

NOTES ON RETROFITTING HOMES TO IMPROVE ENERGY EFFICIENCY

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1. INTRODUCTION

Energy used to heat our homes represents a significant and increasing expense. It also constitutes a significant part of our greenhouse gas emissions in the UK – with 19% coming from heating homes and workplaces (Source: Ref 1 at end of this document).

In order to meet the governments net zero commitments by 2050 - over 27 million existing dwellings in the UK will need to be fitted with **Energy Efficiency Measures** (EEMs).

2. BACKGROUND

The UK government commissioned a report on the effectiveness of home energy efficiency measures in 2015 called the '**Each Home Counts (EHC) Review**'. The report was critical of the effectiveness of the individual measures approach to improving energy efficiency. Installing individual measures often did not result in the intended benefit.

Recommendations from the EHC Review were used to form the current standard for retrofitting dwellings in the UK - the **PAS2035** (PAS means Publicly Available Specification) standard was published in 2019. This is used in conjunction with installers guidelines - the **PAS2030** standard.

The standard is designed to **assess the whole house**, then identify appropriate energy efficiency measure and their potential costs, benefits and risks. A plan is then devised as to the order and number of retrofit measures in discussion with the dwelling owner or occupier. Also, the effectiveness of the measures is assessed to make sure they are in line with the predicted benefit.

3. GENERAL PRINCIPLES OF RETROFITTING

The energy that is needed to heat a building depends on the structure of the building, how well insulated it is and its airtightness. The best approach to improving energy efficiency is to address the **adequacy of insulation of the building first**, including any uncontrolled or unplanned leakage of air from the building, whilst **maintaining adequate ventilation**.

Any changes to a building need to be carefully designed to avoid risks of trapping excessive moisture in the building, which can lead to problems such as condensation and mould. When attempting to improve insulation to a high degree - **thermal bridging** becomes important. Thermal bridging is where heat can inadvertently leak out of the building, typically at the junctions between building structures (e.g. wall, floor, ceiling edges) and any other structures that breach the building envelope (e.g. pipework for services).

Careful design and attention to detail in applying insulation measures is required to minimise thermal bridging. It is also important to assess the condition of the building. For instance, if there is a leaking roof, this can lead to damp in the roof structures that **can reduce building performance**. Loft insulation relies on air trapped in the insulation material for its insulating properties. Damp or compressed insulation will be significantly less effective.

After addressing the fabric of the building, **other measures**, such as low carbon heating and generation of energy, can then be considered.

4. ENERGY EFFICIENCY MEASURES (EEMs)

A great deal of information on EEMs is available on line. The **Energy Savings Trust** and the **Simple Energy Advice** websites are a good place to start (see 'Useful Weblinks' at end).

It should be noted that sections regarding available funding can be out of date, as this is a fast-changing area of government policy. It is recognised that the UK government will need to greatly improve the support for energy efficiency measures, if their plans for **Net Zero by 2050** are to be credible.

List of Some Common Energy Efficiency Measures:

- Loft insulation
- Cavity Wall Insulation
- Solid Wall Insulation - Internal Wall Insulation (IWI), External Wall Insulation (EWI)
- Underfloor Insulation
- Draught proofing

- Heating Controls - eg smart controls
- Heat Pumps - Air Source Heat Pumps (ASHP) and Ground Source Heat Pumps (GSHP)
- Solar Thermal Hot water panels
- Solar Photovoltaic (PV) Panels

- Mechanical Heat Recovery Ventilation
- Windows - Double and triple glazing
- Energy efficient doors
- Insulating pipes, tanks and radiators
- LED lighting
- Efficient electrical appliances
- Smart Meters

Passiv Haus Standard For Retrofitting Buildings:

Passiv Haus is a European standard for designing and building low carbon buildings. For existing buildings there is a related **EnerPHit retrofit standard** for improving energy efficiency.

This involves an assessment and modelling with a software package (**PHPP Passiv Haus Planning Package**). A stepwise plan can then be developed to complete the retrofit measures in the best order. This can be over an extended number of years and the dwelling owner can stop at any stage - depending on circumstances, including financing. Further information can be obtained from the **Passivhaus Trust UK website** (see 'Useful Weblinks' below).

Currently the UK government has **not referenced this standard** in its guidelines, nor for eligibility for funding.

PAS2035 for Retrofitting:

The PAS2035 process is designed to assess the building and develop a **plan to improve energy efficiency in the best order** to avoid any inadvertent problems. The plan should identify the costs and estimate the probable benefits of measures being considered and identify any potential risks.

PAS2035 sets out a government backed procedure for assessing dwellings, formulating a **whole house approach plan for retrofitting**, as well as measures to project manage the installation of measures and verify the success of the plan after completion. There are several professional roles identified.

An accredited **Retrofit Assessor** will produce reports on the dwelling based on current energy bills, occupancy and energy use patterns and an assessment of the building layout and structure. Parts of the reports are **very similar to the Energy performance Certificate (EPC)** using procedures known as the **Standard Assessment Procedure (SAP)** for new buildings or **Reduced SAP RdSAP)** for existing buildings. Note, there is some debate about the adequacy of RdSAP as a process to reach as close to net zero carbon emissions as possible. Its calculations are based on a **non-invasive assessment** and it relies on some **assumptions**, some of which may not be accurate.

Currently RdSAP mainly reports on the **potential money savings**. It does not tend to recommend measures based on carbon savings and it is debatable whether its approach to ventilation issues is optimally assessed. For instance, Air Source Heat Pumps typically don't currently save much money (and can be more costly unless well designed), but can save a lot of carbon emissions if the electricity used to power them is largely from renewables. Another issue is that the estimates of money saving are based on **current utility prices**. In an era where we are transitioning away from fossil fuels and the price of these is likely to increase and be more volatile, estimates based on current prices will underestimate the benefits of taking energy efficiency measures.

An accredited **Retrofit Coordinator** will produce the reports and discuss an ongoing retrofit plan. The Retrofit coordinator is responsible for project managing the process.

In addition, there is a **Retrofit Designer** role. This can be performed by various professionals depending on the energy efficiency measures to be taken. Architects, heating and plumbing specialists and ventilation specialists can all take on this role for different measures - if appropriately qualified. They may also be qualified to perform the **Retrofit Installer** role for one or more of the planned Energy Efficiency Measures.

It is intended that **grants for energy efficiency measures** will require the PAS2035 process to be followed. This has been stipulated for the **ECO3 (Energy Company Obligation)** scheme that finishes in March 2022 and its successor, the **ECO4** scheme, which is anticipated to take over from the old scheme in April 2022.

Accredited Retrofit Assessors, Retrofit Coordinators and qualified Installers of individual energy efficiency measures, in a local area, can be found using the government's **Trustmark website** (<https://www.trustmark.org.uk>). You can search by profession and location.

Details of the **MCS (Microgeneration Certification Scheme)** for accredited installers of some individual measures (eg Solar PV or Thermal, Heat Pumps, Biomass, Wind Turbines, etc) can be found at: <http://MCSaccredited.com>

A useful overview of how PAS2035 works can be found in this 30-minute video. It was produced by a local company **Elmhurst Energy** - who operate a UK wide accreditation scheme for energy assessors and are based in **Lutterworth**: https://www.youtube.com/watch?v=9MTLSfl_3r8

Elmhurst provide training, certification and registration and SAP/RdSAP software for **Domestic Energy Assessors** producing EPCs and PAS2035 training/accreditation. Note: They do **not** provide energy or retrofit assessments for home owners themselves.

5. RENTED PROPERTIES

The government planned to require rented properties to be upgraded to **at least EPC Band C by 2025** - although the details are yet to be finalised. There is debate as to whether this will apply just to new rents. There may be exemptions available if costs to upgrade a property would be excessive. Landlords are advised to look into the details of these proposals and make upgrade plans as early as possible.

6. FUNDING FOR RETROFIT MEASURES

****WARNING**** - WE CANNOT GUARANTEE THAT THIS SECTION IS COMPLETE, ACCURATE OR UP TO DATE. THE SITUATION REGARDING FUNDING MAY CHANGE RAPIDLY AS THIS IS AN AREA THE UK GOVERNMENT NEEDS TO ADDRESS IF NET ZERO IS TO BE REACHED BY 2050.

Some funding for energy efficiency measures is available for dwelling owners, businesses, landlords and tenants. There are a fair number of schemes that have been funded and then withdrawn. It is a fast-changing area of government policy. New schemes and funding are anticipated, so it is useful to check the current eligibility and when schemes are starting and ending. It can be frustrating that **not all websites have kept pace with all the changes**.

Some schemes have a limited funding allocated, so once this is allocated, further applications are stopped. New funding may be allocated periodically, so the situation can be quite fluid. **Some funding is available via local councils, it is worthwhile checking their websites or helplines.**

7. LIST OF SOME FUNDING SCHEMES

OLD DISCONTINUED SCHEMES:

Feed in Tariff (FIT) - A scheme that obliges energy companies to pay a tariff for low carbon energy generation by households, including solar photovoltaic (PV) panels.

Green Deal - *Withdrawn*.

Green Homes Grants - Voucher scheme covering up to two thirds the cost of measures such as insulation, heat pumps, solar thermal, biomass boiler - *Discontinued*, but may re-emerge in some form in the future.

CURRENT SCHEMES:

ECO3 and ECO4 - Energy Company Obligation. Medium and large energy supply companies are obliged to provide funding for energy efficiency measures, usually for households on benefits. Each company decides what help is available and the eligibility. What is available from each individual energy company is shown on their websites. Some suppliers, but not all, will only provide funding for their own customers. The ECO3 scheme ends in March 2022. ECO4 will replace ECO3 and starts in April 2022. Typical measures can be loft, cavity wall or floor insulation, upgrading or replacing boilers.

Boiler Upgrade Scheme (BUS) also known as the **Clean Heat Grant** - a scheme to replace old or failed heating systems with low carbon heating systems. Grants are available for up to £5000 for Air Source Heat Pumps and £6000 for Ground Source Heat Pumps. Funding is for a limited number of installations, so when this initial funding is exhausted, further applications may close, unless the government releases more funding.

Smart Export Guarantee - Replaces the Feed in Tariff (FIT) for solar panels and other low carbon electricity generation. Obliges energy companies to provide a tariff for energy exported to the electricity grid. **Not available for those already receiving the FIT.**

Renewable Heat Incentive (RHI) - funding for a variety of measures including insulation, heat pumps, solar thermal, biomass boiler, double glazing, energy efficient doors, thermostats, heating controls - **closing in March 2022**

Social Housing Decarbonisation Fund - funds for energy efficiency measures for social housing (either private or local authority providers). Funding will be released in waves.

ECO Local Authority Delivery Scheme (LADS) - Funding for energy efficiency measures decided by local authorities. Usually for EPC band E, F and G dwellings for those with household income less than £30,000 a year.

ECO LA FLeX (Flexibility Eligibility) - An extension of the ECO scheme where Local Authorities can extend the eligibility criteria for vulnerable or low-income groups.

Home Upgrade Grant (HUG) - grants for insulation for those living in EPC band E to G properties (sometimes band D) with household income less than £30,000 per year.

Leicestershire Warm Homes Fund - help to install central heating

8. OTHER Grants/Payments to help with energy bills:

Warm Homes Discount - £140 payment for those on eligible benefits

Cold weather payment - available if weather is very cold

Winter Fuel Payments - for those older than 65 years old - typically £100-300

Websites for funding (see 'Useful Weblinks' at end of this document):

Energy Savings Trust

Leicestershire County Council - A to Z - Grants

First Contact Plus - access for Leicestershire County Council Services/grants/advice - also has a helpline.

9. NEW DEVELOPMENTS IN RETROFIT

Energiesprong (Energy Leap) are a Dutch company who specialise in a **modular approach** to retrofitting houses. This includes off-site prefabricated panels which include insulation for walls and both insulation and PV panels for roofs. They also replace heating systems with low carbon prefabricated heating pods and provide energy efficient ventilation.

This modular approach reduces costs and makes it possible to effectively provide a well-insulated envelope for the dwellings with minimal thermal bridges and good airtightness. Costs are roughly £30-40K per dwelling, which is expected to be recouped over 30-40 years through reduced energy bills. Successful schemes have been completed for **social housing in Nottingham**, but it is intended that this will be available for individual house owners at some stage.

Retrofitworks - This is a not-for-profit cooperative that provides low-cost services in coordinating retrofit projects for those able to pay. It aims to provide a streamlined service for the customer, throughout the process of assessment, planning, delivering and verifying retrofit projects. It builds up a **network of trusted professionals** to deliver projects in areas that it operates, including retrofit assessors, coordinators and installers of energy efficiency measures. It works with a variety of partners, such as local community groups and local authorities. It currently operates in about 10 local geographical areas, but aims to launch a National Retrofit service in 2022.

10. GLOSSARY, USEFUL LINKS AND ORGANISATIONS

DEA - Domestic Energy Assessor. This is a professional role for assessing a building energy efficiency and producing an EPC.

ECO3 and ECO4 - (Energy Company Obligation) grant schemes for energy efficiency measures funded by medium and large energy companies, who are obliged to provide these grants by the government, for qualifying individuals. ECO3 ends in March 2022 and ECO4 starts in April 2022.

EPC - Energy Performance Certificate. A legal requirement for properties that are bought, sold or rented out. It gives an energy rating band from A to G (A is most energy efficient), likely energy costs and suggestions for energy efficiency measures with estimates of cost and savings.

Energy Savings Trust - a profit for purpose organisation where it has no share holders and profits are re-invested into the trust. It aims to provide impartial and free information on energy efficiency. Website: <https://energysavingtrust.org.uk>

Microgeneration Certification Scheme (MCS) - <https://mcscertified.com>

A certification scheme for installers of low carbon technologies. Some government grants require installation by an MCS accredited installer.

PAS2035 - Retrofitting Dwellings for Improved Energy Efficiency - Specification and Guidance. PAS stands for Publicly Available Specification. PAS2035 was published by the British Standards Institution in 2019. It is the government's intended standard for retrofitting properties in the UK.

PAS2030 - Specification and Guidance for Installers of Energy Efficiency Measures (EEM) when retrofitting buildings. This guidance is to be used by installers when retrofitting dwellings to PAS2035 standards.

11. USEFUL WEBLINKS

Simple Energy Advice website – a UK government endorsed advice on energy efficiency and grants developed in conjunction with the government's Department of Business, Energy and Industrial Strategy (BEIS): <https://www.simpleenergyadvice.org.uk>

Trustmark - a government endorsed Quality Scheme endorsing qualified traders performing work on dwellings. Some grants are required to use Trustmark registered tradespersons: <https://www.trustmark.org.uk>

Passiv Haus Trust UK: <https://www.passivhaustrust.org.uk>

Ofgem has a useful page on **Environmental and Social Schemes:** <https://www.ofgem.gov.uk>

Leicestershire County Council website has local information on energy efficiency grants - <https://www.leicestershire.gov.uk/leisure-and-community/community-schemes-and-funding>

First Contact Plus in a website tool that helps people find local authority services in Leicestershire. It has useful information on grants under 'Your Home' section then clicking on 'Warm Homes'. It also runs a helpline on: 0116 305 4286 plus their website: <https://firstcontactplus.org.uk>

12. REFERENCES

Ref 1. **Reducing UK Emissions – 2018:** Progress Report to Parliament, Committee on Climate Change, June 2018.