Energy Efficiency in Developments

Supplementary Planning Guidance

April 2025

Fermanagh & Omagh
District Council
Comhairle Ceantair
Fhear Manach agus na hÓmaí

1. Introduction

1.1 The purpose of this Supplementary Planning Guidance (SPG) is to provide advice and guidance, including examples and good practice in relation to achieving energy efficiency in development projects within the district. This should assist applicants in deciding what measures can be incorporated into their scheme and demonstrate that the scheme is energy efficient. Demonstrating energy efficiency is not limited to the construction of new buildings or retrofitting existing buildings, it may equally apply to applications that do not contain any buildings or which involve a change of use. It is also important to consider energy efficiency in terms of the entire development and the entire life cycle of a development including the embodied carbon within developments. How these matters will be addressed will call for a case by case analysis which reflects on the facts of the particular application.

1.2 It is important to recognise that the planning system has an important role to play in the delivery of energy efficient developments. Energy efficiency is not solely the purview of the building control regime. Many important decisions which influence energy efficiency are decisions which the planning system has some influence over. Whilst there is no universal approach to energy efficiency, it is important that all applications address energy efficiency consistently with the requirements of the Plan Strategy. The need for energy efficiency must be considered alongside other material considerations when designing a scheme.

1.3 The document will outline why there is a need to reduce the carbon emissions and why climate change is such a concerning issue globally and within the Fermanagh and Omagh District Council (FODC) area. This document is intended for use by developers, the public and Planning Officers.

1.4 SPG represents planning guidance which supports, clarifies and/or illustrates by example policies included within the Fermanagh and Omagh Local Development Plan – Plan Strategy. The information set out in this SPG should therefore be read in conjunction with the Local Development Plan (LDP) Plan Strategy and the Local Policies Plan (LPP), upon adoption. In addition to the policy approach set out within the Plan Strategy, applications will be expected to comply with local policies and/or key site requirements within the LPP. Copies of the LDP Plan Strategy are available online or from the Planning Department. The SPG is a material consideration in the determination of planning applications.

1.5 This SPG, in conjunction with the Solar Farms and Sustainable Drainage Systems (SUDs) SPGs, forms part of the Council's efforts to support the achievement of net zero, build climate resilience and grow a sustainable economy to achieve a truly sustainable district.

1.6 The Pre-application Advice or Discussion (PAD) stage is the appropriate time for developers/applicants to discuss queries relating to achieving energy efficiency in developments. This should act to frontload the planning application and result in a speedier planning decision. This SPG should be read in conjunction with the Council's other advice guides and protocols, including the Validation Checklist, Applicant/Agent Protocol – A Good Practice Guide and the Pre-Application Discussion advice and guidance.

1.7 This SPG has been developed with input from Queens University, Belfast and the Council's Climate Change and Sustainable Development Officers.

1.8 Appendix 1 of this SPG, provides a good practice template that the Council would encourage applicants and developers to use, when preparing supporting statements in relation to energy and resource efficiency. This template will assist applicants and developers to provide an appropriate and proportionate level of detail and to clearly demonstrate that the proposal is energy and resource efficient in accordance with relevant policies within the Fermanagh and Omagh District Council Local Development Plan – Plan Strategy.

2. Background to Climate Change and Energy Efficiency

2.1 Climate change is the long-term shift in average weather patterns across the world. Since the mid-1800s, humans have contributed to the release of carbon dioxide and other greenhouse gases into the air causing global temperatures to rise, resulting in long-term changes to the climate. Climate change is one of the most critical and challenging issues facing the world today. To tackle this issue there needs to be significant efforts made to implement methods which will aid adaptation and mitigation measures and a multi-stakeholder approach is required.

2.2 The Built Environment is a significant contributor to climate change and buildings are accountable for 35% of total global energy consumption. The energy used to operate, heat and cool buildings is the largest contributor to carbon emissions, with the majority of this coming from heating and cooling demand. The construction industry has a significant role to play in reducing this figure to meet net zero targets and mitigate the worst of the climate crisis. (Source: Passivhaus Trust). It is much more cost-effective to save energy than it is to generate it. Therefore, it is essential that an efficiency first approach is integral in bringing forward proposed developments.

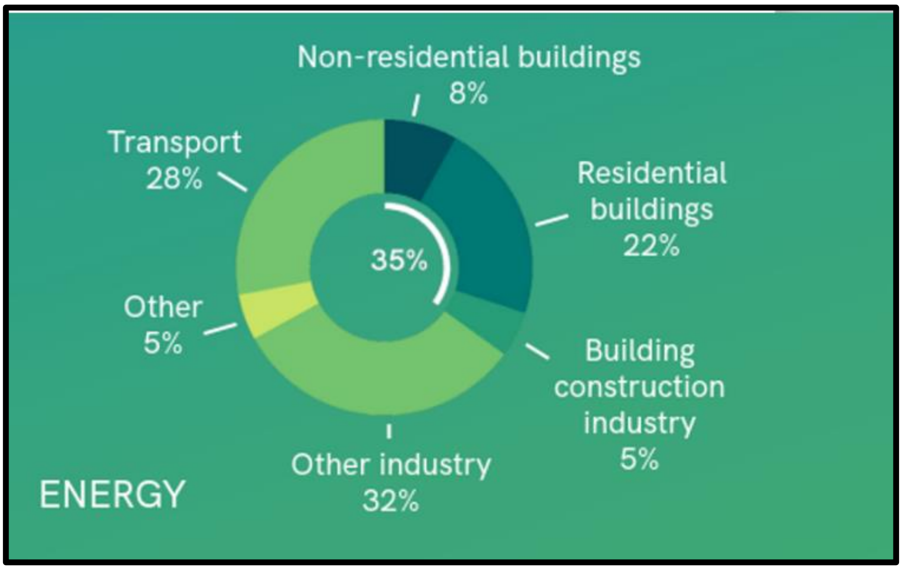

Figure 1: Global share of building and construction final energy, 2019 (Source Passivhaus Trust)

3. Planning Policy and Guidance Context

The Paris Agreement

3.1 The Paris Agreement was adopted by 196 parties in 2015 to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The agreement aims to substantially reduce global greenhouse gas emissions in an effort to limit the global temperature increase in this century to 2 degrees Celsius above preindustrial levels, while pursuing the means to limit the increase to 1.5 degrees.

The Climate Change Act (Northern Ireland) 2022

3.2 The Climate Change Act (NI) 2022 was introduced to set out a government requirement for a reduction in greenhouse gas emissions. The target for the Act is at least a 100% reduction in greenhouse gas emissions by 2050.

3.3 The Act also sets other sectoral targets including 2030 targets at least 80% of electricity consumption from renewable sources (DfE) and 70% of waste is recycled (DAERA) as well as a target for a minimum spend of 10% of overall transport budgets on active travel (DfI).

Regional Development Strategy (RDS) 2035

3.4 The RDS provides an overarching strategic planning framework to facilitate and guide the public and private sectors. Within the RDS there are eight aims listed, one of which is to ' take actions to reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality.' The strategy emphasises that 'it is important that Northern Ireland plays its part by reducing air pollution and greenhouse gas emissions and preparing for the impacts of climate change.' One of the mitigation recommendations is to improve the energy efficiency and adaptability of buildings. It notes that 'around 75% of the current building stock will be standing in 2050. Improvements should be made to buildings to minimise energy use and encourage zero carbon emissions, while ensuring that the character of buildings of architectural or historic interest is maintained.'

Strategic Planning Policy Statement (SPPS) for Northern Ireland

3.5 The SPPS highlights that a central challenge in furthering sustainable development is mitigating and adapting to climate change. This includes the need to reduce emissions of greenhouse gases which contribute to climate change and to respond to the impacts brought about by climate change.

3.6 Some of the methods the SPPS suggest the planning system should help mitigate and adapt to climate change include shaping new and existing developments in ways that reduce greenhouse gas emissions and positively build community resilience to problems such as extreme heat or flood risk and requiring the siting design and layout of all new development to limit likely greenhouse gas emissions and minimise resource and energy requirements.

Future Focused Review of the SPPS on the issue of Climate Change

3.7 At the time of writing DfI have a consultation open to seek views on the proposed areas of focus for a potential focused review of the SPPS and to invite the submission of evidence on the relevant factors which can assist in determining the best way forward. The information will then be considered by the Department and help inform any decision by an infrastructure minister on whether to initiate a formal review of the SPPS.

3.8 If a decision is taken to proceed with a review of the SPPS, the proposal is that this could seek to update and bring forward new and revised policy provisions on Climate Change in relation to the following areas:

- The Purpose of Planning,
- Furthering Sustainable Development (including Mitigating and Adapting to Climate Change and The Importance of Ecosystem Services), and
- The Core Planning Principles of the two-tier planning system.

3.9 A focused review could also encompass a fresh look at the appropriateness of extant policy provisions on flood risk, transportation, and development in the countryside.

Draft revised regional strategic planning policy on renewable and low carbon energy

3.10 On 6 April 2023, DfI published a draft revised policy consultation document for strategic planning policy on renewable and low carbon energy. The review aimed to ensure that the regional strategic policy on renewable and low carbon energy remains up to date and fit for purpose to inform decision-making. It is also intended to inform the local development plan (LDP) process and enable plan-makers to bring forward appropriate local polices for energy and climate emergency.

Fermanagh and Omagh District Council - Climate Change and Sustainable Development Strategy 2020-2030

3.11 The Strategy sets out practical steps to minimise climate change impacts on our day to day lives and to counter the severity of the Climate Emergency and commits FODC to becoming a net-zero district by 2042. It also outlines steps towards achievement of the United Nation’s seventeen Global Sustainable Development Goals by moving closer to building an inclusive, sustainable and resilient future for the population, environment and economy.

3.12 The Strategy recognises that local contributions are part of a complex challenge nationally and internationally and a central challenge in furthering sustainable development is mitigating and adapting to climate change. It acknowledges that the Council aims to do this through the policies, objectives and supporting text within the Local Development Plan Strategy. The Strategy identifies seven key areas where the planning system should help to mitigate and adapt to climate change such as shaping new and existing developments in ways that reduce greenhouse gas emissions, promoting sustainable patterns of development, including the sustainable re-use of historic buildings, where appropriate, requiring the siting, design and layout of all new development to limit likely greenhouse gas emissions and minimise resource and energy requirements and promoting the use of energy efficient, micro-generating and decentralised renewable energy systems.

Inclusive Economy Action Plan 2024-2029

3.13 The Council has also published an Inclusive Economy Action Plan 2024 – 2029 (April 2024), which gives an emissions reduction trajectory, while noting that ‘Neither the 5- or 10-year average reduction rates will be sufficient to meet Net Zero by 2050, and it is clear that a step change in performance is required if the targets are to be met.’

Fermanagh and Omagh District Council - Local Development Plan Policy Context

3.14 FODC Local Development Plan 2030 Plan Strategy was adopted on 16 March 2023. The Plan Strategy makes a commitment to furthering sustainable development and recognises that Planning has a key role to play in addressing the causes (through mitigation) of climate change and dealing with its effects (through adaptation). Many new developments will themselves result in increased carbon emissions however there are opportunities to minimise this through sustainably located and designed developments which utilise measures such as those for energy efficiency to reduce their impact.

3.15 Objective 14 of the Plan Strategy is to 'Follow the principles of sustainability and high quality design standards in all developments to assist with meeting Climate Change targets and place-making'. Policy SP01 states that 'The Council will permit development proposals which further sustainable development and promote measures to mitigate and adapt to climate change, and which have regard to the Local Development Plan' and Policy DE02 – 'Design Quality' states that Council will support development proposals which demonstrate a high quality built environment and meets a number of essential criteria, one of which is that buildings 'are energy and resource efficient and minimise their impact on the environment' (criterion k).

3.16 The Plan further emphasises that a development's impact on the environment can be minimised through adopting sustainable building practices, and by integrating renewable energy technology including micro-generation and Passive Solar Design (PSD) into their layout, siting and design to help achieve energy gains.

4. Net – Zero Building Standards & Certifications

Passivhaus

4.1 Passivhaus, which literally means passive house in English, refers to buildings created to rigorous energy efficient design standards so that they maintain an almost constant temperature.

4.2 The Passivhaus Institute in Germany has developed a wide range of energy efficient building principles and a Passivhaus building aims not to use as much energy in the first place by being effectively sealed against the elements, providing a high level of occupant comfort while using very little energy for heating and cooling. Passivhaus offers a number of solutions and approaches to delivering net zero in new and existing buildings.

4.3 Passivhaus adopts a whole-building approach with clear measured targets, focused on high-quality construction, certified through a quality assurance process. There are a number of different levels of certification that can be achieved through Passivhaus. For more information visit https://www.passivhaustrust.org.uk/

4.4 The Council would encourage applicants and developers to demonstrate Passivhaus standard. Where a development has been designed to meet this standard, this should be set out clearly in the supporting statement.

BREEAM (BRE Environmental Assessment Method)

4.5 BREEAM is used to specify and measure the sustainability performance of buildings, ensuring that projects meet sustainability goals and continue to perform optimally over time. BREEAM is an internationally recognised certification and a BREEAM assessment uses recognised measures of performance, which are set against established benchmarks, to evaluate a building's specification, design, construction and use. Each category focuses on the most influential factors, including reduced carbon emissions, low impact design, adaptation to climate change, ecological value and biodiversity protection. For more information visit https://bregroup.com/products/breeam/

4.6 The South West Regional College Erne Campus building in Enniskillen is the first UK building to achieve both Passivhaus Premium and BREEAM Outstanding accreditations. A case study on the Erne Campus is included below.

4.7 The Council would encourage applicants and developers to demonstrate BREEAM standard. Where a development has been designed to meet this standard, this should be set out clearly in the supporting statement.

5. Whole Life Cycle Approach

5.1 To understand and assess the impact of our built environment in terms of energy efficiency, the Council would encourage applicants and developers to consider the whole life cycle approach when bringing forward developments and outline how this has been considered as part of any supporting statement. This approach takes into account the entire life cycle of a building, including the extraction of raw materials, manufacturing, construction, operation, maintenance and end of life phases, and every effort made to reduce the whole life-cycle energy and resulting carbon emissions, both operational and embodied carbon. The retention of existing buildings could lead to significant carbon emissions reductions in a project, due to the embodied emissions within buildings, making their re-use often the most sustainable alternative.

Operational and Embodied Carbon

5.2 Operational carbon is the emissions associated with energy used to operate the building or in the operation of infrastructure such as hot water, heating and cooling, ventilation, light systems, equipment and lifts.

5.3 Embodied carbon refers to the emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure. This is typically associated with any processes, materials or products used to construct, maintain, repair, refurbish and repurpose a building. Embodied carbon from the construction and refurbishment of buildings currently makes up 20% of UK built environment emissions. (UK Green Building Council)

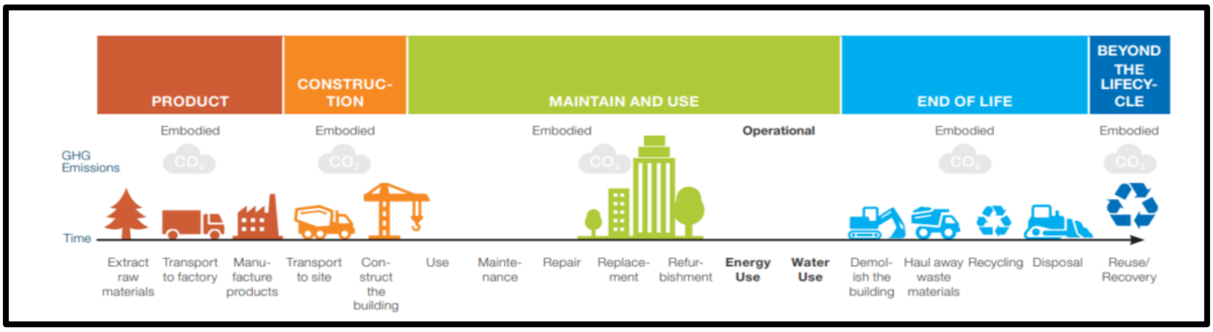

Figure 2. Embodied and operational carbon explained[1].

The Energy Hierarchy

5.4 The Energy Hierarchy is a classification of energy options for developers and consumers in relation to energy usage and sources and they appear in the order of priority in which they should be implemented, from most to the least sustainable and this hierarchy should inform the design, location, siting, construction and operation of new developments and buildings to reduce carbon emissions. In summary the premise of the Energy Hierarchy is to reduce your energy demand first, become more efficient and finally look to generate or use renewable energy. These options will reduce energy costs and provide quick wins in becoming more efficient and reducing carbon emissions. The Energy Hierarchy should be followed through the whole life cycle of a building, in the five stages as outlined below, from product and construction to end of life. The design guidance below will look at these key priority components in more detail.

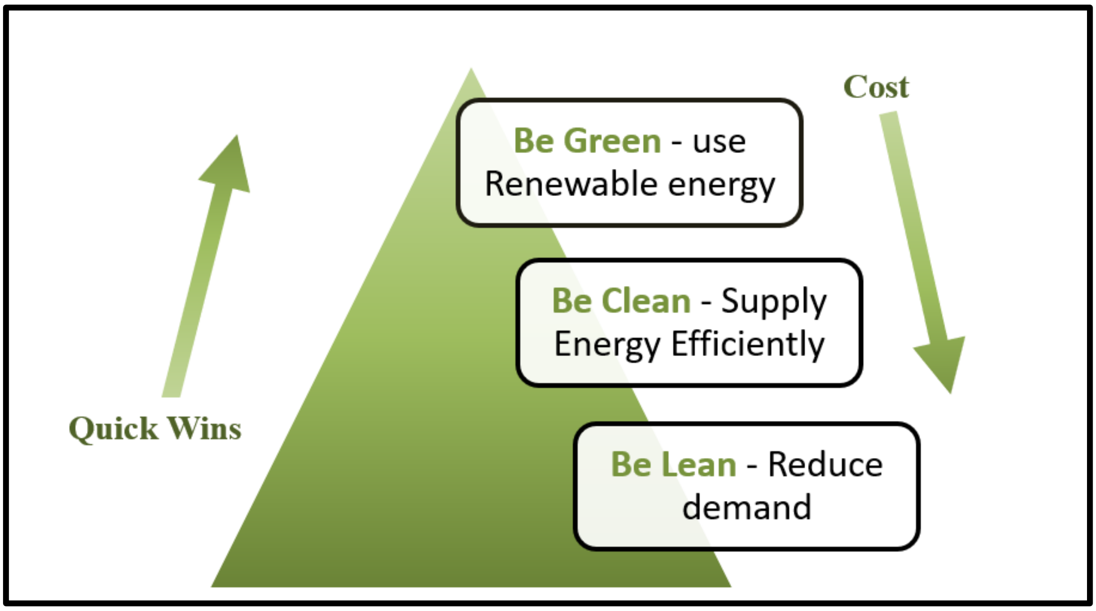

Figure 3. The Energy Hierarchy

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[1] https://newbuildings.org/code_policy/ (accessed April 2025)

6. The Five Stages of Development

6.1 This section will focus on bringing the three fundamental principles within the Energy Hierarchy, (Reducing demand, energy efficiency and use of renewable energy), into practice through the whole life cycle of development. The life cycle will be spilt into five key stages with an emphasis on achieving energy efficiency and reducing carbon emissions.

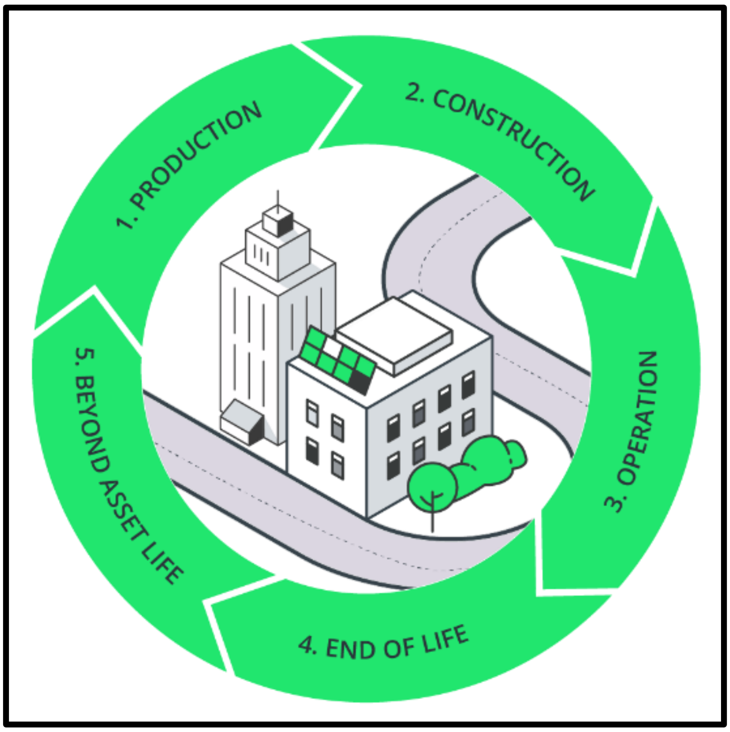

Figure 4. RICS Whole Life Carbon Assessment[2]

6.2 The Council will expect planning applications, including reserved matters submissions where relevant to be accompanied by a supporting statement which clearly demonstrates, in an appropriate and proportionate level of detail that the development is energy and resource efficient. The following guidance and good practice examples should assist applicants in deciding what measures can be incorporated into their scheme to demonstrate that the scheme is energy efficient.

6.3 The five stages of development, as outlined in the RICS Figure 4 above, is how the Council generally expects supporting statements to be laid out and presented when submitting an application. Any alternative approach should be justified by applicants.

[2] https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment.html (accessed April 2025)

Stage 1 – The Production Stage

6.4 At the production stage energy and resources are used to extract raw materials, transport the materials to production facility and production of the final building products. The extraction of raw materials to create building products uses energy and commonly result in carbon dioxide emissions, particularly for timber, metals and minerals. Mining and refinement of these materials also adds to carbon emissions. Concrete and steel are amongst the most widely used building materials in the UK and these materials are responsible for 15% of global carbon emissions. Reducing the use of these materials will impact on embodied carbon emissions.

6.5 Consideration should be given to the use of sustainable, low-carbon building materials such as low-carbon bricks, green concrete, green tiles and recycled metals. Where possible building materials should be locally sourced to reduce transportation. The re-use of buildings and materials such as reclaimed bricks and recycled aggregated will also contribute to reduction of carbon emissions.

Stage 2 - The Construction Stage

6.6 The construction stage involves the transportation of materials to the construction site as well as the energy used to power the construction equipment, to supply supporting construction materials, and to dispose of any waste generated during the construction process.

6.7 The carbon emissions during this stage comes from the transportation of materials to the site, often using carbon intensive methods of transport. Where possible locally sourced materials should be used to reduce delivery miles. Construction machinery on site is often heavy site machinery that operates at high temperatures and subsequently emit large quantities of Co2. Unfortunately, there are still limited zero carbon options for heavy plant machinery, but where possible greener construction equipment should be used, and the use of fossil fuel reduced by using renewable fuels.

6.8 Some building elements can be assembled off-site in a factory, such as pre-cast concrete floors and pre-assembled external walls. Off-site construction reduces energy use on-site and improves waste management, as products are manufactured and assembled in a more controlled environment.

6.9 Designing the building to minimise waste, ensuring accurate measurement of materials, minimising the risk of over-ordering and reducing the need to cut and re-size on site. Site lighting and site offices and staff facilities on site will also contribute to carbon emissions. Low carbon lighting and energy efficient site cabins are also encouraged.

Stage 3 – The Operation and Use Stage

6.10 This stage involves the impacts of occupying a building over its lifetime due to lighting, heating, water use, and any materials used for maintenance, repairs, and replacement. What follows is design guidance on how to reduce carbon emission and increase energy efficiency during this stage.

Sustainable Building Design & Operation

Orientation and Glazing ratio

6.11 A building orientation and glazing ratio is of vital importance to reducing energy demand. In the UK, the ideal building orientation for maximising energy efficiency and solar gain is typically south-facing, which allows the building to receive maximum sunlight throughout the day, especially during the winter months when the sun is lower in the sky. Buildings generally should be designed with larger windows on the southern side.

6.12 It is also recommended to minimise east and west facing windows as excessive exposure can lead to overheating in the morning or afternoon. The optimum glazing ratios for the UK climate are up to 25% glazed on the southern elevation, no more than 20% on the east/west elevations and as little as possible on the northern elevation. The diagram below shows the impact on space heating demand as the same building is rotated to place its originally south facing glazing in a northerly direction (Leti Guide, 2019)

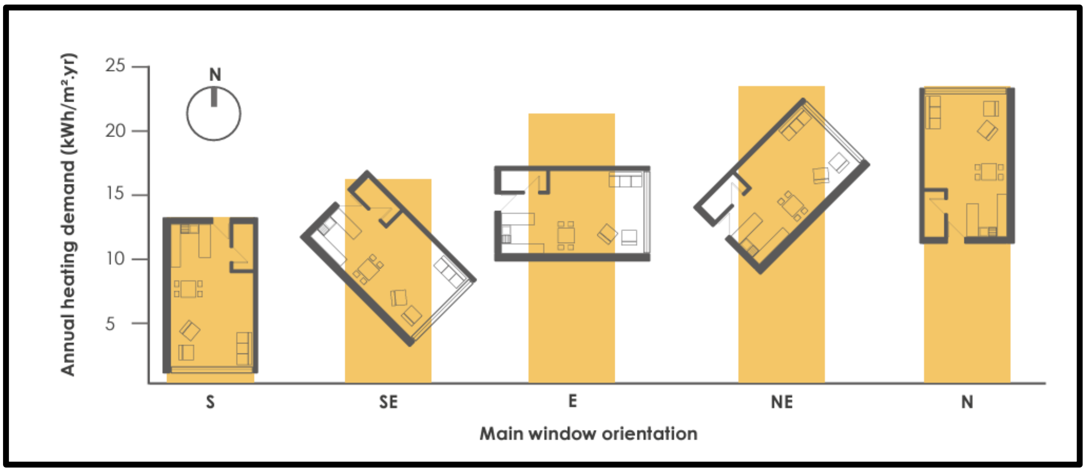

Figure 5: Why orientation is important (source: LETI Guide, 2019)

Internal Layout

6.13 The internal layout of a building should be arranged to maximise the benefits of solar gains by aligning the direction of solar gains with the time of day spaces are in use. Here in the UK in a domestic setting, rooms used in the early morning, such as kitchens, should generally be located towards the north-east, and those used more in the evening should generally be located more towards the west. The glazed area on these facades should also generally be increased to improve solar gains, although again care should be taken to avoid summer overheating, especially on the west facing façade. To reduce envelope heat loss still further, spaces which are not required to be heated to the same level as the main living spaces, (such as utility rooms and garages), should generally be located towards the north of the building. Such an arrangement would act as a thermal buffer for the rest of the rooms because the north façade receives far less useful solar gains.

6.14 Direct Solar Gain in the image below shows how solar energy enters through the south-facing glazing and is absorbed by the thermal mass and stored there during the day and later released into the living space and re-radiated and can maintain a comfortable temperature during cool nights. Direct sunlight entering through the glazing is less in the summer months, helping mitigate overheating in the summer months.

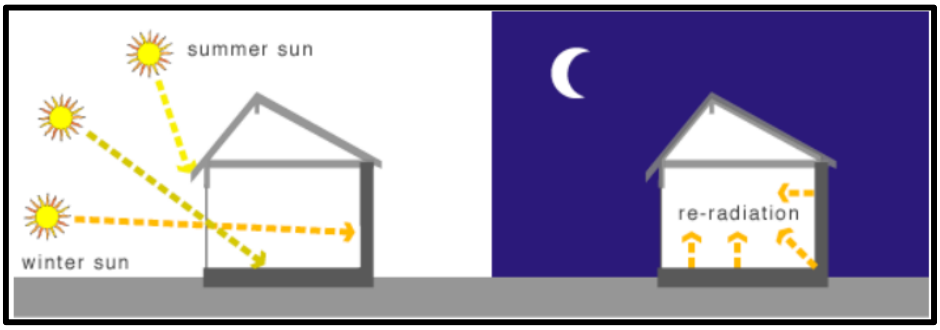

Figure 6: Direct Solar Gain

Building form

6.15 A building's form factor is the ratio of its external surface area to the internal floor area. The lower the ratio, the more efficient the building which lessens the energy demand. Careful consideration should be given to the building form, avoiding too many design features. The more stepped roofs, terraces and overhangs the higher the heat loss from the building. The type of building will also impact the form factor. A detached house of bungalow will have a much higher form factor and be less efficient that a mid-terrace house or a mid-floor apartment.

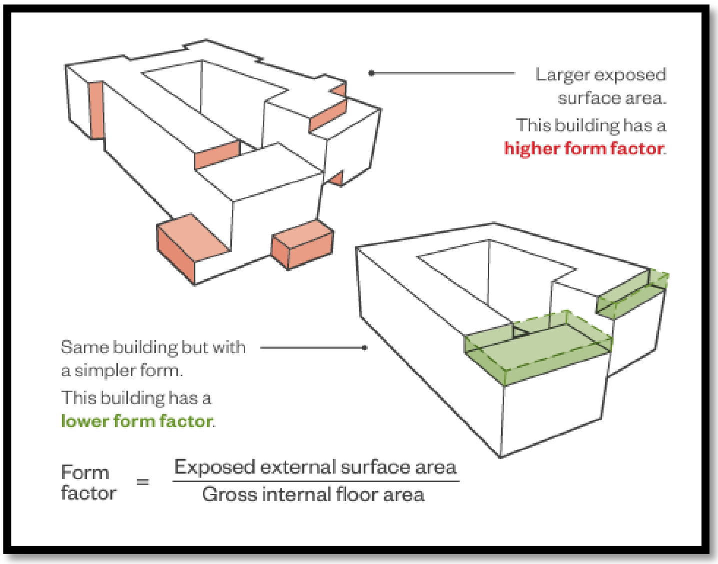

Figure 7: Building from factor – (Source: Levitt Bernstein)

Airtightness & Ventilation

6.16 'Build tight, ventilate right' is a long-standing energy efficiency mantra. Careful attention to airtightness and ventilation is key to keeping heating demand low and for thermal comfort and protecting a buildings structure from dampness and mould.

6.17 Airtightness is about eliminating all unintended gaps and cracks, holes, splits and tears where air can move into and out of conditioned space (i.e. heated or cooled space) of the building. Such gaps, cracks etc can account for up to 50% of all heat losses through the external envelope of a building, and can be caused by poor build, poor design, poor workmanship or the use of wrong or inappropriate materials. It is important to remember that an airtight building does not mean it is hermetically sealed, rather it means that unintended air leakage has been reduced to a minimum (passivehouseplus).

6.18 Simplicity is key in airtightness design. The fewer junctions, balconies, dormer roofs and other features, the simpler the airtightness design will be. Below are areas to consider within a building to increase the airtightness of a building:

- Form an airtight layer in the floors, walls and roof
- Seal the doors, windows and rooflights to the adjacent walls or roof
- Link the interfaces between walls and floor and between walls and roof, including around the perimeter of any intermediate floor
- Seal penetrations through the air barrier, including waste pipes & soil pipes, ventilation ducts, incoming water, gas, oil, electricity, data and district heating, chimneys and flues
(Source – Passivhaus)

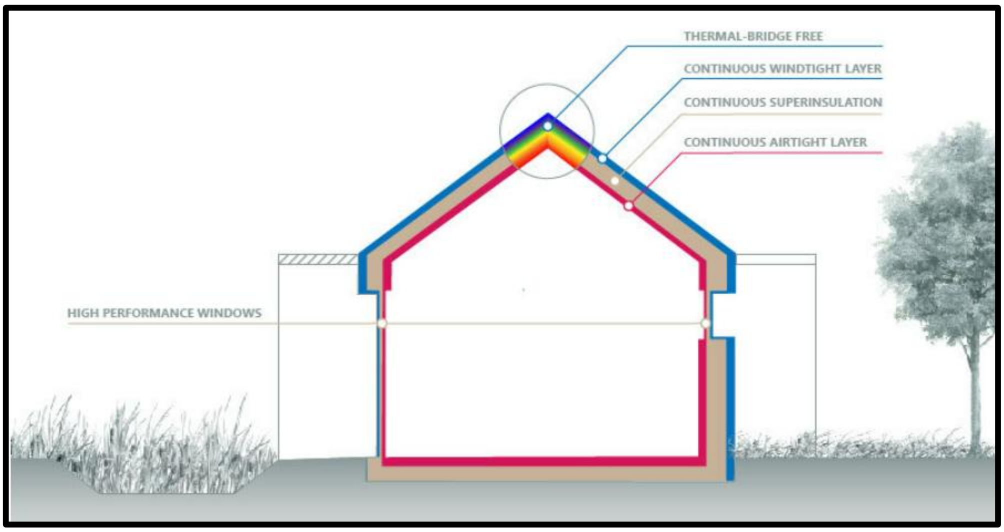

Figure 8: Achieving an airtight building: Source: Passivhaus

6.19 Ventilation is the intentional introduction of outdoor air into a building to maintain good air quality. Ventilation methods can be either natural (for example, windows) or mechanical. The key to managing ventilation in new dwellings is being in control of where, when and how air flows through a building. This starts with very good airtightness, to limit any uncontrolled infiltration.

Natural ventilation

6.20 Implementing natural ventilation in buildings is a sustainable strategy to enhance energy efficiency. It involves using natural air flow to regulate the indoor air temperature, through windows and vents. Incorporating natural ventilation requires careful design considerations, such as building orientation and window placement to optimise air flow.

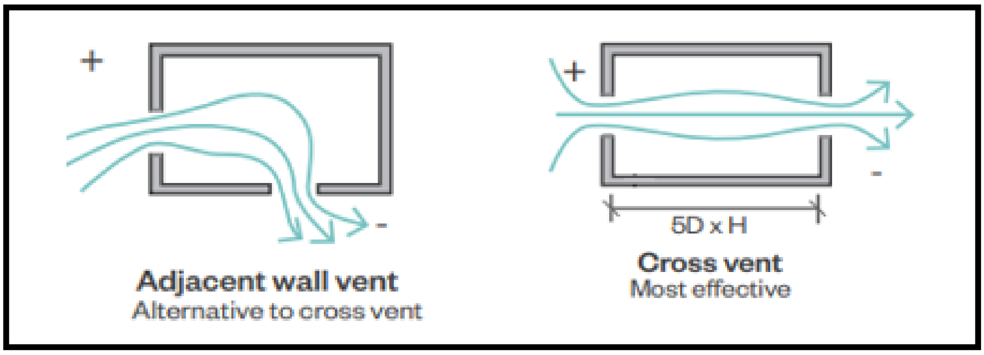

Fig 9. Natural Ventilation (Source: Levitt Bernstein).

6.21 All habitable rooms should have openable windows. Windows in dual aspect homes allow for cross ventilation, which is the most effective form of natural ventilation, particularly when windows are on opposite sides. This should always be the preference. Single aspect homes are the least effective at ventilating and are at risk of overheating. Rooms should have multiple openings of different sizes so that the environment can be controlled.

Mechanical Ventilation and Heat recovery

6.22 Mechanical ventilation with heat recovery (MVHR) combine the various extract fan functions in a home with a small heat exchanger. These systems extract stale air from living spaces, such as kitchens, bathrooms and utility rooms, and recover the heat energy within them. This moist air is then sent through a heat exchanger which keeps the heat and transfers it into the incoming fresh air which is then used to heat the home. The same works with cooling, the heat is extracted from the home and removed from the property. These systems can include a heat pump which will help the heating of a property if required. For MVHR systems to be effective, the home must be airtight.

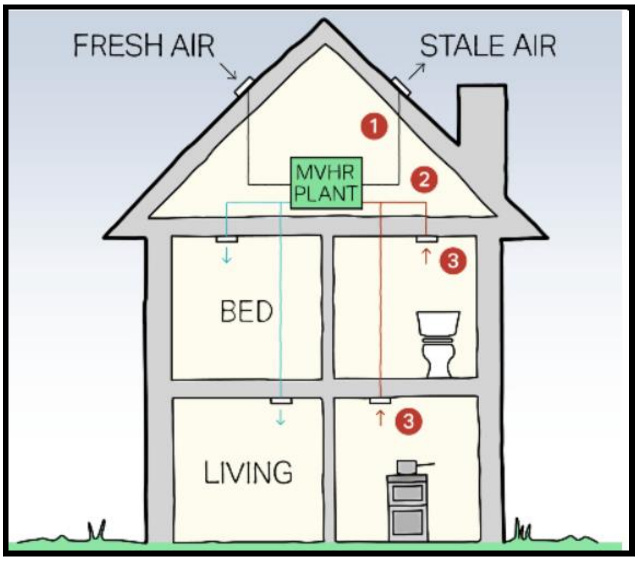

Figure 10: MVHR (Source www.bathnes.gov.uk)

Avoid overheating

6.23 As mentioned above in relation to glazing and orientation, large south facing glazed and less glazing in on east/west orientations areas can help keep a building cooler in the summer months.

6.24 Using materials with a high thermal mass, will help absorb, store and release heat. Heavy construction materials such as concrete, brick and stone have the preferable properties to store heat and allow for a good level of thermal mass. On a warm summer day, the thermal mass (floors, walls and ceilings made of dense materials), will absorb the heat at their surface, storing it until it is exposed to cooler air later on in the day and at night.

6.25 Carefully designed shading measures can also be used such as balconies, roof overhangs, blinds and shutters and trees and vegetation.

6.26 Natural ventilation will also help regulate the temperature within a building.

Urban heat island effect

6.27 The urban heat island (UHI) effect is a phenomenon describing the elevated temperatures felt in towns and cities compared to rural surroundings and particularly felt at night-time as the heat retained by artificial surfaces is slowly released, keeping temperatures higher than in the countryside. To reduce this effect in sufficient space between buildings in urban areas. Tree planting can providing shading and green spaces should be incorporated into development to allow for cooling. The use of green roofs can also help cool and shade buildings.

Design for adaptability and longevity

6.28 To reduce the long term carbon emissions of a building it should be constructed to be adaptable and easily modified to suit its changing requirements over time to lengthen the buildings life span. With a focus on the whole life span of a building, it is important to find a balance between creating a building that is highly energy efficient with low carbon emissions and creating a building that is highly adaptable and will last for many generations. Consideration should be given to whether short-term carbon savings could potentially be detrimental to the long term futureproofing of a building. The carbon implications of demolition and rebuild will likely outweigh the over-investments of material required at initial construction.

Circular economy approach

6.29 Naturally derived materials generally have a lower embodied energy content. The use of plastics and other synthetic materials should be minimised and locally sourced materials are the preference in most cases. The distance from which materials are sourced and therefore the impact of their transportation should be factored into in material choice.

Lighting

6.30 Lighting in both domestic and commercial buildings requires a substantial amount of electricity and installing the correct lighting can reduce the buildings carbon footprint and also reduce consumer bills and improve how a building functions**.**

6.31 Buildings should be designed to avail of maximum solar gain throughout the day and by installing the most energy efficient lighting which will meet the requirements for the intended use. This will involve providing the correct amount of light in a specific place at the desired time and can be done in a number of ways;

Natural Light

6.32 Homes can be designed to make the most of the natural daylight available through clever architectural design in a number of ways including skylights, sun pipes, glass roof tiles, roof lanterns, clerestory windows, glazed gables, glass doors, open tread staircases & fanlights.

Artificial Lighting

6.33 Artificial lighting is typically responsible for between 11% of a buildings energy use (Energy Saving Trust). The need for it cannot be eliminated, however money can be saved and carbon emissions reduced by using energy efficient lighting, with LED lighting being the most efficient form. According to the Energy Saving Trust simply replacing all the bulbs in your home with LED lights, carbon dioxide emissions in the home could be reduced by up to 50kg a year.

Smart Lighting

6.34 Smart lighting is lighting that can be controlled from a smartphone or tablet. It can be used both indoors and outdoors and in a number of different ways such as dimmers, motion sensors, geo fencing and timers. These use LED lighting which can reduce the amount of energy used for lighting within a building and ensuring that lighting is only used when and where it is needed.

Insulation

6.35 Insulation should be considered early in the design stage of a house. Insulating a house can save money and reduce the carbon footprint. The following should be considered:

Roof /Loft - Loft insulation is essential as up to one quarter of the heat in a home can be lost through the roof (Energy saving trust). Lofts are usually insulated with rolls of mineral wool insulation and can be added to new and older houses. This can result in energy efficiency savings for the household and reduce the carbon footprint. However, it is essential that there is adequate ventilation and in older houses additional vents may need to be installed (Energy saving trust – roof and loft insulation).

Walls - Walls make up between 20 and 25% of a home and by insulating properly it will improve the comfort level, reduce moisture and reduce household bills. There are two types of walls, solid and cavity wall. Solid wall homes tend to be older but can still be insulated either by fixing insulation on the outside or inside of the walls. The type chosen will depend on cost and if there are other works planned to your home. Cavity wall insulation can be added to a new or existing dwelling by drilling holes into the outside wall and then injecting insulation and sealing the holes.

Windows - these should generally be double or triple glazed, as these are more energy efficient. This will reduce dampness and condensation and the amount of heat lost from a room and also reduce household bills.

Floors - newer houses tend to have concrete ground floors. Insulation can be added during construction which is an effective way of improving energy efficiency or to older houses when renovated as insulation can be laid on top of the existing concrete.

6.36 Older homes tend to have suspended timber floors, these can be insulated by removing the floorboards and placing a mineral wool insulation between the joists and then replacing the floorboards. A newer technique involves spray foam insulation being added by a robot to the underside of the existing floorboards with the main benefit being avoiding the need to lift the floors in the house. (Energy Saving Trust)

Use of low carbon heat

Air Source Heat Pumps

6.37 An air source heat pump (ASHP) is able to heat and cool a building through recycling heat. Similar to a fridge but in reverse, an ASHP takes heat from outside air and transfers it to an internal heating system. This can be used for heating and hot water. Some heat pumps can reverse the system to provide a cooling function. The major benefit of heat pumps is their efficiency, defined as their Coefficient of Performance (CoP) which ranges from 2 to 4.5. They are also suitable for Northern Ireland Climate and can operate efficiently in temperatures as low *as -20°C*.

Ground Source Heat pumps

6.38 Ground Source Heat Pumps use the solar heat energy stored in the ground to provide heat and hot water for a home.

6.39 Heat pumps are considered the most efficient low carbon heat source keeping energy use to a minimum. The efficiency of a heat pump is governed by the source temperature, in this case either the air or the ground. The colder the source, the harder the heat pump must work. Air source heat pumps can generate up to three times more heat than the amount of electricity they consume. (Source UK Energy Support)

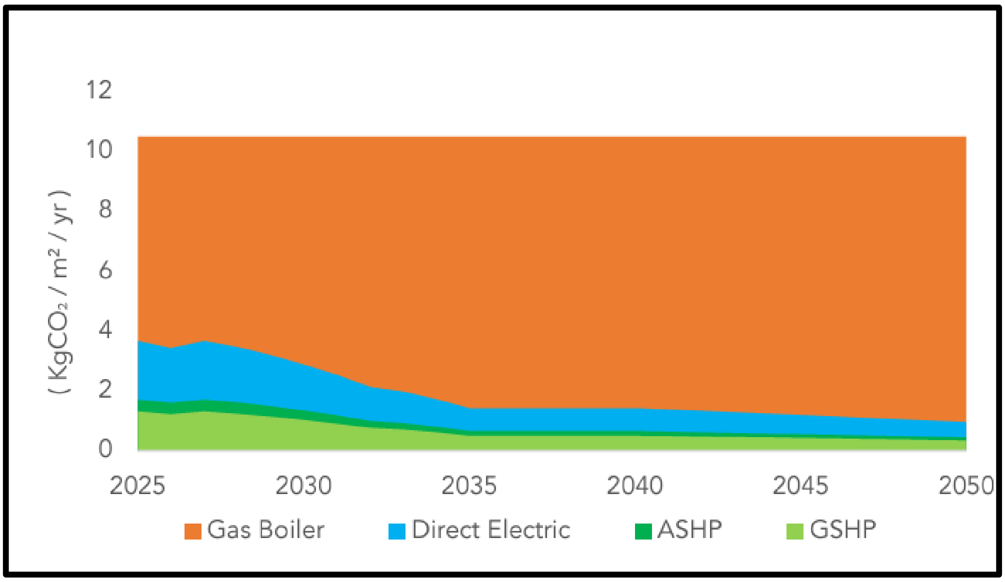

Figure 11: Comparison of carbon emission associated with various heating systems over for a typical home (Source: Cotswold Carbon Toolkit)

Use of Renewable Energy

Solar thermal panels

6.40 Solar thermal panels use energy from direct solar radiation to heat water for the building. Solar thermal system is considered to have efficiencies of between 70% and 80% however variations in sunlight hours and solar radiation leads to seasonal variations in the efficiency of solar thermal. They are most commonly installed on roofs but can be installed at ground level.

Photovoltaic (PV) panels

6.41 Photovoltaics (PV) capture solar radiation from the sun converting it into electrical energy. PV require daylight to work, however do not require direct sunlight and are typically located on south facing roof slopes, however can also be free-standing. They are a simple, mature and reliable renewable energy technology. They are a particularly good match for heat pumps, where much of the solar electricity can be used to provide heating and hot water and for electric vehicles, where the power generated can be used for transportation. On new buildings the roof design should be optimised to make best use of southerly aspects.

Biomass boilers / stoves

6.42 Biomass is a renewable energy source, generated from burning wood, plants and other organic matter, such as manure or household waste. The fuel source is burned in a similar manner to coal or gas in a bio boiler or in a standalone stove, however, unlike fossil fuels, bio-fuels absorb carbon dioxide as they grow, and this off-sets the CO2 emissions given off in its combustion, making them a low or zero carbon fuel source.

Combined heat and power

6.43 Combined heat and power (CHP) is a highly efficient process that captures and utilises the heat that is a by-product of the electricity generation process. By generating heat and power simultaneously, CHP can reduce carbon emissions by up to 30% compared to the separate means of conventional generation via a boiler and power station.

6.44 The heat generated during this process is supplied to an appropriately matched heat demand that would otherwise be met by a conventional boiler. Combined Heat and Power systems are highly efficient, making use of the heat which would otherwise be wasted when generating electrical or mechanical power. This allows heat requirements to be met that would otherwise require additional fuel to be burnt.

Energy Storage

6.45 An energy storage system allows heat or electricity to be captured when it is readily available, typically from a renewable energy system, such as Solar PV, and storing it for use later. The most common energy storage systems include electric batteries, heat batteries and thermal stores. Energy storage is useful for buildings that generate their own renewable energy, as it allows them to use more of their low carbon energy. A typical residential solar system without a battery will cover about 30%-50% of household power consumption. With a battery system, this can be increased to approximately 80% or 90% of household power consumption

District heating and cooling

6.46 District heating is about taking energy released as heat from a central energy sources and connecting to energy consumers through a system of highly insulated pipes. The structure is most widely used to fulfil heating and hot water requirements in apartment complexes. In the UK it is also being used in educational and commercial building. Currently just over 2% of UK home are connected to a district heating network but this figure is expected to increase in the future (Energy Saving Trust). District heating networks offer great potential for efficient, cost-effective and flexible large-scale use of low-carbon energy for heating.

Achieving Energy Efficiency through collaboration

6.47 The Enniskillen Workhouse and South West College Erne Campus are exemplars in this regard. The Workhouse has created an energy usage linkage with the adjoining campus. SWC Erne Campus is the first Passive House Premium project of any kind in the UK. The Workhouse uses excess energy generated by the campus, which is generated from their renewable energy systems. This thermal partnership demonstrates the power of collaboration between stakeholders and the potential synergies which can be obtained.

Stage 4 - End of life

6.48 This stage involves the demolition and disposal of the building as well as waste processing (if the building is not repurposed or improved for further occupancy or use). Embodied carbon emissions are heightened throughout this process if building materials are simply demolished, incinerated, or placed in landfill to decompose. In 2018, 138 million tonnes of waste were generated from construction, demolition and excavation in the UK; equivalent to 62% of the UK's total annual waste. (UK Statistics on Waste 2020). Rather than materials being sent to landfill the building should be deconstructed and materials re-used where possible. If materials cannot be reused they should be recycled.

Stage 5 - Beyond the life cycle

6.49 This stage looks at the benefits and potential reduction in carbon emissions beyond the life of the building from the reuse, recovery and recycling potential of a building or building products.

7 Other Climate Change Mitigation measures

Tree Planting & Biodiversity

7.1 Enhancing biodiversity and providing green and blue infrastructure is encouraged in new developments. It will help to increase the capacity of the environment to absorb CO2 emissions in the local area.

7.2 Trees can be used as natural windbreaks to protect buildings from prevailing winds, which can cause undesired cooling (but care should also be taken to prevent limitation of southerly solar access).

7.3 Green roofs, are roofs which are purposely fitted or cultivated with vegetation and can provide different habitats, affect storm-water runoff, and positively impact energy usage and thermal performance.

Electric Vehicles & Charging

7.4 Installing charge points during the construction phase of a new development is often far easier, cheaper and less disruptive than retrofitting charging infrastructure, benefitting future residents, occupiers, property managers and site owners. At the design stage, suitable locations for charge points within the site can be earmarked and the electricity demand can be factored into other grid connection costs, avoiding or reducing the need for expensive upgrades at a later date. Access to a charge point is an effective selling point for a property and a positive commercial decision long-term.

Retrofitting existing buildings

7.5 Globally 60% of raw materials, are used in the building sector. The Council seeks to encourage retrofitting measures to existing buildings to improve their energy and water efficiency and their adaptability to climate change. All development works to existing buildings should, where possible, consider improvements to the fabric, services and renewable energy generation in to minimise loss of embodied carbon.

Resource depletion can be minimised by:

- Using locally sourced materials
- Using materials found on site
- Minimising use of imported materials
- Use materials from sustainably managed renewable sources where possible, (e.g. timber)
- Use second hand/recycled materials where appropriate
- Re-use existing buildings and structures instead of assuming that new buildings are required

Retrofitting Historic buildings

7.6 Historic buildings present unique challenges and technical issues when implementing energy efficiency and retrofitting renewable and low carbon energy generation measures. Measures can be installed, but require more thought into the approach to energy efficiency in these buildings. Before considering the retrofit of a historic building, it is important to understand the building's age, construction (including materials) and location (including exposure, orientation and degree of sheltering).

7.7 According to British Standard BS 7913:2013: 'Guide to the Conservation of Historic Buildings, 'The most effective way of ensuring energy efficiency and sustainability is to keep historic buildings in good repair so that they last as long as possible, do not need replacement and do not suffer from avoidable decay that would require energy and carbon to rectify… Using natural ventilation and light, and proper temperature and humidity control for individual rooms are ways of minimising energy usage that respect the building's material characteristics.' (BS 7913:2013 Section 5.3.1).

8 Case Studies

South West College, Erne Campus

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Figure 12. - South West College - Erne Campus

8.1 South West College's Erne campus in Enniskillen is an 8,200m² building and is the world's largest passive house premium building and the first educational building to be certified to this standard. The building generates four times more energy on site than it uses. The completed Erne Campus embodies best practice for public buildings, particularly in regards to the reduction of carbon emissions.

8.2 The heating energy demand of the former hospital building which previously occupied the site was 95% higher than the Erne Campus building. Tomás O'Leary Managing Director of MosArt Architects stated that '*The project sets a new standard for educational and public buildings both locally and across the globe in terms of energy efficiency, year round comfort, and indoor air quality'* (South West College).

8.3 Some key factors to note about this building:

- The heating system in the building is a combination of a bio-oil micro CHP producing 80% of the heating energy demand and 100% of the DHW demand and an air-to-water heat pump provided the remaining 20% of heating energy demand
- The Erne Campus building links directly to the recently restored Enniskillen Workhouse via an underground power and data connection and the Workhouse uses surplus power from the Campus
- The building has a large south-facing triple glazed façade and the correct amount of glazing was used to achieve the required U level

- The building has been designed to be thermal bridge free
- The roof of the campus is covered with a 2600m^2 solar photovoltaic system. The solar panels cover an area equivalent of nearly 14 tennis courts
- There is also a 460 kWh of battery storage in the design that will allow for short-term storage
- The building uses both mechanical and natural ventilation systems
- Airtightness trails were carried out during construction to test design and workmanship at various interfaces

Redevelopment of Enniskillen Lakeland Forum site

Figure 13 – Proposed Lakeland Forum redevelopment

8.4 Planning permission was granted for the redevelopment of Fermanagh Lakeland Forum site in October 2023. The proposal includes a new leisure centre building, sports pitches, walkways, trails and other outdoor activity uses, play park, active waterfront areas, new events space, improved pedestrian linkages to Enniskillen Town Centre, car parking area and hard and soft landscaping.

8.5 The redevelopment aims to achieve Passivhaus Certification and will follow Passivhaus design standards.

8.6 The developer aims to reduce embodied carbon in buildings by 30% through reviewing the embodied carbon of materials by selecting better performing materials in terms of emissions and seeking to increase the recycled content of material. This includes the use of concrete ground and first floor slabs with recycled content, coupled with a timber glulam first upper frame and roof structure which will contribute towards a lower emission structure than some steel options. The new Forum building minimises external junctions and complexity on the facade to produce a good form factor, which will reduce the heat loss in the building.

8.7 The new Forum building has internal spaces with differing ambient temperature requirements. Six different zones have been identified ranging from 16 degrees to 33 degrees and these zones vary between actively cooled spaces to heated spaces. The strategy is to provide room adjacencies which were harmonious to ambient temperature requirements. This greatly reduces the unwanted transfer of heat between rooms.

8.8 The design for the new Forum positions the pool halls to the south facade so that they can harness solar gain to assist with the heating of the wet areas. Conversely cooled spaces such as the fitness suite have limited glazing to the east and west aspects with louvring incorporated to prevent over heating yet providing natural daylight and views out. In addition to passive methods, the building will also have user controllable opening windows to allow for heat purging during summer months.

8.9 The new forum building will also use renewable energy and will have a large number of solar panels installed on the roof. Also, where possible, SuDS have been incorporated into the drainage design. The car park will contain permeable paving in each car parking space which storm water passes through and discharges into the drainage network via a series of land drains within it.

Appendix 1

Supporting statement – Sustainability, Energy and Resource Efficiency

The good practice template below, is how the Council would encourage applicants and developers to present supporting statements in relation to energy and resource efficiency. This template will assist applicants and developers to provide an appropriate and proportionate level of detail and to clearly demonstrate that the proposal is energy and resource efficient. It sets out a whole life cycle approach across the key stages of development as outlined by RICS. Applicants should justify any alternative structure used.

Each case will be considered on its own merits and whether a scheme has demonstrated energy and resource efficiency will be a matter of planning judgement. The supporting statement must however be specific to the application submitted, it cannot be generic proformas, technical notes or comments. Whilst a development may be designed to building control standards this will not be considered sufficient to comply with policy DE02 and demonstrate energy and resource efficiency in and of itself.

General

Explain the context of the development and the opportunities and challenges in respect of energy and resource efficiency.

Explain how you have considered a whole life cycle approach.

Explain what carbon reduction emissions may be made as part of the measures

Stage 1 – Production

Explain what raw materials have been chosen for the development. The Council encourages applicants to give consideration to the use of sustainable, low-carbon building materials such as low-carbon bricks, green concrete, green tiles and recycled metals.

The Council encourages re-use of buildings and materials such as reclaimed bricks and recycled aggregated will also contribute to reduction of carbon emissions.

Stage 2 – Construction

Explain where building materials have been locally sourced to reduce transportation and delivery miles.

Explain what construction equipment will be used on site and to supply supporting construction materials to the site, and what approach will be used to dispose of any waste generated during the construction process.

There are still limited zero carbon options for heavy plant machinery, but where possible greener construction equipment should be used, and the use of fossil fuel reduced by using renewable fuels.

Explain what building elements can be assembled off-site in a factory, such as pre-cast concrete floors and pre-assembled external walls. Off-site construction reduces energy use on-site and improves waste management, as products are manufactured and assembled in more controlled environment.

Explain how the design of the building will minimise waste ensuring accurate measurement of materials, minimising the risk of over-ordering and reducing the need to cut and re-size on site.

Site lighting and site offices and staff facilities on site will also contribute to carbon emissions. Low carbon lighting and energy efficient site cabins are also encouraged by the Council.

Stage 3 – Operation and Use

Explain if your proposal a net zero building standard or certification. The Council encourages you to consider Passivhaus standard or BREEAM standard.

The Council would encourage applicants to consider each of the matters listed below and explain clearly in the supporting statement how these have been considered and integrated into the proposal.

- Site layout, Orientation and Glazing ratio
- Building form
- Airtightness & Ventilation
- Natural ventilation
- Mechanical Ventilation and Heat recovery
- Avoid overheating
- Urban heat island effect
- Design for adaptability and longevity
- Circular economy approach
- Lighting and natural light
- Artificial Lighting
- Smart Lighting
- Insulation
- Use low carbon heat (air and ground source heat pumps)
- Use of Renewable Energy
- Achieving Energy Efficiency through collaboration

Stage 4 - End of life

Explain how you have considered the demolition and disposal of the building as well as waste processing (if the building is not repurposed or improved for further occupancy or use).

Embodied carbon emissions are heightened throughout this process if building materials are simply demolished, incinerated, or placed in landfill to decompose.

Rather than materials being sent to landfill the building should be deconstructed and materials re-used where possible. If materials cannot be reused they should be recycled.

Stage 5 - Beyond the life cycle

Explain how you have looked at the benefits and potential reduction in carbon emissions beyond the life of the building from the reuse, recovery and recycling potential of a building or building products.