Mid-Term Adequacy Forecast

MAF 2019

European Network of Transmission System Operators for Electricity (ENTSO-E)

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entsoe
Programme

1. Adequacy at ENTSO-E
2. MAF 2019 methodology and outcomes
3. MAF key take-aways
Adequacy at ENTSO-E
Energy transition requires a robust methodology

- **High temporal volatility**
  - Probabilistic (hourly)

- **High spatial volatility**
  - Interconnections (Pan European)

Need to reflect accurately the complementarities of the different technologies (generation capacity flexibility, storage, demand response, energy efficiency)
Different risks addressed with different timeframes

- **Long term** (>10 years)
  - Policy decisions

- **Mid term** (10 years)
  - Investment decisions

- **Short term** (1 year)
  - Operational decisions
  - REAL TIME

- **Week ahead** (1 week)
  - Seasonal

- **REAL TIME**
  - Week ahead

- **UNCERTAINTY INCREASES**
MAF 2019: Methodology
## MAF 2019 scope and limitations

<table>
<thead>
<tr>
<th>Addressed by MAF 2019</th>
<th>Not yet addressed</th>
</tr>
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<tbody>
<tr>
<td>Identification &amp; quantification of <strong>resource scarcity risk</strong> in day-ahead market in 2021 and 2025</td>
<td>Economic viability assessment</td>
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<td><strong>Accelerated low-carbon</strong> stress test for 2025</td>
<td>Suitability of <strong>regulatory framework &amp; market design</strong> (e.g. rightness of Capacity Mechanism)</td>
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<td><strong>Flow-Based</strong> sensitivity for 2021</td>
<td><strong>Internal congestion</strong> within a Bidding Zone (considered as copper plate)</td>
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Resource Adequacy: General Methodology

Available Generation

Deterministic Forecast:
- ENTSOs’ Scenarios
- Planned Outages

Uncertainty:
- Wind generation
- Solar generation
- Hydro generation
- Forced outages

Network Infrastructure

Demand

Deterministic Forecast:
- ENTSOs’ Scenarios

Uncertainty:
- Temperature

Storage

Import

Export

Available Generation

24/7 365

DSR

Load
Resource Adequacy: Construction of Sample Years

35 years of interdependent climate data

$N$ random draws for unplanned outages

$35 \times N$ (Monte Carlo) sample years
Improvements compared to previous editions: Focus on input data – Hydro and Demand

Hydro Modelling: Complete set of climate years with year-specific hydrological conditions

- Hydropower modelling has a significant impact on the results;

- Harmonized assumptions, common methodology based on re-analysis of historical data and better reflection of the interdependence of hydrological and the rest climate variables (temperature, wind, solar, etc.);

Demand time-series: advanced tool for an improved model

- Common tool and methodology to build time-series for all zones;

- Trained on a number of historical demand time-series and their correlation with climate variables based on identification of significance of each variable, e.g., temperature, irradiance, wind speed, etc.;

- Considering contribution of Electric Vehicles and Heat Pumps.
Improvements compared to previous editions: Focus on input data – Thermal Generation

MAF 2018

PEMMDB 2.0

Clustering:
- generating units clustered by technology

MAF 2019

PEMMDB 3.0

Individual power plant data:
- economic parameters
- technical details
- scenario building fundamental assumptions

- Unit-by-unit granularity of thermal generation data is a milestone for System Development studies;

- Detailed modelling of various properties, e.g., maintenance, derating of generation plants, ramping, expectations of commissioning and decommissioning, economic parameters etc.;
MAF 2019: Main Outcomes
Base case results: Comparison of year 2021 and 2025
Low-Carbon stress test for 2025: 23 GW phased out

*only zones with LOLE > 0.5 hours/year are shown*
MAF 2019: Take-Aways

ENTSO-E MAF is a pan-European, monitoring assessment of adequacy – benchmark for all other regional and national studies.

Data and methodology are important:
- Datasets are updated & improved in quality and granularity year-by-year;
- Methodology evolves & is enhanced with new features towards the ERAA;
- Probabilistic assessment is recognized as state-of-the-art approach;
- Uncertainties and extreme climate years might have significant impact on results.

MAF 2019 identifies restricted number of risks in target years 2021 and 2025, given that the input assumptions on availabilities will materialize.
Thank you for your attention