Key Findings

1. Consistent Lead in Cumulative Power Generation Gain

During the nearly four-month monitoring period from November 6, 2025, to February 28, 2026, high-power TOPCon modules achieved an average power generation gain of 3.16% per watt compared to BC modules of the same power rating. (Cumulative generation per watt reached **310.26 kWh/kW** for the 650W TOPCon module, compared to **300.76 kWh/kW** for the 650W BC module serving as the control.). Month-by-month data shows that the cumulative power generation gain of TOPCon modules remained positive in every month, with no instances of negative gain, validating their reliable performance during autumn and winter and under various weather conditions. For power plant investors, stable positive gains and cumulative returns over the entire lifecycle are the core metrics for evaluating module value.

2. Significant Amplification Effect During Low-Irradiance Periods

From November to December, the Yantai region of Shandong experienced frequent cloudy and hazy weather typical of autumn and winter, resulting in a significant increase in the proportion of low-irradiance periods. According to data from the Yantai Meteorological Bureau (Fushan National Basic Meteorological Station), the number of days with irradiance <400 W/m² in Yantai during November–December was approximately 43–47 days, accounting for 70%–77% (based on a comprehensive estimation of the meteorological station's sunshine, weather, and irradiance data). During this period, the 650W TOPCon modules demonstrated strong low-light performance, with a per-watt gain of up to **5.39%** in November and **4.30%** in December. These figures directly confirm the superiority of TOPCon technology in controlling leakage current under low-irradiance conditions.

3. Effective Utilization of Bifaciality Advantages