

Same Price, Lower LCOE: TOPCon VS XBC Modules for a 100MW Utility Scale Project

The PV industry has transitioned towards n-type technology evolution in pursuit of higher energy efficiency as the dominant technology. Both the foundation technology of TOPCon and the process technology XBC (back contact) provide chances of lowering LCOE.

The LCOE is the average lifetime levelised cost of electricity generation, it is an economic assessment of the average net present cost of electricity generation for a generating plant over its lifetime, which is defined as the total lifetime cost (a composite of capital and operating costs) divided by the lifetime energy yield. Whereas an LCOE assessment is sensitive to module performance, solar resource, system design, labour cost, etc., it is meaningful to make an LCOE analysis for PV technologies based on a variety of scenarios. Here we have chosen three modules for LCOE economic analysis of a real 100MW utility project recently bid in northwestern China, aiming to show savings estimates based on representative systems.

Study Modeling:

For utility applications, a system of approximately 100MW was modelled with a 2P fixed mounting system for both technologies.

Key assumptions for the system modelled include:

- For each technology, the module selected was the central power bin from the highest efficiency module series

TOPCon: Jinkosolar 66N, 625W

TOPCon: Jinkosolar 72N, 595W

BC: HPBC 72, 605W

Module Type	Jinko-66N	Jinko-72N	BC-72
	182*210 (66)	182*182 (72)	182*192 (72)
Module Power	625	595	605
Module efficiency (%)	23.1%	23.0%	22.4%
Module dimension (mm)	2382*1134	2278*1134	2382*1134
Open-circuit voltage (V)	49.28	53.1	52.66
Short-circuit current (A)	16.14	14.03	14.62
Power temp. coefficient	-0.29%/°C	-0.29%/°C	-0.28%/°C
Voltage temp. coefficient	-0.25%/°C	-0.25%/°C	-0.23%/°C
Bifacial factor	80±5%	80±5%	60±5%
1 st degradation	1%	1%	1%
Linear degradation	0.4%	0.4%	0.4%
Module Qty/17.5m truck	900	936	864

Table 1: The specification of PV modules

- 2P Fixed
- Module price per watt was modelled as **0.114 US\$/Wp** for both TOPCon and BC respectively.
- Inverter price per unit and other capital costs were fixed.

The LCOE of a project depends on the energy generated by the system; greater energy generation (in kWh) of a system will result in a lower LCOE (all other things being equal).

Results:

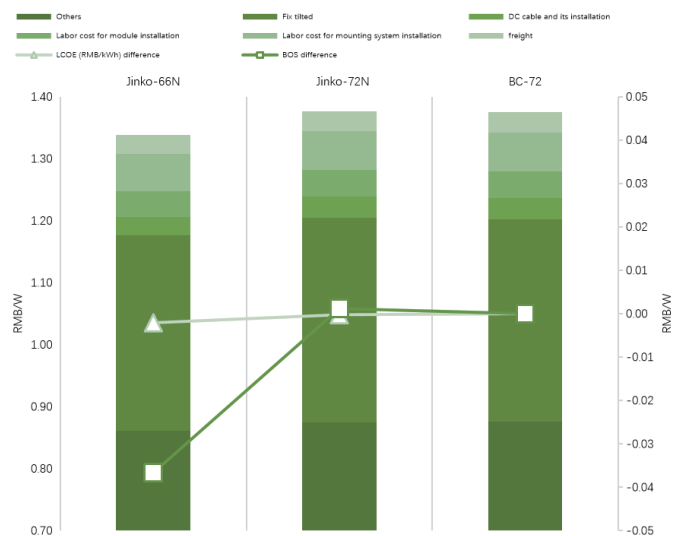
According the systems modelled, at the same \$/watt price level, the TOPCon panels outperform XBC for the modelled utility system in terms of lower LCOE and higher IRR.

TOPCon panel 625W has a **1.21%** lower LCOE compared to XBC 605W
TOPCon panel 595W has a **0.14%** lower LCOE compared to XBC 605W.

Taking XBC 605W as baseline, IRR of TOPCon 625W increased by **0.29%** and TOPCon 595W increased by **0.06%** respectively over XBC 605W.

Project Capacity	100MWp		
Module type	Jinko-66N	Jinko-72N	BC-72
Power	625	595	605
Module Qty/string*	28	26	26
Total module Qty	160,000	168,068	165,290
1 st generation(MWh)	159,800	159,800	158,681
BOS (RMB/w)	1.3382	1.3760	1.3749
BOS difference (RMB/w)	-0.0366	0.0012	Baseline
LCOE difference	-1.21%	-0.14%	Baseline

Table 2: LCOE analysis



Conclusion:

High-performance can enable financial savings

TOPCon PV technology, the current mainstream technology in the industry has been compared with XBC at same price, through parameters including module efficiencies, temperature coefficients and degradation rates.

In each modelled, TOPCon technology has significant improvements in lifetime energy generation compared to XBC. For both modelling, TOPCon provides the greater lifetime energy generation over XBC. This is primarily attributed to the higher bifaciality of TOPCon, better low light generation due to less electricity leakage in the front side and optimized Voc to reduce BOS.

After the rapid development of PV technologies in recent years, the industry has evolved from 'cost-reduction era' to 'performance-improvement era'. The modelling in this real project case shows that as a foundation technology, N-type TOPCon products have higher energy generation in the most scenario that they can be financially beneficial over the lifetime of the system. By considering the potential savings of the advanced solar PV technologies, distributors, installers and end users are able to make informed decisions on which technology has the greatest value for a specific application.