Item: 4

Asset Management Sub-committee: 1 September 2026.

Stromness Swimming Pool – Proposals for Replacement Plant.

Report by Director of Infrastructure and Organisational Development.

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1. Overview

1.1. This report presents a proposal to install replacement plant at Stromness Swimming Pool which is contrary to the Council's Net Zero strategy, for members' consideration.

1.2. The heating plant in Stromness Swimming Pool is at the end of its life and must be replaced. In line with the Council's policy of minimising carbon emissions a Zero Direct Emission Heating (ZDEH) system was investigated.

1.3. However, as swimming pools in general have exceptionally high continuous heat demand, and there are particular space constraints at the location, after early design work was completed, it became clear that the costs associated with a ZDEH replacement would be exceptionally high. |

1.4. Therefore, as current capital budgets are insufficient to cover the costs associated with a ZDEH replacement at this site and delaying replacement would create operational risk, officers have identified a hybrid arrangement which will replace the system with a more efficient oil boiler combined with solar panels.

1.5. It is important to note that despite the exceptional combination of factors in this location leading to a compromise being identified, the Council remains committed to decarbonising the asset in future and remains to commit to zero direct emission heating system by default.

2. Recommendations

2.1. It is recommended that members of the Sub-committee:

i. Agree that the oil boilers at Stromness Swimming Pool be replaced using new, efficient oil boilers complemented by photovoltaic solar panels, as alternative Zero Direct Emissions Heating (ZDEH) technologies, such as air source heat pumps, are not currently considered economically viable for the unique circumstances associated with the property.

3. Background

3.1. In 2019, Orkney Islands Council declared a Climate Emergency and reaffirmed its priority with respect to working towards a carbon neutral economy. Subsequent Net Zero commitments and targets have been made with in the Council Plan and the Council's Delivery Plan 2023-2028 (including that Orkney is on track to become net zero by 2030).

3.2. In 2023, the Council agreed on working principles for the developing climate change strategy and in 2024 agreed a Climate Change vision statement. Aether Ltd were appointed and an independent study was completed with indicative Council transition pathways towards net zero, reported to the Policy and Resources Committee on 17 February 2026. The Council subsequently approved the high ambition scenario and is now aiming for a target of net zero emissions by 2045. The principle of interim targets was also agreed, with buildings and vehicle fleet being identified for full decarbonisation by the mid 2030's. Work is underway to finalise these targets with progress reported to Policy and Resources in June 2026.

3.3. Replacement of the existing boiler plant with a modern efficient oil-based system at Stromness Swimming Pool will result in a small carbon saving and a small revenue saving, but without further abatement or fuel substitution, this will lock in carbon emissions beyond the above target dates. This will leave a future cost on the Council for the net zero ambition to be achieved and is contrary to national and Council policy direction regarding net zero strategy and action. However, as outlined in this report this is considered to be the only economically feasible outcome at this stage for this specific swimming pool building. In this regard, this decision should not be considered a precedent for future decisions regarding a move to net zero technology, but rather a pragmatic and necessary solution to the specific technical requirements of this swimming pool facility. The installation of PV panels and the retention of the existing pool heat pump will add to the potential carbon savings for the building.

3.4. The ZDEH System proposed for Stromness Swimming Pool is a two-stage arrangement with Air Source Heat Pumps (ASHP) developing 40°C water with a second stage Water to Water Heat Pump (WWHP) increasing the temperature to 70°C which is required to meet the Domestic Hot Water demand. At present it is not possible to get a single stage heat pump capable of meeting the building requirement, however the technology continues to advance, and it is hoped that alternative options will exist in future.

3.5. Should Council determine that a ZDEH system must be implemented, a Capital Project Appraisal would need to be considered via the normal capital programme process, including identification of funding and determination via the CPA governance routes.

3.6. The Council has installed Ground Source heating in all new build Care Homes and Schools. In addition, refurbishments and extensions to properties such as St Andrews, Hope and Sanday Schools have also included ZDEH systems. The design process starts with an assumption that renewable heating will be the preferred route, addressing both the Council’s decarbonisation targets and responding to the industry and legislative trend in Scotland to decarbonise heat for all public buildings.

3.7. The existing 4 oil boilers at Stromness Swimming Pool are approximately 30 years old. The oil tank was installed in 2009. The Chartered Institute of Building Services Engineers suggests a replacement cycle of around 20 years for the boilers and 30 years for the oil tank.

3.8. The swimming pool water is heated by a Dimplex S1 30TE ground source heat pump that was installed in 2008 and delivers heat to the pool during the night when the pool covers are in place. This arrangement allows the boiler plant to shut down more frequently minimising fossil fuel use.

3.9. The heating loads in the property are radiators, underfloor heating, air handling units (AHUs) and heat losses from the pool water. Large quantities of hot water are used with concentrated peak loads, resulting in high storage requirements. Some loads like the underfloor heating and the pool water heating are suited to the low temperature output of heat pumps however the AHUs, Radiators and Domestic hot water loads require high flow temperatures which cannot be achieved using a single heat pump but will require a second stage of heating adding significantly to the plant room size and the installation cost.

3.10. The existing boiler house is at the north of the building and is approximately 12m^2. It is anticipated that to accommodate the new heat pump plant, a space of 40m^2 would be required within the building with a further external space of 16m^2 for the external air source heat pumps. Heat pump systems rely on buffer vessels to store heat energy to smooth out peaks and troughs in the load. The buffer vessels are usually quite large volumes of 1500 to 2500L and take up floor space.

3.11. The large increase in required floor area over the current oil boiler plant room could not be accommodated at the north end of the building without serious impact to the disabled access to the building and major civil works as the building is cut into the hillside. A solution would be to relocate the plant to the south end of the building, this would result in the loss of several car parking spaces and would also require underground pipework to reconnect the north end of the building, adding further to the cost of installation.

3.12. An initial cost plan has been undertaken to evaluate the cost of the options available for the project, the following options were considered:

Option	Capital Cost (£)	15Yr Cumulative Operating Cost (£)	Plant Life (Yr)	15yr cumulative Tonnes CO_2 Emitted	£/Tonnes CO_2Saved
Oil boiler replacement plant	£ 430,000	£877,007	20	1555.0	£769
Ground source heat pump (with High Temp water to water heat pumps)	£ 1,655,000	£259,103	20	109.3	£836
Air source heat pump (with High Temp water to water heat pumps)	£ 1,163,500	£302,286	15	127.6	£588

3.13. The cost plans were developed using information from recent projects where similar works have been undertaken including Hope Primary school, Kirkwall Care Home, St Magnus Cathedral and St Andrews Primary school. Further work has now been carried out on the cost plan, with better design information now available and costs updated to account for market inflation as a result the anticipated cost for the Oil Boiler scheme is £490k with the ASHP option at £1,425k.

3.14. The ground source option was based on a bore hole field located in the football pitch to the East of the pool building; costs include for reinstating the playing surface. The ground source option would result in a system with a slightly higher overall efficiency, but this was overshadowed by the significant additional installation cost, and the option was not taken any further.

3.15. The Carbon Trust has undertaken a Decarbonisation Study attached as Appendix 1. This was funded by Innovate UK. The study looked at the various options, assess the carbon emissions of each, and investigate the operational costs.

3.16. The executive summary of the report includes a sensitivity analysis based on the running costs of the ASHP system and the existing inefficient oil boiler plant. This analysis shows a marginal saving of £146/annum based on the current electricity and oil prices.

3.17. For a heat pump to become cheaper to run than an oil boiler, the cost of heating oil will need to be more than the cost of electricity divided by the Coefficient of Performance (COP) of the heat pump system. The following table shows the comparison over the past few years:

Historic Utility Prices

		COP	3
	Electricity P/kWh	Heating Oil P/L	HP Viable
2026/27	16.06	98.60	Yes
2025/26	17.10	53.55	No
2024/25	22.72	53.40	No
2023/24	20.85	62.08	No
2022/23	11.21	74.49	Yes
2021/22	9.19	64.72	Yes
2020/21	9.29	45.57	Yes
2019/20	8.59	53.47	Yes
2018/19	8.01	58.47	Yes
2017/18	7.99	51.88	Yes
2016/17	7.81	46.55	Yes
2015/16	11.49	39.82	Yes
2014/15	11.46	62.59	Yes
2013/14	11.95	63.53	Yes
2012/13	11.64	67.81	Yes

3.18. The assessment for 2026/27 is based on oil prices from April to June 2026. However, these prices have been volatile and elevated due to the conflict in the Gulf. With the elevated oil price we are experiencing in Summer 2026, the cost of operating the heat pump should be less than the equivalent fossil fuel system, but it is difficult to assess the longer-term oil price, and whether a longer-term high oil price will increase the electricity price.

3.19. A further assessment approach is to look at lifetime costs. The UK Government's Green Book identifies a process to calculate the whole life operating cost for a project based on predicted energy price and the cost of mitigating the carbon emissions. When the cost of Carbon is factored into the assessment the running cost of the ASHP becomes 34% that of the oil boiler alternative based on central figures. (see Appendix 2)

3.20. The assessment process includes brackets of costs based on various projections of energy markets. whether we consider high electricity and low oil or low electricity and high oil, the assessment indicates a reduction in operating costs for the ZDEH System over the fossil fuel alternative.

3.21. A further cost consideration remains regarding potential carbon credits which is not possible to estimate currently. Further work on carbon credit assessment is to be progressed through the Climate Strategy Action Plan. Scenario 4 excludes the cost of carbon from the assessment completely and based on central energy prices a ZDEH System will still be cheaper to operate.

For Further Information please contact:
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Implications of Report

1. **Financial:** Given current knowledge and understanding of energy prices, the recommendation is understood to be the most cost-effective replacement option for the Council. A possible additional cost however may arise in the future, should the Council need to compensate for the emissions from the new boilers (for example either by purchasing carbon credits or through nature based projects that would sequester carbon emissions).
   The General Fund Annual Capital Improvement budget is £2M for next financial year, which is not sufficient to finance the air source heat pump project, which has risen from an estimated £500K to £1,163,500.
   An alternative would be to take a separate capital project through the CPA process however the business case for the ASHP will be weakened as the revenue savings of the project do not offset the additional capital cost within the lifetime of the plant. Without external funding to contribute towards it, the alternative is borrowing from the Loans Fund. To ensure the debt is paid off before the heat pumps are obsolete, it means repayment over 15 years, at an average cost of £97K per annum (principal, interest, and debt management costs). This would **exceed any annual revenue savings to the Council, when comparing electricity to oil.**
2. **Legal:** The legal implications are contained within the body of this report**.**
3. **Corporate Governance:** Proposal to install new boiler plant would go against the current Council policy of minimising carbon emissions from our building stock.
4. **Human Resources –** None.

5. **Equalities** – An Equality Impact Assessment is not required.
6. **Island Communities Impact** – An Islands Communities Impact Assessment is not required.
7. **Links to Council Plan:** The proposals in this report support and contribute to improved outcomes for communities as outlined in the following Council Plan strategic priorities:
   ☒Growing our economy.
   ☐Strengthening our Communities.
   ☒Developing our Infrastructure.
   ☐Transforming our Council.
8. **Links to Local Outcomes Improvement Plan:** The proposals in this report support and contribute to improved outcomes for communities as outlined in the following Local Outcomes Improvement Plan priorities:
   ☒Cost of Living.
   ☐Sustainable Development.
   ☐Local Equality.
   ☐Improving Population Health.
9. **Environmental and Climate Risk:** The C cumulative lifetime emissions (15 years) are 1,550 Tonnes CO_2, if deciding to not replace the heating systems with zero emission options. These are 'locked -in' emissions and will not be compatible with the Council's Net Zero targets and its declaration of a Climate Emergency. Possible mitigations could be the future use of alternative substitute fuels, or carbon projects that would sequester carbon as a carbon offset or inset.
10. **Risk:** If the Council progresses with a move away from ZDEH for this refurbishment, the Council risks not meeting its climate change targets and could face a reputational risk relevant to its public commitments and statements on climate change.
11. **Procurement:** All works will be procured through Public Contracts Scotland using contractors on the Dynamic Purchasing Framework**.**
12. **Health and Safety:** None
13. **Property and Assets:** All works will be programmed in line with operational requirements of the building users. The replacement system will be included in the programme of asset maintenance.
14. **Information Technology:** None.
15. **Cost of Living:** None.

List of Background Papers

Valuation of energy use and greenhouse gas (GHG) emissions
https://assets.publishing.service.gov.uk/media/65aadd020ff90c000f955f17/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal.pdf

Appendices

Appendix 1 -Stromness Leisure Centre Heat Decarbonisation Study (V3.3) - Carbon Trust.
Appendix 2 -Stromness Leisure Centre Cost of Carbon Assessment.

Appendix 1

ORKNEY ISLANDS COUNCIL

Stromness Leisure Centre Heat Decarbonisation Study

Version 3.3

Net Zero Living

10 November 2025

Stromness Leisure Centre

Executive Summary

Executive Summary (1/4)

The heating system at Stromness Leisure Centre, Orkney, is now at end of life and in need of replacement. This report has carried out a high-level heating system options appraisal for the leisure centre. This has determined that the most technically feasible options for replacing the end-of-life oil boilers at the site would be either an oil boiler replacement, using modern high-efficiency oil boilers, or replacement with an air source heat pump (ASHP) system. The table below summarises (using predicted 2026 energy prices) that whilst the oil boiler upgrade would be the lowest capital cost, the ASHP would provide the largest carbon saving for the Council and deliver a solution in line with OIC policies on taking action on climate change and addressing the climate emergency.

	Est. Annual Energy Savings			Est. Other Income / Costs			Total Savings (£)	Estimated Cost (£)	Carbon Impact (tCO$_2$e) [Excl. WTT]		
Opportunity[1]	£	tCO$_2$e (2024)	kWh	Export Income (£)	Subsidy (£)	O&M (£)			10 Year Carbon Savings	Lifetime Carbon Savings	£ / Lifetime
Oil Boiler replacement + BMS	£9,800	41.3	161,000	£0	£0	£1,500	£8,300	£430,000	413	559	£769
High temperature ASHPs + BMS	£600	120.4	453,700	£0	£0	£1,500	-£900	£1,163,500	1,288	1,978	£588

A sensitivity analysis was also carried out, showing that in terms of annual running costs the financial case for either system is highly dependent on the unit price of both heating oil and electricity. OIC has experienced volatility in energy prices in recent years; the future cost of both heating oil and electricity, therefore, need to be considered carefully when comparing the two systems and forming an investment decision. It is also important to note that OIC's current electricity tariff rate is ~£0.33/kWh, which is considered high, but is expected to fall by around 20% next year. The estimated rate for 2026 of £0.262/kWh (+CCL) has been used for the modelling in this report. This report also carried out a solar photovoltaics (PV) analysis to calculate the potential impact that adding PV could have on the running costs of an ASHP system.

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[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study.

Executive Summary (2/4)

OIC has experienced volatility in their utility costs over recent years. This has a significant impact on the Council's revenue expenditure and its ability to invest in community assets. To understand how variation in the price of utilities (oil and electricity) might affect future costs at Stromness Leisure Centre for OIC, a sensitivity analysis has been conducted.

The table below details the estimated running costs savings from an ASHP system versus the oil boiler replacement at various unit prices (£/kWh) for heating oil and electricity:

					Annual energy costs savings(£)					
						Electricity				
	£/l	**£/kWh**	**0.350**	**0.300**	**0.280**	**0.260**	**0.240**	**0.220**	**0.200**	**0.150**
Heating Oil	**0.40**	**0.039**	-£22,774	-£16,301	-£13,712	-£11,122	-£8,533	-£5,944	-£3,355	£3,118
	0.45	**0.043**	-£19,957	-£13,484	-£10,894	-£8,305	-£5,716	-£3,127	-£538	£5,936
	0.50	**0.048**	-£17,139	-£10,666	-£8,077	-£5,488	-£2,899	-£310	£2,280	£8,753
	0.55	**0.053**	-£14,322	-£7,849	-£5,260	-£2,671	-£82	£2,508	£5,097	£11,570
	0.60	**0.058**	-£11,505	-£5,032	-£2,443	£146	£2,736	£5,325	£7,914	£14,387
	0.65	**0.063**	-£8,688	-£2,215	£374	£2,964	£5,553	£8,142	£10,731	£17,204
	0.70	**0.068**	-£5,871	£602	£3,192	£5,781	£8,370	£10,959	£13,548	£20,021
	0.75	**0.072**	-£3,054	£3,419	£6,009	£8,598	£11,187	£13,776	£16,366	£22,839

🟥 oil boiler replacement cheaper to run*

🟦 ASHP cheaper to run*

*The darker the shading, the greater the price differential

The analysis above demonstrates that at the 5-year oil price average of 0.60£/l, with an ASHP installed, OIC would be able to save on running costs over the existing system, provided they could procure electricity at 0.26p/kWh or below.

Executive Summary (3/4)

Based on the analysis and assessment of various options, **the combination of ASHP and solar PV is identified as the system with the greatest potential to be a viable long-term solution, consistent with meeting the Council's Net Zero ambitions** and internal decarbonisation policies. As with the oil boiler vs. ASHP comparison, the unit rate of electricity has a large impact on the cost-effectiveness of solar PV alongside an ASHP. The table below demonstrates that at the 2026 predicted electricity supply rate, the ASHP plus solar PV could represent a cost-effective approach for OIC, as well as achieving significantly higher carbon savings for the site than upgrading the oil boilers. An electricity unit rate of 0.262 £/kWh (+CCL) has been used in the analysis below.

	Est. Annual Energy Savings			Est. Other Income / Costs			Total Savings (£)	Cost (£)	Carbon Impact (tCO_2e) [Excl. WTT]		
Opportunity[1]	**£**	**tCO_2e (2024)**	**kWh**	**Export Income (£)**	**Subsidy (£)**	**O&M (£)**			**10 Year Carbon Savings**	**Lifetime Savings**	**£ / Lifetime**
High temperature ASHPs + BMS	£600	120.4	453,700	£0	£0	£1,500	-£900	£1,163,500	1,288	1,978	£588
Solar PV - 61 kWp	£11,700	9.8	43,500	£86	£0	£800	£11,000	£120,000	11	69	£1,092
Total	£12,300	130.2	497,200	£86	£0	£2,300	£10,200	£1,283,500	1357	2088	£615

While the ASHP offers strong potential for decarbonisation, its financial attractiveness is currently limited by high capital costs and electricity prices that affect running costs. In the long term, however, the prospect of securing a lower unit rate for electricity would significantly improve cost-effectiveness. Rising oil prices would further strengthen the case for moving away from oil heating, alongside the need to migrate away from fossil fuel heating and avoid locking in high emissions heating for the next 15-20 years. **We recommend prioritising the ASHP plus solar PV solution for the replacement heating system at Stromness Leisure Centre** – on the provision that sufficient capital can be secured. It is suggested that OIC builds on this report with a detailed feasibility study with a view to making an investment decision.

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[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study.

Executive Summary (4/4)

Conclusion

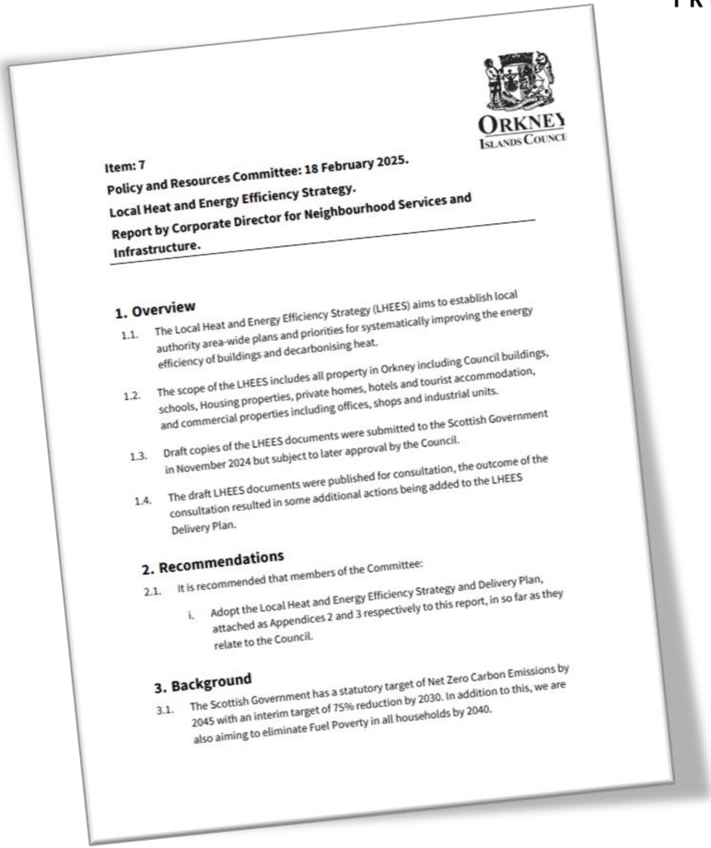
The proposal to install ASHP and PV at Stromness Leisure Centre aligns with the Orkney Islands Council's Local Heat and Energy Efficiency Policy, providing a clear pathway to reduce the leisure centre's carbon emissions.

This also supports wider sustainability goals by:

- Lowering reliance on fossil fuels and potentially reducing energy costs
- Enhancing energy resilience and operational flexibility
- Positioning the Council as a leader in low-carbon public facilities
- Unlocking potential funding opportunities and community engagement

Next steps

- Engage with the DNO to confirm capacity, connection requirements and whether there is sufficient grid capacity to support the heat pump and PV installation
- Evaluate cost vs carbon savings to inform investment decisions
- Explore funding opportunities and market options to optimise financial viability
- Develop implementation plan for phased installation and monitoring



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Item: 7

Policy and Resources Committee: 18 February 2025.

Local Heat and Energy Efficiency Strategy.

Report by Corporate Director for Neighbourhood Services and Infrastructure.

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1. Overview

1.1. The Local Heat and Energy Efficiency Strategy (LHEES) aims to establish local authority area-wide plans and priorities for systematically improving the energy efficiency of buildings and decarbonising heat.

1.2. The scope of the LHEES includes all property in Orkney including Council buildings, schools, Housing properties, private homes, hotels and tourist accommodation, and commercial properties including offices, shops and industrial units.

1.3. Draft copies of the LHEES documents were submitted to the Scottish Government in November 2024 but subject to later approval by the Council.

1.4. The draft LHEES documents were published for consultation, the outcome of the consultation resulted in some additional actions being added to the LHEES Delivery Plan.

2. Recommendations

2.1. It is recommended that members of the Committee:

i. Adopt the Local Heat and Energy Efficiency Strategy and Delivery Plan, attached as Appendices 2 and 3 respectively to this report, in so far as they relate to the Council.

3. Background

3.1. The Scottish Government has a statutory target of Net Zero Carbon Emissions by 2045 with an interim target of 75% reduction by 2030. In addition to this, we are also aiming to eliminate Fuel Poverty in all households by 2040.

Stromness Leisure Centre

Introduction

Introduction

Orkney Islands Council (OIC) has been involved in Innovate UK's Net Zero Living (NZL) programme since 2023. This programme has provided funding to local authorities and other organisations across the UK with a view to supporting and accelerating their local decarbonisation ambitions. Through the NZL programme's *Future Ready* direct technical assistance support on Net Zero Planning, a heat decarbonisation study has been undertaken by the Carbon Trust for the Stromness Leisure Centre.

The current heating system for the leisure centre is at end of life and in need of replacement. This report has therefore been commissioned to answer the following questions:

- What are the heating system options for Stromness Leisure Centre?
- What are the capital, operational and carbon cost impacts of the different heating options?
- A sensitivity analysis to consider the impacts of different energy unit costs on the cost-effectiveness of some heating systems

This report was written by the Carbon Trust and funded through Innovate UK's Net Zero Living Future Ready support.

Drivers for change

Climate Change (Scotland) Act 2009

The Scottish Government has set some of the most demanding national emissions reduction targets in the world. The targets in Scotland's original Climate Change Act were updated in 2025. There are now legally binding national targets in Scotland to reduce emissions by 57% by 2030, by 69% in 2024 and to reach Net Zero by 2045.

Local Heat and Energy Efficiency Strategy (LHEES)

All local authorities in Scotland have been required to produce a Local Heat and Energy Efficiency Strategy (LHEES). Accepted in 2024, Orkney's LHEES provides a long term strategic framework for decarbonising heat and improving energy efficiency across the islands. This includes taking action on non-domestic buildings owned by the Council.

Orkney's leadership on action

Orkney has been at the forefront of delivering action on climate change for decades. Often called the 'Energy Islands', Orkney has pioneered renewable technologies such as wind power, wave and tidal energy generation, and low carbon hydrogen production, among others. Maintaining this leading role on climate change action is a significant driver for action.

Geography

The Orkney Islands are an archipelago off the north coast of the Scottish mainland. This geography provides unique challenges for the Council when it comes to decarbonisation. There is no gas grid on the islands and the electricity network requires careful management. Maintaining secure, reliable and affordable energy sources is especially critical for the islands.

OIC Climate Change Targets

Orkney Islands Council has developed policies and targets to support and advance action on climate change. It declared a climate emergency in 2019 and has a commitment to become a Net Zero local authority. Other key documents include: Carbon Management Plan (2016-2026), Council Plan and Delivery Plan (2023–2028), Net Zero Transition Study (2025) and Community Planning Partnership Climate Vision (2024)

Heat in Buildings Strategy

The Scottish Heat in Buildings Strategy (2021) sets the national vision for achieving net zero-emissions from Scotland's buildings by 2045. It outlines the ambition of the Scottish Government for a transition to zero-emissions heating systems in buildings and the prioritisation of energy efficiency upgrades. It also emphasises a just transition by addressing fuel poverty and ensuring economic opportunities alongside decarbonisation.

Low Carbon Heating Policy

- A commitment to taking action on climate change underpins all the Council's delivery plans.
- There is also a commitment to update the Council's own estate to reduce its carbon footprint.
- The Council's Carbon Management Plan has three main aims: to ensure energy efficiency; win the 'hearts and minds' of our staff and community, and implement best practice in our new build and refurbishment programmes to benefit environmentally and financially from its progression towards a low carbon operation.
- OIC's Energy Strategy highlights the need to diversify the sources of heat generation on the islands to reduce the reliance on fossil fuels. It also outlines the aims to use energy as efficiently as possible, and to have a secure and affordable energy supply to meet its future needs, alongside reducing Orkney's overall carbon footprint.
- OIC published its Local Heat and Energy Efficiency Strategy (LHEES) in 2024. This strategy will support the delivery of the Council's goals of improving energy efficiency, reducing fuel poverty, and decreasing carbon emissions through zero direct emissions heating systems.
- Priority C: Improving carbon efficiency of non-domestic Council buildings, is one of the four central priorities of the LHEES.
- The LHEES outlines that OIC's approach to carbon management will be achieved by replacing oil and other fossil fuel heating systems in existing council-owned buildings with electrified alternatives such as heat pumps.

Background – Stromness Leisure Centre

- Stromness Leisure Centre is currently heated with 2x oil boilers and 2x oil fired water heaters that are approximately 40 years old and at end of life. These units have already significantly exceeded their planned operational lifespan. The Council is therefore aiming to source a replacement heating system for the building in the immediate future.
- The building is heated from radiators, underfloor heating, air handling plant and heat losses from the pool water. Large quantities of hot water are used with concentrated peak loads, resulting in large hot water stores being required to manage these peaks.
- The pool water is heated overnight by a ground source heat pump, installed in 2008 with the aid of grant funding, whilst the oil boiler is used for heating the water during the day.
- Initial work has been undertaken by FLN Consulting Engineers to assess the feasibility of converting the oil-fired heating system to an air source heat pump (ASHP). Whilst it was deemed technically feasible to convert the current oil boiler to an ASHP, the increased cost of electricity since 2020 has meant that this is now perceived as financially challenging for the Council, to meet both the upfront capital expense and the ongoing running costs. Nonetheless, around £500,000 of Council funding has been secured to enable the refurbishment of the current heating system.
- This report aims to support the Council by providing an independent expert review of the possible options for upgrading the heating and hot water system at the Stromness Leisure Centre.

Stromness Leisure Centre

Existing Systems

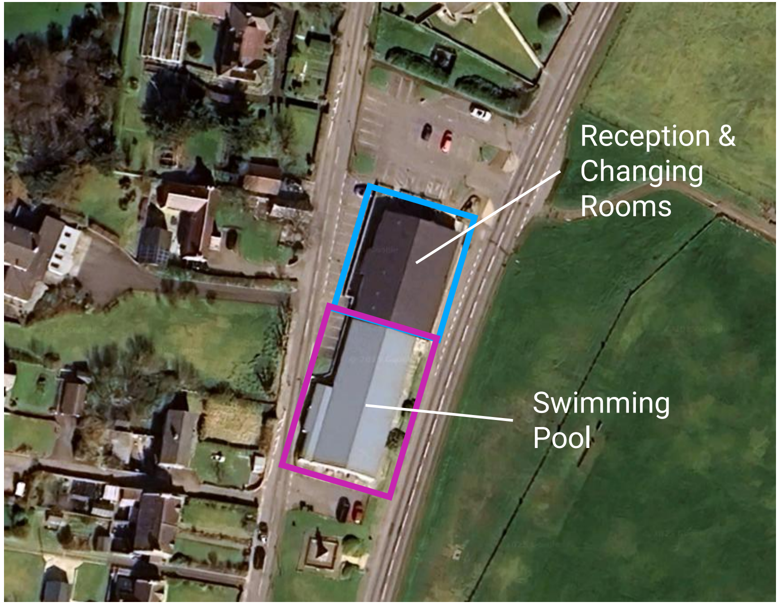
Existing Building

Stromness Leisure Centre comprises a reception and changing room facilities to the north of the building and an adjoining pool house that holds the 25m swimming pool. The current HVAC (heating, cooling and ventilation) equipment for the building is outlined below:

- 2x oil boilers (~40ys old) that provide building heating and 2x oil-fired domestic hot water (DHW) heaters providing DHW for showers and basin taps.
- Radiators, underfloor heating and 2x air handling units (AHU) distribute heating from oil boilers to the building.
- Ground source heat pump [Dimplex S1 30TE], installed in 2008, supplies the overnight heating for the pool water.

The energy costs for the leisure centre for the last full year (2023/24) are outlined below:

	Heating Oil			Electricity		
	L	£	£/L	kWh	£	£/kWh
2023/24	57,392	36,099	0.63	214,034	58,389	0.27



Site Address:
Stromness Swimming Pool and Fitness Centre, North End Road, Stromness, KW16 3AG

Stromness Leisure Centre

Options Appraisal

Heating system options appraisal

To understand potential options for replacing the existing oil boilers and providing heating to the leisure centre, a high-level options appraisal has been carried out. Each potential technology has been assigned a high (red), medium (amber) or low (green) rating against different variables to decide which option(s) should be taken forward for detailed technical analysis.

Heating Source	CAPEX Cost (£)	OPEX Cost (£)	Carbon Impact	Deliverability Risk	Technical Analysis Required	Comments
Oil Boiler Replacement	🟨	🟨	🟥	🟩	✓	The direct, like-for-like replacement of the existing oil boilers with modern oil boilers is the cheapest CAPEX solution in the short term despite the negative carbon impact of locking in fossil fuel use at the site for the long term.
Air Source Heat Pump (ASHP)	🟥	🟨	🟩	🟨	✓	Air source heat pumps are low carbon (using Orkney's low carbon electricity grid) and highly efficient. They would significantly reduce the carbon emissions of the site; however, they have a high upfront cost and high electricity prices could increase annual running costs. Locating the external plant will also be challenging for the site, as well as issues around potential corrosion to the equipment. Despite this, the significance of the potential carbon savings achievable from this technology warrants further investigation.
Ground Source Heat Pump (GSHP)	🟥	🟨	🟩	🟥	X	The estimated capital expense required (~£1.655m) to drill the bore holes and install a GSHP alongside the disruption of the ground works in the car park and adjacent football pitch makes this option more expensive than an ASHP alternative and economically unfeasible for the council. Whilst the COP could be higher than an ASHP, there are also significant challenges around using the adjacent football pitch for bore holes, which make this technology unsuitable for further investigation.
District Heating	🟥	🟨	🟩	🟥	X	There is not currently any district heating network on the island. This would take several years to implement and would therefore not meet the short-term timeframes of replacing the current end of life oil boilers. Additionally, the cost and disruption associated with bringing a heat network to the site would be likely to make this option economically unfeasible.

Heating system options appraisal

Heating Source	CAPEX Cost (£)	OPEX Cost (£)	Carbon Impact	Deliverability Risk	Technical Analysis Required	Comments
Direct Electric	🟨	🟥	🟩	🟩	X	While direct electric heating can be relatively cheap to install and be low carbon using Orkney's low carbon grid, high running costs deem this option unsuitable for further investigation.
Hydrogen	🟨	🟨	🟩	🟥	X	The Council has already piloted hydrogen boilers and found significant issues with the reliability and security of the supply chain. This option is therefore not deemed suitable. There are also wider issues with overall efficiency of hydrogen for heating, compared to electric heat pumps.
Hydrotreated Vegetable Oil (HVO)	🟨	🟨	🟩	🟥	X	HVO can act as a 'drop in' diesel replacement fuel. It is currently supplied for some developments on the islands, however, it is not covered by current supply contracts. There are also significant concerns around the accuracy and credibility of the HVO supply chain, which poses a significant carbon and reputational risk for the council. This fuel type is not recommended for analysis.
Data Centre Waste Heat	🟥	🟨	🟩	🟥	X	Data centres can produce significant waste heat during operation. This waste heat could be captured and used to heat the leisure centre. This would necessitate a data centre in close proximity to the leisure centre. As no data centre currently exists in the vicinity, the delay in action from sourcing a data centre, planning, construction etc. would not meet the immediate time constraints on replacing the current end of life oil boilers at the site. This is also a fairly early-stage technology with limited case studies, posing a possible risk for the council.

Based on this high-level options appraisal, in the following section the two most viable options, i.e., (i) oil boiler replacement and (ii) ASHP, are analysed in greater detail.

Stromness Leisure Centre

Detailed Analysis

Detailed analysis - Introduction

Following the options appraisal of the potential heating systems, two systems were deemed suitable for further analysis. These options were:

1. Replacement of the existing oil boilers with modern high-efficiency oil boilers.
2. Replacement of the existing oil boilers with an electric air source heat pump system.

To support OIC in their decision making, a high-level economic and carbon analysis of these two systems options has been conducted. This analysis assesses the capital costs, ongoing running costs and carbon impact and forecasts these metrics over the short and long term.

Information to help inform the modelling has been taken from initial feasibility work carried out by OIC, industry standard values for respective technologies and experience from the Carbon Trust. The results of the analysis are presented on the following pages.

Oil boiler replacement

Replacing the existing oil boilers (heating and hot water) with modern, high-efficiency units is considered the lowest capital expenditure option for OIC. To assess the carbon and economic impacts of this option, a high-level appraisal has been carried out. This assumes replacing the existing oil boilers, at 74% efficiency (efficiency taken from previous OIC heating calculations), with modern units that operate at 92% efficiency.

	Est. Annual Energy Savings			Est. Other Income / Costs			Total Savings (£)	Estimated Cost (£)	Carbon Impact (tCO_2e) [Excl. WTT]		
Opportunity[1]	£	tCO_2e (2024)	kWh	Export Income (£)	Subsidy (£)	O&M (£)			10 Year Carbon Savings	Lifetime Savings	£ / Lifetime
Oil Boiler replacement + BMS	£9,800	41.3	161,000	£0	£0	£1,500	£8,300	£430,000	413	559	£769

The capital cost of £430,000 is based on previous quotations received by OIC. Compared with the current system, upgrading the oil boilers is expected to save the council £8,300 per year in running costs (at 0.63£/l oil price) and achieve annual carbon savings of 41 tCO_2e from the increased efficiency of the boilers. The above savings also account for an additional 10% reduction in energy consumption achieved through the integration of a BMS system.

While this option does achieve an annual saving in running costs, the high upfront capital means that there would be a long simple payback and OIC would be ‘locking in’ using a fossil fuel heating system for the long term: this option would lock in heating oil consumption for at least the next 15-20 of the lifespan of the boilers (i.e. until approximately 2040-2045), presenting a barrier to the Council’s 2030 Net Zero target for its own operations, as well as Scotland’s 2045 Net Zero target. By contrast, switching to an ASHP solution would enable a low-carbon, future-proof heating system that aligns with both local and national net-zero ambitions, while also offering long-term cost and carbon savings.

[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study.

Air source heat pump (ASHP) replacement

To meet OIC's decarbonising heat policy, a high-level appraisal has also been carried out on an ASHP system. This system would replace the existing oil boilers with electric heat pumps (131kW$_{th}$ total heating capacity) with an average coefficient performance of 3.0 (300%).

	Est. Annual Energy Savings			Est. Other Income / Costs					Carbon Impact (tCO_2e) [Excl. WTT]		
Opportunity[1]	£	tCO_2e (2024)	kWh	Export Income (£)	Subsidy (£)	O&M (£)	Total Savings (£)	Cost (£)	10 Year Carbon Savings	Lifetime Savings	£ / Lifetime
High temperature ASHPs + BMS	£600	120.4	453,700	£0	£0	£1,500	-£900	£1,163,500	1,288	1,978	£588

In comparison to the oil system, higher upfront capital expenditure (using the capital cost from previous quotes provided to OIC) paired with a potential increase in annual running costs (based on estimated energy prices), the ASHP performs worse financially in this scenario. However, the switch from oil to electric heating would deliver significant carbon savings over the oil boiler replacement option. The above savings also account for an additional 10% reduction in energy consumption achieved through the integration of a BMS system.

OIC is currently procuring electricity at a high average unit rate (~£0.33). Whilst the current procurement contract will run until 2028, the unit cost (£/kWh) of electricity is expected to be 20% lower from April 2026 to reflect reductions in the wholesale cost of electricity. To more accurately reflect the reduced energy cost in the coming year, the modelling above has been based on a 20% reduction in the current electricity unit rate. A price of £0.262/kWh (+CCL) has, therefore, been used in the modelling for the ASHP option.

[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study.

Sensitivity Analysis – Energy costs

OIC has experienced volatility in their utility costs over recent years. This has a significant impact on the Council's revenue expenditure and its ability to invest in community assets. To understand how variation in the price of utilities (oil and electricity) might affect future costs for OIC at Stromness Leisure Centre, a sensitivity analysis has been conducted.

The table below details the estimated running costs savings from an ASHP system versus the oil boiler replacement at various unit prices (£/kWh) for heating oil and electricity:

Annual energy costs savings(£)

			Electricity							
	£/l	**£/kWh**	**0.350**	**0.300**	**0.280**	**0.260**	**0.240**	**0.220**	**0.200**	**0.150**
Heating Oil	**0.40**	**0.039**	-£22,774	-£16,301	-£13,712	-£11,122	-£8,533	-£5,944	-£3,355	£3,118
	0.45	**0.043**	-£19,957	-£13,484	-£10,894	-£8,305	-£5,716	-£3,127	-£538	£5,936
	0.50	**0.048**	-£17,139	-£10,666	-£8,077	-£5,488	-£2,899	-£310	£2,280	£8,753
	0.55	**0.053**	-£14,322	-£7,849	-£5,260	-£2,671	-£82	£2,508	£5,097	£11,570
	0.60	**0.058**	-£11,505	-£5,032	-£2,443	£146	£2,736	£5,325	£7,914	£14,387
	0.65	**0.063**	-£8,688	-£2,215	£374	£2,964	£5,553	£8,142	£10,731	£17,204
	0.70	**0.068**	-£5,871	£602	£3,192	£5,781	£8,370	£10,959	£13,548	£20,021
	0.75	**0.072**	-£3,054	£3,419	£6,009	£8,598	£11,187	£13,776	£16,366	£22,839

🟥 oil boiler replacement cheaper to run*

🟦 ASHP cheaper to run*

*The darker the shading, the greater the price differential

The analysis above demonstrates that at the 5yr oil price average of 0.60£/l, OIC would be able to save on running costs with an ASHP if they could procure electricity at 0.26p/kWh or below.

Sensitivity Analysis – SCOP

The efficiency of an ASHP system is measured through its **seasonal coefficient of performance (SCOP)**. This is effectively the ratio of total heat output to total electrical energy input over an entire heating season, accounting for varying temperatures and operating conditions. The higher the SCOP, the more efficiently the system is operating.

The SCOP can be affected by:
- system design (correct sizing of heat emitters etc.),
- quality of the installation (components used, pipe run quality etc.),
- proportion of water heating to space heating (water heating typically has a lower SCOP),
- system controls (such as weather compensation curve and set points) and,
- external weather conditions.

The SCOP of the system will have an impact on the kWh savings, running costs and carbon savings over the course of a year. The table below outlines a high-level sensitivity analysis on how different SCOPs will affect the performance and running costs of the proposed system. A SCOP of 3.0 should be achievable with a good quality design & installation, and has been used as the basis for the modelling in this report. However, the table below demonstrates the effect of a reduced SCOP of 2.5 and an improved SCOP of 3.5 on the system performance.

	Est. Annual Energy Savings			Total Savings (£)	Cost (£)	Carbon Impact		
SCOP	£	tCO_2e (2024)	kWh			10 Year Carbon Savings tCO_2e	Lifetime tCO_2e Savings	£ / Lifetime tCO_2e
3.5	£5,600	125	472,190	£4,100	1,163,500	1317	2016	577
3.0	**£600**	**120**	**453,700**	**-£900**	**1,163,500**	**1288**	**1978**	**588**
2.5	- £6,400	115	427,800	-£7,900	1,163,500	1246	1930	604

Air source heat pump location

The modelling has shown that an air source heat pump is technically feasible at the leisure centre. However, there are challenges around locating the external plant equipment. Previous studies have identified a number of options for plant location, however, each location has its own limitations. The possible positions (A-H) are outlined in the picture below.

After a site review by OIC, it was decided that site A was currently the most likely location given the site constraints. However, this will require the loss of 3 car parking spaces and the construction of an extension that occupies half the gable and the full width of the car park. There will also be technical difficulties with running the flow and return pipes to the north plant room, where the internal equipment will be located, for distribution around the building. Despite the loss of the car park spaces and the increased pipe runs required, which contribute to the high costs, this location was deemed by OIC as the most suitable location given the challenges of the other locations (see *Stromness Swimming Pool HPs v Oil* document for more detail).

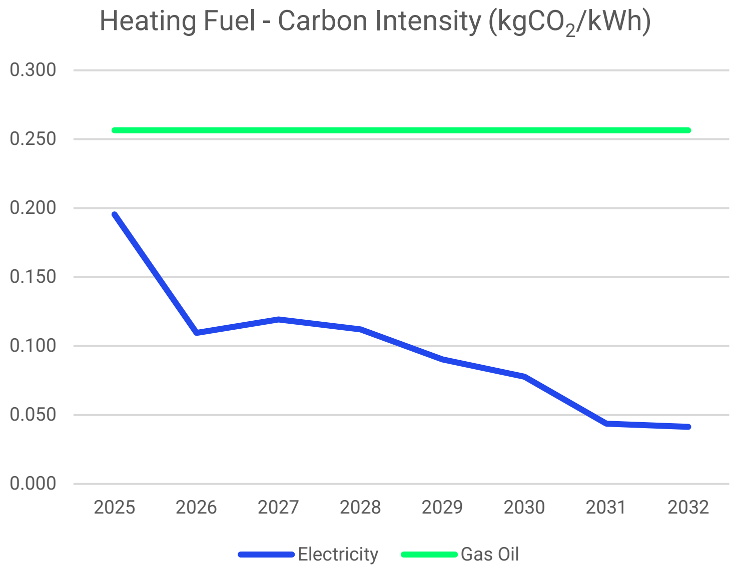
A detailed site audit will be required to confirm the final location of plant equipment before an investment decision is made by OIC.

Future Carbon Intensity Comparison

The UK electricity grid has decarbonised rapidly over the last 20 years. A central mission of the UK Government is to have clean power by 2030, which will further accelerate this decarbonisation in the coming years. The National Energy System Operator (NESO) releases Future Energy Scenarios (FES), which forecast the decarbonisation of the grid in the future. The graph opposite demonstrates the estimated carbon intensity* of UK electricity (incl. T&D) vs heating oil in the coming years based on the 2024 Future Emission Scenarios (Holistic Transition).

The graph clearly shows that whilst the carbon intensity of heating oil will remain largely constant over the coming years, the carbon intensity of UK electricity is expected to reduce significantly.

This further supports the case for the transition to an ASHP, as OIC would avoid locking in a high carbon fuel source and instead would use a fuel that will see continued emissions reductions, supporting the Council's wider Net Zero ambitions.



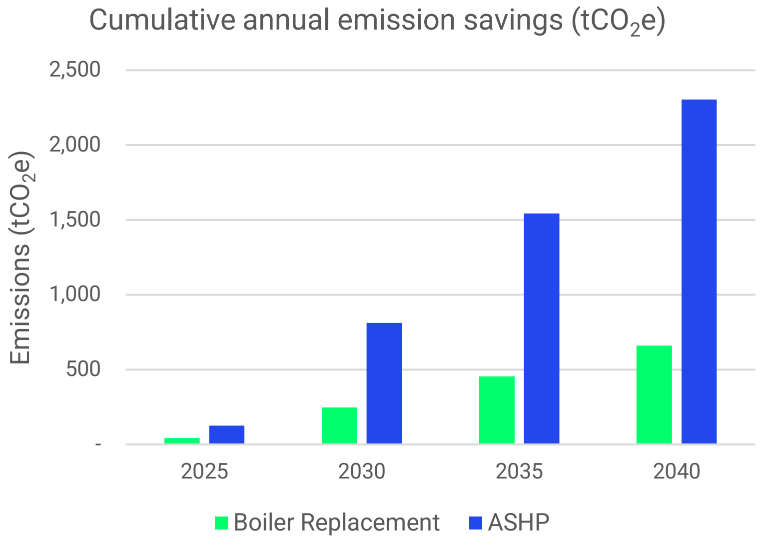
*N.B. Despite the already low carbon intensity of the electricity grid in Orkney, the average carbon intensity of the UK national electricity grid is used for location-based emissions reporting in UK public sector carbon accounting methodologies.

Future Carbon Impact

Carbon reductions across the estate are a significant driver for OIC. To assess the potential future carbon impact of the heating system replacement at Stromness Leisure Centre, using the FES Scenario (2024 – Holistic Transition) described on the previous page, the future cumulative annual emissions savings of the two heating system options can be modelled. The graph opposite details cumulative emissions savings (tCO_2e) that could be achieved from the oil boiler replacement and ASHP options over an assumed 15-year lifespan for the oil boiler.

The annual emissions from oil will remain constant, which results in a small linear increase in cumulative emissions savings over the lifespan of the equipment. This option would achieve an estimated cumulative emission saving of **660 tCO_2e** in 2040 over the existing system, due to the improved efficiency of the new boiler.

The ASHP option will rapidly increase its cumulative emissions savings in the future as the UK grid continues to decarbonise further. This will result in cumulative emissions savings of **2,300 tCO_2e** by 2040, which is a saving of **1,640 tCO_2e** in 2040 over the oil boiler replacement option.



*Oil emissions are excluding WTT (see appendix)

Stromness Leisure Centre

Solar PV

Solar PV - Methodology

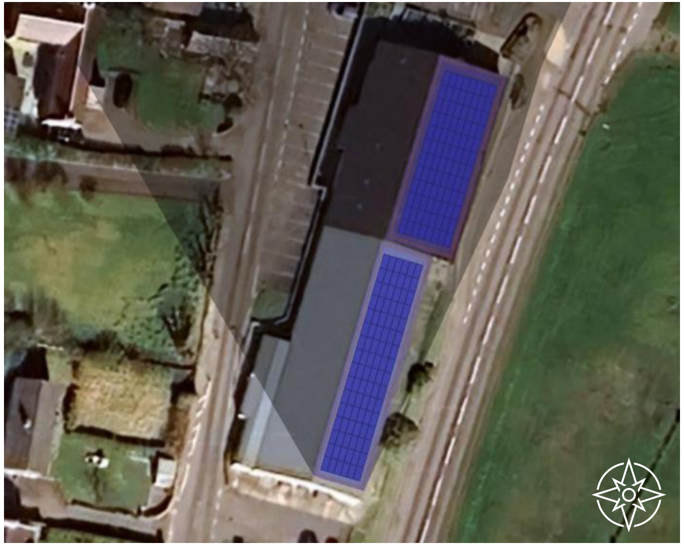
Given the extra electrical demand that an air source heat pump would bring to the site, solar PV could be an attractive proposition for OIC to mitigate against some of the ASHP's additional electrical load on running costs. With an ASHP for the heating and a GSHP for the pool water, Stromness Leisure Centre would become fully electric. This would suggest an excellent business case for investment in solar PV to generate electricity on site and reduce the annual running costs of the site.
The methodology below has been followed to estimate the CAPEX, OPEX and carbon savings from installing a solar PV array at Stromness Leisure Centre:

1. Occupancy profile of the building has been estimated using facility opening times.
2. The annual heating system profile has been estimated based on the occupancy profile and the degrees days for each month (see *2023.11.17 Heating Estimate (SSP)* document).
3. Using the data from the ASHP scenario modelling, the additional electrical demand from the ASHP heating and hot water load has been estimated.
4. The estimated electrical demand from the ASHP scenario has been added to the 2023/2024 half-hourly electricity data from the leisure centre (which accounts for the GSHP and existing electrical demand of lights, pumps and fans, etc.)
5. An estimated solar PV generation profile has been calculated for the site using *HelioScope* software for two different array size scenarios.
6. The estimated total annual electricity demand profile has been set against the estimated solar PV generation profile.
7. The CAPEX, OPEX, cost savings and carbon savings of two solar PV scenarios have then been estimated.

Solar PV – Site Feasibility

Stromness Leisure Centre has two pitched, standing seam roofs (pool and reception) that could both accommodate respective solar PV arrays. Additionally, both roofs face a south-east orientation, which is favourable for solar PV modules. Despite the northerly latitude of the leisure centre, solar PV could still represent a viable technology for the site to reduce the electrical demand from the grid and thereby reduce running costs.

Specification	Details
Total Capacity (kWp)	61.44
No. PV Modules	192 (320W each)
Total generation (kWh/yr)	43,500
kWh / kWp	631



By maximising the favourable roof space, it is estimated that a 61.44 kWp solar PV array could be mounted on the roof of the leisure centre. This would be split across 2 evenly sized arrays of 30.72 kWp on each roof. It is estimated this could generate 43.5 MWh/yr of electricity for the site. A one roof array has also been modelled – see next page. It is important to note that either array (one- or two-roof) will require approval from the DNO, which is outside the scope of this study.

Solar PV - Analysis

The table below outlines the financial and carbon savings that could be achieved from installing solar PV on the roof of Stromness Leisure Centre, combined with an ASHP. The first scenario would be to maximise the available roof space (61 kWp), while the second would be a smaller system that uses just the roof of the reception and changing rooms (31 kWp).

	Est. Annual Energy Savings			Est. Other Income / Costs			Total Savings (£)	Cost (£)	Simple Payback	Carbon Impact (tCO_2e)			Financial Return	
Opportunity[1]	£	tCO_2e (2024)	kWh	Export Income (£)	Subsidy (£)	O&M (£)				10 Year Carbon Savings	Lifetime Savings	£ / Lifetime	NPV	IRR
Solar PV - 61 kWp	£11,727	9.8	43,525	£86	£0	£771	£11,042	£120,000	11	68.9	109.9	£1,090	£48,450	7%
Salar PV - 31 kWp	£6,008	5.0	22,300	£11	£0	£435	£5,584	£60,000	11	35.3	56.3	£1,070	£24,980	7%

Both systems would achieve very high self-consumption at over 96% in each scenario, with annual running cost savings of £5k-11k and carbon savings of 5 – 10 tCO_2e for the site. It is also estimated that despite the difference in the installed capacity of the two arrays, they would both achieve a simple payback of ~11 years with an internal rate of return (IRR) of around 7%. The analysis would suggest it would be more cost-effective for OIC to invest in the larger two-roof solar PV array.

The capital costs used above are estimates provided by OIC based on previous solar PV installations on the islands. It is noted that these are above normal industry averages. To reflect the reduced electricity price anticipated in the next financial year, the modelled £/kWh has been based on a 20% reduction from 2025 prices, at 0.262£/kWh (+CCL).

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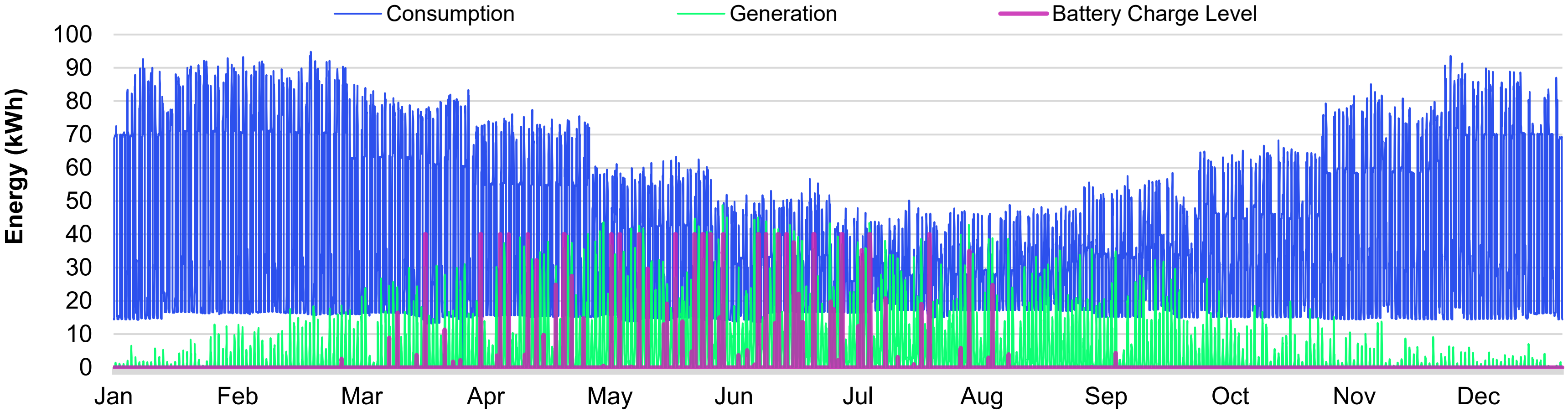
[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study. Numbers presented above are the result of rounding and so may not add up exactly when presented in the table above.

Solar PV – Battery storage feasibility

To assess the feasibility of battery energy storage technology being used in conjunction with the modelled solar PV plus ASHP scenarios, the estimated self-consumption of the solar generation has been modelled over the course of one year. This demonstrated that for the 61kWp array scenario (shown below) there would be a self-consumption of 95% and 99% for the 31kWp array scenario. Given the high self-consumption of solar PV generation and the current high capital cost of battery technology, it can be deemed that there would not be sufficient excess solar generation throughout the course of the year to make battery storage technology a cost-effective solution for Stromness Leisure Centre (see appendix for more detail). OIC could consider using all available roof space, including the less favourable NW-facing roofs, to maximise generation, which could improve the feasibility of battery storage. However, this was outside the scope of the current report.

Electricity Consumption vs Solar PV Generation



Stromness Leisure Centre

Summary

Summary

Based on the analysis and assessment of various options, **the combination of ASHP and roof mounted solar PVs is identified as the system with the greatest potential for a viable long-term solution**, consistent with meeting the Council's Net Zero ambitions and internal decarbonisation policies. Whilst the ASHP enables Stromness Leisure Centre's decarbonisation, its financial attractiveness is currently limited by high capital costs and electricity prices which affect running costs. In the long term, however, the prospect of securing a lower unit rate for electricity would significantly improve cost-effectiveness. Rising oil prices would further strengthen the case for moving away from oil heating, alongside the need to migrate away from fossil fuel heating and avoid locking in high emissions heating for the next 15-20 years. **We recommend prioritising the ASHP plus solar PV solution for the replacement heating system at Stromness Leisure Centre** – on the provision that sufficient capital can be secured. We suggest that OIC now builds on this report with a detailed feasibility study with a view to making an investment decision in the near term.

The following table shows the combined approach for both ASHP and solar PV installed together. This assumes the predicted 2026 electricity rate, at which point the ASHP + solar PV system becomes more cost-effective than the existing system.

	Est. Annual Energy Savings			Est. Other Income / Costs			Total Savings (£)	Cost (£)	Carbon Impact (tCO_2e) [Excl. WTT]		
Opportunity[1]	£	tCO_2e (2024)	kWh	Export Income (£)	Subsidy (£)	O&M (£)			10 Year Carbon Savings	Lifetime Savings	£ / Lifetime
High temperature ASHPs + BMS	£600	120.4	453,700	£0	£0	£1,500	-£900	£1,163,500	1,288	1,978	£588
Solar PV - 61 kWp	£11,700	9.8	43,500	£86	£0	£800	£11,000	£120,000	11	69	109.9
Total	£12,300	130.2	497,200	£86	£0	£2,300	£10,200	£1,283,500	1357	2088	£615

[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study. Numbers presented above are the result of rounding and so may not add up exactly when presented in the table above.

Conclusion and Next Steps

Conclusion

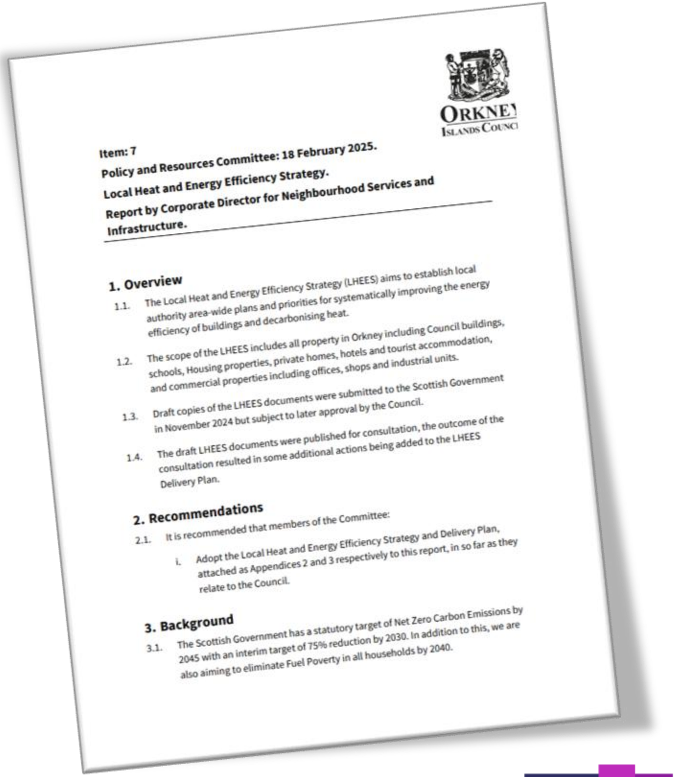
The proposal to install ASHP and PV at Stromness Leisure Centre aligns with the Orkney Islands Council's Local Heat and Energy Efficiency Policy, providing a clear pathway to reduce the leisure centre's carbon emissions.

This also supports wider sustainability goals by:

- Lowering reliance on fossil fuels and potentially reducing energy costs
- Enhancing energy resilience and operational flexibility
- Positioning the Council as a leader in low-carbon public facilities
- Unlocking potential funding opportunities and community engagement

Next steps

- Engage with the DNO to confirm capacity, connection requirements, and whether there is sufficient grid to support the heat pump and PV installation
- Evaluate cost vs carbon savings to inform investment decisions
- Explore funding opportunities and market options to optimise financial viability
- Develop implementation plan for phased installation and monitoring



Item: 7

Policy and Resources Committee: 18 February 2025.

Local Heat and Energy Efficiency Strategy.

Report by Corporate Director for Neighbourhood Services and Infrastructure.

1. Overview

1.1. The Local Heat and Energy Efficiency Strategy (LHEES) aims to establish local authority area-wide plans and priorities for systematically improving the energy efficiency of buildings and decarbonising heat.

1.2. The scope of the LHEES includes all property in Orkney including Council buildings, schools, Housing properties, private homes, hotels and tourist accommodation, and commercial properties including offices, shops and industrial units.

1.3. Draft copies of the LHEES documents were submitted to the Scottish Government in November 2024 but subject to later approval by the Council.

1.4. The draft LHEES documents were published for consultation, the outcome of the consultation resulted in some additional actions being added to the LHEES Delivery Plan.

2. Recommendations

2.1. It is recommended that members of the Committee:

i. Adopt the Local Heat and Energy Efficiency Strategy and Delivery Plan, attached as Appendices 2 and 3 respectively to this report, in so far as they relate to the Council.

3. Background

3.1. The Scottish Government has a statutory target of Net Zero Carbon Emissions by 2045 with an interim target of 75% reduction by 2030. In addition to this, we are also aiming to eliminate Fuel Poverty in all households by 2040.

Stromness Leisure Centre

Appendix

Electric heating

Direct electric heating offers a number of advantages over other heating types as it requires a relatively low capital cost, involves less disruption during implementation, can be operated at a high temperature which requires less enabling works, and can be low carbon through an electricity grid with a low carbon intensity, which is the case for the UK (and especially true when the specific carbon intensity of Orkney's grid is considered).

With a high unit price of electricity (which is open to volatility) and lower operating efficiency compared to a heat pump, direct electric heating can result in very high operating costs (OPEX). Due to the high operating costs and the ongoing strain this could place on the Council's finances, it was decided not to progress electric heating in the detailed analysis of this report. A basic breakdown of estimated heating running costs is, however, presented below as reference. Note these costs are for example comparison purposes only, so may differ from previous figures in this report[1]:

Heating Type	Heating Efficiency	Heat Demand*	Annual kWh Consumption	Unit cost	Annual Running Cost
Oil (new)	92%	224,254 kWh	243,754 kWh**	£3/l	£14,837 /yr
Heat Pump	300%	224,254 kWh	74,751 kWh	£0.31/kWh	£23,173 /yr
Direct Electric	100%	224,254 kWh	224,254 kWh	£0.31/kWh	£69,519 /yr

* Heat demand taken from *'2023.11.17 Heating Estimate (SSP): Pool (Before)', excludes hot water demand.*
** Oil = 10.35kWh/l

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[1] All opportunities included have each been assessed independently in terms of their potential for saving energy and payback. The overall savings figures shown may not be fully achievable due to interactions between measures. All costs and savings in this report are indicative only and subject to further technical and financial feasibility study.

Solar PV + Battery Feasibility

To assess the feasibility of battery energy storage technology (BES) an example 40kWh battery was used. The estimates for incorporating BES to the 61kWp solar PV array are detailed below:

Metric	Details
Battery Capacity	40 kWh
Battery CAPEX (estimated)	£20,000
Annual Savings from BES	£310 /yr
Self-consumption by solar PV only	96.7%
Self-consumption by solar PV + BES	99.2%
Additional demand met by BES	968 kWh/yr
Additional carbon saving from BES	0.2 tCO_2e

Given the limited carbon and financial return from BES versus the large capital outlay required, incorporating BES with the solar PV array at Stromness Leisure Centre is not a recommended measure. Additional savings produced from the solar PV could, however, be used to offset the financial cost of the battery, with a simple payback of the combined system potentially achieved in just over 9 years. Despite this, OIC would be better saving the cost of the battery technology and using the savings from solar PV to fund additional decarbonisation measures across the Council's estate. Battery viability could be improved through the use of cheaper overnight electricity rates. This would allow the battery to be used over the winter months with lower solar PV output. The specifics of this scenario have not been modelled as part of this work.

Assumptions – Air Source Heat Pump

- Performance is calculated using a coefficient of performance (COP) of 3, though the seasonal COP (sCOP) will vary depending on outdoor temperature.
- A capital expenditure (CAPEX) analysis has not been undertaken as part of this feasibility assessment. Instead, we have based our cost assumptions on the client's estimate of approximately £1,163,600 for the heat pump system installation. This figure accounts for the requirement to construct a new plant room, which is a significant cost driver for the project. This figure also includes an allowance for the installation of a BMS system to help reduce running costs.
- The total energy savings from the heat pump system installation also account for an additional 10% reduction achieved through the integration of a BMS system.[1]
- Economic life of the air source heat pump (ASHP) is considered to be 15 years.
- The estimates are based solely on the assumption that the ASHP system will meet both the space heating and domestic hot water (DHW) demands. Whilst in practical delivery the system may involve multiple heat pumps in stages, the modelling has been completed as a whole system.
- This sizing of a heat pump is purely an indicator and should not be used as part of a specification of a heat project. A full feasibility study & design needs to be carried out prior to going to tender.
- A detailed heat load analysis is recommended to ensure the new system is appropriately sized to meet the building's actual heating requirements.
- Carbon values (tCO_2e) are exclusive of well-to-tank (WTT) scope 3 emissions. This is to allow more direct comparison between technologies and allow for easier external dissemination.
- Grid decarbonisation is taken into account when calculating 10 year carbon savings so the 10 year saving is not equal to the year one saving multiplied by ten.

[1] Source: CIBSE Guide F - Energy Efficiency in buildings

Assumptions – Solar PV

The solar panel layout and energy yield is modelled in *HelioScope* software (Folsom Labs, 2024). The indicative panel layouts and energy yields provided for the sites are based on the following assumptions:

- Supply and install cost provided by OIC, it's noted these are above typical industry values for £/kWp.
- Annual operational costs calculated at £12.54/kWp.
- Degradation rate of system included in lifetime analysis at 0.4% annually.
- Grid decarbonisation is taken into account when calculating 10 year carbon savings so the 10 year saving is not equal to the year one saving multiplied by ten.
- Carbon values (tCO_2e) are exclusive of well-to-tank (WTT) scope 3 emissions. This is to allow more direct comparison between technologies and allow for easier external dissemination.
- Development costs of £3,000 included, to account for structural surveys, planning applications and ecological surveys.
- Economic life of the PV array is considered to be 25 years and assumed to be commissioned in 2025.
- No cost allowance is included for measurement and verification (M&V) or other on costs such as contingency, overhead and profit, asbestos removal, security, design, project management, VAT, business rates etc.
- Cost of replacement inverters included at year 11 and 22 in lifetime analysis, at £2,130 each.
- Arrays designed with Trina Solar 320W panels.
- AC/DC ratio set between 1.1-1.25 to appreciate inverter clipping of system.
- Siting includes a set back from roof edge of 0.5m (to meet permitted development rights).

CARBON
TRUST

The Carbon Trust is a company limited by guarantee and registered in England and Wales under company number 4190230 with its registered office at Level 5, Arbor, 255 Blackfriars Road, London SE1 9AX, UK.

Appendix 2

Green Book Assessment - Carbon Cost

Year			2026	2027	2028	.....	2040
Marginal Emission Factor(Elec)	kgCO$_2$e/kWh		0.1872	0.1658	0.1427		0.0065
Emision Factor(Oil)	kgCO$_2$/kWh		0.2456	0.2456	0.2456		0.2456
Carbon Value	£/tCO2e		£ 277.22	£ 281.44	£ 285.73		£ 342.55
Green Book Data							
Retail Electricity Prices	p/kWh	Low	15.02	14.31	13.23		11.96
		Central	17.62	16.21	14.50		12.49
		High	23.03	20.27	16.81		13.46
Retail Oil Prices	p/litre	Low	47.3	46.9	46.3		40.4
		Central	68.2	67.1	66.5		64.4
		High	109.9	110.2	110.1		112.4
Cost of Carbon	£/Tonne	Low	139	141	143		171
		Central	277	281	286		343
		High	416	422	429		514
Scenario 1 (Central Costs)							
Air Source Heat Pump							
Running Cost (Elec)			£ 22,813.86	£ 20,980.71	£ 18,776.82		£ 16,168.24
Cost of Carbon			£ 6,719.46	£ 6,040.46	£ 5,280.19		£ 287.28
	Total	£ 302,286.46	£ 29,533.32	£ 27,021.17	£ 24,057.01	.....	£ 16,455.52
Replacment Oil Boiler							
Running Cost (Oil)			£ 27,682.13	£ 27,251.56	£ 26,988.55		£ 26,131.33
Cost of Carbon			£ 28,739.32	£ 29,176.98	£ 29,621.30		£ 35,511.52
	Total	£ 877,006.87	£ 56,421.45	£ 56,428.54	£ 56,609.85	.....	£ 61,642.86
ASHP Operational Saving	34%	**-£ 574,720.41**					
Scenario 2 (High Oil)							
Air Source Heat Pump							
Running Cost (Elec)			£ 22,813.86	£ 20,980.71	£ 18,776.82		£ 16,168.24
Cost of Carbon			£ 6,719.46	£ 6,040.46	£ 5,280.19		£ 287.28
	Total	£ 302,286.46	£ 29,533.32	£ 27,021.17	£ 24,057.01	.....	£ 16,455.52
Replacment Oil Boiler							
Running Cost (Oil)			£ 44,621.86	£ 44,740.19	£ 44,690.32		£ 45,628.93
Cost of Carbon			£ 28,739.32	£ 29,176.98	£ 29,621.30		£ 35,511.52
	Total	£ 1,157,464.11	£ 73,361.18	£ 73,917.17	£ 74,311.62	.....	£ 81,140.46
ASHP Operational Saving		**-£ 855,177.65**					
Scenario 3 (High Electricity / Low Oil)							
Air Source Heat Pump							
Running Cost (Elec)			£ 29,817.47	£ 26,247.03	£ 21,767.51		£ 17,424.36
Cost of Carbon			£ 6,719.46	£ 6,040.46	£ 5,280.19		£ 287.28
	Total	£ 335,306.20	£ 36,536.92	£ 32,287.49	£ 27,047.70	.....	£ 17,711.64
Replacment Oil Boiler							
Running Cost (Oil)			£ 19,212.27	£ 19,021.62	£ 18,779.04		£ 16,382.54
Cost of Carbon			£ 28,739.32	£ 29,176.98	£ 29,621.30		£ 35,511.52
	Total	£ 747,682.79	£ 47,951.59	£ 48,198.60	£ 48,400.34	.....	£ 51,894.06
ASHP Operational Saving		**-£ 412,376.59**					
Scenario 4 (Central / No Carbon Cost)							
Air Source Heat Pump							
Running Cost (Elec)			£ 22,813.86	£ 20,980.71	£ 18,776.82		£ 16,168.24
Cost of Carbon			£ -	£ -	£ -		£ -
	Total	£ 265,051.90	£ 22,813.86	£ 20,980.71	£ 18,776.82	.....	£ 16,168.24
Replacment Oil Boiler							
Running Cost (Oil)			£ 27,682.13	£ 27,251.56	£ 26,988.55		£ 26,131.33
Cost of Carbon			£ -	£ -	£ -		£ -
	Total	£ 396,787.50	£ 27,682.13	£ 27,251.56	£ 26,988.55	.....	£ 26,131.33
ASHP Operational Saving		**-£ 131,735.59**					