

Solar Photovoltaic Electricity: A Wealth of Investment Opportunities Under the Sun

Under the banner of the IEA Photovoltaic Power Systems Programme ([IEA-PVPS](#)), a workshop, *Solar photovoltaic electricity: a wealth of investment opportunities under the sun*, was held in Zurich (Switzerland) on Tuesday 14th November 2006. The event, focusing on finance and PV, was organised by Nova Energie GmbH of Switzerland and RTS Corporation of Japan, with the support, through INRATE AG, of the Swiss investment and finance sector and the Swiss PVPS Pool.

An audience of fund managers, PV industry representatives, investment institutions, utilities and policy advisers heard presentations from specialists and joined them in a lively debate about today's pressing PV questions. Greg Watt of IEA-PVPS tells the *OPEN Bulletin* about the event and its findings¹.

The message behind the workshop's title certainly hit home, as demonstrated clearly by one participating banker. "When I came in this morning", he declared, "I was sure that PV will never make it. But what I learned today was very, very helpful and changed my opinion about PV."



Greg Watt of IEA-PVPS

It's certainly true that some tough questions are being asked about the outlook for PV, in spite of its very encouraging performance over many years. Can the current PV technology deliver on its promises? Are there sustainable markets for the products? Are the costs (and prices) competitive and in line with potential returns? Could the 'PV bubble' burst? And where exactly do the risks and opportunities lie? The workshop pulled together much fruitful insight on these issues.

Technology evolution, not revolution

Spectacular technical breakthroughs are not to be expected of this industry, but rather a continuous improvement in technology. It is all about evolution and not

¹This article by Greg Watt (Australia) is based on contributions from Alan Hawkins (Switzerland) and Susannah Pedigo (United States). Information on future finance and PV workshops to be organised by IEA PVPS in various countries can be obtained by contacting Pius Hüsser: Pius.huesser@novaenergie.ch

revolution. New materials from nano-science may trigger breakthroughs, though not overnight. Thin-film technology, meanwhile, has created a useful alternative to crystalline silicon but holds only a modest share of the market. The big milestone will be passed when PV becomes cost-competitive with traditional energy sources and other emerging technologies in the various markets. It is expected in some quarters that, by 2015, ongoing development of PV technology will bring the price of solar electricity below that of peak-load power. Movements in the retail price of electricity and the way these tariffs are structured in the various countries are also receiving a lot of attention from the PV community. As one participant pointed out, coming to grips with these scenarios sometimes seems like trying to hit a moving target from the back of a galloping horse.

Homework for investors ...

The investment community is now looking at the PV industry in a more critical manner. After a period of almost unbridled interest and across-the-board investment, testing of individual business-models is more rigorous today. Analysis is focusing more searchingly on situations of explosive demand and on uncertainties concerning the future direction of government policies. The message for analysts today is to "separate the wheat from the chaff". An important consideration is the growth potential in the face of solar-grade silicon scarcity. Sufficient enterprise size and clear business models are equally important. All along the value chain, the risks and returns associated with each segment need attentive monitoring. The current attractive segments of the value chain are feedstock and modules; integrators to a lesser degree.

A real difficulty is predicting what will happen with cell and module prices when the feedstock supply situation eases. Feedstock prices are fixed for a number of years and hedging contracts are in place - sudden drops in price should not be expected from players with such contracts. To counter-balance this, however, order volumes should go up and consequently costs should go down. To complicate matters, materials represent some 70% of module production costs, and they include commodities like aluminium, copper and other minerals. It appears that many companies have not secured 100 % of needed raw materials. Investment banks tend to prefer vertically integrated companies because they control larger segments of the supply chain, diminishing their risks.

... and for industry and the wider community

An important part of the investment equation concerns external cost issues - for example, those associated with traditional power supplies - which are still difficult to quantify and factor in. The real costs of power supply should incorporate environmental and social factors, as well as optimal operation of the electricity network. These factors can be internalised explicitly through pricing or indirectly

through support of alternatives. One clear message that emerged during the workshop was that businesses prepared to do their homework will find where their own PV opportunities lie.

The discussions provided both consensus and some healthy divergence of opinion over costs. There seems little doubt, however, that achieving technology cost reductions making PV pricing competitive with alternative options will require public support - probably significant and possibly over an extended period. The absence of such support could mean that the technology advances only slowly beyond its current very small contribution to global energy supplies. In contrast, achieving marketable price levels within the next decade could herald undreamt of growth possibilities for the industry and the promise of a real impact on energy supplies in coming decades. Action now can ratchet up the potential in the longer-term.

IEA Photovoltaic Power Systems Programme (IEA-PVPS)

IEA-PVPS is a collaborative R&D Agreement, established within the International Energy Agency in 1993, to conduct projects on the application of solar photovoltaic electricity. [IEA PVPS](#) operates worldwide via a network of national teams in member countries.

The long-term participating countries are Australia, Austria, Canada, Denmark, France, Germany, Israel, Italy, Japan, Korea, Mexico, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States of America. The European Commission and EPIA are also members. Malaysia and Turkey are recent participants.

Getting a handle on the market

In order to understand the PV market, it is important to understand the product and its applications, which are many. Broadly speaking, applications for photovoltaics in the various markets range from building-integrated systems and grid-connected power supplies to smaller, stand-alone applications. Depending on the policy environment, high growth rates of installed PV can be achieved, as we have seen.

Today's main markets are in Germany, Japan and the United States. Countries such as Spain, Italy, France and Greece are expected to develop significant markets in the next few years. Currently, grid-connected PV is still strongly dependent on government incentives, except in Japan, where a considerable market for single family homes with solar power supplies exists, thanks to a successfully completed government funding programme.

Not to be forgotten are the roles that PV can play in the developing countries. The big advantage with PV systems is a flexible, modular format that lends itself well to off-grid applications in areas without general access to electricity. In its range of activities, the IEA PVPS Programme ranks the importance of expanding these applications on a par with analysis of high market growth rates, industry expansion,

retail price parity and energy policy alternatives. According to recent IEA analysis, the electricity supply situation in developing countries will worsen over the coming years as a result of population growth. PV offers a way - sometimes the only way - to provide electricity to populations remote from electricity grids and to enhance the standard of existing electricity supplies, thereby dramatically improving quality of life. The problem here is not the great number of potential applications but the lack of spending power and financing options - in spite of the fact that PV is already competitive today with other technologies for these applications.

The structure of the PV industry is as complex as the range of applications. Sophisticated production technologies and processes are needed at each step along the value chain to the finished product. This complexity presents certain challenges because a bottleneck in just one of the process steps can have an effect on the whole business. This is currently the case concerning availability of the solar grade silicon required for the production of PV cells, with corresponding effects on current market prices. The production of solar-grade silicon for PV cells is an extensive process with long set-up periods for industry, once an investment decision has actually been made. It can take a relatively long time before new production facilities come into operation. The PV industry landscape also promises to become even more interesting as new players enter the scene. China, for example, has ambitious export plans on the table because no policy structure is in place to create sustainable domestic PV markets.

The bottom line

To ensure a favourable investment climate, continuing policy support for PV is needed, both for research and development, and for boosting applications. Getting the balance right between R&D funding and market-stimulation funding will be a challenge. How that challenge is addressed will vary from country to country, but it is important for long-term support to achieve the steady cost and price reductions needed if PV is to maintain public favour and kindle emerging interest among investors.

Given the level of interest and engagement generated by the Zurich workshop, IEA-PVPS plans to hold similar events in different countries around the world during 2007/2008.