

# An Introduction to Solar Technology and Markets

***A 2-day Comprehensive Overview of Solar Energy & Power.***

## **Course objectives**

Whether you are new to the industry or want to refresh and update your knowledge, this two-day training course will ensure you are up-to-speed with the key aspects of the solar energy/power industries and the technologies driving them.

With the help of simple calculations and exercises, you will learn how to evaluate the solar energy resource and evaluate the economic cases and market conditions which argue for (or against) solar power. You will understand the different, competing and complementary technologies available to harness the sun's energy, including both photovoltaics (PV) and solar thermal (in particular CSP), exploring the potential of each to contribute to current energy needs and examining the economic, commercial and technical issues which will determine their impact. You will therefore learn not only how the various technologies work but also - most importantly - their commercial and competitive contexts.

## **Level & Style**

The course will explain some key concepts in energy physics and technology which pertain to the solar industry, and assumes no prior technical knowledge. Indeed it is specifically designed to be of value to those working in *non-technical* functions (for example those in marketing, finance, commercial or senior management) - those who need to understand the fundamentals of the industry and the development of its technologies and market applications; not the nuts-and-bolts of engineering or hands-on installation.

The course runs informally, allowing and encouraging time for discussion and questions to ensure that participants get the most out of their time. This 2-day course contrasts from our 1-day briefing in providing coverage of important additional topics (for example understanding the power grid and the issues associated with connecting into it); in expanding on the level of topic coverage throughout; and in allowing time to illustrate and better understand the various topics (such as levelised costs) through some simple calculations and other explanatory exercises.

## **Approximate Timing**

Day 1: Course begins:	09:00	Course ends:	17:30
Day 2: Course begins:	09:00	Course ends:	16.30

(NB. timings are approximate and include lunch plus morning and afternoon refreshment breaks)

## **Agenda Details**

### ***Key concepts in understanding Solar Technology & its Potential***

- An introduction to key energy concepts and measures:
  - Energy, work and power
  - Forms of energy and energy conversion
  - Energy cycles and engines
- The Solar resource
  - The fundamentals of Solar Radiation and the size of the resource

- Solar energy variation: understanding and quantifying the variation in solar resource
- Market context: the wider energy market (and competing energy/power sources)

### **Power Grids**

- An introduction to electrical power
- Understanding the structure and operation of The Grid - and how this affects the deployment of solar power
- Power Demand and its impact on Price and Generation/Supply
- The future: "Smart Grids"
- Integrating Solar Power into the Grid: opportunities and barriers.

### **Photovoltaic (PV) Solar**

- How solar cells work:
  - the photovoltaic effect,
  - PV materials, including crystalline, polycrystalline and thin-film
  - PV cell designs
  - Measuring and improving cell efficiencies and performance
  - Understanding the balance between efficiency and ease/cost of manufacture
- Supply-side issues including materials availability and production capacity
- PV systems: from cells to modules to systems
- Understanding full system costs, including non-solar elements (BOS)
- Emerging PV technologies, including organic and dye-based (DSSC)
- PV concentrators for on-grid solar power
- Space solar; fact or fiction?
- Case studies and examples.

### **Solar Thermal, CSP**

- Low vs. High-temperature solar thermal: applications and market positioning
- Concentrating Solar Power (CSP):
  - The key elements of CSP systems: concentration, collection, storage, generation.
  - Current and emerging designs for on-grid CSP power, including linear/trough, dish and tower topologies.
  - Thermal Energy Storage (TES) mechanisms
  - Case studies and examples
- OTEC (Ocean Thermal Energy Conversion)

### **The Solar Market: Factors and Futures**

- A review of today's Solar Market, both on- and off-grid
- The economics of Solar Power
- Solar Market Drivers (and hurdles):
  - competition
  - regulation
  - consumer / social factors
- Key market trends and indicators
- Grid Parity and Levelised Electricity Costs (LEC / LCoE)