

## What is the 'MAF'?

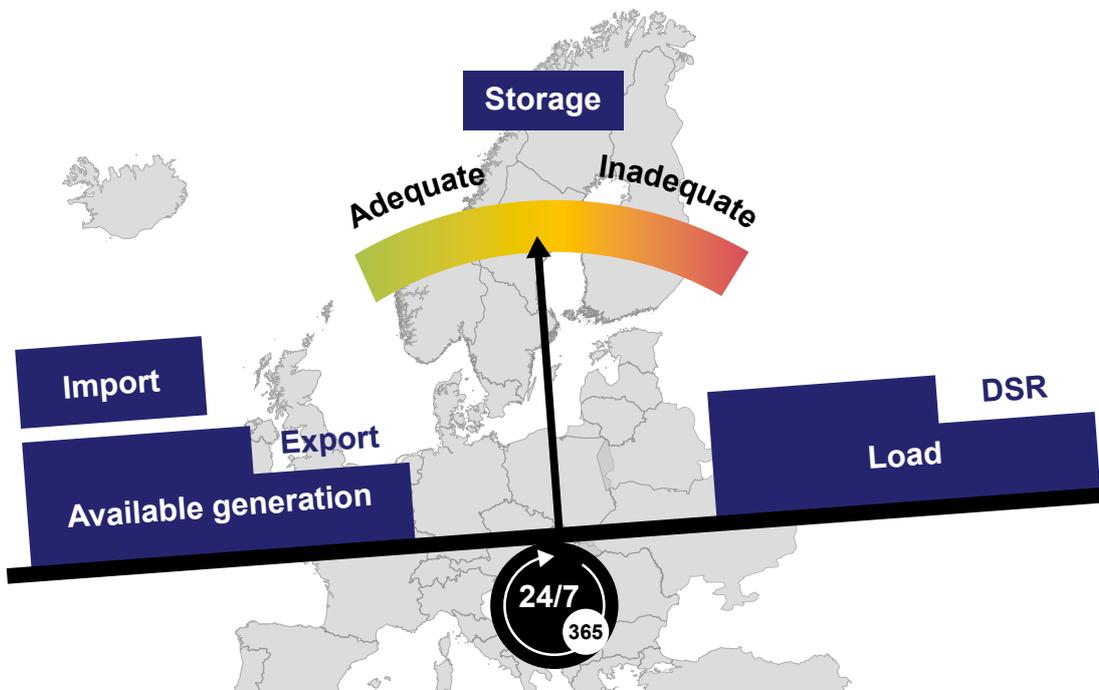
The Mid-term Adequacy Forecast (MAF) is a yearly pan-European monitoring assessment of power system resource adequacy spanning the timeframe up to ten years ahead.

The MAF is based upon a probabilistic analysis, conducted using sophisticated market-modelling tools. Its elaboration involves a large number of assumptions about the future. Therefore, it is important to understand that each edition of the MAF should only be seen as a best estimate of future adequacy conditions, considering the information available at the time of its elaboration.

It aims to provide stakeholders with comprehensive support to take qualified decisions, and answers to ENTSO-E's legal mandate of monitoring Europe's adequacy of supply under Article 8 of EC Regulation no. 714/2009.

## What is system adequacy?

System adequacy is the possibility for a power system to meet demand at all times and thus guarantee security of supply.



## How is the MAF developed?

In the MAF, 2018 five electricity market models were calibrated and run based on TSO datasets for the years 2020 and 2025. The MAF incorporates a number

of different scenarios where different outlooks are studied, namely different levels of generation, demand and climatic conditions.

## What are the main take-aways of the MAF 2018?

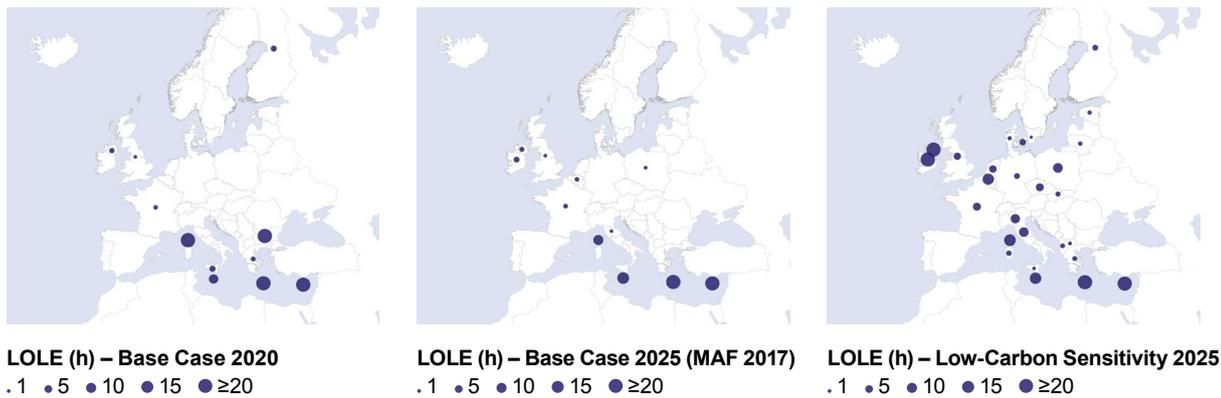
The MAF 2018 highlights the importance of cross-border cooperation in fostering adequacy throughout the pan-European power system. There are complex interdependencies between supply, demand, storage and interconnection capacities.

The MAF 2018 does not indicate considerable adequacy issues in most countries, and the risks of scarcity that were identified concern mainly islands<sup>1</sup> e.g. Cyprus, Malta, Corsica and Crete. A 'low-carbon'

scenario considers the impact of shutting down generation units by 2025 (representing 23 GW) due to an acceleration of environmental policies, for example, a coal phase-out. Results confirm that the decommissioning of polluting generation capacity should be accompanied by the development of the system in different terms e.g. demand-side response, flexibility means including storage, renewable energy sources and interconnections.

<sup>1</sup> Results for islands should be considered with care, since they are more sensitive to updates in modelling assumptions (e.g., integration and updates regarding interconnection projects)

Figure – Market resource adequacy – Loss Of Load Expectation (LOLE) – 2020 and 2025 base case scenario, and low-carbon sensitivity in 2025



### Does the MAF forecast possible risks of blackout?

The MAF uses the indicators Expected Energy Not Served ‘EENS’ (amount of demand for electricity at risk of not being supplied) and Loss of Load Expectation ‘LOLE’ (average number of hours with EENS among all simulations run). However, these indicators must not be understood as a forecast of future outages.

For example, LOLE being greater than zero for a certain date and time does not indicate a risk of blackout or load shedding. That is because the MAF only observes the day-ahead situation, while TSOs have various tools to resolve situations of scarcity within the day, such as contracted industrial load-shedding or strategic reserves.

### What about flexibility?

System adequacy is not only related to the amount of generation capacity installed in the system. Flexibility adequacy – defined as the ability of the installed generation capacity to adjust to the ever-increasing dynamic of dispatch events in the system – is becoming more important. This is mainly due to the

increasing amount of variable renewable energy. The MAF highlights the ramping needs, to cover, for example, the decline in solar power at sunset when demand increases as people get home in the evening, and the need for balancing fast reserves.

### What are the main improvements compared to the MAF 2017?

Since the publication of last year’s report, MAF activities have been consolidated, improved and standardised. Furthermore, the MAF database has been updated to consider the latest country

adjustments, while new modelling features have been tested with an innovative flow-based modelling approach.

**Want to know more? Read the MAF 2018 at [entsoe.eu/outlooks/midterm](http://entsoe.eu/outlooks/midterm)**

**Executive Report:**

- The base case results for 2020 and 2025
- The low-carbon sensitivity analysis results for 2025
- Flow-based study results for 2020.

**Appendix 1:**

- presents a more detailed description of the MAF study, including:
- methodology and assumptions

- detailed results of the different studies
- analysis of the import/export levels during single and simultaneous scarcity situations
- impact analysis of hydro constraints and their relaxation
- description of the market-modelling tools used for the MAF 2018.

**Appendix 2:**

contains the country-specific comments and the relevant references to national and regional studies.