

Free and impartial advice on  
making your business greener

BUSINESS  
ENERGY  
SCOTLAND

# Energy efficiency assessment

**Prepared for:**  
**Glenfarg Village Hall**

energy  
saving  
trust

 Net Zero  
Scotland  
Scottish  
Government

 LET'S DO  
NET ZERO

# Contents

<b>1</b>	<b>Customer and advisor details</b>	<b>3</b>
<b>2</b>	<b>Executive summary</b>	<b>4</b>
<b>3</b>	<b>Your journey to net zero carbon emissions</b>	<b>5</b>
<b>4</b>	<b>Recommendation table</b>	<b>6</b>
<b>5</b>	<b>Current energy consumption at your site</b>	<b>7</b>
<b>6</b>	<b>Recommended and alternative energy efficiency opportunities</b>	<b>8</b>
6.1	Solar PV	8
6.2	Solar PV with battery storage	9
6.3	Lighting upgrade	11
6.4	Building fabric insulation - roof	12
6.5	Glazing measures	13
6.6	Space heating - ASHP	14
<b>7</b>	<b>Conclusion</b>	<b>16</b>
<b>8</b>	<b>Disclaimer</b>	<b>17</b>
<b>9</b>	<b>Confidentiality</b>	<b>17</b>
<b>10</b>	<b>Appendix 1 – Supporting calculations</b>	<b>18</b>
<b>11</b>	<b>Appendix 2 – Subsidy controleee/state aid information</b>	<b>21</b>
<b>12</b>	<b>Appendix 3 – SME loan and cashback information</b>	<b>23</b>

# 1 Customer and advisor details

Customer details	
Contact name	Christine Morton
Contact job title	Trustee
Telephone/mobile	01577 830210 / 07939 466552
Email	<a href="mailto:christine.morton878@gmail.com">christine.morton878@gmail.com</a>
Consultant details	
Consultant name	John Currie
Company	J I Currie
Advisor details	
Advisor name	Brogan Devlin
Telephone/mobile	07791 219132
Email	<a href="mailto:brogan.devlin@businessenergyscotland.org">brogan.devlin@businessenergyscotland.org</a>
Service	Business Energy Scotland
Assessment details	
Assessment date	16 <sup>th</sup> May 2023
Report approved by	Eva Rainey
Date approved	11 <sup>th</sup> July 2023

Business Energy Scotland provides free support to help Scottish small and medium sized enterprises (SMEs) save energy and reduce their carbon emissions. We identify savings opportunities and can also support the implementation of the opportunities identified. This can include helping to identify suppliers, design and assess the results of quote or tender specifications and identify and secure funding.

Obtaining our support on a particular project does not exclude you from obtaining further support.

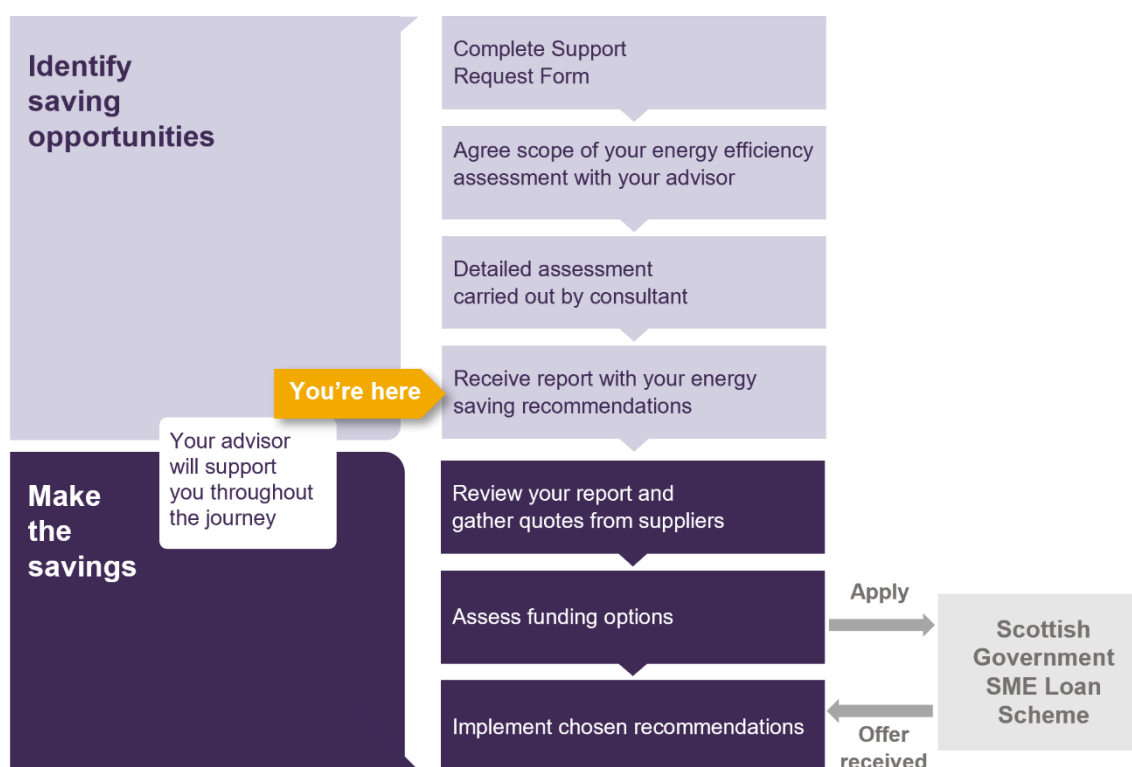


## 2 Executive summary

Glenfarg Village Hall is a Community Centre in the village of Glenfarg. Originally constructed in 1890 the building was extended in 2008 to provide additional meeting space and kitchen facilities. The organisation have also procured the adjoining two-storey schoolhouse which is presently being refurbished.

Following an assessment of the site by a Business Energy Scotland Advisor, the objectives of this report were to conduct an assessment of the premises and make recommendations for possible improvement measures, with specific consideration to a solar PV, space heating, together with building fabric improvements and lighting upgrade. Aside from the improvement measures detailed in this report, no other resource efficiency opportunities were identified.

The diagram below highlights where you currently are on your journey with us and what the next steps are:



The survey has shown that savings can be made in respect of building fabric upgrade, including re-glazing, replacing lighting, installing air source heat pump (ASHP) heating, and installing solar PV, which could generate savings of up to £18,265 per annum for an estimated investment of some £71,584 and achieve a carbon reduction of 5.0tCO<sub>2</sub>e.

Key actions and next steps:

- Obtain competitive quotes for Solar PV installation
- Obtain competitive quotes for lighting upgrade
- Obtain competitive quotes for space heating - ASHP
- Obtain competitive quotations for building fabric insulation
- Obtain competitive quotes for glazing measures

### 3 Your journey to net zero carbon emissions

Scotland has committed to becoming a net-zero society by 2045 which is in line with the advice from the UK Government's independent advisors, the [Climate Change Committee](#).

To help you understand how your enterprise can support that transition, we have identified that your site has the following carbon emissions and we have identified how you can reduce them to support Scotland's net-zero goals:

Annual carbon impact		Equivalent average car miles
Current carbon emissions (tonnes CO <sub>2</sub> e <sup>1</sup> )	6.52	23,085
Potential carbon reduction	77%	17,691

Note that the total realised carbon saving may be less if all the recommendations from this report are implemented as the potential savings from each recommendation are calculated in isolation from each other. In reality, some measures may affect the potential carbon savings of other measures.

Please note that this analysis does not constitute a full carbon footprint.

---

<sup>1</sup> CO<sub>2</sub>e means 'carbon dioxide equivalent'. It is a standard way of presenting the impact considering all associated greenhouse gas emissions.

## 4 Recommendation table

Recommended opportunities								
Finance estimates							Annual environmental saving estimates	
	Annual cost savings	Annual income generated	Investment required	Payback	Potential grant	Payback with grant	Energy	CO <sub>2</sub> e
Description	£ (ex VAT)	£ (ex VAT)	£ (ex VAT)	Years	£	Years	kWh	Tonnes
Solar PV	£5,610	£109	£14,716	2.6	£0	2.6	7,286	1.5
Lighting upgrade	£1,268	£0	£1,500	1.2	£1,125	0.3	1,647	0.3
Building fabric - roof	£750	£0	£2,400	3.2	£1,800	0.8	973	0.2
Glazing upgrade	£285	£0	£6,000	21.1	£4,500	5.3	370	0.1
Space heating - ASHP	£10,352	£0	£46,968	4.5	£10,000	3.6	13,445	2.9
<b>TOTAL</b>	<b>£18,265</b>	<b>£109</b>	<b>£71,584</b>				<b>23,721</b>	<b>5.0</b>
Alternative opportunities								
Solar PV plus battery storage	£7,213	£36	£27,516	3.8	£0	3.8	9,368	2.0

Please note that implementing multiple measures may impact on each other and this may result in the realised savings being less than is presented in this report. Unless otherwise stated, the identified savings presented in this report for each measure are calculated independently from other measures. If required, further support can be provided by Business Energy Scotland to quantify the impact of implementing multiple measures where they impact on each other.

Your Business Energy Advisor can support you to implement the recommendations we have suggested in this report.

Where appropriate, our finance estimates include a cashback grant from the Scottish Government's SME Loan scheme. Please see Appendix 3 for further details on the SME Loan scheme and cashback grant, including eligibility criteria.

## 5 Current energy consumption at your site

Estimated current annual energy use				
Resource	Cost	Consumption	Units	CO <sub>2</sub> e emissions (Tonnes)
Electricity	£23,660	30,728	kWh	6.52
<b>TOTAL</b>	<b>£23,660</b>	<b>30,728</b>	<b>kWh</b>	<b>6.52</b>

Note:

- The costs in this table exclude standing charges and other costs including, where relevant, charges such as the Climate Change Levy. This includes an estimate for energy consumption in the recently acquired schoolhouse using CIBSE TM46 benchmark category 16 (125kWh/m<sup>2</sup>).
- When calculating the potential savings of opportunities, unit costs which exclude standing charges have been used to calculate these as reducing consumption will often not reduce the standing charges.
- While there is volatility in current energy prices, the client requested that the current unit rate of 77.0p/kWh for electricity is used in this report, which is higher than the [domestic price cap](#) at the time of writing this report. This unit price is evidenced in recent billing information provided.
- The CO<sub>2</sub>e emissions detailed above are not equivalent to a carbon footprint for the site.
- It may be beneficial to you to renegotiate your energy contracts if you are going to significantly change your consumption. It is also good practice to regularly review your energy tariffs to ensure they meet your requirements. By changing your tariff or supplier you may be able to decrease your energy costs. Contacting your current supplier to check you are on the most appropriate tariff can be a good place to start. We can also direct you to organisations that provide energy switching advice.

## 6 Recommended and alternative energy efficiency opportunities

### 6.1 Solar PV

#### 6.1.1 Project description and recommended solution

The building has southeast and southwest oriented pitched roof areas atop which is potentially suitable for the installation of solar PV technology. If planning and structural considerations allow, installing a PV array could potentially generate electricity to mitigate primary energy demand. This electricity would reduce the demand on grid-electricity purchases, particularly if the client installs complementary battery storage technology which in turn will provide a cost and carbon saving. Surplus energy that would not be directly consumed on-site could be exported to the grid (if a grid connection can be established) and may receive an income.

We have calculated that a 13kWp system might generate some 10,409kWh annually, and based on your current consumption, hours of operation, and seasonality of your business, we conservatively estimate 70% of this will be used on-site and the remaining 30% exported to the grid.

#### 6.1.2 Benefits, costs and finance

For instance, a 13kWp array could save over £5,719 per annum (including SEG – see 6.1.3 below), depending on technology employed and output utilisation. At an estimated cost of £14,716 for this scale of installation, this might result in a payback of 2.6 years and a carbon reduction potential of some 1.5tCO<sub>2</sub>e.

Please refer to Appendix 1 for calculations.

Financial support for installing eligible energy efficiency and/or renewable energy equipment in Scotland is available through the SME Loan scheme. This offers eligible SMEs, (including charities), interest-free loans from £1,000 to £100,000 for individual measures and packages of linked measures that have a payback period of 20 years or less. Loan repayments are made over an 8-year period.

For eligible non-renewable energy efficiency measures, the Scottish Government is offering a 75% cashback grant to SME Loan recipients for a limited time while funds last. Loan recipients may receive 75% of their project cost back, up to a maximum of £20,000.

For renewable heat measures, the Scottish Government is offering a 75% cashback grant to SME Loan recipients for a limited time while funds last. Loan recipients may receive 75% of their project cost back, up to a maximum of £10,000. This cashback grant would be additional to any received for non-renewable energy-saving measures.

For other eligible renewable measures, such as photovoltaics and wind turbines, you can apply for an interest-free loan, but there is no cashback grant.



This report is regarded as a qualifying report for the SME Loan scheme if required.  
Download the SME Loan application form: <https://businessenergyscotland.org/smeload>.

If you decide to apply for an SME Loan then the interest foregone on your loan, and any grant received, are regarded as state aid under EU-UK Trade and Cooperation Agreement. An estimate of how much aid this might equate to is provided in Appendix 2. Please see Appendix 3 for further details on the SME Loan and cashback grant.

### 6.1.3 Risks and alternative solutions

The Feed-In-Tariff closed to new applicants on 1 April 2019, barring a few exceptions. The Feed-In-Tariff paid businesses on a fixed per kilowatt-hour basis over a set period of time for the electricity generated by eligible renewable energy technologies. There is however a new payment system that came into force on 1 January 2020, called the Smart Export Guarantee (SEG). This pays homeowners and businesses for electricity exported to the National Grid which has been generated by eligible renewable energy technologies. The level of payment and length of contract varies depending on the purchaser of the electricity. For any exported electricity to the National Grid (if applicable), income could be made. Further information on the Smart Export Guarantee can be found here: <https://www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg>

One of the risks associated with such installations is the periodic replacement of electrical components in the system (e.g., inverters, charge controllers) which are often not included in longer term maintenance costing.

Advice should be sought from a professional MCS accredited installer in respect of network connection and planning, system integration/orientation and sizing of installation to meet current and future needs, and thus provide a more consistent specification basis for tender selection. This emphasises the need for controlling and maximising solar PV generation usage onsite.

Please note that the savings estimate some 70% of the electricity generated is used on site and uses your current energy consumption figures. Depending on the actual daily consumption profile of the building, this assumption could be an overestimation meaning more energy is exported to the grid, lowering the potential savings. Additionally, if all the measures described in this report were to be carried out, the self-consumption rate could be lower and savings from this measure could therefore decrease.

## 6.2 Solar PV and battery storage

### 6.2.1 Project description and recommended solution

The business is seeking to maximise the solar generation potential of the system described in section 6.1 above through the installation of complementary battery storage technology. This enables temporal displacement of a proportion of energy generated during the daytime to other times.

As above, we have calculated that a 13kWp Solar PV system might generate some 10409kWh annually. With the added value of battery storage and taking into consideration your current consumption, hours of operation, and seasonality of your business, we estimate 90% of this could be used on-site and the remaining 10% exported to the grid.

## 6.2.2 Benefits, costs and finance

It is estimated that including 16kWh capacity of storage into the installation could save some £7,249 per annum (including SEG – see 6.1.3 below), depending on technology employed and output utilisation. At an estimated cost of £27,516 for the total installation including battery storage, this might result in a payback of 3.8 years and a carbon reduction potential of some 2.0tCO<sub>2</sub>e.

Please refer to Appendix 1 for calculations.

## 6.2.3 Risks and alternative solutions

The Feed-In-Tariff closed to new applicants on 1 April 2019, barring a few exceptions. The Feed-In-Tariff paid businesses on a fixed per kilowatt-hour basis over a set period of time for the electricity generated by eligible renewable energy technologies. There is however a new payment system that came into force on 1 January 2020, called the Smart Export Guarantee (SEG). This pays homeowners and businesses for electricity exported to the National Grid which has been generated by eligible renewable energy technologies. The level of payment and length of contract varies depending on the purchaser of the electricity. For any exported electricity to the National Grid (if applicable), income could be made. Further information on the Smart Export Guarantee can be found here: <https://www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg>

One of the risks associated with such installations is the periodic replacement of electrical components in the system (e.g., inverters, charge controllers) which are often not included in longer term maintenance costing. Consideration should also be given to the lifespan of these components, their maintenance, and the safe replacement/disposal of these at the end of their working life. Lead-acid battery storage units have a lifetime of around five years on average, depending on how the system is used, while lithium-ion systems generally have a lifetime of 10 years or more. Most electric battery storage manufacturers also offer a five-year warranty for lead-acid products and a 10-year warranty for lithium-ion products. Lifetime will be impacted by use, so you should seek guidance from the installer for a warranty specific to your installation.

Advice should be sought from a professional MCS accredited installer in respect of network connection and planning, system integration/orientation and sizing of installation to meet current and future needs, and thus provide a more consistent specification basis for tender selection. This emphasises the need for controlling and maximising solar PV generation usage onsite and the matched sizing of battery storage to achieve this.

Please note that the savings estimate some 90% of the electricity generated is used on site and uses your current energy consumption figures. Depending on the actual daily consumption profile of the buildings, this assumption could be an overestimation meaning more energy is exported to the grid, lowering the potential savings. Additionally, if all the measures described in this report were to be carried out, the self-consumption rate could be lower and savings from this measure could therefore decrease.

## 6.3 Lighting upgrade

### 6.3.1 Project description and recommended solution

The client is seeking to replace the existing compact fluorescent and metal discharge lighting throughout the premises with modern LED fittings and appropriate controls which can save over 60% ( <https://energysavingtrust.org.uk/advice/lighting/> ) in equivalent energy consumption. Lighting in the old schoolhouse has already been equipped with LED, and a trial floodlight LED has been fitted in the main stage area.

### 6.3.2 Benefits, costs and finance

LED lights use less electricity and can last considerably longer than conventional lighting. It is estimated that installing modern LED lighting could save some £1,268 per annum. The cost of replacing the luminaires with LED is estimated at £1,500 (depending on luminaire choice and amount of rewiring), giving a simple payback of 1.2 years (0.3 years with 75% cashback) and a carbon saving reduction potential of some 0.3tCO<sub>2</sub>e.

Please refer to Appendix 1 for calculations.

Financial support for installing eligible energy efficiency and/or renewable energy equipment in Scotland is available through the SME Loan scheme. This offers eligible SMEs, (including charities), interest-free loans from £1,000 to £100,000 for individual measures and packages of linked measures that have a payback period of 20 years or less. Loan repayments are made over an 8-year period.

For other eligible renewable measures, such as photovoltaics and wind turbines, you can apply for an interest-free loan, but there is no cashback grant.

This report is regarded as a qualifying report for the SME Loan scheme if required.

Download the SME Loan application form: <https://businessenergyscotland.org/smelan>.

If you decide to apply for an SME Loan then the interest foregone on your loan, and any grant received, are regarded as state aid under EU-UK Trade and Cooperation Agreement. An estimate of how much aid this might equate to is provided in Appendix 2. Please see Appendix 3 for further details on the SME Loan and cashback grant.

### 6.3.3 Risks and alternative solutions

Care should be taken to ensure compatibility of lamps/luminaires and colour selection matched to the required colour rendering for the environment. The system should be designed to meet the required maintained average illuminance on the working plane for occupational safety and some wiring upgrade might be required to ensure appropriate control is achieved. Advice should be sought from a reputable lighting supply company as to the suitability of the technology chosen, as this has been reported to vary both in light output quality and quantity between manufacturers as well as longevity.

## 6.4 Building fabric insulation - roof

### 6.4.1 Project description and recommended solution

It is reported that a limited amount of insulation presently installed in the main hall roof void, and access was obtained to the more recent extension loft space where some 200mm was evidenced. The schoolhouse loft space is reportedly equipped with currently recommended metrics of 270mm mineral wool or equivalent insulation, and topping up all areas to this level will significantly reduce heatloss.

### 6.4.2 Benefits, costs and finance

It is estimated that installation of the specified ceiling insulation measures could save approximately £750 per annum. At an estimated cost of some £2,400 (depending on access, scaffolding, etc) it is estimated this might payback in approximately 3.2 years (0.8years with 75% cashback) and provide an estimated carbon reduction of 0.2tCO<sub>2</sub>e.

Please refer to Appendix 1 for calculations.

Financial support for installing eligible energy efficiency and/or renewable energy equipment in Scotland is available through the SME Loan scheme. This offers eligible SMEs, (including charities), interest-free loans from £1,000 to £100,000 for individual measures and packages of linked measures that have a payback period of 20 years or less. Loan repayments are made over an 8-year period.

For other eligible renewable measures, such as photovoltaics and wind turbines, you can apply for an interest-free loan, but there is no cashback grant.

This report is regarded as a qualifying report for the SME Loan scheme if required.

Download the SME Loan application form: <https://businessenergyscotland.org/smelan>.

If you decide to apply for an SME Loan then the interest foregone on your loan, and any grant received, are regarded as state aid under EU-UK Trade and Cooperation Agreement. An estimate of how much aid this might equate to is provided in Appendix 2. Please see Appendix 3 for further details on the SME Loan and cashback grant.

### 6.4.3 Risks and alternative solutions

Any such upgrade works should be professionally surveyed to ensure that the applied intervention measure is suitable for the construction, specifically with regard to structural and hygrothermal performance of the building envelope, and that that mechanical and electrical services or structural performance are not impeded or rendered unsafe as a result of any such work.

## 6.5 Glazing and draught proofing measures

### 6.5.1 Project description and recommended solution

The majority of fenestration throughout the buildings is double glazed, with the exception of 3 sash and casement single glazed units in the schoolhouse which presents considerable opportunity for conductive and draught induced ventilation heat loss. It is recommended that these be replaced with modern high efficiency double glazed units.

### 6.5.2 Benefits, costs and finance

It is estimated that such action could save up to £285 per annum for an estimated investment of £6,000 and could result in a payback of 21.1 years (5.3 years with 75% cashback), and a carbon saving of some 0.1tCO<sub>2</sub>.

Please refer to Appendix 1 for calculations.

Financial support for installing eligible energy efficiency and/or renewable energy equipment in Scotland is available through the SME Loan scheme. This offers eligible SMEs, (including charities), interest-free loans from £1,000 to £100,000 for individual measures and packages of linked measures that have a payback period of 20 years or less. Loan repayments are made over an 8-year period.

For other eligible renewable measures, such as photovoltaics and wind turbines, you can apply for an interest-free loan, but there is no cashback grant.

This report is regarded as a qualifying report for the SME Loan scheme if required.

Download the SME Loan application form: <https://businessenergyscotland.org/smelan>.

If you decide to apply for an SME Loan then the interest foregone on your loan, and any grant received, are regarded as state aid under EU-UK Trade and Cooperation Agreement. An estimate of how much aid this might equate to is provided in Appendix 2. Please see Appendix 3 for further details on the SME Loan and cashback grant.

### 6.5.3 Risks and alternative solutions

Care must be taken to ensure any work meets the requirements of any building conservation or listing status and sealing a building envelope too tightly can reduce ventilation rates and possibly lower air quality in certain areas; perhaps resulting in hygrothermal performance reduction and increased risk of condensation.



## 6.6 Space heating – air source heat pump (ASHP)

### 6.6.1 Project description and recommended solution

The building is presently heated by a mix of cost and environmentally inefficient electric resistance heating, and radiant heating in the main hall. An electric boiler services underfloor heating in the recent extension and new wall panels have been fitted throughout the schoolhouse. The client is keen to explore the opportunity for installing a low-carbon heating alternative such as an air-to-water source heat pump (ASHP) to reduce the environmental cost of space heating. Air source heat pumps still require electricity to run the ‘pump’; however, they are more environmentally friendly than current systems as the heat they extract from the air outside is absorbed into a fluid which passes through a compressor, increasing temperatures and transferring that to air heating the building. Such systems can produce up to 3.5 units of heat for 1 unit of electricity consumed, reducing the carbon cost of heating. It might be possible to interface an air to water heat pump with the existing underfloor heating system, but this would require considerable design input and disruption, with potential integration complexity. The clients are thus seeking to install air-to-air source system/systems to service the various sized spaces, as this would provide faster warming response cycles for the intermittently occupied spaces and afford better comfort control.

### 6.6.2 Benefits, costs, and finance

The benefits from ASHP technology are primarily in carbon reduction and with heating demand serviced by a Microgeneration Certification Scheme (MCS) accredited ASHP installation this is estimated to provide an operational cost increase of £10,352 per annum (assuming building fabric measures are implemented as above). At an estimated installed cost of some £46,968 for this scale and complexity of installation and could result in a payback of 4.5 years (3.6 years with 75% cashback), and a carbon saving of some 2.9tCO<sub>2</sub>

Please refer to Appendix 1 for calculations.

Financial support for installing eligible energy efficiency and/or renewable energy equipment in Scotland is available through the SME Loan scheme. This offers eligible SMEs, (including charities), interest-free loans from £1,000 to £100,000 for individual measures and packages of linked measures that have a payback period of 20 years or less. Loan repayments are made over an 8-year period.

For other eligible renewable measures, such as photovoltaics and wind turbines, you can apply for an interest-free loan, but there is no cashback grant.

This report is regarded as a qualifying report for the SME Loan scheme if required.

Download the SME Loan application form: <https://businessenergyscotland.org/smeloan>.

If you decide to apply for an SME Loan then the interest foregone on your loan, and any grant received, are regarded as state aid under EU-UK Trade and Cooperation Agreement. An estimate of how much aid this might equate to is provided in Appendix 2. Please see Appendix 3 for further details on the SME Loan and cashback grant.

### 6.6.3 Risks and alternative solutions

It is recommend having the system size confirmed by a professional Building Services Engineer/MCS accredited installer in respect of system integration, sizing, and control to meet current and future needs, and thus provide a more consistent specification basis for obtaining additional quotations and tender selection. Care should be exercised to ensure quoted costs cover all elements of the heat distribution system within the property (e.g., larger heat emitters, controls etc). Air source heat pumps perform better in well insulated and draught proof buildings and a heat pump is likely to be more viable if good heat loss reductions are also implemented in the areas to be heated.

The actual Seasonal Coefficient of Performance (SCoP) of the overall heating system is lower than the CoP of the heat pump itself and may differ to that mentioned in the report, this and other external variables can influence the efficiency of an ASHP installation.

## 7 Conclusion

The survey has shown that savings can be made in respect of building fabric upgrade, including re-glazing, replacing lighting, installing air source heat pump (ASHP) heating, and installing solar PV, which could generate savings of up to £18,265 per annum for an estimated investment of some £71,584 and achieve a carbon reduction of 5.0tCO<sub>2</sub>e.

## 8 Disclaimer

Every effort is made to ensure that the information given herein is accurate, but no responsibility is accepted for any errors, omissions or misleading statements, and no responsibility is accepted in regard to the standing of any firms, companies or individuals mentioned. It should be noted that any company or individual's details contained within listings of products and services should not be regarded as an endorsement by Business Energy Scotland.

The contents of this report have not been prepared as and may not be construed as design in the context of CDM Regulations. Energy Saving Trust accepts no liability whatsoever to any third party for any loss or damage arising from any interpretation or use of the information contained in this report, or reliance on any views expressed therein.

Any guidance given in relation to legislation is based on the information currently available to Business Energy Scotland. It cannot be regarded as legally binding and should only be seen as advisory. The legislation itself should always be read and understood, as that constitutes the law. As more information surrounding the legislation becomes available, your advisor will be able to provide information on the latest developments.

## 9 Confidentiality

This report is the Copyright of the customer listed in section 1 of the report and has been prepared by Energy Saving Trust. This report may not be reproduced, in whole or in part, nor passed to any organisation or person without the specific prior written permission of the customer.

It is important to note that the information you provide Energy Saving Trust will be treated in the strictest of confidence, except when we are required to disclose data by law or applicable regulatory requirement, including any disclosure required under the Freedom of Information (Scotland) Act 2002 and/or any code or applicable data agreement relating to disclosure and access to information held by public bodies.

Your information will be used for service delivery and research studies by Energy Saving Trust. In addition, we will use your details to send you information about other services and products that may be of interest. If you no longer wish to hear from us or would like to change your subscription preferences, please contact [support@businessenergyscotland.org.uk](mailto:support@businessenergyscotland.org.uk).

For more information visit: <https://energysavingtrust.org.uk/privacy-policy/>.

## 10 Appendix 1 – Supporting calculations

### Solar PV Calculations:

The building has southeast/west oriented pitched roof areas of some 130m<sup>2</sup> for potential installation of solar PV, although no detail on structural suitability could be ascertained. If planning and structural considerations allow, installing a 13kWp PV array could potentially generate some 10409kWh per annum (using JRC Photovoltaic Geographical Information System). In the absence of half-hourly consumption data, it is estimated that a system utilisation of up to 70% might be achieved. At summer insolation peaks the PV system might generate more than the daytime site demand for periods, and if a grid connection can be established, this surplus generation could be exported under a SEG.

The cost saving is thus calculated as  $10409\text{kWh} \times 0.7 = 7286\text{kWh}$  @ 77.0p/kWh = £5,610 per annum in purchased electricity if this can be managed in relation to daily demand. Signing up to an SEG tariff could potentially provide additional benefit for exported electricity at 3.5p/kWh (SSE) =  $10409 \times 0.3 \times 0.035 = £109$  per annum.

Carbon reduction =  $7286\text{kWh} \times 0.212\text{kgCO}_2/\text{kWh} = 1.5\text{tCO}_2\text{e}$

Using government supplied solar PV installation cost data from <https://www.gov.uk/government/statistics/solar-pv-cost-data> using the 2021/22 mean cost of £1,132/kW for installing such solar PV systems, then a 13kWp installation might cost  $13 \times £1,132 = £14,716$ , providing a simple payback = 2.6 years.

### Solar PV Calculations with battery storage:

The business is seeking to install complementary battery storage in order to increase the system utilisation and temporally displace daytime generation to other periods; with the building often having evening working and demand.

Installing 16kWh at a typical cost of £800/kWh (detailed calculations are presently beyond the scope of this report) and this technology can be deployed at peak rate then it is estimated that a system utilisation of up to 90% might be achieved.

The cost saving is thus calculated as  $10409\text{kWh} \times 0.9 = 9368\text{kWh}$  @ 77p/kWh = £7,213 per annum in purchased electricity if this can be managed in relation to daily demand. Signing up to an SEG tariff could potentially provide additional benefit for exported electricity at 3.5p/kWh (SSE) =  $10409 \times 0.1 \times 0.035 = £36$  per annum.

Carbon reduction =  $9368\text{kWh} \times 0.212\text{kgCO}_2/\text{kWh} = 2.0\text{tCO}_2\text{e}$

An estimated total cost for the installation is  $£14,716 + (£800 \times 16) = £27,516$  providing a simple payback = 3.8 years.



## Lighting Calculations

Presently installed lighting load is estimated as 2.2kW and replacing these using LED luminaires could reduce this by up to 60% and save  $2.2 \times 0.6 = 1.32\text{kW}$ . Over an estimated annual operation of 1248h amounts to  $1248 \times 1.32 = 1647\text{kWh}$  @ 77.0p/kWh = £1,268

A typical cost for this capacity of lighting replacement with LED with automatic controls in intermittently occupied areas (depending on access, specification, and any rewiring required) is estimated as £1,500, indicating a payback of 1.2 years.

Carbon saving =  $1647\text{kWh} \times 0.212 \text{ kgCO}_2/\text{kWh} = 0.3\text{tCO}_2\text{e}$

## Fabric Insulation Calculations - Roof:

Based upon insulating some 240m<sup>2</sup> ceiling area U-Value improved from 0.4 to 0.15 W/m<sup>2</sup>K (BRE U-value calculator)

Temperature differential = 13°C

Heating period = 1248hrs p.a.

Saving =  $240 \times (0.4 - 0.15) \times 13 \times 1248 = 973\text{kWh}$  @ 77.0p/kWh = £750

Estimated cost of ceiling insulation (excluding downtakings) =  $240 \times £10/\text{m}^2 = £2,400$  (<https://www.checkatrade.com/blog/cost-guides/loft-insulation-cost/>), indicating a payback of 3.2 years.

Carbon saving =  $973\text{kWh} \times 0.212\text{kgCO}_2/\text{kWh} = 0.2\text{tCO}_2\text{e}$

## Glazing / Draught Proofing Calculations:

The installation of compliant double glazing units could significantly improve the comfort levels in the rooms presently equipped with single glazed sash and casement.

Based upon installing 6m<sup>2</sup> glazed area

Glazing U-Value improved from 5.6 to 1.8 W/m<sup>2</sup>K (CIBSE Guide A)

Temperature differential = 13°C

Heating period = 1248hrs p.a.

Saving =  $(6 \times (5.6 - 1.8)) \times 13 \times 1248 = 370\text{kWh}$  @ 77.0p/kWh = £285

Carbon saving =  $370\text{kWh} \times 0.212\text{kgCO}_2/\text{kWh} = 0.1\text{tCO}_2\text{e}$

Typical costs for installing high efficiency double glazed window units is in the order of £1000/m<sup>2</sup>, indicating a total cost =  $1000 \times 6 = £6,000$  (ex. VAT). This indicates a payback of 21.1 years.

### ASHP Heating Calculations:

Space heating demand is estimated as some 70% of total electricity consumption (CIBSE TM46), which equates to  $30728 \times 0.7 = 21510\text{kWh}$  heating demand.

Reducing this demand in order to account for building fabric measures calculated earlier, and which would be required in order to enable a successful installation =  $21510 - 370 - 973 = 20,167\text{kWh}$

Generating this demand from air source heat pump (ASHP) technologies, as opposed to electric resistance heating, and assuming a heat pump seasonal coefficient of performance (CoP) of 3.0, would require  $20167\text{kWh} / 3.0 = 6722\text{kWh}$  to produce the estimated heat pump electrical heating demand.

The energy saving is thus  $(20167 - 6722) = 13445\text{kWh}$  per annum

Carbon reduction =  $13445\text{kWh} \times 0.212\text{kgCO}_2/\text{kWh} = 2.9\text{tCO}_2\text{e}$

The cost saving =  $13445\text{kWh} @ 77.0\text{p/kWh} = £10,352$

Using typical benchmark data for such systems (DECC: [http://2050-calculator-tool-wiki.decc.gov.uk/cost\\_categories/64](http://2050-calculator-tool-wiki.decc.gov.uk/cost_categories/64)) a commercial heat pump cost at this scale and complexity is estimated to be some £46,968 (depending on final system configuration, specification, and integration complexity). This indicates a payback of 4.5 years.

## 11 Appendix 2 – Subsidy controlee/state aid information

### Advice from Business Energy Scotland

The advice that has been provided in this report is funded with support from Scottish Government but is NOT classed as aid under the EU-UK Trade and Cooperation Agreement or European Commission's de minimis state aid regulations.

If you would like further advice to implement the recommendations or to look at further opportunities, then contact your advisor and they will help you. This support is also NOT classed as aid delivered under the EU-UK Trade and Cooperation Agreement. This means that the advice you receive does not count towards the limits that are set on Special Drawing Rights under the EU-UK Trade and Cooperation Agreement.

### Funding from the SME Loan

If you decide and are eligible to apply to the SME Loan scheme for interest-free financial support then the interest foregone on your loan, and any grant received, are regarded as an exempted subsidy under Article 3.2(4) of the EU-UK Trade and Cooperation Agreement (which replaces de minimis aid under Commission Regulation (EU) 1407/2013 (general de minimis), Commission Regulation (EU) 1408/2013 (production of agricultural products) and Commission Regulation (EU) 717/2014 (fisheries and aquaculture products)).

The value of the interest foregone will depend on which measures you apply for and whether a grant is available however we have estimated the potential value of the Special Drawing Rights that could apply to the recommendations made if there was no grant or cashback grant:

#### Estimated special drawing rights associated with accessing the SME Loan

Item	Description	Investment required	Potential SME loan	Interest rate applied	Interest forgone
1	Solar PV	£14,716	£14,716	0%	£3,169.12
2	Lighting upgrade	£1,500	£1,500	0%	£323.03
3	Building fabric - roof	£2,400	£2,400	0%	£516.85
4	Double glazing	£6,000	£6,000	0%	£1,292.11
5	Space heating - ASHP	£46,968	£46,968	0%	£10,114.67

The information provided above is just an estimate and does not include any Special Drawing Rights aid resulting from any supporting grants. The actual state aid that applies will be supplied to you in the offer letter from Energy Saving Trust's SME Loan team if you decide to apply for the loan.

There is a ceiling of £325,000 Special Drawing Rights for subsidies provided to any one economic actor under this Article over a 3-year period. Any Article 3.2(4) subsidies (or similar aid, including "de minimis" aid granted prior to 31 December 2020 under Commission Regulation (EU) No 1407/2013) awarded to the Grantee will be relevant if the Grantee wishes to apply, or has applied, for any Article 3.2(4) subsidies.

## 12 Appendix 3 – SME loan and cashback information

### The loan

Scottish small and medium-sized enterprises (SMEs) can apply for an interest-free loan, funded by the Scottish Government, of between £1,000 and £100,000, repayable over eight years, to help pay for energy efficiency projects.

Eligible measures can also receive a cashback grant of up to £30,000.

### What can it be used for?

A Scottish Government SME Loan can be used to finance the installation of eligible energy efficiency systems, equipment or building fabric, including:

- Heating, ventilation, and air conditioning upgrades.
- Renewable technologies such as replacing a boiler to an air source heat pump.
- Improving insulation, draught-proofing, double or secondary glazing.
- Installing solar panels, wind turbines and wood-burning stoves.

### Who is eligible?

The loan is available to Scottish businesses that fall within the EU definition of Small and Medium-sized Enterprise (SME), including not-for-profit organisations and charities.

Key eligibility criteria include:

- The organisation has been trading for at least 12 months.
- The organisation is not owned by or owns 25% of another organisation.
- The organisation passes the credit check carried out by Energy Saving Trust.
- The payback for individual measures or a package of linked measures have a payback period of 20 years or less.

This report is regarded as a qualifying report for the SME Loan scheme if required.

Download the SME Loan application form here: <https://businessenergyscotland.org/smeloan>.



## Can I get a cashback grant?

Currently, eligible installations can qualify for a cashback grant:

- 75% of eligible costs up to a maximum of £20,000 can be claimed by qualifying applicants for permitted energy efficiency measures.
- 75% of eligible costs up to a maximum of £10,000 can be claimed by qualifying applicants for any air/ground/water source heat pump, biomass boiler or solar thermal renewable heating technologies.
- 0% is applied to other renewable electricity generating technologies, such as solar PV and wind turbines.

A maximum of £30,000 cashback can be awarded to a single business for eligible technologies and across all of their SME applications (previous or current).

## How do I apply?

You can request an application form from your advisor who will be able to assist you with completing it and can check it over before it is submitted to Energy Saving Trust, which manages the loan on behalf of Scottish Government.

## Key things to note

The SME Loan cannot be applied for retrospectively, so you cannot carry out work and then secure the loan afterwards.

The quote(s) you obtain for implementing the measures must meet the following criteria:

- Be on company-headed paper or have a company stamp.
- Be addressed to the applicant at the correspondence address for the application. This must also include the business name.
- Have the installation address on the quote.
- The details of the measures to be installed must match the measures applied for with a breakdown of the cost of the improvement.
- Include the total cost of the installation with VAT breakdown if applicable.
- Must be dated.

## For more information



**0808 808 2268**



**[businessenergyscotland.org](https://businessenergyscotland.org)**



**[support@businessenergyscotland.org](mailto:support@businessenergyscotland.org)**



**[@busenergyscot](https://twitter.com/busenergyscot)**

Business Energy Scotland is funded by Scottish Government and managed by Energy Saving Trust.  
Energy Saving Trust Limited. Registered in England and Wales No.02622374