ENEL RESPONSE TO ENTSO-E Consultation on Mid-term Adequacy Assessment 2017

4. **From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? Modelling of DSR? Flexibility assessment? Alignment and consistency with TYNDP time horizon and dataset. Extension of PECD?**

   We appreciate the continuous effort of ENTSO-E and the cooperation with national TSOs in order to improve the middle-term adequacy forecast report, in terms of quality of input data, methodologies and models, outputs and considerations.
   In general, the alignment and the consistency with the TYNDP time horizon and dataset and the disclosure of the input data used for the MAF and TYNDP for generation and demand scenarios at 2020 and 2025 goes in the direction of an increased consistency.
   We also appreciate the extension of the Climate Database to 34 years instead of the previous 14 years: the proper consideration of rare and extreme events, which can be captured enlarging the historical time series, is paramount in the evaluation of adequacy issues.
   Concerning the two other aspects (mothballing and flexibility), we consider them extremely important, even if not adequately considered in the study (see our answer to question number 5).
   As a last observation, we agree with ENTSO-E in highlighting the inevitable limitations of a pan-European assessment and the need of regional and national ones in order to identify, with a higher granularity, eventual constraints and adequacy issues and guide regulatory and/or legislation decisions (e.g. the introduction of capacity markets). As confirmed in the report, the MAF is not meant to replace national assessments; rather it should complement and challenge them, providing a methodology to be followed by national TSOs.

5. **From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.**

   Current analysis of mothballing and permanent closure should be modified. As far as we understand, currently ENTSO-E collects data from national TSOs based on their best estimates. On the one hand, it national TSOs have good knowledge of national rules on decommissioning and mothballing. On the other hand, this approach cannot deliver consistent results. In fact, it is not possible to avoid

differences in TSOs' views: some of them will be optimistic and other will be extremely negative. Besides, it is not clear the procedure and the communication tools used by ENTSO-E with national TSOs (e.g. Spain TSO in §5.2.31 is claiming/updating the assumption taken on availability of coal capacity in 2020-2025 considered in the report).
In addition, and more importantly, the current MAF does not take into consideration any economic evaluation, endangering its results on security of supply. The decision to close/mothball a power plant depends on its technical life and its economic viability. In absence of economic analysis, the MAF should only focus its conclusion on the estimated demand of the system and peak consumption. If the MAF would like to provide reliable conclusion on the security of supply, it should deploy sound economic analysis. The best results would be obtain with a market study that analyses the technical and economic revenue of existing power plants and if peak energy rents (and capacity markets) are able to attract new investments in generation, storage, and demand response. Given the complexity of the analysis, a simplified version could be introduced. In particular, in each bidding zone the MAF could analysis type of power plants (e.g. OCGT, CCGT, coal, oil, wind, PV, etc...), instead of profitability of single units. Those analyses should be complemented by regional/national ones in order to better understand possible security of supply issues.
According to us, those analyses should also consider sensitivities on different market model scenarios, for instance: introduction of capacity markets, presence of long-term price signals, and removal of market distortions such as price caps.
In addition, all demand analysis should take in adequate consideration the effect of the required electrification of consumption in order to achieve European decarbonization goals.
Regarding the assessment of flexibility as it is proposed in the report, we would like to have additional details on how it is considered in relation to adequacy. The study correctly highlights:

(i) the increased need of flexibility in the electricity sector in the next years, due to the further penetration of renewables in the energy mix;
(ii) the benefits of interconnected market zones in addressing flexibility needs (e.g. on load ramps).

Nevertheless, it is difficult to assess if an eventual lack of flexibility is considered in the simulations and if results in terms of LOLE and ENS are affected by it. Either major details should be disclosed or a clear statement on the fact that the assessment is only done in a qualitative way should be done.
We consider some other improvements as necessary:

- The model should consider that during dry years outages increase due to low river level, thus the possibility to cool down conventional power plants

- Assumptions on Net Transfer Capacity (NTC) should be in line with reliability of interconnections, maintenance outages and unexpected unavailability of system's elements. For this reason, the MAF should deploy values of interconnection in line with real capacity available during peak and of-peak periods
- The analysis should also consider the aging of nuclear power plants, which is inducing an increase in unavailability factor
- Each TYNDP should contain an in depth analysis showing past forecast and realized outcomes, especially during critical days

6. **To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?**
   These data should not be provided by generators due to commercial confidentiality issues and to uncertainties on their market evaluation. As described in the previous answer, data on mothballing and decommissioning should be result of ENTSO-E economic analysis.

7. **A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?**

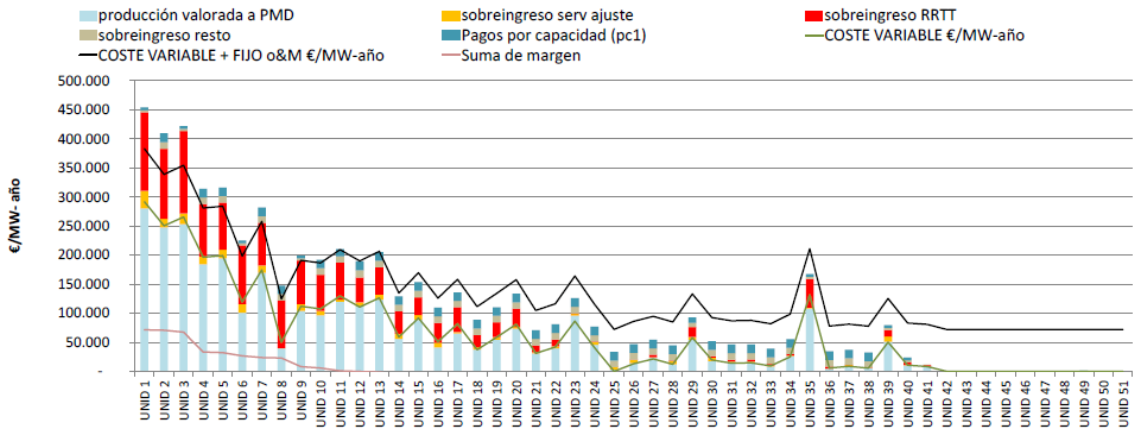
   We agree with the representation of results as currently done in the report and we do not think a common reliability target should be defined. Reliability targets should be set at Member State level and they should depend on national specificities. As highlighted by a study of the European Commission of 2016, Identification of Appropriate Generation and System Adequacy Standards for the Internal Electricity Market, adequacy standards should be set at Member State state level. These values should be based on the evaluation of the VOLL and the costs for additional generation/transmission facilities necessary to increase the reliability of the system (minimization of the total cost).
   In this regard, chapter 4.4 of the report can give misleading messages. Indeed, in the text of this chapter it is recognized that:

- the results presented cannot be generalized nor considered for national/national decisions aimed at addressing adequacy issues;
- National standard targets exist in the different European countries (see also figure 20 of the report).

8. Additional Points

The analysis for Spain on mothballing is showing discrepancy with other official forecasts. The current version of the MAF showed no mothballed capacity, even if CNMC and REE in 2016 already showed that 6000 MW of CCGT could close (see graph below).

In addition, it is seems that the Spanish wind capacity has been underestimated by 4600 MW



Fuente: CNMC

ENTSO-E Mid-Term Adequacy Forecast 2017 consultation

A EURELECTRIC response paper

November 2017

EURELECTRIC is the voice of the electricity industry in Europe.

We speak for more than 3,500 companies in power generation, distribution, and supply.

We Stand For:

***Carbon-neutral electricity** by 2050*

We have committed to making Europe's electricity cleaner. To deliver, we need to make use of **all low-carbon technologies**: more renewables, but also clean coal and gas, and nuclear. Efficient electric technologies in **transport and buildings**, combined with the development of smart grids and a major push in **energy efficiency** play a key role in reducing fossil fuel consumption and making our electricity more sustainable.

***Competitive** electricity for our customers*

We support well-functioning, distortion-free **energy and carbon markets as** the best way to produce electricity and reduce emissions cost-efficiently. Integrated EU-wide electricity and gas markets are also crucial to offer our customers the **full benefits of liberalisation**: they ensure the best use of generation resources, improve **security of supply**, allow full EU-wide competition, and increase **customer choice**.

***Continent-wide** electricity through a coherent European approach*

Europe's energy and climate challenges can only be solved by **European – or even global – policies,** not incoherent national measures. Such policies should complement, not contradict each other: coherent and integrated approaches reduce costs. This will encourage **effective investment to** ensure a sustainable and reliable electricity supply for Europe's businesses and consumers.

EURELECTRIC. Electricity for Europe.

Dépôt légal: D/2017/12.105/54

WG Wholesale Market Design

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KEY MESSAGES

- EURELECTRIC welcomes the methodological improvements brought by ENTSO-E to the Mid-Term Adequacy Forecast 2017 (MAF 2017), in particular the extension of the range of likely climate conditions and the introduction of a sensitivity analysis to account for some level of risk of mothballing or decommissioning of existing assets.

- EURELECTRIC welcomes ENTSO-E's conclusions that the MAF should not replace national assessments and that it cannot be the only factor considered when taking regulatory or legislation decisions on e.g. the implementation of a capacity mechanism. National and/or regional adequacy assessments can indeed embed a finer granularity than the European adequacy assessment to detect potential adequacy constraints and resources. The MAF therefore complements (without replacing) national and regional assessments and it helps enhance their quality (and vice-versa). This should allow a more informed decision-making process by investors and Member States (or groups of Member States) to ensure system adequacy.

  Despite those positive developments, EURELECTRIC regrets that the current MAF does not include several scenarios for the future level of electricity demand (e.g. based on alternative values for GDP, demography growth, energy efficiency gains, prosumer development, electrification of consumption) and of the supply side (e.g. based on the economic viability of existing assets, development of RES capacity, including decentralised generation). It is crucial to correct this in the next edition of the MAF. The MAF 2017 doesn't include anything on the development of storage (including batteries), which is especially odd in the context of MAF's longest time horizon i.e. 2025. The impact of increased storage should be considered in the next edition.

- In EURELECTRIC's view, adequacy forecasts should mostly focus on defining the level of reliable/firm capacity needed in the mid to long term in order to satisfy a predefined reliability standard and the estimated demand. As a prerequisite, ENTSO-E should define a consistent methodology to analyse the demand forecasts and assumptions provided by TSOs, and display the level of firm capacity needed in each bidding zone to achieve the standards of security of supply of each Member State. Additionally, MAF could also include aspects related to flexibility needs, for instance some metrics like the Insufficient Ramping Resource Probability (IRRP, measuring the probability of shortage of upward/downward ramping capacity).

- Once this assessment is made, it is crucial that ENTSO-E performs economic viability assessments, i.e. high-level assessments on the likelihood that the foreseen capacity (per technology and bidding zone) remains economical during the entire MAF timeframe. The closure of plants due to economic reasons can indeed fundamentally change the capacity adequacy situation over the 10 years of the MAF timeframe. In any case, without detailed analysis of the economics of power plants, the MAF is not able to capture appropriately the risks around the supply side. Finally, its results must be complemented by the result of more detailed analyses at regional and national levels.

- To perform such sensitivities, the economic assessment should rather be done top-down (looking into groups of power plants per technology and age) rather than bottom-up (per power plants). As a matter of fact, ENTSO-E already manages estimates of variable costs

per technology. A sensitivity analysis assessing the economic viability of plants y could be performed based on scenarios looking into on the share of power plants likely to be decommissioned for each technology.

- ENTSO-E could also take into consideration the reports produced by investment banks on power plants' spark and dark spreads (clean or not). These could provide a useful estimate of power plants' economic viability in each market. Using these, different scenarios for the economic viability of power plants within the MAF's time horizon could be developed.

4. From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

As pointed out by ENTSO-E, several improvements have been made versus last year's mid-term adequacy forecast. In practice, the following comments should nevertheless be raised.

1. Mothballing sensitivity

EURELECTRIC recognises that the mothballing sensitivity in the MAF 2017 compared to MAF 2016 is a step in the right direction as ENTSO-E is now taking into account, though in a limited way, the risk on installed capacity. Nonetheless, there is room for progress to address this risk factor more concretely, more comprehensively and in a more harmonised manner throughout Europe.

Indeed, ENTSO-E is performing a sensitivity analysis of installed capacity by considering mothballing. According to the explanation provided, *"mothballed capacity should here always be understood as generation capacity that is at risk of being unavailable due to economic or policy reasons"*[1] . Reading the MAF 2017 however casts a doubt on the definition of "mothballing" used by ENTSO-E. In theory, mothballed capacity could, after some time, either return to the market (de-mothballing) or definitively exit the market (decommissioning). In some cases, mothballing can also occur for a temporary period (e.g. units mothballed part of the year to save costs). In the analysis performed by ENTSO-E, the "generation capacity at risk of being mothballed" rather seems to represent an amount of capacity that is at risk of exiting the market (and not returning back to it). The name of the sensitivity should therefore be changed to "**Capacity-exit sensitivity**".

In order to build this sensitivity, ENTSO-E relies on the assessments of its members with respect to installed capacity. For instance, in some regions (e.g. Central European countries), numerous aged power plants are at risk of earlier retirement compared to the base case. In addition, in the sensitivity recent evaluations made by Member States on economic availability/mothballed capacity have not be considered by ENTSO-E. The report should at least explain in the annex the reason behind the different estimation in mothballed capacity. Unfortunately, these assessments are not necessarily performed on similar grounds among Member States, making any comparison between countries difficult. Additionally, it is not clear how the economic viability of the potential assets concerned is assessed.

As a matter of fact, this retirement sensitivity is only a step in the right direction in taking into account the supply side of the electricity market. EURELECTRIC believes that the risks surrounding installed capacity (e.g. market, economical, regulatory and technological risks) should be further integrated in the analysis by considering explicitly the risk factor "installed capacity" and by devising scenarios that are able to provide hints on the economics of existing and future power plants, DSM and storage.

2. Modelling of demand-side response

EURELECTRIC welcomes the fact that ENTSO-E has included explicit demand-side response for the first time in the mid-term adequacy forecast. This is an important step as it acknowledges the fact that demand response will play an increasing role in the future (see e.g. the key role devoted to consumers in the "Clean Energy for All Europeans").

Indeed, market-based demand response can provide considerable support for matching supply and demand in peak situations. Besides industrial and commercial users, domestic consumers are

[1] Page 47 of the consultation documentation

expected to react more and more to market prices based on smart metering and spot-based pricing. Batteries and electric cars could also provide additional resources in the future.

The proposed economic modelling of demand response corresponds to an **explicit demand response** per category of consumers (4 categories), triggered at a price level of 500 €/MWh and with a maximum number of activation hours. Unfortunately, no further details on the assumptions (categories, capacity available and volume called per category, maximum activation period per category, activation price per category, etc.) retained by country is available in the MAF 2017 report. Given the importance of demand response in contributing to the supply-demand balance in a power system with increasing volumes of intermittent renewables generation, further transparency should be provided. In addition, one should acknowledge that explicit demand response could occur at several activation prices, depending on the category.

It would also be interesting to better understand how **implicit demand response** is integrated by ENTSO-E in the load profiles used in the analysis. In particular, EURELECTRIC would like to warn against the risk of double counting demand response resources: demand response was operated implicitly in the past and could therefore be already considered within the demand saturation in cases of extremely temperature (which generally corresponds to high energy prices). EURELECTRIC calls therefore for more information about the modelling of demand (e.g. inclusion of thermal gradient, impact of implicit demand response in case of low/high prices, etc.).

3. Flexibility assessment

ENTSO-E has now embedded into the MAF 2017 report the **flexibility assessment** that was previously performed separately. Flexibility will become increasingly important to fulfil power system operators' needs with a growing share of intermittent renewables generation. It is indeed crucial to assess the need of system operators for flexibility.

However, in the context of the mid-term adequacy exercise, it could be interesting to consider the flexibility assessment when evaluating the level of reliable capacity needed to guarantee a certain level of adequacy.

As shown by ENTSO-E, the spatial aggregation and efficient use of interconnections have a positive impact on the ability of the system to cope with net demand ramps.

ACER's analysis[2] shows that the limited amount of cross-zonal capacity made available by TSOs is one of the most significant barriers to the further integration of wholesale markets. This is clear evidence that action must be taken to maximise cross-border transmission capacity released to the markets in a cost-efficient way. A better use of interconnections will contribute to the integration of higher shares of renewable energy sources and strengthen security of supply. As wholesale markets are increasingly interconnected and coupled, further progress is fundamentally needed to reach the objective of a truly integrated Internal Energy Market. A step-wise regional approach to system operation (i.e. meant to optimise regional welfare) is a key prerequisite.

The same reasoning holds true for system adequacy assessments and the level of cross-border interconnection capacity considered in the analysis. Overall, considering system operation and security of supply from a regional perspective should therefore be a key development to achieve a better system adequacy.

[2] ACER, Market Monitoring Report 2016

4. Alignment on assumptions

EURELECTRIC believes that the alignment of assumptions with other exercises performed by ENTSO-E is important, but that each exercise should also take into account the specificities of the underlying analysis.

For instance, the **net transfer capacities (NTC) or flow-based domains** are related to the level of physical interconnection capacities that are made commercially available to the market participants. The related parameter setting should account for potential countertrading actions triggered by TSOs when they cannot ensure system security with the capacities allocated within day-head coupling. For each interconnection, this level can evolve over time (e.g. winter versus summer) as well as a function of the system state (e.g. level of renewable generation, loop flows). Therefore, the assumptions on network capacities made in the Ten-Year Network Development Plan (TYNDP) should be further refined to cope with the additional needs and requirements of the MAF exercise.

One of the main elements in this MAF analysis is clearly the **demand forecasts** (levels, but also profiles) in the future. Unfortunately, the assumptions underlying the load / demand data are not fully transparent in the MAF report open for consultation. In particular, it is not clear whether all countries are basing their forecasts on coherent underlying assumptions for some key parameters (e.g. GDP growth, energy efficiency, etc.). EURELECTRIC believes that ENTSO-E should ensure consistency in the forecasts considered for the analysis and, if needed, propose a way forward for more harmonisation.

Finally, the demand assumptions should clearly analyze the effects of electrification of consumptions due to the decarbonization of our economy. In particular, the analysis should adequately consider its effect on total consumption, peak consumption and its correlation with extreme weather events.

5. Extension of Pan-European Climate Database (PECD)

The extension of the current climate database to the period 1982-2015 is an interesting aspect of the MAF 2017 report. By extending the time horizon of the historical dataset, it allows to capture more extreme weather events. At the same time, it could increase the computational time needed to perform the simulations

Therefore, the question is how the extended dataset could be appropriately used to devise the analysis of the weather-dependent risk factors (load, renewable generation, technical outages of thermal power plants etc.) without generating unnecessary computational overhead. In practice, the adequacy assessment of the supply-demand balance at European level requires an important amount of data and could become computationally very intensive. For this reason, the scenario building process should not be overlooked.

In practice, the answer in the specific case of the MAF 2017 exercise is not clear – what has been the added value of the extended database compared to the former database?

- ENTSO-E needs to illustrate the impact of this extension of the Pan-European Climate Database (extension of the period of time and growing number of scenarios) on the results. Are the conclusions really so different?

5. From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

EURELECTRIC welcomes the methodological enhancements brought by ENTSO-E to the MAF 2017, but in order to be as close as possible to the reality, some methodological improvements are still needed e.g. on demand and supply-sides assumptions, decentralized generation, storage and hydro assets and adequacy metrics.

1) Demand-side assumptions

EURELECTRIC believes that ENTSO-E should define a consistent methodology for the demand forecasts and assumptions provided by national TSOs. This would include among others an alignment on the macro-economic assumptions (e.g. coherent GDP or demography growth rates), on the energy efficiency gains, on the prosumer development, etc. across countries.

As a prerequisite for any adequacy assessment, it is crucial to define a consistent methodology for demand forecasts in order to obtain a more accurate/rigorous/coherent view on the level of demand that will need to be met (e.g. see our earlier suggestions for methodological improvements). If possible, it would be very valuable to include sensitivities based on different reliability standards and electricity demand growth pattern due to decarbonisation. This would allow a better understanding on how the desired level of adequacy influences the level of firm/reliable capacity needed.

2) Supply-side assumptions

The supply-side assumptions are extremely important when assessing system adequacy as they represent the "second leg" in the reasoning. ENTSO-E should therefore take some care when devising the capacity assumed to be reliable in the future, and perform a sensitivity analysis when needed. In addition, we observe that the data on capacity do not always fully reflect current auction results and Member States plans on RES development. The report should at least explain in the annex the reason behind the different estimation on the supply-side.

In particular, and given the energy transition, ENTSO-E should make sure that the capacity considered as reliable in the future is also economically viable. Otherwise, the analysis could rely on some capacity that might not be present at that moment in time and – a fortiori – that cannot contribute to security of supply. This would significantly lower the expected system adequacy.

In the current exercise, only two scenarios for the supply-side are considered (base case and mothballing sensitivity). While the sampling of planned/unplanned outages is considered in the Monte-Carlo approach, EURELECTRIC believes that additional sensitivities should be considered.

3) Decentralised generation

Given the ongoing energy transition, **decentralised generation** is expected to play a more and more important role in the future electricity supply-demand balance. It is therefore extremely important for ENTSO-E to be able to rely on accurate figures for existing capacity (and related generation) of decentralised generation as well as for the expected developments (coherent with other assumptions, like RES deployment targets). This also requires other actors in the electricity system (like DSOs) to provide more visibility and transparency on the potential impact of their

activities on system adequacy (e.g. aggregated information on “prosumers” connected to the grid, both in terms of type, capacity, generation, etc.)

4) Storage / hydro assets

Hydro management should be better integrated in the analysis, as proper simulations of hydro stock management over the year are a must. In this regard, EURELECTRIC welcomes the willingness of ENTSO-E to represent better hydro infeeds in the climate scenarios.

The MAF 2017 remains silent on storage and batteries. EURELECTRIC believes that it is essential to tackle these issues. Indeed, storage could provide additional resources in the future. In the current MAF, distributed storage capacities are only implicitly modelled. A more explicit modelling would be welcome in the next editions of the MAF to explore the economic potential that is unexplored today.

5) Adequacy metrics

As highlighted by EURELECTRIC during the consultation process on the MAF 2016 report, the set of adequacy metrics considered has to be complemented by at least the following ones:

- The total need for reliable/dispatchable capacity per country (MW) for each scenario as a function of the local adequacy criteria (see Q7)). In EURELECTRIC’s view, adequacy forecasts should mostly focus on defining the level of reliable/firm capacity that is needed in the mid to long-term to satisfy a predefined reliability standard and the estimates of demand. This metric would help the various stakeholders in the market to assess the need for additional investments/divestments based on their own view on the development of existing assets. In addition, it could become instrumental in setting up the capacity demand in capacity remuneration mechanisms. Providing such a metric would also avoid having ENTSO-E struggling with the assumptions on commissioning/decommissioning of assets. In practice, this key performance indicator is a by-product of the analysis of residual load (= load – intermittent renewable generation) and should therefore be readily available within the existing process with low efforts.

- The capacity surplus / deficit (MW) in terms of how much firm capacity is achieved within each bidding zone and for each scenario in comparison with the needed capacity.

6) Transmission capacities with third countries

- In the MAF 2017 imports and exports with third countries are based on statistical analysis and static assumptions. Hence, the price dynamics are ignored. We encourage ENTSO-E to include price dynamics also for imports and exports with third countries to achieve more realistic flow patterns.

6. To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?

See answer to Q3.1 in consultation 2016

It is logical that ENTSO-E does not have full visibility on availability/decommissioning/ mothballing of power plants for the next 5 to 10 years. Generators do not have such a view either. Beyond 3-5 years, there is probably no perfect overview on the evolution of the power plants' park. One should therefore rely on assumptions and scenarios on installed capacity, based on energy policy (nuclear, coal-fired assets), on market fundamentals (coal and gas-fired assets), on RES targets (renewable capacity), etc.

In our opinion, requesting only owners of large (>100 MW) power plants or "system-relevant" generators to report their decommissioning/mothballing plans would be of limited added value:

- The data collected would be unreliable: recent major market shifts (like renewable expansion leading to wholesale prices collapsing below marginal costs, or the gas price decrease putting pressure on lignite operators, or the depressed price of carbon due to the excess of EU ETS allowances) are hard to anticipate properly. Providing decommissioning/mothballing plans years in advance would therefore not make sense given that so many changing economic conditions and regulatory interventions make data very likely open to variation and therefore unreliable.
- The data collected would be incomplete: the trend towards more and more decentralised generation (wind, solar, small scale CHP etc.) in the future should be duly taken into account as these assets may increasingly contribute to security of supply. In general, the future developments for these technologies and the amount of installed capacity are even less clear than the prospects for larger assets. ENTSO-E should therefore get from the DSOs all the relevant information on existing/expected decentralised capacity/generation connected to their distribution grids.
- The data collected are commercially sensitive information: such information is commercially sensitive and would therefore not easily be shared by market participants without strong guarantees on the confidentiality rules to be applied.

Instead, we would encourage TSOs and National Regulatory Authorities to closely follow future changes of generation capacity to have aligned national views on capacity development. It is also our understanding that estimates of decommissioning plants will be included in the national plans that member states should submit to the European Commission as part of the Energy Union's governance framework.

However, we are convinced of the necessity to include proper sensitivities on the supply side (including in particular high-level economic sensitivities/elements) in adequacy studies. In particular, we believe that the economic assessment should rather be based on the economic position of 'classes' of power plants (e.g. CCGTs) and taking assumptions on a level of mothballing based on economic viability; e.g. a top-down approach looking at aggregate availability/mothballing instead of a bottom-up approach looking at individual power plants (such decisions may also be interdependent on other plants, so we believe it is not advisable to look at each plant individually). It is also sensible to use contrasted economic scenarios and to double-check that each scenario is economically consistent with the "economic presence / survival" of the plants needed to ensure adequacy. ENTSO-E does not need the data from market parties to make relevant sensibilities studies.

Reliable scenarios needed: Were these assumptions appropriate, precise and relevant considering the results? EURELECTRIC believes that ENTSO-E could provide some "look-backs" on

the previous exercises (assumptions and results) in order to explain the improvements/corrections/additions/etc. made for each Member State and how they have been affecting the outcome of the exercise.

7. A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

Member States shall have a reliability standard in place indicating their desired level of security of supply in a transparent manner. All Member States (not only those having a capacity mechanism) should define and publicly disclose their desired level of security of supply target, based on harmonised metrics. While the choice of adequacy metrics should be harmonised, each country should be free to set its desired level of adequacy.

Security of supply is a subsidiarity issue belonging to Member States. Therefore, EURELECTRIC believes that ENTSO-E should not choose a common European reliability target to be used in MAF as a reference. In other words, ENTSO-E should be able to assess the key performance indicators related to reliability standards, but each Member State should define its own threshold against which the ENTSO-E assessment should be compared.

8. Please tell us below if you have other suggestions

More transparency: EURELECTRIC acknowledges that transparency has well improved. Nevertheless, in general, we believe that the MAF 2017 report does not provide sufficient transparency on the parameter values used to obtain the presented results. It is necessary that ENTSO-E provides full information on assumptions regarding generation portfolios, demand features and cross-border exchange capabilities under each scenario. For example, the current dataset provides installed capacity by plant type but does not provide information about planned and forced outage rates, the size of operational reserves, the capacity factors and total generation (which makes it difficult to cross-check the results against the provided demand or other sources). Similarly, a key sensitivity of MAF is based around operational reserves contributing to adequacy or not. The published dataset however, does not provide information about the size of reserves used for each country.

Numerical results for the reliability indices should be provided in appendix for all the scenarios considered (including the mothballing scenario). Along with the reliable/firm capacity needed, the reliability indices are important outcomes of this adequacy assessment exercise and give important message to investors and policy makers.

The report does not contain any information on how simultaneous scarcity situations are modelled: the management of such events could have an impact on the adequacy assessments of adjacent countries/zones.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

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Submitted to **Mid-term Adequacy Forecast 2017**
Submitted on **2017-11-10 14:50:36**

Introduction

1 What is your name?

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Consultation questions

4 From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

improvements :
Edison supports the coherence of time horizon and dataset considered in the MAF with the ones used in the TYNDP scenarios development process. These scenarios are a first attempt to develop a comprehensive set of mid- and long-term scenarios that result from a joint effort of both power and gas sector. We believe that using the TYNDP mid-term scenarios for the MAF 2017 is a positive methodological approach for guaranteeing coherence of future expectations. However, as also stated in Edison's response to the TYNDP 2018 scenarios consultation, the data provided for the considered scenarios do not give the possibility to operate quantitative evaluations, in terms of assumptions and results, not enabling operators' further assessments and comparisons. Edison thinks that mothballing sensitivity may be a support for national decisions, since it provides a "pessimistic" view of the future adequacy level of European electrical system, for example in case an economic unfavorable condition or the absence of a capacity market cause a massive production plants decommissioning and their consequent exit from the market. Nevertheless, we deem as fundamental that another assessment, complementary to the 'mothballing' sensitivity analysis, should be carried out, in which the capacity markets already consulted on a national level and in an advanced state of approval are introduced and modelled according to the last publicly available information on the mechanism functioning and expected results. For instance, in the Italian case, it would have been interesting to complement the base case scenario and the mothballing sensitivity analysis with an assessment in which the foreseen Italian capacity mechanism was actively supporting production plants on the national territory in 2020 and, more importantly, in 2025, when the capacity mechanism introduction would certainly have started to influence the Italian and neighboring countries system adequacy.

5 From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

additional improvements:

6 To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?

reliable scenario:

7 A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

reliability standard:

8 Please tell us below if you have other suggestions

other suggestions:
Edison welcomes the consultation on Mid-Term Adequacy Forecast 2017 (MAF 2017), which constitutes ENTSO-E's analysis of power resources adequacy of the electricity system on a pan-European level. We agree on ENTSO-E's approach to consider the MAF as a tool to complement national assessments in order to enhance the overall quality of adequacy analysis and the corresponding investment decisions. We strongly believe that only a joint analysis based on adequacy assessments at national level and at European level represent a good balance between higher granularity and detailed elements inclusion of national data and a

comprehensive view of the benefits of European electrical systems interconnection. Prot. AFIR-Ing.ele/EF-ib/51-17

Response ID ANON-VACD-G7SX-7

Submitted to **Mid-term Adequacy Forecast 2017**
Submitted on **2017-10-09 13:04:47**

Introduction

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Consultation questions

4 From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

improvements :
Mothballing sensitivity - but the high LOLE does not follow, since mothballing will go hand-in-hand with new-build (RES+DSR+storage+interconnector)

5 From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

additional improvements:
A scenario on "accelerated coal phase-out".

6 To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E’s visibility to this information and on how to ensure the reliability of these assumptions?

reliable scenario:
"Mothballing" scenarios need to also assume "high renewables+DSR+storage" because governments will not allow old plant to close unless there is something to replace them.

7 A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

reliability standard:

8 Please tell us below if you have other suggestions

other suggestions:

Response ID ANON-VACD-G768-A

Submitted to **Mid-term Adequacy Forecast 2017**
Submitted on **2017-11-10 17:23:08**

Introduction

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Consultation questions

4 From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

improvements :
ENTSO-E embarked on the ambitious project of developing a pan-European model to assess resource adequacy in 2016 for the first time, in response to requests from stakeholders. Considering the scope of the exercise, we consider that the MAF is still largely work in progress . The new report contains some significant improvements (e.g. flexibility assessment, some centralised assumptions such as fuel prices). However, the assessment still requires further improvements to ensure it is fit-for-purpose to monitor security of supply, aligned with the role it's expected to play from the medium-term. The transparency of the assessment needs to improve significantly to make it a useful document for market participants and stakeholders. Overall the MAF 2017 is a conservative assessment of the risks to security of supply. This is particularly demonstrated by the mothballing sensitivity considered in the assessment. Specifically, this sensitivity assumes several GWs of thermal capacity to mothball across Europe at the same time; for example around 15 GW is assumed to mothball across France, Germany and Poland in 2020 and 2025. The assessment seems to largely ignore market economics. This is more pronounced in the case of Poland, where about 6 GW of plant is assumed to mothball in 2025, despite already tight margins in the Base Case modelled by ENTSO-E . One would expect prices to increase significantly under such conditions of tightness, thus increasing profitability for plant and creating clear incentives for them to remain in the market (or other resources, such as demand response/storage/new generation to come forward). This is also true for plant from neighbouring countries; even though the risks for Germany and France remain quite limited, even after the assumed mothballs, market conditions in Poland (i.e. higher prices) could create opportunities for plant to stay in the market in order to exploit these higher prices. In this regard, ENTSO-E's assessment seems to be a collation of different national scenarios developed in isolation, without consideration of the interactions between market players in different bidding zones. In addition, interconnection assumptions are based on individual TSO assumptions about NTC values and as stated by ENTSO-E "represent a more conservative approach" about the availability of interconnectors. ENSTO-E assumes limited availability of interconnectors, based on TSO inputs, in its assessment to reflect the need to comply with internal grid stability and operational constraints. The report however provides no information to support the credibility of these assumptions nor detailed information about the availability of ICs for SoS purposes (see also response to question 8). Once again, these assessments seem to reflect individual, national views, instead of assumptions based on coordinated efforts by ENTSO-E and TSOs to better understand the possible evolution of the sector. The assessment presents the results of a Base Case, the average value and 95th percentile for the risk metrics, and a mothballing sensitivity. As it is important to explore and report the downside risks (i.e. risks of developments being worse than in the average case), it is equally important to explore and report what could be better than in the average case. In other words the MAF should be a neutral, technical assessment of the risks to security of supply. For example, the assessment could explore the possibility of demothballing (due to better functioning of the markets following the implementation of the proposals by the European Commission in its CE4All package) or higher interconnection due to faster and deeper market integration. In this regard it is positive to see ENTSO-E's intention to include economic modelling in their tools for the MAF. The analysis presents a best view approach for 2025 complemented by one sensitivity. As uncertainty several years out can be significant, it is questionable whether a best view approach can adequately capture the risks in this timeframe. Similar assessments tend to use scenario analysis to capture the risks under uncertainty over the evolution of the power sector. We would welcome some explanation by ENTSO-E as to the advantages and disadvantages of the two approaches. MAF 2017 has improved significantly in some areas. This includes the analysis on flexibility, which is something that was undertaken in the former SO&AF's but was missed in last year's, first MAF. This assessment will be extremely important in the future as more variable renewable generation is deployed, to assess the needs in flexibility. In another positive development ENTSO-E has developed some common assumptions (e.g. fuel prices) to be used by all TSOs; this should help to improve consistency of the scenarios.

5 From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

additional improvements:
It is not clear from the current document whether the methodology applied is suitable use in regional studies. It would be useful if ENTSO-E clarifies this point.

6 To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability

of these assumptions?

reliable scenario:
The current approach used by ENSTO-E to build the European scenarios is based on inputs from national TSOs, which seem to be taken in isolation rather than collectively. We are also concerned that the current approach does not include any review and challenge process of the assumptions. We feel there is significant value for ENTSO-E or regional entities, such as the RSCs (or the future entities that will replace them), to act as a platform for the sharing of information and for a more collective build-up of the scenarios (e.g. coordinated maintenance schedules). We also believe that ENTSO-E (or again regional entities) should have a greater reviewing role of the national scenarios, to ensure that inconsistencies are eliminated. In order to improve the credibility of the scenarios, ENTSO-E and TSOs should first build up their internal capacity to assess the credibility of information provided by stakeholders. A step in this direction would be to create appropriate market models that assess the economic viability, potential, etc. of different resources. It is not obvious how the current approach of the assessment takes into account market economics, e.g. generation assumptions seem to be based on information provided by generators. However it should be recognised that generators (or other resources) have certain business interests and as such an interest in influencing the results in order to benefit their businesses. We welcome ENTSO-E's intention to include economic modelling in its future assessments. To build appropriate scenarios, stakeholders should also be consulted appropriately. While the MAF is consulted early in the development phase of the annual report, there is a lack of further consultations throughout the year (e.g. on the draft MAF scenarios). We are also concerned that national scenarios are not always consulted with stakeholders in all Member States (we also note here that resources/literature for the national scenarios is only provided for a limited number of countries). ENTSO-E can add unique value by working as a platform to share best practice amongst national TSOs and ensure that the data used in its assessment have been appropriately consulted at the national level.

7 A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

reliability standard:
The reliability standard is meant to capture the willingness of consumers to pay for an uninterrupted service. This can vary per country/bidding zone and as such it should be estimated at the relevant level. A uniform standard across Europe would be too aggregated and fail to properly capture the value consumers put on electricity in different member states (e.g. a country with a large share of energy intensive industry is expected to have a higher VoLL than one with high residential demand). We agree with the EC's proposal as per the proposed Electricity Regulation, which sets out that ENTSO-E should develop a methodology for estimating the reliability standard, to be approved by the Agency, and hereafter this should be applied at the MS/bidding zone level. It is not clear from the MAF document why the reliability standard affects the assumptions of the assessment.

8 Please tell us below if you have other suggestions

other suggestions:
ENTSO-E states that the EU wide assessment needs to be complemented by regional and national assessments. We agree that regional assessments have merit in complementing a pan-European assessment, especially as an appropriate, next step from the current practice of national assessments (a European wide assessment could be the ultimate goal once regional assessments have been developed and established, and if an EU-wide assessment is proven to add value to regional ones). On the other hand national assessments are incapable of appropriately assessing the contribution of interconnectors (often make static or oversimplified assumptions about IC flows), and add little value in the current and increasingly integrated European power market. National assessment cannot model neighbouring countries in detail, demand and supply, and therefore cannot assess the complementarity between them, the extent to which the generation mix or load of two countries is complementary (e.g. where peak demands occur at different times of the day), and the potential risk of simultaneous stress periods. As such they are inferior to regional assessments in assessing security of supply. This view is also recognised from several TSOs across Europe that have been at the forefront of developing regional assessments (see for example PLEF region, and the Nordic region which is due to complete its first regional assessment this year). We believe that ENTSO-E should focus its efforts in the short-term in developing more detailed regional studies in the context of the EU-wide assessment, in close collaboration with TSOs and RSCs. Regional assessments would also help to further harmonise the treatment of data and assumptions and contribute to knowledge sharing. A further suggestion is to improve the transparency and data provided. The data currently provided is extremely limited. For example the spreadsheet provided by ENTSO-E contains information only on the assumed installed capacity of different generating technologies, annual demand and incremental demand through new loads (EVs and HPs). On the other hand, it contains no information about peak demand levels, DR achieved, plant availability, IC contribution, etc., nor it contains the results of the modelling (these are only presented in the report). Given that this information is available and used in the model, we recommend that the data of the PEMMDB becomes publicly available (if confidential commercial information is an issue, data could be aggregated in a way, like in the main report, that does not reveal any confidential information). While demand side response has been incorporated in this year's analysis, the information around the way it is taken into account is very limited. There is no information about the DR assumed/achieved in the scenarios, the rationale behind these assumptions, any sectoral information (e.g. DR in the industrial sector) nor any analysis of the potential for the development of DR. The same is true for energy efficiency which hardly appears in the entire document, however is one of the most important resources for the future. As it has been recommended by ACER, NRAs and other market stakeholders, and currently proposed by the EC in its CE4All package, ENTSO-E's assessment needs to appropriately take the demand side into account for future assessments; it is not clear how the current assessment achieves this objective. On page 36 of the main report you state that "widespread use of electrical heating and cooling has a significant impact on the electrical demand". It would be really useful to see more analysis around this (e.g. demand/temperature sensitivity across Europe/regions/MSs).

Response ID ANON-VACD-G7SE-M

Submitted to **Mid-term Adequacy Forecast 2017**
Submitted on **2017-11-10 13:47:25**

Introduction

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3 What is your organisation?

Organisation:
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Consultation questions

4 From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

improvements :
EDF welcomes the improvements introduced in this new ENTSO-E adequacy report compared to the MAF 2016. All evolutions introduced this year improve the quality of previsions and give a better perspective of risks of shortages.First, EDF appreciates the wider sample of climatic scenarios and the improved correlations between climatic conditions and RES production. This improves ENTSOE's previsions, notably for the assessment of values at risk P95. EDF believes that it is necessary to maintain such a diversity of situations for the next MAFs, for which the sample could be extended to account for more recent years. Second, EDF believes that "mothballing" sensitivity is a critical improvement of ENTSOE's methodology. In its response to the consultation on the MAF 2016, EDF advocated the introduction of alternative scenarios with an evolution of the generation fleet depending on the economic viability of each technology in each bidding zone. The "mothballing" sensitivity considers that a subset of the capacities considered in the base case scenario, identified by their respective TSO, will be mothballed regardless of wholesale prices. EDF believes that ENTSO-E should build a more consistent vision on mothballing and economic decommissioning, by considering the number of running hours of each technology in the reference scenario and applying a predefined ratio of exit capacity for each technology to determine how much capacity is likely to be exiting the market (e.g. 100% of CCG is likely to exit if the installed capacity of this technology runs less than 500 hours per year in average, 50% is likely to decommission if it runs less than 1000 hours in average, 10% if runs less than 3000h, 0% if it runs more than 4000 hours in average). The advantage of such an approach is that it requires no additional information than what is already handled by ENTSOE in the framework of the MAF. It does not require any setting for fixed costs of each technology, nor any early notification by market participants of their potential plans to exit specific capacities although final decisions are generally made with a shorter notice. Generation companies could certainly be consulted to set the right formulas for each technology. In EDF's point of view, a scenario based on such an approach could become ENTSOE's best medium-term forecast ahead of the base case which is poorly suited to situations where several capacities are likely to exit. Finally, EDF welcomes the modelling of explicit demand response. However, in order to give the right picture on the expected level of security of supply, ENTSO-E should more clearly distinguish the level of implicit demand response considered in the demand forecasts. Indeed, explicit and implicit demand response frequently compete for the same resource and cannot be cumulated. Regarding the MAF 2017, EDF understands that the calibration of thermo-sensitivity parameters is based on historical records of demand, which include, in particular for France, a significant reduction of demand in periods with high energy prices (strongly related to extremely low temperatures) through implicit demand response programs such as the EJP mechanism in France. It is important that this factor is acknowledged and considered equally with the explicit demand response included in the scenarios.

5 From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

additional improvements:
EDF believes that ENTSO-E could build a vision on exit capacity (mothballing and economic decommissioning) based on the number of running hours of each generation, storage, and demand response technology. As detailed previously, this proposition would be easily implementable as it requires no additional data compared to the current approach. EDF suggests to be more transparent concerning the methodology in the next MAFs, notably for: - The management of hydro stocks and the management of stocks in general. This would be useful to better understand the modelling of markets, and how operational decisions are modelled with respect to the management of resources with limited stocks. - The characteristics of specific assets such as explicit demand response in terms of variable costs, duration and potential. ENTSO-E modelled the hourly residual load ramps of dispatchable units, which characterizes a specific need of system operators. A new indicator which would highlight the number of hours of LOLE due to insufficient ramping capability would be interesting indeed. Finally, EDF understands that ENTSO-E is assessing the possibility of including Flow-Based modelling for the future MAFs. EDF is not convinced that a flow-based approach is appropriate to analyze the generation adequacy. Regardless of the interconnection capacity modelling (NTC or Flow-Based), the main challenge remains setting the right value for every parameter. While the number of parameters is relatively limited for NTCs, it can be much higher with a Flow-Based representation. This can lead to potentially erroneous results if the Flow-Based domain is approximately defined. In addition, historical data of flow-based domains remains limited: most of countries do not have historical data and there is little experience of Flow-Based during critical periods. EDF calls therefore for a parallel run of Flow-Based and NTC in the MAF during several years before switching definitively to a flow-based approach.

6 To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?

reliable scenario:
Lots of countries have a national plan that provides complementary information on the evolution of energy mix over the medium term. ENTSO-E should compare its scenarios with these national targets. It might be relevant to highlight the trend in the evolution of forecasts from one year to another, and to report statistics on the forecast accuracy for each parameter and by each TSO for past delivery years.

7 A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

reliability standard:
The definition of reliability target is a prerogative of the Member States. ENTSO-E is not legitimate to set a single reliability target in Europe.

8 Please tell us below if you have other suggestions

other suggestions:

Response ID ANON-VACD-G7S9-8

Submitted to **Mid-term Adequacy Forecast 2017**
Submitted on **2017-11-10 13:14:13**

Introduction

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Consultation questions

4 From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

improvements :
As pointed out by ENTSO-E, several improvements have been implemented in the mid-term adequacy forecast exercise over the last year. In practice, the following comments should nevertheless be raised. 1) Mothballing sensitivity ENTSO-E is performing a sensitivity on the installed capacity by considering mothballing. According to the explanation provided, “mothballed capacity should here always be understood as generation capacity that is at risk of being unavailable due to economic or policy reasons” (page 47). The use made by ENTSO-E of this mothballed capacity illustrates well the retirement risk for economic reasons faced by some assets. In theory, capacity mothballed for economic reasons could, after some time, be either returned to the market (de-mothballing) or definitively exit the market (decommissioning). In some cases, mothballing can also occur on a periodic basis, e.g. units that are mothballed part of the year to save costs. In the analysis performed by ENTSO-E, the “generation capacity at risk of being mothballed” represents in reality the amount of capacity at risk of exiting the market (and never returning back to it). ENGIE therefore believes that the name of the sensitivity could be changed to “Retirement sensitivity” to clarify the situation. In order to build this sensitivity, ENTSO-E relies on the assessments of its members w.r.t. the installed capacity. For instance, in some regions (e.g. Central European countries) a high number of aged power plants is at risk of an earlier retirement compared to the base case. It would be important to clarify how these assessments are performed by the various members of ENTSO-E and whether their outcomes are comparable. The absence of this information makes the comparison and the impact assessment between countries difficult. Additionally, it is not clear whether and how the economic viability of the potential assets concerned by this sensitivity is really assessed by the various TSOs. As a matter of fact, this retirement sensitivity is a step in the right direction. Although it partly takes into account the supply-side of the electricity market in the analysis of the supply-demand balance, using only this sensitivity is not enough. ENGIE believes that the risks surrounding the installed capacity (e.g. markets risks, economic risks, regulatory risks, technological risks, etc…) should be further integrated in the analysis by considering explicitly the risk factor “installed capacity” and by devising appropriate scenarios on its development. In particular, an assessment of the economic viability per type of assets, as performed e.g. in the market monitoring report of PJM in the US, would contribute to the setting-up of improved retirement sensitivities. 2) Modelling of demand-side response ENTSO-E has added demand-side response for the first time in the mid-term adequacy forecast. This is an important step as it acknowledges the fact that demand response will play an increasing role in the future, see e.g. the key role devoted to consumers in the “Clean Energy for All Europeans” package proposed by the European Commission. Indeed, market-based demand response can provide considerable support for matching the supply and demand in peak situations. Besides industrial and commercial users, domestic consumers are expected to react more and more to market prices based on smart metering and spot-based pricing. Batteries and electric cars could also provide additional resources in the future. The proposed representation of demand response corresponds to an explicit demand response (reduction of demand) per category of consumers (4 categories), triggered at a price level of 500 €/MWh and with a maximum number of activation hours. Unfortunately, no further details on the assumptions (categories, capacity available and volume called per category, maximum activation period per category, activation price per category, etc…) retained by country is available in the MAF2017 report. Given the importance of demand response in contributing to supply-demand balance in a power system with increasing volumes of intermittent renewable generation, further transparency should be provided. Also demand reduction is usually followed by a rebound effect. The time between activation and rebound (often given by inertia or process related) might be short and hence for an extended peak period demand response might be of reduced value. For instance, demand response could be modelled as a storage that needs to be refilled in an application specific time. ENGIE considers this modelling of demand response as more relevant. It would also be interesting to better understand how implicit demand response is integrated by ENTSO-E in the load profiles used in the analysis. In addition, it should be noted that demand response can correspond to a reduction of demand when prices are high, but also to an increase of demand when prices are low. It is not clear whether this dynamic has been taken into account in the analysis. 3) Flexibility assessment ENTSO-E has now embedded into the MAF2017 report the flexibility assessment that was performed separately before. Flexibility will become increasingly important in a power system with a growing share of intermittent RES generation. It is indeed crucial to assess the need for flexibility of the power system. However, in the context of the mid-term adequacy exercise, it is not clear how this flexibility assessment should be taken into account when studying the level of reliable capacity needed to guarantee a certain level of adequacy. As shown by ENTSO-E, the spatial aggregation and the efficient use of interconnections have a positive use on the ability of the system to cope with the need for flexibility. In practice, this means that a further integration of some tasks of the TSOs (e.g. capacity calculation of interconnection capacity made commercially available to the market) should happen at a regional level. In this respect, the concept of “Regional Operational Centres” proposed by the European Commission in its “Clean Energy for All Europeans” package is clearly the right move into the right direction. This will be one of the key enablers of an efficient energy transition, which requires the best use of the electricity infrastructure by the market players. 4) Alignment on

assumptions ENGIE believes that the alignment of assumptions with other exercises performed by ENTSO-E is important, but that each exercise should also take into account the specificities of the underlying analysis. For instance, the net transfer capacities (NTC) are related to the level of physical interconnection capacities that are made commercially available to the market participants. For each interconnection, this level can evolve over time (e.g. winter vs summer) as well as a function of the system state (e.g. level of renewable generation, loop flows). Therefore, the assumptions on network capacities made in the Ten-Year Network Development Plan (TYNDP) should be further refined to cope with the additional needs and requirements of the MAF exercise. The interconnection capacities considered in this exercise should also be in line with the capacity made available to market players. We understand that this is difficult since TSOs have difficulties to give a clear methodology for commercially available capacity even in day ahead, but this is really at the core of the problem. One of the main elements in this MAF analysis is clearly the demand forecasts (levels, but also profiles) in the future. Unfortunately, the assumptions underlying the load / demand data are not fully transparent in the MAF report open for consultation. In particular it is not clear whether all countries are basing their forecasts on coherent underlying assumptions for some key parameters (e.g. GDP growth, energy efficiency, etc.). ENGIE believes that ENTSO-E should ensure consistency in the forecasts considered in the analysis and, if needed, propose a way forward for more harmonization. This is particularly important in a context of increasing electrification of heating and transport since not only the demand level is changing but also the demand profile. 5) Extension of Pan-European Climate Database (PECD) The extension of the current climate database to the period (1982-2015) is an interesting aspect of the MAF2017 report. By extending the time horizon of the historical dataset, it allows to capture more extreme weather events. At the same time, it could increase the computational time needed to perform the simulations. Therefore, the question is how the extended dataset could be appropriately used to devise the analysis of the weather-dependent risk factors (load, renewable generation, technical outages of thermal power plants,…) without generating unnecessary computational overhead. In practice, the adequacy assessment of supply-demand balance at European level requires an important amount of data and could become computationally very intensive. For this reason, the scenario building process should not be overlooked… In practice, the answer in the specific case of the MAF2017 exercise is not clear – what has been the added value of the extended database compared to the former database ?

5 From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

additional improvements:
Ensuring a proper level of system adequacy during the (ongoing) energy transition, not only in the short term but also in the long term, is extremely important to contribute to its success. ENGIE would like to emphasize two structuring elements regarding mid-term adequacy forecast studies. The first element is related to the need to have robust forecasts for demand, consistent across all European countries (e.g. based on a coherent set of macro-economic assumptions) and including also a proper sensitivities on some key underlying parameters (e.g. economic activity, energy efficiency, level of decentralized generation, etc.). On this aspect, ENTSO-E has a clear and important role to play, both in terms of coordination but also of content. The second element is related to the decommissioning of existing assets, not only for technical reasons (e.g. end of lifetime, environmental constraints, etc.) but also for economic reasons (e.g. thermal assets not covering their fixed costs). Although getting a proper view on this aspect is more complex, ENGIE emphasizes the fact that ENTSO-E should certainly provide as a key outcome of its system adequacy assessment the level of reliable capacity needed to ensure targeted adequacy criteria (in each country). *** 1) Demand-side Assumptions ENGIE believes that the on-going energy transition requires regional adequacy assessments to be performed on a sound basis. One of the main elements in this analysis is clearly the demand forecasts (levels, but also profiles) in the future. Unfortunately, the assumptions underlying the load / demand data are not fully transparent in the MAF report open for consultation. In particular it is not clear whether all countries are basing their forecasts on coherent underlying assumptions for some key parameters (e.g. GDP growth, energy efficiency, etc.) and which structural changes are included in the (future) consumption patterns as a consequence of the energy transition. ENGIE believes that ENTSO-E should ensure consistency in the forecasts considered in the analysis and, if needed, propose a way forward for more harmonization. 2) Supply-side Assumptions The supply-side assumptions are extremely important when assessing system adequacy as they represent the “second leg” in the reasoning. ENTSO-E should therefore take some care when devising the capacity assumed reliable in the future, and perform a sensitivity analysis when needed. In particular and given the energy transition, ENTSO-E should make sure that the capacity considered as reliable in the future is also economically viable. Otherwise, the analysis could rely on some capacity that might not be present at that moment in time and – a fortiori – that cannot contribute to security of supply. This would significantly lower the expected system adequacy. In the current exercise, only two scenarios for the supply-side are considered (base case + “mothballing sensitivity”). While the sampling of planned/unplanned outages is considered in the Monte-Carlo approach, ENGIE believes that additional sensitivities should be considered. 3) Decentralized Generation Given the on-going energy transition, decentralized generation is expected to play a more and more important role in the future electricity supply-demand balance. It is therefore extremely important that ENTSO-E could rely on accurate figures for existing capacity (and related generation) of decentralized generation as well as for the expected development (coherent with other assumptions, like RES deployment targets). This also require other actors in the electricity systems (like DSOs) to provide more visibility and transparency on the potential impact of their activities on the system adequacy (e.g. aggregated information on “prosumers” connected to the grid, both in terms of type, capacity, generation, etc…). 4) Storage / Hydro Assets Taking into account the dispatch flexibility provided by centralized as well as decentralized storages is critical for the reliability appraisal, esp. with more and more renewable resources such as solar and wind generation. For instance, the hydro resources in Europe (e.g. located in the Alps, Norway, Spain, Italy, etc) could economically adapt their dispatch throughout the year(s) according to the expected risk of unsatisfied demand (scarcity). ENGIE shares the observation of ENTSO-E that more efforts should be devoted to an accurate representation of storage in this adequacy assessment. It is worth pointing out that some of the tools used (e.g. Bid3, Plexos) seem to have the proper features to deal with such a dynamic modelling of storage. ENGIE believes that ENTSO-E should provide more details on how these features are (or will be) used and to which extent an appropriate management of storage could contribute to security of supply. 5) Adequacy metrics The set of adequacy metrics considered in the MAF2017 report has to be complemented by at least the following ones: a) The total need for reliable/dispatchable capacity per country (MW) : distribution, average, median, p95, standard deviation… In EURELECTRIC’s view, adequacy forecasts should mostly focus on defining the level of reliable/firm capacity that is needed in the mid to long-term to satisfy a predefined reliability standard and the estimates of the demand. This metric would help the various stakeholders in the market to assess the need for additional investments/divestments based on their own view on the development of the existing assets. In addition, it could become instrumental in setting up the capacity demand in capacity remuneration mechanisms. Providing such metric would also avoid having ENTSO-E struggling with the assumptions on commissioning/decommissioning of assets. In practice, this key performance indicator is a by-product of the analysis of the residual load (=load – intermittent renewable generation) and should therefore be readily available within the existing process with low efforts. b) The capacity surplus / deficit (MW) : distribution, average, median, p95, standard deviation… 6) Interconnections: In a highly interconnected electricity system, the availability of interconnections can influence the system adequacy of a country or a region significantly. In the current exercise, interconnections are considered according to an ATC approach. ENGIE believes that a better representation of the flow-based market coupling, including a link between meteorological conditions (cfr wind and solar production) and the network availability, would be helpful. It is also important to challenge the assumptions retained for interconnection capacities with the interconnection capacities commercially available in practice for the market players. For instance, Elia is assuming 4500 MW of simultaneous maximum import capacity for 2017 in its 2016 generation adequacy assessment, but less than 3000 MW are actually available under stress conditions. This kind of difference between theoretical assumptions and real figures could create discrepancies in the analysis, underestimate the actual need for firm capacity and put security of supply at risk.

6 To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?

reliable scenario:
The fact that ENTSO-E does not have full visibility on availability/decommissioning/ mothballing of the power plants for the next 5 to 10 years is unfortunate, but obviously normal in the European market context. In practice, it goes beyond the information available on transparency platforms and the requirements for transparency set on market players. Second, the market players themselves do not have a precise view for their own assets over this time horizon, except for some specific assets (e.g. nuclear) or given specific constraints (e.g. technical lifetime, Industrial Emission Directive compliance). Regarding mothballing, ENGIE recommends that market-based capacity mechanisms are put in place to ensure that the assets needed to ensure security of supply are covering their (fixed) costs. This would incentivize the currently mothballed assets either to return to active duty (and ensuring security of supply) or to be closed and completely leave the market. Given the range of possible decisions regarding investment/decommissioning/mothballing and the impact they could have system adequacy, ENTSO-E should work with a proper sensitivity analysis on the installed/reliable generation capacity or provide the relationship between the level of reliable capacity and the adequacy level. A first approach to get proper sensitivities on the reliable capacity available would be to perform an economic assessment based on several classes of assets (e.g. old or new coal units, CCGT units, etc…) and on some assumptions on the fixed costs (i.e. costs to be covered at least to keep the corresponding units in the system). However, this approach might be very time consuming in a Monte-Carlo simulation approach (the plants' profitability needs to be checked, the capacity level has to be adapted and the simulation has to be redone, etc.). Also, a lot of discussions could be expected on assumed price levels and on some underlying parameters that are only indirectly related to adequacy issues. A second (simpler) approach would focus on quantities, e.g. adjust the level of reliable capacity as long as the LOLE targets are not met. Reliable capacity could then be added (in case of LOLE > target) or subtracted (LOLE < target) by ENTSO-E to reach the adequacy target in each country, without considering plants' profitability. Overall, it amounts to provide the adequacy levels as a function of the reliable capacity available. The capacity/generation mix would probably not be right, but at least this approach would provide a reasonable view on the total reliable capacity needed in the system. Each player would then be able to adapt the view on expected capacity margin based on the baseline reliable capacity assumed by ENTSO-E in the analysis and the equilibrium levels. A side question is however in which country to adapt the reliable capacity above the baseline as there might exist multiple solutions to reach the same adequacy targets (import/export). The energy policy of some countries is planning a reduction or a phase-out in generation for some technologies. For instance, a nuclear phase-out has been announced in Germany and an objective of 50% of nuclear generation by 2025 is included in the energy transition law in France. It would be important to clarify whether ENTSO-E scenarios are compliant with these energy policies and, if not the case, what is the rationale behind the deviation. For instance, the comments provided in the report for France are mentioning that the net generation capacity forecast is "inspired" by the law, but the raw figures seem to imply that the 50% nuclear generation target by 2025 is not reached. More specifically, it is not clear why deviations from the national energy policy would be allowed for some countries in the analysis (e.g. France) and not others (e.g. Germany). Given the prospective nature of a scenario exercise, one should acknowledge that different future generation mixes are possible, including mixes that deviate from the current energy policy, but full transparency on this aspect and equal treatment between countries should be the rule.

7 A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

reliability standard:
As highlighted by DG Competition in its interim report of the sector inquiry on capacity mechanisms (see Section 4), the European countries have different views and practices regarding the adequacy metrics and criteria. In particular, some countries do not have legal reliability standards and, when available, there is not necessarily a link between this criteria, the value of loss load (VOLL), the cost of new entry, etc. As highlighted by DG Competition, this fact raises the question on how to ensure that the reliability standards are based on sound economic assessments. In practice, ENGIE believes that all Member States should have their own reliability standard in place. Although desirable, harmonization of these reliability standards in a common reliability target for all countries should not performed by ENTSO-E, but driven by Member States. ENTSO-E should only provide all relevant elements needed by the Member States and the various market players to assess whether the reliability standards are achieved and which level of firm capacity would be needed to ensure the desired level of security of supply.

8 Please tell us below if you have other suggestions

other suggestions:
Irrespective of the market design, one should keep in mind that adequacy could only be ensured up to a certain level, even in the best case that includes a market-based capacity mechanism (see e.g. the interim report of the sector inquiry on capacity mechanisms by DG COMP, § 4.2.4). Within energy-only markets, price spikes (reflecting a.o. a shortage of supply compared to demand) are expected to cover the fixed (and investment) costs of the marginal units (like CCGT in the current market context), but it might not be sufficient to keep online existing capacity (which should then trigger decommissioning) or to attract new investments (which should then lower adequacy levels). With capacity mechanisms, the level of capacity needed (and therefore remunerated) should ensure security of supply only up to a given level of adequacy. From a regulatory perspective the current adequacy problems might be seen as the consequences of the (patchwork of) market designs and the market conditions, but also of the system interface between generation and network. Going forward and to avoid any conflict of interest between market players and regulated entities, the setup of a European Independent System Operator (ISO) could be considered for managing such interfaces. *** More transparency: in general, we believe that MAF2017 report does not provide sufficient transparency on the parameter values used to obtain the presented results. It is necessary that ENTSOE provides full information on assumptions regarding generation portfolios, demand features, and cross-border exchange capabilities under each scenario. For example the current dataset provides installed capacity by plant type but does not provide information about planned and forced outage rates, size of operational reserves, capacity factors and total generation (which makes crosschecking the results against the provided demand or other sources difficult to do). Similarly, a key sensitivity of MAF is based around operational reserves contributing to adequacy or not. The published dataset however, does not provide information about the size of reserves used for each country. *** France (§ 5.2.11): This section contains the following comment: "The results associated with the mothballed units variant seem irrelevant due to the amount of unsupplied energy identified in the original simulation. Those units should find economic outputs in this context and stay on line.". Could you provide some clarifications on it ? We are not sure to understand the exact meaning as well as the consequences, if any, on the adequacy assessment performed and on the mothballing sensitivity, or whether an economic assessment of the viability of CCGTs in France may have been performed, and in that case, what assumptions have been made.

Response ID ANON-VACD-G7S4-3

Submitted to **Mid-term Adequacy Forecast 2017**
Submitted on **2017-11-09 14:13:07**

Introduction

1 What is your name?

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3 What is your organisation?

Organisation:
HSE Group

Consultation questions

4 From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? modelling of DSR? flexibility assessment? alignment and consistency with TYNDP time horizon and dataset? extension of PECD?

improvements :

5 From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

additional improvements:
When assesting country adequacy it is most relevant to take into account country specifities. For example, Slovenia can import more than two times her maximum electricity consumption for commercial purposes and more than 60% of electricity in Slovenia is produced by two power plant units (thermal TEŠ 6 600MW and nuclear NEK 1/2 350 MW). Total installed generation capacity in Slovenia 3,3 GW. According to the Second State of the Energy Union report. Slovenia has 85% interconnection capacity ratei, which is the highest in the EU. Most Member States have lower possibility to import. This unique situation needs to be recognised especially when it comes to situations, when national security of supply needs to be assured. Interconnectivity is not the only criterion for security of supply.

6 To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?

reliable scenario:

7 A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

reliability standard:
We believe that specific conditions in Member States have to be take into account, rather than setting a reference target - common reliability target.

8 Please tell us below if you have other suggestions

other suggestions:

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IBERDROLA RESPONSE TO ENTSO-E MID-TERM ADEQUACY FORECAST 2017 CONSULTATION

10 NOVEMBER, 2017

Iberdrola welcomes the opportunity to provide comments to ENTSO-E on this matter. Please find below our response to the consultation questions.

Consultation questions

4. From your perspective, which have been the most important improvements compared to MAF 2016, e.g. mothballing sensitivity? Modelling of DSR? Flexibility assessment? Alignment and consistency with TYNDP time horizon and dataset? Extension of PECD?

First of all, it is important to remind the objective of the MAF. According to ENTSOE itself, "*The MAF satisfies the need for a Pan-European adequacy assessment for the coming decade. As such, it provides stakeholders with comprehensive support to take qualified decisions, and will help to develop the European power system in a reliable, sustainable and connected way*".
Thus, the MAF is about supporting decision making by – among others – governments and regulators. In fact, such decisions are not trivial as security of supply is a main driver of energy policy. In this sense, it is also important to remind that an adequacy assessment should not be a "*forecast*", but a "*stress test*":

- It should identify all relevant risk factors (including those originated from the regulatory framework) and probabilistically quantify their impact on adequacy.
- The most extreme conditions must be the focus of the analysis as adequacy depends on rare events – i.e., the tail of the risk factors' probability distribution.

Unfortunately, MAF2016 did not comply with these conditions:

- MAF 2016 considered as risk factors just climate conditions, hydro conditions and forced outages. However, both the central demand estimation and the generation mix in 2020 and 2025 were approached deterministically (i.e., taken as "data") despite being the most relevant adequacy issues from the demand and supply side, respectively. This means that the impact on adequacy of the risk factors affecting the central demand estimation (GDP growth, energy efficiency, EV, etc.) and the generation mix (economic viability of plants, RES penetration, potential regulatory developments, etc.) was not analysed. Thus, the MAF2016 did not deliver a thorough risk assessment.
- This problem had a clear reflection in the MAF2016 results. In fact, for some countries it was estimated that there would be ENS neither in 2020 nor in 2025. However, this is only possible if it is assumed that agents behave irrationally – i.e., they maintain their existing capacities available or investing in new capacities even when they expect to

make losses at least until 2025 (almost for 10 years). This means that potential adequacy concerns were seriously underestimated – see for instance the case of Spain.

- In MAF2016 it was simulated neither the interconnection capacity calculation (flow-based methodology) nor the rules applied in the energy market to deal with simultaneous scarcity events in neighbouring countries. However, both are essential to determine the cross-border contribution to adequacy, which is the main added value of a Pan-European adequacy assessment compared to regional or national adequacy assessments. Thus, there was a major model incompleteness issue to be solved.

Although MAF2017 has introduced several improvements, the issues undermining MAF2016 are still present. Therefore, MAF2017 is not a reliable and complete adequacy assessment and, hence, should not be the basis for any energy policy or regulatory decision.

In any case, MAF is presented as "work in progress" subject to constant evolution. In this sense, the improvements introduced in MAF2017 are welcome:

- *Mothballing sensitivity*. This is a step in the right direction. However, there is still much room for improvement – i.e., address the economic viability of generators issue more concretely, comprehensively and harmonising its analysis across countries. In fact, the whole approach to generation mixes should be revised – i.e., it cannot be just "data" from TSOs plus a "vague" sensitivity analysis. As the generation mix is probably the most relevant adequacy issue from the supply side, a more rigorous approach is needed.

- *Modelling of demand-side response*. Once again, a step in the right direction. However, not much details are given on the assumptions for the explicit demand response approach taken (i.e., categories, capacity available, maximum activation period, activation price, etc.), so further transparency is needed. In addition, it seems that no risk factor associated to demand response has been introduced – i.e., again a deterministic approach incompatible with a vision of the adequacy assessment as a "stress test".

- *Flexibility assessment*. Apparently, the flexibility assessment that in 2016 was carried out separately is now part of the MAF2017.

- *Alignment on assumptions*. Although coherence is always positive, each exercise (MAF, TYNDP) should take into account what are its objectives when defining both the analyses to be carried out and, hence, the assumptions to be made. In the case of the MAF, it is about producing a "*stress test*" on adequacy, while in the case of the TYNDP is about producing a "*forecast*" to be used to build a networks development plan. Thus, the assumptions in the MAF must be much richer – i.e., it is about dealing with the probability distribution of the risks factors relevant for the adequacy assessment. This once again leads to the problem of:

    a) approaching both the central demand estimation and the generation mix in 2020 and 2025 deterministically (i.e., taken as "data"), despite being the most relevant adequacy issues from the demand and supply side, respectively; and

    b) the incompleteness of model in terms of simulating the interconnection capacity calculation (flow-based) and the rules applied in the energy market to deal with simultaneous scarcity events in neighbouring countries – i.e., issues that go far beyond the alignment of assumptions so far carried out.

    Therefore, there is still much room for improvement in order to actually tackle the issues currently undermining the MAF in terms of assumptions.

- *Extension of Pan-European Climate Database (PECD).* The extension of the current climate database to the period 1982-2015 is another positive step as it allows considering more extreme weather events. However, it is not clear that the most extreme weather events possible are in fact included in such a time series – i.e., adequacy concerns lays in the tail of the risk factors' probability distribution. Hence, the MAF should consider building synthetic weather scenarios from probability distribution derived from the historical data available.

5. From your perspective, which would be the most relevant and useful additional methodological improvements for the future MAFs? Please explain in line with the specific needs of your field of activity.

It is important to remind what the objectives an adequacy assessment should pursue are:

- First, it should estimate how much capacity (firm and/or flexible) will be needed in order to achieve the reliability standard and, out of that amount, how much could be provided by neighbouring countries.
- Second, it should identify the risks faced by the system (including those from the regulatory framework) and quantify their impact in a systematic manner. The focus of the analysis must be on the most extreme conditions and the capability of the power system to react to them. Thus, it is about producing a "stress test" in terms of the possibility of having the system not complying with the reliability standard due to a lack of reliable capacity. Member States should be responsible for deciding whether adequacy can be ensured at the required level by the energy market alone given the risks identified in these analyses.

According to these objectives, the most relevant and useful additional methodological improvements for the future MAFs would be as follows. From the demand side:

- All risk factors affecting the central demand estimation (GDP, population, energy efficiency, electrification, etc.) cannot be neglected. This calls for abandoning a limited scenario-based approach and opting for defining a probability distribution for the central demand estimation. Such probability distribution would internalise the uncertainties on the underlying parameters. In fact, the central demand estimation is subject to a significant estimation error due to (a) the time horizon of the adequacy assessment (at least 10 years), and (b) the large number of uncertainties / risks factors embedded in its estimation. Hence, a first step could be to build such probability distribution considering that estimation error.
- In addition, the impact of climate and demand response should also be considered. Once again, probability distribution functions should be estimated (historical data has here a clear role to play; uncertainty on future developments should be reflected in the distributions).
- The analysis of demand, combined with the national reliability standards, should serve first of all to estimate how much firm capacity will be needed.

From the supply side:

- The economic viability of generation plants must be a criterion to define the generation mix. However, turning the MAF into a central planning exercise, in which the generation mix is an output of the model is both unrealistic and unworkable. Similarly, requiring generators to declare whether they will be or not available in 5-10 years is disproportionate. Hence, an alternative is needed.

- Such alternative could consist in building from the already existing generation fleet several generation mix scenarios that (a) represent a likely evolution from a technical point of view (e.g. aging), (b) reflect well-defined potential regulatory frameworks (e.g., restrictions on nuclear or coal), and (c) with new capacities restricted to just those that are already under constructions and those related to achieving the RES objective.
- These basic generation mix scenarios would be introduced in the market model (i.e., merit order), together with (a) the probability distribution of the demand previously described, and (b) the probability distribution of RES conditions, hydro conditions and forced outages (with the corresponding correlations with demand).
- The results of this model (Montecarlo) would make it possible to analyse the probability distribution of the expected utilisation of each of the individual existing MWs within each generation class (i.e., lignite, hard coal, CCGT, OCGT, nuclear, etc.) – i.e., a low utilisation profile would indicate a risk of having that capacity exiting the market. Thus, it would be possible to characterise the risk of having existing generators exiting the market.
- Therefore, the risk of having existing generators exiting the market, together with the probability distribution of the ENS, would give an indication of what the need for new reliable capacity could be in order to fulfil the reliability standard.
- It is for Member States to decide whether such a risk can be managed by the energy market alone or a capacity mechanism is needed.

Finally, it is important to note that there should be consistency between the cross-border agreements included in the risk-preparedness plans (and specifically when a crisis situation occurs at both sides of the interconnector) and the cross-border participation in capacity mechanisms – i.e., it does not make sense to consider in the Capacity Mechanism a cross-border contribution larger than the expected capacity margin available for import from a neighbouring country in time of scarcity.

6. To build appropriate and reliable scenarios, information regarding commissioning, decommissioning and mothballing decisions is crucial. Do you have any concrete proposal on how to increase ENTSO-E's visibility to this information and on how to ensure the reliability of these assumptions?

Once again, an adequacy assessment is not a "forecast", but a "stress test" – i.e., it is not about having a perfect forecast of what the future will bring, but about identifying and measuring the risks potentially affecting adequacy. In this sense, in the previous question some ideas were put forward on how to cope with the economic viability criterion.

Furthermore, it is important to note that not even the generators have a clear view of whether they will or not mothball / decommission their plants in the next 5-10 years and. Hence, this would not only be very sensitive commercial information, but also very unreliable for the purposes suggested in this question (i.e., generators change their plans according to changing expected market circumstances).

7. A significant number of assumptions is mandated to perform the MAF, which mainly correspond to all the data input (e.g. generation, demand, interconnection, availability of renewable generation, etc.) or modelling assumptions (software specifications, optimization assumptions, etc.). Considering the resulting complexity in aligning the aforementioned assumptions, would you find it beneficial to define a common reliability target – or range - (e.g. LOLE 3 or 5 or h/y) to be used in MAF as a reference? Which reliability target should be used in MAF as a reference?

As long as the MAF is supposed to support decision making by – among others – governments and regulators, the reliability standards considered in the MAF should be those actually used by Member States for making such decisions. In other words, the MAF must be adapted to the reliability metrics and levels considered in each Member State – i.e., it does not make sense to have Member States changing their reliability standards in order to reduce MAF complexity.

In any case, it seems clear that (a) Member States should have a reliability standard in place indicating their desired level of security of supply in a transparent and predictable manner (i.e., it should be public), and (b) such reliability standard should reflect a compromise between the cost of reliability and how consumers value that reliability. However, it is not that clear that the metrics used should be necessarily the same, as national circumstances might make it more convenient to define / measure adequacy in different manners.

8. Please tell us below if you have other suggestions

Although the MAF is a very complex exercise in terms of data, assumptions and modelling, and acknowledging that transparency has improved in the MAF2017 compared to previous versions, it must be highlighted that more efforts are needed in this regard.

An especial mention must be done regarding the scenarios provided by TSOs for the MAF – i.e., central demand estimation, demand response potential, generation mixes, etc. Although these are essential elements for the adequacy assessment, no detail is given on how they were derived. Thus, as significant transparency effort is still to be made.