

TWO YEARS OF OPERATION OF SOLAR BRISE-SOLEILS AT GERMINARE INSTITUTE IN BRAZIL:

Performance monitoring and BIMsolar simulations

Clarissa Debiazi Zomer PhD., Arqitetando Energia Solar, Brazil



Computer simulations

Before PV system implementation:

- Used satellite-based irradiation data, transposed to tilted module orientations.
- Applied a simplified energy-generation formula for expected output.

In 2025, the system was re-simulated using the new BIMsolar BIPV software.

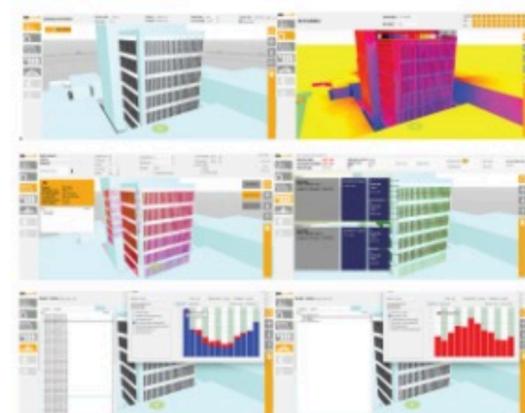


Figure 7. BIMsolar simulation for the Germinare brise-soleil system.

Simulated x Measured



Figure 8. Comparison between simulated and measured total energy generation.

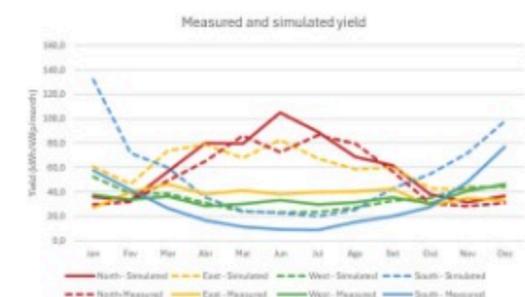


Figure 9. Simulated vs. measured energy generation per façade orientation.

- Formula-based model: +7% vs. BIMsolar
- BIMsolar (2025): +36% vs. measured
- Main discrepancy cause: PVGIS irradiation overestimation in January: +35% and April: +20%

Conclusions

- Solar brise-soleils on façades are technically viable in Brazil.
- All façades contribute meaningfully due to seasonal shifts in solar availability.
- BIMsolar provides more reliable BIPV predictions than formula-based methods.
- Project serves as a replicable model for institutional buildings seeking architectural PV integration. This study reinforces the potential of façade-integrated photovoltaics in institutional buildings and provides a valuable case study for future BIPV applications in Brazil.

Acknowledgments

Edo Rocha Arquiteturas: for embracing our design recommendation and contributing to the development of the final BIPV solution.
Garantia Solar BIPV: for its pioneering role in developing and executing a project of this scale and complexity.
Instituto J&F: for believing in this photovoltaic façade concept and making its implementation possible.
PV Doctor: for initiating detailed data acquisition that will enable extensive performance analyses in the future.



Partners



Figure 1. Germinare building with photovoltaics brise-soleils in São Paulo, Brazil.

Background

- Six-story educational building (São Paulo, Brazil).
- BIPV system fully integrated into vertical photovoltaic brise-soleils on all façades.
- Recognized nationally and internationally as a reference for BIPV in educational buildings.
- Collaboration between Edo Rocha Arquiteturas, Arqitetando Energia Solar, and Garantia Solar BIPV.

Results

System-wide metrics

- Average monthly generation: 2,422 kWh
- Average monthly GHI: 137 kWh/m²
- Annual yield: 466.1 kWh/kWp

Seasonal energy behavior

- Autumn & Spring: East façade leads
- Winter: North façade dominates
- Summer: South façade has highest yield
- Strong seasonal complementarity between façades

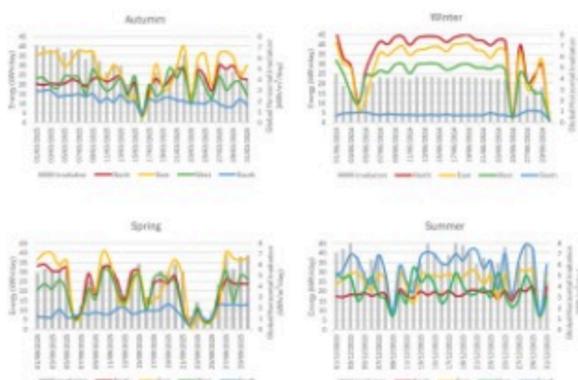


Figure 3. Daily energy generation in four seasons.



Figure 4. Daily energy generation on selected clear-sky days of each season.

Monthly and Annual Yield per Façade



Figure 5. Monthly yield per façade orientation.

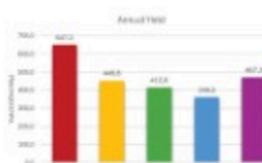


Figure 6. Annual yield per façade orientation.

System Overview

- 564 CIGS modules (125 W): 70.5 kWp
- Installed on North, South, East, West façades
- Custom vertical brises: 3.3 m x 0.35 m, 30° tilt, 66 cm spacing
- 8 string inverters
- Aluminum + ACM support structures

Table 1. Configuration of the Germinare brise-soleils PV system.

System configuration					
Inverter	Number of PV modules	Nominal Power (W)	Installed capacity (kWp)	Inverter Power (kW)	Overload
North #1	112	125	14	12	117%
North #2	26	125	3.25	2	163%
East #1	90	125	11.25	12	94%
East #2	88	125	9.25	12	89%
West #1	90	125	11.25	12	94%
West #2	42	125	5.25	3.6	179%
South #1	112	125	14	12	117%
South #2	26	125	3.25	2	163%
Total	564	125	70.5	67.6	104%



Figure 2. Structure of the photovoltaics brise-soleils

Method

- Energy data: June 2023–Oct 2025 (FusionSolar)
- Irradiation data: INMET – Mirante A701 (São Paulo)
- Simulation tools: Initial formula-based model + BIMsolar (2025)
- Analyses:
 - Daily & monthly generation
 - Seasonal comparison
 - Yield by façade
 - Simulated vs. measured energy