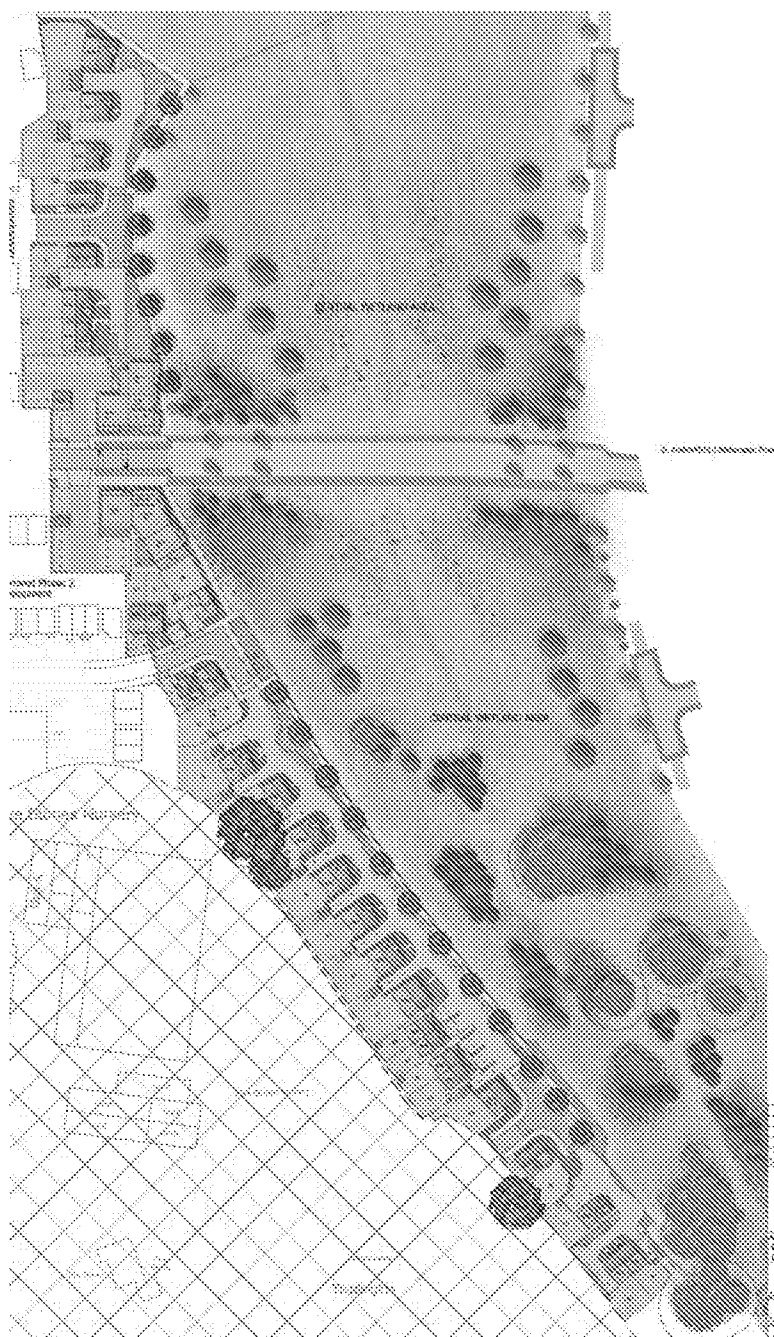


PERSIMMON

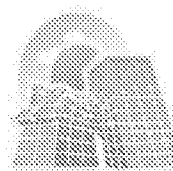
Together we make a home

LITTLEHAMPTON - PHASE 4



ENERGY STATEMENT

18th June 2020



Southern Energy
Consultants
Energy & Sustainability Solutions

About Southern Energy Consultants Ltd

Southern Energy Consultants Ltd are a construction consultancy specialising in sustainability, energy conservation, the application of renewable technologies and statutory utilities infrastructure design and management. As a consultancy we do not sell or have financial interest in any products so are able to take an objective view of developments to assist developers with incorporating cost effective and practical solutions.

Our services include Planning Energy Statements, energy calculations for Building Regulation compliance, Code for Sustainable Homes assessments and utilities design and management. Our team of consultants include registered SAP, SBEM and Code for Sustainable Homes assessors, Planning Specialists, Renewable Energy Specialists, CAD Specialist, Utilities Specialists and Civil Engineers.

Within SEC Ltd we have over 25 years experience working with and for National Developers, Construction and Design and Build Contractors we apply our expertise not only to assist with developers understanding of new energy and sustainability obligations but also in a way that ensures that the needs and responsibilities of all stakeholders are wholly respected.

Report prepared by:
QA:

David Cook
Steve Smith

18th June 2020

Report type:

Planning Application - Supporting Document

Revisions:

A - Minor Mix Change Plot 26 Derwent revised to Lockwood Corner

Contents

1.0	Introduction	3
2.0	Emissions Baseline and Energy Efficiency Proposals	5
3.0	Conclusion	12
Appendix		13
	Solar PV Panel Location Plan	
	Viridian Solar – Solar PV Performance Evaluation Schedules	
	Clearline Fusion – SAP Performance Data Sheet	

1.0 Introduction

1.1 This Energy Statement has been commissioned by Persimmon Homes (the Applicant) and carried out by Southern Energy Consultants as part of a comprehensive analysis of available opportunities to reduce carbon dioxide emissions and energy consumption across Phase 4 of their development at Littlehampton. The site falls under the West Sussex District Council jurisdiction and Phase 4 include 46 dwellings of mixed type and tenure.

1.2 This Statement provides a response to Planning Condition 31 of the Consent (Application Reference: LU/47/11). Condition 31 is entitled 'Energy' and states the following:

"At least 10% of the energy supply of the development shall be secured from decentralised and renewable or low carbon energy sources (as described in the glossary at Annex 2 of the National Planning Policy Framework, March 2012). Details and a timetable of how this is to be achieved for each phase or sub phase of development, including details of physical works on site, shall be submitted to and approved in writing by the Local Planning Authority before any development in that phase or sub phase begins. The development shall be implemented in accordance with the approved details and timetable and retained as operational thereafter, unless otherwise agreed in writing by the Local Planning Authority."

Strategy and Planning Background

1.3 The Applicant intends to deliver a 10% reduction in site-wide carbon dioxide emissions, with respect to the standard set by Part L1a of Building Regulations, through the adoption of best practice energy efficiency measures and installation of renewable energy technologies. The Applicant's proposed approach for minimising greenhouse gas emissions from the new dwellings in Phase 4 of the Littlehampton development is supported by national planning policy guidance and will help to reduce fuel bills for future occupants. At a national level, planning policy guidance is stimulated by the Climate Change Act (2008) and fully espoused within the National Planning Policy Framework (2019) (NPPF). The Climate Change Act requires the UK Government to *"ensure that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline"*. This legal commitment sets the overriding objective for sustainable energy provision in the UK: the reduction of carbon dioxide emissions.

1.4 In 2019, the revised NPPF was published. This document asserts that:

“At the heart of the NPPF is a presumption in favour of sustainable development which should be seen as a golden thread running through both plan-making and decision-taking. For decision-taking this means:

- *Approving development proposals that accord with the development plan without delay; and*
- *Where the development plan is absent, silent or relevant, policies are out-of-date granting permission unless*
 - *Any adverse impacts of doing so would significantly and demonstrably outweigh the benefits when assessed against the policies in this Framework taken as a whole; or*
 - *Specific policies in this Framework indicate development should be restricted.”*

1.5 The NPPF proceeds to state that:

“To support the move to a low carbon future, local planning authorities should:

- *Plan for new development in locations and ways which reduce greenhouse gas emissions;*
- *Actively support energy efficiency improvements to existing buildings”*

Objectives

1.6 In the light of the requirements set by Planning Condition 31 and the NPPF, this Statement will set out an array of best practice energy efficiency proposals and renewable energy installations, sufficient for the 46 dwellings proposed across Phase 4 of the Littlehampton development to deliver reductions in carbon dioxide emissions of 10% compared to a Part L1a (2013) compliant baseline.

Structure

1.7 The remainder of this Statement calculates the carbon dioxide emissions baseline using the Standard Assessment Procedure (SAP), outlines the Applicant’s energy efficiency measures for complying with and bettering the baseline standard, considers the most suitable renewable energy technology for the site, and finally demonstrates how renewable energy technologies will deliver the sought after 10% reduction across Phase 4 of the Littlehampton development.

2.0 Emissions Baseline and Energy Efficiency Proposals

Building Regulations (2013) Baseline

- 2.1 In order for an energy assessment to be conducted, a Building Regulation (2013) baseline for carbon dioxide emissions must first be calculated for the 46 dwellings. The predicted emissions for the dwellings include all sources from hot water, space heating and fixed electrical items. The baseline has been calculated by an accredited energy assessor using SAP (2012) methodology and Elmhurst approved software. This baseline will then be used as a standard to demonstrate the reductions that will result from energy efficiency measures and renewable energy technologies. The Building Regulation (2013) baseline for the development identifies predicted carbon dioxide emissions, relative to each dwelling type's Target Emission Rate, of **70,455 kgCO₂/year**. Table 1 below sets out the baseline emissions for each dwelling type and in aggregate, with detailed examples of SAP calculations provided in the Appendix to this Statement.

Table 1: Baseline Carbon Dioxide Emissions (kgCO₂/year) for Phase 4, Littlehampton

	Number of Dwellings	Emissions (kgCO ₂ /year)	Total Emissions (kgCO ₂ /year)
Private			
Barton / Barton CR	6	1,294	7,764
Ashworth	2	1,401	2,802
Derwent	2	1,578	3,156
Lockwood / Lockwood CR	5	1,733	8,665
Coniston / Coniston CR	2	2,027	4,054
Mayfair	7	2,091	14,637
Holywell	2	2,121	4,242
Marylebone	1	2,299	2,299
Marlborough	1	2,236	2,236
Sub-total		28	49,855
Affordable			
Apartments	18	1,110	19,980
Sub-total		18	19,980
TOTAL		46	69,835

- 2.2 In accordance with the Applicant's intentions set out in the Introduction, this Statement will now continue by detailing the range of best practice energy efficiency measures and renewable energy technologies to deliver a reduction of at least 10% compared to the baseline scenario. This amounts to a required reduction of at least **6,984 kgCO₂/year**.

Best Practice Energy Efficiency Measures

- 2.3 As a first energy efficiency measure, the proposed dwellings will incorporate sufficient insulation in the building envelope (walls, roofs, floors and glazing) to achieve average U-values considerably better than the limiting standards demanded by Part L1a of 2013 Building Regulations. Table 2 below illustrates the proposed U-values and the limiting area-weighted values set by Part L1a of 2013 Building Regulations.

Table 2: Insulation Enhancement Proposals for Main Thermal Elements

Thermal Element	Maximum Area-Weighted U-value (W/m ² K) Allowable Under 2013 Building Regulations	Applicant's Proposed U-value (W/m ² K) Required To Meet 2013 Building Regulations Baseline	% Improvement On 2013 Allowable U-Value Standard
Main external walls (houses)	0.30	0.28	6.67
Main external walls (apartments)	0.30	0.26	13.33
Roof (joists)	0.20	0.15	25.00
Roof (rafters)	0.20	0.19	5.00
Ground floor	0.25	0.16-0.18	28.00-36.00
Windows	2.00	1.40	30.00

- 2.4 The Applicant intends to meet the U-value performance standards detailed in Table 2 through the following construction specification for the main thermal elements:

Table 3: Fabric Enhancement Construction Specification

Thermal Element	Proposed U-value (W/m ² K) required to Meet 2013 Building Regulations Baseline	Construction Measures
Main external walls (houses)	0.28	Space 4 timber frame construction including mineral wool insulation, plus either a reflective breather membrane or reflective vapour barrier.
Main external walls (apartments)	0.26	Masonry construction, including outer leaf or 100mm brick or external cladding on medium density blocks, 100mm cavity fully filled with Knauf Supafil 34 insulation ('k' value of 0.034), 100mm aircrete blocks ('k' value of 0.19).
Roof (joists)	0.15	One layer of 100mm mineral wool insulation ('k' value of 0.044) quilt laid between ceiling joists and one layer of 200mm mineral wool ('k' value of 0.044) laid over to provide a total thickness of 300mm.
Roof (rafters)	0.19	Space 4 cassette roof system.
Ground floor	0.16-0.18	Beam and block construction to include 75mm Kingspan Thermawall TF70 insulation ('k' value of 0.022).
Windows	1.40	BFRC, PVC-U double glazed, soft-coated with 'g' value of 0.46.

Heating and Controls

- 2.5 The Applicant proposes the installation of Ideal Logic Combi ESP1 35 gas boilers, which possess a SEDBUK (2009) efficiency of 89%. All dwellings will benefit from efficient heating controls, including Time and Temperature Zone Controls and optimum start thermostats. Due to the former, it will be possible for the future homeowners to co-ordinate the heating performance of at least two distinct zones within their property. Thermostatic radiator valves will be provided to all radiators as a form of localised heating controls.

Ventilation and Air Tightness

- 2.6 Ventilation to all dwellings will be provided via highly efficient intermittent extract fans. Air tightness standards will be improved by the Applicant adopting a mixture of 'Space4' (houses), Aircrete Product Association (apartments) and Accredited Construction details for non-repeating thermal bridges, which are typically far superior to the default psi value standards assumed by SAP (2012). Each dwelling's design air permeability will be reduced from 10 m³/hm² to 5 m³/hm² to further lower space heating requirements.

Internal Lighting

- 2.7 All of the Applicant's internal lighting throughout the development will be of the dedicated low energy type. Although not assessed within the Building Regulations calculation, external lighting will also be low energy and some will be controlled through PIR sensors or daylight cut-off devices to minimise use and promote the security of the development.

Energy Demand After Energy Efficiency Proposals

- 2.8 The energy efficiency measures detailed in Paragraphs 2.4 to 2.8 will reduce the predicted carbon dioxide emissions at the Littlehampton, Phase 2 development from **69,835 kgCO₂/year** to **68,482 kgCO₂/year**. This is a reduction of **1,353 kgCO₂/year**, or **1.93%**. A further reduction in emissions of at least **5,631 kgCO₂/year** must be secured via the installation of renewable energy technologies in order to deliver a 10% reduction compared to the baseline case.

Feasibility of Renewable Energy Technologies

- 2.9 This section of the Statement conducts a thorough review of the renewable energy and low carbon technologies that could theoretically be applied to Phase 4 of the Littlehampton development. Renewable energy is defined as *"those energy flows that occur naturally and repeatedly in the environment – from the wind, the fall of water, the movement of oceans, from the sun and also from biomass"* (London Plan, 2008). This definition has been widened by the UK Government through the use of the term 'Low or Zero Carbon Technologies' (LZC), which include heat pumps and gas-fired CHP – technologies not always considered as being renewable. The technologies to be evaluated in this Statement are as follows:

- Combined Heat and Power
- Biomass

- Heat pumps (ground source and air source)
- Hydroelectric power
- Wind energy
- Solar thermal panels
- Solar photovoltaic panels

Combined Heat and Power

- 2.10 CHP is a form of decentralised energy generation that generally uses gas to generate electricity for local consumption, reducing the need for grid electricity and its associated high carbon dioxide emissions. As the CHP system is close to the point of energy demand, it is possible to use the heat that is generated during the electricity generation process. As both the electricity and heat from the generator is used, the efficiency of the system is increased above that of a conventional power plant where the heat is not utilised. CHP is suitable for dense, mixed-use developments where there is a high, constant and varied heat demand. This is not the case for Phase 4 of the Littlehampton development, which is residential and only incorporates a total of forty-six dwellings. In addition, as there are no other CHP networks in the vicinity of the development with which to forge a connection, this is not a suitable technology for the development.

Biomass

- 2.11 Biomass community heating is an alternative to conventional fossil fuel heating but, as per the reasons used against the installation of gas-fuelled CHP, should be discounted as an option for the proposed dwellings. Biomass boilers within individual dwellings are usually installed with a standard gas boiler as back-up in case the occupier runs out of fuel. Although they are reducing in size, they are still large enough to require a dedicated room with additional space for the fuel – there is insufficient space available for such infrastructure in the majority of proposed dwelling types, especially the apartments. The management of fuel deliveries and ash dispersal is also complex, necessitating a dedicated operative as opposed to residents of the future dwellings. Furthermore, the emissions of Nitrous Oxide and particulate matter that are associated with biomass installations would have the capacity to worsen local air pollution.

Ground and Air Source Heat Pumps (GSHPs)

- 2.12 Neither of these technologies has been considered for implementation at Littlehampton due to their higher carbon dioxide emissions compared to the proposed gas boiler specification. Although both technologies are renowned for delivering reductions in carbon dioxide emissions, they do so from a much higher baseline than when gas is the specified fuel for space heating and hot water generation. Electricity consumption is also associated with much higher Nitrous Oxide emissions than Class 5 gas boilers.

Hydroelectric power

- 2.13 Hydroelectric power plants generate electricity using the gravitational force of flowing or falling water. However, there are no rivers of sufficient scale in the vicinity of the Littlehampton development to facilitate a hydroelectric power installation.

Wind Turbines

- 2.14 Wind turbines are a modern, high-technology descendant of the windmills that have been around for centuries. In modern windmills the kinetic energy of the wind is used to turn a turbine to generate electricity as opposed to moving water or turning a grist mill wheel. A site with an average wind speed of 5m/s or more is generally considered to be suitable for installing a wind turbine. The average wind speed at the Littlehampton development is 4.5m/s at 10m AOD and is below the level required to generate significant carbon dioxide reductions or commercial take-up. The installation of a single, large wind turbine to serve the development would also be controversial due to the nature of the locality. Even if space could be found within the development to accommodate a very high (15-20m) turbine, their installation would then present a significant visual blight to neighbours.

Solar thermal and photovoltaic panels

- 2.15 Solar thermal heating panels contribute to the hot water demand of a dwelling. Water or glycol (heat transfer liquid) is circulated to roof level where it is heated using solar energy before being returned to a thermal store where heat is exchanged with water from the conventional system. The proposed dwellings generally contain suitable attributes (orientation, available roof-space and limited shadowing) for solar photovoltaic installations to be designed-in, although solar thermal installations are unsuitable. In part this is because the smaller dwelling types – for example, the Barton – have very little space to accommodate a hot water cylinder, however, even if this was not the case, the technology is unable to deliver a 10% reduction in carbon dioxide emissions from the

theoretical baseline – only around an 8% reduction on average can be obtained due to the limits of hot water demand. The specification of gas combination boilers also reduces the energy demand for heating and storing hot water.

- 2.16 However, there are few constraints on the capacity for solar photovoltaic panels to deliver reductions in emissions. For all dwellings on the site, roof-space is available at no worse than a west-east orientation, sufficient for solar photovoltaic installations to be effective at delivering emissions reductions. Further SAP calculations have been carried out, which show the reductions in emissions that could be secured given the installation of **11.34 kWp** of solar PV output, with priority given to installing arrays on optimally orientated (south-facing) dwellings. These are Plots 36 (Mayfair), 37 (Marlborough) and 42 (Coniston), with each dwelling allocated 3.78 kWp (14 panels). A detailed calculation of the emissions reductions secured via these installations is provided in the Appendix to this Statement, along with a site layout plan identifying the three plots with solar PV panels.

Modelling of Solar PV Installations and Emissions Reductions

- 2.17 Further SAP calculations have been carried out to model the effects on site-wide emissions of introducing 11.34 kWp of solar PV panels to Phase 4 of the Littlehampton development. Overall, the introduction of 11.34 kWp of solar PV output to optimally orientated dwellings will reduce emissions across the site by **6,084 kgCO₂/year**. In addition, to the reductions secured via best practice energy efficiency measures, which were **1,353 kgCO₂/year**, this amasses to a total reduction of **7,437 kgCO₂/year**.
- 2.18 Compared to baseline emissions of **69,835 kgCO₂/year**, this is equivalent to an overall reduction in emissions of **10.65%**. This is summarised in Table 4 overleaf. At the detailed design stage, the number of installations may reduce due to optimisation of plot design and the rated output of the specified panels, however, the reduction in carbon dioxide emissions will remain the same.

Table 4: Emissions Reduction from Energy Efficiency Measures and Solar PV Installations – Phase 4, Littlehampton

	Emissions (kgCO ₂ /year)
Baseline	69,835
Reduction from energy efficiency measures	(1,353)
Reduction from 11.34 kWp solar PV output	(6,084)
Total reduction	(7,437)
Emissions after reductions	62,398
Overall percentage reduction from baseline	10.65%

3.0 Conclusion

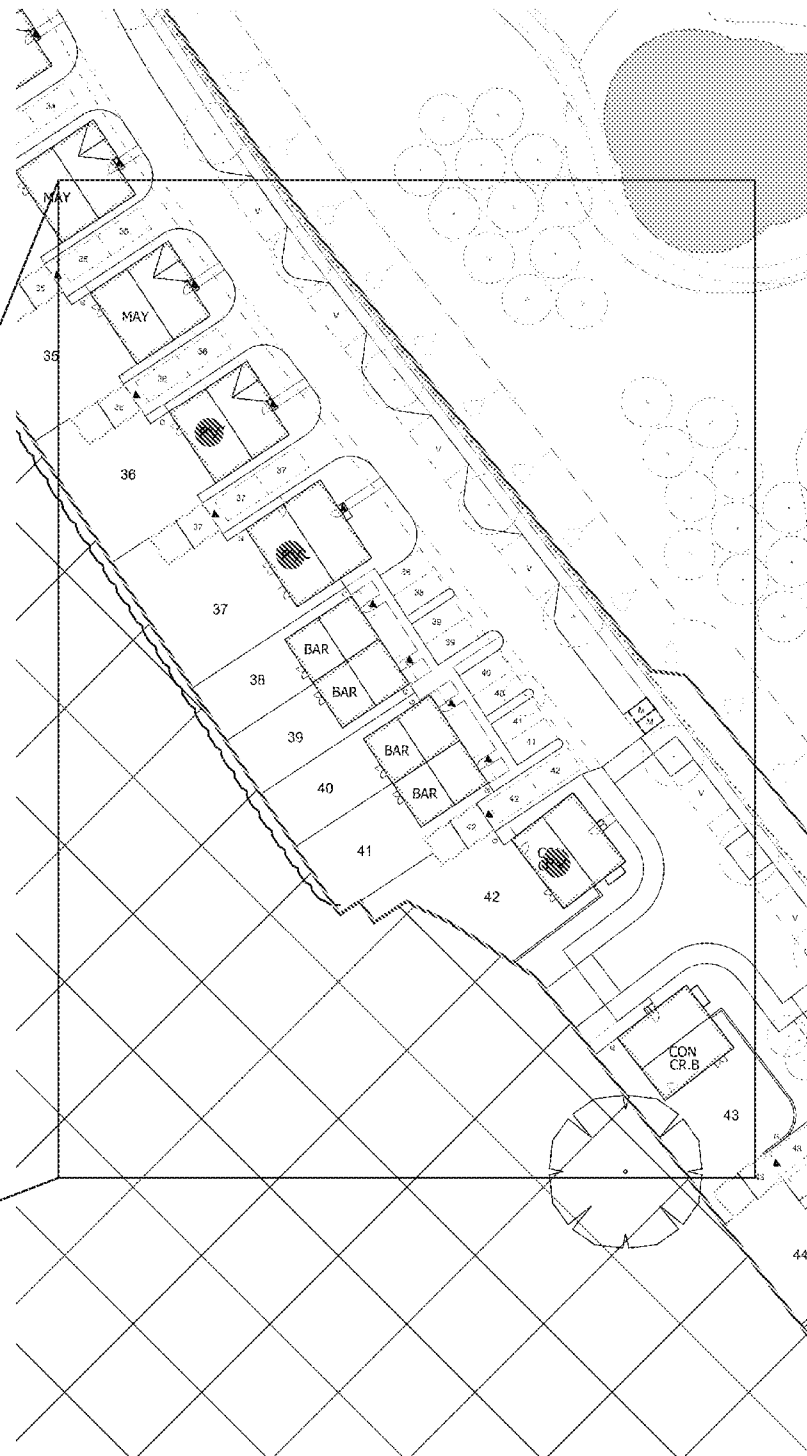
- 3.1 This Energy Statement has set out the Applicant's detailed energy strategy pertaining to Phase 4 of their development at Littlehampton. The strategy has been developed to comply in full with the requirements of Planning Condition 31 and the NPPF by delivering a 10% reduction in carbon dioxide emissions compared to the target standard set by Part L1a of Building Regulations (2013). The focus of the strategy has been to first reduce energy consumption at the point of demand by introducing a robust fabric specification and efficient heating and ventilation systems. Secondly, renewable energy installations, in the form of **11.34 kWp** of solar PV output, will be installed to further reduce carbon dioxide emissions on a site-wide basis.
- 3.2 SAP calculations, carried out by an accredited energy assessor, have verified that the Applicant's proposed approach will deliver a **10.65%** reduction in carbon dioxide emissions compared to the baseline scenario. Once the dwellings are built, as built compliance reports will be compiled to verify that the development has been built out in accordance with the energy efficiency measures and renewable energy installations proposed in this Statement.

Appendix

Solar PV Panel Location Plan

Viridian Solar – Solar PV Performance Evaluation Schedules

Clearline Fusion – SAP Performance Data Sheet



Viridian Solar has produced this design based on information and drawings supplied by the client. It remains the client's responsibility to ensure that shading from nearby buildings and trees does not affect the system.

PV16 (Fusion PV)	21kg
------------------	------

Where the panels are fitted into a pitched tiled/slate roof, they sit directly on the roof battens with a uniformly distributed load of 13kg per m² for PV16. Therefore, they almost certainly weigh less than the roof covering they are replacing. Roof structure modifications are unlikely to be necessary.

Roof Installation typically starts with the bottom left panel. Setting out dimensions are given to the bottom left corner of this panel. Please refer to Viridian Installation Guides and standard roofing practices

Location of PV Array

Source Drawing

Portsmouth Heights, Thames Valley Portsmouth Heights, Inc. Park Cambridge, Mass 02142-1702 TEL: 617/275-9030/31	
NAME Phase 4 Littlehampton	DATE Jan. 2020 NO. OF 1,500 @ A1 PRICE \$43.4 C. P. 10
NAME OF Site Layout	
Drawing Number:	SCALE AT M DATE PREPARED BY: JURY



Viridian Solar
Atlas Building, 68 Stirling Way
Papworth Everard, Cambs.
Tel: 01480 839 865
enquiries@viridiansolar.co.uk
www.viridiansolar.co.uk

TITLE Viridian Clearline Fusion
PV Site Plan - Littlehampton
Phase 4

DRAWN DG	CHECKED N/A
DRAWING NUMBER 14071 / SK1	Sheet Number
DATE 20.02.20	SCALE NTS

Solar PV Energy Calculation



Project Name

Project Postcode

BN

Irradiation Zone

Zone 2 - Brighton

MIS 3002 Methodology

Array 1

House type	Elevation	Plot	Annual Energy Saving kWh	Annual CO2 Saving kgCO2	PV16- 270P	kWp	Roof Orientation deg from S	Tilt Angle deg from horiz	Overshading Factor	Kk kWh / kWp	Annual Energy kWh
Mayfair		36	3,886	2,017	14	3.780	55	35	1	1028	3,886
Marlborough		37	3,886	2,017	14	3.780	55	35	1	1023	3,886
Chedworth		42	3,950	2,050	14	3.780	50	35	1	1045	3,950
TOTAL			11,722	6,084							
TARGET*				5,834							
			kWh	kgCO2							

The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the Government's standard assessment procedure for the energy rating of buildings (SAP) and is given as guidance only. It should not be considered as a guarantee of performance.

* TARGET - Email 17.02.20 Steve Smith

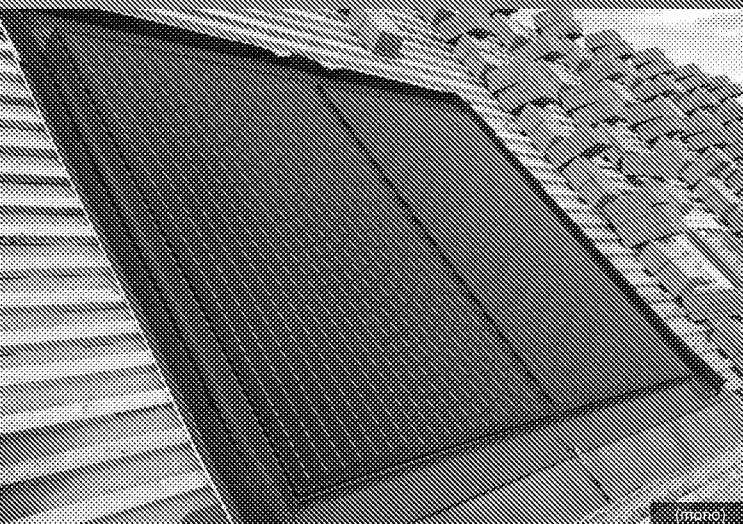
Littlehampton Phase 4

14071 - Viridian Fusion - PV Schedule

20/02/2020



Plot No.	Block / Plot Type	Solar Panel Orientation	Elevation	Portrait	Portrait Flashings					Clearline Solar Pty Panel Code	Actual PV Output	Notes
				Panel Layout	F16-TL	F16-TC	F16-TR	F16-TY	F16-J			
36	Mayfair	South West	Rear	2 x 7	1	5	1	1	6	14 PV16-270P-W	3780	
37	Marlborough	South West	Rear	2 x 7	1	5	1	1	6	14 PV16-270P-W	3780	
42	Chedworth	South West	Rear	2 x 7	1	5	1	1	6	14 PV16-270P-W	3780	
					3	15	3	3	18	42		
					Total	Total	Total	Total	Total	Total number of PV panels	11.34 kWp	
Plot No.	Block / Plot Type	Solar Panel Orientation	Elevation	Panel Layout	F16-TL	F16-TC	F16-TR	F16-TY	F16-J	Clearline Solar Pty Panel Code	Actual PV Output	



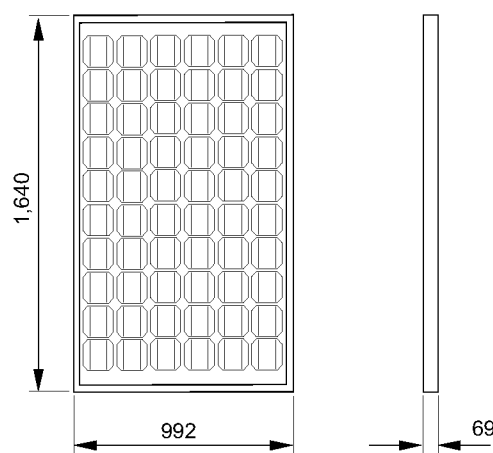
- Simple roof integration with clean, low-profile aesthetic for new build and retrofit
- Rapid installation times of less than 1hour/kWp easily achieved
- Compatible with the widest range of slate and tile including special fixings for Scottish slate roofs
- Fitted during the normal roofing programme, enabling clarity of responsibility and safe working practices
- Achieves highest fire rating and wind resistance without modifications to the roof

Mechanical Specification

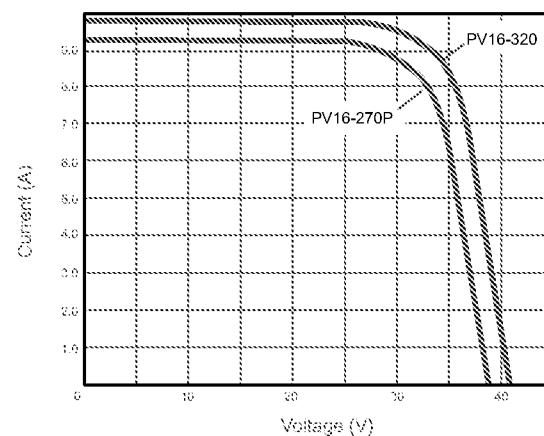
Model		PV16
Aperture Area	m ²	1.6
Width (across roof)	mm	992
Height (up roof)	mm	1,640
Thickness	mm	69
Weight	kg	21.0
Static roof loading (distributed)	kg/m ²	12.9
Characteristic Wind Resistance	kPa	5.32
Ultimate Design Load ¹	kPa	5.32
Positive Design Load	IEC 61215	5.40
Fire Rating	EN 13501-2	B _{ROOF} (T1, T2, T3, T4)
Power Warranty	% rated	90% 10 years, 80% 25 years
Standards		IEC 61215, 61730, TÜV, MCS05, MCS12

Electrical Specification

Model	PV16-	270P	300	320
Peak Power ²	Wp	270	300	320
Module Efficiency ³	%	17.3	19.2	20.5
Number of Cells		60	60	60
Maximum Power Voltage (V _{mp})	V	30.7	33.1	34.0
Maximum Power Current (I _{mp})	A	8.8	9.1	9.4
Open Circuit Voltage (V _{oc})	V	37.3	40.1	41.6
Short Circuit Current (I _{sc})	A	9.3	9.6	9.8
NOCT ⁴	°C	45.0	45.0	
Cell Type (-crystalline Silicon)		Poly-	Mono-	
Power Temperature Coefficient	% / °C	-0.40	-0.45	
Current Temperature Coefficient	% / °C	0.06	0.06	
Voltage Temperature Coefficient	% / °C	-0.30	-0.34	
Maximum System Voltage	V _{dc}	1,000		
Safety Classification		Class II		



I-V Curves



1200-500

270P-B

270P-W

1. Design resistance to ultimate loads includes a partial material safety factor of 1.10

2. Subject to a manufacturing tolerance of $\pm 3\%$

3. Based on aperture area

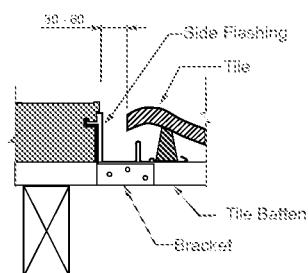
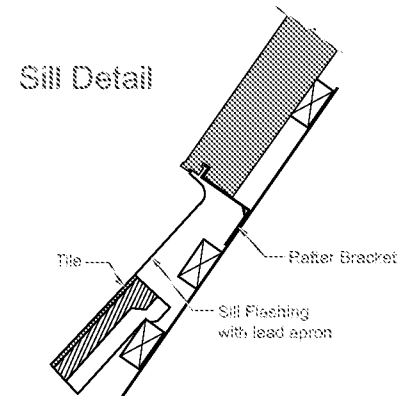
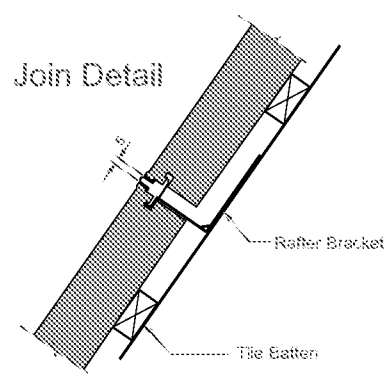
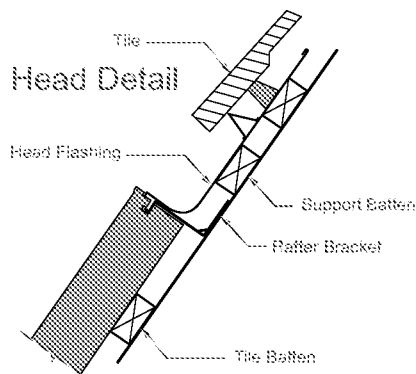
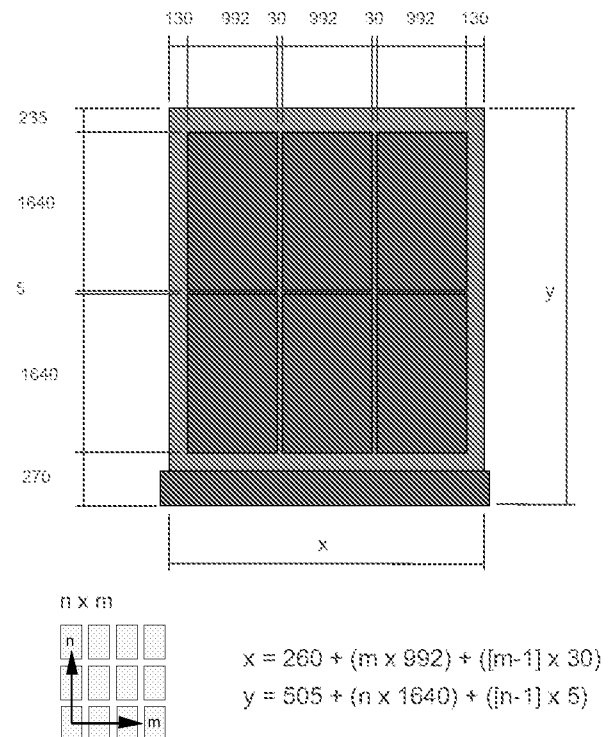
4. Nominal Operating Cell Temperature

Electrical specification measured under standard test conditions: Irradiation 1 kW/m² with light spectrum AM 1.5 and a cell temperature of 25 °C

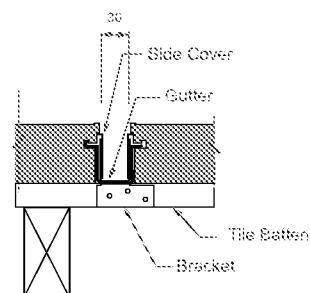
Pitched Roof Integration

Sleek, low-profile integrated solar that replaces the roof covering for an improved aesthetic and for simple roof maintenance, now at similar cost to above-roof panels. Simple, beautiful, durable.

Solar never looked so good.



Side Detail



Gutter Detail
(joined flashings)

Southern Energy Consultants Ltd

Suite 36, Liberty House
The Enterprise Centre
Greenham Business Park
Newbury
Berkshire
RG19 6HS



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