# Mid-term Adequacy Forecast Appendix 1

## Detailed Results and Input Data
2020 Edition

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# 1 Overview of target years, demand levels and resource capacities

The input data for MAF 2020 were sourced from the Pan-European Market Modelling Database (PEMMDB – See Appendix 2) and the target years (TY) analysed were 2025 and 2030. TY 2025 was chosen since it represents a pivotal year for evaluating adequacy due to expected reductions in coal and nuclear capacity in Europe. This allowed a comparison with MAF 2019, in which the same TY was studied. TY 2030 was chosen to evaluate the adequacy situation further ahead, at the end of the 10-year time horizon. A probabilistic adequacy study such as the present one has many data inputs, and we present key data regarding demand levels and resource capacity (generation capacity and demand-side response (DSR)). The remaining inputs can be found on the ENTSO-E website[1].

High demand levels - especially peak demand levels - are a major source of inadequacy. Figure 1 displays the average yearly demand (AYD) and maximum peak demand (MPD) out of all the forecasted demand profiles by country in TY 2025 as well as the changes from TY 2025 to 2030. In general, all demand profiles for TY 2025 and 2030 were derived by combining historical data from 2012 to 2016 and forecasted based on the climate years from 1982 to 2016 (see Appendix 2). As shown in the bar plots, Germany, France, Turkey, Italy and the United Kingdom are forecasted to have the largest AYD levels and the highest MPD levels by 2025.

The same figure also illustrates changes in these two metrics from TYs 2025 to 2030. In the vast majority of countries, the AYD and MPD are expected to increase from TY 2025 to 2030 across all forecasted demand scenarios. The countries with the largest AYD increases include Turkey, Norway, Poland, Finland and the Netherlands, while only France and Switzerland are expected to decrease. Furthermore, the countries with the largest increases in MPD include Turkey, Germany, Italy, Norway and Hungary, while only the Czech Republic, Spain, France and Switzerland are expected to decrease.

[1] MAF 2020 data



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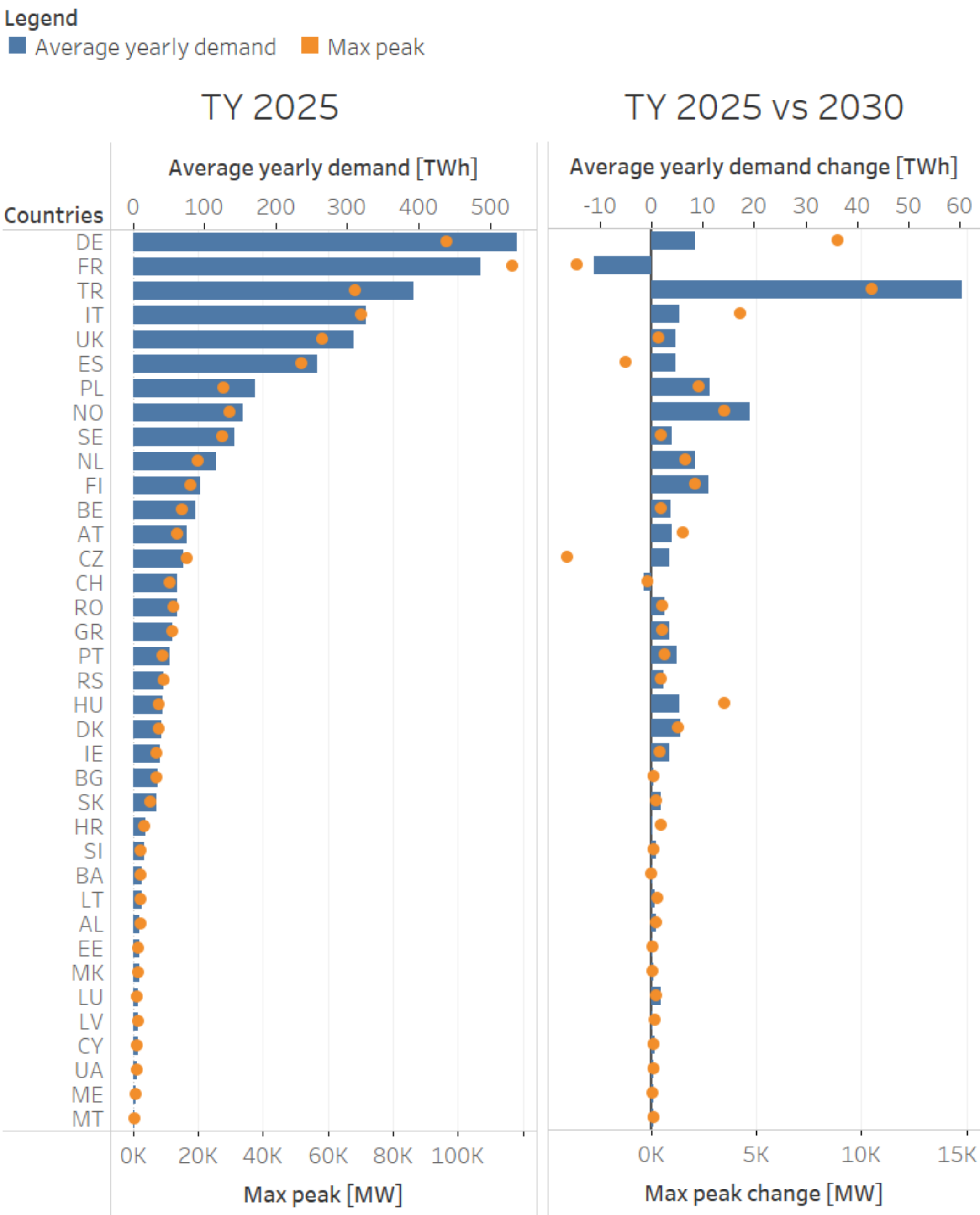


**Figure 1: Average yearly demand [TWh] and max. peak demand [MW] by country for TY 2025 and change from TY 2025 to TY 2030**

Figure 2 presents the resource capacity (net generation capacity and DSR) by country and technology for TY 2025 as well as the proportion of renewable energy sources (RES), non-RES and DSR capacity. As shown in the bar plots, Germany, France, Italy, Spain and the United Kingdom are forecasted to have the highest resource capacity by 2025, at approx. 238, 166, 130, 129 and 110 GW, respectively. RES installed capacities (i.e. solar, wind, hydro and other RES sources) account for a large proportion of installed capacities in these countries. The countries with the highest RES installed capacities include Germany, Spain, France, Italy and Turkey, while the countries with the largest proportion of RES installed capacity include Albania, Luxembourg and Norway.



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According to Figure 2, the countries with the highest thermal (also referred to as non-RES) capacities in TY 2025 - consisting of gas, coal, oil, nuclear, waste and other non-RES sources - include France, Germany, Italy, the United Kingdom and Turkey, while the countries with the highest proportion of thermal capacity include Cyprus and the Czech Republic.

Finally, DSR is expected to account for a small share of the resource mixes of modelled countries. The countries with the highest DSR shares include Norway, Finland and Latvia with 13.6, 8.9 and 6.3% of the total mix. The countries with the highest DSR capacities include Norway, France, Finland, Italy and Spain with approx. 6.3, 4.9, 2.3, 2.3 and 1.6 GW, respectively.



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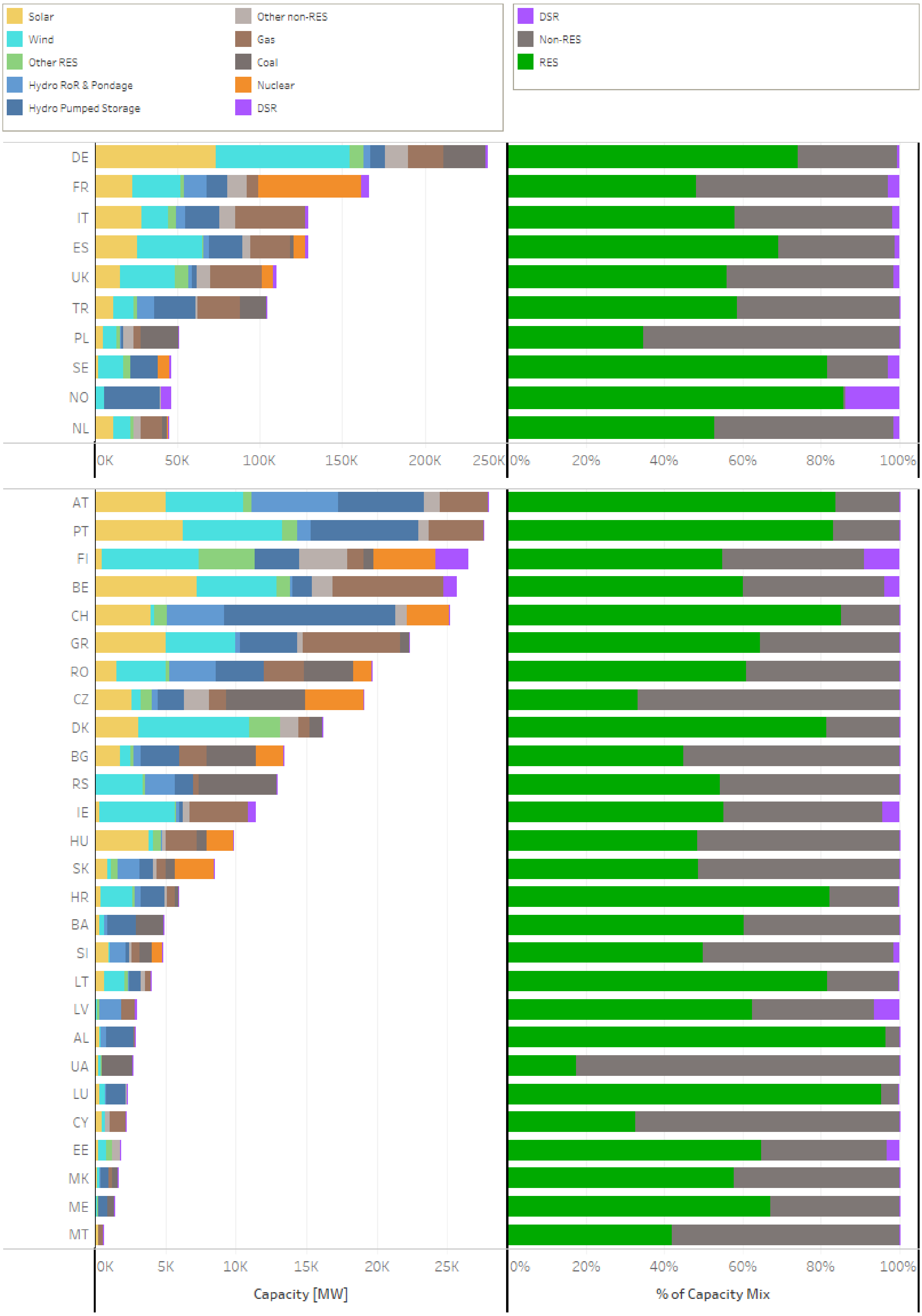


**Figure 2: Resource capacity [MW] and capacity mix [%] for TY 2025**

Figure 3 illustrates the forecasted capacity changes by country and technology from TY 2025 to TY 2030. It presents the change in the proportion of the capacity mix of each technology in a given country (the sum of the proportion changes of each technology in a given country are equal to zero). All of the analysed countries presented an increase in capacity in 2030. The countries with the highest net increases include Germany, Italy, France, Spain and the United Kingdom with approx. 33, 29, 25, 24 and 21 GW, respectively. However, the countries with the highest capacity additions (mainly RES) are Germany, Spain, France, Italy and the the Netherlands, while the countries with the highest capacity reductions (mainly thermal) are Spain, Germany, the Netherlands, France. In addition, the countries with the highest non-RES capacity additions are the United Kingdom, Turkey, Hungary, Romania and Belgium, while countries with the most non-RES capacity reductions include Spain, Germany, the Netherlands, France and Poland. Finally, all countries are forecasted to increase the proportion of RES in their resource capacity mix while reducing the proportion of non-RES, with the exception of Albania.

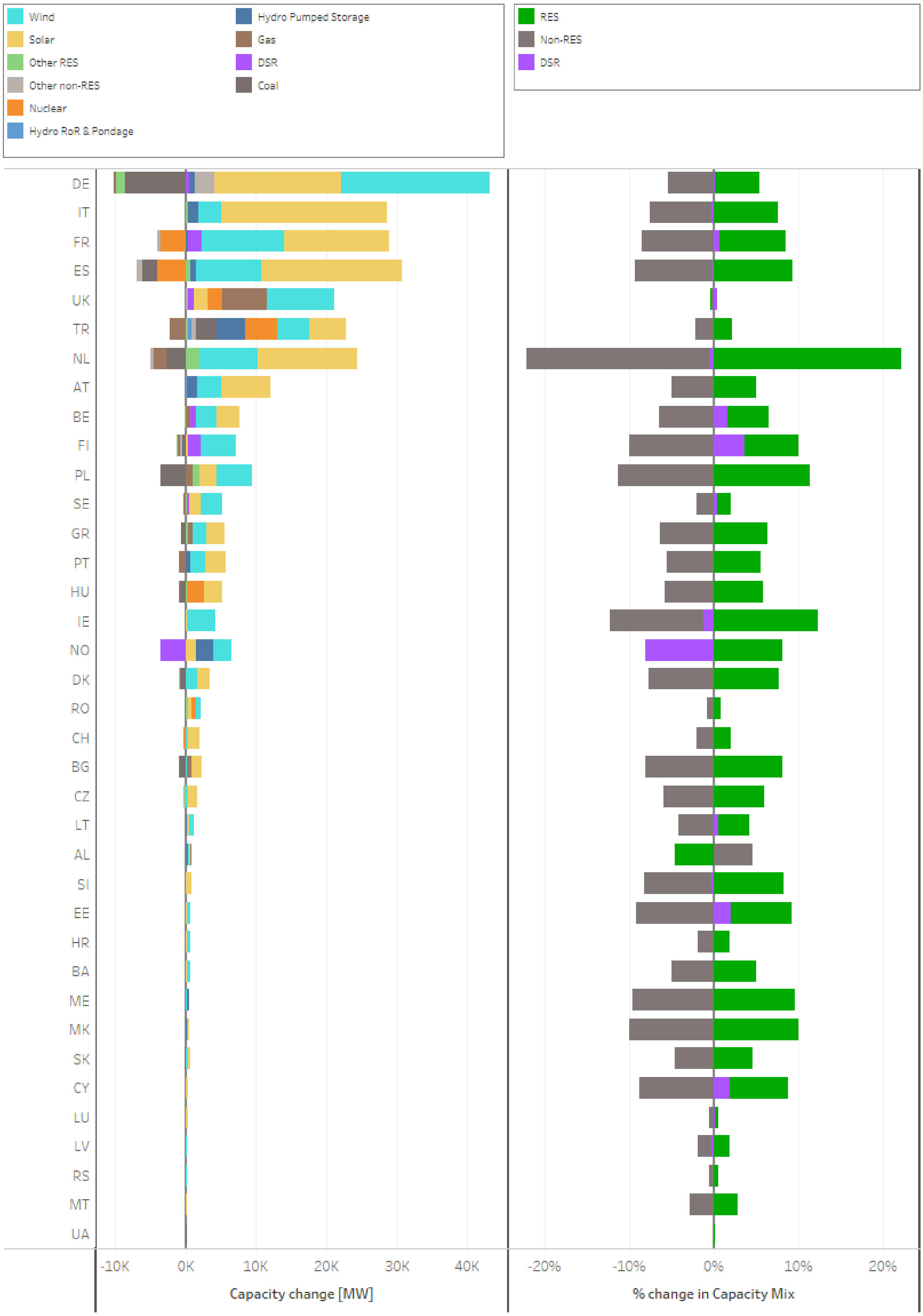


**Figure 3: Changes in resource capacity [MW] and capacity mix [%] by country and technology from TY 2025 to TY 2030**



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Figure 4 illustrates the resource capacity updates for TY 2025 from MAF 2019 and MAF 2020. This data is useful for explaining some of the differences in results between the two adequacy assessments. Overall, the MAF 2020 capacity is higher when compared to the MAF 2019 capacity. Countries experiencing the largest capacity increases include Italy, Poland, Sweden, Denmark and Finland, while those with the largest capacity decreases include the Spain, Hungary and Romania. Countries trading off their thermal capacity for RES or DSR capacity might experience lower adequacy, while countries with unchanged capacity should not experience a change in adequacy. Differences appearing in France for gas and other non-RES between MAF 2019 and MAF 2020 relate to the different categorisations of the same units and thus do not account for actual capacity updates.



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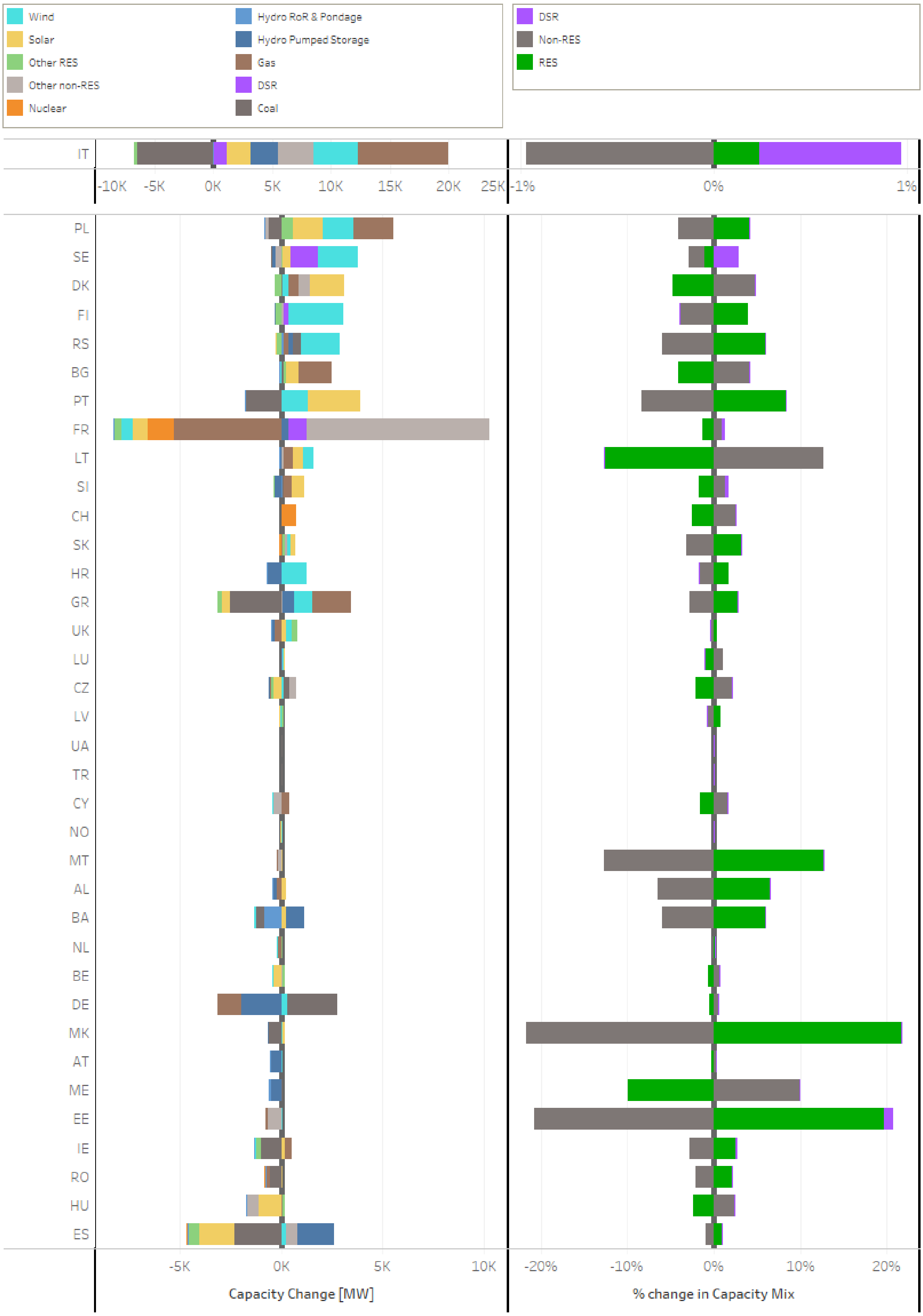


**Figure 4: Changes in resource capacity [MW] and capacity mix [%] by country and technology from MAF 2019 to MAF 2020 for TY 2025[2]**

As per previous MAF editions, reserves were not accounted for when measuring adequacy in MAF 2020. Figure 5 illustrates the forecasted reserve requirements by country for TY 2025, namely frequency restoration reserves (FRRs) and frequency containment reserves (FCRs). A comparison between the reserve requirements of TY 2025 and TY 2030 is also presented in the same figure. The countries forecasted to have the highest reserve requirements in 2025 include the United Kingdom, Italy, Germany, Turkey and France, while the countries with the highest reserve requirements over total installed capacity ratio include Lithuania, Estonia, Hungary, Denmark and Latvia. FRR capacity in TY 2025 is far higher than FCR, and this is trend is expected to grow by 2030 since FRRs represent the largest part of the forecasted additional capacities. A portion of the FCR requirements is reserved out of the market and already reduced from the reported Net Generation Capacities (NGCs) of generation units. Since the capacities that will be used to fulfil the remaining FCR and FRR requirements are not yet identified, they are represented in the model as additional demand or as a constraint to the maximum available hydro generation.

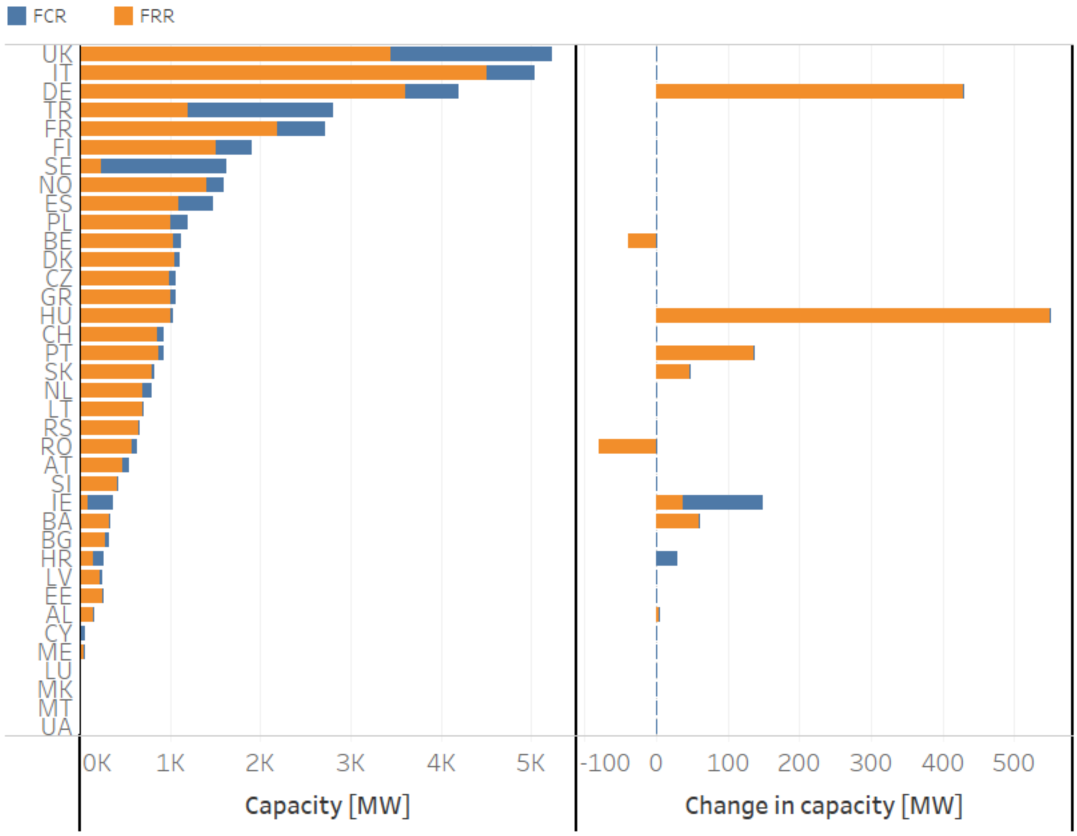


**Figure 5: Reserve requirements [MW] for TY 2025 and the difference from TY 2025 to TY 2030**

[2] Differences appearing in France for gas and other non-RES between MAF 2019 and MAF 2020 relate to the different categorisations of the same units and thus do not account for actual capacity updates.

## 2 Adequacy in numbers: Results for TY 2025 and TY 2030

As introduced in the executive summary, five modelling tools[3] were used. Each tool used the same input data and modelling assumptions (with the exception of forced outage patterns) to build aligned models with aligned results. The results of each simulation include values of loss of load duration (LLD) and energy not served (ENS), which are aggregated in sets of LLDs and ENSs per bidding zone and modelling tool. LLDs are expressed as the number of hours of the simulation's time horizon during which supply could not meet demand in a given bidding zone, while ENSs are expressed in GWh of unserved energy during the LLD hours. For each set of LLDs and ENSs, the mathematical expectation/average and the 95$^{th}$ percentile value were derived. These values are defined as loss of load expectation (LOLE), expected energy not served (EENS), P95 LLD and P95 ENS, respectively. In addition, the ratio between EENS and the annual demand (AD) by bidding zone were also calculated. Readers should refer to Appendix 2 for more details on the calculation methodology.

Tables 1 and 2 provide the aggregated results of the five modelling tools. In addition, the results of some bidding zones were aggregated to the country level, namely:

- Danish bidding zones DKE1 and DKW1 are aggregated in DK00.
- Irish bidding zones IE00 and UKNI are aggregated in I-SEM[6].
- Italian bidding zones ITCA, ITCN, ITCS, ITN1, ITS1, ITSA and ITSI are aggregated in IT00.
- Norwegian bidding zones NOS0, NOM1 and NON1 are aggregated in NO00.
- Swedish bidding zones SE01, SE02, SE03 and SE04 are aggregated in SE00.

Notably, for a geographical area with multiple nodes, ENS is calculated as the total ENS of all its nodes. Moreover, "EENS" is the mathematical average of the ENS calculated over the total number of Monte Carlo sample/simulation years. Similarly, for a geographical area with multiple nodes, LLD is the number of hours during which at least one node in the area experiences ENS during a single Monte Carlo sample/simulation year, while LOLE is the mathematical average of the LLD over the total number of Monte Carlo sample/simulation years.

**Table 1: EENS and ENS [GWh] results by zone for TY 2025 and 2030[4]. Average EENS and average P95 ENS were calculated as the averages of the five modelling tools. Similarly, Min and Max are the minimum and maximum values among the five modelling tools. Empty cells represent null values.**

| Market Zone | TY 2025 | | | | | TY 2030 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | EENS | | | P95 ENS | Average EENS / AD [pcm[5]] | EENS | | | P95 ENS | Average EENS / AD [pcm] |
| | Average [GWh] | Min [GWh] | Max [GWh] | Average [GWh] | | Average [GWh] | Min [GWh] | Max [GWh] | Average [GWh] | |
| AL00 | 0.00 | - | 0.01 | - | 0.00 | 0.00 | - | 0.00 | - | 0.00 |
| AT00 | 0.00 | - | 0.02 | - | 0.00 | 0.01 | - | 0.03 | - | 0.00 |
| BA00 | - | - | - | - | - | - | - | - | - | - |
| BE00 | 0.20 | 0.04 | 0.41 | 0.33 | 0.00 | 0.01 | - | 0.04 | - | 0.00 |
| BG00 | - | - | - | - | 0.00 | 0.00 | - | 0.00 | - | 0.00 |
| CH00 | 0.00 | - | 0.02 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| CY00 | 0.04 | 0.02 | 0.06 | 0.20 | 0.09 | 0.62 | 0.45 | 1.00 | 2.09 | 0.08 |
| CZ00 | 0.09 | 0.01 | 0.23 | - | 0.00 | 0.03 | - | 0.14 | - | 0.00 |
| DE00 | 0.12 | - | 0.46 | 0.00 | 0.00 | 0.33 | 0.03 | 1.28 | - | 0.00 |

[3] See Appendix 2 for the tools used to model MAF 2020.
[4] Outliers were removed from zones PT00, CH00, NOS0 and NOM1 in TY 2025 and zones NOS0 and NOM1 in TY 2030.
[5] 1 pcm=0.001% (per cent mille).



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| Market Zone | TY 2025 | | | | | TY 2030 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | EENS | | | P95 ENS | Average EENS / AD [pcm[5]] | EENS | | | P95 ENS | Average EENS / AD [pcm] |
| | Average [GWh] | Min [GWh] | Max [GWh] | Average [GWh] | | Average [GWh] | Min [GWh] | Max [GWh] | Average [GWh] | |
| DK00 | 0.04 | - | 0.17 | 0.01 | 0.00 | 0.08 | 0.01 | 0.31 | 0.02 | 0.00 |
| DKE1 | 0.03 | - | 0.13 | 0.01 | 0.00 | 0.07 | 0.01 | 0.22 | 0.02 | 0.00 |
| DKW1 | 0.01 | - | 0.04 | - | 0.00 | 0.02 | - | 0.10 | - | 0.00 |
| EE00 | 0.04 | 0.01 | 0.09 | 0.08 | 0.02 | 0.14 | 0.04 | 0.35 | 0.56 | 0.02 |
| ES00 | 0.01 | - | 0.07 | - | 0.00 | 0.04 | - | 0.21 | - | 0.00 |
| FI00 | 0.10 | 0.01 | 0.24 | 0.30 | 0.00 | 0.12 | 0.05 | 0.31 | 0.15 | 0.00 |
| FR00 | 5.27 | 3.66 | 7.14 | 1.27 | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| GR00 | 0.00 | - | 0.00 | - | 0.00 | 0.01 | - | 0.04 | - | 0.00 |
| GR03 | 0.00 | - | 0.01 | - | 0.00 | 0.01 | - | 0.03 | - | 0.00 |
| HR00 | 0.00 | - | 0.00 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| HU00 | 0.01 | - | 0.06 | - | 0.00 | 0.02 | - | 0.11 | - | 0.00 |
| I-SEM[6] | 0.95 | 0.51 | 1.49 | 3.15 | 0.01 | 0.26 | 0.18 | 0.36 | 0.94 | 0.01 |
| IE00 | 0.81 | 0.44 | 1.27 | 3.12 | 0.01 | 0.25 | 0.17 | 0.34 | 1.13 | 0.01 |
| IT00 | 9.99 | 7.27 | 14.94 | 15.83 | 0.00 | 0.11 | - | 0.36 | 0.09 | 0.00 |
| ITCA | - | - | - | - | - | - | - | - | - | - |
| ITCN | 0.03 | - | 0.09 | - | 0.00 | 0.03 | - | 0.14 | - | 0.00 |
| ITCS | 0.00 | - | 0.01 | - | 0.00 | 0.01 | - | 0.03 | - | 0.00 |
| ITN1 | 0.01 | - | 0.05 | - | 0.00 | 0.02 | - | 0.10 | - | 0.00 |
| ITS1 | - | - | - | - | - | - | - | - | - | - |
| ITSA | 9.93 | 7.18 | 14.78 | 31.47 | 0.01 | 0.06 | - | 0.21 | 0.09 | 0.01 |
| ITSI | 0.00 | - | 0.00 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| LT00 | 0.12 | 0.03 | 0.21 | 0.25 | 0.22 | 2.71 | 1.11 | 6.12 | 13.59 | 0.20 |
| LUG1 | 0.01 | - | 0.04 | - | 0.01 | 0.04 | - | 0.21 | - | 0.00 |
| LV00 | 0.03 | - | 0.06 | 0.05 | 0.05 | 0.36 | 0.02 | 1.14 | 1.75 | 0.05 |
| ME00 | - | - | - | - | - | - | - | - | - | - |
| MK00 | 0.00 | - | 0.00 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| MT00 | 4.61 | 4.38 | 4.82 | 14.75 | 10.61 | 30.82 | 30.00 | 31.43 | 72.79 | 9.16 |
| NL00 | 0.01 | - | 0.04 | - | 0.00 | 0.03 | - | 0.13 | - | 0.00 |
| NO00 | - | - | - | - | - | - | - | - | - | - |
| NOM1 | 0.02 | - | 0.06 | - | 0.00 | 0.04 | - | 0.14 | - | 0.00 |
| NON1 | 0.00 | - | 0.00 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| NOS0 | - | - | - | - | - | - | - | - | - | - |
| PL00 | 0.01 | - | 0.05 | - | 0.00 | 0.07 | 0.01 | 0.29 | 0.02 | 0.00 |
| PT00 | 0.00 | - | 0.01 | - | 0.00 | 0.01 | - | 0.06 | - | 0.00 |
| RO00 | - | - | - | - | 0.00 | 0.00 | - | 0.00 | - | 0.00 |
| RS00 | - | - | - | - | 0.00 | 0.00 | - | 0.00 | - | 0.00 |
| SE00 | 0.04 | - | 0.15 | 0.00 | 0.00 | 0.07 | - | 0.30 | - | 0.00 |
| SE01 | 0.00 | - | 0.00 | - | 0.00 | 0.00 | - | 0.00 | - | 0.00 |
| SE02 | 0.00 | - | 0.01 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| SE03 | 0.00 | - | 0.00 | 0.00 | 0.00 | 0.02 | - | 0.11 | - | 0.00 |

[6] I-SEM stands for integrated single electricity market, a wholesale electricity market where electricity is traded in bulk across the island of Ireland.

| Market Zone | TY 2025 | | | | | TY 2030 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | EENS | | | P95 ENS | Average EENS / AD [pcm[5]] | EENS | | | P95 ENS | Average EENS / AD [pcm] |
| | Average [GWh] | Min [GWh] | Max [GWh] | Average [GWh] | | Average [GWh] | Min [GWh] | Max [GWh] | Average [GWh] | |
| SE04 | 0.03 | - | 0.14 | - | 0.00 | 0.04 | - | 0.19 | - | 0.00 |
| SI00 | 0.00 | - | 0.00 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| SK00 | 0.00 | - | 0.01 | - | 0.00 | 0.01 | - | 0.04 | - | 0.00 |
| TR00 | 17.96 | 15.16 | 20.01 | 39.27 | 0.04 | 17.58 | 5.50 | 35.70 | 31.29 | 0.04 |
| UA01 | 0.01 | - | 0.03 | - | 0.00 | 0.01 | - | 0.05 | - | 0.00 |
| UK00 | 0.01 | - | 0.06 | - | 0.00 | 0.00 | - | 0.01 | - | 0.00 |
| UKNI | 0.14 | 0.07 | 0.22 | 0.38 | 0.00 | 0.01 | 0.01 | 0.02 | 0.03 | 0.00 |

**Table 2: LOLE and LLD [h/year] results by zone for TY 2025 and 2030 [7]. Average LOLE and average P95 LLD were calculated as the averages of the five modelling tools. Similarly, Min and Max are the minimum and maximum values among the five modelling tools. Empty cells represent null values**

| Market Zone | TY 2025 | | | | TY 2030 | | | |
|---|---|---|---|---|---|---|---|---|
| | LOLE | | | P95 LLD | LOLE | | | P95 LLD |
| | Average [h/year] | Min [h/year] | Max [h/year] | Average [h/year] | Average [h/year] | Min [h/year] | Max [h/year] | Average [h/year] |
| AL00 | - | - | - | - | - | - | - | - |
| AT00 | - | - | - | - | - | - | - | - |
| BA00 | - | - | - | - | - | - | - | - |
| BE00[8] | 0.22 | 0.08 | 0.44 | 0.67 | - | - | - | - |
| BG00[8] | - | - | - | - | - | - | - | - |
| CH00 | - | - | - | - | - | - | - | - |
| CY00[8] | 1.05 | 0.51 | 1.60 | 5.08 | 10.10 | 8.06 | 14.95 | 27.49 |
| CZ00 | 0.12 | 0.04 | 0.30 | - | 0.02 | - | 0.10 | - |
| DE00[8] | 0.04 | - | 0.10 | 0.01 | 0.08 | 0.02 | 0.20 | - |
| DK00[8] | 0.03 | - | 0.10 | 0.02 | 0.17 | 0.06 | 0.40 | 0.13 |
| DKE1 | 0.04 | - | 0.10 | 0.05 | 0.15 | 0.06 | 0.30 | 0.13 |
| DKW1 | - | - | - | - | 0.02 | - | 0.10 | - |
| EE00 | 0.33 | 0.07 | 0.60 | 0.94 | 0.79 | 0.25 | 1.77 | 4.32 |
| ES00[8] | - | - | - | - | 0.02 | - | 0.10 | - |
| FI00 | 0.18 | 0.03 | 0.54 | 0.66 | 0.18 | 0.10 | 0.23 | 0.36 |
| FR00[8] | 1.18 | 0.80 | 1.49 | 0.70 | 0.00 | - | 0.01 | - |
| GR00[8] | - | - | - | - | 0.02 | - | 0.10 | - |
| GR03[8] | 0.02 | - | 0.10 | - | 0.02 | - | 0.10 | - |
| HR00 | - | - | - | - | - | - | - | - |

[7] Outliers were removed from zones ITSA, PT00, CH00, NOS0 and NOM1 in TY 2025 and zones NOS0 and NOM1 in TY 2030.
[8] Zone in a country with a National Reliability Standard (see Appendix 2).

| Market Zone | TY 2025 | | | | TY 2030 | | | |
|---|---|---|---|---|---|---|---|---|
| | LOLE | | | P95 LLD | LOLE | | | P95 LLD |
| | Average [h/year] | Min [h/year] | Max [h/year] | Average [h/year] | Average [h/year] | Min [h/year] | Max [h/year] | Average [h/year] |
| HU00 | - | - | - | - | 0.02 | - | 0.10 | - |
| I-SEM[6] | 3.12 | 1.91 | 5.43 | 8.37 | 0.96 | 0.55 | 1.54 | 3.00 |
| IE00[8] | 3.20 | 1.87 | 4.76 | 10.11 | 0.87 | 0.52 | 1.32 | 3.81 |
| IT00[8] | 50.56[9] | 22.32 | 111.11 | 86.71 | 0.58 | - | 2.51 | 1.16 |
| ITCA | - | - | - | - | - | - | - | - |
| ITCN | 0.06 | - | 0.19 | - | 0.02 | - | 0.10 | - |
| ITCS | - | - | - | - | - | - | - | - |
| ITN1 | 0.00 | - | 0.02 | - | 0.02 | - | 0.10 | - |
| ITS1 | - | - | - | - | - | - | - | - |
| ITSA | 57.63 | 45.38 | 71.60 | 140.25 | 0.54 | - | 2.51 | 1.16 |
| ITSI | 0.00 | - | 0.01 | - | - | - | - | - |
| LT00[8] | 0.84 | 0.04 | 2.00 | 2.74 | 7.72 | 2.48 | 13.09 | 32.95 |
| LUG1 | 0.02 | - | 0.10 | - | 0.06 | - | 0.30 | - |
| LV00 | 0.28 | - | 0.50 | 0.90 | 1.92 | 0.04 | 5.49 | 9.54 |
| ME00 | - | - | - | - | - | - | - | - |
| MK00 | - | - | - | - | - | - | - | - |
| MT00 | 126.19 | 107.33 | 136.11 | 338.61 | 588.28 | 517.16 | 611.95 | 1054.52 |
| NL00[8] | 0.00 | - | 0.01 | - | 0.03 | - | 0.10 | - |
| NO00 | - | - | - | - | - | - | - | - |
| NOM1 | 0.03 | - | 0.10 | - | 0.05 | - | 0.20 | - |
| NON1 | - | - | - | - | 0.02 | - | 0.10 | - |
| NOS0 | - | - | - | - | - | - | - | - |
| PL00[8] | - | - | - | - | 0.05 | 0.01 | 0.20 | 0.05 |
| PT00 | - | - | - | - | 0.02 | - | 0.10 | - |
| RO00 | - | - | - | - | - | - | - | - |
| RS00 | - | - | - | - | - | - | - | - |
| SE00 | 0.04 | - | 0.10 | 0.00 | 0.07 | - | 0.30 | - |
| SE01 | 0.00 | - | 0.00 | - | 0.00 | - | 0.01 | - |
| SE02 | 0.00 | - | 0.01 | - | 0.00 | - | 0.00 | - |
| SE03 | 0.00 | - | 0.00 | 0.00 | 0.02 | - | 0.10 | - |
| SE04 | 0.03 | - | 0.10 | - | 0.03 | - | 0.10 | - |
| SI00 | - | - | - | - | - | - | - | - |
| SK00 | - | - | - | - | 0.02 | - | 0.10 | - |
| TR00 | 15.53 | 13.70 | 16.90 | 28.96 | 13.27 | 5.86 | 18.33 | 24.50 |

[9] IT does not comply with its binding national reliability standard (3h/year) in TY 2025, which was mainly due to the high LOLE of Sardinia. A table containing the national reliability standards applied by EU Member States as of the end of 2019 can be found in Appendix 2.



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| Market Zone | TY 2025 | | | | TY 2030 | | | |
|---|---|---|---|---|---|---|---|---|
| | LOLE | | | P95 LLD | LOLE | | | P95 LLD |
| | Average [h/year] | Min [h/year] | Max [h/year] | Average [h/year] | Average [h/year] | Min [h/year] | Max [h/year] | Average [h/year] |
| **UA01** | 0.02 | - | 0.10 | - | 0.02 | - | 0.10 | - |
| **UK00**[8] | - | - | - | - | - | - | - | - |
| **UKNI** | 0.95 | 0.70 | 1.39 | 3.46 | 0.12 | 0.05 | 0.23 | 0.28 |



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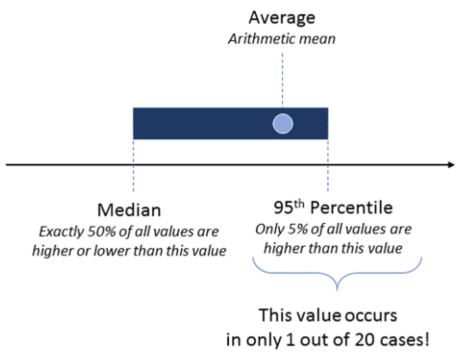
# 3 Detailed results

The bar charts that follow (Figures 6–8) illustrate the simulation results for TY 2025 and TY 2030 by country and modelling tool. For each set described in the previous section, the 50th and 95th percentiles of LLD and ENS values are shown with the average LLD and ENS (LOLE and EENS, respectively).

To improve the clarity of these charts, the results for each country have been sorted according to their maximum P95 LLD value across all tools for TY 2025. Additionally, the results for a given country and tool for which all values are zero have been removed. The underlying dataset can be found on the ENTSO-E website [1].

**Interpreting results**




*Example:*
*For a set of 100 calculated values, the 95th percentile (often abbreviated as P95) represents the value that is greater than or equal to 95% and lower than or equal to 5% of all values contained in the set. Its occurrence corresponds to a probability of 1 in 20.*

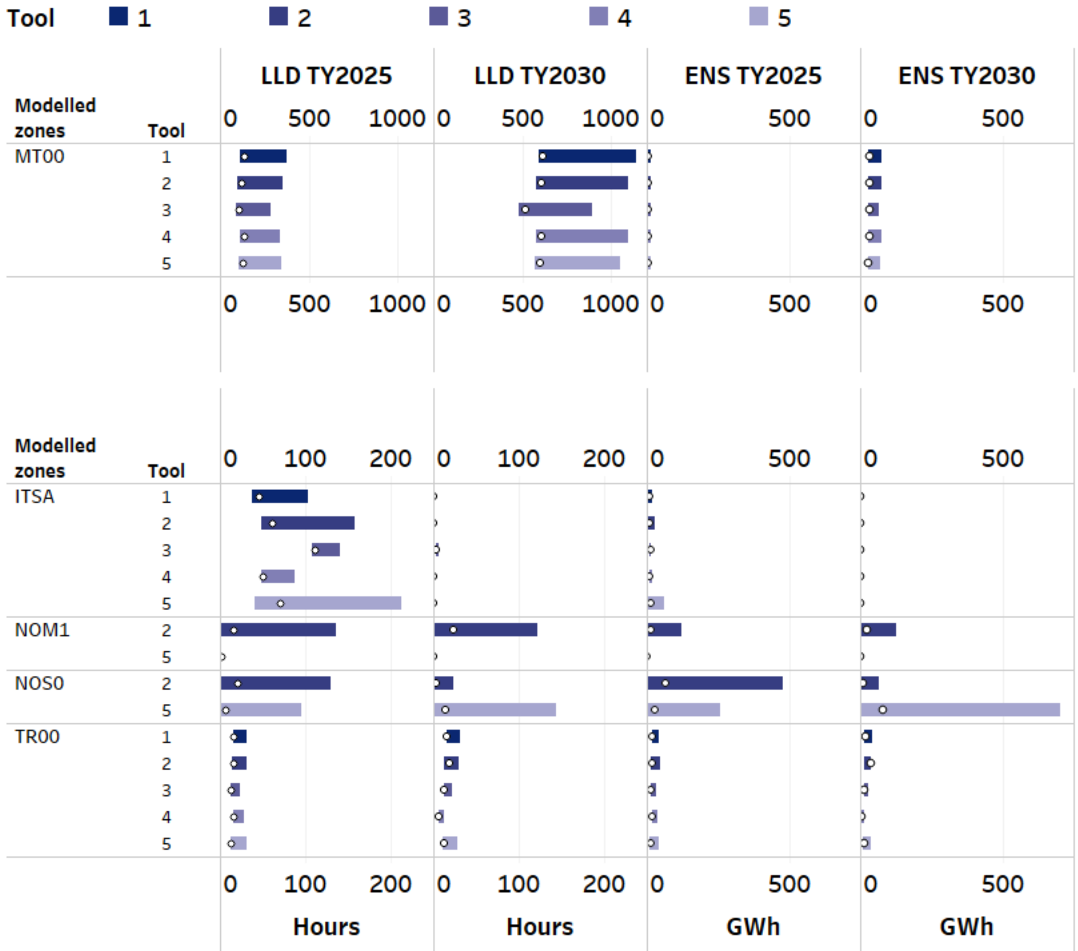



Figure 6: P50, P95, LOLE and EENS values by country and tool for TY 2025 and TY 2030 (Part 1)



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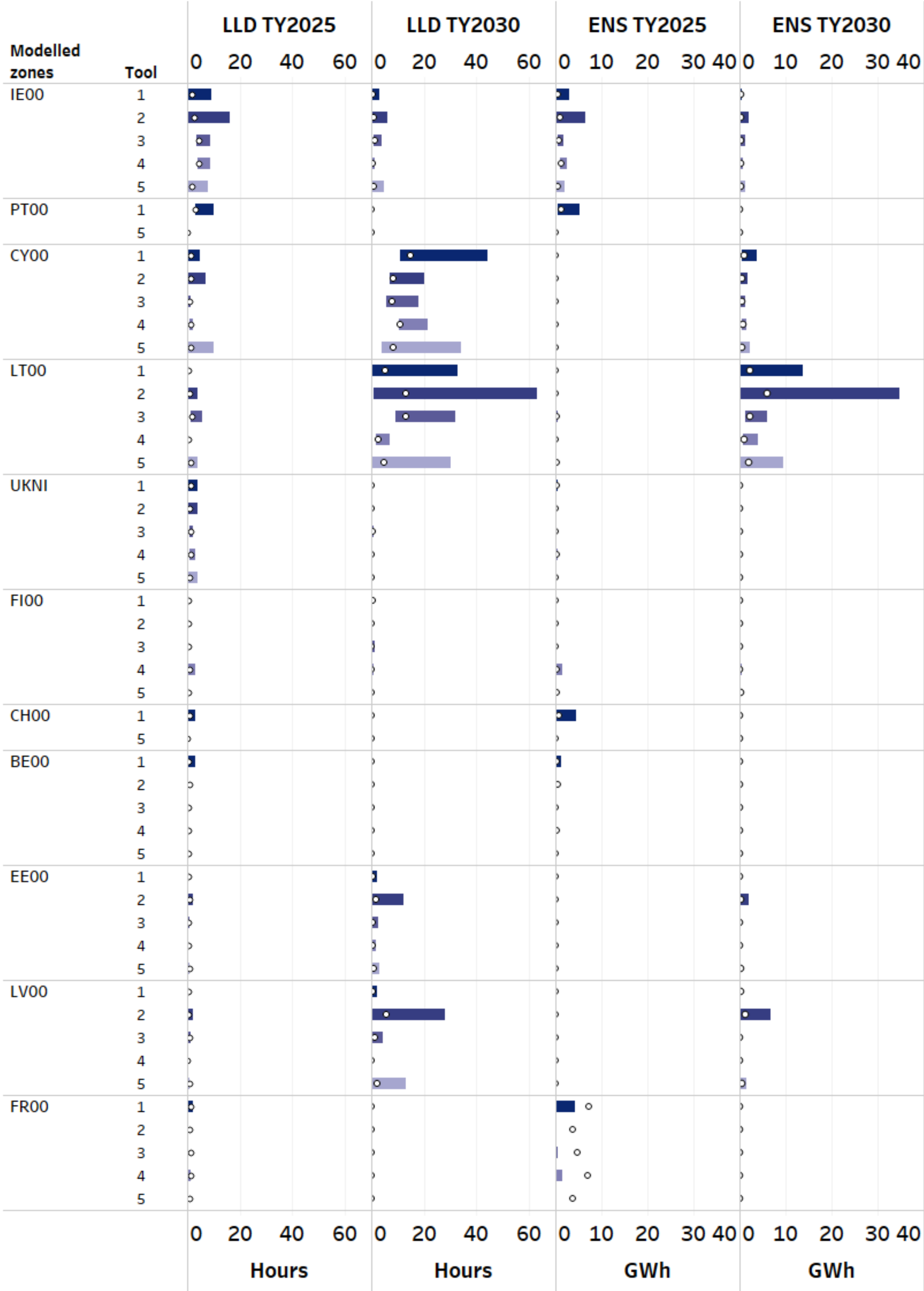


**Figure 7: P50, P95, LOLE and EENS values by country and tool for TY 2025 and TY 2030 (Part 2)**

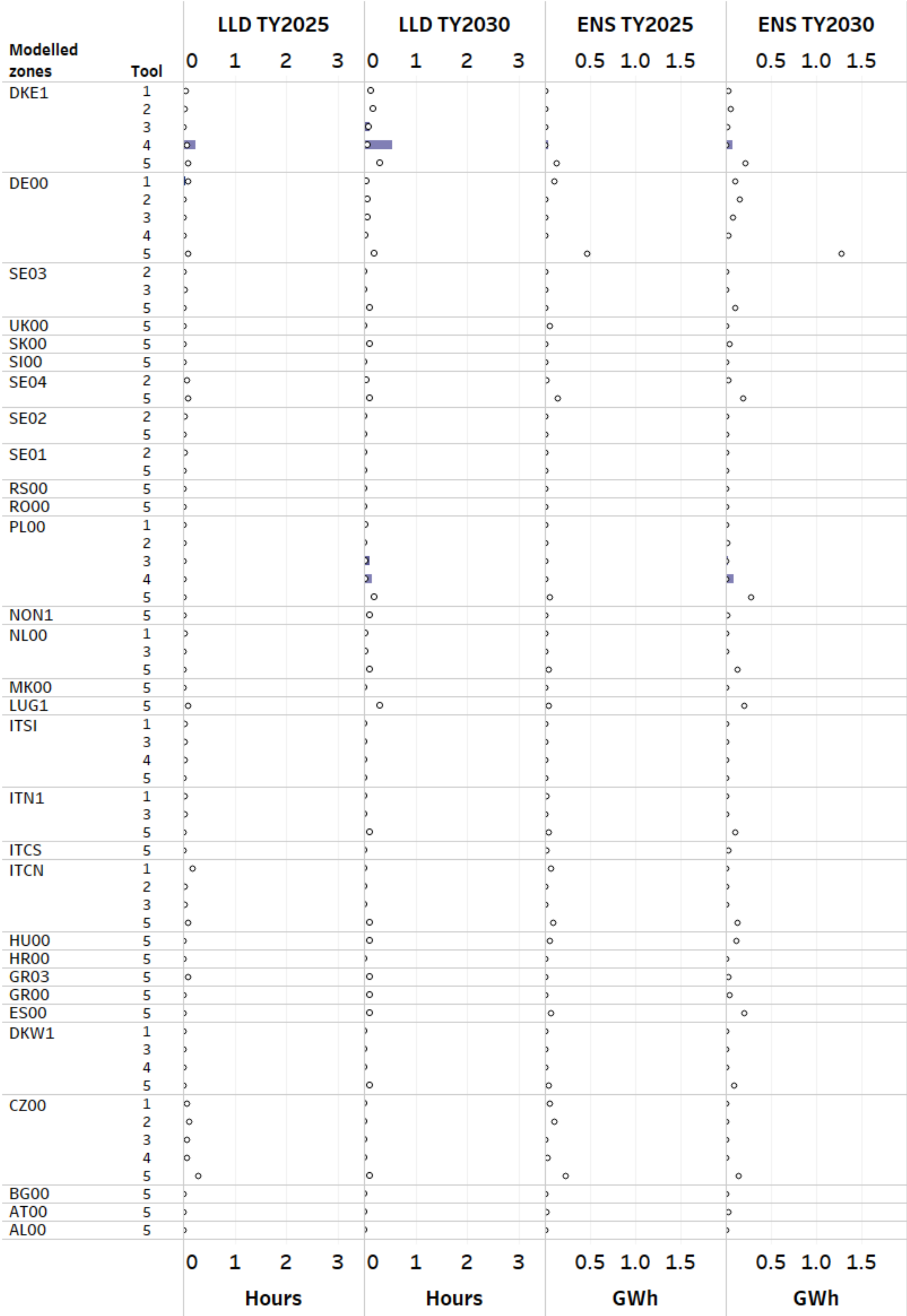


Figure 8: P50, P95, LOLE and EENS values by country and tool for TY 2025 and TY 2030 (Part 3).