

Trina Solar Vertex Series

Aug 2022

天赋能源 合而为一
Power beyond solar

Milestones

1997

Trina Solar is founded

2006

Listed on NYSE

2012

Establishes State Key Laboratory of
PV Science & Technology

2016

Builds factory in Thailand
Establishes storage business

2018

Acquires Spanish tracker company Nclave
Launches energy IoT brand Trina IoT

2021

50GW+ company-wide
production capacity
40GW+ production capacity for industry-
leading 210 Vertex module

2008

Builds Trina Solar PV
Industry Park

2017

Launches Million-Roof Plan
in China

2020

Lists on SSE STAR market
Launches 600W+ ultra-high power new
modules, setting benchmark for PV 6.0 era.

2002

Builds 40 off-grid solar power stations in
Tibet, China

2014

Becomes world's largest PV
module supplier

Globalization



100GW+
Shipments



5.5GW+
Grid-connected

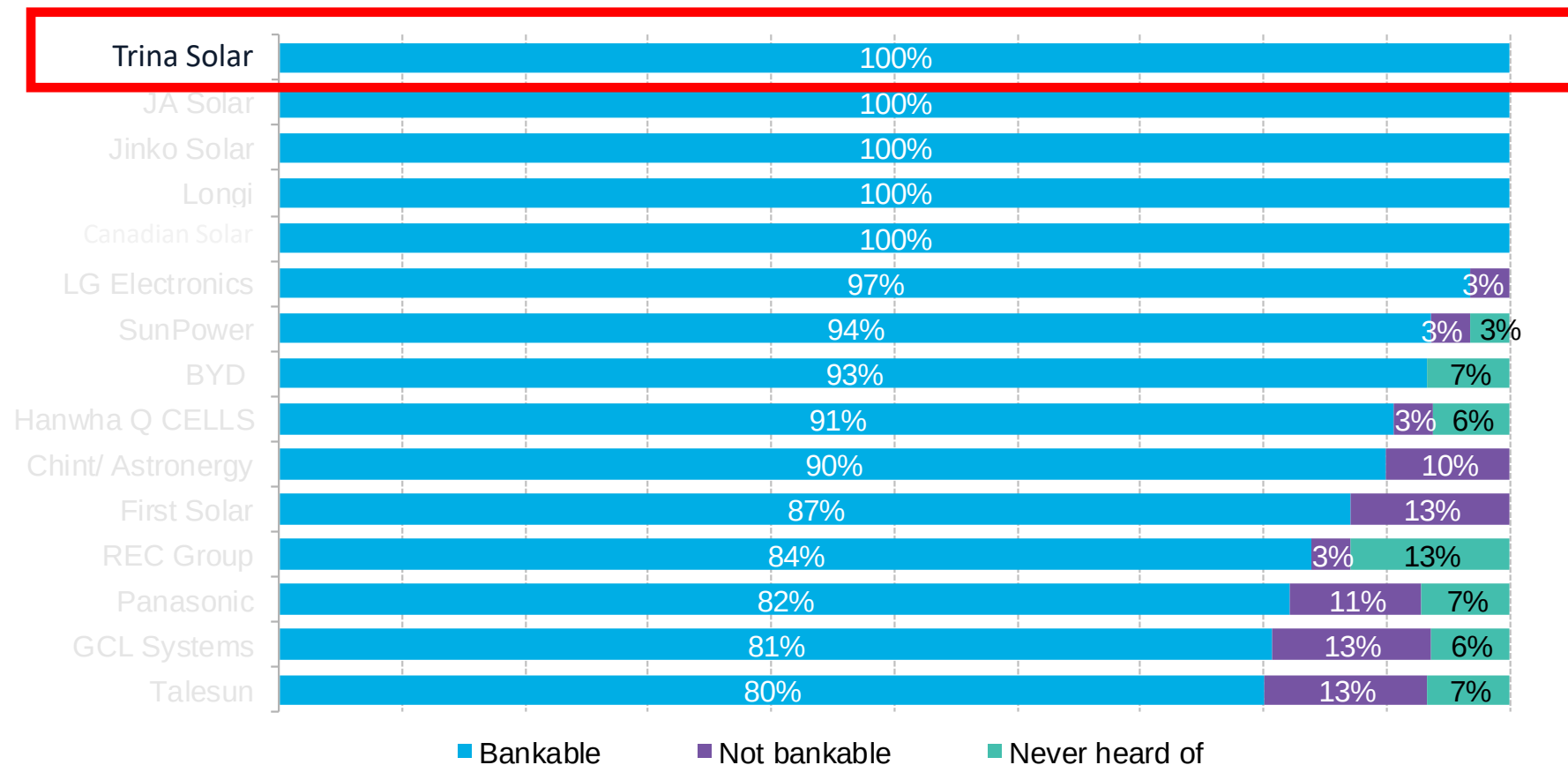


100+
Worldwide Customers



19000+
Employees

BloombergNEF's PV module bankability results



"Top Bankable
Module Supplier"
2016 -- 2021

Six times in a row

Source: BloombergNEF Oct 2021

Fast Growing in APAC

2017 to 2021

Trina Solar have achieved

~13 GW+ module shipment

One of the Top 3

in APAC



210 Vertex UHP modules

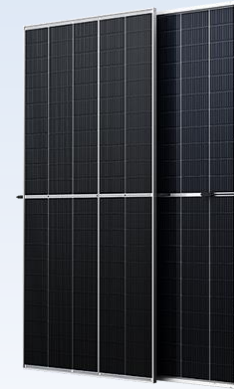
- ▶ 210mm silicon wafer
- ▶ Multi-busbar (MBB)
- ▶ Innovative arrangement and nondestructive cutting mode
- ▶ High-density packing

N-type i-TOPCon large-scale mass production

N-type i-TOPCon cell mass production
average efficiency up to 24%

Applied in China's first batch of
Technology Leader Bases

New world record for
Frontside efficiency 24.58%



Advanced HJT technology reserves

Actual efficiency of HJT cells in mass production
24.5% or above

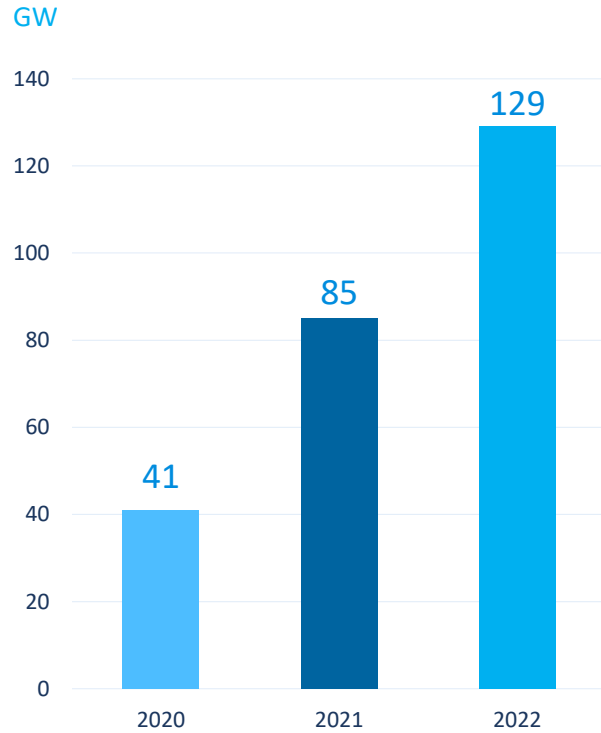
Working on
863 national projects

Patents applied for
20+

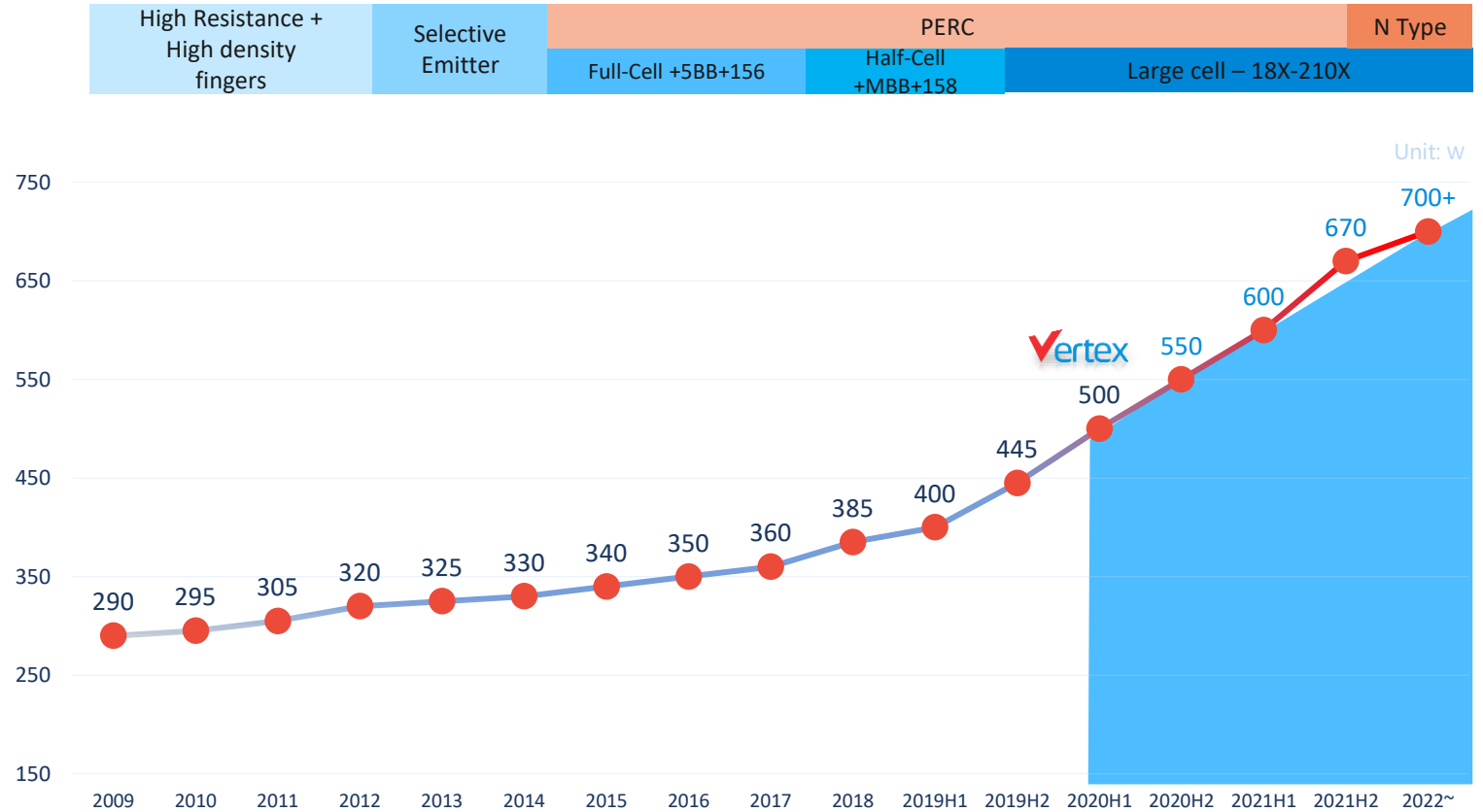
TüV certification of HJT products
awarded in first half of 2021



MODULE POWER TREND LEADING THE ERA OF PV 6.0 into 7.0



Global High power module capacity estimate



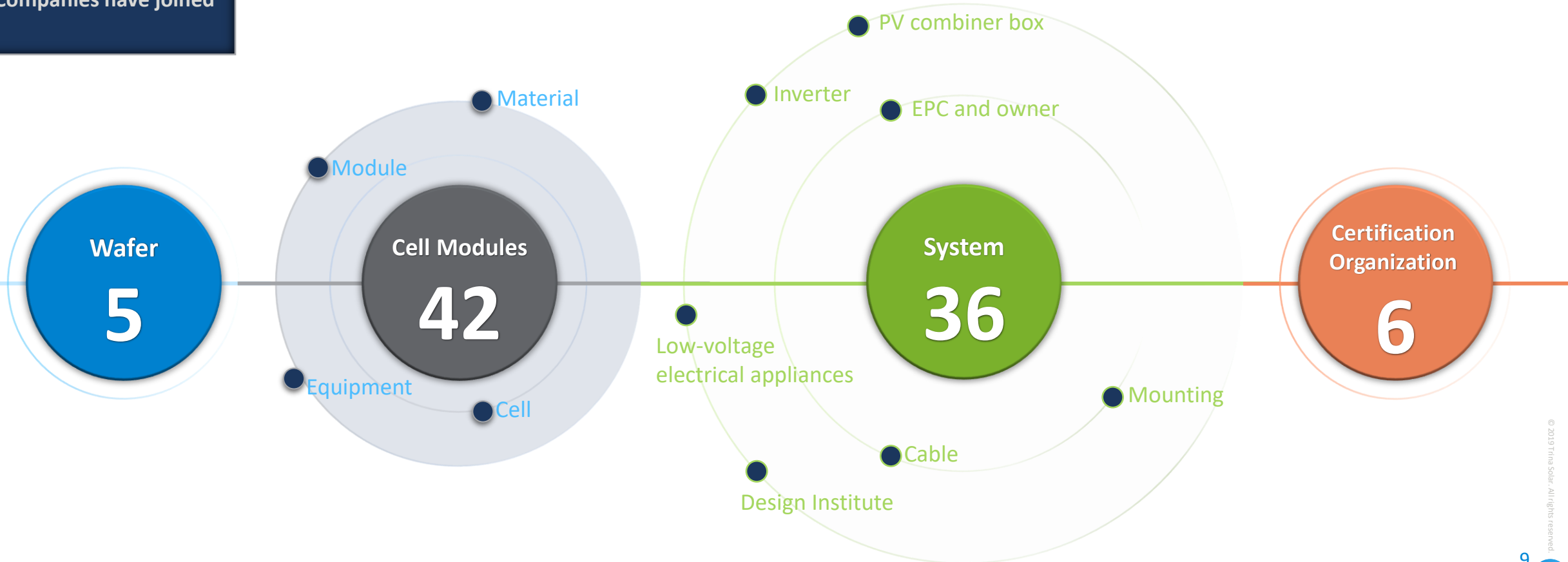
Solar module power trend

600W+ PV open innovation ecological alliance EXPANDING

600W+
PV Open Innovation Ecological
Alliance

89

Companies have joined

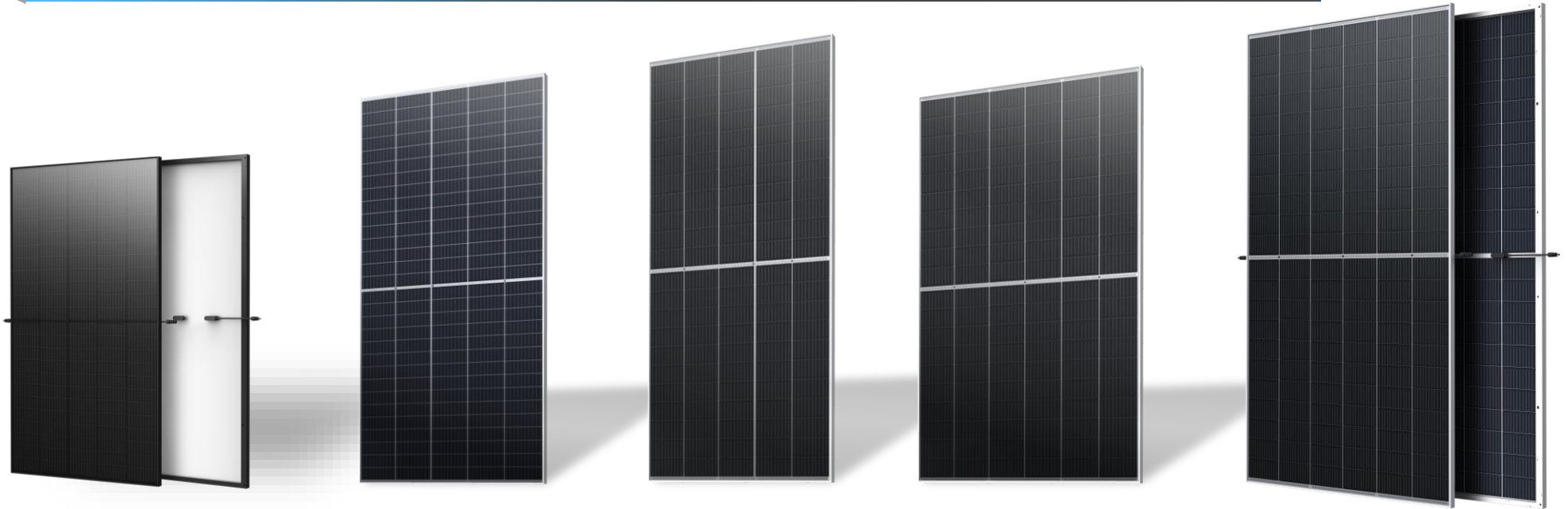


Trina Vertex Family

Leading Technology, Exceed Expectation!

Residential,
commercial &
Industrial

Utility



Vertex S

UP to
405W

18 series(1/3)

UP to
500W

19 series(1/2)

UP to
550W

20 series (1/2)

UP to
600W

21 series (1/2)

UP to
670W

Others

370W

450W

540W

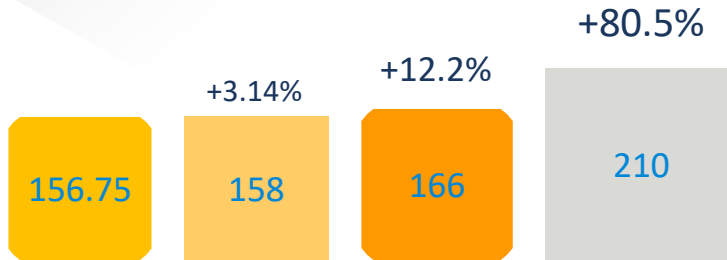
580W

600W+

➤ Vertex series can be applied to various scenarios, such as residential, industrial & commercial rooftops, Agricultural complementary PV project ,fishing complementary PV project and large utility, etc.

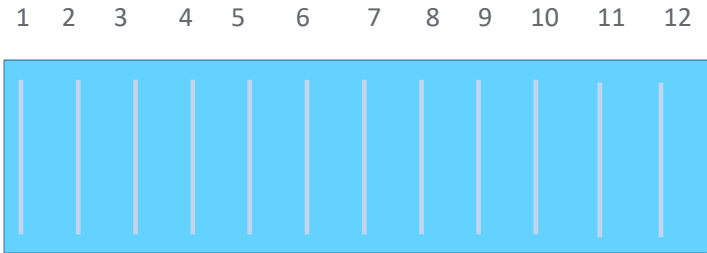
➤ Compared to competitors, 210 modules have 35-90W power increase, bringing more values to customers.

Integration of Innovative Technologies



The largest size of wafer:

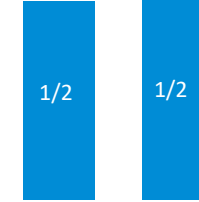
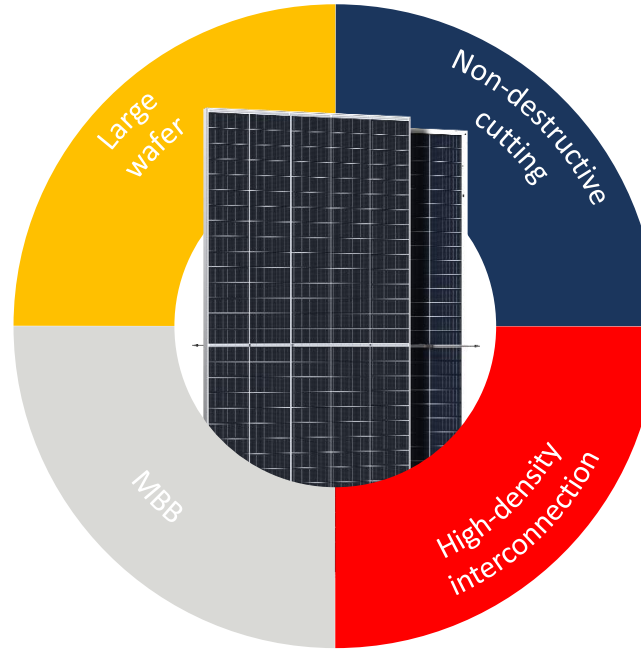
Largest silicon ingot technology from semiconductor industry



MBB(Multi-Bus bar):

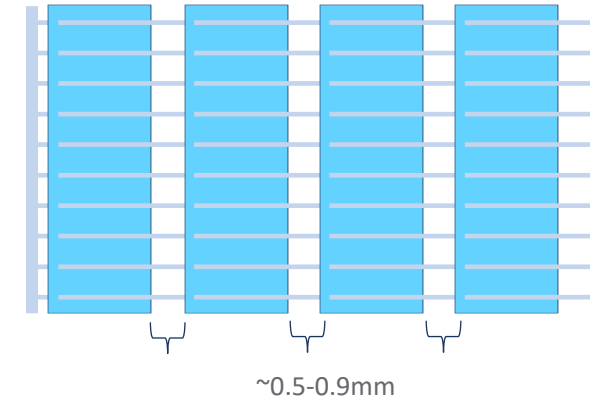
Multiple bus bar match large size wafer perfectly

210mm -> 1/3 cut – 10BB , 1/2 cut 12BB



Non-destructive cutting

Low Temperature laser – similar mechanical loading capabilities as full cell

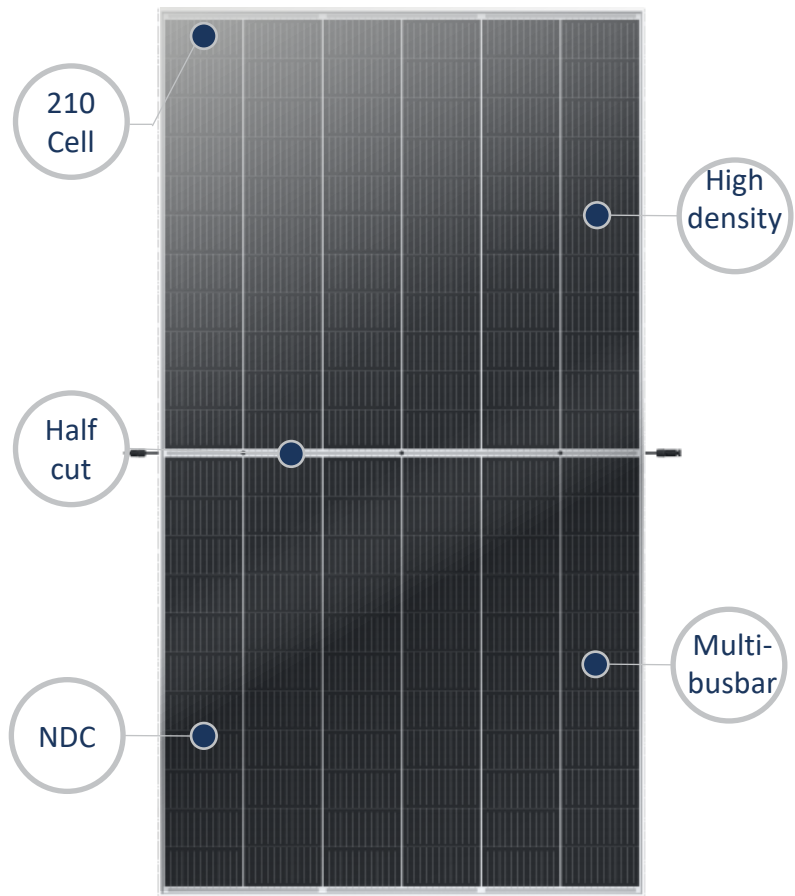


High-density Interconnection technology:

Minimized Space between Cell to Cell to Improve module Efficiency 0.2-0.3%

Electrical Data

Low voltage concept design
 V_{oc} : 45.7V I_{sc} : 18.5A



Dimension : 2384*1303 Weight: 38.7 kg

Power

670W+

Efficiency

21.6%+

210 @ 670	VS.	182 @540	Remark
650-670	Power (W)	525-545	+125W
18,480	String power(W)	14,040	+32%



High Power
& Productive



High
Reliability



Size
Standardized

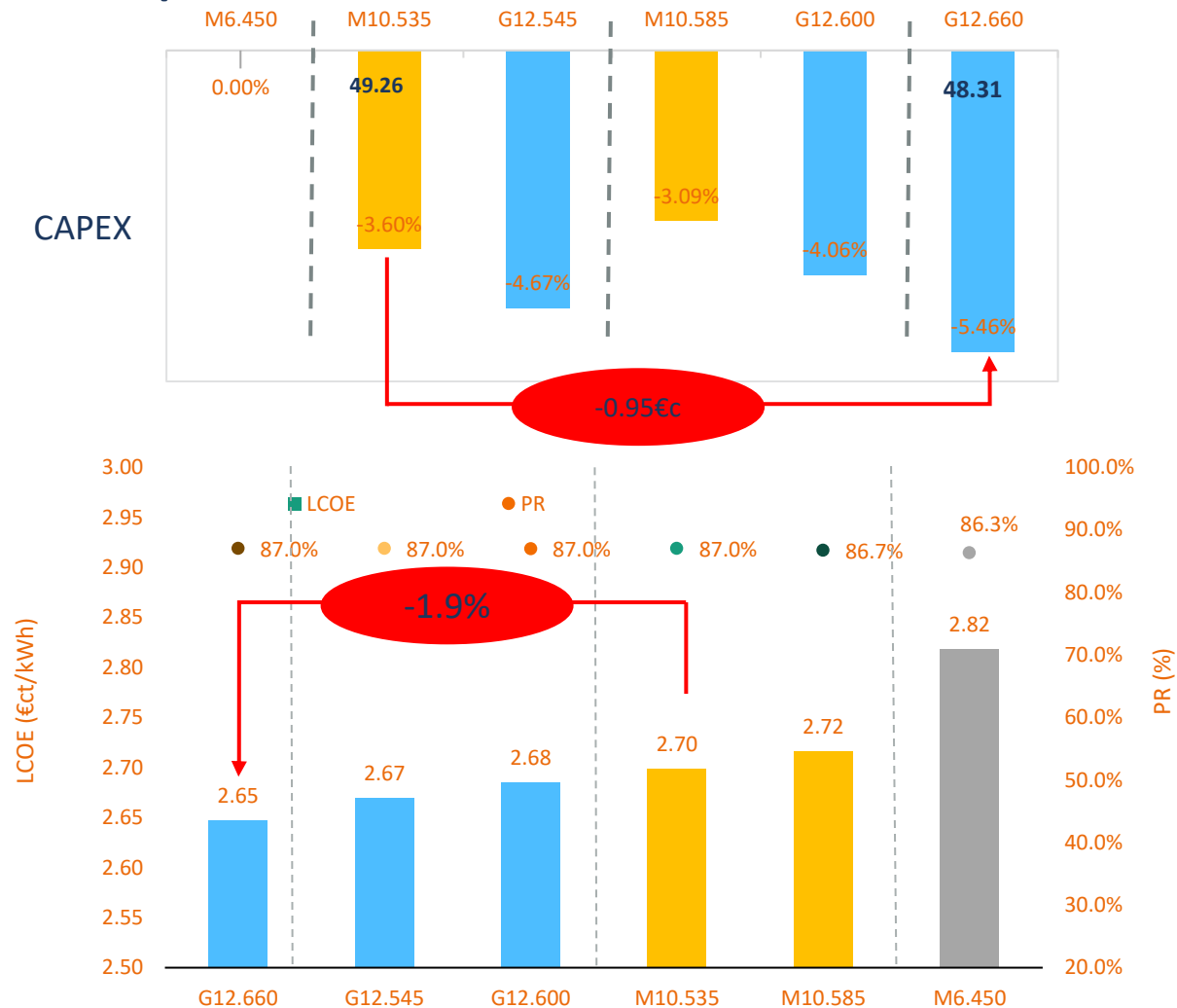


Stable
Supply

Germany: Mono, fixed tilted



Spain: Bifacial 1P tracker

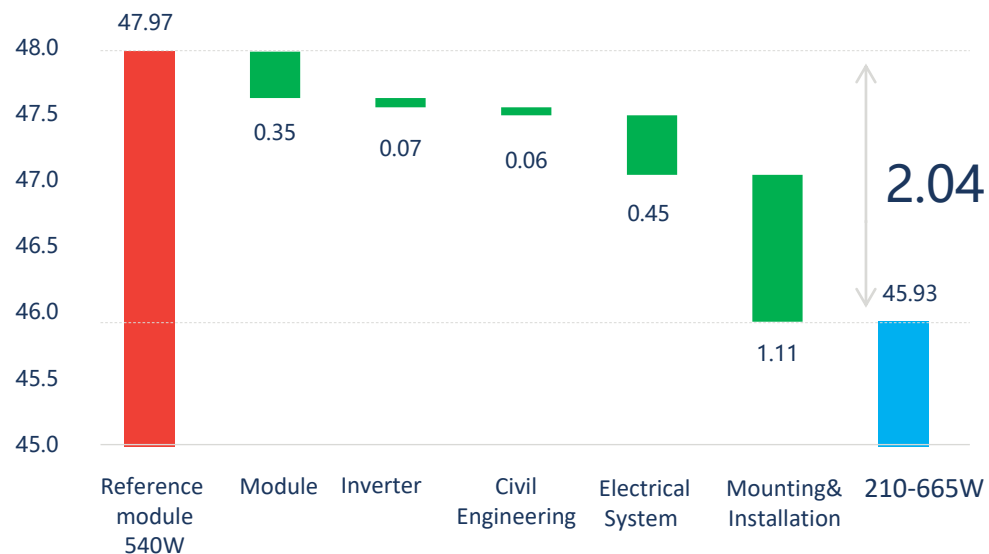


Compare with 540W M10-72, Vertex 660W can achieve CAPEX saving up to 0.95-2.04€ct/Wp,
LCOE Saving up to 1.9-4.1%

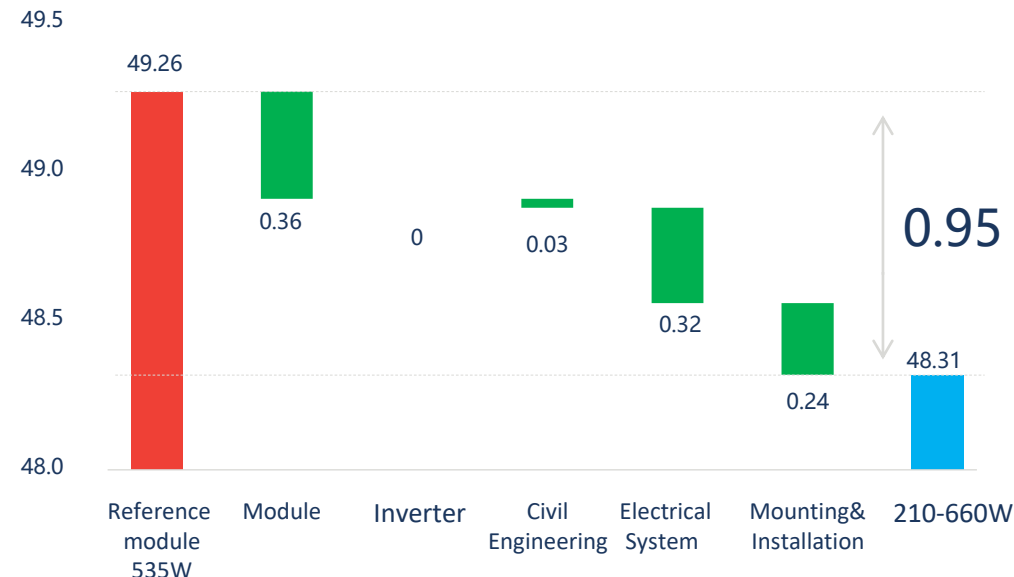
System Cost Saving Elements

600W+ ultra-high power module system value analysis

Analysis on the source of value of the German fixed tilt installation system



Analysis on the Source of Value of Spain's 1P Tracker Installation System



I The savings of the 600W+ system includes mounting & installation, electrical systems, freight

- The innovative low-voltage design > Increase the single-string power by 32% , compared with traditional modules.
- The ultra-high module power > Reduce total quantity of modules of the project .
 - > Reduce the installation effort, speed up the construction progress!

Lower initial investment!

+>20% Energy

Compared to monofacial on fix tilt
Plus additional 3-8% though
intelligent tracking

Same or Better Energy, Outcome
for Fewer MWs

Fewer modules, less steel, less BOS to
procure, ship and install, **>5% lower
capex**

8% lower LCOE, 5% Lower Capex

Lower electricity cost per kWh compared
with fix tilt monofacial

High safety and reliability

Wide applications, resilient to extreme weather
conditions including high wind,
Reliable components, ultra low failure rate =
low O&M cost

Global project design, capacity planning and service

9GW+

Global installations

8GW+

Annual capacity

300+

Tracker projects



CPP

Full aero elastic wind tunnel
testing
Approval to 60m/s wind load

RINA approval to
deploy in Cyclone
regions of Australia

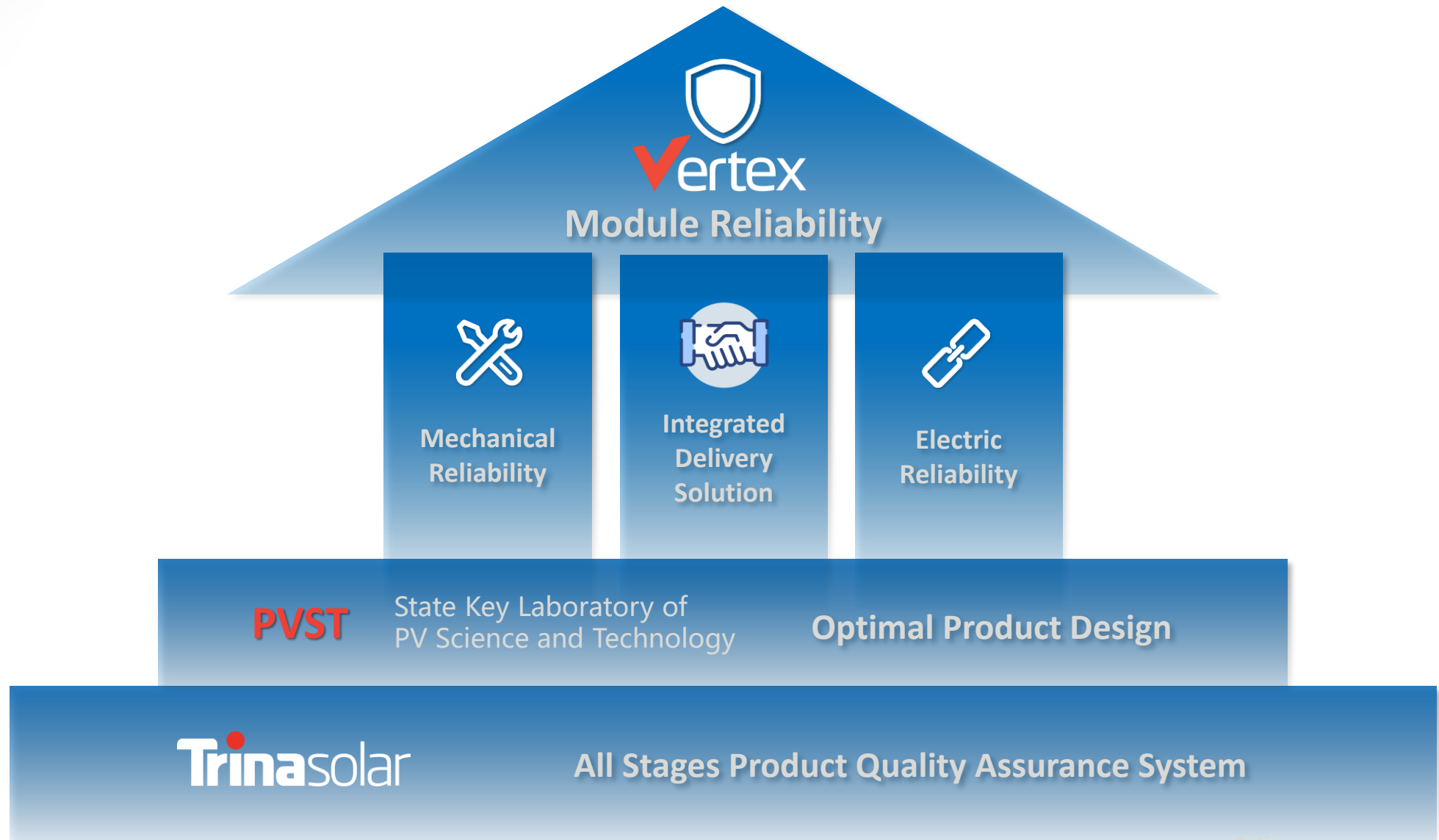


Technical Advisory Services

TrinaTracker Agile-1P - Australian C
Standards Compliance Review

Trina Solar Australia Pty Ltd

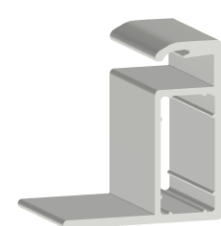
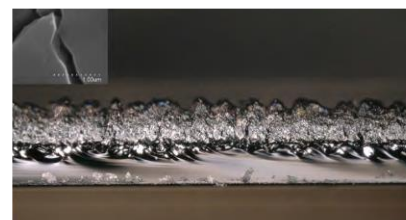
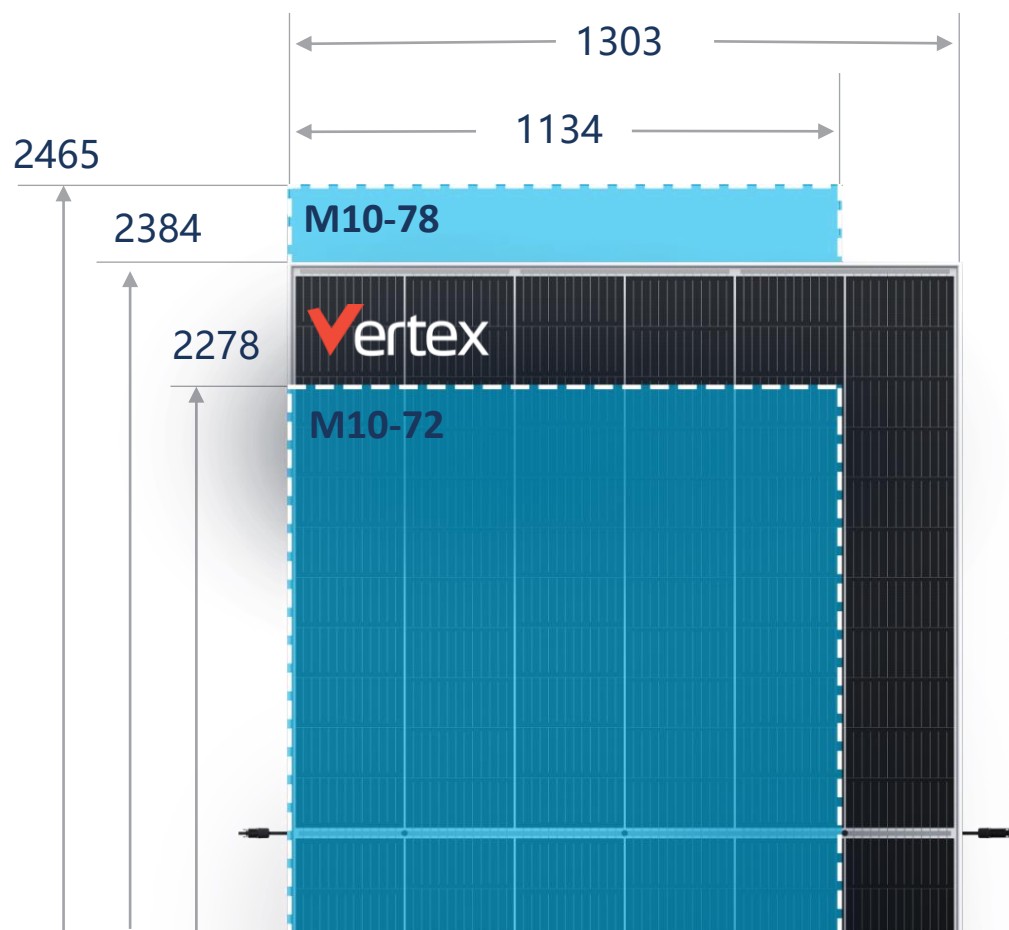
March 2022



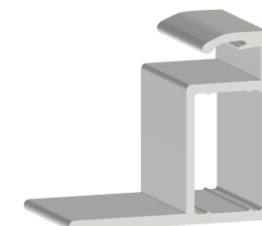
Product optimization design

Top design team creates high-quality products

- | The length of the Vertex 670W module is 4.6% longer than the 182-72 , but 3.4% shorter than the M10-78 ;
- | It's 15% wider than M10 series .



Conventional
structure



670W Vertex module
structure

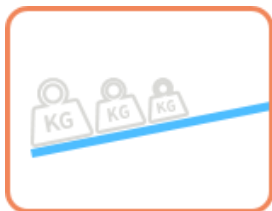
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Enhanced Tests

670W - Proven Mechanical Performance



Static Load



Non-uniform Snow Load



Static Loading under -40°C



Hail Impact



Enhanced Dynamic Load



Wind Tunnel Test

- | High reliability ensures long term power generation
- | All tests conducted by independent 3rd parties
- | All test samples are randomly picked from mass production (DEG21C.20)

Static Load

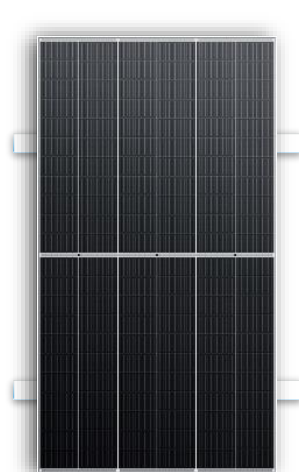
Equivalent Level to Traditional Modules



IEC 61215
IEC 61730
2021.1 Granted

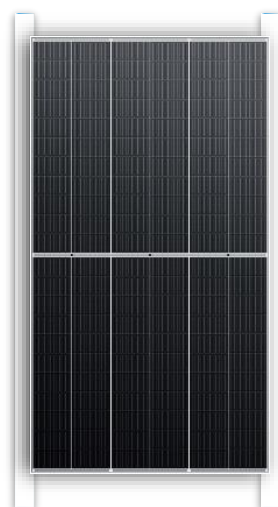


670W Module reliability simulations evaluating wind and snow resistance.



Static load
+5400Pa/-2400Pa

Fixed tilt

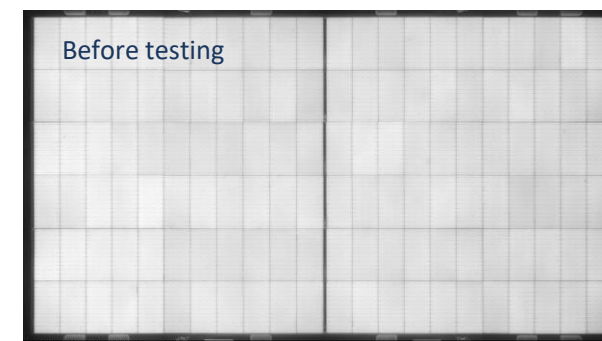


Static load
+3600Pa/-2400Pa



Static load
+2400Pa/-2400Pa

Tracker



670W Double glass module EL image
+5400Pa/-2400Pa (mechanical load)

Hail Impact

35mm Hail Impact Resistance

Simulated impact of different sized hail on module output.

Trina test size



35mm



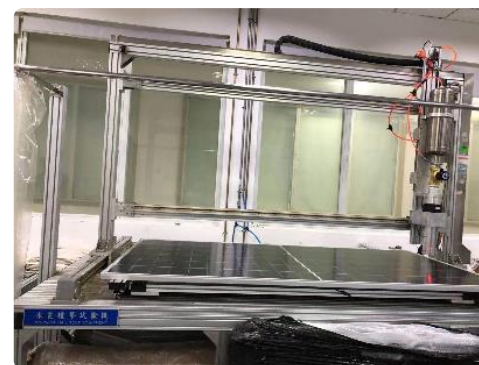
IEC test size



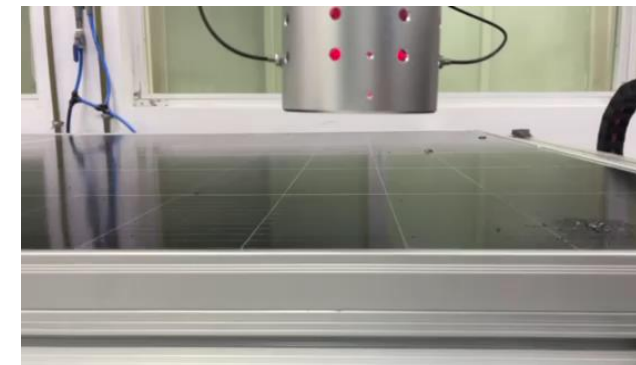
25mm

Single glass—— hail test

IEC standard		Trina test results		Tests passed
Hail size	Power degradation	Hail size	Power degradation	
25mm	<3%	35mm	0.17%	



Dual glass —— hail test



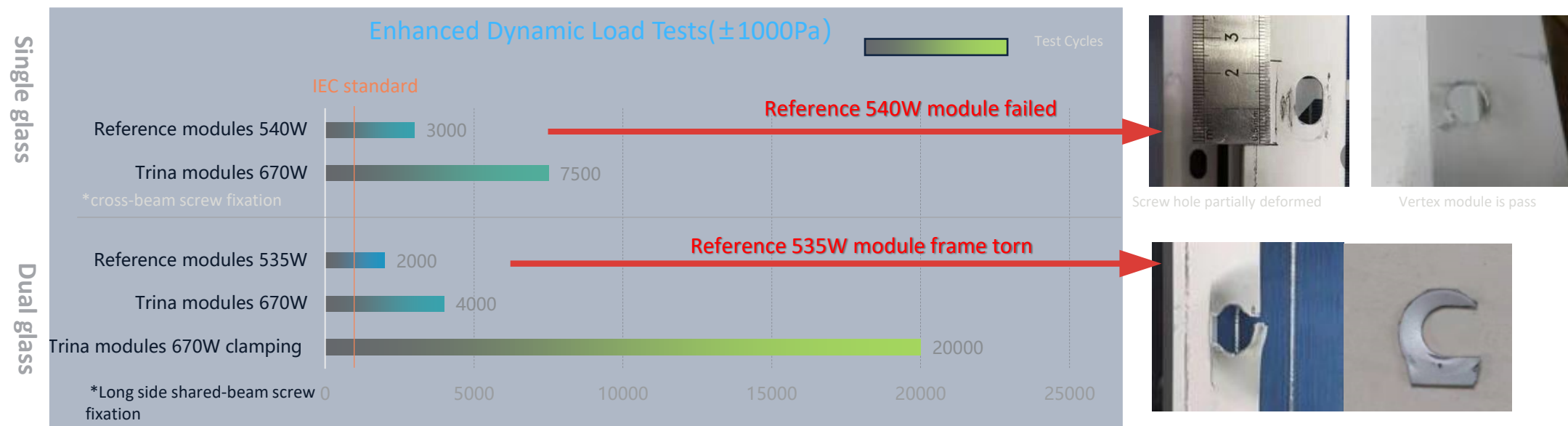
IEC standard		Trina test results		Tests passed
Hail size	Power degradation	Hail size	Power degradation	
25mm	<3%	35mm	0.53%	

Enhanced Dynamic Load Test

±1000Pa @20000 Cycles Passed

During their lifecycle, modules endure long-term dynamic stresses on their upper and back sides. The frame, cells and BoS are subjected to fatigue stress which can be simulated by dynamic load testing.

“ IEC62782: DML±1000Pa: positive and negative cycles 3~7 time/min , 5.6h/1000times ”



Test results: after 1000Pa dynamic load in 20,000 cycles, - power degradation was only 0.1%.

7.5
times IEC standard

Single glass module

4
times standard

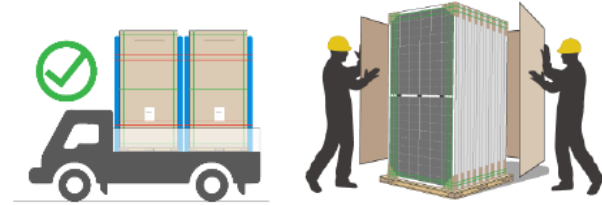
Dual glass module

20
times (clamping) strength than standard

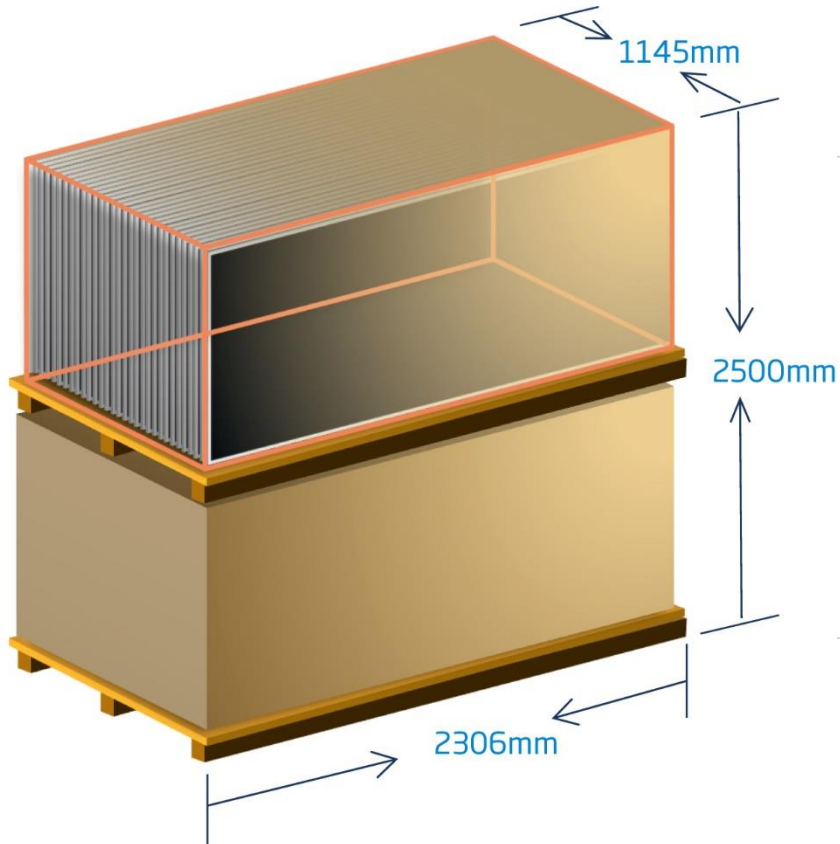
Note: National Key Laboratory for PV Science and Technology

Innovative Packaging Arrangement (applicable for DE20/DE21/DEG21C.20)

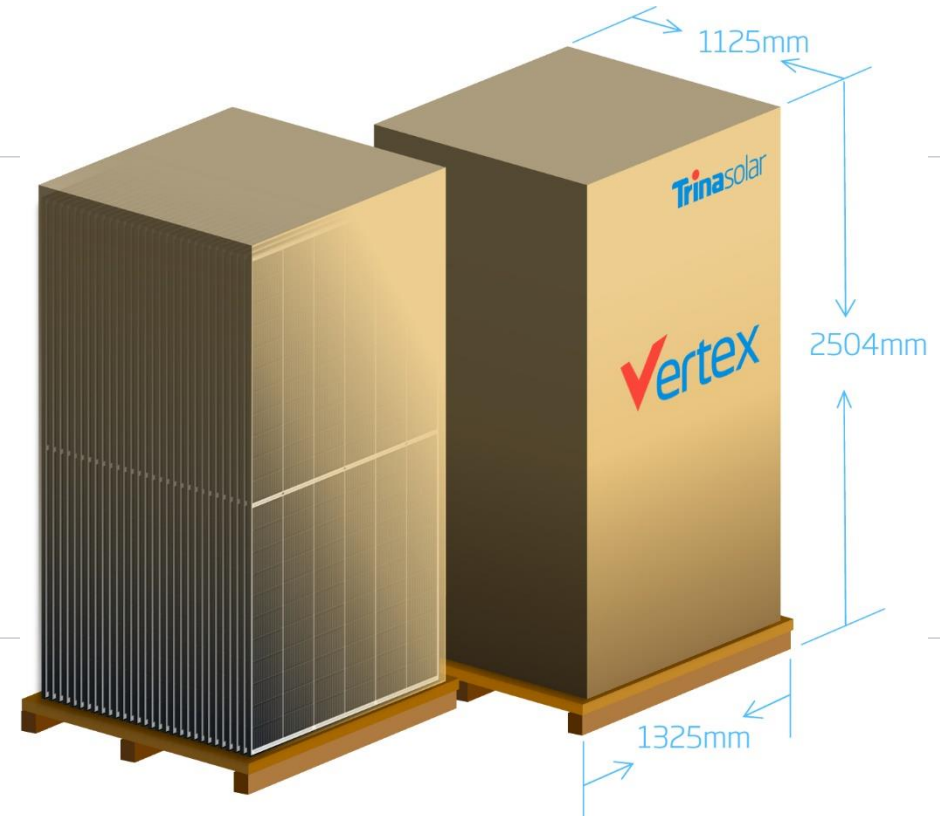
Maximizing the space utilization of containers, 12% saving in transportation costs comparing to the traditional packing.



Conventional packing
Horizontal two-tier stack

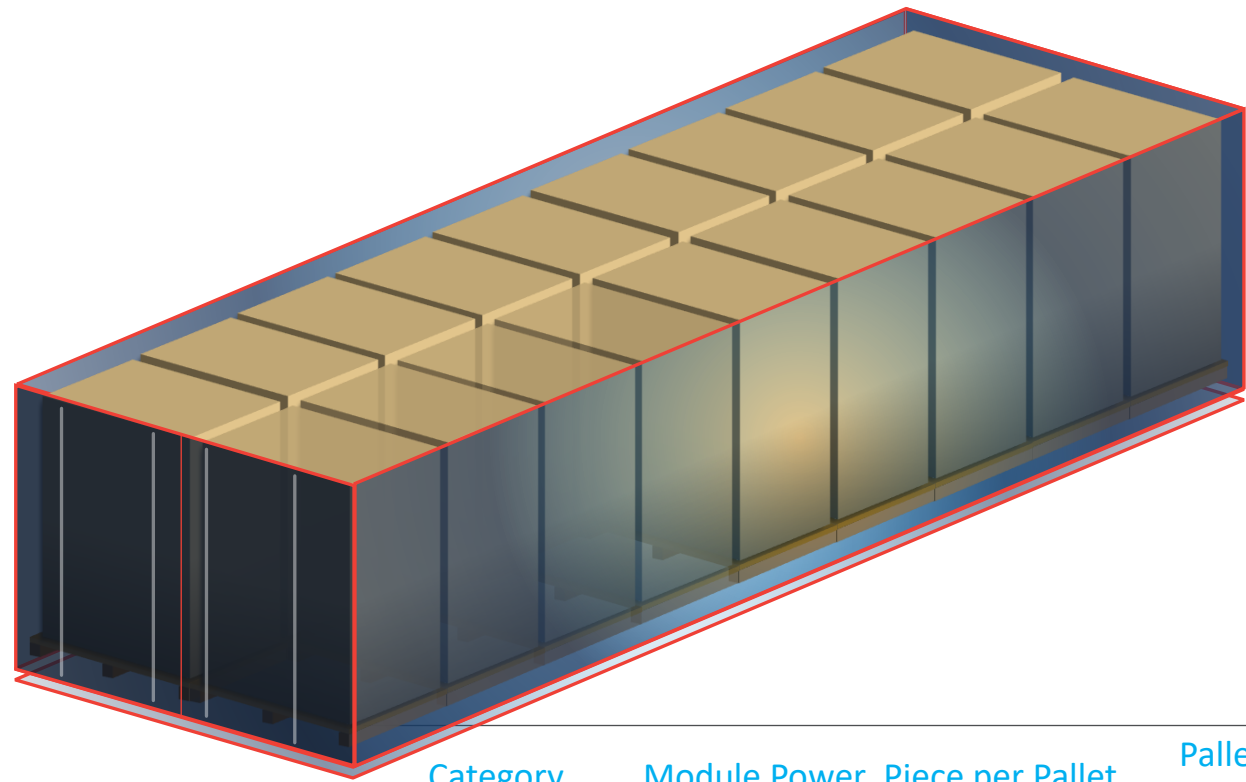


Innovative packing
Vertical placement



Innovative Packaging Arrangement

SPACE LOADING CAPACITY PER CONTAINER
+12%



Category	Module Power	Piece per Pallet	Pallet NO. per Container	Power per Container	
Other Module	540W	31	20	334,800W	
Vertex Module	670W	31	18	373,860W	+39060W (+12%)

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660W Module Integrated Delivery Solution



Dachaidan, Haixi, Qinghai, China
112MW Large-scale PV Project



210 Vertex - 660W / Dual-glass, Bi-facial
Grid Connection on 17 Sep, 2021



Standardized Stand Supporter Unpacking

660W Module Integrated Delivery Solution



Hilly PV Project, Japan

1MW Utility Project 210 Vertex - 660W / Double-glass, Bi-facial 2021

600W Module Integrated Delivery Solution



PV Project, Korea
1MW distribution Project 210 Vertex - 600W / Dual-glass 2021

Vertex 210 modules compatibility

>200 Inverters models from 21 Mainstream Inverter manufacturers



112MW On-grid Qinghai Dachaidan Power Plant

670W Vertex Module+ Sineng Inverter



Luotian 130MW power plant
Reduces 180,000 tons of carbon per year !

210 Module + Huawei smart PV dedicating to Hubei Agrivoltaic construction



Hebei Nandagang 70MW Fisheryvoltaic Complementary Project

670W Vertex Module + Sungrow Inverter

Tracker Compatibility

Company Name	Product Type	210@550W	210@600W	210@670W
Trina Solar Co., Ltd.	1P	√	√	√
	2P			
Arctech Solar Holdings China	1P	√	√	√
	2P			
Array Technologies Inc. USA	1P	√	√	√
Clenergy (Xiamen)	1P	√	√	√
	2P			
FTC Solar Inc., USA	2P	√	√	√
GameChange Solar LP. USA	1P	√	√	√
	2P			
Grace Solar	1P,2P	√	√	√
IDEEMATEC Germany	2P	√	√	√
	2P			
Nextracker Inc. USA	1P	√	√	√
PowerWay	1P,2P	√	√	√
PV HARDWARE Spain	1P	√	√	√
STI Norland S.L., Spain	1P-Dual/Multi	√	√	√
SOLTEC Spain	2P	√	√	√
Soltigua S.R.I, Spain	1P	√	√	√



30 models of Tracker from 14 Top Suppliers are compatible with Vertex

Trina design tool assistant www.pvd.trinsolar.com

Reference ambient temperature: -10°C

Brand



Module Power (W)

550

Scene

C&I

Brand

HUAWEI

Inverter type

Max Voltage (V)

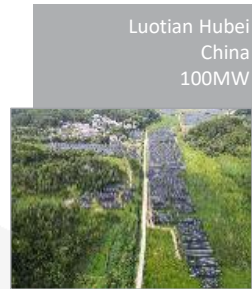
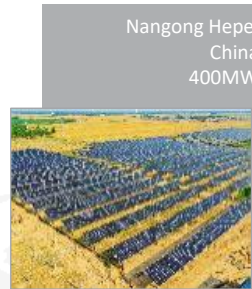
Select

Search

Brand	Scene	Inverter type	MPPT Nb./Max input	MPPT Nb./Max input	Max Voltage (V)	Output Voltage	Module Power (W)	Module Curr
HUAWEI	C&I	SUN2000-30KTL-M3	4/8	26A×4	1100V	220 Vac;380 Va c; 3W / N + PE	550	17.4#

Global application cases of Vertex ultra-high power modules

Spain
176MW & 202MW



Under Construction

Completed

25GW+ Vertex signed orders
10GW+ Vertex shipping record

NA 4,000MW
** ENERGY.

Brazil
715MW & 850MW



Rooftops – Industrial and small commercial





Utility

Ground mounted 100 MW



210 Vertex
Bifacial
PV Module



100MW
System Scale



2021
Commercial Operation Time



China
Location



Floating Project 50.6 MW



210 Vertex
Bifacial
PV Module



50.6MW
System Scale



2020
Commercial Operation Time



My Loi Commune,
Phu My District, Vietnam
Location



Thank you

Trinasolar

