Technoeconomic Advantage of N-type TOPCon Photovoltaic Systems for Green Hydrogen Production

The necessary shift of today's global markets toward a sustainable future, H2 can play a key role when it comes to decarbonizing the energy, industrial, and transportation sectors. However, the conventional grey H2 will not be an option to reduce carbon emissions due to an estimated CO2 emis-

The Levelized cost of electricity (LCOE) and levelized cost of hydrogen production (LCOH) are calculated, and results show that such N-type TOPCon PV systems can generate electricity and produce hydrogen at competitive costs. In the UAE, the LCOE and LCOH can reach as low as 2.1 cents/kWh and $2.51/kg-H2, respectively. In northern west China, these costs can reach as low as 2.9 cents/kWh and $2.86 /kg-H2. Such competitive costs make N-type TOPCon PV systems attractive for new investments in green hydrogen technology in these regions.

Lower Temperature Coefficient of N-type

No matter electrolysis or thermochemical reactions, hydrogen production process generates excessive heat dissipation released into the environment. The lower temperature coefficient of N-type solar cells, which is as low as 0.29%/ Celsius degrees, minimizes the impact of on-site high ambient temperatures, thereby resulting in higher energy yield.

Better Low-Light Performance

The better low light performance of N-type indicates a prolonged daily working time of PV system, which boasts half to one hour longer than P-type system.

In the last few years, the hydrogen economy has gained wider adoption by many countries in the Middle East, including Saudi Arabia and the United Arab Emirates. Saudi Arabia, for example, is planning to be one of the world's biggest exporters of green hydrogen by 2030.

Air products and chemicals, U.S.-based hydrogen production, and hydrogen infrastructure developer, recently signed an agreement in July 2020 with Saudi Arabia' s utilities developer Acwa Power and Neom to develop a $5-billion hydrogen-based ammonia production facility powered by renewable energy in NEOM (the newly developed futuristic megacity in the north of Saudi Arabia where N-type solar-driven electrolysis hydrogen innovation go together).

N-type solar-powered hydrogen has become an exciting and dynamic industry in the UAE, and China, with the construction of n-type solar-driven hydrogen facilities already planned and underway.