TFMES Workshop

H2 demand and H2+ sensitivity

03.03.2026 – Online session.

Agenda

A. Reminder: feedback from DG Energy and Minister's position related to hydrogen

B. Hydrogen volumes to be used in the simulations for the TYNDP 2028-37

C. Next steps

A. The Minister's position: additional H2 demand and sensitivity Hydrogen+

The Minister's position

Un scénario supplémentaire qui se concentre sur le développement ultérieur de l'hydrogène et des dérivés de l'hydrogène. Afin d'obtenir une estimation maximaliste de la demande en hydrogène, ce scénario doit être élaboré selon les modalités proposées par la DG Energie (voir section 6.3, p.70 de l'avis de la DG Energie).

Implementation method

Develop a hydrogen-focused sensitivity using DG Energy assumptions (section 6.3, p.70 of DG Energy advice) to estimate maximum hydrogen demand

Impacts

Recommendation	Fluxys proposal
Consolidation of hydrogen consumption	A proposal will be made to give a high ambition scenario for hydrogen demand
Take into account existing (grey) hydrogen demand including Air Liquide clients.	The (grey) hydrogen production of this demand is integrated in the CH_4 values. Moreover, hydrogen as byproduct from oil/carbo liquids cracking&processing should be integrated in the liquids vector. No detailed information available about capacity and volumes (Air Liquide clients).
Molecules projection until 2050	An estimation will be provided
Steel sector projections : DRI before 2050	The same projection of hydrogen as ELEC scenario will be used (+6 TWh in 2040 due to DRI process)
Integration of hydrogen demand for synthetic fuels	An estimation will be provided
Transit flow to NL and GE	Transit will be included in the investment plan
Dimension of the grid with consumption peak	Internal analysis ongoing to transform yearly value in hourly and peak values
Electrolyser flexibility	Will be considered during the simulation process

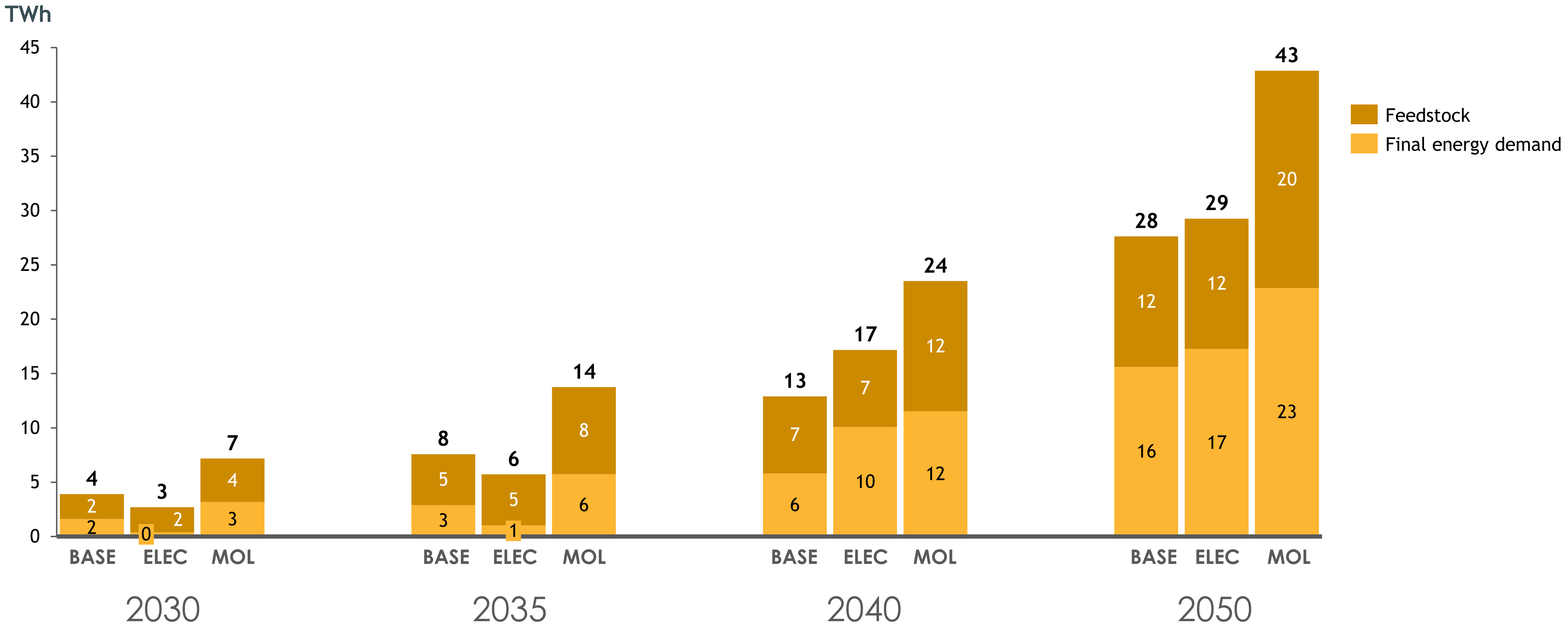
B. Hydrogen volumes to be used for simulations in TYNDP H2 2028-37

1. Conceptual: Total hydrogen volumes to be used in simulations
2. Reminder: H2 demand in ELEC, BASE and MOL scenarios
3. H2+ sensitivity storyline and demand
4. Additional H2 demand for maritime and aviation
5. Additional H2 demand for ammonia production
6. Additional H2 demand for power plants
7. H2 interconnections capacities
8. Matching H2 supply – H2 demand

1. The total low-carbon hydrogen volumes to be used for Fluxys simulations is composed of several elements

Total H2 volumes	ELEC	BASE	MOL	H_2+ sensitivity
Final energy demand	From TFMES updated in January 2026 based on Minister’s feedback			To be presented today
Feedstock				
Additional H_2 demand for domestic ammonia production	To be presented today			
Additional H_2 demand for domestic synthetic fuels production (i.e. e-kerosene, e-liquids, e-CH4)	To be presented today			
Additional H_2 demand for power plants	To be presented today			

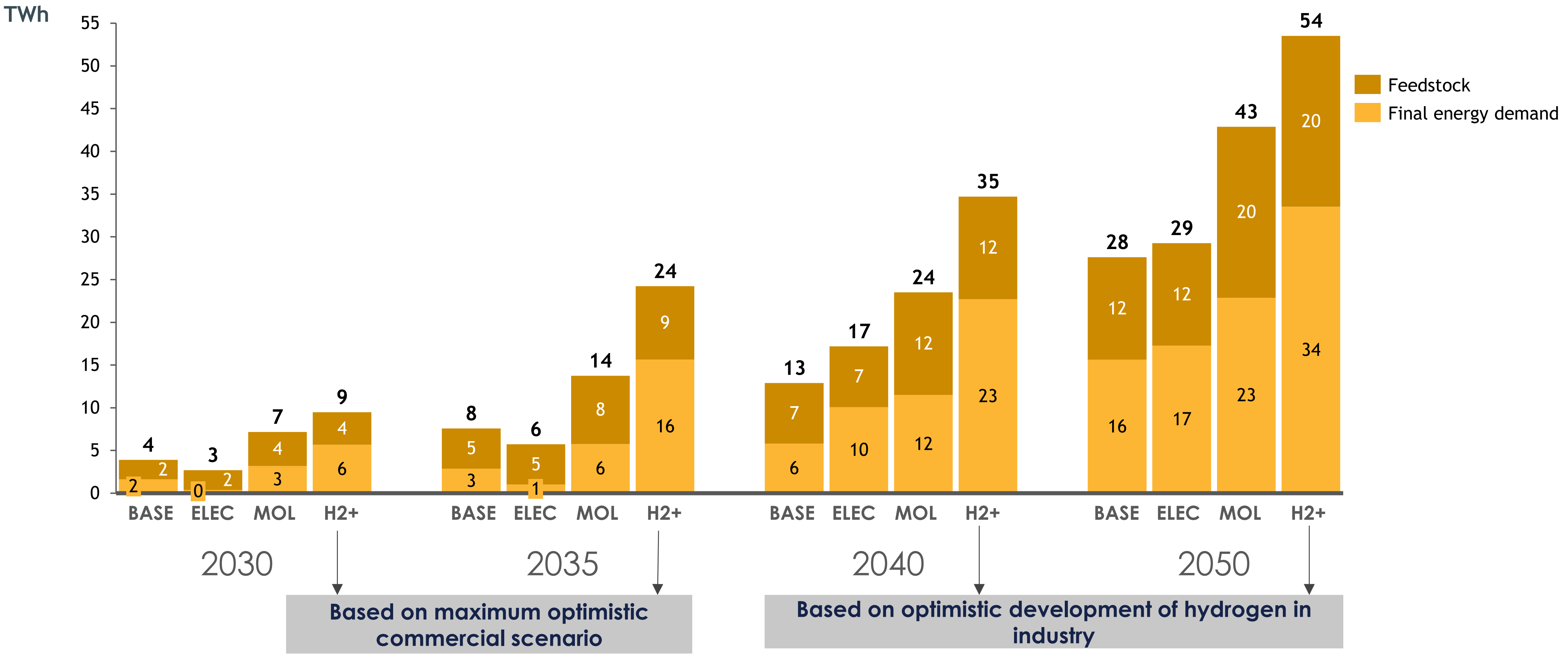
2. Reminder:
Final H_2 demand and H_2 feedstock demand in TFME scenarios



Excluding: H2 from e-fuels and NH3 for international transport and H2 for power plants

3. H_2+ sensitivity: final energy demand and feedstock

The H2+ sensitivity is based on the most optimistic scenario from commercial for short term (2030-2035). For longer term, based on more optimistic development of hydrogen in industry.

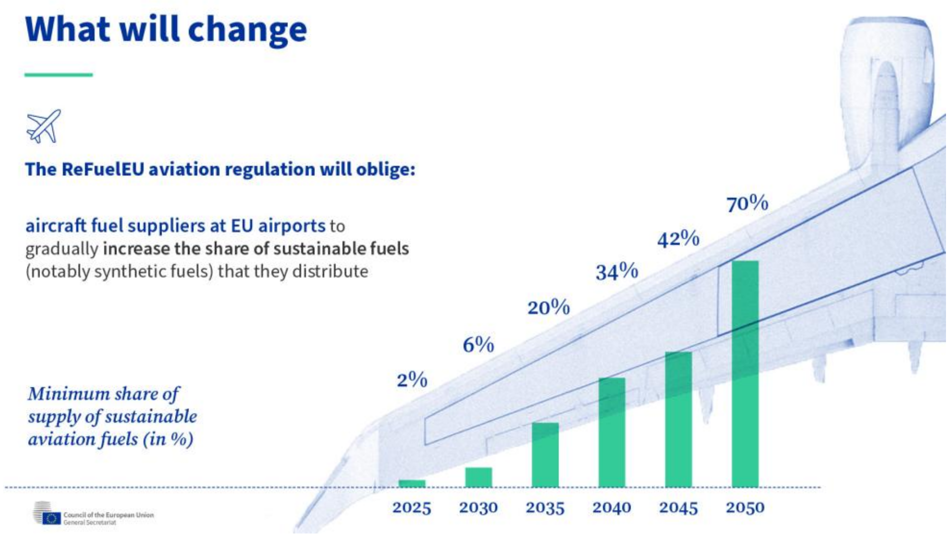


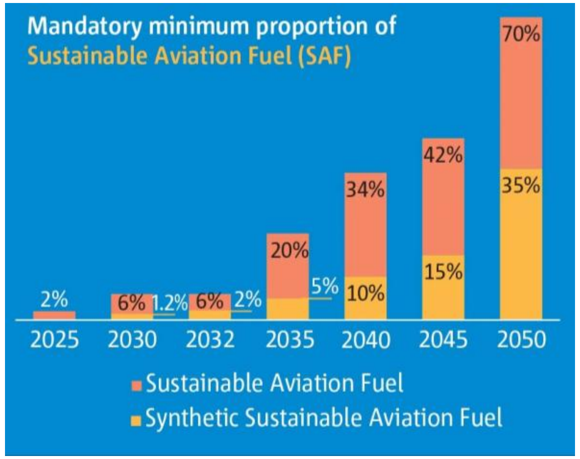
Excluding: H2 from e-fuels and NH3 for international transport and H2 for power plants

4. Additional H_2 demand for international aviation and shipping

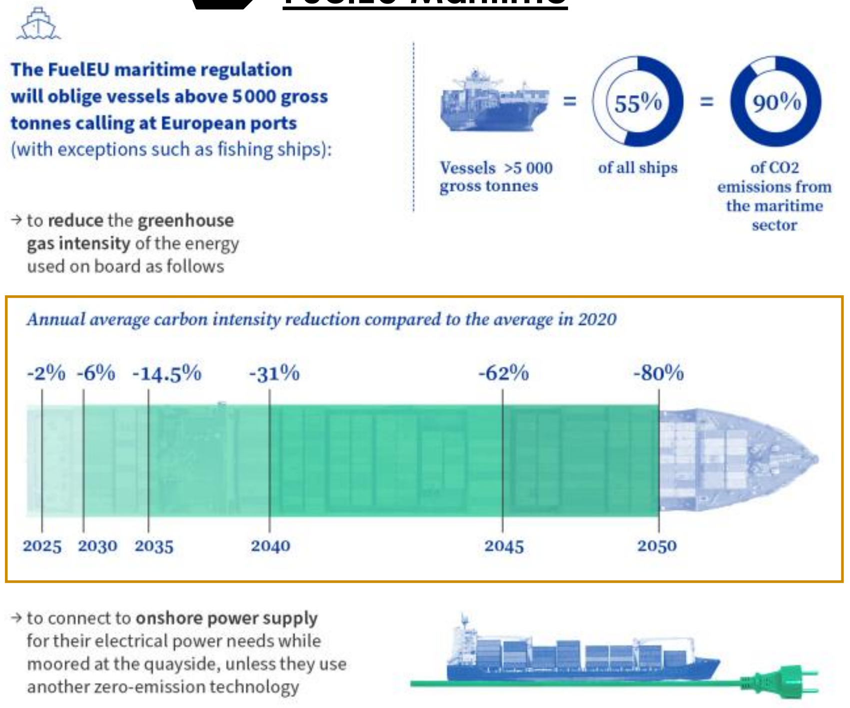
ReFuelEU Aviation and **FuelEU Maritime** regulations impose constraints/targets leading to future additional H2 demand.

ReFuelEU Aviation





FuelEU Maritime



Fluxys assumptions:

- These requirements are to be met at the ship level (for vessels >5000 gross tonnes). However, due to the flexibilities allowed in the regulation and for the sake of simplicity, Fluxys assumes that these reduction percentages can be applied to the entire sector.
- Regarding well-to-wake emissions, Fluxys assumes that tank-to-wake emissions are proportional to well-to-wake emissions.
- Combustion emission intensities associated with energy demand for 2030, 2035, 2040, and 2050 are compared to the one of 2020.

4. Additional H_2 demand for international aviation and shipping

- **4.1 ReFuelEU Aviation**: regulation for aviation transport, **imposing targets for minimum shares of sustainable aviation fuels** (i.e. SAF) and **synthetic aviation fuels** (i.e. e-fuels)
  - ➢ Possible to directly use the shares provided for all time horizons to compute the additional H2 demand
- **4.2 FuelEU Maritime** : regulation for maritime transport, **imposing targets for GHG emission reduction**
  - ➢ Additional assumptions and calculations are required to determine the additional H2 demand, as combinations of e-fuels/biofuels can be used to reach emission targets.

- Once synthetic fuels volumes are determined, it is necessary to assess what share will be produced in Belgium and therefore contribute to domestic H2 demand.

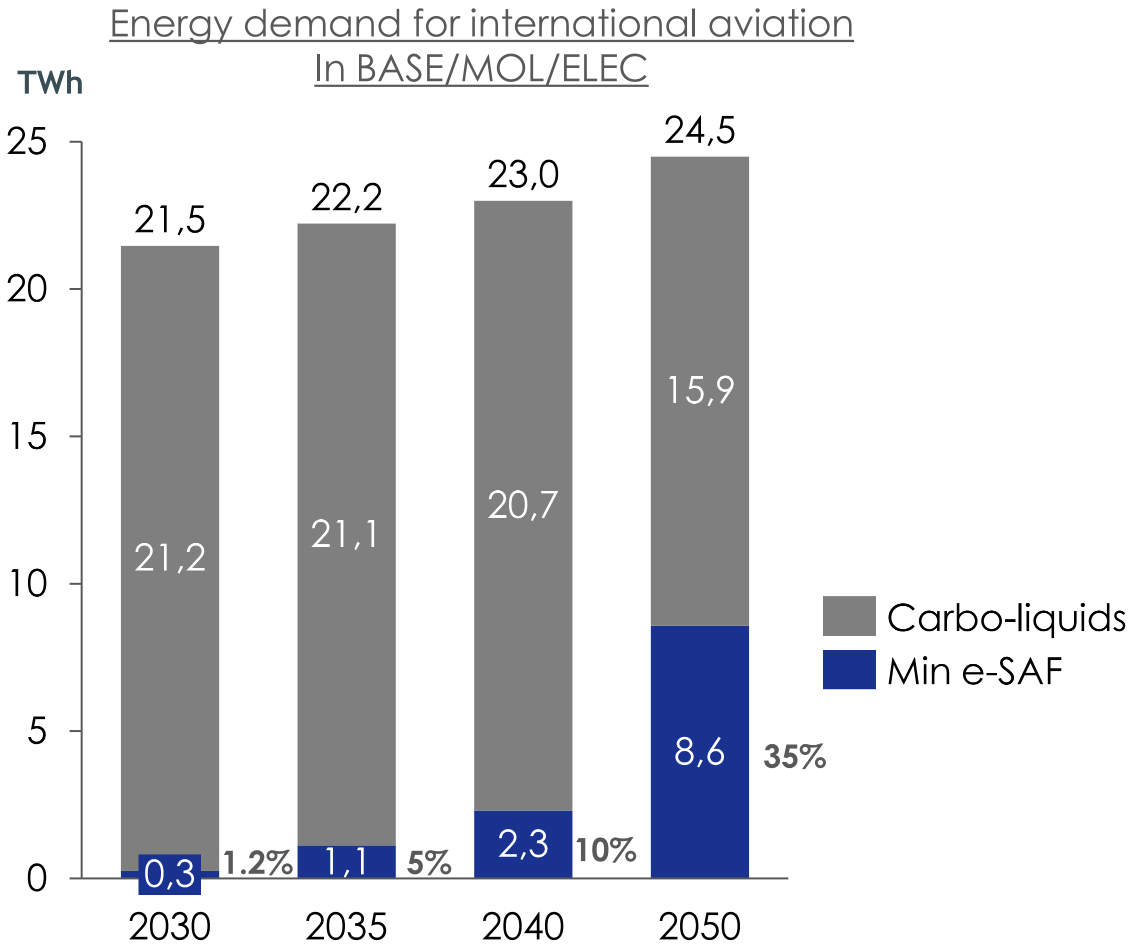
➢ Main assumptions :

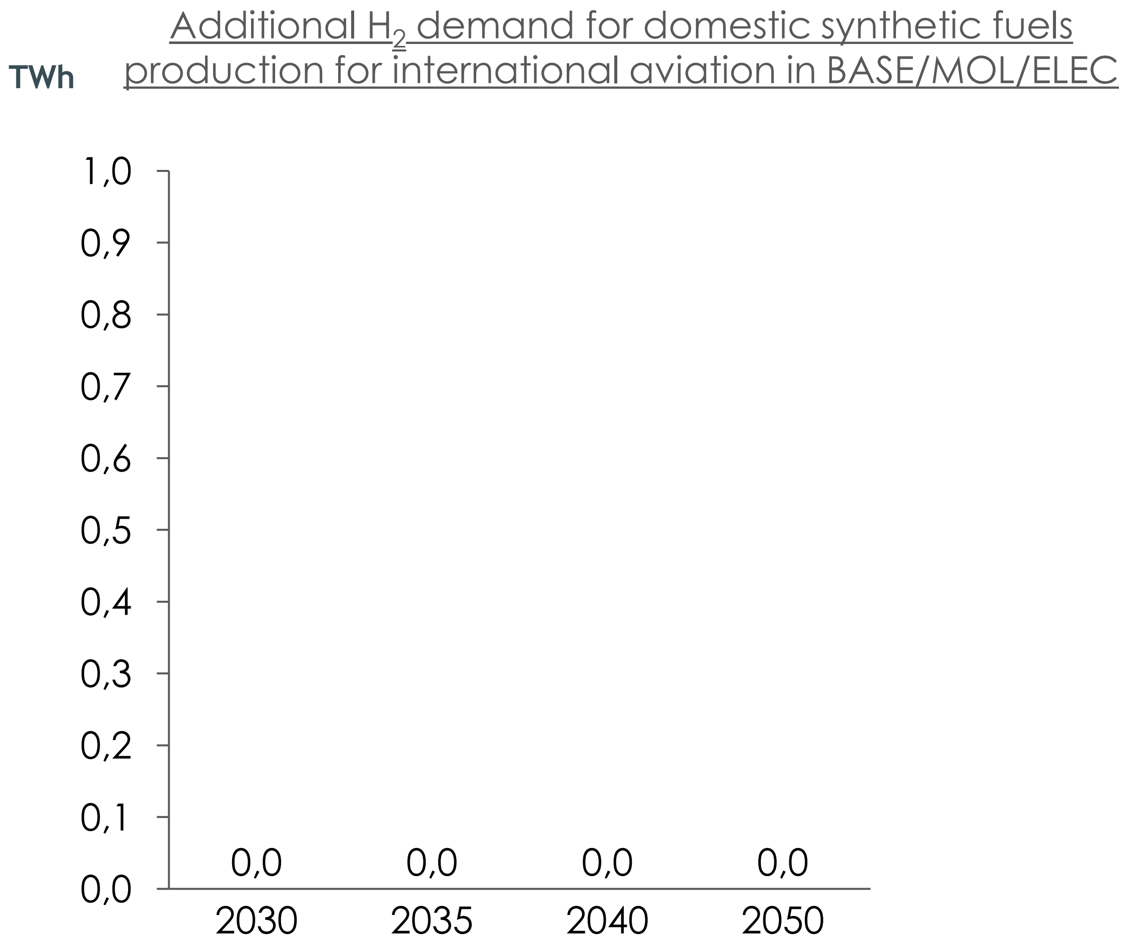
» **Domestic production of synthetic fuels : 0% for BASE/ELEC/MOL and 25% for H2+**

» **Efficiency of H2 to synthetic fuels conversion: 70%**

4.1 ReFuelEU aviation : additional H_2 demand (BASE/ELEC/MOL)

Assumptions:
- **0% domestic production**
- **Conversion efficiency : 70%**



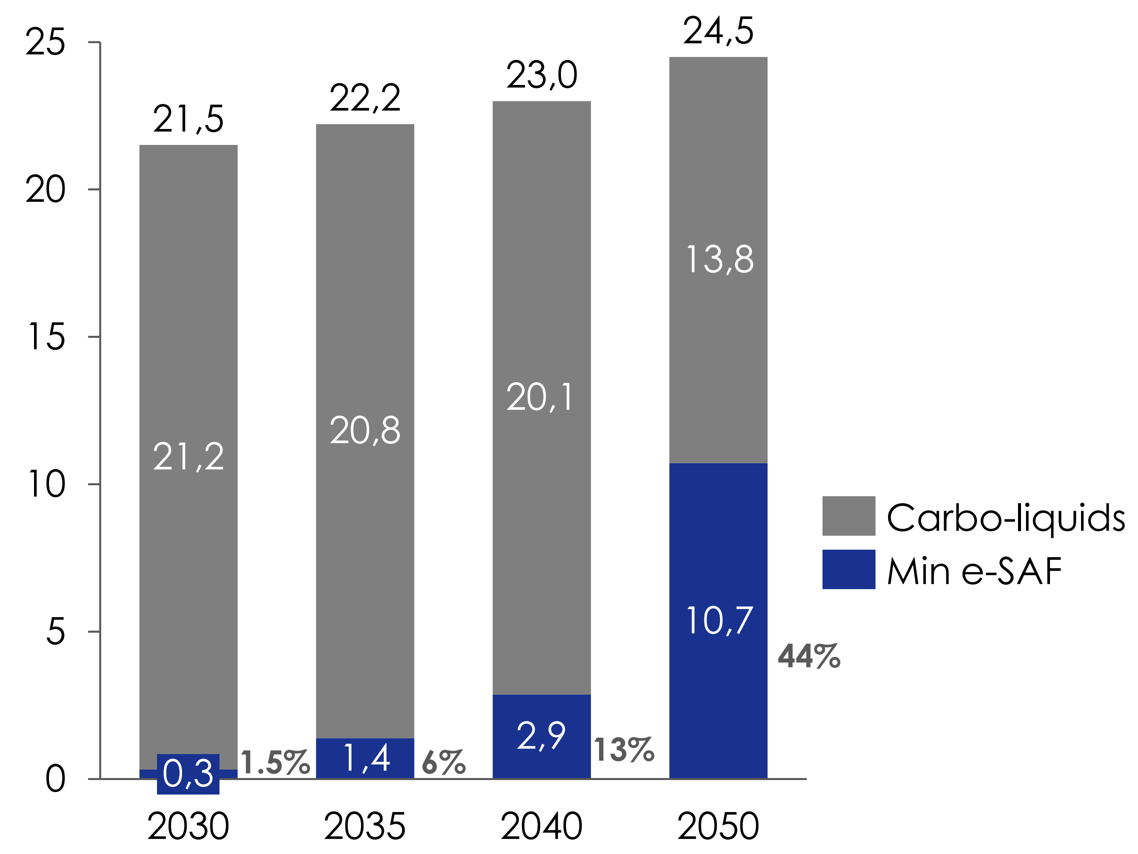


H2+ sensitivity

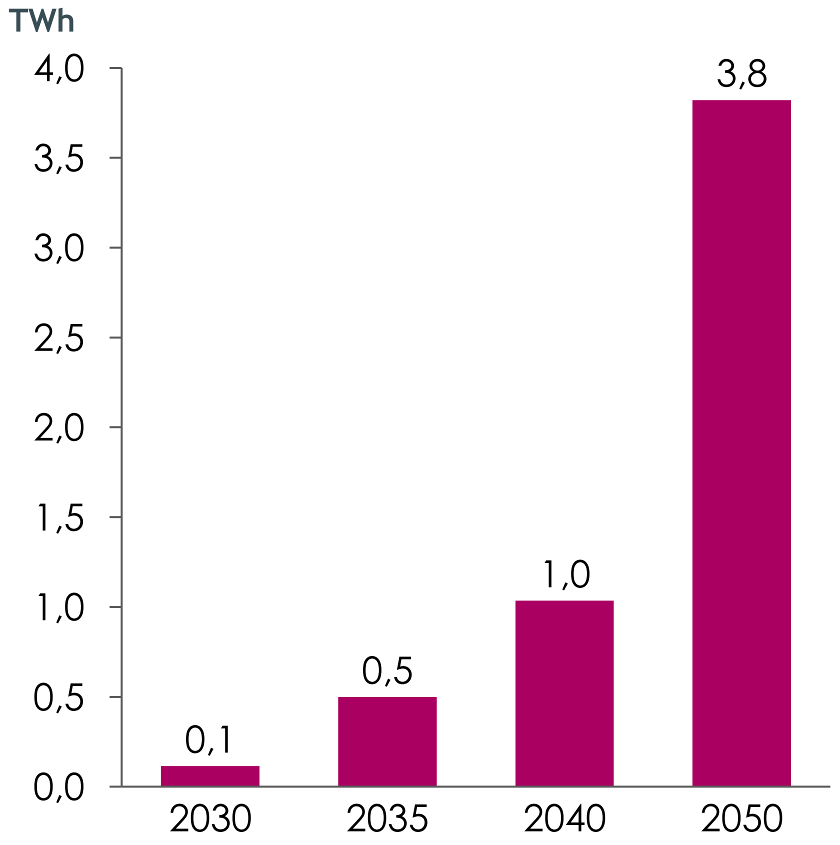
4.1 ReFuelEU aviation : additional H_2 demand (H_2+)

Assumptions:
- 25% domestic production
- Conversion efficiency : 70%
- Share of e-SAF is 25% greater than for BASE/ELEC/MOL

Energy demand for international aviation in H_2 +

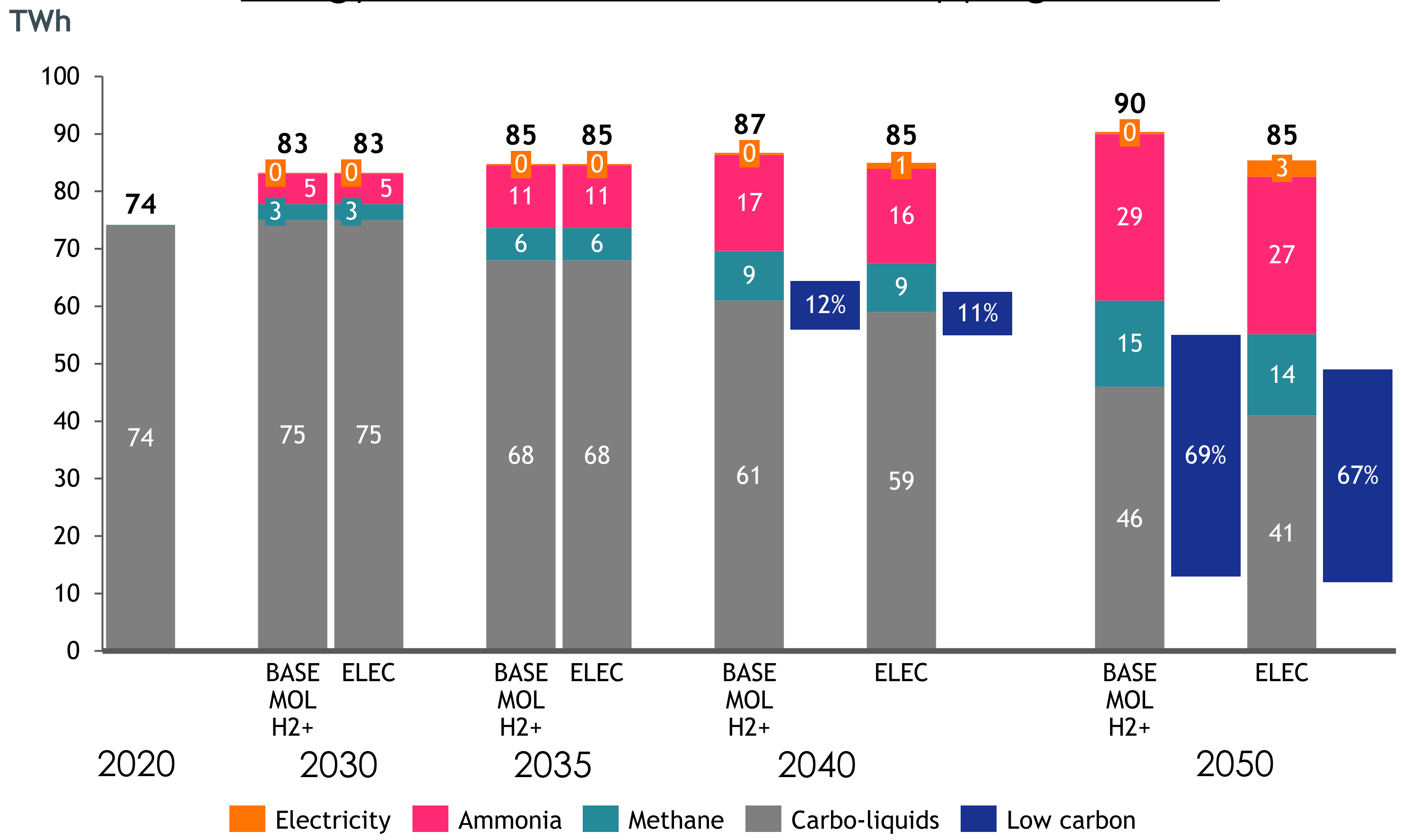


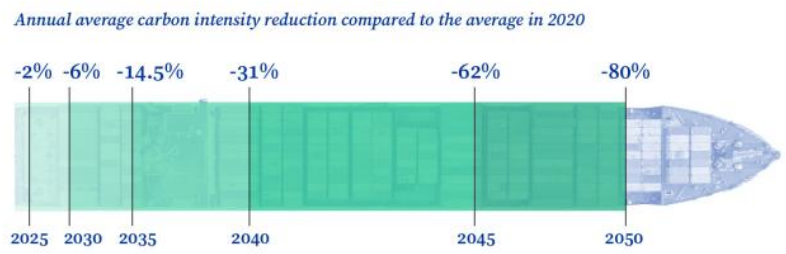
Additional H2 demand for domestic synthetic fuels production for international aviation in H_2 +



4.2 FuelEU Maritime : additional hydrogen required for ammonia production and for e-fuels

Energy demand for international shipping in TFMES

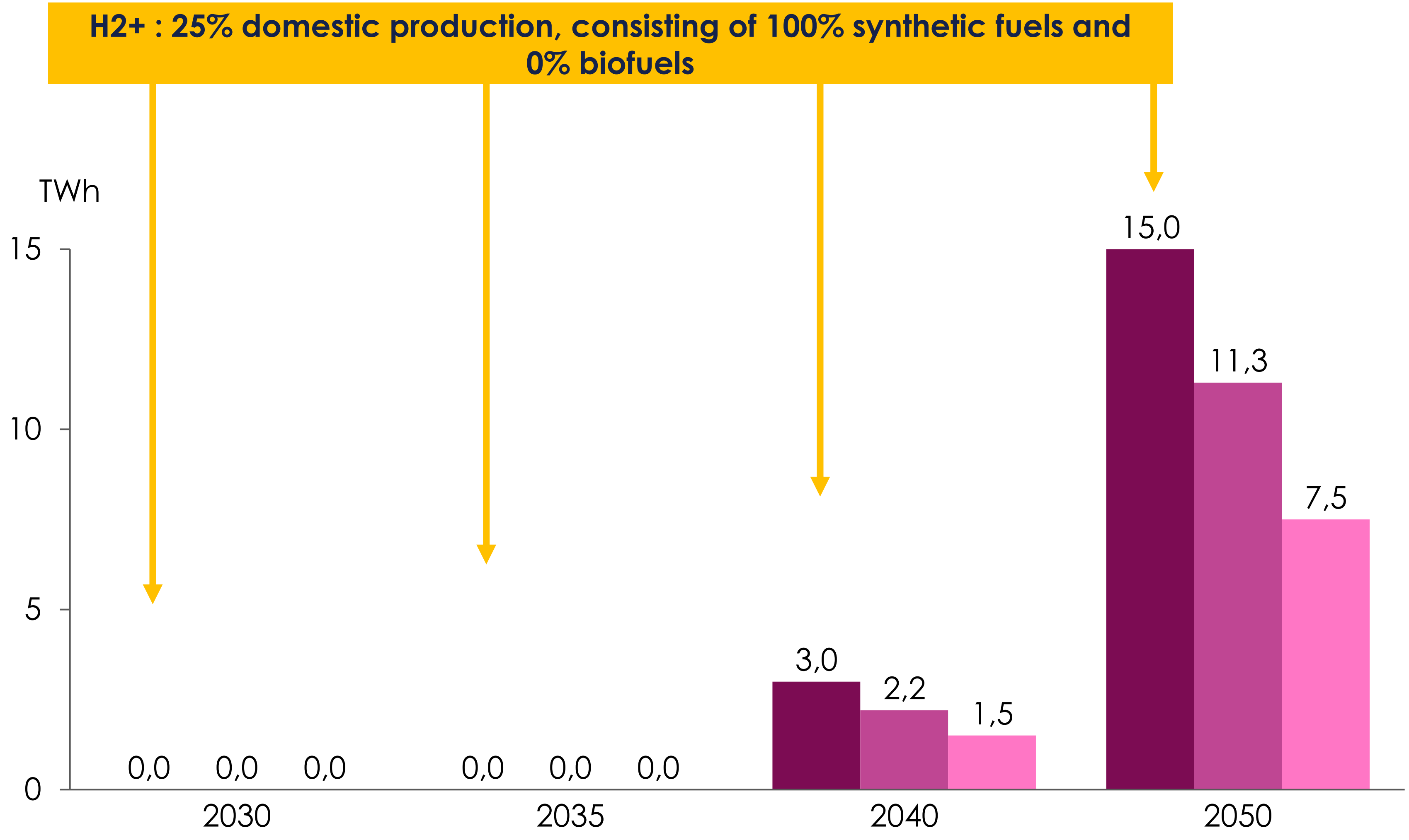




- Shares of carbo-liquids and methane demand should be low carbon (bio/e-fuels)to match emission reductions described in FuelEU maritime regulation.
- Assumption: **share of low carbon methane = share of low carbon carbo-liquids.**

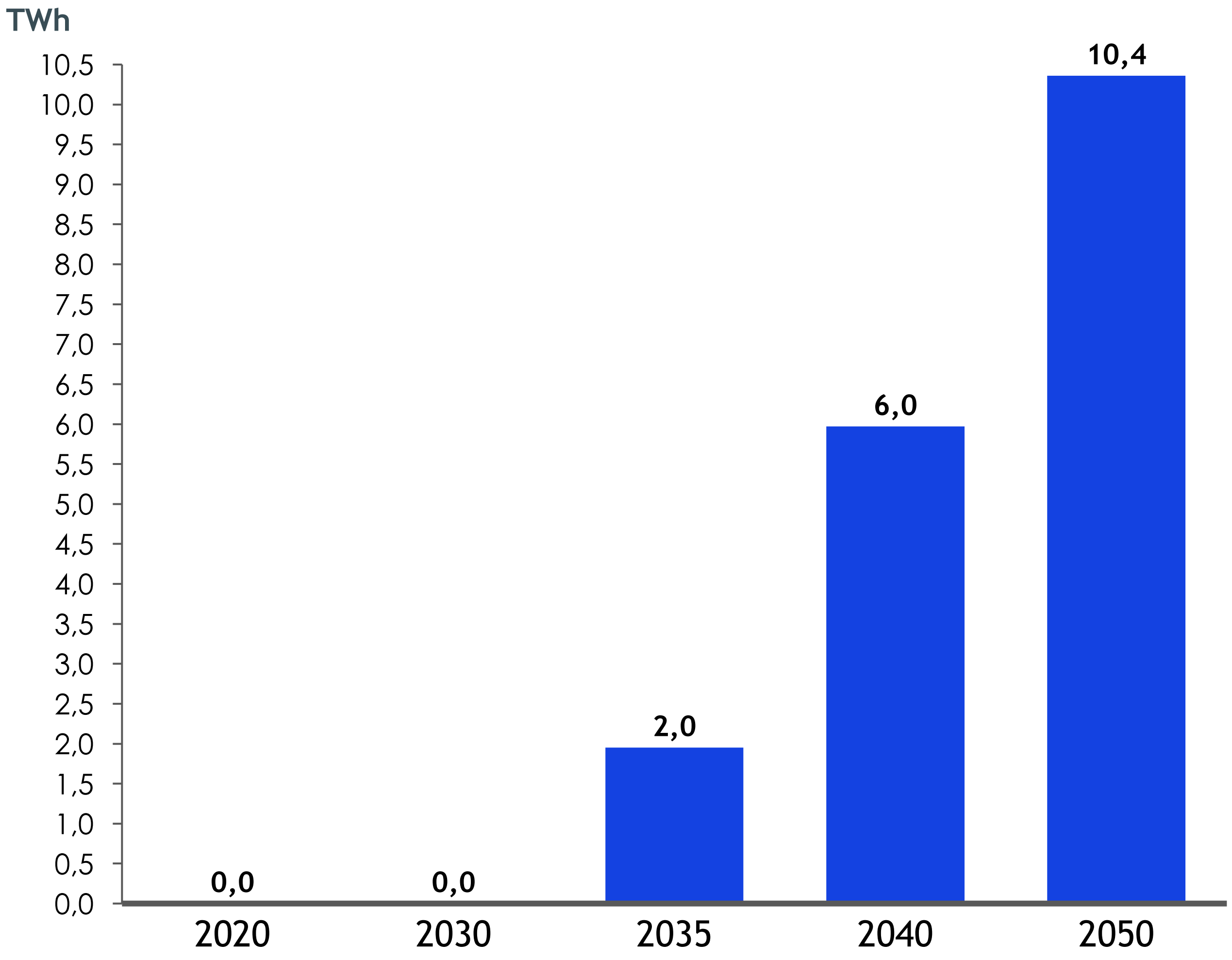
Low carbon methane and carbo-liquids should be distributed between bio/e-fuels

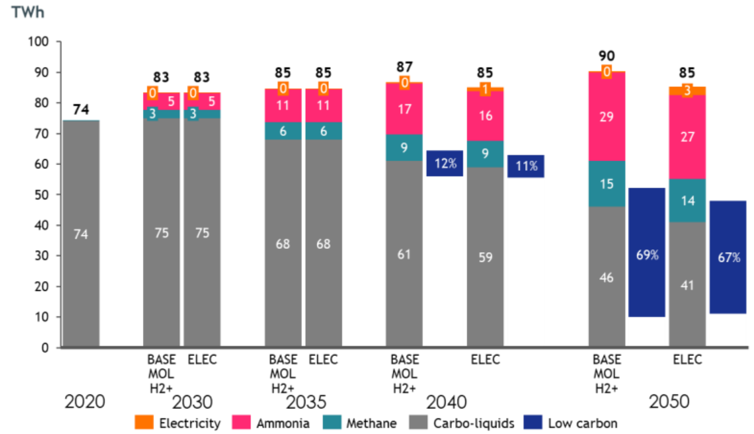
4.2 Additional H_2 demand to produce synthetic fuels or e-methane and comply with FuelEU Maritime (depending on the e-fuel/biofuel repartition)



Assumptions:
- **Domestic production: 25%**
- **Conversion efficiency: 70%**

5. Additional volumes of H_2 for domestic ammonia production for international shipping



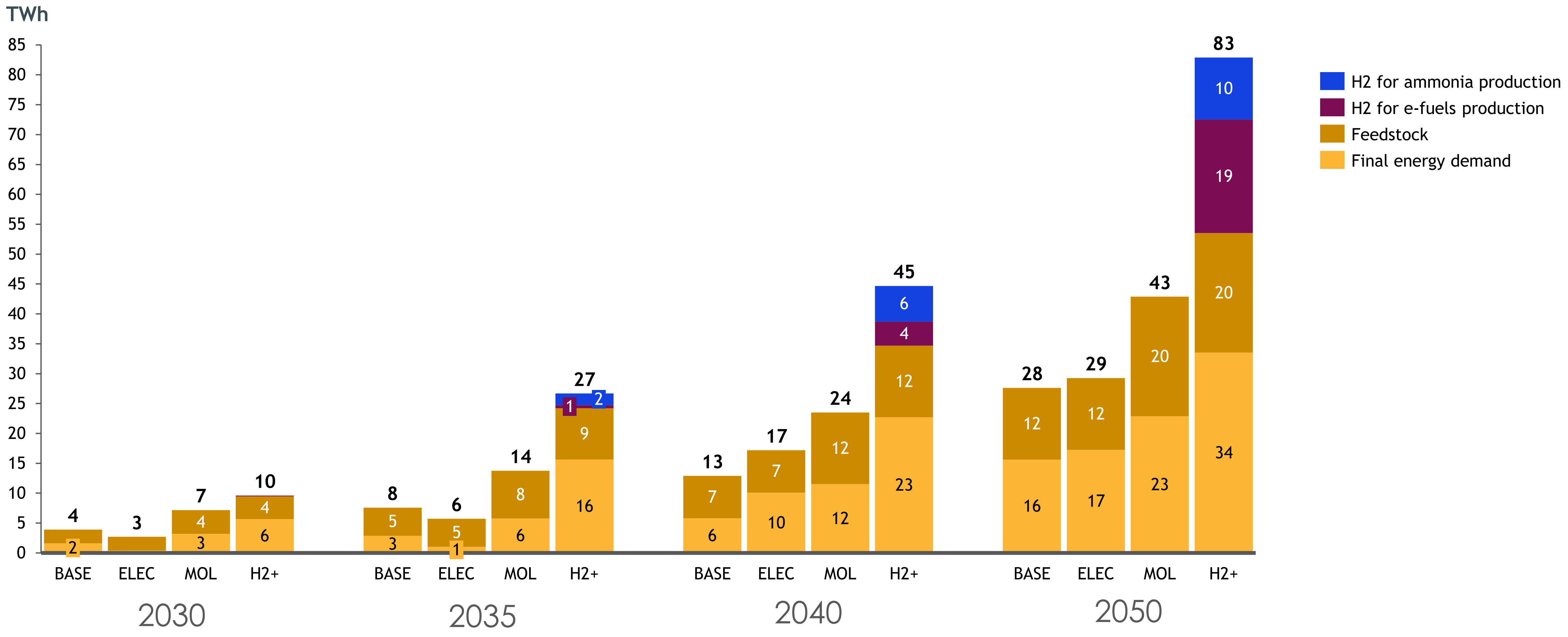


Assumptions H2+:

- 2030 : 0% domestic production
- 2035 : 12.5% domestic production
- 2040 & 2050 : 25% domestic production
- Conversion efficiency : 70%

H2 for ammonia production

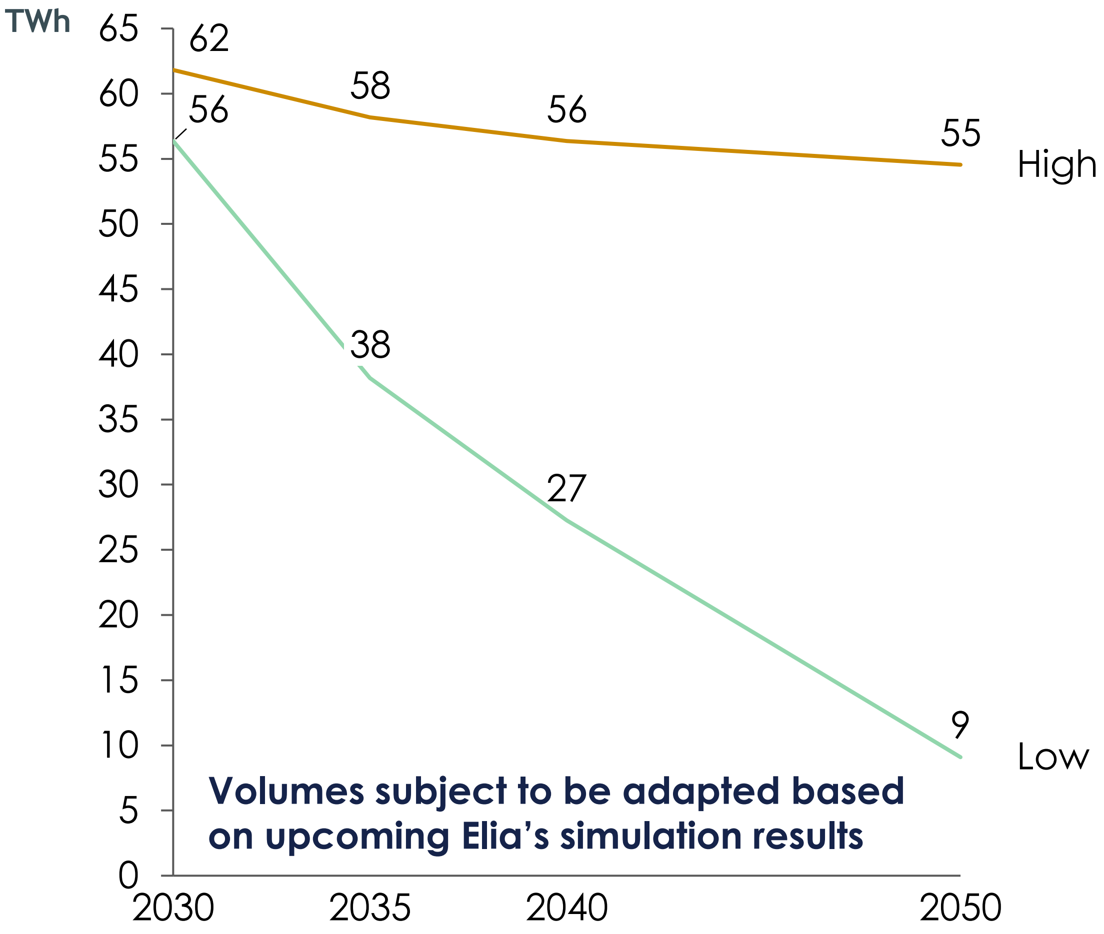
4-5. H_2 final demand, H2 in feedstock and additional H_2 for domestic NH_3 production and domestic e-fuels production



Excluding H2 demand for power plants

6. Hydrogen demand for power plants

Molecules demand* (in TWh) for power plants based on scenarios in Adeq-Flex and Blueprint



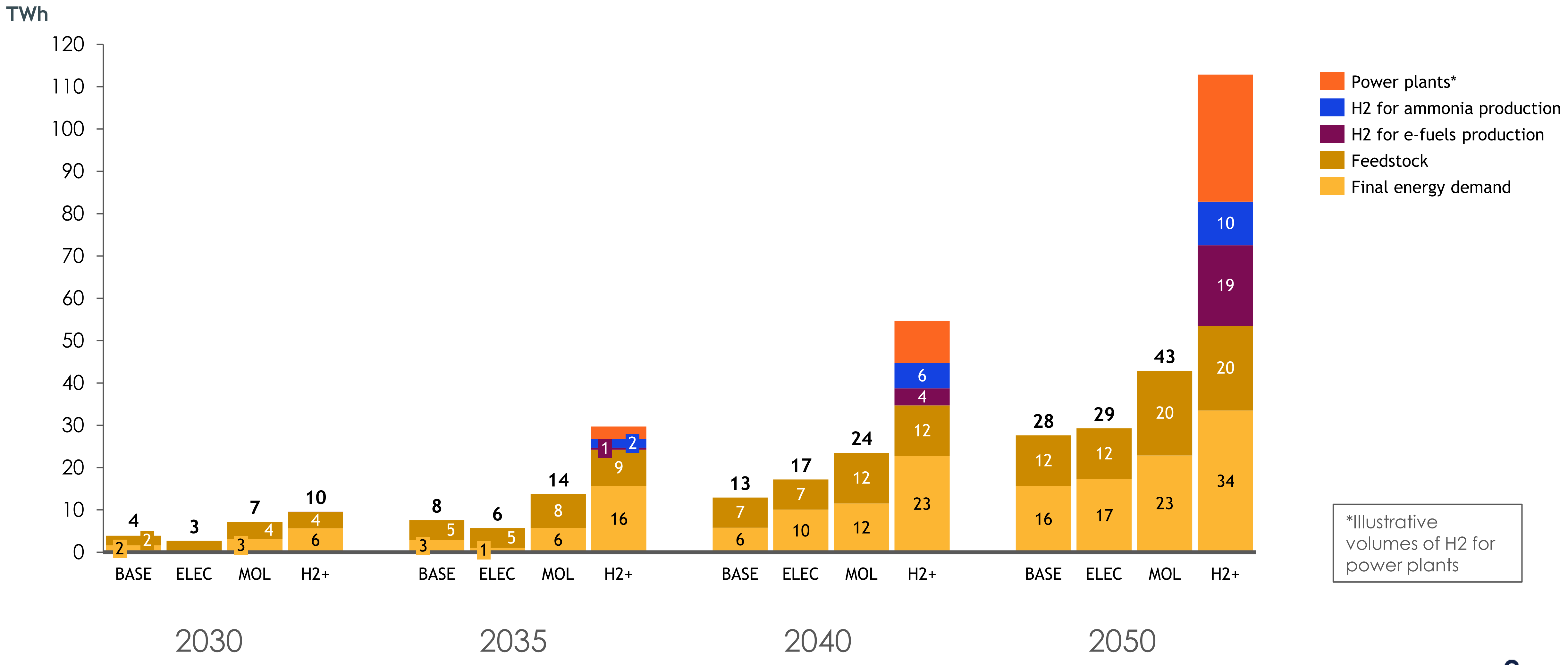
Volumes subject to be adapted based on upcoming Elia's simulation results

H2 power plants :

- **Considering no H2 power plant for BASE/ELEC/MOL**
- **H2+ :**
  - **High H2 demand scenario combined with progressive integration of H2 power plants**
  - **Final H2 volumes for power plants to be determined in the coming weeks with Elia (based on share of new capacities and internal Fluxys data)**

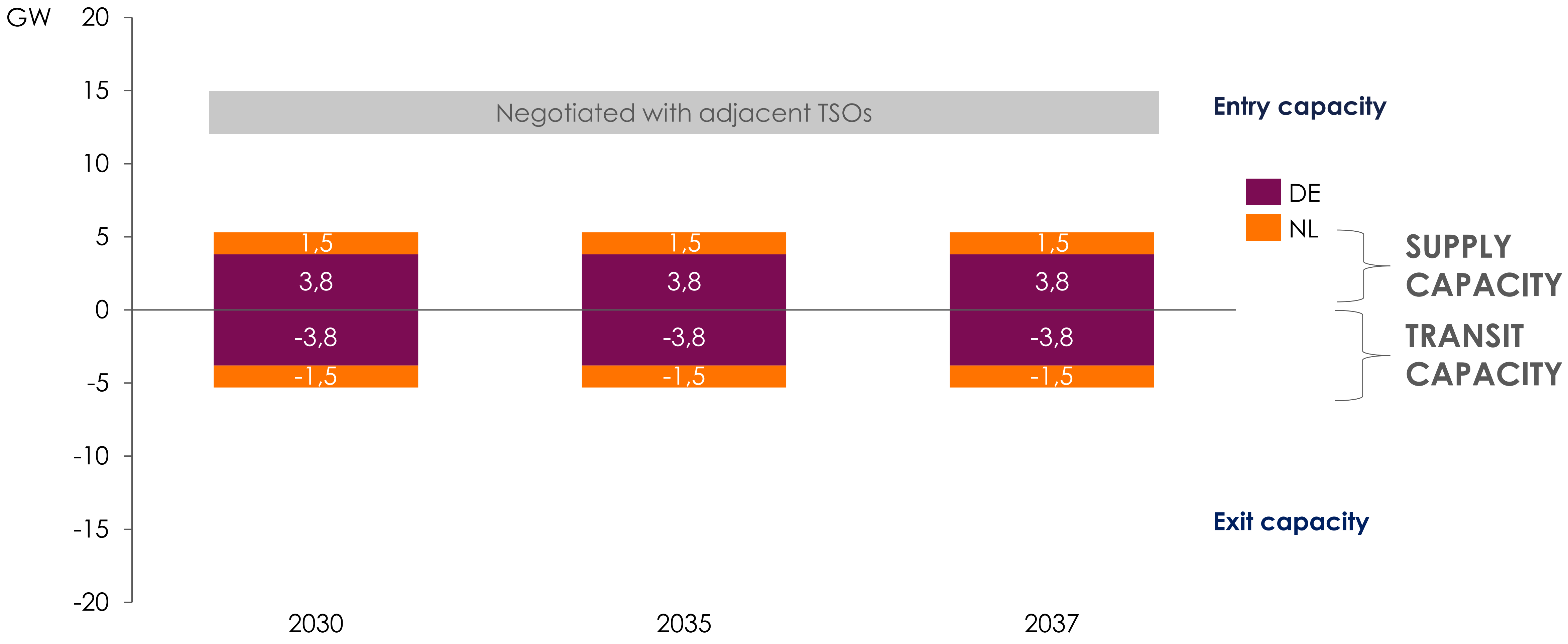
*Based on an average efficiency of 55%

6. H_2 volumes to be used for TYNDP simulations



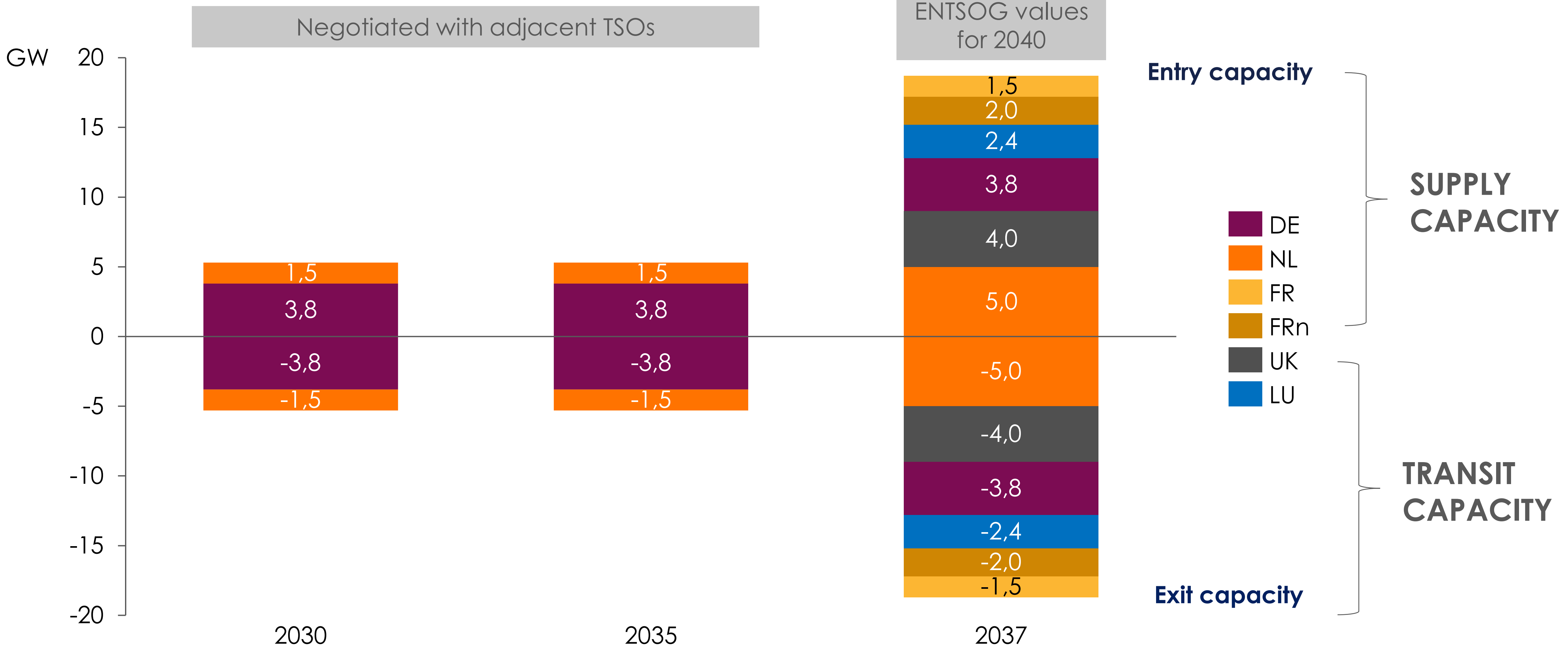
7. IP capacities to be considered as potential (max. value)

BASE/MOL/ELEC scenarios



7. IP capacities to be considered as potential (max. value)

H2+ sensitivity



8. Overview of proposed molecules supply scenarios

estimations based on input data and no modulation

2030

Maximum Potential Capacity [GW] per vector

CH4
- Local Biomethane Production: 0.37 GW

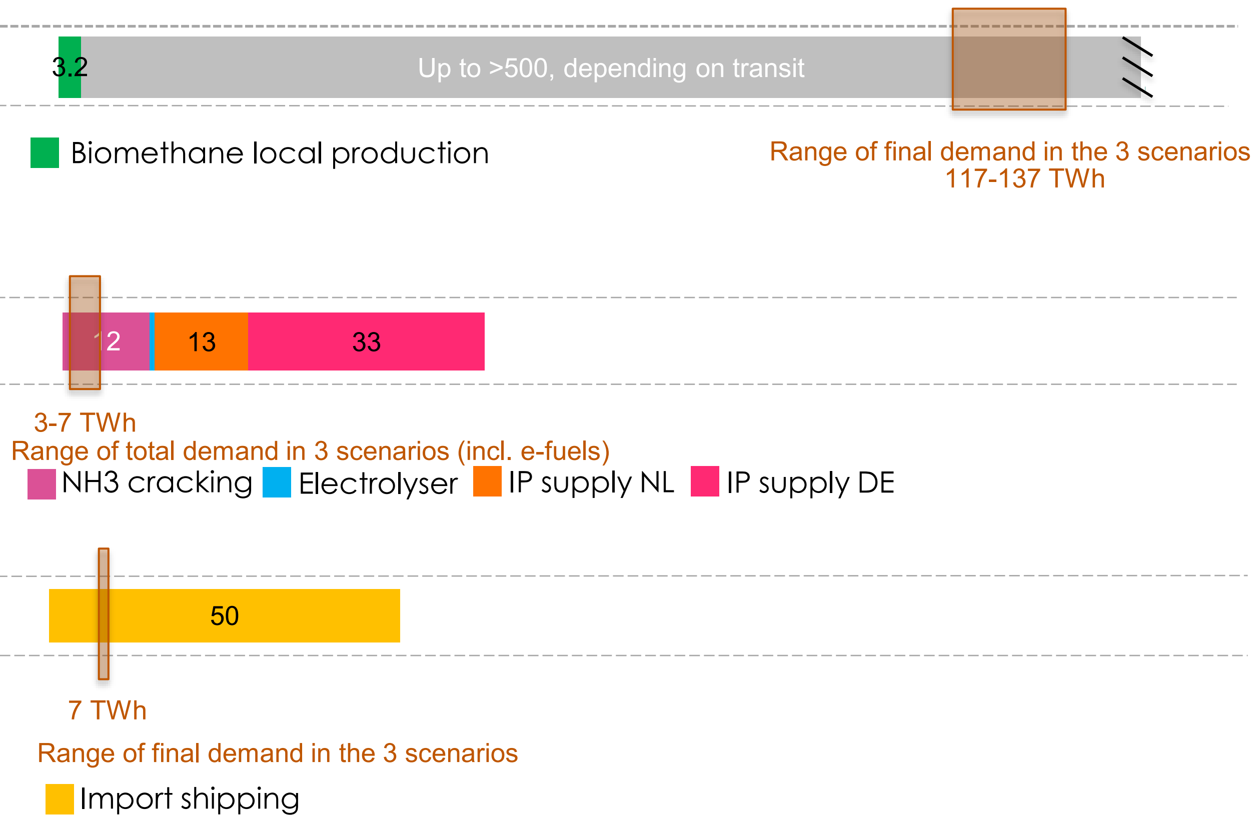
Fossil CH4 not included

H2
- NH3 Cracking: 1.4 GW
- Electrolyser: 0.1 GW_elec
- IP supply NL: 1.5 GW
- IP supply DE: 3.8 GW

NH3
- Haber-Bosch: 0 GW
- Import shipping: 5.7 GW

Note: showed value for Import Shipping NH3 includes NH3 Cracking capacity

Energetical supply mix in TWh



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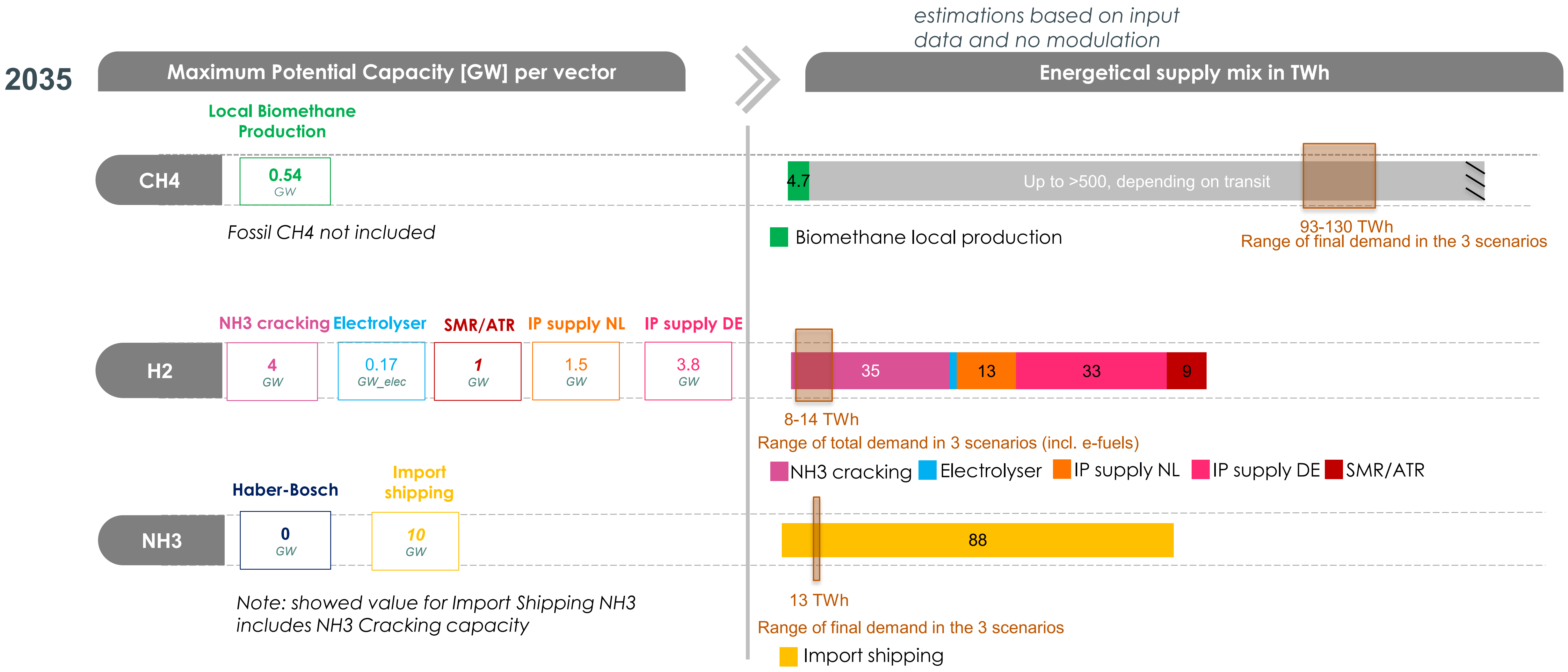


8. Overview of proposed molecules supply scenarios

estimations based on input data and no modulation

2037

Maximum Potential Capacity [GW] per vector

CH4

Local Biomethane Production
0.6 *GW*

Fossil CH4 not included

H2

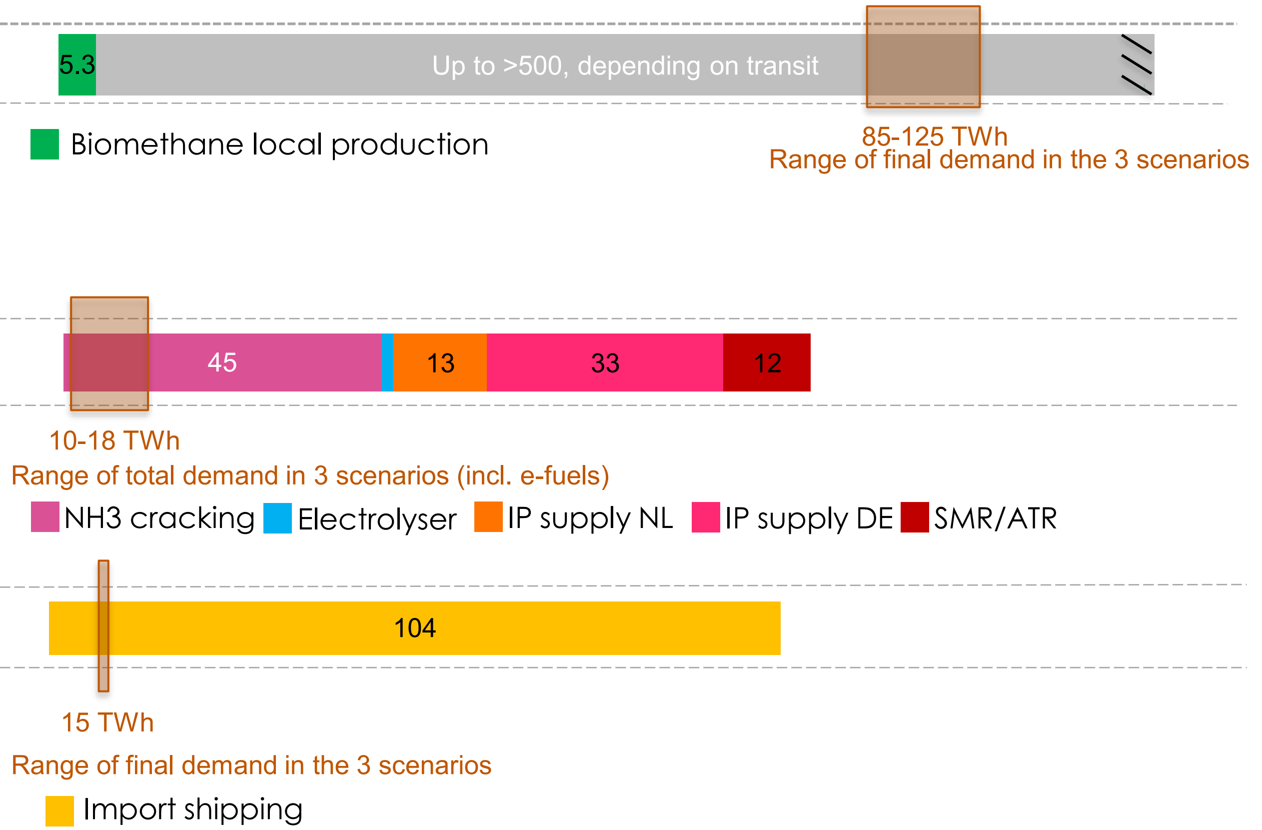
NH3 cracking	Electrolyser	SMR/ATR	IP supply NL	IP supply DE
5.1 *GW*	0.2 *GW_elec*	***1.4*** *GW*	1.5 *GW*	3.8 *GW*

NH3

Haber-Bosch	Import shipping
0 *GW*	*11.9* *GW*

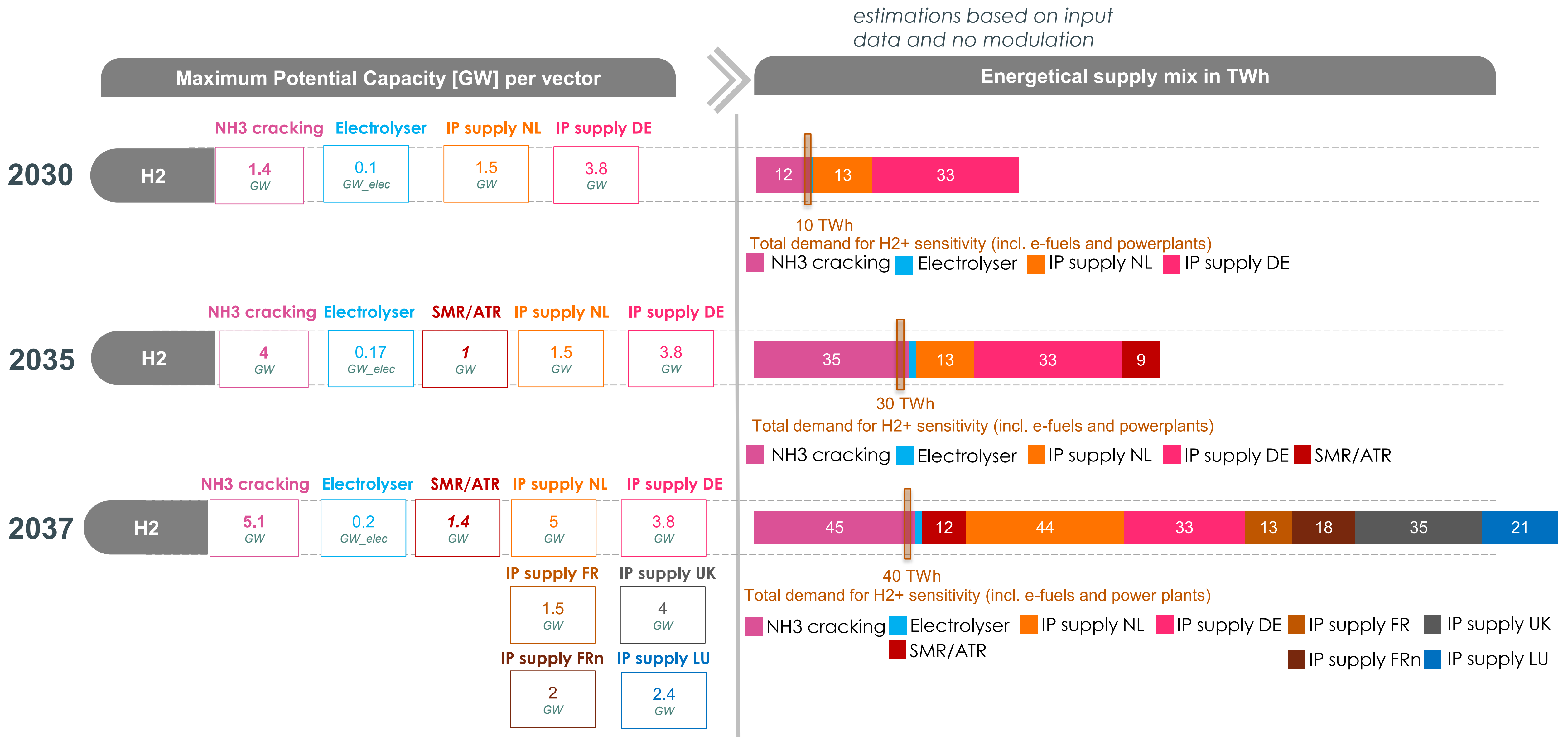
Note: value for Import Shipping NH3 includes NH3 Cracking capacity

Energetical supply mix in TWh



Note : interpolation between 2035 and 2040

8. Overview of proposed molecules supply scenarios



C. Next steps

- Presentation will be published on Fluxys website.

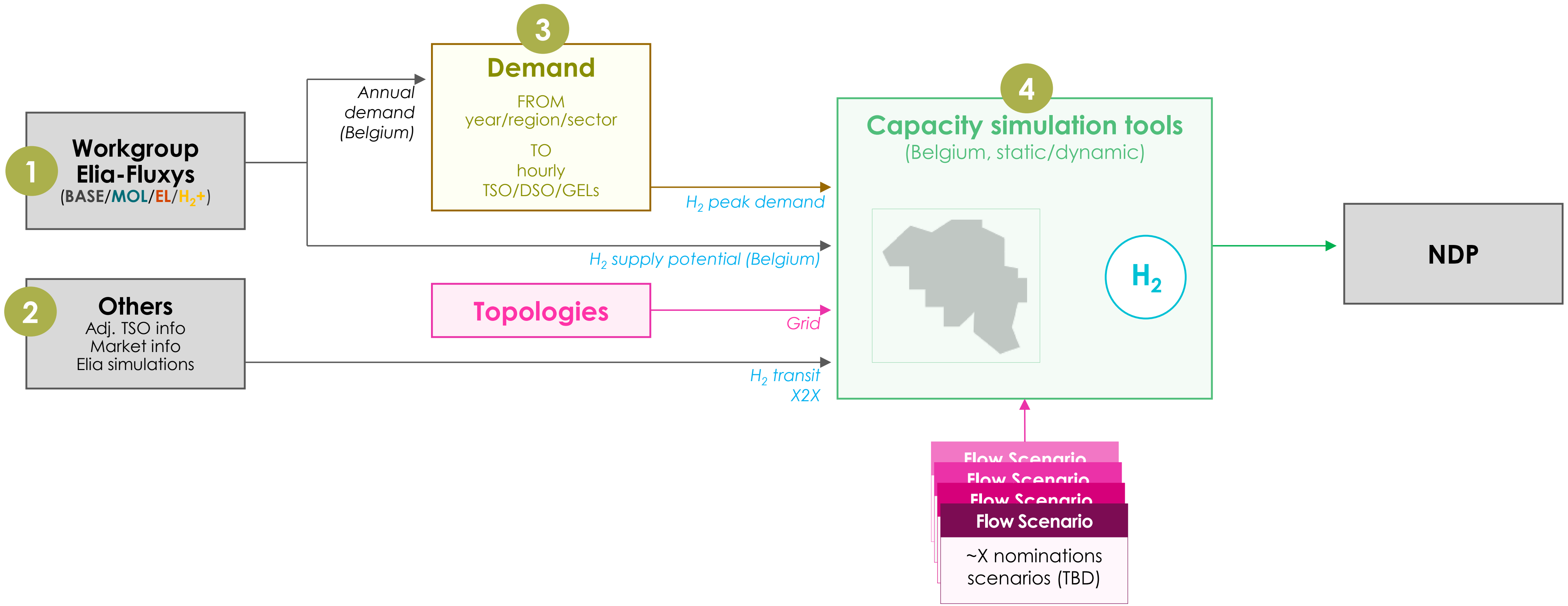
- TYNDP simulations: will start soon.

- TYNDP document: ongoing preparation.

- Following the Royal Decree of the 12.05.2024 a first draft of the TYNDP 2028-37 H2 will be submitted to the CREG for opinion on 1st of September 2026.

Backup: General methodology for TYNDP simulations

From task force results to simulations : general workflow



Yearly to hourly values

- **For H2 simulations (almost exclusively in industry):**
  - Hourly if directly known from clients
  - If not known, apply load factor to yearly values (TBD)

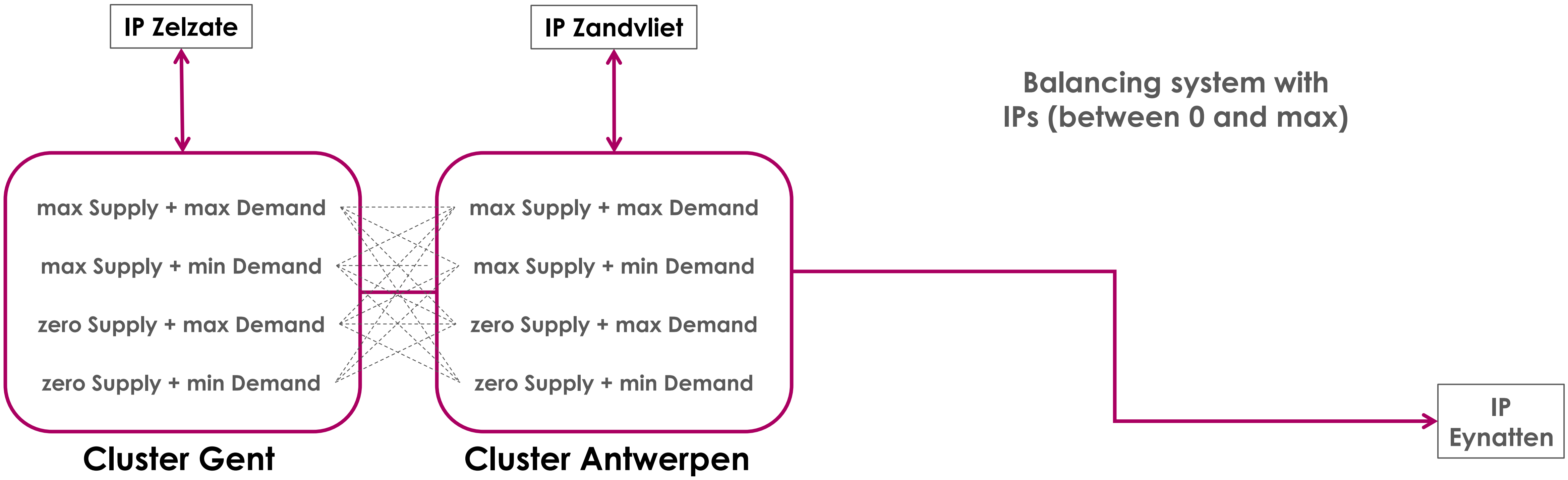
Geographical repartition

- **Demand**
  - Use of clients from commercial scenario
  - For other demand: repartition to geographical demand clusters (Antwerpen, Gent Limburg, Liège and Hainaut) pro rata current subsector density per cluster
- **Supply**
  - Use of clients from commercial scenario
  - IP : as proposed (depending on scenario and year to be simulated)
- **X2X**
  - To be aligned with Elia (electrolysers, power plants, …)
  - H2 for production of e-fuels: simple pro rata demand clusters

Simulation approach

Built up of <u>flow scenarios</u> =
all possible combinations between IN (= supply, including IPs) and OUT (= demand and transit)

Example of simulation of two clusters and three IPs:



Capacity simulation tool for H_2

4

Excel tool → Flexible scenario building

INPUT

Centralized pre-built scenarios

- Production
- Demand
- Network
- Profiles

Flexible combination of scenarios
+
Possibility of individual sensitivities

- Backbone only
- Individual clusters
- Combination

API to send Input (VBA)

SIMULATION

Automated Simone simulations

- Single simulations or pre-defined batch
- Possibility to add dynamic events

API to launch Simulation (VBA)

OUTPUT

Comprehensive output

- Visual overview
  → Backbone + Clusters
- Numerical output
  → High-level summary
  → Full-detail results

API to read Output (VBA)