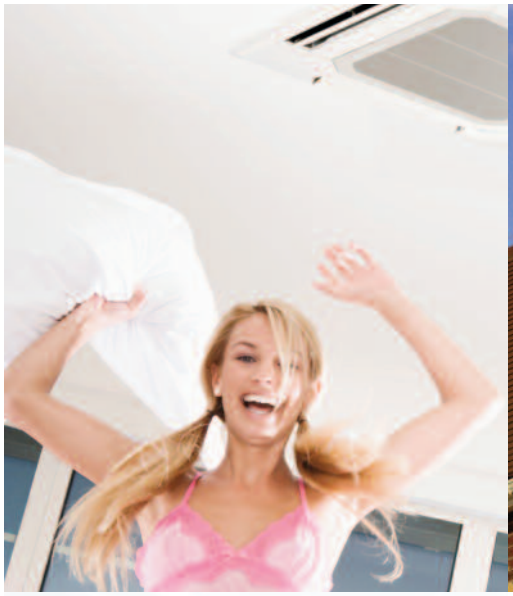




Information Guide:

Microgeneration

Issue 21

CPD CERTIFIED
Construction CPD Certification Service

MITSUBISHI ELECTRIC
AIR CONDITIONING SYSTEMS

Information Guide:

Microgeneration

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.

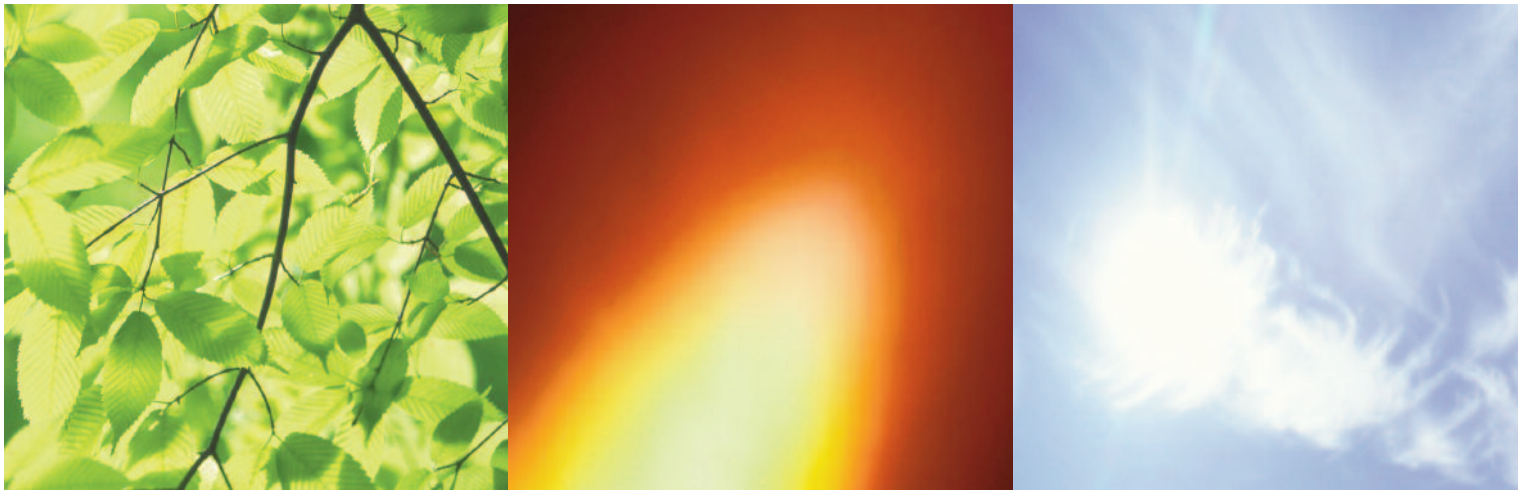
Mitsubishi Electric aims to be a part of this by encouraging employees and customers to work together to increase their knowledge of the latest technology, legislation and markets.

Contents

Making **microgeneration** a viable option

As the cost of fossil fuels rise and with concerns over the effects of climate change increasing, Government is seeking alternative sources of power and heat for homes.

One area which is particularly important to the UK Government is microgeneration, which it regards as a major part of its drive to meet its carbon reduction targets, and to supply domestic energy in a reliable and sustainable way.



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Microgeneration allows householders to produce their own heat or electricity from highly efficient or renewable energy sources. The Government defines microgeneration (in the Energy Act, 2004) as the 'generation of electricity or the production of heat in any plant that relies wholly or mainly on source of energy or a technology on the list below and the capacity of which is less than 45kW of heat or 50kW of electricity'.

The list of energy sources is:

- Biofuels
- Biomass
- Combined heat and power sources
- Fuel cells
- Geothermal sources
- Heat pumps
- Photovoltaics
- Solar power
- Water (including waves and tides)

There is a clause in the legislation which allows for the extension of this list to include 'other sources of energy and technologies for the generation of electricity or the production of heat which would in the opinion of the Government, cut emissions of greenhouse gases in Great Britain'. This means that the list can be extended to allow for future developments in technologies. For example, a recent addition to the list of microgeneration technologies eligible for grants is the air source heat pump which was approved in June 2008.

According to the BRE Domestic Energy Factfile (2006) the average energy consumption per UK household is about 22,000 kilowatts per year. Around 60% of this is used for space heating; 24% for hot water; 3% for cooking; and 13% for electrical appliances and lighting.

In its report 'Domestic Installation of Microgeneration Equipment', produced in April 2007, the Department for Communities and Local Government estimates on how microgeneration technologies might be used to meet the energy demands of the average house. The DCLG believes that a 'reasonable' sized microgeneration device could make a significant contribution to the heating and/or electrical requirements of a house. For example, between 10% and 50% of a household's electricity needs could be met by one of either solar photovoltaics, micro-wind or micro-CHP.

The Government report also estimates that heat pumps and micro CHP could meet all of the heating and hot water requirements, or solar hot water could provide between 40% to 60% of hot water needs. The Government set out its Microgeneration Strategy in a report published in March 2006. The aim of the strategy at that time was to identify obstacles to increasing use of microgeneration; and creating the conditions for microgeneration to become a realistic alternative to fossil fuels.

Over the past two and a half years, a number of those obstacles have been removed, including the removal of planning permission requirements for most forms of microgeneration and development of the Microgeneration Certification Scheme which provides consumers with confidence in selecting products and installers. More householders are turning gradually to microgeneration and the number of installations has grown from 82,000 in place at the end of 2004, to 100,000 at the end of 2007.

Meeting the energy needs of households requires a flexible approach. Our domestic demands are changing over time, with more households now using

power-hungry technologies such as plasma screen televisions, laptops and home computers. Consumption of heat and power is not steady across the day, so peak demand needs to be accounted for, as do the times when a system will not be operating at full power.

Most importantly, not all existing building stock is in the same state, with many poorly insulated homes requiring attention to single glazed windows, draughty doors and loft insulation before microgeneration technologies can be considered a viable option.

Incentives for the market **Microgeneration** and the renewable obligation

Power supply in the UK is still dominated by large, centralised sources operated by large corporations.

In order to encourage a shift towards renewable energy sources the Government developed a Renewables Obligation (RO) which was introduced in 2002.



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The RO obliges the UK electricity suppliers to source an increasing amount of their electricity from renewable sources. The 2010 target is 10%, and targets will be extended to 2027 to give long-term security for the renewables market. It is also likely that the target will be increased over that time.

The value of a ROC is set by the market, so it can fluctuate from £15 to £40 per MWh and is adjusted annually. Cash collected from companies which do not meet their requirements, is paid out to those who do present their certificates. The Office of Gas and Electricity Markets (Ofgem) has responsibility for overseeing and implementing the RO programme.

The scheme was originally designed for large-scale power generation, however it has recently been modified to encourage users of microgeneration technologies. From April 2007, the Government made it easier for microgenerators to participate in the RO scheme, by allowing them to appoint an agent to act on their behalf.

For example, a 1kW wind turbine may only generate enough electricity to claim for one or two ROC's per year, but agents can bring together the output of several microgenerators, which should encourage those who produce even a small amount of power to get involved in the scheme.

A further point about the scheme is that microgenerators do not have to sell their electricity to one of the large power companies, or to an agent. Instead, they can claim for using power they have generated themselves, by joining the scheme and signing an annual declaration of how much of their own energy they have consumed.

Microgenerators must be accredited by Ofgem before they can join the scheme. They can then claim their ROC's on a monthly or yearly basis depending on how much power they produce. The system they are claiming for must be fitted with an Ofgem-approved meter and they can not claim without one of these.

Another step taken by the Government is to make it easier for community electricity generators to supply customers. More than twelve Gigawatts of local or 'distributed' energy schemes are installed around the country in factories and schools. Local electricity generating schemes are growing in number and are often included in new housing schemes. They sell electricity to local residents and have the advantage of reducing the energy losses which occur in the National Grid as electricity is transmitted over long distances.

However, the legislation and industry codes surrounding power generation have made local or community generation schemes costly to set up and run. In some cases, to avoid the costs associated with operating on the national network, suppliers have established 'private wire networks'. Although these networks operate effectively, they make it difficult for customers to switch supplier.

In June 2008, Ofgem announced that it is proposing to eliminate the need for local generators to comply with the rules, which were designed for large scale power stations. The move will clear the way for local generators using renewable and low carbon sources to operate on public networks. Ofgem is working with industry on finalising these plans and expects to have formal arrangements in place by the end of 2008.

Making **Microgeneration** work

Grants and schemes for householders

Developing consumer confidence in microgeneration technologies has been a large part of a Government strategy on growing this market. Adopting microgeneration requires householders to step away from traditional technologies such as the gas boiler, into an area which is largely unknown beyond experts in the sector.

In order to overcome inertia, and to discourage 'cowboy' installers from tapping into this potentially large market, the Government established a Microgeneration Certification Scheme (MCS). The scheme is designed to give consumers independent certification of microgeneration products and services, as well as a route for complaints.

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The MCS is also tied to the Government scheme for microgeneration grants, since householders must use MCS certified products and installers in order to qualify for the money. There are over 400 installers registered on the MCS and there is a growing list of approved products.

The Low Carbon Buildings Programme administers the grants scheme. Householders can apply for grants up to £2,500 per property towards the cost of installing a certified product by a certified installer. Grants vary according to the technology **(see table1)**. There are also grants for community groups and public/non-profit sector applicants (for example, for schools). The grants scheme runs annually and applications are accepted on a first-come-first-served basis.

Domestic applicants must ensure that their houses are insulated to standards required by the Low Carbon Buildings Programme (LCBP). Steps include cavity wall insulation (where applicable), low energy light bulbs and basic controls for the heating system such as a thermostat and timer.

Since grants are allocated from an annual pool of money, it is better for householders to apply early on in the scheme each year which operates from April to April. Money allocated to technologies so far this year is shown in **table 2**. This also indicates the technologies which are being applied for most often.

The MCS is an important scheme because it forms the basis for a number of Government programmes designed to reduce energy use in domestic buildings. For example, the Code for Sustainable Homes requires that technologies and installers are covered by the MCS. Some local authorities are waiving planning permission for householders who want to install technologies such as micro wind turbines and air source heat pumps if they use MCS accredited installers.

The Government is heavily committed to promoting microgeneration technologies and continues to develop existing schemes and incentives and intends to introduce more. Further promotion of the technologies to householders will roll out, for example through the Energy Saving Trust and more information will be supplied on the varying technologies through web sites.

Far from being technology for householders interested in being 'green', microgeneration is being drawn further into the mainstream and is increasingly viewed by householders as a real solution to rising energy bills.

There can be no doubt that the technologies of microgeneration will play a big role in reducing carbon emissions and solving our fuel challenges.

Table 1: Grants available for microgeneration technologies

Technology	Maximum Amount of Grant
Solar Photovoltaics	Up to £2,500 or 50% of the costs, whichever is lower
Wind turbines	Up to £2,500 or 30% of the costs, whichever is lower
Small hydro	Up to £2,500 or 30% of the costs, whichever is lower
Solar thermal hot water	Maximum of £400 or 30% of the costs, whichever is lower
Ground source heat pumps	Maximum of £1200, or 30% of the costs, whichever is lower
Air source heat pumps	Maximum of £900 or 30% of the costs, whichever is lower
Automated wood pellet fed room heaters/stoves	Maximum of £600 or 20% of the costs, whichever is lower
Wood fuelled boiler systems	Maximum of £1500 or 30% of the costs, whichever is lower

Table 2: Applications for microgeneration grants 2008

Technology Total for all technologies	Total Committed £9,479,743.69	Total Committed 6893	Total Paid £7,833,337.88	Total Paid 5288	Total Paid Apps	Paper Apps	Online Apps
Air Source Heat Pump	5,400.00	6	0.00	0	6	1	5
Biomass Room Heater/Stove (Automated Wood Pellet Feed)	11,978.60	23	4,697.55	9	52	8	44
Ground Source Heat Pump	643,058.60	538	367,941.10	308	747	252	495
Heat Pumps (Air)	0.00	0	0.00	0	3	3	0
Small Scale Hydro	17,600.00	5	15,500.00	4	11	5	6
Solar Photovoltaic	5,201,045.00	1158	4,581,905.80	899	1370	484	886
Solar Thermal Hot Water	1,656,110.21	4144	1,321,578.32	3307	5091	1781	3310
Wind Turbine	1,400,288.26	648	1,253,168.00	564	1975	620	1355
Wood Fuelled Boiler System	544,263.26	371	288,547.11	197	531	144	387

Refurbishment case study

A four bedroom house in Bedfordshire is the first home in the UK to benefit from Mitsubishi Electric's revolutionary Ecodan air source heat pump. As a result CO_2 emissions from the home's heating system were reduced by 50% and the overall carbon emissions from the property by an impressive 34%.

The homeowner sought to reduce his carbon footprint and by installing Ecodan was able to do so, whilst at the same time, providing an ideal case study for the advanced heating system in operation. Built in 2000, the four bedroom detached house has double glazed windows as well as loft and wall insulation. The existing heating system was previously run by an 80% efficient gas boiler providing 23.2kW of heat output from an input of 29kW. Based on the existing radiators it was calculated that the total heat output of the radiators was 13.4kW under standard boiler conditions with a flow temperature of 70°C and the hot water demand of the home totals 140 litres per day.

Using the Ecodan heat pump, the heat load of the house was calculated to be 8kW. Operating at a flow temperature of 55°C the heat output of the radiators will be 8.4kW, confirming that Ecodan is fully capable of meeting the heating demand of the house, using the existing radiators. In addition, one area of the house was changed to under floor heating.

Approved product
Microgeneration Certification Scheme
BRE GLOBAL LISTED
Certificate Number: MCS HP0002
Product Reference: PUHZ-W85VHA-(BS), PUHZ-W90VHA-(BS)
PUHZ-W50VHA-(BS), PUHZ-W140VHA-(BS)

The Environment and Energy Awards
Product of the Year 2008

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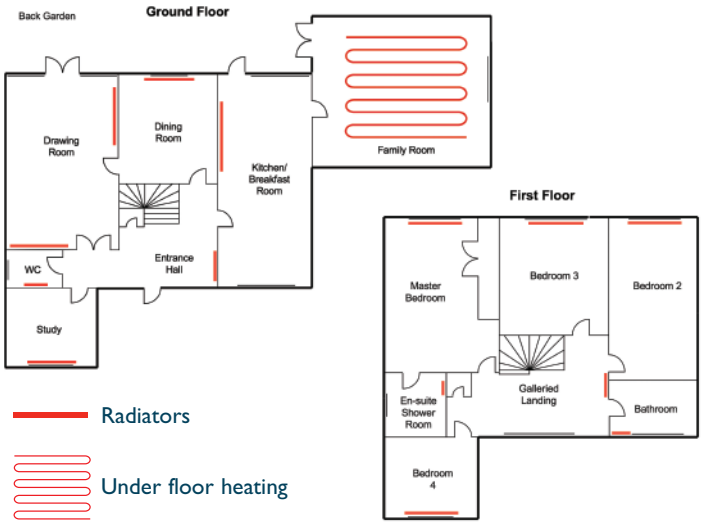
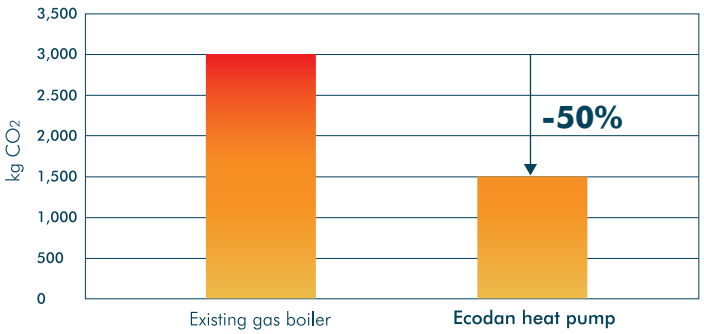


Heating CO_2 emissions

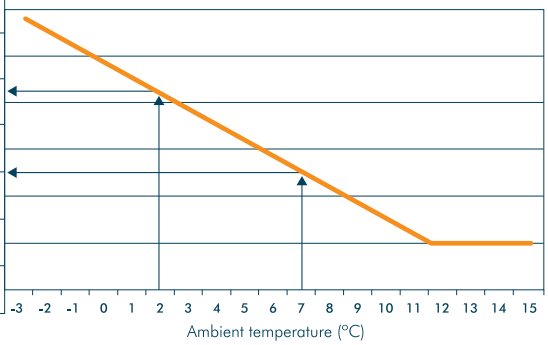


The heat load of a house varies with ambient temperature. Traditional systems would vary the output from the radiators by turning them on and off frequently with Thermostatic Radiator Valves (TRV's), in order to meet the fluctuating demand.

As the ambient temperature increases, the heat load of the house decreases. The highly efficient Ecodan varies radiator heat output by changing the flow temperature, ensuring the highest level of COP possible. With average UK winter temperatures ranging between 2°C and 7°C, Ecodan operates at average flow temperatures between 35°C and 45°C providing the highest levels of energy efficiency.

Flow temperature vs ambient temperature

COP	Capacity	Flow Temp
1.8	8.4	55.0
2.6	6.8	50.0
3.2	5.49	45.0
3.7	4.02	40.0
3.8	2.81	35.0
3.8	1.61	30.0
		25.0



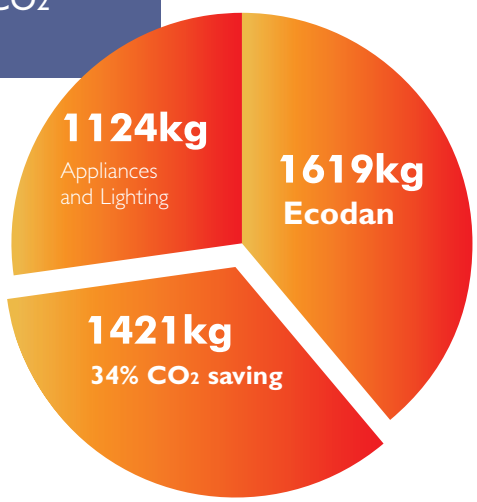
When comparing the existing gas boiler to using Ecodan to provide domestic space heating and hot water, the reduction in CO_2 emissions from the home are startling. The Ecodan with a seasonal COP of 3.4 emits 0.13kg of CO_2 per kW of heat provided to the house, compared to the 80% efficient gas boiler, which emits 0.24kg of CO_2.

This works out to 1,619kg of CO_2 emitted per year when using Ecodan, as opposed to a massive 3,040kg of CO_2 using the existing gas boiler. This clearly demonstrates a reduction of 50% with the help of Ecodan.

When taking into account this property's CO_2 emissions, including that from lighting, appliances, space and water heating, the existing gas boiler accounted for 73% of the total CO_2 emissions. This is dramatically reduced when using Ecodan, with the total CO_2 emissions reduced by 34%. The annual gas bill to operate the existing gas boiler was £560. The estimated electricity running costs of the Ecodan are £358, which represents a saving of £202 (36%) per year.

In the past there was an issue with the noise levels of air sourced heat pumps. The newly developed Ecodan however, offers one of the lowest possible nominal sound levels at 49dBA. External noise levels on the patio at the back of the house with the unit in operation were measured at 39dBA. This is very quiet when you consider that a modern computer has a noise rating of 37 to 39dBA, proving that sound levels are no longer an issue with the introduction of the advanced Ecodan system.

Whole house CO_2 savings in kg



Further **information**

Useful websites

Accredited installers and products - Low Carbon Buildings Programme

www.lowcarbonbuildings.org.uk

Green Book Live: Welcome to the Microgeneration Certification Scheme!

www.greenbooklive.com

Microgeneration - BERR

www.berr.gov.uk

(see the section on Energy for details on the Government's microgeneration programme)

Generating or buying green energy: Directgov

www.direct.gov.uk

(see the section on Environment and greener living)

Mitsubishi Electric Heating Systems

www.mitsubishielectric.co.uk/heating

If you missed the CPD seminar on **Microgeneration**, you can call your Mitsubishi Electric Regional sales office to arrange an in-house presentation of this information.

Please call one of the numbers below:

London North East & East Anglia	**01707 282480**
London North West	**01707 282480**
London South West	**01689 881030**
London South East	**01689 881030**
London Central	**0207 9286810**
Birmingham	**0121 7412800**
Bristol	**01454 202050**
Manchester	**0161 8666060**
Leeds	**0870 330 0347**
Scotland	**01506 444960**

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Fax: 0161 8666081

London South Region
Tel: 01689 881030
Fax: 01689 881031

London North Region
Tel: 01707 282480
Fax: 01707 282481

London Central Region
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Issue 21 Version 2 (Nov 2008)

www.greengatewayinitiative.co.uk