32.330948320 68 04.66

07.82%

1.22%

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Mid-term Adequacy Forecast 2016

6 July 2016

21.520 March 41

What do we assess?





How did we do it?



Market-based probabilistic methodology applied for the 1st 01 time to the pan-EU area $\left[\right]$ **Benchmark of results using 4** different software

Data and assumptions provide basis
for further studies at regional level
and national level

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How did we do it?

What indicators did we use?



- Energy Not Supplied or ENS is the amount of energy not supplied expressed in megawatt hour per year
- Loss of Load Expectation or LOLE is the number of hours per year demand is not met



So what did we find out?

GRAPHICAL GUI INT

Evolution of the risk in Europe



| COUNTRY | | 2025 | | |
|---------|--|--|--|-----------|
| | BASE CASE | SENSITIVITY CASE I | SENSITIVITY CASE II | BASE CASE |
| AL | | | | |
| AT | | | | |
| BA | | | | |
| BE | | | and the second | |
| BG | | | and the second | |
| СН | • | | 1 | |
| CZ | | | | |
| DE | | | | |
| DK | | | | |
| EE | | | and the second | |
| ES | | a de la companya de l | | |
| FI | | | | |
| FR | | | | |
| GB | | | | |
| GR | | and the second | | |
| HR | | | and the second | |
| HU | | | 1 | |
| IE | • | | | |
| IT | | | 1 | |
| LT | | | | |
| LU | | | | |
| LV | | | 1 | |
| ME | | | | |
| MK | | | | |
| NI | • | | | |
| NL | | | | |
| NO | | | | |
| PL | | | • | |
| PT | | | | |
| RO | | | | |
| RS | and the second | | | |
| SE | | | | |
| SI | | | • | |
| SK | | | | |
| CY | | | | |
| TR | | | | |

LOLE < 1 hour

LOLE > 1 hour but under conservative

LOLE > 1 hour

modelling assumptions



Interactive maps

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Probabilistic methods



Combination of factors to detect 'exceptional' situations



Probabilistic methods



Example: 2 Combinations

| HOUR 🕔 | LOAD | RES | HYDRO 🕹 | THERMAL | CROSS BORDER CAPACITY | |
|----------------------------|--|----------------------|---|---|---------------------------------|--------------|
| Scenario 2020 Hour 1 | Low /High Temp High Demand (Winter/Summer) | Low Wind Low PV | Dry conditions Low hydro production | Low availabil- ity of Thermal generation | Low cross border capacity | Ŵ |
| ••• | | | | ••• | | |
| Scenario 2025 Hour 8760 | Moderate Temp Moderate Demand | High Wind High PV | Wet conditions | Normal availa- bility of Thermal generation | Normal cross border capacity | \checkmark |

Probabilistic results





Probabilistic results





Probabilistic results: Base Case 2020

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Probabilistic results: Base Case 2025





2020 → 2025





Thank you for your attention



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Questions?





Lessons learned



For the first time probabilistic methods have been used to assess risk to security of supply at the pan-European level

The MAF gives the pan-European perspective that can later be used for additional regional and national studies



Need for a permanent group of transmission system operators expert to work on MAF

Coordination and consistency between MAF and regional and national studies needs to be improved

Information, knowledge and best practice exchange increase the quality of all outputs



Use the data of **35** climatic years instead of **14**

Improve assumptions on Net Transfer Capacity

Model demand response

Use flow-based models