

Online-Material zum Artikel „Potential von Machine Learning bei der kurzfristigen Leistungsprognose innerhalb einer Laufkraftwerkskette“

für das Grenzkraftwerk Braunau-Simbach (GBR)

Inhalt:

- 1) Zeitreihen für 5 Zeitfenster in der Validierungsphase sowie 4 Prognosestufen (4 bis 1h)
- 2) Feature Importance der ML-Modelle „Random Forest“ sowie „XGBoost“

15.12.2021

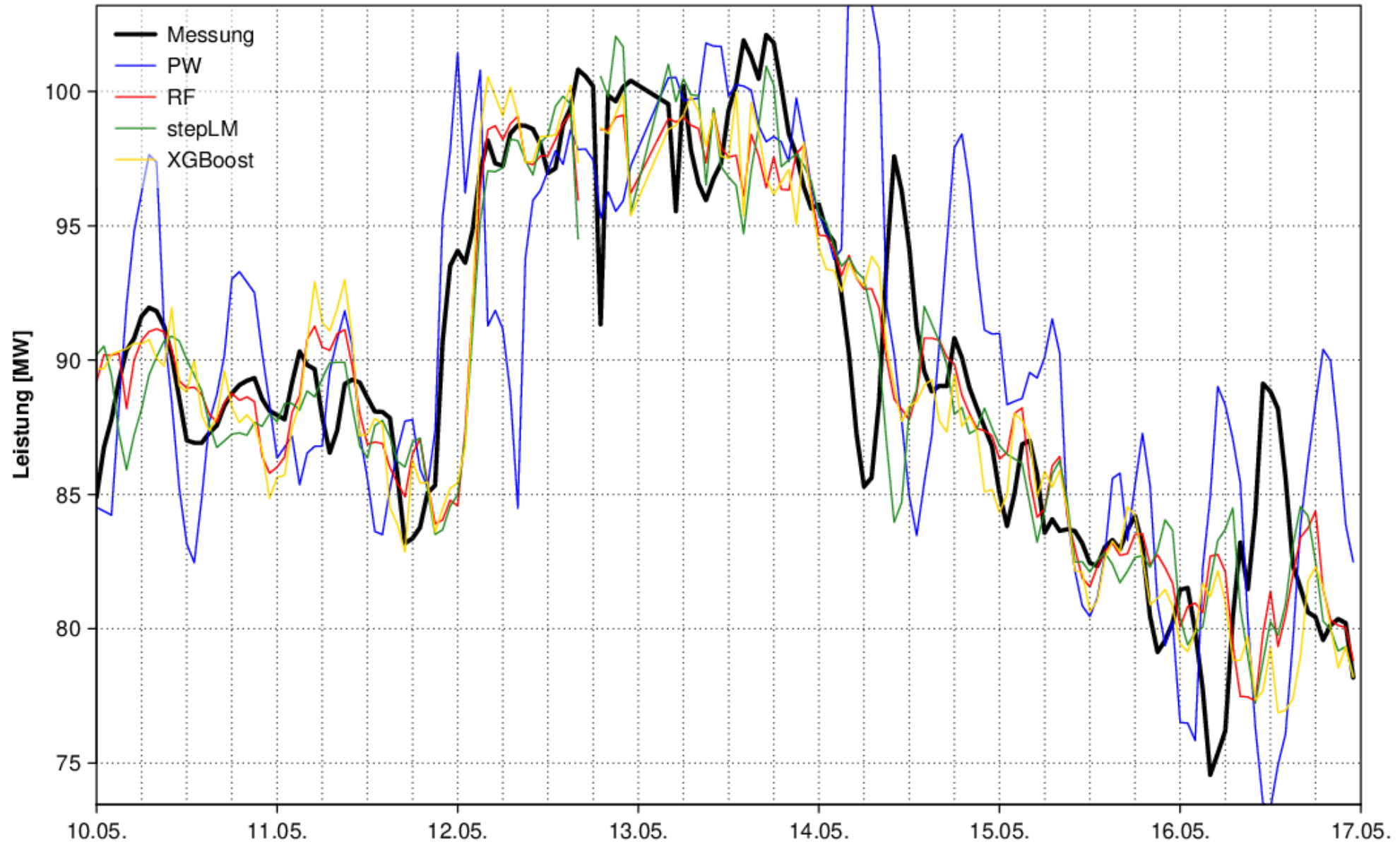
Grenzkraftwerk Braunau-Simbach (GBR)

- Inn-Kilometer 61,1
- Engpassleistung 100 MW
- Mittlere Rohfallhöhe 12,1 m
- Ausbaudurchfluss 1070 m³/s

Quellen: Verbund AG, Wikipedia

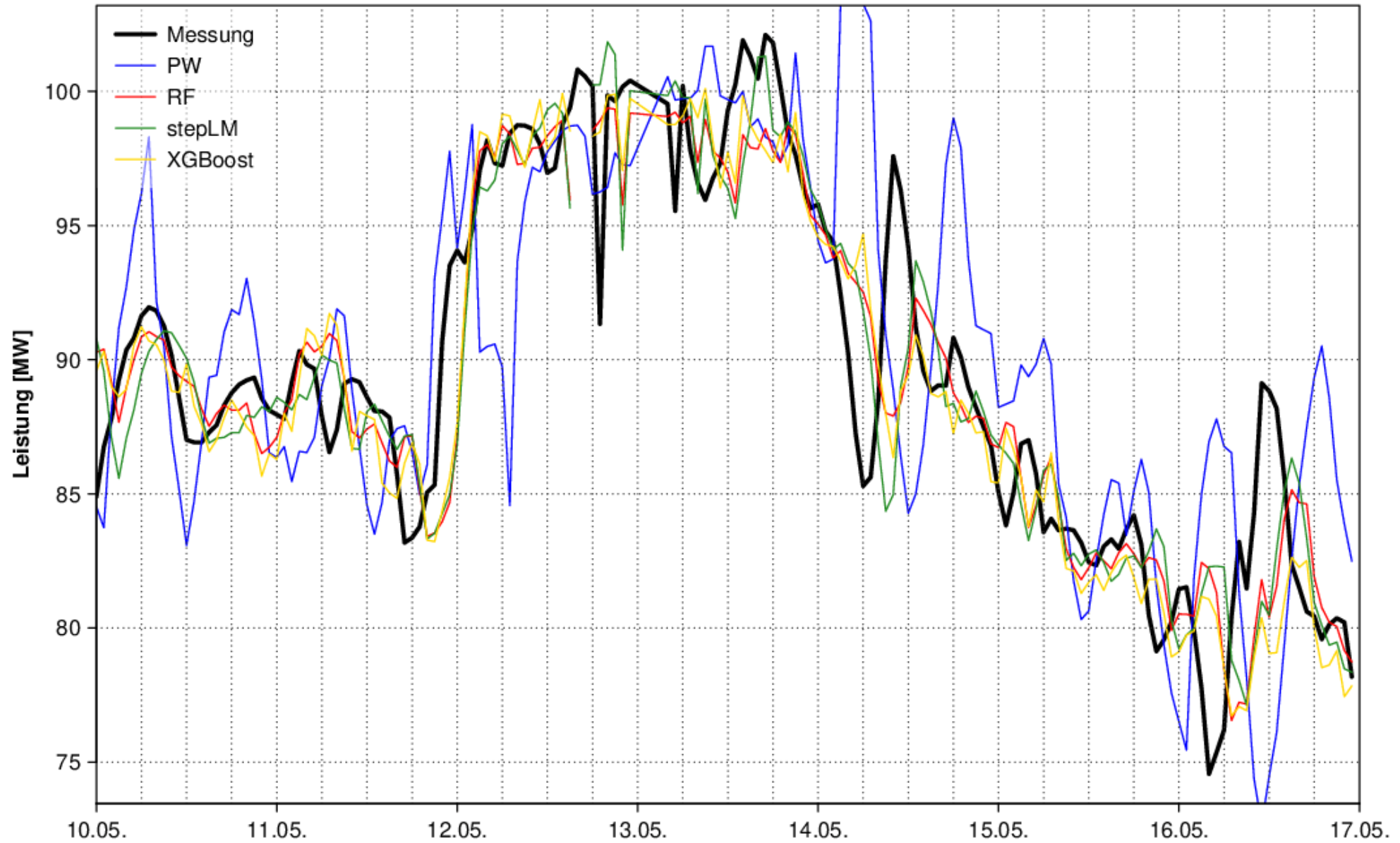
1) Zeitreihen

- für 5 Zeitfenster in der Validierungsphase sowie 4 Prognosestufen (4 bis 1h)
- des Benchmark-Modells „PW“ sowie der
- ML-Modelle „stepwise multiple linear regression“ (stepLM), „Random Forest“ (RF) sowie „XGBoost“
- im Vergleich zu den Messwerten
- Prediktoren-Kombination GBR6 (siehe Tab. 2 im Artikel)



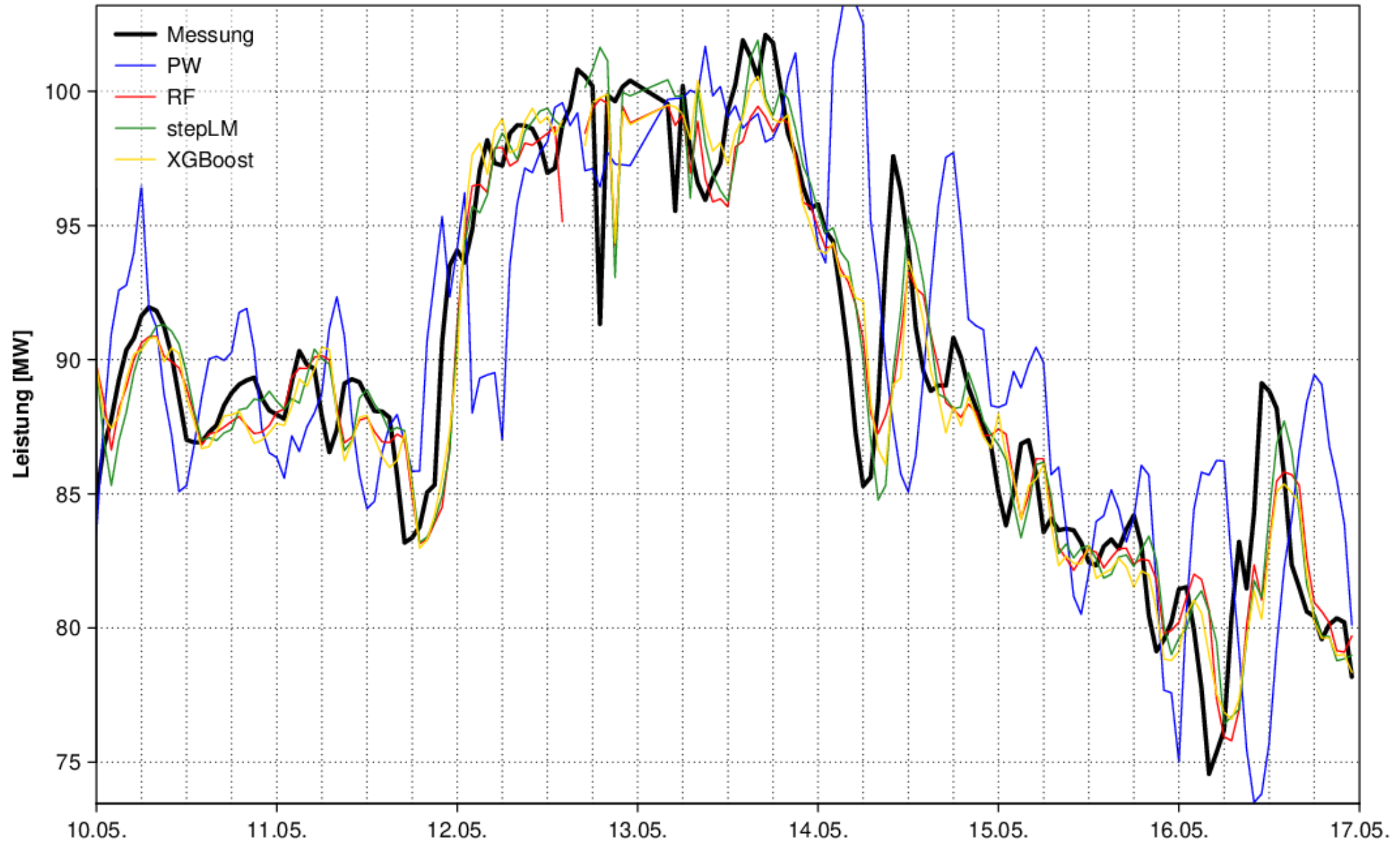
PW: RMSE = 5.67 MW | MAE = 4.24 MW
RF: RMSE = 3.22 MW | MAE = 2.28 MW

stepLM: RMSE = 3.57 MW | MAE = 2.52 MW
XGBoost: RMSE = 3.42 MW | MAE = 2.46 MW



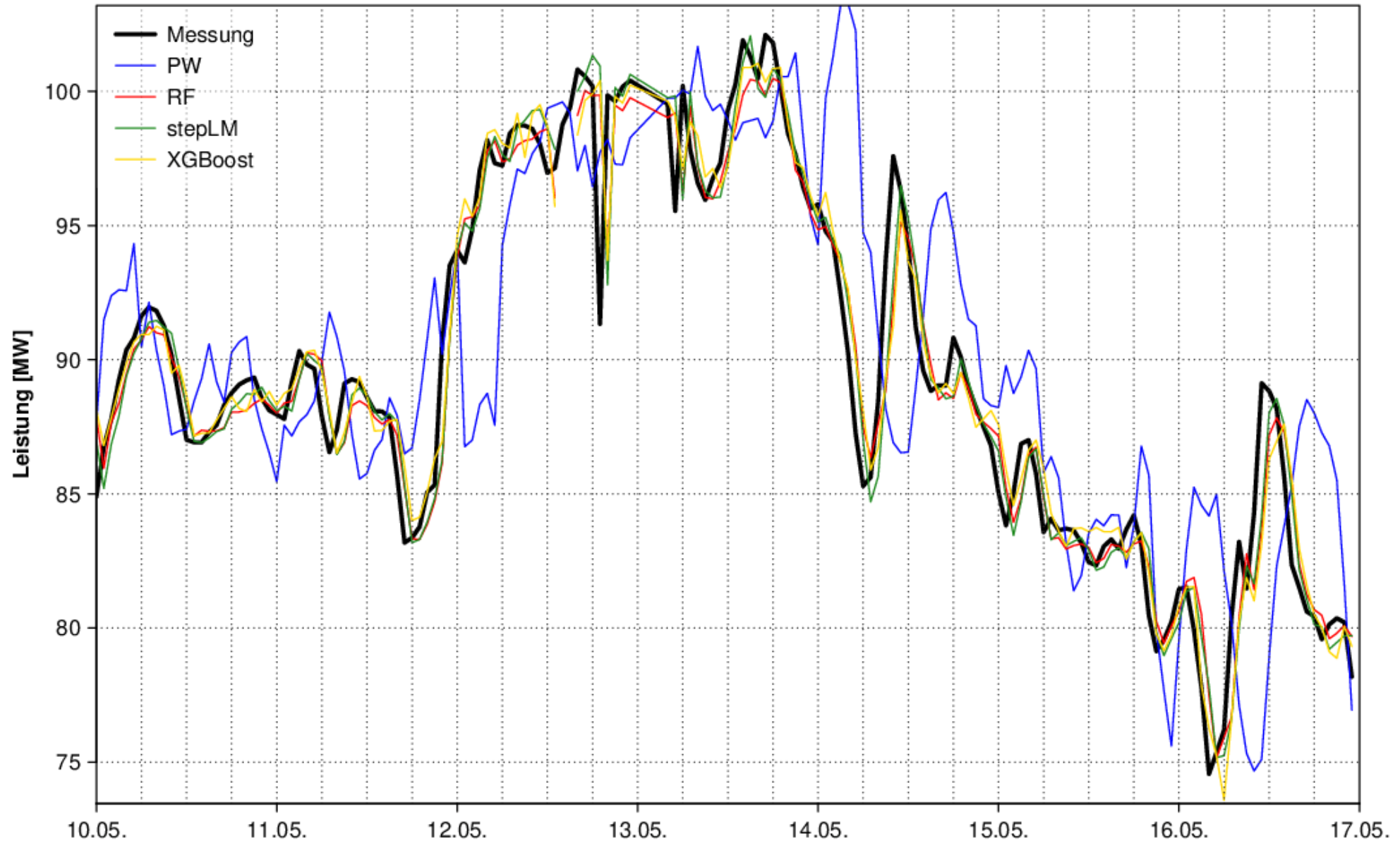
PW: RMSE = 5.53 MW | MAE = 4.12 MW
RF: RMSE = 2.98 MW | MAE = 2.13 MW

stepLM: RMSE = 3.2 MW | MAE = 2.3 MW
XGBoost: RMSE = 3.08 MW | MAE = 2.2 MW



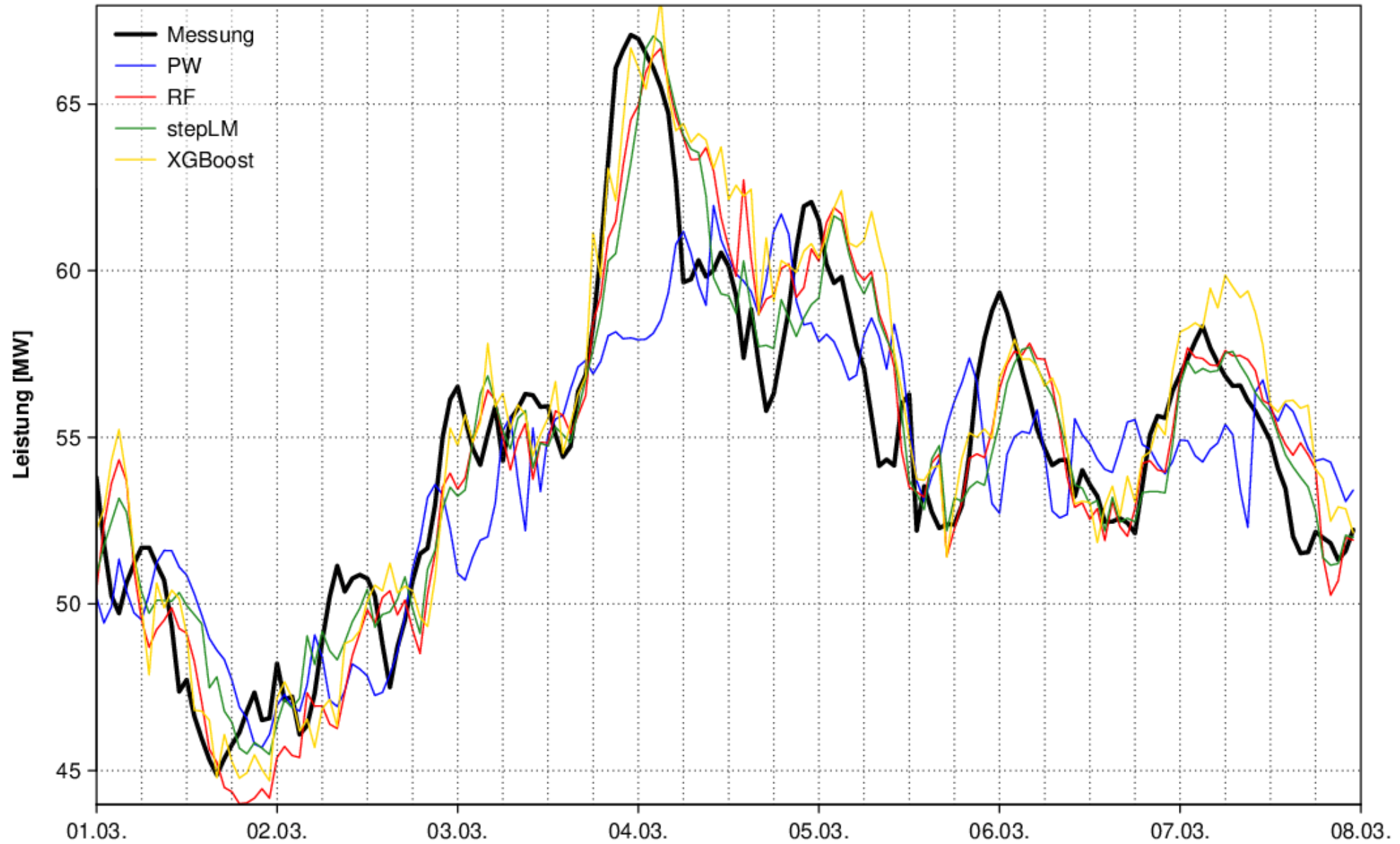
PW: RMSE = 5.14 MW | MAE = 3.89 MW
RF: RMSE = 2.47 MW | MAE = 1.77 MW

stepLM: RMSE = 2.57 MW | MAE = 1.81 MW
XGBoost: RMSE = 2.51 MW | MAE = 1.79 MW



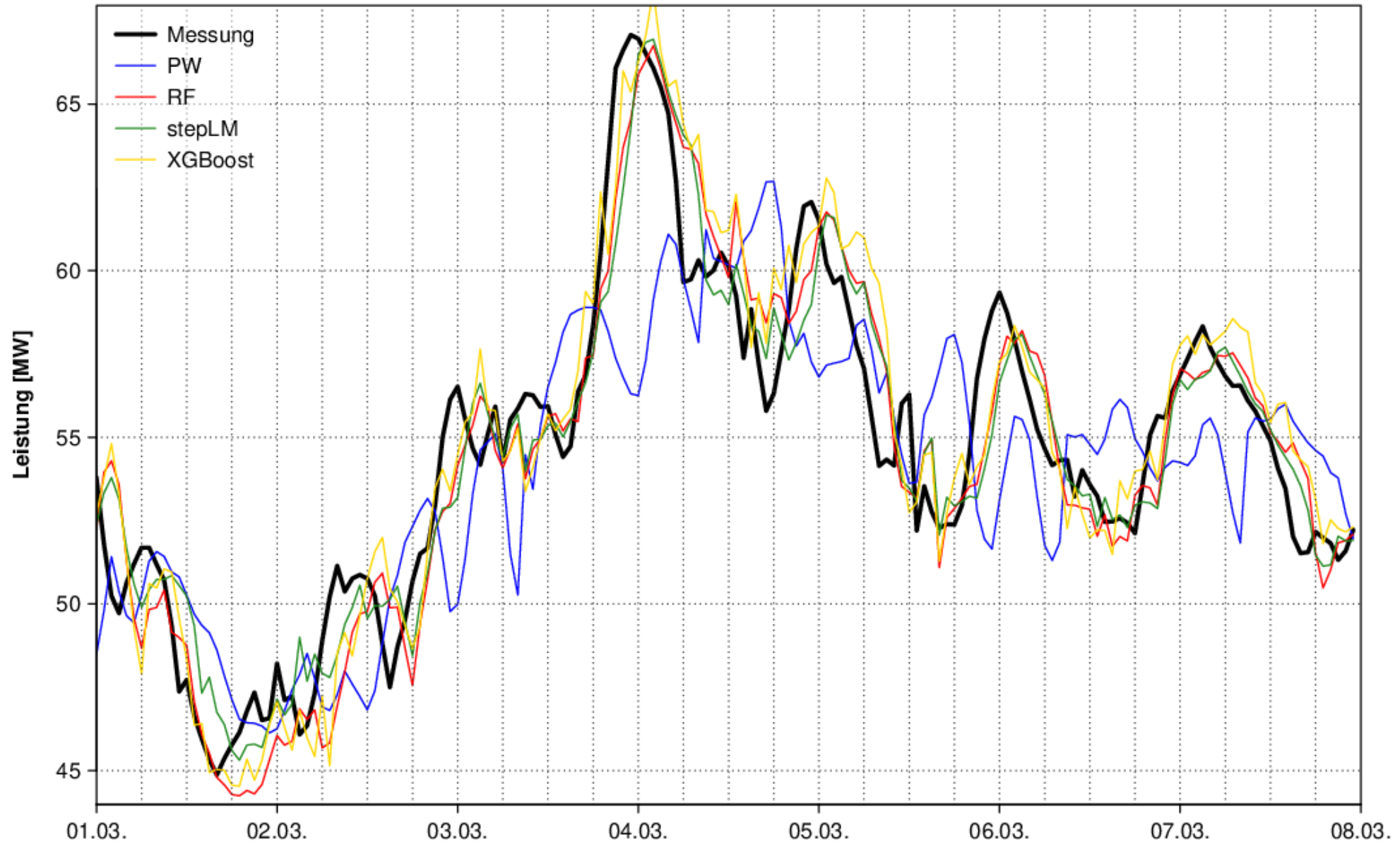
PW: RMSE = 4.64 MW | MAE = 3.55 MW
RF: RMSE = 1.7 MW | MAE = 1.14 MW

stepLM: RMSE = 1.73 MW | MAE = 1.13 MW
XGBoost: RMSE = 1.76 MW | MAE = 1.18 MW



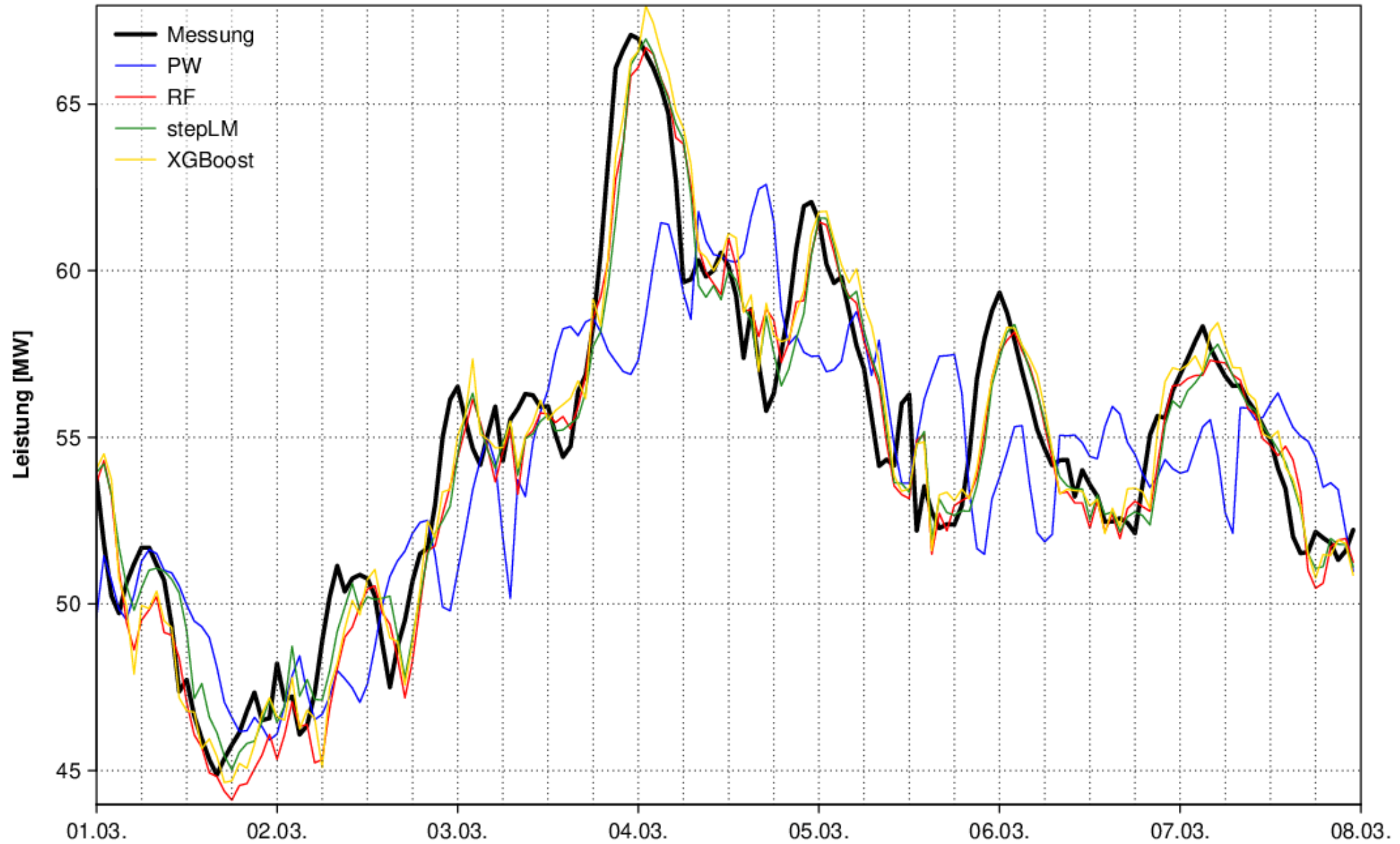
PW: RMSE = 2.98 MW | MAE = 2.35 MW
RF: RMSE = 2.02 MW | MAE = 1.65 MW

stepLM: RMSE = 1.9 MW | MAE = 1.5 MW
XGBoost: RMSE = 2.22 MW | MAE = 1.73 MW



PW: RMSE = 3.36 MW | MAE = 2.65 MW
RF: RMSE = 1.8 MW | MAE = 1.45 MW

stepLM: RMSE = 1.74 MW | MAE = 1.37 MW
XGBoost: RMSE = 1.93 MW | MAE = 1.54 MW



PW: RMSE = 3.18 MW | MAE = 2.5 MW
RF: RMSE = 1.48 MW | MAE = 1.14 MW

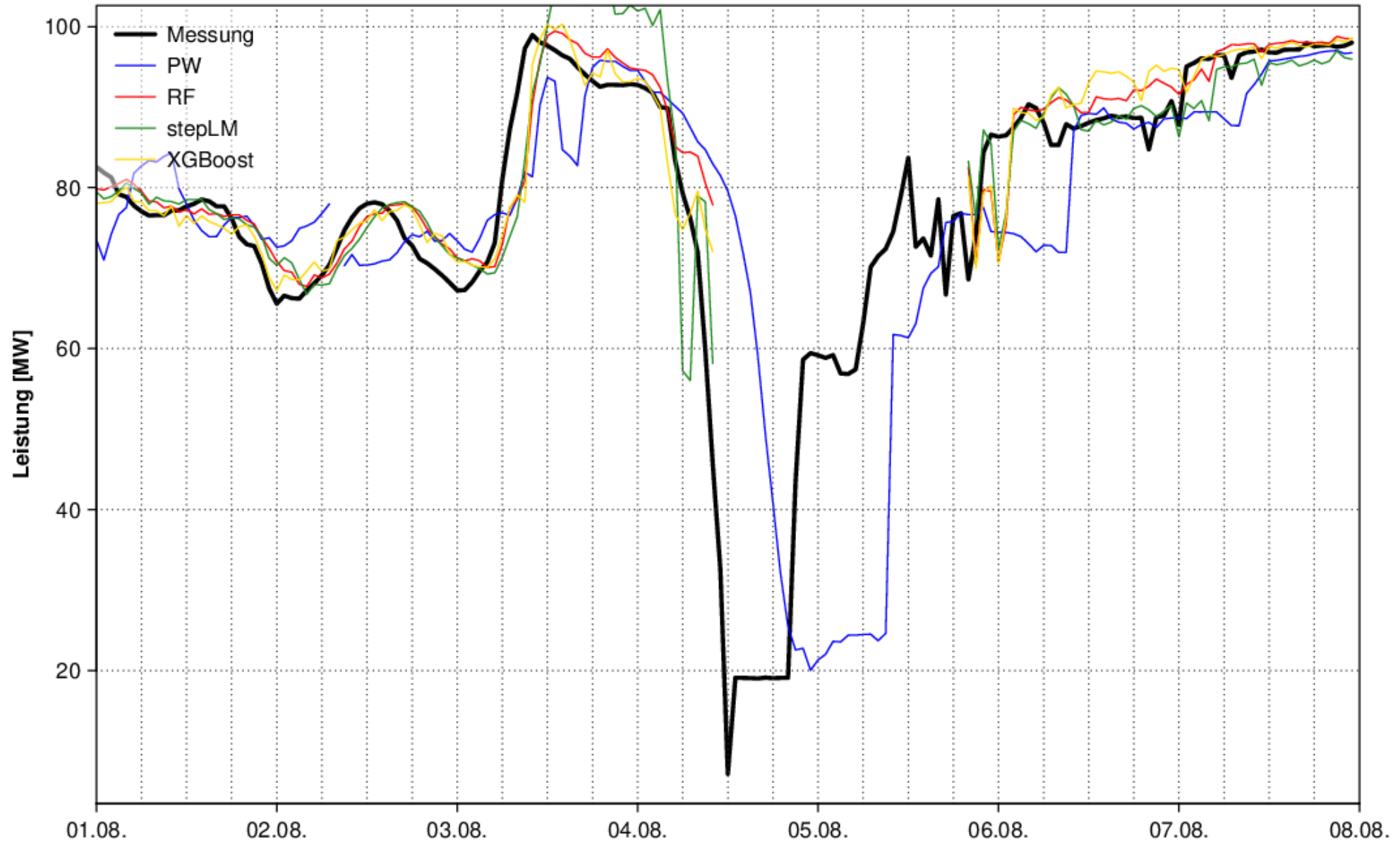
stepLM: RMSE = 1.45 MW | MAE = 1.1 MW
XGBoost: RMSE = 1.45 MW | MAE = 1.14 MW



PW: RMSE = 2.84 MW | MAE = 2.21 MW
RF: RMSE = 0.96 MW | MAE = 0.73 MW

stepLM: RMSE = 0.94 MW | MAE = 0.71 MW
XGBoost: RMSE = 0.98 MW | MAE = 0.76 MW

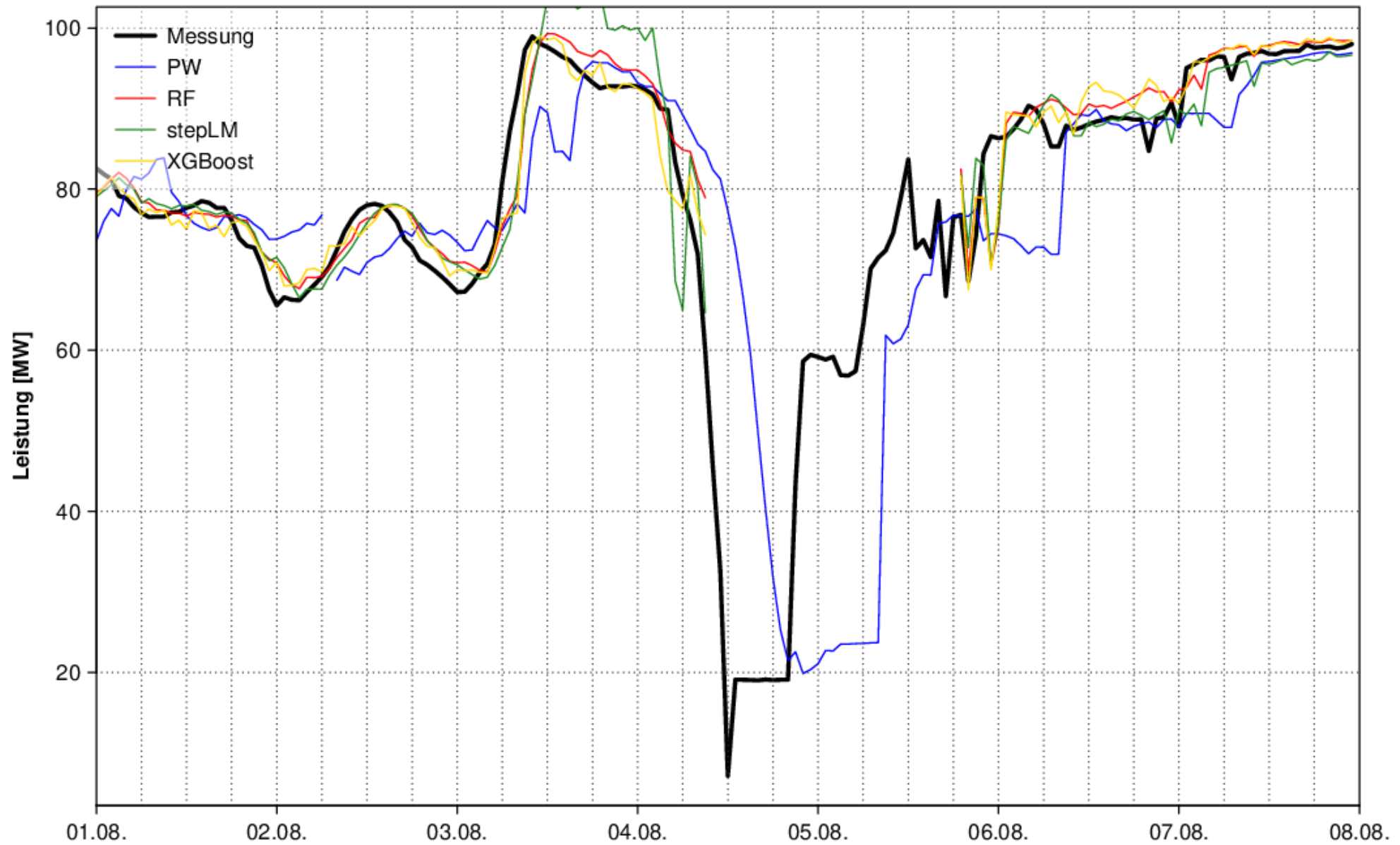
Leistungsprognose KW Braunau | Zeitfenster Val3 | Vorhersage 4h



PW: RMSE = 16.87 MW | MAE = 10.4 MW
RF: RMSE = 5.37 MW | MAE = 3.38 MW

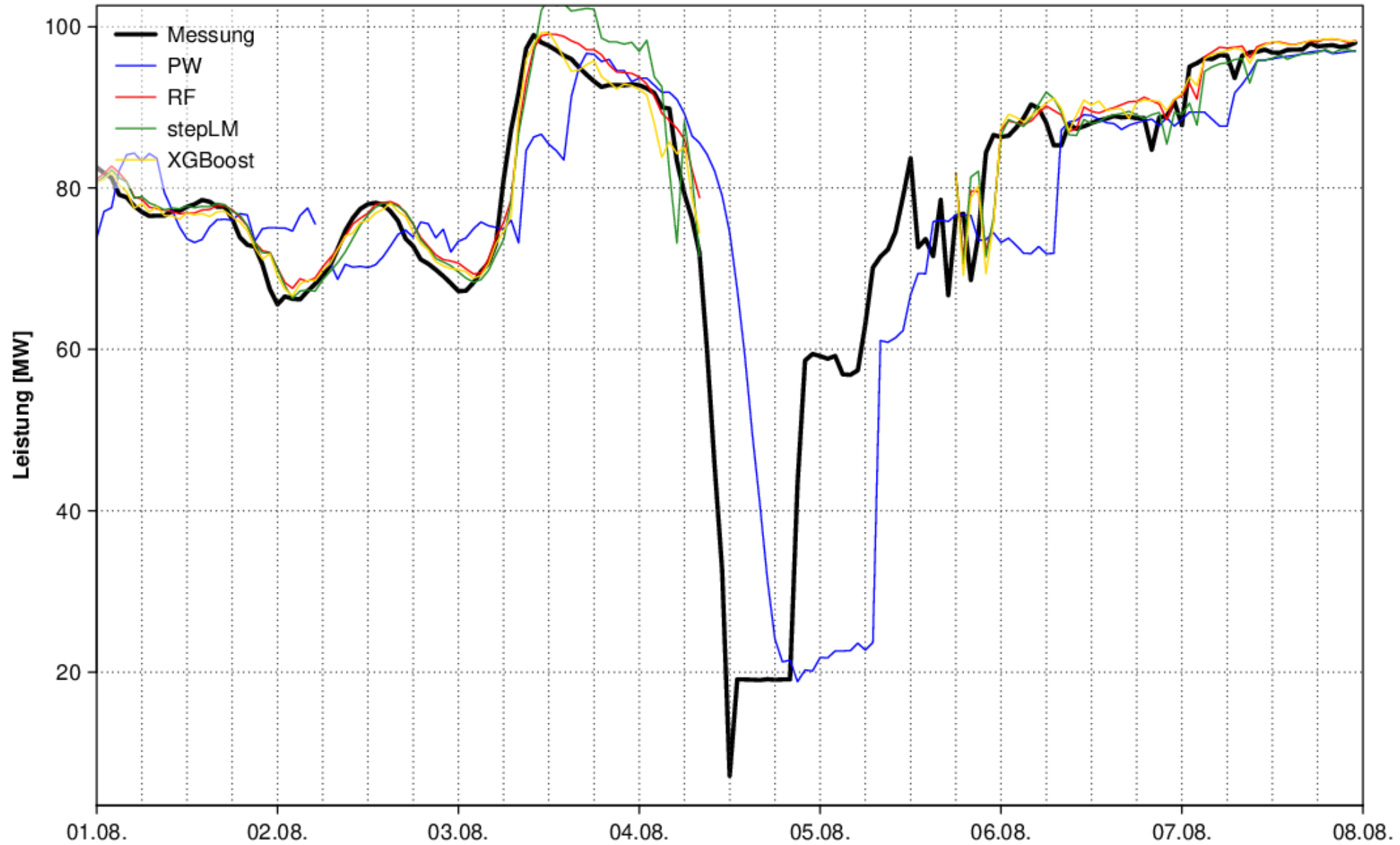
stepLM: RMSE = 6.16 MW | MAE = 4.27 MW
XGBoost: RMSE = 4.99 MW | MAE = 3.17 MW

Leistungsprognose KW Braunau | Zeitfenster Val3 | Vorhersage 3h



PW: RMSE = 15.84 MW | MAE = 9.64 MW
RF: RMSE = 4.07 MW | MAE = 2.74 MW

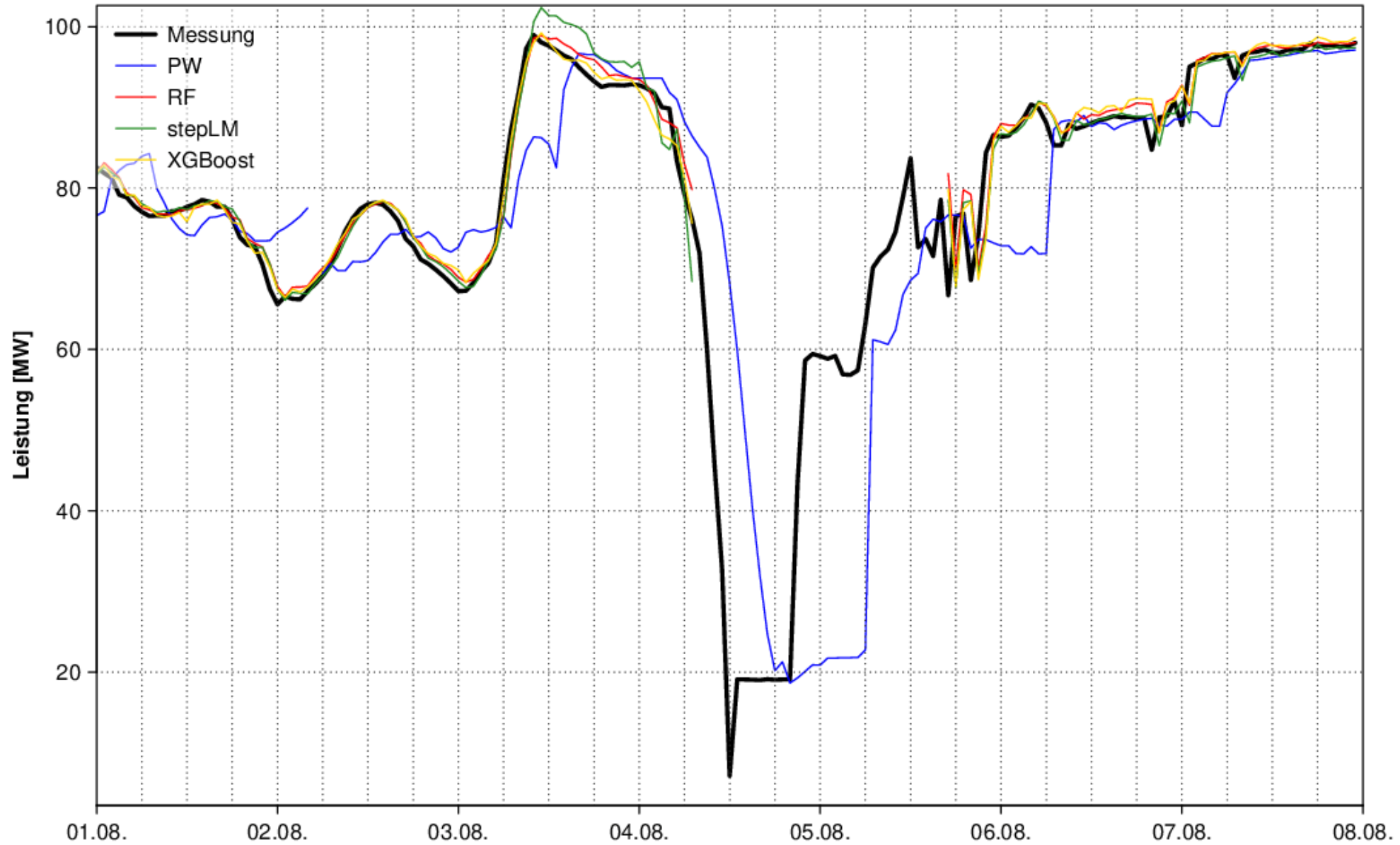
stepLM: RMSE = 4.97 MW | MAE = 3.49 MW
XGBoost: RMSE = 3.79 MW | MAE = 2.48 MW



PW: RMSE = 14.78 MW | MAE = 9.02 MW
RF: RMSE = 3.15 MW | MAE = 2.15 MW

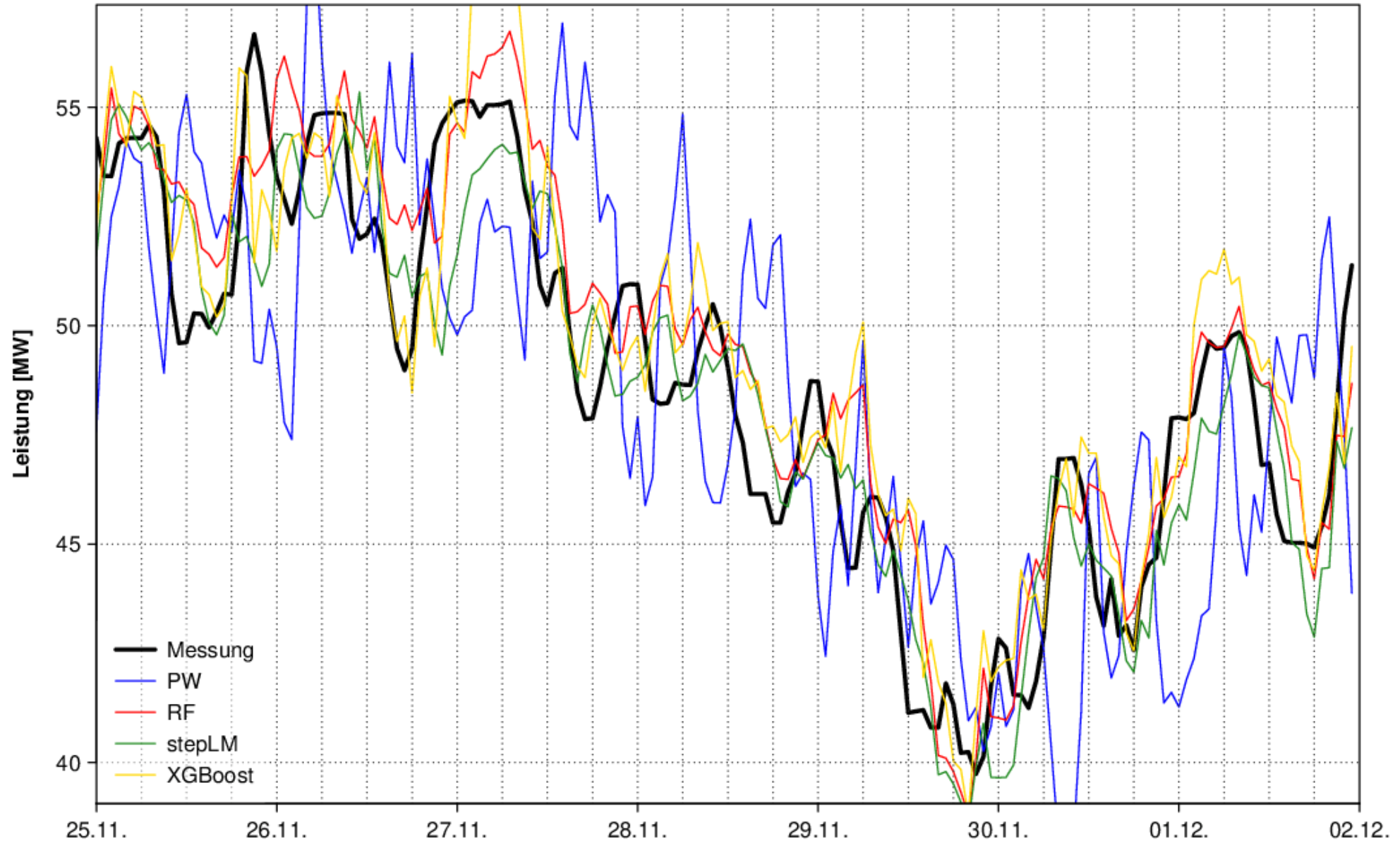
stepLM: RMSE = 4.02 MW | MAE = 2.73 MW
XGBoost: RMSE = 3.11 MW | MAE = 1.94 MW

Leistungsprognose KW Braunau | Zeitfenster Val3 | Vorhersage 1h



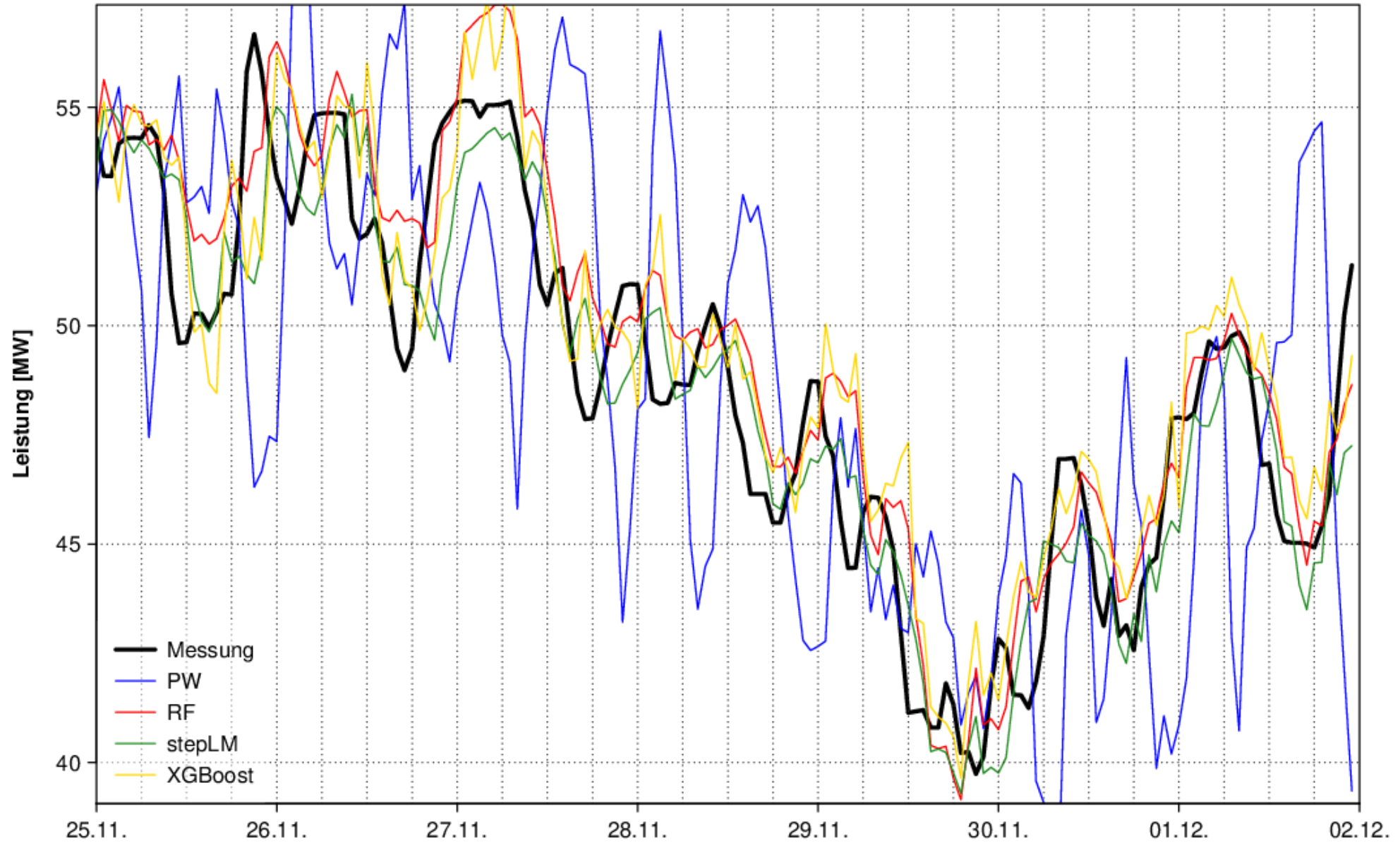
PW: RMSE = 13.41 MW | MAE = 7.92 MW
RF: RMSE = 2.68 MW | MAE = 1.58 MW

stepLM: RMSE = 2.89 MW | MAE = 1.76 MW
XGBoost: RMSE = 2.61 MW | MAE = 1.52 MW



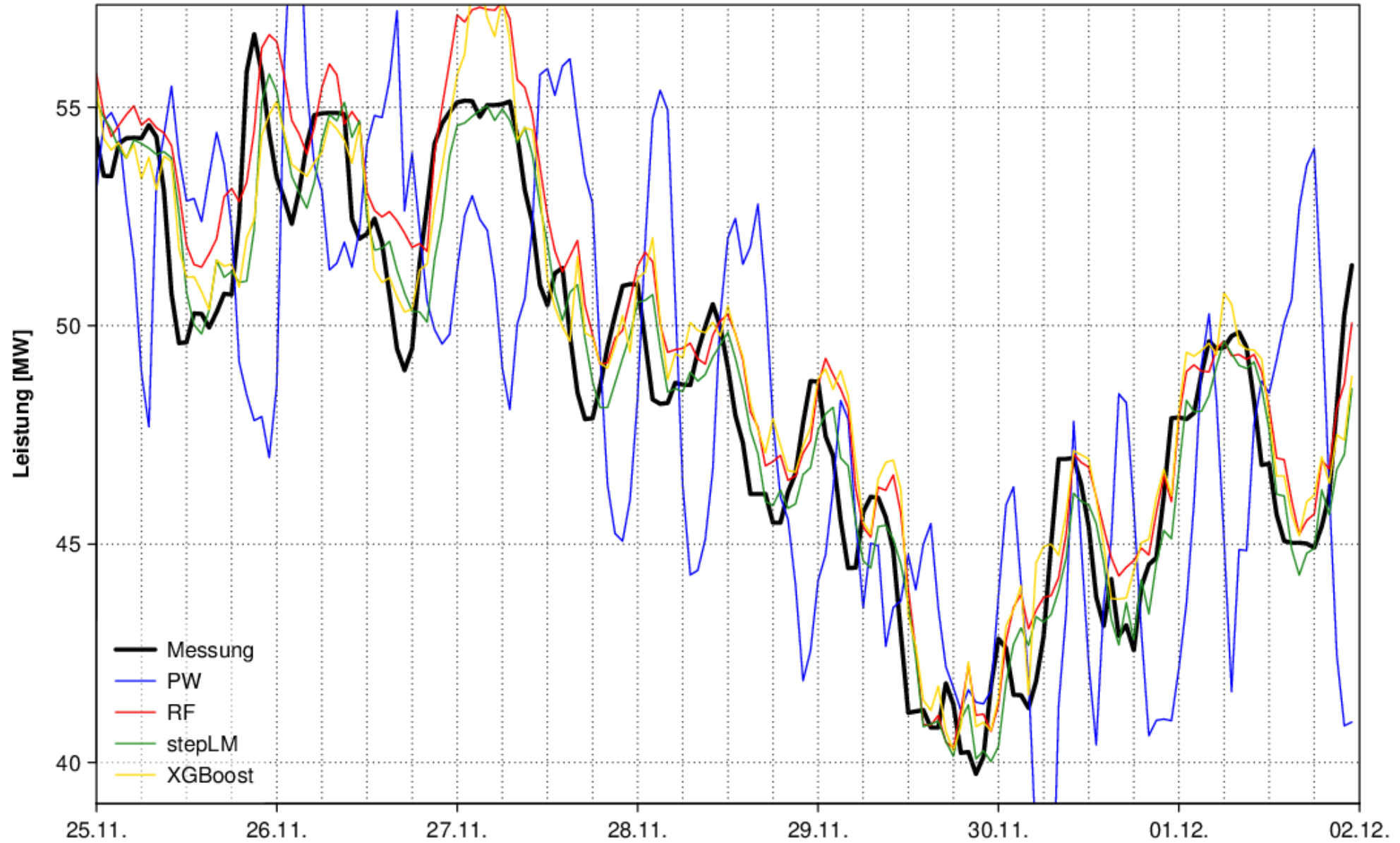
PW: RMSE = 3.83 MW | MAE = 3.23 MW
RF: RMSE = 1.77 MW | MAE = 1.46 MW

stepLM: RMSE = 1.78 MW | MAE = 1.43 MW
XGBoost: RMSE = 1.89 MW | MAE = 1.5 MW



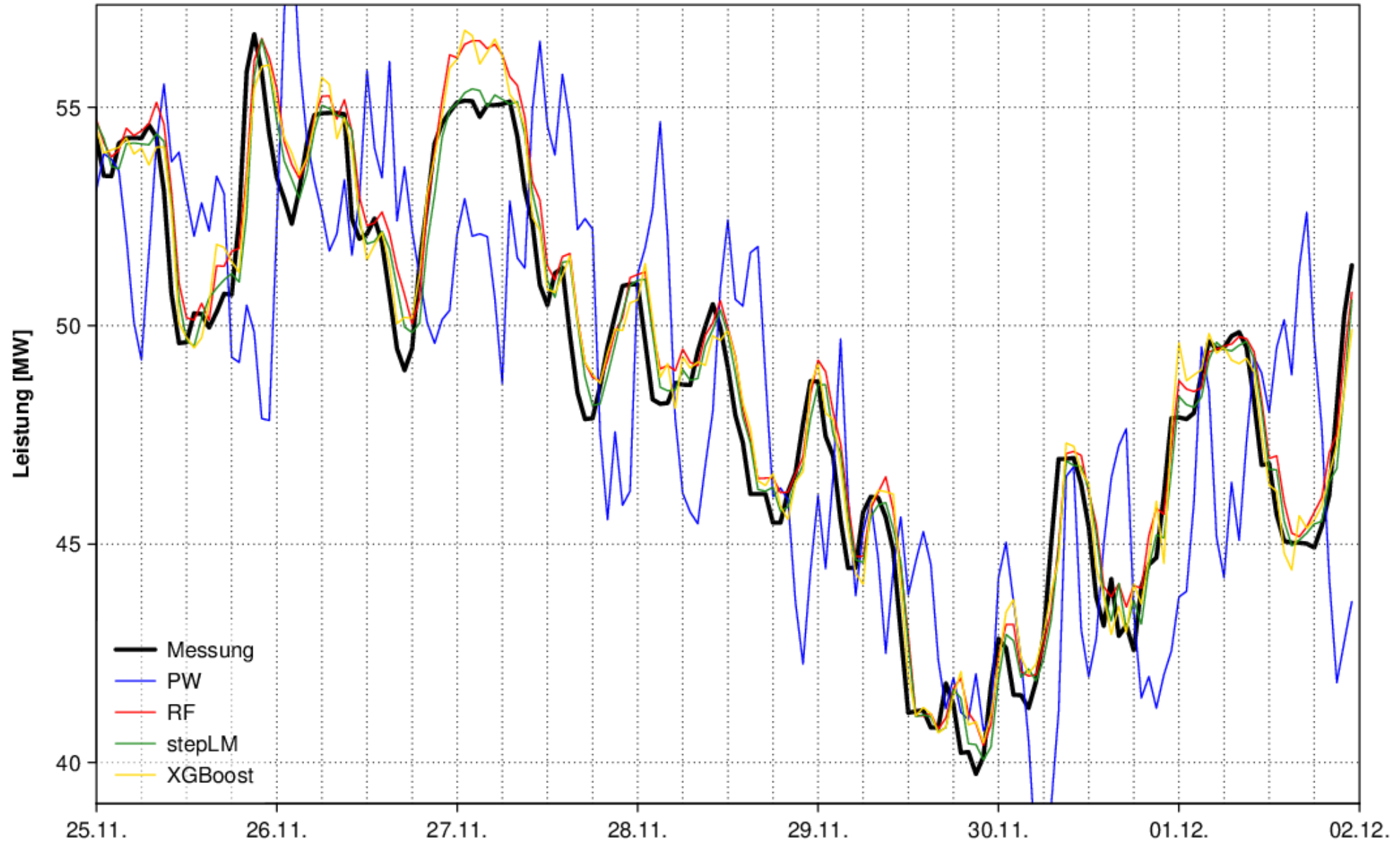
PW: RMSE = 4.64 MW | MAE = 3.83 MW
RF: RMSE = 1.81 MW | MAE = 1.5 MW

stepLM: RMSE = 1.66 MW | MAE = 1.3 MW
XGBoost: RMSE = 1.93 MW | MAE = 1.55 MW



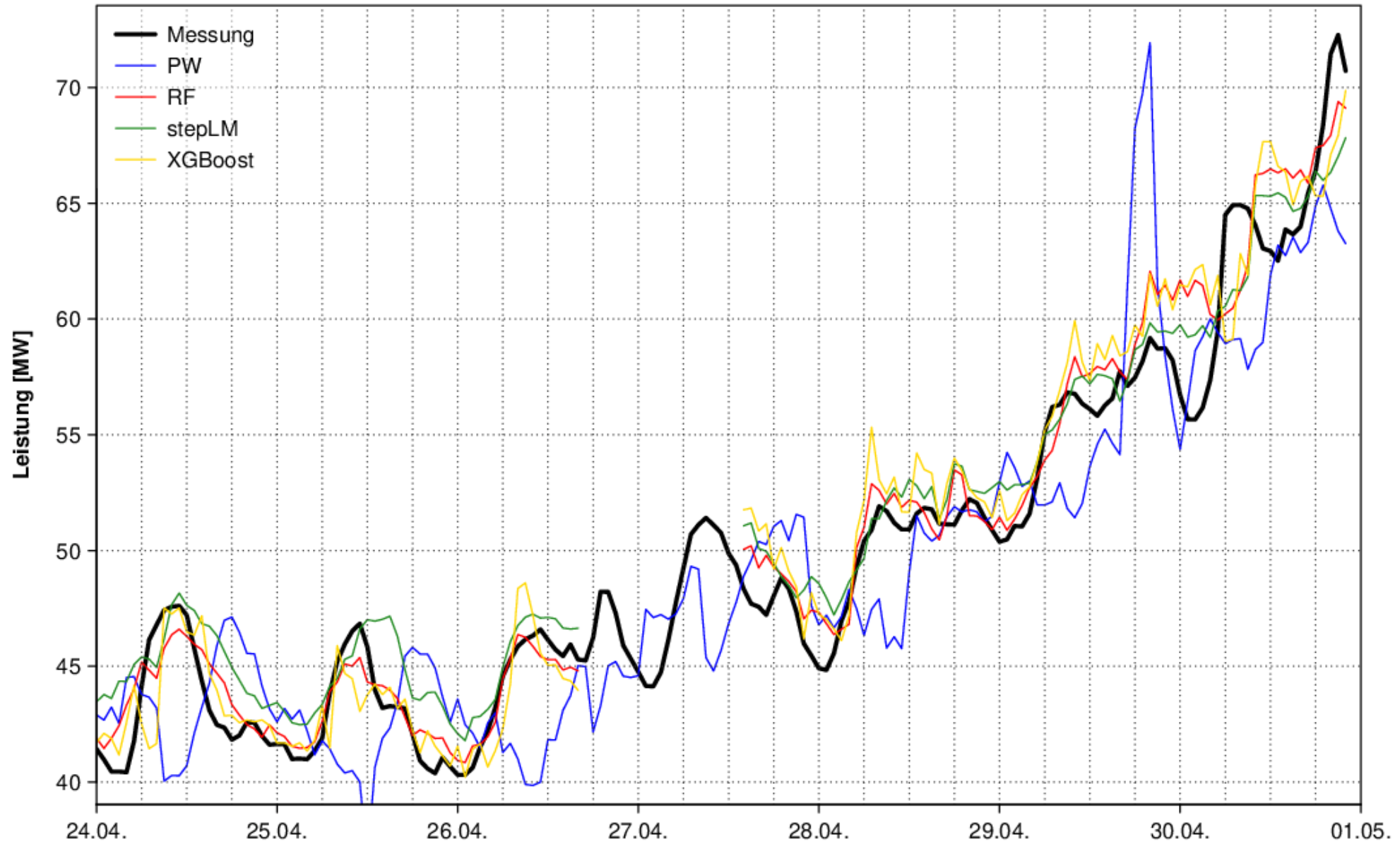
PW: RMSE = 4.28 MW | MAE = 3.61 MW
RF: RMSE = 1.59 MW | MAE = 1.31 MW

stepLM: RMSE = 1.34 MW | MAE = 1.04 MW
XGBoost: RMSE = 1.5 MW | MAE = 1.21 MW



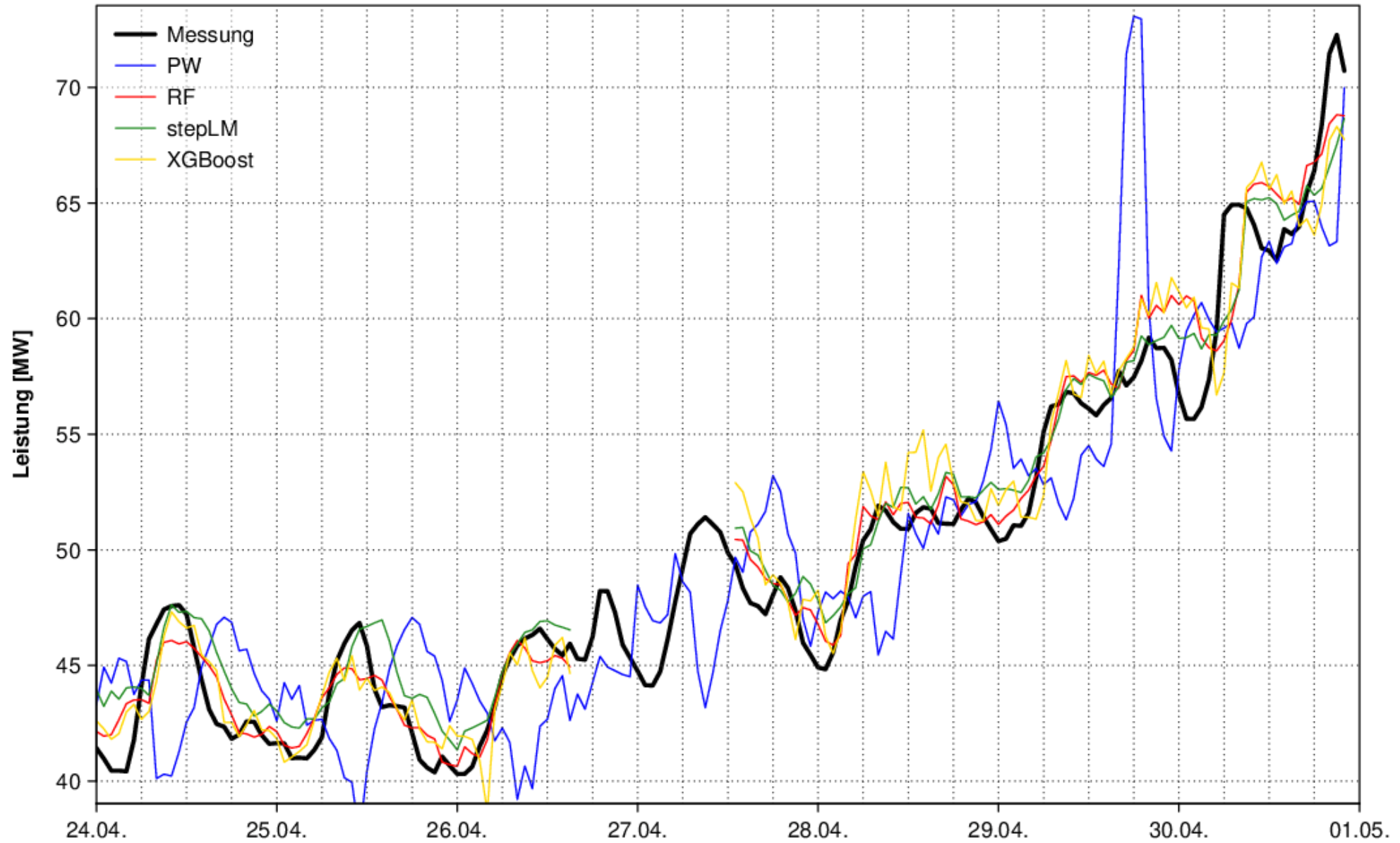
PW: RMSE = 3.51 MW | MAE = 2.99 MW
RF: RMSE = 0.96 MW | MAE = 0.77 MW

stepLM: RMSE = 0.84 MW | MAE = 0.64 MW
XGBoost: RMSE = 0.92 MW | MAE = 0.75 MW



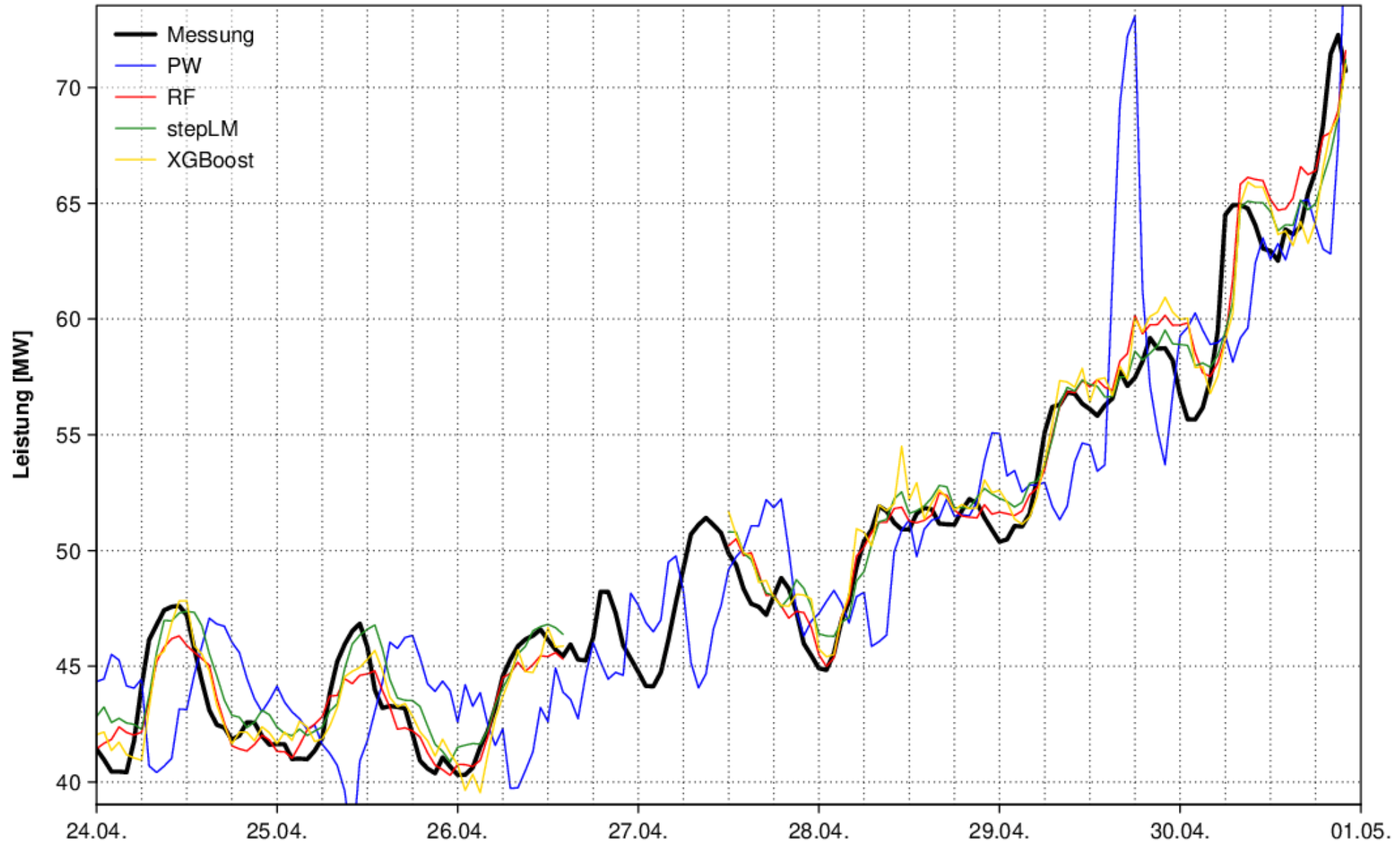
PW: RMSE = 3.83 MW | MAE = 3.02 MW
RF: RMSE = 1.78 MW | MAE = 1.34 MW

stepLM: RMSE = 2.06 MW | MAE = 1.7 MW
XGBoost: RMSE = 2.23 MW | MAE = 1.7 MW



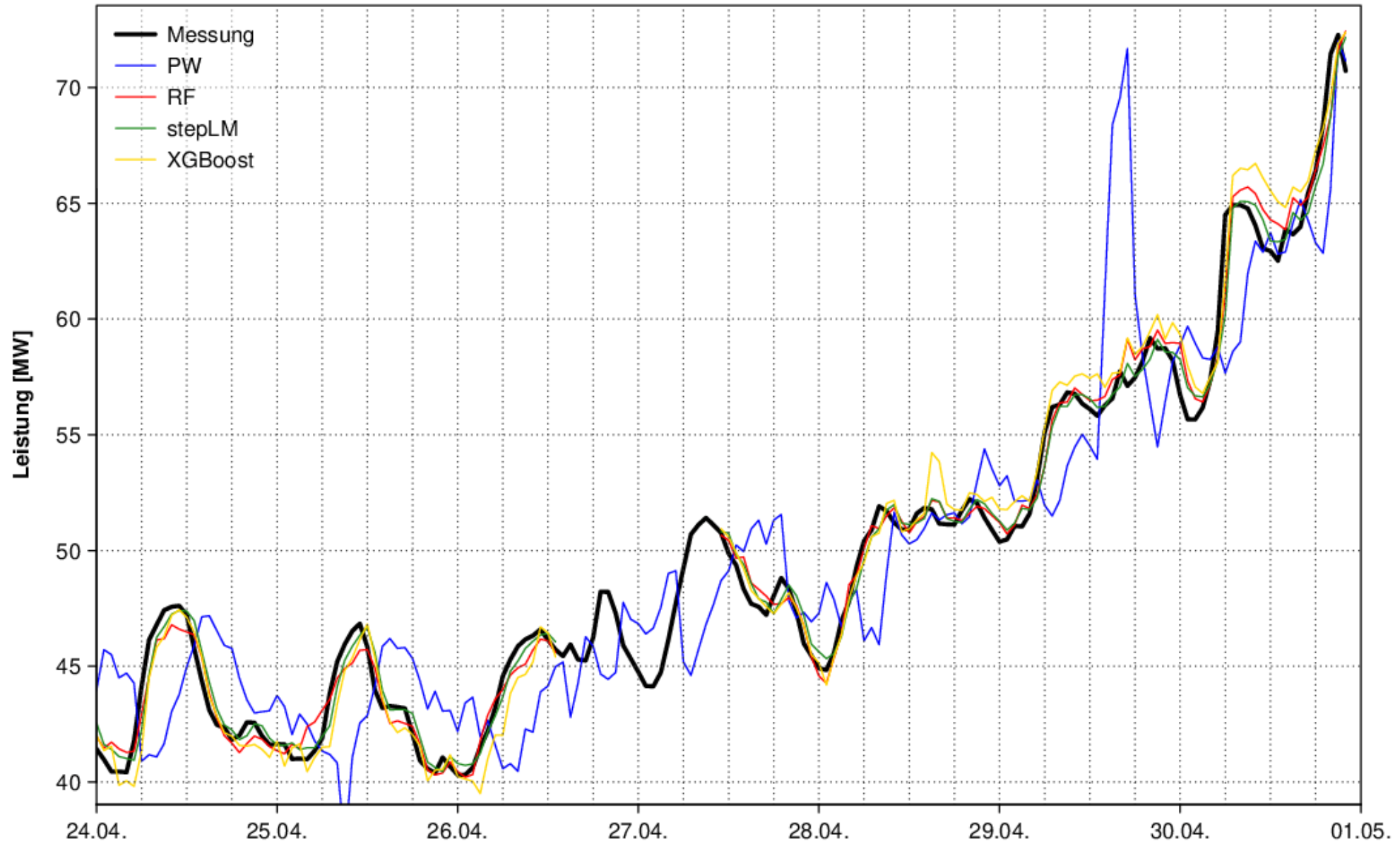
PW: RMSE = 4.11 MW | MAE = 3.22 MW
RF: RMSE = 1.62 MW | MAE = 1.24 MW

stepLM: RMSE = 1.83 MW | MAE = 1.46 MW
XGBoost: RMSE = 2.05 MW | MAE = 1.6 MW



PW: RMSE = 3.94 MW | MAE = 3.09 MW
RF: RMSE = 1.35 MW | MAE = 1.01 MW

stepLM: RMSE = 1.42 MW | MAE = 1.1 MW
XGBoost: RMSE = 1.49 MW | MAE = 1.13 MW



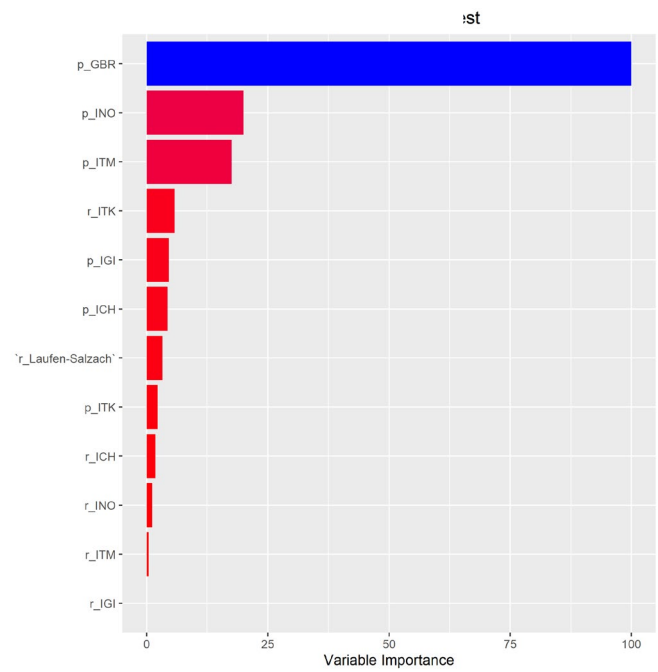
PW: RMSE = 3.45 MW | MAE = 2.67 MW
RF: RMSE = 0.85 MW | MAE = 0.67 MW

stepLM: RMSE = 0.82 MW | MAE = 0.62 MW
XGBoost: RMSE = 1.16 MW | MAE = 0.91 MW

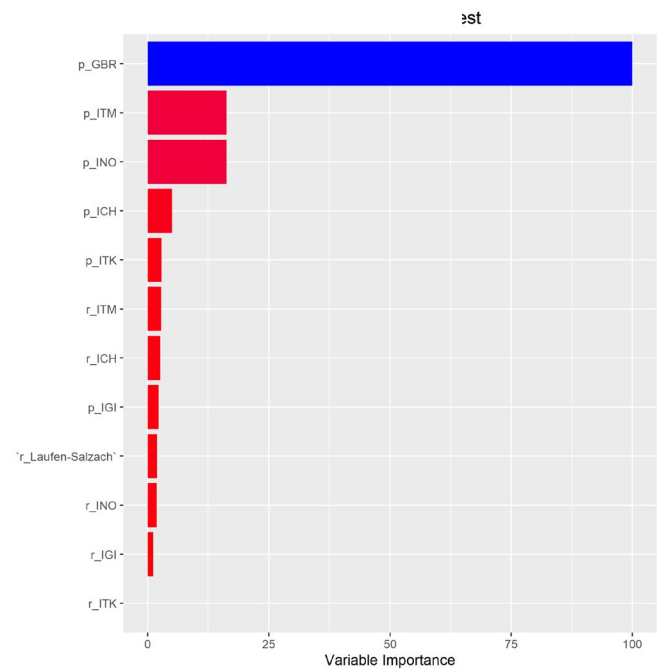
2) Feature Importance

- der ML-Modelle „Random Forest“ (RF) sowie „XGBoost“
- für alle 4 Prognosestufen (4 bis 1h)
- auf einer relativen Skala
- Prediktoren-Kombination GBR6
- Kürzel der Variablen siehe Zusatz von Tab. 2 im Artikel

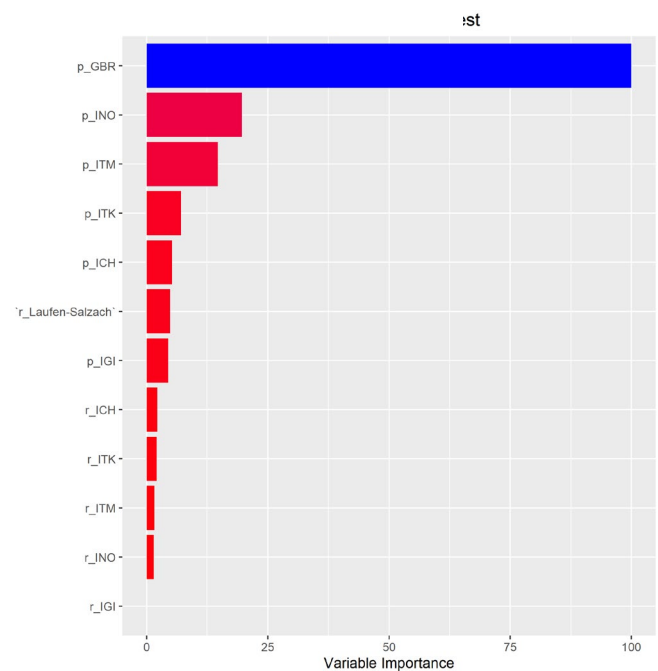
RF | 4h



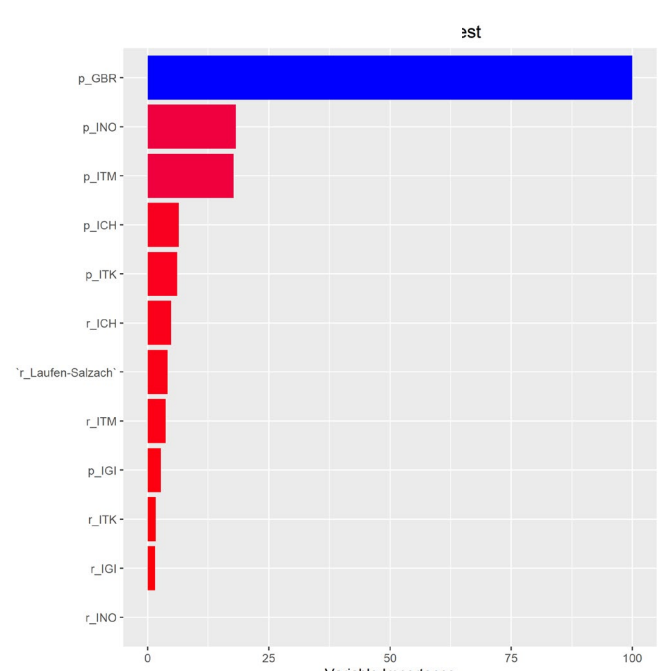
RF | 2h



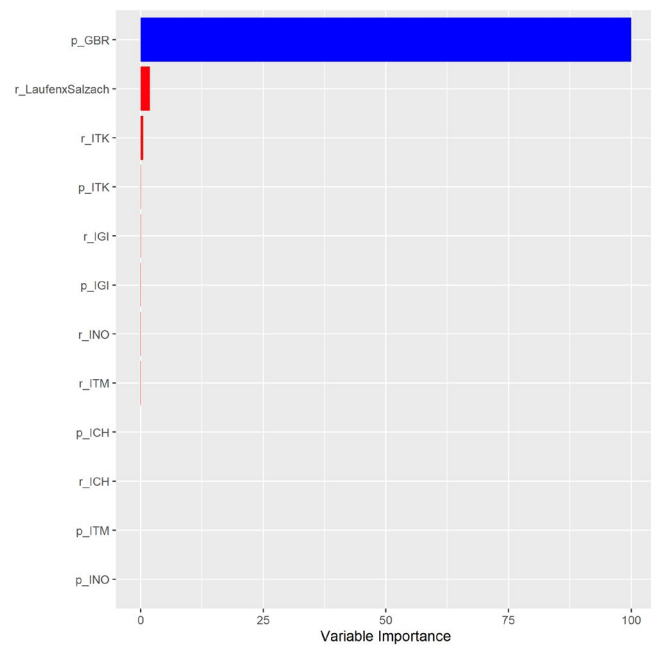
RF | 3h



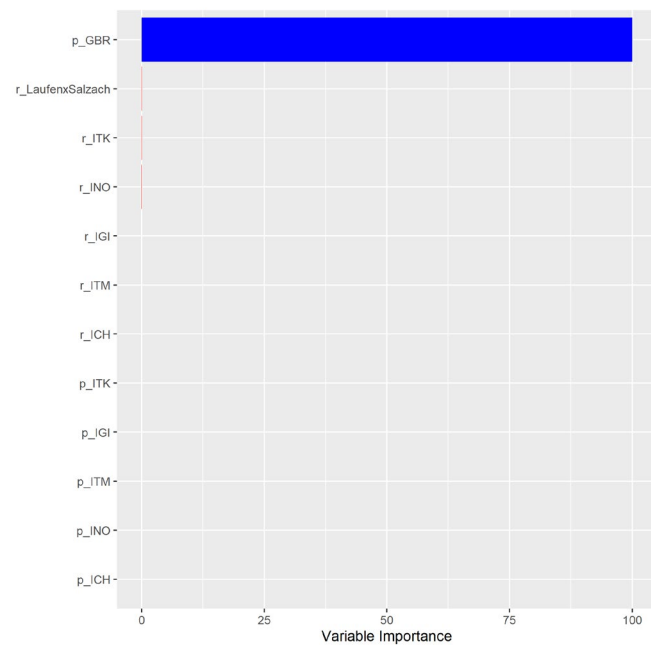
RF | 1h



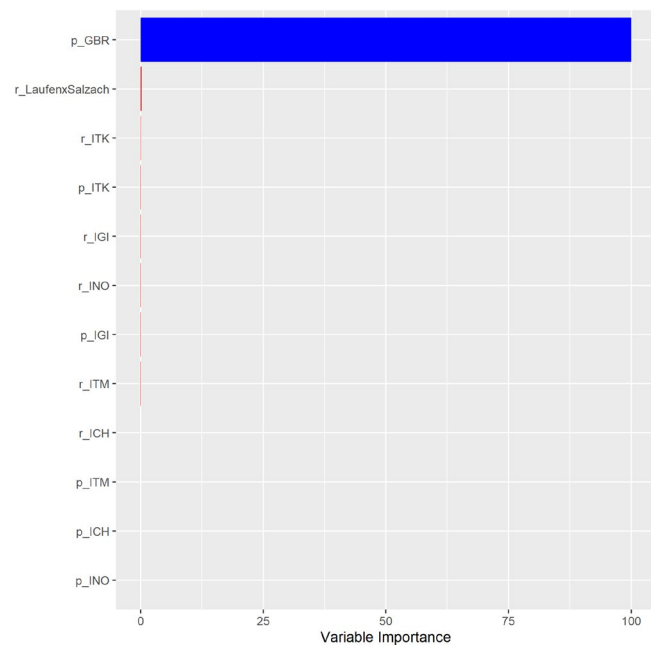
XGB | 4h



XGB | 2h



XGB | 3h



XGB | 1h

