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Markets & Trends

Southeast Asia: Thailand leads the way, and a number of new markets emerge. Policy is key. *Page 22*

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Solar seas: Solar has long been used in sailing circles, but commercial craft are turning to PV. *Page 100*

Industry & Suppliers

German equipment suppliers: New lines deliver demand, but challenges remain for German firms. *Page 82*

pv magazine

PHOTOVOLTAIC MARKETS & TECHNOLOGY

30 TECHNOLOGY HIGHLIGHTS

3 AWARD WINNERS • 5 FINALISTS

Image: Harald Schütt

For this, the SNEC edition of **pv magazine**, we are encouraging you to be a Solar Superhero. There are heroes throughout the issue and amongst us.

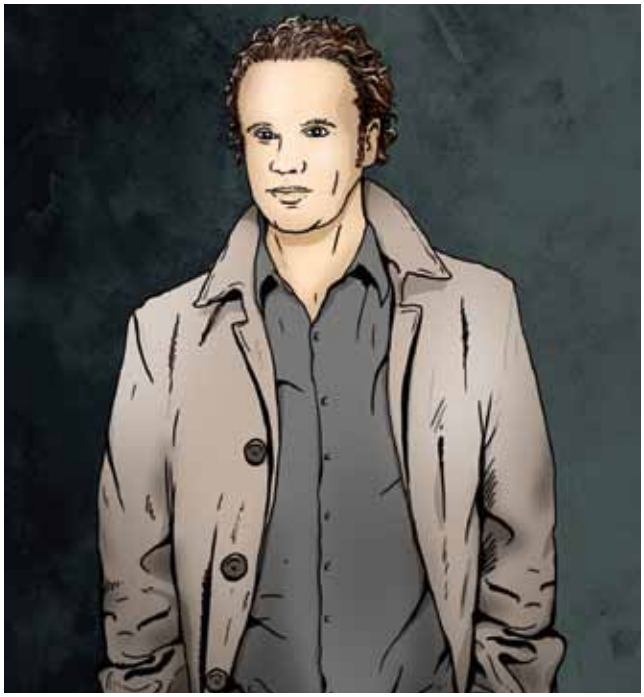

Illustration: pv magazine/Stefan Lochmann

Super technology for a super industry

It grew with alarming alacrity, slipped, staggered, and failed. The rise and fall of SunEdison, with the company filing for bankruptcy last month, was intriguing to watch. The irony of SunEdison's official bankruptcy filing coming only one week after coal giant Peabody went the same way was lost on few. While overreach and an aggressive expansion strategy underpinned both SunEdison's and Peabody's failures, the two companies were at opposite ends of an energy tug of war.

SunEdison, riding high on bullish market valuation and 'buy' ratings from analysts, had embarked on a multifaceted expansion plan, launching its TerraForm Power in a move that seemed an innovation set to deliver value long term and ongoing possibilities for solar project developers. SunEdison's failure (p. 6) has not only raised questions about yieldcos for solar projects, but about the PV project business more generally.

Peabody had fatally scaled up its production in anticipation of ever-growing demand from China to feed the country's steel mills, and for electricity supply. This demand, as has been well documented, has not transpired and in many ways Peabody is finding itself on the wrong side of history. But the 'buy' sentiment that emboldened SunEdison was also informed by the very same macro trend: the transition away from polluting fossils like coal and towards clean technology like PV.

China is playing a crucial role in this energy shift, as it did with Peabody's fate. The country will be very much in focus within this month, with the 10th SNEC conference and trade show taking place in Shanghai. SNEC will have an increased number of halls, and what is already the world's biggest PV trade show will tap into and showcase the booming solar sentiment in China today. With NEA figures revealing more than 7 GW of PV installed in China in Q1 of this year, China is delivering scale to the PV project sector as only China can (pp. 8 – 9).

The country's manufacturing segment has also profoundly affected the solar landscape in recent years and will be on display in all of its forms at the SNEC show. With leading Chinese manufacturers expanding their operations both at home and in Southeast Asia (pp. 70 – 73), new opportunities have emerged for PV capital equipment suppliers. While this will deliver orders to foreign equipment makers, such as the formerly world-leading Germans (pp. 82 – 85), the fast-rising Chinese technology suppliers are capturing market share and will be well worth investigation at this year's SNEC.

And the technology being delivered by PV equipment and production material suppliers is in sharp focus in this edition. The second edition of **pv magazine**'s Technology Highlights (pp. 50 – 69) feature brings together 38 outstanding entries. For the first time, a jury of industry experts have selected two outright award winners, and one "technology to watch" from a pool of eight finalists, and produced a ranking of the remaining 30 technology entrants.

Congratulations to Meyer Burger, Eternal Sun and DSM for rising to the surface in 2016's Technology Highlights awards. We hope you enjoy reading about the innovations on display in the 20 page feature, while bearing in mind that it is precisely these incremental and step change pieces of technology that will keep PV on its march towards ever-increasing competitiveness; a march that promises to bring many more coal giants to their knees.

Sound like fighting talk? That's because super solar requires super technology, and a few Superheroes (pp. 42 – 48) to lend a hand along the way.

Jonathan Gifford
Editor in Chief

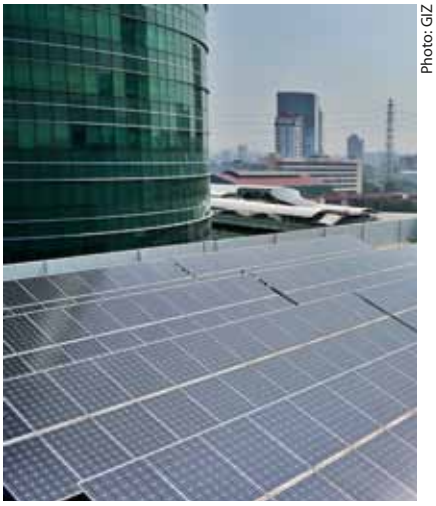

Photo: GIZ

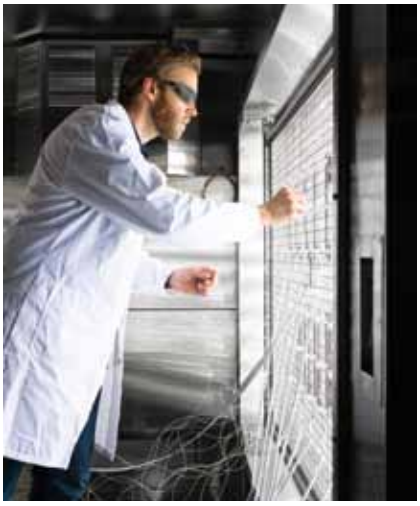

Photo: Eternal Sun

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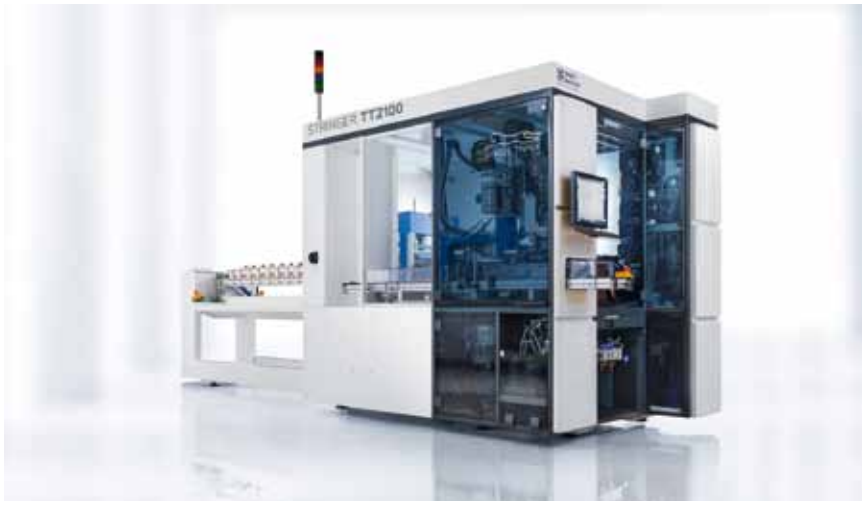

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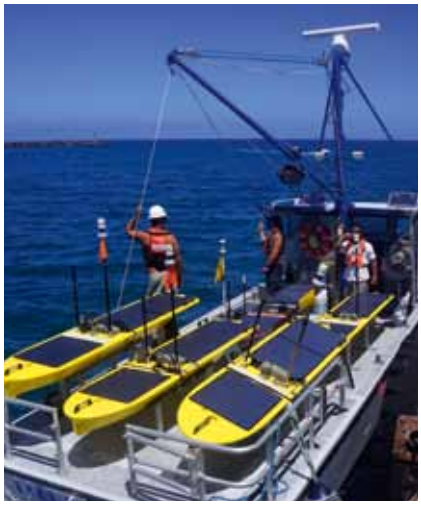

Photo: Liquid Robotics

Industry & Suppliers

Applications & Installations

Storage & Smart Grids

Service

Photo: Coveme

Luigi Marras is Head of Innovation at Coveme, a role that involves the identification of short and long-term new business opportunities driven by market trends and technology innovations.

"Quality is the absence of defects"

Quality, innovation and sustainability in the backsheet market: pv magazine talks with Luigi Marras of Coveme to discuss recent trends in the backsheet industy, including geographical preferences, quality development and pioneering back contact cells.

pv magazine: Coveme has been doing PV backsheets for 20 years. How has your approach changed during this time?

Luigi Marras: Being innovative permitted Coveme to establish its leadership position. In order to be innovative it is not necessary to invent something revolutionary, but to be able to understand the needs of the market. Since the market changes, we were always able to change accordingly, by offering new products and adapting our technologies, our structure, and our approach to the customers.

We started by offering Tedlar-based backsheets, then developed a PET-based backsheet, because the market was asking for something different to Tedlar. We focused all our strategies on polyester-based backsheets, by working with suppliers and developing new materials resistant to hydrolysis and UV. Our strategies have always been focused on marketing PET-based backsheets, by adapting our production technology, our bill of materials, and the quality of our backsheet to the requirements of the market.

When there was a need for higher production capacity, we added new and improved lines in Europe, and moved to China before the market did. We focused on service to the customer and on cost reduction by keeping a high ratio of quality versus cost for our PET-based backsheet.

The market is moving towards higher power output, and we recently developed solutions for 1,500 VDC systems, high reflectance, high water vapor barrier for moisture sensitive cells (thin film, HJT), and have pioneered solutions for back contact cells through our brand EBfoil.

Why was it important for Coveme to develop manufacturing in China?

If you want to sell something in China, you need to be there. The Chinese plant utilizes state of the art technology and the best practice in quality, combining both high efficiency with quality and flexibility.

We are now able to offer top quality backsheets in time all over the world, and we see that there will be some geographical movement and the need for shorter supply chains. We will need to stay very close to the market.

We have noted that different backsheet materials are dominant in China versus Europe. Why are there differing preferences in these markets?

The reasons are mainly technical, but not only. There are many different types of backsheets. The market is growing with newcomers and established companies need to differentiate their offer. We are not worried about this but happy, because it pushes competition and innovation, and increases the level of global knowledge.

We are convinced that backsheets based on our PET films offer the best performance and cost balance, compared to the top class products including those that contain fluorine. Some markets are more influenced by costs, some by technical performance, some from political influence. Additionally, decision-makers and decision processes can vary from continent to continent, and country to country. The bill of materials can be decided by module manufacturers, installers, EPCs and financial funds.

Technically speaking, the most difficult thing is to make people understand that PET films are a huge family of products that can have different performance.

What are the differentiating factors in backsheet quality?
Quality means a lot of things. We think the differentiating factors are the performance (primarily insulation and environmental resistance), and the ability to guarantee them at the right cost. An important differentiating factor in quality is the assurance that the performance is maintained in each delivered square meter of material, especially when you make a volume of more than five million square meters per month. This is possible thanks to our production plants. We have new sophisticated technologies, which permit us to have high volume and large-scale volume with strong attention to deliver exactly what we sell. Quality is the absence of defects.

Can you talk about end of life issues with backsheets, and particularly fluoropolymer vs. non-fluoropolymer backsheets?
The issue of end of life for PV panels is very important, because of its direct impact on costs and the environment. We have estimated that there is nearly one million [metric] tons of backsheets globally in the field that will have to be gradually taken back. Considering the growing annual installation forecast for the near future, this gives you an idea of the problem. What will be taken back in 20 years is designed now. So if, from one side, we need to work on recycling processes with a longer time line, we need to understand the environmental impacts of different materials and work on the design and the bill of material by choosing those that can permit the least impact possible. At this stage, there are only a few laws.
An important step has been made by one important regulation in Europe, the WEEE Directive, through which, from 2014, all installers and manufacturers are obliged to be responsible and pay for the disposal of PV modules. That includes backsheets.
The environmental impact on end of life PV modules is particularly important for backsheets, which at the moment are not recyclable. There is no technology available on the market that permits the people who take back PV modules to reuse or recycle a backsheet. The only options are landfill or, in case of best practice, energy recovery through incineration.

What are the factors that inspired Coveme to get into the market for backsheets for back contact cell technology with the EBfoil line? Can you talk about this market?
We started as a pioneer. Back contact cells were promising higher efficiency and high performance. But they only offer the best of their possibility at the module level, when cells are integrated. We understood there would be a new run for high-efficiency panels and we decided to invest in developing a breakthrough technology that can bring the benefits of back contact cells to its maximum. This means new equipment and a radical change, but also risks and investment. The market situation was not good for new equipment, due to overcapacity. That's why the market did not boom, but this was considered in our strategies. This permitted us to be a first mover, and to develop production capacity and validated product. Things are now changing. We see a renewed rush for higher efficiency and power output driving decision makers when installing new lines.
We are enthusiastic about the development we have with EBfoil and the demands for it. It will still take a while to get a high share, but we see an even more bright future considering all the most promising technologies for high-efficiency (PERC, HJT, IBC …) are all compatible with back contact. Back contact backsheets will further increase efficiency and output when they make the step from cell to module. ◆

Interview by Christian Roselund

Photo: Coveme

With production facilities in China and Italy, Coveme believes it is well situated to supply global module production.