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PROJECT NAME

36 Bath Road

DATE

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ENERGY STATEMENT



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Contents

Executive Summary	4
Dwelling Emissions Reduction	4
Design Principles to Reduce Energy Consumption and Carbon Emissions	5
Fabric	5
Fenestration and Solar Gain	5
Mechanical Services	5
Lighting	6
Overall performance	6
Energy Efficiency	7
Table 1 – Proposed Fabric Values	7
Other Considerations	8
Air Quality	8
Sustainable Materials	8
Minimisation of Waste	8
Smart Meters	8
Water Conservation	8
Selecting Low and Zero Carbon Technologies	9
Table 2 – Feasibility Matrix of Appropriate LZC Technologies	9
Feasibility of Appropriate Technologies - Conclusion	10
Appropriate Solution	10
Table 3 – Proposed Low and Zero Carbon Technologies	10
Table 4 – Dwelling Emission Rates (DER) ASHP	11
Appendix A – Photovoltaic Panels	12
What are Photovoltaic Panels?	12
Space Requirements	12
Installation Costs, Funding, Maintenance and Payback	13
Advantages of Photovoltaic Panels	13
Disadvantages of Photovoltaic Panels	13
Appendix B – Solar Thermal Panels	14
What is Solar Thermal Energy?	14



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Space Requirements	14
Installation Costs, Funding, Maintenance and Payback	15
Planning Requirements.....	15
Advantages.....	15
Disadvantages	15
Appendix C – Air Source Heat Pumps	16
What are Air Source Heat Pumps?.....	16
Space Requirements	17
Installation Costs, Funding, Maintenance and Payback	17
Planning	17
Advantages.....	17
Disadvantages	17
Appendix D – Ground Source Heat Pumps	18
What are Ground Source Heat Pumps?	18
Space Requirements	18
Installation Costs, Funding, Maintenance and Payback	19
Planning Requirements.....	19
Advantages.....	19
Disadvantages	19
Appendix E – Biomass	20
What is Biomass?	20
Space Requirements	20
Installation Costs, Funding, Maintenance and Payback	20
Planning	21
Advantages.....	21
Disadvantages	21
Appendix F – Combined Heat and Power	22
What is Combine Heat and Power?	22
Space Requirements	22
Installation Costs, Funding, Maintenance and Payback	23
Advantages.....	23



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Disadvantages	23
Appendix G – District Heating	24
What is District Heating?	24
Space Requirements	24
Installation Costs, Funding, Maintenance and Payback	24
Advantages.....	25
Disadvantages	25



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Executive Summary

This Energy Statement has been compiled to demonstrate compliance with Wiltshire Council Core Strategy Policy 41

The proposal is for the development of two detached dwellings at 36 Bath Road, Bradford-on-Avon.

This report quantifies the benefits of implementing suitable low carbon technologies as part of this development. For the purposes of this report sample calculations have been completed for the two proposed dwellings.

SAP calculations achieving Part L compliance have been modelled, including the use of appropriate low and zero carbon technologies. The calculations confirm that a minimum of 10% dwelling emission reduction will be achieved.

Dwelling Emissions Reduction

Minimum of 73.47%



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Design Principles to Reduce Energy Consumption and Carbon Emissions

Fabric

Low U-values and good detailing will help to limit heat losses through the fabric of the proposed dwellings.

All non-repeating thermal bridges (e.g. between the external walls and the roofs) will be specified to Recognised Construction Details (RCDs) for the site. This will ensure that heat losses through these junctions are minimised and that the corresponding psi values can be utilised in the SAP calculations.

Fenestration and Solar Gain

Careful consideration will be given to the fenestration. Low U-values will need to be specified to limit heat losses through these areas. The glazing design allows for passive heating. However, to minimise the risk of overheating within the proposed dwellings, the glazing will be openable where practical and internal shading will be employed.

The positioning of the glazed openings will also maximise the available daylight into the two dwellings. This will not only improve comfort levels for the occupants but also reduce the energy consumption through artificial lighting.

Mechanical Services

A well-designed building envelope must be supplemented by appropriate services within the plots.

It is proposed that the heating and hot water to the dwellings could be provided by air source heat pumps and the use of solar panels are proposed.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Lighting

It is proposed that only energy efficient lighting is installed within the dwellings. This means that all light fittings should have lamps with a luminous efficacy of greater than 45 lamp lumens per circuit-watt and a total output greater than 600 lamp lumens.

Overall performance

The following tables detail how the proposed dwellings have been specified at this stage, incorporating the above principles. Also displayed is how the building performs in relation to the building regulations and the planning requirements.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Energy Efficiency

Table 1 – Proposed Fabric Values

Well-designed buildings take on a ‘fabric first’ approach. This means that the thermal elements are specified to perform beyond the minimum standards as set out in Part L of the building regulations. Taking this approach ensures that the heating systems used in the dwellings can operate efficiently and be employed more sparingly, saving fuel and cost.

Showing the minimum specification required to achieve compliance with Part L. The specification is assumed at this stage as no specific build-ups are currently available.

Category	Item	Value/Details	Part L Minimum Standard
Building Fabric (W/m²K)	New Ground Floor	0.13	0.18
	New External Walls	0.18	0.26
	New Warm Pitched Roof	0.11	0.16
	New Flat Roof	0.10	0.16
	Solid Door	1.00	1.00
	New Windows	1.20	1.60
	Roof Lights	1.30	2.20
Thermal Bridging (y-value)	Recognised Construction Details (RCDs)	0.053-0.055	-
Ventilation	Air Permeability (m ³ /hm ²)	5.00	8.00
	Mechanical Ventilation	Natural Ventilation	Natural Ventilation
Heating	Primary Heating System	Grant Aerona HPR2909 Heat Pump	Gas boiler
	Controls	Time and temperature zone controls	Programmer, room thermostat and TRVs
	Heat Distribution	Underfloor heating	-
	Water Heating	300litre water cylinder, 1.69kwh/day declared loss	-
	Secondary Heating System	None	None
Additional Features	SAP Appendix Q	None	None
	Renewables	Plot 1 – 0.8kWPeak Plot 2 – 0.8kWPeak	-
	Regulation 36 Compliance	125 litres/person/day	125 litres/person/day

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Other Considerations

Air Quality

As there will be no gas on site, there is no local risk of NO_x or CO₂ emissions.

This scheme is committed to only use 'no' or 'low' VOC paints and varnishes in the build. Additionally, no products regulated by the Dangerous Substances Directive 2004/42/CE will be used nor any materials containing heavy metals, toxic elements, or regulated biocides.

Sustainable Materials

All materials specified for the new construction will be at least 'B' rated or higher under the BRE's Green Guide to Specification. This will ensure that construction is more sustainable and environmentally friendly.

Where feasible, the most local suppliers of materials will be selected to minimise the environmental impact of transportation.

Only suppliers with a certified chain of custody showing responsible sourcing will be used to source materials. This includes ensuring that 100% of timber is legally sourced.

All insulation materials will have zero Ozone Depletion Potential (ODP) and a low Global Warming Potential (GWP).

Minimisation of Waste

A Site Waste Management Plan (SWMP) will be developed for this project. Waste groups to be monitored will be identified and targets set in order to identify how waste will be reduced, diverted from landfill, reused or recycled wherever possible. If waste is unavoidable, it will be disposed of responsibly.

Smart Meters

Smart meters will be installed in the new dwellings to support the growth of demand side response. This will help to enhance understanding of the potential for turning off non-essential equipment or running some equipment at a lower capacity during times of peak demand.

Water Conservation

Water conserving appliances and fittings will be selected to reduce water and energy consumption. This may include dual flush toilets, flow restrictors fitted to the taps and low capacity baths.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Selecting Low and Zero Carbon Technologies

Table 2 – Feasibility Matrix of Appropriate LZC Technologies

Showing the considerations in choosing an LZC technology for this site.

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 or other location on-site for equipment	Yes	Yes
	Aesthetic considerations	Yes	
	Noise impact	Yes	
	Any size development	Yes	
Ground source heat pumps	External space for horizontal trench or vertical borehole	Yes	No
	Medium to large sized development	No	
	Archaeology	Unknown	
	Best suited to underfloor heating	Yes	
Biomass	Space needed for plant, fuel storage and deliveries	Yes	No
	Medium to large sized development	No	
	Minimal impact on residents (air quality, deliveries)	No	
Combined heat and power	Space need for plant, access and servicing	No	No
	Large sized development (large heat demand)	No	
District heating	Available network	No	No
	Very large sized development (substantial heat demand)	No	

Please refer to Appendices A through G for more in-depth information on the above technologies.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Feasibility of Appropriate Technologies - Conclusion

Air source heat pumps are feasible for this development. The performance of the units have been selected to be conservative whilst being reflective of products available on the market. Additionally, the heat pumps will also provide hot water heating via cylinders fed from the heat pumps. This will allow space and hot water heating to the dwellings to be provided year-round without requiring any additional 'top up' heating systems. The use of air source heat pumps will need to be confirmed by survey before installation.

As a standalone technology, solar thermal panels would not provide sufficient carbon reductions in order to achieve compliance.

Solar photovoltaic panels (PV) are also feasible. It is proposed that both dwellings could have solar photovoltaic panels installed, on the east and south west facing sloping roofs. The array sizes have been chosen in accordance with the size of the proposed dwellings.

Appropriate Solution

Air Source Heat Pumps
Solar Photovoltaic Panels

Table 3 – Proposed Low and Zero Carbon Technologies

Showing LZC technologies added to the specification to reduce energy consumption and carbon emissions.

Category	Item	Value/Details
Heating	Primary Heating System (per plot)	MCS Installed Grant Aeron HPR2909 Air Source Heat Pump*
	Water Heating (per plot)	Heat pump-fed cylinder 300 Litre, 1.69 kWh/day declared loss factor
Renewables	Photovoltaic Panels	0.80kW/Peak proposed for Plot 1 0.80W/Peak proposed for Plot 2

**Needs to be confirmed by survey prior to installation.*

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Table 4 – Dwelling Emission Rates (DER) ASHP

Showing the DERs compared to the Target Emission Rates (TERs) for the proposed dwellings with the proposed renewables (see Table 4).

Plot	TER	DER	Percentage Improvement (%)
Plot 1	12.26	3.23	73.65
Plot 2	11.49	3.07	73.28

It can be concluded that it is possible for both proposed dwellings to achieve a minimum of 10% improvement using the proposed renewable.

For further details please refer to the SAP reports.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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 stores 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.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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 vapor 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.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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 then 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 700m²
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.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

Appendix F – Combined Heat and Power

What is Combined 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.

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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

Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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.



Energy Statement

Project: 6007JH - 2025.08 ER (36 Bath Road - Crossman Group)

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