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# Mid-term Adequacy Forecast 2018

Appendix 2: Country views on the MAF 2018

**2018 edition**

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**Note:** all hereby country comments were prepared by TSOs on a voluntary basis. This appendix aims to present additional national insights linked to the present MAF, especially on the considered input assumptions.

### Austria

A further increase of renewable capacities (wind and solar power plants) is expected. For the demand forecast we assume an annual increase of 0.56% until 2020. Beyond 2020, due to energy efficiency, we took an increase of 0.25% per year into account. For the low-carbon sensitivity we deducted plants with CO<sub>2</sub> emissions > 550kg/MWh, which results in a reduction of 178MW ‘Oil’ and 414MW ‘Other Non-RES’ capacities.

### Belgium

Elia, beyond its active involvement in the ENTSO-E MAF report and the regional PLEF GAA study, publishes an annual adequacy assessment covering the three forthcoming winters.

The latest report: ‘Adequacy Study for Belgium: Need of strategic reserve capacity for the next winters: Edition - Winters 2018-19, 2019-20 and 2020-21’ [SR18-19] was published in December 2017. This study evaluated the need for strategic reserve capacity as defined by the Belgian law based on a forecast of production and demand in Belgium and neighbouring countries. The conclusions of this study were updated in August 2018 at the request of the Belgian Minister of Energy, taking into account the most recent evolutions in the electricity market. The yearly update of this study will be published in December 2018, covering one additional winter (2019-20, 2020-21 and 2020-21).

Furthermore, a second relevant adequacy study was published by Elia in 2017: ‘Electricity Scenarios for Belgium towards 2050’. This study built further on the Elia report ‘The need for adequacy and flexibility in the Belgian electricity system for 2017-2027’, published in 2016. This new study analysed both short-term and long-term policy options on the future energy mix for Belgium on the path towards 2050, bearing in mind the planned nuclear phase-out in 2025, and striving towards a sustainable, affordable and adequate electricity system. In addition to quantifying the various future scenarios for 2030 and 2040, the study also focused on the need for sufficient replacement capacity for ensuring security of supply after the Belgian nuclear phase-out.

Elia is committed to ensuring a high level of consistency between the above-mentioned assessments and MAF by developing and applying a common probabilistic methodology and ensuring complementarity of the results obtained between the different studies.

For 2020, the assumptions for Belgium are in-line with the most recent strategic reserve volume evaluation study [SR18-19].

For 2025, the generation fleet and demand for Belgium are taken from the ‘Electricity Scenarios for Belgium towards 2050’ Base Case scenario, which was updated for the ‘Federal Grid Development Plan 2020-2030’ with the latest developments around the ‘Belgian Energy Pact’, which indicated the level of ambition of Belgian authorities regarding the electricity sector.

For the Base Case, the MAF2018 results show no significant LOLE for Belgium in 2020 and 2025 (given that a new built generation was assumed in the assumptions). This is in line with the results of the Base Case scenario considered by Elia in the above mentioned studies.

A ‘Coal Phase-out’ sensitivity is performed for MAF2018. This sensitivity considers a reduction of around 23GW of capacity in the EU perimeter compared to the base case, of which, e.g., a net reduction of more than 8GW coal generation occurs in Germany. The results of this sensitivity resulted in a high value of LOLE for Belgium of more than 10 hours per year. Analysis of this result confirms that the national criteria for adequacy would be met in Belgium with an additional national generation capacity of more than 2GW with respect to the base case assumptions. These results are in-line with the study ‘Electricity Scenarios for Belgium towards 2050’ where it was indicated that in the event of inadequacy of neighbouring countries, the need for generation capacity increases by 1 to 2 GW in Belgium to meet the adequacy criteria.

Finally, for target year 2020, a FB calculation was performed in line with the implementation approach applied in the latest PLEF study. A recent, important evolution is the consideration of the 20% minimum Remaining Available Margin (MinRAM20%) for the day-ahead CWE FBMC. This MinRAM20% level, equalling 20% of the Fmax (the maximum allowed power flow) is applied on each Critical Network Element and Contingency (CNEC). The feasibility of the application of the MinRAM20% is verified by TSOs. The implementation of MinRAM20% provides more capacity for commercial exchanges and thus has a positive effect on the adequacy results. This was not the case in the latest PLEF study, in which no MinRAM20% was considered.

### Croatia

Generation capacities within Croatia are not sufficient to meet the needs for electricity of the Croatian consumers. Hence, adequacy will be achieved primarily due to high interconnections capacities between Croatia and the surrounding countries, but with a strong dependence on the amount of available NTCs to allow sufficient electricity imports.

In the future, the construction of new power plants is expected, which will reduce dependence on imported electricity. However, in the coming decade Croatia will be still dependent on the import of electricity, especially during the winter months.

Finally, no significant adequacy problems are expected until 2020 and 2025.

### Cyprus

Based on the current RES and conventional generators of the System and in relation to the expected Load forecasts for 2020, TSO expects that the expected values of LOLE and EENS for 2020 should be approximately (95th percentage) zero.

Please note that during the last couple of years, the Energy Not Served **due to shortage of adequacy is zero (0) MWh**.

### Czech Republic

CEPS does not expect any significant adequacy issues in the 2020 to 2025 horizon for the Best Estimate scenario. However, potential problems are foreseen for mothballing scenarios. More information can be found in the national report available at <https://www.ceps.cz/en/generation-adequacy> where national specifics and scenarios are considered in more detail.

## Finland

Improved quality of results with relevant changes in assumptions compared to MAF 2017:

- More detailed modelling of Nordic hydro in MAF 2018 has significantly improved the quality of the results for Finland.
- Compared to MAF2017, slower decommissioning of thermal generation capacity is anticipated in Finland.
- Compared to MAF 2017, the availability of imports from Russia was increased to 900 MW during all hours.
- The forced outage rate of thermal power plants in Finland was reduced from default values of 8-10 % to 2-5% which are observed values from actual power stations in Finland in the recent years.
- The results do not take the availability of system reserves in Finland into account, which means that LOLE and EENS in this report do not mean curtailment of demand for Finnish end-consumers. LOLE and EENS should be considered as hours and energy when system reserves are needed to cover the demand in Finland.

## France

### **Load and annual demand forecast provided for 2020 and 2025**

Over the past several years, RTE has observed a stabilisation of electricity demand in France, mainly due to energy efficiency measures and moderate economic growth. These efficiency measures will be further developed in the coming years, so that electricity demand is likely to contract slightly in spite of sustained demographic growth, a recovery in economic activity and environment stimulating electricity-based solutions. In the longer term, sustained development of electrical vehicles is likely to drive electricity demand up again. Peak power demand should follow a similar trend.

Since 2015, a new legal framework known as ‘loi de transition énergétique pour la croissance verte’ with its planification document ‘programmation pluriannuelle des énergies’ has supported new tools to optimise energy consumption in the country and set ambitious targets aimed at reducing the multi-energy consumption. Every year, the generation adequacy report of RTE provides extensive information about electrical consumption in France.

Related links :

<https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385&categorieLien=id>

[https://www.rte-france.com/sites/default/files/bp2017\\_complet\\_vf.pdf](https://www.rte-france.com/sites/default/files/bp2017_complet_vf.pdf)

<http://www.developpement-durable.gouv.fr/programmation-pluriannuelle-energie>

### **Net Generating Capacity forecast provided for 2020 and 2025**

The net generating capacity forecast was mainly inspired by the *Ampère* scenario published in the national adequacy report produced by RTE. It forecasts a decrease in the nuclear power fleet in the mid 2020s to achieve a mix of production composed of 50% nuclear energy at the horizon 2035. This bill outlines the objective to complete this mix of production by 40% of renewables mainly driven by the development of wind and solar technologies. In addition to this deep transformation, coal power plants are expected to shut down at the horizon of 2023.

[https://www.rte-france.com/sites/default/files/bp2017\\_complet\\_vf.pdf](https://www.rte-france.com/sites/default/files/bp2017_complet_vf.pdf)

<http://www.developpement-durable.gouv.fr/programmation-pluriannuelle-energie>

### **National view on the Generation and System Adequacy forecast for 2020 and 2025 and its relation to the MAF results**

RTE produces an annual risk assessment through its national generation adequacy report on an horizon of five years. MAF results seem to be globally in line with national elements even if the LOLE is slightly greater

in the MAF, which is probably linked to a more stressful European context and the predominance of the 1985 years in the 34 climatic years.

The LOLE is expected to increase with the closing of numerous nuclear power plants at this time alongside coal units. However, this increase is limited mainly thanks to the reduction of energy consumption and the development of interconnectors.

Full version in French: [https://www.rte-france.com/sites/default/files/bp2017\\_complet\\_vf.pdf](https://www.rte-france.com/sites/default/files/bp2017_complet_vf.pdf)

Short version in English: [https://www.rte-france.com/sites/default/files/bp2017\\_synthese\\_va.pdf](https://www.rte-france.com/sites/default/files/bp2017_synthese_va.pdf)

### **FYR of Macedonia**

The electricity system of FYR of Macedonia fully meets the adequacy for the two analysed scenarios for 2020 and 2025. For the scenario Low-carbon Sensitivity 2025, the EENS is 0.6 GWh; 50% of the results are greater than 0.1 GWh and only 5% of the results are greater than 2.8 GWh. LOLE is 1.39 h/year; 50% of the results are greater than 0.42 h/year and only 5% of the results are greater than 5.85 h/year.

In the future, these values are expected to decrease. The thermal power plants are in the process of modernization and decarbonization systems are going to be installed; this will improve the adequacy of the system.

### **Great Britain**

Great Britain has established a Capacity Market (CM) to ensure that we have sufficient available capacity to meet our Reliability Standard of 3 hours/year loss of load expectation (LOLE).

The results for the MAF are in line with these expectations and so we are not anticipating adequacy concerns in Great Britain. Recent experience of the CM auctions has seen extra capacity being bought due to the low clearing prices. The latest details regarding the CM in Great Britain can be found on our Electricity Market Reform Delivery Body website:

<https://www.emrdeliverybody.com/SitePages/Home.aspx>.

The assumptions in the MAF are based on National Grid's 2016 Future Energy Scenarios, which is similar to those used in the 2017 MAF. The latest assumptions for our Future Energy Scenarios can be found on our website: <http://fes.nationalgrid.com/>.

### **Greece**

IPTO recently updated the National Adequacy Study for the period 2019 – 2030 for the mainland and the island of Crete.

Regarding the mainland, based on the findings of the national study, it appears that generation adequacy over the next decade will be highly dependent on imports and vulnerable to adverse conditions. MAF 2018 results validate the concerns identified.

However, regarding Crete and particularly for the year 2025, the findings of the MAF 2018 are considerably different from those of the national study. Similarly to the MAF 2018, the National Adequacy Study identifies concerns regarding the adequacy levels in Crete for the year 2020, due to the enforcement of environmental Directives IED and MCPD, as they affect the majority of existing thermal units. However, for the year 2025, MAF 2018 foresees that adequacy levels in Crete will remain practically the same, while the National Study shows that the completion of both phases of the interconnection of Crete (phase I AC link, phase II DC link), with an appropriate number of generating units in cold reserve, are sufficient for adequately meeting demand in the island.

The different findings of the two studies are mainly the result of the different assumptions considered regarding the transfer capacity between Crete and the mainland after the DC link is completed. Data provided for the MAF 2018 had foreseen a total transfer capacity (after the completion of the DC link) between Crete and the mainland of 600MW, while in the National Study it was considered equal to 800MW, according to more recent planning studies.

### Hungary

The results of the assessment confirm that Hungary will continue to rely heavily on imported electricity given the current structure and near-term development of the generation mix. The overall adequacy situation depends to a great extent on the availability of excess generation capacity in the region, which is highly influenced by the overall economic and market framework.

As shown by the low-carbon sensitivity case for 2025, the large-scale reduction of the coal-based generation capacity in the neighbouring countries can result in potential adequacy problems. The new units at Paks Nuclear Power Plant to be commissioned after 2025 can contribute to eliminating the problem of generation capacity deficit risk.

### Ireland

#### **Demand forecast**

Ireland has emerged from a period of recession, and electricity demand is growing. In particular, there is an increasing number of new large energy users (mainly data centres) that are serving to increase our demand forecast. With the pipeline of projects in train, we expect demand growth to continue over the next decade, as reported in our national study, the Generation Capacity Statement 2017-2026<sup>1</sup>.

#### **Capacity**

Between 2020 and 2025, some 0.8 GW of thermal generation will close due to age and/or emissions restrictions. Wind capacity in Ireland is growing, with over 4 GW expected by 2020. With this amount of wind, and other renewables (hydro, biomass, waste-from-energy, solar PV, etc.), we expect to meet our target of 40% RES for electricity by 2020.

We see an increasing level of demand participation in the electricity capacity market.

A second high-voltage interconnector between Ireland and Northern Ireland is forecast to be commissioned by 2022. This will improve security of supply in both jurisdictions on the island.

#### **Adequacy**

In order to comply with the Target Model, the Integrated Single Electricity Market (I-SEM) is due to come into effect in October 2018 in Ireland and Northern Ireland. As part of the I-SEM, a new All-Island capacity market has been designed to ensure there is enough capacity to meet the demand forecast to the target adequacy standard (8 hours LOLE). National studies in the GCS17 (without reserve) indicate that the system is adequate to 2025. MAF studies confirm this.

The MAF 2020 results show an average LOLE of 0 hours for Ireland in the reference case (with operational reserves included). However, with some generation plants expected to shut before 2025, this position worsens. The MAF result for the base case in 2025 shows an average of 4 hours LOLE for Ireland. This is still within our standard of 8 hours LOLE. Again, this is the same story as depicted in our GCS17. Also contributing to generation adequacy in 2025 is the forecasted commissioning of the second North-South Interconnector between Ireland and Northern Ireland.

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<sup>1</sup> [http://www.eirgridgroup.com/site-files/library/EirGrid/4289\\_EirGrid\\_GenCapStatement\\_v9\\_web.pdf](http://www.eirgridgroup.com/site-files/library/EirGrid/4289_EirGrid_GenCapStatement_v9_web.pdf)

If the three large coal units leave the market by 2025, the MAF low-carbon scenario foresees problems, with an average of 90 hours LOLE. If this removal of coal plant were to be flagged in good time, then the capacity market should procure enough low-carbon capacity to keep the system within standard.

## Italy

Resource Adequacy has become in the last years a serious concern in Italy as a consequence of the significant reduction of the conventional (thermoelectric) power fleet. Between 2012 and 2016, about 15 GW installed generation was phased out. In order to keep this trend under necessary control, prevent further shut-downs and keep the power system adequate, a capacity mechanism has been proposed by the Italian decision makers (Ministry and NRA). This was approved by the European Commission in early 2018, together with analogue scheme proposed by Belgium, France, Germany, Greece and Poland.

Improvement of adequacy results in the MAF 2018 compared to the previous MAF should be read in light of this decision, while the MAF 2018 neither analysed the profitability of the power plants (i.e. likelihood of retirement) nor the dimensioning of Capacity Mechanism.

In 2020, an important risk of resource scarcity has been identified in Sicily where the outdated (thermoelectric) power fleet is characterised by frequent unplanned outage. In case of simultaneous occurrence of unplanned outages either in the Central North of Italy either in the neighbouring Countries potential risk could show up also in the rest of the Peninsula.

In 2025, the MAF base case (average condition) shows potential risk at the national level, mainly concentrated in the North, Center North and Sardinia; the interconnection between Sicily and Tunisia, considered in operation in 2025, shows the potential advantage of mutual support between the two electrical power systems (reduction of hours of LOLE in both systems thanks to the interconnection).

Finally, in the context of low-carbon sensitivity the partial phase out creates a significant increase in EENS and LOLE values for North and Central North zone; the total phase out of coal shows highly critical situations in more areas of Italy ( North LOLE: 16 h/Y; Central North LOLE: 12 h/Y; Sardinia LOLE: 115 h/y).

All in all, taking into account the regional dimension of adequacy (i.e. strong interdependency between neighbouring country) and the uncertainty associated to the transition of the generation portfolio in some European countries (e.g. phase-out of nuclear) there is a strong need to monitor carefully adequacy at Pan-European level and at regional level.

## Lithuania

Indigenous generation capacity is not sufficient to meet demand in Lithuania, since large old generating units are uncompetitive and do not participate in the market. Resource adequacy is expected to be ensured through high interconnection capacities with Latvia, Sweden and Poland. However, no significant adequacy problems are expected during the analysed period.

Considering the goals set by the National Energy Independence Strategy approved in 2018 (by 2030 70% of consumed electricity should be produced by local power stations), the situation will change in the future.

## Northern Ireland

### **Demand forecast**

In Northern Ireland, demand for electricity is not expected to grow significantly.



### Capacity

For these MAF studies, the capacity of thermal and other plants is not expected to change significantly from 2020 to 2025.

A second high-voltage interconnector between Ireland and Northern Ireland is forecast to be commissioned by 2022. This will improve security of supply in both jurisdictions on the island.

### Adequacy

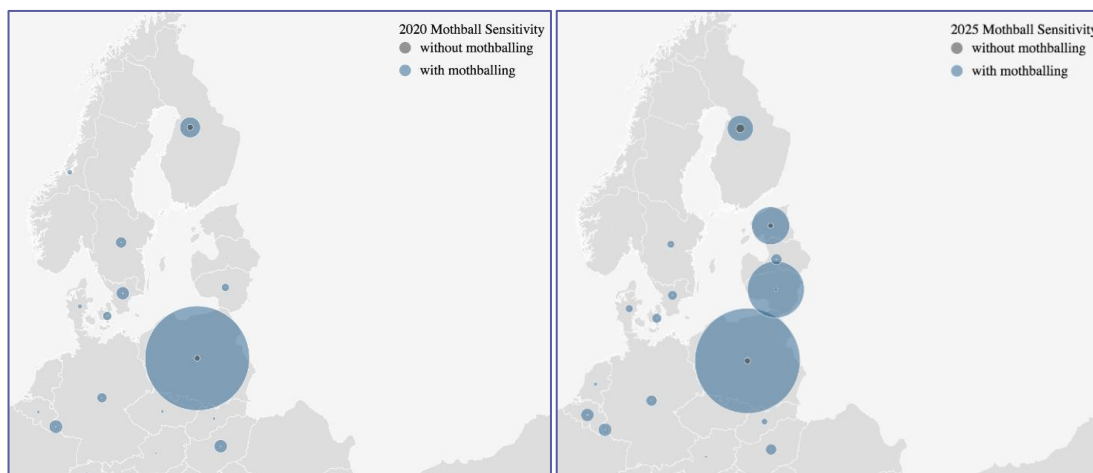
In order to comply with the Target Model, the I-SEM is due to come into effect in October 2018 in Ireland and Northern Ireland. As part of the I-SEM, a new All-Island capacity market has been designed to procure enough capacity to meet the demand forecast to a target adequacy standard (8 hours LOLE).

The base case study for the MAF in 2020 shows an average of 2.8 hours LOLE for Northern Ireland. This improves slightly to 2.6 hours for 2025, in response to the improved interconnection with Ireland.

While Northern Ireland does not have any capacity changes for the MAF low-carbon scenario, its adequacy situation dis-improves to 21 hours LOLE because of the effect of removing large amounts of coal plants in Ireland. It is envisaged that should this removal of coal plants be flagged in good time, then the All-Island capacity market should procure enough low-carbon capacity to keep the whole I-SEM system within standard.

### Poland

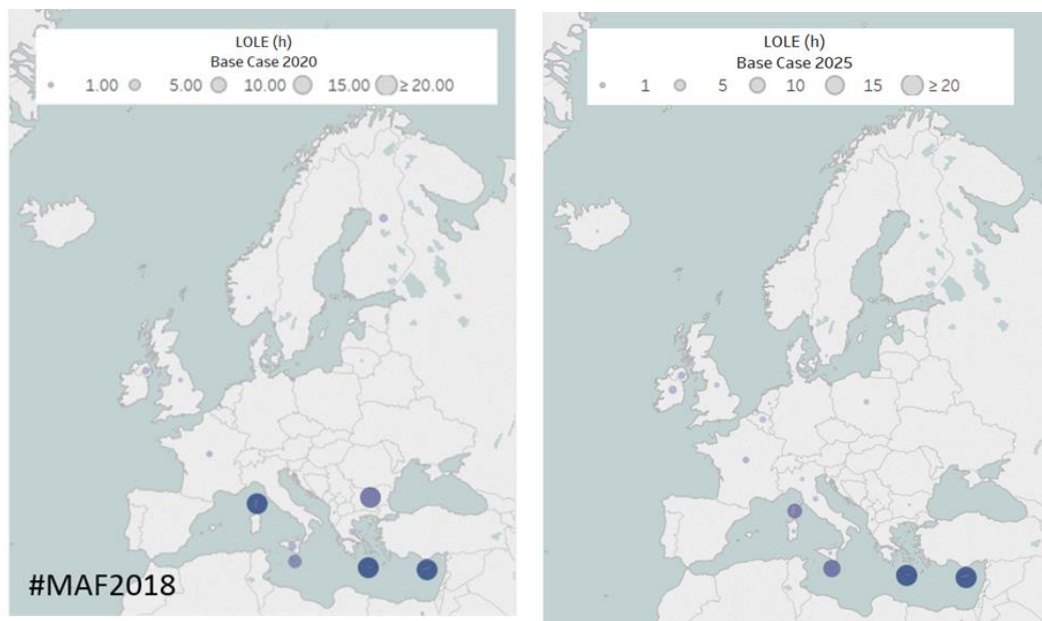
The capacity market processes launched in early 2018 successfully reduced the adequacy threat in Poland identified by the MAF 2017 mothballing scenario:



**MAF 2017: LOLE sensitivity to mothballing results in 2020 and 2025**

The capacity market in general ensures the adequacy at the target LOLE level of 3 hr/y according to national, country specific adequacy analysis – methodologically consistent with the MAF.





MAF 2018: LOLE results in 2020 and 2025

As long as the capacity market exists, PSE does not expect LOLE exceeding 3 hr/y, however the proper amount of capacity is contracted 5 years prior to the delivery year. Thus, the longer time perspective covered in MAF may not include all capacity which is going to be announced as the capacity market effect. For instance, the capacity auction for 2025 will take place in 2020 (main capacity auction) and 2024 (additional auction).

The lack of capacity market or diminishing of its economic effect may lead to the return of the missing capacity problem and renew the adequacy threat.

The MAF methodology mostly covers the specificity of Polish power system. However, national adequacy analysis deepens the demand modelling with respect to differentiation of seasonal growth dynamics as well as different thermal sensitivities for given time periods. As the FB pilot-phase approach has been introduced in the MAF 2018, PSE is looking forward to further development of this approach in order to include system safety criteria and a robust probabilistic approach covering critical system states.

### Portugal

The inputs to the MAF 2018 concerning the future development of the Portuguese electricity system correspond to the long-term forecasts performed in 2016 for the national adequacy report that was published by the Portuguese Directorate-General for Energy and Geology (<http://www.dgeg.pt?cr=15695>).

The electricity demand in Portugal provided for 2020 and 2025 is based on national 'central' growth estimations with efficiency measures, as defined in the revised 'National Energy Efficiency Action Plan'. The projected number of additional electric vehicles is estimated according to the 'National Renewable Energy Action Plan'. No Demand Side Response is assumed.

The MAF expected scenario of generating capacity for 2020 and 2025 is based on national energy policy drivers defined by the Portuguese government (as foreseen in 2016).

Concerning the NTC between Portugal and Spain, a total import capacity of 4200 MW (from Spain) is assumed in the MAF for both 2020 and 2025, already taking into account the new expected interconnection in the north of Portugal. However, it should be noted that this reinforcement project is delayed due to social and environmental challenges, with an expected commissioning date after 2020 (in late 2021, which is already considered in TYNDP 2018). Moreover, given the purpose of the MAF and the expected lower/upper limits

of NTC after the interconnection reinforcements (3600/4200 MW from Spain to Portugal), in 2025 a more conservative approach with a lower value of NTC could be investigated.

Nonetheless, the suggested reduction of NTC contributions to security of supply should have had no impact in MAF outputs for the base case. In fact, results from the national assessment of security of supply in 2020 and 2025 are consistent with the MAF 2018 indicators, confirming that LOLE and EENS indicators are nearly zero, even if the contribution of NTC is only 10% (according to national adequacy criteria).

In the case of the low-carbon sensitivity analysis in 2025, assuming a reduced generation capacity of 1180 MW due to the decommissioning of an old coal power plant, the national adequacy assessment also leads to less adequate levels, which supports the integration of new base-load generation capacity (CCGT) in order to comply with national standards.

### Serbia

The national adequacy analysis, which was performed during the preparation of the national TYNDP (period from 2017 to 2026), shows that no problems are expected until 2026. More information can be found at <http://ems.rs/media/uploads/plan-razvoja/Plan-razvoja-prenosnog-sistema-Republike-Srbije-2017-2026.pdf>.

These results can be confirmed by the outcomes of the MAF probabilistic simulations and the corresponding adequacy indicators (EENS and LOLE). Results in MAF 2018 show that expected values are zero for the Best Estimate scenario. This is a consequence of a large number of interconnection OHL's (on eight borders) and lower demand than net generation capacity.

EMS jsc Belgrade does not expect any significant adequacy issues in 2020 to 2025 horizons.

### Slovak Republic

In comparison with the present situation, significant changes in the particular generation technologies share in the Slovak generation mix for the time horizons 2020 and 2025 are foreseen. These changes, together with the sufficient transmission capacities on the SK cross-border profiles, have a positive impact on Slovak generation adequacy.

Apart from the Low-Carbon sensitivity scenario, the results of the Base Case 2020 and 2025 scenarios in the MAF 2018 probabilistic simulations, specifically confirmed by the adequacy indicators EENS and LOLE, have proven that no adequacy problems are foreseen in Slovakia in the 2020 and 2025 time horizons.

However, it has to be emphasized that the above mentioned results are valid only if the two new nuclear units in Mochovce (approximately 945 MW) are commissioned by 2020.

### Switzerland

The findings of the MAF 2018 Base Case scenarios for the time horizons 2020 and 2025 are consistent with the corresponding national studies for Switzerland commissioned by the Federal Office of Energy and the national regulatory authority ElCom published in October 2017, December 2017 and in May 2018 respectively. No adequacy issues have been detected for the Base Case scenarios in these studies.

The national studies commissioned by ElCom are based on the MAF 2017 methodology. Additionally, several stress scenarios were performed, taking into account supply shortages due to technical failure on a

regional scale as well as import limitations. Assuming these stress scenarios, some adequacy risks for Switzerland have been identified.

### The Netherlands

TenneT issues a National generation adequacy report for the Netherlands every year, with the 2018 edition to be published at the end of this year. The 2017 report can be found here:

[https://www.tennet.eu/fileadmin/user\\_upload/Company/Publications/Technical\\_Publications/Dutch/Rapport\\_Monitoring\\_Leveringszekerheid\\_2017\\_web.pdf](https://www.tennet.eu/fileadmin/user_upload/Company/Publications/Technical_Publications/Dutch/Rapport_Monitoring_Leveringszekerheid_2017_web.pdf)

In addition to the MAF study, TenneT is also actively involved in the bi-annual PLEF adequacy study, where the adequacy developments expected in the PLEF Region (Austria, Belgium, France, Germany, Luxemburg, Switzerland and the Netherlands) in the upcoming seven years are addressed. The most recent PLEF study<sup>2</sup> was issued last January 2018. The next PLEF study will be carried out during the second half of 2019.

TenneT uses the same methodology and starting points regarding the developments on the supply and demand side in the Netherlands for the analyses related to the National, Regional and Pan European reports. The outcomes of the MAF 2018 base case results are in line with the other studies, showing no adequacy issues for the Netherlands in the upcoming years, but with tighter adequacy margins occurring in the longer (> 3 years) term.

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<sup>2</sup> <http://www.benelux.int/nl/kerntemas/holder/energie/pentalateral-energy-forum>