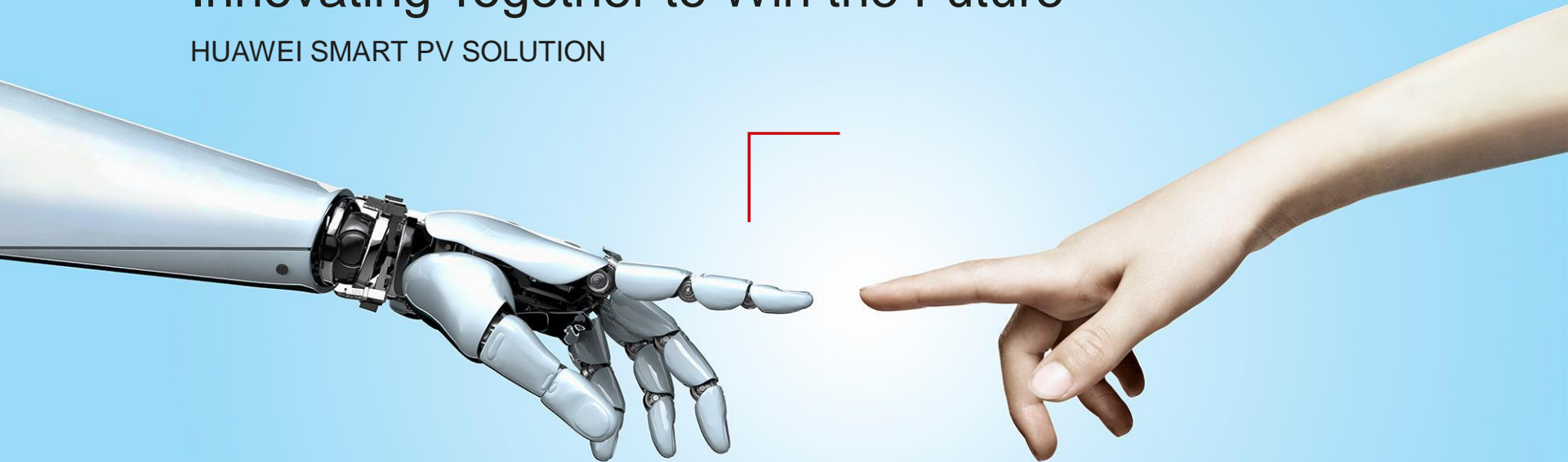


Innovating Together to Win the Future

HUAWEI SMART PV SOLUTION



Contents

- Huawei and Smart PV Solution
- How to get the best LCOE

• Huawei as a Sustainable Company

Continuously Creating Values for Customers Achieving Sustainable Business Growth



Sustainable business growth with large operation
scale & diversified business groups



170+

Countries and regions



61 in

Fortune Global 500



194,000

Employees



96,000+

R&D employees



14

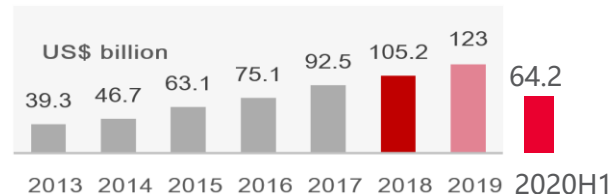
Research institutes/
labs/centers



74 in

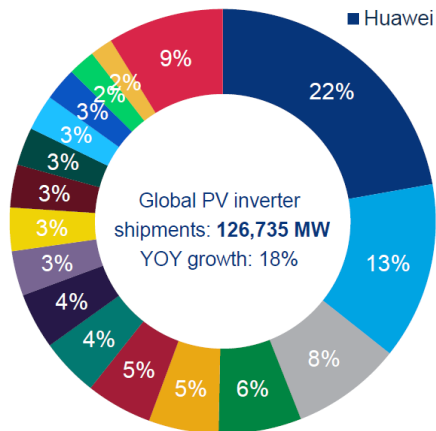
Interbrand's Top 100
Best Global Brands

2020 H1 Sales Revenue **US\$64.2 Billion**
YoY increased by **13.1%**

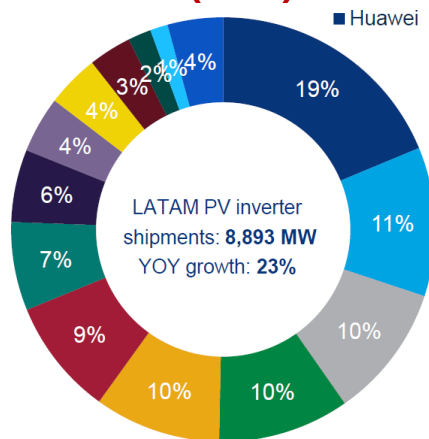


Continuous Innovation, Leading Solar Industry Development

**Global
PV inverter shipments, 2019
(MW)**



**Latin America
PV inverter shipments, 2019
(MW)**



Over 4.6 GW Smart PV in LATAM



Mexico, > 1380 MW

| | |
|---------------|--------|
| Potrero | 270 MW |
| Magdalena II | 220 MW |
| Ciudad Juarez | 220 MW |
| Viborillas | 100 MW |
| Ahumadas | 120 MW |
| Border | 150 MW |

| | |
|--------------|--------|
| Canatlan | 114 MW |
| Calera solar | 104 MW |
| Prana Power | 30 MW |
| Aura III | 25 MW |
| Mi Ranchito | 25 MW |



Chile, > 850 MW

| | |
|-------------------|--------|
| Quilapilun | 6.6MW |
| PMGD | 200 MW |
| Sol de Lila | 160 MW |
| Campos del Sol II | 455 MW |



CA, Colombia > 220MW

Dominica, Honduras, El Salvador, Guatemala, ...



Brazil, > 1500 MW

| | |
|-----------------|---------|
| Boa Hora | 75 MW |
| SGL II | 141 MW |
| Pereira Barreto | 203 MW |
| DG | 1100 MW |



Argentina, > 700 MW

| | |
|--------------|--------|
| Cauchari | 315 MW |
| Altiplano | 100 MW |
| La Puna | 104 MW |
| Guañizuil II | 100 MW |
| Cordillera | 80MW |

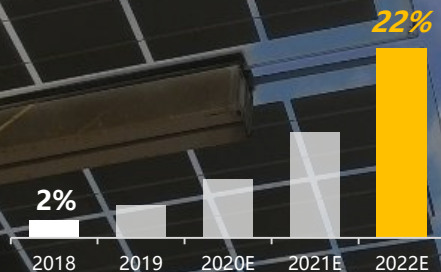


Technique Improvement is Driving Lower Solar LCOE

Bifacial Modules

22%_{@2022}

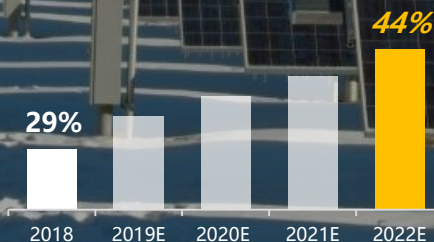
Market Share in PV



Tracking System

44%_{@2022}

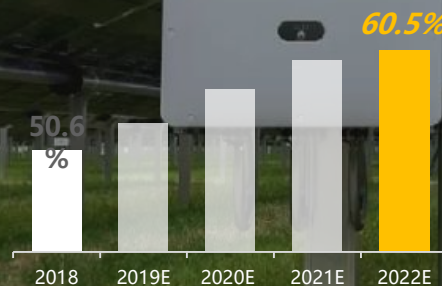
Market Share in Utility



String Inverter

60.5%_{@2022}

Market Share in Utility



Source: GTM Research-Global PV Tracker Landscape

• How to get the best LCOE

Enabling a Lower LCOE for 25-year Lifespan



Higher Yields
>2% Higher



Smart O&M
Lower OPEX



Safe & Reliable
25years' reliability



Equivalent CAPEX
Higher IRR

$$\begin{array}{c} \text{LCOE} \\ \downarrow \\ \text{LEVELIZED COST OF ELECTRICITY} \end{array} = \frac{\overset{\rightarrow}{\text{CAPEX}} + \text{OPEX} \downarrow}{\text{Sum of Yields} \uparrow}$$

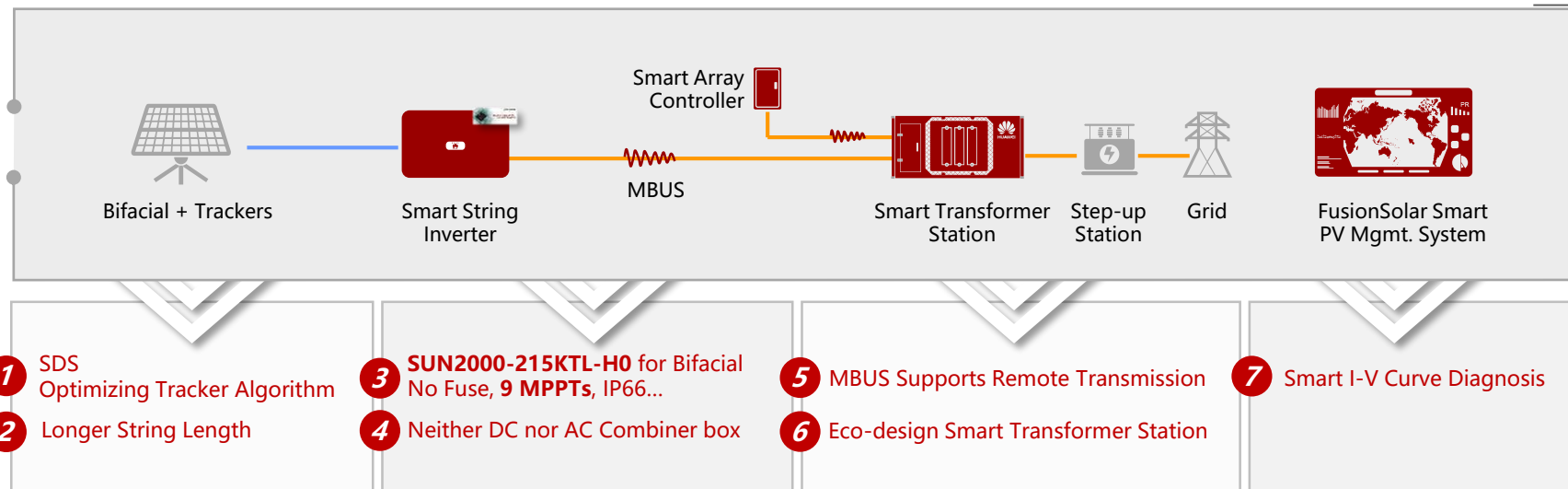
Smart PV Solution Overview

AI BOOST

AI Boost
Smart DC System

AI Boost
Smart I-V Curve

AI Boost
Grid-Connection Algorithm



Field Test and TA Reports to Verify the Optimal LCOE of Smart PV Solution



In Chile

2% Higher Yields **9% Lower OPEX**

Equivalent CAPEX

4% lower LCOE

Nova Olinda 2MW Trail Project

In Brazil



4.4% Higher Yields

17% OPEX Saving

alTran

In KSA

2.1% Higher Yields **¢ 7.2/kWp Lower OPEX**

Equivalent CAPEX

5.1% lower LCOE

vectorcuatro
A company of FALCK RENEWABLES

In Mexico

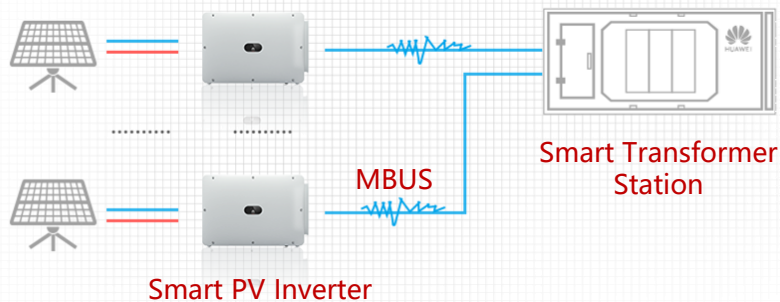
1.12% Higher Yields **¢ 8/kWp Lower OPEX**

¢ 2.3/Wac CAPEX saving

9.2% lower LCOE

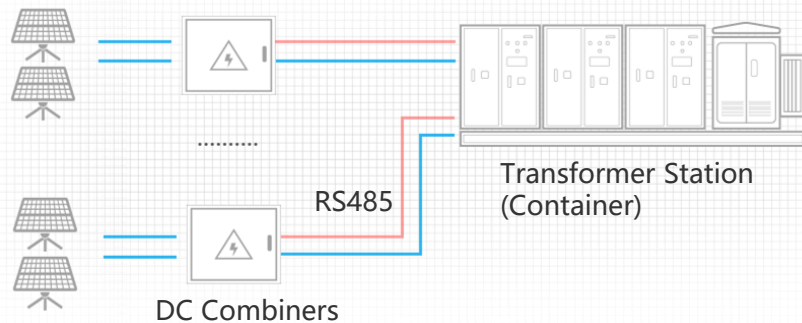
Smart PV Solution vs Central Solution

Smart PV Solution



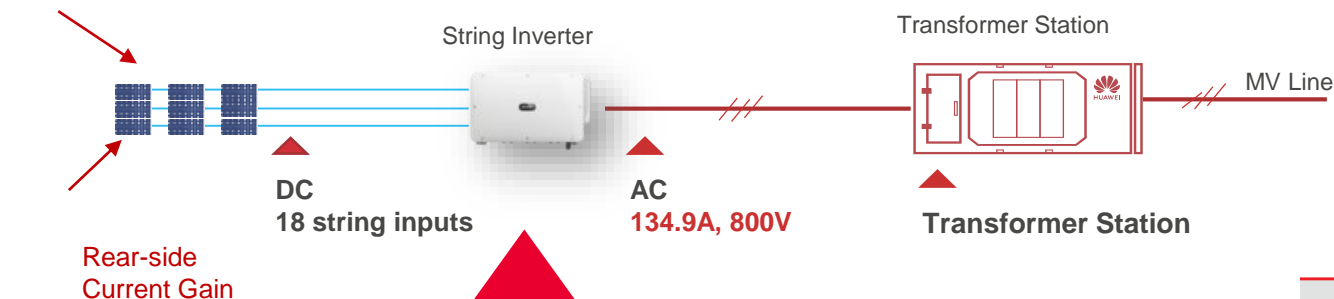
- **36** units x SUN2000-185KW-H1 (18 inputs)
- **1** unit* 6.3MVA Transformer

Central Solution



- **36** units x 18-in-1 DC Combiner
- **2** units x Central Inverter
- **1** unit x 6.3MVA Transformer

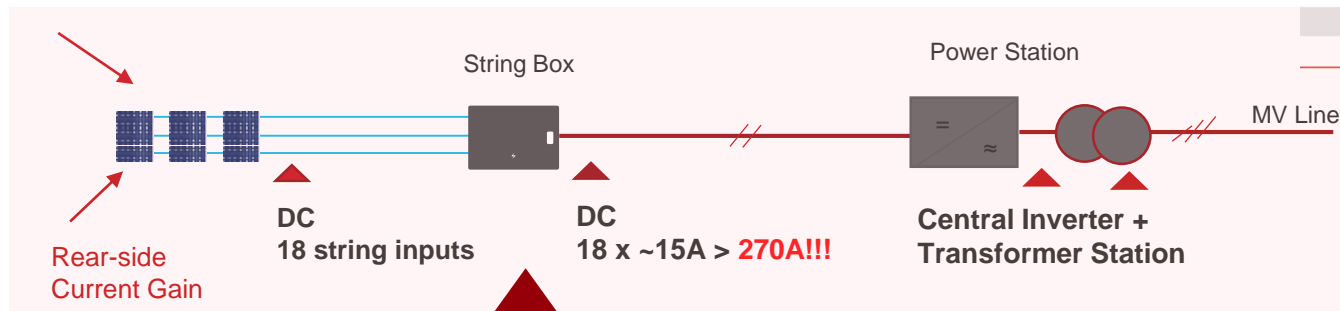
Bifacial Modules, Rear-side Current Gain and Inverter Current Clipping



Current Clipping

LR5-72HBD
520~540M

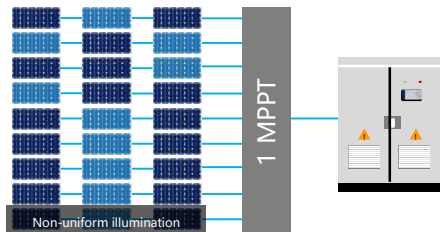
| Imp /A | Pmax gain |
|--------|-----------|
| 13.46 | 5% |
| 14.10 | 10% |
| 14.74 | 15% |
| 15.38 | 20% |
| 16.02 | 25% |



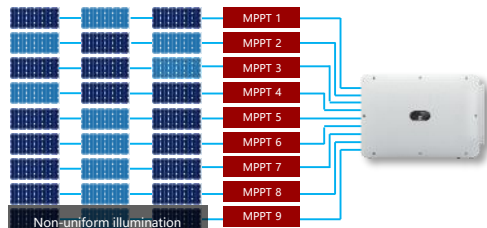
No Current Clipping

Multi-MPPT Design, Effectively Minimizing the Mismatch of Bifacial

Central Solution



Smart PV Solution



VS

1st Year Yields of Central Solution 2333 kWh/kWp

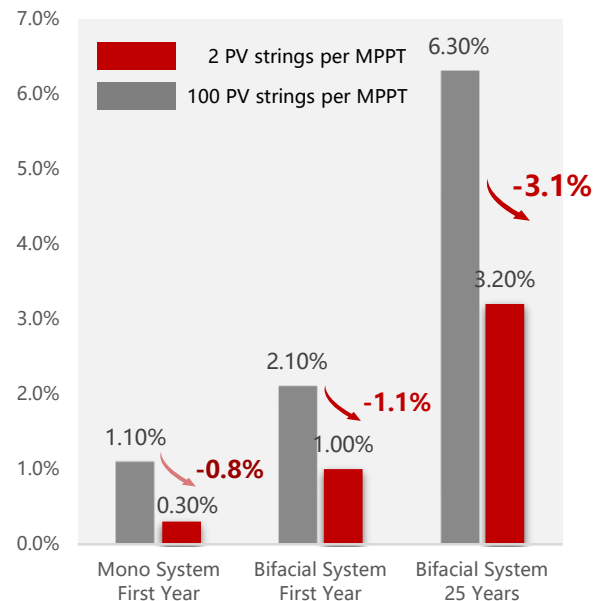


1st Year Yields of FusionSolar 2403 kWh/kWp



Simulation Location: Seville, Spain

6.3MW Block, **324** MPPTs vs. **2** MPPTs



Availability, the Key to Measuring Power Generation

Top Three Factors Effecting Availability

1 Technology Route

FusionSolar superior to Central
No Combiners, 185kW vs. 3125kW

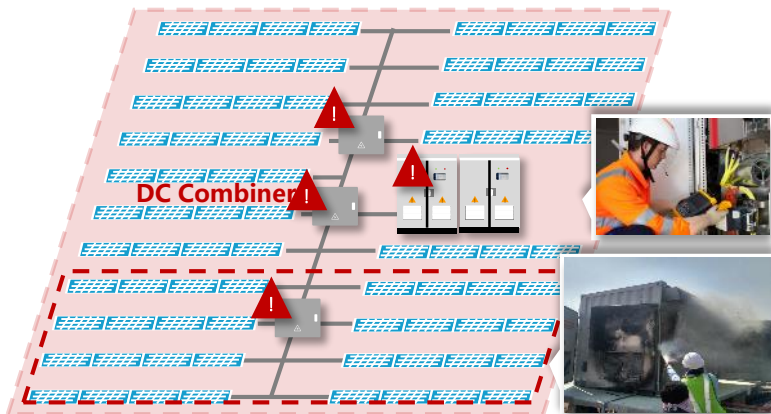
2 Failure Rate

FusionSolar lower than Central
<0.5% lower than 2%

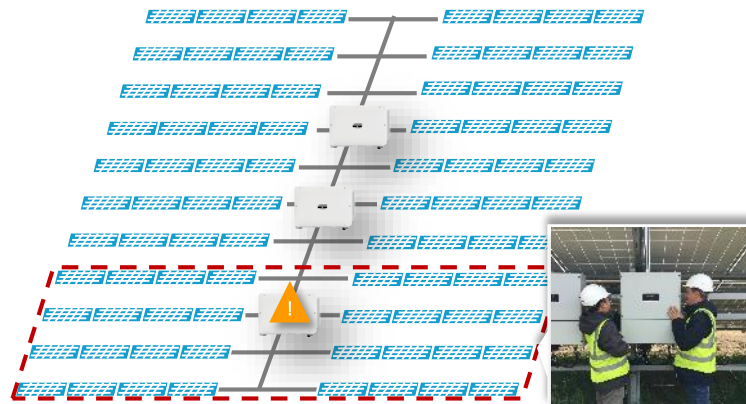
3 Recovery Time

FusionSolar less than Central
0.5 day vs. 2~15 days

Central Solution



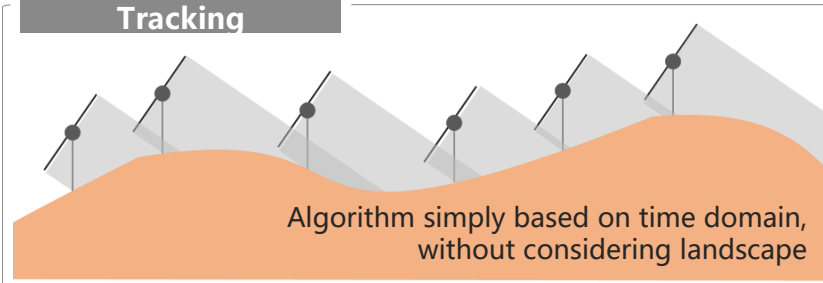
Smart PV Solution



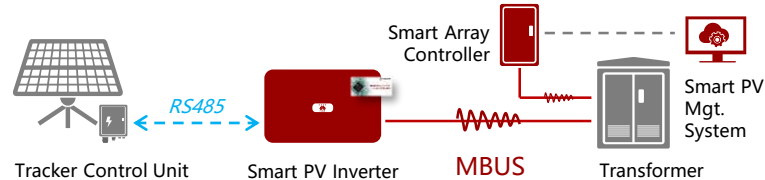
SDS: Smart DC System

Optimizes Tracking Algorithm in complex scenarios

Traditional Tracking

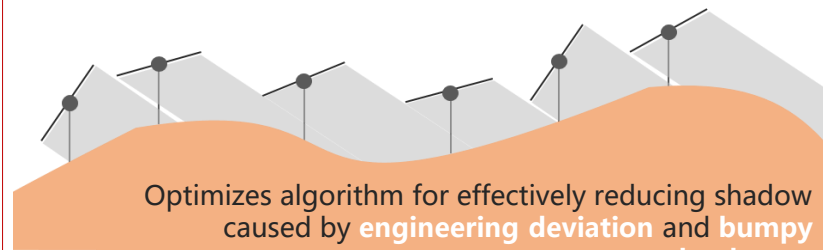


Solution Network



Smart PV Solution

Optimizes algorithm for more capturing more irradiances during **rainy or cloudy** days

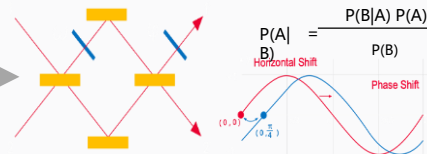


Training Database

Neural Network Training

Model Validation

Environmt.
Astr o. Alg.
+ Generation Hist.
Weather.
....



Optimized Tracking Angle

Low-efficient Manual O&M vs Massive Capacity

Programa Energía Solar

Febrero 2017. Santiago de Chile

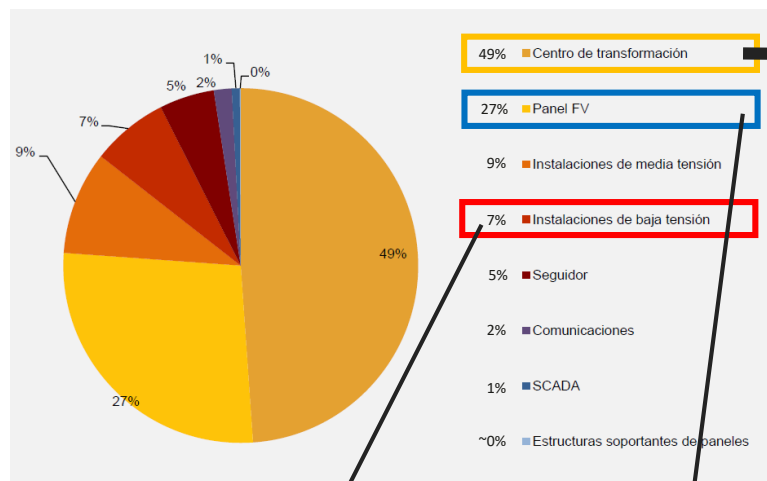
Source: Benchmarking Study of PV Plants in Chile

Study in the Chilean market covering 42% of the installed power in 2017, **585MW** in total.

"All money that is not invested in CAPEX will be an OPEX problem.", Tomás Baeza Jeria, CORFO.

Source: <https://www.energiastراتيجية.com/las-8-fallas-afectan-plantas-fotovoltaicas-segun-corfo-chile/>

Whole PV plant



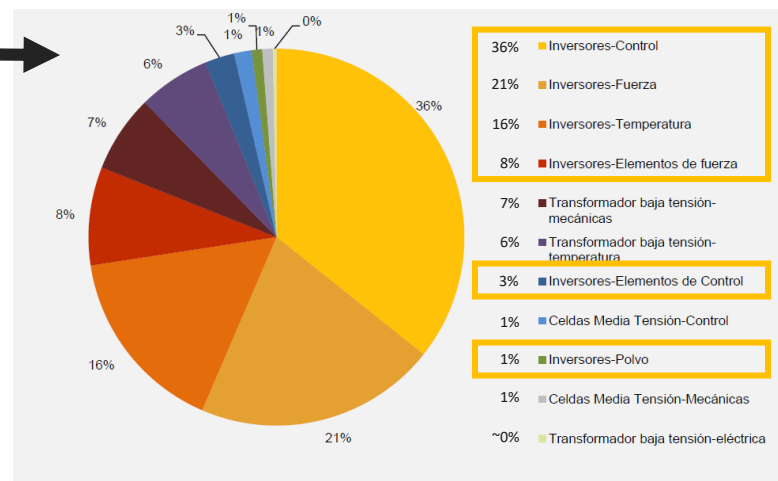
From Strings to DC boxes **7%**

97% fuses.

3% Connections / Connectors.

PV Module + String **27%**

Transformer Station



Inverter **42%** (85% x 49%)

$36\% + 21\% + 16\% + 8\% + 3\% + 1\% = 85\%$

Modular Design

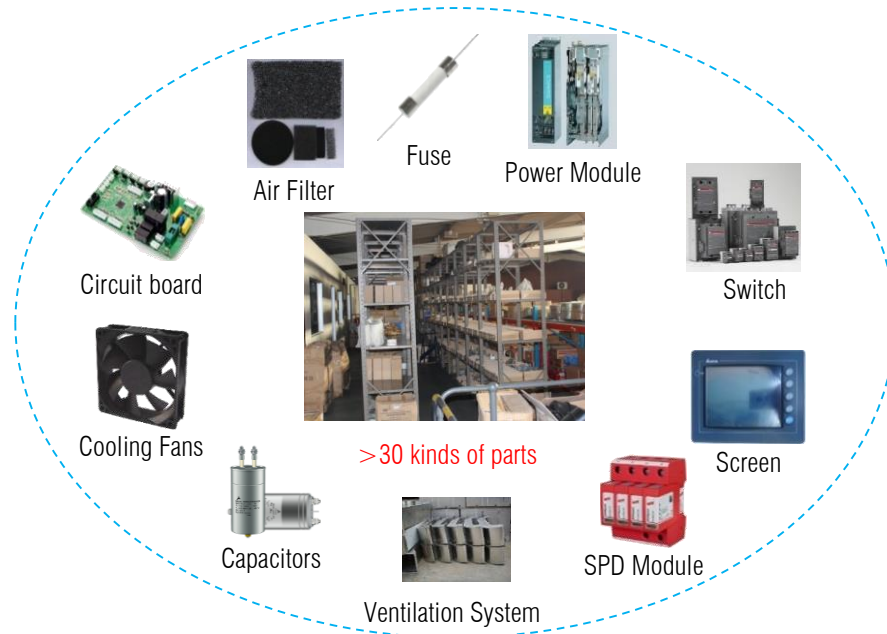
Smart PV Solution



Only 1 spare part

Finding a replacement will get easier and easier.

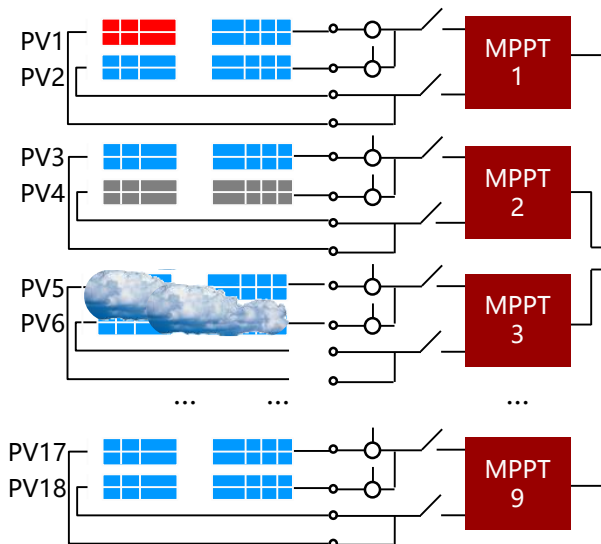
Central Inverters



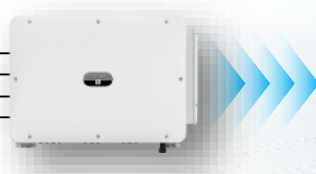
String-level Management Digitalizes Smart O&M



0.5%

High-accuracy
data collectionReal-time, String-level
Optimization

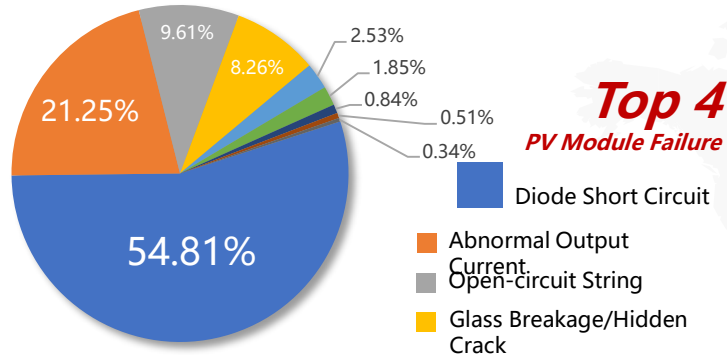
- 1 Accurate detection & less mal-alarm with <0.5% high-accuracy data of each string
- 2 Auto-alarm & O&M advice generation, well-prepared for on-site failures
- 3 Instant failure locating & recovery based on logical & physical location of strings



Smart I-V Curve Diagnosis

5 GW+ Application Worldwide for Elevated O&M Efficiency

Accurate Failure Diagnosis & Recovery Suggestions Provided



How to Solve Diode Short Circuit

- Step 1** - Inspect modules.
- Step 2** - If burning happens in connection points, replace the module.
- Step 3** - If not, use IR camera to find internal failures.
- ...

How to Solve Abnormal Output Current

- Step 1** - Inspect modules. If there are shades, eliminate them.
- Step 2** - If not, check if there is dirt on the surface
- Step 3** - If not, check if any module has a broken glass panel.
- ...

14.5 MW — Failure Rate **0.74%**

Portfolios of PMGD projects in Chile



40 MW — Failure Rate **1.42%**

Ground-mounted PV Plant in Golmud



Ground-mounted PV Plant in Mexico

49 MW — Failure Rate **12.1%**

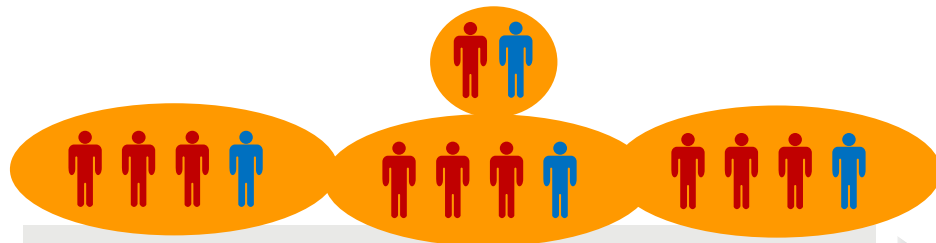


Ground-mounted PV Plant in Thailand

4 MW — Failure Rate **3%**

Huawei String Solution: Less people and experts on site

Traditional Dispatch Central: *manual* collection & Analyze



Separate operation of each plant

Operation

- Daily Sub-array inspection (Maintenance of fuse, fan, cleaning, etc.)
- Supervisor by the management system.
- Report to the HQ, etc.

Ground



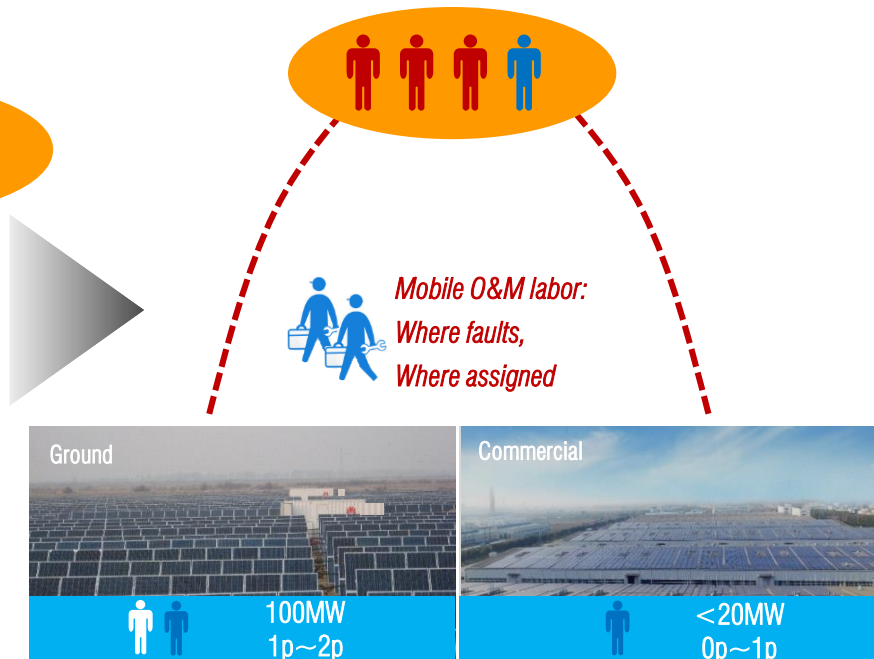
100MW
~10p

Commercial



20MW
2p~3p

Smart Dispatch Central: *automation* collection & analyze



experts



O&M Technician

Bring digital to every person, home and organization
for a fully connected, intelligent world

