

Information Guide

Renewable commercial heating

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Guide to renewable commercial heating

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.

New commercial buildings are covered by a range of regulations from emissions reduction (Part L of the Building Regulations) to ventilation (Part F of the Building Regulations). Ensuring the building complies with these, alongside planning rules of local government, is now a very real challenge.

As heating accounts for the greatest proportion of energy usage in non-domestic buildings in the UK, it must be considered carefully when looking at the overall emissions of both new and existing buildings. The Government's Carbon Reduction Commitment Energy Efficiency Scheme (CRC) is one of the strongest drivers towards lower emissions in commercial buildings.



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1. Low carbon commercial heating: Why now?

Heating accounts for over half the energy used in commercial buildings. According to the Carbon Trust, “Heating and hot water can account for up to 60% of a building’s (financial) energy costs.”¹

There can be little question that heating is an area that designers and managers of commercial buildings need to consider carefully.

Table 1 shows how different building services relate to carbon emissions from non-domestic buildings².

Heating is an important factor in the comfort of occupants. Meeting their requirements for comfort and providing hot water for hygiene, whilst also ensuring that the building complies with a growing body of regulations and targets is now a very real challenge.

End-use	% of UK carbon emissions
Heating	46%
Lighting	23%
Cooling and ventilation	11%
Catering	8%
Hot water	4%
Office equipment	3%
Other	5%

Table 1

New commercial buildings are covered by Part L 2010 of the Building Regulations, which requires an average emissions reduction against 2006

standards of 25% – although this can be higher for some types of building. Part F of the Building Regulations also requires that fresh air must be introduced into commercial buildings, to counteract the higher levels of air tightness that now have to be achieved in construction. Looking to the future, Part L will continue to be developed (a new version will be introduced in 2013) and those targets for emissions reduction will increase.

At a local level, designers of commercial buildings also have to take



into consideration the planning rules of Local Government. In 2003 Merton Borough Council in London stipulated that all new commercial developments must generate 10% of their energy needs on-site. In 2007 the UK Government published its Planning Policy Statement – Planning and Climate Change PPS1. This required all UK local planning authorities to adopt a ‘Merton Rule’. These planning rules not only relate to use of renewables, but also allow local authorities to stipulate building energy efficiency standards above those set by the Building Regulations.

New buildings are not the only area to be affected by requirements to reduce emissions and energy use. The UK’s existing building stock is responsible for far more emissions than new-build, and will continue to be so for many decades to come. Upgrading these buildings and finding ways to reduce their carbon emissions and energy usage is therefore vital.

Building owners and managers are now obliged to track their energy use and carbon emissions for a number of schemes. Energy Performance Certificates (EPCs) have to be

independently verified and show the real carbon emissions of a particular building. Some public sector buildings which are over 1,000m² and which are frequently visited by the public, also have to generate Display Energy Certificates (DECs) to make their carbon emissions visible to anyone visiting the building.

Most of these drivers have been around for some time, and their targets set higher standards for the performance of commercial heating systems. However, one of the strongest drivers for businesses today is to look at how their heating performs against the Carbon Reduction Commitment Energy Efficiency Scheme (CRC).

Businesses using more than 6,000MWh per year of electricity (equivalent to an annual electricity bill of around £500,000 per year), and using half-hourly metering, are obliged to report their carbon emissions according to a set of measurement rules. The first annual report is due in July 2011. From 2012 participants in the CRC will buy allowances from the Government to cover their emissions in the previous year.

Companies that lower their emissions

will therefore lower their costs under the scheme. Furthermore, a publicly available league table will show how each participant is performing, adding a further incentive for organisations to lower emissions.

The Government is also set to introduce a Renewable Heat Incentive (RHI). At the time of publication (August 2011) not all details are known, but ultimately the scheme will reward those using renewable technologies for their commercial and domestic heating needs.

With these drivers and incentives in mind, our next section will consider one technology that offers an excellent solution to these challenges.

REFERENCES

1. Carbon Trust, Energy Saving Fact Sheet: Heating, May 2006
2. (100% = 106MtCO₂). Source: BRE (2005); Carbon Trust Analysis. From Carbon Trust publication *Building the Future, Today*, December 2009

2. Heating non-domestic buildings – finding a lower carbon approach



Finding a low-carbon approach to heating commercial buildings is a key challenge for designers and building operators. The right solution has to offer a number of characteristics for it to be suitable for commercial buildings.

Firstly, the solution needs to be straightforward for end-users to operate and to live with on a daily basis. This is a very important point, because previous experience shows how quickly a technology becomes obsolete if it hinders day-to-day business or causes too much inconvenience.

Secondly, the technology has to be scalable. This means that the equipment can be deployed in buildings of varying sizes, and offer both small- and large-scale heating solutions. It also implies that the technology can be manufactured in such a way that it can be deployed in large numbers, and that it is supported by a wide skills infrastructure that is already in place, or that is ready to be educated.

Of course, the technology has to be environmentally sound compared to existing technologies, offering demonstrable energy-use and emissions savings. However, it is also very important that the right solution for renewable commercial heating is also economical. That is, in most cases it will deliver operational cost savings when compared with fossil fuel alternatives.

Heat pumps offer all of these characteristics, and as a result are becoming an increasingly popular option in the commercial sector. Already a proven technology, heat pumps have been established for over fifty years. Over the past

decade advances such as the introduction of inverter technology have helped to make heat pumps even more energy- and carbon-efficient.

Both the Building Services Research and Information Association (BSRIA) and Building Research Establishment (BRE) have independently tested the efficiency of heat pumps. At point of use for every 1 kilowatt of electrical energy input into a heat pump, 3.2 kilowatts of heat is produced. This means that for the same heat output, heat pumps use less primary energy than direct electric heating, gas or oil boilers.

Where a product falls within the scope of the scheme, specifiers and end-users should check that the equipment they select is approved by the Microgeneration Certification

Scheme (MCS). A list of approved manufacturers' technologies can be found on the website www.microgenerationcertification.org.

Heat pumps can extract renewable energy from the ground, from a body of water such as a lake or river near the building, or from the air. They can deliver heat into a building in a variety of ways including underfloor heating, radiators or via warmed air. This flexibility gives designers more choices about what delivery system will work best for their project.

Our next feature will look at some applications of heat pumps for commercial heating, as well as some of their other uses that can help to reduce overall building energy use and emissions.

Heat pumps: established technology

Heat pumps use the vapour compression cycle, in the same way as a domestic refrigerator, but in reverse. The main components of a heat pump are: compressor, expansion device and two heat exchangers – the evaporator and condenser.

- The evaporator contains a refrigerant. This is colder than the heat source, so attracts heat and evaporates.
- The resulting vapour moves to the compressor where its pressure and temperature are increased.
- The hot vapour now enters the condenser where it gives off its usable heat and liquefies again.
- The refrigerant then moves to the expansion device where it drops pressure and temperature.
- The liquid-vapour mix returns to the evaporator and the process starts again.



3. The London Plan – a driver for renewable approaches

In July 2011, the Mayor of London published the London Plan, which is an overall strategic plan for the UK's capital city. The Plan covers a broad range of important issues including transport, economics and the environment.

One of the most important parts of the London Plan covers 'London's response to climate change'. This section of the document deals with how the city will be affected by increasing temperatures and rising sea levels. The UK Climate Projects 2009 (UKCP09)¹ suggest that by 2020 London could experience an increase in the mean summer temperature of 1.5°C. This would be accompanied by a rise in mean winter rainfalls of 6%.

The Plan is very clear that one of the biggest challenges is in the built environment. Under the Greater

London Authority Act 2007, the London Mayor has a statutory duty to 'contribute towards the mitigation of, and adaptation to, climate change in the UK'.

According to The London Plan, London contributes 8.4% of the UK's carbon emissions², amounting to around 44.71 million tonnes. Due to the high density of development in London, and the high use of public transport, the city does have the lowest carbon emissions per-person-per-year of all the UK regions². However, this does not diminish the scale of the challenge.

The building stock is a key area of concern for London, and the Plan estimates that around 80% of the existing building stock will still be in use in 2050. The Plan concentrates mainly on influencing new-build projects, with the aim of limiting future changes in carbon emissions beyond what is already calculated.

For new-build projects, the emphasis in the latest version of the London Plan is very much on reducing carbon emissions. The aim is to achieve an overall reduction in London's carbon dioxide emissions of 60% below 1990 levels by 2025. All London boroughs are expected to play their parts in achieving this goal.

The Plan sets carbon emissions targets for new buildings which are expressed as improvements on the 2010 Building Regulations.



These target reductions will be set higher each year up to 2031 when new buildings will have to be zero carbon.

Carbon reduction targets for non-domestic buildings

Year	Improvement on 2010 Building Regulations
2010–2013	25%
2013–2016	40%
2016–2019	As per Building Regulation requirements
2019–2031	Zero carbon

The London Plan expresses clearly that new development proposals should use renewable technologies, including heat pumps, wherever possible. A wide range of technologies is recommended, to ensure that each site uses the most suitable renewable solution, and can achieve the most cost-effective carbon emissions savings.

References

1. UKCP09: Department for Environment, Food and Rural Affairs (DEFRA) June 2009.
2. Figures from The London Plan July 2011, Chapter 5 *London's Response to Climate Change*.

EUROPEAN LEGISLATION

Heat pumps recognised as renewables

The European Union Directive (2009/28/EC) on the Promotion and use of energy from renewable sources (RES) recognises heat pump technology as a source of renewable heat for buildings. This EU law was transposed into UK law at the end of 2010. Heat pumps are also already highlighted as one of the key technologies for achieving the UK's move to greater use of renewables in the 2011 document *UK Renewable Energy Roadmap*. Alongside this, in the March 2011 document on the proposed *Renewable Heat Incentive*, from the Department of Energy and Climate Change, heat pumps are offered as a supported technology.

The method for calculating the renewable energy achieved from heat pumps is something that specifiers and designers need to bear in mind. The wording of the RES is: 'The amount of aerothermal, geothermal or hydrothermal energy captured by heat pumps is to be considered energy from renewable sources (ERES) for the purposes of this Directive.'

The RES Directive also states that because heat pumps require electrical or other auxiliary energy to function, the energy used to drive heat pumps should be deducted from the total usable heat. Therefore only heat pumps with a seasonal efficiency (SCOP) of 2.9 and above will be classed as being renewable.

MORE INFORMATION

www.commercialheating.mitsubishielectric.co.uk

This website contains the latest information on Mitsubishi Electric commercial renewable heating systems, including case studies and product details.

www.decc.gov.uk

The website of the Department for Energy and Climate Change. Includes information on legislation regarding renewables, as well as the latest news on incentive schemes such as the Renewable Heat Incentive (RHI)

www.heatpumps.org.uk

Website of the UK Heat Pump Association which includes updates on news relating to the technologies as well as case studies and a list of members.

www.euractiv.com

Useful website with information on the latest European legislation and policies on issues such as the use of renewable energy.

www.london.gov.uk

For the full version of The London Plan and information on the background and consultation process.

Further information

If you missed the CPD seminar on **Renewable commercial heating** 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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