



**Consultation report of the public consultation on the data used for the study regarding the adequacy and flexibility needs of the Belgian power system for the next 10 years.**

**MARCH 2019**

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## Introduction

Elia organised a public consultation on the input data and sources that will be used for the study regarding the adequacy and flexibility needs of the Belgian power system for the 2020-2030 time horizon.

The consultation aimed at receiving comments from market participants on these data and on any suggestion for sensitivities on the base case scenario.

The consultation period was set from Monday 21th of January 2019 until Monday 11th of February 2019, 6:00pm, was publicly announced on the Elia website and was discussed at a Task Force Implementing Strategic Reserves on January 22<sup>nd</sup>, 2019.

This consultation report provides the overview of received questions and how these will be taken into account for the study.

Finally, Elia would like to thank all the market parties for their contributions during the Task Force of January 22<sup>nd</sup>, 2019 and for providing written feedback during the public consultation.

## 1 General overview

### 1.1 Legal framework

Since the Federal Electricity Law was modified around the summer of 2018, Elia has received a new task, which is to elaborate each two year a study on adequacy and flexibility of the country for a time horizon of the next ten years. The first edition of this study is to be performed by June 30<sup>th</sup>, 2019.

This task is specified in article 7bis, §4bis of the Federal Electricity law:

*[NL-version] “Uiterlijk op 30 juni van iedere tweejaarlijkse periode voert de netbeheerder een analyse uit met betrekking tot de noden van het Belgische elektriciteitssysteem inzake de toereikendheid en de flexibiliteit van het land voor de komende tien jaar. De basishypothesen en -scenario's alsook de methodologie die gebruikt worden voor deze analyse worden bepaald door de netbeheerder in samenwerking met de Algemene Directie Energie en het Federaal Planbureau en in overleg met de commissie.”*

*[FR-version] § 4bis. Au plus tard le 30 juin de chaque période biennale, le gestionnaire du réseau réalise une analyse relative aux besoins du système électrique belge en matière d'adéquation et de flexibilité du pays sur un horizon de dix ans. Les hypothèses et scénarios de base, ainsi que la méthodologie utilisés pour cette analyse sont déterminés par le gestionnaire du réseau en collaboration avec la Direction générale de l'Energie et le Bureau fédéral du Plan et en concertation avec la commission.*

As stipulated in this article, the base case assumptions and scenarios have been elaborated together with the FPS Economy, the CREG and the Federal Planning Bureau. Also, specific attention is given to discuss the new methodology for the flexibility study. In this respect

several meetings have taken place prior to the public consultation on November 20<sup>th</sup> 2018 and December 13<sup>th</sup> 2018, as well as after the public consultation on March 6<sup>th</sup> 2019.

In order to involve a larger number of market actors, it has been decided to voluntarily (no legal obligation) organize an additional stakeholder involvement via a public consultation on the data for the study. This has been announced in the Task Force Implementing Strategic Reserves, during which also an explanation has been given about the methodology that will be used. This report is the result of this additional stakeholder involvement.

Finally, the study is foreseen to be made public by June 30<sup>th</sup> at the latest. The market actors will obviously also be informed of the results around that timing (via mailing and/or a special event/explanation via the Elia market actor involvement platforms).

## 1.2 Received answers

There were 5 public reactions and 2 confidential reactions.

The public reactions can be found on the Elia website (together with this consultation report) and were provided by:

- CREG;
- FEBEG;
- FEBELIEC;
- COGEN Vlaanderen;
- D. Woitrin (ACER).

## 1.3 Clarification on the sources used for the reference scenario

As general clarification, Elia would like to emphasize that the proposed data to be used in the 'base case' scenario are based on public data and ambition of the Belgian and European authorities.

### **'Base Case' is built based on:**

#### **Draft NECP (scenario WAM) for**

- *RES (wind, PV, biomass)*
- *Nuclear (which follows the current law)*
- *Final consumption growth (Eurostat definition) - (was previously set to "IHS Markit" but to maintain consistency with the rest of the data, was changed to the NECP consumption growth)*

As submitted to the EC end of December. Elia would like to remind that those assumptions are based on what the Belgian authorities have agreed to propose to the EC to reach the 2030 targets.

Source and more information: <https://economie.fgov.be/fr/publications/projet-de-plan-national>

**“Energy Pact” for:**

- *Market response volume*
- *Storage volume*

The EnergyPact text agreed between the federal and regional authorities has set (amongst other) targets for storage and market response to be achieved.

Source and more information: [https://www.tommelein.com/wp-content/uploads/bsk-pdf-manager/Visienota - BE Interfederaal Energiepact 209.pdf](https://www.tommelein.com/wp-content/uploads/bsk-pdf-manager/Visienota_-_BE_Interfederaal_Energiepact_209.pdf)

**FOP 2020-30 & TYNDP 2018 for:**

- *Planned grid reinforcements for the grid model*

Those consist in the latest commissioning date for each project.

Source and more information: <https://tyndp.entsoe.eu/>  
<https://eliafederaldevelopmentplan.be/>

**IEA – WEO 2018 for:**

- *Fuel and CO<sub>2</sub> prices*

Source and more information: <https://www.iea.org/weo/>

**MAF2018 (or MAF2019 if available) for:**

- Other countries installed capacities, consumption (20 countries)
- Complemented with additional info from the market:
  - ‘PPE’ in France
  - ‘Coal phase out commission’ outcome in DE
  - NL adequacy study
  - Future Energy Scenarios 2018 in UK

The full MAF dataset containing all European countries can be found on the ENTSO-E website following the link below.

**MAF:** <https://www.entsoe.eu/outlooks/midterm/>

**France: PPE:** <https://www.ecologique-solidaire.gouv.fr/programmations-pluriannuelles-lenergie-ppe>

**Germany:**

[https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen\\_Institutionen/Versorgungssicherheit/Netzreserve/netzreserve-node.html](https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/Versorgungssicherheit/Netzreserve/netzreserve-node.html)

Complemented with: <https://www.ft.com/content/9b1b8bde-2218-11e9-8ce6-5db4543da632>

**The Netherlands:** adequacy study:

[http://files.smart.pr/70/33fbb0037611e9974b07bf97787b0f/20181218-Rapport-Monitoring-Leveringszekerheid-2018-2017-2033\\_.pdf](http://files.smart.pr/70/33fbb0037611e9974b07bf97787b0f/20181218-Rapport-Monitoring-Leveringszekerheid-2018-2017-2033_.pdf)

**The UK:** Future Energy Scenarios – Steady State: <http://fes.nationalgrid.com/>



## 2 Questions and comments received

Due to the large amount of comments received and the fact that these are often covering similar topics, they have been **clustered the comments into several categories**. By doing so, we aim to make the consultation document as user friendly as possible. It is possible that some questions/comments are covering more than one topic.

### 2.1 General questions

<p>FEBEG</p>	<p><u>FEBEG welcomes the new adequacy and flexibility study</u>          The adequacy and flexibility study of Elia is considered as very important for the Belgian energy sector – and for the Belgian society as a whole – as the study will be a crucial element in the ongoing discussions on the implementation of a capacity remuneration mechanism in Belgium. For this reason, FEBEG welcomes this consultation on the input data and – more generally – the update of the adequacy study that will be broadened with a study on the flexibility needs in the Belgian electricity system.</p> <p><u>FEBEG regrets that there's no consultation on the methodology</u>          FEBEG clearly appreciates this consultation on the input data for the adequacy and flexibility study, but regrets that there's as such – at least in this stage - no consultation on the methodology that will be used for the study while the part on the identification of the flexibility needs is new.</p>
<p>Febeliec</p>	<p>Febeliec would like to thank Elia for this consultation on the input data for the adequacy and flexibility study to be conducted by end of June 2019. Febeliec regrets that only three weeks are given for this consultation, which severely limits the possibility of stakeholders to provide (quantified) input data.</p> <p>Febeliec strongly regrets that Elia only conducts a consultation on the input data, and does not conduct a consultation on the methodology it will apply for this double study, which will be reiterated every second year. Febeliec strongly regrets that Elia has chosen to not involve the stakeholders in the development of this methodology, other than the stakeholders imposed by the law (FPS Economy and Federal Planning Bureau, plus coordination with CREG). Even though no such legal obligation exists, Elia could (and according to Febeliec, should) have opted for a much larger involvement from all stakeholders, in order to obtain a much stronger buy-in from stakeholders in the methodology, the study and its results had they been involved from the beginning and the design phase, especially as the flexibility part of the study is a totally new domain that Elia will explore.</p>

We thank the market actors for their support and for welcoming the study and the organized stakeholder interaction. However, as stipulated in part one of this report, the consultation is a voluntary initiative, which had certain constraints in terms of timing and scope. It is in addition difficult to consult on a methodology without having any insights on the results. However, the main approach and principles of the methodology have been presented and discussed during a Task Force-meeting (which is reflected in the meeting



minutes of that meeting). In the final report, the entire methodology will be described in detail, with of course the corresponding results. Any suggestions for improvement can be taken on board for future studies, as this study will be performed again by the summer of 2021.

While Elia is thus looking forward to further discussions with the stakeholders, Elia will not organize a public consultation on the methodology before publishing the study in June. As this is a new methodology, Elia believes that it is in interest of efficient discussions to conduct further discussions after the publication of the results of the study.

However, Elia welcomes any remarks at any stage of the process, including after the publication of the study. Should there thus be any remark, suggestion or question, please feel free to share this with Elia.

Febeliec	<p>0. Scenario Framework</p> <p>Febeliec does not see how the proposed framework will provide a clear answer to the flexibility part of the study. Whereas adequacy involves supply covering demand at any price (de facto, market cap of 3000€/MWh in DAH market), flexibility (demand response, but also emergency generators, storage, ...) will participate in the market at a wide range of prices. Moreover, with the study looking ten years ahead, Febeliec wonders how Elia will cover future evolutions in flexibility. Whereas generation might be quite predictable with respect to future evolution paths (technological and from a cost perspective) (potentially for some technologies, as recent history has shown that predictions have been more wrong than right), the recent past clearly shows that any predictions about flexibility have all been very much off, as flexibility has developed substantially each time the markets showed a clear interest in them (with clear price signals); new actors, new business models and new products have (swiftly) been developed to answer a new need. As such, Febeliec wonders how Elia wants to capture these observed historic market dynamics in its forward-looking models, in order to avoid underestimating flexibility in the market and thus overestimating artificially the need for a “structural block”. Moreover, it is unclear how Elia is planning to incorporate for example the gigantic potential of a combination of smart meters and variable price contracts for MSE and residential customers which should invigorate to a large extent demand response in the market.</p> <p>In general, Febeliec regrets that the sources of data in the spreadsheets are lacking, making it almost impossible to validate the proposed data by Elia. It is impossible to discern whether the values are based on external sources, internal estimates, or a mix of both, making it also nearly impossible to validate or falsify the data.</p>
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First of all, in the final report an extensive bibliography will be included with a transparent overview of used sources. As for demand response values, the number included in the Energy Pact are used for this study for the years 2025 and 2030. As for the shorter term years, i.e. 2020-2025 the demand response values will be interpolated on the basis of the values following from the methodology as used in the framework of the strategic reserves. This methodology has been elaborated and agreed by consensus with the concerned

market actors in the Task Force Strategic Reserves and is on this moment the best and most representative methodology at hand for this study.

FEBEG	<p><u>On the adequacy part:</u>          FEBEG understands that the methodology for the adequacy study is in line with the methodology used for the determination of the volumes of the strategic reserve (including some improvements as mentioned in the task force organized on 24th of January, 2019). Yet, FEBEG is wondering if the methodology is in line with the one of ENTSO-E?</p>
FEBEG	<p>FEBEG would like to draw the attention of Elia to the recent evolutions in the Clean Energy Package in terms of adequacy assessment and reliability standards in the framework of the implementation of a capacity remuneration mechanism. For instance, the national adequacy assessments should contain the central scenario of ENTSO-E.</p>

The methodology used by Elia is fully aligned with the one used by ENTSO-E. It uses the same datasets, methodologies and models. Elia details further the assumptions for Belgium and updates the assumptions of neighbouring countries with the latest developments. The data collection of the MAF happens in the beginning of the year while the study is published around October. Such large interval leads to data that for some of the countries are not up-to-date. Elia will therefore take into account the MAF2018 and will complement it with the latest developments. Those will be explicitly mentioned in the study.

CREG	<p>1. De raadpleging heeft betrekking op een Excelbestand waarin de hypothesen aangaande de data voor de studie worden vermeld. De CREG meent dat een begeleidend raadplegingsdocument bij deze raadpleging nuttig zou zijn geweest, zeker voor de actoren die geen deel uitmaken van de ISR-TF (Taskforce van Elia voor de implementatie van de strategische reserve), waarbinnen er op 22 januari 2019 een presentatie werd gegeven over de aanpak van deze studie. (De slides van deze presentatie zijn weliswaar beschikbaar op de website van Elia, maar er is geen verwijzing vanuit de publieke raadpleging naar deze presentatie.)</p> <p>2. Deze raadpleging is de enige raadpleging die Elia wenst te organiseren in het kader van haar studie. De huidige raadpleging geeft echter hoogstens de data voor het basisscenario weer. De sensitiviteitsanalyses zullen bepaald worden in functie van de antwoorden op deze raadpleging. Hierdoor is het voor de marktactoren niet duidelijk welke scenario's en sensitiviteitsanalyses effectief zullen gebruikt worden in de studie van Elia.</p> <p>3. De CREG merkt verder op dat Elia geen motivering geeft voor de gekozen evoluties, wat wel had kunnen bijdragen tot een beter begrip van de voorgestelde data en mogelijks meer gerichte vragen door marktactoren had kunnen teweegbrengen.</p>
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CREG	<p>41. De CREG stelt in deze nota een aantal vragen ter verduidelijking van de data waarover geraadpleegd wordt.</p> <p>42. Daarnaast stelt de CREG vast dat het bestand dat ter raadpleging voorligt niet alle data bevat voor de simulaties die zullen worden uitgevoerd en geen enkele indicatie geeft over welke sensitiviteitsanalyses er zullen worden gedaan. Bijgevolg is het voor de marktpartijen afwachten tot het verschijnen van het eindrapport om te weten te komen welke analyses er precies worden uitgevoerd in deze studie van Elia.</p> <p>43. De CREG meent dat hierdoor de openbare raadpleging haar doel onvoldoende bereikt.</p>
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The initiative and approach for the public consultation was discussed in the working group with the DG Energy, Planning Bureau and the CREG. This public consultation explicitly foresaw the possibility for market actors to propose any suggestion for a sensitivity. This has been widely followed-up and many suggestions have been received (cf. infra). The data sources have equally been discussed in the working group and explained to the market actors during the Task Force of January. The data are all used based on external, predominantly public sources, such as the energy pact, the (draft) national climate and energy plan, the federal development plan, etc. The final report will clearly include all references to these external data, used to objectivize the study as much as possible.

CREG	<p>2. De CREG stelt vast dat het “structureel blok” veel ruimer wordt gedefinieerd dan in de eerste adequacy en flexibiliteitsstudie van Elia in 2016. De wijze waarop dit structureel blok ingevuld zal worden en de criteria die hiervoor zullen gebruikt worden, zijn nog onduidelijk voor de CREG. Teneinde de resultaten van de studie toch te kunnen vergelijken met de Elia-studie van 2016, vraagt de CREG om in het resultaat van de simulaties ook de nodige volumes te geven die overeenkomen met het structureel blok zoals gedefinieerd in de studie van 2016.</p>
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Elia will ensure that in the final report a clear comparison with previous similar studies will be possible (both in a descriptive and a visual way).

## 2.2 Flow based

### 2.2.1 Clean Energy Package

FEBEG	How will the new article 14 of the Electricity Regulation – part of Clean Energy Package - and in particular the 70 % of thermal capacity that must be available for the market on the day-ahead timeframe, be implemented in the study? How to cope with potential internal and cross-border congestions that must be solved with redispatch and curtailment? It is not because the flow-based domain is bigger that the feasible market clearing point can reach the edges of this domain.
CREG	19 .De CREG vindt in het consultatiebestand van Elia geen indicatie dat de doelstelling van minimum 70% RAM die vastgelegd worden in het Clean Energy Package ook wordt meegenomen voor bepaling van de Belgische importcapaciteit.
Febeliec	6.o With respect to the flow-base domain, it is very unclear how Elia will take into account the proposed modifications as well as certain clarifications and specifications that have been added in the Clean Energy Package, more precisely in the Energy Directive and Regulation, with respect to the cross-border market coupling and loopflows.

Elia is aware of the Electricity Regulation of the CEP. This is one of the triggers to perform this study with a flow based methodology that will allow to take into account the different rules defined in the CEP. Using the so called “NTC” method is unfortunately not suitable to implement those rules in a correct way.

When constructing flow based domains for the different time horizons, the new regulations will be taken into account. While the target “70%” is clear, whether a linear trajectory will be applied (gradual increase of the %) or derogations will be applied is at the moment unclear. It is foreseen to apply a gradual increase of the CEP rule from 2020 (20%) until 2025 (70%).

Elia will detail all assumptions taken with regards the flow based construction in the report and publish the domains used for the study and the different time-horizons.

Elia is aware of the fact that increasing the flow based domains can lead to situations where additional redispatching might be needed after the market. It is at the moment not planned to perform European redispatching simulations after the market to verify the grid feasibility.

## 2.2.2 Flow Based method

CREG	<p>16. De CREG meent dat het nodig is om ook een simulatie te maken met het gebruik van NTC-capaciteit van minstens 6500 MW op de interconnecties naast de flow-based simulatie. Op die manier kan de impact van de flow-based market coupling duidelijk worden.</p> <p>17. Tevens moet Elia in de resultaten aangeven, zowel voor de flow-based methode als de NTC-methode, wanneer en onder welke omstandigheden er minder dan 6500 MW import beschikbaar is voor België. Deze resultaten moeten opgesplitst worden in enerzijds de uren waarbij de netwerkcapaciteit de beperkende factor is en onder welke omstandigheden dit het geval, en anderzijds de uren waarbij de beschikbaarheid aan productiemiddelen in het buitenland ontoereikend is en onder welke omstandigheden dit het geval is.</p>
FEBEG	<p>12. What is the 'simplified flow-based method' and how does it differ from the actual flow-based method? How does it impact the results compared to ATC and to the flow-based method? What is the added value?</p>

The flow based methodology used in the strategic reserve volume evaluation is not suitable for the present study as it uses historical domains (based on typical days methodology used for the SPAIC). With the large amount of changes expected in the next years and the new regulation in place, Elia is working on creating flow based domains for future years which can take such changes into account. In order to do so, there is a need to re-create the process that is followed today in the day-ahead capacity calculation method with at least:

- A future grid model (PTDF N and N-1);
- Calculation of the base case flows;
- Applying additional rules set by policy makers (e.g. MinRAM, CEP 70%,...).

Such method is very complex and it is impossible to create domains for every hour of the simulations (that would imply creating more than 200000 domains (one domain for each hour of each climate year)). As done for the "typical days" in the SPAIC, a clustering of days will be performed and a limited amount of flow-based domains will be used in the simulations. The methodology (which will be in detail described in the final report) will not be different in essence but the amount of grid situations that will be included will be limited.

Elia would like to remind that the NTC method (using one commercial capacity for the whole year) is not suitable for an adequacy study for Belgium where the imports are already today fully determined by the so called "flow based capacity calculation method". Moreover, the NTC method does not allow to take into account the expected changes in the regulation (see previous paragraph). It is also important to mention that it is also the aim to apply a flow-based methodology in the future European Adequacy Assessment.

### 2.2.3 Initial grid assumptions

ACER	1. Interconnexions : il semble que l'exportation possible vers la France future soit sous-évaluée suite au renforcements Mercator-Avelgem-Avelin/Mastaing (conducteurs HT) et aux deux nouvelles lignes RTE Avelin-Gavrelle et Lonny-Seui/Vesle de grande puissance. Voir les projets RTE.
ACER	2. Interconnexions : il semble que les deux PST's supplémentaires (Zandvliet) ainsi que la nouvelle ligne BRABO et les renforcements hollandais Zandvliet-Kreekrak/TenneT ne soient pas pris en compte dans les capacités qui seront bientôt disponibles à la frontière hollandaise. Voir les projets TenneT.

The NTC capacities given in the consultation file were the ones used for previous adequacy studies as from 2025. Those are indicative and are in-line with the NTC used in the framework of the MAF 2018 European Adequacy Assessment.

<https://www.entsoe.eu/outlooks/midterm/>

In terms of projects included in the grid model that will be the basis of the "flow based" domain calculation, the latest models from the TYNDP 2018, where each TSO has inserted all projects with their associated timing, will be used. The mentioned projects are indeed part of the dataset at their expected commissioning dates. This information is included in the draft Federal Development Plan 2020-2030.

<https://eliafederaldevelopmentplan.be/>

Febeliec	For Febeliec it is unclear how for example Alegro will be taken into account in the model and what will be the impact. Moreover, as the study looks 10 years ahead, Febeliec wonders how potential projects proposed in the Elia TYNDP (Nautilus, Alegro II) should be taken into account (making even abstraction of all other interconnectors with for example the UK and the Nordics will be realised from CWE in the next decade). The same applies to all the enormous grid improvement and extension projects Elia has planned on the backbone grid as well as the underlying grids in the next decade.
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ALEGrO is taken into account as in the "evolved flow based" method. More information can be found on page 20 of the following document:

[https://docstore.entsoe.eu/Documents/Network%20codes%20documents/Implementation/ccr/methodologies/explanatory\\_note\\_for\\_core\\_da\\_id\\_fb\\_ccm\\_june2018\\_final.pdf](https://docstore.entsoe.eu/Documents/Network%20codes%20documents/Implementation/ccr/methodologies/explanatory_note_for_core_da_id_fb_ccm_june2018_final.pdf)

*"This is achieved by taking into account the impact of an exchange over an HVDC interconnector on all CNEs directly during capacity allocation" [...]*

On the investments in the grid, those will be taken into account according to the

TYNDP2018 and the draft Elia federal development plan 2020-2030 (projects for approval). <https://eliafederaldevelopmentplan.be/>

CREG	18. De CREG meent dat de vereenvoudigde methodologie en data van de flow based methode ook ter publieke consultatie zou moeten worden voorgelegd.
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Given that the methodology is new and not yet finalised when answering the present public consultation, it won't be send to public consultation.

Elia will explain in details how the flow based method was implemented and will provide the resulting domains (such as done for the strategic volume evaluation study) when publishing the report.

Elia welcomes any remarks at any stage of the process, including after the publication of the study. Should there thus be any remark, suggestion or question, please feel free to share this with Elia. Any suggestions for improvement can be taken on board for future studies, as this study will be performed again by the summer of 2021.

## 2.3 Demand

FEBEG	What are the forecasts of peak demand (MW)? This is crucial data which has not been listed in the excel file. With the increasing share of heat pumps and cooling systems (and expected more extreme weather conditions), the peak demand could increase more than the energy consumption. Will Elia make sensitivities on the demand curves? Has Elia aligned with the scenarios from ENTSO-E? Is there a consistency between demand scenarios across countries (cfr. regional adequacy assessments will be needed to get approval from DG COMP)? Which demand profiles will be used, e.g. sourced from ENTSO-E?
CREG	30. Hoe worden de energie-efficiëntie maatregelen die in het energiepact zijn voorzien, in rekening gebracht? Het energiepact vermeldt immers geen cijferwaarden.
CREG	29. Welke zijn de onderliggende assumpties die deze evolutie van de vraag creëren? De voorgestelde evolutie van de energievraag geeft geen indicatie over hoe de piekvraag zal evolueren. Welke aannames neemt Elia hierover? De CREG stelt immers vast dat de piek van de Elia Grid load de laatste vijf jaren nagenoeg constant gebleven is.



Febeliec	<p>12. Febeliec wants in this framework refer to the comments it always makes in the framework of the input data for the yearly study for the determination of the required volumes for strategic reserve and wants to point to the historic growth rates which show far from the very clear year-on-year increase of 0,49 to 0,74% that Elia foresees for the future. The historical values show that even for economically sound years as 2016 total electricity demand can diminish, whereas Elia only (macro-economically?) discerns never-ending year-on-year increases for the whole of the next decade. Febeliec reiterates previous demands to validate historical IHS forecasts with actually observed values for the recent years, in order to provide confidence in the applied methodology or, in case the IHS track record would not be so sound in predicting future electricity consumption, develop an alternative and more correct forecast tool. In any case, Febeliec observes that even after a few years of economically sound years (2011-2017), total electricity demand has still not returned to the level of 2011 (let alone pre-2008 levels!), whereas Elia now decidedly takes into account an increase of almost 7 TWh in demand in the next decade!</p> <p>o In any case, Febeliec urges Elia strongly to include several sensitivity analyses on this point, as overestimates in total electricity demand will automatically lead to overestimated needs for (flexible) capacity and thus unnecessary investments in Belgium, both for adequacy and maybe even for flexibility purposes.</p>
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Elia (as the other TSOs or ENTSO-E) takes into account the so called “total consumption of electricity” which includes all electricity use in the country (and not only the one seen on the Elia Grid). That includes the consumption that is “auto-consumed”, the losses on the grid (DSO and TSO),...

A more detailed definition is also available on the Elia website:

<http://www.elia.be/en/grid-data/Load-and-Load-Forecasts/total-load>

In order to define the consumption profiles, Elia will use the state of the art tool developed and used by ENTSO-E to create the consumption profiles for all countries for its adequacy and market studies. Such tool<sup>1</sup> takes into account several parameters (historical profiles, temperature, heat pumps, electric vehicles.... It is therefore consistent with the ENTSO-E method and other countries consumption profiles. In terms of peak demand, this is an output of the consumption data creation (the peak consumption is impacted by the

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<sup>1</sup>[https://docstore.entsoe.eu/Documents/SDC%20documents/MAF/MAF\\_2018\\_Methodology\\_and\\_Detailed\\_Results.pdf](https://docstore.entsoe.eu/Documents/SDC%20documents/MAF/MAF_2018_Methodology_and_Detailed_Results.pdf), page 11 a.f.

different assumptions taken to create the demand profiles). The different peak consumption distributions will be published with the final report (such as done for any adequacy study that Elia publishes).

In terms of consumption growth, Elia will align the consumption growth with the values taken into account in the draft NECP (scenario WAM) for the final consumption growth that was submitted by Belgian authorities end of December 2018. It therefore includes the planned measures foreseen in the framework of the European energy efficiency targets for 2030. A forecast of DSO and TSO grid losses (not part of the final consumption definition used in the NECP) will be added.

All information can be found here: <https://economie.fgov.be/fr/publications/projet-de-plan-national>

## 2.4 RES

### 2.4.1 Source for the RES capacities

For the RES (biomass, wind and PV), Elia will base its numbers for the reference scenario on the draft NECP submitted to the EC end of December 2018.

Elia had initially proposed the values of the “Energy Pact”. Those were very similar to the ones finally proposed in the NECP but for coherence and in order to use the latest data that were approved by Belgian authorities, it will be adapted to be fully aligned with the NECP.

The NECP data and underlying documents can be found at the following link:

<https://economie.fgov.be/fr/publications/projet-de-plan-national>

	Unit	2005	2010	2015	2020	2025	2030
Nuclear energy	GW	5.802	5.927	5.913	5.927	2.389	0.000
Solids	GW	0.000	0.000	0.000	0.023	0.023	0.023
Oil (including refinery gas)	GW	0.000	0.000	0.000	0.302	0.264	0.219
Gas (including derived gases)	GW	4.357	3.652	4.702	5.851	8.041	10.374
Biomass-waste	GW	0.445	0.877	0.821	0.949	0.616	0.635
Hydro (pumping excluded)	GW	0.105	0.118	0.112	0.124	0.137	0.151
Wind	GW	0.167	0.912	2.176	5.020	5.865	8.450
Solar	GW	0.002	0.904	3.122	5.504	8.249	11.005
Geothermal and other renewables	GW						
Other fuels (hydrogen, methanol)	GW						

A linear interpolation will be applied between the different time-horizons. For the wind offshore, it is assumed that the capacity will be available after 2025 and before 2028 hence the increase by +2 GW between those 2 years.

FEPEG	PV: for clarity purposes, could Elia provide a split of the installed capacity per region?
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Elia is taking the NECP values for Belgium. If a split per region exist, it can be found in the NECP documents (as each region and the federal has submitted its plan).

FEBEG	On biomass: what are the units behind the individually modelled biomass? There are still many uncertainties on prolongation of green certificates' regime both in Wallonia and Flanders.
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Elia will take into account the values from the NECP. Those lead to a decrease in the biomass capacity by around 300 MW from 2020 to 2025 which most probably reflects those uncertainties. The individual list of units modelled can be found:

[http://www.elia.be/~media/files/Elia/publications-2/Public-Consultation/2018/20180827\\_Strategic-Reserve-2019-20-input-data.xlsx](http://www.elia.be/~media/files/Elia/publications-2/Public-Consultation/2018/20180827_Strategic-Reserve-2019-20-input-data.xlsx)

Febeliec	As the source of the provided data is lacking, it is impossible for Febeliec to make any valuable contributions. Are the proposed data based on the NECP, an Elia analysis, based on announced projects or linear extrapolation? For offshore wind, Febeliec notices that Elia adds 2GW as of 2028, without any project realization curve (as opposed to what has been observed in the past). Also for PV, Febeliec notices an increase by a 100% by 2030 but cannot discern how this result was obtained. The same comment essentially applies to all categories.
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See above for clarification on the sources.

CREG	<p>9. De voorgestelde data geven enkel een stijging van de geïnstalleerde capaciteit voor PV en wind (onshore &amp; offshore) weer. De geïnstalleerde capaciteit van de andere technologieën blijft stabiel. De CREG meent dat de evolutie van andere technologieën (bijvoorbeeld biomassa) toch ook dient te worden overwogen.</p> <p>11. De voorgestelde evolutie van de offshore windmolencapaciteit is voor de CREG aanvaardbaar.</p> <p>12. De CREG wenst dat Elia aangeeft of de evoluties van de andere hernieuwbare energiebronnen met de gewesten werden afgetoetst. Dergelijke afstemming lijkt de CREG nuttig.</p>
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The values will be fully aligned with the draft NECP corresponding to the official numbers of the different regions and the federal authorities submitted to the EC.

CREG	10. Het verbaast de CREG dat afvalverbranding ("waste") bij hernieuwbare energie wordt ingedeeld, tenzij de capaciteiten enkel betrekking hebben op de biologische fractie van de afvalverbranding met elektriciteitsopwekking. Enige verduidelijking hierbij is wenselijk.
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Waste is always mentioned separately in Elia reports. For simplification it was added in the RES sheet in the consultation file. This will be adapted in future documents to avoid further misunderstandings.

## 2.4.2 Climate years

FEBEG	<p>On the 34 historical scenarios used:</p> <ul style="list-style-type: none"> <li>- Are these scenarios available for PV, wind and demand? Since markets are highly interconnected and will be even more in the future, these scenarios should also be available for the other countries modelled.</li> <li>- Does Elia take into account the climate change phenomenon into account? A new (set of) climatic conditions could be simulated.</li> </ul>
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Yes, those are climate data correlated for all Europe for PV, wind onshore, offshore and temperature (one set of data per country). The latter is then used to create the demand profiles.

Elia bases itself on the database used by ENTSO-E (to be fully in line with the European adequacy assessment). Those data consist of 34 hourly historical climate years. The historical values are used hence no changes are apply to take into account certain climate condition changes for the future.

## 2.4.3 Sensitivities

FEBEG	<p>FEBEG observes optimistic assumptions in terms of development of renewable capacity, especially wind and PV, in the study: the capacity will double at the 2030-horizon. FEBEG understands that these assumptions are based on expressed political ambitions and that the construction of this capacity will for a large part depend on the support mechanism in place. These optimistic assumptions raise a lot of questions and doubts. Are the figures in line with the most recent figures as published in the different climate plans? What are the expected system costs for these scenarios? What are the expected costs for the according grid development? What about the needs, opportunities or constraints with regard to the repowering of these assets after a certain years of operations? For the abovementioned reasons, FEBEG considers it valuable to adjust the base case or to at least add sensitivities with less renewables capacity (e.g. 150 % increase of wind and PV capacity by the end of 2030).</p>
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The figures will be based on the NECP (see above for more details) hence in-line with the most recent climate plans. The concerns raise on costs or on repowering of RES capacities are out of scope of the study. What concerns grid development and related costs, the draft Federal Development Plan followed by a public consultation in 2018 provides more details.

<https://eliafederaldevelopmentplan.be/nl/>

A sensitivity with lower values could be performed.

## 2.5 CHP

### 2.5.1 Proposed capacity

COGEN	See Excel additional categories for new CHP
FEPEG	The capacity level of CHP by 2030 – thus including prolongation of some large CHP's - is quite uncertain given the reduction of green certificates. What is the reasoning behind these stable figures?
CREG	21. De CREG vraagt zich af waarom enkel gasgestookte WKK's in aanmerking worden genomen? De evolutie van gasgestookte WKK wordt bovendien constant beschouwd over de ganse studieperiode (dus geen enkele nieuwe capaciteit). De CREG meent dat ook bijkomende WKK het structurele blok kunnen opvullen.
Febeliec	4.1 CHP Febeliec takes note that Elia will take into account a 100% flat CHP profile for the next decade, without the phase-out nor construction of any CHPs. As this scenario seems quite unlikely, Febeliec would urge Elia to include at least some sensitivity scenarios where additional CHPs are taken into account. Elia takes into account an increase in total demand (to be discussed below), a.o. because of increased demand from industrial consumers (e.g. new large investments in Belgium), but does not take into account any investments in CHPs for any of such projects nor for any residential neighbourhood level CHP systems.

Based on the suggestion, Elia will create a new category for the following 2 units: Zandvliet Power and Inesco. Those will be included in a new category called "CHP-CCGT". This will avoid the confusion on the CHP installed capacity in Belgium.

The CHP capacity is indeed uncertain. For the base scenario, the same level as expected based on known projects will be used. Those include the projects reported to Elia by industrials and DSOs. Those are cross-checked yearly with the regions during summer with the DG Energy in the framework of the strategic reserve volume evaluation.

More information on the installed capacities and individual list of units can be found here:

[http://www.elia.be/~media/files/Elia/publications-2/Public-Consultation/2018/20180827\\_Strategic-Reserve-2019-20-input-data.xlsx](http://www.elia.be/~media/files/Elia/publications-2/Public-Consultation/2018/20180827_Strategic-Reserve-2019-20-input-data.xlsx)

## 2.5.2 Sensitivities

COGEN	Het vermogen van de steg-WKK's dient mee in rekening gebracht te worden. (See excel) Een stagnatie van het opgesteld vermogen aan WKK is een conservatief scenario. COGEN heeft in het verleden berekend dat er een potentieel is van 1000 MWe extra WKK-vermogen mogelijk is tegen 2025-2030. Een sensitiviteitsanalyse dient een scenario mee op te nemen waarbij het opgesteld vermogen aan WKK stijgt met 1000 MWe tussen 2020 en 2025-2030.
ACER	3. CHP : étonnant qu'il n'y ait pas plus de visibilité sur l'installation de nouvelles CHP tant industrielles qu'au niveau des GRD's ? – au moins une analyse de sensibilité à faire.
COGEN	Alternatieve scenario's COGEN: Stijging van het opgesteld vermogen WKK met 1000 MWe tussen 2020 en 2025-2030 Daling van het opgesteld vermogen WKK met 1000 MWe tussen 2020 en 2025-2030

Additional sensitivities on the CHP capacity could be foreseen in the final report.

## 2.6 Storage

### 2.6.1 Source of the base case scenario

FEBEG	16. What is the reasoning behind the important increase in the development of batteries? Is Elia sufficiently confident that this battery capacity will come to the market given the expected evolution of electricity prices? In addition, what is the costs behind this development of new batteries if their development is not triggered by the market? What would be the market design to enable such investments? What is the impact of peak/off-peak spreads?
Febeliec	10. The same issues arise for storage as for previous categories as no source is available for the information nor a breakdown (e.g. In number of batteries, technologies, vehicles, ...) nor a methodology describing the increase of storage, making it impossible to provide any meaningful comments to the proposed data

As mentioned in the introduction, the values are based on the Energy Pact for the storage.

In the Energy Pact, 3.5 GW of storage are mentioned for 2030. Those include the currently installed pumped storage units and a new one of 600 MW. It was decided to threat the latter one out of the base case (and could consist in a sensitivity). This results for 2030 in 1.6 GW (3.5 GW -1.9 GW) of storage in the form of large scale batteries, small scale batteries and 'vehicle to grid'. The detailed assumptions are then explained in the next paragraph.

## 2.6.2 Categories split

CREG	<p>26. De CREG meent dat een duidelijke beschrijving en definitie van de verschillende categorieën van opslag noodzakelijk zijn.</p> <p>27. Het is ook onduidelijk hoe de omzetting van capaciteit (zoals vermeld in het energiepact) omgezet werd naar energie (in MWh). Voor Large scale storage zijn de cijferwaarden van de capaciteit (MW) en de cijferwaarden voor het reservoirvolume identiek (MWh). Dit betekent dat Elia meent dat de capaciteit van large scale storage slechts één uur benut kan worden.</p>
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For storage, Elia based itself on the Energy Pact figures. Those mention a certain amount of storage in the future years. Although the total power capacity is mentioned in the Energy Pact, no split nor reservoir capacity are provided.

Additional assumptions on the reservoirs capacities were defined as follows:

- **In 2030: 1,6 GW storage** (excluding “pumped storage”)
- The split between 3 types of storage was defined:
  - V2G (bi-directional EV charge/discharge to the grid)
    - 5% of the EV fleet providing it (and permanently connected to the grid);
    - 7 kW charger;
    - **4 hours storage** (50% of the battery size used for V2G purposes)  
*(This assumes an increase of the average battery size in electric vehicles)*
  - Small scale (“power walls”, <100 kW)
    - Based on PV installations (5% of PV installations (1 kW storage for 1kW PV) )
    - **3 hours storage** (based on current and future expected average battery sizes)  
*(Current Tesla powerwall has 2 hours storage)*
  - Large scale (>100 kW)
    - Remaining capacity = TOTAL (1.6 GW for 2030) – V2G – Small scale
    - **1 hour storage** (based on current and future expected average battery sizes.  
*(Current and projects in CWE have 0,7 hours storage. Source: BNEF)*

## 2.6.3 Pumped storage and sensitivities

ACER	<p>5. Elia semble très (trop ?) optimiste sur les « autres » stockages mais donne une probabilité nulle à Coo3 (décision imminente ?), ou à d'autre PHS ? – au moins une analyse de sensibilité à faire.</p>
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A sensitivity on the storage capacity could be foreseen by considering an additional pumped storage unit in Belgium.



## 2.7 FO rates

### 2.7.1 Additional clarifications

FEBEG	It would be valuable to integrate the statistics observed in 2018 in the data set. Should DSM not also have a forced outage? How exactly is the number of FO rate used in the model? What about maintenance and planned outages: how are they modelled?
CREG	34. De CREG vraagt Elia te verduidelijken hoe de onbeschikbaarheidsdata werden bepaald (op jaarbasis of enkel voor de winterperiode?). Is er voor bepaalde eenheden een correlatie tussen de seizoenen en de 'Forced Outage' (FO)? De CREG meent te begrijpen dat voor iedere FO ook de gemiddelde onbeschikbaarheidsduur wordt toegepast. De CREG vraagt ELIA te onderzoeken of deze voorgestelde methode voldoende correcte resultaten oplevert. Een eenheid die uitzonderlijk een langdurige stilstand heeft gekend zou de gemiddelde onbeschikbaarheidsduur sterk kunnen beïnvloeden. Zou het gebruik van een kansverdelingscurve op basis van de waargenomen onbeschikbaarheden en significant verschillend resultaat opleveren?

Maintenance of units are based on the ENTSO-E standard dataset for each type of unit and the maintenance profiles used in the MAF and other adequacy studies.

No FO rates are applied to batteries and DSM. For the latter it is assumed that those are included implicitly in the volumes given to the market.

For forced outages, those are drawn by the model for each day based on the forced outage rate (Markov chain).

The forced outage rates are calculated for the whole historical period. The values obtained for Belgium are based on the historical analysis and are in the range of the standard data used by ENTSO-E for its adequacy studies.

#### **3 different outage parameters are needed for the current study:**

The definitions of the first two parameters are used in adequacy studies and are in-line with the ENTSO-E methodology.

##### **1. The outage rate (used for the adequacy study)**

- a. This consists in the amount of unavailable energy due to forced outage divided by all the other moments when the unit was available and in forced outage.

$$b. \text{ Average forced outage rate} = \frac{(FO \text{ energy}_{2007 \rightarrow 2017})}{(FO \text{ energy}_{2007 \rightarrow 2017} + \text{Available status}_{2007 \rightarrow 2017})}$$

##### **2. The average outage duration (used for adequacy and flexibility study)**

- a. This is the average length of an outage
- b. 
$$\text{Average duration of FO} = \frac{\text{Average}(FO \text{ duration}_{2007} + \dots + FO \text{ duration}_{2017})}{\#FO \text{ over } 2007 \rightarrow 2017}$$

##### **3. The average amount of events (only used in the flexibility study)**

- a. This consists in average the amount of outage events that happen per year
- b.  $Average \#FO = Average(\#FO_{2007} + \dots + \#FO_{2017})$

Indeed, in the case of flexibility it is particularly important to cover unexpected outage events immediately after the events (ramping and fast flexibility) and during intra-day (slow-flexibility). After day-ahead, these fall under the scope of the adequacy analysis, in which the duration and the outage rate is particularly important (i.e. the time a unit is effectively in outage).

## 2.7.2 DC links

Febeliec	Febeliec regrets that no sources have been provided, making it difficult to assess the information. For example for DC links, Febeliec wonders on which historical data this is based and which technologies have been taken into account; Febeliec has always understood that the applied technology for at least NEMO (and Alegro?) is new and thus wonders how this historical value has been determined.
CREG	35. Hoe werd de FO-rate bepaald voor DC-lijnen ?

For DC-links, note that 6% is proposed by ENTSO-E for HVDC FO rate. However, in the scope of SR, stakeholders have expressed the fact that 6 % is too high. A consensus was reached with 5% of FO. This is the value taken as well in this study. Given that NEMO is only in service for a few weeks, it is impossible to get reliable data on its FOs. For the forced outage duration, a period of 7 consecutive days was retained and corresponds to the assumption used by ENTSO-E (based on CIGRE data) for the Mid-term Adequacy Forecast.

For the amount of events representing the probability to face an outage, a value of 2 outages per year (in each direction) is assumed. This value is also used in Elia's proposal on the methodology and results of its reserve dimensioning for 2019 (approved by CREG)<sup>2</sup>. An analysis of historic outages of other DC-interconnectors in Europe (cfr. BritNed) does not provide indications that this value would not be realistic. However, Elia aware that experiences from one DC-interconnector are not necessarily transferable to others (due to differences such as technology and age). If experience with NEMO-link gives an indication that this value should be updated, Elia will do so.

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<sup>2</sup> [\\*https://www.creg.be/nl/openbare-raadplegingen/raadpleging-over-ontwerpbeslissing-b1808-betreffende-de-vraag-tot-goedkeuring](https://www.creg.be/nl/openbare-raadplegingen/raadpleging-over-ontwerpbeslissing-b1808-betreffende-de-vraag-tot-goedkeuring)

### 2.7.3 Other countries

FEBEG	How is the forced outage rate modelled in the other countries (e.g. nuclear in France)?
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Elia uses the ENTSO-E forced outages to model other countries (unless differently reported by the country).

### 2.7.4 Forced outage table

#### Forced Outage Probability

Public consultation : adequacy and flexibility study 2019

	Number of FO per year 2020	Average forced outage rate over 2007-2017 [%]	Average duration of forced outage rate (2007-2017) [days]
Nuclear	1.6	3,5%	7 days -171 hours
Classical	6.1	7,9%	3 days -83 hours
CCGT	5.2	8,9%	4 days -97 hours
GT	2.8	12,3%	6 days -133 hours
TJ	2.2	4,3%	4 days -105 hours
Waste	1.3	1,5%	3 days -72 hours
CHP	3.5	6,4%	5 days -111 hours
Pumped storage	1.9	4,3%	6 days -141 hours
NEMO-link (per side)	2,0*	5,0%*	7 days -168 hours

Elia (2007-14)
ETP (2015-17) where available
SR - MAF
Analysis

\* Note that 6% is proposed by ENTSO-E for HVDC FO rate. However, in the scope of SR, stakeholders have expressed the fact that 6% is too high. A consensus was reached with 5% of FO

\*Analysis BritNed (but not necessarily transferable to NEMO-link)  
14 outages (2016-2018) = 5 outages per year = 2 + 2 outages

$$\text{Average \#FO} = \text{Average}(\#FO_{2007} + \dots + \#FO_{2017})$$

$$\text{Average duration of FO} = \frac{\text{Average}(FO \text{ duration}_{2007} + \dots + FO \text{ duration}_{2017})}{\#FO \text{ over } 2007 \rightarrow 2017}$$

$$\text{Average forced outage rate} = \frac{(FO \text{ energy}_{2007-2017})}{(FO \text{ energy}_{2007-2017} + \text{Available status}_{2007-2017})}$$

## 2.8 Economic assumptions

### 2.8.1 Investment costs

CREG	33.De voorgestelde gegevens voor de kosten zijn reeds gedateerd. De CREG beveelt aan om een ad hoc studie te maken teneinde deze cijfers te updaten voor de Belgische markt in de huidige en toekomstige context (momenteel weinig vraag naar nieuwe eenheden in Europa). Ook dient er een onderscheid gemaakt te worden tussen de investeringskosten voor nieuwe eenheden en de kosten voor werken aan bestaande eenheden.
FEBEG	The values for the CAPEX are not pertinent in the framework of an adequacy study. However, they will be needed when considering how to solve the identified adequacy issues

Febeliec	Febeliec cannot validate most of the proposed assumptions, but refers to a previous comment on the fact that Elia locks in current efficiency factors and cost factors with this data and does not take into account efficiency gains or learning curve effects or even economies of scale/scope.
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The adequacy and flexibility study will only give indicative economic results. The CAPEX values are only used to derive a certain annuity for each type of unit. Such annuity is then used to compare the revenues from the market to the fixed costs (as done in the first 10 year adequacy & flexibility study in 2016). A range of WACC and CAPEX will be used to reflect the uncertainty. Such approach was already applied in the previous study of April 2016. If stakeholders have relevant sources or data that Elia can take into account in the study, those can be sent to Elia.

Febeliec	With respect to demand shedding and shifting, Febeliec wonders why shedding is linked to industry and shifting to residential. Both categories can be linked to both types of grid users. Moreover, Febeliec does not understand why industry is considered to have no CAPEX and residential does and how the other parameters are introduced. Also on the economic lifetime, Febeliec does not understand why residential consumers are valued at 8 years, whereas industrial consumers should be around indefinitely.
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Elia acknowledges the fact that both shedding and shifting can be at residential or industrial grid users. The CAPEX figures for DSM are based on a study made for the French market by the regulator (CRE).

<https://www.cre.fr/documents/deliberations/proposition/effacements-de-consommation/annexe-4-etude-des-avantages-que-l-effacement-procure-a-la-collectivite-et-de-leur-integration-dans-un-dispositif-de-prime>

If Febeliec or any other stakeholder has a counter proposal to be used (with data and underlying assumptions or sources), Elia can further take those into account for the study or future studies.

Febeliec	<u>Renewables:</u> What is lacking here is also the involved costs (CAPEX/OPEX) that are associated with these technologies. Especially when also looking into flexibility, such information should be very relevant.
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As renewable capacity is driven by policy measures (mainly) and that as 'base scenario', the NECP scenario will be used (submitted to the EC end of 2018). The goal of the adequacy or flexibility study is not to evaluate the amount of subsidies for RES in the future years but to evaluate what is the 'structural block' remaining assuming a certain amount of RES.

## 2.8.2 Fuel and CO2 prices

CREG	31. Op basis van de voorspelling van het IEA komt de CO <sub>2</sub> -prijs in 2030 op 28€/ton. De CREG meent dat een variante met een hogere evolutie van de CO <sub>2</sub> -prijs nuttig is, gezien de huidige prijzen reeds tussen 20 en 25 €/ton variëren. 32. Elia kiest om het scenario « new policies » van het IEA te gebruiken. Werden deze waarden vergeleken met andere bronnen?
FEBEG	What are the yearly CO <sub>2</sub> emissions obtained in the 10-year-exercise? Will Elia make a sensitivity with the introduction of a carbon price in other countries (above the existing EU-ETS)?
Febeliec	Febeliec hopes Elia will conduct some sensitivity analyses on these parameters, as they will have an enormous impact on the outcome, but regrets that Elia has not included any data for such sensitivities (e.g. based on other IEA scenarios or scenarios from other sources)

Elia has checked other sources for the carbon price (IHS, BNEF, European Commission, ...) which all converge to around 30 €/tCO<sub>2</sub> for 2030 (in €2017). Those assumptions are also in-line with the MAF2018 were the IEA-new policies scenario was used.

As sensitivity, Elia could propose to use the IEA – SDS scenario where the CO<sub>2</sub> price rises more quickly to achieve around 80 €/tCO<sub>2</sub> in 2030 (in €2017).

## 2.9 Flexibility

### 2.9.1 Objective of the flexibility study

FEBEG	FEBEG is wondering what the real objective of this part of the study is. Is it the objective to provide visibility to guide market participants and investors in their decision-making or will Elia propose concrete recommendations and actions? If so, what kind of recommendations and actions? Will the results lead to certain choices in the design of the capacity remuneration mechanism or to the development of new products in short term markets? FEBEG would like to call upon Elia to be prudent and to carefully consider possible recommendations or actions in order to avoid to launch a new debate or controversy on the energy mix that would delay the implementation of a capacity remuneration mechanism.
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As explained during the Users Group workshop on the methodology on January 22, 2019, the objective of the flexibility study is to provide information to stakeholders and investors on the future system conditions and requirements concerning flexibility. However, if certain specific challenges would be identified, Elia does not exclude to formulate conclusions towards measures to be taken to ensure future system stability.

However, it is not Elia's intention to elaborate in a detailed way on market mechanisms in the framework of this study. In a case where new market mechanisms are needed, or existing mechanisms need to be modified, Elia will facilitate corresponding discussions in the relevant working groups. Elia also want to remind that there is no direct interaction between this study, and future potential CRM processes which will be organized by means of a specific legal framework.

## 2.9.2 Technologies accounted in the flexibility study

ACER	Unité flexibles existantes (neuves ou rénovées) : on peut supposer que les simulations en tiendront compte.
CREG	36. Andere categorieën van flexibele capaciteiten die het structureel blok kunnen invullen zouden ook moeten worden in rekening gebracht als bron van flexibiliteit (diesels, turbojets,...). Indien de noodzaak aan bijkomende flexibiliteit beperkt is (bij voorbeeld enkel in een P95 scenario of slechts voor een beperkte tijd in de gemiddelde scenario's) dan kunnen dergelijke types van capaciteiten volgens de CREG zeker een nuttige bijdrage leveren.
Febeliec	Febeliec regrets that diesel generators (and similar technologies) have not been introduced.

A combination of new and existing units will be included in the structural block, by means of different sensitivities (as further explained in Section 2.10 of this consultation report). The flexibility study will take into account the flexibility characteristics of each technology type as used in the simulations. It is to be noted that a distinction between existing, recent and new units was already foreseen for OCGT and CCGT as can be seen in the consultation document (cfr. part on the flexibility characteristics).

The technology mix in the structural block has not been defined yet at the time of concluding the public consultation (and further clarified in Section 2.10 of this consultation report). However, following the inputs of several stakeholders, a scenario with diesels and turbojets technologies could be added by means of a sensitivity. The flexibility study will take into account the flexibility characteristics of each of the technologies in the reference scenario and the sensitivities. Turbojets and diesels will be treated as very flexible technologies (having full fast flexibility and slow flexibility in both directions and only having ramping flexibility when being dispatched). No other constraints are accounted besides the scheduled positions in the adequacy simulations (representing their hourly day-ahead schedule).

### 2.9.3 Combined Heat and Power

Febeliec	Moreover, Febeliec regrets that CHP is only to be considered existing/old CHP with flexibility similar to that of old CCGTs, whereas no new CHPs (small and large scale) are considered nor any improvement in flexibility of such units.
COGEN	Cfr. Excel file with proposal

Elia implemented the level of detail based on information it has available at this moment. Elia would like to thank COGEN for its specific proposals allowing Elia to improve its assumptions in the modelling of CHP in the adequacy and flexibility study. Following COGEN's information, Elia will further detail the split of CHP in different category types :

1. **CCGTs which will be modelled individually as CHP-unit** taking into account must run operational constraints. Therefore, these CCGT-units do not react solely only on electricity prices. Flexibility will follow the same characteristics as any other recent CCGT-units (as already specified in the consultation document) allowing to provide up- and downward flexibility depending on their scheduled power.
2. **Gas turbines which are modelled individually as must-run units.** Characteristics are adapted based on the inputs of COGEN to take into account specific operational limits: 4 hours min up and down time, 1 hour hot and warm start-up time, 4 hours cold start-up, minimum stable load of 50% of the Pmax of the unit and a ramping rate of 10% of Pmax per minute. The 2 hours transitional time from hot to warm and warm to cold is kept from Elia's initial proposal.

These units are assumed to be able contribute to downward flexibility. Underlying heat constraints justify to model these units are modelled to operate at Pmax (only providing downward flexibility) while imposing maximum duration in which flexibility can be delivered of 8 hours. No further operational limits on the amount of start-ups in a day is taken into account as this operational constraint is already accounted by means of the other operational constraints.

3. **Internal combustion engines are based on production profiles** and are therefore not assumed to participate in upward or downward flexibility.

Elia recognizes that modelling CHP by means of generic categories is inevitable as each CHP has a specific underlying application affecting its schedule and dispatch. It does not exclude to further increase level of detail towards future versions of the study. At this point, information is not available to increase the level of detail in the modelling.

CREG	38. Verdere vragen ter verduidelijking : - Wat wordt bedoeld met "Based in E-CUBE study [9] and Elia's best estimate. Share of 86% evolves towards 74% from 2020 to 2030." - Wat is de bedoeling van de grijs gekleurde gedeeltes in de tabel
Febeliec	For demand response, the included data has almost no added value as compared to the names of the categories



	<p>chosen by Elia and as such it is very difficult to add additional validation. Febeliec nevertheless wonders why for CAT-4H there is a value in column M (fast flexibility limit), whereas all other categories have no values there. Does this mean that Elia considers this category inherently different from the other ones and if so, on what grounds? With the non-existent additional information from Elia, it is impossible to provide any input on this point.</p> <p>Febeliec also wonders what the cryptic comment in cell S30 means, especially “share of 86% evolves towards 74% from 2020 to 2030”. Febeliec cannot validate this as it is unclear to what this refers.</p>
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In 2020, a market response capacity of 1403 MW is assumed (extrapolation of market response capacity following E-CUBE study published in 2018), which is expected to include an ancillary service volume of 535 MW (estimation given in the current market response study). The capacity excluding ancillary services is allocated over five categories following Elia’s assumption based on the E-CUBE study. The capacity of ancillary services is added to the 4 hour duration category, as this corresponds with the current products of ancillary services resulting in a share of 86% in 2020, going to a share of 74% in 2030 (as the capacity of market response grows in this category while the 535 MW is kept constant).

We can therefore assume that this share will be able to deliver fast flexibility, as it is able to deliver ancillary services in 15 minutes today, corresponding to the current product characteristics. The areas in grey mean that no capacity is able to deliver this type of flexibility.

After further analysis, it is also concluded by Elia that the split in categories is less relevant for the flexibility study as most market response is delivered through aggregation (allowing certain flexibility to allocate flexibility to the product of choice). This simplification is implemented (but the categories are kept in the adequacy study). This results in a total share of around 40% of installed market response which can participate in fast flexibility. Furthermore, Elia increases its assumption on share which can deliver ramping flexibility of 10% of installed market response.

	Maximum upward flexibility		
	Ramping flexibility limit	Fast flexibility limit	Slow flexibility limit
All categories	$\text{Min}(10\%P_{\text{max}}, P_{\text{max}} - P_{\text{nom}})$	$\text{Min}(40\%P_{\text{max}}, P_{\text{max}} - P_{\text{nom}})$	$P_{\text{max}} - P_{\text{nom}}$

## 2.9.4 Interconnections

FEBEG	<p>On the estimation of flexibility needs: are the data available with a 15 minutes granularity for all countries modelled? This question is also valid for the estimation errors in function of the time to real-time.</p> <p>At the moment, there are no flexibility studies published in other countries. How does Elia take the neighboring countries into account? What is the mechanism of the borders and the timing of borders?</p>
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FEPEG	For the flexibility study, the cross-border capacity that is considered is the left-over of the day-ahead capacity. This approach is less precise than what is done today operationally. Shouldn't Elia consider a more advanced approach for defining the intraday cross-border capacity (at least in line with the current practices, or foreseeing the arrival of the flow-based intraday capacity calculation)? Does Elia plan to benchmark the results of the modelling and forecasting with real situations, e.g. flows during system stress.
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Elia clarifies that the required flexibility needs from other countries is not explicitly modelled. Flexibility needs are only calculated for Belgium. These needs have to be covered with local flexibility or flexibility available in other countries. For flexibility imported from or exported to other countries, this can be delivered by available generation, storage or demand response capacity, or simply by netting prediction errors in another direction. It is to be taken into account that the interconnection capacity available after the day-ahead market and can be used to deliver flexibility which can cover the local needs.

All remaining flexibility after the day-ahead stage is assumed to be available for the intra-day market and is assumed to be available for delivering slow flexibility. Additionally, a capacity of 50 MW (up) and 350 MW (down) of fast flexibility is taken into account (based on current reserve sharing capacity). The current approach assumes that only remaining capacity after day-ahead trading can be used for intra-day actions. This assumption takes into account transmission limits and market liquidity (assuming that the capacity for import is already largely used during periods with shortages and excess).

At this stage, Elia does not see the need to implement a more sophisticated methodology and assesses the current methodology as sufficiently accurate. Elia will further continue to improve the methodology towards the next version of the study based on further analysis of the results, and stakeholders' input.

### 2.9.5 Methodology clarifications

CREG	37. De CREG vraagt Elia ook om te verduidelijken in welke mate Elia rekening houdt met de beschikbaarheid van balancing reserves (FCR en FRR) om in extreme gevallen deze te gebruiken om een activatie van het afschakelplan te vermijden.
ACER	On suppose que la situation la plus critique pour le réseau est le déclenchement de « tout » l'Offshore suite à une violente tempête, sauf s'il est prévu une réduction volontaire en cas d'annonce météo. Cela semble supérieur au déclenchement de NEMO ou ALEGrO ou d'une CN.

As explained during the Users Group workshop on the methodology on January 22, 2019, no distinction is made in the study between reserve capacity and flexibility: FRR is not modeled explicitly as it is part of the ramping and fast flexibility. The allocation towards flexibility for the market and Elia's balancing capacity is out of scope of the flexibility study as this analysis is conducted in the daily dimensioning of reserve capacity). An exception is the FCR which is still modelled separately as it is not covered by ramping, fast or slow flex (i.e. 90 – 100 MW).

Elia want to stress that flexibility, and in particular the fast flexibility including FRR (being part of the ramping and fast flexibility) needs to be kept available at all times to cover variations or prediction errors, including during peak demand periods, but also forced outages of generation and transmission assets. Elia accounts the contribution of variable generation to adequacy by means of taking into account their production during peak demand periods. However, this also means that one needs to take into account their variability and uncertainty during such periods. For this reasons the flexibility requirements need to be taken into account as a reserve margin.

Elia refers to its proposal for the dimensioning of reserve capacity in 2019<sup>3</sup> and the discussions held with stakeholders in the framework of the dimensioning of reserve capacity for 2019, in which Elia explains that the impact of offshore storm disconnection is not a typical forced outage event<sup>4</sup>. The same is true for the flexibility study in which forecast errors and variations of offshore are taken into account, but not as forced outage or N-1. These conclusions were based on the outcome of Elia’s offshore integration study.

[\\*https://www.creg.be/nl/openbare-raadplegingen/raadpleging-over-ontwerpbeslissing-b1808-betreffende-de-vraag-tot-goedkeuring](https://www.creg.be/nl/openbare-raadplegingen/raadpleging-over-ontwerpbeslissing-b1808-betreffende-de-vraag-tot-goedkeuring)

## 2.10 Thermal units

### 2.10.1 Existing units

FEBEG	In the framework of the consultations on the input data for the determination of the volume of strategic reserves, Elia provides a list with units – by technology – constituting this capacity. Could Elia not provide similar information in the context of this consultation?
ACER	Unité flexibles existantes (neuves ou rénovées) : on peut supposer que les simulations en tiendront compte.

This study aims to look at a longer horizon than the yearly adequacy study for the determination of the strategic reserve volume. It is therefore not possible to elaborate a best estimate on the evolution of the current thermal fleet over such a long period besides the units that have already announced their retirement.

<sup>3</sup> <https://www.creg.be/nl/openbare-raadplegingen/raadpleging-over-ontwerpbeslissing-b1808-betreffende-de-vraag-tot-goedkeuring>

<sup>4</sup> [http://www.elia.be/en/users-group/Working-Group\\_Balancing/Projects-and-Publications/Study-on-the-integration-of-offshore-wind-in-the-Belgian-balancing-zone](http://www.elia.be/en/users-group/Working-Group_Balancing/Projects-and-Publications/Study-on-the-integration-of-offshore-wind-in-the-Belgian-balancing-zone)

The complete list of existing units can be found in the following file:

[http://www.elia.be/~media/files/Elia/publications-2/Public-Consultation/2018/20180827\\_Strategic-Reserve-2019-20-input-data.xlsx](http://www.elia.be/~media/files/Elia/publications-2/Public-Consultation/2018/20180827_Strategic-Reserve-2019-20-input-data.xlsx)

In the simulations, those units will be part of the structural block and can contribute to it.

## 2.10.2 Structural block fill

CREG	28. Deze tekst roept reeds eerder gestelde vragen op. Welke andere vormen van capaciteit worden her bedoeld en hoe worden ze gekwantificeerd? Elia verwijst naar sensitiviteitsanalyses, maar in het consultatiedocument wordt geen enkel sensitiviteitsanalyse voorgesteld. Tenslotte kan terug de vraag gesteld worden waarom de resterende nood enkel met CCGT en OCGT zal worden ingevuld. De CREG vraagt dat Elia preciseert In welke mate er zal rekening gehouden worden met het aantal uren dat deze capaciteiten nodig zijn voor de bevoorradingszekerheid.
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The aim of this public consultation was to receive suggestions for further sensitivity analysis. This goal was achieved given the large amount of suggestions from stakeholders. New built CCGT and OCGT (if needed) will be considered when the assumed volumes in all other technologies would not be sufficient to meet adequacy and flexibility requirements of the system.

Elia will also publish the hours during which this capacity is needed for adequacy but it is important to mention that the way those hours are calculated are not the way the market functions. A certain unit will be dispatched in the system depending on its place on the merit order and imports of electricity depend on the energy mixes and prices in Belgium and abroad.

Febeliec	11. Febeliec regrets to see that Elia makes technological choices in this data file and thus also in the methodology for the adequacy and flexibility study and this over the course of an entire decade as Elia will only assess (current) CCGT and OCGT technologies. This thus de facto excludes not only all other (potential or existing) technologies but also locks in current efficiency rates for these types of plants and thus excludes efficiency gains and learning curve effects. Mentioning that “other forms of capacity are already taken into account in the scenario definition and sensitivities will be performed to those” does not alleviate the concerns of Febeliec on technology neutrality, as this still clearly indicates a technological preference of Elia towards CCGTs and/or OCGTs.
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Elia does not make any technological choice in the dataset. **All technologies are considered for the adequacy and flexibility study (existing and new).** The way that

Elia will work to fill the structural block is based on the fact that some assumptions dependent on policy measures and other on economics:

First policy driven technologies will be taken into account:

- RES, Nuclear;
- Imports are taken into account;

The rest is called the “structural block” and can consist of:

- Existing and new CHP;
- Existing and new storage (pumped storage, batteries, V2G, small scale home batteries,...);
- Existing and new market response (demand shedding, demand shifting, emergency generators);
- Existing and new diesel generators/turbojets;
- Existing and new CCGT/OCGT.

If any relevant technology is missing from the above list, Elia welcomes more details about.

In terms of future volumes for each technology, Elia will work with scenarios. The ‘base scenario’ being the NECP/Energy Pact for Belgium where levels of storage, market response, RES, nuclear... are set. In order to ensure an adequate system and meet the flexibility requirements, the last technologies listed above will be used as “adjustment”. Sensitivities can be applied on the level of storage, market response, CHP... which will lead to a different gap needed to be filled by thermal generation.

CREG	20. In het consultatiebestand van Elia wordt geen overzicht gegeven van de evolutie van de bestaande geïnstalleerde capaciteit (met uitzondering van hernieuwbare energie en nucleaire energie). Nochtans lijkt dit een belangrijk deel te vormen van de middelen om het structureel blok in te vullen.
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The existing units are part of the structural block. Those will indeed be used to fill it in while providing economic/viability results.

### 2.10.3 Nuclear

CREG	<p>13. Voor de evolutie van de nucleaire capaciteit wordt de wettelijke uitstap gevolgd. De CREG meent dat dit een terechte keuze is om in het basisscenario opgenomen te worden.</p> <p>14. De figuur met de nucleaire uitstap toont de situatie op het einde van elk kalenderjaar. Kan Elia bevestigen dat in het model rekening wordt gehouden met de werkelijke data van nucleaire sluiting (en dus met de aanwezigheid van de nucleaire centrales vóór deze data)?</p> <p>15. Gezien de vraag over het behoud van deze nucleaire uitstapkalender op de politieke agenda staat, lijkt het de CREG nuttig (vooruitlopend op toekomstige vragen), om ook een scenario met een nucleaire verlenging van 2GW te simuleren. De CREG benadrukt dat ze hier zelf een neutrale partij is en dat de beslissingen over de nucleaire uitstap toekomen aan de beleidsmakers.</p>
Febeliec	<p>4. Febeliec would however propose to include some sensitivity scenarios on this phase-out in order to obtain insight in the impact of this political choice, including cost impacts as this information will be very valuable. It concerns here (avoided) investments costs but also operation costs and the impact on flexibility in the system and thus the need for flexible or non-flexible capacity.</p>

Elia takes note of the request to consider a nuclear extension scenario and will consider this as one of the sensitivities.

Elia confirms that the exact dates in the law will be taken into account for the simulations.

## 2.11 Other countries

### 2.11.1 Base assumptions sources

FEBEG	<p>What are the data used for the capacity available in neighboring countries? Do they integrate recent announcements on coal phase-out (e.g. Germany)? How is regulatory uncertainty on nuclear and/or coal capacity taken into account?</p> <p>Which scenario is used for France, e.g. the recently published PPE or the scenario used by RTE in the Bilan Prévisionnel (Ampere, etc.)?</p> <p>Germany has 3 different reserves in place: the grid reserve (internal congestion), the climate reserve (lignite) and the capacity reserve (for addressing overall scarcity risk). How are these reserves considered in the modelling?</p> <p>What are the assumptions on the cross-border contributions with non-modelled countries during stress events? What is the consistency with the assumptions of neighbouring TSO's (esp. for modelled countries)?</p>
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CREG	<p>39. Elia verwijst voor de hypothesen van de buurlanden naar een aantal rapporten. Sommige van deze rapporten bevatten verschillende scenario's voor de betrokken landen. De CREG meent dat het duidelijk moet zijn welke scenario's en welke evoluties Elia exact wenst te gebruiken. Door enkel te verwijzen naar deze rapporten zonder verdere referenties naar bepaalde scenario's blijft er een grote onduidelijkheid bestaan. De CREG meent dat deze onduidelijkheid de effectiviteit van de raadpleging niet ten goede komt. De CREG is van mening dat er moet geconsulteerd worden over een voorstel van te gebruiken data, door bijvoorbeeld een samenvattende tabel ter raadpleging voor te leggen waarin voor elk land de belangrijkste evoluties worden hernomen.</p>
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The assumptions for the neighboring countries will be based on the MAF2018 production fleet (or MAF2019 dataset if available) complemented with the most recent announcements in Europe on coal and nuclear phase outs.

- Germany: with the planned coal phase outs (recent announcement) & RES ambitions;
- France: with the new PPE (RES and nuclear ambitions)

For Germany, the contracted reserves are not part of the energy market and are used and needed for other purposes. Those are not modelled in the simulations (such as done for any adequacy study on Regional, European or National level).

No exchanges are assumed between non-modelled countries and the modelled perimeter. This has little impact and is one of the reasons to cover a broad geographical perimeter of more than 20 countries (neighbours of Belgium and their neighbours).

The detailed assumption of the MAF (for each country) can be found on-line: <https://www.entsoe.eu/outlooks/midterm/> ("Download the MAF data").

### 2.11.2 Sensitivities

FEBEG	<p>FEBEG would also like to suggest Elia to carefully model the available capacity in neighboring countries in the short and medium term: FEBEG observes changing energy policies across Europe (e.g. recent announcement of the coal phase-out in Germany, next to other coal phase-outs announced). For this reason, Elia should be prudent in assessing the expected contribution of foreign countries to the security of supply of Belgium in case of simultaneous scarcity situations at CWE level (in combination with the constraints on the grid). At the minimum, Elia should model a scenario with reduced thermal capacity in Germany, France and the Netherlands. According to FEBEG, the level of dependence of imports is rather a political decision - as it has many macro-economic impacts - and a question of coordination between</p>
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	TSO's. Elia should be very explicit on the risks for the system associated with a high level of dependence on imports. Elia could also list the indirect impacts (e.g. macro-economic impacts) of such a choice with the cooperation of the Federal Planning Bureau for instance.
CREG	40. De CREG wil ook dat alle realistische scenario's van vervangcapaciteiten (waarbij bijvoorbeeld steenkool-eenheden worden omgebouwd tot gas- of biomassa-eenheden) en demothballing van productiecapaciteit worden meegerekend wanneer de beschikbare capaciteit in het buitenland wordt gemodelleerd.

For the adequacy results, sensitivities on the production fleet abroad will be performed. Elia will further develop such scenarios for different countries (uncertainty on French nuclear availability, coal phase-outs across Europe ...) such as done in the MAF2018 or in other national/regional adequacy studies (RTE, PLEF ...).

## 2.12 Market response and diesels

### 2.12.1 Base Scenario assumptions

CREG	22. Voor 2018 wordt uitgegaan van een marktrespons volume van 1236 MW. De CREG vraagt Elia te verduidelijken hoe er rekening zal worden gehouden met de bijkomende volumes die in de winterperiode 2018-2019 blijkbaar gecontracteerd werden door onder meer Engie naar aanleiding van de onbeschikbaarheid van de kerncentrales, en extra volumes aan marktrespons die door andere marktpartijen werden gecommuniceerd? De voorgestelde capaciteit van 1236 MW lijkt heel conservatief te zijn ingeschat.
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Febeliec	<p>Febeliec refers to the numerous comments it made to the methodology developed by E-Cube in the recent past and its reservations it has towards this methodology</p> <ul style="list-style-type: none"> <li>o Moreover, Febeliec strongly wants to contest that base value that Elia is using for the determination of demand response in the future. It is unclear on which source Elia bases its initial starting point of “Belgian Market Response volume” for 2018, But according to Febeliec +/- 1250MW is a gross underestimate, taking into account all the demand response that exists in the balancing market as well as the announcements by for example two of the largest BRPs in the Belgian system for winter 2018-2019 of substantial volumes (+500MW and +200MW) of contracted market response, apart from what all other actors such as aggregators still had contracted in their portfolios. Febeliec would greatly appreciate that Elia provides a detailed breakdown of its data in order to be able to analyse it. In any case and as already indicated, Febeliec has the feeling that Elia underestimates the real market response that was available in 2018-2019 and as such should use this higher value as the starting point for its analysis. As prices (as well as (media) attention) drew all market actors to look at their energy portfolios, market dynamics have lead to the emergence of previously untapped market response in the market. This should clearly be taken into account, in order to avoid to underestimate the inherent flexibility in the system.</li> <li>o Moreover, Febeliec refers to its comment on the introduction of smart meters and variable price contracts and the fact that this will unlock a vast volume of currently untapped (untappable) flexibility in the residential and SME segments. Febeliec wonders whether, how and from when onwards this is taken into account in the Elia proposed values.</li> <li>o In general, it is very difficult to provide any useful input on the data presented by Elia, as any breakdown is missing (e.g. on total demand shifting volumes).</li> </ul>
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CREG	23. De CREG vraagt ook te verduidelijken hoe de verdeling van de maximale duur van demand respons werd ingeschat en hoe de uitrol van digitale (en eventueel slimme) meters in rekening gebracht?
CREG	25. De CREG vraagt Elia ook te verduidelijken hoe het totaal demand shifting volume werd bepaald?

First of all, as for all the other technologies, the base case scenario consists of the ambition set in the NECP and the “Energy Pact”. In the latter one, the authorities have set the following targets/ambitions for market response for 2030 in the Energy Pact:

- 2.0 GW demand shedding;
- 1.5 GWh demand shifting.

It is also mentioned that the main increase will be after 2025 (so from 2025 to 2030) with around 30% to 40% of the target achieved in 2025.

The market response volumes will be based on the Energy Pact figures with 1.1 GW in

2025 and 2 GW in 2030 for the reference scenario. The E-Cube study is only used for 2020/2021 and to make the linear interpolation between the first 3 years and 2025.

Elia also assumed that the volumes proposed do not include the demand response participating today to the ancillary services (which is around 470 MW for winter 2017/18, cf. supra)). Elia has therefore decided (in concertation with CREG, FOD and Plan Bureau) to add this latter volume to the targets set by the authorities.

The split in the different categories of market response is based on a study performed for the evaluation of the strategic reserve volume determination in 2017 where it was calculated based on a questionnaire sent to market participants.

[http://www.elia.be/~media/files/Elia/users-group/Working-Group-Balancing/TF\\_Strategic\\_Reserves/E-CUBE\\_Elia\\_Market\\_Response\\_TF.pdf](http://www.elia.be/~media/files/Elia/users-group/Working-Group-Balancing/TF_Strategic_Reserves/E-CUBE_Elia_Market_Response_TF.pdf)

(slide 31).

It was assumed that the additional volume of around 470MW that is today providing ancillary services has characteristics of 4 hours (cf. supra).

	Voulme at the end of the mentioned year[MW]												
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Total volume</b>	<b>1.236</b>	<b>1.316</b>	<b>1.403</b>	<b>1.496</b>	<b>1.513</b>	<b>1.532</b>	<b>1.547</b>	<b>1.565</b>	<b>1.765</b>	<b>1.965</b>	<b>2.165</b>	<b>2.365</b>	<b>2.565</b>
Max use of 1 hour	79	82	87	93	95	97	98	100	120	140	160	180	200
Max use of 2 hours	275	287	304	326	332	338	344	350	420	490	560	630	700
Max use of 4 hours	528	578	622	658	660	662	663	665	685	705	725	745	765
Max use of 8 hours	236	246	260	279	284	290	295	300	360	420	480	540	600
No limit	118	123	130	140	142	145	147	150	180	210	240	270	300

Ancillary services volume included in "Max use of 4 hours" [MW]

	449	496	535	565	565	565	565	565	565	565	565	565	565
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Elia also reminds that the emergency generators are to be considered as part of the "market response" volume.

## 2.12.2 Diesels

CREG	<p>5. Volgens het toegevoegde schema zal opslag, WKK en marktrespons gebaseerd worden op aannames ("assumptions") en wordt het structurele blok opgevuld met open cyclus en gesloten cyclus gasturbines (OCGT en CCGT) teneinde de criteria inzake adequacy en flexibiliteit te voldoen.</p> <p>6. De CREG stelt zich vooreerst de vraag hoe andere productie-installaties worden meegenomen in de simulaties (bestaande diesels, gasmotoren, stoomturbines, afvalverbranding met elektriciteitsopwekking (tenzij bij hernieuwbare bronnen gevoegd), noodaggregaten die kunnen synchroniseren met het net, ...)</p>
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Febeliec	<p>Diesel generators (and similar technologies) are completely missing in the file from Elia. CREG studies have shown that for example only the (aggregated) Belgian hospitals already have up to 400MW of diesel generators and this is not taking into account all the other emergency generators (from industrial sites over public services, office buildings to even residential consumers) that are operational in Belgium. Moreover, the current winter shows that even large BRPs install more than substantial volumes of diesel generators to cover their positions (diesel generators which cannot be formally accounted for as “emergency” generators as they are not connected to specific consumption processes). Febeliec asks Elia to introduce this category of diesel generators (and similar technologies) to the file.</p> <p>In case Elia would account for them in the category “market response”, Febeliec would want to see a clear breakdown of the different constituting elements (in order to be able to assess the expected evolution over time by Elia) and also wonders whether the category of non-emergency diesel generators would be accounted for as they do not constitute negative offtake. Moreover, if Elia would count diesel generators (and similar technologies) as market response, the volume of market response is an even large underestimate than described above (cfr previous remarks)</p>
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Following those comments, Elia has added a category “diesels”. Sensitivities with additional diesel/turbojet volume will be conducted as part of the structural block volume. Emergency generators are part of the market response volume used for this study.

### 2.12.3 Sensitivities

CREG	<p>7. Verder stelt de CREG zich de vraag waarom enkel OCGT en CCGT in aanmerking worden genomen om de resterende noden van het structurele blok in te vullen.</p> <p>8. Wat betreft marktrespons, meent de CREG dat de behoefte aan marktrespons minstens gedeeltelijk het aanbod kan creëren. In die zin zou de optimale variëte van markt respons moeten gedefinieerd worden in functie van de resultaten van de simulaties.</p>
FEBEG	<p>What is the reasoning behind the strong increase of market response, especially at the 2025-30 horizon? Is Elia sufficiently confident that this capacity will come to the market given the expected evolution of the electricity prices?</p> <p>Will Elia cross-check of the level of market response observed this winter, also considering that some exceptional measures have been taken that may not re-materialize under normal market conditions?</p> <p>FEBEG also suggests to look at the time between activations and the impact of rebound effect.</p>

CREG	24. De CREG meent dat de behoefte aan demand respons minstens gedeeltelijk het aanbod kan creëren. In die zin meent de CREG dat ook de optimale variante in demand respons zou moeten gedefinieerd worden in functie van de resultaten van de simulaties.
ACER	Market response : il semble que les possibilités soient limitées ? peu d'ambition ou prix trop faibles ? ->< faibles réserves au niveau CWE CORE suite au déclassement de beaucoup d'unités flexibles (nuc ?, charbon) dans notre zone interconnectée. – au moins une analyse de sensibilité à faire.

As mentioned above, the 'base case' scenario figures are based on the 'Energy Pact' ambition set by the authorities in terms of market response. Different sensitivities (with higher and lower volumes) will be conducted to assess the impact on adequacy and flexibility of the system.

FEBEG	<p>FEBEG also observes very optimistic assumptions on the evolution of batteries and market response capacity. In this context, it is important to first point out the following elements.</p> <ul style="list-style-type: none"> <li>- FEBEG would like to highlight that – due to technical and operational constraints - the duration (MWh) is crucial when talking about available capacity for batteries and market response.</li> <li>- FEBEG also understands that these assumptions are again based on expressed political ambitions. However, at this stage, there is no support mechanism in place - as this is the case for renewables - to boost the development of such capacities. FEBEG does not believe that the expected market conditions will be sufficient to trigger such amount of new capacity in the short and medium term.</li> </ul> <p>FEBEG understands that the battery and market response capacities – together with gas-fired power plants - will constitute the structural block. However, FEBEG is of the opinion that a substantial part of this capacity increase could actually only materialize when a support mechanism – such as a capacity remuneration mechanism - would be implemented in Belgium at that horizon. For this reason, the hypothesis related to storage and market response should be reviewed: only the capacity that would be developed based on market conditions, could be used as input in the modelling. FEBEG has the impression that – both for batteries and market response - the methodology compared to the study 2017-2027 changed on that matter as the hypotheses taken in the previous study did not include such a growth that most probably will not materialize under current market conditions without support.</p> <p>FEBEG also wants to point out that it is up to the market to decide on an efficient mix of technologies that will constitute the structural block. Unless specific measures are concretely being put in place by authorities, the market will decide on the technology mix. In other words, the adjusting variable of the structural block should not be limited to gas-fired power plants.</p>
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Elia is technology neutral in the choice of the future energy mix. In order to evaluate if a

certain energy mix can comply with the adequacy criteria and flexibility requirements of the system, one has to make several assumptions and scenarios. Those scenarios consist in elaborating assumptions on future technologies and corresponding developments.

Based on the comments above and also the ones included in the paragraph on “Market response and diesels”, sensitivities on the quantities used for this study are foreseen.

## 2.13 Sensitivities requests

Briefly, this is an overview of the requested sensitivities (based on the comments/answers received):

### On Belgian level:

- Nuclear [CREG + 2GW, Febeliec]
- Low RES [FEBEG]
- Different Demand [FEBEG], Lower Demand [Febeliec]
- Higher CHP [CREG, Febeliec, COGEN (+1GW)]
- Lower CHP [FEBEG, COGEN (-1GW)]
- Existing thermal in structural block [CREG]
- Market response volume in function of results [CREG]
- Lower storage as it won't develop without support [FEBEG, ACER]
- Lower Market Response as won't develop without support [FEBEG]
- Additional diesels/turbojets [CREG, Febeliec]

### On European Level:

- Reduced thermal in CWE [FEBEG], Replace coal by gas abroad [CREG]
- CO2 price [CREG], Carbon price sensitivity [FEBEG]

The large amount of sensitivities requested and possible combinations between them is not possible to be simulated by Elia. Depending on the results of the 'base case' scenario, the most relevant sensitivities impacting the results will be chosen. Those will be discussed with the FOD, CREG and Plan Bureau prior to the publication.