

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

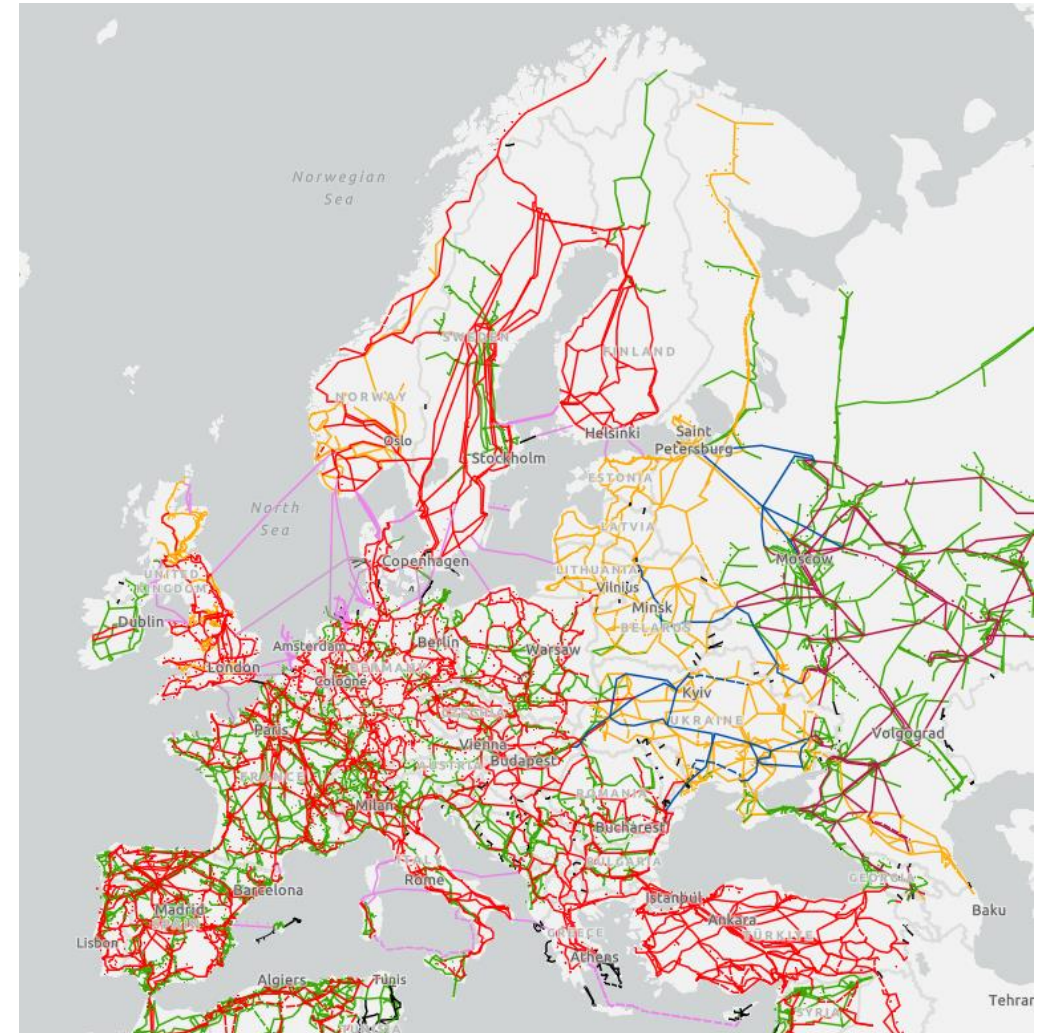
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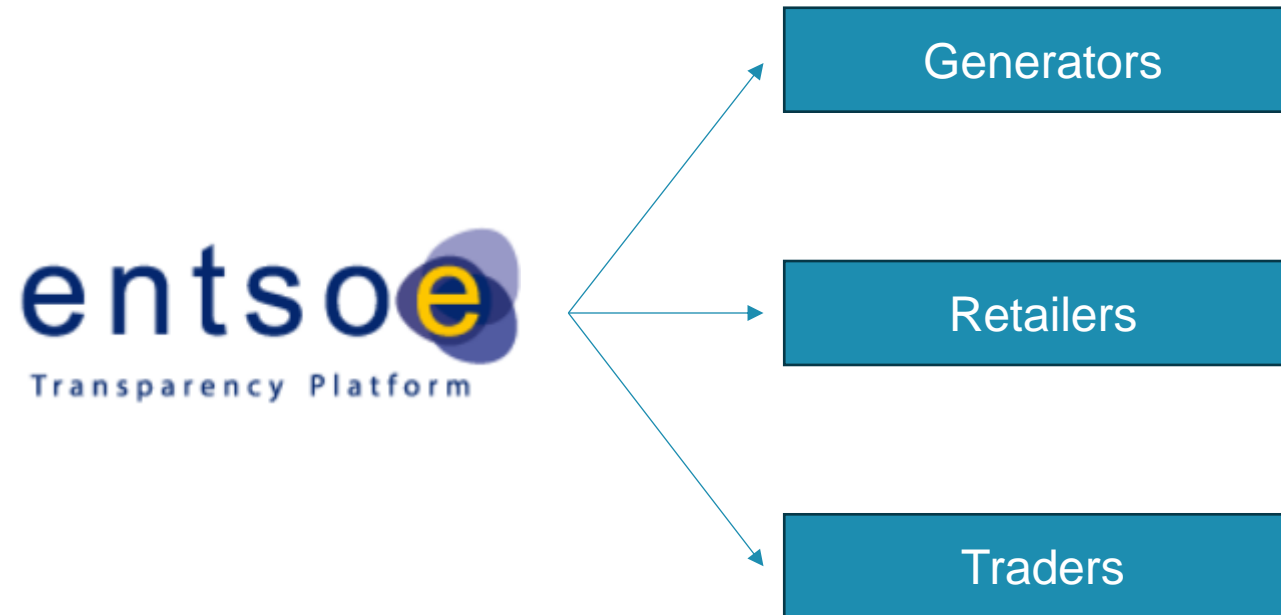
Introduction

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



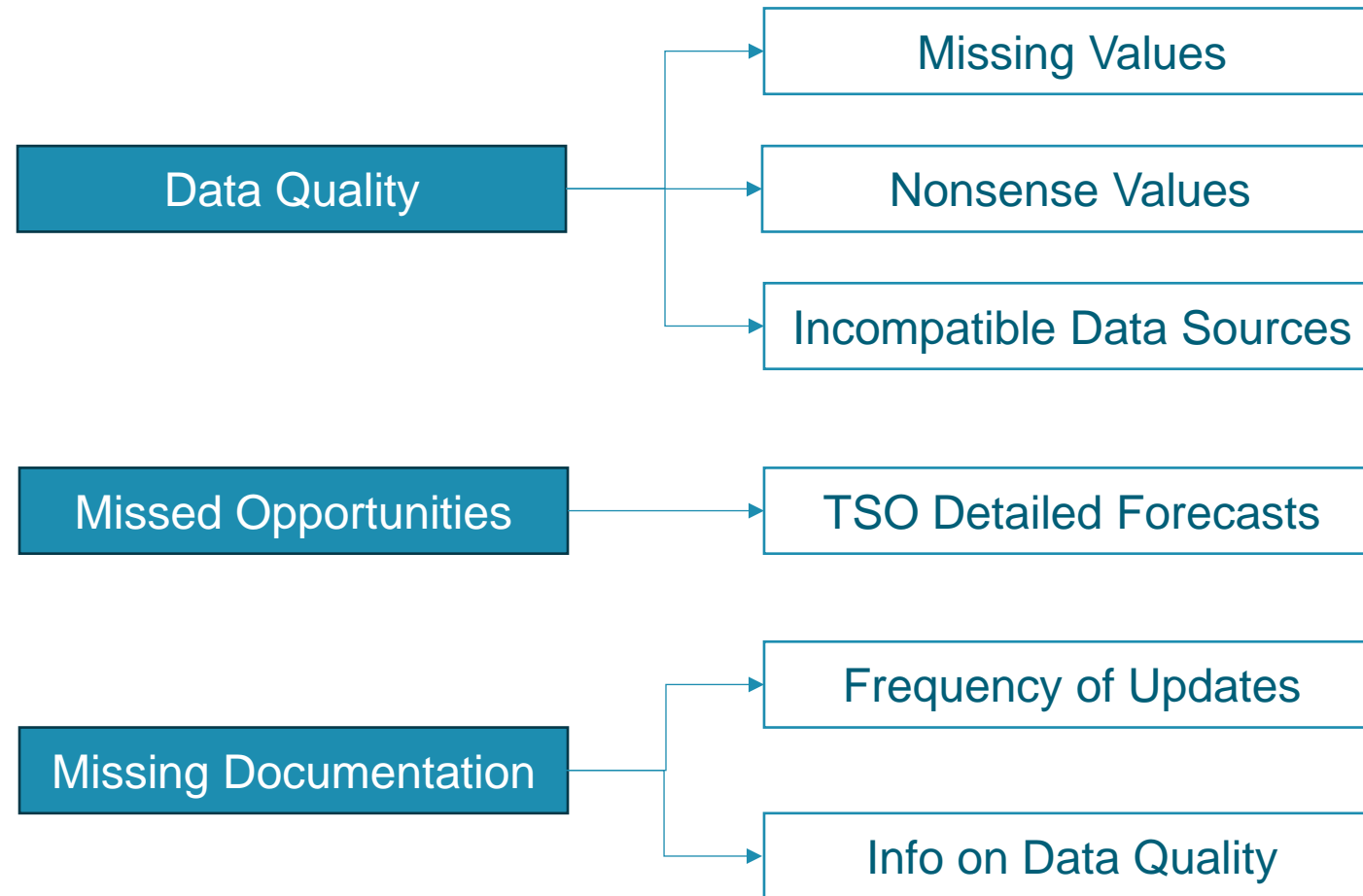
Transmission system network. ENTSO-E image.

ENTSO-E Transparency Platform (TP)



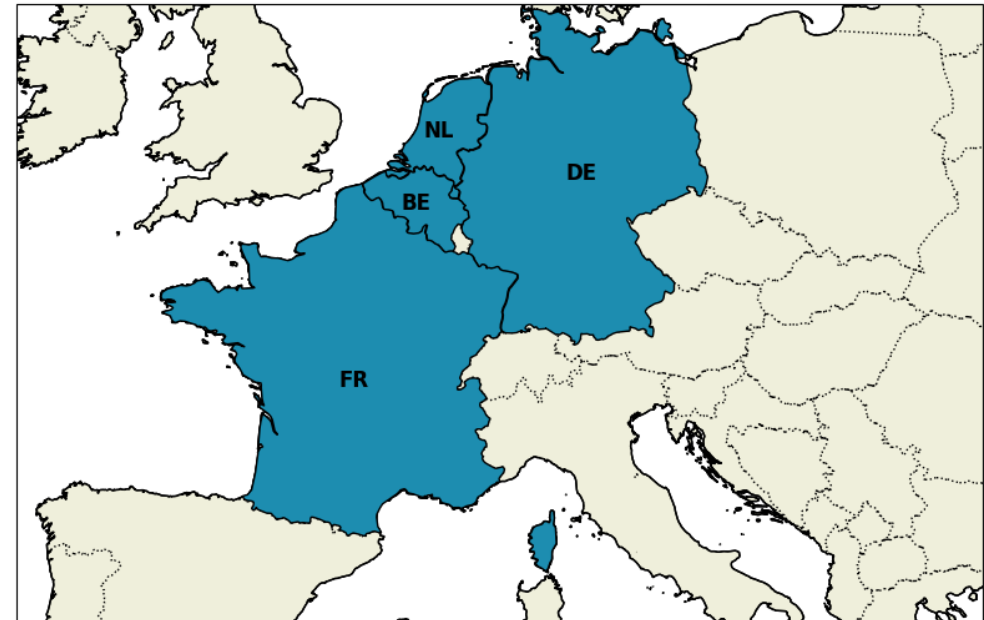
Central point for the collection, aggregation, and publication of electricity market data across Europe

ENTSO-E TP | Problems



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

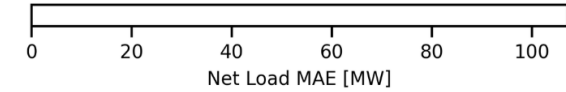
W_t^{off} : Actual wind offshore generation at time t

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

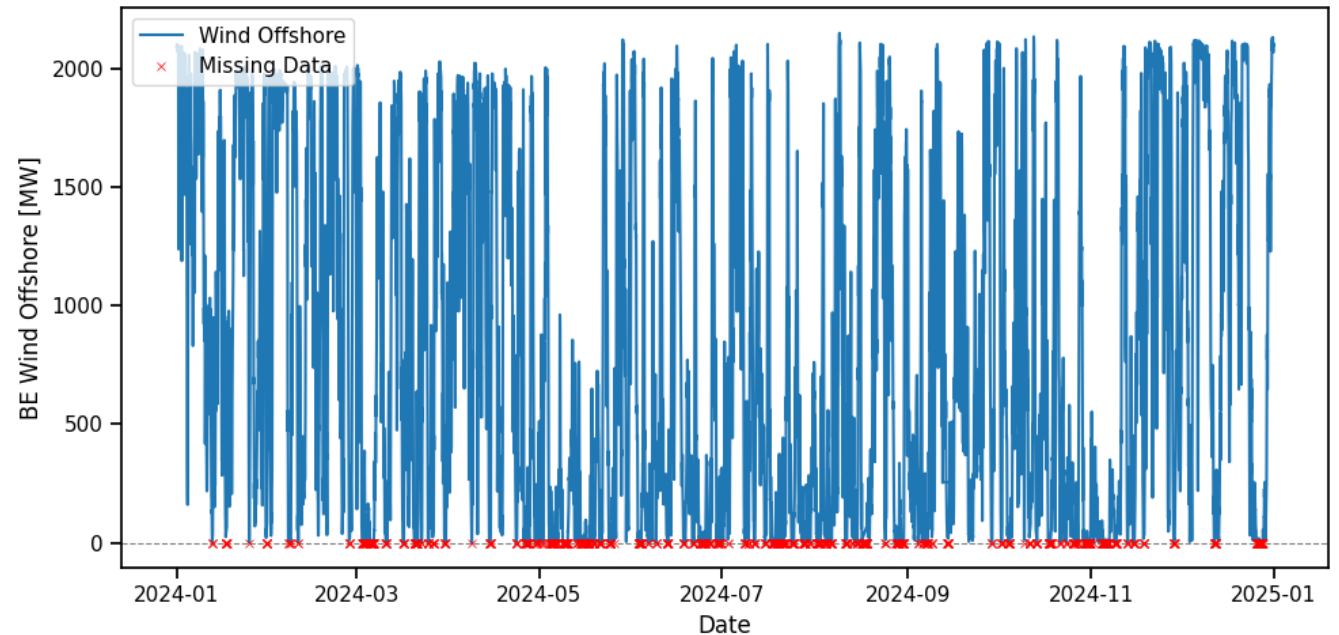
MAE_{pers} : MAE of the persistence model

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

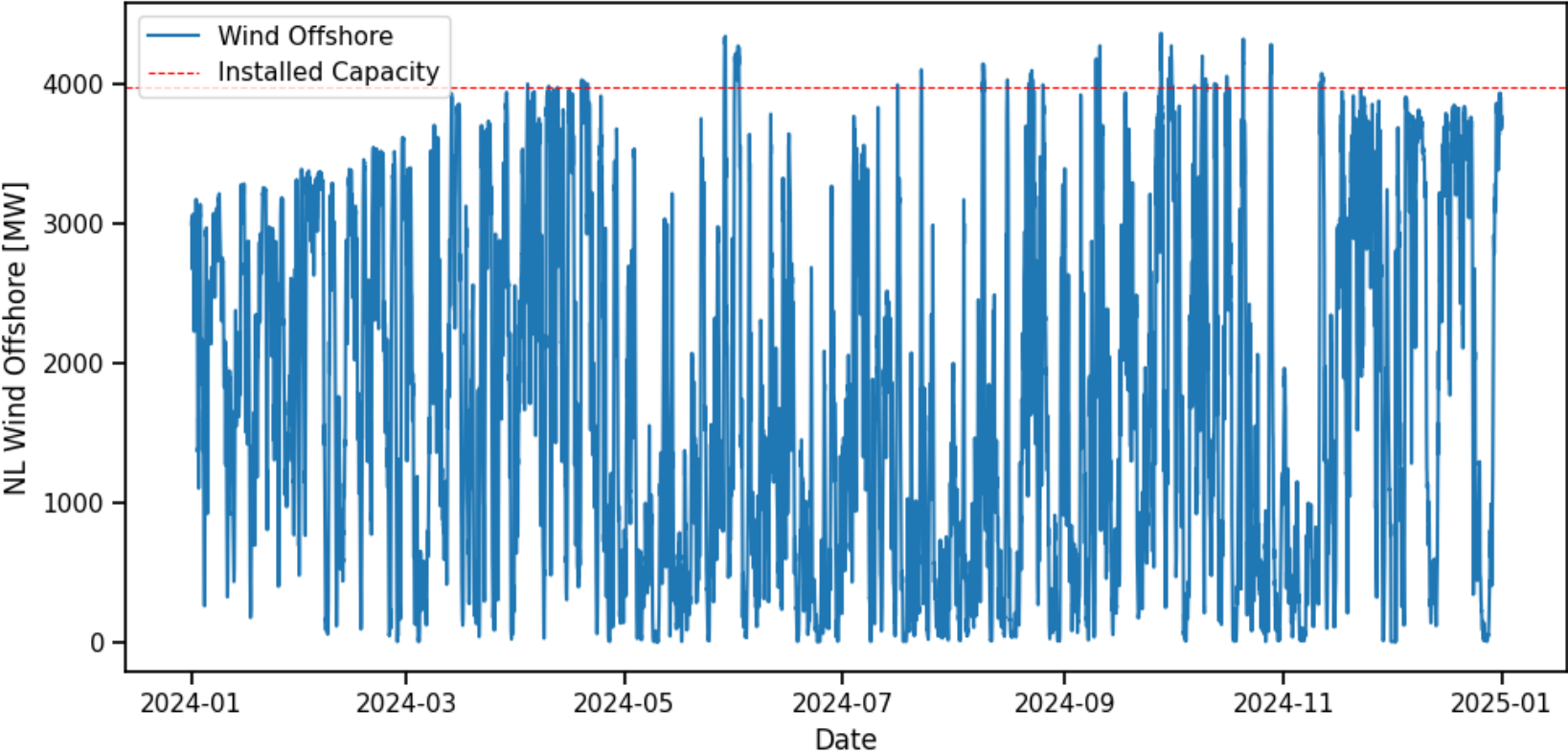
$C_{installed}$: Installed capacity (or average load for the load)

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



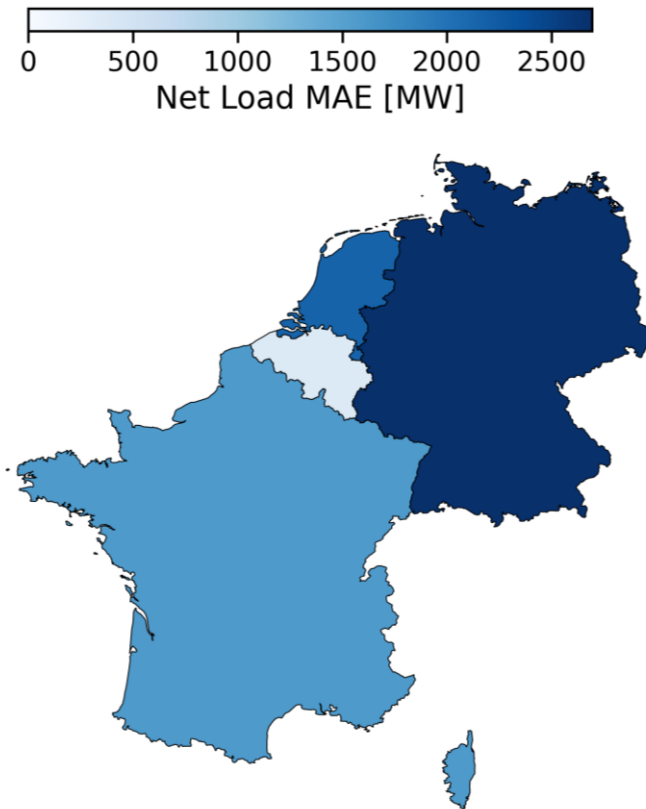
Results: Data Quality - Consistency

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

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

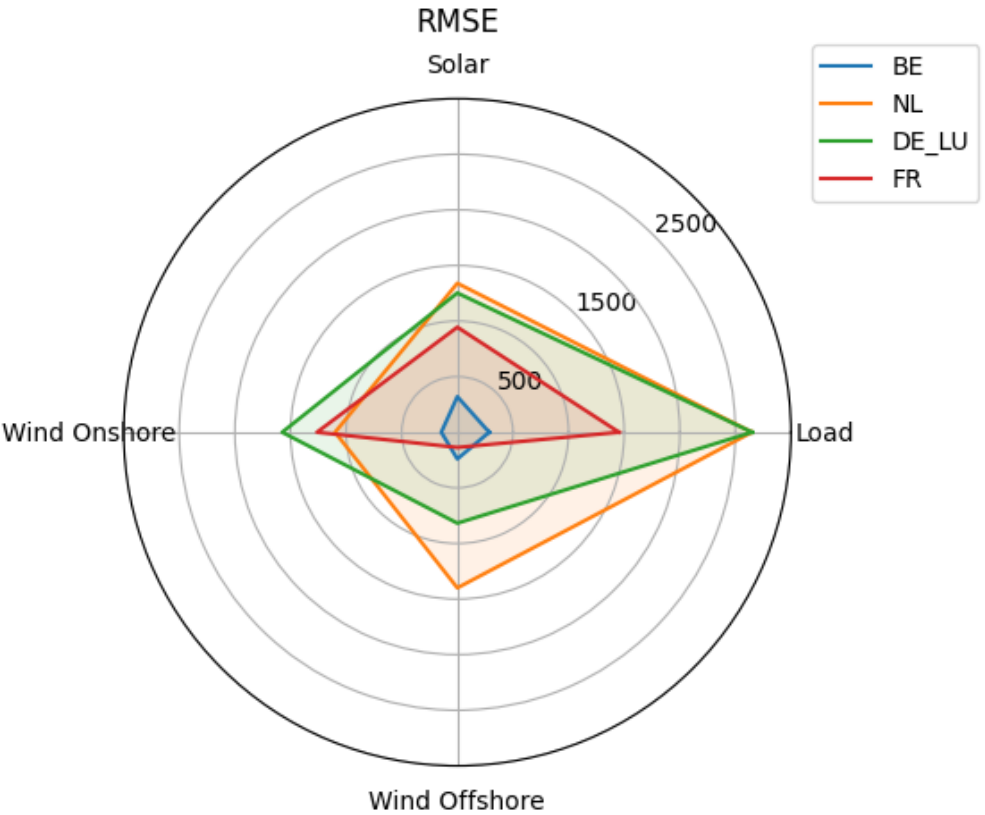
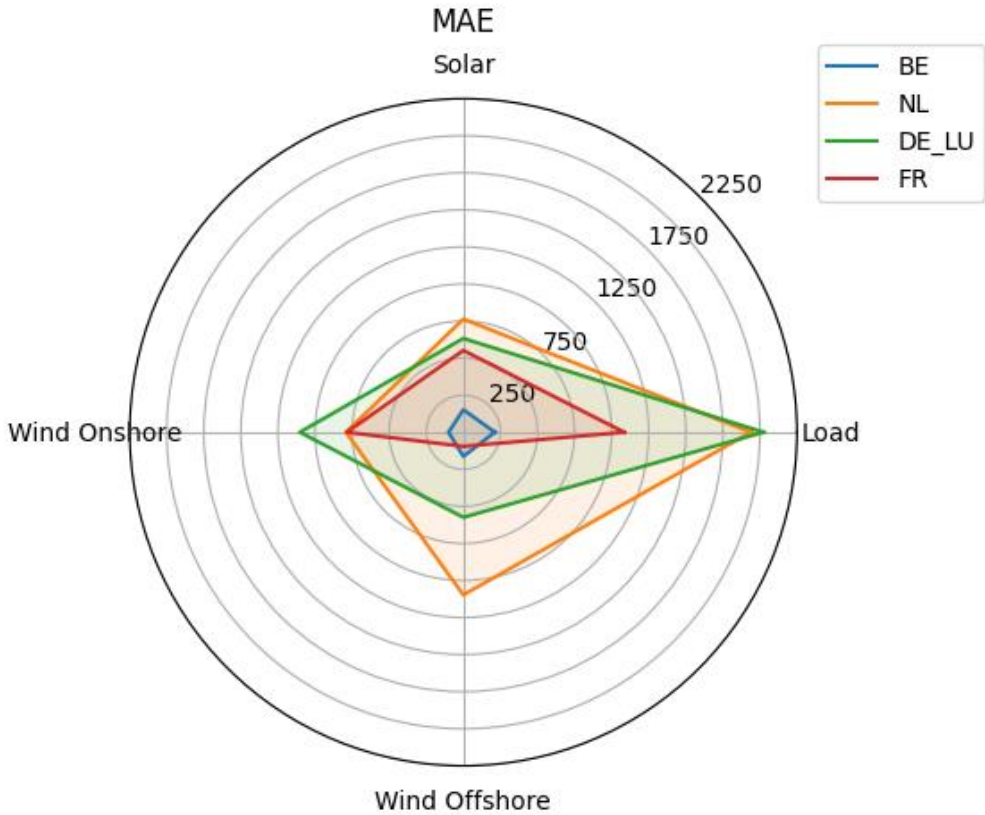


Results: Zonal Statistics

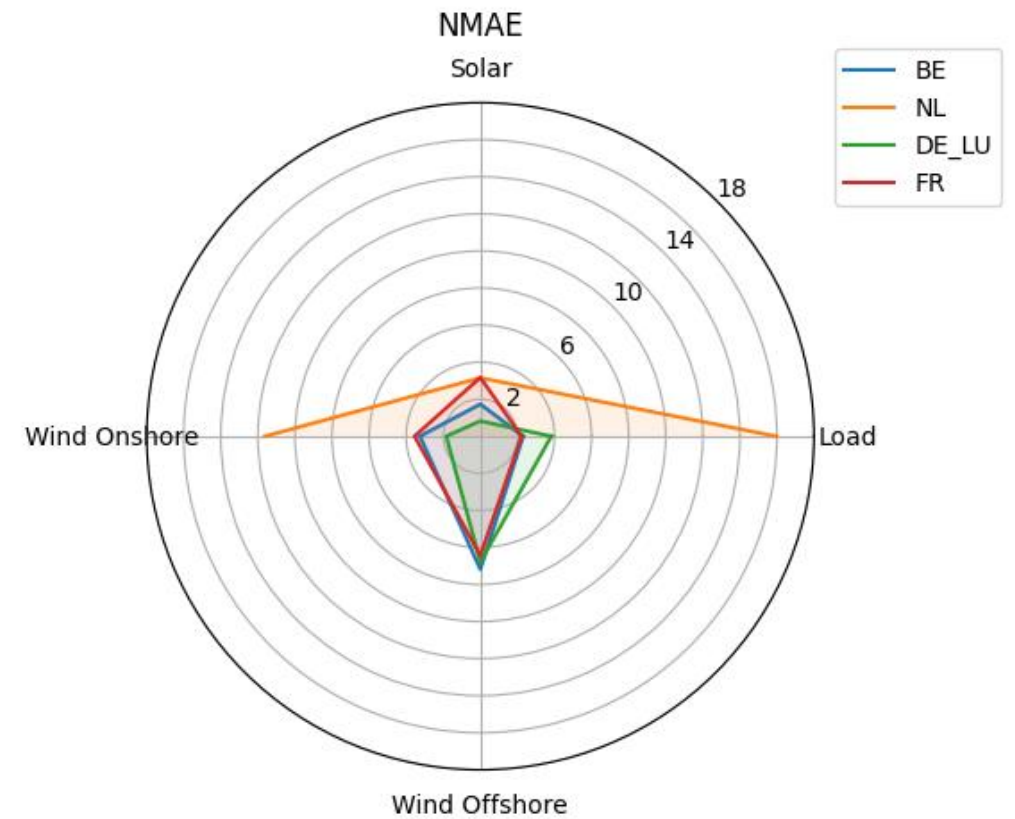
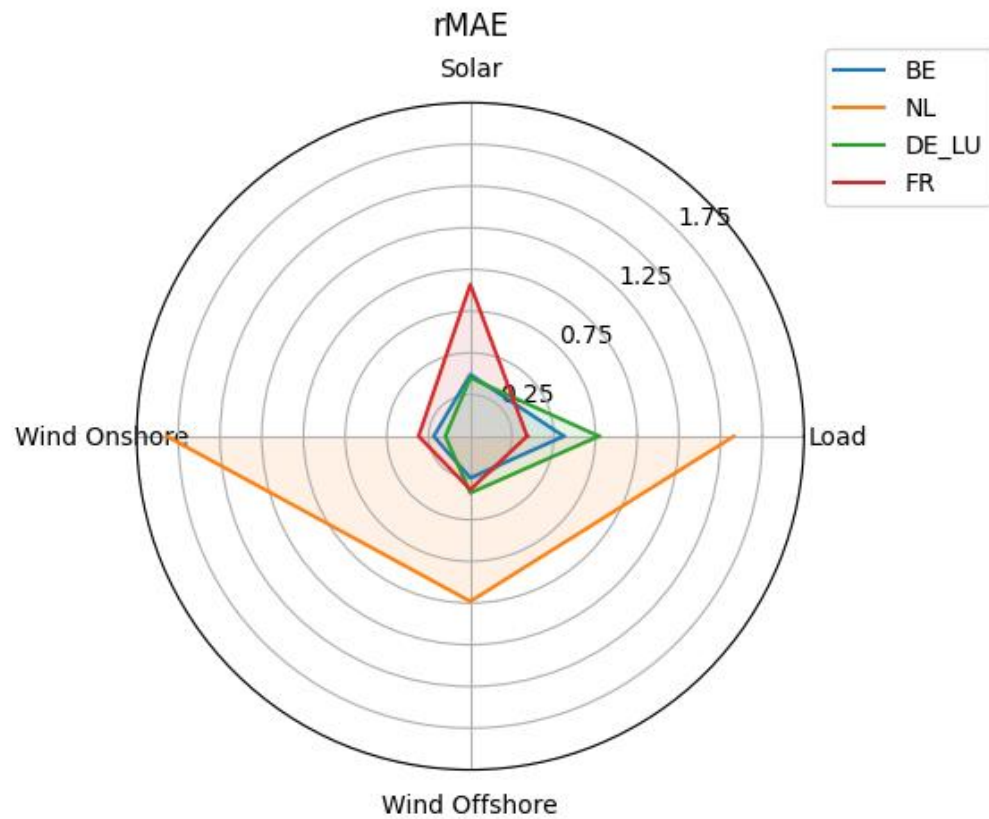


BDZ	NL MAE [MW]
BE	358.95
NL	2166.38
FR	1583.81
DE-LU	2692.47

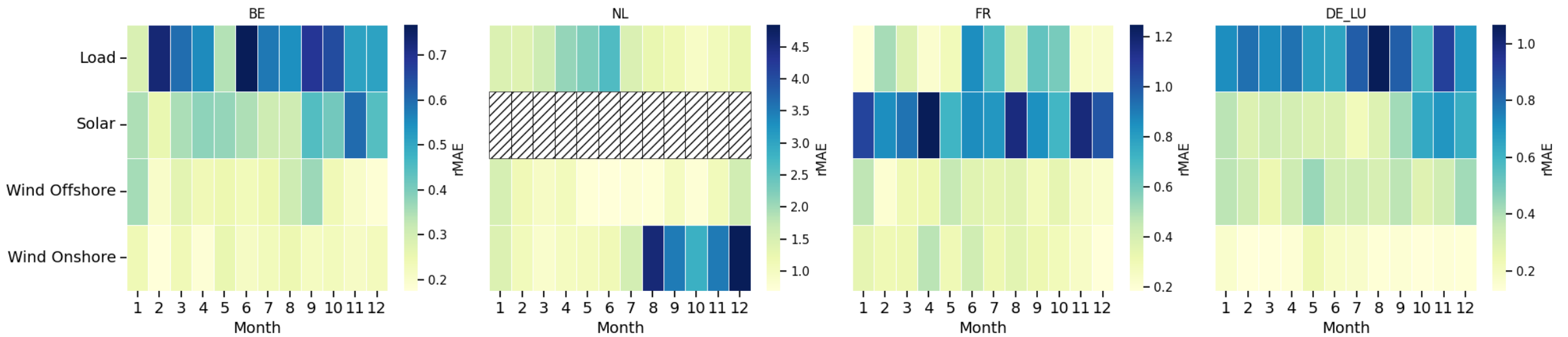
Results: Forecast Accuracy



Results: Forecast Accuracy



Results: Forecast Accuracy



Dashboard | Transparency++

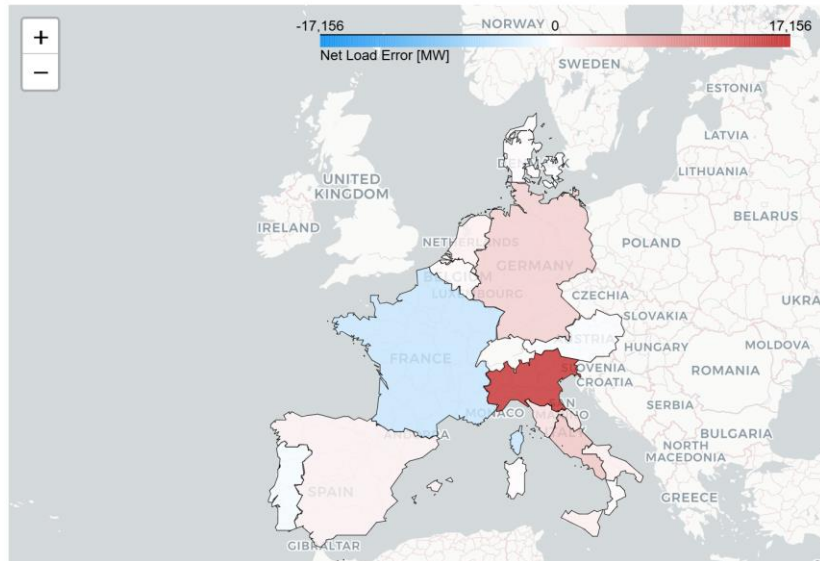
Transparency++



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.

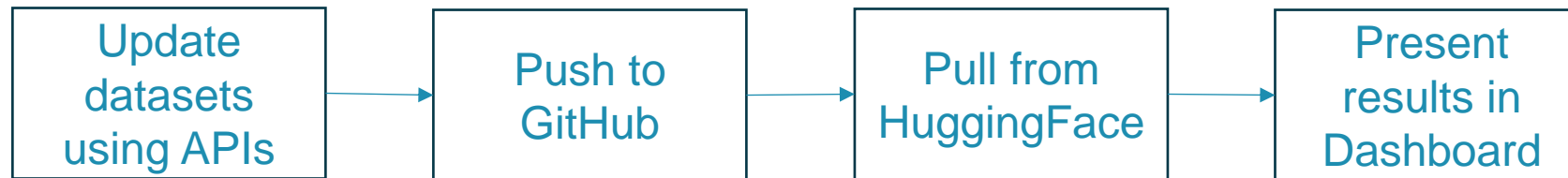


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Pipeline | Transparency++

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Conclusion

