SPIC's 100MW Project in North West China Power Generation Comparison: JinkoSolar N-TOPCon Energy Gain of 5.12%

Background Introduction:

In the 100 MW PV power plant (Phase II of the Project) developed by the State Power Investment Corporation (SPIC) in North West China, we conducted a comparative study on the power generation performance of PV modules with two different cell technologies, TOPCon and PERC. The location of the project belongs to the moderately warm temperate and extremely arid desert climate with hot summers and cold winters. The region is rich in heat and has significant temperature differences annually and daily speaking. The annual average irradiance is about 5800.01MJ/m2, which is considered abundant in solar energy resources and favorable for the development and construction of solar grid-connected power stations.

Comparison	Capacity (MWP)	Cumulative Power Generation (kWp)	Power Generation per Kilowatt (kWh)	Gain (%)
N-type 560Wp	1.12112	90440.07	80.669	
P-type-1 550Wp	1.2012	92854.13	77.301	**4.36%**
P-type-2 545Wp	1.17611	90256.63	76.742	**5.12%**

Note: Data is provided by SPIC

Table 1: Comparison of energy yield and gain of N-type and P-type modules

Technical Specification:

The rated capacity of the power station is 100 MW, consisting of 32 power matrices, with a DC/AC ratio of 1.3. Bifacial modules are selected for the system design and based on the system voltage of 1500V, 26 modules are designed as a string connecting to a 225kW inverter through 20-21 strings. Fixed tilts are selected with an inclination of 36 °, and the minimum height of the modules from the ground is about 0.5 meters. The overall project covers an area of approximately 2110 m^2.

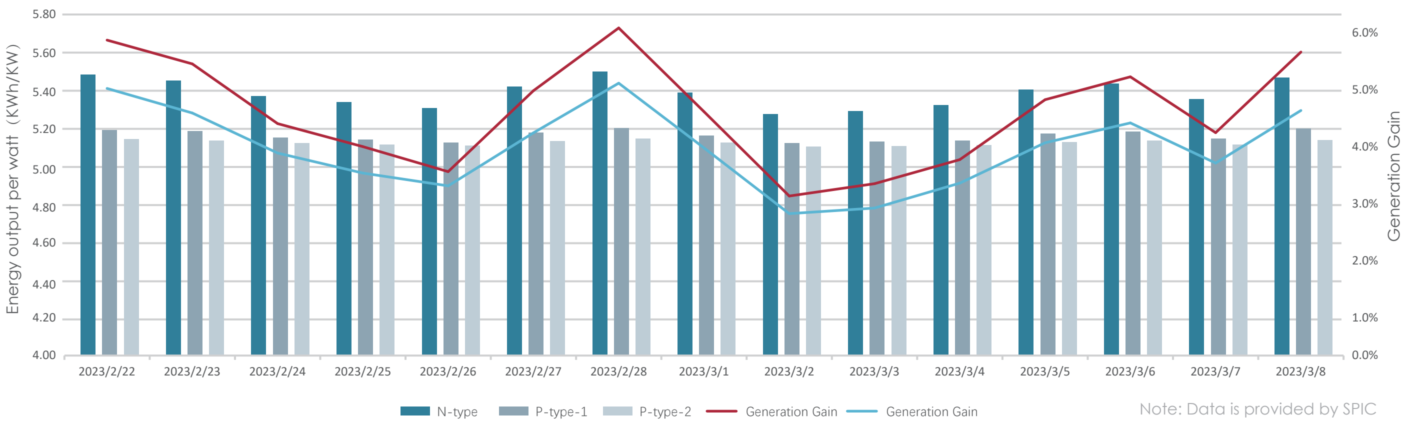
The performance comparison section of the project includes N-type and P-type modules. During the power generation simulation through PVsyst, the N-type TOPCon PAN files uses Jinko' s Tiger Neo 560Wp module, meanwhile, the PAN files of PERC are based on a general industry-wide performance level 550Wp and 545Wp.

Result:

Compared to the conventional P-type PERC modules, the Tiger Neo series N-type modules which are equipped with advanced TOPCon cell technology independently developed by Jinko Solar have relative advantages such as low degradation, low-temperature coefficient, high bifacial factor and excellent low irradiance performance. During the simulation, the mentioned N-type module can bring at least 3% extra power gain under the same installation capacity. The climate area where this project is located is hot in summer, with extremely high temperatures up to 41℃. With good solar irradiance, the operating temperature of the module during the summertime will significantly increase and affect the power output. The N-type TOPCon module has a lower temperature coefficient, which has decreased from 0.35% of the P-type to 0.29%, which means that it is less affected under high ambient temperatures and exhibits better power generation performance. At the same time, the project is constructed in the desert area with good ground reflection conditions, and the snow in winter can further improve the reflectivity. The higher bifacial factor of TOPCon modules (up to 85%) can bring more backside power gain under the same operating conditions and increase the total power generation. Based on the actual power generation data of N-type and P-type modules in this power plant, it was found that compared to the two P-type arrays in the project, the average per kW extra power gain of Jinko' s Tiger Neo modules have reached **4.36%** and **5.12%** respectively, far exceeding the 3% level during the simulation

Conclusion:

N-type TOPCon has a lower temperature coefficient and a higher bifacial factor. These competitive advantages have been better highlighted in hot areas and regions with excellent ground reflection conditions such as the desert. Additionally, higher efficiency of the N-type modules can significantly reduce the system costs in regions with high BOS (such as Europe, Australia, the Middle East, and Africa), endowing N-type the TOPCon product with greater premium extra value. In summary, even considering the price difference between N/P type modules, TOPCon module will have the highest priority in most climatic regions based on its higher efficiency and outstanding power generation performance.



Note: Data is provided by SPIC

Figure 1: Comparison of daily energy yield of N-type and P-type modules