



POLYSOLAR

Building with PV

Presentation by
Hamish Watson CEO Polysolar Ltd

www.polysolar.co.uk



Company Profile

- Award winning Cambridge technology company established 2007
- Leading edge developer of colourless transparent photovoltaic architectural glazing based on innovative ultra low cost solution processing of organic polymer materials in collaboration with Pilkington and Solvay
- Supplying revolutionary high performance transparent tinted thin film amorphous silicon photovoltaic glazing modules for building integrated applications



Why BIPV

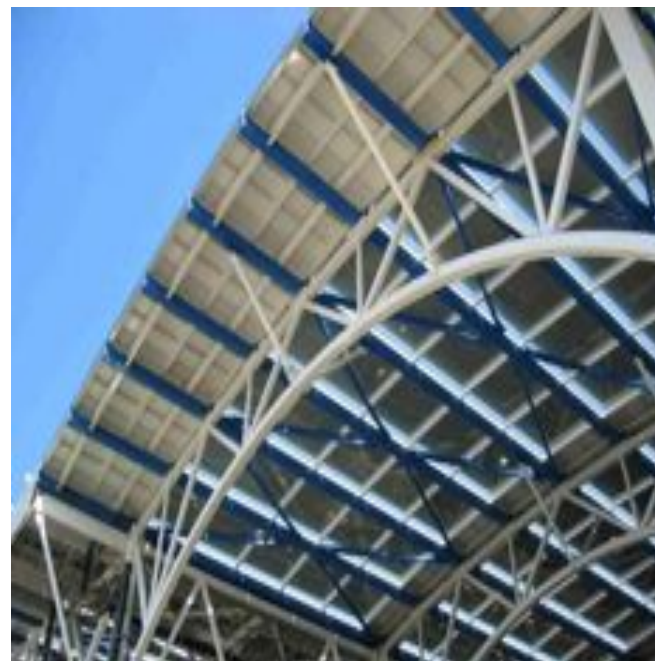
Building Integrated Photovoltaics

- ‘The utilisation of the PV as a building material to replace existing construction components’ ‘rather than a tack on addition’ - Forming part of building envelope (roofing, façade, windows, devices, & architectural elements and structures)
- Resulting in a marginal additional cost over existing/replacement materials, minimal installation costs addition with no added area footprint or grid infrastructure/servicing requirements



BIPV Drivers

- Proportional BOS Costs
- Preferential Incentives
- Planning Requirements
- Building Regulations
- Sustainability Commitments
- Image / Responsibility
- Maintenance



But requiring a whole new architectural/construction way of thinking and industry supply chain



PV Technologies

3 generations of technology offering different BIPV attributes & constraints



I-Crystalline Silicon

- high performance (~15%)
- high cost
- long life, direct sunlight



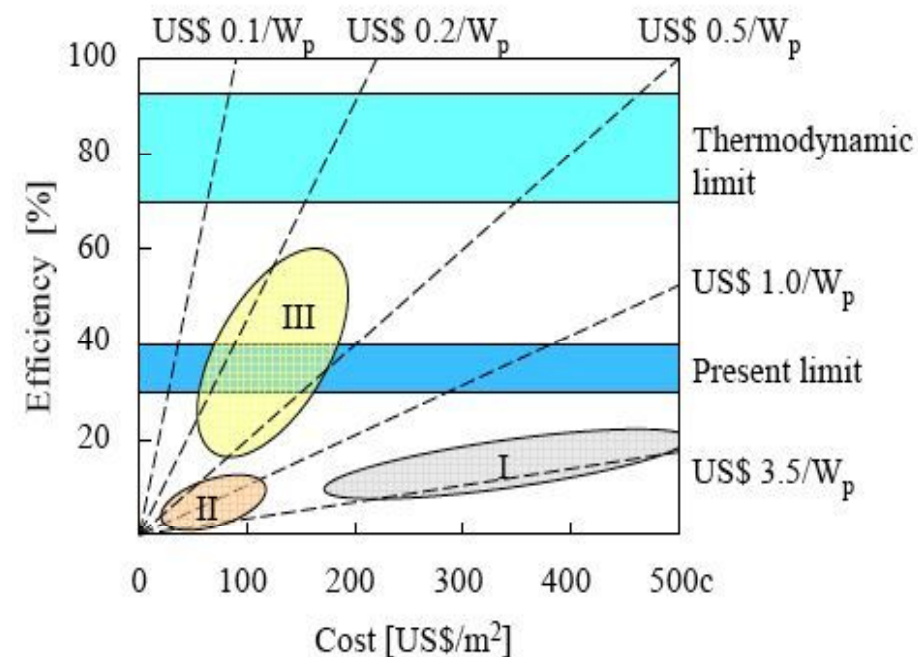
II-Thin Film (a-Si, CIGS, CdTe)

- medium efficiency (~ 10%)
- lower cost
- ambient light



III-Organic (Dye, Polymer)

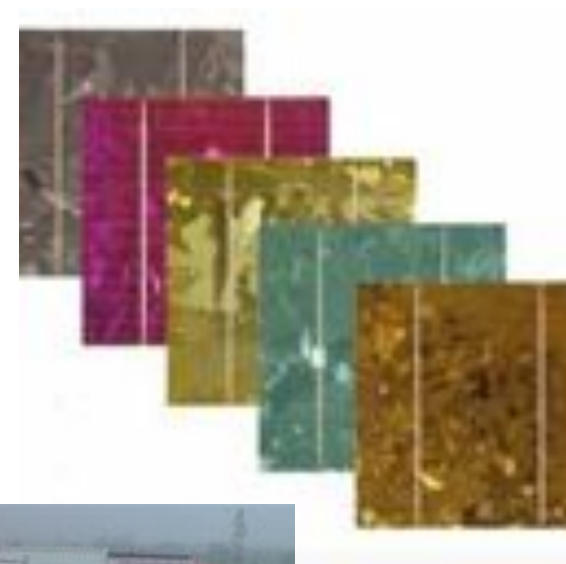
- low efficiency (~ 5%)
- ultra low cost
- Low light





BIPV Products

- Rigid Glass/Plastic
- Glass/Glass
- Flexible
- Semi-Transparent





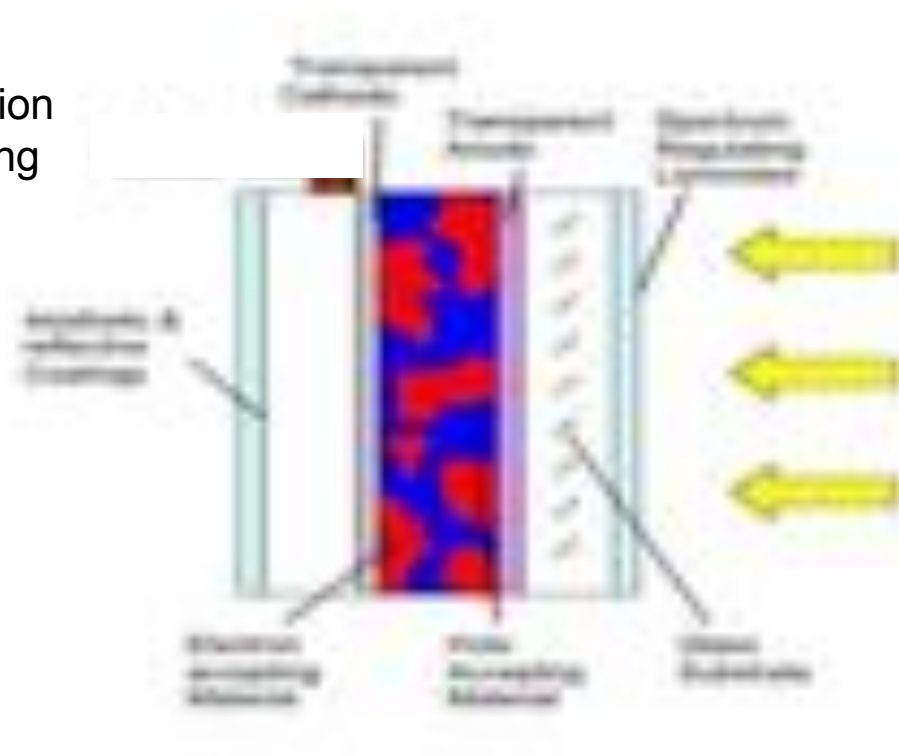
Polymer OPV Solar Cell

Advantages

- Low cost fabrication
- Ease of processing
- Large area
- Aesthetics

Challenges

- Efficiency
- Lifetime
- Durability
- Scale-up



Solutions

- Material selection
- Active layering optimisation
- Barrier Coatings
- Solution Print Deposition
- TCO Manipulated Glass
- Alternating cell design
- Electrical configuration
- Laser Weld Sealing
- Vacuum Lamination



Polysolar a-Si Products

- Range of transparent and opaque modules 85-105W/peak at highly competitive prices
- IEC TUV certified with performance warranted for 20 years. MCS certification pending
- Independent UK field testing at Sheffield University



Opaque Type



Semi-Transparent



Low Voltage



High Performance

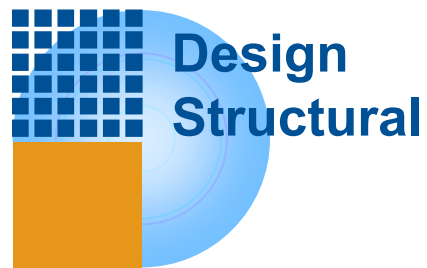
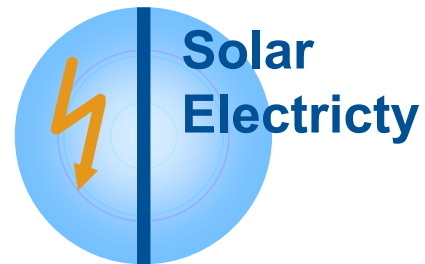


Technology Benefits

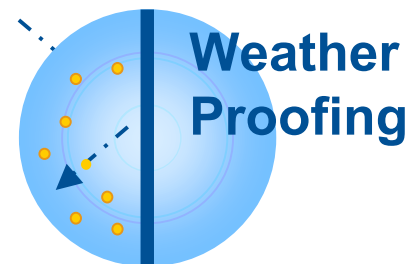
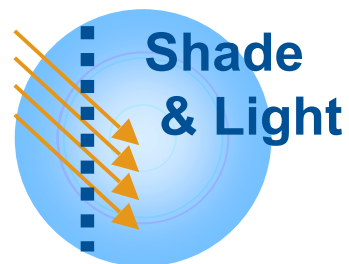
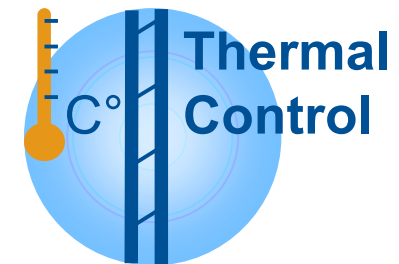
- Established thin-film technology
 - 20 year performance guarantees and 2 year manufacture warrantee.
Manufactured using latest vapor deposition equipment and TCO coatings
- Superior Aesthetics
 - Transparent (20% light transmission) brown tinted glass/glass laminate offering attractive and easy incorporation into structural design
- Better performance in low light
 - High output in ambient/low light conditions (down to 10% of sunlight) offering higher yields over a year in UK and suitability for non optimal positioning
- Low temperature Coefficient
 - Module efficiencies are maintained at high temperatures so optimising power output and avoiding cooling requirements.
- Less affected by shading
 - Modules are high voltage (140volts) resulting in parallel linking, so operating independently and effective over entire building at non optimal positions



Multifunctional



Transparent PV Glass





Business Case

Building Roof Balustrade

BIPV -100m² (London, vertical positioned, 20% system losses)

= 67 Polysolar transparent modules x 90Wp

= 6kWp system generating ~5000kWh/ year

Module & BOS costs = £23,000

Offset glass cost 100m² = £7,000

Revenues - 5000kWh X £0.361 (FIT) = £1,805 p.a Electricity use

5000kWh X £0.12 = £600 p.a

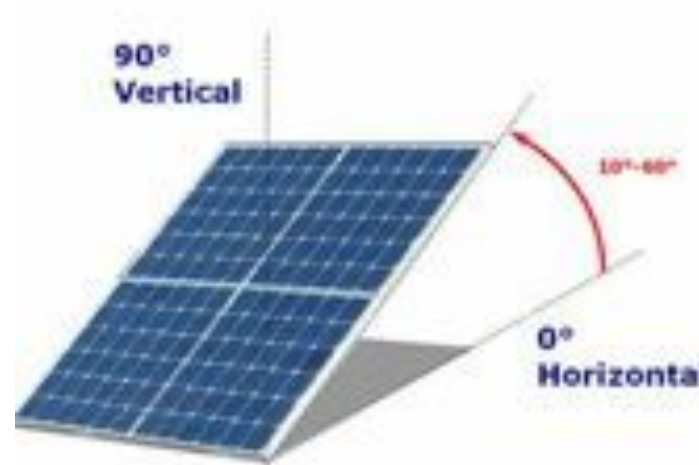
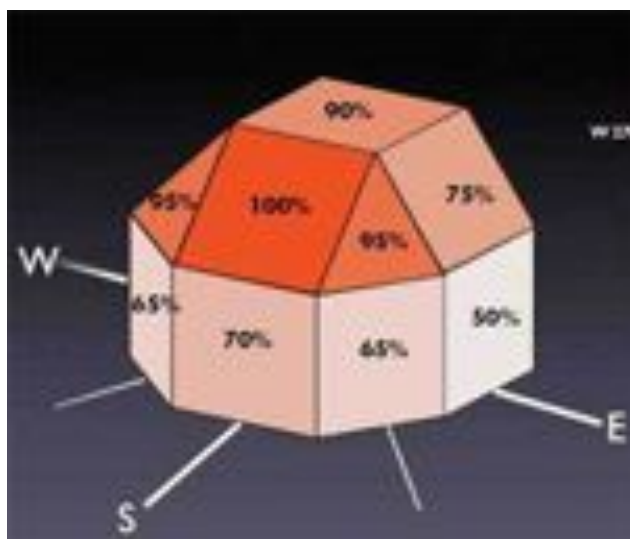
Payback ~6.7 Years

Plus non quantifiable (energy savings, regulatory, inflation, etc)



How to build with PV

- Orientation and Angle of Inclination

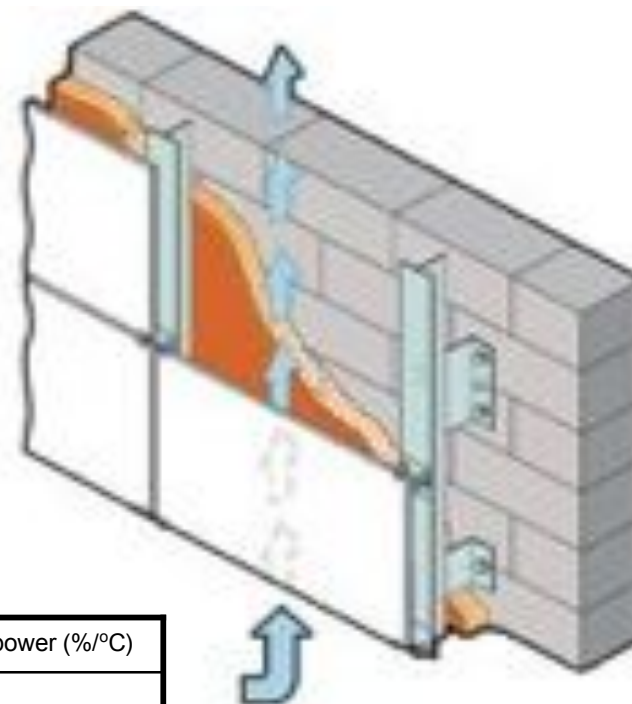
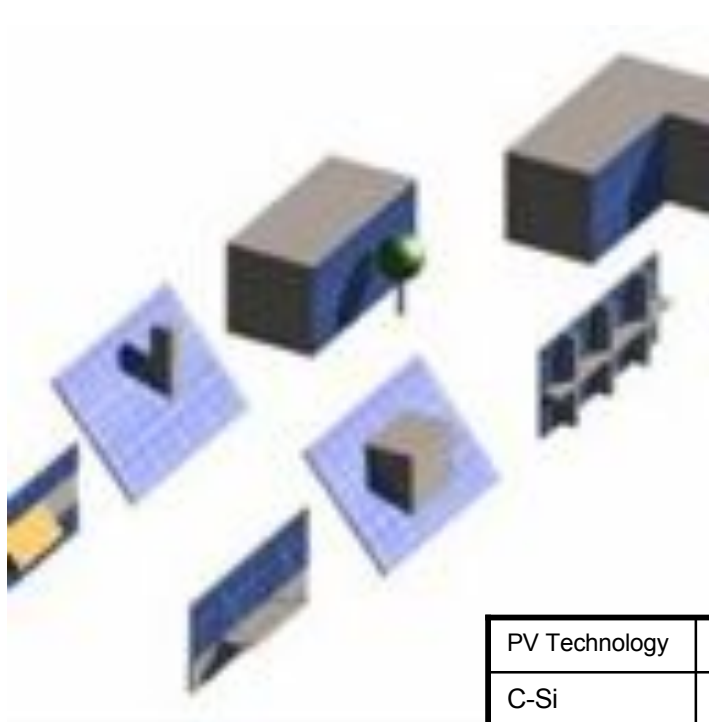


Trade off between power generation and architectural considerations



Integration Considerations

- Shading & Ventilation/Cooling

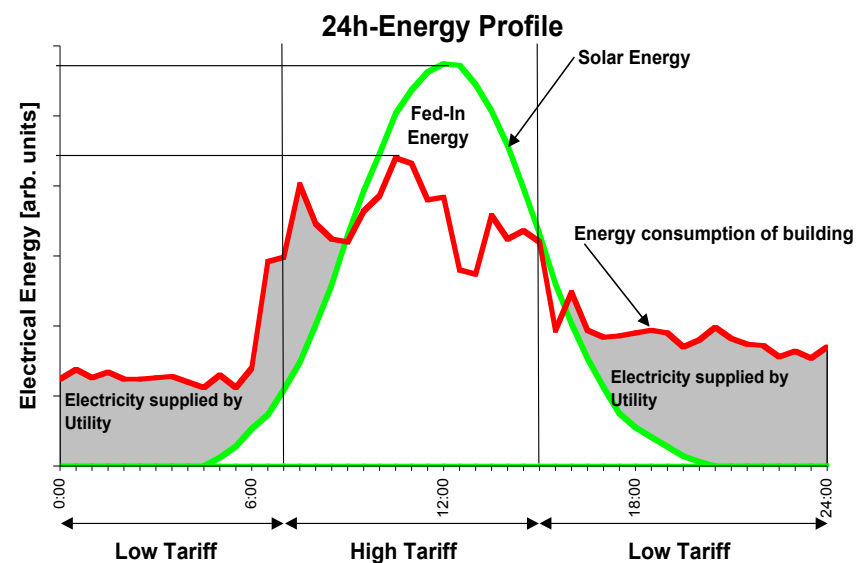


PV Technology	Coefficient temp / power (%/°C)
C-Si	-0.4 ~ -0.5
CIS, CdTe	0.2 ~ 0.5
a-Si	-0.1 ~ -0.2



System Configuration

- Inverters
- Series or parallel connection
- Grid tied /storage
- AC/DC systems
- PV technology Watt/Volt
- Module/string level controls
- Power usage / needs





Construction Issues

- Architectural Design
- Specification /Procurement
- Planning
- Certification
- Building regulations
- Construction / Handling
- Build Schedule
- Skills
- Insurance
- Security

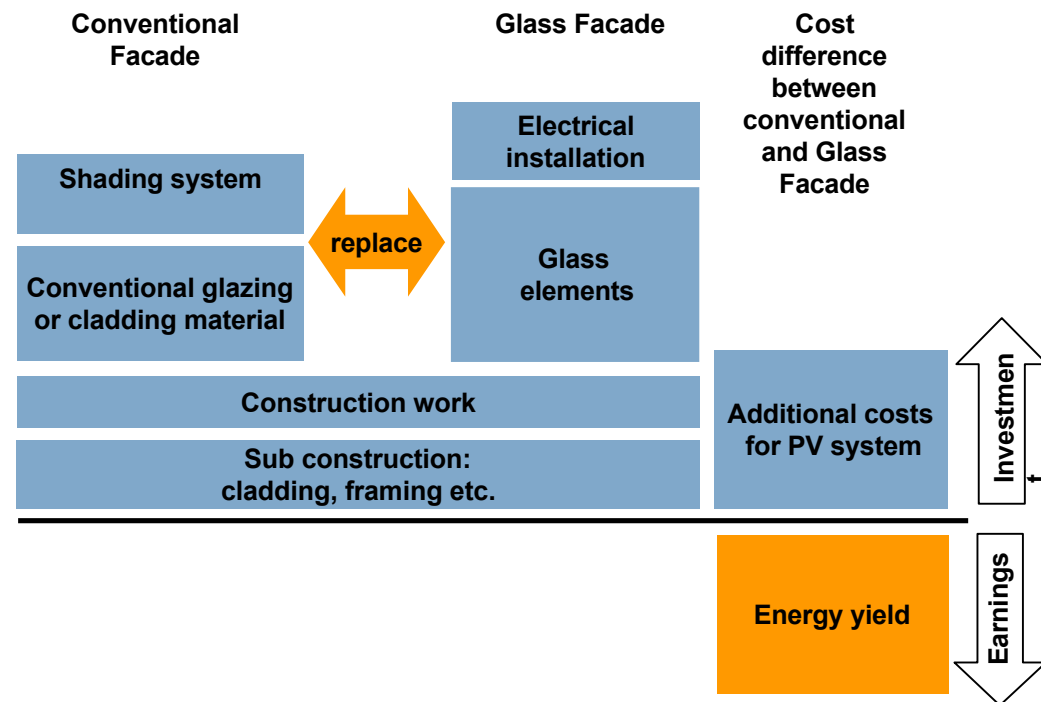




Costs/Benefit Analysis

Issue of how measured

- Owner occupier/Developer
- Payback/ROI
- Incremental/Additional cost
- Life cycle cost/Net present value
- Values divers
- Costs per kWh/Cost per m2





BIPV Application Solutions



Shelters





Facades





Curtain Walling





Flat Roofing





Pitched Roofing





Windows/Atriums





Balustrades/Structures





Greenhouse/Conservatories





Thanks

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