Energy Statement

53-55 Chalton Street & 60 Churchway

September 2018

Report Ref: ES/CS/201809 - BC

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DOCUMENT CONTROL SHEET:

Rev.	Issue Purpose	Author	Signature	Checked	Signature	Date
-	For Initial Comment	Bianca Chitic		Ryan Thrower		04/10/2016
A	Summer 2018 Update	Bianca Chitic		Ryan Thrower		05/09/2018

1. EXECUTIVE SUMMARY

1.1 NRG Consulting have been appointed by Rangepay Ltd to undertake an Energy Statement in support of the planning application for the proposed development at 53-55 Chalton Street NW1 1HY and 60 Churchway NW1 1LT.

1.2 The proposal is for the construction of a 5-storey hotel with guest rooms and associated reception, restaurant, conference room, back office, bins and cycle stores and landscaping.

1.3 With over 1,000sqm non-domestic floorspace proposed, it is a requirement to achieve a minimum 35% CO_2 reduction on-site as per the London Plan Policy 5.2. The proposed energy strategy demonstrates a reduction of 36.66% of the CO_2 emissions via on-site measures prioritised in accordance with the London Plan energy hierarchy:

- *Be Lean (6.27% CO_2 reduction over Part L)*
  - Low U-values
  - Low Air Permeability
  - High Efficiency HVAC
  - 100% Low Energy Lighting

- *Be Clean (22.19% CO_2 reduction over Part L 2013)*
  - Gas CHP will supply the base hot water load and will work in tandem with back-up boilers
  - The infrastructure will enable a future connection to district heating

- *Be Green (36.66% CO_2 reduction over Part L 2013)*
  - 50sqm of Photovoltaic Panels

Calculations of the CO_2 emissions at each stage and the savings achieved can be found in Appendix 1.

1.4 A BREEAM 'Other – Residential Institutions' Pre-Assessment, provided under separate cover, demonstrates how the development achieves an 'Excellent' rating, in line with Camden Council's Policy CC2 Adapting to climate change.

1.5 Adequate measures are being implemented to avoid the risk of overheating, in line with London Plan Policy 5.9. These include:

- Reduced pipe length for the heat distribution infrastructure to minimise internal heat generation;
- High insulation level to reduce the heat entering the building;
- Provision of Mechanical Ventilation with Heat Recovery to all guest rooms;
- Provision of Active Cooling via electric heat pumps.

1.6 This report responds to the energy requirements of the following:

- The National Planning Policy Framework (2018);
- Chapter 5 of the London Plan (March 2016):
  - Policy 5.1: Climate Change Mitigation
  - Policy 5.2: Minimising Carbon Dioxide Emissions
  - Policy 5.3: Sustainable Design and Construction
  - Policy 5.6: Decentralised Energy in Development Proposals

    - Policy 5.9: Overheating and Cooling
- The GLA Guidance on preparing energy assessment (2016);
- London Borough of Camden Council's Local Plan (2017):
    - Policy CC1 Climate change mitigation
    - Policy CC2 Adapting to climate change
- Camden Planning Guidance 3 Sustainability.

Disclaimer

The performances of renewable systems, especially wind and solar, are difficult to predict with any certainty. This is due to the variability of environmental conditions from location to location and from year to year. As such all budget/cost/sizings, which are based upon the best available information, are to be taken as estimation only and should not be considered as a guarantee.

This report relates to pre-planning stage therefore final specification must be provided by an M & E consultant after stage C. NRG Consulting disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report. This report is confidential to the Client and NRG Consulting accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

2. POLICY FRAMEWORK

2.1 With over 1,000sqm non-domestic floorspace proposed, the development falls within the Government's "major" category of planning applications.

2.2 The National Planning Policy Framework (2018)

14. Meeting the challenge of climate change, flooding and coastal change

"151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

153. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

154. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable."

2.3 Part L of the Building Regulations (2013 with 2016 amendments)

Part L 2013 covers the conservation of fuel and power, maintaining a focus on the target to reduce carbon emissions by 80% by 2050 compared to the 1990 levels. The Building Regulations set out requirements for specifics aspect of building design and construction so that it "shall not exceed the target CO_2 emission rate for the building", as stated in Regulation 26. Key criteria described in Approved Document L include:

- The designed carbon emission rate (DER for self-contained dwellings and BER for buildings other than dwellings) must not exceed the Target Emission Rate (TER) for a notional building.
- Minimum limiting parameters are set for key components of the building fabric and fixed building services to achieve reasonable standards of energy efficiency.

2.4 The London Plan (2016) – Chapter Five: London's Response to Climate Change

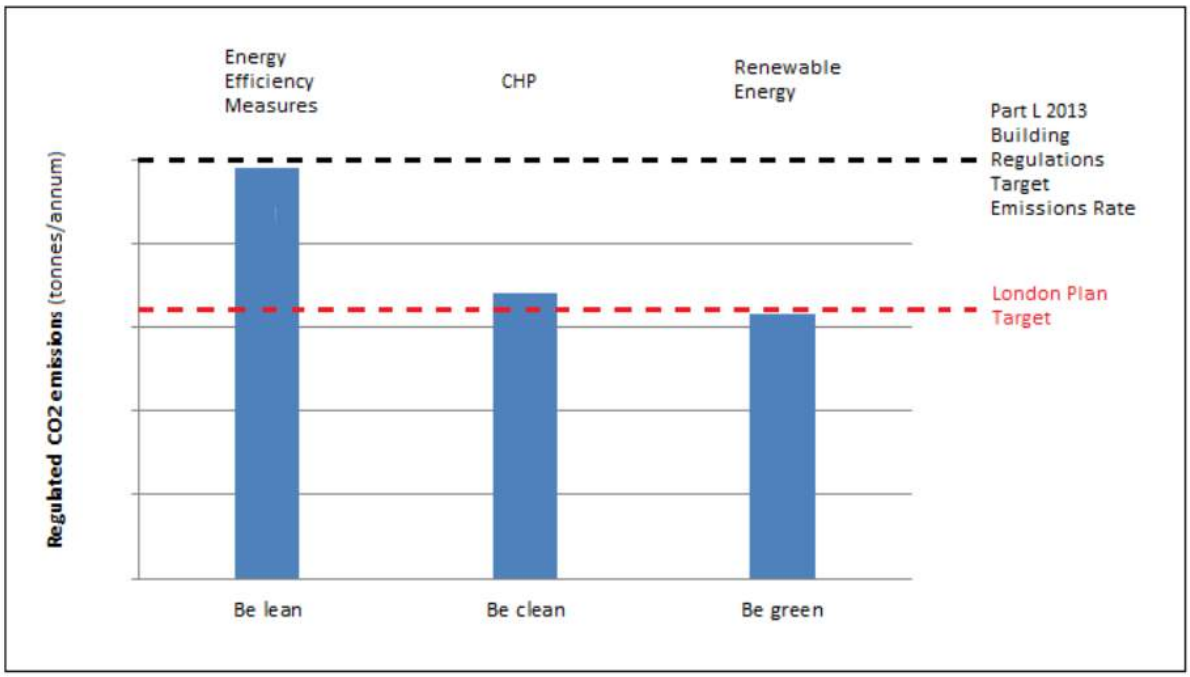
The London Plan is designed to set out an integrated economic, environmental, transport and social framework for London. The main objectives relating to energy for development are outlined in the following policies:

Policy 5.2: Minimising Carbon Dioxide Emissions

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

1. *Be Lean: use less energy*
2. *Be Clean: supply energy efficiently*
3. *Be Green: use renewable energy"*

The concept of applying the energy hierarchy in relation to Part L 2013 is illustrated below:



Policy 5.3: Sustainable Design and Construction

"a. The highest standards of sustainable design and construction should be achieved;

b. Development should demonstrate that sustainability is integral to the design;

c. Major developments should meet the minimum standards set out in the SPD, and demonstrate it in the design and access statement;

d. The following principles (relevant to this statement) should be pursued:

i. Minimising CO_2 emissions;
ii. Avoiding overheating and urban heat island;"

Policy 5.6: Decentralised Energy

"a. Developments should evaluate the use of CHP;

b. Major developments should select decentralised heating according to the following hierarchy:

i. Connection to existing heat networks;
ii. Site-wide CHP network;
iii. Communal heating and cooling;"

Policy 5.9: Overheating

"a. Major development proposals should reduce their reliance on air conditioning and potential overheating in accordance with the following cooling hierarchy;

i. Minimise internal heat sources;
ii. Minimise external heat gain;
iii. Utilise thermal mass and high ceilings;
iv. Passive ventilation;
v. Mechanical ventilation;
vi. Low carbon active cooling systems;

b. Major development proposals should demonstrate design to minimise cooling."

2.5 London Borough of Camden Council's Local Plan (2017)

Policy CC1 Climate change mitigation

"The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

For decentralised energy networks, we will promote decentralised energy by:

i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment."

"8.11 The Council will expect developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions 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. This is in line with stage three of the energy hierarchy 'Be green'. The 20% reduction should be calculated from the regulated CO2 emissions of the development after all proposed energy efficiency measures and any CO2 reduction from non-renewable decentralised energy (e.g. CHP) have been incorporated."

Policy CC2 Adapting to climate change

Sustainable design and construction measures

"The Council will promote and measure sustainable design and construction by:

h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019."

2.6 Camden Planning Guidance 3 Sustainability

"What to include in an energy statement?

2.6 An energy statement is to set out how a development has been designed to follow the steps in the energy hierarchy. It should demonstrate how the proposed measures are appropriate and viable to the context of the development.

Baseline energy demand and carbon dioxide emissions

Calculate the baseline energy demand of the development and the corresponding carbon dioxide emissions arising from the development. You should clearly show the methodology used. See below for more guidance on how to calculate the baseline demand and carbon dioxide emissions.

Reduce the demand for energy

Describe the design measures which are proposed to maximise the energy efficiency of the development. See sections 2 and 3 for guidance on how to ensure your development is as energy efficient as possible.

Supply energy efficiently

Describe how your development has considered further reducing carbon dioxide emissions by sourcing energy efficiently e.g. through the use of decentralised energy, such as combined heat and power systems. See section 4 for guidance on decentralised energy network and combined heat and power.

Calculate the energy use and the corresponding carbon emissions from the development having applied the first two stages of the energy hierarchy.

Use renewable energy

Describe how your development has considered using renewable energy technologies to further reduce carbon dioxide emissions. See section 5 for more guidance on renewable energy.

Calculate the remaining energy use and the corresponding carbon emissions from the development having applied all three stages of the energy hierarchy. "

3. BASELINE CO_2 EMISSIONS

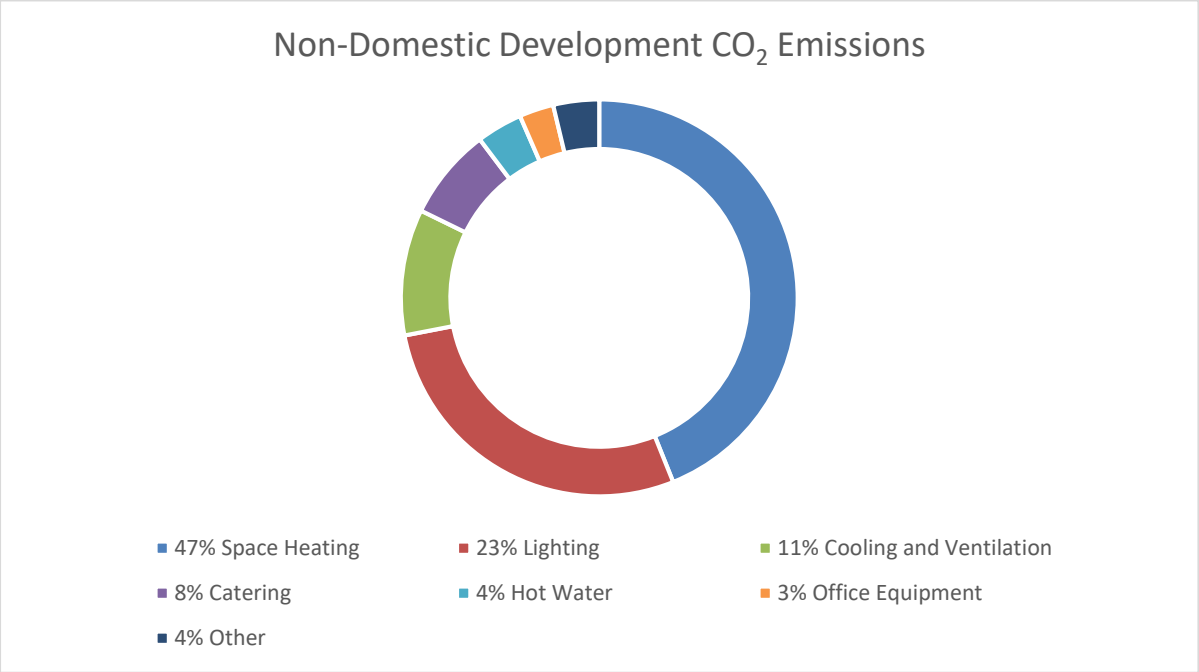
3.1 In order to estimate the predicted energy demand and regulated CO_2 emissions for the site, SBEM Calculations have been carried out by a licensed and accredited NDEA SBEM Assessor. The building has been modelled using the approved Integrated Environmental Software (IES) in accordance with Building Regulations Part L2a 2013.

3.2 The baseline CO_2 emissions covered by Part L 2013 of the Building Regulations will be expressed as the Target Emissions Rate (TER), obtained from the SBEM calculations.

3.3 Regulated CO_2 emissions result from the energy use for:

- Space heating
- Hot Water
- Cooling
- Lighting
- Pumps and Fans

3.4 Typical CO_2 emissions for residential development are broken down as follows:



3.5 Unregulated energy use is not counted for the purpose of Part L. In line with CIBSE Guide F and other best practice standards, unregulated emissions for the proposed hotel cover the use of:

- Appliances
- Commercial Laundry
- Restaurant/Catering

3.6 Due to the nature of these emissions, it is impossible to predict by how much they can be reduced as this relies outside the control of the authors and developers. Therefore, these emissions as noted will remain the same throughout the energy hierarchy. However, the following measures will be adopted to minimise these emissions:

- Energy Efficient lifts with measures such as power conservation.
- Provision of low energy fittings with PIR sensors for the communal and external areas.

3.7 According to the SBEM calculations, the baseline CO_2 emissions of the development are as follows:

	CO_2 Emissions (Tonnes per Annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development (TER)	**87.7**	**23.5**

4. BE LEAN

4.1 In line with the London Plan policies 5.2, 5.3 and 5.9, the proposed development includes both passive and active design measures to reduce energy demand. These include optimising the insulation and the provision of high efficiency HVAC, as detailed below.

4.2 Passive Design

The design of the development prioritises passive measures in order to minimise heat loss cost effectively. The U-values and the air permeability rate have been selected to exceed the minimum requirements of the Building Regulations, as follows:

Element	Part L2a Limiting Fabric Parameters	Proposed Parameters
Ground Floor U-value	0.25 W/m^{2}K	0.18 W/m^{2}K
External Walls U-value	0.35 W/m^{2}K	0.2 W/m^{2}K
Semi-Exposed Walls U-value		0.2 W/m^{2}K
Roof U-value	0.25 W/m^{2}K	0.16 W/m^{2}K
Windows and Rooflights Averaged U-value	2.2 W/m^{2}K	1.49 W/m^{2}K
Personnel Doors U-value	2.2 W/m^{2}K	1.8 W/m^{2}K
Air Permeability	10 m^3/(hm^2) @50Pa	5 m^3/(hm^2) @50Pa

4.3 Active Design

The development will incorporate efficient HVAC system to limit carbon emissions, including low-NOx heating system and low energy lighting. The proposed building services are in compliance with the Non-Domestic Building Services Compliance Guide (2013) and are detailed in the following table:

Building Services	Specifications
Ventilation	Guest Rooms: MVHR, 90% HR Efficiency Bathrooms & Stores: Mechanical Extract, Exhaust SFP of 0.61 W/l/s
Space Heating	Mains Gas Boiler 96% Seasonal Efficiency *Assumed as a theoretical baseline for the purpose of 'Be Lean', in line with the GLA requirements*
Emitters	Fan Coil Units
Heating Controls	Local Time and Temperature Controls

Hot Water	From Boiler
Cooling	VRF System Via Split or Multi-Split System Cooling COP of 6.5
Lighting	100% Low Energy Minimum luminous efficacy of 90 lm/W
Lighting Controls	PIR and Manual Switching

4.4 The BRUKL Report at this stage of the energy hierarchy can be found in the appendices to verify the above inputs.

4.5 By adopting enhanced building fabric and energy efficient services, the CO_2 emissions of the development are reduced by 6.27% over Part L 2013 as follows:

	CO_2 Emissions (Tonnes per Annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development (TER)	**87.7**	**23.5**
Be Lean: Energy Demand Reduction	**82.2**	
Regulated CO_2 Savings at *'Be Lean'* over Part L 2013	**6.27%**	

5. BE CLEAN

5.1 The energy systems for the development have been selected in accordance with the London Plan decentralised energy hierarchy listed in Policy 5.6:

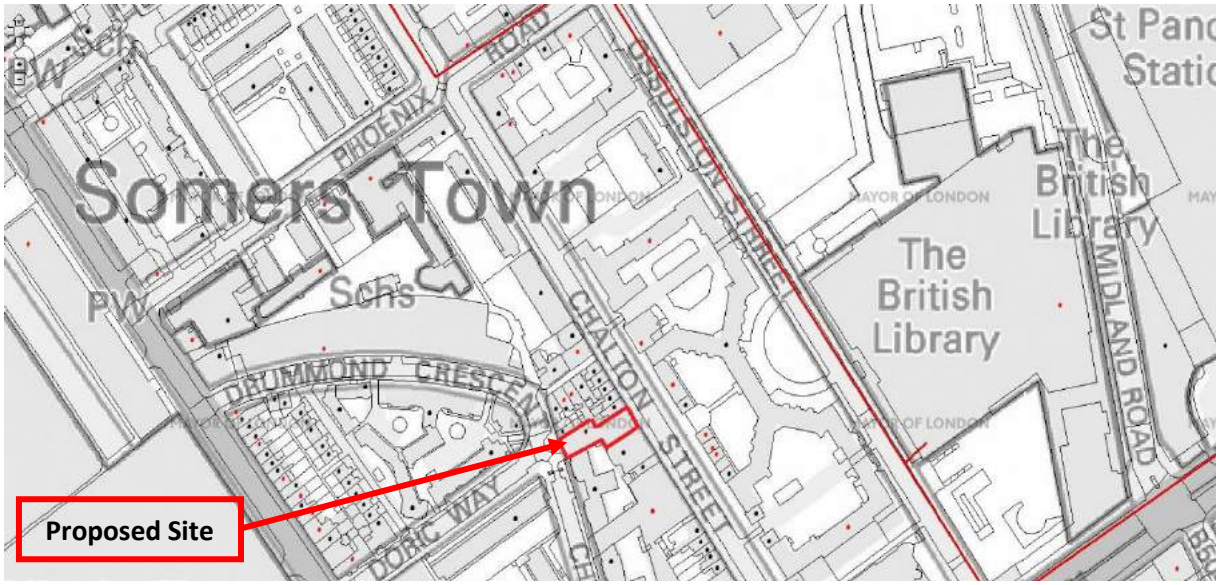
A. Connection to existing heating and cooling networks

B. Site wide CHP networks

C. Communal heating and cooling

A. Connection to Area Wide Low Carbon Heat Network

The local area has been investigated to ascertain the availability of district heating schemes in the vicinity of the proposed development. A review of the London Heat Map and publicly available information shows that Somers Town Heat Network is located circa 270m North-East from the site:



The Somers Town Heat Network is currently operational along Purchese Street and Polygon Road, in close proximity to the proposed hotel.

Contact has been made with the Council's sustainability office to investigate the potential of connecting the proposed site to Somers Town heat network. Please refer to Appendix 5 for the email correspondence with the heat network manager Jennifer Belk, who confirms this connection is unfeasible due to the long distance from the development to the network, which would imply a long and costly pipe run.

As there is a high potential for other buildings in the vicinity to become eligible for connection and therefore for this heat network to be expanded, it is planned to add sufficient infrastructure to the plant room to facilitate a future connection. This design will be in-line with Appendix 1 of the London Heat Network Manual.

B. Combined Heat and Power (CHP)

A CHP system generates electricity as well as heat in the form of hot water from a single piece of plant. CHP offers CO_2 emissions savings by reducing the amount of carbon heavy electricity from the grid, provided there is significant hot water demand to keep the system under constant operation.

The feasibility of installing a site-wide CHP is investigated below:

Advantages

- Compared to a standard fossil fuel Power Plant reaching efficiencies of up to 40%, a Combined Heat and Power (CHP) benefits from higher Thermal and Electrical Efficiencies, making it more advantageous than conventional power stations.
- A CHP system is able to modulate the heat and power depending on the dwellings requirements and system configuration and it is therefore constantly in operation to maintain steady heating, hot water and electricity.
- To maximise its efficiencies, it is recommended that the system should operate for a minimum of 5,000 hours per year, making it suitable for the proposed hotel with 24/7 heating and hot water demand.
- CHP systems are eligible for several Government incentives, including Exemption from the CCL and from the Carbon Price Support Tax for the gas purchased.
- The system generates free electricity, resulting in reduced energy bills.
- CHP benefits from reduced distribution losses compared to standard Power Plants.

Disadvantages

- It is capital intensive, with installation costs of up to £10,000 per unit.
- Compared to a standard communal gas heating system, the CHP requires a larger plant room.
- Increased overheating risk due to escalating return temperatures.
- Difficulties in obtaining an ESCO arrangement.

Feasibility

According to the SBEM calculation, the annual hot water demand of the development is estimated at 252.8 MWh, providing an ideal hot water load for the use of CHP. The installation of CHP would contribute significantly to CO_2 and energy savings and would successfully meet the base hot water load of the guest rooms. Sufficient space has been allowed at the Basement Level for the Plantroom required for the installation of CHP. Potential issues with the high capital investment can be hedged through available incentives and by generating electricity on-site which would otherwise be purchased from the

grid. A CHP system can also contribute to strategic heat network policies by allowing future connection to district heating.

It is therefore proposed that the heating and hot water demand will be served by a system comprising of a 9kWe CHP unit as the lead heating source and back-up gas boilers. The proposed CHP would reduce the development's CO_2 emissions by 14 tonnes, equivalent to 16.98% after *'Be Lean'* and it can contribute to strategic heat network policies by allowing future connection to district heating.

5.2 Future Connection to District Heat Networks

In order to enable future connection to heat networks and ensure that the space provision for a future heat exchanger and associated equipment is adequate, the following guidelines are to be followed:

- London Heat Network Manual – Appendix 1 – Future Network Connections;
- BSRIA TN 9/92 – Space and Weight Allowances for Building Services Plant;
- BS 8313:1997 – Code of Practice for Accommodation of Building Services in Ducts.

To ensure adequate space and facilities for future connection to a District CHP or CCHP Network, the technical information contained within the London Heat Network Manual has been adhered to, in particular the following Plant Room requirements:

Item	Specification Requirements
Room Illumination	Minimum light level: 150 lux
Electrical Connection	III 380V to earth / 32 A (See Note 1 below)
Electrical Supply	220 V AC (+/- 5%), 50 Hz (+/- 3%) Thermo-magnetic protection recommended 16 A curve C (the box incorporates a thermomagnetic protection of 10 A curve C in the supply)
Water Supply	DN 25
Water Discharge	Provide wastewater discharge line in the plant room and a sump to collect condensation from heat exchangers
Concrete Bases	Provide concrete bases for heat exchangers and pumps (if present)
Ventilation	Mechanical and continuous, with a minimum of three air changes per hour
Health & Safety	Plan showing evacuation route in case of fire, located in a visible place. The plant room should not have elements of risk to health and safety (sharp metallic objects, holes in roof or floor without protection,…)
Layout & Dimensions	As described for the relevant packaged substation unit

Space Requirements

- Supply Side – Heat network route and heat source interface between heat production plants and network, which will comprise the plant and equipment to accept the heat supplied by the Heat Supplier into the network;
- Consumer Side – Consumer heat interface between the network and the heat consumer. The consumer heat interface will comprise the equipment to deliver the heat from the network to the customer.

The proposed Plant Room will be located at the Basement Level and will have sufficient space to accommodate the equipment required for a potential connection to district heat network. The indicative location at the Basement Level is as follows:

5.3 The CO_2 savings achieved through the CHP system amounts to an additional 29.50% reduction in regulated emissions over the 'Be Lean' stage. Overall, the proposed scheme achieved a regulated CO_2 emissions reduction of 33.92% over the Part L 2013 baseline, which meets the London Plan target for major non-domestic development, as shown below:

	CO_2 Emissions (Tonnes per Annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development (TER)	**87.7**	**23.5**
Be Lean: Energy Demand Reduction	**82.2**	
Be Clean: Supply Energy Efficiently	**58**	
Regulated CO_2 Savings at *'Be Clean'* over Part L 2013	**33.92%**	

5.4 Following the incorporation of CHP, the updated heating, hot water and cooling strategy for the development is:

Space Heating	Via VRF Heating COP of 0.96
Hot Water	Via Gas CHP and back-up Boilers Water Heating Efficiency of 96%
Cooling	Via VRF Cooling COP of 6.5

6. BE GREEN

6.1 The feasibility of all applicable renewable energy technologies is investigated below, taking into consideration the following factors:

- CO_2 savings achieved;
- Site constraints and opportunities;
- Potential conflicts with alternative solutions;
- Level of maintenance;
- Cost.

Solar Photovoltaic	
Advantages	**Disadvantages**
• It can provide significant CO_2 savings by producing electricity which is carbon intensive; • It is relatively easy to install and manage compared to other renewable technologies; • It requires no fuel; • It has a zero-carbon footprint, with no GHG emitted from its operation; • Feed-in Tariffs are available for excess energy produced, which can be sent to the grid;	• The development has limited available roof space for the installation of PV; • It has low efficiencies at nights and under clouds; • It requires un-obstructed and un-shaded space of the roof;
Feasibility	
Solar PV would successfully contribute to meeting the on-site electrical demand and also to achieving the CO_2 reduction targets. The roofs of the development provide optimum orientation to maximise the PV output. Therefore, this technology is deemed feasible for the development.	

Solar Thermal Collectors	
Advantages	**Disadvantages**
• It is relatively easy to install and manage; • It has low capital cost and near-zero maintenance costs; • No fuel is required; • There are no associated noise issues or GHG emissions;	• This technology is not compatible with CHP as they both compete to provide the base hot water load; • additional plumbing and space for hot water storage is required, which may reduce the space; • long piperun from the collectors to the cylinders is required, resulting in distribution losses;
Feasibility	
Solar thermal collectors are not compatible with CHP systems as both technologies compete to provide the hot water base load, meaning the running hours and efficiency of the proposed CHP would be restricted if thermal collectors would be installed. Furthermore, this technology is not	

preferred due to the additional requirements for hot water cylinders and long piperun, which may cause overheating due to distribution losses.

Biomass

Advantages	Disadvantages
• It has no requirement for additional gas or electrical supplies; • It has the potential to reduce a substantial amount of CO_2. • It would replace a conventional gas heating system, meaning the cost may be offset through money saved on a traditional boiler;	• The burning of wood pellets releases substantially more NOx emissions than a gas boiler, which could reduce the air quality of the site. • Regular fuel transportation and waste disposal required would add to air quality and traffic issues; • There is low availability of fuel supply contractors; • A plant room, fuel and ash storage is required, which may take additional land from the development; • Requires taller flues than gas boilers;

Feasibility

Biomass is not a preferred system due to potentially high NOx and particulate emissions which may have negative impacts upon the local air quality. Furthermore, fuel storage and delivery and waste disposal would be difficult due to space constraints on-site and lack of local biomass suppliers.

Air Source Heat Pumps

Advantages	Disadvantages
• The system has high performance coefficients (COP), producing 2-3 units of heat energy for every unit of input energy; • As ASHPs would replace a standard heating system, part of the cost would be offset through money saved on a traditional boiler; • It reaches optimum efficiencies with low temperature systems, such as underfloor heating; • It is easier and cheaper to install than a GSHP due to no requirement for buried pipes;	• Heat pumps have higher associated CO_2 emissions than a gas boiler, primarily due to the electric immersion top-up for hot water and the electricity required to run the pump; • Compared to a GSHP, it has lower COP due to varying levels of air temperatures compared to a more stable ground temperature; • The outdoor condensing unit can have negative visual and noise impacts, with noise levels of 50-60dB; • It is most effective for sites not connected to gas networks;

Feasibility

Issues of noise may be of concern for the guest rooms, especially at night. The units would require providing heat in the winter when the difference between the internal and external air temperatures would be large, making the system less efficient. Therefore, ASHP is discounted.

Ground Source Heat Pumps (GSHP)	
Advantages	**Disadvantages**
• It has higher performance coefficients than ASHPs; • It has low maintenance and it is easy to manage; • As GSHPs would replace a standard heating system, part of the cost would be offset through money saved on a traditional boiler;	• A geological study would be required to see if the soil can provide adequate thermal transfer; • The installation of ground loops would significantly increase the construction time and complexity; • The cost of installing boreholes is very high; • Boreholes require a significant amount of space on site;
Feasibility	
A GSHP system would not deliver substantial carbon savings given the installation complexity and high capital cost which would outweigh the benefits, in comparison to other renewable technologies such as PV. This is corroborated by the lack of large amenity space required for the necessary infrastructure. Therefore, this technology is being discounted in favour of PV.	

6.2 Following the above feasibility, PV panels are being proposed as the most suitable renewable energy technology. The proposed system details are:

PV System Details	
CO_2 Reduction required for 20% Renewable Energy Target	**0.9 tonnes CO_2/year**
CO_2 Reduction required for 35% Improvement over Part L	**11.6 tonnes CO_2/year**
CO_2 Offset via 1kWp	**0.448 tonnes CO_2/year**
PV Required for 20% Target	**25.87 kWp**
PV Required for 35% Target	**2.11 kWp**
Maximum PV Allowed (Proposed)	**8.37 kWp**
Module Output	**270 Watts**
Number of Panels	**31no.**
Tilt of Collectors	**0 to 15 degrees**
Over-shading Factor	**<20%**

6.3 The CO_2 savings achieved through the PV system amounts to an additional 4.14% reduction in regulated emissions over the 'Be Clean' stage. Overall, the proposed scheme achieved a regulated CO_2 emissions reduction of 36.66% over the Part L 2013 baseline, which meets the London Plan target for major development, as shown below:

	CO_2 Emissions (Tonnes per Annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development (TER)	**87.7**	**23.5**
Be Lean: Energy Demand Reduction	**82.2**	
Be Clean: Supply Energy Efficiently	**58**	
Be Green: Use Renewable Energy	**55.6**	
Regulated CO_2 Savings at *'Be Green'* over Part L 2013	**36.66%**	

6.4 Due to space constraints on-site, the 20% renewable energy target cannot be achieved. The maximum amount of PV will be installed to maximise CO2 savings, taking into account there is no significant over-shadowing and sufficient space for access, installation and maintenance is provided. An indicative layout of the PV system on the roof of the development is illustrated on the following page:


70 Churchway
Wrisham House
CHARLTON STREET
SCALE 1:200

7. COOLING AND OVERHEATING

7.1 Adequate measures shall be proposed in the areas where overheating is likely to be an issue. In line with London Plan Policy 5.9, the overheating prevention and cooling strategy shall be development in accordance with the following hierarchy:

Cooling Hierarchy	Measures Undertaken
Minimising internal heat generation through energy efficient design	• Energy efficient lighting which lowers the internal gains from lighting; • Heat distribution infrastructure within buildings should be designed to minimise pipe lengths, particularly lateral pipework in corridors of apartment blocks. • Adopting pipe configurations which minimise heat loss e.g. twin pipes
Reducing the amount of heat entering the building in summer	• Carefully designed shading measures have been considered, including specification of Internal blinds
Use of thermal mass and high ceilings to manage the heat within the building	• Level of exposed thermal mass has been maximised to help to absorb excess heat within the building.
Passive Ventilation	• Openable windows will allow natural ventilation;
Mechanical Ventilation	• MVHR will be installed to all Guest Rooms. Mechanical Ventilation will make use of 'free cooling' (when the outside air temperature is below that in the building during summer months). This will be achieved via a by-pass mode on the heat recovery system for summer mode operation.
Active Cooling	• Air Conditioning units will be supplied via VRF system. The actual cooling demand has been minimised below the notional target as follows: **Notional Cooling Demand**: **7,544 kWh/year** **Actual Cooling Demand**: **5,189 kWh/year**

7.2 CIBSE Guide A – Environmental Design (2015) is the reference standard for overheating in the GLA SPG on Sustainability and the current industry standard amongst other CIBSE guides such as CIBSE TM52 "The Limits of Thermal Comfort: Avoiding Overheating in European Buildings" (2013).

7.3 In conclusion, the risk of overheating can be largely mitigated through the following:

- enhanced fabric performance through high levels of insulation;
- inclusion of internal blinds and solar control glazing;
- provision on mechanical ventilation with heat recovery;
- provision of Active Cooling via VRF system.

8. CONCLUSION

8.1 This document has been written to satisfy the energy requirements of the following:

- The GLA Guide to Energy Statements (2016)
- The Mayor's Sustainable Design and Construction SPG (2014)
- Chapter Five of The London Plan (2016)
- The Local Plan of the London Borough of Camden

8.2 The development has CO_2 baseline emissions that are Part L compliant via passive Energy Efficiency Measures alone as highlighted in Section 4.

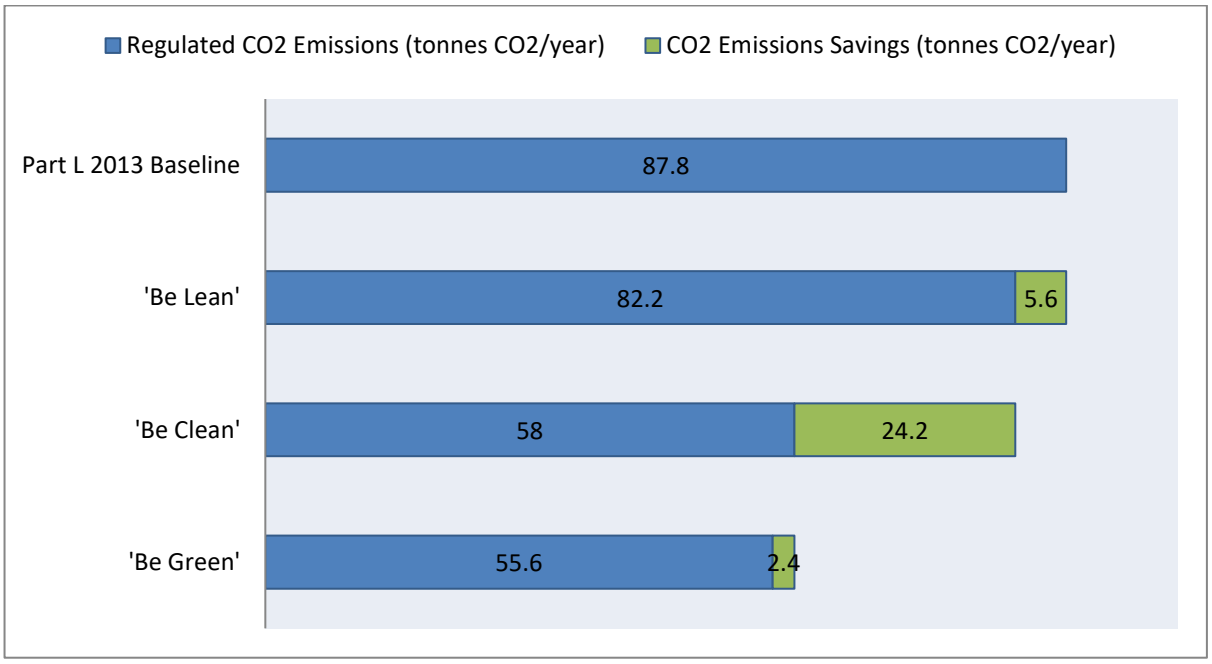
8.3 The baseline CO_2 emissions drop from 87.7 tonnes CO_2/year to 82.2 tonnes CO_2/year, that equates to a 6.27% decrease at the *'Be Lean'* stage, when taking into account the following:

- High levels of insulation to achieve low U-Values;
- High efficiency HVAC;
- Low air tightness requirements;
- Mechanical Ventilation with Heat Recovery to all Guest Rooms;
- 100% low energy lighting with a minimum luminous efficacy of 90lm/W.

8.4 CHP will be installed to provide the base hot water load of the development, delivering CO2 savings of 33.92% over Part L 2013.

8.5 50sqm of PV are being proposed to maximise the CO_2 savings on-site and achieve the London Plan reduction target.

8.6 The CO_2 reduction requirement of the London Plan Policy 5.2 is therefore achieved. For clarity, the CO_2 emissions associated with each stage of the energy hierarchy are broken down below:



Appendix 1

53-55 Chalton Street & 60 Churchway

REDUCTION OF CARBON EMISSIONS

AREA	TER *Baseline Emissions*	Total Part L Baseline CO_2	BER *'Be Lean'*	Total BER *'Be Lean'*	BER *'Be Clean'*	Total BER *'Be Clean'*	BER *'Be Green'*	Total BER *'Be Green'*	Unregulated CO2	Total Unregulated CO2
m^2	kg $CO_2/m^2/yr$	kg CO_2/yr	kg $CO_2/m^2/yr$	kg CO_2/yr	kg $CO_2/m^2/yr$	kg CO_2/yr	kg $CO_2/m^2/yr$	kg CO_2/yr	kg CO_2/yr	kg CO_2/yr
1410.1	62.2	87,708	58.3	82,209	41.1	57,955	39.4	55,558	16.6	23,464

CO_2 Reduction at *'Be Lean'*	6.27%
Cumulative CO_2 Reduction at *'Be Clean'*	33.92%
Cumulative CO_2 Reduction at *'Be Green'*	36.66%
CO_2 Reduction via Renewable Energy	4.14%

Appendix 2

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Chalton Street - BE LEAN

As designed

Date: Wed Sep 05 12:32:28 2018

Administrative information

Building Details

Address: 53-55 Charlton Street, London, NW1 1HY

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , , Postcode

Certifier details

Name: NRG Consulting Ltd

Telephone number:

Address: PB219, The Pillbox, 115 Coventry Road, London, E2 6GG

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	64.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	64.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	55.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	1K000000:Surf[1]
Floor	0.25	0.18	0.18	1K000000:Surf[0]
Roof	0.25	0.16	0.16	1P000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.49	1.71	1B000005:Surf[1]
Personnel doors	2.2	1.8	1.8	0R000001:Surf[6]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	6.5	0	0	0.9
Standard value	0.91*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- Main system bathrooms/stores

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	6.5	0	0	0.9
Standard value	0.91*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.96	-
Standard value	0.8	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
-1 plant/store room	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 linen store	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
0 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
0 WC	-	0.1	0	-	-	-	-	-	-	-	N/A
0 luggage store	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1 kitchen	-	90	-	380
-1 kitchen	-	90	-	48
-1 kitchen	-	90	-	55
-1 plant/store room	90	-	-	67
-1 stair	-	90	-	20
-1 corridor	-	90	-	122
-1 bedroom	-	90	-	24
-1 bedroom	-	90	-	23
-1 bathroom	-	90	-	17
-1 bathroom	-	90	-	17
-1 linen store	90	-	-	3
-1 bathroom	-	90	-	19
-1 bedroom	-	90	-	30
-1 bathroom	-	90	-	20
-1 bedroom	-	90	-	29
-1 bathroom	-	90	-	19
-1 bedroom	-	90	-	34
-1 bathroom	-	90	-	19
-1 stair	-	90	-	29
-1 bedroom	-	90	-	19
-1 bathroom	-	90	-	22
-1 bedroom	-	90	-	22
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	39
-1 bathroom	-	90	-	17
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	20
-1 bedroom	-	90	-	23
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	22
-1 bathroom	-	90	-	21
0 restaurant	-	90	22	171
0 private dining	-	90	22	156
0 bar	-	90	22	49
0 store/chiller	90	-	-	13
0 bathroom	-	90	-	31
0 stair	-	90	-	25
0 corridor	-	90	-	50

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
0 reception	-	90	22	441
0 WC	-	90	-	87
0 back office	90	-	-	174
0 luggage store	90	-	-	11
0 stair	-	90	-	42
1 bedroom	-	90	-	35
1 bedroom	-	90	-	25
1 bathroom	-	90	-	22
1 bathroom	-	90	-	18
1 bathroom	-	90	-	17
1 bathroom	-	90	-	17
1 bedroom	-	90	-	28
1 corridor	-	90	-	19
1 stair	-	90	-	20
1 corridor	-	90	-	14
1 corridor	-	90	-	110
1 bedroom	-	90	-	21
1 bathroom	-	90	-	21
1 bedroom	-	90	-	26
1 bathroom	-	90	-	42
1 bathroom	-	90	-	17
1 bedroom	-	90	-	15
1 bedroom	-	90	-	15
1 bathroom	-	90	-	19
1 bathroom	-	90	-	18
1 bedroom	-	90	-	25
1 bathroom	-	90	-	16
1 bedroom	-	90	-	37
1 bathroom	-	90	-	21
1 bedroom	-	90	-	28
1 bathroom	-	90	-	17
1 stair	-	90	-	29
1 bathroom	-	90	-	19
1 bedroom	-	90	-	28
1 bedroom	-	90	-	22
1 bathroom	-	90	-	19
1 bedroom	-	90	-	24
1 bathroom	-	90	-	17
1 bathroom	-	90	-	17
1 bedroom	-	90	-	13
2 bedroom	-	90	-	35
2 bathroom	-	90	-	19
2 bathroom	-	90	-	21

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
2 bedroom	-	90	-	21
2 bedroom	-	90	-	25
2 bathroom	-	90	-	21
2 bedroom	-	90	-	28
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bedroom	-	90	-	25
2 corridor	-	90	-	19
2 corridor	-	90	-	14
2 corridor	-	90	-	10
2 stair	-	90	-	20
2 bedroom	-	90	-	31
2 bedroom	-	90	-	18
2 bedroom	-	90	-	24
2 bedroom	-	90	-	22
2 bedroom	-	90	-	28
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bathroom	-	90	-	19
2 bathroom	-	90	-	19
2 stair	-	90	-	29
2 corridor	-	90	-	22
3 bedroom	-	90	-	30
3 bedroom	-	90	-	43
3 bedroom	-	90	-	25
3 bedroom	-	90	-	21
3 bathroom	-	90	-	21
3 bathroom	-	90	-	17
3 bathroom	-	90	-	19
3 bathroom	-	90	-	21
3 corridor	-	90	-	16
3 corridor	-	90	-	14
3 corridor	-	90	-	10
3 stair	-	90	-	20
3 bedroom	-	90	-	31
3 bedroom	-	90	-	18
3 bathroom	-	90	-	17
3 bathroom	-	90	-	17
3 bathroom	-	90	-	17
3 bathroom	-	90	-	19
3 bathroom	-	90	-	19
3 stair	-	90	-	29

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
3 corridor	-	90	-	22
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	24
3 bedroom	-	90	-	19
3 bedroom	-	90	-	20

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 kitchen	N/A	N/A
-1 kitchen	N/A	N/A
-1 kitchen	N/A	N/A
-1 plant/store room	N/A	N/A
-1 stair	N/A	N/A
-1 corridor	NO (-93.6%)	NO
-1 bedroom	NO (-73.1%)	NO
-1 bedroom	NO (-46%)	NO
-1 bathroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 linen store	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-91.3%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-76.1%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-63.8%)	NO
-1 bathroom	N/A	N/A
-1 stair	N/A	N/A
-1 bedroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-66.4%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-74.2%)	NO
-1 bathroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-27.5%)	NO
-1 bedroom	YES (+2.1%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-69.5%)	NO
-1 bathroom	N/A	N/A
0 restaurant	NO (-23.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0 private dining	NO (-91.9%)	NO
0 bar	NO (-43.9%)	NO
0 store/chiller	N/A	N/A
0 bathroom	N/A	N/A
0 stair	N/A	N/A
0 corridor	N/A	N/A
0 reception	NO (-38.4%)	NO
0 WC	NO (-89.1%)	NO
0 back office	NO (-54.4%)	NO
0 luggage store	N/A	N/A
0 stair	N/A	N/A
1 bedroom	NO (-8.5%)	NO
1 bedroom	NO (-58.5%)	NO
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-64.3%)	NO
1 corridor	N/A	N/A
1 stair	N/A	N/A
1 corridor	N/A	N/A
1 corridor	NO (-79.6%)	NO
1 bedroom	NO (-81%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-87.5%)	NO
1 bathroom	NO (-64.6%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-53%)	NO
1 bedroom	NO (-45.7%)	NO
1 bathroom	NO (-83.3%)	NO
1 bathroom	N/A	N/A
1 bedroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-82.5%)	NO
1 bathroom	NO (-88.1%)	NO
1 bedroom	NO (-78%)	NO
1 bathroom	N/A	N/A
1 stair	NO (-71.1%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-38.4%)	NO
1 bedroom	NO (-55.6%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-57.1%)	NO
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-60.4%)	NO
2 bedroom	NO (-65%)	NO
2 bathroom	N/A	N/A
2 bathroom	NO (-76.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2 bedroom	NO (-65.4%)	NO
2 bedroom	NO (-66.9%)	NO
2 bathroom	N/A	N/A
2 bedroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bedroom	NO (-76.2%)	NO
2 corridor	N/A	N/A
2 corridor	N/A	N/A
2 corridor	N/A	N/A
2 stair	N/A	N/A
2 bedroom	NO (-67.5%)	NO
2 bedroom	NO (-57.9%)	NO
2 bedroom	NO (-66.9%)	NO
2 bedroom	NO (-65.7%)	NO
2 bedroom	NO (-52.2%)	NO
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 stair	NO (-63.9%)	NO
2 corridor	N/A	N/A
3 bedroom	NO (-75.2%)	NO
3 bedroom	NO (-92.3%)	NO
3 bedroom	NO (-69%)	NO
3 bedroom	NO (-57.3%)	NO
3 bathroom	NO (-84.1%)	NO
3 bathroom	N/A	N/A
3 bathroom	NO (-91.5%)	NO
3 bathroom	N/A	N/A
3 corridor	YES (+46.4%)	NO
3 corridor	YES (+257.4%)	NO
3 corridor	YES (+248.5%)	NO
3 stair	N/A	N/A
3 bedroom	NO (-64.6%)	NO
3 bedroom	NO (-78.4%)	NO
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 stair	NO (-61.7%)	NO
3 corridor	YES (+150.3%)	NO
3 bedroom	NO (-76%)	NO
3 bedroom	NO (-75.2%)	NO
3 bedroom	NO (-75%)	NO
3 bedroom	NO (-76%)	NO
3 bedroom	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
3 bedroom	N/A	N/A
3 bedroom	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1410.1	1410.1
External area [m^2]	1824.8	1824.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	624.21	879.39
Average U-value [W/m^2K]	0.34	0.48
Alpha value* [%]	10.1	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
100	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	41.03	49.77
Cooling	3.68	5.35
Auxiliary	0.37	1.77
Lighting	12.42	22.23
Hot water	179.31	179.71
Equipment*	32.07	32.07
TOTAL**	**236.81**	**258.83**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	203.46	227.43
Primary energy* [kWh/m^2]	318.11	367.81
Total emissions [kg/m^2]	55.9	64.4

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	77.8	75.8	22.9	4.3	0	0.94	4.86	0.96	6.5
	Notional	0	0	0	0	0	0	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	528.5	2.1	155.9	0.1	2.6	0.94	4.86	0.96	6.5
	Notional	90.7	84.5	29.2	6.2	0	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	560.6	10.6	180.6	0.8	12.6	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.2	1K000000:Surf[1]
Floor	0.2	0.18	1K000000:Surf[0]
Roof	0.15	0.16	1P000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.45	1C000000:Surf[2]
Personnel doors	1.5	1.8	0R000001:Surf[6]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Appendix 3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Chalton Street - BE CLEAN

As designed

Date: Wed Sep 05 12:19:59 2018

Administrative information

Building Details

Address: 53-55 Charlton Street, London, NW1 1HY

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , , Postcode

Certifier details

Name: NRG Consulting Ltd

Telephone number:

Address: PB219, The Pillbox, 115 Coventry Road, London, E2 6GG

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	62.2
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	62.2
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	41.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	1K000000:Surf[1]
Floor	0.25	0.18	0.18	1K000000:Surf[0]
Roof	0.25	0.16	0.16	1P000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.49	1.71	1B000005:Surf[1]
Personnel doors	2.2	1.8	1.8	0R000001:Surf[6]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Main system VRF

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	6.5	0	0	0.9
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- Main system bathrooms/stores

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	6.5	0	0	0.9
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.96	-
Standard value	0.8	N/A

1- CHECK2-CHP

	CHPQA quality index	**CHP electrical efficiency**
This building	0	0.31
Standard value	Not provided	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	**System type in Non-domestic Building Services Compliance Guide**
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
-1 plant/store room	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1 linen store	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
0 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
0 WC	-	0.1	0	-	-	-	-	-	-	-	N/A
0 luggage store	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1 kitchen	-	90	-	380
-1 kitchen	-	90	-	48
-1 kitchen	-	90	-	55
-1 plant/store room	90	-	-	67
-1 stair	-	90	-	20
-1 corridor	-	90	-	122
-1 bedroom	-	90	-	24
-1 bedroom	-	90	-	23
-1 bathroom	-	90	-	17
-1 bathroom	-	90	-	17
-1 linen store	90	-	-	3
-1 bathroom	-	90	-	19
-1 bedroom	-	90	-	30
-1 bathroom	-	90	-	20
-1 bedroom	-	90	-	29
-1 bathroom	-	90	-	19
-1 bedroom	-	90	-	34
-1 bathroom	-	90	-	19
-1 stair	-	90	-	29
-1 bedroom	-	90	-	19
-1 bathroom	-	90	-	22
-1 bedroom	-	90	-	22
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	39
-1 bathroom	-	90	-	17
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	20
-1 bedroom	-	90	-	23
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	22
-1 bathroom	-	90	-	21
0 restaurant	-	90	22	171
0 private dining	-	90	22	156

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
0 bar	-	90	22	49
0 store/chiller	90	-	-	13
0 bathroom	-	90	-	31
0 stair	-	90	-	25
0 corridor	-	90	-	50
0 reception	-	90	22	441
0 WC	-	90	-	87
0 back office	90	-	-	174
0 luggage store	90	-	-	11
0 stair	-	90	-	42
1 bedroom	-	90	-	35
1 bedroom	-	90	-	25
1 bathroom	-	90	-	22
1 bathroom	-	90	-	18
1 bathroom	-	90	-	17
1 bathroom	-	90	-	17
1 bedroom	-	90	-	28
1 corridor	-	90	-	19
1 stair	-	90	-	20
1 corridor	-	90	-	14
1 corridor	-	90	-	110
1 bedroom	-	90	-	21
1 bathroom	-	90	-	21
1 bedroom	-	90	-	26
1 bathroom	-	90	-	42
1 bathroom	-	90	-	17
1 bedroom	-	90	-	15
1 bedroom	-	90	-	15
1 bathroom	-	90	-	19
1 bathroom	-	90	-	18
1 bedroom	-	90	-	25
1 bathroom	-	90	-	16
1 bedroom	-	90	-	37
1 bathroom	-	90	-	21
1 bedroom	-	90	-	28
1 bathroom	-	90	-	17
1 stair	-	90	-	29
1 bathroom	-	90	-	19
1 bedroom	-	90	-	28
1 bedroom	-	90	-	22
1 bathroom	-	90	-	19
1 bedroom	-	90	-	24
1 bathroom	-	90	-	17

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1 bathroom	-	90	-	17
1 bedroom	-	90	-	13
2 bedroom	-	90	-	35
2 bathroom	-	90	-	19
2 bathroom	-	90	-	21
2 bedroom	-	90	-	21
2 bedroom	-	90	-	25
2 bathroom	-	90	-	21
2 bedroom	-	90	-	28
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bedroom	-	90	-	25
2 corridor	-	90	-	19
2 corridor	-	90	-	14
2 corridor	-	90	-	10
2 stair	-	90	-	20
2 bedroom	-	90	-	31
2 bedroom	-	90	-	18
2 bedroom	-	90	-	24
2 bedroom	-	90	-	22
2 bedroom	-	90	-	28
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bathroom	-	90	-	19
2 bathroom	-	90	-	19
2 stair	-	90	-	29
2 corridor	-	90	-	22
3 bedroom	-	90	-	30
3 bedroom	-	90	-	43
3 bedroom	-	90	-	25
3 bedroom	-	90	-	21
3 bathroom	-	90	-	21
3 bathroom	-	90	-	17
3 bathroom	-	90	-	19
3 bathroom	-	90	-	21
3 corridor	-	90	-	16
3 corridor	-	90	-	14
3 corridor	-	90	-	10
3 stair	-	90	-	20
3 bedroom	-	90	-	31
3 bedroom	-	90	-	18
3 bathroom	-	90	-	17

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
3 bathroom	-	90	-	17
3 bathroom	-	90	-	17
3 bathroom	-	90	-	19
3 bathroom	-	90	-	19
3 stair	-	90	-	29
3 corridor	-	90	-	22
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	24
3 bedroom	-	90	-	19
3 bedroom	-	90	-	20

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 kitchen	N/A	N/A
-1 kitchen	N/A	N/A
-1 kitchen	N/A	N/A
-1 plant/store room	N/A	N/A
-1 stair	N/A	N/A
-1 corridor	NO (-93.6%)	NO
-1 bedroom	NO (-73.1%)	NO
-1 bedroom	NO (-46%)	NO
-1 bathroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 linen store	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-91.3%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-76.1%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-63.8%)	NO
-1 bathroom	N/A	N/A
-1 stair	N/A	N/A
-1 bedroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-66.4%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-74.2%)	NO
-1 bathroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-27.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 bedroom	YES (+2.1%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-69.5%)	NO
-1 bathroom	N/A	N/A
0 restaurant	NO (-23.4%)	NO
0 private dining	NO (-91.9%)	NO
0 bar	NO (-43.9%)	NO
0 store/chiller	N/A	N/A
0 bathroom	N/A	N/A
0 stair	N/A	N/A
0 corridor	N/A	N/A
0 reception	NO (-38.4%)	NO
0 WC	NO (-89.1%)	NO
0 back office	NO (-54.4%)	NO
0 luggage store	N/A	N/A
0 stair	N/A	N/A
1 bedroom	NO (-8.5%)	NO
1 bedroom	NO (-58.5%)	NO
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-64.3%)	NO
1 corridor	N/A	N/A
1 stair	N/A	N/A
1 corridor	N/A	N/A
1 corridor	NO (-79.6%)	NO
1 bedroom	NO (-81%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-87.5%)	NO
1 bathroom	NO (-64.6%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-53%)	NO
1 bedroom	NO (-45.7%)	NO
1 bathroom	NO (-83.3%)	NO
1 bathroom	N/A	N/A
1 bedroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-82.5%)	NO
1 bathroom	NO (-88.1%)	NO
1 bedroom	NO (-78%)	NO
1 bathroom	N/A	N/A
1 stair	NO (-71.1%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-38.4%)	NO
1 bedroom	NO (-55.6%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-57.1%)	NO
1 bathroom	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1 bathroom	N/A	N/A
1 bedroom	NO (-60.4%)	NO
2 bedroom	NO (-65%)	NO
2 bathroom	N/A	N/A
2 bathroom	NO (-76.8%)	NO
2 bedroom	NO (-65.4%)	NO
2 bedroom	NO (-66.9%)	NO
2 bathroom	N/A	N/A
2 bedroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bedroom	NO (-76.2%)	NO
2 corridor	N/A	N/A
2 corridor	N/A	N/A
2 corridor	N/A	N/A
2 stair	N/A	N/A
2 bedroom	NO (-67.5%)	NO
2 bedroom	NO (-57.9%)	NO
2 bedroom	NO (-66.9%)	NO
2 bedroom	NO (-65.7%)	NO
2 bedroom	NO (-52.2%)	NO
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 stair	NO (-63.9%)	NO
2 corridor	N/A	N/A
3 bedroom	NO (-75.2%)	NO
3 bedroom	NO (-92.3%)	NO
3 bedroom	NO (-69%)	NO
3 bedroom	NO (-57.3%)	NO
3 bathroom	NO (-84.1%)	NO
3 bathroom	N/A	N/A
3 bathroom	NO (-91.5%)	NO
3 bathroom	N/A	N/A
3 corridor	YES (+46.4%)	NO
3 corridor	YES (+257.4%)	NO
3 corridor	YES (+248.5%)	NO
3 stair	N/A	N/A
3 bedroom	NO (-64.6%)	NO
3 bedroom	NO (-78.4%)	NO
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 stair	NO (-61.7%)	NO
3 corridor	YES (+150.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
3 bedroom	NO (-76%)	NO
3 bedroom	NO (-75.2%)	NO
3 bedroom	NO (-75%)	NO
3 bedroom	NO (-76%)	NO
3 bedroom	N/A	N/A
3 bedroom	N/A	N/A
3 bedroom	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1410.1	1410.1
External area [m^2]	1824.8	1824.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	624.21	879.39
Average U-value [W/m^2K]	0.34	0.48
Alpha value* [%]	10.1	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
100	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	8.75	16.77
Cooling	3.68	5.35
Auxiliary	0.37	1.77
Lighting	12.42	22.23
Hot water	215.48	179.71
Equipment*	32.07	32.07
TOTAL**	**205.64**	**225.83**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	35.06	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	203.46	227.43
Primary energy* [kWh/m^2]	256.94	407.51
Total emissions [kg/m^2]	41.1	62.2

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	77.8	75.8	4.9	4.3	0	4.41	4.86	4.5	6.5
	Notional	0	0	0	0	0	0	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	528.5	2.1	33.3	0.1	2.6	4.41	4.86	4.5	6.5
	Notional	90.7	84.5	9.8	6.2	0	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	560.6	10.6	60.9	0.8	12.6	2.56	3.79	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.2	1K000000:Surf[1]
Floor	0.2	0.18	1K000000:Surf[0]
Roof	0.15	0.16	1P000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.45	1C000000:Surf[2]
Personnel doors	1.5	1.8	0R000001:Surf[6]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Appendix 4

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Chalton Street - BE GREEN

As designed

Date: Wed Sep 05 12:12:56 2018

Administrative information

Building Details

Address: 53-55 Charlton Street, London, NW1 1HY

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , , Postcode

Certifier details

Name: NRG Consulting Ltd

Telephone number:

Address: PB219, The Pillbox, 115 Coventry Road, London, E2 6GG

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	62.2
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	62.2
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	39.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	1K000000:Surf[1]
Floor	0.25	0.18	0.18	1K000000:Surf[0]
Roof	0.25	0.16	0.16	1P000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.49	1.71	1B000005:Surf[1]
Personnel doors	2.2	1.8	1.8	0R000001:Surf[6]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Main system VRF

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	6.5	0	0	0.9
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- Main system bathrooms/stores

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.5	6.5	0	0	0.9
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.96	-
Standard value	0.8	N/A

1- CHECK2-CHP

	CHPQA quality index	**CHP electrical efficiency**
This building	0	0.31
Standard value	Not provided	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	**System type in Non-domestic Building Services Compliance Guide**
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
-1 plant/store room	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
-1 linen store	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
-1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
0 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
0 WC	-	0.1	0	-	-	-	-	-	-	-	N/A
0 luggage store	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
1 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
2 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A
3 bathroom	-	0.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1 kitchen	-	90	-	380
-1 kitchen	-	90	-	48
-1 kitchen	-	90	-	55
-1 plant/store room	90	-	-	67
-1 stair	-	90	-	20
-1 corridor	-	90	-	122
-1 bedroom	-	90	-	24
-1 bedroom	-	90	-	23
-1 bathroom	-	90	-	17
-1 bathroom	-	90	-	17
-1 linen store	90	-	-	3
-1 bathroom	-	90	-	19
-1 bedroom	-	90	-	30
-1 bathroom	-	90	-	20
-1 bedroom	-	90	-	29
-1 bathroom	-	90	-	19
-1 bedroom	-	90	-	34
-1 bathroom	-	90	-	19
-1 stair	-	90	-	29
-1 bedroom	-	90	-	19
-1 bathroom	-	90	-	22
-1 bedroom	-	90	-	22
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	39
-1 bathroom	-	90	-	17
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	20
-1 bedroom	-	90	-	23
-1 bathroom	-	90	-	17
-1 bedroom	-	90	-	22
-1 bathroom	-	90	-	21
0 restaurant	-	90	22	171
0 private dining	-	90	22	156

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
0 bar	-	90	22	49
0 store/chiller	90	-	-	13
0 bathroom	-	90	-	31
0 stair	-	90	-	25
0 corridor	-	90	-	50
0 reception	-	90	22	441
0 WC	-	90	-	87
0 back office	90	-	-	174
0 luggage store	90	-	-	11
0 stair	-	90	-	42
1 bedroom	-	90	-	35
1 bedroom	-	90	-	25
1 bathroom	-	90	-	22
1 bathroom	-	90	-	18
1 bathroom	-	90	-	17
1 bathroom	-	90	-	17
1 bedroom	-	90	-	28
1 corridor	-	90	-	19
1 stair	-	90	-	20
1 corridor	-	90	-	14
1 corridor	-	90	-	110
1 bedroom	-	90	-	21
1 bathroom	-	90	-	21
1 bedroom	-	90	-	26
1 bathroom	-	90	-	42
1 bathroom	-	90	-	17
1 bedroom	-	90	-	15
1 bedroom	-	90	-	15
1 bathroom	-	90	-	19
1 bathroom	-	90	-	18
1 bedroom	-	90	-	25
1 bathroom	-	90	-	16
1 bedroom	-	90	-	37
1 bathroom	-	90	-	21
1 bedroom	-	90	-	28
1 bathroom	-	90	-	17
1 stair	-	90	-	29
1 bathroom	-	90	-	19
1 bedroom	-	90	-	28
1 bedroom	-	90	-	22
1 bathroom	-	90	-	19
1 bedroom	-	90	-	24
1 bathroom	-	90	-	17

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1 bathroom	-	90	-	17
1 bedroom	-	90	-	13
2 bedroom	-	90	-	35
2 bathroom	-	90	-	19
2 bathroom	-	90	-	21
2 bedroom	-	90	-	21
2 bedroom	-	90	-	25
2 bathroom	-	90	-	21
2 bedroom	-	90	-	28
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bedroom	-	90	-	25
2 corridor	-	90	-	19
2 corridor	-	90	-	14
2 corridor	-	90	-	10
2 stair	-	90	-	20
2 bedroom	-	90	-	31
2 bedroom	-	90	-	18
2 bedroom	-	90	-	24
2 bedroom	-	90	-	22
2 bedroom	-	90	-	28
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bathroom	-	90	-	17
2 bathroom	-	90	-	19
2 bathroom	-	90	-	19
2 stair	-	90	-	29
2 corridor	-	90	-	22
3 bedroom	-	90	-	30
3 bedroom	-	90	-	43
3 bedroom	-	90	-	25
3 bedroom	-	90	-	21
3 bathroom	-	90	-	21
3 bathroom	-	90	-	17
3 bathroom	-	90	-	19
3 bathroom	-	90	-	21
3 corridor	-	90	-	16
3 corridor	-	90	-	14
3 corridor	-	90	-	10
3 stair	-	90	-	20
3 bedroom	-	90	-	31
3 bedroom	-	90	-	18
3 bathroom	-	90	-	17

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
3 bathroom	-	90	-	17
3 bathroom	-	90	-	17
3 bathroom	-	90	-	19
3 bathroom	-	90	-	19
3 stair	-	90	-	29
3 corridor	-	90	-	22
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	4
3 bedroom	-	90	-	24
3 bedroom	-	90	-	19
3 bedroom	-	90	-	20

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 kitchen	N/A	N/A
-1 kitchen	N/A	N/A
-1 kitchen	N/A	N/A
-1 plant/store room	N/A	N/A
-1 stair	N/A	N/A
-1 corridor	NO (-93.6%)	NO
-1 bedroom	NO (-73.1%)	NO
-1 bedroom	NO (-46%)	NO
-1 bathroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 linen store	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-91.3%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-76.1%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-63.8%)	NO
-1 bathroom	N/A	N/A
-1 stair	N/A	N/A
-1 bedroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-66.4%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-74.2%)	NO
-1 bathroom	N/A	N/A
-1 bathroom	N/A	N/A
-1 bedroom	NO (-27.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 bedroom	YES (+2.1%)	NO
-1 bathroom	N/A	N/A
-1 bedroom	NO (-69.5%)	NO
-1 bathroom	N/A	N/A
0 restaurant	NO (-23.4%)	NO
0 private dining	NO (-91.9%)	NO
0 bar	NO (-43.9%)	NO
0 store/chiller	N/A	N/A
0 bathroom	N/A	N/A
0 stair	N/A	N/A
0 corridor	N/A	N/A
0 reception	NO (-38.4%)	NO
0 WC	NO (-89.1%)	NO
0 back office	NO (-54.4%)	NO
0 luggage store	N/A	N/A
0 stair	N/A	N/A
1 bedroom	NO (-8.5%)	NO
1 bedroom	NO (-58.5%)	NO
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-64.3%)	NO
1 corridor	N/A	N/A
1 stair	N/A	N/A
1 corridor	N/A	N/A
1 corridor	NO (-79.6%)	NO
1 bedroom	NO (-81%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-87.5%)	NO
1 bathroom	NO (-64.6%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-53%)	NO
1 bedroom	NO (-45.7%)	NO
1 bathroom	NO (-83.3%)	NO
1 bathroom	N/A	N/A
1 bedroom	N/A	N/A
1 bathroom	N/A	N/A
1 bedroom	NO (-82.5%)	NO
1 bathroom	NO (-88.1%)	NO
1 bedroom	NO (-78%)	NO
1 bathroom	N/A	N/A
1 stair	NO (-71.1%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-38.4%)	NO
1 bedroom	NO (-55.6%)	NO
1 bathroom	N/A	N/A
1 bedroom	NO (-57.1%)	NO
1 bathroom	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1 bathroom	N/A	N/A
1 bedroom	NO (-60.4%)	NO
2 bedroom	NO (-65%)	NO
2 bathroom	N/A	N/A
2 bathroom	NO (-76.8%)	NO
2 bedroom	NO (-65.4%)	NO
2 bedroom	NO (-66.9%)	NO
2 bathroom	N/A	N/A
2 bedroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bedroom	NO (-76.2%)	NO
2 corridor	N/A	N/A
2 corridor	N/A	N/A
2 corridor	N/A	N/A
2 stair	N/A	N/A
2 bedroom	NO (-67.5%)	NO
2 bedroom	NO (-57.9%)	NO
2 bedroom	NO (-66.9%)	NO
2 bedroom	NO (-65.7%)	NO
2 bedroom	NO (-52.2%)	NO
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 bathroom	N/A	N/A
2 stair	NO (-63.9%)	NO
2 corridor	N/A	N/A
3 bedroom	NO (-75.2%)	NO
3 bedroom	NO (-92.3%)	NO
3 bedroom	NO (-69%)	NO
3 bedroom	NO (-57.3%)	NO
3 bathroom	NO (-84.1%)	NO
3 bathroom	N/A	N/A
3 bathroom	NO (-91.5%)	NO
3 bathroom	N/A	N/A
3 corridor	YES (+46.4%)	NO
3 corridor	YES (+257.4%)	NO
3 corridor	YES (+248.5%)	NO
3 stair	N/A	N/A
3 bedroom	NO (-64.6%)	NO
3 bedroom	NO (-78.4%)	NO
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 bathroom	N/A	N/A
3 stair	NO (-61.7%)	NO
3 corridor	YES (+150.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
3 bedroom	NO (-76%)	NO
3 bedroom	NO (-75.2%)	NO
3 bedroom	NO (-75%)	NO
3 bedroom	NO (-76%)	NO
3 bedroom	N/A	N/A
3 bedroom	N/A	N/A
3 bedroom	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1410.1	1410.1
External area [m^2]	1824.8	1824.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	624.21	879.39
Average U-value [W/m^2K]	0.34	0.48
Alpha value* [%]	10.1	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
100	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	8.75	16.77
Cooling	3.68	5.35
Auxiliary	0.37	1.77
Lighting	12.42	22.23
Hot water	215.48	179.71
Equipment*	32.07	32.07
TOTAL**	**205.64**	**225.83**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	3.28	0
Wind turbines	0	0
CHP generators	35.06	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	203.46	227.43
Primary energy* [kWh/m^2]	256.94	407.51
Total emissions [kg/m^2]	39.4	62.2

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	77.8	75.8	4.9	4.3	0	4.41	4.86	4.5	6.5
	Notional	0	0	0	0	0	0	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	528.5	2.1	33.3	0.1	2.6	4.41	4.86	4.5	6.5
	Notional	90.7	84.5	9.8	6.2	0	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	560.6	10.6	60.9	0.8	12.6	2.56	3.79	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.2	1K000000:Surf[1]
Floor	0.2	0.18	1K000000:Surf[0]
Roof	0.15	0.16	1P000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.45	1C000000:Surf[2]
Personnel doors	1.5	1.8	0R000001:Surf[6]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Appendix 5

Chalton Street
LoadTracker CHP (XRGI 9G)
Carbon Reduction Assessment (CRA)

Please note that the results presented in this assessment are specific to XRGI 9G LoadTracker

Number of CHP units at 9 kWe	1
Recommended heat storage vessel	At least 500 ltr per CHP
Type of usage	Hotel

1.0 Summary of Usage:

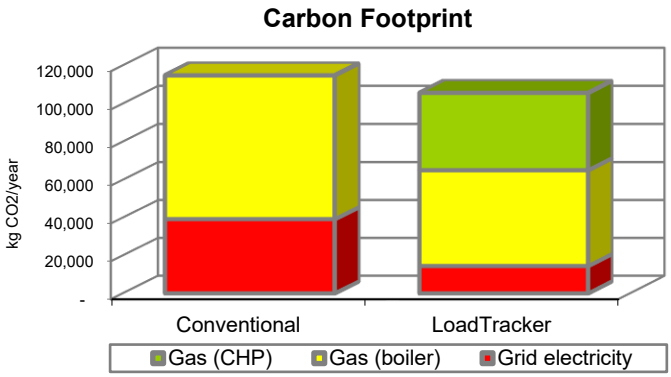
Annual electricity consumption	75,553 kWh
Electricity price (without CCL)	13.19 p/kWh
Annual gas consumption	349,776 kWh
Gas price (without CCL)	3.48 p/kWh

1.1 CO2 Emission Factors used:

- For grid electricity = 0.519 kg/kWh
- For grid displaced electricity = 0.519 kg/kWh
- For gas = 0.216 kg/kWh

2.0 Carbon Footprint of Project User Centre:

CO_2 (conv)	114,764 kg CO_2 pa (a)
CO_2 (CHP)	105,601 kg CO_2 pa (b)
Net reduction	9,163 kg CO_2 pa



By introducing a CHP, a reduction of 9.2 tonnes of CO_2 emissions (9,163/114,764 = 8%) could be expected relative to a conventional mains supply/gas boiler system.

Notes:

(a) = (electricity consumption x 0.519) + (gas consumption x 0.216)

=(75,553 kWh x 0.519) + (349,776 kWh x 0.216) = 114,764 CO_2 pa

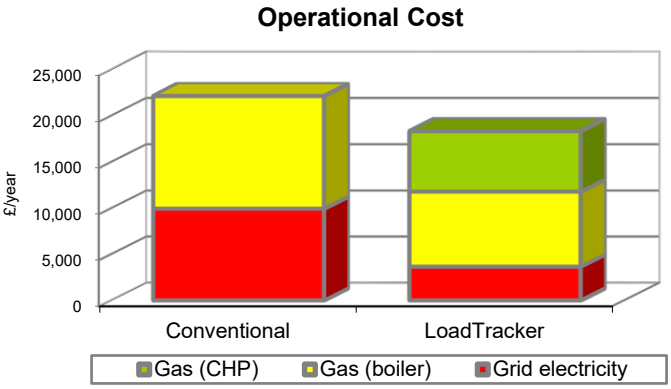
(b) = (CHP gas consumption x 0.216) + (supporting boiler gas consumption x 0.216) + (electricity consumption x 0.519) - (CHP electricity production x 0.519)

=(187,764 kWh x 0.216) + (234,350 kWh x 0.216) + (75,553 kWh x 0.519) - (47,761 kWh x 0.519) = 105,601) kg CO_2 pa

3.0 Cost Savings:

Comparisons are shown between the operational costs of a conventional system (mains supply/gas boiler) and 1 x LoadTracker 9G CHP unit.

	Conv.	CHP
Electricity	£9,965 (c)	£3,666 (d)
Gas (Boiler)	£12,172 (e)	£8,155 (f)
Gas (CHP)	0	£6,534 (g)
Total	£22,138	£18,355



The use of LoadTracker CHP would result in annual savings of £22,138 - £18,355 = £3,782 pa relative to a conventional mains supply/boiler system.

Notes:

(c) = 75,553 kWh x 0.1319 £/kWh = £9,965

(d) = Assessed by LoadTracker programme

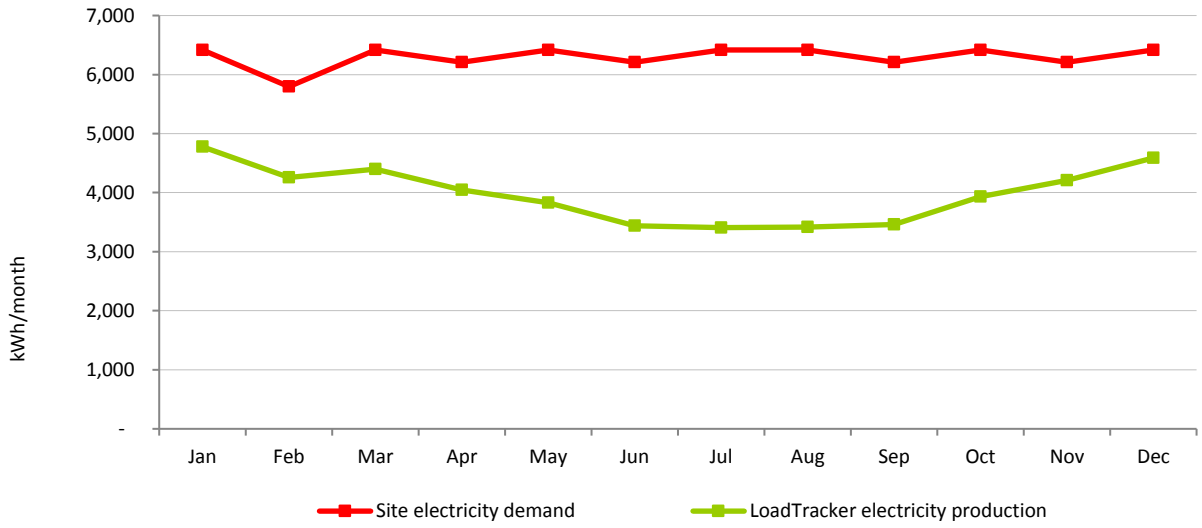
(e) = 349,776 kWh x 0.0348 £/kWh = £12,172

(f) = Assessed by LoadTracker programme

(g) = Assessed by LoadTracker programme

4.0 LoadTracker CHP Contribution to Electrical Needs of User Centre

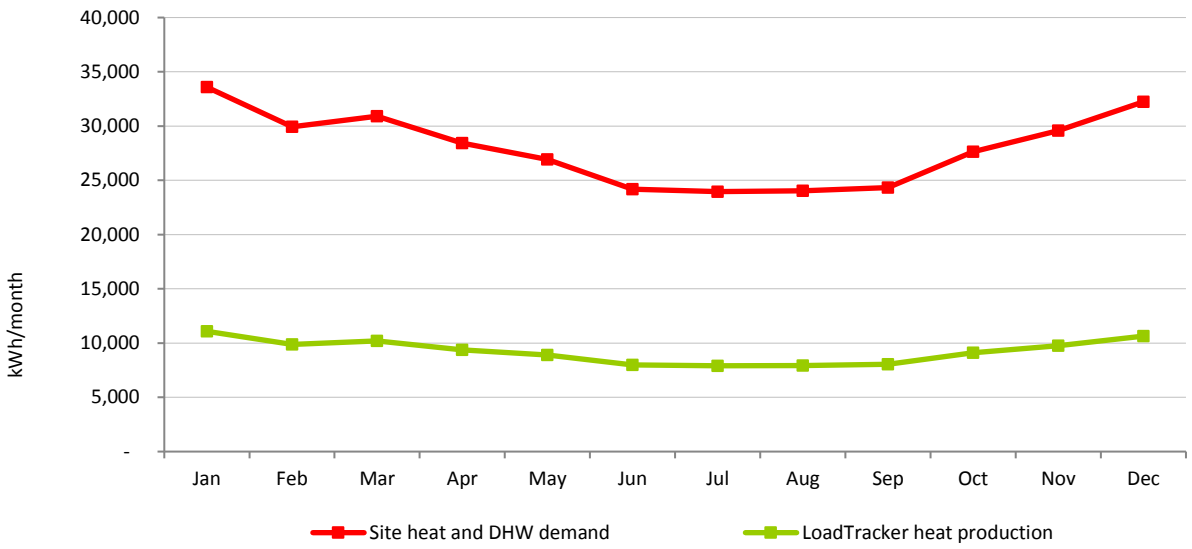
Typical seasonal variations in electricity consumption have been assumed, in producing an approximate consumption pattern for the User Centre.



CHP accounts for 47,761 kWh / 75,553 kWh = 63% of electricity requirements of the User Centre.

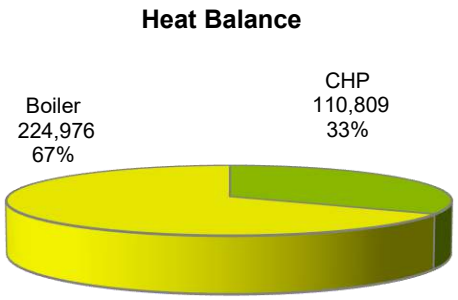
5.0 LoadTracker CHP Contribution to Heat Needs of User Centre

Similarly to item 4.0, typical seasonal variations in heat requirements have been assumed.
The CHP LoadTracker units can maintain a similar profile for heat production, as shown below:



6.0 Heat Balance for User Centre

Heat consumption by User Centre	335,785 kWh (h)
Heat production (CHP)	110,809 kWh (i)
Heat production (boiler)	224,976 kWh (j)
Consumption by boiler	234,350 kWh (k)



It can be seen that CHP account for 110,809 kWh/335,785 kWh = 33% of heat requirements of the user

Notes:

(h) = 349,776 kWh @ 96% (assumed boiler efficiency) = 335,785 kWh
(i) = Assessed by LoadTracker programme, to give max possible CHP usage
(j) = Net difference (h) - (i)
(k) = Heat production (j) factored up assuming 96% efficiency = 224,976/0.96

Appendix 6

FBT - FLUSHING BYPASS TAPPING

- ISOLATION VALVE

STR - STRAINER

T - TEMPERATURE SENSOR

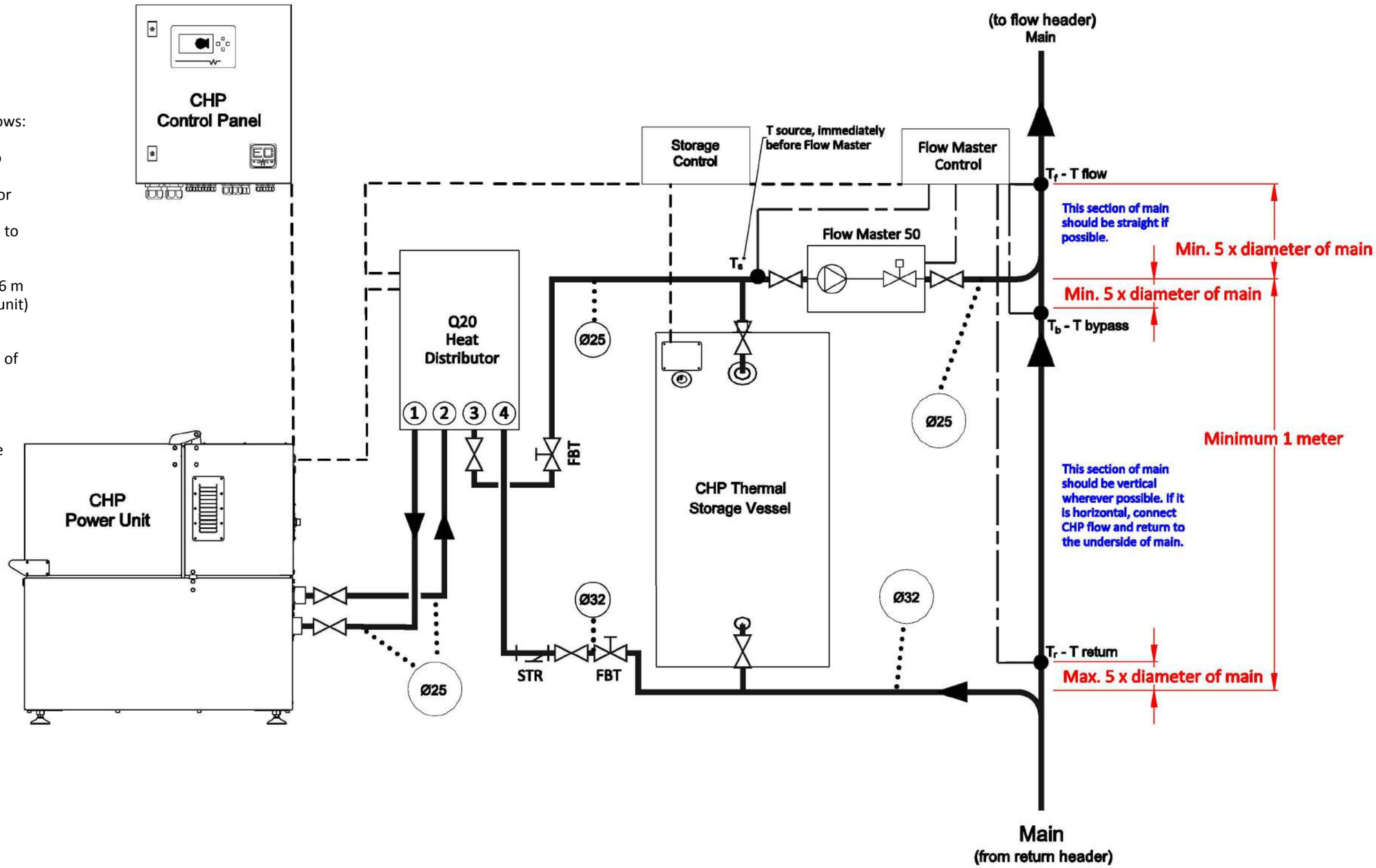
CHP system components should be located in close proximity to each other. Recommended lengths for mechanical connections are as follows:

- max. 1.5 m from power unit to heat distributor
- max. 10 m from heat distributor to storage vessel
- max. 10 m from storage vessel to the main

The Q20 must be fitted at least 0.96 m from the floor (higher than power unit)

Consideration must be given to thermal expansion and contraction of CHP secondary side.

Flow Master temperature sensors should be installed in the screw-in pockets (35 mm fitting length, male thread $\frac{1}{2}$" pipe).



EC POWER
SAV SYSTEMS
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LoadTracker CHP Energy Centre

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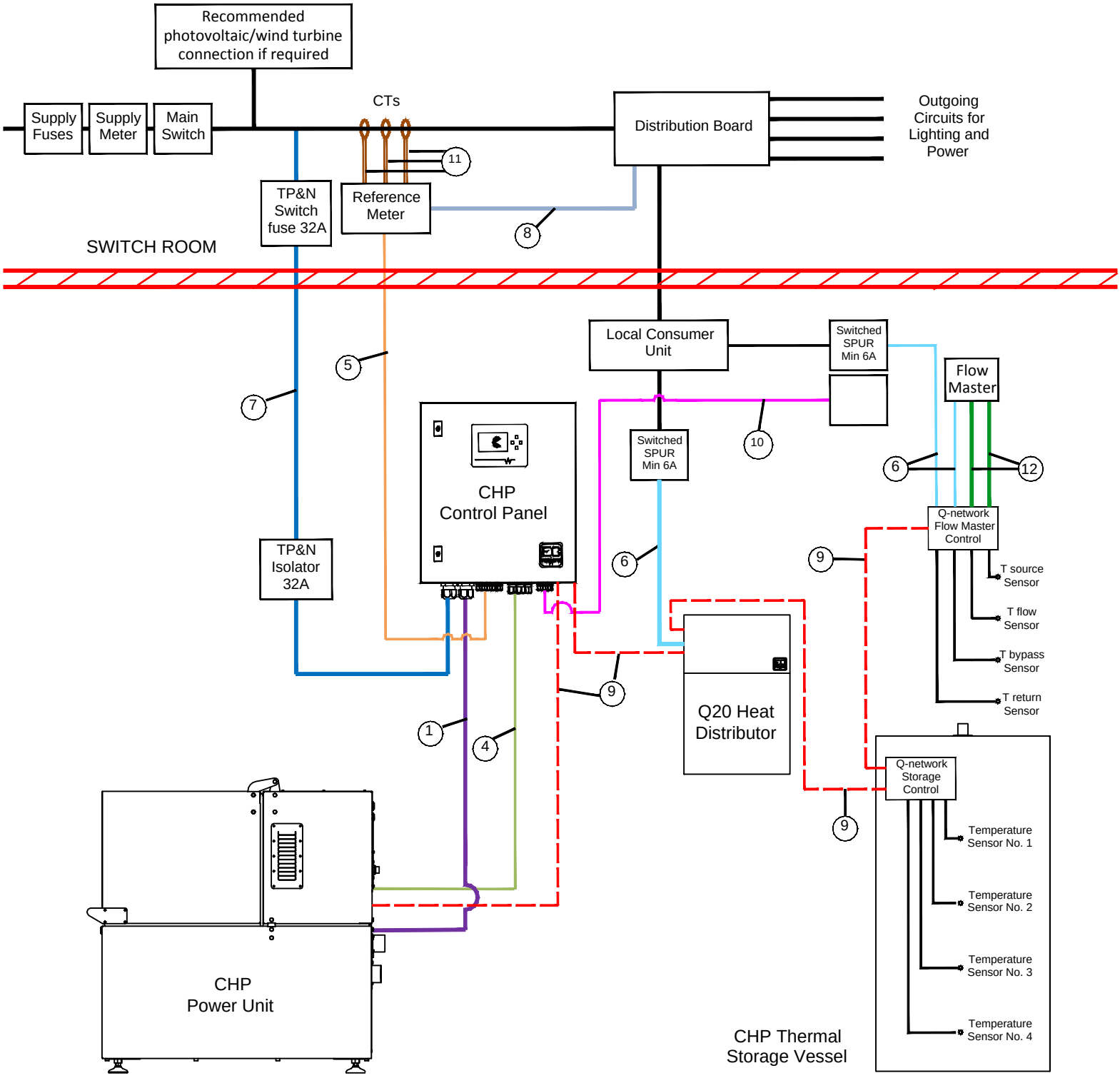
Drawn EC-Power | Date 19/05/2016 | Scale n/a

Checked | Date

1xCHP (XRGI 6 or XRGI 9) with Flow Master 50

Drawing No SAV-02-010-1959 | Rev D



Cables provided by SAV	Cables to be provided by installer
1 — 6 mm², 4 core SY, LSF	7 — to mains, 400V, 5 core, 3 phase, 32 A
4 — 0.75 mm², 3 core SY, LSF	8 — 6 amps, 4 core, 3 phase, SY
5 — 0.75 mm², 2 core, signal cable screened, LSF	9 — CAT 6 network cable, RJ45 connectors
6 — 1 phase, power connector lead	10 — link to gas solenoid valve/BMS, min. 0.75 mm², 3 core
12 — Signal cables for control	11 — brown, 2.5 mm² 6491b

Notes:

1. The supply to the CHP must be taken from a point after the main switch fuse but before the CTs and distribution boards.
2. If using a panel board, the panel manufacturer must be informed at the planning stage to allow sufficient room for the CTs.
3. Standard CTs supplied by SAV are rated at 300 amps. Larger CTs (up to 2000 amps) are available on request.
4. If the incoming supply is higher than 2000 amps, the reference meter and CTs can be dispensed with.

SAV SYSTEMS
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Single XRGI 6 / XRGI 9 LoadTracker CHP electrical connections
Drawing No SAV-02-010-1979

04/06/2015
Rev B

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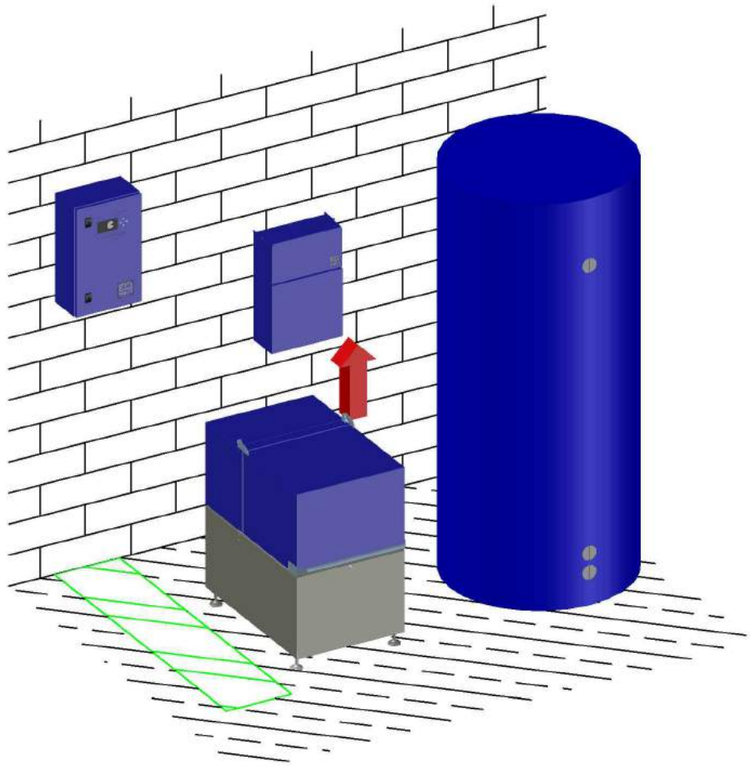
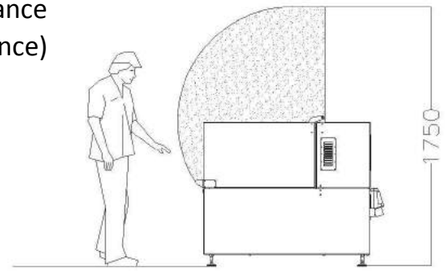


Ensure minimum 500-mm clearance in front of CHP Power Unit and 790-mm above for maintenance (i.e. 1750 floor to open lid clearance)



Equipment

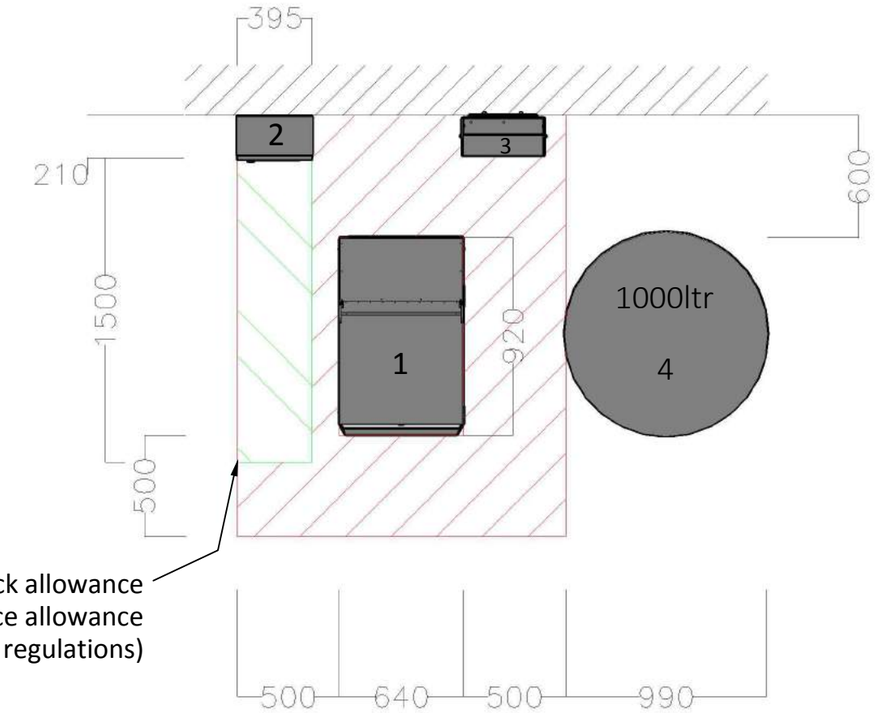
1.	CHP Power Unit	(440 kg)	H 960	D 920	W 640
2.	CHP Control Panel	(30 kg)	H 595	D 210	W 395
3.	Q20 Heat Distributor	(25 kg)	H 600	D 195	W 400
4.	Thermal Storage Vessel	(1133 kg)	H 2300	Ø 990	

CHP system components should be located in close proximity to each other. Recommended lengths for mechanical connections are as follows:

- max. 1.5 m from power unit to heat distributor
- max. 10 m from heat distributor to storage vessel
- max. 10 m from heat distributor to the mains

A minimum of 250 mm clearance between the back of the power unit and the flue is required for maintenance. Please allow for suitable horizontal flue pieces before any vertical flue sections.

The Q20 must be fitted at least 960mm from the floor (higher than the power unit).



Space reserved for throw back allowance (installer to ensure space allowance conforms to latest electrical regulations)

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LoadTracker CHP Energy Centre

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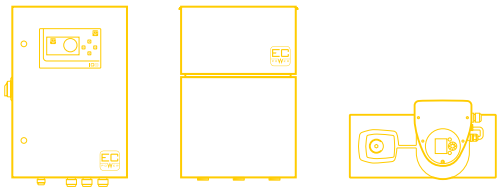
Drawn	JWHH	Date	22/07/2015	Scale	-
Checked		Date			

1 x XRGI 6 or XRGI 9 with 1 x 1000 ltr thermal storage vessel

Drawing No	SAV-01-010-1952	Rev	A



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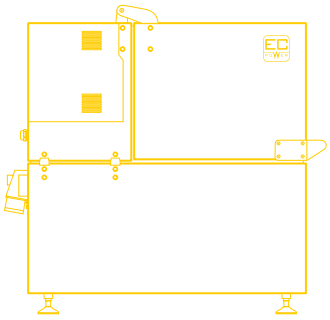

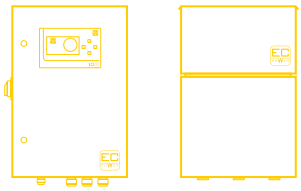

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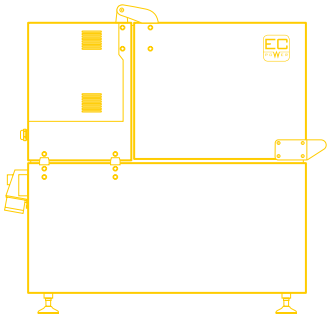


XRGI® 9

TECHNICAL DATA

EC POWER SAV SYSTEMS

TECHNICAL DATA FOR THE XRGI® 9

Product data sheet in accordance with Regulation (EU) No. 811/2013, Dated 26.09.2015

A++

The XRGI® is a combined heat and power plant (CHP) that works on the principle of cogeneration.
An XRGI® system consists of three main components – the Power Unit, Q-Heat Distributor and the iQ-Control Panel. In a package with a Flow Master (temperature controll, class II = 2 %) the XRGI® is rated as seasonal space heating energy efficiency class A+++.

In addition, you can also extend your XRGI® system with a storage tank with a capacity of 500, 800 or 1,000 litres for optimum operation.

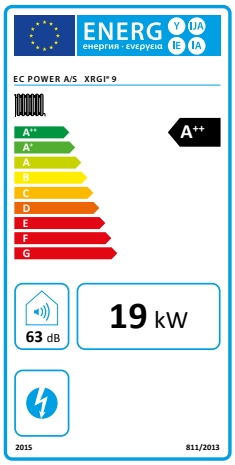
ORDERING DATA

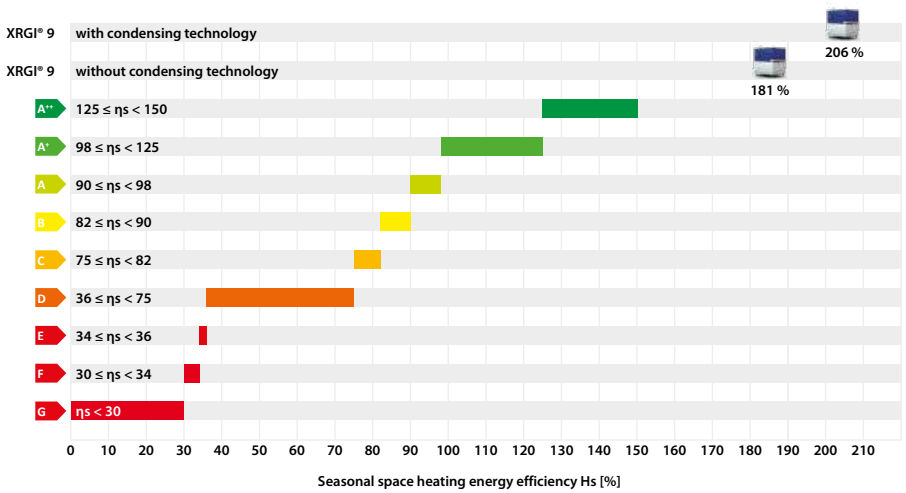
Supplier's name or trademark	EC POWER	
Supplier's model identifier	**XRGI® 9 without condensing technology[1]**	**XRGI® 9 with condensing technology[1]**
Article number	X090001	X090001+01KIT2616
Modules	Power Unit, iQ10-Control Panel, Q20-Heat Distributor	Power Unit, iQ10-Control Panel, Q20-Heat Distributor + Condensing and exhaust gas heat exchanger kit

ErP-LABEL DATA[2]

Seasonal space heating energy efficiency class		A++	A++
Rated heat output	P_{rated}	19 kW	21 kW
Seasonal space heating energy efficiency; Hs	η_s	**181 %** [1]	**206 %**
Sound power level, indoors	L_{WA}	63 dB	63 dB
Electrical efficiency; in accordance with heating value Hi	$\eta_{el\ CHP100+SUP\ 0}$	30 %	31 %
All special precautions to be taken during assembly, installation or service		Refer to Commissioning and Service Manual	Refer to Commissioning and Service Manual

[1] Return temperatures as per EN 50465 2015 7.6.1: Without condensing technology 47 °C, with condensing technology 30 °C.
[2] The values were rounded in accordance with the requirements governing product data sheets by Regulation (EU) No. 811/2013.





OUTPUT

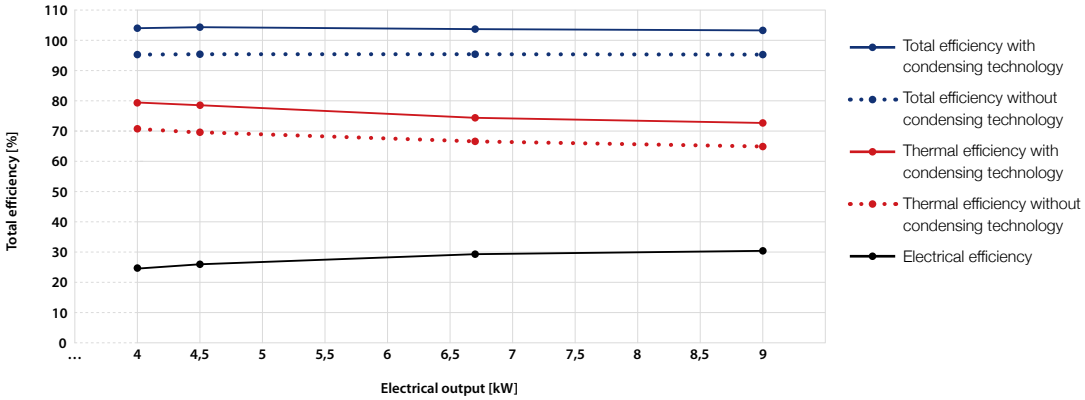
XRGI® system			XRGI® 9 without condensing technology[1]			XRGI® 9 with condensing technology[1]		
Power modulation*			50 %	75 %	100 %	50 %	75 %	100 %
Electrical output, modulating*		kW	4.5	6.8	9.0	4.5	6.8	9.0
Thermal output, modulating*		kW	12.0	15.4	19.2	13.5	17.2	21.3
Power consumption, gas	in accordance with Hi	kW	17.3	23.2	29.5	17.2	23.1	29.3
Electrical own demand, production		kW	0.101	0.100	0.099	0.102	0.101	0.100
Electrical own demand, stand-by		kW		0.024			0.024	

EFFICIENCIES & OPERATING PARAMETERS

Power modulation*			50 %	75 %	100 %	50 %	75 %	100 %
Electrical efficiency	in accordance with Hi	%	25.9	29.3	30.4	25.9	29.4	30.6
Thermal efficiency	in accordance with Hi	%	69.6	66.1	64.9	78.5	74.4	72.7
Total efficiency	in accordance with Hi	%	95.4	95.4	95.3	104.3	103.7	103.3
Seasonal space heating energy efficiency in operating mode [2,3]	η_{son}	%		186			211	

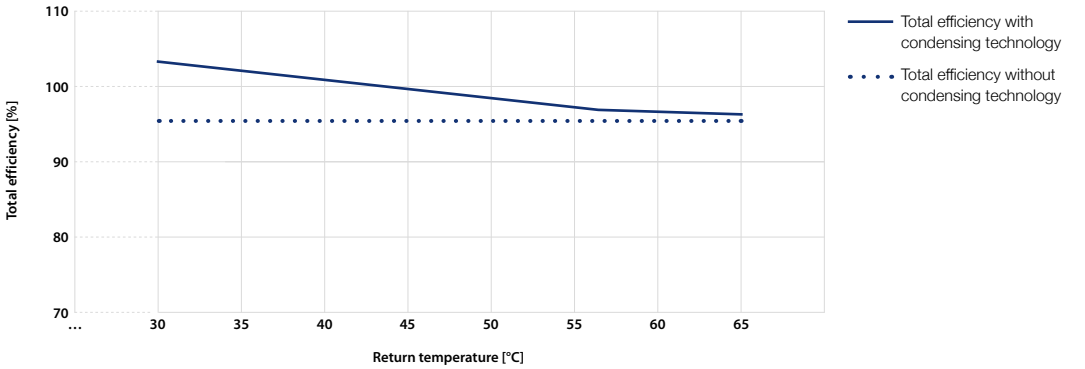
POWER MODULATION

Continuous modulation of 4 – 9 kW in power-controlled mode



TOTAL EFFICIENCY AT FULL LOAD

XRGI® 9 total efficiency / return temperature



* Continuous modulation in power-controlled mode

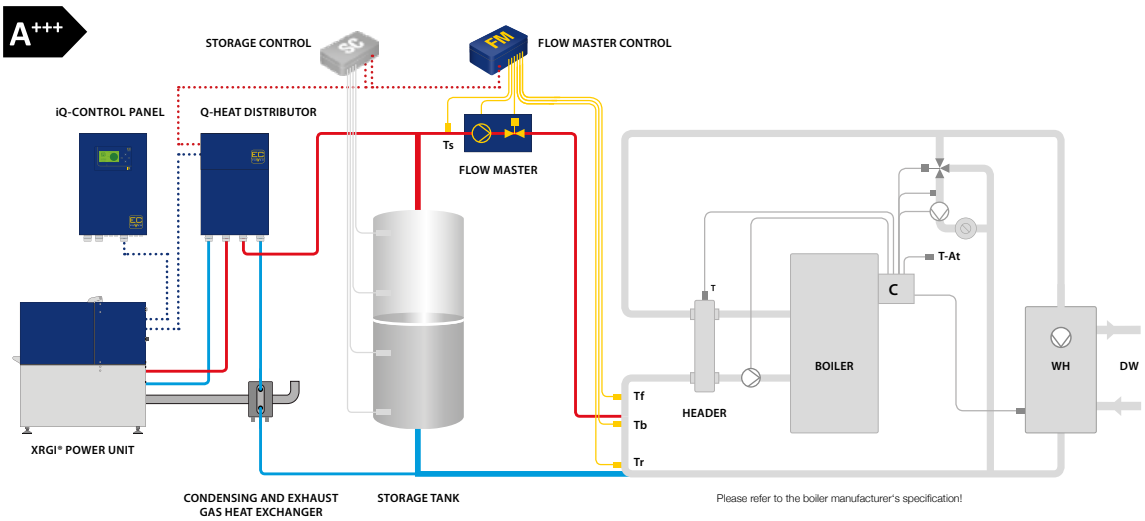
[1] Return temperatures as per EN 50465 2015 7.6.1: Without condensing technology 47 °C, with condensing technology 30 °C.

[2] Based on the values measured by the Danish Gas technology Center and accredited independent third-party organisations.

[3] Efficiency at rated heat output as per the delegated Commission Regulation (EU) No. 811/2013

HYDRAULIC INTEGRATION

Principle circuit diagram: Series circuit with injection – boiler with header



More principle circuit diagrams and information can be found in the EC POWER „Hydraulic Solutions“.

NOTE:
If products from other companies are used in the system in addition to EC Power products, EC POWER assumes no liability for the accuracy of the energy efficiency class calculation for the entire system.

XRGI® system		XRGI® 9 without condensing technology[1]	XRGI® 9 with condensing technology[1]
Flow temperature, constant	°C	~ 80	~ 80
Return temperature, variable	°C	5-70	5-70

FUELS

Natural gas (all qualities), propane, butane	yes	yes

EXHAUST GAS

Power modulation			50 %	75 %	100 %	50 %	75 %	100 %
Max. exhaust gas temperature		°C	-	-	100	-	-	90
Condensate		kg/h	-	-	-	1.9	2.3	2.6
Emissions (test data)	CO < 70	mg/Nm³	-	-	52	-	-	55
	NOx < 100	mg/Nm³	-	-	52	-	-	54

SOUND

Sound pressure level at a distance of up to 1 m (based on surroundings)	dB(A)	49

POWER CONNECTION

Voltage, 3 phases + N + Earth	V	400
Frequency	Hz	50

SERVICE

Service interval (operating hours)	Hours	10,000

DIMENSIONS AND WEIGHT

		XRGI® 9 Power Unit	Q20-Heat Distributor	iQ10-Control Panel
Dimensions, W x H x D	mm	640 x 960 x 920	400 x 600 x 195	400 x 600 x 210
Footprint	m²	0.59	wall mounted	wall mounted
Weight	kg	440	25	30

All values are net and have been certified by an independent inspection body. Tolerance ±5 %.
Specifications subject to change without notice.

TECHNICAL DATA FOR THE XRGI® 9 WITH FLOW MASTER

(Temperature control, Class II = 2 %)

Product data sheet in accordance with Regulation (EU) No. 811/2013, Dated 26.09.2015

Q20 iQ10 FM

Figure shows FM type 350

A+++

The Flow Master including Flow Master Control regulates the supply of heat from the XRGI® and from the storage tank to the consumer network. This technology enables a significantly higher heat output to be temporarily made available to the consumer side. This allows peaks of heat demand to be handled by the XRGI®, thereby extending its service life and increasing electricity production.

The 4 models can deliver a heat output of 50, 150, 250 or 350 at a ΔT of 20 K.

ORDERING DATA

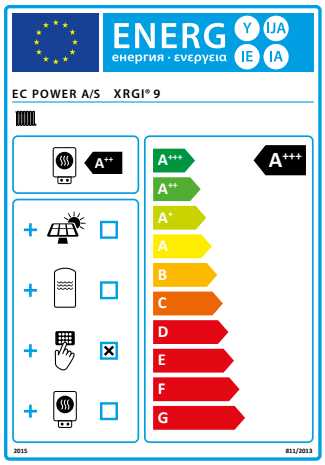
Supplier's name or trademark	EC POWER			
Supplier's model identifier	**XRGI® 9 without condensing technology[1]**		**XRGI® 9 with condensing technology[1]**	
Article number	X090001		X090001+01KIT2616	
Modules	Power Unit, iQ10-Control Panel, Q20-Heat Distributor		Power Unit, iQ10-Control Panel, Q20-Heat Distributor + Condensing and exhaust gas heat exchanger kit	
Supplier's model identifier	**Flow Master including Flow Master Control**			
FM-type (Temperature control, Class II = 2 %) 2	**FM 50**	**FM 150**	**FM 250**	**FM 350**
Article number	17D1130	17D1131	17D1132	17D1133

ErP-LABEL DATA[2]

Seasonal space heating energy efficiency class of package	A+++	A+++
Seasonal space heating energy efficiency of package 5	**183 %**	**208 %**

[1] Return temperatures as per EN 50465 2015 7.6.1: Without condensing technology 47 °C, with condensing technology 30 °C.

[2] The values were rounded in accordance with the requirements governing product data sheets by Regulation (EU) No. 811/2013.



The energy efficiency of the package of products provided for in this fiche may not correspond to its actual energy efficiency once installed in a building, as this efficiency is influenced by further factors such as heat loss in the distribution system and the dimensioning of the products in relation to building size and characteristics.

Seasonal space heating energy efficiency of the space heater with cogeneration — 1 — **181** %

Temperature control (From fiche of temperature control): Class I = 1 %, Class II = 2 %, Class III = 1,5 %, Class IV = 2 %, Class V = 3 %, Class VI = 4 %, Class VII = 3,5 %, Class VIII = 5 %, — 2 — + **2** %

Supplementary boiler (From fiche of boiler): Seasonal space heating energy efficiency in % — 3 — ( ) -'I') x 'II' = − %

Solar contribution (From fiche of solar device)

Collector size (in m²)	Tank volume (in m³)	Kollektorwirkungsgrad (in %)	Tank rating A⁺ = 0,95, A = 0,91, B = 0,86, C = 0,83, D-G = 0,83

('III' x) + 'IV' x) x 0,7 x (/ 100) x = — 4 — + %

5

Seasonal space heating energy efficiency of package — **183** %

Seasonal space heating energy efficiency class of package

G	F	E	D	C	B	A	A+	A++	A+++
< 30 %	≥ 30 %	≥ 34 %	≥ 36 %	≥ 75 %	≥ 82 %	≥ 90 %	≥ 98 %	≥ 125 %	≥ 150 %
									✖

We reserve the right to make technical modifications!

Q20-/Q80-HEAT DISTRIBUTOR

STRUCTURE

The Q-Heat Distributor plays an important role in the XRGI® system. It:

- Separates the (primary) engine circuit from the heating network
- Protects the primary circuit
- Controls the engine temperature
- Controls the system temperature
- Manages loading and unloading of the storage tank
- Manages energy flows

Fig. 1. - Q20/Q80

Fig. 2. - Q20

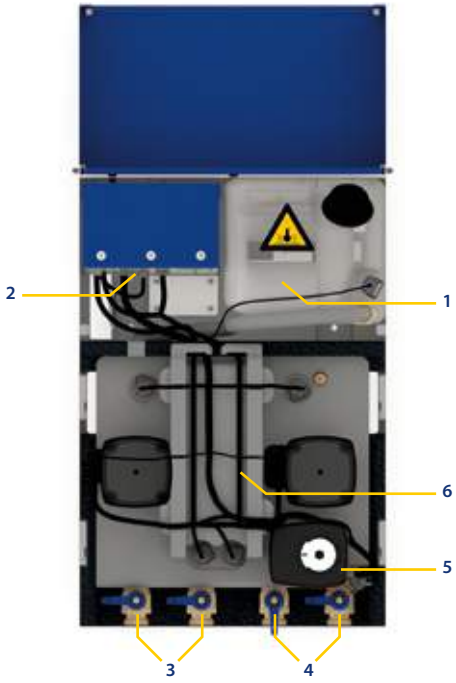
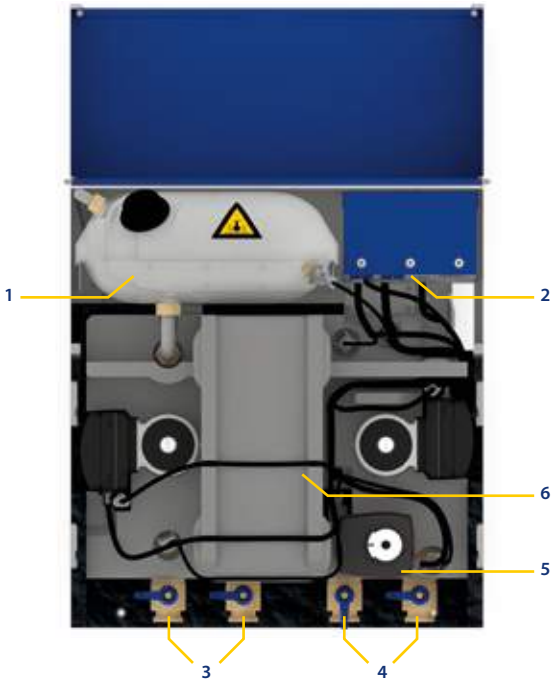


Fig. 3. - Q80



Key:

1. Cooling water expansion tank
2. Two connections for Q-Network an two for the iQ-Control Panel an Power Unit.
3. Power Unit connections
4. Storage tank connections
5. Mixer to control the engine temperature
6. Plate heat exchanger

DIMENSIONS AND CONNECTIONS

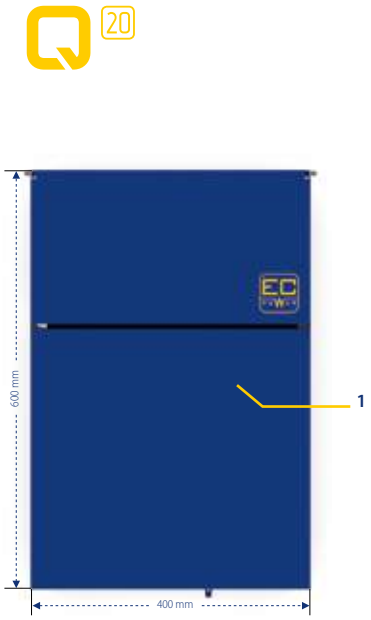


Fig. 4.

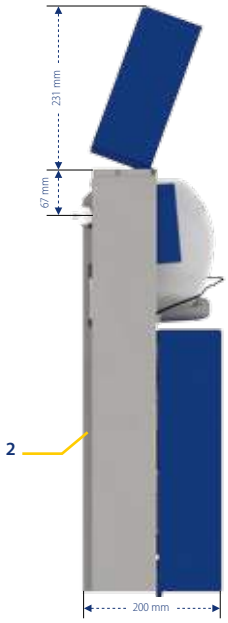


Fig. 5.

Key:

1. Cover (insulated)
2. Installation plate
3. Power Unit return (1“ PT)
4. Power Unit flow (1“ PT)
5. Storage tank connection (1“ PT)
6. Storage tank connection (1“ PT)

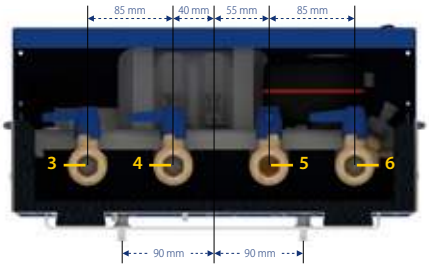


Fig. 6.

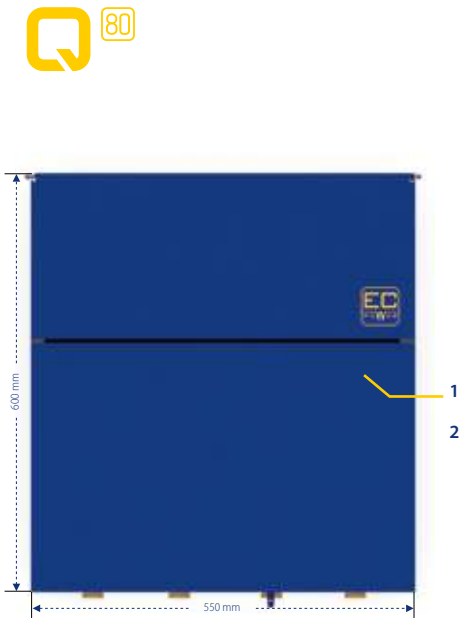


Fig. 7.

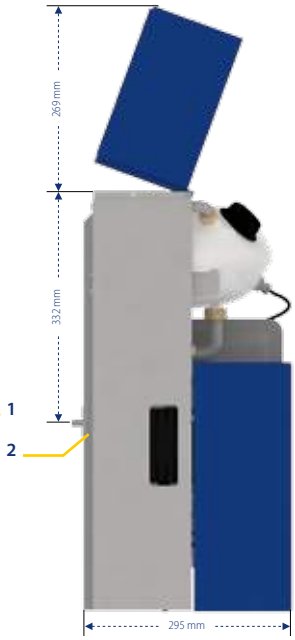


Fig. 8.

Key:

1. Cover (insulated)
2. Installation plate
3. Power Unit return (1 ¼“ PT)
4. Power Unit flow (1 ¼“ PT)
5. Storage tank connection (1 ¼“ PT)
6. Storage tank connection (1 ¼“ PT)

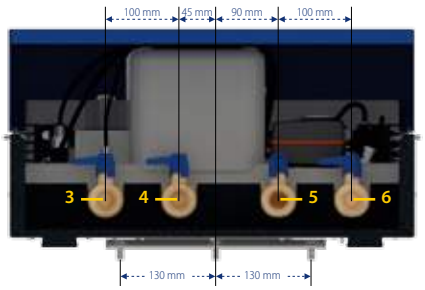


Fig. 9.

FUNCTION

The Q-Heat Distributor separates the engine circuit (Power Unit cooling water circuit) from the heating system via a plate heat exchanger. The cooling water expansion tank thus protects the engine circuit. The circulation pump for the engine circuit is fitted to the bottom left of the primary Q-Heat Distributor circuit. Once the Q-Heat Distributor is connected to the mains the circulation pumps run for 5 – 10 seconds to check that they are working properly.

The pumps do not need to be configured. They start together with the Power Unit, and stop approx. 10 – 20 minutes after the Power Unit switches off. The power is controlled by the Q-Heat Distributor as required. The storage charging group (bottom right of the Q-Heat Distributor) controls the engine temperature via the assigned mixer and the speed-controlled circulation pump. The system is designed to maximise the storage charging temperatures (80 - 85 °C).

CONFIGURATION

The Q-Heat Distributor does not need to be adjusted after installation.

TECHNICAL DATA

	Q 20	Q 80
DIMENSIONS		
Dimensions (H x W x D) mm	600 x 400 x 195	600 x 550 x 295
Weight (kg)	25	44
CONNECTIONS		
Pipe (PT)	1“	1 ¼“
Storage charging circuit	Grundfos: UPM3 15-75 130	Grundfos: UPMXL 25-125 180
Engine water circuit	Grundfos: UPM3 15-75 130	Grundfos: UPMXL 25-125 180
Q-Network connections	Storage Control Flow Master	Storage Control Flow Master
Power consumption at full load (W)		
Stand-by consumption (W)		
ENGINE WATER CIRCUIT		
Engine heat output (kW)	5 – 20	20 – 80
Permissible cooling water temp. inlet (°C)	95	95
Permissible cooling water temp. outlet (°C, controllable)	80 – 90	80 – 90
Max. permissible pressure in the system (bar)	1,0	1,0
Colling water circulation quantity (m^3/h, controllable)	1,0 – 2,1	2,5 – 5,8
Protective valve (bar)	1	1
PUMP ENGINE WATER CIRCUIT		
Manufacturer	GRUNDFOS	GRUNDFOS
Type	UPM3 15-75 130	UPMXL 25-125 180
Max. transport height (m)	7,5	12,5
Max. transport volume flow: XRGI® 15 (Q80) / XRGI® 9 (Q20) m^3/h)	2,1	5,8
Pump housing material	Cast iron GS 111B0003	Cast iron EN-GJL-150
Wheel material	Composite	Composite
Type of pipe connection	Rear connection	Rear connection
Nominal pressure (bar)	10	10
Permissible media temperature (°C)	95 (110)	95 (110)
Net weight (dry) (kg)	1,8	2,4
Colour	Aluminium black pump head	Aluminium black pump head
Control signal	PWM	PWM

	Q 20	Q 80
STORAGE CHARGING CIRCUITS		
Thermal capacity **(kW,** adjustable)	5 – 20	20 – 80
Vokume flow **(m^3/h,** adjustable)	1,0 – 2,3	2,5 – 6,0
Permissle floe temperature **(°C,** adjustable)	80 – 90	80 – 90
Max. permissible return temperature **(°C)**	70	75
Max. permissible pressure in the system **(bar)**	10	10
Protective valve **(bar)**	na	na
PUMP STORAGE CHARGING CIRCUIT		
Manufacturer	GRUNDFOS	GRUNDFOS
Type	UPM3 15-75 130	UPMXL 25-125 180
Max. transport height **(m)**	7,5	12,5
Max. transport valume flow **(m^3/h)**	3	6
Pump housing material	Cast iron GS 111B0003	Cast iron EN-GJL-150
Wheel material	Composite	Composite
Type of pipe connection	Rear connection	Rear connection
Nominal pressure **(bar)**	10	10
Permissible media temperature	95 (110)	95 (110)
Net weight (dry) **(kg)**	1,8	2,4
Colour	Aluminium unpainted pump head	Aluminium black pump head
Control signal	PWM	PWM

Sole UK Distributors of EC Power Denmark Products

XRGI 6G & 9G Load Tracker CHP Energy Centre

Warranty & Service Document

Dated 18 September 2014

18 September 2014

XRGI 6G & 9G Load Tracker CHP Energy Centre

WARRANTY

- SAV Systems warranty for Load Tracker CHP is for a period of 24 months commencing from the date of commissioning, or 90 days from the date of delivery, whichever is the earlier.
- The warranty covers the cost of parts and labour to make good any CHP related breakdown or failure of the CHP equipment which result from defects in manufacture.
- Should servicing or repairs to the equipment be carried out during the warranty period through an agreement *other than that* between the customer and SAV Systems, the warranty would no longer apply.

WATCHMAN Automatic Monitoring & Service Cover UK Price List

CONTINUING CHP MAINTENANCE

Once outside the 24 month warranty period, ***Watchman Automatic Monitoring and Service Cover*** ensures continuing rapid access to spares and specialist labour. Parts and labour for such incidents to be invoiced as and when incurred.

Servicing of a XRGI 6G or 9G CHP power unit should be carried out either:

a) Each time the power unit clocks up 10,000 running hours (equivalent to approximately 14 months operational running 24/7)

Or

b) A calendar back stop of 2 years has elapsed since the previous service, or initial commission. Regulatory Annual Gas Safe certification of the CHP will be required if the CHP service falls into this category.

- Professional Manufacturers scheduled service of the CHP comprising of an oil change (the sump contains 40 litres, thus allowing long intervals between services), cleaning of strainers, replacement of Oil & Air filters, Spark plugs, and other listed manufacturers service related parts, including the safe disposal of all used items. A CHP system Health Check will also be carried out as part of the service. Also included is the cost of service parts, labour and travelling within the UK.

- Gas Safe certification checks on the CHP will be carried out, including checking of emission levels, setting up the CHP engine, and the issue of a CHP Gas Safe certificate, upon the CHP service completion.

- For multi-unit installations, it should be noted that site electrical demand is distributed approximately equally between all units by the CHP load-sharer device. This means that all units at any multi-unit installation should reach the 10,000 hour threshold at around the same time. Arrangements for servicing should therefore be simplified.

- SAV Systems maintain a database of all EC Power CHP installations in the UK and ROI. This database includes the automatic counter for operating hours by each unit. When the counter for a XRGI 6G or 9G CHP unit gets to 9,000 hours from first start or previous service, e-mail notification of this event will be sent by SAV Systems to the client's nominated contact, if given. This is to enable timely arrangements to be made for the next service visit.

- XRGI 6G or 9G CHP units should not normally continue operation beyond a service interval of 10,000 hours, or 2 years' calendar service, from initial commission.

- Should operation of a XRGI 6G or 9G CHP unit from initial commissioning continue beyond the first 10,000 hours, SAV Systems would not consider itself bound by any subsequent warranty claim.

- **Gas certification**. Although Gas Safe certification is an integral part of initial CHP commissioning, please note that it is a legal requirement check due at the 12 month anniversary date from the initial commission, or the last service carried out. SAV can carry out this annual check, to keep certification in line with Gas Safe requirements.

Please see over for CHP service costing's for XRGI 6G & 9G.
(Service prices are slightly higher for the 9G CHP, due to extra service parts required)

CHP XRGI 9G Service Tariffs

XRGI 9G CHP Power Unit Maintenance Service Tariff

XRGI 9G CHP unit: **£1555.00 per CHP**

Annual Gas Safe Certification & Health Check only **£ 465.00 per CHP**
(Separate to CHP main service)

- **CHP professionally serviced iaw the manufacturers schedule using manufacturer's genuine service replacement components.**
- **Gas Safe checks carried out on CHP equipment.**
- **Gas Safe certification issued upon completion.**
- **Ensure combustion & compartment ventilation is correct.**
- **Check of Flue & gas pipework for conformity.**
- **Test Flue flow & spillage rates are satisfactory.**
- **Check of ventilation or Flue fan Interlock for correctness.**
- **Test & record gas working pressures & emmissions.**
- **Issue of Inspection record and Gas Safety certificate**.
- **Check of CHP System for leaks**.
- **Run up of CHP for system operation, including installing any software updates, that the manufacturer has issued.**

Prices are valid for 3 months from Quote date

(Service excludes the replacement of any component found defective during the service, unless the CHP unit is still within the manufacturer's warranty period, and the fault is not caused by an external issue)

GAS safe REGISTER
Registration 543636

18 September 2014

Appendix 7

From: Belk, Jennifer
To: Bianca Chitic
Cc: "Ryan Thrower"; Lopez, Ana
Subject: RE: Potential Connection to Somers Town Network - 53-55 Chalton Street, NW1 1HY
Date: Wednesday, November 23, 2016 1:00:38 PM
Attachments: image003.png

Dear Bianca,

Sincere apologies for the delay in getting back to you regarding the below development.

As you may or may not know, the Somers Town Energy scheme is currently operational along Purchese Street and Polygon Road, close to but not running past your client's development.

We have delivered an extension study for the network and are putting into place firm plans for this. I can, however, confirm that there are no current connection opportunities for your client's development as it would require a pipe run of approximately 270m to the network just for the one connection.

As per our CPG3 guidance, we would however expect that your client's development is future proofed to connect to the Somers Town Energy network as there may be other developments in the vicinity of your client's that also become eligible for connection and that will make extension of the network in this area viable.

If you're happy with this approach, I have a range of questions to forward to you regarding your client's development so we can feed it into our expansion work. Please note that the above is in regards to the connection to the Somers Town Energy network only and you will need to consider the development's compliance with our Sustainability policies in the round.

Also, one clarification from the BRUKL document you sent through. I have derived that you're opting for communal gas boilers to provide heating for your development – can you confirm this?

Let me know if you'd like to proceed with the above approach and please do give me a call to discuss if easier.

Kind regards,

Jen

Jennifer Belk
Senior Sustainability Officer (Low Carbon Energy)

Telephone: 020 7974 5657

From: Bianca Chitic [mailto:bianca.chitic@nrgconsulting.org]
Sent: 16 November 2016 15:58
To: Belk, Jennifer
Cc: 'Ryan Thrower'
Subject: RE: Potential Connection to Somers Town Network - 53-55 Chalton Street, NW1 1HY

Dear Jennifer,

Our Client is preparing to submit his application for Chalton Street and we would appreciate it if you could let us know if it is possible to link this development to Somers Town Heat Network. The Council has strongly advised us to investigate this potential connection and has referred you to be the manager of this network.

I've copied the heat map below for your reference. Feel free to give us a call if you wish to discuss.

Thanks in advance.

Regards,

Bianca Chitic
NRG Consulting
www.nrgconsulting.org

T +44 (0)20 7998 6481
E bianca.chitic@nrgconsulting.org

New address: Studio 7, 3rd Floor, 138-148 Cambridge Heath Road, London, E1 5QJ
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