



Markets & Trends

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Smart power plants: How intelligent software and hardware controls some of China's largest PV plants. *Page 50*



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pv magazine

PHOTOVOLTAIC MARKETS & TECHNOLOGY

Supersized solar

Bigger, smarter, lower cost and higher yield: pushing the boundaries of PV power plants. *Pages 18-22, 32-41, 50-60*





pV magazine's Jonathan Gifford and Andrea Jeremias with some solar engineers of the future in Istanbul, at the Solarex trade show.

Still a place for going big

It is the season for records. With spring having sprung in the northern hemisphere, the past few weeks have repeatedly shattered records for solar electricity being fed into Germany's grid. With its 38.5 GW of installed capacity, each time a high-pressure weather system moves into place over central Europe, Germany's electricity network is on the receiving end of a flood of solar power. And the lights stay on.

Only weeks ago Germany's grid also survived the country's first eclipse of its solar (and wind) powered age. During the partial solar eclipse, Germany's electricity supply from solar dropped by 15 GW, requiring a range of alternative power sources from thermal, demand response and pumped hydro to kick in to make up the shortfall. Then, as the eclipse passed, the solar rushing back had to be actively balanced.

These fluctuations and those caused by a range of random and expected weather events prove challenging for grid operators, and backup capacity by thermal sources, generally coal and gas, is still required at present. Excellent weather data is also vital, and monitoring equipment at solar parks crucial, as data becomes king in this heavily renewable grid.

"Our job has become much more complex," Gunter Scheibner told Bloomberg in an interview from the 50Hertz Transmission control center outside Berlin, in one of Germany's four main grid operators. "It's not an easy mission, and it will cost money. But if you are doing it consciously, then it will be doable. We have already come so far."

And how far Germany's solar industry has come, too. It is clear that recent years have not been a particularly happy time, with installations slumping as the government has actively sought to cool the market, but surviving German companies are back with some success on the global stage.

The ability to quickly and skillfully deploy utility-scale solar has been one of the key skills the German industry has devel-

oped, and a healthy large-scale sector was a big driver of economies of scale and price declines from which the entire industry has benefited.

In this edition of **pV magazine** we take the temperature of the PV power plant sector, addressing a range of global markets, applications and enabling technologies. While distributed generation (DG) may prove to be a better fit for PV in the long run, **pV magazine** finds a large-scale sector still with an important role to play and much remaining to be achieved in the years to come.

On to the emerging MENAT region, where Turkey appears finally to be delivering on its promise (pp. 22–25) and Egypt's market is heading in the right direction. In Asia, Indonesia's many islands (pp. 26–29) are proving a good fit for PV, while island powerhouse Japan (pp. 32–35) is still driving a significant proportion of mega solar. Australia too might finally see some policy roadblocks removed (pp. 36–39) – a 2 GW multi-stage project is even in the works (pp. 40–41). Although China continues to push DG despite strong headwinds, we find smart PV power plants being deployed (pp. 50–53), and on the technology front, the trend toward three-phase string inverters at large scale is also noteworthy (pp. 54–57).

In the U.S., where prices for PPAs are hitting new lows, we find a market maturing beyond Renewable Portfolio Standards (pp. 60–61) and American Indian communities deploying PV for their energy needs (pp. 64–66). It is also hard to ignore Europe's largest PV power plant, in Cestas, France, which is taking shape thanks to innovative installation robots (pp. 62–63).

Big PV is an important part of the industry's heritage, and as the market matures and enters into a new phase, there are plenty of signs that it will continue to have a strong future.

Jonathan Gifford
Editor in chief



Photo: Huawei



Photo: Jeda Villa Bali

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China is pioneering a new approach to large-scale solar, rooted in intelligent controls.

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Hope for a solar spring is eternal in Indonesia, where conditions are good but potential remains cloudy.

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Photo: Jinko Solar



Photo: Michael Tapp/Flickr

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pv magazine's annual cell manufacturer ranking finds a market that is managing to grow despite ongoing international trade disputes. Technologies for high efficiencies are beginning to cascade throughout the industry.

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Photo: Solar Choice

Angus Gemmell is a Sydney barrister specializing in defamation law. After concluding his law degree at UNSW and working as a solicitor in Canberra, Angus achieved the highest score in the 1999 NSW Bar Exams, for which he was presented with the "Award of Robes" by the NSW Chief Justice. In 2008 he turned his interest in renewable energy into a career by founding solar brokerage and developer Solar Choice.

"Large-scale solar is on the right side of history"

Australia: Although below expectations when Australia's Renewable Energy Target totaled 41 GWh, the market for PV power plants may just to burst back to life. While some, such as the Australian Solar Council, believe that the proposed compromise position of a reduced 33.5 GWh target will result in limited opportunities for PV, others like Angus Gemmell beg to differ. The Solar Choice MD spoke to **pv magazine** about this and his highly ambitious 2 GW Bulli Creek plans.

Now that there looks like there may be some resolution regarding the RET, what do you make of the prospects for large-scale PV through 2020?

I think the prospects now, towards the end of Q1 2015, are substantially better than they were for large-scale solar one year ago. We're certainly on the cusp of an outcome at long last as to the renewable energy target within the federal landscape.

During the last 18 months the industry has been in a lull, but in that time large-scale solar has caught up by a considerable measure to large-scale wind in terms of both the price points we can offer for PPAs, and also the value adds we can offer to large energy retailers for those PPAs.

The value adds are principally three things: reliability, peak pricing compatibility, and community support in rural and regional Australia. This all stands large-scale solar in good stead in the short term, and even better stead in the medium term.

What do you expect in terms of capacity for large-scale solar under the reduced 23.5 GWh RET?

If the RET had remained unchanged, there would be approximately 8 GWp of renewables to be built in Australia by 2020. At around 32 TWh that figure comes down to roughly around 5 GWp of large-scale wind and solar. As to how that is going to be apportioned, at least at this stage there is no carve out for wind or solar – that has been an option that has been floated in the negotiation process [between the Coalition government and the Labor opposition].

But at this stage there is no carve out in any direction and it will be a battle of the PPAs between the two industries to see who can show the most value.

In the solar world we have seen utility-scale projects sign PPAs for something like US\$0.06/W for a 20 year PPA, particularly the DEWA auction that AQUA was awarded. What PPA would you be willing to sign in Australia?

In terms of duration we would be looking for something in between 10 to 15 years and, in terms of price, that's a closely guarded secret at the moment because we can't give that edge away. But we feel that we would be able to design PPAs that would be as competitive, if not more competitive, than wind on price, in the vicinity of something like 200 to 500 MW tranches.

Is the price in the ballpark of the DEWA figure?

That price is just not possible in Australia because of the high cost of labor. Australia has a very powerful trade union movement and we're unable to access those price points that can be accessed around Dubai where there is cheap labor, mostly provided by Nepalese workers. But even so I think as an industry we would be looking at ways we can employ things like the robotic rollout of projects to try to achieve those price points in the medium term. In the short term we will be striving to be south of AU\$0.10/kWh (US\$0.08), but as to where exactly we fall in that realm, we need to keep that confidential at this stage.

In regards to the financing side of things, what type of appetite do Australian banks have for the development of PV power plants?

The Australian banks will take longer to get on board compared to how North American or European banks will act. We are anticipating our funding for the first stages of these projects to predominately be from overseas investors. The reason for this is

that Australian banks still have another one or two years' learning curve before they are 100% comfortable with the process.

But do you anticipate the Australian banks getting involved as minor partners in projects in the near term, just so they can become familiar with the process?

We would like to bring one or two along on the journey because ultimately we would prefer to have Australian banks funding these projects. I know they certainly have the appetite for renewable energy projects.

Your proposed 2 GW multi-stage Bulli Creek solar project has certainly attracted a lot of attention. I know that getting projects to regulatory and local government approval stages certainly takes some time and money. Is there a danger that in this instance the case has been burned because of the reduced RET situation?

There is a risk but it is one that Solar Choice is prepared to take and we maintain the view that large-scale solar in Australia is on the right side of history: It is a matter not of *if* these projects are going to be built, but *when*.

So we feel that even if it does take some time, all the work we are doing in strategically locating our site close to the major transmission loads in the sunniest parts of the country, whether that work will be made redundant, will ultimately steer Australia towards visionary large-scale PV projects. We have abundant space, plenty of sunshine, the longest contiguous grid on the planet, and very modern infrastructure. We should be heading

down this track, and so we view the lull in activity more as an opportunity rather than as a reason to do nothing.

As you say though, Bulli Creek is a remote spot. Why on earth is there so much transmission capacity right out in the middle of nowhere?

Because we are located out by the 330 kV substation, which is on the main arterial connector that shunts power between NSW and QLD, so we are right on the spine of the national grid, west of the great divide.

If you follow the transmission network around the country, there are actually surprisingly few locations where there is everything aligning at once for such a site. There are plenty of large transmission nodes by the urban centers but then you have to aggregate hundreds of landowners to get scale – which won't work. The ones west of the Great Dividing Range are in forest or in steep country so they are not suitable and to connect into the transmission network you can't key into the grid, you have to plug into an existing node, so you don't run the risk of tripping half of Australia out! So having all of those circumstances aligning at once is rare.

Was it a 'eureka moment' when you found the Bulli Creek site?

Almost, yes. I remember taking a deep breath when I hit send on lodging the town planning report. At the same time, though, it was exhilarating. ♦

Interview by Jonathan Gifford

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