At its deepest, the 12 August eclipse cost Spain about 4.2 GW of solar output

Mikko Rautiainen
Chief Technology Officer, Sustainable Digital Assets Inc.

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SUMMARY

Grid operators spent days bracing for the eclipse. It came, smaller and shorter than the biggest forecasts. Measured against clear days, Spain was down about 4.2 GW at the deepest point and Germany-Luxembourg about 1.9 GW. Most of it happened within a single hour of early evening.

4.2 GW
Spain's shortfall at 18:15 UTC, against clear days

1.9 GW
Germany-Luxembourg's shortfall at 17:45 UTC

5.8 GW
five zones combined at 18:00 UTC

Spain's solar plants were producing 1,948 MW at 18:15 UTC on 12 August 2026. Take a clear day from the same week, move it to that date, and the fleet would have managed about 6,127 MW in that quarter-hour. So 4,179 MW went missing. That was 68% of expected output, and the eclipse's deepest cut into the Spanish system.

Germany-Luxembourg hit its low point half an hour ahead of Spain. At 17:45 UTC, output stood at 1,065 MW against a baseline of 2,997 MW, a shortfall of 1,932 MW.

Both figures come from actual generation published on the ENTSO-E Transparency Platform at 15-minute resolution, set against each country's own clear days between 2 and 22 August.

1. What the operators expected

Red Eléctrica put the maximum reduction on the Peninsula at approximately 5 GW, around 13% of peak demand on a typical Wednesday in August, and warned that cloud cover could change the final impact. The four German transmission system operators said feed-in would fall by up to 2 GW under a cloudless sky, against more than 110 GW of photovoltaic capacity installed in Germany. Europe-wide, ENTSO-E put the figure at up to 9.7 GW under clear-sky conditions.

Germany called it spot on. The afternoon of 12 August was clear there, they expected a 2 GW drop, and we measured 1.9 GW. Spain depends on the baseline: our lowest gives a peak loss of 3.2 GW and our highest 4.4 GW. Red Eléctrica said 5 GW, and that was too high on every baseline we tried.

2. How the baseline was built

At 18:15 UTC, Spanish output on clear days drops by about 290 MW a day through August, because sunset comes a little earlier each evening. That is enough to bias a simple average of the days before and after the eclipse.

Only clear days go into this baseline. A day qualifies when its output between 12:00 and 16:45 UTC adds up to at least 90% of an envelope made of the highest output recorded at each quarter-hour across the 21 days. Each qualifying day is then moved to 12 August along a straight line fitted to the trend at that quarter-hour, and the baseline is their median. The spread of those days sets the range.

Before first contact, 12 August itself reached 0.977 of the clear-sky envelope in Spain and 0.989 in Germany-Luxembourg, so the evening dip cannot be put down to cloud.

3. An eclipse at sunset

In Madrid the eclipse reached its maximum at 18:32 UTC, when the sun stood 7 degrees above the horizon, and that late hour did much to limit the loss. In Berlin, maximum came at 18:08 UTC, with 84.8% of the sun covered but the sun only 3 degrees up.

Solar plants were already on the steep part of their evening decline. The eclipse brought the evening decline forward instead of taking a bite out of a full afternoon.

Table 1. Solar output in Spain and Germany-Luxembourg on 12 August 2026 against the clear-day baseline, MW, UTC.

UTC, 12 August	Spain actual MW	Spain baseline MW	Spain shortfall MW	Germany-Luxembourg actual MW	Germany-Luxembourg baseline MW	Germany-Luxembourg shortfall MW
17:30	12,876	13,834	958	3,413	4,771	1,358
17:45	9,308	11,260	1,952	1,065	2,997	1,932
18:00	4,968	8,745	3,777	126	1,653	1,527
18:15	1,948	6,127	4,179	85	730	645
18:30	1,040	3,892	2,852	73	227	154

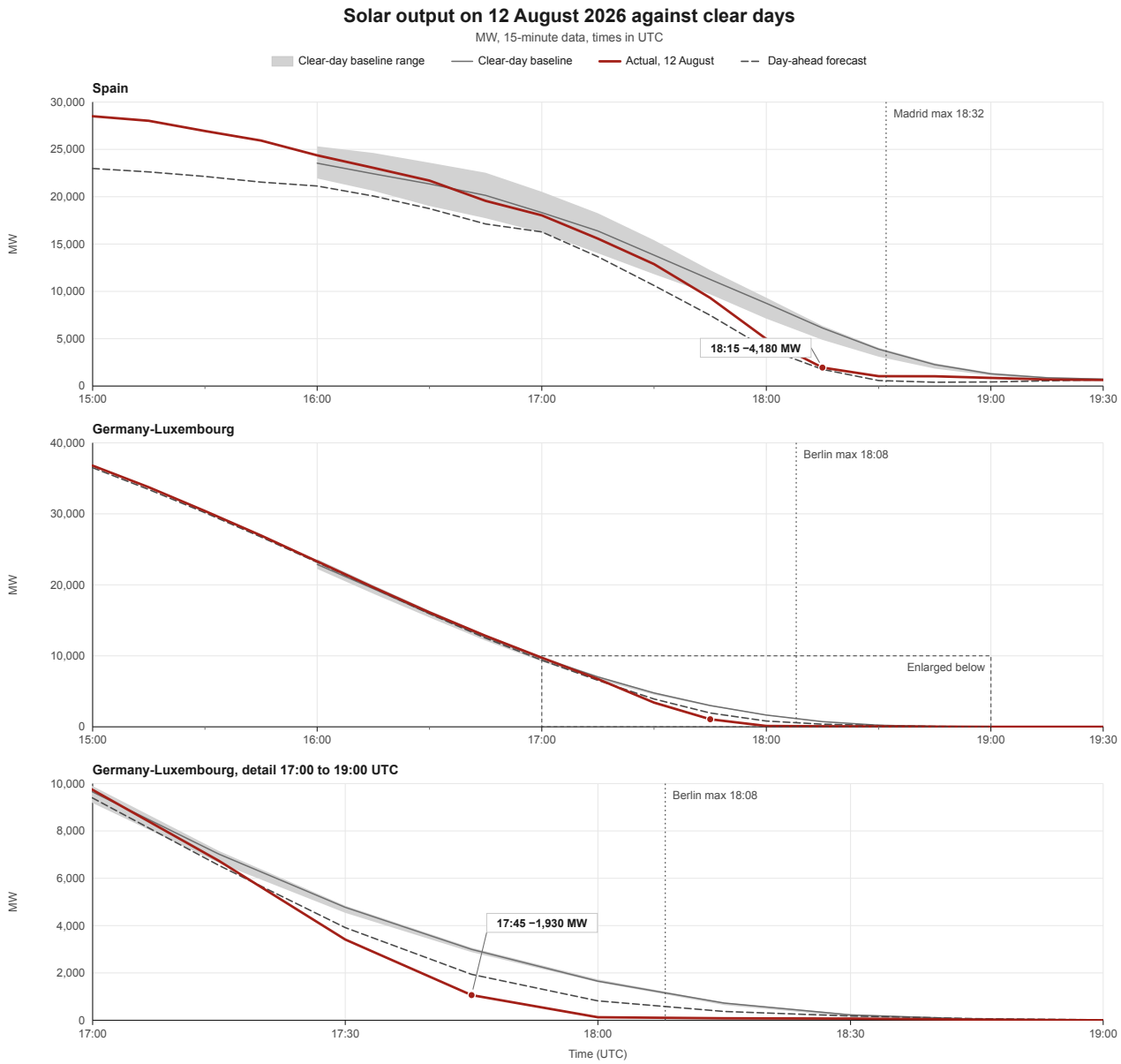


Figure 1. Solar output on 12 August 2026 in Spain and Germany-Luxembourg against clear days, with an enlarged view of the German evening.

4. Across the zones with usable data

Five bidding zones had both 15-minute data and a clear afternoon: Spain, Germany-Luxembourg, France, Austria and Czechia. Their combined shortfall peaked at 5,814 MW at 18:00 UTC. Taking the extremes of each zone's clear-day range, the combined figure could be as low as 4,053 MW or as high as 6,533 MW.

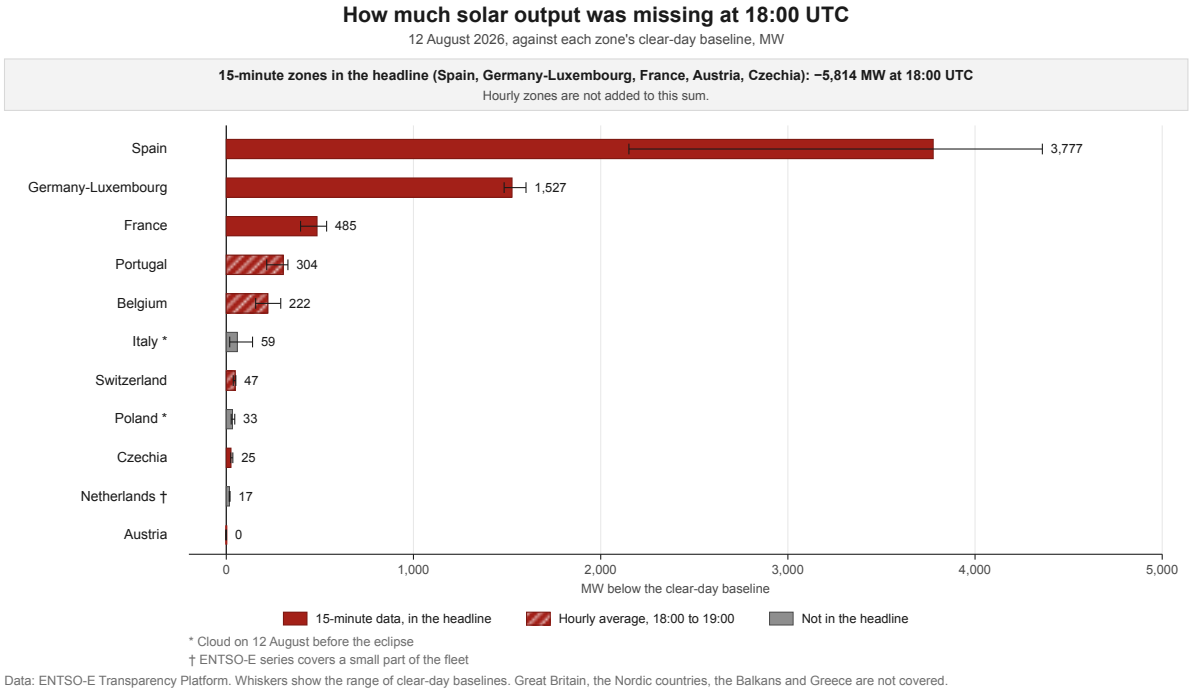


Figure 2. Solar output missing at 18:00 UTC by bidding zone, against each zone’s clear-day baseline.

So the 5.8 GW and ENTSO-E's 9.7 GW measure different things. The European number was a clear-sky forecast for a wider group of countries.

5. Small in energy, visible in the control room

The eclipse made only a small dent in the energy total. Over its eclipse window Spain's solar shortfall came to 3,914 MWh, 1.3% of the 293.76 GWh of solar it generated that day. Germany-Luxembourg lost 1,482 MWh, 0.3% of 493.56 GWh, and 12 August turned out to be its highest solar day of the 21 examined.

The operational impact was still real. NESO issued a precautionary Electricity Margin Notice for the evening peak in Great Britain and cancelled it before real time.

6. Why forecast misses point to storage

The two day-ahead misses ran in opposite directions. Spain's forecast for 18:30 UTC came in 460 MW below outturn, so it slightly overestimated the eclipse. Germany-Luxembourg's forecast for 17:45 UTC was 877 MW above outturn, so it underestimated the dip. Either way, hundreds of megawatts arrived that the day-ahead schedule did not contain, and the operators had warned in advance that cloud could change the outcome.

Covering that difference in real time is a job for fast-responding resources, and grid-scale batteries can do it if they are built, qualified and used by the system operator. Sustainable Digital Assets Inc., issuer of SDA Token (SDA), lists battery energy storage systems among its proposed projects. They are proposals, not operating assets.

DATA AVAILABILITY

The summary tables behind Table 1 and Figures 1 and 2 are archived with this note (https://doi.org/10.5281/zenodo.24290240) and published with the online article. They hold the clear-day baselines, shortfalls by zone and quarter-hour, forecasts against outturn and daily solar energy, not the full source series.

Source data: ENTSO-E Transparency Platform (transparency.entsoe.eu): actual generation per production type (solar, document A75) and day-ahead and intraday solar forecasts (A69), 2 to 22 August 2026, for the bidding zones in the tables. Modified: for each zone we built a clear-day baseline per quarter-hour, subtracted actual output and summarised the shortfall by zone, time slot and day; the tables contain those results and the actual values inside the eclipse window only. Retrieved 14 September 2026. Not endorsed by ENTSO-E.

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DISCLOSURE

Mikko Rautiainen is Chief Technology Officer of Sustainable Digital Assets Inc., the issuer of SDA Token (SDA). The article was written and published by the issuer. It is informational and is not investment advice. Information about SDA Token is in the white paper (https://sdafintech.com/documentation/whitepaper) and the risk disclosures (https://sdafintech.com/documentation/risk-disclosures).

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LICENCE

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