Policy Title:

LP24 - Energy Management in New Development

Existing Policies Which adopted Core Strategy or Policies Sites and Places (PSP) policy would eventually be replaced	**Policies, Sites and Places Plan Policy PSP6 – Onsite renewable and low carbon energy**
Non-Strategic / Strategic	**Non-Strategic**

Purpose

This policy concerns operational energy use in new and refurbished development: that is the energy used to heat, cool, and light buildings and run appliances and services. The purpose is to ensure that new buildings are designed, and constructed in ways that minimise operational energy use, and greenhouse gases emissions arising from these demands, and to maximise the amount of energy that can be generated from building-integrated renewable energy technologies so that energy demand is balanced by energy generation on an annual basis.

The Climate Change Act requires the UK government to set legally binding 'carbon budgets' as stepping stones to achieving 'net zero' emissions in 2050. Each budget is a cap on the quantity of greenhouse gases emitted in the UK over a five-year period. Under the 4th carbon budget, which runs from 2023 to 2027, emissions must be reduced by 52% from 1990 levels, then by 58% by 2032 and 77% by 2037 under the 5th and 6th budgets. 'Net zero' means reducing UK emissions by a 100% and that any emissions that cannot be eliminated, are offset by activities that remove an equivalent quantity of greenhouse gases from the atmosphere. For electricity, net zero means generating power in ways that do not emit greenhouse gases, or capturing emissions where fossil fuels are used. For heating it means replacing gas and oil boilers with renewable heating, such as air or ground source heat pumps or connection to a heat network supplied by heat generated renewably or by waste heat recovered from industrial or commercial processes.

As more of our electricity is generated renewably, buildings that use electricity rather than gas or oil for heating will have lower carbon dioxide emissions – regardless of how efficient they are – because the electricity itself is low carbon. The fall in the carbon intensity of electricity is a welcome and crucial step in response to the climate emergency. But it means that on their own, emissions of carbon dioxide are no-longer a good indicator of the energy efficiency or 'sustainability' of a building. For this reason, this policy uses annual energy usage and annual energy generation as the performance targets for new development.

The policy sets two energy efficiency targets, one for space heating and one for total energy use. Total energy use, also known as Energy Use Intensity (EUI), is the total amount of energy used in a building as recorded by the energy meter. To allow for differences in the size of buildings, both targets are expressed per square meter of floor area and refer to the energy used in one year. EUI targets for non-residential buildings are adjusted according to building type, to reflect different functions and levels of use.

The policy also requires new buildings to achieve 'net zero energy' on an annual basis. A net zero energy building will generate as much energy as it uses in one year from renewable sources, such as solar photovoltaic (PV) panels, attached to the building.

Policy wording

Operational Energy

Energy Hierarchy for new development

1. **All residential and non-residential development proposals will be expected to:**
    a. **Calculate and report predicted energy use intensity (EUI) using an operational energy model; and**
    b. **Minimise energy demand for heating, cooling, hot water, lighting and power through building and site-level measures adopting a 'fabric first' approach, and including demand response and storage measures to support energy system flexibility; and then**
    c. **Meet its remaining heat/cooling demand sustainably as set out below; and then**
    d. **Maximise on-site renewable energy generation to achieve an annual net zero energy balance; and then if necessary;**
    e. **Meet any outstanding balance in residual energy use through energy offsetting.**
2. **Using the information in their Energy and Sustainability Statement, proposals should show how these policy requirements will be met, including the specific standards set out below.**

Specific standards for development

3. **All proposals for residential and non-residential development must achieve the following standard:**
    a. **A space heating demand equal to or less than 20kWh/m^2.yr in bungalows and detached dwellings, and equal to or less than 15kWh/m^2.yr in all other building types; and**
4. **All proposals for residential development should also achieve a total energy use (EUI) equal to or less than 35 kWh/m^2.yr: and**
5. **All proposals for non-residential development should also achieve a total energy use equal to or less than the following targets, based on typology:**
    a. **Student accommodation: 35kWh/m^2.yr**
    b. **Multi-residential accommodation: 35kWh/m^2.yr**
    c. **Key worker accommodation: 35kWh/m^2.yr**
    d. **Care homes: 35kWh/m^2.yr**
    e. **Warehouses: 35kWh/m^2.yr**
    f. **Light industrial units: 35kWh/m^2.yr**

g. **Schools: 65kWh/m^2.yr**

h. **Leisure centres: 100kWh/m^2.yr**

i. **Offices: 70kWh/m^2.yr**

j. **Retail: 70kWh/m^2.yr**

k. **Higher education teaching facilities: 70kWh/m^2.yr**

l. **Research facilities: 150kWh/m^2.yr**

m. **GP surgeries: 70kWh/m^2.yr**

n. **Hotels: 160kWh/m^2.yr**

6. **Where it can be demonstrated that for technical reasons it is not feasible to generate sufficient energy from on-site renewable energy technologies to match annual energy consumption, then**

   a. **the development proposal should provide on-site renewable energy of at least 150 kWh/m^2_{fp}/year in 1 and 2 storey industrial buildings, and 105 kWh/m^2_{fp}/year in other buildings and then:**

   b. **the remaining operational energy needs of the development should be met by offsetting measures as set out below.**

Energy Offsetting

7. **Where the requirement to achieve net zero energy cannot be met through on-site energy generation measures alone, any remaining balance in annual energy demand will be met by offsetting measures such as:**

   a. **Entering into an appropriate legal agreement to provide a financial contribution to South Gloucestershire Council,**

   b. **Agreeing to provide new and acceptable, directly-linked or near-site renewable energy generating capacity.**

8. **The financial contribution required will be a one-off payment equivalent to the cost of providing additional small-scale solar PV energy generation elsewhere in South Gloucestershire, over a 30-year period. This cost is tied to the most recent UK government solar PV cost data for small scale solar PV, and includes a 15% administrative charge. Currently, the cost is £99 per MWh. This rate is index linked and will be adjusted annually.**

Development involving existing buildings

9. **Where work is being undertaken on existing buildings and it is not feasible for the full residential and non-residential targets above to be met, the Energy and Sustainability Statement should explain why (for example the building is listed) and show that energy demand has been reduced to the lowest practical level using energy efficiency measures, heating/cooling systems have been selected in accordance with the heating/cooling hierarchy and that on-site renewable energy will be installed where feasible.**

Passivhaus

10. An alternative route to compliance is through the certified PassivHaus Plus or certified Passivhaus Premium standards. Where it is proposed to build and certify development to the Passivhaus Plus or higher Passivhaus standard, it will not be required to meet the specific policy requirements above relating to energy use, on-site renewables and energy offsetting. In this instance a full Energy assessment will not be required as part of the Energy and Sustainability Statement. It will be sufficient to submit the technical information required to demonstrate that the PassivHaus Plus standard (or higher) can be achieved and for the Energy Assessment to demonstrate that residual heating/cooling demand for the development has been met sustainably, as set out below.

Demand and System Flexibility

11. Proposals for major development should demonstrate how smart and flexible technologies that support the balancing of energy supply and demand over the course of the day and seasonally have been incorporated, taking account of the latest best practice and guidance.

12. Among others, measures may include:

- **a. Minimising energy demand at peak times;**
- **b. Allocating space for internal and/or external battery energy storage; and**
- **c. Making provision for the installation and use of vehicle-to-grid (V2G) bi-directional charging.**

Heating and Cooling Systems

13. Development will be expected to demonstrate through its Energy and Sustainability Statement that heating systems have been selected in accordance with the following hierarchy:

- **a. Where feasible connection to an existing classified heat network or a new classified heat network from the point of occupation; and then**
- **b. Elsewhere, employing individual renewable heat or communal renewable heat which is fossil fuel free.**

14. Proposals should seek to eliminate the need for cooling systems throughout the lifecycle of the development and, in instances where cooling systems are required, minimise their capacity and energy consumption in accordance with the following steps:

- **a. Optimise solar gain in order to minimise unwanted heat entering buildings during warmer months through measures including orientation, built-form, fixed, moveable and seasonal shading, surface finish, glazing design and G-values and insulation without penalising beneficial solar gain during the heating season; then**
- **b. Minimise internal heat generation through energy efficient design and specification; then**

c. **Maximise the use of passive cooling and ventilation to manage internal temperatures; and then**

d. **Having minimised the need for cooling, meet any residual requirement through energy efficient mechanical ventilation and active cooling systems.**

Monitoring

15. **Proposed development will be expected to minimise the potential performance gap between design aspiration and completed development. The Energy Statement must set out details of the assured performance arrangements that will be implemented.**

16. **As a minimum, this will require:**

    a. **The submission of 'pre-built' estimates of energy performance; and**

    b. **Prior to each building being occupied, the submission of updated, accurate and verified 'as built' calculations of energy performance.**

17. **Such a submission should also be provided to the first occupier (including a Non-Technical Summary of such estimates to allow occupants to compare actual and predicted energy demand).**

18. **In addition to minimising the performance gap, and assisting occupants to reduce their energy consumption and running costs, this information is intended to inform future advice and policy.**

Supporting text

Energy use in development

1. This policy concerns operational energy use in new development; that is the energy used to heat, cool, light and run appliances and services in buildings. Measuring and reducing the embodied carbon in a building is addressed in a separate policy. Together, operational emissions and embodied carbon emissions make up the whole life emissions of the building.
2. Almost half of UK greenhouse gas emissions are linked to the construction and operation of its built environment, and 90% of a building's environmental impact is defined by early design decisions. Ensuring new development achieves the net zero energy standards set out above is a key part of responding to the climate emergency.

Energy assessments

3. Proposals for development should be accompanied by an Energy Assessment as part of the Energy and Sustainability Statement submitted with the planning application. The Energy Assessment should describe how the operational energy needs of the building or buildings will be met, and how the space heating and energy use intensity (EUI) targets set in this policy will be achieved.
4. The EUI and space heating demand should be calculated using the gross internal floor area (GIA) and expressed as the energy consumption per square meter of floor area (kWh/m^2). The EUI is the total energy use of the building as recorded at the consumption meter so includes regulated and unregulated energy use. It excludes the energy used to charge electric vehicles.

Modelling operational energy use

5. The statement should include all energy use (regulated and unregulated), calculated using a methodology proven to accurately predict a building's actual energy performance.
6. Currently, South Gloucestershire Council's preferred approach to modelling operational energy use is for developers to use CIBSE TM54: Evaluating Operational Energy Use at Design Stage, and for residential development the Passivhaus Planning Package (PHPP). Any change to this will be detailed in further guidance issued by the Council.

Space heating, hot water, and cooling

7. The Energy Assessment should demonstrate how the maximum space heating demand target of $15kWh/m^2$/year, ($20kWh/m^2$/year in bungalows and detached dwellings) has been achieved.
8. The Energy assessment should follow the energy hierarchy and demonstrate how:
    a. The demand for heating, cooling, hot water, auxiliary energy, lighting and unregulated energy consumption will be minimised through energy efficiency measures; then

b. The remaining heat/cooling demand will be met sustainably; then

c. On-site renewable energy generation will achieve net zero energy; then

d. Any remaining outstanding reduction in residual emissions will be achieved through accepted means of energy offsetting.

9. Building design (including built form, orientation, layout, and glazing ratios) should seek to optimise solar gain, that is make use of beneficial solar gain during winter months without increasing the risk of summer overheating or the need for active cooling now or in the future.

10. In accordance with the hierarchy above, measures to control solar gain including fixed, moveable, and seasonal shading, deeper reveals, and reduction in glazing G-values (total solar transmittance) should applied before active cooling is considered.

11. Where usability issues (as described in Part O of the Building Regulations), such as noise, are stated as the reason that a development requires active cooling, then all reasonably practicable passive means of minimising cooling requirements should be applied first and a full justification as to why they were insufficient provided.

Definition of renewable heating

12. Renewable heating includes ground, water and air source heat pumps, geothermal heat, heat and cooling from former mine workings, solar thermal, and biomass.

13. The policy approach to heating systems intentionally excludes non-renewable electrical space and water heating, (such as electric resistive heating and electric immersion heaters) with a Seasonal Performance Factor (SPF) of less than 2.5, and in all cases excludes individual gas boilers.

14. In the case of certified Passivhaus Plus and Passivhaus Premium developments non-renewable electric heating (also known as direct electric heating or resistive electric heating) may be specified. This is because in such schemes the need for space heating has been shown to be minimal and is largely met through the heat recovery ventilation system, and the 'performance gap' is very small or effectively eliminated meaning buildings achieve their design performance. Also, certified Passivhaus buildings are much less likely than conventional buildings to be subject to an evening peak in space heating demand.

Communal gas and gas CHP

15. Where the use of gas boilers or gas CHP is proposed as a temporary or interim source of heat for a heat network or communal heating system, a full justification will be required within the Energy Assessment explaining why non-fossil gas alternatives are not feasible, and including evidence to show how and when gas will be removed.

16. When considering proposals for heat pumps and active cooling systems, the global warming potential of the refrigerants used will need to be taken into account in a manner consistent with the policy on embodied carbon.

Hydrogen

17. Given the low overall ('round-trip') efficiency when using hydrogen for heating, its limited availability, and a potential need to use it to decarbonise specific processes such as steel production, we do not expect to see hydrogen being used as a fuel for heating and cooling. However, where hydrogen constitutes all or a part of the energy mix for a development's heating or cooling strategy, all CO_2,methane and other greenhouse gas emissions arising from the production of the hydrogen must be accounted for within calculations submitted in the Energy Assessment. A 20-year integrated time-period, and a global warming potential of no less than 86 must be used when calculating the impact of methane emissions.

Biomass and bioenergy

18. Biomass and bioenergy refer here to the burning of biomass (including wood chip, wood pellets, logs straw and liquid and gaseous biofuels) for the production of heat, electricity or heat and electricity (CHP).

19. Given concerns about particulate emissions and whole life greenhouse gas emissions from burning biomass we do not expect developers to specify biomass as the primary source of fuel for heating or power generation or production of heating and power.

20. Where biomass is specified as a primary or secondary source of heat a full description justification and whole life carbon assessment must be provided in the Energy Assessment. This should set out how concerns about particulate emissions have been addressed, describe the fuel source and how this will deliver genuine reductions in carbon dioxide emissions for the lifetime of the scheme. All schemes using crops should demonstrate a positive impact on biodiversity where the fuel is grown or sourced from.

21. Where biomass appliances are specified to meet peak heating demand and allow a smaller primary heat system to be specified, the Energy Statement should provide full justification and demonstrate how other policy requirements will be met and issues relating to air quality and whole life emissions have been addressed.

Heat networks

22. Heat networks (also known as district heating) supply heat from a central source to consumers, via a network of insulated underground pipes carrying hot or ambient temperature water. Heat networks can serve large areas including towns and cities or supply a small cluster of buildings or units within a single building, avoiding the need for individual boilers or electric heaters. Heat networks delivering heat at ambient temperatures (8-15 deg C) can be used to provide heat during the heating season and cooling during the summer months.

23. Heat networks supplying heat generated from renewable sources such as air and water source heat pumps, or recovering 'waste' heat that would otherwise be rejected to the atmosphere are key to decarbonising heating and cooling in existing buildings as well as new development. Connecting new developments to a heat network can support the expansion of a network to existing settlements and buildings.

24. The development of heat networks is central to South Gloucestershire Council's strategy for delivering affordable, secure and zero carbon heat and the Council is actively considering how heat networks can be used to provide affordable and very low

carbon heat to existing communities and new development in the district. This includes the potential use of reject heat from industrial and commercial processes and the thermal energy in flooded former mine workings as a source of heat and coolth.

25. 'Classified heat networks' refer to heat networks which may be developed by South Gloucestershire Council or third parties, and which meet specific requirements.

26. These are:

    a. Compliance with the appropriate technical standards (presently the CIBSE Code of Practice), and regulatory requirements set by Ofgem or another regulator.

    b. The heat and cooling supplied by the network is derived from renewable/low carbon sources or it can be demonstrated that the network is on a clear timeline and technology pathway towards decarbonising the heat provided by the energy centre or centres.

    c. The heat network provider offers heating and/or cooling services at a fair and affordable price to the consumer in accordance with minimum standards set by the regulator or industry best practice (such as standards defined by the Heat Trust or Ofgem).

    d. The heat network provider publishes an annual report on the energy performance and carbon content of the network.

    e. Residual emissions from low-carbon sources of heat (including gas) are offset by approved measures.

27. The creation of new heat networks should be considered in the case of proposals that would provide more than 100 homes or 10,000m² floorspace. In these cases, a feasibility study should be undertaken by or on behalf of the applicant to establish whether a new heat network could be established. This should include an assessment of whether there are local sources of waste heat that could be recovered.

28. Where heat networks are proposed as part of development, they will be expected to meet the requirements for a 'classified' heat network as set out above.

29. When calculating the Energy Use Intensity (EUI) of a development connecting to a heat network, an Energy Conversion Factor will be applied to take account of the efficiency of the network and energy centre. Energy Conversion Factors for classified heat networks will be provided by South Gloucestershire Council, or the heat network operator, and updated to reflect changes in the operation of the heat network.

30. Where new heat networks are proposed that connect to or form part of an existing network, the Energy Conversion Factor shall be calculated by the applicant and supported by a full methodology.

<u>Former mine workings as a source of heating and cooling</u>

31. South Gloucestershire has an extensive network of former mine workings with a potential thermal resource that could provide heating and cooling to new and existing developments. For developments of 100 units or more the Energy Assessment should consider whether flooded, former mine workings could serve as a source of heating and cooling delivered via a heat network.

Net zero energy and on-site renewable energy generation

32. A net zero energy building will generate as much energy from renewable sources at is uses in one year.

33. For buildings achieving net zero energy by using on-site PV there may be periods when the electricity generated by the PV system exceeds demand and vice versa. At times when supply exceeds demand, the 'surplus' power will be exported to the distribution network, however, as energy demand from charging electric vehicles increases, and static, building-integrated battery energy storage becomes more affordable the proportion of energy used in the building or to charge electric vehicles is likely to increase.

34. The Energy Assessment should set out what renewable heating, renewable cooling and renewable power generation measures have been considered and which will be incorporated into the proposed specification. The Assessment should show that minimum targets for electricity generation from PV have been met and that the scheme will generate sufficient energy to achieve net zero energy. Where this cannot be achieved full justification with data and calculations should be provided.

Energy Offsetting

35. We expect net zero energy to be achievable in most instances, so energy offsetting should only be considered as a 'last resort' where it is not possible to generate sufficient energy on-site to meet annual energy demand.

36. Where an applicant believes that net zero energy is not achievable, they will need to demonstrate to the satisfaction of the planning authority why it is not possible, with full justification.

37. The Energy Offsetting fund will be established and administered by the Council and will be collected via Section 106 agreements. Financial contributions will be spent on the delivery of new additional renewable energy generation within South Gloucestershire. The financial contribution cost per MWh will be index linked and updated annually to reflect the costs of administrating, purchasing and installing additional solar PV.

38. Further information will be set out via South Gloucestershire's website.

Passivhaus

39. In recognition of the high sustainability standards required to achieve a 'certified Passivhaus Plus' scheme, this may be used as an alternative route to policy compliance.

40. Passivhaus is an international energy standard for buildings. It sets stringent standards on energy consumption for heating, air permeability and total energy demand, and also sets design requirements to control the quality of the internal environment.

41. Proposals seeking to follow the Passivhaus Plus route to compliance set out in this policy will need to be accompanied by full Passivhaus Planning Package outputs demonstrating that the Passivhaus Plus standard or Passivhaus Premium Standard can be achieved.

42. Prior to commencement, a 'Pre-construction Compliance Check' completed by a Passivhaus certifier will be required and secured by condition.

43. Upon completion, a Quality Approved Passivhaus Plus certificate for each dwelling/building will be required.

44. For developments where existing buildings are being refurbished, applicants should consider whether the Passivhaus EnerPhit standard can be applied.

Minimising the performance gap and delivering modelled performance

45. There is a significant body of evidence showing that the actual energy performance of buildings is worse, and in some cases significantly worse than their design energy performance, and that this difference is greatest where quality regimes have not been applied. The variation between anticipated and actual performance is known as the 'performance gap'.

46. Addressing the performance gap is a key part of ensuring the built environment is net zero in practice.

47. Implementing a quality regime from the design stage, through to construction and handover has been shown to reduce the performance gap.

48. Relevant regimes include:

    a. BSRIA Soft Landings;

    b. Government Soft Landings;

    c. NABERS Design for Performance;

    d. Passivhaus;

    e. EnerPHit;

    f. Actions set out in BREEAM credits Ene 01 Reduction of Energy Use and Carbon Emission, Man 04 Commissioning and Handover and Man 05 Aftercare; and

    g. Actions set out in the Home Quality Mark issues 9 Quality Assurance and 11 Customer Experience.

49. Monitoring, verifying and reporting on the actual energy performance of buildings in-use can enhance the construction industry's knowledge on the performance gap and help to identify issues with new buildings that then can be addressed by building owners.

50. Reporting on energy performance will become increasingly common whether through Government initiatives such as the proposed national performance-based policy framework for rating the energy and carbon performance of commercial and industrial buildings or voluntary initiatives such as the Built Environment Carbon Database.

51. Weight will be given to proposals which demonstrate a deliverable commitment to on-going monitoring of energy consumption, post-occupation, and monitoring regimes where occupiers are notified if actual energy use exceeds design calculations, and advice and information is provided to enable the potential causes to be identified.

Additions	
Key evidence	
Other relevant policies to cross-reference?	