



Large single-axis trackers for bifacial systems

Soltec

Soltec specializes in the manufacture and supply of **single-axis solar trackers** with global operations and a workforce of **over 750 people** blending experience with innovation.

- ✓ Top-tier manufacturer and supplier
- ✓ Tracking Specialist with **14 years history**
- ✓ Specialist in **customer experience** and innovation
- ✓ Investor in **growth and people**
- ✓ Global supplier with **regional operations**

14 Years
Company History

1+ GW
Annual Sales

Top 3
Global Tracker
Supplier (2017)



4.6+ GW
Track-record



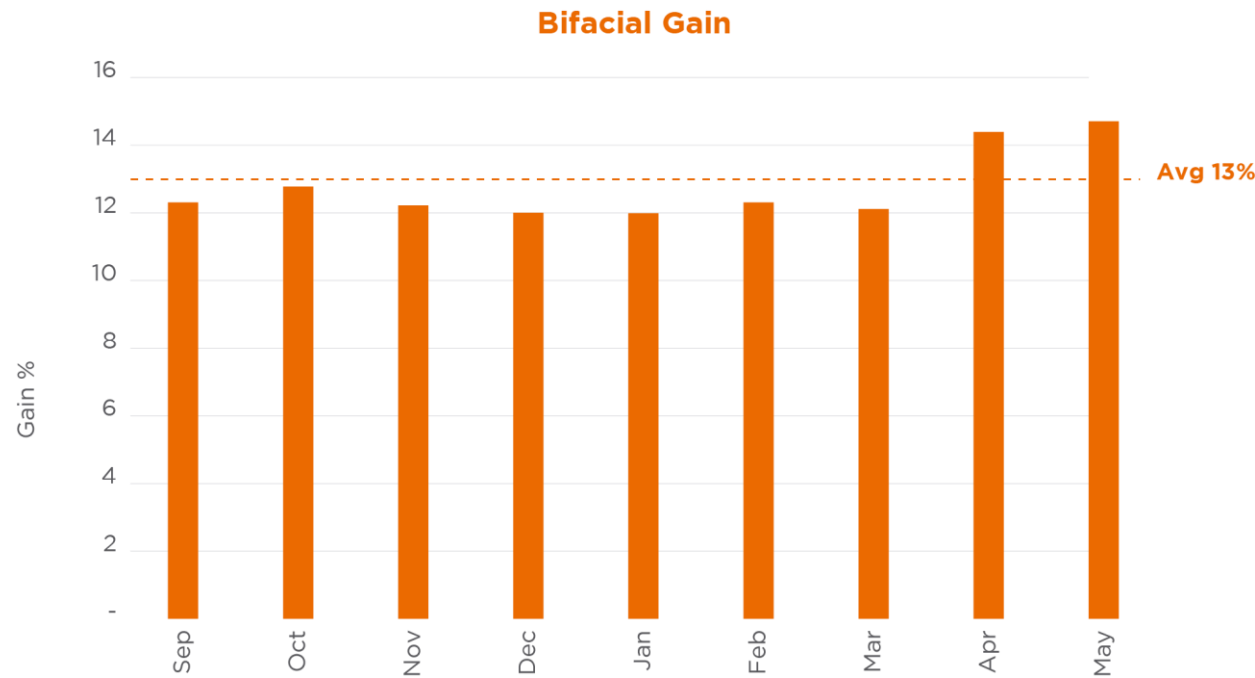
'La Silla' solar plant (Chile), 2015. Soltec produced the first solar tracker specifically designed for bifacial modules installed in a utility scale solar plant.



Study Case: La Silla (Chile, 2015)



GCR=0.33, PV bifacial module



Energy Gain=13%


	Gain=12%	Gain=15%
Δ LCOE	-5.3%	-7.2%
Δ IRR	5.7%	9.1%

Source: Agnese Di Stefano, Giuseppe Leotta, Fabrizio Bizzarri, Enel Green Power SpA (2017) 'La Silla PV plant as a utility-scale side-by-side test for innovative modules technologies'. 33rd European Photovoltaic Solar Energy Conference and Exhibition.

Bifacial: New vision for a PV plant design

Monofacial tracking PV plant Vs. Bifacial tracking PV plan  Energy production kWh/kWp **Vs.** Smaller plant  kWp for  kWh

	Same peak power	Same production
Peak power	50 MWp	43,85 MWp
Module units	=	↓ 12%
Module price	↑ 5%	↓ 4%
Tracker units and price	=	↓ 12%
DC-AC-MV	↑ 10%	=
Labour structure	=	↓ 12%
Civil Works	=	↓ 12%
Labour DC	=	↓ 12%
kWh/year	↑ 14%	=
Final price	↑ 4%	↓ 7%

- 
- Lower GCR
 - Less structure
 - Less cable
 - Better price for installation

Case: Albedo: 40%, GCR: 0.33 → Bifacial Gain: 14%

BITEC: Bifacial Tracker Evaluation Center

Bifacial testing in Livermore

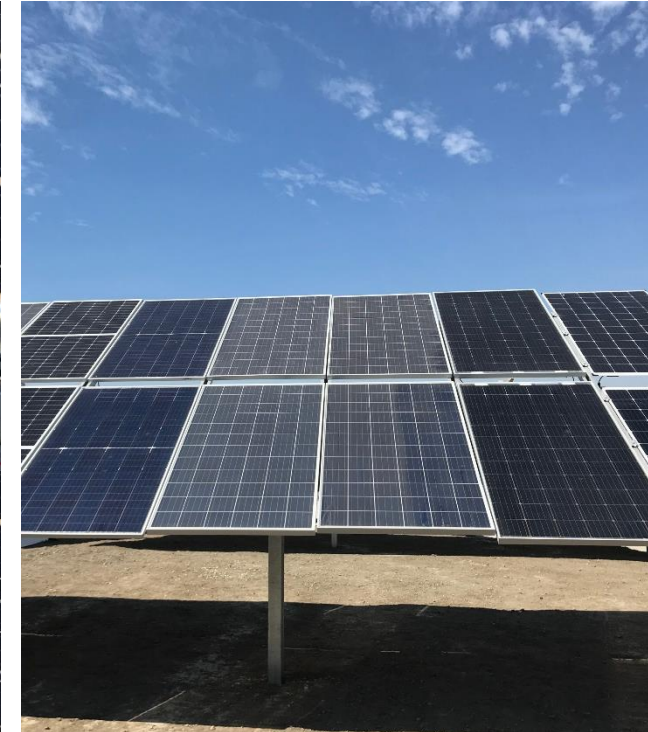
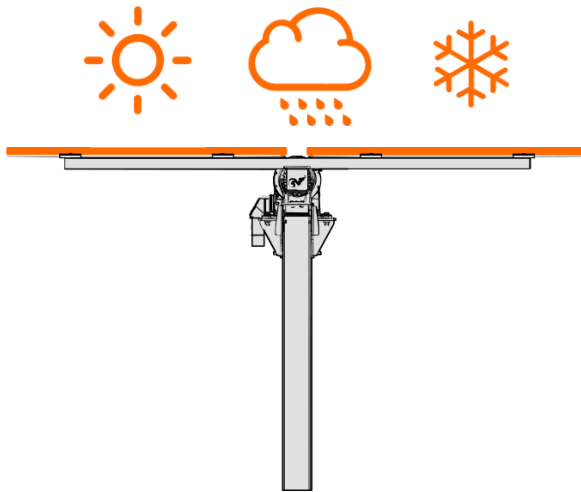
Objectives of study from Soltec:

1. Lay out criteria

- . Optimal height
- . Different Ground color and texture
- . Pitch
- . Configuration

2. Energy Yield = f(G, h, Pitch, Soil color)

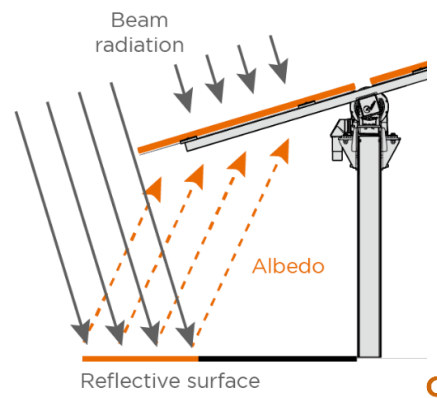
3. Tracking algorithm optimization for bifacial



Variables:

- Measure albedo in different soils
- Measure different pitches
- Measure different heights
- Measure in real conditions
- TeamTrack Backtracking

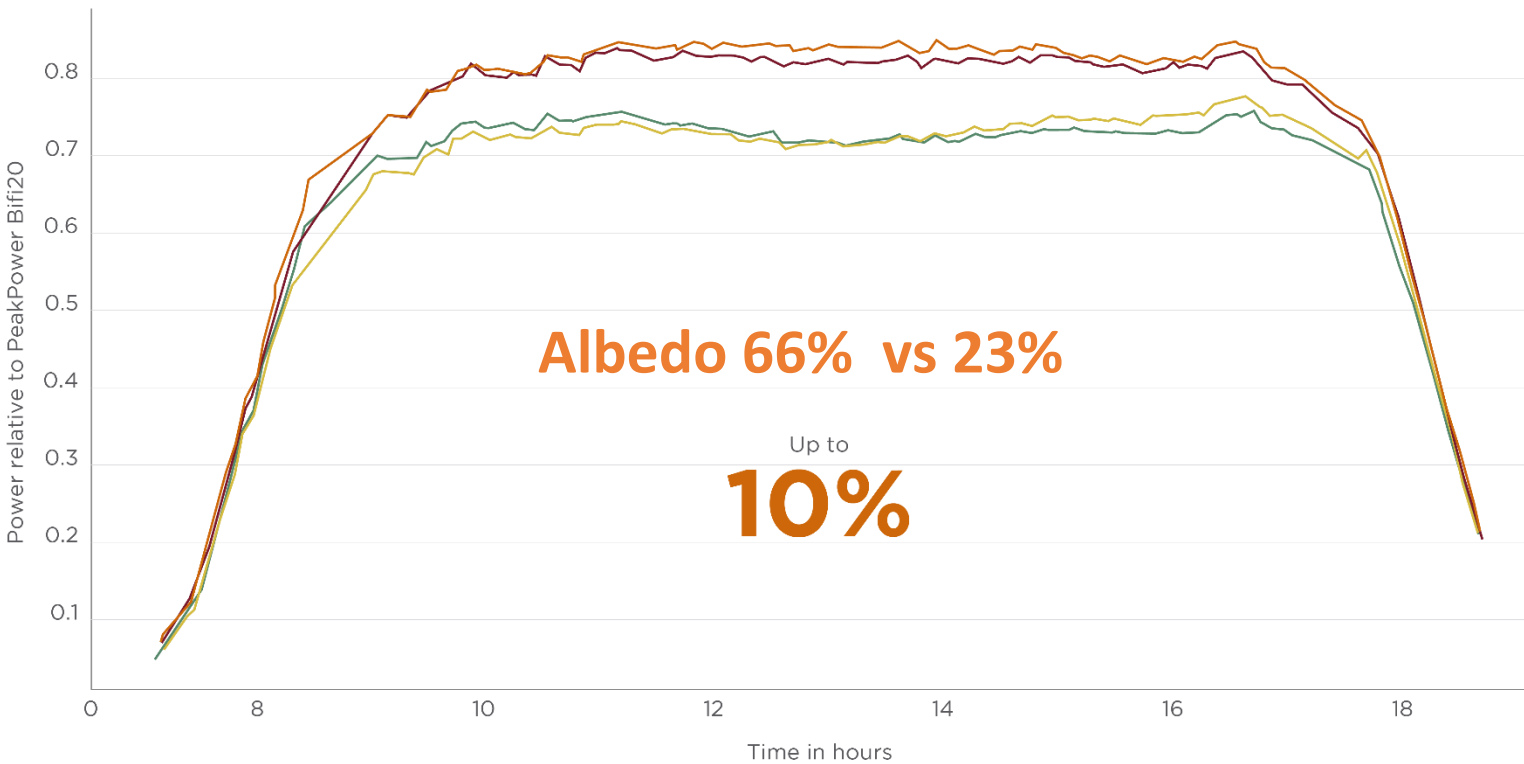
Energy gain: maximize it



Albedo: Soil surface (Bifacial Ratio)

- ✓ Surface's size between rows of trackers determinates the reflected surface.
- ✓ ¿Approximately linear?

Comparison 2P Albedo JW-DT-355



It can vary with seasons:

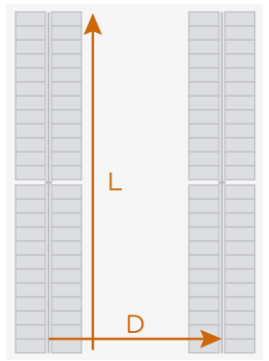


- Best Case **Snow**
- Good Case **White sand**
- Medium Case **Ground-grass varieties**
- Worst Case **Volcanic Rock**

GCR 0.4

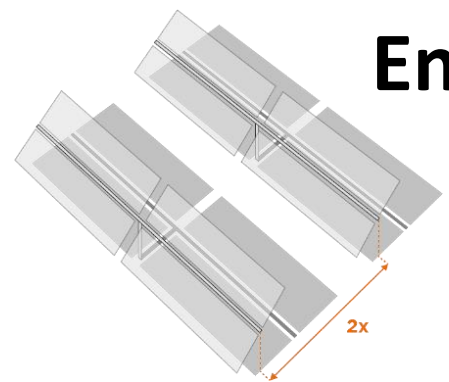


$$E_{bifacial} = E_{monofacial} \times (1 + \text{Bifacial Ratio} \times \text{bifaciality})$$

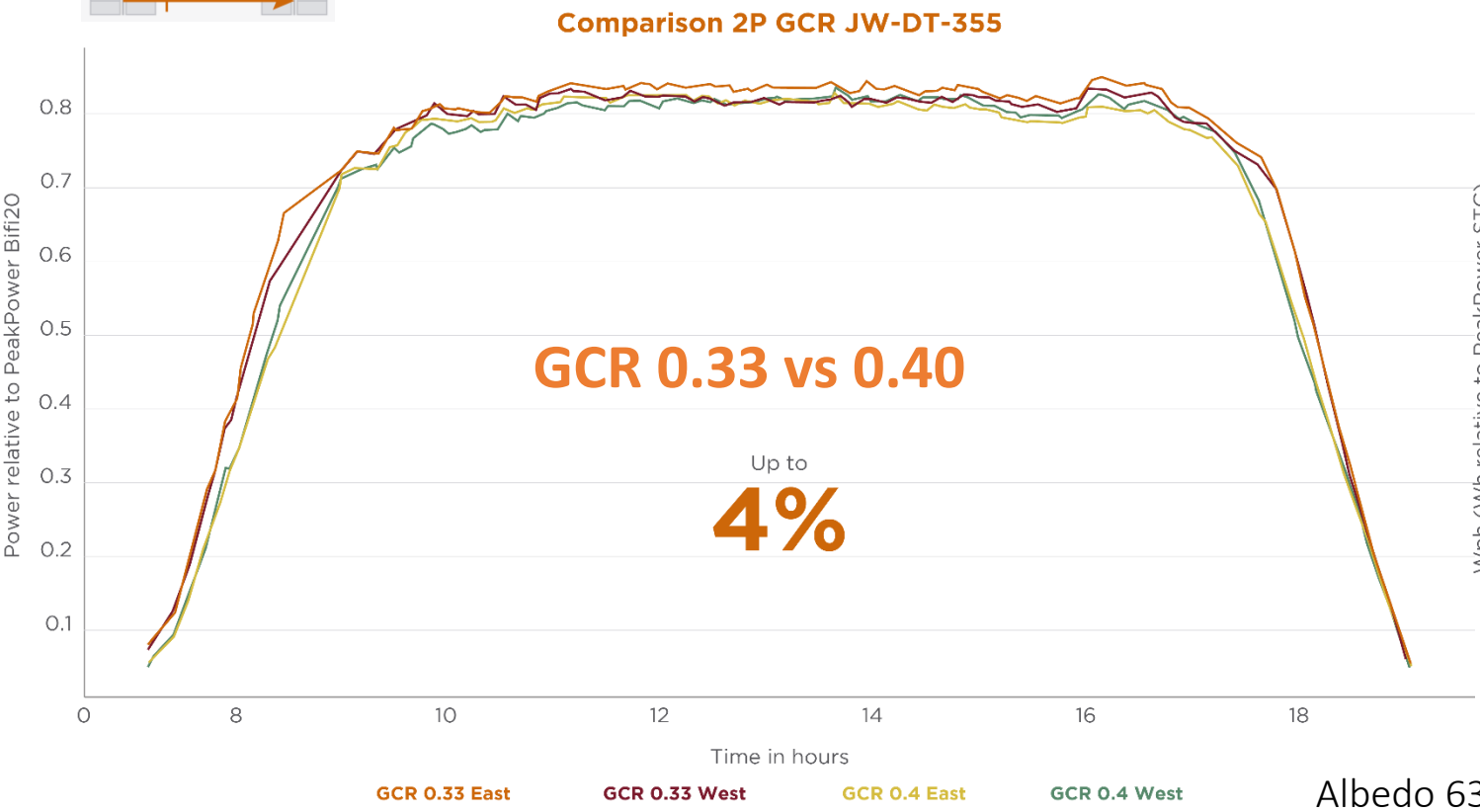


↑ Pitch => ↑ Reflected Area
↓ GCR => ↑ Bifacial Energy

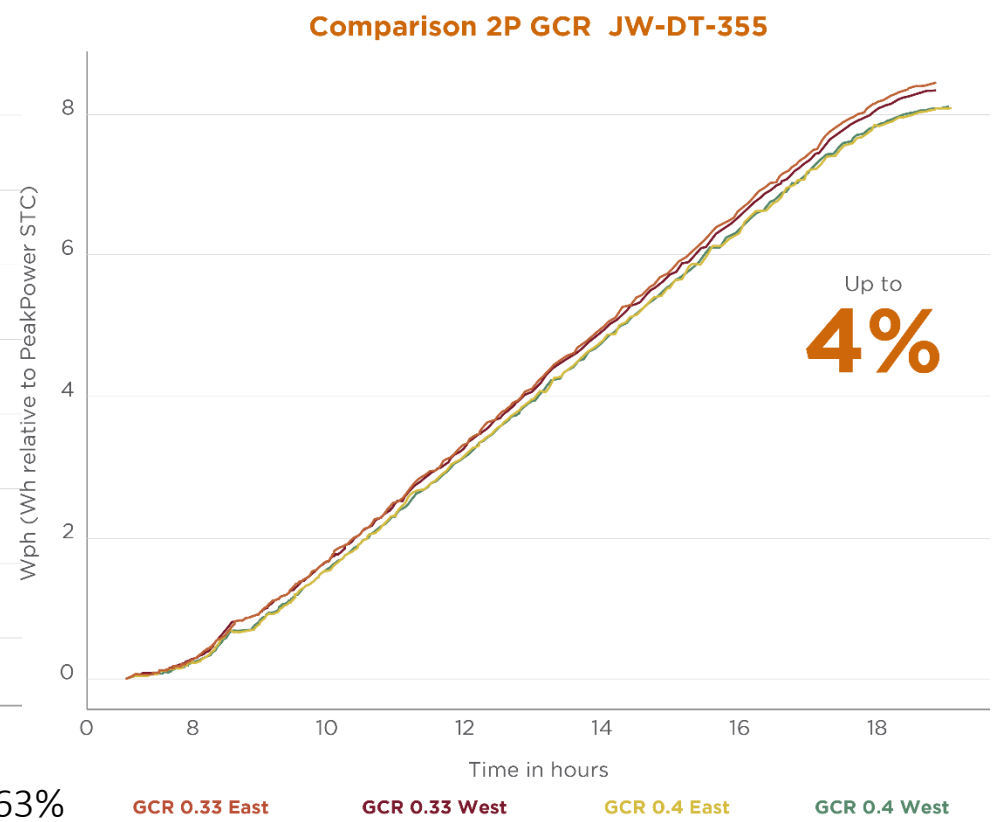
Pitch is relevant: ↑ surface = ↑ energy gain



Energy gain: maximize it



Albedo 63%



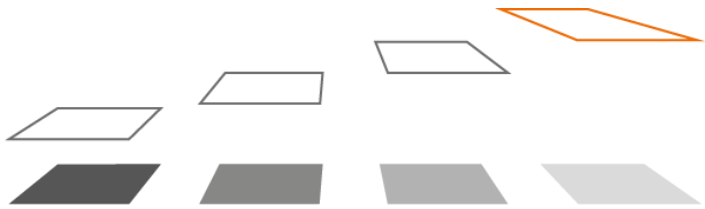
GCR: Ground Coverage Ratio (tracker width/pitch)

$$E_{bifacial} = E_{monofacial} \times (1 + \text{Bifacial Ratio} \times \text{bifaciality})$$

Energy gain: compare it

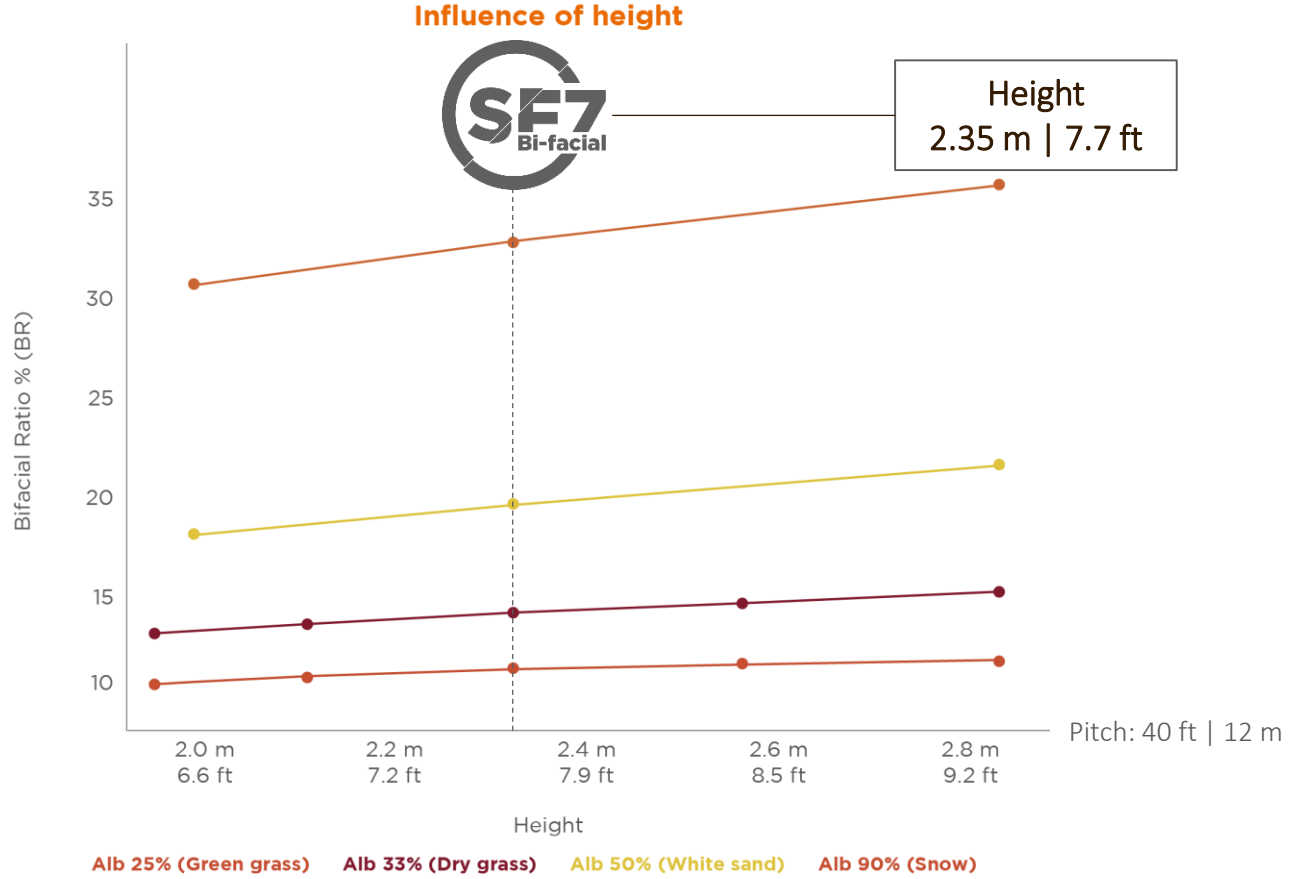
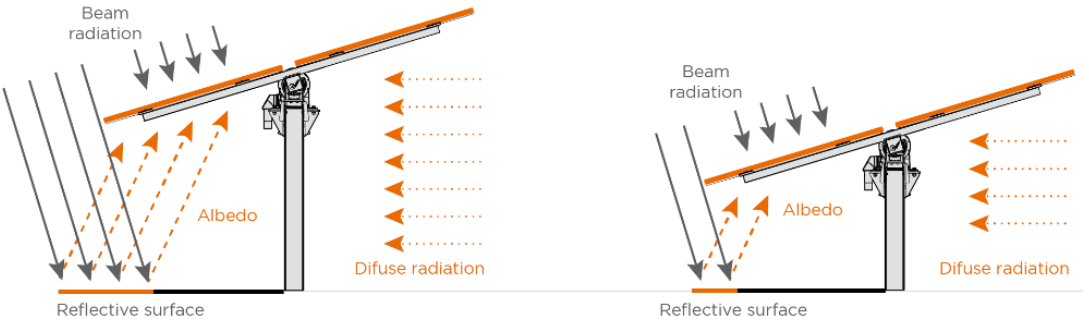
View factor: Height of the tracker

- ✓ The height of the structure is directly correlated with:
 - ✓ The area that reflects
 - ✓ Diffuse input
- ✓ The higher, the more gain energy.



Taller Tracker

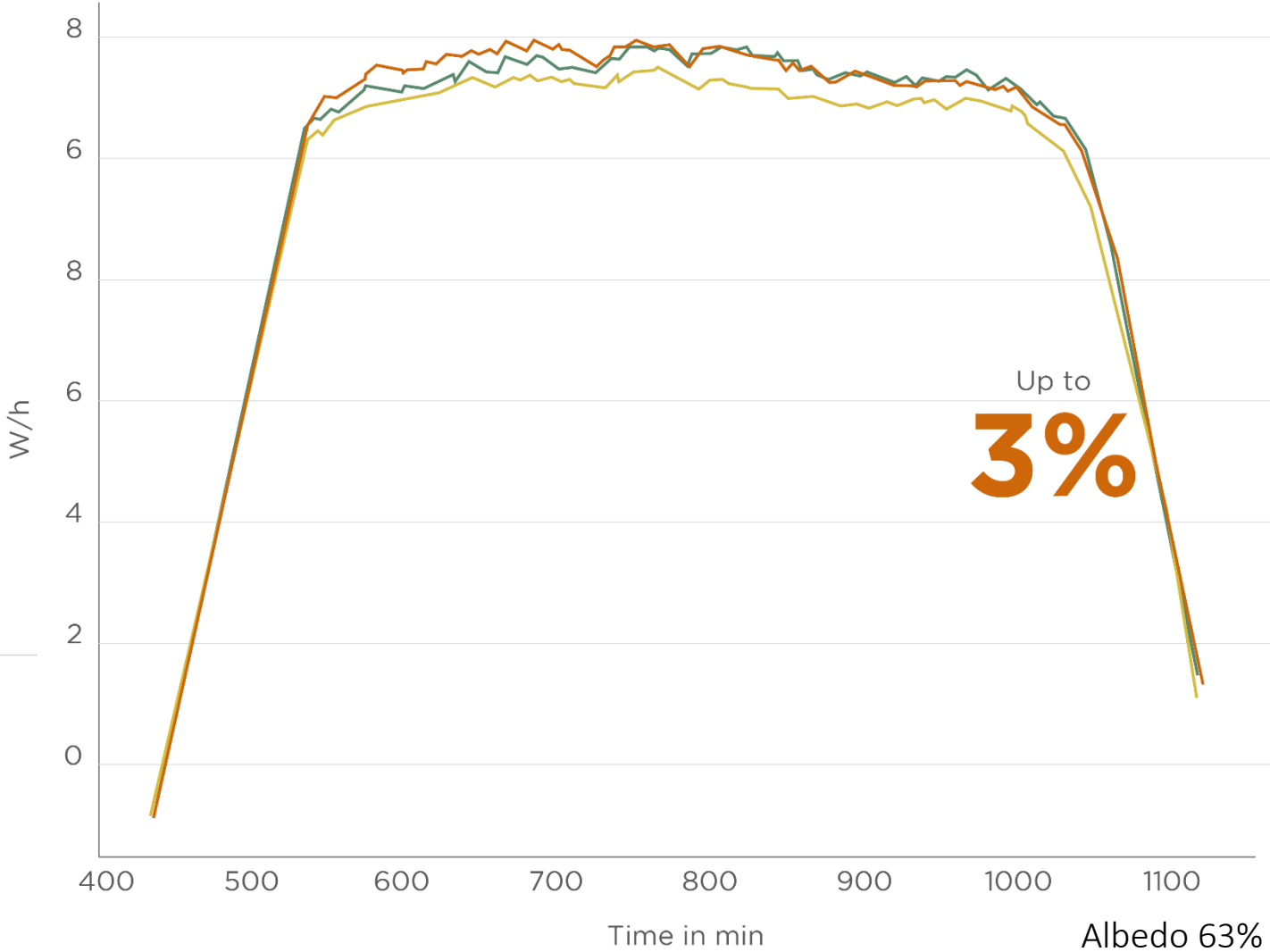
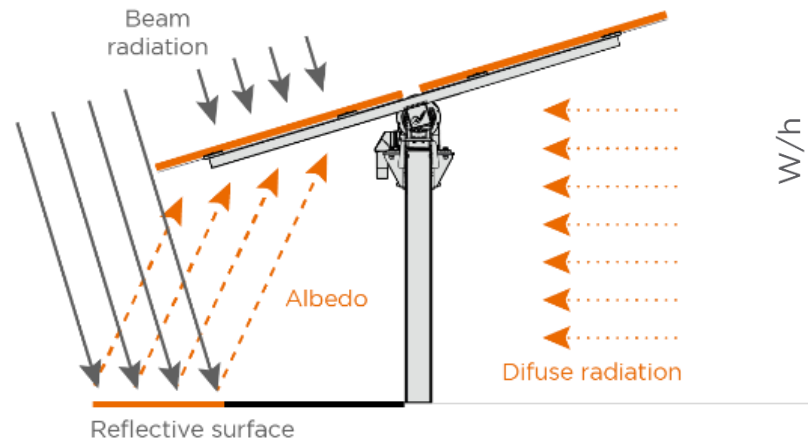
Bifacial performance is increased by height of installation, reducing shadow intensity projection.



Energy gain: compare it 1P Vs. 2P

Comparison 2 Portrait Vs. 1 Portrait Jolywood JW-DT-355

Height of the tracker:
View factor



Up to
3%

1P

2P East

2P West

Albedo 63% | GCR: 0,4

Source: BiTEC, August 2018.



Bifacial: higher current

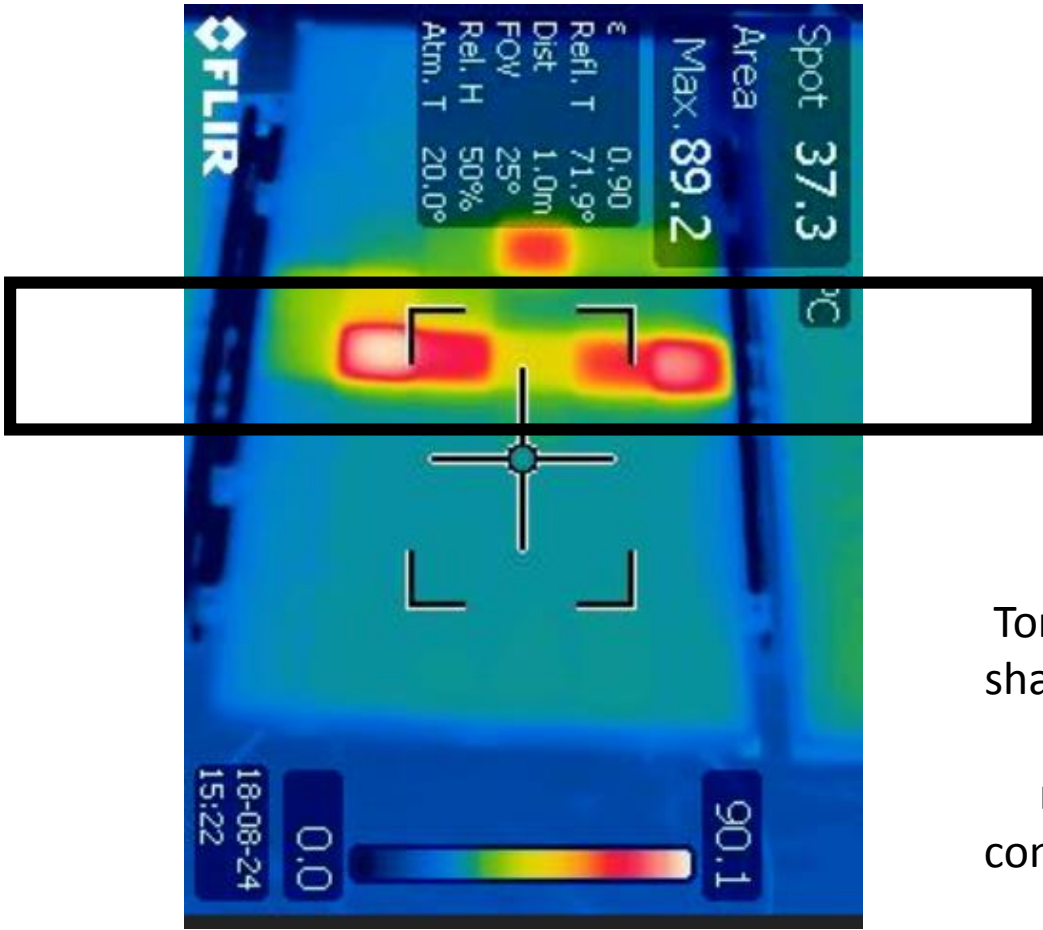
$$I_{Front} + IR_{ear} > IM_{onofacial}$$

¿T Bifacial > T Monofacial?

Torque-tube shading interference

Localized temperature Non-Uniformity under current application

RACKING SHADES INTERFERENCE



Module on short circuit
Albedo 63%

Front side

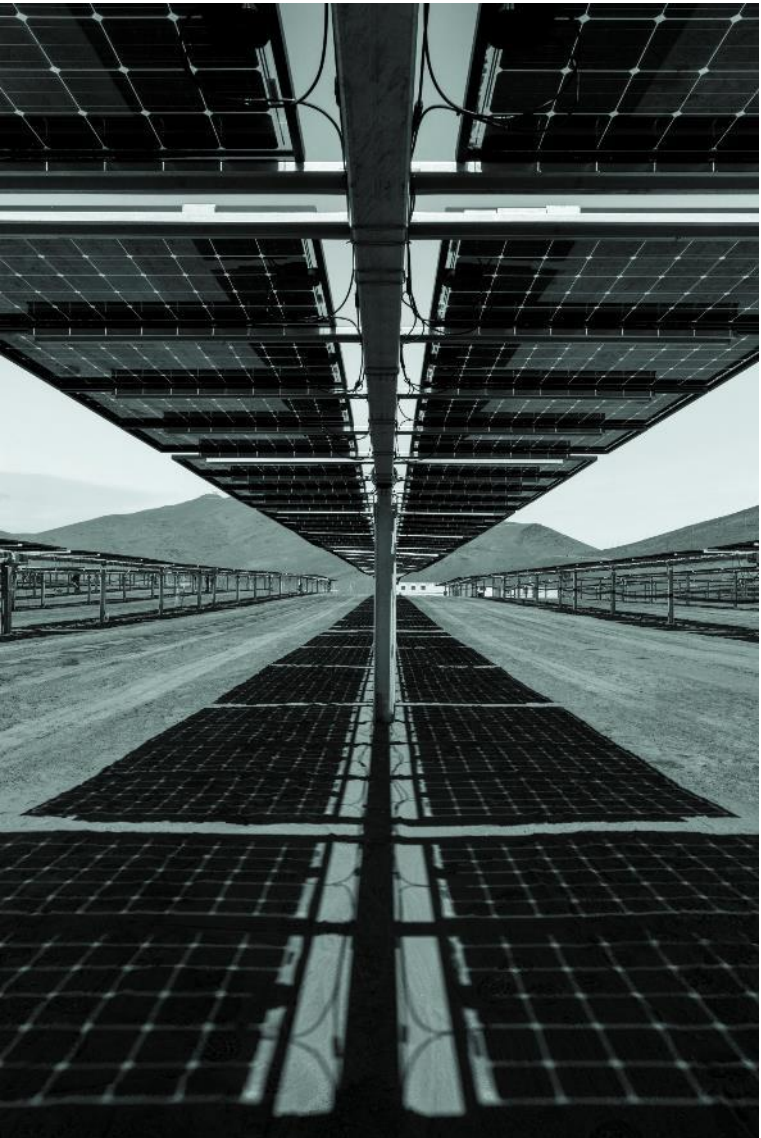
Torque-tube shading in 1P bifacial module configuration



4 inch celarance

Rear side

Source: BiTEC, August 2018.

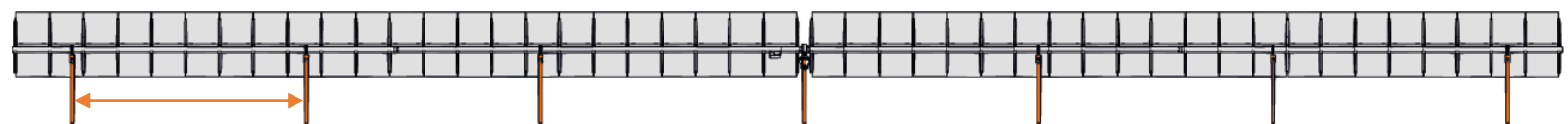
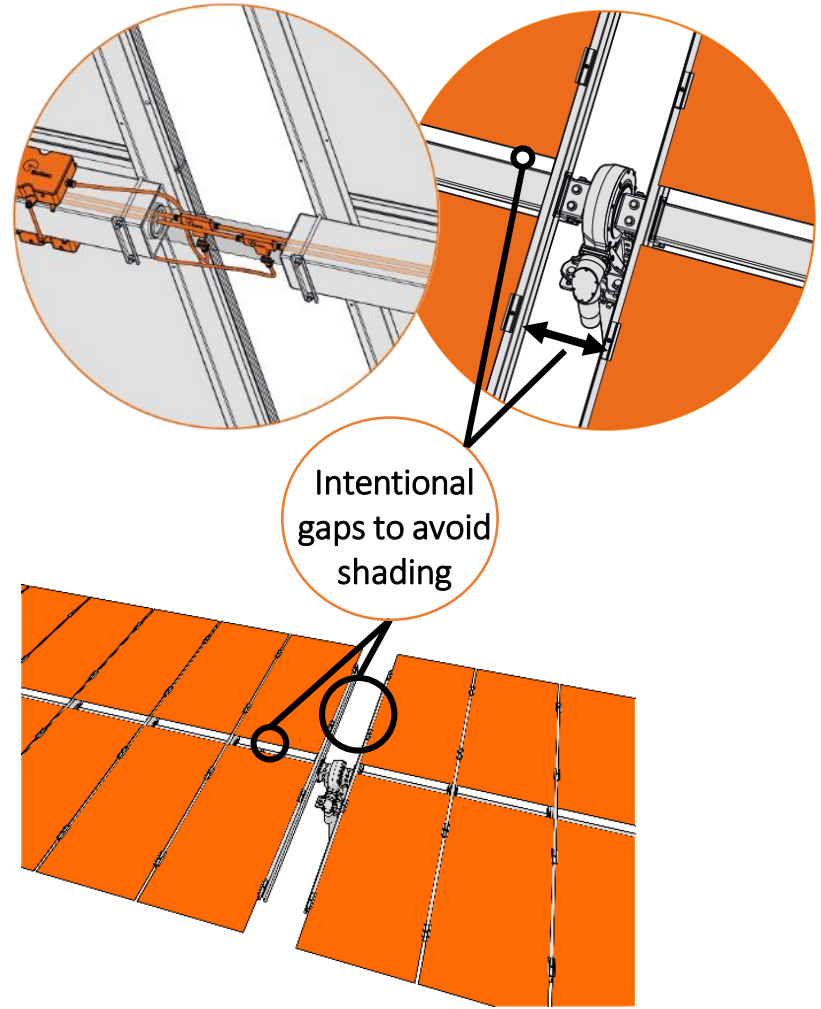


Shading = interference

Bifacial = new concept
All objects cast a shadow.
Shading = losses

Minimizing the number of objects shading:

- ✓ No rear shading from torque tube → 5% less interferences
- ✓ 7 piles/90 modules → 46% fewer piles/MW
- ✓ No hanging wires → 81% fewer wiring → StringRunner
- ✓ No dampers

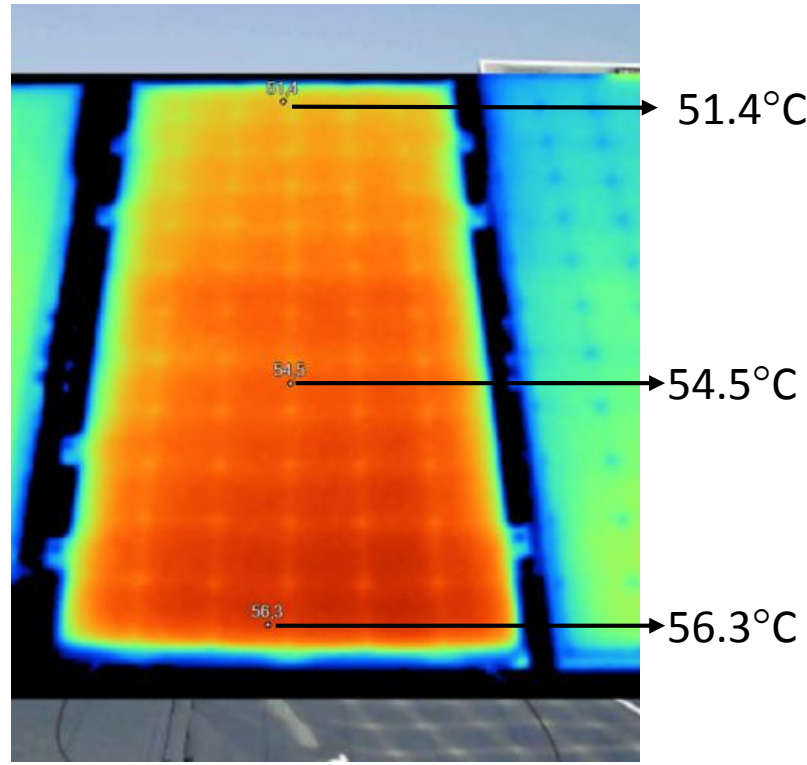
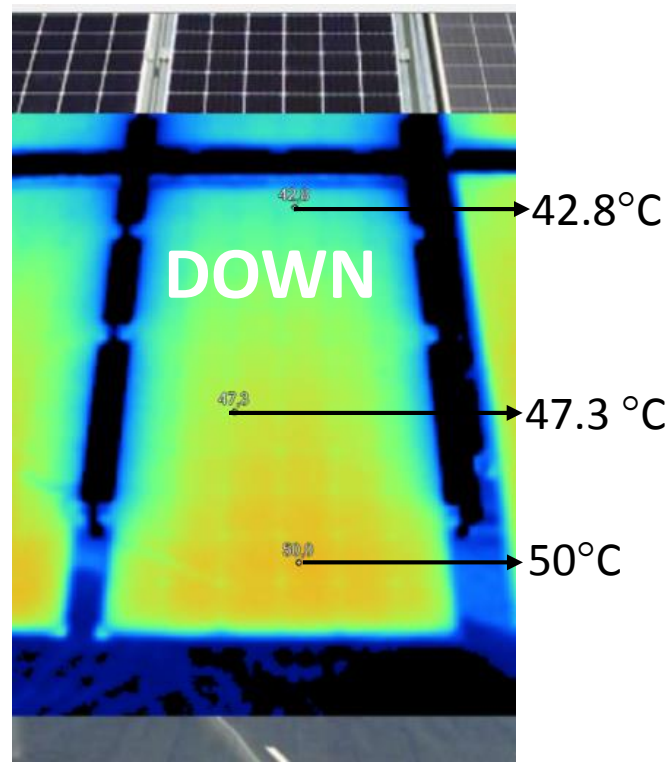
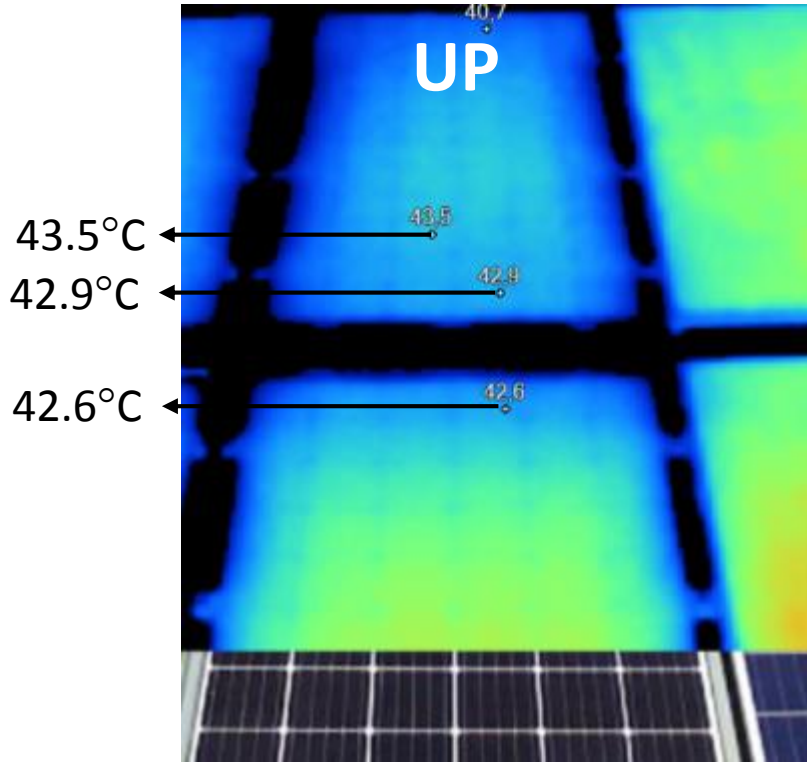


Soltec's DC Harness: <https://www.youtube.com/watch?v=MMxD0hLR5IM>

Module front side temperature: 2P Vs. 1P

2-in-Portrait module configuration

1-in-Portrait module configuration

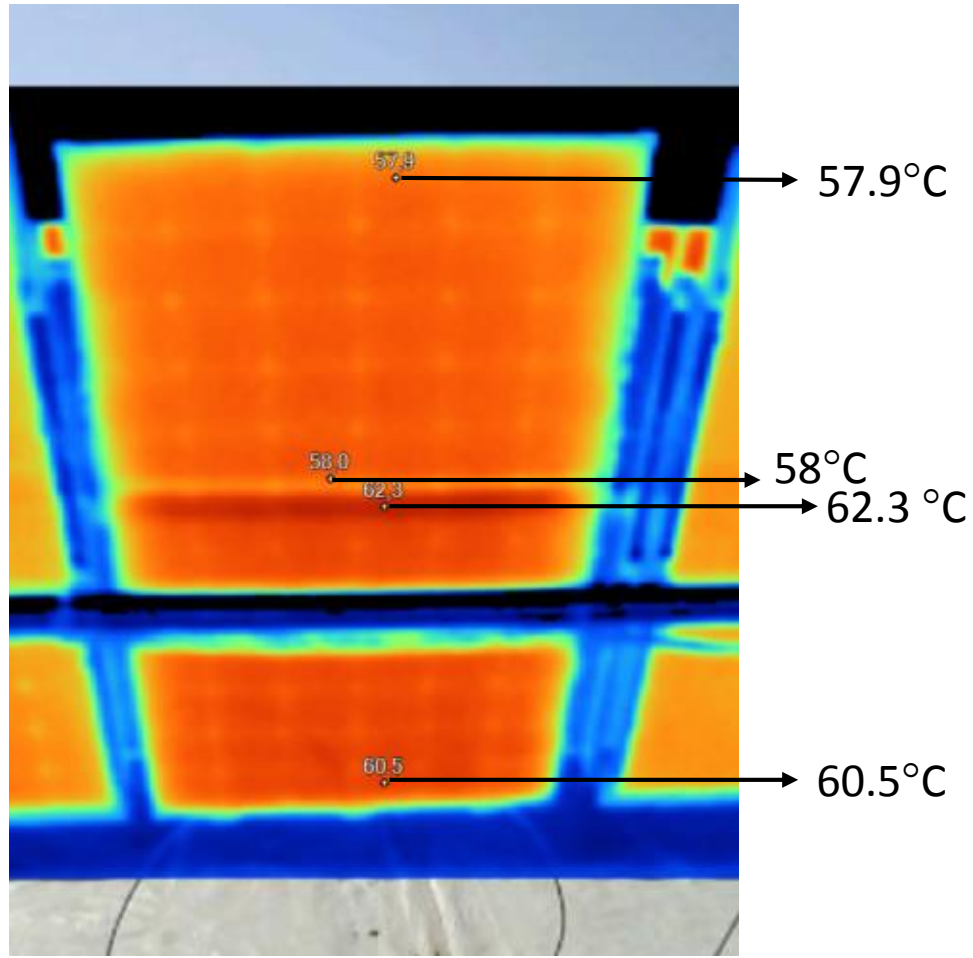
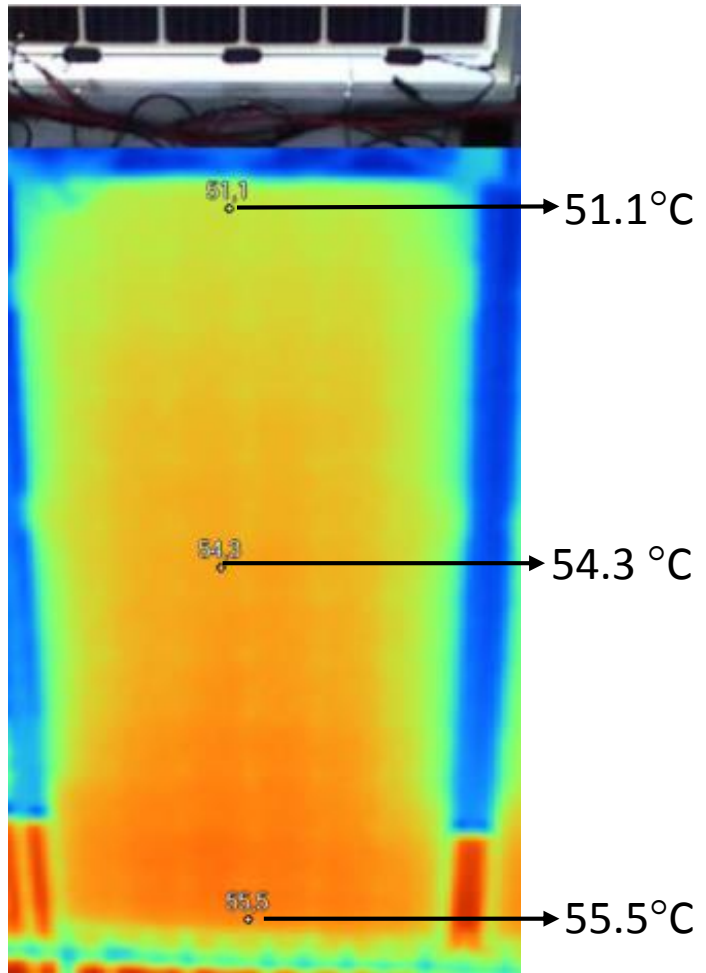
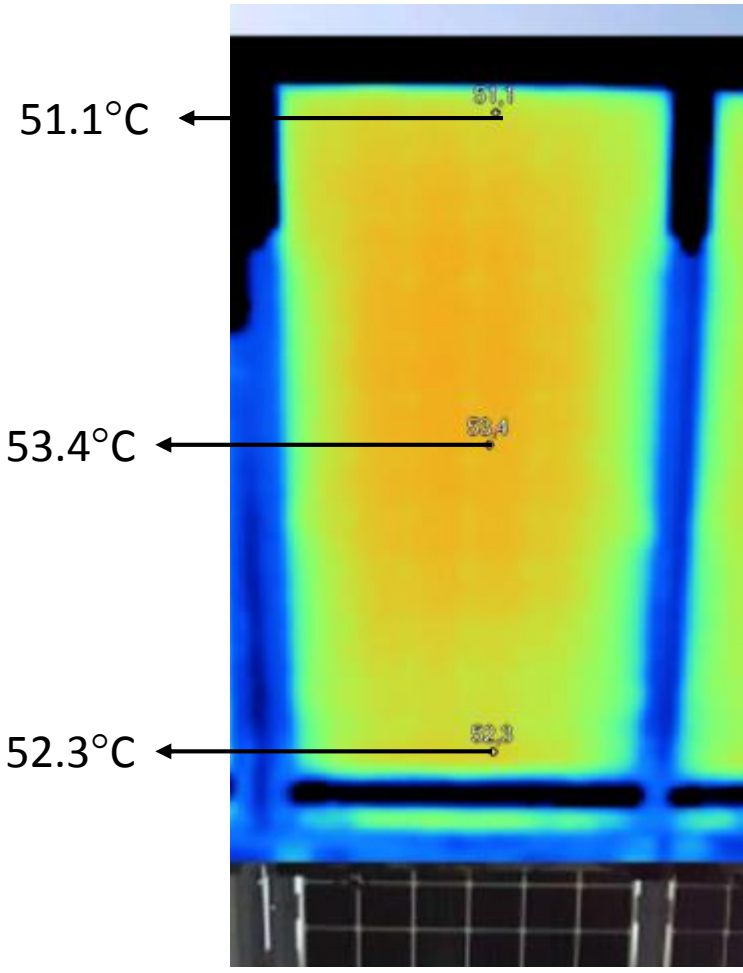


Module JW-D72N, 355 W | 43° | Albedo 63% | GCR: 0,4 | Ambient Temperature: 31°C / 87.8° F | Wind: 7mph

Module rear side temperature: 2P Vs. 1P

2-in-Portrait module configuration

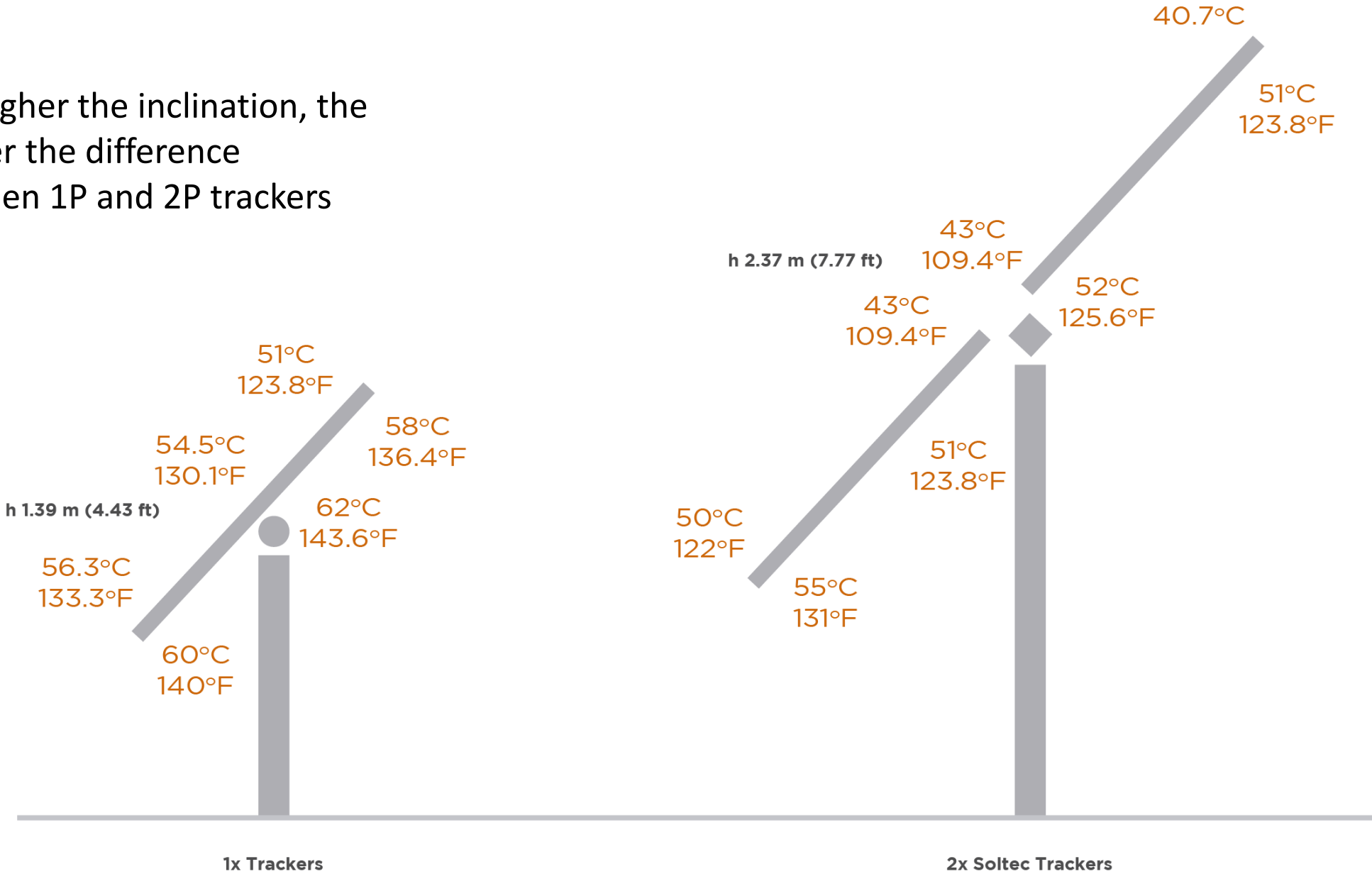
1-in-Portrait module configuration



Module JW-D72N, 355 W | 43° | Albedo 63% | GCR: 0,4 | Ambient Temperature: 31°C / 87.8° F | Wind: 7mph

Module front side temperature: 2P Vs. 1P

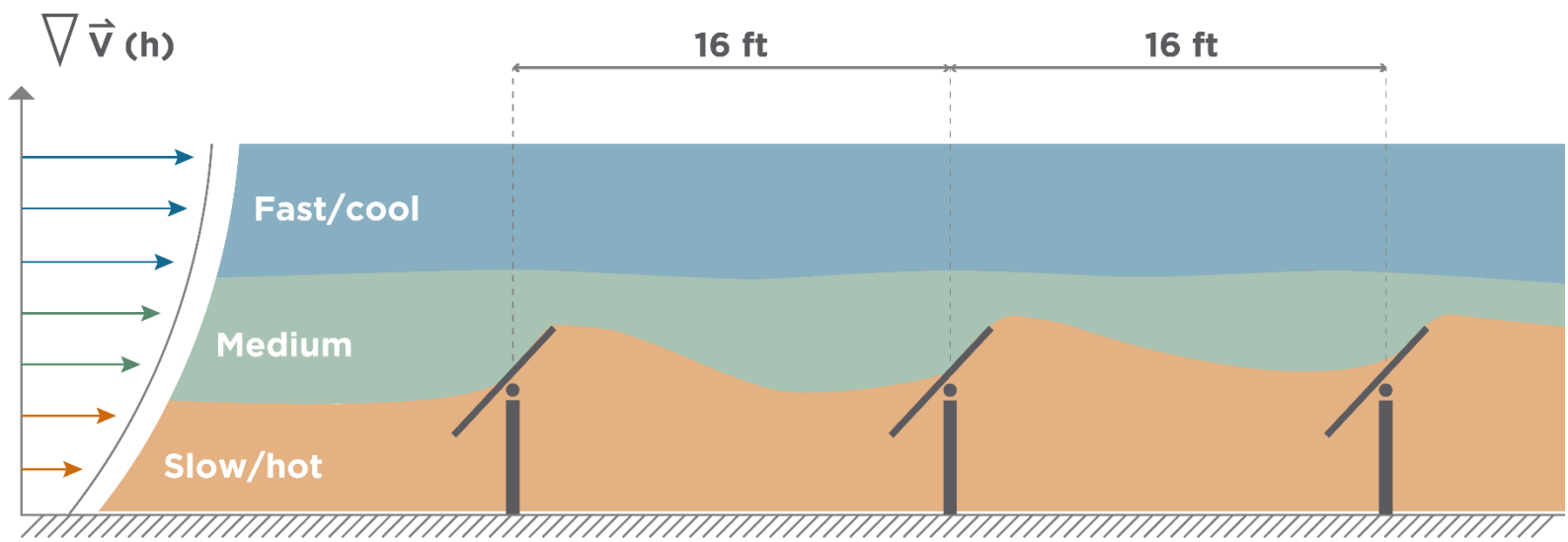
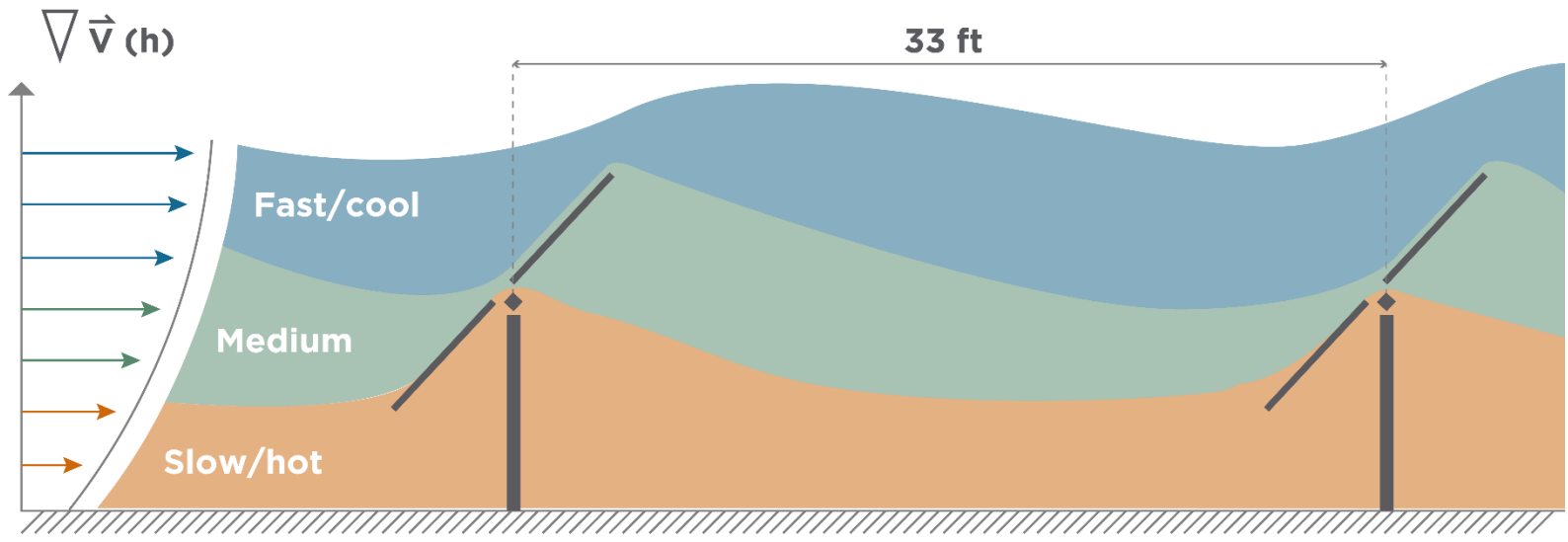
The higher the inclination, the greater the difference between 1P and 2P trackers



1x Trackers

2x Soltec Trackers

2P Vs 1P tracker refrigeration



Tracker refrigeration

- ✓ Higher pitch (2x) eases air flow
- ✓ Torque-tube gap improves the air flow
- ✓ The upper module is cooler

THANK YOU



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