5.52% Yield Gain of JinkoSolar's N-type Achieved in the World's Largest Hybrid Solar-Hydro Plant on the Tibetan Plateau

The world' s largest hybrid solar-hydro power plant, with an installed capacity of 1 GW of solar panels and 3 GW of hydro-power generators, has begun producing electricity in the eastern Tibetan Plateau. Located in Kela town, Yajiang county, Ganzi prefecture, Sichuan, the plant's first phase is empowered by 287.4 MW of Jinkosolar' s N-type TOPCon bifacial panels and was connected to the power grid at the end of June 2023. After the station' s operation stabilized, a comparison study was conducted between N-type and P-type modules in the high-altitude area from July 15 to August 15 2023, in order to investigate their outdoor performance.

The study revealed a 5.52% yield gain of JinkoSolar' s N-type TOPCon bifacial panels (570Wp) over P-type PERC bifacial panels (545Wp) in this massive project.

Situated at an altitude of 4,000 - 4,600 meters (15,000 feet) above sea level, on a mountain in Yajiang county (N29°56' 50.75", E100°37' 1.94"), Ganzi prefecture, Sichuan, the Kela solar-hydro power plant is the highest-altitude project of its kind in the world. It benefits from an annual average irradiation of 6434.8 MJ/m2.

Pic.1:Project Location

Spanning a total area of 74 sq km (28.57 square miles), the plant consists of 149 solar arrays, with single-axis support and ±45 ° tracking tilt angles, as well as 163 fixed-mounted arrays with angles of 26 ° . The pitch distance between arrays is 10.5 meters. The plant utilizes 196 kW string-type inverters, with each string connecting 26 bifacial panels. The DC-AC ratio is set at 1.21 for fixed mounting arrays and 1.15 for single-axis solar arrays. Panels are positioned 1.8 meters above the ground, the lowest profile.This comparative study is based on two arrays with the same system design in the same region: one is an N-type TOPCon bifacial module array, and the other is a P-type PERC bifacial module array.

Component Models	Total Power Generation (kWh)	Unit Power Generation (kWh/kW)	Relative Gain
N-Type 570Wp Bifacial	532046.15	137.55	5.52%
P-Type 545Wp Bifacial	471000.17	130.35	

Table 1: N-type and P-type module power generation and comparison of yeild gain

Results:

The initial data collected from July 15 to August 15 shows a 5.52% yield gain of Jinkosolar' s N-type TOPCon bifacial panels over P-type PERC bifacial panels. This can be attributed to the unique advantages of Jinkosolar' s N-type TOPCon panels, including high efficiency, high power output, high generation capabilities, high bifaciality (80% and above), lower temperature coefficient (-0.29%/℃), and lower degradation. The project serves as a compelling example of the investment and construction advantages of adopting N-type technology in similar projects.

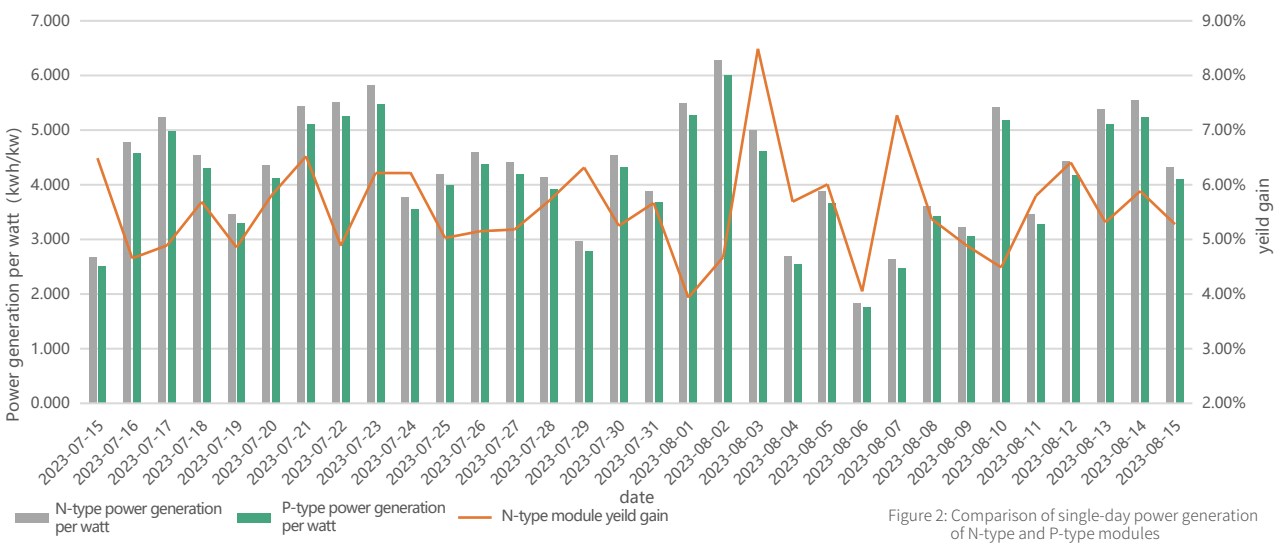

Figure 2: Comparison of single-day power generation of N-type and P-type modules