

ducers anytime soon. There simply is not enough scale, investments in R&D, or any proprietary technology differentiation, Prabhu says. Right now, it is all about cost and making the numbers work for developers. Banks in India tell us that they are more quality conscious, but the government is not too concerned about that because they pay for what is produced.

The MNRE hopes to incentivize the creation of fully vertically-integrated, state-of-the-art solar PV manufacturing facilities in India. Its plan will involve encouraging development of world-class facilities by “addressing the issues of technology obsolescence and fragmented, small-scale operations that are the major challenges currently being faced by the domestic solar PV manufacturing industry in India”, said the MNRE. Some industry analysts worry that these proposals may only support the larger Firms that already have best in class facilities and a good brand presence. The vision is to build an infrastructure that is globally competitive and able to supply a vital component to India’s energy security. To achieve this, the MNRE is considering a study on the critical elements involved in the entire solar production chain, the optimum scale of operation, and the overall cost structure of such facilities. The proposal to ring-fence 7.5 GW of capacity for Indian producers feels protectionist, but if allied to a determined and holistic 10 -20 year technology and R&D road map, infrastructure upgrades, export potential, and job creation, then the industry’s longevity, competitiveness, and eventually profitability may well be assured. ♦ Ian Clover

**PERFORMANCE AND QUALITY DIFFERENTIATOR FOR INDIAN MANUFACTURERS**

With 500 MW of annual module capacity, Bangalore-based Emmvee has established itself as a module maker with a long track record and eye for quality. Around 85% of Emmvee’s annual production at present goes to Indian solar projects, with the vast majority being utility-scale arrays. Srinath T, Emmvee’s Technical Director who has been with the company since 2001, explains that a recent program of equipment upgrades has allowed the company to remain competitive.



*In 2016, Emmvee undertook a process of upgrading some of its key equipment. Why?*

**Srinath T:** We were producing a three-busbar cell configuration in our modules. But we noted that the market was shifting into four-busbar configurations. At the same time we had an issue with space [within the production hall]. So we were looking for equipment that could do four, five, or more busbars and would have a small footprint. We looked at many options and then we decided to go with M10 [Industries]. The M10 [stringing] tool can carry out four or five busbar stringing and it has a very high speed stringing capability. At the moment the [two] machines [at Emmvee] are running at around 5,000 cells/hour and they can be upgraded further to 5,300 cells/hour. In the original three-busbar tool, the stringing was carried out by a process that included the touching of the cells. Over a period of time we found that this wasn’t appropriate for the handling of cells, because it could introduce microcracks. The M10 machine has [non-contact] infrared soldering and so we now find that the soldering quality is much better.

*You also upgraded the laminators, why?*

We went for a multi-stack laminator because the production output from these machines is very high. We looked at different options and decided on the Berkeley laminator that has six chambers. So with two tools we can laminate 12 modules. This is able to handle all of the output

from the stringers.

*How do you perform quality control?*

At the same time [as the upgrades to the stringing and lamination] we introduced EL [electroluminescence] testing before and after lamination. There is an additional EL test [stage] before the modules are packed into boxes. We also introduced an automatic sorting of modules. All of this has given us much better control over quality and allowed us to ship to customers modules that are good quality, and we can ship faster than the customer benefits from better yield.

*How competitive is the Indian market for domestic manufacturers?*

The landscape is dominated by four big manufacturers and the total capacity, as I understand it, is around 5.5 GW. But most of the modules coming into India are coming from China.

*How difficult is it to compete with the Chinese producers?*

It is very challenging. There is no doubt about it.

*Is there a preference among some developers for India-made modules?*

No. There is no such preference.

*So what attracts your customers to Emmvee?*

People who are looking for a high quality and high performance module are the ones coming to us.

Interview by Jonathan Gifford

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