## 1. EXECUTIVE SUMMARY

Clean Power Research commissioned Enertis Applus+ to perform an independent technical validation of the SolarAnywhere v4.0 irradiance dataset against a global portfolio of ground-based irradiance measurements. The objective of the study was to assess the accuracy and consistency of SolarAnywhere Global Horizontal Irradiance (GHI) and Direct Normal Irradiance (DNI) data for solar resource assessment applications.

The validation was performed using quality-controlled observations from a diverse set of meteorological monitoring networks spanning multiple geographic regions and Köppen climate classifications. A standardized workflow was developed to harmonize observational and modeled datasets, apply quality-control procedures, perform temporal alignment, and calculate statistical performance metrics at hourly, daily, monthly, and annual timescales.

The analysis was based on the calculation of Relative Mean Bias Error (rMBE), Relative Mean Absolute Error (rMAE), and Relative Root Mean Square Error (rRMSE). Results were evaluated at the station level and subsequently aggregated by geographic region and climate classification using observation-weighted methodologies.

The validation results demonstrate a high level of agreement between SolarAnywhere and the reference observations. Across the complete validation sample, SolarAnywhere exhibits an overall long-term bias of approximately +0.3% for GHI and +0.5% for DNI, indicating the absence of significant systematic overestimation or underestimation.

The regional analysis shows that GHI performance is highly consistent across all evaluated regions, with long-term biases generally remaining within approximately ±1.2%. DNI exhibits greater spatial variability, as expected for a variable that is more sensitive to atmospheric conditions and measurement uncertainty; however, aggregated regional biases remain within ±5% throughout the validation sample.

| Key Validation Results | | |
|---|---|---|
| **Metric** | **GHI** | **DNI** |
| Global rMBE | 0.30% | 0.52% |
| Std Dev | 2.33% | 3.08% |
| Stations Evaluated | 110 | 72 |
| Maximum Regional Bias | 1.15% | 4.32% |

Table 1.1 Key Validation Results

The analysis of error magnitude indicates that hourly deviations are substantially reduced as data are aggregated over longer periods. Annual GHI rMAE values remain below approximately 2.1% across all regions, while annual rRMSE values remain below approximately 2.5%. These results demonstrate that short-term fluctuations have a limited influence on long-term resource

characterization and confirm the suitability of SolarAnywhere for long-term solar resource assessment applications.

The climate-based analysis further indicates that SolarAnywhere maintains a consistent level of performance across a broad range of Köppen climate classes, including tropical, arid, temperate, continental, and polar environments. No significant climate-dependent biases were identified for the most representative climate categories included in the study.

The temporal analysis of annual metrics indicates stable performance throughout the evaluation period.

Based on the results obtained, Enertis concludes that SolarAnywhere v4.0 demonstrates a high level of accuracy, consistency, and geographical robustness when compared against the observational datasets evaluated in this study. The low long-term bias, the favorable error statistics, and the stability of the results across regions and climate zones support the suitability of SolarAnywhere v4.0 irradiance data for solar resource assessment and energy yield evaluation applications.