# PV Expected Energy, PVEX: Implementing pvlib-Based Modeling From a Grid Operator Perspective

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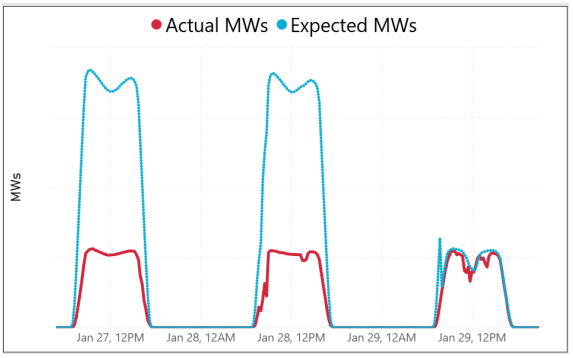
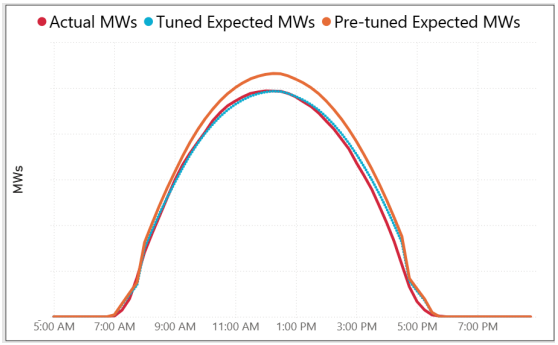
PVEX applies pvlib-based expected energy modeling across a 4,500-MW utility solar fleet to improve operational visibility for grid operators and optimize solar site asset management.

**Outage/Derate Detection:** Enables accurate detection of unreported outages/derates using performance index metrics, improving forecast accuracy and supporting more efficient fleet-level decisions.
**Curtailment Analysis:** Provides analytical tooling used to support curtailed energy analysis.
**Asset Management:** Aids in optimizing solar fleet output by identifying potential maintenance/performance concerns using performance benchmarks.




## Methods:

- PVEX uses pvlib-based modeling[1] along with commercial satellite-based weather observations and fleet coordination to generate intra-hour expected energy values.
- Tuning "dc loss fraction", a catch-all variable within pvlib modeling, was completed to account for non-weather variables affecting solar sites. Tuning is done for each individual site on clear-sky days with no outages.




## Other Uses:

- Forecasting improvements using forecasted weather inputs into the PVEX model
- Maintenance and Diagnostics team support

## Future Improvements:

- Improving automated tuning beyond a single catch-all variable and implementing a regular tuning schedule.
- Automating alerts to operators/plant staff when performance index meets a certain threshold

| Site | PI | Classification |
|---|---|---|
| Site C | 82% | Below Average |
| Site D | 91% | Below Average |
| Site B | 95% | Average |
| Site A | 97% | Average |
| Site E | 103% | Above Average |
| Site F | 104% | Above Average |

[1] https://github.com/williamhobbs/pv-system-model