



# 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

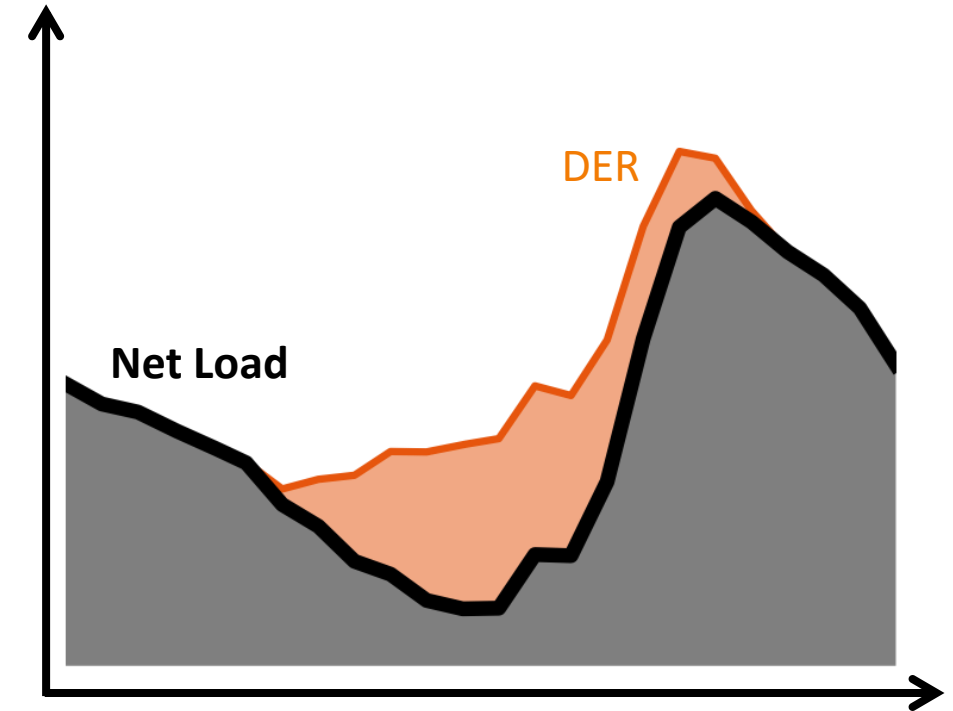
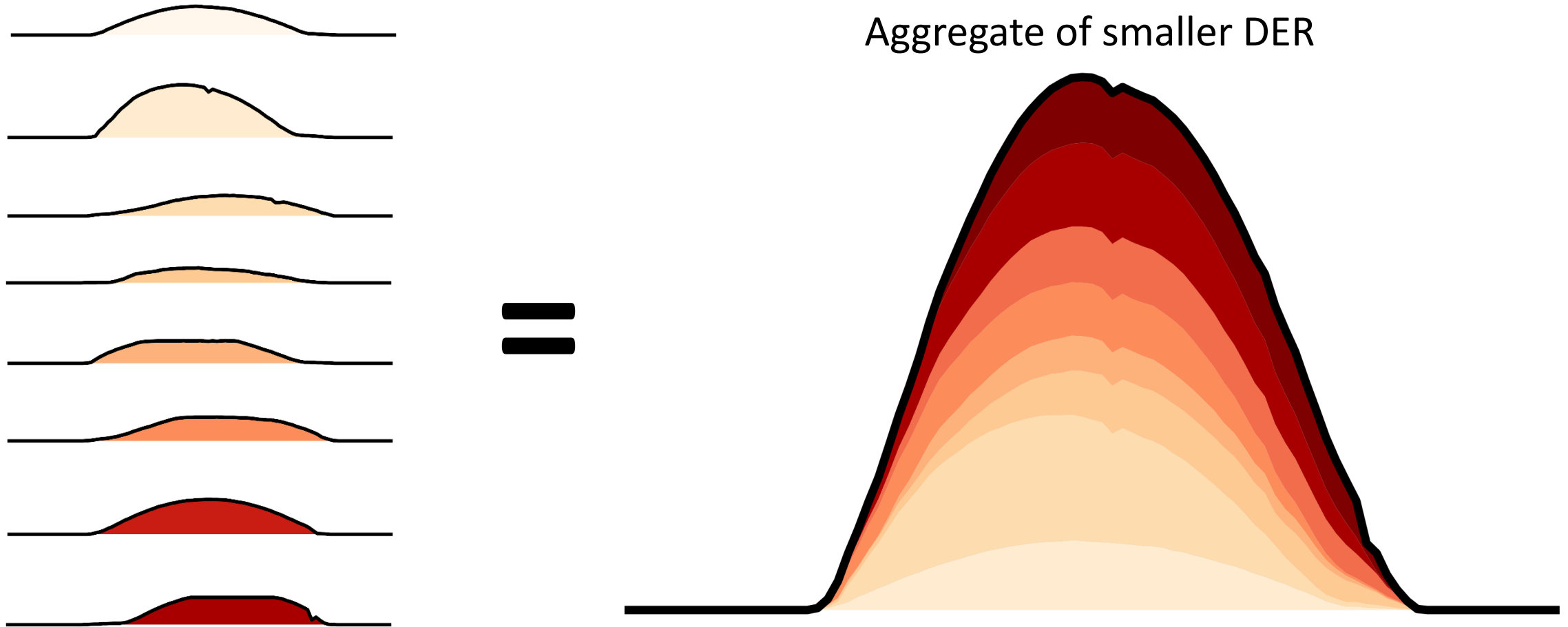


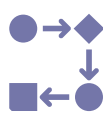
Figure: Example load profile with DER.

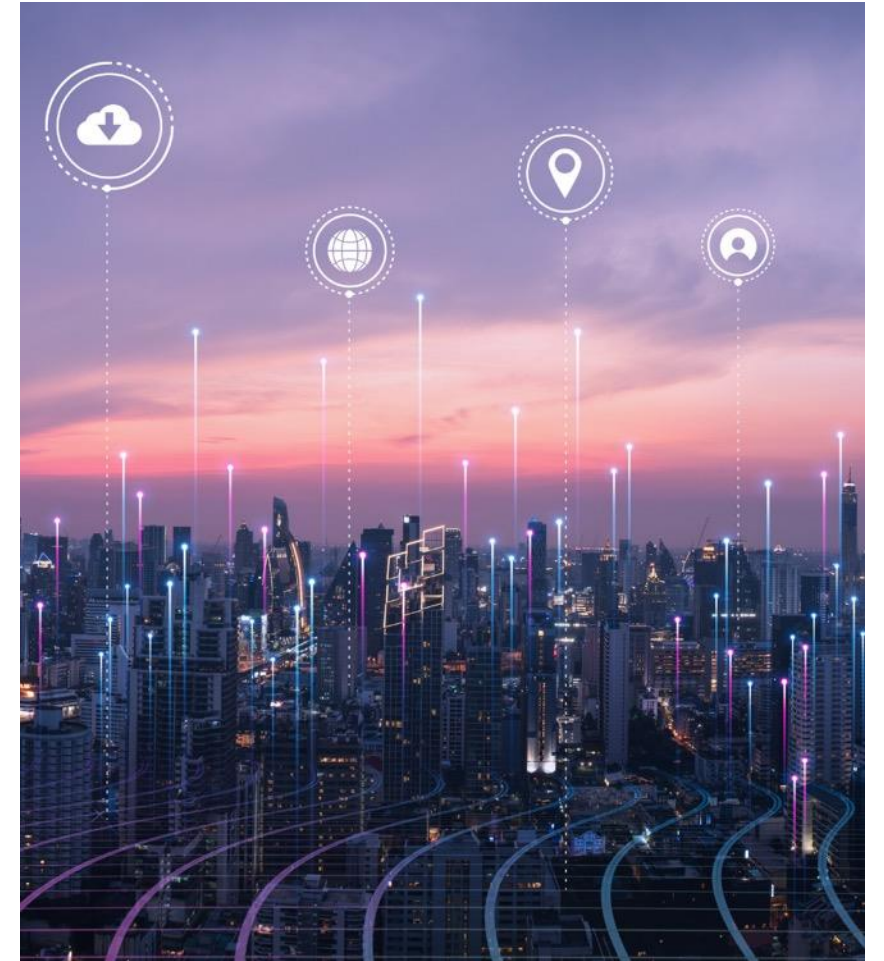
# Small DER in aggregate can have big impacts



**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?

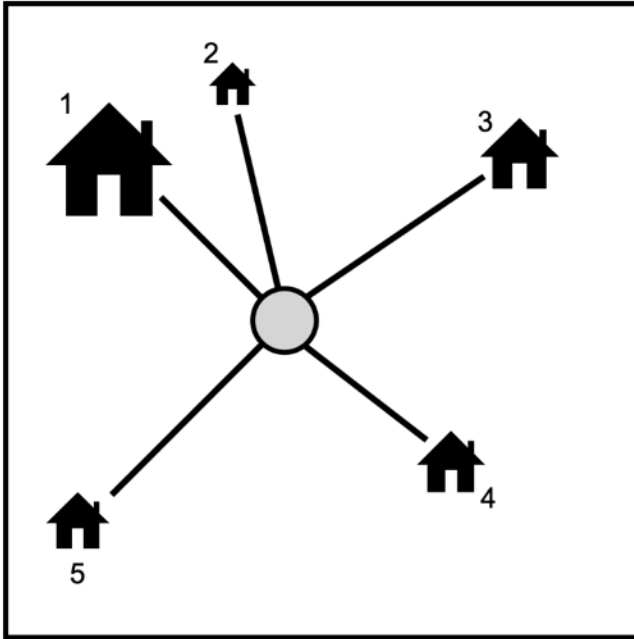
- most DERs are solar photovoltaic (PV)
- solar forecasting is a mature technology
  - years of success in Transmission operations
  - commercially available
  - scalable to many locations
  - minimal data dependencies\*

\*specific data requirements vary between methods

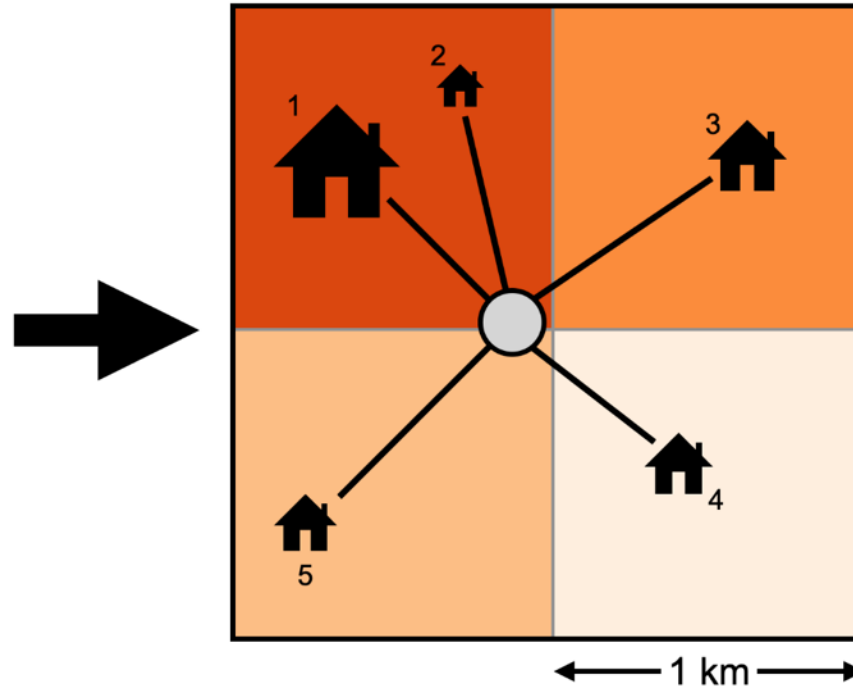


# Estimating PV production using gridded solar forecasts

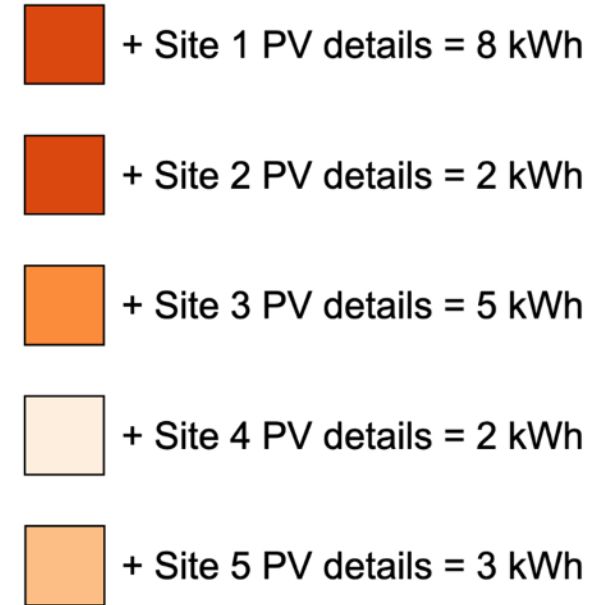
**1** Distribution Network



**2** Solar Irradiance Forecast



**3** Solar Power Forecast



**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\*

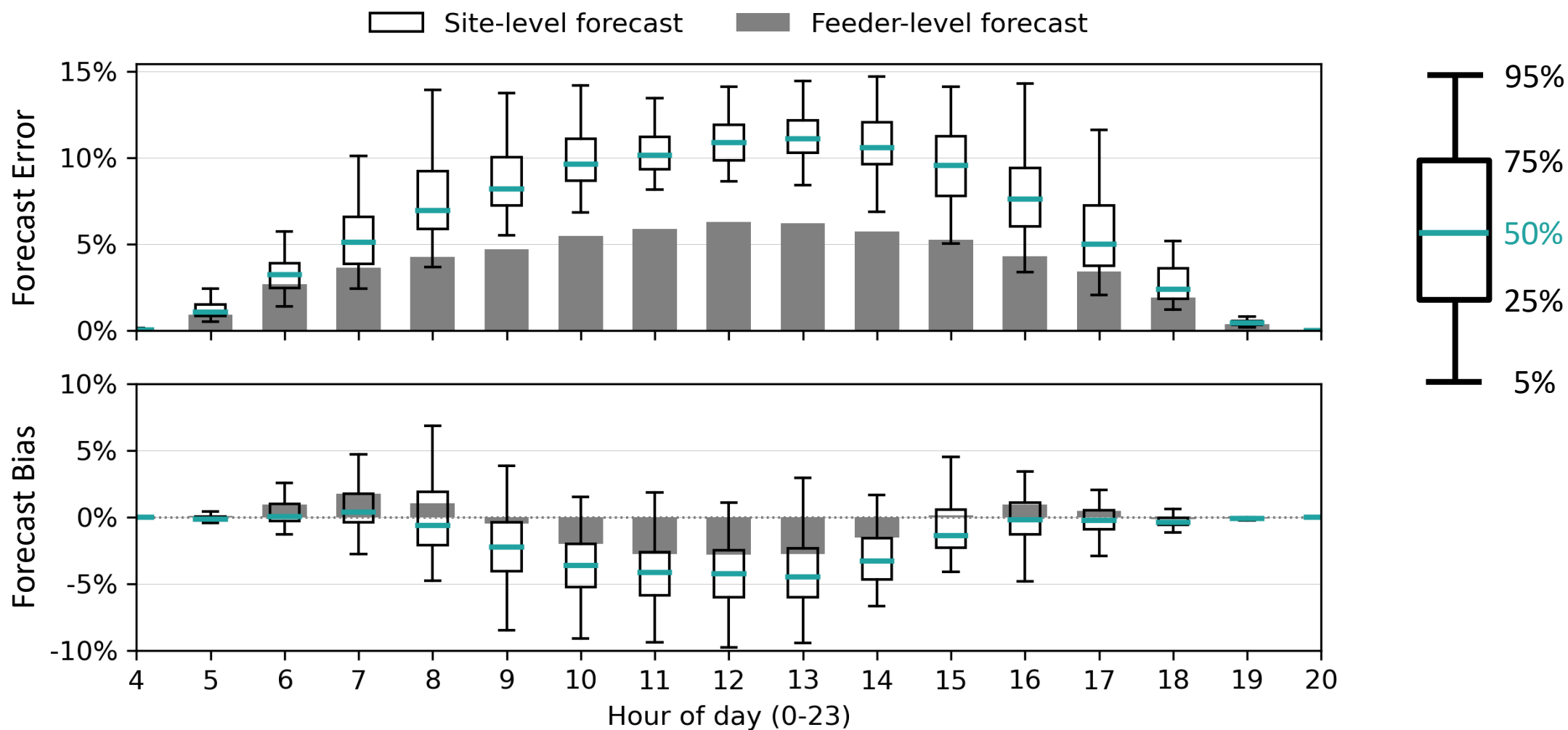
- direct measurements of PV production from >70 sites
  - ~2-years at 15-minute resolution
  - DER-specific meters installed at each site
- forecasts from a **commercial solar forecast provider**
  - 2-years at 15-minute resolution
  - nowcast (<5-minute) to 7-days ahead
  - forecasts did not use any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



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

\*funding provided by NYSERDA

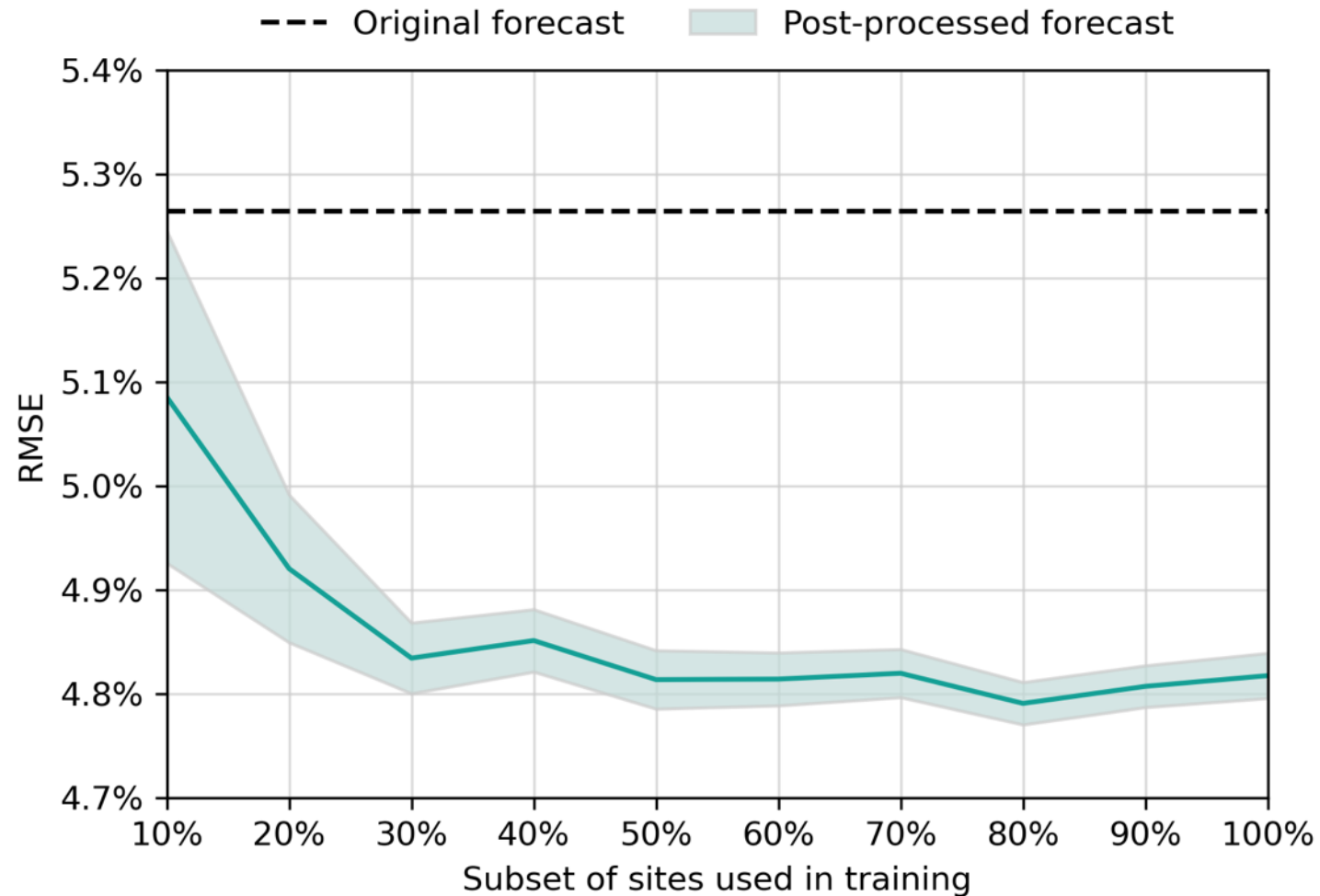
# Takeaway #1: Forecast accuracy varies



\*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.

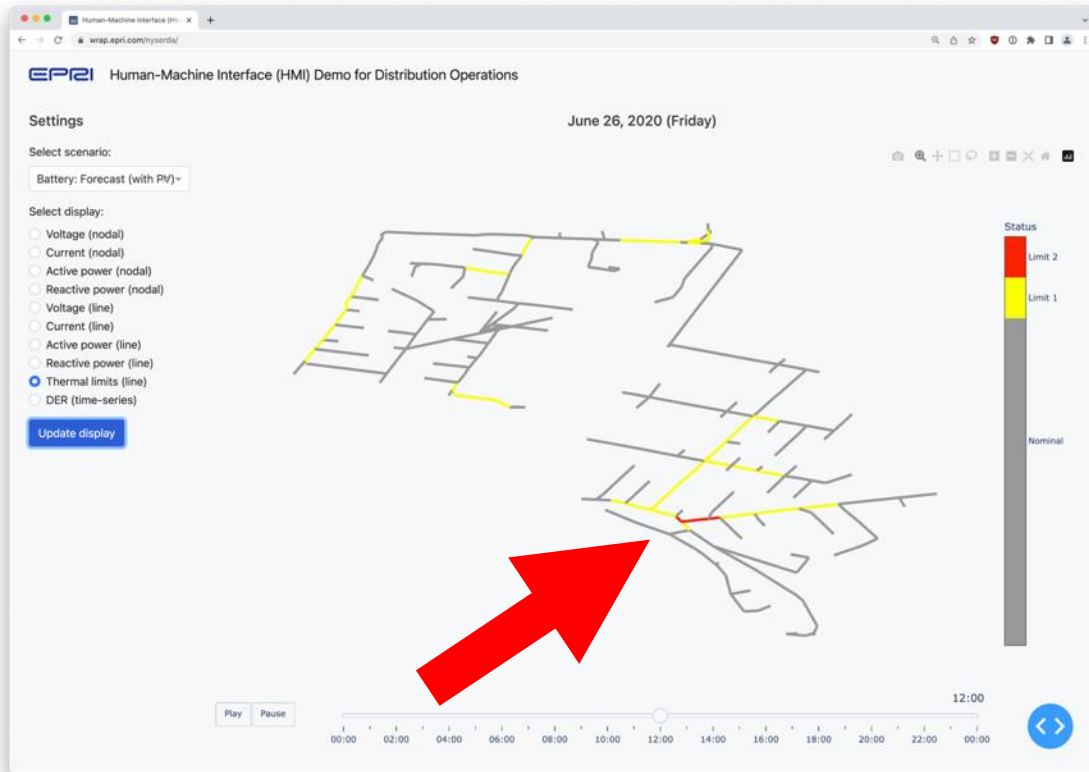
## Takeaway #2: Measurement data still helps



**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

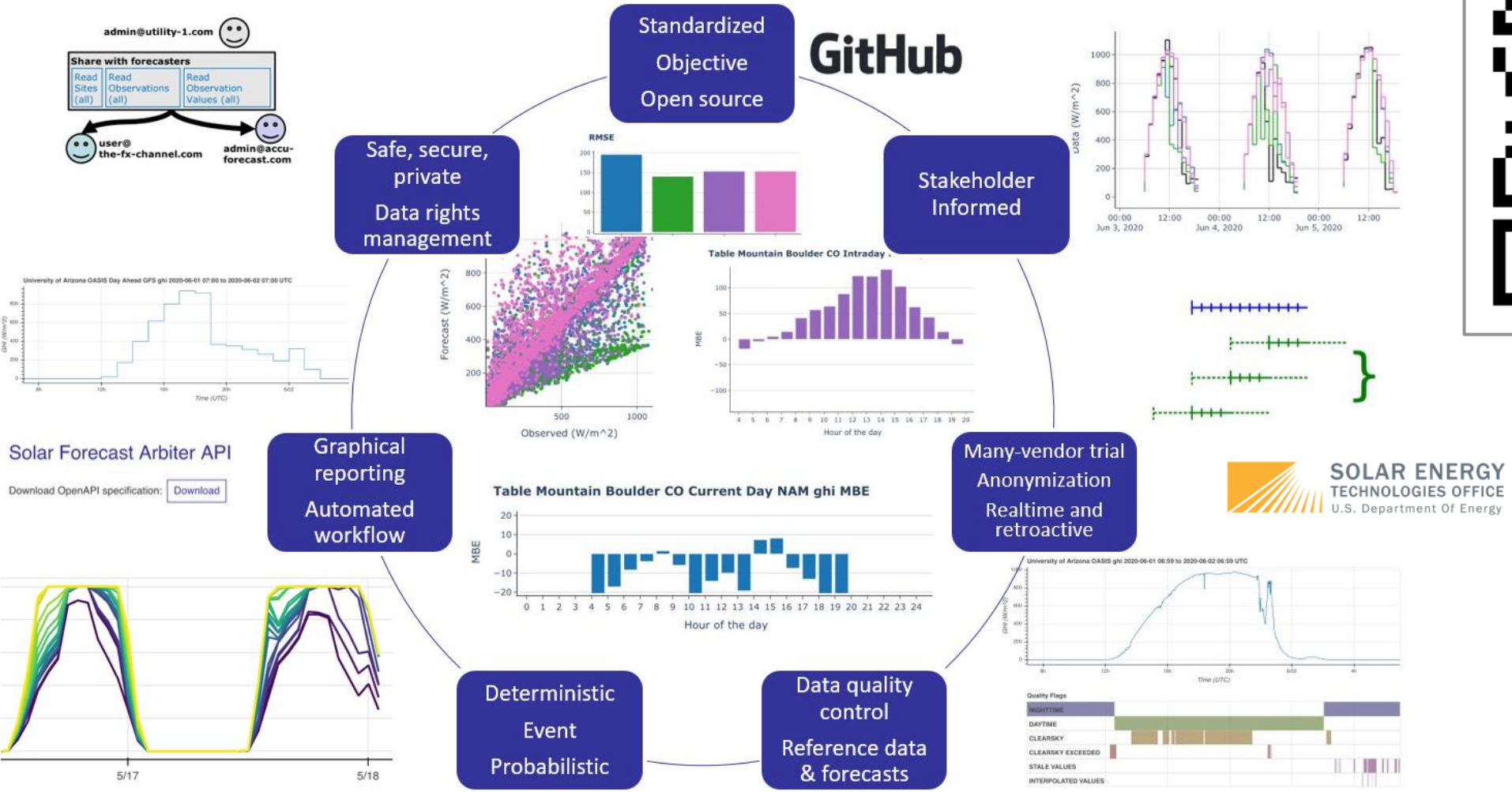


EPRI Product ID: [3002021931](#)



EPRI Product ID: [3002022915](#)

# Forecast Arbiter (aka Solar Forecast Arbiter)



Clear, transparent forecast evaluation tool

A blue-tinted photograph of four people standing in a row. From left to right: a man with curly hair and glasses wearing a lab coat; a man with glasses wearing a lab coat; a woman wearing a hard hat and a lab coat; and a man with glasses and a beard wearing a button-down shirt. The text "Together...Shaping the Future of Energy®" is overlaid in white in the center.

**Together...Shaping the Future of Energy®**