



Energy & Sustainability Consultancy

[carbonfutures.co.uk](http://carbonfutures.co.uk)

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\_\_\_\_\_Carbon Futures are a team of energy and sustainability consultants operating throughout the UK tackling the Climate Emergency.

We carry out energy modelling and produce detailed analysis on building performance to inform design and support the delivery of projects from concept stage masterplanning through to construction and completion.

Our aim is to provide value by working closely with our clients and design team partners to produce sustainable, energy efficient strategies that exceed industry standards and improve the energy performance of buildings throughout the country.

We have extensive experience of supporting a wide range of developments across residential, education and commercial sectors. Together with our commercial awareness we deploy our expert knowledge to provide detailed analysis and support throughout the lifecycle of our projects.

Engaging with our team of experts from as early as concept stage will ensure your project is designed to meet desired levels of energy performance and sustainability from the outset.



## Our Services\_\_\_\_\_

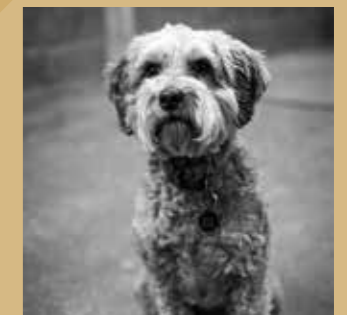
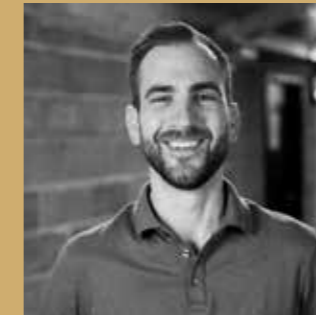
\_\_\_\_\_With the drive towards net zero carbon presenting a challenging landscape, we work closely with our clients to develop sustainable, low carbon solutions that reduce operational energy use and future proof developments against upcoming government and local authority standards.

- ▶ Net Zero Carbon
- ▶ Planning Consultancy
- ▶ Energy Statements
- ▶ Passivhaus Consultancy
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- ▶ Whole Life / Embodied Carbon Assessment
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- ▶ Approved Certifier of Design
- ▶ Energy Performance Certificates



## Our Team\_\_\_\_\_

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## Net Zero Carbon

The Scottish Government have set a target for the country to achieve 'Net Zero' greenhouse gas emissions by 2045, with numerous local authorities aiming to achieve this in their respective cities by 2030. We work closely with our clients and design teams to help deliver on their Net Zero ambitions.

New build development in Scotland has a key role to play in ensuring this target is achieved. It has therefore been highlighted as a sector where change is required in the near-term future. Most new build developments being constructed today do not achieve Net Zero status, primarily as regulation does not yet require such standards to be achieved.

In the built environment, the term Net Zero Carbon has various definitions. Some focus on the carbon reduction associated with regulated operation energy usage, others look towards unregulated in-use energy usage, while some favour the whole-life carbon emissions related to a building (i.e. The UK Green Building Council).

A transition to Net Zero is achievable, however it requires a significant shift from the typical fabric, heating, and renewables strategies being utilised at present. From initial project stages we help our clients to understand the impact and benefits of achieving Net Zero Carbon and identify key aspects which should be considered as early as concept design stage.

Being able to assess the predicted carbon emissions of a new build development is a key part of the design process. With our extensive experience and expertise in energy assessment and dynamic simulation modelling, we use a variety of techniques to create detailed energy models allowing us to propose suitable measures that achieve a Net Zero Carbon standard.

This process takes into account a wide range of influencing factors such as the building geometry, orientation, its location in the UK, shading from neighbouring properties, fabric insulation, window and door performance, different types of heating/cooling systems and their efficiencies, heating controls, lighting, thermal mass of the building, air leakage rates, ventilation, hot water storage efficiencies together with different renewable technologies and their individual efficiency and carbon influences.

Engaging with an independent consultant to develop fully optimised, Net Zero Carbon solutions from the outset will ultimately save time, money and of course energy.





## Planning Consultancy\_\_\_\_\_

\_\_\_\_\_ We are a leading independent energy and sustainability consultancy, highly experienced in supporting the delivery of low-carbon, energy efficient developments across a variety of sectors of the construction industry.

We operate at the forefront of energy and sustainability design and hold a strong track record of delivering cost-effective, sustainable solutions for developments of varying size and complexity.

Whether a project is at early concept stage or progressing through planning, we have the experience of working closely with design teams to ensure proposals are suitably designed with energy efficiency in mind, delivering significant value to our clients from the outset.

From performing daylight analysis studies to producing energy statements in support of planning applications, we have the in-house expertise of supporting developments from concept through to construction and completion, ensuring our clients have a single point of reference for energy and sustainability matters throughout the lifecycle of the development.

## Energy Statements\_\_\_\_\_

\_\_\_\_\_ A sustainable development requires a robust energy strategy from the outset. We work closely with design teams to develop a project specific strategy to meet our client's energy and carbon emission targets, sustainability aspirations (BREEAM credits) and associated legislation requirements.

Energy Statements are a common requirement by Local Planning Authorities across the UK. They demonstrate how the developer will address specific local objectives, like CO<sub>2</sub> emissions or renewable energy targets. We typically adopt the following 'Lean, Mean, Green' energy hierarchy to help us develop an efficient and economical strategy.

### **Lean**

We initially focus on reducing energy demand through passive measures such as improvements to the thermal envelope, a natural ventilation philosophy where suitable and reducing building air leakage.

### **Mean**

Consideration is then given to increasing the efficiency of building services such as boiler and chiller plant, reduced specific fan powers, incorporating daylight and occupancy sensing into the lighting system.

### **Green**

Only once the above measures have been considered, do we look at adding low and zero carbon generating technologies (except where mandatory for local planning requirements). During early stages, where designs are still flexible, more than one 'Green' technology may be viable. We can therefore carry out a more detailed feasibility study to establish the optimum solution based on energy, CO<sub>2</sub> and financial benefits.

Statements produced by Carbon Futures can take many forms depending on the scale of development, but it will generally be prepared at pre-planning stage and accompany your planning application. This will demonstrate how the development will address renewable technology obligations and CO<sub>2</sub> emission targets.



## Passivhaus Consultancy\_\_\_\_\_

\_\_\_\_\_Our Certified Passivhaus Consultancy service provides project design teams with support from concept through to completion ensuring that a development achieves Passivhaus Certification in a cost-effective and efficient way.



With the impact of the climate and fuel crisis becoming ever more evident in our everyday lives, the need to design our homes and buildings to minimise energy demand has never been more pertinent. It is for this reason that we are seeing increased demand for developments seeking to achieve the international Passivhaus standard.

Developed in Germany in the 1990s, Passivhaus, is a quality assured standard and methodology for achieving low energy building design, which creates comfortable buildings, that use around 75% less energy than standard practice for UK new-build homes. The standard consists of super insulation, stringent levels of air tightness, minimal thermal bridging, optimised solar gain, mechanical ventilation with heat recovery and an efficient building form.

Support is provided by our experienced team of qualified Certified Passivhaus Consultants, who offer guidance and provide confidence throughout each stage of the process. Our team can undertake Passivhaus Planning Package (PHPP) calculations to assess compliance and can also produce bespoke Psi-value Calculations to ensure that thermal bridging is minimised.



## Energy Strategy Development\_\_\_\_\_

\_\_\_\_\_With the drive towards 100% net zero carbon buildings presenting a challenging landscape, we work closely with our clients to develop sustainable, low carbon solutions that reduce operational energy use and future proof developments against upcoming government and local authority standards as well as rising energy costs.

Giving some thought to practical matters such as energy demand and sustainability at the early stages is crucial to the success of any project. The earlier potential pitfalls are identified, the more time you have to develop your design around them.

From as early as concept design we help our clients to develop sustainable, low carbon solutions. With our experience in sustainable development and our expertise in building energy performance modelling, we carry out full design reviews to offer a streamlined strategy, often resulting in significant financial savings.

To conduct our analysis, we perform all necessary energy and sustainability assessments and work closely with our design team colleagues to review various aspects of the building design from low carbon heating solutions to product specification and thermal bridging performance.

Engaging with an independent consultant to develop fully optimised, low to zero carbon solutions from the outset will ultimately save you time, money and, of course, energy.



## Fabric First Solutions\_\_\_\_\_

\_\_\_\_\_We can assist design teams to develop fabric first solutions through material selection advice, thermal bridging analysis, U-value performance review and SAP & SBEM assessments to ensure the fabric design is fully optimised from the outset.

A 'fabric first' approach to building design involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building services systems. This can help to reduce capital and operational costs, improve energy efficiency and reduce carbon emissions whilst reducing ongoing maintenance costs.

Buildings designed and constructed using a fabric first approach aim to minimise the need for energy consumption through methods such as:

- Maximising air-tightness
- Increased levels of insulation
- Optimising solar gain through the provision of openings and shading
- Optimising natural ventilation
- Using the thermal mass of the building fabric

Focusing on the building fabric is generally considered to be more sustainable than relying on energy saving products, or renewable technologies, which can be expensive and may or may not be used efficiently by occupants.

Integrating energy efficiency into the building envelope can decrease the requirement for occupant interaction with complex controls and new technologies, reducing the reliance on the end user to achieve the desired energy performance of buildings.

We guide you through the process by reviewing material selection, U-value performance, thermal bridging and overall energy performance to develop a highly efficient, cost-effective fabric design.

## Whole Life Carbon / Embodied Carbon Assessment\_\_\_\_\_

\_\_\_\_\_Whole Life Carbon Assessments account for the total carbon footprint of an entire building, from cradle to grave or cradle to cradle.

Although we have been measuring operational emissions from buildings for some time (i.e. the impact of occupying and operating a building), Whole Life Carbon assessment gives us much better understanding of the impact of those emissions already 'built in'. These embodied emissions can contribute 40-70% of total emissions in a new building.

Whole Life Carbon emissions include those operational emissions from regulated and unregulated energy use, and embodied carbon. Embodied carbon covers the carbon emissions from raw material extract, manufacture of products, transport of materials, construction, maintenance, repair replacement, demolition and disposal.

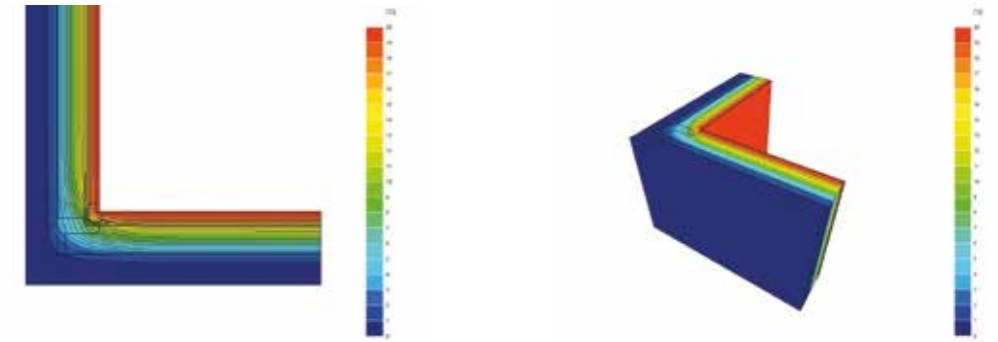
The objective of a Whole Life Carbon Assessment is the mitigation of carbon impact throughout a project's lifecycle. Whole Life Carbon reporting should allow future comparison of results and allow benchmarking and target setting.

We work with clients and design team members to help identify which industry benchmarks best serve your development. Our assessments are undertaken at design stage to help shape specifications and maximise the impact on your project.



# Thermal Bridging Calculations

As accredited thermal modellers, we can produce bespoke Psi-value calculations to achieve an accurate, highly efficient, and cost-effective fabric performance for new-build developments.



UK Building Standards require the insulation envelope of any heated building to be designed and constructed to limit heat loss through thermal bridging. Furthermore, Section 6 (Energy) and Part L1A of the Building Regulations also require thermal bridging to be taken into account as part of energy assessments. Whilst repeating thermal bridges are accounted for within U-value calculations, a separate Psi-value calculation is required to assess non-repeating thermal bridges.

Thermal bridging accounts for 20-30% of total building heat losses, which is significant. As thermal modellers, we can work closely with clients and design teams to identify effective measures to reduce thermal bridging. This process also involves calculating the Temperature Factor for each junction, which helps to mitigate the risk of condensation and mould growth at the junction.

As one of the first accredited thermal modellers in the UK, Carbon Futures have worked closely with a variety of clients in order to improve thermal bridging on projects.

## Local Authorities and Housing Associations

Within SAP and SBEM calculations, having bespoke Psi-values available to energy assessors will not only help to improve the dwelling (DER) or building (BER) emissions rating, it will also significantly reduce the space heating energy demand; a common funding requirement of most local authorities and housing associations who aim to achieve a higher level of sustainability for their social and affordable housing stock.

## Contractors and Housebuilders

We have supported many leading building contractors by producing bespoke Psi-values for their preferred methods of construction. This process involves working closely with design and procurement teams to review various aspects of the building fabric from material specification to U-value performance resulting in a highly efficient and cost-effective fabric design.

## Architects and Planners

Clients who engage with us at concept design stage have the opportunity of utilising our in-house thermally modelled construction detail packages which, when applied through SAP and SBEM calculations, can deliver up to a 50% improvement in thermal bridging performance for a typical dwelling (when compared with accredited details). This service is particularly beneficial to architects and designers who are keen to establish an accurate energy strategy from the outset.







## Dynamic Simulation Modelling\_\_\_\_\_

\_\_\_\_\_Dynamic Simulation Modelling (DSM) allows us to create a very detailed thermal model of your proposed building to accurately assess any heating, cooling and ventilation issues it may have once it is built.

Analysing a new building to assess how it will perform and how comfortable it will be to occupy is a very important part of the design process. Occupant comfort should be assessed year-round as a building's propensity to overheat can be just as important as how cold it may become in winter.

Building Regulations require buildings to be built with high levels of insulation and very airtight. However, these buildings can suffer from overheating during the summer, often requiring a complete change of cooling/ventilation strategy after the building is built.

Dynamic Simulation Modelling (DSM) allows us to create a very detailed thermal model of your proposed building to accurately assess any heating, cooling and ventilation issues it may have once it is built. This allows us to consider the design and positioning of solar shading, passive stack ventilation, night time cooling, CO<sub>2</sub> & temperature sensors etc.

The DSM process takes into account a wide range of different influencing factors such as the property's shape and orientation, its location in the UK, shading from neighbouring properties, fabric insulation, window and door performance, different types of heating/cooling systems and their efficiencies, heating controls, lighting, thermal mass of the building, air leakage rates, ventilation, hot water storage efficiencies together with different renewable technologies and their individual efficiency influences.

For highly glazed properties or complex buildings with modern heating, cooling and ventilation strategies it's important that these areas are addressed at concept stage to ensure the building will be practical and comfortable to live or work in.



## Daylight Analysis\_\_\_\_\_

\_\_\_\_\_The provision of sufficient natural daylight is known to boost the health and wellbeing as well as performance of individuals in buildings.

We can undertake dynamic simulations to predict daylight levels to ensure client targets and aspirations can be achieved from the outset.

Visual comfort is another factor which clients and planning departments are more frequently asking design teams to consider because of the known health benefits and sustainability impact it offers.

Achieving suitable daylight conditions can have a positive influence on building occupants (e.g. health and productivity), as well as reducing the requirement for energy and carbon intensive artificial lighting.

We use the IES Virtual Environment software to calculate the daylight provision in buildings and help our clients meet the recommended industry levels such as:

- BREEAM Hea 01 Visual Comfort
- Climate Based Daylight Modelling (CBDM)
- BRE BR209: Site Layout Planning for Daylight and Sunlight
- Building Bulletin 87 (BB87)

We can also undertake overshadowing calculations to assess the impact of a proposed building or structure on existing properties or solar panels.

Through early engagement on projects, we can optimise window arrangements for achieving the required daylight levels whilst considering the impact on thermal comfort and Building Regulation compliance.

## Thermal Comfort & Overheating

A sustainable building promotes the health and wellbeing of its occupants by providing a comfortable internal environment.

By working closely with design teams, we can undertake an assessment to predict the indoor temperatures and recommend measures to prevent overheating in current and future climates and comply with industry requirements.

The drive towards delivering low energy buildings in recent years has provided designers with another challenge – achieving thermal comfort levels in an unpredictable environment due to climate change.

Draughty buildings, along with energy demanding mechanical cooling and ventilation systems, meant that overheating in many buildings could previously have been avoided; but not anymore, as recent revisions to recognised industry guidance demand a more onerous approach to designing buildings that don't overheat.

We use advanced modelling techniques within the IES Virtual Environment software to predict indoor thermal comfort levels against the following industry guidance:

- CIBSE TM52 (predominantly non-domestic)
- CIBSE TM59 (Residential)
- Building Bulletin 101 (Educational buildings)
- BREEAM Hea 04 Thermal Comfort

Where spaces are identified to be at risk of overheating, we will recommend preventative measures and assess their impact until a compliant solution is achieved.

Passive preventative measures (e.g. solar shading, natural ventilation etc.) will always be considered before a mechanical solution, to avoid increasing energy usage, CO<sub>2</sub> emissions and costs to your building. Regardless, we can then assess the impact of any measures on the overall building performance to ensure it still complies with your project energy and CO<sub>2</sub> emissions targets.

Indoor air quality can also be improved by limiting the indoor carbon dioxide levels that can typically build up due to respiration from occupants. We can calculate predicted CO<sub>2</sub> concentrations against CIBSE and Building Bulletin 101 recommendations.



# Building Regulation Compliance

As accredited Energy Assessors and Low Carbon Consultants, we are fully qualified to produce energy assessments on both residential (SAP) and commercial (SBEM) developments.

From planning to practical completion, working with us will ensure that your project complies with the relevant energy and carbon requirements of the Building Regulations.

## Building Regulations

Under Section 6 (Energy) and Part L1A, all new buildings (domestic and non-domestic) require energy assessments to be carried out before work can start on site.

An energy assessor is therefore required to perform an assessment of the design using a prescribed methodology to demonstrate compliance with the regulations. The results of this assessment must then be submitted to Building Control as part of the building warrant application process. The Building Regulations outline different procedures for assessing energy in domestic and non-domestic buildings as described below.

## Domestic (SAP)

The Standard Assessment Procedure (SAP) is adopted by Government as the UK methodology for calculating the energy performance of dwellings.

The SAP rating is based on the energy costs associated with space heating, water heating, ventilation and lighting, less cost savings from renewable technologies.

## Non-domestic (SBEM/DSM)

The Simplified Building Energy Model (SBEM) is the equivalent methodology for calculating energy performance in non-domestic buildings in the UK. For more complex buildings, approved dynamic simulation modelling (DSM) software is used.

Both methodologies compare CO<sub>2</sub> emissions, where the emissions from the 'actual' building must not exceed those which are calculated for the 'notional' (benchmark) building to comply with the Building Regulations.

## What happens if compliance is not achieved?

Following a review, should compliance not be achieved, Carbon Futures will provide advice and solutions to ensure compliance is accomplished in the most cost-effective manner.

When this process is complete, we will issue a series of reports that will be passed onto Building Control for approval to allow construction to begin on site.



# Approved Certifier of Design (Energy)\_\_\_\_\_

\_\_\_\_\_As Approved Certifiers of Design we are fully qualified to certify the energy design of buildings in Scotland.

The certification system is based upon the principle that qualified and experienced building professionals can (without the need for further scrutiny by local authorities) take responsibility for ensuring compliance with the Building Regulations.

An Approved Certifier of Design (ACD) may be appointed to ensure that their building meets the requirements of Section 6 (Energy) of the Scottish Building Standards. Using an ACD is an option open to applicants carrying out work that requires a building warrant such as a new build project, extension or refurbishment. A Certificate of Design provides assurance of compliance with the energy standards.

An applicant for a building warrant using an ACD should indicate on the warrant application that certification services are being used and include the relevant design certificate. Failure to do so will result in refusal of the discount and may increase the length of time required to process the application by the verifier. A certificate may be submitted to the verifier at any stage of the building warrant process (should a discount not be desired).

There are numerous benefits to appointing an Approved Certifier of Design:

- ACDs can assist at the design stage to ensure developments exceed regulations, maximise fuel efficiency and use less energy;
- 10% discount is applied to the entire cost of the building warrant application fee when a Certificate of Design is submitted with the original application;
- Building warrant applications are handled quicker as there is no need for further checking of design work that has been certified by an ACD;
- ACDs are building professionals who meet very high standards of qualification and experience that are necessary to be accepted for membership by scheme providers;
- Members of a certification scheme have their work audited by the scheme provider and must maintain the quality standards expected of certification;
- ACDs are authorised to issue an Energy Performance Certificate once the building is completed. EPCs help identify a property's energy performance and includes cost-effective home improvement measures that will help save energy, reduce bills and cut carbon emissions.

Engaging with Carbon Futures as Approved Certifier of Design has proven to significantly improve the building warrant process, speeding up verification, resulting in quicker commencement on site.



# Energy Performance Certificates\_\_\_\_\_

\_\_\_\_\_As experienced energy assessors we are fully accredited to produce Energy Performance Certificates (EPCs) for new-build dwellings and commercial buildings throughout the UK.



An Energy Performance Certificate (EPC) is a document which states the energy efficiency of a building. They provide an analysis of a property's energy performance and identify cost-effective improvement measures that help to save energy, reduce bills and cut carbon dioxide emissions.

## **'Design Stage' Assessment**

It is prudent to check the EPC rating that your building is likely to achieve, particularly if you wish to achieve a specific EPC rating. We will perform an assessment using approved software to establish the EPC rating your building is achieving based on design stage data.

## **'As-Built' Assessment**

We are fully qualified to produce EPCs for a variety of buildings across the construction industry. Once the construction of the building is complete a second assessment will be undertaken by Carbon Futures to check that any deviations from the 'design stage' calculation are reviewed to ensure compliance with regulations has been maintained.

Towards completion, we will typically distribute a checklist requesting as-built details of the thermal envelope, building services, air pressure test results and any other changes that may have occurred during the build process.

Upon receipt of the signed checklist, the EPC will be lodged on the central register, enabling us to generate the EPC for the dwelling in electronic PDF format. A copy of the EPC will then be emailed to the relevant person for submission to Building Control and display within the dwelling.

For non-domestic, EPCs must be performed by an accredited Low Carbon Energy Assessor and lodged on a central register. Towards completion, we will distribute a schedule of information requesting as-built details of the thermal envelope and building services. The thermal model is updated to reflect the building before running the EPC calculation within the IES Virtual Environment software.

The Low Carbon Energy Assessor is also required to visit the site to verify the installation reflects the as-built information. After the survey, and on receipt of all as-built information, the EPC can then be lodged on the central register and will be issued. As Low Carbon Energy Assessors are externally audited, you can be assured that we perform at the highest of standards, whilst we work swiftly to avoid handover delays.



## Contact us \_\_\_\_\_

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