Solar Forecast Arbiter.org

SAND2019-7756C

An open source evaluation framework for solar forecasting

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Sharply Focused
Understanding Renewable Resources

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U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Outline

- Project Summary : Vision, timeline, milestones
- Technical aspects:
  - Data sharing policy
  - Use cases
  - Data modeling
  - Benchmark forecasts
  - Validation data sources
  - Data Model and Deployment
- Public engagement

Vision

Open-source framework for solar forecast evaluations that are impartial, repeatable, and auditable.

- Objective, consistent evaluations
  → better solar forecasts
  → increased confidence in use of forecasts
- Standardized, automated evaluations → reduce costs
- Easily extend to wind power and load forecasting

Timeline and Milestones

Year 1

Design, build, test and demonstrate the framework.

Year 2

Refine the framework and host two operational forecast competitions

Year 3

Support evaluations for Solar Forecasting II Topic 2 and Topic 3 awardees.

Transition framework to new operator.

Public Engagement

5 primary topics

- Data policies
- Use cases
- Data modeling
- Benchmark forecasts
- *Metrics and reporting (ongoing)*

Please join the Stakeholder Committee! (open to all)

solarforecastarbiter.org/stakeholdercommittee

Year 1 engagement process

Stakeholder Workshop

St. Paul, June 2018

→ Team discussions

Proposal documents

→ Stakeholder feedback

Revised documents

Stakeholder Meeting

Denver, June 2019

→ Stakeholder consensus

Initial capability documents

Data Sharing and Privacy

1. Organizations retain ownership of the data they upload
2. Users upload data to the framework on behalf of organizations.
3. Users control access and sharing of data. Default: private.
4. Users may delete data from the framework.
5. The framework will not expose data or statistics derived from the data, without explicit user permission.
6. Data will NOT be transferred to the new operator unless data owner explicitly permits transfer
7. Enabled by a standardized Nondisclosure Agreement

Use Cases

solarforecastarbiter.org/usecases

A. Compare a forecast to measurements (July)

B. Compare a probabilistic forecast to measurements

C. Compare multiple forecasts to measurements (July)

D. Compare forecasts to measurements for sites and aggregates

E. Evaluate an event forecast

F. Conduct a forecast trial (September, first trial in 2020)

G. (*stretch*) Compare multiple overlapping forecast runs to measurements

H. (*stretch*) Establish long-term performance baseline of state-of-the-art operational forecasts

Benchmark Forecasts

Required Attributes

- Available throughout the US
- Freely accessible or easily implemented
- Provide quantities of interest to both forecast users and providers
  - Irradiance
  - PV power
  - Net load (system load less behind-the-meter PV power)
- Stakeholder buy-in

Benchmark Forecasts

solarforecastarbiter.org/benchmarks

Irradiance and power forecasts

- For 1 hour – 7 day ahead and longer horizons:

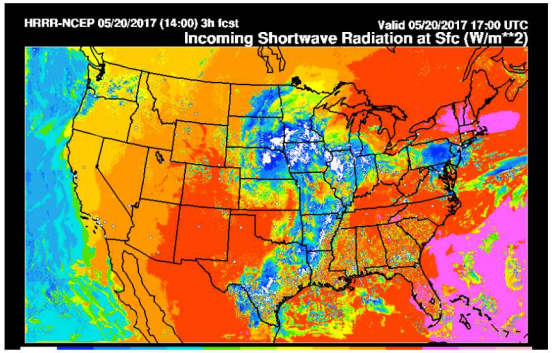
NOAA operational weather models that forecast irradiance, cloud cover

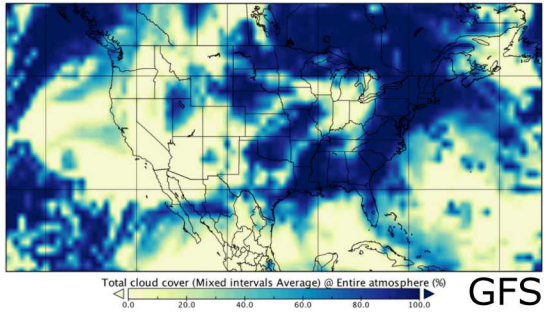
- HRRR, RAP, NAM, GFS (cloud cover)
- Cloud cover to irradiance by a linear translation
- Extensible framework accepts additional forecast sources

- For intrahour horizons:

Persistence, persistence of the clear sky index

- Net load: future development

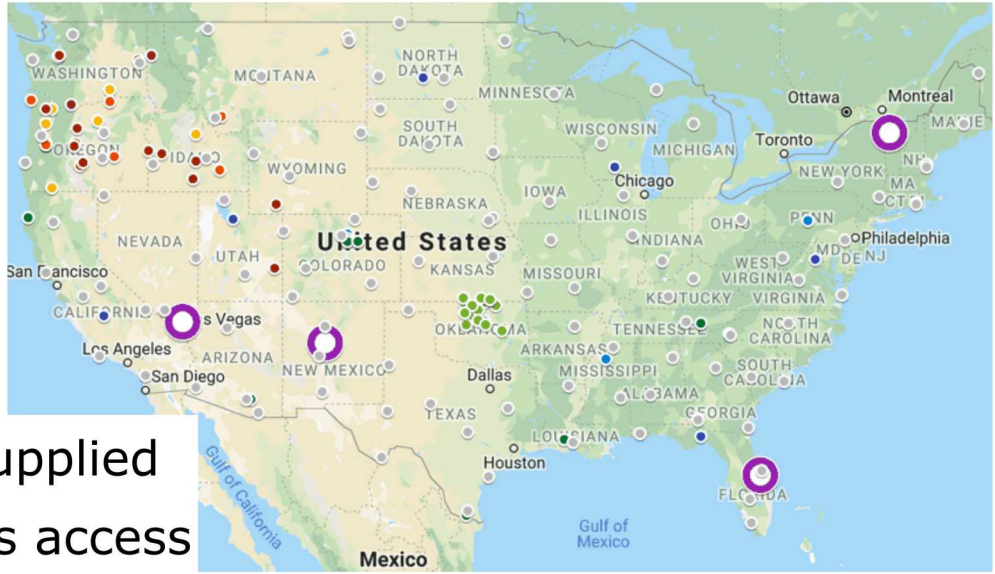




Validation and Reference Data Sources

Reference Data

- NOAA: SURFRAD, SOLRAD, CRN
- NREL MIDC
- DOE ARM
- U. Oregon SRML
- EPRI
- Sandia
- **RTC** (PV power)



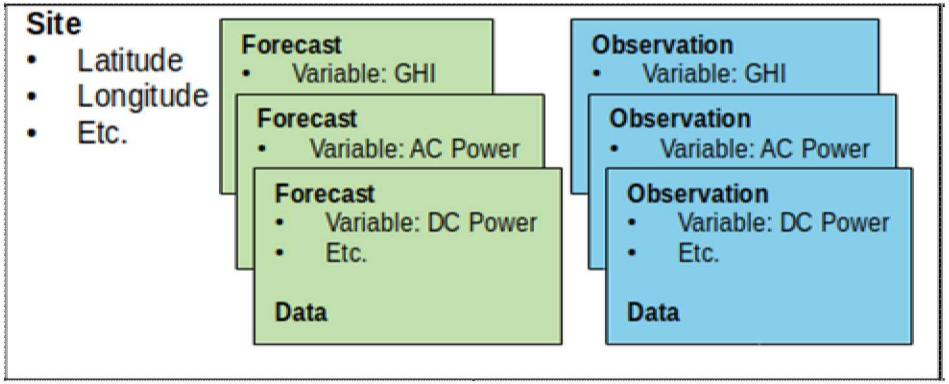
User Data

- Stakeholder supplied
- Owner controls access
- Commitments: TEP, Abengoa, Southern Co.
- **Contributions welcome**

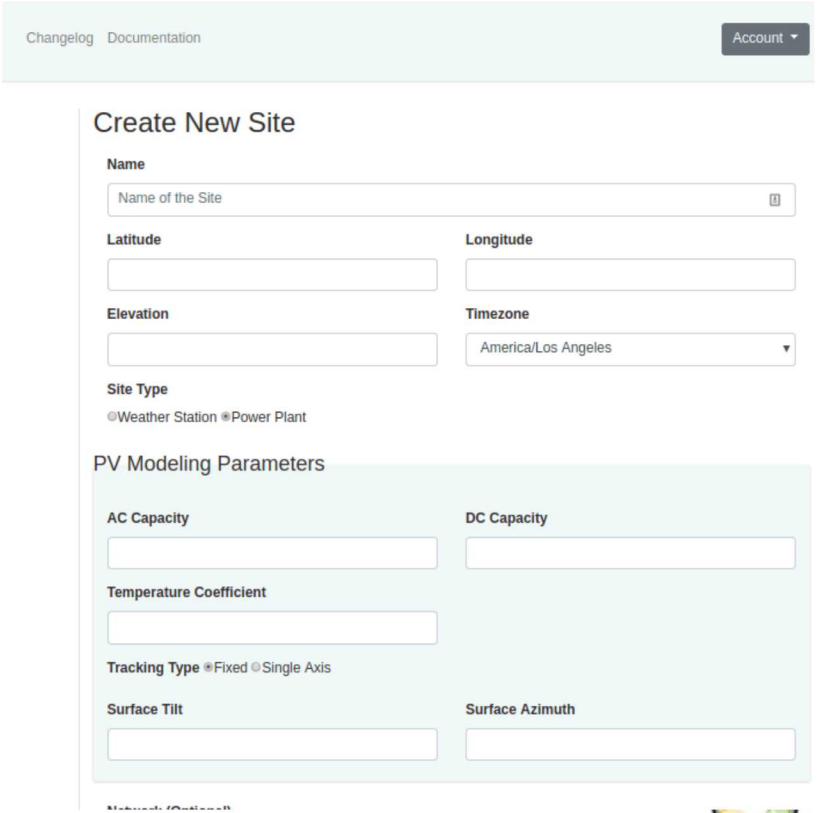
solarforecastarbiter.org/referencedata

Data Modeling

solarforecastarbiter.org/datamodel

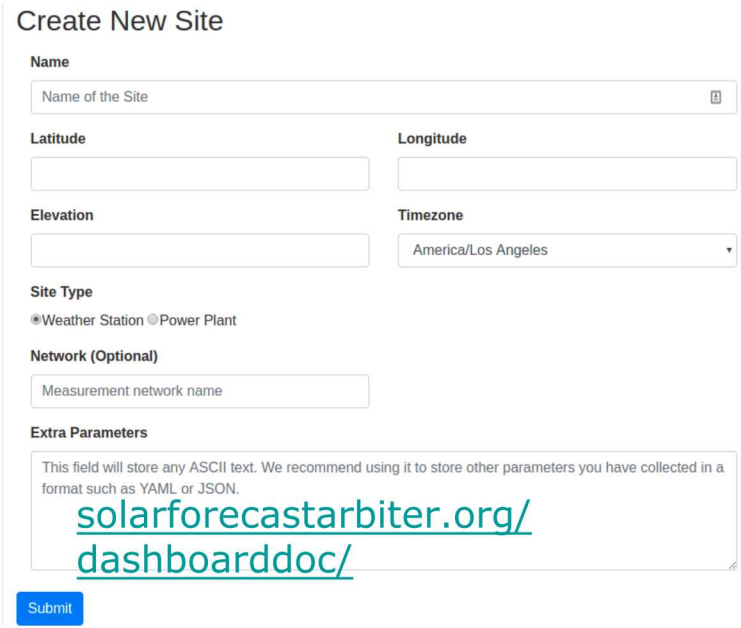


Weather to power using PVWatts from pvlib python



Implementation

Dashboard



solarforecastarbiter.org/dashboarddoc/

API

Solar Forecast Arbiter API (0.1.0)

Download OpenAPI specification: Download

Solar Forecast Arbiter Team: info@solarforecastarbiter.org
URL: https://github.com/solararbiter/solarforecastarbiter-api | License: MIT

The backend RESTful API for Solar Forecast Arbiter.

dev-api.solarforecastarbiter.org/

Public Engagement

- Initial capability August 2019
- Sign up for email list
- Please use the Arbiter!
  - Beta-test dashboard at www.github.com/SolarArbiter/2019-Denver-Workshop
- We look forward to your feedback

- Reference data sources for PV system power
- Code is open source
  - www.github.com/SolarArbiter
- Contributions are welcome
  - Forecast and data parsers
  - Data qualification toolkit
  - Reporting