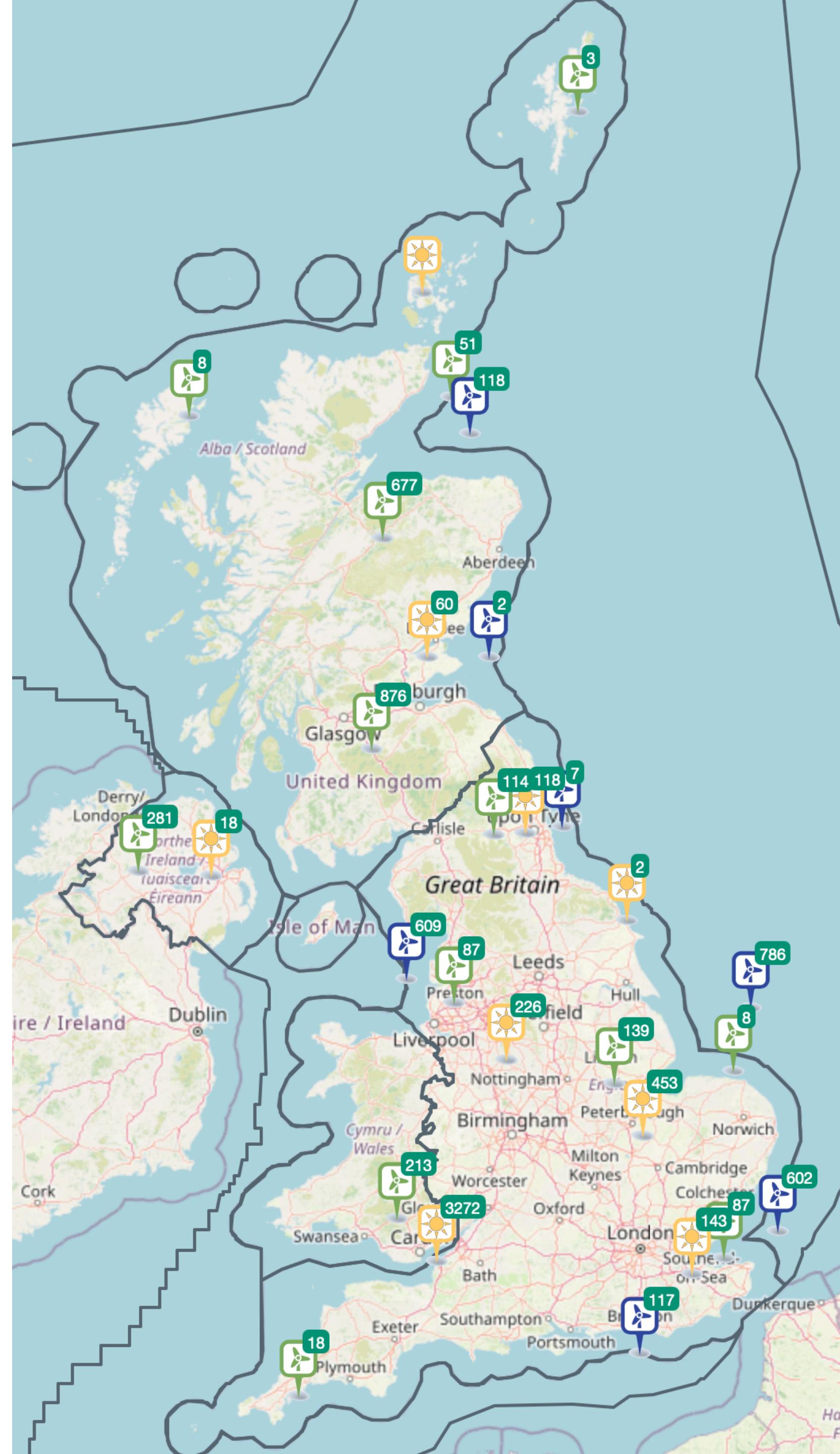


Development of a power price forecasting model to find the most diversified wind farm in Great Britain

Data provided by NESO, ENTSO-E, NYMEX and Open Power System Data

Content

1. Target and Data Basis
 2. Influence Factors on the Day Ahead Power Price
 3. Price Forecasting Model
 4. Model Output
 5. Wind Farm Valuation
 6. Summary



Target and Data Basis

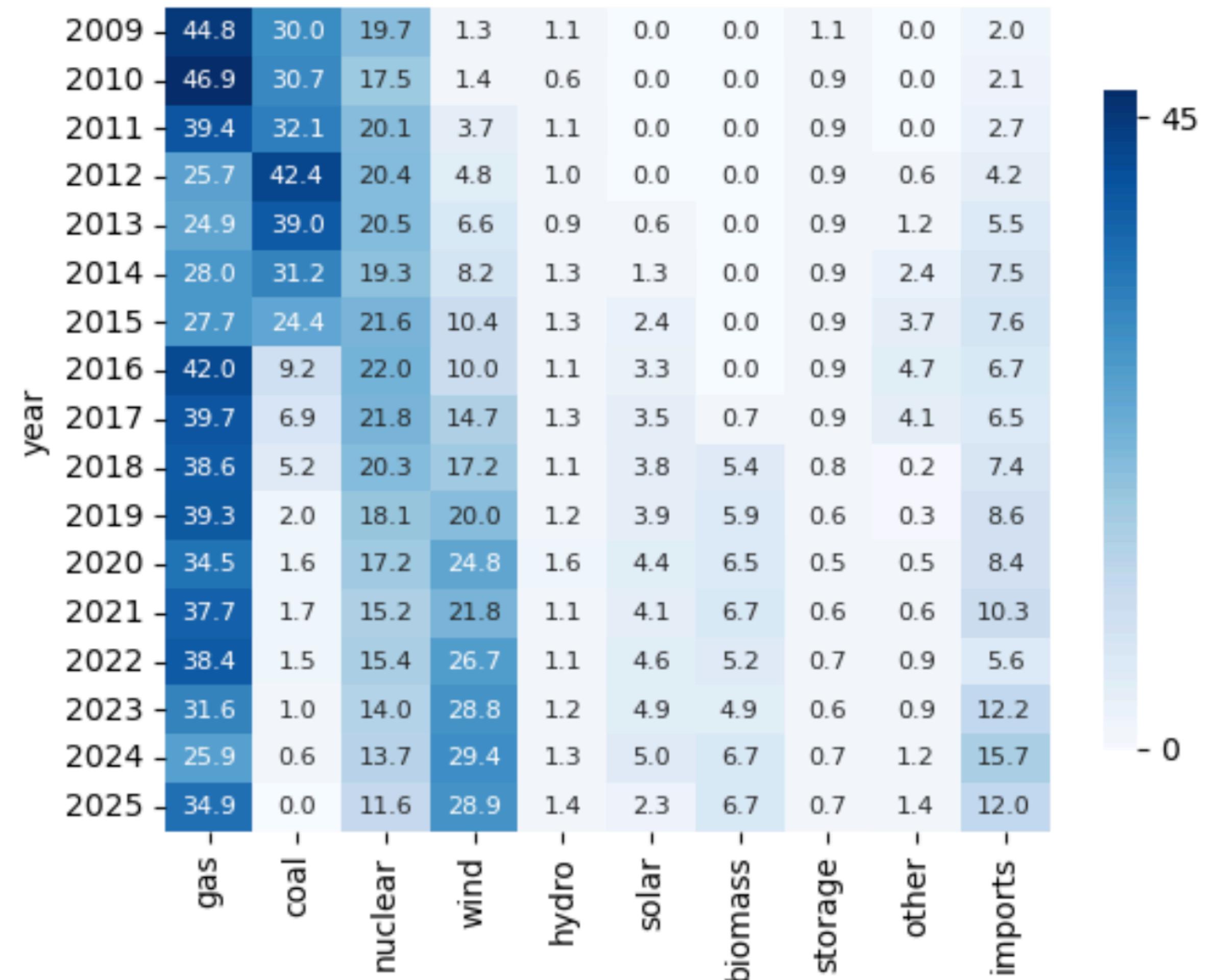
- **Target:**
 - Development and Implementation of a Day Ahead Power Price Forecasting Model for GB
 - Finding the most diversified wind farm in GB (for a given time period)
- **Data Basis**
 - 6 csv-files from different sources: NESO, ENTSO-E, NYMEX, Open Power System Data
 - Historical data in 30/60min and 1 day granularity between 08.05.2019 - 30.09.2020 used to build the model
 - Forecasting data of demand, solar, wind and the current gas price used to predict prices, wind farm load factors and capture rates

Influence Factors on the Day Ahead Power Price

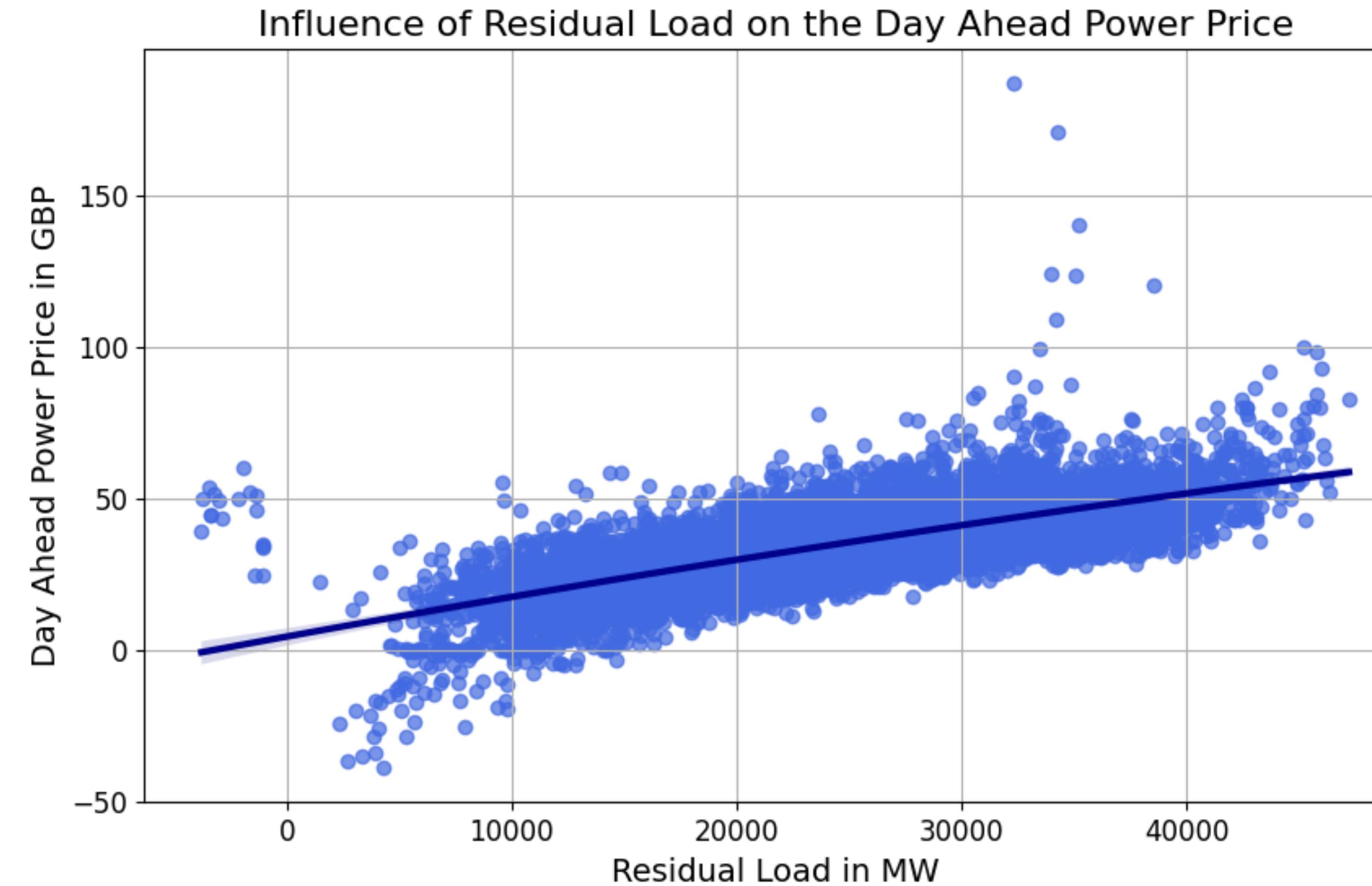
Key Factors

- Demand -
Renewables =
Residual Load
- Power plant
availabilities and
commodity prices
- Crossborder Flows

Development of the Power Generation Mix and Imports [%]

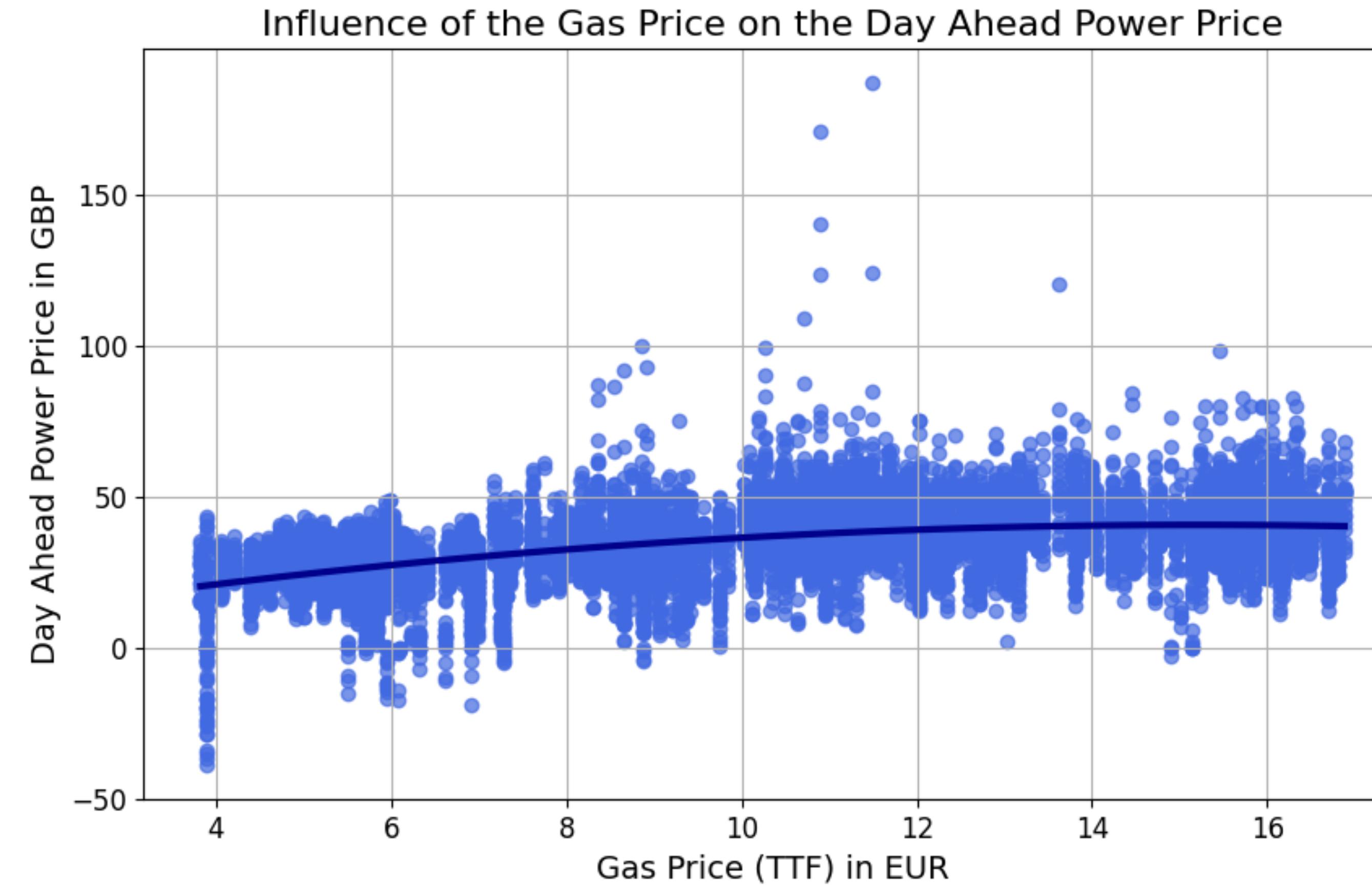


Influence Factors on the Day Ahead Power Price



- High renewable output and low demand lead to low power prices

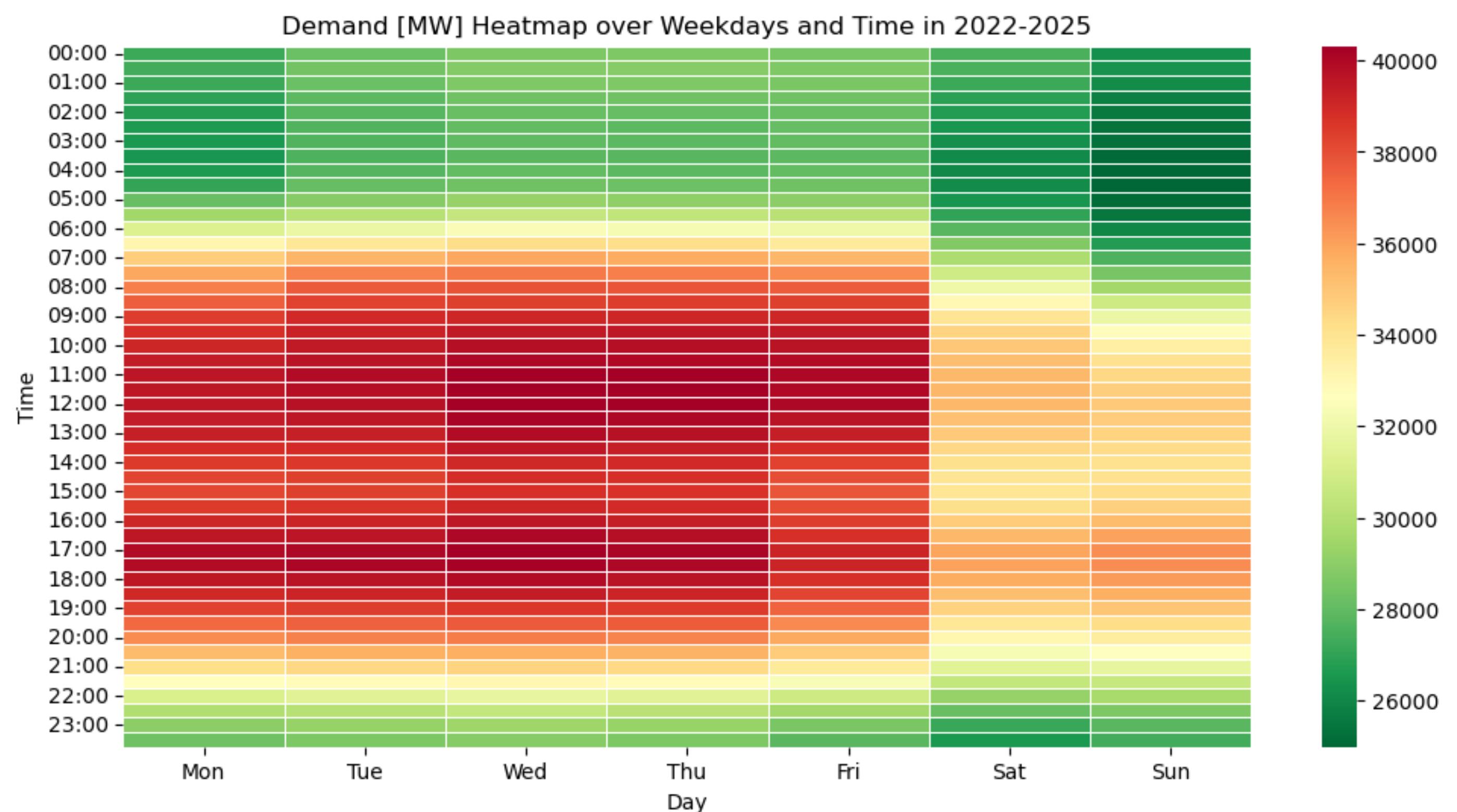
Influence Factors on the Day Ahead Power Price



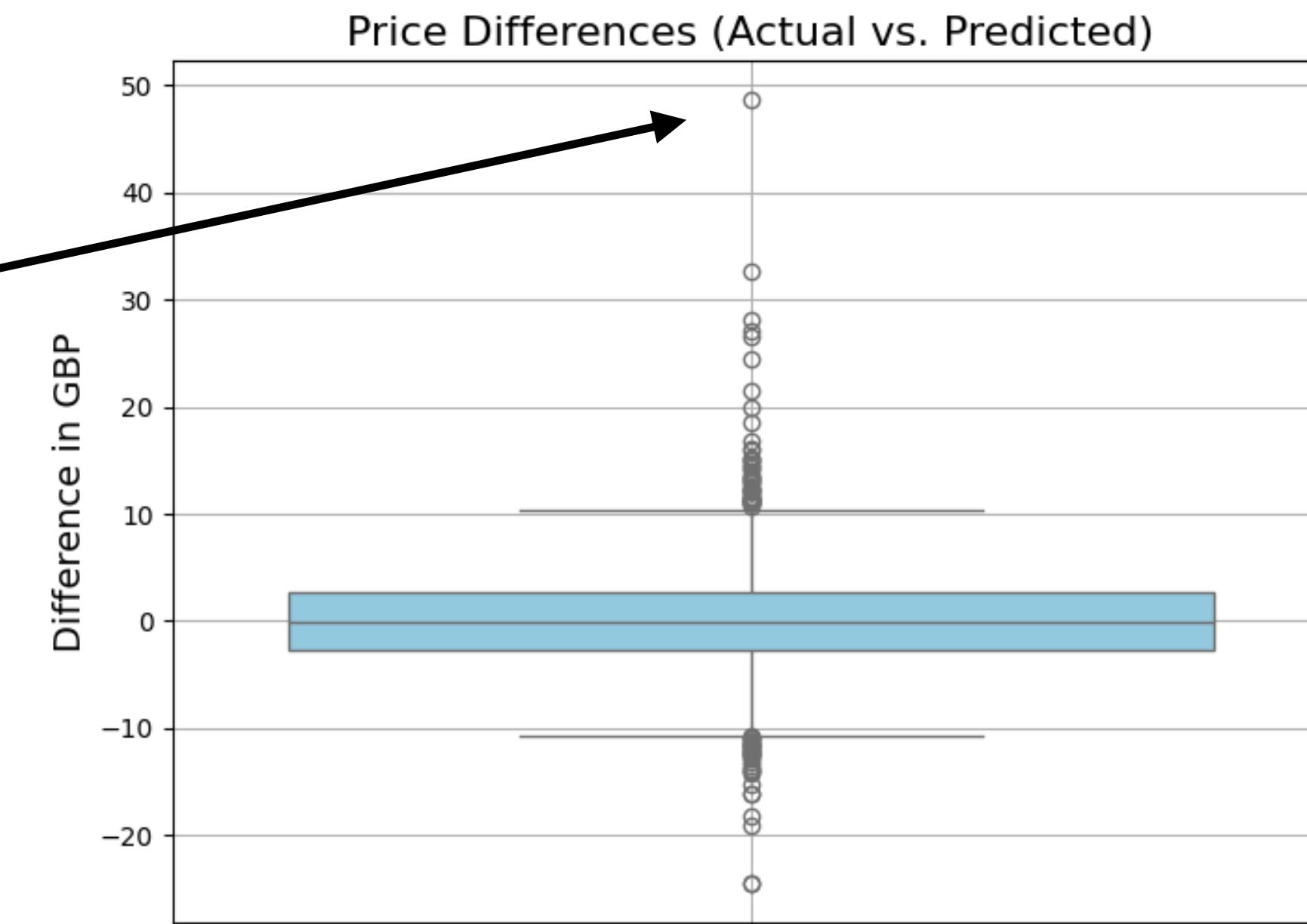
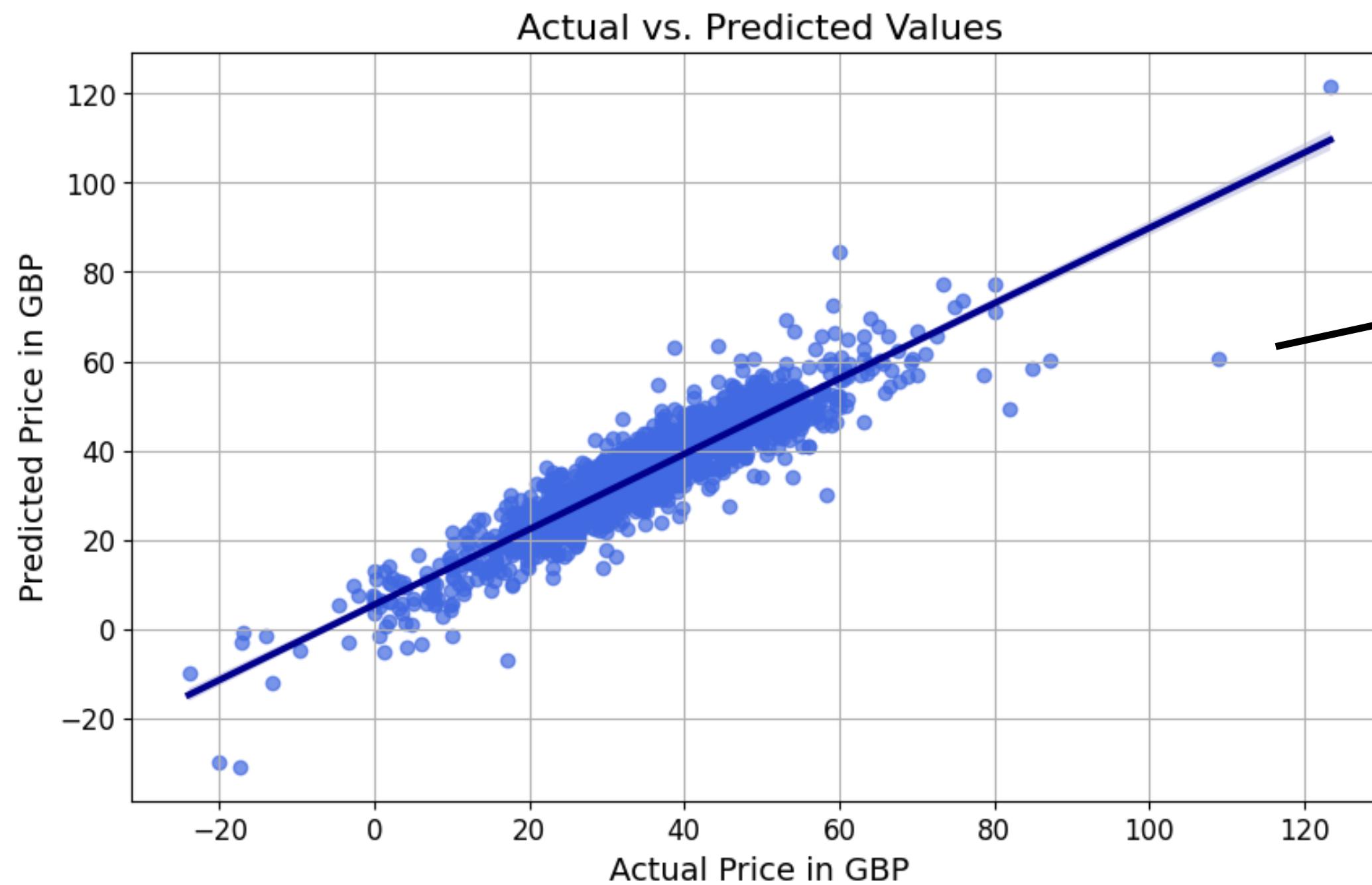
- The large share of gas-fired power plants in the energy mix leads to gas price dependencies

Price Forecasting Model

- XGBR Regressor is the best performing model regarding results and calculation time
 - One-Hot-Encoding of weekdays and hours improved the model significantly (R^2 : 0.763 → 0.843)
 - Mean absolute error is 3.50 GBP/MWh

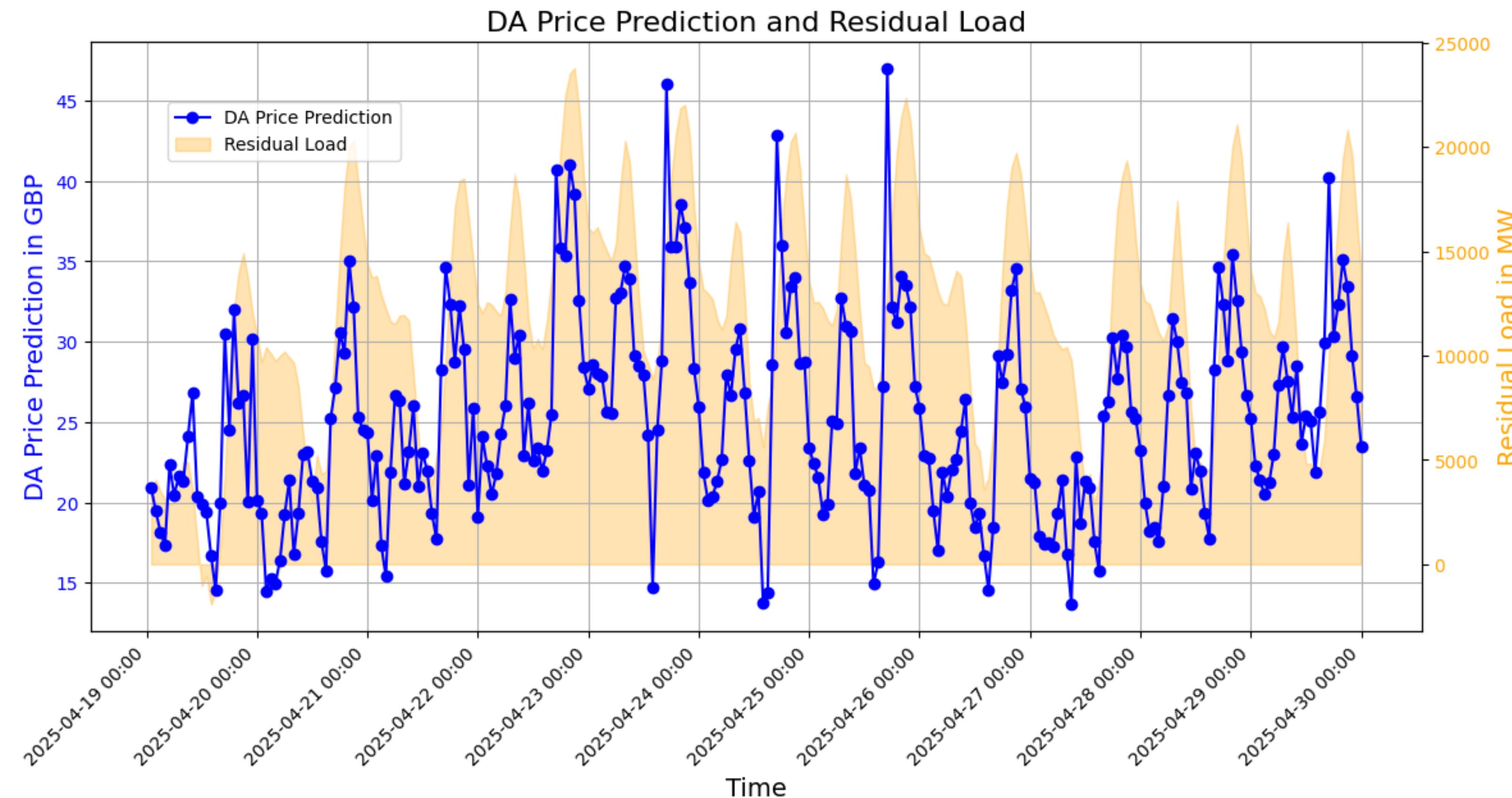


Model Output



- The price predictions are normally distributed around the actual prices
- While most of the predictions are very close to the actual values, there are some extreme outliers

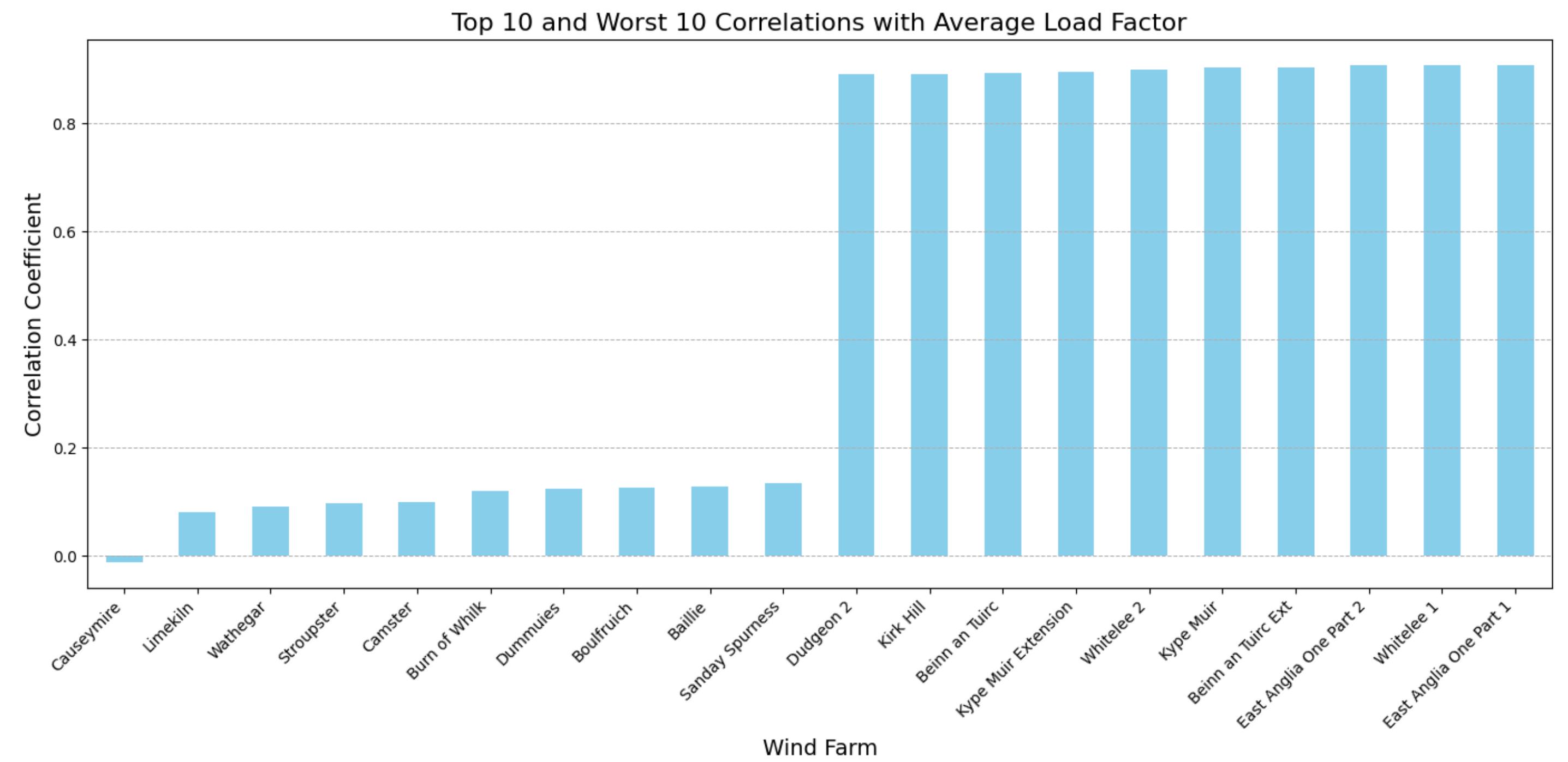
Model Output



- Prediction of the power prices between 19.04. - 30.04.2025 with the fundamental data forecasts and a fixed gas price of 35.605 EUR/MWh

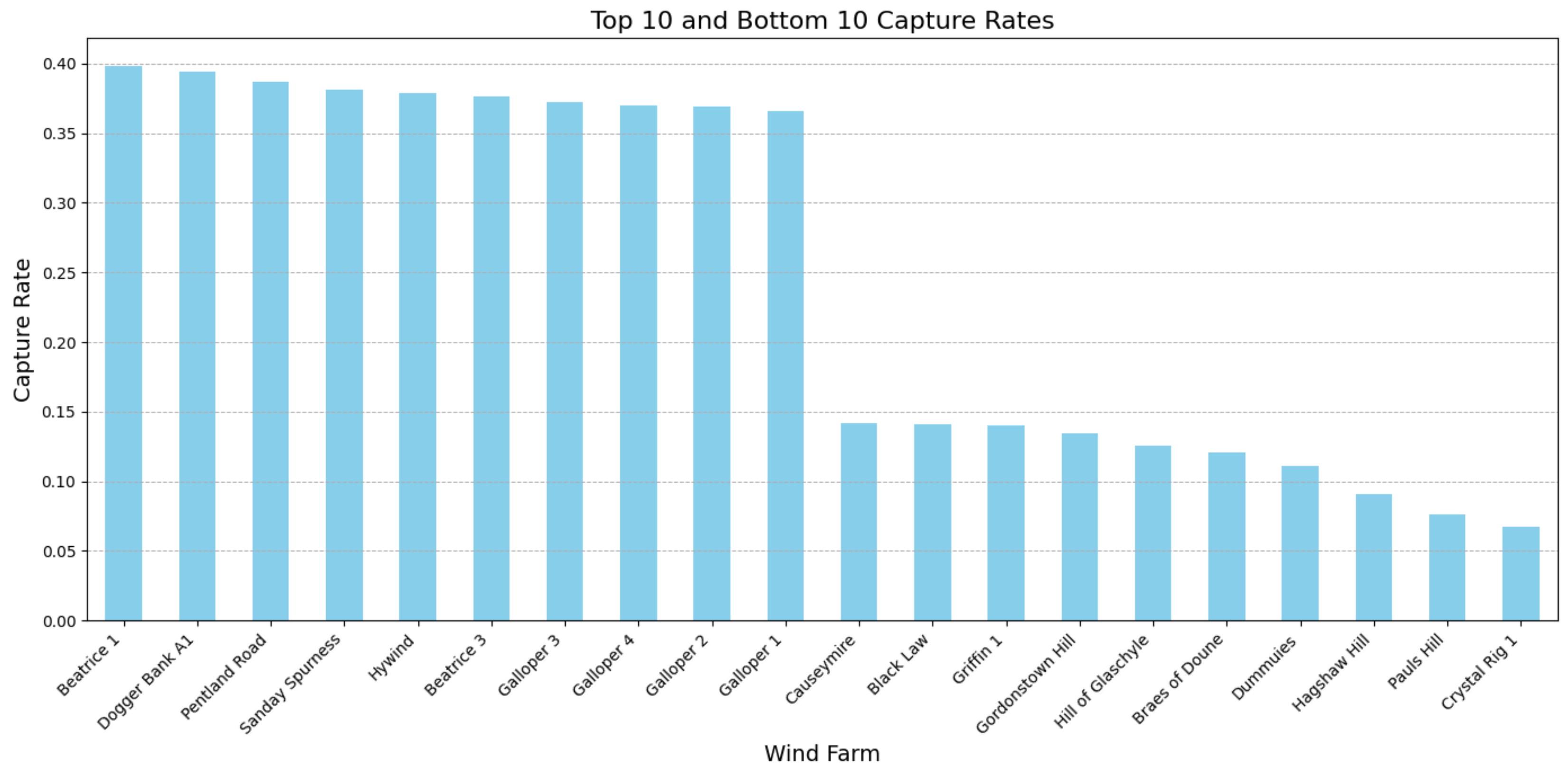
Wind Farm Valuation

- 249 wind farms need to be evaluated
- Wind farms with more than 10 zero values during the investigated time horizon will be dismissed in the analysis
- The correlation between the wind farms hourly load factors and the average load factor varies a lot
- Less correlation → less cannibalization effect



Wind Farm Valuation

- The higher the capture rate, the more value of high power prices can be extracted
- The capture rate also varies a lot between the different wind farms



Wind Farm Valuation

- The diversification winner for this period of time is the Sanday Spurness Wind Farm
- 5 Vestas V80/2000 wind turbines with a total installed capacity of 10 MW owned and operated by SSE Renewables
- Located on the Orkney island of Sanday in North Scotland



Summary

1. The residual load as well as the gas price have a significant impact on the day ahead power price in GB
2. The XGBR Regressor is the best forecasting model to predict power prices
3. Load factors and capture rates can give hints regarding the building of a diversified renewable energy portfolio

Thank you!

Q&A