Information Guide

New and Existing Homes – a Sustainable Approach.

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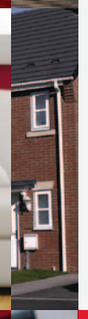

Guide to new and existing homes – a sustainable approach

This is an independent guide produced by Mitsubishi Electric to enhance the knowledge of its customers and provide a view of the key issues facing our industry today. The Guide accompanies a series of seminars, all of which are CPD accredited.

The Government is aiming for a 60% reduction in carbon emissions created by UK households by 2050. However, the vast majority of our existing dwellings will still be in use in 2050. The management of energy usage in existing homes, then, is a key challenge.

In the same way, the costs of energy are continually increasing, leaving a growing number of families facing fuel poverty. To counter this, the Government has launched a number of initiatives to reduce energy usage in our homes and to make them more sustainable.

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1. New and existing homes – a sustainable approach

One third of all UK carbon emissions is the result of our domestic building stock. The Energy Saving Trust (EST) calculates that every household in the UK creates around 5.5 tonnes of carbon every year. Government has therefore targeted the UK's homes for a wide range of legislation and incentives geared to reducing energy use and carbon emissions. The official target is a 60% reduction in CO_2 emissions by 2050.

This challenge would be difficult enough if we simply had to build sustainable and energy efficient new homes. However, the vast majority of our existing dwellings will still be in use in 2050. According to figures from the Building Research Establishment (BRE), at current rates of demolition and new-build it would take over one thousand years to replace the existing domestic building stock.

Another challenge for Government and householders is that domestic energy prices are rising continually. The EST states that the average fuel spend is around £1200 per year, but a growing number of households face fuel poverty – where more than 10% of the family income is spent on fuel bills. This is something that the Government wants to tackle as well as reducing emissions.

Insulating existing homes has been an important step in helping to reduce energy use and CO_2 emissions which has been a key Government campaign.

Insulation can reduce the requirement for space heating. In an uninsulated house more than half the heat is lost through the walls and the roof. Insulation also helps to prevent condensation on walls and ceilings and create a more even indoor temperature year-round.

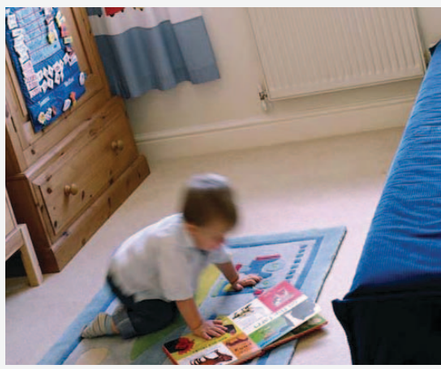
There are a number of areas of legislation and also voluntary codes and schemes that exist to guide the development of sustainable homes that both cut carbon emissions and also reduce energy use. There have also been changes in some parts of the law, such as Planning Regulations, to make it easier to install new low-carbon technologies for domestic properties.

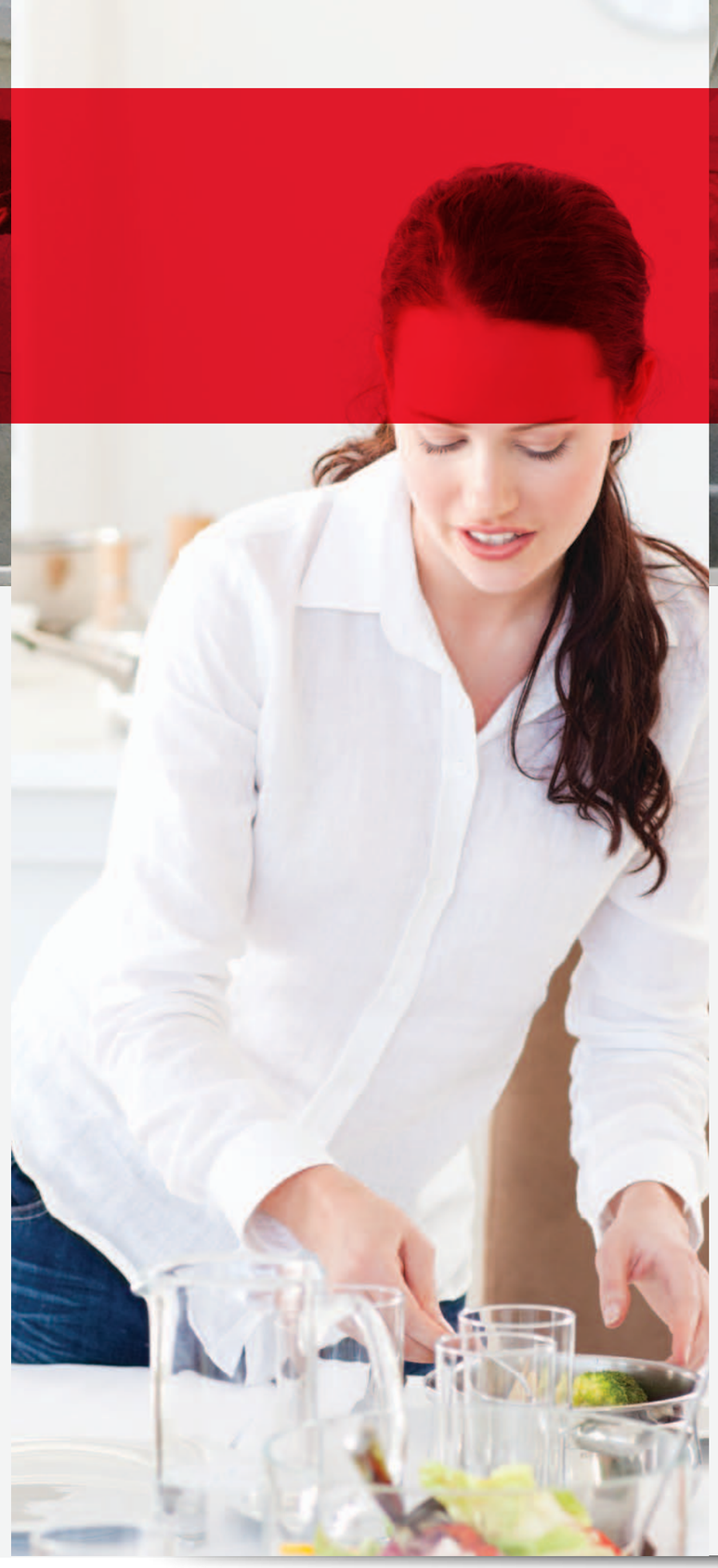
Part L of the Building Regulations

Part L deals with the conservation of fuel and power in new and existing buildings. In 2010 a new version of Part L was introduced which saw some important changes from the 2000 version.

For new homes, CO_2 emissions have to be calculated at the design stage and handed over to the Building Control Body. A list of specifications for the new dwelling also has to be given to Building Control before the start of building work. A further CO_2 emission rate calculation also has to be submitted after completion of the building work.

This annual CO_2 emission rate for dwellings is calculated using a system called SAP. According to SAP rules, the emission rate, "must not exceed the target set by reference to a notional dwelling with an additional overall improvement of 25% on 2006 standards".





Part L also applies to existing dwellings when certain types of extension are added to a house. There is an exemption for conservatories or porches which are at ground level and where the floor area is less than 30m^2. They are also exempt from Part L 1B 2010 where the existing walls, doors and windows of the dwelling which separates the conservatory are retained – or, if removed, are replaced by walls, doors and windows which meet energy efficiency requirements. The conservatory or porch is also exempt where the heating system of the dwelling is not extended into it.

Where the conservatory or porch is not exempt, then there are certain rules that must be followed:

1. There must me effective thermal separation between the heated area in the existing dwelling and the extension. This means that the walls, doors and windows between the dwelling and the extension must be insulated and draught-proofed to at least the same extent as the existing dwelling.
2. There must be independent temperature and on/off controls to any heating system in the extension.
3. Glazed elements must meet Part L requirements.
4. If thermal separation between the conservatory and dwelling are removed (and not replaced) then this constitutes a change to the building's energy status. This means that the conservatory or porch is treated as an 'extension' and must meet the standards for fabric, windows, doors and other parts set out in Part L 1B (paragraphs 4.1 to 4.7). The same rule applies if the dwelling's heating system is extended into the porch or conservatory.

In both cases, the impact on carbon emissions from that extension to the home has to be calculated and shown to Building Control.[1]

Code for Sustainable Homes

The Code for Sustainable Homes (CSH) was introduced in 2007. The code sets a national standard for the design and construction of new homes. In the social housing sector, the Code is compulsory – all new social housing has to be built to a minimum of Code Level 3.

The Code sets higher standards than Part L of the Building Regulations, so houses built to Code 3 are more energy efficient than those constructed to Part L regulations. The Code remains voluntary for private housebuilders.

EcoHomes and BREEAM Refurbishment

The EcoHomes scheme was introduced in 2000, and formed the basis of the development of the CSH. Although EcoHomes is no longer applied in England, Wales or Northern Ireland it does continue to be used in Scotland.

EcoHomes can be used for major refurbishments such as conversions. However, it will be superseded by the BREEAM Domestic Refurbishment scheme which was piloted in 2011 and launched in 2012.

BREEAM Domestic Refurbishment will provide a rating from Pass to Outstanding. It is designed to evaluate the 'environmental credentials' of individual refurbishment projects. The aim is for BREEAM Domestic Refurbishment-rated designs to be 'Green Deal-ready' and therefore able to qualify for the incentives offered.

Permitted Development

Some significant changes have been made to the Planning Regulations that give 'permitted development' status to a number of low-carbon technologies such as air source heat pumps and solar photovoltaic systems.

The outcome is that, on the basis of certain criteria, these renewable technologies do not have to go through the planning process. The objective is to make it far easier for householders to specify and install these energy-saving technologies for their homes.

1. For more details of exemptions and requirements or to download Part L documents, see www.planningportal.gov.uk

2. Encouraging the growth of green homes

Although legislation can go some way to driving the development of sustainable, low-carbon and energy efficient homes, it is not the whole story. As previously discussed, the vast majority of homes already exist, and persuading current householders to adopt energy efficient and low-carbon technologies is an important element of the Government's strategy.

Over the last five years there have been a number of incentive schemes offering reduced capital costs or longer-term financial incentives to encourage homeowners to enhance their homes with various technologies that can reduce their energy use or generate electricity on-site. There are now three major schemes either recently introduced or in the pipeline that are aimed at further supporting this move to 'greening' our domestic building stock: the Green Deal, the Renewable Heat Incentive and Feed-In Tariffs.

The Green Deal – The Energy Bill

The Energy Bill was introduced to Parliament in December 2010 and included a provision for the Green Deal. The Green Deal puts the emphasis very much on energy efficiency of buildings. It establishes a framework to allow private firms to offer consumers energy efficiency improvements to their homes with no capital cost expenditure. The money is repaid through a charge in instalments on the energy bill of that dwelling.

The intention is to have a list of approved technologies that is updated annually. The Department for Energy and Climate Change (DECC) states that: "The Green Deal has been designed to finance the installation of a broad range of energy efficiency measures, products and systems".

A number of proposed measures have already been outlined in the consultation document[1]. These measures are recognised as improving the energy performance of buildings and generating fuel savings. The box on this page shows those measures that are mentioned in the consultation document. (See box: overleaf on page 11 Proposed efficiency measures under the Green Deal).

The Government's aim is that the measures can be adopted as packages, optimising their energy-saving impact.

The amount of Green Deal finance available will depend on the total estimated fuel bill savings it can generate: this is the Green Deal's 'Golden Rule' principle.

From a householder point of view, the Green Deal will allow them to add energy-saving technologies to their homes at no up-front cost.
The payments for the technology will appear on utility bills, alongside the savings they are making in energy use.

Furthermore, if the consumer moves out of that property, the financial obligation does not move with them. Instead the next occupier will continue to pay through their energy bills. This means that only those enjoying the benefits of the technologies will pay for them.

There are a number of important points to note about the Green Deal system:

- Energy saving measures must be approved by an accredited person before they are undertaken
- The Golden Rule will apply – expected financial savings must be equal to or greater than the cost attached to the energy bill

In addition to the above points, Greg Barker MP, Minister of State for Energy and Climate Change has made it clear that any household wishing to apply for Green Deal support will have to ensure that the house is first made energy-efficient. This will include the installation of insulation where possible[2].

The first Green Deals are due to launch in Autumn of 2012.

1. For details on the DECC consultation http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx
2. Greg Barker MP, November 2011
3. For full details on RHPP and how to apply see www.energysavingtrust.org.uk

Renewable Heat Incentive scheme (RHI)

The RHI will be introduced in two phases. Phase One was originally set to launch in September 2011 although it has been delayed. This phase will offer long-term tariff support in the non-domestic sector. Industry, business and the public sector account for 38% of the UK's carbon emissions so Government aims to move this sector away from its reliance on carbon-emitting fuels. The Government objective is that by 2012 12% of the UK's heating is fuelled from renewable sources.

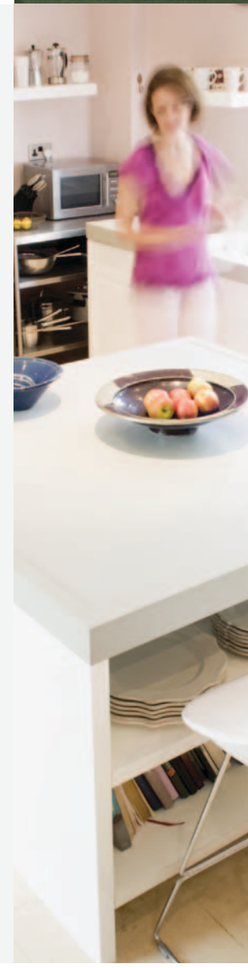
In Phase 1 a sum of £15 million was set aside for households to access through the Renewable Heat Premium Payment (RHPP). The RHPP is a one-year payment to cover part of the installation costs. It will be particularly aimed at those who are off the gas grid and therefore reliant on expensive forms of fossil fuel heating. Table 1 below shows the type of payment that is being offered:

Technology	Voucher Value
Solar thermal hot water	£300
Air source heat pump	£850
Ground source or water source heat pump	£1250
Biomass boiler	£950

Figures from the Energy Savings Trust website December 2011

It should be noted that grants for solar thermal funding is available to all, but only those currently not able to access the gas grid are able to apply for grants for air, ground or water-source heat pumps. Before applying for a payment the dwelling must have loft insulation to 250mm and cavity wall insulation where practical.[3]

The Second Phase is being timed to align with the Green Deal so it is set for launch in Autumn 2012. This phase will see further support for the domestic sector in the form of regular incentive payments. The RHI will be administered by Ofgem E-Serve.



Proposed efficiency measures under the Green Deal

At the current consultation phase, the Government has stated its intention that the list of approved measures will be the same for domestic and non-domestic buildings. In practice, some measures will only be appropriate for one type of building. Government is asking for comments on this approach during the consultation, so this policy may change on the launch of the Green Deal.

Feed-in Tarrifs (FiTs)

The Feed-in Tariff was introduced in April 2010 with a view to encouraging householders to install photovoltaic systems. The scheme pays homeowners with PV systems for the electricity they generate and use in their homes, as well as offering bonus payments for power exported back to the grid. There is the extra incentive of reduced electricity bills for the householders.

FiTs offer an ongoing income to system owners, based on the output of the system. This additional income reduces payback times and creates opportunities for system owners to profit from the system.

In the UK, the FiT mandates payments to owners of PV systems from their electricity supplier. There are two components to the payment; the generation tariff, paid on the total generated and the export tariff, paid on the amount of unused electricity that is exported to the grid.

The FiT offers different rates according to the size of the system. Information on the current tariff rates can be found on the DECC website at www.decc.gov.uk.

It can be seen from these schemes and legislation that there is a clear strategy to move the UK's existing and new housing stock away from a reliance on fossil fuels.

Householders and local authorities in charge of social housing will have a number of key choices to make if they decide to take up the opportunities offered.

The rule for the Green Deal is that the financial savings from measures taken must be equal to or greater than the cost attached to the energy bill is important. It emphasises the importance of identifying and applying technologies that are cost effective as well as environmentally sound. Our next feature will consider two of these options.

Measures Specified as Energy Efficiency Improvements

1. Air source heat pumps
2. Biomass boilers
3. Biomass room heaters with radiators
4. Ground source heat pumps
5. Micro combined heat and power
6. Micro wind generation
7. Photovoltaics
8. Solar water heating

Qualifying Energy Improvements

For domestic retrofits, the Reduced Data Standard Assessment Procedure (RdSAP) assessment tool, used to produce EPCs for homes, already contains a list of measures which can improve the energy performance of buildings. This list has been used to create the list of qualifying Green Deal energy improvements.
Being modelled in RdSAP also means that the measures can be recommended by a Green Deal assessor.
It is intended that this list will be added to as new technologies become available.

1. Air source heat pumps
2. Biomass boilers
3. Biomass room heaters with radiators
4. Cavity wall insulation
5. High efficiency gas-fired condensing boilers
6. Oil-fired condensing boilers
7. Cylinder thermostats
8. Draught proofing
9. Energy efficient glazing
10. External wall insulation
11. Fan-assisted replacement storage heaters
12. Flue gas heat recovery devices
13. Ground source heat pumps
14. Heating controls (for wet central heating systems and warm air systems)
15. High efficiency replacement warm air units
16. High thermal performance external doors
17. Hot water cylinder insulation
18. Internal wall insulation
19. Lighting systems, fittings and controls
20. Loft or rafter insulation
21. Mechanical ventilation with heat recovery
22. Micro combined heat and power
23. Micro wind generation
24. Photovoltaics
25. Roof insulation
26. Room in roof insulation
27. Solar water heating
28. Under-floor heating
29. Under-floor insulation
30. Waste water heat recovery devices attached to showers

3. Finding the right Solution

Space and water heating account for around 80% of energy use in our homes[1]. It makes sense to target these areas with technology that can provide low-energy heating.

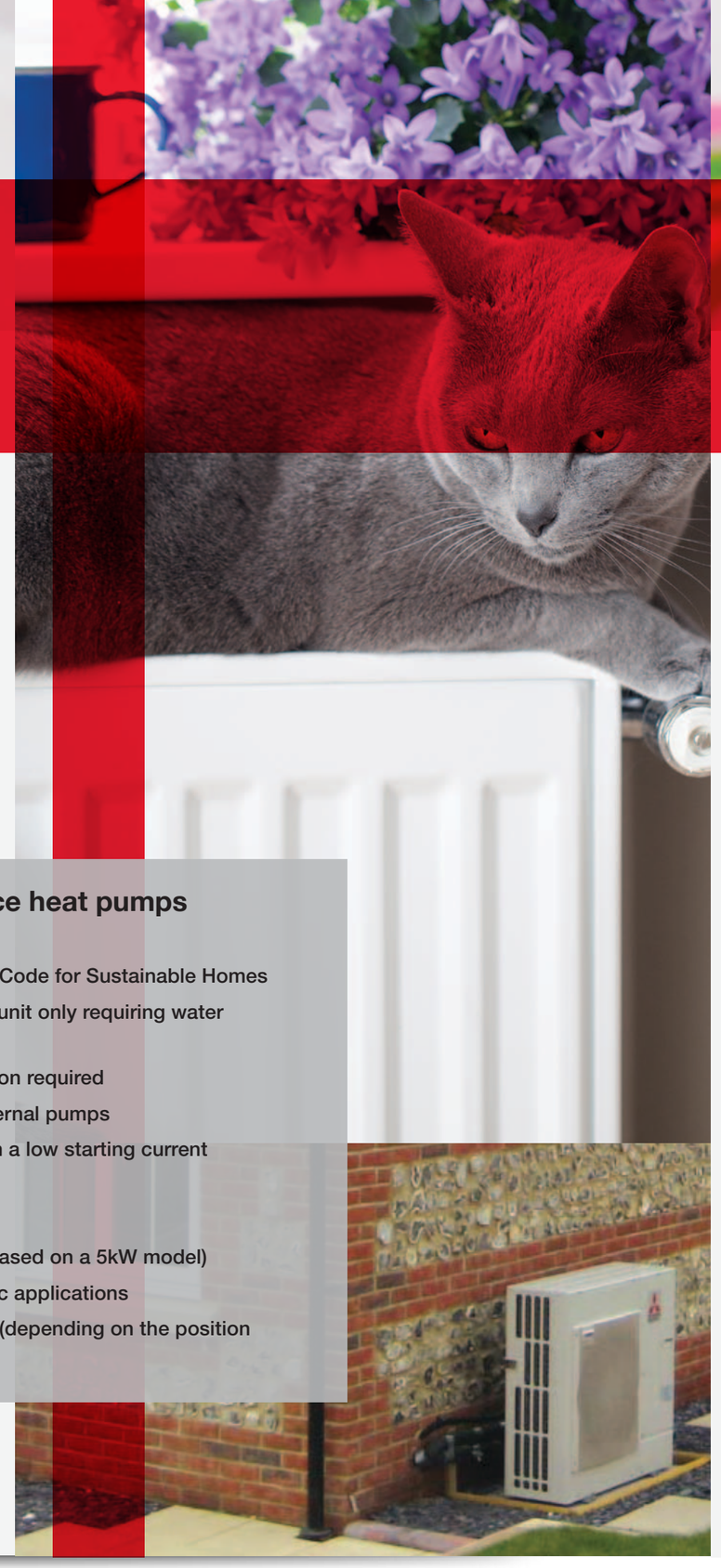
There can be no doubt that the priority for many existing homes is to increase their energy efficiency with the application of better insulation. There are 26.6 million homes in Great Britain[2]. Of these 23.3 million have lofts and 18.7 million have cavity walls. Figures show that just under 13 million homes have loft insulation of at least 125mm. Cavity wall insulation has been installed in 10.6 million homes. The Green Deal will be targeting these homes and there will be an emphasis on reducing the need for heating through better insulation before applying new technologies.

Once a home's insulation has been brought up to higher standards, it will be more practical to consider low-energy heating technologies. Air source heat pumps are already on the Government's list of Green Deal Measures under consideration, so it makes sense to view these as a viable option for the social and private housing sectors. Significantly, air source heat pumps operate on electricity, so they are very useful for homes that are off the gas grid – an area that the Government is keen to target for a reduction in reliance on expensive fossil fuels such as oil.

Under the Code for Sustainable Homes, application of a heat pump to the project can help to achieve Level 3 – compulsory for social housing.

The main advantage of heat pumps is that as well as offering significant reductions in CO_2 emissions compared to conventional gas boilers, they can also offer high efficiency levels and low energy costs for users.

1. Figures from DECC Energy Trends (September 2008) www.dec.gov.uk
2. Figures from DECC statistical release on estimates of home insulation levels in Great Britain (January 2011) www.decc.gov.uk



Taking the example of Mitsubishi Electric's Ecodan heat pump, every 1kW of electricity fed into the heat pump (i.e. the outdoor unit) could produce at least 3kW of heating energy. The overall system efficiency and energy savings will depend on the comparison with the existing heating system, as well as good design, installation and operation.

The latest air source heat pumps use inverter driven compressors to modulate the system to match the exact capacity required along with weather compensation in central heating mode – thereby achieving very high efficiency levels.

One of the most important characteristics of heat pump systems is that they can be controlled easily by domestic users. With controls that are very similar to those on gas-fired central heat systems, users can control the heating and hot water production in a way that is already familiar to them. This is a crucial factor for new technologies – usability makes it more likely that they will be readily adopted in the domestic setting.

Changes to regulations also mean that air source heat pumps fall under the Permitted Development rules. It should be noted that this only applies in England and Scotland (in Wales and Northern Ireland they currently require planning permission).

From December 2011, a domestic air source heat pump was classed as a Permitted Development provided they comply with certain rules such as:

- The external unit is less than 0.6m^3 in size
- It is used only for heating
- The unit is more than one metre from the edge of the householders property
- It is not on a pitched roof or near the edge of a flat roof
- It meets additional criteria if in a conservation area or World Heritage Site

There are other criteria regarding the use of air source heat pumps in apartment blocks, and these can be checked on the planning website.

Photovoltaic systems are another technology that can be considered.

Both the Green Deal and FiTs schemes are supporting greater adoption of these systems that enable householders to generate on-site electricity for use in their own homes, and for export back to the grid.

The FiTs will still guarantee an income from the system, and also offer an 'export' tariff of 3.1p for electricity put back into the grid. There is also the added benefit of reduced electricity bills – a significant factor when domestic energy bills are set to rise for the foreseeable future.

The benefits of air source heat pumps

- **Reductions in CO_2 emissions**
- **Helps to achieve Level 3 of the Code for Sustainable Homes**
- **Easy to install – self-contained unit only requiring water and electric connections**
- **No gas supply, flues or ventilation required**
- **No need for groundwork or external pumps**
- **Single phase power supply with a low starting current**
- **Low running costs**
- **Low maintenance**
- **Low noise: 45dBA at 1 metre (based on a 5kW model)**
- **VAT reduced to 5% for domestic applications**
- **Minimal planning requirements (depending on the position of the outdoor unit)**

Further information

If you missed the CPD seminar on **New and Existing Homes – a Sustainable Approach** you can call your Mitsubishi Electric Regional sales office to arrange an in-house presentation of this information.

If you would like to receive invitations to future CPD events, please email **lesmarcomms@meuk.mee.com**

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