Multi-Site Solar Resource Screening v1.1

NASA POWER API | GHI-Based Screening Assessment

January 31, 2026

Important Notice

> ⚠ **Methodology Disclaimer**
> Energy and capacity factor estimates are screening-level derived from GHI, not a full plane-of-array (POA) + system simulation. For bankable estimates, use PVWatts, SAM, or site-specific modeling tools.

Data Window

Start Date:	2025-01-01
End Date:	2025-12-31
Months Covered:	12
Window Note:	12 complete calendar months (Jan-Dec 2025)

System Assumptions

System Configuration

Capacity:	100 kW
Tilt:	latitude-based (site-specific)
Azimuth:	180° (South)
Tracking:	none (fixed-tilt)

Loss Assumptions

Inverter Efficiency:	96.0%
Wiring Losses:	2.0%
Soiling Losses:	3.0%
Mismatch Losses:	2.0%
Availability:	98.0%
Total Derate Factor:	0.87

Caveats

- GHI-based screening estimate only
- POA irradiance not modeled (requires PVWatts/SAM for accuracy)
- Temperature derating not included in this screening
- Albedo assumed 0.2 (ground reflectance)
- No shading or horizon effects modeled

Site Rankings by Solar Resource

Rank	Site	Avg GHI (kWh/m²/day)
1	Phoenix, AZ	5.78
2	Los Angeles, CA	5.5
3	Las Vegas, NV	5.49
4	Denver, CO	4.82
5	Seattle, WA	3.61

Best Solar Resource: Phoenix, AZ

Lowest Solar Resource: Seattle, WA

GHI Spread: 2.17 kWh/m²/day (60.1%)

Site: Phoenix, AZ

GHI Statistics

Avg Daily:	5.78 kWh/m²
Max Daily:	9.04 kWh/m²
Min Daily:	0.89 kWh/m²
Annual:	2102.6 kWh/m²

Clear-Sky Fraction

Value: 89.5%

Definition: GHI / Clear-Sky GHI × 100

NOT industry 'Performance Ratio'; renamed for clarity (fix L01)

Temperature

Avg Ambient: 23.4°C

Max Recorded: 47.9°C

Ambient air temperature; cell temperature not modeled (fix L07)

Seasonal GHI (kWh/m²/day)

Winter:	3.82
Spring:	6.82
Summer:	7.74
Fall:	4.68

Capacity Factor Screening

Fixed-Tilt Estimate:	20.9%
Single-Axis Tracking:	26.1%

GHI-based screening; NOT POA simulation (fix L02)

Site: Los Angeles, CA

GHI Statistics

Avg Daily:	5.5 kWh/m²
Max Daily:	9.0 kWh/m²
Min Daily:	0.25 kWh/m²
Annual:	2007.5 kWh/m²

Clear-Sky Fraction

Value: 86.2%

Definition: GHI / Clear-Sky GHI × 100

NOT industry 'Performance Ratio'; renamed for clarity (fix L01)

Temperature

Avg Ambient: 17.7°C

Max Recorded: 36.5°C

Ambient air temperature; cell temperature not modeled (fix L07)

Seasonal GHI (kWh/m²/day)

Winter:	3.42
Spring:	6.16
Summer:	7.87
Fall:	4.51

Capacity Factor Screening

Fixed-Tilt Estimate:	19.9%
Single-Axis Tracking:	24.9%

GHI-based screening; NOT POA simulation (fix L02)

Site: Las Vegas, NV

GHI Statistics

Avg Daily:	5.49 kWh/m²
Max Daily:	9.14 kWh/m²
Min Daily:	0.54 kWh/m²
Annual:	2004.7 kWh/m²

Clear-Sky Fraction

Value: 83.9%

Definition: GHI / Clear-Sky GHI × 100

NOT industry 'Performance Ratio'; renamed for clarity (fix L01)

Temperature

Avg Ambient: 21.2°C

Max Recorded: 45.2°C

Ambient air temperature; cell temperature not modeled (fix L07)

Seasonal GHI (kWh/m²/day)

Winter:	3.44
Spring:	6.5
Summer:	7.58
Fall:	4.43

Capacity Factor Screening

Fixed-Tilt Estimate:	19.9%
Single-Axis Tracking:	24.9%

GHI-based screening; NOT POA simulation (fix L02)

Temperature Comparison

Site	Avg Temp (°C)	Max Temp (°C)
Phoenix, AZ	23.4	47.9
Los Angeles, CA	17.7	36.5
Las Vegas, NV	21.2	45.2
Denver, CO	10.2	36.0
Seattle, WA	9.4	30.3

Higher temperatures reduce panel efficiency (~0.4%/°C above 25°C). Phoenix max temp: 47.9°C vs Seattle max: 30.3°C. Desert sites require temperature derating in production models.

Capacity Factor Summary

Fixed-Tilt Estimates

Site	CF (%)
Phoenix, AZ	20.9%
Los Angeles, CA	19.9%
Las Vegas, NV	19.9%
Denver, CO	17.5%
Seattle, WA	13.1%

Single-Axis Tracking Estimates (~25% boost)

Site	CF (%)
Phoenix, AZ	26.1%
Los Angeles, CA	24.9%
Las Vegas, NV	24.9%
Denver, CO	21.9%
Seattle, WA	16.4%

These are GHI-based screening estimates only. Actual CF requires POA modeling.

Methodology & Data Quality

Source:	NASA POWER API (RE community)
Parameters:	ALLSKY_SFC_SW_DWN (GHI), CLRSKY_SFC_SW_DWN, T2M, T2M_MAX
Total Data Points:	1822
Version:	1.1
Generated:	2026-01-31T00:19:54.096782

v1.1 Fixes Applied:

- L01: Renamed 'Performance Ratio' to 'Clear-sky fraction' with correct definition
- L02: Added 'GHI-based screening' disclaimer throughout
- L03: Added explicit loss assumptions block (inverter, wiring, soiling, etc.)
- L04: Clean 12-month window (Jan-Dec 2025), no off-by-one
- L05: Removed placeholder text
- L06: Clearsky fraction clearly labeled as NOT industry PR
- L07: Temperature labeled as ambient; cell temp not modeled
- L08: Seasonal variation formula defined
- L09: Removed 'Forecast' language (historical data)
- L10: Temperature data provided per site to support derating claims
- L11: Removed unsupported correlation claims
- L12: Tracking boost caveat added

Clean Metrics Studio