WEBINAR
NEW PRODUCT AGILE 1P
GLOBAL LAUNCH

Date: April 15th 2021   Time: 4-5pm CET
CONTENTS

- TRINATRACKER OVERVIEW
- AGILE INTRODUCTION
- AGILE SYSTEM FEATURES
- OUTLOOK
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COMPANY DEVELOPMENT

Trina Solar acquired 51% of the company Nclave in May; TrinaPro was launched.

The brand name was renewed and renamed as "TrinaTracker";

Clavijo acquired MFV solar:
Established Nclave, ranking among the Top 10 in global shipments.

Trina Solar 100% acquired Nclave;
ACHIEVEMENTS

Over 12 Years Experience

40 COUNTRIES Across 5 continents

5GW+

GLOBAL INSTALLATIONS

- Offices & Branches
  - Spain / France / United States / Mexico / Brazil / Chile / Argentina / Japan / Australia / China

- Production center
  - Spain / Brazil / Argentina / China
TRINATRACKER PORTFOLIO

Vanguard™
Independent row 2P configuration

Agile™
Dual row 1P configuration
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Agile™

- Dual-Row Single-Axis
- 1P configuration
- UP TO 120 modules per tracker
- New Drive system – Dual Slewing drive
KEY MECHANICAL COMPONENTS

- **Drive System**
  - Slewing drive & cardan design
  - Simple assembly process

- **Trina Clamp**
  - Robust and easy to assemble

- **Torque Tube**
  - Standard shape for supply chain efficiency

- **Spherical Bearing**
  - Self-alignment, easy to assemble

- **Piles**
  - W/H pile option for difficult ground conditions
PATENTED
SPHERICAL BEARING AND TRINA-CLAMP

Spherical Bearing
- Self-lubricating plastic
- Resistance to solar degradation (accelerated life cycle tested)
- 12 years proven in harsh environments
- Avoids the need for calibration during the installation process
- Minimizes structure stress and deformation
- Enables increase of ramming tolerances

Trina-Clamp
- Innovative Trina Clamp installation
- Save 50% installation time
- Updated design for large modules
CONTENTS

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**AGILE SYSTEM FEATURES**

**DESIGN**
- Module & Tracker Compatibility
- Advanced Wind design
- Integrated Alarm Strategy

**HARDWARE**
- Multi-drive system
- Length of the tracker

**SOFTWARE**
- SuperTrack
- SCADA System
## DESIGN: TRACKER & MODULE COMPATIBILITY

### Agile™

<table>
<thead>
<tr>
<th>MODULE TYPE</th>
<th>POWER</th>
<th>MODULE WIDTH</th>
<th>MODULE LENGTH</th>
<th>MODULE PER STRING (20°C)</th>
<th>No. MODULE</th>
<th>MAX STRING PER ROW</th>
<th>TRACKER LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE17 DEG17C.20</td>
<td>450 W</td>
<td>1046mm</td>
<td>2111mm</td>
<td>30</td>
<td>120</td>
<td>2</td>
<td>62.76 m</td>
</tr>
<tr>
<td>DE19 DEG19C.20</td>
<td>550W</td>
<td>1096 mm</td>
<td>2384mm</td>
<td>38</td>
<td>114</td>
<td>1.5</td>
<td>63.81 m</td>
</tr>
<tr>
<td>DE20 DEG20C.20</td>
<td>600W</td>
<td>1303 mm</td>
<td>2172mm</td>
<td>33</td>
<td>99</td>
<td>1.5</td>
<td>65.70 m</td>
</tr>
<tr>
<td>DE21 DEG21C.20</td>
<td>670W</td>
<td>1303 mm</td>
<td>2384mm</td>
<td>32</td>
<td>96</td>
<td>1.5</td>
<td>63.75 m</td>
</tr>
</tbody>
</table>
Trackers are flexible structures even with frequencies higher than 1 Hz

Wind tunnel pressure model test
- Pressure coefficient definition. Rigid structure

3D Full aeroelastic test
- Critical wind speed definition. Flexible structure

On-site Pluck Test
- Dynamic parameter measurement: Frequency and Damping
ADVANCED WIND DESIGN

WIND MITIGATION STRATEGY

Wind stow strategy
High tilt angles

Considers critical, maximum structural and design wind speed limits
Configure per tracker and project
No risk for each location and weather conditions

Different types of tracker depending on the location on the plant to enhance efficiency.
### Design: Integrated Alarm Strategy

<table>
<thead>
<tr>
<th></th>
<th>Low Battery</th>
<th>Comm Alarm</th>
<th>Manual Stow Alarm</th>
<th>Hail Stow</th>
<th>Wind Alarm</th>
<th>Snow Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Stow position is command if the battery energy is not enough to stay tracking</td>
<td>Stow position is command if no communications with NCU are available</td>
<td>Stow position is command by the plant operator in case of any extreme risk</td>
<td>Hail Stow position is command in case of hails storms</td>
<td>Wind Stow position is command in case of wind alarms</td>
<td>Snow Stow position is command in case of wind alarms</td>
</tr>
<tr>
<td><strong>Activation / Deactivation</strong></td>
<td>Automatically by the TCU SOC estimation</td>
<td>Automatically by the TCU</td>
<td>Manually by the operator</td>
<td>Manually by the operator</td>
<td>Automatically by the weather station</td>
<td>Automatically by the weather station</td>
</tr>
<tr>
<td><strong>Priority</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
HARDWARE: MULTIDRIVE SYSTEM

ONE LINEAR ACTUATOR

TWO SLEWING DRIVES

±60° Tracking range
10% E-W
20% N-S
12° Adaptability
HARDWARE: TRACKER LENGTH

Shorter - Agile dual row 1P

- Up to 72m
- Per MW: 12.6 trackers
- -33% Trackers per MW
- -45% Shorter. Less grading
- -9% DC cable

Longer - Single row 1P

- 110m
- 46 trackers
  - 3036kW
  - (46*60*2*550W)
- 53 trackers
  - 2625.5kW
  - (53*90*550W)

Optimized BOS
**SOFTWARE: SUPERTRACK ALGORITHM**

**STA**

Smart Tracking Algorithm
- Designed for bifacial modules
- Accounting for diffuse and reflected irradiance
- Ensure optimized tracker position for max yield gain at all times
- More effective under cloudy and overcast weather

STA can boost the energy gain by up to 5% on cloudy and overcast days

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**SBA**

Smart Backtracking Algorithm
- Accounting for complicated terrain variations
- Ensure module shading avoidance at all times
- Most effective during dawn and evening periods

SBA can boost the energy gain by up to 3% during early morning and late afternoon

*the above diagram illustrates the application of bifacial modules*
SOFTWARE: SCADA SYSTEM

TrinaSCADA = Tracker Monitoring & Alarm + **System Diagnosis** + **Intelligent Control** = Easier O&M

Upgrade to SCADA system based on current TrinaTracker Cloud
TECHNICAL ADVANTAGES
SUMMARY OF AGILE 1P

- Multidrive system (bi-slewing drive)
- Shorter Tracker Design
- Advanced wind design: CCP Wind tunnel test

**HIGH RELIABILITY**

**OPTIMIZED BOS**

- Fewer Trackers Needed
- Spherical bearing
- TrinaClamp

- Advanced Supertrack Algorithm

**GREATER POWER GENERATION**

**ENHANCED ADAPTABILITY**

- Multidrive system (bi-slewing drive)
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Currently no unified mature standards in the tracker industry which leads to transaction costs increase. Standards needs to be established for the long-run.

With the technology development, well-established standards and integration of the whole industry chain, the value of trackers will be greatly improved, which will further increase the global market share of trackers.
DNV has continually provided valuable validation to TrinaTracker
THANK YOU!

For more information, contact us at:
info.trinatracker@trinasolar.com
Tracker bankability review

How to mitigate investment risk in tracker technology

César Hidalgo, DNV, Barcelona, Spain

15 April 2021
Bankability of PV trackers

- DNV
- What is bankability?
- What are the aspects to review?
- Are existing building codes enough for structural calculation of trackers?
- Is necessary to undertake dynamic analysis for trackers?
- Do new backtracking algorithms allow any energy yield increase?
- CONCLUSIONS
Broad and deep expertise in solar projects
DNV Solar: a few figures in Iberia and Latin America

2,5GW+ Financing under development
1,5GW+ in Iberia
1,0GW+ in LATAM
in the last four years.

160+ Financing under development
120+ projects in Iberia
40+ projects in LATAM

0,6GW+ Re-Financing under operation
0,4GW+ in Iberia
0,2GW+ in LATAM
in the last four years.

70+ Re-Financing operational assets
60+ projects in Iberia
10+ projects in LATAM
Bankability

Bankable = stable and secured Cash Flow

“Bankability means that the bank is convinced to the greatest possible extent that the cash flows are stable and the loan will be repaid.”

Credit Risk Manager, Structured Finance, Energy, Major bank
Aspects to review in a PV tracker bankability process

A bankable tracker is a good quality tracker

Aspects to consider in the evaluation

| Certification | Raw materials | Adequate design for the site conditions | Easy operation and maintenance | Lifetime expectation |

Manufacturing quality control: Quality instructions, traceability, Health and Safety, Bill of Materials, logistics, after sales department

Warranty terms: standard terms, exclusions

Track record and operating history of product/company
Existing building codes used for PV trackers

1) Existing building codes like the Eurocode in Europe or ASCE in USA were never intended for solar. Therefore, compliance with those codes is not a total guarantee of lifetime. Natural frequency: buildings at 1 Hz, PV trackers between 1.5 Hz and 3 Hz in most of cases. Finite Elements (FE)

2) Wind tunnels are required for an accurate structural assessment (static and dynamic wind tunnels)
Aeroelastic instability in PV trackers

Buffeting, vortex-induced vibrations, aeroelastic deflection, torsional fluttering/galloping, torsional divergence

Catastrophic failures occurred in Spain due to winter storms in 2020 and 2021: many PV plants involved, and several manufacturers affected. Damages have occurred at much lower wind speeds than maximum design wind speeds, so it does demonstrate that the amplification function of these instabilities

Vortex shedding around a cylinder (courtesy Cesareo de La Rosa Siqueira).
New 3D Backtracking algorithms

DNV has used SolarFarmer with 5 min data to simulate the shadings of conventional backtracking algorithm compared to new 3D backtracking algorithms.

DNV has found net energy gains of 0.4% in relatively benign sites and 1% in site with medium topography complexity (slopes up to 4%-6%).
Conclusions

• PV tracker industry is lacking of standardization
• Bankable trackers are good quality trackers but this concept involves many parameters
• Hot topics in the today industry of trackers: optimum design for aeroelastic instabilities and the new backtracking algorithms
• DNV has been undertaking PV tracker bankability reports for the last years with a guideline published in 2018
• DNV has technically reviewed Agile and Vanguard trackers from TrinaTracker