BRE: Feed in tariff update

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Feed in Tariffs - Update

- The feed in tariff (FIT) scheme encourages the uptake of small scale low carbon technologies
- Tariff payment is paid on both generation and export of produced renewable energy
- The Department of Energy and Climate Change (DECC) plan to encourage low carbon electrical generation by organisations that are not traditionally engaged in the electricity market

Who is taking it up?

- Owner occupiers – better returns than an ISA
- Register social landlords – fuel poverty benefits
- Local authorities for public buildings and housing
- Retailers – energy bills, carbon and CSR
- Agriculture – put shed roof space to work
- House builders – meet higher Code levels and make money
- Commercial developments
- Factories

Payments and Benefits

- A payment for every kWhr generated
  - the "generation tariff"
- An additional payment for every kWhr exported to grid
  - the "export tariff"
- Additional benefit of avoided electricity from the grid
  - avoided costs

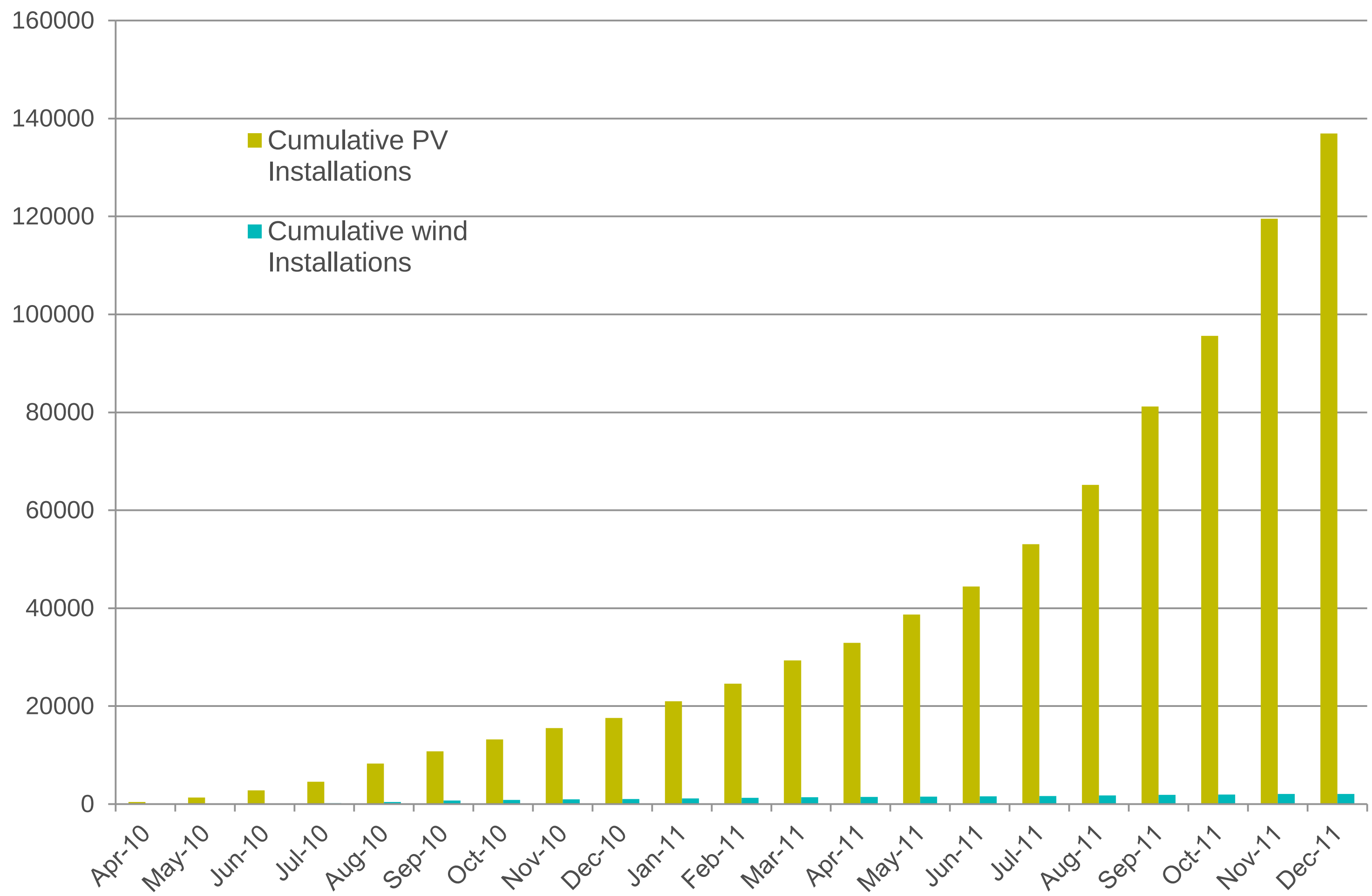
Important Points

- Started April 1st 2010
- Once you start, Tariff is RPI linked and guaranteed for 25 yrs
- Highest generation rate available until 2012, then decreases for new entrants
- Tariffs paid by a utility company, administered by Ofgem
- Electricity not used can be exported
- You do not need to be the building owner to claim the generation tariff
- Significant alterations in market conditions since introduction
- First FIT Review and Comprehensive Review (consultation) have altered the market

Which technologies?

- Anaerobic Digestion – farmers, food manufacturers, food retailers
- Hydro – houses with streams, buildings with rivers, villages, farms
- PV – suitable for all with south facing space
- Wind – farmers, communities, exposed buildings (not urban)

Installations to November 2011



Generation Tariffs – RPI and First Review and Comprehensive Review

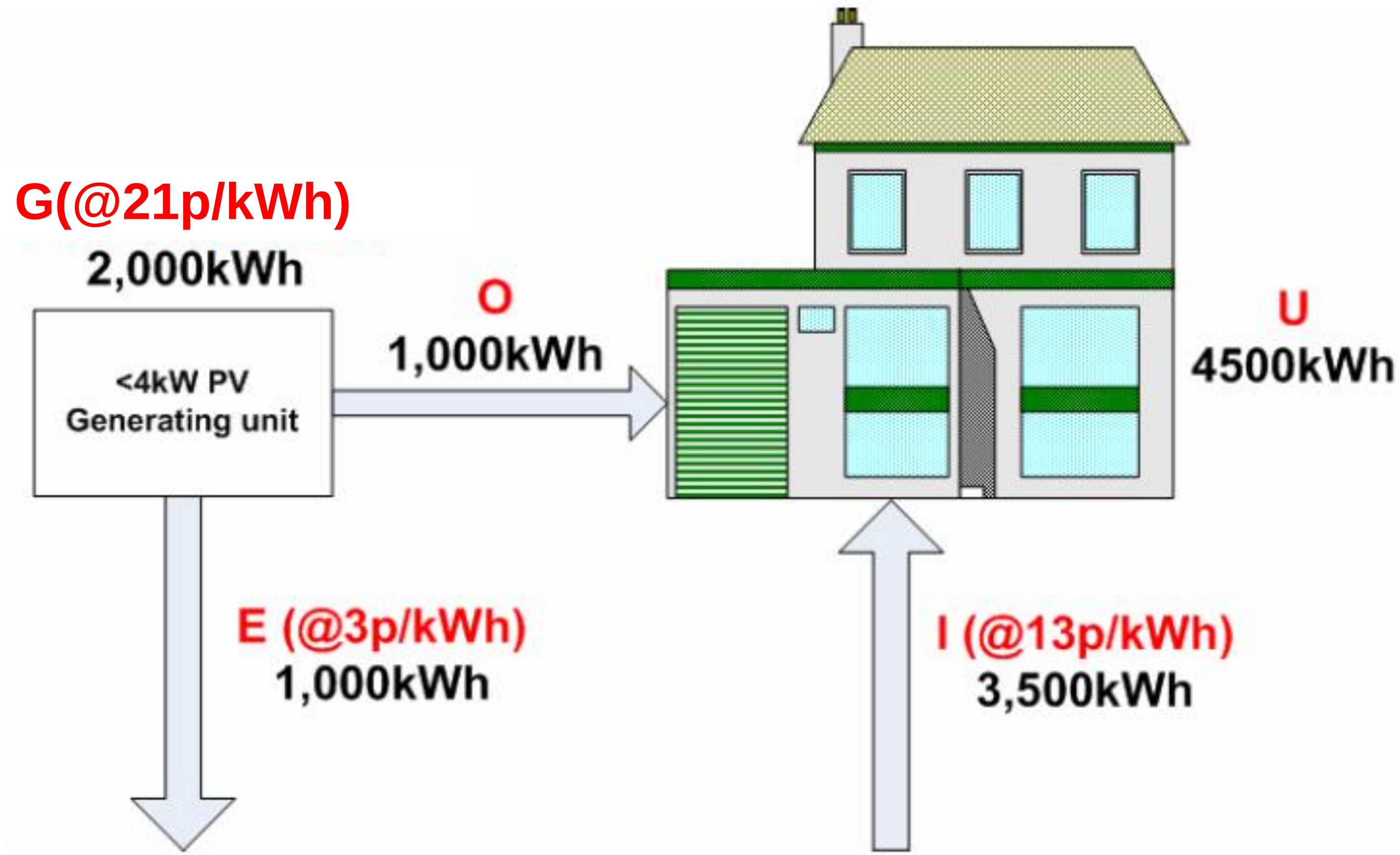
- Generation tariffs have increased following RPI application in April
- First FIT review effected installations >50kW
- The latest "comprehensive review" cuts the tariffs further
- Consultation suggests that EPC D rating will be required from Apr
- PV can contribute to the EPC rating
- 21p/kWhr from 3rd March
- Tariffs currently depending on Supreme Court ruling

Generation Tariffs following Comprehensive Review

Technology	Scale	Generation Tariff (p/kWhr) Pre-review	Generation Tariff (p/kWhr) Post-review
PV	≤ 4kW (new build)	37.8	21.0
PV	≤ 4kW (retrofit)	43.3	21.0
PV	> 4- ≤ 10kW	37.8	16.8
PV	> 10 - ≤ 50kW	32.9	15.2
PV	> 50 - ≤150kW	19.0	12.9
PV	> 150 - ≤ 250kW	15.0	12.9
PV	>250kW - ≤ 5MW	8.5	8.5

- Multiple installation rates reduced a further 20%

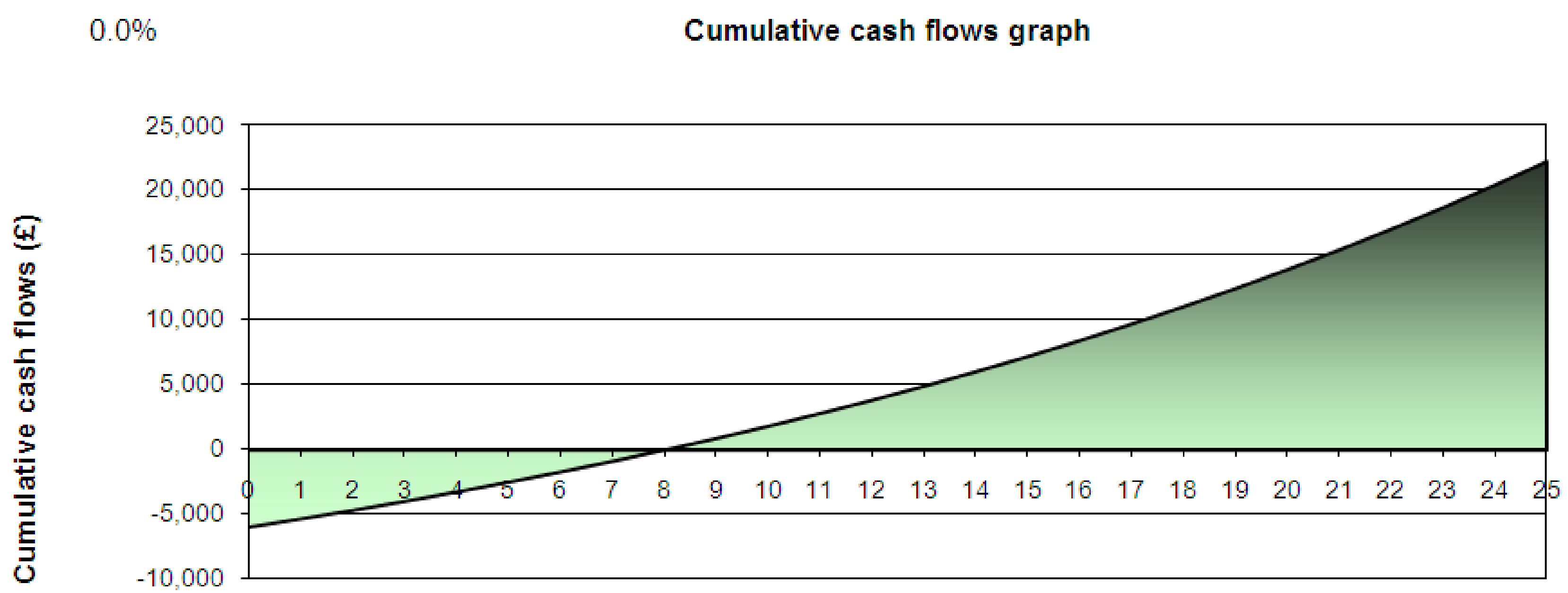
FITs in Practice – domestic example



Case Study Using New Rates - House

- Assume a 2.5kW system – typical house
- Generation @21p/kWhr, Export @3.1p/kWhr, Grid elec @13p/kWhr
- DNO grid connection cost = Zero
- Capital cost of installation = £2,600 per kW installed.
- 50% of electricity generated is used in the building
- Inverter replacement after 10 years (2 over lifetime)
- Annual maintenance minimal

Case Study Using New Rates - House



Overall income = £653 per year (£472 from generation tariff)

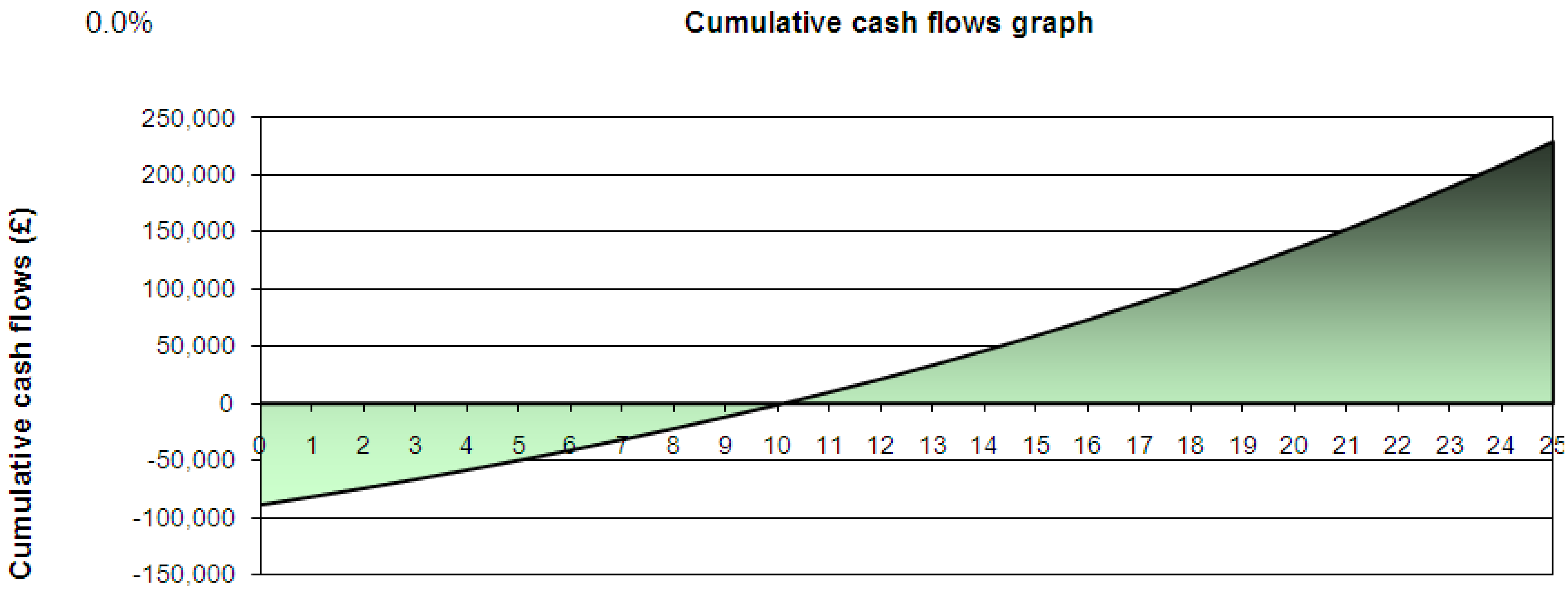
Internal rate of return = 13.9%

Simple payback = 8 years

Case Study Using New Rates – school or large flats

- Assume a 35kW system – typical school
- Generation @16.8 p/kWhr, Export @3.1p/kWhr, Grid elec @9p/kWhr
- DNO grid connection cost = £8,000
- Capital cost of installation = £2,300 per kW installed.
- 50% of electricity generated is used in the building
- Inverter replacement after 10 years
- Annual maintenance minimal

Case Study Using New Rates - School



Overall income = £6,695 per year (£5,121 from generation tariff)

Internal rate of return = 10.9%

Simple payback 10 years

MCS – Microgeneration Certification Scheme

- Danger of "cowboys"
- All FIT installations must use the "MCS Products List" (at less then 50kW)
- All products must be installed by an "MCS Installer"
- There will be issues for those who had chosen bad contractors

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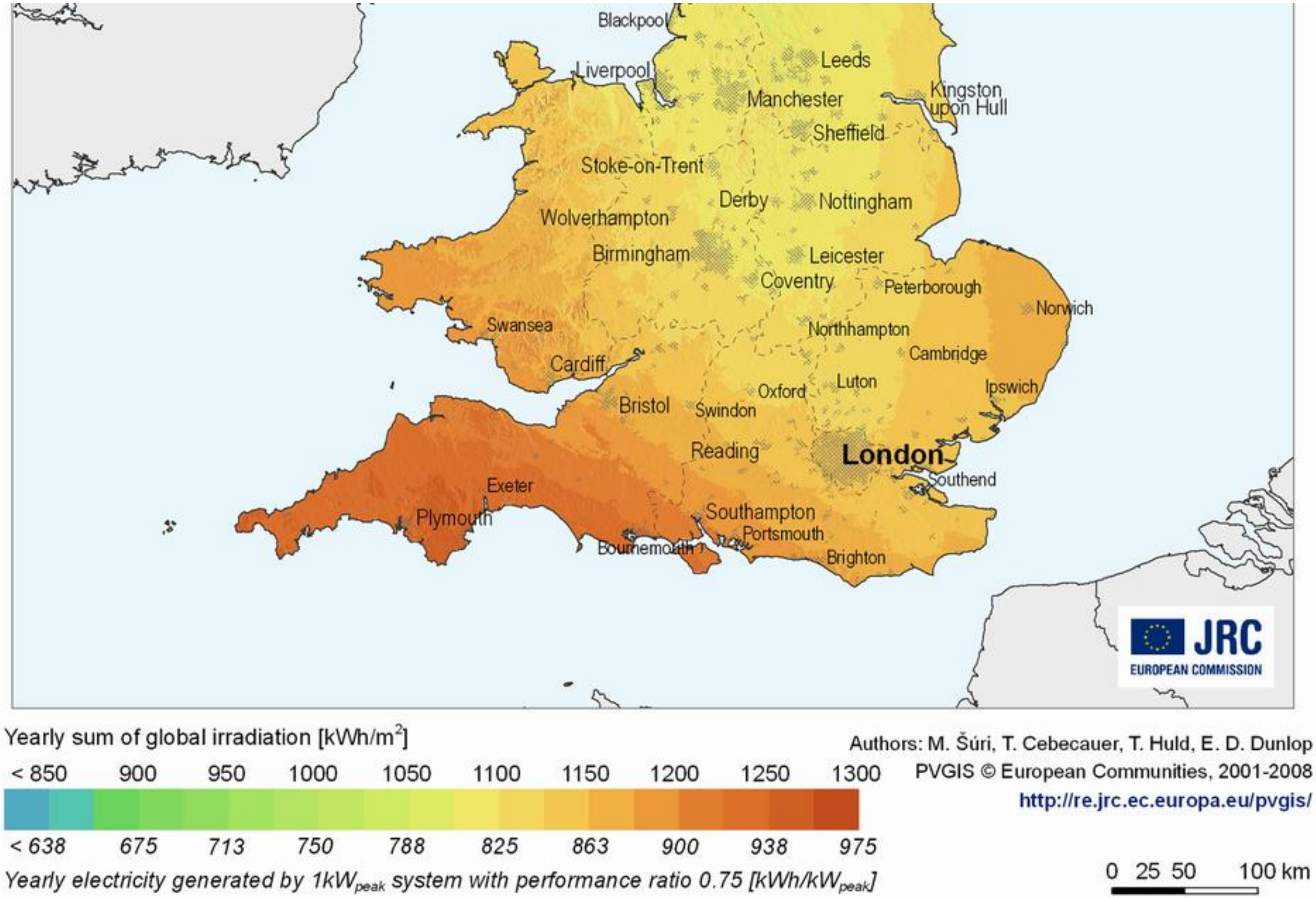
Some important issues to consider

- Site orientation and shading
- System specification
- DNO connection for larger systems
- Financial assumptions on technical performance
- Pre-payment meters and metering
- Replacement of components over time
- Output drop over time
- Fixing methods
- Resident engagement
- Financial Models and Insurance


Blackpool
Liverpool
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Derby
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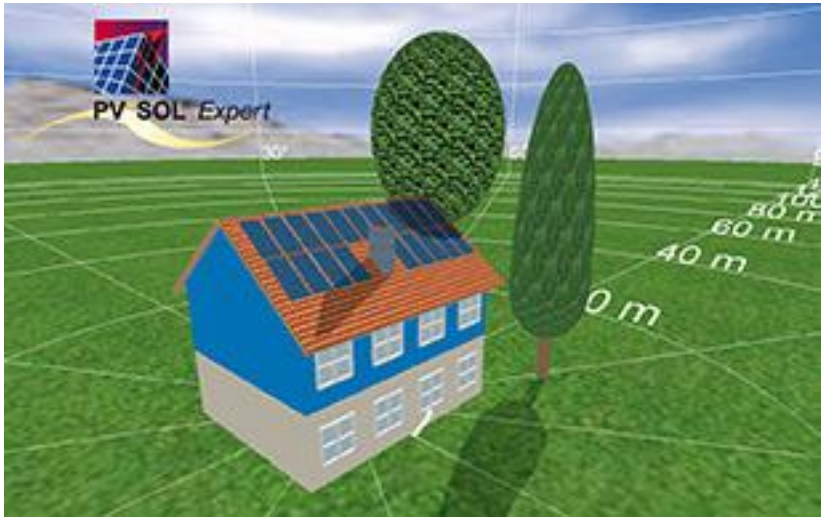
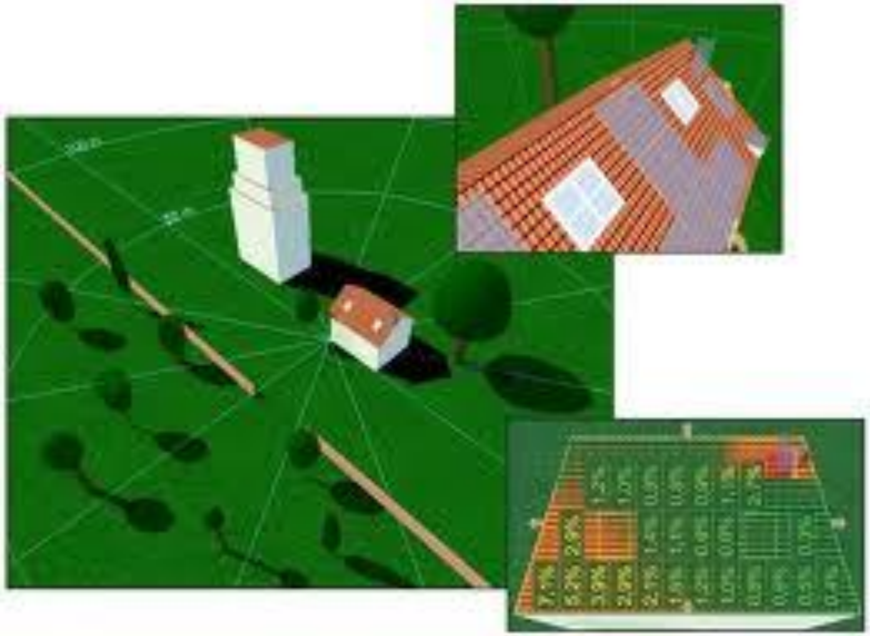
Coventry
Peterborough
Norwich
Swansea
Northhampton
Cambridge
Cardiff
Luton
Ipswich
Oxford
Bristol
Swindon
Reading
London
Southend
Exeter
Plymouth
Southampton
Portsmouth
Bournemouth
Brighton
JRC
EUROPEAN COMMISSION
Yearly sum of global irradiation [kWh/m2]
< 850 900 950 1000 1050 1100 1150 1200 1250 1300
< 638 675 713 750 788 825 863 900 938 975
Yearly electricity generated by 1kWpeak system with performance ratio 0.75 [kWh/kWpeak]
Authors: M. Šúri, T. Cebecauer, T. Huld, E. D. Dunlop
PVGIS © European Communities, 2001-2008
http://re.jrc.ec.europa.eu/pvgis/
0 25 50 100 km

Feed in Tariff for PV – Site and Shading

Site Selection:

- South facing
- Essential to consider over-shading to calculate generation yields



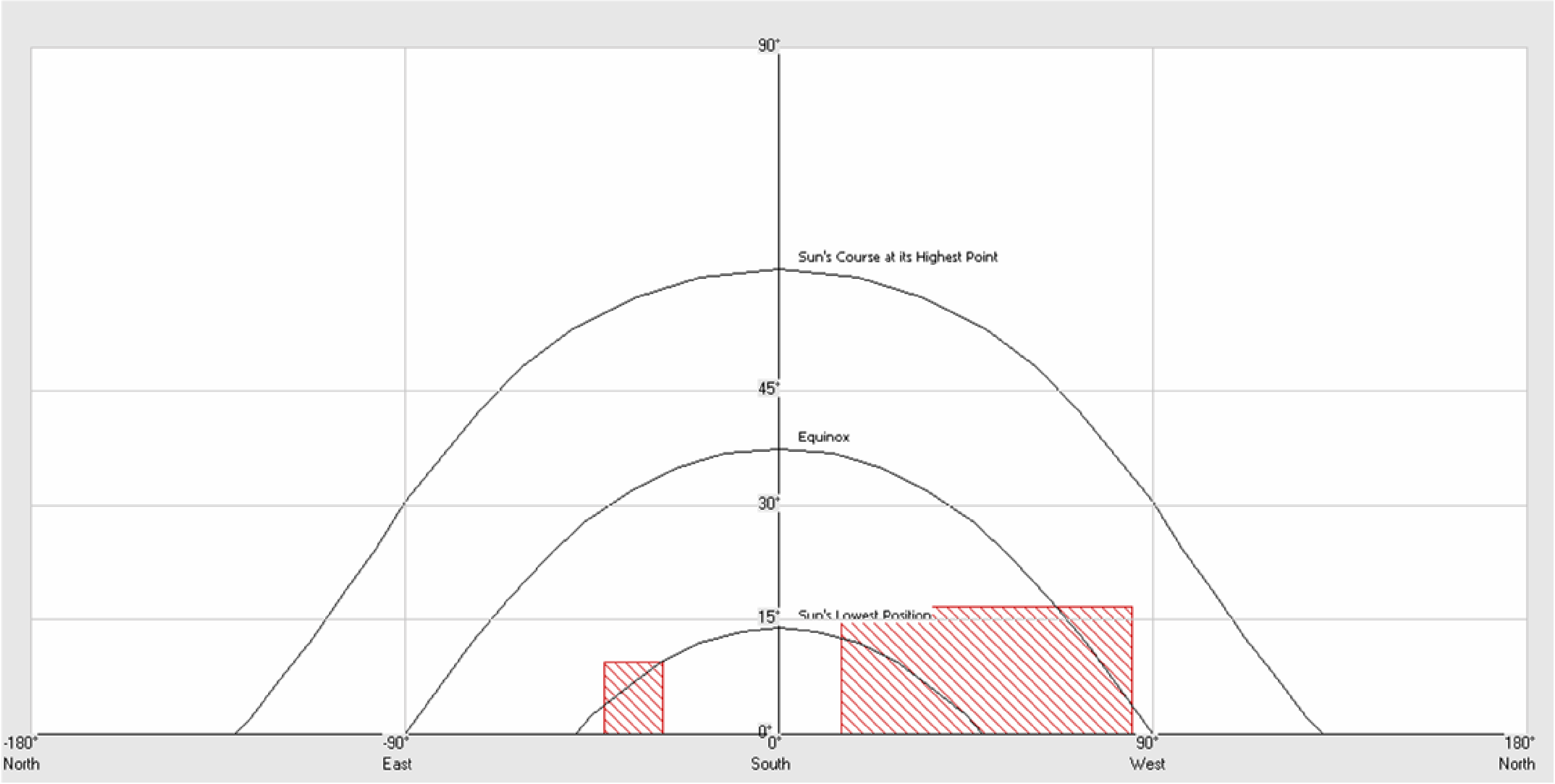


3D – Shading Analysis

Inclination	West -90°	-75°	-60°	-45°	-30°	-15°	South 0°	15°	30°	45°	60°	75°	East 90°
90°	56	60	64	67	69	71	71	71	71	69	65	62	58
80°	63	68	72	75	77	79	80	80	79	77	74	69	65
70°	69	74	78	82	85	88	87	87	86	84	80	76	70
60°	74	79	84	87	90	91	93	93	92	89	86	81	76
50°	78	84	88	92	95	96	97	97	96	93	89	85	80
40°	82	86	100	95	97	99	100	99	98	96	92	88	84
30°	86	89	93	96	98	99	100	100	98	96	94	90	86
20°	87	90	93	96	97	98	98	98	97	96	94	91	88
10°	89	91	92	94	95	95	96	95	95	94	93	91	90
0°	90	90	90	90	90	90	90	90	90	90	90	90	90

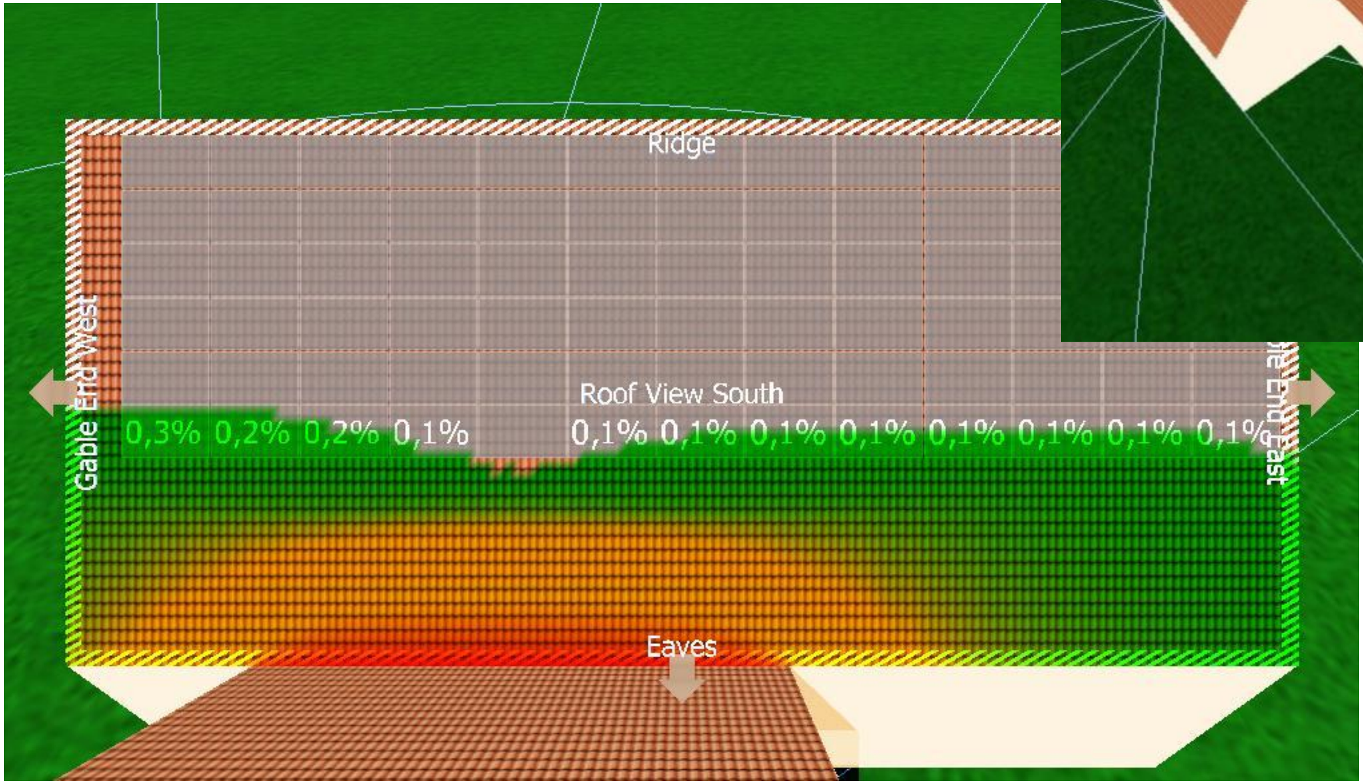
Example: variation in output with pitch and orientation [CIBSE]

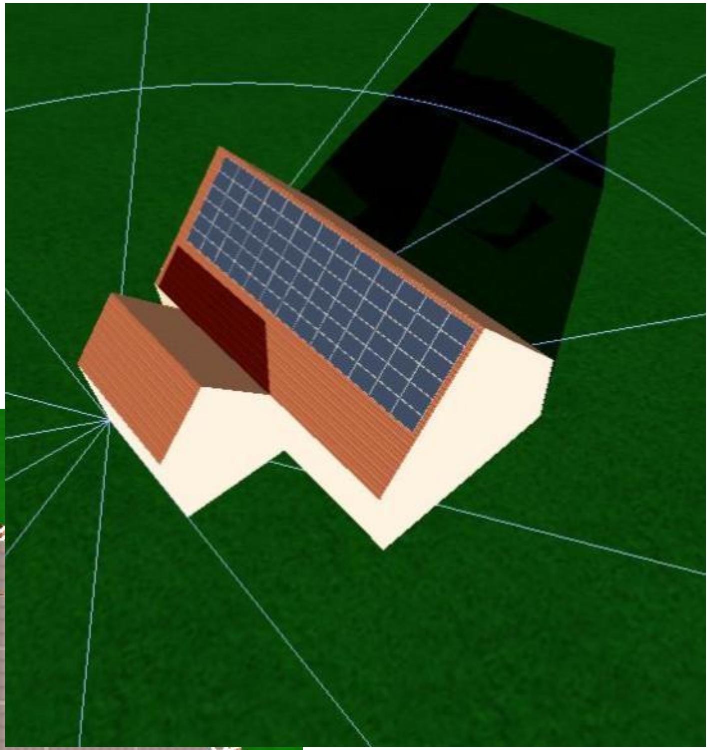
Shading Analysis



2D – Shading Analysis

Shading Analysis





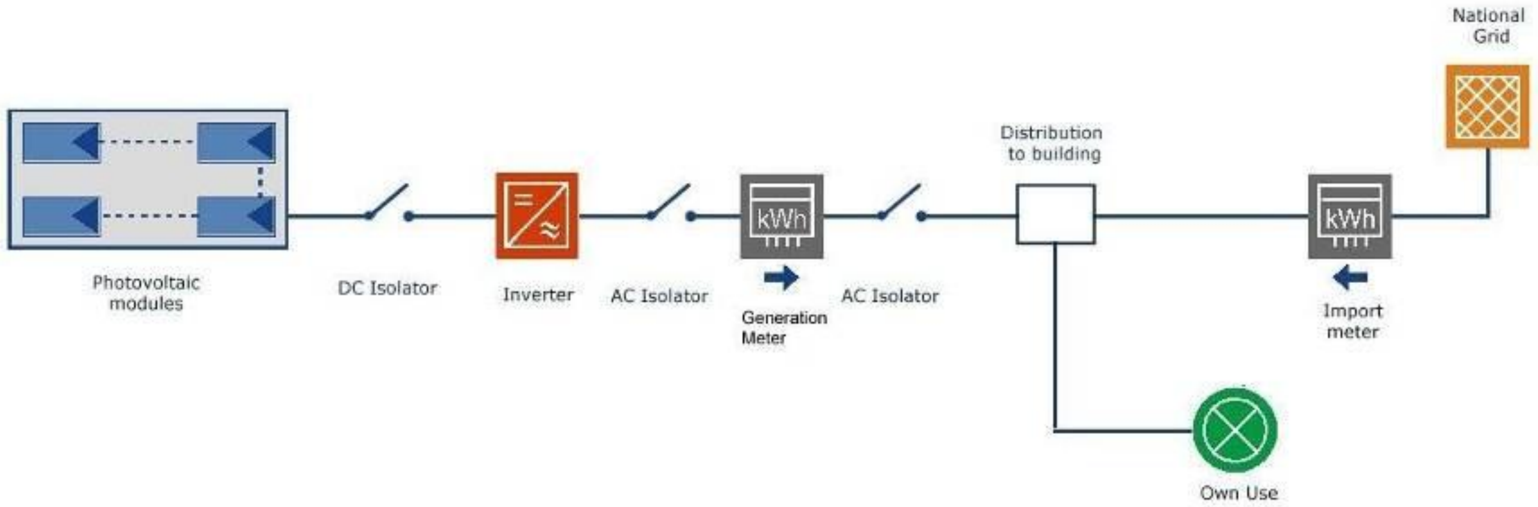
Feed in Tariff for PV

Configuration of PV Modules and Inverter:

•A balance between maximum efficiency and inverter reliability

•Impact on replacement times

•Many different specifications: efficiencies, costs, performance



Wind Loading and Fixing

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Wind loads on roof-based photovoltaic systems

Digest 489

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There is a little information and no authoritative guidance about wind loads on roof-based photovoltaic (PV) systems available to the designer. In the UK, determining wind loading on PV systems and their component parts tends to be based on experimental data, extrapolation of wind loading data intended for other building elements, or from design guidance for PV installations in other countries where the wind loads or construction practice can be quite different. This gives rise to a wide range of design wind loads and, sometimes, potentially unsafe designs.
This Digest reviews the wind loading information appropriate for roof-based PV systems and gives recommendations and guidance for the design of roof-based PV systems for wind loads. It has been developed from work undertaken during a Partners in Innovation project funded by the DTI; a list of the partners in this project is given on page 8.

Determining wind loads

Information is required to allow you to determine wind loads on individual PV modules, arrays of modules and supporting structures and fixings. This requires knowledge of extreme wind speeds expected at the particular site and appropriate pressure coefficients. The British Standard for wind loading on building structures, BS 6399: Part 2, gives methods for determining the gust peak loads on 'buildings and components thereof'. The equivalent European standard is EN1991-1-4. As there are no wind loading standards specifically for PV systems, BS 6399: Part 2 is the most appropriate for the UK although it will eventually be superseded by EN1991-1-4.

Determining wind loads is conceptually simple although quite complex in practice. The first step is to determine the basic mean wind; the next step is to determine the dynamic wind pressure for the particular site by applying a series of factors to account for terrain, topography, building height, etc. This dynamic wind pressure should embody all of the statistical parameters which govern the probability of occurrence of wind speed and hence the wind load. The wind force on the PV module is then obtained by multiplying the dynamic wind pressure by the area over which the wind load acts and pressure (or force) coefficients.

The dynamic wind pressure can be readily determined for any PV installation in the UK from BS6399, or from the simplified approach in this Digest. However, pressure coefficients are not so readily available because the BS does not specifically include values appropriate for PV systems. Therefore, the recommended values of pressure coefficients for PV systems given here have been derived using expert judgement and data from other published sources.

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Mechanical installation of roof-mounted photovoltaic systems

Digest 495

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This Digest gives guidance on installing and using photovoltaic systems on domestic roofs. The guidance refers only to the mechanical installation of roof mounted integrated and stand-off photovoltaic systems; it provides best practice guidance on installation requirements and does not constitute fixing instructions.

A classification system for photovoltaic systems is included, which incorporates illustrations of commercially available systems. Care, maintenance and inspection are also covered.

This Digest has been prepared as part of a Partners in Innovation project funded by the Department of Trade and Industry.

Introduction

There are many different types of roof mounted photovoltaic (PV) systems in use in the UK. Some have been designed specifically for UK roof construction and practice, whilst others are imported systems originally designed for use in other countries. This can lead to confusion and in some cases inadequate installation has resulted in failures under wind action or rain penetration. Guidance exists for electrical installation of PV systems but there is no equivalent guidance for mechanical installation.

The PV system should be fully defined at the planning stage, including all system components. This includes co-ordination of the assembly sequence for individual system components. The overall design, assembly sequence and detail design solutions should be mutually consistent. Special consideration should be given to the adequacy of the fixings or anchors to ensure that they can withstand wind forces. It should be noted that wind forces vary throughout the UK and are affected by roof height, roof pitch, orientation, etc. Therefore a design that is suitable for one roof shape might not be suitable for a differently shaped roof, or a fixing system used in the London area might not be adequate for use in northern England or Scotland. Digest 489 gives further information on calculating wind loads[1].

The specifications of the roof covering, roof weatherproofing system or external substrate should be taken into account when planning the installation of a PV system. In particular thermal insulation, structural stability and weather-tightness of the existing roof should not be compromised by the installation of a PV system. Installation should not reduce the air space beneath the roof covering to such an extent that it affects roof ventilation. The ideal free air gap beneath the roof covering is 50 mm, although 25 mm is acceptable in some situations: a similar air gap should be maintained beneath PV modules (see BS 5534[2] and *Thermal insulation: avoiding risks*[3] for more information).

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Feed in Tariff for PV

Consultancy for PV

•Identifying the most suitable sites

•Accurate predictions of energy generation

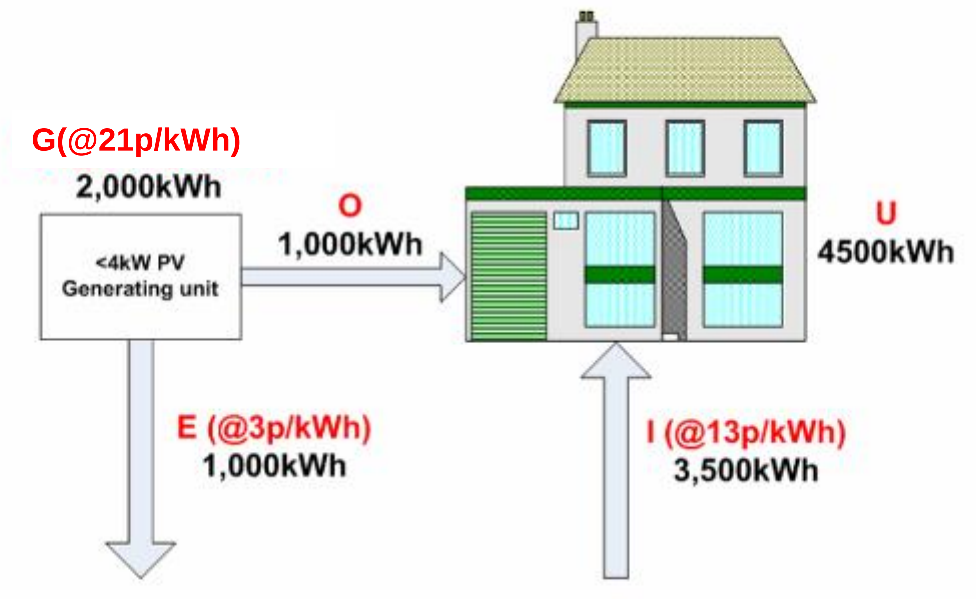
•Modelling of shading

•Modelling Module/Inverter configurations

•Support tender evaluation

•Confirm specifications

• Support investment case



Thank you very much for your attention

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