



California ISO

Reference for Forecasting Metrics

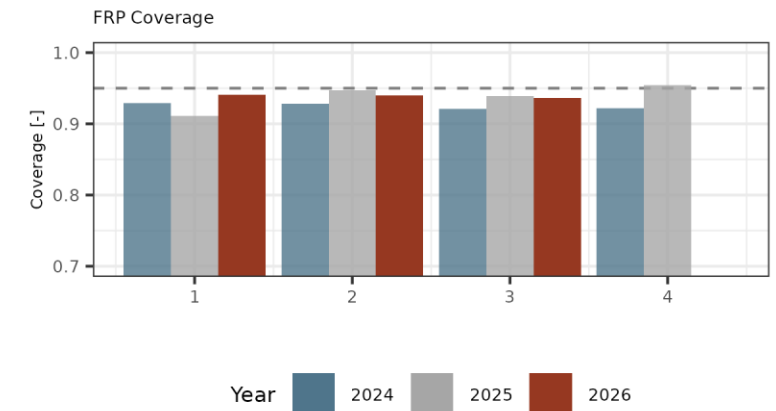
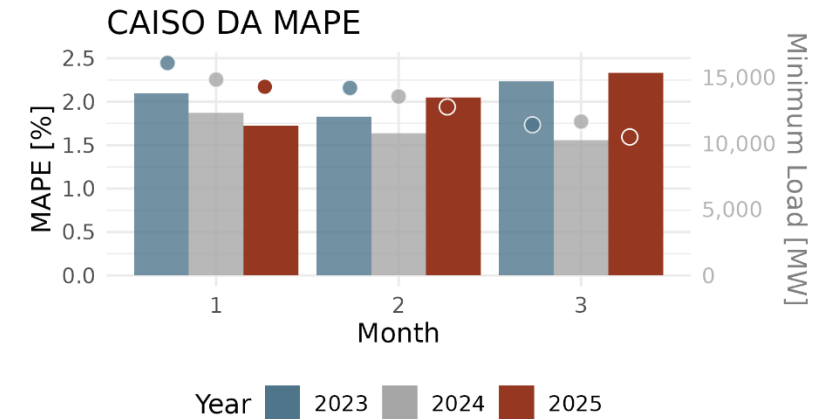
Short Term Forecasting

Updated: September 11, 2026

STF metrics highlights

- Short Term Forecasting (STF) provides quarterly reporting on load, uncertainty, and renewable forecast performance
 - Historically reported in Market Performance and Planning Forum (MPPF) and quarterly WEIM Forecasting Forum until April 2026
 - Now reporting metrics in Forecasting Forum as of July 2026
- Organization
 - Load and uncertainty metrics are collected and ordered by balancing area (BA)
 - EIM Area and EDAM Area are aggregations we report on for FRP and IR respectively
- Sample
 - Load and renewables report through a latest completed month
 - Uncertainty will include metrics for incomplete quarters
 - Where possible, we provide a three-year window to compare metrics with historical performance

Preview of graphical performance metrics

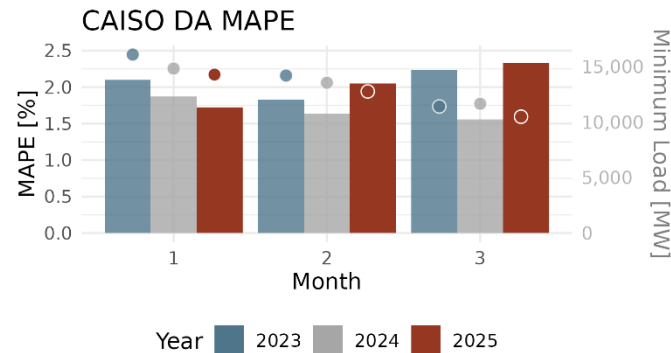


Data current to 2026-07-07. Quarter number on x-axis.

Interpreting load forecast accuracy plots

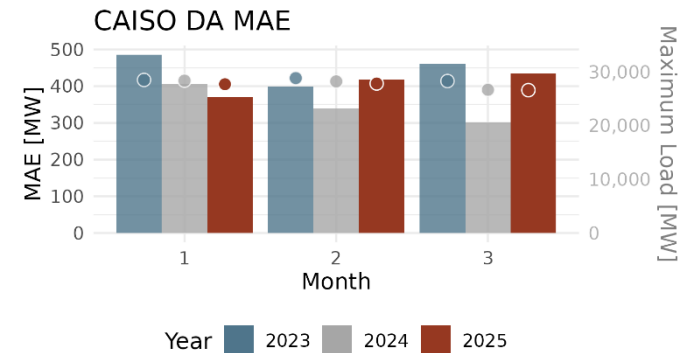
Mean absolute percent error (MAPE)

$$\text{MAPE} = \frac{1}{N} \sum_{i=1}^N \left(\frac{|\text{Forecast} - \text{Actual}|}{\text{Actual}} \right)_i$$



Mean absolute error (MAE)

$$\text{MAE} = \frac{1}{N} \sum_{i=1}^N (|\text{Forecast} - \text{Actual}|)_i$$

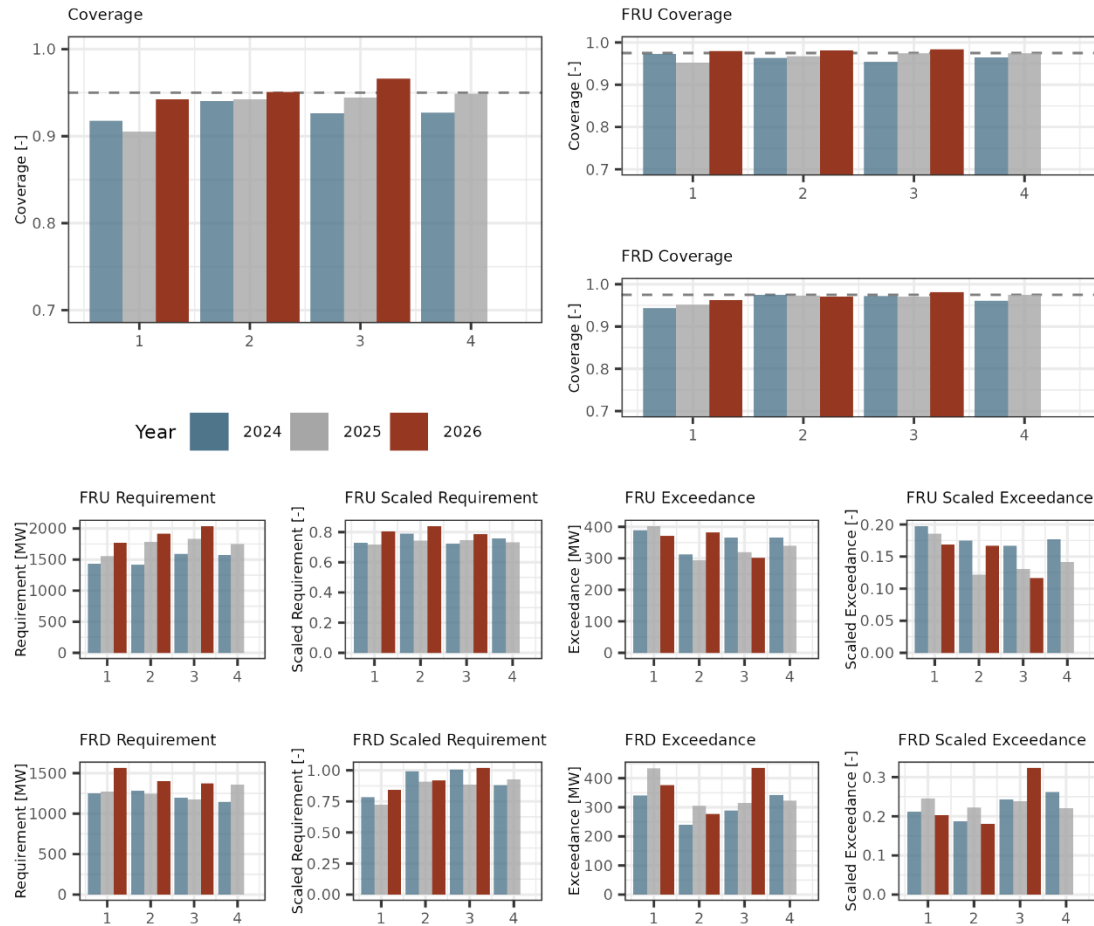


- MAPE is shown with *minimum* load per month on a secondary y-axis.
- **Expected:** Low midday loads will lead to higher MAPE. More BTM solar and DERs will decrease midday load.
- **Desired:** MAPE decreases over time.

- MAE is shown with *maximum* load per month on a secondary y-axis.
- **Expected:** Higher loads will lead to higher MAE. Peak loads may grow over time.
- **Desired:** MAE decreases over time.

Interpreting uncertainty plots

EIM AREA



Data current to 2026-07-06. Quarter number on x-axis.

Uncertainty plots show quarterly coverage, directional coverage, directional requirement and exceedance, and scaled directional requirement and exceedance.

FRP statistics reflect RTPD where uncertainty is the RTD binding forecast minus RTPD advisory forecast. IR statistics reflect uncertainty defined as the RTPD binding forecast minus DA advisory forecast.

Goal:

- Obtain coverage near target
- Keep requirement magnitudes comparable to observed net demand uncertainty
- Decrease average exceedance

Quarters are defined by calendar month. Quarter 1 is Jan – Mar, Quarter 2 is Apr – Jun, etc. Note, we provide reporting on incomplete quarters, whose metrics will update with the next reporting cycle.

Caption notes the latest trade date included in the current quarter evaluation as MPPF slides are prepared prior to the end of the quarter.

Uncertainty metrics

Applicable for flex ramp product (FRP) and imbalance reserve (IR).

Both products have an upward and downward requirement representing a high and low percentile probabilistic forecast that estimates net demand uncertainty.

Coverage captures the percentage of time when uncertainty falls within the requirement range.

$$\text{overall coverage} = \frac{1}{N} \sum_{i=1}^N (\text{RD} \leq x \leq \text{RU})_i$$

$$\text{RU coverage} = \frac{1}{N} \sum_{i=1}^N (x \leq \text{RU})_i$$

$$\text{RD coverage} = \frac{1}{N} \sum_{i=1}^N (x \geq \text{RD})_i$$

Requirement captures average directional requirement MW value.

$$\text{RU requirement} = \frac{1}{N} \sum_{i=1}^N (\text{RU})_i$$

$$\text{RD requirement} = \frac{1}{N} \sum_{i=1}^N (\text{RD})_i$$

Exceedance captures average MW value that observed uncertainty exceeds the directional requirement.

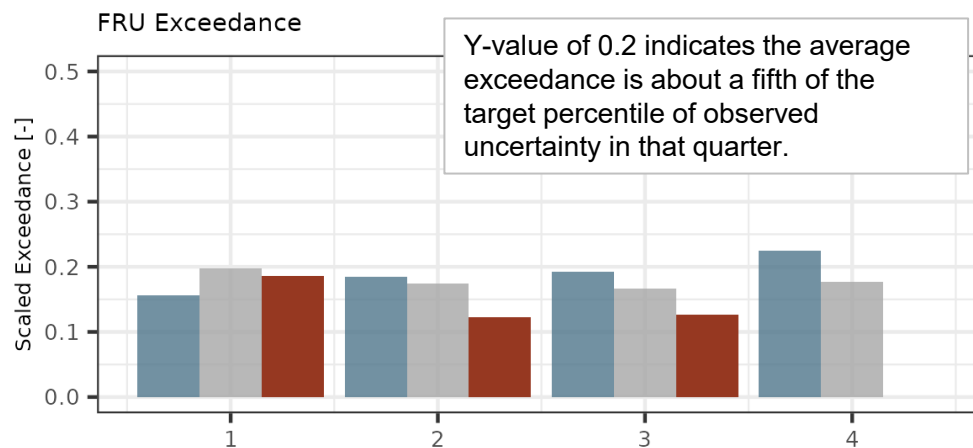
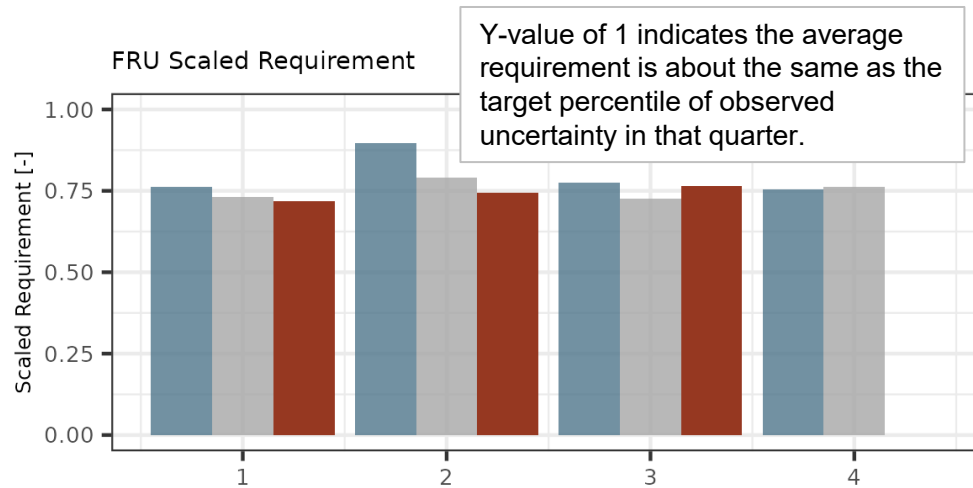
$$\text{RU exceedance} = \frac{1}{M} \sum_{j=1}^M (x - \text{RU})_j, \text{ for interval } j \text{ where } x_j > \text{RU}$$

$$\text{RD exceedance} = \frac{1}{M} \sum_{j=1}^M (x - \text{RD})_j, \text{ for interval } j \text{ where } x_j < \text{RD}$$

Symbol	Name
RU	Upward requirement; requirement at the high percentile (FRU or IRU)
RD	Downward requirement; requirement at the low percentile (FRD or IRD)
x	Realized uncertainty
N	Total number of intervals under evaluation
M	Number of intervals under evaluation where realized uncertainty was not covered

Interpreting uncertainty metrics: scaled requirement and exceedance

Scaling requirement and exceedance adds another dimension for evaluation, where these MW metrics are reviewed in the context of uncertainty patterns.



Scaled requirement

- Presented as positive factor
- **Requirement / realized uncertainty**
 - Upward requirement / 97.5th uncertainty for FRU
 - Downward requirement / 2.5th uncertainty for FRD
 - Upward requirement / 90th uncertainty for IRU
 - Downward requirement / 10th uncertainty for IRD
- Scaled requirements may generally be near ~1 as requirements should be comparable to target uncertainty

Scaled exceedance

- Presented as positive factor
- **Exceedance / realized uncertainty**
 - Upward exceedance / 97.5th uncertainty for FRU
 - Downward exceedance / 2.5th uncertainty for FRD
 - Upward exceedance / 90th uncertainty for IRU
 - Downward exceedance / 10th uncertainty for IRD
- Exceedance sample size will vary per quarter. If a historical value is missing post-onboarding, it indicates a quarter in which there was no exceedance

Interpreting scaled requirements

Ideally: Overall coverage is on target and scaled requirement < 1

For probabilistic forecasting, there's a trade off between accuracy and efficiency, i.e. coverage and requirements. We aim to maximize efficiency (minimize requirements) without compromising coverage. A scaled requirement of ~1 is generally meeting performance expectations. In addition, comparing the requirement to scaled requirement trends help indicate performance as outlined below.

Requirement trend year-on-year per quarter	Scaled requirement trend year-on-year per quarter	Scenario description	Interpretation, assuming coverage is about the same
Decreasing	Decreasing	Requirements are decreasing faster than observed uncertainty (uncertainty is staying about the same or increasing)	Great
	Staying the same	Requirements are decreasing at about the same rate as observed uncertainty	Performance is meeting expectations. Overall, this is a good trend since uncertainty is decreasing.
	Increasing	Requirements are decreasing on average, but observed uncertainty is decreasing at a faster rate	Good from an operations standpoint since requirements are decreasing. Neutral to negative on mosaic performance as the model may be lagging the uncertainty trend; requirements tend to be larger than needed.
Staying the same	Decreasing	Requirements are staying the same despite observed uncertainty increasing	Maintenance – mosaic is looking more efficient
	Staying the same	Requirements and observed uncertainty are staying consistent for the season	Maintenance – fair
	Increasing	Requirements are staying the same, but observed uncertainty is decreasing	Maintenance – mosaic has been less efficient
Increasing	Decreasing	Requirements are increasing at a slower rate than observed uncertainty	Good from model performance standpoint as mosaic is looking efficient. May be challenging operationally since requirements are increasing.
	Staying the same	Requirements are increasing at about the same rate as observed uncertainty	Performance is meeting expectations. Entity may want further review to identify why uncertainty is increasing. Review coverage metrics, scaled requirements relative to 1, renewable capacity growth, and load and renewable forecast accuracy.
	Increasing	Requirements are increasing faster than observed uncertainty (uncertainty is staying about the same or decreasing)	Bad. This is challenging operationally since requirements are increasing and mosaic has been less efficient.