



SPECIAL CABINET – 18TH JANUARY 2023

SUBJECT: HEATING PLANT REPLACEMENT – TY PENALLTA

REPORT BY: CORPORATE DIRECTOR FOR ECONOMY AND ENVIRONMENT

1. PURPOSE OF REPORT

- 1.1 To update Cabinet in relation to works required to the heating plant at Ty Penallta and to outline the costs and work programme involved in the upgrade.
- 1.2 To seek Cabinet approval for the upgrade to be funded through a combination of a Salix interest free loan and a contribution from uncommitted capital earmarked reserves.

2. SUMMARY

- 2.1 The Ty Penallta building was constructed some 16 years ago and officially opened in 2008. Consequently, there is an inevitability linked to this timeline that some maintenance works (particularly mechanical and electrical) will now be required. Furthermore, technology advancement linked to being more carbon efficient will influence some maintenance strategies moving forward.
- 2.2 Ty Penallta has an energy centre with ground source heating and cooling plant that supplies heat and cooling via air handling equipment and under floor systems. Gas boilers are installed in a separate fifth floor plant room and supply space heating via radiators and hot water to the building. The heating and cooling system was installed in 2007/2008 and comprises of three heat pumps, two of which are reversible for cooling. The source for the heat pumps is a vast array of vertical closed loop boreholes installed beneath the car park of the site.
- 2.3 The heating system is currently exhibiting a number of problems and is at risk of failing if a package of upgrade/replacement works are not implemented.

There are several reasons why the existing system needs to be replaced: -

- A review of the operation and performance of the existing system finds that there are operational issues with the system and the conclusion is that the system is not performing as well as expected.

- The system design does not allow variable speed control of the bore hole pumps and as a result contributes to high parasitic electrical demand leading to costs that could otherwise be avoided with improved system design.
- Recent operational information has revealed the equipment is no longer supported by the installer/manufacture and spare parts are not available.
- The compressors that form the main element of the heating and cooling system use refrigerant R134a which has a high Global Warming Potential (GWP) and is being phased out as part of the Kigali amendment to the Montreal Protocol.
- The current system is designed to only provide low carbon heat to some parts of the building and due to temperature limitations of the existing heat pumps do not heat the whole building which leaves a large proportion of heat and hot water being generated by gas boilers increasing the carbon intensity of the building.
- The ground source array of boreholes represents a considerable capital investment and following some outline testing and review it is understood that the bore field is in serviceable condition and as such represents a significant asset in the objectives to decarbonise the heat, hot water and cooling systems at Ty Penallta.

2.4 As a result of the issues outlined above, the Ty Penallta heating system requires a significant upgrade.

2.5 Welsh Government Energy Service (WGES) were asked to undertake a review of all technologies for the replacement of the heating plant, this included the use of wood chip/pellets, the use of gas as a primary heating fuel and other formats. WGES concluded that the existing heat pump technology remains the most appropriate technology confirming that Ty Penallta's heating is from a sustainable source. It is also renewable given that the electricity supply to the building is 100% green renewable energy.

2.6 The installation of a gas system would represent a retrograde step given the climate emergency declaration and would emit significantly more CO₂e over the lifetime of the installation whilst simultaneously increasing reliance on fossil fuels and the associated costs.

2.7 As a result of confirmation by WGES that ground source heat pumps represent the most carbon efficient system, officers have engaged with Welsh Government's public sector decarbonisation delivery body Salix to explore interest free "invest to save" loan options. Salix has indicated that the business case is likely to be supported (dependant on a formal application being considered and approved) for circa £1m of loan funding which can be repaid from the resultant energy savings over the 8 year repayment period. However there will still be a shortfall of circa £0.4m which will need to be funded by the Authority.

3. RECOMMENDATIONS

3.1 That Cabinet agrees the upgrade to the heating system set out in this report and the project timeline set out in Appendix 1 to this report.

- 3.2 That Cabinet approves the overall funding envelope of £1.4m and agrees that this is funded through an application for a Salix interest free loan (£1.015m), and a contribution from uncommitted capital earmarked reserves (£0.385m).

4. REASONS FOR THE RECOMMENDATIONS

- 4.1 To ensure that the heating and cooling system at Ty Penallta is fit for purpose and also contributes to the authority's carbon reduction targets, which is estimated to be in the region of 2,264 tonnes over the 20-year project lifetime.
- 4.2 To give officers the authority to make a funding application and ensure that the scheme is progressed in a timely manner in order to achieve the energy, financial and CO2e savings as soon as possible.

5. THE REPORT

- 5.1 Ty Penallta is the main corporate office of Caerphilly County Borough Council and will be developed into an agile working hub. This will provide a mix of fixed and hot desks, meeting rooms and other collaborative spaces. As asset rationalisation workstreams are completed the importance of providing an efficient, resilient and productive working environment for officers, members and visitors is essential for the services based there.
- 5.2 The heating and cooling for the air handling and under floor systems are supplied by an energy centre comprising three heat pumps, two of which are reversible for cooling. The source for the heat pumps is a vast array of vertical closed loop boreholes beneath the car park. Three gas boilers are installed in a separate 5th floor plant room and supply space heating via radiators and hot water to the building.
- 5.3 In late 2021/22 Sustainable Energy Ltd (SEL) were appointed by Caerphilly County Borough Council to review the heat pump installation and to investigate problems experienced with high pumping rates, under-utilisation of heat and cooling from the heat pumps, plant reliability issues, poor comfort conditions and poor control of heating and cooling. SEL undertook site visits on the 27th April and 26th May 2022.
- 5.4 The review process was broken down into the following workstreams: -
- Bore field operation assessment.
 - Energy demand and supply assessment.
 - Development of concepts and design approach for the upgrade of the heat pump system.
 - Carbon and cost assessment and presentation of findings.
- 5.5 The three heat pumps referred to in paragraphs 2.3 and 5.1 above are no longer supported by the installer / manufacturer and spare parts are not available. 50% of the three pumps have been stripped to enable the continued operation of the remaining plant, which is currently keeping the building serviced.
- 5.6 Discussions between relevant officers and Gibsons Specialist Technical Services, who are our current Mechanical and Electrical (M&E) Engineers have concluded that there are ongoing significant challenges, which will result in total failure of the system should a suitable replacement not be procured.

- 5.7 If the remaining heat pumps fail, there will not be sufficient gas pressure within the building to sustain all services. However, mitigation could be the temporary installation of an oil tank linked to the plant room, the costs of which would need to be determined if the scheme does not progress.

6. CONCLUSION

- 6.1 The existing heating and cooling system installed at Ty Penallta is no longer fit for purpose and a suitable replacement system needs to be procured. Currently the aging system is failing due to the lack of ongoing support from the manufacturer and availability of parts combined with some design flaws when the building was constructed in 2007/8.
- 6.2 If the outline design approach for connecting the two plant rooms and installing dedicated heat pumps and chillers is agreed as the way forward, a RIBA Stage 3 design and specification should be developed to take the project to tender with the requirement for a main contractor to develop RIBA Stage 4 and 5 design, with an independent client engineer engaged to ensure compliant delivery. The project timeline is set out in appendix 1 to this report.
- 6.3 The proposal to expand the work of the heat pumps to offset heat generated by gas boilers will result in a reduction of fossil fuel use and therefore carbon emissions. The carbon savings are estimated at 84 tonnes per year. Given the significant carbon savings we would be eligible to make a SEELS funding bid to Salix Finance to part fund the project via an interest free "Invest to Save" loan
- 6.4 The SEELS funding will be an interest free "Invest to Save" loan. The loan repayments will be made from the gas budget and repaid over a maximum of 8 years. Calculations and data will need to be verified by Salix however issues are not anticipated following on from initial discussions regarding the application. If the application is unsuccessful, a further report will be presented to Cabinet with alternative funding proposals.
- 6.5 There are further carbon savings to be made through the use of a variable speed drive on the heat pump and through improved building energy management controls. Information to establish how much additional energy can be saved is shown in Appendix 2. This would allow for a SEELS bid value of £ 1,015,296.
- 6.6 Caerphilly County Borough Council has declared a climate emergency and to be a net carbon neutral authority by 2030. To achieve this the authority has developed a new carbon strategy which outlines key areas for consideration, one of which is energy use within buildings. National guidance states that the UK needs to decarbonise the gas network or to step away from using gas by using alternative fuels for heating, this is essential for meeting Net Zero targets.
- 6.7 Improvements and replacement of the heating plant will result in a positive improvement on the buildings Display Energy Certificate, which is a public facing document. The proposal in this report to further reduce our reliance on gas, by using the building's gas boilers less, and to increase the work undertaken by the heat pumps will make Ty Penallta a more sustainable building and reduce national demand on fossil fuels and help us reach our Net Zero goal.
- 6.8 As the building will use substantially less gas for heating as a result of the investment there will be an annual energy cost saving of £126,912, which can be used to service the interest free "Invest to Save" loan.

6.9 With the improved levels of control, and monitoring there will be an improvement in comfort levels throughout the building.

7. ASSUMPTIONS

7.1 It has been assumed that the defects with the existing heating plant will worsen over time and the unavailability of parts will continue to present challenges.

8. SUMMARY OF INTEGRATED IMPACT ASSESSMENT

8.1 As this report only relates to the replacement of existing heating plant, no Integrated Impact Assessment is required.

9. FINANCIAL IMPLICATIONS

9.1 The total cost of the project is estimated at circa £1.4m (including design and supervision fees).

9.2 As outlined above, officers will explore opportunities for interest free loan funding (SEELS) from Salix. An interest free loan of £1,015m should be feasible (over an 8-year repayment period). If the loan application is successful, then a balance of £0.385m will remain and it is proposed that this is funded from uncommitted capital earmarked reserves. If the Salix loan application is not approved, a further report will be presented to Cabinet with alternative funding proposals.

9.3 In the event of failure there will be ongoing additional revenue implications to procure, rent and maintain a suitable temporary oil-fired plant alongside additional gas costs.

10. PERSONNEL IMPLICATIONS

10.1 There are no direct personnel implications associated with this report.

11. CONSULTATIONS

11.1 The views of the listed consultees have been incorporated into this report.

12. STATUTORY POWER

12.1 Local Government Acts.

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Consultees: Corporate Management Team (CMT)
Christina Harrhy, Chief Executive
Cllr Nigel George, Cabinet Member for Corporate Services and Property

Cllr James Pritchard, Cabinet Member for Prosperity, Regeneration and Climate Change.

Mark S Williams, Corporate Director Economy and Environment

Stephen Harris, Head of Financial Services and S151 Officer

Robert Tranter, Head of Legal Services and Monitoring Officer

Ben Winstanley, Head of Land and Property Services

Mel Hunt, Building Services Engineer

Paul Rossiter, Energy and Water Officer

Background Papers:

Ground Source Heat Pump Review report by Sustainable Energy, September 2022

Appendices

Appendix 1 - Project Timeline

Appendix 2 - Salix Seels Loan Calculation