PT Trina Mas Agra Indonesia

Introduction to TMAI Solar PV Technology

Breaking the Walls: Indonesia's Future on Solar Energy and Storage Innovations

Jakarta, October 15th, 2024

Solar PV Manufacturing Investment

PT Trina Mas Agra Indonesia

Shareholders:

Trinasolar · DSS energy and infrastructure · PLN Indonesia Power

TMAI Groundbreaking Ceremony
28 August 2023

TMAI Shareholder's Agreement
11 October 2023

Location : Kendal Industrial Park

Capacity : 1GW in 1st Phase (Solar Cell & Solar Module); extendable to 3GW
Product: up to 720 W/panel @ 23.2% eff

Technology : Tier-1 N-type Topcon Cell & Module (**AAA** bankability by BNEF)

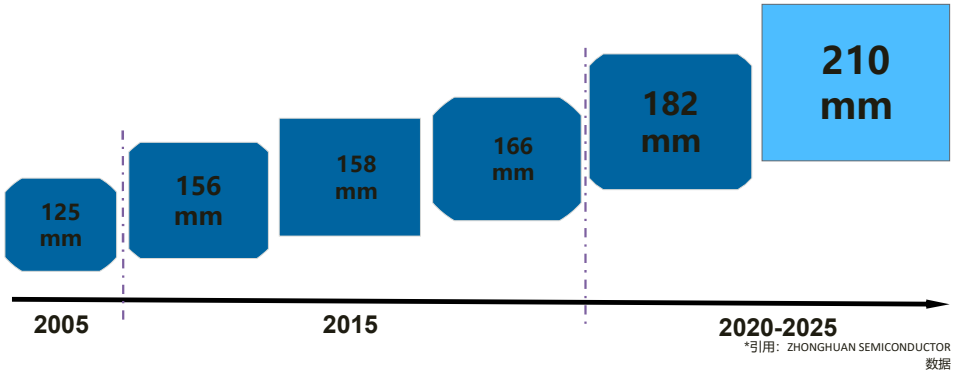
Investment: more than 100 Mn USD

Land preparation: Dec 2023
EPC: Mar 2023
Financial Close: 31 Jul 2024
COD Solar Module: Q3 2024
COD Solar Cell: Q4 2024

TKDN Local Content Compliant
>40% as Per MoI Reg 34/2024

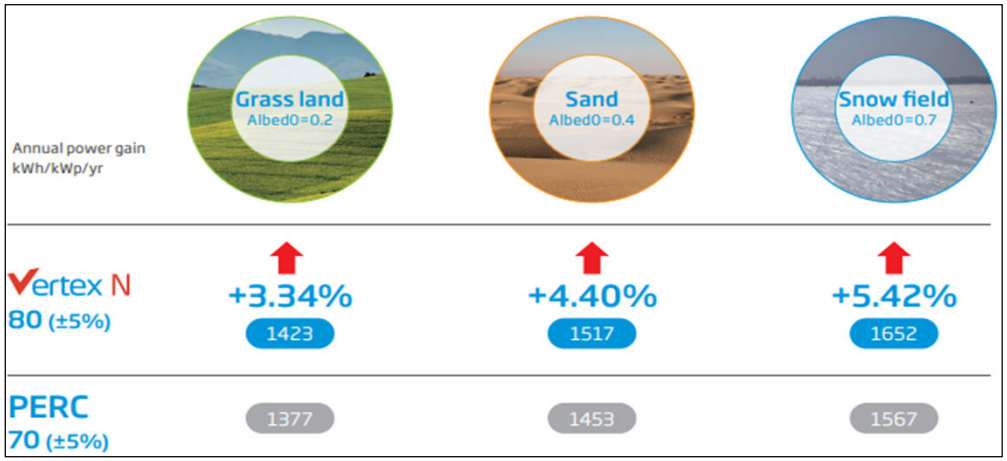
Market: Utilities Projects

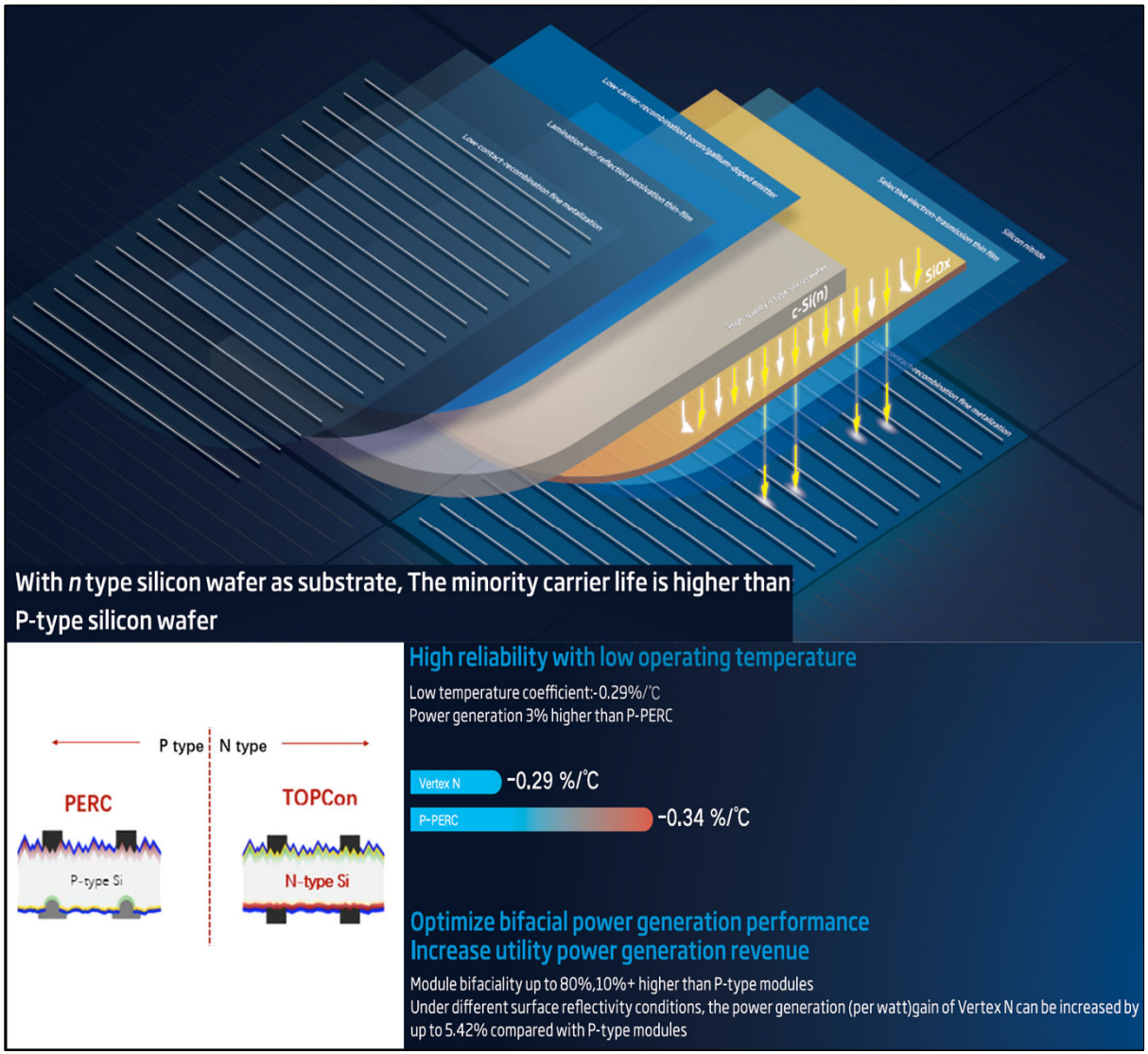
Why Cell Type: 210 n-type iTOPCon Monocrystalline?



210 n-type iTOPCon offers Benefit:

1. Combined with low voltage design, can effectively increase increases string power by 10% than 182 mm cell , reduce BOS cost.
2. The most advanced silicon wafer from the semiconductor-grade wafer to improve the performance and reliability of the modules.
3. Higher Bifaciality Performance with generation gain of min 3%





Product Type: NEG21C.20

High String Power| High Power Generation| High Reliability

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Vertex N

Maximum Power

Up to 720W

Physics Parameter

Size: 2384*1303mm

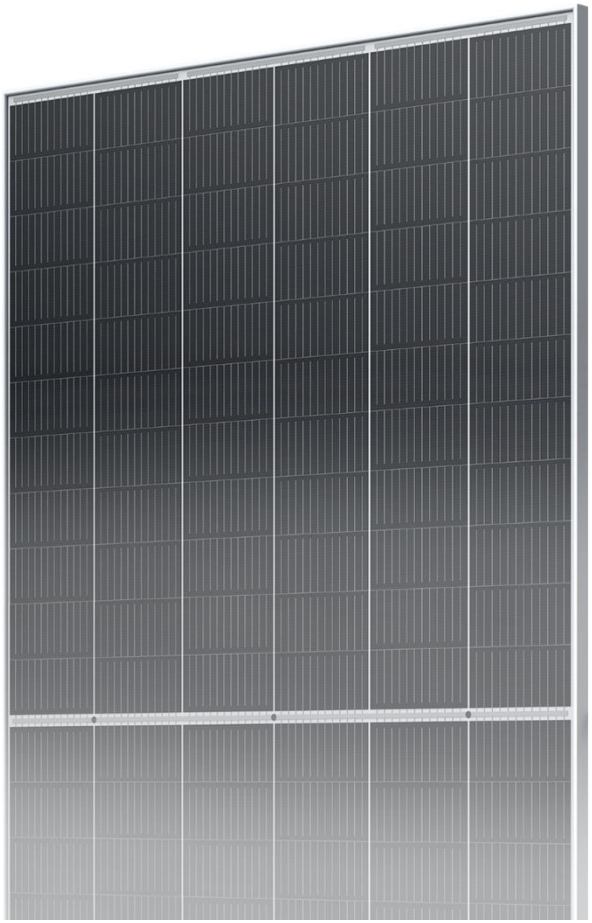
Weight: 38.7kg

Technical Parameter

Low voltage design concept

Voc: 49.4V

Imp : 17.44A



Efficiency

Up to 23.2%

MOST EFFICIENT TRINA'S PRODUCT TO DATE

Higher efficiency & performance compared to previous Gen

BETTER RESISTANCE TO HARSH ENVIRONMENTAL CONDITION

Low LID (Light Induced Degradation) and PID (Potential Induced Degradation), High Performance on Mechanical and Thermal Extreme Condition

MORE OPTIMIZED TO REDUCE BOS COST

more optimized module design for large-scale utility installations, reducing balance of system (BOS) cost

Product Performance Comparison

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Extra power gain during the module life cycle

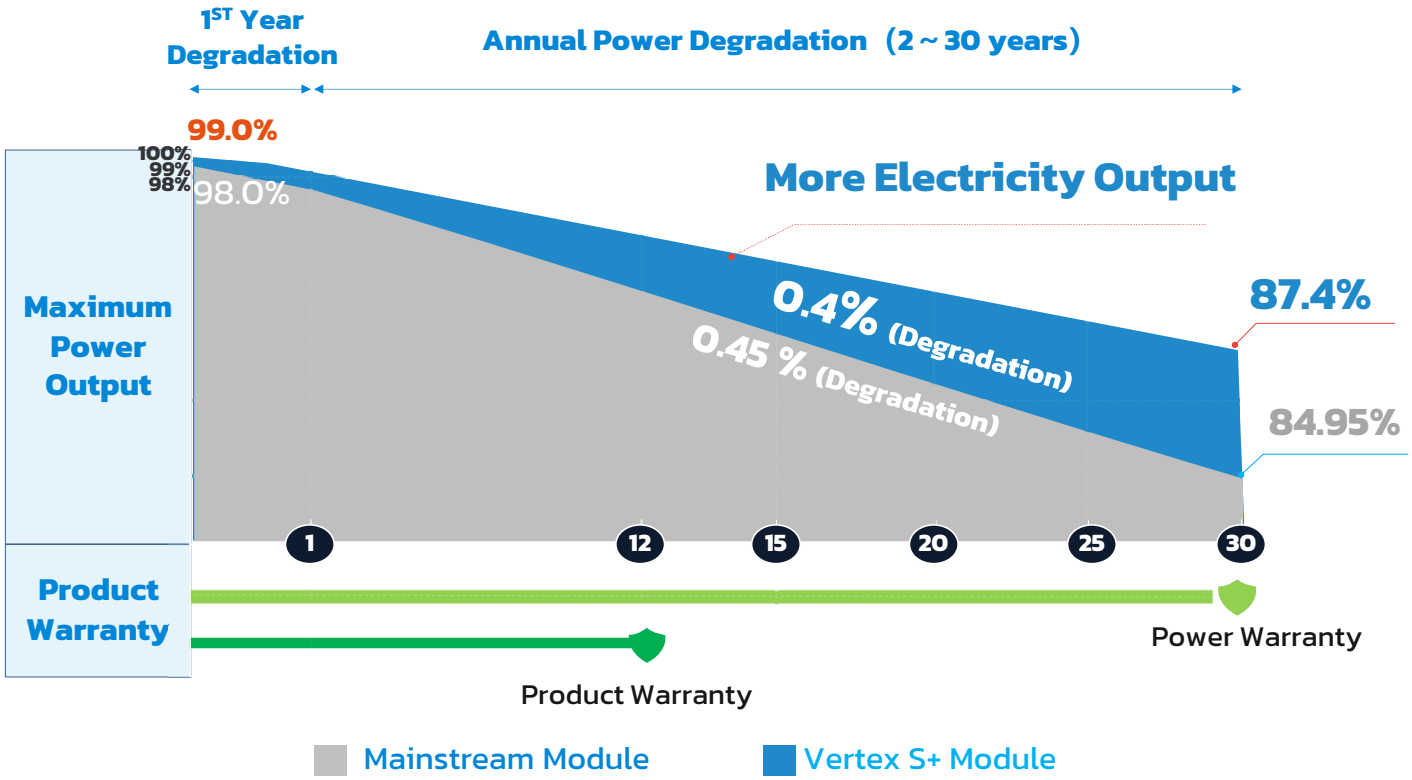
30Yr
Power Warranty

12Yr
Product Warranty

1%
1st Year Degradation

0.4%
Annual Power Attenuation

Lower degradation, ~3% higher energy yield!



~3% more power generation over 30 years

TMAI TKDN Self Assessment

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	Component	Domestic Supplier	Permen 34/2024	TMAI Score
Overseas Manufacture	Silica Sand	N/A	2.50	0.00
	Silicon metallurgical grade	N/A	7.50	0.00
	Silicon solar grade	N/A	15.00	0.00
	Ingot	N/A	5.00	0.00
	Brick	N/A	2.50	0.00
	Wafer	N/A	2.50	0.00
Indonesia Manufacture	**Blue Cell**	**TMAI**	**7.50**	**7.50**
	Cell	**TMAI**	**7.50**	**7.50**
	Tempered Glass	Unqualified	12.00	0.00
	PV Junction Box	**Available**	**8.00**	**8.00**
	Backsheet/ Bifacial	**Available**	**4.00**	**4.00**
	Frame	**Available**	**9.00**	**9.00**
	EVA Film	N/A	4.00	0.00
	PV Ribbon	N/A	2.00	0.00
	Solar Silicon	Available – TBD	2.00	0.00
	Production Workforce	**Available**	**5.00**	**3.50**
	Factory Overhead (incl. Equipment)	**Available**	**2.00**	**2.00**
	TMAI Score			**41.50**

Based on recent Ministry of Industry regulation no 34 year 2024, PV Module local content calculation policy has been updated.

With the revised policy, **TMAI can achieve approx. 41.5% TKDN** once its solar cell factory starts operation

TMAI is looking to increase manufacture capacity and invite supply ecosystem investment in order to reach higher TKDN standard.

Other Solar Panel Component Specification

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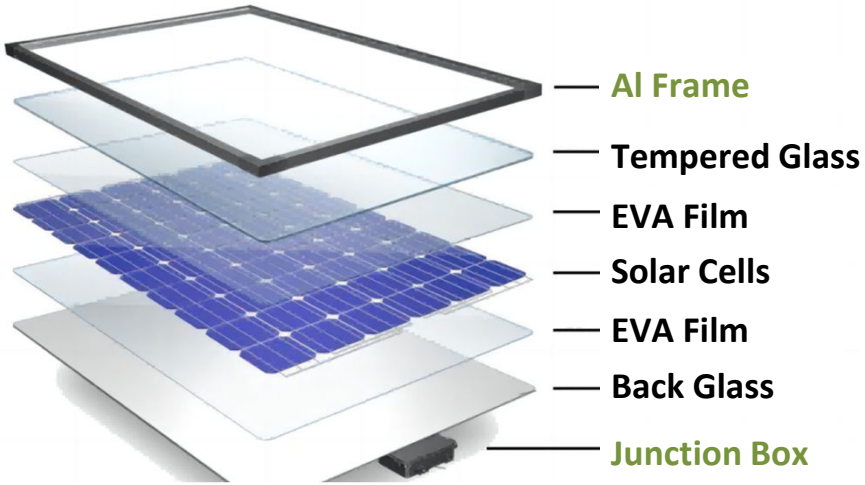

Key Component's specification (non-exhaustive)		Domestic Supplier
Cell	• n-Type I-TOPCon Technology • 210mm half-cut cell with non-destructive cutting	TMAI self production
EVA Film	• Double Patterned • High Transmittance: > 90.5 % (for Wavelength of 380-1,100 nm) > 80.0 % (for Wavelength of 320 nm) • Cohesive Strength (> 120 N / 15 mm) • Electrical Strength (> 30 KV / mm) • Durability (Tensile Strength ≥ 16 Mpa) • Durable with High Elongation (break ≥ 550%)	Existing suppliers has no experience in supplying for solar PV customer
Tempered Glass	• Thickness: 2.0 mm (~0.08 inches) • High Transmission (> 93 %) • AR Coated Heat Strengthened Glass • High Resistance to Temperature Difference (≥ 180° C) • Strong Wind Load Resistance (≥ 2400 Pa) • Low Fe Content (≤ 130 parts per million)	Unable to provide <3 mm tempered glass
PV Ribbon	• Tin-Coated Leaded Copper (Cooper Content > 99.95 %) • Low Resistivity (≤ 2.4 x 10^{-8} Ω.m) • High Durability (Tensile strength ≥ 150 Mpa)	No qualified supplier
Silicon Sealant	• Higher Elongation (Break at ≥ 200%) • High Durability (Shear Strength ≥ 1 Mpa) • Flame-retardant is HB Grades (According to UL94)	Suppliers run business as trader, not as producer

Note:
EVA: Ethylene Vinyl Acetate
Mpa: Mega Pascal

Supports Required from Government

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1. **Expansion and Acceleration of demand execution**
   - Generate **new solar projects pipeline** to be ratified in the new RUPTL for sufficient market share and economics of scale
   - **Accelerate project preparation and transaction** for quicker project execution
   - **Wider implementation of TKDN-mandatory projects** (rooftop, electricity export, captive powers, SOE projects)

2. **Acceleration of solar panel-grade industry supply chain**
   - **Fiscal incentive** specific to promote the growth of solar panel supporting industry
   - **Involvement of SOE** as the industry player to catalyst the growth
   - Clarity on the **specification and certification** of solar panel-grade components

3. **Local industry protection from Government**
   - Heavy **import duty** on solar panel and solar cell import, like other countries
     - US: 14.5 + 15-200% (depending on countries)
     - India: 25% for solar cell and 40% for solar panel
     - Turkey: USD 9c/Wp for solar cell and USD 14c/Wp for solar panel
   - **Strict requirements** for using **imported panels** (bank guarantee, proof of tangible investment and capital provision)
   - Clarity on **Price Preference** (electricity tariff pricing) of using TKDN-compliant solar panels for PLN projects
   - Incentive or **preference for real investment** project against *makloon* scheme

Manufaktur RI Anjlok, Jokowi Keluarkan Titah Ini

Foto: Muchlis Jr - Biro Pers Sekretariat Presiden

*Untuk permasalahan itu, Jokowi menekankan kembali pentingnya penggunaan produk lokal. "**Penting belanja produk lokal sekali lagi saya tekankan, kemudian penggunaan bahan baku lokal dan perlindungan terhadap industri dalam negeri kita**," tegasnya.*

https://finance.detik.com/industri/d-7486369/manufaktur-ri-anjlok-jokowi-keluarkan-titah-ini. (13 Aug 2024)

Therefore, Indonesia can **accelerate** its execution on **energy transition**, **renewable energy supply resilience** and increase the **depth of its local solar power industry**. In addition, **new technology** will be transferred to Indonesia and **new high-skilled workforce** will be created

Thank You

PT Trina Mas Agra Indonesia

Factory
Kawasan Industri Kendal
Jl. Indraprasta No. 6
Kendal, Jawa Tengah 51372
Phone: (0271) 3100 101

Corporate Office
Sinarmas Land Plaza, Tower 2, 16th Fl
Jl. M.H. Thamrin No 51
Jakarta Pusat, DKI Jakarta 10350
Phone: (021) 4008 0010
Email: commercial@tmai.co.id