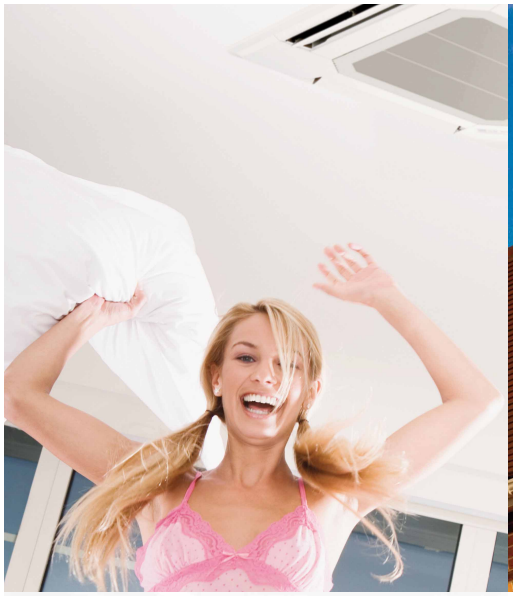
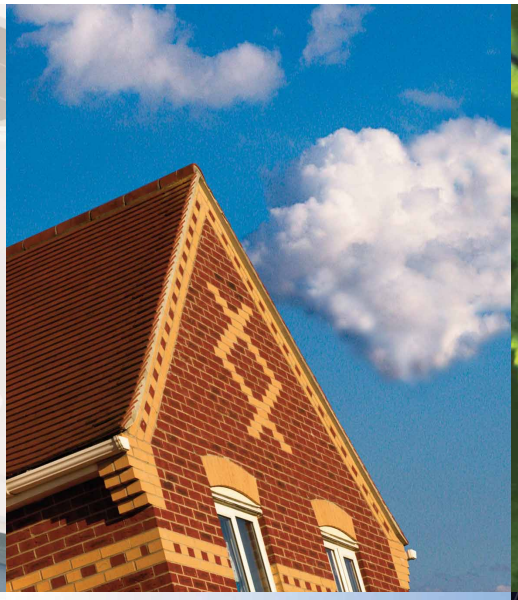


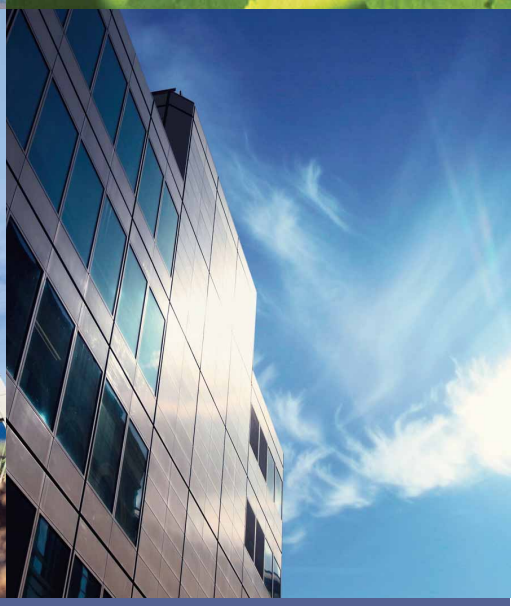

Information Guide:

Renewable legislation and grants:
heat pumps for sustainable buildings

Issue 25

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Information Guide:

Renewable legislation and grants: heat pumps for sustainable buildings

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 changing face of construction in the 21st Century demands that designers, specifiers and suppliers work as teams to create better buildings - or occupants and the environment.

Mitsubishi Electric aims to be a part of this by encouraging employees and customers to work together to increase their knowledge of the latest technology, legislation and markets.

Contents

Heat pump technology - simple and efficient

A heat pump is a device which moves heat from one area to another. This means that it is possible to move heat energy from a lower temperature environment (such as the ground or the air) to a higher temperature environment (for example, inside a building). In practice, this means that heat can be extracted from the ground or air and moved into a building, for example by attaching the heat pump to an underfloor heating system or fan coils.

Heat pumps work by circulating a refrigerant around a compression/expansion cycle. The technology inside a heat pump is therefore similar to that found in any domestic refrigerator using the vapour compression cycle.

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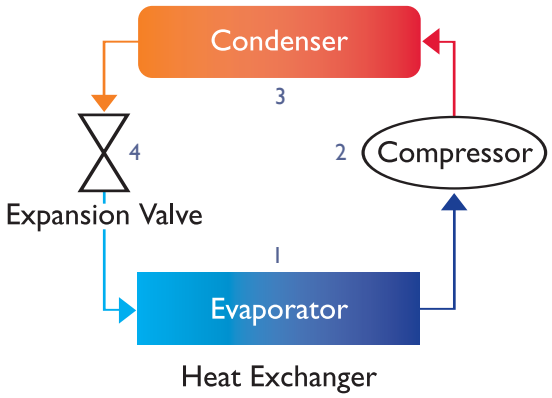


How a heat pump works

1. Refrigerant in the evaporator is colder than the heat source. This causes the heat to move from the heat source (in this case the outside air) to the refrigerant which then evaporates.
2. This vapour moves to the compressor and reaches a higher temperature and pressure.
3. The hot vapour now enters the condenser and rejects heat as it condenses.
4. The refrigerant then moves to the expansion valve; drops in temperature and pressure; and then returns to the evaporator.

The diagram above shows how a heat pump system uses 'free' energy to create heat for space and water heating. The 'heat source' is usually either the external air, the ground or nearby water supply. These give the names to air source, ground source or water source heat pump systems. The final destination for the heat extracted from the source is also used to describe a heat pump. Air to air systems for example extract heat from ambient air and introduce this heat to an occupied space via fan coils. Air to water systems extract heat from ambient air and heat water for direct use or for space heating via suitable heat emitters.

Ground source heat pumps (GSHP) are connected to a pipe buried horizontally or vertically in the earth. A GSHP relies on the fact that at a certain depth the temperature of the earth remains at a steady 12°C to 14°C, whatever the ambient air temperature above ground. Where there is nearby water, this can be used as the heat source since, like the earth, water remains at a steady temperature at certain depths. The water can be in the form of a nearby river or canal, or below ground in an aquifer.

Air source heat pumps (ASHP) use the heat energy from the outside air. They don't require 'warmth', and can operate at temperatures as low as -20°C. The choice of heat source will depend on local conditions and building requirements. All are energy efficient, though ground source is generally considered the most energy efficient because it offers steadier heat source temperatures than air. However, ASHPs have the advantage that they do not require the drilling of boreholes, and can therefore be used more easily in retrofitting projects.

A heat pump is at its most efficient when the difference between the heat source and the required heat delivery temperature is minimised. Domestic heat pumps therefore offer the best efficiencies when linked to a low-temperature heating system such as underfloor heating or suitably sized radiators (an air-to-water heat pump).

The main advantage of heat pumps is that as well as offering 30% to 50% reductions in CO_2 emissions compared to conventional gas boilers, they also offer high efficiency levels and lower energy costs for users. With conventional boilers, 1kW of input energy provides less than 1kW of output energy or heat. By contrast, on average an ASHP converts 1kW of input energy to 3.6kW of output energy or heat. The latest ASHP's also use inverter driven compressors to modulate the system to match the exact capacity required - thereby achieving very high efficiency levels.

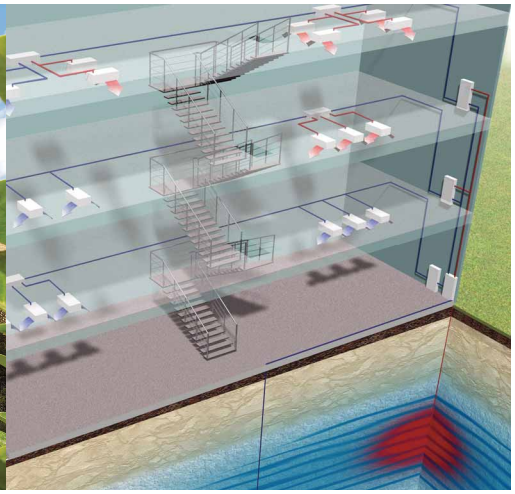
Heat pumps have been accepted as a highly energy efficient technology, and grants for GSHPs and ASHPs have been available for some time through the Low Carbon Buildings Programme. However because they do require a power input to operate, there has been some question over whether heat pumps should be considered 'renewables'.

Lobbying by groups such as the Heat Pump Association to have all types of heat pump accepted as 'renewable', appears to be paying off, as two new European Directives will shortly recognise heat pumps using any heat source as 'renewable'. While this will not make any difference to the efficiency of the technology, which is the key reason for its rapid market growth, this new status is likely to encourage even more use of heat pumps across a wider range of new and existing buildings. It will also help to ensure that grants continue to be available for heat pumps through new Government programmes to support the renewable energy and heating sector.

Heat pumps - recognised as renewables

Because of their highly energy-efficient operation, heat pumps offer a useful choice for designers looking to meet heating or cooling needs in today's domestic and commercial buildings. Many European countries such as Germany and France have used heat pump technology extensively in commercial and domestic applications for some time. The UK is slightly behind on this trend, but certainly seems to be waking up to their energy-saving potential.

Government has helped to encourage use of energy efficient technologies including GSHPs and ASHPs, through grants delivered via its Low Carbon Buildings Programme (LCBP). Grants are available at domestic and commercial levels, although the LCBP fund does tend to run out quickly for more popular technologies.



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Anyone who wants to access a grant, for example for installation of an ASHP, must ensure that they appoint an installer who is registered with the Microgeneration Certification Scheme (MCS). The LCBP website includes a list of what funds are available for the various technologies and accredited installers. ASHPs from certain manufacturers are also eligible for tax relief through the Enhanced Capital Allowances (ECA) scheme for energy efficient products.

The Low Carbon Buildings Programme has recently been extended to June 2010 (which means applications for grants must be received by this time; projects do not have to be completed by that date). Government has not yet indicated what will happen once this 2010 deadline is reached, and the LCBP comes to an end. It may be that the scheme is extended again (it has already gone beyond its planned lifespan of three years).

However, it seems likely that the LCBP will be replaced by another mechanism for delivering financial incentives to householders and businesses to encourage take-up of renewables and microgeneration.

New responses to renewables targets - heat pumps as renewables

One of the main reasons to introduce a new grant delivery programme in the UK is that new higher targets for use of renewables are being set at the European level. New EU rules are also changing what technologies are considered 'renewable'. One of the main mechanisms for increasing renewable energy sources in Europe will be the European Directive on Promotion of Renewable Energy Sources (RES). This new Directive was ratified by the European Council and Parliament in March 2009, as part of a climate-energy legislative package.

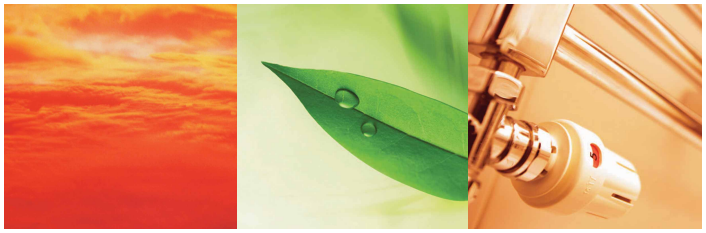
The RES Directive sets mandatory national targets for renewables - aiming for 20% of all EU energy to be sourced from renewables by 2020. Each EU member state has its own national target as part of this overall objective, and the UK's is 15%. The Directive also requires EU member countries to encourage use of building integrated renewables and larger scale technology such as district heating. The RES Directive also specifies what technologies are considered 'renewable'. It is highly significant that both air and water sourced heat pump systems are now viewed as 'renewable', along with GSHPs.

The text of the RES Directive explains how the renewable element of heat pumps should be calculated by building designers: "Heat pumps enabling the use of aerothermal, geothermal or hydrothermal heat at useful temperature need electricity (or other auxiliary energy) to function.

The energy used to drive heat pumps should therefore be deducted from the total usable heat. Only heat pumps with an output that significantly exceeds the primary energy needed to drive it should be taken into account."

The acceptance of heat pumps as renewable puts them on a more equal footing with solar panels and wind turbines in the eyes of the EU. The Directive includes all forms of heat pump technology because it recognises that they will be vital in helping EU member states reach their targets for increasing their use of renewable energy sources.

The RES Directive requires all EU member states to provide a national renewable energy action plan by June 2010. Every country will have to set out its national targets for the share of energy from renewable sources consumed in transport, electricity, heating and cooling in 2020 - and how it plans to achieve these.

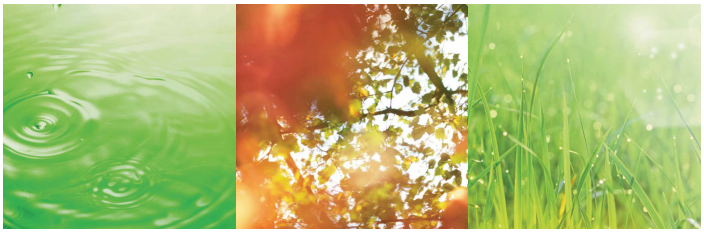


Incentives for efficient heating

In response to its own targets for reducing carbon, as well as new EU drivers to increase the share of energy sourced from renewables, the UK Government has been consulting on a proposed Heat and Energy Saving Strategy (HES) since February 2009.

The consultation period is due to end in early May 2009. The HES proposal sets out the UK Government's vision for 'decarbonising' the way we heat our homes and businesses. Its twin aims are to reduce the UK's CO_2 emissions, and to contribute to the overall EU 20% renewables target.





The Renewable Heat Incentive (RHI) looks set to become an important part of the overall UK Heat and Energy Saving Strategy. Heat generated from renewable sources in the UK currently accounts for only 0.6% of total heat demand. This may need to rise to 14% to reach the EU targets. The RHI would be a grant delivery scheme aimed at encouraging greater use of renewable technologies such as heat pumps.

Details of the RHI are currently (May 2009) in development, but the finalised scheme should be in place by April 2011. The key principles are that the financial incentives on offer will apply to domestic and commercial buildings, from household to community level. The proposal is that the scheme covers a wide range of technologies: ASHPs and GSHPs, biomass CHP, solar hot water and others. A levy on fossil fuel suppliers will provide the funds for the incentive payments.

As well as incentives the HES will also seek to encourage greater building energy efficiency, using some current mechanisms such as Energy Performance Certificates, and enforcing existing energy-related building regulations (e.g. Part L) through extra support for Building Control.

A new Energy Performance Directive

While the Renewable Energy Sources Directive looks to reduce the EU's reliance on fossil fuels, another new Directive is being lined up to enforce greater energy efficiency in buildings. The Energy Performance of Buildings Directive 2002 (EPBD) is familiar to anyone working on the design and construction of buildings. However the EPBD is set for a 'recast' - that means the Directive is currently being substantially re-written and will be introduced in its new form some time in 2010.

The re-cast EPBD contains many highly significant proposals, including a new rule that all new buildings have to be 'zero energy' by 2019. However, from the point of view of heat pumps in particular it is important to note that ASHPs look set to be recognised as 'renewables' in the new EPBD. The proposed text states: "heat pump means a machine, a device or installation that transfers heat from natural surroundings such as air, water or ground to buildings or industrial applications..." More specifically, the EPBD proposed text says that it will treat heat pumps in the same way as the Renewable Energy Sources Directive when making energy calculations.

Directives and grants - clearing up the confusion

It is never easy to offer clear guidance on what grants will be in place for particular low carbon or renewable technologies at any given time. New European Directives and UK legislation seem to be introduced at an ever-faster pace, and it can be difficult to keep abreast of what laws are in place, and what legislation is still in Consultation phase, or awaiting approval by the European Parliament.

However, as far as ASHPs are concerned, we can say that these are definitely covered by the existing Low Carbon Buildings Programme, and funding is available (May 2009) as long as the installation is carried out by accredited installers.

Looking to the future, beyond the end of the LCBP in 2010, it seems highly likely that grants for ASHPs will be available through a new scheme under the RHI to be introduced in April 2011. In April 2009 the Promotion of Renewable Energy Sources Directive was ratified in the EU, and clearly states that ASHPs should be regarded as renewable. The effects of the RES Directive will begin to be felt in the UK when the Government has to set its own action plan on renewables by June 2010. Also, the EPBD is set to be 're-cast' at the end of 2010 and the current text of the proposed document also treats ASHPs as renewables.

Heat pumps which are available from reputable manufacturers with a long-standing reputation in the UK marketplace are also much more likely to be viewed by Government as a reliable technology for delivering low-carbon, energy efficient heating into more UK homes. While heat pumps cannot meet all the targets for renewable energy or energy efficiency, they can certainly play a significant part.

Further information

You can find more information on the topic of **Renewable legislation and grants: heat pumps for sustainable buildings** and related issues at the following websites:

Department for Energy & Climate Change (DECC) www.decc.gov.uk

Low Carbon Buildings Programme www.lcbp.co.uk

Heat and Energy Saving Strategy http://hes.decc.gov.uk

Changes to EPBD (DIAG) www.diag.org.uk

Heat Pump Association www.heatpumps.org.uk

European Heat Pump Association www.ehpa.org

European Partnership for Energy and the Environment (EPEE) www.epeeglobal.org

If you missed the CPD seminar on **Renewable legislation and grants: heat pumps for sustainable buildings** you can call your Mitsubishi Electric Regional sales office to arrange an in-house presentation of this information.

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www.greengatewayinitiative.co.uk