## FIRST SOLAR AND INGETEAM UTILITY-SCALE PV PROJECTS AROUND THE GLOBE



# Ingeteam

Ingeteam is a company specialising in power and control electronics (inverters, frenquency converters, controllers and protections), generators, motors and pumps, electrical engineering and automation projects. The company completes its offer with operation & maintenance services.

Ingeteam develops its products in the following key sectors: wind, PV, hydro and fossil fuel power generation; metal processing industry; marien; rail traction; power grid, including substations, always seeking to optimise energy consumption and to maximise generating efficiency, also covering energy transport and distribution.

The company operates throughout the world, employing 3,800 persons. R&D is the backbone of Ingeteam's business activity, in which 5% of the company's turnover is invested annually.



## FIRST SOLAR AND INGETEAM ARE WORKING TOGETHER TO BRING UTILITY-SCALE PV PROJECTS AROUND THE WORLD

- Large Scalable Blocks 1 - 4 inverters
  - 1.6 MVA 7.2 MVA

**Dual Inverter Station** 

From 2,340 up to 3,600 kVA.

- Certified to work with Series 6 modules - IEC & UL
- PV and Battery Inverters



Single Inverter + Dual Inverter Station From 3,510 up to 5,400 kVA.



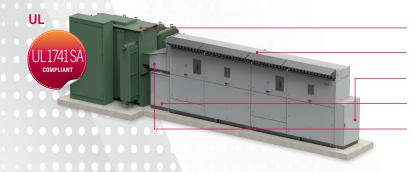


With more than 45 years' experience in the power electronics sector, and more than 28-year track record in renewable energy, Ingeteam has designed an extensive range of PV solar and storage inverters with rated capacities from 2.5 kW up to 7,200 kW.

Since 1999, Ingeteam has supplied more than 10 GW. equipping residential, C&I and also large-scale multi-megawatt PV plants with INGECON® SUN inverters.

The Ingeteam PV network of sales offices are strategically located in Spain, Italy, Germany, France, USA, Brazil, Mexico, Chile, the Czech Republic, India, South Africa, Uruguay, Philippines, Panama and Australia to provide effective sales coverage and after-sales services.





MV transformer with reduced power losses Dual inverter up to 3.6 MVA Auxiliary services panel Auxiliary services transformer AC closed-coupled connection

## Ingeteam

## UNPARALLELED OPEX

- With an MTBF of 55 years and a design life of 25 years, your investment is safe
- 5 year warranties extendable up to 20 years
- Inverter design streamlined O&M

## INGETEAM PROVIDES A WORLDWIDE NETWORK OF SERVICE PERSONNEL

### FIRST SOLAR'S PLANT PREDICT https://plantpredict.com/

 Ingeteam's Inverters are incorporated in Plant Predict to model system performance around the world

## PLANT PREDICT

A product of First Solar

#### PREDICTION SUMMARY

First Solar.

SYSTEM CHARACTERISTICS					
Project Name	FSLR Southern CA Calibration	DC Size MW	146.25		
Lat/Long	35.373 / -119.019	Plant Limit MW	Off		
Locality	Bakersfield, CA / United States	≠ of Arrays	75		
Elevation m	123	DC: AC Ratio	1.2492		
AC Size MW	117.08	Grid Voltage <i>kV</i>	34.5		

#### SIMULATION SETTINGS

2 Apr 2018
First R1
6.0.0.10831
Version 6
Neil Shea
1 Jan 2010
31 Dec 2010
Perez
None
None
Heat Balance
2-Param Pwat and AM

### PLANT CHARACTERISTICS

Mounting Type	Horizontal Tracker
Rotational Limits ° +/-	-60 / 60
Tracking Method	True-Tracking
Avg Azimuth °	180
Avg Row Spacing <i>m</i>	6.70
Avg GCR %	30.00
Avg DC Arry Size MW	1.95
Avg AC Arry Size MW	1.56

FIRST YEAR RESULTS	
P-LEVEL	P50
Plane of Array Insolation kWh/m²/year	2686.39
Specific Yield DC kWh/kWpDC/year	2141.09
Performance Ratio %	79.70
AC Capacity Factor %	30.53
Array Net Energy GWh/year	4.18
Plant Net Energy GWh/year	313.13
Night Time Losses MWh/year	2516.52

## **ENVIRONMENTAL CONDITIONS**

Weather Name	Clean Power Research	- 35.35N - 118.95W	
Provider	Clean Power Research	GHI kWh/m <sup>2</sup>	1962.16
Lat/Long	35.35 / -118.95	DHI kWh/m <sup>2</sup>	592.85

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
Spectral	-2.4	-1.4	-1.0	0.3	-0.8	-0.6	0.2	-0.5	-1.4	-1.6	-3.3	-3.3	
Soiling	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	

#### COMPONENTS

INVERTER	INGECON®SUN 1640 TL B630	
Temp. Adj. kVA	1561	
Design Derate	1.00	
kW Design Rating kW	1561	
(MODULES) 0 0 0	FS-6445 CdTe Dec2017	
Wattage W	445	

LOSS FACTORS %	
Transposition on POA	36.92
Far Shadings/Horizon	0.00
Near Shading on Global	-3.51
IAM Factor on Global	-1.15
Module Irradiance %	-0.26
Module Temperature %	-6.10
Spectral %	-0.94
Soilling %	-1.93
Module Quality %	0.00
Module Mismatch %	-0.94
DC Health %	-0.94
Light Induced Degradation %	0.00
DC Wiring Loss %	-1.10
Inverter Efficiency %	-1.63
Inverter Limitation %	-0.84
Inverter Cooling %	0.00
Tracker Motor Losses %	-0.09
Data Acquisition & Aux %	-0.16
MV Transformers %	-1.60
AC Collection Lines %	-1.00
Availability Loss %	0.00
Plant Output Limitations %	0.00
Degradation Loss %	0.00