Southstudio

Appendix 5A

Sustainability Plan - Energy Statement
'The Cottage', Spaniards Road, London, NW3 7JH

July 2014

FILE NOTE

Client	Richard Brearley	Project No.	0065
Project Title	The Cottage	Author	JB
Subject	Energy Statement	Date	23/07/14

1 Introduction

Kaizenge Design Limited (KDL) has been appointed by Lawrence Kershen to work in conjunction with Richard Brearley (Southstudio Architects) to provide planning stage energy and sustainability advisory services in relation to proposals for the design and construction of a new dwelling at the site of 'The Cottage' on Spaniards Road, in the London Borough of Camden (LBC).

The project consists of replacement of the existing dilapidated 2 storey 1940's house and garage with a new family residence comprising 2 storeys plus a basement together with a glazed link to a single storey garden assisted bed-sitting suite.

The purpose of this sustainability statement is to inform the design team and LBC Planning Department, as part of the full planning application, of the intentions for the development in relation to energy and water conservation. The energy assessment undertaken follows the Greater London Authority (GLA) guidelines (Greater London Authority, 2011), and takes a hierarchical approach to energy and CO_2 emissions reduction.

Figure 1 – Diagram section of new dwelling (Ref: Southstudio)

1.1 Area Schedule

The proposed gross internal area (GIA) for the new building has been estimated based on Architects drawings:

Building	Area (m^2)
The Cottage	527

Table 1 – Area schedule

2 Policy Context

The borough's Development Plan is comprised of the London Plan (produced by the Mayor of London) (Greater London Authority, 2011), Development Plan Documents (DPD) including the Core Strategy and other Development Policies, and other LDF documents. This set of documents is used to manage development by helping to assess planning applications. It is guided by national policy and supported supplementary guidance.

2.1 London Plan

The London Plan is the overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. It forms part of the development plan for Greater London. Of particular relevance is *Chapter 5: London's response to climate change*.

2.1.1 *Policy 5.2: Minimising Carbon Dioxide Emissions.*

This policy requires residential buildings to meet a 25% improvement in CO_2 emissions over those required to meet 2010 building regulations. This corresponds to Code for Sustainable Homes (CfSH) Level 4.

2.2 Camden Core Strategy (CS) 2010 – 2025

The Core Strategy (London Borough of Camden, 2010) sets out the key elements of the Council's planning vision and strategy for the borough. It is the central part of the Local Development Framework (LDF).

2.2.1 *Policy CS13: Tackling climate change through promoting higher environmental standards*

This policy generally refers back to the London Plan Energy Hierarchy; be lean (use less energy), be clean (supply energy efficiently), and be green (use renewable energy). The policy specifically states that viability of connection to existing local energy sources should be considered (Kings Cross decentralised energy network etc), however, none of these are in proximity of the proposed development along Spaniards Road.

This policy also supports promotion of local energy generation:

> *The Council will expect developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation (which can include sources of site-related decentralised renewable energy) unless it can be demonstrated that such provision is not feasible.*

2.3 Camden Development Policies (DP) 2010 – 2025

Camdens Development Policies are contained within the LDF and support the Core Strategy by setting out additional policies that the Council will use when making decisions on planning applications.

2.3.1 *Development Policy DP22: Promoting sustainable design and construction*

The council requires development to incorporate sustainable design and construction measures and demonstrate how sustainable design principles will be incorporated. This is promoted and benchmarked using the Code for Sustainable Homes (CfSH). In 2013, CfSH Level 4 will be required (as per the London Plan). Schemes will also be required to incorporate climate change adaptation measures. In terms of renewable energy, again there is an expectation that schemes should meet 20% on-site renewables. The Borough states that Biomass energy is the least preferred option when considering renewables.

2.4 Camden Planning Guidance (CPG) 3: Sustainability

Camden Planning Guidance documents support the policies contained within the LDF suite of documents. CPG 3 covers Sustainability and how to achieve CO_2 emissions reductions, in addition to tackling climate change, promoting sustainable design, and water consumption. Of particular relevance are the following areas:

2.4.1 Renewable Energy

The following requirements are of relevance:

> *All developments are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved.*

2.4.2 Water

The scheme should follow the following approach:

> *The Council expects all developments to be designed to be water efficient by minimising water use and maximising the re-use of water. This includes new and existing buildings.*

2.4.3 Materials

The scheme should meet the following:

> *All developments should aim for at least 10% of the total value of materials used to be derived from recycled and reused sources.*

2.4.4 Code for Sustainable Homes (CfSH)

This section details the Councils requirements under CfSH. It reiterates the requirement to meet CfSH Level 4 and that schemes are strongly encouraged to meet the following:

- Minimum standard in energy category = 50% of un-weighted credits; and
- Minimum standard in water category = 50% of un-weighted credits.

2.5 Summary of Requirements

Key Policy Requirements (minimum standards):

- 25% improvement in CO_2 emissions over those required to meet 2010 building regulations (CfSH Level 4);
- CfSH minimum standards in energy and water categories; and
- Demonstration of application of energy hierarchy.

Aspirational Standards (or 'Preferred'):

- 20% on-site renewables;
- 40% improvement in CO2 emissions over those required to meet 2010 building regulations (CfSH Level 4); and
- Passivhaus standard.

3 Baseline Energy and CO_2 Emissions

3.1 Overview

This energy assessment follows Greater London Authority (GLA) guidelines, and takes a hierarchical approach to energy demand and CO_2 emissions.

As per the methodology contained within Approved Document Part L1A, CO_2 emissions are generally split into two categories:

- **Regulated:** emissions associated with heating, cooling, hot water, lighting and other building services equipment (those covered under Building Regulations Part L1A)
- **Unregulated:** emissions associated with small power (plug-in equipment) and any other process or plant equipment (these are not covered under Building Regulations Part L1A).

This report principally outlines the energy strategy to achieve the project target of 25% reduction in **regulated** CO_2 emissions over a Part L1A compliant baseline. This is also consistent with the approach and requirements contained within LBC's Core Strategy. For the purposes of this energy assessment, energy demand and associated CO_2 emissions have been estimated based on a benchmarking exercise, following the methodologies provided under Standard Assessment Procedure (SAP) (DECC, 2011) and the Building Research Assessment Domestic Energy Model (BREDEM) (BRE, 2012) for Regulated and Unregulated Emissions respectively.

3.2 Regulated Emissions

Heating and how water demand has been estimated for the dwelling, while auxiliary and lighting power requirements have been based on previous SAP calculations and industry published benchmarks for similar dwellings. All fabric attributes for the baseline case are as per the notional building. The following table shows the baseline U-values:

Building Element	Part L1A 2010 Notional Building U-value (W/m^2K)
Roof	0.16
Wall	0.35
Floor	0.25
Glazing	2.00

Table 2 – Notional Building Fabric U-Values

The air permeability (air leakage index) is 10 $m^3/m^2/hr$ @ 50 Pa.

The dwelling uses a gas boiler for heating and hot water and grid derived electricity for all lighting and power. The building is assumed to be naturally ventilated with mechanical extract used for wet areas (kitchen and bathrooms). All efficiencies for the baseline case match the notional building. Refer to SAP Appendix R for further information (DECC, 2011).

3.3 Unregulated Emissions

Unregulated emissions relate to any energy consuming activities that are not covered under Building Regulations Part L. These are usually associated with small power (plug-in devices) and any other plant equipment. For the Cottage this will include:

- **Small power** – Computers, laptops, televisions and any other electrical equipment;
- **Kitchen equipment** – Cookers, fridges, dishwashers etc; and
- **Swimming pool equipment** – Hot water heating, and other ancillaries.

Unregulated energy consumption for dwellings have been estimated based on a BRE Domestic Energy Model (BREDEM) calculation. For the purposes of this calculation, which takes into account the number of bedrooms, the occupancy for the Cottage is assumed to be 6 persons.

Type	Breakdown of Unregulated Energy	Energy Consumption (kWh/yr)	CO_2 Emissions ($kgCO_2/m^2$)
Small power	Appliance energy (plug in items)	8,500	4,400
Cooking	Based on large cooker (range gas type)	17,500	3,500
Swimming pool	Gas fire water heater for pool heating (note, space heating, and ventilation included in regulated energy)	20,900	4,100
Total		46,900	11,600

Table 3 – Unregulated Energy Assumptions

3.4 CO_2 Emissions Target

Based on the design parameters described previously, the baseline energy consumption and CO_2 emissions for the dwelling are:

Emissions	CO_2 Emissions ($kgCO_2/m^2$)
Heating	28.7
Hot Water	7.0
Auxiliary	0.6
Lighting	2.7

Table 4 - Baseline CO_2 emissions by component

An indicative Part L1A Target Emission Rate (TER) for the dwelling has been estimated based on the SAP methodology as shown below:

$$TER = \{[(Space + Hot\ Water) \times FF \times EFA] + (Lighting \times EFA)\} \times 0.6$$

$$FF = Fuel\ Factor = 1.0$$

$$EFA = Emission\ Factor\ Adjustment = \frac{SAP\ 2009}{SAP\ 2005}$$

TER = 23.4 $kgCO_2$/m2 (13,100 $kgCO_2$/yr)

The TER equates to the total baseline (notional) regulated CO_2 emissions for the development. Table 5 summarises the total regulated and unregulated emissions for the baseline case.

Emissions	CO_2 Emissions ($kgCO_2/m^2$)	Total CO_2 Emissions ($kgCO_2/yr$)
Regulated	23.4	13,100
Unregulated	21.4	11,600
Total	44.8	24,700

Table 5 - Baseline CO_2 Emissions (Regulated and Unregulated)

To meet the LBC target of a **25% reduction in regulated CO_2 emissions** will result in a final site CO_2 emissions rate of **17.5 $kgCO_2/m^2$ (9,800 $kgCO_2/yr$).**

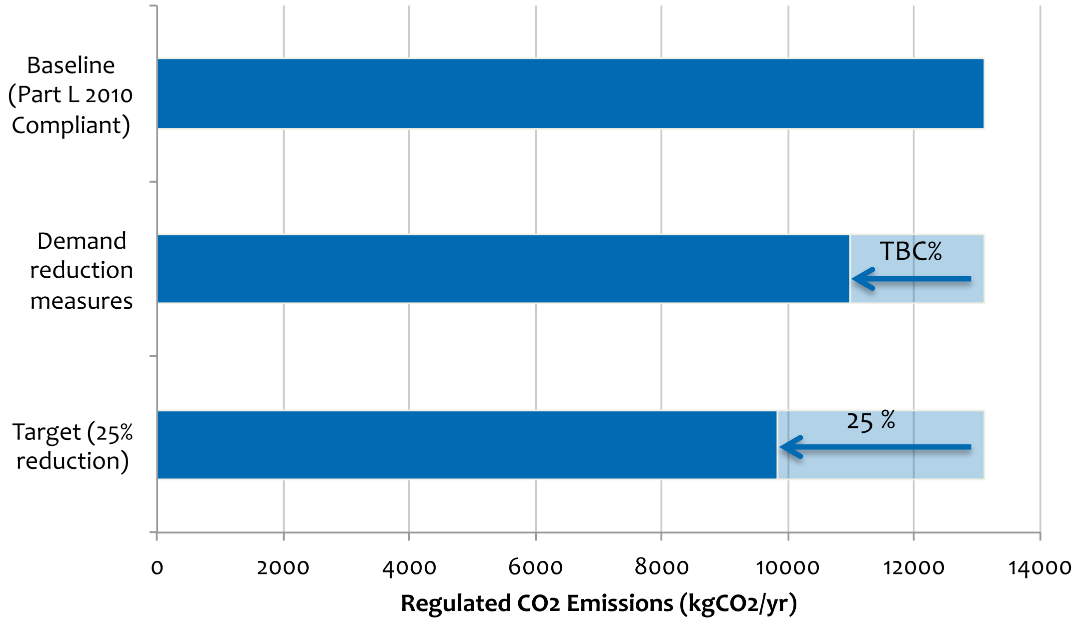

Figure 2 - Regulated CO2 Reduction Requirement

4 Energy Demand Reduction (Be Lean)

4.1 Overview

This section looks at measures to reduce the energy demand for the Cottage against the notional building baseline.

4.2 Passive Design

U-Values and air permeability will be designed to be better than Building Regulations 2010 to ensure the developments heating and summer cooling demands are reduced as much as practicable. Orientation and layout has also been given consideration to help limit heat loss in winter and maximise the potential for free cooling in summer to help limit the risk of overheating.

It is proposed that the building will meet Fabric Energy Efficiency (FEE) standards in line with those put forward under the Zero Carbon Hub consultation (beyond both Part L 2010 and 2013 levels) as shown in Table 6.

- The proposed air permeability (air leakage index) will be 3 $m^3/hr/m^2$@50Pa.
- The glazing g-value (solar factor) is proposed to be 0.5.

Building Element	Part L1A 2010 Notional Building U-value (W/m²K)	Proposed Building U-value (W/m²K)
Roof	0.16	**0.13**
Wall	0.35	**0.15**
Floor	0.25	**0.13**
Glazing	2.00	**1.30**

Table 6 – Proposed Fabric U-values

4.3 Active Design

High efficiency building services will be used throughout the scheme and currently include the following:

Heating and cooling – High efficiency gas system boiler incorporating flue heat recovery (Efficiency, 91%) to serve heating and hot water demands for the house. Hot water storage will be provided via a domestic cylinder (incorporating a high level of thermal insulation).

Mechanical Ventilation – It is proposed that the building will utilise mechanical ventilation with heat recovery (MVHR) to help reduce the heating demand. Heat recovery will be in excess of 80%, and the unit will be selected with efficient fans to ensure a low specific fan power (SFP) and electrical consumption.

Lighting – The building will use efficient fittings throughout and include a mixture of compact fluorescents. LED's will also be considered for inclusion.

Controls – Boilers will incorporate weather compensation and zone controls to ensure efficient operation.

Table 7 provides an indicative comparison for a selection of notional building performance parameters and those proposed at The Cottage.

Building Service	Description	Part L1A / L2A 2010 Notional Building	Proposed Building
Heating and Hot Water	Gas Boiler Efficiency	78%	91%
Lighting	Percentage low energy light	30%	100%

Table 7 – Building Services performance against Notional Building

4.4 Unregulated Energy

It is proposed that domestic white goods are in line with CfSH criteria '*Ene 5 – Energy Labeled White Goods*', meaning that any fridges, freezers, washing machines or tumble dryers will have an A or A+ rating under the EU Energy Labeling Scheme.

The swimming pool design could incorporate a range of energy efficiency measures, such as thermal heat recovery for the ventilation to the pool hall. This will help to reduce the heat loss significantly as the air change rate is likely to be very high during pool usage. A high efficiency gas fired water heater is proposed for hot water production, and a pool cover should be provided in order to limit evaporation heat loss when the pool is not in use. In addition, further consideration will be given to the design criteria specified for the ambient air temperature, water temperature in the pool, and relative humidity.

It is difficult to accurately predict the reduction in energy consumption and CO_2 emissions through inclusion of these measures, however, at this stage the Cottage will target a reduction of 10% against the notional building baseline case. This will be considered further during the next design phase.

4.5 Summary

The tables below provide a summary of CO_2 emissions reduction following demand reduction measures.

Energy Hierarchy Stage	Total CO_2 Emissions ($kgCO_2$/yr)	
	Regulated	Unregulated
Building Regulations 2010 Part L Compliant Development	13,100	11,600
After Energy Demand reduction	11,000	10,400

Table 8 - CO_2 emissions after energy demand reduction

Energy Hierarchy Stage	Regulated CO_2 Savings	
	$KgCO_2$/yr	%
After Energy Demand Reduction	2,100	16

Table 9 – Regulated CO_2 savings from energy demand reduction

5 Heating and Cooling Infrastructure (Be Clean)

5.1 Overview

This section relates to Policy 5.6 of the London Plan '*Decentralised Energy in Development Proposals*', whereby the developments heating, cooling and power systems have been selected to minimise CO_2 emissions in the following order:

1. Connection to an existing heating or cooling network;
2. Site wide CHP network; and
3. Communal heating and cooling.

5.2 District Heating

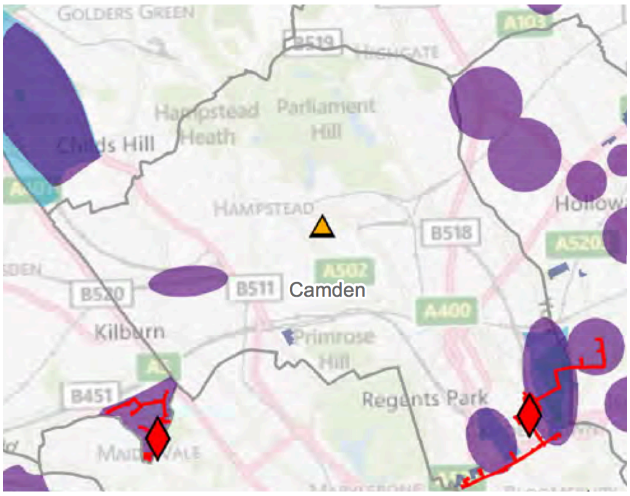

Figure 3 – London Heat Map of the Camden area

London Heat Map Figure 3 shows the London Heat Map for the Camden area, this highlights areas of major heat demand that could be suitable for a Decentralised Energy Network in purple, and also shows current district heating energy centers, distribution and transmission routes in red.

The scheme is located in the North of the borough of Camden, therefore a connection to an existing district heating network is not likely to be viable, the scheme is also not in an area which is deemed to be viable for district heating. The scheme could be connected to the King's Cross Decentralised Energy Network – however the cost of pipework for connection is likely to be unaffordable.

5.3 Combined Heat and Power (CHP)

Due to the lack of a year round heating demand it is unlikely that a micro-CHP system would provided sufficient economic benefits and sufficient carbon savings to be a viable option for The Cottage. CHP is also not currently supported under the Renewable Heat Incentive for domestic installations; therefore other low or zero carbon technologies are preferred.

5.4 Summary

Following the application of stages 1 and 2 of the energy hierarchy[1], communal heating or cooling infrastructure will not be implemented.

Energy Hierarchy Stage	Regulated CO_2 Savings	
	$KgCO_2/yr$	%
After Communal Infrastructure	0	0%

Table 10 – Regulated CO_2 savings from communal heating and cooling infrastructure

6 Renewable Energy (Be Green)

6.1 Overview

In line with Policy 5.7 of the London Plan, this section considers the renewable energy technologies that could be installed to meet the aggregate target 25 % CO_2 emissions reduction.

Following energy demand reduction measures and having ascertained that a site wide heating approach is not viable, the residual CO_2 reduction that is to be met from on-site renewable technologies will be **1,200 $kgCO_2/yr$**. This corresponds to a **9** % reduction in CO_2 emissions against the site wide Baseline from on-site renewable technologies.

6.2 Renewable Energy Options

Solar Photovoltaics: Solar PV could be used to offset grid electricity through generation of on-site renewable electricity. Solar PV's have the potential to provide a large reduction in CO_2 emissions, as they offset grid electricity which has a relatively high CO_2 factor (0.517 $kgCO_2/kWh$). Architects initial plans and elevations also indicate there would be suitable roof space to position the panels, that is orientated between south west and south. PV is a suitable technology. **Viable.**

[1] Use less energy (be lean), supply energy efficiently (be clean), and use renewable energy (be green).

Solar thermal hot water: Solar thermal systems use solar collectors, placed on the roof of a building, to preheat water for use in sinks, showers, under floor heating and other hot water applications. As for PV, solar collectors could be installed on the flat roof areas, in a south orientation to maximum energy generation potential. It should be noted that the CO_2 reduction potential for solar thermal systems is not as great as for PV as they offset grid derived natural gas (0.198 $kgCO_2$/kWh), however, there is likely to be a large hot water sink through the provision of a swimming pool. The downside of this approach is that, while efficient and suitable to reduce the swimming pool heating demand, the targeted CO2 reductions relate to regulated emissions only (domestic hot water to showers, wash hand basins and sinks). This hot water demand is likely to be relatively low, and as such the CO2 reduction potential is limited. **Potential.**

Wind: A wind turbine, or roof mounted microturbine, positioned on the roof of the house, could be used to offset grid electricity through generation of on-site renewable electricity. There is, however, unlikely to be a suitable place to site a turbine. While wind speed in the vicinity is relatively high (Approximately 5.8 m/s at 10m height), a turbine would need to be located in a suitable location away from obstacles. As a guide, turbines should be located a minimum distance of 10 times the respective height of an obstacle. The site is very limited in terms of open space to make citing turbines in this manner viable. Due to the suburban location, and associated impacts in terms of visual appearance, noise and shadow flicker, turbines are not considered viable for the development. **Not viable.**

Biomass: A wood pellet or chip boiler could be used to provide low carbon heating and/or hot water to the development. Biomass is likely to provide a significant CO_2 reduction, however, it is better suited to communal heating infrastructure due to the requirement for relatively high bulk storage of wood fuel. While biomass is a low carbon fuel source, providing it is designed properly and fuel is sourced locally from a sustainable source, it produces other greenhouse gas emissions. These include high nitrogen oxide (NO_x) emissions, in addition to nitrogen dioxide (NO_2), particulates (PM) and sulphur dioxide (SO_2). The entire borough of Camden is an Air Quality Management Area (AQMA) and the borough follows the Mayor of London's Air Quality Strategy, which states that small biomass boilers (below 500kWth, which would be the case for the Cottage) are not suitable in AQMA's unless they have no adverse effects on local air quality compared to conventional gas fired boilers. Biomass is not considered a viable technology for the development. **Not viable.**

Ground Source Heat Pump (GSHP): A vertical or horizontal heat pump could be used to provide low carbon heating to the development. A GSHP would have the potential to reduce the energy consumption and subsequent CO_2 emissions significantly, however, there is unlikely to be sufficient area to lay ground coils to provide a substantial portion of the heating and hot water demand. Vertical boreholes could be used, but these are undesirable due to their high capital cost. Issues regarding heating demand, diversity and communal infrastructure would also apply as previously discussed. **Not viable.**

Air Source Heat Pump (ASHP): ASHP's could be used to provide low carbon heating to the dwelling. While ASHP's have a lesser efficiency than GSHP's (defined by their coefficient of performance, CoP), their relatively low cost makes them attractive as an alternative to gas heating. This system would require an external heat pump (condenser unit), which could be sited at roof or ground level. Due to the visual and noise impact of the heat pump, this is not a preferred approach for the Cottage. **Not viable.**

6.3 Proposed Renewable Technology

In order to achieve the final CO_2 reductions it is proposed that a PV array will be provided, sized to meet the yearly CO_2 requirements.

The PV array will be sited on the flat roof at a suitable pitch to maximise energy generation potential Currently it is proposed that standard monocrystalline panels be installed as these generally have a high efficiency and are cost effective, particularly when taking into account the income stream from feed-in-tariff (FIT) payments.

Figure 4 – Example roof mounted monocrystalline array

Table 11 shows the amount of PV required for the dwelling. Accounting for maintenance access and overshadowing, the total geometric area that would be required to site the PV array will be approximately 35 m^2. There is more than sufficient roofspace to site the PV array.

Technology	$kgCO_2/m^2/yr$ offset required	Total $kgCO_2/yr$ offset required	PV Area required (m^2)*	Approx. kWp	Approx. kWh/yr	No. Panels
PV	2.1	1,150	16.6	2.8	2,100	12

Table 11 – Building PV area requirements[1]

7 Conclusions

After analysis of the expected CO_2 emissions under building regulations Part L1A and having undergone a Lean Design process to reduce the demand for energy, it is proposed that renewable technologies in the form of a PV array will be included, in order to meet the target of a 25% reduction over Part L 2010. In order to achieve the required CO_2 emissions, the design team have followed the principles of the energy hierarchy.

Following energy demand reduction measures, the residual energy consumption for the building will be met through the design and selection of efficient building services equipment. These currently include A-rated gas boilers serving heating and hot water systems, low energy lighting and controls, and low specific fan power ventilation systems. Mechanical Ventilation with Heat Recovery (MVHR) will also be installed to further reduce heating energy consumption and associated on-site CO_2 emissions.

[1] Calculations based on GB Sol 70 monocystalline PV system. Module efficiency 15.2%. Power 250W. Size 0.49 m^2. For further information refer to manufacturers literature http://www.lg.com/uk/monox-black/lg-LG250S1K-monox-black.

PV will be oriented south on the roof of the Cottage in order to maximise the yearly electricity generation potential, this will also minimise the visual impact of the array, as the view from the street level will be limited.

The following tables show the application of the energy hierarchy at the Cottage:

Energy Hierarchy Stage	Total CO_2 Emissions ($kgCO_2/yr$)	
	Regulated	Unregulated
Building Regulations Part L Compliant Baseline	13,100	11,600
After Energy Demand Reduction (Be Lean)	11,000	10,400
After Communal Heating and Cooling (Be Clean)	11,000	10,400
After Renewables (Be Green)	9,800	10,400

Table 12 - CO_2 emissions at each stage of the energy hierarchy

Energy Hierarchy Stage	Regulated CO_2 Savings	
	$kgCO_2/yr$	%
After Energy Demand Reduction	2,100	16%
After Communal Heating/Cooling	0	0%
After Renewable Energy	1,200	9%
Total	**3,300**	**25%**

Table 13 - CO_2 savings after each stage of the energy hierarchy

The total net savings in regulated CO_2 emissions is predicted to be **3,300 $kgCO_2/yr$ (3 $tonnesCO_2/yr$)**, which corresponds to a 25% reduction against the Part L baseline. While it is difficult to estimate the reduction in Unregulated CO_2 emissions, a combination of equipment and white goods, in addition to following a green purchasing policy will be pursued in order to target a reduction of 10% against a comparable standard practice new development.

Figure 5 shows the CO_2 emissions at each stage of the energy hierarchy for regulated and unregulated emissions for the dwellings. The 40% improvement in CO_2 emissions is shown against the Part L compliant development (TER).

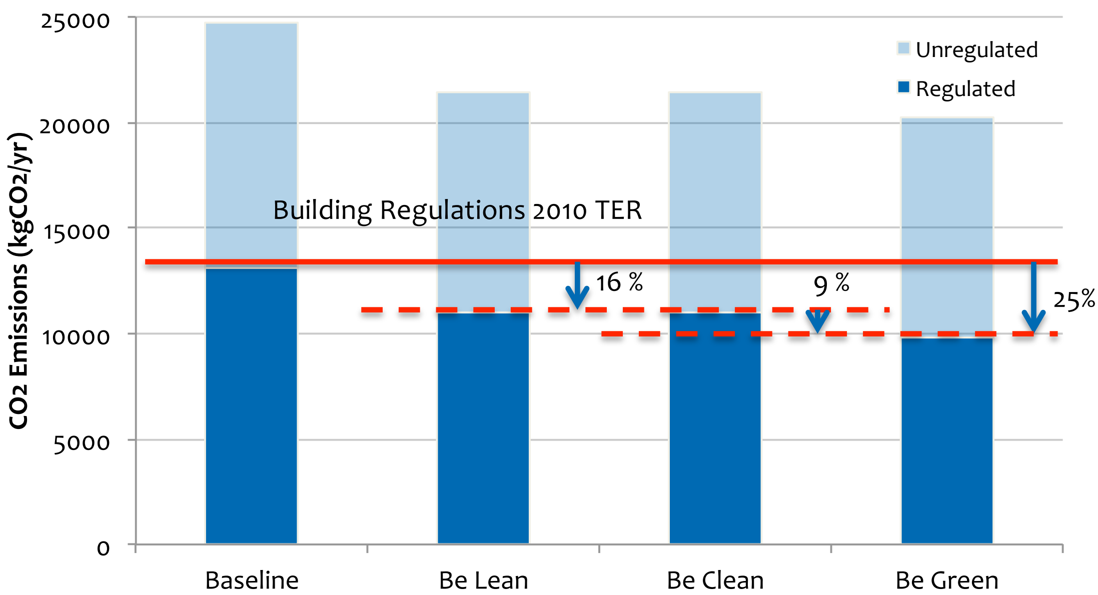

Figure 5 - The energy hierarchy for the Cottage

8 Bibliography

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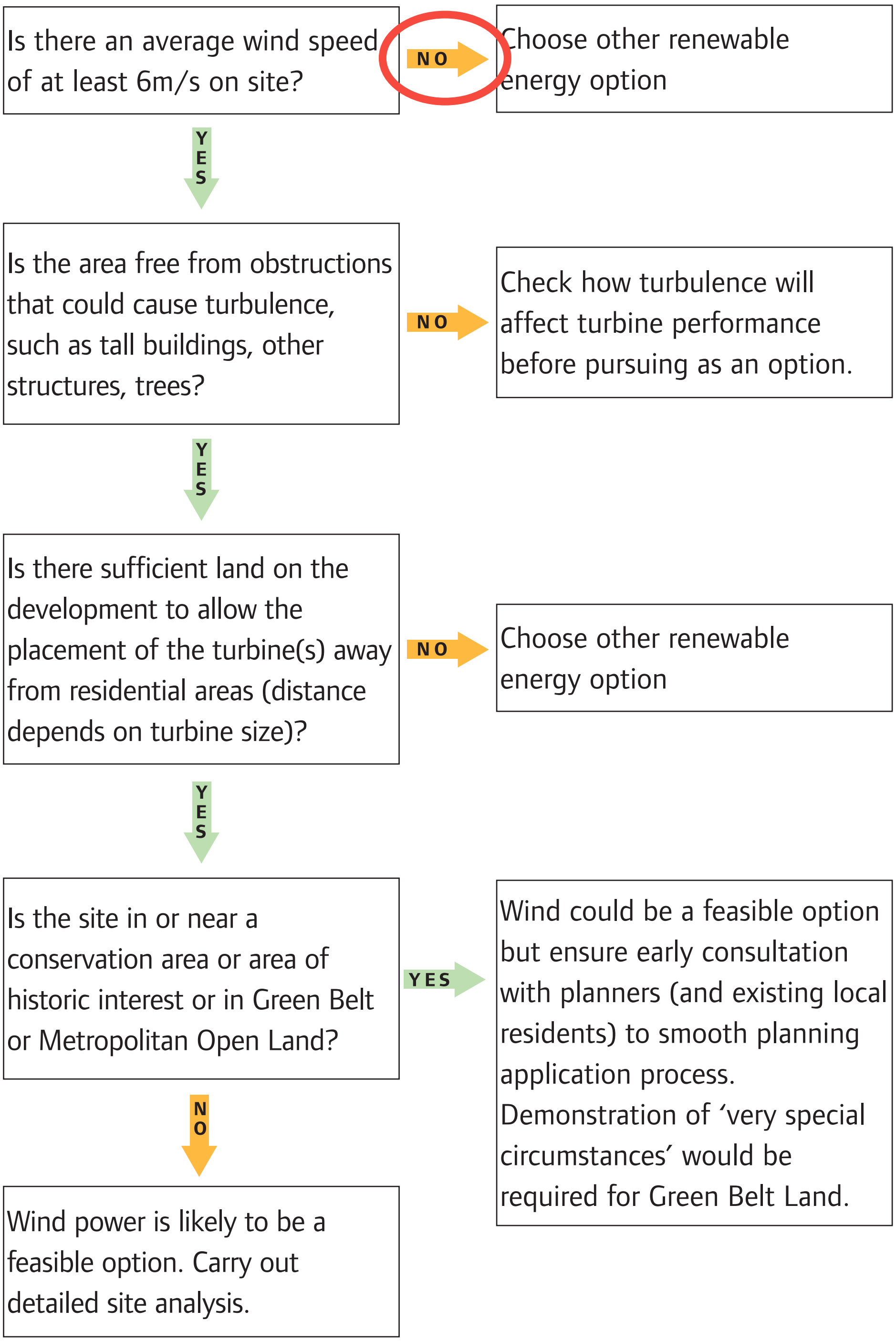
Appendix A – London Renewables Toolkit Outline Feasibility

The reference tables in section 4.12 give a broad indication of the scope for contribution that a technology can make to carbon emissions reduction and the increase in build costs for a given building and location type.

4.1.1 GUIDELINES FOR SUITABLE LOCATIONS FOR STAND ALONE WIND TURBINES



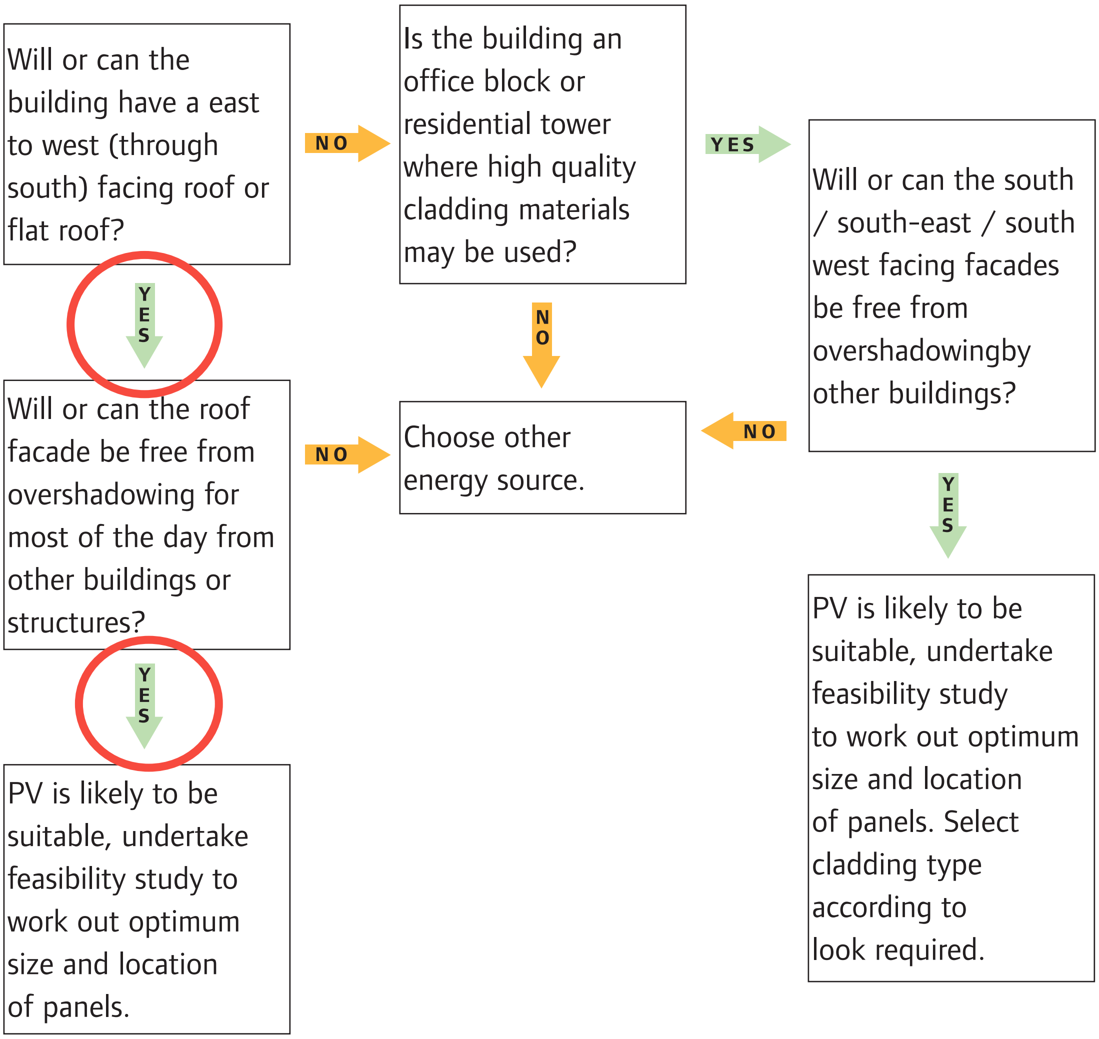
4.1.2 GUIDELINES FOR SUITABLE LOCATIONS FOR ROOF MOUNTED WIND TURBINES

Roof mounted wind turbines have not been widely demonstrated, but are currently under trial by a number of manufacturers.

The criteria for mounting a small (1.5kW) turbine on a roof are minimal - as they are designed to fit any roof design and are mounted on the wall. They have been designed to work in turbulent wind conditions (as might be experienced on roof tops) and have been designed to minimize vibrations through use of damping systems.

The turbines will work in lower wind speeds than larger turbines, estimated at 3.5m/s.

4.1.3 GUIDELINES FOR SUITABLE LOCATIONS FOR PHOTOVOLTAICS



4.1.4 GUIDELINES FOR SUITABLE LOCATIONS FOR SOLAR THERMAL SYSTEMS

SOLAR THERMAL FOR OFFICE, RETAIL, INDUSTRIAL AND LOCKS OF FLATS

Will the building have a year round hot water demand? (eg canteen, washrooms, showers, industrial process).

NO → Choose other renewable energy source.

YES ↓

Will the building have an open aspect south-east to south-west facing roof (or flat roof)? If not, can it be reoriented so it will?

NO → Choose other renewable energy source.

YES ↓

Is there space for a hot water cylinder(s) close to the panels? If not, can the design be altered to provide suitable space>

NO → Longer, more complicated/ expensive pipe work might be required but still possible. Carry out study of roof and roof space.

YES ↓

Is the building in a conservation area?

YES → Start early discussions with the planning authority and ensure system is located as unobtrusively as possible. Systems have been installed in conservation areas.

NO ↓

Solar water heating is likely to be suitable for this site. Check that planners won't require planning consent and ensure the system design is discreet. Carry out more detailed survey to work out size of panels required.

Note: Refer to 3.6.11 for detail on communal systems for flats.

4.1.7 GUIDELINES FOR SUITABLE LOCATIONS FOR BIOMASS HEATING

NON-DOMESTIC BIOMASS HEATING

Is there the potential for a local supply, delivery and storage for biomass fuel?

NO → Choose other renewable energy source, only if it is not possible to set up a fuel supply chain.

YES ↓

Can the boiler house be located so it is suitable for biomass supply, with sufficient storage capacity?

NO → Check other renewable energy source, only if there is no scope to design in storage capacity in the scheme.

YES ↓

Will boiler be part of a modular system to allow for shut down and cleaning?

NO → Redesign to be part of a modular design, if not possible, choose another renewable energy source.

YES ↓

Your site is likely to be suitable for biomass heating. Carry out feasibility study.

4.1.8 GUIDELINES FOR SUITABLE LOCATIONS FOR BIOMASS CHP

Will the development have a year-round demand for heat, and a communal heating system?

NO → Choose other renewable energy source

YES ↓

Is a reliable guaranteed CHP system available at the appropriate size?

NO → See if it is possible to re-size the CHP plant, otherwise choose other renewable energy source.

YES ↓

Is there potential for a local supply, delivery and storage for biomass fuel?

NO → Choose other renewable energy source, only if it is not possible to set up a supply chain.

YES ↓

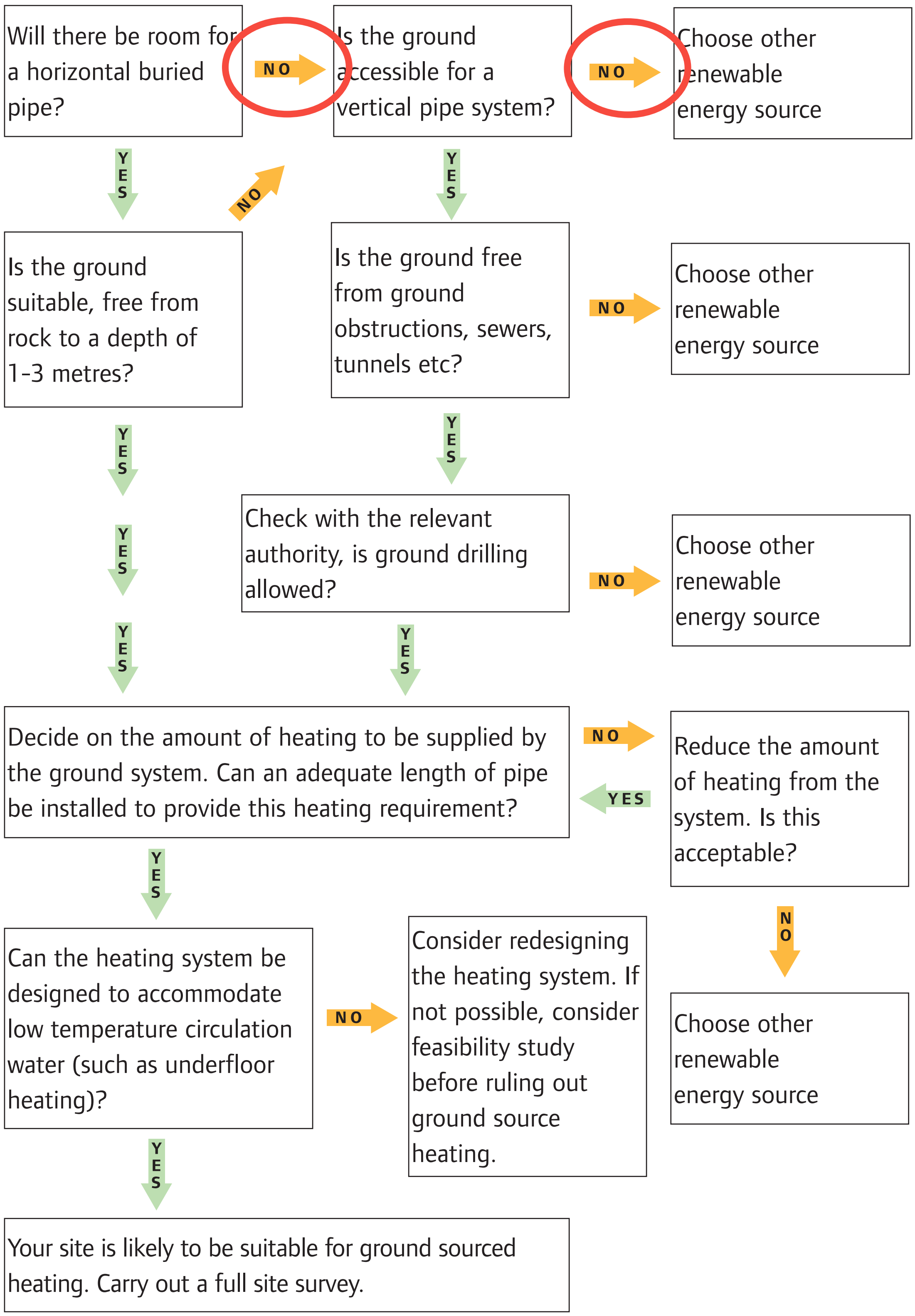
Can a reliable CHP repair and maintenance system be put in place in the completed development?

YES → Choose other renewable energy source

YES ↓

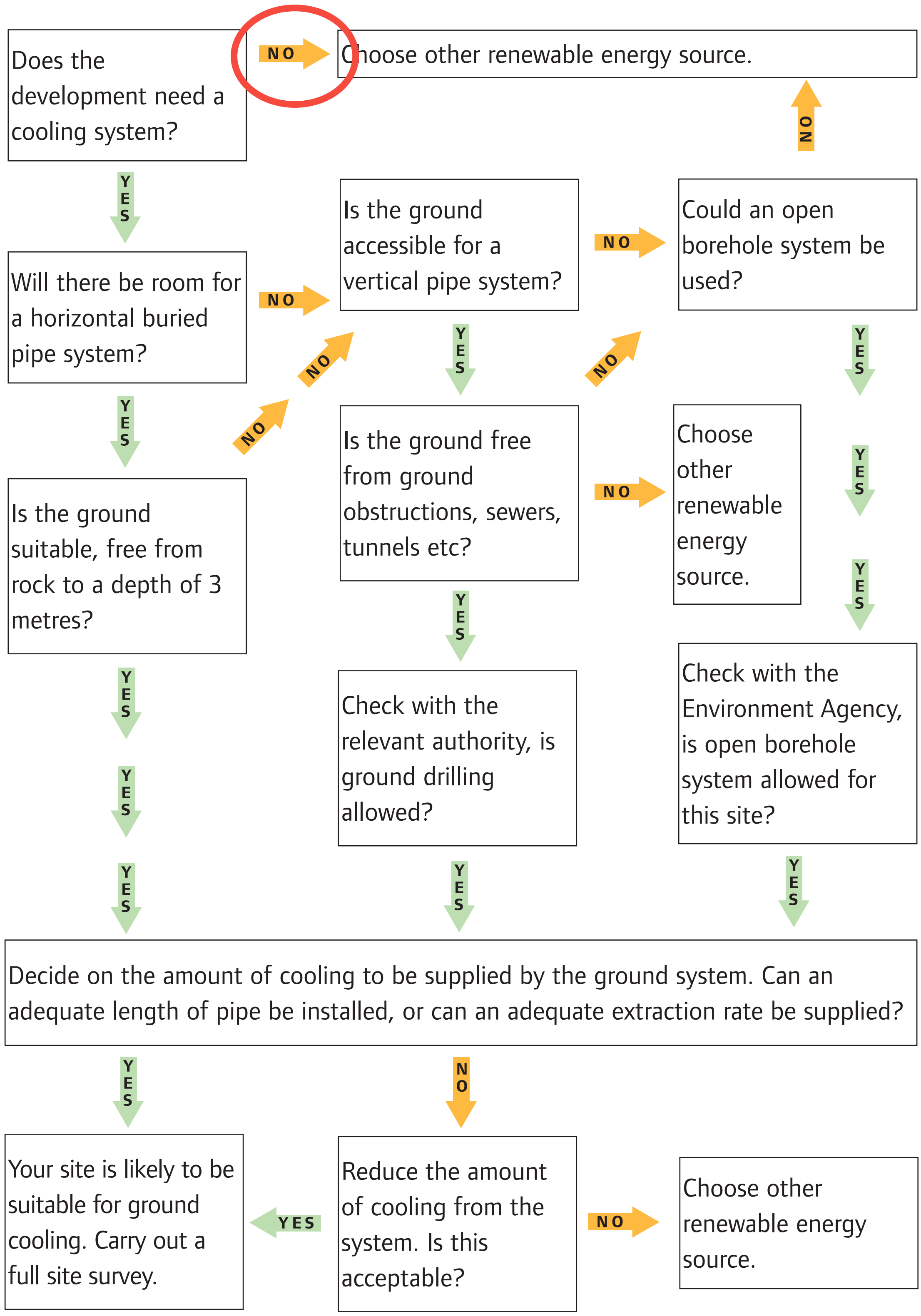
Your site is likely to be suitable for biomass CHP. Carry out feasibility study.

4.1.9 GUIDELINES FOR SUITABLE LOCATIONS FOR GROUND SOURCE HEATING



Please note: The same equipment may be used for cooling.

4.1.10 GUIDELINES FOR SUITABLE LOCATIONS FOR GROUND COOLING SYSTEMS



Please note: The same equipment may be used for heating.