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Document Name: Moorside Rooms Optioneering Report

Document Date: 7th April 2025

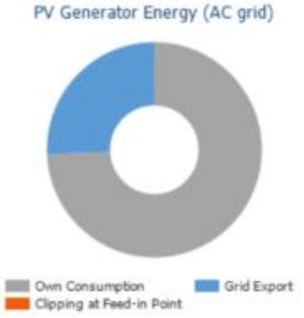
Site Address: 9 Church Lane, Kirkbymoorside
North Yorkshire YO62 6AZ

Photovoltaic System Overview

Results Total System

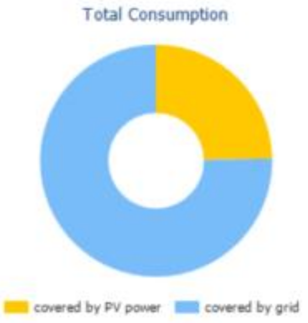
PV System

PV Generator Output	4.70	kWp
Spec. Annual Yield	1,059.46	kWh/kWp
Performance Ratio (PR)	88.79	%
Yield Reduction due to Shading	0.0	%
PV Generator Energy (AC grid)	4,984	kWh/Year
Own Consumption	3,703	kWh/Year
Clipping at Feed-in Point	0	kWh/Year
Grid Export	1,281	kWh/Year
Own Power Consumption	74.3	%
CO_2 Emissions avoided	2,340	kg / year



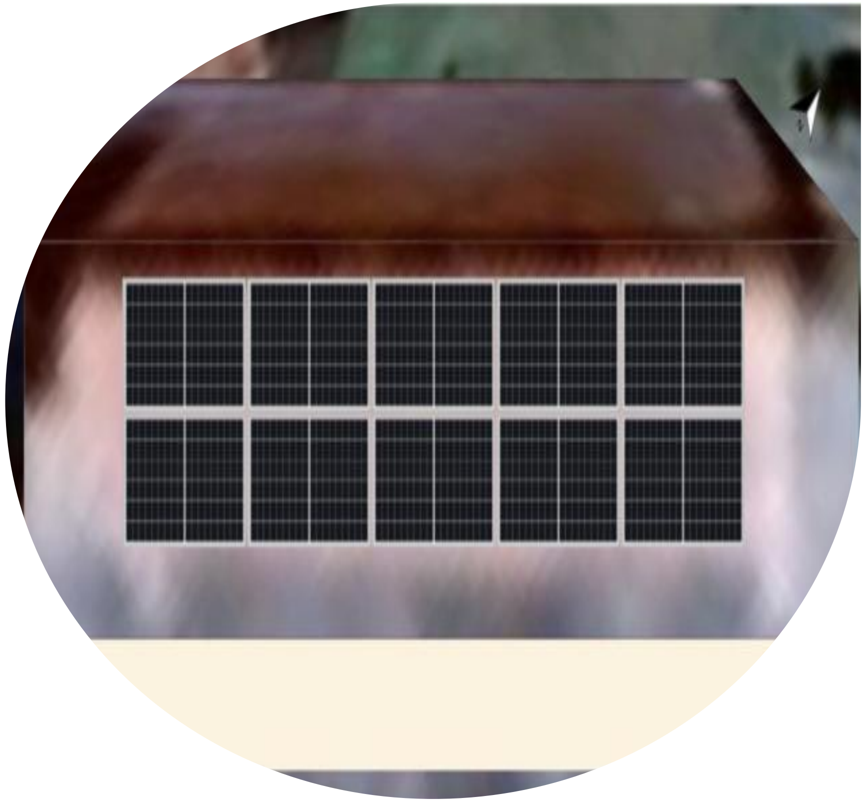
Appliances

Appliances	15,000	kWh/Year
Standby Consumption (Inverter)	4	kWh/Year
Total Consumption	15,004	kWh/Year
covered by PV power	3,703	kWh/Year
covered by grid	11,301	kWh/Year
Solar Fraction	24.7	%

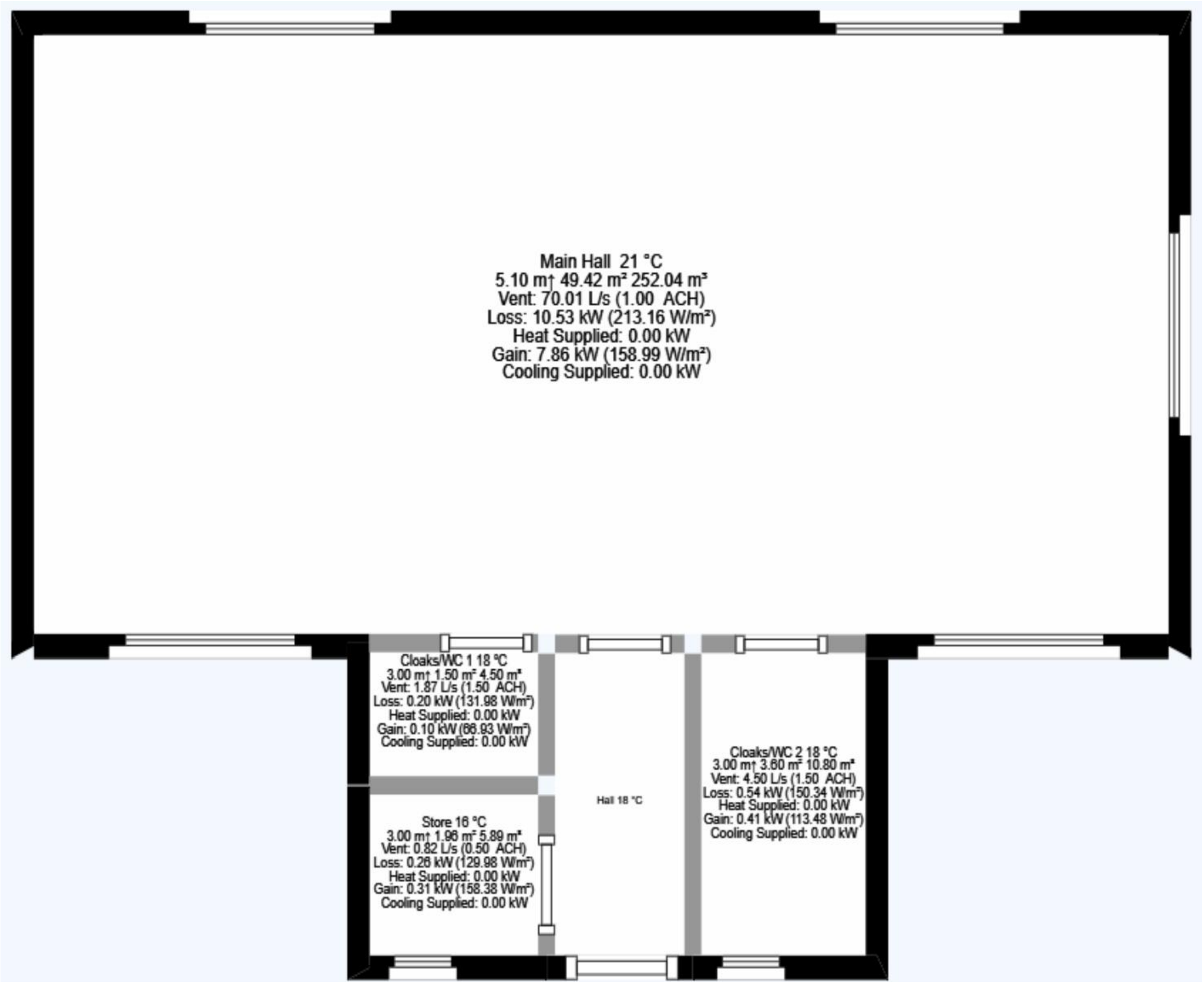


Level of Self-sufficiency

Total Consumption	15,004	kWh/Year
covered by grid	11,301	kWh/Year
Level of Self-sufficiency	24.7	%



Building Geometry & Infrastructure Overview



The building consists of five rooms as follows:

- Main Hall
- Cloakroom 1
- Cloakroom 2
- Hall
- Store

The footprint of the building is approximately 57.87 m^2, with an estimated total volume of 281.73 m3.

The building is heated by electric panel heaters and towel rails.

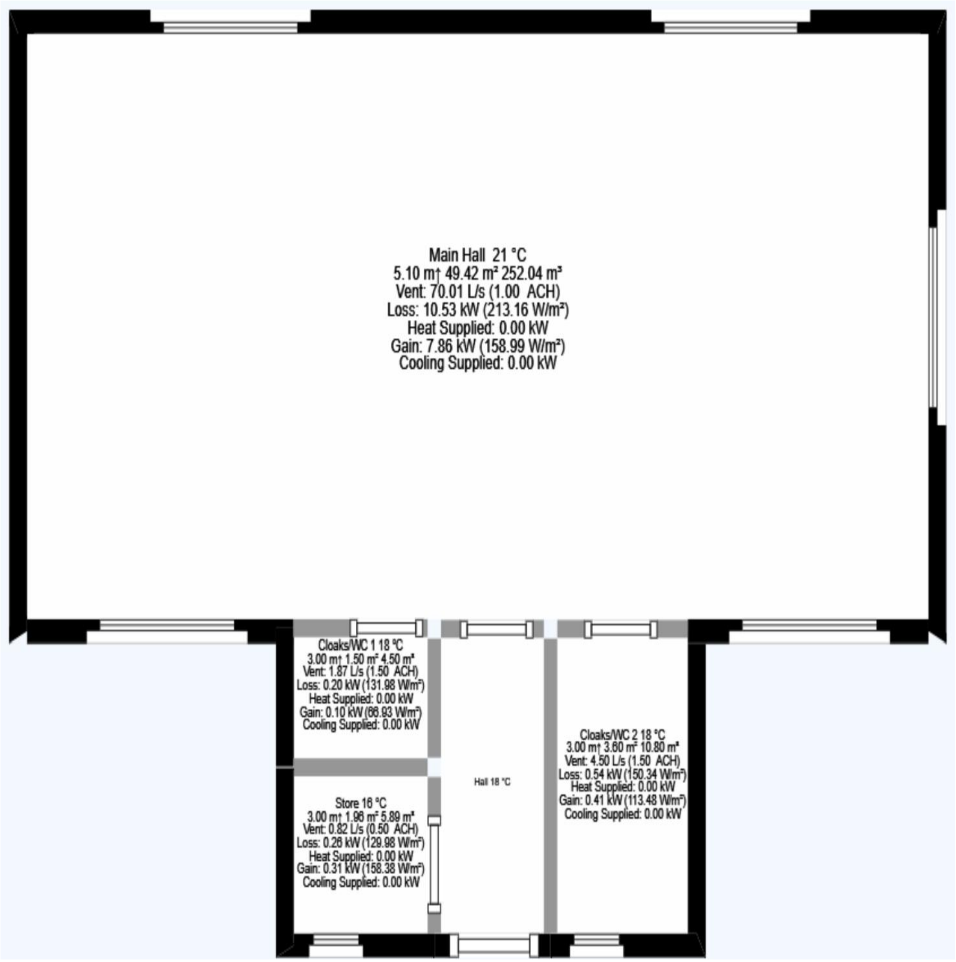
The panel heaters in the main hall have a total heat output of 4kW based on the heat loss calculations; the installed capacity is circa 62% undersized. During the survey, we were unable to ascertain the output of the towel rails.

The panel heater in the Entrance Hall has an output of 500 Watts, which broadly correlates with the heat loss.

Domestic Hot Water (DHW) is generated by:

1x point of use water heater, which is installed in the store at a high level

Building Heat Loss



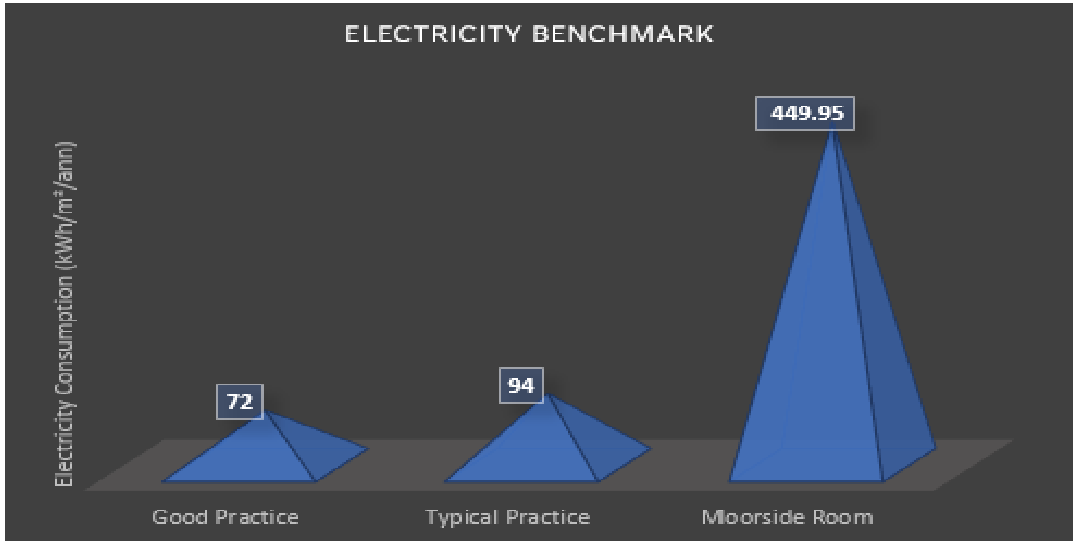
Having conducted detailed heat loss for the building, the findings are detailed below:

Design Criteria

Material	Description	U-Value
External Wall	610mm Stone with 100minerail Wool, Plater Board on Batons	0.30
Internal Wall	Stud work	n/a
Floor	Solid Floor No Insulation	1.15
Ceiling / Roof	No Insulation	2.51
External Doors	Wooden Door 25% Glazing	3.7
Double Glazing	Double Glazing PVC-U Frames	2.8
Single Glazing	Single Glazing Wooden Frame	4.8

Room	Outside Temp	Target Temp	ACH	Heat Loss
Main Hall	-5	21	1	10.53
Cloakroom 1	-5	18	1.5	0.20
Cloakroom 2	-5	18	1.5	0.54
Hall	-5	18	1	0.54
Store	-5	18	0.5	0.26

Building Performance & Benchmark



Name	Design Temp	Air Changes / Hour	Thermal Bridging	Area	Volume	Fabric Heat Loss	Ventilation Heat Loss	Spare Capacity Heat Loss	Total Heat Loss	W/m²	Annual Energy
Main Hall	21.0 °C	1.00	0.05	49.42 m²	252.04 m³	6893.39 W	3296.22 W	0.00 W	10534.29 W	213.16 W/m²	23407.18 kWh
Cloaks/ WC 1	18.0 °C	1.50	0.05	1.50 m²	4.50 m³	138.96 W	52.06 W	0.00 W	197.97 W	131.98 W/m²	439.89 kWh
Store	16.0 °C	0.50	0.05	1.96 m²	5.89 m³	223.33 W	20.74 W	0.00 W	255.24 W	129.98 W/m²	567.15 kWh
Hall	18.0 °C	1.00	0.05	2.83 m²	8.50 m³	398.25 W	65.56 W	0.00 W	483.71 W	170.73 W/m²	1074.81 kWh
Cloaks/ WC 2	18.0 °C	1.50	0.05	3.60 m²	10.80 m³	396.33 W	124.91 W	0.00 W	541.06 W	150.34 W/m²	1202.23 kWh
Total	**NA**	**NA**	**NA**	**59.32 m²**	**281.73 m³**	**8050.26 W**	**3559.49 W**	**0.00 W**	**12012.27 W**	**796.18 W/m²**	**26691.26 kWh**

The charted Institute of Building Service Engineers (CIBSE) have benchmarked several buildings for energy performance in the Moorside room case; the nearest comparison is a community centre

Based on the anticipated heating consumption alone would equate to 449.5kWh/ m2
The above graph details the comparison against benchmark data.

The above graph doesn't include the day-to-day small power consumption

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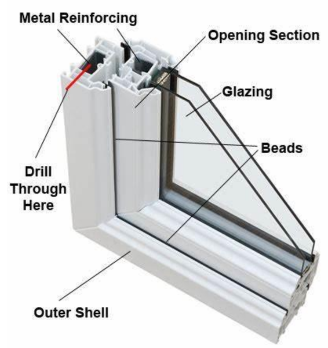
Fabric Improvements

Replace Windows - Loft insulation is essential for reducing heat loss through the roof and improving a home's energy efficiency. According to current UK Building Regulations, the recommended U-value for lofts in new builds and extensions is 0.11 W/m²·K. To achieve this, around 270mm of mineral wool or equivalent insulation material is typically required. Proper loft insulation helps lower energy bills and supports carbon reduction goals.



Loft Insulation - Loft insulation is a key energy-saving measure that helps reduce heat loss through the roof of a building, improving thermal comfort and lowering heating bills. It works by creating a barrier that slows down the transfer of heat between the inside of the house and the colder air outside. In the UK, current Building Regulations recommend that loft insulation should achieve a U-value of 0.11 W/m²·K or better for new builds and extensions. This typically requires around 270mm of mineral wool insulation, though the exact thickness may vary depending on the material used. Upgrading existing insulation can significantly enhance a home's energy efficiency and help meet net-zero carbon targets.

Internal Wall Insulation - Internal wall insulation involves fitting insulation material to the inside of external walls to improve a building's thermal performance. This method is commonly used in solid wall properties where cavity wall insulation is not possible. The insulation is typically applied using rigid boards, insulated plasterboard, or stud wall systems filled with mineral wool or similar materials, followed by a plaster finish. Internal wall insulation helps reduce heat loss, lower energy bills, and improve overall comfort. While it can slightly reduce room size and requires adjustments to sockets, radiators, and skirting boards, it's a practical and cost-effective solution for retrofitting older buildings without altering the external appearance.

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Space Heating Options

Replacement Direct Heating - Direct replacement electric heaters are modern electric heating units designed to replace older storage heaters or panel heaters with minimal disruption. These heaters are typically wall-mounted and sized to fit existing fixings and wiring, making installation quick and straightforward. They offer improved energy efficiency, faster heat-up times, and more precise temperature control compared to traditional models. Many features, such as built-in digital thermostats, programmable timers, and smart controls, enhance comfort and reduce running costs. Direct-replacement electric heaters are ideal for upgrading outdated systems in homes, offices, or rental properties without the need for significant electrical or structural changes.

Underfloor Heating - Overlay underfloor heating is a low-profile system specifically designed for retrofit projects where traditional screed-based underfloor heating is not feasible. It consists of slim, pre-routed panels—usually made of high-density insulation board or gypsum fibreboard—that sit directly on top of the existing floor. Pipes carrying warm water are laid into these channels and covered with a suitable floor finish, such as laminate, engineered wood, or tiles. Because of its shallow depth, typically around 18mm to 22mm, overlay systems cause minimal disruption to floor heights, making them ideal for renovation projects. They offer efficient, even heat distribution and can be connected to most heat sources, including boilers and heat pumps

De-Stratification Fans - Destratification fans are energy-efficient devices designed to reduce temperature stratification in large indoor spaces by redistributing warm air that naturally rises to the ceiling back down to the occupied zone. Commonly used in warehouses, gymnasiums, retail spaces, and industrial buildings, these fans help maintain a consistent temperature throughout the space, reducing heating costs and improving comfort. By circulating air vertically, destratification fans minimise hot and cold spots, which also supports the efficiency of the HVAC system. They are especially beneficial in buildings with high ceilings, where temperature differentials can reach 10°C or more between floor and ceiling levels.

On average, **efficiency gains of 20% to 30%** in heating energy usage can be achieved by using destratification fans, particularly in buildings with high ceilings. In some cases—especially in warehouses or industrial facilities with very high stratification—**savings can exceed 40%**. These gains come from reducing the workload on heating systems, as the fans recirculate the warm air that would otherwise accumulate near the ceiling, bringing it back down to where it's needed at occupant level. The actual savings depend on factors like ceiling height, building insulation, existing HVAC efficiency, and how well the fans are installed and controlled

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Estimated Operational Cost / Savings

<u>Estimated Operational Costs</u>

Direct Heating – Based on 26,691.26kWh @ £0.38 per kWh = £11,282.67

UFH – To include 15% Distribution Losses = 30,694.95kWh @ £0.38 per kWh = £12,975.08

UFH & HP 26,691.26 /3.9 = 6,843.91kWr @ £0.38 per kWh = £2,892.99

<u>Savings</u>

Windows – Baseline: 26,691.26kWh with replaced Glazing, saving 786.16kWh per annum Saving £298.74 per annum.

Internal wall insulation according to current building regulations: 26,691.26kWh saving, 2,755.17kWh per annum saving £1,046.96 per annum.

Loft Insulation to 300m in depth – Baseline 26,691.26kWh saving 5,121.88kWh saving £1,946.31 per annum.