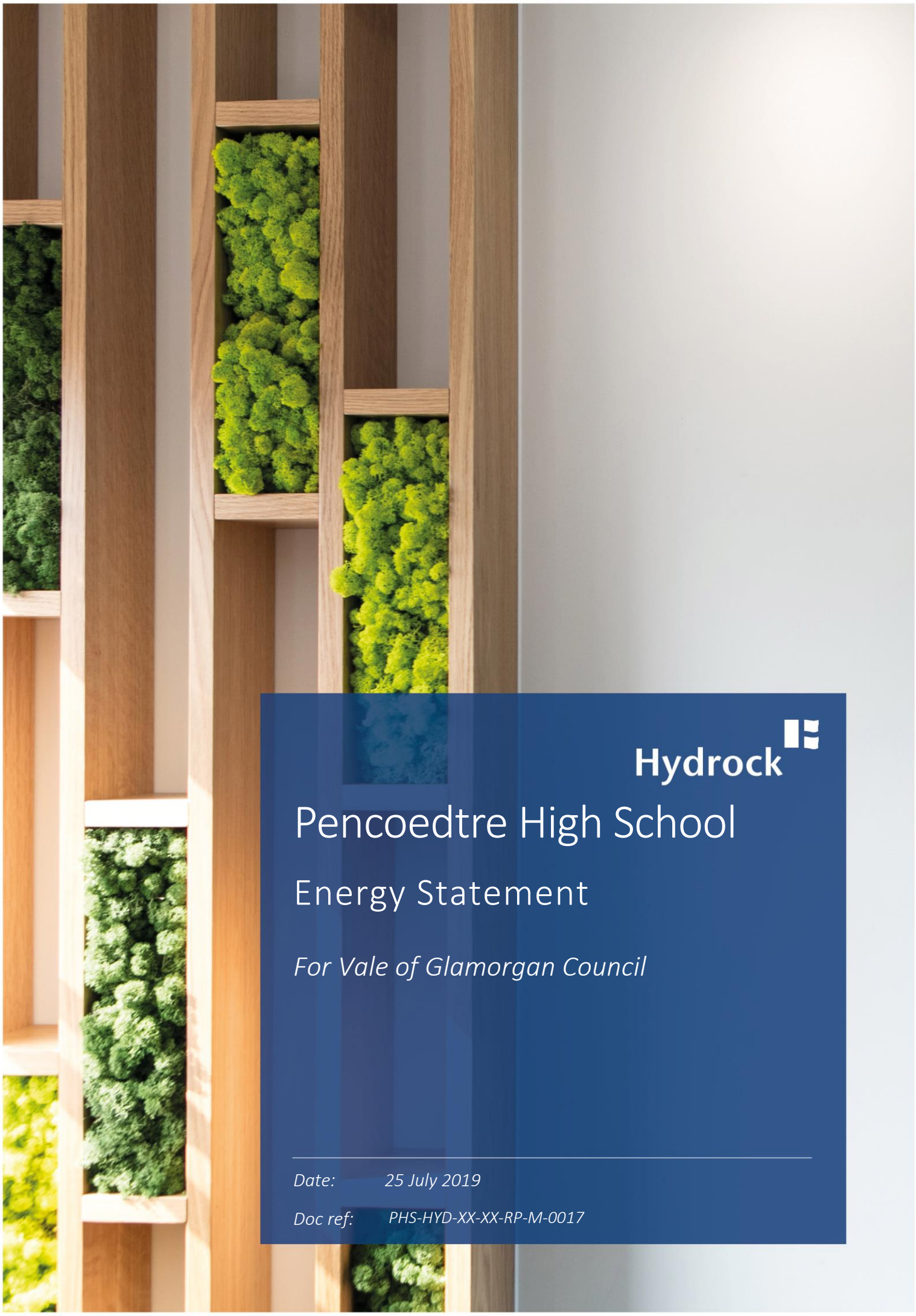

Hydrock

Pencoedtre High School

Energy Statement

For Vale of Glamorgan Council

Date: *25 July 2019*

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Issued by	Hydrock Consultants Limited 5 Castlebridge 5-19 Cowbridge Road East Cardiff CF11 9AB	Tel: 02920 023665 www.hydrock.com
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Prepared by	Rhys Coleman
Checked by	Oliver Scull
Approved by	Daniel Beynon

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CONTENTS

1. INTRODUCTION

1.1 Purpose of the Report

This report has been issued to inform the project team of the energy and sustainability strategy for the Pencoedtre High School development in Barry, and how this will address local and regional planning policies.

This process includes following the energy hierarchy, by first looking to reduce the need for energy, then looking to ensure energy is supplied in the most efficient manner possible, and lastly the use of renewable energy sources.

The secondary school is required to comply with Building Regulations Part L2A Wales criteria. A Dynamic Simulation Model (DSM) calculation has been performed for the facility to assess compliance. This assessment will determine the school's primary energy use and CO_2 emissions, and highlight ways to reduce them where practicable.

2. PLANNING POLICY OVERVIEW

This section summarises the key local policy and national regulations affecting the proposed development.

2.1 Policy and Regulations Overview

Local and national policy, regulations and guidance have been followed, along with Hydrock's best practice standards.

2.2 National Policies

2.2.1 Overview

The Government is committed to meeting the target for the UK to achieve 15% of its energy consumption from renewable sources by 2020.

2.2.2 Planning Policy Wales-Edition 10

The Planning Policy Wales 10 (PPW 10) was designed to ensure that that developments are planned and constructed with sustainability as a priority. It aims to contribute towards sustainable development and social, economic, environmental and cultural wellbeing of Wales.

The particular areas of PPW 10 that can influence this report include:

Section 3.7-Environmental Sustainability, which states:

> *"Good design promotes environmental sustainability and contributes to the achievement of the well-being goals. Developments should seek to maximise energy efficiency and the efficient use of other resources (including land), maximise sustainable movement, minimise the use of non-renewable resources, encourage decarbonisation and prevent the generation of waste and pollution. An integrated and flexible approach to design, including early decisions regarding location, density, layout, built form, the choice of materials, the adaptability of buildings and site treatment will be an appropriate way of contributing to resilient development."*

Section 4.1.39-Ultra Low Emission Vehicles, which encourages and supports the provision of ultra-low emission vehicle charging points for new developments with car parking facilities. It is recommended that 10% of car parking spaces should contain charging points.

Section 6-Distictive and Natural Places, Distinctive and Natural Placemaking and Well-being, Well-being of Future Generations Act, A Prosperous Wales, this section discuses future proofing economic assets in response the challenges presented by climate change and providing cost effective services such as clean air and water.

2.2.3 Building Regulations, Part L

Part L2A Wales of the Building Regulations details the minimum standards new build, non-domestic developments are required to meet when built within Wales, thus ensuring reduction in both carbon emissions and a development's dependency on grid supplied resources.

2.3 Local Planning Policies

Reviewing the Vale of Glamorgan Local Development Plan (2011-2026), there are no additional requirements to pass building compliance over-and-above Part L2A Wales.

In Policy MD19 - Low Carbon and Renewable Energy Generation, it states that renewable energy will be permitted where it can be demonstrated to have no negative impacts or violate other policies on the interests of:

- Best and most versatile agricultural land;
- Aviation safeguarding;
- Electrical, radio or other communication systems;
- Landscape importance;
- Natural and cultural heritage;
- Nature conservation;
- Residential amenity; and
- Soil conservation

Where necessary, proposals should be informed by a landscape and visual impact assessment.

2.4 BREEAM Education 2018 Assessment

A BREEAM Excellent rating is necessary for the school due to the Welsh Government funding requirement. Under the BREEAM assessment a minimum of 4No. Ene01 (Reduction of Emissions) credits must be achieved to comply with the "Excellent" rating. Currently 5No. credits are being targeted as part of the Pencoedtre School assessment.

3. ENERGY STRATEGY

The energy strategy for Pencoedtre High School has been established in accordance with the appropriate policies (including Part L2A Wales) and is based on the principles of the Energy Hierarchy, a framework that assists progress towards more sustainable energy systems. The basic principles of the energy hierarchy are:

1. Be Lean – Use less energy.
2. Be Clean – Use energy more efficiently.
3. Be Green – Use renewable energy.

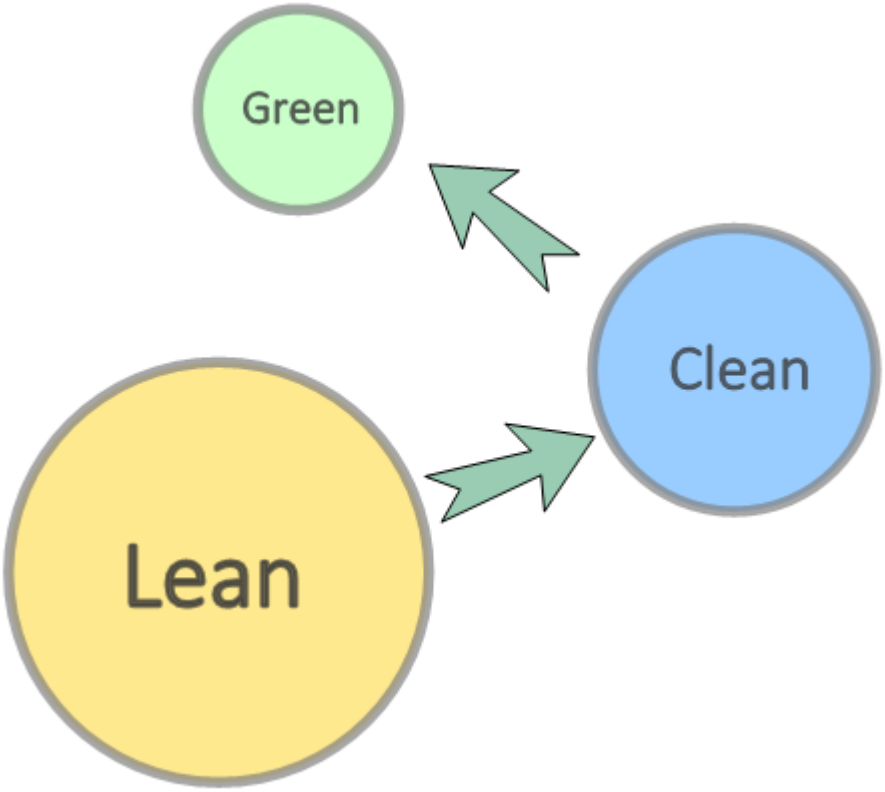

Figure 1: Energy Hierarchy

3.1 Step 1 – Minimising Energy Consumption – Be Lean

Energy demand reduction provides the largest opportunity for minimising a building's potential CO_2 emissions. Minimising energy consumption for the development will be accommodated by driving down energy demand through passive building design and operational techniques, prior to focusing on energy efficient plant and controls.

The first principle therefore relies on energy efficient design and the site characteristics which embody passive designs. Furthermore, the design of the building fabric can reduce energy wastage and associated energy demand.

Passive design can be described as designing a building to take maximum advantage of the light and heat from the sun and natural ventilation to reduce the energy demand of a building. The following passive design measures can be exploited to improve both the performance and energy efficiency of the building:

- Location, grouping, orientation and layout
- Natural ventilation
- Landscape features and shading
- Thermal mass
- Architectural massing

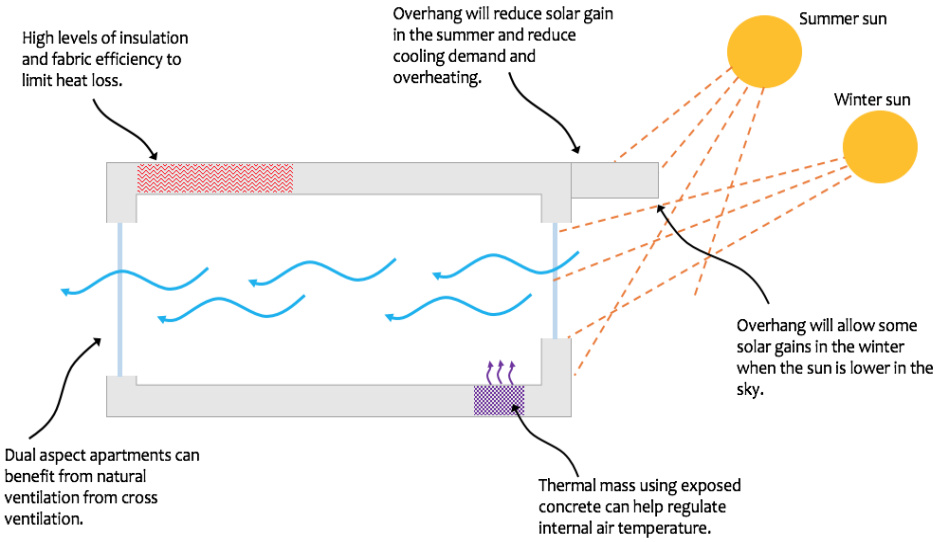

Figure 2: Example of Passive Design Options

The school has been designed to have generous amounts of glazing to allow daylight to penetrate into the spaces, reducing reliance on artificial lighting.

High performance glazing will maximise day lighting and winter sun solar gain whilst reducing heat loss through the glazed areas.

The building fabric used for the development will be specified with high efficiency building fabric to minimise heat loss and air leakage.

Following the implementation of all appropriate passive measures, the integration of energy efficient technologies into the development should be sought.

3.2 Step 2 – Supply Energy Efficiently – Be Clean

The second principle places the emphasis on using energy more efficiently. This is on the understanding that low carbon technologies can be cost-effective and can also provide significant carbon savings when compared to conventional technologies.

The heating and hot water demand for the development will be provided by a series of high efficiency boilers and direct gas-fired water heaters.

The building will also encourage the use of low energy appliances and provide information and guidance on efficient use and operation of the buildings. Appliances will be chosen where practicable to be A/A+ rated under the EU Energy Labelling Scheme.

3.3 Step 3 – Utilising Low to Zero Carbon Technologies – Be Green

A further opportunity to increase the sustainability of a development is through the inclusion of renewable energy sources into the energy strategy. The most desirable technology may not necessarily be the most appropriate technology for the scheme.

After producing a thermal model to assess Part L compliance of the scheme, it is clear that the technology most suitable for inclusion at Pencoedtre High School is a roof-mounted PV array due to the ample pitched roof area.

4. THERMAL MODELLING ASSESSMENT

This development has been modelled using IES VE 2018 under a DSM assessment.

The building fabric parameters used for the simulation can be seen in the below table. These values represent a sizeable reduction compared to the base L2A Wales 2014 values used for the notional building.

Building Element Thermal Properties		
U-Values		
External Walls	0.15	W/m^{2}K
Exposed Floor	0.15	W/m^{2}K
Roof	0.14	W/m^{2}K
Glazing	1.42	W/m^{2}K
External Doors	2.2	W/m^{2}K
Glazing G-Value	0.40	-
Air Permeability	5.0	m^3/(h.m^2) @50Pa

Table 1: Thermal Elements Properties

4.1 Building Services Systems

Throughout the simulation the following building services assumptions were taken into account:

- Heating – Technology advancements in Gas-Fired Boilers provide upwards of 95% energy efficiency. The heating distribution is generally supplied to Panel Radiators throughout.
- Cooling - Air-Conditioning (AC) Units will be used to provide comfort cooling to specific rooms that require it due to process loads.
- Ventilation – Generally the building is naturally ventilated. Fresh air will be provided to internal occupied spaces via Air Handling Units (AHU). MVHR units and local extract will also be required in a number of rooms to comply with BB101 2006 requirements.
- Domestic Hot Water – DHW will be direct gas-fired hot water cylinders with a designed delivery efficiency of 98%.
- Lighting – High efficiency LED lighting is assumed throughout the building.

The assumed photovoltaic specification is listed in the table below.

Renewables and Low Carbon Specification			
	Specification	Output	Quantity
PV	Modular Efficiency: 20% Electrical Conversion Efficiency: 95%	69,440kWh/annum PV	450m² (estimated based upon output)

Table 2: Renewables and Low Carbon Technology Specification

4.2 Part L2A Results

The results of the DSM assessment for the building, with and without any PV array, are shown below. A building must beat both the Target Emissions Rate (TER) and the Target Primary Energy Consumption (TPEC) to comply with Part L2A Wales.

Building Emissions Rate - Pencoedtre High School					
	Target Emissions Rate ($kgCO_2/m^2$ per annum)	Building Emissions Rate ($kgCO_2/m^2$ per annum)	Target Primary Energy Consumption (kWh/m².annum)	Building Primary Energy Consumption (kWh/m². annum)	Emissions Rate Compliance Margin
Without PV	11.8	13.9	77.91	71.09	+17.8%
With 69,440kWh/annum PV	11.8	10.8	77.91	71.09	-8.5%

Table 3: Dynamic Simulation Results

These results show that without Photovoltaics the building fails to achieve the Target Emissions Rate by a margin of 17.8%. This means that the introduction of PV is necessary to comply with Building Regulations.

Introducing 69,440kWh/annum of roof-mounted PV electricity production provides an 26.3% improvement in the building emissions rate compared to the baseline. It also achieves the notional building emissions rate by 8.5% and passes Building Regulations compliance.

The over performance is necessary to achieve the necessary BREEAM Ene 01 credits required for an "Excellent" rated building.

As the BER is less than the TER, and the BPEC is less than the TPEC, the secondary school with approximately 450m² of PV complies with Criterion 1 of Approved Document L2A Wales 2014.

5. CONCLUSION

The energy requirements and potential sources have been considered and discussed for the development of Pencoedtre High School. The relevant local and national policies have been analysed and the assessments carried out show that the requirements of these policies are satisfied. The overarching requirement is compliance with Building Regulations Part L2A Wales 2014.

It has been shown through dynamic simulation modelling that the implementation of passive design and energy efficiency measures, alongside the inclusion of approximately 450m² of PV array, satisfies the energy requirements for the development as a whole.