

Low Carbon Heating Project at Burwell House

To: Environment and Green Investment Committee

Meeting Date: 16 September 2021

From: Steve Cox, Executive Director of Place and Economy

Electoral division: Burwell

Forward Plan ref: n/a

Key decision: No

Outcome: Reduction of 24 tonnes of carbon dioxide equivalent (CO₂e) emissions per annum as part of the Council's "scope 1" direct carbon emissions through the replacement of fossil fuel heating at Burwell House, with low carbon Air Source Heat Pumps (ASHPs).

Recommendation: The Environment and Green Investment Committee is asked to:

- a) To approve the investment case set out in paragraph 2.10 and proceed with the project to install ASHPs and upgrades for the incoming electricity supply at Burwell House
- b) To note the project risks set out in paragraphs 2.13-2.18
- c) Delegate the decision to go into contract to the Executive Director of Place & Economy in consultation with the Chief Finance Officer and Chair and Vice-Chair of the Environment and Green Investment Committee.

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1. Background

- 1.1 In December 2019, following an update to Buildings Regulations on 'Nearly Zero Energy Buildings', the Council's General Purposes Committee resolved unanimously to install low carbon heating systems for any refurbishments and boiler replacements. This would both reduce the Council's carbon footprint and maximise energy benefits to the Council.
- 1.2 In February 2020, the Council included a £16million Environment Fund in its budget plan to support delivery of its commitments set out in the Climate Change and Environment Strategy approved in May 2020 at Full Council. The £16million Environment Fund is to implement near-term targets set out in the Climate Change and Environment Strategy and £15million of the fund is earmarked for replacing oil and gas heating with renewable heating, at the approximately 70 buildings owned and occupied by the Council.
- 1.3 The Council's annual carbon footprint report for 2018-19 shows that heating of 73 buildings with oil and gas accounted for 61% of the Council's 'Scope 1' carbon footprint, and this was similar in 2019-20. Scope 1 emissions are direct emissions from the Council's own assets and as such are those that we have the greatest control over. It will not be possible to meet the Council's climate change targets whilst so many of its buildings are heated with gas and oil.
- 1.4 In June 2020, the Environment and Sustainability Committee agreed the assessment criteria for the Low Carbon Heating Programme for the Council's buildings against which individual projects can draw down investment from the Environment Fund for their implementation and thus enable the Council to proceed with significant work towards meeting its climate change commitments. The approved criteria for investment are:
 - Individual sites are owned (either freehold or long term leaseholds) and occupied by the Council;
 - The individual site is not planned to be sold or let out within the next five years (based on currently known and agreed plans);
 - The total investment for the Low Carbon Heating Programme is approved at a cap of £15million to decarbonise all Council buildings that are heated by oil or gas (approximately 70 buildings);
 - The proposed design meets the Council's renewable heating specification (detailed in Appendix B);
 - A report must be produced detailing the whole lifecycle costs (financial and environmental), current and expected energy usage, projected energy savings and carbon reductions from the project and how this contributes to our targets;
 - The Programme is expected to achieve a simple average payback of 20 years or better for the £15million investment, taking into account the value of carbon. (Individual projects may exceed this as long as the average is maintained);
 - If any individual project is greater than £500,000, the business case will come forward to Committee for approval.

- 1.5 Also, in June 2020, the committee resolved to approve the inclusion of a carbon savings cost into the business case to sit alongside the financial business case for the low carbon heating programme.
- 1.6 The most suitable technologies for heating buildings from renewable sources are Air Source Heat Pumps (ASHPs) and Ground Source Heat Pumps (GSHPs). In ASHPs, outside air is used to heat a liquid refrigerant. The pump uses electricity to compress the refrigerant to increase its temperature then condenses it back to release stored heat. This heat is then used to heat water which is then piped to either radiators or under-floor heating. ASHPs still work well even when the outside air temperature is very low. They are generally very reliable sources of heat and require very little maintenance. GSHPs work in a similar way, except that coils or pipes containing refrigerant are buried in the ground. Note that whilst heat pumps do use electricity, they are very different to traditional electric heating, in that the electricity is not the source of heat. Heat pumps typically produce a heat output 3 to 4 times as much as the electricity they use. GSHPs are considerably more expensive than ASHPs.
- 1.7 The intended outcome of this report is to agree whether to proceed with installation of ASHPs at Burwell House and make the CO₂e savings.

2. Main Issues

- 2.1 The Burwell House site consists of an eighteenth-century house with several smaller modern buildings on 3 acres of land. The site has been owned by Cambridgeshire County Council since 1965.
- 2.2 The building retains the atmosphere of a large family home and is currently heated by a gas boiler. The boilers are approximately 10 years old and will need replacing within the next five years and the hot water cylinder is about 20 years old so at the end of its life expectancy. The controls are also around 10 years old and the pipework, valves, etc are about 20 years old.
- 2.3 Design of a low carbon heating solution for the site has been completed by Ridge and Partners LLP who were appointed following a competitive tender process. The proposed design will entail the removal of the existing gas boiler and the installation of:
- 2 Strebel S-ASX 70 ASHPs for the main building;
 - New radiators throughout;
 - Improvements to insulation
- 2.4 Drawings of the layout of the proposed design are appended as separate documents in Appendix A.
- 2.5 The installation of “small ancillary buildings, works and equipment” on local authority controlled land for local authority purposes may be regarded as permitted development under Part 12 class A of the Town and Country Planning (General Permitted Development) (England) Order 2015 (as amended). The limitation is 4 metres in height or 200 cubic metres in capacity, and the proposed design will not exceed those dimensions.

Financial

- 2.6 A tender for the construction and installation phase was completed through the Council's existing minor works framework contract. Three bids were received. The price from the successful contractor for the construction and installation has been used to prepare the

lifecycle costs analysis for the project.

- 2.7 In late 2020, the government's Public Sector Decarbonisation Scheme (PSDS) was launched by Salix Finance and offers grant funding to local authorities for heating decarbonisation projects. The Council was notified that our grant application was successful, and we have been awarded a total of £2,520,117 towards the costs of 15 ASHP projects, of which approximately £279,889 is for the Burwell House project.
- 2.8 The grant will cover costs of up to £500 per tonne of carbon saved over the project lifetime, which is calculated automatically in the application, plus up to 100% of particular costs such as metering and electricity supply upgrades. For the proposed project at Burwell, the maximum grant would be approximately £279,889, and the grant will cover approximately 60% of the total project costs. This means that the net cost to the Council of the ASHP project could be £231,410 if all the contingency is used on the project.
- 2.9 An analysis of the lifecycle costs of the project was completed, comparing the low carbon (ASHP) option with a gas heating replacement counterfactual. Based on current best estimates of the 25-year lifetime total costs, including the value of carbon, undiscounted, with the maximum grant funding, the project would pay back within 15 years when compared to the counterfactual scenario of replacing with new gas heating. This is a worst case scenario assuming that all contingency sums are required.
- 2.10 A summary of the lifecycle costs is shown in the table below.

Item	Gas counterfactual cost	Low carbon ASHP cost (with grant)
Design work and preliminary costs	£8,000	£8,000
Internal staff costs for project	£3,000	£3,500
Double-glazing (already installed)	£44,000	£44,000
Electricity supply upgrade costs	Not applicable	Quoted £95,580
Construction and installation costs (including £20,000 provisional sum for asbestos costs)	Estimated £110,000	Quoted £318,753
Other contingency	£9,000	£41,436
Total project costs, excluding contingency (before grant)	£145,000	£449,863
Total capital expenditure (including contingency, before grant)	£174,000	£511,299
Grant	0	-£279,889
Total investment in year 1	£174,000	£231,410
Annual running costs (energy + maintenance) thereafter (excluding value of carbon) (ignoring inflation)	£11,312	£10,851
Annual running costs (energy + maintenance) thereafter (including value of carbon) (ignoring inflation)	£13,179	£10,851
Value of carbon emissions over 25 years (virtual cost)	£128,687	£0
25-year lifetime total cost, excluding value of carbon, undiscounted	£596,027	£614,213
25-year lifetime total cost, including carbon, undiscounted	£724,714	£614,213

Item	Gas counterfactual cost	Low carbon ASHP cost (with grant)
Project payback (including value of carbon) (compared to counterfactual)	Not applicable	15 years
25-year lifetime total cost, including value of carbon, discounted to 2020	£460,365	£432,845

- 2.11 The total costs include £44,000 for the replacement of windows with double-glazing. This aspect of the work has already been completed (and paid for) in 2020 and therefore appears in both options. These costs are included in the lifecycle costs for completeness.
- 2.12 The lifecycle costs analysis includes a cost for an upgrade to the capacity of the incoming electricity supply to the site. This is based on a formal quotation from UK Power Networks (UKPN) of £95,580. There will also be some further related costs for additional supporting works such as trenching (included in contingency).
- 2.13 The financial risk on the project relate to whether asbestos or other problem issues are found on site that must be dealt with once works commence. In the scenario that all contingency and provisional sums are fully utilised on the project, the total capital expenditure for the project (including double glazing) could exceed the threshold of £500,000.

Timing

- 2.14 The grant end date is set by Salix as 31 March 2022. This is a hard deadline for spending the grant allocation on the project. However, Salix have confirmed that the grant can still fund any eligible part of the works that can be invoiced up to that date. The Council would be required to fund any work aspects completed after 31 March 2022. As the grant only covers part of the costs anyway, this will be acceptable. However, all efforts will still be made to complete the project within the timetable set out below.
- 2.15 The revised planned timetable for the project is as follows:
- September 2021: Place orders with the winning contractor for construction and installation, with UKPN for electricity supply upgrade, and with Total Energies for meter replacement.
 - Mid-November 2021: Contractor to start works on site
 - End January 2022: Electricity supply upgrade to be completed on site.
 - End March 2022: Majority of works on site to be completed.
 - May 2022: Final commissioning and handover.
- 2.16 Following a temporary closure due to Covid-19 restrictions, the site has now re-opened for residential and day visits, meaning that works will need to be carefully co-ordinated with site users to minimise disruption. It is likely that parts of the site would need to be closed or cordoned off for part of the time during the works, particularly as radiators are replaced. To facilitate this, a detailed plan would need to be agreed between the site manager and the contractor for the works.
- 2.17 Since the heating works are due to take place in autumn and winter, it is likely that temporary alternative heating could be needed whilst the works take place. This will depend on the exact timing, duration of works, outside temperature at the time, and the occupancy of the site.
- 2.18 Supply chain challenges are a significant risk to the delivery and meeting the timetable. For

example:

- The heat pump manufacturer, Strebel, has informed us that they are cannot deliver the heat pumps until May 2022 due to a global shortage of microprocessors and various raw materials. Work is underway to source alternative ASHP manufactures that meet our design specification who could deliver sooner in order to meet the programme deadlines set out in paragraphs 2.16 and 2017.
- The potential for labour shortages due to Covid-19
- The potential for unforeseen technical or practical issues on site

2.19 Grafham Water Residential Centre also received Public Sector Decarbonisation Grant for low carbon heating. Energy efficiency and construction challenges with this building mean that investment into Grafham Water using this round of PSDS grant will not be possible.

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do

There are no significant implications for this priority. However, there will be a benefit to workers involved in the works. The site having updated heating systems will benefit the staff and service users who use the site.

3.2 A good quality of life for everyone

There are no significant implications for this priority. However, a reduction in the carbon footprint for Cambridgeshire has benefits to the quality of life of our residents.

3.3 Helping our children learn, develop and live life to the full

Burwell House offers a wide variety of residential and non-residential courses for children, young people and adults. This site will benefit from the updated heating systems with a reduced carbon footprint.

3.4 Cambridgeshire: a well-connected, safe, clean, green environment.

This project will help the Council to meet its carbon reduction ambitions in relation to this priority.

3.5 Protecting and caring for those who need us

There are no significant implications for this priority.

4. Significant Implications

4.1 Resource Implications

The report above sets out details of significant implications in paragraphs 2.6-2.13 including the requirement for the Environment Fund to support additional staff resources for project delivery. Our experience to date is that delivering low carbon heating schemes for projects does require additional staff resource. In 2.10 above a nominal £3,500 has been allocated towards staff costs but as the low carbon heating programme progresses there will be a need to increase the allocations for staff resource to manage an increasing programme of delivery.

4.2 Procurement/Contractual/Council Contract Procedure Rules Implications

The report above sets out details of significant implications in paragraph 2.6.

4.3 Statutory, Legal and Risk Implications

All building works will need to comply with Building Regulations and Health and Safety legislation and policies; and key risks include potential delays or additional costs owing to asbestos remedial works, COVID-19-related delays to materials supplies or contractor staff shortages or electricity supply upgrades. These are all being monitored and managed by the project team.

4.4 Equality and Diversity Implications

Access to the buildings by staff and service users may be temporarily restricted whilst works on site are taking place. This could include temporarily closing buildings or relocating access routes, workspaces and services to other parts of the building or other buildings. This will be assessed in further detail to determine whether any restrictions will be required at Burwell House, and alternative plans put in place where required to ensure staff and service users with protected characteristics are not negatively impacted.

4.5 Engagement and Communications Implications

Extensive consultation with the public and other organisations on the Council's Climate Change and Environment Strategy and Action Plan took place before the final version was agreed. It was also developed in collaboration with a cross-party Member Advisory Group and a cross-departmental Officer Steering Group. The Council's Energy and Property FM teams have worked together to identify a list of properties for the first batch of projects to replace oil or gas heating with ASHPs. This list has been assembled with input from representatives of the Cambs2020 team, the Property FM team, the Energy Investment Unit and the Strategic Property Asset Board at their meeting in March 2020.

4.6 Localism and Local Member Involvement

The Climate Change and Environment Strategy was developed in collaboration with a cross-party Member Advisory Group.

4.7 Public Health Implications

The works will need to be done whilst minimising disruption and still adhering to social distancing requirements that may still be in place at the time, due to the COVID-19 situation. Reducing our carbon footprint and helping to mitigate climate change also has public health benefits in the long term.

4.8 Environment and Climate Change Implications on Priority Areas:

4.8.1 Implication 1: Energy efficient, low carbon buildings.

Positive Status:

Explanation: This project will directly reduce carbon emissions from heating our buildings.

4.8.2 Implication 2: Low carbon transport.

Neutral.

Explanation: There are no changes to transport as a result of this project.

4.8.3 Implication 3: Green spaces, peatland, afforestation, habitats and land management.

Neutral.

Explanation: no impact

4.8.4 Implication 4: Waste Management and Tackling Plastic Pollution.

Neutral.

Explanation: no impact

4.8.5 Implication 5: Water use, availability and management:

Neutral.

Explanation: no impact

4.8.6 Implication 6: Air Pollution.

Neutral.

Explanation: no impact

4.8.7 Implication 7: Resilience of our services and infrastructure, and supporting vulnerable people to cope with climate change.

Neutral.

Explanation: no impact

Have the resource implications been cleared by Finance? Yes

Name of Financial Officer: Sarah Heywood

Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the LGSS Head of Procurement? Yes

Name of Officer: Henry Swan

Has the impact on statutory, legal and risk implications been cleared by the Council's Monitoring Officer or LGSS Law? Yes

Name of Legal Officer: Fiona McMillan

Have the equality and diversity implications been cleared by your Service Contact? Yes

Name of Officer: Elsa Evans

Have any engagement and communication implications been cleared by Communications? Yes

Name of Officer: Joel Lamy

Have any localism and Local Member involvement issues been cleared by your Service Contact? Yes

Name of Officer: Steve Cox

Have any Public Health implications been cleared by Public Health Yes or No

Name of Officer: Iain Green

If a Key decision, have any Environment and Climate Change implications been cleared by the Climate Change Officer?

Yes

Name of Officer: Emily Bolton

5. Source documents

Source documents: none.

Appendix A – Drawings of Proposed Design

See separate documents attached.

Appendix B – Renewable Heating Specification for retrofits

Low carbon heating technologies

All new heating systems installed into Council buildings must be from renewable sources. Designers should consider heating options in line with the list below.

Air Source Heat Pumps: preferred option, suitable for most sites.

Ground Source Heat Pumps: may be suitable for larger sites with sufficient land.

Water source heat pumps: may be considered for sites adjacent to a water course.

Biomass or biogas boilers: unlikely to consider.

Hydrogen: Technology not yet widely available but may consider in future.

Heat networks: May consider if part of a larger scheme e.g. for villages, blocks or areas of several buildings. Not suitable for individual buildings.

Electric heating: Do not install new. May keep existing systems.

Gas / Oil / kerosene / LPG / Coal: Do not install. Replace existing systems when feasible.

Energy Performance Requirements

Technical specification

Heat demand of the building must be considered and heating systems sized appropriately to meet demand.

For installations 60kW and above, the Seasonal Coefficient of Performance (SCOP) of any Air Source Heat Pump (ASHP) must be no lower than 4.0 at 35°C and 3.0 at 55°C.

For installations below 60kW, the SCOP of any ASHP must be no lower than 3.5 at 35°C and 2.8 at 55°C.

The energy rating of any unit must be no lower than Class A+.

Forecasting energy use, carbon savings and life cycle costs

An Energy Performance Certificate (EPC) must be obtained if there is not already one within the last two years, or if significant changes to the building have been carried out since the last EPC. Design proposals must include information on forecast energy use of the new system, comparison to current/previous use, and estimates of carbon emissions savings, both annually and over the lifetime of the system.

Design proposals and supporting information should provide the data to enable Whole Life Cycle Costs (including the cost of carbon) to be calculated.

Building fabric efficiency upgrades

Building improvement works should be carried out where necessary to achieve an EPC level of 'C' or better for existing buildings. New builds (including extensions if heated separately) should target an EPC 'A' rating.

For some buildings, upgrades to the fabric of the building (e.g. insulation, windows, draught-proofing) or to other elements of the plumbing and heating system (e.g. radiators) may also be required.

- Wall insulation and loft/roof insulation must be installed in any buildings where these measures are recommended in the EPC. In these cases, a new EPC must be obtained after the insulation works are completed.
- Single glazed windows should be replaced with double- or triple-glazing where possible.
- Consideration should be given to any other measures recommended in the site's EPC Advisory report and/or the DEC Recommendation Report.

Metering

Heating systems should be sub-metered in order to identify the electricity usage and heat output of the heating system.

Ongoing maintenance

Provision should be made for ongoing maintenance in line with that required by manufacturers' specifications, to ensure the system continues to function well.