Electricity production in a changing climate

Potential climate change impacts of water, wind and temperatures on electricity production from today's power plants

Northern EU
Southern EU

Wind Production

Less than +/-1% impact
with 1.5 °C, 2 °C and 3 °C warming

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Electricity production costs

More hydropower resource means lower production costs

1.5 °C: **-1%** 2 °C: **-2%** 3 °C: **-4%**

More fuels needed to compensate lower hydro production, leading to slightly more expensive production costs

1.5 °C: **+0%** 2 °C: **+1%** 3 °C: **+1%**

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Solar Production

Less than +/-1% impact
with 1.5 °C, 2 °C and 3 °C warming
The lower efficiency of solar panels due to higher temperature is small

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Less thermal power production (biomass, coal, gas, oil) is needed to meet demand thanks to higher hydro production

1.5 °C: **-4%** 2 °C: **-7%** 3 °C: **-15%**

River water is used to cover the cooling needs of thermal plants

1.5 °C: **-1%**
2 °C: **-2%**
3 °C: **-5%**

Lack of cooling water

Indirect impacts

1.5 °C: **+1%**
2 °C: **+2%**
3 °C: **+1%**

Nuclear

Other Thermal

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Spill-over effects from the rest of the world are small (less than +0.1%)

Despite lower availability of cooling water, excess capacities of biomass, coal, gas and oil, are used to compensate the lower hydro and nuclear production to meet demand.

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Hydro production **increases** in northern EU

1.5 °C: **+4%** 2 °C: **+7%** 3 °C: **+13%**

Overall, the EU **increases** its hydro production

1.5 °C: **+1%** 2 °C: **+2%** 3 °C: **+3%**

Hydro production **decreases** in southern EU due to water scarcity

1.5 °C: **-1%** 2 °C: **-2%** 3 °C: **-2%**

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river runoff

KEY MESSAGES

In northern EU, increasing water availability leads to more power production by hydro and less by other thermal sources through substitution.

In southern EU, reduced water availability leads to less hydro and nuclear power production.

Electricity production costs are pushed up in southern EU and down in northern EU.

For the EU & UK as a whole, wind and solar are not significantly impacted.

For more information, including assumptions of the modelling framework used, see: JRC PESETA IV project https://ec.europa.eu/jrc/en/peseta-iv

European Commission