New Energy Projections for the European Domain

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17 January 2018
• Reminder on our energy models
• Energy projections: assumptions
• Our new energy projections dataset
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
Energy Models - Demand

Generalized Additive Models

Daily data - verification over 2014-2015

- Cor: 0.98 for AT
- Cor: 0.97 for DE
- Cor: 0.99 for FR
- Cor: 0.97 for UK

T2m
GHI
RH
WS@10m

ECEM vs ENTSO-e daily demand 2014-2015 for AT, DE, FR and UK
Physical Model

GHI
T2m

PV power from ECEM compared to TSO data for Germany, year 2014
- Physical Models: 1 single wind turbine type
- Statistical Models (SVR)

Country mean wind power capacity factor for ECEM models, and NINJA and JRC datasets
Statistical Models (RnF)

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

Correlation with ENTSO-e data
• Reminder on our energy models
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• Our new energy projections dataset
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
Energy Projections – Assumptions

Demand

Generation – Installed Capacity
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
Outline

- Reminder on our energy models
- Energy projections: assumptions
- Our new energy projections dataset
Future scenarios: Demand - FR

ECEM Timeseries: Demand (DEM) Power (PWR)

- FR DEM PWR GamNT 12m
- FR DEM PWR GamWT 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)
Future scenarios: Demand Anomaly

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

- FR DEM PWR GamAN RCMO NoEH R45 12m
- ES DEM PWR GamAN RCMO NoEH R45 12m
- UK DEM PWR GamAN RCMO NoEH R45 12m
- DE DEM PWR GamAN RCMO NoEH R45 12m

Produced by the ECEM Demonstrator Vn5.3 (http://ecem.climate.copernicus.eu/demo)
Future scenarios: Demand – ES – DJF/JJA

ECEM 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 ECEM Demonstrator Vn5.3 (http://ecem.climate.copernicus.eu/demo)
Future scenarios: Demand Anomaly - FR

Energy Projection | France

- RCP 8.5
- RCP 4.5

Demand Power | Normalised Anomalies [%]


Produced by the ECEM Demonstrator Vn5.3 (http://ecem.climate.copernicus.eu/demo)
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)
Future scenarios: Wind Capacity factor

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

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

Produced by the ECEM Demonstrator Vn5.3 (http://ecem.climate.copernicus.eu/demo)
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
And now?

➔ 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**.
Thank You