

# Keep solar power green

Solar PV is more environment-friendly than other forms of power generation but there are problems that need attention, says MOHAN MENON and KANAN DUBAL

India has achieved substantial growth in its electricity generation capacity over the last decade, much of it through the addition of coal-based generation capacities. This trend is now being dramatically changed with the Government's thrust to promote renewable-based power generation to the level of 175 GW and even more. Not only would this be good for the country's energy security, it would also help India meet its climate commitments and Prime Minister Modi's vision of zero environmental effect in meeting India's ambitious development goals.

We are a tropical nation with generous sunshine through the year, India has pitched its renewable programme mainly on solar power. Revision of the targets in 2014 under National Solar Mission (NSM) from the previous level of 20 GW to 100 GW was the first big step. India's leadership of the International Solar Alliance (ISA) is another one. As a platform for over a hundred solar rich countries between Tropic of Cancer and Tropic of Capricorn, the ISA headquartered in India would add a further thrust to the renewable.

The Government's determination to make sure that electricity reaches to all unconnected areas by March 2019 would add a new aspect to the power sector landscape, including generation, transmission, and distribution. Providing power at affordable rates and with minimum impact to the environment is also a marked priority for the Government. The Electric Vehicles agenda of the Government would add to the need for clean and green electricity in increasing quantities.

The past one year has been particularly memorable for renewable energy as extremely low solar tariffs (₹2.44 per kWh achieved in May 2017) and wind tariffs (₹2.44 per kWh achieved in February 2018) were discovered. For the first time in history, more solar PV capacity was set up in 2017 than any other form of power generation. While solar tariff levels may have thereafter increased slightly, they have established a benchmark that offers direct competition to conventional forms of power. It is only the intermittency factor that holds it back from challenging the base load status of coal-based power.

The output gaps of solar PV caused by the non-availability of 24x7 sunlight would get filled by conventional power, especially coal-based capacity, for quite some time to come. This would be supplemented by a stronger transmission backbone, at least until bulk electricity storage becomes com-

mercially competitive. Solar PV is more environment-friendly than other forms of power generation but there are problems that need attention. One big concern around this massive production of solar energy is about what will happen to decommissioned solar panels at their end-of-life. While the production of solar energy is green, there is a well thought through and environment-friendly plan for end-of-life treatment of Solar PV panels and associated equipment?

## LACK OF REGULATIONS

It is evident that the Government and its key agencies are aware of the large amount of waste that would be generated by decommissioned Solar PV panels in future. The Solar Energy Corporation of India (SECI) and NTPC have incorporated clauses on waste handling in their contract conditions. But, there are some gaps that need to be plugged quickly.

Solar PV tenders issued by NTPC and SECI place the end-of-life responsibility on the Solar Power Developers as prescribed under the E-Waste Management Rules. But these Rules don't cover solar PV panels under their ambit and actually cover electronic waste from various other manufacturing processes and equipments. While it appears that there have been discussions within the Government around the necessity to include solar panels in the ambit of these Rules, nothing till date has materialised. This reason could be the warrantable life of currently sold PV panels is around 25 years and hence the repercussions of waste from used PV modules are not glaring presently. But on the one side, panels sold a few years ago had much lower life and on the other, there is the possibility of early failure on any panel which can happen due to many reasons like glass breakage, installation failures and backsheet related failures, like delamination and degradation.



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## WHY IS THIS ISSUE SO IMPORTANT

As the solar industry grows, so will the amount of PV waste generated from decommissioned PV panels. As per the report published by International

Energy Agency (IRENA), cumulative PV waste generated in India was between 1000-2500 metric tonne in 2016 which will probably rise to 50,000-320,000 metric tonne by 2030, and further culminating in 4.4-7.5 million metric tonne by 2050 as a result of the NSM. Thus it's imper-

ative to manage the disposal of PV waste that is generated at the end-of-life of these PV solar modules.

## INTERNATIONAL PRACTICES

The European Union is the only region that has formulated guidelines around waste generated from solar panels. The WEEE (Waste of Electric and Electronic Equipment) Directive places the onus on the manufacturer to responsibly collect back the solar modules and dispose it. As per the regulations, the collection, transport and treatment (recycling) of PV panels are regulated in every single EU country including setting minimum collection and recovery targets. Japan, as recently as December 2017 acknowledged the repercussions that the decommissioned solar panels could cause. The Japan Photovoltaic Energy Association (JPEA) voluntarily issued guidelines, which are not enforceable yet strongly recommended to the industry, on 'proper disposal' of used solar modules.

## WHAT COULD BE DONE

The first step could be to include solar PV panels in the existing e-waste management Rules so as to regulate its recycling. India is identified as one of the top five countries that will generate large volumes of end-of-life PV panels by the IRENA report, alongside China, USA, Japan and Germany and thus it's a pressing issue.

The three basic principles of waste management are — reduce, reuse and recycle. With the ambitious target set for solar energy, 'reduce' is a limited option linked to efficiency improvements that would bring down the number of panels per MW of output. Also, solar is expected to play an increasingly crucial role in reducing India's dependence on fossil fuels. So, we should focus on — reuse and recycle.

Another concern about solar panels is about the materials used in the solar panels which make recycling a challenge. A

2017 study by a US-based research and policy organisation in the field of clean energy warns that toxic waste from used solar panels now poses a global environmental threat due to the use of heavy metals, including lead, chromium, and cadmium. Looking at the amount of predicted PV waste, it's time that India builds and adequately regulates the PV recycling industry as not all the components of solar panels are made of biodegradable materials.

For solar power to be truly green, the producers/manufacturers must use greener and environmentally sustainable elements. These would call for better specifications on the one hand and the removal of restrictive aspects that may prevent better and cleaner components from replacing traditional ones. NTPC and SECI have taken a significantly positive step towards making PV cleaner in India by opening up the technical requirement of PV backsheet allowing equally performing but more sustainable backsheets to be used in the solar PV panels. This makes it a level playing field in the solar sector for all the industrial players in striving to attain what is best for India — environmentally, economically as well as technologically.

As the Prime Minister said very recently in his address at the World Sustainability Summit in Delhi, it's crucial that India ensures that sustainability is an essential aspect of all its endeavours in achieving economic progress. He reiterated his call for zero environmental effect of technology deployment. This calls for a close look at the use of the right materials, efficient design and operations and robust recycling programmes. Comprehensive regulations around the handling of solar e-waste generation would form part of this endeavor. As India moves forward in its determination to make power for all a reality, it must strive to keep the sources of power generation as clean as possible through the choice of appropriate technologies, whether these be in the use of renewable sources of energy or even in the cleaner use of conventional sources. While the government has taken a great step towards green energy, it should not get shortsighted. Even though the problems owing to heaps of decommissioned panels may aggravate only 5-10 years from now, it would be prudent to address the problem in its early stages rather than when we are already in the middle of it. The time for action is now!

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