



PV TRACKERS FOR ULTRA HIGH POWER MODULES GENERATION

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1 Company Introduction

Nclave was born as the merger of two companies with extensive track record in the solar PV market and currently it is 100% owned by **Trina Solar**.

Nclave has been supplying and manufacturing trackers and fix structure since 2005

Core Strengths:

- High Qualified Team
- Entire Tracker Value Chain (from R&D to Maintenance)
- Customized and flexible solutions
- Widest portfolio
- Cutting Edge R+D+i
- In-house production and a worldwide supply chain network



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Company Introduction

More than 5.4 GW deployed worldwide

MW deployed

North America: 190 MW

LATAM: 1930 MW

Europe: 2160 MW

MEA: 400 MW

Asia-Pacific: 755 MW

TOTAL 5.435 MW

Offices & Branches:

Spain
France
USA
Mexico
Brazil
Chile
Argentina
Japan
Australia
China
United Arab Emirates.

Production Centers:

Spain
Brazil
Argentina
China
Saudi Arabia*
South Africa*





2 Products - SP160 Liza



- **Upgraded multi-point driver**

Stronger wind resistance, suitable for large-size module.
Greatly improve the stability of the system.

- **Higher N° of modules per tracker:**

Designed with two-in-portrait configuration(2P), 3 or 4 strings of 1500V per row

- **Supports larger modules:**

SP160 Liza is designed to support larger modules improving the LCOE without compromising aeroelastic stability.

- **Lower N° of piles & weight per MW:**

Number of piles and the total weight per MW has been optimized resulting in 2% less weight in materials and 47% fewer piles. (around 100 piles/MW with 600wp modules)



2 Products - SP240 Sunna

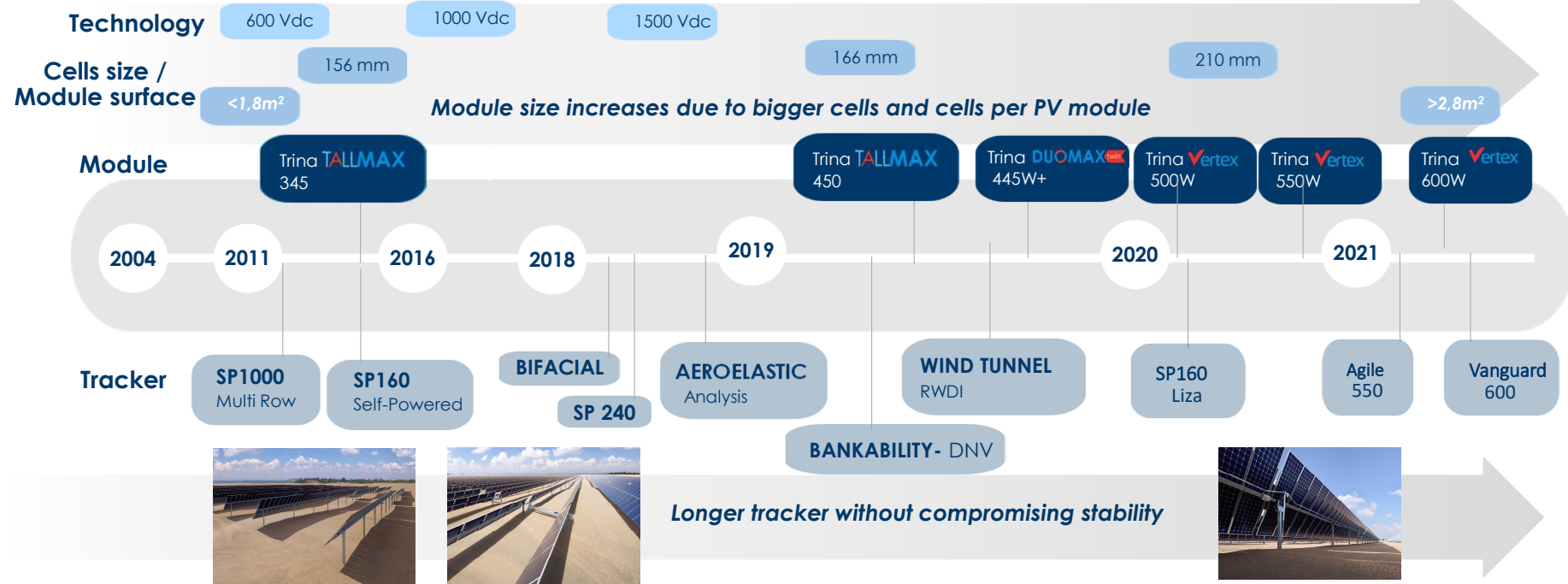
- **Multirow Evolution:**
SP240 is an evolution of the SP1000 tracker combining robust design with improved terrain adaptability.
- **Minimum O&M costs:**
SP240 has one drive system for every two rows, reducing the number of key components that need maintenance for example: motors, drive Units and TCUs.
- **Designed for challenging conditions:**
The SP240 has been designed for sites that have both challenging terrain and high wind conditions.
- **Nclave clamp:**
Nclave clamp is a proprietary product that is quick and easy to use with the 1P configuration, reducing the assembly time and cost.





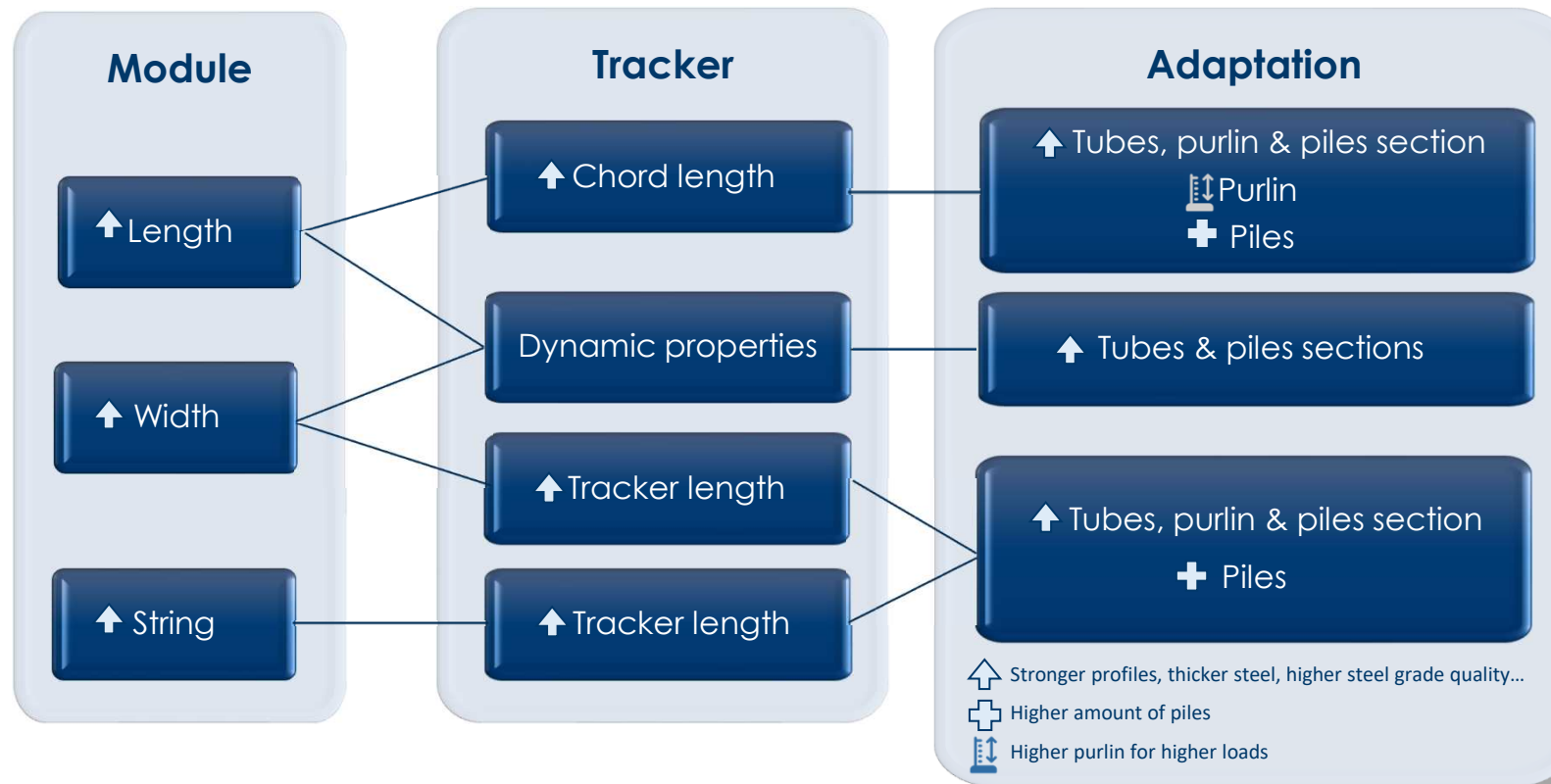
3 Larger modules integration

Road Map



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High wind & larger modules



3 High wind & larger modules

SP160 Liza

SP240 Sunna

The tracker has been redesigned to support **larger modules** the main changes are:

1. Improved **drive system**: Multi-point drive system

Increase natural **frequency**

High **accuracy**

High **stability**



Actuator 2
(Type: secondary)



Actuator 1
(Type: primary)



Actuator 3
(Type: secondary)

2. Improved **bearings**:

Heavier **loads**

Steeper **slopes**

3. Increased **torque tube** dimensions.

12% more resistant

4. Increased **motor power** by **33%**

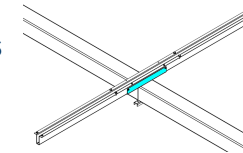
5. Standard **pile types** (IPE, W): easier pile driving works avoiding:

Pile head damage

Pile twisting



6. Reinforced **purlins**



7. New **Wind tunnel test** and engineering consulting specifically designed for bigger modules.

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3 High wind & larger modules

State-of-the-art wind tunnel analysis

- **Pressure model wind tunnel research** to determine the static and dynamic wind loading.
- **2D Sectional Model Tests** to extract the self-excited forces of the tracker by measuring the aerodynamic derivatives and the static aerodynamic force and moment coefficients, which were used as input for the 3D Flutter Analysis and 3D Buffeting Response Analysis to derive design wind loads.
- **3D Flutter Stability Analysis** to assess the sensitivity of the tracker to the dynamic actions of the wind caused by aerodynamic instability phenomena such as flutter.
- **3D Buffeting Response Analysis** to obtain full-scale peak responses by combining the effects of mean wind loads, gust wind loads, and the inertial wind loads to determine equivalent static design wind loads.



*Ongoing for 1P configuration
Expected December 2020



3D Rendering of RWTH A24/8 Wind Tunnel

4 Conclusions

SP160 Liza and SP240 Sunna are ready...

	SP160 Liza 550Wp	SP240 Sunna 500Wp	SP160 Liza 600Wp	SP240 Sunna 600Wp
Solar tracker type	One row	Two rows	One row	Two rows
Standard configuration	Two modules in portrait (2P) 3 strings per row (1500 V string)	One module in portrait (1P) 2 strings per row (1500 V string)	Two modules in portrait (2P) 4 strings per row (1500 V string)	One module in portrait (1P) 1.5 strings per row (1500 V string)
Drive unit	Multidrive system	Linear actuator	Multidrive system	Linear actuator
Piles per MW	~106 piles/MW	~333 piers/MW	~97 piles/MW	~303 piers/MW
Terrain adaptability	15% N-S 10% E-W	15% N-S 8% E-W	15% N-S 10% E-W	15% N-S 8% E-W
Communication with the tracker	Wired option: RS485 Wireless option: Zigbee	Wired option: RS485 Wireless option: Zigbee	Wired option: RS485 Wireless option: Zigbee	Wired option: RS485 Wireless option: Zigbee
Power supply	Grid connection, string powered or self-powered	Grid connection, string powered or self-powered	Grid connection, string powered or self-powered	Grid connection, string powered or self-powered
No. Tracker per MW	16	17	14	15
Approx. Tracker length (m)	70	70	70	70
Module per string	Up to 36	Up to 36	Up to 36	Up to 36

