Climate variability and European power systems

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Climate variability and change in European power systems

- **First step**: historical using 26 climate years
- Unit commitment model and hydrothermal scheduler
- **Second step (planning)**: 2030/2050 scenarios with climate change

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“Why variability is important?”
Example – renewable generation in Spain

- Northern: 57%-77%
- Iberia: 35%-50%
- Italy: 34%-40%
- Europe: 29%-34%
- CWE: 23%-27%
- SEE: 23%-30%
- CEE: 16%-19%
- British Isles: 13%-17%

Share of renewable generation (%)
“And what about the future?”
Heatwave hits French power production

France has shut down the equivalent of four nuclear power stations as the heatwave eats into the country's electricity generating capacities.

Freezing Europe hit by Russian gas shortage

2003 European heat wave

2012 Cold spell
Hydropower inflow across the years

Figure 4. Annual variability (percentage deviation from the average) of daily inflow in the 26 climate years for the considered regions.
Wind (onshore)

**Figure 5.** Annual variability (percentage deviation from the average) of onshore wind resources in the 26 climate years for the considered regions.
**Solar (PV)**

**Figure 6.** Annual variability (percentage deviation from the average) of solar resources in the 26 climate years for the considered regions.

The diagram shows the annual variability of solar resources in different regions across various years. The regions include Europe, CEE, CWE, Iberia, Italy, Northern, SEE, and UK & Ireland. A heat wave in 2003 is highlighted on the diagram, indicating significant variability during that year.
$\text{CO}_2$

**Figure 18.** Intensity of the $\text{CO}_2$ emissions of the regional power systems.

- Europe
- CEE
- CWE
- Iberia
- Italy
- Northern
- SEE
- UK & Ireland

$\text{CO}_2$ emissions intensity (g$\text{CO}_2$/kWh)
Our data products

EMHIRES: Wind & Solar power generation:
30 years hourly-time series

ENSPRESO: Energy System Potentials for Renewable Energy Sources

JRC Open Power Plants Database (JRC-PPDB-OPEN)

Water-Energy-Food-Ecosystem Nexus Data Collection

...and many other datasets on the JRC Data Catalogue

https://data.jrc.ec.europa.eu/
Other reports

[Links to reports]

https://europa.eu/!Xv74Nh

https://europa.eu/!tw97wu