



Carbon Emissions - The Ex factor



In July 2018 BRE published Version 10.0 of the Government's Standard Assessment Procedure for Energy Rating of Dwellings (more commonly known as SAP 10). Of the many changes from the 2012 version, the most significant is the reduction in the carbon factor of electricity which is now almost on a par with that of gas. In other words, allowing for the inefficiencies of a gas fired boiler system, all things being equal it may be more environmentally friendly to use direct electric heating to heat a building rather than a traditional wet heating system. Ahead of any changes to the Building Regulations, the latest guidance on Energy Assessment published by the GLA in October 2018, requires that SAP 10 carbon factors are to be used from January 2019 onwards in all planning applications, until the government has finalised their consultation. Any applicant not using the new carbon factors, should have a justification for doing so.

Energy Source	SAP 2012 (kg CO ₂ /kWh)	Proposed SAP 10.0 (kg CO ₂ /kWh)
Main Gas	0.216	0.210
Grid Electricity	0.519	0.233

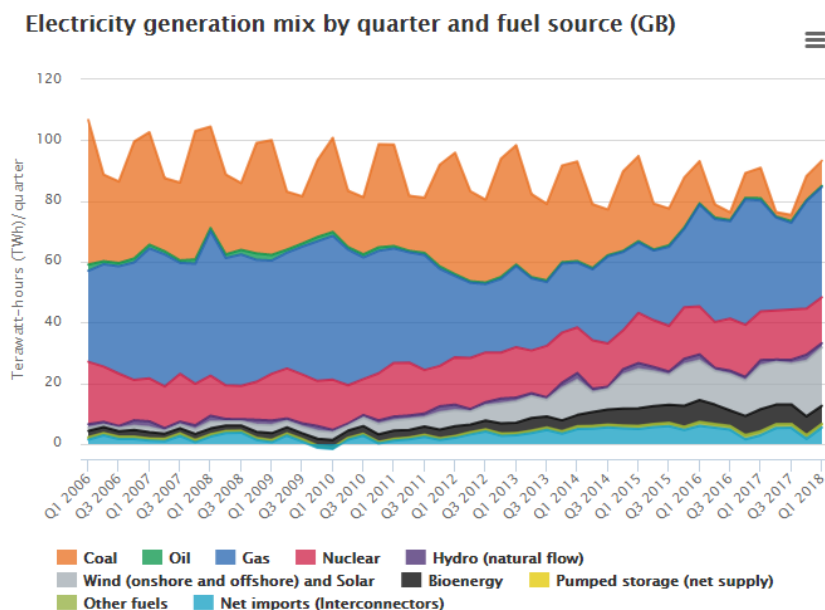
Practitioners within the industry have long known that the average annual Electricity Carbon Factor has been falling and has been much lower than the electricity carbon factor within Part L for some time. This discrepancy is due to a combination of grid electricity

becoming decarbonised faster than anticipated and the absence of a mechanism to adjust the carbon factors within Part L without having to revise the Building Regulations something which the government has been reluctant to do. As a consequence of this anomaly the carbon emission calculations in the building industry have been inaccurate for a number of years. Considering that the carbon emission factors within Part L are being used to make design decisions that will last for many years, at least for the average life of the building services installed in the building, this change is long overdue and will have a major effect on the way we design buildings in the future.

In 2015 Ofgem estimated that almost 85% of homes in Great Britain were heated by gas while less than 9% of homes are heated by electricity. Of the homes using direct electric heating over 70% use storage heaters. The use of electricity as a primary source of heating had been in decline since 2002, when carbon factors were first introduced into Part L of the Building Regulations. With the subsequent changes to Part L it became increasingly difficult to comply with Building Regulations Part L using direct electric heating alone, therefore updating the carbon emission factors used in SAP may allow designers greater freedom to select electric heating when this is deemed to be appropriate, especially when heating demand is minimal and increasing energy bills will not be an issue. However, with greater efficiencies, heat pumps will increasingly be the most popular option as a result of these changes.

So why is the grid carbon factor lower than before?

The below graph shows the contribution of various fuel sources to the electricity generation in the UK since 2006 till now. The contribution of renewable energy has significantly increased in recent years while the amount of coal being used to generate electricity is far less than it has been historically.



Source: BEIS Energy trends section 5:Electricity (ET 5.1) July 2018

What does it mean for the future building design?

Implications from a Building Regulations perspective:

In terms of carbon emissions, there is almost no difference between specifying direct electric heating and gas fired heating. This doesn't necessarily mean that specifying direct electric heating will easily allow you to pass the new Part L for domestic or commercial buildings. The definition of notional building, which is not yet known (notional building provides a benchmark for actual building to be compared) determines whether direct electric heating could work. What is clear though, is that among the conventional building services strategies, heat pumps will emerge as the most effective solution from a carbon emissions point of view as they use electricity and their efficiency can be significantly more than that of direct electric heating.

The decarbonisation of the grid also means that there is no real advantage, from a carbon emission point of view, in using gas fired CHP anymore, as using gas to generate electricity on site can be less efficient than using the grid electricity.

Implications from a Planning perspective:

As the GLA will require the new carbon factors to be used for all planning applications submitted after January 2019, existing strategies will need to be reassessed. For example the lower carbon emission factors will mean that the contribution of photovoltaic panels in reducing carbon emissions in London will be lower than their current contribution, and a

gas-fired CHP will effectively have no contribution in CO₂ saving on site.

It should be noted that the GLA energy hierarchy has not changed, so while the new carbon emission factors may not necessarily support the installation of a communal heating system in large scale developments, all major developments are still expected to provide a single energy centre to serve all of the units within the development where possible, so they can be connected to future district heating networks. The GLA have made it clear that direct electric heating will not be accepted in the majority of cases as it will not provide any on-site carbon savings in line with the energy hierarchy.

If the generators in the current and future district heating networks are changed to suitable renewable fuels, these potential low/zero carbon district heating systems could play a fundamental role in a low carbon economy; however, given the distribution losses are significantly lower with grid electricity, and decarbonising it has been much more successful to date, it does beg the question how much longer can the GLA prioritising district energy centres over other solutions.

Implications from a Financial perspective:

The ratio of the old carbon factors were more-or-less in line with the ratio of their cost and consequently the strategies that would provide the most carbon efficient solutions tended to be the most cost effective ones, as electricity was both more expensive and more carbon-intensive than gas. Going forward this will not necessarily be the case anymore, therefore reporting on carbon emissions for each strategy alone is not going to be enough. Instead the clients who

are interested in the running cost of the developments, should also demand calculations of cost saving for each energy strategy. For example while direct electric heating may be more carbon efficient than gas heating, it is nearly three times more expensive. Further, while installation of CHP may not make sense from a carbon emission point of view, it will still be a cost-effective solution depending upon the application.

Implications for the Air Source Heat Pump Industry:

As a result of the decarbonisation of grid, heat pumps have become the most effective technology to reduce the carbon emissions, at least theoretically. There are various concerns within the industry with regards to how the efficiency/seasonal efficiency of heat pumps are being measured and calculated, and whether the efficiencies claimed in theory can ever be achieved in practice. These concerns need to be addressed moving forwards since they could be a source of significant performance gap issues and undermine the credibility of the assessment method in a similar way the Volkswagen emissions scandal undermined testing in the motor industry.

Of the various types of heat pumps on the market, air source heat pumps are possibly the easiest to install and maintain. Therefore, it is predicted that there will be significant growth in this sector with the technology being used more frequently in the future. Depending on the building type, air-to-air or air-to-water heat pumps could work best in various scenarios.

Implications for Local air quality:

Air quality has become one of the main areas of concerns in our urban and built environment and therefore designers should be aware of the impact of their design strategies on air quality. The New London Plan has highlighted air quality as the first policy under green infrastructure section, before any other policy on carbon reduction.

To protect the local air quality, using electricity is generally much better than using any onsite combustion engine including boilers or CHP engines. However, it should be noted that a radical shift from gas to electricity (rather than a gradual change) may have some unintended consequences on the carbon intensity of the grid.

While the grid is currently being decarbonised a sudden increase in the demand for grid electricity, from a switch away from gas or increase in the use of electric cars, may result in more carbon intensive sources being used to make up the shortfall which could tip the balance back in favour of gas.

For more information and for project specific advice, please **contact**

Mecserve

The logo for Mecserve, featuring the word 'MECSERVE' in a bold, sans-serif font. The 'E' is stylized with three horizontal bars of varying lengths, creating a unique graphic element.

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