SOLCAST

a DNV company

Recent improvements in accuracy and interactivity of satellite-derived irradiance data, and associated validations

Hugh Cutcher, Michael Foley, Harry Jack, James Luffman

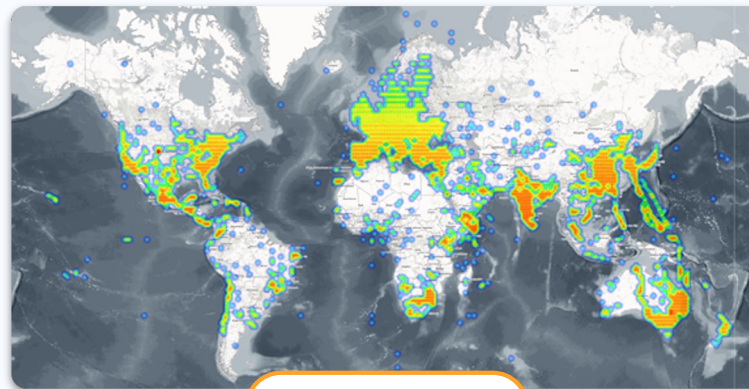# Solcast (a DNV company): Company overview

| Founded in **2016** | Acquired by DNV in **2022** | Headquartered in **Sydney** | Sales & Support in **USA & EU** | Serving **300+ Customers** |

200+
Validation Sites

Recent API Usage

Providing services for
200+ GW

| **130+** Countries | **2TB** Data every day | **30+** Publications | **26 million** API calls daily | **99.99%** API uptime |

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Wed 08 Nov 2023 (UTC)

Solar radiation (GHI) W/m²

0   1000

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Inputs and algorithms

Cloud Model

Historic	Live	Forecast		
2007 to -7 Days	-7 days to present	Present to +2 hours **Nowcast**	+2 hours to +4 hours *Blend*	+4 hours to +14 days **NWP**

GMS Satellite Archive

- NOAA GOES
- EUMETSAT Meteosat
- JMA MTSAT & Himawari

Live GMS Satellite Data

- GOES 16 & 18
- Meteosat 09, 10 & 11
- Himawari 9

Nowcast
(GMS Satellite Extrapolation)

- GOES 16 & 18
- Meteosat 09, 10 & 11
- Himawari 9

Numerical Weather Prediction

- NOAA GFS, ECMWF IFS
- BOM ACCESS-G (UKMO)
- WRF

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Irradiance Model

Algorithms
- REST2 clear sky model
- Solcast cloud model
- Solcast separation model
- Transposition model (Hay, Reindl)
- Snow Soiling (Ryberg and Freeman)

Additional Inputs
- Albedo: MERRA2, MODIS
- Aerosols: CAMS, MERRA2

Solcast data specifications

Solcast Cloud Tracking

Solcast Actuals: 2023-03-03 15:02:30Z   GFS: 2023-03-03 16:00Z
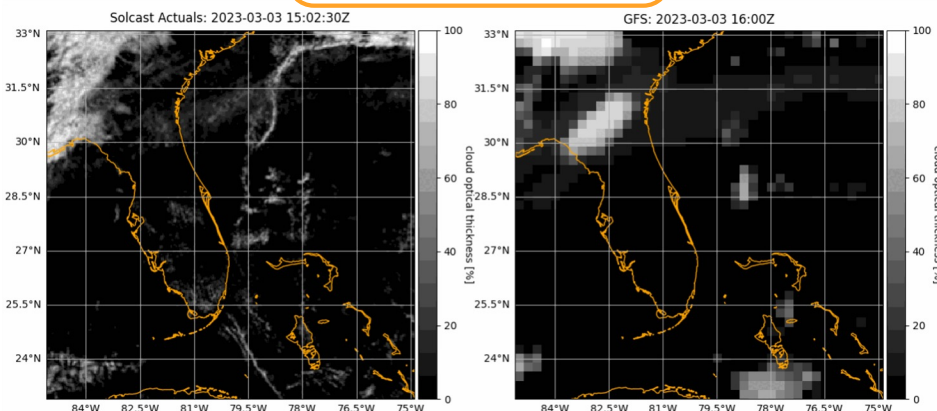
5, 10, 15, 20, 30, 60 min.	90m terrain, 2km cloud
2007 to +14 days	Updates every 5-15 min

- 12+ irradiance params
- 30+ weather params
- Terrain shading
- Albedo
- Snow soiling

- PV power
- Clear-sky scenarios
- p10/p90 forecasts
- Solar eclipses
- Historical forecasts

- Python SDK
- Example Notebooks
- Unmetered test locations
- Multiple formats

- ISO 27001 certified
- TLS 1.2 compliant
- 24x7 support
- SLA options

JSON, CSV, TMY, PVSYST	Native Web Toolkit
99.99% uptime	180ms API latency

Solcast API & Toolkit

Native Integrations
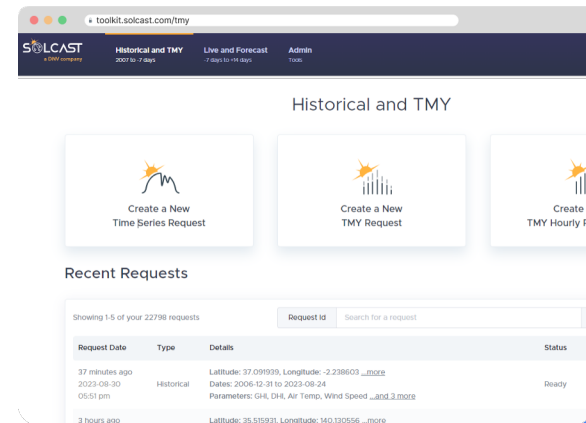
Recent irradiance algorithm improvements

User-optional terrain shading

- 150m global terrain data

- Tested at 15 terrain-affected locations

- Users simply append "&terrain_shading=true" to their API calls, or select option in toolkit

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Quantifying 2022 irradiance modelling improvements

70-site internal Solcast validation results following improvements

	GHI		DNI	
	v1	v2	v1	v2
mean(bias %)	0.4%	-0.1%	-3.5%	0.9%
std(bias %)	2.6%	2.2%	6.7%	6.6%
mean(RMSE %)	17.9%	17.5%	40.8%	40.4%
mean(MAE %)	11.1%	10.7%	23.8%	23.5%

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- Improved Clear sky GHI, and DNI separation model
- Improved elevation corrections to input data
- Introduced aerosol corrections for CAMS and MERRA-2 aerosol inputs
- Switched to MODIS-based data for albedo -> clear sky GHI

External validation results 2023

Upcoming DNV 200+ site validation
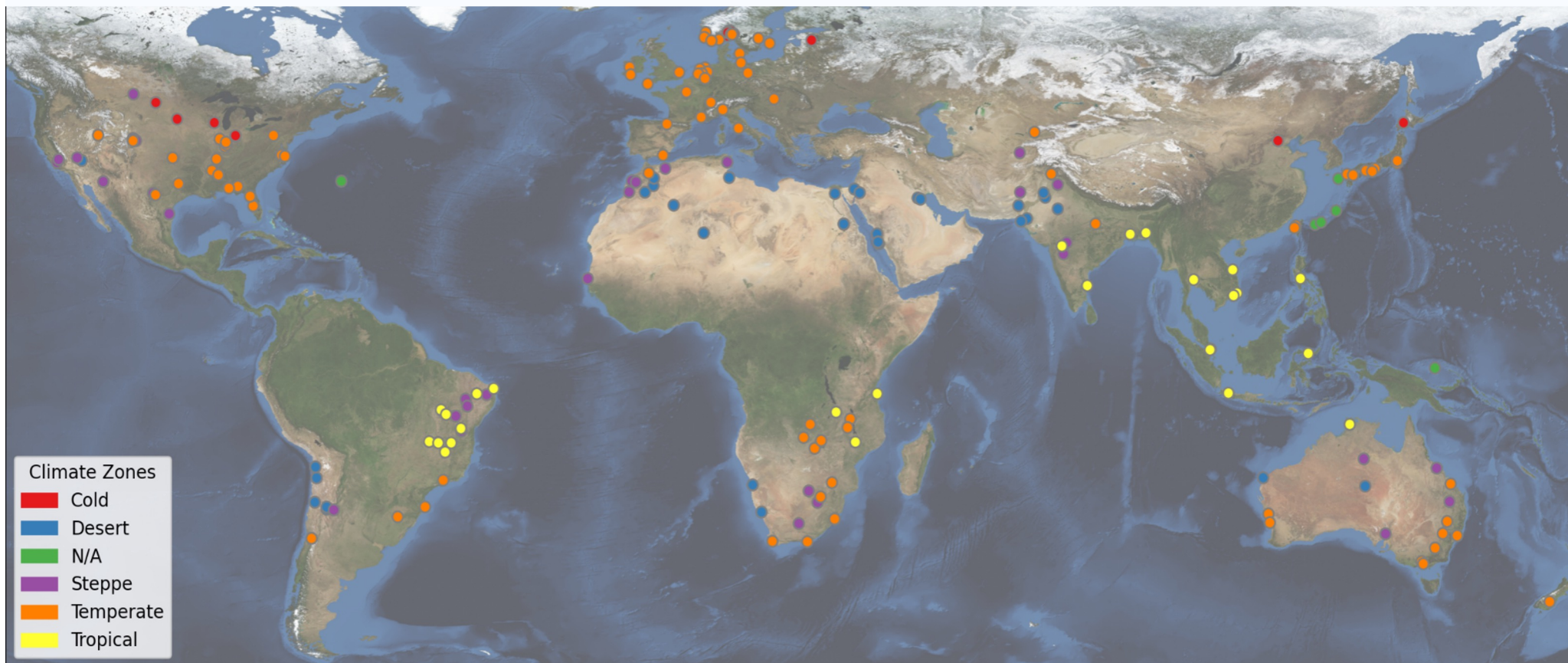
New PV power forecast validation

Solcast 1ˢᵗ place
Independent trial results
8 vendors, 5 sites, 3 months
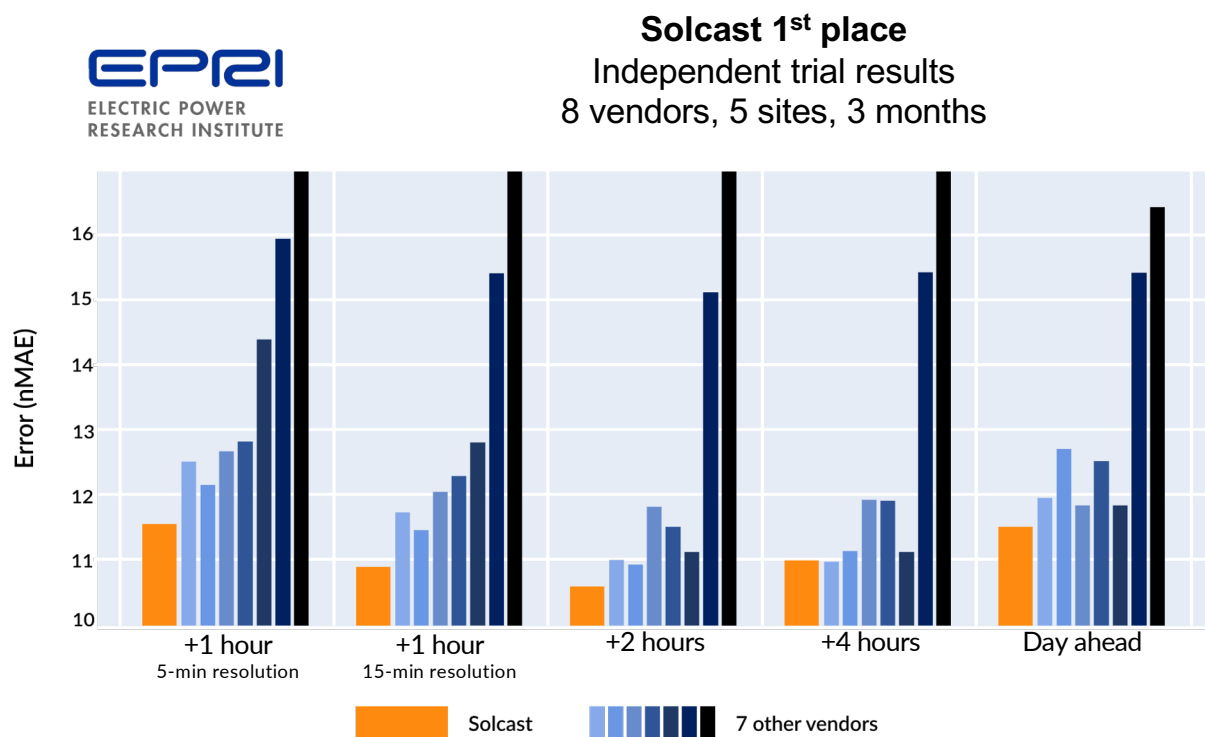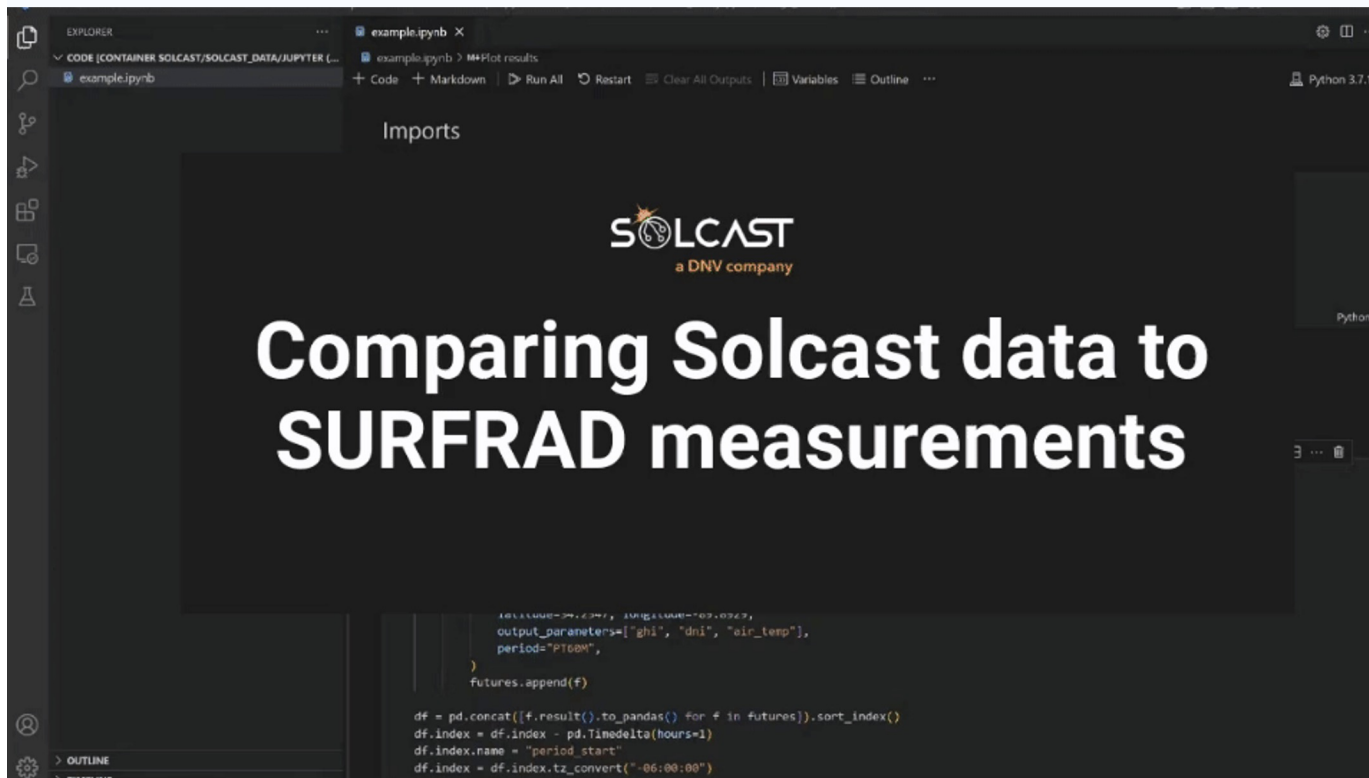
- Head-to-head trial administered through Solar Forecast Arbiter
- Trial run for 5 sites across Southern USA
- Solcast 100% availability
- Solcast forecast clearly ahead in 4/5 time horizons

Product accessibility and interactivity upgrades

Synchronous API access for Historical Data & TMY

- 15+ year time series now take 4-20 seconds

- Synchronous API added early 2023 - allowing TMY and Time Series embedded into workflows
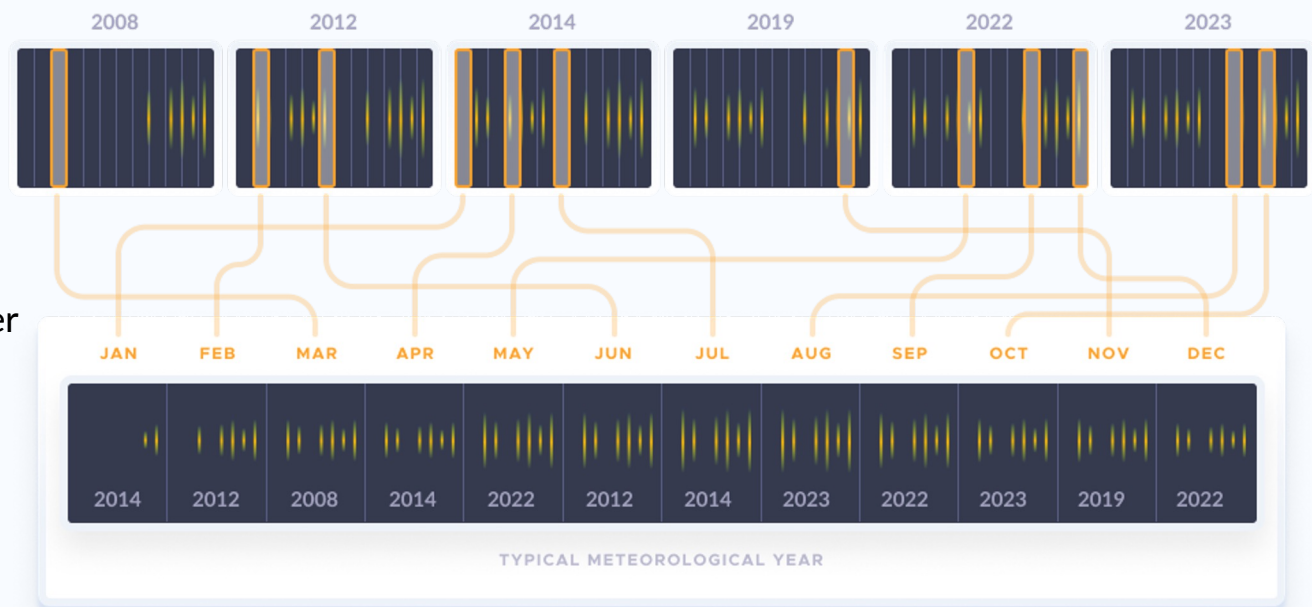
"TMY on the fly"

Input: User Requirements
- Lat/Lon
- **GHI/DNI weight**
- PXX selection
- 15-60 minute resolution
- GTI parameters, panel or site specification for GTI or PV Power

Time:
- 10-60 seconds (parameter dependent)

Output: Custom TMY file
- API
- CSV, JSON, PVSYST, SAM

Python SDK

Help developers, data scientists and engineers do their work faster, easier, better

- Data access
- Example notebooks
  - QC
  - Gap filling
  - Accuracy metrics

Looking into solcast data integration into pvlib.iotools

For any questions...

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