Centre for Sustainable Energy

Home Energy Plan

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FUTURE PROOF

Your Home Energy Plan

Address: **Assessment date:**

What this report contains

This report provides recommendations on your retrofitting your property, summarising the key points discussed during the assessor visit.

This includes any differences spotted between your current EPC (if applicable) and the points of interest for improving the energy efficiency and comfort levels.

Further context is provided to each measure suggested in the *Measures and considerations* section, followed by a section providing information for your next steps, as well as a glossary of terms you may find in this report.

Retrofit in a wider context

Buildings are interconnected systems, and it's important to identify how energy efficiency measures (EEMs) and buildings can work together for optimal results while minimizing unintended side effects. Our approach considers not just energy use, but also comfort, ventilation, air quality, building condition, aesthetics, and heritage.

Prioritising remedial work and building fabric improvements is a good starting point, but the addition of heating and renewable measures, such as heat pumps, should not disregarded early on.

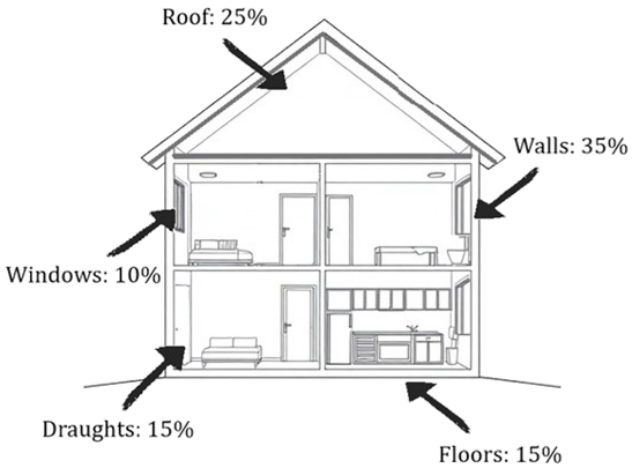
The term 'Fabric First' is often used in a retrofit context: it refers to reducing heat loss through insulation and air tightness improvements as a first step. However, deep retrofits on traditional properties (those built before 1919) can be costly, disruptive, or unsuitable.

Many traditional, solid wall properties can be suitable for a heat pump prior to any insulation works, if the heat pump installation is correctly sized, designed and implemented.

Heat loss from a typical home

This graphic to the right approximately shows the amount of heat loss from different parts of a property, on average.

Heat loss will vary depending on the materials of the property, the type of detachment (e.g. mid terrace or detached) but in general, the larger the surface area of a material, the more heat it will lose.



Ventilation and moisture management

Adequate ventilation and good indoor air quality are essential for our health. We produce considerable amounts of moisture every day through breathing, cooking, bathing and drying clothes.

As we reduce unintended airflow through gaps and cracks to reduce heat loss, we need to ensure that moist stale air is removed, and enough fresh air is introduced. Inadequate ventilation can lead to poor indoor air quality, condensation and mould. This is a risk to human health and can threaten the condition of the building too. Moist air also requires more energy to heat, therefore high humidity internally could result in lower levels of comfort and higher fuel bills.

Different buildings manage moisture in different ways. Older buildings with solid walls were designed to be vapour open, meaning that moisture could pass through the external building elements. They are usually quite draughty too. Newer buildings are typically vapour closed and moisture is kept out of the building elements, while internal moisture is managed through ventilation systems, such as extractor fans or trickle vents in windows.

A common issue is that many of our older buildings have been altered in ways which have reduced the vapour permeability, such as the use of cement-based plasters and renders, vapour closed insulation materials, vapour impermeable paints and lack of intentional ventilation.

This can lead to various problems when moisture becomes trapped within the building structure, not just causing damp and mould but threatening the structural integrity of the building itself, particularly around timbers. This is a critical risk we must consider when we want to insulate solid walls.

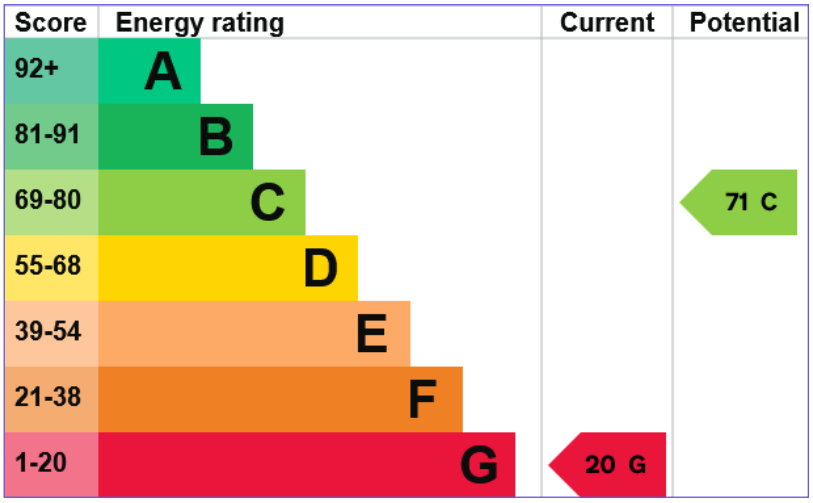
Insulate Tight, Ventilate Right

Your property

Energy Performance Certificates (EPCs) provide some details regarding the property's characteristics, however they do not always reflect the true situation. This may be due to changes in the building since the previous assessment or errors/oversights during the previous assessment.

This section compares your energy performance certificates (EPC) with any differences observed during the assessment.

Your EPC has been found online through the page www.gov.uk/find-energy-certificate



Feature	Description	Rating
Wall	Cavity wall, as built, no insulation (assumed)	Poor
Roof	Pitched, 150 mm loft insulation	Good
Window	Fully double glazed	Good
Main heating	Boiler and radiators, oil	Poor
Main heating control	Programmer, TRVs and bypass	Average
Hot water	From main system	Poor
Lighting	Low energy lighting in 93% of fixed outlets	Very good
Floor	Suspended, no insulation (assumed)	N/A
Secondary heating	None	N/A

- Your EPC from September 2024 assumes there is no cavity wall insulation, but you found that there is blown fibre insulation present. See below for more information regarding this.

- The EPC does not reference the sun room extension, which has an insulated suspended floor.

Property discussion overview

This section provides a summary of the site visit. It starts with notes regarding property condition, leading onto the suggested energy efficiency measures, from the quick wins and basic installs to more complex or disruptive. Any measures that are highlighted in **bold** have more details provided in the "Measures and considerations" section that follows.

Property condition

The property is in good condition, no issues were noted with the structure. The presence of blown fibre insulation is not inherently bad: this form of insulation is not used any more as properties exposed to wind-driven rain may suffer from damp if water is able to enter the cavity and soak through the insulation. Regular maintenance of the external wall/mortar to prevent water ingress is advised. It was also noted that two water drainage pipes at the rear of the property were not exiting into the drain nearby - adding an angled pipe into the drain to prevent large volumes of water soaking at the base of the property is recommended.

Measure suggestions

The lowest disruption measure to begin with will be improving the **airtightness** of the property. There main areas of note during the visit were:

- Open chimney
- Radiator pipework into sub/intermediate floor voids
- Mains water pipework

For the chimney, a chimney balloon or chimney sheep would be recommended. Airtightness tape, expanding foam insulation or silicone caulking could be used to fill gaps around pipework. Remember that anywhere a plumber or electrician would work, which you wouldn't typically look at, is somewhere to look for air loss pathways.

The mechanical ventilation in the property is currently adequate, but improvements could be made. You mentioned that the bathroom would be refitted at some point in the near future: installing a decentralised mechanical extract vent **(dMEV)** to replace the intermittent extract ventilation (IEV) would be advisable. These units work automatically to extract more air when it detects that humidity is high. The ventilation in the kitchen is adequate, and where there is no other clear location for a ventilation unit other than the window, it would be recommended to keep this in place and use it often. Having ventilation installed within windows is expensive and the units present in the glass have a strong enough extraction rate to be satisfactory.

The **loft insulation** is currently under the recommended minimum of 270mm depth - if you are plan to replace the roof, then new insulation would be required as part of the job. Alternatively, you may be able to get grant funded insulation through a scheme called the Energy Company Obligation Flexible Criteria (ECO Flex). Route 3 of ECO flex provides grant funding for measures if someone in the property has a health condition that is exacerbated by the cold. If your partner's asthma can be signed off by a GP as part of the process, then this could be fully funded. To discuss a referral for this, call our freephone advice line on 0800 082 2234. The funding would not cover having the loft boarded post insulation, which would be advisable if you wish to retain storage space in the loft.

If applying for this scheme, I would also advise asking for a check on the cavity wall insulation. The contractor will do a borescope survey to check the walls for insulation.

A deeper retrofit option would be to install **underfloor insulation**. At present you have floor insulation in the sun room, but not in the main property. This process is more disruptive and is typically done in one of two ways: by installing batts of insulation between all the joists, or by using spray foam insulation on the underside of the floorboards. The latter often only requires a few floorboards to be pulled up for access, but makes access at later points more difficult. Installing underfloor insulation would be recommended to be done at the same time as underfloor heating from an air-source heat pump.

For a long term option regarding heating, an **air-source heat pump** (ASHP) would be the biggest impact measure to reduce carbon impact and at current prices would be comparable running costs to a mains gas boiler. There is space for the external monobloc unit, however a location for the hot water cylinder would need to be considered. The cylinder tends to require a space of about 6ft by 3ft. The efficacy of the system is in large part down to the workmanship of the install. Here is a link to a website that shows the efficiencies of different installs, with details of the property's build characteristics and the installers (and whether they've had expertise training from companies like *Heat Geek*). The SPF is the seasonal performance factor, i.e. the efficiency, where an SPF of say, 5, would mean an efficiency of 500%. There is a scheme available (linked at the end of this report) called the Boiler Upgrade Scheme which offers £7500 towards a new ASHP install.

Solar PV is also an option for further down the line. This tool provides an estimate to the amount of energy you could generate from your roof. The addition of a battery would be beneficial to benefit from time-of-use tariffs for both charging the battery at night at cheaper rates, as well as for your electric vehicle.

Measures and considerations

This section will outline the measures highlighted in bold in the Property discussion overview and provide further guidance on what should be considered with each measure.

Improved airtightness

Process

Improving the airtightness of a building involves reducing draughts from all areas where external air may unintentionally infiltrate and internal air can unintentionally escape.

Examples of this may be around windows, doors, between floorboards or skirting boards on walls and service entrances (like pipework or cabling into the loft space for example).

This can be done with a range of products including airtightness tape, draught-proofing strips, silicone sealants or foam. The process can be facilitated with an airtightness test using a blower door and/or thermal imaging survey, which exaggerate and highlight the air leakage points.

Considerations

Reducing draughts requires detailed attention and care: there are many areas in which air can unintentionally infiltrate and it depends on many variables, such as whether you have solid walls or cavity walls.

When improving the airtightness, you should also ensure that there is adequate ventilation. Background vents (such as trickle vents on windows), mechanical extract ventilation in "wet rooms " (i.e. kitchens, bathrooms or utility rooms: any rooms which create moisture) and a 1cm undercut beneath internal doors is considered the minimum requirement to ensure adequate ventilation around the property.

Improving airtightness without improving ventilation will increase the likelihood of condensation, damp and mould occurring.

Ventilation (dMEV)

Process

Adding decentralised mechanical extract ventilation (dMEV) units is recommended due to their automatic nature.

They act in a similar fashion to intermittent extract ventilation (IEV), such as in a bathroom where the extractor turns on with the light, or a cooker hood that extracts outside. The difference with dMEVs is that they run continuously at a low speed.

Many units include a humidistat, where the fan speed, and therefore extraction rate, increases if the humidity exceeds suggested levels.

Considerations

Ensuring the units are correctly sized and installed is important: rigid ducting is advisable to get the maximum extract rate from the unit, however flexible ducting can be used. If flexible ducting is used, ensure that it is not kinked or twisted.

Units typically have a maximum suggested distance of ducting under 5 metres. Background vents, such as trickle vents, are not necessarily needed in rooms with continuous extract.

The level of sound that a dMEV produces depends on the quality of the install as well as the unit itself. Ensure the unit is installed tightly and securely, and all ducting is supported where possible to reduce possible noise from vibrations.

Loft Insulation (joists)

Process

Rolls of mineral wool are typically used, with a roll being laid between the ceiling joists and subsequent rolls being laid across the joists to eliminate any gaps, to a recommended depth of at least 270mm, up to 400mm at most.

Struts can also be added to the joists, which then have boarding affixed to create storage without affecting the insulation.

If possible, a breathable windtight membrane can be laid over the insulation to reduce 'wind washing'/thermal bypass where cold external air moves over the insulation negating some of its benefit.

Considerations

By increasing the insulation you will reduce the temperature in the loft which could increase the risk of condensation. Ensure there is sufficient ventilation in the loft space, usually through the eaves and ridge tiles. Additional tile vents can also be added.

If you have a hot water tank and pipework in your loft this will also need to be insulated to protect from freezing.

Electric cables should not be covered by insulation, trunking and loft lids for downlights should be used. You should also insulate and securely draught-proof your loft hatch. You want to make the ceiling as airtight as possible. If adding struts for storage, at least a 50mm gap should be left between the insulation and the boarding. Wool insulation should not be squashed as it reduces it's effectiveness.

Floor Insulation (suspended floor)

Process

Insulating between the joists in a suspended floor can be done from either below or above. Access from below requires enough space, via a basement or deep sub-floor void. Insulating from above is more common and requires lifting floorboards to insulate between the joists.

The insulation material used should be approx. 175 to 200mm deep mineral wool batts, depending on your joist depth, as these are vapour permeable and easy to fit within the gaps between joists. The insulation should be held in place by straps, mesh hammocks or a vapour open membrane. The insulation should stay in place by friction but not stuffed in tight.

A vapour closed control layer membrane should be used between the floorboards and the insulation, to ensure moisture from above cannot get to the insulation. Whilst the floorboards are lifted, it is recommended to use air tightness tape around the edges of the floor where the joists meet the wall, as well as sealing the vapour control layer together where there are overlaps.

Considerations

Insulating the floor will reduce the amount of air flow to the sub-floor void, therefore adequate ventilation to this area should be installed. The current air bricks should be inspected to ensure they're not blocked and you may need to add more air bricks than are currently present to ensure adequate cross-flow ventilation. The risk of not doing this would be to cause an increase in moist air within the void space, potentially causing damp or rot of the underfloor joists.

Air-source heat pump (ASHP)

Process

An air-source heat pump (ASHP) takes heat from the air and 'upgrades' it to provide heating and hot water for your home, even at sub-zero temperatures.

They work like a fridge but in reverse. They are very efficient, at around 300-450% compared with a new boiler at around 90%. This means would produce at least 3 to 4.5 units of heat for every unit of electricity they consume, meaning they can reduce carbon emissions by 70-90% compared to a gas boiler.

There are two main parts to an ASHP, an external fan (monobloc) unit and an internal hot water cylinder. They can often be connected to existing pipework from your gas central heating, because

Considerations

Careful design and installation is critical to ensure heat pumps work efficiently. Radiators and some pipework usually need to be replaced: heat pumps work similarly to boilers, where heated water is sent through radiators or underfloor heating, however the water is heated to a lower temperature with heat pumps, therefore larger radiators may be required.

A suitable outdoor location is needed for the external unit which takes into account potential noise levels for your neighbours as well as adequate airflow for the unit to work efficiently.

You also need somewhere to locate a hot water cylinder if you don't already have one, but the location of the existing boiler is often suitable.

You should consider any other possible insulation upgrades prior to fitting a heat pump as they are accurately sized to match the home's heat loss. Should you upgrade the insulation after a heat pump install, the system may be oversized and require changes to work as efficiently as possible.

The Boiler Upgrade Scheme (BUS) is a government grant offering £7,500 towards a heat pump.

installation (see the Next steps below for a more information).

The way heat pumps work mean the heating should essentially be on 24/7; if you currently only heat for a few hours each day then a heat pump could cost more to run, but your home may be more comfortable.

Solar PV (with optional battery)

Process

Installation of solar photovoltaic (PV) panels on your roof and an inverter to change the generated electricity into usable electricity. This is installed either inside or outside of the property. The inverter is connected to your electricity meter and a new export meter will be installed, to allow export to the grid when excess energy is generated.

The installation typically requires scaffolding to be erected. A domestic battery system could also be included to store excess energy for later use, reducing the need to import energy. Solar diverters could also be included (see below as a separate measure).

Considerations

Solar PV requires a suitable space, usually on the roof where it won't be impacted by any shading from trees or other buildings. The panels would ideally be facing south and at worst facing east or west.

The roof structure would also need to be checked to ensure that it can handle the weight of the panels. This can all be calculated by a contractor. You will also require electrics which fit current safety standards and a smart meter would be required to financially benefit from exporting your energy.

Your energy supplier can offer you an export tariff which dictates how much they will pay you for energy exported, in kWh. The rates paid for your exported electricity will differ between suppliers, so it is good to shop around. Lots of companies pay higher export rates if you are a customer of theirs for your electricity supply. You can compare export rates by looking online at price comparisons, such as this one by the Eco Experts: The Smart Export Guarantee explained or this one from *Which?*: Smart Export Guarantee rates: the best and worst SEG tariffs for solar panel owners

If you have a battery, suppliers may allow you to buy energy for very cheap overnight, and if you wish, sell it back at a higher rate during peak times. This capability should be discussed with the solar PV contractor.

Batteries will not necessarily work by default if there is a power cut, so if you wish to have a system which provides personal energy security, there may be extra equipment required and therefore more costs associated with a setup like this. The more electricity you use at home, the more you will benefit from PV and the quicker it will pay for itself. Electric vehicles and heat pumps will maximise savings from PV.

Next Steps

Below are some links regarding services and schemes that should help you with the next stages of retrofitting your property.

Energy efficiency measure cost and savings calculator

A government website which can help you in determining potential costs and savings from implementing different low carbon and energy saving measures.

gov.uk/improve-energy-efficiency

The Green Register

A national register of construction professionals skilled in sustainable building practices.

greenregister.org.uk/the-register

Trustmark

Trustmark is the only government endorsed quality assurance scheme for tradespeople. You can search for Trustmark registered contractors on their website.

Trustmark.org.uk

Great British Insulation Scheme (GBIS)

This is a government scheme to install loft and/or cavity wall insulation in domestic properties. This is not means tested and instead based on your council tax band and the current property energy performance.

gov.uk/apply-great-british-insulation-scheme

Boiler Upgrade Scheme (BUS)

This is a government scheme to replace boilers with heat pumps, offering a £7500 discount to the install. The property must have a valid energy performance certificate to be eligible.

gov.uk/apply-great-british-insulation-scheme

Microgeneration Certification Scheme (MCS)

MCS is a consumer standards organisation for low carbon installations, such as solar PV or heat pumps. They have a postcode search for contractors in your area.

mcscertified.com

Solar Wizard

A free tool which provides some details around the solar potential of your rooftop, such as area of roof available, potential shading from nearby trees and/or buildings and financial estimates.

solarwizard.org.uk

Energy Saving Trust

A national, independent organisation focused on improving energy efficiency within both the domestic and commercial sectors. Their website provides more information regarding low-carbon technologies and tools to assist you in reducing energy.

energysavingtrust.org.uk/

Centre for Sustainable Energy

We run an advice line that can offer free and impartial advice across the southwest, regarding energy use, bills and retrofit.

cse.org.uk

Glossary

ASHP	**Air source heat pump,** a heating system that absorbs heat from the outside air through a floor mounted unit and transfers it to water running through the radiators / underfloor heating pipework.
CWI	**Cavity wall insulation** – typically using expanded polystyrene (EPS) beads nowadays, but in the past blown fibre was used.
dMEV	**Decentralised mechanical extract ventilation,** a ventilation unit which runs continuously to extract moist air, varying in speed based on room humidity.
EEM	**Energy efficiency measure** such as loft insulation or solar PV
ESH	**Electric storage heaters,** also known as night storage heaters, which use electricity to store heat in thermal bricks on a cheaper night rate tariff.
EWI	**External wall insulation,** insulation that is applied to the outside of the wall, usually for solid brick or stone walls that do not have a cavity.
GCH	**Gas central heating,** i.e. a gas boiler that delivers hot water to radiators from a single point.
GSHP	**Ground source heat pump,** a heating system that absorbs heat from the coils in the ground and transfers it to water running through the radiators / underfloor heating pipework
HWC	**Hot water cylinder,** which heats your water either as part of a boiler, heat pump or electric heating system. It may have an immersion heating element.
IEV	**Intermittent extract ventilation,** a ventilation system which turns on intermittently, such as the common setup found in bathrooms where it turns on and off with the light switch
Interstitial Condensation	Interstitial condensation occurs when water vapour condenses within the layers of a building's wall, floor, or roof. This can lead to hidden damp and mould. A factor that must be considered when installing some kind of IWI.
IWI	**Internal wall insulation,** insulation installed on the internal surfaces of the property.
kWh	**Kilowatt hours,** a unit to measure the kilowatts of energy used in one hour. This is the standard measurement for energy use in the home.
LI	**Loft insulation**: this may be insulation laid across the floor of the loft between the joists, or insulation between the diagonal rafters of the pitched roof.
MVHR	**Mechanical ventilation with heat recovery,** a ventilation system which exchanges heat from the outward air flow to warm up the intake air from outside.
SEG	**Smart Export Guarantee,** a tariff paid to homeowners with solar PV panels when they export energy to the UK power grid. Usually set up directly with your energy supplier.
Solar Diverter	A technology which diverts energy created by a solar PV system to heat up a hot water cylinder before exporting the energy to the UK power grid.
Solar PV	**Solar Photovoltaic** panels: solar panels which generate electricity that can be used in the home, stored in domestic batteries or exported to the grid.
Solar Thermal	Solar panels which heat hot water for use within the property.
Thermal bypass	When a material, such as insulation, is unintentionally circumvented and renders the more thermally efficient material redundant.
TRV	**Thermostatic Radiator Valves,** the numbered valves on the sides of radiators that can change the temperature of the radiator independently from the boiler.
U-value	A U-value is a figure given to materials to measure how much heat transfers through it. A material with a lower u-value is more insulating and therefore has lower heat loss. Lower values are better within a retrofit context.
Vapour permeability	Vapour open/permeable or vapour closed/impermeable: refers to whether a material, such as insulation or render will allow water vapour to pass through it. Sometimes referred to as breathability. Vapour open materials are an important factor when retrofitting solid wall properties.

Assessment Disclaimer

- This report is an initial exploration to inform the direction of the proposed retrofit strategy. It is not exhaustive and represents the first step of this process.

- Whilst during this survey some obvious building condition issues may be noted, this survey does not replace a building condition survey, and we shall not be held liable for any issues subsequently found.

- This survey aims to include a basic assessment of your building's energy performance, your indoor air-quality, and how the property is used. It does not make detailed designs or specifications that would be required before undertaking works, please check with a suitably competent trades person before proceeding with any works.

- We inspect the inside and outside of the domicile but we do not force or open up the fabric of the building. We also inspect parts of the electricity, gas/oil, water heating and drainage services that can be seen, but we do not test them.

- We carry out only a visual inspection. This means that we do not take up carpets, floor coverings or floorboards, move furniture or remove the contents of cupboards. Also, we do not remove secured panels or undo electrical fittings. We inspect roofs, chimneys and other surfaces on the outside of the building from ground level. We inspect the roof structure from inside the roof space if there is safe access (although we do not move or lift insulation material, stored goods or other contents). We examine floor surfaces and under-floor spaces so far as there is safe access to these (although we do not move or lift furniture, floor coverings or other contents). We are not able to assess the condition of the inside of any chimney, boiler or other flues.

- We note in our report if we are not able to check any parts of the property that the inspection would normally cover. If we are concerned about these parts, the report will tell you about any further investigations that are needed. We do not report on the cost of any work to put right defects or make recommendations on how repairs should be carried out.

- Services are generally hidden within the construction of the property. This means that only the visible parts of the available services can be inspected, and the assessor does not carry out specialist tests. The visual inspection cannot assess the efficiency or safety of electrical, gas or other energy sources; plumbing, heating or drainage installations (or whether they meet current regulations); or the inside condition of any chimney, boiler or other flue.

- The assessor produces a report of the inspection for you to use but cannot accept any liability if it is used by anyone else. If you decide not to act on the information in the report, you do this at your own risk. The report provides you with an objective assessment on the general condition of the main elements of a property.