Mid-term Adequacy Forecast Appendix 3

Country Comments
2020 Edition

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Disclaimer: All country comments below were prepared by the TSOs on a voluntary basis. This appendix aims to present national insights linked to the present MAF, especially with regards to input assumptions.

Contents

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1 Belgium

Previous adequacy studies performed for Belgium have all concluded that Belgium will face a serious security of supply challenge, mainly due to the full phase-out of nuclear capacity in Belgium towards 2025. Given the substantial import dependence of Belgium in moments of scarcity, power system evolutions in neighbouring countries also play a key role for Belgium's Security of Supply. A significant need for new capacity was established, as the existing installed capacity in addition with ambitious assumptions regarding import availabilities and future capacity developments such as Demand Response or RES proves insufficient to maintain the country's Security of Supply standards.

For the above reasons, the Belgian State has adopted a federal law, foreseeing the introduction of a market wide, technology-neutral and centralised CM for Belgium with first delivery year in 2025. An investigation by the European Commission in the framework of the State Aid Guidelines is currently ongoing.

Given this anticipated introduction of a CM for Belgium, for 2025, the addition of 2.5 GW[1] new capacity is assumed in MAF2020, which is to be delivered under the CM in order to reach adequacy for Belgium (based on the quantification of the required volumes performed through the 'EU-BASE' scenario of the Belgian 10-year adequacy study, further denoted as '2019 Elia study[2]'). Furthermore, it should be noted that in the same study a volume of 3.9 GW new capacity has been identified to be required to ensure an adequate Belgian system while covering for uncertainties impacting the amount of imports for Belgium during moments of scarcity, which are 'beyond control' of Belgium.

Assumptions for 2025 and 2030

Elia is committed to ensuring a high level of consistency between national, regional and Pan-EU adequacy assessments relevant for Belgium, by developing and applying a common probabilistic methodology and ensuring complementarity of the results obtained between the different studies.

The assumptions used in MAF are in line with most recent national reports (for the corresponding time horizons)

For the 2025 and 2030 time horizons tackled in the MAF, the assumptions for Belgium are in line with the recent 2019 Elia study. Significant amounts of new capacities are assumed towards 2025 and 2030: RES growth assumptions are based on the 'National Energy and Climate Plan' submitted by Belgium end of December 2018. The additional DSR and storage capacities are based on the 'Belgian Energy Pact' assumptions agreed upon by different Belgian authorities in 2018. For 2025 no nuclear capacity is assumed in Belgium, in accordance with the planned nuclear phase-out. The data for Belgium has been slightly updated with respect to the MAF2019 data based on latest available information known middle 2020. Updates relate to: i) -0.1GW due to the decommissioning of biomass capacity; ii) +0.4GW considering the return to the market of some gas capacity.

Assumption on new built capacity

In the 2019 Elia study, a minimum volume (assumed 100% available) of required 'new built' capacity of 2.5 GW is identified in the Base Case ('EU-BASE'). Furthermore, it should be noted that this volume

[1] This is 2.5 GW 100% available which is here assumed to be 2.5 GW thermal generation. The choice of technology was arbitrary.
[2] https://www.elia.be/en/publications/studies-and-reports

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increases to 3.9 GW to cover for uncertainties mostly impacting the importing levels available for Belgium in scarcity periods, which are beyond Belgium's control.

This volume of 2.5 GW, which reflects the new capacity assumed for Belgium, would increase to about 4 GW should the currently existing capacity in Belgium which is in need of a significant refurbishment be considered also at risk, due to adverse economic viability conditions. This capacity is assumed to remain in the market in Belgium for both considered time horizons in MAF, although there is no guarantee this capacity would actually remain in the market without support.

National view on the Generation and System Adequacy forecast and its relation to the MAF results

For the Base-Case 2025 scenario, the MAF 2020 NTC results show an average LOLE of ~0.4h, which therefore meets the legal adequacy criterion for Belgium of LOLE < 3. It should however be noted that the simulated average LOLE for Belgium in MAF 2020 should be carefully interpreted taking into account the following considerations:

- There is a significant amount of assumed 'new built' capacity in MAF2020 distributed over a large set of countries. It should be noted that there is in general no certainty that these capacities would finally materialize in 2025, hence these assumptions and the results following those as presented in MAF2020, should be interpreted carefully.
- Furthermore, Belgium is since several years part of the region where Flow-Based Market Coupling has already been implemented. Whereas a flow-based simulation model has been developed and implemented by Elia, eg. in the 2019 Elia study and which was also used in the PLEF GAA 2020 study[3], such approach is not yet used in the present MAF2020 study. Linked to this subject is also the implementation of the 'Adequacy Patch' in the 2019 Elia study and in PLEF GAA 2020, which imposes the curtailment sharing rule as applied in the Euphemia algorithm for day-ahead market coupling. Both aforementioned methodological differences can have a significant impact on the simulated adequacy results for Belgium.

Finally it is worth mentioning that an important sensitivity of the PLEF GAA 2020 study was the 'Low Gas' sensitivity. This sensitivity confirmed an important structural adequacy deficit in 2025 for Belgium (LOLE ~ 8.1h), once the nuclear phase-out is completed and in case that the 2.5GW new capacity in Belgium would be at risk due to adverse economic conditions. There is no indication that such investment in the identified new capacity would occur in Belgium towards 2025 without a supporting capacity mechanism. Such risks are well captured within the storyline agreed between PLEF Ministries for this 'Low Gas' sensitivity.

For the 2030 horizon included in the MAF2020 report, generally the same remarks made above related to the 2025 time horizon apply. The impact of mentioned considerations can be assumed to be even more pronounced given the longer time horizon of the analysis.

To conclude, and in line with the statements presented in the disclaimer of this MAF2020 report, its results should be interpreted cautiously. For Belgium, the analysis presented in the MAF report should be read in conjunction with the national adequacy analysis performed biannually by Elia, and for which a new, updated publication is expected for June 2021.

[3] https://www.elia.be/en/news/press-releases/2020/05/20200520_third-regional-generation-adequacy-assessment-report

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2 France

The National Energy and Climate Plan (NECP)

Since 2015, a new legal framework known as "loi de transition énergétique pour la croissance verte" with its planification documents "stratégie nationale bas-carbone" and "programmation pluriannuelle de l'énergie" has been established to provide a roadmap for the energy field in the next years.
In April 2020 the National Energy and Climate Plan, elaborated in these two documents[4,5], has been officially passed by the energy ministry after a two-month public consultation.

Load and annual demand forecast provided for 2025 and 2030

This year 2020 is marked by the COVID-19 outbreak, which, on top of the health crisis, has significantly impacted the French electricity demand, particularly during the lockdown that occurred between March and June. Starting with a peak of decrease of 15% in the first weeks of the lockdown, this impact has thereafter reduced due to a gradual recovery of economic activity. At the end of the summer, the decrease of demand was assessed below 5% compared with what would be expected without the effects of the outbreak[6,7]. Since the end of October, a second lockdown has been introduced and is supposed to last until at least the beginning of December.

Without regards to the current pandemic, RTE has observed over the past several years a stabilization of electricity demand in France, mainly due to energy efficiency measures, in compliance with the ambitions of the French NECP, that partially counterbalance sustained demographic growth, a recovery in economic activity and a development of the electricity uses (transport, heating…) with reduced CO2 emissions.

As the data for this MAF has been collected in early 2020 and does not include the impact of the current outbreak, the demand forecast for the target year 2025 is assumed to be equivalent to the level of the past few years.

For the target year 2030, the demand forecast is consistent with the data taken into account in the TYNDP 2020[8]. It is based on one of the projections ("Trajectoire haute") assessed by RTE in its last long-term adequacy report published in 2017[9] and assumes a slight decrease compared with the current level of demand (without considering the effects of COVID-19). As the load forecast has been collected in January 2020, it does not include the latest information for some inputs, e.g. consistency with the NECP published in April, ambitions regarding the development of hydrogen, etc..

Net generating capacity forecast provided for 2025 and 2030

The targets of the French NECP are reached within the central scenario of the MAF 2020. The paramount evolutions for the French energy mix are :

[4] https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385&categorieLien=id
[5] https://www.ecologie.gouv.fr/programmations-pluriannuelles-lenergie-ppe
[6] https://assets.rte-france.com/prod/public/2020-06/Analyse_preliminaire_hiver_2020-2021_-_VFinale-pdf.pdf
[7] https://assets.rte-france.com/prod/public/2020-09/Analyse-securite-approvisionnement-hiver_sept2020.pdf
[8] https://tyndp.entsoe.eu/
[9] https://assets.rte-france.com/prod/public/2020-06/bp2017_complet_vf_compressed.pdf

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- Accelerated development of RES (wind and solar capacities are multiplied by more than three in the next ten years) ;
- Coal phase-out complete by the end of 2022 ;
- No commissioning of new gas units, except OCGT Landivisiau in 2021 ;
- Commissioning of the new Flamanville power plant in 2023[10] ;
- Four nuclear units will be shut down between 2027 and 2030 (in addition to the closure of the two Fessenheim reactors that occurred in mid-2020), in order to reduce the nuclear share in electricity production to 50% by 2035.

National view on the Generation and System Adequacy forecast and its relation to the MAF results

RTE produces an annual risk assessment through its national generation adequacy report on a time horizon of five years[11]. MAF 2020 results seem to be partially in line with national elements published in November 2019[12] as both reports indicate that the adequacy issues are supposed to decrease after 2024 under several positive effects, allowing to respect the national reliability standard. However LOLE is lower in the MAF[13]. Indeed, for the time horizon 2025, the MAF highlights an average loss of load expectation of between 0.8 and 1.5 hours, which is slightly more optimistic than the last French national adequacy study for this time horizon.

The discrepancy between both analyses mainly result from several elements :

- As mentioned in the disclaimer of the executive report of this MAF, the results of this MAF can be deemed to present an optimistic view on the European adequacy situation, given the combination of large amounts of new capacities being introduced throughout Europe for the analysed time horizons and the fact that economic viability or feasibility checks on those inputs, provided by the TSOs, have not been implemented.
- They do not use the same climate database. While the one used in the French study models 200 potential forecasting climatic years with a full correlation between load, solar and wind conditions, the one used for the different studies at ENTSOE (Seasonal Outlook, MAF, TYNDP) is based on 35 historical climatic years.
- The nuclear availability in France is also taken into account differently in both resource adequacy assessments. The French generation adequacy study combines a deterministic approach for the ten-year inspections[14] (information shared via the official transparency channels - REMIT) for which each duration is probabilistically extended consistently with what has been observed in the past years, and a probabilistic one for the other outages. In the MAF, the simulated availability of nuclear power plants do not model the uncertainty on the extension of duration of outages, but take it into account only in a deterministic manner instead of probabilistically. This can lead to underestimate the occurrence of some simulated situations with very low availability of the nuclear generating fleet.

[10] Due to technical issues, the producer EDF has announced that the power plant will not be commissioned before the end of 2022. The assumption for the MAF is thus based on a commissioning in 2023.
[11] The next French national report, which will be published in early 2021, will study the adequacy up to 2030.
[12] https://assets.rte-france.com/prod/public/2020-09/2019_generation_adequacy_report.pdf
[13] Since the last French adequacy report studied up to 2025, only 2025 is analyzed in both assessments.
[14] In the next French national report, which will be published in early 2021, all kind of planned outages that are declared on the transparency platform will be modelled via the deterministic approach, like the ten-year inspections.

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- The flow-based approach, which is studied through a sensitivity in the MAF, is modelled for the central scenario in the French national study.
- The data collection for the French generating fleet do not occur in the same time (September 2019 for the last French adequacy report, January 2020 for this MAF), leading to potential discrepancies based on the latest information in Europe (e.g. coal phase-out combined with commissionings of new CCGT in Italy)

As a consequence the result of the MAF adequacy study for France has to be treated cautiously and read jointly with the French national generation adequacy studies[15] (also called "Bilan prévisionnel"), especially with the next report that will be published in early 2021.

3 Germany

The MAF 2020 foresees no critical adequacy issues for Germany in 2025 and 2030. LOLE values are expected to be below 1h/year which is in line with the national reliability target (LOLE < 5h) as defined by the German Authority in the national adequacy report (BMWi Monitoringbericht zur Versorgungssicherheit[16]). The MAF 2020 takes an increasingly important role in the assessment of the future generation adequacy taking into account recent political as well as economic developments (shut-down of conventional units to meet national CO2 targets, non-profitability of units etc.). It also takes into consideration the most recent decision about the coal phase out in Germany as announced in July 2020 (Kohleausstiegsgesetz[17]).

The current methodology of the MAF 2020, however, lacks an appropriate consideration of uncertainties in the long term development of the power system. The MAF 2020 forecasts adequacy up to 10 years ahead which makes a consideration of a variety of scenarios indispensable. Different outcomes for a variation of important input parameters that impact the adequacy situation, such as the evolution of peak demand, new technologies and installed thermal and RES capacities should be analysed in different and consistent scenarios. This approach would be aligned with other studies such as the Ten-Year Network Development Plan (TYNDP[18]) published by ENTSO-E as well as the German Network Development Plan (NEP[19]).

Besides, it should be noted that LOLE and EENS results represent average values over a large number of synthetic Monte Carlo years. Even if a LOLE of 1 h/year is achieved, the Loss of Load Duration (LLD) in a significant number of Monte Carlo years could actually lie above this value. Therefore, more critical results, such as the P95 ("1-in-20-years") value and the distribution of LLD are important metrics to consider beside the (average values of) LOLE and EENS.

A detailed analysis of these critical situations would be an improvement for future MAF studies, in order to develop an understanding of possible climate conditions and outage occurrences that hamper the generation adequacy. E.g., this could be an analysis of the resource adequacy in a more critical "1-in-20-years" event including an investigation for impact factors that stress the system in this situation. Besides a probabilistic assessment, an overall adequacy assessment should analyse this kind of situations in more detail.

Further challenges that should be accounted for, in future ERAA studies, are as follows:

[15] https://assets.rte-france.com/prod/public/2020-09/2019_generation_adequacy_report.pdf
[16] https://www.bmwi.de/Redaktion/DE/Publikationen/Energie/monitoringbericht-versorgungssicherheit-2019.html
[17] https://www.bmwi.de/Redaktion/DE/Artikel/Service/kohleausstiegsgesetz.html
[18] https://tyndp.entsoe.eu/
[19] https://www.netzentwicklungsplan.de/de/netzentwicklungsplaene/netzentwicklungsplan-2035-2021

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- Consideration of Common-Mode events which could be observed in recent years (e.g. low water level in Germany in the river Rhine in Summer 2018 which resulted in limited availability of coal units; nuclear unavailability due to missing operation licenses).
- The impact from climate change on the power system in future ERAA should not only focus on changes in demand but also increased risk for low water levels, unavailabilities due to critical water temperatures in Summer and other potential risks.

4 Great Britain

The results of the MAF indicate that no adequacy issues are expected in Great Britain in the next few years, which is consistent with recent experience in Great Britain, where the LOLE for Winter 2020-2021 is expected to be below 0.1 hours per year, based on National Grid ESO's analysis in its Winter Outlook report[20].

The adequacy analysis for GB also indicates a low LOLE for 2025. Note that the highest peak used in this study is 57471 MW. A LOLE nearer to 3 hours would be expected for an ACS peak demand of 60800 MW, as in the Steady Progression scenario published in the Future Energy Scenarios 2020 report[21]. These results further support the way in which the capacity market in Great Britain continues to ensure that the country will remain within the reliability standard of 3 hours LOLE set by the government.

The electricity system in Great Britain is undergoing significant change to meet decarbonisation targets, as highlighted in the third allocation round for Contracts for Difference, which will deliver further growth in offshore wind. In addition, National Grid ESO has the ambition to be able to operate the electricity system with zero carbon by 2025. The capacity market is expected to continue to deliver security of supply in Great Britain during this period, as older coal and nuclear stations are scheduled to close in the early 2020s.

5 Greece

Over the next years, according to the National Energy and Climate Plan (NECP)[22], the electricity landscape in Greece is expected to drastically change. All existing lignite units are expected to be decommissioned by the end of 2023. At the same time, the addition of new natural gas units, as well as significant new storage capacity is foreseen. In order to achieve the targets for increased RES penetration, an ambitious plan for new RES capacity is envisaged, with total RES capacity expected to exceed 19 GW in 2030. Furthermore, by the end of the decade, practically all islands with significant electricity demand will be interconnected with the mainland.

MAF 2020 input data for Greece (demand and generation capacity evolution) is aligned with the provisions of the final NECP, which has significant differences and even more ambitious targets compared to the Draft NECP (taken into account in MAF 2019).

Adequacy issues in the target years 2025 and 2030 are not identified for Greece (the mainland or Crete) in the MAF 2020 report. These findings are consistent with the findings of the National Generation Adequacy

[20] https://www.nationalgrideso.com/research-publications/winter-outlook
[21] https://www.nationalgrideso.com/future-energy/future-energy-scenarios
[22] https://ec.europa.eu/energy/sites/ener/files/documents/el_final_necp_main_el.pdf

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Study for the period 2020-2030[23] issued by IPTO. However, these results are only valid to the extent that the electricity sector in the future evolves as foreseen in the National Trends scenario (NECP assumptions). As shown in the sensitivity analysis of the national study, Greece could face adequacy issues if the massive retirement of existing lignite-fired units is not accompanied by the realization of foreseen new equivalently 'firm' generation, or if the foreseen energy-saving measures do not compensate timely the trends for electricity demand increase (e.g. electrification of activities and/or economic growth).

6 Ireland

The Single Electricity Market (SEM) is the wholesale electricity market for the island of Ireland (incorporating Ireland and Northern Ireland), designed to be compliant with the European Target Model. It provides wholesale electricity at the lowest possible cost, ensuring that there is adequate supply to meet demand and to support long-term sustainability.

Data submitted to the PEMMDB for Ireland included some consequences of the Clean Energy Package, namely the decommissioning of high-carbon generating units in 2025.
In reaction to these retirements, the SEM Capacity Market has procured new capacity, as it was designed to do, in order to keep within our national adequacy standard of 8 hours LOLE per year.
This new capacity was also included in Ireland's submission to the PEMMDB.

With these assumptions for PEMMDB inputs, the MAF 2020 studies for Target Year 2025 show Ireland to be within its adequacy standard. This matches to Ireland's national adequacy calculations, as published annually in its Generation Capacity Statement[24].

The proposed Celtic Interconnector between Ireland and France is due to be installed later in the decade - this further enhances the adequacy assessment for Ireland in Target Year 2030.

7 Italy

As required by current national regulation, Terna provides a yearly adequacy report in order to identify the mix of resources that are needed to guarantee the respect of adequacy threshold (3 hours/year of LOLE). Like ENTSO-E's MAF 2020, the national report includes an analysis for 2025 and 2030 (based on a Monte Carlo approach), complemented by an economic viability check of the generation fleet to identify power plants that face the risk of being decommissioned for economic reasons..

The national report highlights that the results of the capacity market (CM) auctions, carried out at the end of 2019, significantly contributed to mitigating the adequacy and security risks of the Italian electricity system in the medium term (2025), especially in the northern area of the country, confirming the Italian CM as one of the fundamental tools to accompany the energy transition underway.

Despite this, critical issues remain in the medium term (2025) for the two major islands of Sardinia and Sicily. For both areas, the critical issues are related to the combined effect of two factors:

[23] https://www.admie.gr/sites/default/files/users/dssas/meleti-eparkeias-ishyos-2020-2030.pdf

[24] https://www.eirgridgroup.com/site-files/library/EirGrid/All-Island-Generation-Capacity-Statement-2020-2029.pdf

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- the expected reduction in conventional generation capacity, in the case of Sardinia due to the decarbonisation policies of the electricity system (coal phase out) and in the case of Sicily due to the presence of obsolete, polluting and economically inefficient generation plants (mainly oil-fired, identified on the base of economic viability check performed);
- insufficient transmission capacity with the mainland, which is increasingly important to guarantee the adequacy and safety of the islands in the face of the expected growth of intermittent renewable sources.

To solve the critical issues in Sardinia and Sicily will be necessary to:

1. deploy at least 400 MW of new dispatchable capacity (e.g. thermal gas and / or biomass, hydroelectric and / or electrochemical storage with an adequate energy-power ratio) appropriately distributed in Sardinia;
2. increase the transmission capacity of Sicily with the mainland, strengthening the current connection between Sicily and Calabria and
3. create a new transmission link between Central South Italy - Sicily - Sardinia (Tyrrhenian Link).

For 2030-time horizon, the report does not reveal major adequacy issues, provided that all investments in the National Transmission Grid envisaged in Terna's Development Plan are realized and that all scenario assumptions of the Italian NECP hold true. This includes a massive development of solar and wind generation capacity, as well as the deployment of new storage capacity (+6 GW of utility-scale storage alone by 2030).

In this sense, the 2020 national adequacy report also highlights how a delay especially in storage development on the national territory can significantly worsen the adequacy conditions of the electricity system. Under such circumstances, especially in the medium term (2025), it would be risky to decommission the remaining coal-fired generation plants and any other additional plants, especially on the two main islands.

8 Northern Ireland

The Single Electricity Market (SEM) is the wholesale electricity market for the island of Ireland (incorporating Ireland and Northern Ireland), designed to be compliant with the European Target Model. It provides wholesale electricity at the lowest possible cost, ensuring that there is adequate supply to meet demand and to support long-term sustainability.

Data submitted to the PEMMDB for Northern Ireland reflected the closure of some thermal generating units in 2023. The data submission also reflects additional new capacity procured through the SEM Capacity Auction, in order to keep within the agreed Northern Ireland adequacy standard of 4.9 hours of LOLE per year.

Arising from these PEMMDB inputs, the MAF 2020 studies for Target Year 2025 show Northern Ireland to be within its adequacy standard. This matches Northern Ireland's adequacy calculations, as published annually in its Generation Capacity Statement[25].

[25] https://www.eirgridgroup.com/site-files/library/EirGrid/All-Island-Generation-Capacity-Statement-2020-2029.pdf

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9 Poland

PSE fully support the message coming from the disclaimer provided in Executive Summary part of the MAF 2020 package, especially the part "the methodology followed does not yet comply with important elements of the CEP/ERAA framework, notably, but not limited to, an economic viability assessment.

PSE would like also to underline that results for Poland, especially for year 2025 are based on optimistic assumptions, as the result of positive impact of Capacity Market implementation in Poland since 2021. Also results for 2030, where small LOLE value was detected for Poland, looks to be optimistic ones, as there is very high uncertainty of economic viability of coal fired units resulting from the 550kg CO2 emission limit of CEP regulation.

PSE states on the position, that only Economic Viability check may provide the answer about the future of each unit on the market and give input for complete system adequacy forecast. Also the analysis at a specific point in time (limited number of target years) may not show the full picture, as investment decisions refer to whole operational life span of the unit.

10 Portugal

The inputs to MAF 2020 concerning the future development of Portuguese electricity system correspond to best estimates that result from long-term forecasts performed in 2019 for the national adequacy report that was published by Portuguese Directorate-General for Energy and Geology[26].

The electricity demand in Portugal provided to 2025 and 2030 is based on national "central" growth estimations with efficiency measures as defined in the revised "National Energy Efficiency Action Plan" , also taking into account both Directive (EU) 2018/844 and Directive (EU) 2018/2002. The projected number of additional electric vehicles is estimated according to the "National Energy Climate Plan 2030" (NECP). No Load Management is assumed.

The MAF expected scenario of generating capacity for 2025 and 2030 is based on national energy policy drivers defined by the Portuguese government in NECP.

Concerning NTC between Portugal and Spain, a total import capacity of 4200 MW (from Spain) is assumed in MAF for both TY2025 and TY2030, already taking into account the new expected interconnection in the north of Portugal (commissioning date in late 2022).

Results from national assessment of security of supply are consistent with MAF 2020 indicators, confirming that LOLE and ENS indicators are nearly zero, even if contribution from neighbouring systems (Spain) is limited to 10% of NTC (according to national adequacy criteria). Portuguese generation system is expected to comply with national reliability standards in both TY2025 and TY2030, mainly due to expected commissioning of new hydro capacity along with maintaining all other base-load generation capacity (CCGT).

11 Spain

The MAF 2020 foresees no critical adequacy issues for Spain in 2025 and 2030. Although Spain does not present adequacy issues in the analyzed horizons, the uncertainty about the evolution of the thermal capacity (coal capacity disappears, nuclear power will be reduced and the combined cycles situation will depend on

[26] https://www.dgeg.gov.pt/media/exen4koz/i017284.pdf

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its economic expectations) means that the unexpected thermal reductions could imply adequacy issues in Spain in 2030 horizon.

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