



CONFERENCE PVCELLTECH

12-13 MARCH 2019 | PENANG, MALAYSIA

AGENDA



Morning Session 1: The cell production landscape in 2019: which technologies are really in mass production today?

- Opening talk from Finlay Colville, Head of Research, PV-Tech & Solar Media Ltd.: Cell production for 2019: technology offerings, company productivity, cell efficiencies and substrate types used
- Other speakers to include 2019 market-leaders in n-type and p-type wafer supply, and multi-GW cell producers shaping the industry today.

This session will set out exactly what cell technologies make up the 100GW-plus being manufactured in 2019. This will involve looking closely at wafer supply, in particular mono wafers for n-type and p-type cell production, in addition to cell capacities and utilizations across the different high-efficiency segments making up the industry today.

Information presented will clarify exactly how much cell production is coming from p-mono PERC, new n-type capacities across n-PERC and heterojunction lines in China. Part of this will include what is available today for mono cell producers (both n-type and p-type) and how mono wafer supply levels are currently playing a key role in mono cell production levels.

Morning Session 2: Keeping both multi and mono p-type cells competitive in the market

- Speakers to include leading companies that are setting the benchmarks for efficiency, yield and cost metrics at the 5-10 GW per annum production levels across both p-multi and p-mono variants.

During 2018, the PV industry has been equally supplied by multi and mono cell technologies, with mono set to be the market-leader in 2019. This contrasts hugely with the 70-80% market-share levels coming from p-type multi just a few years ago.

Both p-type mono and multi producers have been driving one another to increase cell efficiencies, where operating lines with improved yields, narrower distributions and lower production costs.

This session will hear from some of the multi-GW cell makers that have been instrumental in setting the benchmarks for cost/efficiency across both p-type mono and multi technologies.

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Afternoon Session 1: Passivated contacts: what is needed for this process flow to become a mainstream offering in the PV industry?

- Speakers to include leading research labs engaged in technology-transfer, materials/equipment suppliers currently assisting in cell line design and optimization, and cell producers already in mass production using passivated contacting.

The widespread roll-out of passivation layers on the rear side of solar cells (from p-type PERC, n-PERT and advanced HJT/IBC) has been instrumental to enable higher-efficiency process flow arrangements. While one of these is clearly the ability to access bifaciality, it has also stimulated production equipment upgrades to both improve passivation layer deposition, but also for passivated contacts, removing the need for laser openings on the rear layer stacks.

Moving to passivated contacts has, until now, been the domain of a small number of advanced n-type cell producers, but is currently being implemented by more mainstream segments of the cell production sector. Starting with n-PERT enhancements (potentially making this technology more differentiated and competitive with best-in-class p-mono PERC producers), the use of passivated contacts may soon see adoption across p-type cell producers.

This session will explain what passivated contacts are, where concepts such as TOPCon or poly-Si fit in, and what progress has been made so far to bring the upgrade technology to mass production. The presentations will also look at which equipment companies are best positioned to supply drop-in process tools, and what remaining challenges need to be overcome before passivated contacts become a standard, easily-adopted process flow stage for existing and new cell lines.

Afternoon Session 2: Heterojunction cell expansions: is 2019 to be a breakthrough year for Chinese HJT in multi-GW mass-production?

- Speakers will be from some of the leading Chinese companies that have recently ramped up GW-levels of HJT capacity during 2018, in addition to key equipment/materials suppliers and leading technology-transfer research institutes.

Investments into new heterojunction cell capacities in China can be considered among the most ambitious and disruptive technology threats to mainstream p-type offerings to the PV industry today. Furthermore, the potential performance levels have the scope to threaten existing premium n-type producers, including the only company that has a long track-record making heterojunction cells, Panasonic/Sanyo.

With many of the investments spanning the period 2017-2018, and lines being installed/qualified during the second half of 2018, it seems that 2019 will be the year when first mass-production results will be seen.

This session will focus on the companies seeking to drive new HJT production levels to the 5-GW-level in the next 12-18 months, what average cell efficiencies are coming out of mass production lines, utilization rates and production costs. The goal will be to determine how close these new entrants are to Panasonic-performance and best-in-class China p-type cost, throughput and utilization rates.

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Morning Session 1: The rise of p-mono PERC: enhanced performance from cell-cutting, bifaciality, multi-busbar/grid-interconnects, copper plating, etc.

- Speakers will come leading GW-scale p-mono PERC cell producers that are upgrading lines for higher efficiency, enhanced productivity and lower costs.

There is currently a wide range of upgrade options being pursued by p-mono cell producers, looking at getting the most out of the p-mono cell structure. This includes half-cut cells and singulated strips, 5-to-6 busbars, multi-wire interconnections, and many more efficiency-enhancing process flow changes.

During 2019, and likely into 2020, this will keep p-mono PERC based cells as the mainstream offering to the PV industry. However, what is the intrinsic limitation of the p-type substrate, and how can p-type mono compete if n-type expansions are proven to offer higher output yields with lower manufacturing costs?

This session will review the upper limit of p-type mono, indirectly providing the target metrics that n-type cells must satisfy before they can start taking market-share from p-mono PERC cell producers.

Morning Session 2: n-PERT and variants: benchmarking with state-of-the-art p-mono PERC and HJT/IBC mass production leaders

- Speakers from companies that have introduced GW-scale n-PERT lines in China during the past 12 months, in addition to companies that have added pilot-line n-PERT lines to ensure they are positioned if the technology puts p-PERC under pressure. Speakers will also come from European and Chinese equipment and materials suppliers that have benefited from recent capex in China.

Multi-GW of n-type PERT lines have been added in China during the past few years, with many companies initially adopting process flows transferred from ECN (starting with the Panda lines installed by Yingli Green almost a decade ago).

Chinese new-entrants over the past few years that wanted to differentiate themselves from multi-GW scale p-type market-leaders typically chose the n-PERT route, as opposed to the more challenging HJT/IBC alternatives. For many companies in China, the goal was to emulate the performance of LG Electronics, but at China cost levels.

Today, n-PERT producers are being forced to react to p-mono PERC advances, while seeking to approach levels seen from the higher-performing HJT cell platforms.

With some of the leading Chinese cell makers keen to add high levels of n-PERT based capacity in 2019, can this technology, through adding passivated contacts, multi-wire interconnections and other advanced features, emerge as a viable alternative that bridges the gap between state-of-the-art p-mono PERC and HJT/IBC cell types?

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Morning Session 3: Advanced inspection, yield optimization and cost-controlling measures; maximizing the potential of high-efficiency cell production with the lowest production costs

- **Speakers in this session will come from some of the leading equipment and process control companies that are pivotal to companies being able to drive down production costs with narrow distributions and predictable cell output parameters.**

A key challenge for many of the new high-efficiency cell concepts (from p-mono PERC to all n-type variants) is to ramp up production lines with optimized processing, so that the efficiency of cells produced can be predicted and controlled.

This is being enabled today through new inline inspection tools, modelling and feedback loops that can also troubleshoot process tool issues that could adversely impact performance levels. New factories in China are becoming more intelligent as a result of this.

This session will focus on how cell production lines can be optimized and what cost benefits are on offer through higher yields and uptime metrics.

Afternoon Session 1: PV technology roadmap I: the views of leading cell producers and materials/equipment suppliers

- **Speakers here will represent the different views of the industry, in particular companies that set the benchmarks in cell technology that others tend to follow when successfully demonstrated.**

This session is the first of two parts that focus specifically on the technology roadmap for the PV industry, looking at the next 12-18 months and then out 3-5 years.

Understanding the real PV technology roadmap has been a major challenge for the PV industry during its growth from 1GW annually to north of 100GW today. Even a few years ago, few predicted that p-mono cells would grow from 20% to 60% market-share, for example.

With so many new concepts being championed and strong investments still flowing into technology-differentiated new entrants (often at the multi-GW level of capacity), it is now very important to know in which direction the industry will move, and which c-Si technology platforms may end up being sidelined, in exactly the same way that the industry bypassed a-Si and CIGS options several years ago.

Hearing the arguments from leading cell producers and key equipment/materials suppliers is essential, as part of the overall technology roadmap for the industry. Whether there is alignment here is a different issue and is therefore a key output expected to be discussed during invited panel discussions following the roadmaps presented.

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Afternoon Session 2: PV technology roadmap II: forecasts from third-party trade bodies and PV-Tech

- During all previous PV CellTech conferences, the event has been chosen as the launch platform for ITRPV annual releases, and this is expected to be featured. The ITRPV roadmap remains one of the most-read third-party roadmap forecasts offered to the PV industry.
- The closing talk from come from Finlay Colville, Head of Research, PV-Tech & Solar Media Ltd.: Factors driving the PV roadmap for 2019-2022; commercial, technical and trade-based factors underpinning market-share dominance and control.

How technology evolves in the PV industry remains the most-asked question, and it is fitting that PV CellTech now prioritizes this during the closing sessions of the event as a regular feature.

Many factors drive the roadmap, not simply what may appear as obvious to many or what the current market-leaders hope will unfold going forward. In the past couple of years, mono wafer supply has been the most important issue for the PV cell technology roadmap, effectively moving p-mono from 20% to 60% share-levels.

PV CellTech will therefore close with an interactive Q&A / panel-discussion, compered by conference Chair Dr. Finlay Colville.

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