ENERGY STATEMENT

NEW DIALYSIS UNIT, PORT TALBOT

18TH JULY 2024

DOCUMENT CONTROL

Project	New Dialysis Unit, Acacia Avenue, Port Talbot
Reference Number	8687

Document Checking:

Prepared By:	Owain Morgan	Signed:	OMorgan
Checked By:	Daryl Fisher	Signed:	DFisher
Verified By:	Daryl Fisher	Signed:	DFisher

Issue	Date	Status
1	19/07/2024	First Issue

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

1.1 This report represents the Energy Statement to support the planning application of the proposed Dialysis Unit off Acacia Avenue, Port Talbot. The report provides an overview of the relevant planning policies for the proposal, placing emphasis on sustainability through energy efficient designs with low carbon and renewable technology appraisal.

1.2 An overview of the proposed design is provided including fabric efficiency measures and energy efficient building services.

1.3 The assessment provides a baseline energy and CO2 emissions result for the scheme which represents the worst acceptable performance standard dictated by Building Regulations Approved Document L (2021). This result is then used to assess proposed enhancements to the building design.

1.4 A fabric first approach is adopted with enhanced insulation levels beyond the minimum Part L standards. This results in a 3.8% reduction in CO2 emissions through lower heating demand.

1.5 Furthermore, the assessment has identified air conditioning through air source heat pump split system VRF as a means of supplying heating and cooling through an energy efficient, on-site low carbon energy source. This is considered the most appropriate renewable or low-carbon energy source for the scheme as it would deliver heating and cooling to most occupied spaces in an energy efficient manner and ensure exceptional thermal comfort for the building users which is an essential aim of the development.

1.6 In addition, incorporating mechanical ventilation with heat recovery (MVHR) to make use of waste heat and low energy LED lighting is also proposed, maximising energy demand reduction. Overall, CO2 emissions are reduced by 1.9 tCO2/year, approximately 14% lower than the Part L compliant baseline emissions scenario.

2. INTRODUCTION

Site Context

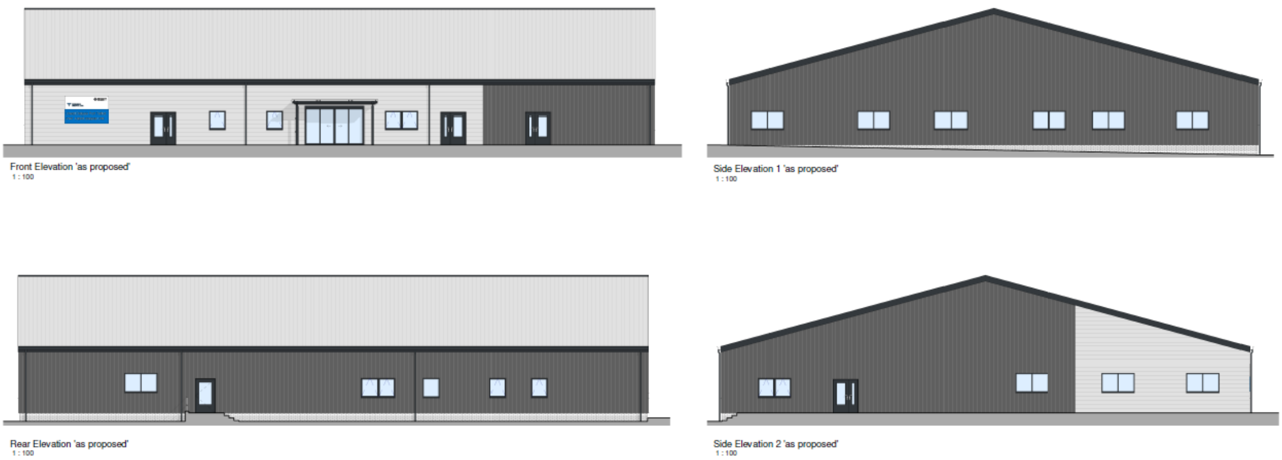
2.1 The site includes the proposed redevelopment of Stationery House, including the part demolition of the existing factory building and rebuilding work, change of use from vacant factory (Use Class B1 & B8) to form a Satellite Dialysis Unit (Use Class D1), including alterations to the existing building, with associated car parking, landscaping, refuse storage and engineering works.

Figure 1: Site Location Plan (Courtesy of CTD Architects, July 2024)

2.2 The proposed scheme consists of a single storey building, oriented to the south-east. Publicly occupied spaces are provided around the external perimeter of the building, benefiting from windows providing natural light to the occupied spaces while optimising natural ventilation strategies from openable windows. Treatment spaces and consulting rooms which may require privacy are located internally.

2.3 Existing vegetation and trees will be maintained where practical and new rain garden and soft landscaping features introduced to enhance the external spaces around the building. Additionally, cycle storage and dedicated parking spaces and provision for electrical vehicles charging is to be supplied to encourage their use.

Figure 2: Proposed Elevations (Courtesy of CTD Architects, July 2024)



3. LOCAL PLANNING POLICY & REGULATIONS

3.1 The following section is a review of the policy and regulatory considerations that have been considered as part of this proposal. The purpose of this document is to assess the proposed energy efficiency and carbon emission reduction measures that are proposed for the development that exceed the requirements of the relevant regulatory requirements.

Local Planning Policy – Sustainability

3.2 The Neath Port Talbot County Borough Council Local Development Plan 2011-2026 includes a series of policies relating to the implementation of renewable energy systems within new development.

3.3 This statement seeks to address the requirements of Policy RE2 *Renewable and Low Carbon Energy in New Development* as outlined below by submitting an Energy Assessment in support of the application which advises the feasibility of adopting the most appropriate technology applicable to the development.

> Policy RE2
>
> Renewable and Low Carbon Energy in New Development
>
> Schemes that connect to existing sources of renewable energy, district heating networks and incorporate on-site zero / low carbon technology (including microgeneration technologies) will be encouraged.
>
> The following proposals will be required to submit an Energy Assessment to determine the feasibility of incorporating such a scheme and where viable, would be required to implement the scheme:
>
> (a) Residential development for 100 or more dwellings;
>
> (b) Development with a total floorspace of 1,000 sqm or more.

3.4 As set out within the policy quotation above, an Energy Assessment is required for developments with a total floorspace of 1,000m^2.

3.5 This Statement describes the energy efficiency measures that are adopted within the proposals including on site zero/low carbon technologies and energy efficiency measures. No existing sources of renewable energy or district heating networks are present within the development.

Approved Document Part L 2022

3.6 Separate from the planning considerations, the energy strategy for the development is also fundamental for building regulation compliance under Approved Document Part L: Volume 2.

3.7 This necessitates that all renovation projects must demonstrate improved insulation levels beyond those minimum standards set out within the Approved Document in an effort to reduce the energy requirement to condition the building. The Approved Document also sets out minimum efficiency standards for new and replacement building services to ensure that the building is serviced as efficiently as possible.

3.8 The development at Stationary House has been identified as a renovation and material change of use rather than a new building due to the retention of key building elements therefore the energy strategy reported within this statement has adopted these standards.

4. BASELINE CALCULATION

4.1 To assess the likely energy demands and carbon dioxide emissions of the proposed development, SBEM calculations have been undertaken using drawings produced by CTD Architects and details of potential building services strategies provided by the design team.

4.2 In order to establish the baseline energy demand for the development, the SBEM calculation methodology has been utilised. SBEM was developed by the Building Research Establishment (BRE), as a tool to help deliver its energy efficiency policies, which provides a framework for calculating the energy consumption of non-residential buildings.

4.3 The baseline calculation provides a construction specification that can be followed to reach the minimum acceptable compliance standard of Part L Building Regulations and provides a benchmark from which any further improvements can be assessed.

4.4 The following tables specify the performance standards used within the baseline representing the worst acceptable standards that should be met within the development.

Table 1: Baseline Fabric Performance Specification

Building Fabric Baseline Performance		
Item	Construction	Part L2 U-Value Standard (W/m2K)
Floors	Ground Floor	0.25
Walls	External Walls	0.26
Roof	Pitched Roof	0.18
Openings	Solid Doors	1.80
	Windows	1.80
Air Tightness	15 m^3/hm^2 (Default Value for existing buildings)	

Table 2: Baseline M&E Performance Specification

M & E Specification Baseline Performance		
Item	Element	Efficiency
Lighting	Main Lighting	95 lm/cW
	Display Lighting	80 lm/cW
Ventilation	Mechanical Ventilation with Heat Recovery (MVHR)	SFP: 2.3 W/l/s
	Zonal Extract Systems	SFP: 0.5 W/l/s
Direct Heating Systems	Direct Electric Heaters	100% Efficiency
Air Conditioning Systems	Split system VRF	S.C.O.P: 2.5 S.E.E.R: 5.0
Hot Water Systems	Gas fired boiler system	91%

4.5 The results of the initial baseline calculation are presented within Table 3. In total regulated energy consumption is predicted at approximately 87,166 kWh per year, equivalent to 13,505 kg CO2e.

Table 3: Baseline Energy & CO2 Emissions Result

M & E Specification Baseline Performance				
Item	Regulated Energy Consumption (kWh/year)	Regulated CO2 Emissions (kgCO2/year)	Regulated CO2 Saving (kfgCO2/year)	Regulated CO2 Emissions Saving (%)
Baseline (Part L Minimum Standard)	87,166	13,505	-	-

5. BUILDING FABRIC IMPROCEMENTS

5.1 The proposed development will take a fabric-first approach through adopting good levels of insulation and exceeding the minimum Building Regulations standards, ensuring that the building will optimise energy efficiency and make the best use of building systems.

5.2 New walls and roofs are proposed with insulation standards that improve upon the minimum requirements for the scheme, thus contributing to a reduced energy demand to heat the building. Furthermore, new windows and doors will be installed throughout the building.

5.3 The design team propose to maintain the existing floor slab, this is expected to be uninsulated however u-value calculations indicate that a u-value of 0.23 W/mK can be expected which is within the limiting performance standard for a retained ground floor therefore would be considered compliant with Part L requirements.

5.4 Since the development is considered a renovation and change of use, there is no regulatory requirement for an air tightness test to be undertaken on completion, therefore the default value of 15 m^3/hm^2 is adopted as the most appropriate input for this building.

5.5 Air tightness refers to the unintentional air leakage from the building, the higher the value the more air is lost and more cooler air infiltration into the building which in turn would require additional energy to maintain comfortable temperatures.

5.6 It is highly likely that in practice the building will be more airtight, and a lower score can be applied however this would require practical testing on completion of the scheme. For the purpose of this assessment the default value is applied for consistency.

5.7 In all cases, building elements reach or improve upon the minimum standard for building regulations compliance as defined within Table 4.

Table 4: Proposed building fabric specification

Building Fabric Baseline Performance			
Item	Construction	Part L2 U-Value Standard (W/m2K)	Proposed building U-value standards (W/m2K)
Floors	Ground Floor	0.25	0.23
Walls	External Walls	0.26	0.22
Roof	Pitched Roof	0.18	0.16
Openings	Solid Doors	1.80	1.80
	Windows	1.80	1.80
Air Tightness	15 m^3/hm^2 (Default Value for existing buildings)		

5.8 By improving upon the insulation levels, the energy requirement for heating the building is reduced resulting in the energy and CO2 emissions reductions as reported within Table 5.

5.9 A 510 kgCO2/year reduction beyond the baseline is anticipated, equivalent to 3.8% emissions saving.

Table 5: Improved Building Fabric Energy & CO2 Results

Improved Building Fabric Energy & CO2 Results				
Item	Regulated Energy Consumption (kWh/year)	Regulated CO2 Emissions (kgCO2/year)	Regulated CO2 Saving (kgC02/year)	Regulated CO2 Emissions Saving (%)
Baseline (Part L Minimum Standard)	87,166	13,505	-	-
Building Fabric Improvements	83,929	12,994	510	3.8%

6. BUILDING SERVICES STRATEGY

6.1 Following improvement to the insulation standards, the design team propose adopting energy efficient systems to service the building and adopting the most practical solution for the intended use of the development.

6.2 Heating and cooling will be provided to most spaces within the building through a highly efficient split system VRF which utilises heat pump technology to deliver heating and cooling to the occupied spaces, thus ensuring occupant comfort in an energy efficient way.

6.3 Heating to other areas such as circulation spaces, changing rooms and WCs will be supplied by direct electric panel heaters with programmable controls which will be easily operated by the occupants.

6.4 By supplying heating and cooling by electrically powered systems rather than fossil fuels, the design team will optimise the building for future decarbonization of the national grid, thus allowing for continuous carbon reduction in future.

6.5 Mechanical ventilation and heat recovery systems are also proposed for building to optimise occupant comfort and to improve on energy efficiency. The heat recovery features of the MVHR system makes use of waste heat during the ventilation process by converting a portion of the heat contained within extracted air to incoming fresh air. This acts as an efficient way of supplying fresh air to the occupied spaces while also maximizing energy efficiency by making use of waste heat.

6.6 Through previous experience of other similar projects, the design team has identified that a gas fired heating system as the most effective method of meeting the hot water requirements of the scheme therefore this strategy is proposed at this development. Generally, although gas fired systems are thought of as a higher carbon option, they are still a very efficient solution for providing hot water.

6.7 The energy demand for lighting is a major contributor to the energy consumption within the building therefore energy efficient LED light fittings are proposed throughout the building. Although not included within the current model, the design team can also explore efficient lighting control strategies through incorporating presence detectors to automatically turn off lights when not in use. This could further reduce energy consumption in rooms that are only periodically occupied.

6.8 Table 6 summarises improvements in the M&E services beyond the minimum Part L requirements that are proposed for the scheme. When combined, these contribute to a further reduction in the predicted energy demand and the resultant carbon emissions.

Table 6: Proposed M&E Service Efficiency Improvements

Proposed M & E Specification Performance			
Item	Element	Worst Acceptable Efficiency	Proposed Efficiency
Lighting	Main Lighting	95 lm/cW	110 lm/cW
	Display Lighting	80 lm/cW	110 lm/cW
Ventilation	Mechanical Ventilation with Heat Recovery (MVHR)	SFP: 2.3 W/l/s	SFP: 1.8 W/l/s
	Zonal Extract Systems	SFP: 0.5 W/l/s	SFP: 0.5 W/l/s
Direct Heating Systems	Direct Electric Heaters	100% Efficiency	100% Efficiency
Air Conditioning Systems	Split system VRF	S.C.O.P: 2.5 S.E.E.R: 5.0	S.C.O.P: 4.0 S.E.E.R: 5.0
Hot Water Systems	Gas fired boiler system	91%	92%

6.9 By implementing improved systems performance beyond the minimum standards an additional 1.39 tCO_2 per year saving beyond the improved building fabric model scenario can be demonstrated, equivalent to a 10.7% reduction as reported within Table 6.

Table 7: Improved Building Services Energy & CO2 Results

Improved Building Fabric Energy & CO2 Results				
Item	Regulated Energy Consumption (kWh/year)	Regulated CO2 Emissions (kgCO2/year)	Regulated CO2 Saving (kgC02/year)	Regulated CO2 Emissions Saving (%)
Baseline (Part L Minimum Standard)	87,166	13,505	-	-
Building Fabric Improvements	83,929	12,994	510	3.8%
Improved M&E Specification	74,114	11,602	1,392	10.7%

7. ON-SITE RENEWABLE TECHNOLOGY APPRAISAL

7.1 In addition to the energy modelling, an initial assessment of feasible renewable energy sources has been carried out with results described below. This appraisal has considered specific site constraints such as location, access and orientation of the building in addition to the intended use of the scheme and the resultant energy needs.

7.2 The study has assessed the use of wind turbine, solar thermal collectors, biomass heating, ground/air source heat pumps and solar photovoltaic systems.

ON-SITE LZC & LOW CARBON FEASIBILITY

Wind Turbine Generators

7.3 The wind speeds and frequencies in urban areas such are not expected to yield any significant carbon reductions. For these reasons the application of a wind turbine for the project has not been considered.

Solar Thermal

7.4 Solar thermal panels are used to produce hot water and consist of roof mounted collector panels that make use of heat energy from the sun to heat water circulating in a closed loop. Usually, this heat is then transferred via a heat exchanger into a hot water storage tank that is also heated by a gas or other boiler.

7.5 Two main types of solar water heating system are used in the UK: flat plate collectors and evacuated glass heat tubes. Flat plate collectors circulate water around a black coloured receiver plate that is heated by direct sunlight and to some extent by indirect light; heat being retained by a thermally glazed panel above. Evacuated glass heat tubes are more efficient, particularly in the UK, as they can work more effectively at low solar radiation levels. They are, however, more expensive than flat plate collectors. They consist of rows of parallel transparent glass tubes, each containing an absorber tube which converts the sunlight into heat energy.

7.6 To achieve a substantial CO_2 reduction through solar water allocation alone, a significant number of panels would be required, and it is unlikely that the building will require the amount of hot water that would be produced from such a system. As a result, it is not recommended to install a solar hot water system at the proposed development.

Ground Source Heating

7.7 Ground source heat pumps (GSHP) extract heat from the ground and work on the principle that the below ground temperature is more constant compared to above ground.

7.8 In the winter months, the below-ground temperature is warmer than above ground and the heat carrier fluid circulating within the absorber pipes absorbs the heat. This heat energy is then raised by a compressor (using the compression cycle) and through a heat exchanger, distributed via a low temperature distribution system such as under floor heating, to satisfy a proportion of space heating requirements. GSHP systems are not suitable for satisfying high temperature hot water demands.

7.9 In the summer months, the below-ground temperature is colder than above ground and heat carrier fluid circulating within the buried pipes rejects building heat. This heat rejecting capacity is then raised by a compressor (using the compression cycle), and through a heat exchanger, is then distributed via a chilled water distribution system to satisfy a proportion of space cooling requirements.

7.10 There are several configurations for GSHP systems, however the installation of a vertical collector system or horizontal collector system is not considered technically feasible for the project, given the restricted areas available for their installation.

7.11 Given the limited installation area for required for collectors (horizontal and vertical), and the relatively high cost of GSHP systems, it is not recommended to install a ground coupling at the proposed development.

Air Source Heating

7.12 Air source heat pumps (ASHPs) utilise the outside air as a heat source or heat sink. Heat can be used to warm water for radiators or underfloor heating systems or through air-to-air systems that can provide heating and cooling.

7.13 ASHPs work on a similar principle to a fridge, which extracts heat from its inside. An evaporator coil mounted outside absorbs or expels the heat; a compressor unit then drives refrigerant through the heat pump and compresses it to the right level to suit the heat distribution system.

7.14 ASHP technology is considered one of the most feasible low carbon technologies for the development, and due to the low carbon emissions provided by electrical and ASHPs these are considered more sustainable than fossil fuel systems. For this reason, air source heat pumps have been specified for the primary heating in this development, providing heating and cooling to most occupied spaces through the proposed split system VRF.

Biomass

7.15 Biomass boilers replace conventionally powered boilers with an almost carbon neutral fuel such as wood pellets or wood chips. The fuel is classed as almost carbon neutral because the CO_2 released during the burning of biomass is balanced by that absorbed by the plants during their growth.

7.16 The proposed development could allocate space for boilers and fuel storage, but fuel would likely be sourced from outside the area surrounding the proposed development.

7.17 Though biomass is a cleaner fuel than gas or heating oil, it should be noted, however, that fossil fuels are utilised in the production, processing and transportation of biomass fuels. Therefore, a key issue when choosing the biomass fuel supplier is the distance between the grower and the boilers as well as the method of transportation.

7.18 Although many biomass burners will meet Clean Air Act requirements, combustion of woody biomass releases higher quantities of NO_X, SO_X and particulates (PM10 and PM2.5) compared to a comparable system fuelled by natural gas, which can adversely affect local air quality.

7.19 Given site spatial limitations, the management burden of fuel deliveries and removal of ash and the potential impact on local air quality, biomass has been deemed unfeasible for the project.

Photovoltaic Cells

7.20 Solar Photovoltaics (PVs) are solar panels which generate electricity through photon- to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells are made up from layers of semi-conducting silicon material which, when illuminated by the sun, produces an electrical field which generates an electrical current. PVs can generate electricity even on overcast days, requiring daylight, rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day. PVs offer a simple, proven solution to generating renewable electricity.

7.21 The main types of commercially available PV panels on offer in the UK are constructed from cells as described below:

- Monocrystalline silicon cells are the most efficient of the PV technologies with a conversion efficiency of between 15-18% (available solar energy to electricity produced). They are cut from single ingots of silicon, have an unbroken crystal lattice and are the most expensive of PVs.

- Polycrystalline silicon cells have a conversion efficiency of between 13-16%. They are less expensive than monocrystalline cells, are constructed of numerous smaller crystals and are recognisable from a visible 'grain' on the panel; and

- Thin film cells have a conversion efficiency of between 5-10%. As well as being less efficient, they are cheaper than silicon derived cells. Thin films can be mounted on folded or curved surfaces and are used extensively in Building Integrated PV products.

7.22 The electricity produced by PV cells is Direct Current (DC) which is converted to Alternating Current (AC) using an inverter before use within a building or export to the local distribution network.

7.23 PV systems are not currently included within the proposal however the design team can further explore their viability as the development progresses.

EXPORTING RENEWABLE ENERGY OR LOW CARBON HEATING

7.24 The design team has sought to optimize the building services for the development. The proposed system will be sized by specialist engineers to provide heating, cooling and hot water in the most efficient way, for this reason the systems are not intended to deliver excess capacity for export or delivery to neighbouring properties.

7.25 The export of waste heat from industrial process is also considered within the local policy. The nature of the building use does not lend itself to this as there is not thought to be a substantial component of waste heat that could be exported.

8. TOTAL ENERGY & CO2 SAVING

8.1 Following the implementation of both the building fabric and systems efficiency improvements the overall energy & CO2 emissions saving can be reported.

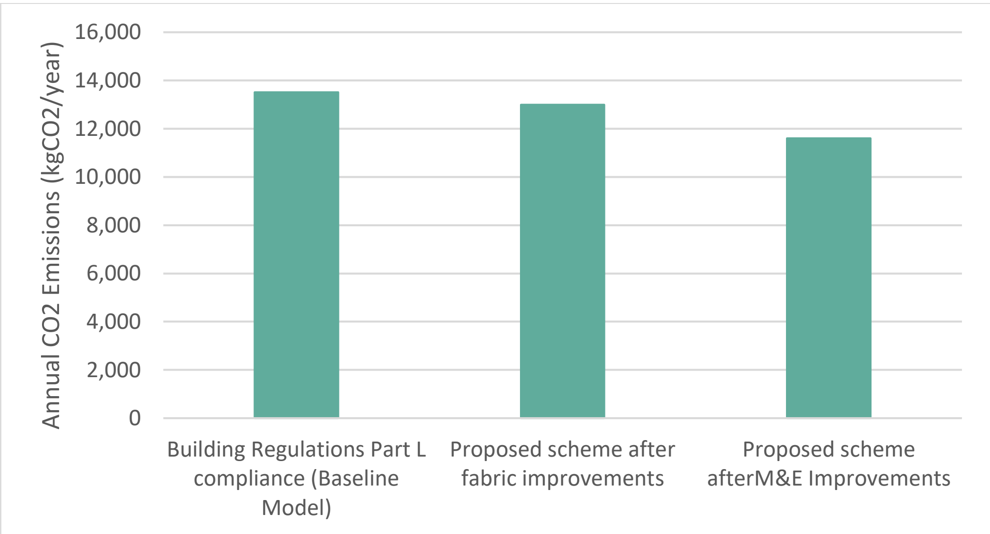
8.2 Following the introduction of the energy efficiency measures reported, annual regulated energy consumption is predicted at 74,114 kWh per year equivalent to 11.6 tC02 emissions annually.

8.3 In total a saving of 1.9tCO2 can be demonstrated by adopting the measures outlined within this report which represents a 14.1% saving beyond the baseline performance standard.

Table 8: Improved Building Energy & CO2 Results

Improved Building Fabric Energy & CO2 Results				
Item	Regulated Energy Consumption (kWh/year)	Regulated CO2 Emissions (kgCO2/year)	Regulated CO2 Saving (kgC02/year)	Regulated CO2 Emissions Saving (%)
Baseline (Part L Minimum Standard)	87,166	13,505	-	-
Building Fabric Improvements	83,929	12,994	510	3.8%
Improved M&E Specification	74,114	11,602	1,392	10.7%
TOTAL EMISSIONS SAVING	-	-	**1,903**	**14.1%**

Figure 3: CO2 Emission Reduction following energy efficiency improvements



9 CONCLUSION

9.1 The design team have sought to reduce emissions through a fabric first strategy, emphasizing energy efficiency through increased insulation levels beyond the minimum regulatory requirements. Overall, a 3.8% reduction in energy demand is achieved through this measure.

9.2 Further energy savings and CO2 emission reduction is achieved through adopting energy efficient building services such as high efficiency LED lighting, split system VRF heating and cooling systems and mechanical ventilation with heat recovery (MVHR) systems.

9.3 A feasibility study of potential renewable and low carbon building services has also been conducted. This has concluded that the most practical adoption of the low carbon heating system is via the split system VRF powered by air source heat pump technology which provides heating to the majority of the building.

9.4 Heating to other areas is proposed via direct acting electric heaters which, by operating on direct fed electricity, future proof the heating strategy for future decarbonization of the national grid.

9.5 In total, a 1.9 tCO2/year reduction in emissions is demonstrated from the energy efficiency measures outlined within this report, equivalent to a 14.1% reduction beyond the regulatory compliant benchmark demonstrating the effectiveness of the sustainability aspects introduced to the scheme.