Why Bigger is Better When Bifacial Modules Meet Single Axis Trackers

Andrew Gilhooly
Head of TrinaPro Asia Pacific

Trinasolar | TrinaTracker

pv magazine

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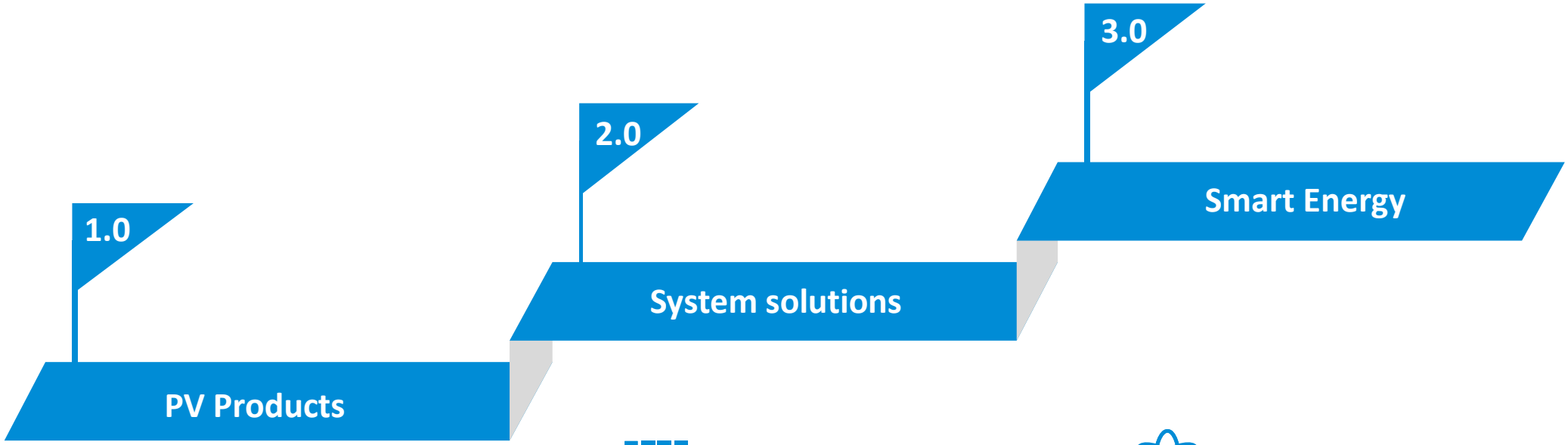
Business Units….More then Merely a Module Manufacturer



PV Products	System solutions	Smart Energy
High Efficiency Module	Utility Project	Smart Micro-grid
	Distributed PV System	Energy Storage System
	TrinaPro / TrinaTracker	Energy Cloud-Platform

LCOE is Reducing Globally

Global average LCOE

$/MWh

Qatar's 800 MW tender draws world record solar power price of $0.01567/kWh

Utility Kahramaa has revealed ... with the price then reduced b...

JANUARY 23, 2020 EMILIANO ...

...ium initially offered $0.01745/kWh ...dices.

India draws new record-low solar tariff of INR 2/kWh

A recent SECI auction secured th... 2.36/kWh record-low ... previously.

...kWh, 15% lower than the INR ...er Solarpack in a 2 GW auction

RENEW ECONOMY

Clean Energy News and Analysis

SOLAR RENEWABLES

Solar, wind and battery storage now cheapest energy options just about everywhere

Giles Parkinson 28 April 2020 0 Comments

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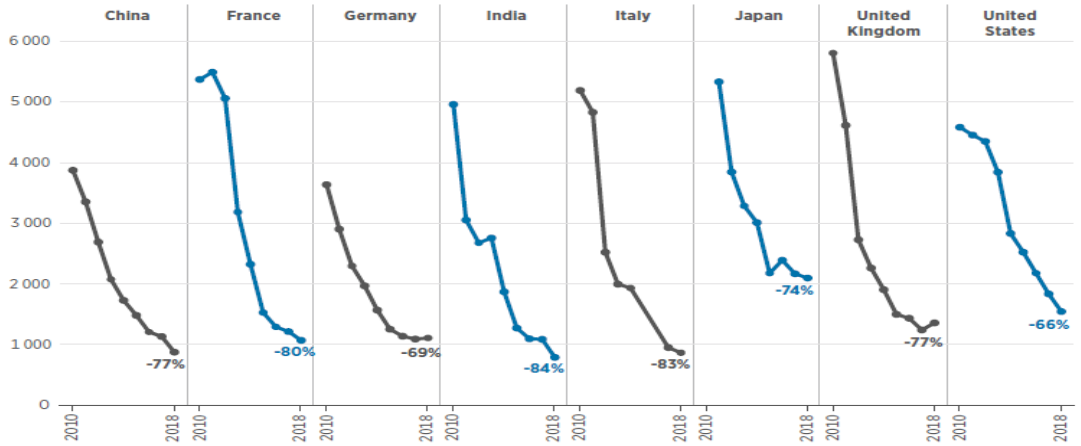
LCOE reduction is becoming trend globally



2009-Worldwide LCOE of PV project reduce from

0.32$/kWh to <<0.04$/kWh

Bifacial with single-axis trackers is low-cost king for global solar – SERIS

By José Rojo Martín | Jun 05, 2020 10:38 AM BST | 0

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	China (Zhongba)	USA (Yuma)	Japan (Mine)	Germany (Dornstetten)	India (Kavalanahalli)
Monofacial-Fixed	2.9 ± (0.5)	4.8 ± (0.7)	5.0 ± (0.7)	6.9 ± (1.0)	4.8 ± (0.9)
Bifacial-1T	2.4 ± (0.4)	3.9 ± (0.5)	4.3 ± (0.6)	5.6 ± (0.7)	4.1 ± (0.7)

Challenges in Big Solar

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Long read: Faltering grid curtails, delays, stalls solar

RENEW ECONOMY
Clean Energy News and Analysis

SOLAR RENEWABLES STORAGE

Covid-19 to pause gigawatt solar project in Australia

The pandemic will postpone or cancel th wind in Australia, according to Norwegi Australian dollar renders projects unec will be New South Wales.

WoodMac: Grid congestion chokes renewables investments in Australia

Wood Mackenzie analysts have expressed concern over deteriorating renewable energy investment conditions in Australia, noting that greater clarity on transmission investment is needed to support the sector.

RENEW ECONOMY
Clean Energy News and Analysis

SOLAR RENEWABLES STORAGE

Lawyers' picnic, and $47m at play, as Sunraysia solar farm faces further delays

Covid-19 to wreck economics of new solar and wind projects

While the full extent of the impact of the Covid-19 pandemics on the renewable energy market is yet to reveal itself, Norwegian consultancy Rystad Energy predicts new solar and wind projects will grind to a halt this year and experience a ripple effect in the years beyond as currencies across the globe continue to fall against the US dollar.

UK infrastructure investor suffers big losses from two Australia solar farms

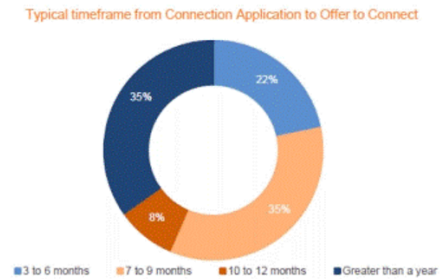
Bloomberg

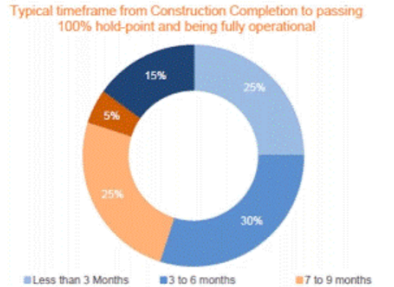
post COVID-19 economy. **Enable desktop notifications.**

Economics

Australians Love Rooftop Panels. That's a Problem for Big Solar

CONNECTION DELAYS





CLEAN ENERGY COUNCIL

- EPCs transferring connection risks back to IPPs/Developers
- Sites becoming increasingly challenging - EPCs becoming more selective
  - Constrained sites – <u>especially for co-located with storage</u>
  - Geotech
  - Topography
  - Flood
  - Remote location
  - Schedule (Covid, union issues etc)

A Considerable Opportunity still remains

RENEW ECONOMY
Clean Energy News and Analysis

SOLAR RENEWABLES STORAGE E

NSW first renewable zone attracts stunning 27GW of solar, wind, storage proposals

NSW to go 'even bigger' with second, 8GW renewable energy zone

By Jules Scully | Jul 13, 2020 11:46 AM BST | 0

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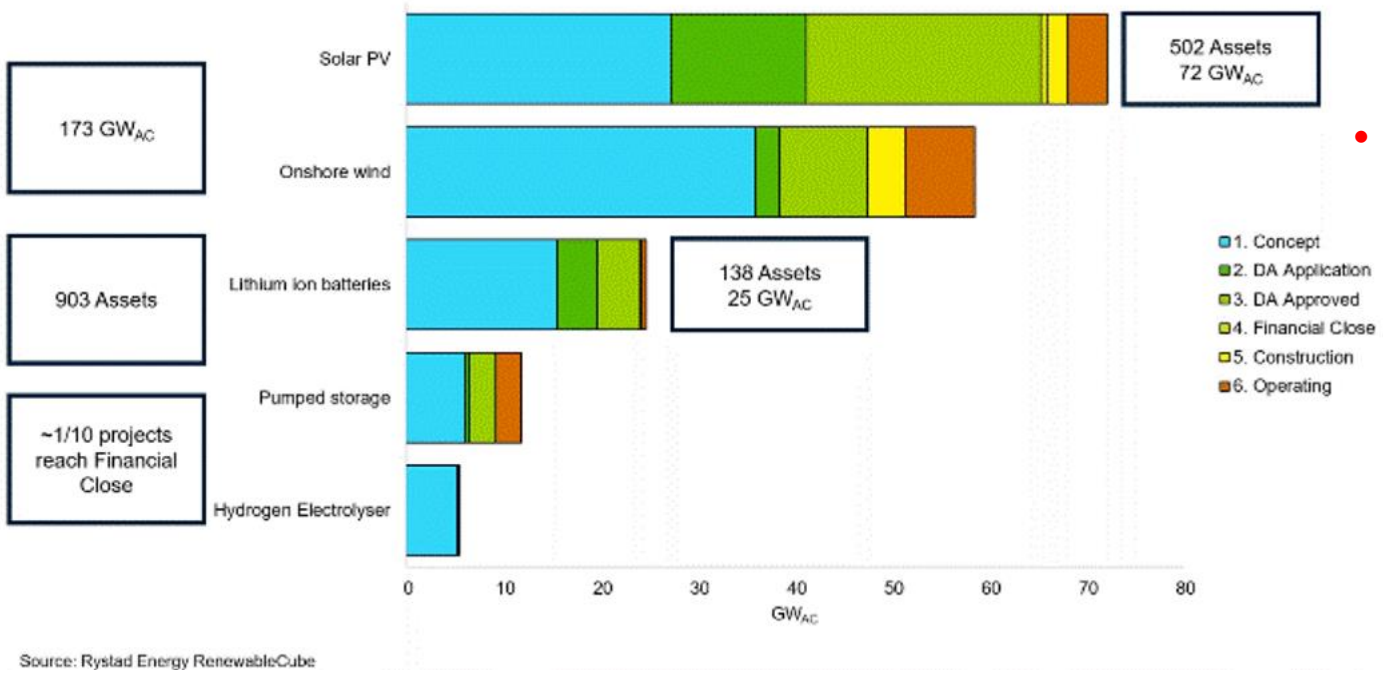
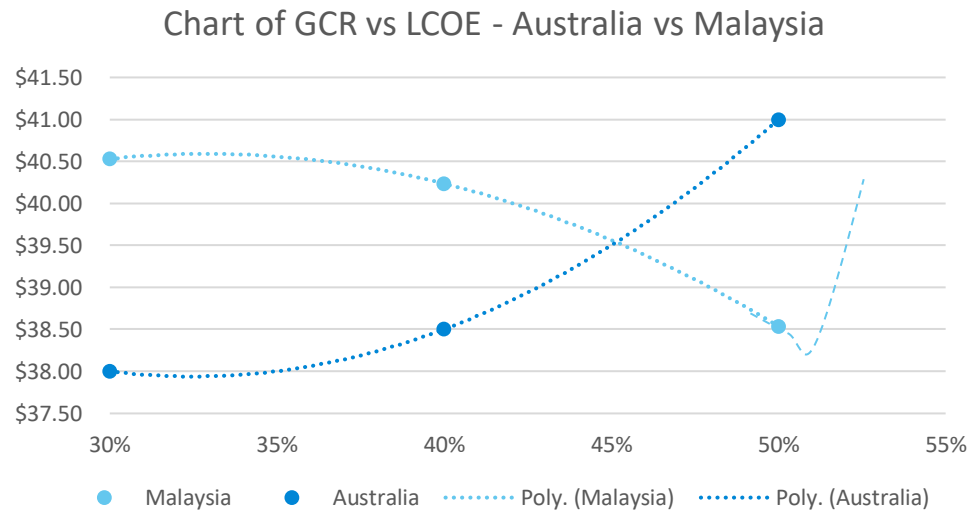
Australia's renewables pipeline continues to grow at record speed led by solar PV

Australia utility PV, wind and storage pipeline: 9/7/2020



Source: Rystad Energy RenewableCube

- To unlock this pipeline, aside from solving connection/grid and investor misgivings we need to continue to innovate to simplify engineering and de-risk construction
- **Tracking at wide GCR increases construction risk**



TrinaPro Overview

TrinaPro is a one-stop smart photovoltaic solution developed by Trina Solar for large-scale power stations.

Covering different terrain, different slopes, different wind speeds speeds and other complex application scenarios.

The system integrates three core products: high-efficiency PV modules, intelligent tracking system and reliable inverter. The system innovatively provides customers with hardware system design, software function integration, integrated services and intelligent operation and maintenance services .

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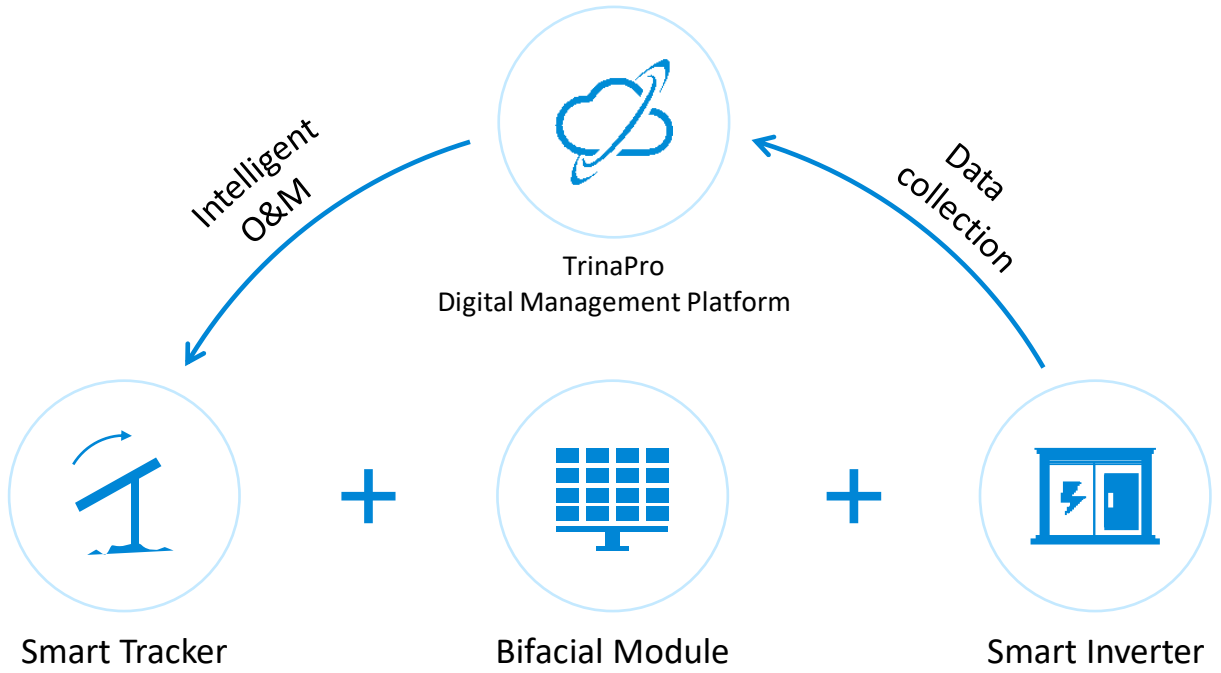

Hardware-software integration

Reduce BOS cost

8-15%

Intelligent tracking

Increase power generation

3-8%

Customized design

System Availability

99.9%

One Stop solution

Delivery efficiency increase

15%

Integrated Solutions Unlock Value Add Support

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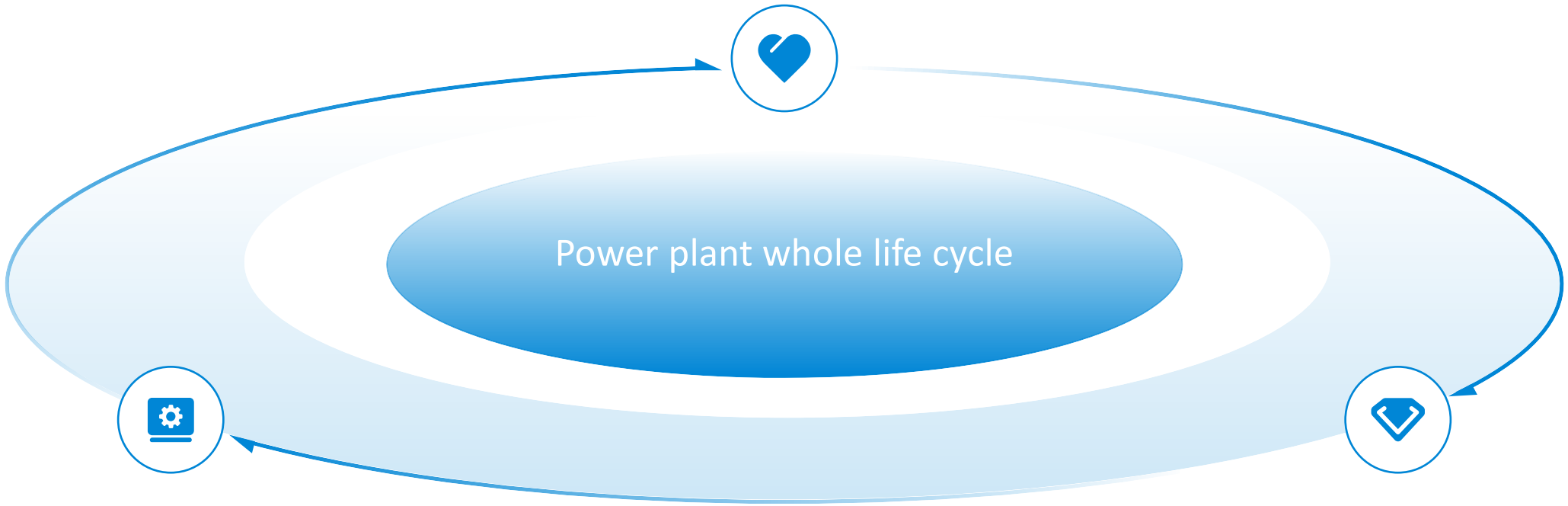
Streamlined Contracting | Arrival in stages | Pre-sales installation training | On-site installation | Device connection debugging

Delivery and Service



Design and Engineering

- Layout Optimisation
- Yield Assessment
- IRR calculation
- Topo and Geotech Support

Operation and Maintenance

- Cloud based Monitoring
- Remote Control
- Remote Fault Alarm
- Robotic Cleaning
- Drone Inspection

Extensive Verification for 210mm Wafer modules

Increased module size and weight requests higher static mechanical bearing capacity and dynamic running stability of the tracker system, tested for 3D Flutter and Buffeting by RWDI

Higher static mechanical bearing capacity

Dynamic running stability

Multiple drive, Accurate synchronization

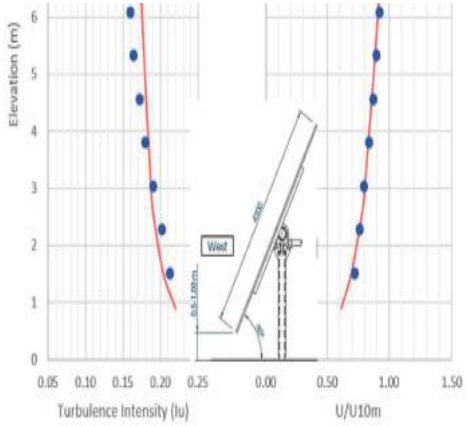
More stable

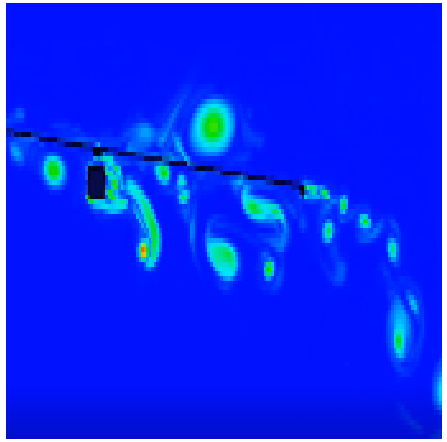
wind tunnel test of a world-renowned laboratory

More trustworthy

Adapt to 1.5 times load and test standards

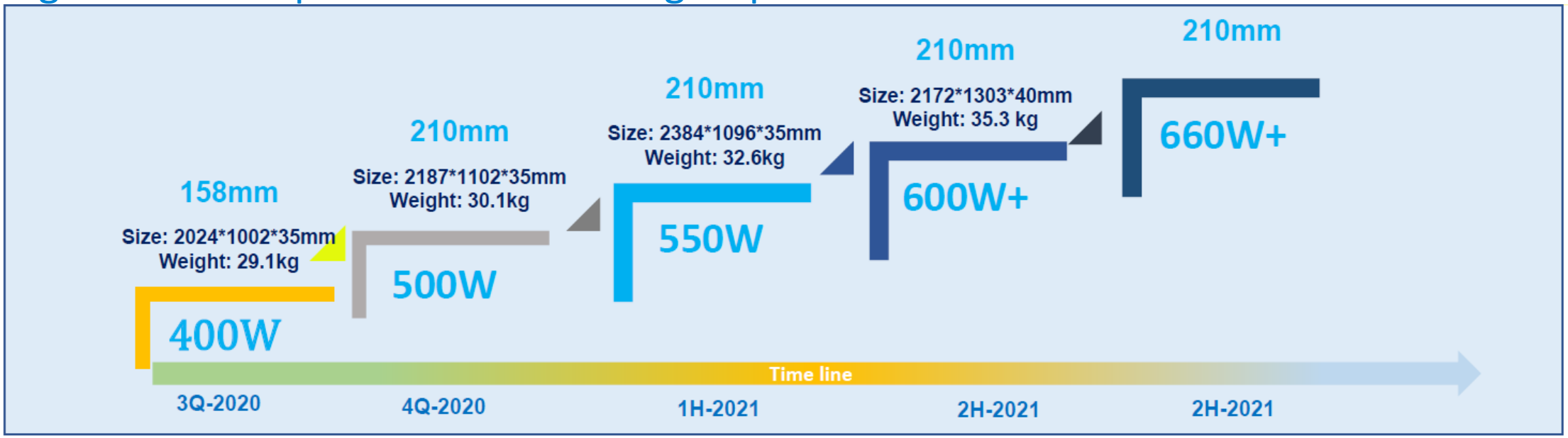
Ensure structural reliability





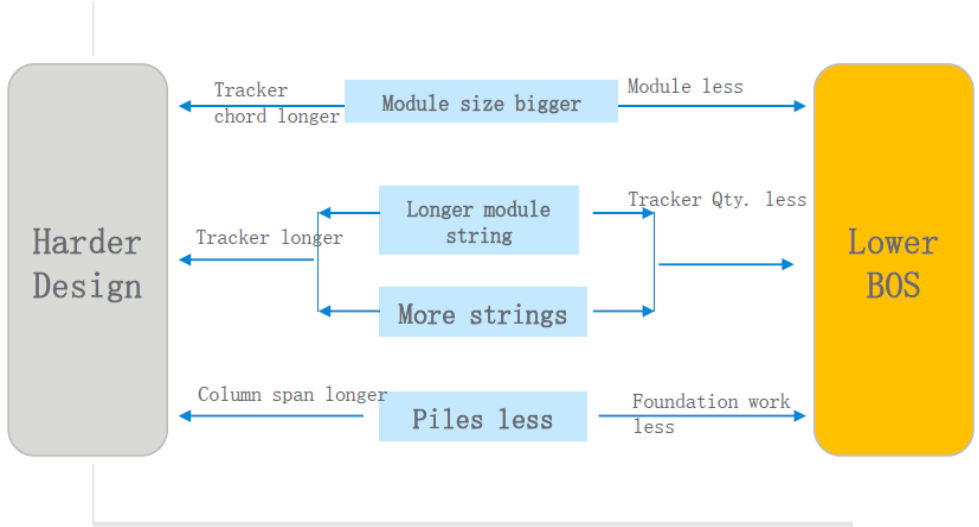
Laboratory test

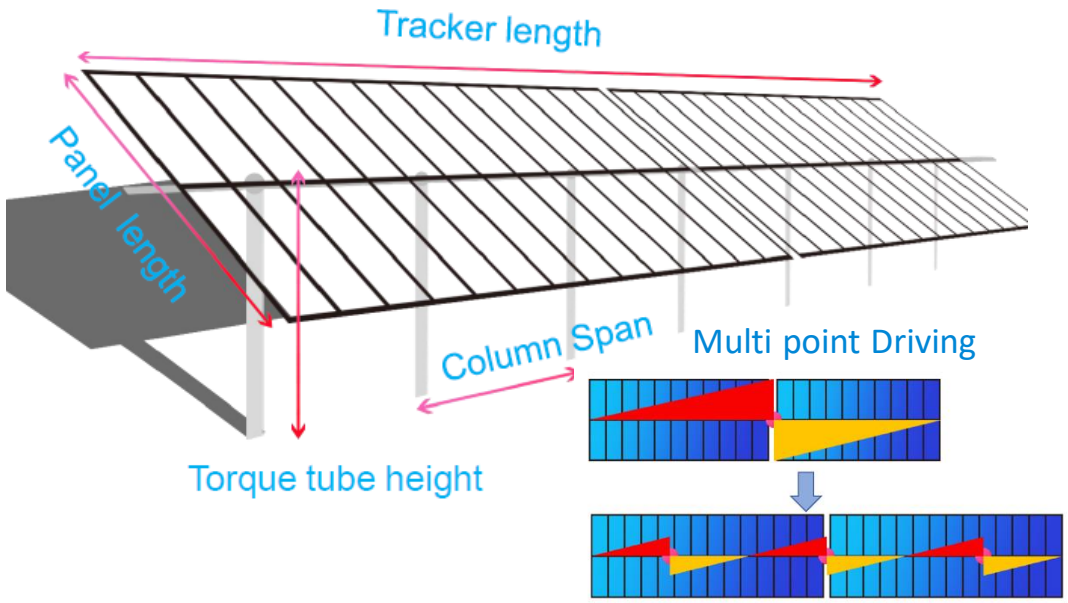
Large Module Impact on Tracker Design Optimisation



Length
+20%

Width equivalent (~1.1m)





TrinaTracker provides Solutions for Every Site

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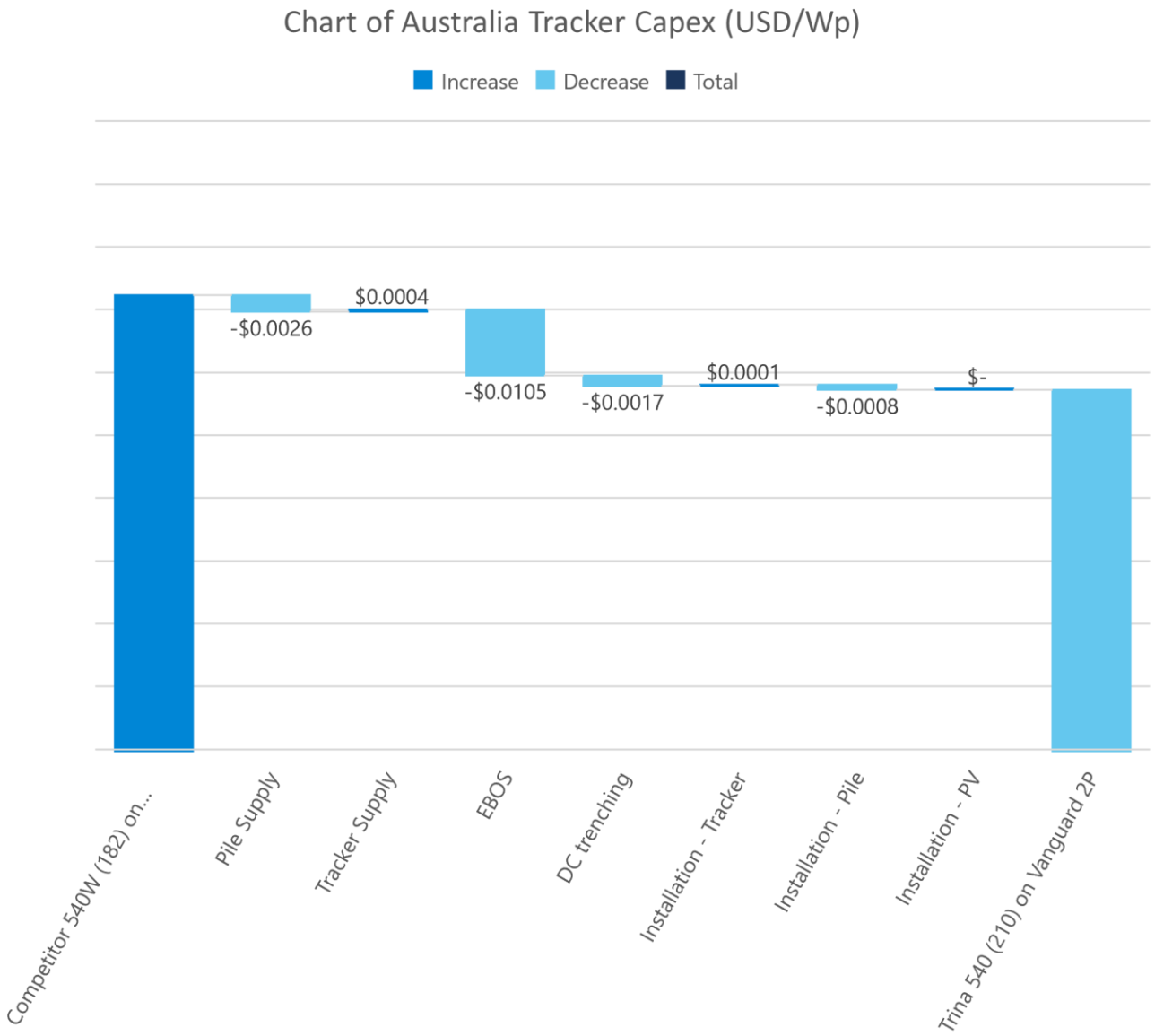
Vanguard

- 2 in portrait, specifically engineered for large modules with multi point drive for stability
- Up to 120 modules per tracker – optimised for Low Voltage up to 40 modules per string
- Individual row actuation for optimum bifacial yield and wide unimpeded vehicle access every row (easiest O&M)
- Optimised slope tolerance up to 30% (15% standard)
- Lowest installed cost – 7 piles per table, <120 piles per MW
- Best for Challenging sites: irregular/constrained, geotech, undulating, flood plain

Agile

- 1 in portrait, specifically engineered for large modules
- Up to 120 modules per tracker – optimised for Low Voltage up to 40 modules per string
- Dual row actuation for enhanced bifacial yield and wide vehicle access every other row (easy O&M)
- Fewest motors/controller/battery per MW (save capex & opex)
- Enhanced slope tolerance -15% N/S, 8% E/W
- Best for less challenging sites

Impact of Higher Module Wattage and Low Voc on BOS Costs



- Total capex saving >USD1.5c/Wp
- 2% lower Capex
- Reference Project 128MWp Australia, 20% predrill/concrete backfill piles

	500W	Competitor 540W	Trina 540W	Delta 210 vs 182
Module Wattage	500	540	540	-
Module Voc	51.7	49.9	37.7	-24.5%
Module Area sqm	2.41	2.60	2.61	+0.3%
Power Density W/m2	207	208	207	-0.7%
Modules per String	28	28	38	+35.7%
Strings per Tracker	4	4	3	-25.0%
Modules per Tracker	112	112	114	+1.8%
kWp per tracker	56.0	60.4	61.6	+2.0%
Piles per MWp	161	132	114	-13.7%
Piles per Tracker	7 inner / 9 outer	7 inner / 9 outer	7	
100MWp SA Project				
Total Piles	20,571	16,931	14,555	-13.7%
Total Strings	9,481	8,466	6,238	-26.4%
Capex Saving USD/Wp		-$0.0061	-$0.0220	-1.59c/Wp
Capex Savings		-0.75%	-2.69%	-1.94%

Intelligent Tracking for Higher Yield

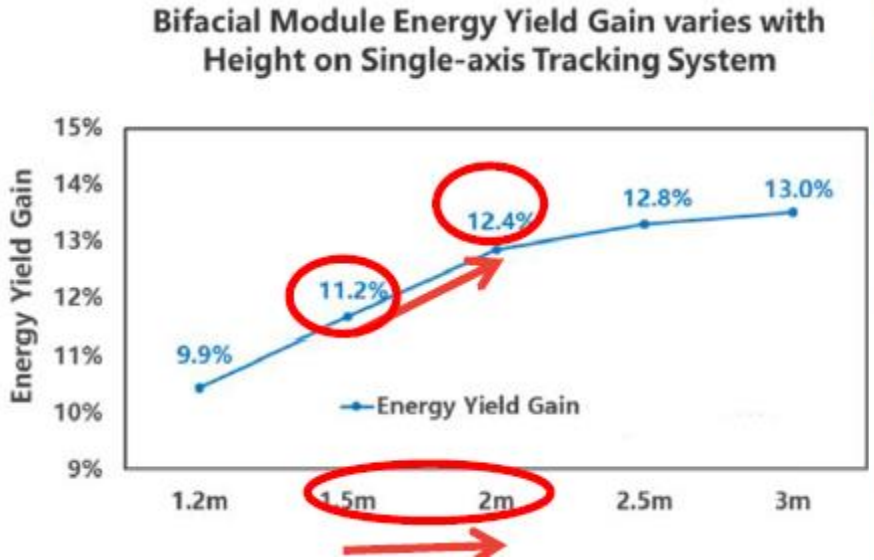
SuperTrack is one of the highlights & features of Trina Tracker, and developed to overcome the shortcomings of conventional Astronomical Algorithm and to avoid or mitigate row-to-row shading, fully considering the features of rear sides and overall performance of bifacial modules.

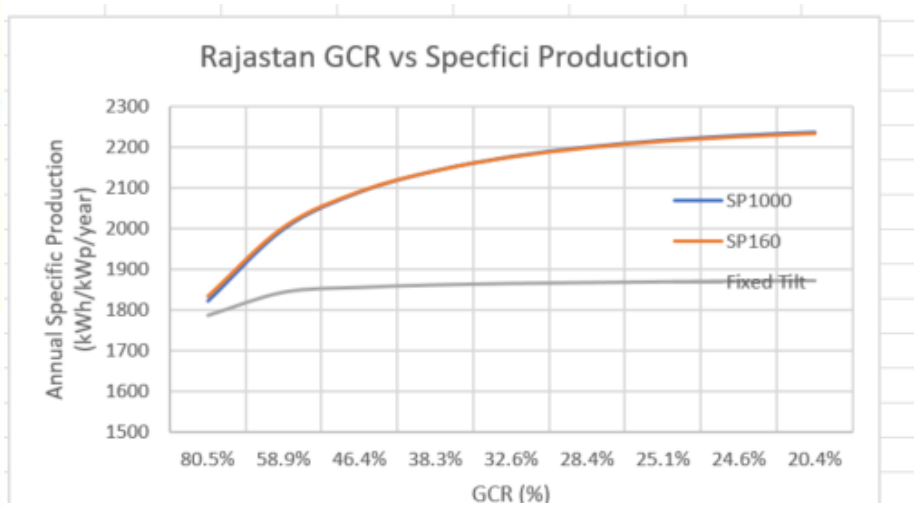
SuperTrack is featured with two innovative technologies. Smart Tracking Algorithm (STA) is to optimize for high diffuse irradiation, and Smart Backtracking Algorithm (SBA) for undulating terrains.

3rd party verified by CGC for yield boost >3% (up to 8%)

Translating Lower Capex and Higher Yield into Lower LCOE

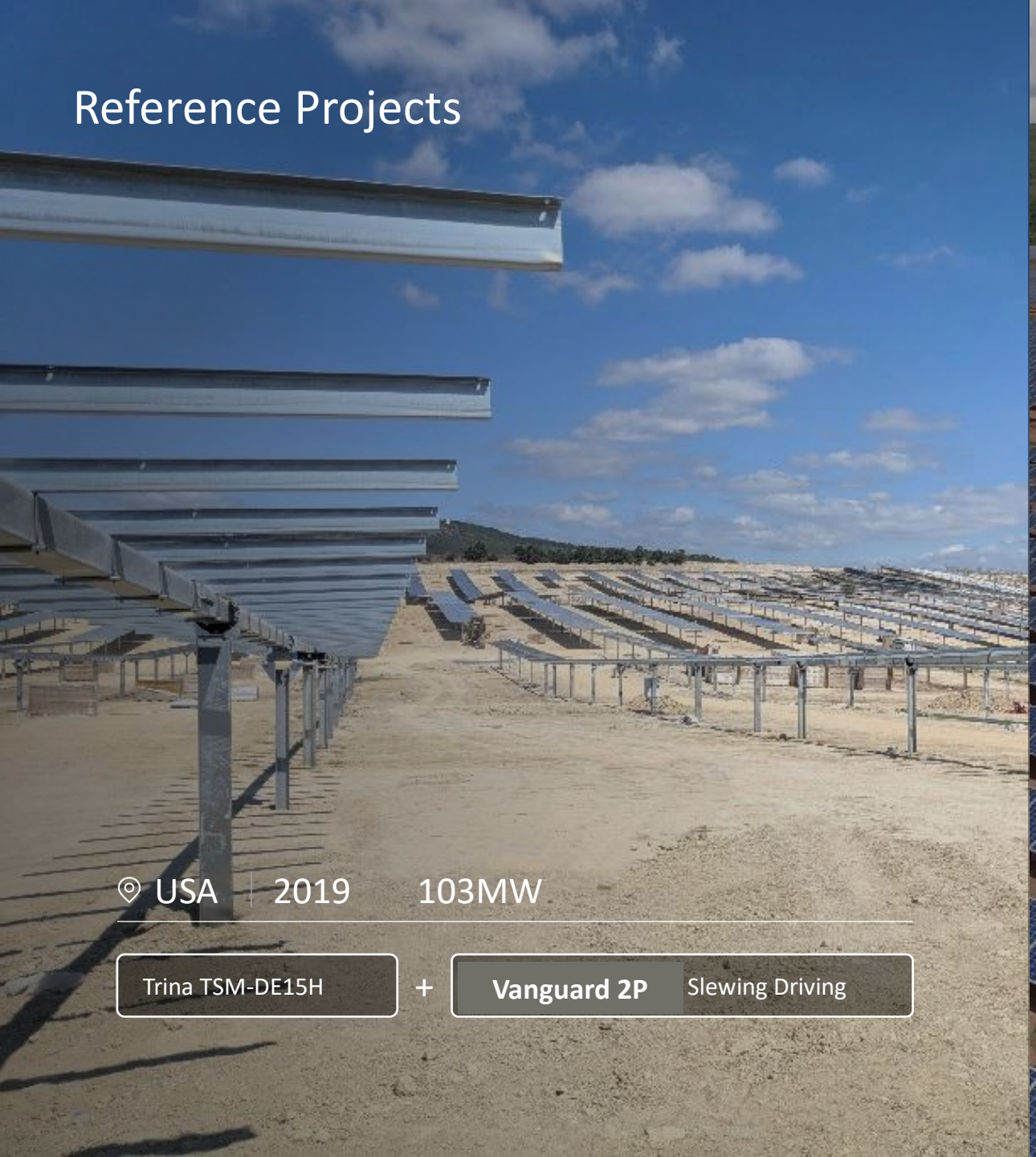
Option	Structure	Module	MWp	GCR	Capex (USD/Wp)	Delta	Land Required (acre)	Delta	Land	Land Cost (USD/Wp)	Yield (kWh/kWp)	Delta	IRR	LCOE (USD/MWh)	Delta
1	Fix	540	250	64%	$ 0.433		487		Acquired	$ 0.019	1,794	0%	9.7%	$ 31.08	0%
2	Fix	540	250	64%	$ 0.414	-4%	487	0%	Leased	$ 0.014	1,794	0%	9.8%	$ 30.73	-1.1%
3	Agile 1P	535	250	50%	$ 0.492	14%	620	27%	Acquired	$ 0.024	2,103	17%	10.1%	$ 30.20	-2.9%
4	Agile 1P	535	250	50%	$ 0.468	8%	620	27%	Leased	$ 0.017	2,103	17%	10.3%	$ 29.82	-4.1%
5	Vanguard 2P	535	250	50%	$ 0.496	15%	620	27%	Acquired	$ 0.024	2,124	18%	10.1%	$ 30.08	-3.2%
6	Vanguard 2P	535	250	50%	$ 0.472	9%	620	27%	Leased	$ 0.017	2,124	18%	10.3%	$ 29.71	-4.4%
7	Agile 1P	535	250	30%	$ 0.509	17%	1033	112%	Acquired	$ 0.041	2,215	23%	10.5%	$ 29.51	-5.1%
8	Agile 1P	535	250	30%	$ 0.468	8%	1033	112%	Leased	$ 0.029	2,215	23%	10.8%	$ 28.90	-7.0%
9	Vanguard 2P	535	250	30%	$ 0.513	18%	1033	112%	Acquired	$ 0.041	2,237	25%	10.6%	$ 29.39	-5.4%
10	Vanguard 2P	535	250	30%	$ 0.472	9%	1033	112%	Leased	$ 0.029	2,237	25%	10.9%	$ 28.79	-7.4%
11	Vanguard 2P	535	250	40%	$ 0.472	9%	775	59%	Leased	$ 0.022	2,166	21%	10.5%	$ 29.36	-5.5%





Reference Projects

Reference Projects



USA | 2019 | 103MW

Trina TSM-DE15H + **Vanguard 2P** Slewing Driving

Mexico | 2019 | 23MW

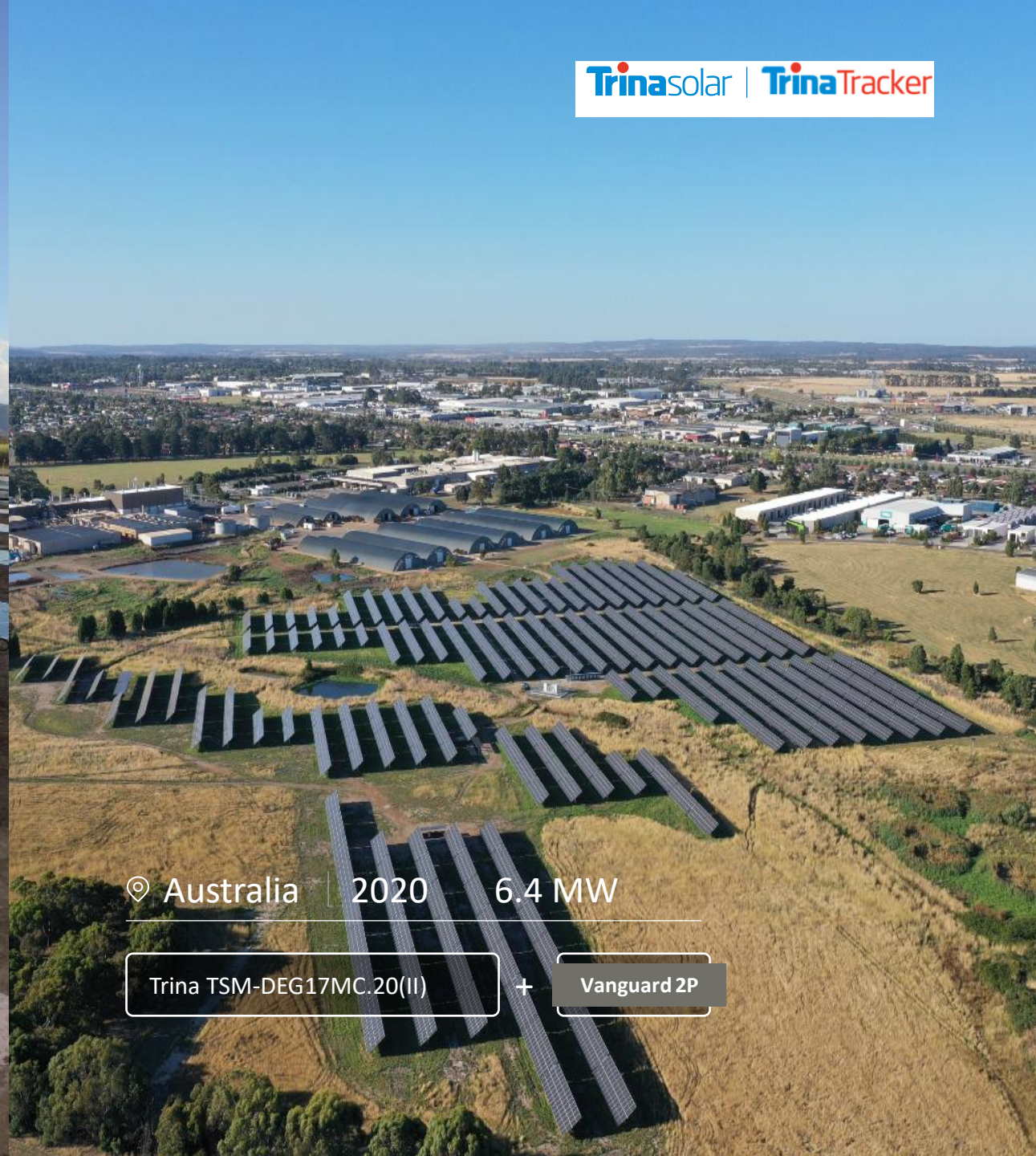
Trina TSM-DEG14H.20(II) + SP1000

Reference Projects

Trinasolar | TrinaTracker

Australia | 2018 | 120 MW

Trina + SP1000 1V



Australia | 2020 | 6.4 MW

Trina TSM-DEG17MC.20(II) + Vanguard 2P

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Maximise your Energy Generation and Adaptability

For all enquiries please contact

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