

MONITORING REPORT

Belgian electricity market
Implementation plan

July 2023

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1. Introduction

It has been three years since the approval by the European Commission of the original implementation plan¹ leading to the establishment of a capacity remuneration mechanism in Belgium.

Since then, the energy conjunctural framework for which the European Commission initially approved the mechanism evolved.

As is foreseen in article 20.3 of “Regulation 2019/943 of 5 June 2019 on the internal market for electricity” (hereafter: Regulation 2019/943), Member States with identified resource adequacy concerns shall develop and publish an implementation plan with a timeline for adopting measures to eliminate any identified regulatory distortions or market failures as a part of the State aid process.

As is foreseen in article 20.6 of Regulation 2019/943, Member State shall monitor the application of their implementation plans and shall publish the results of the monitoring in an annual report and shall submit that report to the Commission. This is the present document, the “Monitoring Report”.

To elaborate this monitoring report, the DG Energy of the FPS Economy collaborated with CREG, ELIA and the Regions who provided input in their field of competence and expertise.

Chapter 2 discusses the changes in the policy environment that have taken place since the last monitoring report and also provides some key figures about the Belgian electricity system. Chapter 3 provides an explanation of the changes from the last monitoring report². Chapter 5 concludes.

In its decision of 12/12/2022³, the European Commission welcomed Belgium’s efforts to deliver on time most of the measures included in its final Market Reform Plan. The Commission invited Belgium to continue implementing those measures in order to eliminate any identified regulatory distortions or market failures and to alleviate resource adequacy concerns. In order to specifically respond to the European Commission’s demand on resource adequacy evaluation following the implementation plan, the Chapter 4 of the present report will describe the adequacy status for the different points of update detailed in Chapter 3.

2. Context

2.1. Policy context

The federal government has confirmed in April 2023⁴ a series of targets and measures that will contribute to reducing emissions by 55% by 2030. The main energy measures aimed at accelerating the energy transition are:

- additional ambitions for offshore wind energy (8 GW by 2040)
- commitment to hydrogen, both in terms of production and imports (infrastructure)
- increased attention paid to energy security (among others the policy of diversification, the winter plan)
- the strengthening of interconnections (electricity, gas, offshore) with neighbouring countries
- affordability of energy bills.

Due to the unforeseen international context and the European response to the Russian-led war in Ukraine, the Belgian federal government decided on March 18th 2022 to partially reassess the timing of the nuclear phase-out, by allowing the extension, for a period of ten years, of the operation lifetime of two of the seven nuclear units (Tihange 3 and Doel 4), with a combined nominal power of ca. 2 GW. An agreement

¹ https://energy.ec.europa.eu/system/files/2020-05/adopted_opinion_be_en_0_1.pdf

² <https://economie.fgov.be/sites/default/files/Files/Energy/CRM-Monitoring-Report-Belgian-electricity-market-Implementation-plan-2022.pdf>

³ https://energy.ec.europa.eu/system/files/2023-01/C_2022_9059_1_EN_ACT_adopted.pdf

⁴ <https://economie.fgov.be/fr/nouveautes/le-gouvernement-presente-les>

with Engie for this extension was reached in June 2023. The closure of the other nuclear units (totalling a nominal power of ca. 4 GW) remains according to schedule⁵, i.e. the last decommissioning date is December 1st 2025. The aim is to begin LTO (Long Term Operation) for Doel 4 and Tihange 3 from November 2025⁶.

Since then, uncertainty has further increased because of the current gas crisis, the low unavailability of the French nuclear fleet and the changes in the electricity market design.

In response to the demand reduction in compliance with the articles 3 and 4 of the Reg. UE 2022/1854⁷, the Belgian Federal State implemented a number of initiatives. It is to be noted that the reduction in demand is a matter for the regional authorities⁸, the factors that have helped to reduce consumption at federal level are obviously the high prices, but also the launch of two large-scale initiatives :

- “Ik heb impact”⁹ (from April to mid-May 2022) in reaction to the Russo-Ukrainian war, referring to the regional authorities
- Energywatchers¹⁰, a federal website launched by the Federal Public Service for Public Health, Food Chain Safety and the Environment.

As well as the plan to reduce energy consumption in public buildings of the federal administration and monuments on the proposal of the Minister for the Public Function Petra De Sutter and the Secretary of State responsible for Public Buildings Management Mathieu Michel.

The last Belgian National Resource Adequacy Assessment (NRAA) was established by the TSO in June 2023¹¹. A brief summary of the Belgian NRAA main results over the consumption and Belgian grid sections has been compiled further in this Chapter 2.

2.2. Key facts about Belgian electricity system

This section aims to provide a non-exhaustive overview of the recent trends in the electricity sector in Belgium.

2.2.1. Production

As shown in Figure 1, the Belgian gross electricity production in 2022 was 95,2 TWh which is 5,8 TWh more than in 2020.

⁵ To be entirely complete, for the upcoming winter '22-'23 it is investigated if Tihange2 could run until maximum 31/03/23 instead of until 01/02/23, in order to maximise available Belgian capacity and to help alleviate the tight situations in especially Germany and France.

⁶ [Engie keurt doorstart kerncentrales in 2025 goed | De Tijd](#)

⁷ <https://economie.fgov.be/fr/themes/energie/suivi-des-objectifs-europeens/suivi-des-objectifs-europeens>

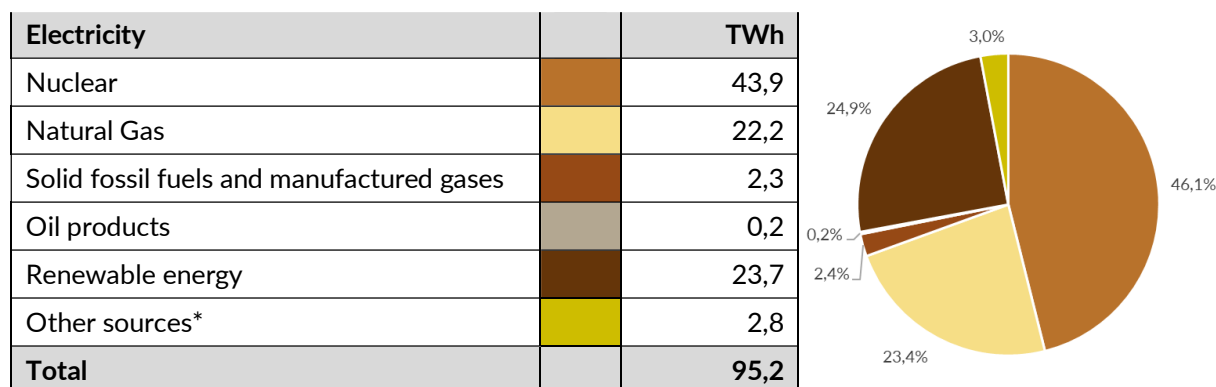
⁸ Information about the regional measures can be found on chapter 2.2.2. of the document <https://economie.fgov.be/sites/default/files/Files/Energy/Analyse-de-risque-securite-appvisionnement-electricite-gaz-naturel-territoire-belge-2030.pdf>

⁹ <https://www.ikhebimpact.be>

¹⁰ <https://www.energywatchers.be/fr>

¹¹ https://issuu.com/eliagroup/docs/adequacy_flexibility_study_for_belgium_2024-203?fr=sOTBhNDYxOTUwMTY

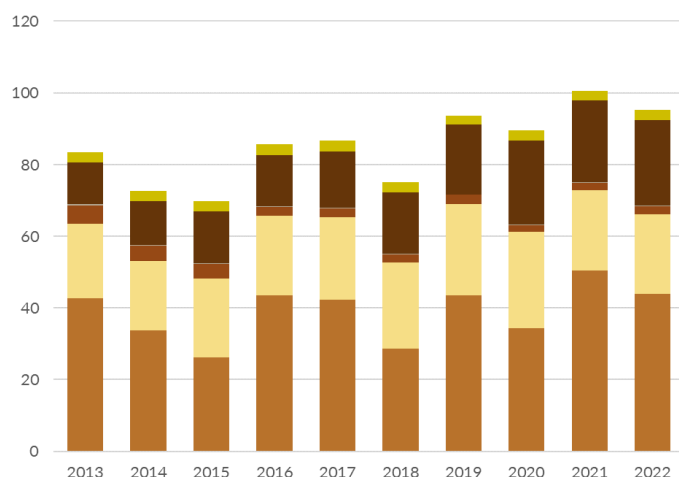
Figure 1 Belgian gross electricity production in 2022¹²



*Other sources include pumped hydro, heat recovery, non-renewable waste and other.

In 2022, the gross electricity generation was 5.2% lower than in 2021, mainly due to lower output from nuclear facilities (-12.8%, or -6.4 TWh). The exploitation of Tihange 2 ended on the 1st of February 2022 and Doel 3 was closed on 23 September 2022. However, 2022 remains the second highest year, after 2021, in terms of gross electricity production. Over the last decade, the most remarkable increase has been in renewable energies, where production has risen by 102.4% (or +12.0 TWh) compared with 2013. The use of petroleum products and solid fossil fuels has fallen sharply (-15.4% and -55.9% respectively over the past decade), mainly to the benefit of renewables. The last power plant running on solid fossil fuels closed in 2016. The electricity still generated today from this fuel group comes from gases manufactured in the steel industry and from small multi-fuel cogeneration plants.

Figure 2 Evolution of gross electricity production (TWh) in the last decade in Belgium



Source: Belgian Energy Data Overview - July 2023

¹² <https://economie.fgov.be/sites/default/files/Files/Energy/belgian-energy-data-overview-juillet-2023.pdf>

2.2.2. Consumption

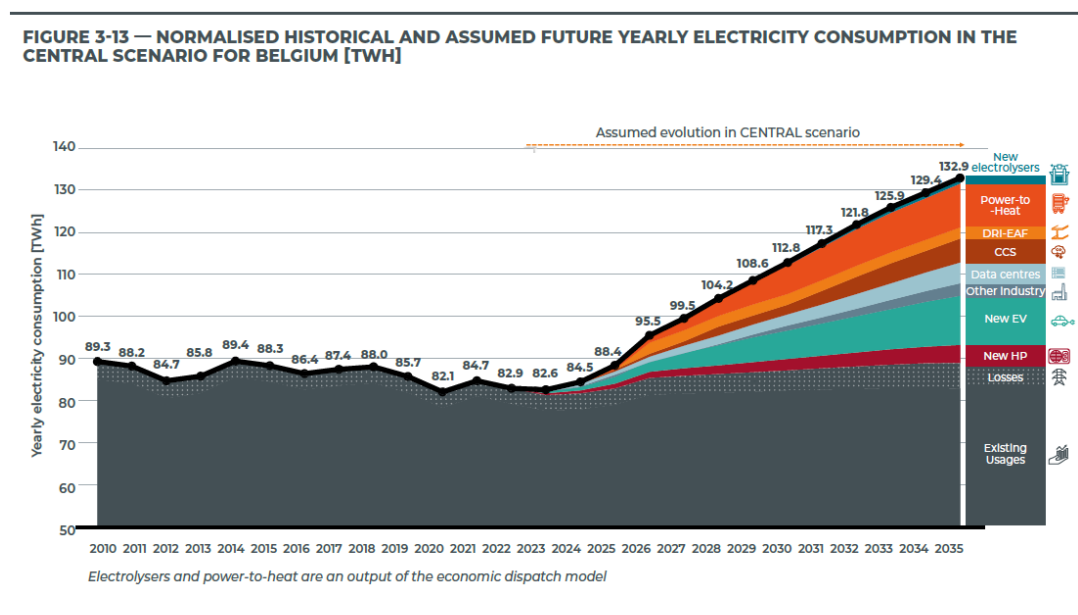
Figure 3 shows the evolution of the electricity demand from 2010 until 2035 for the central scenario of the most recent Adequacy & Flexibility study published the 29/06/2023. The future consumption is based on the most recent information known on February 2023 for the additional electrification. Those are in-line with the regional and federal climate action plans that will be handed over to the EC as the draft NECP for Belgium:

- Electrification of mobility based on the regional and federal ambitions/targets;
- Electrification of heating in buildings based on the regional ambitions/targets.

The electrification in industry was also accounted for based on the information that the TSO has gathered from the existing clients and projects.

The impact of the recent 'energy crisis' is also accounted for in the upcoming years.

Figure 3 Evolution of the electricity demand from 2010 to 2035

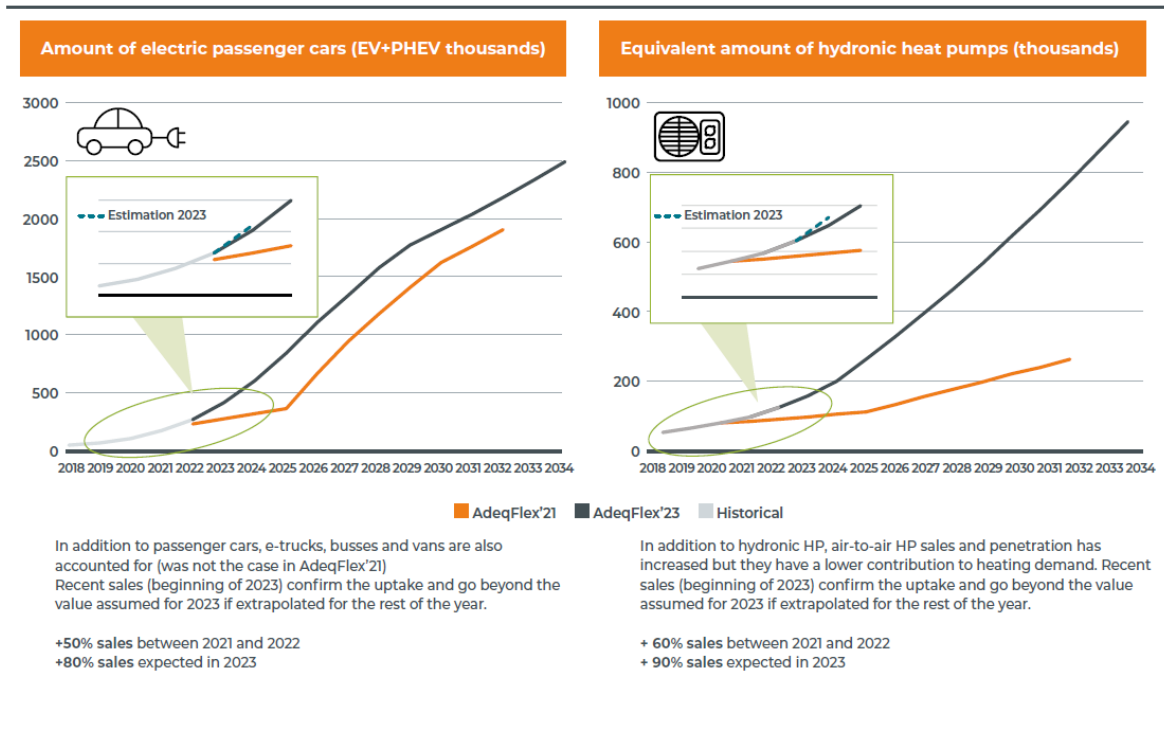


Compared to the previous projections and previous NECP made in 2019, we observe an acceleration of the pace of electrification in the heating and mobility sector:

- The sales have increased by +50% in 2022, compared to 2021 for the EVs
 - The sales for heat pumps have also increased by +60% in 2022 compared to 2021
- In addition, the ambitions and measures being put in place at regional and federal level lead to much higher penetration of EVs and HPs by 2030

The figure 4 provides the comparison for the EV and HPs.

Figure 4 Electric vehicles and heat pumps evolution comparison



2.2.3. Belgian grid

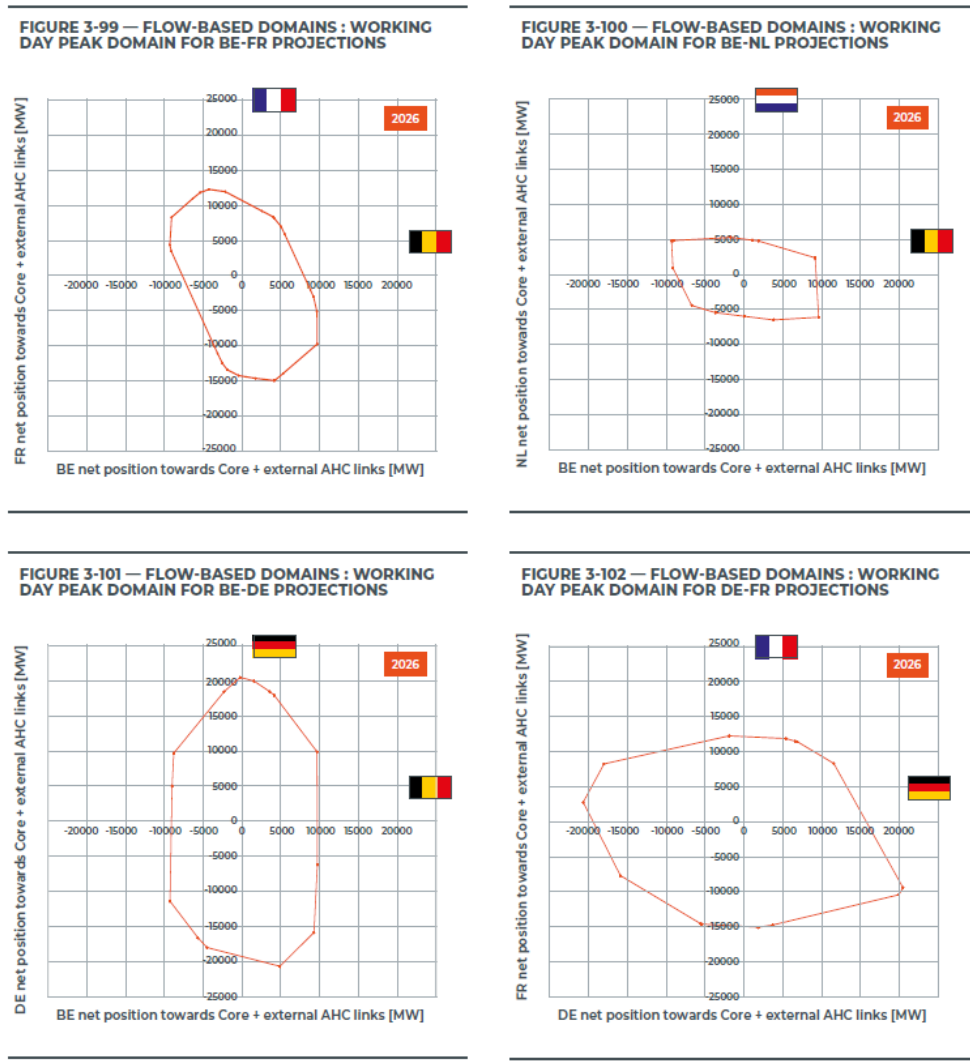
Belgium has one of the highest interconnection capacities shared with neighbours (when comparing the share of market maximum capacities to the peak consumption of each country).

The Federal energy minister has recently approved under conditions¹³ the federal grid development plan that span over the next decade.

As depicted on figure 5, Belgium can import up to 9 GW in 2026 from the other Core countries (if the energy is available abroad). In addition, Belgium is also connected to the UK via the NemoLink which consists of an additional 1 GW. Those values should be compared to the peak demand which is of about 13 to 14 GW.

¹³ [Moniteur Belge - Belgisch Staatsblad \(fgov.be\)](https://www.fgov.be/moniteur-belge)

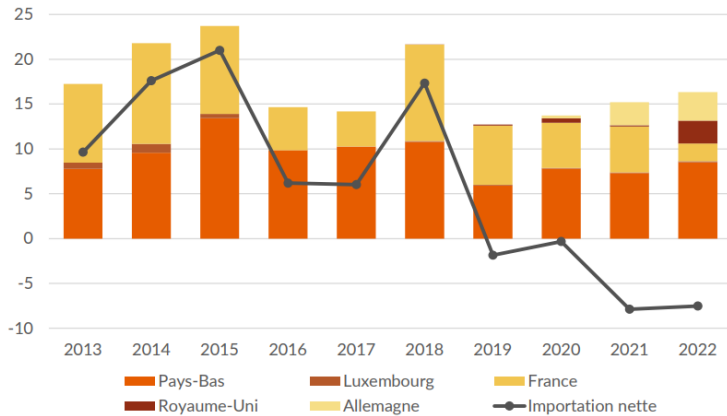
Figure 4 Imports from the Core countries



Belgium was a net importer of electricity between 2010 and 2018. In 2015 the net imports amounted 21 TWh and were linked to low availability of the nuclear fleet in the country. A similar situation was observed in 2018. As from 2019, Belgium was found to be a net exporter of electricity. In 2022, net electricity imports were negative for the fourth consecutive year. Belgium's net imports were positive with the Netherlands and Germany (3.6 and 1.3 TWh respectively); they were negative with France, Luxembourg and the United Kingdom (-9.9, -1.8 and -0.8 TWh respectively). This resulted in a net export of 7.5 TWh in 2022. The exports to the UK were mainly due to higher prices at peak times in the UK than on the continent. The increase in exports to France was mainly due the very tight situations experienced with missing out on nuclear generation capacity due to corrosion discovered in several generation facilities.

Figure 6 Historical electricity imports evolution in TWh

Évolution en TWh

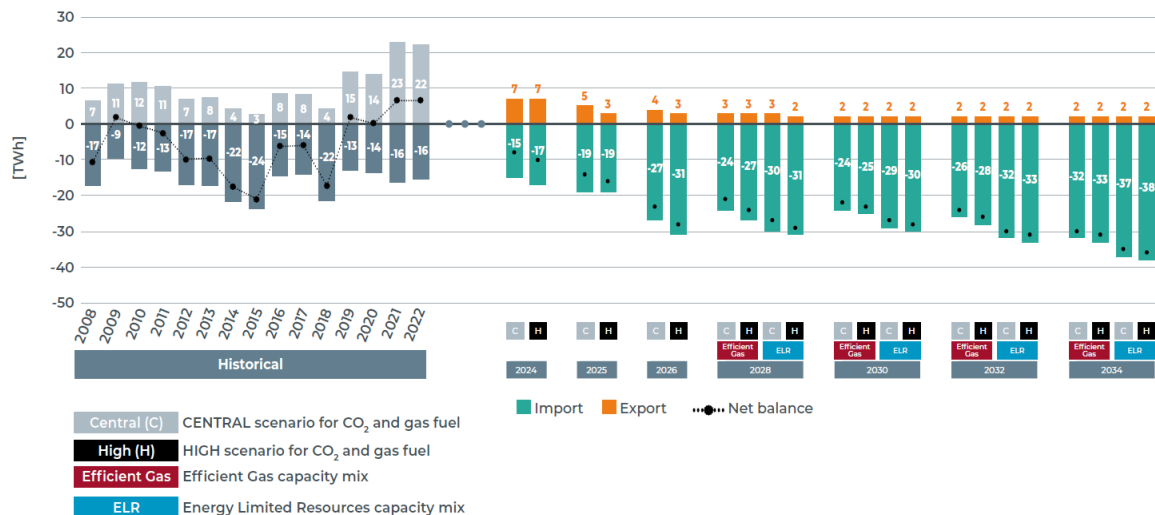


Source: Belgian Energy Data Overview - July 2023

With the decommissioning of several nuclear units, Belgium is expected to be a net importer in the coming decade. The figure 7 provides more details on the results from the central scenario simulated in the Adequacy & Flexibility 2024-34 study.

Figure 7 Yearly imports/exports of electricity for Belgium in the EU-BASE scenario

FIGURE 7-6 — YEARLY IMPORTS/EXPORTS OF ELECTRICITY FOR BELGIUM IN THE EU-BASE SCENARIO (FOR THE 'EFFICIENT GAS' AND 'ENERGY LIMITED RESOURCES' (ELR) CAPACITY MIX COMBINED WITH CENTRAL AND HIGH GAS/CO₂ PRICES SCENARIOS)



2.3. CRM: first auctions

The first auction in 2021¹⁴ generated approximately 1700MW (derated) of new capacity (1600 MW in the form of 2 CCGT power plants (Seraing and Les Awirs) + 10MW of small battery projects and 30MW of 4 large battery projects.

The second Y-4 auction of the Belgian CRM was held in October 2022 for the 2026-2027 delivery period. The results were published¹⁵ on the October 31st 2022, with an update on April 13th 2023, and approved by the national regulator¹⁶. No capacity has been selected for this second auction. This is due to the fact that the majority of generators in the market decided to postpone their participation to the second auction Y-1 in 2025. The volume of 6617 MW which has made an opt out IN completely covers the volume that was auctioned (6417 MW). For this reason, it was not necessary to select the 800 MW of new capacity that was offered in this auction.

The bid volume weighted average bid price of the submitted bids is equal to 19,718.68 €/MW/year.

¹⁴ <https://www.elia.be/en/grid-data/adequacy/crm-auction-results>

¹⁵ <https://www.elia.be/en/grid-data/adequacy/crm-auction-results>

¹⁶ [CREG validation \(creg.be\)](https://www.creg.be) – Available only in French and Dutch

3. Implementation plan - Monitoring 2023

Table 1 provides a summary of the different measures that will be discussed in Chapter 3. The status of each of these measures, in comparison to their status in the last monitoring report, is given.

Table 1: Summary of the different measures

Measures	Status
Wholesale markets	Updated
Price limits	Updated
Offers in the wholesale market	No change
Generation reserves by TSOs	No change
CWE flow-based market coupling	No change
CORE region	No change
Integration of HVDC interconnectors	No change
Balancing markets and ancillary services	Updated
Improved balancing publications	Updated
Revision of the alpha component	No change
Further implementation of frequency-related ancillary service Product Roadmaps	Updated
Participation in EU Balancing Projects	Updated
Regional imbalance settlement harmonization	No change
Internet of Energy	No change
Flexibility	Updated
Transfer of Energy	Updated
EMD	Updated
Smart Meters	Updated
Regulated prices	Updated
Interconnections and internal grid capacity	Updated
Self generation, energy storage and energy efficiency	Updated
Reliability standard	Updated

3.1. Wholesale markets

3.1.1. Price limits

Following the high prices on 3rd of April 2022 in France, exceeding a value of 60% of the harmonised maximum clearing price of the Day Ahead Markets, the harmonised maximum clearing price was increased by 1,000 EUR/MWh¹⁷ from 3000€/MWh to 4000€/MWh on the 10th of May 2022. This in line with HMMCP Methodology in accordance with Article 41(1) of Commission Regulation (EU) 2015/1222 of 24th July 2015 (CACM Regulation).

Following a decision from the Extraordinary TTE (Energy) Council Meeting of 9 September 2022, a second planned increase of the maximum price for the day ahead market in October 2022 was suspended¹⁸ at the request of CRE¹⁹ and ACER²⁰. The maximum price remained therefor at 4000€/MWh, which is the same limit as the previous monitoring report 2022.

On the 11th of January 2023, ACER approved²¹ a new automatic maximum price limit adjustment mechanism ensuring a more gradual increase of the price limits for the day ahead and intraday market. This change will allow a better short-term dispatch of generation and will boost demand response thanks to fewer and smaller adjustment of price limits. This change has been taken into account in the Adequacy and Flexibility study of Elia in 2023.

¹⁷ <https://www.epexspot.com/en/news/harmonised-maximum-clearing-price-sdac-be-set-4000-eurmwh-10th-may-2022>

¹⁸ <https://www.epexspot.com/en/news/no-changes-harmonised-maximum-clearing-price-sdac-20-september-it-remains-4000-eurmwh>

¹⁹ <https://www.cre.fr/en/News/preparing-for-next-winter-the-cre-calls-for-a-review-of-the-automatic-rise-in-the-price-cap-for-the-wholesale-electricity-market>

²⁰ <https://www.acer.europa.eu/news-and-events/news/acer-urges-review-rules-automatic-maximum-price-adjustment-mechanism-day-ahead-electricity-market>

²¹ <https://www.acer.europa.eu/news-and-events/news/acer-approves-new-automatic-maximum-price-limit-adjustment-mechanism-european-electricity-spot-markets>

3.1.2. Offers in the wholesale market

No changes compared to the previous monitoring report 2022.

3.1.3. Generation reserves released by TSOs

No changes compared to the previous monitoring report 2022.

3.1.4. CWE flow-based market coupling improvement

No changes compared to the previous monitoring report 2022.

3.1.5. CORE region

No changes compared to the previous monitoring report 2022.

3.1.6. Integration of HVDC interconnectors:

No changes compared to the previous monitoring report 2022.

3.2. Balancing markets and ancillary services

Measures taken and significant advances made since the 2022 Monitoring Report are **highlighted** in this Chapter 3.2.

3.2.1. Improved balancing publications

The changes foreseen towards improved balancing publications have been implemented as planned, including the development of an IT tool allowing Elia to communicate the relevant information to (registered) BRPs within 15 minutes after the respective quarter-hour. This development helps BRPs to determine their imbalance.

Elia is already one of the TSOs publishing the most information on its website, including a lot of information close to real-time (e.g. 1' system imbalance, expected imbalance price based on current activation of balancing reserves, etc.).

Additional evolutions of the balancing publications are foreseen in the context of the connection to the European balancing platform to provide BRPs with the best possible view on the system and market conditions.

3.2.2. Revision of the alpha component

No change compared to the previous report.

3.2.3. Further implementation of frequency-related ancillary service

Product Roadmaps

Various actions related to the evolution of the different balancing products were implemented step by step, after a close interaction with the market :

- **FCR** : FCR is open to all technologies and all players. Tendering is taking place on a daily basis and at regional level since July 2020. **Elia is working together with the other TSOs of the FCR Cooperation on the harmonization of the monitoring and penalization of BSPs in case of poor performance. Elia intends to amend in 2024 its local market rules to apply principles identified as common best practices for monitoring.**
- **aFRR**: Since September 2020, aFRR is open to all technologies and all players except for active consumers at low voltage level. Tendering takes place on a daily basis. The design of the aFRR capacity auction has been improved in 2021 and the changes implemented in May 2022 to facilitate the efficient competition between CCGTs and other technologies in the same market. **Elia has proposed, in dialog with the CREG, a new methodology to dimension aFRR needs. This**

dynamic dimensioning methodology based on AI should better consider local market and system circumstances and make the methodology more robust in the context of increasing RES integration.

- **mFRR:** mFRR is open to all technologies and all players, except for active consumers at low voltage level. Sizing & Tendering are taking place on a daily basis. Marginal pricing for activated balancing energy is enabled since February 2020. The contribution of reserve sharing to cover part of the FRR needs has been increased from 50MW to 250MW in January 2021, resulting in a reduction of procured mFRR capacity.

Moreover, in line with the explanation provided by the TSO in the Working Group Balancing held on 29/06/2023, a High Incompressibility Risk Procedure applies in case of high incompressibility risk from Thursday 06/07/2023 until 21/09/2023 included.

3.2.4. Participation in EU Balancing Projects

FCR is already tendered and procured at regional level since July 2020. With respect to the other products:

- **aFRR:** accession to PICASSO is foreseen for June 2024. Marginal pricing of activated energy will be implemented for each optimization cycle when connecting to PICASSO. Elia's analysis of the potential consequences on aFRR activation costs and imbalance tariff of a connection to PICASSO, in particular before the connection of RTE to the platform, led to the decision to postpone the connection of Belgium to the platform. Elia is actively participating to discussions on potential mitigations to connect to the platform without exposing tariff payers and/or BRPs to high financial risks.
- **mFRR:** accession to MARI is foreseen for April 2024. The accession to the platform has been postponed on request of BSPs, to give them more time to prepare to the changes necessary to the connection (in particular, the explicit bidding of the flexibility on large generation units).

3.2.5. Regional imbalance settlement harmonization

No changes compared to the previous monitoring report 2022.

3.2.6. Internet of Energy

No changes compared to the previous monitoring report 2022.

3.3. Flexibility

3.3.1. Transfer of Energy

Transfer of energy for participation to wholesale market (DA and Intraday markets) has been implemented and has entered into force on July 1st 2021.

The assessment of the need for transfer of energy in the aFRR market segment has taken place but revealed that potential benefits on high and medium voltage are highly limited, whereas there are significant challenges for successfully applying the design on low-voltage. For this reason, other promising design schemes are being investigated by the TSO in cooperation with the DGOs. These aim at reducing entry barriers and fostering the development of DSR (especially at low voltage and among others for the aFRR market segment). These schemes are tested in pilot projects in 2022.

The Belgian federal government considers that flexibility should play an increasingly important role in the energy market. Legislative initiatives have already been taken to promote flexibility. The key to unleash flexibility consist in giving an active role to the consumer, while keeping its participation seamless.

Together with DGO's and other stakeholders and in concertation with the federal Government, Elia is currently working on an upgrade of the market design that combines two main features:

1. The first pillar is to allow a decentralized exchange of energy, on and behind the head-meter, between the consumer and any other market party, allowing him to benefit from dedicated energy service per appliance. In order to ensure a good functioning market, it is key that impact of active consumer participation on the supplier and the associated BRP is correctly allocated and neutralized for the concerned market parties, taking into account possible limitations like local congestions in the transmission and distribution systems.
2. The second pillar is the evolution to a “Real-Time Price”. Elia is engaged in a major reflection on the evolution of the imbalance price, that makes it easily interpreted by the consumer and/or its Energy Service Provider and facilitate the valorization of flexible assets in accordance with the real-time system needs.

Elia intends to open to her customers 3 new services (based on easy valorization of flexibility by any energy service provider) by the end of 2023.

3.3.2. EMD

Federal

No changes compared to the previous monitoring report 2022.

Flemish region

The 4th Energy Package, adopted on July 14, 2019, has been transposed in Flemish legislation by the Decree of 2 April 2021²². Especially the transposition of the Directive 2019/944 brings new rights and obligations for consumers, introduces new market roles such as the flexibility service provider and energy communities. DSO's will be able to use flexibility as an alternative to network investments to tackle local congestions and use flexibility for voltage regulation.

On 28 October 2022 the Flemish Government approved a new *Flexibility plan 2025*²³. This plan consists of twenty measures to stimulate the use and supply of flexibility at the DSO level in Flanders.

- Informing consumers about flexibility and raising awareness about the possible advantages for the use of flexibility e.g. smart charging of EV's, smart controlling of heat pumps and small scale energy storage ...
- Fostering flexibility in the industry
- Investigating and setting up indicators and relevant datasets on the use of flexibility
- The DSO provides transparency on the status of his grid (e.g. congestion risks, capacity ...)
- Smart meters must provide quarterly hour data as a standard
- Investigating the use of flexibility within the Flemish government buildings and associated public companies (public transport, water companies, ...)

Walloon region

No changes compared to the previous monitoring report 2022.

Brussels

No changes compared to the previous monitoring report 2022.

²² This new Decree can be found on the website of the Belgian official Journal:
<http://www.ejustice.just.fgov.be/eli/decreet/2021/04/02/2021041519/staatsblad>

²³ <https://beslissingenvlaamseregering.vlaanderen.be/document-view/635A45301EA6B745D23CC9F2>

3.3.3. Smart Meters

The deployment of smart meters in line with articles 19 to 22 of Directive 2019/944, which is a competence of the Regions in Belgium, is explained in this section.

Each of the regional governments has specific targets for the installation of smart meters. In the Walloon Region and Brussels-Capital Region, complete or near-complete coverage is not expected until after 2030.

Flemish region

Following the precedingly mentioned speed up of the roll-out of smart meters led by the Flemish Government, the Flemish government set the ambition that all traditional meters in Flanders should be replaced by digital energy meters by 1 July 2029. **Today 2.524.653 or 40% of all meters are smart meters.**

The Flemish DSO Fluvius works actively to promote 'smart' applications for end-users. Today, every Flemish household with smart meters can consult their personal energy usage or feed-in via a new free online consumer portal. The data can be consulted in great detail: per 15 minutes for electricity and per hour for natural gas. These data are also available to commercial companies for tailor made energy advice. The Flemish smart meters also offer two data ports (P1 and S1) for commercially available smart energy applications. **An overview of those applications can be found on www.maakjemeterslim.be**

Walloon region

No change compared to the previous report.

Brussel Capital region

The Brussels-Capital Region has been organising the deployment of smart meters since 2018.

The ordinance of 17 March 2022 amending the electricity ordinance completes the framework applicable to the deployment of smart meters. The ordinance also requires the distribution system operator to offer a smart meter to each network user.

In order to guarantee transparency on the state of deployment, the ordinance also introduces an obligation for the distribution system operator to report annually to the Government and to Brugel – the energy market regulator - as well as an obligation to draw up a deployment roadmap, established for the period up to 2030 in accordance with the spirit of the Directive 2019/944.

As of February 2023, 42 873 smart meters have been installed by the distribution system operator on the distribution network.

3.4. Regulated prices

Belgium has no exemptions from network or energy-related costs for specific classes of consumers which might affect demand response incentives.

Belgium has a social tariff system, which contributes to the European objectives aiming at i) guaranteeing the right of access to energy (essential good) for all; ii) protecting vulnerable consumers and (iii) fighting against energy poverty, of which a key explanatory factor also lies in the level of energy prices (in addition to the two other key factors; i.e. income level and energy efficiency of housing and equipment), and this without preventing electricity and gas bills of social tariffs beneficiaries from following downwards as well as upwards price market developments.

Social tariffs have the following economic properties :

- Identical through the whole Belgian territory, social tariffs are based on the cheapest commercial tariff offered in the cheapest distribution area and corrected with the application of a maximum increase per quarter and per year, to dampen energy price shocks; a link with the supply market conditions is therefore structurally guaranteed (supply market-based);
- they are transparent (published by the CREG) and subject to continuous monitoring by the CREG;
- they do not disturb competition and do not create market distortion;
- they do not restrict the freedom of the beneficiaries to change suppliers if they wish;
- they provide a rough indication of the competitive potential in the supply market.

Social tariffs have been set up in the law in 2004 and these preferential commercial rates have been reserved to certain categories of consumers commonly called "protected residential customers with modest incomes or in a precarious situation". The system is financed through an excise duty mechanism. Improvements have taken place over time to improve the efficiency of the system.

Between February 1st 2021 and June 30th 2023, in answer to the very high prices, the group of beneficiaries of the system has been temporarily extended to more categories of vulnerable consumers. Other price-related measures that have been decided to tackle the energy crisis consist of, amongst others, lowering VAT from 21% to 6% for residential consumers, and the allocation of energy cheques to some categories of clients.

3.5. Interconnections and internal grid capacity

The Federal Development Plan 2024-2034 describes several projects to increase interconnection and internal grid capacity.

Elia is still actively developing the projects proposed in its previous Plan : HTLS reinforcement of the 380 kV backbone and new corridors Ventilus and Boucle Du Hainaut.

On the interconnection side, Elia is also actively working on projects as put forward in the Federal Development plan. The projects of the Plan are as follows :

NL border :

- Zandvliet-Rilland: Expected by end 2023.
- Van Eyck – Maasbracht : Reinforcement of the interconnection with HTLS conductors (expected by 2032-2034) after the needed reinforcements of the internal backbone in order to host the upgraded interconnection capacity.

DE border :

- Alegro: taken into service at the end of 2020.
- Germany - Belgium II: New studies on the optimal capacity, and connection points will be launched. The commissioning date is not expected before 2037-2038, after the needed reinforcements of the internal backbone in order to host the new interconnection capacity.

FR border :

- Lonny-Achène-Gramme: Reinforcement of the interconnection with HTLS conductors (expected by 2030-2032) and installation of 2 Phase Shifting transformers (1PST is expected by 2025 and second one by 2030-2032).

Offshore :

- Triton Link (BE-DK): Elia actively investigates a new hybrid system (wind + interconnection) between Belgium and Denmark. A memorandum of understanding (MoU) has been signed on February 2021. The objective of this MoU is to initiate cooperation on the planning of a possible interconnection with an energy hub in the Danish economic zone in the North Sea with mutual benefit to the two countries. The preliminary study has shown that the project is both socioeconomically and technically feasible and will result in significant CO2 reductions at a European level. Following this positive result, in November 2021, a Memorandum of Agreement has been signed by the Belgian and Danish ministers of Energy and a new cooperation agreement between the two system operators Elia (Belgium) and Energinet (Denmark) on the implementation of what could become a world first: the first undersea connection between two artificial energy islands which will be able to exchange power between the two countries and at the same time transport electricity from offshore wind farms to the mainland.
- BE-UK: On 23rd February 2022, authorities of Belgium and the United-Kingdom signed a Memorandum of Understanding to strengthen their energy cooperation and including the development of a second interconnector between Belgium and the United-Kingdom. Upon approval of the federal grid development plan 2024 – 2034, the minister of Energy decided that a preliminary cost-benefit analysis and a comparative study of alternatives is required on the basis

of which further concrete details in view of the development of a second interconnector between Belgium and the United-Kingdom should be included in an adjusted next network development plan.

3.6. Self generation, energy storage and energy efficiency

3.6.1. Self generation

CEER has defined self-generation as the use of power generated on-site by an energy consumer in order to reduce, at least in part, the purchase of electricity from the grid. Be it with rooftop photovoltaic, small wind turbines or other small scale electricity generation, Belgium has seen a regional progression in consumers' empowerment for self-generation.

Flemish region:

At the end of 2022, the installed PV capacity was approximately 5.0 GWe. The solar map shows that there is sufficient potential available on roofs to achieve significant growth. Further annual growth of 500 MWe is estimated over the period 2024-2030, with the aim being for solar PV capacity to reach 8,9 GWe in Flanders by 2030. This target is within the potential identified using the solar map, and also within the system integration and balancing capacity. A Solar Plan 2025 with projections to 2030 has been produced in order to increase solar power. Under the Flemish government agreement, the existing investment aid system is to be expanded through budgets set annually for small and medium-sized wind farms and medium-sized PV projects from 2021 so that the most cost-effective projects are carried out. The aid system is to be funded by the Energy Fund.

On 4 December 2020 the Flemish Government approved a new *Solar Plan 2025* and on 11 December 2020 a new *Wind Plan 2025*.

Solar Plan:

- the existing investment aid system for small and medium-sized wind turbines is expanded for small and medium-sized PV projects from 2021 so that the most cost-effective projects are carried out (call procedure). The aid system is to be funded by the Energy Fund (16,5 million € in 2022);
- investment support for small PV until 10 kW (20,6 million € in 2022);
- Lower threshold of grid study for PV deployment of 10-40 kW
- facilitate the integration of PV in the energy market and net exploitation;
- Update calculations Solar map
- Exemplary role of public authorities
- Premium asbestos removal combined with solar panels
- Set up research agenda to support objectives Solar plan

After the approval of the Solar Plan, an additional decision was taken by the Flemish government to introduce a PV obligation on roofs of large electricity consumers. Large electricity consumers with an annual offtake of more than 1 GWh and public buildings with an offtake of more than 250 MWh will be obliged to install a minimum capacity of solar panels.

Wind plan:

- phasing out the support of wind in 2025 (mature technology) and monitoring the profitability of wind energy projects;
- empowering local governments ;
- pilot project of tendering wind energy on government land;
- facilitate Repowering ;
- The development of a Flemish vision that provides sufficient space for the development of wind energy in Flanders
- evaluation of the permit framework for wind turbines;
- public acceptance by local support of new projects (Local Energy and Climact pact, focus on local stakeholders, communication).

After the approval of the Wind Plan 2025, the Flemish Government decided on additional measures: facilitating the implantation of wind turbines in valuable agricultural areas and in areas with green zoning (buffer zones). In addition, an environmental impact analyses procedure will be started for areas with a green zoning with non-qualitative nature value in order to determine to what extent wind turbines can also be implanted here.

The Flemish Government encourages the production of electricity from renewable energy sources through the system of green energy certificates (GEC). In 2020, important additional measures were taken: limit the internal rate of return used in banding factor calculations, gradual phase-out of renewable electricity support through the certificate system until 2023, to be completed by 2025.

Walloon region

On the 5th May 2022, the Walloon Government has adopted a decree implementing the concepts of EU Directive 2019/944. The decree thereby creates a legal framework for (renewable) energy communities, self-consumption of renewable energy within a same building, participation in flexibility services and the thereby linked activities through creating the status of active clients (activities like self-production, self-storage, self-consumption, peer-to-peer, participation in flexibility services or in energy efficiency programmes etc.).

In March 2023 an implementing act was adopted detailing the modalities to create and operate (renewable) energy communities and self-consumption of renewable energy within a same building.

Brussels-Capital Region

In 2021 solar photovoltaic installed capacity continued to increase (by 6.5%) to reach 213 MWp. With an estimated potential of 2500 MWp, this corresponds to 8,5% of the region's potential. Those installed capacity generated 162 GWh of renewable electricity or the equivalent of 87% of the 185 GWh projected production as part of the 2019 NECP. This projection of 185 GWh is currently being reviewed as part of the 2023 Air-Climate-Energy Plan (PACE 2.0) of the Brussels Region.

The implementation of modifications to the electricity ordinance in 2022 is now allowing to share electricity between prosumers and consumers through energy communities. This should improve self-consumption of electricity and help the market to better balance production and demand.

3.6.2. Energy storage

Federal

The storage of electricity in batteries (or indirectly via heat pumps in boilers, for example) has already been technically developed and can be used to absorb short-term fluctuations. Energy storage in the form of hydrogen or other synthetic fuels offers an alternative for long-term storage.

As previously mentioned, with regard to pumped hydro, the owner has decided to expand the existing largest pumped hydro storage plant Coe by 2024. This will increase the energy storage by 425MWh and the power output by 84MW.

On the grid level, the federal grid development plan 2024– 2034 describes multiple projects to enhance the integration of large scale offshore wind production in combination with an increase in interconnection capacity. The expansion of the transmission grid is described in other sections of this document, the main driver is to tackle large fluxes within the transmission grid originating from large renewable energy production in Belgium and Europe.

Energy storage units directly connected to the (regional) transport grid are exempted from access tariffs.

Walloon region

The legal framework around storage in Wallonia still needs to be updated. This is subject to a specific measure (measure n°267) mentioned in the Plan Air Climat Energie adopted by the Walloon Government on 21st March 2023.

Flemish region

Encouraging energy storage through an incentive

Flemish authorities are encouraging the Flemish market for energy storage and management systems by supporting investments in electricity storage through a purchase incentive. Such energy storage systems will help to ensure system stability during peaks in demand and generation. They form a temporary alternative to additional investments in the system. This subsidy was available from 2018 to March 2023. This subsidy was very successful and resulted in a strong growth of home battery systems.

By the end of 2022 almost 58.000 battery systems with a total power of +- 300 MW and a total capacity of +- 525 MWh were connected to the distribution network in Flanders. These numbers probably are underestimated because the data about the battery systems connected to the distribution network is lagging behind.

Establishing a regulatory framework for energy storage

Flemish authorities do not allow system operators to own, develop, manage or operate energy storage installations. In addition, studies will be conducted regarding the role of energy storage within districts, and any obstacles to this, and support measures will be adopted or initiatives if needed. This framework will be closely linked with the regulatory frameworks for flexibility, and with the local energy communities that are currently being developed as a result of the transposition of the European Directive on electricity and renewable energy, within which energy storage (at district level) may play an important role.

Demonstration projects for power-to-x

Electricity can be stored in batteries or converted to hydrogen and other molecules. Decreasing the cost of such technologies takes a lot of RD&D effort. The Flemish region is therefore going to launch new pilot and demonstration projects for power-to-x.

Brussels-Capital Region

No change reported.

3.6.3. Energy efficiency

Flemish region

No change compared to the previous report.

Walloon region

The Walloon Government adopted its Plan Air Climat Energie (PACE) on 21st March 2023. The Plan indicates that by 2030, the final energy consumption compared to 2005 should have decreased by 29% (about 105TWh for all sectors).

According to the Energy Efficiency directive 2018/2002, there is also an obligation to reduce the final energy consumption by 0.8% every year from 2021 to 2030, i.e. 1004GWh each year for Wallonia, leading to a cumulative target of 55.2TWh for the 10 years period till 2030. The PACE also underlines that it could be expected that this objective double as from 2024 with the adoption of the Fit for 55 package.

Brussels-Capital Region

No changes compared to the previous monitoring report 2022.

3.7. Reliability standard

On 15th September 2021, a new reliability standard of 3h entered into force. This value was set by applying the VoLL and CONE values as calculated by the competent authorities in accordance with Article 25 of the Regulation 2019/943.

As stated in the Commission decision on the aid scheme SA.54915, Belgium committed to update the VoLL based on a new survey regarding willingness to pay, in line with the CONE/VOLL/RS methodology and, if needed, set a new reliability standard before September 2022, with a view to using the new reliability standard to determine the volume to be procured at the latest for the 2023 auction.

Accordingly, the DG Energy of the FPS Economy, in collaboration with CREG and Federal Plan Bureau, conducted a new survey regarding the maximum electricity price that customers are willing to pay to avoid a supply interruption in situations where capacity resources are insufficient to meet the demand. Based on the results of the survey, DG Energy of the FPS Economy, the competent authority to determine the value of lost load, estimated that the Belgian VoLL amounted to 12.832,48 €/MWh²⁴.

In parallel, DG Energy of the FPS Economy updated the estimation of the cost of new entry²⁵. The changes from the previous report (May 2021) are as follows:

- replacement of the technology IC engine Diesel by IC engine Gas: this choice was a.o. motivated by the decision of the European Investment Bank (EIB) to limit funding for new fossil fuel projects since the end of 2021;
- CAPEX, FOM and economic lifetime of batteries were updated based on more recent studies²⁶;
- derating factors were updated based on the ones determined for the CRM-auction 2022.

The new values of CONE for the different reference technologies are shown in the table below:

Table 2 New CONE values for different technologies

Reference technology	EAC - [€/kW/y]	Derating Factor - [%]	CONE _{fixed,RT} - [€/kW/y]
Open cycle gas turbine (OCGT)	60,7	91%	67
Combine cycle gas turbine (CCGT)	88,4	92%	96
Internal combustion engines (IC engines) - Gas	60,3	65%	93
CHP	141,4	93%	152
Photovoltaics (PV)	88,2	1%	8823
Wind onshore	163,3	9%	1814
Wind offshore	360,6	13%	2774
Battery storage	43,3	31%	140
Demand Response	20	66%	30

Based on the new value of lost load and the new estimations of cost of new entry, the Regulator (CREG) had to make a proposal for a new reliability standard. Based on this proposal, ELIA and the Ministry have sent their advices to the Minister. The new reliability standard entered into force in September 4th 2022²⁷ as planned in the previous monitoring report.

²⁴https://economie.fgov.be/sites/default/files/Files/Energy/CRM-Note_Estimation-cout-d-energie-non-distribuee-territoire-belge-VoLL-10062022-signed.pdf

²⁵<https://economie.fgov.be/sites/default/files/Files/Energy/CRM-Note-Cout-d-un-nouvel-entrant-CONE-BE-10062022-SIGNED.pdf>

²⁶<https://www.nrel.gov/docs/fy21osti/79236.pdf>

²⁷<https://www.ejustice.just.fgov.be/eli/arrete/2022/09/04/2022041878/moniteur>

4. Resource Adequacy

In its opinion of 12 December 2022 the Commission invited Belgium to explain whether and how the measures implemented have contributed to reducing or addressing the adequacy concerns. In particular, the Commission invites Belgium to monitor the effectiveness of the adopted measures and quantify their impact on resource adequacy.

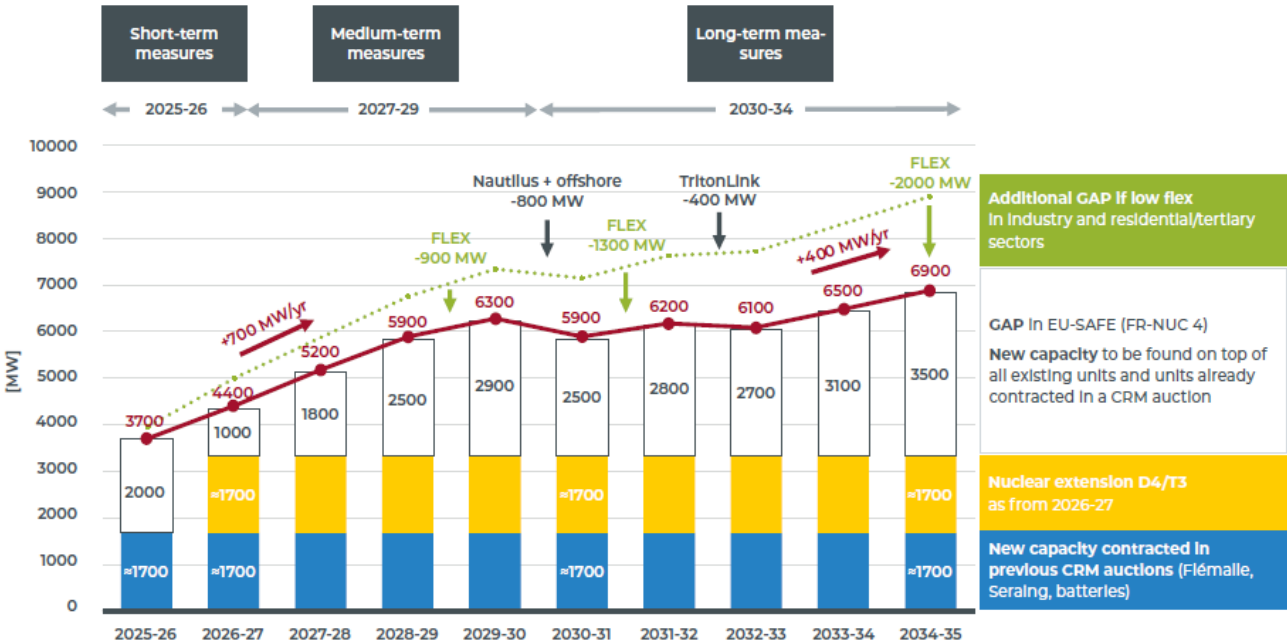
This section illustrates the results of the last Adequacy and Flexibility study performed by Elia in June 2023. The individual impact of all the measures outlined in this report could not always be calculated since the study of Elia did not isolate specific measures. Besides, the synergy between different measures would not be captured. It is in our view important to capture the impact of smart meters combined with the increase in domestic batteries and solar panels for example.

Nevertheless, the measures described in this report have a positive impact and alleviate resource adequacy concerns for Belgium which will be demonstrated in this section. A more thorough quantification will be performed for the evaluation plan.

4.1. General results

As it can be seen on the figure below, the need for electrification has significantly increased due to the goal of achieving a carbon neutral electricity system in line with Belgian and European goals. New capacities are increasingly needed in the future to meet this push for more electricity based-solutions for the industrial and residential sector. Additionally, the war in Ukraine and the subsequent rise in gas prices have further accelerated the will of an independent energy system.

Figure 9 Required new capacity to ensure security of supply after 2025



It is important to note that the nuclear extension of Doel 4 and Tihange 3 would already start from the winter 2025-2026 thanks to the deal between Engie and the Belgian authorities in June 2023. This would reduce the gap for 2025-26 by 1700 MW. Based on current foresights, there is a need of estimated 300 MW new capacity to be found in the Y-1 auction of the CRM. This need gradually increase in the future

but as a result of the measures planned by the Belgian authorities in terms of flexibility, interconnections and low carbon technologies such as storage or self-generation, the need for new capacities is mitigated.

4.2. Impact of flexibility on adequacy

On the graph above, it can also be observed that the impact of low flexibility of the residential, tertiary and industrial sector is very high on the gap. Based on the central scenario that Belgium is currently following, the need for new capacity for 2034 is 6900MW with 3400 MW already covered by the nuclear extension and the already contracted capacity in the CRM. However, if the flexibility follows a low scenario, this gap increases by 2000 MW. For the year 2028-2029, the increased gap due to a potential low flexibility is 900MW.

We can thus observe how big of a role flexibility will play for the electrical system of Belgium. Every measure which increases flexibility will be beneficial to the adequacy of Belgium. Certain sensitivities calculated by Elia allow to quantify more precisely the impact of the measures undertaken by the Belgian authorities.

Concerning the smart meters, it will help to unlock the potential flexibility of heat pumps and electrical vehicles of end-users. Elia calculated that in a scenario with low flexibility of heat pumps and electrical vehicles, which could be used as a proxy for low implementation of smart meters, the gap would increase by 400MW by 2028, 600 MW by 2030 and 1000MW by 2034 in comparison with the central scenario. As mentioned before, the impact of this measure will be evaluated more accurately for the evaluation plan but the proxy used here shows how smart meters are needed to alleviate resource adequacy concerns. Smart meters have more advantages than just increasing the flexibility of heat pumps and electrical vehicles and the impact mentioned should be viewed as a broad estimation.

Furthermore, Elia will publish in November 2023 a new study about the barriers that are present in Belgium and preventing from reaching the full potential of flexibility. This study will also outline the solutions to unlock this potential.

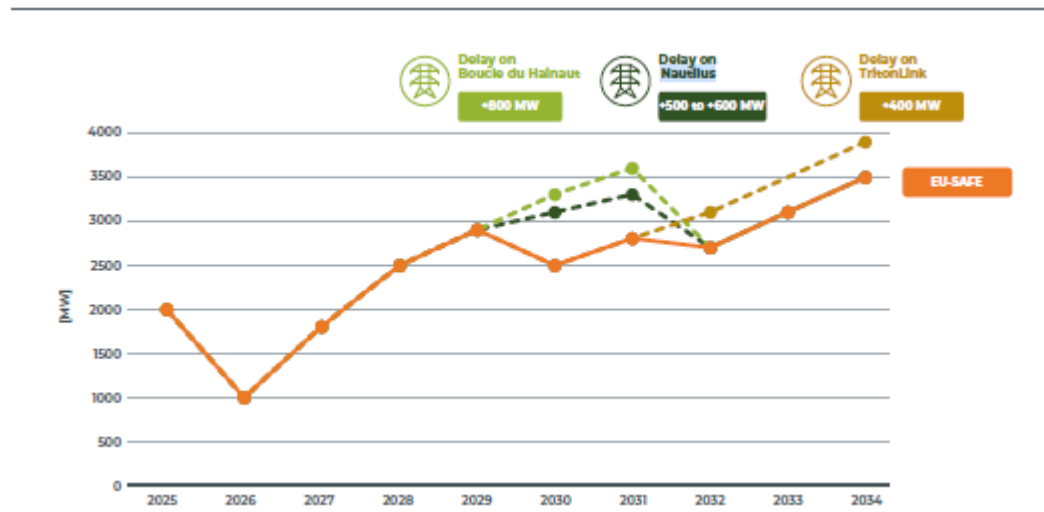
4.3. Impact of interconnections and internal grid on adequacy

The growing need of building more interconnection infrastructures has become evident in accelerating the energy transition, particularly in areas where the potential in renewable energy is high but are often located in regions too remote. The development of such infrastructure is vital to enhance market integration but also to increase the security of supply. As mentioned in the last monitoring report, two main projects are ongoing and will have a significant positive impact on the adequacy of the Belgian electricity system.

The first project is an interconnector between Denmark and Belgium, the Triton link. As mentioned above, a memorandum of agreement has already been signed and a study has shown that it was both socioeconomically and technically feasible. The project would reduce the CO₂ emissions on an European scale. With regards to its impact on the adequacy of Belgium's electricity system, Elia calculated that it would narrow the gap by 400 MW in 2032 when the interconnection would be completed.

The second project concerns an interconnector between the United Kingdom and Belgium. A memorandum of understanding has already been signed. Further studies concerning the alternatives and a preliminary cost-benefit analysis are needed. This ambitious project aims to construct a hybrid system, combining the function of connection of an offshore windfarm with an interconnector. This would reduce the gap by 500MW in 2030.

Figure 10 Impacts of the delays on the construction of grid infrastructure



4.4. Impact of self-generation and storage

In comparison with the previous monitoring report, there has been a significant increase in self-generation and storage capacities. This growth is the result of combined efforts from each region and the federal state to develop these new capacities. These capacities bolster the security of supply of Belgium while reducing the CO2 emission and accelerate the energy transition.

In order to assess the evolution with the last monitoring report, this section will quantify the impact of the increased development of solar panel and storage between the Adequacy and Flexibility study conducted in 2021 and 2023. We can thus quantify the measures undertaken by Belgium to reduce its adequacy resource needs while aiming for a more carbon neutral electrical system. The comparison will be done on two target years, namely 2025 and 2030.

Regarding self-generation, the total capacity of PV estimated to be on the market in 2025 was 8000MW in 2021 and increased to 10 090MW in 2023, representing a substantial increase of 2090MW. For the year 2030, this increase amounts to 3490MW. Considering that PV capacity contributes proportionally less to the security of supply, these increases resulting from the efforts of the region have a low impact but still noticeable. Taking into account a derating factor of 1%²⁸, the gap for the year 2025 is reduced by 21MW and for the year 2030 by 35MW. This represents an estimation and will be calculated in more details in the evaluation plan.

Regarding storage at the federal level, the increase in power of CoO by 2024 of 84 MW will have a positive impact on the security of supply. Considering a derating factor of 48%, the positive impact on the gap is estimated at 41MW.

Concerning small-scale batteries, the main measure which helped their development was the subsidy offered by the Flemish government for the installation of a domestic battery that ended in March 2023. Nevertheless, this measure can be considered as a success in promoting their installation. While only a capacity of 173 MW was estimated to be present in 2023 for the year 2025, it is now estimated to be 384MW. This represents an increase of 210MW for the year 2025. For the year 2030, this increase amounts to 605MW. Considering a derating factor of 39%, this respectively represents a positive impact on the gap of 82MW and 236MW for the year 2025 and 2030. Recent expectations, based on requests for grid connections and offers in the CRM, show a potential exponential growth of large-scale batteries in the coming years.

²⁸ https://www.ejustice.just.fgov.be/cgi_2018/article.pl?language=fr&sum_date=2023-03-31&lg_txt=f&numac_search=2023041521

The quantifications given in this chapter are estimations and should be considered as such. More accurate impact quantification will be performed for the evaluation plan.

4.5. Impact of wholesale markets and balancing markets on adequacy

Despite the taken measures we still don't see new generation capacity develop, although studies clearly show the need, and electricity prices are at higher levels as previous years.

Moreover comparing the Adequacy and Flexibility study of 2021 and 2023 would not yield accurate impact of these measures given that many parameters and variables have changed between the two studies.

5. Conclusion

As is foreseen in article 20.3 of Regulation 2019/943, Belgium monitors the application of its implementation plan and publishes the results of the monitoring in an annual report and submits that report to the Commission.

To elaborate this monitoring report, the DG Energy of the FPS Economy collaborated with CREG, ELIA and the Regions who provided input in their fields of expertise.

Through this document, Belgian authorities provide an explanation of the changes from the last monitoring report and demonstrate that the explained measures to eliminate any identified regulatory distortions or market failures and to alleviate resource adequacy concerns in Belgium are ongoing.