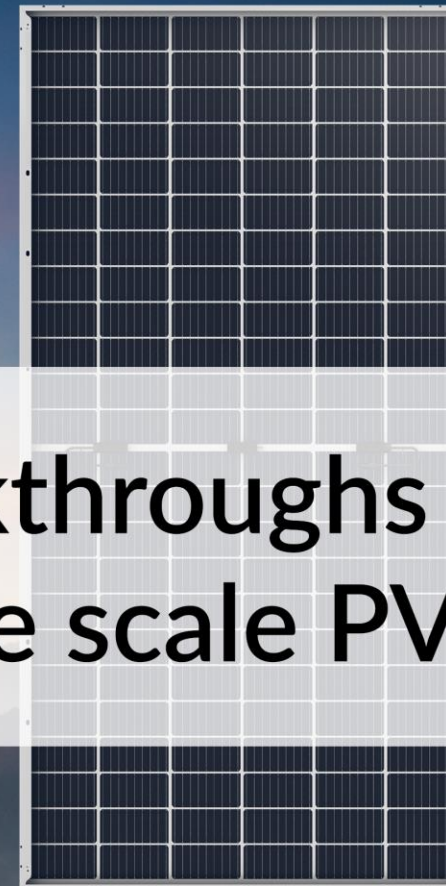
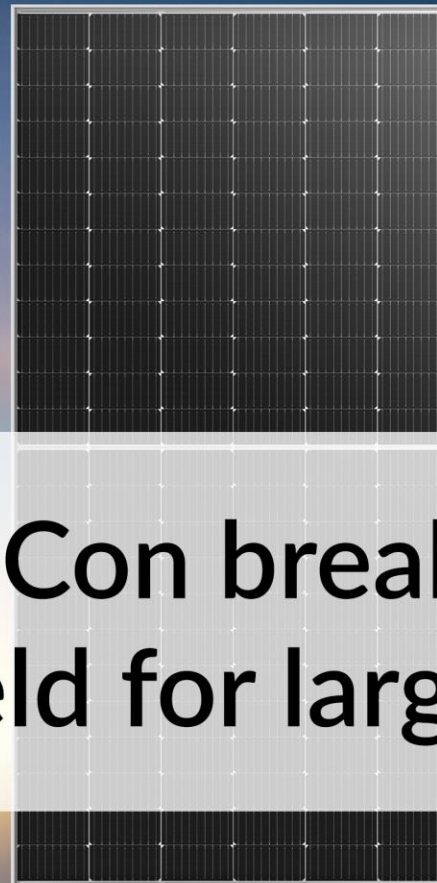


WEBINAR | **28** JULY
2021

LONGi's Hi-MO N: N-type TopCon breakthroughs boost efficiency and energy yield for large scale PV



PRESENTED BY:

VITOR RODRIGUES

Technical Service Director, Europe
LONGi Solar



MODERATED BY:

LIAM STOKER

Editor in Chief
Solar Media

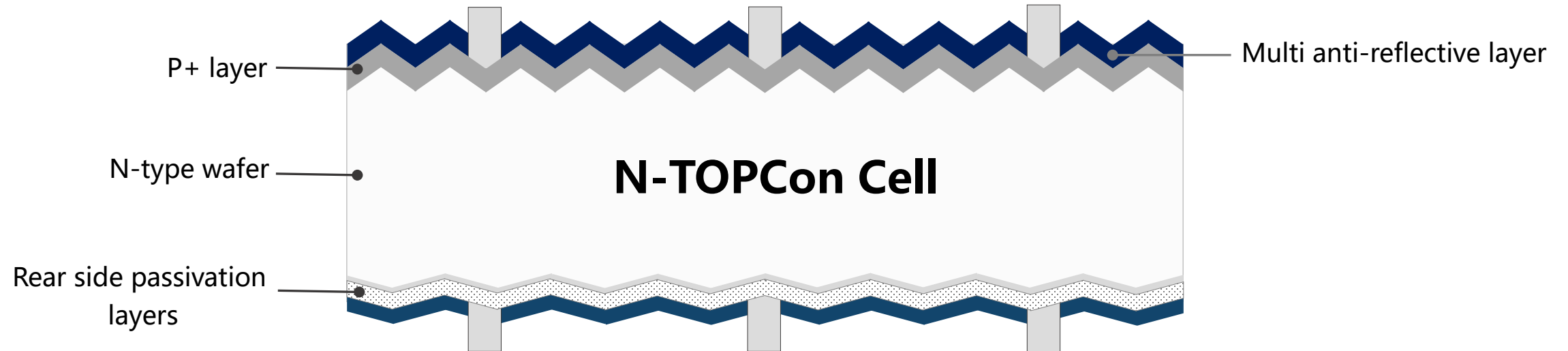
LONGi

Hi-MO **N**

Propelling the Transformation with N-type
TOPCon Technology

Still advancing cell technology

TOPCon — Advancing Cell Passivation Technology



TOPCon Cell — Commercialising Advanced Cell Technology

Early knowledge

- MIS cell structure
- Application of polysilicon

Technical Proposal

2013



Theoretical Limit

28.7 %*



Lab record

25.8 % N-type

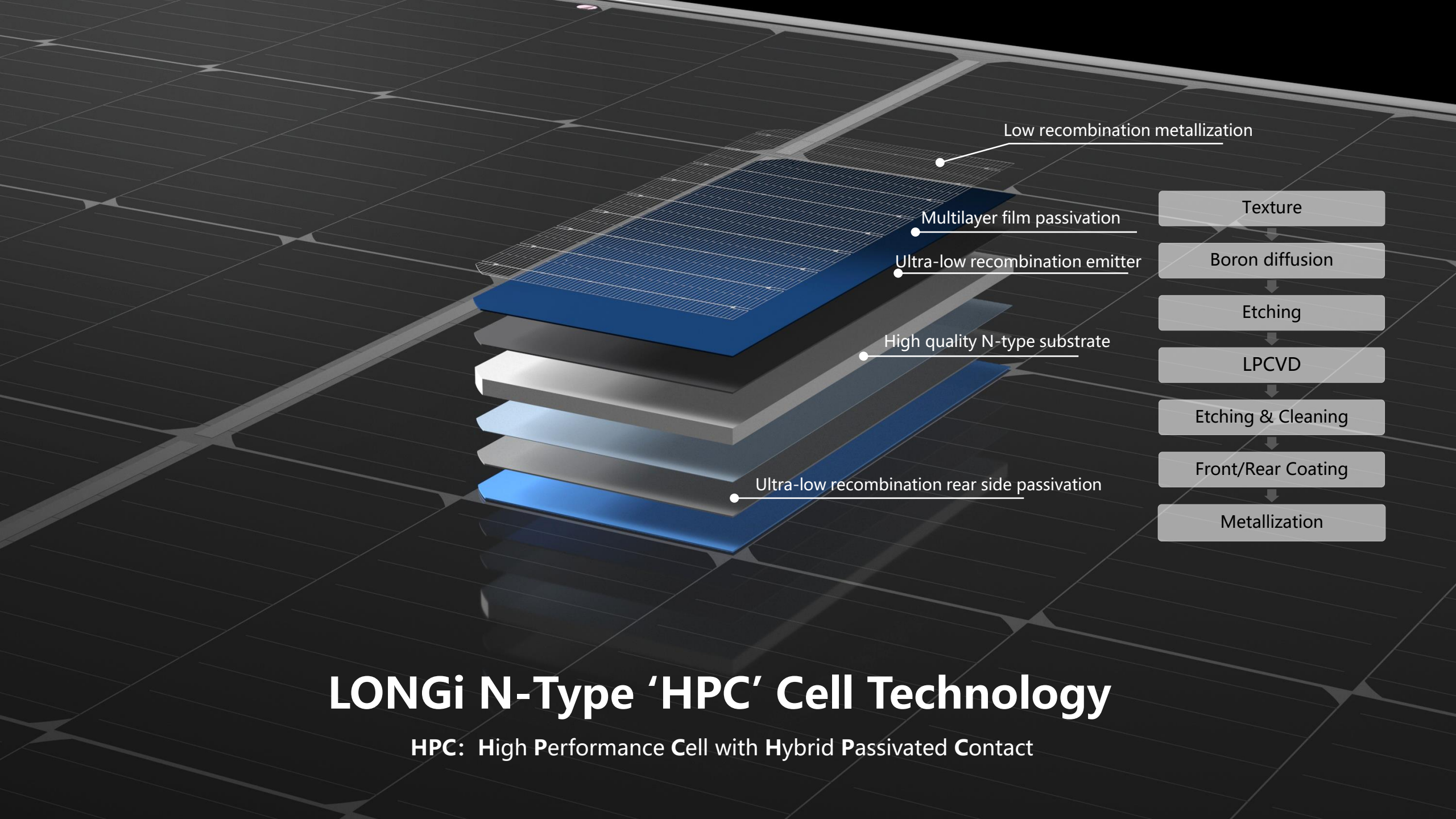


Commercial Size Record

25.21 % N-type



* Jan S , Robby P , Rolf B . Surface passivation of crystalline silicon solar cells: Present and future. Solar Energy Materials and Solar Cells, 2018, 187:39-54.



Low recombination metallization

Multilayer film passivation

Ultra-low recombination emitter

High quality N-type substrate

Ultra-low recombination rear side passivation

Texture

Boron diffusion

Etching

LPCVD

Etching & Cleaning

Front/Rear Coating

Metallization

LONGi N-Type 'HPC' Cell Technology

HPC: High Performance Cell with Hybrid Passivated Contact

Hi-MO Module

Advanced Cell + Optimal Module Size, efficiency 22%+

Advanced Technology Integration

- M10 mono N-type wafer

- HPC bifacial cell

- 2+2mm glass-glass module

Optimal module size for utility
Area < 2.6m², Width ~ 1.13m

- Smart Soldering without cracks

Smart Soldering

Using integrated segmented ribbons.

Module efficiency increasing by 0.3% compared to conventional MBB product.

- Triangular section
maximize sunlight capturing

- Flat section
Enable solar cells low stress dense packing

- Small-gap
The best combination of high efficiency,
reliability and cost

Smart Soldering - Better Mechanical Load Properties

Test conditions

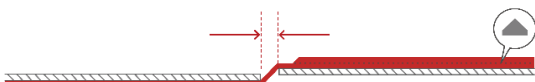
Sequence test

5400Pa SML

1000Pa DML

TC50

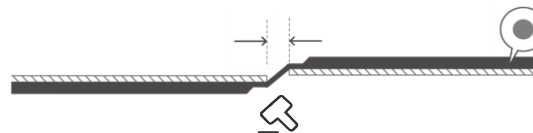
Smart Soldering



-2.90%



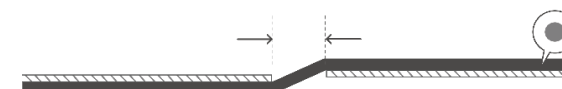
Round deformed ribbon



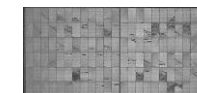
-4.95%



Normal round ribbon



-6.65%



Optimal Module Size

Enhanced mechanical loading capability

Improved mechanical load performance

- Reduced stress on frame and glass under static loading
- Well controlled deformation and power degradation under load
- Designed for improved Dynamic Load characteristics



Compatible with global shipping

- Robust packaging
- Convenient loading and unloading
- Stable and safe stacking



Manageable by two people

- Weight under 33kg
- Sized for stable handling



Low resistive losses

- Imp 13A, avoids high resistive loss
- Better power temperature coefficient



System compatibility

- Compatible with mainstream junction box
- Compatible with all inverters (15A)
- Optimal overall BOS cost



570W~22.3%

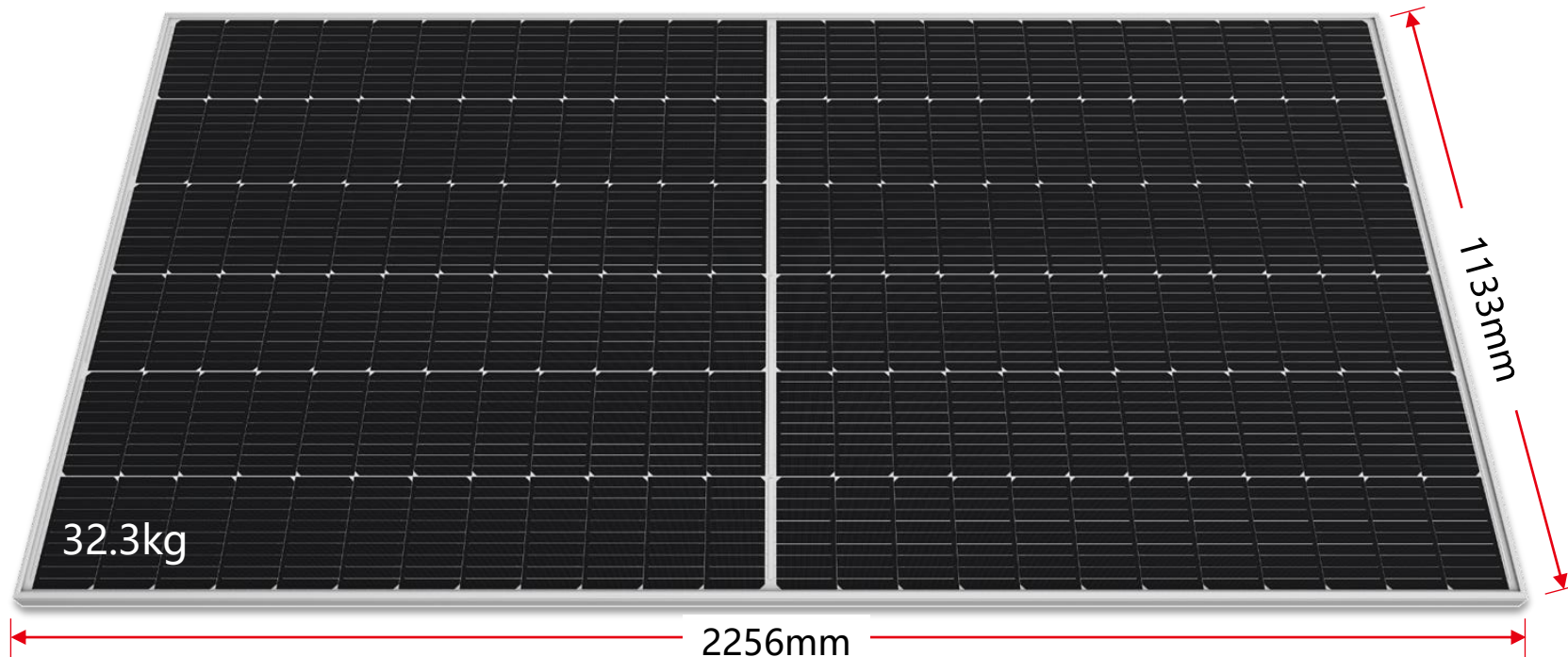
LR5-72HND

Voc 51.6V

Imp 13.0A

Power Temperature Coefficient $-0.31\%/^{\circ}\text{C}$

Bifaciality $80\pm 5\%$



High Bifaciality

- With greater bifaciality, energy yield can be increased by 1.7%

Mainstream module

Bifaciality: ~70%

Typical bifacial gain: 12%



Hi-MO N

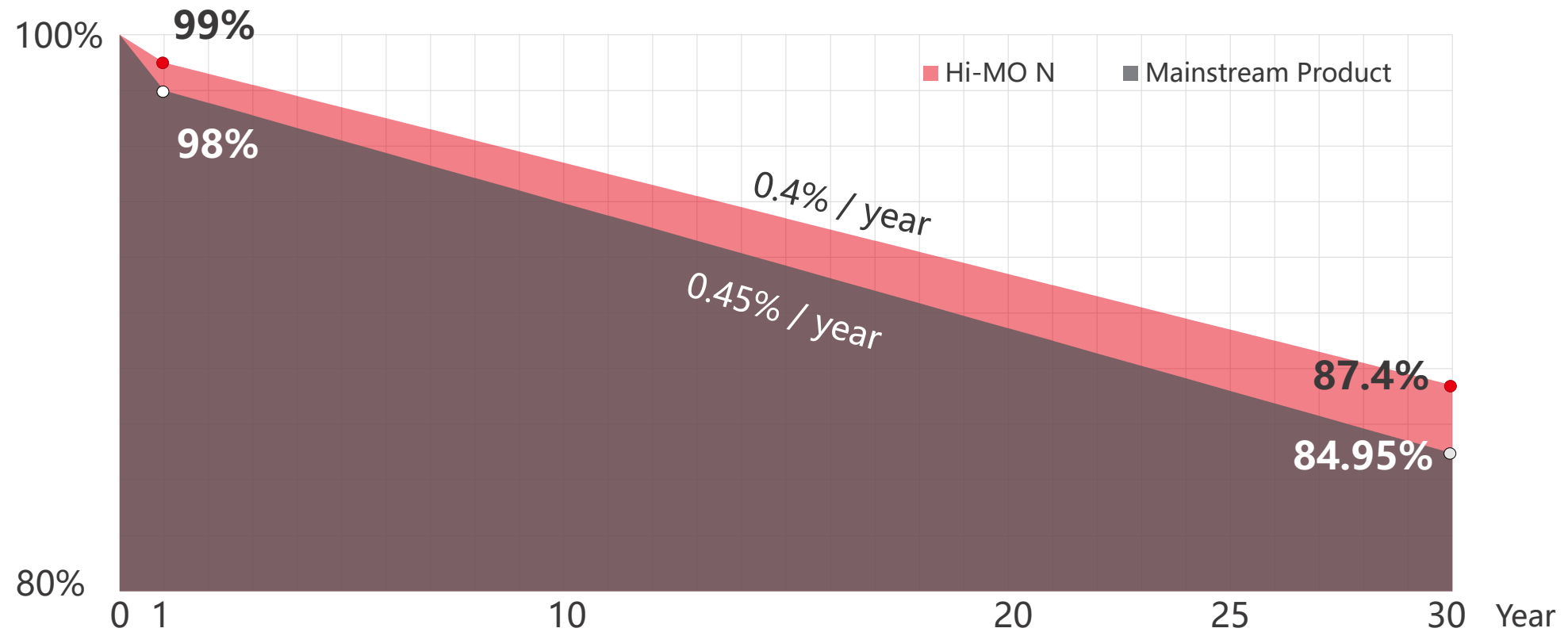
Bifaciality: ~80%

Typical bifacial gain : 13.7%

Sandy Land

Leading Power Warranty

1st year degradation $\leq 1\%$, Linear degradation $\leq 0.4\%$



- 12 years Product warranty

Product Value-**High Energy Yield**



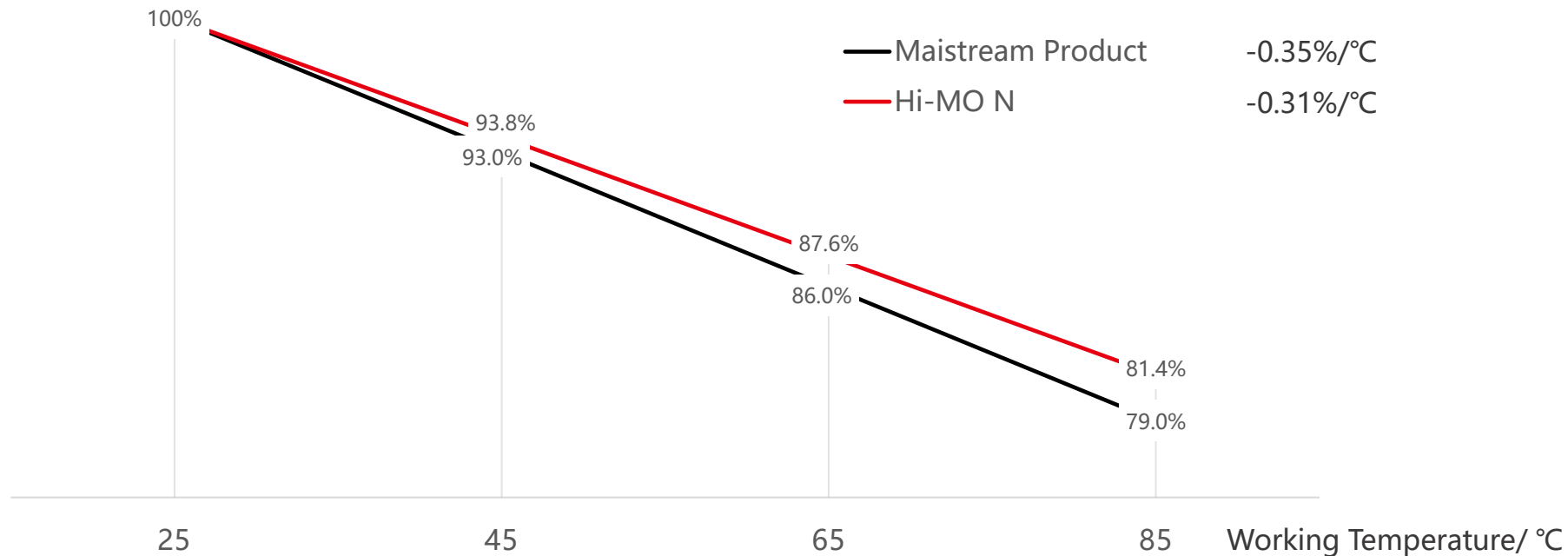
Hi-MO 

For Utility Power Plants

Delivers Lower LCOE with Ultra High Value

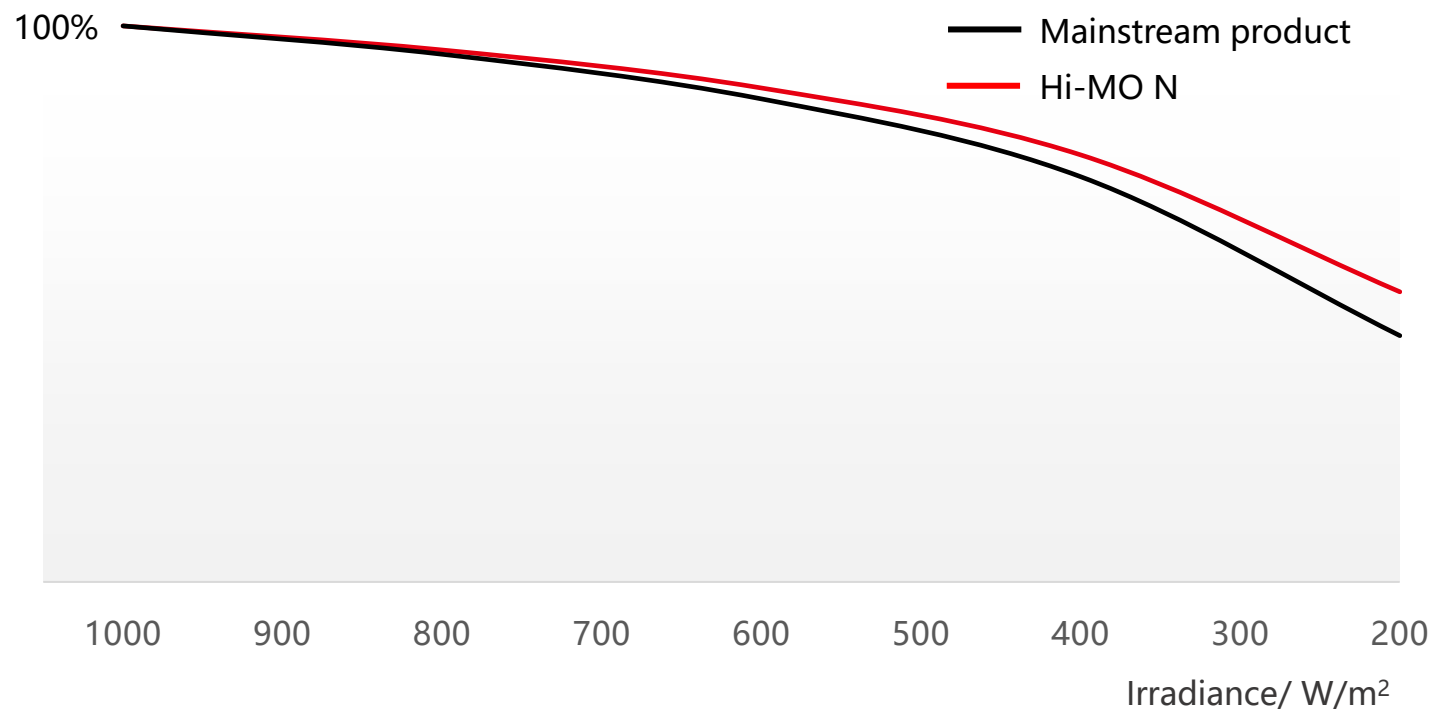
Better Temperature Coefficient

- Energy yield can be increased by 1% due to lower Power Temperature Coefficient
- Lower working temperature due to high efficiency of the HPC cells

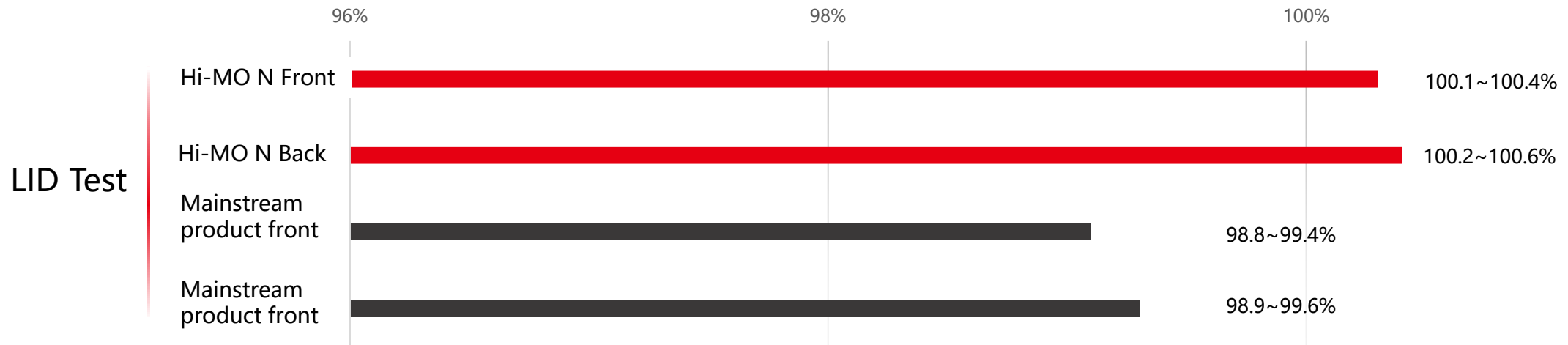


Low Irradiance Performance Improvement

- Benefited by HPC cell high parallel resistance ($> 3000\Omega$)
- Improves energy yield in dawn, dusk and in cloudy weather



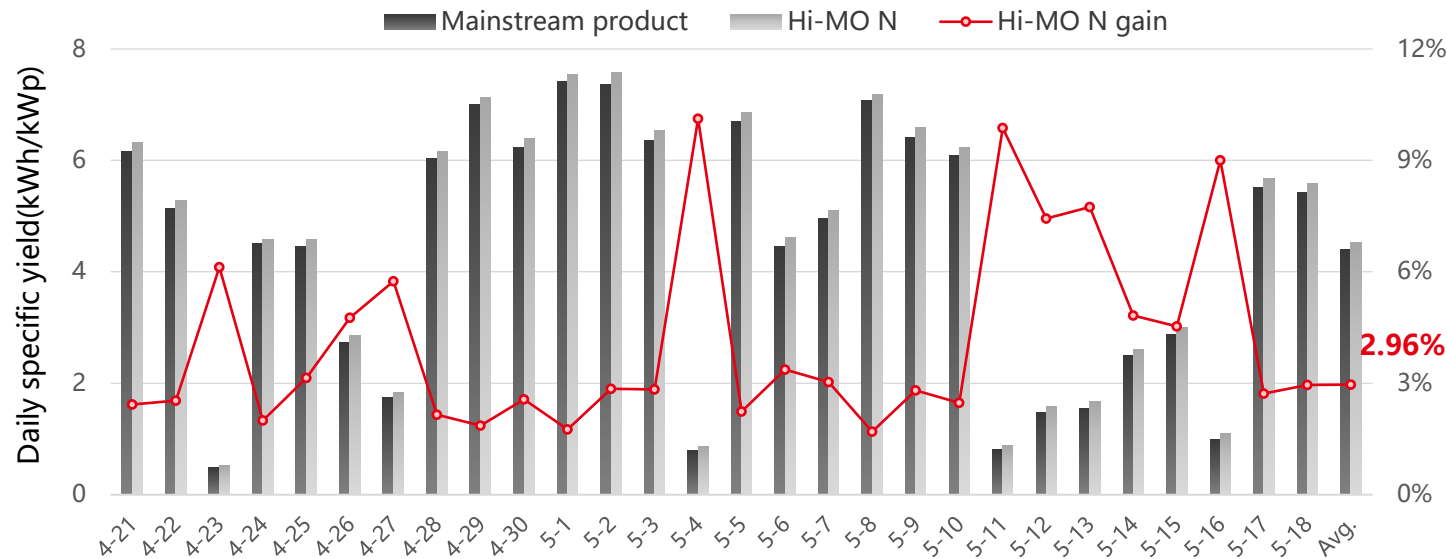
Approaching zero LID



On-the-Field: Energy Yield Test



LONGi Taizhou pilot project (32.5° N/ 119.9°E)
Sand surface, 30° tilt angle

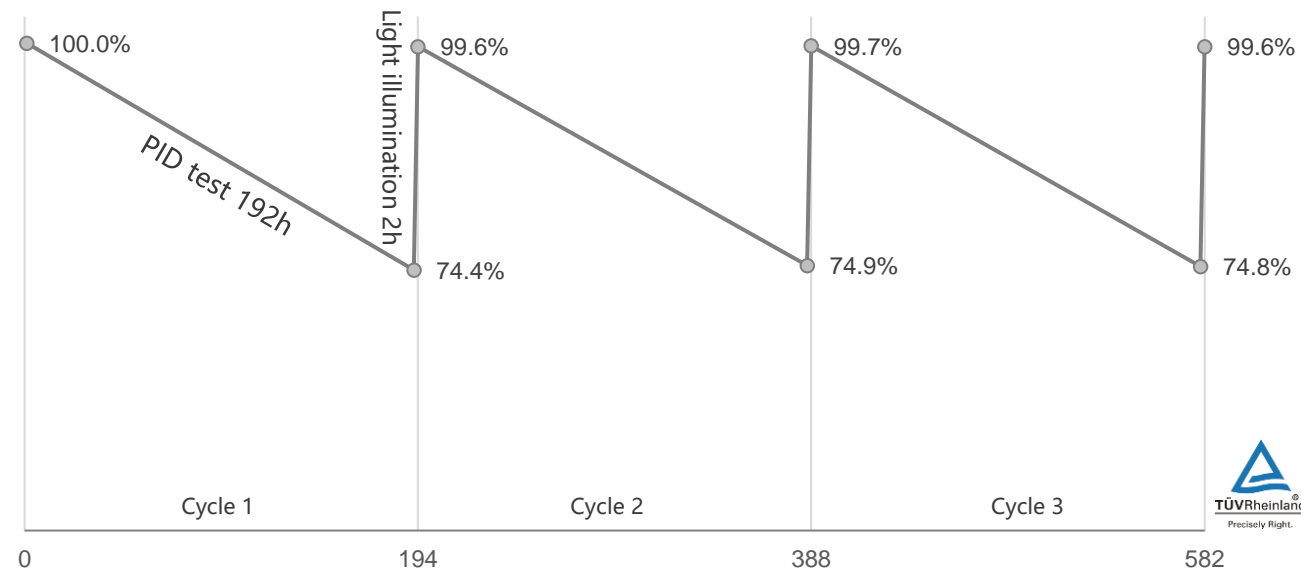


Third-party pilot project plan



PID Fast Recovery Mechanism

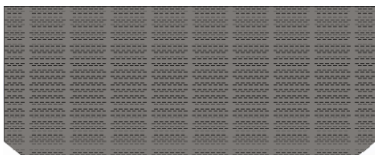
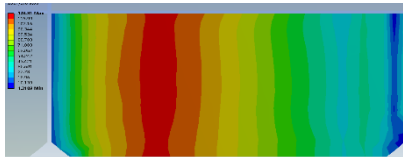


- Electronic polarization mechanism only exists with HPC cells, no PID effect, no power degradation under illumination



Using PID sensitive encapsulation, lab test indicated that HPC cell will be recovered at light illumination condition.

Stringing process designed to reduce cell damage, enhancing mechanical load property

- Backside laser grooving is not required for HPC cell. Cell stresses reduced by 7% under the same ML test condition resulting in reduced cracking.

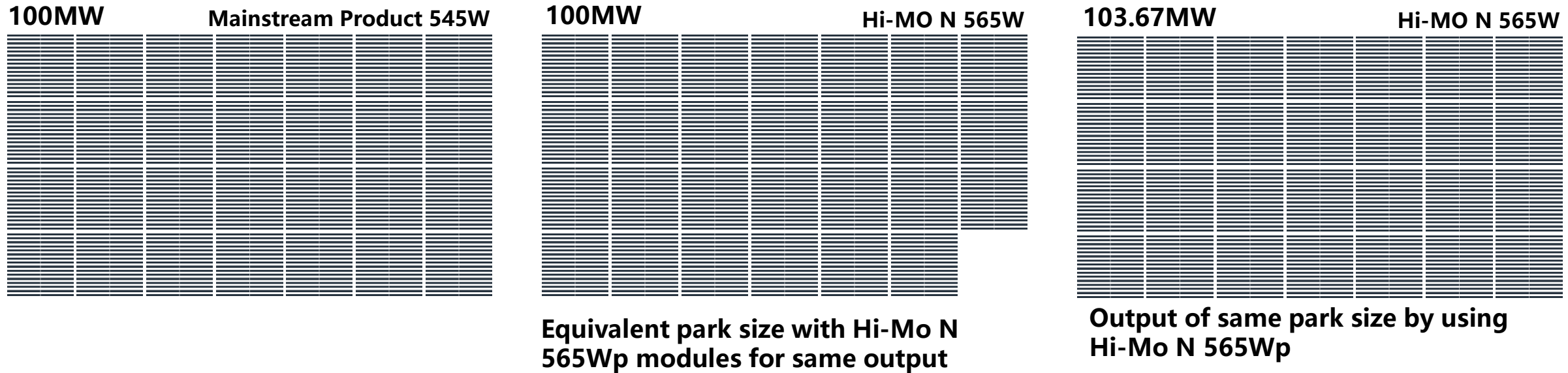
Module	Structure Diagram	Stress picture	5400Pa Stress (MPa)
Mainstream Product			124.8
Hi-MO N			115.8

Ansysis Simulation

Hi-MO **N**

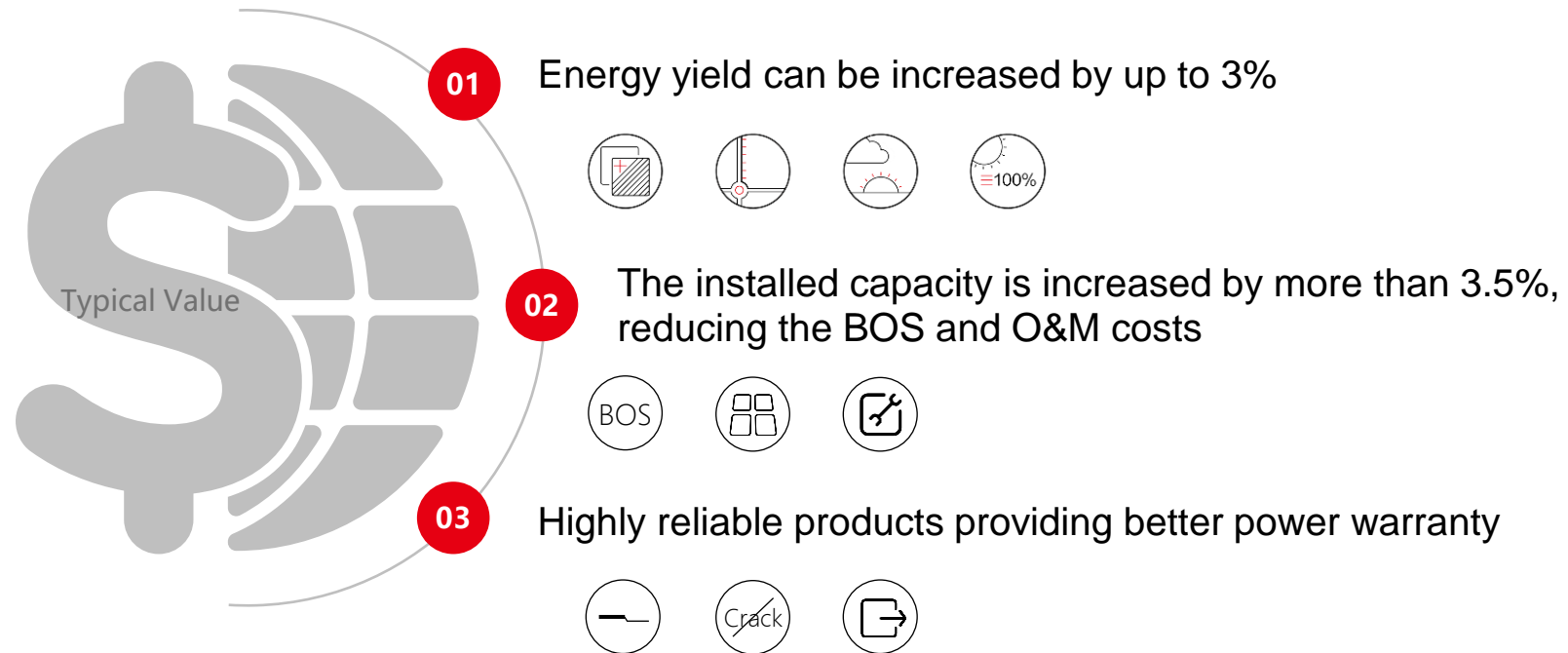
Product Value - **Reduced BOS Cost**

Hi-MO **N** BOS Cost Analysis



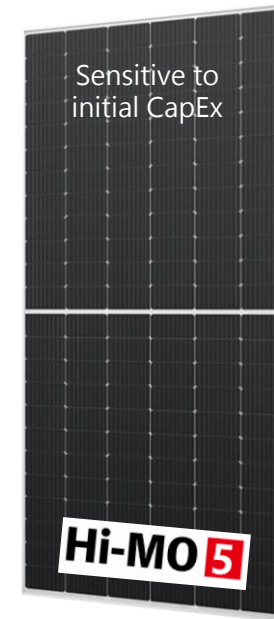
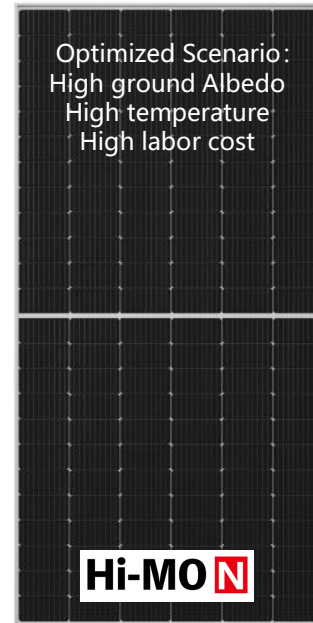
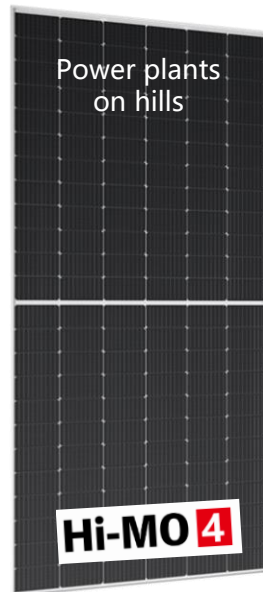
- BOS includes: rack and foundation, cabling, land, inverter and labour costs.
- Increasing module size has implications on BOS, including on rack length, power loss in cabling, manual handling and system compatibility.
- By increasing efficiency, BOS cost can be saved with fewer Hi-MO N modules.
- Power increases of more than 3.5% compared with mainstream products, saving 3% BOS cost with same DC capacity.
- DC capacity will increase more than 3.5% when land utilization rate is same, further reducing the AC side equipment cost.

Hi-MO **N** Value Proposition



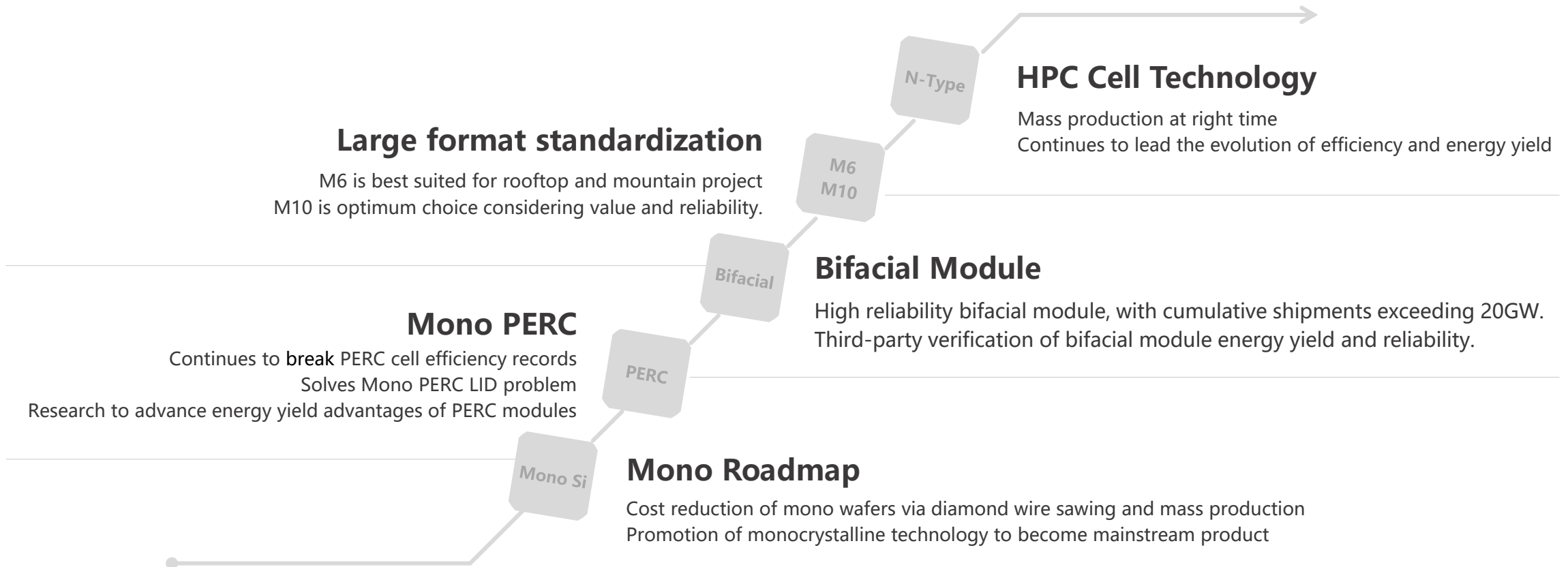
LONGi Product Portfolio

(For utility projects)



Still Shaping The Future

Every innovation from LONGi realizes industrial value and accelerates the optimization of LCOE



Thank you!



Vitor Rodrigues
Europe Technical Director
LONGi Solar Technology Co., Ltd.
Add.: Madrid, Spain
Email: vitorrodrigues@longi.com



- <https://en.longi-solar.com>
- LONGi Solar. All rights reserved.