Rooftop solar PV nears grid parity – without subsidies

By J Ward, Powermode.

Renewable energy sources include the sun, wind, rain, tides, waves and geothermal heat. They account for around 16% of the energy consumption of the globe. As far as electric power generation is concerned, other than hydroelectricity, only a small percentage of the contribution - less than 3% - is from the sun.

Nevertheless, solar energy is one of the most promising contributors, as technology is improving at a rapid pace and prices for solar solutions are falling dramatically.

Passive... Active

Solar technologies are broadly characterised as ‘passive’ or ‘active’ depending on the way they capture, convert and distribute solar energy. Passive solar techniques include orienting a building towards the sun, selecting materials with favourable thermal mass or light dispersing properties or designing spaces that naturally circulate air.

Active solar techniques include the use of photovoltaic (PV) panels and industrial-scale solar thermal collectors to harness the energy.

The solar PV industry, in particular, has witnessed a number of dynamic changes in the last 12 to 18 months. Because solar panel or 'module' prices have fallen significantly, solar PV technologies now present a potentially disruptive change in the energy scenario.

Transition to sustainable energy economy

South Africans can expect solar power to make a meaningful and substantive contribution to the country’s eventual transition to a sustainable energy economy, with all its citizens having access to a reliable source of electricity.

The seeds have been sown and private investments in solar PV are ramping up. What is needed now is for the South African government to tend these ‘green shoots’ and put significant national resources behind them.

However, while the world has steadily increased its embrace of renewable and sustainable energy sources, South Africa has lagged behind, hampered by a number of artificial barriers. These include the authorities dragging their heels on regulatory issues, such as net metering and feed-in tariffs which would boost renewable energy commercialisation and open up the solar market to more players.

Other countries, not so hamstrung, have readily embraced solar energy. India, for example, has increased its solar capacity from less than 20 megawatts to more than one gigawatt in the last two years, while Australia has seen growth in installed PV capacity increase more than ten-fold since 2010.

Germany leads the way with a solar PV capacity (as of December last year) of more than 32,3 gigawatts. Germany’s goal is to produce 35% of its electricity from renewable sources by 2020 and 100% by 2050. From a global perspective, renewable power generation technologies account for around half of all new large-scale industrial power generation capacity additions.

Solar landscape changing

In this light, it is clear that the solar landscape is changing. Today’s solar PV power generation technologies are increasingly cost-competitive and they are now seen, from an economic standpoint, as viable options for off-grid electrification in certain circumstances.

This rapid deployment of solar PV installations has had a significant impact on costs. For instance, for every doubling of the installed capacity of solar PV systems, module costs decrease by as much as 22%.

In the last two years alone PV module costs fell by around 60% to below one (US) dollar per watt. This is largely due to a massive increase in the world’s production of polycrystalline silicon - the key component in solar PV module construction. Up until 2006, there was a dearth of polysilicon material, with only a limited number of factories producing it. However, since 2011, with supplies entering the market from China, there is now an excess of production capacity.

In 2010, the globe’s total polysilicon production was 209 000 tons, with Chinese manufacturers accounting for around 30% of market share. With figures still to be confirmed, it is estimated that 2012 production was in the region of 330 000 tons – a 58% increase in 24 months. Reports indicate that a one billion dollar polysilicon plant is to be built in the Middle East, destined to become one of the biggest international suppliers of the material to the solar PV industry.

Market watchers predict that 2013 polysilicon production could top 350 000 tons with demand only reaching around 200 000 tons. They expect spot prices to fall by more than 50% during the course of this year as a result.

Renewable revolution

All this evidence is a sure sign that the renewable revolution is underway, gathering momentum and in the process of sustaining a virtuous circle of rapidly declining costs. As more installations spring up, so production increases and the price falls further.

In fact, renewables are becoming increasingly competitive with grid-supplied, utility power prices. In Germany the costs of installed rooftop systems fell by 65% between 2006 and 2012, making solar
PV competitive with current electricity tariffs in this country. In South Africa, with its high (and climbing) electricity costs, solar PV installations are rapidly gaining grid parity.

**Levelised cost of electricity**

In fact, the levelised cost of electricity (LCOE) of solar PV (the ratio of lifetime costs to lifetime electricity generation, both discounted back to a common year using a rate that reflects the average cost of capital) is declining to a point where it will soon be seen as the most economic solution for off-grid electrification and grid extension in most areas. There are four major components that largely determine the levelised cost of electricity for renewable power generation technologies – resource quality, equipment cost and performance, the balance of project costs, and the cost of capital.

Each can vary significantly between individual projects and countries. And each component can typically make a difference of a factor of two, in some cases even more.

In remote locations in South Africa, solar PV is already seen as the best option and if it is increasingly applied, it could help the country meet many of its economic and social development goals.

It is important to note that rooftop solar PV (and small wind generating) installations can provide new capacity without the need for additional transmission and distribution investments and therefore should not be directly compared with large utility-scale renewable solutions.

In this vein, solar PV can be significantly cheaper than (currently common) diesel-fired power generation used for base load power in areas characterised by poor or even non-existent infrastructure and where lengthy transport routes can increase the cost of diesel by 10% to 100%. Also finding increasing favour in these areas is the solar PV/diesel hybrid system - a solution pioneered in the mining industry.

Such a hybrid system typically supplies 40% of daytime energy demands using solar power, at the same time saving around an average of 35% to 40% of the fuel usage of traditional diesel-only generation. A key feature of solar PV/diesel hybrid systems is reduced downtime due to generator failures and subsequent repairs since the systems ensure that all the components are used efficiently at optimum rates. What is more, because diesel generators are used more often at minimum specified load, the power generation operation itself is much quieter and more eco-friendly.

Already, solar PV/diesel hybrid power generating systems with yearly yields of up to two gigawatt hours of solar energy have been commissioned worldwide, while solar PV marketplace penetration in the diesel base load generation arena is expected to reach 65% by 2015. To realise the most benefits from a solar/diesel hybrid system, the sizing of the various installations will need to be done on a case-by-case basis as every application will be different depending on specific load profiles, solar irradiation and generator setup, influencing the power yield/fuel saving calculation accordingly.

If these trends continue, solar energy grid parity with residential electricity tariffs could soon be the norm, rather than the exception. It is a target that is within sight in Spain, thanks - surprisingly - to the government cancelling financial support for large scale solar power plant developers and subsidies for commercial (and private) solar power users in the wake of the on-going crisis in Europe.

While it was a move that fuelled anger in the community, it also reportedly sparked a technological revolution within the country, creating an industry for solar PV solutions in which levelised solar power prices are envisioned to rival utility prices in the immediate future, dependent - let it be said - on efficiencies and technologies continuing to improve and the dynamic for increased solar penetration continuing to grow in step with rising electricity prices.

A similar scenario is playing out in Italy where it is reported that for small commercial enterprises that can achieve 50% or more self consumption, solar is now competitive with grid electricity in most parts of the country. A prominent European bank recently released a report saying that an ‘unsubsidised solar revolution’ is imminent. ‘Thanks to significant cost reductions and rising retail tariffs, households and commercial users are set to install solar systems to reduce electricity bills without any subsidies’, it confirmed.

**Conclusion**

In South Africa, solar PV has the advantage that, once grid parity is reached and the domestic installation market developed further, solar installations at public and private sector sites (factories, assembly plants, learning institutions) could be ramped up to meet government policy goals including electricity needs for informal settlements and disadvantaged communities. No other power generation technology shares this flexibility. In the short term however, the limiting factor in South Africa might not be cost, but rather the challenge of integrating private solar PV resources into the policy framework – if not the power grid itself.

---

About the author

Jack Ward is the managing director of Powermode, a leader in the field of advanced power provisioning systems for medium to large corporations. The company designs, supplies and commissions a broad spectrum of innovative, turnkey power protection, management and generating solutions. He has more than 35 years of experience in the IT, telecommunications and power protection industries throughout Africa in senior executive roles. Enquiries: Email garrethj@powermode.co.za.