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ENERGY ASSESSMENT

PROJECT NAME
561-563 Upper Richmond Road West

DATE
12th June 2024

ASSESSOR
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Energy Assessment

Project: 5493KJ - 2024.05 SAP (Upper Richmond Rd West - Mehdi Taghavi)

Contents

Executive Summary

The proposal is for the conversion of the buildings at 561-563 Upper Richmond Road West, East Sheen, SW14 7ED into two 3-bedroom houses. The approximate total internal floor area is 279.54m^2.

Table 1 – Floor Areas for Each Use Type

Use Type	Floor Area (m^2)
Domestic	279.54
Total	279.54

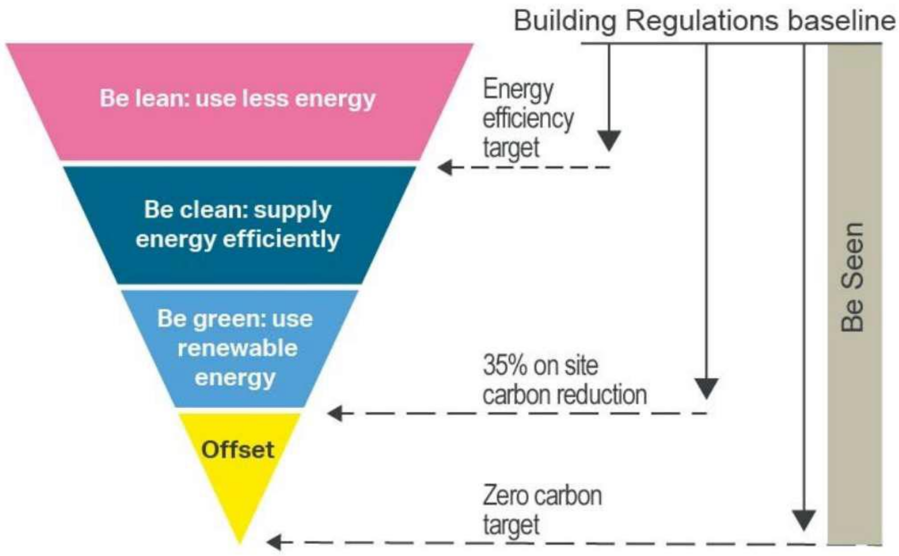
This Energy Assessment has been compiled to demonstrate that climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It aims to ensure that energy remains an integral part of the development's design and evolution ["Energy Assessment Guidance – Greater London Authority guidance on preparing energy assessments as part of planning applications (April 2020)].

Under the energy policies of the London Plan, this development has been assessed against the criteria of achieving zero carbon – a 100% reduction in CO_2 emission beyond minimum compliance with Part L of the Building Regulations, with a 10% reduction (15% for non-domestic developments) resulting from the use of energy efficiency measures only. The relevant calculations have been carried out using SAP 10.2 emissions factors as well as the latest SAP10 software. This assessment follows the energy hierarchy which is comprised of the following stages:

1. Be Lean – reducing energy demand through fabric improvements, energy efficiency measures and flexibility measures
2. Be Clean – utilising local energy sources such as waste heat and supplying clean energy efficiently by connecting to district heating networks
3. Be Green –producing, storing and using renewable energy on-site as far as is practical
4. Be Seen – monitoring, verifying and reporting on energy performance throughout the lifetime of the project

These stages can be summed up in the following graphic:

Figure 1 – The London Plan Energy Hierarchy



The measures used at each stage of the Energy Hierarchy, as well as the resulting decrease in carbon dioxide emissions, as well as the overall reduction in emissions, are summarised in the following sections.

Also addressed in this assessment are the following:

- How the site layout, building design and passive and active measures have been chosen to minimise the CO_2 emissions and address the risk of overheating
- The potential to connect to an existing or proposed district heating network
- The impact of the development on the air quality of the surrounding area
- Running costs, including fuel, installation and maintenance costs

Carbon Savings

Table 2 – Carbon Dioxide Emissions After Each Stage of the Energy Hierarchy for Domestic Buildings

	Carbon dioxide emissions for domestic buildings (SAP10)	
	Regulated (Tonnes CO_2 per annum)	Unregulated (Tonnes CO_2 per annum)
Baseline: Part L 2021 of the Building Regulations Compliant Development	6.81	7.17
After energy demand reduction	5.73	7.17
After heat network/CHP	5.73	7.17
After renewable energy	0.98	7.17

Table 3 – Regulated Carbon Dioxide Savings From Each Stage of the Energy Hierarchy for Domestic Buildings

	Regulated domestic carbon dioxide savings (SAP10)	
	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	1.08	0.16
Be clean: Savings from heat network/CHP	0.00	0.00
Be green: Savings from renewable energy	4.75	0.70
Cumulative on site savings	5.83	0.86
Annual savings from off-set payment	0.98	
	(Tonnes CO_2)	
Cumulative savings for offset payment	30	
Cash-in-lieu contribution*	**£2,805**	

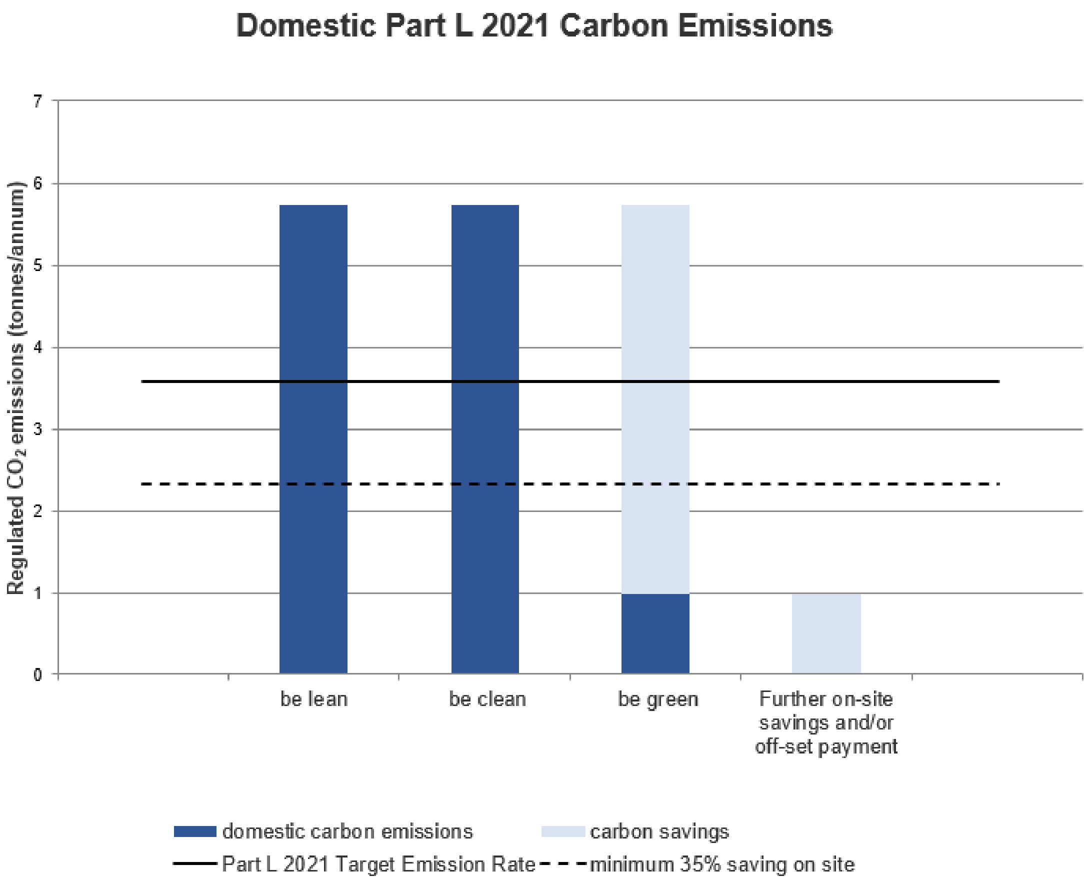
*Price calculated assuming the standard value of £95 per tonne of CO_2 over 30 years

Table 4 – Plot Detail

Total regulated carbon dioxide from each stage of the energy hierarchy for domestic buildings (Tonnes)				
Dwelling	A: Baseline CO_2 emissions (Part L 2021 of the Building Regulations Compliant Development)	B: CO_2 emissions after energy demand reduction (be lean)	C: CO_2 emissions after energy demand reduction (be lean) AND heat network (be clean)	D: CO_2 emissions after energy demand reduction (be lean) AND heat network (be clean) AND renewable energy (be green)
Plot 1	3.584	3.030	3.030	0.511
Plot 2	3.228	2.702	2.702	0.473
Site Total	**6.812**	**5.732**	**5.732**	**0.984**

Please refer to the SAP reports and the following sections for more details.

Figure 2 – Domestic SAP 10 Carbon Emissions



Demand Reduction (Be Lean)

As demonstrated in the following table, the proposed building specification has been used to exceed the minimum requirements of Part L of the Building Regulations.

Table 5 – Proposed Specification

Category	Item	Value/Details	Part L1 Limiting Values
Building Fabric (W/m^2K)	Existing Floor	0.18	0.25
	Existing External Walls	0.26	0.30
	New Cavity Walls	0.18	0.18
	Ceiling to Roof space	0.10	0.16
	Warm Pitched Roof/External Flat Roof	0.16	0.16
Fenestration (W/m^2K)	External Door	1.40	1.40
	Window	1.40	1.40
	Roof Window	1.40	1.40
Ventilation	Mechanical Ventilation	Intermittent extract fans	Intermittent extract fans
Heating	Primary Heating System	Regular condensing gas boiler	-
	Controls	Time and temperature zone controls by arrangement	Programmer, room thermostat and TRVs
	Heat Distribution	Radiators	-
	Water Heating	Boiler-fed cylinder	-
	Secondary Heating System	None	-
	Active Cooling	None	-
Additional Features	Low Energy Lighting	100lm/W	75lm/W
	SAP Appendix Q	None	-
	Renewables	None	-
	Regulation 36 Compliance (litres/person/day)	105	125

Note: the limiting values given above are taken from Approved Document L1.

Table 6 – Fabric Energy Efficiency

	Target Fabric Energy Efficiency (kWh/m^2)	Design Fabric Energy Efficiency (kWh/m^2)	Improvement (%)
Development Total	80.97	76.72	5

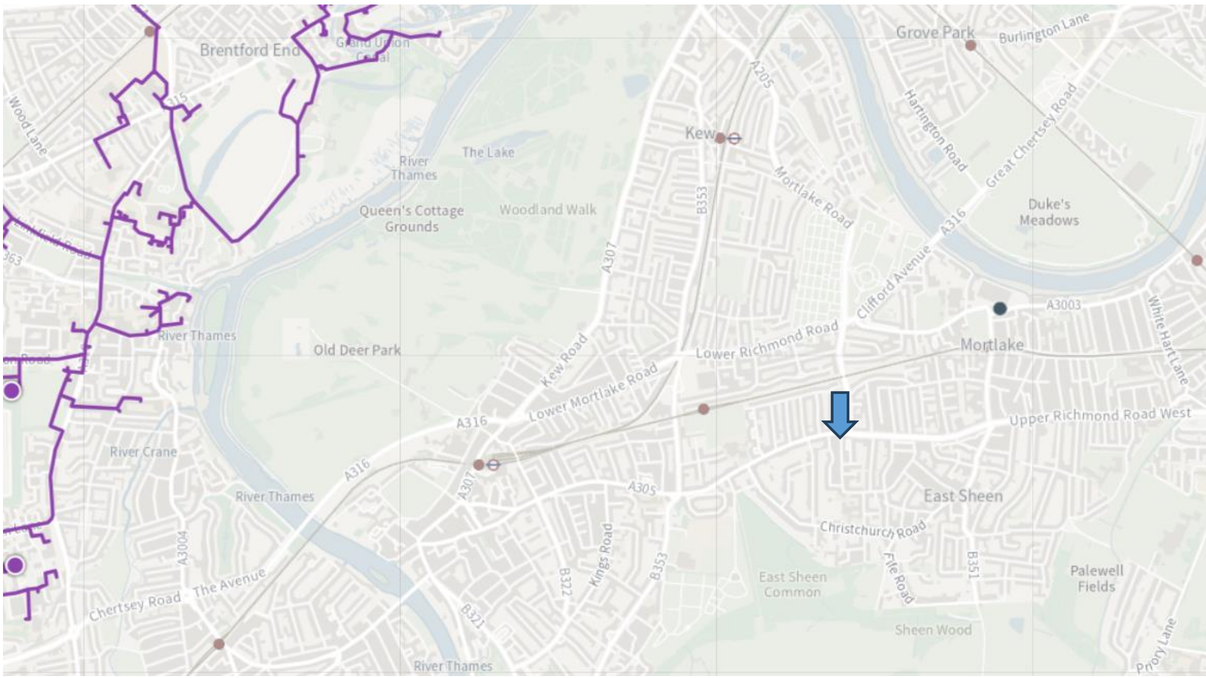
Table 7 – EUI and Space Heating Demand

Building type	EUI ($kWh/m^2/year$) (excluding renewable energy)	Space heating demand ($kWh/m^2/year$) (excluding renewable energy)	Methodology used	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
Residential	61.34	77.50	Part L1 - SAP 10.2	SAP equations L13 & L15 used to approximate unregulated energy use in the absence of a full operational energy assessment

Heating Infrastructure Including CHP (Be Clean)

As can be seen on excerpt from the London Heat Map below, there is no area heat network in operation or planned within 3km.

Figure 3 – London Heat Map



The proposed heating strategy is a wet central heating system which could facilitate the connection to a future area heating network. However, the losses associated with connecting to this small, low energy-demand development may not make this feasible.

Furthermore, due to the relatively small size and low energy demand of this project, CHP or a dedicated heat network are considered inappropriate.

Therefore, as displayed on Tables 1-6 earlier in this document, there are no proposed energy and carbon savings that can be attributed to the connection to an area heating network or the use of a CHP system.

Renewable Energy (Be Green)

The following considerations have been made in selecting the preferred renewable energy option.

Table 8 – Feasibility Matrix of Appropriate Renewables

Technology	Requirements	Requirements Met?	Appropriate?
Photovoltaic panels	Roof facing east to west (through south)	Yes	Yes
	Little/no or modest overshading	Yes*	
	Flat roof or pitched roof not greater than 45°	Yes	
	Any size development	Yes	
Solar thermal	All requirements as for photovoltaic panels	Yes	Yes
	Hot water tank possible	Yes	
Air source heat pumps	Suitable external wall	Yes	Yes
	Aesthetic considerations	Yes	
	Noise impact	Yes	
	Any size development	Yes	
Ground source heat pumps	External space for horizontal trench or vertical borehole	No	No
	Medium to large sized development	Yes	
	Archaeology	Unknown	
	Best suited to underfloor heating	No	
Biomass	Space needed for plant, fuel storage and deliveries	No	No
	Medium to large sized development	Yes	
	Minimal impact on residents (air quality, deliveries)	No	

**See the following aerial image demonstrating that the overshading risk is low for the likely location of any solar panels.*

Please refer to appendices A through G for more information about these technologies.

Figure 4 – Overshading Risk – Aerial Image of the Site

Note: the blue arrow shows the approximate location of the proposed building. As can be seen, there are no obstructions that are likely to create overshading to any potential solar panels.

Feasibility of Appropriate Renewables - Conclusion

Due to the size and location of this development, some renewable technologies are considered inappropriate for this site.

Solar thermal panels would not provide sufficient carbon reductions in order to achieve compliance.

Air source heat pumps are feasible for this development. The external units can be discretely sited to the rear of the building where they will not affect access to or the aesthetics of the property but can easily be accessed for maintenance as well as allowing air to flow freely around the external units. The performance of this unit has been selected to be conservative whilst being reflective of products available on the market. Additionally, this heat pump will also provide hot water heating via a cylinder fed from the heat pump. This will allow space and hot water heating to the dwelling to be provided year-round without requiring an additional 'top up' heating system, while the use of a wet central heating system provides the possibility of connecting to a future district heating network were one to become available in the local area. The use of this heat pump allows the minimum 35% emissions reduction to be easily achieved on this site.

However, there is scope for further emissions reduction on-site. A photovoltaic panel array could be fitted to the east, west and south facing roofs with the array size scaled to make maximum use of the available roof space. This will need to be confirmed by a survey prior to installation. Additionally, it may be possible to tie in this proposed PV array to an energy storage system or electric vehicle (EV) charging point, although this would depend on these technologies being found suitable for this site.

Although high yield photovoltaic panels and an efficient heat pump have been chosen for this development, due to the small scale of the site and the limited roof space which is suitable for PV panels it is not possible to offset all of the carbon emission associated with this site, requiring an offset payment to be made, as shown in Tables 2 and 4 above.

Chosen Solutions

Photovoltaic Panels
ASHP

Table 9 – Proposed Renewables Specification

Plot	Array Size	Orientation	Inclination	Overshading
Plot 1	1.60kWp	South	30° (nominal)*	None or very little
	2.40kWp	East	30° (nominal)*	None or very little
Plot 2	0.80kWp	South	30° (nominal)*	None or very little
	2.80kWp	West	30° (nominal)*	None or very little
Total	**7.60kWp**			

**The SAP calculation accepts 0°, 30°, 45°, 60° and 90°. The angle given is the nearest of these values to the true pitch of the PV.*

With this configuration, the photovoltaic panels are estimated to generate 2,739.11kW/year. See the SAP reports for further details.

The total amount of PV required can be achieved with 19 × 400-Watt panels or equivalent and take up an area of approximately 38m^2 of roof space.

The selected air source heat pump is assumed to be 409% efficient (SEER/SCOP of 4.1) and is predicted to use 7,223kWh/year.

Post Construction Monitoring (Be Seen)

There is now a requirement that all major developments (10 or more dwellings, or more than 1,000m^2 of non-domestic floor space) monitor and report their energy performance post-construction to ensure that the actual energy usage and carbon emissions do not exceed the predicted values as well as ensuring that the development is in line with the overall net zero carbon target.

While this development is too small for the requirement to apply directly, the principles of monitoring energy usage can still be applied. As such, a smart meters will be installed to allow overall electricity consumption to be monitored as well as being easily visible to the occupants, while both the proposed heat pumps and photovoltaic panels will be monitored and kept well maintained to ensure effective and efficient operation after installation. Any problems identified will be rectified as soon as reasonably possible to ensure continuing energy efficiency throughout the lifetime of the dwelling.

Monitoring the performance of the renewable technologies, as well as the energy efficiency measures incorporated into the design, will also help to keep running costs low for future occupants. The use of smart meters and clear billing as well as selling excess electricity generated by the PV array, will help to keep down costs as well as protecting the occupants against high energy prices.

Estimates of Associated Costs

Table 10 below give an estimate as to the costs associated with the renewable strategy, breaking down the overall cost into various categories. This includes both initial installation costs as well as the subsequent running costs.

Fuel costs are taken from SAP10.2 Table 12, with a grid electricity price of 16.49p/kWh. Standing charges for fuel prices (£81/year for grid electricity) are included within the overheads row, with the relevant cost being applied to each plot. This also includes provision for other costs not covered elsewhere if applicable.

It is assumed that the heat pumps will require replacement once each over the 30-year period. The PV panels themselves are likely to last the full 30 years of the cost analysis (with most arrays only requiring replacement after a minimum of 25 years) and so the cost of replacing the panels (approximately £500 per panel) is not included. However, the inverters will need to be replaced once during this time span at a cost of around £800. Annual servicing for each PV array, including inspection and cleaning, would cost approximately £150. An annual servicing for a heat pump is estimated at £100. Maintenance, installation and plant replacement costs are based on values from the Energy Saving Trust.

It is assumed that all electricity generated by the PV array will be used in the property, thus representing the savings associated with the use of locally generated electricity (with a cost factor of -16.49p/kWh) rather than payments made from selling electricity to the grid, which generally has a lower cost factor. As it is unlikely that all generated electricity will actually be used on site in practice, the savings from electricity sales are likely to be less.

The initial installation costs are assumed at £10,000 for each air source heat pump setup given the size and complexity of each setup. An installation cost of £11,100 for the 7.60kWp PV arrays is also assumed, based on the number of panels and inverters required. These values are reported in the installation costs section of each table below the running costs section to account for the fact that these higher costs only need to be paid once.

Table 10 – Running Costs Over 30 Years (PV & ASHP)

Item	Cost Over 30 Years
Fuel Costs	£71,277.30
Incentives	£0.00
Electricity Sales	-£13,550.38
Plant Replacement	£28,100.00
Overheads	£4,860.00
Maintenance	£10,500.00
Total Running Costs	**£101,186.93**
Initial Installation Costs	£32,100.00
Total Cost	**£133,286.93**

Note: The costs in Tables 10 applies to the entire site, including the costs from both dwellings.

Cooling and Overheating

The building has been designed to be airtight and with a high performing fabric. However, other features incorporated within the design of the building mitigate against the effects of overheating.

The heat distribution system within the houses will be designed such that the heat pump internal unit is in close proximity to all hot water outlets, and the heating system will be configured with efficient pipe layouts and a short overall length. Additionally, the high thermal mass of the building will help to retain heat, and the rooms will be of standard height – approximately 2.4m from floor to ceiling.

Openable windows at opposite ends of the dwellings will enable cross ventilation whilst the overall proportion of glazing to wall area will be kept below 20% (15% for Plot 1 and 17% for Plot 2), helping to limit solar gain. This will help to reduce the need for artificial cooling in a potentially warmer future climate.

Additional Considerations

To address air quality, the proposed heating system (air source heat pumps) does not produce any local emissions.

Table 11 – Air Quality Impact

Energy Source	Total Fuel Consumption – Residential (MWh/year)
Grid Electricity	14.41
Domestic/Communal Gas Boilers	0.00
Gas CHP	0.00
Connection to existing District Heating Network	0.00
Other Gas Use (e.g. Cookers)	0.00

Appendix A – Photovoltaic Panels

What are Photovoltaic Panels?

Photovoltaic Panels (PV) panels convert the energy in light received from the Sun into electricity. There are two types of system – grid connected systems are the most common and allow electricity to be drawn from the national grid during times when the panels are not generating enough electricity to provide all the power needs. This setup also allows any surplus electricity to be sold back to the grid. Conversely, standalone systems are not connected to the grid and so require supplementing with other power generating systems or batteries to ensure that the supply of electricity is not interrupted.

Space Requirements

PV Panels are composed of a series of small solar cells that are connected together. They come in a variety of shapes, sizes and outputs and ideally will be installed on an inclined south-facing roof to maximise the power generated. Larger arrays will result in more power being generated, up to the limits of available roof space. If space is limited, solar tiles can be installed as these can fit more capacity into the same area. However, these are more expensive than traditional panel installations.

Installation Costs, Funding, Maintenance and Payback

The average cost for a solar panel installation for a small-scale building is approximately £5,000-£9,000, although this is highly dependent on the size of array being installed. Planning permission is not usually required unless the panels are to be installed on a listed building or the property is situated in a conservation area.

The photovoltaic array can be expected to last for up to 25 years, depending on the manufacturer.

On January 1st 2020, a new government incentive scheme was introduced, known as the Smart Export Guarantee (SEG). For those installing small scale renewable technologies, with a maximum capacity of 5MW, the SEG will pay for each unit of electricity fed into the National Grid. It is anticipated that payback for a PV system could be achieved in approximately 12 years.

Advantages of Photovoltaic Panels

- Electricity bills reduced
- Source of renewable energy
- Reduced carbon footprint
- Low maintenance

Disadvantages of Photovoltaic Panels

- Relatively high upfront cost
- Energy generation varies with the average annual amount of radiation received
- Power output highly weather dependent
- No electricity produced at night
- Requires a lot of roof space for an effective array.

Appendix B – Solar Thermal Panels

What is Solar Thermal Energy?

A solar thermal system uses energy from the Sun to heat water which is then stored in a hot water cylinder.

Space Requirements

For a small scale solar thermal setup, it is suggested that approximately five square meters of south facing space will be required, to ensure that as much solar energy as possible can be collected. A sloping roof is not required as the panels can be fitted to a frame mounted on a flat roof or even hung from a wall.

Before installing a solar thermal system, it is important to check if your current setup is suitable – solar thermal systems require a hot water cylinder to store the heated water and are therefore not compatible with combination boilers or direct acting water heaters. If the cylinder present prior to the installation of the solar thermal system is not a solar cylinder, it will be necessary to either replace the cylinder with one which has a solar heating coil fitted or to add an extra cylinder with a solar coil to ensure that the system works correctly.

Installation Costs, Funding, Maintenance and Payback

The initial cost of installing a typical small scale solar thermal system is generally between £5,000 and £9,000. There are currently no financial schemes available for solar thermal panels.

Very little maintenance is usually required after the system is installed, although it is important to have the system inspected every three to seven years by a qualified solar panel expert.

The payback costs for solar panels depend greatly on the installation costs. For example, a system costing between £5,000 and £7,000 to install has a typical payback time between 13 and 17 years.

Planning Requirements

Planning permission is generally not required for the installation of a solar thermal system. However, restrictions may apply if the building is listed or sited within a conservation area – it is advisable to check with the local council prior to installation.

Advantages

- Clean and efficient water heating
- Easy to maintain
- Quiet
- Low carbon footprint

Disadvantages

- High initial cost
- Effectiveness depends on the number of hours of sunshine your area gets during the day
- The system is limited to only heating water – no electricity is produced
- Only useful if there is meaningful hot water demand

Appendix C – Air Source Heat Pumps

What are Air Source Heat Pumps?

Air source heat pumps (ASHPs) extract thermal energy from outside air (using the principles of vapour compression refrigeration), which can then be used to heat the building as well as to provide hot water. Heat pumps can also be run in reverse, cooling the building and transferring the excess heat to the outside.

There are two types of air source heat pump systems:

1. **Air to air** systems transfer the warmed air throughout the building using fans
2. **Air to water** systems transfer heat to water, which is then distributed via plumbing similar to that used in a conventional heating system with a boiler

Air source heat pumps operate at lower temperatures than traditional gas boilers. This means that these systems can be utilised more effectively with an underfloor heating setup compared to using radiators, as with underfloor heating the warmth is distributed more evenly and thus more efficiently. It is vital that the building fabric be well insulated if the benefits of an air source heat pump are to be fully utilised.

Space Requirements

An area on the exterior of the building, such as on a wall or roof, will be required for the external unit. This ideally should be in a warmer location which not only has enough space for the unit but is also clear of obstructions to allow air to flow freely.

Additionally, space will be required for the internal unit. Typically, these are no larger than a standard hot water cylinder or boiler unit, depending on the exact setup used. However, with many setups a separate hot water cylinder, along with the space for this, is also required.

Installation Costs, Funding, Maintenance and Payback

The cost of purchasing and installing an air source heat pump system is generally between £3,000 and £11,000, depending on the size and complexity of the setup. Additional costs may be incurred if your property is particularly large. However, it may be possible to obtain payments from the Government's Renewable Heat Incentive (RHI), which will offset some of the costs incurred with installing the heat pump.

Air source heat pumps can be expected to last for up to 20 years as long as they are inspected every three to five years by a qualified technician. A typical payback period for ASHPs is around 12 years, once RHI is taken into account.

Planning

It is advisable to consult your local planning authority prior to purchasing the heat pump to establish whether there are any restrictions as to the positioning of the external unit.

Advantages

- Lower fuel bills
- Can provide heating in winter and cooling in the summer as well as hot water year-round
- Low maintenance
- Low carbon footprint

Disadvantages

- Works more efficiently with underfloor heating, or larger radiators
- The outdoor unit produces noise so careful siting is required
- Less efficient in winter due to the need to extract heat from colder air, resulting in lower Coefficient of Performance (COP) values.

Appendix D – Ground Source Heat Pumps

What are Ground Source Heat Pumps?

Ground source heat pumps (GSHPs) use pipes, buried in available land close to the building, to extract heat from the ground. Water and antifreeze are circulated around the pipes absorbing heat, which is the transferred through a heat exchanger in the heat pump into the building. From this point, the heat can be used to provide space or hot water heating, or the system can be run in reverse to provide cooling.

Ground source heat pumps operate at lower temperatures than traditional gas boilers. This means that these systems can be utilised more efficiently with an underfloor heating setup than with radiators. It is particularly vital that the building be well insulated to fully take advantage of the benefits of a ground source heat pump.

Space Requirements

There are two types of ground source heat pump systems:

1. **Horizontal** systems, which require an area of approximately 700m^2
2. **Vertical** systems, which have a borehole approximately a quarter of a metre across and up to 100m deep.

Larger sites will require either a larger area or more boreholes. Whichever system is chosen, suitable access must be available for the machinery required to install the pipework, especially in the case of the drill rig required for the vertical systems.

Space must also be available for the internal unit. These are typically larger than a standard gas boiler, approximately the size of a domestic hot water cylinder.

Installation Costs, Funding, Maintenance and Payback

Installing ground source heat pumps can cost between £10,000 and £18,000. The horizontal system is often cheaper as the expensive drill rig required to drill the borehole is unnecessary.

It may be possible to obtain payments from the Government's Renewable Heat Incentive (RHI), which will help to offset some of the costs involved with installing the heat pump. Additionally, the heat pump, if inspected regularly by a qualified servicer, can be expected to last for up to twenty years.

With low running costs and possible income from the RHI, the payback period can typically be between 8 and 12 years.

Planning Requirements

Ground source heat pumps are generally permitted, but some restrictions apply, such as with listed buildings. Consulting your local authority prior to installation is recommended.

Advantages

- Lower fuel bills, especially if used to replace direct electric heating
- Can provide both space and hot water heating
- Can provide heating in winter and cooling in summer as well as hot water year-round
- Lower carbon footprint
- Low maintenance
- More efficient in winter than air source heat pumps due to ground temperatures remaining more constant throughout the year

Disadvantages

- More expensive to install than air source heat pumps
- Suitable land must be available for the pipework or boreholes
- The building must be very well insulated
- Works most efficiently with underfloor heating or warm air distribution

Appendix E – Biomass

What is Biomass?

Biomass is any fuel obtained from natural or organic material, such as manure, forest debris or agricultural or horticultural waste. The most common biomass energy source is wood in the form of pellets, wood chips or logs. Biomass boilers can be used as a replacement for a fossil fuel-based heat source, and are best suited to medium to large scale sites.

Space Requirements

Typically, biomass boilers are contained in a single plant room serving the whole site. This room needs to be big enough for the boiler or boilers themselves, along with water tanks and space for fuel storage.

Installation Costs, Funding, Maintenance and Payback

The cost of a biomass boiler depends on a number of factors, including the type of boiler used, the fuel type and storage size. For example, the cost, including installation, of an automatically-fed pellet boiler can be as much as £20,000. It is important to note that biomass boilers are also eligible for the Government Renewable Heat Incentive (RHI) scheme, which provides payments to those using renewable heating systems. Therefore, despite the high initial cost, biomass boilers can have relatively short payback times of around 5-7 years.

Biomass boilers should be serviced every 12 months to ensure continued efficiency and to prevent any breakdowns.

Planning

There may be restrictions on the installation of biomass systems, due to concerns over local pollution and disruption to residents caused by deliveries.

Advantages

- Sustainable energy source
- Reduces dependence on fossil fuels
- Carbon-neutral – the carbon produced is absorbed by plants which can then be used as future biomass fuel
- Reduces waste sent to landfill
- Abundant availability of fuel

Disadvantages

- The burning of biomass fuels produces various gases that can contribute to local air pollution
- Space is required on-site for a plant room and fuel storage, as well as a designated fuel delivery area
- Constructing and operating biomass energy plants are often more expensive than more traditional power plants

Appendix F – Combined Heat and Power

What is Combine Heat and Power?

Combined Heat and Power (CHP), sometimes referred to as cogeneration, is a setup in which heat and power are generated simultaneously.

Energy which is lost at various steps in producing electricity in a conventional power plant can be captured and used to provide warmth. For example, water which has condensed from the steam used to turn the generating turbine is typically cooled in large cooling towers, with all the energy lost to the air. In a CHP plant, this 'waste' heat is instead used to produce hot water, hot air or steam, which can then be distributed to heat local buildings.

Space Requirements

Significant space is required for the power plant itself, as well as the additional space required for the recovery of the otherwise wasted heat. Additionally, to use this energy effectively, a large pipe network is needed to distribute the heat around the local area.

Installation Costs, Funding, Maintenance and Payback

The costs involved with setting up a CHP system, especially if the power plant is being constructed along with it rather than converted, are relatively high. As a result of this, these schemes tend to be large-scale long-term projects.

The network must be kept well maintained to avoid loss of service and to ensure continued operation. However, a large-scale network can heat a wide area more efficiently than with individual building heating systems, providing good long-term return on investments.

Advantages

- The CHP process can be applied to power plants that use either renewable or fossil fuels as well as those which use a combination of the two
- Emissions are generally lower than other electricity and heat producing systems
- A variety of energy consumers can benefit from the installation of a CHP plant, including hospitals, schools and industrial sites

Disadvantages

- CHP plants need to be local to their users to ensure as little energy is lost in the transmission as possible.
- The technology needed is expensive and more complex. Maintenance costs can also be greater
- Considerable amount of space is required for a full-size CHP setup, making it suitable only for larger sites

Appendix G – District Heating

What is District Heating?

Instead of relying on one boiler for each unit on site, district heating utilises hot water or steam from a single communal heat source and distributes that energy to a variety of consumers through a network of insulated pipes. This network can be as large as desired, allowing entire communities to benefit, as well as reducing the need for additional energy to be produced specifically for heating buildings in the local area.

In the individual property or building, a heat interface unit (HIU) gives the consumer control over the hot water they use in a similar manner to that provided by a traditional boiler.

Space Requirements

An energy centre or large plant room would be required for this type of system. Depending on the scale of the heat network, pipework may need to be laid underground to distribute the hot water across the site or to the local area.

Installation Costs, Funding, Maintenance and Payback

The initial cost of setting up district heating, including the plant and infrastructure needed to deliver the heat, is relatively high and so these large-scale schemes tend to be a long-term investment.

Regular maintenance is essential to ensure continued efficiency and to prevent any breakdowns.

Advantages

- More energy efficient as energy which is otherwise wasted can be used
- Lower carbon emissions
- Has the potential to reduce heating costs

Disadvantages

- If the main fuel source experiences problems, whole areas could potentially be without heating or hot water
- Can in some cases be more expensive than traditional heating
- A large network is required to gain full benefit – it is only suitable for use on very large sites or where there is a network already present