



## GSHP's, Building Regulations and CO<sub>2</sub> Emissions V3

In 2006 the UK Building Regulations changed and one of the main requirements for meeting the energy efficiency criteria of the regulations (Part L, in England and Wales, Part J in Scotland) is now based on CO<sub>2</sub> emissions from the proposed building.

Part L now states that the annual CO<sub>2</sub> emission rate or Dwelling Emission Rate (DER) of the completed building must not exceed a Target Emission Rate (TER) set by reference to a notional building of the same size and shape.

The DER and TER are calculated according to the Standard Assessment Procedure (SAP) 2009 for domestic buildings and the Simplified Building Energy Model (SBEM) calculation for commercial projects. (For SBEM the DER is actually termed the Buildings Emission Rate or BER) SAP is the Government's standard methodology for assessing the energy consumption in new domestic dwellings. The latest version of SAP is SAP 2009. The SAP scale runs from 1 (poor) to 100 (excellent) and is based on estimated annual energy use for space heating, domestic hot water, ventilation and internal fixed lighting. A SAP of 100 now represents zero energy cost for these items. It can be above 100 for dwellings that are net exporters of energy.

A SAP Assessor, who are available nationwide, can provide a SAP report. SBEM uses a computer program developed by the Building Research Establishment (BRE) that provides an analysis of a commercial building's energy consumption. It is a recognised method to assist in demonstrating compliance with the Building Regulations Part L2A or L2B, (England and Wales).

### Facts at a glance

**Building Regulations**—Part L (Part J in Scotland) now states that the annual CO<sub>2</sub> emission rate or Dwelling Emission Rate (DER) of the completed building must not exceed a Target Emission Rate (TER)

**SAP**—Standard Assessment Procedure is the Government's standard methodology for assessing the energy consumption in new domestic dwellings.

**SBEM**—Simplified Building Energy Model (SBEM) is used to calculate the energy consumption for commercial projects.

**CO<sub>2</sub> emissions**—A ground source heat pump can reduce the CO<sub>2</sub> emissions by 37% over gas and 55% over oil.

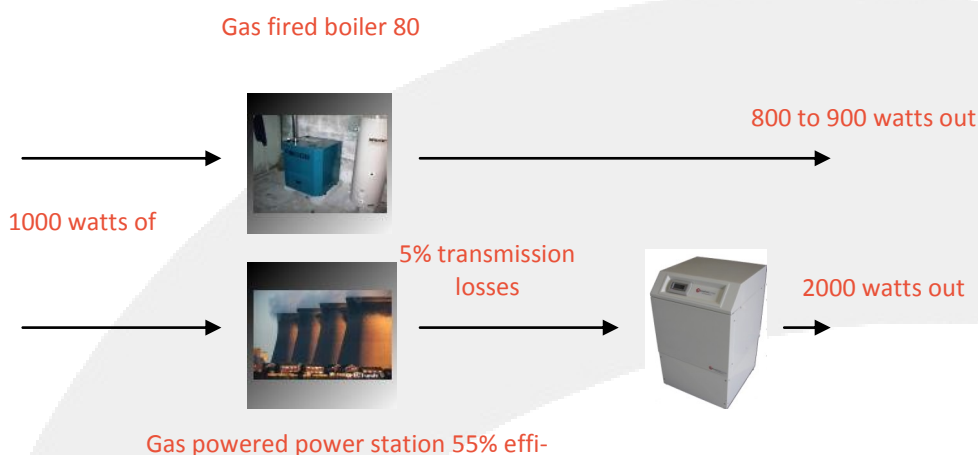
**Ground Source Heat Pumps**—By using a GSHP to provide a building's heating requirement the DER/BER of the building is reduced and hence is more likely to pass building regulations on the CO<sub>2</sub> emission requirements.

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An SBEM Energy rating is not a design of the heating, ventilation or lighting system, which may be required for more complex building types. SBEM can be provided by some SAP assessors, or a Building Services Engineering Company. Ground Source Heat Pumps can help dwellings achieve compliance with Building Regulations by reducing the DER/BER of buildings.

[Ground Source Heat Pumps](#) can help dwellings achieve compliance with Building Regulations by reducing the DER/BER of buildings.

The equation overleaf shows that by utilising the energy in the ground, a ground source heat pump can produce over twice the amount of energy for the same amount of initial energy input as a gas fired boiler. This means that the CO<sub>2</sub> emissions will be lower for a Ground source Heat Pump than other non-renewable fuels.



The following table is based on data published by DEFRA/DECC in 2013 and gives CO<sub>2</sub> emissions per kWh for different fuels.

Fuel	Kg CO <sub>2</sub> /kWh
Electricity	0.45
Natural Gas	0.18
Coal	0.31
Oil	0.25
LPG	0.21

Although a Ground Source Heat pump uses electricity (which has the largest emission rate) as it can operate with a COP of 4, i.e. for every one kW of electrical energy used it produces 4 kW of thermal heat, the actual CO<sub>2</sub> emission rate for providing heat to a building is 0.113kg CO<sub>2</sub>/kWh. This shows a CO<sub>2</sub> reduction of 37% over gas and 55% over oil.

By selecting a Ground Source Heat Pump to provide a building's heating requirement the DER/BER of the building is reduced and hence the building is more likely to pass building regulations on the CO<sub>2</sub> emission requirements.