Hyder

A2Dominion

Bicester Eco Development

Energy Strategy Implementation Plan

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CONTENTS

1 Introduction

This Energy Strategy Implementation plan is provided as a continuation and update to the Exemplar Sustainable Energy Strategy submitted in March 2011 and in addition, the Updated Zero Carbon Calculation Memorandum submitted in July 2011 relative to the NW Bicester eco development planning application; and in direct response to planning condition No. 4 which states:

"That full details of the measures to achieve zero carbon energy use as defined in PPS 1: Eco Towns, through on site solutions, shall be submitted for approval prior to the commencement of development. Should it be demonstrated to the satisfaction of the local planning authority that it is not possible to achieve zero carbon on site, a scheme for off site mitigation in Bicester shall be provided, prior to the first residential occupation, for that portion of the energy use that cannot be met on site."

This Energy Strategy Implementation Plan includes updated energy model showing the carbon balance for the development. This approach is in keeping with the definition of zero carbon as specified in the PPS1 eco-towns supplement; which states in paragraph ET 7.1:

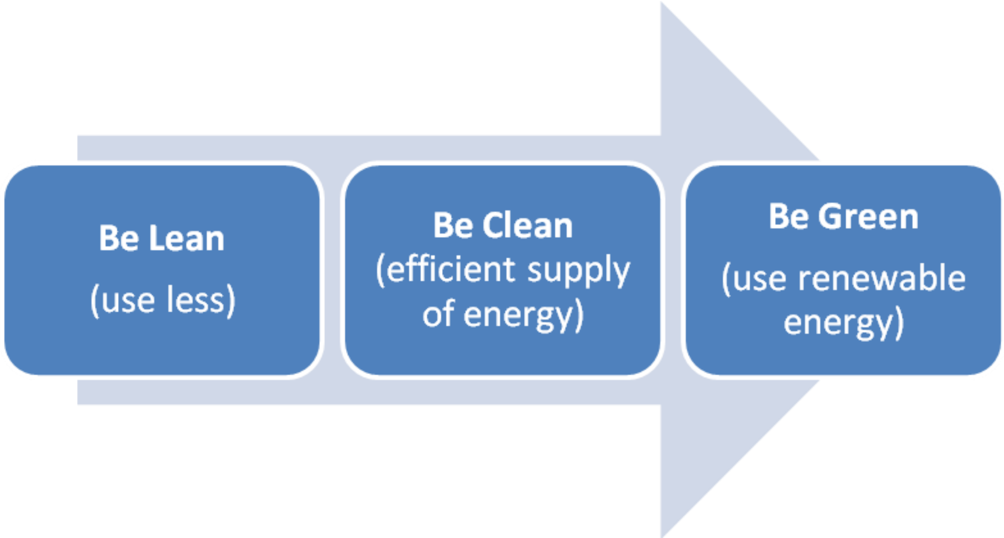
"*The definition of zero carbon in eco-towns is that over a year the net carbon dioxide emissions from all energy use within the buildings on the eco-town development as a whole are zero or below. The initial planning application and all subsequent planning applications for the development of the eco-town demonstrate how this is to be achieved*."

It is clarified in the PPS1 eco-towns supplement that the "*definition of zero carbon applies solely in the context of eco-towns, and applies to the whole development rather than to individual buildings*."

2 Energy Strategy

This Energy Implementation Plan should be read in conjunction with the original Exemplar Sustainable Energy Strategy submitted in March 2011 and in addition, the Updated Zero Carbon Calculation Memorandum submitted in July 2011.

The zero carbon energy strategy remains unchanged from that originally proposed; following the energy hierarchy of reducing demand through exemplar fabric energy efficiency (designed to meet CfSH level 5/6) and efficient mechanical and electrical systems, followed by using low and zero carbon technology including a district heat network and building mounted photovoltaics.



However, a number of detailed changes have resulted from the direct involvement of the preferred ESCo operator (SSE Utility Solutions) and their specialist subcontractors (Vital Energi) who are engaged by A2Dominion at a group level. The key drivers for implementation of the changes are the need to optimise the ESCo operation, reduce operational and financial risk, facilitate a further reduction in CO_2 emissions and improve the fiscal performance of the scheme.

The following sections identify the progression of the energy strategy and how it will be implemented to the scheme

2.1 Updates to Energy Strategy

As mentioned above; a number of detailed changes have occurred during the continued building design including updated SAP analysis and through the involvement of the preferred ESCo operator. These changes are identified in the table 2.1 below

Table 2.1 Updates to Energy Strategy

Ref.	Energy Strategy Aspect	Original Strategy	Changes to Strategy
1	Domestic floor areas	The average dwelling floor area used in the original submitted version of zero carbon modelling was 110.12 m^2.	The dwelling floor areas have been reduced during detailed design. The calculated dwelling floor area used in the updated zero carbon model is based on the weighted average floor areas of all dwelling types. The calculated dwelling floor area used in the updated energy model is 95.24 m^2.
2	Fabric Energy Efficiency	Original strategy specified the following FEE standards (U values Wm2K): • Ground floor; 0.15 • External wall: 0.15 • Roof; 0.13 • Windows: 0.8 • Front door:0.8 • Air perm: 3 m3/(hr.m2) • 0.04 y-value	There is very little change to the proposed FEE standards, as shown below (only front door which will have minimal effect): • Ground floor; 0.15 • External wall: 0.15 • Roof; 0.13 • Windows: 0.8 • Front door:1.1 • Air perm: 3 m3/(hr.m2) • 0.04 y-value
3	District heating – biomass boiler	The submitted energy strategy proposed installation of a biomass boiler and gas CHP (back up by gas boilers).	The proposed changes omit the biomass boiler due to potential operational issues. These include concerns regarding the uncertainty of biomass quality, costs and security of supply. The ESCo operator has proposed an approach which achieves the carbon savings through use of a more efficient CHP engine (see item 3 below)
4	District heating – CHP engine	The submitted energy strategy proposed installation of a CHP engine sized to meet all the required thermal energy demand between June and September without the need to operate the	The proposed changes suggest a larger and more efficient CHP engine to supply 90% of the total annual heat demand. The remaining 10% heat demand will be supplied by the gas-fired top-up/back-up boilers. The 38.5% electrical and 39.5%

Ref.	Energy Strategy Aspect	Original Strategy	Changes to Strategy
		biomass boiler or the gas-fired top-up/back-up boilers. The 33% electrical and 52% thermal CHP engine efficiencies were used in the zero carbon modelling.	thermal CHP engine efficiencies are used in the updated zero carbon model; which are based on the efficiencies of the 844 kWe Janbacher CHP engine (see Appendix 1 data sheet) or similar engine.
5	District heating – Gas boilers	The submitted zero carbon modelling assumed 90% energy efficient boilers.	The updated zero carbon model uses gas boiler efficiency of 90%. This was based on weighted efficiency of the proposed condensing and non-condensing boilers, taking into account their heat supply contribution.
6	District heating losses	The submitted zero carbon modelling assumed 20% district heating system losses.	The updated zero carbon model uses 28% district heating system losses. The 28% loss figure relates to the Logstor Conti Series 2 pipework specified for the project. The heat loss figure is provided by Logstor using their online calculation tools.
7	Domestic buildings energy benchmarks	The energy benchmark relating to the domestic buildings was derived from the initial sample SAP assessments of the proposed 9 dwelling types.	The design stage SAP assessments have been provided by PRP Architects. These updated figures take into account the building fabric efficiency, changes in floor areas and the changes in ventilation strategy (see item 3 below). Table 2 in Appendix 2 present the SAP results. It is estimated that under the current proposal, the average space heating demand, water heating demand (Box 45) for each dwelling are 28.12 kWh/year and 16.48 kWh/year respectively.
8	Ventilation strategy	Original strategy assumed the use of MVHR throughout all dwellings.	The figures included in the design stage SAP assessment take into account the use of MEV system, with trickle vents, for private tenure and shared ownership dwellings and the use of MVHR for rented dwellings. This will enable a direct comparison of the differing ventilation strategies available, Monitoring of the performance of each ventilation strategy, including occupant surveys relative to use and comfort.
9	Energy savings – appliances energy efficiency	The submitted energy strategy assumed energy efficient appliances (white goods and induction hobs) in all private,	The current proposals suggest the installation of energy efficient white goods (A++ rated fridges, freezers, washing machines and ovens and A+ rated ovens)

Ref.	Energy Strategy Aspect	Original Strategy	Changes to Strategy
		shared ownership and rented dwellings. It was estimated that the energy efficient white goods may reduce the total energy demand associated with lighting and appliances by circa 18%. It was also estimated that use of induction hob technology would further reduce the total electric demand associated with cooking by 33%.	in private and shared ownership dwellings; A2D will launch a promotion of energy efficiency white goods and financial incentive scheme to all rented dwellings (meeting CSH requirements). However, as a conservative approach the energy model now assumes that no additional efficiency savings will be generated from the rented dwellings. It is estimated that under the current proposal, the energy efficient white goods will reduce the total energy demand associated with lighting and appliances by circa 13%.
10	Gas cooking	The submitted proposals assumed gas cooking only for the eco pub / restaurant under the non-domestic buildings category.	The current proposals assume gas cooking for the eco pub / restaurant and for the school.
11	Electric cooking	The submitted proposals assumed electric cooking for all dwellings. It was estimated that the use of induction hobs could reduce the total electric demand associated with cooking by 33%.	The current proposals assume the installation of electric cooking using induction hobs in private and shared ownership tenure dwellings; and the promotion of energy efficiency electric hobs to rented tenure dwellings. It is estimated that under the current proposal, the use of induction hobs can reduce the total electric demand associated with cooking by circa 25%.
12	Domestic and non-domestic roof areas available for PV installation	South facing roof area of each dwelling used in the zero carbon modelling was calculated based on the architectural drawings provided by Farrells. It was estimated that school has circa 2,520 m^2 of roof area of which 60% was available to PV. All other non-domestic buildings estimated to have a total roof area of circa 3,602 m^2 of which 70% was available to PV.	South facing roof areas provided by PRP Architects for the Phase 1 dwellings indicate that there is marginal difference between the previous and current total roof areas available to PV (see Appendix 2). Design of roof areas for dwellings post Phase 1 are yet to be finalised by PRP Architects. However, based on the Phase 1 roof area it is anticipated that the differences between the original and updated roof areas will be marginal. It is estimated that the dwellings have circa 15,902 m^2 of total south facing roof area. It is estimated that of this total roof area a maximum of 10,385 m^2 (65% of the total

Ref.	Energy Strategy Aspect	Original Strategy	Changes to Strategy
			south facing roof area) will be available for PV installation due to the estimated 500mm clearance between the PV panels and the edge of the roofs. However, to balance the carbon model only 9,700 m^2 will be utilised for PV installation (61% of the total south facing roof area). The west/south/east facing roof areas of the school and the other non-domestic buildings remain as previously estimated based on the outline designs. However, current proposal assumes that only 60% of the non domestic roof area and 35% of the school roof area will either be available for or be installed with PV.
13	PV Strategy	The submitted proposals assumed a PV peak output of 1.25 kWp and an average annual PV output per 1kWp of 850 kWh/year for all buildings.	The current proposal takes into consideration the use of four types of PV panels for the dwellings with an average of 1.41 kWp per $10m^2$ based on proposed distribution of PV types across the units. The average PV peak output per $10m^2$ has been based on the use of the following PV panels: • Type A:1.26 kWp per $10m^2$ • Types B, C and D: 1.47 kWp per $10m^2$ This average PV peak output has been applied to calculate the dwellings and the non-domestic buildings total annual output from PV respectively. The PV peak output for the school remains as previously estimated based on the outline design.
14	Overshadowing	The overshadowing effect caused by adjoining roofs and buildings was taken into consideration during monthly solar energy output calculations. Some roofs were overshadowed for a short period of time in the winter months, the effect was minimal on the solar panels as the solar flux intensity during this period is low. For the rest of the year the roofs were clear of	The current proposal takes into consideration the impact on PV output from overshadowing. As a conservative approach the energy model assumes, from year 1, the predicted shade cast by the trees when they reach maturity (20 years). The tree shadows cast have been calculated at monthly intervals throughout the year and at 12:00 pm when the sun is between 14° and 62° in elevation. Each monthly figure has then been analysed to show which area of will be in shadow throughout the day. Overshadowing of gables and saw tooth

Ref.	Energy Strategy Aspect	Original Strategy	Changes to Strategy
		shadows. The overshadowing study showed a 4% overshadowing effect reduction on the total annual energy production.	roofs has also been considered, as has the dwelling orientation and roof angle. It is estimated that circa 20% of the roof area available to PV of dwellings with gables and saw tooth will be overshadowed. The orientations of the residential dwellings have been measured from CAD drawings and applied on intervals of 15° (west/south/ east). The roofs angles have been provided by PRP Architects. An overshadowing reduction of 5.28% on average from maximum annual PV output installed (based on building roof types and tree overshadowing, building orientation and roof inclination) is currently estimated. The energy centre is not affected by tree or other building shadow – but may be slightly affected by the flue.

The updated zero carbon model shows a reduction in the total electricity demand and an increment on total heat demand. This is primarily due to a reduction in the floor area of the dwellings and improved accuracy in the SAP calculations derived from using site specific unit type data; as opposed to generic data.

The updated zero carbon model shows an improvement in the district heating system carbon balance. This is primarily achieved through changes to the heat generation strategy, which omits the biomass boiler and utilises a larger CHP engine with greater electrical efficiency. The above strategy will also assist in eliminating the risks associated with operation of the biomass boiler, improve financial viability of the ESCo model and reduce charges to residents associated with the heat supply.

The total CO_2 emissions to be offset by PV has reduced; primarily due to reduction in the total energy demand. The detailed design, sizing and CO_2 reduction modelling of the PV systems is being completed by Willmott Dixon Housing. Final confirmation of achieving zero carbon target will only be possible once the PV system design has been finalised with accompanying CO_2 reduction modelling.

However, a reduction in CO_2 emissions derived the modelled total energy demand; due to changes to the dwelling specification and DHN, indicate that the development is able to accommodate a sufficient amount of PV panels to offset the remaining CO_2 emissions.

This means that the zero carbon target can still be achieved through on-site measures. The updated zero carbon calculations are provided in a series of tables which are attached in Appendix 3. These include:

- Table 1 – Baseline energy demand
- Table 2 – Results of SAP analysis

3 Exemplar Energy Centre Implementation Plan

The District Heating (DH) scheme has been based around a gas fired CHP selected for lowest CO_2 emissions. The low emissions are achieved through efficient conversion of gas to electricity. Heat is a by product of this process and the CHP installation is designed to recover the maximum amount of heat, eg condensing heat recovery from the flue gases.

The operating philosophy is for the CHP to operate at times of highest electricity price to maximise the CHP economics. All heat1 from the CHP is either used immediately by the heat loads on the DH network or is stored in the thermal stores. When the CHP is not operating the DH heat loads are served by heat stored in the thermal stores. When the thermal stores are empty the CHP is restarted to supply the DH heat loads and to replenish the thermal stores. In this way the CHP can provide 90% of the total heat demand. Gas boilers provide the other 10% of heat and operate when the heat demands exceed the capacity of the CHP and thermal stores to provide and when the CHP is off for maintenance and repair. A gas engine CHP is expected to have an annual availability of 93% ie it will be unavailable for operation 3-4weeks per year. The design strategy allow for this CHP down time.

The installed plant will be:

CHP 800 - 850kWe gross electrical efficiency of over 38% Heat efficiency over 40%

Boilers - 1600kW condensing boiler gross efficiency up to 97%

Back up Shell and tube boiler of 1600kW gross efficiency of 84%

80m3 of thermal storage

The district heating design use high quality steel and Aluflex pipe. The pipe selection has higher than standard insulation levels with additional elements within the construction to ensure continued long term maintenance of the as manufactured insulation performance. The steel pipe and jointing design, post construction testing and alarm system will ensure a long 60 year + design life. Aluflex is hybrid PEX / Aluminum preinsulated pipe which at the Bicester Exemplar operating temperature and pressures should be expect to have a similar life as for the steel DH pipe. Aluflex is used on the final connect to houses where the flexibility and availability of long continuous lengths of pipe reduce installation costs and removes the need for any pipe joining under the houses.

A water treatment system will continually monitor and adjust the pH and levels of inhibitor of the water in the DH system to ensure longest life of the plant and DH pipe. Continual fine filtration of the DH water assists in the maintenance of good water quality and prevention of the build up of larger particles within the flow that could impact upon the operation of energy centre plant or HIUs in houses.

The energy centre plant will be controlled by a BMS (Building Management System – in this case just controlling Energy Centre plant). The BMS controls pumps, boiler, and operation of CHP. The BMS monitors fire alarms, gas alarms, all plant and DH operating parameters. The BMS notes alarms and faults and relays this information in real time to maintenance staff via text message / email. The BMS allows remote access to all this information so many plant

[1] Some heat from the CHP intercooler circuit at 40C is rejected – this is too low a temperature to be utilised in the DH network. The CHP heat recovery design has reduced this heat rejection to below the usual amount.

control actions can be acted on remotely to address any fault arsing. Remote access is possible via any internet connected PC. The BMS is programmed to automatically operate back up plant should there be an alarm/fault on operating plant. This level of automation and remote monitoring and control allow the Energy Centre to operate in the main as an un manned site.

3.1 Energy Centre and DHN details

The energy centre will be designed to be fuelled by natural gas and comprise of all the necessary equipment to control, monitor and operate the system to generate the LTHW heat and distribute it around the district heating circuit to allow operation of the HIUs at each point.

Equipment will be positioned to allow for maintenance and access.

3.1.1 Energy Centre Equipment and Phasing

The energy centre (EC) will consist of the following main equipment:

a) 1 No (1600kW) gas fired LTHW shell and tube boiler - **Phase 1**
b) 2 No (1600kW) gas fired LTHW shell and tube boilers - **Phase 2**
c) 2 No (800Kw) gas fired condensing LTHW boilers - **Phase 1**
d) 1No (~800kWe) gas CHP for LV generation - **Phase 1**
e) 2 x No 40000ltr Thermal Stores (80,000ltr Total) - **Phase 1**
f) New Flue/Chimney System - **Phase 1**
g) Main Pressurisation Unit, water softener and chemical dosing equipment and all ancillary plant equipment for the system - **Phase 1**
h) Supply, installation and commissioning of gas distribution system within the Energy Centre for the CHP and gas fired boilers - **Phase 1**
i) Building management system (BMS) - **Phase 1**
j) LV electrical supplies and controls to the new boilers and ancillaries from the LV switchboard / BMS panels and field wiring of all plant items and equipment within the boundary of the Energy Centre. - **Phase 1**
k) LV transformer Installation and associated containment and cabling - **Phase 1**
l) Small power and lighting within the energy centre - **Phase 1**
m) Fire and gas alarms within the energy centre - **Phase 1**
n) Ventilation system within the energy centre - **Phase 1**

3.1.2 Shell & Tube Boilers

The shell and tube boilers will have their own 3 port control valve and single shunt pump. Each boiler will also have its own expansion vessel and expansion relief valve. Each boiler will have its own separate flue.

Boiler/Burner shall be single fuel Natural Gas designed to generate low temperature hot water. This boiler system shall include all equipment to allow safe generation of the hot water. The boiler will be low NOx emissions.

The Equipment which forms the boiler system will generally comprise of:

- Boiler (Shell and connections) - pre-insulated
- Modulating Gas Burner with control panel
- A Boiler Control panel with appropriate control sensors that communicates with the burner panel.

- Double High pressure and temperature switches connected to the boiler panel to allow compliance with BSEN 12828
- Low Pressure and Low water switches wired direct to the boiler/burner panel for protection of the boiler
- Temperature Gauges and Pressure gauges.
- Safety valve/s rated for the System design pressure. All Safety Devices shall comply with BS5978

Boiler shall be of three pass type design for high efficiency and designed to BS2790/BSEN 12953,

The boilers shall be of the following specification at least:

- Minimum number of Units: 1 unit for phase 1 (1600Kw) and 2 x (1600Kw) Phase 2
- Total Thermal Output: equal to or exceeding the design peak load for the district heating system
- Minimum thermal efficiency (NCV basis): 90%
- Test pressure: 1.5 x design pressure
- Fuel type: mains natural gas
- Water quality: treated to BS6880
- Burner turndown ration: minimum 2:1
- Maximum NOx emissions: between 60 -115mg/kwh
- Maximum noise emissions: 72dB(A) at 1m
- Boiler/Burner shall be single fuel Natural Gas designed to generate low temperature hot water.

Shell and tube Boiler Flue

A new flue will be constructed taking the exhaust gas from the boiler and releasing it outside in a safe and environmentally friendly manner. Flues will be of twin walled insulated, stainless steel design. They will be manufactured to BSEN1856-1 and Building regulations Document J. The flues will pass through the boiler house and run vertical externally. They will form a single flue run, supported internally and locally (from wall and/or ground). The chimney will be an extended part of the flue and form a three flue supported system fixed to the building. The flue shall be rated to a max temperature 200°C.

Boiler Shunt Pumps and Control valve

The shunt pumps will be variable speed pumps with a built in inverter, controlled from the BMS the back end protection three port valve will be a spring return electric valve powered and modulated from the BMS panel.

3.1.3 Condensing Boiler Specification

This boiler system shall include all equipment to allow safe generation of the hot water. Boiler will be low NOx.

The Equipment which forms the boiler system will generally comprise of:

- Boiler - pre-insulated
- Modulating Gas Burner with control panel
- A Boiler Control panel with appropriate control sensors that communicates with the burner panel.
- Double High pressure and temperature switches connected to the boiler panel to allow compliance with BSEN 12828
- Low Pressure and Low water switches wired direct to the boiler/burner panel for protection of the boiler
- Temperature Gauges and Pressure gauges.
- Safety valve/s rated for the System design pressure. All Safety Devices shall comply with BS5978

Boiler shall be of condensing type design for high efficiency and designed to BS2790/BSEN 12953. The boilers shall be of the following specification at least:

- Minimum number of Units: 2 unit for phase 1 (800Kw)
- Total Thermal Output: equal to or exceeding the design peak load for the district heating system
- Minimum thermal efficiency (NCV basis): 105%
- Test pressure: 1.5 x design pressure
- Fuel type: mains natural gas 20 mbar
- Water quality: treated to BS6880
- Burner turndown ration: minimum 5:1
- Maximum NOx emissions: 40mg/Nm3 approx
- Maximum noise emissions: 72dB(A) at 1m
- Boiler/Burner shall be single fuel Natural Gas designed to generate low temperature hot water.

Boiler Shunt Pumps and Control valve

The shunt pumps will be variable speed pumps with a built in inverter, controlled from the BMS The back end protection three port valve will be a spring return electric valve powered and modulated from the BMS panel.

3.1.4 Pumps

Boiler Shunt Pumps

Each boiler has its own single shunt pump designed for full flow rate through the boiler. The pumps are inline and with inbuilt inverters to allow external modulation of the pump speed.

Pumps will include necessary equipment to minimise vibration (where required), this possibly includes inertia base and flexible or special pumps designed for pipe-mounting.

DH Pumps

Inverter driven distribution pumps, with a standby facility fitted with appropriate strainer, check valves and isolation.

Phase 1 - 2 pumps duty stand by

Phase 2 - extra pump fitted and then duty / assist / standby

The pumps will have a differential pressure switch and sensor fitted across them for monitoring. Pumps will include necessary equipment to minimise vibration (where required), this possibly includes inertia base and flexible or special pumps designed for pipe-mounting.

CHP System

Overall there will be no permanent HT dump facility for the engine and when the thermal store is fully charged the CHP will switch off.

The CHP system comprises all elements for control and operation of the CHP engine and alternator.

The system will allow generation of Low Voltage electricity, recovery of the LTHW heat and disposable of low temperature intercooler heat. The CHP is fitted with an exhaust exchanger to allow recovery exhaust gas to the LTHW circuit along with Jacket water. The CHP is to have a flue gas heat recovery heat exchanger; this is recover the heat from the exhaust system of the CHP.

The CHP acoustic enclosure is to be designed and manufactured to maintain a noise level of 65dBA at 1m from the unit.

CHP Engine and Alternator The engine shall be designed for high efficiency. Engine will be located on a bedplate to accommodate flexibly coupled engine/alternator

Complete with 24 DC starter Motor. CHP is not designed for island mode or black start

Alternator: 50Hz, synchronous, IP23, Class H insulation, Class F temperature rises.

Unit to be suitable to be connected to mains distribution via appropriate G59 protection

CHP Enclosure The CHP engine shall be installed in an acoustic enclosure with the required ventilation, designed to reduce the overall noise level to less than 65 dB(A) measured at 1m from the enclosure and ventilation inlet/outlet louvers.

Lifting beam/s shall be installed in the enclosure to accommodate maintenance of the CHP (Note: if required)

The enclosure will be designed to allow for access around the engine.

The CHP enclosure will have maintenance access to enable safe replacement of the air inlet filters and maintenance of the ventilation inlet fan.

The enclosure will be fitted with a fire and natural gas detection system. The system will comply with IGE UP 3.

Enclosure Ventilation: To supply combustion and ventilation air to maintain a maximum working temperature of about 40dgc for the engine.

This will consist of an inlet duct taking air from external, fan and attenuator located near to the enclosure. The fan will operate to maintain temperature. The outlet duct will come from a separate connection positioned to allow flow across the engine. It will exit via attenuator/s to ducting taking the air to external

Inter Cooler Circuit: A cooler circuit is required to remove the heat from the CHP intercooler and will operate continuously during CHP operation. The circuit will be filled with a glycol/additive mix to allow operation in sub-zero temperatures and through the engine.

The cooler circuit will consist of single circulation pump suitable for operation with glycol mix fluid, three port electric control valve, dry air cooler and associated pipe-work and ancillaries. Pipe-work and ancillaries will be of the same type specified in the previous section.

Dry Air Coolers: The LT dry air cooler will be positioned outside the energy centre. It will remove the heat for the Low temperature cooling circuit for the engine.

The cooler will be an air blast radiator type and shall be designed and constructed such that the genset shall operate when there is an ambient temperature of 30-35dgc and the circuit contains glycol mix for operation in potential freezing ambient conditions. The fans will be inverter controlled to help limit maximum noise level and give better temperature control. These will be controlled from the CHP system.

HT Cooler : The CHP shall incorporate an connection for a high temperature cooler, the connection for the high temperature cooler shall be incorporated at commissioning stage only. This is to get the CHP to operate, using potential load.

HT Cooling Circuit Engine cooling that can accept DH System return temperatures is to be utilised within the district heating system. This will mainly consist of the jacket water cooling, lube oil and HT intercooler. This circuit will be filled with a glycol/additive to operate through the engine.

The Circuit will include circulation shunt pump, electric heater for start-up water heating, expansion vessel and plate heat exchanger.

Electric Heater: Fitted on the return of the engine to limit low temperatures entering engine on start up.

Expansion: System will be a closed circuit so a single expansion vessel is fitted with relief valve.

Plate Heat Exchanger: The plate heat exchanger will act as interface between the CHP cooling circuit and the CHP LTHW circuit which is connected directly in to the energy centre/DH circuit. This allows the CHP cooling circuit pressure and fluid to be independent from the main circuit. This then allows higher pressures and fluids to be distributed without the limitations of the CHP.

The Plate heat exchangers will be sized to allow full transfer of heat based for the appropriate worse case temperatures (lowest LMTD)

Engine Exhaust Exchanger: The engine will be supplied with a specifically designed and manufactured (by CHP manufacturer) waste heat exchanger (exhaust gas to LTHW). Unit will be designed for direct connection into the LTHW energy centre circuit. Controls will be integrated into the CHP for safe operation. It will be fitted appropriately sized and rated. Exchanger will be fully insulated

Exhaust System: The exhaust system will exit the engine with stainless steel flue section and enter the exhaust exchanger positioned locally to the CHP. After the exchanger the flue duct will enter a silencer. The silencer will be designed to limit noise output from the engine exhaust. The engine will be connected to the exhaust flue by flexible bellows to remove vibration.

Between the engine and exhaust exchanger will be fitted a purge system and explosion relief.

Purge system: If required an air purged system will be designed to IGE UP 3 requirements. However due to the low output of the engine and location close to the chimney, this would possibly not be required.

This would consist of high temperature damper, purge fan, duct work and controls. It will allow full purging of the CHP line before start-up.

Flue Gas Condensing Heat Exchanger: The CHP shall incorporate a flue gas condensing heat exchanger, this is to recover heat from the flue, and input the recover LTHW from the flue gas and introduce them into the system. The flue gas condensing heat exchanger shall incorporate sufficient vent and drain lines, to make a correct operation occurs of the flue gas condensing occurs.

Exhaust Flue Duct: Before Exhaust Exchanger - The exhaust ducting shall be sized to minimum pressure drop, and will be capable of handling exhaust gases up to a temperature of 500ºC continuous running this will be supplied as part of the CHP package.

The exhaust silencer and ductwork to exchanger will be fully insulated and clad. Insulation will be designed for three purposes; to limit heat gain/lost into the area, protection of personnel from injury and sound reduction for duct work prior to silencer (only where duct works is external to acoustic enclosure).

After Exchanger and Flue Stack - Due to the reduced temperatures the duct work will be thin walled stainless steel suitable for use expected temperatures and pressures. The flue duct will run from the silencer to the new individual chimney

Explosion relief: An explosion relief will be fitted on the duct work after the engine to relieve pressure due to explosion should it occur. This shall be of the re-settable valve type.

Lubrication Oil System: Dirty and Clean oil tanks are to be supplied connected to the CHP system as part of the CHP automatic and manual maintenance procedures. They are fitted with oil pump and solenoids linked into the CHP control system. The lubricating oil tanks shall be located local to the CHP system and close together and both bunded. The tanks will be sized to allow for engine operation change over and maintenance cycles.

A fill cabinet shall be installed for safe filling by oil suppliers. Final operation of fill system to be determined at detailed design. A separate oil pump will be connected on the dirty oil tank and control linked to the fill cabinet to allow the tank to emptied.

CHP Control System:

The CHP will consist of a control suite consisting of three main sections. These include:

Engine Manufacturers generator: control system designed to control and regulate all engine functions which are required for a safe and reliable operation of the genset,

Power section housing the main 3 pole withdrawable synchronising breaker, CTs for monitoring the generator load current and circuit breaker. Metering and external power connection

Auxiliary Power and Control Section: Includes for additional control and I/Os for the auxiliary equipment surrounding the engine, pumps, fans control valve, external monitoring. It will also include all power supplies for the auxiliary equipment plus any extra external communication equipment. The auxiliary power is fed direct from the Power Section.

These will be fitted in a panel or panels to form the control suite for full CHP system operation, monitoring synchronising and ancillaries' control. A graphical interface will be fitted to allow interrogation and monitoring of the system.

The panels will be positioned local to the engine with easy access for operation. Final panel supply will depend on detailed design and alterations in CHP design and operation

Power and Control Cabling: All power and control cabling for the CHP will be completed for operation of the CHP system. The power cable will terminate within the Switch board.

Gas System: A CHP specific safety shut-off valve shall be fitted in the branch off line to the CHP. This will be In addition to the main building gas isolation valve. The CHP will come complete with low pressure gas booster, to boost the gas up the required level for the CHP

The engine is supplied by the manufacturer with its own gas train system. 80Mbar is required, the CHP system will come with a gas booster to achieve this.

Condensing LTHW Circuit This circuit will transfer the heat from the HT Cooling exchanger and Exhaust Heat Exchanger to the thermal store. It will run from the thermal store return connection to the plate heat exchanger and then to the Exhaust heat Exchanger. It will consist of circulating pump & three port control valve to limit minimum return to the HT heat exchanger.

Circulating Pumps (LT, HT cooling and LTHW Circuit): Single fixed speed pump designed to transfer heat from the HT Cooling circuit of the engine to the Plate Heat Exchanger/System CHP LTHW Circuit.

Pumps will include necessary equipment to minimise vibration where required, this possibly includes inertia base and flexible or special pumps designed for pipe-mounting.

3.1.5 Thermal Store

A total of 80m3 of thermal store volume will be supplied; comprising 2 x 40m3 thermal stores will be installed.

Standard thermal stores are low pressure vessels vented to atmosphere. The thermals stores are at the DH system operating pressures. The water within the thermal store (stored water) will be heated by a CHP unit utilising surplus heat from electrical generation.

Thermal Stores are fully PED compliant and designed generally to BS853 or equivalent design code. The vessel will have a suitably sized man way as per the design code. It will be fitted with sensors for monitoring and pressure gauge for operational indication. All vessels will be fitted with a relief valve.

The unit will be fully insulated and clad. The thickness of the insulation shall be in keeping BS 5970 Code of Practice and materials used in accordance with BS EN 13163:2001. Minimum insulation thickness to be 200mm. Insulation shall be water resistant. Cladding shall be resistant against corrosion and weathering and the exterior appearance shall be as agreed with the local planning authority and shown in the approved plans.

3.1.6 Chimney

The chimney will consist of 5 runs of flues for the boilers for phase 1 &2 and 1 flue stack for the CHP. In the initial phase 1 there will be 3 x flues installed for the boilers 1 x flue installed for the CHP. In phase 2 there will 2 x flue installed for the boilers. All of the flues will connect to a chimney which will rise to 12m approx from ground level.

Access points for emissions monitoring (Particulates and Nitrous oxides) will be provided in straight, vertical flue sections for the insertion of monitoring probes.

3.1.7 Ventilation

Appropriately sized and located ventilation will be installed within the building to supply air for cooling and combustion. At this stage it is envisaged that the ventilation will be a natural ventilation strategy.

Following the guidance in BS 6644 for naturally ventilated plant rooms the required free area would be 2.95 m2 at low level and 2.22 m2 at high level for boilers and 2.50 m2 at inlet and 6.25 m2 at outlet for CHP .

Louvers should have mullions into which blades are fitted and designed to withstand wind loads. Louvres shall provide suitable resistance to rain ingress.

Steel Construction: Casing of 1.5mm galvanised steel. Galvanised louvre blades of aerodynamic section set it approximately 45° on 150mm pitches. A raised lip shall be incorporated at the rear of each blade to minimise rain ingress. The bird screen shall consist of 12mm × 12mm × 1mm galvanised after manufacture wire mesh.

Aluminium Construction: Casing of 1.5mm aluminium. Aluminium louvre blades of aerodynamic section set at approximately 45°, on 150mm pitches. A raised lip shall be incorporated at the rear of each blade to minimise rain ingress. The bird screen shall consist of 12mm × 12mm × 1mm galvanised after manufacture core mesh.

Finishes: The louvres shall be polyester powder painted to a suitable BS 4800 or RAL colour agreed with the architect/client.

3.1.8 Water Softener

An appropriate sized water softener will be fitted in the feed line to the pressurisation unit. This will be of the duplex type to allow operation during charging. It will be supplied with Brine tank. The control of the water softener will be automatic, recharging on volume used. The softener will be sized for make up only and will sit on the cold feed make up line.

3.1.9 Side Stream Filter and Dosing

A side stream filter will be fitted on the flow side of the Distribution system prior to the main DH pump. It will be fitted with its own pump to generate the flow across it

3.1.10 De-aerator and Dirt Separator

A De-aerator is to be fitted in high level pipe-work on the Flow side prior to the pumps. The unit will be fitted with automatic air vent piped to low level.

A dirt separator will be fitted on the return leg of the district heating line. The unit will be of the demountable type for easy maintenance. As the system will be new the unit will not require a magnet.

3.1.11 Pressurisation and Expansion

This will be a Open spill type system to minimise floor area.

The unit will be supplied with electronic level control to allow correct operation of the water softener. Feed pumps will be duty/standby with pressure switches and electronic controller. The control will include hard wired pressure switches for alarm indication

The spill tank will have level indication on the outside and come complete with overflow and low level detection. The unit will have a suitably sized expansion/control vessel to limit spill valve operation during normal operation pressure changes. The unit will also include an expansion relief valve discharging back to the spill tank.

The make up valves will be solenoid fully open/close type to maintain a constant flow during filling

3.1.12 Electrical systems

To accommodate the CHP generated power 800kWe a HV connection is required back to the HV supply. A transformer is to be installed in the switch room for connection back to the DNO HV supply connection point (to be confirmed after application).

An LV switchboard will be installed to feed the essential services control panel, BMS control panel and the various items of Plant in the energy centre. Including the Boilers, DH Pumps and Shunt pumps

The Essential Services Distribution Board will supply power to the internal and external lighting, energy centre small power, gas & fire detection systems, CCTV and intruder alarm (Gas & Fire, CCTV and Intruder by others) .

Final confirmation of panels, distribution, connections and configuration shall be determined at detail design stage

The power supply requirements will be 3 Phase and Neutral 400V @ 50Hz, with single Phase and neutral 230V for some small equipment and panels. Where possible the control voltages will be 24Vac except for the gas isolation valve which will 230V to enable possible link to safety circuits.

The new BMS control panel will be supplied power from the LV Switchboard. This will Monitor and control the various equipment within the plant room and allow full control of the energy centre as detailed in the operating and control philosophies. The panel will allow local and remote monitoring with the use of relevant software.

DH Monitoring: The District Heating is monitored by a leak detection system within the pipe linking to a local monitoring system in the energy centre and linked to the BMS controller for remote alarms.

Small power internal / external lighting and equipotential bonding / earthing will be installed by VE within the boiler house area. Lighting will be installed to achieve generally 250Lux. Emergency lighting will be fitted to achieve approximately 2Lux.

All power and connections will be designed and installed in accordance with BS7671:2008 Requirements for Electrical Installations

Emergency Stops: An Emergency stop will be located on the main BMS Panel. Emergency Stops will be located near the motor equipment, and pumps. Gas Isolation Buttons will be located at appropriate exits. A full assessment to be carried out at detailed design stage

3.2 Operational Regime of Energy Centre

The DH scheme has been based around a gas fired CHP selected for lowest CO_2 emissions. The low emissions are achieved through efficient conversion of gas to electricity. Heat is a by product of this process and the CHP installation is designed to recover the maximum amount of heat, eg condensing heat recovery from the flue gases.

The operating philosophy is for the CHP to operate at times of highest electricity price to maximise the CHP economics. All heat from the CHP is either used immediately by the heat loads on the DH network or is stored in the thermal stores. When the CHP is not operating the DH heat loads are served by heat stored in the thermal stores. When the thermal stores are empty the CHP is restarted to supply the DH heat loads and to replenish the thermal stores. In this way the CHP can provide 90% of the total heat demand. Gas boilers provide the other 10% of heat and operate when the heat demands exceed the capacity of the CHP and thermal stores to provide and when the CHP is off for maintenance and repair. A gas engine CHP is expected to have an annual availability of 93% ie it will be unavailable for operation 3-4weeks per year. The design strategy allow for this CHP down time.

Some heat from the CHP intercooler circuit at 40C is rejected – this is too low a temperature to be utilised in the DH network. The CHP heat recovery design has reduced this heat rejection to below the usual amount.

The energy centre plant is controlled by a BMS (Building Management System – in this case just controlling Energy Centre plant). The BMS controls pumps, boiler, and operation of CHP. The BMS monitors fire alarms, gas alarms, all plant and DH operating parameters. The BMS notes alarms and faults and relays this information in real time to maintenance staff via text message / email. The BMS allows remote access to all this information so many plant control actions can be acted on remotely to address any fault arsing. Remote access is possible via any internet connected PC. The BMS is programmed to automatically operate back up plant should there be an alarm/fault on operating plant. This level of automation and remote monitoring and control allow the Energy Centre to operate in the main as an un manned site.

3.3 District Heating Network Operation, Efficiency & Installation

The district heating design use high quality steel and Aluflex pipe. The pipe selection has higher than standard insulation levels with additional elements within the construction to ensure continued long term maintenance of the as manufactured insulation performance. The steel pipe and jointing design, post construction testing and alarm system will ensure a long 60 year + design life. Aluflex is hybrid PEX / Aluminum pre-insulated pipe which at the Bicester Exemplar operating temperature and pressures should be expect to have a similar life as for the steel DH pipe. Aluflex is used on the final connect to houses where the flexibility and availability of long continuous lengths of pipe reduce installation costs and removes the need for any pipe joining under the houses.

A water treatment system will continually monitor and adjust the pH and levels of inhibitor of the water in the DH system to ensure longest life of the plant and DH pipe. Continual fine filtration of the DH water assists in the maintenance of good water quality and prevention of the build up of larger particles within the flow that could impact upon the operation of energy centre plant or HIUs in houses.

Below are the design parameters of the district heating network.

3.3.1 District Heating Design Parameters

Primary District Heating

The design conditions of the District Heating (DH) system are:

Flow Temperature in winter (normal)	85C
Return Temperature in winter (normal)	40C
Maximum flow temperature	90C
Maximum working pressure	6 bar g
Minimum working pressure	0.7 bar g
Test pressure	9 bar g
Maximum differential pressure	3.5 bar
Minimum differential pressure	0.5 bar

The minimum flow temperature in summer shall be used when sizing the plate heat exchanger for domestic hot water production

Heating Circuit

It is required that the heating system in houses and that non domestic heat connections are designed to the following parameters:

Flow Temperature in winter (normal)	70C
Return temperature in winter (normal)	40C

Maximum working pressure	6 bar g
Test pressure	9 bar g

Domestic Hot Water Service

The domestic hot water service (DHWS) shall be designed to the following parameters:

Minimum DH flow temperature	75C
DH return temperature at maximum hot water supply	25C
DHWS maximum required flow rate	0.3 litres/sec
DHWS design cold feed temperature	10C
DHWS supply temperature	48C
DHWS supply temperature (non domestic connections)	55C
Minimum cold water supply pressure	0.5 bar
Maximum cold water supply pressure	3.0 bar

Note: Where cold water supply pressures are found to be less than the minimum required by the HIU, a solution for operating the HIU shall be and agreed with SSE/Vital. Pressure-reducing valves shall be installed where supply pressures are observed or likely to be in excess of the maximum for the HIU. The Supplier shall provide the solution for low and high pressure situations.

It is import that these parameters of the district heating network are adhered to, as a change to these parameters will affect the thermal efficiency of the system. If the system is to operate at a higher temperature, this generates more heat losses in the distribution system, this then decreases the thermal efficiency of the system, as the equipment used to produce the energy within the network has to increase in terms of hours of operation, to produce the energy required for the increased heat losses on the network.

At present the network is proposed to operate at the following parameters:

Flow Temperature in winter (normal)	85C
Return Temperature in winter (normal)	40C
Maximum flow temperature	90C

This would at present give 28% (approx.) thermal losses on the network. This is based on using a district heating design use high quality steel and Aluflex pipe. The DH pipe has increased insulation thickness (Series 2) and a vapour barrier over insulation to ensure long term maintenance of the thermal performance of the pipe insulation.

3.4 District Heating Pipework Installation

The district heating network is typically installed using the following procedures

1 A trench is dug using the parameters set out below

2 Pipework is welded/jointed together above trench using the parameters set out below

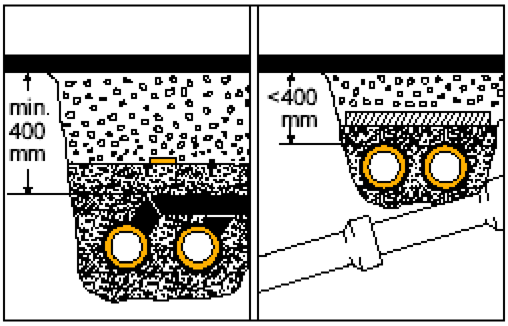
3 Pipework is then lowered into trench using the parameters set out below

4 Trench is then back filled using the parameters set out below

The min. dimensions, stone less sand layer, distance between the outer casings and the cover of the pipes, required for a correct system function, appear from the trench profile.

The minimum cover of 400 mm allows a maximum surface load of 800-900 kPa (0.8-0.9N/mm2). In areas with heavy traffic 400 mm are measured from the top of the pipes to the bottom of the road layer.

In areas with no traffic 400 mm are measured to the top of the area (1).



In connection with pipe dimensions larger than ø 609.6/780 mm the necessary installation depth and pipe distance are determined in each case.

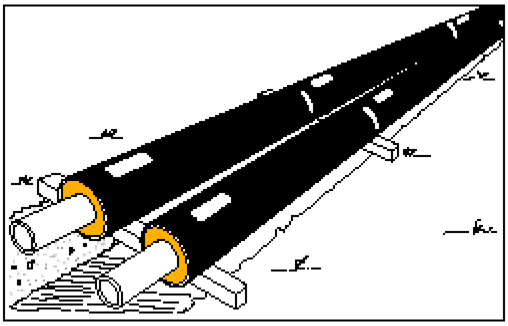
At branches the 400 mm are measured from the top of the branch pipe.

If the cover is less than 400 mm the pipes must be secured against overloading - e.g.by means of a reinforced concrete plate.

Excavation of trench: The Contractor pipes are installed in trenches in accordance with the minimum dimensions appearing from the table.

Installation in trench

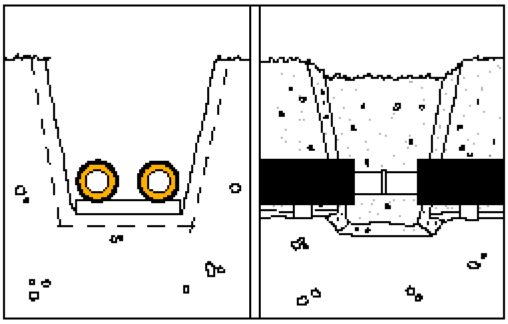
The pipes can be installed in the trench, supported by cushions of sand or sleeperswhich are removed before the trench is filled with sand.



In case of joints it is recommended to increase the trench width and depth to 250-300 mm to ensure good space for welding and installation of the muffs.

Connection above trench

A simple and quick installation is achieved by connecting several pipes above or alongside the trench.



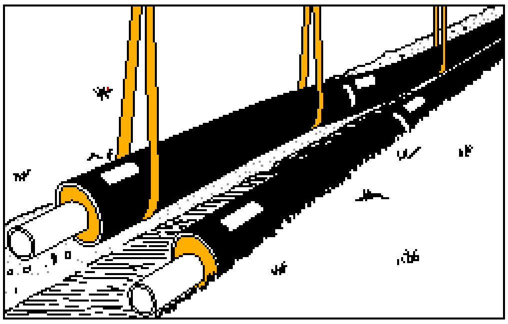
Support the pipes by sleepers, made from square timber e.g. 100 x 100 mm, with suitable distance between them.

Sleepers must also be used, if several pipe lengths are installed alongside the edge of the trench.

When installing pipes with built-in surveillance system place the pipes so that there is only one label at each joint.

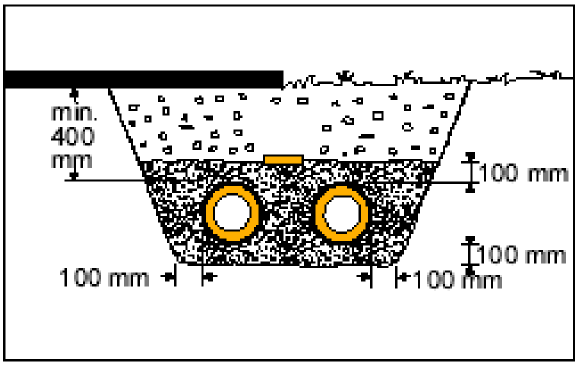
This is necessary for the surveillance system to function.

Lowering into trench



When a pipe length has been welded together, the pressure test has been carried out and the muffs installed and insulated, lower the section into the trench with wide straps by means of cranes. The number of straps and cranes depends on the length and dimension of the pipe section. When utilizing this installation technique, it is important to keep the pressure limitation of max. 300 kPa on the outer casing. Deflections may not result in tensile stresses > 200 kPa, corresponding to a material strain of approx. 0.1%. See curved pipes, section 2, elastic radius.

Backfilling



Level the bottom of the trench with a min. 100 mm stone free sand layer which is compacted.

Remove all sleepers after installation of the pipes and cover with 100 mm stone free sand.

Place the warning tapes on the sand surface and make final backfilling with an optional stone free material.

The sand surrounding the pipes is important - not just to protect the pipes, but also to ensure the friction between the outer casings and the sand which restrains the expansion of the pipes as provided in the installation rules.

Appendix 1

CHP Engine Specification

08/2012

Technical Description

Cogeneration Unit

JMS 412 GS-N.L

For Information

Electrical output **844 kW el.**

Thermal output **865 kW**

Emission values

NOx < 500 mg/Nm³ (5% O_2)

0.01 Technical Data (at module)

Data at:				**Full load**	**Part Load**	
Fuel gas LHV		kWh/Nm³		9.5		
				100%	75%	50%
Energy input		kW	[2]	1,977	1,525	1,074
Gas volume		Nm³/h	*)	208	161	113
Mechanical output		kW	[1]	871	653	435
Electrical output		kW el.	[4]	844	631	418
Recoverable thermal output						
~ Intercooler 1st stage		kW		164	83	24
~ Lube oil		kW		110	95	79
~ Jacket water		kW		217	188	158
~ Exhaust gas cooled to 120 °C		kW		374	311	234
Total recoverable thermal output		kW	[5]	865	677	495
Total output generated		kW total		1,709	1,308	912
Heat to be dissipated						
~ Intercooler 2nd stage		kW		53	44	29
~ Lube oil		kW		~	~	~
~ Surface heat	ca.	kW	[7]	69	61	55
Spec. fuel consumption of engine		kWh/kWh	[2]	2.27	2.34	2.47
Lube oil consumption	ca.	kg/h	[3]	0.26	~	~
Electrical efficiency		%		42.7%	41.4%	38.9%
Thermal efficiency		%		43.8%	44.4%	46.0%
Total efficiency		%	[6]	86.4%	85.8%	84.9%
Hot water circuit:						
Forward temperature		°C		90.0	85.7	81.4
Return temperature		°C		70.0	70.0	70.0
Hot water flow rate		m³/h		37.1	37.1	37.1

*) approximate value for pipework dimensioning
[_] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance, and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...). In the specifications in addition to the general tolerance of +/- 8% on the thermal output a further reserve of 10% is recommended for the dimensioning of the cooling requirements.

Main dimensions and weights (at module)

Length	mm	~ 6,000
Width	mm	~ 1,800
Height	mm	~ 2,200
Weight empty	kg	~ 14,200
Weight filled	kg	~ 14,900

Connections

Hot water inlet and outlet	DN/PN	80/10
Exhaust gas outlet	DN/PN	300/10
Fuel gas (at gas train)	DN/PN	125/16
Fuel Gas (at module)	DN/PN	125/10
Water drain ISO 228	G	½''
Condensate drain	DN/PN	50/10
Safety valve - jacket water ISO 228	DN/PN	1½''/2,5
Safety valve - hot water	DN/PN	40/16
Lube oil replenishing (pipe)	mm	28
Lube oil drain (pipe)	mm	28
Jacket water - filling (flex pipe)	mm	13
Intercooler water-Inlet/Outlet 1st stage	DN/PN	80/10
Intercooler water-Inlet/Outlet 2nd stage	DN/PN	65/10

Output / fuel consumption

ISO standard fuel stop power ICFN	kW	871
Mean effe. press. at stand. power and nom. speed	bar	19.00
Fuel gas type		Natural gas
Based on methane number|Min. methane number	MZ d)	94|70
Compression ratio	Epsilon	12.50
Min./Max. fuel gas pressure at inlet to gas train	mbar	80 - 200 c)
Allowed Fluctuation of fuel gas pressure	%	± 10
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	℃	40
Spec. fuel consumption of engine	kWh/kWh	2.27
Specific lube oil consumption	g/kWh	0.30
Max. Oil temperature	℃	85
Jacket-water temperature max.	℃	95
Filling capacity lube oil (refill)	lit	~ 315

c) Lower gas pressures upon inquiry
d) based on methane number calculation software AVL 3.1 (calculated without N2 and CO2)

0.02 Technical data of engine

Manufacturer		GE Jenbacher
Engine type		J 412 GS-B05
Working principle		4-Stroke
Configuration		V 70°
No. of cylinders		12
Bore	mm	145
Stroke	mm	185
Piston displacement	lit	36.66
Nominal speed	rpm	1,500
Mean piston speed	m/s	9.25
Length	mm	3,200
Width	mm	1,495
Height	mm	2,085
Weight dry	kg	5,200
Weight filled	kg	5,695
Moment of inertia	kgm²	9.42
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	7
Starter motor voltage	V	24

Thermal energy balance

Energy input	kW	1,977
Intercooler	kW	217
Lube oil	kW	110
Jacket water	kW	217
Exhaust gas total	kW	501
Exhaust gas cooled to 180 ℃	kW	293
Exhaust gas cooled to 100 ℃	kW	401
Surface heat	kW	42

Exhaust gas data

Exhaust gas temperature at full load	℃ [8]	390
Exhaust gas temperature at bmep= 14.3 [bar]	℃	~ 412
Exhaust gas temperature at bmep= 9.5 [bar]	℃	~ 435
Exhaust gas mass flow rate, wet	kg/h	4,494
Exhaust gas mass flow rate, dry	kg/h	4,175
Exhaust gas volume, wet	Nm³/h	3,551
Exhaust gas volume, dry	Nm³/h	3,167
Max.admissible exhaust back pressure after engine	mbar	60

Combustion air data

Combustion air mass flow rate	kg/h	4,352
Combustion air volume	Nm³/h	3,367
Max. admissible pressure drop at air-intake filter	mbar	10

Sound pressure level

Aggregate b)	dB(A) re 20µPa	95
31,5 Hz	dB	87
63 Hz	dB	88
125 Hz	dB	95
250 Hz	dB	95
500 Hz	dB	94
1000 Hz	dB	90
2000 Hz	dB	86
4000 Hz	dB	84
8000 Hz	dB	86
Exhaust gas a)	dB(A) re 20µPa	117
31,5 Hz	dB	105
63 Hz	dB	120
125 Hz	dB	115
250 Hz	dB	113
500 Hz	dB	113
1000 Hz	dB	111
2000 Hz	dB	108
4000 Hz	dB	109
8000 Hz	dB	107

Sound power level

Aggregate	dB(A) re 1pW	115
Measurement surface	m²	95
Exhaust gas	dB(A) re 1pW	125
Measurement surface	m²	6.28

a) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635, precision class 2.
b) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635, precision class 3.
The spectra are valid for aggregates up to bmep=19 bar. (for higher bmep add safety margin of 1dB to all values per increase of 1 bar pressure).
For operation with 1200 rpm see above values, for operation with 1800 rpm add 3 dB to the above values.
Engine tolerance ± 3 dB

0.03 Technical data of generator

Manufacturer		STAMFORD e)
Type		PE 734 B e)
Type rating	kVA	1,305
Driving power	kW	871
Ratings at p.f. = 1,0	kW	844
Ratings at p.f. = 0.8	kW	835
Rated output at p.f. = 0.8	kVA	1,044
Rated current at p.f. = 0.8	A	1,453
Frequency	Hz	50
Voltage	V	415
Speed	rpm	1,500
Permissible overspeed	rpm	2,250
Power factor lagging		0,8 - 1,0
Efficiency at p.f. = 1,0	%	96.9%
Efficiency at p.f. = 0.8	%	95.9%
Moment of inertia	kgm²	31.75
Mass	kg	2,710
Radio interference level to VDE 0875		N
Construction		B3/B14
Protection Class		IP 23
Insulation class		H
Temperature (rise at driving power)		F
Maximum ambient temperature	℃	40
Total harmonic distortion	%	1.5

Reactance and time constants (saturated)

xd direct axis synchronous reactance	p.u.	2.25
xd' direct axis transient reactance	p.u.	0.14
xd'' direct axis sub transient reactance	p.u.	0.10
Td'' sub transient reactance time constant	ms	10
Ta Time constant direct-current	ms	20
Tdo' open circuit field time constant	s	2.14

e) GE Jenbacher reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

0.04 Technical data of heat recovery

General data - Hot water circuit

Total recoverable thermal output	kW	865
Return temperature	℃	70.0
Forward temperature	℃	90.0
Hot water flow rate	m³/h	37.1
Nominal pressure of hot water / (operating pressure)	PN / (bar)	10 / (6)
Pressure drop hot water circuit	bar	0.90
Maximum Variation in return temperature	℃	+0/-20
Max. rate of return temperature fluctuation	℃/min	10

Mixture Intercooler (1st stage)

Type	gilled pipes	
Nominal pressure of hot water / (operating pressure)	PN / (bar)	10 / (6)
Pressure drop hot water circuit	bar	0.30
Hot water connection	DN/PN	80/10

Mixture Intercooler (2nd stage) (Intercooler separate)

Type	gilled pipes	
Nominal pressure of hot water / (operating pressure)	PN / (bar)	10 / (6)
Pressure drop hot water circuit	bar	0.80
Hot water connection	DN/PN	65/10

Heat exchanger lube oil

Type	plate heat exchanger	
Nominal pressure of hot water / (operating pressure)	PN / (bar)	10 / (6)
Pressure drop hot water circuit	bar	0.20
Hot water connection	DN/PN	80/10

Heat exchanger engine jacket water

Type	plate heat exchanger	
Nominal pressure of hot water / (operating pressure)	PN / (bar)	10 / (6)
Pressure drop hot water circuit	bar	0.20
Hot water connection	DN/PN	80/10

Exhaust gas heat exchanger

Type	shell-and-tube	
PRIMARY:		
Exhaust gas pressure drop approx	bar	0.02
Exhaust gas connection	DN/PN	300/10
SECONDARY:		
Nominal pressure of hot water / (operating pressure)	PN / (bar)	10 / (6)
Pressure drop hot water circuit	bar	0.20
Hot water connection	DN/PN	80/10

connection variant F

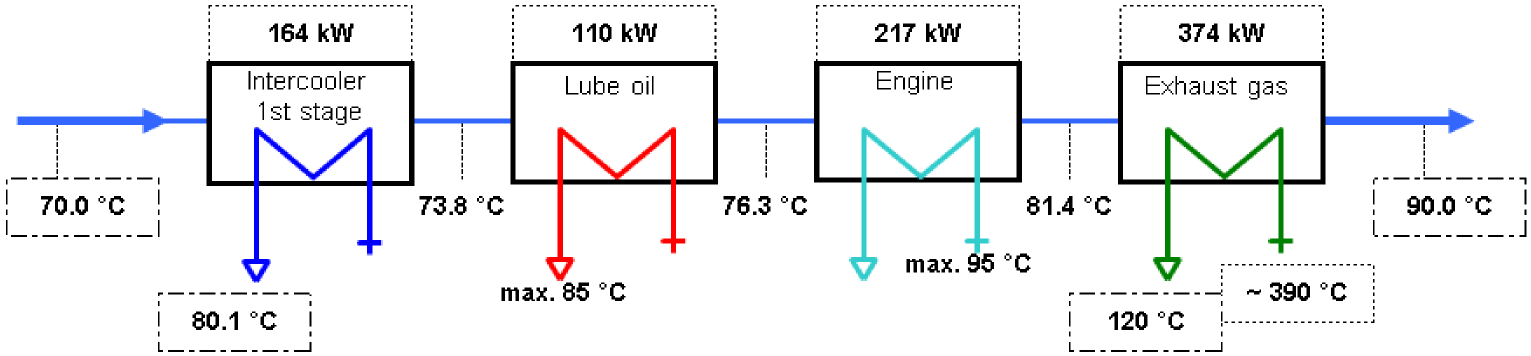
JMS412GS-NL **J 412 GS-B05**

Hot water circuit

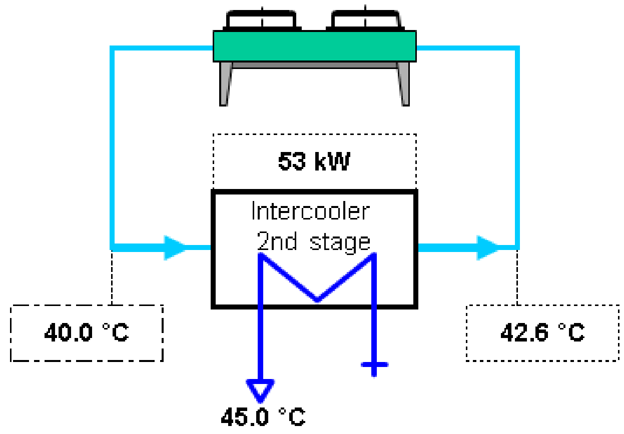
Recoverable thermal output = 865 kW

(±8% tolerance +10% reserve for cooling requirements)

Hot water flow rate = 37.1 m³/h



Low temperature circuit (calculated with Glykol 37%)



Heat to be dissipated = 53 kW

(±8% tolerance +10% reserve for cooling requirements)

Cooling water flow rate = 20.0 m³/h

established

0.10 Technical parameters

All data in the technical specification are based on engine full load (unless stated otherwise) at specified temperatures and the methane number and subject to technical development and modifications.

All pressure indications are to be measured and read with pressure gauges (psi.g.).

(1) At nominal speed and standard reference conditions ICFN according to DIN-ISO 3046 and DIN 6271, respectively
(2) According to DIN-ISO 3046 and DIN 6271, respectively, with a tolerance of + 5 %.
Efficiency performance is based on a new unit (immediately upon commissioning).Effects of degradation during normal operation can be mitigated through regular service and maintenance work.
(3) Average value between oil change intervals according to maintenance schedule, without oil change amount
(4) At p. f. = 1.0 according to VDE 0530 REM / IEC 34.1 with relative tolerances
(5) Total output with a tolerance of +/- 8 %
(6) According to above parameters (1) through (5)
(7) Only valid for engine and generator; module and peripheral equipment not considered
(8) Exhaust temperature with a tolerance of +/- 8 %

Radio interference level
The ignition system of the gas engines complies the radio interference levels of CISPR 12 and EN 55011 class B, (30-75 MHz, 75-400 MHz, 400-1000 MHz) and (30-230 MHz, 230-1000 MHz), respectively.

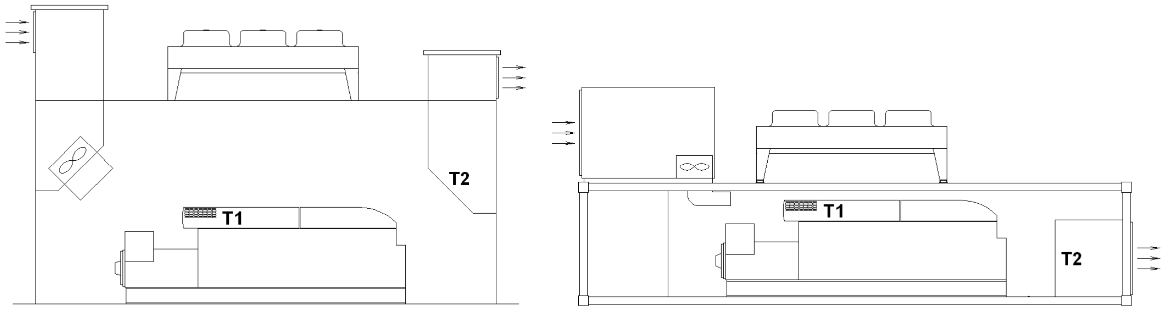
Definition of output
- ISO-ICFN continuous rated power:
  Net break power that the engine manufacturer declares an engine is capable of delivering continuously, at stated speed, between the normal maintenance intervals and overhauls as required by the manufacturer. Power determined under the operating conditions of the manufacturer's test bench and adjusted to the standard reference conditions.
- Standard reference conditions:

Barometric pressure:	1000 mbar (14.5 psi) or 100 m (328 ft) above sea level
Air temperature:	25℃ (77℉) or 298 K
Relative humidity:	30 %

- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)

Pressure:	1013 mbar (14.7 psi)
Temperature:	0℃ (32℉) or 273 K

Output adjustment for turbo charged engines
Standard rating of the engines is for an installation at an altitude ≤ **500 m** and an air intake temperature ≤ **30 ℃** (T1)
Maximum room temperature: **50℃** (T2) -> engine stop



If the actual methane number is lower than the specified, the knock control responds. First the ignition timing is changed at full rated power. Secondly the rated power is reduced. These functions are carried out by the engine management system.
Exceedance of the voltage and frequency limits for generators according to IEC 60034-1 Zone A will lead to a derate in output.

Parameters for the operation of GE Jenbacher gas engines
The genset fulfills the limits for mechanical vibrations according to ISO 8528-9.
If possible, railway trucks must not be used for transport (**TI 1000-0046**).
The following "Technical Instruction of GE JENBACHER" forms an integral part of a contract and must be strictly observed: **TI 1100-0110, TI 1100-0111, and TI 1100-0112.**

Parameters for the operation of control unit and the electrical equipment
Relative humidity 50% by maximum temperature of 40°C.
Altitude up to 2000m above the sea level.

PV Roof Area Information

AA2699C

BICESTER ECO TOWN
EXEMPLAR SITE
ACCOMMODATION SCHEDULE

Plot No.	PRP GIA Affordable [m²]				PRP GIA Private [m²]			difference in GIA between Tender & PRP current		No. of storeys	TENURE	TYPE	MATERIAL - WALL	ROOF TYPE	MATERIAL - ROOF	PRP - LOFT ADAPTABLE LABC COMPLIANT	FARRELLS - LOFT ADAPTIONS TYPE IN CONSENT	ENRICHED UNITS ROOM IN ROOF AS CONSENT BASE DESIGN	UNITS WITH HOME OFFICE (POTENTIAL ROOF ADAPTION/GARAGE OR IN BASEBUILD)	HOME OFFICE	PV TYPE	ROOF AREA South facing	ROOF AREA AS REPORTED BY HYDER	GARDEN ROOM South facing	Farrells Drg. No. BIMP2_PA_05_xxx	PRP Drg. No. AA2699/1.0/xxx	CLIENT APPROVAL STATUS
1					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Linear	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
2					**196.10**	5B10P	1	0.00	Detached	2	Private	E2 - [PH]	Bekstone	Linear	Slate			N	0	NO	B		48.09		092-D		
3					119.32	4B6P	1	5.92	Detached	2	Private	5	Bekstone	Gable	Bekstone	N	S		1	POT G	C		44.44			AA2699C / 1.3 /045	
4					119.32	4B6P	1	8.62	Detached	2	Private	5	Bekstone	Gable	Bekstone	N	S		1	POT G	C		44.53			AA2699C / 1.3 /045	
5					119.32	4B6P	1	8.62	Detached	2	Private	5	Brick [red]	Gable	Slate	N	S		1	POT G	B		44.53			AA2699C / 1.3 /045	
6					92.76	3B5P	1	0.76	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	36.06			AA2699C / 1.3 /043	
7					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
8					**85.84**	2B4P-crank	1	3.94	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B		36.06				
9					92.76	3B5P	1	0.76	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	36.06			AA2699C / 1.3 /043	
10					92.76	3B5P	1	0.76	End Terrace	2	Private	5	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	35.84			AA2699C / 1.3 /043	
11					**85.84**	2B4P-crank	1	2.74	Mid Terrace	2	Private	5	Brick [red]	Linear	Slate	N			0	NO	B		35.95				
12					83.00	2B4P	1	1.10	Mid Terrace	2	Private	5	Brick [red]	Linear	Slate	Y	S		1	YES	B	31.89	32.18			AA2699C / 1.3 /040	
13					92.76	3B5P	1	-2.74	End Terrace	2	Private	5	Brick [red]	Linear	Slate	Y	S		1	YES	B	35.39	41.06			AA2699C / 1.3 /043	
14					119.32	4B6P	1	5.92	Detached	2	Private	5	Bekstone	Gable	Slate	N	S		0	NO	B		44.53			AA2699C / 1.3 /045	
15					119.32	4B6P	1	5.92	Detached	2	Private	5	Brick [red]	Gable	Slate	N	S		0	NO	B		44.37			AA2699C / 1.3 /045	
16					**159.20**	4B6P	1	0.00	Detached	2.5	Private	E1 - [HY]	Timber	Monopitch	Slate			Y	1	YES	B		39.24		073-A	AA2699C / 1.3 /045	
17					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
18					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
19					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
20					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	41.06			AA2699C / 1.3 /043	
21					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
22					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	32.18			AA2699C / 1.3 /040	
23					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	31.63			AA2699C / 1.3 /040	
24					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
25					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	41.06			AA2699C / 1.3 /043	
26					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
27					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
28					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
29					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
30					**196.10**	5B10P	1	0.00	Detached	2	Private	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B		43.09		092-D		
31					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	B		44.24			AA2699C / 1.3 /045	
32					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	B		44.24			AA2699C / 1.3 /045	
33					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
34					150.94	5B9P	1	-13.86	Detached	2	Private	5	Brick [red]	Gable	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
35					150.94	5B9P	1	-13.86	Detached	2	Private	5	Brick [red]	Linear	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
36					119.32	4B6P	1	5.92	Detached	2	Private	5	Bekstone	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
37					119.32	4B6P	1	5.92	Detached	2	Private	5	Bekstone	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
38	89.54	3B5P	1	End Terrace				-5.96		2	Affordable [Rent]	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	34.20	38.28			AA2699C / 1.3 /036	
39	77.24	2B4P	1	Mid Terrace				-4.66		2	Affordable [Rent]	1	Brick [red]	Linear	Alternative	Y	L		1	POT L	B	29.27	34.40			AA2699C / 1.3 /035	
40	76.02	2B4P	1	End Terrace				-5.88		2	Affordable [Rent]	1	Brick [red]	Linear	Alternative	Y	L		1	POT L	B	29.27	32.18			AA2699C / 1.3 /035	
41					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	32.18			AA2699C / 1.3 /040	
42					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
43					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
44					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
45					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
46					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
47					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
48					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
49					**183.00**	5B9P	1	0.00	Detached	2.5	Private	E1 - [HY]	Brick [red]	Sawtooth / Linear	Slate			Y	1	YES	B		67.13		074-C	AA2699C / 1.3 /048	
50					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Gable	Slate	NA	S		1	YES	B		44.49			AA2699C / 1.3 /048	
51					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
52					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
53					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
54					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
55					**118.70**	3B5P	1	0.00	End Terrace	2.5	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	B		44.07		070-G		
56	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	5	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
57	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Rent]	5	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
58	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Rent]	5	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
59	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	5	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
60	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	5	Render [White]	Gable	Slate	N	S		0	NO	B	36.39	35.97			AA2699C / 1.3 /036	
61	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Rent]	5	Render [White]	Gable	Slate	N	L		0	NO	B	32.38	31.10			AA2699C / 1.3 /035	
62	76.02	2B4P	1	End Terrace				-8.38		2	Affordable [Rent]	5	Render [White]	Gable	Slate	N	L		0	NO	B	32.38	35.43			AA2699C / 1.3 /035	
63					81.78	2B4P	1	-2.62	End Terrace	2	Private	5	Render [White]	Gable	Slate	N	L		0	NO	B	33.26	31.10			AA2699C / 1.3 /040	
64					83.00	2B4P	1	-1.40	Mid Terrace	2	Private	5	Render [White]	Gable	Slate	N	L		0	NO	B	33.26	31.10			AA2699C / 1.3 /040	
65					92.76	3B5P	1	-4.74	End Terrace	2	Private	5	Render [White]	Gable	Slate	N	S		0	NO	B	37.41	40.20			AA2699C / 1.3 /043	
66	119.48	4B7P	1	Semi Detached				-0.02		2	Affordable [Rent]	3	Render [White]	Gable	Slate	N	L		1	POT G	B		41.30				
67	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	3	Render [White]	Linear	Slate	Y	L		1	POT L	B	29.27	35.49			AA2699C / 1.3 /035	
68	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	3	Render [White]	Linear	Slate	Y	L		1	POT L	B	29.27	33.27			AA2699C / 1.3 /035	
69	**128.60**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	A		45.81		071-G		
70	**101.00**	3B5P	1	Mid Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	A		45.81		071-G		
71	**101.00**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	A		49.36		071-G		
72	119.48	4B7P	1	Semi Detached				-0.02		2	Affordable [Rent]	3	Timber	Linear	Slate	Y	L		1	POT G	A		43.93				
73	119.48	4B7P	1	Semi Detached				-0.02		2	Affordable [Rent]	3	Timber	Linear	Slate	Y	L		1	POT G	A		46.42				
74					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
75					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
76					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	38.56			AA2699C / 1.3 /043	
77	119.48	4B7P	1	Semi Detached				-0.02		2	Affordable [Rent]	3	Render [White]	Gable	Slate	N	S		1	POT G	B		46.16				
78					81.78	2B4P	1	-3.52	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.62			AA2699C / 1.3 /040	
79					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
80					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	32.18			AA2699C / 1.3 /040	
81					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	34.40			AA2699C / 1.3 /043	
82					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
83					**152.70**	4B6P	1	0.00	Detached	2.5	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	B		59.64		073-A	AA2699C / 1.3 /045	
84					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		43.24			AA2699C / 1.3 /045	
85					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B	37.41	49.93			AA2699C / 1.3 /043	
86					93.12	3B5P	1	1.12	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /043	
87					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	B	33.26	39.95			AA2699C / 1.3 /040	
88					81.78	2B4P	1	-0.12	End Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	B	33.26	39.95			AA2699C / 1.3 /040	
89					**95.30**	3B5P	1	0.00	End Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	B		44.07		070-G		
90					**81.90**	2B4P	1	0.00	Mid Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	B		35.33		070-G		
91					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	POT L	B	37.41	44.83			AA2699C / 1.3 /043	
92					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	32.18			AA2699C / 1.3 /040	
93					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
94					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
95					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	29.96			AA2699C / 1.3 /040	
96					92.76	3B5P	1	0.76	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
97					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
98					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
99					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	32.18			AA2699C / 1.3 /040	
100					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	44.39			AA2699C / 1.3 /043	
101					93.12	3B5P	1	1.12	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	33.84			AA2699C / 1.3 /043	
102					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	38.28			AA2699C / 1.3 /043	
103					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	33.84			AA2699C / 1.3 /043	
104					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	A	33.26	31.07			AA2699C / 1.3 /040	
105					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	38.28			AA2699C / 1.3 /043	
106	76.02	2B4P	1	End Terrace				-11.78		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	35.76			AA2699C / 1.3 /035	
107	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
108	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
109	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	38.20			AA2699C / 1.3 /036	
110	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	34.20	38.20			AA2699C / 1.3 /036	
111					83.00	2B4P	1	-2.30	Semi Detached	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	31.89	34.68			AA2699C / 1.3 /040	
112					83.00	2B4P	1	1.10	Semi Detached	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
113					**92.00**	3B5P	1	0.00	End Terrace	2	Private	E2 - [PH]	Timber	Gable [Asymetric]	Slate			N	0	NO	B		33.86		090-C		
114					**81.90**	2B4P	1	0.00	Mid Terrace	2	Private	E2 - [PH]	Timber	Gable [Asymetric]	Slate			N	0	NO	B		26.50		090-C		
115					**92.00**	3B5P	1	0.00	End Terrace	2	Private	E2 - [PH]	Timber	Gable [Asymetric]	Slate			N	0	NO	B		29.94		090-C		
116					92.76	3B5P	1	0.76	Semi Detached	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B	37.41	49.93			AA2699C / 1.3 /043	
117					92.76	3B5P	1	0.76	Semi Detached	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /043	
118					81.78	2B4P	1	-0.12	End Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	B	33.26	44.39			AA2699C / 1.3 /040	
119					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	B	33.26	39.95			AA2699C / 1.3 /040	
120					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Timber	Linear	Slate	Y	S		1	POT L	B	35.39	36.06			AA2699C / 1.3 /043	
121					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Timber	Linear	Slate	Y	S		1	POT L	B	35.39	36.06			AA2699C / 1.3 /043	
122					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Timber	Linear	Slate	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
123					81.78	2B4P	1	-3.52	End Terrace	2	Private	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
124	**118.40**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		51.70		071-G		
125	**118.40**	3B5P	1	Mid Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		48.86		071-G		
126	**88.00**	2B4P	1	Mid Terrace				0.00		2	Affordable [Rent]	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B		51.47		091-C		
127	**88.00**	2B4P	1	Mid Terrace				0.00		2	Affordable [Rent]	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B		48.41		091-C		
128	**112.40**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B	34.20	55.31		091-C		
129	**112.40**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B	34.20	55.31		091-C		
130	**88.00**	2B4P	1	Mid Terrace				0.00		2	Affordable [Rent]	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B		48.41		091-C		
131	**88.00**	2B4P	1	End Terrace				0.00		2	Affordable [Rent]	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B		51.39		091-C		
132	**101.00**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		38.34		071-G		
133	**101.00**	3B5P	1	Mid Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		38.34		071-G		
134	**101.00**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		38.34		071-G		
135					92.76	3B5P	1	0.76	Semi Detached	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	36.06			AA2699C / 1.3 /043	
136					92.76	3B5P	1	0.76	Semi Detached	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
137					119.32	4B6P	1	-33.38	Detached	2	Private	3	Brick [red]	Linear	Slate	N	S		0	NO	B		40.92			AA2699C / 1.3 /045	
138					119.32	4B6P	1	5.92	Detached	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	B		43.90			AA2699C / 1.3 /045	
139	**128.60**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		43.00		071-G		
140	**118.40**	3B5P	1	Mid Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		43.00		071-G		
141	**118.40**	3B5P	1	Mid Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		43.00		071-G		
142	**118.40**	3B5P	1	End Terrace				0.00		2.5	Affordable [Rent]	E1 - [HY]	Brick [red]	Saw tooth	Slate			Y	1	POT L	B		43.00		071-G		
143	89.54	3B5P	1	Semi Detached				-11.16		2	Affordable [Shared ov	3	Render [White]	Gable	Slate	N	S		0	NO	B	36.39	35.76			AA2699C / 1.3 /036	
144	89.54	3B5P	1	Semi Detached				-7.96		2	Affordable [Shared ov	3	Render [White]	Gable	Slate	N	S		0	NO	B	36.39	40.09			AA2699C / 1.3 /036	
145					83.00	2B4P	1	-12.30	Semi Detached	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.68			AA2699C / 1.3 /040	
146					83.00	2B4P	1	1.10	Semi Detached	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
147					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
148					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	33.84			AA2699C / 1.3 /043	
149					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
150					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
151					93.12	3B5P	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	35.39	33.84			AA2699C / 1.3 /043	
152					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /040	
153	119.48	4B7P	1	End Terrace				-0.02		2	Affordable [Rent]	3	Timber	Gable	Slate	N	L		1	POT G	A		46.41				
154	119.48	4B7P	1	Mid Terrace				-0.02		2	Affordable [Rent]	3	Timber	Gable	Slate	N	L		1	POT G	A		41.43				
155	119.48	4B7P	1	End Terrace				-0.02		2	Affordable [Rent]	3	Timber	Gable	Slate	N	L		1	POT G	A		41.43				
156	76.02	2B4P	1	End Terrace				-8.38		2	Affordable [Rent]	3	Timber	Gable	Slate	N	L		0	NO	A	32.38	35.43			AA2699C / 1.3 /035	
157	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Rent]	3	Timber	Gable	Slate	N	L		0	NO	A	32.38	31.10			AA2699C / 1.3 /035	
158	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	3	Timber	Gable	Slate	N	L		0	NO	A	36.39	35.76			AA2699C / 1.3 /036	
159					**118.70**	3B5P	1	0.00	End Terrace	2.5	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	A		44.17		070-G		
160					81.78	2B4P	1	-0.12	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	A	31.89	32.18			AA2699C / 1.3 /040	
161					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y	S		1	POT L	A	31.89	32.18			AA2699C / 1.3 /040	
162					92.76	3B5P	1	0.76	End Terrace	2	Private	1	Brick [red]	Linear	Alternative	Y			1	POT L	A	35.39	38.28			AA2699C / 1.3 /043	
163					92.76	3B5P	1	-2.74	Semi Detached	2	Private	3	Timber	Gable	Slate	N			0	NO	B	37.41	44.83			AA2699C / 1.3 /043	
164					83.00	2B4P	1	1.10	Semi Detached	2	Private	3	Timber	Gable	Slate	N	L		0	NO	B	33.26	44.39			AA2699C / 1.3 /040	
165					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B		44.37			AA2699C / 1.3 /045	
166					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B		44.37			AA2699C / 1.3 /045	
167					**152.70**	4B6P	1	0.00	Detached	2.5	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	B		64.07		073-A	AA2699C / 1.3 /045	
168	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	33.13			AA2699C / 1.3 /035	
169	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	35.13			AA2699C / 1.3 /035	

AA2699C

BICESTER ECO TOWN
EXEMPLAR SITE
ACCOMMODATION SCHEDULE

Plot No.	PRP GIA Affordable [m²]				PRP GIA Private [m²]			difference in GIA between Tender & PRP current		No. of storeys	TENURE	TYPE	MATERIAL - WALL	ROOF TYPE	MATERIAL - ROOF	PRP - LOFT ADAPTABLE LABC COMPLIANT	FARRELLS - LOFT ADAPTIONS TYPE IN CONSENT	ENRICHED UNITS ROOM IN ROOF AS CONSENT BASE DESIGN	UNITS WITH HOME OFFICE (POTENTIAL ROOF ADAPTION/GARAGE OR IN BASEBUILD)	HOME OFFICE	PV TYPE	ROOF AREA South facing	ROOF AREA AS REPORTED BY HYDER	GARDEN ROOM South facing	Farrells Drg. No. BIMP2_PA_05_xxx	PRP Drg. No. AA2699/1.0/xxx	CLIENT APPROVAL STATUS
170	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	33.32			AA2699C / 1.3 /035	
171	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	35.22			AA2699C / 1.3 /035	
172					92.00	3B5P	1	0.00	End Terrace	2	Private	E2 - [PH]	Timber	Gable [Asymetric]	Slate			N	0	NO	A		41.40		090-C		
173					85.84	2B4P-crank	1	3.94	Mid Terrace	2	Private	E2 - [PH]	Timber	Gable [Asymetric]	Slate			N	0	NO	A		37.70		090-C		
174					92.00	3B5P	1	0.00	End Terrace	2	Private	E2 - [PH]	Timber	Gable [Asymetric]	Slate			N	0	NO	A		37.88		090-C		
175					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	49.93			AA2699C / 1.3 /043	
176					93.12	3B5P	1	1.12	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	45.50			AA2699C / 1.3 /043	
177					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	33.26	39.84			AA2699C / 1.3 /040	
178					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	45.50			AA2699C / 1.3 /043	
179					95.30	3B5P	1	0.00	End Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	A		44.17		070-G		
180					81.90	2B4P	1	0.00	Mid Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate	N		N	0	NO	A		39.26		070-G		
181	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
182	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	34.20	38.20			AA2699C / 1.3 /036	
183	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	34.20	38.20			AA2699C / 1.3 /036	
184					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		45.89			AA2699C / 1.3 /045	
185					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		43.86			AA2699C / 1.3 /045	
186					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		43.86			AA2699C / 1.3 /045	
187					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		43.86			AA2699C / 1.3 /045	
188					95.30	3B5P	1	0.00	Semi Detached	2	Private	E1 - [HY]	Brick [red]	Gable	Slate			N	0	NO	A		40.24		072-B		
189					95.30	3B5P	1	0.00	Semi Detached	2	Private	E1 - [HY]	Brick [red]	Gable	Slate			N	0	NO	A		44.17		072-B		
190	119.48	4B7P	1	Semi Detached				-0.02		2	Affordable [Rent]	3	Brick [red]	Linear	Slate	Y	L		1	POT G	A		46.42				
191	119.48	4B7P	1	Semi Detached				-0.02		2	Affordable [Rent]	3	Brick [red]	Linear	Slate	Y	L		1	POT G	A		43.93				
192	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Shared ov	3	Timber	Linear	Slate	Y	L		1	POT L	A	34.20	40.09			AA2699C / 1.3 /036	
193	89.54	3B5P	1	Mid Terrace				-7.96		2	Affordable [Shared ov	3	Timber	Linear	Slate	Y	L		1	POT L	A	34.20	35.76			AA2699C / 1.3 /036	
194	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Shared ov	3	Timber	Linear	Slate	Y	L		1	POT L	A	34.20	35.76			AA2699C / 1.3 /036	
195					183.00	5B9P	1	0.00	Detached	2.5	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	B		67.13		074-C	AA2699C / 1.3 /048	
196					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
197					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
198					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
199					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		44.37			AA2699C / 1.3 /045	
200					83.00	2B4P	1	-2.30	Semi Detached	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	31.89	38.28			AA2699C / 1.3 /040	
201					92.76	3B5P	1	10.86	Semi Detached	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	34.68			AA2699C / 1.3 /043	
202					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B	37.41	49.93			AA2699C / 1.3 /043	
203					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	B	33.26	39.84			AA2699C / 1.3 /040	
204					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /043	
205					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
206					119.32	4B6P	1	8.62	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
207					119.32	4B6P	1	8.62	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
208					150.94	5B9P	1	-13.86	Detached	2	Private	5	Render [White]	Gable	Bekstone	NA	S		1	YES	C		46.26			AA2699C / 1.3 /048	
209					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
210					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Bekstone	NA	S		1	YES	B		46.26			AA2699C / 1.3 /048	
211					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES			46.31			AA2699C / 1.3 /048	
212					119.32	4B6P	1	5.92	Detached	2	Private	5	Brick [red]	Gable	Slate	Y	S		1	POT G	B		43.86			AA2699C / 1.3 /045	
213					119.32	4B6P	1	5.92	Detached	2	Private	5	Render [White]	Gable	Bekstone	N	S		1	POT G	C		43.86			AA2699C / 1.3 /045	
214					150.94	5B9P	1	-13.86	Detached	2	Private	5	Render [White]	Gable	Bekstone	NA	S		1	YES	C		46.26			AA2699C / 1.3 /048	
215					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.37			AA2699C / 1.3 /045	
216					119.32	4B6P	1	5.92	Detached	2	Private	1	Brick [red]	Linear	Slate	Y	S		1	POT G	B		44.12			AA2699C / 1.3 /045	
217					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
218					171.80	5B9P	1	0.00	Detached	2.5	Private	E1 - [HY]	Brick [red]	Saw tooth	Bekstone			Y	1	YES	B		72.02		074-C	AA2699C / 1.3 /048	
219					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
220					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
221					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Linear	Slate	Y	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
222					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
223					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Gable	Slate	N	S		1	POT G	B		44.49			AA2699C / 1.3 /045	
224					119.32	4B6P	1	5.92	Detached	2	Private	3	Timber	Linear	Slate	Y	S		1	POT G	B		45.89			AA2699C / 1.3 /045	
225					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Slate	NA	S		1	YES	B		46.26			AA2699C / 1.3 /048	
226					196.10	5B10P	1	0.00	Detached	2	Private	E2 - [PH]	Bekstone	Linear	Slate		S	N	0	NO	A		46.99		092-D		
227					196.10	5B10P	1	0.00	Detached	2	Private	E2 - [PH]	Bekstone	Linear	Slate		S	N	0	NO	A		46.99		092-D		
228					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Bekstone	NA	S		1	YES	B		46.26			AA2699C / 1.3 /048	
229					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Bekstone	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
230					150.94	5B9P	1	-13.86	Detached	2	Private	5	Render [White]	Gable	Slate	NA	S		1	YES	B		46.26			AA2699C / 1.3 /048	
231					150.94	5B9P	1	-13.86	Detached	2	Private	5	Render [White]	Gable	Slate	NA	S		1	YES	B		46.26			AA2699C / 1.3 /048	
232					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Bekstone	NA	S		1	YES	B		46.26			AA2699C / 1.3 /048	
233					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Bekstone	NA	S		1	YES	B		46.31			AA2699C / 1.3 /048	
234					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Slate	NA	S		1	YES	A		46.26			AA2699C / 1.3 /048	
235					150.94	5B9P	1	-13.86	Detached	2	Private	5	Render [White]	Gable	Slate	NA	S		1	YES	A		46.26			AA2699C / 1.3 /048	
236					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A	33.26	44.39			AA2699C / 1.3 /040	
237					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A	33.26	44.39			AA2699C / 1.3 /040	
238					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	45.50			AA2699C / 1.3 /043	
239					95.66	3B5P	1	0.16	End Terrace [Bay]	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	35.68			AA2699C / 1.3 /043	
240					95.66	3B5P	1	0.16	End Terrace [Bay]	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	50.82			AA2699C / 1.3 /043	
241					85.84	2B4P-crank	1	2.34	Mid Terrace	2	Private	3	Timber	Gable	Slate	N	L		0	NO	A		39.84				
242					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Timber	Gable	Slate	N	S		0	NO	A	37.41	49.93			AA2699C / 1.3 /043	
243					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	35.39	36.06			AA2699C / 1.3 /043	
244					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	31.89	32.18			AA2699C / 1.3 /040	
245					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	31.89	34.40			AA2699C / 1.3 /040	
246					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	35.39	36.06			AA2699C / 1.3 /043	
247					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	35.39	36.06			AA2699C / 1.3 /043	
248					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	31.89	32.18			AA2699C / 1.3 /040	
249					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	31.89	34.40			AA2699C / 1.3 /040	
250					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	35.39	36.06			AA2699C / 1.3 /043	
251					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	49.38			AA2699C / 1.3 /043	
252					85.84	2B4P-crank	1	2.34	Mid Terrace	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A		39.95				
253					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A	33.26	44.39			AA2699C / 1.3 /040	
254					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	45.50			AA2699C / 1.3 /043	
255					95.30	3B5P	1	0.00	End Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	A		44.17		070-G		
256					85.84	2B4P-crank	1	3.94	Mid Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	A		39.26		070-G		
257					118.70	3B5P	1	0.00	End Terrace	2.5	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	A		39.26		070-G		
258					118.70	3B5P	1	0.00	End Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			Y	1	YES	A		35.33		072-B		
259					85.84	2B4P-crank	1	3.94	Mid Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	A		35.33		072-B		
260					81.90	2B4P	1	0.00	Mid Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	A		35.33		072-B		
261					95.30	3B5P	1	0.00	End Terrace	2	Private	E1 - [HY]	Timber	Saw tooth	Slate			N	0	NO	A		44.17		072-B		
262					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	35.39	36.06			AA2699C / 1.3 /043	
263					85.84	2B4P-crank	1	2.44	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A		36.06				
264					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	A	35.39	38.28			AA2699C / 1.3 /043	
265					95.30	3B5P	1	0.00	Semi Detached	2.5	Private	E1 - [HY]	Timber	Gable	Slate			N	0	NO	A		39.26		072-B		
266					118.70	2B4P	1	0.00	Semi Detached	2	Private	E1 - [HY]	Timber	Gable	Slate			Y	1	YES	A		39.26		072-B		
267					95.66	3B5P	1	3.66	End Terrace [Bay]	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	36.29			AA2699C / 1.3 /043	
268					93.12	3B5P	1	1.12	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /043	
269					150.94	5B9P	1	-18.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	A		46.31			AA2699C / 1.3 /048	
270					150.94	5B9P	1	-18.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES	A		46.31			AA2699C / 1.3 /048	
271					150.94	5B9P	1	-18.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	A		46.31			AA2699C / 1.3 /048	
272					150.94	5B9P	1	-18.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	A		46.31			AA2699C / 1.3 /048	
273					95.66	3B5P	1	3.66	End Terrace [Bay]	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	44.50			AA2699C / 1.3 /043	
274					83.00	2B4P	1	-9.00	Mid Terrace	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A	33.26	44.50			AA2699C / 1.3 /040	
275					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	49.93			AA2699C / 1.3 /043	
276	81.64	2B4P-BUNG	1	Detached				-0.96		1	Affordable [Rent]	8	Bekstone	Gable	Bekstone	N	BUNG		0	NO	B	108.07	67.27			AA2699C / 1.3 /037	
277	81.64	2B4P-BUNG	1	Detached				-0.96		1	Affordable [Rent]	8	Bekstone	Gable	Bekstone	N	BUNG		0	NO	B	108.07	67.27			AA2699C / 1.3 /037	
278					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	A	35.39	40.72			AA2699C / 1.3 /043	
279					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	A	31.89	34.40			AA2699C / 1.3 /040	
280					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	A	35.39	38.51			AA2699C / 1.3 /043	
281					105.30	3B5P	1	0.00	End Terrace	2	Private	E2 - [PH]	Brick [red]	Gable [Asymetric]	Slate		S	N	0	NO	A		39.64		090-C		
282					103.50	2B4P	1	0.00	Mid Terrace	2	Private	E2 - [PH]	Brick [red]	Gable [Asymetric]	Slate			N	0	NO	A		35.23		090-C		
283					103.50	3B5P	1	0.00	End Terrace	2	Private	E2 - [PH]	Brick [red]	Gable [Asymetric]	Slate		S	N	0	NO	A		36.11		090-C		
284					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	49.93			AA2699C / 1.3 /043	
285					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A	33.26	39.95			AA2699C / 1.3 /040	
286					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	45.50			AA2699C / 1.3 /043	
287					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	51.04			AA2699C / 1.3 /043	
288	98.31	3B5P-BUNG	1	Detached				0.71		1	Affordable [Rent]	8	Bekstone	Saw tooth	Bekstone	N	BUNG		0	NO	B	126.72	67.27			AA2699C / 1.3 /038	
289	98.31	3B5P-BUNG	1	Detached				0.71		1	Affordable [Rent]	8	Bekstone	Saw tooth	Bekstone	N	BUNG		0	NO	B	126.72	67.27			AA2699C / 1.3 /038	
290					92.76	3B5P	1	10.86	Semi Detached	2	Private	3	Brick [red]	Gable	Slate	N	S		0	NO	A	37.41	34.40			AA2699C / 1.3 /043	
291					83.00	2B4P	1	1.10	Semi Detached	2	Private	3	Brick [red]	Gable	Slate	N	L		0	NO	A	33.26	32.18			AA2699C / 1.3 /040	
292	81.64	2B4P-BUNG	1	Detached						1	Affordable [Rent]	8	Render/Timber	Saw tooth	Slate / Green	N	BUNG		0	NO	B	108.07				AA2699C / 1.3 /037	
293					95.66	3B5P	1	3.66	End Terrace [Bay]	2	Private	3	Brick [red]	Linear	Slate	N	S		0	NO	B	35.39	36.06			AA2699C / 1.3 /043	
294					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Brick [red]	Linear	Slate	N	S		0	NO	B	31.89	32.18			AA2699C / 1.3 /040	
295					84.68	2B4P	1	-0.62	End Terrace [Bay]	2	Private	3	Brick [red]	Linear	Slate	N	S		0	NO	B	31.89	34.40			AA2699C / 1.3 /040	
296	63.00	1B2P-F	1	Flat				4.50		1	Affordable [Rent]	7	Render / Timber	Flat	Green				0	NO	D		37.00				
297	63.00	1B2P-F	1	Flat				4.50		1	Affordable [Rent]								0	NO			37.00				
298	70.98	2B4P-F	1	Flat				-1.02		1	Affordable [Rent]								0	NO			37.00				
299	70.98	2B4P-F	1	Flat				-1.02		1	Affordable [Rent]								0	NO			37.00				
300					150.94	5B9P	1	-13.86	Detached	2	Private	5	Bekstone	Gable	Bekstone	NA			1	YES	B		46.26			AA2699C / 1.3 /048	
301	89.54	3B5P	1	Semi Detached				-11.16		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	34.20	40.36			AA2699C / 1.3 /036	
302	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Rent]	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	33.16			AA2699C / 1.3 /035	
303	89.54	3B5P	1	Semi Detached				-7.96		2	Affordable [Rent]	1	Bekstone	Linear	Bekstone	Y	L		1	POT L	C	34.20	40.36			AA2699C / 1.3 /036	
304	89.54	3B5P	1	Semi Detached				-7.96		2	Affordable [Rent]	1	Bekstone	Linear	Bekstone	Y	L		1	POT L	C	34.20	40.63			AA2699C / 1.3 /036	
305	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Shared ov	1	Bekstone	Linear	Bekstone	Y	L		1	POT L	C	29.27	35.49			AA2699C / 1.3 /035	
306	89.54	3B5P	1	Semi Detached				-7.96		2	Affordable [Shared ov	1	Bekstone	Linear	Bekstone	Y	L		1	POT L	C	34.20	37.92			AA2699C / 1.3 /036	
307					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES	B	77.00	46.03			AA2699C /1.3 /048	
308					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Linear	Bekstone	NA	S		1	YES	C	77.00	46.03			AA2699C /1.3 /048	
309					150.94	5B9P	1	-13.86	Detached	2	Private	5	Brick [red]	Linear	Slate	NA	S		1	YES	B	77.00	46.03			AA2699C /1.3 /048	
310					150.94	5B9P	1	-13.86	Detached	2	Private	5	Brick [red]	Linear	Slate	NA	S		1	YES	B	77.00	46.03			AA2699C /1.3 /048	
311					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Linear	Bekstone	NA	S		1	YES	C	77.00	46.03			AA2699C /1.3 /048	
312					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES	B	77.00	46.03			AA2699C /1.3 /048	
313					196.10	5B10P	1	0.00	Detached	2	Private	E2 - [PH]	Brick [red]	Linear	Slate			N	0	NO	B	52.14	52.14		092-D		
314					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Gable	Slate	NA	S		1	YES	B	58.14	43.79			AA2699C / 1.3 /048	
315					84.68	2B4P	1	-0.62	Semi Detached [Bay]	2	Private	5	Bekstone	Linear	Slate	Y	S		1	POT L	A	31.89	37.00			AA2699C / 1.3 /040	
316					83.00	2B4P [v2]	1	1.10	Semi Detached	2	Private	5	Bekstone	Linear	Slate	Y	S		1	POT L	A	31.89	32.03			AA2699C / 1.3 /042	
317					92.76	3B5P	1	0.76	Semi Detached	2	Private	5	Bekstone	Linear	Slate	Y	S		1	POT L	A	35.39	38.28			AA2699C / 1.3 /043	
318					92.76	3B5P	1	-2.74	Semi Detached	2	Private	5	Bekstone	Linear	Slate	Y	S		1	POT L	A	35.39	38.28			AA2699C / 1.3 /043	
319					150.94	5B9P	1	-13.86	Detached	2	Private	1	Bekstone	Linear	Slate	NA	S		1	YES	A	77.00	46.31	23.00		AA2699C / 1.3 /046	
320	51.27	1B2P-F	1	Flat				-16.53		1	Affordable [Rent]	7-[A1-A]	Render / Timber	Flat	Single Ply Membrane				0	NO	D	146.66	23.00			AA2699C / 1.1 /020	
321	61.84	2B3P-F	1	Flat				11.54		1	Affordable [Rent]	7-[A2-A]							0	NO			23.00			AA2699C / 1.1 /020	
322	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.00			AA2699C / 1.1 /020	
323	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.00			AA2699C / 1.1 /020	
324	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.00			AA2699C / 1.1 /020	
325	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.00			AA2699C / 1.1 /020	
326					92.76	3B5P	1	0.76	End Terrace	2	Private	3	Render [White]	Gable	Slate	N	S		0	NO	B	37.41	38.28			AA2699C / 1.3 /043	
327					83.00	2B4P [v2]	1	1.10	Mid Terrace	2	Private	3	Render [White]	Gable	Slate	N	L		0	NO	B	33.26	29.96			AA2699C / 1.3 /042	
328					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Render [White]	Gable	Slate	N	S		0	NO	B	37.41	43.28			AA2699C / 1.3 /043	
329					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES	B	58.14	44.01			AA2699C / 1.3 /048	
330					150.94	5B9P	1	-13.86	Detached	2	Private	1	Brick [red]	Linear	Slate	NA	S		1	YES	B	51.03	44.01			AA2699C / 1.3 /048	
331					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	A	35.39	38.84			AA2699C / 1.3 /043	
332					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	A	31.89	34.40			AA2699C / 1.3 /040	
333					81.78	2B4P	1	-0.12	End Terrace [Bay]	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	A	31.89	32.18			AA2699C / 1.3 /040	
334	78.94	2B4P	1	End Terrace [Bay]				-8.86		2	Affordable [Shared ov	1	Bekstone	Linear	Slate	Y	L		1	POT L	A	29.27	35.76			AA2699C / 1.3 /035	
335	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Shared ov	1	Bekstone	Linear	Slate	Y	L		1	POT L	A	29.27	33.32			AA2699C / 1.3 /035	
336	76.02	2B4P	1	End Terrace				-8.38		2	Affordable [Shared ov	1	Bekstone	Linear	Slate	Y	L		1	POT L	A	29.27	35.49			AA2699C / 1.3 /035	
337					92.76	3B5P [v]	1	0.76	End Terrace	2	Private	1	Brick [red]	Gable	Slate	N	S		0	NO	B	37.41	49.93			AA2699C / 1.3 /044	
338					93.12	3B5P [v]	1	1.12	Mid Terrace	2	Private	1	Brick [red]	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /044	

BICESTER ECO TOWN
EXEMPLAR SITE
ACCOMMODATION SCHEDULE

Plot No.	PRP GIA Affordable [m^2]				PRP GIA Private [m^2]			difference in GIA between Tender & PRP current		No. of storeys	TENURE	TYPE	MATERIAL - WALL	ROOF TYPE	MATERIAL - ROOF	PRP - LOFT ADAPTABLE LABC COMPLIANT	FARRELLS - LOFT ADAPTIONS TYPE IN CONSENT	ENRICHED UNITS ROOM IN ROOF AS CONSENT BASE DESIGN	UNITS WITH HOME OFFICE (POTENTIAL ROOF ADAPTION/GARAGE OR IN BASEBUILD)	HOME OFFICE	PV TYPE	ROOF AREA South facing	ROOF AREA AS REPORTED BY HYDER	GARDEN ROOM South facing	Farrells Drg. No. BIMP2_PA_05_xxx	PRP Drg. No. AA2699/1.0/xxx	CLIENT APPROVAL STATUS
339					92.76	3B5P [v]	1	-2.74	End Terrace	2	Private	1	Brick [red]	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /044	
340					92.76	3B5P [v]	1	0.76	Mid Terrace	2	Private	3	Render [White]	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /044	
341					83.00	2B4P [v1]	1	83.00	End Terrace	2	Private	3	Render [White]	Gable	Slate	N	L		0	NO	B	33.26	0.00			AA2699C / 1.3 /041	
342					92.76	3B5P [v]	1	0.76	End Terrace	2	Private	3	Render [White]	Gable	Slate	N	S		0	NO	B	37.41	49.93			AA2699C / 1.3 /044	
343	56.35	1B2P-F	1	Flat				-1.55		1	Affordable [Shared ov	7-[A1-B]	Render / Timber	Flat	Single Ply Membrane				1	YES	D	161.25	24.00			AA2699C / 1.1 /022	
344	56.35	1B2P-F	1	Flat				-11.45		1	Affordable [Shared ov	7-[A1-B]							1	YES			24.00			AA2699C / 1.1 /022	
345	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Shared ov	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
346	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Shared ov	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
347	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Shared ov	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
348	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Shared ov	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
349	56.35	1B2P-F	1	Flat				-1.55		1	Affordable [Rent]	7-[A1-B]	Render / Timber	Flat	Single Ply Membrane				1	YES	D	161.25	24.00			AA2699C / 1.1 /022	
350	56.35	1B2P-F	1	Flat				-11.45		1	Affordable [Rent]	7-[A1-B]							1	YES			24.00			AA2699C / 1.1 /022	
351	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Rent]	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
352	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Rent]	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
353	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Rent]	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
354	67.48	2B4P-F	1	Flat				-0.32		1	Affordable [Rent]	7-[A2-C]							0	NO			24.00			AA2699C / 1.1 /022	
355	81.64	2B4P-BUNG	1	Semi Detached				-0.96		1	Affordable [Rent]	8	Render/Timber	Saw tooth	Slate / Green	N	BUNG		0	NO	B	108.07	51.61			AA2699C / 1.3 /037	
356	81.64	2B4P-BUNG	1	Semi Detached				-0.96		1	Affordable [Rent]	8	Render/Timber	Saw tooth	Slate / Green	N	BUNG		0	NO	B	108.07	51.61			AA2699C / 1.3 /037	
357	76.02	2B4P	1	End Terrace				-21.58		2	Affordable [Rent]	3	Render [White]	Gable	Slate	N	L		0	NO	B	32.38	43.34			AA2699C / 1.3 /035	
358	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Rent]	3	Render [White]	Gable	Slate	N	L		0	NO	B	32.38	39.01			AA2699C / 1.3 /035	
359	89.54	3B5P	1	End Terrace				-4.96		2	Affordable [Rent]	3	Render [White]	Gable	Slate	N	L		0	NO	B	36.39	44.43			AA2699C / 1.3 /036	
360	76.02	2B4P	1	End Terrace				-11.78		2	Affordable [Shared ov	1	Bekstone	Linear	Slate	Y	L		1	POT L	B	29.27	35.49			AA2699C / 1.3 /035	
361	78.94	2B4P	1	Semi Detached [Bay]				-8.86		2	Affordable [Shared ov	1	Bekstone	Linear	Slate	Y	L		1	POT L	B	29.27	35.49			AA2699C / 1.3 /035	
362					81.78	2B4P [v2]	1	-0.12	End Terrace [Bay]	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	B	31.89	34.40			AA2699C / 1.3 /042	
363					83.00	2B4P [v2]	1	1.10	Mid Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	B	31.89	32.18			AA2699C / 1.3 /042	
364					92.76	3B5P	1	-2.74	End Terrace	2	Private	1	Bekstone	Linear	Slate	Y	S		1	POT L	B	35.39	36.06			AA2699C / 1.3 /043	
365	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Shared ov	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	31.10			AA2699C / 1.3 /035	
366	76.02	2B4P	1	Semi Detached				-8.38		2	Affordable [Shared ov	1	Brick [red]	Linear	Slate	Y	L		1	POT L	B	29.27	35.43			AA2699C / 1.3 /035	
367					92.76	3B5P [v]	1	0.76	End Terrace	2	Private	3	Render [White]	Linear	Slate	Y	S		1	POT L	B	35.39	38.28			AA2699C / 1.3 /044	
368					83.00	2B4P [v1]	1	1.10	Mid Terrace	2	Private	3	Render [White]	Linear	Slate	Y	S		1	POT L	B	31.89	29.96			AA2699C / 1.3 /041	
369					92.76	3B5P [v]	1	-2.74	End Terrace	2	Private	3	Render [White]	Linear	Slate	Y	S		1	POT L	B	35.39	41.06			AA2699C / 1.3 /044	
370	51.27	1B2P-F	1	Flat				-16.53		1	Affordable [Rent]	7-[A1-A]	Render / Timber	Flat	Single Ply Membrane				0	NO	D	154.60	23.60			AA2699C / 1.1 /021	
371	61.84	2B3P-F	1	Flat				11.54		1	Affordable [Rent]	7-[A2-A]							0	NO			23.60			AA2699C / 1.1 /021	
372	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.60			AA2699C / 1.1 /021	
373	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.60			AA2699C / 1.1 /021	
374	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.60			AA2699C / 1.1 /021	
375	61.84	2B3P-F	1	Flat				-5.96		1	Affordable [Rent]	7-[A2-B]							0	NO			23.60			AA2699C / 1.1 /021	
376					119.32	4B6P	1	-45.48	Detached	2	Private	1	Bekstone	Linear	Slate	N	S		1	POT G	B	51.16	46.03			AA2699C / 1.3 /045	
377					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Render / Timber	Gable	Slate	N	S		0	NO	B	37.41	45.50			AA2699C / 1.3 /043	
378					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Render / Timber	Gable	Slate	N	L		0	NO	B	33.26	39.95			AA2699C / 1.3 /040	
379					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Render / Timber	Gable	Slate	N	L		0	NO	B	33.26	39.95			AA2699C / 1.3 /040	
380					83.00	2B4P	1	1.10	Mid Terrace	2	Private	3	Render / Timber	Gable	Slate	N	L		0	NO	B	33.26	39.95			AA2699C / 1.3 /040	
381					92.76	3B5P	1	-2.74	End Terrace	2	Private	3	Render / Timber	Gable	Slate	N	S		0	NO	B	37.41	49.93			AA2699C / 1.3 /043	
382	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	3	Render / Timber	Linear	Slate	Y	S		1	POT L	B	34.20	38.20			AA2699C / 1.3 /036	
383	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Rent]	3	Render / Timber	Linear	Slate	Y	S		1	POT L	B	29.27	35.49			AA2699C / 1.3 /035	
384	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	3	Render / Timber	Linear	Slate	Y	S		1	POT L	B	34.20	38.20			AA2699C / 1.3 /036	
385					92.76	3B5P [v]	1	-2.74	End Terrace	2	Private	1	Bekstone	Gable	Bekstone	N	S		0	NO	A	37.41	43.28			AA2699C / 1.3 /044	
386					83.00	2B4P	1	1.10	Mid Terrace	2	Private	1	Bekstone	Gable	Bekstone	N	L		0	NO	A	33.26	26.63			AA2699C / 1.3 /040	
387					92.76	3B5P [v]	1	-2.74	End Terrace	2	Private	1	Bekstone	Gable	Bekstone	N	S		0	NO	A	37.41	33.84			AA2699C / 1.3 /044	
388	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Shared ov	3	Render / Timber	Gable	Slate	N	L		0	NO	A	36.39	44.43			AA2699C / 1.3 /036	
389	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Shared ov	3	Render / Timber	Gable	Slate	N	L		0	NO	A	32.38	39.01			AA2699C / 1.3 /035	
390	76.02	2B4P	1	End Terrace				-8.38		2	Affordable [Shared ov	3	Render / Timber	Gable	Slate	N	L		0	NO	A	32.38	43.34			AA2699C / 1.3 /035	
391	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	3	Render / Timber	Gable	Slate	N	L		0	NO	A	36.39	44.43			AA2699C / 1.3 /036	
392	77.24	2B4P	1	Mid Terrace				-7.16		2	Affordable [Rent]	3	Render / Timber	Gable	Slate	N	L		0	NO	A	32.38	39.01			AA2699C / 1.3 /035	
393	89.54	3B5P	1	End Terrace				-7.96		2	Affordable [Rent]	3	Render / Timber	Gable	Slate	N	L		0	NO	A	36.39	48.76			AA2699C / 1.3 /036	

difference in GIA between Tender & PRP: -745.76

Total Affordable [m^2]	Total Private [m2]	Total of units (m2)
10106.1	29271.58	39377.68

Total affordable units	119
Total private units	274
Total number of units	393

Units with home office: 240

Percentage of dwellings with home office, either in base design or by adaption: **61.07%**

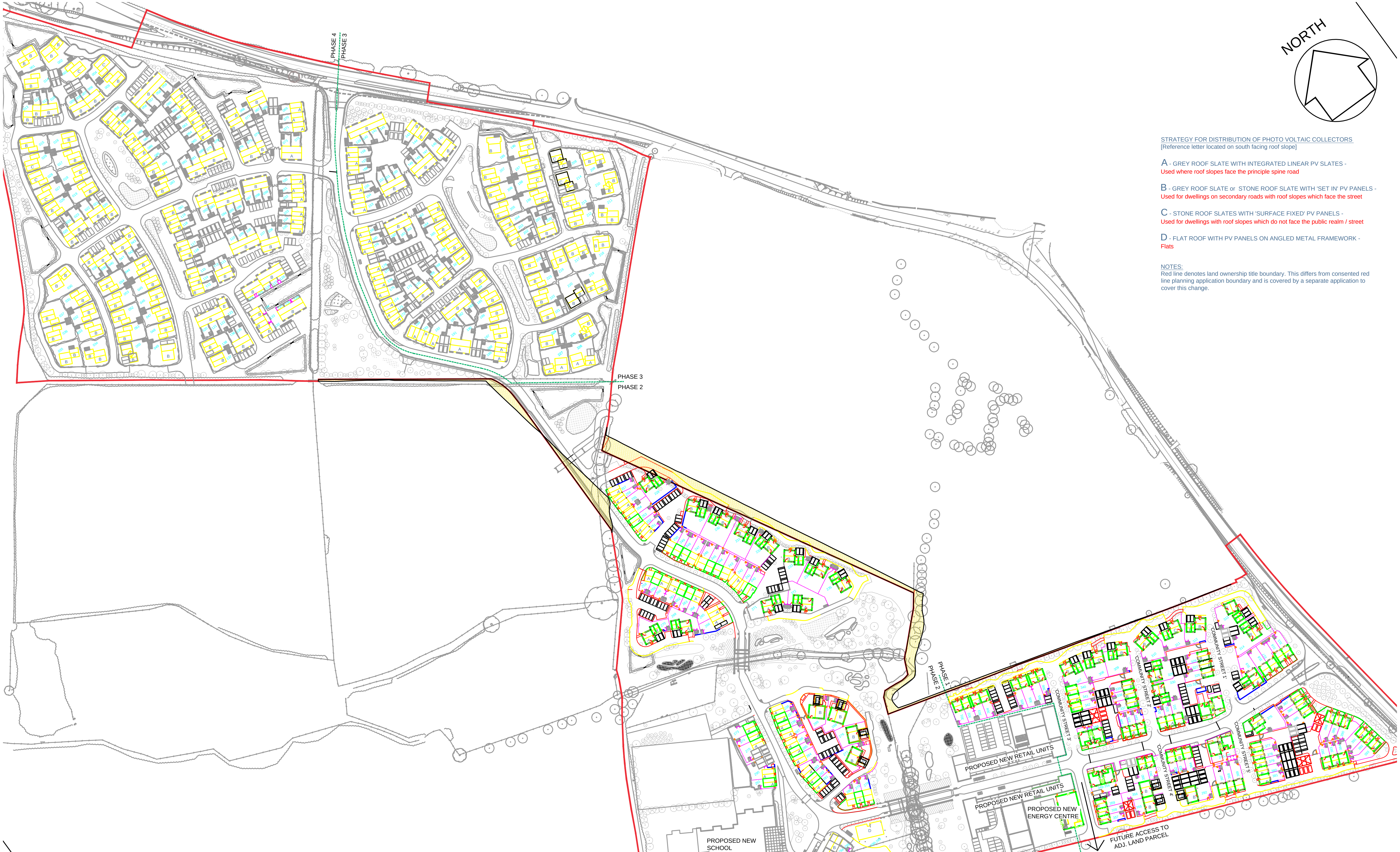
KEY TO HOME OFFICE

YES	home office can be accomodated within base design
POT L	potential for home office with Loft adaption
POT G	potential for home office with Garage adaption
NO	no home office in base design or adaption potential

KEY TO COLC KEY TO COLOURS

1-138	1 Bed 2 Person Flat
139-227	2 Bed 3 Person Flat
228-300	2 Bed 4 Person Flat
301-393	
	2 Bed 4 Person House
	3 Bed 5 Person House
	4 Bed 6/7 Person House
	5 Bed 9/10 Person House
	2 Bed 4 Person Bungalow
	3 Bed 5 Person Bungalow

NOTES:
Figures in **bold** are areas previously reported by other which require verification



STRATEGY FOR DISTRIBUTION OF PHOTO VOLTAIC COLLECTORS
[Reference letter located on south facing roof slope]

A - GREY ROOF SLATE WITH INTEGRATED LINEAR PV SLATES -
Used where roof slopes face the principle spine road

B - GREY ROOF SLATE or STONE ROOF SLATE WITH 'SET IN' PV PANELS -
Used for dwellings on secondary roads with roof slopes which face the street

C - STONE ROOF SLATES WITH 'SURFACE FIXED' PV PANELS -
Used for dwellings with roof slopes which do not face the public realm / street

D - FLAT ROOF WITH PV PANELS ON ANGLED METAL FRAMEWORK -
Flats

NOTES:
Red line denotes land ownership title boundary. This differs from consented red line planning application boundary and is covered by a separate application to cover this change.

notes

- The contractor is responsible for checking dimensions, tolerances and references. Any discrepancy to be verified with the Architect before proceeding with the works.
- Where an item is covered by drawings to different scales the larger scale drawing is to be worked to.
- Do not scale drawing. Figured dimensions to be worked to in all cases.

CDM Regulations 2007

ALL current drawings and specifications for the project must be read in conjunction with the Designer's Hazard and Environmental Assessment Record.

CDM 2007

date	rev	revision/author/checker
24.02.2012	-	First issue; jsw
22.06.2012	A	Roof layout updated in accordance with current site layout ; jsw
11.07.2012	B	Roof layout updated in accordance with current site layout drawing AA2699C/1.1/100-F; roof orientations switched for plots 314, 329, 330, 388-390 ; jsw
20.07.2012	C	Roof orientations switched for plots 314, 329, 330, 388-390 ; jsw
07.09.2012	D	Roof orientations switched for plots 314, 329, 330; jsw
09.10.2012	E	Update of layout to plots 258-266 & 269/270; jsw

purpose of issue
COMMENT

project
BICESTER ECO TOWN EXEMPLAR SITE

drawing
Overall Site Roof Plan indicating PV provision strategy PHASES 1-4

drawing no	rev
AA2699C/1.1/103	E

drawn jsw	checked
scale @ A1 1:1250	date Feb 2012

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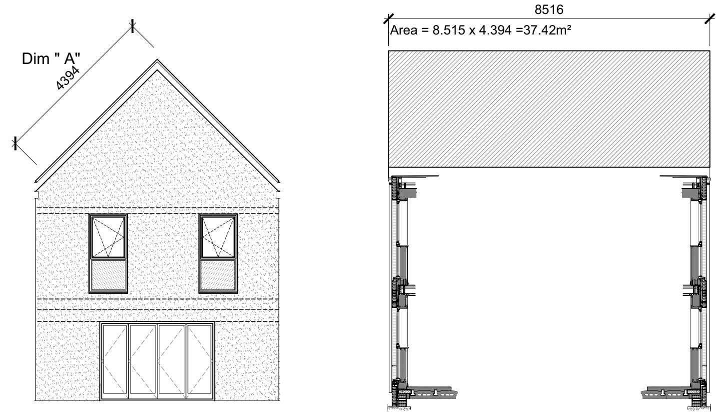
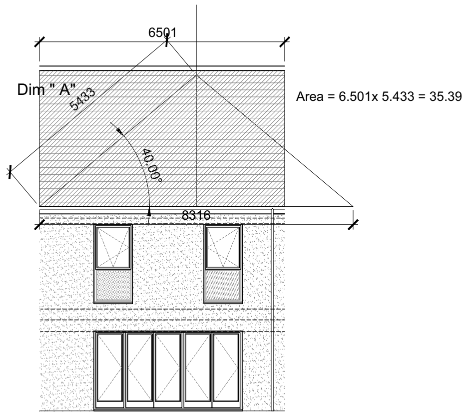
PRP

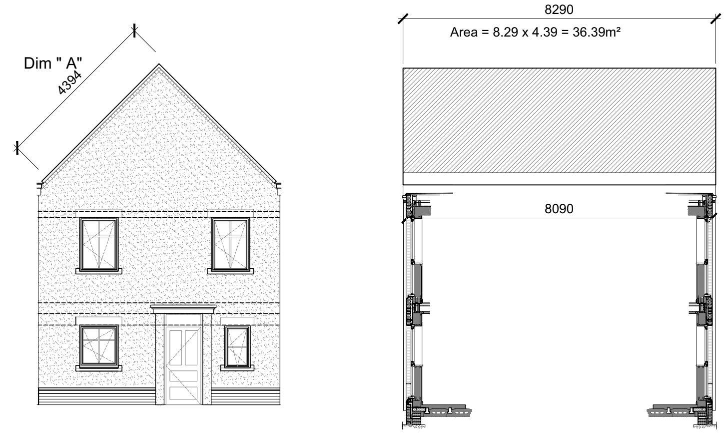


Gable pv areas

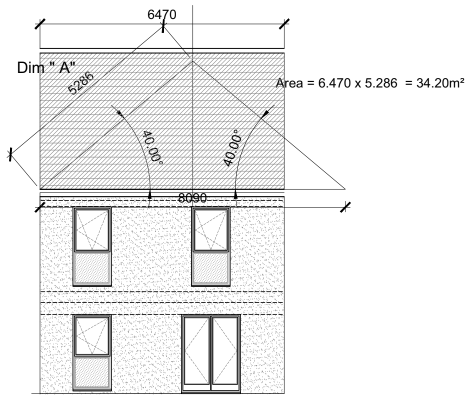


linear pv areas

3 bed 5 person Private

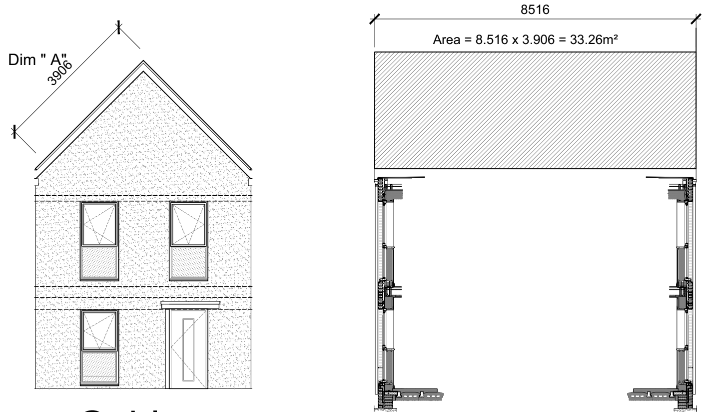


Gable pv areas

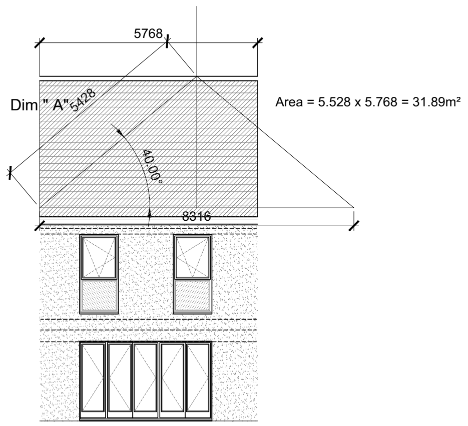


linear pv areas

3 bed 4 person Affordable

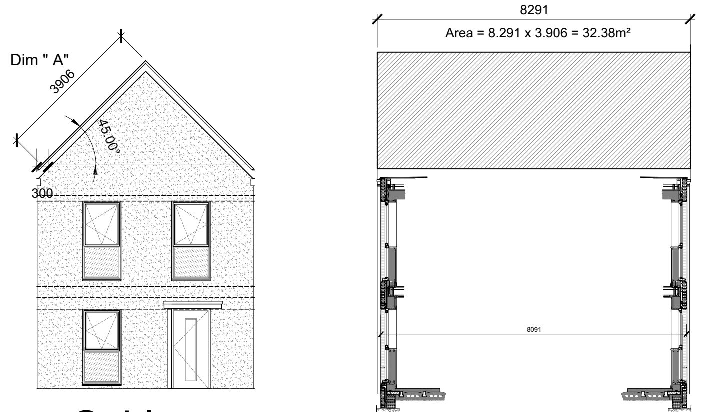


Gable pv areas

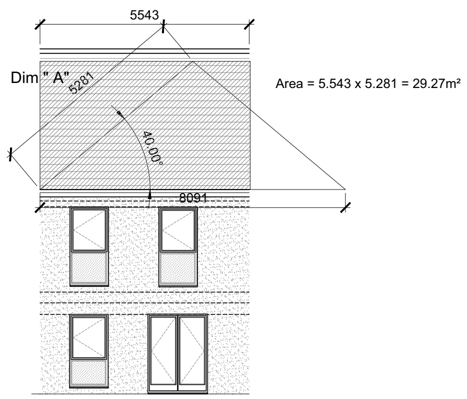


linear pv areas

2 bed 4 person private

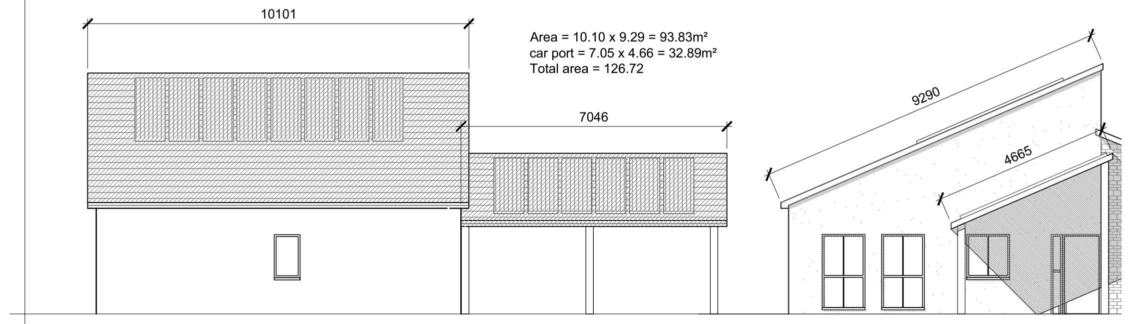


Gable pv areas

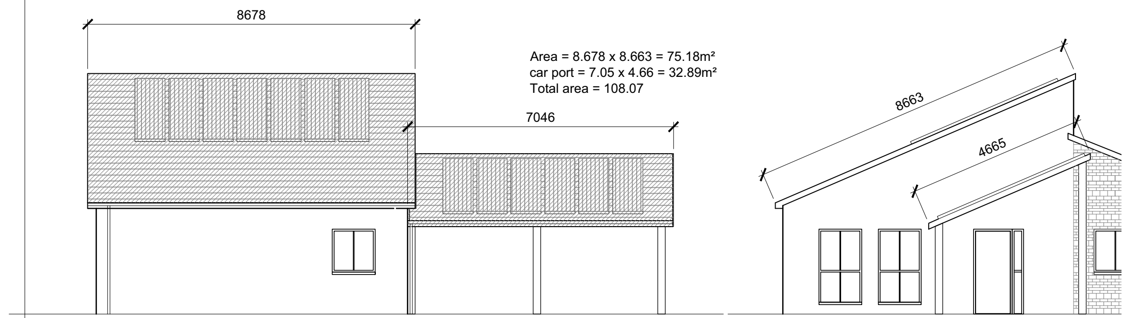


linear pv areas

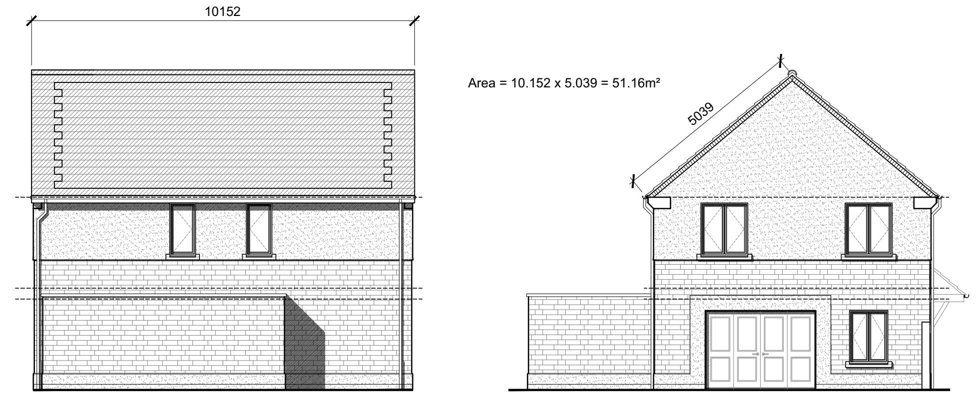
2 bed 4 person Affordable



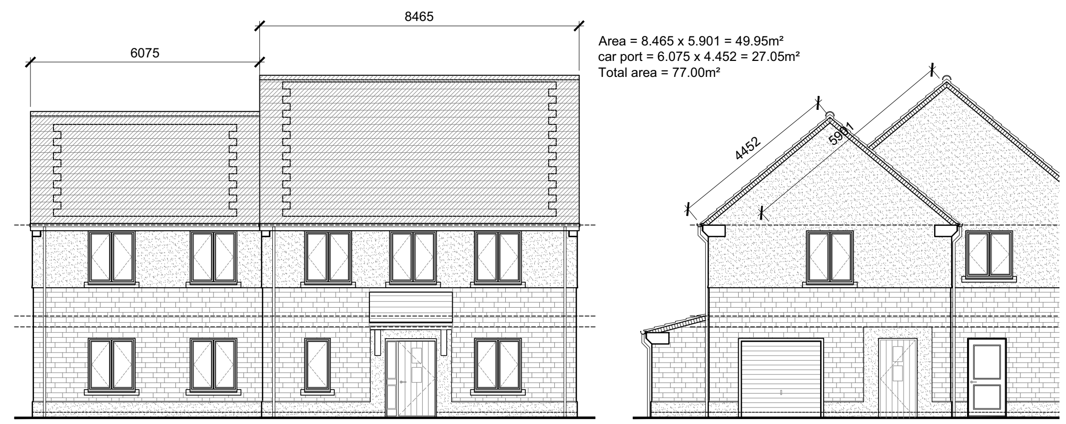
3 bed 5 person Affordable bungalow



2 bed 4 person Affordable bungalow



4 bed 6 person private (376) linear



5 bed 9 person private (319) Gable

notes

- The contractor is responsible for checking dimensions, tolerances and references. Any discrepancy to be verified with the Architect before proceeding with the works.
- Where an item is covered by drawings to different scales the larger scale drawing is to be worked to.
- Do not scale drawing. Figured dimensions to be worked to in all cases.

CDM Regulations 2007

ALL current drawings and specifications for the project must be read in conjunction with the Designer's Hazard and Environmental Assessment Record.

CDM 2007

date	rev	revision/author/checker	
12-09-2012	A	Elevation added to 4 bed 6 person house	DGH

purpose of issue
COMMENT

project
BICESTER ECO TOWN
EXEMPLAR SITE

drawing
Solar pv areas to roofs

drawing no	rev
AA2699C/1.1/514	A
drawn dgh	checked
scale @ A1	date June 2012

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Appendix 3

Updated Energy Model Calculation Tables

carbon emissions factor (gas) 0.198 $kgCO_2/kWh$

carbon emissions factor (electricity) 0.517 $kgCO_2/kWh$

Table 1 – Baseline energy demand

Boiler efficency 85%

Use Class	Sub Use	Description			GIA (m²)	assumed building type	% of GIA	basis of benchmark			good practice energy/FF benchmark ($kWh/m^2/yr$)				good practice energy benchmark ($kWh/m^2/yr$)		Energy Use (kWh/year)				total (kWh/yr)		total (kWh/yr)		carbon dioxide emission ($kgCO_{2/yr}$)	
										(m²)	space	water	L&A	cooking	Fossil Fuel	Electricity	space	water	L&A	cooking	Energy	Electricity	Fossil Fuel	Electricity	Fossil Fuel	Electricity
		5.1 Retail (Use Class A)			**960**																					
A1	(a)	Food Store			385	Small food store - Co-operative	100%	CIBSE TM46 (Small food store)	gross floor area	385	-	-	355	-	0	355	0	0	136,675	0	0	136,675	0	136,675	0	70,661
A1	(a)	Convenience Retail			385	Shops/stores: non-food stores (hairdressers)	100%	CIBSE TM46 (General retail	gross floor area	385	-	-	165	-	0	165	0	0	63,525	0	0	63,525	0	63,525	0	32,842
A3		Restaurants & Café's			190	ECO-PUB Restaurants (with bar) and cafe	100%	CIBSE TM46 (Restaurant)	gross floor area	190	40	120	90	210	370	90	6,460	19,380	17,100	39,900	65,740	17,100	70,300	17,100	13,919	8,841
		5.2 Business (Use Class B)			**3,275**					-																
B1	(a)	ECO-Business Centre			1,800	Office, air conditioned (standard)	100%	CIBSE TM46 (General office)	gross floor area	1,800	70	50	95	-	120	95	107,100	76,500	171,000	0	183,600	171,000	216,000	171,000	42,768	88,407
B1	(c)	Offices			1,100	Office, air conditioned (prestige)	100%	CIBSE TM46 (General office)	gross floor area	1,100	70	50	95	-	120	95	65,450	46,750	104,500	0	112,200	104,500	132,000	104,500	26,136	54,027
B1	(c)	Light Industrial			-	Light manufacturing	100%	BSRIA Rules of Thumb	gross floor area	-	49	-	31	-	49	31	0	0	0	0	0	0	0	0	0	0
B1	(c)	Energy Centre			375	Workshops	100%	CIBSE TM46 (Workshop -electricity only)	gross floor area	375	-	-	35	-	0	35	0	0	13,125	0	0	13,125	0	13,125	0	6,786
										-																
		5.3 Hotels & Residential Institutions (Use Class C)			**-**																					
C1		Mid-range Hotel			-	Hotels: small	100%	CIBSE TM46 (Hotel)	gross floor area	-	165	110	105	55	330	105	0	0	0	0	0	0	0	0	0	0
C1		Country Club (Golf) Hotel			-	Hotels: business/holiday	100%	CIBSE TM46 (Hotel)	gross floor area	-	165	110	105	55	330	105	0	0	0	0	0	0	0	0	0	0
C2		Assisted Living			-	Residential and nursing homes	100%	CIBSE TM46 (Long Term Resi)_	gross floor area	-	200	120	65	100	420	65	0	0	0	0	0	0	0	0	0	0
										-																
		5.4 Residential Dwellings (Use Class C)	**95.24**	**393**	**37,430**			Approved Document L1A 2006	gross floor area	37,430	37< >43	36< >46	34< >36	13< >19	757		1,279,434	1,210,811	1,301,331	542,768	3,033,014	1,301,331	3,472,469	1,301,331	687,549	672,788
		5.5 Non Residential Institutions (Use Class D)			**3,220**																					
D1	(c)	Primary Schools			2,520	Primary school	100%	CIBSE TM46	gross floor area	2,520	83	53	40	15	150	40	176,715	112,455	100,800	37,800	326,970	100,800	378,000	100,800	74,844	52,114
D1	(c)	Secondary School			-		100%	CIBSE TM46	gross floor area	-	66	45	40	39	150	40	0	0	0	0	0	0	0	0	0	0
D1	(c)	Further Education Institution			-	Further & Higher Education - Teaching	100%	BSRIA Rules of Thumb	gross floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
D1	(c)	Community Centre			350	Local authority buildings - community centres	100%	CIBSE TM46 (public buildings with light use)	net lettable items	350	85	20	20	-	105	20	25,288	5,950	7,000	0	31,238	7,000	36,750	7,000	7,277	3,619
D1	(c)	Office			-	Emergency services	100%	CIBSE F	treated floor area	-	80	50	95	-	130	95	0	0	0	0	0	0	0	0	0	0
D1	(c)	Nursery			350	Primary health care (general practitioners' surgeries and dental practices)	100%	CIBSE TM46 Clinic	gross floor area	350	115	85	70	-	200	70	34,213	25,288	24,500	0	59,500	24,500	70,000	24,500	13,860	12,667
D1	(c)	Private Hospital			-	Hospitals: acute	100%	CIBSE F	heated floor area	-					0	0	0	0	0	0	0	0	0	0	0	0
D1	(c)	Outdoor Market			-		100%	CIBSE F								0										
D1	(c)															0										
																0										
		5.6 Assembly & Leisure Facilities (Use Class D)			**-**											0										
D2		Equestrian Centre				Sports and recreation: dry sports centre	100%	CIBSE F	treated floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
D2		Tennis Academy				Sports and recreation: dry sports centre	100%	CIBSE F	treated floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
																0										
						Totals				**82,316**							**2,974,093**	**2,707,945**	**3,240,888**	**1,163,237**	**6,845,275**	**3,240,888**	**7,847,988**	**3,240,888**	**1,553,902**	**1,675,539**

Notes

1 good practice benchmarks can be assumed upper limits for new build
2 where no good practice benchmarks available, typical practice benchmarks used
3 fossil fuel taken to be gas (fossil-thermal energy)
4 benchmark figures include cooling, as applicable to building type
5 calculations are for EXEMPLAR build

Table 2 – Results of SAP Analysis

MVHR	Affordable
MEV	Private and rented

Property Type	Built Form	Plot nos	No	TFA	TER	DER CHP	Ene1 CHP	DER EE	Ene1 EE	FEE	Post CHP Space Heating (DER worksheet Box 98)	Post CHP Space Heating /m^2	Post CHP Water (box 64)	Post CHP Water (Box 45)	Post CHP Pumps & Fan	Post CHP Lighting
				m2	CO2/m2/yr	CO2/m2/yr	%	CO2/m2/yr	%	kWh/m²/year	kWh/yr	kWh/m2/yr	kWh/yr	kWh/yr	kWh/yr	kWh/yr
House	End Terrace	156	2	76.8	19.08	3.81	80.00%			39.71	1522.37	19.82	2426.36	1438.12	215.45	351.06
House	Mid Terrace	182	4	93.2	16.63	3.87	76.70%			35.28	1600.84	17.18	2292.59	1538.39	294.15	404.16
House	Semi Detached	191	12	113.34	18.54	3.63	80.40%			44.82	3015.12	26.6	2588.97	1600.73	357.71	438.04
Bungalow	Detached	288	2	97.54	19.58	3.47	82.30%			48.27	2957.02	30.32	2544.8	1556.56	250.61	403.41
Bungalow	Detached	292	5	82.63	20.61	3.6	82.50%			48.83	2481.13	30.03	2468.13	1479.89	212.3	363.79
Flat	Flat	296	3	62.99	21.16	3.7	82.50%			46.07	1655.29	26.28	2301.04	1312.8	165.3	285.61
Flat	Flat	298	2	70.98	18.56	3.66	80.30%			42.09	1576.65	22.21	2377.79	1389.55	186.27	315.75
House	Semi Detached	304	3	89.6	18.4	3.89	78.90%			39	1827.9	20.4	2509.09	1520.85	282.78	391.91
Bungalow	Semi Detached	355	7	82.63	19.85	3.6	81.90%			46.8	2321.35	28.09	2468.13	1479.89	212.3	362.92
Bungalow	Semi Detached	356	1	82.63	19.85	3.64	81.70%			46.8	2318.72	28.06	2468.13	1479.89	212.3	369.44
House	End Terrace	357	1	76.8	19.08	3.81	80.00%			39.71	1522.37	19.82	2426.36	1438.12	215.45	351.06
House	Mid Terrace	358	1	77.24	17.26	3.76	78.20%			34.93	1166.46	15.1	2429.75	1441.51	216.69	345.75
Flat	Flat	370	5	55.23	21.83	3.73	82.90%			46.68	1437.07	26.02	2218.38	1230.14	144.94	253.13
House	End Terrace	384	12	93.2	18.08	3.87	78.60%			39.73	1967.63	21.11	2292.59	1538.39	294.15	404.16
House	Mid Terrace	392	13	77.24	17.26	3.76	78.20%			35.47	1193.62	15.45	2429.75	1441.51	216.69	345.75
House	End Terrace	393	23	89.54	18.43	3.81	79.30%			39.12	1791.28	20.01	2508.77	1520.53	251.19	407.91
House	Detached	50	2	151	17.74	2.18	87.70%			46.31	5569.51	36.88	2627.28	1639.04	123.9	511.65
House	Mid Terrace	98	1	93.2	16.63	2.68	83.90%			35.58	2506.08	26.89	2292.59	1538.39	79.31	404.16
House	Mid Terrace	101	1	93.2	16.63	2.68	83.90%			35.58	2506.08	26.89	2292.59	1538.39	79.31	404.16
House	Mid Terrace	104	1	77.24	17.26	2.69	84.40%			34.93	1895.32	24.54	2429.75	1441.51	56.34	345.75
House	End Terrace	105	4	93.2	18.08	2.68	85.20%			39.72	2760.83	29.62	2292.59	1538.39	79.31	404.16
House	Mid Terrace	151	9	93.2	16.63	2.68	83.90%			35.28	2472.55	26.53	2292.59	1538.39	79.31	404.16
House	End Terrace	152	5	81.78	18.91	2.74	85.50%			39.86	2397.73	29.32	2462.48	1474.24	69.59	363.72
House	End Terrace	160	10	81.78	18.91	2.74	85.50%			39.03	2339.61	28.61	2462.48	1474.24	69.59	363.72
House	Semi Detached	164	4	81.78	18.91	2.74	85.50%			39.03	2339.61	28.61	2462.48	1474.24	69.59	363.72
House	Mid Terrace	176	1	93.2	16.63	2.68	83.90%			33.99	2383.71	25.58	2292.59	1538.39	79.31	404.16
House	Mid Terrace	193	7	93.2	16.63	2.68	83.90%			34.47	2414.35	25.91	2292.59	1538.39	79.31	404.16
House	Detached	198	2	113.34	18.54	2.44	86.80%			44.88	3896.1	34.38	2588.97	1600.73	96.45	438.04
House	Detached	206	1	113.34	18.54	2.44	86.80%			44.33	3839.38	33.87	2588.97	1600.73	96.45	438.04
House	Detached	207	30	113.34	18.54	2.44	86.80%			43.92	3800.51	33.53	2588.97	1600.73	96.45	438.04
House	Detached	210	1	151	17.74	2.18	87.70%			46.19	5554.47	36.78	2627.28	1639.04	123.9	511.65
House	Detached	221	8	113.34	18.54	2.44	86.80%			45.02	3908.44	34.48	2588.97	1600.73	96.45	438.04
House	Detached	223	10	113.34	18.54	2.44	86.80%			44.56	3862.46	34.08	2588.97	1600.73	96.45	438.04
House	Detached	224	7	113.34	18.54	2.44	86.80%			44.2	3823.47	33.73	2588.97	1600.73	96.45	438.04
House	Mid Terrace	249	2	77.24	17.26	2.69	84.40%			34.93	1895.32	24.54	2429.75	1441.51	56.34	345.75
House	End Terrace	250	2	93.2	18.08	2.68	85.20%			39.42	2720.93	29.19	2292.59	1538.39	79.31	404.16
House	Semi Detached	265	5	93.2	18.08	2.68	85.20%			39.73	2753.76	29.55	2292.59	1538.39	79.31	404.16
House	Mid Terrace	268	2	93.2	16.63	2.68	83.90%			34.47	2414.35	25.91	2292.59	1538.39	79.31	404.16
House	Detached	272	2	151	17.74	2.18	87.70%			46.55	5608.44	37.14	2627.28	1639.04	123.9	511.65
House	Semi Detached	290	1	89.6	18.4	2.7	85.30%			39.6	2635.12	29.41	2509.09	1520.85	76.25	391.91
House	Semi Detached	291	1	81.78	18.91	2.74	85.50%			39.71	2379.57	29.1	2462.48	1474.24	69.59	363.72
House	End Terrace [Bay]	293	2	89.6	18.4	2.7	85.30%			39	2588.56	28.89	2509.09	1520.85	76.25	391.91
House	Mid Terrace	294	2	77.24	17.26	2.69	84.40%			35.42	1927.47	24.95	2429.75	1441.51	56.34	345.75
House	Detached	307	9	151	17.74	2.18	87.70%			45.86	5514.12	36.52	2627.28	1639.04	123.9	511.65
House	Detached	314	10	151	17.74	2.18	87.70%			45.78	5503.58	36.45	2627.28	1639.04	123.9	511.65
House	Semi Detached [Bay]	315	10	79	19.07	2.69	85.90%			40.14	2303.17	29.15	2442.94	1454.7	57.62	353.26
House	Semi Detached	317	12	89.6	18.4	2.7	85.30%			39.84	2647.09	29.54	2509.09	1520.85	76.25	391.91
House	Detached	319	5	151	17.74	2.18	87.70%			46.46	5592.91	37.04	2627.28	1639.04	123.9	511.65
House	End Terrace	326	7	93.2	18.08	2.68	85.20%			39.73	2753.76	29.55	2292.59	1538.39	79.31	404.16
House	Detached	329	4	151	17.74	2.18	87.70%			46.54	5603.63	37.11	2627.28	1639.04	123.9	511.65
House	End Terrace [Bay]	334	3	79	19.07	2.69	85.90%			40.14	2303.17	29.15	2442.94	1454.7	57.62	353.26
House	Mid Terrace	335	15	77.24	17.26	2.69	84.40%			34.93	1895.32	24.54	2429.75	1441.51	56.34	345.75
House	Mid Terrace	338	6	93.2	16.63	2.68	83.90%			35.58	2506.08	26.89	2292.59	1538.39	79.31	404.16
Flat	Flat	346	2	67.08	17.15	2.68	84.40%			33	1496.84	22.31	2341.65	1353.41	45.77	302.29
Flat	Flat	348	9	67.08	18.93	2.68	85.80%			41.85	2039.3	30.4	2341.65	1353.41	45.77	302.29
House	End Terrace [Bay]	362	10	81.78	18.91	2.74	85.50%			39.03	2339.61	28.61	2462.48	1474.24	69.59	363.72
House	End Terrace	364	9	93.2	18.08	2.68	85.20%			38.62	2664.75	28.59	2292.59	1538.39	79.31	404.16
House	Semi Detached	365	15	79	19.07	2.69	85.90%			39.78	2286.04	28.94	2442.94	1454.7	57.62	353.26
House	Mid Terrace	368	5	81.94	17.16	2.74	84.00%			35.33	2066.72	25.22	2463.55	1475.31	69.73	364.38
House	Detached	376	3	113.34	18.54	2.44	86.80%			44.82	3886.5	34.29	2588.97	1600.73	96.45	438.04
House	Mid Terrace	380	11	77.24	17.26	2.69	84.40%			35.47	1922.63	24.89	2429.75	1441.51	56.34	345.75
House	End Terrace	381	18	93.2	18.08	2.68	85.20%			38.62	2664.75	28.59	2292.59	1538.39	79.31	404.16
House	End Terrace	388	4	89.54	18.43	2.73	85.20%			39.12	2592.07	28.95	2508.77	1520.53	65.31	407.91
House	Mid Terrace	389	4	77.24	17.26	2.69	84.40%			35.42	1927.47	24.95	2429.75	1441.51	56.34	345.75
House	End Terrace	390	3	79	19.07	2.69	85.90%			40.47	2332.47	29.52	2442.94	1454.7	57.62	353.26
			393													

Space Heating Demand	Water Heating Demand (box 45)	Water Heating Demand (box 64)	Pumps & Fans	Lighting
kWh/m^2/yr	kWh/m^2/yr	kWh/m^2/yr	kWh/m^2/yr	kWh/m^2/yr
19.82	18.73	31.59	2.81	4.57
17.18	16.51	24.60	3.16	4.34
26.60	14.12	22.84	3.16	3.86
30.32	15.96	26.09	2.57	4.14
30.03	17.91	29.87	2.57	4.40
26.28	20.84	36.53	2.62	4.53
22.21	19.58	33.50	2.62	4.45
20.40	16.97	28.00	3.16	4.37
28.09	17.91	29.87	2.57	4.39
28.06	17.91	29.87	2.57	4.47
19.82	18.73	31.59	2.81	4.57
15.10	18.66	31.46	2.81	4.48
26.02	22.27	40.17	2.62	4.58
21.11	16.51	24.60	3.16	4.34
15.45	18.66	31.46	2.81	4.48
20.01	16.98	28.02	2.81	4.56
36.88	10.85	17.40	0.82	3.39
26.89	16.51	24.60	0.85	4.34
26.89	16.51	24.60	0.85	4.34
24.54	18.66	31.46	0.73	4.48
29.62	16.51	24.60	0.85	4.34
26.53	16.51	24.60	0.85	4.34
29.32	18.03	30.11	0.85	4.45
28.61	18.03	30.11	0.85	4.45
28.61	18.03	30.11	0.85	4.45
25.58	16.51	24.60	0.85	4.34
25.91	16.51	24.60	0.85	4.34
34.38	14.12	22.84	0.85	3.86
33.87	14.12	22.84	0.85	3.86
33.53	14.12	22.84	0.85	3.86
36.78	10.85	17.40	0.82	3.39
34.48	14.12	22.84	0.85	3.86
34.08	14.12	22.84	0.85	3.86
33.73	14.12	22.84	0.85	3.86
24.54	18.66	31.46	0.73	4.48
29.19	16.51	24.60	0.85	4.34
29.55	16.51	24.60	0.85	4.34
25.91	16.51	24.60	0.85	4.34
37.14	10.85	17.40	0.82	3.39
29.41	16.97	28.00	0.85	4.37
29.10	18.03	30.11	0.85	4.45
28.89	16.97	28.00	0.85	4.37
24.95	18.66	31.46	0.73	4.48
36.52	10.85	17.40	0.82	3.39
36.45	10.85	17.40	0.82	3.39
29.15	18.41	30.92	0.73	4.47
29.54	16.97	28.00	0.85	4.37
37.04	10.85	17.40	0.82	3.39
29.55	16.51	24.60	0.85	4.34
37.11	10.85	17.40	0.82	3.39
29.15	18.41	30.92	0.73	4.47
24.54	18.66	31.46	0.73	4.48
26.89	16.51	24.60	0.85	4.34
22.31	20.18	34.91	0.68	4.51
30.40	20.18	34.91	0.68	4.51
28.61	18.03	30.11	0.85	4.45
28.59	16.51	24.60	0.85	4.34
28.94	18.41	30.92	0.73	4.47
25.22	18.00	30.07	0.85	4.45
34.29	14.12	22.84	0.85	3.86
24.89	18.66	31.46	0.73	4.48
28.59	16.51	24.60	0.85	4.34
28.95	16.98	28.02	0.73	4.56
24.95	18.66	31.46	0.73	4.48
29.52	18.41	30.92	0.73	4.47

	TFA	Space Heating Demand	Water Heating Demand (box 45)	Water Heating Demand (box 64)	Pumps & Fans	Lighting
	m^2	kWh/m^2/yr	kWh/m^2/yr	kWh/m^2/yr	kWh/m^2/yr	kWh/m^2/yr
	153.6	39.65	37.45	63.19	5.61	9.14
	372.8	68.71	66.03	98.39	12.62	17.35
	1360.08	319.23	169.48	274.11	37.87	46.38
	195.08	60.63	31.92	52.18	5.14	8.27
	413.15	150.13	89.55	149.35	12.85	22.01
	188.97	78.84	62.52	109.59	7.87	13.60
	141.96	44.43	39.15	67.00	5.25	8.90
	268.8	61.20	50.92	84.01	9.47	13.12
	578.41	196.65	125.37	209.09	17.98	30.74
	82.63	28.06	17.91	29.87	2.57	4.47
	76.8	19.82	18.73	31.59	2.81	4.57
	77.24	15.10	18.66	31.46	2.81	4.48
	276.15	130.10	111.37	200.83	13.12	22.92
	1118.4	253.34	198.08	295.18	37.87	52.04
	1004.12	200.89	242.62	408.94	36.47	58.19
	2059.42	460.12	390.58	644.42	64.52	104.78
	302	73.77	21.71	34.80	1.64	6.78
	93.2	26.89	16.51	24.60	0.85	4.34
	93.2	26.89	16.51	24.60	0.85	4.34
	77.24	24.54	18.66	31.46	0.73	4.48
	372.8	118.49	66.03	98.39	3.40	17.35
	838.8	238.77	148.56	221.39	7.66	39.03
	408.9	146.60	90.13	150.56	4.25	22.24
	817.8	286.09	180.27	301.11	8.51	44.48
	327.12	114.43	72.11	120.44	3.40	17.79
	93.2	25.58	16.51	24.60	0.85	4.34
	652.4	181.34	115.54	172.19	5.96	30.36
	226.68	68.75	28.25	45.69	1.70	7.73
	113.34	33.87	14.12	22.84	0.85	3.86
	3400.2	1005.96	423.70	685.28	25.53	115.94
	151	36.78	10.85	17.40	0.82	3.39
	906.72	275.87	112.99	182.74	6.81	30.92
	1133.4	340.79	141.23	228.43	8.51	38.65
	793.38	236.14	98.86	159.90	5.96	27.05
	154.48	49.08	37.33	62.91	1.46	8.95
	186.4	58.39	33.01	49.20	1.70	8.67
	466	147.73	82.53	122.99	4.25	21.68
	186.4	51.81	33.01	49.20	1.70	8.67
	302	74.28	21.71	34.80	1.64	6.78
	89.6	29.41	16.97	28.00	0.85	4.37
	81.78	29.10	18.03	30.11	0.85	4.45
	179.2	57.78	33.95	56.01	1.70	8.75
	154.48	49.91	37.33	62.91	1.46	8.95
	1359	328.66	97.69	156.59	7.38	30.50
	1510	364.48	108.55	173.99	8.21	33.88
	790	291.54	184.14	309.23	7.29	44.72
	1075.2	354.52	203.69	336.04	10.21	52.49
	755	185.20	54.27	87.00	4.10	16.94
	652.4	206.83	115.54	172.19	5.96	30.36
	604	148.44	43.42	69.60	3.28	13.55
	237	87.46	55.24	92.77	2.19	13.41
	1158.6	368.07	279.94	471.86	10.94	67.14
	559.2	161.34	99.04	147.59	5.11	26.02
	134.16	44.63	40.35	69.82	1.36	9.01
	603.72	273.61	181.58	314.17	6.14	40.56
	817.8	286.09	180.27	301.11	8.51	44.48
	838.8	257.33	148.56	221.39	7.66	39.03
	1185	434.06	276.21	463.85	10.94	67.07
	409.7	126.11	90.02	150.33	4.25	22.23
	340.02	102.87	42.37	68.53	2.55	11.59
	849.64	273.81	205.29	346.03	8.02	49.24
	1677.6	514.65	297.11	442.77	15.32	78.06
	358.16	115.79	67.93	112.07	2.92	18.22
	308.96	99.82	74.65	125.83	2.92	17.91
	237	88.57	55.24	92.77	2.19	13.41
TOTAL	**37430.29**	**11049.80**	**6477.82**	**10517.27**	**516.20**	**1665.12**
	95.24	**28.12**	**16.48**	**26.76**	**1.31**	**4.24**

Table 3 – Advance Practice Energy Efficiency (APEE) demand

carbon emissions factor (gas) 0.198 $kgCO_2/kWh$

carbon emissions factor (electricity) 0.517 $kgCO_2/kWh$

Domestic Boiler efficency 90%

Non-domestic benchmark adjustmei 75%

Non-domestic Boiler efficiency 85%

Use Class	Sub Use	Description			GIA (m²)	assumed building type	% of GIA	basis of benchmark			good practice energy/FF benchmark (kWh/m²/yr)				good practice energy benchmark (kWh/m²/yr)		Energy Use (kWh/year)				total (kWh/yr)		total (kWh/yr)		carbon dioxide emission ($kgCO_{2/yr}$)	
										(m²)	space	water	L&A	cooking	Fossil Fuel	Electricity	space	water	L&A	cooking	Energy	Electricity	Fossil Fuel	Electricity	Fossil Fuel	Electricity
		5.1 Retail (Use Class A)			**1,250**																					
A1	(a)	Food Store			750	Small food store - Co-operative	100%	CIBSE TM46 (Small food store)	gross floor area	750	-	-	266	-	0	266	0	0	199,688	0	0	199,688	0	199,688	0	103,238
A1	(a)	Convenience Retail			253	Shops/stores: non-food stores (hairdressers)	100%	CIBSE TM46 (General retail	gross floor area	253	-	-	124	-	0	124	0	0	31,309	0	0	31,309	0	31,309	0	16,187
A3		Restaurants & Café's			247	ECO-PUB Restaurants (with bar) and cafe	100%	CIBSE TM46 (Restaurant)	gross floor area	247	30	90	68	158	278	68	6,308	18,925	16,699	38,964	64,198	16,699	68,651	16,699	13,593	8,633
																0										
		5.2 Business (Use Class B)			**1,540**					-						0										
B1	(a)	ECO-Business Centre			495	Office, air conditioned (standard)	100%	CIBSE TM46 (General office)	gross floor area	495	53	38	71	-	90	71	22,089	15,778	35,269	0	37,868	35,269	44,550	35,269	8,821	18,234
B1	(c)	Offices			745	Office, air conditioned (prestige)	100%	CIBSE TM46 (General office)	gross floor area	745	53	38	71	-	90	71	33,266	23,761	53,113	0	57,027	53,113	67,091	53,113	13,284	27,460
B1	(c)	Light Industrial			-	Light manufacturing	100%	BSRIA Rules of Thumb	gross floor area	-	37	-	23	-	37	23	0	0	0	0	0	0	0	0	0	0
B1	(c)	Energy Centre			300	Workshops	100%	CIBSE TM46 (Workshop -electricity only)	gross floor area	300	-	-	26	-	0	26	0	0	7,875	0	0	7,875	0	7,875	0	4,071
										-						0									0	
		5.3 Hotels & Residential Institutions (Use Class C)			**-**											0										
C1		Mid-range Hotel			-	Hotels: small	100%	CIBSE TM46 (Hotel)	gross floor area	-	124	83	79	41	206	120	0	0	0	0	0	0	0	0	0	0
C1		Country Club (Golf) Hotel			-	Hotels: business/holiday	100%	CIBSE TM46 (Hotel)	gross floor area	-	124	83	79	41	206	120	0	0	0	0	0	0	0	0	0	0
C2		Assisted Living			-	Residential and nursing homes	100%	CIBSE TM46 (Long Term Resi)_	gross floor area	-	150	90	49	75	240	124	0	0	0	0	0	0	0	0	0	0
										-						0										
		5.4 Residential Dwellings (Use Class C)		**393**	**74,861**											0										
C3										-						0										
		Average house (Refer to 2b.1 SAP calcs input for detailed information)	95.24	393	37,430		100%	Approved Document L1A 2006	gross floor area	37,430	28.12	16.48	20.19	3.32	357	188	1,052,410	616,964	755,677	124,222	1,669,374	879,900	1,854,860	879,900	367,262	454,908
		5.5 Non Residential Institutions (Use Class D)			**3,220**											0										
D1	(c)	Primary Schools			2,520	Primary school	100%	CIBSE TM46	gross floor area	2,520	62	39	30	11	113	30	132,536	84,341	75,600	28,350	216,889	75,600	283,500	75,600	56,133	39,085
D1	(c)	Secondary School			-		100%	CIBSE TM46	gross floor area	-	50	34	30	29	83	59	0	0	0	0	0	0	0	0	0	0
D1	(c)	Further Education Institution			-	Further & Higher Education - Teaching	100%	BSRIA Rules of Thumb	gross floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
D1	(c)	Community Centre			350	Local authority buildings - community centres	100%	CIBSE TM46 (public buildings with light use)	net lettable items	350	64	15	15	-	79	15	18,966	4,463	5,250	0	23,428	5,250	27,563	5,250	5,457	2,714
D1	(c)	Office			-	Emergency services	100%	CIBSE F	treated floor area	-	60	38	71	-	98	71	0	0	0	0	0	0	0	0	0	0
D1	(c)	Nursery			350	Primary health care (general practitioners' surgeries and dental practices)	100%	CIBSE TM46 Clinic	gross floor area	350	86	64	53	-	150	53	25,659	18,966	18,375	0	44,625	18,375	52,500	18,375	10,395	9,500
D1	(c)	Private Hospital			-	Hospitals: acute	100%	CIBSE F	heated floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
D1	(c)	Outdoor Market			-		100%	CIBSE F								0										
D1	(c)															0										
																0										
		5.6 Assembly & Leisure Facilities (Use Class D)			**-**											0										
D2		Equestrian Centre				Sports and recreation: dry sports centre	100%	CIBSE F	treated floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
D2		Tennis Academy				Sports and recreation: dry sports centre	100%	CIBSE F	treated floor area	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0
																0										
						Totals				**80,871**							**3,396,055**	**2,017,126**	**2,710,209**	**439,981**	**5,452,156**	**3,082,876**	**6,108,433**	**3,082,876**	**1,209,470**	**1,593,847**

Notes

1 good practice benchmarks can be assumed upper limits for new build
2 where no good practice benchmarks available, typical practice benchmarks used
3 fossil fuel taken to be gas (fossil-thermal energy)
4 benchmark figures include cooling, as applicable to building type
5 calculations are for EXEMPLAR build

Table 4 – Energy demand profiles

ENERGY BASELINE

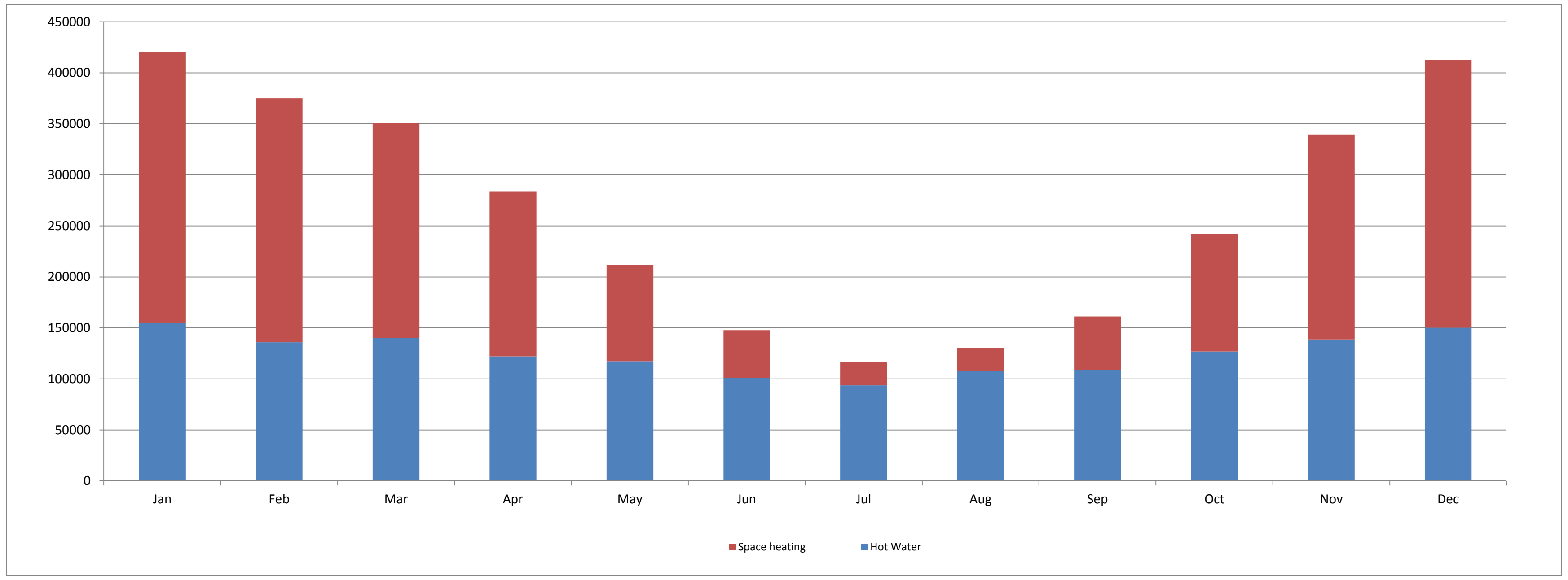
Hot water and space heating calcs

	Average Floor Area from SAP	Hot water demand	Space Heating demand	Number of Units	Total Hot water demand	Total Sapce heating demand
Domesctic					1210811	1279434
Non-Domestic					173868	238510
School					112455	176715
Total					**1497134**	**1694659**

Weighted space heating											
0.156	0.141	0.124	0.095	0.056	0.027	0.014	0.014	0.031	0.068	0.119	0.155
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month
199873	180749	159158	122145	71559	35163	17273	17273	39481	86982	151755	198022
37260	33695	29670	22770	13340	6555	3220	3220	7360	16215	28290	36915
27606	24965	21983	16871	9884	4857	2386	2386	5453	12014	20960	27351
264739	**239409**	**210811**	**161785**	**94783**	**46575**	**22879**	**22879**	**52294**	**115211**	**201006**	**262288**

Weighted hot water											
0.104	0.091	0.094	0.082	0.078	0.068	0.063	0.072	0.073	0.085	0.093	0.100
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month
125517	109781	113283	98765	94768	81772	75773	86955	87991	102549	112097	121559
18024	15764	16267	14182	13608	11742	10881	12486	12635	14726	16097	17455
11657	10196	10521	9173	8802	7595	7038	8076	8172	9524	10411	11290
155198	**135741**	**140071**	**122120**	**117178**	**101109**	**93692**	**107517**	**108799**	**126799**	**138605**	**150305**

TOTAL	**419937**	**375151**	**350882**	**283905**	**211961**	**147684**	**116570**	**130396**	**161093**	**242010**	**339611**	**412593**



APEE ENERGY ENERGY BASELINE

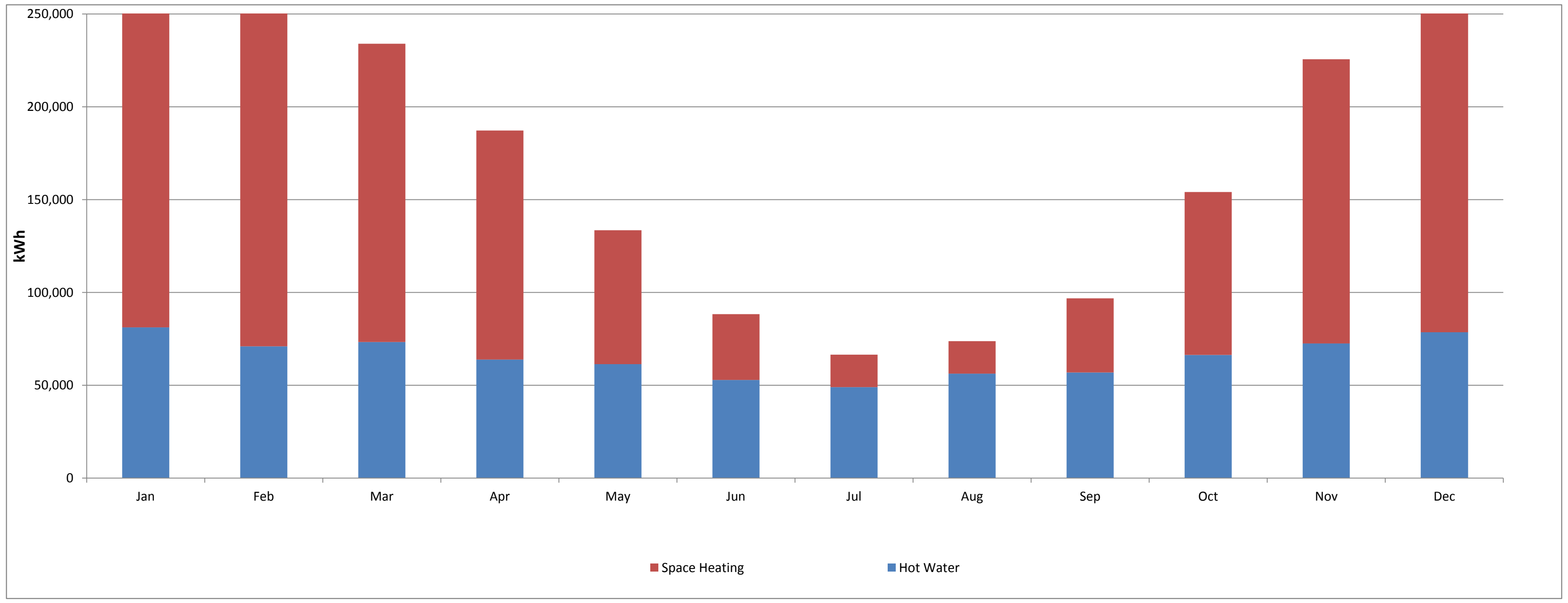
Hot water and space heating calcs

	Average Floor Area from SAP	Hot water demand	Space Heating demand	Number of Units	Total Hot water demand	Total Sapce heating demand
Domesctic					616964	1052410
Non-Domestic					81893	106289
School					84341	132536
Total					**783198**	**1291235**

Weighted space heating											
0.156	0.141	0.124	0.095	0.056	0.027	0.014	0.014	0.031	0.068	0.119	0.155
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month
164407	148677	130917	100471	58862	28924	14208	14208	32476	71548	124828	162885
16604	15016	13222	10147	5945	2921	1435	1435	3280	7226	12607	16451
20705	18724	16487	12653	7413	3643	1789	1789	4090	9010	15720	20513
201717	**182416**	**160626**	**123271**	**72219**	**35487**	**17432**	**17432**	**39845**	**87784**	**153155**	**199849**

Weighted hot water											
0.104	0.091	0.094	0.082	0.078	0.068	0.063	0.072	0.073	0.085	0.093	0.100
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month	kWh/month
63957	55938	57723	50325	48289	41667	38610	44307	44836	52254	57119	61940
8489	7425	7662	6680	6410	5531	5125	5881	5951	6936	7582	8222
8743	7647	7891	6880	6601	5696	5278	6057	6129	7143	7808	8467
81189	**71010**	**73276**	**63885**	**61299**	**52893**	**49013**	**56246**	**56916**	**66333**	**72509**	**78629**

TOTAL	**282905**	**253427**	**233902**	**187156**	**133519**	**88381**	**66445**	**73678**	**96761**	**154117**	**225664**	**278478**



DOMESTIC ENERGY DEMAND PROFILE

Month	Heat Demand (kWh)					Fossil Fuel (Gas) Demand (kWh)					Electricity Demand (kWh)	
	BASELINE			APEE		BASELINE			APEE		BASELINE	APEE
	Hot Water	Space heating	Cooking	Hot Water	Space heating	Hot Water	Space heating	Cooking	Hot Water	Space heating	Electricity	Electricity
Jan	125517	199873	45231	63957	164407	139463	222081	50256	71063	182675	108444	73325
Feb	109781	180749	45231	55938	148677	121979	200833	50256	62154	165197	108444	73325
Mar	113283	159158	45231	57723	130917	125870	176842	50256	64137	145463	108444	73325
Apr	98765	122145	45231	50325	100471	109738	135716	50256	55917	111635	108444	73325
May	94768	71559	45231	48289	58862	105298	79511	50256	53654	65402	108444	73325
Jun	81772	35163	45231	41667	28924	90858	39070	50256	46296	32137	108444	73325
Jul	75773	17273	45231	38610	14208	84193	19192	50256	42900	15787	108444	73325
Aug	86955	17273	45231	44307	14208	96617	19192	50256	49231	15787	108444	73325
Sep	87991	39481	45231	44836	32476	97768	43868	50256	49817	36084	108444	73325
Oct	102549	86982	45231	52254	71548	113944	96646	50256	58059	79497	108444	73325
Nov	112097	151755	45231	57119	124828	124553	168617	50256	63465	138698	108444	73325
Dec	121559	198022	45231	61940	162885	135066	220025	50256	68822	180983	108444	73325
Total	**1,210,811**	**1,279,434**	**542,768**	**616,964**	**1,052,410**	**1,345,346**	**1,421,593**	**603,076**	**685,515**	**1,169,344**	**1,301,331**	**879,900**

NON-DOMESCTIC ENERGY PROFILE

Month	Heat Demand (kWh)					Fossil Fuel (Gas) Demand (kWh)					Electricity Demand (kWh)	
	BASELINE			APEE		BASELINE			APEE		BASELINE	APEE
	Hot Water	Space heating	Cooking	Hot Water	Space heating	Hot Water	Space heating	Cooking	Hot Water	Space heating	Electricity	Electricity
Jan	18024	37260	3325	8489	16604	20026	41400	3694	9433	18449	44785	30631
Feb	15764	33695	3325	7425	15016	17516	37439	3694	8250	16684	44785	30631
Mar	16267	29670	3325	7662	13222	18074	32967	3694	8513	14691	44785	30631
Apr	14182	22770	3325	6680	10147	15758	25300	3694	7422	11275	44785	30631
May	13608	13340	3325	6410	5945	15120	14822	3694	7122	6605	44785	30631
Jun	11742	6555	3325	5531	2921	13047	7283	3694	6145	3246	44785	30631
Jul	10881	3220	3325	5125	1435	12090	3578	3694	5694	1594	44785	30631
Aug	12486	3220	3325	5881	1435	13874	3578	3694	6535	1594	44785	30631
Sep	12635	7360	3325	5951	3280	14039	8178	3694	6613	3644	44785	30631
Oct	14726	16215	3325	6936	7226	16362	18017	3694	7707	8029	44785	30631
Nov	16097	28290	3325	7582	12607	17885	31433	3694	8424	14008	44785	30631
Dec	17455	36915	3325	8222	16451	19395	41017	3694	9135	18278	44785	30631
Total	**173,868**	**238,510**	**39,900**	**81,893**	**106,289**	**193,186**	**265,011**	**44,333**	**90,992**	**118,098**	**537,425**	**367,577**

SCHOOL ENERGY PROFILE

Month	Heat Demand (kWh)					Fossil Fuel (Gas) Demand (kWh)					Electricity Demand (kWh)	
	BASELINE			APEE		BASELINE			APEE		BASELINE	APEE
	Hot Water	Space heating	Cooking	Hot Water	Space heating	Hot Water	Space heating	Cooking	Hot Water	Space heating	Electricity	Electricity
Jan	11657	27606	3150	8743	20705	12953	30674	3500	9715	23005	8400	6300
Feb	10196	24965	3150	7647	18724	11329	27739	3500	8497	20804	8400	6300
Mar	10521	21983	3150	7891	16487	11690	24425	3500	8768	18319	8400	6300
Apr	9173	16871	3150	6880	12653	10192	18745	3500	7644	14059	8400	6300
May	8802	9884	3150	6601	7413	9780	10982	3500	7335	8236	8400	6300
Jun	7595	4857	3150	5696	3643	8439	5396	3500	6329	4047	8400	6300
Jul	7038	2386	3150	5278	1789	7819	2651	3500	5865	1988	8400	6300
Aug	8076	2386	3150	6057	1789	8973	2651	3500	6730	1988	8400	6300
Sep	8172	5453	3150	6129	4090	9080	6059	3500	6810	4544	8400	6300
Oct	9524	12014	3150	7143	9010	10583	13349	3500	7937	10012	8400	6300
Nov	10411	20960	3150	7808	15720	11568	23289	3500	8676	17467	8400	6300
Dec	11290	27351	3150	8467	20513	12544	30390	3500	9408	22792	8400	6300
Total	**112,455**	**176,715**	**37,800**	**84,341**	**132,536**	**124,950**	**196,350**	**42,000**	**93,713**	**147,263**	**100,800**	**75,600**

Table 5 – Energy Strategy – carbon balance

DOMESTIC CARBON BALANCE

		JANUARY 31			FEBRUARY 28			MARCH 31			APRIL 30		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006													
Gas demand		411,801	81,537		373,068	73,867		352,969	69,888		295,711	58,551	
Electricity demand		108,444	56,066		108,444	56,066		108,444	56,066		108,444	56,066	
APEE ENERGY BASELINE													
APEE gas demand		253,738	50,240		227,351	45,015		209,600	41,501		167,551	33,175	
APEE elec demand		73,325	37,909		73,325	37,909		73,325	37,909		73,325	37,909	
APEE heat demand		228,364			204,616			188,640			150,796		
GAS CHP													
Heat output of Gas CHP system	kWth	866			866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844			844		
Efficiency of Gas CHP		78%			78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03			1.03		
Heat demand	kWh	205,528			184,154			169,776			135,717		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from Gas CHP		285,455			255,769			235,800			188,495		
hours/d		11			11			9			7		
Hours of operation	hrs	330			296			272			218		
Gas consumption of CHP	kW/hrs	2191			2191			2191			2191		
Total gas consumption of CHP	kWh	722,671	143,089		647,517	128,208		596,962	118,198		477,203	94,486	
Electricity output	kWh	278,228		147,183	249,294		131,877	229,830		121,580	183,723		97,190
GAS BOILER													
Heat output of Gas Boiler	kWth												
Efficiency of Boiler		87%			87%			87%			87%		
Heat Demand		22,836			20,462			18,864			15,080		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from biomass boiler		31,717			28,419			26,200			20,944		
Total gas consumption	kWh	36,448.19	7,217		32,658	6,466		30,108	5,961		24,068	4,765	
PV													
Elec capacity	kWp	1,371			1,371			1,371			1,371		
Elec output	kWh/mo	35,187		18,614	52,780		27,921	87,967		46,534	105,560		55,841
Total available heat generated	kWh	317,172			284,188			262,000			209,439		
Generated electricity		313,415			302,074			317,797			289,283		
Heat CO2 cost at 2006 baseline			81,537			73,867			69,888			58,551	
Elec CO2 cost at 2006 baseline			56,066			56,066			56,066			56,066	
Total CO2 at 2006 baseline			137,602			129,933			125,954			114,616	
CO2 emission from option			22,418			12,786			- 6,046			- 15,870	
			84%			90%			105%			114%	

		MAY 31			JUNE 30			JULY 31			AUGUST 31		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006													
Gas demand		235,064	46,543		180,184	35,677		153,641	30,421		166,065	32,881	
Electricity demand		108,444	56,066		108,444	56,066		108,444	56,066		108,444	56,066	
APEE ENERGY BASELINE													
APEE gas demand		119,056	23,573		78,434	15,530		58,687	11,620		65,017	12,873	
APEE elec demand		73,325	37,909		73,325	37,909		73,325	37,909		73,325	37,909	
APEE heat demand		107,150			70,590			52,818			58,516		
GAS CHP													
Heat output of Gas CHP system	kWth	866			866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844			844		
Efficiency of Gas CHP		78%			78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03			1.03		
Heat demand	kWh	96,435			63,531			47,536			52,664		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from Gas CHP		133,938			88,238			66,023			73,144		
hours/d		5			3			2			3		
Hours of operation	hrs	155			102			76			85		
Gas consumption of CHP	kW/hrs	2191			2191			2191			2191		
Total gas consumption of CHP	kWh	339,084	67,139		223,387	44,231		167,146	33,095		185,176	36,665	
Electricity output	kWh	130,547		69,059	86,004		45,496	64,351		34,042	71,293		37,714
GAS BOILER													
Heat output of Gas Boiler	kWth												
Efficiency of Boiler		87%			87%			87%			87%		
Heat Demand		10,715			7,059			5,282			5,852		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from biomass boiler		14,882			9,804			7,336			8,127		
Total gas consumption	kWh	17,102	3,386		11,267	2,231		8,430	1,669		9,339	1,849	
PV													
Elec capacity	kWp	1,371			1,371			1,371			1,371		
Elec output	kWh/mo	127,552		67,475	140,747		74,455	136,348		72,128	127,552		67,475
Total available heat generated	kWh	148,820			98,042			73,358			81,272		
Generated electricity		258,099			226,751			200,699			198,844		
Heat CO2 cost at 2006 baseline			46,543			35,677			30,421			32,881	
Elec CO2 cost at 2006 baseline			56,066			56,066			56,066			56,066	
Total CO2 at 2006 baseline			102,608			91,742			86,487			88,947	
CO2 emission from option			- 28,101			- 35,581			- 33,497			- 28,766	
			127%			139%			139%			132%	

		SEPTEMBER 30			OCTOBER 31			NOVEMBER 30			DECEMBER 31			TOTAL		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006																
Gas demand		191,892	37,995		260,846	51,648		343,426	67,998		405,347	80,259		3,370,015	667,263	
Electricity demand		108,444	56,066		108,444	56,066		108,444	56,066		108,444	56,066		1,301,331	672,788	
APEE ENERGY BASELINE																
APEE gas demand		85,901	17,008		137,557	27,236		202,163	40,028		249,806	49,462		1,854,860	367,262	
APEE elec demand		73,325	37,909		73,325	37,909		73,325	37,909		73,325	37,909		879,900	454,908	
APEE heat demand		77,311			123,801			181,947			224,825			1,669,374		
GAS CHP																
Heat output of Gas CHP system	kWth	866			866			866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844			844			844		
Efficiency of Gas CHP		78%			78%			78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03			1.03			1.03		
Heat demand	kWh	69,580			111,421			163,752			202,343			1,502,436		
Efficiency of heat distribution system		72%			72%			72%			72%			72%		
Heat output from Gas CHP		96,639			154,751			227,433			281,031			2,086,717		
hours/d		4			6			9			10			7		
Hours of operation	hrs	112			179			263			325			2,411		
Gas consumption of CHP	kW/hrs	2191			2191			2191			2191			26,294		
Total gas consumption of CHP	kWh	244,656	48,442		391,776	77,572		575,780	114,005		711,472	140,871		5,282,829	1,046,000	
Electricity output	kWh	94,192		49,828	150,834		79,791	221,675		117,266	273,917		144,902	2,033,889		1,075,927
GAS BOILER																
Heat output of Gas Boiler	kWth															
Efficiency of Boiler		87%			87%			87%			87%			87%		
Heat Demand		7,731			12,380			18,195			22,483			166,937		
Efficiency of heat distribution system		72%			72%			72%			72%			72%		
Heat output from biomass boiler		10,738			17,195			25,270			31,226			231,857		
Total gas consumption	kWh	12,339	2,443		19,759	3,912		29,040	5,750		35,883	7,105		266,442	52,755	
PV																
Elec capacity	kWp	1,371			1,371			1,371			1,371			1,371		
Elec output	kWh/mo	114,357		60,495	87,967		46,534	52,780		27,921	35,187		18,614	1,103,982		584,006
Total available heat generated	kWh	107,377			171,946			252,704			312,257			2,318,575		
Generated electricity		208,549			238,800			274,455			309,103			3,137,871		
Heat CO2 cost at 2006 baseline			37,995			51,648			67,998			80,259			667,263	
Elec CO2 cost at 2006 baseline			56,066			56,066			56,066			56,066			672,788	
Total CO2 at 2006 baseline			94,060			107,713			124,064			136,324			1,340,051	
CO2 emission from option			- 21,528			- 6,932			12,476			22,370			- 106,270	
			123%			106%			90%			84%			108%	

CO2 based on monthly outputs	1,340,051	kgCO2/year
total CO2 at 2006 baseline	- 106,270	kgCO2/year
CO2 emission from option	108%	

NON-DOMESTIC CARBON BALANCE

		JANUARY 31			FEBRUARY 28			MARCH 31			APRIL 30		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006													
Gas demand		65,121	12,894		58,649	11,613		54,736	10,838		44,752	8,861	
Electricity demand		44,785	23,154		44,785	23,154		44,785	23,154		44,785	23,154	
APEE ENERGY BASELINE													
APEE gas demand		27,882	5,521		24,934	4,937		23,204	4,594		18,697	3,702	
APEE elec demand		30,631	15,836		30,631	15,836		30,631	15,836		30,631	15,836	
APEE heat demand		25,094			22,441			20,884			16,827		
GAS CHP													
Heat output of Gas CHP system	kWth	866			866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844			844		
Efficiency of Gas CHP		78%			78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03			1.03		
Heat demand	kWh	22,584			20,197			18,795			15,144		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from Gas CHP		31,367			28,051			26,105			21,034		
hours/d		1			1			1			1		
Hours of operation	hrs	36			32			30			24		
Gas consumption of CHP	kW/hrs	2191			2191			2191			2191		
Total gas consumption of CHP	kWh	79,410	15,723		71,015	14,061		66,088	13,085		53,250	10,544	
Electricity output	kWh	30,573		16,173	27,341		14,463	25,444		13,460	20,501		10,845
GAS BOILER													
Heat output of Gas Boiler	kWth												
Efficiency of Boiler		87%			87%			87%			87%		
Heat Demand		2,509			2,244			2,088			1,683		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from biomass boiler		3,485			3,117			2,901			2,337		
Total gas consumption	kWh	4,005	793		3,582	709		3,333	660		2,686	532	
PV													
Elec capacity	kWp	217			217			217			217		
Elec output	kWh/mo	5,879		3,110	8,818		4,665	14,696		7,774	17,636		9,329
COOKING (gas)	kWh/mo	3,247	643		3,247	643		3,247	643		3,247	643	
Total available heat generated	kWh	34,852			31,168			29,005			23,371		
Generated electricity		36,452			36,159			40,140			38,137		
Heat CO2 cost at 2006 baseline			12,894			11,613			10,838			8,861	
Elec CO2 cost at 2006 baseline			23,154			23,154			23,154			23,154	
Total CO2 at 2006 baseline			36,048			34,767			33,992			32,015	
CO2 emission from option			13,713			12,122			8,991			7,380	
			62%			65%			74%			77%	

		MAY 31			JUNE 30			JULY 31			AUGUST 31		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006													
Gas demand		33,637	6,660		24,025	4,757		19,362	3,834		21,146	4,187	
Electricity demand		44,785	23,154		44,785	23,154		44,785	23,154		44,785	23,154	
APEE ENERGY BASELINE													
APEE gas demand		13,727	2,718		9,391	1,859		7,289	1,443		8,129	1,610	
APEE elec demand		30,631	15,836		30,631	15,836		30,631	15,836		30,631	15,836	
APEE heat demand		12,354			8,452			6,560			7,316		
GAS CHP													
Heat output of Gas CHP system	kWth	866			866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844			844		
Efficiency of Gas CHP		78%			78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03			1.03		
Heat demand	kWh	11,119			7,607			5,904			6,584		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from Gas CHP		15,443			10,565			8,200			9,145		
hours/d		1			0			0			0		
Hours of operation	hrs	18			12			9			11		
Gas consumption of CHP	kW/hrs	2191			2191			2191			2191		
Total gas consumption of CHP	kWh	39,096	7,741		26,746	5,296		20,759	4,110		23,152	4,584	
Electricity output	kWh	15,052		7,963	10,297		5,447	7,992		4,228	8,914		4,715
GAS BOILER													
Heat output of Gas Boiler	kWth												
Efficiency of Boiler		87%			87%			87%			87%		
Heat Demand		1,235			845			656			732		
Efficiency of heat distribution system		72%			72%			72%			72%		
Heat output from biomass boiler		1,716			1,174			911			1,016		
Total gas consumption	kWh	1,972	390		1,349	267		1,047	207		1,168	231	
PV													
Elec capacity	kWp	217			217			217			217		
Elec output	kWh/mo	21,310		11,273	23,514		12,439	22,779		12,050	21,310		11,273
COOKING (gas)	kWh/mo	3,247	643		3,247	643		3,247	643		3,247	643	
Total available heat generated	kWh	17,159			11,739			9,111			10,161		
Generated electricity		36,362			33,811			30,772			30,223		
Heat CO2 cost at 2006 baseline			6,660			4,757			3,834			4,187	
Elec CO2 cost at 2006 baseline			23,154			23,154			23,154			23,154	
Total CO2 at 2006 baseline			29,814			27,911			26,988			27,341	
CO2 emission from option			5,375			4,156			4,519			5,307	
			82%			85%			83%			81%	

		SEPTEMBER 30			OCTOBER 31			NOVEMBER 30			DECEMBER 31			TOTAL		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006																
Gas demand		25,911	5,130		38,073	7,538		53,013	10,497		64,106	12,693		502,531	99,501	
Electricity demand		44,785	23,154		44,785	23,154		44,785	23,154		44,785	23,154		537,425	277,849	
APEE ENERGY BASELINE																
APEE gas demand		10,257	2,031		15,735	3,116		22,432	4,442		27,414	5,428		209,090	41,400	
APEE elec demand		30,631	15,836		30,631	15,836		30,631	15,836		30,631	15,836		367,577	190,037	
APEE heat demand		9,231			14,162			20,189			24,672			188,181		
GAS CHP																
Heat output of Gas CHP system	kWth	866			866			866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844			844			844		
Efficiency of Gas CHP		78%			78%			78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03			1.03			1.03		
Heat demand	kWh	8,308			12,746			18,170			22,205			169,363		
Efficiency of heat distribution system		72%			72%			72%			72%			72%		
Heat output from Gas CHP		11,539			17,702			25,236			30,840			235,227		
hours/d		0			1			1			1			1		
Hours of operation	hrs	13			20			29			36			272		
Gas consumption of CHP	kW/hrs	2191			2191			2191			2191			26,294		
Total gas consumption of CHP	kWh	29,212	5,784		44,816	8,874		63,888	12,650		78,077	15,459		595,511	117,911	
Electricity output	kWh	11,247		5,950	17,254		9,127	24,597		13,012	30,060		15,902	229,272		121,285
GAS BOILER																
Heat output of Gas Boiler	kWth															
Efficiency of Boiler		87%			87%			87%			87%			87%		
Heat Demand		923			1,416			2,019			2,467			18,818		
Efficiency of heat distribution system		72%			72%			72%			72%			72%		
Heat output from biomass boiler		1,282			1,967			2,804			3,427			26,136		
Total gas consumption	kWh	1,473	292		2,260	448		3,222	638		3,938	780		30,035	5,947	
PV																
Elec capacity	kWp	217			217			217			217			217		
Elec output	kWh/mo	19,105		10,107	14,696		7,774	8,818		4,665	5,879		3,110	184,440		97,569
COOKING (gas)	kWh/mo	3,247	643		3,247	643		3,247	643		3,247	643		38,964	7,715	
Total available heat generated	kWh	12,821			19,669			28,040			34,267			261,363		
Generated electricity		30,352			31,951			33,415			35,938			413,711		
Heat CO2 cost at 2006 baseline			5,130			7,538			10,497			12,693			99,501	
Elec CO2 cost at 2006 baseline			23,154			23,154			23,154			23,154			277,849	
Total CO2 at 2006 baseline			28,285			30,693			33,651			35,847			377,350	
CO2 emission from option			6,499			8,899			12,091			13,707			102,757	
			77%			71%			64%			62%			73%	

CO2 based on monthly outputs	377,350	kgCO2/year
total CO2 at 2006 baseline	102,757	kgCO2/year
CO2 emission from option	73%	

SCHOOL CARBON BALANCE

		JANUARY 31			FEBRUARY 28			MARCH 31		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006										
Gas demand		47,127	9,331		42,568	8,428		39,616	7,844	
Electricity demand		8,400	4,343		8,400	4,343		8,400	4,343	
APEE ENERGY BASELINE										
APEE gas demand		32,720	6,479		29,301	5,802		27,087	5,363	
APEE elec demand		6,300	3,257		6,300	3,257		6,300	3,257	
APEE heat demand		29,448			26,371			24,378		
GAS CHP										
Heat output of Gas CHP system	kWth	866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844		
Efficiency of Gas CHP		78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03		
Heat demand	kWh	26,503			23,734			21,940		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from Gas CHP		36,810			32,963			30,473		
hours/d		1			1			1		
Hours of operation	hrs	43			38			35		
Gas consumption of CHP	kW/hrs	2191			2191			2191		
Total gas consumption of CHP	kWh	93,190	**18,452**		83,452	**16,523**		77,146	**15,275**	
Electricity output	kWh	35,878		**18,979**	32,129		**16,996**	29,701		**15,712**
GAS BOILER										
Heat output of Gas Boiler	kWth									
Efficiency of Boiler		87%			87%			87%		
Heat Demand		2,945			2,637			2,438		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from biomass boiler		4,090			3,663			3,386		
Total gas consumption	kWh	4,700	**931**		4,209	**833**		3,891	**770**	
PV										
Elec capacity	kWp	110			110			110		
Elec output	kWh/mo	2,987		**1,580**	4,480		**2,370**	7,467		**3,950**
COOKING (gas)	kWh/mo	2,363	**468**		2,363	**468**		2,363	**468**	
Total available heat generated	kWh	40,900			36,626			33,858		
Generated electricity		38,865			36,609			37,168		
Heat CO2 cost at 2006 baseline			**9,331**			**8,428**			**7,844**	
Elec CO2 cost at 2006 baseline			**4,343**			**4,343**			**4,343**	
Total CO2 at 2006 baseline			**13,674**			**12,771**			**12,187**	
CO2 emission from option			**2,548**			**1,715**			**108**	
			81%			**87%**			**99%**	

		APRIL 30			MAY 31			JUNE 30		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006										
Gas demand		32,437	6,423		24,262	4,804		17,335	3,432	
Electricity demand		8,400	4,343		8,400	4,343		8,400	4,343	
APEE ENERGY BASELINE										
APEE gas demand		21,703	4,297		15,571	3,083		6,329	1,253	
APEE elec demand		6,300	3,257		6,300	3,257		6,300	3,257	
APEE heat demand		19,533			14,014			9,339		
GAS CHP										
Heat output of Gas CHP system	kWth	866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844		
Efficiency of Gas CHP		78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03		
Heat demand	kWh	17,579			12,613			8,405		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from Gas CHP		24,416			17,518			11,673		
hours/d		1			1			0		
Hours of operation	hrs	28			20			13		
Gas consumption of CHP	kW/hrs	2191			2191			2191		
Total gas consumption of CHP	kWh	61,812	**12,239**		44,348	**8,781**		29,552	**5,851**	
Electricity output	kWh	23,798		**12,589**	17,074		**9,032**	11,378		**6,019**
GAS BOILER										
Heat output of Gas Boiler	kWth									
Efficiency of Boiler		87%			87%			87%		
Heat Demand		1,953			1,401			934		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from biomass boiler		2,713			1,946			1,297		
Total gas consumption	kWh	3,118	**617**		2,237	**443**		1,490	**295**	
PV										
Elec capacity	kWp	110			110			110		
Elec output	kWh/mo	8,961		**4,740**	10,827		**5,728**	11,947		**6,320**
COOKING (gas)	kWh/mo	2,363	**468**		2,363	**468**		2,363	**468**	
Total available heat generated	kWh	27,129			19,464			12,970		
Generated electricity		32,758			27,901			23,325		
Heat CO2 cost at 2006 baseline			**6,423**			**4,804**			**3,432**	
Elec CO2 cost at 2006 baseline			**4,343**			**4,343**			**4,343**	
Total CO2 at 2006 baseline			**10,765**			**9,147**			**7,775**	
CO2 emission from option			**- 748**			**- 1,811**			**- 2,468**	
			107%			**120%**			**132%**	

		JULY 31			AUGUST 31			SEPTEMBER 30		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006										
Gas demand		13,970	2,766		15,124	2,995		18,639	3,691	
Electricity demand		8,400	4,343		8,400	4,343		8,400	4,343	
APEE ENERGY BASELINE										
APEE gas demand		5,865	1,161		8,718	1,726		11,354	2,248	
APEE elec demand		6,300	3,257		6,300	3,257		6,300	3,257	
APEE heat demand		7,067			7,846			10,219		
GAS CHP										
Heat output of Gas CHP system	kWth	866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844		
Efficiency of Gas CHP		78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03		
Heat demand	kWh	6,361			7,062			9,197		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from Gas CHP		8,834			9,808			12,774		
hours/d		0			0			0		
Hours of operation	hrs	10			11			15		
Gas consumption of CHP	kW/hrs	2191			2191			2191		
Total gas consumption of CHP	kWh	22,365	**4,428**		24,830	**4,916**		32,339	**6,403**	
Electricity output	kWh	8,611		**4,555**	9,560		**5,057**	12,450		**6,586**
GAS BOILER										
Heat output of Gas Boiler	kWth									
Efficiency of Boiler		87%			87%			87%		
Heat Demand		707			785			1,022		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from biomass boiler		982			1,090			1,419		
Total gas consumption	kWh	1,128	**223**		1,252	**248**		1,631	**323**	
PV										
Elec capacity	kWp	110			110			110		
Elec output	kWh/mo	11,574		**6,123**	10,827		**5,728**	9,707		**5,135**
COOKING (gas)	kWh/mo	2,363	**468**		2,363	**468**		2,363	**468**	
Total available heat generated	kWh	9,816			10,898			14,193		
Generated electricity		20,185			20,387			22,158		
Heat CO2 cost at 2006 baseline			**2,766**			**2,995**			**3,691**	
Elec CO2 cost at 2006 baseline			**4,343**			**4,343**			**4,343**	
Total CO2 at 2006 baseline			**7,109**			**7,337**			**8,033**	
CO2 emission from option			**- 2,301**			**- 1,895**			**- 1,271**	
			132%			**126%**			**116%**	

		OCTOBER 31			NOVEMBER 30			DECEMBER 31		
		Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving	Demand	CO2 cost	CO2 saving
BASELINE 2006										
Gas demand		27,431	5,431		38,357	7,595		46,434	9,194	
Electricity demand		8,400	4,343		8,400	4,343		8,400	4,343	
APEE ENERGY BASELINE										
APEE gas demand		17,949	3,554		26,143	5,176		32,201	6,376	
APEE elec demand		6,300	3,257		6,300	3,257		6,300	3,257	
APEE heat demand		16,154			23,529			28,981		
GAS CHP										
Heat output of Gas CHP system	kWth	866			866			866		
Electricity output of Gas CHP system	kWe	844			844			844		
Efficiency of Gas CHP		78%			78%			78%		
Heat to power ratio of CHP system		1.03			1.03			1.03		
Heat demand	kWh	14,538			21,176			26,082		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from Gas CHP		20,192			29,411			36,226		
hours/d		1			1			1		
Hours of operation	hrs	23			34			42		
Gas consumption of CHP	kW/hrs	2191			2191			2191		
Total gas consumption of CHP	kWh	51,119	**10,122**		74,458	**14,743**		91,711	**18,159**	
Electricity output	kWh	19,681		**10,411**	28,666		**15,164**	35,309		**18,678**
GAS BOILER										
Heat output of Gas Boiler	kWth									
Efficiency of Boiler		87%			87%			87%		
Heat Demand		1,615			2,353			2,898		
Efficiency of heat distribution system		72%			72%			72%		
Heat output from biomass boiler		2,244			3,268			4,025		
Total gas consumption	kWh	2,578	**510**		3,755	**744**		4,625	**916**	
PV										
Elec capacity	kWp	110			110			110		
Elec output	kWh/mo	7,467		**3,950**	4,480		**2,370**	2,987		**1,580**
COOKING (gas)	kWh/mo	2,363	**468**		2,363	**468**		2,363	**468**	
Total available heat generated	kWh	22,436			32,679			40,251		
Generated electricity		27,148			33,147			38,295		
Heat CO2 cost at 2006 baseline			**5,431**			**7,595**			**9,194**	
Elec CO2 cost at 2006 baseline			**4,343**			**4,343**			**4,343**	
Total CO2 at 2006 baseline			**9,774**			**11,938**			**13,537**	
CO2 emission from option			**- 4**			**1,677**			**2,541**	
			100%			**86%**			**81%**	

		TOTAL		
		Demand	CO2 cost	CO2 saving
BASELINE 2006				
Gas demand		363,300	71,933	
Electricity demand		100,800	52,114	
APEE ENERGY BASELINE				
APEE gas demand		240,975	47,713	
APEE elec demand		75,600	39,085	
APEE heat demand		216,878		
GAS CHP				
Heat output of Gas CHP system	kWth	866		
Electricity output of Gas CHP system	kWe	844		
Efficiency of Gas CHP		78%		
Heat to power ratio of CHP system		1.03		
Heat demand	kWh	195,190		
Efficiency of heat distribution system		72%		
Heat output from Gas CHP		271,097		
hours/d		1		
Hours of operation	hrs	313		
Gas consumption of CHP	kW/hrs	2191		
Total gas consumption of CHP	kWh	686,321	**135,892**	
Electricity output	kWh	264,234		**139,780**
GAS BOILER				
Heat output of Gas Boiler	kWth			
Efficiency of Boiler		87%		
Heat Demand		21,688		
Efficiency of heat distribution system		72%		
Heat output from biomass boiler		30,122		
Total gas consumption	kWh	34,615	**6,854**	
PV				
Elec capacity	kWp	110		
Elec output	kWh/mo	93,713		**49,574**
COOKING (gas)	kWh/mo	28,350	**5,613**	
Total available heat generated	kWh	301,219		
Generated electricity		357,946		
Heat CO2 cost at 2006 baseline			**71,933**	
Elec CO2 cost at 2006 baseline			**52,114**	
Total CO2 at 2006 baseline			**124,047**	
CO2 emission from option			**- 1,910**	
			102%	

CO2 based on monthly outputs	124,047	kgCO2/year
total CO2 at 2006 baseline	- 1,910	kgCO2/year
CO2 emission from option	**102%**	

CARBON BALANCE - DOMESCTIC		
CARBON BALANCE - DOMESCTIC & NON-DOMESTIC		
CARBON BALANCE - DOMESCTIC, NON-DOMESTIC & SCHOOL		
CARBON BALANCE - DOMESTIC	- **106,270**	kgCO2/year
CARBON BALANCE - DOMESTIC & NON-DOMESTIC	- **3,513**	kgCO2/year
CARBON BALANCE - DOMESTIC, NON-DOMESTIC & SCHOOL	- **5,423**	kgCO2/year

NOTES

1 CO2 factors

Gas	0.198	from mains
Electricity	0.517	from mains
Displaced Electricity	0.529	
woodchip	0.009	

2 Solar Photo-Voltaic (PV)

PV peak output — kWp output per 0 m2

3 Gas CHP

39.5%	Thermal efficiency
38.5%	Electrical efficiency
78%	efficiency
1.03	Heat/Power Ratio
0.90	% of total heat supply

6 Gas Boiler

87%	efficiency
0.10	% of total heat supply

7 Heat Distribution System (Including Storage)

72.0% efficiency

Table 6 – Solar PV system output

INPUTS - DOMESTIC

	Solar Photo-Voltaic (PV)			
Annual PV output per 1kWp	850	kWh/year		
PV peak output	1.41	kWp output per	10	m2
Total available roof area - domestic	15,902			
% of total non-domestic roof area allocated tc	61%			
Total available PV area - domestic	9,700		15901.99	
Total PV Installed capacity	1,371	kW		
Total annual output from PV	1,165,485	kWh/year		

SOLAR ENERGY PROFILE

40	60	100	120	145	160	155	145	130	100	60	40
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
45	68	113	135	163	180	175	163	146	113	68	45
0.032	0.048	0.080	0.096	0.116	0.127	0.124	0.116	0.104	0.080	0.048	0.032
37,147	55,720	92,867	111,441	134,658	148,588	143,944	134,658	120,728	92,867	55,720	37,147
35,187	52,780	87,967	105,560	127,552	140,747	136,348	127,552	114,357	87,967	52,780	35,187

INPUTS - NON DOMESCTIC

	Solar Photo-Voltaic (PV)			
Annual PV output per 1kWp	850	kWh/year		
PV peak output	1.41	kWp output per	10	m2
Total available roof area - non-domestic	2,791	m2		
% of total non-domestic roof area allocated tc	55%			
Total available PV area - non-domestic	1,535			
Total PV Installed capacity	217	kW		
Total annual output from PV	184,440	kWh/year		

SOLAR ENERGY PROFILE

40	60	100	120	145	160	155	145	130	100	60	40
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
45	68	113	135	163	180	175	163	146	113	68	45
0.032	0.048	0.080	0.096	0.116	0.127	0.124	0.116	0.104	0.080	0.048	0.032
5,879	8,818	14,696	17,636	21,310	23,514	22,779	21,310	19,105	14,696	8,818	5,879

INPUTS - SCHOOL

	Solar Photo-Voltaic (PV)			
Annual PV output per 1kWp	850	kWh/year		
PV peak output	1.25	kWp output per	10	m2
Total available roof area - non-domestic	2,520	m2		
% of total non-domestic roof area allocated tc	35%			
Total available PV area - non-domestic	882			
Total PV Installed capacity	110	kW		
Total annual output from PV	93,713	kWh/year		
	2116	kW		

SOLAR ENERGY PROFILE

40.00	60.00	100.00	120.00	145.00	160.00	155.00	145.00	130.00	100.00	60.00	40.00
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
40	60	100	120	144	159	154	144	129	100	60	40
0.032	0.048	0.080	0.096	0.116	0.127	0.124	0.116	0.104	0.080	0.048	0.032
2,987	4,480	7,467	8,961	10,827	11,947	11,574	10,827	9,707	7,467	4,480	2,987