



JinkoSolar EU

Can N-type Modules conquer the Project Market?

Roberto Murgioni | Head of Technical Service & Product Management EU

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No.1 Shipment for 4 Consecutive Years

70GW+

Delivered

14.3%

Market Share

15

World Records

32GW

Module Capacity

Global Leader in Technological Innovation



Applied for
1632 Patents



968 Authorized
Patents

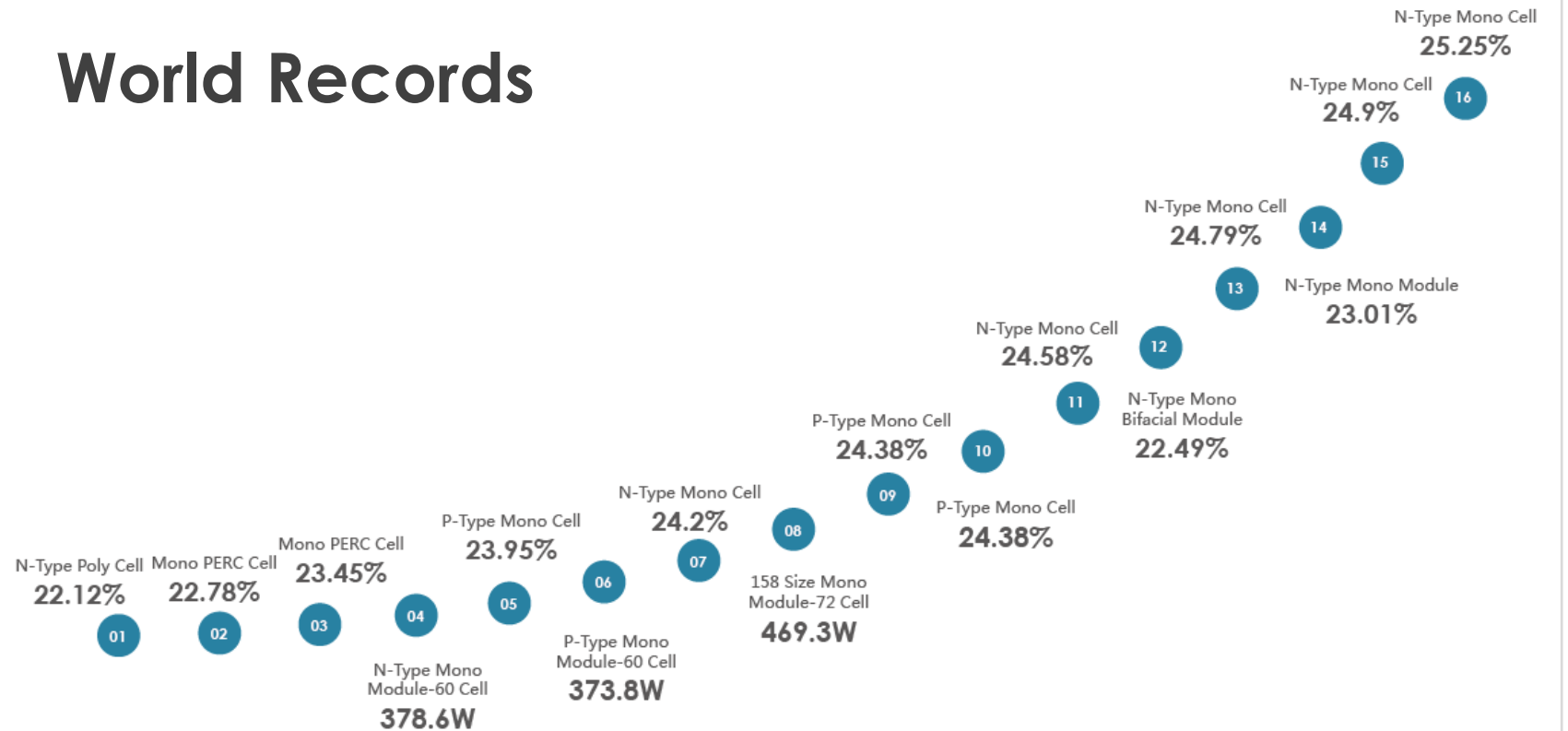


R&D Team
900+Engineers
and Scientists



R&D Investments
1.274 Billion
(CNY)

World Records



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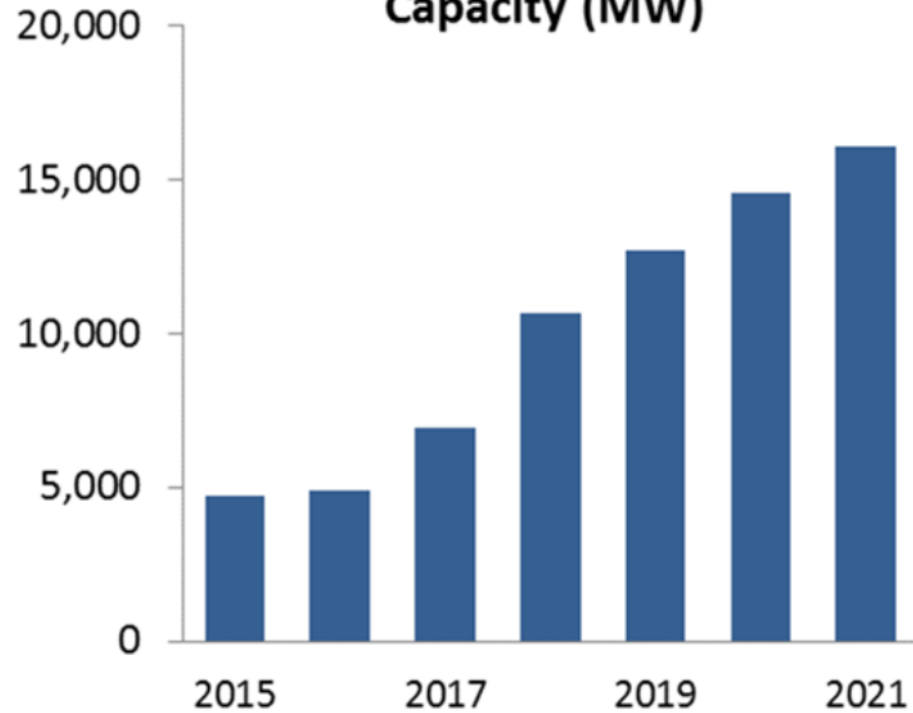
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N-Type Cell - Trends

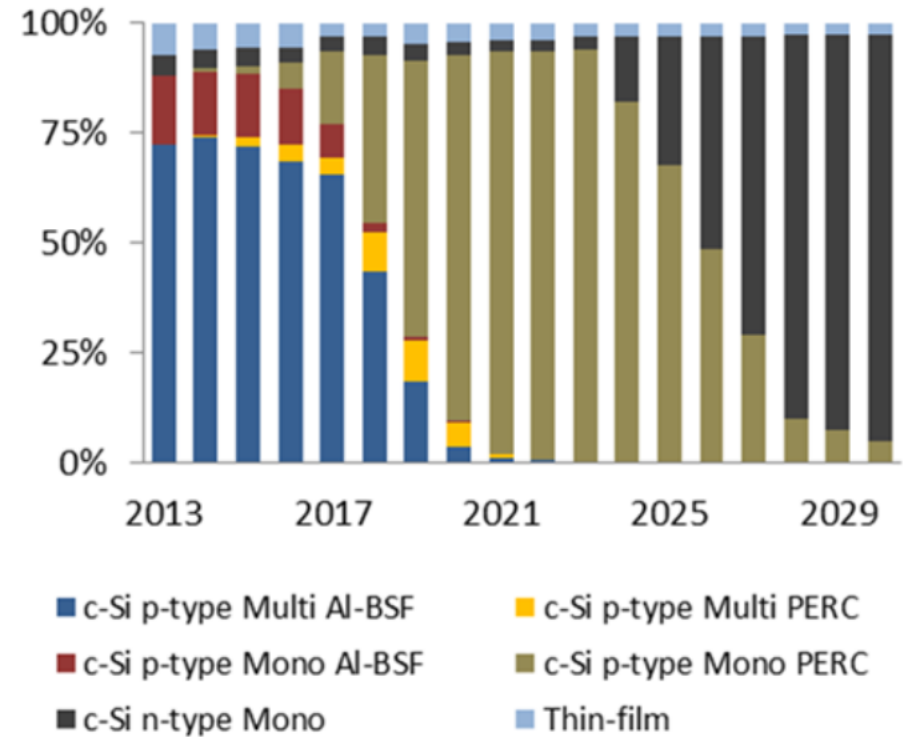
Y/E Effective n-type Cell Capacity (MW)



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 Source: PV Manufacturing & Technology Quarterly report, May 2021 release.



Cell Production by Technology



© Solar Media, Ltd. 2021
 Source: PV Manufacturing & Technology Quarterly report, May 2021 release.



The Breakthrough of Cell Efficiency



24.5%

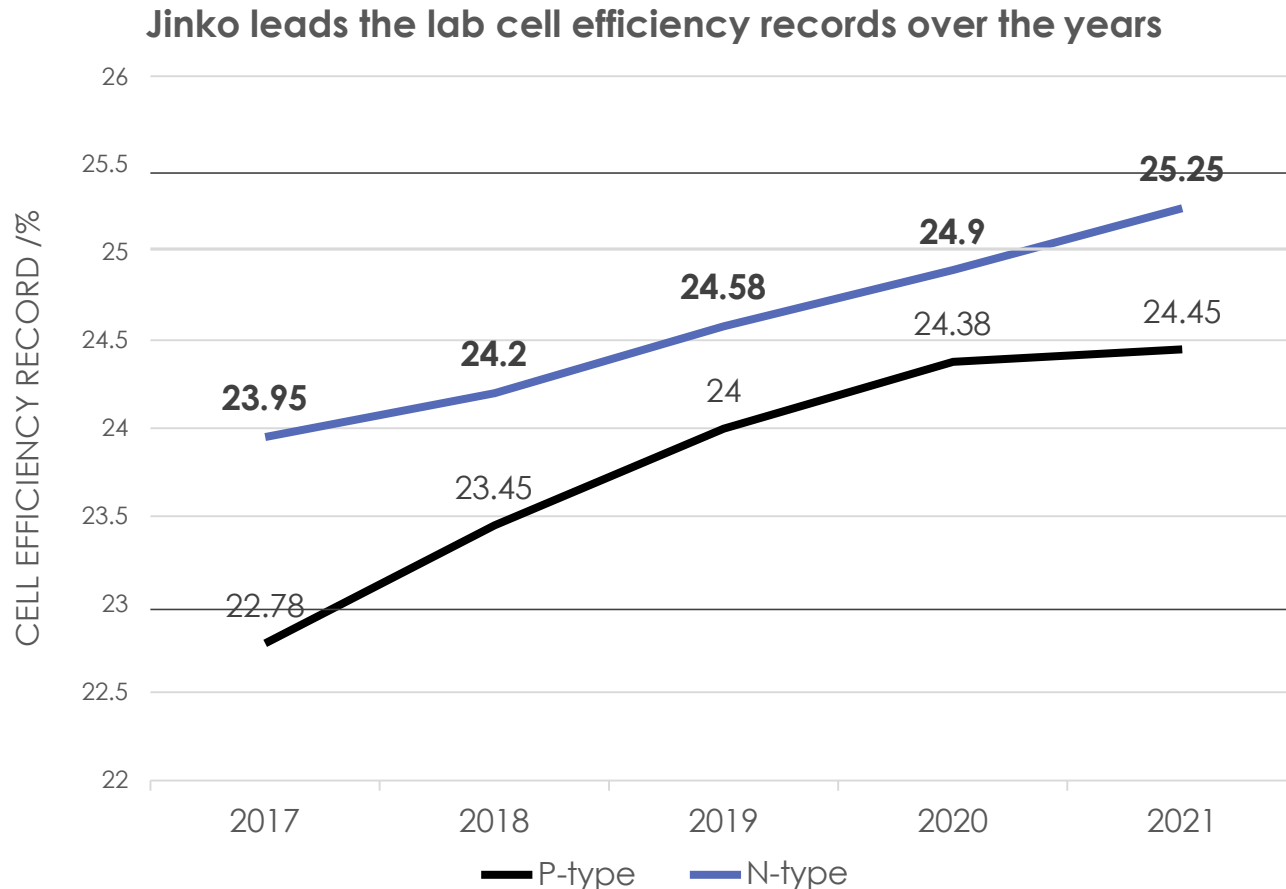
Mass Production Efficiency

The application of Hot 2.0 technology has contributed to a new breakthrough in N-type cells, and the efficiency of mass-produced cells can reach 24.50%.

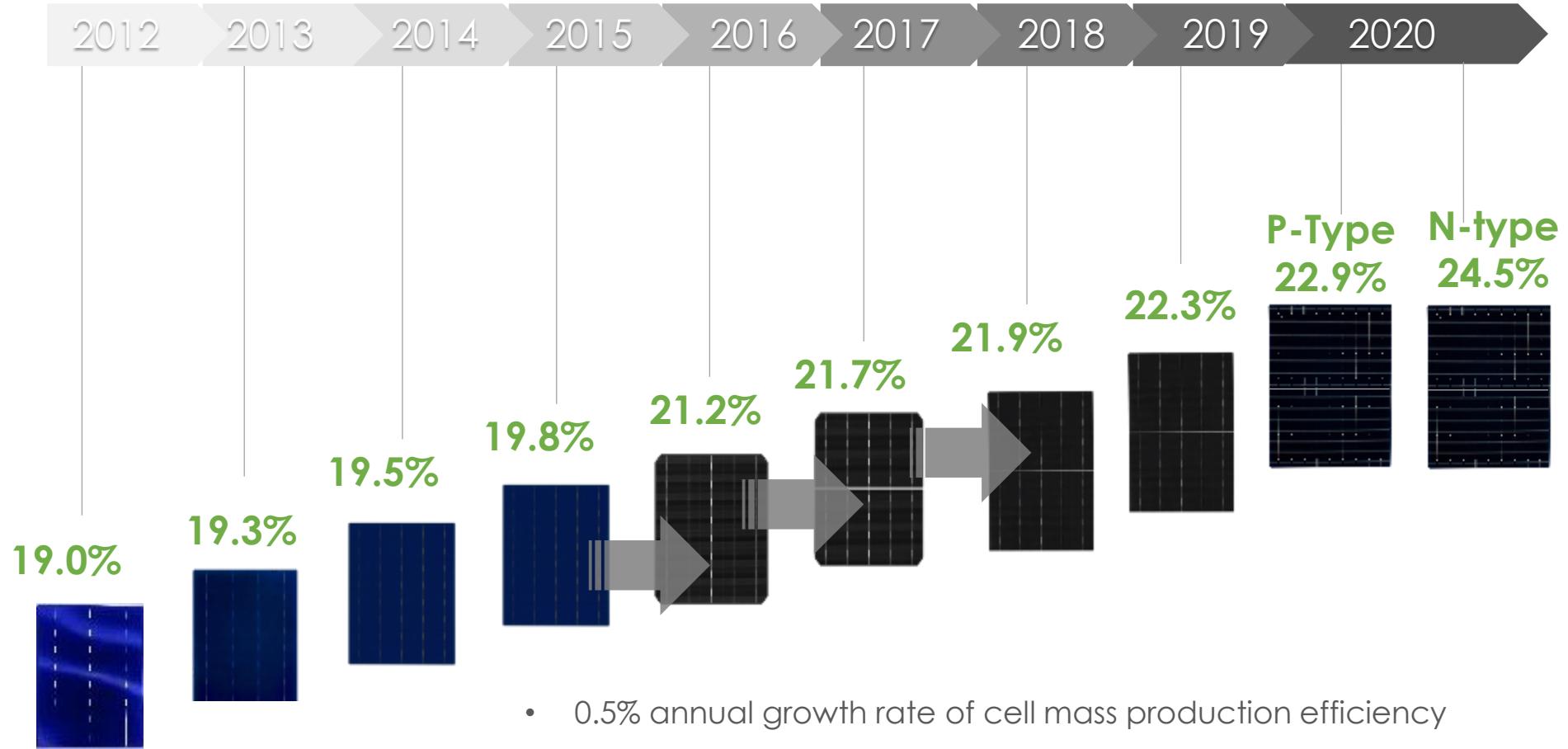
28.70%

Higher Efficiency Limits

Topcon cells have higher efficiency limit (28.2%~28.7%), much better than PERC cells.

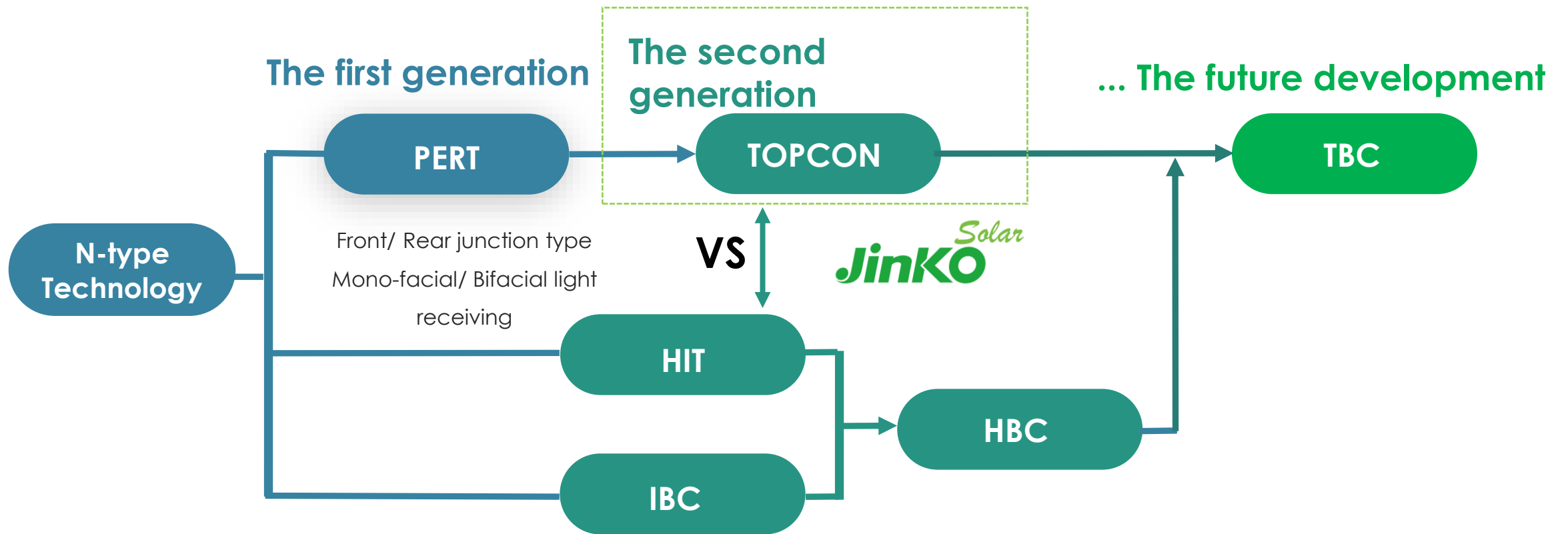


Technology Roadmap – Cell Efficiency



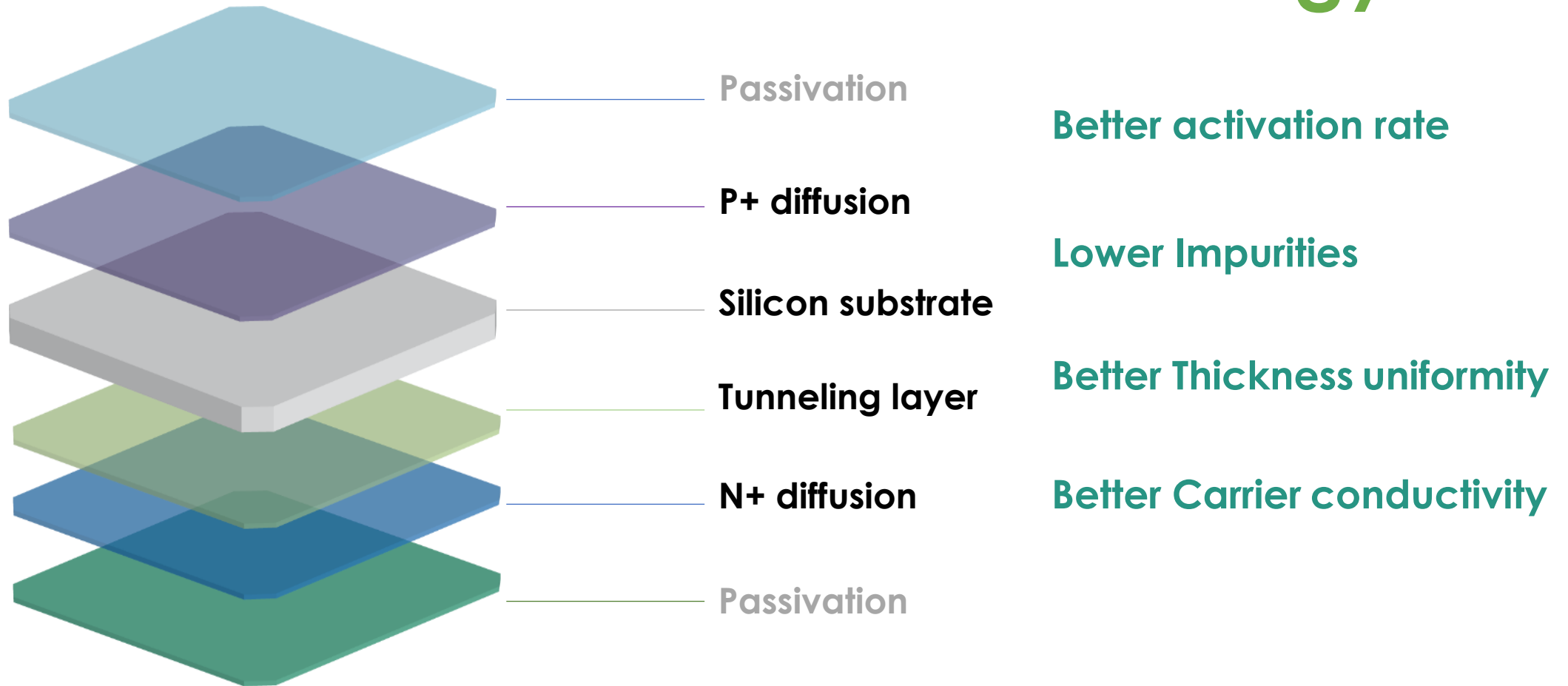
- 0.5% annual growth rate of cell mass production efficiency
- From poly to mono, full cell to half cell, 156.75mm to 158.75mm,
- From Tiger P&N-Type Mono PERC to Tiger Pro, 163.75mm to 182mm

N-type cell — The technical classification

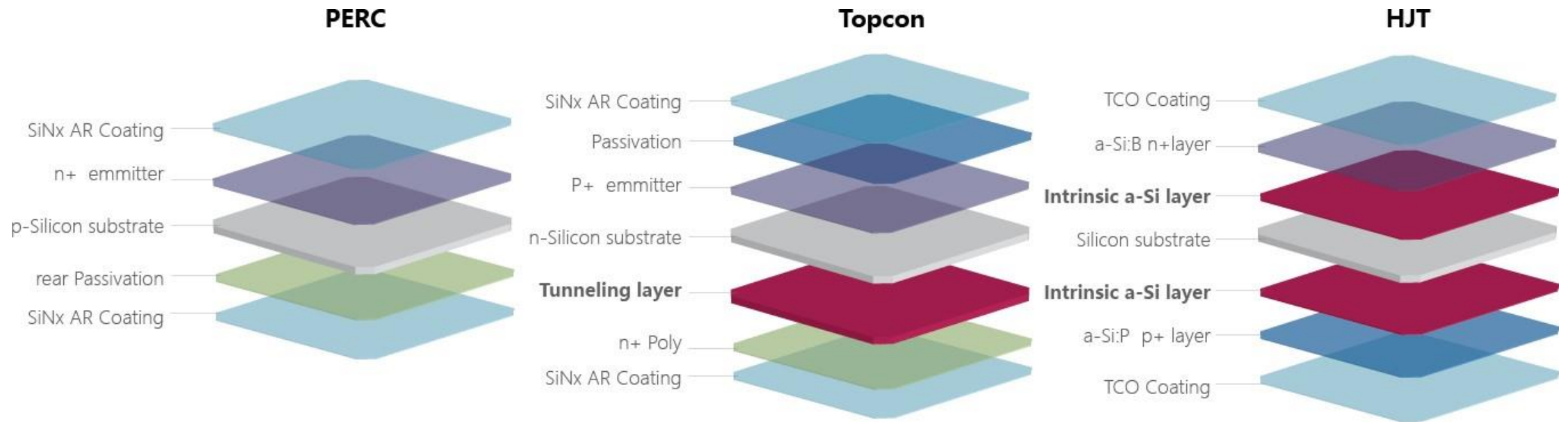


N-type cell — Structure innovation

HOT2.0 Technology



N-type Cell – Topcon & HJT



Both Topcon and HJT achieve power improvement through **passivation**. The former one uses tunneling oxide layer while HJT uses **intrinsic amorphous silicon film**. The differences in the methods lead to the differences in their respective processes, resulting in the difference in the commercial cost between the two.

N-type cell – HOT 2: TOPCON

Technical superiority

Higher Cell Efficiency

Tunneling oxide layer

Tunneling oxide layer brings higher efficiency

Mass eff. : **24.15%**(N) VS **22.8%**(P)

Higher Power Output

Lower operating temperature & optimized temperature coefficients

Operating temperature is 2 °C lower than PERC module, Temperature coefficient of Pmax is **-0.34%** for HOT2.0 and **-0.35%** for PERC

Negligible LID

New doping technology

N-type cells are not affected by light-induced degradation (LID)

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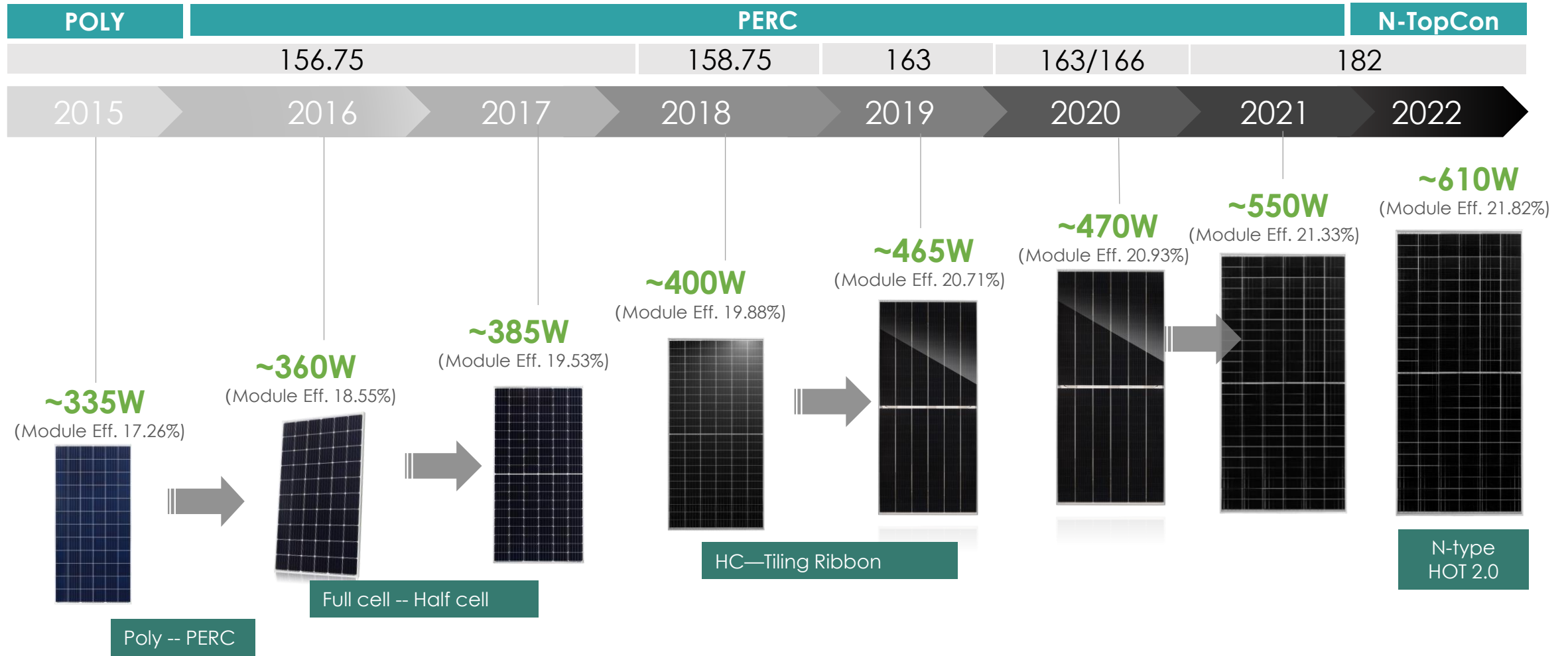
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Product Roadmap – Wafers & Modules Power



Product Introduction - For Distribution Market

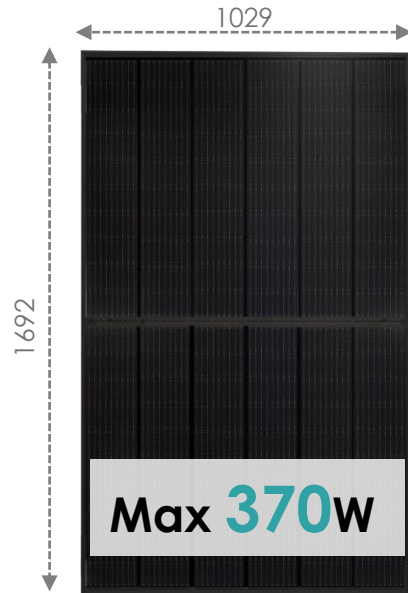


60 CELLS TR MODULE

Standard



All Black

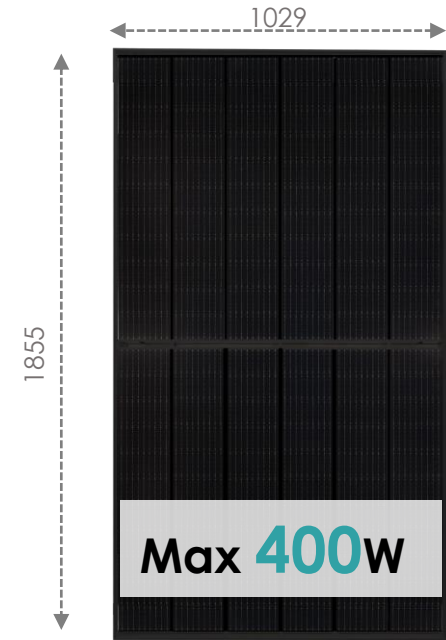


66 CELLS TR MODULE

Standard



All Black



TOPCON Technology
Higher Module Efficiency
Up to **21.54%**



Better Temp. Coefficient
-0.34%



Linear Power Warranty
1st year: **1%**
2-30 years: **0.4%**



Product Warranty
White backsheet:
15 years
Black backsheet:
25 years

New Product 2022



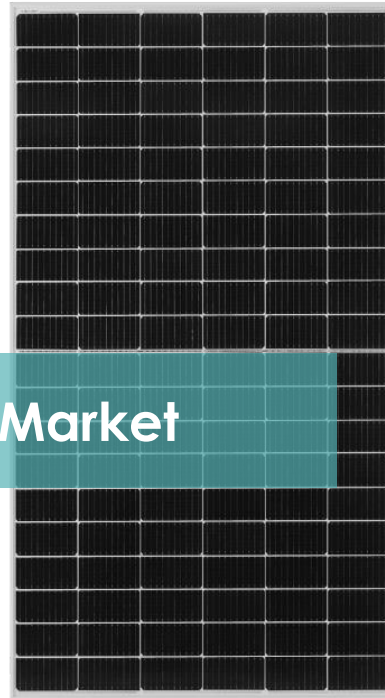
Tiger NEO N-type

Tiger Neo 54
405W-425W



1903*1134

Tiger Neo 60
465W-480W

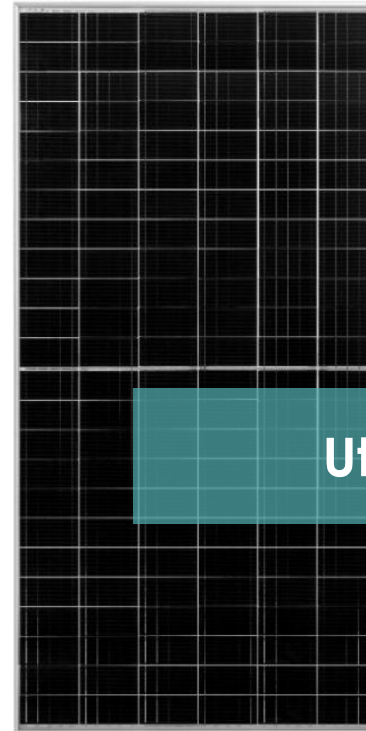


1903*1134

Distribution Market

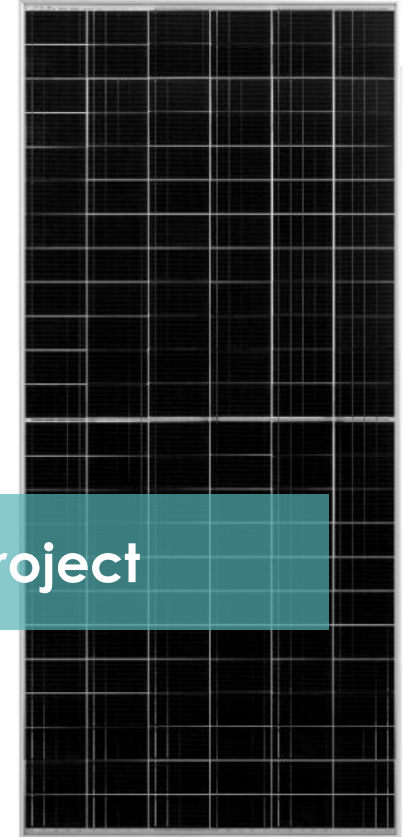
Monofacial

Tiger Neo 72
550W-575W



2278*1134

Tiger Neo 78
590-610W



2465*1134

Utility Project

Monofacial & Bifacial DG

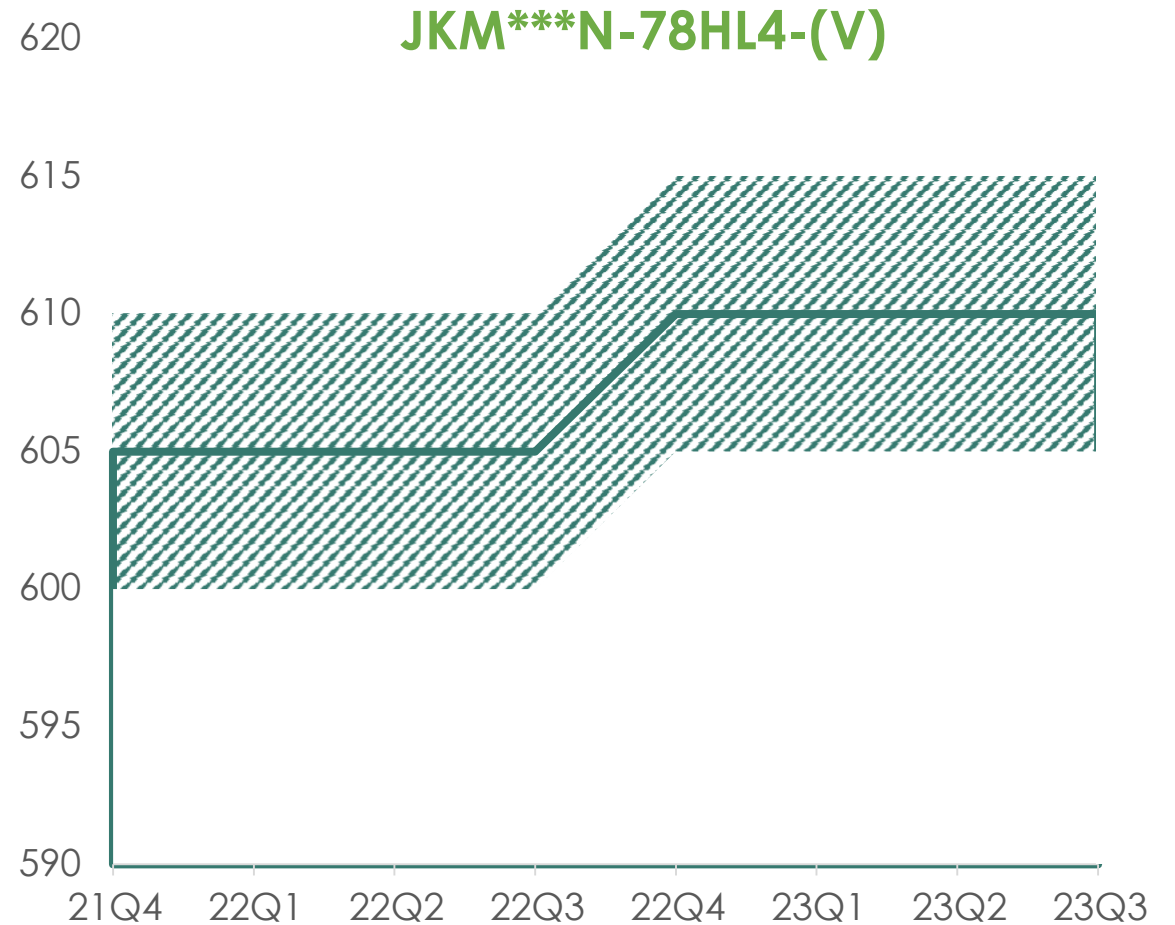
Tiger Neo Series



Tiger Neo 78

Monofacial

- 78 HC+MBB
- N-type M10 wafer
- Power warranty: 1st yr. $\leq 1\%$, 2nd to 25th yr. $\leq 0.40\%$



*Maximum power is based on high efficiency technology with white EVA

Distribution markets – Demands and Solutions



Residential



Commercial



Module

Appearance
Power & Efficiency
Size

System Design

Compatibility
Mechanical Load
Weight

Service

Installation instruction
System solution

O&M

Product warranty
Reliability

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Product Advantage I

Optimized Degradation Advanced Warranty



The power warranty could achieve 30 years compared with traditional P-type modules.

The first year degradation is lower than 1% which means the power output could remain over 87.4% compared with the 1st year.

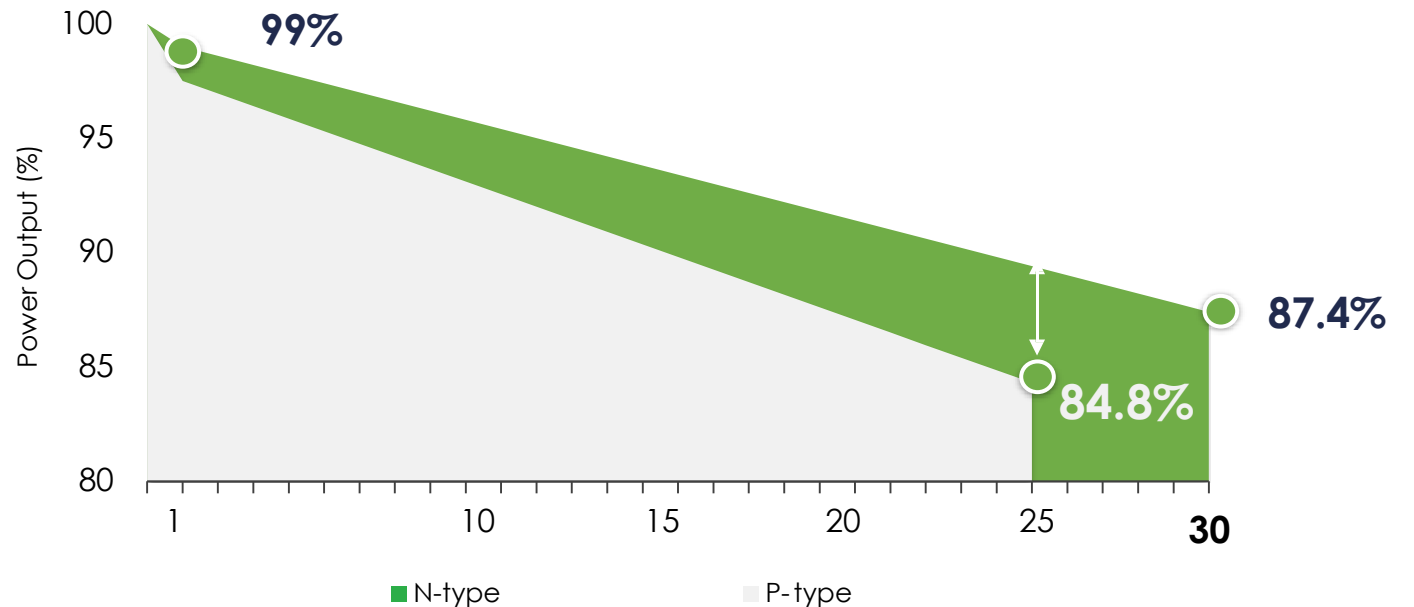
30 years Power Warranty

$\leq 1\%$

First year degradation

-0.4%

Linear degradation



Product Advantage II

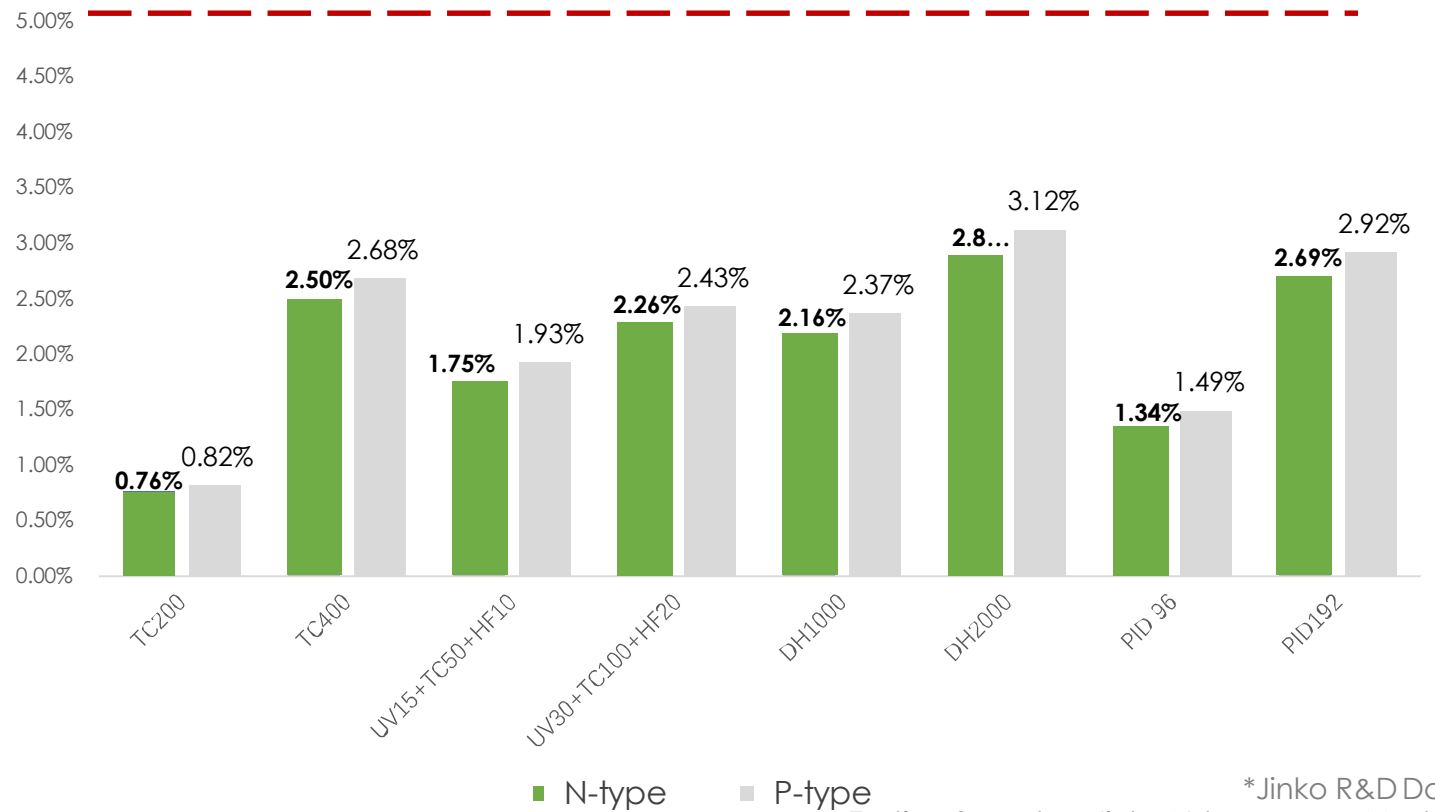
Enhanced Reliability



The N-type modules have better indicators than normal IEC standard and perform excellent during test process.

Tiger Pro N Reliability Test

IEC 5%



*Jinko R&D Data
 Testing Sample: Jinko N-type mono Module
 Jinko P-type mono Module

Product Advantage III

- Tiger Neo's power output will increase with the better **temperature coefficient** (**0.75%** higher compared with PERC)
- Under the same external environment, Tiger Neo's **operating temperature** is lower (**>1 %** compared with the same specification P-type)
- Under high temperature conditions, the advantage will further expand (**~2%** higher)

Optimized Temperature Coefficients

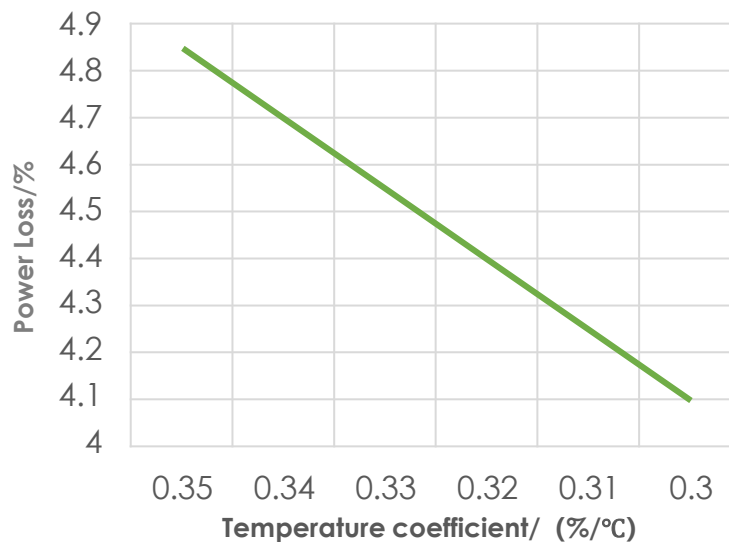
-0.30%/ °C



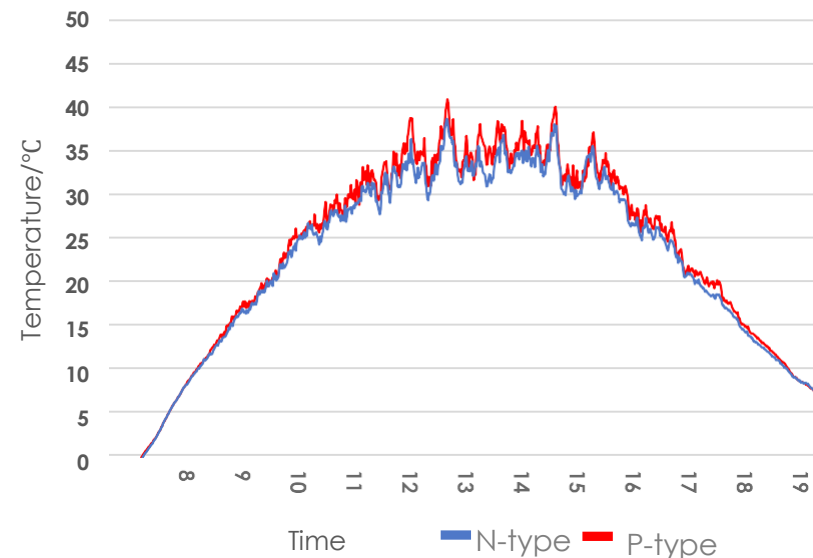
P-type -0.35%

N-type -0.30%

Power Loss influenced by temp. coefficient



Real-time operating temperature



Product Advantage IV

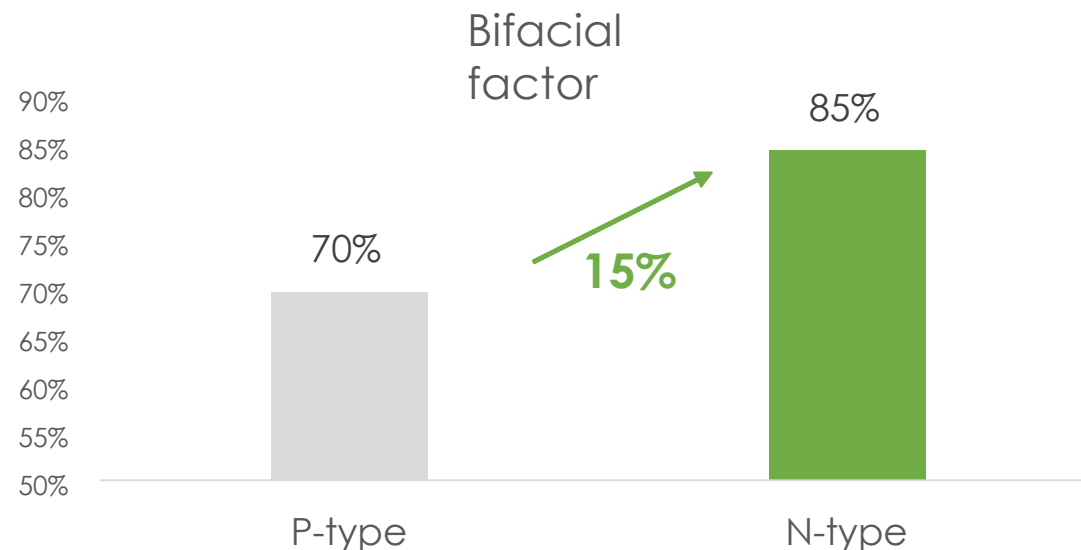
Bifacial Factor

85%



N-type's higher bifacial factor will bring significant power gain

around **2.03%**



$$P_{\text{Integrated power}} = P_{\text{front}} * (1 + \text{BSI} * \text{Bifi})$$

*Bifi: Module bifacial factor

*BSI: Bifacial stress irradiance coefficient (depend on real irradiance & groundreflectivity)

Power gain contrast :

PERC: BSI*70%=**9.45%**

HOT: BSI*85%=**11.48%**

Improved Energy Generation over 3%



1

Optimized Temperature Coefficients

The advanced N-type HJT2.0 technology brings better temperature coefficients from -0.35% (P-type) to -0.30% (N-type)

2

Higher Bifacial Gain

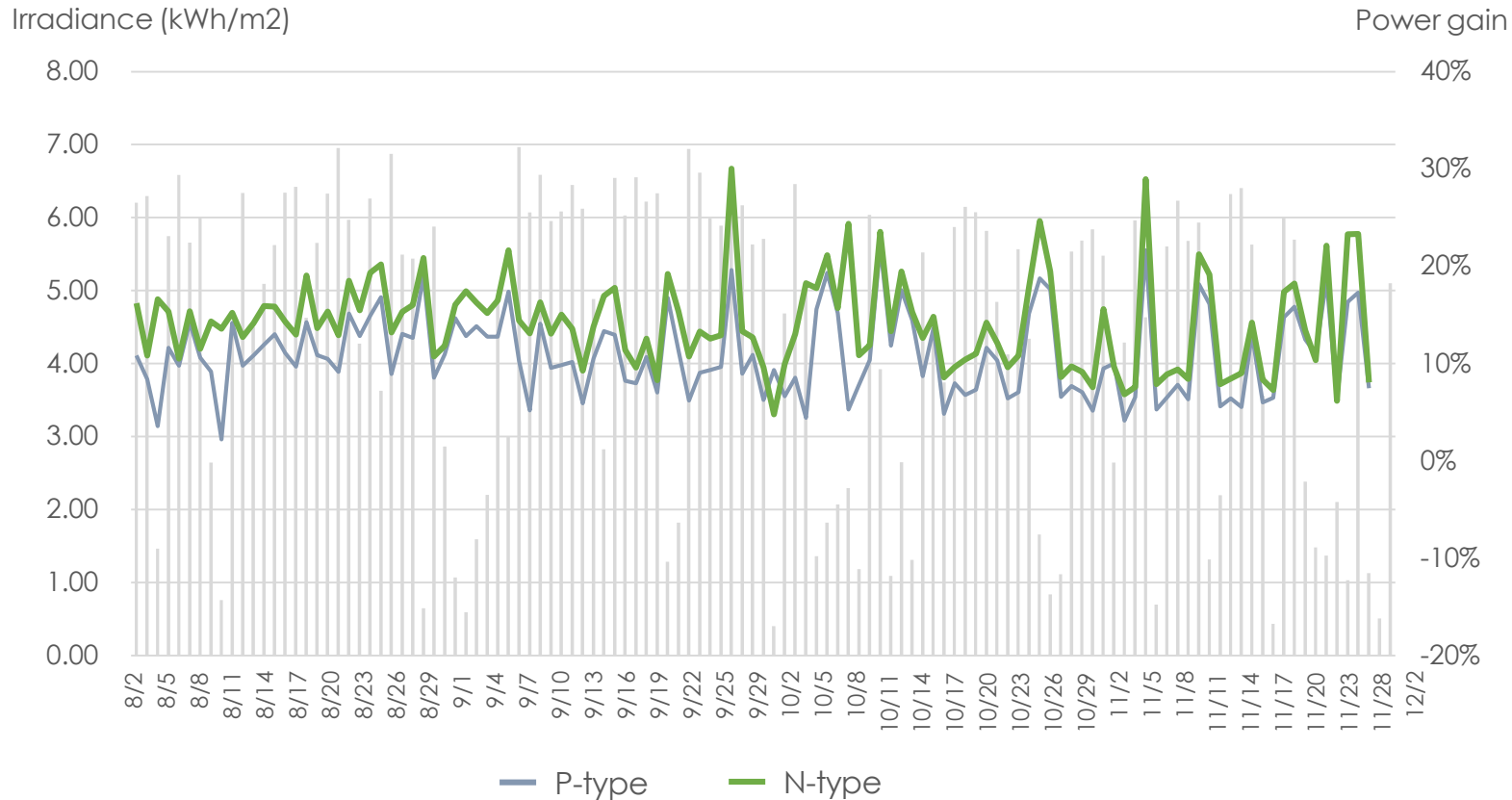
N-type modules have higher bifacial factor: 70% (P-type) up to 85% (N-type), significantly optimizing power generation capacity.

3

Lower LID / LETID

Low B content in N-type c-Si doped with P (significantly lower LETID from 0.9~1.2% (P-type) to 0.4% (N-type) and improved LID < 0.5%)

Outdoor Project Data Support – Topcon VS PERC



P-type bifacial module

Power gain

9.7%

N-type bifacial module

Power gain

12.7%

The power generation difference reaches **3%**

* Location: Haining
Angle: 30°

Height: 0.7m
Ground : cement

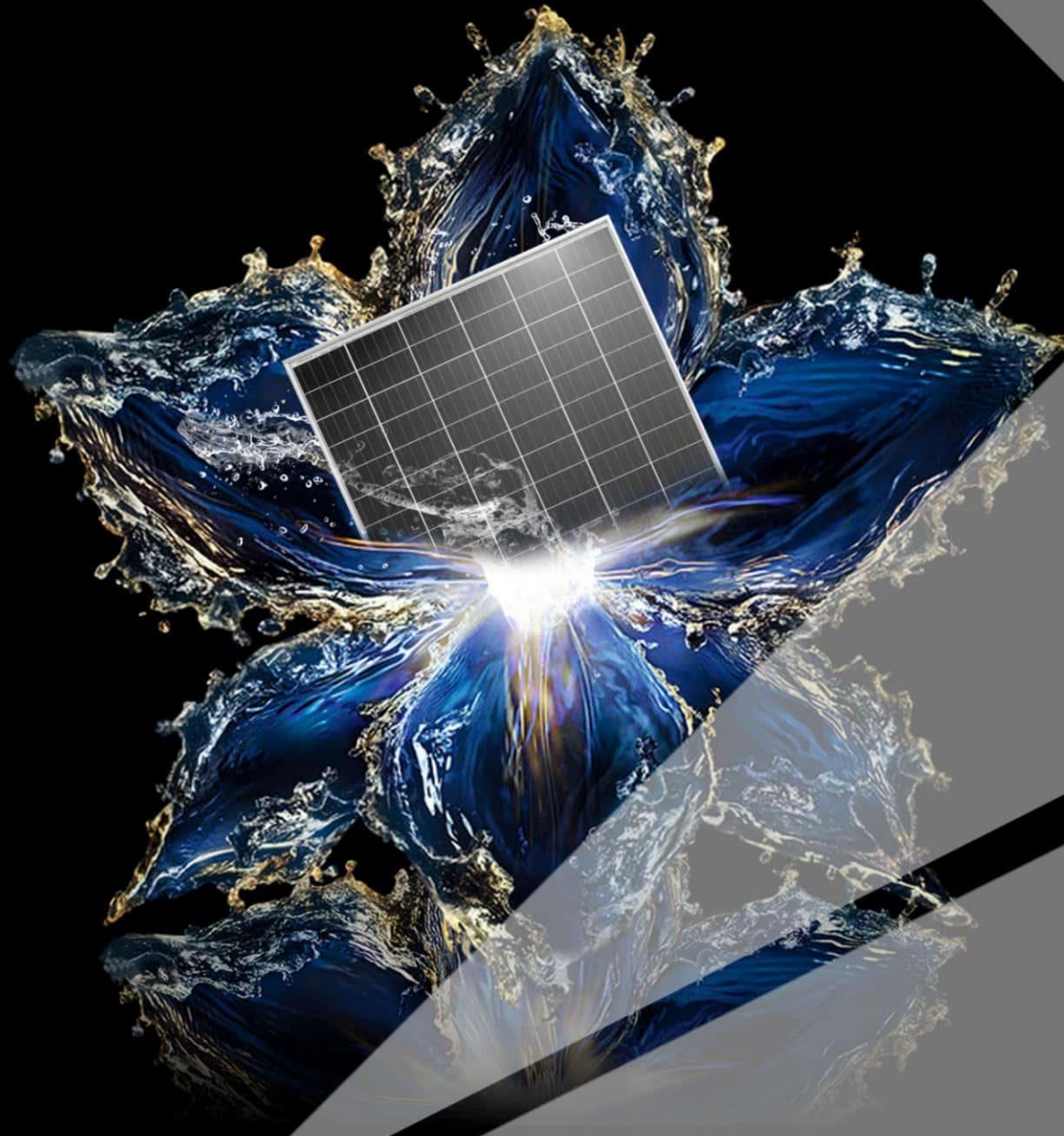
Capacity: P-TV 6.93kWp
N-TV 7.2kWp

Tiger Neo Series – BOS/LCOE Analysis for Utility Project

Tiger Neo 182 mm shows more savings in BOS and lower LCOE than 210 mm modules



		182N-72	210P-60	210P-66
200 MW - Saudi Arabia 2P tracker vertical	Module Power (W)	565	600	660
	ΔBOS (US Cent/W)	-	▲ 2.80%	▲ 0.40%
	ΔLCOE (US Cent/W)	-	▲ 6.20%	▲ 4.94%
		182N-78	210P-60	210P-66
200MW - Spain 2P tracker vertical	Module Power (W)	605	600	660
	ΔBOS (US Cent/W)	-	▲ 2.65%	▲ 0.37%
	ΔLCOE (US Cent/W)	-	▲ 4.78%	▲ 3.84%



Thanks!