Forecasting of DERs for Distribution Operations

Session 2: DER Forecasting for Operations

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Distribution utilities face varying levels of DER visibility

- Most utilities have “real-time” **net load** telemetry (SCADA, AMI)
- But few have **DER production** telemetry
  - especially for smaller DER (< 100 kW)
- Growth of DERs means **DER visibility** is becoming more critical for Distribution operations

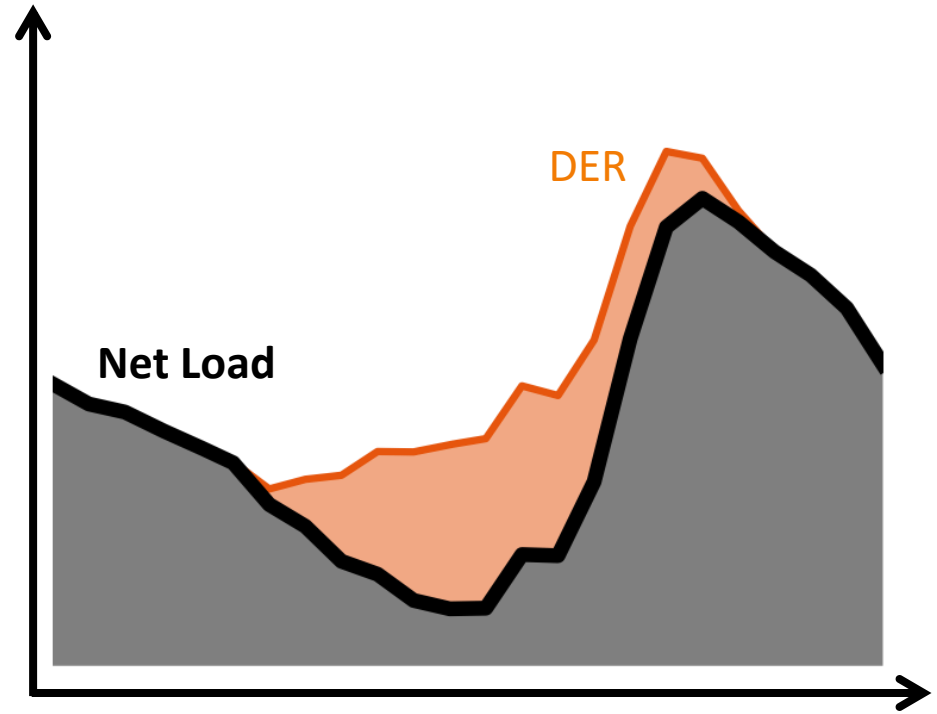
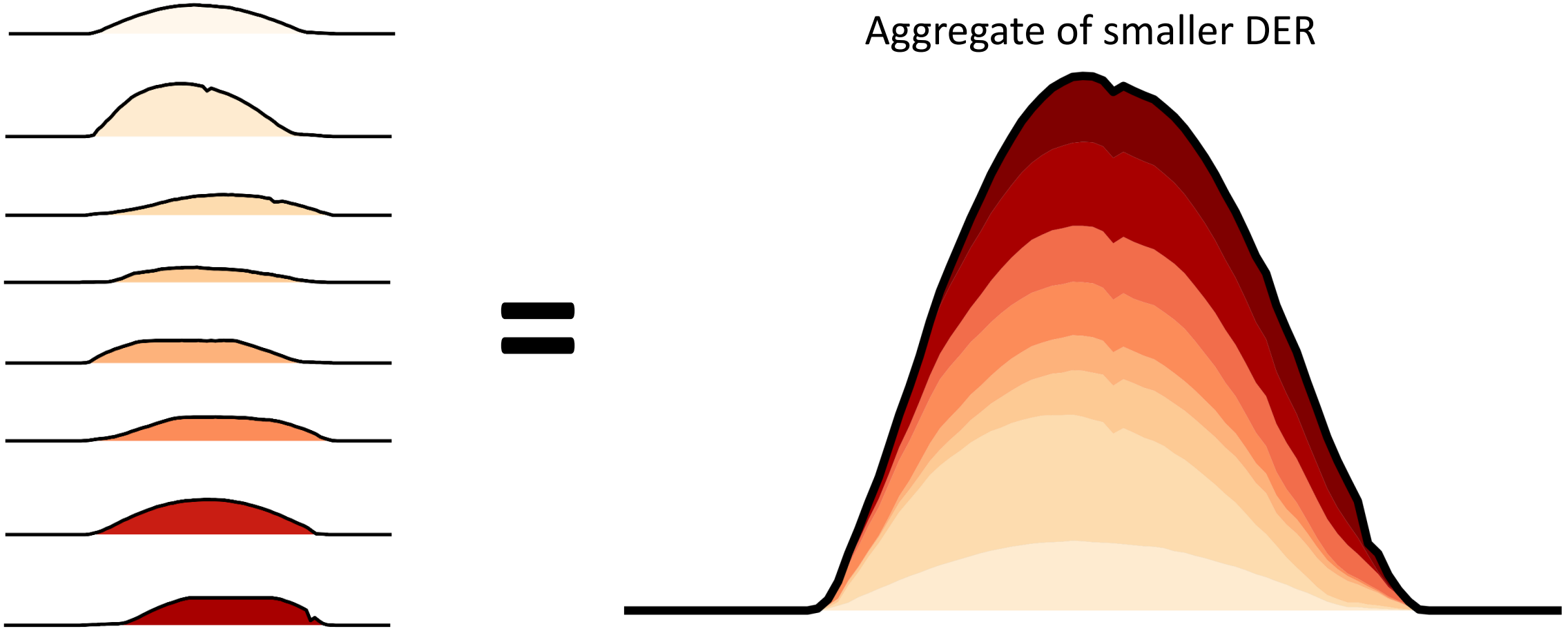


Figure: Example load profile with DER.

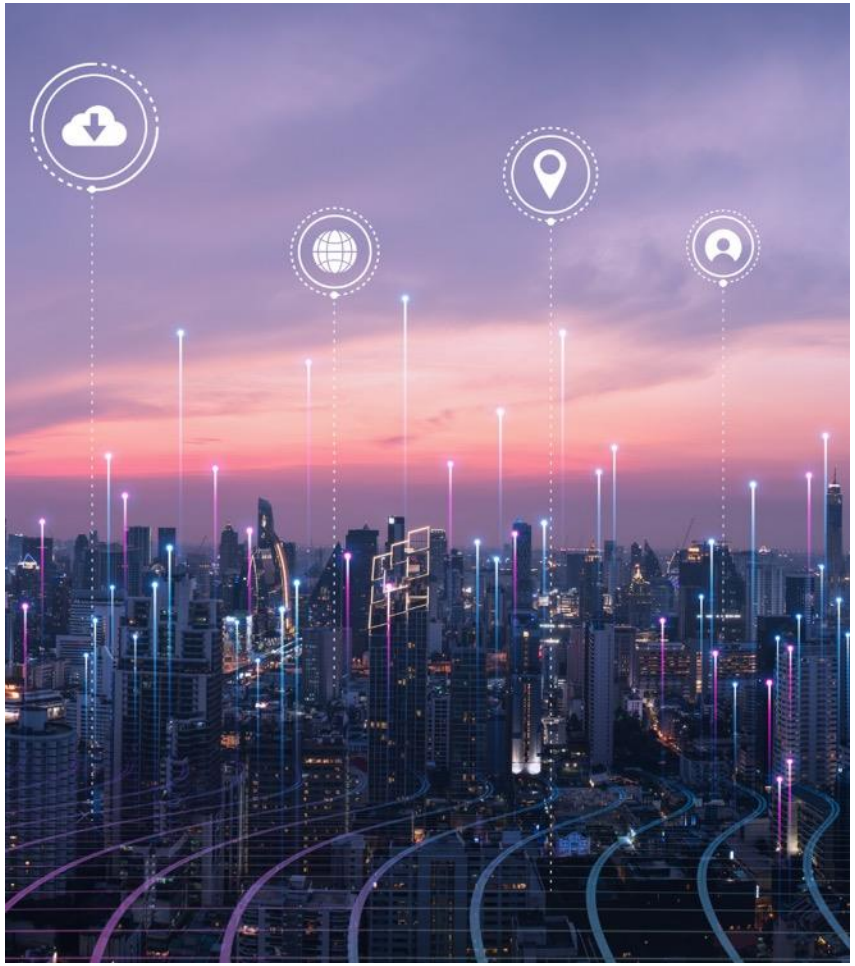
Small DER in aggregate can have big impacts



But operators are more likely to lack visibility of small DER

Improved DER visibility can…

- improve situational awareness
- boost confidence on automated power restoration schemes (FLISR)
- improve volt-var optimization (VVO) outcomes
- increase accuracy of other advanced DMS functions
- inform DER dispatch needs
- enable the use of hosting capacity calculations



How to provide DER visibility in a cost-effective and scalable way?

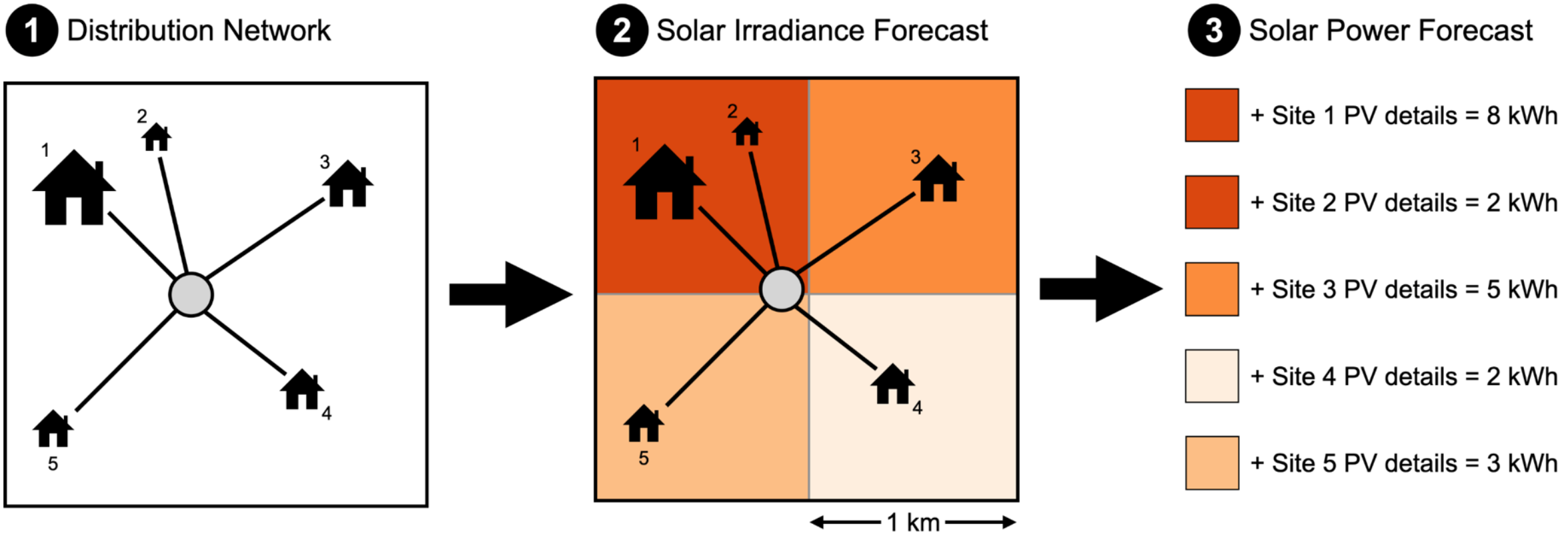
Why short-term forecasting?

- most DERs are solar photovoltaic (PV)

- solar forecasting is a mature technology
  - years of success in Transmission operations
  - commercially available
  - scalable to many locations
  - minimal data dependencies*

*specific data requirements vary between methods

Estimating PV production using gridded solar forecasts



Only need basic info on the PV sites (location, size in kW, etc.); no PV actuals required

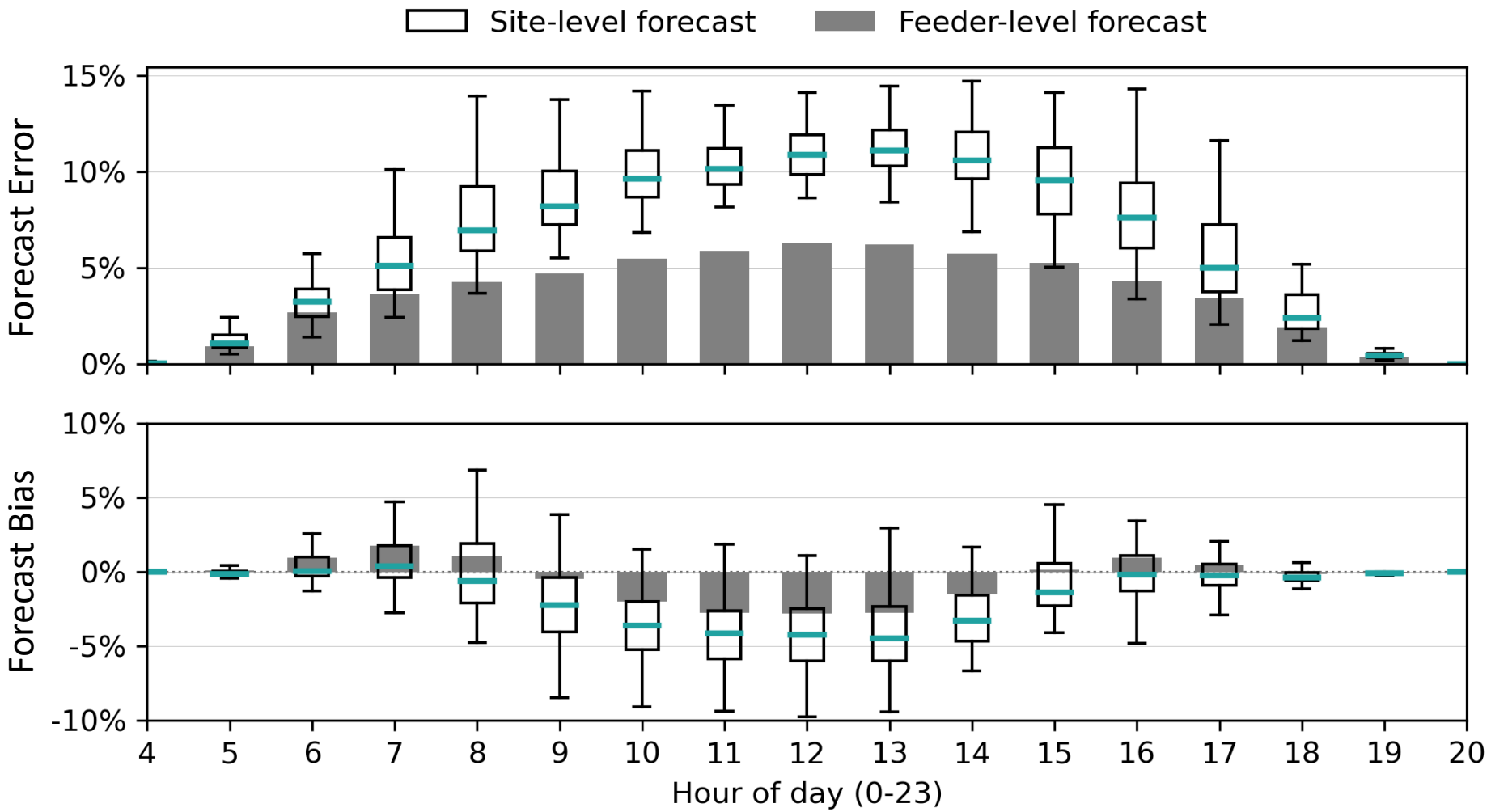
Case study with a Distribution utility in New York State*

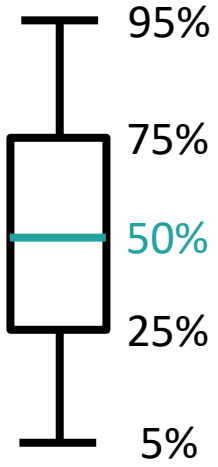
- direct measurements of PV production from >70 sites
  - ~2-years at 15-minute resolution
  - DER-specific meters installed at each site
- forecasts from a **commercial solar forecast provider**
  - 2-years at 15-minute resolution
  - nowcast (<5-minute) to 7-days ahead
  - forecasts did not use any PV production data

Figure: Example of a DER-specific meter for measuring PV production. Image adapted from: connectder.com

*funding provided by NYSERDA

Takeaway #1: Forecast accuracy varies

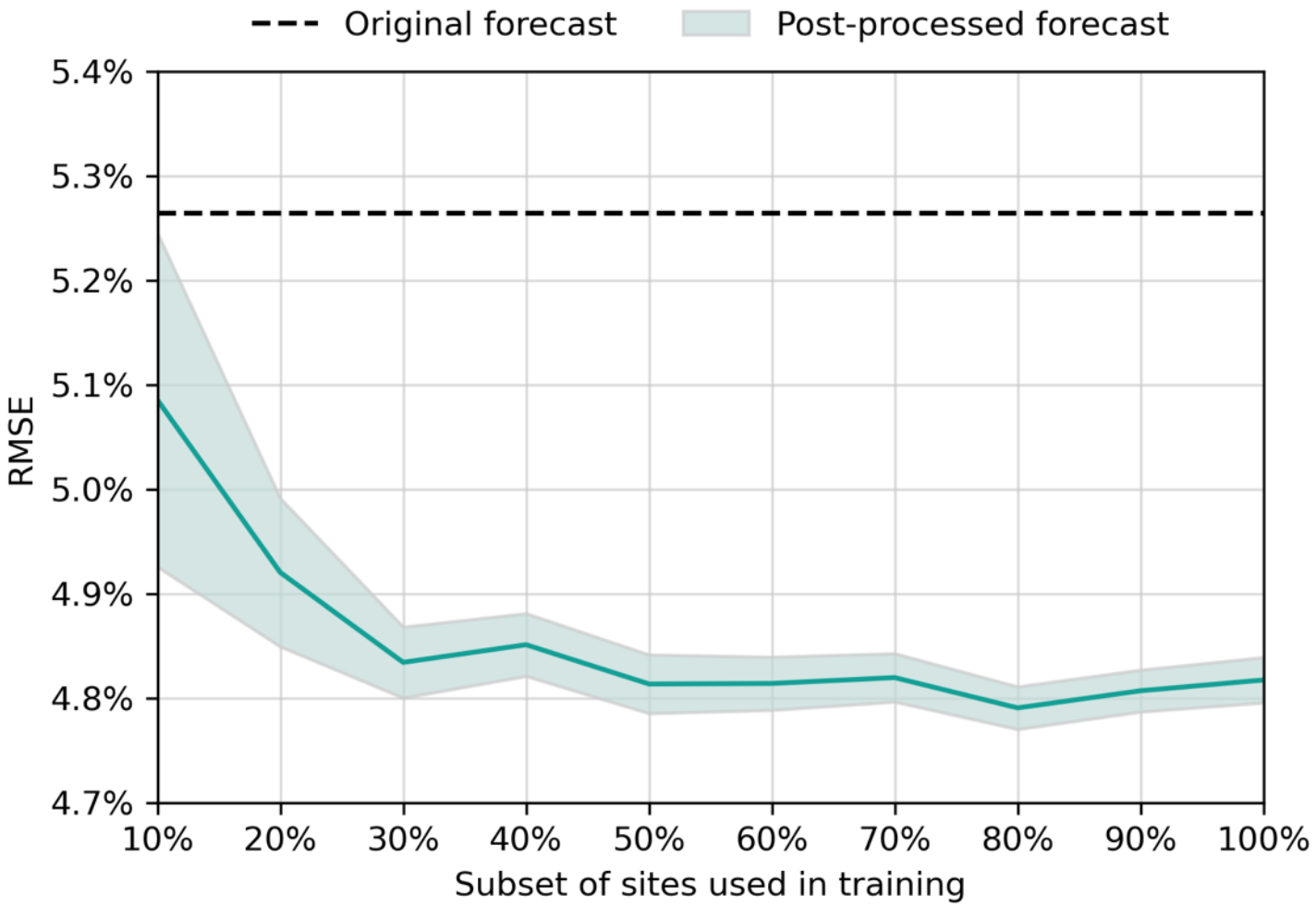




*Here, “Forecast Bias” measures whether the forecasts tend to over-predict (positive bias) or under-predict (negative bias).

**Site-level is the forecast accuracy per PV site, whereas feeder-level is the aggregated of all PV on the same feeder.

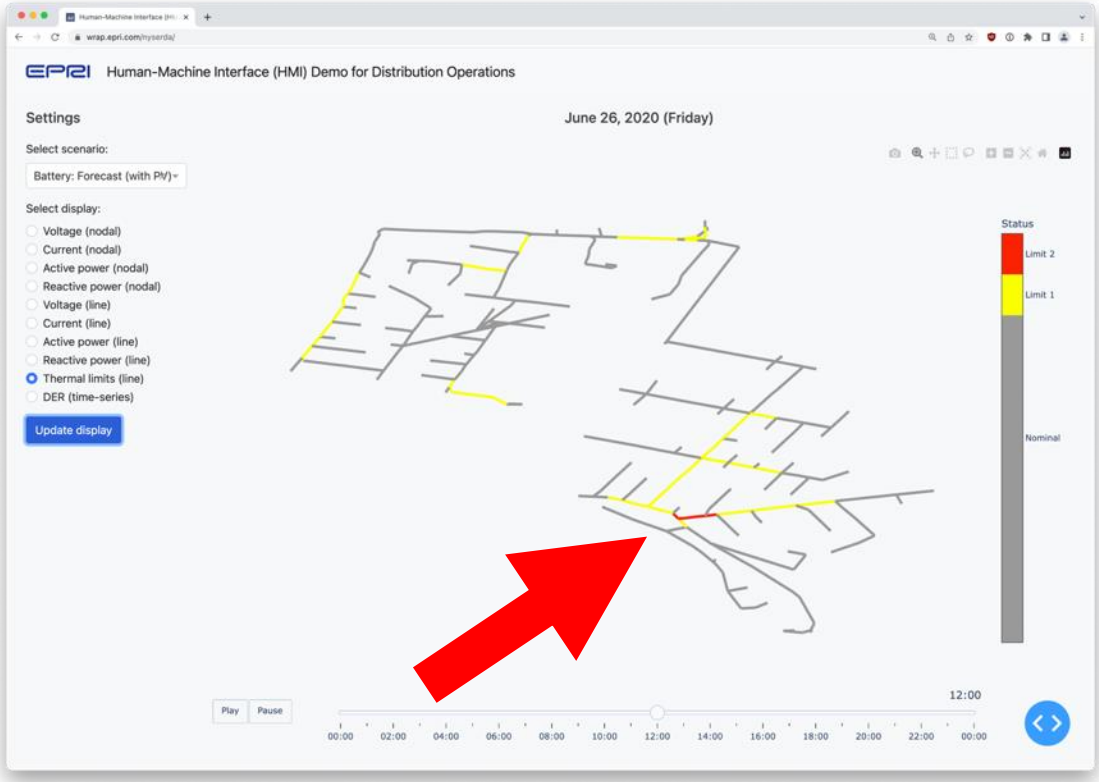
Takeaway #2: Measurement data still helps



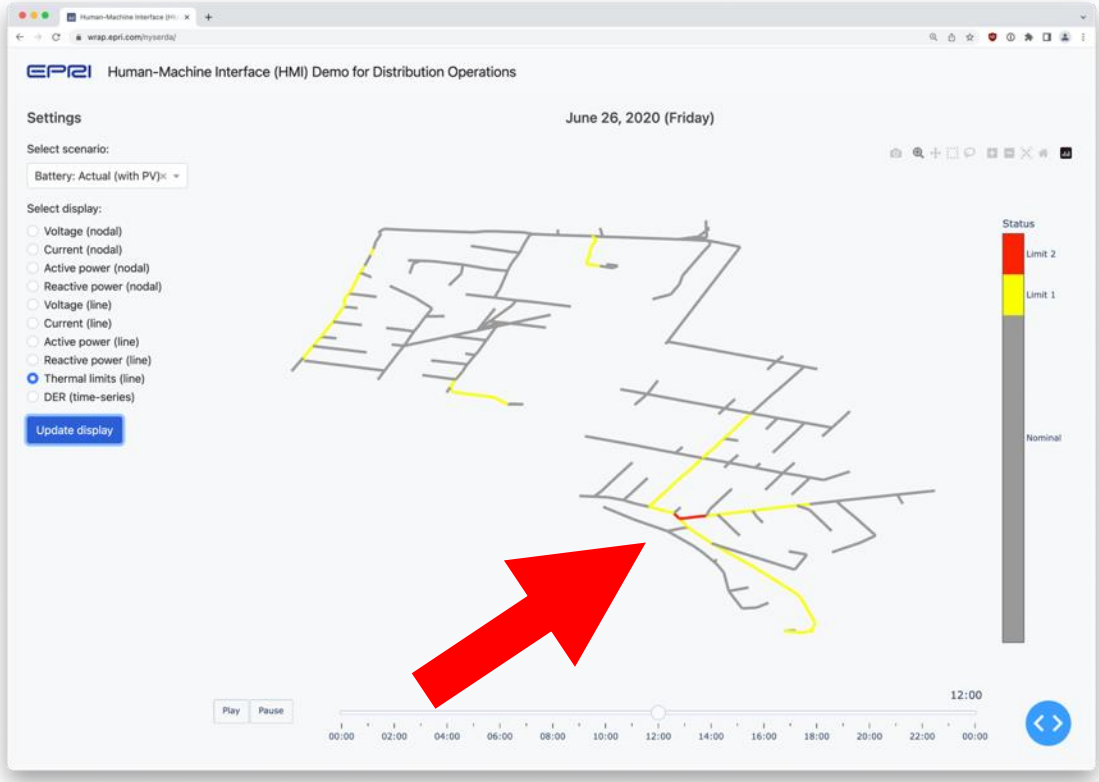
Measurements from a few sites can improve forecasts at all sites

Takeaway #3: Forecasts can help identify issues early

(1) Thermal limits based on forecasts



(2) Actual limits in real-time



Forecasts predicted a thermal limit issue, which was then observed in real-time

Where do we go from here?

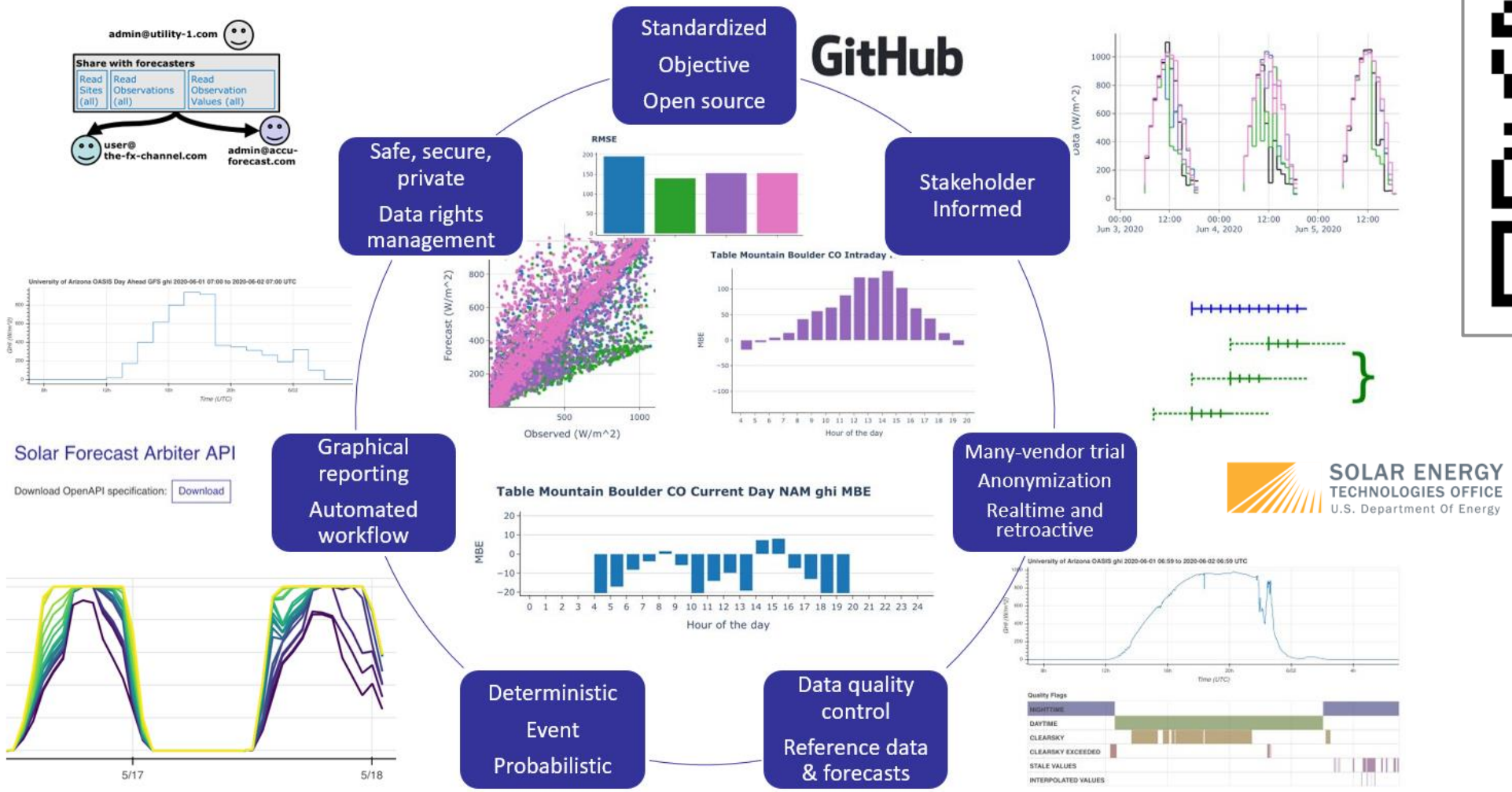
- How best to integrate DER forecasts into Distribution operations?
- Sensors vs forecasts vs hybrid?
- What about other types of DERs?
- Probabilistic forecasts?

Public whitepapers on DER forecasting

EPRI Product ID: 3002021931

EPRI Product ID: 3002022915

Forecast Arbiter (aka *Solar Forecast Arbiter)*



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Clear, transparent forecast evaluation tool