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Mitsubishi Electric Guide to the UK Net Zero 2050 roadmap and the built environment

Information Guide 75

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Mitsubishi Electric Guide to the UK Net Zero 2050 roadmap and the built environment

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.

This guide accompanies a series of seminars, all of which are CPD certified.

Contents

Introduction

The climate emergency means that governments, corporations and individuals all have their parts to play in mitigating human-caused global warming.

Scientific evidence shows that we must reduce our output of greenhouse gases with real urgency. The built environment is a significant contributor to these emissions. Professionals involved at every stage from design to construction and operation must be aware of how to ensure buildings of all types are as energy efficient and sustainable as possible.

This Mitsubishi Electric Guide gives an overview of the main challenges, legislation and impacts for professionals in the built environment.

Greenhouse gases

The Kyoto Protocol of 1992 was a landmark international treaty adopted by the United Nations Framework Convention on Climate Change (UNFCC). It signified global recognition of climate warming as a phenomenon caused by human activity.

The 37 signatory countries, including the United Kingdom as a member of the European Union at the time of signing, agreed that they would establish legally-binding national targets to reduce emissions of greenhouse gases (GHGs). These gases were identified by the UNFCC as being the main cause of global warming because they trap thermal energy from the sun within the Earth's atmosphere. UN-lead research shows that human activity has increased the presence of these gases in the atmosphere, leading to rises in global temperatures and associated climactic changes.

The Protocol identified seven direct greenhouse gases:

Greehouse gases	Contribution to global warming
Carbon dioxide (CO_2)	80%
Methane (CH_4) **Nitrous oxide (N_2O)**	<20%
Hydrofluorocarbons (HFCs) **Perfluorocarbons (PFCs)** **Sulphur hexafluoride (SF_6)** **Nitrogen trifluoride (NF_3)** *(Known as 'F gases')*	<5%

These gases are referred to as 'direct' GHGs as they are known to trap heat within the Earth's atmosphere. The last four gases in this group (HFCs, PFCs, SF_6 and NF_3) are also known as the 'F gases' and are covered under separate regulations to limit their use and leakage into the atmosphere.

There are also four 'indirect' gases:

- Nitrogen oxides (NOx)
- Carbon monoxide (CO)
- Non-methane volatile organic compounds (NMVOC)
- Sulphur dioxide (SO_2)

The first three gases on the list are referred to as 'indirect' because they cause increases in ozone concentrations which in turn leads to atmospheric warming. Sulphur dioxide is also an indirect GHG as it contributes to aerosol formation which is another cause of global overheating.

The Kyoto Protocol was superseded in 2016 by the Paris Agreement which set further targets on reduction of greenhouse gases, with more nations signing (190 countries ratified the treaty in 2021).

The built environment and global warming

According to the World Green Building Council[1], buildings and construction account for 36% of global final energy use and 39% of energy-related carbon-dioxide emissions when upstream power generation is included.

Energy use in domestic and commercial buildings is an important issue because many nations rely heavily on fossil-fuels such as gas and oil for the generation of electricity. According to the Council's Global Status Report in 2017: "The energy intensity per square meter of the global buildings sector needs to improve on average by 30% by 2030 (compared to 2015)."

The Global Alliance for Buildings & Construction (of which the UK is one of 30 member countries) is part of the UN Environment Programme. The Alliance regards buildings as: "A key driver of energy demand and emissions. Buildings and construction, led by residential building energy consumption represent 36% of final energy demand globally and almost 40% of global energy-and process-related emissions"[2].

Tables: Global Share of buildings and construction final energy and emissions 2018

Energy	
Other industry	32%
Transport	28%
Residential	22%
Non-residential	8%
Construction industry	6%
Other	4%

Emissions	
Other industry	31%
Transport	23%
Construction industry	11%
Residential (Indirect)	11%
Non-residential (Indirect)	8%
Residential (Direct)	6%
Non-residential (Direct)	3%
Other	7%

(Figures from IEA 2019 via Global Alliance for Buildings & Construction)

In spite of global and national targets, the built environment and construction sector has some way to go to improve its environmental performance. The Global Alliance notes that in 2018 global buildings sector emissions increased by 2%. This was mainly the result of increases in floor space and demand for electricity, which around the world is still largely generated from fossil fuels.

This is why legislation to reduce energy use in buildings of all types is so important to tackle our climate emergency. Here in the UK we have introduced a range of requirements and legislation for building design and operation, many of which are in the process of being updated during 2021 to bring them in line with the UK's national goal of reaching net zero greenhouse gas emissions by 2050.

Emissions targets in the UK

The UK's strategy on emissions reductions is steered by the Climate Change Committee (CCC). This body was established in 2008 (under the Climate Change Act) to provide recommendations for policies and to hold the government to account on its progress to meeting targets.

The CCC has been setting 'carbon budgets' for the UK, since its inception. In 2020 it produced the Sixth Carbon Budget[3] which recommended a 78% reduction in UK GHG emissions by 2035. This requires adoption of new technologies across all major industry sectors, as well as some significant changes in consumer and business behaviour.

The UK was the first major economy in the world to introduce a net zero emissions law which it did in June 2019[4]. The national objective is to "bring all greenhouse gas emissions to net zero by 2050."

And in 2021, the government updated this goal to reflect the CCC recommendation, by adopting the target of a 78% reduction in GHGs by 2035. The new target includes the UK's share of international aviation and shipping emissions for the first time. This does not alter the ultimate 2050 net zero target, but it does set a significant legal milestone along the way.

Figures from the Department for Business Energy & Industrial Strategy (BEIS)[5] show that in 2020, total UK emissions of the main direct GHGs were 414.1 million tonnes carbon dioxide equivalent ($MtCO_2e$) which is 48.8% lower than they were in 1990.

This puts the UK around half-way to its net zero goal. The main source of that achievement has been in the 'greening' of the country's electricity grid. Due mainly to the closure of coal-fired power stations and investment in renewables such as wind farms, emissions from the UK's energy supply are 65.5% lower than they were in 1990.

Emissions targets in the UK

The CCC recommends four main steps that the UK needs to take going forward in order to meet its 2035 and 2050 targets:

- **Take-up of low-carbon solutions:** By the early 2030s all new cars, vans and all boiler replacements in homes and other buildings are low carbon - "largely electric". (In November 2020, after lobbying by the car industry, the government agreed to allow the sale of hybrid vehicles to remain on sale until 2035).
- **Expansion of low-carbon energy supplies:** UK electricity production is zero carbon by 2035 with offshore wind becoming the backbone of the whole UK energy system. Low carbon hydrogen scales up to be almost as large in 2050 as electricity production is today.
- **Reduced demand for carbon-intensive activities:** The UK wastes fewer resources and reduces its reliance on high-carbon goods. Buildings lose less energy through a national insulation programme. Diets change as we reduce our consumption of higher-carbon intensity meat and dairy.
- **Land and greenhouse gas removals:** Transformation in agriculture; addition of mixed woodland as a natural carbon sink; a shift to production of energy crops.

At the end of 2020, the government launched its *Ten Point Plan for a Green Industrial Revolution*[5]. The Plan reflects the recommendations of the CCC and sets out how the government will invest £12 billion of public money to achieve the net zero carbon goal. The Plan covers a number of industry sectors, including the built environment.

Net Zero - Scotland, Wales and Northern Ireland

All parts of the United Kingdom are included in the UK government's plans for a net zero carbon future. However, Scotland, Wales and Northern Ireland are also pursuing their own pathways to achieving net zero in ways that are appropriate for their local conditions and economy.

The Scottish Climate Change Act 2019 commits Scotland to net-zero emissions of all greenhouse gases by 2045. The Scottish Building Regulations are currently under review ahead of a proposed update in 2022. Updated regulations will reflect Scotland's net zero target and will encompass its draft Heat in Buildings Strategy (2021) which includes the 2024 New Build Heat Standard.

Heat in buildings accounts for 20% of Scotland's greenhouse gas (GHG) emissions, and with this in mind, the Scottish government produced the Draft Heat in Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings. Consultation on the draft strategy was closed on 30th April 2021 and the Scottish government is currently working on producing a final draft.

The proposals include improving the energy efficiency of all buildings, new and existing. Decarbonising heating using technologies such as heat pumps, heat networks and some hydrogen is also a key objective. The aim is for 1 million homes and around 50,000 non-domestic buildings to use low and zero emissions heating systems by 2030. And by 2024, the Scottish government wants to ensure that new buildings use heating systems which 'produce zero direct emissions at the point of use'.

Further details can be found at:
https://www.gov.scot/publications/scottish-building-regulations-proposed-changes-energy-standards-associated-topics

Emissions targets in the UK

The Welsh government responded to advice from the Climate Change Committee in 2019 and made a commitment to achieving net zero emissions by 2050. Wales also has interim targets of a 63% reduction by 2030; and an 89% reduction by 2040.

As in England and Scotland, decarbonising heating in buildings is considered a key objective and the Welsh Parliament is exploring options for alternative technologies. Wales is covered by the same Building Regulations as England, which are due to be updated in 2021.

Further information can be found at:
https://research.senedd.wales/research-articles/climate-change-the-path-to-zero-emissions/

The Northern Ireland Assembly has proposed a target of net zero emissions by 2045. The proposal also includes the appointment of a climate commissioner to direct the Assembly's efforts. However, there is also a second proposed target from Northern Ireland's Department for Agriculture, Environment and Rural Affairs (DAERA), which is an 85% reduction in emissions by 2050.

This second target is in line with recommendations from the Climate Change Committee which believes that it is a more appropriate goal for Northern Ireland. Decisions are expected to be made on the final target by the end of 2021.

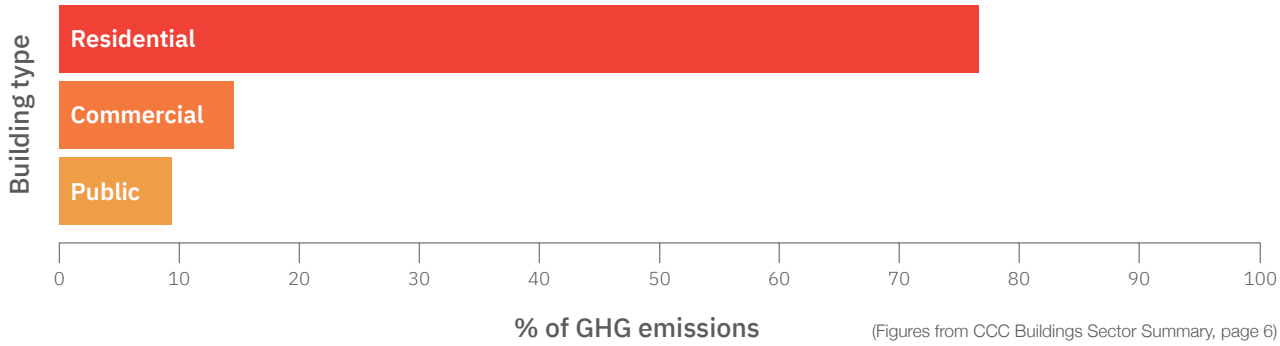
Moves are already underway to make buildings more energy efficient and to reduce carbon emissions from the built environment. Northern Ireland's Building Regulations Part F deal with the Conservation of Fuel and Power. These were updated at the end of 2020 and require all new buildings to be 'nearly zero energy' (resulting in low or zero carbon emissions) which is demonstrated by meeting a Target Emission Rate.

The regulations allow for nearly zero energy to be achieved through building fabric improvements, use of low carbon heating technologies, building integrated renewable energy generation - or a combination of these.

Full details can be found at: **https://www.finance-ni.gov.uk/topics/building-regulations-and-energy-efficiency-buildings**

The built environment and emissions

CCC research shows that direct greenhouse gas emissions from buildings were 85 $MtCO_2e$ in 2019. This is around 17% of the UK's total emissions.



(Figures from CCC Buildings Sector Summary, page 6)

Most of these direct CO_2 emissions result from the use of fossil fuels for heating and hot water production. Approximately 74% of our demand for heating and hot water is met from natural gas, making this an important area for GHG emissions reductions.

Buildings also use 59% of the UK's electricity production which, the CCC states, adds a further 31 $MtCO_2e$ of indirect emissions. Most of this electricity use is for appliances and lighting in homes. In commercial buildings, cooling, I.T. and catering account for the largest electricity users.

UK Building Regulations have resulted in improved energy performance over time. Direct emissions from buildings fell by 19% from 1990 to 2015. Demand for gas and electricity has also fallen by 16% and 14% respectively since 2005.

Indirect emissions from buildings (due to electricity use) have also been falling at about 10% per year since 2009. This is due to reduction in demand, and the UK's increased use of renewables for electricity production.

However, the fact that direct emissions reductions have been relatively static since 2015 points to a significant requirement for getting to net-zero carbon emissions by 2050: decarbonising heat.

Around 23 million UK homes[6] are on the gas grid and have wet central heating systems. A further 4 million are off the grid, and more likely to use oil or liquid petroleum gas (LPG) as the fuel for space heating and hot water. So this is a challenge which requires solutions that can work at scale and that are attractive to householders as well as commercial building owners and occupiers. *(For further information on the decarbonisation of heating, see the Mitsubishi Electric Guide to Renewable Commercial Heating[7])*

In order to achieve these changes, the government is introducing a raft of new policies, with regulations and standards in place to deliver more energy efficient, low-carbon heating and hot water to residential, commercial and public buildings.

Policies and regulations

In its Sixth Carbon Budget, the Climate Change Committee highlights four strategies that it proposes to "reduce emissions in buildings to zero by 2050 at the latest."

- **Upgrade domestic buildings to EPC level C over the next 10 to 15 years** (2030 is the preferred date). It is also proposed that rented commercial and public buildings achieve a minimum EPC of B by 2030. Consultation on these areas is underway as of June 2021.
- **Grow the market for heat pumps** as a crucial technology for decarbonising space heating. This will be accompanied by a phase-out of gas boilers in all buildings (domestic and commercial)
- **Expand the use of heat networks** in areas such as cities using "anchor loads" such as schools and hospitals. Fossil-fuel combined heat and power (CHP) will be phased out and replaced with low-carbon or waste-heat CHP systems from the mid-2020s
- **Prepare for a "potential role" for hydrogen-generated heat**

The *Ten Point Plan* reflects these CCC recommendations, with a particular emphasis on introducing more heat pumps. The government is aiming for 600,000 heat pump installations per year by 2028 in homes as well as commercial and public buildings.

As a further result of the Sixth Carbon Budget, the government has been consulting on changes to the Building Regulations Part L (Conservation of fuel and power) as well as Part F (Ventilation).

The consultation has been in two stages, which have produced two key documents: the *Future Homes Standard* and the *Future Buildings Standard*. While they largely deal separately with domestic and non-domestic buildings, there is some overlap so it is best to consider them as a whole.

Stage 1: The Future Homes Standard[8]

Government published its response to the consultation on changes to Building Regulations Part L and Part F for new dwellings of in January 2021. The document is titled *The Future Homes Standard* and it is a summary of government responses to industry feedback.

One of its most-widely reported proposals is to ban the installation of gas boilers in new homes from 2025. It will also require that new homes will be specifically designed for the use of low-temperature heating systems (such as heat pumps) and require "no further energy efficiency retrofit work" to become zero carbon.

Homes built to the new standard will have CO_2 emissions at least 75% lower than homes built to current standards. Government has stated its intention to produce a full technical specification for the *Future Homes Standard* by 2023.

However, in the meantime, there will be an "interim uplift" in Part L regulations for new homes which are due to be introduced in 2022. From that time new homes will be expected to produced 31% less CO_2 emissions compared to current standards.

Date	Action
January 2021	Publication of The Future Homes Standard
June 2022	Interim Part L, Part F and Overheating Regulations for domestic and non-domestic buildings come into effect
Summer 2022 to 2024	Sector-specific guidance and technical specification for the Future Homes Standard developed
Spring 2023	Technical consultation on proposed specification for the Future Homes Standard
2024	Part L FHS regulations made
2025	Part L FHS regulations come into effect

(From Future Homes Standard 2019, page 23)

The Future Homes Standard focuses on proposed regulation changes for new dwellings. However, The *Future Buildings Standard (see next section)* also touches on domestic buildings, and points to a general proposal for: "Improvements to standards when work is carried out in existing homes."

Policies and regulations

Stage 2: The Future Buildings Standard[9]

This document is a consultation which launched in January 2021 and closed in April 2021. As of July 2021, Government has not yet produced its response.

The *Future Buildings Standard* deals with new and existing non-domestic buildings alongside some aspects of new and existing dwellings. It builds on the work done for The *Future Homes Standard* and completes the consultation on Parts L and F of the Building Regulations for non-domestic buildings and dwellings.

One of the important overarching proposals raised in the *Future Buildings Standard* is an interim uplift of Part L and Part F standards for new and existing non-domestic buildings (Section 3). The aim is to encourage the industry to develop lower-carbon buildings as soon as possible and to prepare for more stringent carbon reduction requirements in the updated regulations.

The government's preferred option is for an interim Part L that delivers a 27% reduction in carbon emissions on average per non-domestic building compared to the current standard The alternative is a slightly lower figure of a 22% required reduction in carbon emissions. A decision is expected towards the end of 2021 (Section 3.4.4).

It is important to note that this consultation document sets out a 'high level vision' for The *Future Buildings Standard*. Before a new Standard for non-dwellings is introduced, there will be a further technical consultation on how that vision can be delivered, including what metrics should be used and an assessment of associated costs and impacts.

The points below highlight other key proposals in this consultation that may have an impact on building services design, installation and operation.

Proposals for new buildings - non-domestic

- There is an expectation that the higher carbon reduction and primary energy targets will lead to a phase out of fossil-fuels in non-domestic buildings (Section 2.3.2).
- Buildings constructed to the *Future Buildings Standard* will need to use low-carbon heating and hot water systems to meet its carbon and primary energy targets (Section 2.3.3). These include heat pumps and heat networks.
- The Standard recognises that with regard to building fabric, high levels of insulation can cause more problems than they solve, including leading to higher overall building energy use. The proposal is that designers will be required to 'seek the right specifications' (Section 2.3.8).
- Proposed performance metrics for new non-domestic buildings are: primary energy target, CO_2 emission target, and minimum standards for fabric and fixed building services. These metrics would also apply in the case of the proposed interim Part L uplift (Section 3.5.3).
- An update to the National Calculation Methodology is also proposed (Section 3.6.3). This includes reducing the number of notional building space heating types to reflect the switch to low carbon heating. And the proposed CO_2 emission factor for electricity is now lower than for fossil fuels.

Policies and regulations

- The consultation recognises the importance of building controls for energy efficiency. While controls are included in the current Part L of the Building Regulations, they are not provided for in any great detail. The Future Buildings Standard consultation raises the proposal of a requirement to install a Class A control system as defined by BS EN 15232[10], "on the understanding that this is the necessary specification to meet ISO 16484[11]" (Section 3.10.17).

- Another important proposal is to extend the commissioning requirements and make them much clearer by providing a dedicated section in the updated Part L. This reflects government's view that high performing services in buildings can only be effective if the services are "tested and adjusted properly after installation."

  The proposed update will include a legal requirement with guidance on how to meet the regulations. The consultation document notes: "We also propose to expand guidance on commissioning by referencing specific commissioning guidance beyond the currently reference CIBSE Guide M" (Section 3.10.18).

- There is proposed guidance on sizing and controls for building services systems. The problems of over-sizing all equipment is well-known in the industry and the new proposed rules would help to alleviate these issues (Section 3.10.23).

- Reflecting the proposed changes for new homes, the Future Buildings Document proposes that wet space heating systems in new non-domestic buildings are designed to operate with a flow rate temperature of 55ºC or lower in the final heating circuit (Section 3.10.26).

- It is proposed that all supply and extract systems should have heat recovery where technically feasible (Section 3.10.4).

Proposals for existing buildings - non-domestic

Many of the proposed updates for changes to regulations on existing non-domestic buildings are the same as those for new buildings. This reflects the need to upgrade our current building stock to ensure the net zero carbon target can be achieved.

- If fixed building services are being replaced in an existing non-domestic building, and this involves a change of fuel being used, it is proposed that the new services should not emit higher CO_2 than those being replaced. Furthermore, the proposal is that the new equipment should not have higher primary energy demand than the service being replaced (Section 3.11.1).
- It is proposed that when a building automation and control system (BACS) is installed in an existing building with a heating or air conditioning system over 290kW, it should meet the same proposed standards required in a new non-domestic building (3.11.4).
- Similarly, the proposed changes to commissioning new non-domestic buildings would also apply to existing buildings. Also, the Standard proposes to introduce requirements for when work is carried out on a building services system, or a new system is installed in an existing non-domestic building. This would require the installer to provide information on the energy performance of the new equipment (Section 3.11.16).
- If a whole wet space heating system is replaced in an existing non-domestic building, it must be designed to operate at 55ºC. This update includes the heat appliance and emitters. The aim is to ensure that the building is prepared for low-carbon heating systems such as heat pumps or district heating (Section 3.11.18).

Policies and regulations

Proposals for new dwellings (not covered in the Future Homes Standard)

- Preparing homes to cope with higher temperatures in the UK is an important aspect addressed in this document. Government has identified overheating as a critical health risk, with around 2,000 heat-related deaths each year in England and Wales. This number is expected to triple to over 7,000 annual deaths by 2050 as a result of climate change (Section 1.2.2).
- Fabric Energy Efficiency Standard - this continues from the *Future Homes Standard* and includes guidance on the calibration of equipment for carrying out air tightness testing on new homes (Section 1.4.2).
- For building services in new and existing homes, the proposal is to change the minimum SCOP (seasonal coefficient of performance). This would be a minimum SCOP of 3.0 for heating and 2.0 for domestic hot water. For cooling systems, the proposed SEER (seasonal energy efficiency ratio) is 4.0.
- For supply and extract ventilation systems in new and existing homes, the proposed requirement is heat recovery at a minimum of 73% efficiency. Packaged systems would also be required to include a summer bypass and variable speed controller (Section 6.7.5).

Proposals for existing dwellings

- The consultation highlights the importance of decarbonising existing homes, "where there are cost-effective, practical and safe opportunities to do so" (Section 1.1.3).
- There are proposed uplifts in energy and ventilation standards when work is done to existing homes (Section 1.4.9).
- These are accompanied by proposed new minimum standards for new and replacement thermal elements, windows and doors in existing homes (Section 6.3).
- While the drive to low-carbon domestic heating is a priority, The *Future Buildings Standard* recognises that fitting heat pumps, for example, into poorly-insulated homes is not energy efficient, or practical for homeowners. The proposal is to use the SAP method of compliance for a new extension on an existing dwelling, evaluating the CO_2 emissions, as well as the primary energy and the fabric energy of the proposed home plus notional extension (Section 6.3.6). Full details of this can be found in Approved Document L, Volume 1: Dwellings.
- The *Future Buildings Standard* (Section 6.6.2) states that it will not alter the timing of when the rule of consequential improvements' applies, adding: "Improving the energy efficiency of the existing housing stock will be the subject of other government consultations."

Beyond Parts L and F of the Building Regulations, the government is also setting out other consultations and future policies. One of these is the BEIS strategy on heating in homes and other buildings.

As previously noted, one of the most challenging elements of the net zero journey will be to decarbonise the UK's heating which currently relies heavily on natural gas. BEIS is due to set out a Heat Policy Roadmap some time in 2021 which will clarify how government proposes to tackle the issue and encourage greater take up of low-carbon heating technologies by consumers and businesses.

The Net Zero future - whole life carbon

The CCC continuously researches methods and approaches for reducing UK GHG emissions. It is therefore useful to be aware of some other potential targets that the CCC has highlighted for the construction industry.

One of these is whole life carbon disclosure for buildings, sometimes referred to as embodied carbon. It was a point raised in the CCC's June 2020 report, *Reducing UK emissions: Progress report to Parliament*[12]. The recommendation was to: "support the assessment and benchmarking of whole-life carbon in buildings". This was alongside a further recommendation to rapidly scale up the levels of wood used in construction.

In its response to the CCC, the government recognised that it does not currently "assess or benchmark" the embodied carbon of buildings. However, the principles behind embodied carbon assessment are not unknown to the construction industry. For example, the new *London Plan*[13] has recognised the significance of embodied carbon in the built environment. The Plan requires the disclosure of a whole life carbon calculation for major projects in the city.

This is important for the building services sector because building services equipment can represent a significant embodied carbon impact in new buildings and retrofit projects. The CCC produced a briefing document on *The potential of product standards to address industrial emissions*[14] which addresses the challenge of how to measure the whole life carbon footprint of manufactured products.

At the present time, it may be possible to access Environmental Product Declarations (EPDs) for some products in the construction sector, although they are not currently widely available. Standards for EPDs are set by organisations such as ISO and measure the emissions across the life-cycle of a product, including the manufacturer's supply chain.

The CCC suggests a number of possible approaches to setting standards for whole life carbon in products. For example, setting a "carbon cap" benchmark for a product type which could be voluntary or mandatory. Alternatively there are "non-carbon" measures which may not directly address carbon, but if adhered to would result in lower carbon emissions. An example of this is the Ecodesign standard which might be updated to require use of recycled materials or low-carbon fuels in the manufacturing process.

The development of whole life carbon product certification would involve detailed input from manufacturers. It is also likely to impact the design of HVAC products, as manufacturers seek to address the embodied carbon of their products, particularly in terms of materials used, packaging, recyclability and manufacturing locations.

However, the CCC also points out that some of the burden is likely to fall to specifiers and building owners who would have to demonstrate their compliance with the requirements on embodied carbon disclosure when purchasing equipment.

CIBSE publication TM65: *Embodied carbon in building services: A calculation methodology*[15] provides guidance on how to use EPDs for building services products, and how to estimate the embodied carbon of products when an EPD is not available. It also provides useful data capture and reporting forms.

The Net Zero Future - smart buildings and cities

The Climate Change Committee's Sixth Carbon Budget recognises that smart technologies such as digital optimisation, design and artificial intelligence (AI) will be important for the UK as the country switches to greater reliance on electricity. The Budget states that this "is an area where the UK already has prowess and will be increasingly important in a renewables-centric world".

As previously noted, one of the proposals for a new Part L of the Building Regulations is to introduce a more prescriptive requirement for building controls. This proposal indicates the growing importance of technology in delivering buildings that are efficient and low-carbon not only in design but also in operation.

Another important aspect of controls is that they allow for closer monitoring of building performance, leading to more effective operation. Data collection and analysis is a crucial element of efficient building operation, ensuring that buildings are equipped with this capability is key to success.

For building services, the application of technology gives engineers the opportunity to use energy in buildings intelligently. For example, heat produced as a by-product of cooling in an office could be used to provide hot water in nearby residential area.

These projects are already happening in cities where mixed-use developments are becoming more common and are known as 'energy loops'. They can harness 'free' heat energy from natural sources such as rivers, or from heat ejected from cooling systems. Using heat pump technology, this low-grade energy is boosted to deliver space heating or to support domestic hot water production. Similarly, it is possible to use waste heat from an industrial process to provide a boost to hot water for a hospital, saving significant amounts of energy.

There is no doubt that if we are to achieve Net Zero by 2050, then we have to harness as many technologies and techniques as possible. This not only involves not using fossil fuels for heating, but also re-using heat energy wherever possible to reduce energy demand.

Conclusion

If the UK is to reach its goal of net zero emissions by 2050, the built environment has to be a target for change.

The UK has made a strong commitment to the continued 'greening' of its electricity grid, taking us towards an electric economy. The government has set a clear intention to end our reliance on fossil fuels for heating and hot water, which will be one of the biggest challenges we have to tackle in the next decade.

A growing number of high-profile businesses have made commitments to sustainable operations, with many aiming for their own net zero operations. For example, the global Mitsubishi Electric Corporation has developed its Environmental Vision 2050 to achieve net zero by that year, with the corporate aim of: **"Protecting the air, land and water with our hearts and technologies to sustain a better future for all."**

In pursuit of that goal, we have submitted our reduction targets to Science Based Targets Initiative (SBTi)[16]. This organisation enables corporations to make a public commitment to emissions reductions targets which are backed by science-based criteria.

As a result of this growing environmental activity, contractors and engineers face the challenge of balancing the net zero goals of clients with other factors such as indoor air quality; occupant health and comfort; and of course cost.

The technologies to achieve this are in place. For example, heat pumps and renewable heat networks are tried-and-tested now, with many successful examples operating in dwellings and non-domestic buildings. Mechanical ventilation with heat recovery offers a balance of good indoor air quality and energy efficiency.

It is to be hoped that solutions that were once the preserve of 'sustainable' construction projects enter the mainstream and are applied widely. Building services professionals have unique insights into delivering energy efficient solutions. The next decade should provide plenty of opportunity for them to share their knowledge for the greater good.

What do we mean by 'net zero' emissions?

The UK's greenhouse gas emission target is net zero - not gross zero. A gross target would require a total eradication of all GHG emissions, which is regarded as impossible to achieve. As the Institute for Government (IfG)* states: "A net zero target recognises that there will still be some emissions but that these need to be fully offset."

Offsetting carbon is one of the main thrusts of the UK government policy. Research is underway to investigate both natural carbon sinks (e.g. forests and seas) as well as man-made carbon sinks to boost the removal of carbon. But reducing the UK's emissions is still key to achieving net zero. As the IfG points out: "When the amount of carbon emissions produced are cancelled out by the amount removed, the UK will be a net-zero emitter. The lower the emissions, the easier this becomes."

(*Institute for Government (on the net zero target):
https://www.instituteforgovernment.org.uk/explainers/net-zero-target

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   https://library.mitsubishielectric.co.uk/pdf/book/Issue_71_Commercial_Renewable_Heating#page-1
8. **The Future Homes Standard**
   https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings
9. **The Future Buildings Standard**
   https://www.gov.uk/government/consultations/the-future-buildings-standard
10. **BS EN 15232: Energy performance of Buildings. Impact of Building Automation, Controls and Building Management**
    https://shop.bsigroup.com/ProductDetail?pid=000000000030331529
11. **ISO16484-5:2017 Building automation and control systems (BACS) Part 5: Data communications protocol**
    https://www.iso.org/standard/71935.html
12. **CCC Reducing UK emissions: Progress report to Parliament (June 2020)**
    https://www.theccc.org.uk/publication/reducing-uk-emissions-2020-progress-report-to-parliament/
13. **The London Plan 2021**
    https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021
14. **CCC briefing document: The potential of product standards to address industrial emissions**
    https://www.theccc.org.uk/publication/the-potential-of-product-standards-to-address- industrial-emissions/
15. **CIBSE TM65: Embodied carbon in building services: A calculation methodology (PDF format free to members)**
    https://cibse.org/
16. **Science Based Targets Initiative (SBTi)**
    https://sciencebasedtargets.org/

To receive a CPD seminar on ‘The UK Net Zero 2050 roadmap and the built environment’, 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 **livingenvironmentalsystems@meuk.mee.com**

Further information

Regional Sales Offices, please call one of the numbers below:

Birmingham
Tel: 0121 329 1970

Bristol
Tel: 01454 202050

Wakefield
Tel: 01924 241120

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Tel: 01506 444960

Manchester
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London South Region
Tel: 01737 387170

London North Region and East Anglia
Tel: 01707 282480

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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric’s air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of October 2021

Green Gateway greengateway.mitsubishielectric.co.uk