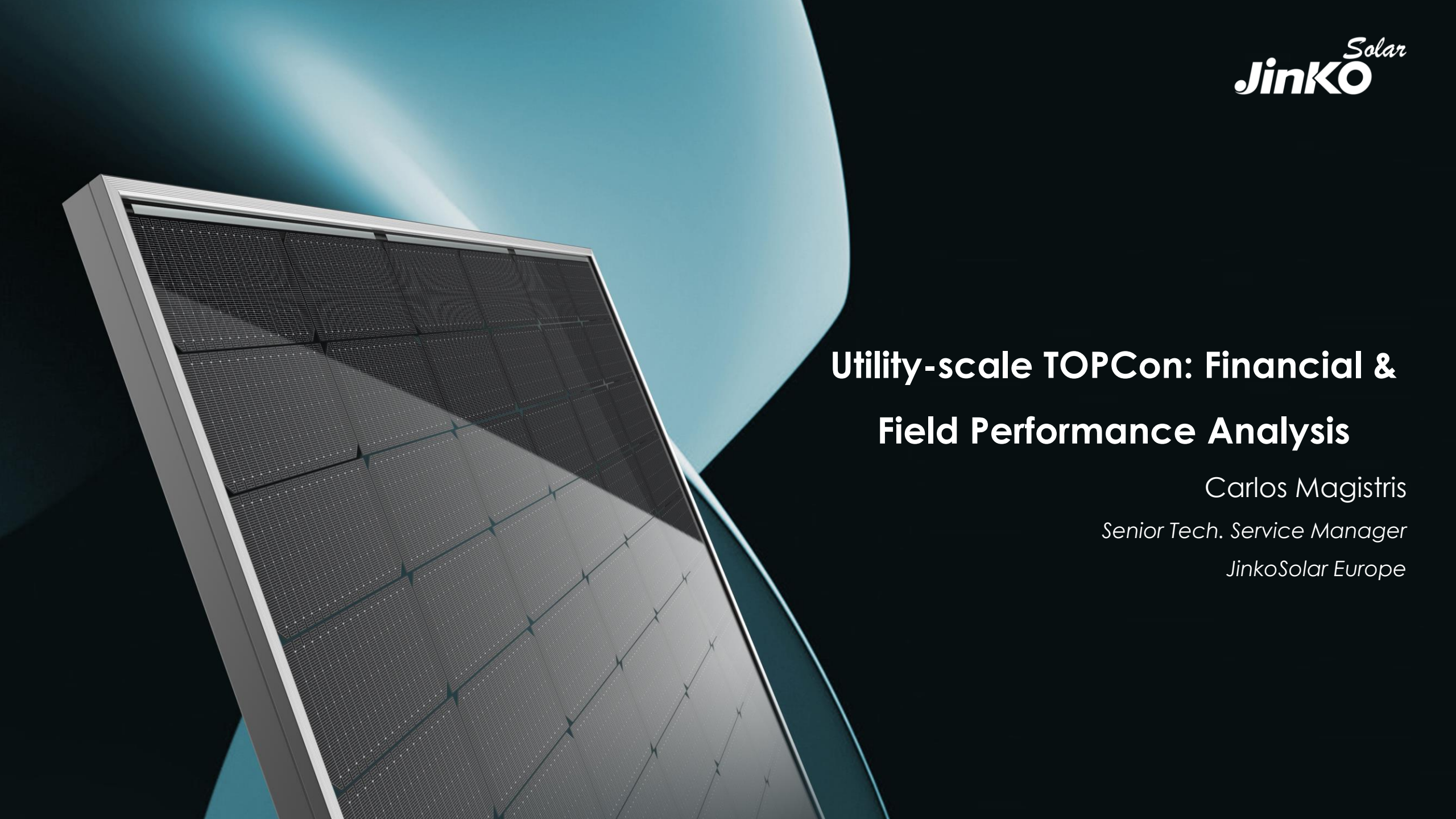
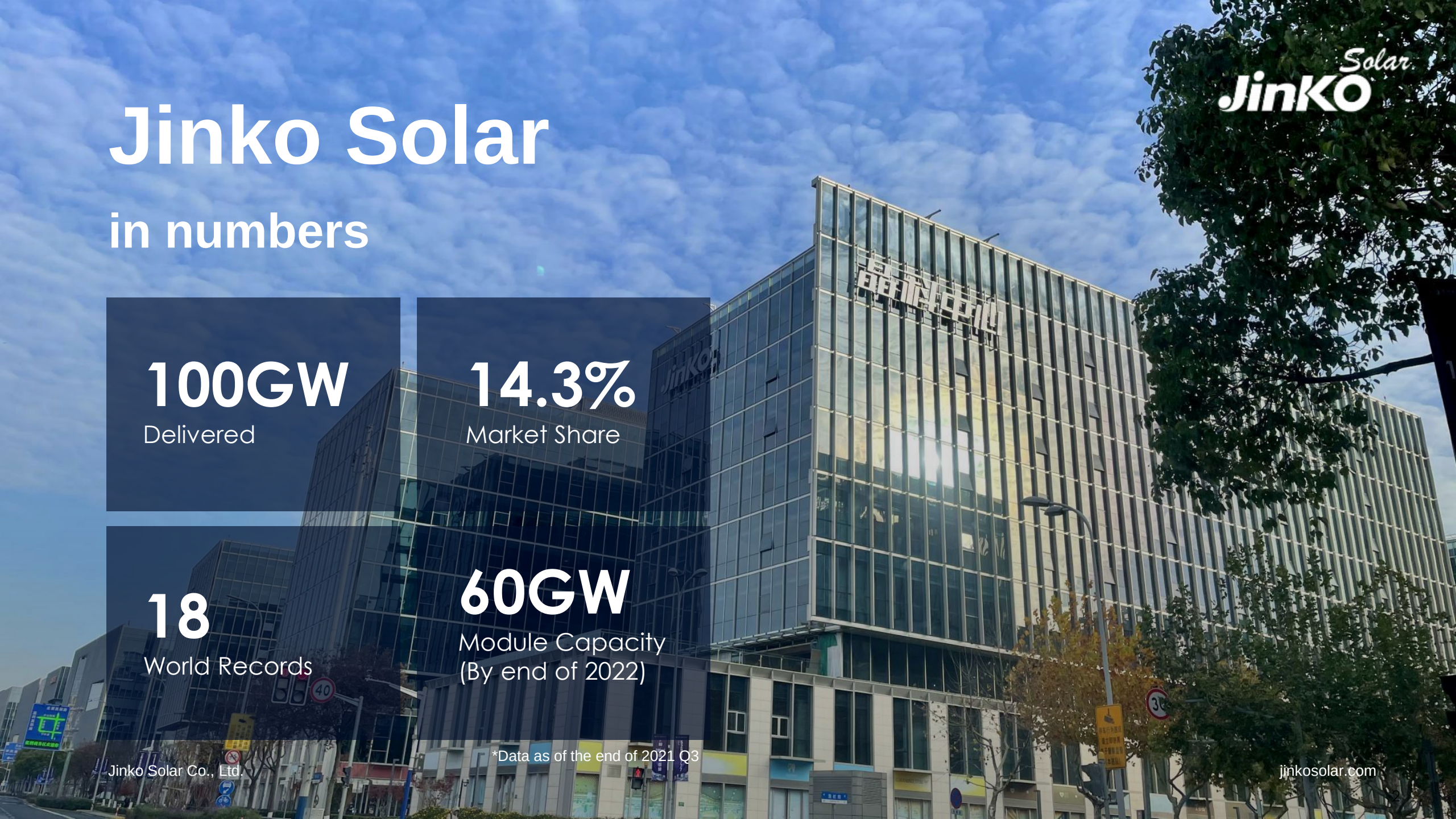


Utility-scale TOPCon: Financial & Field Performance Analysis

Carlos Magistris

Senior Tech. Service Manager

JinkoSolar Europe



Jinko Solar

in numbers

100GW
Delivered

14.3%
Market Share

18
World Records

60GW
Module Capacity
(By end of 2022)

*Data as of the end of 2021 Q3

Global Leader in Technological Innovation

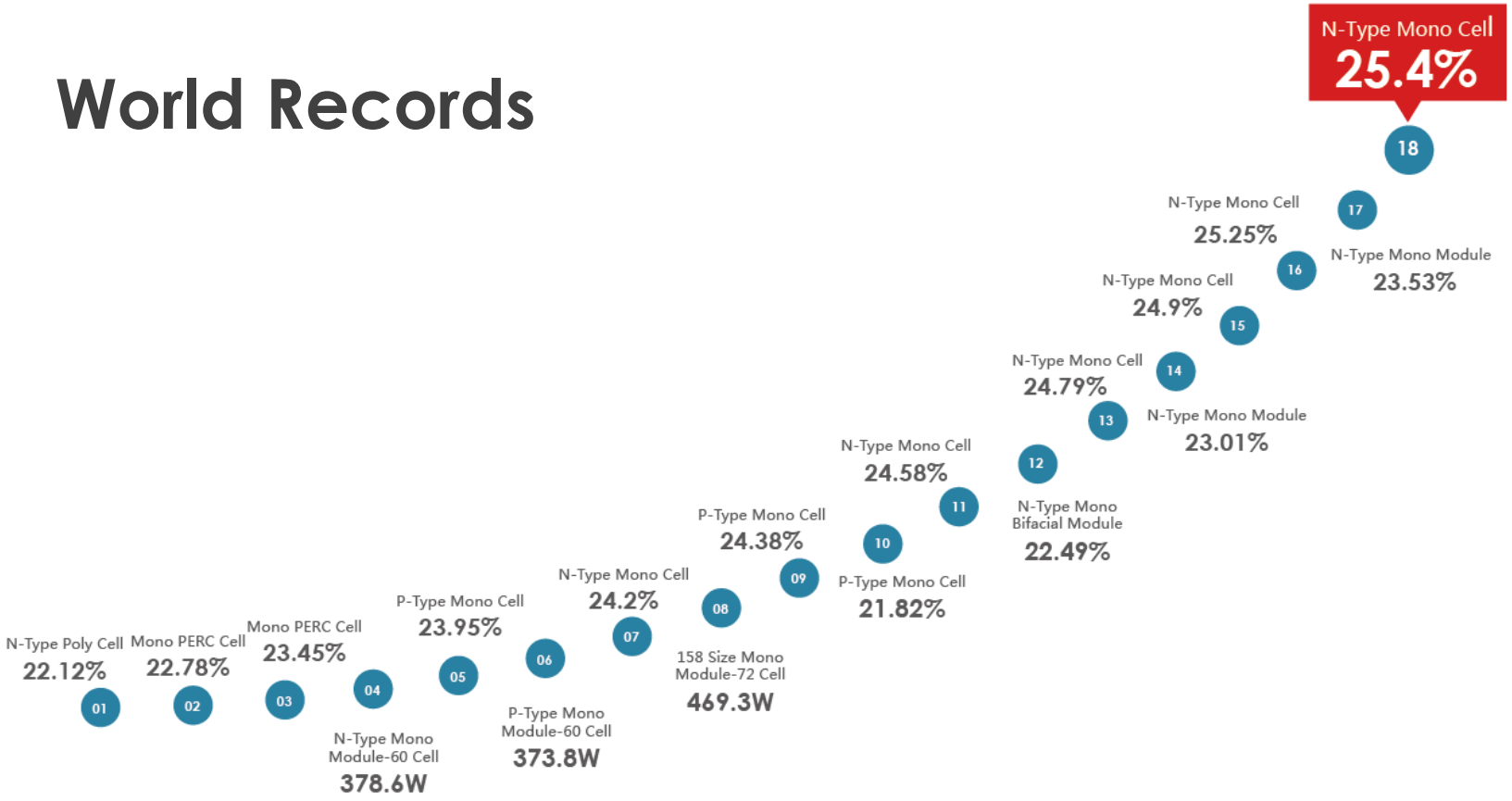
2059 Invention Patents

1163 Granted Patents

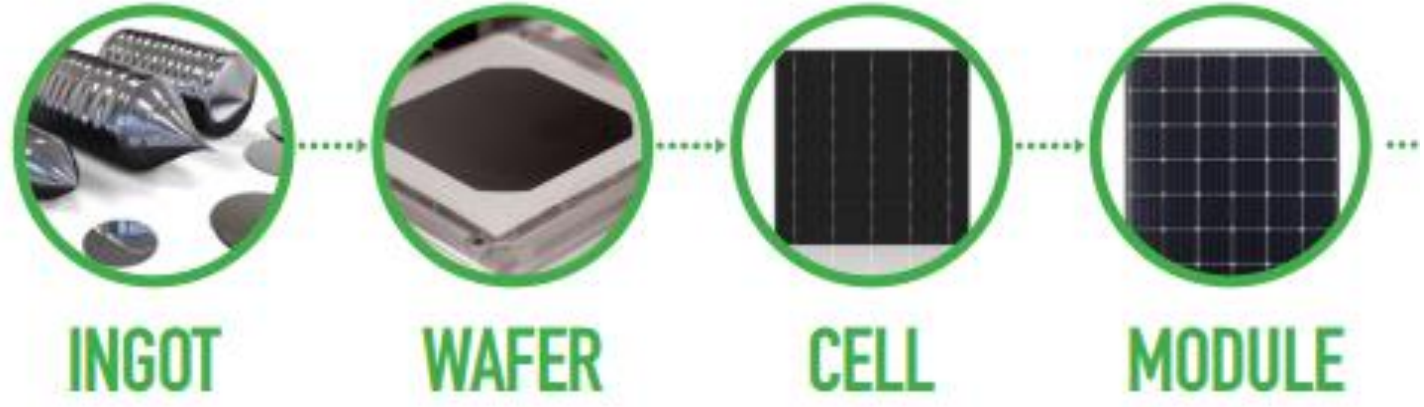
R&D Team 1000+Engineers and Scientists

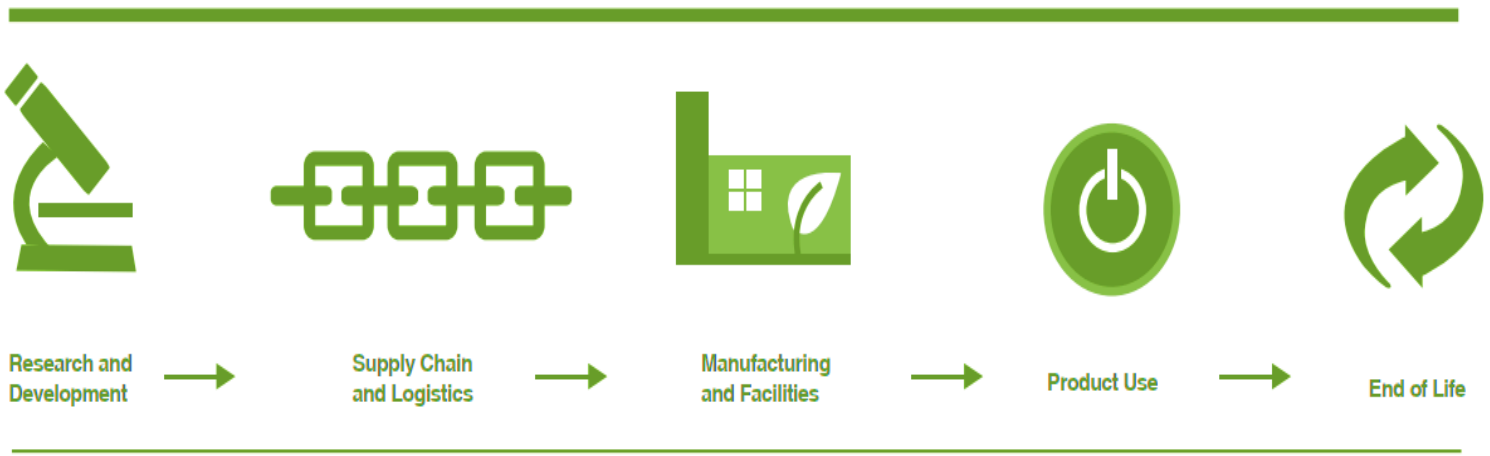
2 R&D Centers

World Records



Vertically Integrated Production



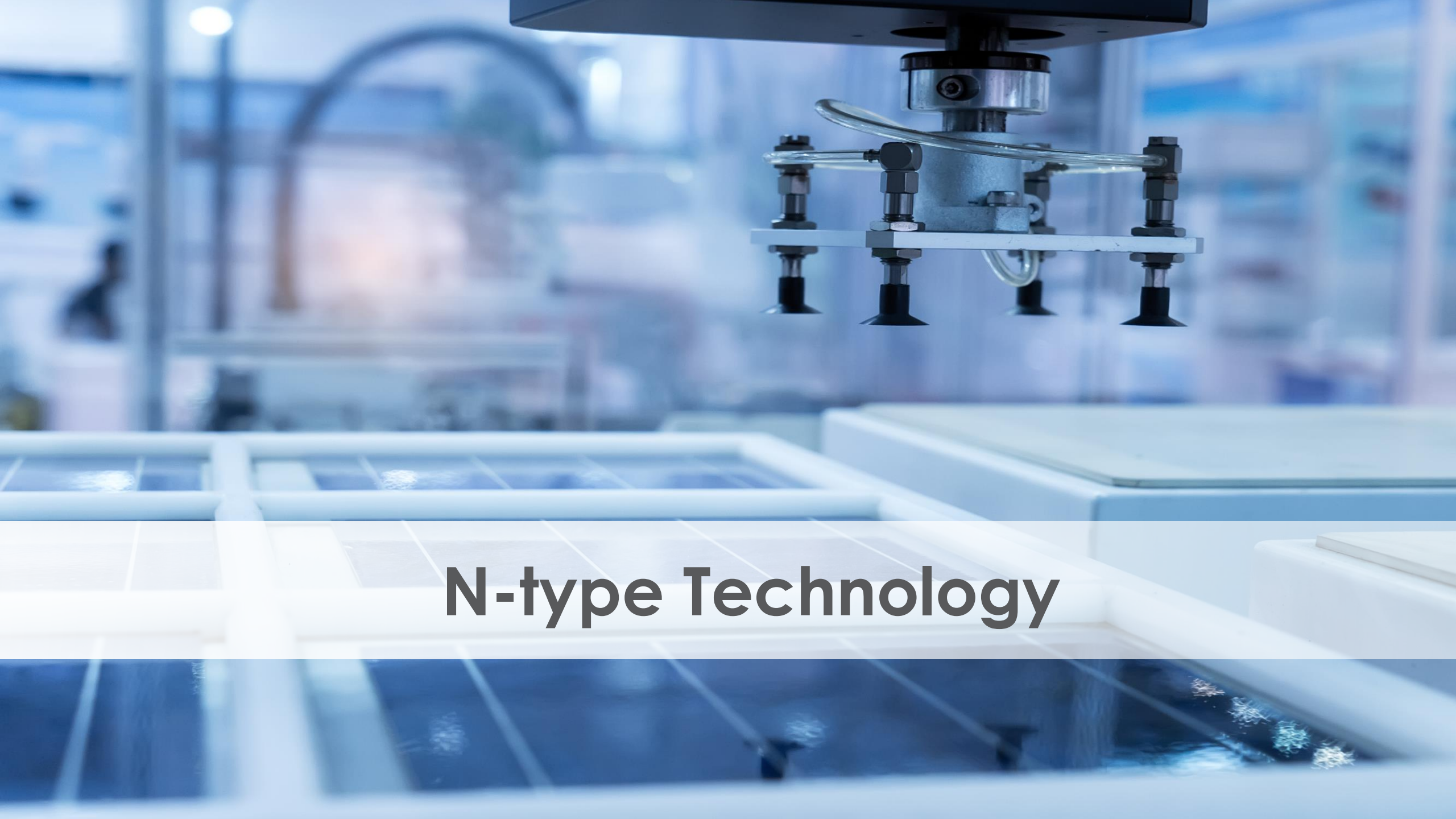


First-Class Components

Guaranteed Quality

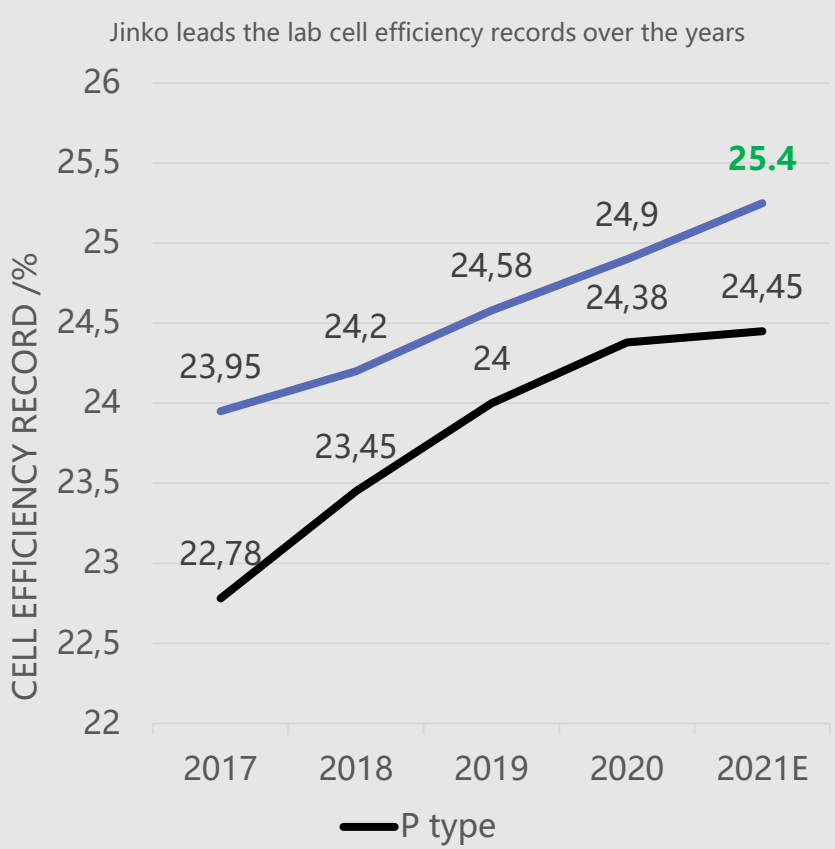
Optimized Cost structure

Sustainability Complete System

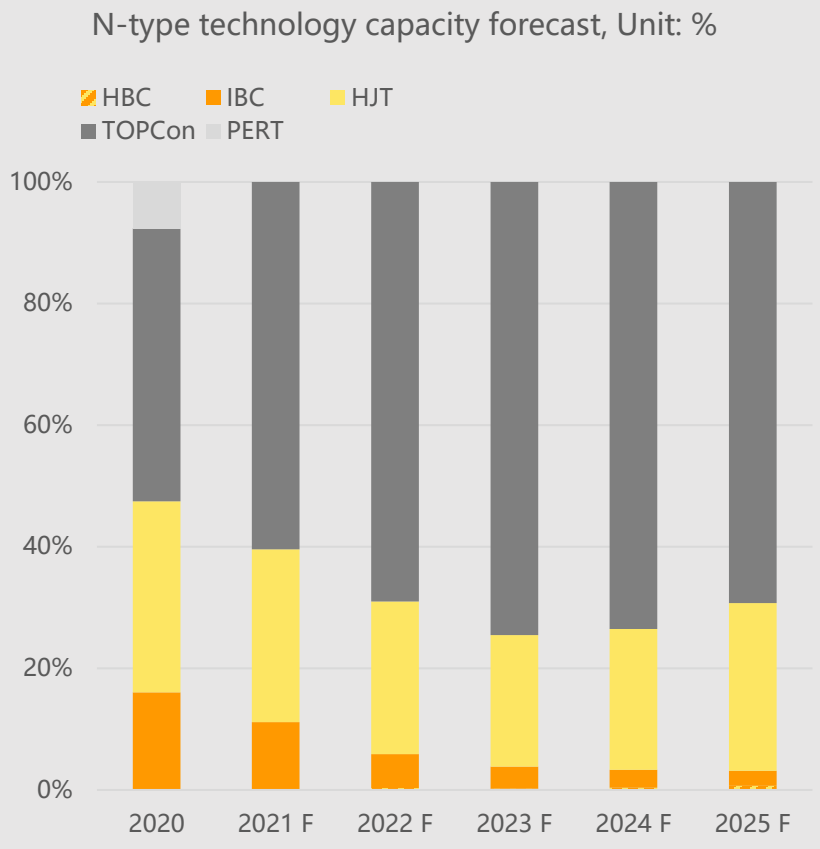


N-type Technology

The Breakthrough of Cell Efficiency



Data source：Jinko R&D



Data source：PVinfo

24. 5%

Mass Production Efficiency

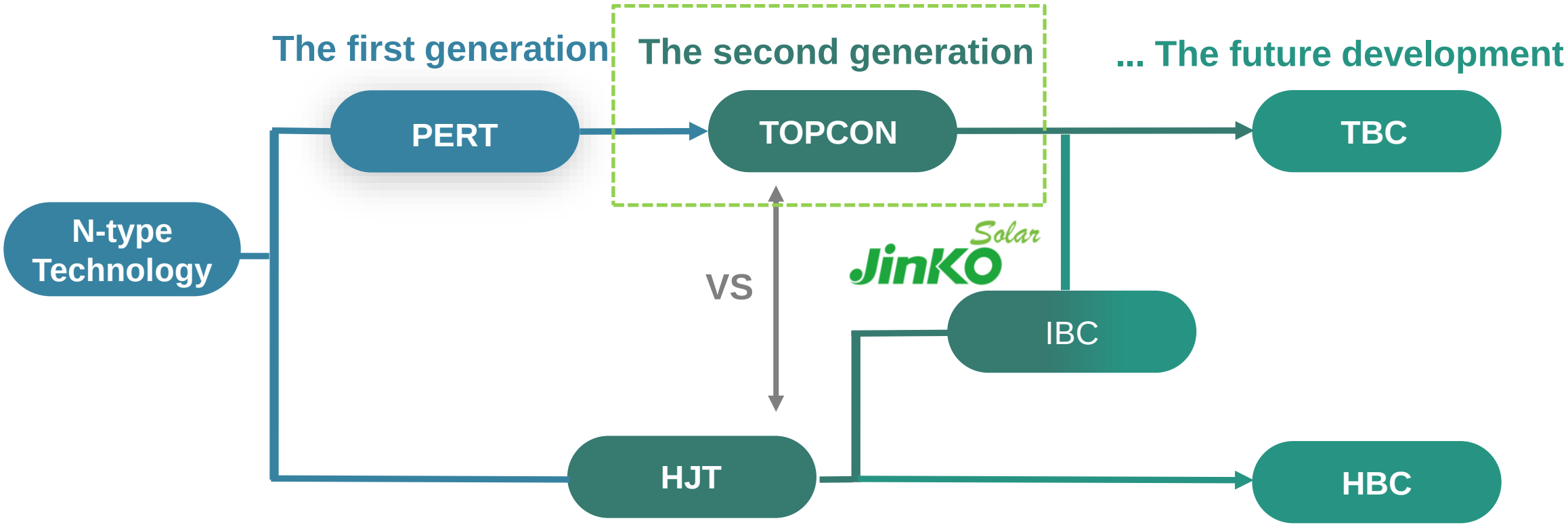
The application of HOT 2.0 technology has contributed to a new breakthrough in N-type cells, and the efficiency of mass-produced cells can reach 24.50%.

28.70%

Higher Efficiency Limits

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

Tiger Neo Series— Cell technology

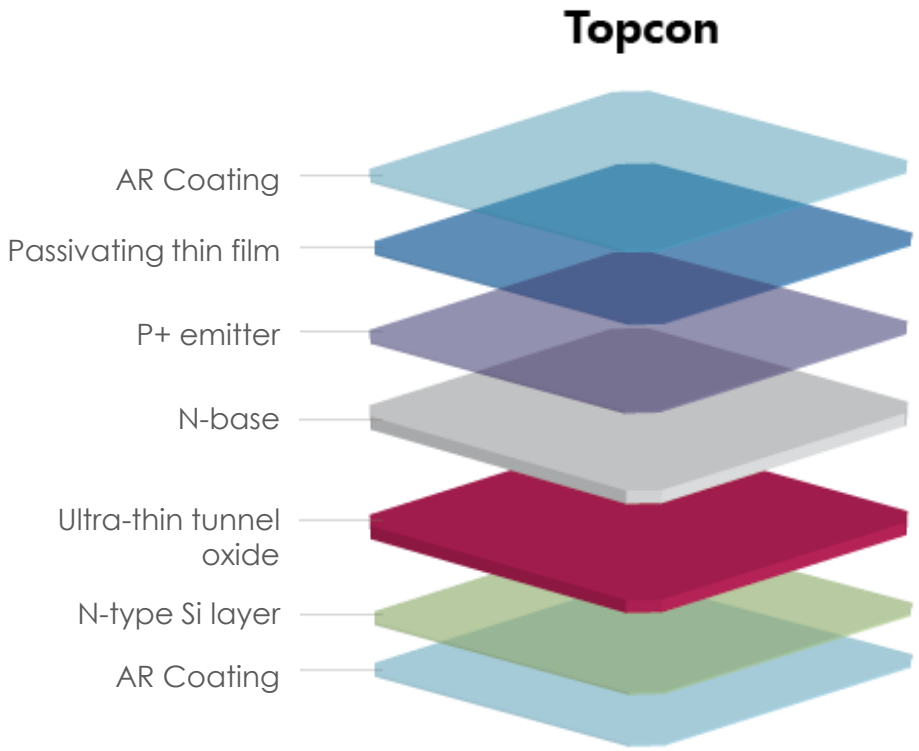


PERT : Passivated Emitter Rear Totally Diffused)

*TOPCON ; Tunnel Oxide Passivated Contact
HJT : Heterojunction
IBC : Interdigitated Back Contact

TBC: Transparent Back Contact
HBC: heterojunction back contact

Tiger Neo Series – Technical advantages



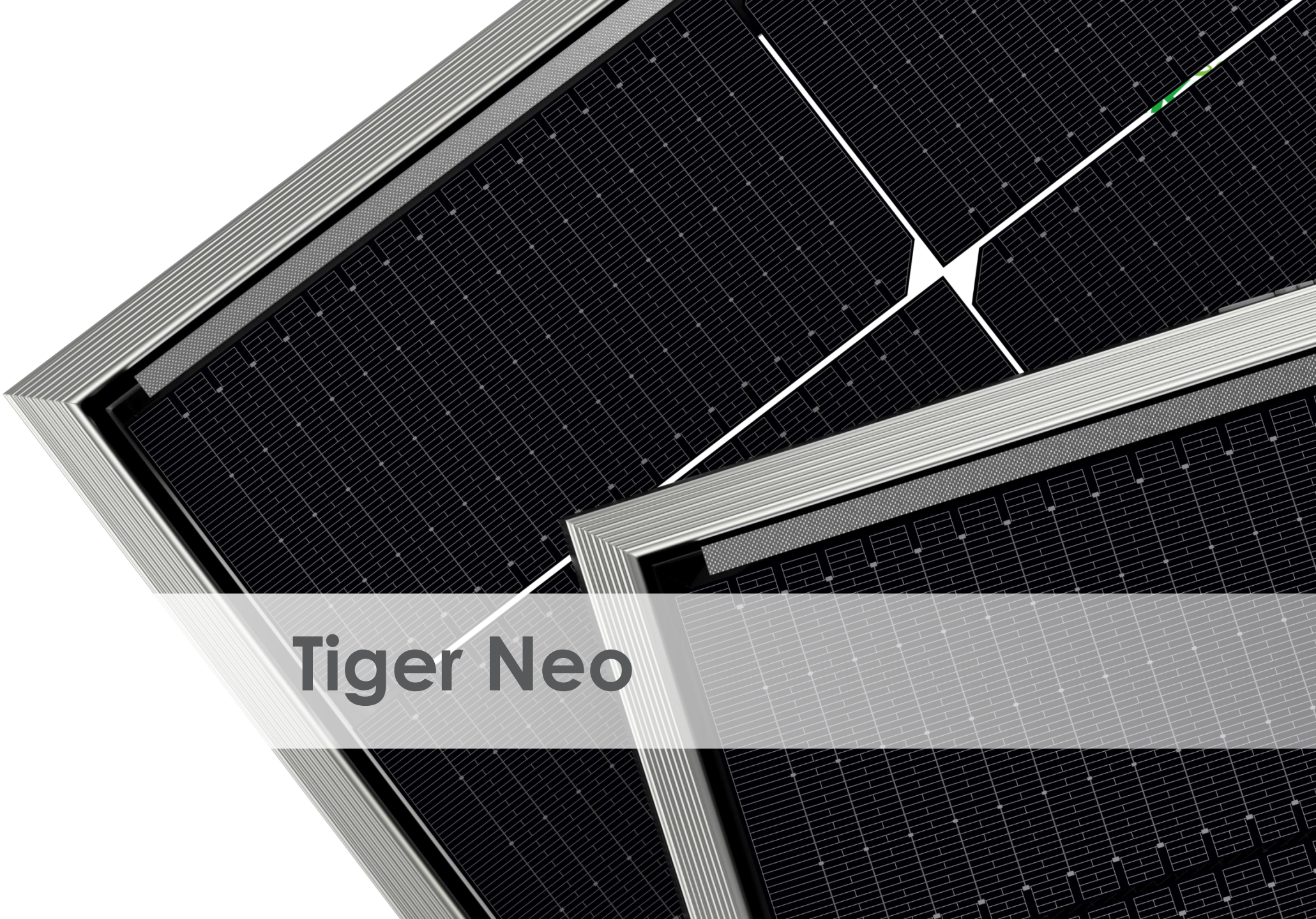
TOPCon

Higher boron atomic activation rate

Less impurities

Better thickness uniformity

Better carrier conductivity

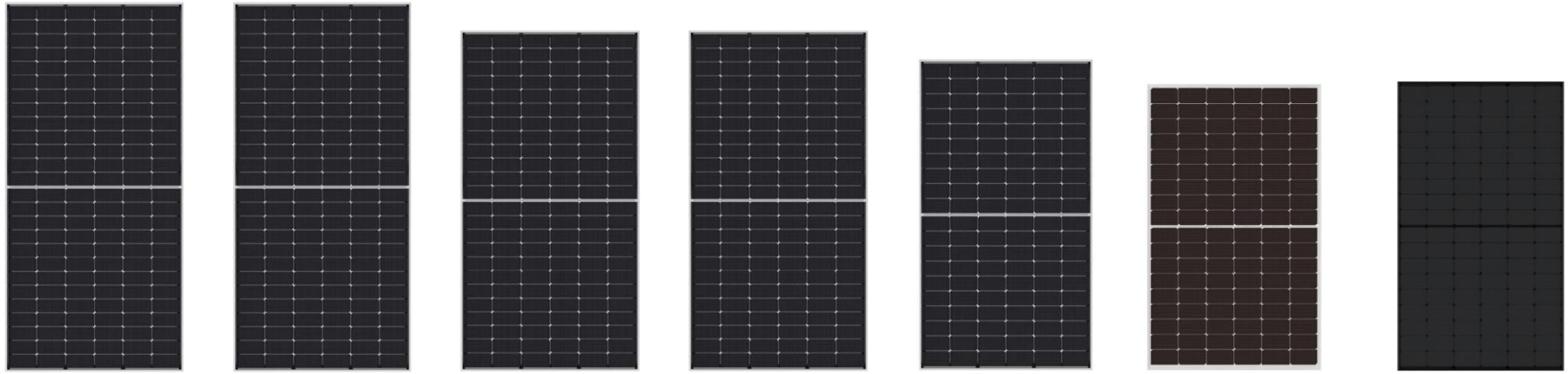


Tiger Neo

2022 New Product

Tiger Neo

TOPCON Technolgoy



JKMxxxN-78HL4-(V)	JKMxxxN-78HL4-BDV	JKMxxxN-72HL4-(V)	JKMxxxN-72HL4-BDV	JKMxxxN-60HL4-(V)	JKMxxxN-54HL4-(V)	JKMxxxN-54HL4-B
600-610 W	595-605 W	560-570 W	555-565 W	460-470 W	410-420 W	395-415
2465*1134 mm	2465*1134 mm	2278*1134 mm	2278*1134 mm	1903*1134mm	1722*1134mm	1722*1134mm
78P	78P	72P	72P	60P	54P	54P-all black
Mono-facial	Bifacial	Mono-facial	Bifacial	Mono-facial	Mono-facial	Mono-facial

*LID: Light Induced Degradation / LETID: Light-elevated temperature-induced degradation

Product Advantage Ⅰ Optimized Degradation

Advanced Power Warranty

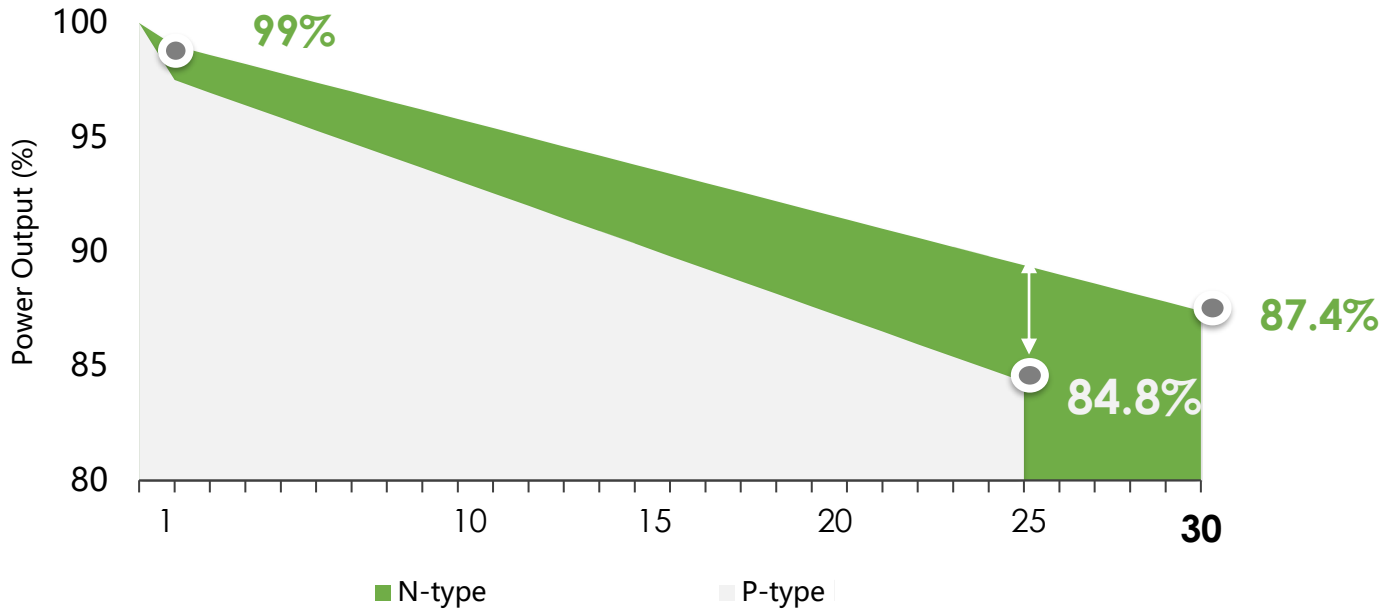
N-type: 30 years vs. P-type module: 25 years.

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

30 years Power Warranty

≤ 1%
First year degradation

0.4%
Linear degradation



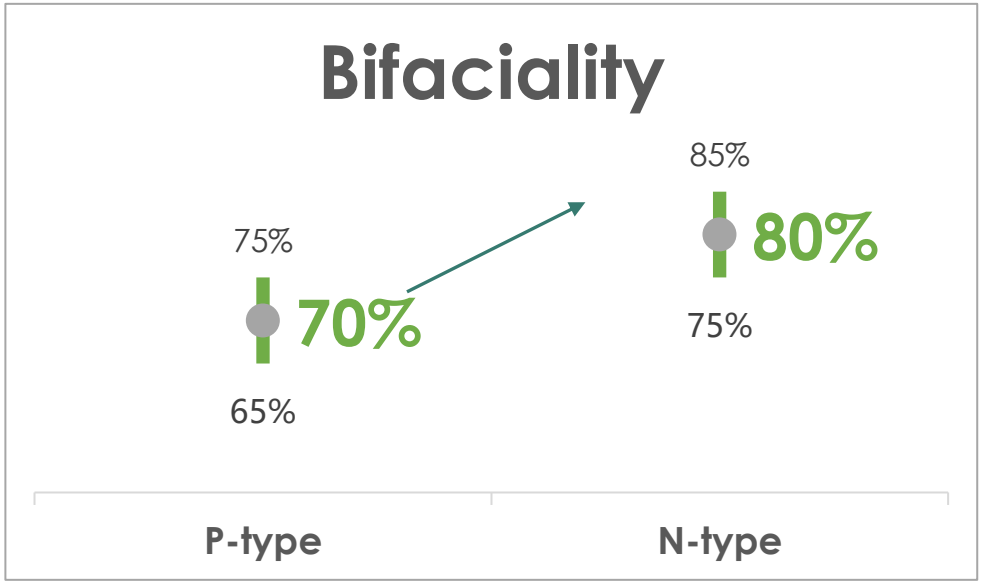
Product Advantage II

Bifaciality Factor

80%

N-type's higher bifaciality will contribute to obtain a

Higher Bifacial gain



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

*Bifi: Module bifacial factor
*BSI: Bifacial stress irradiance coefficient (depend on real irradiance & ground reflectivity)

Power gain contrast

PERC	BSI*Bifi(70%)≈**9.45%**
TOPCon	BSI*Bifi(80%)≈ **10.80%**
	BSI*Bifi(85%)≈ **11.48%**

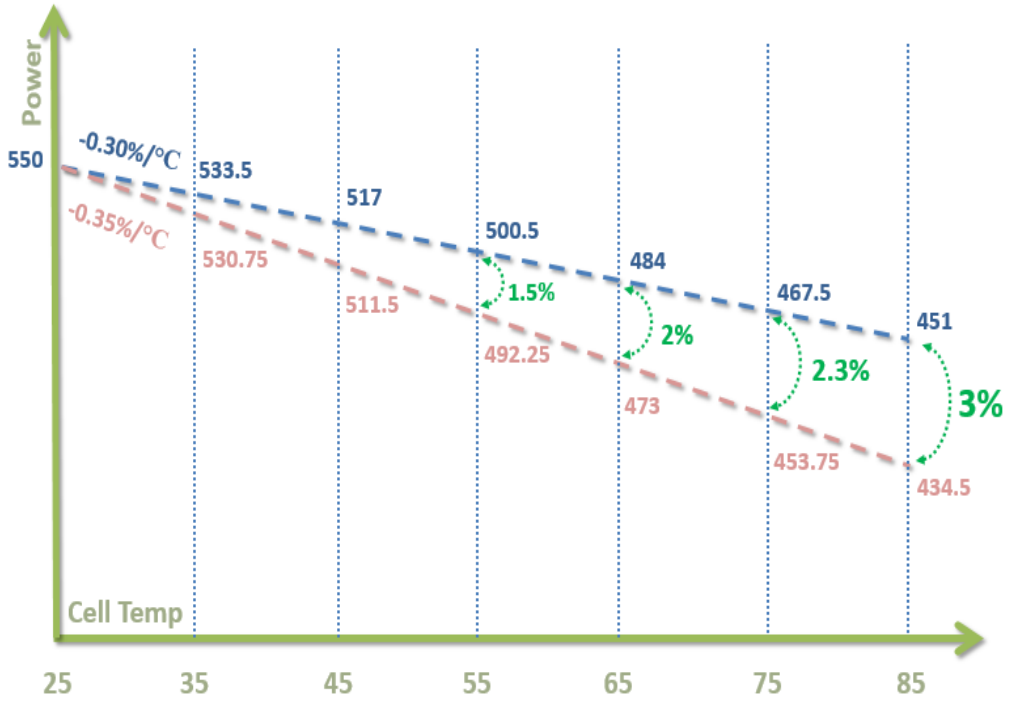
Simulation results for location Haining

Product Advantage Ⅲ Optimized Temperature Coefficients

-0.30%/ ℃

P-type -0.35%

N-type 0.30%

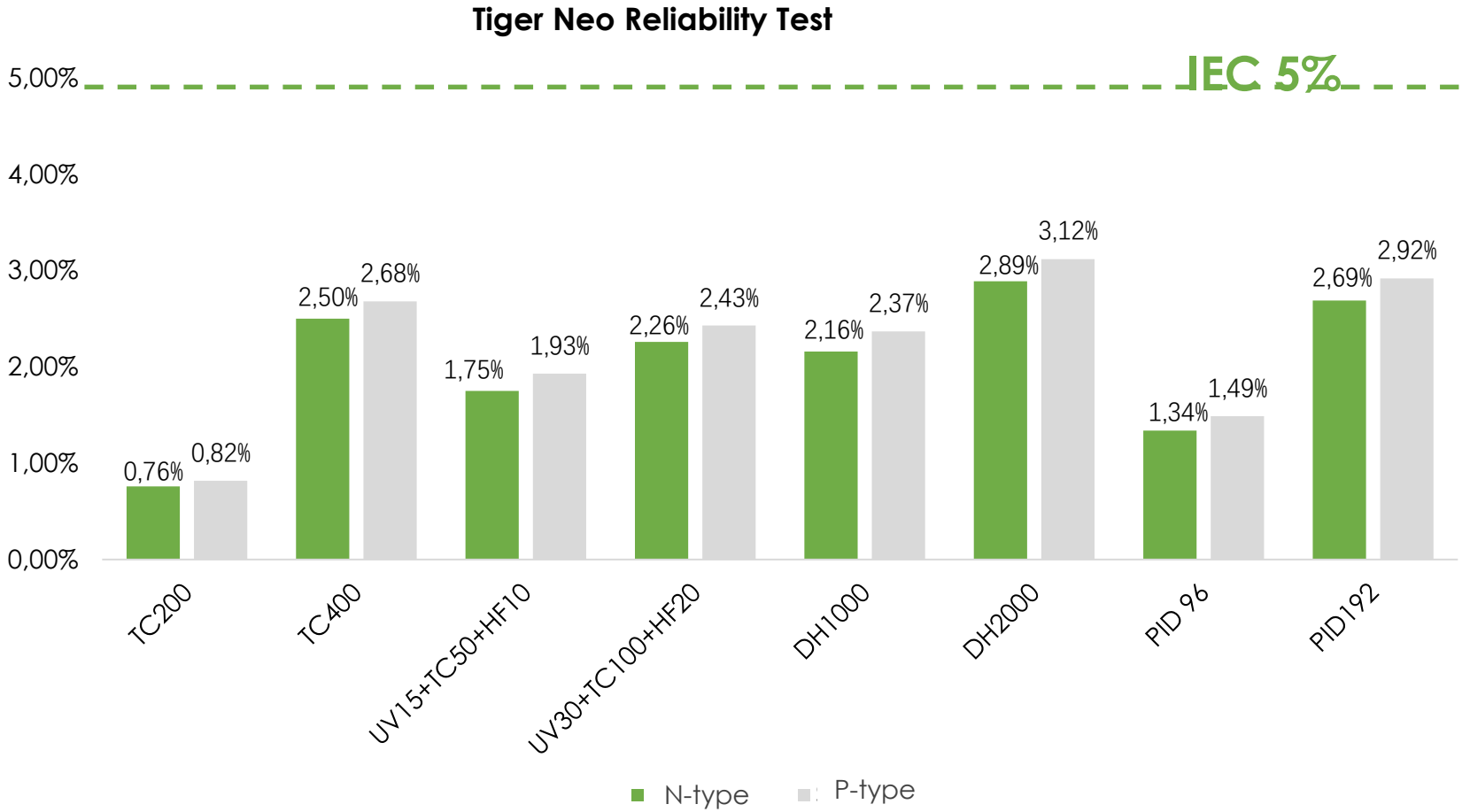


The power temperature coefficient has improved with every generation of PV technology, but the switch from PERC to TOPCon will further improve it by +15%.

Product Advantage IV

Enhanced Reliability

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



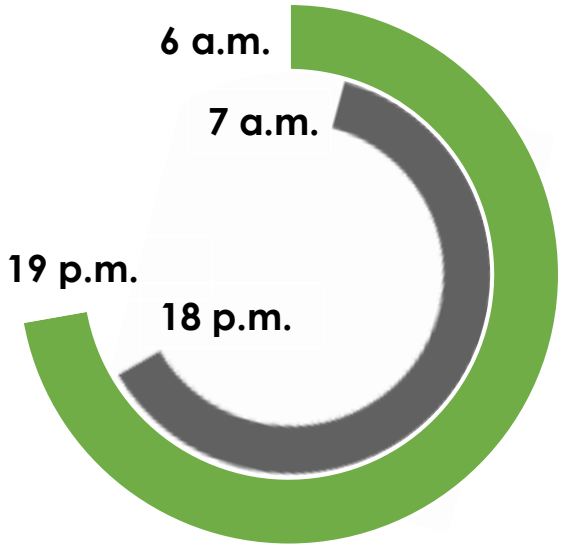
*Jinko R&D Data

Testing Sample: Jinko N-type mono-facial module, Jinko P-type mono-facial module

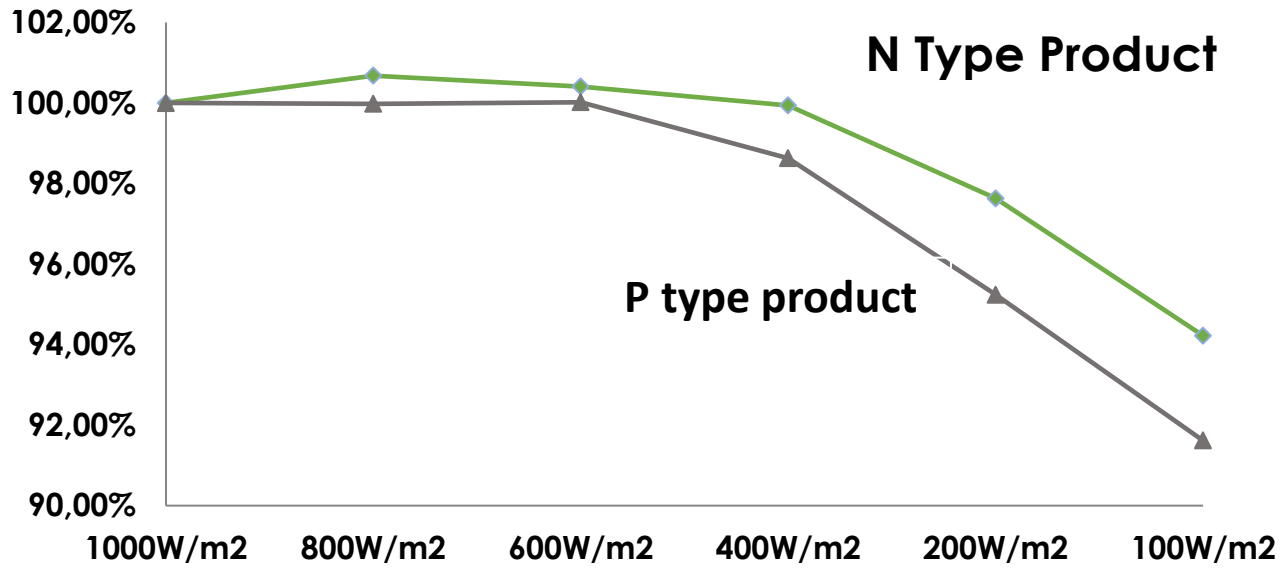
Product Advantage V

Better low light performance

N-type cell, higher internal resistance, longer minority carriers life, naturally better low light response



- Compared with traditional PERC modules, N-type TOPCon modules have a better response to low light, extend the power generation period by about 1H in the morning and evening.
- At low light conditions, especially below 600W/m^2, N-type show better performance than P-type.



Improved Energy Generation

over 3%

1 Advanced Power Warranty

N-type TOPCon offers 30 yrs. warranty compared to 25 yrs. of p-type. Besides of a 1st year degradation of only 1% and annual 0.4% only.

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 Optimized Temperature Coefficients

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

Improved Long-term

Performance & Reliability

4

Enhanced Reliability

N-type modules have better reliability indicators than the requirement of the IEC standards and show improved results than p-type.

5

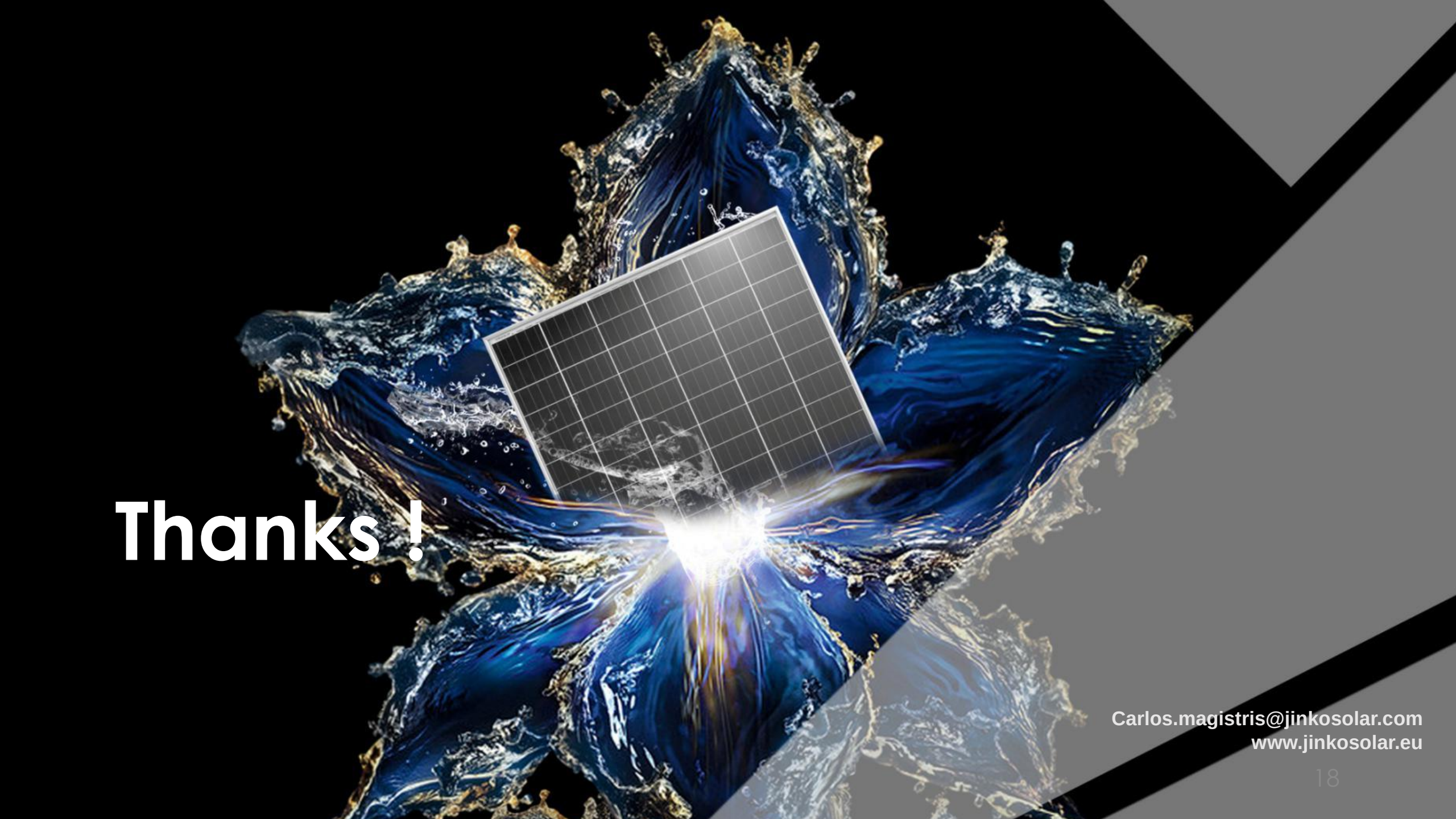
Lower LID / LETID

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 negligible LID < 0.5%)

6

Excellent Low Irradiance Response

Compared with traditional PERC modules, N-type TOPCon modules have a better response to low light, extend the power generation period by about 1H in the morning and evening.



Thanks !

Carlos.magistris@jinkosolar.com
www.jinkosolar.eu