Climate Spectator

By Giles Parkinson on 4 June 2012

If you want to get a glimpse of how the energy profiles of many major economies will evolve in coming years, then the energy production data from Germany for the month of May is not a bad place to start.

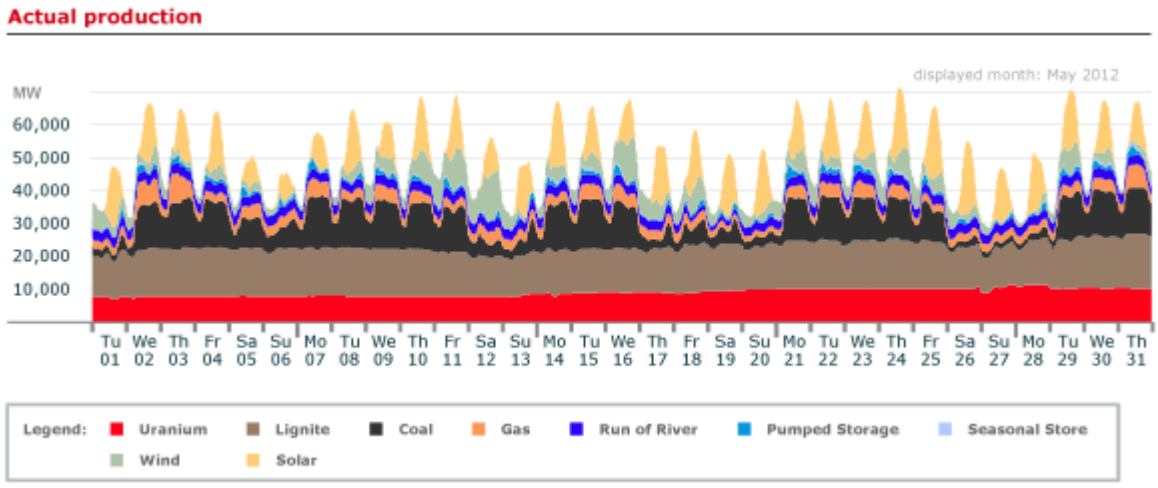
Below are a series of graphics that will be presented at the Australian-German solar forum in Berlin this week by Dr Martin Green, the solar cell pioneer and head of the school of photovoltaics at the UNSW, and Dr Bruno Burger from the Fraunhofer Institute for Solar Energy Systems in Frieburg.

The first is the most dramatic. It illustrates the growing impact of renewables on the German electricity grid in the month of May just past. It is based on actual production data supplied by the local market. Although much was made by the record 20GW of capacity from solar PV on Friday, May 26, and the 22GW set the next day, the graph makes clear that solar was a major contributor for the entire month.

Germany, of course, has more PV (27GW) installed than the rest of the world combined. Dr Green, however, thinks that this graph will soon be repeated in many other energy markets as solar PV continues its rapid cost decline and its rapid deployment.

Australia has just 1.5GW of solar PV installed, and the technology is barely discernible on the National Electricity Market. But based on the forecasts released by the Australian Energy Market Operator last week, for up to 18GW of rooftop PV by 2031 (not including utility-scale solar PV or solar thermal), then that graph could look even more dramatic on Australia's national Electricity Market – particularly considering the size of Australia's grid, and the fact that our country enjoys twice as good solar resources as Germany.

And as AEMO pointed out, that amount of rooftop solar will not be deployed because of huge government subsidies, or even any at all. It will be deployed because solar PV is emerging as a cheaper source of energy at the socket than grid-based power, and will continue to do so as solar PV prices fall, grid-prices increase, and new financing methods are introduced to make solar PV more widely available.



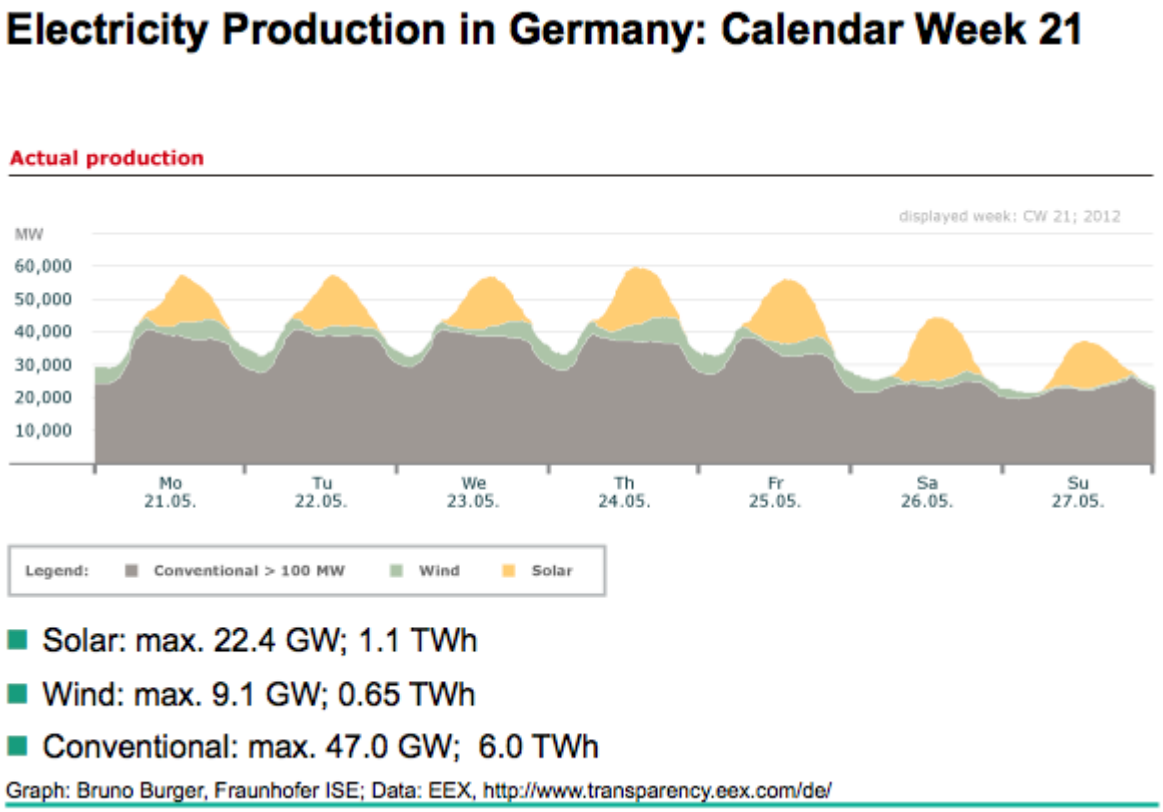
This next graph (below) shows the last week of May in a bit more detail. Those peaks now occupied by solar are what the gas-fired generators would normally expect to occupy. Not only is solar muscling these generators out of the system, they are also causing a significant reduction in wholesale prices – the merit order effect.

According to energy analysts Platts, wholesale energy prices in Germany started falling dramatically on Friday as the amount of solar PV peaked at over 22GW. And on the weekend, when solar accounted for a massive 40 per cent of the nation's electricity production at noon, wholesale prices were €4 (or nearly 15 per cent) below the previous weekend's price, despite more energy being consumed. On the last Saturday and Sunday of the month, the gas plants hardly got a guernsey.

But while this is seen by the solar industry as a sign of progress, it poses a major problem for the government and energy authorities. Gas is needed as the most flexible fuel to respond to the ebb and flow of renewables, but it is being priced out of the market by nuclear and coal on one side, and by solar and wind on the other. The major energy utilities are closing some older gas plants and refusing to build others, forcing the German government to consider the introduction of capacity payments – essentially a subsidy to keep the gas plants open so they can respond as required. It also needs gas to replace the red line (nuclear) that will be removed by 2022, and fill in the gaps left by offshore wind and solar.

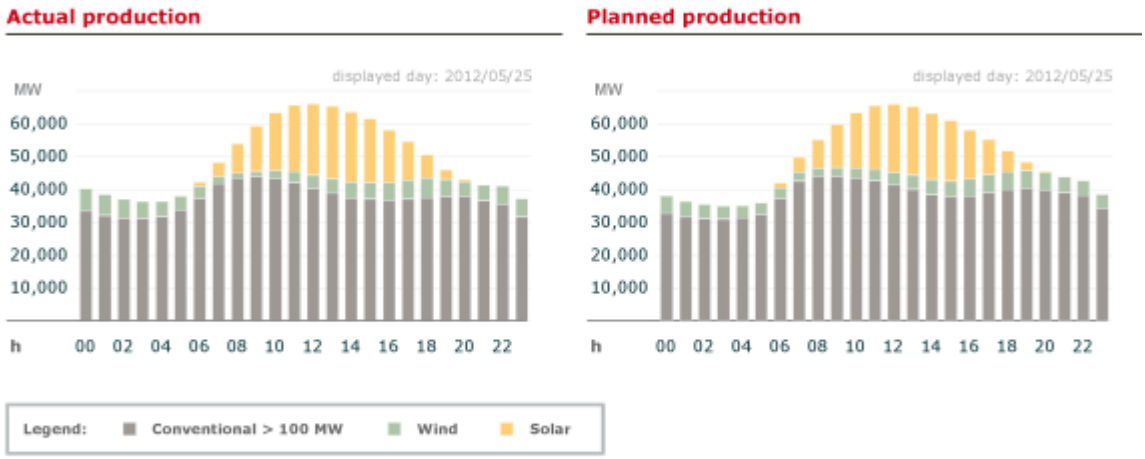
A similar scenario is expected to be played out in Australia. Indeed, to understand why Origin Energy is trying to dilute the renewable energy target, you only have to look at their generation portfolio. The company has invested heavily in gas – both combined cycle (baseload) and open cycle (peaking), but their economics are being squeezed because the brown coal generators are barely grazed by the carbon price, and lower overall demand and the impact of renewables will reduce the amount of energy it can produce in high-margin peak times.

It raises the prospect that not only will brown coal generators receive compensation for the carbon price, some will receive payments for closure, and gas plants may well in the future receive similar capacity payments to ensure they remain available as the merit order bites further into their revenue and margins. There must be some irony in the fact that subsidies to fossil fuel plants will need to continue long after the subsidies for renewables generation are wound down.



This graph below illustrates what happened with production on Friday, May 25, when solar PV production peaked at 22.4GW. In the heat of the day, when conventional power would normally count on increased production (and prices), they are effectively pushed aside by wind and solar which delivers electricity at a marginal cost of production of close to zero. (The merit order effect).

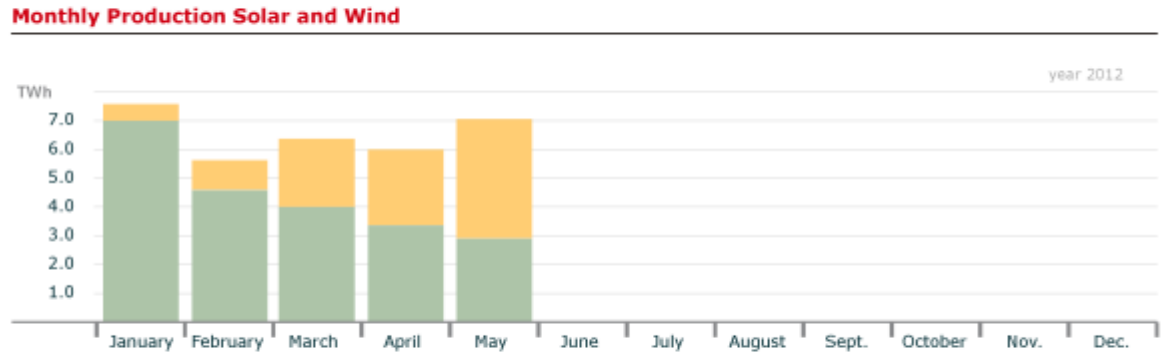
Electricity Production in Germany: Friday 25th of May 2012



- Solar: max. 22.4 GW; 189 GWh
- Wind: max. 7.0 GW; 108 GWh
- Conventional: max. 44.1 GW; 892 GWh

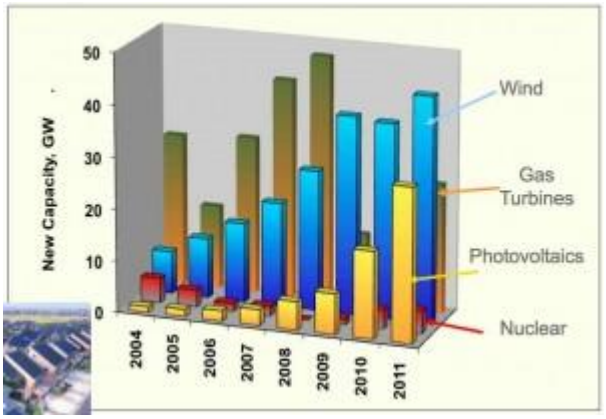
And here is an interesting graph (below) showing how wind and solar are working together. Indeed, according to these graphs, which show their combined production over the first four months of the year, including from the depths of winter, production is fairly constant. This is important, because when these two technologies are deployed on an even great scale, that balance could be crucial – some of the gaps will be bridged by storage, others by flexible production from gas plants. It also fits in with some of the work on 100 per cent renewable road maps done by UNSW and the solar thermal developer David Mills.

Monthly Production Solar and Wind



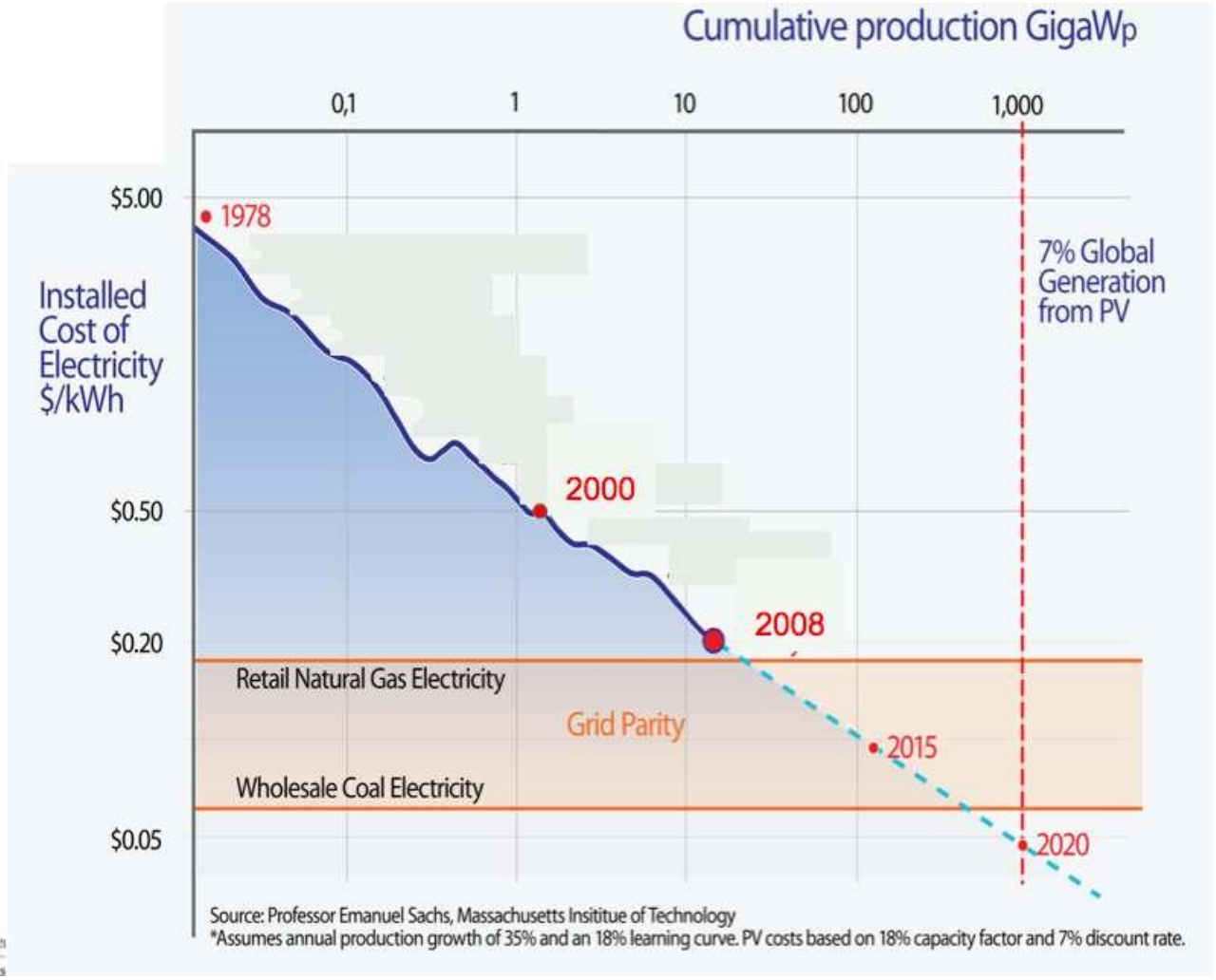
- The maximal sum of solar and wind production was 7,6 TWh in January 2012
- The minimal sum was 5,6 TWh in February 2012

Here is another graph (below) that highlights the changing face of energy grids worldwide, and highlights the new capacity that has been installed across the world in the last seven years. Wind and solar dominate, and their deployment is expected to accelerate dramatically in coming years.



The next graph underlines exactly where we are headed – noting that solar PV is already competitive with gas prices and is heading towards wholesale coal prices – which it will better by the end of the decade. This is consistent with predictions from governments in the US, China and India.

Although this prediction was made by Professor Emanuel Sachs of the Massachusetts Institute of Technology in 2009, Green says it may actually be a conservative forecast. That's because Sachs predicted around 150GW of PV installed around the globe by 2015. But the European Photovoltaic Industry Association recently predicted that the world was now headed for between 169GW and 266GW by 2015. "EPIA has been notoriously conservative in the past, so Sachs' estimate of 1,000 GW by 2020 and 7 per cent is very reasonable on this basis," says Green. "I think many countries grid profile will look like Germany's by this time."



Yingli's hockey stick forecasts

It is generally agreed that global solar PV manufacturers are facing a tough time as they deal with the problems of overcapacity and wait for the industry to adjust to a world of declining tariffs. But what happens next?

An interesting perspective was provided in the results of Yingli Solar, one of the biggest Chinese solar module manufacturers, which said that solar PV had reached a "turning point" around the world and predicted that its growth would surge, particularly in areas with excellent solar resources. For Yingli, this meant parts of the US, but also Latin American countries such as Mexico, Brazil, Chile, and Peru – in both the utility-scale and the rooftop marketplaces.

Robert Petrina, Yingli's head in the Americas, predicted "hockey stick" growth once the "proverbial grid parity" is reached. "You go to conferences in these different regions and nobody talks about incentives or feed in tariffs," he told analysts on a conference call. "They talk about policy frameworks that can enable the development of solar in a way that's efficient, with no significant cost. They are small projects, but there are some very substantial ones in the queue as well."