Nu Carb CVD Extension, Holbrook Lane, Coventry

190598

Energy Statement

DOCUMENT REVISION HISTORY			Ref:	190598 [Nu Carb CVD Extension]
Rev	**Author**	**Verification By**	**Date**	**Comments / Status**
P1	A. JONES	R. GIBSON	04/07/19	Draft Issue

Birmingham | Nottingham | Huntingdon | Leeds | Bristol | Leicester | London | Manchester

www.cpwp.com

Contents

Energy Statement: Nu Carb CVD Extension

1.0 Introduction

Couch Perry Wilkes have been appointed by Meggitt to provide the following Energy Statement in order to inform the energy credentials for the proposed new build extension to the existing Nu Carb CVD facility at their plant on Holbrook Lane, Coventry.

It is intended that the report will demonstrate that the requirements of Coventry City Council's New Local Plan, is met in relation to:

- Policy EM2: Building Standards
- Policy EM3: Renewable Energy Generation

The planned new extension of approximately 1,890m[2] Gross Internal Area (GIA) is shown below:

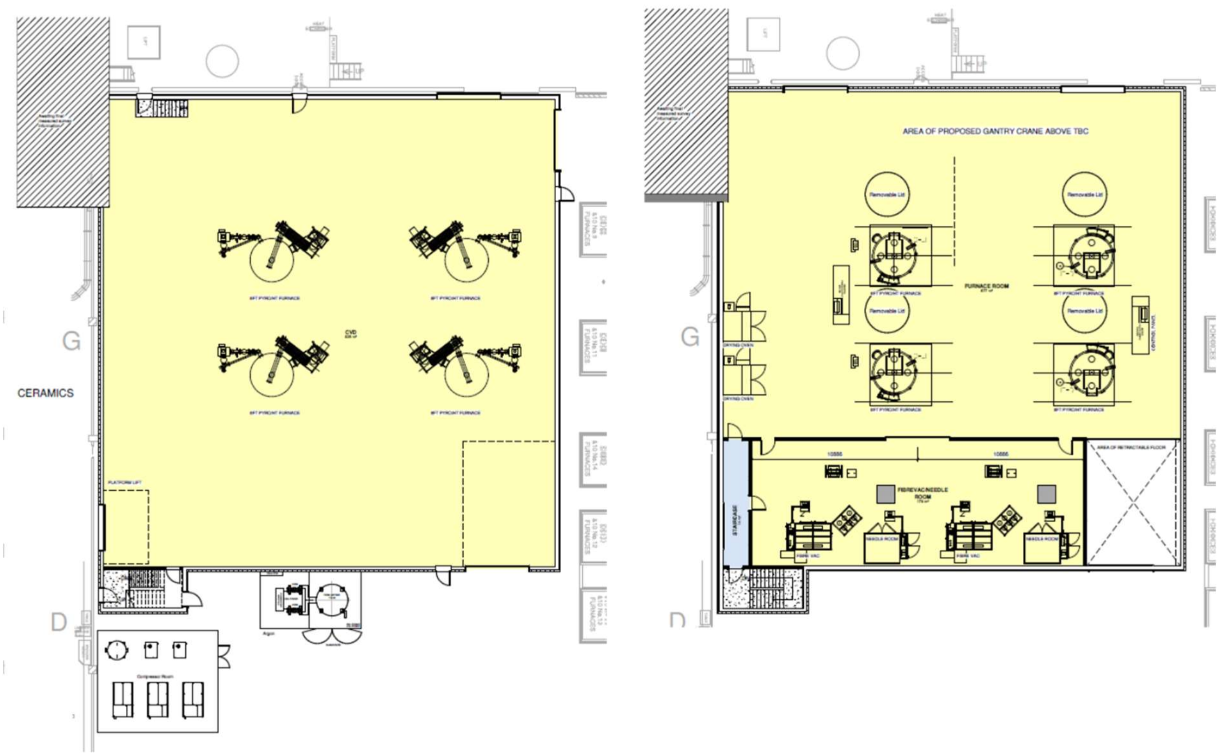

Figure 1 – Proposed GF and FF Floor Plans

With the current emphasis placed on energy conservation, the applicant is keen to demonstrate that the proposed extension can satisfy the conservation of fuel and power requirements of Part L of the Building Regulations by minimising operational energy demand through passive and best-practice measures.

2.0 Planning Policies

2.1 Policy EM2 – Building Standards

1) New development should be designed and constructed to meet the relevant Building Regulations, as a minimum, with a view to:

   a) Maximising energy efficiency and the use of low carbon energy;

   b) Conserving water and minimising flood risk including flood resilient construction;

   c) Considering the type and source of the materials used;

   d) Minimising waste and maximising recycling during construction and operation;

   e) Being flexible and adaptable to future occupier needs; and

   f) Incorporating measures to enhance biodiversity value.

2) In meeting the carbon reduction targets set out in Building Regulations, the Council will expect development to be designed in accordance with the following energy hierarchy:

   a) Reduce energy demand through energy efficiency measures

   b) Supply energy through efficient means (i.e. low carbon technologies)

   c) Utilise renewable energy generation

3) A Sustainable Buildings Statement should demonstrate how the requirements of Climate Change policies in this Plan and any other relevant local climate change strategies have been met, and consider any potential coal mining legacy issues including land stability.

4) A comprehensive update of the Delivering a More Sustainable City SPD incorporating the approach to Building Sustainability Standards will be developed.

It should be noted that the following Energy Statement only addresses elements 1 and 2 of EM2, with elements 3 and 4 addressed elsewhere within the planning submission for the proposed development.

2.2 Policy EM3 – Renewable Energy Generation

1) Proposals for the installation of renewable and low carbon energy technologies, including both building-integrated and standalone schemes will be promoted and encouraged, provided that:

   a) any significant adverse impacts can be mitigated;

b) where biofuels are to be utilised, they should be obtained from sustainable sources and transportation distances are minimised;

c) any energy centre is suitably located and designed to a high quality such that it is sympathetically integrated with its surroundings; and

d) all proposals are consistent with any relevant Policies in this Plan.

3.0 Energy Benchmarking

3.1 Estimated Energy Demand & CO_2 Emissions

In order to benchmark the proposed new extension, estimated energy demands and CO_2 emissions data have been calculated. These estimated energy consumptions are indicative only at this stage. They will, however, be used as a guideline to assess the percentage of the building's total energy consumption and CO_2 emissions that could be reduced or offset by applying best practice energy efficiency measures and/or LZC technology solutions.

Approved Dynamic Simulation Model (DSM) software using government and industry agreed National Calculation Method (NCM) room templates containing standard operating conditions has been utilised to derive the figures detailed within this report.

To assist with the formulation of an energy strategy, the estimated regulated notional energy consumption and CO2 emissions for the development have been derived from approved DSM software (IES):

- The total predicted regulated notional energy consumption is: **80,919 kWhr per year**
- The total predicted regulated notional CO2 emissions are: **31,014 kgCO_2 per year**

Note 1. CO_2 emission factors of 0.216 for Gas and 0.519 for Electricity have been used to calculate the above and are taken from Building Regulations Approved Documents.

4.0 Methodology

4.1 Be Lean: Energy Efficient Design

Reducing energy usage is the priority in the energy hierarchy. It is often the measure with the least cost implications, an any reduction will, in turn, reduce the requirement for on-site generation from renewable energy sources.

Achieving an optimum use of energy throughout a building's life requires the implementation of passive design to reduce the need for energy associated with controlling the environment and efficient controls to assist in occupant's use of energy.

The calculated energy demand is based on the following specification:

- Maximising daylighting across the spaces. The glazing specification of the roof lights shall be carefully considered, aiming to provide an optimum balance between passive solar heating, limiting summertime overheating and maximising the potential for natural daylight transmission.
- Passive solar control to assist in avoiding the requirement for mechanical cooling systems.
- HVAC and lighting systems to operate 'on demand' where practical
- The use of natural ventilation maximised where appropriate
- Practical zoning of HVAC systems
- LED lighting to be adopted throughout
- Specified direct gas fired heaters to have a minimum seasonal efficiency of 98%
- An air permeability of $2m^3/hr/m^2$ @ 50Pa will be targeted
- The following 'U' values are proposed for the building fabric of the new building:

Element	Proposed 'U' value ($W/m^2.K$)	Part L 2013 Limiting 'U' value ($W/m^2.K$)	% Betterment
External Wall	0.20	0.35	43
Ground Floor	0.16	0.25	36
Roof	0.14	0.25	44
Glazing (roof lights)	1.40	2.20	36

Carbon emissions for the 'Be Lean' building are taken from the IES software model, and as detailed in the table below:

BE LEAN APPROACH BUILDING ENERGY DEMAND AND CARBON DIOXIDE EMISSIONS

	Regulated Annual Energy Demand (kWhr)	Regulated Annual Emissions ($KgCO_2$)
Proposed Building	65,116	27,926
Reduction over Notional	19.5%	10.0%

4.2 Be Clean: CHP and Community Heating Systems

A heat network is in operation within Coventry city centre. In Phase I, heating and hot water is supplied to a range of Council buildings and Coventry Cathedral. The scheme will benefit the environment by providing low carbon heat which will be cheaper than heat from traditional gas boilers, providing the Council with reduced costs and also saving circa 1500 tonnes of carbon per annum – the equivalent of fuelling 300 homes. Later phases will connect to residential properties as well as businesses and institutions who want to save money and reduce their carbon footprint

The site of the proposed new development is well away from the current heat network installations and, as such, significant infrastructure installations would be required from the extent of the current network to enable connection of the proposed new development.

It should also be considered that, due to the process nature of the operations being undertaken within the proposed new extension, there is no domestic hot water or low pressure hot water heating demand associated. As such, the proposed development does not offer any base load required for CHP operation.

Carbon emissions for the 'Be Clean' building are taken from the IES software model, and as detailed in the table below:

BE CLEAN APPROACH BUILDING ENERGY DEMAND AND CARBON DIOXIDE EMISSIONS

	Regulated Annual Energy Demand (kWhr)	Regulated Annual Emissions ($KgCO_2$)
Proposed Building	65,116	27,926
Reduction over Notional	19.5%	10.0%

4.3 Be Green: Renewable Energy Technology

The third stage of the energy hierarchy refers to the production of renewable energy, relating to the reduction in carbon emissions from on-site or near site renewable.

A range of approved renewable technologies have been appraised, considering the suitability, feasibility, size and capital cost of each system required to meet the target. This is summarised as below:

Technology	Brief Description	Benefits	Issues / Limitations	Feasible for Site?
Solar Photovoltaic	Solar photovoltaic panels convert solar radiation into electrical energy through semi-conductor cells.	• Low maintenance / no moving parts • Easily integrated into building design • No ongoing costs	• Any overshadowing affects panel performance • Panels ideally inclined at 30° to the horizontal facing a southerly direction • Suitable access for maintenance required which is unavailable in this case due to the layout of the proposed extension in relation to the existing building stock surrounding	No
Solar Thermal	Solar thermal energy can be used to contribute towards space heating and hot water demand. The two most common forms of collector are panel and evacuated tube.	• Low maintenance • Little on going maintenance costs	• Must be sized for building DHW requirements. Due to the process nature of the operations, there is no domestic hot water demand associated with the proposed new development	No
Ground Source Heat Pump (GSHP)	GSHP systems tap into the earth's considerable energy store to provide heating and cooling to buildings. Installs include horizontal trench and vertical borehole	• Minimal maintenance • Unobtrusive technology (once implemented) • Flexible installation options to meet available site footprint	• Large area required for horizontal pipes and no available space on this project • Full ground survey required to determine geology • More beneficial if cooling req • Low grade heat derived cannot be utilised in developments of this nature – suits underfloor heating	No

Energy Statement: Nu Carb CVD Extension

Air Source Heat Pump (ASHP)	As an alternative to GSHPs, ASHP systems draw energy from the air to provide heating and cooling to buildings. Installation methods include air-to-water and direct refrigerant (VRF)	• Limited plant space requirements • Efficient when supporting both heating and cooling (FibreVac / Needle Loom space)	• External plant area required • Low flow temperatures mean DHW generation cannot be supported entirely	Yes – for the FibreVac / Needle Loom space
Wind Turbine *(Roof Mounted)*	Wind generation equipment operates on the basis of wind turning a propeller, used to drive an alternator to generate electricity. Small scale (1kW – 15kW) turbines can be pole or roof mounted	• Low maintenance / on going costs • Local wind speed is sufficient *(www.bwea.com)* • Excess electrical generation can be exported to grid	• Planning issues • Aesthetic impact and background noise • Structural / vibration impact on building to be assessed • Potential for downstream turbulence due to proximity to other buildings	No
Gas Fired Combined Heat & Power (CHP)	A CHP installation is effectively a mini on-site power plant providing both electric power and thermal heat. CHP is strictly an energy efficient measure rather than a renewable energy technology	• Efficient use of fuel • Excess electrical generation can be exported to grid • Benefits from being part of an energy centre / district heating scheme	• Must be sized for building DHW requirements. Due to the process nature of the operations, there is no domestic hot water demand associated with the proposed new development	No
Bio-Renewable Energy Sources *(Automated feed wood-fuel boiler plant)*	Modern wood-fuel boilers are highly efficient, clean and almost carbon neutral (the tree growing process effectively absorbs the CO2 that is emitted during combustion). Automated systems require mechanical fuel handling and a large storage silo	• Stable long term running costs • Potentially good CO2 savings	• Large area needed for fuel delivery and storage, no available space on this project. • Reliable fuel supply chain required • Regular maintenance required • Significant plant space required	No
Fuel Cells	Fuel cells convert chemical energy directly into electricity by combining hydrogen and oxygen in a controlled reaction	• Virtually no pollution • High electrical efficiency	• Expensive • Early stages of commercialisation • High technology risk	No

It is proposed that the heating and cooling provision to the FibreVac / Needle Loom space is met by the installation of air source heat pumps in the form of VRF plant.

Although included within the overall carbon savings detailed below, the IES dynamic model does not separate the figures associated with the ASHPs out within the 'Energy Production by Technology' summary table. As such, carbon emissions and energy demand for the 'Be Green' building as taken from the IES software model, and shown in the table below, are as the 'Be Clean' Approach above.

Due consideration has been given to the incorporation of a number of other low or zero carbon (LZC) technologies within the proposed new build extension. However, due to the process nature of the operations anticipated to be undertaken within the proposed extension, no LZC technologies are deemed viable for incorporation at this time.

BE GREEN APPROACH BUILDING CARBON DIOXIDE EMISSIONS

	Regulated Annual Energy Demand (kWhr)	Regulated Annual Emissions ($KgCO_2$)
Proposed Building	65,116	27,926
Reduction over Notional	19.5%	10.0%

5.0 Recommendations and Conclusion

In order to demonstrate that the sustainable planning requirements of Coventry City Council can be met by the proposed new build extension, the well structured energy hierarchy has been followed to demonstrate that carbon reductions can be made.

Due to the process nature of the operations anticipated to be undertaken within the proposed extension, there is little potential to incorporate either the 'Be Clean' or 'Be Green' components of the energy hierarchy with the exception of air source heat pumps in the form of VRF to deliver the heating and cooling demand of the VibreVac / Needle Loom space. It is therefore proposed to maximise the 'Be Lean' components in order to not only demonstrate but, significantly better, the conservation of fuel and power (Part L) requirements of the Building Regulations.

The total calculated carbon reduction is 10.0%, and the total calculated energy usage reduction is 19.5% when compared against the Notional Benchmark Building.

In the first stage of the energy hierarchy (Be Lean) a number of passive and high efficiency measures have been applied to contribute to reducing the energy consumption of the proposed new extension through improving the thermal envelop, system efficiencies etc. These elements are generally less expensive to implement and require very little on-going maintenance, thus providing goo value for money.

Importantly, in order to assist with reducing both the energy loads of the development, along with potential summertime overheating, there are several factors influencing the specification of the proposed glazing to the roof lights. These include maximising daylighting, and minimising the potential for glare and solar gain. The outputs of the dynamic model have been utilised to inform and ensure a balance is struck when specifying the final window and glazing specification, design and subsequent sizing.

The outcome of this analysis confirms that all occupied spaces of the proposed development comply with the criteria as dictated within the Building Regulations in relation to limiting solar gains. This, in turn, reduces the potential load of any mechanical cooling plant (within the proposed FibreVac / Needle Loom space).

In the second stage of the energy hierarchy (Be Clean), it has been determined that connection onto the Coventry City Heat Network is not yet feasible for this particular development and that, in any case, there is no base heating load associated with the proposed process activities of the space that would warrant an efficient connection / deliver a base load.

It is for the reasons as detailed above that the inclusion of a Combined Heat and Power (CHP) installation would not be of benefit.

In the third stage of the energy hierarchy (Be Green) it is considered that utilising sustainable air source heat pump (ASHP) technology in the form of VRF to provide the heating (and cooling) demand of the FibreVac / Needle Loom space will further demonstrate the sustainable credentials of the development as this technology has previously been identified as low/zero carbon by both BCC and the BRE.