Large single-axis trackers for bifacial systems
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.
Large single-axis trackers for bifacial systems | NREL Bifacial PV Workshop

Study Case: La Silla (Chile, 2015)

Bifacial Gain

Energy Gain=13%

Gain=12%  Gain=15%

ΔLCOE  -5.3%  -7.2%

ΔIRR  5.7%  9.1%

# Bifacial: New vision for a PV plant design

**Monofacial tracking PV plant vs. Bifacial tracking PV plan**

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

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

**Case:** Albedo: 40%, GCR: 0.33 → Bifacial Gain: 14%
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
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**Albedo: Soil surface (Bifacial Ratio)**

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

Energy gain: maximize it

It can vary with seasons:

- **Fall**: Humid soil (15%)
- **Winter**: Snow (90%)
- **Summer**: Dry grass (33%)
- **Spring**: Green grass (25%)

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

GCR 0.4

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

Comparison 2P Albedo JW-DT-355

Albedo 66% vs 23%

Up to 10%
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↑ Pitch => ↑ Reflected Area
↓ GCR => ↑ Bifacial Energy

Pitch is relevant: ↑ surface = ↑ energy gain

Energy gain: maximize it

Comparison 2P GCR JW-DT-355

GCR 0.33 vs 0.40

Up to 4%

GCR: Ground Coverage Ratio (tracker width/pitch)

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

- Height 2.35 m | 7.7 ft
- Pitch: 40 ft | 12 m
Energy gain: compare it 1P Vs. 2P

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

Height of the tracker: View factor

Albedo 63% | GCR: 0.4

Source: BiTEC, August 2018.
Bifacial: higher current

\[ I_{\text{Front}} + I_{\text{Rear}} > I_{\text{Mono facial}} \]

¿T Bifacial > T Monofacial?

Torque-tube shading interference

Localized temperature Non-Uniformity under current application

RACKING SHADES INTERFERENCE

Module on short circuit
Albedo 63%

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

- UP: 43.5°C, 42.9°C, 42.6°C
- DOWN: 42.8°C

1-in-Portrait module configuration

- UP: 51.4°C
- DOWN: 54.5°C, 56.3°C

Module JW-D72N, 355 W | 43º | 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
The higher the inclination, the greater the difference between 1P and 2P trackers.
Tracker refrigeration

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