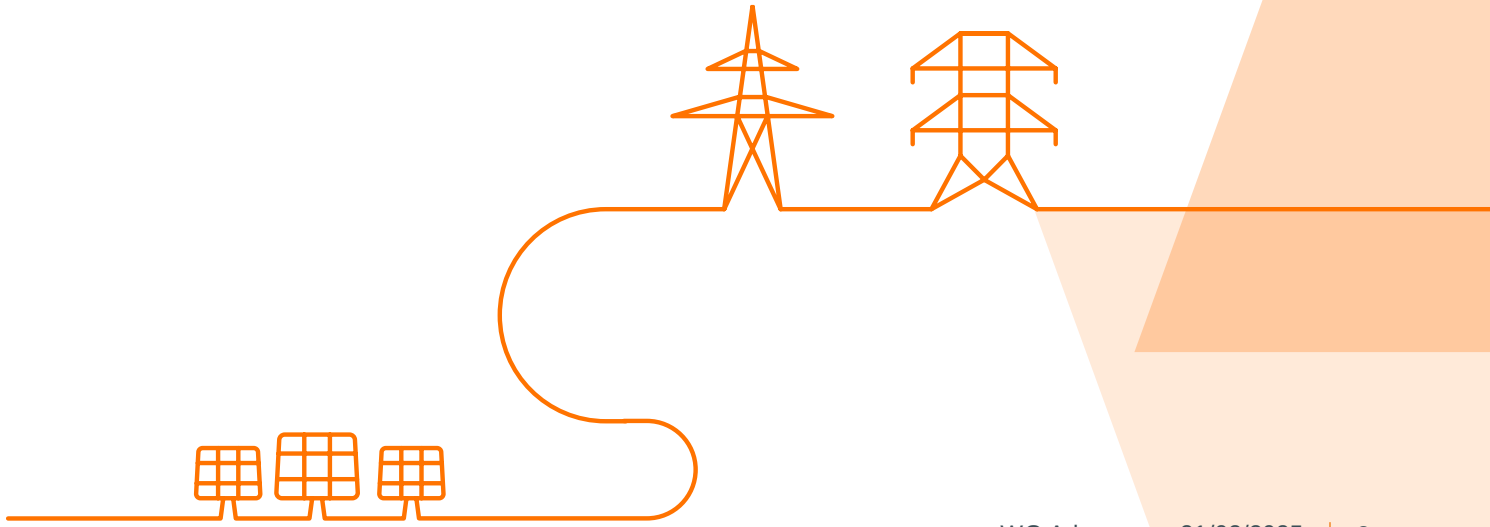
WG Adequacy #38

21/02/2025

Agenda

- Welcome
- Validation Meeting Minutes
- Reactions to Public Consultation of Adequacy & Flexibility 2026-2036
- Status Availability Monitoring and Payback Obligation implementation & next sessions
- AOB & Next meetings



Welcome

Validation meeting minutes

Meeting Minutes WG Adequacy #37 (27/01/2025)

- No comments were received

Reactions to Public Consultation Adequacy & Flexibility study

elia | Elia Group

Feedback on public consultation

21.02.2025

Adequacy and Flexibility Study for Belgium

2026-2036

This study will be based on the requirements set in the electricity law and will use the expertise that Elia has developed in its past Adequacy and Flexibility studies

APR 2016

Adequacy & Flexibility 2017-2027

Adequacy Flexibility

At the request of the Minister of Energy, an ad hoc study covering the adequacy and flexibility of Belgium's needs was published in April 2016. As requested by the authorities, an addendum was subsequently published in September 2016, based on a large stakeholder consultation which was undertaken following the publication of the initial study.

JUL 2018

Legal requirement in the Belgian Electricity Act

Art. 7bis, §4bis (Elia's translation into English): "*No later than 30 June of each biennial period, the system operator shall carry out an **analysis of the needs** of the Belgian electricity system in terms of the country's **adequacy** and **flexibility** for the next **ten years**.*
*The basic **assumptions** and **scenarios**, as well as the **methodology** used for this analysis, shall be determined by the system operator **in collaboration** with the **Directorate General for Energy** and the **Federal Planning Bureau** and in **concertation** with the **regulator**.*"

JUN 2019

Adequacy & Flexibility 2020-2030

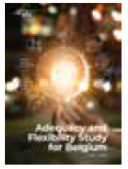
Adequacy Flexibility

The first study published in 2019 after the modified law.

JUN 2021

Adequacy & Flexibility 2022-2032

Adequacy Flexibility



JUN 2023

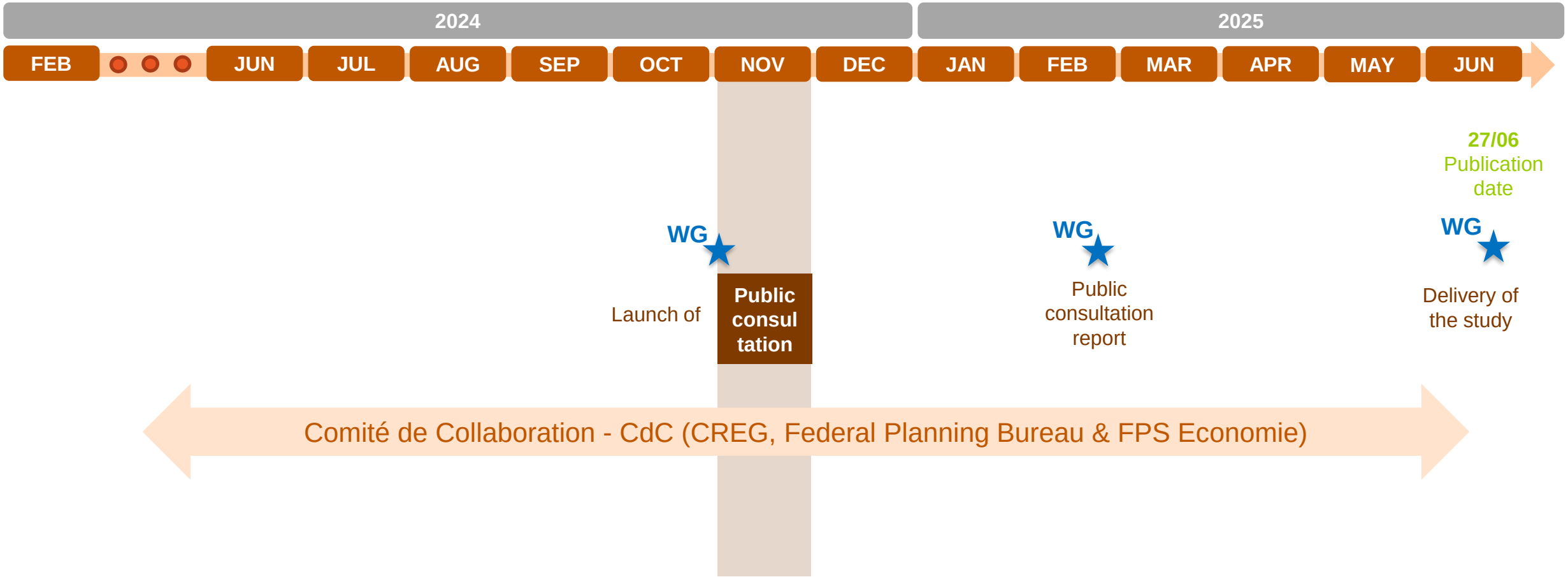
Adequacy & Flexibility 2024-2034

Adequacy Flexibility

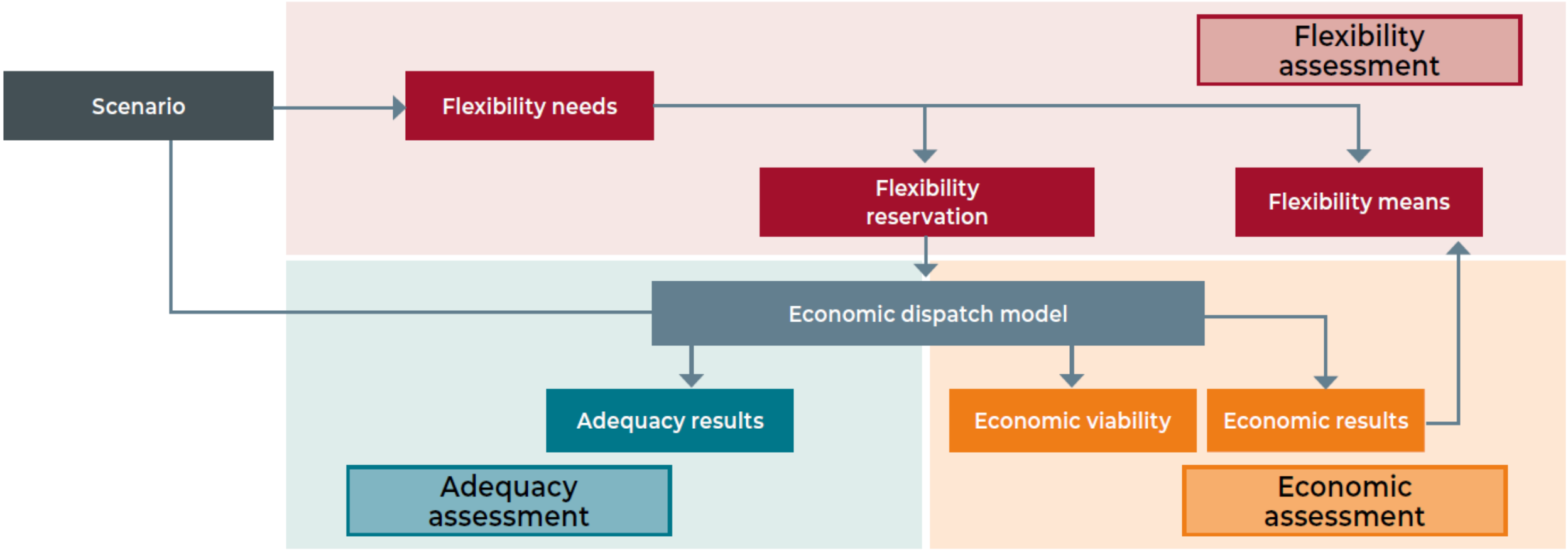
JUN 2025

Adequacy & Flexibility 2026 – 2036

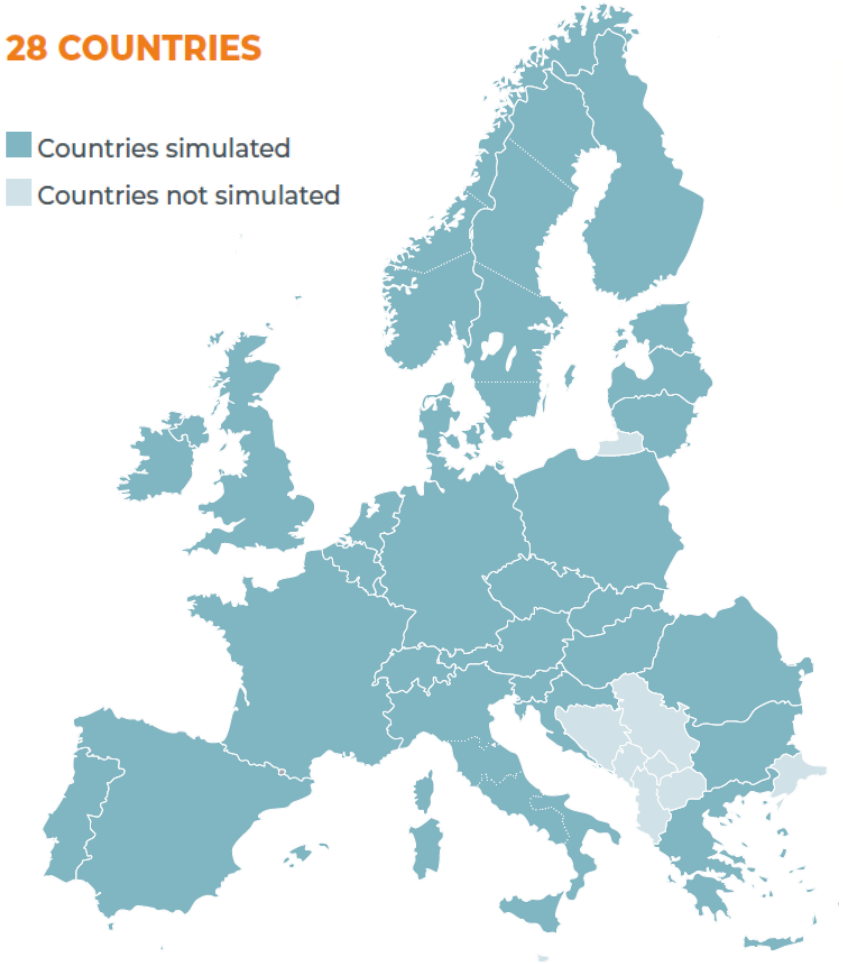
High level timeline of the study delivery

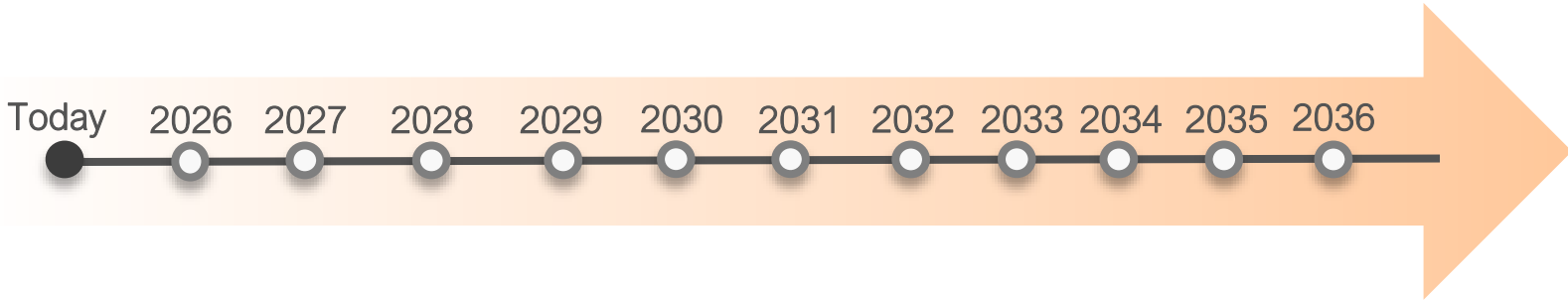


This study covers 3 main topics related to adequacy, flexibility and economics



The study will look 10 years ahead, and will simulate 28 countries





Adequacy assessment

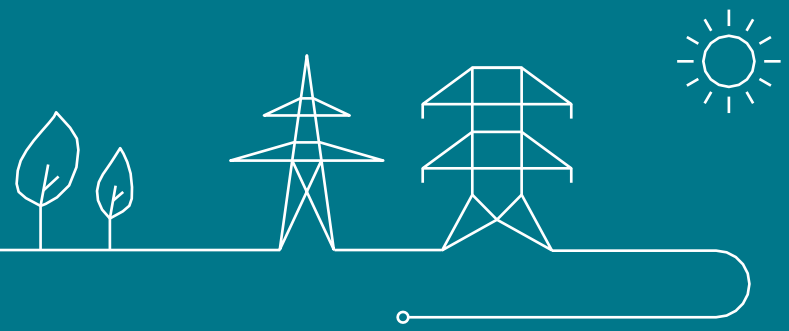
Economic assessment

Short-term flexibility assessment

Depending on the amount of sensitivities, a more limited set of years will be chosen for certain of those

Years are simulated from 1 September Y to 31 August Y+1,
hence 2030 corresponds to 1 September 2030 until 31 August 2031.

Context of the study

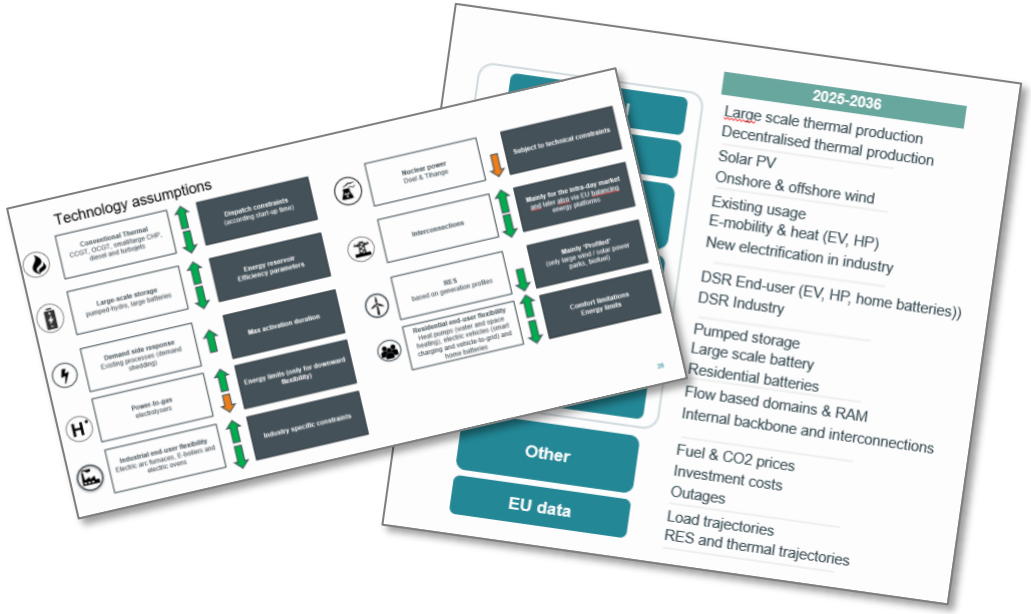


Overview of documents submitted to public consultation

Scenario & data

Accompanying documents describing the scenario

Excel tables with the data



Methodology

+ Methodology documents

A. **Unit commitment -** 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 -** Details the way heat pumps are modelled, including their flexibility
F. **Batterie -** 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 the approach of the economic viability assessment
L. **Cross-border capacities -** Details the way that interconnections and flow based are modelled
M. **Short-term flexibility methodology -** Details the way the short-term flexibility assessment is performed

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

Feedback received to public consultation

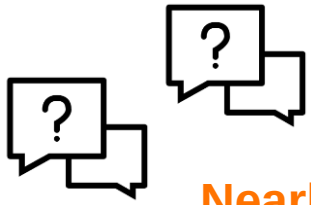
Elia thanks all the stakeholders for the feedback received.

12 stakeholders with non-confidential feedback

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

+ 3 stakeholders with confidential feedback

The non-confidential feedback are attached to the consultation report that will be published on Elia website



Nearly 100 comments

Input data / General	3
Input data / Cogeneration, biomass and thermal production	5
Input data / Renewable energy sources	4
Input data / Storage	1
Input data / Electricity demand	35
Input data / Investment cost	6
Input data / Grid & Flow based domains	1
Input data/ Data for other countries	2
Input data / Other	1
Methodology / General	2
Methodology / Adequacy study	1
Methodology / Climate years	3
Hurdle rates and Prof. K. Boudt study	4
Assessment of short-term flexibility	4
CRM	1
Scenarios and sensitivities	15
General comments	2

Preliminary information

Today's objectives

- Presenting **reality checks** and **updates** performed early 2025 as promised by Elia;
- Presenting **consultation report** in a **transparent** and **comprehensive** way while covering **most of the answers** given;

- It is however **not possible** to go **through each** of the feedback/answers of the report;
- Elia refers to the consultation report that will be made available on Elia's website

AdeqFlex – 3 main scenarios instead of 1

Three main scenarios will be studied (complemented with other analysis as done in the past)

- During the public consultation, many comments received were referring to sensitivities and scenarios, asking for more analysis but also combined sensitivities.
- There are many uncertainties on the evolution of certain technologies, macro-economic trends, policies..
- Therefore, AdeqFlex'25 will analyze **three main scenarios**.
- Even though additional combined scenarios were analyzed during AdeqFlex'23, these were not put forward.
- Additional sensitivities will still be analyzed on top of the three main scenarios (high/low for different types of technologies...).

AdeqFlex'23

- **One CENTRAL scenario**, based on official targets and latest announced policies.
- Many dedicated **sensitivities** focusing on specific subjects.
- **Combined scenarios** based on **coherent storylines** presented **as side-analysis**.

AdeqFlex'25

- ✗ No CENTRAL scenario.
- Additional dedicated **analysis** focusing on specific subjects will still be performed.
- **Three main combined scenarios,** based on **coherent storylines, put forward in the study.**

Three probable scenarios will be analysed

Constrained transition

- Considering **lack of macro-economic** conditions with 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**.
- Follows slower uptake of EV & HP and reduced and slower industry electrification, including some industry closures*, slower uptake of end-user flexibility, RES and grid projects.

Current commitments & ambitions

- Considering **announced targets and policies,** previously called **'**central' or 'reference' (=submitted to consultation) & gov. ambitions
- Follows **official projections** (Bureau du Plan, NECP, latest government agreements, industry electrification plans).

Prosumer power

- Considering current **trends** related to **prosumer** accelerate further, with prices that continue to further decrease for PV, batteries, EV,…make them very cheap and accessible. Faster shift to heat pumps not only in new buildings.
- Considering more end-user flexibility.
- Other targets and ambitions are kept as announced (industry load, onshore/offshore wind, etc.)

A sufficiency scenario will also be studied

** Based on E-CUBE study presented during WG Adequacy in August 2024.*

Trajectories for parameters in scenarios

		Current commitments & ambitions	Prosumer power	Constrained transition
Electricity consumption				
Transport & building heat electrification	EV	Current policies	Faster uptake	Slower uptake
	HP	Current policies	Faster uptake	Slower uptake
Existing usages	Industry	Current projections (CLIMACT based on Fed. Planning Bureau data), including energy efficiency		
	End-user*	*+ Partial recovery*	*+ Full recovery*	*+ No recovery*
New industrial electrification (industry & data centers)		TSO client input reviewed + DSO desktop studies		Further delays & abandons
Flexibility				
Transport & building heat electrification	EV	Current ambitions & trends	Faster uptake of dynamic & incentive tariff	Slower roll-out of smart meters & dynamic contracts
	HP			
New industrial electrification (industry & data centers)		TSO client input & literature		
Batteries	Residential	Current ambitions	Faster uptake	Slower uptake
Generation				
Renewable Energy sources	PV	Current ambitions	Faster uptake	Current ambitions
	Wind On.	Current ambitions	Current ambitions	Slower uptake
	Wind Off.	Current ambitions	Current ambitions	Slower uptake

➔ On top of the 3 scenarios, sensitivities will be caried out on Current Commitments, e.g. high/low Flex

**residential & tertiary*

Trajectories for parameters in scenarios

Update since Nov. 2025
on Current Commitment scenario

Electricity consumption		
Transport & building heat electrification	EV	Reality check 2024 + Efficiency
	HP	Reality check 2024 + COP
Existing usages	Residential	Reality check 2024 + Energy efficiency
	Industry	
New industrial electrification (industry & data centers)		Update of TSO-clients input + DSO desktop studies
Flexibility		
Transport & building heat electrification	EV	Reality check 2024
	HP	Reality check 2024
New industrial electrification (industry & data centers)		Update of TSO-clients input + DSO desktop studies
Batteries	Residential	Reality check 2024
Generation		
Renewable Energy sources	PV	Reality check 2024
	Wind On.	Reality check 2024
	Wind Off.	*Fed gov agreement*
Thermal	Nuclear	*Fed gov agreement*

Feedback on input data

Overview of input data

- General
- Electricity demand
- Thermal production
- Renewable energy sources
- Storage
- Investment cost
- Flow based domain
- Data for other countries

Overview of input data

- **General**
- Electricity demand
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General

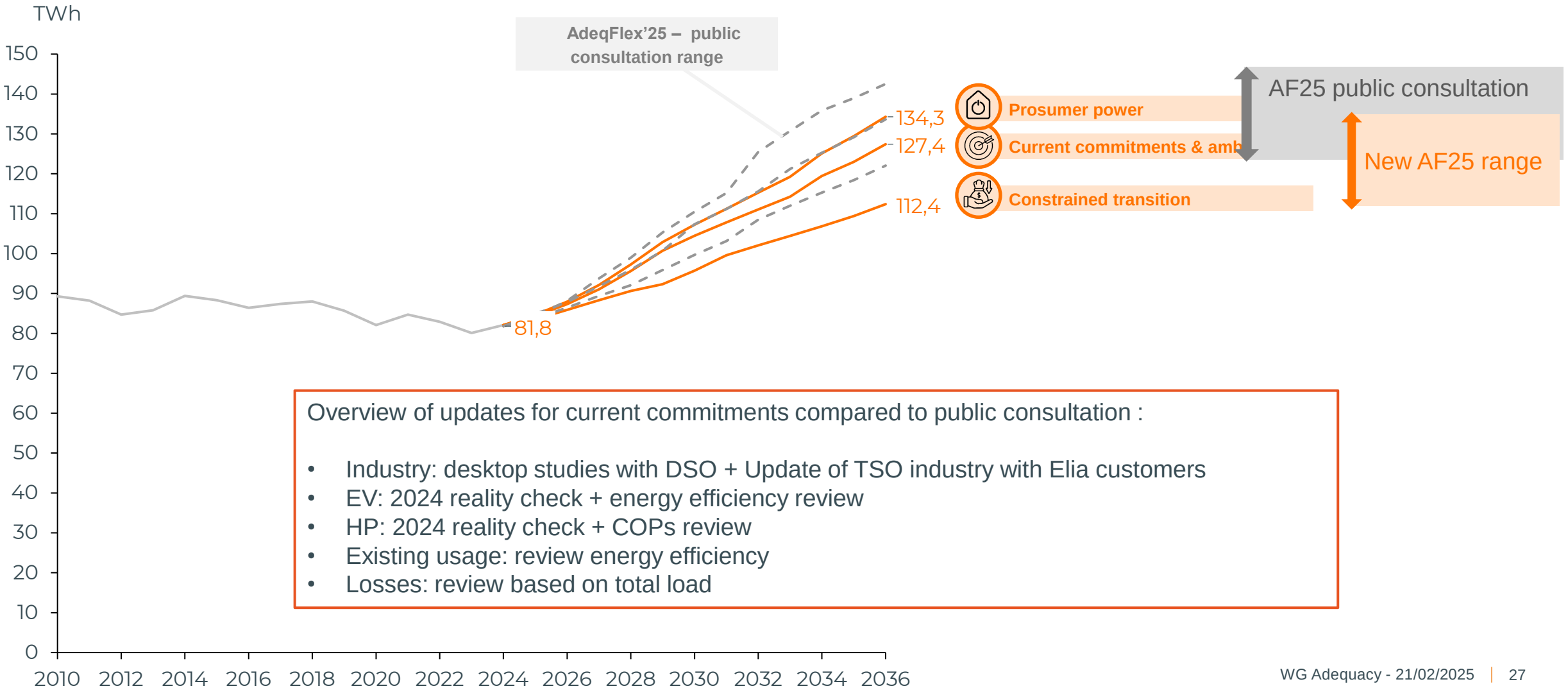
- Febeliec finds the **one-month consultation period challenging.**
- Comments from CREG, negaWatt and ABOUSCO on the fact that **not all data are submitted for public consultation** and that this should be the case to ensure the **greatest possible transparency**. They cannot recalculate evolution trajectories of Elia.
- For negaWatt, Elia should **openly release the source code** together with the non-IP-protected input data to promote transparency and collaboration.
- The Shifters Belgium would have liked to **see more scenarios** put forward for consultation, with the four main levers: energy efficiency, sufficiency, nuclear power and renewables.

- The public consultation timeline balances **meeting stakeholder expectations with the legal mandate to publish the study by June**.
- The public consultation provides a **very significant level of details and explanations** to ensures **transparency and effective collaboration.** A document of more than 50 pages detailing all the input data was submitted to consultation, together with an Excel file of 16 sheets, which is **already challenging** for stakeholders to analyze.
- Regarding the methodology, it is fully described in the appendices submitted to consultation. Regarding the software, Elia **is using the Antares software** which is an **open-source tool** with accessible source code provided by RTE.
- **Additional data** could be submitted to public consultations in the future if deemed relevant.
- Regarding the scenarios, **the study now looks at 3 scenarios** with various level of electrification, RES, storage, etc. An additional scenario on **sufficiency** will also be developed.

Overview of input data

- General
- **Electricity demand**
- Thermal production
- Renewable energy sources
- Storage
- Investment cost
- Flow based domain
- Data for other countries

Load trajectory has been reviewed for the 3 scenarios

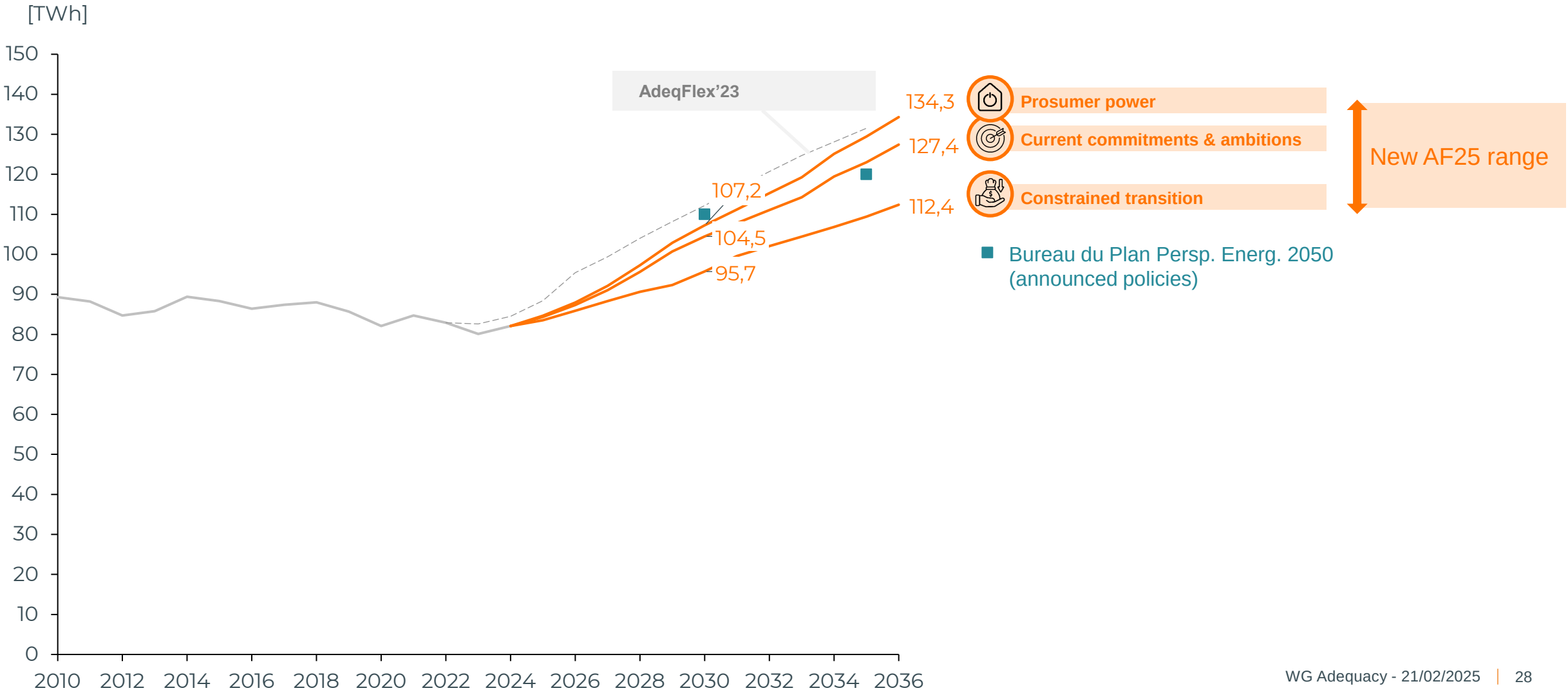


Overview of updates for current commitments compared to public consultation :

- Industry: desktop studies with DSO + Update of TSO industry with Elia customers
- EV: 2024 reality check + energy efficiency review
- HP: 2024 reality check + COPs review
- Existing usage: review energy efficiency
- Losses: review based on total load

Normalised total load (climate 1991-2020). Excluding electrolyser consumption, including grid losses. Final load after market dispatch can be different due to flexibility activation

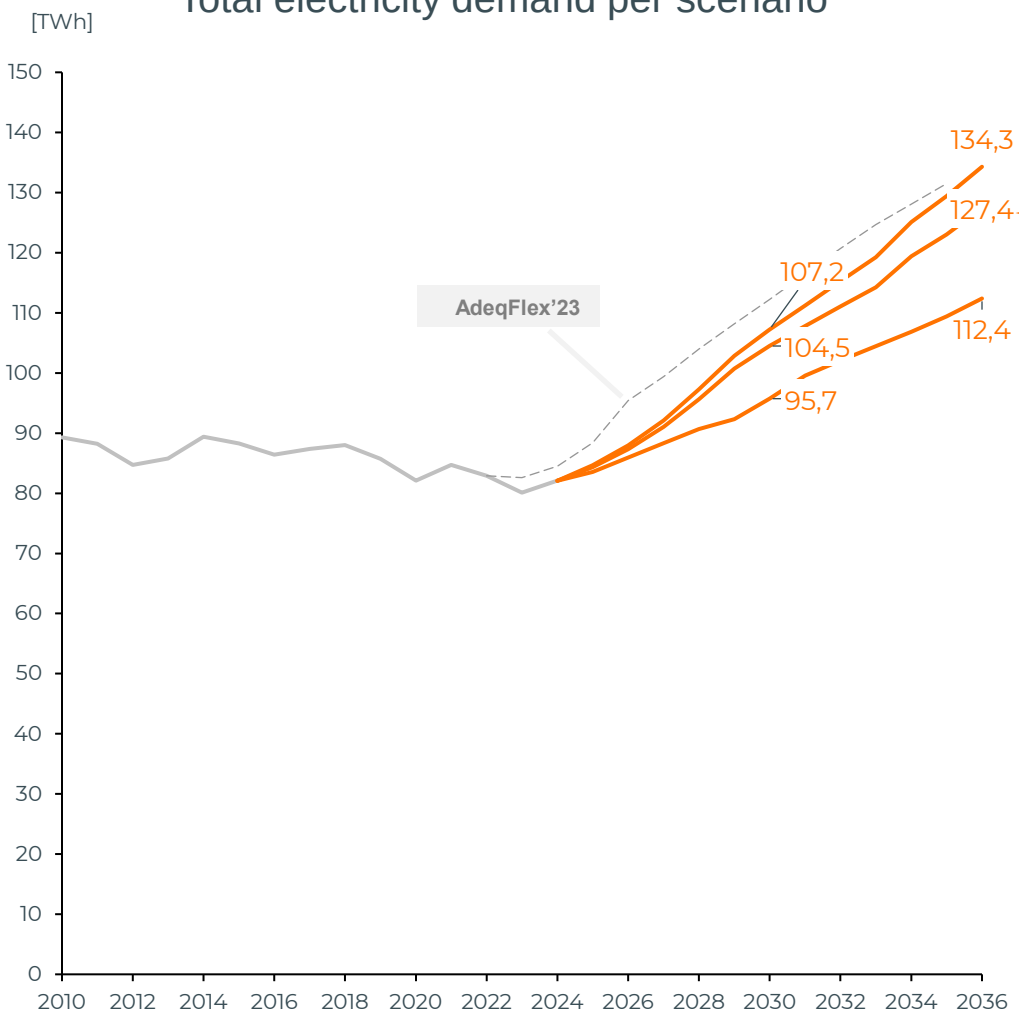
Load trajectory has been reviewed for the 3 scenarios



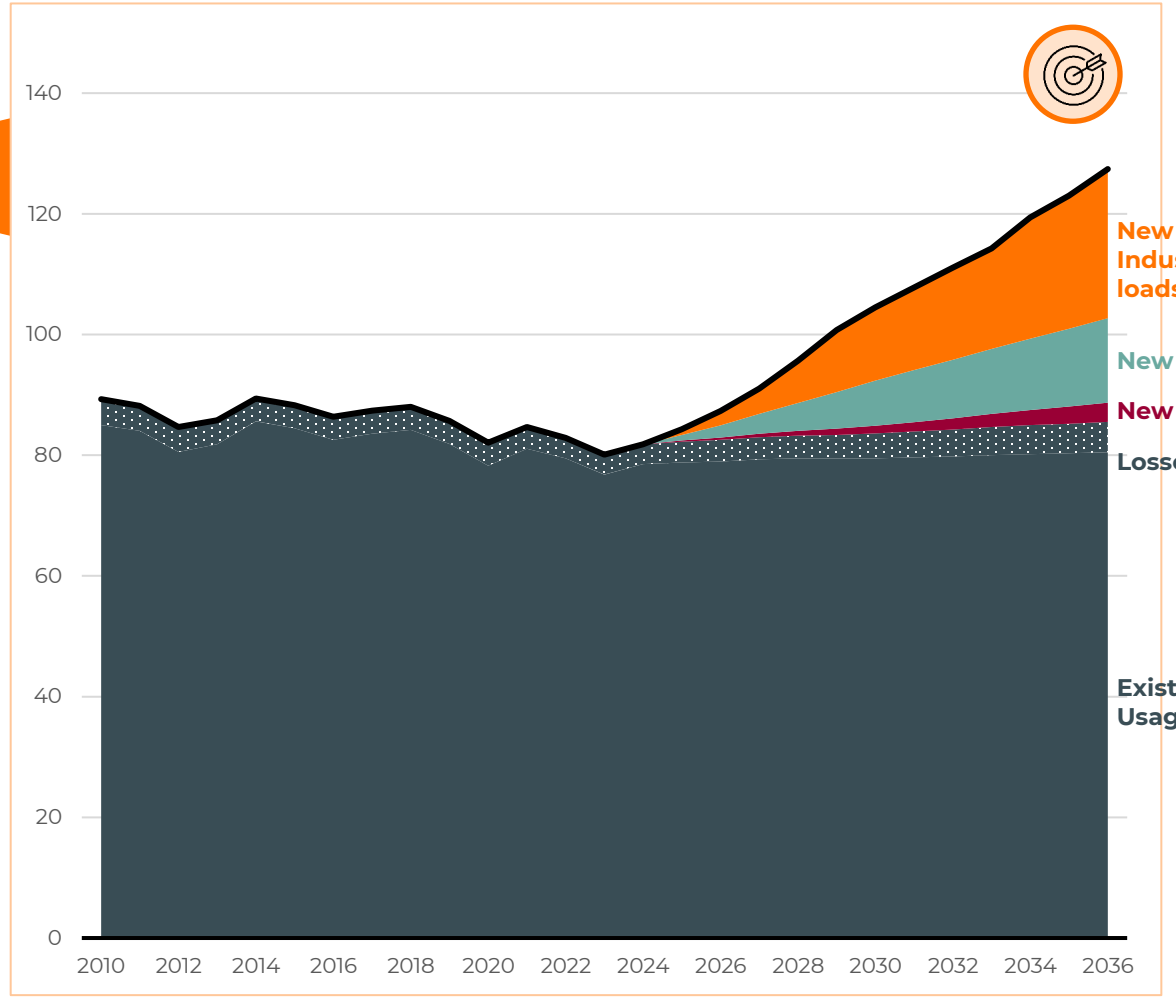
Normalised total load (climate 1991-2020). Excluding electrolyser consumption, including grid losses. Final load after market dispatch can be different due to flexibility activation

Load trajectory has been reviewed for the 3 scenarios

Total electricity demand per scenario



… per **new** demand category vs 2024 for **Current Commitments**



Normalised total load (climate 1991-2020). Excluding electrolyser consumption, including grid losses. Final load after market dispatch can be different due to flexibility activation

Electricity demand

- CREG notes that Elia's **forecasted electricity demand growth for Belgium** from 2025 to 2036 is among the highest in Europe (+46% to +66% towards 2036).

➢ The revised load trajectories from the 3 scenarios now projects from + **37%, +55% and +64% increase** towards 2036, aligning Belgium with Germany and the Netherlands, but below the UK's projections.

➢ Similar relative increases are noted in other EU countries, like Denmark and Sweden, but each country's context varies.

- CREG suggests that Elia's **process-based allocation of additional electrification demand is less relevant** for studying electricity consumption evolution and proposes **sector-specific allocation** instead.

➢ Elia will detail **consumption per industrial sectors in the final documents.** Process split remains however relevant as it impacts the flexibility potential.

Electricity demand - Existing usages

- CREG notes that the Bureau Fédéral du Plan's projections only extend to 2029. They request Elia to **clarify in the consultation report that these data are extrapolated for 2030-2036**, and to **justify why.**

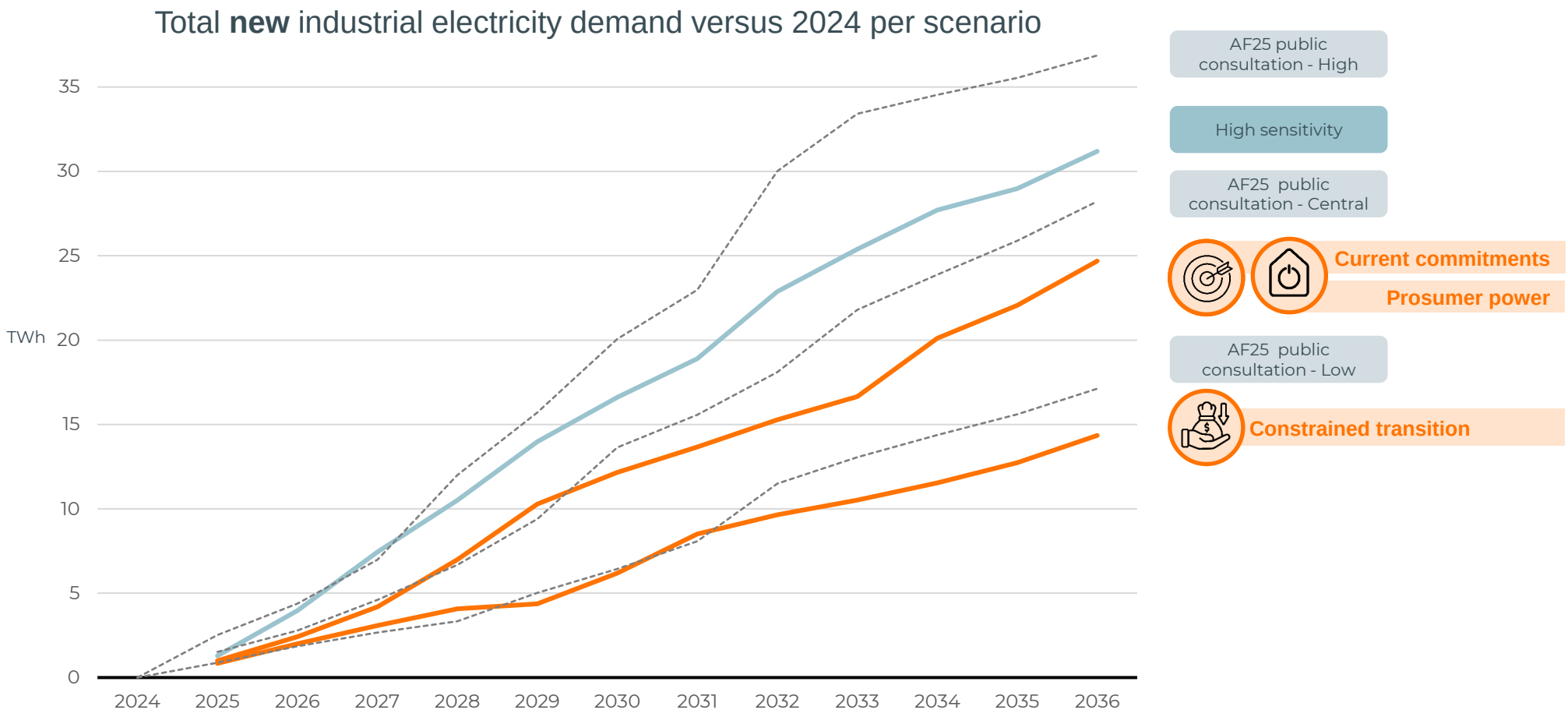
➢ Elia emphasizes transparency in its assumptions, **extending the 2024-29 macroeconomic outlook's growth beyond 2029**, based on work performed by the Plan Bureau. The GDP growth assumption of 1.4% per year from 2027-2050 follows the announced policy framework.

- CREG finds the **0.2 TWh annual increase of existing usage insufficiently justified**. They request detailed data from the CLIMACT BECalc tool, particularly on **reductions** due to **energy efficiency** and increases from more household appliances and heightened economic activity in the tertiary sector and ask Elia to include this in the consultation report.

➢ **Energy efficiency has been reviewed in the residential and tertiary categories**, with CLIMACT. This results in lower consumption in the existing usage category.

➢ Elia **consider this request for future public consultation exercise.**

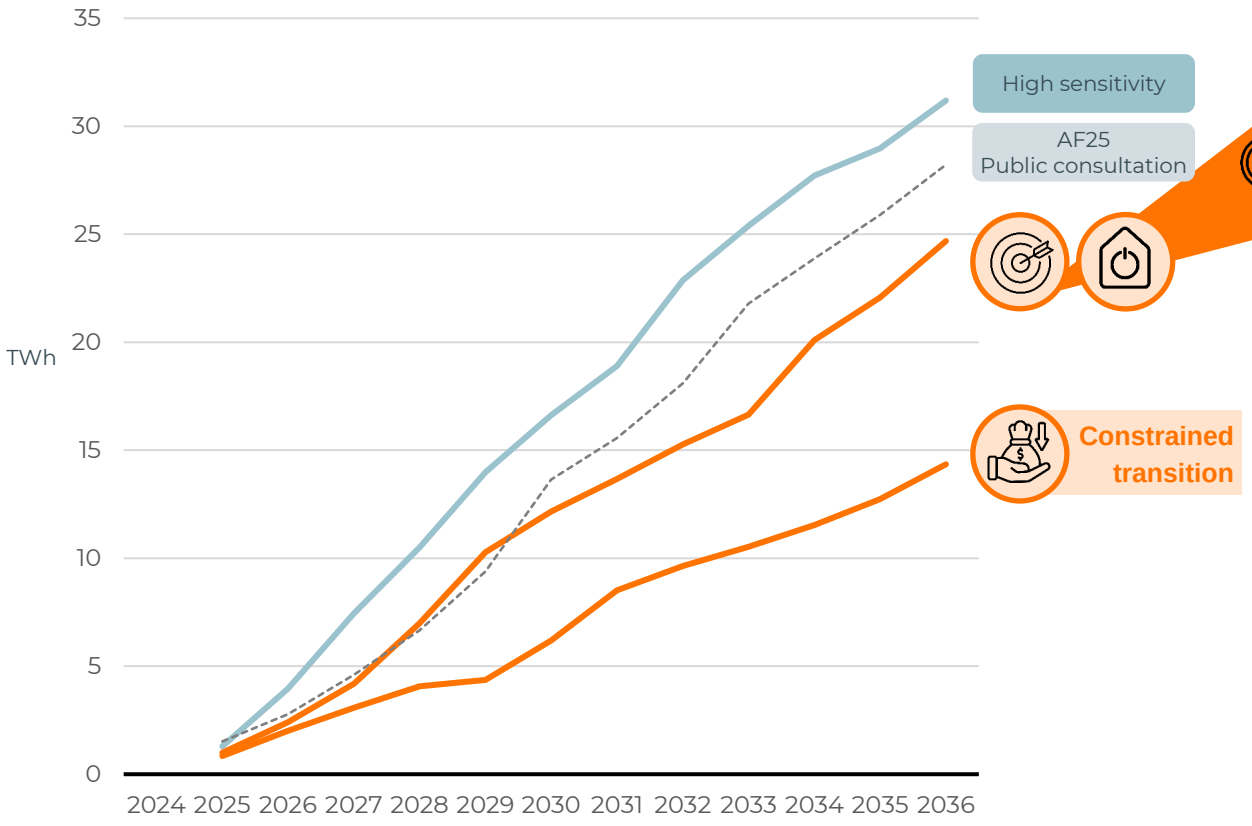
New industrial electrification



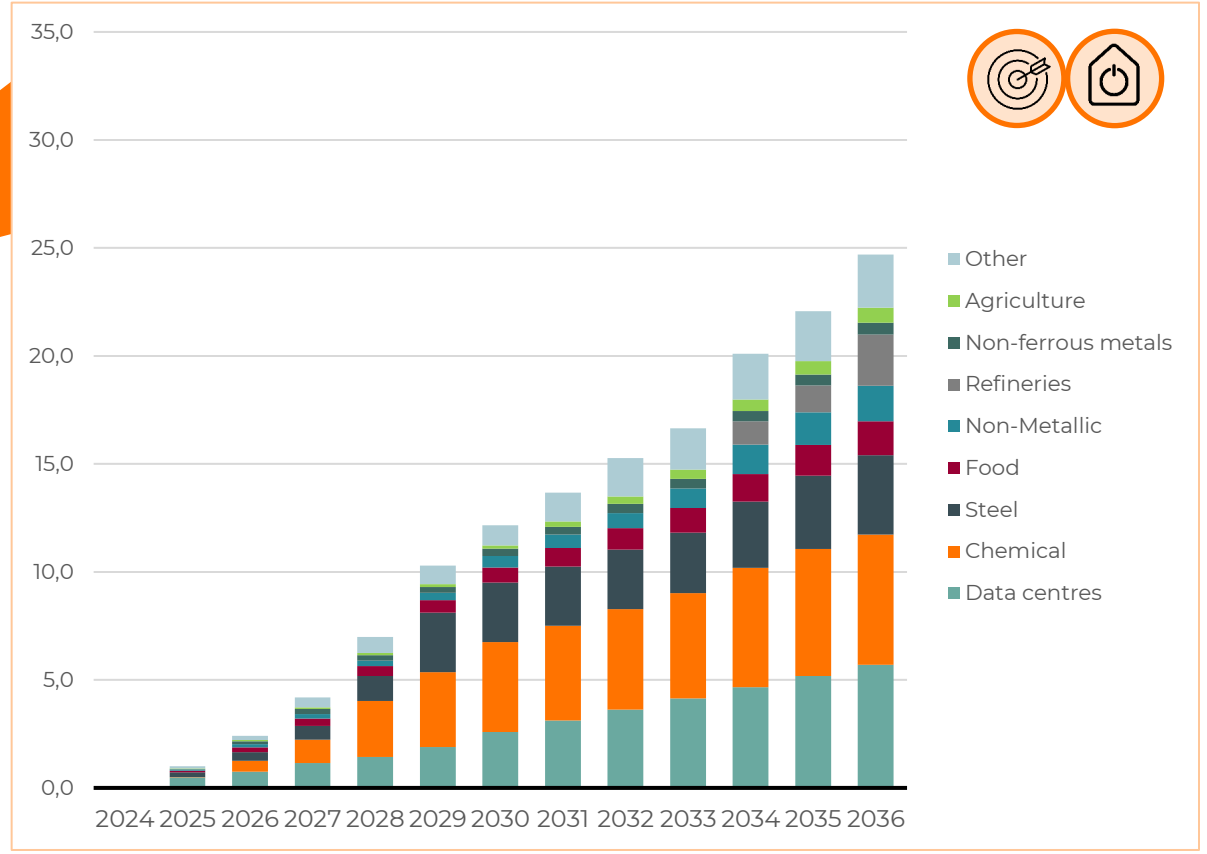
- **Update** of industry
  - Direct exchanges with Elia's largest customers. Some confirmed their trajectories, some adapted it. Consolidation of these data into Elia scenarios (low / central / high)
  - After sectoral analysis, trajectories were reviewed for all grid users (100+) for all Elia scenarios (low / central / high)
  - Desktop studies with DSO on industry electrification connected at DSO-level

New industrial electrification

Total **new** electricity demand vs 2024 per scenario



… Sectoral details for **Current Commitments** scenario and **Prosumer Power**



Excluding electrolyser consumption. Final load after market dispatch can be different due to flexibility activation (for example: power-to-heat)

Electricity demand - Industry & data-centers electrification

- CREG emphasizes the necessity for a rigorous and realistic **verification of the industrial projections** and suggests using the 'Low' scenario, which accounts for realistic electrification and uncertainties, as ‘Central’.
- CREG highlights that **Elia's electrification trajectories do not account for potential factory closures or the non-realization** of electrification projects.

➢ Elia has **updated and reviewed industry electrification trajectories**. Some customers confirmed their project and past submitted data; others updated their projections, further challenged by Elia. The actual direct input of TSO-clients is only used for the ‘high sensitivity’.

➢ The **different scenarios** consider **different levels of realization (or non-realization) of electrification projections** as well as **delays**.

➢ The ‘Constrained Transition’ considers **potential factory closures** (based on E-CUBE study presented in August 2024).

- FEBEG and ODE Vlaanderen points out that Elia may **not fully account for the rapid electrification by SMEs using e-boilers and heat pumps at lower voltage levels** and questions **if the demand growth from these levels is sufficiently considered**.

➢ **Lower voltage industry electrification is included** through updated desktop studies with DSO’s.

- Regarding flexibility, ODE Vlaanderen indicates that no additional consumption is expected before 2026 for electric boilers and 2027 for heat pumps. For them, this appears to be an underestimate.

➢ Elia lacks an exhaustive list of installed industrial boilers and heat pumps but agrees to **conduct a sensitivity analysis for faster electrification.**

Electricity demand - Industry & data-centers electrification

- FEBEG and ODE Vlaanderen also mention the **uncertainty and varying expectations regarding the role of green molecules** in decarbonization and their impact on electricity demand.

➢ Elia considers **all publicly known projects for local production of green molecules**.

➢ The **trajectories** presented by Elia can involve **different levels of development of green molecules**.

- For CANOPEA and Bond Beter Leefmilieu, the **CCS integration projections are overestimated**, with significant industrial CCS projects.
- For CREG, the bottom-up approach for **CCS/CCU relies on announced industrial projects, which may not align with actual emission needs**.

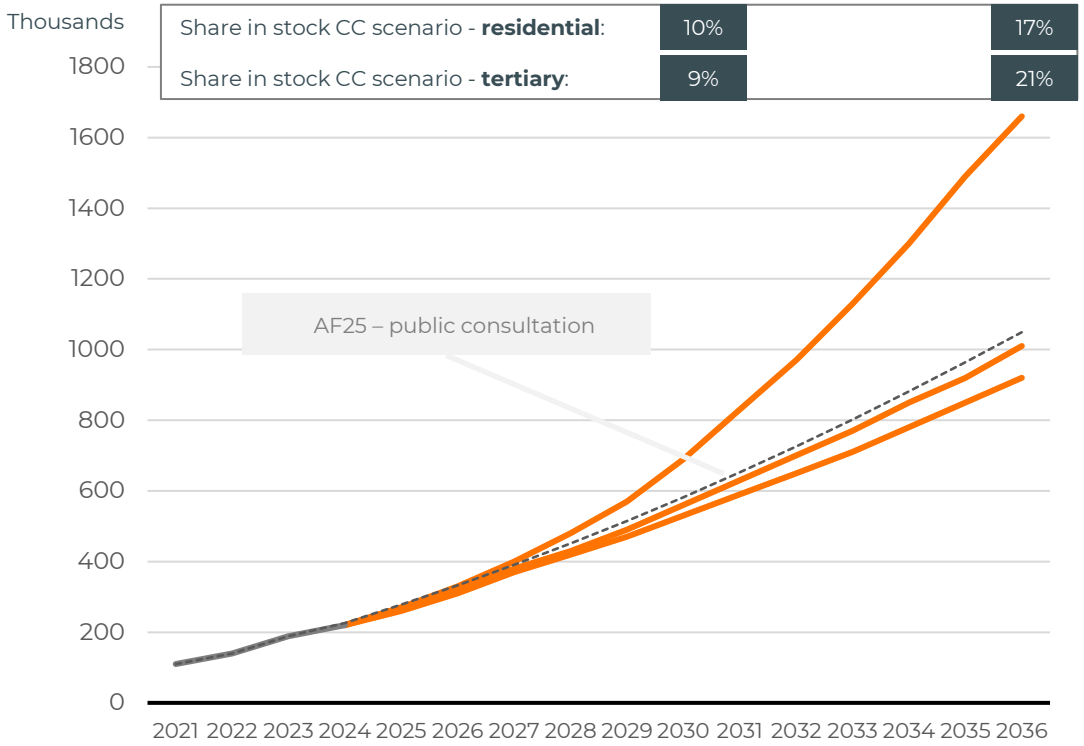
➢ Elia's CCS trajectory is **based on the direct feedback from TSO-clients ('Load Management' exercise)**

➢ These trajectories, were updated in January 2025, to reflect the **latest customer plans**.

➢ As explained previously, they are also reviewed into coherent Elia scenarios.

Heat Pumps– final trajectory

Hydronic HP installed in residential + tertiary (AW+GW)



Prosumer power

Assumptions residential sector:

New build: WL & BXL **100% HP/DH from 2030** (2025 for FL)
Boiler replacements & renovations: **100% HP from 2035 (already 100% in 2030 for renovations)**

Current commitments

New build: WL & BXL **100% HP/DH from 2035** (2025 for FL)
Boiler replacements & renovations: **20% HP (2030), 35% HP (2035)**

Constrained transition

New build: WL & BXL **100% HP/DH from 2040** (2025 for FL)
Boiler replacements & renovations: **15% HP (2030), 20% HP (2035)**

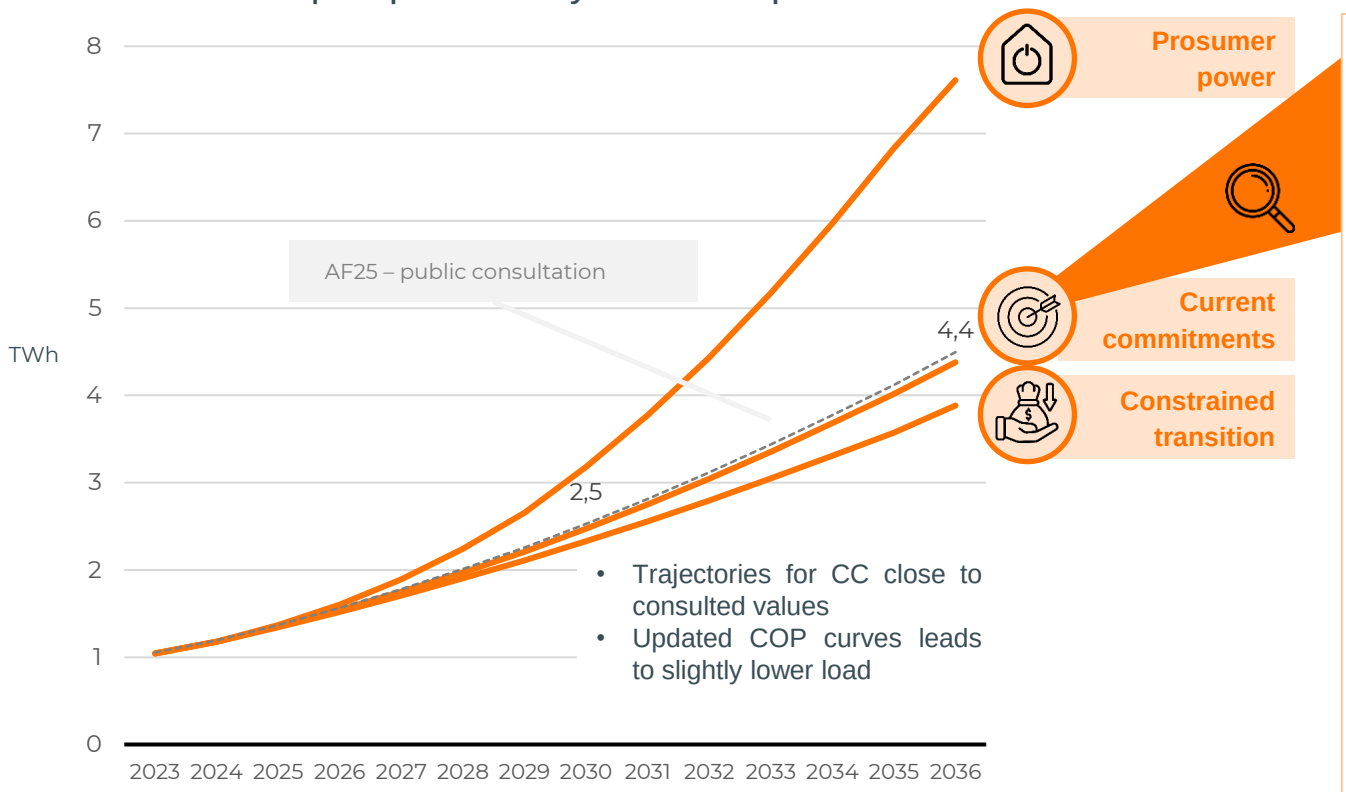
Same evolution of new builds assumed in all scenarios, but different renovation rates.

Tertiary sector follows similar trajectory with higher assumed uptake for renovations and boiler replacements (see report)

- Reality check for 2024: mainly higher AA HPs
- Current Commitments scenario: No change in uptake new builds & boiler replacements assumptions

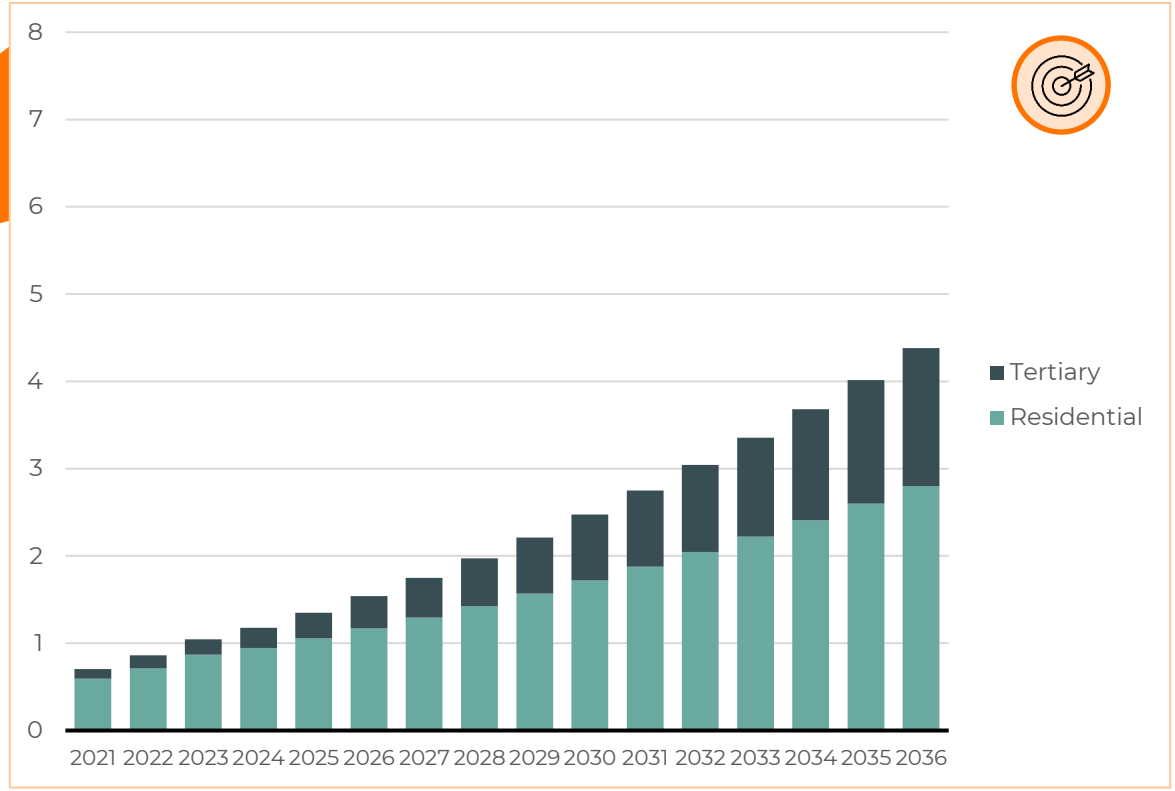
Heat Pumps – Electricity demand: minor impact compared to consultation values

Total heat pump electricity demand* per scenario



*normalized for 1991-2020 climate

… details for **Current Commitments** scenario



Heat Pumps

- CREG recommends a **reduction** in new housing construction towards 2036, from 40 000 in 2026 to 33 600 in 2036. CREG advises Elia to **clarify assumptions on the habitable surface area and heating volumes**, reflecting trends towards smaller new constructions and energy-efficient renovations.
- CREG advises Elia to **segment heat demand estimates by building type** (new or renovated) and validate that the linear relationship with temperature uses equivalent temperatures, using recent data for accuracy.

➢ Elia notes a temporary reduction in new buildings for 2024 (~45k units) but will **keep the public consultation value of 41k new dwellings** (which is already conservative in the context of growing population) **constant over the full period.**

➢ Elia divides heat pumps into **residential/tertiary and new/renovated categories**, using fixed heating demand per unit without explicit heating surface data, and employs historical averages for calculations, aligning closely with CREG's assumptions*.

- Elia uses a daily average temperature-based COP to estimate heat pump electricity needs. CREG suggests to **cross-check and adjust COP curves for some heat pump types**, at very low temperature.

➢ Elia will use **CREG's COP curves and adjust ground-source heat pump source temperatures seasonally from 12°C to 2.5°C**

➢ However, we cannot implement hourly efficiency curves due to modeling constraints and recomputation needed in the presence of flexibility activation of heat pumps

**Analysis on the relationship between the cost of heating with heat pumps and other more sustainable technologies and the cost of heating with fossil fuels.*

Heat Pumps

- Elia assumes only 10% of daily energy consumption can be shifted, affecting their **heating flexibility methodologies**. CREG recommends more ambitious assumptions: **20% for heating and 100% for hot water**, applied to both Pre-Heated Profile and Market Dispatch of Heat Pumps.

  - The cited study concerns the UK market and mentions 20% of households are equipped with a hot water tank. This then only concerns Hydronic (Air-Water, or ground-sourced) HP. Most HP in Belgium are Air-Air.
  - Elia will keep the **10% daily energy shifting for heat pumps, based on this study***.
  - If enough time, Elia will perform a sensitivity with 20% daily energy shifting.

- Elia anticipates that all new buildings in Wallonia and Brussels will have heat pumps or be connected to a heat network by 2035. CREG suggest different projections with **heat pump adoption at 15-20% by 2030 and 25-30% by 2035 for renovations**.
- ODE Vlaanderen highlights that **the heat pump trajectory leads to very low level of heat electrification**, that may not be compliant with climate and decarbonization targets.

  - Elia acknowledges differing viewpoints on heat pump uptake assumptions, proposes **maintaining current projections for the Current Commitments scenario as many incentives are (expected) to be put in place** (EPBD, ETS2, Fed & VL gov agreements) **. Elia will consider delayed and accelerated adoption** in other scenarios.
    - The **Constrained Transition** scenario assumes **20%** by **2035** in renovation and boiler replacements, and no gas phase-out for new builds in Wallonia & Brussels regions with still ~25% gas boilers installed by 2035.
    - The **Prosumer Power** scenario assumes all new builds equipped with a heat pump from **2030** and no new fossil fuel boilers installed from 2035 in all regions also in renovations and boiler replacements

**Controlling Electricity Consumption by Forecasting its Response to Varying Prices February 2013. Power Systems, IEEE Transactions on 28(1):421-429 DOI:10.1109/TPWRS.2012.2197027*

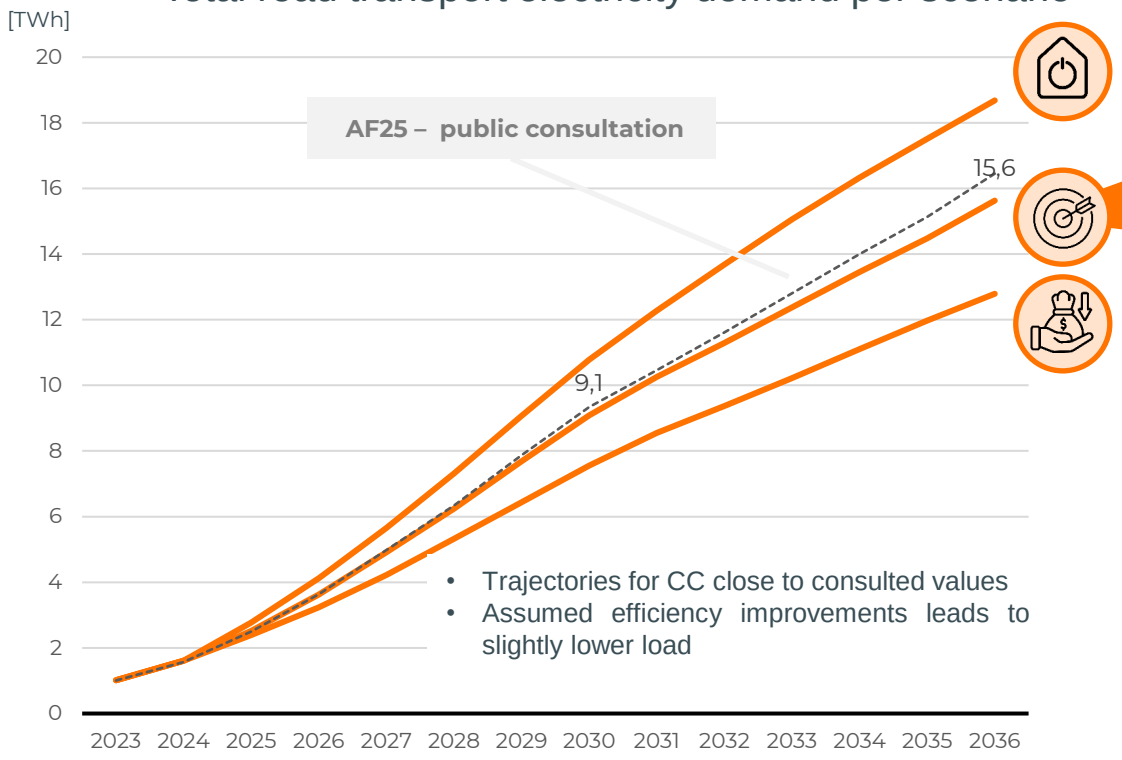
Heat Pumps

- ODE Vlaanderen questions the modelling of HP. They emphasize accurate modeling for energy transition impact, suggest **updating (i) COP curves** to reflect technological advancements, **(ii) daily consumption profiles** aligned with heat pump behavior, and **(iii) support UGent's suggestion for a backup electric resistance scenario during cold winter days.**

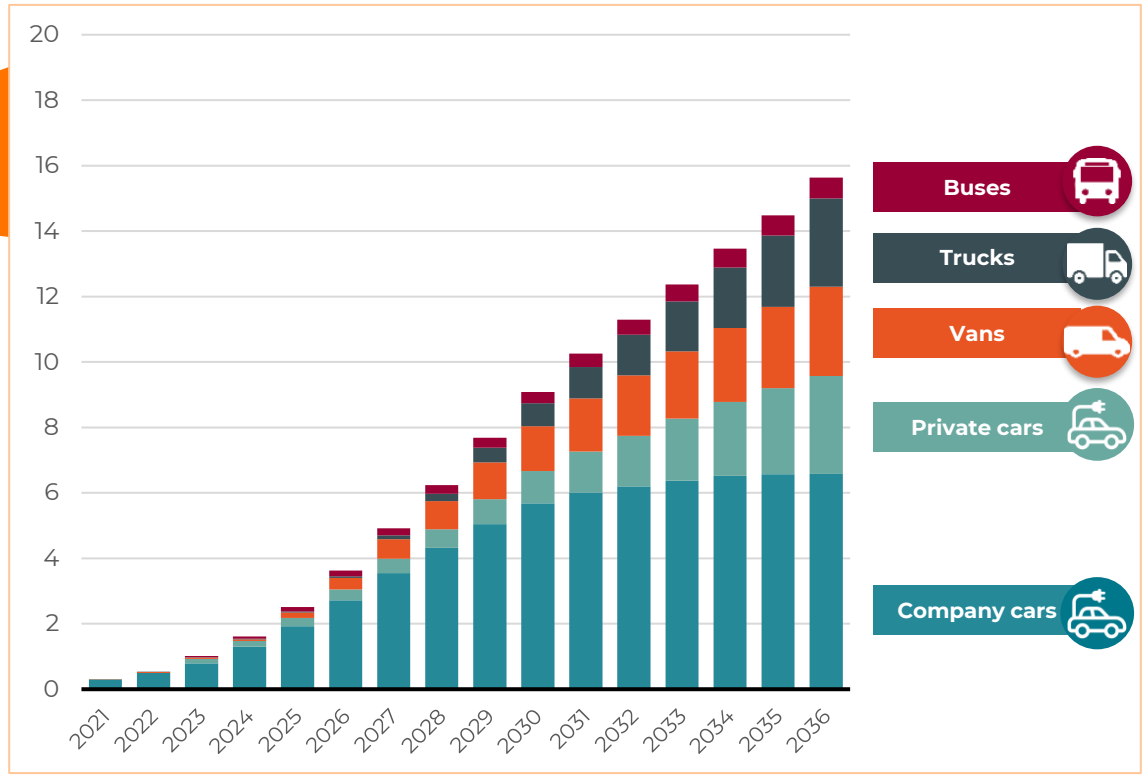
- Elia uses **historical gas appliance profiles as proxies for heat pumps** due to limited specific data and welcomes any historical data on Belgian heat pumps to enhance their analysis.
- COP curves are now **aligned with data supplied by the CREG**.
- Elia will **analyze the impact of these heaters in a sensitivity** as highlighted by UGent.

Electric Vehicles – Electricity demand

Total road transport electricity demand per scenario



… details for **Current Commitments** scenario



Prosumer power

100% BEV from 2030: sales for passenger cars, vans
100% BEV sales from 2035 for trucks and faster uptake already in 2030

Current commitments

100% BEV cars & vans sales from **2035**
90% BEV trucks sales from **2036**

Constrained transition

Delay of **100% BEV for private cars and vans to 2040**,
more PHEV for company cars in intermediate period <2030
90% BEV trucks sales from **2040**

Same evolution of total vehicle sales & stock assumed in all scenarios

Electric Vehicles

- Elia estimates an **average consumption of 19 kWh/100 km for electric vehicles in Belgium from 2026-2036**, based on arithmetic averages across most sold EV models in Belgium. CREG suggests **using a weighted average**, as well as **lower consumption for the future fleet** (linked to increased engine efficiency, and overall reduction in size of cars).

➢ Estimating EV consumption in grid studies should consider charging pole to wheel. Manufacturer WLTP values are often low estimate and expressed as battery-to-wheel, whereas charging pole to battery losses need to be accounted for (in the range 7-15%). In recent trends, cars have evolved to be larger and heavier, Elia assumes similar size towards the future which can be considered conservative.

➢ Elia proposes to **maintain the 19 kWh/100 km efficiency value for 2024** for BEVs while assuming a 6% total stock efficiency improvement by 2036 to all road transport segments due to technological advancements (based on RTE study)

- FEBEG notes Elia **lowered electrification and demand growth expectations**, despite **high BEV sales in Belgium expected to increase further**, both for company cars and private cars, with lowering costs of EVs. Assumptions of total fleet could be on the lower end according to them.
- Fluvius highlights **higher EV estimates in Flanders**, indicating Flemish stakeholders have no reason to believe in a lower trajectory.

➢ Elia assert that **company car sales will not stagnate** and agree that growth can be expected in the private car segment as well**,** however for **the latter we expect this rather to accelerate around 2030**

➢ Elia **scenarios** cover different trajectories of EV adoption to tackle uncertainties around the topic

Electric Vehicles

- Febeliec calls for **reconsideration of the PHEV battery use assumptions, stating that 50% electric mode is too high**

➢ Elia wants to clarify that the value of **50% of kilometers driven by a PHEV in electric mode only applies to the private car segment**; for **company cars this value is indeed much lower at around 15%**, based on a study by the ICCT share by CREG during the AdeqFlex'23 public consultation.

- CREG recommends **adjusting the estimates of total EV passenger cars**, stating charging infrastructure challenges and financial constraints.

➢ Elia asserts that **sufficient charging infrastructure** is in place, based on assessments by the EU Commission and KULeuven*, indicating Belgium significantly overshooting it's target for charging infrastructure. In 2024, Flanders nearly doubled the amount of public chargers as compared to end 2023.

➢ **Anticipated battery cost reductions** to drive EV affordability and **more stringent EU targets from 2025**, will push manufactures to bring more (affordable) EV models to market. Elia asserts that the assumed uptake of private cars in the CC scenario is mainly oriented towards the period 2030-2035

➢ Elia will consider two other trajectories

  ➢ The **Constrained Transition** with a **delayed EV adoption**, compared to current ambitions and trends.

  ➢ The **Prosumer Power** with an **accelerated EV adoption** , compared to current ambitions and trends.

*Target tracker | European Alternative Fuels Observatory
BEV Barometer - KULeuven

DSM & Industry flexibility

- FEBEG urges Elia to adopt a **more cautious** approach to future DSR volume forecasts, as overly optimistic assumptions on market response capacity growth could threaten supply security. For FEBEG, the current DSM assumptions, despite a 200 MW reduction, remain **too optimistic**.

➢ Elia will perform a **downward sensitivity on industry flexibility.**

Flexible access

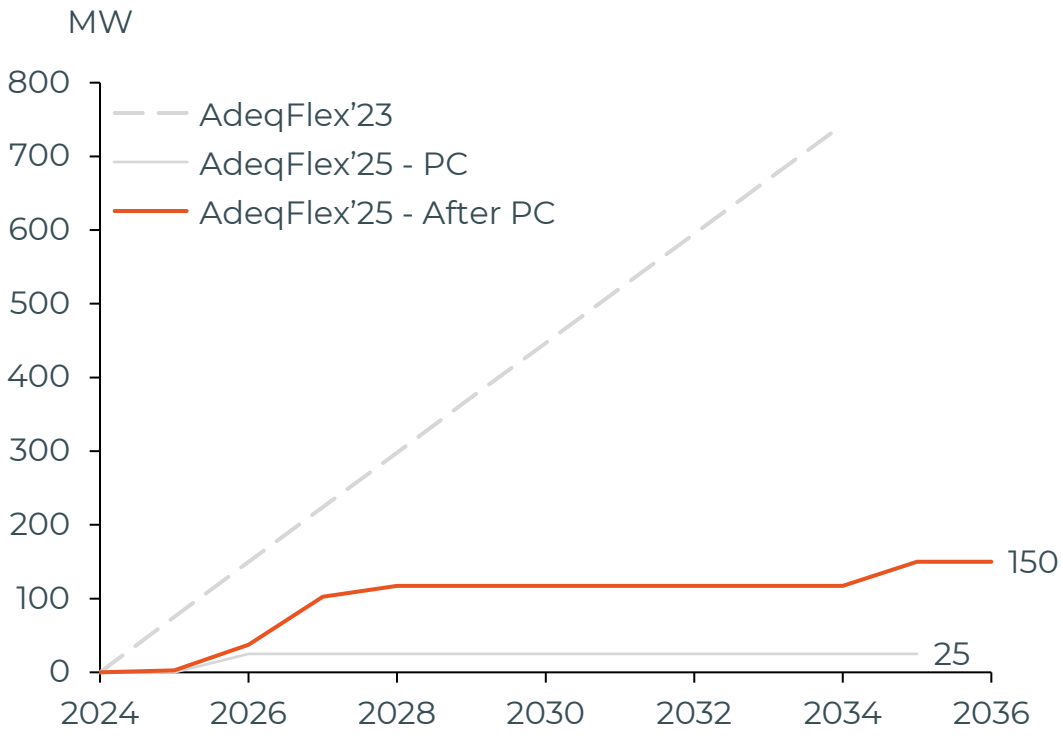
- FEBEG asks Elia to be prudent in the assumptions of the contribution of some the technologies to fulfill the flexibility needs because of the ongoing discussions on **flexible access** agreements.

➢ Elia notes that the **impact of connections** with flexible access on **adequacy results is limited** and based on preliminary analysis **scarcity events** and activation of **flexible** access seems **negatively correlated.** Due to uncertain impacts on flexibility and challenges in modelling, Elia proposes not integrating these connections into the main scenarios but **introducing a sensitivity analysis on batteries' availability to represent potential effects**.

Electrolyzer

- Virya Energy outlines that **their electrolyzer (HyOffWind) will be flexible on 80% of its range** (implying a 20% baseload).

➢ After discussion with Virya, it is **unlikely that electrolyzers will run in scarcity situation**. Hence, **the modelling will not change for adequacy simulations** (100% flexible), but this comment will be considered for short-term flexibility.



Update of the electrolyzer capacity trajectory considering existing projects referred by SPF and aligned with 2036.

Overview of input data

- General
- **Electricity demand ➔ Flexibility**
- Thermal production
- Renewable energy sources
- Storage
- Investment cost
- Flow based domain
- Data for other countries

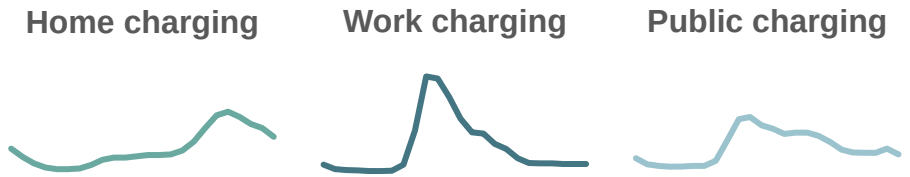
Update of the flexibility

- No specific comments received on trajectories for end-user or industrial flexibility, except suggestions of sensitivities.
- End-user flexibility (EV, HP)
  - An update has been carried out on number of smart meters and dynamic contracts, based on available data end-2024.
  - Trajectories are available for the 3 scenarios, with varying levels of assets and flexibility unlocked

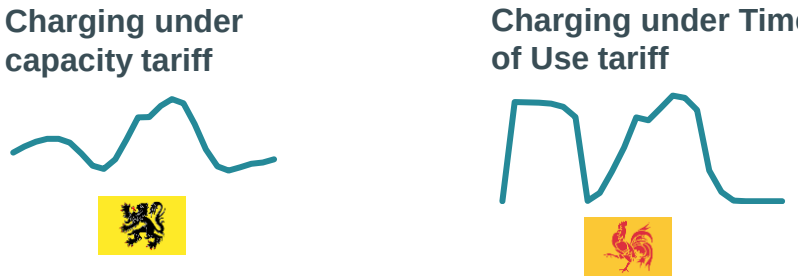
		Current commitments & ambitions	Prosumer power	Constrained transition
Electricity consumption				
Transport & building heat electrification	EV	Current policies	Faster uptake	Slower uptake
	HP	Current policies	Faster uptake	Slower uptake
New industrial electrification (industry & data centers)		TSO clients input reviewed + DSO desktop studies		Further delays & abandons
Flexibility				
Smart meters		Follow planned roll-out (DSO & region gov declarations)		2yrs delay in roll-out
Dynamic contracts		1 M in 2036	2.3 M in 2036	0.5 M in 2036
New large-scale loads (industry & data centers)		TSO clients input reviewed & literature		
Batteries	Residential	Current ambitions	Faster uptake	Slower uptake

Flexibility from electric vehicles, heat pumps and home batteries had been further improved to account for regional specificities

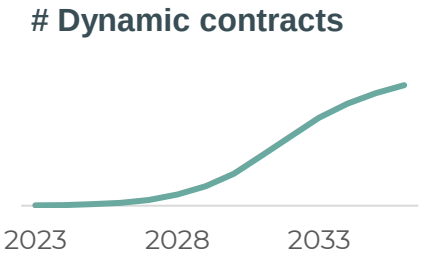
EV charging profiles for home and for work & public charging (from metered data).



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



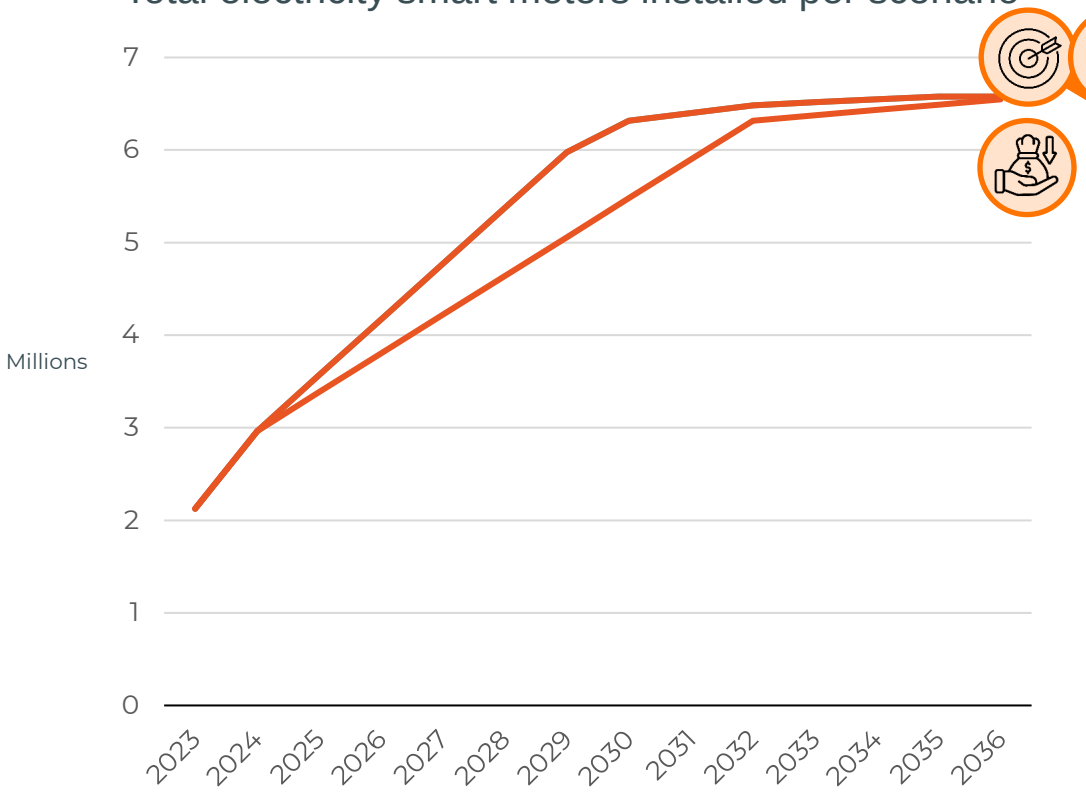
Market optimisation with EV, HP and home batteries reacting on market prices through **dynamic contracts**.



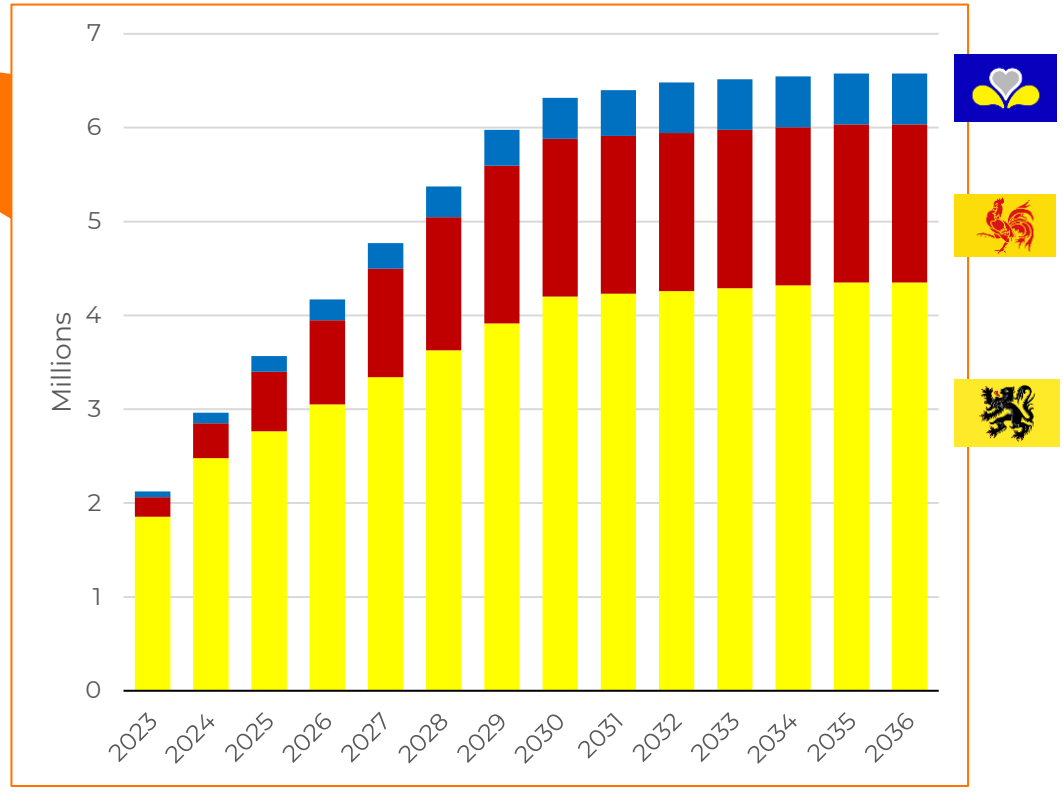
Source: Elia – Adequacy & Flexibility study public consultation Nov. 24

Smart meters

Total electricity smart meters installed per scenario

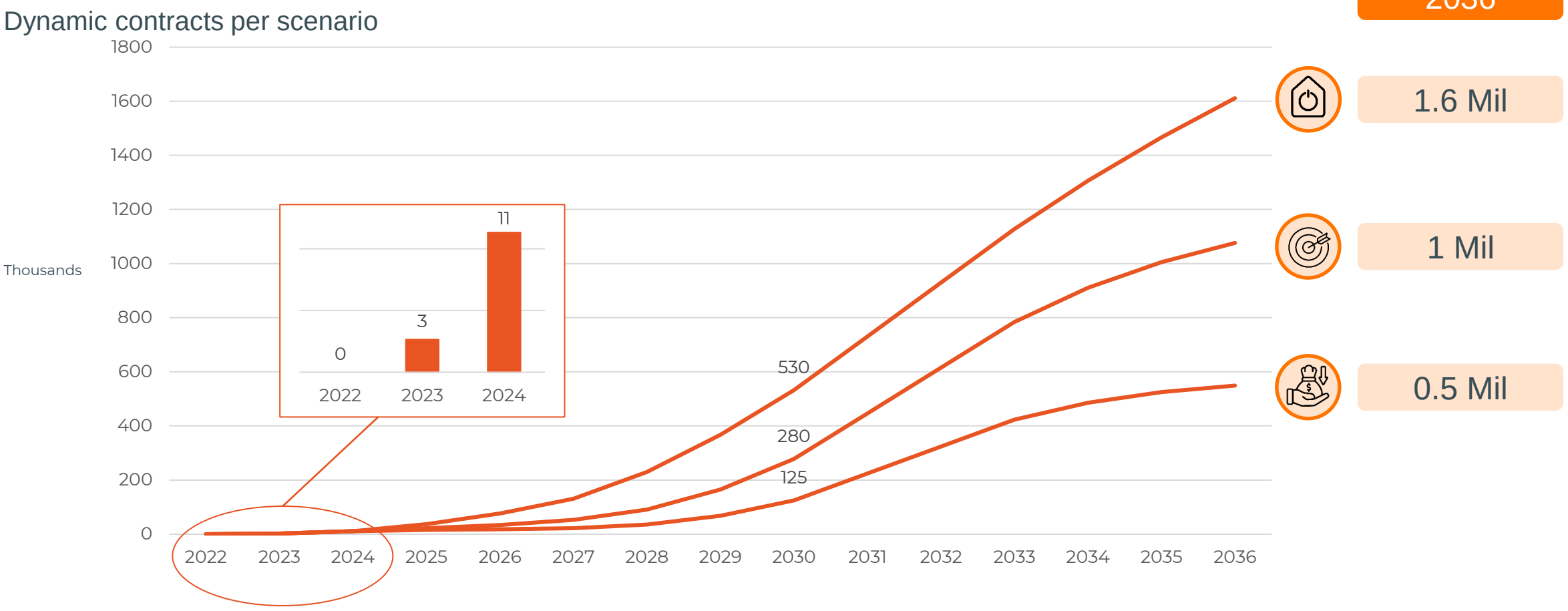


… details for **Current Commitments** scenario



- **Update** of smart meters trajectories
  - Reality check 2024 on smart meters
  - Constrained transition includes a 2 yr delay in the planned installation by DSOs

Dynamic contracts



- **Update** of dynamic contracts trajectories
  - Reality check 2024 on current numbers
  - Trajectories assume different levels of consumer readiness to flexibilise their assets following market prices

Overview of input data

- General
- Electricity demand
- **Thermal production**
- Renewable energy sources
- Storage
- Investment cost
- Flow based domain
- Data for other countries

Thermal fleet – decentralized CHP, biomass & waste

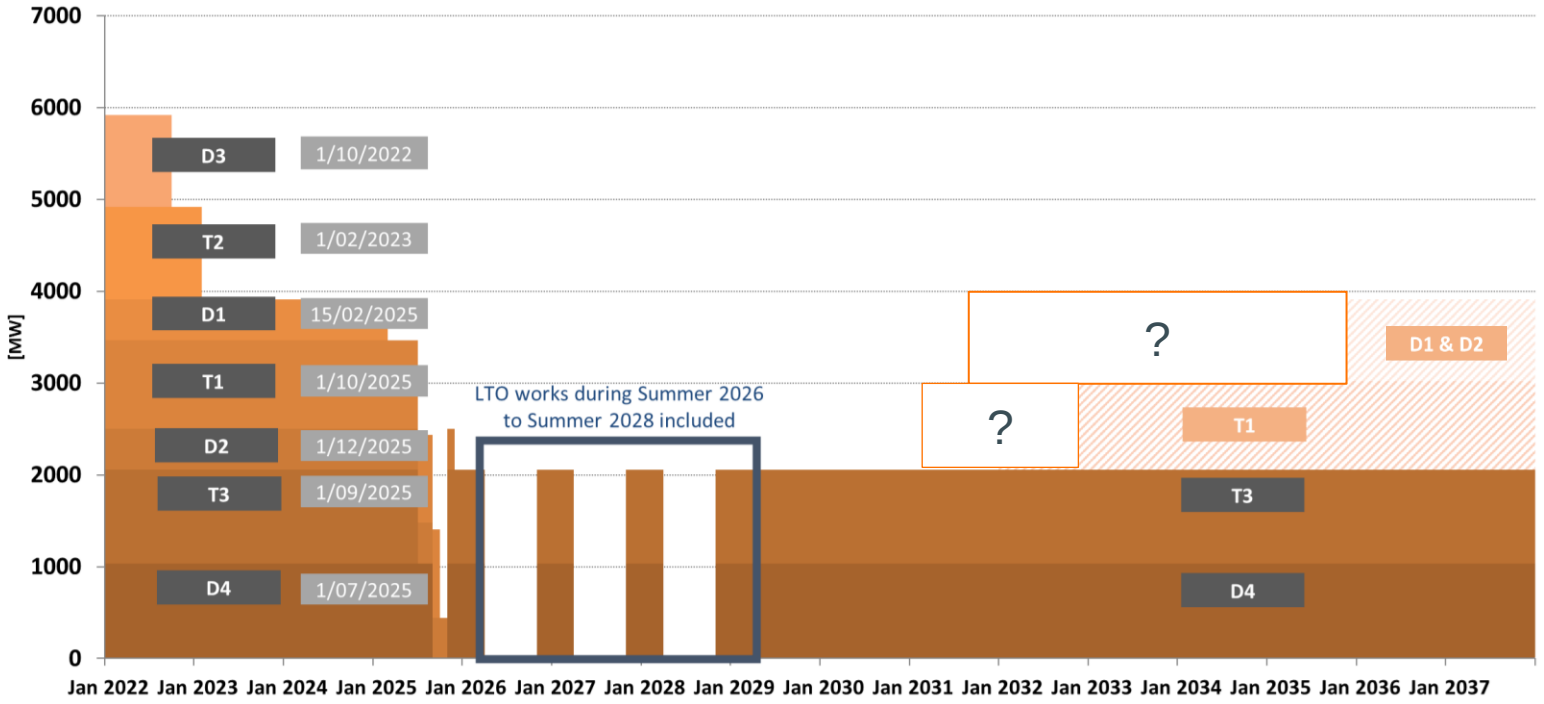
- The installed capacity of **decentralized CHP and biomass** should increase for Elia, but COGEN and ODE Vlaanderen think it will **decrease**.
- For **decentralized waste,** Elia estimates that installed capacity will remain constant, but COGEN believes it will also **decrease**. COGEN and ODE Vlaanderen would like further information on the **background to these assumptions**.
- FEBEG argues against Elia's **optimistic cogeneration capacity** assumptions, citing **lower support** and the shift to electrification and biogas methanization. They suggest **expecting a decline in CHP capacity**, impacting supply security.

- Without clear announcement of closures and given decentralized gas-CHP are also said to be kept as back-up of new e-boilers, **considering a lower trajectory for gas-CHP is not straightforward**. Therefore, **the current trajectory** (considering existing capacity and few additional based on advanced-stage projects) **will be kept for adequacy simulation**.
- In order to account for the current situation, Elia will however **analyze the possibility to perform an EVA on the existing to assess** whether those capacity will be kept in the market.
- Elia will also perform a **sensitivity with higher and lower CHP capacity**.

Update of the nuclear capacity in Belgium following latest announcements

Given the new federal agreement, it is proposed to consider

- **D4/T3 prolonged for 20 years as reference** (instead of until 2035)
- **Additional prolongations as sensitivities as it is less clear what will be feasible + timing** (grid reinforcements are needed)
- **New nuclear = out of AdeqFlex scope**



Considering a forced outage rate of 10%

SENSITIVITY 4 GW
Extension of D1 & D2 (on top of T1)

SENSITIVITY 3 GW
Extension of T1

Further extending reactors in Tihange or Doel requires regulatory, political, operating, EU approval, ... and is also subject to grid constraints.

REFERENCE 2 GW
Extension of T3 & D4, even after 2035

A sensitivity without T3 & D4 during winter 2036/37 (in case no agreement is found)

Overview of input data

- General
- Electricity demand
- Thermal production
- **Renewable energy sources**
- Storage
- Investment cost
- Flow based domain
- Data for other countries

Photovoltaïcs

- The method used to predict the **adoption of photovoltaics** over the coming years does not consider the **historical and exponential nature of cost reductions** and their impact on adoption rates, according to negaWatt, For them, this risks underestimating the installation potential of future photovoltaic capacity.

➢ Elia **agrees prices for PV and batteries might continue to fall.** However, challenges like **DSO grid integration and the end of incentives may arise**. Announced targets will stay the reference for the **Current Commitments** scenario. A faster trajectory will be considered in the **Prosumer Power** scenario.

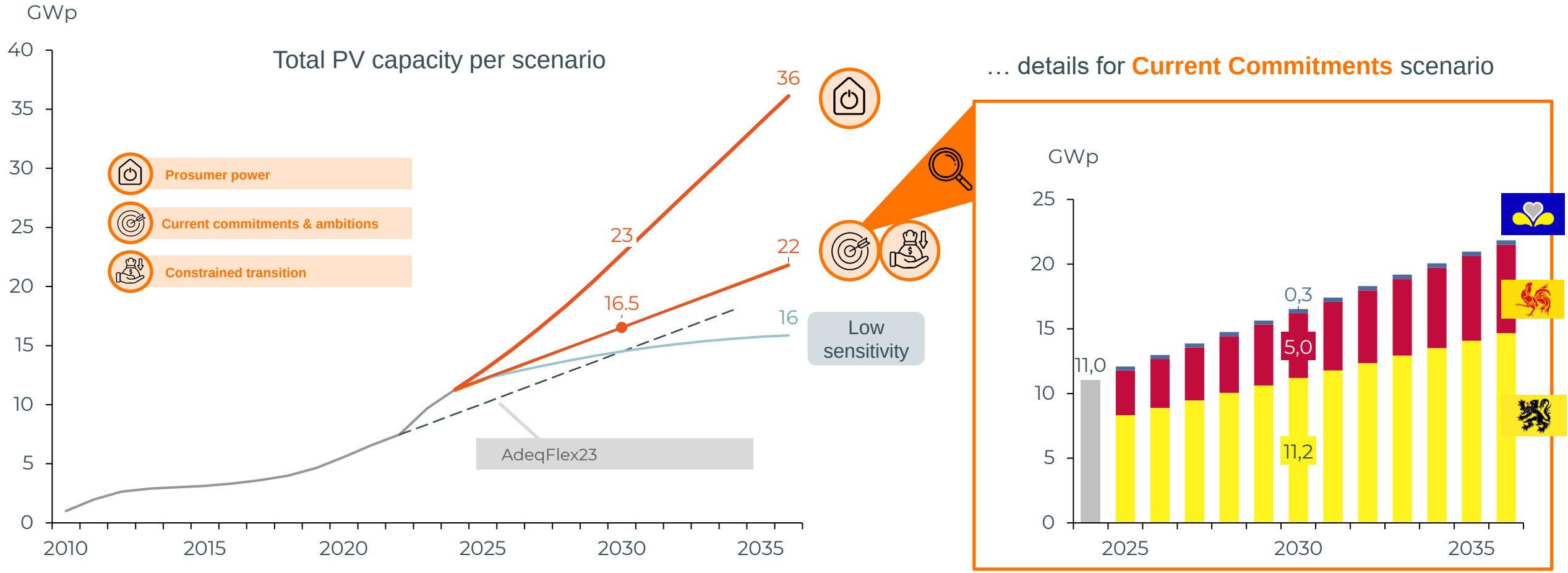
- According to ODE Vlaanderen, the estimate of **1.12 kWp/kVA assumed for PV** is considered **too low, mainly for industrial PV**. ODE suggests also to

➢ Elia uses a 1.12 kWp/kVA ratio for industrial PV **based on historical Fluvius data** (no updated number available) and uses this average ratio. It is also not clear what type of PV (industrial vs residential) is assumed in 2030 regional targets. Elia will further investigate.

- ODE Vlaanderen emphasizes that a PV installation must take into account the fact that **there is self-consumption** and the possibility of using **flexibility options**.

➢ Elia wants to highlight that self-consumption of solar photovoltaics is **considered in end-user flexibility assumptions**.

Photovoltaïcs



- Update of realised 2024 data based on available information. Keep 2030 targets per region.
- Addition of ‘prosumer power’ scenario considering increasing annual growth rate, up to record rate (2023) in 2030, then kept constant. (assuming even further drop in PV cost, and additional gov support e.g. subsidies, incentivised tariff).
- Addition of a low sensitivity considering a decreasing annual growth rate.

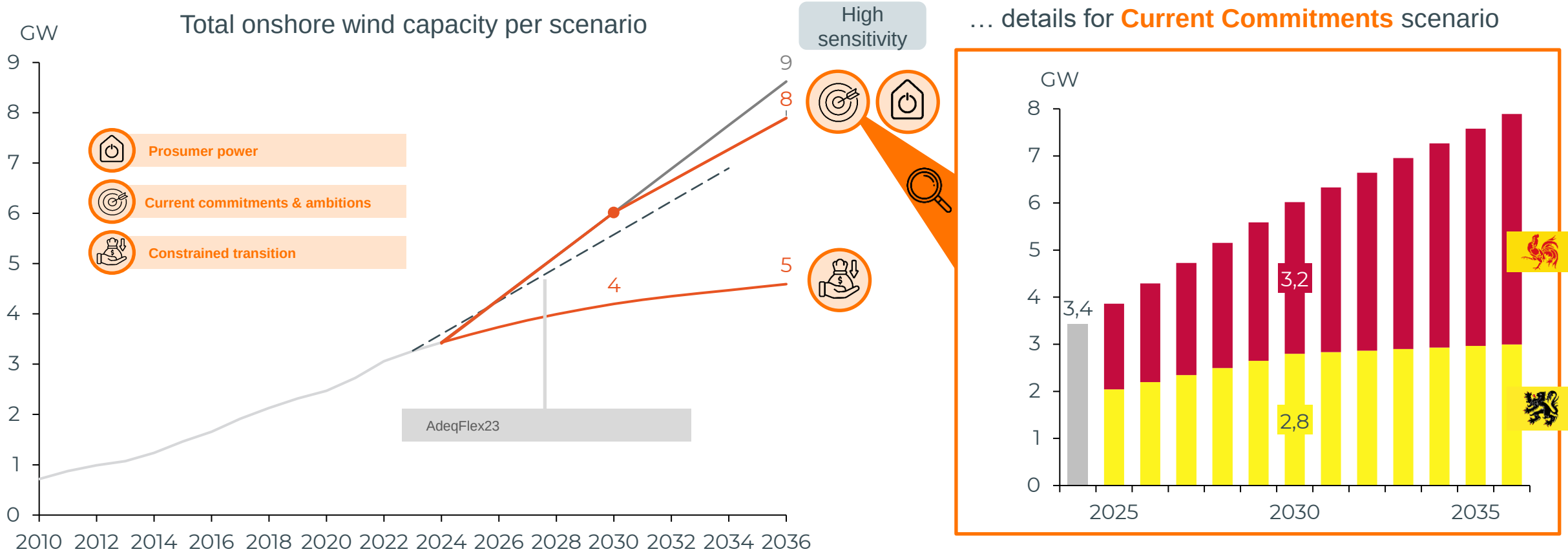
Onshore wind

- CREG considers Elia's **forecasts to be conservative after 2030 for onshore wind** (i.e. slowdown of yearly increase in FL) and believes that European climate targets could further stimulate the development of renewable energies. CREG asks for clarification on how the **repowering** is considered.
- FEBEG points out that current targets for **onshore wind power** will **not be met** without **additional regulatory**, and investment measures. The **assumed yearly growth rate is unrealistic** when compared to past & current growth. FEBEG asks for a more realistic approach instead of policy ambitions that are not sufficiently supported by policy measures.

- Elia agrees that **regulatory and investment framework reviews are necessary** to meet ambitions, while both Flemish and Walloon governments express **commitment to RES targets**.
- Elia follows **regional targets** in the **Current Commitments** scenario, considering **repowering onshore** is already integrated in the regional target given the complexity of new permit.
- A **slower wind uptake in the Constrained Transition scenario** will be considered to account for the uncertainty.

Onshore wind

3 trajectories for the scenarios and a high sensitivity



- Update of realised 2024 data based on available information.
- Keep 2030 targets per region for Current Commitments and Prosumer Power.
- Lower growth rate for the ‘constrained transition’ assuming supply chain issues, NIMBY,..
- High sensitivity with no permitting issues in Flanders.

Overview of input data

- General
- Electricity demand
- Thermal production
- Renewable energy sources
- **Storage**
- Investment cost
- Flow based domain
- Data for other countries

Large-scale batteries

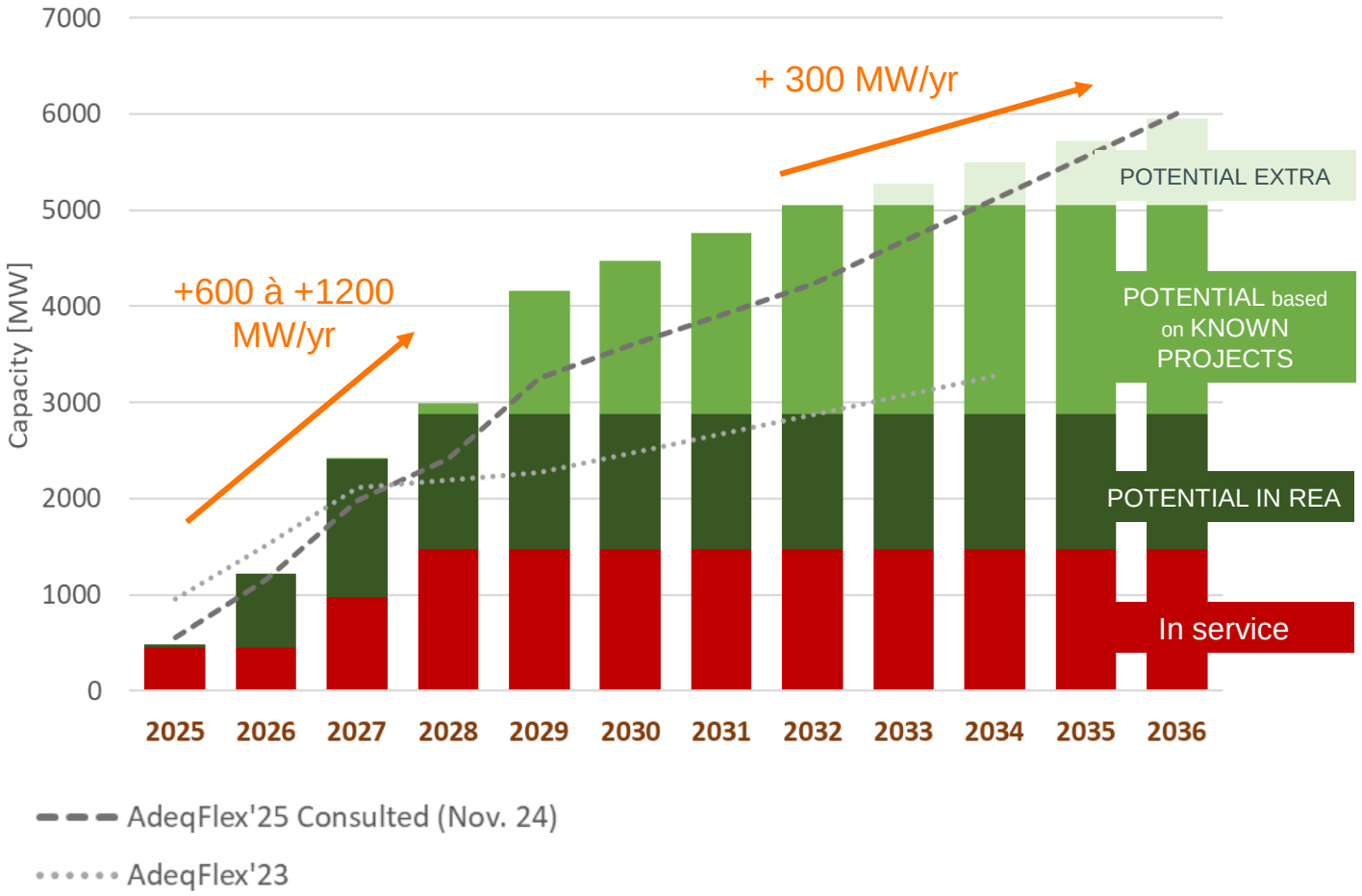
- FEBEG notes **high expectations for large-scale storage capacities**, based on current ambitions and projects at Elia. It is crucial to **check** short- and medium-term **grid connection possibilities for these batteries** and the potential impact on the **economic viability** (and thus realization) of the projects.

- Elia closely monitors large-scale battery projects. The study will consider full capacity for ‘existing’ and ‘in realization’ batteries projects. Additional potential based on batteries in ‘connection studies’ and ‘feasibility studies’ are considered with a certain percentage to account for probability of realization, e.g. permit, material, grid connection possibilities, …
- 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.

Large-scale batteries

The **new status update** of the large-scale batteries projects leads to **higher additional potential**.

The potential is then used as upper bound in the EVA.



Additional potential

33% of connection study projects
15% of feasibility study projects

100% of IN REA projects

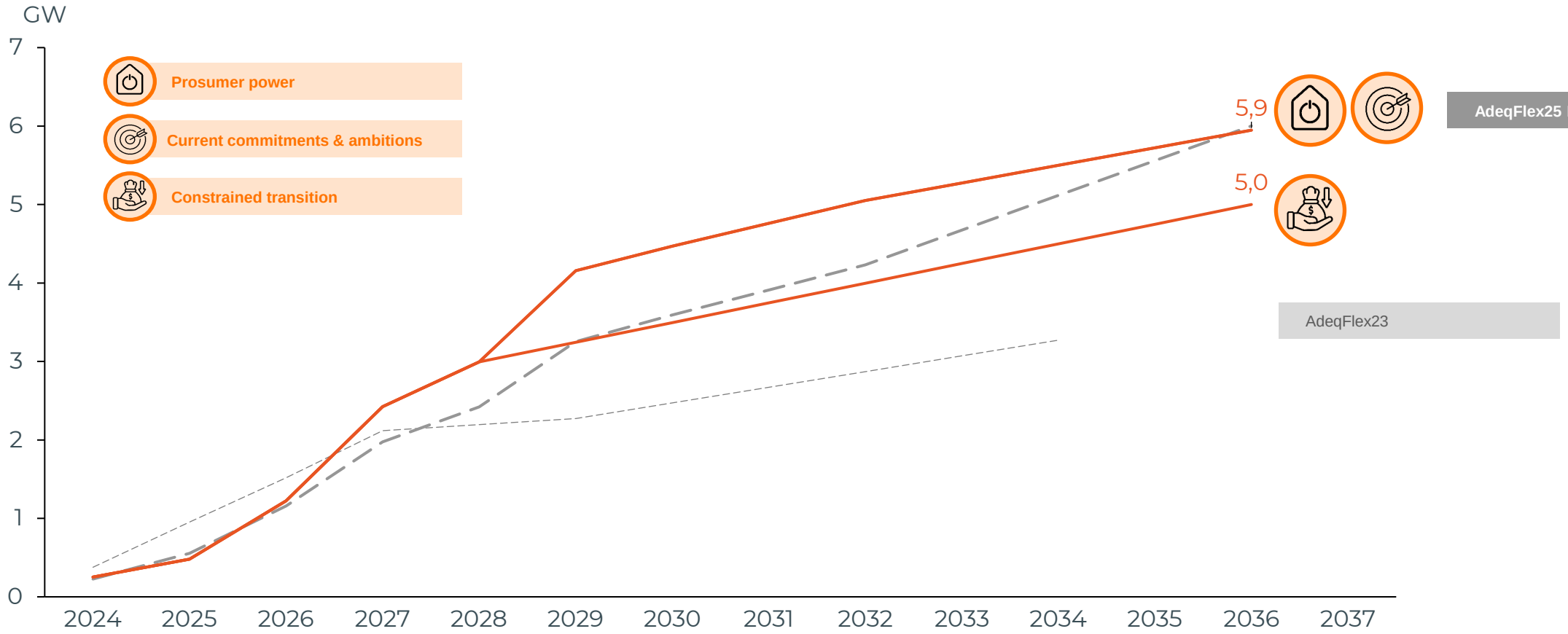
In service
= existing + already contracted in a CRM auction volume.

.

% based on **expert view** of all projects.

Large-scale batteries

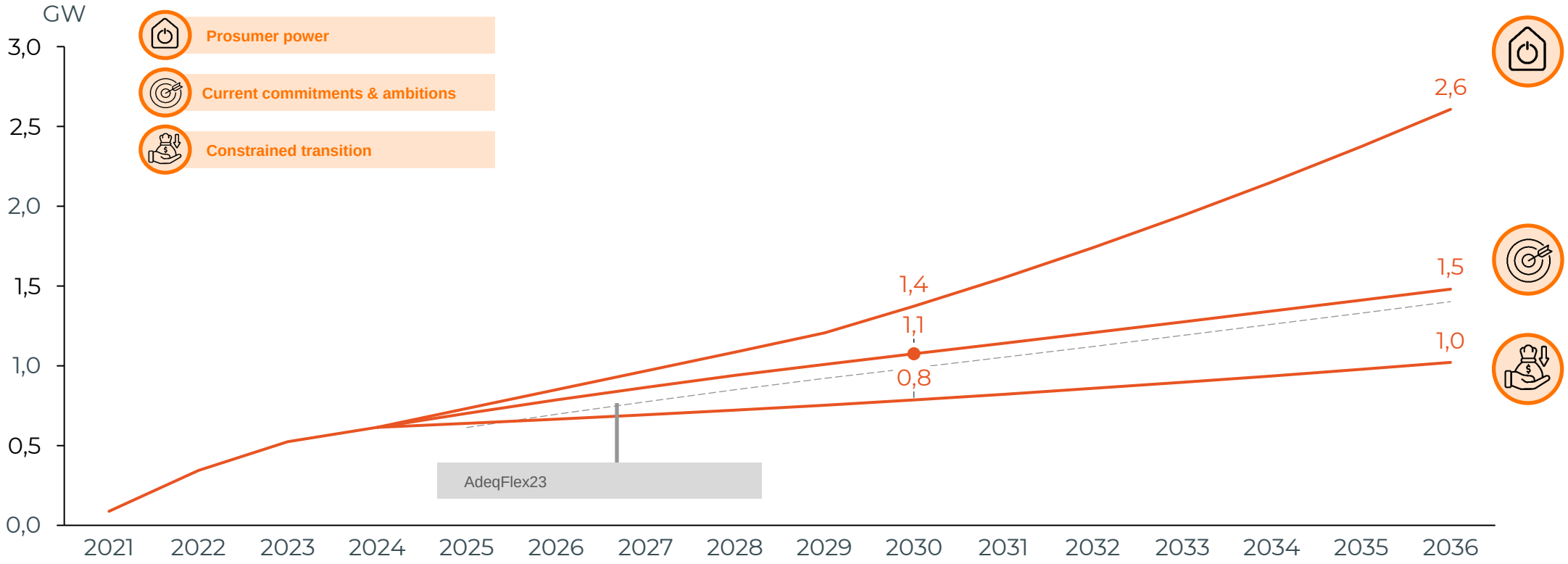
Total **potential** for large-scale batteries (maximum amount possible in the EVA)



- Update based on latest projects status
- A lower growth rate for the potential assumed as from 2029 considering less study projects would be realised (lower CAPEX, grid limit due to lower grid investments, etc.)

Small-scale batteries

For info, 3 scenarios, with updated 2024 starting value



- Updates: reality check 2024, per region
- Proportional installation rate than PV for WAL & BXL. Aligned with Fluvius for FL.
- Lowest historical installation rate - assuming bad macro-eco conditions and battery CAPEX not decreasing as expected
- Increasing installation rate – assuming large drop in CAPEX and gov support, as well as incentive market (tariffs & dynamic contracts)
- Share of flex also updated based on dynamic contracts and smart meters trajectories

Overview of input data

- General
- Electricity demand
- Thermal production
- Renewable energy sources
- Storage
- **Investment cost**
- Flow based domain
- Data for other countries

Investment cost

- FEBEG supports price evolution assumptions but finds the **CAPEX data outdated and underestimated.** They also consider it **unrealistic to assume no CAPEX for DSR** (incl. in FOM). They also ask info **on the FOM** for the different categories of **Demand Side Response estimation method**.

➢ Regarding **Demand Side Response CAPEX and FOM based** upon the study from the University of Cologne (2020). Without other sources being suggested, **Elia will keep the current hypothesis.**

- FEBEG shared sources indicating higher CAPEX for **onshore wind** and **PV** compared to CREG's estimates. FEBEG estimates that IC Gas Engine CAPEX are also underestimated.
- Febeliec believes Elia's **cost evolution assumptions for batteries** (home and grid scale) are **too pessimistic** and requests more information.
- CREG requests Elia to specify the **primary sources of CAPEX data**, often attributed to Blueprint.

➢ **Current CAPEX assumptions are back-up by relevant sources**, applicable in Europe.

➢ The sources are shared in the consultation report. For the **Blueprint study**, **Elia asked Compass Lexecon to do a market review for the costs of the energetic system**. (See details in the report of public consultation)

- CREG recommends a **20-year economic lifetime** for **offshore** wind investments to align with the reference scenarios for the 2025 CRM auctions.

➢ Elia will update the **'investment economic lifetime' of offshore** to 20 years to ensure alignment with CRM.

Overview of input data

- General
- Electricity demand
- Thermal production
- Renewable energy sources
- Storage
- Investment cost
- **Flow based domain**
- Data for other countries

Flow based domain

- FEBEG believes the **fixed minRAM 70% for the entire European perimeter is overly optimistic**, citing slow progress and significant challenges in achieving this across the EU by 2026.

➢ Similarly to previous studies, Elia will consider **sensitivities** with **RAM values below 70%**.

Overview of input data

- General
- Electricity demand
- Thermal production
- Renewable energy sources
- Storage
- Investment cost
- Flow based domain
- **Data for other countries**

Data for other countries

- FEBEG advises Elia to **model neighboring countries' capacity carefully**, include **French nuclear availability** as a sensitivity, and emphasize the **importance of interconnected capacity from France for Belgium**. They suggest **excluding uncertain UK nuclear plant extensions**.

➢ Scenarios and sensitivities will be carried out considering availability of production capacity in neighboring countries (e.g. French nuclear availability and UK nuclear power).

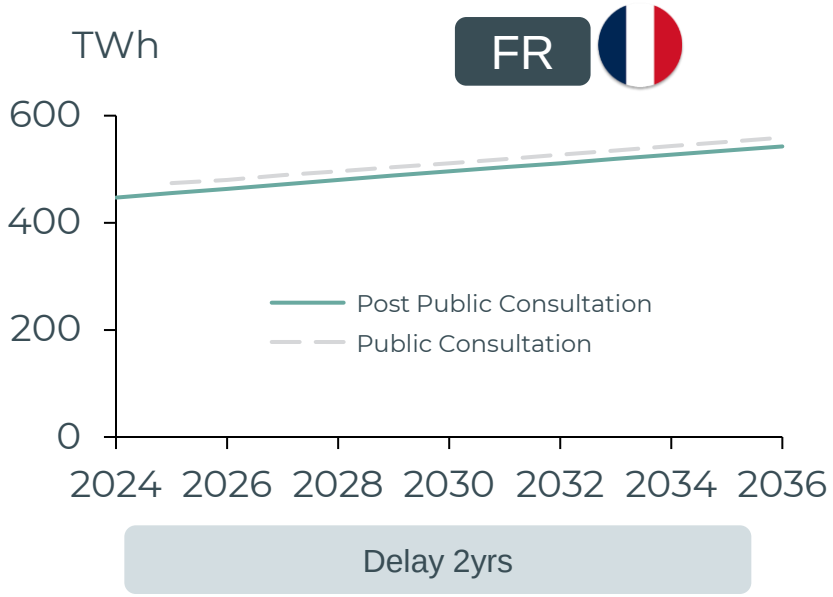
**Based on (i) bilateral exchanges with TSOs, or (ii) Elia's own 2024 normalised estimate, based on EUROSTAT data, in the lack of official data*

Data for other countries

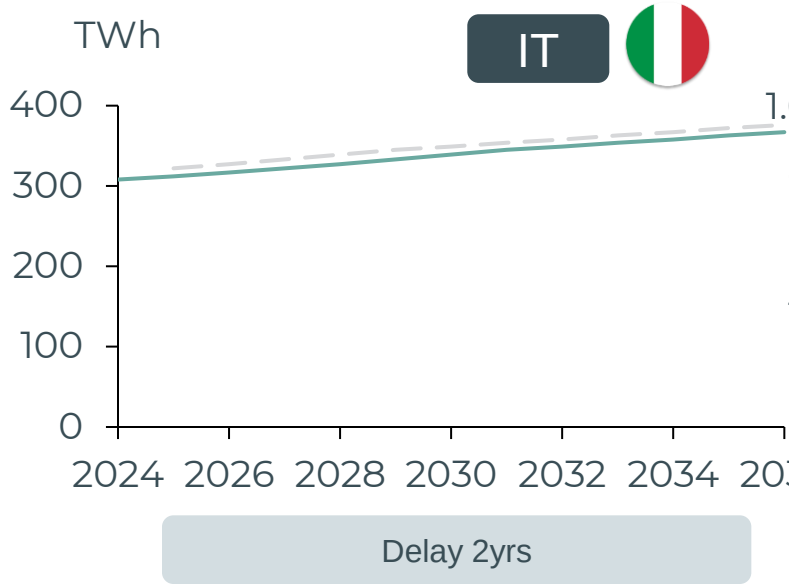
- Febeliec asks that the future electricity demand in the rest of Europe is also significantly revised downwards.

➢ The European scenario framework for energy adequacy is based on the ERAA24 dataset, filled in by all TSOs for their respective bidding zone

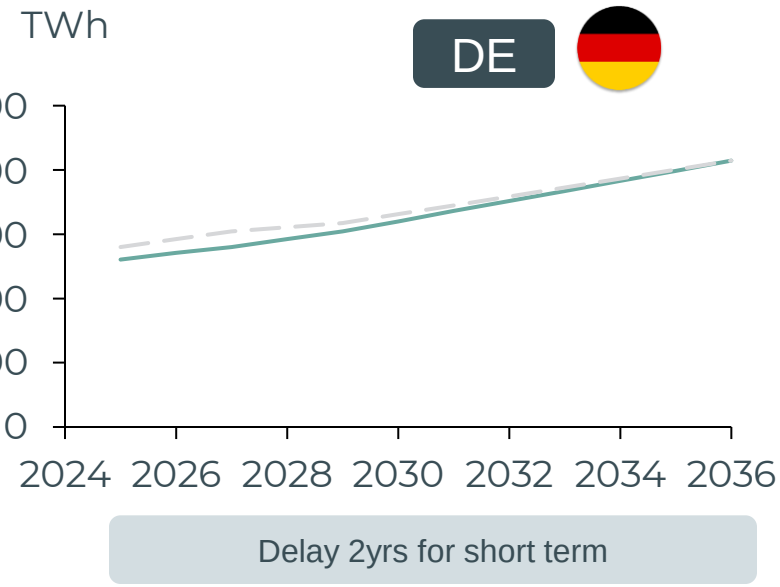
➢ In the meantime, load trajectories have been updated, based **on 2024 realized load consumption* and bilateral discussions with TSOs**. This leads to delays in public consultation trajectories, or lowered demand projections



Delay 2yrs



Delay 2yrs



Delay 2yrs for short term

**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

Feedback on methodology

Overview of methodology

General

Adequacy study

Climate years

Adequacy study methodology

- The treatment of **decentralized resources, particularly the energy communities, in the adequacy study is overly aggregated**, according to negaWatt. For them, this led to uncertainties about their flexibility. For negaWatt, a **detailed bottom-up approach into the modeling framework** is needed.

➢ Elia emphasizes the **importance of decentralized resources' flexibility in economic dispatch simulations**, updating assumptions annually based on new data. The study **accounts for the flexibility of technologies, some which might be part of energy communities in the future**. At this moment, there is no much data available on energy communities. Also, the study does not focus on the mechanisms with which the energy and flexibility is brought to the system or market.

Climate years methodology

- CREG suggests using synthetic climate years representative of **2030** for the 2026-2036 adequacy study to better reflect rapid climate changes and recommends Elia **check for updated** data from MétéoFrance.

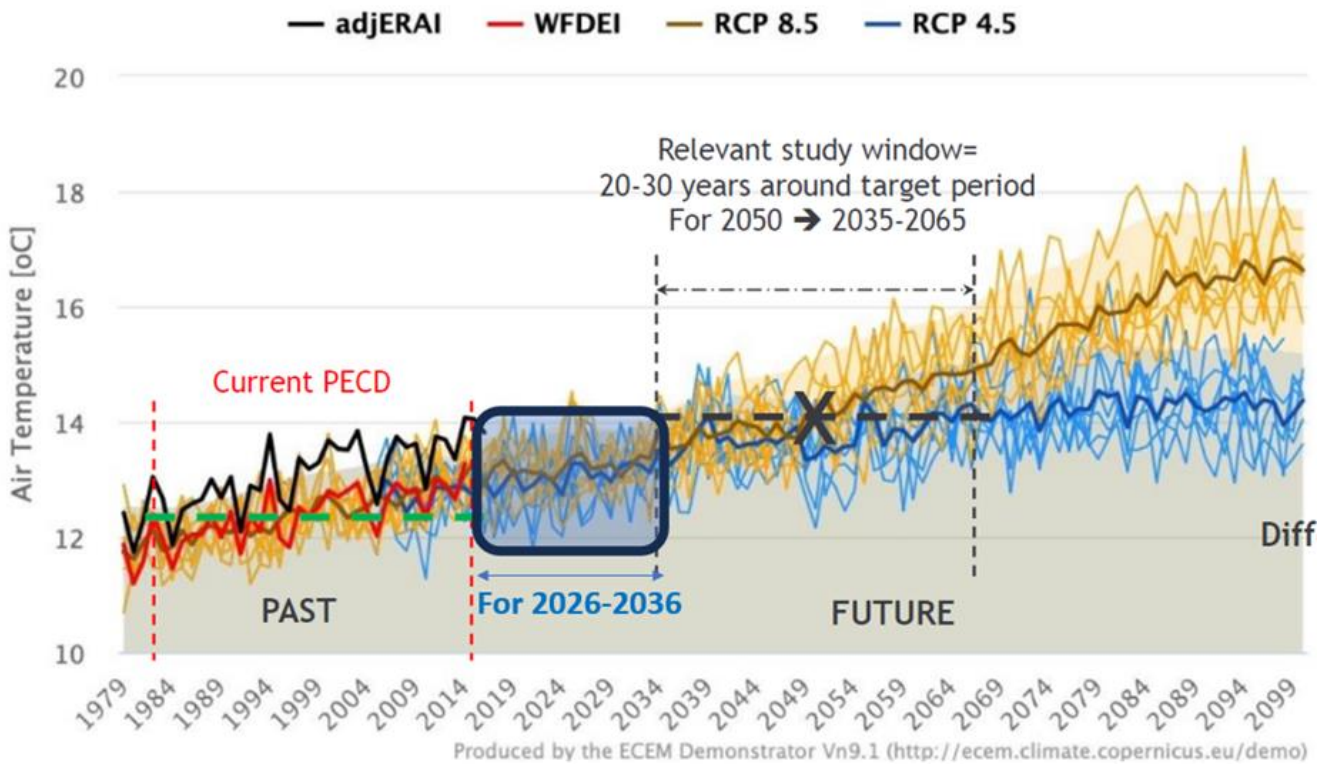
- Febeliec criticizes the **lack of transparency** in Elia's use of a climate database due to commercial confidentiality and **suggests using the latest 30 climate years for simulations** to improve transparency and reliability.

- Elia's use of the MétéoFrance Climate Database Climate 2025 for 2026-2036 **aligns with** World Meteorological Organization **30-year standard for defining climate**.
- MétéoFrance's **200 climate projections** meet **ACER's requirements** with a more robust longer period.
- MétéoFrance indicated to Elia that **no update of the current 200 climate years database was available**.

Climate years methodology

- FEBEG considers **RCP 8,5 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.

➢ 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.



Short-term flexibility

Short-term flexibility assessment

Elia received four comments on the short-term flexibility assessment:

Virya Energy : revision of technical capability assumptions on electrolysers
→ Additional technical constraints will be accounted but electrolysers will also be assumed to provide ramping flex

ODE : indicates existence of downward flexibility on market response category through heat pumps and e-boilers
→ A volume of 150 MW is identified for participation and will be applied for short-term flex (as post-processing)

FEBEG: recommends to be cautious with over-estimating (short-term) flexibility in scenarios
→ Considered through a low flex sensitivity where the slower uptake of DSO-level flexibility will be considered

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

No fundamental comments are received on the short-term flexibility study.

Inclusion of downward market response for short term flexibility

Existing E-assets are observed to already deliver downward flexibility, but were previously not modelled as short-term flexibility

Downward market response for short term flexibility:

- In the context of the market response study, 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.
- A volume of 150 MW is found which is assumed to be present for short-term flexibility.
- This capacity will be modelled as available for short-term flexibility except when economic dispatch simulation prices are zero: when these prices are zero or negative, all downward market response is assumed to be sold in day-ahead markets.

Hurdle rates and Prof. K. Boudt study

Hurdle rates and Prof. K. Boudt study

- For the cost of debt, CREG and FEBEG suggests using the **most up-to-date rate.** Regarding the gearing ratio, they **recommend a minimum of 60%**, as the proposed 44% is too low compared to the 80% often used for CCGT, OCGT, and battery investment projects.

➢ Elia confirms **Prof. K. Boudt will update the WACC value and reassess the gearing ratio in 1Q2025**, considering recent market changes and public consultation feedback.

- FEBEG believe **the risk premiums by technology are inadequately assessed**, not reflecting the actual market risks and investment returns required.

➢ Elia confirms that **the hurdle premium for batteries is lower than OCGT** due to lower financial risk but remains **above wind and solar due to higher technology risk.**

- For Febeliec, the analysis **overlooks forward markets as a risk management tool**, focusing on short-term market revenues. For them, this **inflates perceived risk and leads to a higher discount rate and capacity requirements**, increasing costs. Febeliec thinks that forward markets, which help investors hedge and lower risks, should be considered.

➢ Elia highlights that **Prof. Boudt qualitatively includes hedging impacts**, resulting in lower hurdle premiums for baseload capacities due to observed lower variability in forward markets.

List of scenarios & sensitivities

List of scenarios & sensitivities

Who reacted ?

List of suggested scenarios & sensitivities

3 main scenarios proposed by Elia, additional scenarios and sensitivities will also be analysed

Who reacted?

- **CREG** → comments on **macroeconomic variables,** on **future electricity demand**, on **gas prices**, on **nuclear,** on **flexibility** and on **alternative scenarios**
- **negaWatt** → comment on **future electricity demands**
- **The Shifters Belgium** → comments on **future electricity demand** + comments on **macroeconomic variables** and **nuclear**
- **FEBEG** → sensitivities on **generation** proposed + propose to **combine** some of these **sensitivities** + comments on **DSM and storage capacity** and on **FB CEP rules**
- **ABOUSCO** → comments on **resilience to crises**
- **CANOPEA** and **Bond Beter Leefmilieu** → comments on **future electricity demand**

Suggested scenarios and sensitivities by stakeholders

- *Planned*
- *Not planned*
- *Noted, to be analysed*

General

- **Alternative scenarios**, in particular the “Socio-cultural change (sufficiency)” — 3 main scenarios, 1 sufficiency scenario
- **Combine** some of the sensitivities to better understand the combined effect — 3 combined scenarios
- On impact analysis of change of one single variable on adequacy and flexibility needs — Covered by dedicated analysis
- On **resilience to crises**, such as those linked to climate change — Meteo-France database considers climate change.

Macroeconomic variables

- On **macro-eco variables** to quantify their **effects on different sectors** (electrification, production, etc.)
- On **« Thwarted globalisation »** where variables evolve under less favorable conditions

Covered by the Constrained Transition scenario

Suggested scenarios and sensitivities by stakeholders

- *Planned*
- *Not planned*
- *Noted, to be analysed*

Electricity demand

- On impact of **a fall in GDP** on demand in the various sectors. — Partially covered in Constrained Transition
- On energy **sufficiency** — Sufficiency scenario
- On **industrial production cuts/reductions on the winter peak** — High/low flex (incl. industry)
- On **electric heater used in HP in winter**

Generation

- Same sensitivities of the ‘Adequacy & Flexibility 2024-2034’ study — Depending on workload & timing
- On **Belgian nuclear generation capacity** (possible total or partial prolongation of the existing nuclear fleet)
- On **non-availability of several French nuclear reactors** (with various levels of unavailability)
- On **higher share of low-carbon molecules** (e.g. : “blue” hydrogen or locally-produced “green” hydrogen) in the energy mix
- On **lower RES development**
- On **gas-fired power plants being excluded** from the assumed capacity — CHP and turbojet capacity
- On **closure of part of the cogeneration capacity** due to lowered support and decarbonization targets

Suggested scenarios and sensitivities :

Planned
Not planned
Noted, to be analysed

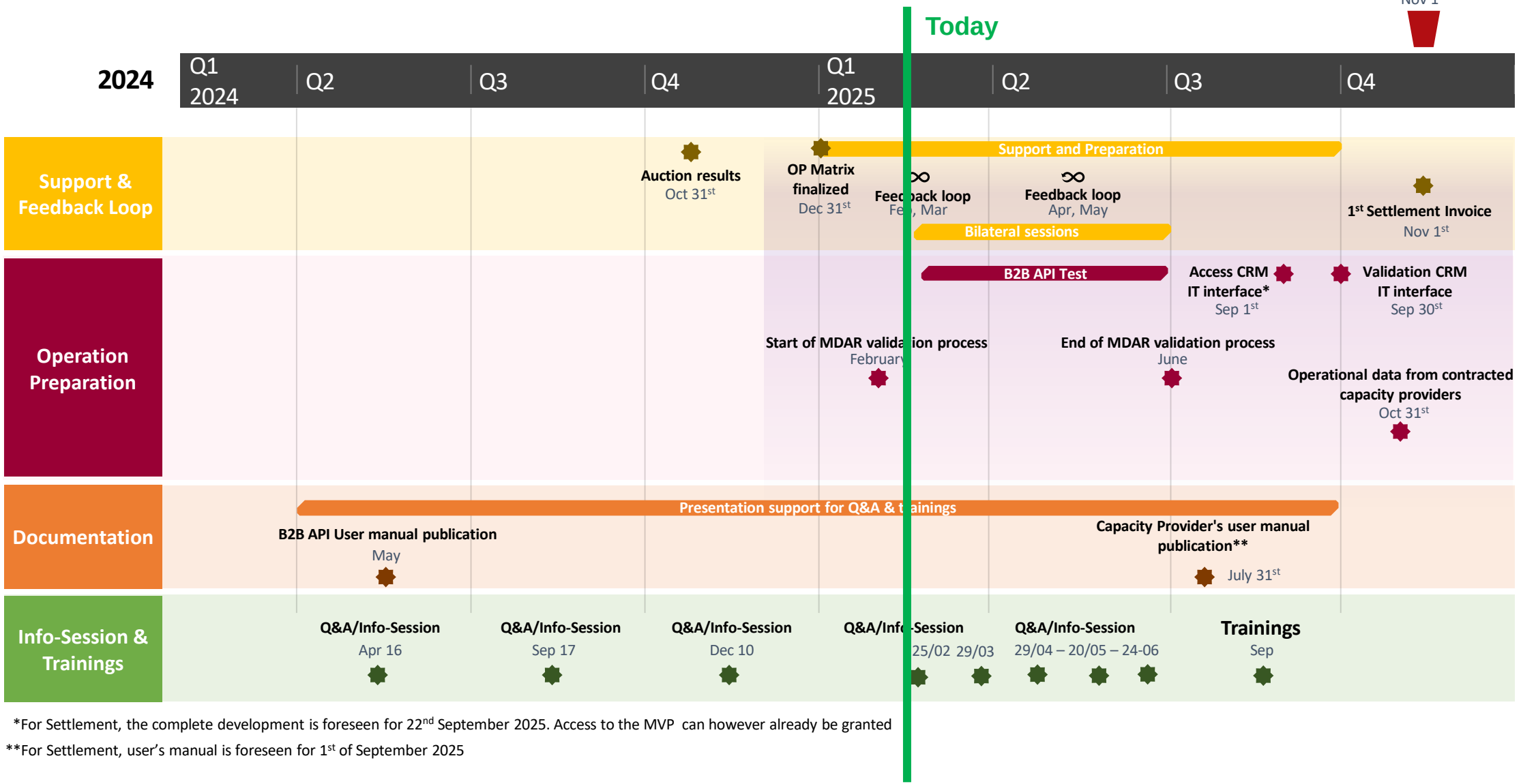
Other

- On **price of gas** to study the effects that this variation would have on **the entire value chain** (consumption and production)
- On **less DSM and storage capacity**
- On **non/strict achievements of the FB CEP rules**
- On **HP Flexibility** (20% of daily energy shift, instead of 10%)
- On **UK Nuclear** (on delivery of Hinkley Point C)
- On **electrolysers flexibility** (running with 20% baseload)
- On industry flexibility

Thank you

Availability Monitoring & Payback Obligations

AMPBO Operational Readiness Timeline – Status Update



*For Settlement, the complete development is foreseen for 22nd September 2025. Access to the MVP can however already be granted

**For Settlement, user's manual is foreseen for 1st of September 2025

Upcoming Q&A Session on 25/02/2025

- **First Q&A session of the Year**
- **Goal:** Answer to your questions and present you the progress of our Implementations
- **Content:** In addition to the Q&A, Elia foresees a demo of “how to **notify the scheduled maintenance days** " in the CRM interface tool, offering practical insights to help you navigate the implementation process.
- **Date & Time:** 25/02 – 14:00 to 15:00 (Via Teams Only)
- **Confirmation of participation:** At the latest on 21/02 - taskforce.CRM@elia.be

- **Upcoming sessions:**
  - Tuesday, March 25th
  - Tuesday, April 29th
  - Tuesday, May 20th
  - Tuesday, June 24th

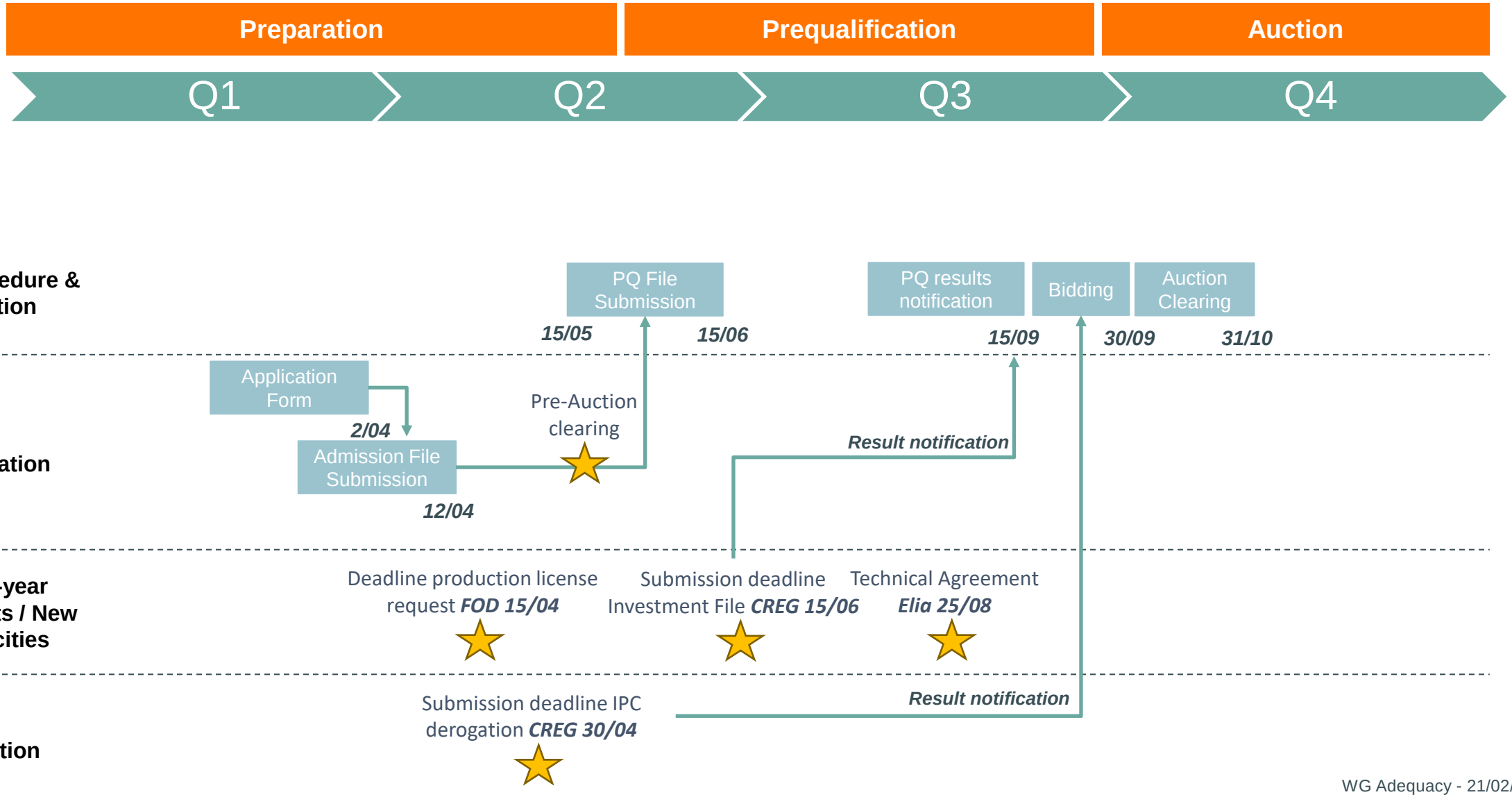
AOB

The following documents have been published:

- Functioning Rules v5
  - More information can be found on the public consultation page here
  - And on the CRM page under “Formal documents”

- Design Notes
  - More information can be found on the CRM page under “CRM Design Notes”

High level view on the CRM process



Next meetings

Next meetings

- **Tuesday 25/02/2025: Q&A and Demo Session on Availability Monitoring and Payback Obligation** (from 14:00 to 15:00)
- **Monday 03/03/2025: General info session** (from 13:00 to 15:00)
- **Tuesday 25/03/2025: Q&A and Demo Session on Availability Monitoring and Payback Obligation** (time TBD)
- **Tuesday 25/03/2025: Detailed info session** (from 13:00 to 17:00)
- **Friday 28/03/2025: WG Adequacy** (from 13:30 to 16:30)
- **Thursday 10/04/2025: Detailed info session** (from 13:00 to 17:00)
- **Thursday 17/04/2025: WG Adequacy** (from 13:30 to 16:30)

Please find further information on the next meetings through the WG Adequacy webpage

Thank you.