

# **Climate Scenarios Use in Long-Term Prospective**

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#### What ?

- RTE has done a comprehensive study « 2050 Energy Futures », on the evolution of the power system, to reach carbon neutrality by 2050
- It assesses different scenarios for the French power system, and provides an analysis according to 4 different axes:



It includes climate change effects by considering 3 different climate databases : 1 for the past and 2 for the future (2 greenhouse gases emissions scenarios)

## Météo-France « constant climate » simulations



- 3 simulations sets with « constant climate » (fixed CO2 emissions)
  - □ 200 years « climate 2000 »
  - □ 200 years « climate 2050 » RCP4.5
  - □ 200 years « climate 2050 » RCP8.5





Source Météo-France

#### From climate parameters to power system modeling

Different climate parameters	Power system parameters
femperature	Electricity demand
	Wind power generation
	Solar PV power generation
→ Wind speed	Hydro power generation
-🔆 Solar irradiation	Availability of nuclear and thermal power generation
Precipitations & river flows	Consumption & generation of border countires
For all EU countries	Interconnection capacities

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## These energy variables then feed the ANTARES model





#### Heat and cold waves will significantly change with climate change



### Take away messages

- The approach has assumptions and limits...
- > ... However RTE's study is the first of its size that takes climate change into account
  - Current & future climate / 2 different emissions scenarios
  - Spatial and temporal relationships between variables are taken into account (demand and RE generation in particular)
  - 200 climate years  $\rightarrow$  representation of extreme events
- Stress tests are part of the study, in particular for heat and cold waves & hydrological and wind droughts
- These climate databases are also used in other projects, including network assets resilience studies.
- Increased collaboration between energy modelers and climatologists is essential for the assessment of climate change impacts on infrastructure systems, their adaptation to, and their contribution to mitigation of climate change