

Webinar



Soltec



BLACK &
VEATCH

Trackers boosting economic viability: Assessing the bankability of a 1P vs 2P solar PV project



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Bankability of PV Trackers

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BUILDING A WORLD OF DIFFERENCE®
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BLACK & VEATCH

Black & Veatch Today



10,000+ Professionals

in 110+ offices.



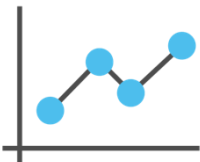
\$3.2 Billion

revenue in 2016.



**Consulting
Markets Served**

in the power, oil & gas
and water industries.



Safety Performance

0.58 Recordable Incident Rate.
0.05 Lost Time Incident Rate



7,000 Active Projects

worldwide on six
continents.



100+ Years

experience.
Founded in 1915.



A Bankability Study:



Is a component in a financial institution's risk assessment process.



Provides an honest evaluation and representation of the manufacturer and product to the outside world.

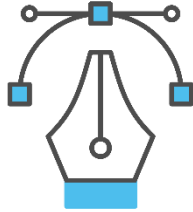


Helps stakeholders get comfortable with technology.

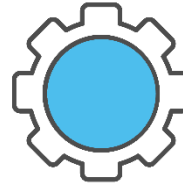


Can help to finance projects using new products/technologies.

How Do We Assess Tracker Risk?



Tracker Design



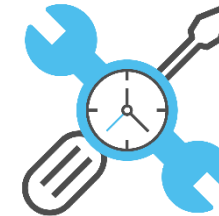
Manufacturing



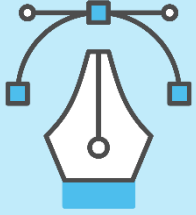
Company



**Performance and
Reliability**



**Installation, Operation
and Maintenance**



Tracker Design

Is the tracker design capable of meeting the technical specifications claimed by the manufacturer?

Design Specifications:

- Electrical
- Mechanical
- Performance
- Safety

E.g. Structural Analysis 1P vs. 2P tracker

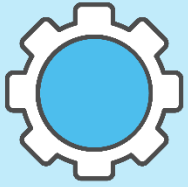
- Size and strength of critical components:
 - Posts
 - Torque Tubes
 - Purlins



Performance and Reliability

Does the tracker performance and reliability meet the technical specifications?

- Field Performance
- Benchmarks
- Qualification testing results
- Durability testing results



Manufacturing

Are the manufacturing operations capable of consistently delivering trackers that meet the technical specifications?

- Manufacturing Process
- Quality Assurance
- Documentation Control
- Human Resources
- Supply Chain



Installation, Operation and Maintenance

What does system ownership entail?

- Product Installation Process
- Regular Operational Procedures
- Ongoing Maintenance Activities
- Ownership costs





Company

How well is the company positioned to meet its objectives?

- Organization and management
- Financial position and trends
- Market and competition
- Warranty
- Manufacturing capacity
- Intellectual property

BUILDING A **WORLD** OF DIFFERENCE

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Soltec

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INTEGRATED PLAYER ALL-IN-ONE

About us

Soltec is a Vertically Integrated PV company specialized in the manufacture and supply of single-axis solar trackers with global operations and a workforce of over **1200** people, blending experience with innovation, with already **146** active patents.

16.7 GW

Projects
Worldwide

4 GW

Combined
Backlog

25.3 GW

Soltec
Pipeline

7.1 GW

Powertis
Pipeline

Soltec Industrial 16.7GW

PROJECTS

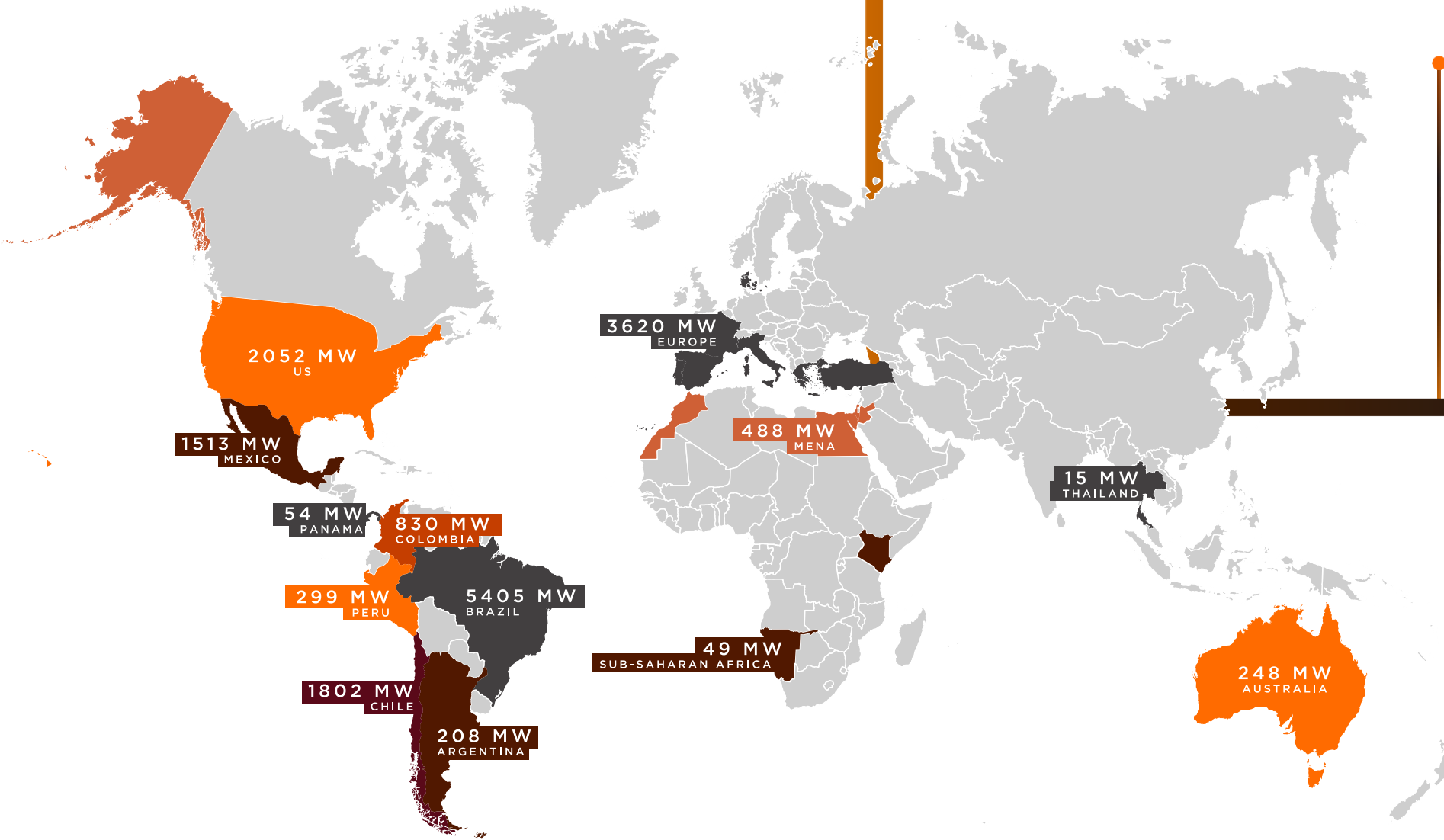
With contracted and ongoing projects

3.2GW

BACKLOG

25.3GW

PIPELINE

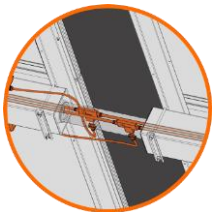


Innovation

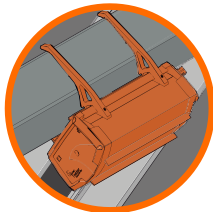
BEST IN CLASS PRODUCTS AND DIFFERENTIATED SOLUTIONS

Implementing all the products and processes to each project through its R&D team thought its dedicated Patent Box:

**Soltec Innovations, with
146 Active Patents**



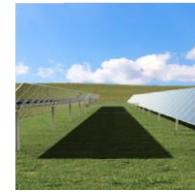
DC Harness



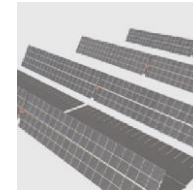
SPS 2.0
+ Full Wireless



Dy-WIND



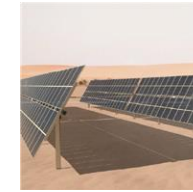
SF ONE
2021



Solarfighter
(Gen 2-DG)
2021



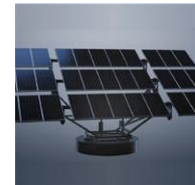
SF8
2020



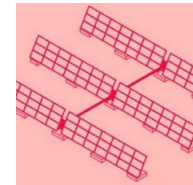
SF7 Tandem
2020



SF7 Bifacial
2018



10K5
2007



SA Series
2010



Solarfighter
(Gen 1)
2011



SF Utility
2013



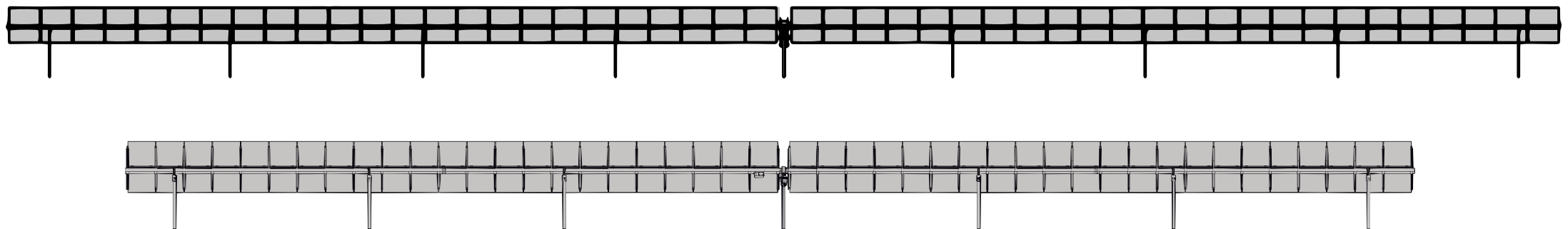
SF7
2017

Comparison between 1P & 2P trackers: modules

Ratio modules per pile in 2P: 12-13 modules
Ratio modules per pile in 1P: 6-7 modules



When the terrain is complicated due to rock, topography, etc., the 2P configuration has **61%** fewer piles than the 1P, what affects to risk and time of installation



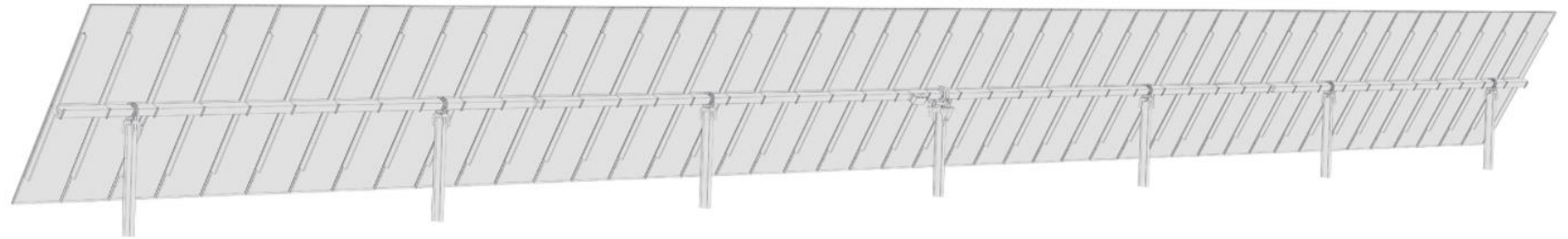
Comparison between 1P & 2P trackers: piles

Piles in 1P trackers are thinner profiles and often don't need to be driven as deep
Piles for 2P configuration are fewer in number but heavier. Sometimes this also means fewer refusals



Comparison between 1P & 2P trackers: wind

Both 1P and 2P trackers can be properly engineered to withstand high winds. 1P trackers can do so while using less steel and there are commercially-available dampers that help with this effort. Soltec has the developed Dy-WIND system for 2P trackers to deal with high winds without the need for dampers.



Comparison between 1P & 2P trackers: terrain

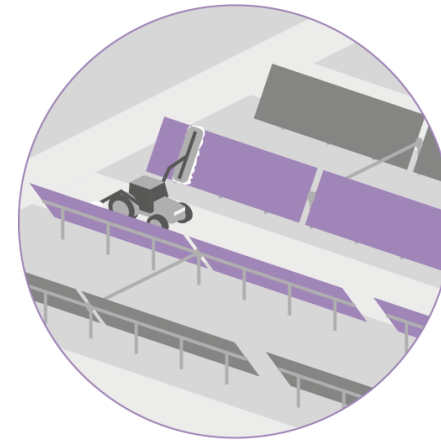
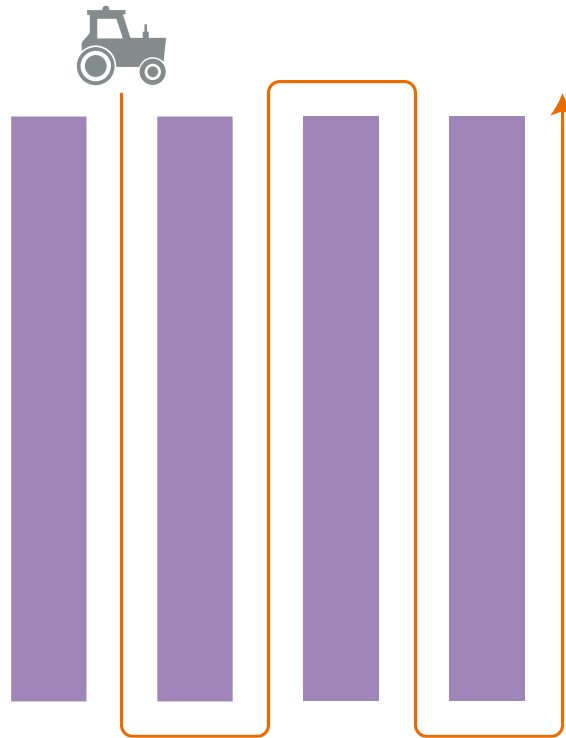
2P trackers more easily adapt to slopes and undulations in the terrain. Installation tolerances are more favorable.



Comparison between 1P & 2P trackers: maintenance

Clearing and cleaning is faster and less expensive in 2P plants, since there is better access with machinery to all aisles than in the case of the double-row 1P, so the Opex of the plant varies

Soltec **SF7 2P** tracker is easier to clean between aisles



FACE-2-FACE

Face-2-Face positioning helps washing vehicles cover twice the array-area per vehicle pass, thus proportionately reducing the hours-per-MW washing rate

Comparison between 1P & 2P trackers: bifaciality

BiTEC findings reveal that a bifacial module installed on a **SF7 Bifacial** 2P tracker has significant operational differences with the same module installed on a 1P tracker. Such differences would explain the 2.1% power generation increase measured on a SF7 bifacial tracker versus a standard 1P tracker. SF7 Bifacial is consistent in all seasons with an upward trend during periods of increased radiation-

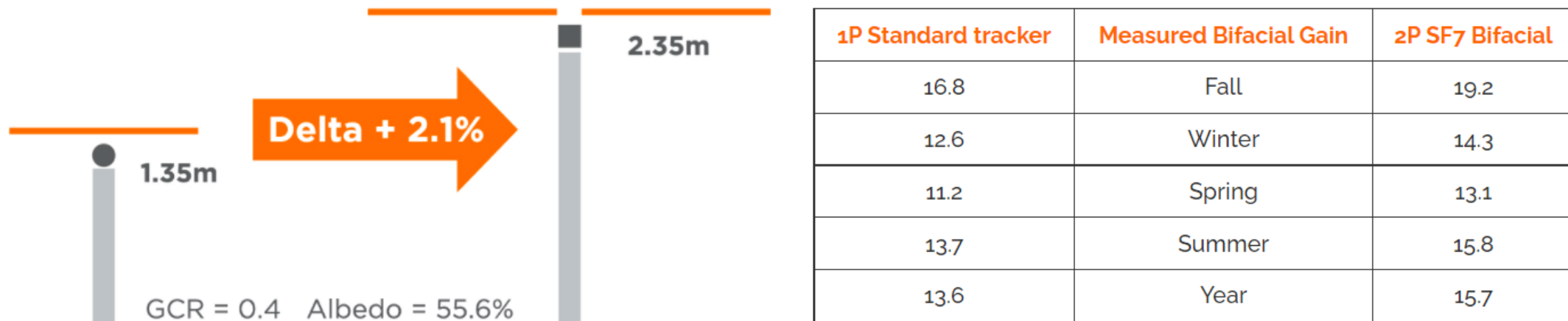


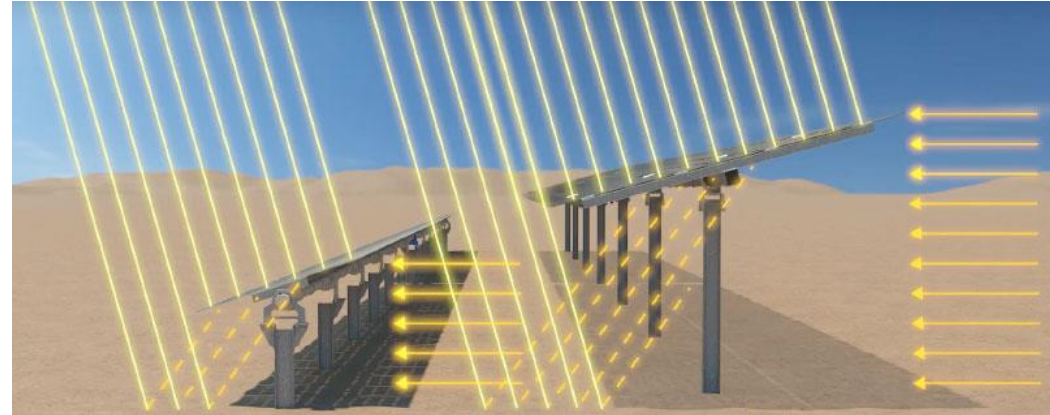
Figure 17. Bifacial Gain calculation for modules on trackers in 1P & 2P configurations for one year (September 2018-September 2019). Source: BiTEC

Comparison between 1P & 2P trackers: bifaciality

Height

The design of tracker sizing usually includes a gap between tracker and ground. That means normalized standard 2P tracker height tends to be lower, which in turn means that reflected radiation capture in lit areas is also lower.

Graphic representation of irradiation capture in a 1P and 2P tracker. Source: Soltec.



Reduced effective height of 1P trackers.
Source: RES



Comparison between 1P & 2P trackers: bifaciality

Influence of height: cooling

Temperature decreases as distance from the ground increases. This trend applies to both 1P and 2P tracker, meaning the average temperature of the lower module in a 2P tracker is similar to that of the 1P tracker module. As for the upper module, temperature values are lower. Measurements show that the average difference of 6 degrees Celsius translates into a power gain for the entire plant of about 1.2%.

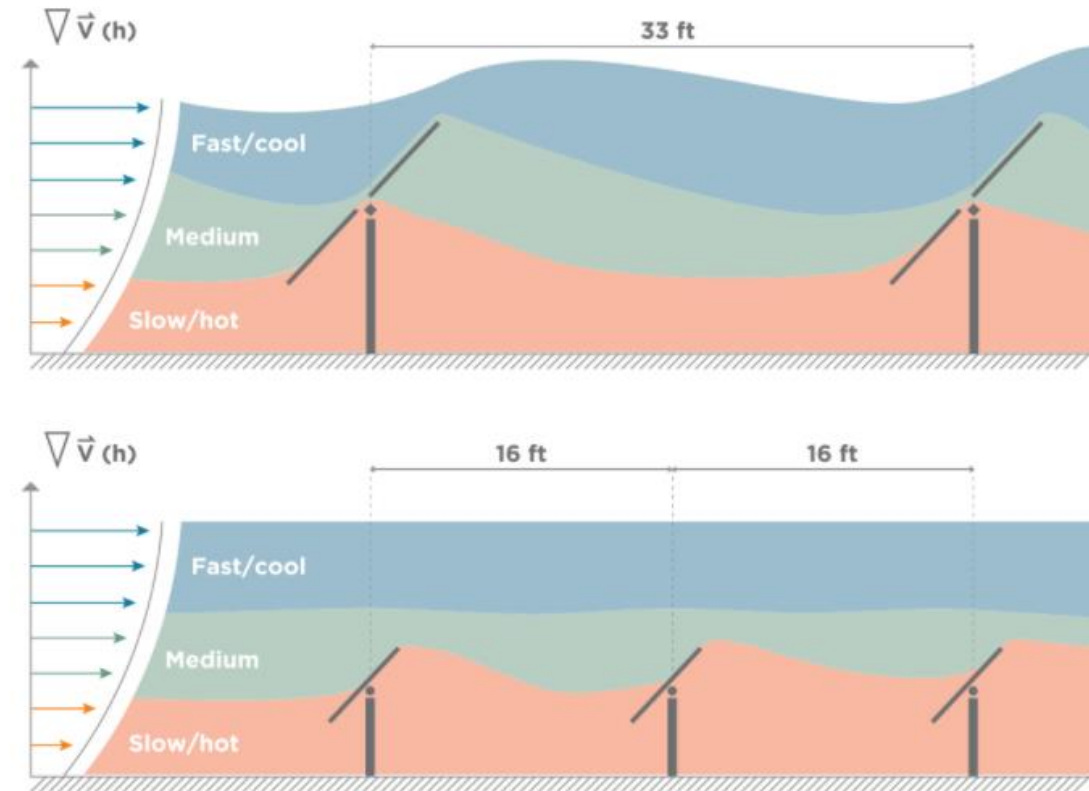
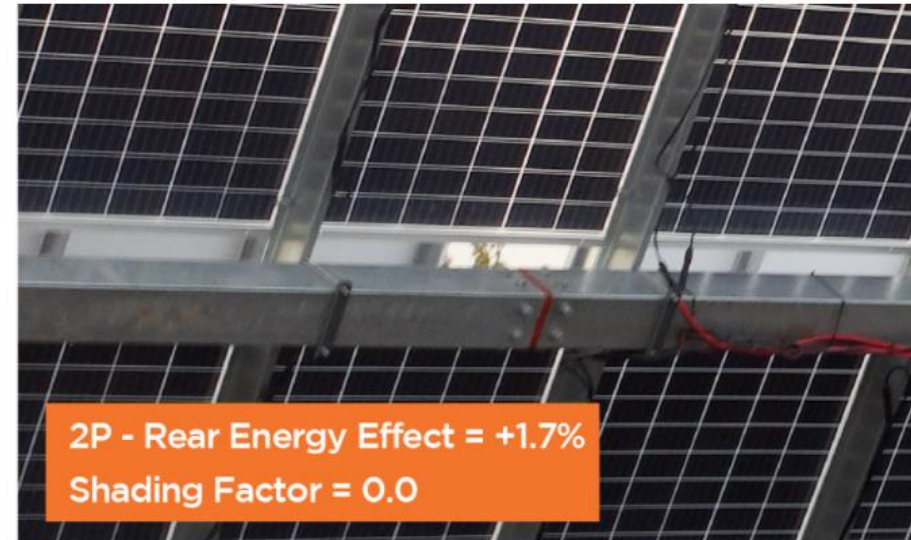
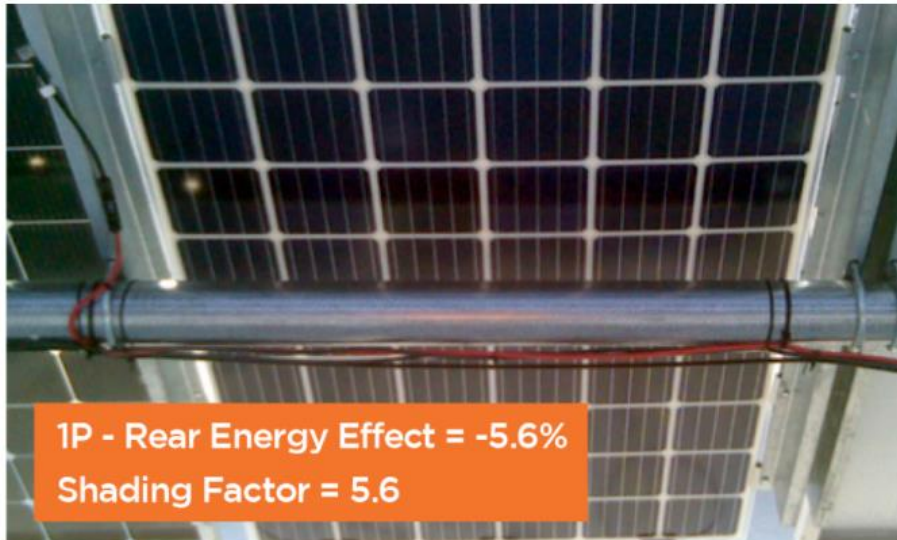


Figure 27. 2P SF7 Bifacial Vs. 1P standard tracker cooling. Source: Soltec

Comparison between 1P & 2P trackers: bifaciality

Rear Interferences Impact

In the case of standard 1P solar trackers, the torque tube is a significant module shading source. SF7 bifacial trackers are designed to prevent torque tube shading by having a gap between modules over the torque tube

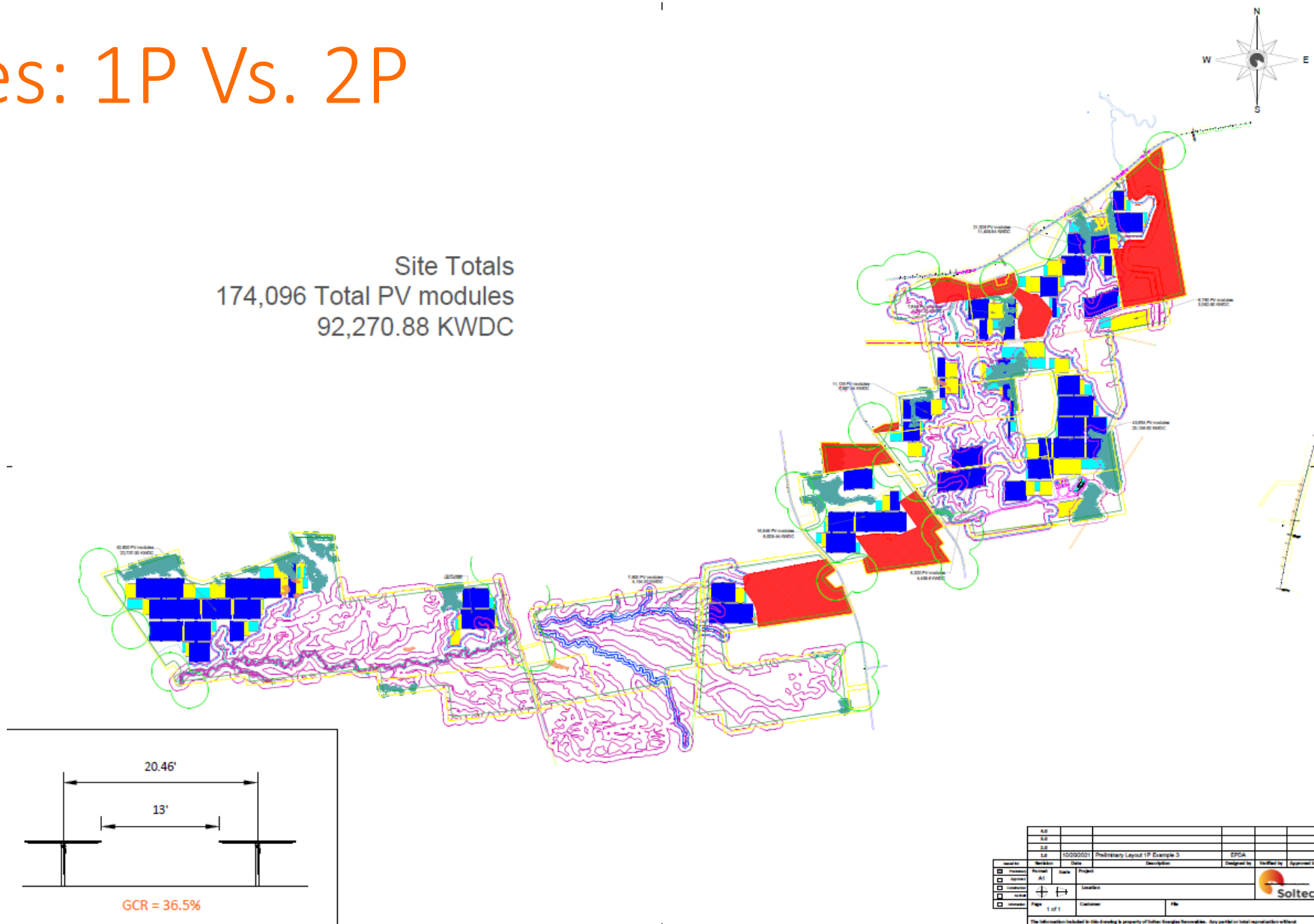


Shading factor estimation 1P and 2P. Assessment with Bifacial Radiance 0.30 during one year for Livermore (CA), GCR=0,4 Albedo 38%. Source: Soltec/NREL.

Examples: 1P Vs. 2P

1P Layout

Site Totals
174,096 Total PV modules
92,270.88 KWDC

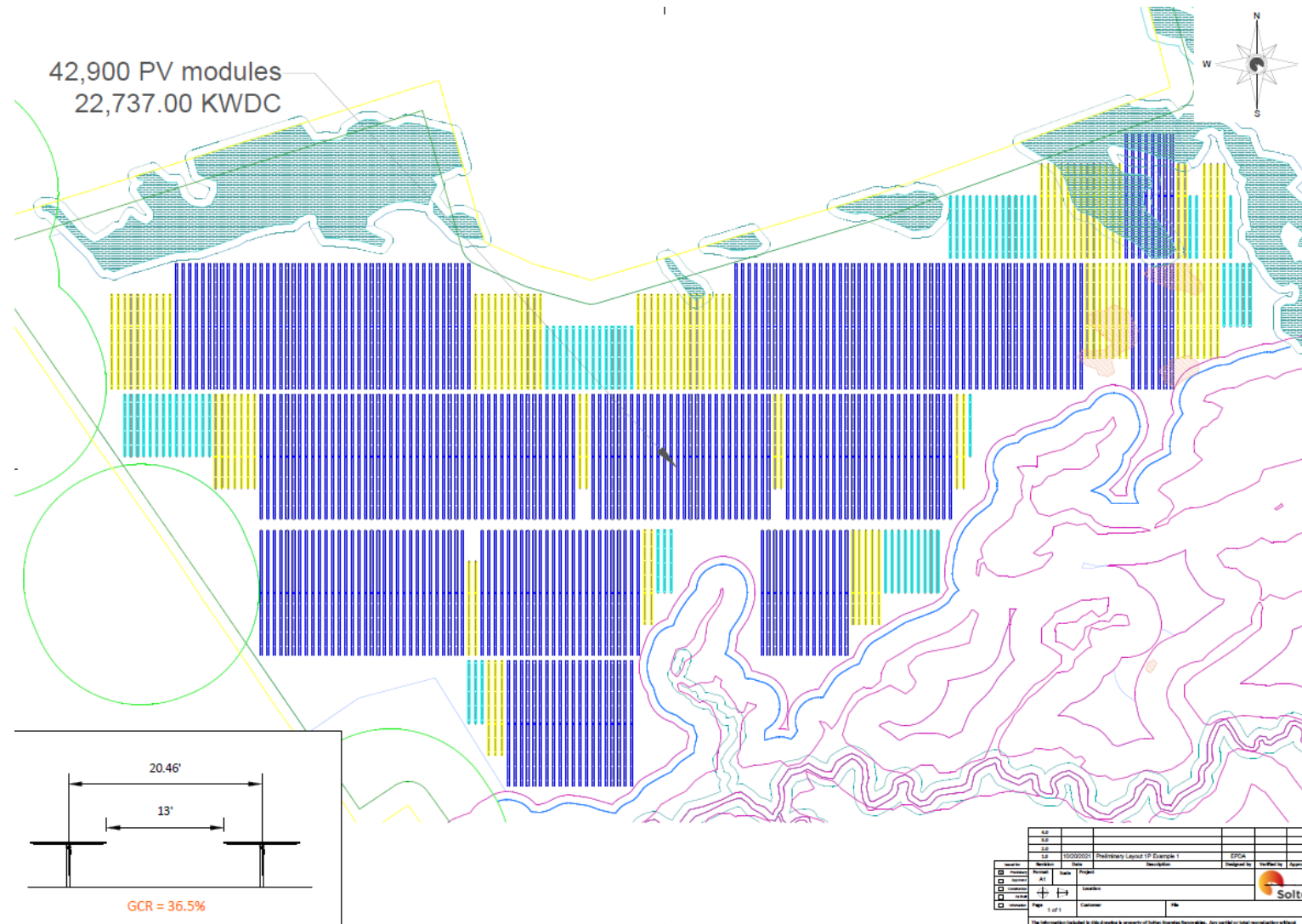


2P Layout



Examples: 1P Vs. 2P

1P Layout





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