

Let **ME** lighten your load



Technical Advisory Service

Specifiers require prompt, knowledgeable and detailed responses to a vast range of enquiries covering everything from the embodied energy of a typical roof tile, to the different ventilation options available.

Our Technical Advisory Service is staffed by a qualified team with specialist knowledge not only of all Marley Eternit products, but also crucially, how those systems integrate with other roofing components and comply with Building Regulations, Health and Safety, environmental and other critical roofing criteria.

In addition to general technical enquiries, the services available from the Technical Advisory Service include:

Fixing specifications: Bespoke fixing specifications can be provided, taking into account location, dimensions and degree of exposure for individual buildings.

Estimating the quantities: Calculation of materials required for any roofing project including tiles, battens, underlay, ancillary fittings and accessories.

We also have on-line tools which can help create fixing specs or with estimating quantities.

contact tel 01283 722588
e-mail info@marleyeternit.co.uk

Sample Services

Samples of all our roofing and cladding products are available on request.

contact tel 01283 722588
e-mail info@marleyeternit.co.uk
web www.marleyeternit.co.uk/samples

Sales Support

Our Area Sales Managers have in depth knowledge of your local area and local building types. They are available to visit your site to carry out a roof survey, and to offer specific solutions for both new build and refurb projects.

contact tel 01283 722588
e-mail info@marleyeternit.co.uk



Customer Services

Marley Eternit is committed to providing outstanding customer care and is staffed by experienced personnel. Services include:

Training Centre: We have a purpose-built training centre where we are able to impart our expertise through a range of practical and classroom courses.
Tel 08705 626400

Advice and ordering information

contact tel 08705 626400
e-mail info@marleyeternit.co.uk

Literature: All current product and technical literature can be downloaded from:

www.marleyeternit.co.uk/downloads

contact tel 08705 626400
e-mail info@marleyeternit.co.uk

Stockist information: To find details for stockists of Marley Eternit products, visit:
www.marleyeternit.co.uk/stockists

contact tel 08705 626400
e-mail info@marleyeternit.co.uk



SOLESIA

Integrated PV roofing systems

For further information

Tel 01283 722588 Fax 01283 722219 E-Mail info@marleyeternit.co.uk

www.marleyeternit.co.uk/solar



an **Etex** GROUP company



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The UK has the highest proportion of solar-suitable roofs in Europe, but one of the lowest take-ups.

Solesia gives the specifier the potential to incorporate PV in roofs seamlessly without compromise to design or performance.

”



For over 100 years, Marley Eternit has been providing innovative pitched roofing solutions for residential and commercial buildings and the company is committed to developing sustainable construction methods.

Solar power is one of the fastest growing markets in the world, with continuous developments leading to solar cells that are ever-more efficient and economical. The technology of photovoltaics is proven and safe and such products do not release any emissions that contribute to global warming.

Marley Eternit's range of Solesia PV systems offer a fully integrated solution that is straight forward to install and provide the roof owner with renewable, cheap electricity. This is solar power that meets the needs of specifiers, planners, contractors and end-users alike.

The benefits of Solesia PV Systems:

- ✓ Fully integrated system for Modern concrete interlocking tiles and Domino clay interlocking tiles
- ✓ Easy to install
- ✓ Contributes to achieving Levels 5 and 6 in Code for Sustainable Homes
- ✓ Helps achieve high BREEAM ratings for non-domestic buildings
- ✓ Systems qualify for Feed-in Tariffs
- ✓ MCS certified
- ✓ 25 year electrical warranty
- ✓ Silent operation
- ✓ High energy output*
- ✓ Reduces CO₂ emissions by up to 1 tonne per annum
- ✓ Pitched roof provides optimum location
- ✓ Long functional life – 25 years

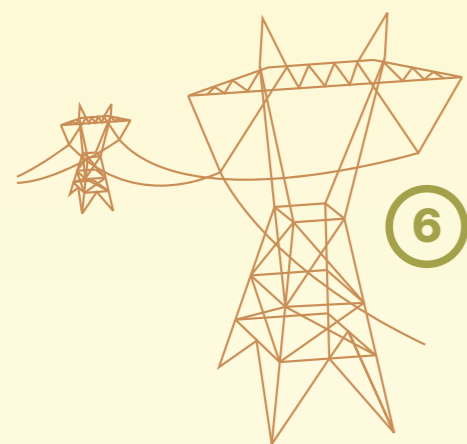
* Up to 144W/p/m² for concrete and clay BIPV



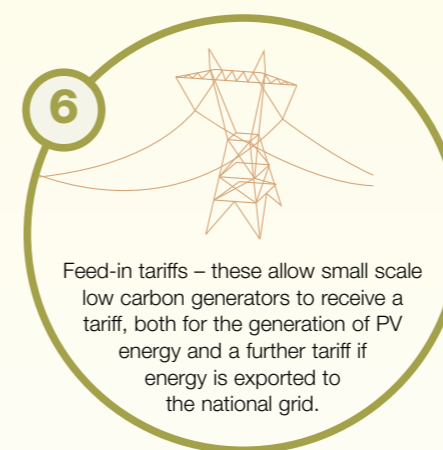
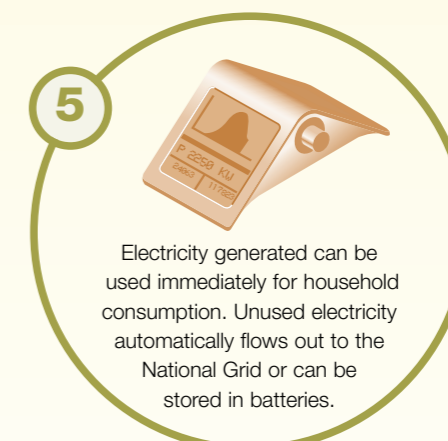
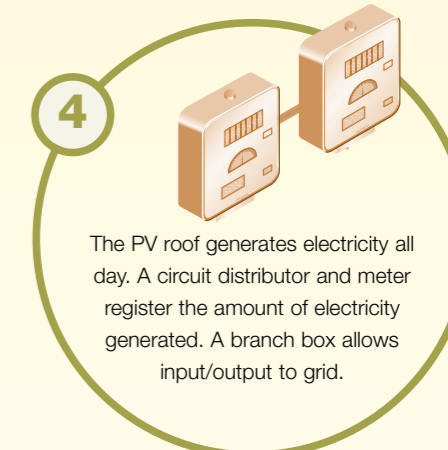
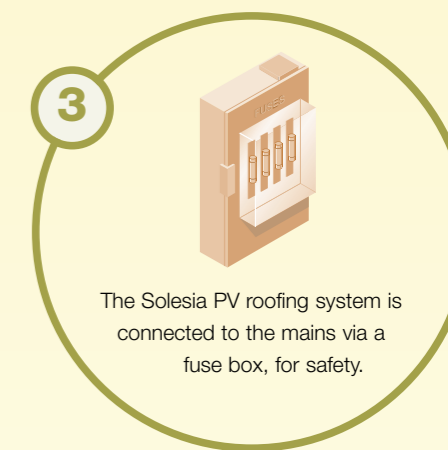
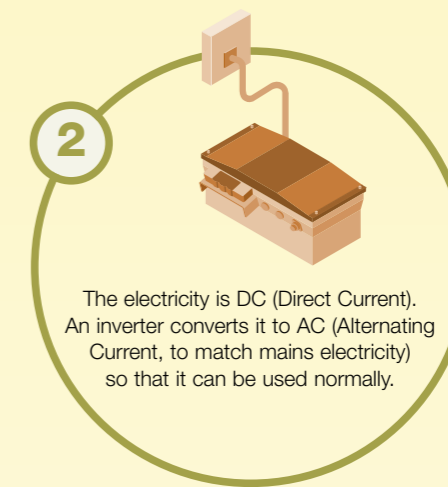
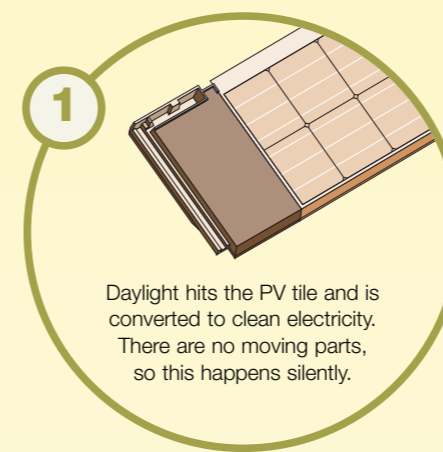
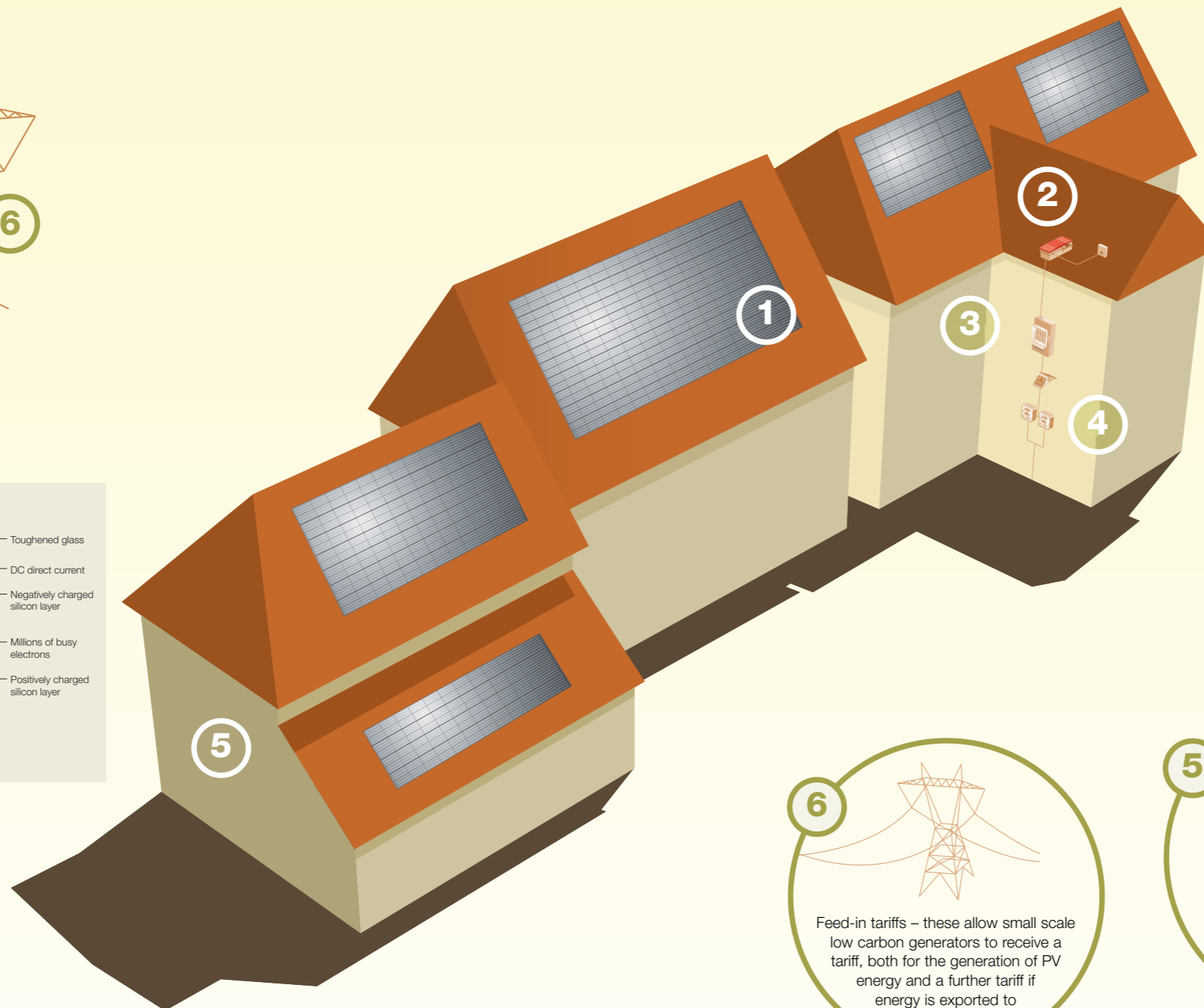
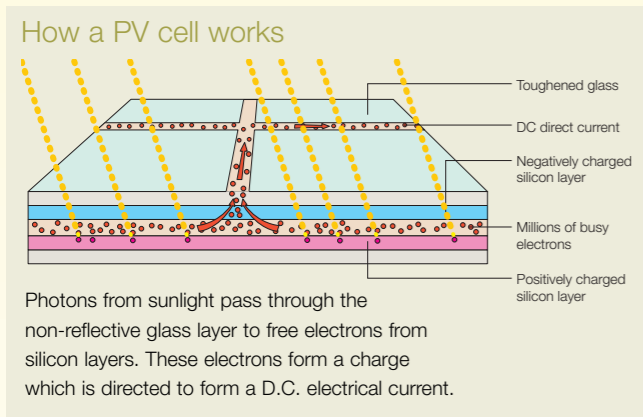
How does a Solesia PV System work?

This illustration diagrammatically represents the production of electricity from light using Solesia PV systems.

All electrical connections and meters are contained within the building envelope.



6



How can solar energy work for you?



Why install a PV system?

Solar radiation is a non-polluting energy source, increasingly recognised as a major renewable technology for the future.

Installing your own solar PV system means that you can generate your own electricity from the free and inexhaustible energy from the sun.

A photovoltaic system never needs refuelling, has no moving parts, emits no pollution, is silent, and requires minimal maintenance. And, of course, your electricity bills can be substantially reduced.

What are the benefits?

PV roofs generate electricity all day and can provide enough energy for the daily electrical requirement of the building (lights, appliances, etc.), excluding central and water heating, and also the energy used by the system itself. A Solesia PV roof not only cuts the household electricity bill, but can also produce surplus electricity, which can be exported to the National Grid and for which Feed-in Tariffs are received.

What are feed-in tariffs?

The Feed-in Tariff Scheme (FITs) is a new environmental programme introduced by the government to promote wide spread take-up of renewable electricity generation technology, such as PV.

The scheme will require Licensed Electricity Suppliers (FIT Licensees) to pay a generation tariff to small-scale low-carbon 'generators' for electricity generated (whether or not such electricity is exported to the national grid) and an export tariff to them where such electricity is also exported to the national grid. For PV, 'Generators' will be the roof owner – small companies, homeowners etc. These payments are currently guaranteed for 25 years from the registration of the system and, for electricity for home use, are not subject to income tax. For further information on FITs visit:

www.ofgem.gov.uk/sustainability/environment/fits

or

www.fitariffs.co.uk

Code for Sustainable Homes

The Code is a mandatory national standard for the sustainable design and construction of new homes. It adopts a one to six Code Level rating and currently, new homes in the public sector must achieve Code Level 4 and in the private sector Code Level 3.

Renewable energy systems, such as Solesia PV, can contribute towards higher point scores and therefore better code levels.

Code Level 6 which will be mandatory for public sector dwellings in 2013 and all dwellings by 2016 – can only be achieved using on-site generation of renewable electricity for the home such as Solesia PV.



Eligibility for Feed-in Tariffs requires both the PV system used and the installer to be MCS certified. Solesia PV Tiles are MCS certified and should be installed by MCS approved installers to ensure that FIT qualification is achieved. A list of MCS accredited installers can be obtained from www.microgenerationcertification.org.

Photovoltaic modules can be placed on almost any building surface which receives daylight for most of the day.

Optimising PV efficiency

Photovoltaic modules can be placed on almost any building surface which receives daylight for most of the day. Roofs are the most efficient location for PV systems as they are orientated towards the sun and the UK has the highest proportion of PV-suitable roofs in Europe. Photovoltaic modules can also be placed on façades, conservatories, atrium roofs, sunshades, etc.

The surface on which the PV array is mounted should receive as much light as possible as the more light received, the more electricity will be generated. (See Figs 1 and 2, below). The three issues which affect how much light a surface receives are:

Orientation

Due south is the best possible orientation. Systems should preferably be within 45 degrees of south facing.

Pitch

A pitched array will receive more light than a vertical or horizontal array. The optimum roof pitch should be between 20 and 50 degrees.

Shadowing

Shadowing, for example from tall trees or neighbouring buildings, can reduce system performance considerably (See Fig 3).

In addition, the area needed for a PV array depends on the output electricity desired and the type of module used.

PV technology and sunlight intensity

The electrical output of a PV cell is dependent upon the intensity of the light to which it is exposed. So PV cells will tend to generate more electricity on bright days than when skies are overcast. However, photovoltaics do not need to be in direct sunlight to work, so even on overcast days a PV cell will be generating electricity.

Estimation of PV required

The calculation which determines how many tiles are required against your building's electrical consumption is called 'sizing'. This is explained in detail on page 14.

Note: typical annual power output can be calculated using the Government's Standard Assessment Procedure (SAP2 2009) in support of Part L of the Building Regulations.



Fig 1 – Finding the optimum roof orientation

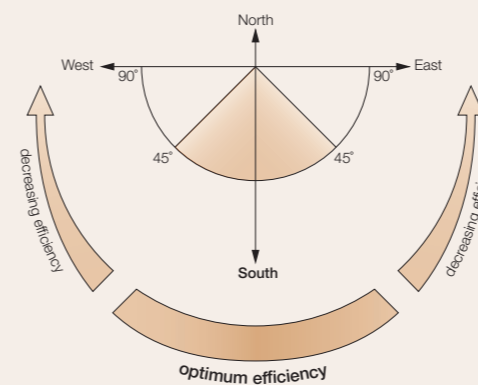


Fig 3 – Avoid shadows from trees and tall buildings where possible

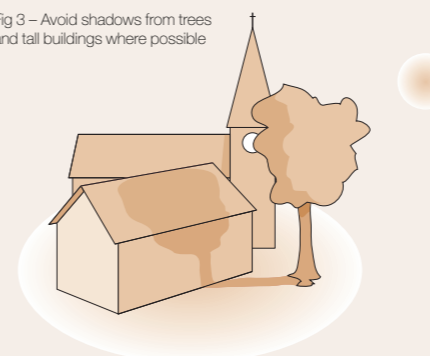


Fig 2 – Finding the optimum roof pitch

Orientation from due south (degrees)	Roof pitch (degrees)						
	21-30	31-40	41-50	51-60	61-70	71-80	81-90
0-15	Very Good	Good	Fair	Poor			
16-30	Very Good	Good	Fair	Poor			
31-45	Very Good	Good	Fair	Poor			
46-60	Very Good	Good	Fair	Poor			
61-75	Very Good	Good	Fair	Poor			
76-90	Very Good	Good	Fair	Poor			
91-150	Very Good	Good	Fair	Poor			
>150	Very Good	Good	Fair	Poor			

Key **Very Good** **Good** **Fair** **Poor**

Integrated PV roof systems for Modern and Domino tiles

Solesia PV modules are fully functional, integrated parts of the roof and provide the following advantages:

- Seamless match with Domino clay interlocking and Modern/Duo Modern concrete interlocking tiles
- No need for roof covering under the solar panel
- Easy to install, no special equipment required
- No special roof penetration or weathering flashing
- Ventilation provided to rear of panels

Solesia electrical data

PV cell type	Mono-crystalline silicon
Cell dimensions	156 x 156 mm
No. of cells per module	22
Output (peak wattage)	90 Wp ⁽¹⁾ ⁽²⁾
Output per m ²	Modern/Duo Modern - 137 Wp/m ² ⁽¹⁾ Domino - 144 Wp/m ² ⁽¹⁾
Short circuit current	8.46 A ⁽¹⁾
Current at max. power	8.02 A ⁽¹⁾
Rated voltage	11.33 V ⁽¹⁾
Open circuit voltage	13.86 V ⁽¹⁾
Max. system voltage	750 V
Current-temperature coefficient at short circuit	-0.000254 mA/°C
Voltage-temperature coefficient at open circuit	-0.049 mV/°C
Power-temperature coefficient at max. power	-0.43 %/°C
Cable and connectors	Class 5 double insulated, 4mm
Module efficiency	Modern/Duo Modern - 13.7% Domino - 14.4%

⁽¹⁾ Values of current, voltage and power +/- 10%

⁽²⁾ Measured under standard test conditions: 1000W/m², AM 1.5 spectrum, 25°C cell temperature

Solesia with Modern/Duo Modern

Ventilation slots at the top and bottom for maximum cooling

Seamless integration with Marley Eternit Modern tiles

Screw fixings allow easy replacement of Solesia panels, even after installation

Modern dimensional and coverage data

Dimensions per panel	overall: 1940 x 469 x 30mm exposed area: 1902 x 345mm
PV module replaces	6.5 Modern/Duo Modern tiles
Weight (per module)	11kg
Laid weight	17kg/m ²
Headlap	75 mm (min.) 80 mm (max.)
Effective exposed area	0.65 m ² (75 mm headlap)
Covering capacity	1.53 modules/m ² installed
Gauge (batten spacing)	340 mm (min.) 345 mm (max.)
Roof pitch	22.5° (min.) 69° (max.)
Batten size (typical)	25 x 50 mm
No. of battens required	3 lin.m/m ²

Solesia with Domino

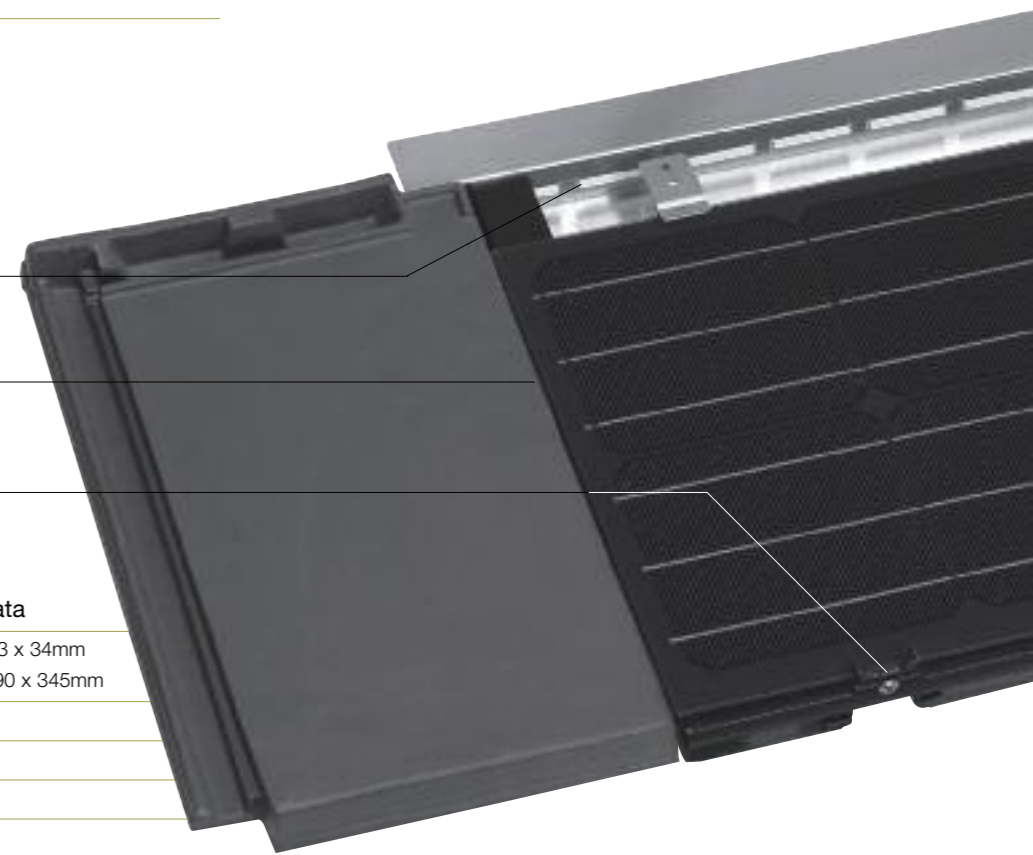
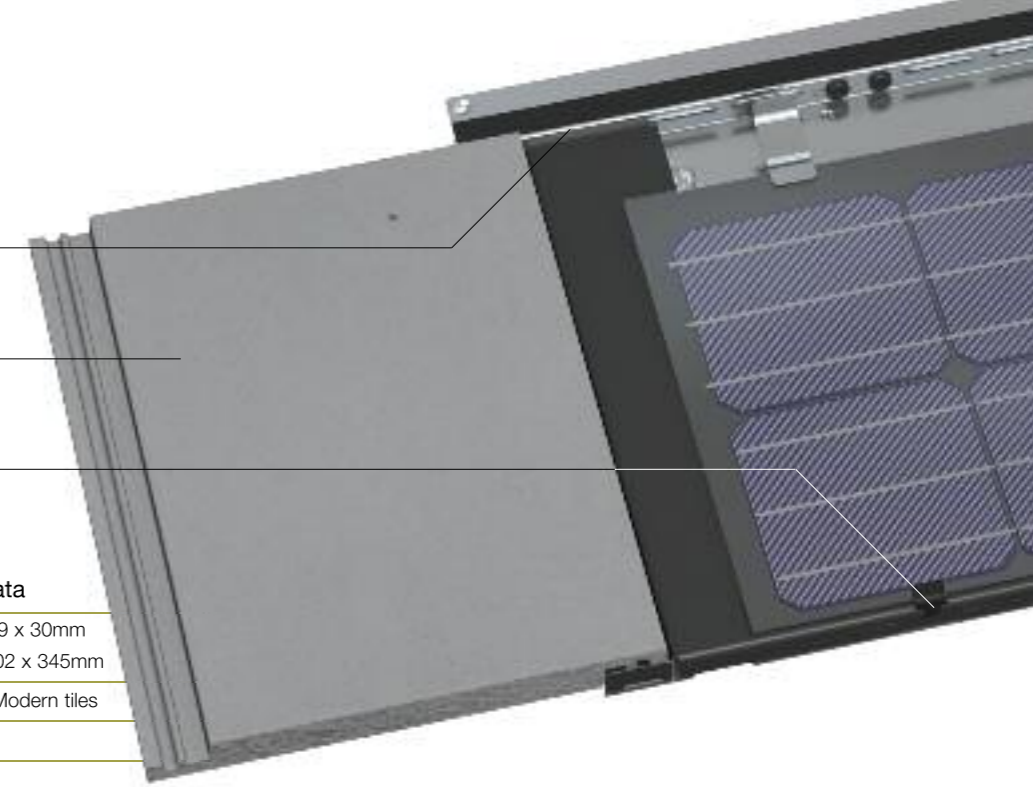
Ventilation slots at the top and bottom for maximum cooling

Seamless integration with Marley Eternit Domino tiles

Screw fixings allow easy replacement of Solesia panels, even after installation

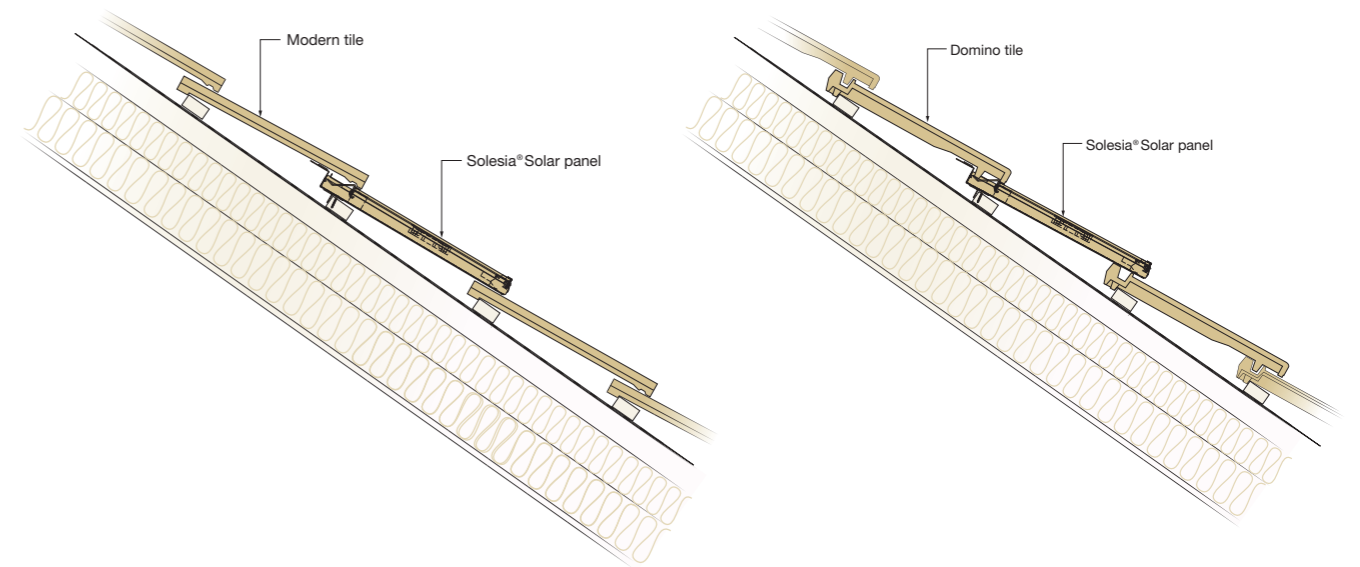
Domino dimensional and coverage data

Dimensions per panel	overall: 1822 x 473 x 34mm exposed area: 1790 x 345mm
PV module replaces	8 tiles
Weight (per module)	10kg
Laid weight	16.2kg/m ²
Headlap	92-97 mm
Effective exposed area	0.62 m ² (345 mm gauge)
Covering capacity	1.62 modules/m ² installed
Gauge (batten spacing)	340-345 mm
Roof pitch	25-69°
Batten size (typical)	50 x 25 mm





Design detailing



Modern/Duo Modern NBS clause 860 – Photovoltaic Modules

Modules

- Manufacturer – Marley Eternit Ltd
- Product Reference – Solesia Modern/Duo Modern Fully Integrated PV module
- Size – 1940mm x 469mm x 30mm
- Output – 90 Wp
- Colour – Blue/Grey

Fixing

On the underside of each bottom course of modules, slide and lock the fixing clips supplied into the base tray before locating under the top edge of the tiles below as the module is fitted into position. Fix the top of each module to the timber batten using the four stainless steel screws provided.

Tiles

Ensure all tiles laid adjacent to the modules are head fixed using 50mm x 3.35mm stainless steel 'Poqidrive' screws and tail clipped where required. Fit Modern Half Tiles (Code 37200) immediately adjacent to either side of modules in photovoltaic array to maintain broken bond laying pattern.

- Commissioning and testing authority – (to be nominated by the client)
- Notify before commencing tests – 2 weeks
- Test Results – submit on completion of commissioning tests (refer to BS EN 61215).

Other requirements

Installation must comply with the Construction (Design and Management) Regulations (CDM) and Health & Safety requirements for the site. Completion of the surrounding roof tiling should be in accordance with BS 5534, BS 8000-6, and current manufacturers' fixing instructions.

Domino NBS clause 860 – Photovoltaic Modules

Modules

- Manufacturer – Marley Eternit Ltd
- Product Reference – Solesia Domino Fully Integrated PV module
- Size – 1822mm x 473mm x 30mm
- Output – 90Wp
- Colour – Blue/Grey

Fixing

On the underside of each bottom course of modules, slide and lock the fixing clips supplied into the base tray before locating under the top edge of the tiles below as the module is fitted into position. Fix the top of each module to the timber batten using the four stainless steel screws provided.

Tiles

Ensure all tiles laid adjacent to the modules are head fixed using 'Zial™' head clips (Code 30454) and 'Zial™' tile clips (Code 30453) where required. Fit Domino Half Tiles (Code 50384 or Code 25710) immediately adjacent to either side of modules in photovoltaic array to maintain broken bond laying pattern.

- Commissioning and testing authority – (to be nominated by the client)
- Notify before commencing tests – 2 weeks
- Test Results – submit on completion of commissioning tests (refer to BS EN 61215).

Other requirements

Installation must comply with the Construction (Design and Management) Regulations (CDM) and Health & Safety requirements for the site. Completion of the surrounding roof tiling should be in accordance with BS 5534, BS 8000-6, and current manufacturers' fixing instructions.

System components and installation

The system is completely modular to meet the requirements of any roofing application, whether new or refurbishment.

Solesia PV system components

Solesia is available in standard pack consisting of four basic components, or as module and cable packs in quantities shown in the table below.



PV modules

These are specific to Marley Eternit Domino, Modern and Duo Modern tile profiles to ensure a visually seamless join between the PV modules and the surrounding roof tiles. As well as optimal aesthetics, this offers the best in weather performance and system durability.

Solesia PV modules are made of an IEC 61215 certified laminate and an aluminium frame for maximum durability and fire resistance.

Cables

Solesia PV modules have two pre-integrated cables. When installing PV modules in a string, no additional cables are required.

When connecting Solesia PV modules in different strings, additional cables and connection sets are required. These should be specified at time of order.

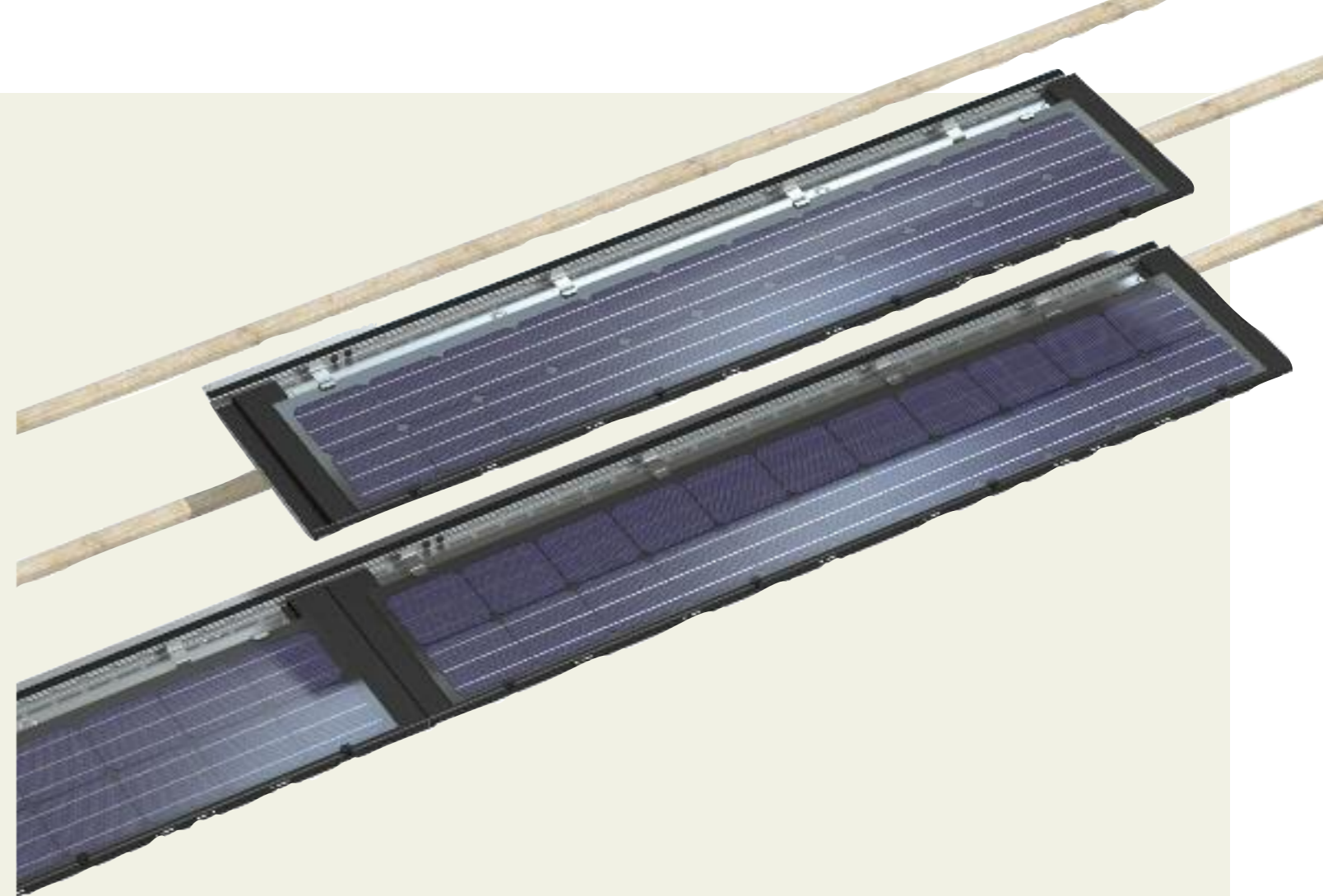
Fixings

All the fixings are supplied within the Solesia PV Pack. There are no flashings, or additional components to use to make the system weathertight, making it easy and quick to install. A voltmeter and screw driver are the only tools required.

Modern/Duo Modern and Domino pack sizes

No. PV modules per pack	Modern/Duo Modern PV (m ²)	Domino PV (m ²)	Pack size (kWp)
8	5.2	4.8	0.72
12	7.9	7.1	1.08
16	10.5	9.5	1.44
24	15.7	14.3	2.16
32	21.0	19.0	2.88
40	26.2	23.8	3.60
48	31.5	28.6	4.32
56	36.4	33.6	5.04
64	41.6	38.3	5.76

The table above details the packs available for Solesia Modern/Duo Modern and Domino PV modules (number of modules per pack, PV area/m² and system output kWp)



Inverter

A range of market leading inverters available to match the PV system design.



Sunnybeam display

This wireless monitor and display is for system monitoring at a glance. The device displays all the essential data by linking directly to the PV system.

Marley Solesia modules are installed by MCS accredited and trained installers

The installation of Marley Eternit Solesia modules should only be carried out by competent and fully trained installers. A list of suitable MCS accredited installers can be obtained from: www.microgenerationcertification.org
MCS Helpdesk – Tel 020 7090 1082



→ More

For Solesia fixing instructions, visit www.marleyeternit.co.uk/solar

System performance and payback

The tables show the range of PV module packs available for Modern and Domino; the number of PV modules per pack, and quantity per pack; the number of strings per pack; PV area (m²) and the system output (kWh), with typical CO₂ savings based on DEFRA recommended values.

The calculations on expected output are based on 50% of the electricity generated being used on-site with the remaining 50% being fed back into the Grid, with the Solesia PV modules being located on a south facing roof of 30° pitch with little or no shading. Any variations to these conditions will affect the figures quoted.

Solesia Modern/Duo Modern and Domino performance

No. PV modules per pack	Modern PV (m ²)	Domino PV (m ²)	Pack size (kWp)	Typical annual power output (kWh) ¹	Typical Annual CO ₂ saving (kg) ²
8	5.2	4.8	0.72	618	266
12	7.9	7.1	1.08	927	399
16	10.5	9.5	1.44	1236	532
24	15.7	14.3	2.16	1854	797
32	21.0	19.0	2.88	2472	1063
40	26.2	23.8	3.60	3090	1329
48	31.5	28.6	4.32	3708	1595
56	36.4	33.6	5.04	4326	1860
64	41.6	38.3	5.76	4944	2126

¹ Typical annual power output calculated using the government Standard Assessment Procedure (SAP 2009) Annex M methodology. Note: The calculation does not take into account the module/inverter combination or geographical location of the PV system. The module orientation is assumed to be on a 30° pitched roof facing South with no overshadowing.

² CO₂ savings are based on DEFRA recommendations of 0.43kg/kWh

Solesia Modern/Duo Modern and Domino sizing data

No. of modules	Modern m ² (approx.)	Domino m ² (approx.)	Energy yield (kWh/year)								
			0	500	1000	1500	2000	2500	3000	3500	4000
8	5.2	4.8	618		0.72 kWp						
12	7.9	7.1	927		1.08 kWp						
16	10.5	9.5	1236		1.44 kWp						
24	15.7	14.3	1854		2.16 kWp						
32	21.0	19.0	2472		2.88 kWp						
40	26.2	23.8	3090		3.60 kWp						
48	31.5	28.6	3708		4.32 kWp						
56	36.4	33.6	4326		5.04 kWp						
64	41.6	38.3	4944		5.76 kWp						

Questions and answers

How are Solesia PV modules connected to the National Grid?

Solar panel systems can be either stand-alone or grid-connected. Legislation and the requirements of the Regional Electricity Company govern grid-connected systems.

The DC electricity produced by the PV modules is converted by the Inverter to AC, and then connected to the mains via a fuse box, so that any spare electricity automatically flows out to the grid. It is possible to have an extra electricity meter fitted to measure how much is exported. Of course, if you require more electricity than your solar panels are currently providing, this is still automatically drawn from the grid.

Income generated from selling electricity back to the Grid can be used to reduce the pay-back period. Details of current arrangements can be obtained from your Regional Electricity Company.

How do I get permission?

Installations must be connected to the grid to receive funding under the FITs programme. Connecting a PV system to the distribution network will require permission from the local Distribution Network Operator (DNO). The system installer will make the necessary arrangements with the local DNO for grid connection.

What if I'm not on the National Grid?

If connection to the National Grid is not available, any power generated must be stored in batteries. Please contact the Marley Eternit Technical Advisory Service for guidance in the use of Solesia PV systems for 'off grid' applications.

Does solar PV provide hot water or heating?

Solar PV systems provide electricity, which can then be used for a variety of purposes, including powering electric boilers or water heaters. Solar PV technology does not however directly generate hot water.

What is the system performance?

Life Cycle Analysis of Photovoltaic systems indicates energy payback times of 4-9 years for grid connected systems with a system lifetime of 25 years.

As an integrated product, they are designed to meet the same rigorous performance standards as the surrounding roof tiles and have been tested under driving rain and wind uplift conditions. Marley Eternit Solesia PV modules are guaranteed for a period of 10 years at a minimum of 90% and for 25 years a minimum of 80% of the power output, as well as 30 years on the water resistant capacity of the individual BIPV system, subject to the installation being done according to the instructions and normal usage. For inverters there is a guarantee of 5 years on materials.

Will I require planning permission?

Planning permission is not normally required. However, exceptions may apply for systems on listed buildings or in areas of outstanding natural beauty. In all cases it is best to check with your local council Planning Department. If you do require planning permission, you will need to get this approval before funding can be awarded under the programme.

How do I get a Solesia PV system installed?

There are a number of MCS approved PV contractors. Please visit www.microgenerationcertification.org for more information.

What maintenance or cleaning is required?

There are no moving parts to the system and no maintenance is necessary. Generally, Solesia PV tiles are self cleaning but normal glass cleaning products can be used to remove dirt.

The Solesia PV modules have a self locking fixing system that allows the glass laminate to be easily removed for inspection, cleaning or replacement.

What are Feed-in Tariffs (FITs)?

Introduced in April 2010, the Feed-in Tariff is a government backed scheme to encourage the uptake of small scale low carbon energy generation. Linked to RPI, FIT levels have been set to provide an expected nominal rate of return of 8-10%.

How do I find out more?

For further information on FITs, please access the website

www.ofgem.gov.uk/sustainability/environment/fits

or www.fitariffs.co.uk

For more information about Marley Eternit Solesia PV systems, visit www.marleyeternit.co.uk/solar or contact the Marley Eternit Technical Advisory Service on 01283 722588.