AG2 PJM Solar Forecast

White Paper | Model Methodology, Performance, and Market Application

Evaluation period: January 2025-May 2026 | Forecast cycle: 7am Eastern Prevailing Time

Executive summary

Atmospheric G2's PJM Solar model converts high-resolution numerical weather prediction signals into solar generation forecasts that reflect the operating behavior of the PJM solar fleet. The model extends AG2's wind generation and demand forecasting suite with a dedicated solar forecast designed for both system-level and sub-region-level decision-making.

The most important differentiator is granularity. PJM publishes solar forecasts for the PJM Aggregate, but does not provide forecast or observed solar insight at the three main PJM sub-regions. AG2 fills that gap by delivering sub-regional solar forecasts and estimated observations, giving clients a more complete view of local solar conditions, regional production risk, and evolving net demand.

Based on skill metrics covering the January 2025 through May 2026 period, the 7am forecast performs particularly well against the PJM benchmark, especially for the Next Day period (Day 2). For PJM Aggregate Daytime Hours, AG2 improves MAPE by 17.8% on Day 2. For Peak Solar Hours, AG2 improves MAPE by 11.3% on Day 2. Lower MAPE indicates better forecast accuracy.

Forecast window	Forecast Day	AG2 MAPE	PJM MAPE	Improvement vs. PJM
Daytime Hours	Day 1	13.6	15.3	10.7%
Daytime Hours	Day 2	13.9	16.9	17.8%
Peak Solar Hours	Day 1	11.0	11.3	3.0%
Peak Solar Hours	Day 2	11.0	12.4	11.3%

Table 1. PJM Aggregate 7am solar forecast performance scores calculated on January 2025-May 2026 sample.

Atmospheric G2

1. Market Need: Solar volatility is now a PJM operational variable

Solar growth has changed the shape of intraday supply risk in PJM. Cloud cover, irradiance variability, snow cover, seasonal sun angle, and regional asset distribution can all shift expected solar output rapidly. A useful forecast therefore needs to do more than provide a single system-level curve; it must explain when and where solar generation is likely to deviate from expectations.

For traders, schedulers, risk teams, utilities, and large energy users, those deviations are not isolated solar questions. Solar forecast error ultimately flows into residual demand, price formation, congestion exposure, and the amount of dispatchable supply needed to serve load. This is why the release of PJM Solar is strategically important for AG2: together with PJM wind generation and demand forecasts, AG2 can now provide clients with a complete renewable generation and demand picture for PJM and support NetLoad forecasts for customers who subscribe to all three services.

2. Product Differentiation

- **Sub-region visibility:** AG2 provides forecasts for the three main PJM sub-regions. PJM does not currently provide forecast or observation insight at the sub-region level, which leaves clients without regional context for solar production risk.
- **Forecast window:** PJM currently provides forecasts only through 48 hours. To provide additional insight, AG2's forecasts are available out to 120 hours (5 days) with plans to further extend the forecasts to the 10-15 day period.
- **Estimated observations:** In addition to forecasts, AG2 provides estimated solar observations. This gives clients a real-time reference point for model monitoring, forecast calibration, and intraday situational awareness where direct observed data is unavailable.
- **NetLoad readiness:** With solar now added alongside the PJM wind generation and demand forecast services, AG2 provides PJM NetLoad forecasts for clients subscribed to all three services. NetLoad connects renewable generation and demand into one operational signal.
- **Weather-aware AI/ML translation:** The modeling framework translates ensemble and deterministic weather information into MW-level solar generation using engineered solar-weather features and machine learning trained on historical solar generation behavior.

3. Modeling Methodology

At a broad level, the PJM Solar forecasting process converts numerical weather prediction output into expected solar power generation. AG2 ingests multiple weather model runs, including ensemble and operational systems, to capture a range of possible atmospheric outcomes and forecast uncertainty.

Raw weather information is then processed specifically for solar generation forecasting. Weather fields are mapped to generation-weighted regions and solar asset concentrations, with special attention to irradiance, cloud cover, solar geometry, time of day, and seasonal production patterns. This produces regionalized weather representations that are more closely tied to expected solar fleet behavior than a generic grid point weather forecast.

The model then engineers features that capture solar irradiance availability, cloud impacts, intraday production shape, ramp behavior, astronomical patterns, historical generation behavior, and system-level dynamics.

Multiple feature combinations and forecast configurations are evaluated to identify robust predictive relationships by horizon and region.

Finally, machine learning models trained on historical weather and observed solar generation translate forecasted atmospheric conditions into expected solar generation in MW. Multiple forecast pathways are evaluated and combined to improve reliability across changing weather regimes, particularly during cloud transitions, rapid ramps, and seasonal variability.

4. Performance Results

Performance is summarized below, where lower MAPE values are better. The results below are based on the 7am EPT forecast cycle and cover January 2025 through May 2026. PJM benchmark comparisons are only available for Day 1 and Day 2.

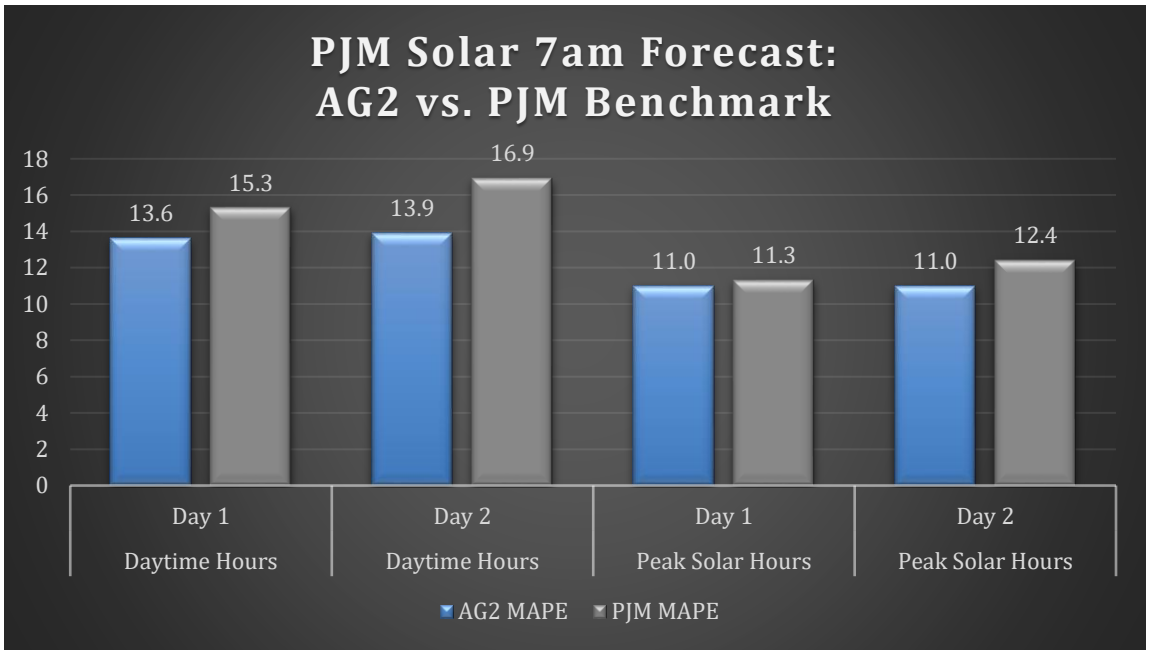

Figure 1. AG2 vs. PJM benchmark MAPE on comparable Day 1 and Day 2 forecasts.

4.1 PJM Benchmark Comparison

AG2 shows the strongest benchmark separation on Day 2. In the Daytime Hours evaluation window, AG2 reduces MAPE by 4 points, an improvement of 17.8%. In the Peak Solar evaluation window, AG2 reduces MAPE by 1.4 points , an improvement of 11.3%.

Day 2 is particularly important for operational planning because it is far enough ahead to influence market positioning, risk planning, and next-day scheduling decisions, while still close enough for weather-driven uncertainty to be actionable.

Window	Day	AG2 MAPE	PJM MAPE	Improvement
Daytime Hours	Day 1	13.6	15.3	10.7%
Daytime Hours	Day 2	13.9	16.9	17.8%
Daytime Hours	Day 3	14.0	—	—
Daytime Hours	Day 4	14.0	—	—
Daytime Hours	Day 5	14.2	—	—
Peak Solar Hours	Day 1	11.0	11.3	3.0%
Peak Solar Hours	Day 2	11.0	12.4	11.3%
Peak Solar Hours	Day 3	11.9	—	—
Peak Solar Hours	Day 4	11.7	—	—
Peak Solar Hours	Day 5	11.8	—	—

Table 2. PJM Aggregate skill summary. PJM benchmark and improvement values are provided for Day 1 and Day 2 only.

4.2 PJM Sub-region and Aggregate Forecast Skill

The graph below depicts the 7am forecast skill for The PJM Aggregate, Mid-Atlantic, South, and West, demonstrating the regionalized forecast capability that clients do not receive from PJM. These sub-region metrics are important because regional solar deviations can be masked in a single aggregate PJM number.

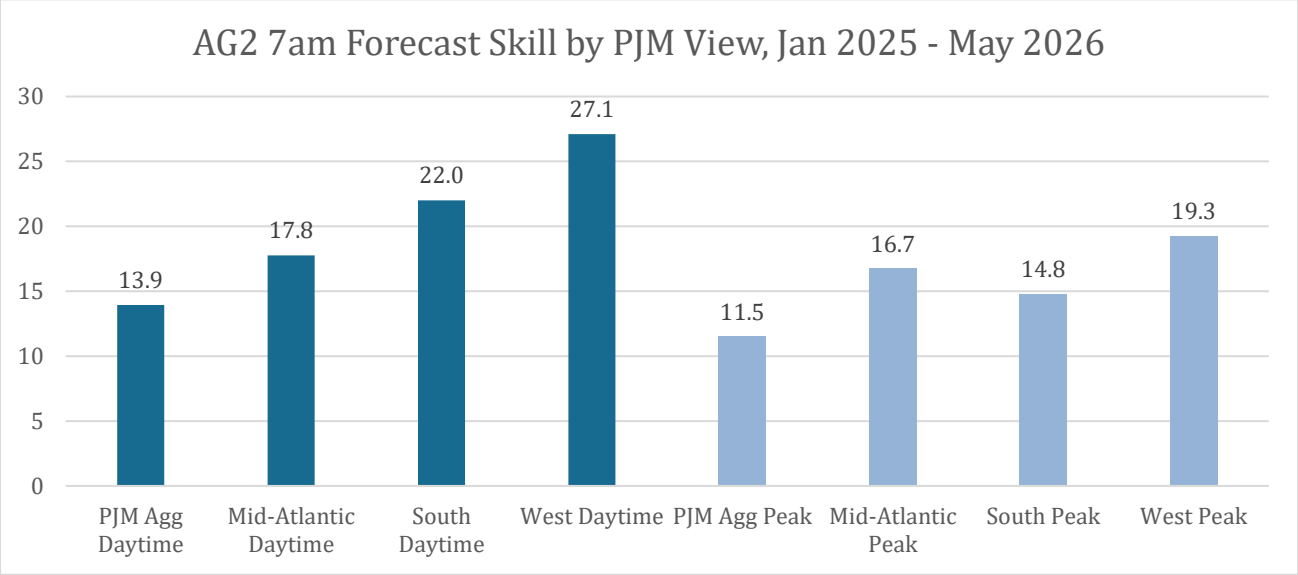

Figure 2. Average AG2 MAPE by PJM region, averaged across Day 1-Day 5 period

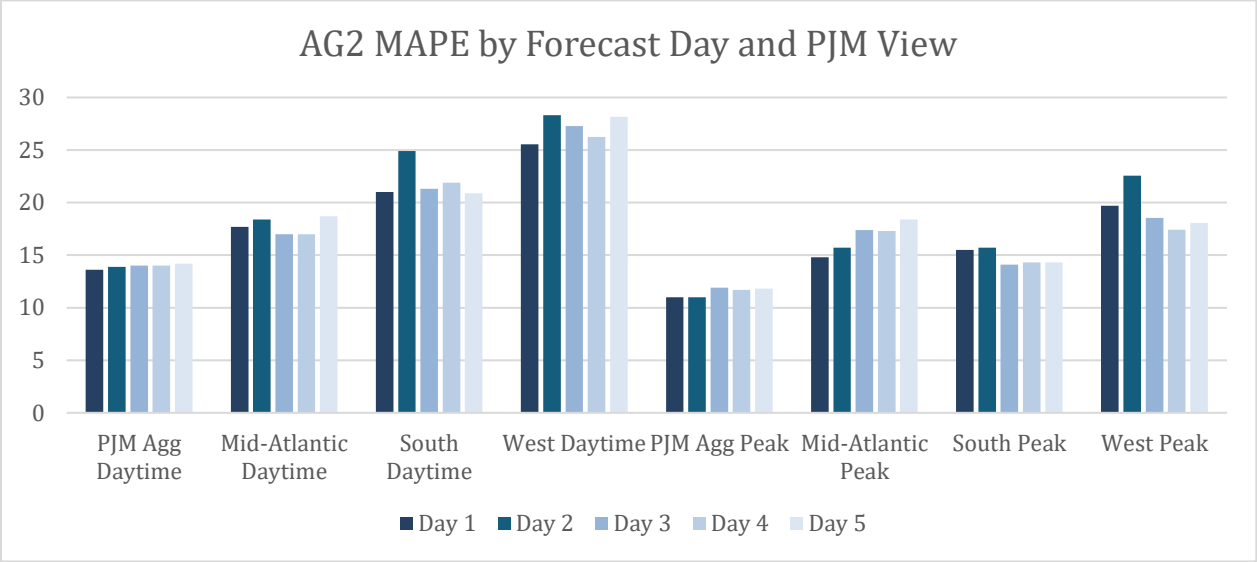

Table 3. AG2 MAPE by forecast day and PJM region. All values are percentages; lower is better.

Figure 3. AG2 Trader screenshot showing a sub-region forecast along with our estimated observations.

5. Client Applications

- **Renewable supply forecasting:** PJM solar generation forecasts at both the aggregate and sub-region levels, allowing for a clearer understanding of where specifically solar generation is concentrated.
- **Intraday and next-day risk management:** Use Day 1 and Day 2 solar signals to anticipate changes in residual demand, renewable underperformance, and potential ramp periods.
- **Sub-region situational awareness:** Compare estimated observations against forecasts by region to diagnose where forecast error is emerging and whether it is localized or broad-based.
- **NetLoad forecasting:** Combine PJM Solar, PJM Wind, and PJM Demand to provide NetLoad forecasts for clients subscribing to all three services. This converts separate weather-sensitive variables into a single view of renewable supply-demand balance.

6. Conclusion

AG2'sPJM Solar model expands AG2's coverage of forecast services into a complete PJM renewable-and-demand forecasting framework. Its value is not only in system-level accuracy, but also in the sub-region-level forecast and estimated observation visibility that PJM does not provide.

The January 2025-May 2026 score set shows meaningful Day 2 improvements against PJM where direct comparison is available, particularly across Daytime Hours and Peak Solar Hours. Combined with AG2's existing wind and demand forecasting, PJM Solar enables a full NetLoad view for clients who need to understand the intersection of weather, renewables, and demand.