

WHERE ENERGY  
**MEGA  
WHAT?** **H<sub>2</sub>O**  
MEETS WATER

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**ON THE RECORD**  
LEON AWERBUCH, CHAIRMAN,  
IDA ENERGY TASK FORCE

**SECTOR REPORT**  
THE RESURGENCE OF  
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# STRIKING A BALANCE

IS THE OIL AND GAS INDUSTRY PREPARED TO  
TACKLE ITS GROWING WATER FOOTPRINT?

## HEAD LINES

- JAPANESE GROUP TARGETS IRAQ'S PRODUCED WATER MARKET
- VENTURE CAPITALISTS SHY AWAY FROM WATER TECH





## PV cost cuts: More to come?

**Following the free fall of module prices, solar energy systems cannot get that much cheaper for the time being – or so we thought. But the cost reduction potential of PV is far from exhausted.**

Germany's solar industry is angry with the Federal government, which wants to cut solar power funding by up to 30%. "We can't cut costs by as much as that at all anymore," said Solarworld boss Frank Asbeck.

However, the actual market situation may be a lot less dramatic: "In Germany, people are still busy installing solar energy systems. This year a new extension record of 8 GW is feasible," claimed analyst Stefan de Haan from IHS iSuppli. One thing is certain: the price of solar energy systems is currently falling at the same rate as that of solar energy tariffs. Whereas a small turnkey rooftop system including installation still costs on average two Euros per kilowatt (kW) at the turn of the year, surveys by IHS iSuppli found that it is currently 25% cheaper at 1.50 Euro. The reason for the rapid price slump is tough competition within the PV industry. "Chinese manufacturers in particular have invested heavily in new technology and have quickly developed major production facilities," said de Haan. The consequence: massive surplus capacities, which is forcing producers to sell their modules in some cases below their production costs. "Since mid-2010, the average price of modules has almost halved," said de Haan.

### Tough price battle

For the solar energy industry, the price slump is both a blessing and a curse. On the one hand, an increasing number of manufacturers worldwide find themselves in the

red, because they have had to contend with high losses in the price battle with their Asian competitors. In April 2012, Q-Cells became the fourth German solar energy company to announce bankruptcy. On the other hand, the PV sector is taking giant strides towards competitiveness. According to the standard electricity price formula, with system prices of 1.50 Euro per watt, a kilowatt hour (kWh) can be produced for 12 Eurocents today. As a result, solar power in Germany is still around four Eurocents more expensive than the kWh produced by conventional gas power stations and coal power stations which currently costs about eight Eurocents. In countries such as Italy, Spain and the USA, thanks to lower electricity production costs, PV is already very close to being competitive. In many countries, solar energy will therefore no longer be dependent on funding.

But taking the last step towards competitiveness will be tough for the sector. "Following the free-fall of module prices, cost savings in the area of cell and module production will now become increasingly difficult", said Eric Maiser, Executive Director, Federal Association of Photovoltaic Production Instruments (Fachverband Photovoltaik-Produktionsmittel) within the German Engineering Federation VDMA. In this connection, according to a study conducted by IMS Research in early 2011, the price of wafers (which is the preliminary stage of cells) fell by 70% to 30 US Cents by the first quarter of 2012. So, there is not much scope in this key sector of the solar value chain.

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Nevertheless, there is hope for the industry. The system level, including inverters, frames, cabling along with installation, still offers great savings potential. Whereas as much as one third of total costs of a solar project was accounted for by the so-called Balance-of-System (BOS) costs in 2010, their share is now approximately around half that figure. “We must now therefore focus greater attention on the BOS costs,” said Eicke Weber, Head of the Fraunhofer Institute for Solar Energy Systems (Institut für Solare Energiesysteme - ISE), in Freiburg.

### System peripherals the focal point

Weber estimates that the system costs could fall by 20% in the next two years. Things have already really started to happen on the inverter market, as Eckhard Wolf, Director Business Line Management at inverter manufacturer AEG Power Solutions, explained: “With the entry of the Asian producers, the small appliances sector is on the way to mass production.” This trend is also reflected in the frames sector. Major aluminium producers and profile manufacturers such as Sapa, Hilti or Cooper B-Line are positioning themselves in order to supply the world market. Their entry indicates that we can expect major supplier cost advantages.

On the raw materials side, the price curve is also clearly moving downwards. Raw materials expert Simon Jäger from the Frankfurt Dekabank estimates that the silicone price will reach a new record low of \$20 per kilogramme in the coming months due to increasing production capacities. By comparison: when the PV boom started five years ago, due to the dramatic increase in demand, one kg of silicon on the spot market cost up to \$400, in other words 20 times the current amount.

Glass prices can also still clearly fall. The cost share accounted for by covering and supporting glass formats in a module is currently on average around 10%. With a current module price of 80 Eurocent, this is eight Eurocents. “These costs can be cut by two thirds using new manufacturing processes and small, de-centralised production units,” explained glass specialist Heiko Hessenkämper from the TU Freiberg (University of Applied Sciences). In this connection, his Institute for Ceramics, Glass and Construction Materials (Institut für Keramik, Glas und Baustofftechnik) has developed a special surface finishing process which can replace the previously conventional thermal-hardening process for flat glass.

Thanks to this process, cost of around five Eurocents per watt can be saved, and in addition, a higher consistency achieved says Hessenkämper. “We are reducing the spontaneous breakage problem.”

Another approach aimed at reducing costs is offered by so-called alumino-silicate glass. Hessenkämper added that it can be obtained cost effectively from residual materials such as industrial slay, and compared to the previously used raw glass, offers the advantage of coating at high temperatures. “With thin-film modules this enables higher deposition rates and up to 25% higher efficiency,” explained Hessenkämper. In this connection for example, the efficiency of panels on a copper, indium, gallium and selenium (CIS) basis can be increased from the current level of 13 to 16%. This corresponds to the current efficiency level of crystalline silicon modules.

### New approaches in the glass sector

In a few years, small rolling glass factories integrated in module production could come onto the market, avoiding long transportation routes and glass breakage thus saving logistics costs. Rolled glass specialist Fickert + Winterling from Marktredwitz in Upper Franconia is planning to open a glass factory by 2015, which, with daily production of 30 to 50 tonnes, is much smaller than conventional glass factories. The company is currently developing this factory in cooperation with other glass specialists within the framework of the Solarvis network. “We believe that an in-house solution for module manufacturers can be an interesting one”, says Werner Haag, Head of Development at Fickert + Winterling.

This view is also shared by glass expert Hessenkämper: previously the module manufacturers obtained their ultra-white supporting and covering glass from production lines or finishing facilities, which are often many hundreds of kilometres away from their production locations. Hessenkämper estimates that three quarters of solar glass costs are accounted for by transport and finishing. At 10 Euros per square metre, the going price for the material, that is nevertheless 7.50 Euro. At the International Trade Fair for Solar Production Equipment, solarpeq, and the parallel event glasstec, the leading world fair for the glass industry, from 23 to 26 October 2012 in Düsseldorf, manufacturers can obtain an impression of the innovations and visions presented by the glass producers. In addition,



# PVsolar

on 22 and 23 October at the Exhibition Centre, the "solar meets glass" conference will be held, concentrating on the interface themes of the glass and solar energy industry and concerning itself among others with the issue of costs.

Until solutions such as the "Mini-glass factory" become standard features, the industry is banking on clear-cut innovations. The East German solar glass manufacturer F-Glass, a joint venture between Interpane and the Dutch company Scheuten, is for example now offering float glass, which with a thickness of two mm, is more than one mm thinner than conventional solar glass. "In taking this approach, we are reducing the price per unit and enabling module manufacturers to develop new products," said F-Glass sales and marketing manager Thomas Keyser. In this connection, thanks to the thinner panes, glass-glass modules could be

produced, which are more robust and have a longer life-cycle than conventional glass film modules. "This will enable manufacturers to become the technology leaders," said Keyser.

In addition to other material savings, F-Glass will also be working on higher throughputs in glass production as well as on consistent logistical improvements. "We can facilitate the ordering logistics for customers by handling their material planning." As a result, F-Glass can avoid high warehouse stock levels and reduce costs, promises Keyser. In autumn, in Düsseldorf, solarpeq and glasstec will clearly show that it would be almost negligent to solely rely on the increased efficiency of cells and modules when it comes to further cost reductions. Solar energy can still become much more affordable also through innovations in the solar glass sector.



Future product: Module productions are becoming increasingly efficient. As a result, photovoltaics are rapidly approaching competitiveness. (Photo: Centrosolar)



In the solar energy laboratory, the efficiency potential of photo-voltaic cells is far from exhausted. Researchers are working intensively on new concepts. (Photo: DuPont)



Fast enough? Even solar technology engineers can reduce costs – by providing more efficiency for rooftop installations in the shortest time. (Photo: Bosch)



Quality control: high-quality white glass is indispensable when it comes to high-performance solar modules. (Photo: Bosch)