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Energy Statement
London Irish Centre

Project No. A600

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Energy Statement

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EXECUTIVE SUMMARY

O'Connor Sutton Cronin & Associates Ltd have been appointed by Coffey Architects to prepare an Energy Statement to support a planning application for the development of London Irish Centre ("the proposed development") located in the London Borough of Camden.

This Energy Statement presents the energy strategy for the proposed development in relation to building energy and carbon performance, and planning policy targets as laid out within the following documents:

- National Planning Policy Framework (2012)
- The Draft London Plan (2018)
- Camden Local Plan (2017)

Specifically, Draft London Plan (2018) *Policy 5.2 'Minimising Carbon Dioxide Emissions'* requires the proposed development to achieve a minimum of 35% reduction in carbon emissions compared to the Building Regulations Part L 2013 baseline, and encourages the maximisation or on-site renewable energy generation..

The energy strategy has been developed in line with the London Plan 'Energy Hierarchy', which encourages a tiered approach to low carbon design, comprising; adoption of measures for energy demand reduction (Be Lean) in the first instance, integration of energy efficient supply (Be Clean) secondly, and use of renewable energy (Be Green) as the final consideration. Following this approach, it is demonstrated that the proposed development energy strategy can meet and exceed energy and carbon policy targets through the application of enhanced energy efficient building fabric and servicing design measures, sufficient to provide 15% betterment over Building Regulations.

Based on energy assessment of the strategy, it is demonstrated that the proposed development can achieve a reduction in annual carbon dioxide (CO_2) emissions of up to 69% compared to the Building Regulations Part L 2013 baseline (Carbon emissions calculated against the latest SAP 10 emission factors). The carbon dioxide emissions and savings achieved for each tier of the energy hierarchy are illustrated in Figure 1 and Table 1, Table 2 and Table 3.

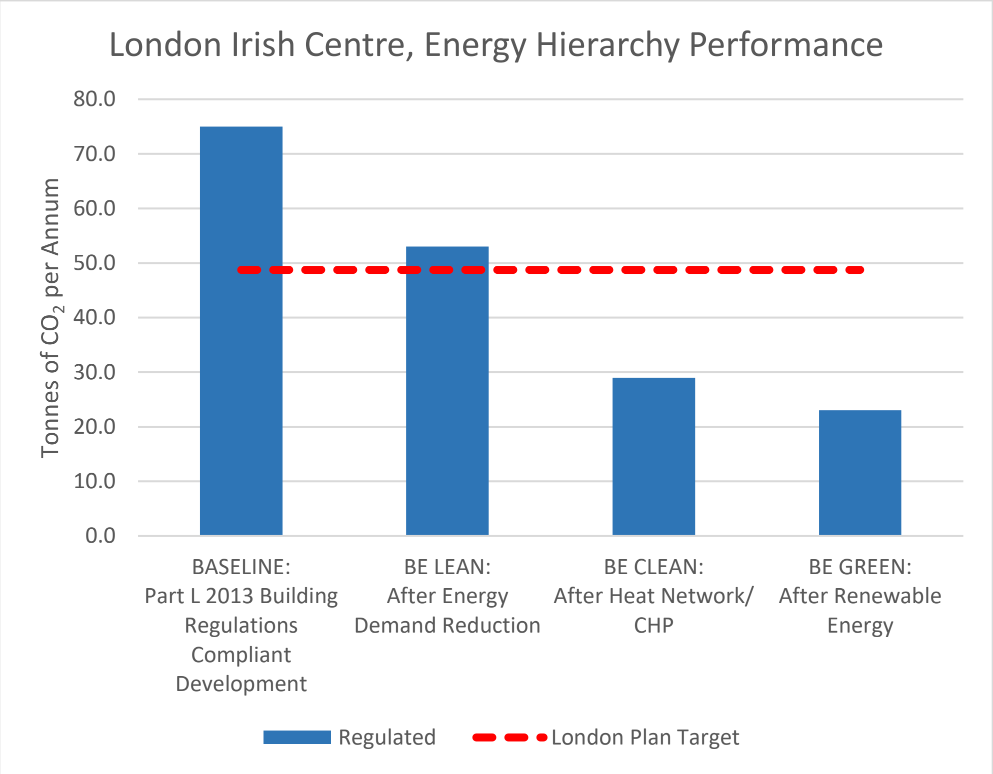


Figure 1 – Energy hierarchy performance

GLA Energy Planning Table 1	Carbon Dioxide Emissions (Tonnes CO_2 per Annum) – with SAP 10 Carbon emissions factors	
	Regulated	Unregulated
BASELINE: Part L 2013 Building Regulations Compliant Development	75	91
BE LEAN: After Energy Demand Reduction	53	91
BE CLEAN: After Heat Network/ CHP	29	91
BE GREEN: After Renewable Energy	23	91

Table 1 – CO_2 emissions by energy hierarchy stage

	Regulated CO_2 emissions savings (with SAP 10 Carbon emissions factors)	
	Tonnes CO_2 per Annum	%
London Irish Centre	51	69

Table 2 – Regulated CO_2 emissions saving

	Regulated CO_2 emissions savings (with SAP 10 Carbon emissions factors)	
	Tonnes CO_2 per Annum	%
Savings from Energy Demand Reduction	22	29
Savings from Heat Network/ CHP	24	32
Savings from Renewable Energy	5	7
Total Cumulative On Site Savings	**51**	**69**

Table 3 – Overall Regulated CO_2 emissions saving by energy hierarchy stage

1. INTRODUCTION

O'Connor Sutton Cronin & Associates Ltd have been appointed by Coffey Architects to prepare an Energy Statement to support a planning application for the development of London Irish Centre (the proposed development) located in the London Borough of Camden (LB Camden).

This statement presents the outcome of the energy appraisal of the proposed development and details the approach that the applicant and the design team have collectively taken towards achieving a high standard of operational energy performance. The measures suggested with the design proposals to reduce the energy demand, energy use, resultant carbon dioxide emissions and environmental impact of the scheme are outlined. In addition to the consideration of demand reduction and energy efficient design, the statement assesses the suitability of low and zero carbon technologies (LZCs) for application to the proposed development.

The Energy Statement includes:

- Description of the proposed development;
- Summary of the relevant national, regional and local energy planning policy drivers;
- Definition of the energy hierarchy applied to the development;
- Examination of the performance of the scheme in accordance with key energy policies at all levels, including the London Plan and Camden Local Plan; and
- A review of the proposed development's performance against set planning objectives and good practice identifying the opportunities and constraints of both the application site and the proposals.

2. THE PROPOSED DEVELOPMENT

The application site is located at 50-52 Camden Square in the London Borough of Camden.

The proposed development consists of the retention and elevational alterations of existing buildings at No.50, 51 and 52 Camden Square and the McNamara Hall. Demolition in part and redevelopment to provide new and reconfigured community floor space; associated landscaping and cycle parking.

Figure 2 below illustrates the proposed massing of the site.

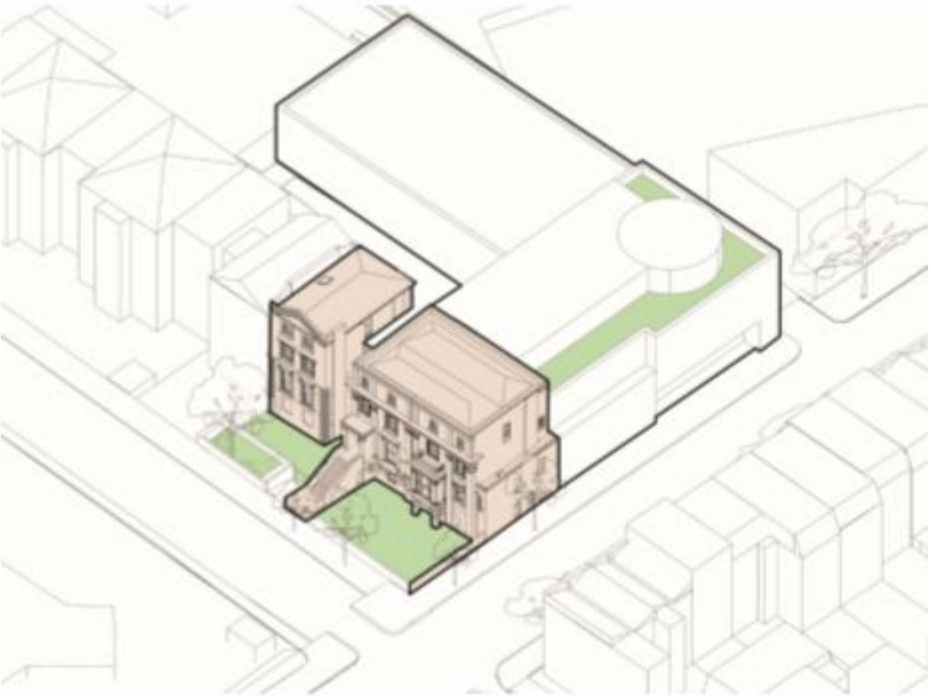


Figure 2 – Proposed Massing

The proposed development is classified as a D1 (non-residential institution) and D2 (Assembly and Leisure)

3. PLANNING POLICY

The planning policy context for London Irish Centre comprises the national, regional and local planning policy as detailed below:

NATIONAL PLANNING POLICY FRAMEWORK (2019)

The revised National Planning Policy Framework (NPPF) was published in February 2019 and sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally prepared plans for housing and other developments can be produced. This revised Framework replaces the previous National Planning Policy Framework published in March 2012, which was adopted as a key part of the Government's reforms to make the planning system less complex and more accessible, whilst protecting the environment and promoting sustainable growth.

At the heart of the NPPF is a 'presumption in favour of sustainable development', which requires Local Authorities as part of any plan-making and decision-making to provide clear guidance on how the presumption should be applied locally. The NPPF additionally sets out thirteen core land-use planning principles that the Government has identified to underpin both plan-making and decision-making. Of these, the following has been identified as being relevant to energy:

'The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including conversion of existing buildings, and support the renewable and low carbon energy and associated infrastructure.'

THE DRAFT LONDON PLAN (2018)

The new Draft London Plan (2018) has been introduced and its new energy assessment guidance came into force in January of 2019. The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. In terms of energy and carbon, Chapter 9 *'Sustainable Infrastructure'* outlines a number of the policies that set the overarching principles for reducing carbon emissions in the built environment. The relevant policies of Chapter 5 include:

Policy SI2: Minimising Greenhouse Gas Emissions

A. Major developments proposals should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- Be Lean- use less energy and manage demand during operation
- Be Clean- exploit local energy resources and supply energy efficiently and cleanly
- Be Green- maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35% beyond Building Regulations is required for major development. Residential development should achieve a 10%, and non-residential development should achieve 15% through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1. through a cash in lieu contribution to the borough's carbon offset fund, or
2. off-site provided that an alternative proposal is identified and delivery is certain.

9.2.4

A zero-carbon target for major residential developments has been in place for London since October 2016 and will apply to major non-residential developments from 2019 (when draft London Plan 2018 comes into effect later on this year).

9.2.10

The highest standards of sustainable design should be achieved to improve the environmental performance of a new development. The main information that should be contained in energy strategies:

- Calculation of the energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions from any part of the development, that are not covered by the Building Regulations (i.e. the unregulated emissions), at each stage of the energy hierarchy.

- Proposals to reduce carbon emissions beyond Building Regulations through the energy efficient design of the site, building and services.
- Proposals to further reduce carbon emissions through the use of zero or low emissions decentralised energy where feasible, prioritising connection to district heating and cooling networks.
- Avoiding internal overheating; and
- Avoiding pollution.

Policy SI3: Energy Infrastructure

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
    a) connect to local existing or planned heat networks
    b) use zero-emission or local secondary heat sources (in conjunction with heat pump if required)
    c) use low emission combined heat and power (CHP) (only where there is a case of CHP to enable the delivery of an area-wide heat network)
    d) use ultra-low NOx gas boilers
2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI1 for improving air quality
3) Where a heat network is planned but not yet in existence, the development should be designed for connection at a later date.

9.3.7:

Increasing the amount of renewable energy is supported and development proposals should identify opportunities to maximize renewable energy production on-site

Policy SI4 Managing heat risk

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the cooling hierarchy.

CAMDEN LOCAL PLAN

The relevant planning authority is Camden Council and planning policy for the area is detailed in Camden Local Plan (2017). The Relevant policy CC1 for climate change mitigation indicates:

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

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

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

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

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

4. BUILDING REGULATIONS

The Building Regulations 2013 (England & Wales) set out standards and requirements that individual aspects of building design and construction must achieve. Approved Document Part L *'Conservation of fuel and power'* 2013 edition of the Building Regulations (BR Part L 2013) deals with energy efficiency requirements for buildings. The Approved Document relevant to the proposed development, and the basis against which compliance of the development energy strategy is measured against is:

- Non-residential: Building Regulations Part L2a 2013 *'Conservation of fuel and power in new buildings other than dwellings'*.

For new build non-residential buildings, the respective Government approved methodology for calculating energy efficiency and carbon emissions in accordance with Building Regulations Part L is the National Calculation Methodology (NCM). The current DesignBuilder v6.1 software (NCM) calculates the energy requirements for space and water heating, ventilation and internal lighting of buildings. The outputs produced from the software include a dwelling/ building carbon emission rate (BER) in terms of $kgCO_2/m^2/year$ for the modelled building.

To comply with Building Regulation Part L2a in terms of the carbon emissions rate, the BER must be equal to or better than the Target Emission Rate (TER), which is the Building Regulations baseline. The proposed development energy strategy performance has therefore been assessed in accordance with this carbon emission rate criterion to determine compliance of the proposals.

5. ENERGY ASSESSMENT

A Building Regulation Part L 2013 compliant energy assessment has been undertaken in order to assess the likely energy demands and carbon dioxide emission of the proposed development. The energy calculations have been produced based on information provided, which includes accommodation schedules, and layout plans for the proposed development, along with information regarding acceptable constructions and energy efficiency improvements.

The methodology used to estimate the energy demand from buildings on the proposed development site has been informed by the guidance in the following publications:

- National Calculation Methodology (NCM) 2013 guidance;
- The Draft London Plan (2018);
- The GLA Energy Assessments Guidance (October 2018)
- The London Renewables Toolkit for Planners, Developers and Consultants; and

An energy modelling exercise has been undertaken to establish the anticipated regulated carbon dioxide emissions in accordance with Building Regulations Part L 2013. SBEM compliant software have been utilised to energy model the proposed development residential and non-residential buildings.

Grid electricity has significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations. The impact of these new emission factors is significant in that technologies generating on-site electricity (such as gas-engine CHP and solar PV) would not achieve the carbon savings they have to date therefore it is anticipated that developments would need to utilise alternative or additional technologies to meet the 35 per cent on-site carbon reduction target, including using zero emission or local secondary heat sources. The update on the carbon emissions is shown on the table 4 below.

Fuel type	Fuel Carbon Factor (kgCO2/kWh)	
	SAP 2012	SAP 10
Natural Gas	0.216	0.210
Grid Electricity	0.519	0.233

Table 4 – SAP 2012 and SAP 10 carbon emission factors

The GLA is encouraging applicants to use the SAP 10 emissions factors for referable applications when estimating CO_2 emission performance against London Plan policies. As such, these figures have been used for the assessment of this building.

5.1 Regulated Emissions Baseline

The regulated emissions baseline is taken as the Target Emission Rate (TER) against Part L 2013, and are presented for the non-domestic building. This is calculated by modelling the actual geometry and type of use of the proposed building/ units, and applying notional (Building Regulations minimum) building fabric and building services performance values to the models. Table 6 shows the calculated average TER and overall carbon dioxide emissions with SAP 10 emissions factors, as per GLA guidance, for the regulated baseline.

Use	TER with SAP 2012 figures ($KgCO_2/m^2/yr$)	Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors
London Irish Centre	30.2	75

Table 5 – Target Emission Ratings for London Irish Centre

5.2 Regulated and Unregulated Emissions

For new developments, energy use within buildings is regulated to conserve heat and power as described in Chapter 5. In addition to the resultant carbon dioxide emissions from the regulated emissions, there are additional uses of energy which are unregulated, examples of which include energy for small power appliances, IT equipment and white goods. Such energy use in buildings is described as unregulated energy use (emissions) as it is not covered by the NCM calculation methodology for Building Regulations Part L.

For non-residential buildings, assessment of unregulated energy is best considered by using benchmarks generated by datasets of typical buildings. Benchmarks published by the CIBSE (Guide F) indicate the estimated overall emissions by building use type.

Table shows the estimated performance of the proposed development which includes regulated and unregulated emissions.

Building Regulations 2013 Part L Compliant Development with SAP 10 Emission Factors	Overall Baseline Emissions (tonnes CO_2)	
	Regulated	Unregulated
Non-residential	75	91

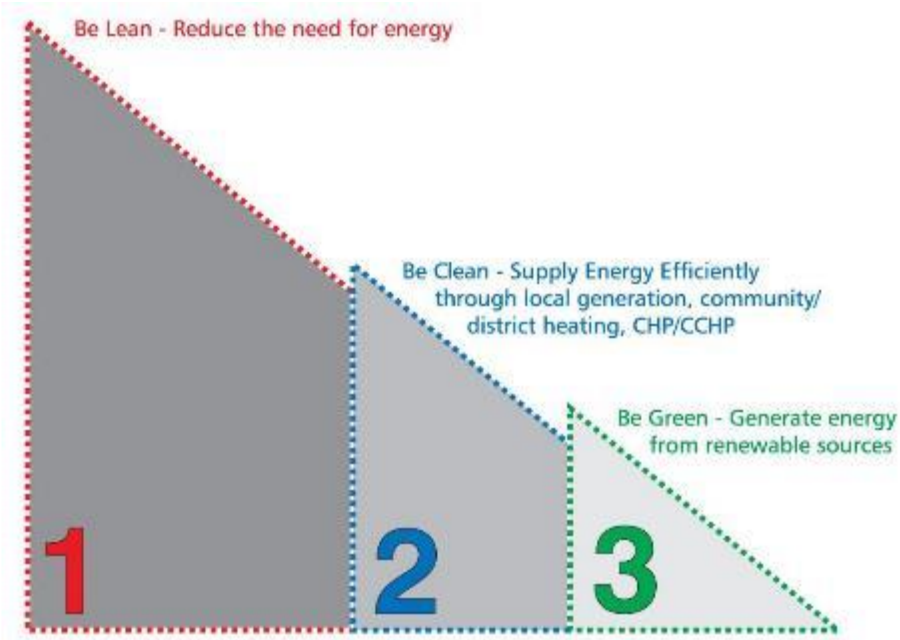
Table 6 – Carbon Dioxide Emissions Baseline for London Irish Centre

Note: Unregulated carbon dioxide emissions are to be included for information only as stated in the GLA Guidance on Preparing Energy Assessments (October 2018).

6. ENERGY EFFICIENCY MEASURE – BE LEAN

The London Plan and *GLA Guidance on Preparing Energy Assessments* describes a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. These guiding principles are referenced in the London Plan, which states that '*The following hierarchy should be used to assess applications'*:

- Using less energy, in particular by adopting sustainable design and construction measures;
- Supplying energy efficiently, in particular by prioritising decentralised energy generation; and
- Use renewable energy.



In addition to the London Plan guidance, the Camden borough supports and reinforces this approach, making it a priority to install energy efficiency measures and to use low carbon generating technologies to reduce CO_2 emissions from new development.

6.1 Be Lean Measures

The first tier of the energy hierarchy requires energy strategies to consider energy demand reduction measures specific to the development, and seek to not only comply with the Buildings Regulation Part L baseline, but improve over Building Regulations Part L by at least 15% with these measures alone. Such measures typically include both architectural and building fabric measures (passive design) and energy efficient services (active design) in order to achieve a building that meets and exceeds Building Regulations energy performance. BRUKL reports indicating the BER and TER of the modelled building at this stage of the energy hierarchy is shown on Appendix C. The proposed development energy strategy incorporates the following energy efficiency design measures to maximise the benefit of energy demand reduction in the energy strategy:

Passive Design

- Enhanced building envelope performance over and above Building Regulations Part L2a minimum U-Values, as outlined in Table 9.
- Enhanced air infiltration target.

Element	Current 2013 Part L2A U-values (W/m².K)	Energy Strategy U-values (W/m².K)
External Walls	0.35	0.13
Existing Walls	0.35	0.15
Floors	0.25	0.1
Existing Floor	0.25	0.13
Roofs	0.25	0.13
Windows	2.2	1
Air permeability	10 $m^3/(h.m^2)$@50pa	3.5 $m^3/(h.m^2)$@50pa

Table 9 – Proposed Non-residential Envelope Performance

Active Design Measures

- 100% low energy light fittings provision.
- Occupant and daylighting control of lighting, with occupancy sensors and dimming throughout.
- Highly efficient Heat Pumps and Mechanical Ventilation with Heat Recovery
- Effective monitoring and management of heating, cooling, ventilation and air conditioning systems.

6.2 Emissions Performance Following Demand Reduction Measures

The energy modelling of the proposed development indicates that by incorporating demand reduction 'Be Lean' measures, the following performance can be achieved:

Use	BER with SAP 2012 figures ($KgCO_2/m^2/yr$)	Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors
London Irish Centre	20.3	53

Table 10 – Be Lean: Building Emissions Rating for London Irish Centre

BE LEAN	Carbon Dioxide Emissions (tonnes CO_2 per annum) with SAP 10 emissions factors	
	Regulated	Unregulated
Building Regulations 2013 Part L Compliant Development	75	91
After Energy Demand Reduction	53	91

Table 11 – Be Lean: Annual Emissions for London Irish Centre

BE LEAN	Regulated Carbon Dioxide Savings with SAP 10 emissions factors	
	Tonnes CO_2 per annum	%
Savings from Energy Demand Reduction	22	29

Table 12 – Be Lean: Emissions Savings for London Irish Centre

7. SUPPLYING ENERGY EFFICIENTLY – BE CLEAN

7.1 Existing and Planned Heat Networks

In response to the second tier of the energy hierarchy and LB Camden planning policy requirement that developments seek to connect to decentralised energy networks, an assessment of adjacent existing and future heat loads and infrastructure has been undertaken. Using the London Heat Map (https://maps.london.gov.uk/heatmap/) the potential for connection to an existing or proposed scheme in the locality of the proposed development has been examined.

An extract from the London Heat Map at the proposed development and surrounding area is shown in Figure 3.

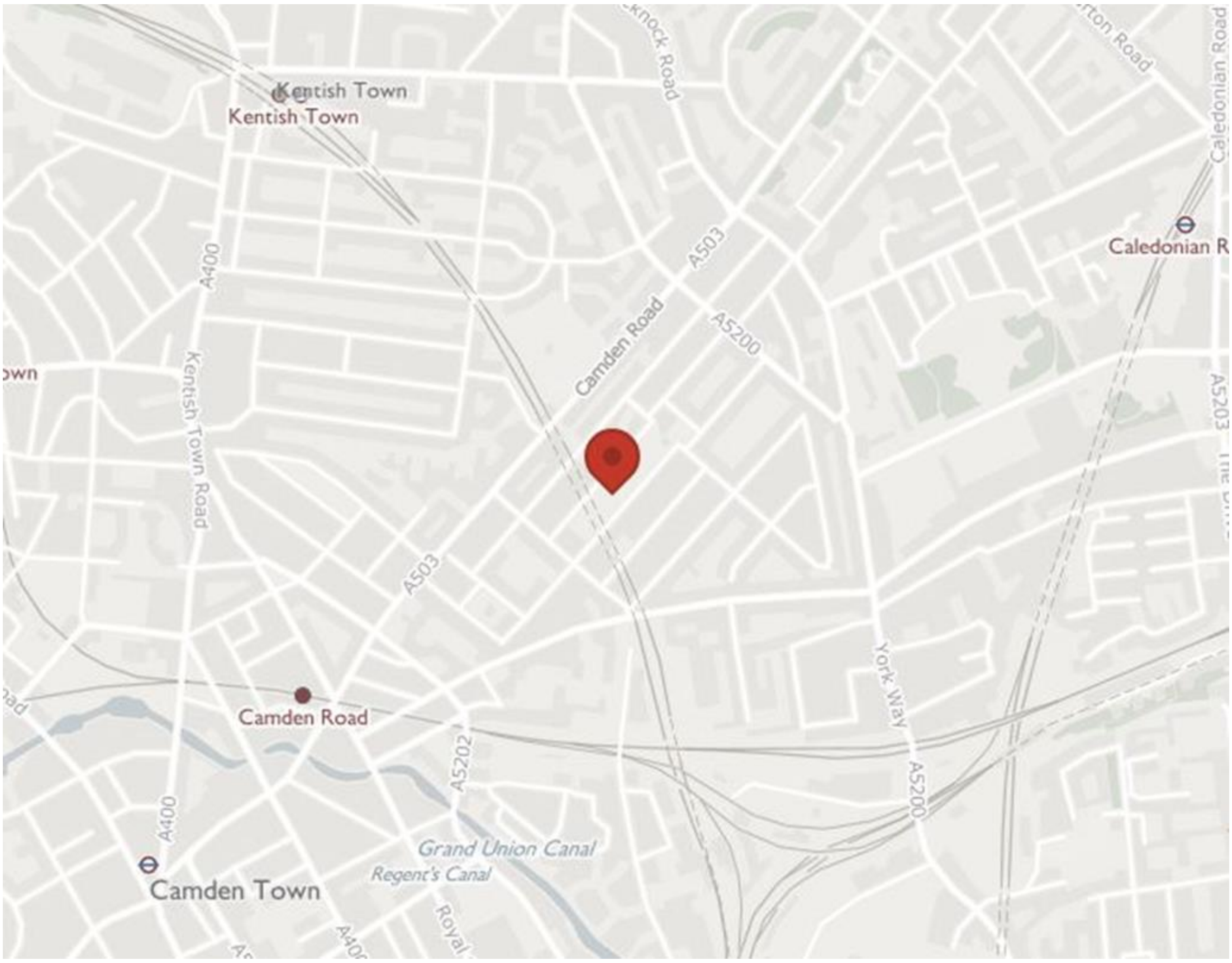


Figure 3 – London Heat Map for Application Site and Surrounding Areas

The heat map extract shows that there are currently no existing or planned decentralised energy networks within the vicinity of the proposed development, and therefore no opportunity for connection to a decentralised energy supply.

7.2 Site-wide Heat Networks

Local heat and power sources minimise distribution losses and achieve greater efficiencies when compared to separate energy systems, thus reducing CO_2 emissions. In accordance with policy, the energy systems for the site have been determined in accordance with the following hierarchy:

1. Connection to existing heating and cooling networks
2. Site wide CHP network
3. Communal heating and cooling

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residencies and commercial units.

Site Wide Heating Network and CHP Combined heat and power engines are not viable for this development due to its small size.

Technical Assessment for future connection to DH network

Based on the proposed servicing strategy, a highly efficient refrigerant based VRF system is to be installed to provide simultaneous heating and cooling to the spaces at the London Irish Centre.
It would therefore not be feasible to connect any future DH network to the development should one become available in the future.

Heat Pumps

Heat pumps draw thermal energy from the air, water or ground ("source") and upgrade it to be used as useful heat at another location ("sink"). Heat pumps require electricity to operate (or gas in the case of Gas Absorption Heat Pumps) as mechanical input is required to convert harvested energy to useful heat and complete its transport to the "sink". Heat pumps are generally considered as renewable (despite an electrical or gas requirement) because the source of the heat is the ambient temperature in the exterior environment, which is ultimately heated via the sun.

7.3 Emissions Performance Following Low Carbon Energy Supply

The energy modelling of the proposed development indicates that by incorporating the 'Be Clean' features described in the chapter, the following performance can be achieved:

Use	BER with SAP 2012 figures ($KgCO_2/m^2/yr$)	Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors
London Irish Centre	16.3	29

Table 14 – Be Clean: Building Emissions Rating for London Irish Centre

BE CLEAN	Carbon Dioxide Emissions (tonnes CO_2 per annum) with SAP 10 emissions factors	
	Regulated	Unregulated
Building Regulations 2013 Part L Compliant Development	75	91
After Energy Demand Reduction	53	91
After Energy Supply	29	91

Table 15 – Be Clean: Annual Emissions for London Irish Centre

BE CLEAN	Regulated Carbon Dioxide Savings with SAP 10 emissions factors	
	Tonnes CO_2 per annum	%
Savings from Energy Demand Reduction	22	29
Savings from Energy Supple	24	32

Table 16 – Be Clean: Emissions Saving for London Irish Centre

8. USE LOW AND ZERO CARBON TECHNOLOGIES – BE GREEN

This section describes the low and zero carbon (LZC) technologies which have been considered for the proposed development.

When addressing the third tier of the energy hierarchy, the aim is to identify the feasibility of LZC technologies at the application site and recommendations based on cost/ effectiveness. As planning policy targets now focus on overall emissions reductions, rather than simply requiring a percentage of renewable energy generation, the assessment provides an indication of feasibility for the application site, but does recommend by default that any technologies are incorporated.

8.1 Technologies Excluded From Analysis

The renewable energy feasibility study has excluded the analysis of fuel cells, hydroelectricity and piezoelectric technologies for incorporation at the proposed development.

8.2 Technologies Included in Analysis

The LZC feasibility study for the proposed development has assessed the use of solar thermal collectors, photovoltaic modules, biomass heating, heat pumps and wind turbines.

8.2.1 Solar Thermal Collectors

Solar thermal panels convert energy from the sun to produce hot water for heating application within buildings. To maximise the irradiance level exposure, solar panels should ideally be installed on a flat or sloping roof orientated south and at an angle of 30°.

Recommendation

The installation of solar thermal collectors is technically feasible, however is not recommended given the proposed installation of heat pumps to provide heat energy.

8.2.2 Photovoltaic Modules

Solar Photovoltaics (PVs) are solar panels which generate electricity through photon-to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells are made up from layers of semi-conducting silicon material which, when illuminated by the sun, produces an electrical field which generates an electrical current. PVs can generate electricity even on overcast days, requiring daylight, rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day. PVs can therefore offer a simple and proven solution to generating renewable electricity.

Recommendation

The integration of PV arrays on roof space is technically feasible for the proposed development. They are considered suitable for the contribution towards reducing the carbon emissions on site and to align with planning policy which encourages the incorporation on-site renewable generation, where feasible.

For the London Irish Centre, a PV array of 79 modules of high efficiency (0.37kWp per panel of 1.558m x 1.046m), totalling 19.23 kWp total is proposed to be installed with 30° tilt and Southeast orientation, with 1.5m spacing. More details of the proposed photovoltaic module are shown on Appendix B. An indicative roof allocation for PV array is shown on figure 8 below. Incorporation of PV arrays is expected to provide a 7% reduction on the carbon emissions of the building. The allocation shown in figure 8 is indicative and is subject to adjustment.

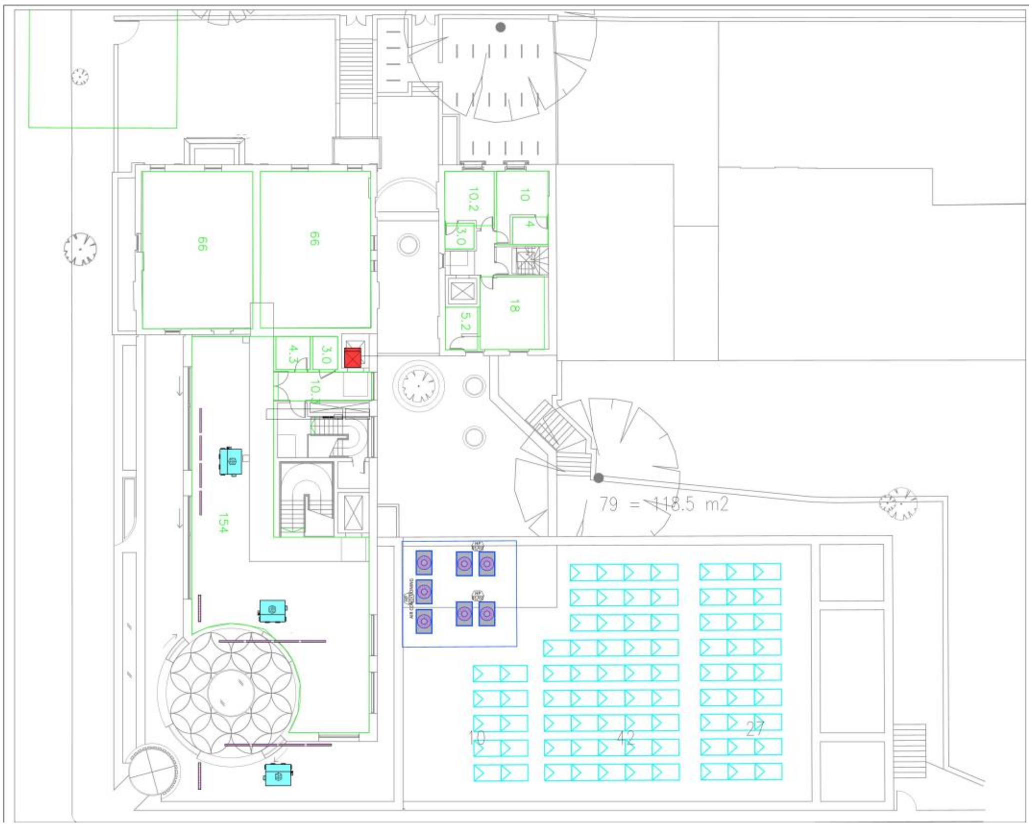


Figure 8 – Proposed PV array allocation

8.2.3 Biomass Heating

Biomass boilers replace conventionally powered boilers with an almost carbon neutral fuel such as wood pellets or wood chips. The fuel is classed as almost carbon neutral because the CO_2 released during the burning of biomass is balanced by that absorbed by the plants during their growth. Although biomass is considered a cleaner fuel than gas or heating oil, it should be noted that fossil fuels are utilised in the production, processing and transportation of the fuels. A key issue when choosing the biomass fuel supply is therefore distance between producer and processor, and from supplier and site, as well as the method of transportation.

Recommendation

Biomass heating for the proposed development is technically feasible, however is not recommended as an option for a range of considerations, including; significant site spatial requirements for storage, delivery and access, on-going management burden of regular fuel deliveries and maintenance requirements (removal of ash), and potential visual and air quality impact associated with the technology.

8.2.4 Wind Turbines

Wind turbines are an established means of capturing wind energy and converting it into usable electricity. A wind turbine usually consists of a nacelle containing a generator connected, sometimes via a gearbox, to a rotor consisting of three blades.

The two main types of commercially available wind turbines on offer in the UK are described below:

- Horizontal axis wind turbines (HAWT) are traditionally the most common form of wind turbines installed in the UK. They are usually formed of three blades and work best when provided with a constant laminar air flow; and
- Vertical axis wind turbines (VAWT) are less efficient compared to HAWTs, but have the advantage that they can cope with variable wind flows as they do not have to 'face' the wind.

Referring to the Numerical Objective Analysis Boundary Layer (NOABL) wind speed database as adopted by the DECC, the application site experiences fairly low wind speeds in this area, averaging 4.8 m/s assuming a rotor height at around 10m above ground level. Taking a roof mounted turbine with a rotor at 45m above ground level may increase wind speeds to 6.0 m/s, but given the urban environment, it is unlikely that average speeds will meet this estimate given the experience of urban installations.

Recommendation

The installation of wind turbines though technically feasible at the application site, are not considered appropriate. This recommendation is based on consideration of the low wind speed availability in the area, and nature of the proposed development and surrounding areas, which is likely to give rise to amenity issues, including shadow-flicker and noise associated with operation of wind turbines.

8.3 Emissions Performance Following Assessment of LZC Technology

The carbon emissions following the 'Be Green' step are shown below, after the application of the LZC technologies.

Use	BER with SAP 2012 figures ($KgCO_2/m^2/yr$)	Annual CO_2 Emissions (tonnes CO_2) with SAP 10 emissions factors
London Irish Centre	13.3	23

Table 17 – Be Green: Building Emissions Rating for London Irish Centre

BE CLEAN	Carbon Dioxide Emissions (tonnes CO_2 per annum) with SAP 10 emissions factors	
	Regulated	Unregulated
Building Regulations 2013 Part L Compliant Development	75	91
After Energy Demand Reduction	53	91
After Energy Supply	29	91
After LZC	23	91

Table 18 – Be Green: Annual Emissions for London Irish Centre

BE CLEAN	Regulated Carbon Dioxide Savings with SAP 10 emissions factors	
	Tonnes CO_2 per annum	%
Savings from Energy Demand Reduction	22	29
Savings from CHP	24	32
Savings from LZC	5	7

Table 19– Be Green: Emissions Saving for London Irish Centre

9. COOLING AND OVERHEATING

9.1 Active Cooling

The energy strategy approach for non-residential developments is to avoid to the need for active cooling. At the detailed design stage, the strategy for minimising cooling demand will be fully developed in accordance with Policy SI4 of the London Plan. To reduce the potential of internal overheating and reliance on air conditioning systems, the following principles of cooling hierarchy are recommended:

1. Reduce the amount of heat entering a building in summer through orientation, shading, high albedo materials, fenestration, insulation and green infrastructure.
2. Minimise internal heat generation through energy efficient design.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.
4. Passive ventilation.
5. Mechanical ventilation.
6. Active cooling systems.

9.2 Overheating Risk

Assessment of criterion 3 of Building Regulations Part L2A indicate that the building does not have a high risk of overheating.

To validate these findings, detailed calculations in accordance with CIBSE TM52 and TM49 guidance will be provided in a separate report.

10. CONCLUSIONS

This Energy Statement has demonstrated how the proposed development will be designed to accord with the energy hierarchy of the London Plan to deliver significant carbon dioxide savings as compared to a Building Regulation Part L 2013 baseline compliant building, and by using the most up to date carbon emission factors as presented in SAP 10. More specifically, the development is:

(a) Applying the energy hierarchy approach and included building design and technology energy efficiency measures.
(b) Demonstrating carbon dioxide emission reductions beyond 35% of the Building Regulation Part L 2013 baseline.
(c) Applying on-site renewable generation to minimise the carbon emissions of the building as close to zero as possible.

The energy strategy demonstrates that energy and carbon policy targets can be achieved through application of enhanced energy efficient building fabric and servicing design measures, and integration of heat pumps for the heating and cooling provision. The energy assessment of the strategy demonstrates that the proposed development can achieve an overall reduction in annual carbon dioxide (CO_2) emissions on-site of up to 69% compared to the Building Regulations Part L 2013 baseline. The overall savings from applying the principles of the energy hierarchy are summarised in Table 21, Table 22 and Table 23.

	CO_2 emissions (Tonnes CO_2 per Annum) with SAP 10 emission factors	
	Regulated	**Unregulated**
Baseline: BR Part L 2013 Baseline (TER)	75	91
Be Lean: After Energy Demand Reduction	53	91
Be Clean: After Energy Supply	29	91
Be Green: After Renewable Energy	23	91

Table 21 – CO_2 emissions by energy hierarchy stage

	Regulated CO_2 emissions savings	
	Tonnes CO_2 per Annum	**%**
London Irish Centre	51	69

Table 224 – Regulated CO_2 emissions saving

	Regulated CO2 emissions savings	
	Tonnes CO_2 per Annum	**%**
Savings from Energy Demand Reduction	22	29
Savings from Energy Supply	24	32
Savings from Renewable Energy	5	7
Total Cumulative On Site Savings	**51**	**69**

Table 23 – Overall Regulated CO_2 emissions saving by energy hierarchy stage

Overall, it can be concluded that the appropriate and available measures will be taken to ensure that London Irish Centre will have the lowest carbon emissions possible.

APPENDIX A – MODELLING ASSUMPTIONS FOR London Irish Centre

NON-RESIDENTIAL	Parameter	Specification
Fabric thermal parameters	Roof	0.13 W/m².K
	External walls	0.13 W/m².K
	Existing walls	0.15 W/m².K
	Ground floor	0.1 W/m².K
	Existing Floor	0.13 W/m².K
	Doors	0.7 W/m².K
	Windows	1.0 W/m².K T-Solar=0.36 L-Solar-0.65
	Air permeability	3.5 m³/(h.m²)@50pa
Heating & Cooling	Heat Pump	Heating SCOP=4.3, Cooling SEER=6.9 (space heating only)
	Water Heating	SEER=3.9 Cylinder storage: 300L x2, Insulation thickness-40mm
Ventilation	Local Extract only ventilation	Toilets, Servery, Store SFP=0.25W/l/s
	MVHR	Multifunctional Space, 74% heat recovery efficiency SFP=1.36
	MVHR	Mcmanara Hall, Community hub & lounge, LIC Community & Care Spaces, Mezzanine Function space, Function room 78% heat recovery efficiency SFP=1.36 (1.3 for Mcmanara Hall)
	MVHR	Wellbeing Centre, Archive Library 74% heat recovery efficiency SFP=1.52
	Mechanical Ventilation	Kitchen, SFP=1W/l/s
Electrical Demand	Electric Power Factor	>0.95
	Lighting	125 lm/circuit Watt LED with light output ratio of 1 Air extracting luminaires Occupancy sensing: Auto-On-Off, with parasitic power of 0.05W/m²

		Constant illuminance control Photoelectric control with dimming – standalone sensors with parasitic power of 0.05W/m^2 Separately sub-metered with alarm for 'out of range' values Full L.E.N.I. calculation methodology to be used
Building Regulations (with SAP 2012 carbon emissions factors)	TER	31.9kgCO_2/m^2/yr
	BER	13.3 kgCO_2/m^2/yr
	Compliance	**58.3%**

APPENDIX B – Proposed PV module

X SERIES

SUNPOWER®

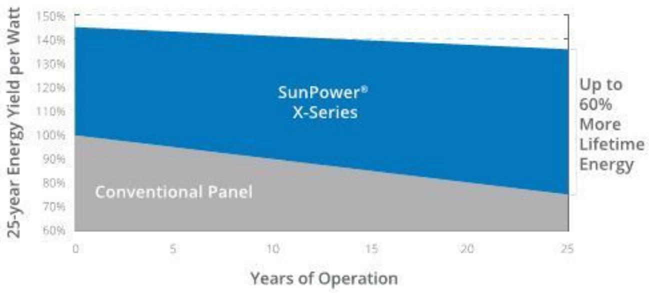
SunPower X-Series: X22-370

SunPower® Residential DC Panel

SunPower X-Series panels combine the top efficiency, durability and warranty available in the market today, resulting in more long-term energy and savings.[1,2]

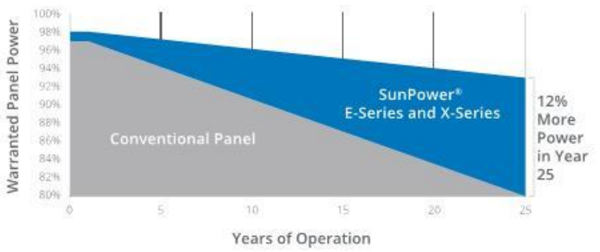
Maximum Power. Minimalist Design.
Industry-leading efficiency means more power and savings per available space. With fewer panels required, less is truly more.

Highest Lifetime Energy and Savings
Designed to deliver 60% more energy in the same space over 25 years in real-world conditions like partial shade and high temperatures.[2]



Best Reliability, Best Warranty
With more than 25 million panels deployed around the world, SunPower technology is proven to last. That's why we stand behind our panel with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.

BETTER PRODUCT · BETTER WARRANTY
25-yr SunPower Complete Confidence



Fundamentally Different. And Better.

The SunPower Maxeon® Solar Cell

- Enables highest efficiency panels available[2]
- Unmatched reliability[3]
- Patented solid metal foundation prevents breakage and corrosion

LEED

Certified cradletocradle SILVER

As Sustainable As Its Energy

- Ranked #1 in Silicon Valley Toxics Coalition 2015 Solar Scorecard[4]
- First solar panels to achieve Cradle to Cradle Certified™ Silver recognition[5]
- Contributes to more LEED categories than conventional panels[6]

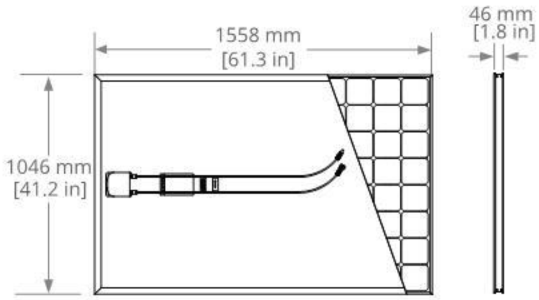
sunpower.com

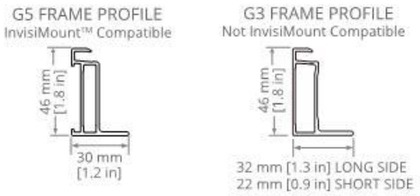
X-Series: X22-370 SunPower® Residential DC Panel

Electrical Data	
	SPR-X22-370
Nominal Power (Pnom)[7]	370 W
Power Tolerance	+5/0%
Panel Efficiency	22.7%
Rated Voltage (Vmpp)	59.1 V
Rated Current (Impp)	6.26 A
Open-Circuit Voltage (Voc)	69.5 V
Short-Circuit Current (Isc)	6.66 A
Max. System Voltage	600 V UL & 1000 V IEC
Maximum Series Fuse	15 A
Power Temp Coef.	−0.29% / °C
Voltage Temp Coef.	−167.4 mV / °C
Current Temp Coef.	2.9 mA / °C

Operating Condition And Mechanical Data	
Temperature	−40° F to +185° F (−40° C to +85° C)
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)
Appearance	Class A+
Solar Cells	96 Monocrystalline Maxeon Gen III
Tempered Glass	High-transmission tempered anti-reflective
Junction Box	IP-65, MC4 compatible
Weight	41 lbs (18.6 kg)
Max. Load	G5 Frame: Wind: 62 psf, 3000 Pa front & back Snow: 125 psf, 6000 Pa front G3 Frame: Wind: 50 psf, 2400 Pa front & back Snow: 112 psf, 5400 Pa front
Frame	Class 1 black anodized (highest AAMA rating)

Tests And Certifications	
Standard Tests[8]	UL1703 (Type 2 Fire Rating), IEC 61215, IEC 61730
Quality Management Certs	ISO 9001:2015, ISO 14001:2015
EHS Compliance	RoHS, OHSAS 18001:2007, lead free, Recycle Scheme, REACH SVHC-163
Sustainability	Cradle to Cradle Certified™ Silver. "Declare." listed.
Ammonia Test	IEC 62716
Desert Test	10.1109/PVSC.2013.6744437
Salt Spray Test	IEC 61701 (maximum severity)
PID Test	1000V: IEC 62804, PVEL 600 hr duration
Available Listings	UL, TUV, MCS, FSEC, CEC





G5 frames have no mounting holes. Please read the safety and installation guide.

1 SunPower 360 W compared to a Conventional Panel on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 4% more energy per watt (based on PVSyst pan files), 0.75%/yr slower degradation (Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013).
2 Based on search of datasheet values from websites of top 10 manufacturers per IHS, as of January 2017.
3 #1 rank in "Fraunhofer PV Durability Initiative for Solar Modules: Part 3". PVTech Power Magazine, 2015. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.
4 SunPower is rated #1 on Silicon Valley Toxics Coalition's Solar Scorecard.
5 Cradle to Cradle Certified is a multi-attribute certification program that assesses products and materials for safety to human and environmental health, design for future use cycles, and sustainable manufacturing.
6 X-Series and E-Series panels additionally contribute to LEED Materials and Resources credit categories.
7 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25° C). NREL calibration Standard: SOMS current, LACCS FF and Voltage.
8 Type 2 fire rating per UL1703:2013, Class C fire rating per UL1703:2002.

See www.sunpower.com/company for more reference information.
For more details, see extended datasheet: www.sunpower.com/solar-resources.
Specifications included in this datasheet are subject to change without notice.

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APPENDIX C – NON_RESIDENTIAL ENERGY MODELLING OUTPUTS

The modelling of the building has been undertaken using approved National Calculation Methodology compliant software (DesignBuilder v6.1). The modelling results included here are an early stage of the iterative process where the fabric performance and building systems are refined to meet building design and amenity targets.