renewable sources. Eligible installations from businesses, the public-sector and non-profit making organisations receive quarterly payments based on the amount of heat generated. Both projects are potentially eligible for the Renewable Heat Incentive (RHI), which provides a guaranteed quarterly payment (per kWh used) for approximately 20 years. This is a significant source of revenue; however, the scheme is due to close shortly so the projects would need to progress quickly in order to be eligible for payments. The scheme is administered by Ofgem.

- 1.5 As an alternative to either continued usage of gas or installation of a water-source heat pump system, biomass could also be considered. This would have a lower installation cost than the heat pump system, however it will require regular fuel deliveries and careful arrangement of a sustainable fuel supply. In addition, the RHI for biomass (3.15 p/kWh) is less than half of the expected rate for heat pumps (6.98 p/kWh). The option of using biomass is considered an inferior option to the use of heat pump technology and there are supply chain concerns, which may mean that a sustainable fuel supply is hard to guarantee.

2. OVERVIEW – EBLEY MILL

- 2.1 Ebley Mill is a Grade II* Listed Building, heated primarily by three large gas boilers, which are due for replacement within the next 10 years. In addition, there are two smaller gas boilers in a separate plant room, which were installed more recently. Secondary glazing has been installed throughout the building.
- 2.2 The report by Renewables First indicates that the river and canal are both suitable for a water-source heat pump system, which could easily provide sufficient heat for Ebley Mill.
- 2.3 The report shows that it is likely to be cost-effective to replace radiators throughout, to increase their heat output. This additional cost will be more than compensated for by the improvement in performance, as it will allow a lower flow temperature to be used.
- 2.4 Withycombe advised that the total costs of the works would be greater than Renewables First have indicated, as their costs do not include the cost of a new plant room, all builders' work (to enable the engineering installations to be installed) and all necessary consents and fees. The additional costs for these elements are shown in the tables below.
- 2.5 During the detailed design, it may be shown that a lower heat output would be sufficient. This could significantly reduce the project costs and improve the financial return.
- 2.6 The proposal could also be improved technically by the installation of further insulation to the building and changes to the glazing and natural ventilation. The additional cost of these measures may be balanced out by a reduction in the heat pump system costs. However, the tight timescales associated with the heat pump project may preclude this, as precise details of the heat demand of the building need to be submitted to Ofgem during September 2020 to achieve the anticipated RHI rate.

3 OVERVIEW – BRIMSCOMBE PORT MILL

- 3.1 The Mill at Brimscombe Port is a Grade II Listed Building, similar in construction but on a smaller scale to Ebley Mill. The boilers serving the mill are located in a separate building known as The Port House, which is due to be demolished as part of the infrastructure works to the Port, facilitating the reinstatement of the canal and basin and redevelopment of the Port (subject to planning and Listed Building consents, currently awaited). As part of de-risking the site, the boilers were due to be relocated into The Mill this summer. They are relatively new having been installed in 2013 by Stroud Valleys Canal Company, prior to the council managing the site.
- 3.2 The Mill and Port are now owned by Stroud District Council, having transferred on 1st April, but Homes England retain charges on the property, which will be released once the Port has been developed.

- 3.3 The report by Renewables First indicates that the river is suitable for a water-source heat pump system, which could easily provide enough heat for The Mill.
- 3.4 As with Ebley Mill, Withycombe advised that the total costs of the works they have indicated would be greater than the costs stated by Renewables First, as their costs do not include the cost of a new plant room, all builders' work (to enable the engineering installations to be installed) and all necessary consents and fees. The additional costs for these elements are shown in the tables below.
- 3.5 The proposal could also be improved technically by the installation of further insulation to the building and changes to the glazing and natural ventilation. The additional cost of these measures may be balanced out by a reduction in the heat pump system costs. However, the tight timescales associated with the heat pump project may preclude this, as precise details of the heat demand of the building need to be submitted to Ofgem during September 2020 to achieve the anticipated RHI rate.

4 FINANCES

- 4.1 The following tables show the capital cost, revenue and net present value of the water-source heat pump projects. Also shown are counterfactual scenarios for continued use of gas, with replacement of gas boilers as they reach the end of the useful life and for biomass.
- 4.2 The capital costs are based on estimates by Renewables First and Withycombe following completion of the feasibility studies. The accuracy of the cost estimates will be improved at two key stages: 1) Competitive tender bids for design & build; 2) Completion of detailed heat demand modelling, to confirm the heat pump capacity required.

Table 1: Comparison of Net Present Values for Heating Systems at Ebley Mill

Heating system	Water-Source Heat Pump		Gas	Biomass
	Sept RHI submission	Impact of 3 month delay to Programme		
Date of Ofgem Stage 1 submission	Sept 2020	Dec 2020	n/a	Jul-Sept 2020
Total cost in Year 0	£1,045,627	£1,045,627	0	£515,000
Total cost in Year 1	0	0	0	£0
Total cost in Year 5	0	0	£60,000	£0
Total cost in Year 16	0	0	0	£0
Total cost in Year 20	0	0	£80,000	£0
RHI annual revenue	£41,934	£37,741	n/a	£18,924
Existing revenue costs				£23,210
Reduction in annual running costs	£35	£35		-£10,821
Total effective annual revenue during RHI period	£41,969	£37,776		£8,104
Net present value over 25 years (0% discount rate)	-£5,321	-£109,247	-£140,000	Not provided
Net present value over 25 years (3.5% discount rate)	-£311,984	-381,747	-£132,652	-£410,031

Table 2: Comparison of Net Present Values for Heating Systems at Brimscombe Port Mill

Heating system	Water-source heat pump		Gas	Biomass
	Sept RHI submission	Impact of 3 month delay to Programme		
Date of Ofgem Stage 1 submission	Sept 2020	Dec 2020	n/a	Jul-Sept 2020
Total cost in Year 0	£382,998	£382,998	£0	£265,000
Total cost in Year 1	£0	£0	£50,000	£0
Total cost in Year 5	£0	£0	£0	£0
Total cost in Year 16	£0	£0	£20,000	£0
Total cost in Year 20	£0	£0	£0	£0
RHI annual revenue	£17,350	£15,615	n/a	£7,830
Existing Running costs				£11,780
Reduction in annual running costs	£2,700	£2,700		-£3,164
Total effective annual revenue during RHI period	£20,050	£18,315		£4,666
Net present value over 25 years (0% discount rate)	£127,000	£84,408	-£70,000	Not provided
Net present value over 25 years (3.5% discount rate)	-£30,570	-£59,434	-£66,979	-£198,905

Source: Renewables First

5 PROGRAMME

5.1 The target programme for both sites is:

- Jun 2020 Consent applications (EA)
- Jun 2020 Competitive tender advertised for design & installation
- Jul 2020 Appointment of main contractor
- Aug-Sep 2020 Detailed design
- Sep 2020 Consents granted
- Sep 2020 Stage 1 Ofgem applications
- **31 Sep 2020 *Deadline for Stage 1 Ofgem application to avoid RHI depression***
- Oct 2020 Stage 2 Ofgem applications*
- Dec 2020 Place order for main components
- Mar-May 2021 Installation & commissioning
- Mar-May 2021 Stage 3 Ofgem applications

**Arrangements for project financing need to be finalised by this point.*

5.2 The Stage 1 Ofgem application is an important step as this will secure the RHI tariff rate. This application can only be made once the necessary consents have been obtained and sufficient design work has been completed to finalise the basic parameters of the system such as heat output and heat demand profile.

5.3 If installation and commissioning takes place after 31st March 2021, the RHI period will be slightly shorter than 20 years, as no payments will be made after 31st March 2041.

This means that the system would ideally be commissioned by 31st March 2021, however the impact of slight delays beyond this is relatively minor.

6 RISKS

- 6.1 Inadequate heat supply. The heat pump system may not provide enough heat, or may not heat the building up quickly enough. However, Renewables First assure us that, as long as the detailed design is done to a good standard, this is a very low risk. The heat pump system and radiators will be specified to ensure that the heat supply and warm-up times are suitable. Water-source heat pumps are not a new technology and have been used effectively elsewhere. It is possible to retain the gas boilers as a back-up system, but this would add cost and complication, and could diminish the carbon reductions.
- 6.2 Disruption to occupiers during installation. The installation is likely to take place during the 2020/21 heating season, so will result in some disruption. This is particularly the case at Ebley Mill, where the gas boilers will probably need to be removed before the heat pumps are installed.
- 6.3 Impacts on occupiers during operation. Occupiers may also be affected by a change in the behaviour of the heating system. For example, the heat pump will be designed to operate more consistently, so warm-up times may be increased slightly (a higher output heat pump system would avoid this, but may not be cost-effective). Likewise, the internal temperature may slightly lower than the existing internal temperature (again, a higher output heat pump would allow higher temperatures to be achieved, but may not be cost-effective).
- 6.4 Change of Use of Buildings – if there were to be a change of use for either building to residential within the payback period the project would still fall under the same Non-Domestic RHI scheme and would receive the same tariff rate. However, the project would become a 'shared ground loop' installation, for which slightly different rules apply. We are advised that there doesn't appear anything in the legislation that prohibits such a change but this would need to be confirmed before the Council was committed to going ahead with either installation to determine whether there would be any impact on the payback period.

(NB If water source heat pumps are not installed now; a non-gas system would need to be installed when the gas boilers need replacing as gas installations in domestic properties are due to stop in 2025. The current RHI scheme will not be available beyond 2021 see 6.6 below)

- 6.5 Early disposal of building assets. An early disposal of the mill buildings within the payback period will mean that the Council will not have received the income to payback capital. It may be that the water source heat pump would increase the market value or marketability of the buildings.
- 6.6 Not meeting RHI deadlines. The Renewable Heat Incentive deadlines may not be met and payback forecast wouldn't be achieved. The current official deadline for installation is 31st March 2021, however the Government has indicated that they intend to allow installation & commissioning after this date (until 31st March 2022) providing that 'stage 2' (financial close) information has been submitted to Ofgem by 31st March 2021. RHI payments would end on 31st March 2041, so payments may be made for slightly less than 20 years.

- 6.7 The government has stated that a new programme of grant support called the Clean Heat Grant will replace the RHI from April 2022, however this is expected to consist of grants of up to £4,000 and only for installations of up to 45 kW, so would not be suitable for these projects.
- 6.8 Consenting delays or difficulties. Consent is required from the Environment Agency together with Listed Building Consents although initial discussions have been held with positive responses. The longest determination period will be for the abstraction licence at Ebley Mill, which is expected to take at least three months.
- 6.9 Impacts of COVID-19. The effects of COVID-19 could potentially affect the programme, which is highly sensitive to delays given the requirement to meet various RHI deadlines. COVID-19 will have resulted in delays for many projects and a backlog of installations for contractors to complete once restrictions are fully lifted. This may also reduce the number of good tender responses received.
- 6.10 Reduction of RHI tariff rate. The RHI is also subject to quarterly degressions (rate reductions), due to which the projects would need to be consented and have secured funding by 31st September 2020, in order to meet the anticipated payback.
- 6.11 Variation in future fuel prices. The RHI payments provide the majority of revenue for the project, and these would be guaranteed for approximately 20 years and index-linked. However, the project payback is also affected, to some extent, by the cost of gas and electricity. All work to date has been based on present day fuel prices.
- 6.12 Higher capital costs than expected. This risk will be mainly addressed through the competitive tender process and the subsequent detailed design stage.
- 6.13 Lower revenue than expected. Aside from the RHI tariff rate and fuel prices considerations above, it is important to note that the RHI payments are made based on metered heat usage at each property. Therefore, if the properties are not fully let, the project revenue will be lower.
- 6.14 Abortive costs. There is a risk of abortive costs if the project doesn't proceed through its respective phases. However, this is unlikely to occur beyond the detailed design work, which makes up a small proportion of the overall costs.

7 CONCLUSIONS

Ebley Mill

- 7.1 Ebley Mill is suitable for installation of a water-source heat pump system, which will have a total cost of approximately £1.05m and provide an CO₂ saving of 70-110 tonnes per year. Approximately 80% of the initial capital costs will be recovered through receipt of RHI payments over a period of 20 years. The heat pump system is expected to last for 25 years.
- 7.2 Given the availability of the Renewable Heat Incentive and the upcoming replacement of the main gas boilers at Ebley Mill, it is now a convenient time to consider progressing with this project. If the project is considered at a later date, there may be difficulties in sourcing parts for the ageing gas boilers, there will be increased pressure to eliminate

gas usage, but the RHI will no longer be available. Making use of the RHI now enables SDC to make full use of this valuable incentive from central government.

- 7.3 In order to achieve the anticipated performance, it is essential that the project progresses quickly to the design & build tender stage. To avoid further tariff reductions, the design will need to be sufficiently advanced to allow a 'Stage 1' Ofgem application to be submitted during September 2020.
- 7.4 Whilst the capital investment isn't fully paid back over the life of the RHI payment period, the environmental benefits of the installation are also a key consideration. In view of the Council's CN2030 commitment, it is recommended that the Council proceeds with installation of the WSHP at Ebley Mill, subject to the necessary consents being secured. The competitive tender and subsequent design work will provide more certainty on the project costs and performance, before any more significant project costs are incurred.

Brimscombe Port Mill

- 7.5 Brimscombe Port Mill is suitable for installation of a water-source heat pump system, which will have a total cost of approximately £380k and provide an CO₂ saving of 27-46 tonnes per year. All of the initial capital costs will be recovered through receipt of RHI payments over a period of 20 years. The heat pump system is expected to last for 25 years.
- 7.6 Given the availability of the Renewable Heat Incentive and the upcoming relocation of the gas boilers to accommodate the redevelopment of Brimscombe Port, it is now a convenient time to consider progressing with this project. If the project is considered at a later date, there will be increased pressure to eliminate gas usage, but the RHI will no longer be available. Making use of the RHI now enables SDC to make full use of this valuable incentive from central government.
- 7.7 In order to achieve the anticipated performance, it is essential that the project progresses quickly to the design & build tender stage. To avoid further tariff reductions, the design will need to be sufficiently advanced to allow a 'Stage 1' Ofgem application to be submitted during September 2020.
- 7.8 In view of the Council's CN2030 commitment, it is recommended that the Council proceeds with installation of the WSHP at Brimscombe Port Mill, subject to the necessary consents being secured. The competitive tender and subsequent design work will provide more certainty on the project costs and performance, before any more significant project costs are incurred.

8 FURTHER WORK

- 8.1 In anticipation of needing to meet RHI deadlines the district council has procured a consultant to write the client's requirements and prepare the tender documents for the design and install contracts. WDS have been appointed and have prepared a set of Employer's Requirements to enable competitive tenders for the design and installation to be sought.
- 8.2 Minor testing work as part of the Ebley Mill feasibility study by Renewables First is still outstanding due to COVID-19 delays. This will be carried out when possible, with results incorporated into the tender documents.

- 8.3 Due to the urgency of submitting consent applications and the relatively low cost associated with this, this will be carried out prior to the main design & install contract.
- 8.4 The design and installation contracts would include the following steps:
- Thermal simulation of buildings to finalise the heat demand profile
 - Design & specification of the heat pump systems and radiator upgrades
 - Installation & commissioning, including RHI accreditation

9 IMPLICATIONS

Financial Implications

- 9.1 The Council's capital strategy requires that all recommendations to Council for new capital schemes include consideration of financials, strategic objectives, capacity and deliverability. All of these issues have been addressed with the report and associated feasibility studies.
- 9.2 As a new addition to the capital programme, and one which is supported by a future revenue stream, borrowing has been identified as the most appropriate funding source. Whether this is external borrowing or borrowing from internal cash resources is at the discretion of the S151 Officer within the limits of the approved Treasury Management Strategy.
- 9.3 As a scheme funded by borrowing, the impact on the Council's annual revenue budget is a combination of Minimum Revenue Provision (spreading the capital cost over asset life) and interest on the borrowing. For the two schemes proposed the provisional costs of these have been calculated on an annuity basis to give an estimate of the annualised cost over 25 year terms. The exact annual cost may vary. On the day of writing the interest available on 25 year loans through the Public Works Loan Board was 2.4% and that rate has been used in the calculations.

Table 3

	Ebley Mill	Brimscombe Mill
Annual Saving (see table in report)	41,969	20,050
MRP and Interest	(56,105)	(20,550)
Annual Budget Impact	(14,136)	(500)

- 9.4 Table 3 clearly reflects, as shown elsewhere in the report, that the Brimscombe project is effectively self-funding whilst the Ebley Mill project requires a financial subsidy (although delivers environmental benefits). It is proposed to use the climate change reserve to meet the annual revenue cost at Ebley Mill until the medium term financial plan becomes clearer. The estimated annual cost of the Brimscombe project can be met by existing budgets.
- 9.5 Calculations shown that part funding the Ebley Mill Scheme with £263k of the capital reserve would produce a net zero impact on the Council budget. This approach will be considered by the S151 Officer upon final financing of the project but is not currently

recommended as it effectively frontloads the net Council subsidy required and does not allow for the benefit of the time value of money reducing MRP impact in future years.

- 9.6 Should either building be sold in the next 25 years the first use of any capital receipt will be to repay any outstanding capital costs from these schemes.
- 9.7 The decision being taken by the committee will only allow the scheme to proceed if there is a successful application to the RHI which helps to limit the financial risk.

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Legal Implications

- 9.8 Any specific legal implications arising from the technical aspects of the scheme in terms of consents and licences are set out in the body of the report. On the basis that the purpose of the recommendation in this report is to ask Council to add this scheme into the capital programme, there are no additional legal implications. In due course, there will be procurement requirements to be met which must comply with the Contract Procedure Rules but there are tight timescales to be managed as set out above.

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Equality Implications

- 9.9 There are no specific changes to service delivery proposed within this decision.

Environmental Implications

Ebley Mill

- 9.10 The WSHP at Ebley Mill would be replacing boilers within a decade of their expected lifecycle. Given that the outlook on plans to decarbonise the grid is that gas boilers will be phased out from 2025 it therefore seems reasonable that an early replacement to allow advantage of incentives designed to ease this transition is taken advantage of. It is noted the new equipment would have a lifecycle of 25 years before replacement needs consideration, which is a good lifecycle duration.
- 9.11 The existing boilers at Ebley Mill will be stripped down and harmful materials suitably removed under licence before being disposed of for recycling and reprocessing of materials.
- 9.12 The WSHP will be providing heat at a much greater efficiency of 400% compared with the existing gas boilers (approximately 85%) and given the fabric issues on the aged Ebley Mill it is anticipated that it would return a carbon saving at the higher end of the estimate of 70 -110 tonnes per year.
- 9.13 The WSHP installation proposal is complementary to our Carbon Neutral 2030 commitment and, given the listed building status and context of the building the viable alternatives for heating supply are limited. Biomass is a potential solution but requires ongoing deliveries and storage space and there is a question as to whether local supply chains are well enough developed at this time.

- 9.14 The tender documentation includes for the successful contractor to liaise with the Statutory authorities and all license applications.
- 9.15 The Ebley Mill WSHP would provide a CO2 saving of 70-110 tonnes per year, with a system lifetime of approximately 25 years.

Brimscombe Port Mill

- 9.16 The replacement of 3 relatively new gas boilers on this site requires some consideration of life cycle cost. Taking into account the efforts and materials required to re-site them from their current location and the commencement of phasing out of gas boilers from 2025 replacement with new technology is considered reasonable.
- 9.17 In the first instance consideration will be given to the possibility of re-using the boilers from Brimscombe Port Mill and installing in a Council owned building. Should this prove to be either uneconomic or installation is not compatible with those buildings they will be offered for sale and use by others.
- 9.18 Regardless of the age of the current system the new technology offers much better efficiency and a significant carbon saving. The Brimscombe Port Mill WSHP would provide a CO2 saving of 27-46 tonnes per year, with a system lifetime of approximately 25 years.
- 9.19 Enhancements to the fabric of the Brimscombe Port Mill in particular are to be included within the builders' works package to improve the insulation of the external elements and reduce heat loss (including additional loft insulation, draft proofing and secondary glazing).
- 9.20 The tender documentation includes for the successful contractor to liaise with the Statutory authorities and all license applications.

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