

New Energy Projections for the European Domain



Climate Change

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Climate
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Outline

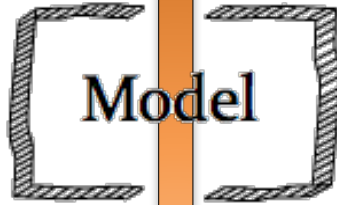
- Reminder on our energy models
- Energy projections: assumptions
- Our new energy projections dataset

Energy Models

 **Climate Data**
(Bias Adjustment)

 **Energy Data**

Analyse



Predict

Simulated energy variables on long periods:

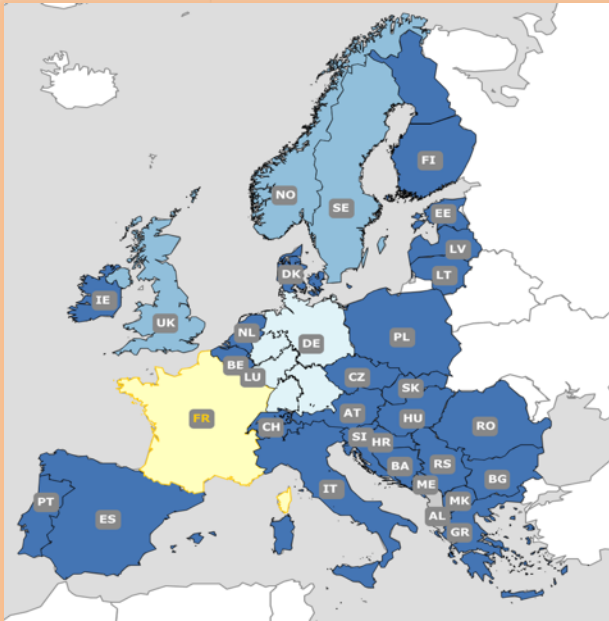
- Past (Reanalysis)
- Months ahead (Seasonal Forecasts)
- **Long-term (Climate Projections)**

Models have been
set up & calibrated
on the historical
period



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Energy Models - Demand



T2m
GHI
RH
WS@10m

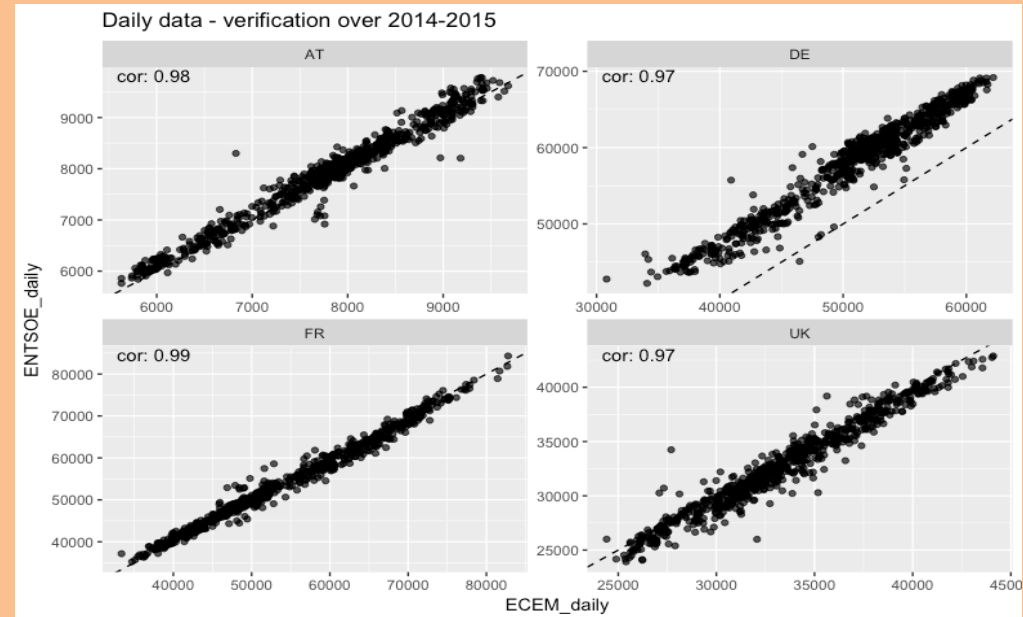
*ECM vs ENTSO-e
daily demand
2014-2015 for AT,
DE, FR and UK*



Demand



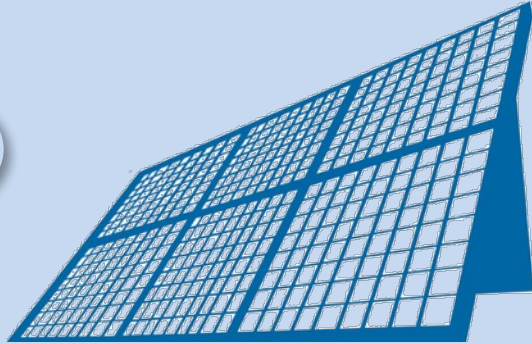
Generalized Additive Models





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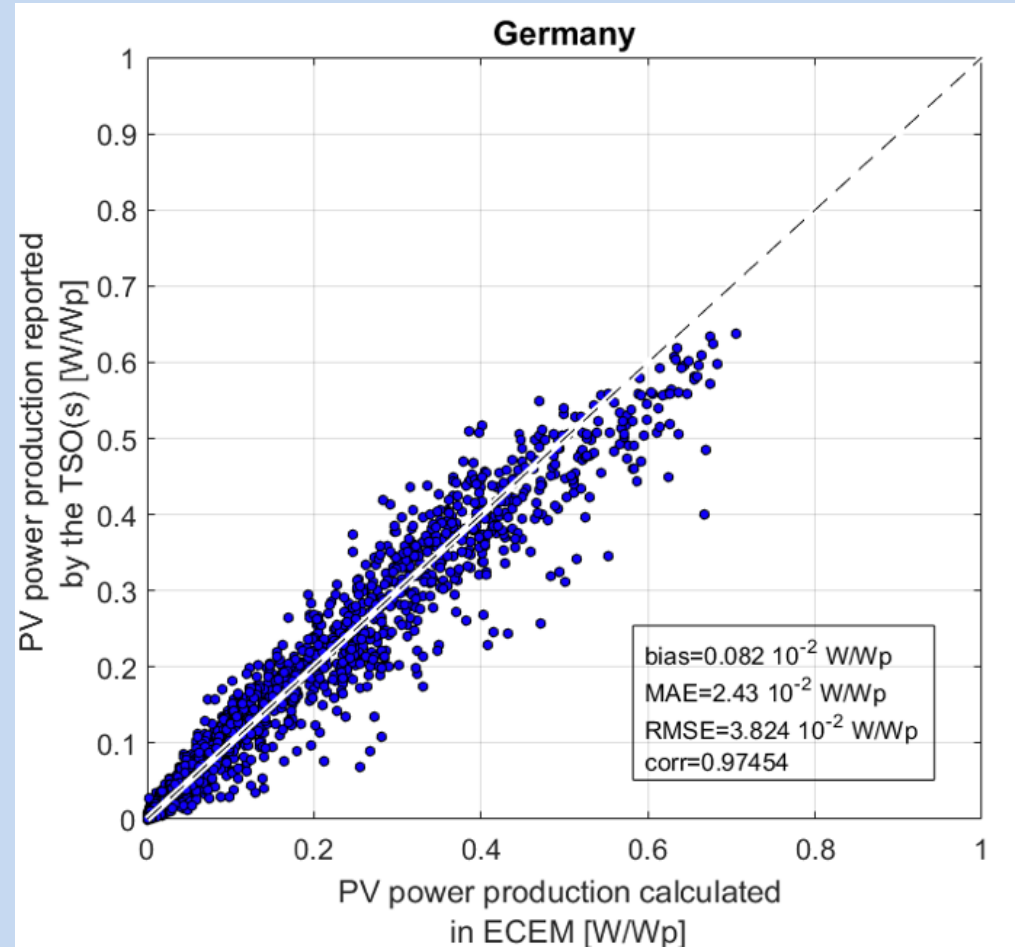
Supply



Physical Model

GHI
T2m

*PV power from ECEM compared
to TSO data for Germany, year
2014*

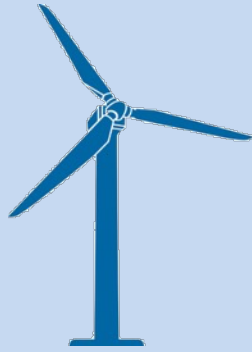




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Energy Models - Wind Power

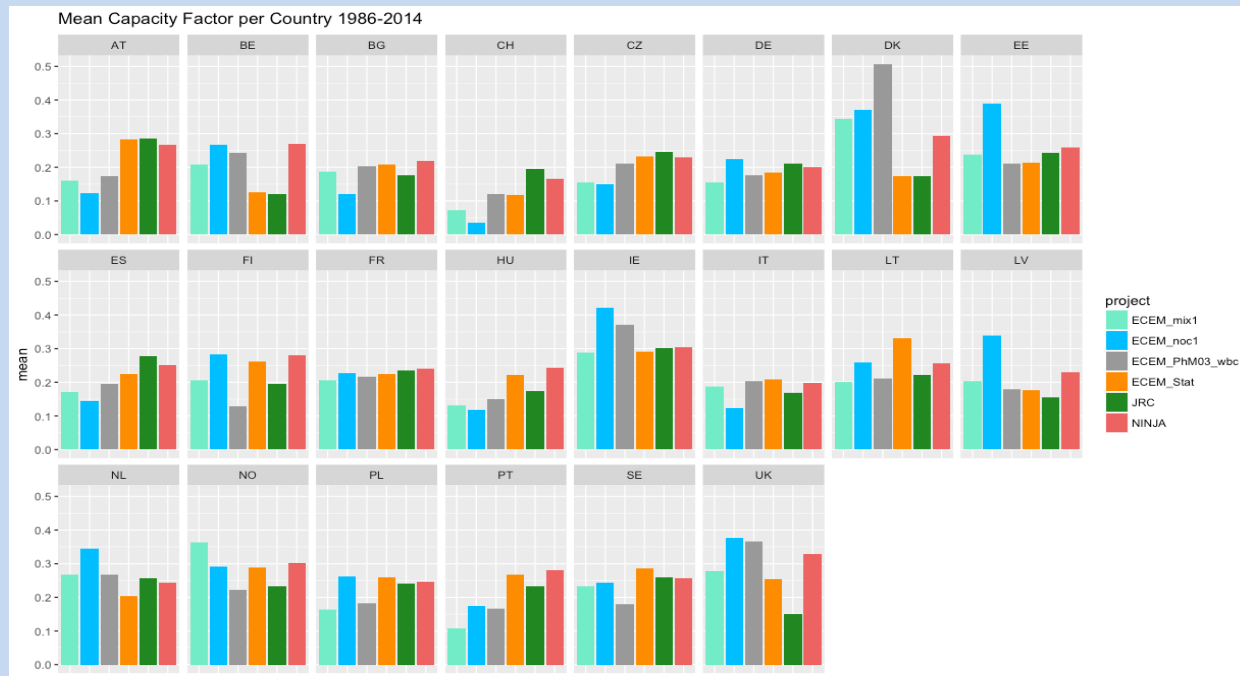
Supply



- Physical Models: 1 single wind turbine type
- Statistical Models (SVR)

WS@10m

*Country mean wind
power capacity
factor for ECEM
models, and NINJA
and JRC datasets*

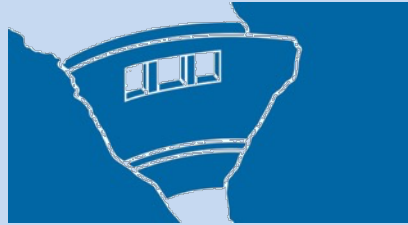




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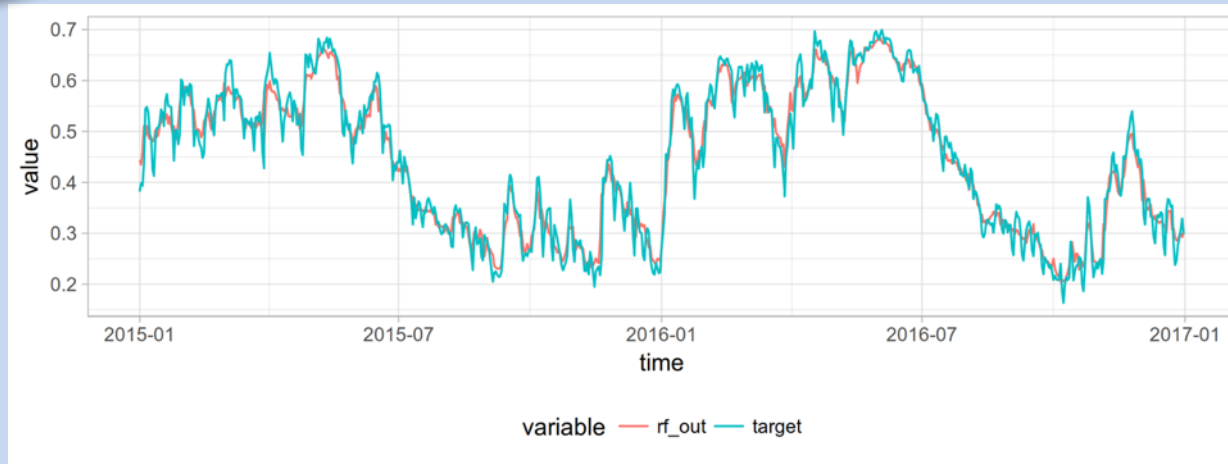
Energy Models - Hydro Power

Supply



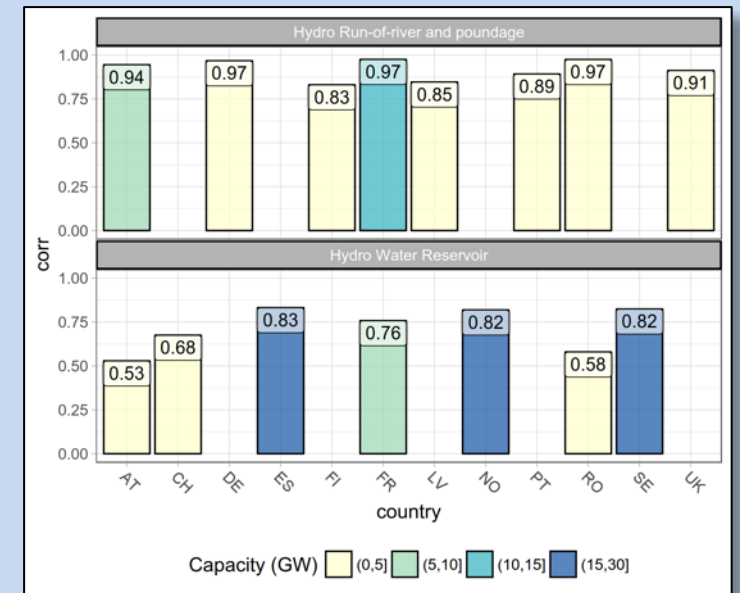
Statistical Models (RnF)

Precipitation
Temperature
(snow cover)



*Run-of Hydro power capacity factor for France,
2015-2016, compared to ENTSO-e data*

Correlation with ENTSO-e data





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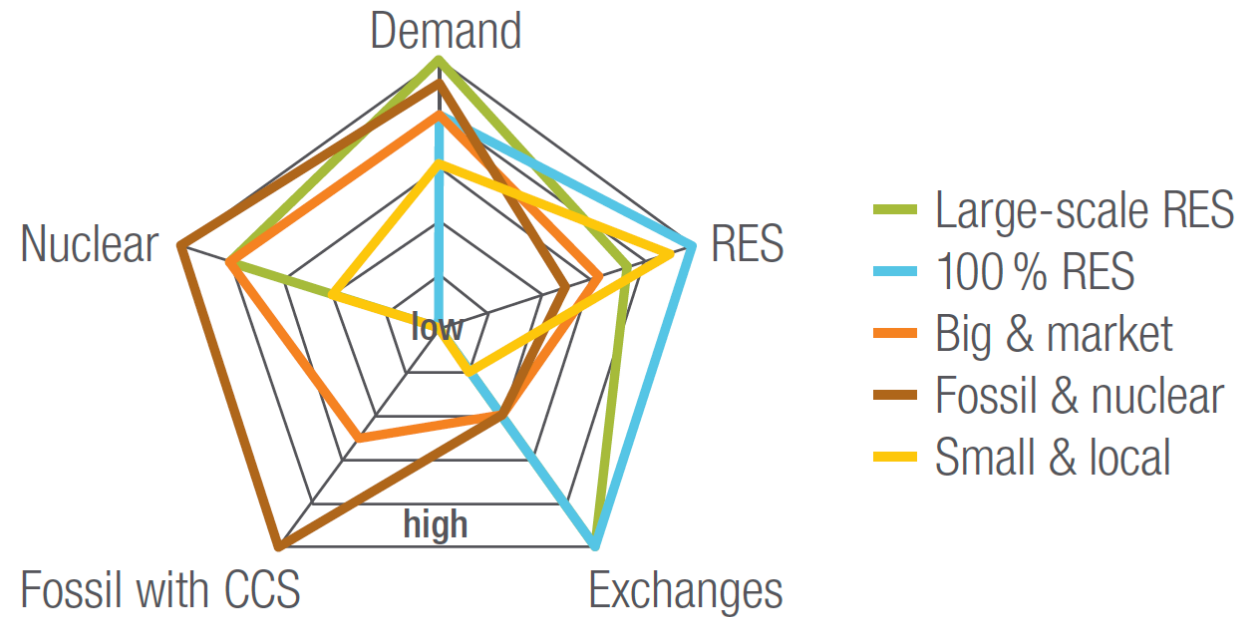
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Energy Projections – Assumptions

We used the models set up on the historical period

- energy demand anomalies
- wind, solar and hydro capacity factors

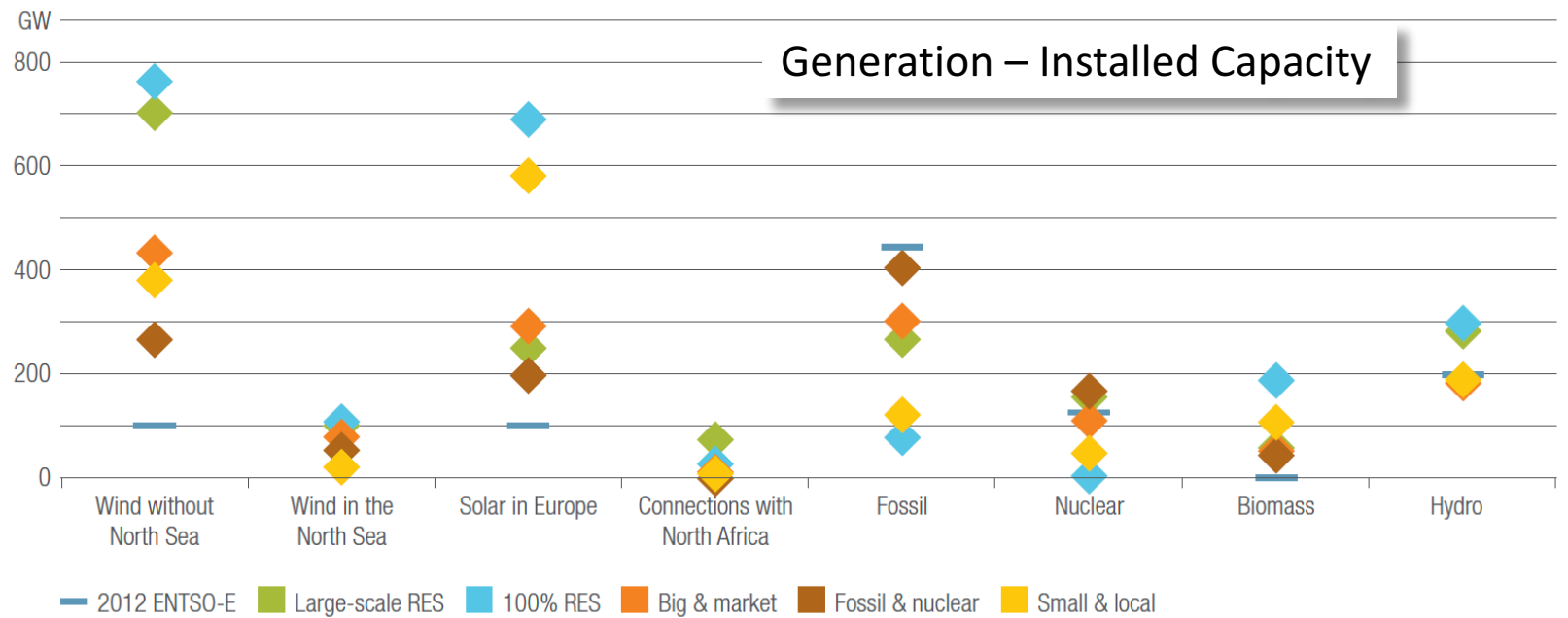
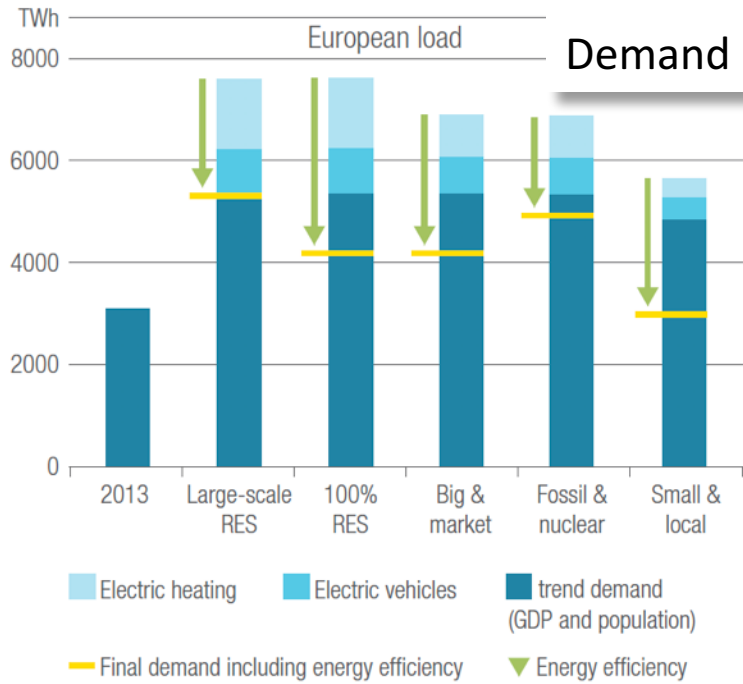
Power and Energy projections are then based on the [eHighWay2050](#) project scenarios





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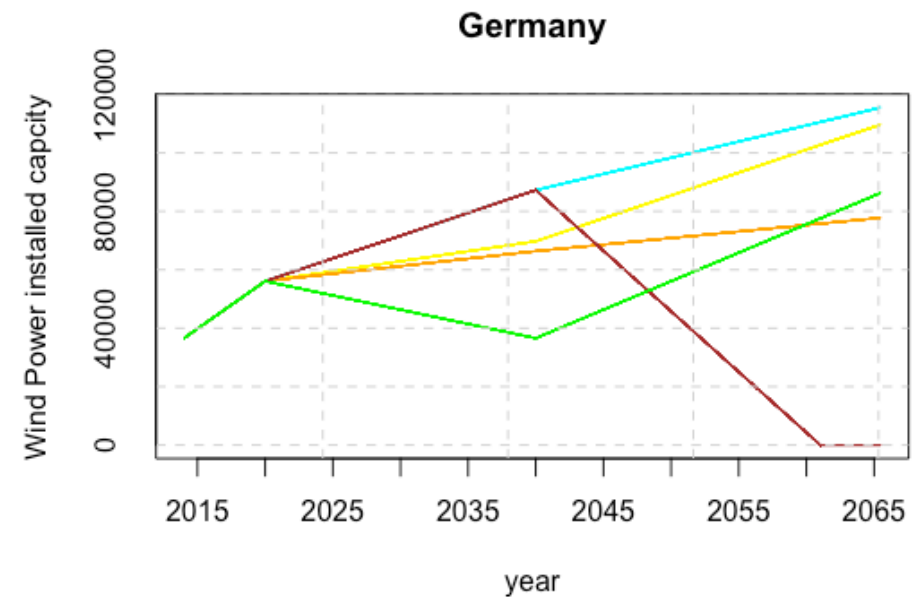
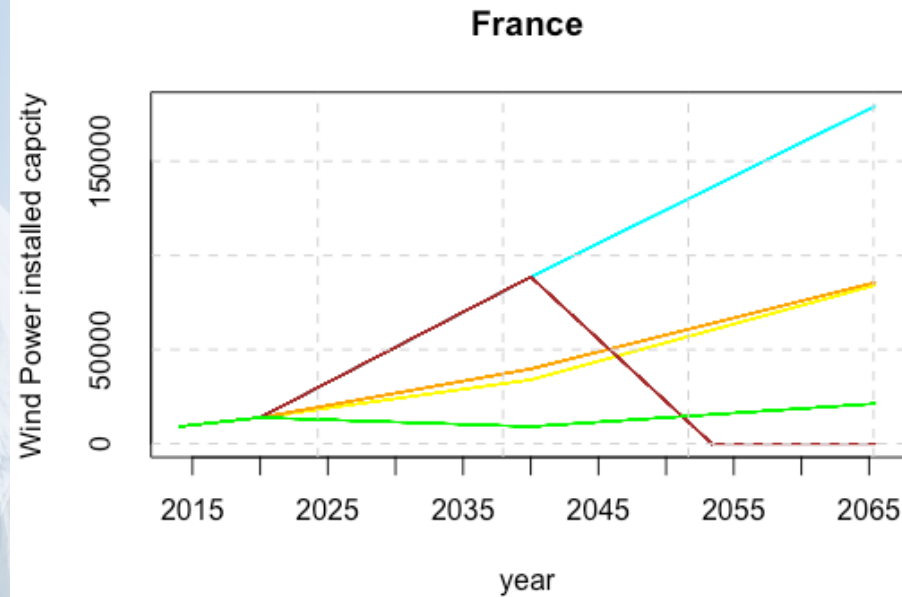
Energy Projections – Assumptions





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Energy Projections – Assumptions



In eHighWay 2050, installed capacities and mean demand levels are given only in 2040 and 2050, starting from ENTSO-E 2014 values.

→ we linearly interpolated these values to get daily time series



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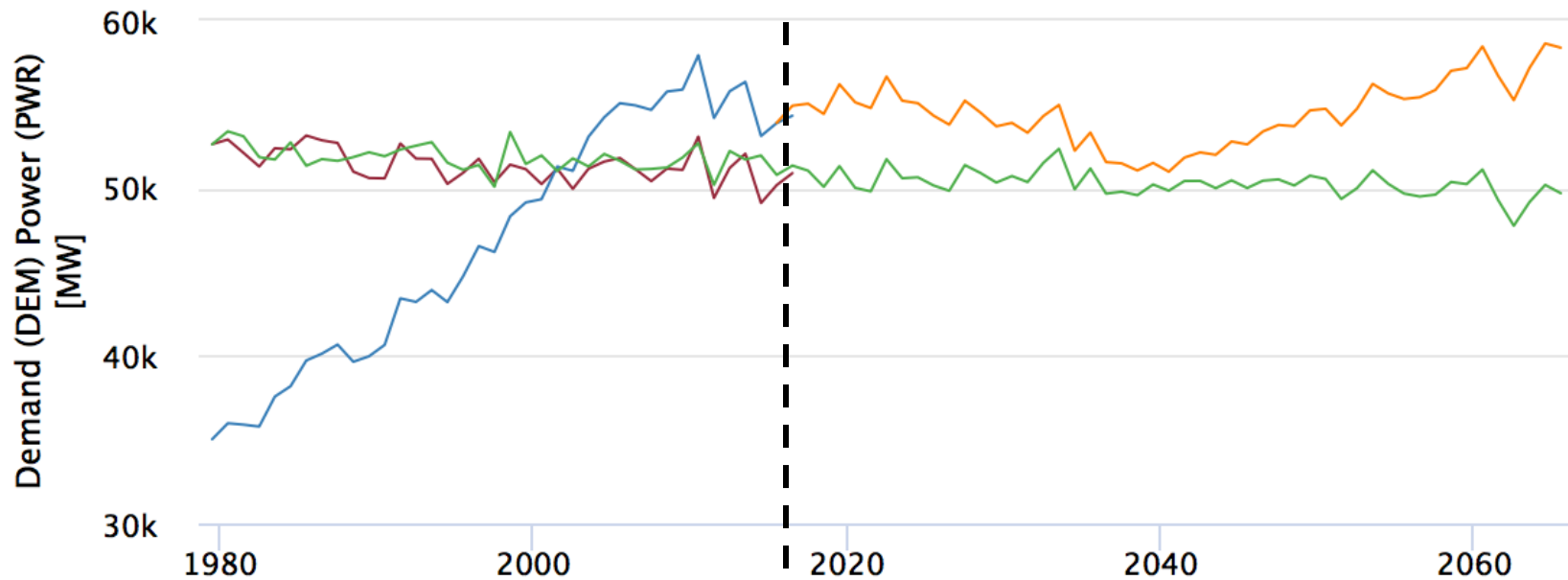


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Future scenarios: Demand - FR

ECM Timeseries: Demand (DEM) Power (PWR)

- FR DEM PWR GamNT 12m
- FR DEM PWR GamNT RCMO NoEH R45 12m
- FR DEM PWR GamNT RCMO NoEH R85 12m
- FR DEM PWR GamWT RCMO EH1 R45 12m**
- FR DEM PWR GamWT RCMO EH2 R45 12m
- FR DEM PWR GamWT RCMO EH3 R45 12m
- FR DEM PWR GamWT RCMO EH4 R45 12m
- FR DEM PWR GamWT RCMO EH5 R45 12m
- FR DEM PWR GamWT RCMO EH4 R85 12m



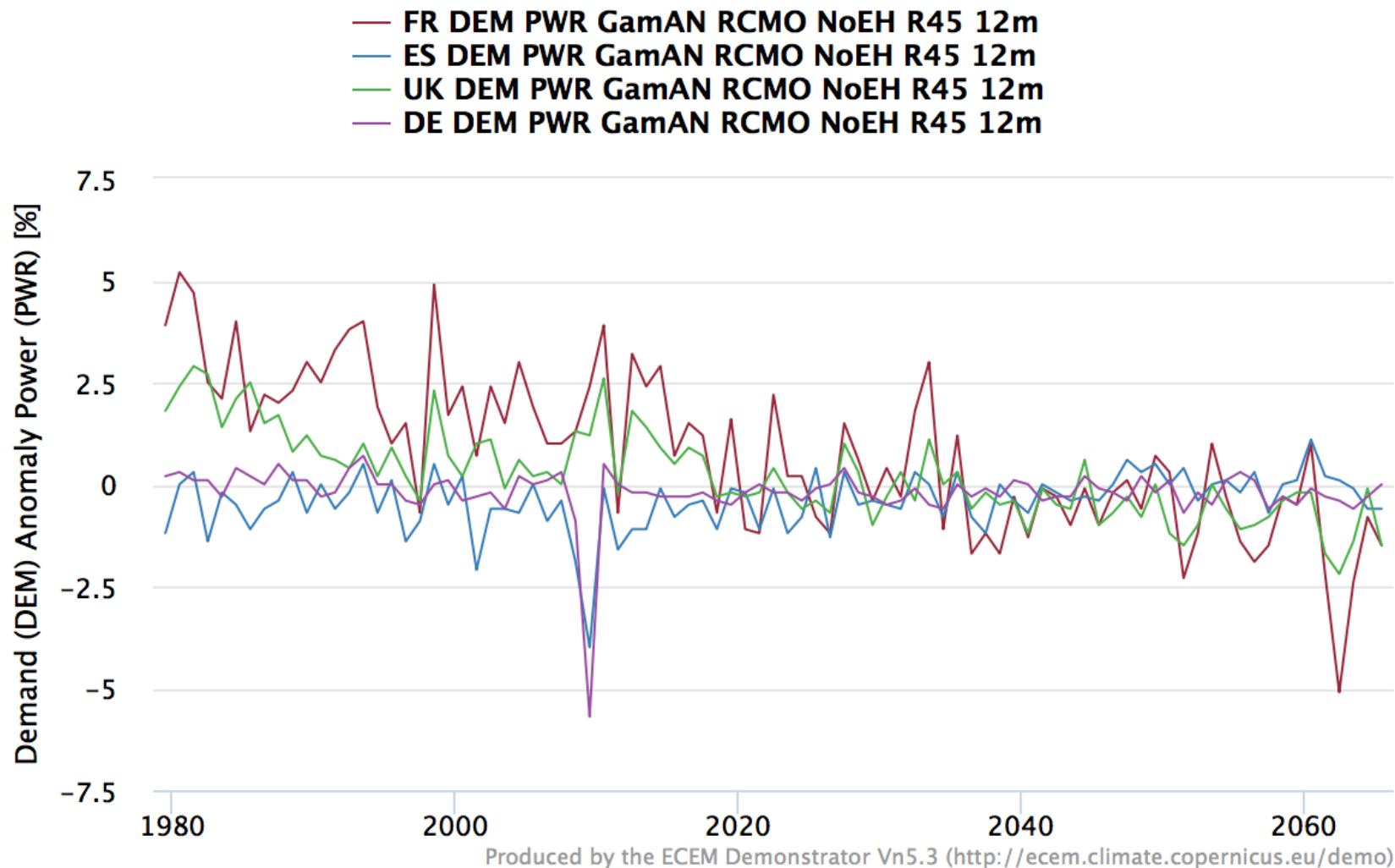
Produced by the ECEM Demonstrator Vn5.3 (<http://ecem.climate.copernicus.eu/demo>)



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Future scenarios: Demand Anomaly

ECM Timeseries: Demand (DEM) Anomaly Power (PWR)



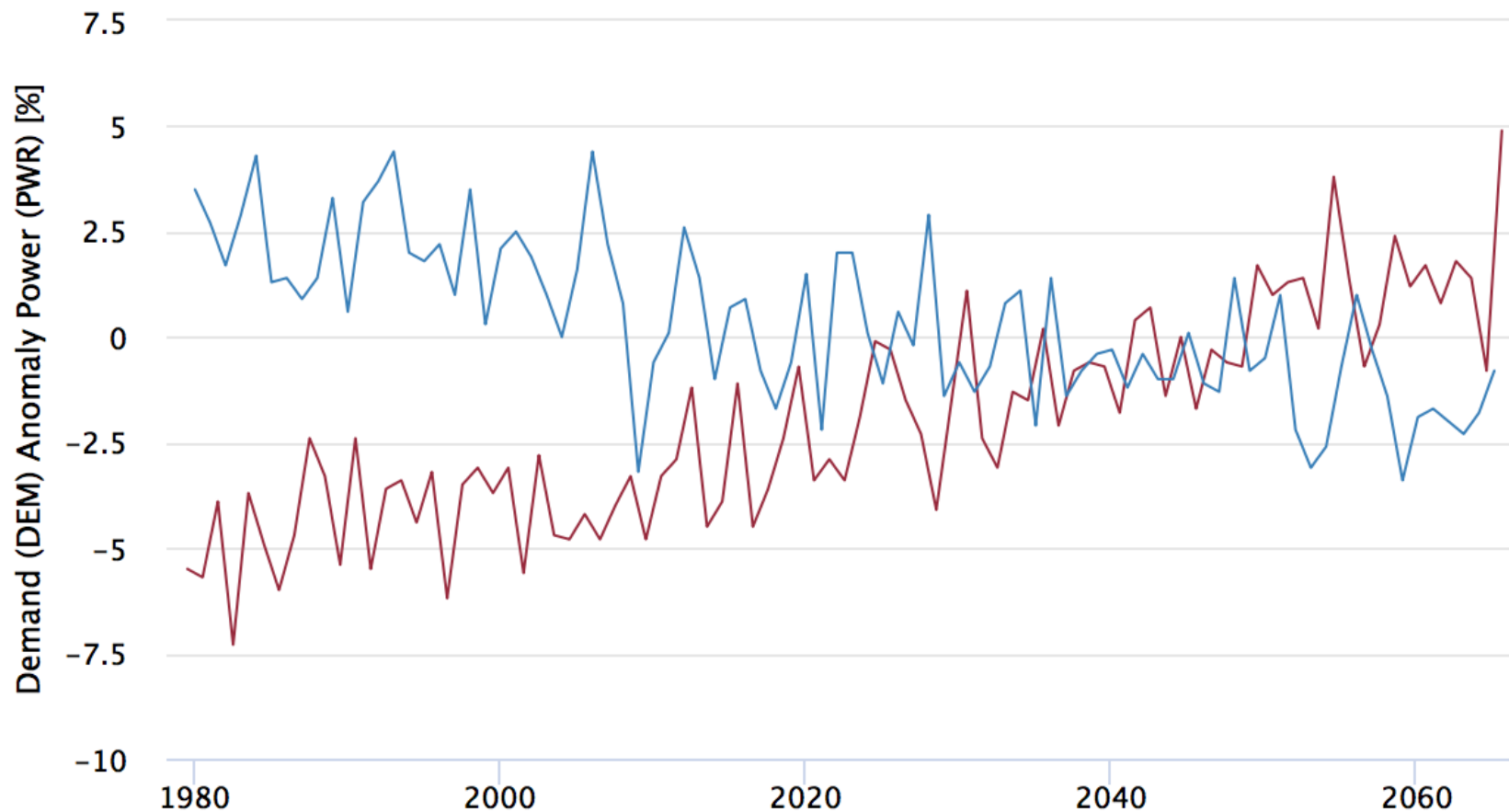


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Future scenarios: Demand – ES – DJF/JJA

ECM Timeseries: Demand (DEM) Anomaly Power (PWR)

— ES DEM PWR GamAN RCMO NoEH R85 JJA
— ES DEM PWR GamAN RCMO NoEH R85 DJF



Produced by the ECM Demonstrator Vn5.3 (<http://ecem.climate.copernicus.eu/demo>)

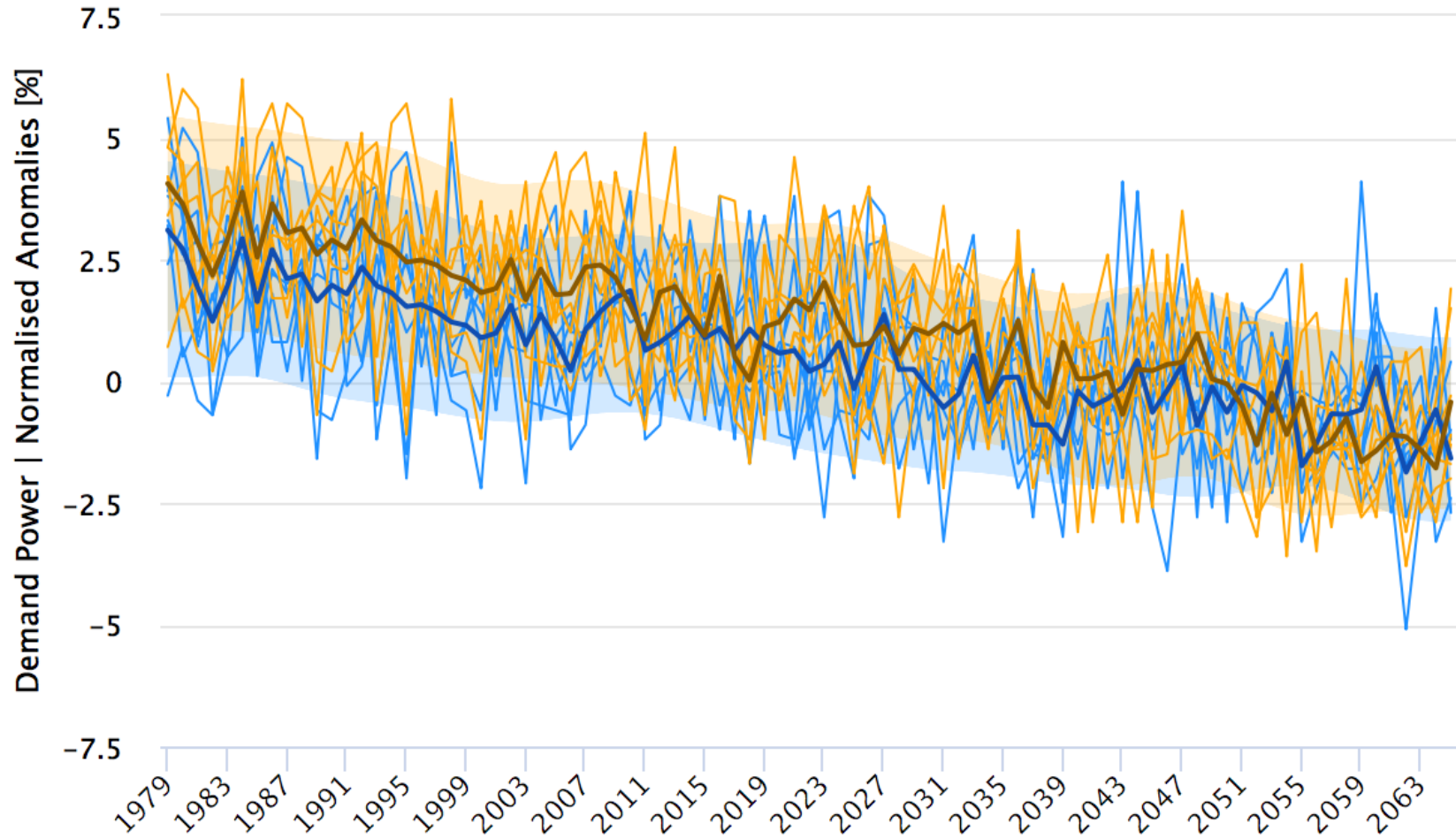


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Future scenarios: Demand Anomaly - FR

Energy Projection | France

— RCP 8.5 — RCP 4.5



Produced by the ECEM Demonstrator Vn5.3 (<http://ecem.climate.copernicus.eu/demo>)

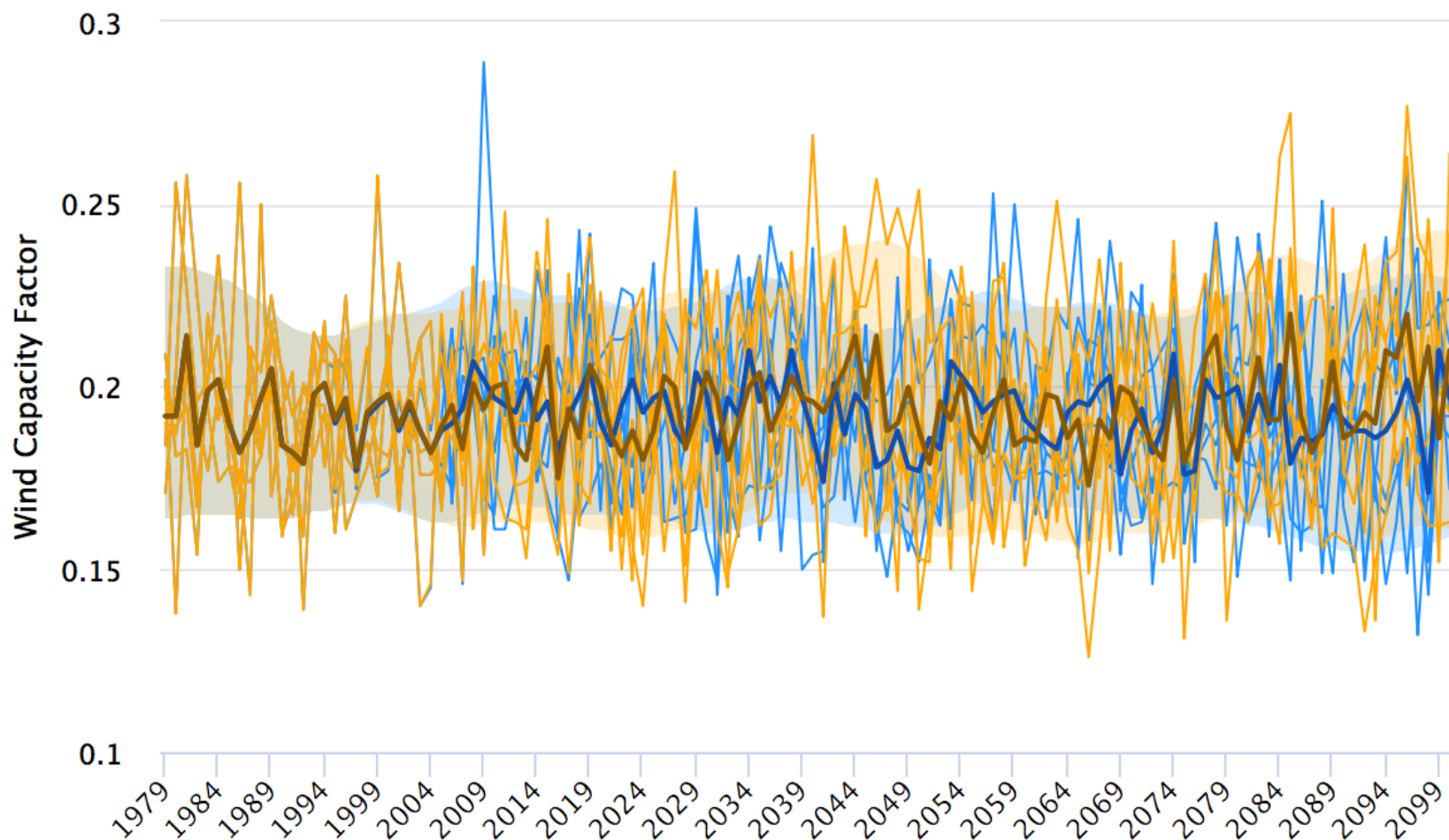


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Future scenarios: Wind Capacity factor

Energy Projection | Germany

— RCP 8.5 — RCP 4.5



Produced by the ECEM Demonstrator Vn5.3 (<http://ecem.climate.copernicus.eu/demo>)

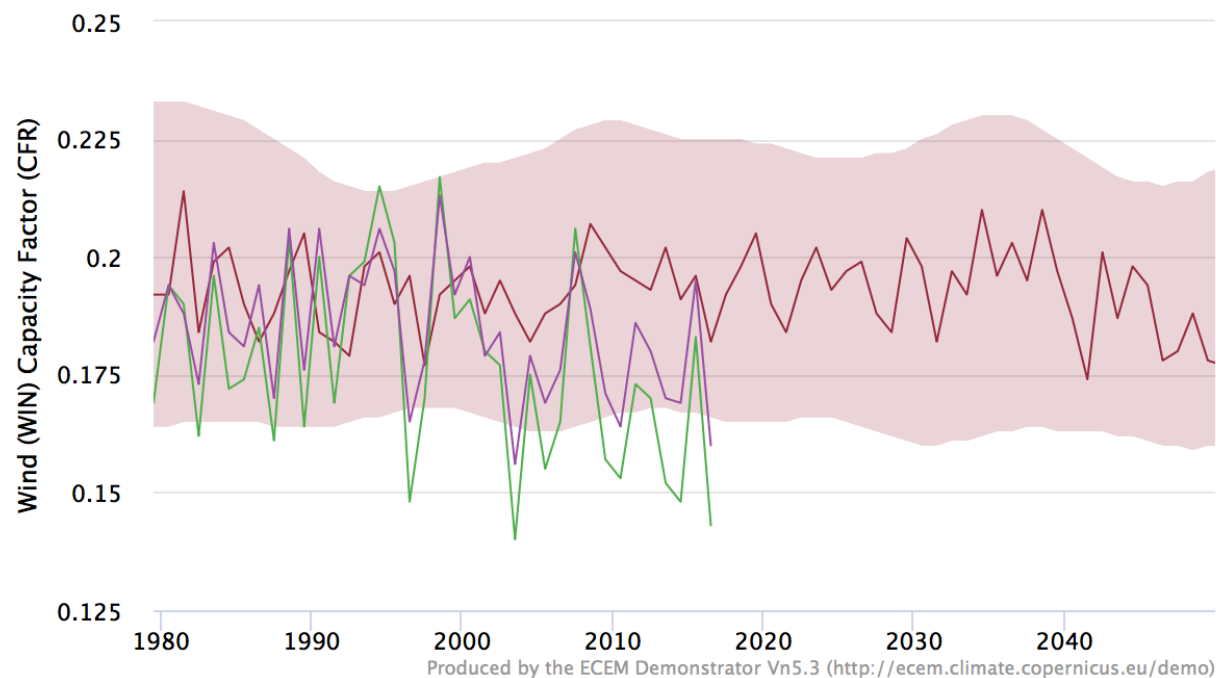


Climate
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Future scenarios: Wind Capacity factor

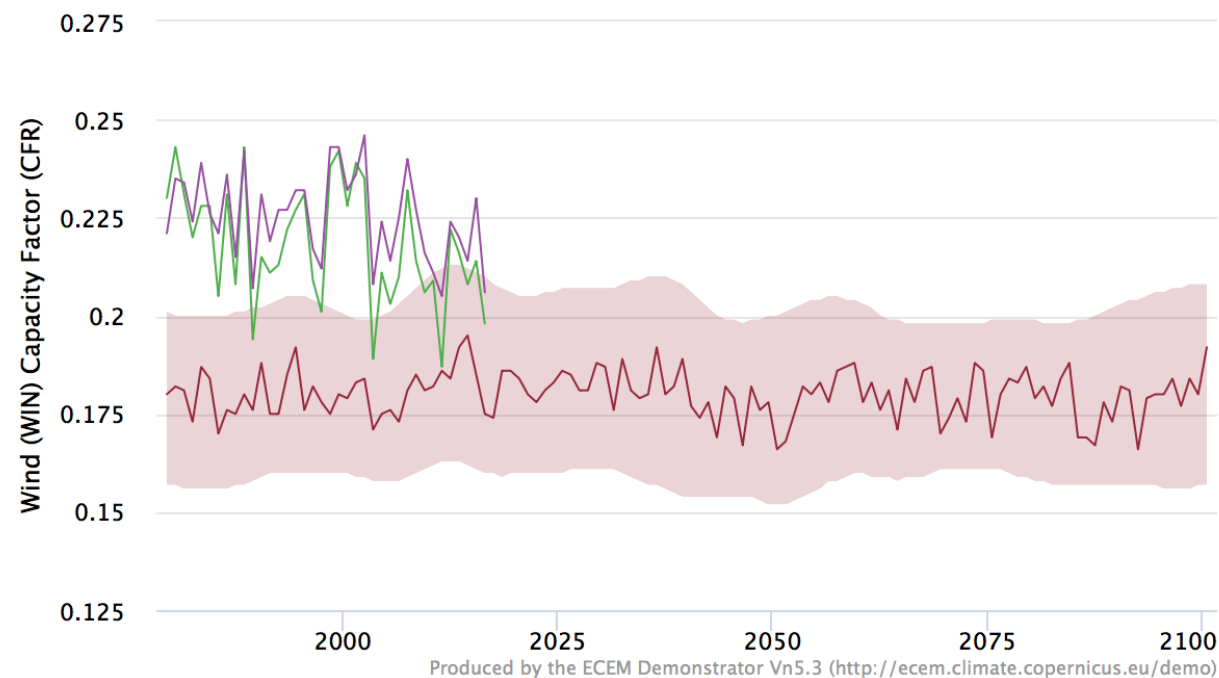
ECM Timeseries: Wind (WIN) Capacity Factor (CFR)

— DE WIN CFR ENSM NoEH R45 12m — DE WIN CFR PhM03 12m
— DE WIN CFR StSVR 12m



ECM Timeseries: Wind (WIN) Capacity Factor (CFR)

— FR WIN CFR ENSM NoEH R45 12m — FR WIN CFR PhM03 12m
— FR WIN CFR StSVR 12m



S u m m a r y

The models built on the historical period have been used for projections

Power & Energy are dependant on assumptions on installed capacity (linear interpolation from 3 values)

But Demand anomalies and Generation Capacity factors are independant of these assumptions

Limitations:

Our dataset doesn't take into account technology changes (new wind turbine types, energy efficiency...)

But it shows how simulated climate change may impact energy demand and supply

Main signals:

- decrease in winter energy consumption due to increase in temperatures
- increase in summer energy consumption due to increase in temperatures
- not much signal on solar and wind power generation
- we are less confident in the hydro power projections, due to weaknesses in simulated precipitations

A n d n o w ?

➔ Remind this is a **Proof of Concept!**

Read carefully the documentation to make sure you're fully aware of the limitations

You can use the demonstrator and download the data

Please give us **feedback** and **report** any issue you may find

C3S Energy products will come to an **operational** phase in the next 2 years, based on what the two Energy PoCs have produced (including new energy scenarios)

We'll have opportunities to interact directly during our final [symposium](#), **5 & 6 March in Paris**



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Thank You

