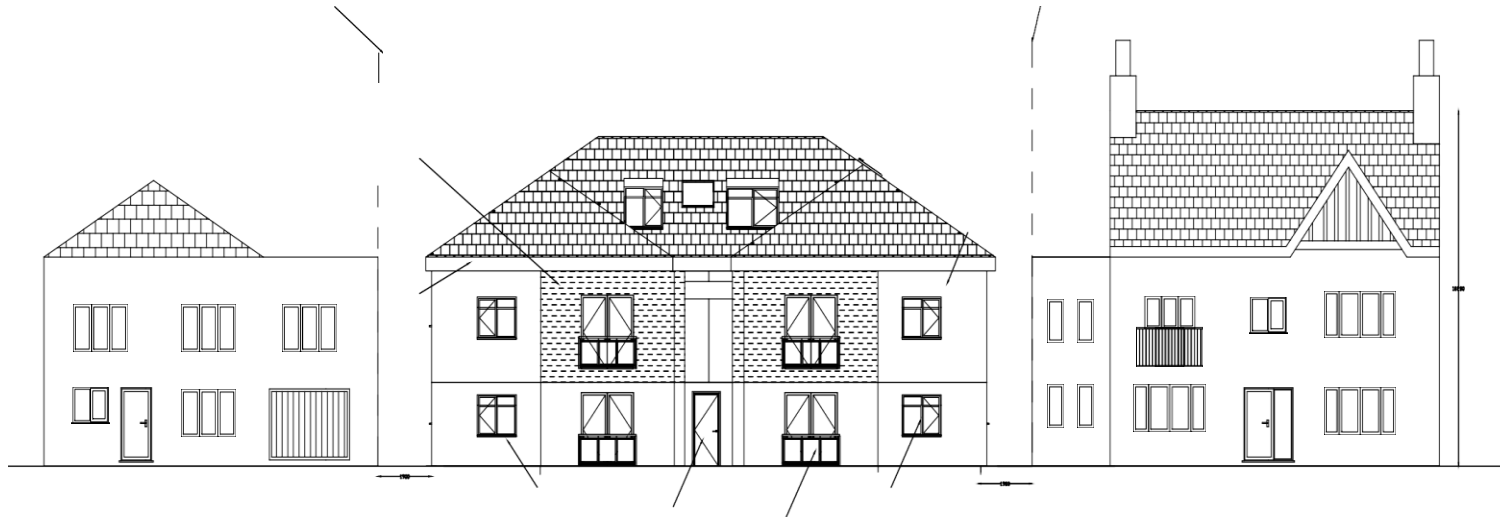




1015 Oxford Road Energy Efficiency Statement

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1. Executive Summary

This report describes the energy efficiency strategy for 1015 Oxford Road, setting out how the proposed development will respond to current local and national planning policy and regulations on energy efficiency.

The proposal includes energy efficiency targets to meet the requirements set out in Zero Carbon Homes as well as meeting the requirements for a new building under Part L1 (2021), including:

- Dwelling emissions rate 35% lower than notional values
- Dwelling primary energy rate lower than notional values
- Dwelling fabric energy efficiency rate lower than notional values

The energy efficiency strategy follows a reduce energy demand strategy first by proposing passive design features, including using high performance building fabric materials to reduce u-values and lower air infiltration rates.

Once the total demand has been reduced, low and zero carbon technologies are introduced to reduce energy demand and carbon emissions. A heat pump system is proposed to eliminate on site carbon emissions in the provision of space heating and domestic hot water whilst PV panels are proposed to provide on-site electricity generation.

Using these proposals result in 53.2% reduction in the notional emissions rate values, 6.0% reduction in the notional primary energy rate and 6.1% reduction in the notional fabric energy efficiency rate.

It should be noted that all calculations presented within this document can only be indicative as the design and specification is not yet finalised, and that further analysis should take place upon completion.

2. Introduction

The proposed development at 1015 Oxford Road, Reading, RG31 6TL involves the demolition of an existing residential property and the construction of a new 3-storey block of 8no. two bedroom flats and 1no. three bedroom flats (9no. flats total) with an approximate gross internal area of 570 m². The development is located in close proximity to Tilehurst train station and Arthur Newbery Park.



Figure 1: 1015 Oxford Road location

This report has been produced to form part of the planning application submission for 1015 Oxford Road and intends to summarise how the proposed development intends to comply with national and local regulations and strategies pertaining to energy efficiency. The report includes details on thermal properties and building services to be considered at the design stage which will ensure the property achieves zero carbon homes status.

3. Energy Efficiency Policies

3.1. National Policies & Regulations

The following documents are understood to be current national policies for sustainable development:

- National Planning Policy Framework (NPPF), 20th July 2021
- Building Regulations Part L1, 2021
- Building Regulations Part O, 2021

3.2. Local Policies

Local policies for development are set out in the Reading Borough Local Plan (November 2019). The relevant policies for an Energy Efficiency Statement are as follows:

3.2.1. Policy CC1: Presumption in Favour of Sustainable Development

Policy CC1 states that a positive approach to considering development proposals will be taken that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework (NPPF). Where appropriate, the Council will work proactively with applicants jointly to find solutions which mean that proposals can be approved wherever possible.

Planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise. Planning applications that accord with the policies in the development plan (including, where relevant, with policies in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise. Proposed development that conflicts with the development plan will be refused, unless other material considerations indicate otherwise.

Where there are no policies relevant to the application or the policies which are most important to determining the application are out of date at the time of making the decision then permission will be granted unless material considerations indicate otherwise – taking into account whether:

- The application of policies in the NPPF that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or
- Any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the NPPF taken as a whole

3.2.2. Policy CC2: Sustainable Design & Construction

Policy CC2 states that proposals for new developments will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take into account the effects of climate change.

This policy also sets out expectations for the performance of new-build homes in terms of emissions. However as the development is a new-build residential project, the expectations are deferred to Policy H5 (Standards for New Housing Policy).

3.2.3. Policy CC3: Adaptation to Climate Change

Policy CC3 states that all developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures are required to be incorporated into the development:

- Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements.
- Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance

and resilience to climate change, for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc.

- Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions.
- All developments shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change.

3.2.4. Policy CC4: Decentralised Energy

Policy CC4 states that there is a requirement for consideration to be given to securing energy for the development from decentralised energy sources. Developments of 10 dwellings or more will be required to link into the existing decentralised energy network or otherwise demonstrate why this is not feasible.

This policy aims to promote the integration of technologies such as combined heat and power (CHP) and community heating where feasible.

3.2.5. Policy CC5 : Waste Minimisation & Storage

Policy CC5 states that the development should demonstrate measures to minimise the generation of waste in the construction, use and life of the building and promote more sustainable approaches to waste management, including the reuse and recycling of construction waste and the promotion of layouts and designs that provide adequate, well designed space to facilitate waste storage, reuse, recycling and composting.

3.2.6. Policy H5: Standards for New Housing Policy

Policy H5 states that new build housing should be built to the following standards, unless it can be clearly demonstrated that this would render a development unviable:

- All new build housing outside the Central Area as defined on the Proposals Map will comply with the nationally-described space standard.
- All new build housing will be built to the higher water efficiency standard under Regulation 36(3) of the Building Regulations.
- All major new-build residential development should be designed to achieve zero carbon homes.
- All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulation.
- All new build housing will be accessible and adaptable in line with M4(2) of the Building Regulations, unless it is built in line with M4(3).
- On developments of 20 or more new build dwellings, at least 5% of dwellings will be wheelchair user dwellings in line with M4(3) of the Building Regulations, Any market homes provided to meet this requirement will be “wheelchair adaptable” as defined in Part M, whilst homes where the Council is responsible for allocating or nominating an individual may be “wheelchair accessible”.

4. Energy Efficiency Strategy

As per Policy H5 in the 2019 Local Plan, as the development is a major new build residential project, there is a requirement to meet the Zero Carbon Homes standard. This means that there needs to be at least a 35% reduction in CO₂ emissions beyond what is regulated in Building Regulations Part L (Target Emissions Rate) with the remaining emissions to be offset through a cash in lieu contribution to be ring-fenced for carbon savings elsewhere.

In order to propose the right technologies required to reach this target, a series of Standard Assessment Procedure (SAP) calculations have been carried out which provide target values to be achieved. The SAP calculations have been carried out using SAP 10 which measures against the standards set out in Part L1 (2021).

Part L1 highlights 3 energy related factors that need to be calculated to give a measure of energy efficiency; Dwelling Primary Energy Rate (DPER), Dwelling Emissions Rate (DER) and Dwelling Fabric Energy Efficiency (DFEE). These calculated values are required to be lower than the values set by the Building Regulations for a notional building of the same size. These values are Target Primary Energy Rate (TPER), Target Emissions Rate (TER) and Target Fabric Energy Efficiency (TFEE) respectively.

For the purpose of meeting the Zero Carbon Homes standards, the DER and the TER are the key factor that will require assessment, specifically the DER will be required to be at least 35% lower than the TER. However, consideration will also be given to ensuring the DPER and DFEE are below the TPER and the TFEE respectively.

As all dwellings in the development are similar in size and requirements, all SAP calculations in this report are based on a single dwelling.

It should be noted that all SAP calculations presented in this report are to highlight the validity of proposals and hence are indicative only. It is recommended that further analysis take place once the design has been finalised.

4.1. SAP Assessment – Part L1 Minimum Requirements

A preliminary assessment has been carried out using the minimum values for thermal properties, infiltration rates and heating efficiencies for new dwellings. For the purpose of this assessment, a gas fired combi boiler has been selected. For information about the input parameters used, please refer to Appendix B. See the table below for results of the minimum requirements assessment.

	Dwelling Rate	Target Rate	Pass/Fail
Emissions Rate (kgCO₂/m²)	19.21	12.03	Fail (-59.68%)
Primary Energy Rate (kWh/m²)	111.54	63.53	Fail (-75.56%)
Fabric Energy Efficiency (kWh/m² per annum)	36.52	25.56	Fail (-42.90%)

As can be seen, by using the minimum allowable parameters set out in Part L1, the building would not get be able to pass building regulations requirements, and would certainly not come close to meeting the Zero

Carbon Homes requirements. Therefore, further investigation into the potential for design improvements is required.

4.2. Passive Design

In order to reduce the emissions rate to a suitable level, the first proposal is to reduce the building's total energy demand through the appropriate design of the external envelope in order to reduce the buildings overall heating requirements.

Key features that are to be considered include:

- The large majority of the glazing is provided on the front and back facades, which face mostly north-east and south-west respectively, allowing useful solar gains in the winter and daylighting from the north. By contrast, the east and west elevations are mostly solid, which results in a reasonable overall proportion of glazing in relation to the total façade area, helping to avoid excessive winter heat losses or summer heat gains while allowing daylighting.
- High performance levels of insulation and glazing as well as improved levels of air tightness are proposed.
- A preliminary investigation into overheating has been carried out and the development is found to be at a moderate risk. In order to mitigate these risks, consideration will be given to medium thermal mass building elements and internally fit light coloured curtains or blinds. At the design stage, a dynamic thermal model should be assessed in accordance with Building Regulations Part O and CIBSE TM59 in order to determine the extent of overheating risks.

4.3. Low & Zero Carbon Technologies

Once a passive design is in place, it is important to look into low & zero carbon (LZC) technologies as their effectiveness will be greatly improved

with a good building fabric in place. This section covers the feasibility for installation of a range of LZC heating and energy sources.

- Combined Heat and Power (CHP)
- Biomass boilers
- Solar thermal panels
- Wind turbines
- Photovoltaic panels (PV)
- Ground source heat pumps
- Air source heat pumps.

Each LZC system was assessed taking account of the following factors:

- Potential CO2 savings
- Contribution to the building's expected thermal and electrical demand profile
- Urban residential Conservation Area, with visual, noise, and delivery implications
- Air quality implications
- Maintenance and operational constraints.

4.3.1. Combined Heat & Power



Figure 2: Combined Heat & Power (CHP)

Combined Heat & Power (CHP) is the on-site generation of electricity and the utilisation of the heat that is a by-product of the generation process. Due to the utilisation of heat from electricity generation and the avoidance of transmission losses because electricity is generated on site, CHP typically achieves a 20-30% reduction in primary energy usage compared with power stations and heat only boilers.

The development as a whole is expected to have a reasonable high domestic water demand due to the number of dwellings therein. Therefore a small CHP unit could be implemented to deliver most of the hot water load, resulting in CO₂ savings of approximately 25% on regulated CO₂ emissions.

However, these CO₂ savings would rely on a constant hot water demand throughout the year, particularly in the summer, with a minimum of 4,500 full load equivalent hours for the CHP to run. This is not considered a viable assumption as demand for hot water would be expected to be reduced during summer months at times when the dwellings may be unoccupied for periods. Furthermore, CHP would require regular maintenance and would present negative air quality implications and so this option is not proposed.

4.3.2. Biomass Boilers



Figure 3: Biomass Boiler

Biomass heating systems combust biomass material (e.g. crop residues, wood waste, etc) in a biomass boiler in order to heat water in the same way that a typical gas boiler operates. Biomass heating approaches a carbon neutral process as the CO₂ that is emitted had previously been absorbed from the atmosphere in when the biomass fuel was originally cultivated. Biomass boilers require storage adjacent to the boiler to be provided with a hopper feeding directly into the boiler.

A biomass boiler system could meet the space heating and hot water loads for the building which would deliver a CO₂ saving compared to a typical system of gas fired boilers. However, a biomass boiler requires fuel to be delivered by a lorry, which would add noise and traffic to an already busy road. Additional air quality implications this system provides, as well as the increased maintenance requirements means that this option is not proposed.

4.3.3. Solar Thermal Panels



Figure 4: Solar Thermal Panels

Solar water heating systems use energy from the sun to pre-heat domestic hot water. They are generally composed of solar thermal collectors and a fluid system to move the heat from the collector to a storage tank to store the heat for subsequent use.

A large area of solar thermal panels could in theory be implemented on the roof (36m²) to produce a large portion of the annual hot water load and deliver a large reduction in CO₂ emissions.

However, as with CHP, this system is most effective when there is a regular hot water demand throughout the year. As this system operated at its highest efficiency in summer, when demand for hot water is theoretically

at its lowest, this may result in the generated heat being wasted. Therefore, this option is not proposed.

4.3.4. Wind Turbines



Figure 5: Wind Turbine

Wind turbines use the force of the wind to turn a rotor and hence generate electricity. Wind turbines can be used at large scale in offshore or onshore wind farms or on a smaller scale with individual turbines being installed on buildings.

A small wind turbine could be installed to deliver approximately 0.5 – 5 kW of electrical energy. However, wind turbines can generate noise in their operation and appear unsightly, neither of which may be acceptable in a residential area. Therefore, this option is not proposed.

4.3.5. Photovoltaic Panels



Figure 6: Photovoltaic (PV) Panels

Photovoltaic panels (PV panels) are devices that generate electricity directly from sunlight. They require very little maintenance and when electrical demand within the building is low, the excess electricity generated can be used to charge a battery system for consumption at a later time or be exported to the national electrical grid with costs offset via the Smart Export Guarantee (SEG).

A preliminary analysis has been carried out and it has been concluded that approximately 36m² of PV panels could be mounted on the roof, facing south-east to south west and at a 5 degree angle to minimise the visual impact whilst still allowing a minimal slope for efficiency and self-cleaning purposes.

This system would represent a peak capacity of 7.2kW, estimated to save approximately 0.48 tonnes of CO₂ emissions per year across the whole building, a total saving of 11.4%.

The proposed area for incorporating is shown in figure 7.

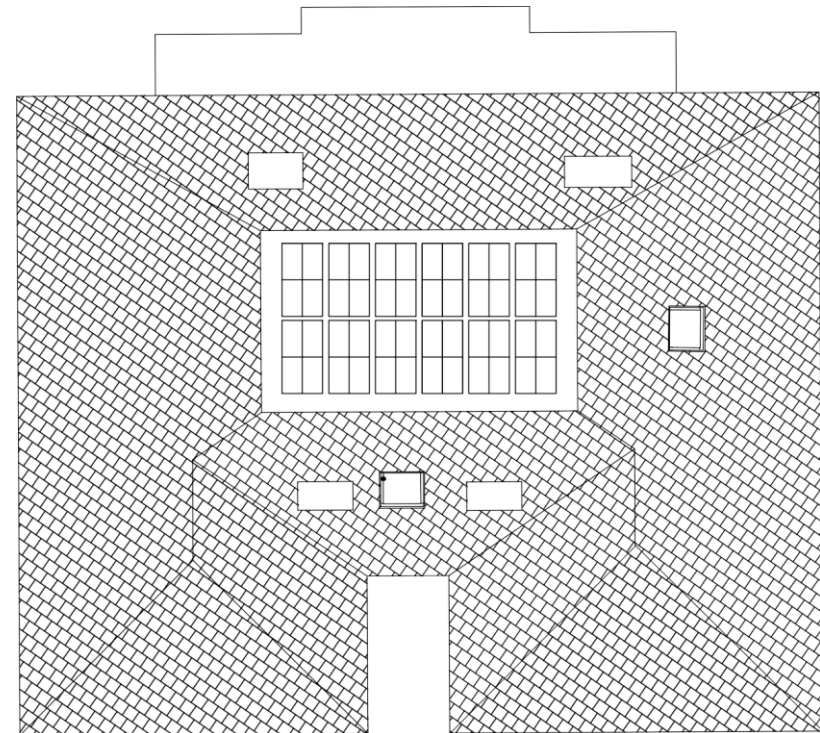


Figure 7: Indicative solar array layout.

4.3.6. Ground Source Heat Pumps



Figure 8: Ground Source Heat Pump

Ground source heat pumps (GSHPs) can be used to extract heat from the ground by circulating a working fluid through a system of pipes to a heat exchanger which transfers the energy to the distribution network. They have the advantage that they can act as a source of both heating and cooling for the building. Balancing heat rejection and abstraction over the year also tends to increase their efficiency.

In order for GSHPs to operate, they require loops for the working fluid to be circulated through. Generally, there are 2 options for this:

- I. Trench loops. These loops are laid out horizontally in trenches across open ground. In order to achieve sufficient operational capacity, a large amount of open ground is required.
- II. Borehole loops. Where there is not enough horizontal space to install a trench loop, a borehole can be used. The operation of this is similar to trench loops but instead of extending horizontally, they extend vertically down into the ground. This can be useful when the space is not available for trench loops, but the cost of installation can be so high that it can make the system unviable.

The amount of ground space required for a trench loop system means that this system is not viable. Additionally the costs of installing a borehole system makes this option prohibitive as there is likely to be a very minor benefit compared to other options. Therefore this option is not proposed.

4.3.7. Air Source Heat Pumps



Figure 9: Air Source Heat Pump

Air source heat pumps (ASHPs) can be used to provide heat by absorbing heat from the air into a refrigerant. By utilising the vapour compression cycle, this heat can be collected and transferred via pipework to somewhere it can be of use.

This technology has the capability to provide heating via radiators and/or underfloor heating as well as providing domestic hot water services. These systems are generally considered to be more efficient than traditional gas fired boilers and electric heating systems. They can also be powered entirely by renewable energy technologies.

Using this option would enable all CO₂ from heating and hot water to be removed from the site.

4.3.8. Low & Zero Carbon Technologies Summary

Based on the discussions set out in this section, the LZC technologies proposed for this development are PV panels to decentralise electricity generation and ASHPs to meet heating and domestic hot water demands. The implementation of these targets will enable the development to meet the requirements of zero carbon homes.

4.4. SAP Assessment – Improved Fabric & Heat Pump

A second assessment has been carried out using improved thermal properties for the building, with an air source heat pump providing heating and domestic hot water services and improved lighting. For information about the input parameters used, please refer to Appendix C. See the table below for results of the minimum requirements assessment.

	Dwelling Rate	Target Rate	Pass/Fail
Emissions Rate (kgCO ₂ /m ²)	6.01	11.65	Pass (48.41%)
Primary Energy Rate (kWh/m ²)	64.17	61.47	Fail (-4.40%)
Fabric Energy Efficiency (kWh/m ² per annum)	24	25.56	Pass (6.08%)

As the results above show, by improving the thermal performance of the building and installing a heat pump to provide space heating and domestic hot water the DER and DFEE can improve upon the TER and TFEE

respectively. The DER is also low enough that it passes the requirements set out in Zero Carbon Homes (7.57kgCO₂/m² in this instance).

However, in terms of building regulation approval, the DPER is still too high. This means that there needs to be a reduction in total grid energy consumption achieved.

4.5. SAP Assessment – PV Panels

A third assessment has been carried out using the parameters set out in the second assessment but with the addition of PV panels. The preliminary assessment of PV capacity has shown that there could be potential for 7.2kW of electricity generation for the whole building. As there are 12 dwellings in the building, for the purpose of the calculations it is assumed that there would be 0.6kW (7.2kW ÷ 12 dwellings) for each dwelling. For information about the input parameters used, please refer to Appendix C. See the table below for results of the minimum requirements assessment.

	Dwelling Rate	Target Rate	Pass/Fail
Emissions Rate (kgCO ₂ /m ²)	5.52	11.8	Pass (53.22%)
Primary Energy Rate (kWh/m ²)	58.55	62.26	Pass (5.96%)
Fabric Energy Efficiency (kWh/m ² per annum)	24	25.56	Pass (6.08%)

The results above now show that with the combination of a high performing building fabric, heat pumps providing heating & domestic hot water and PV panels providing on-site electricity generation the building meets the requirements of Part L1 and Zero Carbon Homes.

4.6. Energy Efficiency Strategy Conclusion

The target of achieving at least 35% reduction in regulated carbon emissions beyond the requirements set out in Part L1 of the building regulations is proposed to be achieved by implementing the following energy strategies:

- A high standard of passive design, improving on the minimum building fabric and air tightness set out in the Building Regulations.
- Installation of an ASHP system to provide heating and hot water services to dwellings.
- Installation of PV panels to provide a renewable source of on-site electricity generation.
- Additional factors including improved heating controls and high performance LEDs.

The remaining carbon emissions are to be offset through a cash in lieu contribution to be ring-fenced for carbon savings elsewhere.

Overall this has led to the DER 53.22% lower than the TER, the DPER 5.96% lower than the TPER and the DFEE 6.08% lower than the TFEE with a total CO₂ emission of 0.31 tonnes/year for each dwelling.

5. Appendix A – Part L1 Minimum Assessment Input

Appendix A presents the minimum allowable building parameters as set out in Part L. These parameters form the basis for the preliminary assessment of the building.

U-Values	
Roof	0.16 W/m ² K
Wall	0.26 W/m ² K
Floor	0.18 W/m ² K
Party Wall	0.20 W/m ² K
Window (including glazed doors)	1.6 W/m ² K
Doors	1.6 W/m ² K
Air Permeability	8.0m ³ /(hm ²) @ 50Pa
Heating	
Type	Combi Boiler
Fuel	Natural Gas
Efficiency	92%
Heat Emitters	Radiators
Control	Local TRVs
Domestic Hot Water	
Type	Combi Boiler
Fuel	Natural Gas
Efficiency	92%

Ventilation	
Type	Intermittent Extract
Quantity	2no. (WC & kitchen)
Lighting	
Type	LED
Efficacy	75 lumens/W
Power	10 W
Quantity	7no.
Renewables	
Photovoltaic	No
Wind Turbine	No
Solar Thermal	No
Other	No

6. Appendix B – Improved Assessment Input

Appendix B presents the improved parameters to reflect an improved level of thermal performance and an air source heat pump providing heating and domestic hot water services. These parameters form the basis for the improved assessment of the building.

U-Values	
Roof	0.11 W/m ² K
Wall	0.18 W/m ² K
Floor	0.13 W/m ² K
Party Wall	0.0 W/m ² K
Window (including glazed doors)	1.2 W/m ² K
Doors	1.0 W/m ² K
Air Permeability	5.0m ³ /(hm ²) @ 50Pa
Heating	
Type	Air Source Heat Pump
Fuel	Electricity
Efficiency	170%
Heat Emitters	Radiators
Control	Programmer, thermostat and TRVs
Domestic Hot Water	
Type	Air Source Heat Pump
Fuel	Electricity
Efficiency	170%

Ventilation	
Type	Intermittent Extract
Quantity	2no. (WC & kitchen)
Lighting	
Type	LED
Efficacy	220 lumens/W
Power	10 W
Quantity	7no.
Renewables	
Photovoltaic	No
Wind Turbine	No
Solar Thermal	No
Other	No

7. Appendix C – PV Panels Assessment Input

Appendix C presents the parameters set out in Appendix B but with added PV panels. These parameters form the basis for the improved + PV panels assessment of the building.

U-Values	
Roof	0.11 W/m ² K
Wall	0.18 W/m ² K
Floor	0.13 W/m ² K
Party Wall	0.0 W/m ² K
Window (including glazed doors)	1.2 W/m ² K
Doors	1.0 W/m ² K
Air Permeability	5.0m ³ /(hm ²) @ 50Pa
Heating	
Type	Air Source Heat Pump
Fuel	Electricity
Efficiency	170%
Heat Emitters	Radiators
Control	Programmer, thermostat and TRVs
Domestic Hot Water	
Type	Air Source Heat Pump
Fuel	Electricity
Efficiency	170%

Ventilation	
Type	Intermittent Extract
Quantity	2no. (WC & kitchen)
Lighting	
Type	LED
Efficacy	220 lumens/W
Power	10 W
Quantity	7no.
Renewables	
Photovoltaic	Yes – 0.6kW
Wind Turbine	No
Solar Thermal	No
Other	No