Volume determination of the strategic reserve for winter 2020-21

Answer to the public consultation on methodology, hypotheses and data sources

Contents

1 Introduction

The consultation aimed to receive any comments of market parties on the methodology, assumptions and data sources to be used for the strategic reserve volume determination for winter 2020-2021. The consultation period was set from Friday April 25th to Friday May 24th 2019, 18h00[1].

Elia received 4 non-confidential answers to the public consultation from

- FEBEG
- FEBELIEC
- CREG
- Belgian Offshore Platform (BOP)

totalling 33 questions.

The feedback and the answers by Elia System Operator ("Elia") are grouped in five categories in this document:

- Data and Assumptions
- Publication of data
- Publication of results
- Market response
- Flow based modelling

In order to facilitate the readability of this report, similar questions from multiple stakeholders are grouped and answered as one.

All relevant information to this consultation can be found on the following Elia webpage:

http://www.elia.be/nl/over-elia/publications/Publieke-consultatie/20190426_Public-consultation-on-the-methodology-Report

The results of this consultation will also be presented during the Task Force implementation Strategic Reserve (TF iSR) of July 8, 2019.

Note that an additional consultation on the input data used for the calculation will be organized when this data will be available for Elia. This consultation will take place at the end of August.

[1]www.elia.be/nl/over-elia/newsroom/news/2019/20190426_Public-consultation-on-the-methodology-Report

2 Acknowledgement

Generally, most market participants welcome the improvements Elia integrated in the methodology over the last years.

- *FEBEG welcomes the organization of a consultation on the methodology, hypothesis and data sources for the dimensioning of strategic reserve needed for winter 2020-21 and following ones.*
- *FEBELIEC would like to the thank Elia for this consultation on the methodology, hypotheses and data sources for the dimensioning of the volumes of strategic reserve for winter 2020-2021.*

Elia appreciates these acknowledgements and will continue to involve stakeholders in its studies to further improve the results in the interest of society.

3 Translations

Any questions asked in a language other than English are shown in their original form, as well as in their English translation. Translations were done by Elia employees who are not native English speakers. While reasonable efforts are made to provide accurate translations, portions may be incorrect. No liability is assumed by Elia for any errors, omissions, or ambiguities in the translations provided.

4 Questions on Data and Assumptions

1. *[BOP] "Elia bases itself on the latest information available to consolidate a forecast of the installed capacity of offshore wind." Met welke concrete cijfers wordt er gerekend voor de geïnstalleerde vermogens aan offshore wind in de winterperiodes onder evaluatie? [Elia states that it bases itself on the latest information available to consolidate a forecast of the installed capacity of offshore wind. What specific data source is used to determine the installed capacities of offshore wind during the winter periods under consideration?]*

Elia sums the contracted connection power from currently installed offshore windparks, with the planned power as described in the concession planning. The contracted connection power can differ from the total installed power. However, the first cannot be exceeded which is why we apply this for the strategic reserve volume determination.

2. *[FEBEG] Elia plans to build its own demand forecasting framework. We would like to have more information on what are the expected improvements compared to the current approach?*

3. *[FEBELIEC] On the growth of the total Belgian load, we take note that Elia continues to use IHS MARKIT, despite underperformance of these forecasts when comparing the previous forecasts made in the past with the (in the meantime historic) observed reality. Elia mentions the development of an internal demand forecasting framework, presumably also in light of the other studies on system adequacy that Elia is performing or will have to perform. We hope that such framework will be more robust and hopes that Elia will consult stakeholders on this framework, as presumably will in any case have to be done within the governance framework of at least some of the adequacy assessment exercises.*

Up until today, Elia has used demand growth rates as forecasted by 'IHS Markit'. The main critique with this approach is the lack of transparency both in terms of input data and methodology. The relationship between input parameters and output (increase in demand) is not explicitly known (e.g. linear, cubic, what are the coefficients …).

Elia does not agree that these forecasts are underperforming. Specifically for the short term, there is no bias (both under- & overestimations have been observed in the recent past) and growth rate deviations were within 0.3 percent points in the last few years. However, even having analysed this, and having detailed the multi-sector approach in last year's methodology report, Elia wants to address these stakeholder concerns by developing a new forecasting framework so that it can answer to all future stakeholder questions. Elia is currently developing this forecast method and is committed to involve stakeholders whenever deemed appropriate.

4. *[FEBEG] Elia mentions that all seven nuclear reactors (5,9 GW) are operational for the whole length of the study. FEBEG reminds that this is not the case for winter 2022-23 (Doel 3 will stop on 01/10/22 and Tihange 2 on 01/02/23 according to the existing legal framework).*

Elia will of course take into account the correct definitive shutdown dates (based on the law) of the nuclear units in the modelling for winter 22-23. This will be detailed in the volume determination report.

5. *[FEBEG] Elia does not consider any planned outage for the winter 2021-22 & 2022-23 (since no information is available). Could Elia confirm that no planned outage will happen in possible scarcity periods?*

Elia strives to remove all planned maintenance from winter periods by providing the market with an optimal revision schedule. This exercise shows how much "margin" is available throughout the year so that generation unit owners can optimally schedule their revisions. This exercise does not foresee any margin for the whole of the winter period. However, this does not mean that in reality no maintenance will be planned, as in the end, the generation unit owners are responsible for their outage planning. Information about planned and unplanned unavailability of Production Units can be found on Elia's website[2] for units whose Producers have chosen Elia as Data Provider, according to the article 4 of Commission Regulation 543/2013 of the EU. A complete overview of all planned and unplanned unavailability of Production Units can be found on the ENTSO-E Transparency platform[3].

6. *[FEBEG] Elia mentions that the balancing reserves are modelled as a reduction of the available capacity to cope with adequacy. Does the study also account for capacity reservation for ancillary services in neighbouring countries?*

The approach used follows the MAF methodology where the balancing capacity is defined for each country[4]. The reserves volumes of the neighbouring countries are treated in the same way as they are treated for Belgium, i.e. a reduction of generation capacity on flexible units is imposed to meet the requirements for capacity reservation for ancillary services.

7. *[FEBELIEC] We would like to get some clarity on the relation between this exercise on the dimensioning of strategic reserve, the Adequacy and Flexibility study that Elia has to conclude by the 30th of June 2019 and the future regional resource adequacy assessment that will have to be conducted in case Belgium would opt for the implementation of a capacity remuneration mechanism in Belgium. It is clear that all three studies will discuss system adequacy in Belgium, but with different scope and time horizons as well as governance. However, it is unclear to what extent the current study with respect to the strategic reserve 2020-2021 is modified compared to the study for the strategic reserve for winter 2019-2020 in light of the discussions of Elia with other stakeholders, both market and non-market, on the other study currently being developed and the new or improved insights resulting from these (e.g. on total demand growth or the volume of market response).[4]*

[2] http://www.elia.be/en/grid-data/power-generation/unplanned-outages
[3] https://transparency.entsoe.eu/
[4] Data are publically available on the MAF website for 2020 – 2025 in the Excel file https://www.entsoe.eu/outlooks/midterm/

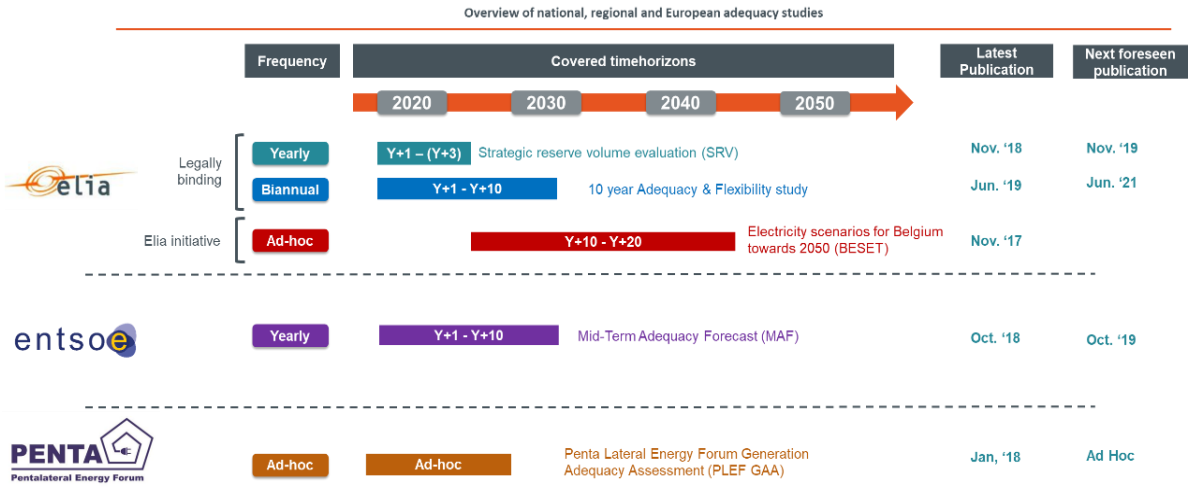

Figure 4-1

Elia strives towards maximum consistency between its different studies. The adequacy assessment methodology is in line with European studies. The reasons for discrepancies between subsequent studies are the following:

1. As shown in Figure 4-1, the time horizons of Elia's studies differ. Short term and mid-term studies may require different approaches. A good example is the flow based model framework. Here for short term studies, historical domains are used, while for mid-term studies, a flow based prediction framework is applied.
2. Input data are the same for horizons covered by 2 or more studies. Nevertheless differences may occur due to the different period of data collection. Elia performs indeed a data collection for every study. New market information, driven by legislation (e.g. CEP), or national incentives (e.g. German coal phase out), are always incorporated as soon as possible.
3. Evolutions that allow for a more detailed modelling of specific market parameters are preferred over older methods, that would ensure backwards compatibility. Different research questions beg for different approaches. A good example is the recent addition of HVDC outage modelling.

8. *[FEBELIEC] On the demand profiles for all European countries and the new ENTSO-e software TRAPUNTA, we would have liked to get a better grasp on what the implications are of the switch to this new approach. Will this have a significant impact or is it merely a new source of data that will be used in a standardized way across Europe.*

The model used for the creation of hourly load profiles for all European countries is called 'TRAPUNTA' (Temperature REgression and loAd Projection with UNcertainty Analysis) and comes in a new software application developed by Milano Multiphysics.

It allows to easily perform electric load prediction starting from data analysis of historical time series (electric load, temperature, climatic variables and other). In addition, TRAPUNTA incorporates the decomposition of time series into basic functions, which reduces the computational burden and required data fed into the forecast model.

In a second phase, TRAPUNTA adjusts load time series using TSOs bottom-up scenarios that reflect future evolution of the market (e.g., penetration of heat pump, electric vehicles, batteries). The forecast model reads a diverse set of data sources (historical load

profiles, temperature time series, heat pumps, electric vehicles, etc.) and can provide multi-year demand forecasts in hourly resolution. TRAPUNTA will be a fundamental input to European adequacy studies performed by ENTSO-E. With regard to the past modeling approach, its utilization brings several advantages (non-exhaustive list):

- Multiple historical climate and load time series are used to derive forecasted load profiles for each market node. In the previous methodology, only one reference year was used during the forecasting process;
- Automatic identification of different climate variables needed for the forecasting process (temperature, irradiance, wind speed, etc);
- Better treatment of historical profiles used in the forecasting process (correction of holiday periods, exceptional events, etc.);
- The load forecast is broken down into temperature-dependent and temperature-independent components. That way, final load profiles are adjusted, taking into account added consumption from heat pumps and electric vehicle charging. This way, the forecasts also consider the interdependencies of historical temperatures of each climate year and historical load patterns.

The applied methodology therefore ensures consistency with the ENTSO-E methodology and with consumption profiles applied for other countries.

9. *[FEBELIEC] On the low probability high impact sensitivity, we regret that Elia has not indicated which would be the parameters that will be applied for this sensitivity as we have indicated for the previous exercise (as well as other related exercises) that an increase in the height of the impact (e.g. increase of nuclear unavailability from 1GW to 1,5GW as a result of the unavailability of several nuclear plants operated by the incumbent producer in Belgium during one exceptional winter) leads to an increase of the need for strategic reserve and thus cost for consumers, while it is unclear to what extent such scenario is relevant towards the future (very low probability as compared to low probability) and to what extent the (recent) past has not shown that under exceptional circumstances mitigating solutions have been found within the market that were not identified before (relating also to the previous comment on the underperformance of the methodology for the assessment of market response).*

10. *[FEBELIEC] On the base case and sensitivities (point 3.1.5) Elia mentions that "analysis will determine the amount of generation volume that should be considered unavailable in Belgium & France". We wonder when this information will become available and whether this will only be communicated in the results of the study, meaning that stakeholders cannot react to this important input hypothesis, or that this will already be communicated in the planned consultation on the input data.*

The analysis is performed in a later stage in the process as in order to take into account the latest forecasts and events (REMIT data, announcements of closures according to article 4bis in the electricity law, etc.) this can only happen close to the report delivery. Performing this earlier might lead to outdated assumptions. The low probability – high impact scenario aims to capture unforeseen events of large scale (+ 1GW) as have been observed in the previous winters. This approach has been approved by the European commission DG competition (in the context of the state aid evaluation of the strategic reserve mechanism). While one can debate how relevant historical outages are towards future estimations, it is fact that the real Belgian adequacy situation for winter 2018-19 and winter 2019-20 are worse than estimated in the 'low probability – high impact' volume

determination of November 2017 and November 2018 respectively. Elia believes the approach holds its merits in identifying, apart from a base case volume need (or margin), also an extreme case volume need (or margin). It is then up to the Minister to decide how much should be contracted.

11. *[FEBELIEC] We want to reiterate our position, already expressed in previous years, towards the methodological approach of increasing the margin and/or strategic reserve volume by blocks of 100MW in the iterative process for the determination of the potential required volume. For us, a finer granularity than 100MW should be used, as even the lack of 1MW under the current approach would immediately lead to a need of 100MW additionally. Applying a finer granularity would avoid sourcing unneeded volumes. Alternatively, an approach could be implemented where very marginal transgressions of the LOLE criterion do not automatically lead to an increased contracting of strategic reserve volumes, through the application of a deadband, taking into account the multiple layers of sensitivity already applied by Elia in combination with low probability, high impact scenarios, which already skew all the results towards a very conservative approach. For us, it should in any case be avoided to increase the cost for the grid users unnecessarily by following a much too conservative approach.*

Elia has shown last year that the statistical convergence of the model prohibits the use of a block smaller than 100MW[5]. Indeed, too many parameters impact the end result, that using a block less than 100MW would break reproducibility of the outcome. Elia has shown this by means of an extensive analysis last year, involving 5000 Monte Carlo year simulations and corresponding LOLE and P95 boxplot analysis. This result was in line with earlier European findings. Elia does not apply a deadband as the needed volume, when it has to be contracted, is a fixed number and no ambiguity should exist when the analysis is complete.

12. *[FEBEG] B.2.2 – Grid topology: we don't have the means to verify the validity of the following assumption: there is no network congestion inside an area and the load of an area can be satisfied by any local power plant. Also, what about the situation in neighboring countries?*

The ANTARES simulator is an energy market simulator. In ANTARES an area is a copperplate where the location of the generation is not important. As in the current market design, we simulate market operations by modelling a bidding zone as an area. Congestions from energy exchanges are managed through flow based by means of the addition of binding constraints. The flow based domains are constructed based on grid constraints, representing the limits of the network elements or the so-called CNECs (Critical Network elements and Contingencies). It is important to note that not only cross-border CNECs are taken into account but also some internal CNECs might be considered in order to take into consideration congestion issues.

[5]http://www.elia.be/~/media/files/Elia/users-group/Working-Group-Balancing/TF_Strategic_Reserves/Agenda/TF_09072018_Elia.pdf

5 Questions on the Publication of Data

13. *[BOP] "The forecasts for installed capacity are combined with the historical production profiles to obtain 33 different time series for the winter period and for onshore wind, offshore wind and photovoltaic production separately." De historische productieprofielen worden niet getoond. BOP wenst meer details over deze profielen. Welke locatie werd gekozen voor offshore wind? Wat is de gemiddelde load factor van deze profielen per maand? In het 2018 rapport "The need for a Strategic Reserve for winter 2019-20" werden meer details gepubliceerd over de variabiliteit van onshore wind power (Figuur 8.3 – 8.4, pagina 154). BOP vraagt dat gelijkaardige informatie ter beschikking wordt gesteld voor offshore wind energie. [Elia states that the forecasts for installed capacity are combined with the historical production profiles to obtain 33 different time series for the winter period and for onshore wind, offshore wind and photovoltaic production separately. Historical production profiles are however not shown. We wish to have more information on these profiles. What location was chosen for offshore wind? What is the average load factor of these profiles per month? In the November 2018 report Elia published detailed graphs for onshore wind power (figures 8.3 and 8.4). Can Elia share similar results for offshore power?]*

To ensure consistency with other European adequacy studies, most notably the Mid-term Adequacy Forecast, Elia uses the Pan European Climate Database (PECD). The PECD was developed by ENTSO-E in cooperation with the DTU university in Denmark. Currently the PECD contains 34 climate years (1982 to 2015). The calibration of the PECD model parameters has been done using recently available datasets (e.g. Transparency Platform operated by ENTSO-E) and considering latest developments (e.g. increased height of wind turbines, size of turbine blades …). Since the PECD is not a publically available database Elia is not authorized to divulge more detailed profile data for the time being. Currently, there is one profile for all offshore wind power for Belgium, hence location does not matter.

14. *[CREG] As stated in note (Z)1752 (see CREG website), the model used by Elia to determine the volumes of strategic reserve should be made publicly available.*

Elia has provided in the past additional and bilateral explanations on the model (including a demo-session) for the CREG and the DG Energy in order to support their missions as public authorities and to ensure full understanding. It was also explained that there doesn't exist 'a model' that can be transmitted as such, but is actually a combination of several applications that are used for the calculations. In addition, further information on the model is provided in the report and all used data is made publically available. Finally, the ANTARES[6] solver has been made open source by RTE under the GPLv2 license, which makes it free for anyone to use and possible to inspect the algorithms in the source code. Therefore, it is entirely possible to use these data with any other model to make similar studies as the strategic reserve calculation.

15. *[FEBEG] We would welcome more clarity on the hypothesis regarding reserve/capacity mechanism outside Belgium (France/Germany/UK) and their effectiveness in keeping/attracting capacity and more generally speaking on*

[6] https://github.com/antaresproject

projections of available thermal capacity in neighboring countries at the different horizons.

16. *[FEBEG] Elia explains the hypotheses for the other simulated countries. FEBEG would like to have more information on the hypothesis used for the projections of available thermal capacity in the neighboring countries. For indications after winter 2020-21, can Elia be more specific related to the various mechanisms in place to attract/keep capacity for adequacy? For instance:*

    - *FR: Is there an assumption on how much new capacity (DSM/generation capacity) will be attracted in the framework of the LT auctions organized by RTE ("appels d'offres long terme – AOLT")?*
    - *DE: In the framework of the coal/lignite phase-out, how many units are not available anymore for adequacy (15GW targets proposed by the coal commission relate to operating capacity in the market)? What about the recently announced need of 10.6GW (BNetzA) grid reserve for the winter 2022/23, is it assumed available and does it include new capacity to be built?*
    - *UK: Does the study assume additional capacity attracted in the framework of the UK CRM?*

All of these mechanisms are very distinct. Some countries have strategic reserves in place to guarantee their adequacy. As these capacities are considered to operate out-of-market as last-resort solutions when a national scarcity situation would occur, these strategic reserves cannot be relied upon by other countries. The results of the market simulations are not impacted as these strategic reserves are supposed to be dispatched after the market has depleted all its in-the-market resources and de facto reaches the price cap. From a model perspective it does not impact the flows, nor the market prices. Other mechanisms may impact the Belgium adequacy situation. FR, UK and DE will be treated as explained below.

FR & UK: countries that have implemented a market-wide CRM are forced to have an adequate system in relation to their national reliability standard. The initial dataset might still show adequacy issues in those countries. If it is the case, additional capacity will be added in order to comply with their adequacy criteria.

DE: There are different capacity reserves in Germany for different purposes: the 'capacity reserves', the 'grid reserves' and the 'climate reserves'. As these capacities are 'out of the market' or contracted for other purposes, they cannot be relied upon by other countries for their security of supply.

- The 'capacity reserve' was approved by the EC beginning of 2018 and would start to be procured in 2019. From winter 2020-21, there are 2 GW of capacity to be expected in this reserve. The value might be adjusted for upcoming winters. This 'out of market' capacity is to be used by German TSOs after the market clearing in order to safeguard German adequacy in the coming years;
- The 'grid reserves' (or 'Netzreserves' in German) are contracted by the German TSOs to cope with congestion management and are not dispatched on the energy market. There are currently 6.8 GW in this reserve and the latest German study on the matter shows that for the winter 2022-23, the capacity to be contracted would increase to reach 10.6 GW. This capacity consists of units in the south of Germany which are being dispatched to solve congestions in the German grid. They also may participate in the 'capacity reserve' tender;

- The 'climate reserve' or (or 'Sicherheitsbereitschaft' in German) is a temporary measure where a total of eight lignite power units with a total capacity of 2.7 GW are progressively taken out of the market for a financial compensation. Those units need to be able to be operational within 240 hours if requested by the TSOs. Those units are therefore temporarily shut down and will be finally shut down after four years in this mechanism. This mechanism is planned to be stopped in 2023.

17. *[FEBEG] Elia plans to build a statistical modelling for nuclear planned outages. FEBEG doesn't understand why to rely on statistical modelling for planned outages (as it seems more relevant for unplanned outages). What does Elia expect as outcome?*

In the past, some voices have challenged Elia's use of REMIT as the sole reference for thermal unit revisions, stating that "delays in planned outage durations are to be expected". Elia wants to do a numerical analysis to validate this statement. The model would consist of 2 steps. In a first step historical announcements of planned outages would be compared to the length of the real outage period. Then outlier analysis would be applied to exclude exceptional situations (e.g. problems with concrete). If a consistent deviation (underestimation or overestimation of the outage duration) is found, this could then be applied in step 2 to the latest REMIT information. This approach draws from the effort performed by RTE in the analysis of the 'visites décennales' of the EDF nuclear plants. Here RTE has shown that the duration of these types of outages was consistently under estimated by EDF with 1-2 months. The main challenge of building such a model for Belgium is the limited size of the nuclear production park and the availability of historical data. The results of the analysis will be shared with the stakeholders during the TF iSR.

6 Questions on the Publication of Results

18. *[FEBEG] Scarcity can happen while energy is still served (no involuntary load curtailment). It would be interesting to differentiate these situations. Furthermore, it would be interesting to characterize scarcity situations in terms of: duration (consecutive hours) and what is driving the scarcity (high demand or a combination of high demand/low RES, etc.).*

We assume this involves situations where price taking orders are met, but lower price demand offers aren't. In ANTARES the load for each hour is inelastic. The elastic part of the load is covered through an explicit modeling of market response. We do not identify scarcity hours when demand response is capable of avoiding ENS. Only hours where all means are depleted qualify as scarcity hours. Improvements on the transparency of scarcity drivers were identified as one of the main topics for this year's assessment.

19. *[CREG] In relation to the output of the results, we would like that Elia indicates if adequacy needs are due to interconnection constraints or to lack of available capacity in neighbouring countries (which ones?).*

20. *[FEBELIEC] On the evolution of simultaneous import capacity restrictions and cross-border import in general, we would like to state strongly that the Clean Energy Package should have entered into force by 01/01/2020, including the provision on the volume of cross-border capacity that has to be given to the market. We hope that this will be included in the analysis for the following three winters and would like*

Elia to detail how this has been done and what the impact is on the adequacy assessment. Moreover, Febeliec would like to reiterate its request to indicate very clearly in case of limitation of cross-border flows, in this as well as other adequacy related studies, whether this is the result of either lack of cross-border interconnection capacity or lack of energy in interconnected markets, as this is very valuable information and will become of much more significance in the future when the Clean Energy Package will be fully implemented.

Within the context of a Flow Based Market Coupling (FBMC), energy/resource constraints cannot be fully separated or distinguished from grid capacity constraints. In all scarcity situations the available grid capacity will be used to its limits, and an active grid constraint is therefore very likely to exist.

Very important however is the notion of simultaneous scarcity, where scarcity events occur in multiple (linked) countries at the same time (e.g. Belgium and France). This can be opposed to isolated scarcity, where e.g. Belgium is the only country experiencing a scarcity event at a certain point in time.

For isolated scarcity, it can be assumed that the most important limitations to the contribution of imports are interconnection capacity constraints, as the boundaries of the capacity domain where the imports for Belgium are maximized will be reached. In general, in such situations Belgium will import from every neighbouring country. However, up until SRV6 a flow based domain reduction technique was applied ('buckyball' conversion of the domain) which led to the replacement of true CNEC's with 36 approximate halfspaces. This approach has big advantages for the computational complexity of the model, but it means the identification of the real constraining network elements is no longer possible.

For simultaneous scarcity, e.g. Belgium together with France, the maximal importing capacity of Belgium cannot be reached as e.g. France will not be able to export to Belgium. Therefore, capacity constraints are in such case combined with restricted exporting capabilities of neighbouring countries.

A combination of situations with isolated scarcity for Belgium and situations where simultaneous scarcity occurs between Belgium and neighbouring countries will determine the scarcity moments.

Regarding the impact of CEP provisions on cross-border capacity on the adequacy assessment, it should be noted that the implementation of this rule is under discussion at MS/NRA level regarding possible derogations on the implementation of this rule. Such positions by MS is to become public after the completion of this study.

7 Questions on Market Response

21. *[CREG] The results for the Market Response as presented in the ISR-TF of 1st of April 2019 in the framework of the coming 10 year Adequacy and Flexibility Study, are far below common expectations based on the observations of last winter and measures which were announced by market parties. The numbers presented are based on the same "E-Cube methodology" as used for determining the volume of Strategic Reserve. We believe that the main reason for the differences is that the total Market Response Volumes are not offered at EPEX and are thus not reflected in the aggregated curves, which are used by the E-cube methodology. We believe that the methodology for estimating the Market Response should be thoroughly reviewed for future volume assessments.*

22. *[FEBELIEC] On Market Response, we would clearly like to stress that it has never agreed with the methodology for market response as it was developed by E-Cube for Elia, but rather that it was overruled by Elia and that Elia has chosen to proceed with this methodology despite our comments and concerns. We are strongly of the opinion that the (preliminary) results for market response (which is broader than demand side response) presented as outcome of this methodology in the framework of the Adequacy and Flexibility study that Elia has to conclude by the 30th of June 2019 clearly show that the methodology leads even for historic periods (winter 2018-2019) to lower volumes of market response than have been announced and observed in the market. The last step of the methodology developed by E-Cube for Elia entails a sanity check, but we regret that this step is overlooked and that as a result no lessons learned are drawn nor the methodology adapted in order to find a solution that better captures market response volumes. We strongly urge Elia to perform this sanity check and if the results would not be in line with the past (as is our opinion), either Elia should revise the methodology or at least use any higher value that could have been observed in the market as an under limit for the forecast. We also want to express serious concerns to the international comparison point Elia is referring to with respect to the relation between market response volumes and maximum peak of the system, as market response, and explicitly demand response (because of opportunity costs), only develops in systems that are not structurally oversupplied with generation assets and thus comparing internationally with countries that (still) have structural overcapacity does not provide any meaningful benchmark point for the assessment of market response in Belgium, unless only countries would be taken into account with similar situations.*

Elia agrees that if more MR volume is available, it was not offered in the market in the previous winter, as otherwise the E-Cube study would have uncovered it. Winter 2018-19 was unprecedented in terms of Belgian adequacy situation, leading to higher prices on EPEXspot in general, but also to exceptional price peaks from September to November 2018 for Belgium (as recently analysed by CREG[7]). Having applied alternative approaches in the past, in the 2017 Market response working group, this methodology was thoroughly discussed and finally agreed upon as it takes into account observable price-driven market response. It was the preferred option of the 8 proposed in the E-cube workshops. For the current assessment, the legally binding deadlines do not allow for such a major change of methodology at this point. However, Elia is open to further discuss this in the taskforce with the stakeholders and is eager to hear what solutions could be preferred over the current methodology or which improvements could be considered.

23. *[FEBEG] Elia does an assessment of demand response (incl. ancillary services volumes). FEBEG supposes that the volumes contracted in ancillary services are also modelled as a reduction of the available capacity to cope with adequacy (cf. point 3.2.1.5).*

In the context of the E-Cube Market Response study[8], the growth of Market Response volumes (incl. ancillary services volumes) is estimated. Using a forecast of the future Market Response participating to the ancillary services allows to determine a forecast of the Market Response available in the future for the energy market (by subtracting the forecasted volume of Market Response participating in ancillary services). The part of the

[7] https://www.creg.be/sites/default/files/assets/Publications/Studies/F1950NL.pdf
[8]http://www.elia.be/~/media/files/Elia/users-group/Working-Group-Balancing/TF_Strategic_Reserves/Agenda/20190401_Elia_Market_Response_TF_Presentation.pdf

Market Response which is assumed to participate in the ancillary services is taken into account when determining the part of the ancillary services need provided by classical thermal generation. These volumes are therefore not assumed to be available to cope with adequacy.

24. *[FEBELIEC] On the way ANTARES takes into account demand response, we understand that Elia has to work within the limits of the tool, but regrets that the tool has still no other way to approach demand response other than modelling it as "very expensive generation units". We would also like to stress that Elia is referring here to demand response, whereas actually market response should have been used, unless Elia is incorporating all non-demand response elements of market response elsewhere in the model. If the latter would not be the case, this would imply an underestimation of market response in the model.*

25. *[FEBEG] B.2.2 – Demand response: Elia models the demand response in the tool by using very expensive generation units. FEBEG would like to remind that DSM also faces flexibility and duration constraints which generation units do not.*

Elia confirms that it refers to market response. Elia would like to clarify that it does not model them just as "very expensive generation units", but rather mimics the true market behaviour of such technology. The modelling of market response fully considers the input from the E-Cube study:

- Elia model considers 7 different categories of MR each as a share on the total volume of market response, and each with a different cost;
- Each of these categories is modelled as a "technology unit" in the model subject to a capacity constraint plus maximum duration constraints and maximum number of activations per week.

8 Questions on Flow based

26. *[FEBELIEC] On flow based modelling, we continue to wonder what will be the (quantitative) impact of the incorporation of ALEGRO into the flow based domain, a question we already had last year, as it is still unclear even though the interconnector should enter into service next year and thus be in service by winter 2020-2021. The same applies to the HTLS upgrades on certain parts of the 380kV grid.*

Historical domains from the SPAIC process "4 winters days winter 2018/19" will be used as base domains. A recalculation of those to account for the ALEGrO will be performed. A comparison of the results with and without ALEGrO will provide an indication of the impact of ALEGrO to adequacy. See also figure 5.7 in last year's report.[9]

On HTLS upgrades, see the answer to question 30 below.

27. *[FEBELIEC] On the AT-DE Bidding Zone split, (point 3.4.2.3), Febeliec thinks that the second alinea is redundant as this split has been introduced in October 2018 and actual data exist, so reliance on a (potentially faulty) SPAIC seems to Febeliec a non-conform approach.*

[9]https://www.elia.be/~/media/files/Elia/Products-and-services/Strategic-Reserve/2018/20181128_Adequacy-study.pdf

28. *[FEBEG] What if the new SPAICs are not ready in time? As the results of the FB simulation will be severely outdated, will there an update be performed at some point?*

The SPAIC typical day selection process is not based on expert view. It is the result of a k-medoid clustering of multidimensional domains. Before the DE-AT split, this problem was restricted to 4 dimensions, which could be reduced to 3 dimensions using the zero sum constraint. Since the DE-AT split, the problem size goes up one dimension. The dissimilarity matrix that is needed for the k-medoid clustering requires a scalar metric that compares these 4 dimensional polytopes (the historical domains). As no ready-made solutions to this problem exists, this has to be developed by the SPAIC working group at CWE. At the time of writing, intermediate results have shown promise, so we are hopeful that a typical day clustering will be possible in due time & that representative domains incorporating this split can be used for this year's analysis.

29. *[FEBEG] How many representative FB domains will actually be used? as SPAICs typically cover a limited number of such domains (e.g. 12 for the DE/AT SPAIC) that cover the entire year, not only winter conditions.*

In a SPAIC a set of 12 typical days are selected: 4 for summer, 4 for interseason and 4 for winter. In the Strategic Reserve volume assessment only the 4 winter days are of importance. Of these 4 winter days 3 are week days and 1 is a weekend day.

30. *[FEBEG] For what network changes concern, will there be SPAICs available, used: DE/AT split, NEMO, Allegro, BE 380k grid evolution, HTLS upgrades? Will all these changes be assessed and integrated in one step, or will we be able to see the impacts of each, individual change?*

Historical domains corresponding to the 4 SPAIC typical days from winter 2018/19 will be used as base domains. Historical domains and the current operational FBMC framework do not include the above mentioned network changes, ALEGrO and BE 380kV grid evolutions and HTLS upgrades. The results of the official SPAICs regarding these grid modifications will not be available at the time of the assessment. For winter 20-21 the main evolution of the AC grid is the HTLS upgrade of the Avelin/Mastaing – Horta axis. For winter 20-21, the impact of this reinforcement on adequacy is assumed low given that scarcity issues for BE are mostly happening simultaneously with FR today and in the very near future. Elia has developed a method to account for the additional capacity and flexibility that Alegro will bring into the system. The final domains will therefore incorporate Nemo, Alegro and the DE/AT split, which were the 3 main deliverables following discussions with the stakeholders.

31. *[FEBEG] How will the provisions regarding Interconnector availability from the Clean Energy Package be integrated? What are the assumptions on cross-border capacity availability for the market from 1 January 2020 onwards?*

At this point in time, a CEP action plan is still under construction (possible derogations on the implementation of this rule are still under discussions at MS/NRA level). The operational framework does not incorporate different virtual margins bigger than 20% at this point.

32. *[FEBEG] Elia mentions that in case of simultaneous scarcity in France and Belgium, the import levels in BE do not reach 6500 MW. FEBEG would appreciate to know the level of net imports in Belgium and its direct neighbors in scarcity moments.*

For last year's analysis, these values can be derived from the figures 6.3, 6.4, 6.14, 6.15. This year, similar graphs will again be shown in the November report.

33. *[FEBEG] Adequacy patch: Can Elia show results on how scarce generation capacity is allocated among countries in times of system stress? Could a country in excess of capacity at national level (e.g. NL) be obliged to curtail load in order to serve load abroad? (only countries with a structural deficit are discussed in the box on p.37).*

Elia has implemented the adequacy patch as described in the Euphemia guidelines. Only countries that rely on import to cover their demand are selected by the adequacy patch to participate in curtailment sharing. Countries that have undispatched generation capacity that exceeds any level of import (in other words the national available production capacity exceeds the load) are constrained from increasing their export by the adequacy patch, and can therefore not be obliged to curtail load.