

## Carbon facts



A saving of 1,848 kWh of electrical consumption will save one tonne of carbon emissions



A saving of 5,447 kWh of gas consumption will save one tonne of carbon emissions



A saving of 362 litres of fuel oil consumption will save one tonne of carbon emissions

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Go to our website to find out how MITIE CarbonCare is benefiting other organisations such as North Somerset Schools and Tesco. And to find how your organisation can benefit - call us now!

# This brochure is full of useless information

Your essential guide  
to carbon management

MITIE\_Use-less\_Nov2010

CarbonCare 





# The MITIE CarbonCare handy guide to reducing energy, carbon emissions and costs in your buildings

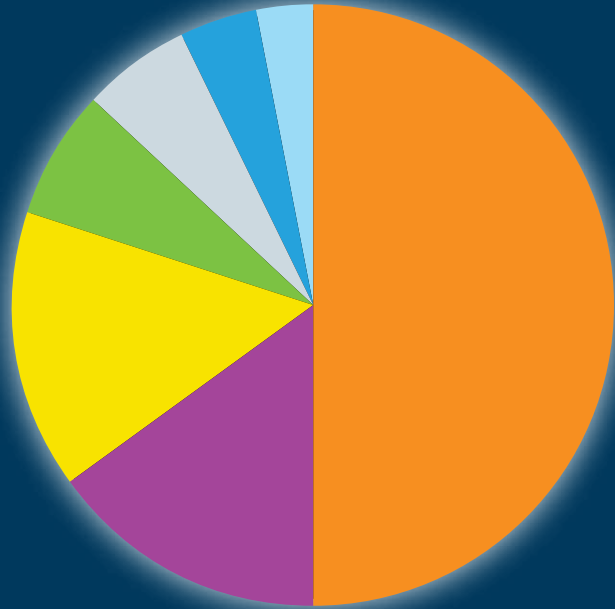
“

Today we are all  
conscious of the effect  
we are having on  
accelerating climate  
change as well as  
the spiralling cost of  
energy.

”



# Typical energy consumption in a commercial building



- Space heating 50%
- Hot water 15%
- Lighting 15%
- Computing 7%
- Cooling ventilation 6%
- Catering 4%
- Other 3%

## What causes energy waste and climate change?

Fossil fuels such as oil, coal and natural gas are burned to produce the energy your building uses (for electricity, heat and cooling) and the resulting emissions are creating an atmospheric greenhouse effect that is raising world temperatures.

A major way of responding to climate change is to reduce the wasteful consumption of energy in our buildings. Around one half of the UK's CO<sub>2</sub> emissions come from buildings, notably corporate and public buildings. Yet property owners in the UK are still wasting as much as 30% of the energy they consume every year. Waste occurs predominantly from inefficient processes, plant and equipment, badly designed distribution systems and poor practices by employees.

## Where should you start?

The UK Government is already taking action to pressure organisations into a more sustainable approach to the management of their buildings through major legislation such as the Carbon Reduction Commitment Energy Efficiency scheme.

We are witnessing a new economic age based on a low carbon economy. But where do you start?

## Where should you concentrate?

The diagram [left] shows which areas consume the most energy in typical UK commercial buildings and it is clear that heating and hot water are a major drain. People often use the words 'energy' and 'electricity' interchangeably, but don't forget that energy also includes heat and in a commercial building the fuel consumed can emit just as much carbon every year as the carbon emitted during generation of the electricity used in the building. Providing heat in a more sustainable and controlled way is one of the cheapest options for mitigating climate change and delivers the greatest impact on reducing carbon emissions and your energy costs.

# 10

**steps you can take now to save energy, cut costs, reduce carbon and save the planet.**

The simplest way to save energy in your building is to not heat, cool, ventilate or light areas which are unoccupied, especially outside normal working hours. MITIE has found that solutions include:

- ▶ Identifying occupant usage patterns for the different areas in your building
- ▶ Installing automatic controls to switch off equipment such as non-critical computers, copiers and network printers when not in use
- ▶ Installing presence detectors or time-clocks for toilet lighting with interlocked extraction fans
- ▶ Implementing employee awareness campaigns to encourage occupants to turn off office equipment [see step 10]

**Switch off!**

# 1

**5–10%**  
savings possible



# 2

## Improve the installation and operation of hot water boiler plant

Heating in commercial buildings often accounts for over 60% of total energy consumption and hot water generation makes up a large percentage of this. In many office buildings, boilers and hot water pipe networks are often not designed with energy efficiency in mind. Many are also poorly installed and not operated in the most energy efficient manner. As a result, significant energy is wasted. MITIE estimates that up to 30% of the fuel energy consumed by boiler and hot water distribution systems in operation in UK commercial buildings today could be saved. MITIE has a wealth of experience in optimising the operation of boiler plant and related equipment. Our Energy Team can quickly and easily identify opportunities to improve efficiency and reduce costs, implement those measures and guarantee the energy savings achievable.

**20–30%**  
savings possible

Temperature controls are critical if you are to minimise energy consumption by your hot water boilers. If the temperature is set too high, unnecessary energy is being consumed. For example, if a temperature of 50–60°C is required, staff often set an average operating temperature of 85°C just to be on the safe side. Actually 70–75°C would suffice most of the year and this extra 10°C results in 5–10% excess energy consumption! MITIE's Energy Team has the expertise to correctly optimise temperature settings for the complete hot water network throughout your building. With little or no investment, payback can be dramatic and almost immediate.



## Set correct operating temperatures of hot water distribution systems

# 3

**5–10%**  
savings possible



# 4

## Optimise refrigeration chiller performance

As with hot water, temperature controls are also critical if you are to minimise energy consumption for your chiller plant. If the temperature is set too low, unnecessary energy is being consumed. For example, if a comfort temperature of 18°C is required in the building, to be on the safe side staff often set the chillers between 7° and 9°C. Actually 12° to 14°C would suffice most of the year and just this extra 3–4 degrees results in up to 25% excess energy consumption! MITIE's Energy Team can make small changes to your existing chiller plant which improves energy efficiency such as loading and unloading switches and condenser cooling water temperature settings. Beyond simple measures, MITIE has found that depending on the type and age of your chiller plant, new energy efficient plant may need to be recommended to obtain significant energy reduction improvement. In addition, the configuration of the chilling circuit can often be altered to adapt new technology and improve performance even further. For example, chillers have condensers which cool the refrigerant. This plant is often poorly designed, setup and maintained. As a consequence, the energy consumption of the chiller is higher than is necessary, with savings of 10–15% on offer. Also, MITIE has found that often an additional, yet unnecessary, energy consuming cooling water pump is in use in these systems offering further opportunities to save energy and so reduce carbon emissions.

**20–25%**  
savings possible

Pumps are used to circulate fluids such as hot water around your building and normally they have a common circulation line with take off lines to the various floors and offices. MITIE has found that often the flow is kept constant, irrespective of demand. This results in increased, unnecessary energy consumption. The same occurs with fans and blowers on air conditioning systems, which once installed are often not properly balanced and dampers are poorly setup. Again this consumes excess energy. MITIE's Energy Team can provide solutions to optimise fluid flow by controlling the speed of pumps and fans and by correctly setting damper openings – all of which can make dramatic reductions in your energy consumption and costs.



## Optimise the operation of fans and blowers and chilled, hot and cold water pumps

# 5

**20–30%**  
savings possible



# 6

## Reduce the energy consumption of your lighting

Lighting is one of the major energy consumers in a commercial building. If not controlled properly it can contribute to high energy costs as well as increased lighting maintenance costs due to the longer than necessary hours they are on. The MITIE Energy Team has made significant reductions in the energy consumption of lighting with corresponding cost savings by:

- ▶ Relamping with energy efficient lamps and controls (common for buildings older than 15 years)
- ▶ Replacement with better luminaires and lamps during refurbishment
- ▶ Incorporating better controls (light level detection, presence detection, motion sensors etc) within the Building Management System
- ▶ Optimising the voltage for discharge lamps with constant loads

15–30%  
savings possible

Air handling units (AHU's) are critical for ensuring comfort conditions by maintaining the flow of conditioned air throughout your building. The air within your building is continuously re-circulated through the AHU's with the help of a supply and extract fan. Additionally, dust is removed from the air through AHU filters and air temperature is controlled by the heating and cooling coils. In some buildings the humidity is also controlled by electrical steam humidifiers. MITIE has found that the energy consumed by the AHU supply and extract fan can be higher than necessary due to incorrect setting of the damper controls. By correcting these, including rebalancing the circuits, and incorporating a variable speed drive, a significant 20–30% saving in the AHU's energy consumption can be made.



## Optimise the operation of air handling unit supply and extract fans

# 7

20–30%  
savings possible



# 8

## Fine tuning your Building Management System

Your Building Management System (BMS) is a critical component in controlling and minimising the energy consumption of your building. However, MITIE has found that the BMS is often left to operate within the parameters that were set during its installation. A BMS needs to be fine tuned on a continuous basis if savings are to be made and these savings are to be sustained. MITIE's Energy Team can fine tune the BMS parameters often providing a saving in energy consumption of 10–15%. Additionally, MITIE's Building Controls Team can upgrade or design, install and commission the latest BMS technology to deliver the optimum in building operating control efficiency.

**10–15%**  
savings possible



Space heating of buildings is the single greatest consumer of energy. Yet many buildings have radiators blazing away over the winter months regardless of the outside temperature. This often results in employees opening the windows to cool their offices and causes needless energy consumption. MITIE has also found radiators running at full temperature in infrequently used areas such as stairwells. The MITIE Energy Team can audit your building to establish where heat is being wasted, suggest which radiators should be used and install thermostatic controls on the radiators, making sure they are set at the correct levels. In this way, a major source of energy inefficiency can be eliminated which can deliver significant cost savings.

## Control radiator temperatures

# 9

**5–15%**  
savings possible



# 10

**Engage with employees to make savings and make them stick**

One of the simplest ways to reduce energy consumption and importantly make the savings stick, is to ensure that the staff who work in the building are made aware of the implications of climate change, the impact of energy consumption, where energy is wasted in the building and how they can help to stop the waste. MITIE has helped many companies to devise and implement energy awareness campaigns. These have involved setting energy savings goals and informing employees about how they can both help and benefit. Posters, 'switch-off' stickers, competitions, building energy champions, energy consumption reports, performance league table, and progress updates are just some of the elements which when used in a structured campaign which can have a major impact on energy reduction and cost savings.

# -10%

**On their own, any of these ten steps will significantly reduce your current energy spend. Collectively, they can have a dramatic impact, not only on your bottom line but also on reducing the carbon footprint of your whole building or buildings portfolio by a minimum of 10% overall.**





**Every day, MITIE CarbonCare is helping clients to stop energy waste, improve energy efficiency, reduce carbon emissions and cut costs. Here's how...**

Running buildings efficiently, safely and cost effectively is what we do. We help clients reduce CO<sub>2</sub> and costs simultaneously through "CarbonCare", helping adapt your business model for the low carbon economy. Our unique understanding of energy and carbon management, combined with practical engineering expertise and the application of the latest technologies, allows

us to deliver financial and environmental benefits with guaranteed results.

So, whether you have just started thinking about how to deal with problem of meeting Government carbon reduction targets, or are already well down the road with advanced programmes, "CarbonCare" can help you meet your goals through its structured, six step approach.

### CarbonCare is:



#### Raising awareness

Helping your organisation and staff make the link between energy use, carbon emissions and climate change.



#### Innovative ideas

Bringing you new ideas, technologies and innovations and showing you how best to exploit them.



#### Data management

From establishing an accurate carbon footprint for your site to more effective utility procurement, bill validation and reporting.



#### Carbon compliance

Ensuring you comply with your legal energy obligation including CRC Energy Efficiency Scheme.



#### Guaranteed reductions

Giving you better energy efficiency and lower CRC obligations through improved maintenance and operations, changes in behaviour and no/low-cost initiatives.



#### Decentralised energy

Designing and installing cleaner, local renewable energy solutions including biomass, wind, solar and geothermal serving both you and surrounding area.



# Jargon Buster

With the increasing focus on energy and carbon emissions reduction, here's a guide to help you understand some of the most common terms in use.

## Additionality

A term used to describe a carbon reduction project that would not have occurred had it not been for the concern of reducing environmental emissions (as opposed to a project that would have occurred under business as usual operations).

## Carbon

The term 'carbon' is often used as shorthand for carbon dioxide. Actually there is a range of gases that contribute to climate change, which are collectively referred to as greenhouse gases. The main greenhouse gas is carbon dioxide (CO<sub>2</sub>). Others include methane, nitrous oxide, (H) CFCs and SF<sub>6</sub>. Farming and landfills are major sources of methane.

CO<sub>2</sub> has become the standard measure of emissions with the other greenhouse gases converted into CO<sub>2</sub> equivalents (CO<sub>2</sub>e) to provide a common currency when discussing emissions.

## Carbon capture and storage

This is a plan to mitigate climate change by capturing CO<sub>2</sub> from large sources such as power plants and subsequently storing it away safely instead of releasing it into the atmosphere. Storage of CO<sub>2</sub> is envisaged either in deep geological formations, deep oceans or in the form of mineral carbonates.

## Carbon footprint

A carbon footprint is a way of expressing the amount of CO<sub>2</sub> emitted as a result of an organisation's operations. Carbon footprints are usually expressed in tonnes of carbon dioxide emitted per year. They are calculated by auditing the energy consumption of various processes and activities for example across commercial buildings as well as the source of that energy.

A typical commercial building with 700 occupants can have a carbon footprint of 1050 tonnes of CO<sub>2</sub> emissions every year.

## Carbon Reduction Commitment Energy Efficiency Scheme (CRC)

The CRC will apply mandatory emissions trading to cut carbon emissions from large commercial and public sector organisations, focusing on emissions that are outside of Climate Change Agreements and the EU Emissions Trading Scheme. An undertaking in the UK that consumes in aggregate more than 6,000,000 kWh of half-hourly metered electricity in 2008 is required to participate in the CRC.

Entry within the CRC requires the highest UK undertaking to account for and report emissions on behalf of all majority shareholding subsidiaries. The CRC became effective from September 2010, when eligible firms must have registered.

## Climate change

Climate change includes global warming but also refers to the other changes to the Earth's climate such as Extreme Weather Events that are believed to be caused by the increase in greenhouse gases in the Earth's atmosphere.

## Climate Change Levy (CCL)

Introduced on April 1 2001, the Climate Change Levy is a tax on the use of energy by businesses in the UK with the aim of providing a clear incentive to improve energy efficiency. The CCL is a tax on energy delivered to users in the United Kingdom. Its aim is to provide an incentive to increase energy efficiency and to reduce carbon emissions. It applies to electricity, gas, coal and LPG and the charges increase by the Retail Price Index annually.

## Combined Heat and Power (CHP)

Combined Heat and Power (CHP) sometimes known as Cogeneration is the use of a single piece of plant to generate both heat and electricity (or Trigereneration where the generation includes heating and cooling and electricity). In conventional power generation large quantities of energy in the form of heat are wasted. By using CHP, the total energy conversion efficiency can reach 90%.

Although not a renewable technology, combining CHP with sustainable fuels such as Biomass with energy saving measures can provide low cost heating that has a

minimal carbon footprint. CHP is a key technology in the government's drive away from centralised power generation towards decentralised energy generation.

CHP plant is available in all capacities from large CHP plants where the electricity output feeds into the national network and the heat is used locally; through building or community sized CHP plants to Micro CHP units that effectively replace the boiler of a single building.

## Energy Performance of Buildings Directive (EPBD)

The European Commission's Action Plan on Energy Efficiency (2000) indicated the need for specific measures in the building sector. In response, the European Commission published the proposed Directive on The Energy Performance of Buildings which became law in January 2003.

The principal objectives of the Directive are:

- ▶ To promote the improvement of the energy performance of buildings within the EU through cost effective measures
- ▶ To promote the convergence of building standards towards those of Member States which already have ambitious levels

## EPBD – Part L

Part L introduces:

- ▶ Defined methodology for calculating energy performance of buildings
- ▶ Minimum energy performance standards for new and existing buildings
- ▶ The requirement to consider alternative energy sources for new and refurbished buildings over 1000m<sup>2</sup> eg CHP or connection to community energy scheme
- ▶ Energy performance certificates to be issued to prospective purchasers and tenants

## Energy performance certificate

The EU Energy Performance of Buildings Directive requires commercial and large public buildings to have an energy performance certificate. This became a requirement in October 2008 for all buildings.

The certificates will show how energy efficient a building is and how much carbon dioxide it emits into the atmosphere. The certificates will look similar to the labeling used for electrical white goods and shall include an energy rating from A to G - A being the best, G the worst.

There are two main forms of certificate:

- ▶ Energy Performance Certificates (EPCs), required when buildings are constructed, sold or rented out, based on calculated energy use and carbon dioxide emissions (called 'asset ratings') and valid for ten years. A recommendation report accompanies the certificate and is valid for seven years. The report suggests energy improvements ranked in order of payback and energy impact.
- ▶ Display Energy Certificates (DECs) required when the total useful area of buildings are greater than 1000m<sup>2</sup>, occupied by public authorities and certain public institutions, based on actual annual energy use ('operational ratings') and renewed annually. DECs must be publicly displayed. The size of building reduces to 250M<sup>2</sup> from December 2010 and from 9th July 2012 will be applicable to buildings occupied by public authorities OR which are frequently visited by the public, such as shops and shopping centres, supermarkets, restaurants, theatres, banks and hotels

Air Conditioning Inspections are required when the

electrical rating of the cooling system is greater than 250 kW and from 4th January 2011 this drops to 12 kW which will cover most systems in a building.

### Feed-in tariffs (FITs)

The FITs system incentivises the widespread uptake of renewable electricity generating technologies such as wind turbines and solar panels, through financial payments to businesses and individuals who are prepared to invest. By 2020 it's expected that 750,000 low carbon schemes will be in place through FITs, saving 7 million tonnes of CO<sub>2</sub>.

### Fossil fuels

The term fossil fuels refers to coal, oil and natural gas. Burning these fuels to produce energy is among the biggest contributors to increasing levels of CO<sub>2</sub> in the Earth's atmosphere.

### Global Warming

Global warming refers to the trend of rising average temperatures that the world is experiencing as a result of increased levels of greenhouse gases in the Earth's atmosphere and is often used with the term 'climate change'.

### Government commitments

At the Kyoto Summit in 1997, the UK government agreed to a 12.5% reduction in

greenhouse gas emissions below 1990 levels by 2008 to 2012. Addressing climate change and the UK's impact on global warming, the government has set targets of:

- ▶ A 60% reduction in UK CO<sub>2</sub> emissions by 2050;
- ▶ Government departments to reduce carbon emissions by 10% by 14 May 2011;
- ▶ A 30% reduction in carbon emissions from central government buildings by 2020.

### The Greenhouse Effect

Certain gases in the Earth's atmosphere act like a greenhouse, keeping in reflected heat from the Sun. These are known as greenhouse gases. The main greenhouse gas is carbon dioxide (CO<sub>2</sub>). As the atmospheric concentration of these gases increases, more of the Sun's energy is trapped, like a blanket, over the Earth causing temperatures to rise.

### Intergovernmental Panel on Climate Change (IPCC)

The IPCC was established in 1988 by the World Meteorological Organisation and the United Nations Environmental Programme. Made up of a panel of experts, the IPCC assesses the scientific, technical and

socio-economic information relevant for understanding the risk of human influenced climate change.

### Kyoto Protocol

Sponsored by the United Nations, the Kyoto Protocol is an agreement between countries to reduce their greenhouse gas emissions by a set percentage. It was established in Japan in 1997 but didn't become international law until February 16 2005. As of May 2008, 181 countries and the EEC have ratified the treaty. Major countries who have chosen not to be involved in the treaty are the USA and Australia with developing nations excluded from binding targets for reducing emissions.

### Mitigation

Mitigation refers to activities which try to reduce the amount of greenhouse gases emitted into the Earth's atmosphere. Improving energy efficiency has the greatest impact as it reduces the amount of fossil fuels which need to be burned to generate the energy we consume. Renewable energy sources also have a big impact as they generate energy using methods which don't produce greenhouse gases.

### Offsetting

Offsetting is an idea for reducing the impact of carbon dioxide emissions from everyday activities such as travel and energy consumption. The emissions from such activity are calculated by a carbon offsetting provider and then paid for through a donation to a project that reduces carbon by the equivalent amount, typically in the developing world.

Environmental campaigners say it sends out the wrong message, namely that you can buy your way out of the problem of rising carbon emissions and that offsetting discourages individuals and companies from improving energy efficiency and sourcing renewable energy to cut greenhouse gases in the first place.

Tree planting is a common offsetting activity in offsetting, however, large-scale plantations reduce biodiversity and cause social disruption in the developing world.

The UK government admits that "offsetting isn't the answer to climate change". They urge individuals and companies to first think about how they can avoid and reduce emissions but view offsetting as a useful way to deal with those emissions that can't be avoided.

### Renewable energy

Renewable energy is generated from natural sources such as the wind, the sun, the sea, rivers and organic matter used for fuel. The most common types of renewable energy are wind power, hydro electric, biomass, biofuels, wave, tidal and solar.

### Renewable Heat Incentive (RHI)

In order to meet the 2020 15% renewable energy target, the Government needs to promote new ways of generating renewable energy and specifically around heat generation. The proposed Renewable Heat Incentive (RHI) programme will provide financial support for those who install certain types of renewable heating, which qualify for support under the scheme.

### Stern Review

In November 2006, the economist Sir Nicholas Stern published 'The Stern Review', a report on the economics of climate change. His main conclusion was that the cost to the world's economy of not acting immediately to tackle climate change is far greater (at 20% of global GDP) than the cost of taking action now (only 1%).