



RIDGE

**BOGNOR REGIS GOLF COURSE
ENERGY STATEMENT**

01 February 2022



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ENERGY STATEMENT**

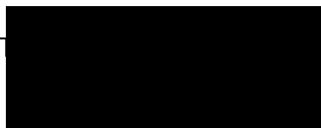
01 February 2022

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1. INTRODUCTION

1.1. Site Overview

The Bognor Regis golf course shall be located in Bognor Regis. The site location is shown in Figure 1.1 below:

Hallam Land Management has commissioned Ridge and Partners LLP to prepare a sustainability statement to support the planning application for the 'Bognor Regis Golf Course', which comprises of an 18 hole 72 par golf course, a 9 hole golf course, practice greens and a driving range; construction of a club house and associated golf facilities.

The purpose of the report is to outline a strategy of how Hallam Land Management and their consultant team intend to deliver a low energy highly sustainable building which limits the impact of the building on the environment and its neighbours.



Figure 1-1: Site Location Map

The proposed contemporary golf facilities are intended to present an inclusive and accessible environment for people of all golfing and physical abilities and are designed to act as a pathway into the sport as well as presenting a challenge for experienced players. Hallam Land Development is focused on improving the sustainability of the golf course, and the provision of a new golf course enables them to incorporate modern energy efficiency and sustainability measures into the development.

2. POLICY CONTEXT

2.1. Overview

This report supplements the planning application for the proposed Bognor Regis Golf Course, and aims to address strategic issues raised by local, regional and national policies relating to climate change and sustainability.

2.2. Part L of the Building Regulations

Approved Document Part L Conservation of Fuel and Power sets out the energy efficiency requirements of the Building Regulations.

The current section of Part L that applies to new build, non-residential developments is Approved Document L2A: Conservation of Fuel and Power in New Buildings other than Dwellings (2013).

Notably, however, a revised version of Part L has now been published by the UK government. The section in the revised Part L that would apply to this scheme is Approved Document L, Conservation of Fuel and Power, Volume 2: Buildings Other Than Dwellings (2021).

As of 15 June 2022, the revised version of Part L will come into force. Transitional arrangements will apply to schemes where a building notice or initial notice has been given to, or full plans deposited with a local authority before 15 June 2022 provided that the building work is started before 15 June 2023.

At this stage, it is anticipated that this scheme will fall under the requirements of the revised Part L – Part L 2021.

Part L 2021 sets an overall carbon emissions target for new buildings, in the form of the Target Emission Rate (TER). In order to comply, the calculated Building Emission Rate (BER) for a new non-domestic building needs to be less than or equal to the TER.

Part L 2021 also sets a target primary energy rate (TPER) for new buildings. In order to comply, the calculated Building Primary Energy Rate (BPER) for a new non-domestic building needs to be less than or equal to the TPER.

2.3. Planning Context

There is increasing awareness and legislation regarding low carbon design in the built environment. Rather than considering alternative energy sources at the end of a development, stakeholders are increasingly recognising the benefits of an early appraisal of such technologies.

Against a context of the relevant planning policies, this report focuses on minimising energy consumption during the life of the development, supplemented by on site LZC energy sources where feasible.

The proposed development site is located within the jurisdiction of Arun District Council. The energy and sustainability strategy for the Bognor Regis Golf Course, has been developed in accordance with the requirements set out in the Arun Local Plan 2011- 2031.



2.4. Arun Local Plan 2011-2031

The Arun Local Plan 2011-2031 was adopted on the 18th of July 2018. It sets out Arun District Council's vision for the development of Arun up to 2031. The Plan contains strategic and development management planning policies that will shape the future of the area and will inform the consideration of planning applications.

Arun District Council promotes sustainable development to reduce the effects of global warming. There are a number of key policies within the Arun Local Plan that outline Arun District Council's approach to low carbon development.

The Arun Local Plan stipulates that development in the District must be designed to mitigate against the impacts of climate change by reducing the greenhouse gas emissions in line with the Energy Hierarchy. The Energy Hierarchy is outlined below:

1. Reduce the use of energy;
2. Use energy more efficiently;
3. Move to energy from renewable sources; and
4. Use remaining fossil fuels cleanly.

Three key policies relating to energy usage are Policy ECC SP1 – Adapting to Climate Change, Policy ECC SP2 – Energy and Climate Change Mitigation and Policy ECC DM1 – Renewable Energy.

These policies are detailed below:-

Policy ECC SP1 – Adapting to Climate Change

The Council will support development which is located and appropriately designed to adapt to impacts arising from climate change such as the increased probability of tidal and fluvial flooding; water stress; health impacts as a result of extreme temperatures and a decline in the quality of habitats and richness of biodiversity.

In order to achieve this, development must be designed to take account of the following issues:

- a. Location (in relation to flood risk and vulnerability to coastal erosion);
- b. Water efficiency;
- c. Shade, cooling, ventilation, solar gain;
- d. Connectivity to the green infrastructure network;
- e. Layout and massing;
- f. Resilience of buildings and building material to extreme weather events; and
- g. Capacity of drainage systems and incorporation of Sustainable Urban Drainage Systems (SuDS)

Policy ECC SP2 – Energy and Climate Change Mitigation

All new residential and commercial development (including conversions, extensions and changes of use) will be expected to be energy efficient and to demonstrate how they will:

- a) Achieve energy efficiency measures that reflect the current standards applicable at the time of submission.
- b) Use design and layout to promote energy efficiency; and



- c) Incorporate decentralised, renewable and low carbon energy supply systems, for example small scale renewable energy systems such as solar panels.

All major developments must produce 10% of the total predicted energy requirements from renewable or low carbon energy generation on site, unless it can be demonstrated that this is unviable. Energy efficiency measures will be taken into consideration when the total predicted energy requirements are calculated. The Council will consider "allowable solutions" where it is clearly demonstrated that the provision of onsite renewable or low carbon energy generation is unviable or not feasible.

In assessing the achievement of these standards the Council will consider:

- Site constraints;
- Technical viability;
- Financial viability; and
- Delivery of additional benefits.

Policy ECC DM1 – Renewable Energy

The Council will support renewable energy development subject to the criteria in this Policy. Schemes will be expected to contribute to the social, economic and environmental development and overall regeneration of the District.

Within areas of protected or sensitive landscapes, areas or buildings, development should generally be small scale or community based.

The Council will support proposals for appropriately located renewable energy development, and their ancillary development where they meet the following criteria:

- a. The proposal is located and designed to minimise adverse impacts to landscape, habitats, the historic environment and residential amenity including visual, noise and odour impacts;
- b. The location and design of proposals will need to take account of the Council's landscape assessment and landscape sensitivity studies (or successor documents) and proposals for large scale renewable energy projects will need to be supported by a zone of theoretical visibility and viewpoint assessment;
- c. Proposals will need to demonstrate that there are no detrimental cumulative impacts on landscape character, biodiversity, key species or residential amenity;
- d. Proposals located within or close to the boundaries of areas designated for their landscape, ecological, or historic interest should demonstrate that development will not impact upon the purposes of designation;
- e. Proposals will need to demonstrate the potential benefits of the development to the host communities and identify opportunities for environmental enhancement;
- f. Priority should be given to proposals that integrate with existing or new development where appropriate to do so having regard to (a);
- g. For proposals that make use of biomass or energy crops, applicants will need to demonstrate the proposal is appropriately located so that it will not result in the loss of high grade agricultural land and to the local transport network and that the network has sufficient capacity to safely absorb additional traffic resulting from the development; and
- h. All proposals will need to demonstrate a suitable connection to the electricity distribution network, or appropriate energy storage facility, and provide evidence to demonstrate that the connection will not result in unacceptable impacts upon the landscape, natural and historic environment or visual and residential amenity.

Scheme falling within landscape or nature designations will be considered where there are no alternatives and where a considerable community benefit is demonstrated and considered to outweigh the landscape impact.

2.5. Arun District Design Guide SPD

The Arun District Design Guide was adopted in January 2021. It encourages sustainable development and managed future growth to ensure that change across the District is appropriate to meet the needs of the local area.

The Guide includes a section dedicated to Climate Change & Sustainability – Section K – that sets out a requirement to maximise energy efficiency and minimise whole life carbon.

It is a requirement in the Guide that design must demonstrate that each step of the energy hierarchy is followed. The energy hierarchy published in the SPD is included in Figure 2.1.

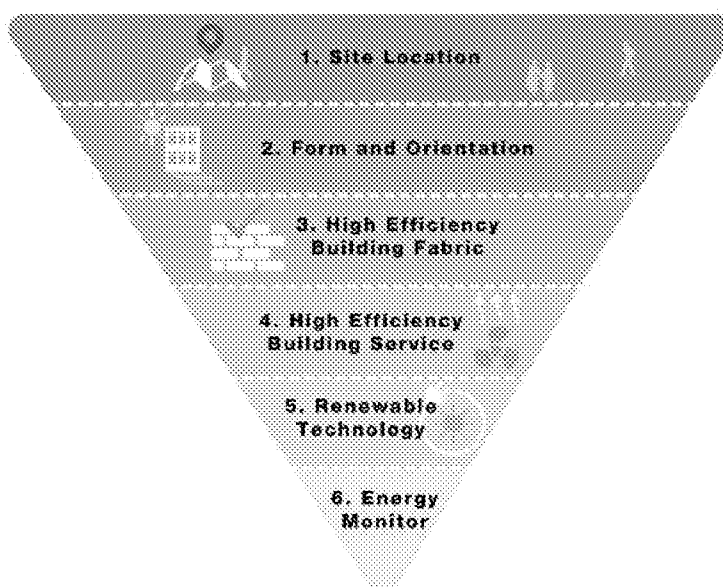


Figure 2.1 - The Energy Hierarchy Published in the Arun District Design Guide SPD

This is a more detailed breakdown of the 4-step energy hierarchy that is set out in the Arun Local Plan.

The Guide also sets out a checklist for items relating to Energy & Carbon that should be considered for new developments, as set out below:

1. Set targets for energy and carbon reductions beyond the relevant Part L Building Regulations.
2. Demonstrates consideration of embodied carbon (emissions from the manufacture, transport and construction of building materials, together with end of life emissions).
3. Incorporates passive solar design measures such as avoiding single aspects, including south facing windows on habitable rooms, minimising north facing glazing, using roof lights and sunpipes and providing shading to south facing windows through tree cover.
4. Uses heat recovery systems wherever mechanical ventilation is installed (MVHR).
5. Considers the ventilation strategy alongside proposed air tightness levels, to ensure buildings are not left susceptible to mould growth. This may include hydrothermal modelling.

The SPD also considers wider sustainability objectives for new developments, beyond the scope of energy and carbon. The wider sustainability strategy for the scheme is addressed in the BREEAM Pre-Assessment Report that has been undertaken by Ridge & Partners LLP and is submitted under separate cover.

2.6. Key Planning Policy Energy Performance Targets

In summary, the key energy performance targets outlined in the core policies of the Arun Local Plan 2011 – 2031 are as below:

- Compliance with the requirements of Part L of the Building Regulations;
- Development of an energy strategy in line with the principles outlined in the Energy Hierarchy; and
- Demonstrate that 10% of the building energy requirements for the scheme will be met from renewable or low carbon sources.

3. ADOPTION OF THE ENERGY HIERARCHY

3.1. Overview

In line with the energy hierarchy referenced in the Arun District Design Guide SPD, the following steps of the energy hierarchy have been assessed in turn for application to the development:

1. Site Location
2. Form and Orientation
3. High Efficiency Building Fabric
4. High Efficiency Building Services
5. Renewable Technology
6. Energy Monitor

3.2. Passive Design

The first 3 steps of the energy hierarchy are passive design considerations. Passive design uses local climatic conditions to reduce the amount of applied energy required to heat, cool or light a building. Passive design centres around the building envelope and its relationship with its surroundings. Some of the key proposed passive design measures will be detailed within this section of the report.

3.2.1. Site Location

The development site is located in Bognor Regis, UK. The UK has a temperate oceanic climate – with a relatively narrow temperature range throughout the year and precipitation fairly evenly distributed throughout the year. The heating season in the UK typically runs from October to March/ April. Bognor Regis however, does experience relatively milder conditions than inland areas due to its proximity to the coast.

Key passive design measures due to these climatic considerations are set out below:

- Enhanced, thermally efficient building fabric is proposed (refer to Table 3.1) to reduce winter heating loads associated with the local climate.
- Solar control glazing to be proposed (refer to Table 3.2) – to further aid in mitigating peak solar gains.

3.2.2. Building Form and Orientation

The building has been laid out on an approximate south to north axis with the main glazed areas on the south and east elevations. This orientation will enable a substantial degree of passive solar gain in the winter months and adequate daylighting.

Additionally, it is proposed to install glazing with performance in line with the properties detailed in table 3.2. Solar control glazing will aid in controlling solar heat gains, whilst a visible light transmittance of approximately 60% will aid in ensuring that adequate daylighting is still maintained.

Dynamic thermal modelling will be undertaken as the design for the scheme progresses to develop the thermal comfort strategy for the scheme further.

3.2.3. High Efficiency Building Fabric

The specification of building elements with low U values on a scheme can facilitate significant energy savings by reducing the heat loss from the building during the heating season, and therefore the associated energy usage of the heating system.

Table 3.1 demonstrates the improvements that are proposed for the building fabric thermal performance of the extension areas of the scheme over Part L (2021) limiting standards.

ELEMENT	PART L (2021) LIMITING VALUES	PERFORMANCE TARGET	% IMPROVEMENT
Walls	0.26	0.20	23%
Floor	0.22	0.15	32%
Roof	0.18	0.15	17%
Windows, Rooflights & Pedestrian Doors	1.6	1.1	31%
Air Permeability m ³ /h/m ²	3	3	0%

Figure 3.1 - Building Fabric Performance Targets for Extensions

Furthermore, it is proposed that all new glazing on the scheme will meet/ exceed the further glazing performance targets set out in Table 3.2, below.

ELEMENT	PERFORMANCE TARGET
Glazing Solar Transmission (%)	27 – 40 (dependant on orientation / solar overheating)
Visible Light Transmission (%)	≥60

Figure 3.2 - Further Glazing Properties

3.3. High Efficiency Building Services

Part L of the Building Regulations set out the minimum performance requirements for fixed building services systems in new developments. It is proposed that the efficiency of the proposed fixed building services plant for this scheme will meet/exceed the minimum standards set out in this regulatory guidance.

This section of the report will address the energy reduction strategy to be adopted for primary system energy uses within the development relating to the fixed building services systems.

3.3.1. Space Heating

The mechanical heating system proposals for the main clubhouse and green keepers building are as detailed in table 3.3 below.

SYSTEM PROPERTY	
Club House	
Heat Source	Air Source Heat Pump
Fuel Type	Electric
Emitters	Radiators & Underfloor Heating
Seasonal Efficiency	2.93
Green Keepers Building	
Heat Source	Electric Panel Heaters
Fuel Type	Electric
Seasonal Efficiency	100%

Figure 3.3 - Space Heating Plant Properties

3.3.2. Reduction in Domestic Hot Water Loads

BREEAM water conservation credits have been targeted in the BREEAM Pre-Assessment undertaken for the scheme. Therefore, the domestic hot water (DHW) consumption will be reduced and a saving in DHW system energy requirements will be achieved.

It is proposed that the DHW storage cylinder/s will come equipped with factory installed insulation and that all DHW service flow, return and secondary return pipework will be fully insulated to reduce heat losses.

3.3.3. Heat Recovery Ventilation Systems

For an airtight building with air permeability equal to or less than $3.0\text{m}^3/\text{m}^2\cdot\text{hr}$ it would be appropriate for heat recovery systems to be installed - it is therefore proposed to incorporate Mechanical Ventilation with Heat Recovery (MVHR) systems within the development. These systems have the capability to recoup heat from the extracted warmed air and transfer it to the incoming fresh air supply stream. This reduces heat lost in the heating season and therefore can reduce the overall heating load of a development significantly. In the summer condition, MVHR systems can be equipped with a bypass function when the heat recovery function is not required.

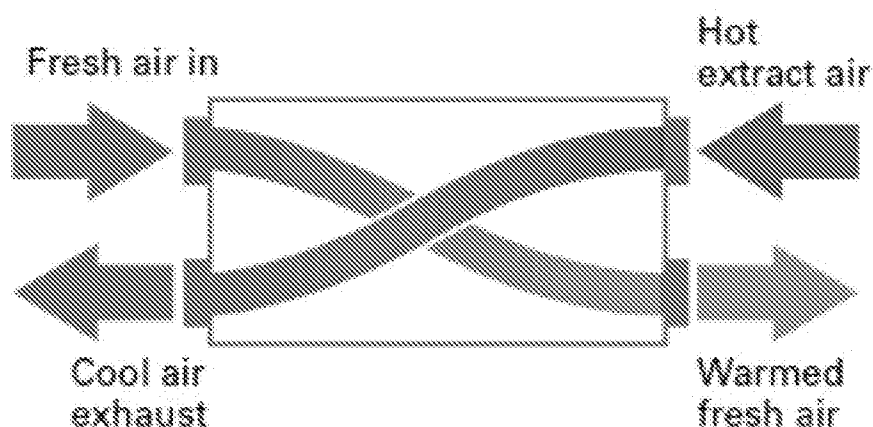


Figure 3.4 - MVHR Diagram (image source: www.nfan.co.uk)

It is assumed that the following provisions shown in Table 3.5 shall be made for ventilation within the new build development.

ELEMENT	PERFORMANCE TARGET
SFP (W/l/s)	1.4
Heat Recovery Efficiency (%)	73

Figure 3.5 - MVHR Ventilation Plant Properties

3.3.4. Internal Lighting Strategy

It is proposed to install energy efficient lighting systems throughout the scheme to aid in reducing the electrical loads associated with these systems.

It is proposed to install LED light fittings throughout.

As a minimum, it is proposed that all general lighting will have an average luminaire efficacy of 95 luminaire lumens per circuit-watt.

Both daylight level and occupancy sensing controls will be provided to all applicable areas. Daylight level control will be offered to both immediate window threshold zones and intermediate zones subject to the assessed daylight provision. These measures will aid in reducing the energy usage of artificial lighting systems in the building.

3.3.5. Reduction of Non-Building Regulation Loads

Loads associated with equipment other than fixed building services are not regulated as part of the Part L energy performance calculations that have been undertaken for the scheme.

3.3.6. Log Book

A Building Log Book will be provided to the Client as required by the Building Regulations. This document will contain information on the operation and predicted energy use of various systems and will assist the building management team in operating an energy efficient building.

The information within the Log Book shall be presented in a template/ format that accords with the guidance provided in CIBSE TM31.

A Building User Guide (BUG) will also be supplied for the scheme in the format set out by the BREEAM assessment requirements.

3.4. Renewable Technologies

3.4.1. Overview

In line with the energy hierarchy, after the feasibility of passive and lean measures have been assessed, the next step is to consider the application of renewable technologies to a scheme. Renewable energy is generated from natural resources – such as sun, wind, water, geothermal heat – utilising technology to harness the energy without compromising the ability of the energy stores to naturally replenish.

This section of the report will assess the feasibility of the adoption of a range of renewable technologies to the development.

The Low and Zero Carbon (LZC) technologies listed below have been assessed for their applicability to this development:

- Photovoltaics
- Solar hot water (solar thermal)
- Wave Power
- Tidal Power
- Small Scale Hydropower
- Wind Power
- Air Source Heat Pumps (ASHP's)
- Ground Source Heat Pumps (GSHP's)
- Anaerobic Digestion
- Biomass boilers

A series of assessments have been undertaken to assess the viability of the above technologies from an initial feasibility assessment through to final selection.

3.4.2. Preliminary Assessment

To aid final renewable technology selection, a number of technologies have been disregarded at a preliminary stage due to technical and practical issues applying them to the Bognor Regis Golf Course. Table 3.6 shows why a number of renewable technologies have been disregarded in the preliminary assessment.



Table 3.6– Preliminary Assessment of Renewable Technologies

	INCIDENT SOLAR ENERGY	COASTAL LOCATION	RIVER/ STREAM ACCESS	WIND ACCESS	ACCESS TO SOLAR WARMED AIR	ACCESS TO WARMED GROUND	ACCESS TO WASTE ORGANIC MATERIALS	LIMITED NOISE/ AESTHETIC IMPLICATIONS?	DEPENDENCY ON BIOMASS FUEL SOURCES ACCEPTABLE?	NOTES
Air Source Heat Pump					✓					– To be considered further.
Photovoltaics	✓									– Large, appropriately orientated roof area. – To be considered further.
Solar Thermal	✓									– Large, appropriately orientated roof area. However, large arrays required to make a significant contribution to thermal loads. Also, compatibility issues with other heat producing technologies. Therefore, this technology has not been considered further.
Wave Power		✗								– Not an immediate coastal location.
Tidal Power		✗								– Not an immediate coastal location.
Small Scale Hydropower			✗							– No suitable river/ stream on site.
Wind Power				✓				✗		– The NOABL wind map indicates that a wind speed of 5.3m/s is likely at a height of 10 metres. At 45m the wind map indicates that a wind speed of 6.6m/s is likely. However, this technology will still present aesthetic and noise implications.
Ground Source Heat Pump						✗				– Available access to warmed ground, although a year-round energy balance has not been demonstrated at this stage and other technologies are more likely to be financially viable. Therefore, this technology has not been considered further.
Anaerobic Digestion							✗			– Unlikely that organic waste streams in the quantities required for this form of heat generation plant will be generated on site.
Biomass Boilers									✗	– Not considered further due to potential dependence on biomass fuel sources, transportation, maintenance and air quality issues.

3.5. Decentralised Energy

3.5.1. Overview

As part of the sequential approach to the carbon reduction strategy for the development, the feasibility to connect to a decentralised energy and heating network will be investigated within this section of the Energy and Sustainability Statement.

3.5.2. Overview of Decentralised Energy Production

A decentralised energy network is a network in which energy is generated in the vicinity of where it is to be used – rather than at a large centralised plant where it is then distributed through the national grid.

Decentralised energy generation may be via combined heat and power (CHP), solar energy, geothermal or biomass. The generation of energy locally can reduce transmission losses and carbon emissions from energy generation.

3.5.3. Existing Local Decentralised Energy Production

The Association for Decentralised Energy (ade) have produced an online District Heating Installation map. This map can be used to find decentralized energy systems in the vicinity of new developments, and categorises them into residential/ commercial, university and hospital systems.

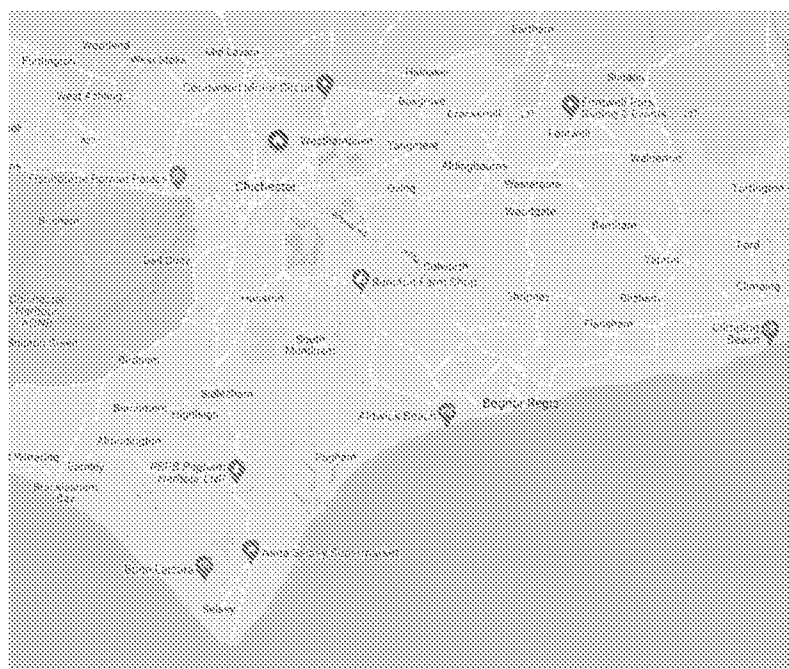


Figure 3-7: District Heating Installation Map Source (www.theade.co.uk)

This database has been accessed for the purpose of this energy strategy exercise. Figure 3.7 shows the area in the vicinity of Bognor Regis. The map indicates that the closest established district heating network is the Grayling Park District Heating Scheme – with no schemes located at present in Bognor Regis. Given the significant distance from this network to the development site – it is not considered to be feasible potential connection.

3.5.4. Feasibility of Connecting to a Decentralised Energy Network in Future

If a local decentralised energy network develops in the future, this development could potentially be connected by means of heating mains to the main plantroom.

3.5.5. CHP

A CHP engine generates electricity and heat in a single process from a single fuel (typically natural gas). This cogeneration process has historically facilitated greater fuel efficiencies being achieved and reduces transmission losses. This is illustrated in Figure 3.8, below.

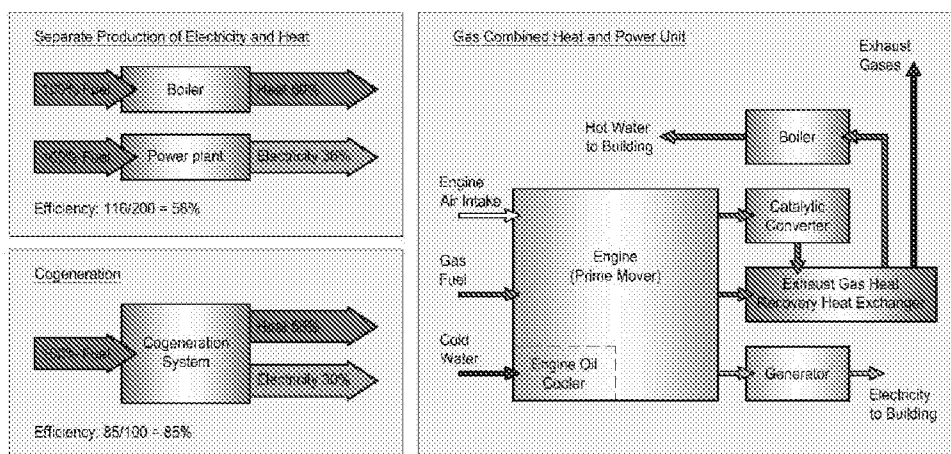


Figure 3.8 – Illustrative CHP Schematic

With the decarbonisation of the national grid, which is to be reflected by upcoming changes to the Part L emission factor for electricity, the regulated CO₂ emissions savings associated with the implementation of a CHP installation are anticipated to be significantly reduced.

As the decarbonisation of the grid has reduced the feasibility of implementing CHP installations, this technology will not be considered further for this scheme.

3.6. Secondary Assessment

A secondary LZC assessment was then completed to further investigate the remaining technologies. The remaining and most suitable LZC technologies for the Bognor Regis Golf Course are:

- Air source heat pumps (ASHPs)
- Photovoltaics

3.6.1. Air Source Heat Pumps (ASHP)

Air source heat pumps have, in general, been developed using existing air conditioning technology. However, instead of cooling, the refrigerant cycle is reversed so that heating is supplied to the building. The equipment is typically supplied as a package, with two major components:

- External unit
- Thermal store



Figure 3.9 – Air Source Heat Pump (Image Source: www.mitsubishielectric.co.uk)

The external unit is a fully integrated package including the complete refrigerant circuit. A typical cooling system would have an in-room evaporator unit. The advantage of the integrated approach is that the unit is supplied and pre-charged with refrigerant and skilled labour is not required; only a water pipe work circuit needs to be connected.

Were this technology to be incorporated into the design, the units are located externally and screened from view.

The efficiency of air source heat pumps typically drops at low external ambient conditions and/or at higher distribution temperatures when the demand for the generated heat is greatest. The heat pumps are electrically driven so there are associated reductions in CO₂ emissions with the greening of the electricity grid.

Many ASHP installations feature de-frost functions on the coils and electric immersion heaters on the space heating circuits to overcome low ambient conditions. However, with appropriate control systems these direct electric functions should seldom be called upon.

The heating distribution system for ASHP applications is generally underfloor heating or a convector designed for low flow temperatures. The final strategy will be determined within the detailed design.

There may be potential issues with the application of this technology due to noise generation and aesthetics. Which can be addressed by the location of the unit and enclosure within acoustic screening.

3.6.2. Photovoltaics

Photovoltaics are semiconductor devices that convert sunlight into direct current (DC) electricity. Groups of panels can be electrically configured into arrays which can be used to power a building's electrical load.

A number of photovoltaic systems including monocrystalline, polycrystalline and thin film are available, generally made up into arrays using multiple panels or roof slate "substitutes". Photovoltaic panels can also replace vertical cladding systems.



Figure 3.10: Photovoltaic array (Source: Sunpower)

A photovoltaic (PV) installation generally consists of panels, inverters, controls and wiring for integration into a building's main electrical distribution system.

The use of a photovoltaic array would be compatible with the hours of usage of the building. The significant daytime equipment and lighting loads will coincide with hours where the panels are generating the most electricity from the incident sunlight.

The orientation and mounting angles of the panels are critical in order to maximise their output. The Bognor Regis Golf Course clubhouse and green keepers building has areas of roof available for the erection of PV arrays at an optimised angle.

Overshadowing should always be considered when assessing the feasibility of installing a PV installation as it can significantly reduce the output of a solar photovoltaic system. In the case of this development, there is little overshadowing risk on the site, as can be seen in the site location map, Figure 1.1. Overshadowing from neighbouring panels could be easily avoided by providing adequate spacing between the panels.

Notably, the UK government scrapped the Feed-in Tariff scheme in April 2019. The scrappage applied to both export and generation tariffs. Prior to the scrappage of this scheme, solar photovoltaic arrays were eligible to receive payments per unit of electricity generated and excess electricity could also be exported back to the grid in return for an additional export tariff payment. In January 2020 the UK government brought in the Smart Export Guarantee (SEG). The SEG dictates that there will be a legal requirement for qualifying suppliers with more than 150,000 customers to offer payment for surplus power that new solar arrays export back into the grid. Although the rate received for this exported electricity will not be fixed as it was in the previous government scheme, this will still offer a means of some financial return for exported electricity.

A solar photovoltaic array has therefore been found to be a suitable form of LZC technology for this development.

3.6.3. Summary of Proposals

An analysis of the available low and zero carbon technologies has determined that the most appropriate forms of technologies for application to Bognor Regis Golf Course would be a PV array and ASHP.

- Club House – To incorporate ASHP and PV
- Green Keepers Building - To incorporate PV

3.7. Energy Monitoring

3.7.1. Overview

It is recognised that in order to achieve truly carbon efficient buildings, there will be a need to monitor and understand operational energy use on occupation and work towards minimising the performance gap – i.e. the difference between predicted energy usage at design stage and the actual energy use on occupation.

3.7.2. Monitoring and Metering

A Building Energy Monitoring System (BEMS) is proposed for the scheme to control and monitor the building services systems that are to be installed. This system will facilitate remote monitoring of system performance – with alarms for faults and remote meter reading capability.

Individual heat meters will be installed to the heating circuit and to the domestic hot water circuit. All heat meters will be equipped with M-bus (/equivalent) to allow for remote monitoring.

A utility meter is to be installed for the electricity supply to each building on the development. Electricity sub metering will also be installed at the below locations as a minimum:

- Mechanical services plant;
- PV arrays; and
- Split distribution boards for lighting and small power.

All electricity sub meters will be equipped with Mod-bus (/equivalent) to allow for remote monitoring.

The metering/ sub-metering strategy for the scheme will be developed further at detailed design stage. The comprehensive metering provision will allow full remote monitoring capabilities for the energy usage on site, which will facilitate the performance monitoring of the systems.

3.7.3. Building Services Controls Systems

An automatic controls system will be specified at detailed design stage to operate, control and monitor all central plant. It is anticipated that its performance will exceed the requirements of Part L and will optimise energy use. A controls interface will be allowed for which will allow monitoring and logging of the building's energy use via sub-metering systems.

3.8. BREEAM

3.8.1. General

The Building Research Establishments Environmental Assessment Method (BREEAM) sets the standard for best practice in sustainable design.

A BREEAM assessment features assessment criteria covering the following environmental areas:

1. Management
2. Health and Wellbeing
3. Energy
4. Transport
5. Water



6. Materials
7. Waste
8. Land Use & Ecology
9. Pollution

Additional innovation assessment credits are also available to allow developments to gain further credits within certain areas for going above and beyond the baseline assessment requirements.

For the Bognor Regis Golf Course an overall **BREEAM rating of 'Very Good'** has been targeted. This target has been set for the development as the result of detailed discussions with the client and design team to establish which of the environmental issues could be sensibly targeted for the development within the project's restraints.

4. ENERGY PERFORMANCE

4.1. Overview

An initial assessment of regulated energy usage has been undertaken for the proposed development, based on the preliminary energy strategy that has been set out for the scheme in Section 3.

It is the intention that this energy modelling will demonstrate the following:

- Compliance with Part L of the Building Regulations; and
- Demonstrate that 10% of the building energy requirements for the scheme will be met from renewable or low carbon sources.

4.2. Part L Compliance

In order to demonstrate the impact of the proposed energy efficiency measures for the scheme, an energy model has been built for the scheme using iSBEM v6.1.a.

This software is an approved Simplified Building Energy Model (SBEM) interface - approved by Communities and Local Government to produce Energy Performance Certificates for non-domestic buildings and to check compliance with Part L of the building regulations. This version of iSBEM software assesses compliance against Part L 2021 of the Building Regulations.

The BRUKL output documents from the undertaken SBEM models are included in Appendix 1. The BRUKL output document demonstrates:

- Building Emission Rate (BER) < Target Emission Rate (TER)
- Building Primary Energy Rate (BPER) < Target Primary Energy Rate (TPER)

When the detailed design and construction programme for the scheme is established, the Part L compliance strategy will need to be revisited by the design team to ensure compliance of the detailed design proposals with the relevant version of Part L of the Building Regulations.

4.3. Contribution from Renewable or Low Carbon Energy Sources

Two forms of LZC technology are proposed for the scheme – an ASHP to meet the thermal loads of the scheme and a solar PV array to contribute to the electrical energy demands of the scheme.

The SBEM compliance calculation undertaken for the scheme has demonstrated the following:

Club House

- PV array produces 65% of annual, regulated energy consumption; and
- ASHP produces 49% of annual, regulated energy consumption.

Green Keepers Building

- PV array produces 76% of annual, regulated energy consumption.

It is therefore demonstrated that significantly more than 10% of the annual, regulated energy consumption of the buildings will be met by LZC technologies.

5. WATER SAVING TECHNOLOGIES ASSESSMENT

5.1. Rainwater Recycling

Rainwater recycling is a system which collects, stores, and utilises rainwater for use either within a building or for irrigation purposes around the site. The water is usually collected from the roof and channelled in rainwater pipes to a central storage tank. Filtration systems ensure that large detritus such as leaves and sediments don't enter the tank and clog up the system. The water is then pumped to where it is required which would be non-potable outlets such as WC cisterns, irrigation, or laundry.

Due to spatial constraints at the Golf Course the rainwater storage would likely have to be located underground. There are increased costs with installing the tank underground due to ground works however if the tank is underground the water temperature stay fairly constant and does not go above 20°C. This reduces the risk of Legionella significantly, however it is recommended that a UV filter be included if the water is to be used in conjunction with a spray fitting.

The factors that are considered for rainwater recycling feasibility are:

- The historical rainfall data for the local area
- The area of roof for rainwater collection
- The number of outlets that can use recycling rainwater (WCs, irrigation, laundry)
- Frequency of use of these outlets (occupancy of building, and type of building)
- Space for rainwater tank and booster pumps

It should be noted that where a building utilises rainwater recycling there will need to be 2No. water supplies to the building, 1 for potable water and 1 for the rainwater. This means increased amounts of pipework, this added cost is not normally accounted for in rainwater system quotes.

5.2. Greywater Recycling

Another way to reduce water consumption is to use greywater recycling. This is system collects wastewater from showers, wash hand basins, baths...etc. and re-uses the water in non-potable applications such a WC flushing and irrigation. Greywater systems are more complex and expensive than rainwater systems due to the routing of drainage throughout the building and the filtration/treatment systems required. Due to the risk of biological contamination greywater cannot be stored unless treated. Greywater recycling also requires more maintenance than a rainwater system due to the level of treatment/filtration required.

6. CONCLUSIONS

When reviewing the energy and sustainability strategy for this development, careful consideration has been given to the context of the site, local planning policy and Part L of the Building Regulations.

The approach taken for the proposed energy strategy for the development has followed the guidance of the Arun Local Plan 2011-2031. A sequential approach has been adopted in line with the Energy Hierarchy - assessing in turn the feasibility of reducing the energy demand of the building, using energy more efficiently, applying LZC technologies and using the remaining fossil fuels cleanly.

A number of passive design measures have been implemented including optimising the thermal performance of the building envelope beyond the minimum U value and air infiltration standards set out in Part L of the Building Regulations, providing a sensible glazing façade ratio and utilising solar control glazing to reduce the risk of overheating.

Energy efficient building servicing systems are proposed for the development to reduce the energy loads of the development on occupation. Key measures that are proposed for the scheme to reduce regulated energy usage are factory applied insulation on domestic hot water stores, heat recovery ventilation systems, high efficiency lighting installations with occupancy and photocell controls where appropriate and an intelligent automatic controls system to optimise system performance.

A feasibility assessment has been undertaken evaluating the applicability of a number renewable and clean technologies to the Bognor Regis Golf Course development (Clubhouse & Green Keepers Building). The technologies identified as being the most appropriate for application to the site were ASHPs and PV.

It is proposed that this energy strategy for the scheme will be implemented to:

- Abide by the Arun energy hierarchy.
- Meet the energy performance requirements of Part L of the Building Regulations; and
- Meet the 10% renewable target set out in the Arun Local Plan 2011-2031.

APPENDIX 1

BRUKL Output Documents

APPENDIX 1 – BRUKL OUTPUT DOCUMENTS

BRUKL Output Document



Compliance with England Building Regulations Part L 2021

Project name

Bognor Regis Golf Course

As designed

Date: Fri Jan 28 16:05:12 2022

Administrative information

Building Details

Address: Bognor Regis,

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.a.0

Interface to calculation engine: iSBEM

Interface to calculation engine version: v6.1.a

BRUKL compliance check version: v6.1.a.0

Certifier details

Name: Ridge & Partners LLP

Telephone number: 01962 834400

Address: Partnership House, Moorside Road, Winchester,
SO23 7RX

Foundation area [m²]: 1402

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.56
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.18
Target primary energy rate (TPER), kWh/m ² annum	49.1
Building primary energy rate (BPER), kWh/m ² annum	21.4
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{limit}	U _{calc}	U _{max}	First surface with maximum value
Walls*	0.26	0.2	0.2	Board Room / Family Room / Staff Room/e
Floors	0.18	0.15	0.15	3TT Accessible Changing/f
Pitched roofs	0.16	0.15	0.15	Cellar/c
Flat roofs	0.18	0.15	0.15	Board Room / Family Room / Staff Room/c
Windows** and roof windows	1.6	1.1	1.1	Board Room / Family Room / Staff Room/n/g
Rooflights***	2.2	-	-	No external rooflights
Personnel doors*	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors
U_{limit} = Limiting area-weighted average U-values [W/m²K] U_{calc} = Calculated area-weighted average U-values [W/m²K] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. * For the doors, limiting U-value is 1.6 W/m²K. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modeled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

BRUKL Output Document

HM Government
Compliance with England Building Regulations Part L 2021

Project name

Bognor Regis Golf Course - Green Keepers

As designed

Date: Tue Feb 01 14:01:55 2022

Administrative information

Building Details

Address: Bognor Regis,

Certification tool

Calculation engine: SBEM

Calculation engine version: v8.1.a.0

Interface to calculation engine: iSBEM

Interface to calculation engine version: v8.1.a.0

BRUKL compliance check version: v8.1.a.0

Certifier details

Name: Ridge & Partners LLP

Telephone number: 01902 834400

Address: Partnership House, Moorside Road, Winchester,
SO23 7RX

Foundation area [m²]: 833

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	3.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	3.51
Target primary energy rate (TPER), kWh/m ² annum	38.02
Building primary energy rate (BPER), kWh/m ² annum	31.33
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{limit}	U _{mean}	U _{max}	First surface with maximum value
Walls*	0.28	0.2	0.2	Head Green Keeper/in
Floors	0.18	0.09	0.15	Store/f
Pitched roofs	0.18	0.15	0.15	Head Green Keeper/c
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.1	1.1	Training Room/w/g
Rooflights***	2.2	-	-	No external rooflights
Personnel doors*	1.6	1.6	1.6	Chemical Safe Area Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Area Roller Door
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{limit} = Limiting area-weighted average U-values [W/(m²K)]
U_{mean} = Calculated area-weighted average U-values [W/(m²K)]
U_{max} = Calculated maximum individual element U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
* For fire doors, limiting U-value is 1.8 W/(m²K).
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3



RIDGE

