

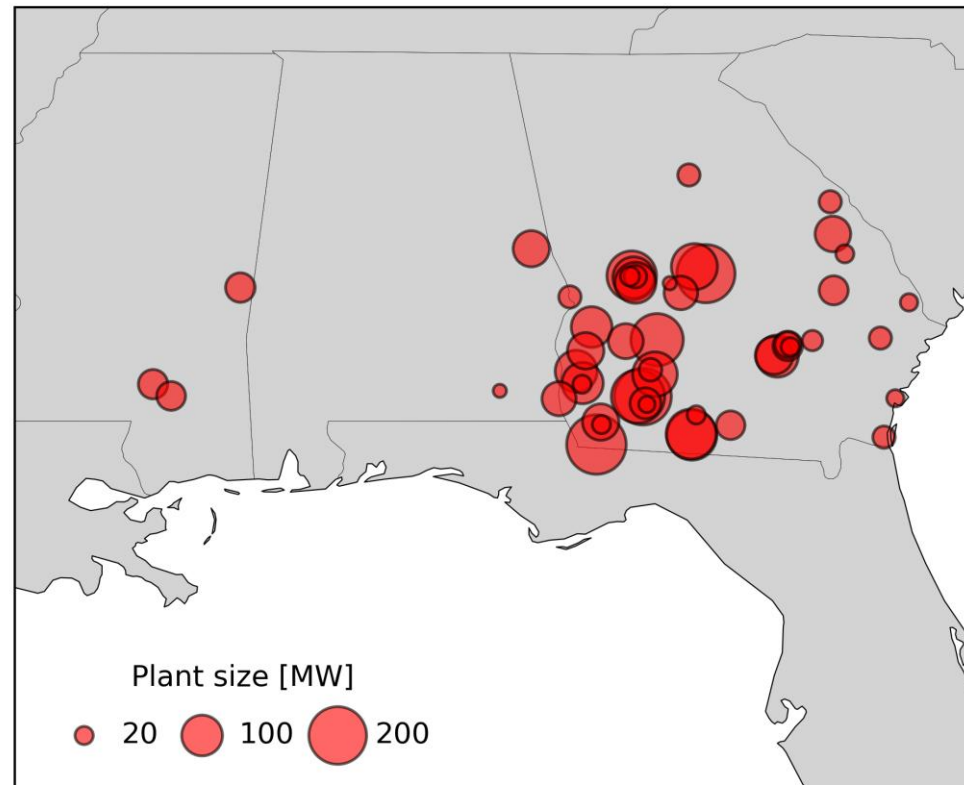
Open-Source Software: Use and Needs

Will Hobbs, PE
Southern Company R&D
Aug. 4, 2026



Southern Company R&D

- Solar R&D supporting 3 vertically integrated and 1 wholesale utility
 - ~3 GW of owned/operated solar
- Southern also operates a Southeast Balancing Area



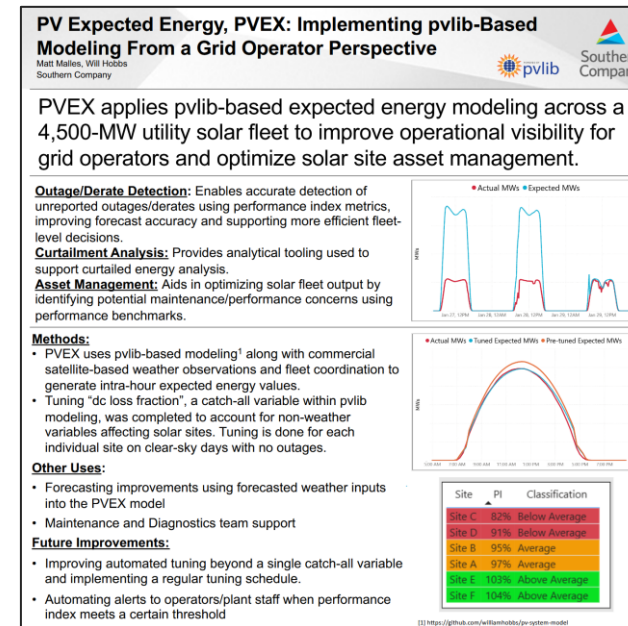
Solar in Balancing Area (~2024), Plants ≥ 10 MW

What's new since 2022?



More pvlib adoption! (not just R&D)

- Production tools supporting:
 - plant O&M (see Ishtiza's talk later)
 - grid operations and more plant O&M (Matt Malles' PVPMC poster*)
 - pvlib + real time satellite data for the whole balancing area
- More grid operations:
 - Forecasting, Probabilistic forecasting



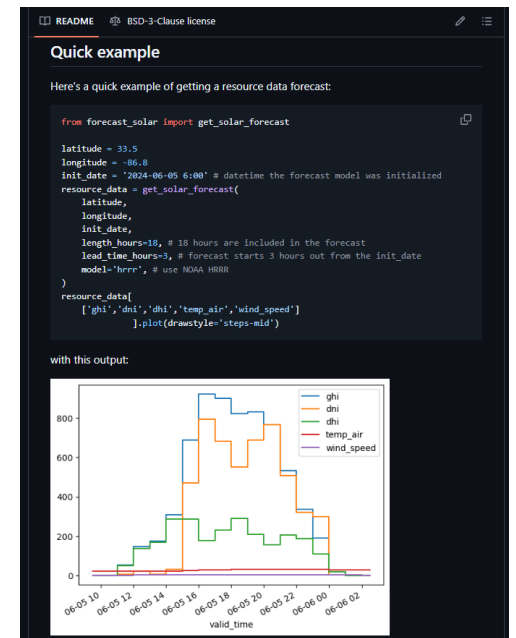
*Malles & Hobbs, PV Expected Energy, PVEX, PVPMC 2026, <https://pvpmc.sandia.gov/download/13131/?tmstv=1785762598>

Forecasts (2 separate open-source tools)

- Fleet-level probabilistic forecasts¹
 - **pvlib**, **Herbie** (Bryan Blaylock), **quantile-forest** (Zillow), **sklearn**
 - Used in operations
- **hefty**: lightweight energy forecasting tools²
 - `pip install hefty`
 - Access and process many major NWP/AIWP forecast models
 - Uses an open pvlib-based power model³



(redacted screenshot of cool internal probabilistic forecast dashboard)



[1] <http://github.com/williamhobbs/solar-fleet-forecast-probability-tool>

[2] <https://github.com/williamhobbs/hefty>

[3] <https://github.com/williamhobbs/pv-system-model>

Why open-source this work?

1. Make better tools to accelerate research *everywhere*
2. Free testing and contributions from others in industry

Adoption by industry w/ bug reporting!

Error from get_solar_forecast #56

Closed

kurt-rhee opened on Jun 10

Contributor

```
✓ Found | model=ifs | product=oper | 2026-Jun-10 00:00 UTC F102 | GRIB2 @ google | IDX @ local
/Users/kurt/Programs/mono/.venv/lib/python3.12/site-packages/herbie/core.py:1280: UserWarning: Will not remove GRIB file because it
  warnings.warn("Will not remove GRIB file because it previously existed.")
/Users/kurt/Programs/mono/.venv/lib/python3.12/site-packages/cfgrib/xarray_store.py:51: FutureWarning: In a future version of xarray
  o = xr.merge([o, ds], **kwargs)
Traceback (most recent call last):
  File "/Users/kurt/Programs/mono/forecast/_scripts/test_dbd_e2e_forecast.py", line 306, in <module>
    main()
  File "/Users/kurt/Programs/mono/forecast/_scripts/test_dbd_e2e_forecast.py", line 272, in main
    weather_forecast = WeatherForecast.create(
                      ^^^^^^^^^^^^^^^^^^^^^
  File "/Users/kurt/Programs/mono/forecast/p02_weather_forecast/c_orchestrator.py", line 45, in create
    forecast_output = make_weather_request(
                      ^^^^^^^^^^^^^^^^^^^^^
  File "/Users/kurt/Programs/mono/forecast/p02_weather_forecast/s02_make_request.py", line 36, in make_weather_request
    data_frame = hefty.solar.get_solar_forecast(
                  ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
  File "/Users/kurt/Programs/mono/third-party/hefty/src/hefty/solar.py", line 191, in get_solar_forecast
    ds = xr.merge(ds, compat='override')
          ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
  File "/Users/kurt/Programs/mono/.venv/lib/python3.12/site-packages/xarray/structure/merge.py", line 1127, in merge
    raise TypeError(
TypeError: objects must be an iterable containing only DataTree(s), Dataset(s), DataArray(s), and dictionaries: ['u10', 'v10']
```

I'm getting an error here trying to get data from ECMWF. It looks like I'm getting maybe wind speed at 10m `u10` and `v10` (I'm not exactly sure) in a format that xarray doesn't expect.

Create sub-issue



THANKS WILL #58

Closed

kurt-rhee opened on Jun 18

Contributor

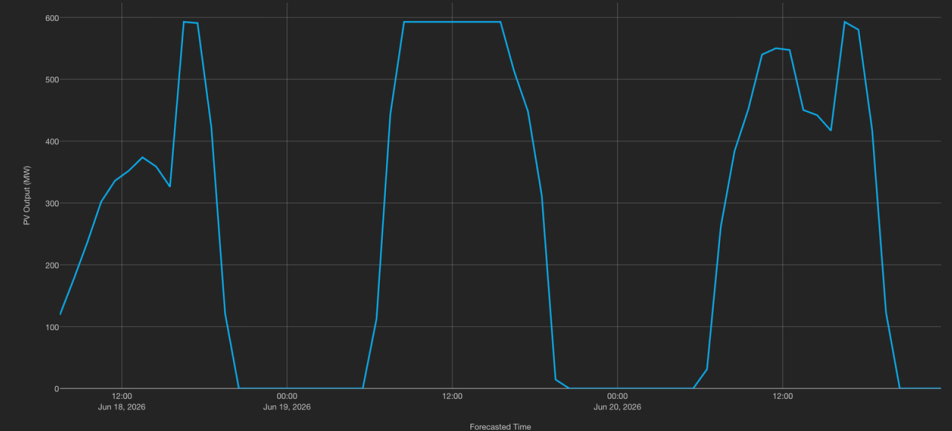
Forecast from hefty (ECMWF IFS) runs through lambda, runs through our pv expected energy model, drops into our database and is now visible in the Proximal frontend. Will start wiring it into other parts of the platform as well.

System Performance

Real-time Day View Long Term Forecast

<< < 2026/06/18 - 2026/06/20 > >>

FORECAST RUN
Jun 18, 2026 7:00 AM



Create sub-issue



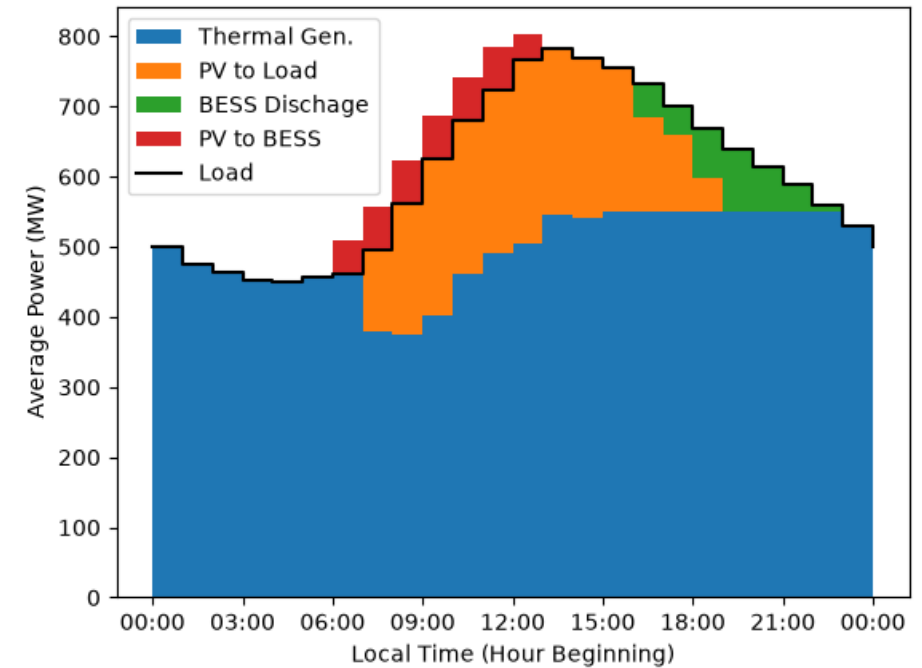
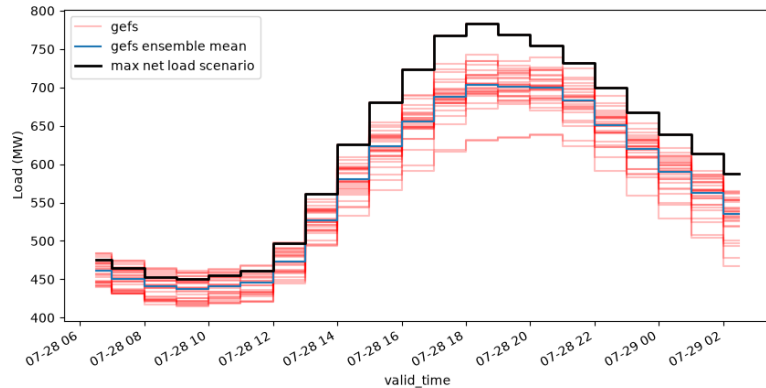
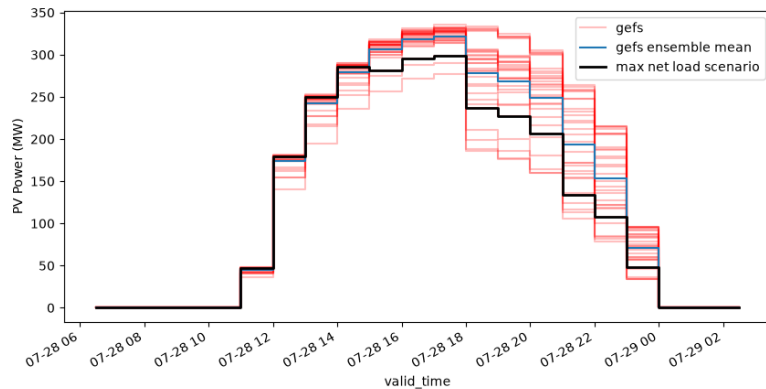
1

Why open-source this work?

1. Make better tools to accelerate research *everywhere*
2. Free testing and contributions from others in industry
3. Vendors can adopt it and give us better products
4. Increase interest from upstream entities
 - Team from ECMWF saw `hefty` and offered to help
 - dynamical.org is working to expand catalog to work with `hefty` (could *massively* speed up downloads)
5. To “give back”: none of this would be possible without open-source data and tools (personal projects, corporate projects, DOE-funded projects)

What's next?

- Load forecasting with heft y, integration with NLR SAM via PySAM for probabilistic scenario-based battery dispatch and reserve scheduling



What's needed?

Things we need

- More examples!
- Educational materials
 - E.g., open, interactive performance engineering digital textbook!
- Benchmark tools for PV analytics
 - Similar to benchmark/ref forecasts for Solar Forecast Arbiter
 - pvanalytics, PVMAC?
- Real-time satellite irradiance data (NOAA GOES DSR already exists¹, fold into NSRDB?) -> useful for load forecasting, not just solar...
- More open datasets
 - DOE Bounty Prize part II would be great, but even existing lab data would help (like data behind Lelia's paper²)
- Support for production cost modeling efforts (PyPSA)

[1] Hobbs et al., Free near-real-time irradiance data from NOAA GOES satellite program, <https://pvpmc.sandia.gov/download/13043/?tmstv=1785765391>

[2] Deville et al., Open-source photovoltaic model pipeline validation against well-characterized system data, <https://doi.org/10.1002/pip.3763>

Hesitancy to contribute

- Shyness/unfamiliarity
 - Process and people
- Protecting organization's IP/competitive advantage
- Is it allowed? (external publication/communication/IP policies, etc.)

Questions?

whobbs@southernco.com

