

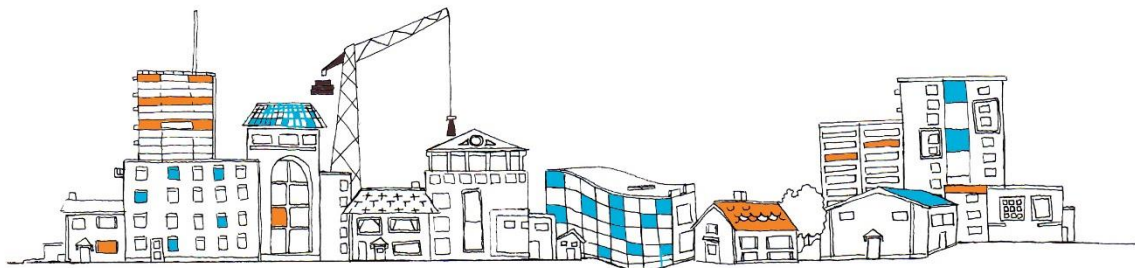
ENERGY STATEMENT

Site: **Park View Care Home, Uxbridge**
On behalf of **Hunter & Partners Limited**

Revision: **A**

Date: **01/09/2015**

Energist UK



REVISION HISTORY

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Calculations contained within this report have been produced based on information supplied by the Client and the design team. Any alterations to the technical specification on which this report is based, will invalidate its findings.

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1. EXECUTIVE SUMMARY

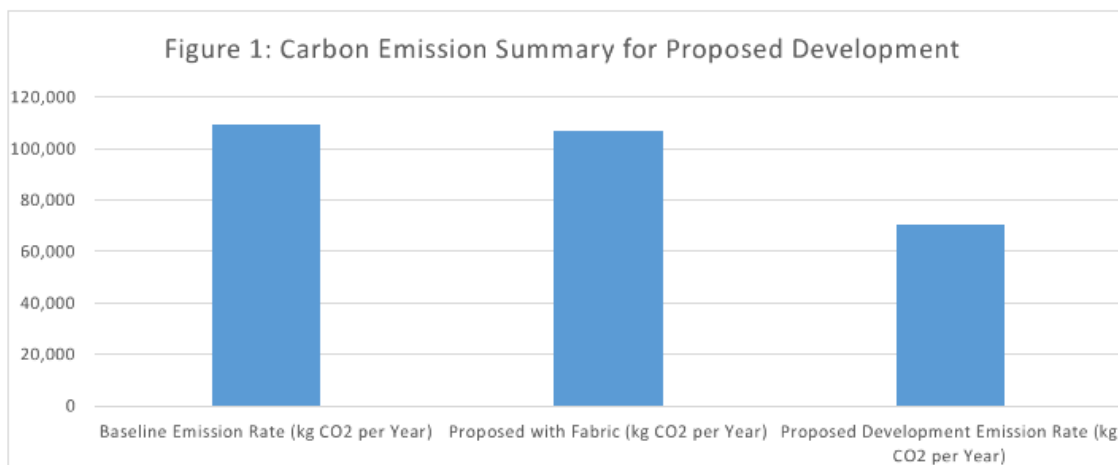
This report outlines how the development at Park View Care Home in Uxbridge will meet the requirements of the National Planning Policy Framework, Local Planning Policy and the requirements of The London Plan.

The development on Farrier Drive in Uxbridge will consist of a new care home complex, including 60 self-contained units and associated communal and staff areas. The total internal floor area is approximately 5,700 sqm.

The following measures will be incorporated into the development to ensure compliance with the requirements of The London Plan.

- Efficient Building Fabric
- Efficient building services
- Renewable energy generation through solar PV panels
- The use of a communal heating system with integrated Combined Heat and Power (CHP)

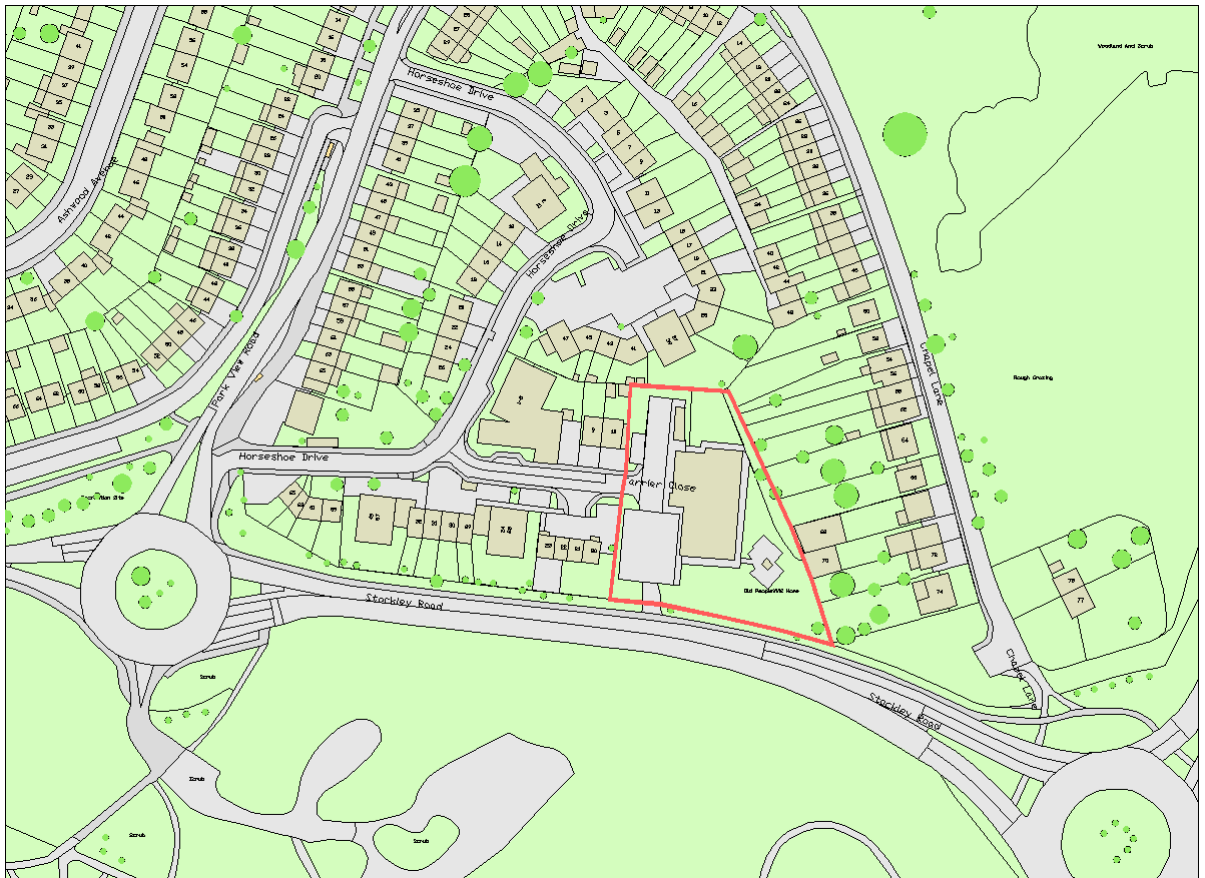
Table 1: Carbon Emission Summary				
Baseline Emission Rate (kg CO2 per Year)	Proposed with Fabric (kg CO2 per Year)	Proposed Development Emission Rate (kg CO2 per Year)	Reduction in emissions over baseline (kg/CO2 per year)	% reduction in emissions over baseline
109,202	106,927	70,526	38,676	35.42%



2. INTRODUCTION

The development of Park View Care Home in Uxbridge will consist of a new care home complex, including 60 self-contained units and associated communal and staff areas. The total internal floor area is approximately 5,700 sqm.

The development falls under the jurisdiction of the London Borough of Hillingdon and was granted planning permission at the end of August 2015.



This statement will assess the development against the requirements of National, Regional and Local Planning Policy to demonstrate a reduction in **carbon emissions of 35% over a baseline assessment**.

An SBEM 2012 calculation has been carried out on the complete building, including residential areas. The results from this assessment are used to establish baseline carbon emissions and to calculate subsequent improvements in energy performance.

3. PLANNING POLICY AND SUSTAINABILITY REQUIREMENTS

The Climate Change Act (2008)

Passed in November 2008, the Climate Change Act mandated that the UK would reduce emissions of six key greenhouse gases, including Carbon Dioxide, by 80% by 2050.

As a consequence, the reduction of carbon dioxide emissions is at the forefront of National, Regional and Local Planning Policy, along with continuing step changes in performance introduced by the Building Regulations Approved Document L (2013).

Approved Document L (2013)

This development is subject to the requirements of Approved Document L (2013). ADL 2013 represented an approximate reduction of 6% in the Target Emission Rate (kilograms CO₂/m²/year) over the requirements of Approved Document L (2010) for residential development and an aggregate 9% reduction for non-residential development. ADL (2013) also sees the introduction of a Fabric Energy Efficiency Target, a measure of heating demand (kWh/m²/year) to ensure new build dwellings with low carbon heating systems, still meet satisfactory energy efficiency standards.

National Policy

The National Planning Policy Framework encourages Local Planning Authorities to “Have a positive strategy to promote energy from renewable and low carbon sources” (NPPF paragraph 97), whilst “Ensuring that the adverse impacts are addressed satisfactorily, including cumulative landscape and visual impacts”. This suggests whilst LPA's should encourage renewable technology, the merits of such should be assessed on a site by site basis.

The NPPF also requires that policy making and planning obligations do not threaten the viability of a development, by maintaining competitive returns for developers and landowners alike. In this respect flexibility is encouraged by LPAs to ensure sustainability standards can be met, without incurring unreasonable development costs.

Regional Policy

As this development is on land which is governed by the London Borough of Hillingdon, Policy 5.2 of The London Plan applies in relation to reducing carbon emissions of new developments:

“Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- 1 – Be lean: use less energy
- 2 – Be clean: Supply energy efficiently
- 3 – Be green: Use renewable energy

The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reductions in buildings.

These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon non-domestic buildings from 2019.

Year: 2013 – 2016

Improvement on 2010 Building Regulations: 40 percent

Improvement on 2013 Building Regulations: 35 percent

Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy

As a minimum, energy assessments should include the following details:

- A) Calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations at each stage of the energy hierarchy
- B) Proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services
- C) Proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)
- D) Proposals to further reduce carbon dioxide emissions through the use of onsite renewable energy technologies.

The carbon dioxide reduction targets should be met onsite. Where it is clearly demonstrated that the specific targets cannot be fully achieved onsite, any shortfall may be provided offsite or through a cash in lieu contribution to the relevant borough to be ring-fenced to secure delivery of carbon dioxide savings elsewhere.”

The Housing Standards Review and implications on Local Planning Policy

On March 25th 2015 the Government confirmed its policy to limit energy efficiency targets that can be imposed on a development as a result of the outcome of the Housing Standards Review. New developments should not be conditioned to achieve a reduction in Carbon Emissions exceeding a 19% improvement over the requirements of Approved Document L (2013) – the equivalent energy performance of a Code for Sustainable Homes Level 4 dwelling.

In addition the Government confirmed that the Code for Sustainable Homes is no longer an applicable standards for planning permissions granted on or after March 26th 2015. If a Local Planning Authority has an existing policy requirement for the CSH it may still condition the Ene 1 and Wat 1 requirements for CSH Level 4, but cannot require assessment against the remaining categories and full CSH Certification.

Sites with planning permission granted prior to March 25th 2015, can still be assessed and certified against the Code for Sustainable Homes, where there is a requirement to do so (known as legacy sites).

A CSH requirement can also apply where a previously approved Outline Planning Permission has been granted prior to March 25th 2015.

Sustainability Standards to be met at Site Name

Taking the above into consideration the development will be constructed to meet the following standards:

- Compliance with the Target Emission Rate as calculated under Part L2, revision 2013.
- A 35% improvement over this Target Emission Rate must be shown in line with the London Plan. This includes adopting the three-tier approach:
 - Be Lean
 - Be Clean
 - Be Green

4. BASELINE CARBON DIOXIDE EMISSIONS CONSUMPTION

Baseline carbon dioxide emissions for the development have been calculated using SBEM methodology. The complete building has been assessed, and the predicted total energy consumption and carbon dioxide emissions have been calculated.

Compliance with Approved Document L (2013) must be met through a fabric first approach, meaning unless entirely necessary, renewable energy generation and decentralised energy systems should not be considered.

On this development ADL (2013) compliance can be demonstrated with the following specification:

Note: The specification listed in this table has been used to create the Baseline assessment only – it is NOT the proposed approach as confirmed by the developer. Details of this enhanced specification are covered in following chapters of this Energy Statement.

Element	Performance
Ground Floor U Value (w/m ² .k)	0.22
External Wall U Value (w/m ² .k)	0.26
Roof U Value (w/m ² .k)	0.18
Glazing U Value – including Frame (w/m ² .k)	1.60
Glazing Transmittance Factor	71%
Glazing G-Value	40%
Door U Value (w/m ² .k)	2.20
Design Air Permeability	3.0
Space Heating	Based on an assumed gas boiler system with 91% efficiency
Heating Controls	Appropriate Building Managing system
Hot Water	From the main heating system

Ventilation	Based on a building-wide heat recovery ventilation system with a central specific fan power of 1.8 and heat recovery exchanger efficiency of 70%
Lighting Efficiency	All lighting should operate at an efficiency of 60 lumens per circuit watt
Lighting Controls	Occupancy and daylight sensing applied to all lighting

Based on this specification, the Target Emission Rate (TER) for the baseline assessment is 19.02 kgCO₂ per sqm per annum. By multiplying this figure by the total floor area, the total expected carbon emissions for this building are 109,202 kgCO₂ per sqm per annum.

Note: Unregulated energy use (anything other than heating, lighting, hot water and ventilation requirements) is not included within the SBEM methodology assessment.

This specification equals the Target Emission Rate as calculated using Approved Document Part L2, revision 2013.

In order to show compliance with The London Plan, the building needs to be shown to use no more than 70,981 kgCO₂ annually after the Be Lean, Be Clean, Be Green hierarchy has been applied.

5. A FABRIC FIRST APPROACH

Many Local Planning Authorities are now recognising the benefits of a “Fabric First” approach, whereby focus on the lifetime energy consumption of the dwelling takes precedence over the use of “bolt on” renewable technology.

It is clear that the fabric first approach can create dwellings with a very comfortable living environment. The internal temperature is consistent, and fuel bills are kept to a minimum. One key advantage of a fabric first approach is that it does not require changes to the behavioural patterns of the occupants and as such, a fabric first dwelling will often perform more effectively once completed, than a dwelling which incorporates a technology that require behavioural change (solar thermal for example).

This will become an increasingly important consideration as energy costs rise and the issue of fuel poverty becomes common place.

We must therefore consider the fabric first approach as the priority solution for this development. This is the first tier of the Energy Hierarchy which has been adopted by The London Plan and the London Borough of Hillingdon.

The developer intends to use the following building fabric details for Park View Care Home:

Element	Performance
Ground Floor U Value (w/m ² .k)	0.18
External Wall U Value (w/m ² .k)	0.26
Roof U Value (w/m ² .k)	0.18
Glazing U Value – including Frame (w/m ² .k)	1.40
Door U Value (w/m ² .k)	1.30
Design Air Permeability	5.0
Party Wall U Value (w/m ² .k)	0 (fully filled and sealed)

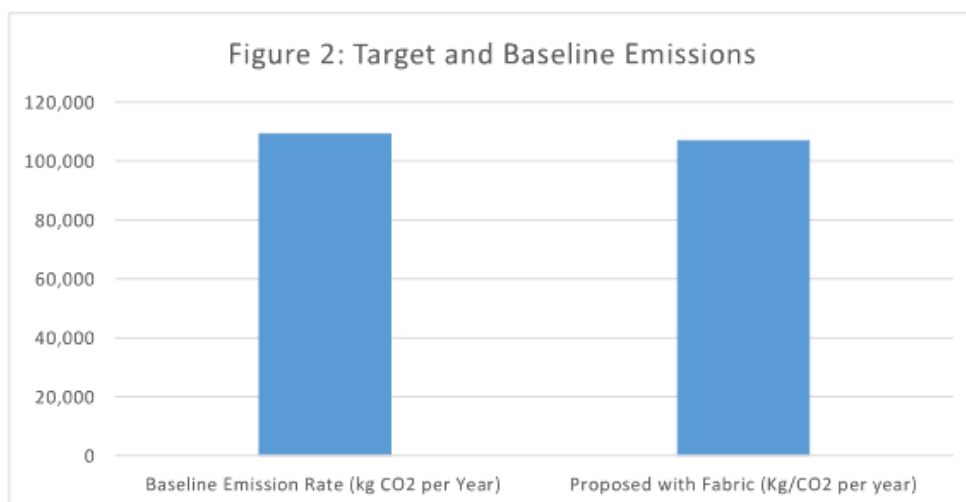
As well as adopting these enhanced building fabric details, the developer also proposes to use the following, high-efficiency building services:

Ventilation	Natural ventilation. Extraction fans will be installed to all wet rooms with a typical specific fan power of 0.5 w/l/s
Lighting Efficiency	All internal lighting will be LED throughout. As an average, the lighting will operate at 5 watts per square metres
Lighting Controls	Given the building use, it is not appropriate to have automatic controls in some area (such as residential areas). Therefore, manual lighting controls will be installed, with daylighting sensors in communal areas which have large areas of natural light

By utilising this specification, and retaining the same building services for the time being, the revised, predicted carbon emissions for this building is 106,927 kgCO₂ annually.

This gives a total reduction of 2.1% in carbon emissions over the baseline standard before the introduction of renewable technology

Table 2: Baseline Carbon Dioxide Emissions			
Baseline Emission Rate (kg CO ₂ per Year)	Proposed with Fabric (Kg/CO ₂ per year)	Reduction (Kg/CO ₂ per year)	% Reduction
109,202	106,927	2,275	2.08%



6. LOW/ZERO CARBON AND RENEWABLE ENERGY TECHNOLOGIES

Having established baseline carbon dioxide emission rates for the development we must review the appropriate renewable and LZC solutions for this site. The viability of the following technologies will be considered for this development:

- Solar Photovoltaic Panels
- Solar Thermal Panels
- Wind Turbines
- Air Source Heat Pump
- Ground Source Heat Pump
- Biomass Boilers
- Combined Heat and Power

Solar Photovoltaic Panels

PV panels convert solar radiation into electricity which can be used on site or exported to the national grid.

Installation considerations:

- Operate most efficiently on a south facing sloping roof (between 30 and 45 degree pitch)
- Shading must be minimal (1 shaded panel can impact the output of the rest of the array)
- Panels must not be laid horizontally on a flat roof, as they will not self-clean. Panels will therefore need to be installed at an angle and with appropriate space between them, to avoid over-shading.
- Large arrays may require upgrades to substations if exporting electricity to the grid.
- Local Planning requirements may restrict installation of panels on certain elevations
- Installation must take into account pitch and fall of the roof, along with any additional plant on the roof to ensure there is sufficient room.

Approximate upfront cost:

£2,200 – £2,700 per kWp (figures to be verified by your installer – indicative only)

Advantages:

- Relatively straightforward installation – connection to landlords supply and metering
- Linear improvement in performance as more panels are installed
- Maintenance free
- Installation costs are continually reducing
- Can benefit from the Feed in Tariff to improve financial payback

Disadvantages:

- Not appropriate for high rise developments, due to lack of roof space in relation to total floor area.
- Performance can be restricted in densely populated and built up areas, where over-shading from adjacent buildings is an issue.

Suitable for this development?

Solar PV Panels are suitable for this development, as there is appropriate unshaded roof space available for installation. PV panels will therefore be considered as a solution in this report.

Solar Thermal Panels

Solar Thermal Panels generate domestic hot water from the sun's radiation. Glycol circulates within either flat plate or evacuated tube panels, absorbing heat from the sun, and transferring this energy to a water cylinder. A well designed solar thermal system will account for 50-60% of a dwelling's annual hot water demand. Sizing the system to meet a higher demand will lead to excess heat generation in the summer months, and overheating of the system.

Installation considerations:

- Size of the array is determined by the hot water demand of the dwelling. The system cannot be oversized.
- Similar to a PV array, operate most efficiently on a south facing sloping roof (between 30 and 45 degree pitch)
- Shading must be minimal
- Panels must not be laid horizontally on a flat roof, as they will not self-clean. Panels will therefore need to be installed at an angle and with appropriate space between them, to avoid over-shading.
- Local Planning requirements may restrict installation of panels on certain elevations
- Installation must take into account pitch and fall of the roof, along with any additional plant on the roof to ensure there is sufficient space.

Approximate upfront cost:

- The cost of a solar thermal system in this scenario is bespoke, and would need to be confirmed by a specialist consultant.

Advantages:

- Can lead to a 10% reduction in carbon emissions when installed to dwellings with gas fired heating systems
- Limited maintenance required
- Perform effectively in dwellings or non-domestic developments with a high hot water demand.

Disadvantages:

- Performance is limited by the hot water demand of the dwelling – system oversizing will lead to overheating
- Homeowners need to adapt their behaviour to ensure they are using hot water at times where the cylinder has been heated from the sun.
- Solar cylinders tend to be larger and heavier than standard cylinders and therefore airing cupboard sizing and structural considerations come into play.
- Plumbing to apartment blocks can add complication and cost

Suitable for this development?

Solar Thermal Panels are suitable for this development, as there is appropriate unshaded roof space available for installation. STP panels will therefore be considered as a solution in this report

Wind Turbines

Wind turbines come in a variety of sizes and shapes. Turbines of 1Kw can be installed to single house and large scale turbines of 1-2MW can be installed on a development to generate electricity to multiple dwellings and other buildings. In both instances the electricity generated can be used on site or exported to the grid. Vertical or horizontal axis turbines are available.

Installation considerations:

- Local wind speed is a determining factor. A minimum average wind speed of 6m/s is required.
- Noise considerations can be an issue dependant on density and build-up of the surrounding area.
- Buildings in the immediate area can disrupt wind speed and reduce performance of the system.
- Planning permission will be required along with suitable space to site the turbine, whether ground installed or roof mounted.

Approximate upfront cost: (taken from the Energy Saving Trust, TBC by your supplier)

- A roof-mounted 1kW micro wind system costs up to £3,000
- A 2.5kW pole-mounted system costs between £9,900 and £19,000
- A 6kW pole-mounted system costs between £21,000 and £30,000.

Advantages:

- Generation of clean electricity which can be exported to the grid or used on site
- Can benefit from the Feed in Tariff reducing payback costs

Disadvantages:

- Planning restrictions and local climate often limit installation opportunities
- Annual maintenance required
- High initial capital cost

Suitable for this development?

Wind turbines are not considered suitable for this development, given initial capital outlay, lack of space for installation and aesthetic reasons. They will therefore not be considered as a solution for this development.

Air Source Heat Pumps

Air Source Heat Pumps (ASHPs) extract heat from the external air and condensing this energy to heat a smaller space within a dwelling or non-domestic building. A pump circulates a refrigerant through a coil to absorb energy from the air. This refrigerant is then compressed to raise its temperature which can then be used for space heating and domestic hot water. They can feed either low temperature radiators or underfloor heating and often have electric immersion heater back up for the winter months. High efficiency (250%+) means they are a more efficient solution to electric panel heaters, but due to high cost and carbon factor of electricity, running costs will be comparable to A rated gas boilers.

Installation considerations:

- ASHPs operate effectively in dwellings with a low energy demand, as they emit low temperate energy, suitable for maintaining rather than dramatically increasing internal temperatures. It is therefore vital that the dwelling have a low heating demand to ensure the system can provide appropriate space heating capability.
- The system may need to defrost in winter, by running in reverse, so appropriate back up space heating may be required.
- Underfloor heating will give the best performance but oversized radiators can also be used.
- Immersion heater back up required to ensure DHW temperature in winter months
- Any planning restrictions which could limit installations outside the dwelling?
- Noise from the external unit can limit areas for installation

Approximate upfront cost:

- The cost of an air source system in this scenario is bespoke, and would need to be confirmed by a specialist consultant.

Advantages:

- Considerable improvement in energy efficiency and carbon emissions over electric panel heaters, making them an ideal off grid solution
- Perform well in well insulated homes, with limited heating demand

Disadvantages:

- Will not perform well in poorly insulated homes with a large heating demand or homes that are left unoccupied and unheated for a long period of time.
- Back up immersion heating can drastically increase running costs
- Noise and aesthetic considerations limit installation opportunities.
- Similar running costs and carbon emissions to A rated gas boilers, with substantially higher installation cost.

Suitable for this development?

ASHPs could be considered as a suitable alternative heating system for this development, however there is not expected to be a significant reduction in running costs or carbon emissions in comparison to gas boilers.

Ground Source Heat Pumps

Ground source heat pumps (GSHPs) operate on the same principle as an Air Source Heat Pump, in that they extract heat from a source (in this instance the ground) and compress this energy to increase temperature for space heating and hot water. Pipework is installed into the ground, either through coils or in bore holes and piles, circulating a mix of water and antifreeze to extract energy from the ground, where the year round temperature is relatively consistent (approx. 10 degrees at 4 metres depth). This leads to a reliable source of heat for the dwelling. Again an electrically powered pump, circulates the liquid and power the compressor, however annual efficiencies for GSHPs tend to be higher than that of ASHPs

Installation considerations

- Require appropriate ground conditions to sink piles/bore holes or excavate for coils (which also require a large area of land)
- Decision between coils or piles can lead to significant extra cost
- Use on large apartment blocks will require multiple piles – may not be possible to meet entirety of heat demand through GSHP alone.
- Will low temperature output be fed through underfloor heating (most efficient) or oversized radiators?
- Similar to ASHPs, perform best in well insulated dwellings with a low heating demand
- Electric immersion heater required for winter use

Approximate upfront cost:

- The cost of a ground source system in this scenario is bespoke, and would need to be confirmed by a specialist consultant.

Advantages:

- Considerable improvement in energy efficiency and carbon emissions over electric panel heaters, making them an ideal off grid solution
- Perform well in well insulated homes, with limited heating demand
- More efficient than air source heat pumps

Disadvantages:

- Installation costs can be high if ground conditions are not ideal for coils.
- Will not perform well in poorly insulated homes with a large heating demand or homes that are left unoccupied and unheated for a long period of time.
- Back up immersion heating can drastically increase running costs
- Large area of ground needed for coil installation

Suitable for this development

GSHPs are not considered suitable for this development given ground conditions, upfront capital costs and limited area for installation.

Biomass Boilers

Biomass boilers generate heat for space heating and domestic hot water through the combustion of biofuels, such as woodchip, wood pellets or potentially biofuel or bio diesel. Biomass is considered to be virtually zero carbon. They can be used on an individual scale or for multiple dwellings as part of a district heating network. A back up heat source should be provided, as consistent delivery of fuel is necessary for continued operation.

Installation considerations:

- Biomass boilers are larger than conventional gas fired boilers and also require what can be significant storage space for the fuel source. This needs to be considered at planning stage to ensure an appropriate plant room can be provided.
- Flue required to expel exhaust gases – design needs to be in line with the requirements of the Building Regulations.
- Will fuel deliveries be reliable and consistent to the location of the site (especially relevant in rural areas) and can the plant room be easily accessed by the delivery vehicle?
- Are there any emission restrictions prohibiting the use of biomass?

Approximate upfront cost: (taken from the Energy Saving Trust, TBC by your supplier)

- £9,000-£21,000 for a system which is capable of providing a large dwelling with heat and hot water
- Large scale community systems will be substantially more expensive

Advantages:

- Considerable reduction in carbon dioxide emissions

Disadvantages:

- Limited reduction in running costs compared to A rated gas boilers, but at a substantially higher upfront cost.
- Plant room space required for boiler and storage

- Dependant on consistent delivery of fuel
- Ongoing maintenance costs (need to be cleaned regularly to remove ash)

Suitable for this development?

The use of biomass is not considered suitable for this development due to limited plant space, potential delivery issues and significant upfront costs for a very large reduction in carbon emissions, which greatly exceed the required LPA targets.

Combined Heat and Power

Combined Heat and Power (CHP) is a relatively simple technology comprising of an engine (usually gas fired, but can be oil or biomass fired) which fires a generator producing on site electricity. This process also generates heat as a by-product, which can then be used to provide space heating and hot water. CHP systems can be small scale, and used in single dwellings or large scale, used in a community or district heating network. As electricity is produced on site, distribution losses in comparison to the national grid are minimal and the heat by-product is captured instead of being wasted. As a result CHP provides low carbon electricity and heat generation.

Installation considerations:

- The sizing of a CHP system is critical to its efficiency and operation. An oversized system, will require a large buffer tank to absorb excess heat and will often have to turn off, not good for long term operation.
- Systems should therefore be undersized and meet base heating demand (usually hot water demand) to ensure continuous operation.
- Large scale CHP systems will require sufficient plant room to accommodate the engine and buffer vessel.
- Large systems suitable for developments of 500 or more units, although can be viable on smaller schemes.
- Systems perform well, where there is a consistent demand for heat.
- Export of electricity could require upgrade to local substation.
- Flue design important
- Design needs to be bespoke to the needs of your development

Approximate upfront costs (TBC by your supplier)

- The cost of a CHP system in this scenario is bespoke, and would need to be confirmed by a specialist consultant.

Advantages:

- Significant CO₂ reductions for large scale development (multiple apartment blocks) where there is a consistent requirement for heat.

Disadvantages:

- No financially viable on smaller developments.
- Plant room space required.

- Will not perform well where there is inconsistent demand for heat.
- Upfront and ongoing costs are higher than commercial gas boilers.
- Distributions losses make connection to houses expensive and inefficient.

Suitable for this development?

- The use of CHP is considered suitable for this development due to the anticipated heat demand, the size of the building and the proximity of the residential units. CHP will be considered as a solution for this site.

Having assessed the viability of the technologies listed above, it is concluded that the following are appropriate for this development:

- Solar Photovoltaic Panels
- Solar Thermal Panels
- Combined Heat and Power

In order to achieve a 35% reduction in carbon emissions as required by The London Plan, three additional assessments have been calculated

- An option showing the addition of Photovoltaic panels only
- An option showing how the notional gas boiler can be replaced by a Combined Heat and Power communal system
- An option showing CHP and PV combined

7. OPTION 1: PV PANELS

This first option for introducing low and zero carbon technologies into the proposed development makes use of the Fabric First and Building Services details which have already been assessed, plus the following:

Element	Performance
Photovoltaic Panels	The inclusion of 925 square metres of photovoltaic panels to the south facing roof. Based on a 30 degree pitch with little or no oversharing

This option is unlikely to be considered feasible, as the inclusion of this many PV panels onto a single building could lead to:

- An overpowering change to the street-view, and the general appearance of the building
- Weight issues which could lead to structural issues with the roof
- The kilowatt peak value for an array of this size would be approximately 125-140. This amount of energy generation is likely to require specialist electrical work to be carried out to local substations to ensure they are able to cope with peak demands.

By including this specification as part of the overall set of improvements, the revised, predicted carbon emissions for this building is 70,526 kgCO₂ annually.

This gives a total reduction of 35.4% in carbon emissions over the baseline standard. This exceeds the 35% reduction which is required by The London Plan.

8. OPTION 2: CHP

This second option for introducing low and zero carbon technologies into the proposed development makes use of the Fabric First and Building Services details which have already been assessed, plus the following:

Element	Performance
Space Heating	Based on a communal Combined Heat and Power boiler system to serve the whole building, and to meet 95% of the annual heating demand. This is based on a system of a heating efficiency of 50% and an electrical efficiency of 30%. There will be a secondary, backup gas boiler which will meet the remaining 5% of heating demand. This is based on a communal gas boiler with an efficiency of 91%
Heating Controls	Appropriate Building Managing system
Hot Water	Hot water to be provided by the secondary, backup boiler. This is based on a 1,000 litre hot water cylinder with assumed heat losses of 520 mega joules per month.

By including this specification as part of the overall set of improvements, the revised, predicted carbon emissions for this building is 93,277 kgCO₂ annually.

This option is considered feasible on a practical and technical level, however this improvement gives a total reduction of 14.6% in carbon emissions over the baseline standard. This falls short of the 35% reduction which is required by The London Plan.

9. OPTION 3: PV PANELS & CHP

This third option for introducing low and zero carbon technologies into the proposed development makes use of the Fabric First and Building Services details which have already been assessed, plus the following:

Element	Performance
Photovoltaic Panels	The inclusion of 610 square metres of photovoltaic panels to the south facing roof. Based on a 30 degree pitch with little or no overshadowing
Space Heating	Based on a communal Combined Heat and Power boiler system to serve the whole building, and to meet 95% of the annual heating demand. This is based on a system of a heating efficiency of 50% and an electrical efficiency of 30%. There will be a secondary, backup gas boiler which will meet the remaining 5% of heating demand. This is based on a communal gas boiler with an efficiency of 91%
Heating Controls	Appropriate Building Managing system
Hot Water	Hot water to be provided by the secondary, backup boiler. This is based on a 1,000 litre hot water cylinder with assumed heat losses of 520 mega joules per month.

This option is considered to be feasible, however specialist consultants should advise if the total amount of PV panels is practically and technically feasible given the bullet points as specific in Option 1.

Depending on manufacturer efficiencies, 610sqm of PV panels is approximately 80-95 kilowatt peak.

By including this specification as part of the overall set of improvements, the revised, predicted carbon emissions for this building is 70,526 kgCO₂ annually.

This gives a total reduction of 35.4% in carbon emissions over the baseline standard which exceeds the 35% reduction required by The London Plan.

10. CONCLUSION AND RECOMMENDATIONS

In order to achieve compliance with the requirements of The London Plan and the London Borough of Hillingdon, it is recommended that 'Option 3' is used as part of the Park View Care Home development.

The developer will:

- Adopt Fabric First enhancements to the specification of the building
- Use high-efficiency lighting and ventilation systems
- Incorporate 610sqm of photovoltaic panels to the south facing roof of the building
- Ensure the building is heated through the use of a community gas boiler network with integrated Combined Heat and Power

This will generate a total reduction in carbon emissions of 35.4% over the 2013 Target Emissions Rate.

Table 1: Carbon Emission Summary				
Baseline Emission Rate (kg CO2 per Year)	Proposed with Fabric (kg CO2 per Year)	Proposed Development Emission Rate (kg CO2 per Year)	Reduction in emissions over baseline (kg/CO2 per year)	% reduction in emissions over baseline
109,202	106,927	70,526	38,676	35.42%

