The Low Temperature Tape Solution for Module Production with Back Contact Solar Cells

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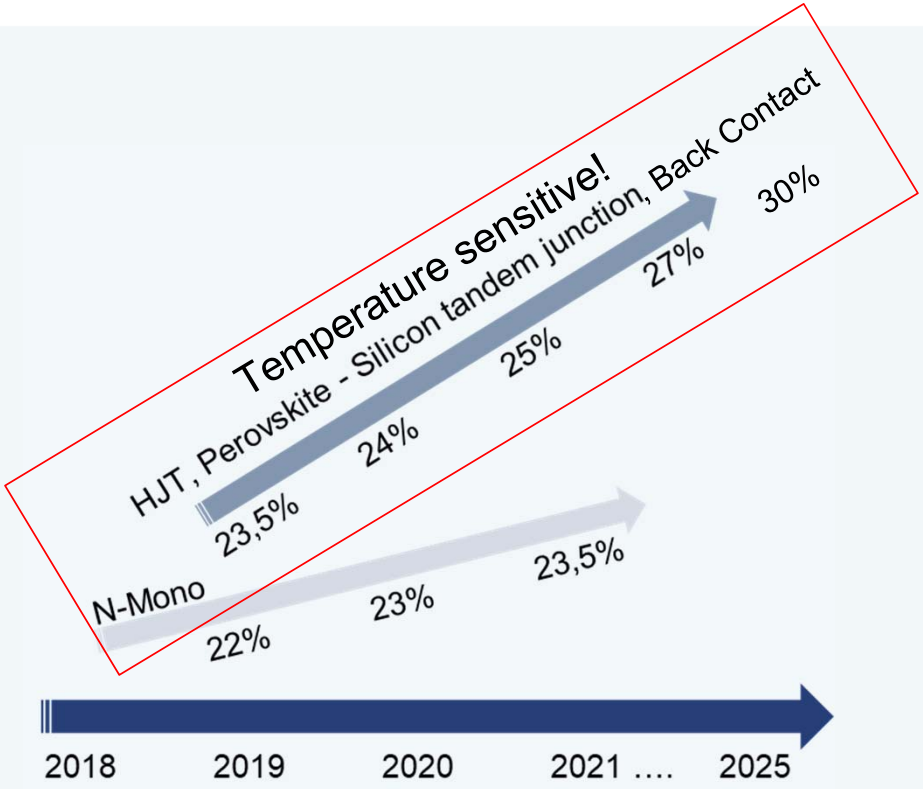
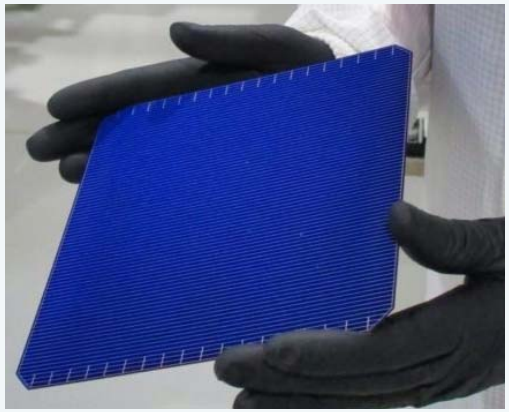
Outline of my talk

- Introduction of the tape solution
- How does it work?
- Test setup
- Test results

Motivation





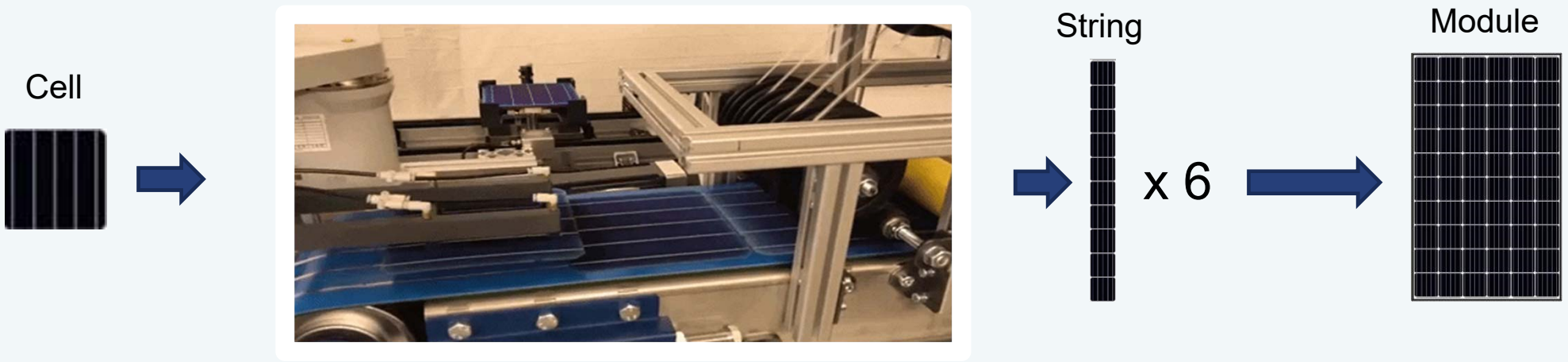
Highly efficient solar cell, BB0

Back Contact solar cell

The Tape Solution is a low temperature cell interconnection method.
Stringing is done in room temperature with an adhesive tape that holds cells and wires together. The final connection is formed with the heat and pressure during the module lamination step. A low temperature soldering process.

The Tape Solution | Key features

Tape stringer Machine connects cells into strings without heat **at room temperature**



Low T cell interconnection
(enabler for high eff. cell concepts)

60% reduced silver demand
(5-7% of panel cost)

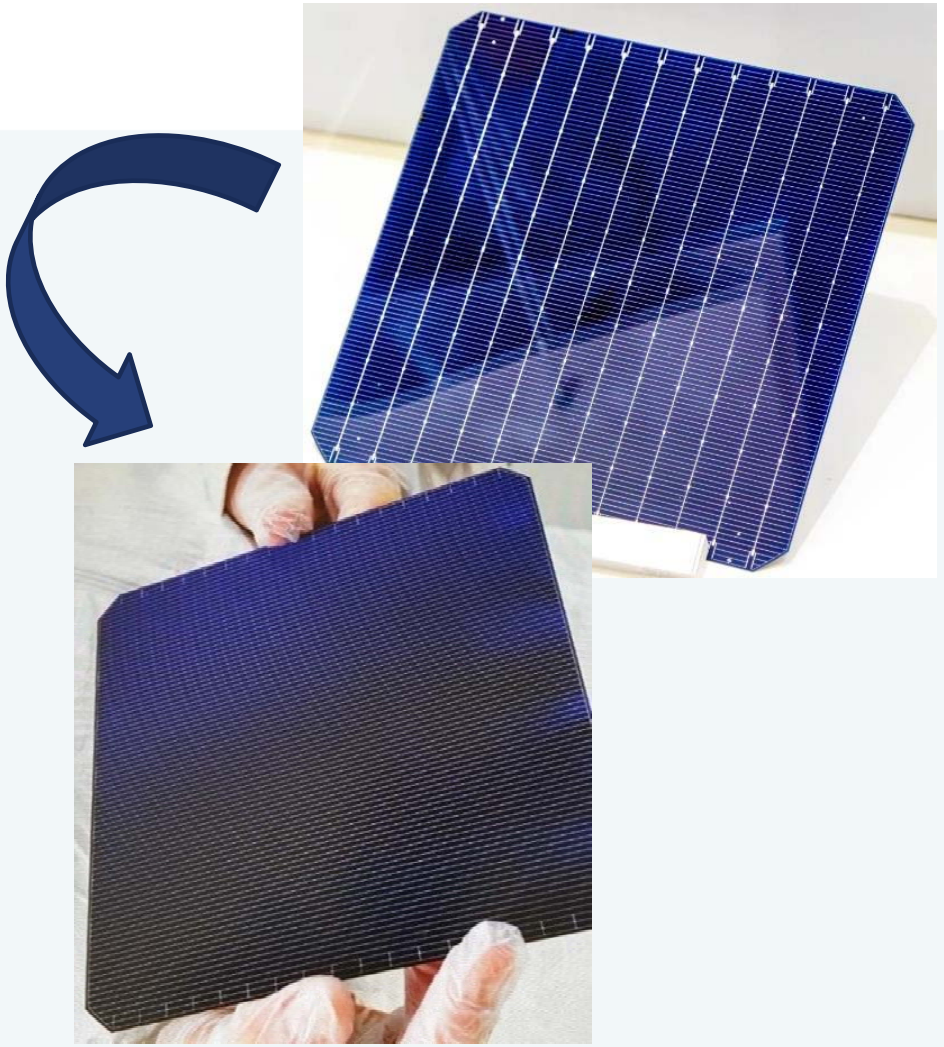
Lead avoidance

The Tape Solution is well suited for current PERC cells, have advantages when contacting back contact (BC) cells (mitigate bowing) and is crucial for Hetero Junction (HJT) and Perovskite tandem cells due to its low temperature requirement.

Cost of use

CAPEX
Production equipment relatively simple in comparison to standard tabber stringers. Possible at produce at same or lower cost.

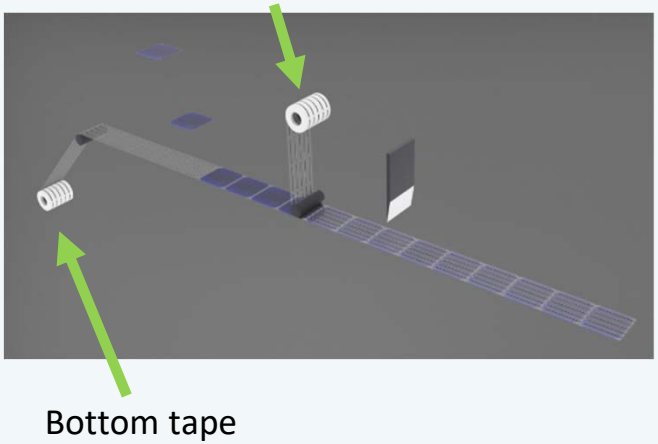
OPEX
The tape is slightly more expensive than standard ribbon but the tape saves up to 60 % of the silver in the grid which makes the total cost for interconnect cells with the tape solution less than standard soldering.



Technology - how does it work?

Top tape

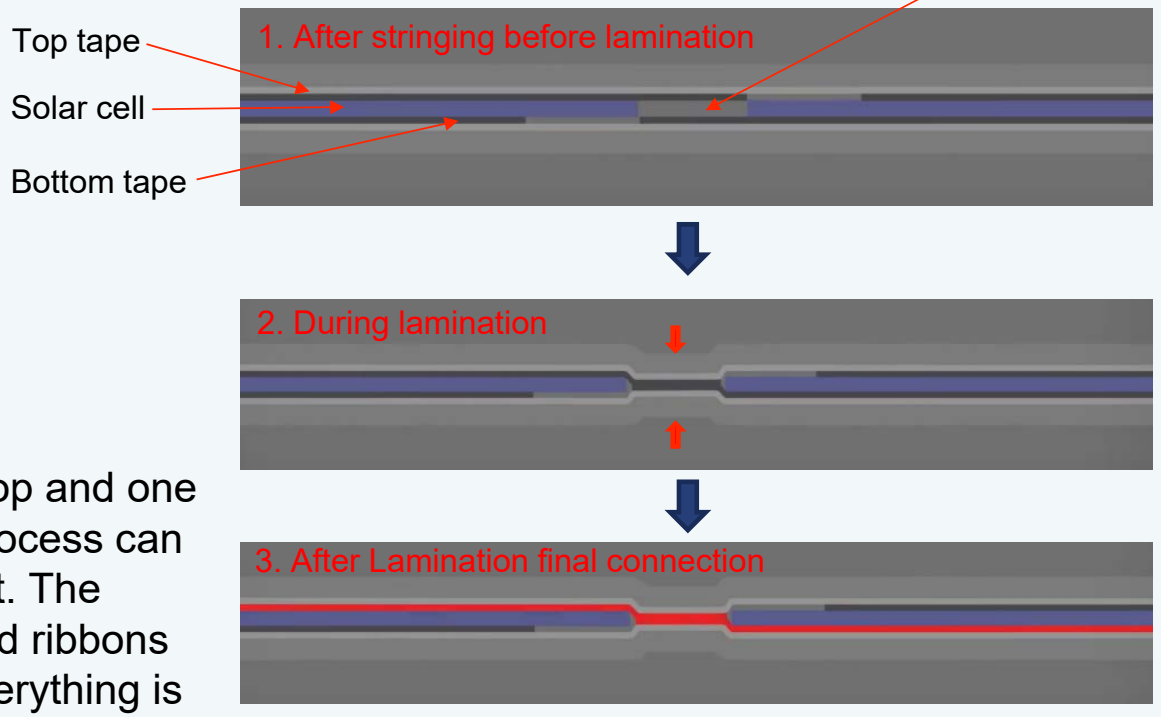
Animation of the process: www.stickysolarpower.com



Bottom tape

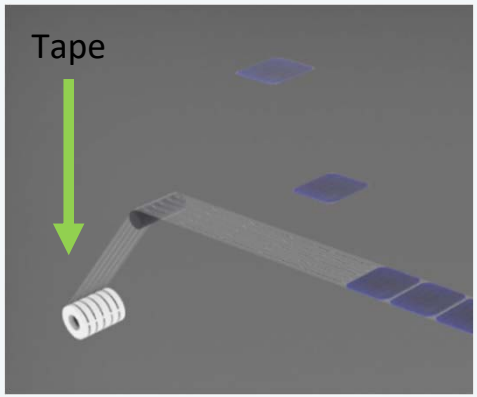
X-section

Gap between cells



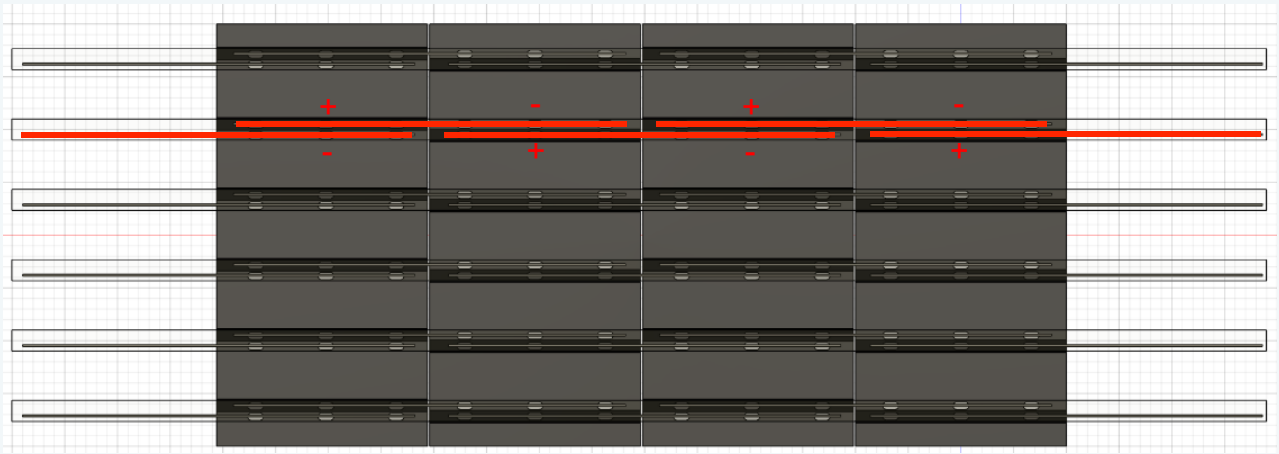
By dividing the connection into two tapes, one on top and one on the bottom side of the solar cell, the stringing process can be simplified and automated with higher throughput. The adhesive in the transparent tape is holding cells and ribbons together and strings is formed without heat until everything is fixed with the heat and pressure during the lamination process.

Technology for Back Contact solar cells



For Back contact cells, only the bottom tape is used. The adhesive in the transparent tape is holding cells and ribbons together and strings are formed without heat until everything is fixed with the heat and pressure during the lamination process.

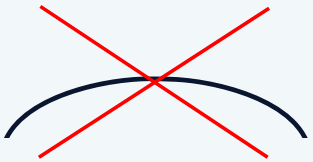
Every other tapes are shifted ½ period



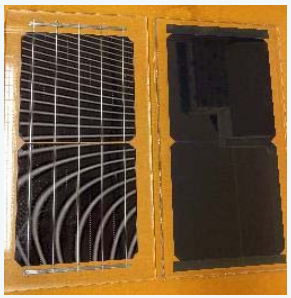
Interconnection of Back Contact cells

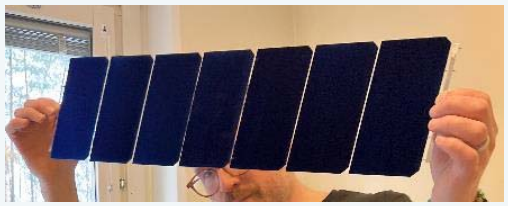
The Tape solution is well suited for low cost high througput interconnection of back contact cells.

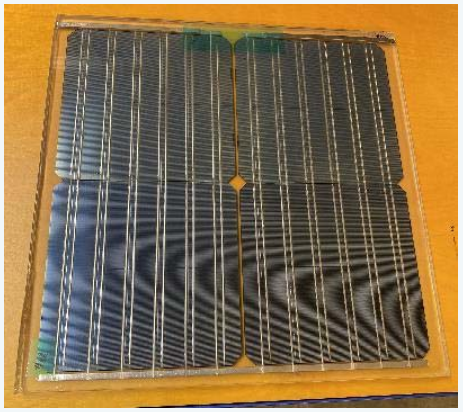
The solution uses an adhesiv tape to fix cells and ribbons together. No heat is used during stringing which avoids bowing of cells.

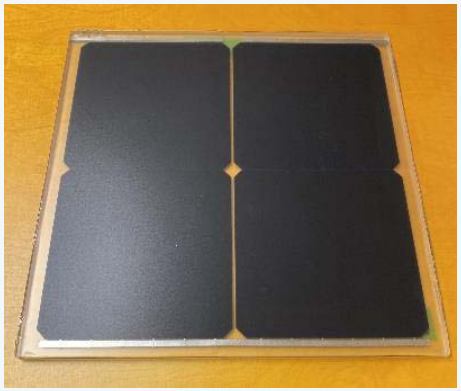


Stickys Advantage, ability to use full black cells





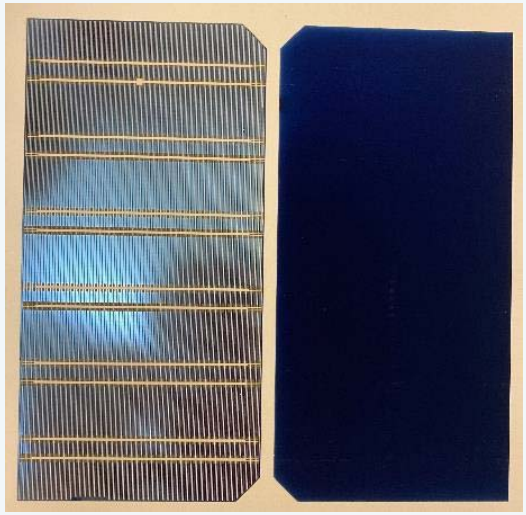


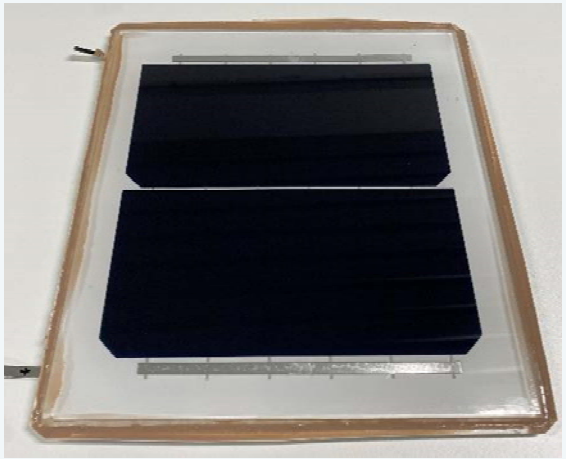


Test – UV exposure, Thermal Cycling and Damp heat

Mini modules was fabricated with The Tape Solution at Sticky Solar Power and tested at Protech together with Dr. Juras Ulbikas, Algirdas Balezentis at The Applied Research Institute for Prospective Technologies in Vilnius Protech

½ cut M6 Zebra cells with 6BB from ISC Konstanz was used to make 8 minimodules.



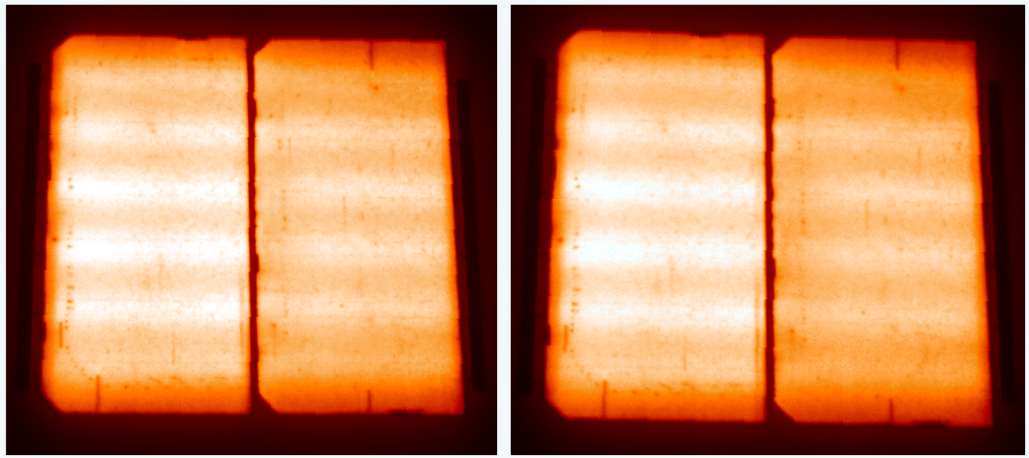


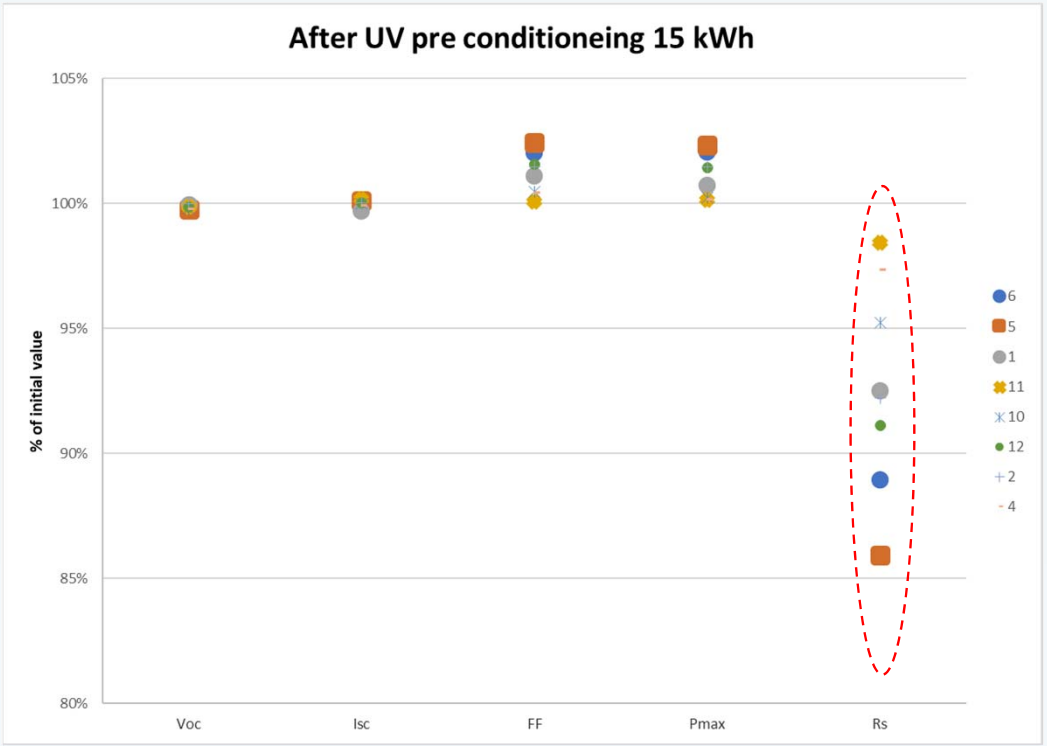
PROTECH protechlab

Test results – UV 15 kWh

15 kWh of UV Preconditioning gave decrease in series resistance which gave FF & Pmax increase.

#6, before & after



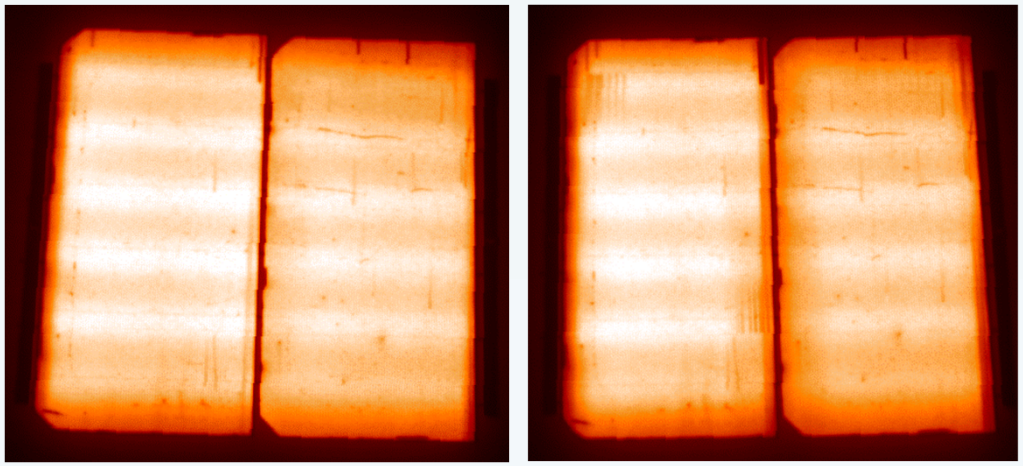


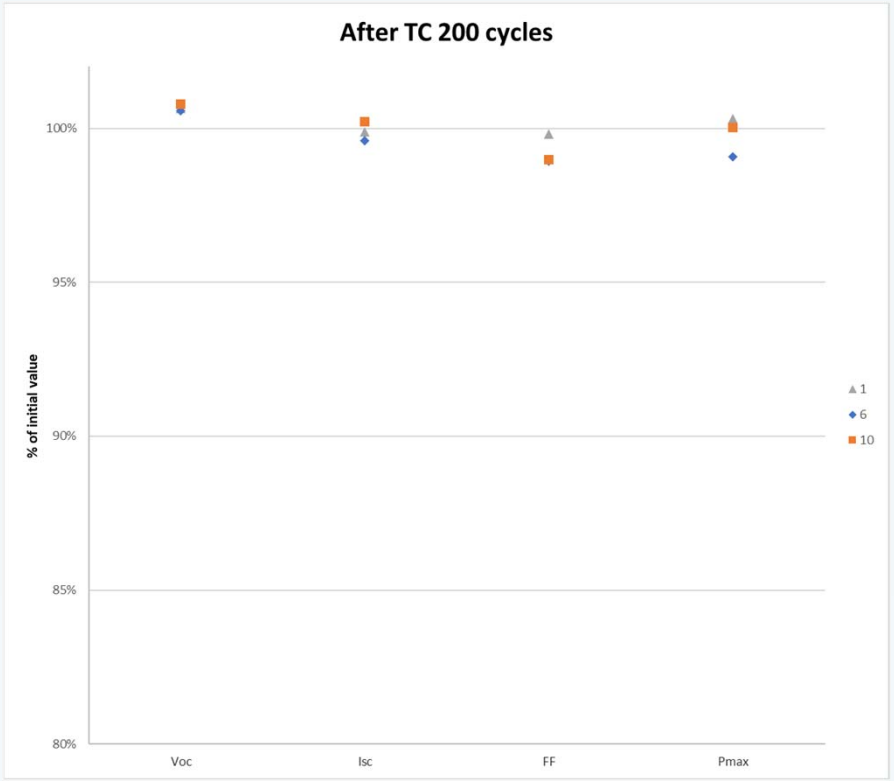
Flasher: PASAN HighLight LMT

Test results – TC 200

TC 200 cycles showed no significant change.

#1, before & after



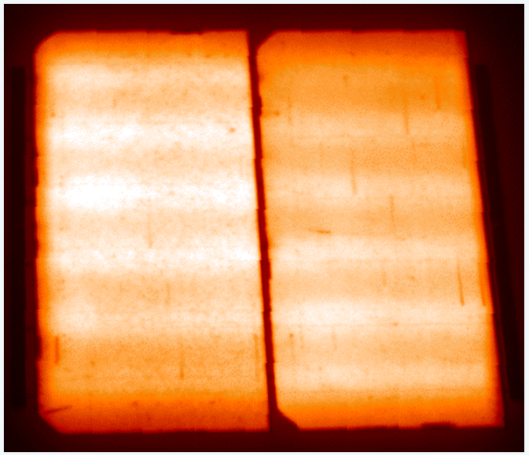


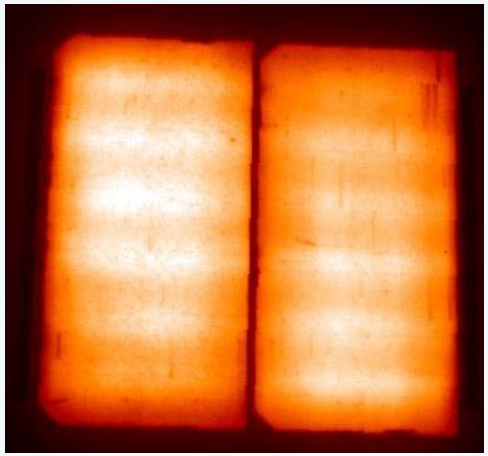
Flasher: PASAN HighLight LMT

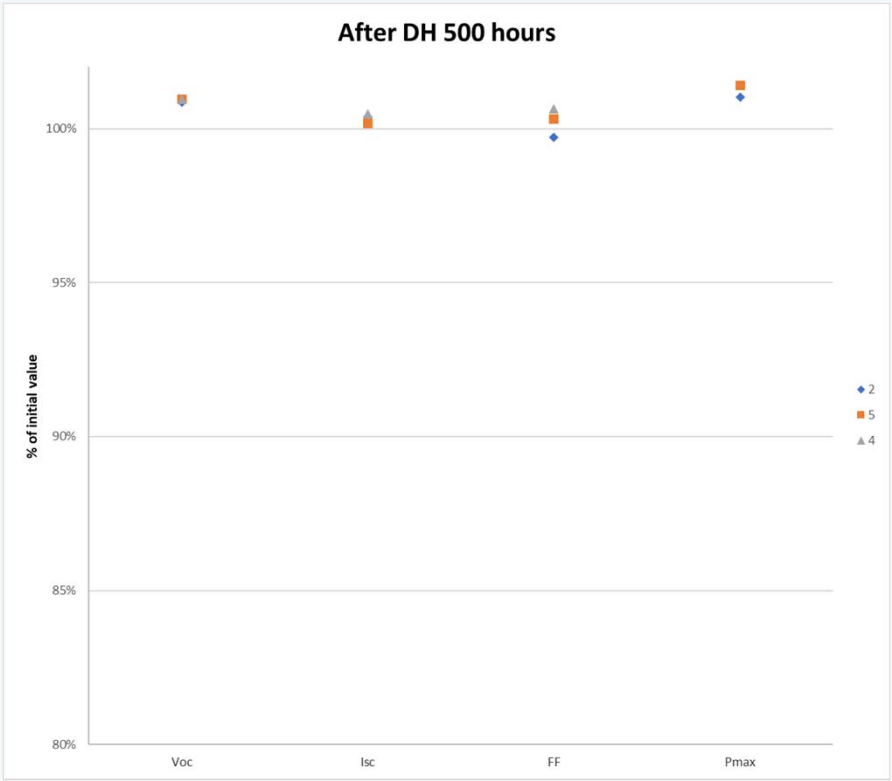
Test results – DH 500 hours

DH 500 hours showed slight increase of Isc & Pmax.

#5, before & after



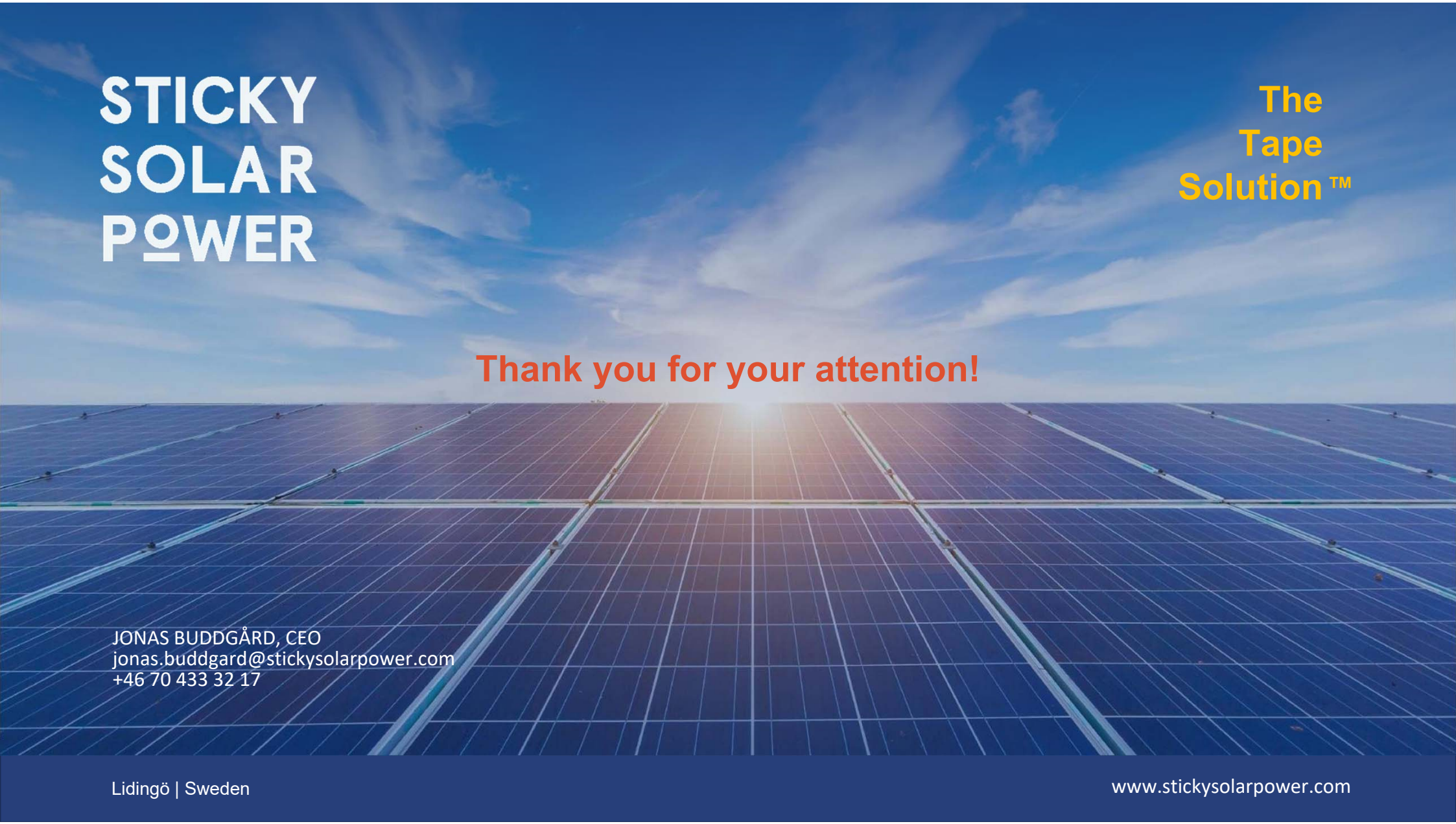




Flasher: PASAN HighLight LMT

Summary – The Tape Solution for interconnection of Back Contact solar cells

- **UV Exposure 15 kWh – Decrees in Series resistance**
- **TC 200 cycles – no significant effect**
- **DH 500 hours showed slight increase of Isc & Pmax. → update from the full 1000 hours in the proceedings.**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