

Transparency++: Bringing more transparency to the ENTSO-E TP data and forecasts

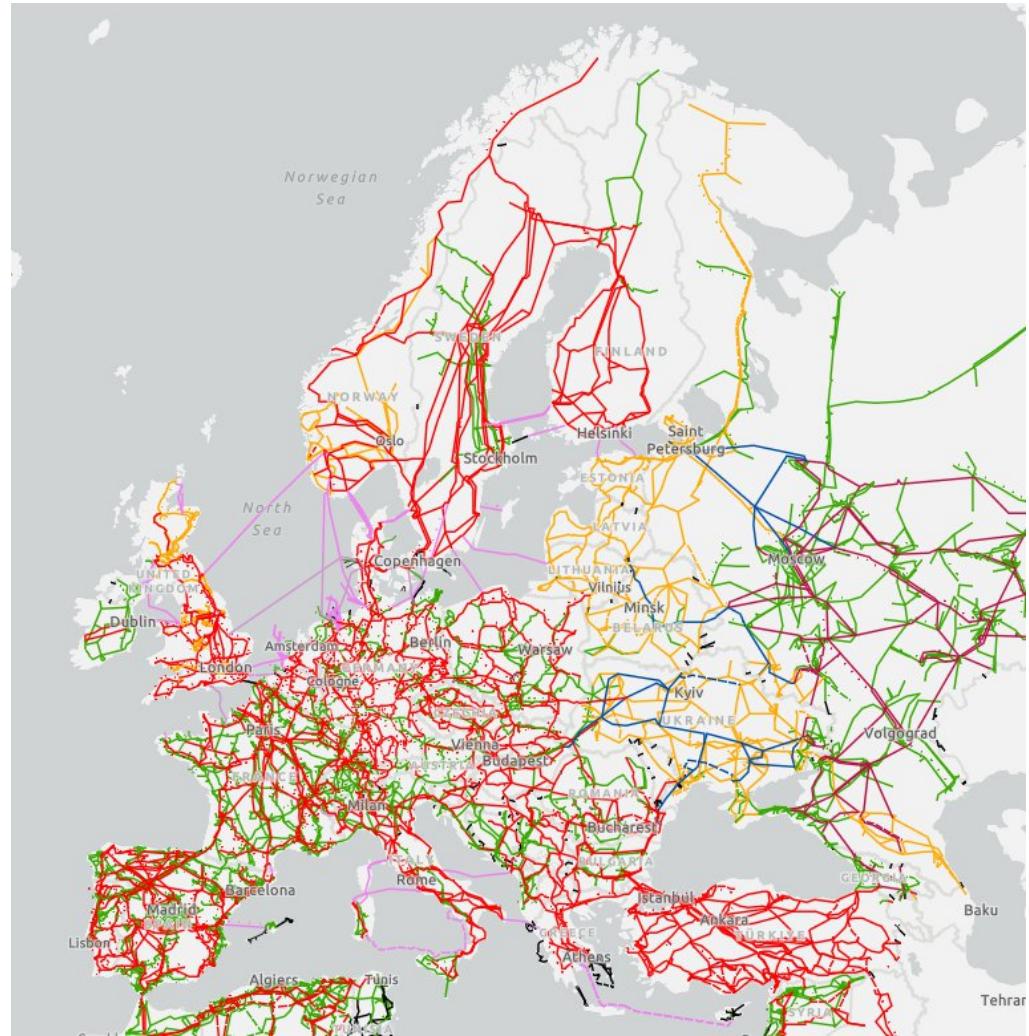
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- Introduction
- ENTSO-E Transparency Platform (TP)
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- What can be done?
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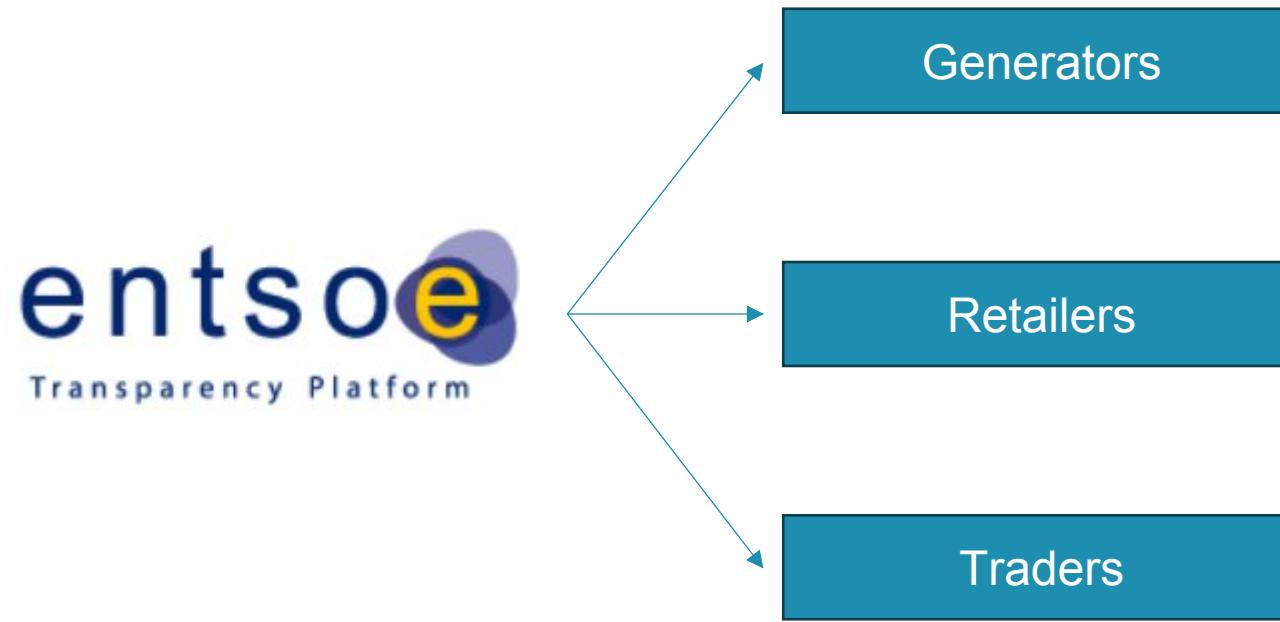
Introduction

- TSOs: forecast load, renewable generation
- Contract: generation, reserve capacity
- Third parties use forecasts
- Inaccurate forecasts: higher balancing, costs
- Cross-border flows



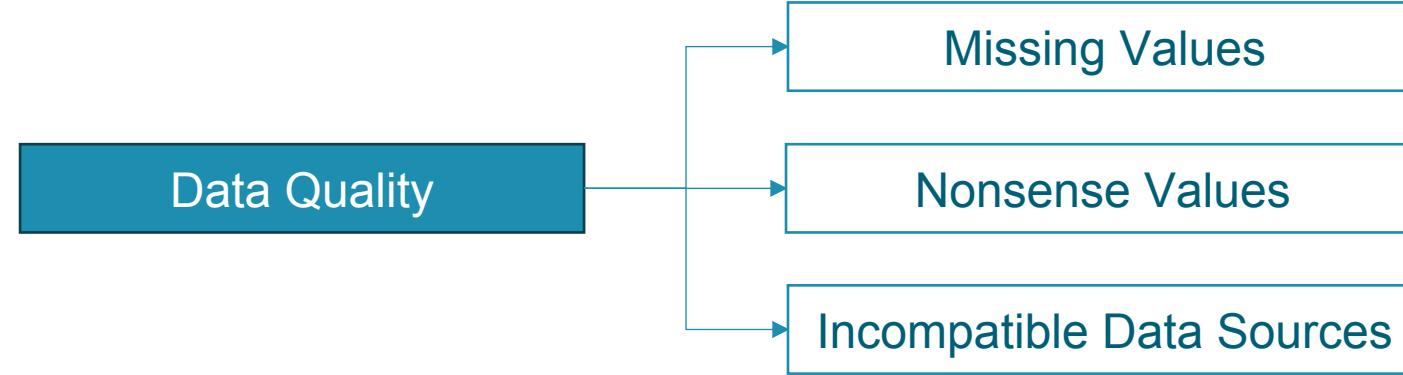
Transmission system network. ENTSO-E image.

ENTSO-E Transparency Platform (TP)

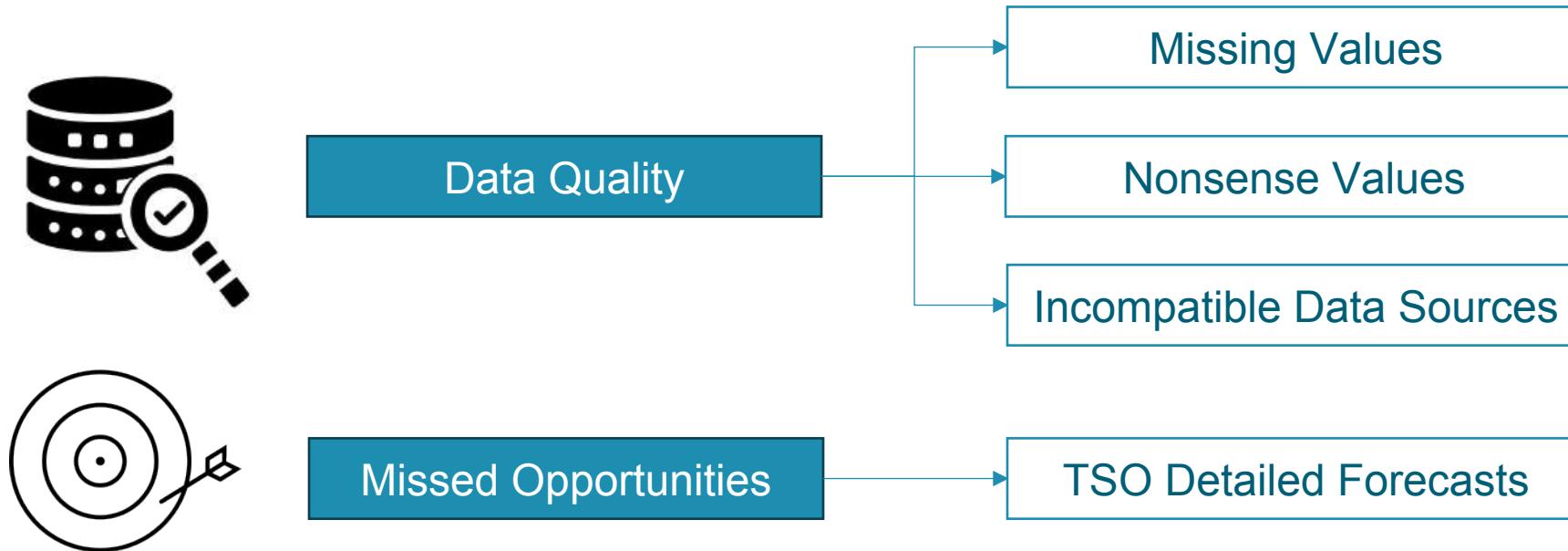


Central point for the collection, aggregation, and publication of electricity market data across Europe

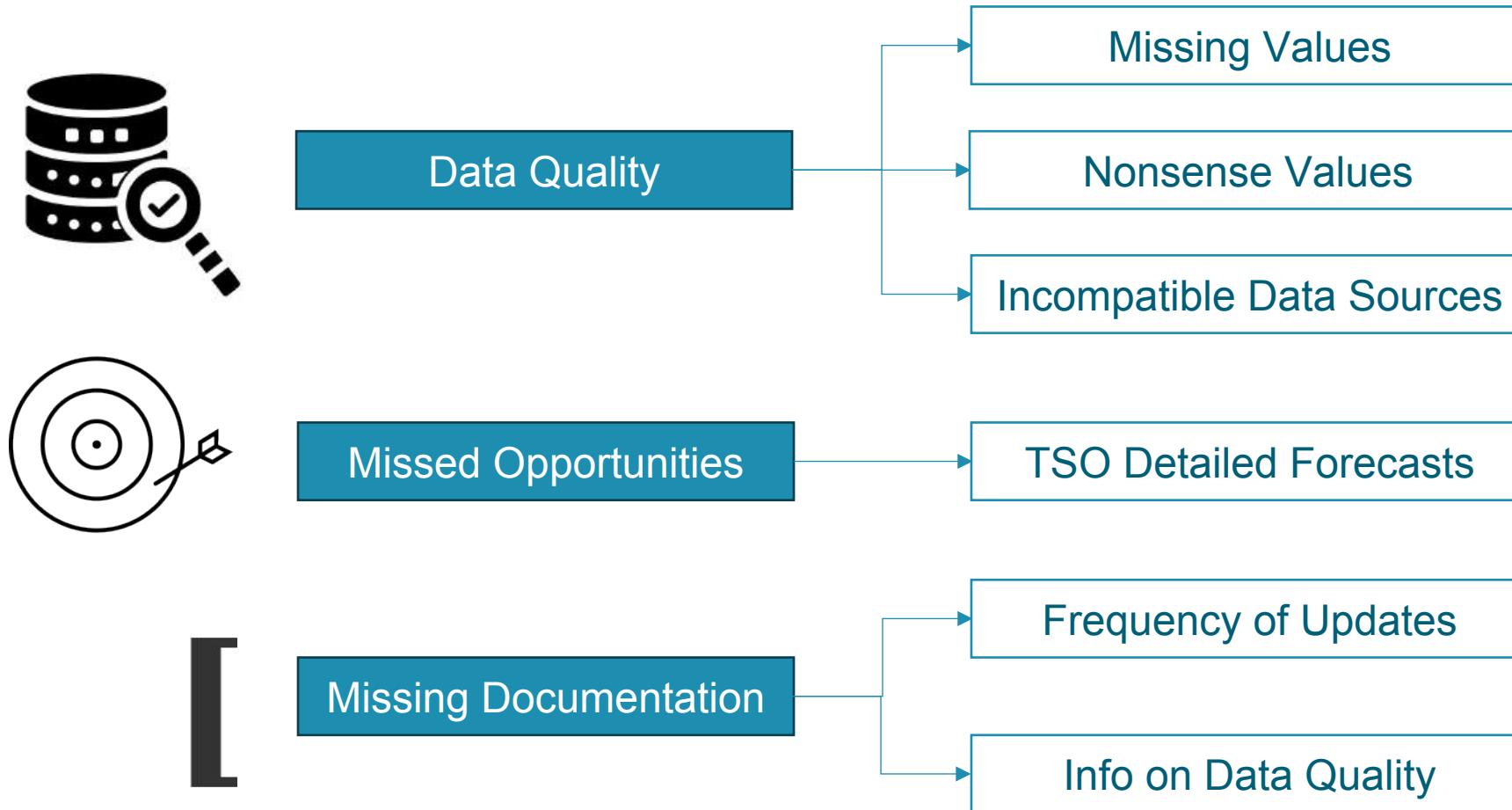
ENTSO-E TP | Problems



ENTSO-E TP | Problems



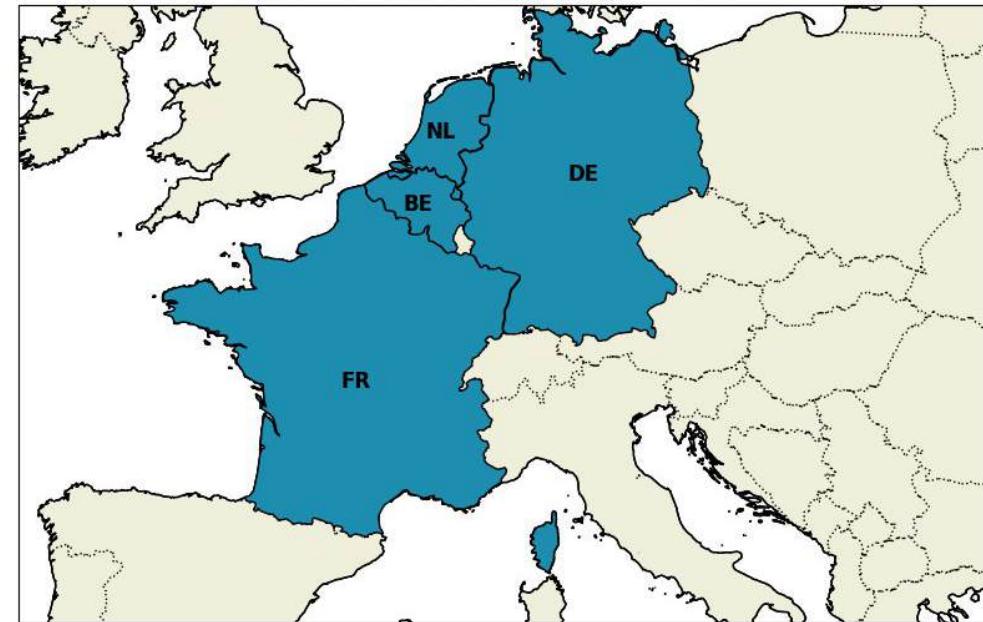
ENTSO-E TP | Problems



Data

Data from BE, FR, NL and DE-LU | 2024

- Load
- Load Forecast
- Solar
- Solar Forecast
- Wind Onshore
- Wind Onshore forecast
- Wind Offshore
- Wind Offshore forecast



Evaluation Metrics

Data Quality

Zonal Statistics

Forecast Accuracy

Evaluation Metrics

Data Quality

- **Completeness** - Percentage of missing values per field
- **Plausibility** - Values were flagged if negative or exceeding installed capacity (for solar and wind); for load, only negative values
- **Consistency** - Repeated measurements (>24 times) were flagged

Evaluation Metrics

Zonal Statistics

Net Load (NL):

$$NL_t = L_t - (W_t^{\text{on}} + W_t^{\text{off}} + S_t)$$

MAE of the NL:

$$MAE_{NL} = \frac{1}{N} \sum_{t=1}^N |NL_t - NL_t^f|$$

L_t : Actual load at time t

W_t^{on} : Actual wind onshore generation at time t

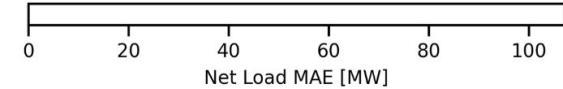
W_t^{off} : Actual wind offshore generation at time t

S_t : Actual solar generation at time t

NL_t : Actual net load at time t

NL_t^f : Forecast net load at time t

N : Total number of observations



Evaluation Metrics

Forecast Accuracy

$$MAE = \frac{1}{N} \sum_{t=1}^N |y_t - \hat{y}_t|$$

$$RMSE = \sqrt{\frac{1}{N} \sum_{t=1}^N (y_t - \hat{y}_t)^2}$$

$$rMAE = \frac{MAE}{MAE_{pers}} = \frac{\frac{1}{N} \sum_{t=1}^N |y_t - \hat{y}_t|}{\frac{1}{N} \sum_{t=1}^N |y_t - y_{t-\delta}|}$$

$$NMAE = \frac{MAE}{C_{installed}} \times 100 = \frac{\frac{1}{N} \sum_{t=1}^N |y_t - \hat{y}_t|}{C_{installed}} \times 100$$

y_t : Actual value at time t

\hat{y}_t : Forecast value at time t

$y_{t-\delta}$: Actual value δ hours before time t (persistence model)

N : Total number of observations

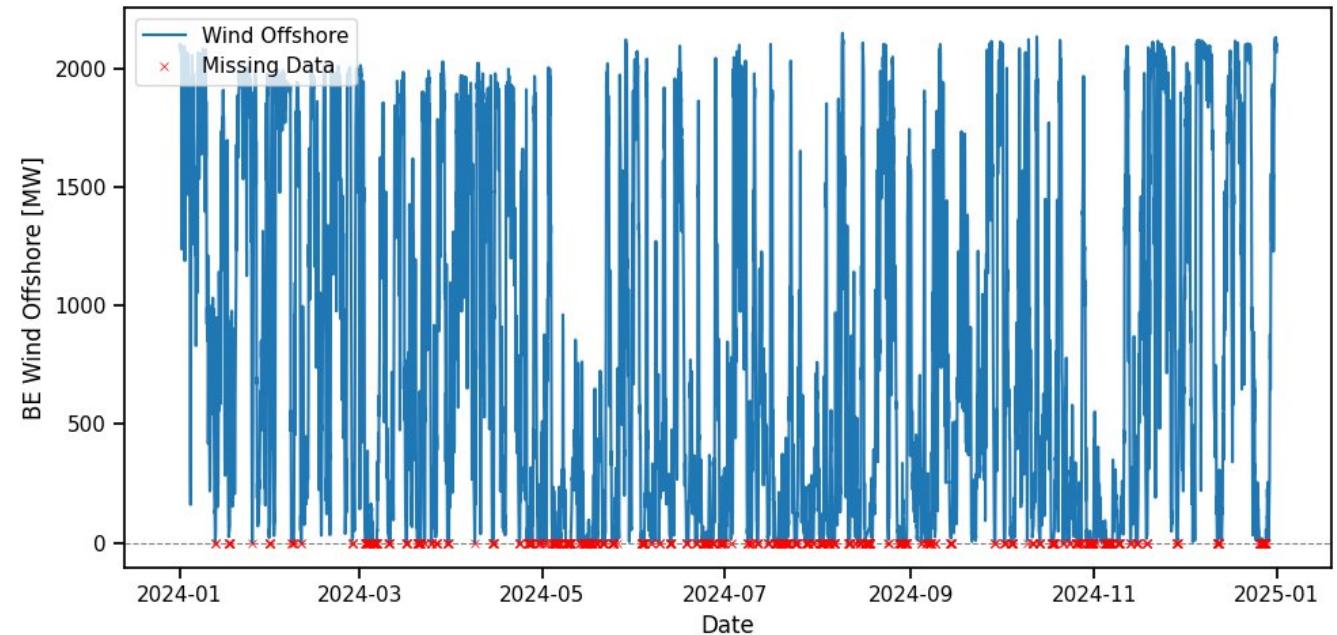
MAE_{pers} : MAE of the persistence model

δ : 24 hours (solar, wind) or 168 hours (load)

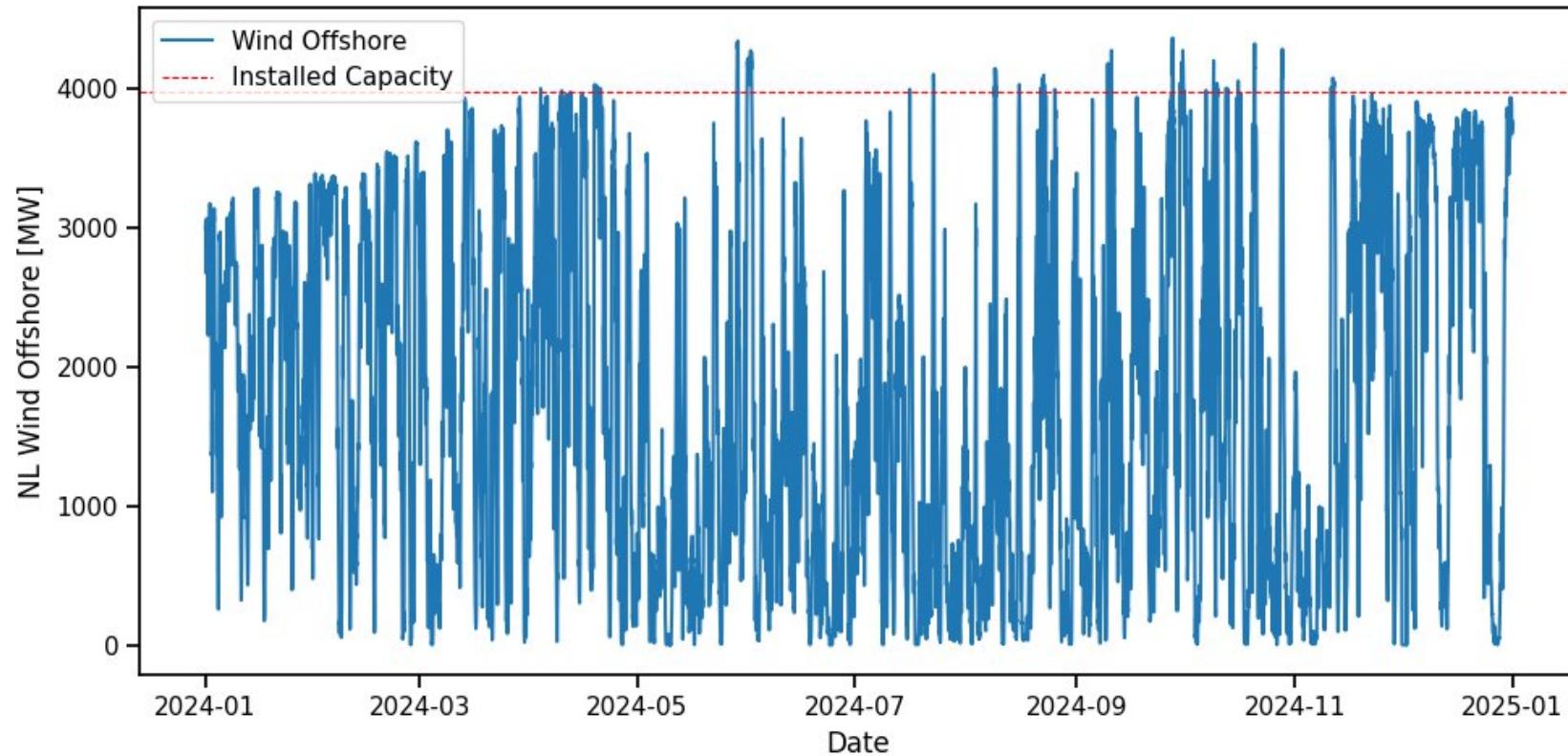
$C_{installed}$: Installed capacity (or average load for the load)

Results: Data Quality - Completeness

BDZ	Variable	Missing Values [%]
BE	Wind offshore	10.79
NL	Load	0.24
FR	Load	0.11
FR	Solar forecast	0.01
FR	Wind offshore	0.23
FR	Wind onshore forecast	0.01
DE-LU	Load	0.25
DE-LU	Solar forecast	0.55
DE-LU	Wind onshore forecast	0.27

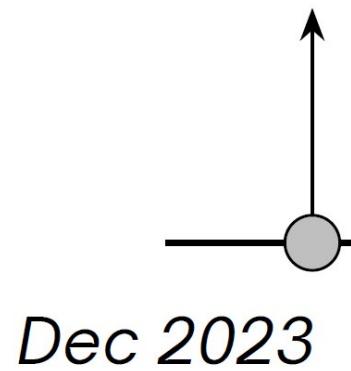


Results: Data Quality - Plausibility

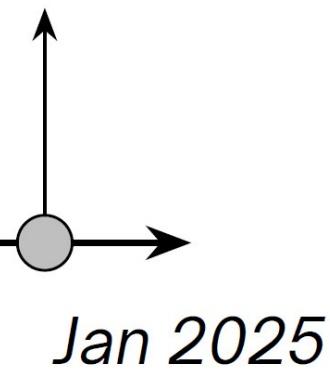


Results: Data Quality - Consistency

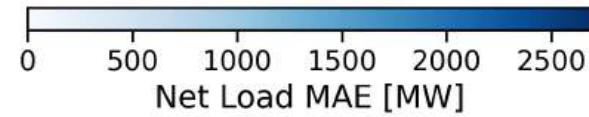
FR Wind Offshore Forecast
Constant Value (240 MW)
(Dec 30–Jan 4)



NL Wind Onshore & Offshore
Constant Value (0 MW)
(Dec 1–2)

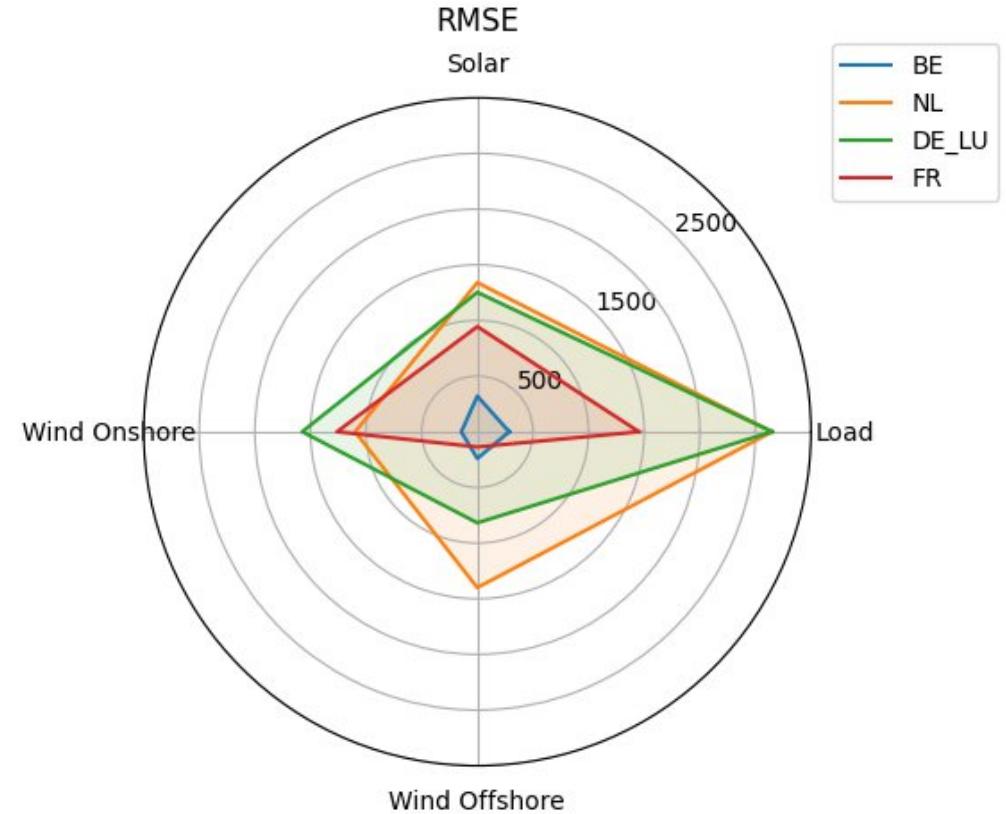
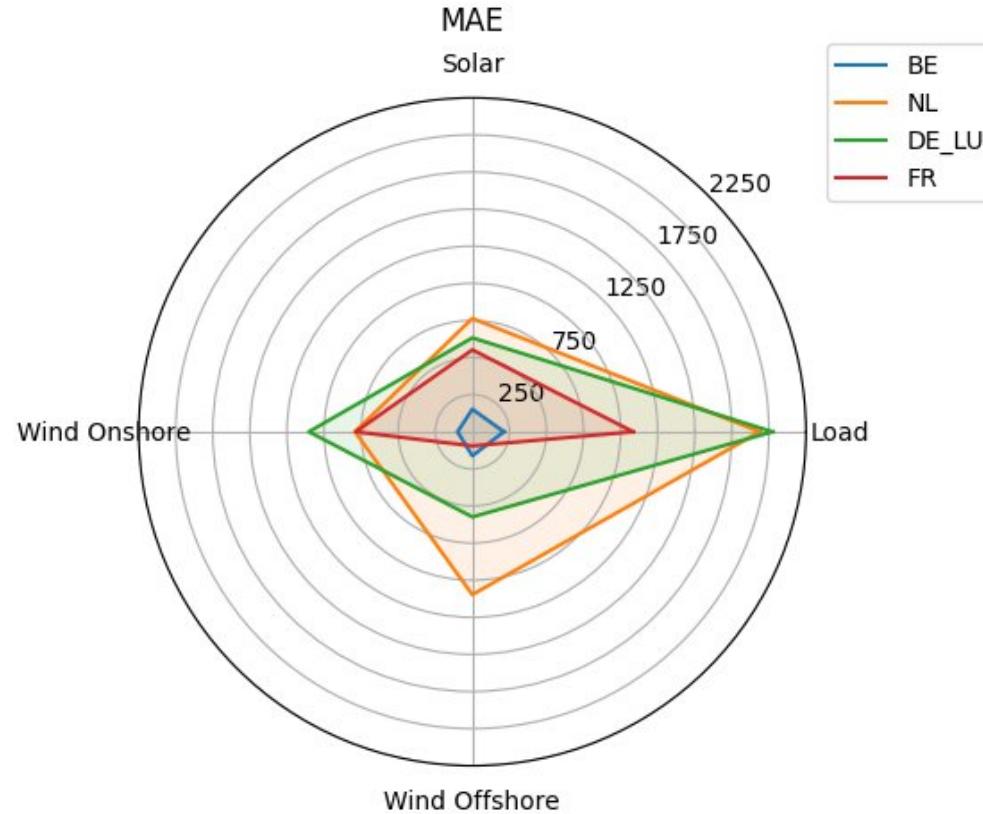


Results: Zonal Statistics

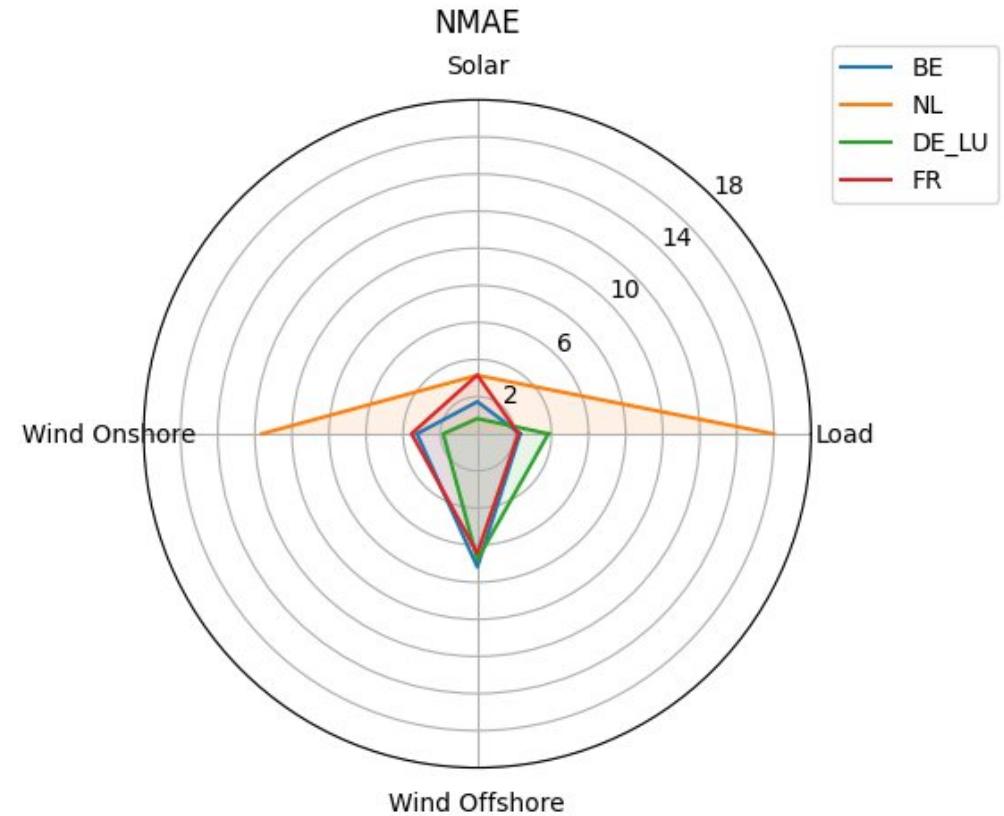
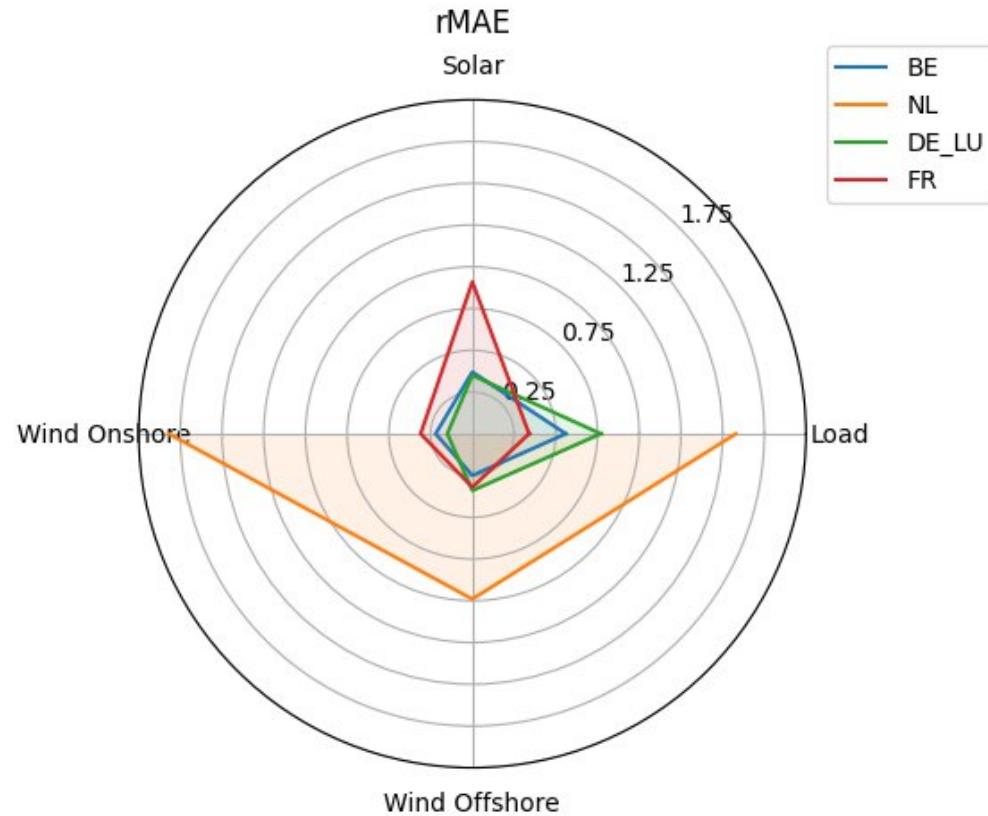


BDZ	NL MAE [MW]
BE	358.95
NL	2166.38
FR	1583.81
DE-LU	2692.47

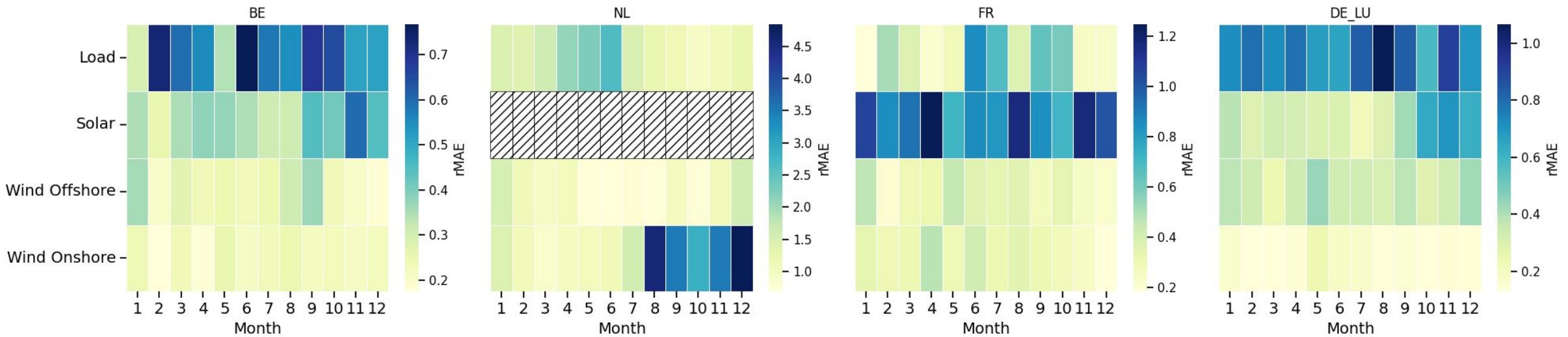
Results: Forecast Accuracy



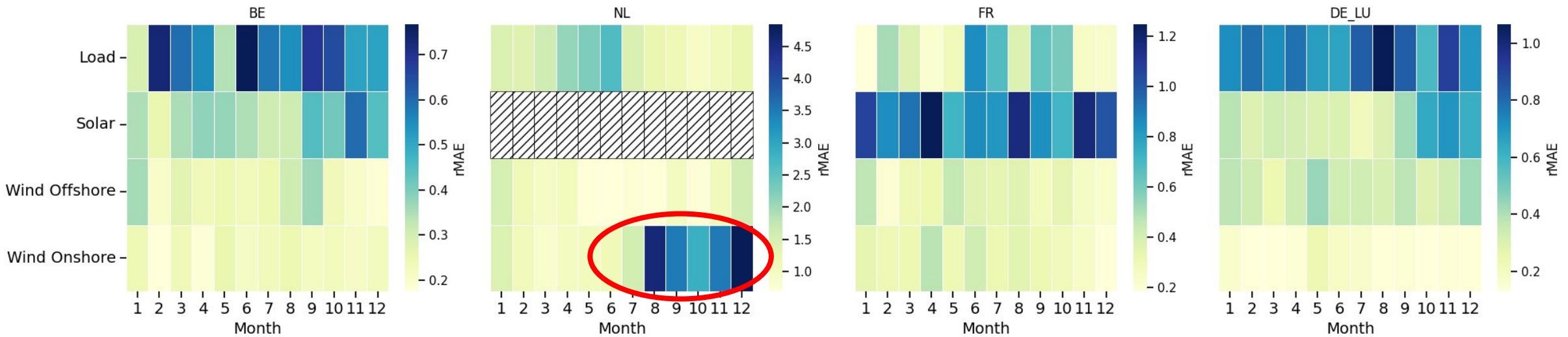
Results: Forecast Accuracy



Results: Forecast Accuracy



Results: Forecast Accuracy



Dashboard | Transparency++

Transparency++



Dashboard | Transparency++

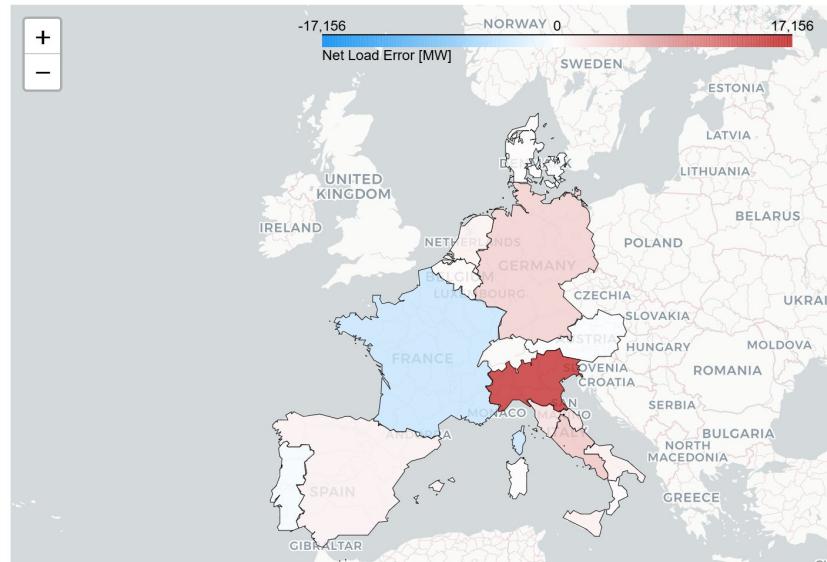
Transparency++ [🔗](#)



Evaluate and analyze ENTSO-E Transparency Platform data quality, forecast accuracy, and energy trends for ENTSO-E member countries.

Net Load Error Map

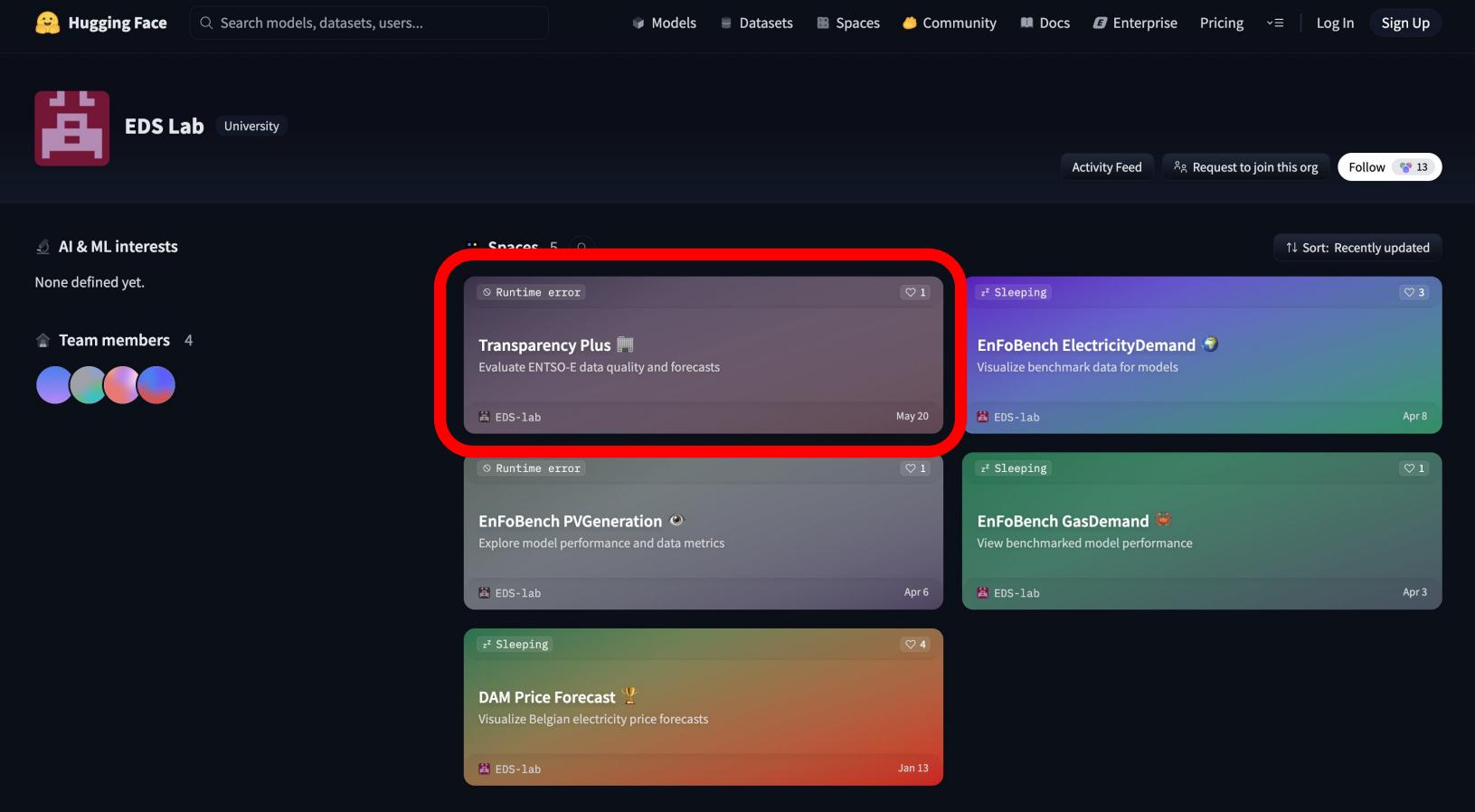
The net load error map highlights the error in the forecasted versus actual net load for each country. Hover over each country to see details on the latest net load error and the timestamp (with the time zone of the corresponding country) of the last recorded data.



Transparency++



Dashboard | Transparency++



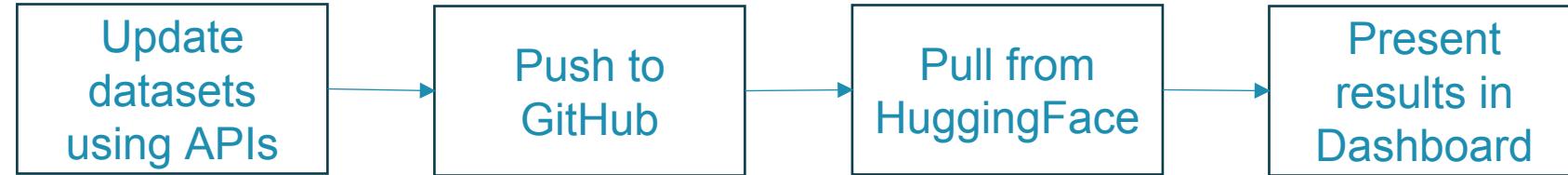
The screenshot shows the Hugging Face platform interface for the EDS Lab organization. The top navigation bar includes the Hugging Face logo, a search bar, and links for Models, Datasets, Spaces, Community, Docs, Enterprise, Pricing, Log In, and Sign Up. The EDS Lab organization profile is displayed, featuring a logo, the name 'EDS Lab', and the tag 'University'. Below the profile, there are sections for 'AI & ML interests' (None defined yet) and 'Team members' (4). The main content area displays a list of projects under the 'Spaces' tab, sorted by 'Recently updated'. The projects shown are:

- Transparency Plus** (Runtime error, May 20): A project to evaluate ENTSO-E data quality and forecasts. It is highlighted with a red box.
- EnFoBench ElectricityDemand** (Sleeping, Apr 8): A project to visualize benchmark data for models.
- EnFoBench PVGeneration** (Runtime error, Apr 6): A project to explore model performance and data metrics.
- DAM Price Forecast** (Sleeping, Jan 13): A project to visualize Belgian electricity price forecasts.
- EnFoBench GasDemand** (Sleeping, Apr 3): A project to view benchmarked model performance.

Each project card includes the project name, status (e.g., 'Sleeping' or 'Runtime error'), last update date, and the EDS-lab creator.



Pipeline | Transparency++



Conclusion



What's Next

- Transparency ++ (v0.2)
 - ✓ Extended monitoring to all binding zones of ENTSO-E
 - ⚠ WORK IN PROGRESS Move from monitoring to forecasting; operational, daily forecasts
 - ⚠ WORK IN PROGRESS Benchmark against TSO / ENTSO-E forecasts
- 💡 What features or insights would help your applications (e.g., conformal predictions of the forecasts, other metrics, consistency checks, cross-model comparisons)?