

Beware of turnkey thin films

Long live the turnkey thin-film model. The turnkey thin-film model is dead.

These were the contradicting messages two production equipment makers gave last month. While Germany's Manz Automation announced its entry into producing CIGS thin-film module lines on July 16, only 11 days later, US heavy-weight Applied Materials said it would limit sales of its silicon thin-film turnkey SunFab product to existing customers after not selling one single new device in 2 years – a move tantamount to throwing in the towel. One decision is an acceptance of how things are, the other wishful thinking of how things aren't.

Put simply, in today's PV world, there's obviously no space for expensive production lines that only lead to 6- to 7-percent efficient amorphous silicon (a-Si) modules produced by the bulk of Applied's clients. Nor is there a market for the slightly higher 8-percent efficient a-Si/ μ c-Si modules. On the other hand, the chances of Manz's CIGS turnkey line producing nearly 12-percent efficient modules would appear much better, in particular as its technology was licensed by Germany's Würth Solar, which has been producing such panels in a commercial 30 MW factory for years. But the likelihood is very small that Manz will succeed where Applied has failed – the truth is that most turnkey thin-film equipment manufacturers are stumbling along.

Applied's main problem was that its new line was far from ready when the company announced its market entry in September 2006. The semiconductor equipment giant simply underestimated the task. Its thinking? If it is possible to produce deposition machines for large LCD panels of over 5 m² for TV screens, it should be a piece of cake to modify such equipment to make silicon thin-film PV modules. It wasn't.

The company's idea of a thin-film factory »in a box« to undercut skyrocketing polysilicon-based product costs attracted a lot of attention at the time. But Applied, wanting too much too fast, should have waited till gaining experience on a full-scale module pilot line (the first one was only opened in China last October). This left its engineers constantly busy troubleshooting lines for nearly a dozen PV thin-film clients while trying to do their homework to meet a challenging roadmap – 10-percent efficient modules at production costs of \$1 per W by 2010.

It's obvious that Applied's current customers won't make the grade. Two have already filed for bankruptcy protection, among them Applied's poster child Sunfilm, which has the largest line and was the first to produce a-Si/ μ c-Si tandem modules. The fate of the others is not hard to imagine. At capital expenditures of an estimated \$3.25 per W, assuming a price of about \$130 million for a 40 MW a-Si line 3 years ago and a 5-year depreciation period, Applied's equipment



costs alone equal 65¢ per W. Competing against First Solar, with its module production cost of 76¢ per W, not to mention the leading integrated c-Si module manufacturers approaching costs of \$1 per W, is just not possible.

And as for Manz, despite its positive announcement, it is facing big challenges as well – its new CIGS turnkey factory, with a per-fab capacity of up to 120 MW, is still not yet ready for primetime. At a sales price of €150 million (\$183.7 million) for a big fab, plus a one-time licensing fee to deposition-equipment designer Würth Solar of €12 million (\$14.7 million), the initial cost for the line will be €1.35 (\$1.65) per W – and that doesn't even include construction outlays. Certainly, for Manz's initial lines, getting production costs below \$1 per W will be next to impossible.

Even if Manz's first line were sold and shipped in 2011, the customer's full production wouldn't start until late 2012 at the earliest – that's when Japanese CIGS module maker Solar Frontier plans to produce around 1 GW, a level at least over a dozen crystalline wafer-based module producers will easily achieve by then as well. With looming overcapacity and a potential slump in the event of a major market downturn, Manz could end up facing the same sales drought from which Applied Materials has been suffering. But as a much smaller company, the impact for Manz could be a lot worse.

The take-away? Even if CIGS seems to be the next big thing after the a-Si/ μ c-Si hype is over, customers should think twice about whether they really want to go for such thin-film turnkey lines: they're always expensive, and – unlike with wafer-based silicon cells or modules – the risk of failure is very high. Applied seems to have learned its lesson – it is now focusing on selling its wafer-based equipment.

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