

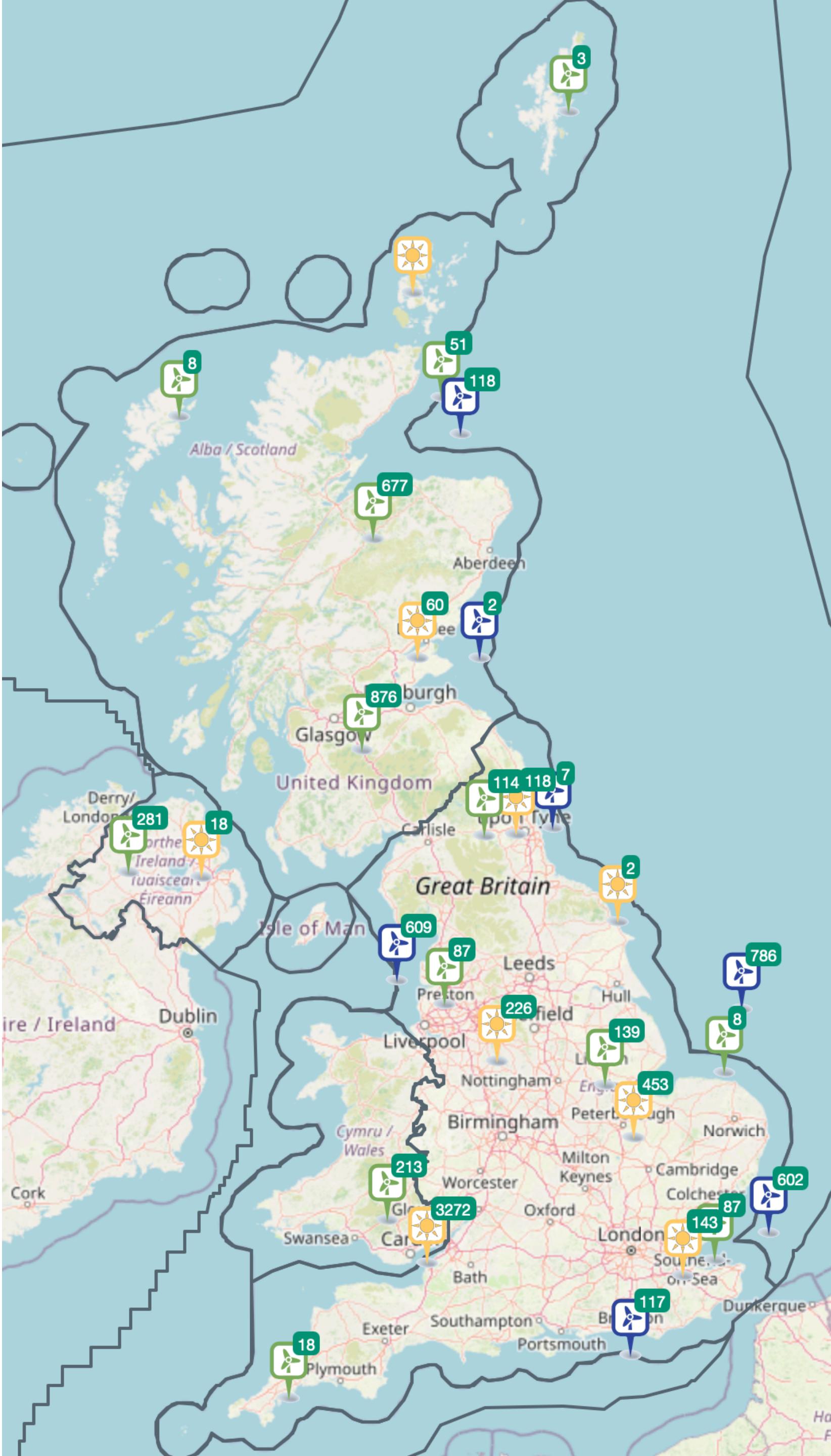
Research Project: Development of the Power Generation Mix in the UK with Focus on Renewables

Data provided by NESO

David Thrien, 07. March 2025

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Target and Data Basis

- **Target:**
 - Overview about the developments of the power generation mix by generation typ
 - Analysis of the contribution of wind and solar energy to the overall generation mix and impact on power demand
- **Data Basis**
 - Continuously updated csv-file from the National Energy System Operator (NESO) in the UK
 - Rows contain energy mix data for every 30 minutes, spanning from 2009 to the present
 - Correction of the column „generation“ (included imports) and establishment of a „demand“ column

Development of the Generation Mix

Key Findings

- Coal phase-out
- Increasing generation of renewable energy, especially wind
- Increasing imports
- Gas and wind are the most important sources in the energy mix

Development of the Power Generation Mix and Imports [%]

year	gas	coal	nuclear	wind	hydro	solar	biomass	storage	other	imports
2009	44.8	30.0	19.7	1.3	1.1	0.0	0.0	1.1	0.0	2.0
2010	46.9	30.7	17.5	1.4	0.6	0.0	0.0	0.9	0.0	2.1
2011	39.4	32.1	20.1	3.7	1.1	0.0	0.0	0.9	0.0	2.7
2012	25.7	42.4	20.4	4.8	1.0	0.0	0.0	0.9	0.6	4.2
2013	24.9	39.0	20.5	6.6	0.9	0.6	0.0	0.9	1.2	5.5
2014	28.0	31.2	19.3	8.2	1.3	1.3	0.0	0.9	2.4	7.5
2015	27.7	24.4	21.6	10.4	1.3	2.4	0.0	0.9	3.7	7.6
2016	42.0	9.2	22.0	10.0	1.1	3.3	0.0	0.9	4.7	6.7
2017	39.7	6.9	21.8	14.7	1.3	3.5	0.7	0.9	4.1	6.5
2018	38.6	5.2	20.3	17.2	1.1	3.8	5.4	0.8	0.2	7.4
2019	39.3	2.0	18.1	20.0	1.2	3.9	5.9	0.6	0.3	8.6
2020	34.5	1.6	17.2	24.8	1.6	4.4	6.5	0.5	0.5	8.4
2021	37.7	1.7	15.2	21.8	1.1	4.1	6.7	0.6	0.6	10.3
2022	38.4	1.5	15.4	26.7	1.1	4.6	5.2	0.7	0.9	5.6
2023	31.6	1.0	14.0	28.8	1.2	4.9	4.9	0.6	0.9	12.2
2024	25.9	0.6	13.7	29.4	1.3	5.0	6.7	0.7	1.2	15.7
2025	34.9	0.0	11.6	28.9	1.4	2.3	6.7	0.7	1.4	12.0

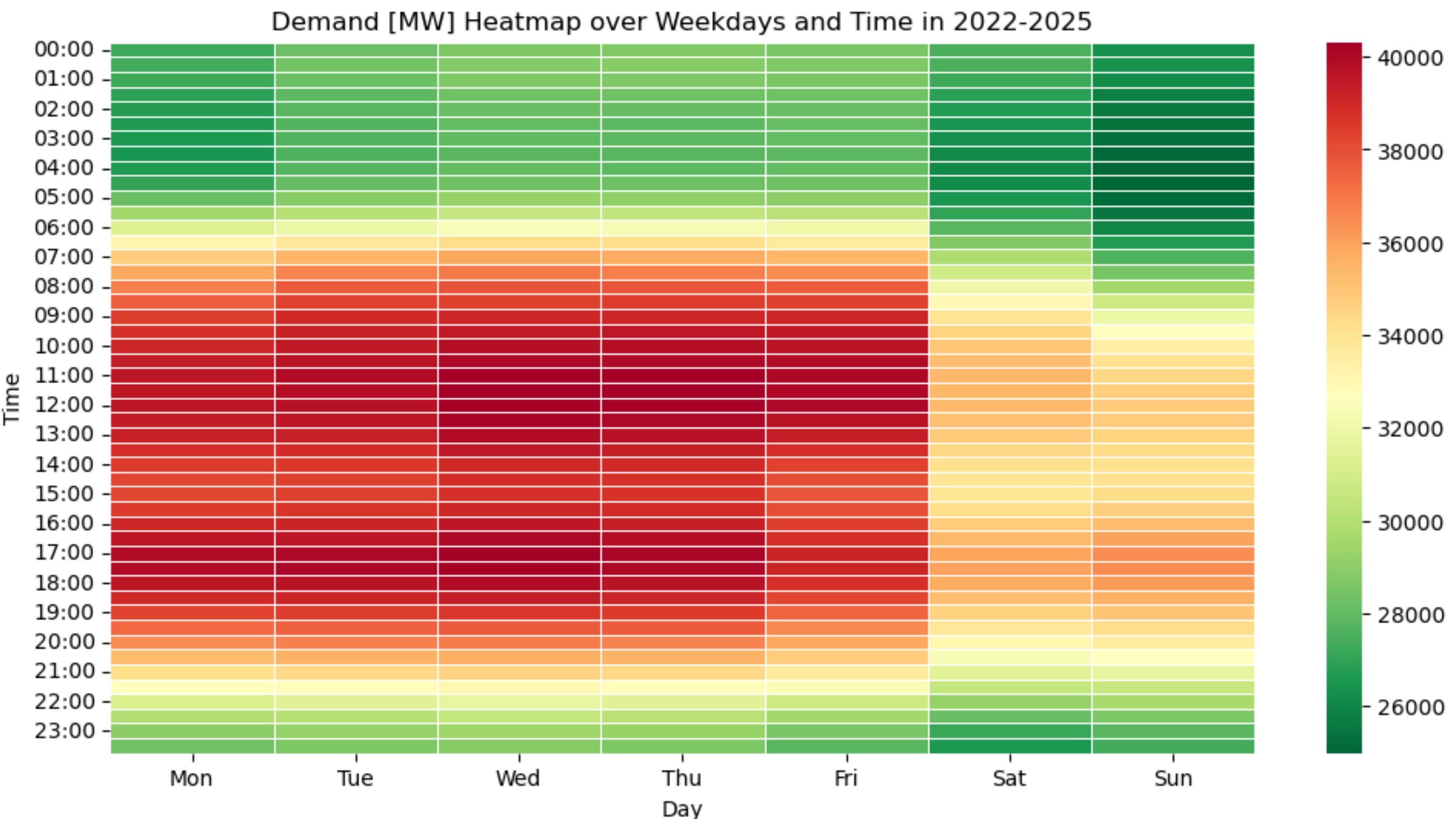
- 45

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Demand

Demand Shape

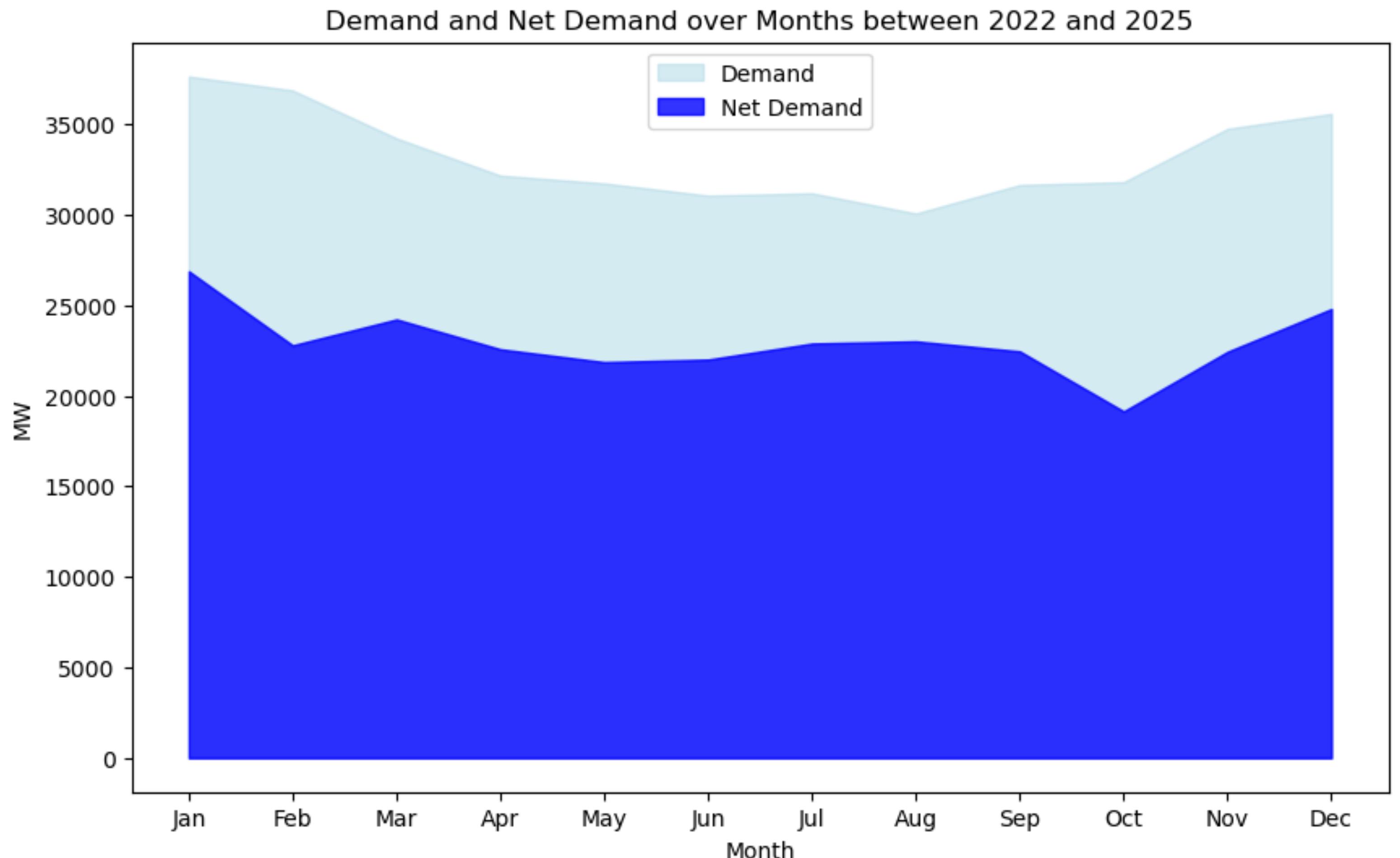
- Peak demand during the morning and evening hours on weekdays
- Slow ramp up on Mondays and earlier drop on Fridays
- Weekends show the weakest demand



Demand

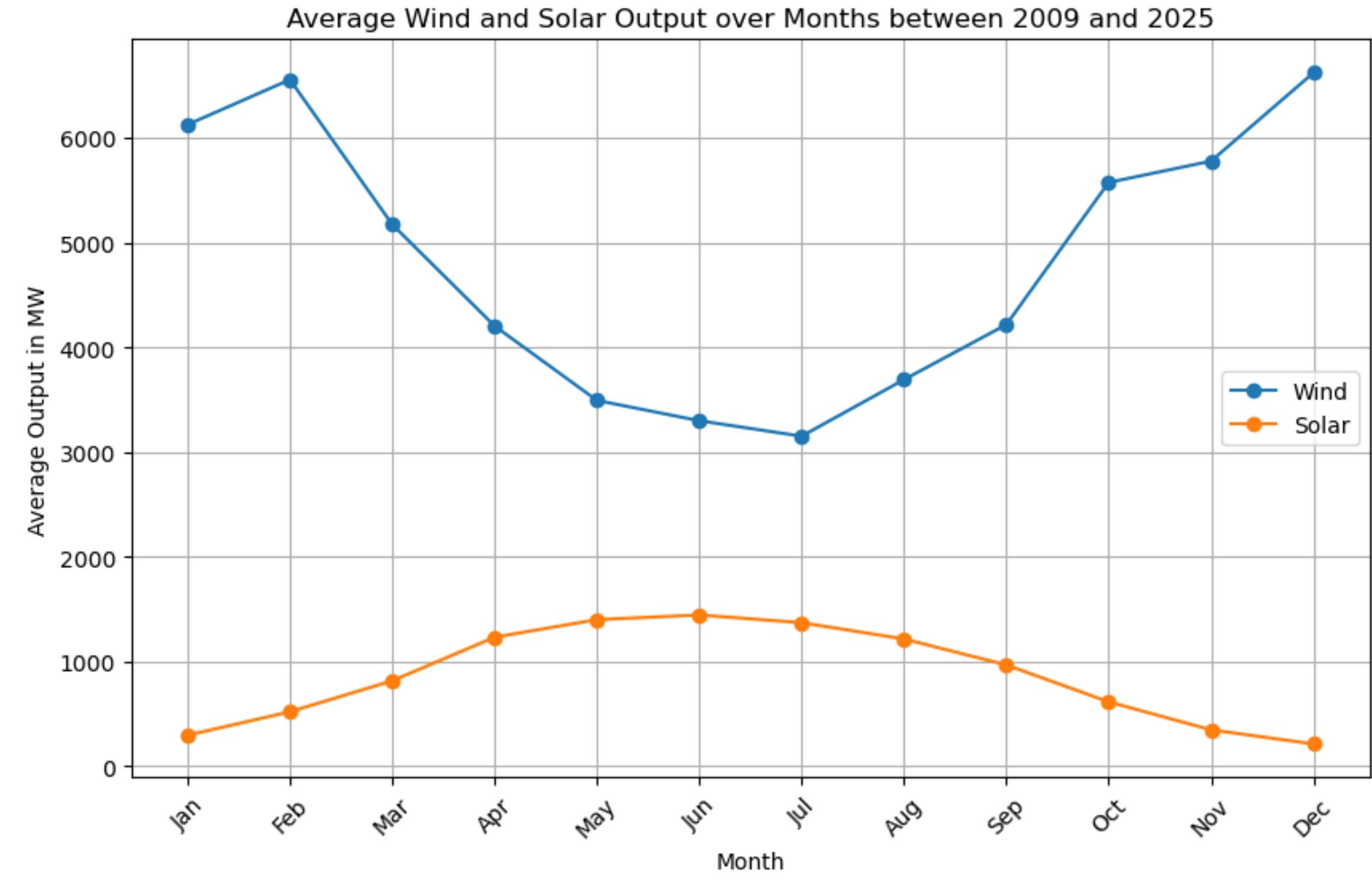
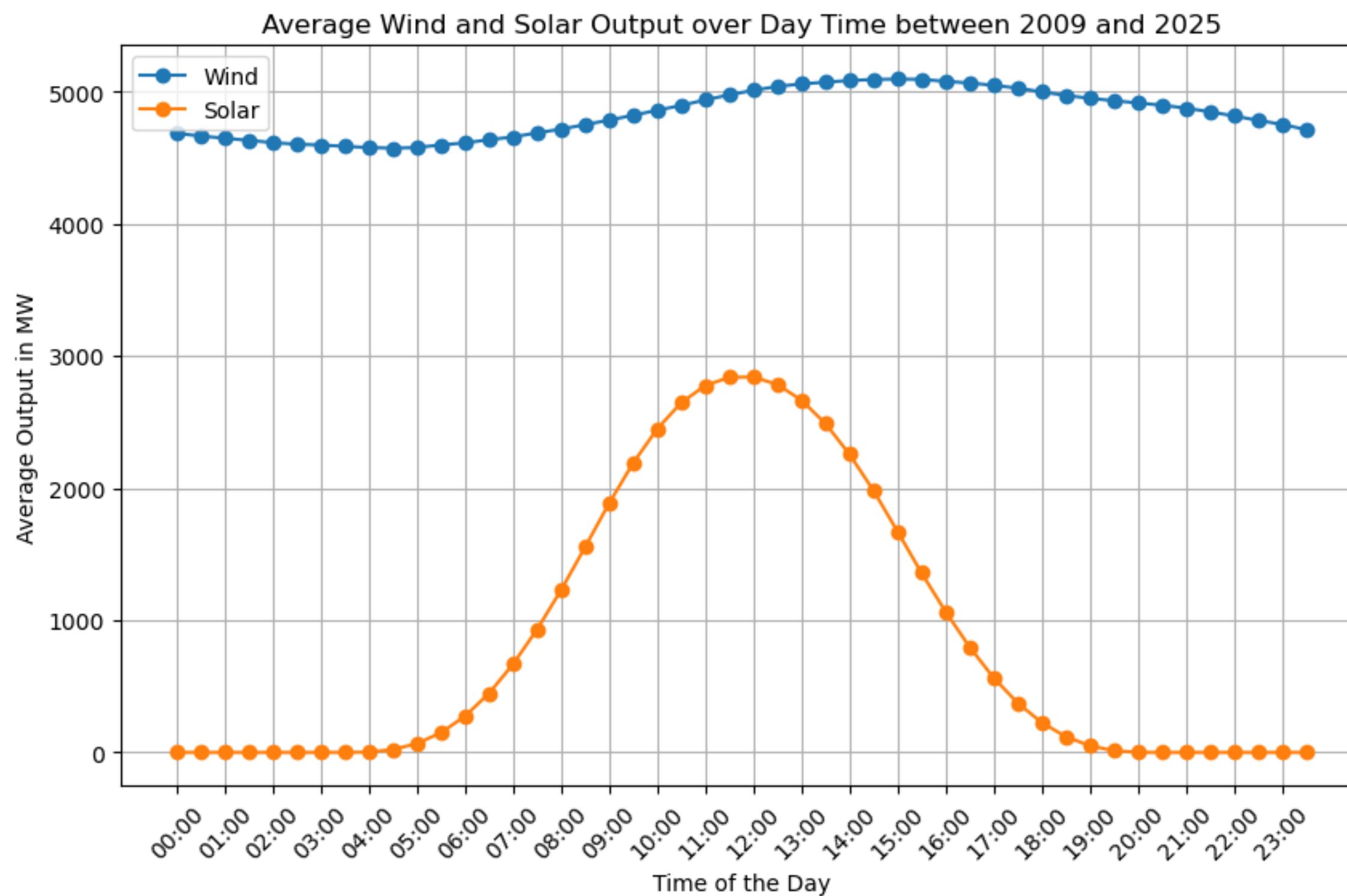
Role of Renewables

- Higher demand during the winter time
- Net demand is demand - (wind + solar)
- Renewables reduce the need for conventional power plants and imports significantly
- Lowest net demand occurs in October



Impact of Wind and Solar

Availability of Wind and Solar

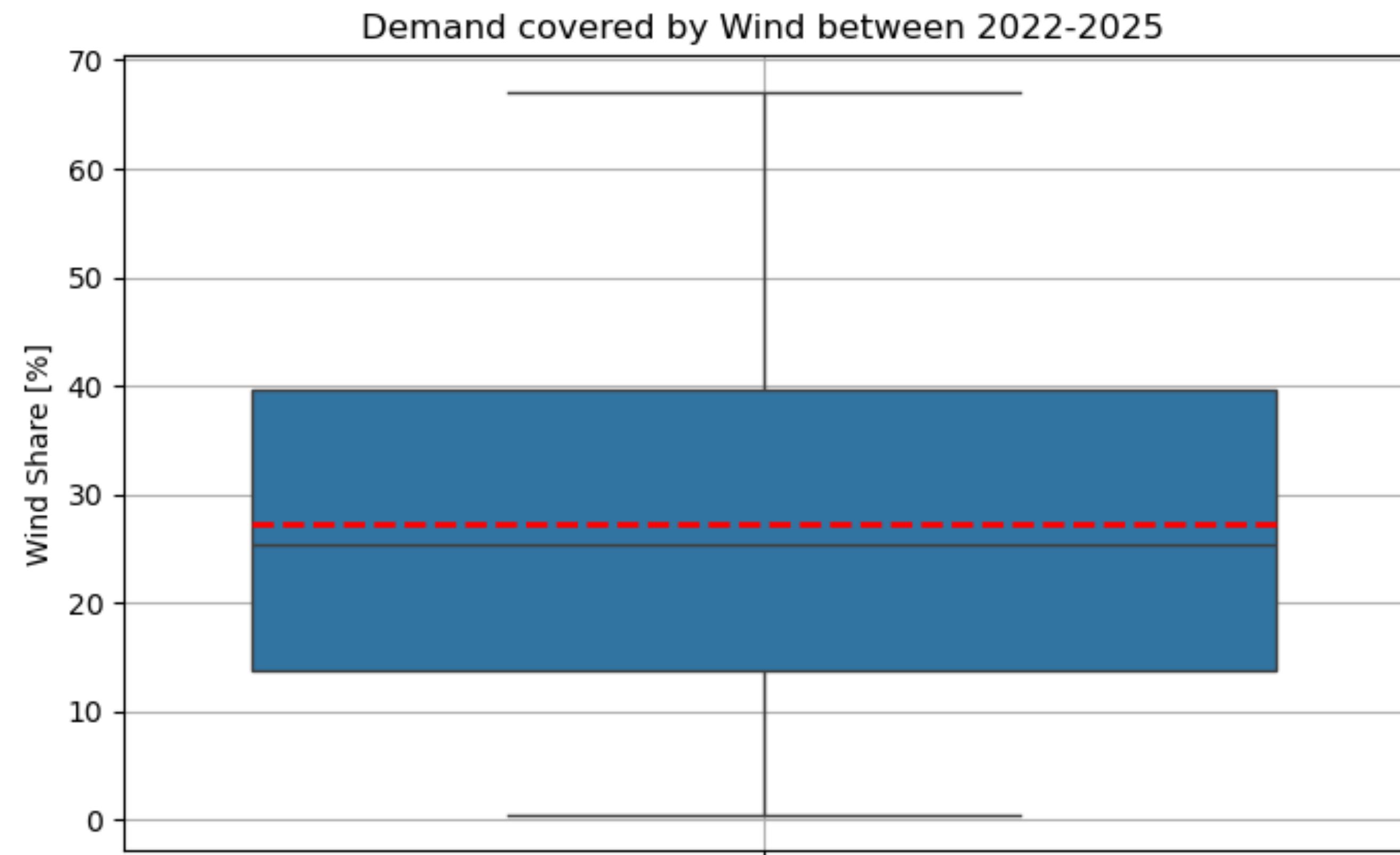


While there is a weak positive correlation (+56%) on day time basis, there is a significant negative correlation (-96%) on monthly basis

Impact of Wind and Solar

Impact of Wind

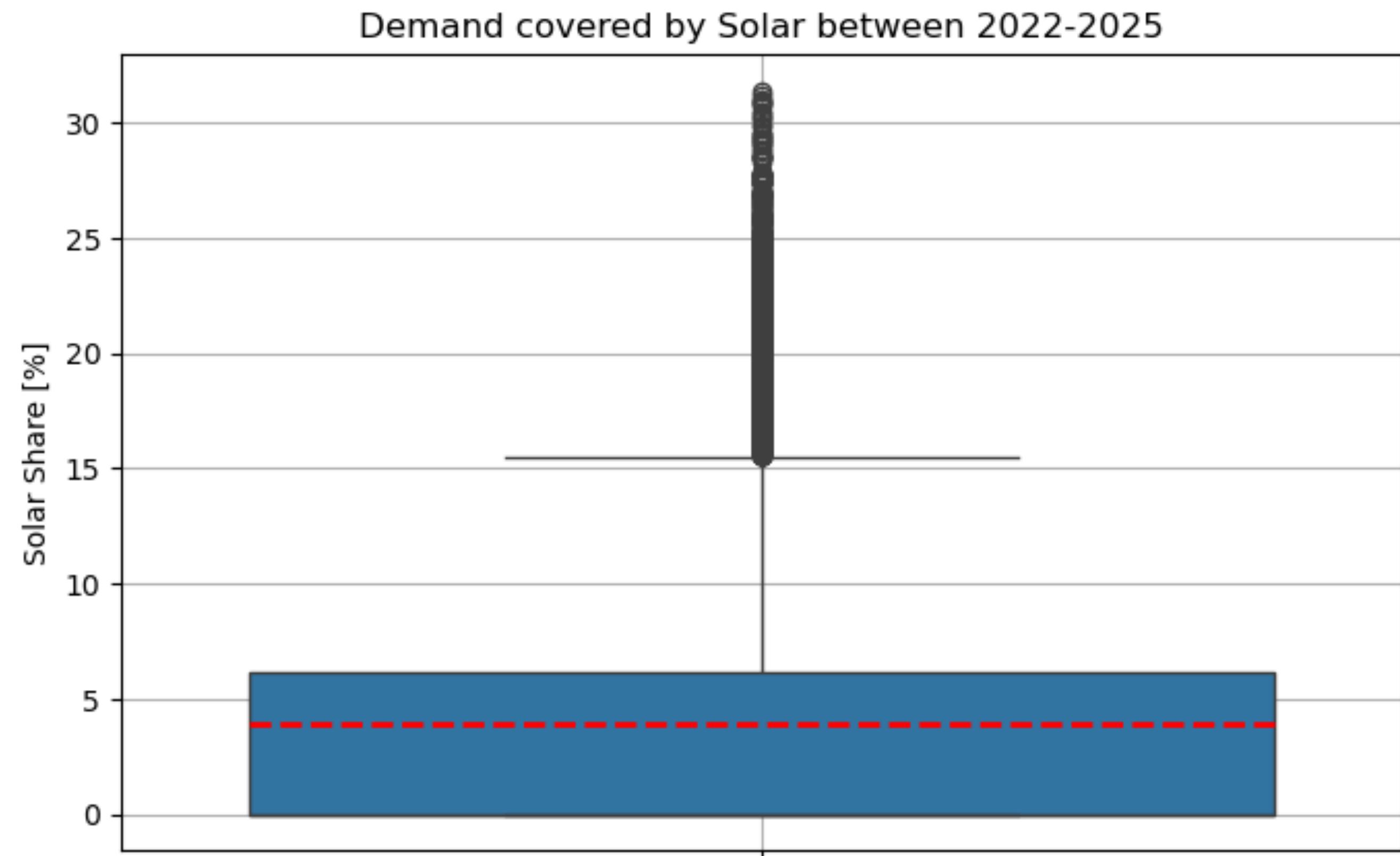
Statistical Indicator	Value
Abs. max MW	22,510
Abs. min MW	1
Abs. mean MW	4,830
Abs. Std MW	4,531
Mean %	27.3
Median %	25.4
Skew	0.31
Kurtosis	-0.96



Impact of Wind and Solar

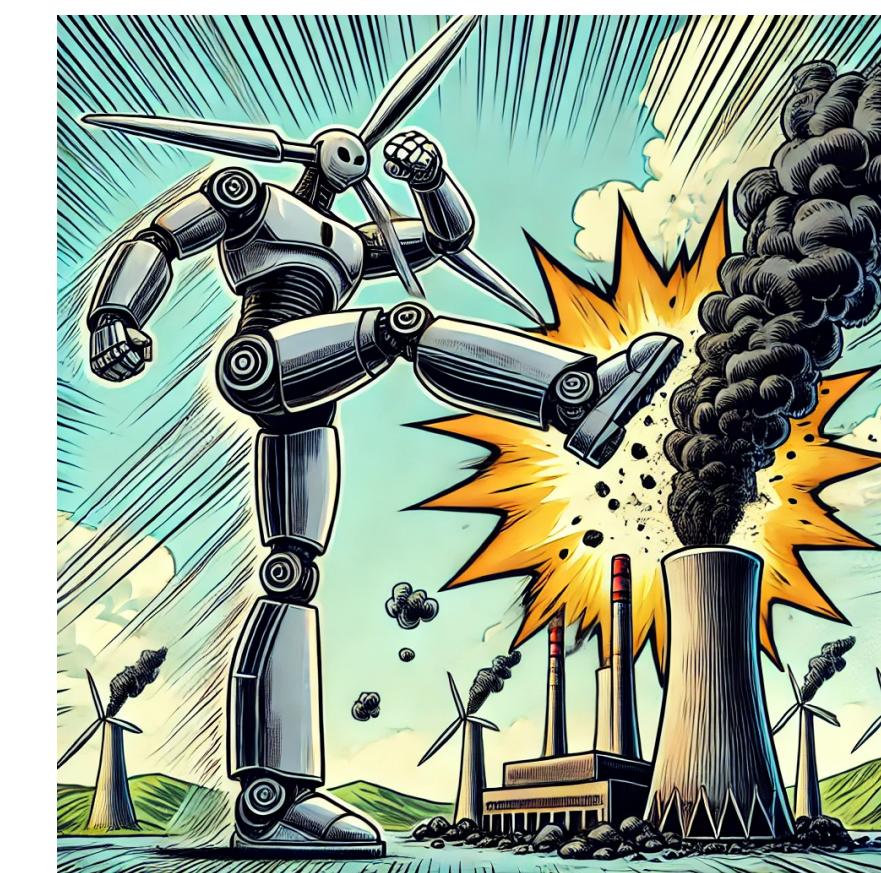
Impact of Solar

Statistical Indicator	Value
Abs. max MW	11,498
Abs. min MW	0
Abs. mean MW	862
Abs. Std MW	1,747
Mean %	3.95
Median %	0
Skew	1.66
Kurtosis	1.9



Summary

1. Increasing share of renewables, especially wind, while coal was phased out
2. Renewables can offset a big share of the power demand
3. Wind and solar power production compensate for each other over the year
4. Wind power is a more reliable energy source in the UK, while solar power lacks this quality



Thank you!

Q&A