CONSULTATION REPORT

Report on the public consultation regarding the adequacy and flexibility study 2026-2036

21/02/2025

Contents

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

1. Introduction

Elia organized a public consultation from 05/11/2024 to 05/12/2024 on the input data and assumptions, as well as on methodology that will be used for the study regarding the adequacy and flexibility needs of the Belgian power system for the 2026-2036 time horizon. The documents were presented during an Adequacy Working Group on Novembre 05, 2024 and published on the website that day. The documents alongside with all the comments and answers can be found on Elia website [ELI-1].

The assumptions regarding the input data and changes to methodology had been presented and discussed with the FPS Economy and the Federal Planning Bureau with whom this study is performed in collaboration and with the CREG, with whom this study is performed in concertation, following Article 7bis 4bis of the Electricity Law. All these actors were invited to the Comité de Collaboration (CdC).

The public consultation is a voluntary initiative by Elia in the framework of the Adequacy & Flexibility study in order to elaborate a robust study and to collect the valuable input from market parties, both on input data and the methodology. Note that the complete methodology (made of several appendix documents and which builds further on the methodology of the previous study) was also available within this public consultation. Some methodological changes require several months/years of work and/or are not always possible in the context of this legally required study but those will be considered (when relevant) for future studies.

This public consultation is taking place in a complex and rapidly evolving context. The European energy market continues to adapt to the challenges of the energy transition, the lasting impacts of the energy crisis, and the geopolitical tensions caused by the ongoing conflict in Ukraine. A new European parliament has been recently formed after the elections. Additionally, Member States, including Belgium, need to align their energy strategies with European initiatives such as the EU Compass to regain competitiveness [EUC-1], the Industrial Green Deal [EUC-2], the Net-Zero Industry Act [EUC-3] and related updates to renewable energy targets and market designs.

When looking at Belgium, the context has also changed in the past months. Governments were formed in Flanders and in Wallonia, as well as at federal level. At the time of finalizing this report, no agreement was yet reached for Brussels. Looking at the available governmental declarations, several elements were pushed forward with respect to energy and climate. A few examples (non-exhaustive) here:

- **at federal level,** electricity cost mitigation for industry (‘energy norm’ for companies, plans to adapt the electricity tariff, support for green investment in industry like flexibility, CCUS and energy efficiency), change in taxes for residential and tertiary heating devices (lower VAT on heat pumps and higher VAT on fossil fuels) and push for nuclear power plants (extension of existing plants and new ones).
- **in Flanders**, increased onshore wind and PV 2030 targets, support to electrification of industrial processes with attractive total price, support to flexibility and smart grid management.

- **in Wallonia**, acceleration of the smart meters roll-out, new mechanisms to support the development of renewable energy, exploration of industry flexibility and push for residential & tertiary flexibility.

In response to this dynamic landscape, to the fast evolution of certain technologies and given the many comments received during this public consultation referring to sensitivities and scenarios, Elia is planning to analyze (at least) three main probable future scenarios for Belgium. Those scenarios will be combined with scenarios at European level and complemented with sensitivities (e.g. variation of one parameter only). The scenario submitted to consultation, which is renamed '**current commitments and ambitions**' scenario, will be studied together with the '**constrained transition**' and '**prosumer power**' scenarios. More information on the three scenarios is given in Section 5.

In order to ensure that short-term projections remain as accurate and relevant as possible, Elia has updated its assumptions and input data where feasible, to reflect the most recent information on installed capacities and market trajectories. The 'current commitments and ambitions' scenario has also been adjusted, considering new ambitions set by the new federal and regional governments and the 'reality check' performed with the data available for the year 2024 as well as latest plans from industries regarding electrification.

The purpose of this report is to consolidate the feedback received from the public consultation, while at the same time reflecting Elia's position on these reactions which were discussed within CdC.

This consultation report is publicly available, alongside with the non-confidential received stakeholder contributions and was presented on 21 February 2025 to the market parties during an Adequacy Working Group. The slides, including the update of the trajectories, are attached to this report. Together with this report, it enables the reader to understand how the trajectories were adapted compared to the one submitted to public consultation.

2. List of documents submitted to consultation

As part of this public consultation, several documents were presented on the WG Adequacy of 5 November 2024 and submitted to consultation.

Documents on the input data

- **Accompanying 'scenario document'** (about 50 pages) describing how the scenario submitted to consultation has been elaborated
- **Excel file** (16 sheets) containing the data values of the scenario submitted to consultation.

Documents on the methodology

A. **Unit commitment & Economic dispatch -** Details the unit commitment model used for the adequacy and economic simulations
B. **Electricity consumption -** Details the way the electricity consumption is derived and the derivation of hourly profiles
C. **Thermal generation modelling -** Details the way thermal generation is modelled
D. **Electric vehicle modelling -** Details the way electric vehicle are modelled, including their flexibility
E. **Heat pump modelling -** Details the way heat pumps are modelled, including their flexibility
F. **Battery modelling -** Details the way large-scale and residential are modelled, including their flexibility
G. **Adequacy study -** Details the way that the adequacy simulations and Monte-Carlo approach are performed
H. **Reliability standard –** Details the Loss of Load Expectation metric
I. **Adequacy patch -** Details the way that curtailment sharing is dealt with
J. **Climate years -** Details on the content of the climate database
K. **Economic viability assessment -** Details how the economic viability assessment is performed
L. **Cross-border capacities -** Details the way that interconnections and flow based are modelled

Documents focussing on the short-term flexibility

- **Short-term flexibility methodology** - Details the way short-term flex assessment is performed
- **Short-term flexibility assumptions** - Details the assumptions for short-term flex assessment

Addition external studies

- **Study by Prof. Boudt** on hurdle rates
- **PRICED study by E-CUBE** on electricity consumption of existing usages
- **UGent** review of HP parameters

3. List of stakeholders having reacted

In response to the public consultation, Elia received non-confidential replies from the following parties:

- ABOUSCO
- Bond Beter Leefmilieu
- CANOPEA
- FEBEG
- COGEN
- CREG
- FEBEG
- Febeliec
- Fluvius
- NegaWatt
- ODE Vlaanderen
- The Shifters Belgium
- Virya Energy

In addition, 3 responses were received that were designated as confidentials. These responses will be answered with dedicated confidential reports.

All non-confidential contributions received are also available on Elia's website. These reactions, together with this consultation report, is available on Elia's website.

4. Instructions for reading this document

This consultation report is structured as follows:

- Section 1 contains the introductory context,
- Section 2 gives the list of documents submitted to consultation,
- Section 3 gives the list of the stakeholders of the responses received,
- Section 4 contains instructions for reading this document,
- Section 5 contains the preliminary information on the update,
- Section 6 discusses the general comments received,
- Section 7 discusses the comments received regarding input data,
- Section 8 discusses the comments received regarding the methodology,
- Section 9 discusses the comments received on the hurdle rate study of Prof. K. Boudt,

- Section 10 discusses the comments received on the assessment of short-term flexibility,
- Section 11 discusses the comments received on the CRM,
- Section 12 discusses the comments received on suggested scenarios and sensitivities,
- Section 13 contains the next steps,
- Section 14 contains the list of annexes of the consultation report,
- Section 15 contains the references,

This consultation report is not a 'stand-alone' document but should be read together with the proposal submitted for consultation, the reactions received from the market participants (annexed to this document) and the slides of the meeting Adequacy Working Group of 21/02/2025.

Sections 6 to 12 of the document are structured as follows with additional information on the content below.

[A] **Figure with overview of the trajectories** of the discussed parameter (if deemed relevant)

[B] **Subject/Article/Title**

Stakeholder	Feedback received
C	D

[E] **Answer from Elia**

A. Figures displaying the trajectories of the 3 scenarios, if relevant to the concerned section.
B. Subject matter covered by the various responses received.
C. Indication of the party that has introduced the comment.
D. This document contains an overview of the main, but also specific comments on the document submitted for consultation.
    - In doing so, an attempt was made to list/consolidate all comments received and to argue whether or not they should be taken into account.
    - In order to maintain authenticity, the comments have been copied as much as possible in this document. However, the comments have sometimes been shortened and uniform terms are utilized to make them easier to read.
    - For clarification purposes, it is recommended to always consider the original comment of the stakeholder concerned, as included in the appendix to this report and the slides of the meeting Adequacy Working Group of 21/02/2025.
E. This part contains Elia's answer and arguments as to why a comment was or was not considered, further explanation on the topic, proposed update for the topic.

5. Preliminary information on the update and scenarios

Elia has received numerous comments from stakeholders regarding various sensitivities and scenarios, including their storylines and the inclusion of broader contextual elements. Additionally, we have noted several remarks on the evolution of the electricity demand, particularly concerning the industry sector. In response to this feedback, we have undertaken two demanding actions:

Firstly, different future scenarios for Belgium have been developed (combining several uncertainties/sensitivities under a coherent storyline).
The energy landscape is rapidly evolving, around many uncertainties. Both market and policies can leap in different directions. To capture these uncertainties, 3 different scenarios have been established for Belgium.
Those are based on different narratives (macroeconomic conditions, international relations, supply chain dynamics and economic trends) which will impact trajectories of parameters used in this study. These scenarios aim to provide a comprehensive understanding of the potential future landscapes, and the study will be carried out on these 3 scenarios, presented in the next section.

Secondly, a thorough review of the electricity demand projections has been performed. A part of this review, an update of the TSO-connected clients future electricity demand projections (gathered via the 'Load Management' exercise) has been realized, through bilateral contacts with our customers.
After contacting them, some customers kept their previous trajectories confirming their plans, but others adapted them. This allows us to better reflect the actual conditions and expectations of the industry sector in our scenarios.

In addition to the review of the projections of industry & data-center future electricity demand at TSO-level, several other important updates were carried out:

- A **2024 'reality check'** on latest data available for various parameters (Heat Pumps, Electric Vehicles, realized 2024 electricity demand). This allows us to use latest data and have the right starting point for the projections. Note that this check has note only been carried out on parameters of electricity demand, but also on RES installed capacities.
- Desktop studies carried out jointly with Belgian Distribution System Operators (**DSOs**) to estimate electrification of the industry connected at DSO-level.
- **Energy efficiency** in the residential and tertiary sector has been reviewed based on the E-CUBE deliverable in the framework of the PRICED study.
- Other adaptations based on stakeholder's feedback were introduced such as a review of the COP curves for Heat Pumps (**HP)**, or increasing energy efficiency over time for Electric Vehicles (**EVs)**.

These actions are aimed at ensuring that the scenarios and sensitivity analyses are robust, comprehensive, and reflective of the latest information and stakeholder feedback.

5.1. SCENARIOS PRESENTATION

During the public consultation, many comments received were referring to sensitivities and scenarios, asking for more analysis but also for combined sensitivities. Given that there are many uncertainties such as the evolution of certain technologies, the future macro-economic trends or the policies that will be effectively be implemented, several main scenarios have been developed.

The reader can note that additional combined scenarios were already analysed during the previous AdeqFlex'23 study (on top of the many sensitivities focusing on one/few dimension(s) at a time).

In the AdeqFlex'25, (at least) **three main scenarios are planned to be analyzed**. Note that **additional scenarios and sensitivities** will still be analyzed on top of the three main scenarios (e.g. high/low for different types of technologies but also European scenarios and sensitivities...).

Constrained transition: considering **poor macro-economic** conditions potentially impacting affordability of the energy transition, impacting new grid & RES projects and decarbonization of the industry. Considering **deglobalization** and scarce **supply chain**, delay of some policies (e.g. ETS2) and limited **public acceptance for grid & wind projects**.
This is translated into slower uptake of EV & HP and reduced and slower industry electrification, including some industry closures[1], slower uptake of end-user flexibility, and delayed realisation of RES and grid projects.

Current commitments & ambitions: considering **announced targets and policies**, previously called 'Central' or 'reference' scenario. This is the scenario submitted to public consultation in November 2024. It follows projections from Bureau du Plan for macro-economic evolutions, NECP plans submitted by regions and federal, latest government agreements and industry electrification plans.

Prosumer power: considering current **trends** related to **prosumers** accelerate further, with prices that continue to further decrease for PV, batteries, EV,… making them even cheaper and more accessible. A quicker transition to heat pumps, not only in new constructions but also across the existing building stock. It considers more residential flexibility. Other targets and ambitions are kept similar to 'Current commitments & ambitions' (e.g. industry load, onshore/offshore wind).

An overview on how the type trajectories considered for each parameter in the 3 scenarios is given in Figure .

[1] E-CUBE 'PRICED' study presented during **Adequacy Working Group of August 2024**

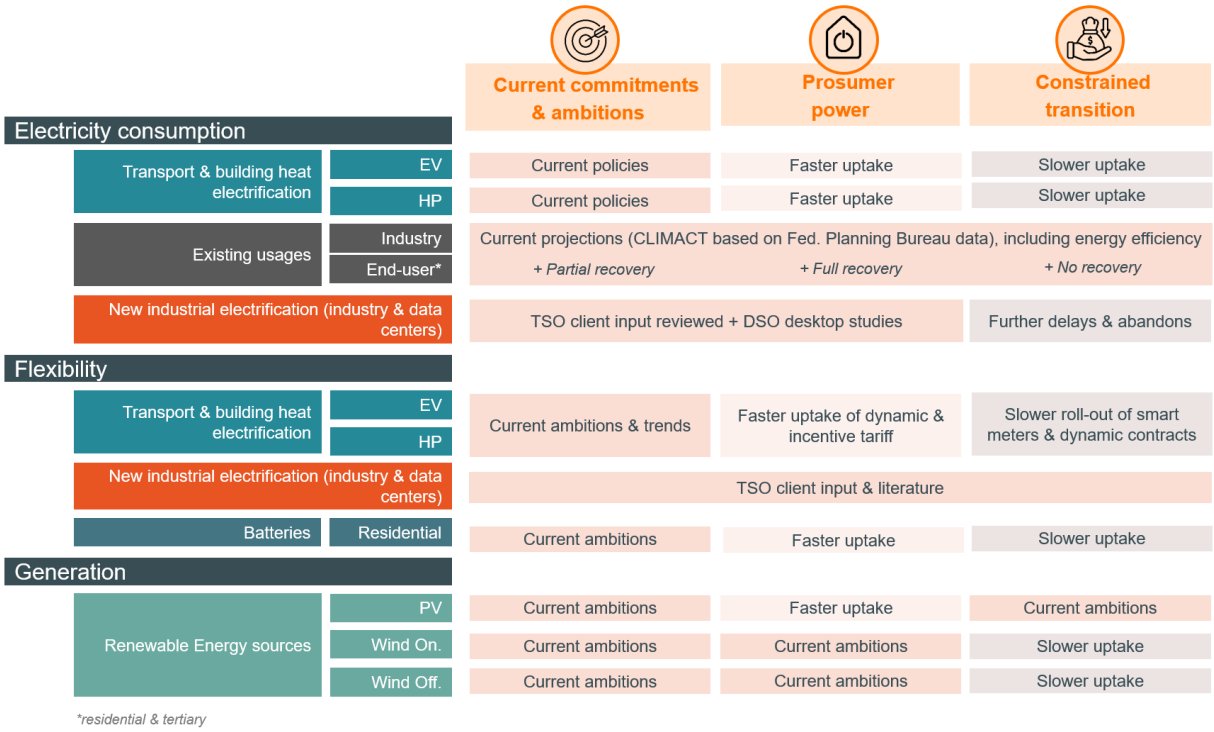


Figure 1 - Overview of the main parameters in the 3 scenarios for Belgium

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

6. General comments received

This section provides an overview of the general reactions and concerns of market players that Elia received on the document submitted for consultation.

STAKEHOLDER	FEEDBACK RECEIVED
Febeliec	Febeliec wants to state that a consultation period of only one month for the very large quantity of data and input is quite challenging and that as a result its input cannot be exhaustive. As a result, the omission of comments on certain points should in no case be interpreted as an implicit approval of Febeliec. Febeliec also wants to refer to its comments on the previous consultations for the Elia Adequacy and Flexibility studies as well as the related consultations for the determination of parameters and scenarios for the CRM.
negaWatt	Opening up the adequacy & flexibility analysis The transition of the Antares model to a fully open-source platform aligns with a broader movement toward openness in modeling. Increasingly, entities are releasing their models under open licenses, encompassing both source code and input data. This shift is a critical step in fostering transparency and collaboration within the scientific and policy communities. Fundamental scientific principles—transparency, peer review, reproducibility, and traceability—are nearly impossible to achieve without full access to the models and data underpinning studies. Open access facilitates a robust exchange of ideas, enabling more effective collaboration across the science policy interface. The adequacy study should openly release the source code together with the non-IP-protected input data in such a way to deliver more transparent and scientifically grounded analyses.

ANSWER:

Regarding the input data, this public consultation provides a significant level of detail and explanations. The large amount of data and inputs provided is required to meet the stakeholders expectations regarding (see the feedback from negaWatt above) i) fostering transparency and accountability within the stakeholder's scientific, industrial and policy community and ii) enabling more effective collaboration across the stakeholders' scientific, industrial and policy community. On the other hand, Article 7bis 4bis of the Electricity Law stipulates the publication date of the study in June. The period of public consultation (which is not mandated by law) is the best possible compromise to setup the study in the most transparent and robust manner while making it feasible to perform and publish the study within the legally mandated timeline within the Electricity Law.

Elia is committed to perform scientifically grounded analysis based on state-of-the-art modelling and methodologies while performing this analysis within a transparent, reproducible and traceable framework. Still, Elia would like to remind that this study is a legally mandated study following Article 7bis 4bis of the Electricity Law. In order to fulfill the requirements stipulated in the Electricity Law, Elia relies on the experience gained over the period of the last 10 years using the Antares software for performing economic and adequacy market studies. Antares is already an open-source market modelling tool. The source code of Antares is therefore readily available and provided by RTE [ANT-1]. This model is also used by other TSOs or ENTSO-E.

Regarding the input data, this public consultation provides a significant level of detail and explanations with an Excel file of 16 sheets giving the quantified trajectories and a PDF document of more than 50 pages describing how those trajectories are built.

Finally, Elia is also committed to a robust and open exchange of ideas, and to fostering transparency and collaboration across the scientific and policy communities, within but also beyond its legally mandated activities, for instance by engaging with relevant academic partners within Energy Transition Fund (ETF) projects.

Updated scenarios

STAKEHOLDER	FEEDBACK RECEIVED
ABOUSCO	**Données de base** : Il est crucial que les données de base soient à jour et reflètent les dernières tendances du marché. Je recommande de vérifier si les données sur les énergies renouvelables et les prévisions de consommation d'énergie sont suffisamment robustes pour soutenir les conclusions de l'étude. Une transparence totale sur la source des données renforcerait également la confiance des parties prenantes.
The Shifters Belgium	L'association The Shifters Belgium aurait cependant souhaité que plus d'un scénario soit proposé à consultation. Cette évolution unique risque de ne pas représenter les futurs possibles et limite la possibilité d'avoir une vision complète des options et opportunités. A cet égard, TSB est convaincue qu'en développant des scénarios alternatifs, Elia parviendra à identifier les leviers pour atteindre les objectifs climatiques et de souveraineté énergétique à l'horizon 2035. Face à des besoins d'électricité qui augmentent dans tous les secteurs et pour assurer la sortie des énergies fossiles ainsi que la réindustrialisation de la Belgique, quatre leviers essentiels sont à explorer : - L'efficacité énergétique - La sobriété - Le nucléaire - Les renouvelables

ANSWER:

The scenario submitted to consultation was indeed following the announced policies combined with the current trends in technology development. Since then, latest announcements and government declarations (at federal and regional levels) have been studied and integrated in the trajectories of the 'Current commitments and ambitions' scenario (see examples given in Section 1.

Given the timeframe of the study and the large work it already represents to prepare a scenario based on the current commitments and announced policies, it was therefore not possible to prepare such additional scenarios for the public consultation. Note that for the industry load, considering the way in which the exercise was performed, a LOW/HIGH range was already presented in November 2024 for the public consultation.

Elia however acknowledges there are uncertainties around policies and trajectories for parameters In order to cover those uncertainties and given the comments received in this public consultation, Elia will also consider 3 different scenarios for Belgium (see Section 5 for information on the different scenarios and Section 1012 on Scenarios and Sensitivities for more info) to account for possible future trajectories.

Regarding the levers identified to successfully deliver the energy transition, Elia agrees there are many and different scenarios and sensitivities will be carried out to address these. For example, a 'sufficiency' scenario will be developed, sensitivities on extension of nuclear plants in Belgium and on RES development (faster or slower). Additionally similar scenarios/sensitivities will also be carried out at European level.

To fully address all uncertainties, many other sensitivities are planned. See Section 12 for the draft list.

7. Comments received on input data

This section provides an overview of the reactions and concerns of market players that Elia received to the document submitted for consultation regarding the input data.

7.1 GENERATION IN BELGIUM

7.1.1 Nuclear fleet

Before discussing the comments received on RES and co-generation production, Elia would like to highlight the update regarding the nuclear fleet. The reader will find several comments in this report that are referring to the nuclear fleet in Belgium. Those are not reproduced here because they refer to suggestion of scenarios and/or sensitivities and are therefore included in other sections (see Section 6 and Section 12).

The recently formed federal government stipulates in the governmental agreement that the government is committed to extending existing capacity in the short term, and, in the long term, to invest in the construction of new capacity.

In this context, the scenarios will now consider an extension of 20 years instead of 10 years for Tihange 3 and Doel 4, meaning 2 GW of nuclear also during the latest years studied (2036), even though an agreement still needs to be found with ENGIE but also the regulatory framework, approval by the EC, law… to be changed.

Regarding additional extension of other nuclear reactors in Belgium, it will be considered in sensitivities to account for the many uncertainties and pre-conditions that are still pending before such extensions (including grid constraints as already communicated by Elia earlier for Tihange 1[2]). In practice, the extension of Tihange 1 will be studied as sensitivity, as well as the extension of Doel 1 and 2 on top of Tihange 1 as this is also in the recent federal agreement.

In case new nuclear reactors are built in Belgium, it is assumed that it would be beyond the time horizon of this study, as a minimum of 10 years is usually considered as minimum lead time (when looking at other European countries).

[2] **https://economie.fgov.be/sites/default/files/Files/Energy/Annexe-3-Grid-constraints.pdf**

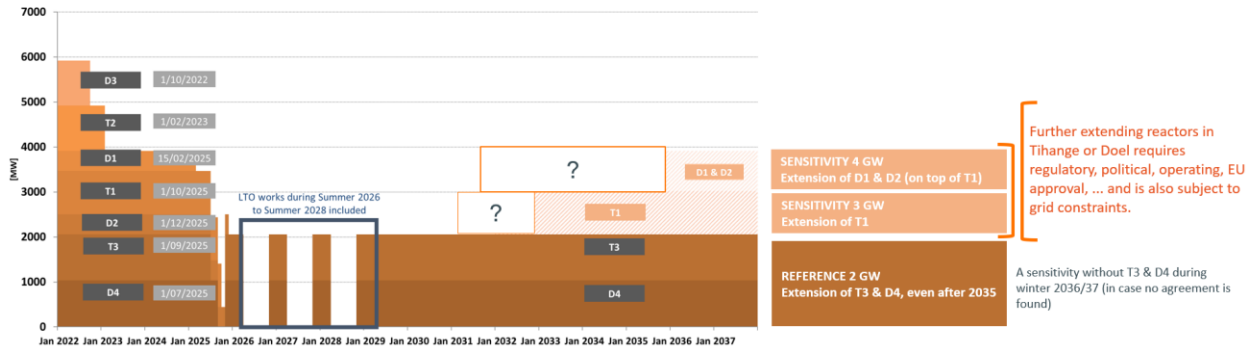


Figure 2 - Nuclear fleet in Belgium assumed in the study

7.1.2 Photovoltaïcs

Several trajectories are now considered for photovoltaics in Belgium:

- The 'Current commitments and ambitions' trajectory is similar to the one submitted to consultation, the same 2030 regional targets are kept (see public consultation document for more information), only the realized 2024 installed capacity has been updated with a new estimate.
- The 'Prosumer power' trajectory assume an increasing yearly growth rate until 2030 (reaching record rate of 2023), considering a further drop in PV cost, additional governmental support, incentivized tariff or obligations to install PV in some buildings etc.)
- The 'Constrained transition' scenario follows the 'Current commitment and ambitions' trajectory assuming that even in a context of deteriorated macro-economic situation, such kind of PV trajectory could still be reached.
- However, a 'Low' sensitivity will still be studied, considering a decreasing annual growth rate in PV (e.g. as consequence of grid saturation, increased in PV cost...).

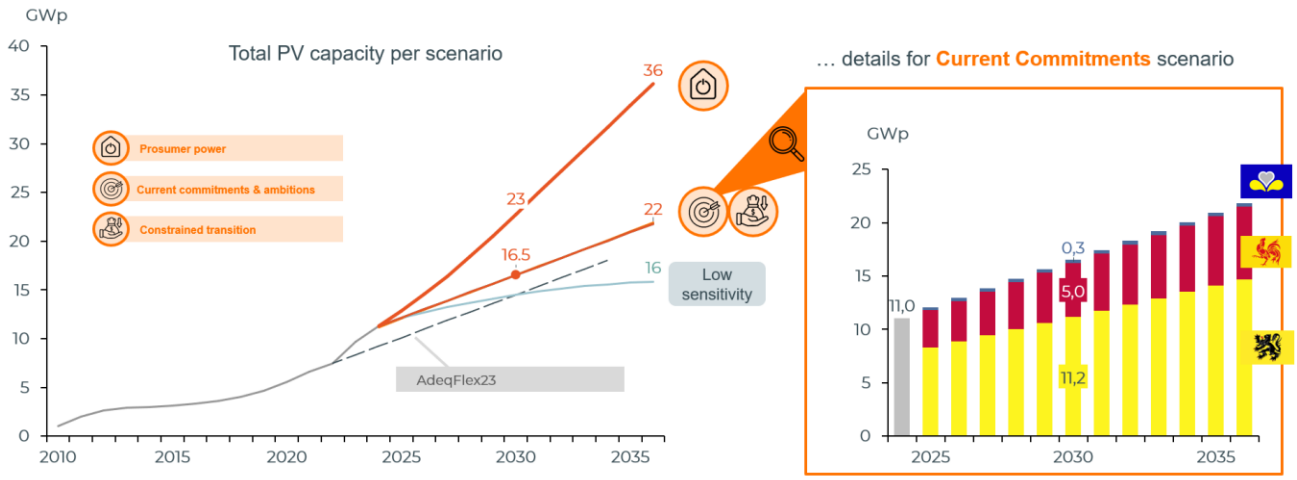
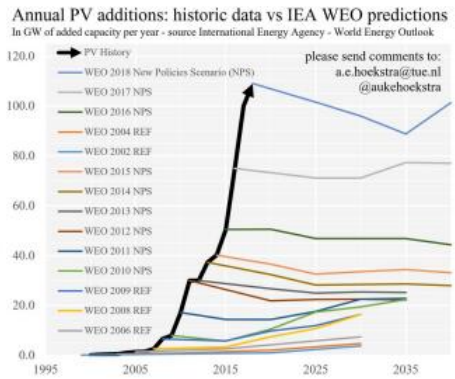
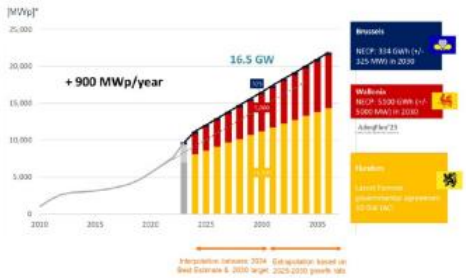


Figure 3 - Solar PV capacity in Belgium for the different scenarios

STAKEHOLDER	FEEDBACK RECEIVED
negaWatt	Comment 2 : PV deployment The ongoing decrease in the cost of photovoltaic (PV) modules and batteries continues to re-shape the energy landscape, with prices exhibiting a significant downward trend. However, the modeling approach in the adequacy study appears to rely on a fairly linear projection, as evidenced by the assumption workbook or in Figure 6-1 of the scenario document. It is worthwhile to note that the current trends already invalidates the assumption of the previous adequacy assessment. This approach overlooks the historical and exponential nature of cost reductions and their corresponding impact on adoption rates. Failing to account for the disruptive fall in PV and battery prices, as has been observed in prior World Energy Outlook scenarios (see figure below), risks underestimating the potential for future PV capacity installation. As a result, the assumed solar capacity for Belgium, around 22 GW by 2036, is significantly lower than in other scenarios. As an example, the Negawatt BE scenario considers 35 GW by 2040, while the EnergyVille scenarios assume between 31 and 57 GW by 2040. The study should consider this, e.g. through a sensitivity analysis. Such an inclusion would enable a better understanding of how accelerated PV deployment might affect critical factors like congestion, curtailment levels and the occurrence of negative energy prices.

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

	  *Figure 6-1 Proposed solar PV capacity evolution in Belgium*
ODE Vlaanderen	Voor Industriële PV (bijlag verslag) is momenteel 80 à 90 procent van de projecten Oost-West geörienteerd met gemiddeld 1,35 kWp/kVA en hellingsgraad van 10 graden. Een productieprofiel hiervoor (voor 1 MW omvormervermogen) in bijlage. Naarmate er de komende 10 jaar meer PV bijkomt, verwachten we dat omwille van economische redenen de kWp/kVA verder zal verhogen en ook de hellingsgraad gradueel zal opschuiven richting 15 a 20 graden. Als de eisen rond Power Quality van de netbeheerders zouden verstrengen, kan dit de kWp/kVA anderzijds doen dalen, dus een exacte voorspelling is niet evident. PV-Vlaanderen als platform binnen ODE Vlaanderen, stelt dat ook de vraag om de 1,12 kWp/kVA te heroverwegen, deze wordt als een te lage inschatting ervaren. Voor de verdeling tussen residentieel en industrieel, wil PV Vlaanderen graag verwijzen naar onze visietekst en de bijhorende brongegevens, ook in bijlage. Voor de verdeling van residentieel gaat Elia in zijn assumpties uit van 1,12, momenteel ziet PV Vlaanderen echter een stijgende trend. PV Vlaanderen raadt Elia aan om data op te vragen bij Fluvius om deze trend bevestigd te zien. Verder wil PV Vlaanderen nog meegeven dat bij een PV installatie rekening mee gehouden dient te worden dat er zelfverbruik is, dat er gebruik kan gemaakt worden van flexibiliteitsmogelijkheden zoals vraagverschuiving, vrijwillige productievermindering, … .

ANSWER:

It is true that the evolution of PV has been significant over the past recent years, partially driven by the decreasing PV prices, the energy crisis and the incentives and policy framework in place (green certificates in Brussel, net metering in Wallonia and other regions, etc.), with an important amount of installed PV, in particular in 2023.

Regarding the comparison of the two charts put forward by negaWatt, Elia would like to nuance some elements. It should be first noted that the two graphs are showing different things: yearly additional PV capacity (compared to IEA projections) versus total PV capacity trajectory for Belgium. If the worldwide evolution in PV has been faster than

expected, this is also applicable to Belgium to some extend. However, the difference between the past projections of AdeqFlex'23 and installed capacity today does not show such high discrepancy.

Elia would like also to recall that the trajectory submitted to consultation was based on regional data, discussed with DSO, aligned with official regional targets, considering latest governmental agreements. This trajectory is the one considered for the 'Current commitments and ambitions' scenario.

It is possible that the price for PV and batteries will continue to fall and at the same time, other challenges may arise such as DSO grid integration, end of some of the incentives, etc. Therefore, Elia will consider the announced targets in the 'Current commitments & ambitions' scenario while different trajectories will be assumed in the other scenarios and sensitivities as suggested by negaWatt. For instance, the prosumer scenario will consider a greater PV trajectory.

For the information on the industrial PV regarding the ratio kWp/kVA, which is needed in this study to convert kVA into kWp, the 1.12 kWp/kVA ratio that is used in this study is actually based on historical data from reporting requirement at Fluvius. Fluvius does not have updated precise data on this subject. Elia will further investigate it because as mentioned by ODE Vlaanderen, other requirements might also influence the ratio in another direction. It is also not known to Elia which share of industrial versus residential PV is assumed in the regional targets, therefore the use of an averaged ratio.

On self-consumption of solar photovoltaics, this is taken into account in the assumptions on decentralized end-user flexibility of electric vehicle charging, heat pump and home batteries. Self-consumption incentives are accounted as local optimization, impacting the consumption of profiles of these technologies. See illustrative profiles present in the excel published in this public consultation, representing consumption for V1H, HP1H and B2H (local optimized profiles based on PV self-consumption).

7.1.3 Onshore and offshore wind

Several trajectories are now also considered for **onshore wind** in Belgium:

- The 'Current commitments and ambitions' trajectory is similar to the one submitted to consultation, the same 2030 regional targets are kept (see public consultation document for more information), only the realized 2024 installed capacity has been updated. As submitted to consultation, a slower growth rate in Flanders is assumed after 2030, after feedback from the Region.
- The 'Prosumer power' scenario follows the 'Current commitment and ambitions' trajectory assuming that even in a favorable context of accelerated trends related to prosumer, the installation rate of onshore wind in Belgium would not be affected as it not directly correlated. Furthermore, building new onshore wind farms is becoming more and more challenging in terms of permitting, even for repowering existing parks.
- The 'Constrained transition' scenario follows a slower uptake, not reaching the 2030 regional targets, assuming supply chain issues, NIMBY, etc.

- On top of the three scenarios, a 'High' sensitivity will still be studied, considering a constant annual growth rate for Flanders, even after 2030 (while a reduced growth rate is assumed by Flanders after 2030 in the other scenarios).

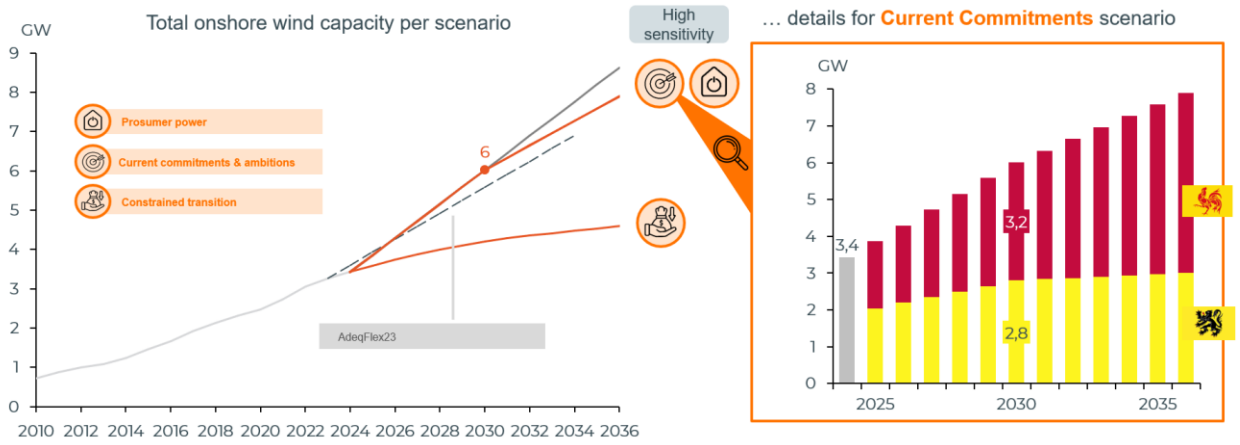


Figure 4 – Onshore wind capacity in Belgium for the different scenarios

STAKEHOLDER	FEEDBACK RECEIVED
CREG	En ce qui concerne l'éolien terrestre, Elia intègre les récents engagements gouvernementaux dans ses prévisions. L'accord flamand de septembre 2024 a relevé l'objectif pour 2030 de 2,6 GW à 2,8 GW, tandis que l'accord wallon confirme l'ambition de respecter les objectifs européens tout en révisant le cadre de développement de l'éolien terrestre. Sur cette base, Elia anticipe une capacité éolienne onshore totale de 6 GW en Belgique d'ici 2030. Pour la Wallonie, au-delà de cette date, Elia extrapole un taux de croissance basé sur la période 2025-2030. En Flandre, un ralentissement est envisagé après 2030, en raison des limites imposées par les conditions actuelles d'octroi de permis. Elia estime ainsi un rythme de croissance de 300 MW/an pour l'éolien onshore en Belgique entre 2030 et 2036. La CREG considère toutefois que cette estimation pourrait être trop conservatrice, en particulier pour la Flandre. D'une part, le renforcement des ambitions climatiques de l'Union européenne, via le Green Deal et la révision du paquet "Fit for 55", impose aux États membres, y compris la Belgique, d'accélérer le développement des énergies renouvelables. Cela pourrait stimuler le déploiement de l'éolien terrestre, même après 2030. D'autre part, Elia devrait clarifier ses hypothèses concernant le repowering, c'est-à-dire le remplacement des éoliennes existantes par des

	modèles plus performants sur les mêmes sites. Cette approche peut significativement augmenter la capacité installée sans nécessiter de nouveaux espaces.
FEBEG	The objectives for renewable energy sources are ambitious, but the NIMBY-effect and the delaying effects of appeal procedures should not be underestimated. For offshore wind growth, the timely execution of the Ventilus project and the energy island is crucial. Experience has shown that large-scale projects face significant challenges before realization, as illustrated by the opposition to the Boucle du Hainaut. Therefore, in the base case scenario, Elia should consider a postponement of at least a part of the additional offshore capacities. Regarding onshore wind, FEBEG wants to stress that the policy targets used in the AdFlex study will not be reached with the current regulatory and investment framework. The assumption of a yearly growth of 400 MW is unrealistic based on past and current capacity growth. Although FEBEG urges governments to provide the right investment framework and permitting conditions, there are no strong indications of additional measures that will speed up the rollout of onshore wind to align with stated ambitions. The AdFlex study should at least compare the expectations to see if they match the ambition levels since these form the basis for assessing the security of supply in the coming decade. FEBEG wants to repeat that boosting the development of renewables (on- offshore wind and PV) is a no-regret measure that brings many benefits to society. However, in light of the adequacy and flexibility study, FEBEG expects the assumptions to be based on realistic expectations rather than policy ambitions that are not sufficiently supported by policy measures that ensure the realization of the ambitions. A more prudent approach seems in its' place here, since the results from the AdFlex study form the basis for assessing future security of supply.

ANSWER:

Elia would like first to recall that the trajectory for onshore wind submitted to consultation was based on official regional targets for 2030 (from NECP or latest regional government) and aligned with DSO or the regions. The 'Current Commitments' scenario will follow these official targets (see also document submitted to consultation for more information).

Regarding the repowering, Elia agrees that repowering of onshore wind will probably be one of the main leverage points to reach the announced targets in Flanders and Wallonia, given the difficulties to get new permits. In Flanders, it is difficult to get permits for new sites since already a few years [NIE-1]. The situation is similar in Wallonia. On the other hand, repowering often leads to larger wind turbines, which potentially create more noise and shade, a fact also criticized by neighborhood committees.

In this study, Elia considers that repowering is already part of the solution in the announced targets considered in the proposed scenario. In Wallonia, the new '*Cadre de référence éolien*' [SPW-1] voted early 2024, in which repowering

for the existing wind farms is encouraged, defines criteria that are in line with the objective of achieving 6200 GWh per year by 2030. This is also why the Flemish Region assumes a slower yearly growth after the 2030 targets.

As highlighted by FEBEG, the current ambition might be seen as optimistic, if the regulatory and investment framework are not being reviewed. With the new regional governments, it is also not clear what the support new installation will get. The '*Call groene stroom'* with subsidies for wind (and large PV) in Flanders has been stopped (no calls foreseen in 2024) and alternative support mechanism will be studied by the new government, such as *contract for difference.* Elia notes however that both the Flemish and the Walloon governmental agreement highlight their support to the RES targets.

Next to the 'Current Commitments' scenario, additional trajectories will also be considered for the **onshore wind**:

- The 'Constrained transition' scenario follows a slower uptake, not reaching the 2030 regional targets, assuming supply chain issues, NIMBY, etc.
- The 'High' sensitivity considers a constant annual growth rate for Flanders, even after 2030 (while a reduced growth rate is assumed by Flanders).

7.1.4. Cogeneration and biomass

GAS – CHP

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	Regarding cogeneration capacity, Elia already states that the assumption is rather optimistic. FEBEG sees little reason for this optimistic assumption since support for these installations is being lowered and reformed and the Flemish Agriculture minister has recently stated that the growing emissions of the agriculture sector are mainly caused by the adoption of CHPs and should decline in the future. On top of that, the electrification is starting to pick up in for example the greenhouse horticulture sector, traditionally a sector that has a significant share of CHPs. The same goes for CHPs in industry, there is no real growth to be expected, which makes a decline more feasible due to ageing installations and difficult economic circumstances for Belgian industry. Since CHPs often take part in the CRM, a lower installed capacity will have a direct impact on the security of supply. Methanization of biogas is also growing in popularity, this leads to less electricity production from biogas because the methane will be used in other sectors. Because of the above reasons, FEBEG believes it is better to assume a decline in 5 rather than a small increase or steady capacity up to 2036. If not considered in the base scenario, this is at least another sensitivity that should be taken into account.

COGEN Vlaanderen	De geïnstalleerde capaciteit aan 'Gas CHP – profiled' zou volgens de voorgestelde aannames toenemen van circa 1.435 MWe in 2024 naar 1.567 MWe in 2030 om vervolgens constant te blijven tot en met 2036. We hadden graag bijkomende informatie over de achtergrond van beide veronderstellingen. Op dit ogenblik zijn er verschillende tendensen in het Vlaams en Federaal energiebeleid die op korte termijn weliswaar een stabilisatie aan opgesteld vermogen zal impliceren, maar op langere termijn eerder een daling zal veroorzaken. We vermoeden immers dat bestaande cogeneratie-installaties bij het huidige beleid eerder nog verschillende jaren in dienst zouden worden gehouden (tot 10 jaar na indienstname) maar vervolgens in een "run-to-failure" zouden worden uitgebaat (jaarlijkse of tweejaarlijkse beslissing inzake noodzakelijk onderhoud). Hieronder volgen enkele illustraties. • Illustratie 1: Het stimuleren van rationeel energiegebruik van fossiele brandstoffen door middel van Vlaamse warmte-krachtcertificaten werd stopgezet met de uitfasering van de certificatensteun voor nieuwe of ingrijpend gewijzigde fossiele cogeneratie-installaties met startdatum vanaf 1 januari 2023. Nieuwe of ingrijpend gewijzigde cogeneratie-installaties met een startdatum vanaf 1 januari 2023 komen niet langer in aanmerking om warmte-krachtcertificaten te ontvangen voor de gerealiseerde primaire energiebesparing. Ook de Vlaamse investeringssteun voor micro-WKK werd stopgezet voor installaties die werkzaam zijn op fossiele brandstoffen. Investeringen in nieuwe WKK's op fossiele brandstoffen worden hierdoor binnen de huidige beleidscontext zeldzaam, waardoor de veronderstelling van een groei aan opgesteld vermogen niet ondersteund is. • Illustratie 2: Binnen het federale capaciteitsremuneratie-mechanisme (CRM) wordt de investeringskost voor het vernietigen van de restwarmte uit elektriciteitsproductie (koeltorens, etc.) toegelaten binnen het CRM-dossier om mee te dingen op basis van een multi-jaar contract. Investeringskosten voor de uitrusting voor het kunnen recupereren en valoriseren van de restwarmte uit elektriciteitsproductie (i.e. cogeneratie) worden niet toegelaten. Deze logica, samen met wat in illustratie 1 toegelicht wordt, leidt ertoe dat investeringen in nieuwe WKK's (decentrale productie) niet langer in beschouwing genomen worden, ondanks hun mogelijke bijdrage aan adequacy. Investeringen in nieuwe WKK's op fossiele brandstoffen worden hierdoor binnen de huidige beleidscontext zeldzaam, waardoor de veronderstelling van een groei aan opgesteld vermogen niet ondersteund is. • Illustratie 3: Ten gevolge van bovenstaand beleid, worden ook installaties die na 2023 aan het einde van hun steunperiode komen, enkel nog op basis van korte termijn beslissingen beschikbaar gehouden. Vervangingsinvesteringen gaan eerder in de richting van minder kapitaalintensieve oplossingen (aardgasketels, al dan niet in combinatie met elektrische weerstandsketels), waarbij vervanging van de "gen-set" niet langer weerhouden wordt. Hierdoor is de veronderstelling van een stabilisatie van het opgesteld vermogen na 2032 niet ondersteund. In feite zou er

	bijkomendrekening moeten gehouden worden met een stijging van de elektriciteitsvraag die slecht gedeeltelijk afschakelbaar zal zijn.

ANSWER:

Elia thanks COGEN Vlaanderen and FEBEG for the detailed comments received. Elia understands that the present context with the end of the support mechanism in Flanders for gas Combined Heat & Power generation units ('warmte-krachtcertificaten') can impact the future evolution of such capacity in Belgium.

Given the unclear situation, Elia follows this approach:

- As long as no official closures are reported by DSO, the existing capacity is assumed to stay, with possible participation to the capacity remuneration mechanism (CRM) in place which could cover the missing money of such units that also have the possibility to choose for a SLA derating factor, or with possible participation to flexibility services like mFRR for industrial CHP.
- For new capacity, Elia follows the same approach as in previous studies, i.e. looking at the foreseen projects based on data shared with DSO (PISA database), considering only the projects with an advanced stage.

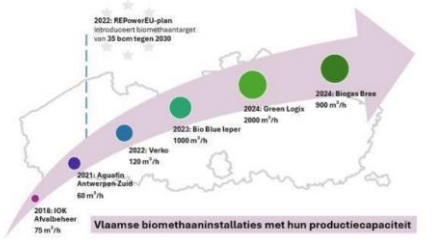
In order to account for the current context, Elia will however analyze the possibility to perform an EVA on the existing capacity to assess whether those capacity will be kept in the market.

In order to assess the impact of potential closures of CHP and/or reduced running hours of those units (e.g. in case of combination of the CHP with e-boiler or low temperature HP), a sensitivity with no additional CHP and closure of part of the capacity is considered relevant.

Biomass & waste

STAKEHOLDER	FEEDBACK RECEIVED
COGEN Vlaanderen	De geïnstalleerde capaciteit aan 'Biomass – profiled' zou volgens de voorgestelde aannames toenemen van circa 521 MWe in 2024 naar 564 MWe in 2030 om vervolgens constant te blijven tot en met 2036. We hadden graag bijkomende informatie over de achtergrond van beide ver-onderstellingen. Op dit ogenblik zijn er echter verschillende tendensen in het Vlaams energiebeleid die eerder een daling impliceren. Hieronder volgen enkele illustraties. • Illustratie 1: Samen met het stopzetten van de Vlaamse certificatensteun voor nieuwe of ingrij-pend gewijzigde fossiele cogeneratie-installaties met startdatum vanaf 1 januari 2023, werden verschillende representatieve projectcategorieën geschrapt die ook van toepassing waren voor cogeneratie-installaties op biomassa. Enkel biomassa-installaties groter dan 5 MWe kunnen nog

	projectspecifiek een aanvraag indienen voor warmte-krachtcertificaten (ondersteuning voor de gerealiseerde primaire energiebesparing)11, maar komen niet langer in aanmerking voor het aanvragen van groenestroomcertificaten (ondersteuning voor de productie van groene stroom). • Illustratie 2: Het Vlaams beleid kende tijdens de regeerperiode 2019-2024 eerder een shift richting het toepassen van biogas, biomassa voor warmte-productie, ondanks het feit dat cogeneratie energetisch een veel efficiëntere toepassing is dan heat-only toepassingen van dezelfde brandstof (zie Figuur 1). Zie onderstaande extracten uit het **Vlaams Energie- en Klimaatplan**: *"3.1.2.2.3 Biogas* *Het betreft binnenlands beschikbare energiebronnen, die ook bijdragen leveren aan andere doelstellingen inzake bevoorradingszekerheid en netstabiliteit, verwerking van mest en nutriënten, circulaire economie, koolstofvoorraden in de* *bodem, enz. Vanuit die invalshoek is het wenselijk de benutting van binnenlands beschikbare stromen te ondersteunen, waarbij rekening wordt gehouden met de gewenste shift naar groene warmte (al dan niet in combinatie met kwalitatieve WKK). Dit potentieel* *is reeds in belangrijke mate ingevuld en er is dus in verhouding tot andere reeds vermelde potentiëlen geen grote toename te verwachten."* *"3.1.2.2.4 Biomassa* *Voor de grootschalige biomassa-installaties op houtafval wordt ervan uitgegaan dat de capaciteit zoals voorzien in het Energieplan 2020 tegen 2030 behouden blijft. De centrale van Rodenhuize op houtpellets gaat volgens de laatste informatie in 2023 uit dienst en voor de installaties op biomassa-afval wordt een belangrijke omschakeling van groene stroom naar groene warmte via warmtenetten verondersteld. Dit verklaart de daling van de productie van groene stroom uit biomassa. Daarnaast wordt een voorbehoud ingebouwd om rekening te houden met de gevolgen van de inzet van biomassa op duurzaamheidsdoelstellingen, de kostenefficiëntere inzet voor de productie van groene warmte, en de beperkte beschikbaarheid van biomassa en de betaalbaarheid van de doelstellingen."* • Illustratie 3: Biomethanisatie, de opwaardering van biogas tot biomethaan om deze vervolgens te kunnen injecteren en verkopen via het aardgasnet, is sterk in de opmars. Het rationeel energiegebruik van biomethaan door middel van cogeneratie wordt op dit ogenblik echter nog niet gestimuleerd om Vlaams niveau. De energetische toepassing van het biomethaan wordt momenteel volledig aan de (internationale) markt overgelaten en komt niet noodzakelijkerwijs bij de elektriciteitssector (waaronder cogeneratie) terecht, maar eerder in de transportsector in binnen- of buitenland. De afname van certificatensteun voor biogas-WKK's maken de businesscase in vele gevallen financieel minder interessant ten opzichte van biomethaanproductie, waarvoor de internationale vraag sterk is toegenomen. De potentiële broeikasgasemissiereductie bij de energetische toepassing van het biomethaan, dreigt op deze manier Vlaanderen te verlaten, gekoppeld met de uit dienst name van biogas-WKK's. Dit op een ogenblik dat het Vlaamse energiesysteem zou moeten evolueren naar het gebruik van duurzame, groene energiebronnen. De

	voorbije jaren en maanden zijn er verschillende projecten tot ontwikkeling gekomen om biogas op te zuiveren tot biomethaan (zie Figuur 6 naar rechts). Er zijn heel wat signalen, onder meer naar aanleiding van de energiecrisis en het Europese REPowerEU-plan, dat deze markt zich de komende jaren verder zal ontwikkelen, met heel wat recente berichten en aankondigingen van onder meer Berichtgevingen duiden aan dat sommige nieuwe biomethanisatie-projecten ter vervanging komen van biogas-WKK's waarvoor, onder meer omwille van de afbouw in certificatensteun, de businesscase financieel minder interessant is geworden. Gas.be[14], Green Logix[15], Biogas Bree[16,17], Engie[18] en BASF[19], Aquafin[20], Biométhane du Bois d'Arnelle[21], en een grootschalig project in Wallonië om Vlaamse meststromen te verwerken[22,23].  Figuur 6 – Evolutie van Vlaamse biomethaaninstallaties met hun productiecapaciteit (bron: LinkedIn bijdrage van Biogas-E (link))
ODE Vlaanderen	Voor de opmerkingen rond biomassa sluit het Bio-Energieplatform binnen ODE Vlaanderen zich aan bij de vragen en opmerkingen die ook Cogen Vlaanderen op deze consultatie formuleert: publieke consultatie: 1. Veronderstelde evolutie van het opgesteld vermogen aan biomassa-gebaseerde elektriciteitsopwekking, waaronder cogeneratie-installaties ('Biomass – profiled'). 2. Veronderstelde evolutie van het opgesteld vermogen aan afval-gebaseerde elektriciteitsopwekking, waaronder cogeneratie-installaties ('Waste – profiled'). De geïnstalleerde capaciteit aan 'Biomass – profiled' zou volgens de voorgestelde aannames toenemen van circa 521 MWe in 2024 naar 564 MWe in 2030 om vervolgens constant te blijven tot en met 2036. We hadden graag bijkomende informatie over de achtergrond van beide veronderstellingen. Op dit ogenblik zijn er verschillende tendensen in het Vlaams energiebeleid die eerder een daling impliceren. Hieronder volgen enkele illustraties. • Illustratie 1: Samen met het stopzetten van de Vlaamse certificatensteun voor nieuwe of ingrijpend gewijzigde fossiele cogeneratie-installaties met startdatum vanaf 1 januari 2023, werden verschillende representatieve projectcategorieën geschrapt die ook van toepassing waren voor cogeneratie-installaties op biomassa. Enkel biomassa-installaties groter dan 5 MWe kunnen nog projectspecifiek een aanvraag indienen voor warmte-krachtcertificaten (ondersteuning voor de

	gerealiseerde primaire energiebesparing), maar komen niet langer in aanmerking voor het aanvragen van groenestroomcertificaten (ondersteuning voor de productie van groene stroom). • Illustratie 2: Het Vlaams beleid kende tijdens de regeerperiode 2019-2024 eerder een shift richting het toepassen van biogas, biomassa voor warmte-productie (zie Figuur 1). Zie onderstaande extracten uit het Vlaams Energie- en Klimaatplan. (*See COGEN comment below)*
COGEN Vlaanderen	De geïnstalleerde capaciteit aan 'Waste – profiled' zou volgens de voorgestelde aannames tijdens de periode 2024-2036 constant blijven rond 30 MWe. We hadden graag bijkomende informatie over de achtergrond van deze veronderstellingen. Op dit ogenblik zijn er echter verschillende tendensen in het Vlaams energiebeleid die eerder een daling zouden impliceren. • Illustratie: Het Vlaams beleid kende tijdens de vorige regeerperiode een shift richting het toepassen van afval voor warmte-productie, ondanks het feit dat cogeneratie energetisch een veel efficiëntere toepassing is dan heat-only toepassingen van dezelfde brandstof (zie Figuur 1). Zie onderstaand extract uit het Vlaams Energie- en Klimaatplan: *"2.2.5.2.1 Implementatie langetermijnvisie afvalverwerkingsinstallaties* *In 2016 werd het Uitvoeringsplan voor het huishoudelijk afval en gelijkaardig bedrijfsafval 2016-2022 goedgekeurd. Dit plan gaat uit van een evenwicht tussen het aanbod brandbaar afval en de verwerkingscapaciteit. Een tweede doel is dat er 200 tot 250 kton afval uit het restafval zal verdwijnen ten voordele van recyclage en preventie. Deze strategie rond eindverwerking wordt verdergezet in de planperiode 2023-2030 in het nieuwe Lokaal Materialenplan. Het uitvoeringsplan wenst de energieefficiëntie van afvalverbranding te verbeteren door vooral op warmte en stoomtoepassing te oriënteren en minder op groenestroomcertificaten (elektriciteitsproductie)."*

ANSWER:

Elia thanks COGEN Vlaanderen and ODE for the detailed feedback on biomass and waste production, and agrees the future is there also unclear, given reduction in support for biomass cogeneration, a shift in policy focus towards heat production and the limited availability of biomass in Belgium.

It is however hard to deviate from the current installed capacity, without quantified information from the VEKP in terms of biomass capacity trajectory, and without clear announcements of closures and abandon of the advanced stage projects via the data shared with DSO (PISA database).

Regarding large-scale biomass installations, Elia clarifies that Rodenhuize 4 is now used as backup unit to Zelzate Knippegroen (for burning steel gas) when the latter is not available. In addition, the unit is considered to be able to run at Pmin simultaneously with Knippegroen in case of scarcity situation.

Similarly to gas-CHP assumptions, Elia will consider the submitted trajectory. However, to account for the current situation, risk of abandon of projects and risk of closures of existing units, Elia will perform a sensitivity with less installed biomass capacity.

7.2 DEMAND IN BELGIUM

As explained in Section 5, in-depth review of the electricity demand projections has been conducted.

- Update of the **TSO-connected clients** future electricity demand projections.
- A **2024 reality check** on latest data available for various parameters (RES, HP, EV, realized 2024 electricity demand). This allows us to use latest data and have the right starting point for the projections.
- Desktop studies carried out jointly with Belgian **DSOs** to estimate electrification of the industry connected at DSO-level.
- **Energy efficiency** in the residential and tertiary sector has been reviewed based on the E-CUBE deliverable in the framework of the PRICED study.
- Other adaptations based on stakeholder's feedback were introduced such as a review of the COP curves for **HP**, or increasing energy efficiency over time in **EVs**.

Different trajectories have also been developed for the three main scenarios as illustrated on **Error! Reference source not found.** and Figure 6. The next sections will further discuss the updates while answering the comments received.

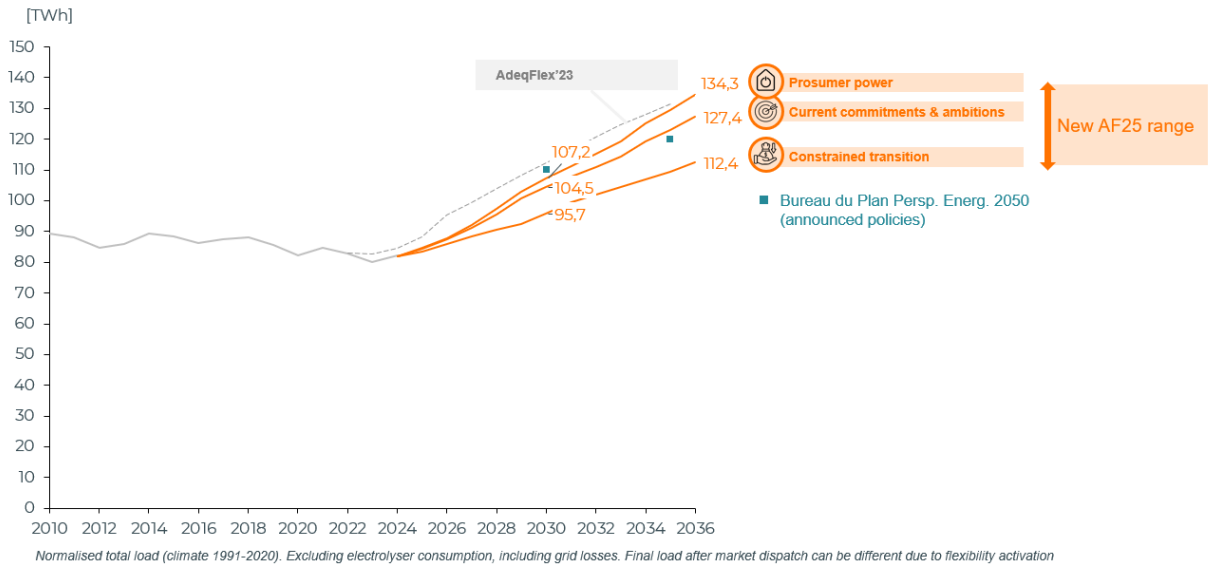


Figure 5 - Electricity demand in Belgium for the different scenarios

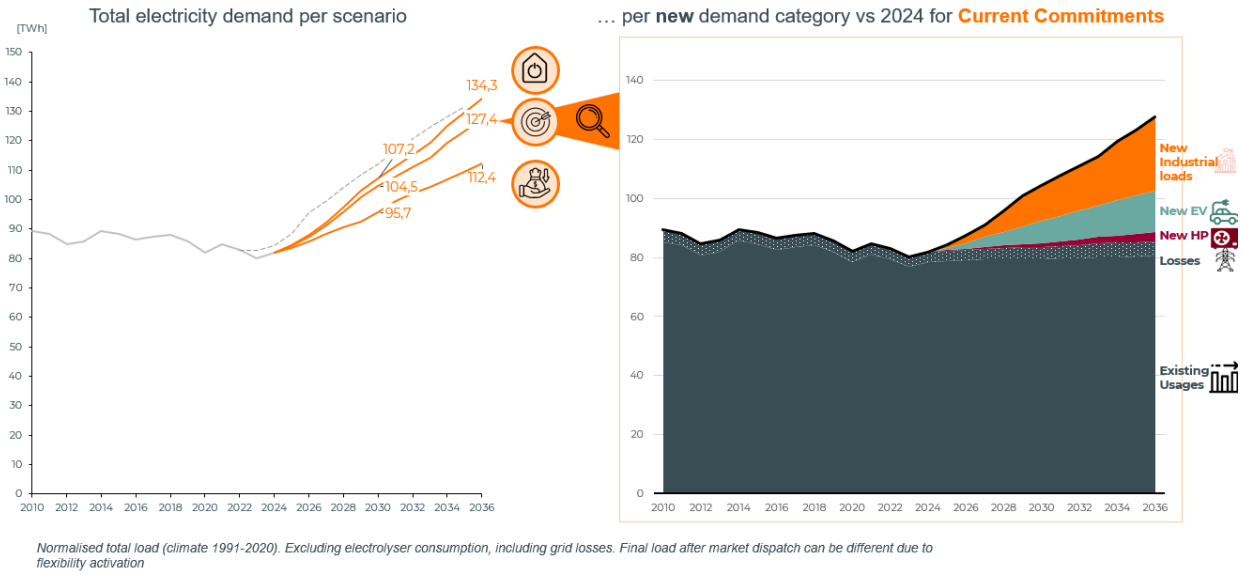


Figure 6 - Electricity demand in Belgium and new demand categories

7.2.1. General

STAKEHOLDER	FEEDBACK RECEIVED
CREG	Tout d'abord, les résultats de la deuxième partie de l'étude PRICED, réalisée par CLIMACT et l'institut LIDAM, ne sont pas encore disponibles et ne seront publiés qu'au début de l'année 2025 dans le rapport qui sera rédigé par Elia après la consultation publique. Bien que la CREG partage le point de vue d'Elia selon lequel l'étude doit se baser sur les données les plus récentes possibles, la CREG est d'avis que toutes les données et hypothèses, même préliminaires, devraient être soumises à consultation publique pour garantir la plus grande transparence possible.
CREG	Par ailleurs, la CREG constate que l'ensemble des données et hypothèses retenues par Elia ne soit pas systématiquement soumis à la consultation publique. En effet, les données et informations fournies par Elia dans les différents documents (note explicative et fichier Excel notamment) sont insuffisantes pour recalculer les trajectoires d'évolution proposées par Elia. C'est par exemple le cas pour l'évolution du nombre de véhicules (notamment électriques), du nombre de logements, du nombre de pompes à chaleur et pour l'évolution des batteries 'small-scale'. Les trajectoires d'évolution proposées par Elia sont généralement le résultat d'un exercice en plusieurs étapes au cours desquelles différentes hypothèses sont retenues. Cependant, ces étapes ne sont pas toujours explicitées (suffisamment), ne permettant pas de recalculer les trajectoires d'évolution.

	La CREG considère que cette approche limite la possibilité pour les acteurs de marché et pour elle-même de vérifier les trajectoires proposées par Elia. Il devient également difficile de formuler des alternatives en l'absence d'une vue complète sur les hypothèses sous-jacentes. La CREG souhaite illustrer cette préoccupation avec les projections d'Elia relatives aux 'new large-scale loads'.
CREG	Enfin, la répartition par processus de la demande additionnelle d'électrification, choisie par Elia, vise à simplifier la modélisation de la flexibilité. Cependant, cette répartition semble moins pertinente quand il s'agit d'étudier l'évolution de la consommation d'électricité. En effet, dans la mesure où tous les sous-secteurs industriels n'ont pas les mêmes perspectives d'électrification, qu'ils ne sont pas impactés de la même manière par des changements de variables macro-économiques et que des informations rendues publiques après le début de la consultation publique ne concerneraient qu'un acteur en particulier ou qu'un sous-secteur, il semble pertinent de répartir l'évolution de la consommation d'électricité par sous-secteur industriel. Par exemple, il n'est pas possible, sur base des informations soumises par Elia à la consultation publique, d'évaluer l'impact de l'annonce par ArcelorMittal du report de ses décisions d'investissement dans la décarbonisation sur l'évolution de la consommation d'électricité du secteur industriel.
CREG	Ainsi, dans le rapport de consultation et pour la prochaine étude 'Adequacy & Flexibility', la CREG recommande de soumettre l'ensemble des données et hypothèses à consultation publique et d'expliciter les différentes étapes nécessaires à la détermination des trajectoires d'évolution.

ANSWER:

First, Elia would like to underline that every year more data are shared during the different public consultations that Elia organizes around future scenarios, as well as more details on the trajectories and methodology. This year an accompanying 'scenario document' of about 50 page was submitted, describing how the scenarios were elaborated, together with an Excel file of 16 sheets containing the data values of the scenario.

The CREG mentions speaking on behalf of market players, asking for more details behind the trajectory. However, it does not seem to be a general feeling within the market players, and it does not seem to impede them to give comments on the trajectories or suggesting additional sensitivities (e.g. this consultation report is more than 100 pages). Some stakeholders have also voiced concerns that the sheer volume of information makes it difficult to provide meaningful input.

Hence, Elia tries to strike the difficult balance of giving enough details, on relevant parameters, and not overwhelm market players with data to review.

Regarding CREG's comment on industrial electricity consumption, Elia will provide detailed consumption data per industrial sector in future Excel reports. The process split remains relevant as it affects flexibility potential and future consumption patterns, which are crucial for studies on adequacy and flexibility.

It's also important to note that individual client data is treated confidentially. This confidentiality is requested by clients because some of their plans are not yet public or are part of their strategic projects. This agreement ensures that clients provide the most up-to-date and accurate information to Elia. Consequently, the information is aggregated across different dimensions.

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	FEBEG wants to emphasize that the use of the federal and regional climate plans in fact is a snapshot that poses the risk of being outdated very soon. After all, these plans are expected to be revised upwards to comply with the higher European ambition level. Keeping in mind that the electrification of transport and heating (residential as well as industry) are expected to be the main drivers of an increased electricity use, increased ambition levels and accompanying measures mean that the expected growth in demand in the AdFlex could be a significant underestimation. FEBEG believes that this should be taken into account in the study.
CREG	La CREG constate que la croissance de la demande totale d'électricité prévue par Elia entre 2025 et 2036 se situe dans une fourchette de +46% à +66%. Lorsqu'on compare ces chiffres aux données des autres pays, sur base de l'ERAA 2024, il apparaît que l'évolution estimée pour la Belgique est parmi les plus élevées. Demand increase 2025-2036 (average): Italy 17% France 18% Spain 19% Poland 23% Germany 48% Netherlands 53% United Kingdom 58% Belgium 46%-57%-66% Figure 1 : Evolution moyenne de la demande d'électricité 2025-2036 (source :ENTSO-E - ERAA 2024 & Elia – Consultation publique' Adequacy & Flexibility 2026-2036') Les écarts entre les différentes trajectoires d'évolution peuvent notamment s'expliquer par des taux d'électrification actuels différents (i.e. tous les pays n'ont pas le même point de départ) mais également par des objectifs différents à l'horizon 2030 et 2035 en termes de décarbonisation.

	La CREG s'interroge tout de même sur les spécificités propres à la Belgique qui pourraient justifier une telle augmentation par rapport aux autres pays européens.

ANSWER:

The 'Current Commitments' scenario translates current ambitions and policies in terms of electrification of transport and heating. It is indeed possible that additional demand could emerge in case of increased ambitions or additional supporting measures. The 'Prosumer Power' scenario consider therefore a faster uptake of EV and residential and tertiary HP.

Regarding CREG's comment, with the update and review, the increase in electricity consumption is no more between +46 & 66%, but 3 scenarios now projects a + 37 / 55 / 64% increase between 2025 and 2036. This makes Belgium fall within the range of countries like Germany, Netherlands and below projections from the United Kingdom.
Additionally, other countries also project similar relative increase in consumption. For instance, data from Energinett and ERAA24 show a relative increase of +54% and +50% respectively for Denmark and Sweden.

Elia is not in a position to comment the particular situation of each European countries, as indeed each country as a different context in terms of current electrification, decarbonization policies, and so forth. For example, France has today greater share of electricity in the final industrial energy demand (36%) than Belgium does (31%) [EUC-4], and its industrial strategy relies much more on hydrogen (aims for 180 TWh of H2 and renewable fuels by 2050 [FRG-1]) than in the case of Belgium [FHY-1][FPS-1].

However, a common trend is observed toward increase in electricity consumption due to the EU's ambition to decarbonize its economy. EU legislation supports electrification as a mean to decarbonize energy use, through financial incentives such as the ETS system, which will make it more expensive to burn fossil fuels, and hence incentivize low-carbon energy sources.

When it comes to TSO-connected clients, Elia assumes that with its privileged position, the bottom-up approach of the load management exercise, which includes challenges by Elia's key account managers through bilateral discussions, is a relevant approach. The main increase of the industrial demand being in the hands of a limited number of clients, this bottom-up approach seems more relevant than feedback from other European TSO's.

7.2.2. Existing usages

As preliminary information, the reader should note that the following updates in existing usages have been performed

- Integration of E-CUBE's assumptions on the energy efficiency (for all scenarios), leading to an increase of the existing usages consumption limited to + 1 TWh by 2035 (compared to +2 TWh in public consultation);

- Consideration of different recovery paths in residential and tertiary sector: In order to review the demand projections considering the recent energy crisis and high prices (which had an impact on energy demand across Europe), the Price-Linked Electricity Demand Evolutions – PRICED – study was carried out and presented to stakeholders in WG Adequacy (in August 2024). One of the deliverable of this study, was to estimate the elastic demand expected to be recovered once power prices comes down to lower levels than the ones seen in 2022 and 2023. Due to the uncertainty, several estimates from this study will be used for the three scenarios.
    - Current commitments: considering the partial recovery estimate (+0.5 TWh) as publicly consulted upon;
    - Constrained transition: considering no recovery given a poor macro-economic situation;
    - Prosumer power: assuming the full recovery estimate (+0.6 TWh), as publicly consulted upon, assuming a better macro-economic situation for the end-user.

STAKEHOLDER	FEEDBACK RECEIVED
CREG	La CREG constate que les projections du Bureau Fédéral du Plan sont utilisées pour alimenter les variables macro-économiques prises en compte par le modèle de Climact. Cependant, ces projections ne sont réalisées que jusqu'en 2029. La CREG demande à Elia de préciser dans son rapport de consultation que ces données sont extrapolées pour la période 2030-2036, et de fournir une justification de la méthodologie employée pour cette extrapolation.
CREG	En ce qui concerne l'évolution de la consommation électrique des usages existants, la CREG estime que l'augmentation linéaire de 0,2 TWh par an n'est pas suffisamment justifiée. Elle estime que les détails chiffrés de la simulation réalisée par CLIMACT grâce à l'outil BECalc devraient être disponibles, notamment en ce qui concerne le détail des augmentations par secteur. En particulier, la CREG regrette que les chiffres relatifs à la réduction de la demande électrique due à des gains d'efficacité énergétique et l'augmentation de la demande électrique due à l'augmentation du nombre d'appareils ménagers pour le secteur résidentiel et à une activité économique renforcée pour le secteur tertiaire n'aient pas été détaillées. La CREG demande à Elia de fournir ces informations dans le rapport de consultation.

ANSWER:

Elia recognizes the importance of being transparent about its assumptions. It is indeed assumed that the growth presented in the work of the "2024-29 macroeconomic outlook" from the Federal Planning Bureau can be extended beyond 2029. This assumption is based on other work of the Federal Planning Bureau, in particular the 'energy prospects of Belgium with announced policy' [FPB-1]. In this last work, the GDP growth hypothesis between 2027-2050 is 1.4% per year [CSF-1], which follows the average growth on the 'macroeconomic outlook 2024-29' [FPB-2]. Elia recalls that the proposed trajectory is based on announced policies.

Regarding the details behind the evolution in the electric consumption of existing usages, these data are based on the exercise realized over the summer 2024 by Climact and presented during the Working Group Adequacy of 27/08/2024 [ELI-2]. The model from Climact is an integrated tool that takes into account macro-economic data from Federal Planning Bureau, together with energy efficiency, considering a continuous improvement along the years. We have discussed with Climact the possibility to get the data as requested by the CREG, however these data are not available as such and it would require several days of additional work. It would require to execute the model several times in order to have elements of comparison (e.g. execute the model with a stagnant efficiency, extract and process the data, compare the data, etc.). Elia takes note that the CREG would like further details in future consultation exercises, for the different components driving existing consumption evolution.

Elia would like to note also that in the updated load trajectory, the existing usage trajectory has been reviewed. Notably reviewing energy efficiency penetration in the existing usage. As a reminder, E-CUBE has reviewed Climact's assumptions of energy efficiency across the residential and tertiary sector. These results have been presented in WG Adequacy [ELI-2] but were not included so far. As a result, the publicly consulted increase in existing usages of about +2 TWh by 2035 (+ 0.2 TWh per year), is now reduced to about + 1 TWh by 2035.

7.2.3. Industry & data-centers

The new industrial electrification (industry and data-centers) has been updated as follows:

- Bilateral exchanges with Elia's largest customers on their latest electrification plans. Some of the clients confirmed their trajectories, some other adapted it.
- Clients input is then further challenged by Elia key account managers and consolidated into Elia scenarios.
- After sectoral analysis, trajectories were reviewed for all Elia clients (100+) for all scenarios.
- Review of the DSO industry electrification connected at DSO-level thanks to desktop studies with DSO's.

The final trajectories are illustrated in Figure 7 and **Error! Reference source not found.**.

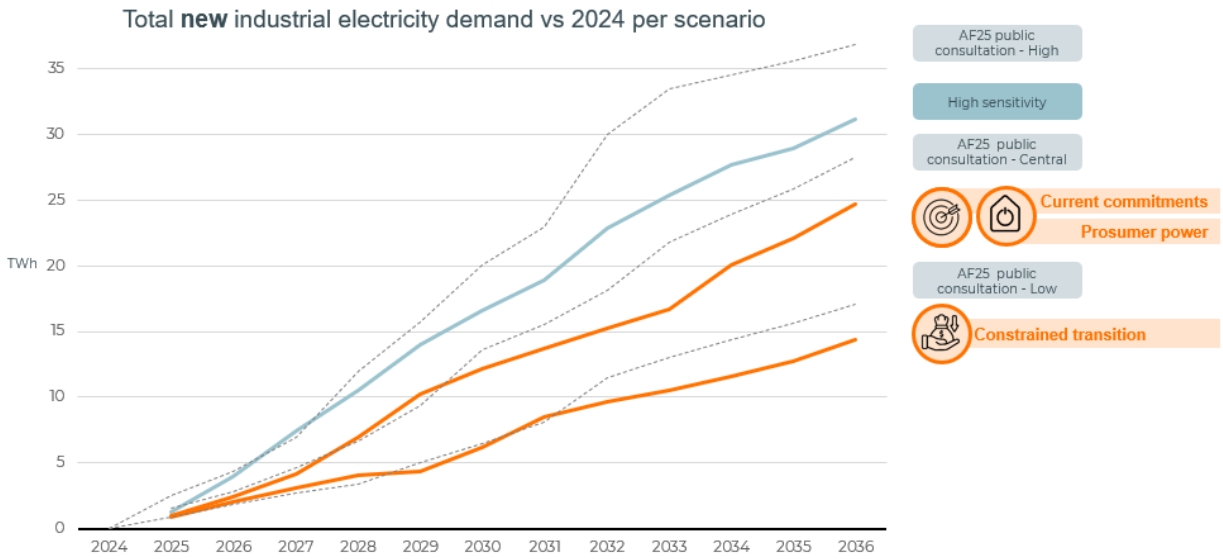


Figure 7 - Total new industrial electricity demand vs 2024 per scenario

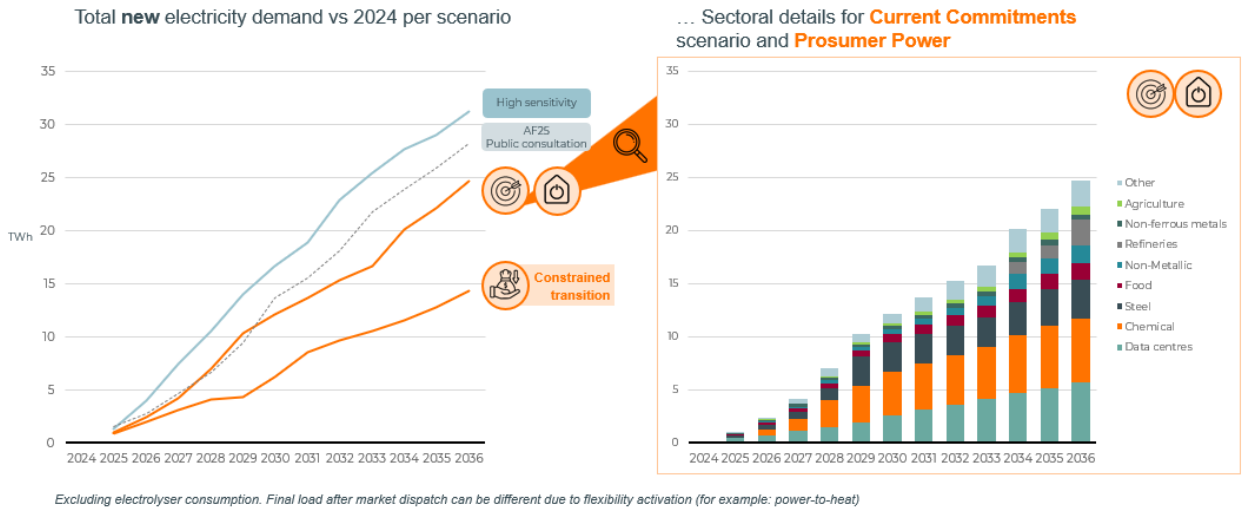


Figure 8 - Total new electricity demand vs 2024 per scenario with sectoral details for Current Commitments scenario and Prosumer Power

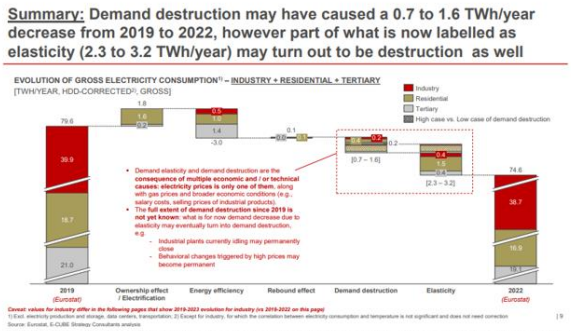
STAKEHOLDER	FEEDBACK RECEIVED
CREG	Dans sa proposition de scénario de référence pour les enchères CRM T-4, T-2 et T-1 de 2025, la CREG a formulé plusieurs remarques sur les hypothèses retenues par Elia qui, selon la CREG, ne reflètent pas suffisamment les incertitudes actuelles qui entourent l'électrification du secteur de l'industrie. Dans la mesure où l'approche retenue par Elia pour déterminer l'électrification additionnelle liée à l'industrie est identique à celle utilisée dans sa recommandation de scénario pour les enchères CRM de 2025, la CREG maintient ses remarques relatives au contexte macro-économique, à l'impact potentiel de l'augmentation des tarifs de transport de l'électricité et à l'approche 'bottomup'. En particulier, la CREG souhaite souligner que toutes les trajectoires proposées par Elia semblent être des trajectoires d'électrification qui ne prennent pas en compte de potentielles fermetures d'usines (au-delà de l'hypothèse de destruction de la demande de 0,5 TWh/an dans le scénario 'low') et la possible non-réalisation de projets d'électrification. Elia suppose seulement, dans le scénario 'low', un retard de quatre ans dans la réalisation des projets d'électrification par rapport au scénario le plus optimiste. La CREG note qu'Elia ne semble envisager, dans aucun de ses scénarios, l'hypothèse où le projet ne se réaliserait pas. L'exercice réalisé par Elia donne davantage une impression de certitude sur la réalisation de tous les projets sondés. Si, à l'avenir, un pays proposait un cadre économique plus favorable au développement de ces projets, la demande nationale pour ces derniers pourrait être altérée.

	De plus, l'approche 'bottom-up' est basée sur l'exercice 'Load Management' mené chaque année par Elia auprès de ses clients industriels. Dans le cadre de l'exercice de 2024, les clients d'Elia ont défini plusieurs scénarios d'électrification avec une probabilité estimée de réalisation. Les scénarios fournis par les clients ont ensuite été réalignes en scénarios cohérents par Elia à des fins de contrôle et de cohérence. Chaque scénario déterminé par Elia est basé sur sa propre storyline qui décrit une électrification plus ou moins rapide en fonction du niveau de développement de l'IA, du niveau de soutien gouvernemental au secteur industriel et de la faisabilité technologique. Ainsi, il semblerait que les scénarios 'low', 'central' et 'high' développés par Elia sont décorrélés de variables macro-économiques telles que le taux de croissance du PIB ou le coût du capital. Or, les acteurs industriels basent leurs décisions d'investissement dans la décarbonation sur une évaluation de tous les facteurs économiques : le contexte macro-économique mais également les facteurs de prix de vente (tels que le niveau de demande ou la compétitivité) et les facteurs de coûts (coûts des matières premières, prix de l'énergie, salaires, etc). Par ailleurs, la CREG souligne l'importance de garantir une vérification rigoureuse et réaliste des projections annoncées par les acteurs industriels. Bien que l'approche 'bottom-up' utilisée par Elia permette d'intégrer l'ensemble des demandes industrielles en matière d'électrification dans les scénarios envisagés, la CREG estime que des informations complémentaires sont nécessaires pour mieux évaluer la méthodologie employée, en particulier sur la confrontation des projections des industriels (voir également la section 'Remarques générales'). En résumé, la CREG recommande d'adopter une approche plus conservatrice et réaliste qui confronterait les projections obtenues à la réalité économique à laquelle font face les acteurs industriels, ce qui mènerait à un scenario central prenant en compte la possible non-réalisation de certains projets d'électrification (et non un simple report dans le temps). La CREG invite Elia à tenir notamment compte, dans le scénario 'central', des dernières annonces des acteurs de marché concernant les projets de décarbonation et leur éventuel report ou annulation (cf annonce d'ArcelorMittal concernant le report de ses décisions d'investissement dans la décarbonation). […] De même, une analyse des scénarios d'électrification de l'industrie proposés par Elia par rapport aux trajectoires de consommation prévues en France par RTE dans son Bilan prévisionnel 2023 révèle des écarts significatifs (voir tableaux à droite): La CREG reconnaît que de simples comparaisons entre la Belgique et la France, qu présentent des niveaux actuels d'électrification et des structures industrielles différentes, ne suffisent pas pour tirer des conclusions définitives. Toutefois, une confrontation des scénarios et une explication des écarts par Elia permettraient de mieux contextualiser les projections belges.

<table>
<tr><td></td><td>Sur base des éléments qui précèdent, la CREG réitère sa recommandation de retenir le scénario ‘Low’ d’Elia pour l’électrification additionnelle correspondant au secteur de l’industrie. Ce scénario tient à la fois compte de l’électrification réaliste de certains secteurs industriels mais également des incertitudes qui entourent l’évolution de la consommation industrielle d’électricité.
La CREG tient à rappeler que l’Arrêté ministériel du 2 octobre 2024 retient, pour la demande en électricité, une estimation intermédiaire entre les prévisions d’Elia et celles de la CREG jusqu’à 2030. Le choix de ces valeurs est notamment justifié par les considérants suivants : « Considérant que la proposition de la CREG sur la demande en électricité pour l’industrie est trop basse à la vue des projets d’électrification déjà annoncés en Belgique » ;« Considérant que la recommandation du gestionnaire de réseau reste néanmoins trop ambitieuse sur le développement de la demande en électricité pour les industries au vu des risques de délocalisation et l’augmentation des tarifs de réseau » ;« Considérant que le résultat final de cet exercice est de l’ordre de grandeur de la moyenne entre les deux recommandations ».
Toutefois, la CREG souhaite souligner que depuis l’Arrêté ministériel de 2 octobre 2024, de nouvelles informations sur des projets d’électrification ont été rendues publiques. ArcelorMittal a notamment annoncé le report de ses décisions d’investissement dans la décarbonation en Europe, impactant directement les projets d’électrification des sites belges de l’entreprise.

<table>
<tr><th></th><th>2035 (vs 2019)</th><th>2035 (vs 2019) Sans production d’hydrogène</th><th>2035 (vs 2019) sans production d’hydrogène et avec data centers</th></tr>
<tr><td>Scénarios A</td><td>+ 36 à 45%</td><td>+14 à 23%</td><td>+ 34 à 47%</td></tr>
<tr><td>Scénarios B</td><td>+ 25 à 33%</td><td>+11%</td><td>+32 à 36%</td></tr>
<tr><td>Scénarios C</td><td>+17 à 22%</td><td>+2,6 à 7,9%</td><td>+19 à 25%</td></tr>
</table>
Tableau 1 : Trajectoires de consommation pour l’industrie en France (source : RTE – Bilan prévisionnel 2023)

<table>
<tr><th></th><th>2035 (vs 2019)</th></tr>
<tr><td>Low</td><td>+ 33%</td></tr>
<tr><td>Central</td><td>+59%</td></tr>
<tr><td>High</td><td>+89%</td></tr>
</table>
Tableau 2 : Scénarios d’électrification du secteur industriel en Belgique (source : Elia – Consultation publique étude ‘Adequacy & Flexibility 2026-2036’)</td></tr>
<tr><td>CANOPEA / Bond Beter Leefmilieu</td><td>Principalement, nos critiques portent sur les projections de consommation finale d’électricité.
Depuis la dernière étude Adequacy, les projections de demande pour 2035 ont été revues légèrement à la baisse (129,2TWh) à la place de 132,9 TWh. C’est une évolution positive, mais qui ne reflète pas la réalité des évolutions historiques de demande électrique observées depuis 10 ans. Il est vraisemblable que le scénario central sur-estime toujours certaines évolutions de demande. A cet égard, les projections d’Elia pour 2030 demeurent dans la tranche supérieure par rapport à d’autres scénarios énergétiques. (Tel que déjà illustré dans la précédente étude Adequacy.)
La demande électrique demeure historiquement basse en 2024 (voir chiffre SPF Economie Figure 1) laissant présumer que la partie de demande détruite pourrait se situer dans la fourchette</td></tr>
</table>

	haute des projections de l'étude Priced soit 1,6 TWH voire d'avantage comme le suggérait l'étude (figure 2 à droite). Les projections macroéconomiques du bureau du plan sur lesquelles repose l'analyse de ELIA semblent questionnables, dont principalement les perspectives de croissance ou d'évolution de l'activité industrielle. Notamment, les projections d'évolution de la consommation électrique industrielle ne figurent pas dans les chiffres fournis dans le cadre de la Consultation. Or, ils reposent sur des scénarios de maintien de l'activité industrielle qui ne se justifient pas dans les faits. Certaines installations industrielles ont ainsi déjà effectivement fermé dont Yara Tertre Ammoniac production ou Audi Forest. Ces fermetures doivent au minimum être intégrées dans les projections. Nous préconisons une mise à jour des données de consommation électrique sur base des évolutions d'activités industrielles récentes.  *Figure 2 : L'étude Priced reconnaît qu'une part de la baisse de la demande due à l'élasticité pourrait en fait être de l'effacement définitif.*
FEBEG	FEBEG wants to point out that while Elia looks at the developments regarding the electrification of the industry on the TSO grid, we see that e-boilers and heatpumps are already being installed in different industries across lower voltage levels. On top of that, investment decisions are often taken faster in SMEs than in large companies thus increasing the likelihood of faster electrification in these companies if taxes on electricity are lowered as is taken up in the Flemish coalition agreement. FEBEG therefore wonders if the growth in demand coming from lower voltage levels is sufficiently taken into consideration. Green molecules will have their role in decarbonizing our society, the level to which is uncertain at this moment and expectations differ (Elia vs. Fluxys study). Although there are multiple paths with different levels of impact on the electricity demand, green molecules production uses electricity, which to our opinion cannot be assumed to be fully flexible.
Febeliec	1. Future electricity demand is overestimated. Elia uses a low, mid and high scenario. This is based on the projections of the future demand of households, tertiary sector and in the industry. The latest developments are such that electrification is being postponed in many industries. This should be considered. Concretely, Febeliec asks that the current low scenario would be considered as the high scenario, with consequently lower mid and low scenarios.

	Febeliec further also wants to refer to its previous comments on Elia's continuous estimates of increases in electricity demand in Belgium which never truly materialized. Febeliec remains surprised to see that Elia estimates that total electricity demand over the next decade increases to never seen absolute levels. Febeliec shares Elia's expectation of electrification of many industrial processes in the following decades, but expects that this evolution will slow down due to economic circumstances.
CREG	Les projections proposées par Elia sont basées sur l'exercice 'Load Management' mené chaque année par Elia auprès de ses clients industriels. Dans le cadre de l'exercice 2024, les clients d'Elia ont défini plusieurs scénarios d'électrification avec une probabilité estimée de réalisation. Les scénarios fournis par les clients ont ensuite été réalignés en scénarios cohérents par Elia à des fins de contrôle et de cohérence : un scénario 'High', un scénario 'Central' et un scénario 'Low', chacun avec sa propre storyline. Enfin, l'augmentation de la consommation d'électricité résultant des différents scénarios a été répartie en fonction des types de processus. Les données mises à disposition par Elia dans le cadre de la consultation correspondent à l'électrification additionnelle de l'industrie, pour chaque année de la période considérée. Une répartition de cette évolution par processus est uniquement disponible pour le scénario 'Central'. Pour les scénarios 'Low' et 'High', seule l'électrification additionnelle totale (i.e. pour tous les processus) est fournie. Ainsi, il n'est pas possible d'identifier où (c'est-à-dire, au niveau de quel(s) processus) se situent les différences entre les scénarios 'Low'/'High' et le scénario 'Central'. De plus, les hypothèses macroéconomiques des différents scénarios ne sont pas partagées et la storyline des scénarios n'est pas suffisamment précise pour permettre de les identifier. Par exemple, dans le scénario 'High', "Datacenter consumption grows exponentially as uptake of AI demands more and more computing power" ou en ce qui concerne l'industrie lourde, "Most optimistic customer scenarios materialize, thanks to positive technological results on electrification and strong governmental support". Quelles hypothèses en termes de résultats technologiques et de soutien gouvernemental sont ici considérées ? Quel développement de l'IA est ici envisagé pour justifier une croissance exponentielle de la consommation ? Comment cette croissance exponentielle est-elle traduite concrètement par Elia en termes d'évolution de la consommation d'électricité des data centers sur la période considérée ?
ODE Vlaanderen	Rond flexibiliteit hebben wij nog volgende vragen: - In tabblad "2.4 industrial demand" wordt de verwachte evolutie van bijkomende elektrificatie tov 2024 beschreven. Hier wordt geen additioneel verbruik verwacht tot 2026 voor e-boilers en 2027 voor warmtepompen. Dat lijkt een onderschatting, aangezien er ondertussen wel wat e-boilers en warmtepompen worden geplaatst in en gebruik genomen. Zie bijvoorbeeld ook publicatie van 'Finale visie glastuinbouw in Vlaanderen'. Er zou vandaag al 100 MW opgesteld staan, en voor volgend jaar wordt verwacht dat er 70 MW bijkomt.

	Graag vragen wij hier inzicht of dit is meegenomen al dan niet, of is dit niet meegenomen omdat Elia vooral enkel kijkt naar de grote industrie (Elia-connected) en niet naar de kleinere industrie? De vraag stelt zich of de kleinere industrie mogelijks sneller schakelt dan de grote industrie.

ANSWER:

On 2024 realized electricity consumption,

The reader can note that the trajectory has been updated with latest measurements. And this includes latest closures or announcements of delayed electrification available in early 2025 (prior to the publication of this report). The projections published for public consultation included already known closures, which includes Yara Tertre Ammoniac and Audi Forest.

Regarding the comment of Canopea and Bong Beter Leefmilieu, the reader should note that electricity consumption needs to be normalized according to temperature and working days to be comparable from one year to another. Absolute level of electricity consumption in a warm or cold year are not directly comparable. Hence, considering normalization, electricity consumption was greater in 2024 than 2023.

On demand destruction and demand recovery,

Regarding the PRICED study, the final estimate of demand destruction is delivered with this consultation report of public consultation, based on the work of the LIDAM institute and CLIMACT, based on the first estimate of E-CUBE.

On macro-economic indicators and current context,

Stakeholders make the comment that this is not well considered in the assumptions. However, these estimates on macro-economic growth are directly coming from the Federal Planning Bureau (‘Perspectives économiques’), which does consider the current international and macro-economic context. The report from the Federal Planning Bureau is the reference in the field as it constitutes an independent body of research that provides quantified feedback to the matter.

On electrification of industry at lower voltage,

Industry at lower voltage is considered as well, through desktop studies carried out jointly with Fluvius ORES and RESA. These desktop studies have been used as input for this report. In the future, those will be complemented with detailed information from ongoing initiatives at regional level such as ‘Plan de puissance’ and ‘EnergieGRIP’.

On industrial consumption and electrification of new large-scale loads,

Elia notes the arguments of the CREG as in two parts: (i) the current macro-economic context would not be well reflected in current trajectory and could negatively impact industries (definitive closures, relocation of industry), and (ii) the investment decision in electrification of processes is driven by multiple macro-eco variables (overall competitivity, profitability of the investment).

On the first comment, Elia would like to attract the CREG's attention towards the study from the Federal Planning Bureau 'Perspectives énergétiques à politique annoncée [FPB-3]', which estimates a growth of the industry outputs in the medium term (towards 2030 & 2035), based on stated policies.

The report indicates no net decrease in industry outputs, or 'net' industry closing. The Federal Planning Bureau even hints an increase in total energy consumed in industry (see 'Graphique 28'). Assuming no decrease in energy efficiency in the processes, this hints at an expansion of the industrial output of the country. The Federal Planning Bureau, considering the macro-eco context, does not see a degradation in industrial output in coming years. Even in the tackled sensitivity of the same report, only a slower growth is assumed, but no decrease in industrial output.

Then regarding the second argument, Elia would like to remind the CREG of the ETS-1 system. With planned phase-out of free allowances, and inclusion of new sectors in the ETS-1 system, current highly emitting processes will become less profitable than decarbonized processes with the arrival of the CBAM mechanism [EUC-5]. Hence, electrifying and reducing the carbon intensity of industrial processes makes economic sense, under currently announced policies.
This is also found in the report from the Federal Planning Bureau, where the share of electricity in the industrial energy demand increases towards 2030 & 2050 (Graphique 29). In the report, one can read that this is due to reduced costs for industrial that electrify/decarbonise compared to the case of not electrifying, for certain sectors.
Additionally, the recent federal government declaration, which outlines industry support for green technologies, as well as electricity cost mitigation for industry (energienorm, tarif reduction for energy intensive industry).
Elia would like to bring to the attention of the reader, that following this study, the current stated policies does not lead to Belgium reaching its 2030 climate goals. This highlights that the level of electrification pushed by the stated policies are not sufficient to decarbonize the Belgian economy. This is however the assumption taken in the 'current commitments and ambitions scenario' constructed in this study.

In conclusion, Elia notes the reserves of the CREG regarding industrial consumption in the future. However, other prospective studies, like the one from the Federal Planning Bureau which is focused on macro-eco indicators, finds (i) an increase in industrial activity (which Elia does not assume in its trajectory), (ii) a greater electricity share in industry energy demand, due to electrification representing a positive business case.

With this being said, Elia always tries to have latest data at hand to perform its studies. Hence, Elia has though revised its trajectories for industry since the public consultation, asking largest electricity consumers for an update. Some customers has confirmed their electrification plans, while others have changed their trajectories. Hence, latest available data has been integrated in the study.

As explained in Section 5, a Constrained Transition scenario will also be studied, with a deteriorated macro-economic situation, leading a postponement of the electrification of some processes.

On the role of green molecules and the flexibility of their production[3],

Elia considers all publicly known projects for local production of green molecules. The trajectories presented

Elia would like to point out that an answer has been provided by Virya energy in this direction, stating that their green electrolyser (HyOffWind) is planned to be flexible on the upper 80% range of power. However, this does not mean that in period of scarcity (with great electricity prices), electrolysers would run. In other words**, for adequacy simulations, electrolysers will be considered fully flexible (to be compliant with the ERAA methodology), and a sensitivity will be analysed (if time) with them running with 20% baseload, except in periods of near scarcity**. For short-term flex computation, we will consider electrolyser to be flexible on 80% of their range, as indicated by Virya Energy.

On storylines for the different scenarios,

Elia refers the reader to Section 5 where the different scenarios are described with their respective storyline.

Regarding specifically ODE Vlaanderen's question on heat pump & e-boiler existing today,

Elia has no certain and exhaustive list of industrial boilers and heat pumps that would have been installed today. Elia would like to also point out to ODE Vlaanderen that the source shared data from 2023, and Elia is not aware of a reality check that would have been carried out on these projections. However, to tackle the uncertainty regarding electrification of industry, Elia agrees to carry a sensitivity with faster electrification.

[3] Elia would like remind stakeholders of EU regulation regarding temporal matching. That up-to 31 December 2029, molecules labelled as "green" (or "sustainable") needs to be produced in the same calendar month as the renewable electricity produced under power purchase agreement. However, after 1st January 2030, it needs to be produced in the same one-hour period. Due to the intermittent nature of low-carbon sources (except for nuclear), and the additionality principal[3], it means that after 2030 "green molecules" will need to be fully flexible within 1 hour, which is the temporal resolution of the Adequacy and Flexibility study, for adequacy simulations.

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

7.2.4. CCS

STAKEHOLDER	FEEDBACK RECEIVED
CANOPEA / Bond Beter Leefmilieu	Les projections en termes d'intégration du CCS semblent également largement surestimées par rapport au développement industriels prévus. A ce stade, une installation (Holcim) est prévue en Wallonie, dont la mise en activité est annoncée en 2029 dans un best case scénario (permis encore en cours, cadre légal pour le transport peu avancé). Tandis que le second projet CCS (Columbus) est abandonné. Les décisions d'investissements ne sont pas encore prises pour d'autres projets (Heidelberg) tandis que les durées de déploiement (y compris pour les infrastructures de transport) s'étaleront dans un very best case scénario sur plusieurs années. Il en ressort une probable sur-estimation de l'évolution du CCS par les industriels. Nous estimons qu'un scénario de développement de la capture du carbone à l'horizon 2036 doit être développé.
CREG	A titre d'exemple, bien que l'installation de technologies de Carbon Capture and Storage (CCS) et Carbon Capture and Utilization (CCU) devrait idéalement être dimensionnée pour combler l'écart avec les objectifs d'émissions résiduelles, l'approche bottom-up adoptée repose sur les projets industriels annoncés. Cette approche ne garantit ni que ces projets soient alignés sur les émissions actuelles, ni qu'ils n'excèdent le besoin réel. La CREG ne dispose pas des données nécessaires pour vérifier la cohérence entre les besoins identifiés via l'approche bottom-up et les besoins globaux réels déterminés par les émissions résiduelles du système.

ANSWER:

The CCS trajectory suggested by Elia is based on the load management exercise which is gathering input from client's projects. This was presented to stakeholders in WG Adequacy [ELI-2].
It must be noted that the amount of CCS/U is not based on a quantification of the delta between (residual) CO_2 emissions and CO_2 emission objectives. Rather, these trajectories directly come from data submitted by customers (industrial clients connected to the high voltage grid / electricity transport system) including actual estimated electricity needs for powering CCS/U processes and reviewed into coherent scenarios (as already explained in the accompanying document submitted to public consultation). Note also, that this has been updated in the month of January 2025. So the proposed trajectory contains latest plans from customers. It must be noted that individual companies make a decision to invest in CCS/U technology for a multitude of reasons. This can be aligned with individual emissions reduction objectives, public image and/or for economical reasons. For instance in a context of increasing CO_2 prices (e.g. after CBAM implementation and reduction of free ETS allowances) the business case for investing in CCS/U might become positive in certain sectors and processes.

7.2.5. Heat pump

Three main trajectories are now considered for heat pumps (HP) uptake in Belgium. Regarding the update, a reality check for 2024 (mainly on higher Air-Air HPs) has been performed. No change in uptake new builds and boiler replacements assumptions will be assumed for the Current Commitments scenario.

The following assumptions are considered in the scenarios for hydronic heat pumps:

Constrained Transition

- New buildings: 100% of new buildings are equipped with HP/district heat as from 2040 in Wallonia and Brussels, still 25% gas boilers installed in 2035. 2025 for Flanders as no new gas connections allowed.
- Renovations & boiler replacements:
  - Residential: 15% of boilers at end of life and/or after renovation are replaced by a HP in 2030, 20% in 2035. Renovation rate reaching 2% by 2050 (linear increase).
  - Tertiary: 50% of boilers at end of life and/or after renovation are replaced by a HP in 2030, 55% in 2035. Renovation rate reaching 2% by 2050 (linear increase).

Current Commitment

- New buildings: 100% of new buildings are equipped with HP/district heat as from 2035 in Wallonia and Brussels, 2025 for Flanders as no new gas connections allowed.
- Renovations & boiler replacements:
  - Residential: 20% of boilers at end of life and/or renovation are replaced by a HP in 2030, 35% in 2035. Renovation rate reaching 3% by 2050 (linear increase).
  - Tertiary: 60% of boilers at end of life and/or after renovation are replaced by a HP in 2030, 65% in 2035. Renovation rate reaching 3% by 2050 (linear increase).

Prosumer Power

- New buildings: 100% of new buildings are equipped with HP/district heat as from 2030 in Wallonia and Brussels, 2025 for Flanders as no new gas connections allowed.
- Renovations & boiler replacements:
  - Residential: 100% of boilers at end of life and/or after renovation are replaced by a HP in 2035. Renovation rate reaching 3% by 2040 (linear increase).
  - Tertiary: 80% of boilers at end of life and/or after renovation are replaced by a HP in 2030, 100% in 2035. Renovation rate reaching 3% by 2040 (linear increase)

The same evolution in the total amount of new buildings is assumed in all scenarios.

The resulting trajectories are illustrated in **Error! Reference source not found.** and Figure 10.

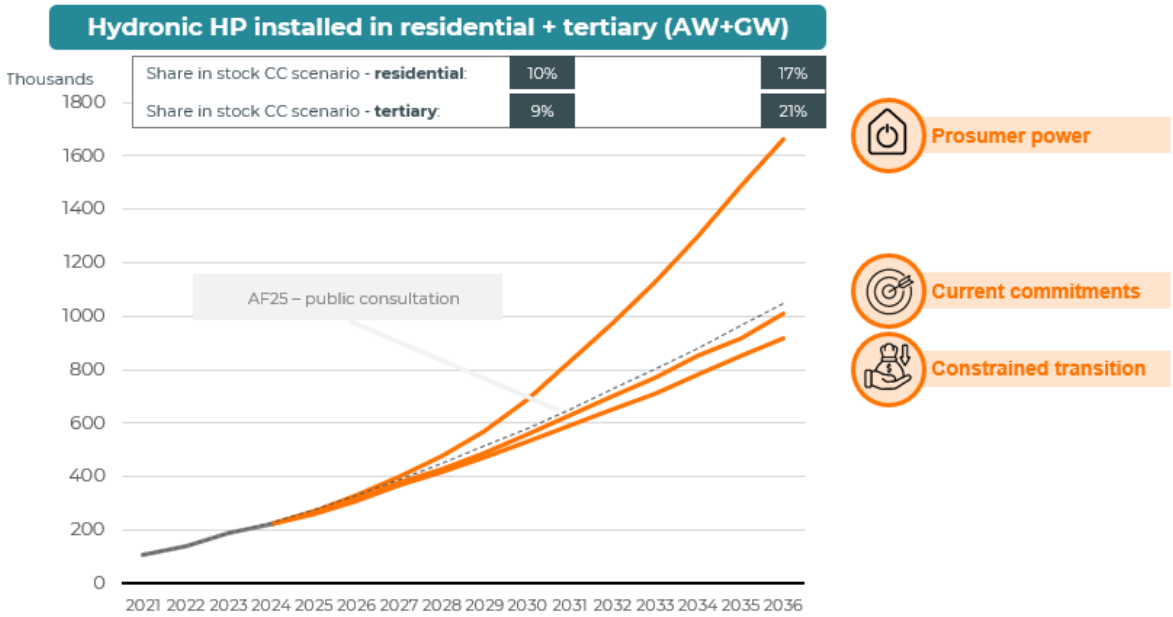


Figure 9 - Hydronic HP installed in residential + tertiary (Air-Water+Ground-Water)

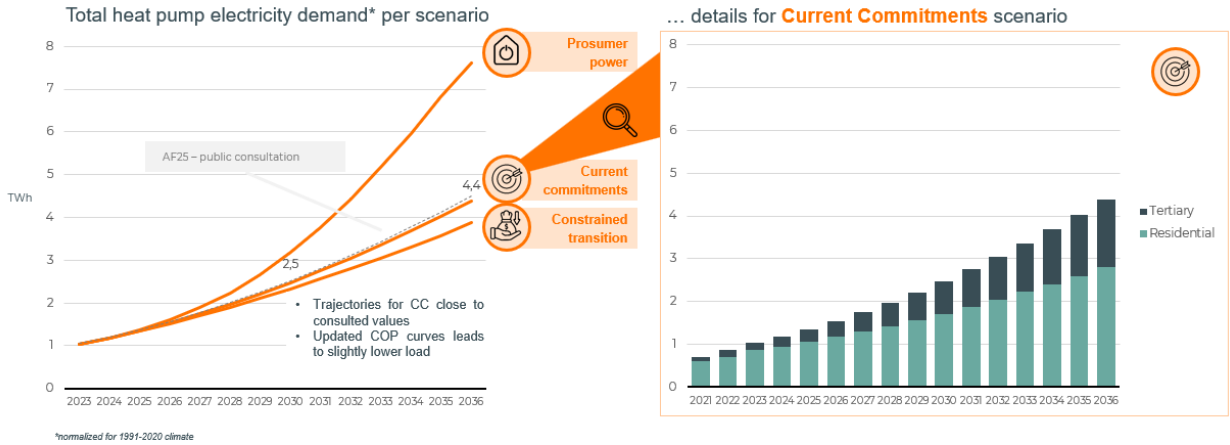
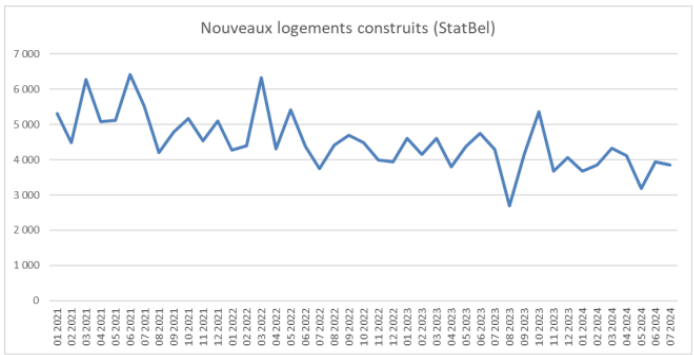


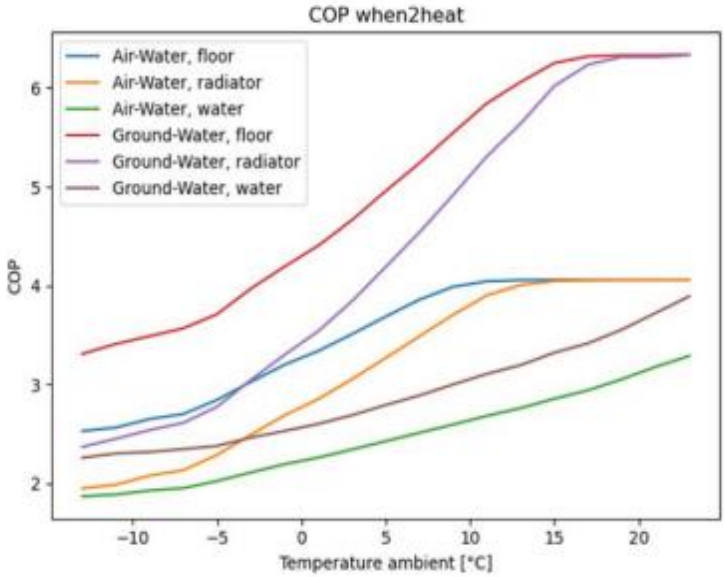
Figure 10 - Total heat pump electricity demand per scenario with details for Current Commitments scenario

STAKEHOLDER	FEEDBACK RECEIVED
CREG	La CREG accueille favorablement la révision par Elia de l'hypothèse concernant le nombre de nouveaux logements construits, qui passe de 55 000 à 40 000 par an par rapport à l'étude précédente. Elle recommande néanmoins qu'Elia précise la répartition géographique de ces nouveaux logements entre les trois régions.
CREG	Malgré une réduction de la taille moyenne des ménages, la baisse de la croissance démographique entraîne également un ralentissement de la croissance du nombre de ménages. Selon

	le Bureau Fédéral du Plan7, on prévoit une augmentation de 30 593 ménages entre 2026 et 2027, contre seulement 25 606 entre 2035 et 2036, ce qui illustre cette tendance à la décroissance. Compte tenu de cette diminution progressive, le nombre de nouveaux logements devrait également ralentir sur la période 2026-2036. La CREG recommande de considérer une baisse du nombre de nouveaux logements proportionnelle à la baisse de la croissance du nombre de ménages. Pour estimer le nombre de nouveaux logements construits, il est également crucial de tenir compte de la diminution des zones constructibles, en particulier en Flandre, où la pression foncière et les objectifs environnementaux restreignent les nouvelles zones à bâtir. Ces contraintes s'inscrivent dans les efforts pour atteindre les objectifs climatiques, qui mettent de plus en plus l'accent sur la rénovation des bâtiments existants, notamment les logements mal isolés. Par ailleurs, il convient de souligner l'impact de la subdivision des logements, particulièrement dans les zones urbaines. Cette tendance inclut des transformations telles que l'aménagement d'espaces non résidentiels (grenier, ancien commerce, etc.) en logements ou la conversion de maisons unifamiliales en plusieurs unités résidentielles. Ainsi, l'augmentation du nombre de logements ne résulte pas nécessairement de nouvelles constructions. Le nombre de 'nouveaux logements construits' (StatBel) s'inscrit en décroissance depuis 2021 (voir figure 3 à droite). Ainsi, la CREG recommande de prendre en compte une diminution du nombre de 'nouveaux logements construits' similaire à celle estimée pour les 'nouveaux logements' sur la période 2026-2036, soit une baisse de 16 %. Concrètement, cela impliquerait de considérer 40 000 'nouveaux logements construits' en 2026 et 33 600 en 2036, avec une évolution linéaire entre ces deux années.  Figure 3 : Nombre de nouveaux logements construits en Belgique (source : Statbel)
CREG	Elia prend en compte une demande annuelle normalisée en chaleur, différenciée selon le type de bâtiment (nouvelle construction ou rénovation) et le secteur (résidentiel ou tertiaire). Elle précise que la demande journalière en chaleur est déterminée en supposant une relation linéaire

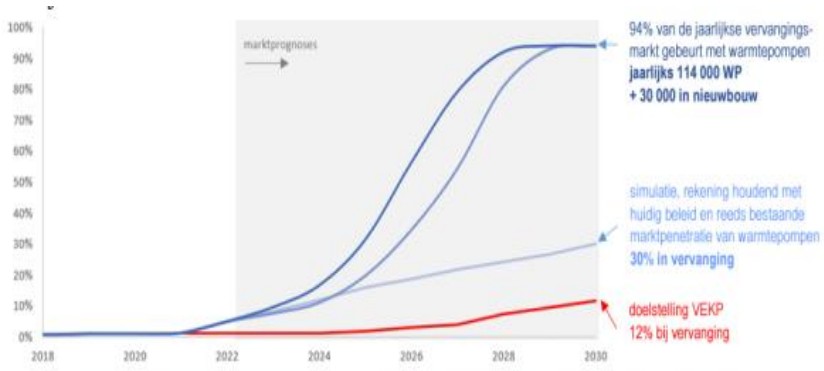
	avec la température extérieure. Cette relation linéaire pour les secteurs résidentiel et tertiaire est établie à partir des données de mesure de Fluxys. La CREG recommande tout d'abord de confirmer et de préciser que cette linéarisation repose sur les températures équivalentes, et non sur les températures moyennes journalières, comme pourrait le suggérer l'annexe E. Par ailleurs, Elia ne spécifie pas la durée de la période historique des données Fluxys utilisées pour estimer cette relation linéaire. Une période trop longue pourrait ignorer des évolutions importantes, telles que l'amélioration de l'isolation des bâtiments, la transition vers des chaudières à condensation plus performantes, l'élasticité prix, ou encore, plus marginalement, le développement des systèmes de chauffage hybrides (comme les pompes à chaleur hybrides). En appliquant sa méthodologie actuelle, Elia présume également que la sensibilité de la demande en chaleur aux variations de température extérieure est homogène pour tous les bâtiments résidentiels, quel que soit leur niveau d'isolation. Cependant, cette hypothèse ne reflète pas les différences importantes entre bâtiments. Les logements mal isolés présentent une plus grande sensibilité aux variations de température extérieure en raison de pertes thermiques accrues, ce qui se traduit par une courbe de demande plus marquée. À l'inverse, les bâtiments bien isolés sont moins affectés par les fluctuations climatiques, leur demande en chaleur restant relativement stable pour une même plage de températures. La CREG recommande donc une approche segmentée, différenciant les bâtiments neufs et les rénovations. Cette segmentation permettrait d'estimer la variation de la demande en chaleur en fonction de la température extérieure sur la base de données spécifiques à chaque type de bâtiment, plutôt que d'utiliser une estimation globale pour l'ensemble du parc résidentiel, qui tend à surestimer la variabilité de la demande en chaleur. Cette estimation pourrait s'appuyer sur des données de consommation de gaz, mais également sur les données de consommation électrique des logements équipés de pompes à chaleur.
CREG	Elia utilise un coefficient de performance (COP) basé sur la température moyenne journalière pour estimer les besoins journaliers en électricité des pompes à chaleur. Cette approche entraîne une surestimation de la demande en électricité, car elle ne reflète pas correctement le COP moyen pondéré par la consommation réelle. En effet, la consommation électrique des pompes à chaleur est principalement diurne (pics de consommation identifiés à 7h et 17h dans l'Appendix E), lorsque les températures extérieures sont généralement plus élevées. Or, le COP augmente avec la température extérieure pour une pompe à chaleur air-eau. Par conséquent, en se basant sur une température moyenne journalière, Elia sous-évalue le COP effectif qui serait calculé en tenant compte des variations horaires de température. Cela conduit mécaniquement à une surestimation des besoins en électricité. La CREG reconnaît que l'application d'un COP horaire pour chaque période peut être complexe et lourde à mettre en œuvre. Elle recommande néanmoins d'introduire une correction afin de

	mieux refléter la performance réelle des pompes à chaleur et d'éviter cette surestimation. Cette correction pourrait consister, par exemple : - En une moyenne pondérée de la température extérieure, calculée selon un profil standard de chauffe ; - En un coefficient de correction empirique, ajusté pour tenir compte de l'écart entre les températures moyennes journalières et les températures diurnes dominantes. Cette approche permettrait d'améliorer la précision des estimations et d'éviter une surestimation de la demande en électricité, tout en restant pragmatique en termes de mise en œuvre. Elia présente, dans sa figure E-2, l'évolution du COP en fonction des températures extérieures. La CREG a réalisé une estimation similaire pour deux types de pompes à chaleur : air-eau et sol-eau, en considérant trois configurations distinctes (sur la base de données disponibles en open source) : - Chauffage par le sol; - Chauffage par radiateur; - Production d'eau chaude sanitaire; Les résultats obtenus par la CREG s'avèrent globalement cohérents avec ceux d'Elia. Toutefois, la CREG s'étonne qu'Elia obtienne un COP plus faible pour une pompe à chaleur sol-eau à -15 °C que pour une pompe à chaleur air-eau. En effet, il est généralement attendu qu'à de très basses températures, le COP de la PAC sol-eau soit supérieur à celui de la PAC air-eau, car la température du sol, utilisée comme source thermique, est plus stable et reste nettement plus élevée que celle de l'air extérieur, qui peut descendre à -15 °C ou moins. Cette stabilité de la température du sol permet à la PAC sol-eau de maintenir une meilleure efficacité énergétique, même par temps froid (voir figure à droite). La CREG recommande donc à Elia de revoir sa courbe de COP, et de préciser la méthodologie utilisée pour établir cette courbe.

	
CREG	Elia anticipe qu'en Wallonie et à Bruxelles, 100 % des nouvelles constructions seront équipées de pompes à chaleur ou raccordées à un réseau de chaleur d'ici 2035. Cependant, la Directive sur la Performance Énergétique des Bâtiments (EPBD), qui impose que les bâtiments soient conformes aux exigences de Nearly Zero Energy Buildings (NZEB), n'a pas encore été transposée dans les réglementations régionales. La CREG recommande donc à Elia de préciser que cet objectif de 100 % repose sur une hypothèse optimiste, fondée sur les transpositions attendues des directives européennes et les évolutions des politiques régionales. Concernant la rénovation et le remplacement des chaudières en fin de vie, Elia estime que les pompes à chaleur représenteront respectivement 23 % et 35 % des installations en 2030 et 2035. À ce jour, il n'existe pas d'interdiction générale d'installer des chaudières fossiles dans le cadre des rénovations. Par ailleurs, le taux d'adoption des pompes à chaleur reste limité dans les bâtiments rénovés, en raison de leur non-rentabilité actuelle. Les hypothèses d'Elia paraissent donc ambitieuses et ne seraient réalisables qu'en présence : - d'incitations financières fortes et continues ; - d'un renforcement des politiques régionales, incluant par exemple l'interdiction des chaudières fossiles pour les rénovations ; - de progrès significatifs en matière d'isolation des bâtiments et de développement de solutions hybrides.

	La CREG recommande à Elia de revoir ses hypothèses en faveur de projections plus réalistes, suggérant une adoption progressive des pompes à chaleur avec un taux de pénétration de 15-20 % d'ici 2030 et de 25-30 % d'ici 2035.
CREG	La CREG n'a pas relevé d'hypothèses spécifiques formulées par Elia concernant l'évolution de la surface habitable des nouvelles constructions ou des rénovations, ni donc sur l'impact de cette évolution sur les volumes chauffables. En Belgique, une tendance récente montre une réduction de la superficie moyenne des nouvelles constructions, notamment dans les zones urbaines. Cette évolution est principalement attribuée à la pression foncière croissante, à la hausse des coûts de construction, ainsi qu'à une demande accrue pour des logements compacts et plus accessibles financièrement. Les appartements, qui dominent de plus en plus le marché des nouvelles constructions, illustrent particulièrement cette tendance. Dans ce contexte, la CREG recommande à Elia de préciser ses hypothèses concernant l'évolution des surfaces habitables et des volumes chauffables. Il est essentiel que ces hypothèses reflètent la tendance actuelle et celle anticipée pour la période 2026-2036, qui devrait être marquée par une poursuite de la diminution des surfaces des logements neufs et par des rénovations visant à améliorer l'efficacité énergétique.
CREG	Elia a retenu une hypothèse prudente selon laquelle seulement 10 % de la consommation quotidienne d'énergie peut être déplacée au cours de la journée, dans le cadre de la méthodologie détermination du « Pre-Heated Profile » estimant que modifier les habitudes de chauffage des habitations affectera la température intérieure. Elia peut-il confirmer que cette limitation ne s'applique pas à la méthodologie de détermination du « Market dispatch of Heat-Pumps » ? Les pompes à chaleur sont envisagées tant pour les nouvelles constructions que pour les rénovations. Dans le cas de bâtiments bien isolés, dotés d'une bonne capacité d'inertie thermique, il est envisageable de décaler davantage les cycles de fonctionnement de la pompe à chaleur, tout en préservant le confort des occupants. L'intégration d'un ballon tampon améliore également la flexibilité, notamment en ce qui concerne la production d'eau chaude sanitaire (ECS). Cette dernière offre un potentiel de flexibilité accru, car la température de l'eau peut être ajustée sur une plage plus large que celle du chauffage des espaces. Un article du Centre for Net Zero10 indique qu'une tarification basée sur l'heure de consommation pour les pompes à chaleur permettrait de réduire de moitié la consommation pendant la pointe du soir. Par ailleurs, la littérature scientifique11 montre que la production d'eau chaude sanitaire est hautement flexible, avec un potentiel de déplacement total de la consommation quotidienne. En ce qui concerne le chauffage des locaux, elle suppose que 20 % des foyers disposent d'une capacité de stockage thermique et d'une capacité de pompe à chaleur suffisantes pour leur permettre de consommer l'électricité nécessaire afin de répondre à leurs besoins quotidiens à tout moment de la journée.

	L'application d'une hypothèse trop conservatrice sur la flexibilité pourrait entraîner une surestimation de la demande de pointe en électricité. La CREG recommande donc d'adopter des hypothèses plus ambitieuses : - 20 % de la consommation journalière d'énergie pour le chauffage des locaux peuvent être déplacés. - 100 % de la consommation journalière liée à la production d'ECS peuvent être déplacés, en supposant la présence d'un ballon de stockage adéquat. Le CREG recommande d'appliquer ces hypothèses tant à la détermination du Pre-Heated Profile qu'au Market Dispatch of Heat Pumps.
ODE Vlaanderen	Feedback op appendix E 'heat pumps modelling' en $7.3 van het Scenario Document Vanuit het Warmtepompplatform binnen ODE Vlaanderen hebben we enkele opmerkingen en suggesties om het aandeel warmtepompen in appendix E verder te verfijnen. We houden daarbij reeds rekening met de bevindingen en opmerkingen gesuggereerd in de externe studie uitgevoerd door UGent. Warmtepompen hebben een essentiële rol in de energietransitie, en een accurate modellering is cruciaal voor het begrijpen van hun impact op het energiesysteem. 1. Aantal geïnstalleerde warmtepompen De aangenomen cijfers voor vervanging van individuele installaties ligt in de Adeflex studie lager dan wat werd opgenomen in de WPP visietekst 2024 (zie onderstaande figuur). Op basis van een extrapolatie van huidig beleid (lichtblauw) wordt daarin een ratio van 30% in 2030 bekomen, conform de Elia studie. Uiteraard zijn toekomstcijfers onzeker, grotendeels ten gevolge van het uitblijven van een taxshift die investeren in warmtepompen moet ondersteunen, maar ook door onzekerheid in de huidige bouw- en verbouwsector. De in het Vlaamse regeerakkoord aangekondigde taxshift, alsook de toename van warmtepompen (op hogere temperaturen) in renovatiecontext, doen verwachten dat de terugvallende markt in 2024 slechts een zeer tijdelijke fenomeen zijn. Uit sectorbevraging bij installateurs rond bijscholing van installateurs naar warmtepompinstallateur, blijkt een ambitieus traject naar 94% realistisch. Voor onderliggende aannames bij deze getallen verwijzen we naar WPP visietekst 2024. 2. COP warmtepompen De COP-curves in figuur E.2 dateren uit 2019. We adviseren dat deze gegevens worden nagekeken door de sector, gezien de technologische vooruitgang sinds die tijd. Er zou onderscheid gemaakt moeten worden tussen diepe renovaties (waar de COP-curve vergelijkbaar kan zijn met nieuwbouw) en beperkte renovaties (waarvoor de huidige curves realistischer lijken). Daarnaast sluiten we ons aan bij de opmerkingen die geformuleerd werden in de studie van UGent rond de zeer lage COP voor grondgekoppelde warmtepompen bij lage buitentemperaturen. We raden daarbij eveneens aan om voor deze curves niet de buitentemperatuur maar de grondtemperatuur te gebruiken, met een langzaam dalende temperatuur van 12°C naar 5°C.

	3. Realistisch gebruiksprofiel in basisscenario HP0 Het basisscenario HP0 maakt gebruik van een traditioneel gebruiksprofiel dat overeenkomt met fossiele installaties. Dit patroon sluit echter niet aan bij het operationele gedrag van warmtepompen, die beter functioneren bij een constantere warmtevraag. Bovendien worden warmtepompen, in tegenstelling tot systematisch over gedimensioneerde gasketels, volgens de regels van de kunst best kleiner gedimensioneerd om deellastverliezen te beperken. Wij zijn daarom van mening dat het profiel uit scenario HP1 realistischer is voor de gemiddelde warmtepompgebruiker die meer en meer inzet op eigenverbruik van PV energie en capaciteitstarief. Dit leidt voornamelijk tot een lagere vraag gedurende de avondpiek. 4. Elektrische weerstand UGent suggereert om in afwezigheid van betrouwbare data een sensitiviteitsscenario te berekenen waarin verondersteld wordt dat warmtepompen tijdens de koudste winterdagen gebruik maken van een elektrische weerstand van 1-3kW voor het leveren van piekvermogen. Hoewel toestellen typisch met hogere vermogens uitgerust worden, worden deze – mede met oog op capaciteitstarief –steeds vaker uitgeschakeld. Een beperkte back-up van 1-3kW lijkt ons daarom inderdaad een goede inschatting.  *Figuur 3: Modellering aantal warmtepompen bij de vervanging van individuele centrale verwarming in Vlaanderen op basis van het VEKP (rode lijn), een doorrekening van de huidige beleidsmaatregelen (lichtblauwe lijn) en de jaarlijkse statistieken van ATTB-Frixis en bevragingen bij installateurs en fabrikanten rond de bijscholing van installateurs naar warmtepompinstallateur (donker blauwe lijnen).*

ANSWER:

On the evolution of the amount of new dwellings

First, Elia would like to point out that, indeed, a reduction has occurred in new buildings for 2024 in Belgium. However, extrapolating the figures until 09/2024 to the rest of the year would give ~ 45.5 k new dwellings [STA-2]. This is above the 41k proposed. It is unclear whether this stark reduction is temporary or expected to remain and/or decrease further in the future.

We acknowledge that the increase in households slightly decreases in the Plan Bureau [FPB-4] figures, as mentioned by CREG. However, Elia believes that the assumed decrease from ~ 55k new dwellings per year historically to 41k

over the simulated period more than anticipates such evolution (lowest value since 2001). It must be noted that new buildings do not necessarily always take up new space, this figure also includes the demolition and rebuild of existing buildings. As can be seen in the Figure 11, taking the projected amount of households (green dotted line) form the Plan Bureau and applying the same historical relation between households and dwellings (black dotted line) would give values significantly higher than the ones currently proposed by Elia and far above the proposal of CREG:

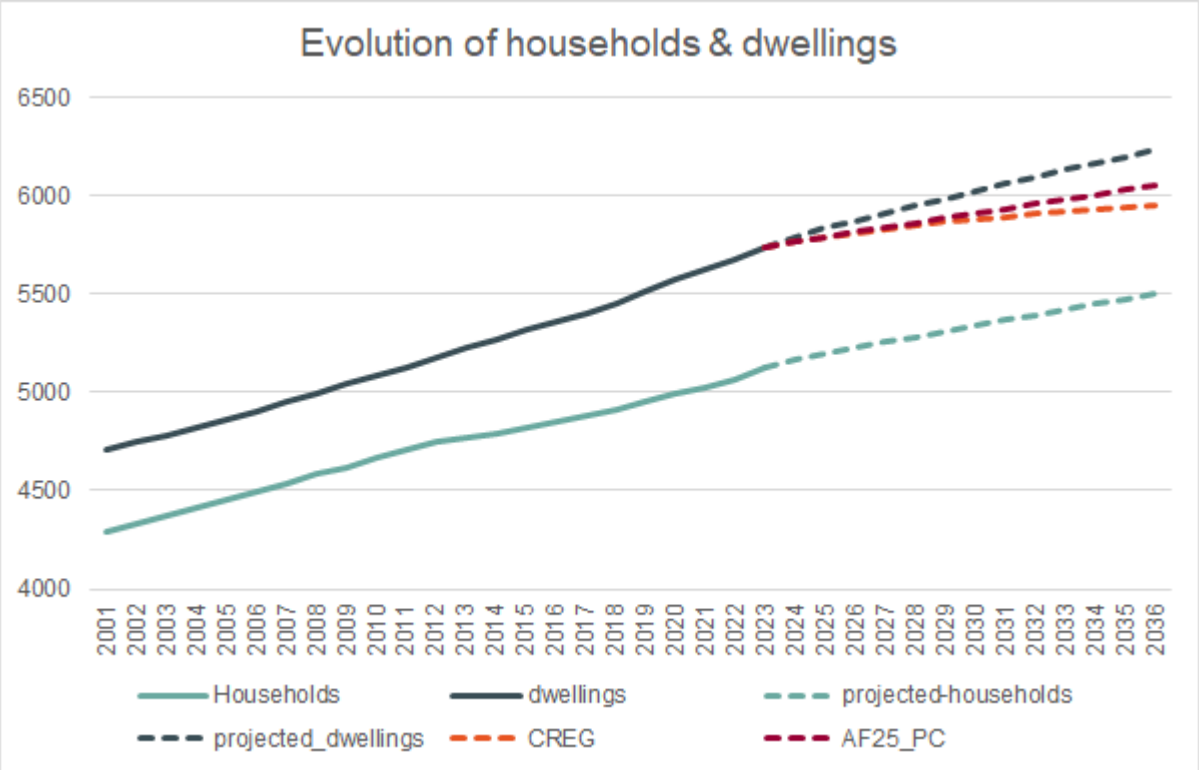


Figure 11 - Evolution of households and dwellings

The Flemish government has acknowledged that the recent reduction in the amount of new dwellings could pose problems in the housing sector and has founded a 'taskforce' to overcome this problem [VLR-1].
Therefore, Elia proposes to keep the value from the public consultation, as previously aligned with Fluvius. Acknowledging that in combination with the projection of the amount of households from the Plan Bureau this might lead to stress on the housing market.

On the assumed share of old appliances being replaced by a heat pump after renovations and/or end-of-life
Elia notes that CREG finds the assumptions too optimistic and ODE rather conservative.

- For the assumed amount of heat pumps in new buildings and renovations, a gradual increase towards the 2030 and 2035 values is assumed. No clear targets exist in terms of uptake of heat pumps in Walloon and Brussels region. However, it must also be noted that the revised Energy Performance of Buildings Directive

(EPBD) [EUC-6] from the EU needs to be translated into regulation by the regional authorities in Belgium. Amongst other elements, this directive aims to increase the amount of renovations, zero-emission new buildings from 2030, general phase-out of new fossil fuel boilers by 2040 and finally achieve a decarbonized building stock by 2050. Therefore, regional regulations accelerating the deployment of heat pumps can be expected in the near term in order to align with this directive.

- CREG argues that the EPBD is not yet enforced in legislation. Elia points out that the EPDB directive must be translated into national law by 30/05/2026 (Article 37, [EUR-1]). The assumption on 100% heat pump/district heating in Wallonia & Brussels is only assumed as from 2035, by then this directive must have been implemented on the regional level.
- ETS2, the European Union's Emissions Trading System covering buildings and road transport, may encourage the uptake of heat pumps in Belgium by creating a financial incentive for reducing carbon emissions. As ETS2 imposes a cost on carbon emissions from fossil fuel heating, households and tertiary buildings may seek more energy-efficient and environmentally friendly alternatives. By shifting to heat pumps, consumers can reduce their carbon footprint and potentially lower their heating costs in the long term.
- The Federal government agreement [LAW-1] foresees a decrease of the VAT on heat pumps from 21% to 6% and an increase from 6% to 21% for fossil fuel heating devices, which improves the business case for heat pumps as compared to fossil fuel alternatives.
- Furthermore, the new Flemish government has put forward a tax-shift from electricity to gas in order to incentivize the uptake of heat pumps [VLR-2].
- As pointed out by ODE, but also apparent from the study by the Federal Planning Bureau [FPB-3]. Under current policies, Belgium will not reach its emission objectives required to be in line with the European climate targets and/or to meet the new EPBD legislation. Indeed, under the current trajectory it must be noted that by 2035, still ~65% of heating appliances in existing buildings would still be replaced by gas boilers. Considering a lifetime of around 20 years, this means that still a significant share of the heating appliances stock in 2050 will be gas-based. Considering the limited amount of bio-methane potential in Belgium, this would mean that Belgium would still have considerable emissions remaining in the building sectors, which -in order to meet its objectives- would need to be compensated by negative emissions in other aspects of the Belgian energy system, such as via CCS etc. This outlines how conservative the current Heat Pump trajectory is in the 'Current commitments & ambitions' scenario considering the climate ambitions stated by the state.

In conclusion, Elia will **keep the uptake of heat pumps suggested for the public consultation** for the 'Current commitments & ambitions' scenario. At the same time Elia proposes two additional trajectories. One which includes a delayed uptake of heat pumps, building mainly on the argumentation of CREG, and one including an accelerated uptake of heat pumps which would allow the sector to reach its climate objectives as put forward by ODE. The accelerated trajectory is applied in the 'Prosumer Power' scenario and the lower evolution in the 'Constrained Transition'.

Regarding the COP curves for heat pumps

CREG and ODE have put forward some questions regarding the COP curves used for heat pumps.

Elia thanks CREG for sharing the computed COP curves and proposes to use these for the calculation of heat pump demand. Elia currently lacks quantified data and/or studies to confirm that heat pumps would increase in efficiency and proposes to use the COP curves as proposed by CREG for the whole simulation perimeter.
As suggested by UGent and ODE, Elia will correct the source temperature for ground-source heat pumps and use a seasonal temperature profile which starts at 12°C at the beginning of the heating season and reduces to 2.5°C at the end of the heating season. This resembles that fact that although the ground temperature is mainly stable over the year, the more heat is sourced from the ground supply, the lower this temperature becomes during the heating season [SCI-1].
The efficiency of the air-sourced heat pumps depends on the average daily ambient temperature. CREG mentions that the hourly temperature should be used instead. However, Elia wants to stress that the modulization of flexibility leads to different daily consumption profiles. Using hourly temperatures, would require to recompute the heat pump consumption during the market modeling step, each time flexibility is activated as it shifts consumption to hours with different temperatures. This is unfortunately not feasible within the current modeling set-up and would require a strong increase of the complexity which is not possible to combine with the complexity of the other parts of the model.

Regarding expected flexibility from Heat Pumps

Elia notes CREG's comment on the % of energy that can be shifted daily. Elia has suggested to assume 10% as a conservative approach for local profiles, to consider all types of heat pumps. The CREG suggests to use a paper from the Centre of Net Zero, that apparently mentions 20% of households with a heat pump to be equipped with a hot water tank, that would allow to fully flexibilize their energy consumption. However, Elia would like to mention that this could only apply to: (i) hydronic heat pump (Air-water, ground-water) where a large share of the heat pump fleet in Belgium are Air-Air heat pump, and (ii) that this represents the English heat pump stock and building stock, which might not be representative for Belgium.
Elia recognizes that there are no studies at this stage for the Belgian heat pump fleet / building stock. There is however one paper studying 20 residential buildings in Denmark being well-cited (+/- 100), which identify to reduce peak consumption 5% with a mean daily shifted energy of 11% [IEE-1], with no mention of specific house insulation or type of heat pumps. **Hence Elia will keep the 10% figure, without further applicable study, but will run a sensitivity on 20% flexibility from heat pumps.** The reader should however note, that no scientific paper known to Elia backs this claim for all type of heat pumps, and hence this is similar to making assumptions regarding parameters increasing the flexibility from heat pumps, such as (i) greater insulation levels for building stocks, (ii) greater number of hydronic heat pumps (with a hot water storage tank) compared to air-air heat pump (which are the primary units being installed in Belgium.

Heating surface (CREG) and heating demand

CREG questions what heating surface Elia takes into account in the simulated period. It must be noted that Elia differentiates heat pumps based on following characteristics:

- Sector: residential/tertiary
- Building state: new/renovated

For the combination of sector and building state, each year a certain amount of heat pumps are added with a fixed heating demand/unit. This means that the average heating surface is not an explicit parameter in the calculation. Elia uses averaged heating demand for those building types, based on historical measurements from Fluvius. For the residential sector, those values are also close to what is assumed by CREG in their 2024 study (Table 1) [CRE-1] .
To implement such a parameter, one would need to know the average heating surface related to those measurements and the expected evolution in the future per building type – both of which Elia lack as a data input. CREG mentions that recent trends show a reduction in the average surface area of new buildings, however the share of apartments in the amount of new dwellings has remained relatively constant since 2010, as derived from [STA-2] and illustrated in Figure 12:

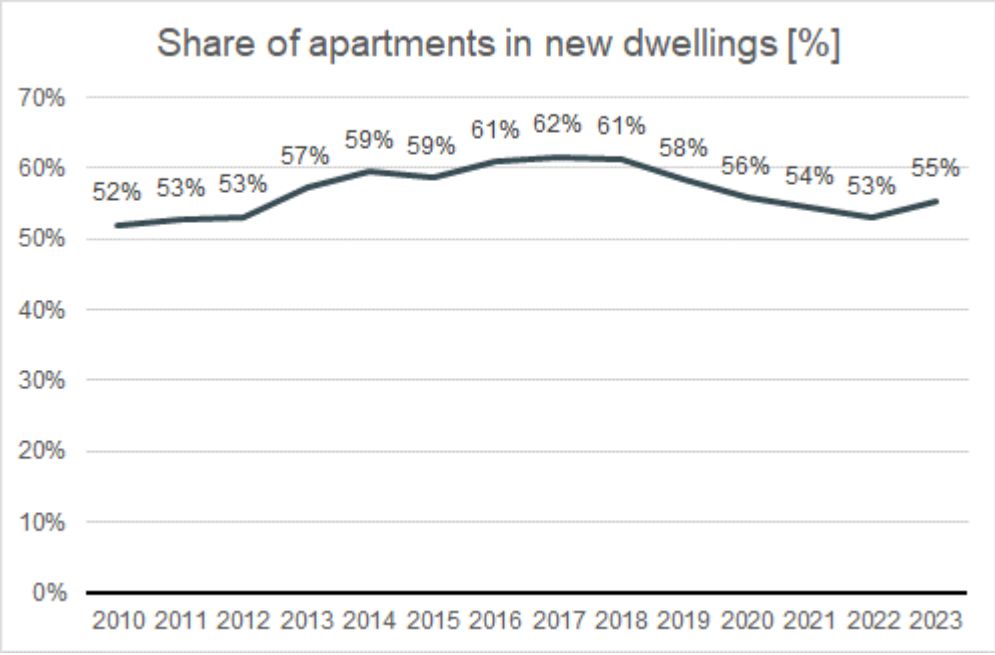


Figure 12 - Share of apartments in new dwellings

As questioned by CREG, Elia confirms that for the derivation of the daily heating needs, the temperature used as independent variable is defined as the 'equivalent' temperature: T_{eq} = 0.6x Td+ 0.3 Td-1 + 0.1Td-2, where Td is temperature of the current day, Td-1, Td-2 the temperatures of one, respectively two days prior. This is done to consider potential inertia in buildings. This is aligned with what is done at Synergrid level for heating degree days [SYN-1].
To compute daily heating demand, Elia indeed uses linear regression curves obtained via Fluxys measurement. Heating behaviour might indeed have changed, but this will mainly impact the annual heating demand and/or the intraday supply of heat (i.e. the hourly heating profiles), whereas these linear curves are only used in a relative way.

Regarding the profile used (ODE),

Elia is aware that heating profiles of gas and electric appliances would be different, due to different technical characteristics. However, as recognized by the UGent in their review of Elia's Heat Pump assumptions, such data for heat pumps are scarce. Hence, for lack of a better source, Elia uses historical profiles from Belgian residential gas appliances as a proxy. Any historical data source from Belgian heat pumps are welcomed to improve the study.

Electric resistance heater as back-up for heat pump (ODE)

In the main scenario, Elia does not consider an electric back-up heater used in heat pumps. This means that electric consumption of heat pumps follows simply the COP curve. One could indeed argue that back-up resistance heaters might be activated during very cold temperatures to deliver the heat supply in case the capacity of the heat pump is insufficient, potentially leading to an underestimation of the peak demand under current assumptions. On the other hand, Elia also implicitly assumes that all heat pumps in Belgium are capable to meet daily heating demands during all conditions, which might be an over estimation. Taking both effects in combination, Elia argues to keep the current way of modeling electric heat pump demand.

UGent performed an analysis of the back-up heater in the note accompanied in the public consultation and concluded: *"As long as these uncertainties persist, it is extremely challenging to make any strong claims about the role of back-up resistance heaters in the future Belgian heat pump fleet, and how they may impact the electricity demand we should expect from this fleet during a rare cold-spell with extreme sub-zero temperatures."*

Therefore, Elia proposes to analyse the impact of this with a sensitivity where heat pumps would indeed be supplied with a back-up electric resistance heater. This was also suggested by UGent.

7.2.6. Electric vehicle

In the AdeqFlex'25, three main scenarios will be analyzed. Here are the main elements for the assumed trajectories of EV.

Constrained transition:

Cars and vans: 100% BEV sales for company cars from 2030 but more PHEV in the period 2025-2029. Delay of 100% BEV for private cars and vans to 2040 (assuming delay in EU regulation of fossil fuel ban),

- Trucks: slower uptake with 23% BEV truck sales in 2030 and 44% in 2035, finally reaching 90% BEV trucks sales from 2040.

Current commitments & ambitions:

- Cars and vans: 100% BEV company car sales from 2030 (some PHEV sales remaining in 2025-2029). Private cars and vans reaching 100% BEV sales from 2035
- Trucks: 40% BEV trucks sales in 2030, finally reaching 90% by 2036

Prosumer power:

- Cars and vans: 100% BEV sales in all segments (company and private), assuming purchasing cost parity with ICE vehicles is reached by 2030.

- Trucks: 60% BEV truck sales in 2030, 100% BEV sales from 2035 for trucks.

In addition, the same evolution of total vehicle sales and stock (all fuel types) are assumed in all scenarios. An overview on how the trajectories are considered for the electric vehicles in the 3 scenarios is given in Figure 13, with a detailed breakdown for the Current Commitments scenario.

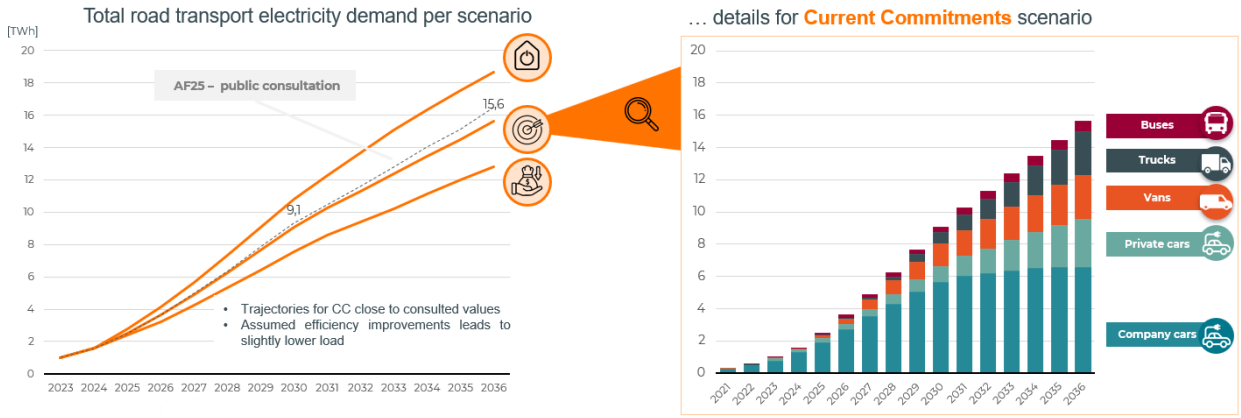
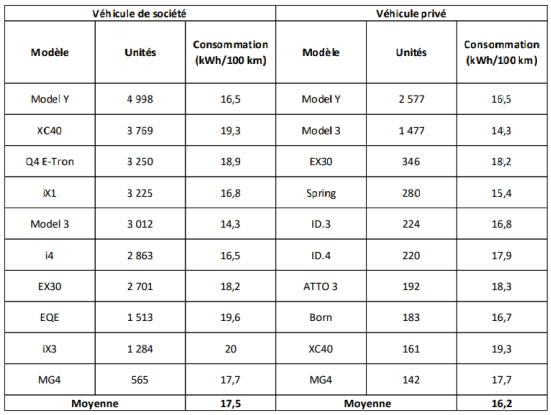


Figure 13 - Total road transport electricity demand per scenario with details for Current Commitments scenario

STAKEHOLDER	FEEDBACK RECEIVED
CREG	Elia considère actuellement une consommation moyenne de 19 kWh/100 km pour les voitures électriques en Belgique, tant pour les véhicules de société que pour les véhicules privés, et ce, pour toute la période 2026-2036. Cette estimation repose sur une moyenne arithmétique des consommations disponibles dans l'Electric Vehicle Database. Elia considère actuellement une consommation moyenne de 19 kWh/100 km pour les voitures électriques en Belgique, tant pour les véhicules de société que pour les véhicules privés, et ce, pour toute la période 2026-2036. Cette estimation repose sur une moyenne arithmétique des consommations disponibles dans l'Electric Vehicle Database. La CREG s'interroge toutefois sur la pertinence de cette augmentation par rapport à l'étude 'Adequacy & Flexibility 2024-2034', ainsi que par rapport à l'hypothèse retenue pour le scénario de référence pour les enchères CRM de 2025, où Elia avait retenu une consommation moyenne de 18 kWh/100 km. À ce jour, environ 85 % des voitures électriques immatriculées en Belgique sont des véhicules de société. Ces voitures, généralement plus grandes et plus lourdes que les véhicules privés, affichent une consommation plus élevée. Par ailleurs, l'offre actuelle de voitures électriques est

	dominée par des modèles volumineux, notamment des SUV, qui, en raison de leur poids important, sont caractérisés par des consommations énergétiques élevées. Une analyse des immatriculations des six premiers mois de l'année 20243, couplée aux données de consommation par modèle issues de l'Electric Vehicle Database, révèle les consommations moyennes suivantes : - pour les véhicules de société : 17,5 kWh/100 km; - pour les véhicules privés : 16,2 kWh/100 km; - pour l'ensemble des véhicules : 17,3 kWh/100 km. Ces données montrent que la consommation moyenne des véhicules privés correspond à environ 93 % de celle des véhicules de société. La CREG recommande de calculer la consommation attendue non pas sur la base d'une moyenne arithmétique, mais sur base d'une moyenne pondérée des nouvelles immatriculations. Cette approche donne une estimation de 17,3 kWh/100 km, légèrement inférieure à celle de l'étude 'Adequacy &Flexibility 2024-2034', ce qui reflète les améliorations d'efficacité énergétique des constructeurs. La CREG propose également de différencier les consommations attendues pour les véhicules de société et les véhicules privés, en retenant pour 2024 les valeurs suivantes : - véhicules de société : 17,5 kWh/100 km; - véhicules privés : 16,2 kWh/100 km. Les données détaillées sur les immatriculations et consommations moyennes par modèle sont présentées ci-dessous (voir figure 2 à droite) Pour les années à venir, les constructeurs annoncent deux tendances majeures : - Une diversification de l'offre, avec davantage de véhicules plus petits et donc moins énergivores ; - Une amélioration de l'efficacité énergétique des véhicules électriques. Par conséquent, il est raisonnable d'anticiper une diminution progressive de la consommation moyenne des voitures électriques en Belgique. À titre de comparaison, le Bilan prévisionnel 2023-20355 de RTE prévoit une baisse de 15 % de la consommation moyenne à l'horizon 2035, par rapport à une base de 19 kWh/100 km en 2023. Afin de mieux refléter ces évolutions, la CREG propose à Elia d'ajuster les projections pour 2036 comme suit: - Véhicules de société : 16,3 kWh/100 km ; - Véhicules privés : 15,1 kWh/100 km. Pour la période 2026-2036, la CREG recommande de modéliser une réduction progressive à partir des consommations actuelles estimées (17,5 kWh/100 km pour les véhicules de société et 16,2 kWh/100 km pour les véhicules privés) afin de refléter cette baisse anticipée.

Véhicule de société			Véhicule privé		
Modèle	Unités	Consommation (kWh/100 km)	Modèle	Unités	Consommation (kWh/100 km)
Model Y	4 998	16,5	Model Y	2 577	16,5
XC40	3 769	19,3	Model 3	1 477	14,3
Q4 E-Tron	3 250	18,9	EX30	346	18,2
iX1	3 225	16,8	Spring	280	15,4
Model 3	3 012	14,3	ID.3	224	16,8
i4	2 863	16,5	ID.4	220	17,9
EX30	2 701	18,2	ATTO 3	192	18,3
EQE	1 513	19,6	Born	183	16,7
iX3	1 284	20	XC40	161	19,3
MG4	565	17,7	MG4	142	17,7
Moyenne		17,5	Moyenne		16,2

Figure 2 : Immatriculations et consommations moyennes (sources : Febiac et ev-database.org)

CREG	La FEBIAC a recensé 1 320 000 voitures de société et d'indépendants pour l'année 2022. De son côté, Elia prévoit que ce chiffre atteindra 1 563 000 véhicules en 2030, soit une croissance annuelle moyenne de 1,2 %. Bien que cette hypothèse puisse sembler conservatrice au regard des tendances des dernières années, plusieurs éléments pourraient freiner cette progression. Tout d'abord, la transition vers les véhicules électriques pourrait réduire la demande globale de voitures de société, tandis que le passage progressif des voitures de société traditionnelles à des budgets de mobilité alternatifs pourrait favoriser l'essor d'autres moyens de transport ou de solutions partagées. Par ailleurs, l'avantage fiscal accordé aux voitures salaires, qui représentait 595 000 véhicules en 2023, est régulièrement remis en question. La suppression de cet avantage réduirait significativement le nombre de voitures de société, rendant incertaines près de la moitié des estimations avancées par Elia. Ainsi, bien que les prévisions d'Elia soient basées sur des tendances passées, les incertitudes liées à la fiscalité, aux politiques de mobilité durable et à la transition énergétique introduisent des risques significatifs quant à la réalisation de ces objectifs.
CREG	Elia table également sur une adoption rapide des voitures électriques (VE) et hybrides rechargeables (PHEV). Cependant, cette transition fait face à de nombreux défis. En Belgique, les calendriers initiaux pour l'interdiction des véhicules thermiques et l'instauration de zones zéro émission ont subi d'importants retards. À Bruxelles, par exemple, l'interdiction des véhicules diesel Euro 5, prévue pour 2025, a été repoussée à 2027 en raison des contraintes économiques qui freinent le remplacement des véhicules polluants par les ménages (Moniteur Auto). En Wallonie, l'idée d'une zone zéro émission généralisée a été abandonnée, et sa mise en œuvre a été reportée indéfiniment, au profit de solutions locales ciblant principalement les grandes villes. Ces retards s'ajoutent aux incertitudes concernant la fin de la commercialisation des véhicules thermiques, initialement prévue d'ici 2030 dans plusieurs régions. Ces obstacles risquent de ralentir considérablement la transition vers les voitures électriques, en particulier pour les véhicules privés.

	Malgré des efforts notables pour développer le réseau de bornes de recharge publiques et privées, la croissance de l'infrastructure reste insuffisante pour répondre à une adoption rapide des VE. La CREG souligne que cette limitation constitue un frein majeur à l'électrification du parc automobile, notamment pour les particuliers. Par ailleurs, bien que le coût des batteries ait baissé ces dernières années, le prix d'achat des VE demeure un obstacle important pour de nombreux ménages. Selon la FEBIAC, cette barrière économique explique en grande partie la réticence des particuliers à adopter ces véhicules, surtout en comparaison des coûts des véhicules thermiques. En outre, les incitants financiers, qui jouent un rôle crucial dans l'accélération de cette transition, connaissent des réductions importantes. Par exemple, le gouvernement flamand a annoncé la suppression de la prime pour les VE dès novembre 2024. L'absence de mesures incitatives à long terme pourrait donc compromettre les prévisions optimistes d'Elia concernant l'adoption des VE. Face à ces constats, Elia a ajusté ses prévisions à la baisse pour les VE et PHEV rechargeables privés d'ici 2030, mais a simultanément augmenté ses projections pour les véhicules de société. Cette compensation est jugée injustifiée par la CREG, qui considère que les nombreux retards et obstacles structurels remettent en cause ces estimations. Sur la base des éléments exposés ci-dessus, la CREG réitère sa recommandation d'ajuster les prévisions concernant les véhicules électrifiés à un niveau plus réaliste. Pour 2030, elle propose une estimation de 1 450 000 véhicules électriques (VE) et 280 000 véhicules hybrides rechargeables (PHEV). En ce qui concerne 2036, la CREG recommande également une révision des projections, en fixant les chiffres à 2 295 000 VE et 98 000 PHEV. Ces ajustements tiennent compte d'une adoption plus progressive des véhicules électrifiés, en raison de contraintes liées au développement des infrastructures et à la disponibilité d'incitants. Par ailleurs, la CREG rappelle que l'Arrêté ministériel du 2 octobre 2024 déterminant le scénario de référence pour les mises aux enchères T-4, T-2 et T-1 de 2025, considérant que les objectifs régionaux en termes de voitures électriques sont ambitieux et que le gestionnaire de réseau surestime leur impact tandis que la commission le sous-estime; considérant que la commission considère une baisse de la croissance des véhicules électriques due au report des zones à basses émissions, au retard du déploiement des bornes de recharge et aux prix élevés des voitures électriques mais que néanmoins le nombre d'immatriculations de ces véhicules continue sa progression en Belgique selon l'Association des Constructeurs européens d'Automobiles malgré un climat mondial défavorable ; considérant que le résultat final de cet exercice est de l'ordre de grandeur de la moyenne entre les deux recommandations,retient une estimation intermédiaire entre les prévisions d'Elia et celles de la CREG, soit 1 604 950 VE et 298 550 PHEV pour 2030.
FEBEG	FEBEG noticed that Elia adjusted downward the expectations regarding electrification and the related increase of demand in the coming years compared to the former AdFlex study. Although

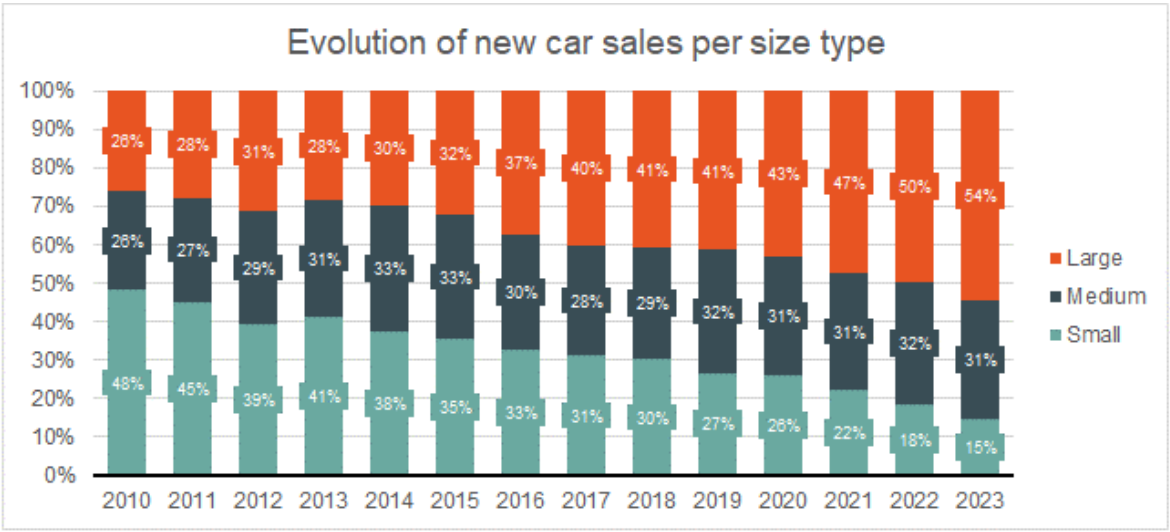
	the past few years show a declined electricity use, FEBEG wants to point out that the electrification is only starting to pick up. The sale of BEVs is high in Belgium and can be assumed to grow further since on top of the company cars, cheaper models will reach the market in the coming years, which will drive the growth in the private car segment. Combined with evermore professional BEVs coming on the market, the assumptions could be on the lower end.
Febeliec	Also, efficiency of existing demand should be shown explicit (the historical rate and the estimated future rate). Finally, Elia considers that a PHEV drives about half on its battery. This is optimistic and should be examined to what level this needs to be lowered.
Fluvius	Weliswaar zien wij in de basisgegevens een verschil in het geschatte aantal EV's in Vlaanderen voor de komende jaren. De onderling afgestemde basisgegevens landden op een hogere schatting. Wij begrepen inmiddels van Elia dat - in het hier geconsulteerde adequacy scenario – de verwachting van het aantal EV naar beneden werd bijgestuurd op basis van andere stakeholderfeedback aan Elia. Wij hebben tot nu toe nog geen signalen gekregen dat de Vlaamse stakeholders ook achter deze bijsturingen staan.

ANSWER:

On the comments regarding the considered efficiency of BEV cars (kWh/100km).

CREG finds the value of 19 kWh/100 km too high

- It must be noted that real world EV consumption is higher than the manufacturer stated (WLTP) numbers [TNO-1].
- The manufacturer stated (WLTP) efficiency calculated from a battery to wheel conversion. However, from a grid perspective it shouldthe efficiency from charging pole to wheels is the relevant metric. This will include charging losses in the battery, battery inverter and charging pole. Based on [ICC-1] these charging losses range between 7% and 17.5% depending on AC or DC charging.
- Regarding **people drive less with an EV** than an ICE because the range is smaller. Elia currently has no clear data on this, one source from Bloomberg points out that this is on the contrary the case [BLO-1].
- There will be **EV efficiency gains**. The aerodynamics will probably still improve by adding diffusers etc. to lower air resistance drag. At a fundamental level however, the drag is proportional to the cross-sectional area and relates to the size of the car (see next point)
- People will **drive with smaller cars.** looking at some recent press releases [TRE-1] the trend shows the opposite. This is also confirmed looking at vehicle type sales as illustrated in the Figure 14, derived from [FEB-1]. This has a direct impact on EV efficiency (see previous point, cross sectional area).



Source: Febiac
Mapping of car segments to size categories:
Large = grandes familiales, limousines, grands breaks, grands monospaces, jeeplike, all-road, jeeplike moyens, grand jeeplikes
Medium = familiales moyennes, breaks moyens, coupes, cabrio, roadsters, ultra sportives, monospaces moyens, combipetits jeeplikes, indeterminés, inconnus
Small = petites urbaines, petites olyvalents, petites familiales, petits breaks, petits monospace

Figure 14 - Evolution of new car sales per size type

In the study by RTE [RTE-1], Elia does not find back this 15% reduction for the full vehicle stock as stated by CREG. Rather this statement can be found: “Dans le scénario «A - référence», la baisse de consommation kilométrique moyenne du parc des véhicules électriques légers est estimée à près de 6%. »

Taking all these factors together we propose to keep the 19 kWh/100km value but include a 6% energy efficiency improvement towards 2036 as done by RTE. The latter being based on technological improvements and aerodynamics. Elia proposes to include these gains not only for passenger cars, but also apply this to all other transport segments (vans, trucks and buses).

Febeliec argues that assuming 50% of kilometers driven by a PHEV in electric mode is too high.

Elia wants to clarify that this value only applies to the private car segment; for company cars this value is indeed much lower at around 15%. This is based on a study performed by the ICCT [ICC-2]. Note that such low electric usage of company PHEVs, leads to WLTP’s values that would actually make these vehicles lose their fiscal advantage [FLE-1].

On the assumed amount of company cars

CREG lists several elements which might slow down the amount of company car sales. Looking at the most recent trends and existing policies, Elia does not see clear indications as too why this value would stagnate or even decrease. Elia assumes 260k company car sales/year, which is for example lower than 2023 (328k) and 2024 (278k), and below the last 5 year average period including the COVID-19 and subsequent period which severely affected sales. The recent government has not declared any legislation which would results in a strong decrease in the absolute amount company car sales. Therefore Elia proposes to keep the trajectory in the Current Commitments scenario,

On the comments regarding the trajectories of passenger EVs.

CREG lists several reasons why it believes the trajectory as proposed by Elia is too high, whereas FEBEG and Fluvius find the assumed values too low.

- As a first point, Elia wants to bring to the attention that in its previous AdeqFlex studies the uptake of electric vehicles were underestimated (see Figure 15). Again, for 2024 FEBIAC reports ~128 000 BEV car sales, whereas in the trajectory put to public consultation Elia estimated this at only 107 000 units [FEB-2]. This demonstrates that EV uptake is happening faster than foreseen by Elia and many of its stakeholders.

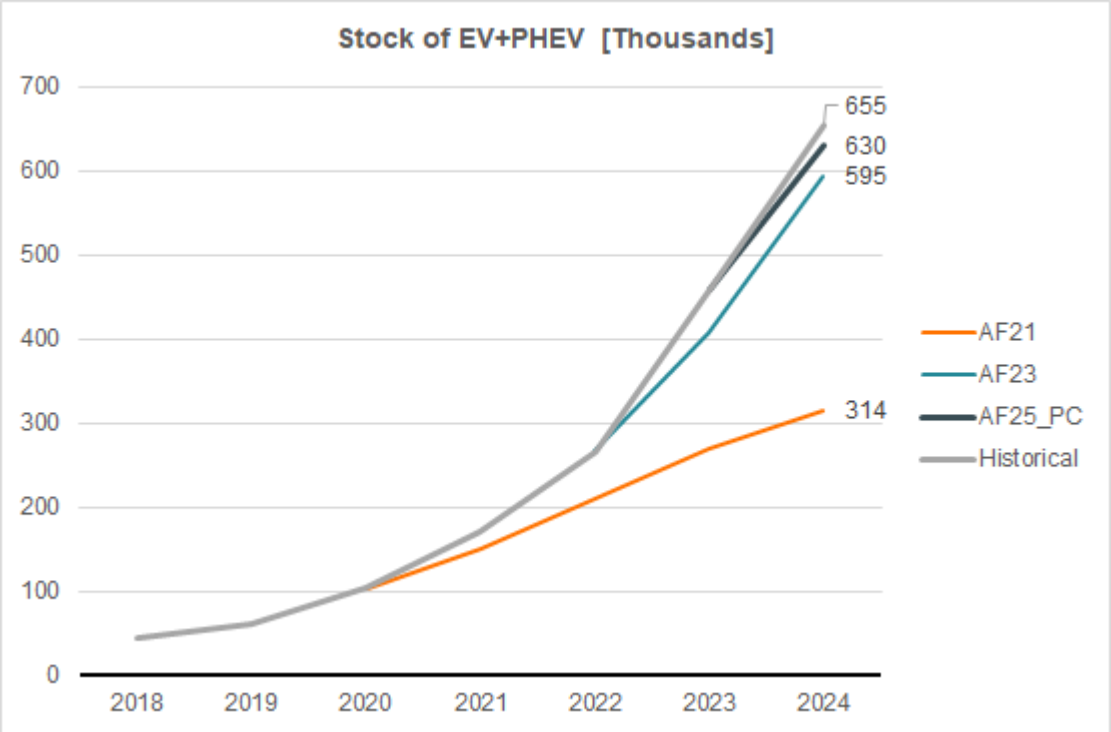


Figure 15 - Stock of EV+PHEV

- Indeed, Belgium is currently one of the frontrunners when it comes to EV uptake, with 28.5% BEV and ~15% PHEV cars sold in 2024. It is currently the 5th largest BEV market in Europe, [ACA-1].
- It must be noted that as from 2025, more stringent EU emission targets will be in place [EUC-7]. To reach these targets, the ICCT and T&E estimate that European BEV shares would need to increase from around 15% in 2024 to around 24-28% in 2025 [ICC-3] [TRE-2]. To reach these shares, car manufacturers might bring new and more affordable car models to the EU markets, which could also positively impact the Belgian private car market. In the long term, the ban of sales of fossil fuels cars by 2035 is still applicable and supported by most car manufacturers.

- Several delays in **ICE bans and LEZ** have happened since previous AdeqFlex'23. Elia acknowledges this but also points out that these are indeed taken into account in the trajectory. For example, Elia does still foresee ICE sales until 2035 in all regions for the private car segment, including the Brussels region.
- **On charging infrastructure,** CREG notes that the expansion of charging infrastructure remains insufficient to respond to a rapidly expanding EV fleet. Elia would like to point out that quantitative evidence suggest the opposite. An assessment by the European Commission [EUC-8] shows that, in 2024 Belgium has already reached nearly 300% of its charging capacity needs with relation to the amount of BEV and PHEV cars on the road as defined by the 'AFIR fleet-based target'. This is confirmed by the assessment by KU Leuven [TML-1]: *The numbers indicate that the provision of charging infrastructure already reached the targets set for 2025 and will be further enhanced by the large investments in this direction that are planned by the Flemish government"* [LAW-1]. The amount of (semi-)public charge points has doubled in 2024, strongly overshooting the ambitions of the Flemish government [DTI-1]. Relatively speaking, Belgium placed 5th in Europe 2024 when it came to public charge points being installed per BEV car and van [ICC-4].
- **On purchasing cost parity.** Already today, the average total cost of ownership of an EV is lower than that of an ICE car, mainly driven by the lower fueling costs [FPB-5]. Battery pack prices are the main driver of the purchasing cost of an EV. Prices of batteries stagnated in 2022-2023 following the post-COVID supply chain shortages. In 2024, battery pack prices have dropped again with 20% versus 2023, which is the highest relative decrease since 2017 [BLO-2]. It can be expected that these cost reductions will trickle down into EV costs in the coming years, as stated as well on the European Commission website [EUC-9]:*"This price drop accelerates the timeline for achieving price parity between EVs and ICE vehicles. The report forecasts that battery pack prices will fall below the $100/kWh benchmark by 2026—considered a critical tipping point for EV affordability. In China, where battery EV prices have already undercut their gasoline-powered counterparts, this milestone has been achieved ahead of schedule."* The new federal government agreement also foresees to study a mechanism which includes the "social lease" of electric vehicles, mainly targeted at low incomes workers [LAW-1].

FEBEG & Fluvius find the EV trajectory too low

- FEBEG expects cheaper EV models to come to market which will impact the private car market. Elia agrees with these expectations but still foresees the rapid breakthrough of BEV shares in this segment rather in the period towards 2030-2035, taking into account several challenges which were also raised by CREG.
- Regarding company cars, it must be noted that Elia already assumes >90% of new company cars to be BEV/PHEV by 2030 with a slight increase in the total yearly stock.

Taken all elements together, Elia proposes to adapt the trajectory such that latest 2024 sales are taking into account and will work with a high and low trajectories taking into account the arguments raised by the stakeholders. Additionally a 6% efficiency improvement for the full EV stock will be assumed for 2035 as compared to 2024, sensitivities on these can also be performed.

In conclusion, Elia proposes to keep the proposed uptake of electric vehicles as proposed during the public consultation for the scenario Current Commitments. At the same time Elia proposes two other scenarios. One which includes a delayed uptake of EVs (“Constrained Transition”), building mainly on the argumentation of CREG, and one including an accelerated uptake of EVs (“Prosumer Power”), based on the comments from FEBEG and Fluvius.

Elia Transmission Belgium SA/NV
Boulevard de l’Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

7.3 FLEXIBILITY IN BELGIUM

No specific comment has been received on trajectories for end-user or industrial flexibility, except suggestions of sensitivities. However, the end-user flexibility was updated based on latest data. The update has been carried out on number of smart meters and dynamic contracts, based on available data end-2024. The trajectories are available for the 3 scenarios, with varying levels of assets and flexibility unlocked, as illustrated in Figure 16.

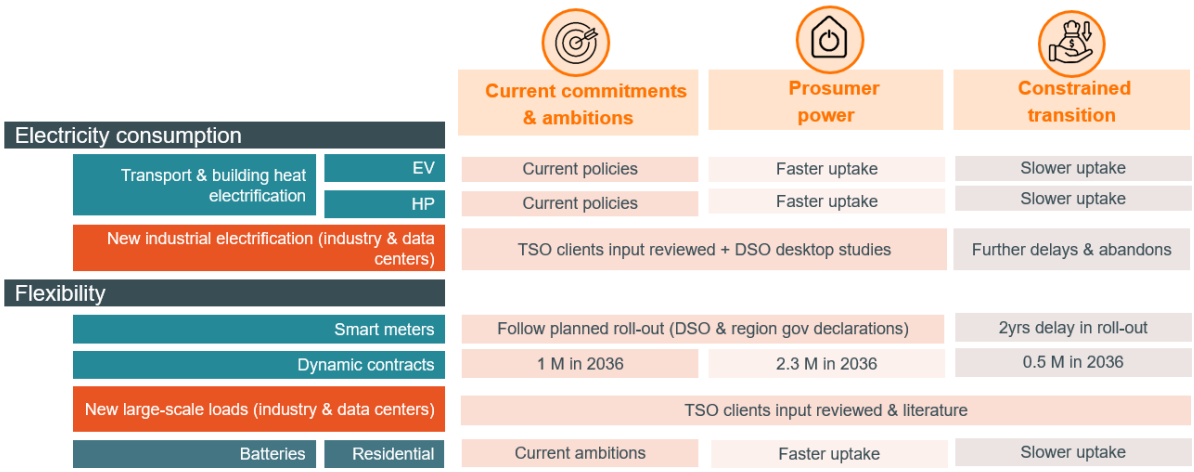


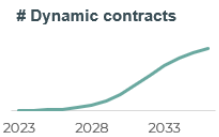
Figure 16 - Update of the flexibility

Flexibility from electric vehicles, heat pumps and home batteries had been further improved to account for regional specificities. The locally optimised profiles are therefore optimized for each day of the year based on the solar production and the associated local incentive (i.e. : regional tariffs).

EV charging profiles for home and for work & public charging (from metered data).

Local incentives considering **regional tariffs and PV auto-consumption**, for each day of every climate year.

Market optimisation with EV, HP and home batteries reacting on market prices through **dynamic contracts**.



Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

The smart meters trajectories have also been updated, based on installed numbers in december 2024. Also, a new trajectory has been built for the 'Constrained Transition scenario' which assumes a 2-year delay in the planned installation by DSOs. Those new assumptions are illustrated in **Error! Reference source not found.**.

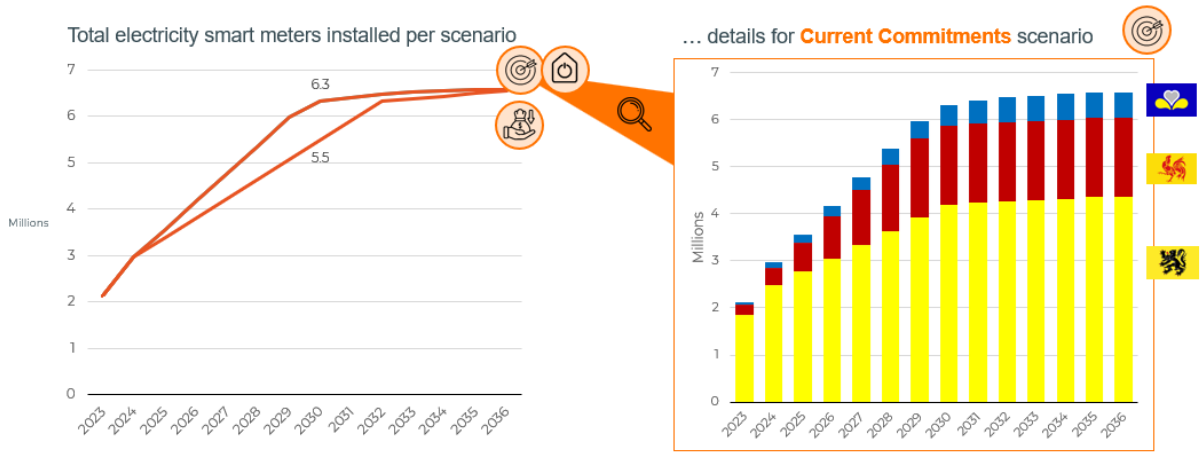


Figure 17 - Total electricity smart meters installed per scenario with details for Current Commitments scenario

The dynamic contracts trajectories have also been updated, based on latest numbers available (i.e.: amount of dynamic contracts in December 2024). We will do a reality check for 2024 on current numbers and assume trajectories with different level of consumer readiness. Those new assumptions are illustrated in **Error! Reference source not found.**.

Figure 18 – Assumed dynamic contracts per scenario

7.3.1. Storage

For clarity, the distinction is made between two type of batteries:

- Large-scale: TSO-connected batteries
- Small-scale: DSO-connected batteries, including both residential and batteries installed by companies (tertiary / industrial sector)

An update of the **large-scale batteries** scenario based on latest projects status has been performed. This leads to higher additional potential compared to the trajectory submitted to consultation. The same methodology is applied. The potential is then used as upper bound in the EVA. This evolution is illustrated in Figure 19. It is important to note that the resulting installed capacity for large-scale batteries will depend on the EVA results.

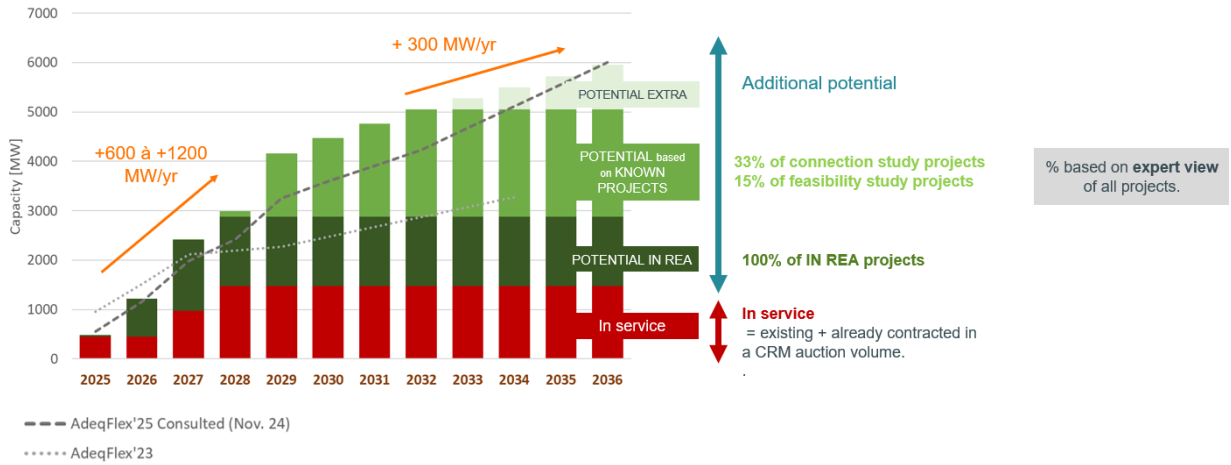


Figure 19 - Large-scale batteries evolution

A reduced trajectory will be considered in the Constrained Transition scenario, as illustrated in Figure 20. A lower growth rate for the potential assumed as from 2029 considering less study projects would be realized (lower CAPEX, grid limit due to lower grid investments, etc.).

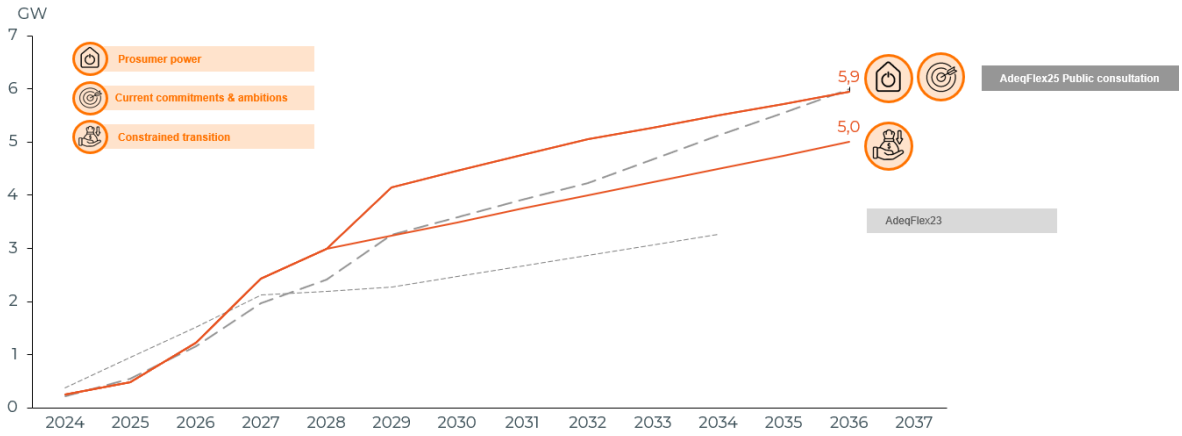


Figure 20 - Total potential for large-scale batteries for the scenarios

An update of the **small-scale batteries** scenario based on reality check of 2024 per region has also been performed. Additionally, three scenarios are now considered:

Constrained transition: considering lowest historical installation rate, assuming deteriorated macro-eco conditions and battery CAPEX not decreasing as expected.

Current commitments & ambitions: assuming an installation rate proportional to PV in Wallonia and Brussels, aligned with Fluvius for Flanders.

Prosumer power: considering increased installation rate, assuming large drop in CAPEX and governmental support, as well as incentive market (tariffs & dynamic contracts).

The new trajectories are illustrated in Figure 21. In addition, the share of flexibility has also been updated based on 2024 reality checks for dynamic contracts and smart meters trajectories

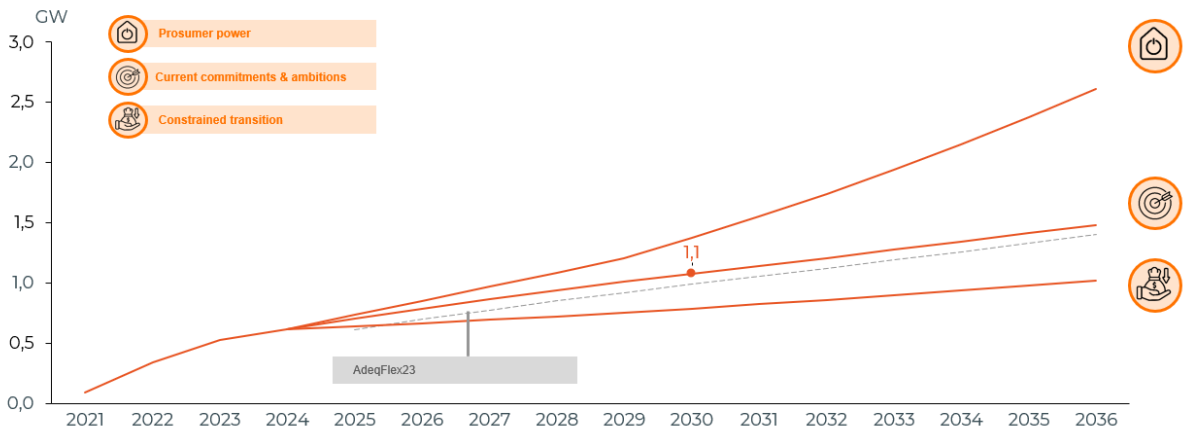


Figure 21 - Total installed capacity for small-scale batteries

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	FEBEG also observes high expectations in terms of large-scale storage capacities. We understand that these assumptions are based on expressed ambitions and plans based on projects known today at Elia. FEBEG wants to point out that while important amounts of battery capacities are in the pipeline we note that the connection to the grid might be more challenging than initially anticipated (we also refer to the on-going discussions regarding flex access and the EOS/EDS processes). Most importantly, next to the economic viability analysis, it is crucial to check the connection possibilities to the grid in the short and medium term for this important volume of expected large-scale batteries and the impact that this can have on the business case and thus realization of the projects.

ANSWER:

As a reminder, Elia would like to recall that a close follow-up of the many large-scale battery projects is performed by Elia. The total capacity assumed in this study look at the following categories:

- Existing
- New Batteries 'in realization'
- New Batteries 'connection studies'
- New Batteries 'feasibility studies'

For 'existing' and 'in realization' batteries, the full capacity is considered. This is also true for the already contracted CRM capacity for the future years. For the additional capacity from 'connection studies' and 'feasibility studies', the potential proposed already takes into account a percentage as not all projects will materialize. It therefore takes into account probability of realization, with respect to the permit, the material, the connection possibilities, etc.

Regarding the business case and the potential cannibalization of additional batteries, it is the aim of the economic viability assessment to ensure to account for profitable capacity.

7.3.2. DSR industry

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	Despite being adjusted downwards by 200 MW since the previous AdFlex study, FEBEG observes very optimistic assumptions on both existing capacity the evolution of market response capacity in Belgium. We wonder if this rapid growth in DSR will in fact be realized taking. Consequently, we consider that Elia should be more prudent when extrapolating future DSM volumes. A too-optimistic view on these volumes could undermine perceived risks in terms of security of supply.

ANSWER:

Elia would like to remind that the DSR trajectory is made of the existing DSR, that is assuming to stay, together with additional potential. This additional potential will be considered if deemed economically viable after economic viability assessment.
The increase in demand side response comes mainly from new electrification of load. And regarding the latter, Elia notes the FEBEG's comment, and a downward sensitivity will be realized on industry flexibility.

7.3.3. Flexible access

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	In regards of the availability of flexibility, FEBEG wants to point out that the ongoing discussion on the design of the framework for flexible access agreements and connections bares into it many risks and uncertainties. The current framework proposals, along with the expected implementation and related consequences, jeopardize the development of at least part of the flexibility and storage volumes that Elia relies on in its AdFlex study. Until the market parties and elia agree on a framework that works for both, FEBEG asks Elia to be prudent in assumptions of the contribution of some of the technologies to fulfill the flexibility needs. FEBEG therefore asks Elia to take this into consideration in the ongoing discussions about flexible connections since this study, once more shows the importance of a well designed framework to ensure future capacities to contribute to all aspects of a working energy system and the market.

ANSWER:

Connections with flexible access might impact the market and introduce additional uncertainties to the energy system modelization.
First, Elia would like to note that the impact on adequacy results is expected to be limited. It was demonstrated in past studies that scarcity situations in Belgium mainly happen in case of low RES infeed or low imports capabilities while most of flexible access activation are negatively correlated to those variables. This correlation is proposed to be further analyzed in this study.

Second, the impact on flexibility needs remains uncertain and not straightforward in terms of modelling. Therefore, Elia proposes to not integrate it in the main scenario as the impact remains uncertain but to introduce a sensitivity on batteries availability to represent what the impact might be.

7.4 ECONOMIC AND TECHNICAL VARIABLES

7.3.4. Investment costs

Regarding the investment costs, no update has been performed (see reactions to the comments received below), except for the VOM values which will be adapted to fully align the ones used in the CRM framework (i.e. based on the ENTRAS study) [ELI-3].

STAKEHOLDER	FEEDBACK RECEIVED
CREG	Concernant la durée de vie économique des investissements (« investment economic lifetime »), la CREG recommande de prendre une durée de 20 ans pour l'éolien offshore afin de s'aligner avec les données du scénario de référence pour les enchères CRM de 2025.
CREG	Pour les CAPEX, Blueprint est souvent cité comme source des données. Or, Blueprint n'est pas la source primaire de ces informations. La CREG demande à Elia d'indiquer dans son rapport de consultation les sources initiales des données.

ANSWER:

Elia takes notes of the CREG comment on the 'investment economic lifetime' of offshore and will update it to 20 years to ensure alignment with CRM.

For the Blueprint study, Elia asked Compass Lexecon to do a market review for the costs of the energetic system. Hereafter is the list of reference used by Compass Lexecon to estimate the costs:
However, it's important to note that some technologies may experience further cost increases/decreases. Additionally, some of the sources referenced are a few years old. Therefore, relevant cost sensitivities, such as for the EVA, will be conducted when necessary.

Gas fired units			
Lazard	2023	[LAZ-1]	2023 Levelized Cost Of Energy+
Elia	2023	[ELI-4]	Adequacy & flexibility study for Belgium (2024-2034)
EC	2021	[EUC-10]	EU Reference Scenario 2020
EnergyVille	2023	[ENE-1]	PATHS 2050 - Scenarios towards a carbon-neutral Belgium by 2050
WEO	2023	[WEO-1]	Renewable Power Generation Costs in 2022
IEA	2020	[IEA-1]	Projected Costs of Generating Electricity 2020
Demand side response			

E-CUBE	2013	[ECU-1]	Etude des avantages que l'effacement procure à la collectivité et de leur intégration dans un dispositif de prime
Compass Lexecon	2017	[CLE-1]	Assessment of the impact of the Polish capacity mechanism on electricity markets
Ademe	2017	[ADE-1]	Evaluation du potentiel d'effacement par modulation de process dans l'industrie et le tertiaire en France métropolitaine
Battery storage			
NREL	2023	[NRE-1]	2023 Electricity ATB Technologies and Data Overview
Lazard	2023	[LAZ-1]	2023 Levelized Cost Of Energy+
Elia	2023	[ELI-4]	Adequacy & flexibility study for Belgium (2024-2034)
RTE	2021	[RTE-2]	Futurs énergétiques 2050
Pumped storage			
NREL	2023	[NRE-1]	2023 Electricity ATB Technologies and Data Overview
Elia	2023	[ELI-4]	Adequacy & flexibility study for Belgium (2024-2034)
Wind, solar, biomass			
NREL	2023	[NRE-1]	2023 Electricity ATB Technologies and Data Overview
EC	2021	[EUC-10]	EU Reference Scenario 2020
RTE	2021	[RTE-2]	Futurs énergétiques 2050
IEA	2020	[IEA-1]	Projected Costs of Generating Electricity 2020
EnergyVille	2023	[ENE-1]	PATHS 2050 - Scenarios towards a carbon-neutral Belgium by 2050
Lazard	2023	[LAZ-1]	2023 Levelized Cost Of Energy+
WEO	2023	[WEO-1]	Renewable Power Generation Costs in 2022
Elia	2023	[ELI-4]	Adequacy & flexibility study for Belgium (2024-2034)

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	FEBEG supports the assumptions taken in terms of price evolutions (consideration of the inflation based on IPP) but will let its members comment on the CAPEX level considered for the different technologies.
FEBEG	The CAPEX is based on the input data used for Elia adequacy and flexibility study of June 2023. CREG concludes that these data are outdated and proposes – based on submitted investment files and recent studies – to apply an overall cost increase of 20 %. First of all, FEBEG wishes to confirm that – based on recent offers received by market actors - the CAPEX for the different technologies – including large scale batteries – are substantially higher than the proposed CAPEX, even to that extent that an overall cost increase of 20 % is not sufficient.

	Secondly, FEBEG is of the opinion that the methodology is not transparent. Submitted investment files, based on offers received months ago, are not relevant for the current market circumstances. Thirdly, FEBEG considers it not realistic that there would be no CAPEX for any category of Demand Side Response, not even when significant volumes would be envisaged. For information – as FEBEG considers that these technologies should not be included in the limited list of reference technologies : - Regarding renewables, we like to share some insights as reported by EDORA in its answer to the recent consultation (July 2024) by SPW on the reference values used in the framework of the reform of the green certificates scheme: for onshore wind, CAPEX costs are in the range of 1700-2100 EUR/kW, and thus significantly higher than the estimations of CREG. For PV, CAPEX can be much higher according to the installation technology. - CAPEX of IC Gas Engine is underestimated.
FEBEG	The FOM for the different categories of Demand Side Response – in steps of 25 EUR/kW/year - seems very arbitrary and not backed up with an in-depth analysis.
Febeliec	1. Cost evolution of batteries. Febeliec would like to have more information on the cost evolution assumptions that Elia uses for batteries (home batteries, grid scale batteries). This cost evolution seems too pessimistic.

ANSWER:

Regarding FEBEG's comment on the EDORA's source, Elia has indeed not been able to trace back the numbers mentioned from EDORA's answer to SPW's consultation on either of their websites. Elia would like to invite stakeholders to join documents or detailed reference, to allow for analysis of the cited material. Therefore, Elia will keep the current values for CAPEX for all units. Note, that the values submitted to public consultation are based on a large literature review. However, Elia will also perform sensitivities on those in order to understand what higher/lower values could provide. Elia will also look for additional more recent sources to check whether a higher or lower sensitivity would make sense to be analysed in the EVA.

Regarding Demand Side Response CAPEX and FOM, Elia's numbers are based several study listed hereafter. Without better numbers being proposed in the consultation, Elia will keep we the current hypothesis. The FOM of the DSR is a proxy for the annualized CAPEX of additional existing DSR.

Author	Year	Titel or link
E-CUBE	2013	**130724-Annexe4-AvantagesEffacementCollectivite.pdf**
Compass Lexecon	2017	**euagenda.eu/upload/publications/untitled-108365-ea.pdf**
Ademe	2017	**Effacement de consommation électrique en France - La librairie ADEME**

Regarding Febeliec's comment on the battery costs, the cost of batteries presented include all the electrical equipment costs needed for the operation, as well as connection costs, land (those are not only EPC costs or battery cell costs) etc. Indeed it is important to consider CAPEX for the full project, and not only the battery cells itself. The final value has been defined after a benchmark of the following sources:

RTE	2024	Bilan prévisionnel 2023
CRM	2024	C2820FR.pdf
NREL	2023	2023 Electricity ATB Technologies and Data Overview
Lazard	2023	2023 Levelized Cost Of Energy+

7.5 GRID & FLOW BASED DOMAINS

MinRAM

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	FEBEG has taken note of the use of fixed RAM 70% for the entire European perimeter, however, as stated previously, FEBEG considers that the consideration of the minRAM 70% for all EU countries listed in the excel sheet is overly optimistic for several reasons. FEBEG members still observe a difficult and slow process to achieve anything near a dependable and universal application of the 70% as confirmed by ACER's monitoring activities on the evolution of cross-zonal capacities over the last years which has shown that a large share of EU TSOs are still far from fulfilling the minimum 70% requirement. It should be noted that ACER sees significant difficulties in achieving the structural and efficient fulfilment of the minimum 70% requirement across the whole EU by 20261. Furthermore, the assumption of a complete transmission grid availability in the winter period remains overly optimistic according to FEBEG. A non-complete grid will increase internal flows on network elements which will put under pressure the compliance with the so-called CEP rule of minRAM 70%. Finally, FEBEG considers that during moments of grid tension, TSO's ability to make the necessary adjustments to guarantee the 70% will be degraded. As such, there will be very limited probability that in such a context 70% will be achieved on all borders, even if the two previous comments would no longer be applicable. Therefore, FEBEG reiterates its view that a sensitivity should be integrated in the reference scenario that is more pessimistic by using RAM values lower than 70% rather than fixed RAM 70%.

ANSWER:

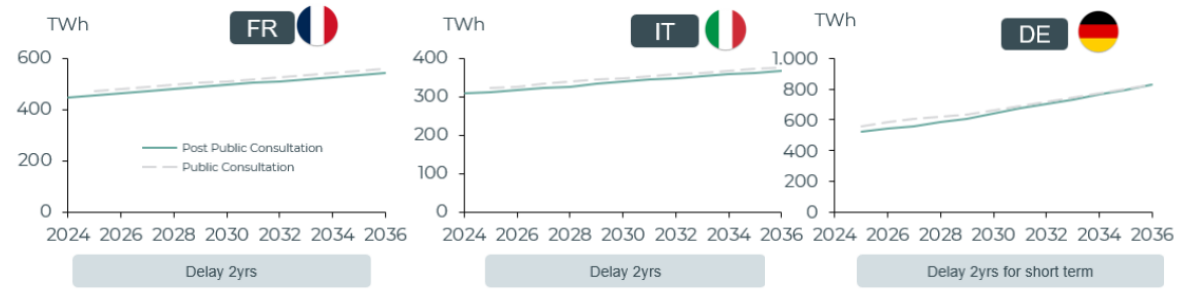
Elia is aware of the latest “2024 ACER’s Market Monitoring Report on Transmission capacities for cross-zonal trade of electricity and congestion management in the EU”, which was highlighted during the launch of the public consultation on the Adequacy Working Group of 5th November 2024. In particular, we remind of the relevant points mentioned during the Adequacy Working Group presentation, namely “Electricity Regulation” includes provisions to derogate or deviate (=validation step in capacity calculation) from the minimum 70% requirement, justified by the need to ensure the operational security of the grid.

Facts and figures are available in ACER’s 70% monitoring report” and “Candidate for sensitivity: a lower minimum available capacity assumption as proxy to model these differences”. To reflect the uncertainties of fulfilling the minimum 70% requirement, the proposed sensitivity to the reference scenario using RAM minMACZT values lower than 70% is in scope. Finally, flow-based domains are computed based on the impact of the flows on Critical Network Element (CNE) taking into account the N-1 criterion, i.e. a combination of CNE and contingencies (C) creating CNECs. This N-1 criterion ensures therefore that security of the grid is guaranteed all year long. To however reflect on the uncertainties of fulfilling the minimum 70% requirement, sensitivities will be performed.

Elia Transmission Belgium SA/NV
Boulevard de l’Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

7.6 DATA FOR OTHER COUNTRIES

Load trajectories have been updated, based on 2024 realized load consumption and bilateral discussions with TSOs. This leads to delays in public consultation trajectories, or lowered demand projections as illustrated in Figure 22.



*Based on (i) bilateral exchanges with TSOs, or (ii) Elia's own 2024 normalised estimate, based on EUROSTAT data, in the lack of official data
Values exclude electrolysers

Figure 22 - Load trajectories in France, Italy and Germany before the Public Consultation and updated

As in previous Adequacy & Flexibility studies, various sensitivities on international assumptions will be analyzed under the 'EU-SAFE' scenario. These will include factors such as the availability of French nuclear power, lower minRAM, and the lack of development of CRMs abroad. These events can significantly impact Belgium's capacity needs due to the country's high level of interconnectivity.

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	FEBEG also recommends Elia to carefully model the expected available capacity in neighboring countries in the short and medium term considering changing energy policies across Europe. FEBEG therefore firmly supports the need to include a sensitivity regarding the French nuclear availability in the reference scenario. France Due to Belgium's particular situation, the availability of interconnected capacity will be heavily dependent on the situation abroad, more in particular in France and Germany. We underline that uncertainties regarding the French nuclear units should be taken into consideration. Since France will have to rely more on imports to ensure its security of supply in case of lower nuclear availability, this will lead to higher transit flows on the Belgian network and thus heavily reduce the import possibilities for specific Belgian capacity needs and thus require more domestic capacities within the Belgian balancing zone to be available to guarantee security of supply in such cases. United Kingdom

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

	Concerning the possible extension for AGR plants, past experiences have demonstrated that making the necessary investments in nuclear plants and guarantee safety and the safety operations usually last much longer than initially expected. Since the extension of the plants is still uncertain, FEBEG fully supports that they are not considered in the base scenario. Including them is a sensitivity seems according to FEBEG premature and overly optimistic. Concerning the entry into service of Hinkley Point C nuclear power plant, we consider that the possible realization of the optimistic scenario where the unit would be available 1 year earlier as very unlikely.
Febeliec	Additionally, Febeliec asks that the future electricity demand in the rest of Europe is also significantly revised downwards, since the slower electrification pace is a European phenomenon. For example, the future electricity demand for Germany and Poland has not changed compared to two years ago. This is vastly overestimating the electricity demand.

ANSWER:

The European scenario framework is based on the latest ERAA24 dataset complemented with more recent data (if available). The process regarding the definition of the assumptions for the other EU countries modelled is:

- Starting point: European Resource Adequacy Assessment – Edition 2024 (ENTSO-E) – (not yet published)
- The ERAA2024 data package has been quality checked and corrected of mistakes if appropriate. Furthermore, in order to retain as 'most up-to-date' as possible data, ERAA2024 data and assumptions have been complemented by latest policies/published studies by TSO or relevant national authorities.
- In each case, Elia has discussed bilaterally with the relevant TSO on several data and assumption items, with special focus on demand, namely i) observed vs short term forecast, ii) mid to low term forecast, electrification, efficiency and load growth or decrease due to recent trends.

As highlighted in previous studies availability of French nuclear units is indeed one of the main drivers for relevant risks to Belgium's adequacy beyond Belgian control. For this study, Elia will use the RTE data as basis and consider different scenarios as well as several sensitivities on the French nuclear with less capacity available. This methodology improvement has been performed following among others the remarks from FPS Economy in the framework of the CdS.
In their latest Bilan Prévisionnel, RTE has considered different scenarios corresponding to 3 different levels of average yearly electricity generation: 330, 360 and 400 TWh. Those will be the basis for the calculations in this study. For the long-term period, the EU-BASE scenario from Elia will integrate the 'Cas de Base' from RTE (i.e.: 360 TWh). Given the impact of these assumptions on Belgian adequacy and the track record of French nuclear availability (e.g. common mode failures that happened in the past) several sensitivities will be performed and some integrated in the scenarios for this study (such as the EU-SAFE). The justification for lower nuclear availability can be supported by RTE's lower scenarios, such as the 'Variante Basse' 330 TWh. Additionally, RTE also considered a stress-test scenario with a

production of 280 TWh, which matches the observed production in 2022.These assumptions provide important elements regarding the definition of scenarios considering the availability of French nuclear units in the study where several sensitivities and scenarios will be accounted for as done in the past.

Considering risks related to the possible extension for AGR plants in United Kingdom, indeed while EDF has indicated plans to extend the lifetime of the final four stations, the decision is subject to regulatory approval and final investment decision. Elia also takes note on the feedback regarding Hinkley Point C. Elia will perform at minimum sensitivity on the realization of Hinkley Point C, following the 3rd scenario suggested by EDF: a 12 month further delay, with realization in 2031 (operational for winter 2031-32 [WNN-1][TGU-1]).

7.4. OTHER

STAKEHOLDER	FEEDBACK RECEIVED
Fluvius	Zoals bekend bereiden wij nu ons investeringsplan voor dat betrekking heeft op de periode 2026-2035. Dit plan zal publiek geconsulteerd worden in de zomer 2025. De eerste vergadering van dit stakeholderoverleg door Fluvius, in het traject voorafgaand aan de publieke consultatie, vond plaats op 4 december. Voor deze investeringsplannen is het van groot belang, en ook wettelijk verplicht, dat Elia en Fluxys onderling afstemmen over de gebruikte scenario's voor de bepaling van de investeringsnoden in de netten. In de voorbije maanden hebben Elia en Fluvius dan ook intensief overlegd over de basisgegevens en scenario's als startpunt voor het investeringsplan van Fluvius. Deze zien we ook als referentie voor de specifieke investeringsnoden in de koppelpunten en het hogerliggend net van Elia, tengevolge van de energiestromen van en naar het distributienet. Elia en Fluvius kwamen in dit onderling overleg tot afgestemde scenario's. Fluvius zal deze scenario's dan ook gebruiken als startpunt voor zijn stakeholderoverleg m.b.t. de investeringsplannen voor het distributienet in Vlaanderen. We stelden de grote lijnen van deze scenario's voor op het stakeholderoverleg van 4 december. Het scenario dat Elia nu consulteert voor de Adequancy and Flexibility Study heeft een ander doel, en is daarom volgens een andere redenering opgebouwd. We begrijpen dat Elia hiervoor één scenario uitwerkt dat zal dienen voor de raming van flexibel vermogen dat tegemoetkomt aan de noden voor adequacy en balancing in de komende jaren. Voor de scenario's die Fluvius zal consulteren voor de investeringsplannen vertrekken we daarentegen van verschillende scenario's (hoog, midden, laag) die we allen doorrekenen, om hieruit dan beste investeringsstrategie uit te bepalen. Een investeringsplan heeft immers tot doel om tijdig te investeren in de ontwikkeling van het net om te anticiperen op knelpunten die op bepaalde plaatsen kunnen optreden. In de uitwerking

	van een investeringsplan is het dan ook zinvol om meerdere alternatieve scenario's te bestuderen, en daarna te evalueren welk volume aan investeringen als "no regret" kan genoemd worden voor een vork van scenario's. De no regret investeringen wordt dan bepaald als het volume aan investeringen die: -voldoende zijn om te anticiperen op het hoge scenario en, -zeker niet overbodig in de toekomst richting 2050, ook in het lage scenario. Het hanteren van één scenario voor een investeringsplan laat niet toe om dergelijke redenering te volgen. Het scenario uit voorliggende consultatie is dan ook moeilijk vergelijkbaar met de onderling afgestemde scenario's voor het investeringsplan. Voor de investeringsplannen gaan we er van uit dat Elia de onderling afgestemde basisgegevens en referentie scenario's als uitgangspunt blijft nemen, die Fluvius heeft voorgelegd aan zijn stakeholders op 4 december. We hebben er ook vertrouwen in Elia blijft afstemmen met Fluvius over eventuele bijsturingen hierop, n.a.v. mogelijke reacties door stakeholders bij de consultatie over de investeringsplannen.

ANSWER:

Both Fluvius and Elia want to collaborate for the studies, whether it concerns adequacy study, investment plans, or other studies. It is in this context that exchanges and discussions on assumptions have taken place in the past months.

While Elia's previous main scenario was following the announced ambitions and policies, sensitivities have always been analysed both for adequacy and grid studies. In this year AdeqFlex study, three different scenarios have been developed for the evolution of Belgian assumptions. Not only the 'Current commitments and ambitions', but also a 'Constrained transition' and 'Prosumer power' scenario – see Section 5 for more information). In these scenarios, different levels of electrification but also of production and flexibility are assumed.

Between the time of Fluvius' reaction to the consultation and the writing of this report, Elia and Fluvius have agreed to continue their collaboration path to further discuss the scenario assumptions and sensitivities for the upcoming development plans. Similarly, discussions and exchanges will continue with the other Belgian DSO's.

8. Comments received on methodology

This section provides an overview of the reactions and concerns of market players that Elia received to the document submitted for consultation regarding the methodology.

8.3. GENERAL

STAKEHOLDER	FEEDBACK RECEIVED
ABOUSCO	**Commentaires sur la méthodologie** : Je trouve que la méthodologie employée pour l'étude est essentielle pour garantir des résultats fiables. Cependant, j'estime qu'il serait bénéfique d'inclure des approches comparatives avec d'autres pays qui ont fait face à des défis similaires. Cela pourrait enrichir l'analyse et offrir des perspectives supplémentaires sur la flexibilité nécessaire.
ABOUSCO	**Suggestions** : En complément des scénarios existants, je suggérerais d'intégrer des évaluations sur l'impact des nouvelles technologies, telles que le stockage d'énergie et la gestion de la demande. Cela pourrait offrir des solutions innovantes pour répondre aux besoins en flexibilité.

ANSWER:

Regarding the methodology coherence with approaches by other countries, we would like to remind that the EU Electricity Regulation 2019/943 and the subsequent ERAA approved ACER methodology define the methodological requirements for both European and National resource adequacy studies, with the idea of methodological coherence among adequacy studies.

We refer to chapter 2.7 “Improvements and compliance with the ERAA methodology” of the previous study [ELI-4] for further details.

Elia takes note of the suggestion regarding the impact of new technologies, such as energy storage and demand management“ and confirms they are already in scope as important drivers for the setup of relevant “Belgian sensitivities” within the study.

8.4. ADEQUACY STUDY

STAKEHOLDER	FEEDBACK RECEIVED
negaWatt	Comment 3: Modeling decentralized resources The treatment of decentralized resources, such as storage and demand response, in the adequacy study is overly aggregated, which introduces significant uncertainties about the flexibility these resources can provide. A more detailed and disaggregated representation would allow for a clearer and more accurate understanding of their future contributions. Particularly, the emerging role of energy communities deserves closer examination. These communities, through mechanisms like collective self-consumption, will most likely influence the demand curve substantially. Additionally, their potential to provide balancing and ancillary services to the grid represents a pivotal development that should be thoroughly evaluated. Incorporating these dynamics in a bottom-up manner into the modeling framework is essential to capture their limitations and properly evaluate the full spectrum of flexibility available in future scenarios.

ANSWER:

The impact of decentralized resources is indeed an important element. Elia already gives great attention to flexibility of the mentioned technologies in the methods and assumptions in the economic dispatch simulations. Elia refers to the assumptions on decentralized flexibility (market response, heat pumps, electric vehicles, home batteries) in the consultation document.

In a nutshell, Elia considers a couple of factors to influence energy use / consumption of these assets. Among these are the financial incentives / costs related to energy use. Instruments like regional tariffs and dynamic contracts, can incentivize consumption / production of energy at certain time of day, to either lower energy costs (eg: load netting for a capacity tariff, or consuming energy at hours with lower price rate), or maximise profits (eg: maximise PV auto-consumption). These are considered to optimize the energy profiles of these technologies.

So implicitly, the ability of energy communities to deliver flexibility is already considered through the mentioned technologies, incentives and modelling. Note that the study does not focus on the market mechanisms with which the energy and flexibility is brought to the system or market.

The capabilities of these technologies to deliver flexibility in intra-day and balancing markets (including ancillary services) is investigated with the short-term flexibility method and assumptions. Note that the study does not focus on the market mechanisms with which the energy and flexibility is brought to the system or market.

7.7 CLIMATE YEARS

STAKEHOLDER	FEEDBACK RECEIVED
CREG	La CREG s'interroge sur la pertinence d'utiliser des années climatiques synthétiques représentant un climat potentiel de 2025 alors que l'étude 'Adequacy & Flexibility' porte sur l'horizon 2026-2036. Compte tenu des évolutions climatiques rapides observées ces dernières années, il semblerait plus pertinent d'utiliser des années synthétiques représentatives d'un climat potentiel de 2030. La CREG est cependant consciente qu'une mise à jour de Météo France serait nécessaire pour qu'Elia puisse adapter l'année de référence, sachant que Météo France n'a actuellement généré des années synthétiques que pour les années cibles 2000, 2025 et 2050. La CREG suggère donc à Elia de vérifier si une actualisation des données à Météo France est disponible et d'utiliser ces données actualisées, si elles existent.
Febeliec	1. Climate database remains untransparent. Elia says it cannot supply the climate years in the climate database used to perform the simulations, due to confidentiality of the commercial data. This means the use of it lacks transparency. This could be easily solved if Elia would choose to perform the analysis based on the latest 30 climate years, an option that is foreseen in Acer's ERAA methodology. If Elia does not want to choose this option, it could perform additional simulations based on the latest 30 climate years, so it would be clear what impact the choice of the climate database has. It is to be expected that a simulation based on the latest 30 climate years would give more stringent capacity requirements than the use of the climate database, since the latter is forward looking and thus taking future climate change into account (lowering the need for capacity).
FEBEG	Simulating consistent meteorological risk factors (wind, PV, temperature) over the full geographical scope of a power system is the current state of the art in power system modelling. FEBEG therefore supports this approach. It guarantees that geographical and spatial correlations are correctly reproduced. These correlations have an important impact on adequacy analyses. They help to reproduce events like the Dunkelflaute, hitting multiple European countries, and pushing the power system to its limits. Among the 4 traditional climate change scenarios, RCP 8.5 is the

	most aggressive scenario, leading to the highest level of climate change. This scenario has become ever less probable because it implies extreme growth in fossil fuel use and related emissions and does not take into account the lower cost of renewables. A quote from a scientific publication by some of the leading experts in this matter, already from 2020, says the following: "Stop using the worst-case scenario for climate warming as the most likely outcome — more-realistic baselines make for better policy." 2 FEBEG considers this scenario could not be sufficiently representative for the longer run and strongly recommends to use RCP 4.5 since there is no scientific argumentation in using the outdated RCP 8.5.

ANSWER:

Regarding the question of usage MétéoFrance Climate Database Climate 2025 for the 2026-2036 period, we would like to remind that this choice is in line with current standard definitions by the World Meteorological Organization for which 30 years is only recommended as standard period for the definition of so-called 'average weather & constant climate'. In this sense, the choice of the MétéoFrance Climate Database Climate 2025 allows for a consistent choice of the same 'climate' for the whole period 2026-2036.

Indeed, ACER approved ERAA methodology presents three choices regarding the consideration of future climate conditions;

i. rely on a best forecast of future climate projection;
ii. weight climate years to reflect their likelihood of occurrence (taking future climate projection into account);
iii. rely at most on the 30 most recent historical climatic years included in the PECD.

ENTSOE reflected on ACER's methodological requirements regarding future climate conditions on a scientific paper together with Climate experts [ERL-1] also following the recommendations from the World Meteorological Organization (WMO) [WMO-1]:

"*Use of a period longer than 30 years for deriving higher-order statistics*"
"A period of 30 years may not be sufficient to capture the full potential range of variation of an element, especially for an element [..] that can be highly variable in time and space"
" While 30 years is still recommended as a standard averaging period for the calculation of quintile boundaries in climatological standard normal, the stability of more-extreme statistics derived from that period is likely to be low for some elements"
"Two approaches to that problem are to fit a statistical distribution [..] to the observed data within a standard 30-year period or to use a period of data substantially longer than 30 years"
"To provide a robust assessment of current and future energy systems under climate change, it should consider data from climate projections"

The proposal to perform analysis based on the latest 30 climate years, is indeed mentioned by the WMO but only as a fallback option in case that records longer than 30 years are not available.

The use of 200 Climate Projections from MétéoFrance Climate Database fulfills ACER methodological requirement and allows to use a period of data substantially longer than 30 years and thus represents the most robust methodological choice to eg assess capacity requirement needs.

On a possible update of the MétéoFrance Climate Database, Elia contacted MétéoFrance and received the confirmation that the Constant Climate Scenarios database which were provided to Elia are no longer been delivered by MétéoFrance since the end of 2023 and therefore no updates are available. MétéoFrance is currently working on a new dataset which is planned to be available only by the end of 2025 or the first quarter of 2026. Therefore an update of the current MétéoFrance Climate Database is not possible within the scope of the current study.

Finally on the comment regarding the use of RCP 4.5 vs RCP 8.5, we acknowledge the statements from the mentioned scientific publication by climate leading experts. Still the large deviations on Climate projections between RCP 4.5 vs RCP 8.5 are visible only around years after 2050 eg 2060 - 2100 (see highlighted area in Figure 23 below [COP-1])

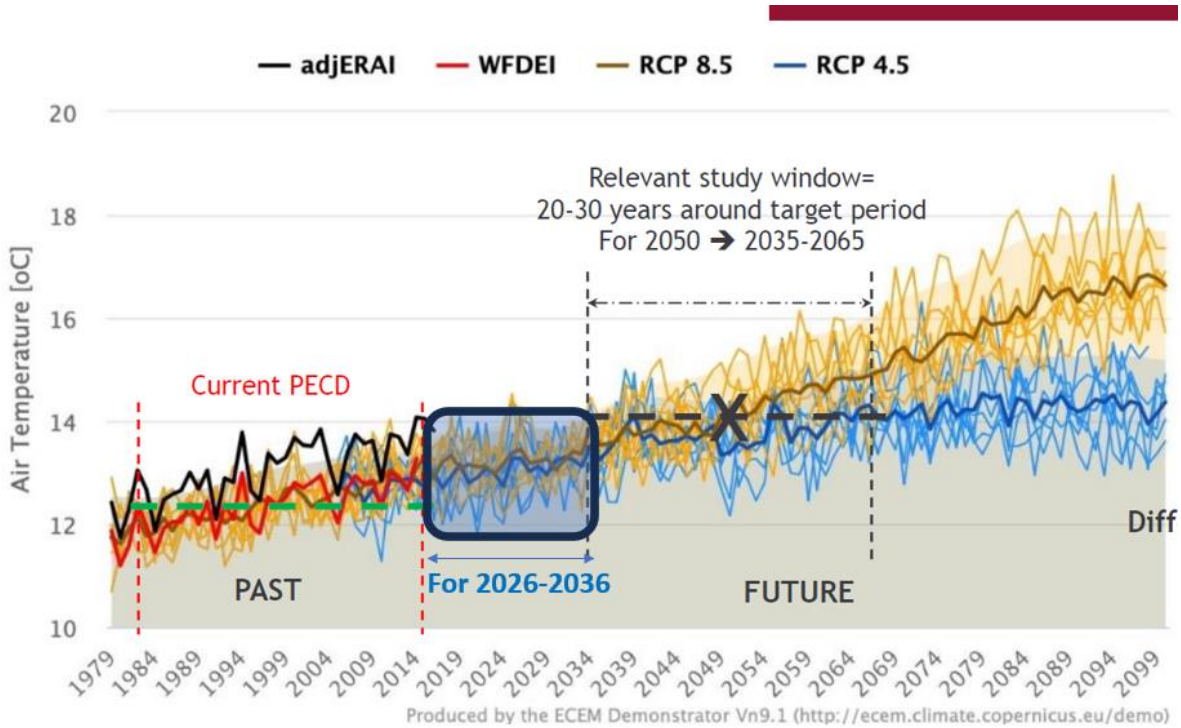


Figure 23 - Climate projections adapted from COPERNICUS

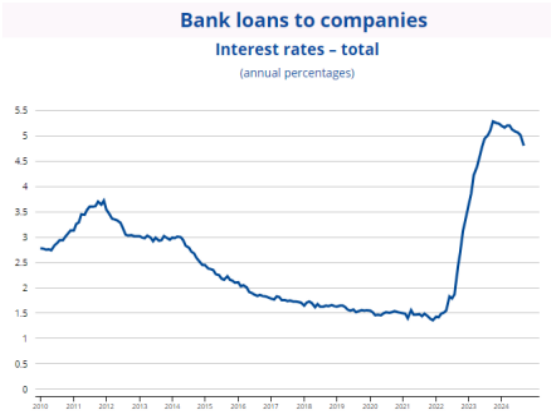
The choice of Climate projections based on RCP 4.5 or RCP 8.5 by MétéoFrance has a negligible impact for the period of the current Adequacy and Flexibility 2026-2036.

Finally also regarding the request for an adaption of the so-called “potential climate” from 2025 to 2030, as demonstrated by COPERNICUS (see Figure 23 - Climate projections adapted from COPERNICUS above) and referring to the definition of the 'average weather & constant climate’ by WMO above, the variability of Climate projections using ‘'average weather & constant climate’ of 2025 or 2030 will be of the same accuracy, ie projections based on ‘constant climate’ 2025 can be used to cover the period 2010 (-15yr) - 2025 - (+15yr) 2040 whereas projections based on ‘constant climate’ 2030 can be used to cover the period 2015 (-15yr) - 2025 - (+15yr) 2045, both being well centered around the simulated years 2026-2036 period.

Furthermore, the usage of 200 realizations of possible climate years within the constant climate’ 2025 provide representative projections which are also statistically robust against possible outliers within the period 2010 (-15yr) - 2025 - (+15yr) 2040. The consideration of 200 realization of possible climate years by Elia is therefore crucial to ensure the validity of the ‘constant climate’ 2025 projections within the simulation framework 2026-2036.

An analysis on "DunkelFlautes" will be performed and presented in the study.

9. Comments received on hurdle rates and Prof. K. Boudt study

STAKEHOLDER	FEEDBACK RECEIVED
CREG	Pour le coût de la dette, un taux de 5% est considéré. Il s'agit d'une valeur d'août 2024 qui n'est déjà plus d'actualité puisqu'en septembre 2024 le taux a baissé à 4,8%. La CREG est d'avis que la valeur retenue pour le coût de la dette devrait tenir compte des informations publiées les plus à jour lorsque les calculs seront réalisés par Elia.  Figure 4 : Taux d'intérêt (source : euro-data-statistics.org)
CREG	Le gearing ratio proposé dans la note du professeur Boudt, soumise à consultation, se réfère à la structure financière des entreprises du secteur, or, pour des projets d'investissement de type CCGT, OCGT, batteries, la pratique courante est de créer une société de projet et de tenir compte, pour le montage financier du projet, d'un taux d'endettement spécifique qui peut atteindre les 80%. La CREG estime donc qu'un taux de 44% est trop faible et recommande de prendre un taux minimum de 60%.
FEBEG	FEBEG wants to clearly state that the proposed WACC's are not acceptable and not matching at all the current market conditions. Firstly, the gearing proposed by CREG – i.e. a debt-to-capital ratio of the project – of 75 % is way too ambitious. A gearing between 60 to 70 % would be more in line with reality, and this for the following reasons:

Elia Transmission Belgium SA/NV
Boulevard de l'Empereur 20 | Keizerslaan 20 | 1000 Brussels | Belgium

	- The market conditions have evolved, and in particular the interest rates have increased. As banks typically ask for a DSCR (debt service coverage ratio) of a certain level - for instance around 140% for projects that bear a market risk/with low cash-flow predictions, meaning that the project's cash flows are supposed to be 140% of the yearly debt service - it is difficult to reach a gearing of 75%, and especially now that the interest rates have increased significantly (which results in a higher debt service). - It was easier to get these gearings of 75-80% in periods of low interest rates, but now with the higher interest rates, such a gearing would generally not allow to reach 140% of DSCR. Hence, 2 solutions: o decrease the DSCR, which - of course - banks are not willing to do and certainly not for merchant risk-bearing projects o decrease the gearing to have a lower debt service each year, which will result in a higher WACC. Secondly, the 7.2% cost of equity used by the CREG is too low: - As the interest rates have increased, the risk-free rate (which is a component of the cost of equity) did as well. - FEBEG observes that higher cost of equity is generally used in the market, e.g. by CWaPE. This is also the conclusion in studies and benchmarks, e.g. IESE Business School (Pablo Fernandez, Diego Garcia and Lucia F. Acin), 'Survey: Market Risk Premium and Risk-Free Rate used for 96 countries in2024', 11 March 2024. Thirdly, FEBEG wants to repeat is comments to the risk premiums by technology and based on the study of Professor Boudts. According to FEBEG, the study on the risk premiums is incomplete in terms of the evaluation of the risks. It should be noted that, even in a context of a capacity remuneration mechanism, market actors still bear important risks and that investment boards still require a return on the investment in line with the companies' policies. In addition, the CONE is a theoretic and generic computation and, hence, does not reflect a particular situation with specific challenges, risks and constraints. - The capacity remuneration does not cover the full revenues: merchant revenues are still considered for most of the technologies in the list. - So far, the capacity remuneration mechanism does not protect against macroeconomic risks (e.g. impact of Ukraine war/energy crisis on value chain and goods and services' cost increase). - The capacity remuneration mechanism still creates important financial risks in terms of availability obligations, more particularly financial penalties and the risk of termination of the capacity contract.

	- Also, pursuant the Royal Decree 'Methodology', Elia uses average market revenues to calculate the net CONE instead of the median revenues (P50), which also increases the risks and should increase the risk premium. Especially for large scale battery storage, the risk premium is much too low and not in line with the risks linked to market revenues. It is not justified that a battery would have a lower WACC than an OCGT for instance.
Febeliec	1. Forward markets are not considered as a risk management instrument. There are about 10.000 simulations of revenues. These revenues are outcomes of short-term markets. The distribution of these revenues determines the risk an investor is taking and thus the discount rate that is applied by Elia in its EVA. However, an investor does not face the distribution of revenues of short-term markets but the distribution of revenues on long-term markets; this distribution is much smaller (fewer negative outliers, less positive outliers), which lowers the risk for risk-averse investors. (The whole idea of forward markets is for investors (and consumers) to hedge themselves and to lower their risks.) Not taking into account the hedging opportunity that forward markets bring implies a too high discount rate and thus a higher capacity requirement, which leads to too high costs.

ANSWER:

Elia takes note of CREG's comment on the value for the interest rate as underlying parameter of the WACC calculation and confirms that Prof. K. Boudt will update the value of the reference WACC in 1Q2025 to account for most recent market evolutions. At the same time, Prof. K. Boudt will re-assess the value of the gearing ratio taking into account the feedback received during this public consultation.

Elia notes that FEBEG's comments on the hurdle rate seem to relate to the values proposed by CREG for the CONE calculation as part of the CRM calibration. Elia would like to remind that the scope and process for the CRM calibration differs from AdeqFlex:

- The values for the hurdle rate in AdeqFlex are proposed by Professor Boudt and are applicable in an EOM context. Hence, the impact of the CRM is not taken into account in the hurdle rates for AdeqFlex.
- Prof. Boudt uses a gearing ratio of 44% for the calibration of the hurdle rate instead of the 75% to which FEBEG refers. Note that Prof. Boudt will re-assess the gearing ratio in 1Q2025 taking into account the feedback from this public consultation.
- The hurdle premium for batteries is set at a lower level than an OCGT given the low observed "revenue distribution and loss aversion" risk. The financial risk profile for batteries is similar to wind and solar capacities, meaning that the simulation analysis under the base scenario demonstrates that the variability of returns is

low for batteries. However, the hurdle premium for batteries is set above the premium for wind and solar given the higher technology risk.

Elia agrees with Febeliec that hedging opportunities should be taken into account in the level of the hurdle premia and would like to remind that Prof. Boudt accounts for the impact of hedging in a qualitative way, similar to the methodology applied in previous AdeqFlex study. More specifically, given the hedging possibilities for baseload capacities, and given the lower variability that is empirically observed in these forward markets, Prof. Boudt applies a lower hurdle premium for “revenue distribution and loss aversion” for this type of technologies than compared to a situation where no forward hedging opportunity would exist.

10. Comments received on short-term flexibility

STAKEHOLDER	FEEDBACK RECEIVED
Virya Energy	We have observed that HyOffWind is referred to as a flexibility capacity. In this regard, please find below clarifications regarding the assumptions to be applied: 1) Excel sheet, tab 3.4: Hyoffwind electrolysers are flexible on 80% of their range (not 100%): the MSOL should be taken into account and this part of the capacity is not flexible. 2) Excel sheet, tab 4.4, line 53: Ramp-up time is 20%/min (guarantee annex K), not 100%/min

ANSWER:

Elia will consider the comment by Virya energy on the electrolyser flexibility on 80% of the range. However, it's unclear whether electrolyser will run in scarcity situation (with very high prices). Therefore, electrolysers will be considered fully flexible in the economic dispatch simulations (to be compliant with the ERAA methodology), and a sensitivity will be run to consider them running with 20% baseload, except in periods of near scarcity.

In the analysis on short-term flexibility, Elia will always consider 80% of the capacity of the electrolyser. As electrolysers are assumed to only provide upward flexibility (e.g. temporary reduce electricity consumption when reducing hydrogen production during high intra-day or balancing prices), this reduction can never go below 20% baseload, hence capping the upward flexibility at 80% of the capacity of the unit.

Virya states their electrolyser has a ramp-up time of 20%/min, which is equivalent to a 100% ramp in 5 minutes. Elia will consider a 20%/min ramp rate and will consequently model electrolysers for ramping flexibility (which includes aFRR) on top of fast- and slow flexibility.

STAKEHOLDER	FEEDBACK RECEIVED
ODE Vlaanderen	In het studie rapport: Adequacy and flexibility study 2026-2036, is het niet duidelijk voor ODE Vlaanderen hoe de grens wordt getrokken tussen "demand side reponse" en "industrial flexibility". Er wordt vermeldt dat als onderscheid het feit wordt genomen of het gaat om "nieuwe" of "bestaande" load.

	In dat geval moeten de reeds geinstalleerde e-boiler en warmtepompen worden meegenomen in de “demand side reponse” en zou daar ook downward flex op toegepast kunnen worden.

ANSWER:

Elia confirms the split between “demand side response” and “industrial flexibility” is based on the distinction between respectively existing and new load.

Furthermore, Elia agrees that existing installed assets such as E-boilers can deliver downward flexibility in line with the stated information found in Excel sheet tab 4.4. For this, the market response method will now for the first time be applied on downward volumes (on top of the upwards volumes). Elia looked at day-ahead market bids in the price range category from 0 to -100 EUR/MWh after filtering out expected bids from renewable energy sources. This way, a volume of 150 MW is found which is assumed to also be present for intra-day and balancing markets. This capacity will be accounted for in the short-term flex computations, at least when prices are positive. When day-ahead prices are zero or negative the capacity is assumed to be already scheduled in day-ahead and not available to provide additional downward flexibility in the intra-day or balancing time frame. Note that the identified volume is derated for ramping and fast flexibility similar to the methodology for upwards demand side response.

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	Regarding the means to offer such flexibility, FEBEG has doubts about the assumptions put forward by Elia. While we hope that more flexibility can be unlocked in the coming decade, we are also concerned that there will be many hurdles still to overcome to tap into the flexibility, especially at the level of the household. We urge Elia to consider scenario’s in which flexibility from the DSO grid (from EVs or heat pumps) will not be easily accessible (for example due to limited consumers interest in such services) as this would be a prudent and correct approach. On top of that, we suggest a slower implementation path, because of forementioned technical and regulatory barriers that still exist. Indeed, to count on such flexibility to be there to balance out many GWs of intermittent wind and solar energy is very optimistic or even dangerous.

ANSWER:

Elia will study a slower uptake of short-term flexibility by incorporating a LOW flex sensitivity where low-voltage flexibility grid will be less accessible.

STAKEHOLDER	FEEDBACK RECEIVED
COGEN Vlaanderen	Omwille van de stuurbaarheid kan een cogeneratie-installatie netondersteunend worden uitgebaat door op de juiste ogenblikken (wel, of juist niet) te produceren. Zo kan de installatie elektriciteit produceren tijdens perioden van verhoogde elektriciteitsvraag (~ op koudere dagen, zoals recentelijk nog bevestigd in de Time-of-Use studie van Fluvius), dewelke vervolgens bijvoorbeeld een lokale warmtepomp kan voeden. Omgekeerd kan een cogeneratie-installatie neerwaarts worden gemoduleerd of stilgelegd om elektriciteit af te nemen van het net op ogenblikken met voldoende hernieuwbare elektriciteitsopwekking uit wind en zon. Het netondersteunend effect van cogeneratie bij een uitrol van warmtepompen wordt ook in de literatuur bevestigd.

ANSWER:

COGEN Vlaanderen confirms the capabilities of CHPs to deliver flexibility (up to very fast reactions). Additional inputs are in line with current modelling and do not warrant changes.

11. Comments received on the CRM

STAKEHOLDER	FEEDBACK RECEIVED
FEBEG	FEBEG is convinced that the existing thermal fleet will continue to play a crucial role for the security of supply of Belgium for the coming decades. For this reason, FEBEG considers of upmost importance to keep a stable and favourable investment framework for those assets to remain on the market in the transition phase towards a fully decarbonized world. In this respect, FEBEG appreciates the efforts of Elia to continue improving the CRM design but would like to remind that, for the moment, there are still some important uncertainties or problematic elements that may impact the future of the existing thermal fleet in Belgium, and in particular: - Not all thermal capacities are contracted for the delivery period 2025-2026. Some capacities have not been offered in the capacity auction: they are considered as 'optout IN', meaning they are considered to contribute to security of supply without being contracted. This is a rather bold assumption: some of these power plants are rather old and might be less reliable. They will not necessarily be repaired when they break down. Other capacities have been offered but are not selected: as they are not needed for security of supply and don't receive a capacity remuneration, they might leave the market jeopardizing security of supply in the following delivery periods. - The requested volumes were not offered in the latest Y-4 auction for the year '28-'29. Correspondingly, the transferred capacity to the Y-2 and Y-1 volumes is higher than should be and leaves uncertainty regarding the security of supply for winter '28-'29. It is important to keep in mind that the CRM is primarily meant to ensure security of supply and must therefore be able to attract sufficient capacity (new and existing). Which we do not see in the latest auction results where 630 MW less was offered than there was requested. FEBEG wants to point out that the Y-4 auction is the main auction to ensure this and should bring certainty regarding security of supply in year Y. In fact, with the outcome of this auction, security of supply for winter '28 – '29 is not assured until the Y-2 and/or Y-1 auctions prove to be successful enough. Even when assuming the requested capacities will be attracted in the next auctions, which is not certain at this moment, it is questionable to only then provide assurance on something fundamentally crucial as our energy supply. FEBEG repeats that we believe that stability and long-term security of supply should be achieved with the CRM and that the framework and conditions should assure this. - Uncertainty on CO2 emissions. Firstly, FEBEG regrets that the CO2 emission limits for participation to the CRM are more strict than the European rules that aim for harmonization. Secondly, as for Investments in new capacities, investments in existing capacities (lifetime extension, repowering, …) are very capital intensive and require a long lead time. For this reason, the lack of visibility on the CO2 emission limits beyond 2032 is hampering the investments in existing ca-

	pacities. Thirdly, strict CO2 emission limits will simply exclude thermal capacities from participation to the CRM, while this would lead to value destruction. Their limited running hours in the future, combined with increased RES and batteries, will contribute to an overall reduction of CO2 emissions of the power sector while ensuring the Security of Supply.Fourthly, regional environmental permits can also foresee constraints or stricter rules preventing a further operation of a thermal power plant. FEBEG therefore thinks that Elia should assume some uncertainties and at least include some sensitivities regarding these capacities in the AdFlex study, e.g. sensitivity on unexpected closure of non-contracted capacities and sensitivity on consequences of stricter CO2 emission limits. - Finally, the increased pressure on the T-4 with participation or opt-out (IN) of DSM, could potentially at some point exclude some existing gas plants, while their participation in the T-4 would actually be required to unlock an investment decisions. We also recommend Elia and the Belgian authorities to review the split between volumes open in the T-4 and the T-1 auctions. FEBEG has always pleaded for a strong base of flexible and steerable capacities located in Belgium to ensure the security of supply in the long run. In this respect, FEBEG also has and continues to plead to have sufficient “local” margin allowing the country to face events limiting its import capabilities such as unavailability of capacities abroad, minRAM 70% not reached, change in foreign policies, …. Indeed, when it comes to power generation capacity, there are not so many short-term solutions bringing significant MW’s to palliate complex problems. The structural issues impacting the availability of the French nuclear fleet and the consequences of the war in Ukraine demonstrate that having sufficient national capacity is actually beneficial for the country. Security of supply is a serious matter and implies the implementation of robust, fair and long-term solutions for market parties. FEBEG calls on authorities to anticipate future capacity needs by (i) reviewing the volume split between the T-4 and T-1 auction, allowing to secure more new capacity in the T-4, (ii) taking realistic hypotheses in terms of contribution of foreign capacity to secure sufficient margin on the Belgium territory and (iii) by avoiding to take rely on ‘ad-hoc’ last-minute palliative measures in the Y-2 and Y-1 auctions. In conclusion, the electricity sector is characterized by high capital investments with a lifetime of more than 20 years. FEBEG once again underlines the need to have a stable longterm investment framework in order to give investors the necessary confidence that will result in maintaining and attracting capacity to ensure security of supply.

ANSWER:

It should be noted that:

- (A) For the delivery year 2025-2026 sufficient capacity was contracted to ensure SoS. Indeed a part of the existing capacity was not contracted in the CRM (either because they were not selected or opted to not bid into the auction). Elia wants to remind FEBEG that obtaining a CRM contract is optional and thus market parties will always have the choice to not participate in the CRM. Furthermore, not contracting non competitive capacities should not be seen as a risk for SoS.
- (B) Since the auction of 2024 a dynamic correction increases the demand curve of the Y-4 auction to account for the participation of capacities without a prequalification obligation (mainly DSM), hence the perceived risk indicated by FEBEG does not hold anymore.

Second, Elia agrees that security of supply is of high importance. In this AdeqFlex study, Elia will continue to assess different scenarios and sensitivities (both for Belgium and other countries in Europe), to account for impact of available production capacity in neighboring, on minRAM for cross-border exchanges, etc. Given Belgium's situation, this is the only way a comprehensive assessment of the security of supply of the country can be done.

12. Suggestions for scenarios and sensitivities

This section provides an overview of the reactions and concerns of market players that Elia received to the document submitted for consultation regarding the scenarios and sensitivities. In response to the many comments on that subject, this section provides first an **overview** (not exhaustive) of the received suggestions.

Suggested scenarios and sensitivities that Elia is planning to assess (in dedicated analysis or covered via one of the three main scenarios for Belgium):

- Alternative scenarios, in particular the socio-cultural change like sufficiency;
- Combining some of the sensitivities to better understand the combined effect;
- Impact a change of one single variable on adequacy and flexibility needs;
- Impact of macro-eco variables on different sectors (electrification, production, etc.);
- 'Thwarted globalisation' where variables evolve under less favorable conditions;
- Impact of industrial flexibility;
- Impact of extending further nuclear generation capacity;
- Impact of closure of certain power plants capacity (CHP, biomass, turbojets…);
- Impact of CO2 limit on CRM capacity;
- Impact of RES development;
- …

On assumptions abroad (part of the 'EU-SAFE' scenario):

- Impact of non-availability of several French nuclear reactors;
- Impact of non/strict achievements of the FB CEP rules
- …

Elia takes note of the request for those additional sensitivities and will further analyze if those are deemed feasible in term of planning:

- All the same sensitivities of the 'Adequacy & Flexibility 2024-2034' study;
- Impact of less DSM and storage capacity;
- Impact of heat pump flexibility;
- Impact of nuclear production capacity in UK;
- Impact of cap-revenue;
- Impact of electrolysers flexibility on economic metrics;
- Impact of high gas prices on economic metrics;
- Higher/lower CAPEX costs for certain technologies impacting the EVA.
- Impact of a varied price cap on the EVA

- …

Other sensitivities or scenarios may emerge during the simulations, depending on the results obtained. These will be analyzed on a case-by-case basis, considering the additional workload they require and the insights they provide.

7.8 GLOBAL APPROACH

STAKEHOLDER	FEEDBACK RECEIVED
CREG	Dans le cadre des études d'adéquation et de flexibilité, une analyse de sensibilité permet d'étudier l'impact du changement d'une variable ou d'une hypothèse sur l'adéquation et les besoins en flexibilité. Par exemple, un retard dans la réalisation d'un projet d'infrastructure, ou sa non-réalisation, un développement plus rapide qu'attendu des énergies renouvelables ou une électrification du secteur des transports moins rapide qu'anticipée. Une telle analyse permet d'isoler l'impact du changement d'une variable ou hypothèse, les autres variables et hypothèses restant égales par ailleurs. Cependant, l'analyse de sensibilités présente quelques limites puisqu'elle ne permet pas d'étudier l'impact du changement simultané de plusieurs variables et hypothèses. Pour cela, de nouveaux scénarios doivent être développés avec leur propre storyline.
CREG	De manière générale, la CREG recommande à Elia d'examiner l'opportunité d'intégrer dans ses études des scénarios alternatifs, à l'image de ceux envisagés par RTE. Ils permettraient d'évaluer l'impact potentiel d'évolutions données sur la consommation globale d'énergie, ainsi que les ajustements nécessaires au niveau de la production et des infrastructures. En outre, ils offriraient une perspective claire sur les bénéfices possibles en termes de sécurité d'approvisionnement, de réduction des émissions de CO_2 et de modération des coûts énergétiques. A ce titre, la CREG aimerait proposer un scénario alternatif qui se base sur la sensibilité étudiée dans l'étude 'Adequacy & Flexibility 2024-2034' sous le nom de « Socio-cultural change (sufficiency), elle-même basée sur la « Clever study ». Les effets d'un certain nombre de mesures ont été étudiés et synthétisés à l'annexe VIII-114. La CREG recommande de développer ce scénario : a. En gardant et actualisant les mesures proposées à l'annexe VIII de l'étude d'Elia ; b. En utilisant les propositions faites dans le cadre de l'étude BluePrint d'Elia ; c. En ajoutant et adaptant au contexte belge les propositions faites par RTE dans son bilan prévisionnel ainsi que dans l'étude Futurs Energétiques ; d. En procédant à un 'benchmarking assumptions' comme celui réalisé dans le cadre de l'étude Shift d'EnergyVille, ceci afin de déterminer et d'affiner les mesures et les hypothèses à prendre en compte ; e. En synthétisant les impacts et les résultats, d'abord par secteur, et ensuite en les combinant.

ANSWER:

Elia agrees that analysing dedicated sensitivities, focussing on one/few dimensions at a time, enables for detailed analysis of specific topics. It makes it indeed possible to isolate an effect from a global scenario. This is why, on top of the three main scenarios for Belgium, dedicated sensitivities (e.g. on flexibility, on generation capacity, etc.) will still be performed. Additional scenarios/sensitivities for other European countries are also planned to be assessed.
Regarding combined scenarios, Elia will analyse and put forward at least three main scenarios, as described in Section 5. The use of combined scenarios enables for considering different coherent storylines, as several dimensions can be correlated. The three main scenarios are 'Current Commitments and Ambitions', 'Constrained Transition' and 'Prosumer Power'.

On the specific comment related to 'social-cultural' changes, Elia agrees that such scenario would be interesting to analyse. Elia would like to recall that a 'sufficiency' scenario in the AdeqFlex'23 study, as mentioned by the CREG, with measures detailed in Appendix VIII. Elia will also carry out a new 'sufficiency scenario'.

7.9 SUGGESTED TOPICS

STAKEHOLDER	FEEDBACK RECEIVED
ABOUSCO	**Scénarios** : Les scénarios envisagés semblent couvrir un éventail d'options, mais j'aimerais voir davantage de scénarios axés sur la résilience face aux crises, comme celles liées aux changements climatiques. Une évaluation approfondie des impacts potentiels de ces crises pourrait mieux préparer le système électrique belge pour l'avenir.
CREG	La CREG suggère de reprendre les sensibilités réalisées dans l'étude 'Adequacy & Flexibility study 2024-2034' à l'exception des sensibilités relatives aux centrales nucléaires et aux centrales de Rodenhuize et Vilvoorde. Toutefois, pour la sensibilité relative au prix du gaz, la CREG recommande d'étudier les effets qu'aurait cette variation sur toute la chaine de valeur (consommation et production) en réalisant de nouvelles simulations à l'aide du modèle d'optimisation. La CREG propose une sensibilité supplémentaire qui analyserait l'impact d'une variation à la baisse de l'évolution du PIB. Cette sensibilité examinerait l'impact d'une évaluation plus défavorable des paramètres macro-économiques sur l'évolution de la demande des différents secteurs étudiés.
FEBEG	FEBEG refers to the general remarks above and the perceived risks for the existing fleet in the framework of the CRM. Taking into account the ageing fleet and risks regarding CO2 emissions limits, we recommend Elia to at least consider a sensitivity where some gas-fired power plants are excluded from the assumed capacity so that authorities can correctly assess the possible impacts on the adequacy.

FEBEG	Considering the elements above, FEBEG would welcome following sensitivities: - Closure of gas-fired power plants due to CO2 emissions' limits in the CRM (current rules – proposed trajectory (if known at the time) – ambitious trajectory) - Non-availability of several French nuclear reactors (with various levels of unavailability) - Higher share of low-carbon molecules (e.g.: "blue" hydrogen or locally-produced "green" hydrogen) in the energy mix - Lower RES development - Closure of part of the cogeneration capacity due to lowered support and decarbonization targets - Less DSM and storage capacity (compared to the base-case scenario which for which the values should already be lowered – cf. comment above) - non/strict achievements of the FB CEP rules FEBEG would also propose to combine some of these sensitivities to better understand the combined effect of the most likely ones on an highly interconnected such as Belgium. Finally, considering the past experiences with the revenue-cap at EU and Belgian level, the impact of such cap should duly be considered in the Economic Viability Assessment, either directly or in the form of a sensitivity.
The Shifters Belgium	Il semble également pertinent de réaliser une sensibilité de scénario portant sur la capacité de production nucléaire belge pour la période. Bien qu'il soit logiquement compris au §5.1 de l'étude d'Elia que le scénario CENTRAL se base sur le scénario légal actuel, pour se préparer à une potentielle modification de la loi de sortie du nucléaire du 31 janvier 2003, nous pensons qu'une analyse de sensibilité pourrait être intéressante. En effet, plusieurs propositions de loi modifiant la loi de sortie du nucléaire pour y proposer une prolongation totale ou partielle du parc nucléaire existant ont été déposées récemment par plusieurs partis présents à la table des négociations. Si l'ensemble de ces propositions de loi n'est pas complètement aligné (prolongement, relancement, construction…), il s'en dégage à minima une base commune de prolongation des unités de Tihange 3 et de Doel 4 pour une durée de 20 ans, soit 10 ans de plus que dans le scénario CENTRAL actuel. Le second point du §5.1 du document principal soumis à consultation par Elia pourrait donc être adapté comme suit pour un scénario de sensibilité qui tiendrait compte d'une prolongation étendue des unités nucléaires belges les plus récentes : "- 20-year nuclear extension of Doel 4 & Tihange 3 with partial availability during summer 2026 to 2028 included due to long-term operation (LTO) works; those units are therefore available from the 1st of November 2025 until the 30th of October 2045."
The Shifters Belgium	D'abord, The Shifters Belgium propose deux analyses de sensibilités. D'une part, une variation des variables macro-économique pour calculer les effets sur l'ensemble du système (et pas

	uniquement sur les usages existants). D'autre part, une potentielle prolongation du nucléaire belge à 20 ans (10 ans supplémentaires). Ensuite, The Shifters Belgium propose à Elia de réaliser deux scénarios alternatifs. La sobriété en est un premier et la prise en compte d'un contexte macroéconomique et énergétique défavorable en est un autre. Ces deux scénarios peuvent apporter des bénéfices cruciaux pour l'atteinte de nos objectifs à moindre coût dans une transition qui sera onéreuse. Il semble primordial de développer ces potentiels futurs alternatifs pour envisager une démarche prudentielle et éviter les effets néfastes. Il en va de la responsabilité de chacun de faire preuve de précaution et de prévision. La prévention prime sur la réaction. Dès lors, The Shifters Belgium pense qu'il serait dommageable pour Elia, mais aussi pour le reste de la société belge, de passer à côté de cette opportunité qui doit objectiver, élargir et faire progresser le débat public sur les futurs électriques possibles du pays. Pour conclure, il nous semble que cette approche doit être centrée sur l'identification des bénéfices économiques et environnementaux pour la Belgique afin de réaliser sa transition de la manière la plus efficace possible.

ANSWER:

Regarding ABOUSCO's comment on resilience to crisis, Elia believes it is not the goal of this AdeqFlex study to cover unexpected and unforeseen crisis. However, when it comes to expected global warming, the 200 climate years database developed by Météo-France, which is used by Elia, does integrate this aspect (see also Section 7.3). Therefore, it seems not relevant to further analysis potential crisis in the framework of this study.

Elia notes the request from the CREG to analyse the same sensitivities as the ones studies during AdeqFlex'23 (except for nuclear, Vilvoorde and Rodenhuize). In view of the additional work related to the three main scenarios, with additional already foreseen scenarios and sensitivities, Elia will assess if it will be possible to perform the same high amount of sensitivities (considering the planning of the study and the additional scenarios that were added).

CREG recommends performing a sensitivity on 'gas price' by assessing the impact on the whole chain (from production to consumption). Elia intends to analyse gas price sensitivity only on the economic results (impact on prices and economic viability), Elia doesn't intend to develop and assess dedicated scenario related to gas price on production and consumption as such global scenario is not straightforward (high gas prices on a long period could lead to higher electricity demand, faster electrification of the industry, but also higher electricity prices, and potential reduction in consumption). Elia refers to the three main scenarios which cover different possibilities.

On that topic, with respect to CREG suggestion for a sensitivity on deteriorated economic situation, the 'Constrained Transition' scenario accounts poor macro-economic conditions impacting the affordability of the energy transition. This leads to reduced electricity demand, considering slower uptake of EV & HP, reduced and slower industry electrification.

Regarding FEBEG's comment on the existing fleet, Elia agrees that CO_2 emissions limits in CRM framework might impact the business case of some units as those won't be eligible in the CRM framework. Elia therefore proposes to consider sensitivities on the closure of units with high CO_2 emissions, in view of the CO2 threshold in the CRM framework.

As performed in the previous study, Elia will also consider scenarios and sensitivities that cover non-availability of several French nuclear reactors and non/strict achievements of the FB CEP rules. If feasible qua timing, Elia will also look at impact of RES development and DSM development. Elia will however not look at higher share of low-carbon molecules, as all projects known are considered in the study.

Elia notes the comment of FEBEG on the revenue cap. Such cap is not currently considered in the Economic Viability Assessment. During the period from August 2022 to June 2023, a revenue cap was implemented as windfall tax on electricity producer to address high energy prices [KPM-1], with an applicable cap at 130 EUR/MWh (with some exceptions). Implementing such rules in the EVA would also require additional work. Therefore Elia will further investigate if and how it could be analyzed, if the workload allows it.

Regarding the nuclear capacity in Belgium, the recently formed federal government will support nuclear plants in Belgium, with a prolongation of 20 years, instead of 10, for Doel 4 and Tihange 3. This will be considered as the basis for the scenarios, although an agreement still needs to be reached with ENGIE and other regulatory, safety, and operational changes may need to be applied. This is however only impacting the last year analysed in this study (2036). Regarding additional extension of other nuclear reactors in Belgium, namely the extension of Tihange 1, Doel 1 & 2, it will be considered in sensitivities, to account for the many uncertainties and pre-conditions that are still pending before such extensions. In case new nuclear reactors are built in Belgium, it is assumed that it would be beyond the time horizon of this study, as a minimum of 10 years is usually considered as lead time.

In line with The Shifter Belgium suggestion, it is Elia's intention to further develop a 'sufficiency' scenario, as already initiated in the previous AdeqFlex'23 study. This will be made possible thanks to valuable inputs from NGO's. This 'sufficiency' scenario, will be assessed in parallel to the 'Constrained Transition' scenario, where a reduced load is assumed, but for other reasons. The impact of those scenarios will be further analysed and shared in the final AdeqFlex'25 report.

7.10 TOTAL ELECTRICITY DEMAND

STAKEHOLDER	FEEDBACK RECEIVED
CREG	La CREG ne considère pas adéquat de se limiter à une seule trajectoire d'évolution des variables macroéconomiques. Elle propose d'étudier une sensibilité dans laquelle ces variables évoluent

	dans des conditions moins favorables (voir section 3). A titre d'exemple, l'étude RTE inclut notamment un scénario de « mondialisation contrariée » dans lequel la croissance du PIB, parmi d'autres indicateurs macro-économiques, est revue à la baisse.
negaWatt	Comment 1: Estimating future electricity demands The central scenario in the adequacy study seems to overestimate the evolution of certain electricity demands, particularly those linked to existing usages. Historical data shows a steady decline in demand for existing usages, making it improbable that this trend would reverse and begin increasing from 2024,as suggested in the sheet '2.1. Tot. elec. Demand' of the workbook. Energy sufficiency measures, which play a critical role in shaping future demand, are insufficiently considered. These measures were explicitly addressed in the Elia Blueprint study for 2050 and should be similarly integrated into the flexibility analysis here. The assumptions regarding behavioral changes and energy sufficiency are notably conservative, projecting minimal reductions in consumption—only a few TWh—despite evidence to the contrary. For example, a recent Nature Communications publication highlights the potential to reduce Belgium's final energy demand by 56% by 20501,. Similarly, the Negawatt BE scenario estimates that sufficiencymeasures could reduce electricity consumption by 16% by 2030 and 27% by 20402. While the PRICED study acknowledges the possibility of permanent demand reductions, it limits thesechanges to price-triggered behavioral changes, overlooking the array of policy tools available to actively promote energy sufficiency. To address these gaps, an energy sufficiency scenario should be incorporated into the adequacy and flexibility study. This scenario should evaluate the impact of sufficiency measures on key performance indicators such as flexibility requirements, congestion, and electricity prices, ensuring a more comprehensive and realistic analysis of future electricity demands.
The Shifters Belgium	A la lecture du rapport, il nous apparaît également que la sobriété manque comme levier dans le scénario central. De manière générale, TSB regrette donc qu'aucune mention à la sobriété (suffiency)n'apparaisse au travers du document soumis à consultation. Les mesures, qu'elles soient d'usage, sociétale ou structurelle ne sont également peu ou pas envisagées. Pourtant, la sobriété énergétique représente un levier clef de la transition énergétique,souvent sous-estimé malgré son potentiel majeur pour réduire les besoins en énergie, limiter les infrastructures nécessaires et renforcer l'indépendance énergétique. Nous pensons qu'au regard de la crise énergétique que nous avons traversée, il est nécessaire pour la Belgique d'envisager certaines mesures ou aspects. Le choix de ces dernières est encore possible aujourd'hui, il ne le sera peut-être plus demain.

	Il est important de rappeler que la sobriété ne doit pas être confondue avec l'efficacité. L'efficacité se réfère à la réduction de la consommation d'énergie d'un dispositif technique tout en maintenant le même niveau de service. Bien qu'elle soit complémentaire à la sobriété, cette dernière va plus loin que la simple amélioration de l'efficacité des équipements. Elle cherche à remettre en question de manière plus profonde les modes de production et de consommation. Selon l'ONG NegaWatt, la sobriété énergétique s'articule autour de quatre leviers : - La sobriété structurelle : organiser l'espace ou les activités pour favoriser la modération. - La sobriété dimensionnelle : dimensionner les équipements par rapport à leurs conditions d'usage. - La sobriété d'usage : utiliser au mieux les équipements pour réduire leur consommation. - La sobriété conviviale : mutualiser les équipements et leur utilisation. Le sujet de la sobriété dans le cadre de la transition énergétique ne fait pas consensus aujourd'hui. En effet, ce sujet regroupe des questions avec de fortes dimensions politiques, sociales et symboliques, voire philosophiques. Cependant, l'exemple du rapport "Futurs Énergétiques 2050" de RTE (gestionnaire de réseau en France) montre que la sobriété peut être abordée de manière structurée et constructive, dans le cadre du développement d'une politique industrielle d'un État. En France, le rapport RTE a eu une contribution très positive au débat public en rationalisant les positions, parfois contradictoires afin de faire évoluer et mûrir chacune des positions pour qu'elles puissent se compléter dans une vision nationale d'ensemble. L'exemple du scénario de RTE en France : Le rapport "Futurs Énergétiques 2050" et le bilan prévisionnel 2023 de RTE, l'agent qui gère le réseau en France, montrent qu'en ajustant les comportements et les usages, il est possible d'abaisser significativement la demande d'électricité (-14 % dans le scénario sobriété de RTE) tout en préservant les objectifs de neutralité carbone. Face au déficit d'attention et de connaissance sur sujet de la sobriété en Belgique, il semble important qu'Elia endosse son rôle d'acteur majeur de la transition énergétique belge, et œuvre à rationaliser le débat en éclairant sur l'ensemble des choix possible (y compris la sobriété) à l'aide de scénarios développés dans une approche consultative. Un tel scénario de sobriété se doit d'explorer l'impact de changements comportementaux, tels que la réduction de l'utilisation des véhicules individuels, l'optimisation des températures de chauffage, ou le développement de l'économie circulaire. Ces mesures permettent de réduire significativement la demande énergétique globale, avec une consommation d'électricité moindre par rapport aux trajectoires tendancielles, tout en répondant aux objectifs climatiques. La sobriété est également une mesure "no regret" face à la raréfaction des ressources fossiles et aux perturbations géopolitiques (cf 'mondialisation contrariée' ci-dessous). Elle contribue à diminuer la dépendance aux importations et à améliorer la résilience du système énergétique. Face à l'absence de scénario relevant de la sobriété, il semble plus que raisonnable de proposer différents scénarios explorant des futurs alternatifs. L'exercice demandé à Elia est similaire à

	l'exercice réalisé par son homologue français RTE qui publie lors de son bilan prévisionnel 2023 (couvrant la période 2023-2035) pas moins de trois catégories de scénarios alternatifs pour un total de sept scénarios. Ce bilan établi par RTE étudie les enjeux de la bascule des énergies fossiles vers l'électricité, qui constitue, à la fois, une nécessité pour la décarbonation mais aussi une sécurisation de sa souveraineté et sa sécurité énergétique. Il semble donc que l'exercice est plus que similaire aux missions adressées à Elia en tant que gestionnaire national du réseau. TSB encourage donc Elia à évaluer la pertinence et, le cas échéant, à développer leur propre scénarios alternatifs, spécifiques au contexte belge. La sobriété dans les scénarios d'Elia : En Belgique, intégrer un tel scénario offrirait une évaluation indispensable des bénéfices, des coûts et des conditions nécessaires pour activer ces gisements de sobriété. De plus, elle permettrait à Elia de jouer un rôle de leader en rationalisant le débat public belge sur ces enjeux cruciaux, encore peu abordés au niveau national. Enfin, un scénario sobriété fournirait une base robuste pour favoriser un dialogue transparent avec les parties prenantes. De plus, il semble que dans son étude BluePrint, Elia propose une conclusion selon laquelle 15% du coût total du système pourrait être réduit par des mesures de sobriété. Il nous semblerait donc qu'une partie du travail a déjà été réalisée sur base d'un scénario appelé "Shift". Il semble opportun que le rapport d'adéquacy d'ELIA se construise sur ces bases déjà posées dans le Blueprint, afin de prolonger et d'approfondir cette conclusion. The Shifters Belgium recommande ainsi vivement qu'Elia intègre un scénario de sobriété dédié dans son étude. Ce scénario reprendrait les mesures proposées dans les deux études RTE (futurs énergétiques et bilan prévisionnel), réévaluées selon les spécificités nationales. TSB se réfère à la Figure 3.26. ainsi que la synthèse réalisée au point 3.5.7.. D'autres mesures sont également étudiées dans l'étude Bilan Prévisionnel 2023 et sont synthétisées à l'Annexe 2.A. Les résultats finaux concernant les effets potentiels de ces mesures se retrouvent synthétisés, notamment, à la page 8 de l'étude synthèse. La destruction de la demande N'ayant pas accès aux résultats définitifs et finaux de la suite de l'étude PRICED, il nous est difficile d'en faire les commentaires. Cependant, TSB invite Elia à considérer une potentielle « non- ou low- recovery » en ce qui concerne la demande résidentielle. En effet, il est fort probable, si ce n'est déjà vérifié, qu'une partie de la demande 'détruite' n'est pas uniquement liée à de l'élasticité mais à un changement de comportement. En ce qui concerne la demande industrielle, TSB recommande à Elia, vu la situation économique existante, de prendre en compte la destruction de la demande (-0.5 TWh) dans le scénario central. Il paraît plus cohérent de procéder ainsi vu les récentes annonces des acteurs industriels. En ce qui concerne les projections de la demande existante, il nous apparaît qu'Elia ne prend pas en compte une potentielle destruction de la demande provoquée par un changement de comportement. Ce que RTE appelle « les gestes simples » dans son bilan prévisionnel permet une réduction de la demande de l'ordre de 4% (sur la demande finale en 2035) et ceci, comme

	minimum, dans tous les scénarios. TSB suggère donc à Elia d'intégrer dans le scénario de référence une destruction de la demande progressive représentant, à terme, 4% du total de la demande en 2036. Ceci afin de quantifier la réduction choisie et/ou subie lors de notre crise énergétique ainsi que durablement dans le futur par nos changements de comportements personnels et sociétaux. Figure 3.26. Futurs énergétique 2050 - RTE  Figure 3.26 Décomposition des leviers de sobriété électrique par secteur d'activité Leviers de sobriété — Effet (TWh évités) Résidentiel Habitat à espaces partagés et légère augmentation de la taille unitaire des ménages 11,9 TWh Limitation de la consommation de chauffage résidentiel 4,0 TWh Limitation de la consommation en eau chaude résidentielle 4,7 TWh Moindre taux d'équipement en climatisation résidentielle 1,1 TWh Limitation de la consommation des autres usages résidentiels 0,7 TWh Tertiaire Recours au télétravail (impact sur la consommation dans les bureaux) 9,1 TWh Limitation des besoins énergétiques sur le lieu de travail 4,7 TWh Limitation de la consommation de chauffage, climatisation et eau chaude sanitaire tertiaires 1,8 TWh Réduction de la surface des commerces 1,1 TWh Réduction des écrans publicitaires 0,5 TWh Limitation de la consommation des autres usages tertiaires 0,8 TWh Transports Report des déplacements individuels en voiture vers le covoiturage 9,8 TWh Réduction moyenne de la vitesse de circulation et véhicules plus petits 5,4 TWh Recours au télétravail (impact sur les déplacements domicile-travail) 2,8 TWh Reconcentration des fonctions de vie 2,7 TWh Recours aux produits issus de circuits courts 0,7 TWh Report modal vers les moyens de mobilité douce 0,7 TWh Industriel Consommation d'une alimentation moins transformée 5,8 TWh Moins d'engrais azotés dans l'agriculture *(y compris effet sur la production d'hydrogène)* 3,4 TWh Allongement des durées de vie des équipements 3,3 TWh Baisse de la vente de véhicules/fabrication de véhicules plus petits 2,8 TWh Réduction de la construction 2,2 TWh Économie circulaire 2,1 TWh Limitation des emballages et de la publicité 1,7 TWh Limitation du plastique à usage unique 0,9 TWh Recours à des matériaux biosourcés dans la construction 0,6 TWh

3.5.7 Synthèse des principales hypothèses du scénario de sobriété

Entre parenthèses, hypothèses retenues pour la trajectoire de référence

Scénario sobriété		2019	2030	2040	2050
Consommation	Consommation intérieure d'électricité	475 TWh	479 TWh (500 TWh)	509 TWh (567 TWh)	555 TWh (646 TWh)
Gisement de sobriété	Nombre moyen de personnes par ménage	2,17	2,23 (2,07)	2,28 (2,01)	2,33 (1,90)
	Baisse moyenne de la température de consigne du chauffage	-	0,3°C (0°C)	0,7°C (0°C)	1°C (0°C)
	% du temps de télétravail	-	20% (4%)	35% (8%)	50% (10%)
	Taux d'occupation moyen des véhicules légers	1,62	1,73 (1,68)	1,97 (1,68)	2,20 (1,70)
	Dépense annuelle moyenne par personne en produits de l'industrie agroalimentaire par rapport à 2019	-	stable (+3%)	stable (+12%)	stable (+21%)
	Évolution de la part de marché des citadines dans les ventes par rapport à 2019	-	+4% (stable)	+8% (stable)	+10% (stable)

Annexe 2.A.

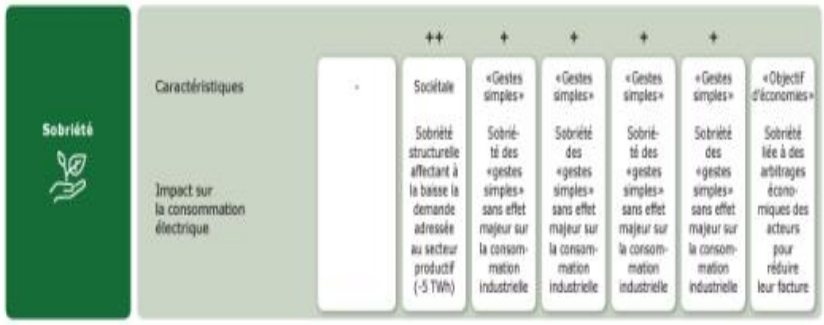
Bilan prévisionnel 2023 – Consommation

Résidentiel

Sobriété			++	+	+	+	+	
	Caractéristiques	-	Sociétale	«Gestes simples»	«Gestes simples»	«Gestes simples»	«Gestes simples»	«Objectif d'économies»
	Nombre moyen de personnes par ménage	2,17	2,13	2,07	2,07	2,07	2,07	2,13
	Évolution de la température de consigne de chauffage (par rapport à 2019)	-	Baisse rapide et pérenne (-1°C dès 2030)	Baisse progressive (-1°C en 2035)	Baisse progressive (-1°C en 2035)	Baisse progressive (-1°C en 2035)	Baisse progressive (-1°C en 2035)	Baisse pérenne (-1°C dès 2024)

Tertiaire :

Sobriété			++	+	+	+	+	
	Caractéristiques	-	Sociétale	«Gestes simples»	«Gestes simples»	«Gestes simples»	«Gestes simples»	«Objectif d'économies»
	Nombre moyen de jour de télétravail des emplois télétravaillables	0,5	1,5 jour	0,5 jour	0,5 jour	0,5 jour	0,5 jour	1 jour
	Évolution de la température de consigne de chauffage (par rapport à 2019)	-	Baisse rapide et pérenne (-1°C dès 2030)	Baisse progressive (-1°C en 2035)	Baisse progressive (-1°C en 2035)	Baisse progressive (-1°C en 2035)	Baisse progressive (-1°C en 2035)	Baisse pérenne (-1°C dès 2024)

	Industriel :  Transport : 
The Shifters Belgium	Variables macro-économique A la lecture du rapport d'Elia, il semblerait que les conditions et variables macro-économiques prévisionnelles issues du bureau du plan soient utilisées dans le calcul des projections de la demande existante. Cependant, TSB remarque que cette méthode n'est pas appliquée pour les autres secteurs de l'étude. En effet, ces derniers ne sont pas influencés par ces variables mais uniquement par un calcul de projections réalisé par Elia (avec les acteurs). De plus, il apparaît qu'Elia garde ces variables constantes tout au long de l'exercice (2026-2036). Vu le contexte économique et politique actuel, il est probable que ces projections varient à un tel horizon. Il nous semble qu'il serait utile de réaliser des analyses de sensibilité sur certaines de ces variables : (PIB, revenu, …) pour conclure sur les effets constatés dans les différents secteurs (usage existant, électrification, production, …). En agissant de la sorte, les conclusions d'une modification d'une de ces variables pourront être quantifiées.
The Shifters Belgium	Nous souhaitons attirer l'attention d'Elia et des décideurs sur le scénario "mondialisation contrariée" décrit dans les différents documents du bilan prévisionnel 2023. Cet exercice réalisé par les experts de RTE nous semble de toute première importance. Ce scénario explore une trajectoire dans laquelle les dynamiques géopolitiques et économiques internationales deviennent moins favorables à une coopération mondiale, entraînant des tensions accrues, une instabilité des chaînes d'approvisionnement et des défis pour la transition énergétique. En somme, nous serions davantage exposés à des limites physiques,économiques et énergétiques.

	La réduction des échanges internationaux limite l'accès aux technologies et ressources clés pour la transition énergétique. Le scénario met en avant la nécessité de renforcer l'autonomie énergétique, en misant sur des stratégies de résilience face à ces perturbations globales. Dans le même ordre d'idée, le Shift Project, en collaboration avec le Ministère de la Défense française et grâce à la base de données prospective Rystad, a objectivé que des contraintes d'approvisionnement des énergies fossiles sont quasi-certaines à échéance 2050. Cette baisse progressive de l'approvisionnement en énergies fossiles, déjà observable, impose de repenser rapidement notre système énergétique et ses infrastructures autour d'une souveraineté énergétique avec des solutions robustes, résilientes et sobres, afin de limiter les risques économiques et sociaux liés à cette dépendance. TSB suggère à Elia d'élaborer un scénario de prise en compte accrue des risques géopolitiques et des contraintes géologiques sur l'approvisionnement des énergies fossiles. Pour les hypothèses et les données chiffrées, TSB propose de se référer aux propositions de RTE en les actualisant pour le contexte national. "La variante « mondialisation contrariée » est caractérisée par "des relations internationales dégradées et des tensions sur les approvisionnements en matières premières et en composants, avec des répercussions multiples sur les perspectives de croissance économique, sur les coûts de la transition énergétique et son rythme" (RTE). Sur la base de ce scénario, Elia pourrait donc tirer les enseignements sur les alternatives de développement du mix énergétique, la sortie progressive des énergies fossiles et la relance industrielle belge et européenne. Les quelques causes (de ce contexte modifié) à étudier prioritairement pourraient être : - Une trajectoire d'évolution du PIB dégradée par rapport à la trajectoire de référence ; - Les coûts des différentes technologies nécessaires à la transition énergétique quipourraient également évoluer sous l'effet des augmentations des prix des matières premières ; - Une difficulté de financement de la transition énergétique ; - La baisse de l'approvisionnement en énergies fossiles en Europe et en Belgique. Et en particulier, les impacts sur le système énergétique à explorer sont: - Les besoins de production énergétique locale. RTE conclut sur le rôle importantd' une expansion accrue des énergies renouvelables et du nucléaire. - La pression et la résilience des infrastructures. RTE conclut sur la nécessité d' investir davantage dans les réseaux locaux et les capacités de stockage. - Les coûts énergétiques potentiellement plus élevés dû à une relocalisation accrue. Cela peut entraîner une hausse des coûts pour les consommateurs - La demande énergétique et la vitesse de transition qui peuvent être ralenties par les contraintes. - La sobriété choisie comme levier de résilience afin d' éviter la sobriété contrainte.
CANOPEA / Bond Beter Leefmilieu	Sur le fond, l'étude Adequacy étant un outil d'aide à la décision politique, nous estimons qu'un scénario "low demand" activant les leviers de la suffisance doit être mieux développé dans le

	cadre de cette étude. La précédente étude Adequacy a mis en évidence que la mise en place de certaines mesures dans l'industrie, le résidentiel (1°C en moins dans les maisons) ou le transport (10 km/h en moins) permettait de ne pas devoir construire 1GW de nouvelles centrales gaz en 2034. Dans Blueprint 20509, Elia a entamé une évaluation économique de l'activation de ces leviers et y conclut que "Les mesures de sobriété ont le potentiel pour réduire le coût du système de 15%". Il est crucial que l'étude Adequacy aille un pas plus loin et propose aux décideurs politiques un scénario "low demand" à part entière allant au dela d'une simple étude de sensibilité. Il est notamment crucial d'évaluer les impacts de ce scénario sur les besoins de capacités ou en terme d'impacts économiques a minima.
CANOPEA / Bond Beter Leefmilieu	Selon un article paru dans Nature Communication en octobre 2024, une implémentation des leviers de la suffisance et de l'efficacité dans les pays européens amènerait à une baisse de la consommation finale d'énergie per capita de 56% en Belgique en 2050 (/2019). Nous nous joignons à la réponse à cette consultation apportée par l'association Negawatt. Principalement, le potentiel des leviers de la suffisance est particulièrement élevé dans certains secteurs industriels bien implantés en Belgique comme le ciment (voir Figure 3). Parallèlement à son impact sur la demande finale d'électricité, le potentiel de réduction de la pointe hivernale de l'industrie est sous-évalué par Elia parce qu'il n'envisage pas des réductions de production industrielle, voire la fermeture temporaire de capacité de production. Le potentiel technique de ces coupures partielles pour plusieurs jours (durant une période hivernale sans vent) a pourtant déjà été évalué techniquement par certains industriels (notamment AGC sur des lignes de verre) mais ils requièrent la mise en place de mécanismes de soutien adéquat. Le rapport Adequacy doit permettre d'évaluer l'opportunité de telle mesure, notamment pour diminuer les capacités requises dans le cadre du CRM. Nous préconisons un scénario de sensibilité pour évaluer le potentiel et l'effet des coupure/reduction de production industrielle sur la pointe hivernale.

ANSWER:

Regarding CREG's comment on having several scenarios for different macro-economic situations, Elia would like first to clarify that the electricity demand trajectory is not based entirely on an economic model that takes into account changes in GDP or other macro-economic variables. It is the 'Existing Usages' part of the demand that uses these parameters as input data. The rest of the trajectory (electrification of transport, heat and industry) is built on the basis of historical sales, announced policies and client's electrification plans.

Secondly, Elia is planning to analyze at least three main scenarios for Belgium as described in Section 5. The Current Commitments scenario considers the economic growth projection from Federal Planning Bureau for the 'Existing usages' evolution, considering also a partial recovery of residential & tertiary consumption (see E-CUBE PRICED study

presented in Elia Working Group Adequacy in August [ELI-2]). In this context, this macro-economic context allows for reaching the announced ambitions. Whereas in the Constrained Transition scenario, a poor macro-economic context leads to slower uptake of EV, HP, delayed electrification plans, etc. Regarding the consumption for 'Existing usages', no recovery of the residential & tertiary consumption is assumed.

Regarding Negawatt's & The Shifters Belgium's comment on the growth of the existing usage electricity consumption, know that it is based on BECalc tool developped by CLIMACT which builds correlation based on historical data between electricity usage, and economic growth projection. Macro-economic projections used as assumptions are based on the Federal Planning Bureau ("perspectives économiques 2024-29", and "perspectives énergétique à politique annoncée en Belgique"), which shows constant growth in the time horizon studied. Note however, that consumption of existing usage and penetration of energy efficiency in that sector has been reviewed, as explained in section 7.2.2.

Regarding the inclusion of sufficiency measures in the central scenario, Elia agrees that sufficiency policies represent an important lever for the energy transition, as highlighted in the last Adequacy & Flexibility study, as well as in the Blueprint study. Note however, that the suggested trajectory represents announced policies, and not the sufficiency potential. A sufficiency scenario will be studied. Elia takes note of the article sent and will examine it.

Elia notes that The Shifters Belgium reference the scenario C1 (Mondialisation Contrariée - Défaut de Réaction) which outlines lower RES development, lower electrification of industry, electrification of transport and of building heat, as well as C2 ("Résilience industrielle"), which considers slightly more RES production. The storyline of these scenarios is partially covered in the "Constrained Transition" scenario put forth in Section 5.1 of this report.

In conclusion, a scenario Constrained Transition has been developed to consider poorer macro-economic context and thwarted globalization, leading to lower load. A scenario with greater sufficiency levers will also be studied. And regarding RES developments, a sensitivity will be carried out on the Current Commitments scenario.

13. Next steps

Elia thanks all the market players for their participation to this public consultation. Based on the reactions received from market players and the answers given, as set out in this consultation report, Elia will implement the changes.

Elia continues working on this study by integrating the feedback, discussing the specific topics within the CdC and implementing the methodology in order to carry out the analysis of the Adequacy and Flexibility needs for the 2026-2036 time horizon by June 2025. The results will be presented on 27 June of 2025 to the market parties during a dedicated meeting and the final report will be made available.

14. Attachments

The reactions Elia received to the document submitted for consultation from the following market parties can be found on Elia website together with this consultation report.

On Elia website, the feedback from the following market parties can be found:

- ABOUSCO
- CANOPEA / Bond Beter LeefmilieuFEBEG
- COGEN
- CREG
- FEBEG
- Febeliec
- Fluvius
- NegaWatt
- ODE Vlaanderen
- The Shifters Belgium
- Virya Energy

15. References

ACEA data	[ACA-1]	https://public.flourish.studio/story/2341586/
Antares Simulator	[ANT-1]	https://antares-simulator.org/
Bloomberg	[BLO-1]	https://www.bloomberg.com/news/newsletters/2024-09-04/electric-vehicles-are-proving-plenty-capable-of-going-the-distance?utm_source=website&utm_medium=share&utm_campaign=twitter
Bloomberg	[BLO-2]	https://www.bloomberg.com/news/articles/2024-12-10/electric-vehicle-battery-packs-see-biggest-price-drop-since-2017
COPERNICUS	[COP-1]	http://climate.copernicus.eu/
Belgian wholesale electricity market	[CRE-1]	https://www.creg.be/sites/default/files/assets/Publications/Studies/F2786NL.pdf
Conseil Superieur des finances	[CSF-1]	Table 6, https://www.plan.be/sites/default/files/documents/FOR_VERG2022_12672_FR.pdf
De Tijd	[DTI-1]	https://www.tijd.be/ondernemen/auto/auto/Laadpalen-in-publieke-ruimte-bijna-verdubbeld-in-een-jaar/10586574
University of Cologne	[ECU-1]	https://www.ewi.uni-koeln.de/cms/wp-content/uploads/2020/09/E-CUBE-EWI-2030-Peak-Power-Demand-in-North-West-Europe-vf3.pdf
Elia	[ELI-1]	https://www.elia.be/en/public-consultation/20241104_public-consultation-on-the-methodology-the-basis-data-and-scenarios
Elia	[ELI-2]	https://www.elia.be/en/users-group/wg-adequacy/20240827-meeting
Elia	[ELI-3]	https://www.elia.be/-/media/project/elia/elia-site/electricity-market-and-system/adequacy/crm/2024/20241129_entras-study.pdf
Elia	[ELI-4]	https://www.elia.be/en/press/2023/06/20230629_pressrelease_adeqflex
Energyville	[ENE-1]	https://perspective2050.energyville.be/sites/energyoutlook/files/inline-files/Full-Fledged%20Report_1.pdf
Environmental research letters	[ERL-1]	" Towards a future-proof climate database for European energy system studies" Environ. Res. Lett. 17 (2022) 121001, L. Dubus *et al.;* WMO Guidelines on the Calculation of Climate Normals (2017)
European Commission	[EUC-1]	https://ec.europa.eu/commission/presscorner/detail/en/ip_25_339
European Commission	[EUC-2]	https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan_en
European Commission	[EUC-3]	https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan/net-zero-industry-act_en

European Commission	[EUC-4]	https://ec.europa.eu/eurostat/databrowser/view/nrg_bal_c__custom_15233385/default/table?lang=en&page=time:2023
European Commission	[EUC-5]	https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en
European Commission	[EUC-6]	https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en#:~:text=of%20Buildings%20Directive-,The%20revised%20Energy%20Performance%20of%20Buildings%20Directive%20(EU%2F2024%2F,performing%20buildings%20in%20each%20country.
European Commission	[EUC-7]	https://climate.ec.europa.eu/eu-action/transport/road-transport-reducing-co2-emissions-vehicles/co2-emission-performance-standards-cars-and-vans_en#:~:text=The%20targets%20that%20will%20apply,%2Fkm%20(2030%2D2034)
European Commission	[EUC-8]	https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/european-union-eu27/target-tracker
European Commission	[EUC-9]	https://alternative-fuels-observatory.ec.europa.eu/general-information/news/electric-vehicle-battery-packs-experience-record-price-drop-2024
European Commission	[EUC-10]	https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en
EUR-Lex	[EUR-1]	https://eur-lex.europa.eu/TodayOJ/
FEBIAC	[FEB-1]	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Ffebiac.be%2Fsites%2Fdefault%2Ffiles%2Fmedia%2Ffile%2F2024-12%2F2.B.7.%2520Evolution%2520des%2520immatriculations%2520de%2520voitures%2520neuves%2520par%2520segment.xls&wdOrigin=BROWSELINK
FEBIAC	[FEB-2]	https://febiac.be/nl/news/inschrijvingen-van-nieuwe-voertuigen-tot-december-2024
France Hydrogène	[FHY-1]	https://s3.production.france-hydrogene.org/uploads/sites/4/2023/10/France-Hydrogene_National-Hydrogen-Strategy_EN.pdf
Fleet	[FLE-1]	https://www.fleet.be/worden-plug-in-hybrides-valse-hybrides-in-2025/
Federal Planning Bureau	[FPB-1]	https://www.plan.be/sites/default/files/documents/FOR_Energy2024_13004_FR.pdf
Federal Planning Bureau	[FPB-2]	https://www.plan.be/sites/default/files/documents/PRESS_20240614_FR.pdf
Federal Planning Bureau	[FPB-3]	https://www.plan.be/fr/publications/perspectives-energetiques-de-la-belgique-politique
Federal Planning Bureau	[FPB-4]	https://www.plan.be/nl/data/bevolkingsvooruitzichten-2023-2070
Federal Planning Bureau	[FPB-5]	https://www.plan.be/sites/default/files/documents/WEBINAR_20230919_slides_NL.pdf

SPF Economy	[FPS-1]	https://economie.fgov.be/en/themes/energy/sources-and-carriers-energy/hydrogen/belgian-federal-hydrogen
French Government	[FRG-1]	https://www.ecologie.gouv.fr/sites/default/files/documents/20200422%20Programmation%20pluriannuelle%20de%20l%27e%CC%81nergie.pdf
KPMG	[KPM-1]	https://kpmg.com/be/en/home/insights/2023/03/ctx-belgian-windfall-tax-on-electricity-producers.html
International Council on Clean Transportation (ICCT)	[ICC-1]	https://theicct.org/wp-content/uploads/2024/04/ID-80-%E2%80%93-BEVs-size-Report-A4-70138-v10.pdf
International Council on Clean Transportation (ICCT)	[ICC-2]	https://theicct.org/publication/real-world-phev-use-jun22/
International Council on Clean Transportation (ICCT)	[ICC-3]	https://theicct.org/publication/2025-CO2-manufacturers-targets-oct24/
International Council on Clean Transportation (ICCT)	[ICC-4]	https://theicct.org/publication/european-market-monitor-cars-vans-2024-feb25/
International Energy Agency (IEA)	[IEA-1]	https://www.iea.org/reports/projected-costs-of-generating-electricity-2020
IEEE Transactions on Transportation Electrification	[IEE-1]	https://www.researchgate.net/publication/260509603_Controlling_Electricity_Consumption_by_Forecasting_its_Response_to_Varying_Prices
Federal Government Agreement	[LAW-1]	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjLmNeM97GLAxUz1wIHHfIc-DqoQFnoECAgQAQ&url=https%3A%2F%2Fwww.vrt.be%2Fcontent%2Fdam%2Fvrtnieuws%2Fbestanden%2F2025%2Fregeerakkoord_01022025.pdf&usg=AOvVaw33MJllBuNK7j_MA9XU2aNE&opi=89978449
Flemish Government	[LAW-2]	https://www.vlaanderen.be/en/authorities/flemish-resilience/expanding-our-charging-infrastructure-is-a-top-priority
Nieuwsblad	[NIE-1]	https://www.nieuwsblad.be/cnt/dmf20250121_95060885#:~:text=In%2029%20Vlaamse%20gemeenten%20konden,is%20dan%20weer%20een%20vergunningskampioen.

National Renewable Energy Laboratory (NREL)	[NRE-1]	https://atb.nrel.gov/electricity/2023/index
Lazard	[LAZ-1]	https://www.lazard.com/research-insights/2023-levelized-cost-of-energyplus/
Réseau de Transport d'Électricité (RTE)	[RTE-1]	https://assets.rte-france.com/prod/public/2024-12/2024-12-16-chap12-volet-mobilite.pdf
Réseau de Transport d'Électricité (RTE)	[RTE-2]	https://www.rte-france.com/analyses-tendances-et-prospectives/bilan-previsionnel-2050-futurs-energetiques#Lesdonnees
Charaka Beragama Jathunge,Amirhossein Darbandi,Seth B. Dworkin,Aggrey Mwesigye	[SCI-1]	https://www.sciencedirect.com/science/article/abs/pii/S0360544224002688
Wallonie énergie SPW	[SPW-1]	https://energie.wallonie.be/fr/cadre-de-reference-pour-l-implantation-d-eoliennes-en-region-wallonne.html?IDD=11176&IDC=6170
Statbel	[STA-1]	https://statbel.fgov.be/nl/themas/bouwen-wonen/bouwvergunningen#news
Statbel	[STA-2]	https://statbel.fgov.be/nl/themas/bouwen-wonen/bouwvergunningen
Synergrid	[SYN-1]	https://www.synergrid.be/nl/documentencentrum/statistieken-gegevens/graaddagen
The Guardian	[TGU-1]	Hinkley Point C owner warns fish protection row may further delay nuclear plant | EDF Energy | The Guardian
Transport and Mobility Leuven (TML)	[TML-1]	https://drive.google.com/file/d/1lNWsTu8V5zpU2ZzVp3mvl_vHiNIiP_Q_/view
TNO	[TNO-1]	https://publications.tno.nl/publication/34642358/YuUfgl/TNO-2023-R12726.pdf
Transport Environment	[TRE-1]	https://www.transportenvironment.org/articles/cars-are-getting-1-cm-wider-every-two-years-research
Transport Environment	[TRE-2]	https://www.transportenvironment.org/articles/the-drive-to-2025-why-eus-2025-car-co2-target-is-reachable-and-feasible
Vlaamse Regering	[VLR-1]	https://www.vlaanderen.be/lokaal-woonbeleid/nieuws/vlaamse-regering-richt-task-force-wonen-ruimte-op-om-bijkomend-betaalbaar-en-duurzaam-woonaanbod-mogelijk-te-maken
Vlaamse Regering	[VLR-2]	https://publicaties.vlaanderen.be/view-file/69476
World Energy Outlook 2022 (IEA)	[WEO-1]	https://www.iea.org/data-and-statistics/data-product/global-energy-and-climate-model-key-input-data

World Meteorological Organization	[WMO-1]	https://library.wmo.int/records/item/55797-wmo-guidelines-on-the-calculation-of-climate-normals
World Nuclear News	[WNN-1]	EDF announces Hinkley Point C delay and rise in project cost - World Nuclear News