CONSULTATION REPORT

Study on the methodology for the dimensioning of the aFRR needs

September 30, 2020

Content

1. Introduction

Elia carried out a public consultation on its study of opportunities to replace or improve the current dimensioning methodology of its aFRR reserve capacity. This study included:

- an analysis of methodologies that could be applied for dimensioning the aFRR needs;
- a recommendation on one of these methodologies to be tested in a proof of concept.

Following this consultation, the proof of concept for the chosen methodology was executed.

In line with Article 157 of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation, Elia shall determine for its LFC block the ratio of automatic FRR (aFRR) and manual FRR (mFRR). While the methodology currently in place meets all legal requirements, Elia investigates possibilities to replace or improve the current dimensioning methodology for the aFRR needs and proposes a methodology to be further investigated in a proof of concept. The study is based on an exhaustive analysis of methodology design options. These options have to be:

- implementable from a practical point of view (in terms of transparency and complexity),
- compliant with European legislation,
- robust towards future power system evolutions (including incremental renewable capacity and HVDC interconnections), and
- able to meet minimum technical criteria and maintain reliability of the system.

The consultation period was set from Tuesday June 2th to Thursday July 2 2020 included. Elia received 3 non-confidential answers to the public consultation:

- **FEBEG**
- **FEBELIEC**
- **Belgian Offshore Platform, hereafter referred to as BOP**

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

The feedback received during the consultation did result in additional sensitivities and analyses in the Proof of Concept, for which the results and conclusions are published in the 2nd part of the report:

- An analysis of the improved current methodology including IGCC and a 5' resolution,
- An analysis of the impact of using only the time features.

The final report, including the results of the Proof of Concept, Elia's recommendations, and a planning for implementation is published together with the consultation report on September 30, 2020.

2. General remarks and questions

- *Febeliec would like to the thank Elia for this consultation on the methodology for the dimensioning of the aFRR needs. For Febeliec, dimension of balancing needs is a very important topic, because it ensures the security of the system by covering the residual system imbalances, but also because the cost for the reservation of balancing reserves is paid for by consumers, with the cost for aFRR being quite substantial.*
- *Concerning the consultation at hand, Febeliec is interested to see what will be the outcome of the proof of concept that will be launched after this public consultation and reserves itself the right to come with additional*

comments on the proposed methodology when those results become available, as for many aspects it is now still unclear what the concrete impact will/could be in the calculations themselves (as they are a black box to all parties except Elia who is conducting the calculations).

- *FEBEG fully supports Elia in its intention to continue the study in a format of "Proof of Concept" as it allows to get a more practical insight in the consequences of the modelling choices. FEBEG is looking forward to the results of this exercise.*

Elia takes note of these positive remarks and will publish the results of the Proof of Concept September 30, 2020.

- *FEBEG generally supports the methodologies proposed by Elia, but has some reservations, mostly regarding the way the simulated mFRR and the IGCC volumes that will be taken into account. FEBEG endorses the use of a probabilistic methodology, as it provides the best equilibrium between accuracy and complexity and has the advantage of transparency.*

Elia will answer specific questions on IGCC and mFRR activations in the next sections of this consultation report.

- *BOP notes that Elia dimensions and procures relatively low aFRR volumes compared to the peak load in the LFC block and compared to its neighboring countries. Compared to the ENTSO-e empirical noise method, which is deemed useful for comparing countries, only about half of the volumes are procured in Belgium. BOP observes that Elia is minimalistic in the dimensioning and procurement of the aFRR needs.*

Elia acknowledges these conclusions from its benchmark and analyses in Section 2.1 of the report. In the same section, Elia also shows it attained with these volumes an acceptable FRCE quality which is shown by its ‘median of class’ performance in terms of the legal minimum criteria. This is not only achieved by its available aFRR means, but also the availability of IGCC (although the availability is not guaranteed) and the dispatch procedures. It must however be noted that a small increasing trend is observed since 2017 in the 15’ variations which was already translated in increasing aFRR needs under the current method.

Ex post, as the FRCE-quality, being an important criteria to assess the dimensioning and dispatch of FRR, and particularly aFRR, is up to now found to be sufficient for system operation, and allowed to meet the FRCE target parameters specified in Article 128 of the SOGL, which have to be considered as absolute warning limits. Elia concludes that such minimalistic dimensioning, as referred to by BOP, is thus justified in terms of system security, while taking into account the higher reservation costs of aFRR compared to mFRR. Of course, Belgium as a small well-interconnected country, largely benefits from the availability of this non-guaranteed IGCC to manage its FRCE.

However, Elia agrees that there is little margin for average aFRR means reductions as the aFRR means procured by Elia are already relatively low compared to volumes procured in other counties and an adequate FRCE-management of individual LFC blocks is important to maintain stable frequency in the European synchronous zone.

- *Febeliec also wants to stress that Elia is only responsible for the residual imbalance of the system, while BRPs need to guarantee balanced positions at every moment, also within the very short timeframe of FCR and aFRR. Febeliec thus encourages Elia to continue its work on providing correct balancing market price signals and thus incentives for BRPs to ensure balanced positions, in order to limit the volume of balancing reserves that need to be contracted by Elia. Febeliec also insists that Elia also takes into account the many steps that have been and will be taken towards this goal in the past and the future, to ensure that the calibration of balancing needs is not overdimensioned, to the detriment of cost for consumers.*

Elia acknowledges the obligation for BRPs to balance their portfolio in accordance with the Terms & Conditions for BRPs, and the importance of financial incentives, provided by the imbalance tariffs. However, this obligation relates to the average position of the BRP over the imbalance settlement period (i.e. 15'). The performance of BRPs to balance their portfolio is automatically taken into account the dynamic FRR dimensioning of Elia: lower BRP imbalances result in lower LFC block imbalances, which will in their turn reduce the results of the probabilistic dimensioning methodology, as this calculation is based on historic LFC block imbalances. A similar approach is proposed for aFRR.

- *As stated above, Febeliec supports the points in section 1.1 of the document, especially related to the residual imbalances and the strengthening of the market signal. However, Febeliec would like to express its utmost caution towards the possibility of eliminating or relaxing the obligation for BRPS to nominate a balanced portfolio in day-ahead. Febeliec will come back on this in the framework of the related consultation in Q3 or Q4 2020, but wants to stress in the strongest possible way that the balancing obligation of BRPs is the cornerstone of the current electricity market model and as such it seems at this point very imprudent to relax this obligation.*

Elia invites Febeliec to provide these comments in the framework of the public consultation on the day-ahead balancing obligation, which was launched on September 22, 2020.

- *Towards the second wave of offshore wind power, Febeliec wants to stress that while the discussions are still on-going on the impact, it is very important to keep in mind that Elia is only responsible for the residual imbalance and that the BRPs themselves should ensure that they are able to cover the intermittent generation they take into their portfolio, by contracting sufficient flexibility themselves and not pushing their responsibility towards the TSO and society, which could be seen as privatising profits and socialising costs.*

Elia refers to its answer above concerning the BRP's balancing obligations. Furthermore, it refers to the answers which are already given in the framework of the consultation on the 4 GW offshore integration study[1].

3. Remarks and question on the proposed method for the Proof of Concept

3.1 On the reliability level

- *BOP remarks that the proposed reliability level of 99%, is at the low end of the range determined in the literature study (99.0 to 99.995%) and the lowest of all neighbouring countries. For instance Germany uses the 99.95% reliability level.*
- *FEBEG endorses a high reliability level. The choice for 99% itself seems arbitrary and should be better justified. Why not 99,5 % or 99,9% as in Germany? FEBEG considers that this is also something that could be further tested in the Proof of Concept.*
- *Febeliec also wants to stress (section 1.3) that Elia indicates that "it is found that long-term aFRR projections might have been too conservative in terms of impact of renewable generation prediction errors on the LFC*

[1]More information will be published on the consultation page : **https://www.elia.be/en/public-consultation/20200608_public-consultation-on-the-integration-of-additional-offshore-capacity**

block imbalance variations" and urges thus extreme caution towards overdimensioning balancing needs, as this comes at a substantial extra cost for consumers. The same can be said about section 2.1.1 where Elia states that "section B-6-2-2-1-5 of the SAFA, although this part is not approved by NRAs, provides some additional guidance", towards which Febeliec wants to urge not to be unduly conservative and thus overdimension the needs, without regulatory approval even for such approach. Febeliec strongly supports the conclusion of section 2.1.1, where Elia states clearly that "due to the absence of clear legal requirements on aFRR dimensioning, the proposed dimensioning methodology and proposed reliability level shall need to find a trade-off between meeting such minimum thresholds (and avoid over-procurement in general) and meeting their responsibility to cover their FRCE as good as possible and contribute to the European frequency stability".

Elia acknowledges the observation of BOP and FEBEG that this reliability level is at the lower end of the range observed in its benchmark. Elia acknowledges in the study (Section 2.1.1) that no clear legal criteria exists for the dimensioning of aFRR and that each TSO has to come with a proposal on the ratio aFRR / mFRR to cover the FRR needs, which is the purpose of the study.

Setting the selected reliability level at a minimal value of 99.0% is aligned with the legal criteria generally used in FRR dimensioning (Article 157 of the SOGL) and can be justified for normal operations (the more extreme events happening 1% of the time should not be covered by reserves but rather with exceptional measures). Finally, setting a reliability too high will result in very volatile results when implemented in a dynamic approach as rare, extreme situations (outliers) may set the aFRR needs.

With the proposed methodology, this reliability level results in aFRR volumes that currently allow Elia to guarantee a satisfying FRCE quality while favoring the procurement of cheaper mFRR means. Elia proposes therefore to stick to this 99.0% level. It will also not conduct additional sensitivities on this as the results will also not bring additional insights (as the effects of a higher and lower reliability level are obvious).

3.2 On forced outages and storm risks

- *FEBEG is in favor of the proposal to eliminate the big imbalances that result from forced outages of power plants or relevant HVDC-interconnectors from the data set (as it is the case in the current methodology) since it is the role of the FCR relayed by the mFRR to compensate them, even if, of course, aFRR equally contributes to this compensation.*

Elia takes note of this remark and confirms that the proposed methodology does not take into account forced outages.

- *BOP urges that the residual forecasting risk relating to storm events is to be included in the data processing of the dynamic dimensioning method (if not already the case) and that the reliability has to be set higher than the 99% percentile in case the residual forecasting risk relating to storm events is not fully covered.*

From the available document it is not clear weather offshore storm events are excluded in the proposed methodology and/or these storm events are included in the 99% percentile of the expected aFRR activations. Please provide some clarification.

In BOPs opinion, as communicated in previous consultations for instance regarding the storm procedure, storm events are not fully predictable. Also the document under consultation mentions several times the 'limited predictability' of renewable capacity, especially offshore wind power, which challenges the power system balancing.

Current forecast models are able to predict the occurrence of a storm during the next day, but with a certain inaccuracy in relation to the beginning and the end of the storm. These small inaccuracies in terms of intensification at the start and fading at the end of a storm, can however lead to significant imbalances in real-time, when aggregated over all the wind parks.

The responsibility of the BRP is to anticipate the 'predictable' imbalance risk and the responsibility of Elia to manage the residual risk. The BRP should anticipate and balance their portfolio as good as possible. There are sufficiently strong incentives in place to guarantee this correct BRP behaviour, via imbalance tariff, alpha-factor etc. Further improving the energy markets to attract more liquidity and to be able to better react more closely to real-time can further reduce the residual imbalance. But as long as the accuracy of the most-recent forecast at the latest possible moment in time to change the nomination schedules, is not accurate enough to correctly predict the storm behaviour, the residual forecasting risk relating to storm events should be considered in the dimensioning of the balancing reserves.

The dynamic dimensioning method is an opportunity to include this forecasting risk in the balancing reserves without unnecessarily increasing the related costs, since storm events are typically short in duration and could be procured for only 1 (or a few) 4-hour blocks per event. It might even be more cost-effective compared to activating slow-start units under the storm procedure, as currently foreseen to cover residual risk of the storm impact.

As explained in Section 3.1.3, the proposed methodology is based on a probabilistic approach based on a time series of the sizing variable for which periods with forced outages are removed from the dataset (as in the current methodology). This includes outages of the Nemo Link interconnector, as well as power plant outages. **Periods with storms are not removed from this dataset and are thus taken into account in this probabilistic methodology.**

This means that periods with storms (or large ramps) can impact the reserve dimensioning. However, due to the selected reliability level of 99.0% and the limited frequency of occurrence of such events, the practical impact on the aFRR needs will be rather low. However, in the proposed dynamic approach, frequent large forecast errors during high wind speed conditions should be captured, and impact the aFRR needs during such predicted system conditions.

Note that this is also the case for FRR dimensioning where storm periods are neither excluded from the probabilistic approach. However, the storm risk is not considered as a forced outage or dimensioning incident due to its nature (less instantaneous and better predictable as forced outage of a power plant or interconnector). For this reason, these events are treated as exceptional measures (as explained in the 4.0 GW offshore integration study).

3.3 On the dynamic dimensioning

- *BOP is convinced that dynamic dimensioning is a step in the right direction towards the energy system of the future with larger share of renewables, as it will allow for optimizing the required balancing needs as function of (expected) system conditions.*
- *FEBEG upholds a dynamic approach to the aFRR dimensioning. We fear however that modulating the needs of aFRR on daily basis might not be useful and risks giving the market an unnecessarily fluctuating indication, whereas a weekly dynamic would probably be sufficient (similar to the German example where a weekly dynamic dimensioning is combined with a 4h granularity on the product that is procured).*
- *About the dynamic approach to the dimensioning, FEBEG would be interested to see the result of a weekly dynamic dimensioning, as it is currently the case in Germany.*

- *On section 1.4, Febeliec hopes that the new aFRR product design will have a positive impact on the dimensioning of aFRR needs, as the dimensioning will be done closer to real time and should thus avoid reserving unneeded yet expensive aFRR means.*

In the Proof of Concept, Elia aims to investigate a full dynamic approach on daily basis, and with a 5' resolution, in line with the sizing variable resolution. This allows to discover if relations between the predicted system features and the sizing variable exist, and if there is a benefit to proceed towards the implementation of a dynamic dimensioning approach. If the results would demonstrate a low benefit, or that most benefits can be obtained in a weekly dimensioning, this shall be considered by Elia when proceeding to the implementation of the method.

A specific sensitivity will however be conducted to analyze the dynamic potential if the only taken into account are time features (which are known well in advance to check how much of the dynamic potential can be captured.

3.4 On taking into account IGCC

- On the balancing energy platforms such as IGCC and PICASSO (and MARI and others outside of the aFRR framework), Febeliec is convinced that these deliver a substantial contribution in the everyday balancing of the Belgian LFC block and as such should be taken into account in the dimensioning exercise, even though their availability is not contractually guaranteed (yet substantial volumes are contracted at a much lower cost), especially taking into account all other market evolutions in the aFRR framework, in particular the closer to real-time procurement and asymmetric dimensioning. Febeliec also wants to reiterate its comment on the responsibility of BRPs to be in balance, for which existing incentives exist but also additional incentives can be created in order to give the correct signals to the markets and the BRPs. On IGCC Febeliec also wants to react to section 3.1.3 as for Febeliec it is important that all cross-border capacity is recalculated in each timeframe taking into account the most recent available information, which should result in more capacity made available to the markets in timeframes closer to real-time as uncertainties should diminish, but which should also result in more cross-border capacity being available for TSOs in the balancing timeframe.

Elia confirms that the proposed methodology takes into account IGCC and agrees on the importance of correct market signals for maintaining the portfolio of BRPs and the system in balance.

Elia agrees also on the importance to recalculate cross-border capacity closer to real time in order to take into account the most recent available information. The Electricity Balancing Regulation foresees that by the end of 2022, all TSOs of a capacity calculation region shall develop a methodology for cross-zonal capacity calculation within the balancing timeframe for the exchange of balancing energy or for operating the imbalance netting process.

- *FEBEG supports taking into account the IGCC activated volumes which constitute a reality in the past and certainly in the future. Until now, IGCC has never been directly accounted in the dimensioning due to the non-guaranteed capacity. FEBEG prefers however to take it into account explicitly, rather than not taking it into account and then applying an empirical 79% of the need. We fear that considering the full historic activated volumes might be too optimistic in view of the non-guaranteed nature of these volumes. FEBEG therefore welcomes the option of simulated IGCC activation rather than the history, as it allows to apply several sensitivities depending on what is assumed for the future (more or less availability and amplitude). We also reiterate our request to take realistic assumptions.*

As mentioned in the recommendations for the Proof of Concept (Section 4.2 of the report) Elia considered the possibility of a historic and a simulated approach for IGCC in the Proof of Concept. However, the Proof of Concept showed that an historic approach is the best way forward as:

- Adopting the more complex simulated approach is not necessary as future evolutions of the imbalance netting potential will be captured by the dynamic dimensioning approach. If the availability of IGCC goes down this will impact the machine learning algorithm in a way that the aFRR needs will increase. Vice versa, an increase in availability may affect the aFRR needs downwards.
- At this moment, Elia does not see any trends or has any expectations towards a decrease of the available IGCC which should be explicitly taken into account. It therefore has no basis to make simulations with reduced availabilities, and the assumptions for such analyses would therefore be rather arbitrarily and provide limited to none added value.

3.5 On simulating the mFRR activations

- *Subject to the remarks hereafter, FEBEG also underwrites the use of simulated activated aFRR as sizing variable. This method allows to estimate aFRR needs by subtracting simulated mFRR activations from the LFC block imbalances. The simulated mFRR activations can in our view however never be an optimal mFRR activation, assuming a perfect foresight. It would clearly minimize the aFRR need under a false pretext and overestimate the effectiveness of the mFRR product. FEBEG prefers Elia to determine its needs based on realistic assumptions, and then to be clear on the percentage of the need that is to be covered by the aFRR product. Preference should therefore be given to a dispatch based mFRR activation, assuming realistic dispatch behavior. A potential additional advantage of this approach is that it could accommodate FEBEG's request for clear and transparent rules for the activation of mFRR.*

Elia acknowledges the advantages of a rule-based approach but concludes that under the right circumstances, an approach based on perfect foresight (or "oracle-based") can be justified. Combined with a sufficiently high reliability level, and a dynamic dimensioning where the needs are adapted to the system conditions, the risk of under-sizing can be limited. In addition, Elia wants to remark that considering the costs of aFRR and mFRR, it is justified to minimize aFRR needs compared to mFRR, as long as system security can be ensured. This is the case with the volumes of aFRR being procured today and that should not be significantly lower (as a starting point at least) when applying the new methodology. For this reason, results of the methods will be assessed against the FRCE quality. In such method, the dimensioned reserves are independent of the dispatcher's activation decisions, which incentivizes to use the available capacity as efficient as possible to maintain the FRCE quality.

An additional advantage of the oracle based method is that it is fairly simple to implement and understand with little parameters to fine-tune. In particular, it is independent from (evolutions in the) dispatch behavior of Elia, which puts a clear incentive on Elia to optimize mFRR activations and makes the method more robust towards the future.

- *If taking dispatch based mFRR activation does not lead to satisfactory results, FEBEG would prefer to keep the current sizing variable of residual LFC block imbalance variations, above taking an optimal mFRR dispatch in a simulated activated aFRR approach. These residual imbalance variations do correctly reflect the actual mFRR dispatch. Something that in that case could also be tested in the Proof of Concept. With regard to the sizing variable, and as indicated above, if taking a dispatch based mFRR activation does not lead to satisfac-*

tory results, FEBEG would prefer to keep the current sizing variable of residual. LFC block imbalance variations, above taking an optimal mFRR dispatch in a simulated activated aFRR approach – and therefore requests that this is taken up in the proof of concept.

Elia takes note of this remark and confirms that a method based on the current sizing variable was analyzed in the Proof of Concept as a benchmark methodology. In order to ensure a fair comparison, the current methodology has been implemented with a 5' resolution, taking into account IGCC-activations and a 99% reliability level. This methodology was quantitatively and qualitatively assessed together with the simulated aFRR method with an oracle and a rule-based approach. For the reasons exposed above, Elia considers that an oracle-based approach is preferable and recommend its selection in its final study.

- *Regarding the analysis on a simulated dispatch based mFRR activation, assuming realistic dispatch behavior, FEBEG would be interested in potential conclusions with regard to effectively implementing such strategies in the mFRR activation.*

Elia takes note of this request. The results of the analyses on the dispatch-based dimensioning methods will be described in the report, however, the analysis towards conclusions or lessons learned for the operational dispatch decisions is out of scope of this study.

3.6 On the sizing resolution

- *FEBEG agrees taking a 5 minutes (or 1 minute) sizing variable resolution, and to test the impact of this choice in the proof of concept.*

Elia takes note of this remark and confirms that a 5' resolution is studied in the proof of concept. In addition, a sensitivity with a 1' resolution is conducted.

4. Specific comments or questions

- *On section 2.2.2, Febeliec thinks that the first paragraph wrongly states Denmark as a neighbouring country of Belgium and presumes Germany is intended, unless Elia were to be planning an interconnector with Denmark in the near future?*

It is indeed Germany that is analyzed in this section, and not Denmark. This will be corrected in the final report

- *On section 2.2.1, Febeliec only wants to comment on the dimensioning process based on upscaling of historic imbalances and whether results from the past are relevant for the future as well as that basic upscaling will reflect the intricate changes to the system, in particular all the design modifications.*

Elia takes note of this remark but reminds that historic observations are often the only information available to start from when conducting mid-term or long-term projections. In order to take into account future expectations, extrapolations can take into account certain correction factors.

Elia wants to remark that one of the main advantages of moving towards daily dynamic dimensioning is that Elia can dimension immediately on the expected system conditions, avoiding to make such extrapolations.

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