TYNDP 2026 Scenario Building

Draft Scenarios Public Consultation Workshop

ENTSO-E & ENTSOG Webinar

Brussels, 4 July 2025 10:00 – 15:00 CEST

TYNDP 2026 Scenario Building

Welcome

Kacper Żeromski ENTSOG
5 minutes

Public Consultation Package, 16th of June – 14th of July, includes following documents:

Draft 2026 TYNDP Scenarios Input Data and Methodologies for Public Consultation

1. TSOs' data reflecting NECPs and national and EU policies – provided for informational purposes, including :

i. ETM Dashboards illustrating energy demand breakdowns by carrier and sector
ii. ETM Links including country and sector specific energy demand inputs
iii. SMR and pyrolysis capacities
iv. PEMMDB 2.5. illustrating electricity generation and flexibility capacities
v. Additional Data Collection supplementary supply and demand datasets

2. Draft Supply assumptions:

i. Commodity Prices
ii. H2 and ammonia import potentials
iii. Import prices for synthetic fuels
iv. Technology costs

3. Draft Market Modelling methodologies – including relevant assumptions

4. Draft Target Compliance and Gap filling methodologies

5. Draft carbon budget methodology

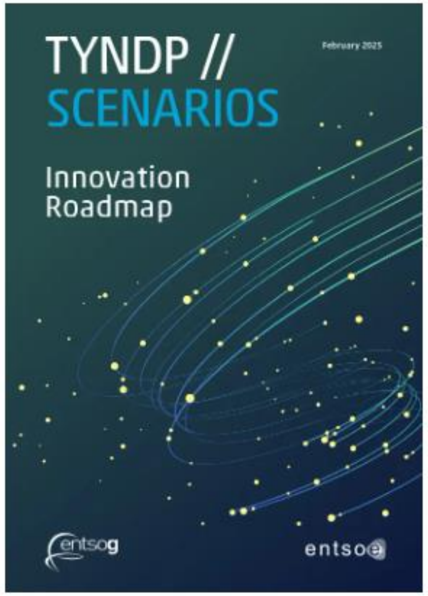
6. Draft Scenarios Grid methodology

7. Draft Scenario weather year selection methodology

8. Scenarios Innovation Roadmap

DOWNLOAD DRAFT 2026 TYNDP SCENARIOS CONSULTATION PACKAGE

TYNDP Scenarios Innovation Roadmap



TYNDP Scenarios Innovation Roadmap

A separate consultation for TYNDP 2026 Scenarios Economic Variants Development Methodology

ENTSO-E and ENTSOG invite all interested stakeholders to take part in the public consultation on the Draft 2026 TYNDP Scenarios' Economic Variants' methodology from 01st July – 29th July

Important note:

This is a separate consultation running in parallel to the ongoing public consultation on the input data and other methodologies on the Draft 2026 TYNDP Scenarios, which is open from 16 June until 14 July. ENTSOG and ENTSO-E welcome stakeholders' input on both consultations, accessible via the Consultation Hub.

TYNDP 2026 Scenario Building

Introduction

Roberto Francia, ENTSOG
5 minutes

Agenda – Morning Session

Topic	Time	Speaker TBC
Welcome Introduction - Purpose of the workshop – Agenda overview	10:35 - 10:40	Kacper Żeromski, ENTSOG, System Development Director, Steering Group Co-Convenor Roberto Francia, ENTSOG, Manager Regulatory Affairs
TYNDP 2026 Scenarios: Points of view by key stakeholders	10:40-11:10	Maciej GRZESZCZYK, The European Commission, DG ENER Stefano ASTORRI, ACER Andrzej Ceglarz, SRG co-convenor & Joni Karjalainen, SRG WG-1 lead
TYNDP 2026 Scenarios Overview Stakeholder Engagement Scenarios Framework & Targets	11:10 - 11:20	Kristy Louise Rhades, ENTSO-E, Stakeholder Engagement Specialist Nalan Buyuk, ENTSO-E, TYNDP Scenarios Project Manager
TYNDP 2026 Scenario Demand & Supply Figures • Demand figures (15’) • Supply figures (20’) *Followed by Q&A session (10’)*	11:20 - 12:05	Eduardo Hermes, ENTSO-E, WGSB Toolchain Team Lead Daniele Ceccarelli, SNAM, WGSB Toolchain Team Co-Lead Pedro Sanchez, ENTSO-E, WGSB Supply Team Co-Lead Mattia Carboni, SNAM, WGSB Deamand Team, Team Member
TYNDP 2026 Scenario Methodologies • Market modelling methodologies (20’) • Scenario grid methodology (5’) • Climate year selection methodology (5’) • Carbon budget methodology (5’) *Followed by Q&A session (10’)*	12:05 - 12:55	Dante Powell, ENTSOG, WGSB Innovation Team Lead Martin Klein, 50Hertz, WGSB Market Modelling Team Rodrigo Barbosa, ENTSO-E, Long Term Planning Manager Andriy Vovk, ENTSO-E, Planning Study Team Mads Boesen, ENTSOG, WGSB Supply Team Lead
ENNOH involvement in the scenario building process	12:55 - 13:00	Alexander Kättlitz, ENNOH
LUNCH BREAK	13:00 - 14 :00	

Agenda – Afternoon Session

Topic	Time	Speaker TBC
Introduction to Economic Variants	**14.00 – 14.05**	Aisling Wall, ENTSOG, TYNDP Scenarios Project Manager
TYNDP 2026 Scenarios Economic Variants Methodology • Presentation on high level principles, key assumptions, parameters and first outcomes *Followed by Q&A session (10')*	**14:05 – 14.35**	Nalan Buyuk, ENTSO-E, TYNDP Scenarios Project Manager Eduardo Hermes, ENTSO-E, WGSB Toolchain Team Lead Jean-Marc Debarnot, ENTSO-E, WGSB Supply & Demand Team Member Pedro Sanchez, ENTSO-E, WGSB Supply Team Co-Lead
TYNDP 2026 Scenarios Economic Variants discussion	**14:35 – 15:25**	Moderated by Bram Claeys, SRG Vice Convenor
Next steps and conclusion	**15:25 – 15.30**	Aisling Wall, ENTSOG, TYNDP Scenarios Project Manager

TYNDP 2026 Scenario Building

TYNDP 2026 Scenarios:
Points of view by key stakeholders

GRZESZCZYK Maciej, The European Commission, DG ENER
10 minutes

Setting the scene for the 2026 scenarios

Maciej Grzeszczyk, ENER C4

TYNDP 2026 Scenarios Public Workshop

European Commission

What is legally required

Article 12 of the TEN-E regulation:

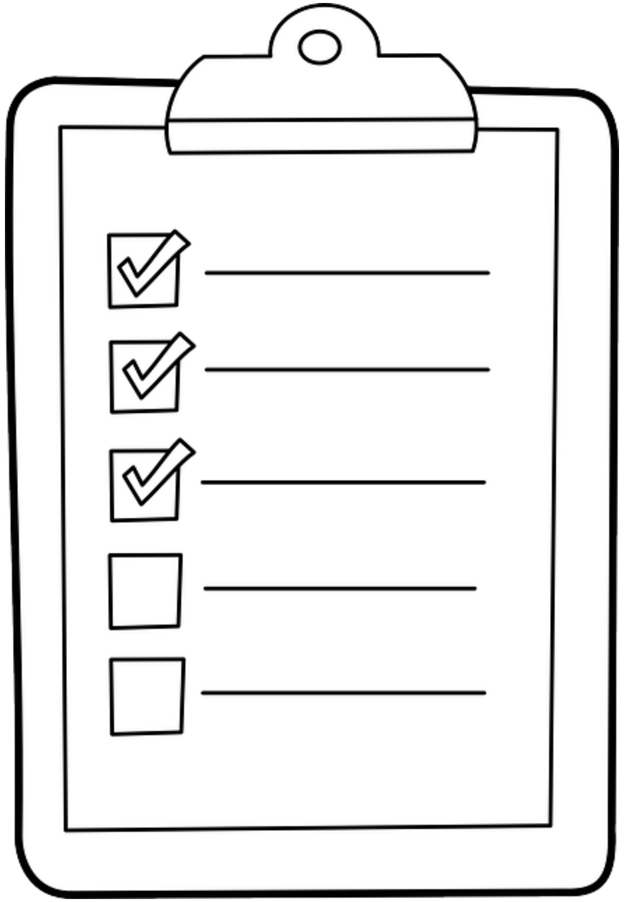
- ENTSO-E and ENTSOG develop joint scenarios that are fully aligned with the European Union’s 2030 energy and climate targets, including the energy efficiency first principle, and its 2050 climate neutrality objective.
- Requirements:
  - consider the latest available Commission scenarios and, when relevant, National Energy and Climate Plans (NECPs);
  - include a long-term perspective until 2050 and include intermediate steps as appropriate;
  - follow the ACER framework guidelines which established criteria for a transparent, non-discriminatory and robust development of scenarios;
  - involve external stakeholders to participate in the development process;
  - input and output data published in a sufficiently clear and accurate form.
- Verification:
  - Possible opinion of the European Scientific Advisory Board and Member States;
  - Opinion by ACER;
  - European Commission’s decision on approval.

What is expected

- Application of the ACER framework guidelines;
- Follow-up of the SRG recommendations;
- Reflection of the opinions including European Scientific Advisory Board on Climate Change (if provided);
- Scenarios fit for purpose:
  - NT+ to become a full-fledged central scenario;
  - Coherent variants – understandable rationale behind the parameters used in economic variants;
  - Flexibility and sensitivities to reflect the uncertainties and dynamic environment;
  - Robust analysis of 2035 and 2040 time-horizon;
  - Scenarios that could and are used in the subsequent deliverables of the TYNDP and beyond
    - clear definition of the indicators and indication of data sources;
    - proper explanation of the methodology;
    - aggregates at country level.

Specific points of the Commission's decision

- Better planned and more timely development of the scenario report;
- Streamlined data collection ensuring compliance with the NECPs and the latest national data;
- Clear and extensive explanation in the report how compliance with the framework guidelines and the requirements of the TEN-E Regulation is ensured;
- Better alignment of the indicators with the Eurostat definitions, in particular regarding the renewable energy and energy efficiency indicators;
- Clear and robust calculation of the estimated GHG emissions to ensure higher credibility of the results and targets' compliance.



Fill in copyright information.

Thank you

TYNDP 2026 Scenario Building

TYNDP 2026 Scenarios:
Points of view by key stakeholders

Stefano ASTORRI, ACER
10 minutes

ACER
European Union Agency for the Cooperation of Energy Regulators

Setting expectations for TYNDP 2026 joint scenarios

Stefano Astorri – Policy Officer, Energy System Needs

ENTSO-E & ENTSOG public hybrid workshop on 2026 TYNDP Scenarios

ACER European Union Agency for the Cooperation of Energy Regulators

What is ACER role in TYNDP scenarios?

1. ACER issues Scenario Framework Guidelines (SFGs)
2. ENTSO-E & ENTSOG develop scenarios, following ACER SFGs
3. ACER issues an Opinion on the compliance with ACER SFGs

ACER
European Union Agency for the Cooperation of Energy Regulators

ACER Scenario Framework Guidelines

- A timely scenario-preparation process
- Robust “objective-driven” scenarios
- Transparent, inclusive and streamlined development process
- A process for stakeholder scrutiny
- A quick-update process

ACER Scenario Framework Guidelines

ACER
European Union Agency for the Cooperation of Energy Regulators

Setting expectations for TYNDP 2026 scenarios

- Keep applying ACER Framework Guidelines
- Work on a timely delivery of scenarios
- Get the central scenario right
- Ensure transparency and stakeholder engagement
- Variants to be contrasted & driven by common sense

Thank you.

The contents of this document do not necessarily reflect the position or opinion of the Agency.

ACER
European Union Agency for the Cooperation of Energy Regulators

info@acer.europa.eu
acer.europa.eu
@eu_acer
linkedin.com/company/EU-ACER/

TYNDP 2026 Scenario Building

TYNDP 2026 Scenarios:
Points of view by key stakeholders

Andrzej Ceglarz, SRG co-convenor
Joni Karjalainen, SRG WG 1 lead
15 minutes

SRG

STAKEHOLDER REFERENCE GROUP

FOR THE TYNDP SCENARIOS

Andrzej Ceglarz & Joni Karjalainen

Stakeholder workshop on the draft input data and methodologies of 2026 TYNDP Scenarios cycle

4th July 2025

What is the SRG?

Stems from the ACER Scenario Guidelines (Jan '23) "to ensure key stakeholders are appropriately consulted and have the opportunity to interaction among themselves."

- Formally established in Autumn 2023, following the application process
- Co-creation of Terms of Reference (TOR)

Responsibilities

1. Timely, independent, expert input to the ENTSOs' development of scenarios
   - Scrutiny of inputs, assumptions and modelling methodologies
   - Informed and balanced view, reflecting majority and minority views
2. Co-creation of stakeholder engagement plans (published by the ENTSOs)
3. Evaluation of the scenario-development process and recommendations for improvements of the next cycle

Members and structures of SRG

SRG Members (currently 27 Members)

- EU DSO Entity
- Associations involved in the electricity market
- Associations involved in the gas market
- Heating and cooling stakeholders
- CCS and CCU stakeholders
- Independent aggregators
- Demand-response operators
- Supply-side operators
- Organisations involved in energy efficiency solutions
- Energy consumer org.
- Civil society reps
- Other organisations
- Independent experts

SRG Observers: ENTSOs, EC, ACER, ESABCC

See list: https://www.entsos-tyndp-scenarios.eu/stakeholder-involvement/

Organisational set-up

Convenors
(2 co-convenors and 2 vice co-convenors)

Working Group 1: Process overview
High-level observations, scenario storylines & modelling methodologies, innovation roadmap

Working Group 2: Demand & Transport
Residential, non-residential, industry and transport (incl. electrification)

Working Group 3: Supply & flexibility
Hydrogen, alternative fuels, power generation, flexibility, storage, commodity prices, grids

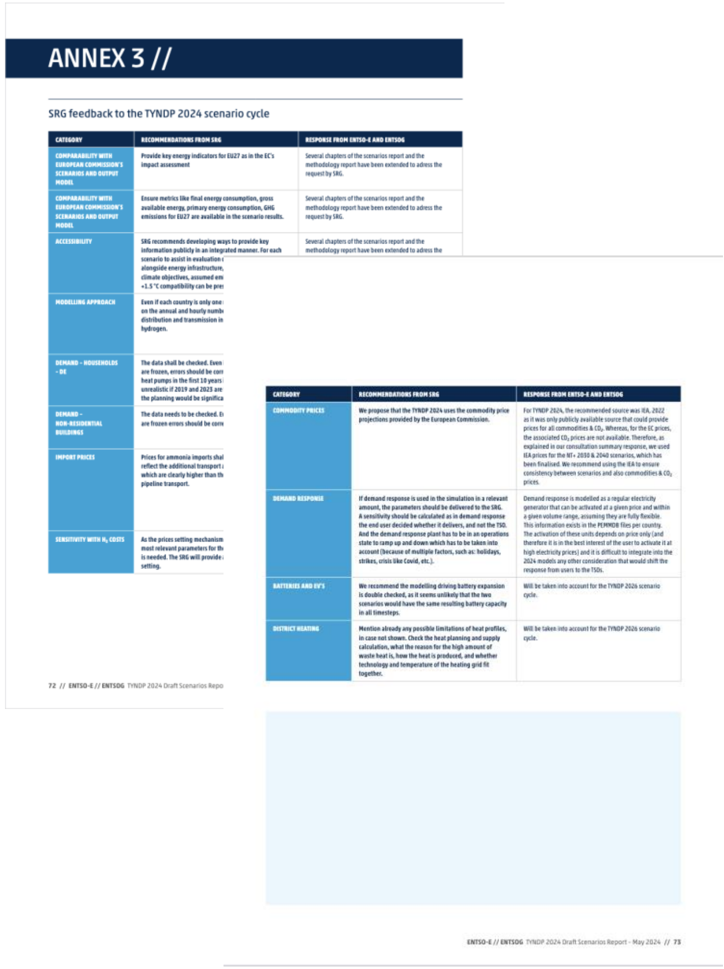
Working Group 4: Carbon
Carbon dioxide removals, GHG emissions and carbon budget

SRG's recommendations for the 2024 TYNDP draft scenarios

Feb '24: SRG delivered **36 recommendations** to the ENTSOs building on the preliminary scenario results.

Nr.	Topic	No. of recommen-dations
1	Timeline	1
2	Quality of provided files and visualisation	2-5
3	Comparability with European Commission's scenarios and output model	6-7
4	Transparency and availability of modelling assumptions and methodologies	8
5	Accessibility	9
6	Modelling approach	1-12
7	Demand	13-21
8	Hydrogen	22-26
9	Wind energy	27
10	Electricity production	28
11	Demand response	29-30
12	Batteries and EV´s	31-32
13	District heating	33-34
14	CO2 supply	35
15	PEMDB (Pan-European Modelling Database)	36

12 recommendations in regards to the 2024 results recognised in the **Scenarios Report**



SRG’s involvement in the 2026 Scenarios process

Feb 2024 — SRG publishes its **36 recommendations** on the 2024 TYNDP draft scenarios with most points relevant for the 2026 and future cycles

Spring 2024 — SRG began to work on the **2026 TYNDP** scenarios

- Weekly coordination meetings with the entire SRG
- ~ Biweekly meetings of Working Groups with compilation of summary documents
- Dedicated thematic workshops (e.g., Scenarios Framework or Innovation Roadmap)

July 2024 — Official **kick-off** of the **2026 TYNDP cycle**

Sept 2024 — SRG publishes its **recommendations** to the Stakeholder Engagement Plan

SRG Recommendations on Stakeholder Engagement

Define overall aims and objectives as well as **specific aims and objectives** per stakeholder group for **Stakeholder Engagement**

Explain and specify how collected stakeholder input will inform operative work

Specify formats of stakeholder engagement and feedback collection, and differentiate when the SRG, and when other stakeholders are involved

Include in the Innovation Roadmap, what innovations exactly were considered and included in the TYNDP 2024 cycle to look for potential synergies and follow ups

Differentiate stakeholder engagement types: informative, consultative, co-creative or joint activity

Involve the SRG to assist the ENTSOs in taking a decision on the Innovation Roadmap

Encourage a diversity of views to be collected at Public Workshops and at other key moments of the scenario cycle

Agree on a cut-off date to the TYNDP 2026 scenario-building aimed at the inclusion of different policies (NECPs, 2040 climate target etc.), datasets etc. in the cycle

Further SRG input on 2026 TYNDP so far (1)

Working Group 1: Process overview

- ENTSOs presented different options on how to deal with the economic variants, with subsequent discussions with the SRG (started May 2024)
- SRG input to the Innovation Roadmap
- Ongoing development of the SRG opinion on the economic variants, the Gap Filling Methodology and the Innovation Roadmap (forthcoming)

Working Group 2: Demand & Transport

- Workshop on EV modelling, with recommendations for improvement (May 2024)
- Workshop on ETM, with suggested data updates and changes (H2 2024)
- Workshop on modelling of demand from heat-pumps, including heating technology shares, COP calculations and load profiles for the demand forecasting tool (Feb 2025)
- Benchmarking demand projections in the TYNDP scenarios (ongoing)

Further SRG input on 2026 TYNDP so far (2)

Working Group 3: Supply

- Recommendation on the commodity prices for the TYNDP 2026 to be based on the European Commission (EC WAM) prices, as opposed to those from the IEA (IEA APS)
- Suggestions to improve the consultation materials about H2 regarding price formation, import versus domestic production and allocation across end-use sectors.
- Discussions on flexibility of heat pumps (ongoing)

Working Group 4: Carbon management

- Discussions on carbon budget methodology for 2026 scenarios (ongoing)

Summary

Since its establishment, SRG became a proven entity within the TYNDP process, capable of fulfilling its responsibilities and tasks

Intense, fruitful and constructive collaboration with ENTSOs and with the organisations, that the SRG's mandate comes from (ACER & EC)

Outputs of the SRG's work improving the TYNDP scenarios process

The SRG functioning confirms the importance of participatory approaches within the TYNDP process

Outlook: observations and insights

Acknowledgment of stakeholder engagement (incl. SRG and ESABCC) and increasing transparency, but still room for improvement (e.g., timeline, cut off date, adoption of recommendations)

Stakeholder scrutiny (incl. SRG and ESABCC) & inputs improving the quality of the process, what leads to increasing mutual trust, accountability and compliance

Recognition of responsiveness & the efforts to improve efficiency (e.g., participation of the WGSB in SRG meetings), but shortcoming related to the timing and delays

A need to discuss the embeddedness and adaptability of the TYNDP scenario process in view of ongoing developments (e.g., climate change or geopolitical tensions on one hand & policy developments, such as European Grids Package on the other)

SRG

STAKEHOLDER REFERENCE GROUP

Thank you!

TYNDP 2026 Scenario Building

Stakeholder Engagement

Kristy Louise Rhades, ENTSO-E, Stakeholder Engagement Specialist
5 minutes

The TYNDP 2026 Scenarios in 2025

Targeted stakeholder reach-out

ACER, European Commission, Stakeholder Reference Group, European Scientific Advisory Board on Climate Change.

SRG commitment

Weekly meetings, 10+ workshops, workshop on economic variants, data discussions.

Public consultation process

16 June – 14 July: Draft Scenarios data & methodologies.
1 – 29 July: Draft economic variants.

Complementary workshops

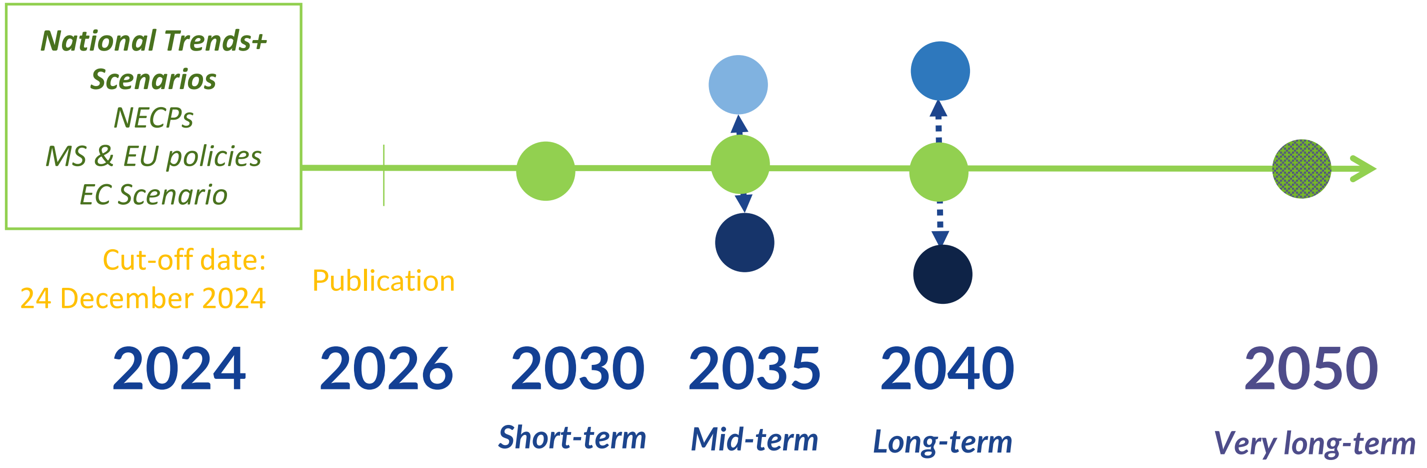
6 March: TYNDP 2026 Scenarios update webinar.
23 June: SRG workshop on economic variants.
4 July: Public workshop draft Scenarios data, methodologies, economic variants.

TYNDP 2026 Scenario Building

Scenarios Framework & Targets

Nalan Buyuk, ENTSO-E, TYNDP Scenarios Project Manager
10 minutes

TYNDP 2026 Scenarios Framework



Higher economic growth

- ✓ *Higher GDP (higher than NECPs)*
- ✓ *Higher sectorial activity*
- ✓ *More purchasing appetite / more willingness to spend*
- ✓ *More focus on innovation & risky investments*
- ✓ *More focus on sustainability, long-term view for investment/purchasing decision*

Central scenario (National Trends+) reflecting latest updated NECPs, national and EU policies

Lower economic growth

- ✓ *Lower GDP (lower than NECPs, close to 0 growth)*
- ✓ *Moderate/less sectorial activity*
- ✓ *Moderate/Less purchasing / spending possibilities*
- ✓ *Less focus on innovation & more business as usual*
- ✓ *More focus on cost and affordability, short-term view for investment/purchasing decision*

Economy variants scenarios

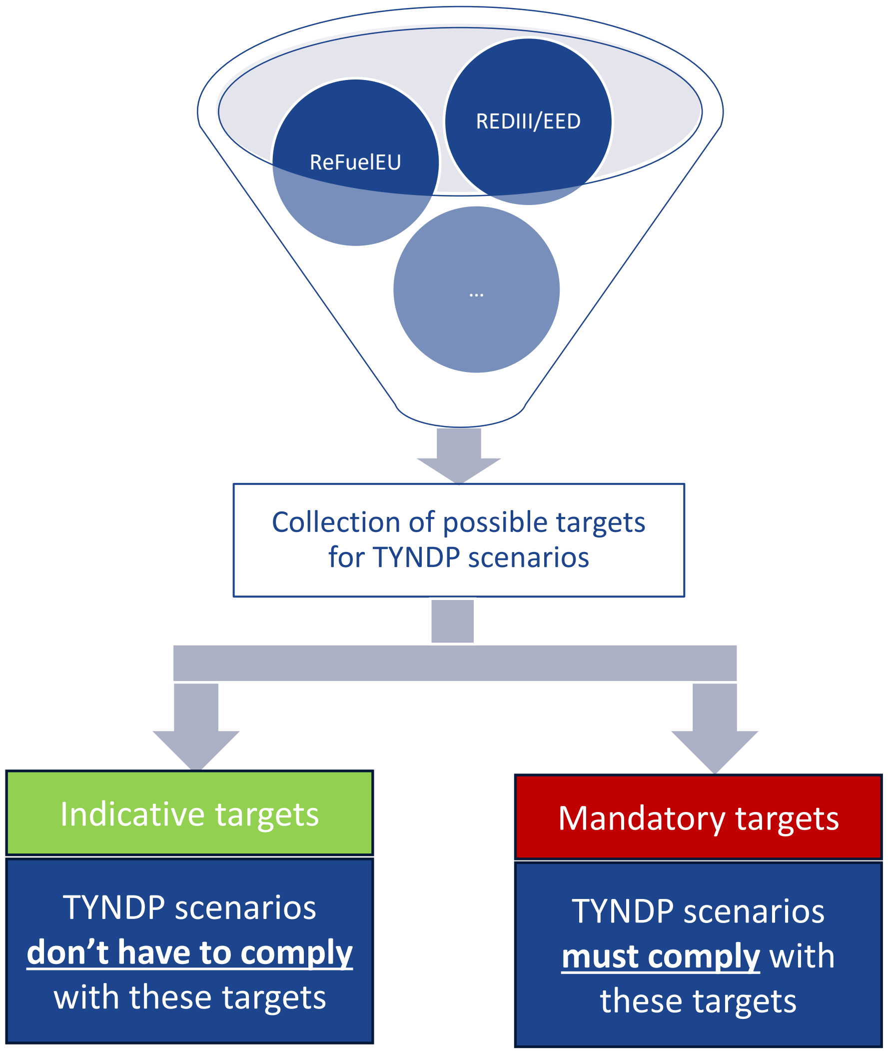
- ✓ *Not a stand-alone product → stress test of central scenario*
- ✓ *Deviates from the NT+ scenario in a balanced way*

Targets checking strategy for TYNDP 2026 scenarios

- TEN-E requires all scenarios to be aligned* with:
  - the energy efficiency first principle
  - with the Union's 2030 targets for energy and climate objective and
  - its 2050 climate neutrality objective
  - And shall e.g., be the latest available Commission scenarios, as well as, when relevant, the NECPs
- According to the ACER guideline, Scenario Report should justify how scenarios are aligned with targets.
- Upon ACER and Scientific Board opinions, the EC will confirm scenarios or request for amend.
- There are no specific targets for 2035 and 2040*. For 2050 only a climate neutrality target check. Therefore, targets justification has to be performed only on NT+2030 and NT+ e.g., horizon (climate neutrality)
- Condition for 2035 and 2040 scenario: no overshoot of 2030 targets (e.g., regarding energy efficiency principle)

** The cut-off date for policy updates was 24th December 2024.*

TYNDP 2026 Scenarios - targets



Mandatory targets for TYNDP 2026 scenarios

GHG reduction targets

- **55% GHG reduction in 2030 compared to 1990 levels** (Source)
- **2050 carbon neutrality** (Source)

Renewable energy target

- **EU-level target of 42,5% of energy from renewable sources in the overall energy mix by 2030** (Source)

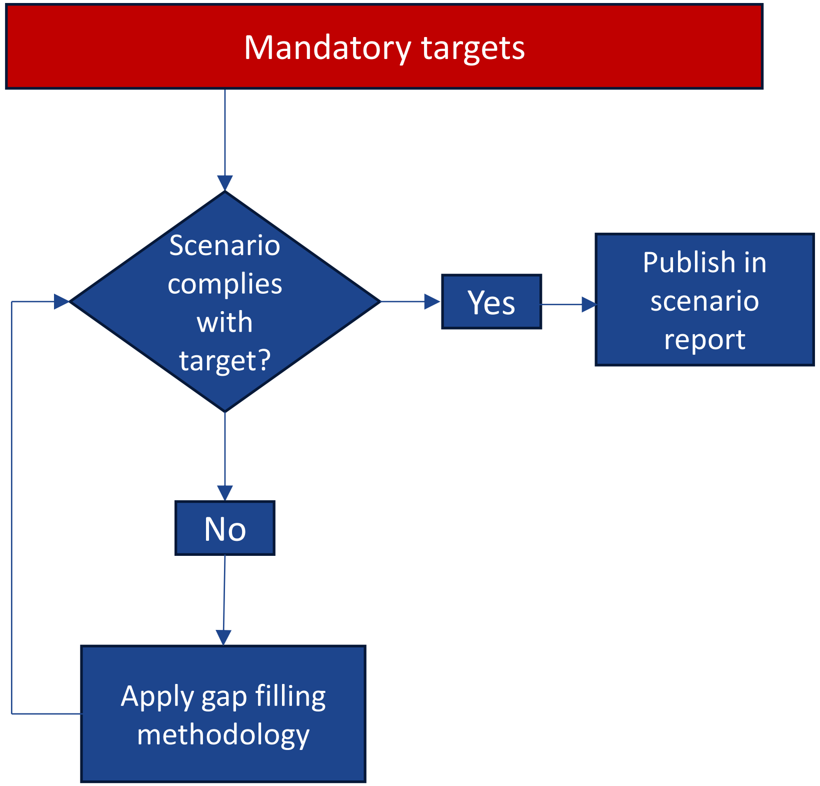
Energy consumption targets

- **EU final energy max = 763 Mtoe** (source)
- **EU primary energy max = 992,5 Mtoe** (source)

Non-binding offshore targets of the Member states

- **Lower ranges are considered as minimum capacities** (source)

Target checking process



Energy consumption targets

→ Reduction of final energy demand, TYNDP 2024 scenario methodology (*please see Annex-2* LINK)

Renewable energy target → Gap filling methodology for energy consumption targets will also ensure gap filling for this target

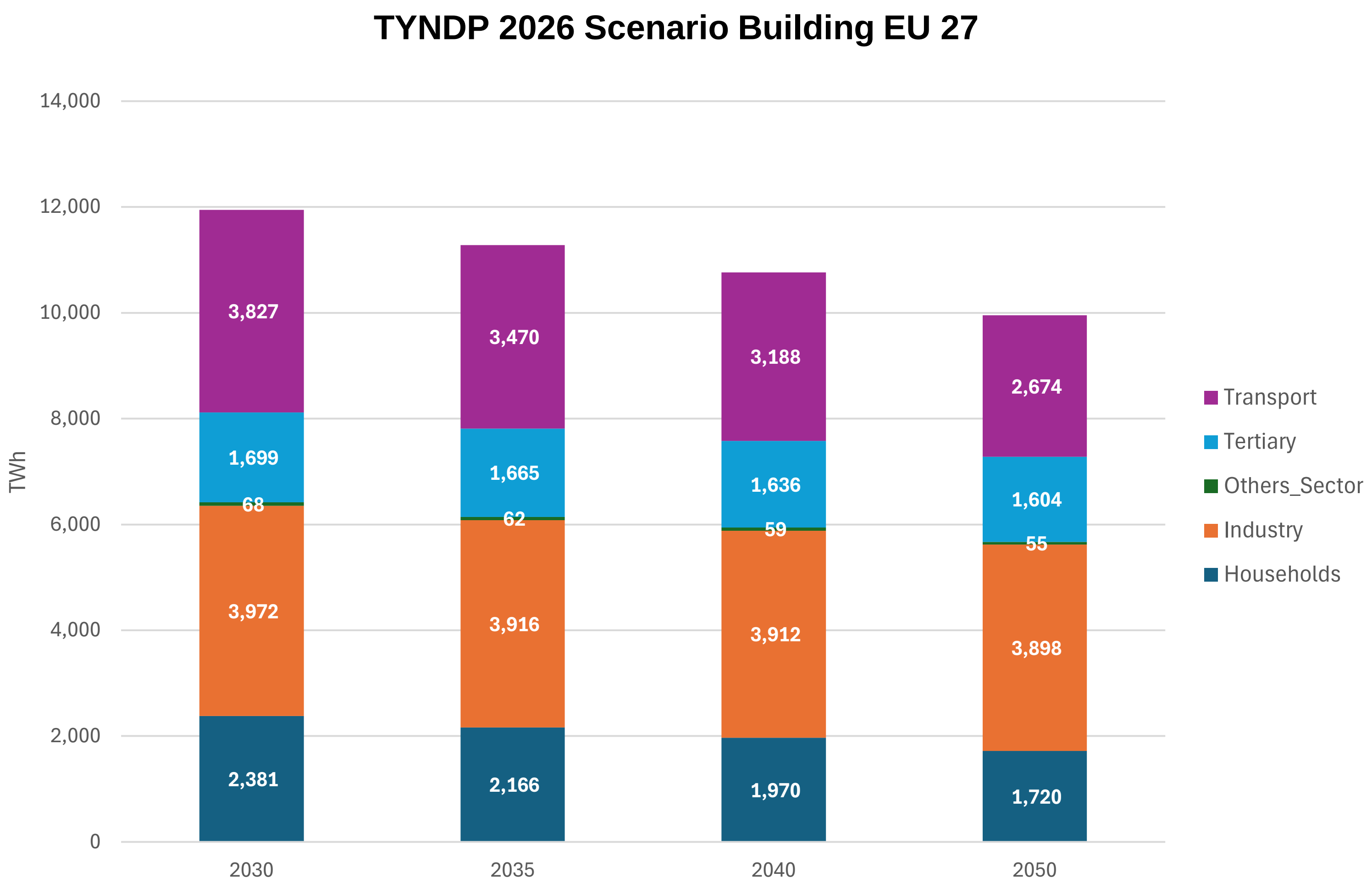
GHG reduction targets → Adaption of the carbon budget methodology (*please see 'Draft Carbon budget - TYNDP 2026 Scenarios.xlsx'*)

TYNDP 2026 Scenario Building

Demand

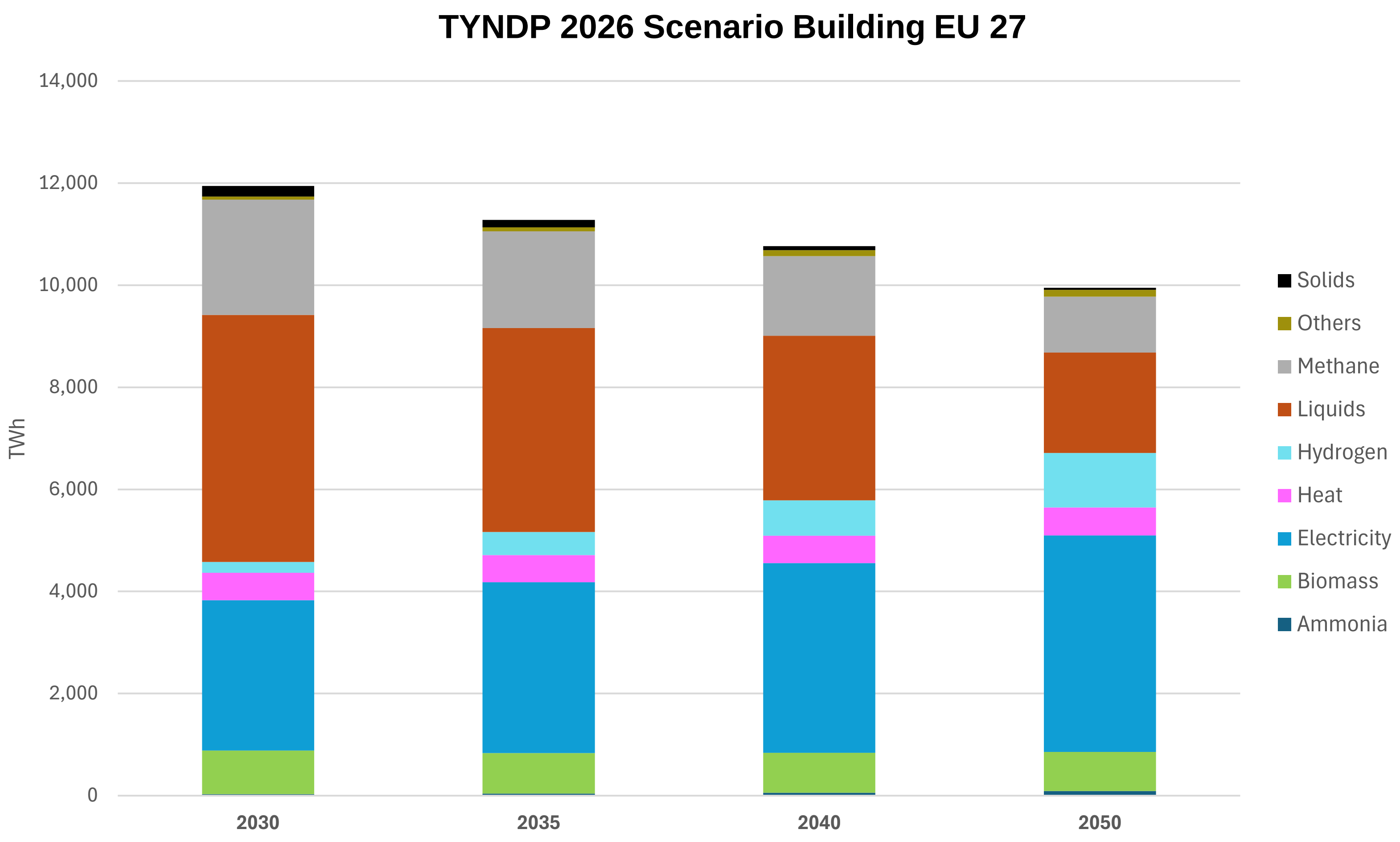
Eduardo Hermes, ENTSO-E, Multi-Energy Scenario Building Specialist, WGSB Toolchain Team Lead
Daniele Ceccarelli, SNAM, WGSB Toolchain Team Co-Lead
15 minutes

Final Energy Demand
per sector



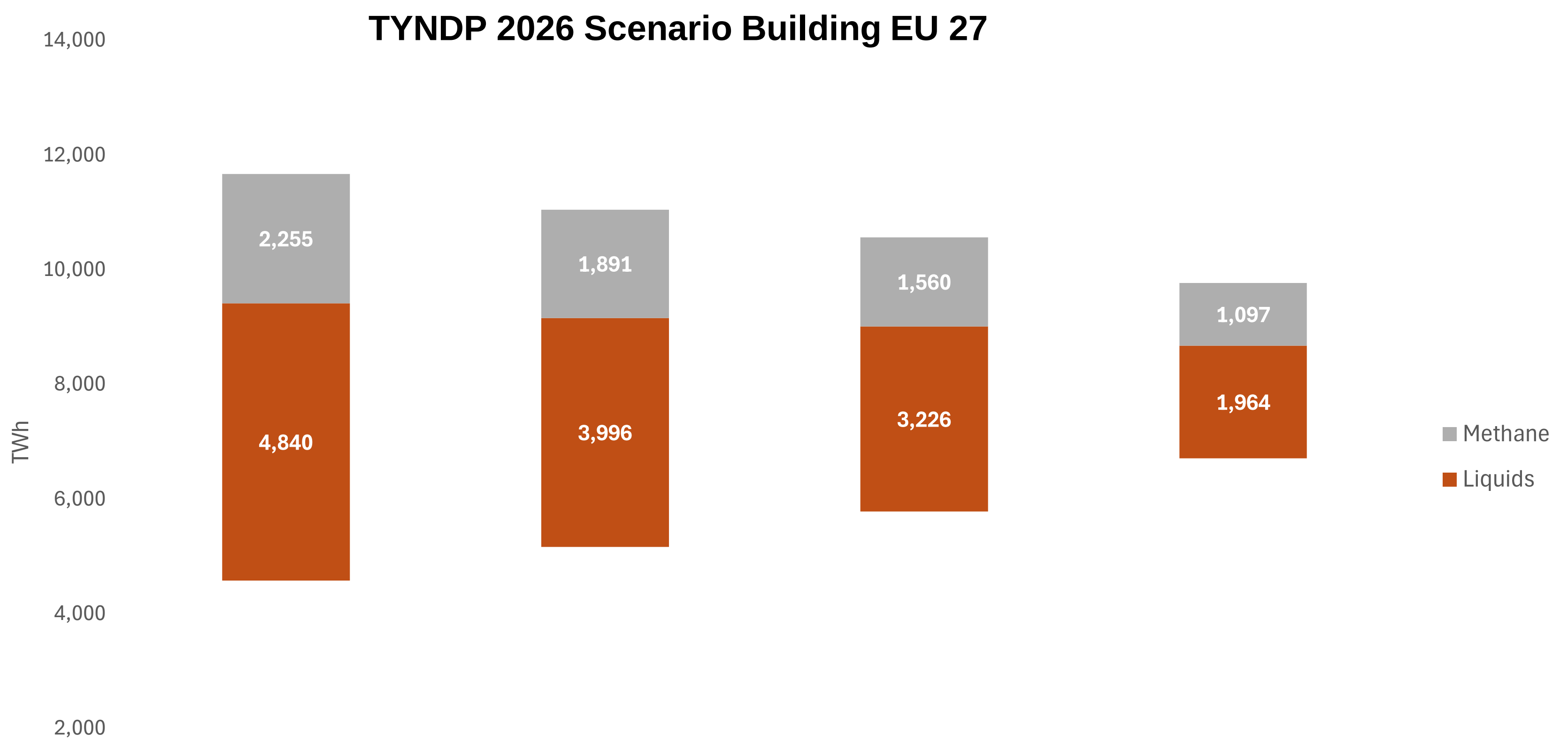
** Tertiary sector encompass Agriculture, Buildings and Datacenters.*
*** Final energy demand includes energy supplied to industry, transport (incl. international aviation), households, services, agriculture & forestry, other end-users, international shipping, non-energy use and excludes energy branch and ambient heat.*

Final Energy Demand
per carrier



** Others carrier includes solar thermal and geothermal energy.*
*** Liquids and methane encompass fossil, synthetic and bio shares.*
**** Heat represents district heating*
***** Final energy demand includes energy supplied to industry, transport (incl. international aviation), households, services, agriculture & forestry, other end-users, international shipping, non-energy use and excludes energy branch and ambient heat.*

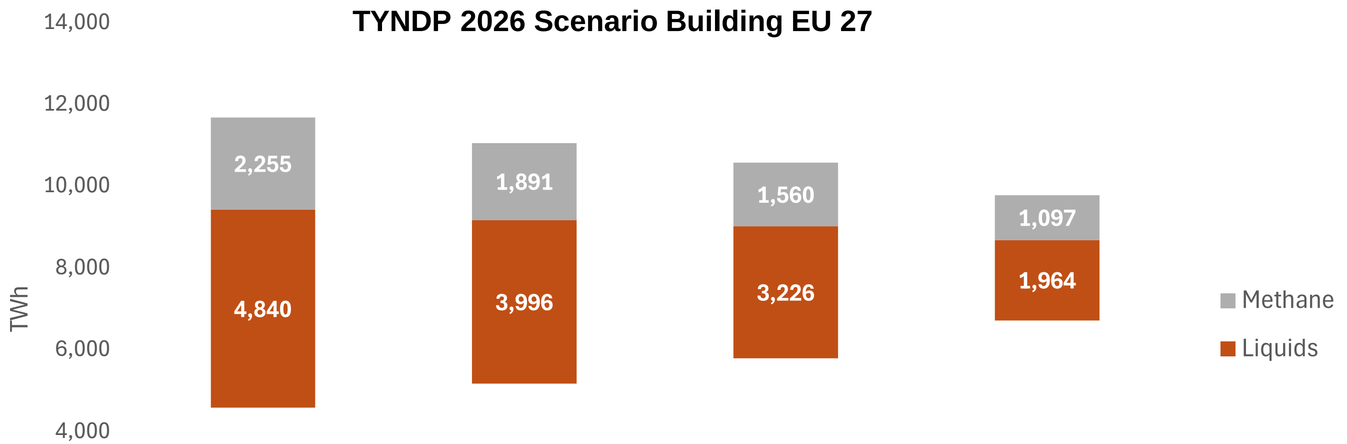
Final Energy Demand
per carrier

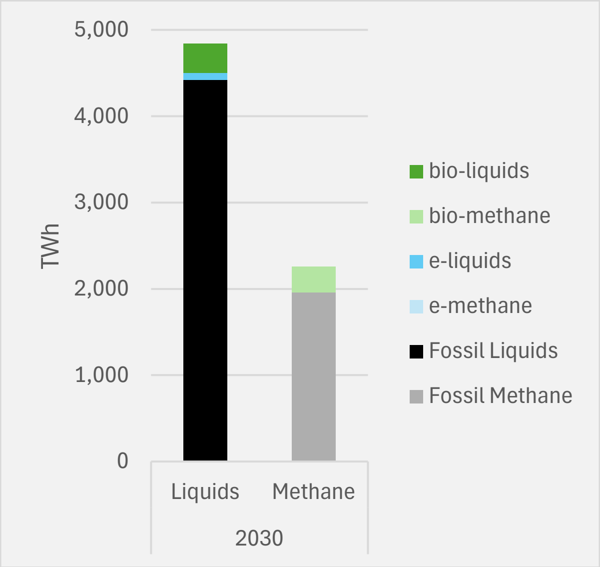


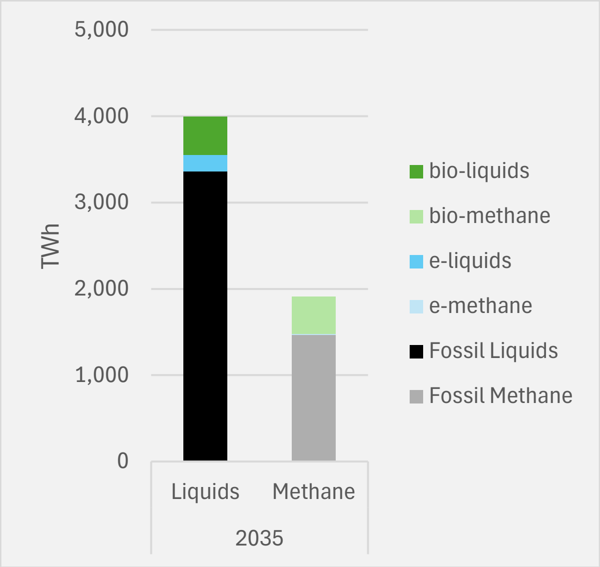
Liquids and methane:

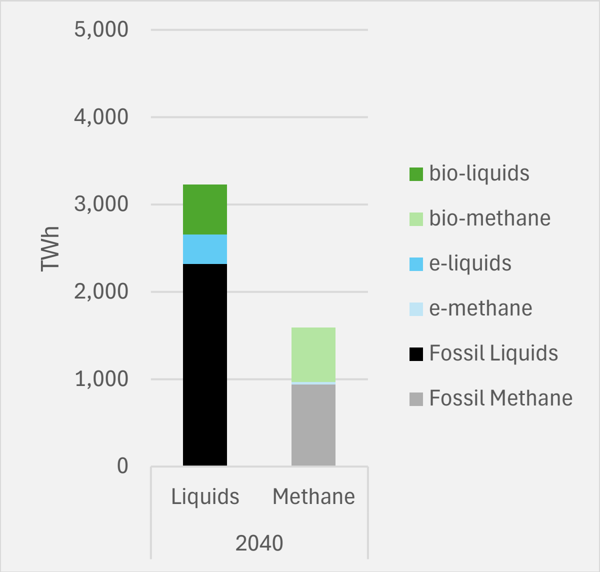
bioliquid/biogas demand + e-liquid/e-methane demand + fossil liquid/fossil gas demand

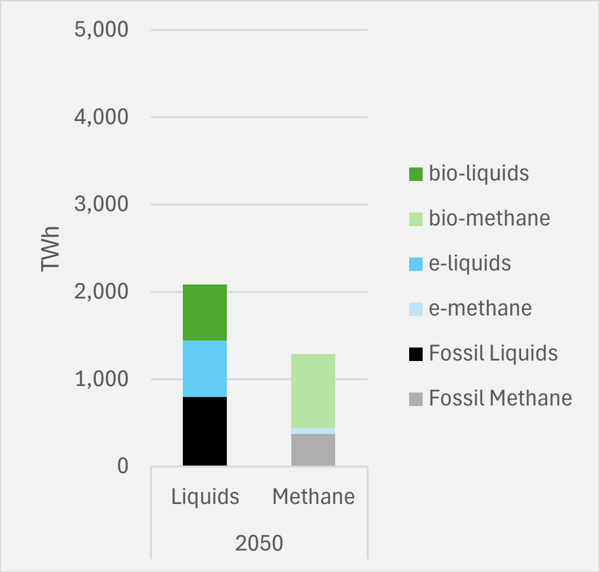
Final Energy Demand
per carrier





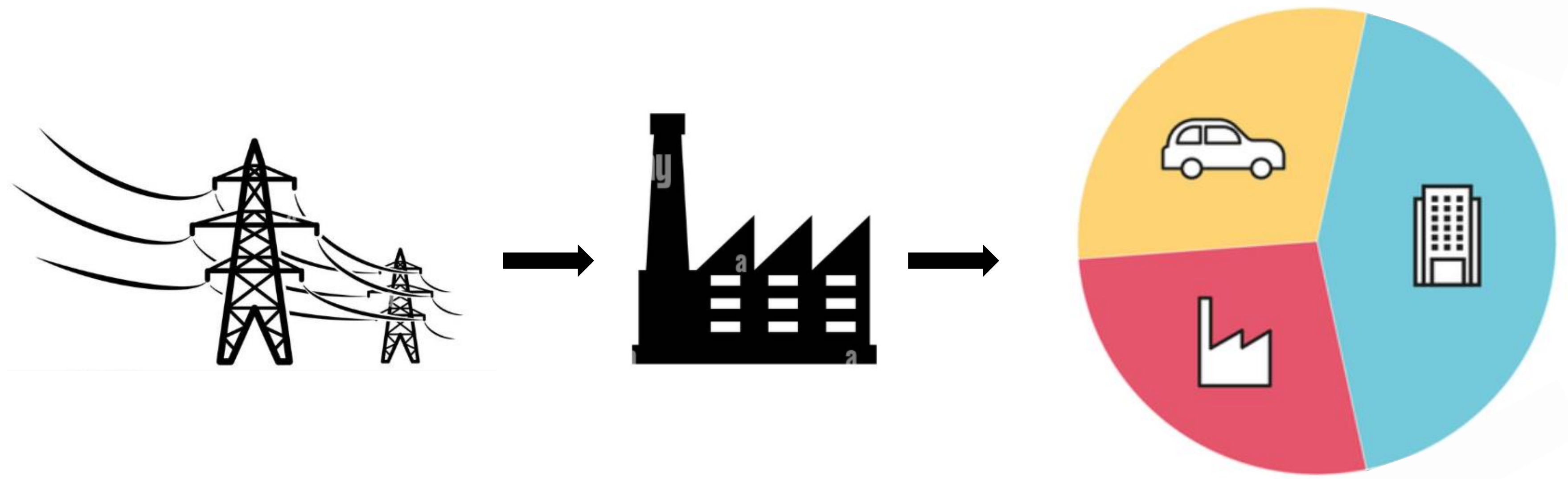






** Gap filling methodology has not been applied to the displayed figures*

Final Energy Consumption
_targets definition



Energy production

Transformation & losses

Final consumption

Includes:

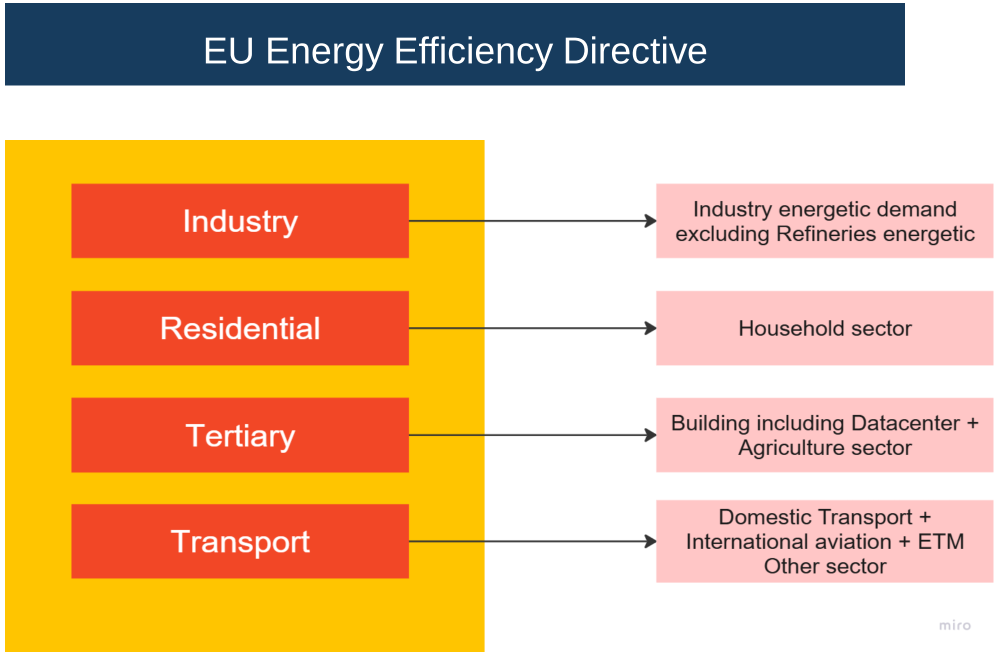
- Industry
- International aviation
- Households, public and private services
- Agriculture & forestry

Excludes:

- International shipping
- Energy sector
- Losses
- Non-energetic use
- Transformation sector

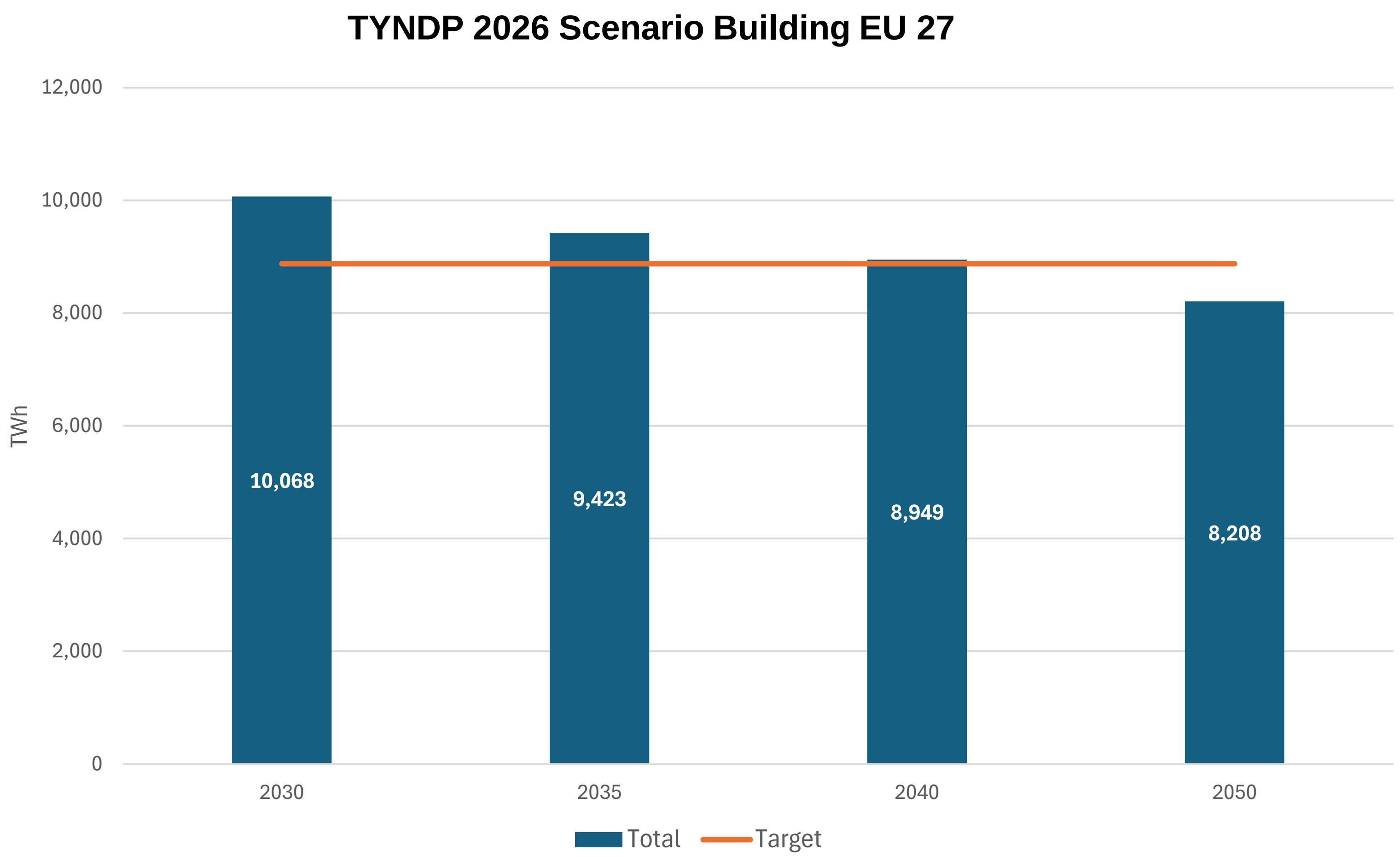
**Definitions in Annex A of Regulation (EC) No 1099/2008*

Final Energy Consumption _*targets definition*



**Definitions in Annex A of Regulation (EC) No 1099/2008*

Final Energy Consumption _*overall*



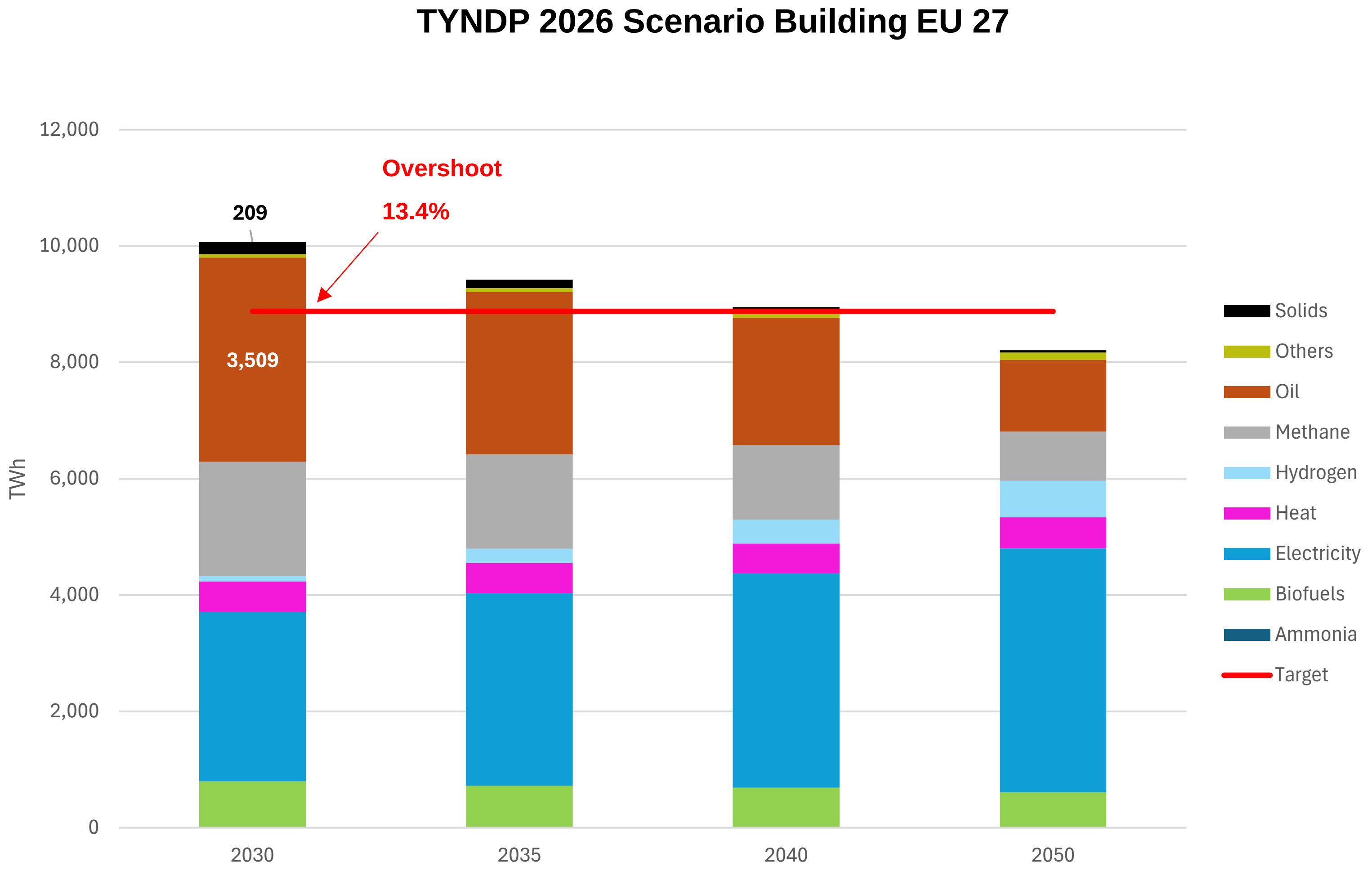
**FEC = all energy supplied to industry, transport (incl. international aviation), households, services, agriculture & forestry and other end-users. Excludes international shipping, ambient heat, non-energy use and energy branch.*

Final Energy Consumption _*by carrier*

NECP-based data was collected from electricity and gas TSOs and spanned a variety of economic sectors and energy carriers.

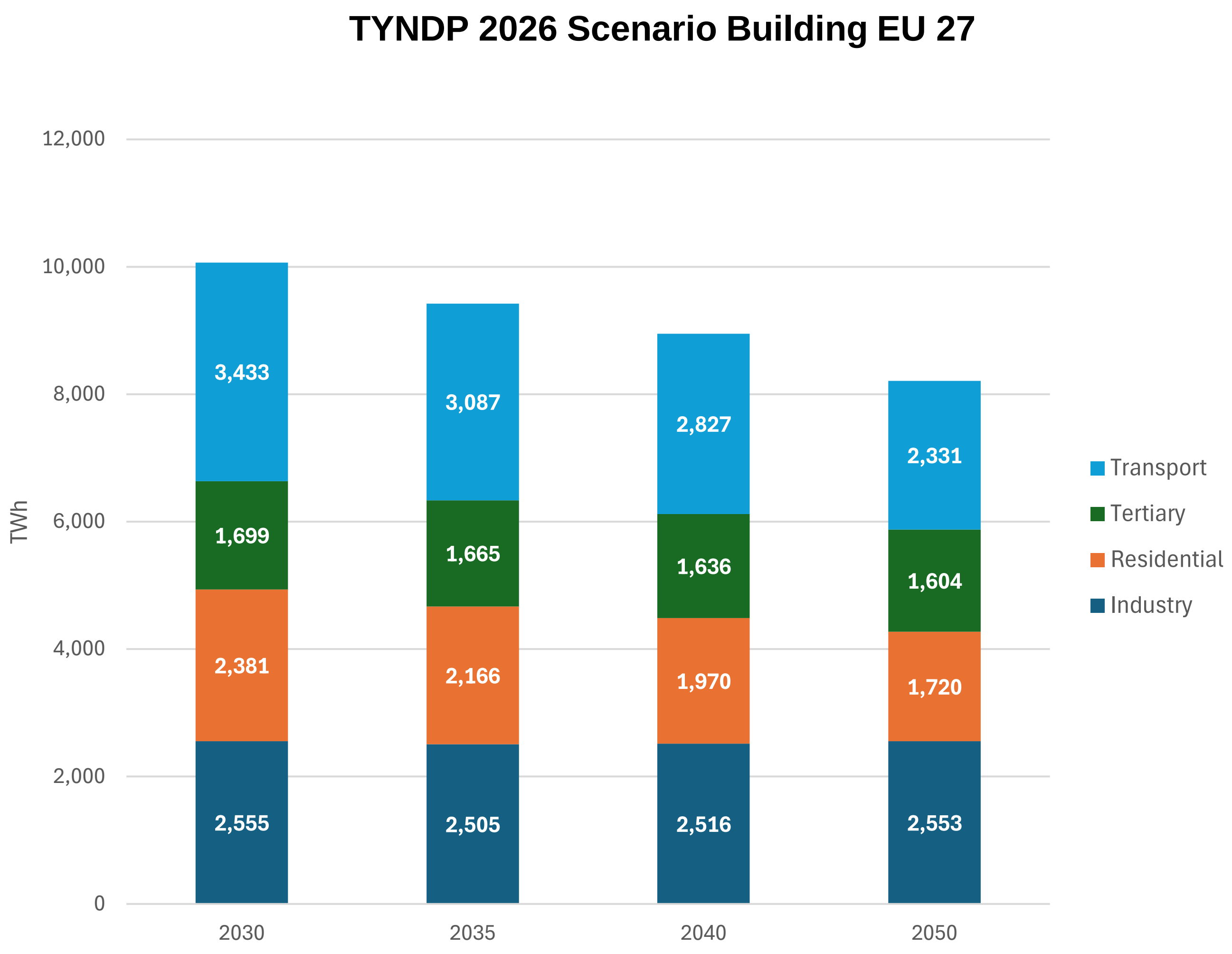
Results of the joint collection reflects an overall overshoot of ~13%.

In this context, a gap closing methodology is developed to further reduce the demand for highly-polluting fuels (solids, crude oil) proportional to the country- and fuel-specific numbers. This methodology is shared within the consultation package.



** Others carrier includes solar thermal and geothermal energy.*
*** Liquids and methane encompass fossil, synthetic and bio shares.*
**** Heat represents district heating*
*****FEC = all energy supplied to industry, transport (incl. international aviation), households, services, agriculture & forestry and other end-users. Excludes international shipping, ambient heat, non-energy use and energy branch.*

Final Energy Consumption
_by sector



** Tertiary sector encompass Agriculture, Buildings and Datacenters.*
***FEC = all energy supplied to industry, transport (incl. international aviation), households, services, agriculture & forestry and other end-users. Excludes international shipping, ambient heat, non-energy use and energy branch.*

TYNDP 2026 Scenario Building

Supply

Pedro Sanchez, ENTSO-E, WGSB Supply Team Co-Lead
Mads Boesen, ENTSOG, WGSB Supply Team Lead
Mattia Carboni, SNAM, WGSB Innovation Team Member
15 minutes

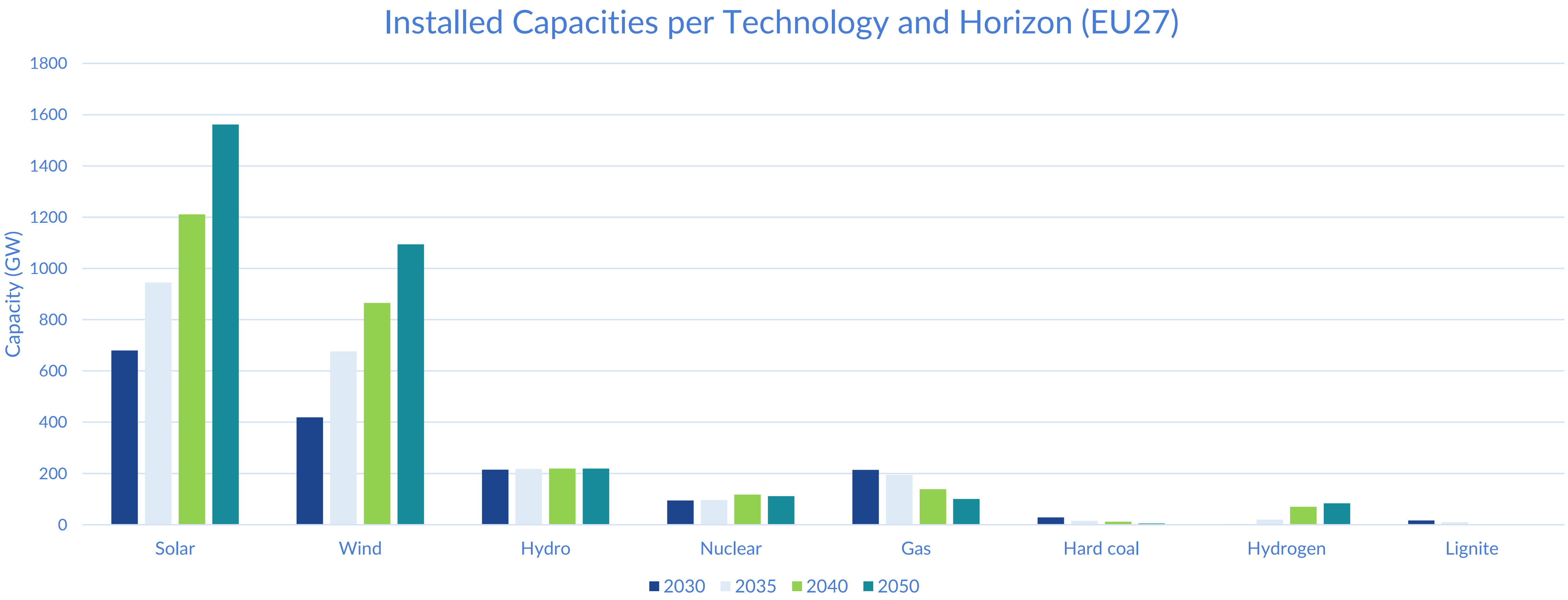
TYNDP 2026 Draft Commodity Prices

Fuel	Unit	2030	2040	2050	Source
Nuclear	€/GJ	**0.6**	**0.6**	**0.6**	EIA (2023) - https://www.eia.gov/electricity/annual/html/epa_08_04.html
Lignite G1	€/GJ	**1.9**	**1.9**	**1.9**	Booze&co
Lignite G2	€/GJ	**2.4**	**2.4**	**2.4**	Booze&co
Lignite G3	€/GJ	**3.1**	**3.1**	**3.1**	Booze&co
Lignite G4	€/GJ	**4.1**	**4.1**	**4.1**	Booze&co
Hard coal	€/GJ	**4.1**	**3.9**	**4.1**	EC- Recommended parameters for reporting on GHG projections in 2025
Natural Gas	€/GJ	**9.2**	**10.4**	**9.8**	EC- Recommended parameters for reporting on GHG projections in 2025
Crude oil	€/GJ	**14.3**	**16.2**	**20.2**	EC- Recommended parameters for reporting on GHG projections in 2025
CO2 price	€/ton	**97.5**	**297.5**	**502.7**	EC- Recommended parameters for reporting on GHG projections in 2025
Biomethane	€/Gj	**13.9**	**14.1**	**13.9**	Calculation based on Danish Technology cataloque
Synthetic Methane	€/Gj	**32.8**	**29.8**	**28.0**	IEA 2022 (APS) - renewable electricity, 70%, 55% and 50% of biogenic CO2.
Light oil	€/GJ	**18.3**	**20.7**	**25.9**	Moddeled from crude oil price (+28%)
Heavy oil	€/GJ	**15.0**	**17.0**	**21.2**	Moddeled from crude oil price (+5%)
Oil shale	€/GJ	**2.3**	**3.3**	**4.8**	Value from last cycle - no updates from TSOs available
Blended gas price	€/Gj	**9.62**	**11.47**	**13.31**	Blend of a forecasted mix of methane, biomethane and synthetic methane

SRG feedback used (Hard coal, Natural Gas, Crude oil, CO2 price)

The commodity prices are sourced from different sources. The sources are given in the table. All prices are converted to 2024 prices by using the EC Harmonised Index of Consumer Prices (HICP) A few of the prices have been calculated: Biomethane, Heavy oil, Light oil and Blended gas price

TYNDP 2026 electricity generation capacities

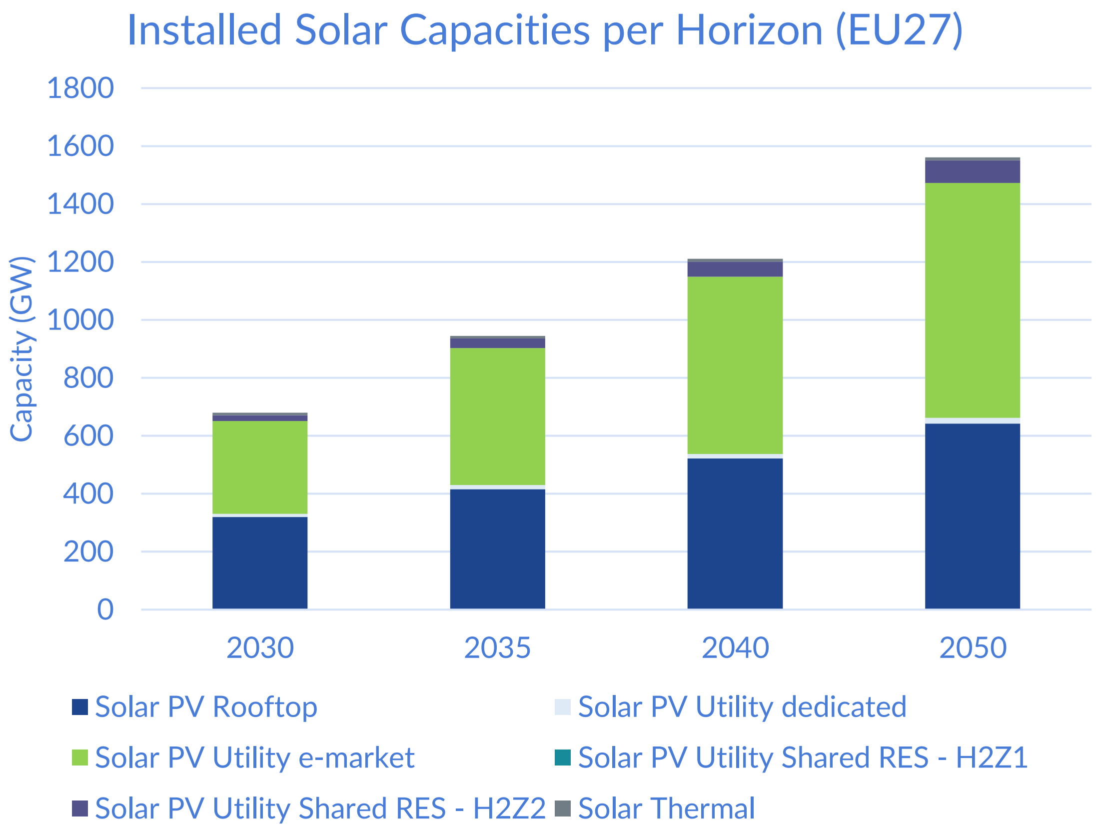


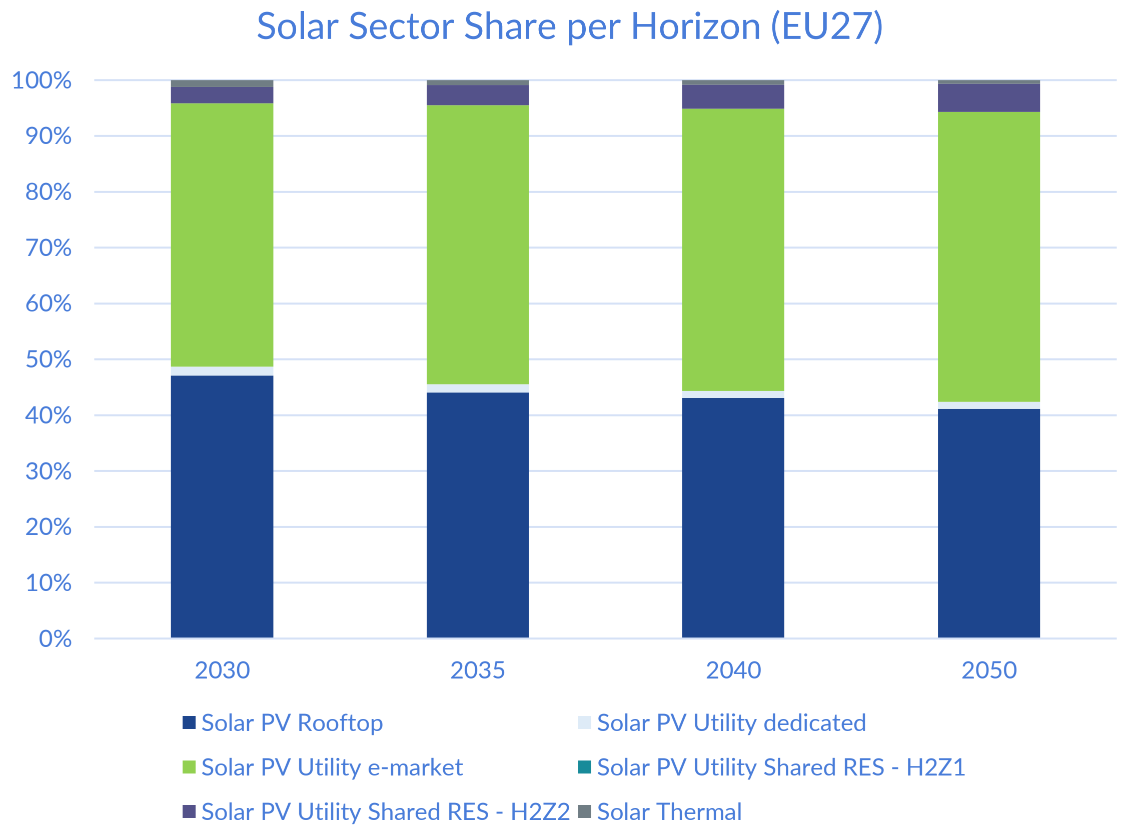
* Solar and Wind technologies are aggregated and include e-market, DRES and SRES.

** Gas is a mix of renewable gas, fossil gas and CCS. ** Data Source: joint electricity and gas TSO data collection (reflects latest NECP, national strategy cut-off date 24-12-2024)

*** Hard coal and Lignite power plants are subject to repurposing and therefore a significant share of these power plants is powered by biofuel.

TYNDP 2026 Electricity generation capacities – Solar





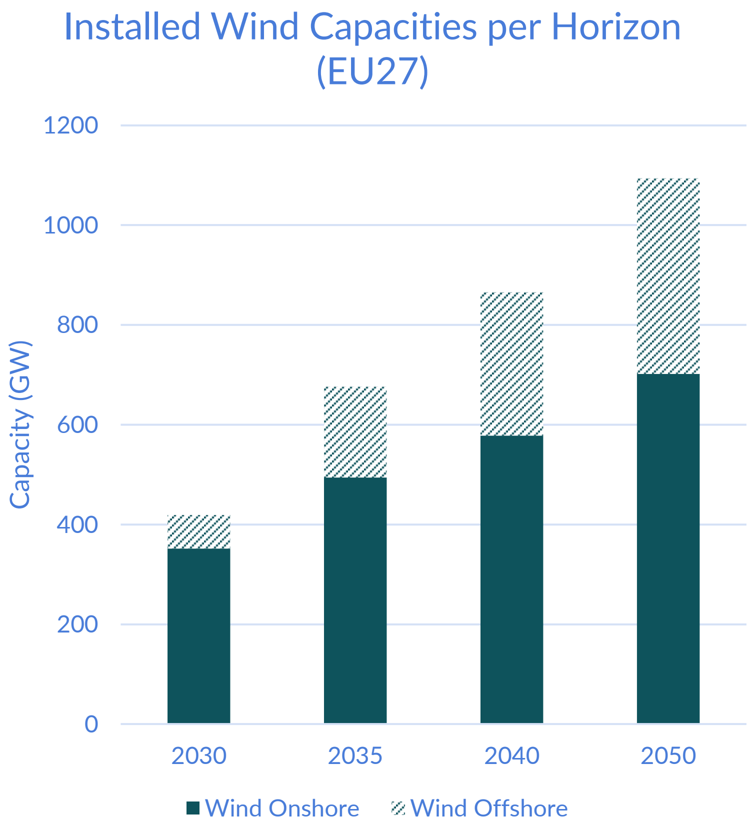
Dedicated – These are renewables physically co-located with electrolysers, either through ownership or contractual agreement, and are categorized as dedicated even without a formal PPA.

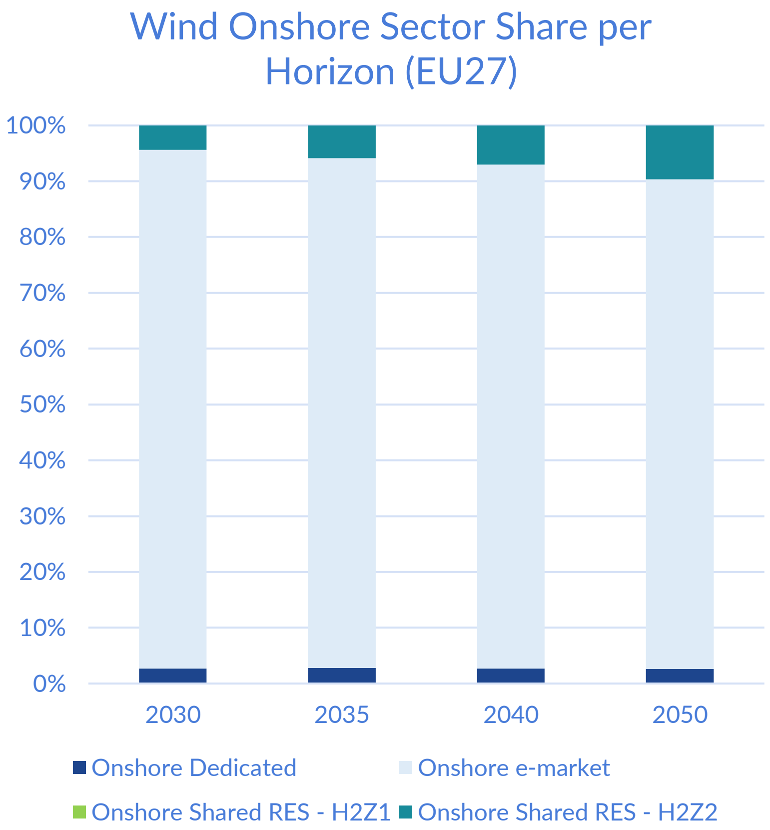
Shared – These are renewable energy sources contractually committed to supply energy to electrolysers without a physical link, requiring electrolysers to prioritize their use and allowing surplus to be sold to the electricity market.

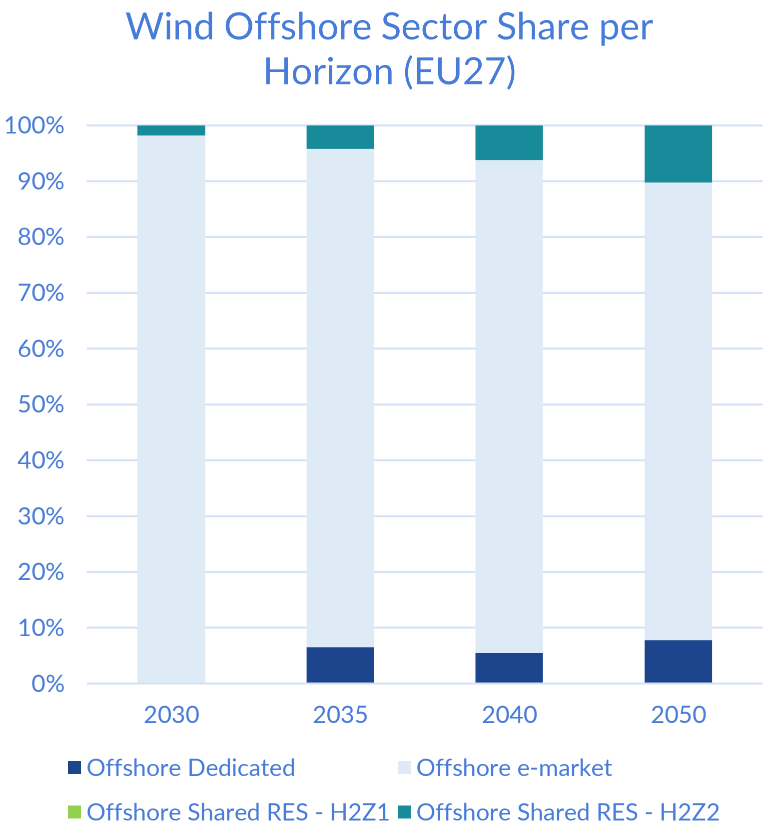
Hydrogen zones – Zone 1 connected to a local H2 grid. Zone 2 connected to the H2 backbone (commercial zone)..

** Data Source: joint electricity and gas TSO data collection (reflects latest NECP, national strategy cut-off date 24-12-2024)

TYNDP 2026 Electricity generation capacities – Wind







Dedicated – These are renewables physically co-located with electrolysers, either through ownership or contractual agreement, and are categorized as dedicated even without a formal PPA.

Shared – These are renewable energy sources contractually committed to supply energy to electrolysers without a physical link, requiring electrolysers to prioritize their use and allowing surplus to be sold to the electricity market.

Hydrogen zones – Zone 1 connected to a local H2 grid. Zone 2 connected to the H2 backbone (commercial zone)..

** Data Source: joint electricity and gas TSO data collection (reflects latest NECP, national strategy cut-off date 24-12-2024)

TYNDP 2026 Offshore Figures vs MS Non-Binding Offshore Targets

Country Code (GW)	TYNDP 2026 Values			MS Non-Binding Agreement (lower band)		
	2030	2040	2050	2030	2040	2050
BE	2,3	8,0	8,0	6,0	8,0	8,0
BG	0,5	2,3	3,8	0,5	1,9	2,9
CY	0,0	0,0	0,1	0,0	0,0	0,1
DE	24,4*	74,0	71,9	30,0	60,0	70,0
DK	4,2	33,3	44,2	4,2**	33,1	42,2
EE	0,0	1,5	2,5	1,0	2,0	7,0
ES	2,8	2,8	2,8	1,0	1,0	1,0
FI	0,0	5,0	12,0	1,0	5,0	12,0
FR	3,0	25,5	45,5	3,6	26,0	46,0
GR	1,9	5,8	11,8	1,9	5,8	11,8
HR	0,0	1,2	3,2	0,5	1,2	3,0
IE	6,0	20,0	37,0	5,2	20,0	37,0
IT	2,1	13,6	15,0	2,1	8,5	8,5
LT	0,0	2,8	4,5	1,4	2,8	4,5
LV	0,0	2,0	5,0	0,4	2,0	5,0
MT	0,0	0,3	0,3	0,1	0,4	0,4
NL	12,2	44,6	66,6	12,0	50,0	70,0
PL	5,9	20,9	26,8	5,9	17,9	17,9
PT	1,8	9,6	9,6	2,0	10,0	10,0
RO	0,0	3,0	4,2	0,0	3,0	3,0
SE	0,5	3,9	8,3	-	-	-
Total	**67,5**	**280,1**	**383,2**	**78,7**	**258,6**	**360,3**

TYNDP 2026 values aligns with the non-binding offshore targets except ~11.2 GW shortfall in 2030.

*The delay in Germany acknowledged in the NSOG corridor NBA's footnote:

- Germany's total deployment goal for 2030 as established in the German Offshore Act is 30 GW, including both the Baltic and the North Sea. However, expansion may fall short of the target by approximately 1 year due to project lead times and grid delays. That is also the reason why the capacities provided for Germany in 2030 are lower (24.4 GW).

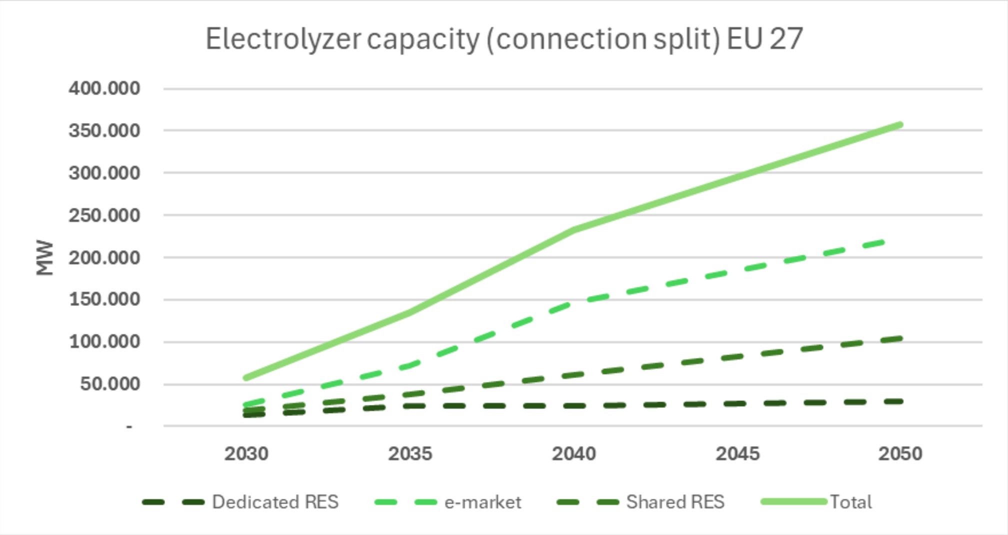
** DK target adjusted to align with the interpretation of the target year capacities as ultimo (13.1 is lower limit for 2031)

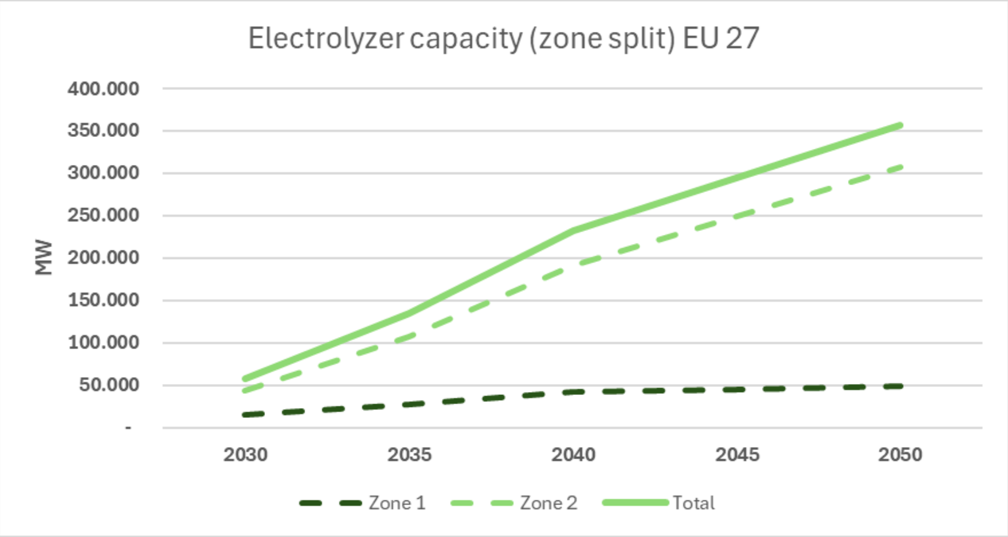
Data Source: electricity TSOs data collection (cut-off date 24-12-2024)

TYNDP 2026 Electrolyzer Capacities

- **Connection:**
  - **E-market connected**: Electrolyzers connected directly to the electricity market
  - **Dedicated RES**: Electrolyser connected directly to a renewable energy source – Electrolyser is the only off taker of the electricity
  - **Shared RES**: Electrolyser connected directly to a RES source but with the possibility to sell the electricity to the market
- **Zone:**
  - **Zone 1**: Connected to a local h2 grid
  - **Zone 2**: Connected to the h2 backbone (commercial zone)

E-market connected electrolyzers in zone 2 are the main types (53% in 2050)





** Data Source: joint electricity and gas TSO data collection (reflects latest NECP, national strategy cut-off date 24-12-2024)

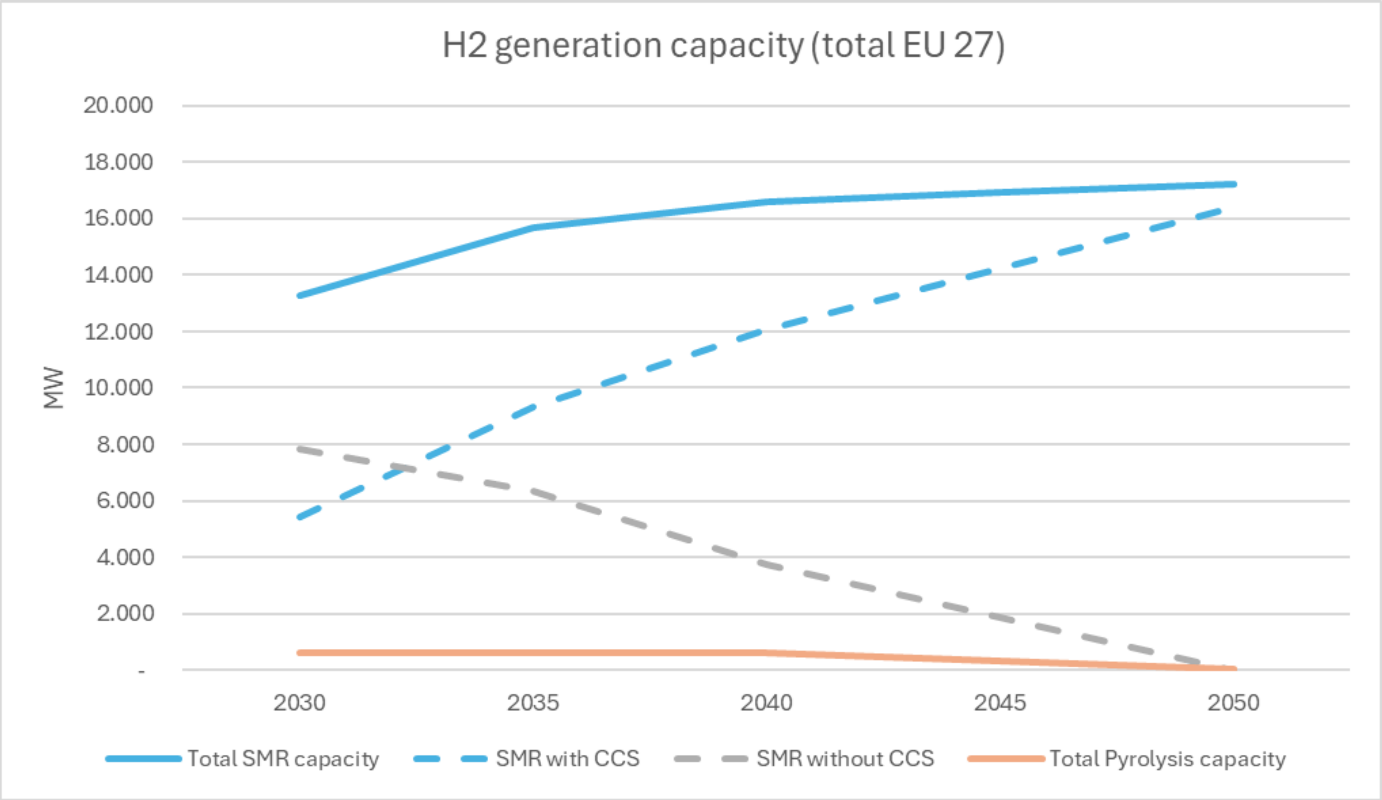
TYNDP 2026 SMR and Pyrolysis capacities

SMR

- The capacity is increasing during the period.
- SMR with CCS is increasing
- SMR without CCS is outfaced

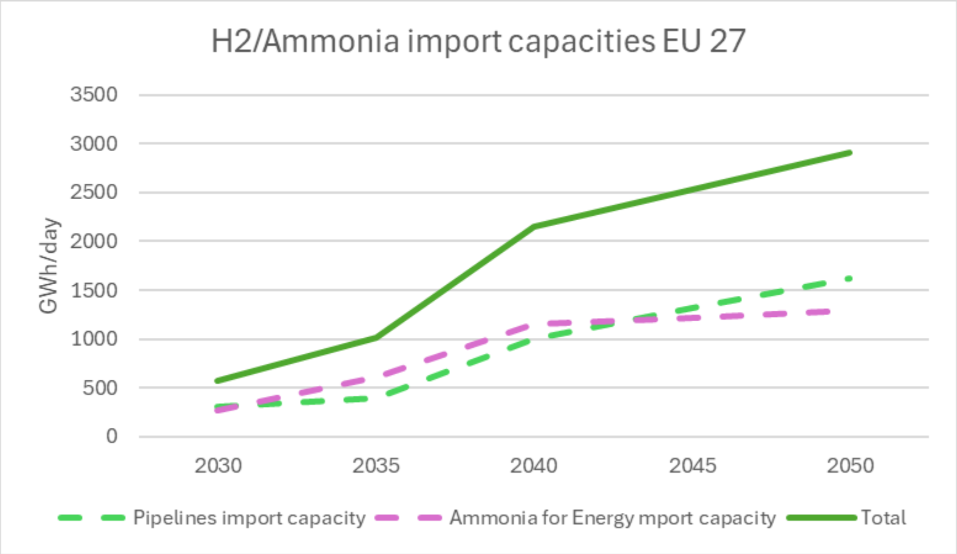
Pyrolysis

- A new technology introduced in 2026
- Two TSOs submitted data for pyrolysis (FI & PL)



** Data Source: gas TSO data collection (reflects latest NECP, national strategy cut-off date 24-12-2024)

TYNDP 2026
Draft H2 and ammonia import potentials



Data – from TYNDP 2024 projects and TSO data on long term strategies

Data has been adjusted together with TSOs for political views

Imports potentials (Starting point adjusted with political views and long term strategies) EU 27

H2 pipelines GWh/day (NCV)	2030	2035	2040	2050
Italy	180	280	379	694
Spain	0	0	89	223
Hungary	0	0	0	107
Slovakia	121	121	121	121
Netherlands	0	0	49	110
Germany	0	0	365	365
Ammonia imports (For energy) GWh/day	**2030**	**2035**	**2040**	**2050**
Germany	52	75	75	75
Netherland	74	197	649	729
Italy	41	41	82	82
Belgium	66	181	211	238
France	20	61	76	106
Greece	0	42	42	42
Poland	15	15	15	15

INFO - Ammonia imports displayed are ammonia for energy = all ammonia is cracked into h2 and enters the h2 grid.

TYNDP 2026 draft import prices for synthetic fuels (liquids)

Import prices for synthetic fuels are computed from the EWI tool

The costs includes:

- H2 cost
- Direct air capturing
- FT/Methanol synthesis
- Storage
- Transportation

Since only one node for imports of liquid synthetic fuel the price is calculated based on the shares of expected imports of the different fuel types.

These shares are indicated in data collections from the TSOs

Average import prices for synfuels €/MWh				
	2030	2035	2040	2050
FT-fuels	289	256	232	212
Methanol	279	248	224	202

Share of import mix (From data collection)				
	2030	2035	2040	2050
FT-fuels*	94%	86%	86%	83%
e-methanol	6%	14%	14%	17%

*e-others, e-kerosene , e-ethanol, e-diesel

Import price for e-liquid blend €/MWh				
	2030	2035	2040	2050
e-liquids	288,4	255,2	231,1	210,6

TYNDP 2026 Scenario Building

Market Modelling Methodologies

Dante Powell, ENTSOG, WGSB Innovation Team Lead
Martin Klein, 50Hertz, WGSB Market Modelling Team
Stefano Costa, ENTSO-E, WGSB Market Modelling Team Lead
20 minutes

Market modelling methodologies

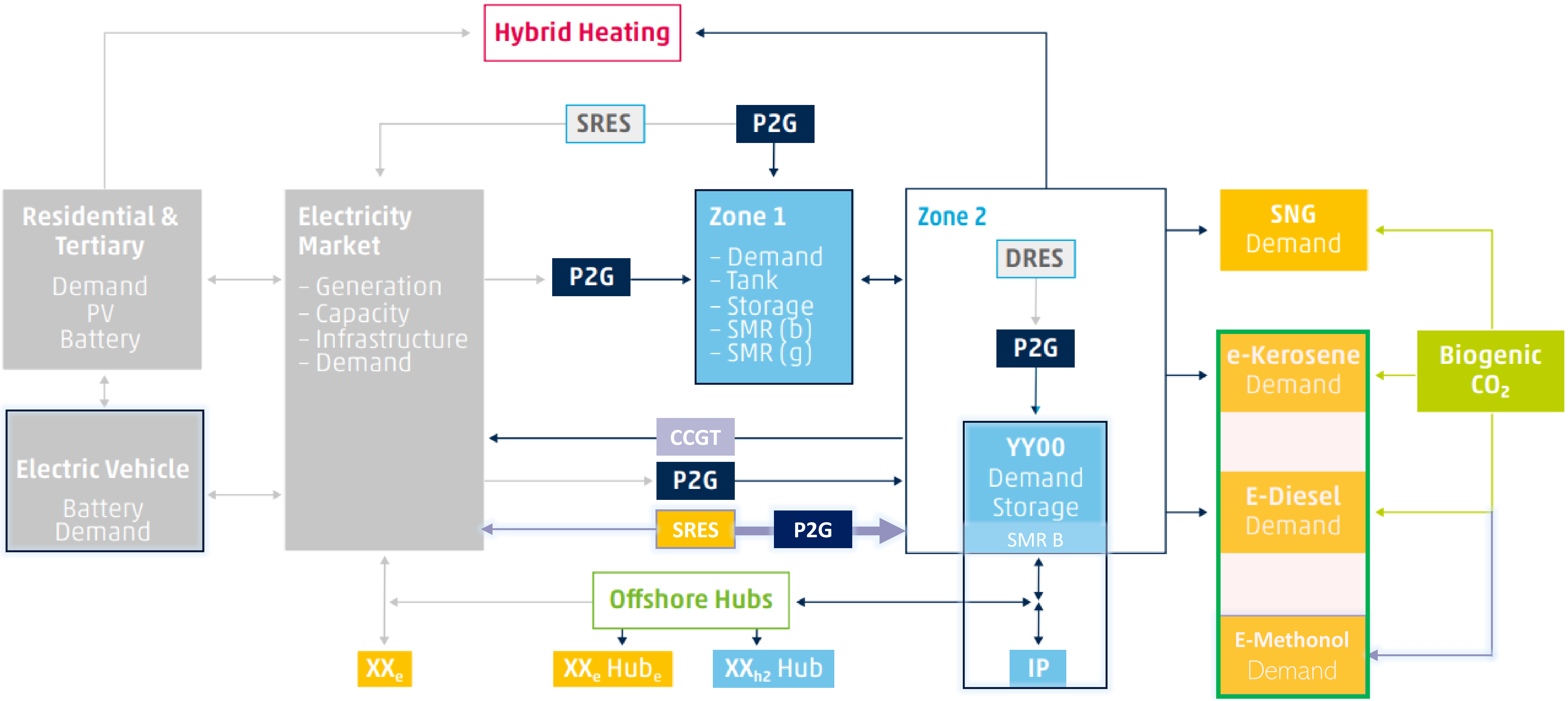
Introduction:

- The presentation outlines the draft market modelling methodologies for the TYNDP 2026.
- It aims to provide a comprehensive overview of the methodologies used for market modelling, including the objectives and scope of the project.

Methodologies and Approaches:

- Detailed explanation of the different methodologies and approaches used in the market modelling process.
- This includes data collection, analysis techniques, and the tools used to ensure accuracy and reliability of the results

Model Structure 2026



Hydrogen Price Formation

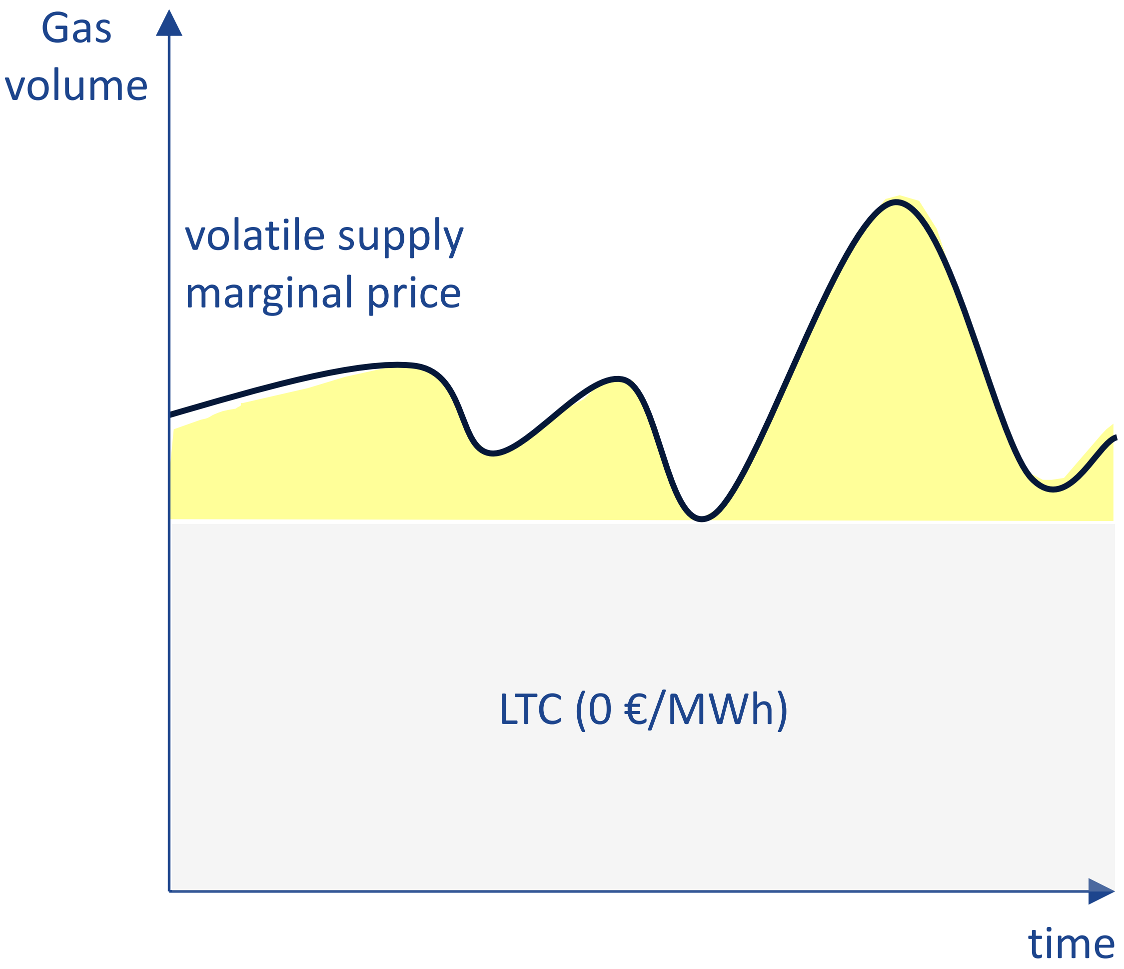
The hydrogen price formation will determine how the hydrogen price is formed in the model. A merit order approach is taken in the economic models. The costing must consider the supply sources

- E-Market Connected Electrolyser
- Shared RES Connected Electrolyser
- Dedicated RES Connected Electrolyser
- Pipeline Imports
- Shipping Import (NH_3)
- Steam Methane Reforming
- Methane Pyrolysis

1. Green H2 pipeline import

Ratios are currently being tested

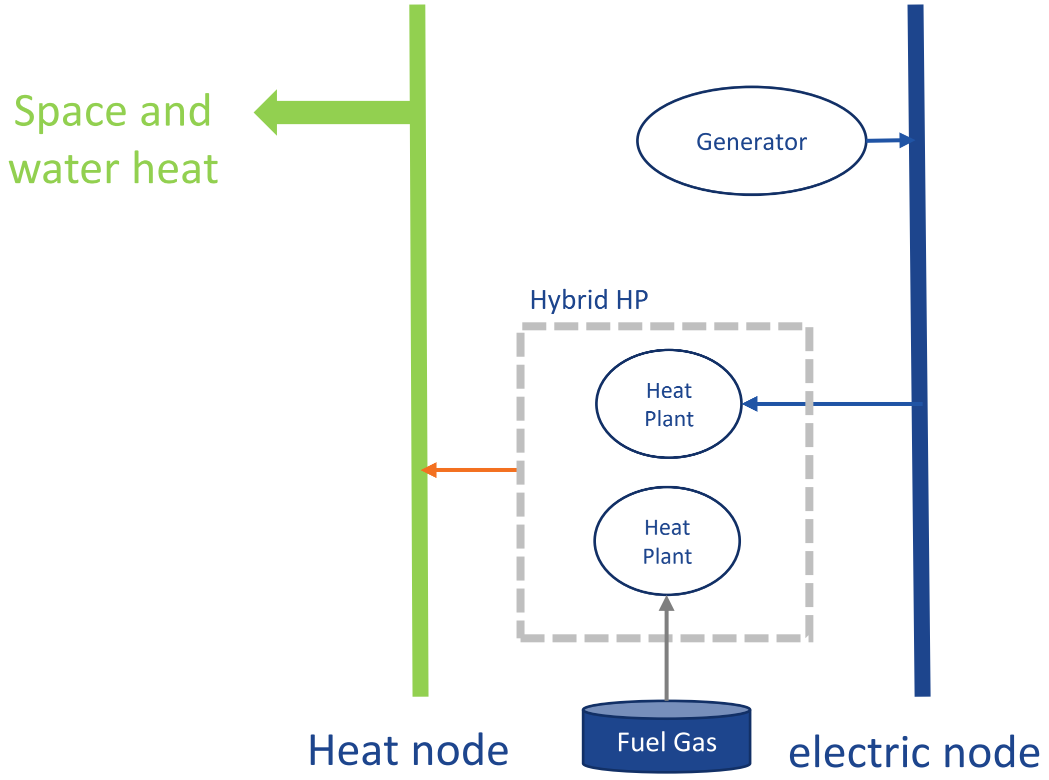
	LTC band	Upper band(s)
Volume	50 - 90 % of total approved volumes	Remaining
Profile	Flat	Follows electrolyser production, based on RES
Price	0, reflecting long term contracts	Marginal pricing approach
Flex	No	Yes



Not intended to be zero price, but to reflect competiteveness on marginal price formation

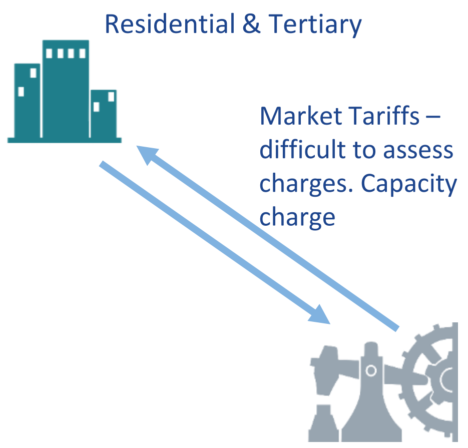
Hybrid Heat Modelling

- Each country will have 2 heat sources. Heat Pump & Gas Boiler
  - Heat pump and boiler capacities are sized to be able to cover peak demand
- The hourly demand timeseries for hybrid heat pumps will be extracted from the ETM inputs and decomposed
- A country based hourly COP curve will be used for heat pumps. Boiler efficiency is constant.



Methodology for prosumer grid costs

- **Data Source**: The values will be taken from Eurostat, which provides cost information for Europe, including energy costs, network costs, taxes, levies, and VAT.
- **Calculation**: The annual values from 2024 will be used, categorized into energy, network costs, taxes, fees, and VAT. Network and excess costs were summed up to determine the prosumer wheeling charge.
- **Comparison**: The updated values for 2024 have been compared with the previous cycle (2022 values) to identify changes in energy prices, network costs, and taxes.



Offshore Topology

TYNDP 2024

- In the previous cycle offshore wind was included as an expansion modelling requiring a complex topology and a multitude of data such as
  - Offshore Technology Split
  - Wider cost of infrastructure (e.g. substation)
  - Deeper technical analysis (e.g. bathymetry)
  - Investment information and trajectories

TYNDP 2026

- The investment models will no longer make decision on the capacities for offshore wind
- The topology, capacity and locations will be determined by TSO
- The topology considered will mirror that of the electricity TYNDP 2024 CBA models

TYNDP 26 Scenarios – EV modeling overview

Electric Vehicles

- **EV passenger cars →** modelled in the market modelling tool (PLEXOS) to capture the relation between market and flexibility. A share of them is considered unflexible and its charging (coming from DFT profiles) is modelled as Fixed Load in Plexos.
- **Trucks, Buses, Vans →** accounted in the electricity demand profiles (input for PLEXOS). They are modelled using one standard charging profile for all EU countries in the Demand Forecasting Tool.

Introduction to EV Fleet Flexibility

Sources of Flexibility:

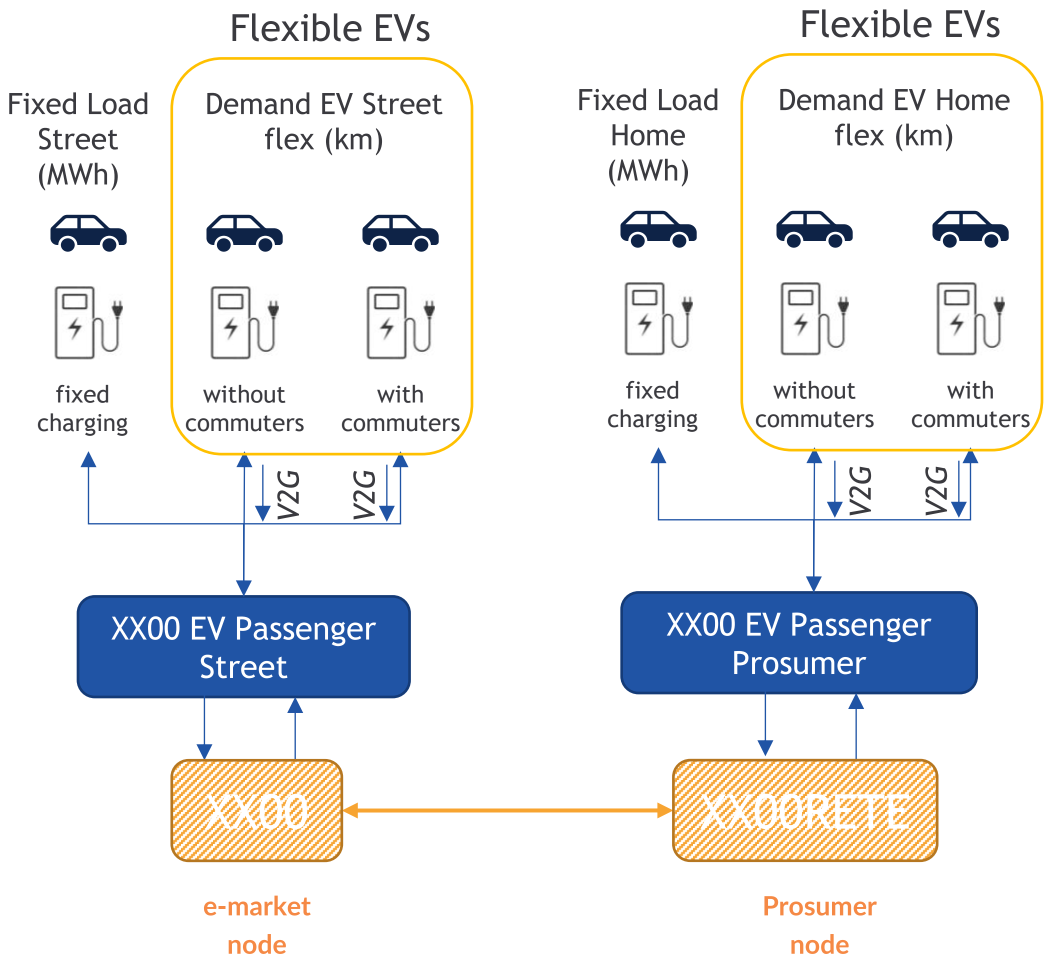
- Smart Charging: When to charge
  - **Key Component: Major source of flexibility in our approach.**
  - Charging EVs during off-peak hours or when renewable energy is abundant helps integrate RES generation and reduce peak demand.
  - Cost Savings: EV owners can take advantage of lower electricity rates during off-peak times, reducing overall charging costs.

- Vehicle-to-Grid (V2G): Discharging electricity back to the grid
  - **Smaller Component: so far unclear participation rate and technical feasibility**
  - V2G can provide additional power during peak demand periods
  - EVs can act as mobile energy storage units and EV users can benefit of price deltas during the day

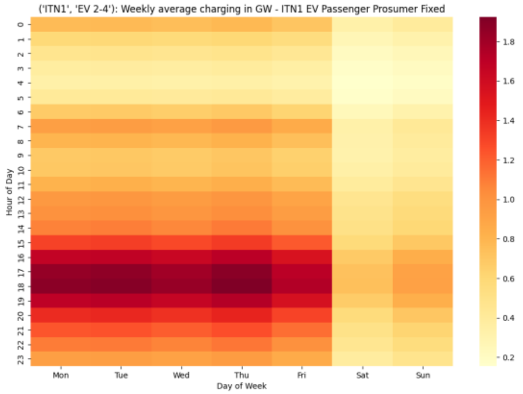
Introduction to EV Fleet Flexibility

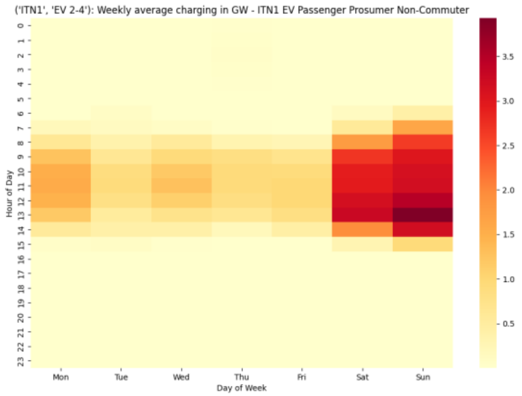
- EV passenger cars modelled with 2 fleets:
  - **User-oriented fleet**: %EVs as Fixed Load from DFT
  - **Market-driven fleet**: %EVs optimized by Plexos
    - 50% With commuters – no charge at noon
    - 50% Without commuters

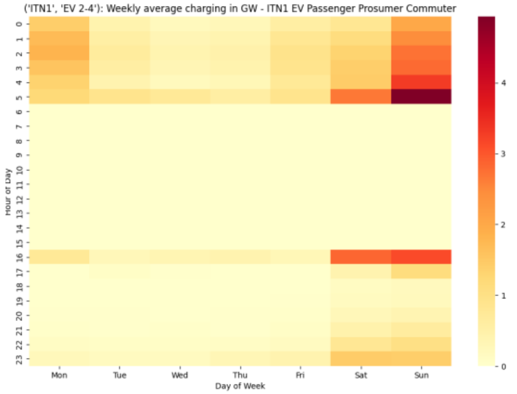
- Use of Plexos Trasport module:
  - EV
  - Charging Station
  - Demand (km)
  - Fixed Load (MWh)

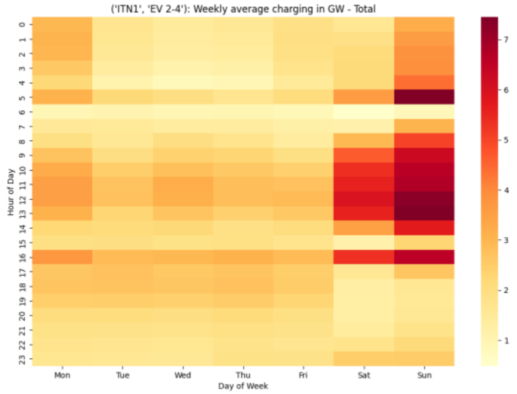


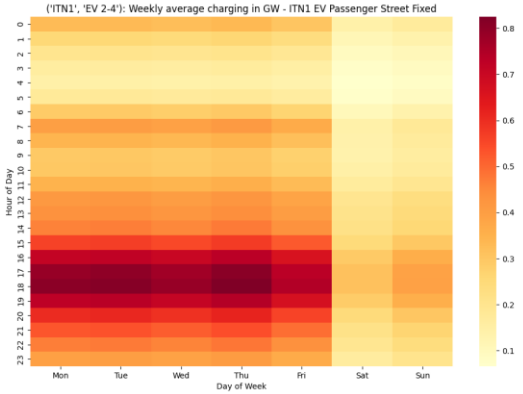
Charging Heatmaps – ITN1 EV 2-4

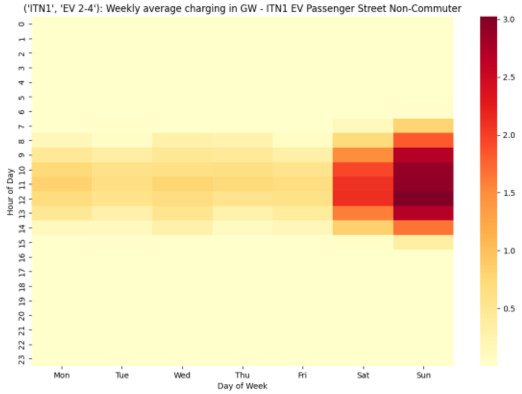


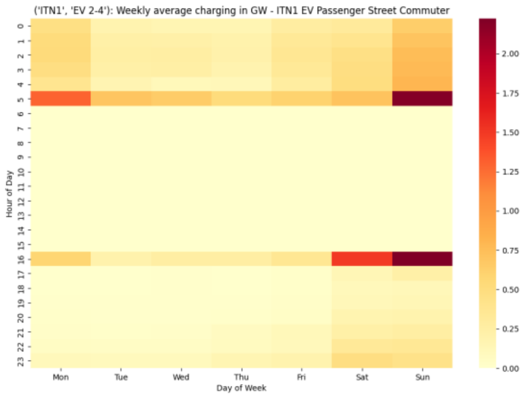




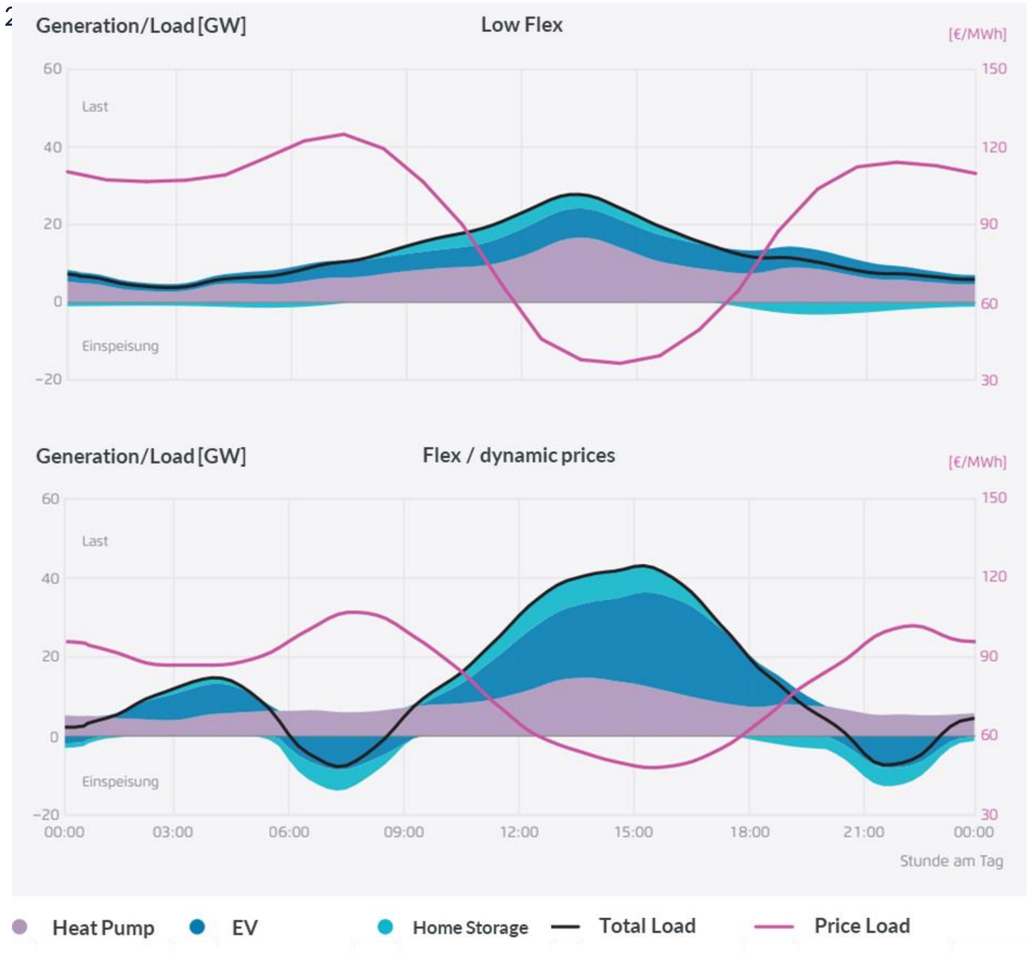


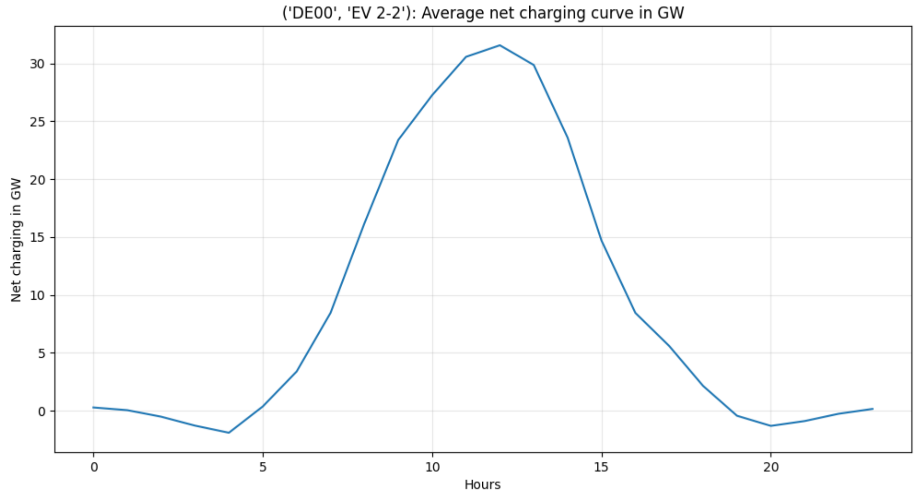


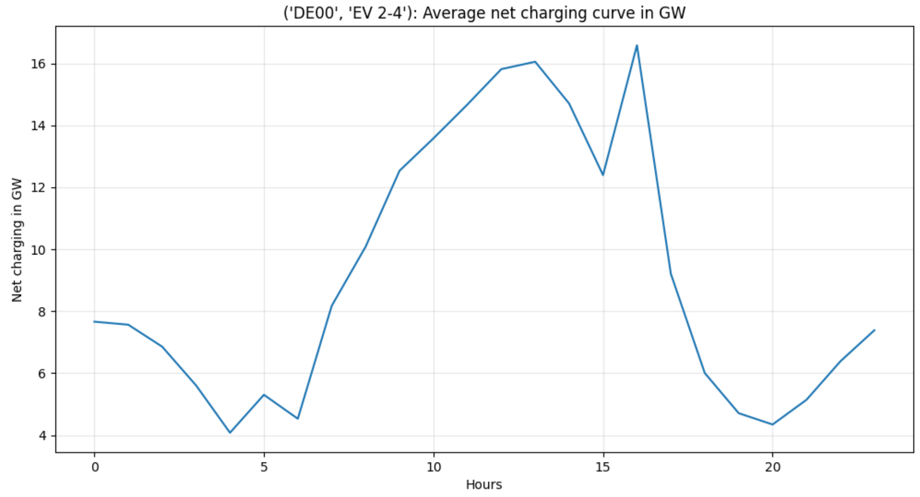




Flexible Charging – Example from study (DE) vs. new model







Agora Energiewende 2023
https://www.agora-energiewende.de/fileadmin/Projekte/2023/2023-14_DE_Flex_heben/A-EW_315_Flex_heben_WEB.pdf

EV Passenger Cars – TYNDP26 parameters

ELECTRIC VEHICLES PROPERTIES	2030	2035	2040	2050
Fleet type (% EVs)	Survey	Survey	Survey	Survey
Battery Capacity (kWh/EV)*	79	81	83	100
Efficiency (Wh/km)	ETM	ETM	ETM	ETM
Transport Demand (km/EV)	ETM	ETM	ETM	ETM
Number of EVs (#)	ETM	ETM	ETM	ETM
Initial SoC (%)	50			
Min SoC (%)	TYNDP24			
Availability Profiles (%)	TYNDP24			
Driving Profiles (%)*	Updated			
Street/Home split (%)	30/70			

CHARGING STATIONS PROPERTIES	Home	Street
Max Charge/Discharge Rate (kW/station)	7.4	16
Use of Station Charge (EUR/MWh)	30	35
Charge/Discharge Efficiency (%)	94	94
Number of Stations per EV (#)	1 station – 1 EV	1 station – 2 EVs
Vehicle-To-Grid ratio (%)	Survey	Survey

TSOs Survey

Fleet type	**Fixed Charging (%)** (DFT)	**Optimized Charging (%)** (PLEXOS)
Market Driven	30	70
Balanced	50	50
Users Oriented	70	30
Business As Usual	85	15

	V2G (%)	**2030**	**2035**	**2040**	**2050**
Home	Low flexibility	0	5	10	20
	Medium flexibility	15	20	25	35
	High flexibility	30	35	40	50
Street	Low flexibility	0	1.5	3	5
	Medium flexibility	0	3.5	7	15
	High flexibility	0	5	10	20

*Following SRG recommendations (increase EV battery capacity and update the EV driving profiles)

TYNDP 2026 Scenario Building

Scenarios Grid Methodology

Rodrigo Barbosa, ENTSO-E, Long Term Planning Manager
5 minutes

Electricity vs H2 reference grid according to CBA Guidelines

Electricity reference grid:

a) **In construction phase, or**

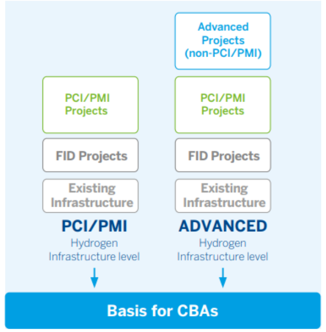
b) **Completed EIA, or**

c) **Permitting or planned, but not yet permitting.** This requirement can be strengthened by:

- NDP
- Legal requirements as stated in the specific national framework
- Defined position with respect to the Final Investment Decision (FID)

H2 reference grid:

- **PCI/PMI -** contains project which have received PCI/PMI status in the last completed PCI project
  - Existing
  - FID
  - PCI/PMI
  - Modifications by requests of EC concerning import corridors
- **Advanced:**
  - Commissioning date ≤ 2030
  - NDP or the project was successfully consulted through a market test (non-binding)
  - Modifications by requests of EC concerning import corridors



- **Under Consideration:** Investments in phase of planning studies and under consideration for inclusion in national plan(s) and Regional/EU-wide TYNDPs of ENTSOE

- **Less-Advanced:** in concept, design and in planning but do not fulfil the advanced criteria

Scenarios Grid

2030

ELECTRICITY:

- Under Construction
- Completed EIA

HYDROGEN:

- PCIPMI
- Advanced

2035

ELECTRICITY:

- Under Construction
- Completed EIA
- In permitting / Planned, but not yet permitting

HYDROGEN:

- PCIPMI
- Advanced

2040

ELECTRICITY:

- Under Construction
- Completed EIA
- In permitting / Planned, but not yet permitting

HYDROGEN:

- PCIPMI
- Advanced
- Less-Advanced

2050

ELECTRICITY:

- Under Construction
- Completed EIA
- In permitting / Planned, but not yet permitting
- Under Consideration
- Conceptual

HYDROGEN:

- PCIPMI
- Advanced
- Less-Advanced
- Conceptual

Conceptual Projects

Conceptual projects (not yet submitted in TYNDP cycle) are those candidates for which TSOs were already investigating the possibility of potential new interconnection capacity, therefore, economic parameters of such project candidates could be to some degree uncertain but very probable and technically justifiable. In some cases, even preliminary technical studies were performed to analyse potential new connections.

Justification: Based on studies / SoS / decarbonization /etc

- To be submitted together with the projects
- Will be published as part of TYNDP 2026 Scenarios Report

Interconnection capacity increase:

- Agreed by both parties
  - if not aligned, min capacity proposed by country A and B
- On existing borders
- Non-existing borders: Only with neighbouring countries:
  - Onshore: physical border
  - Offshore: neighbouring hubs

Threshold:

- 2030 interconnection capacity x2(*) in 2050, or
- 2040 interconnection capacity x1.5(*) in 2050

(*) Will be calculated based on peak demand increases.

TYNDP 2026 Scenario Building

Climate Year Selection Methodologies

Andriy Vovk, ENTSO-E, Planning Study Team
5 minutes

Data used

Wind power generation profiles (PECD*, hourly)

- Onshore
- Offshore

Solar generation profiles (PECD, hourly)

Hydro generation (PECD, weekly):

- Reservoir
- Run of River

HDD/CDD (heating and cooling degree days) derived from Temperature (PECD) as a proxy for Load** (daily)

Renewables installed capacities (PEMMDB) and Load (ETM) (per target year)

*PECD 4.2 SSP 2.45 climate models: CMR5, ECE3, MEHR. For information on the PECD please see: https://cds.climate.copernicus.eu/datasets/sis-energy-pecd?tab=overview & https://confluence.ecmwf.int/pages/viewpage.action?pageId=439598955
** uses threshold for cooling and heating from DFT, with exception of Italy which provided own values

Methodology Overview

Target: Select N most representative Weather Scenarios per study target year

1. **Calculate Average Values** — Yearly averages & cumulative anomalies →
2. **Overall Statistics** — Mean, std dev, and deltas →
3. **Weighting Factors** — Regional capacity weighting →
4. **Normalize Parameters** — Standardization for comparison →
5. **PCA & K-Means** — Dimensionality reduction & clustering

Range of years used for selection

Target Years & Windows

- TY2030: 2025-2034
- TY2035: 2030-2039
- TY2040: 2035-2044
- TY2050: 2045-2054

Climate Models & Candidates

Climate Models: CMR5, MEHR, ECE3

Total Candidates per Target: 3 models × 10 years = 30 climate-year series

Selection Outcome: 3 representative series per target year

Results

Code name	Time period type	SSP scenario	Climate model	Climate year	Study Target Year
WS003	Projection	SSP245	CMR5	2027	2030
WS021	Projection	SSP245	MEHR	2025	2030
WS029	Projection	SSP245	MEHR	2033	2030
WS032	Projection	SSP245	CMR5	2031	2035
WS037	Projection	SSP245	CMR5	2036	2035
WS059	Projection	SSP245	MEHR	2038	2035
WS065	Projection	SSP245	CMR5	2039	2040
WS071	Projection	SSP245	ECE3	2035	2040
WS077	Projection	SSP245	ECE3	2041	2040
WS091	Projection	SSP245	CMR5	2045	2050
WS092	Projection	SSP245	CMR5	2046	2050
WS106	Projection	SSP245	ECE3	2050	2050

Remark: CMR5 overrepresented, but no significance from climate point of view, thus no reason for concerns

TYNDP 2026 Scenario Building

Carbon Budget Methodology

Mads Boesen, ENTSOG, WGSB Supply Team Lead
5 minutes

Carbon budget and climate targets

- The carbon budget in scenarios is calculated as the cumulative net emissions in the period from 2030 to 2050
- The carbon budget is set to 16 Gt CO2-eq in the period – consistently with the indicative "GHG" budget set in the impact assessment report from EC
- EU Targets:
  - 55% reduction in 2030 of net emissions compared to 1990 level
  - Net zero in 2050

Carbon budget methodology

Emissions

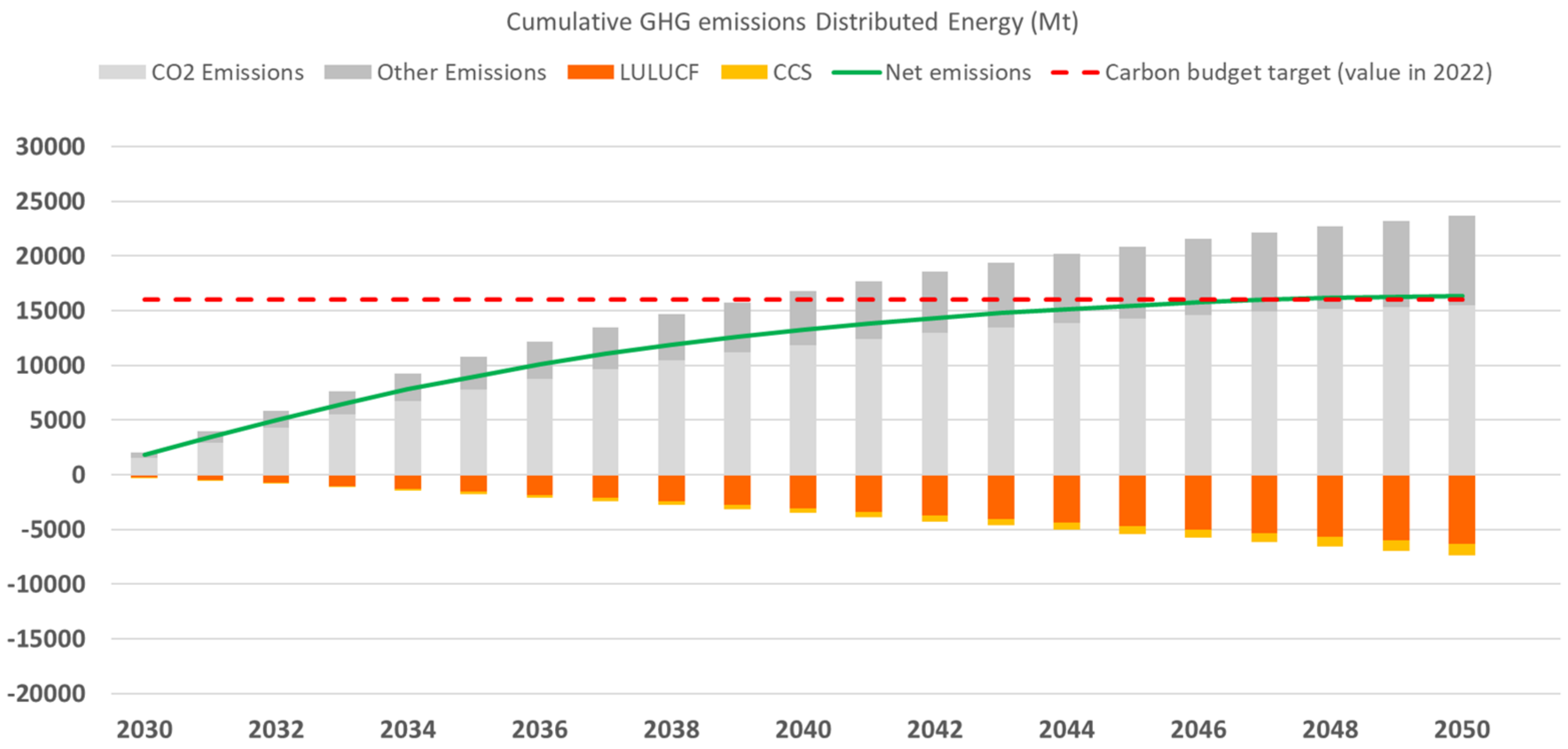
- CO_2 emissions from energy carriers – calculated based on scenario outcomes
- Other emissions (CH_4, N_2O and F-gasses) – Sourced from EC impact assessment report
- Emissions from materials and industrial processes – Sourced from EC impact assessment report

CCU – calculated from produced syn-fuels

Removals

- CCS – Collected values or other sources?
- LULUCF – from EC impact assessment

Carbon budget (illustration from 2024 scenarios)



Improvements

The European Scientific Board on Climate Change (ESABCC) provided feedback on the carbon budget methodology in the previous cycle

Considering this feedback, the following points have been addressed in this cycle:

- Clear methodology of use of CCS and CCU
- Clear display of these numbers in the carbon budget
- Emissions from industrial processes
    - e.g. from materials – be sure they are counted in the budget

TYNDP 2026 Scenario Building

ENNOH involvement in Scenario Building process

Alexander Kättlitz
5 minutes

Public workshop on the 2026 TYNDP Scenarios draft input data and methodologies

Alexander Kättlitz, Senior Advisor

04 July, Brussels

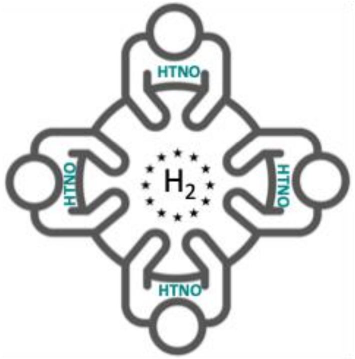
ENNOH Membership

26 EU Countries

36 Members

1 Associated Partner

ENNOH Mission and Scope



Primary Mission

- promote the **development** and proper **functioning** of the **internal H_2 market**
- promote the **cross-border trade** of H_2
- support the **optimal management**, coordinated operation and **sound technical** evolution of the European H_2 **transmission network**
- contribute to the efficient and sustainable **achievement of EU Energy and Climate targets**

TYNDP and related tasks

- Union-wide Ten-Year H_2 Network Development Plan (TYNDP)
  - TYNDP 2026 by ENTSOG
  - ENNOH to take over TYNDP process in 2027
- Cooperate closely with ENTSOE and ENTSOG on fostering system integration and overall energy system efficiency (Union-level Integrated Network Planning)
- Joint Scenarios with ENTSOG and ENTSOE

ENNOH: Summary

- **ENNOH** is being established
- It will play a key role in promoting and facilitating cross-border trade and the **H_2 transmission networks across the European Union**
- The H_2 infrastructure, including the **priority H_2 corridors**, will be an essential part of the future **EU-integrated energy system**
- This is an invitation to all interested parties to **get involved in ENNOH's work** and contribute to the successful deployment of the EU-wide H_2 infrastructure system.

Thank you for your attention

Keep in touch

info@ennoh.eu

www.linkedin.com/company/ennoh/

ENNOH e-mail updates
@ www.ennoh.eu/contact-us.html

Agenda – Afternoon Session

Topic	Time	Speaker TBC
Introduction	**13.30 – 13.35**	Aisling Wall, ENTSOG, TYNDP Scenarios Project Manager
TYNDP 2026 Scenarios Economic Variants Methodology • Presentation on high level principles, key assumptions, parameters and first outcomes *Followed by Q&A session (10')*	**13.35 – 14.10**	Nalan Buyuk, ENTSO-E, TYNDP Scenarios Project Manager Eduardo Hermes, ENTSO-E, WGSB Toolchain Team Lead Jean-Marc Debarnot, ENTSO-E, WGSB Supply & Demand Team Member Pedro Sanchez, ENTSO-E, WGSB Supply Team Co-Lead
TYNDP 2026 Scenarios Economic Variants discussion	**14:10 – 14:55**	Moderated by Bram Claeys, SRG Vice Convenor
Next steps and conclusion	**14.55 – 15.00**	Aisling Wall, ENTSOG, TYNDP Scenarios Project Manager

A separate consultation for TYNDP 2026 Scenarios Economic Variants Development Methodology

ENTSO-E and ENTSOG invite all interested stakeholders to take part in the public consultation on the Draft 2026 TYNDP Scenarios' Economic Variants' methodology from 1st July to 29th July.

Important note:

This is a separate consultation running in parallel to the ongoing public consultation on the input data and other methodologies on the Draft 2026 TYNDP Scenarios, which is open from 16 June until 14 July.

ENTSOG and ENTSO-E welcome stakeholders' input on both consultations, accessible via the Consultation Hub.

Economic Variants Methodology development – from inception to present

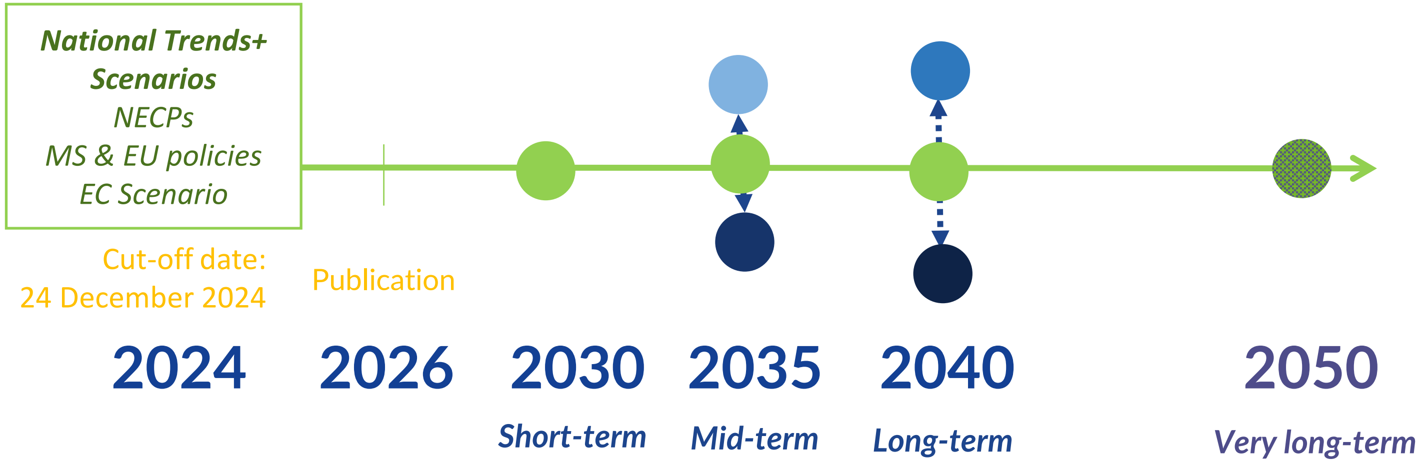
- May 2024: SRG/EC/ACER feedback on the three proposed scenarios' storylines
- July 2024: Presentation of scenarios methodology & consultation of the initial ideas for the economic variants
- August / September 2024: Identification of high-level definition, main principles
- September 2024: SRG review & joint SRG workshop
- November 2024: Identification of key parameters to be differentiated for the development economic variants
- December 2024: SRG physical webinar
- March 2025: Public webinar (high-level definition, main principles, key parameters)
- *March-April 2025 – focus on the central scenario data finalisation*
- May 2025 – Agreed on the set of parameters, development of the scripts, performing the initial tests, list of open questions, developing a fallback option
- June 2025:
  - ACER/EC meeting – aim: get guidance on the open questions & get feedback on the fall-back approach
  - SRG workshop – aim: get feedback on the economic variants' methodologies
  - ENTSOs: publish the draft methodology for public consultation
- July 2025: dedicated public workshop on economic variants methodology and public consultation

TYNDP 2026 Scenario Building

TYNDP 2026 Scenarios Economic Variants Methodology

Nalan Buyuk, ENTSO-E, TYNDP Scenarios Project Manager
Eduardo Hermes, ENTSO-E, Multi-Energy Scenario Building Specialist, WGSB Toolchain Team Lead
Daniele Ceccarelli, SNAM, WGSB Toolchain Team Co-Lead
Jean-Marc Debarnot, ENTSO-E, WGSB Supply & Demand Team Member
Pedro Sanchez, ENTSO-E, WGSB Supply Team Co-Lead
30 minutes

TYNDP 2026 Scenarios Framework



Higher economic growth

- ✓ *Higher GDP (higher than NECPs)*
- ✓ *Higher sectorial activity*
- ✓ *More purchasing appetite / more willingness to spend*
- ✓ *More focus on innovation & risky investments*
- ✓ *More focus on sustainability, long-term view for investment/purchasing decision*

Central scenario (National Trends+) reflecting latest updated NECPs, national and EU policies

Lower economic growth

- ✓ *Lower GDP (lower than NECPs, close to 0 growth)*
- ✓ *Moderate/less sectorial activity*
- ✓ *Moderate/Less purchasing / spending possibilities*
- ✓ *Less focus on innovation & more business as usual*
- ✓ *More focus on cost and affordability, short-term view for investment/purchasing decision*

Economy variants scenarios

- ✓ *Not a stand-alone product → stress test of central scenario*
- ✓ *Deviates from the NT+ scenario in a balanced way*

Main principles on the variants:

Recital 27, Acer Framework Guideline

*The set of **mid-term (2035)** and **long-term scenarios (2040)** shall include the best-estimate central scenario, based on NECPs, and **contrasting "low"-economy and "high"-economy variants that serve as stress-tests of the central scenario**. The Agency finds that stress-testing network development along the dimension of a more conservative ('low') and a more optimistic ('high') view on the economy resonates with decision makers.*

1. Variants are anchored to the central scenario

- ❖Variants serve as stress tests of the central scenario, providing complementary insight. They are not standalone scenarios.

2. Limited variation from the central view

- ❖ The focus is on plausible economy-relevant deviations – not exploring extreme or unlikely economic conditions.

3. Targeted variation of key parameters

- ❖ The aim is not to develop a full storyline, but to test sensitivities through well-chosen, impactful key parameters.
- ❖ This helps to develop fit-for-purpose variants with a focus avoid unnecessary complexity.

4. Balanced contrasts across variants

- ❖ Parameter changes should be applied symmetrically across variants (e.g. +x% in one, −x% in the other) to ensure balanced comparison and interpretability.

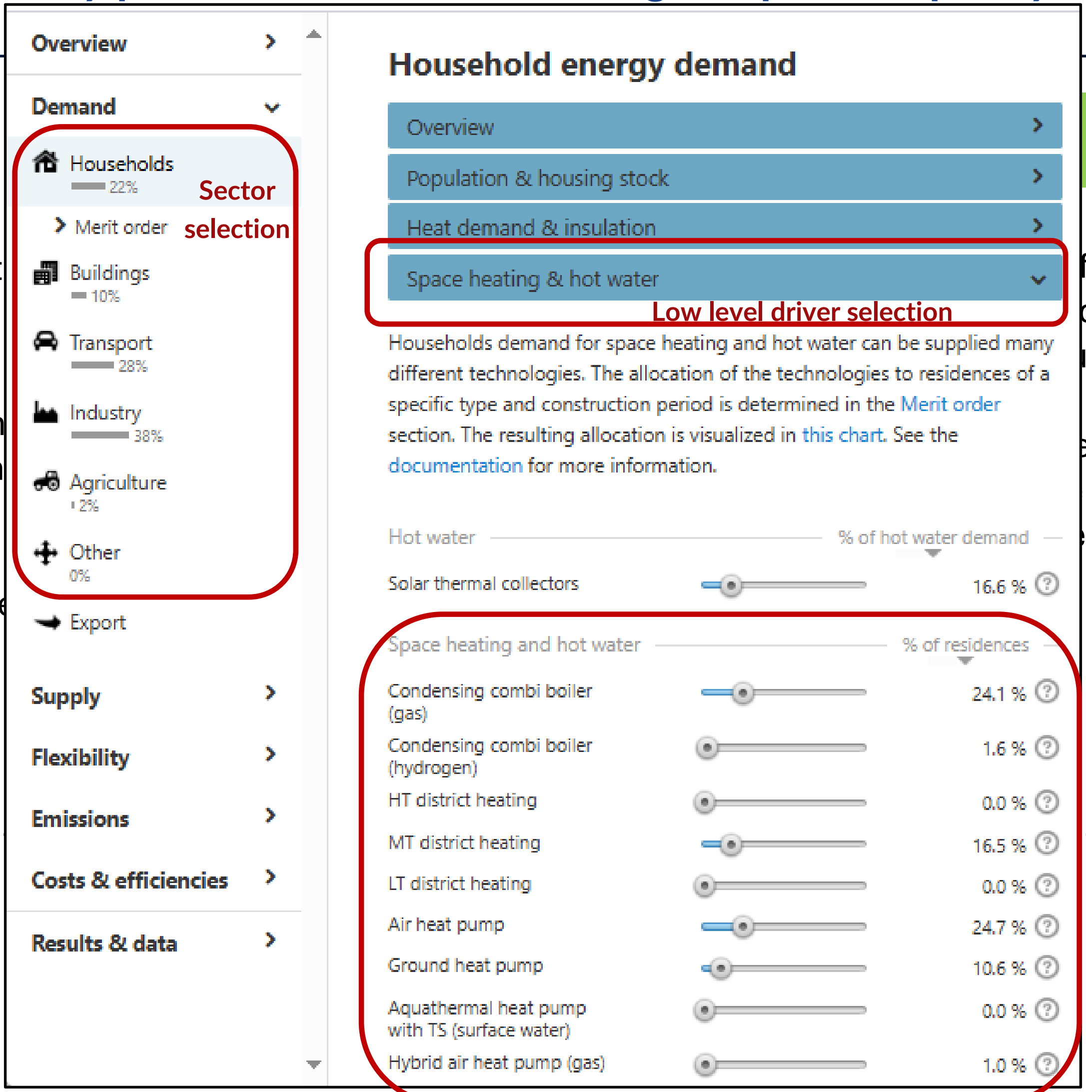
ETM key parameters selected for high-impact simplicity- focus areas for sensitivity testing.

Technology mix

Household & Building: space heat and hot water, cooking, cooling

Transport: only car (passenger tran bus, truck and domestic navigation

Industry: steel production route, Re heat production, Fertilizers NH3 production route, Chemicals heat production, Food heat production, heat production



Tech mix parameter selection

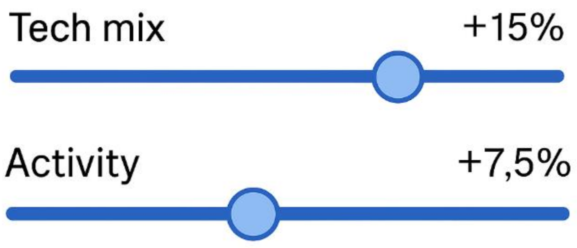
Efficiency

ficiency is covered via chnology choice (e.g. heat imps, EVs)

emand team decision: no parate efficiency knob eeded.

ETM key parameters selected for high-impact simplicity- focus areas for sensitivity testing.

- For the tests, the percentage of change of the parameter has been discussed in demand team meetings.



- The team also conducted tests for different % (e.g. 20% change in technology mix)
- Stakeholder input on acceptable range is welcome.

Initial Test results

Final Energy Demand

Level	year	Central	High	Low	High (Δ%)	Low (Δ%)
EU level	2035	11279	11411	11166	1.17%	-1.00%
	2040	10764	10867	10670	0.95%	-0.88%

Hydrogen Demand

Level	year	Central	High	Low	High (Δ%)	Low (Δ%)
EU level	2035	451	483	412	7.18%	-8.74%
	2040	694	758	624	9.23%	-10.14%

Electricity Demand

Level	year	Central	High	Low	High (Δ%)	Low (Δ%)
EU level	2035	3344	3606	3064	7.84%	-8.36%
	2040	3717	4023	3407	8.24%	-8.35%

Methane Demand

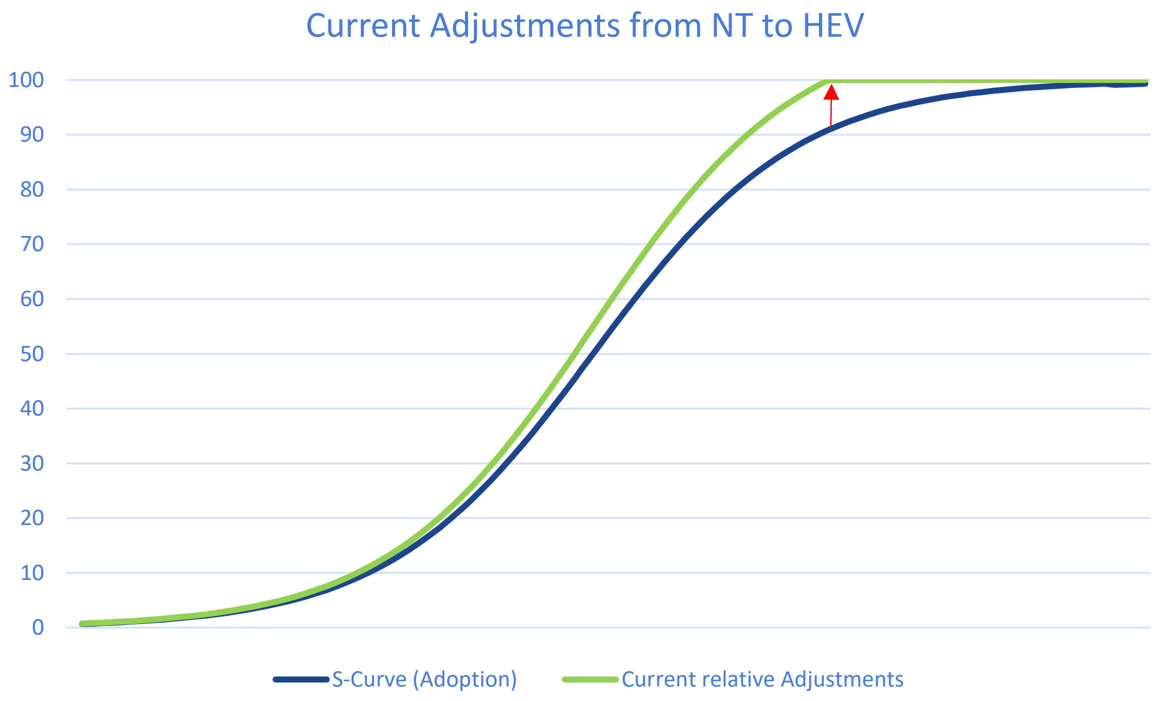
Level	year	Central	High	Low	High (Δ%)	Low (Δ%)
EU level	2035	1891	1808	1989	-4.36%	5.23%
	2040	1560	1429	1690	-8.41%	8.37%

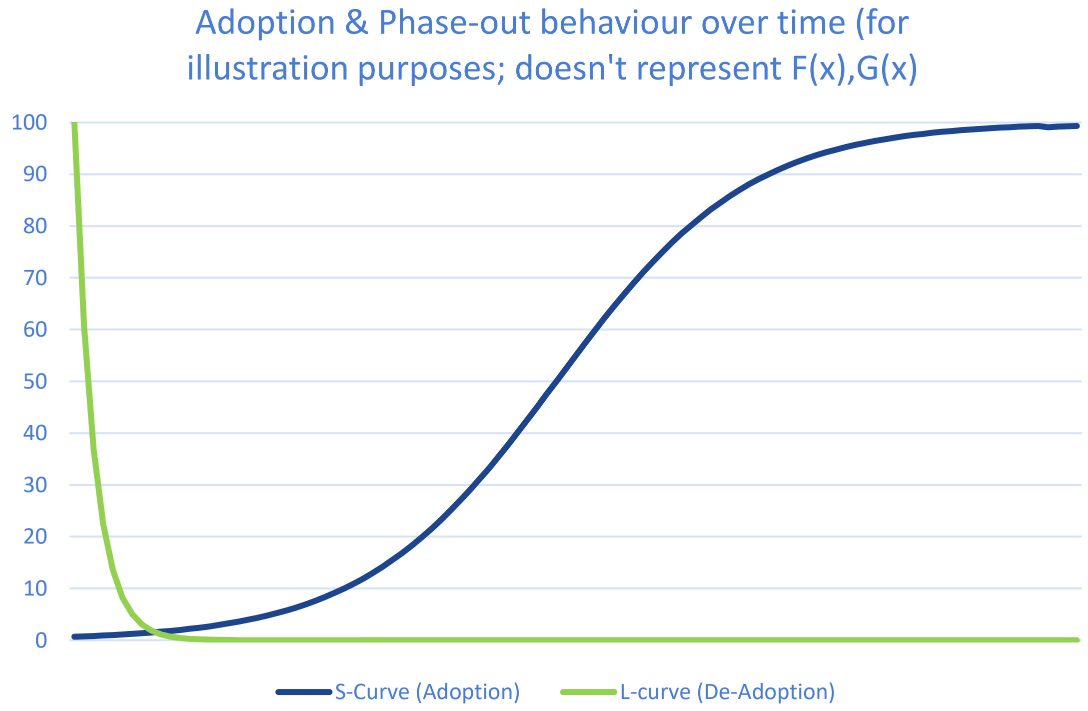
Notes:
- The figures include all sectors except energy branch.
- Methane demand is the sum of fossil gas and renewable gas (biomethane and synthetic methane).

Saturation Methodology

- Technology Adoption follows an S-Curve
  - slow during early adoption, fast during peak adoption and slow again during saturation

- Obsolete technologies lose adoption quickly at first but are difficult to completely eliminate
  - This behaviour should also be observable under changing economic conditions

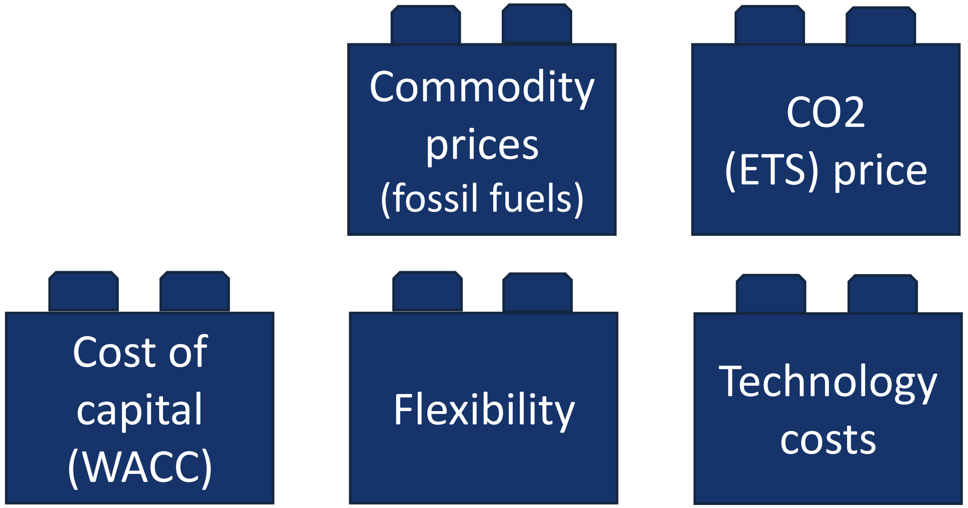




Building blocks for differentiation of the variants – supply have been collaboratively agreed and presented in public webinar:

Overall approach

- Based on the high-level definition of the economic variants, each building block is assessed regarding the possible variation
- For some building blocks, variation in both directions (higher or lower) is imaginable, based on the respective reasoning



Economic Variants Supply Perspective

"Building blocks" to develop the variants from Supply perspective:

- WACC and Technology costs – Disregarded due to not being relevant this cycle (No expansion).
- Installed capacities and flexibility – Not to be changed. We want to stress test both grid and supply capacities in the variants.
- CO_2 prices
- Commodity prices

Building block	High economy	Low economy
CO2 (ETS) price	Higher	Lower
CCU/S	Let model decide	Let model decide
Renewable Extra EU imports	Let model decide	Let model decide
Commodity prices (for fossil fuels)	Higher	Lower

Supply Economic Variants: Stress-test on **grid and supply capacities**

- The supply capacities remain unchanged in this cycle unless technically necessary – to be verified after the model results. From EC's and ACER's feedback:
  - ✓ ACER: The primary goal of stress tests is to evaluate the resilience of grid infrastructure. While ideally supply parameters should also be adjusted, unlike demand, supply capacities are not directly tied to input parameters. This makes output-based percentage adjustments unreliable. Therefore, it is suggested to keep supply capacities unchanged in this cycle.
  - ✓ EC: Supply capacities are often influenced by political and policy-driven factors (e.g. subsidies, prioritization), making them hard to vary consistently. The EC agrees that supply capacities should remain unchanged in this cycle unless technically necessary (e.g. if the model fails to converge with NT supply values).

- Supply approach on variants:
  - Change CO2 and commodity prices by a fixed percentage (10% was decided by WGSB)
    - Blue H2 imported from NO will change accordingly
    - Green imported H2 and NH3 will remain unchanged
    - E-fuels and biofuels share will increase/decrease harmonized with the other changes for each economic variant

Initial findings after test results

**All assumptions are preliminary; revisions might be implemented in case the first model run(s) show inconsistencies*

- Electricity merit order test results shows changing the prices & CO2 cost up to 10% shows minor impact on the merit order.
- Initial findings on the demand shows consistency and balanced way of deviation for both on the electricity, hydrogen and methane demand. However,
  - Change on the demand per carrier and per country is different as the magnitude depends on the carrier and country – as the technology mix & activity level in the central scenarios are different.
  - This approach requires detailed analysis of each country's technology / activity & final demand status.

Next Steps

- Finalise the methodology post consultation
- Finalise the results & verify any inconsistencies or extreme divergence and ensure overall trend is consistent

TYNDP 2026 Scenario Building

TYNDP 2026 Scenarios Economic Variants discussion

Moderated by Bram Claeys, SRG vice convenor
50 minutes

Questions for discussion with participants

1. Does the storyline emerging from the high and low economy variants of the central scenario resonate with you?
   - Do you think it will resonate with policy/decision makers?

2. Do the variants function as a useful stress test of the central scenario?
   - What could be improved?
   - Should variants stress test the grid or also supply capacities and perhaps energy demand?

3. Are the variants sufficiently contrasting?
   - Final energy demand is not balanced around the central scenarios.
   - Demand for electricity and hydrogen are not mirrored around the central scenarios

4. Are variants required to be in line with the EU targets?
   - Should variants stay within policy targets, or is deviation acceptable for stress-testing purposes?
   - ACER requires variants for (mid-term) 2035 and (long-term) 2040 — is inclusion of 2050 compulsory and useful?

TYNDP 2026 Scenario Building

Next Steps, Closing

Aisling Wall, ENTSOG, TYNDP Scenarios Project Manager
5 minutes

TYNDP 2026 Scenarios Timeline (June 2025)

2024

Terms of Reference commencement
TYNDP 2026 Scenarios Framework commencement
Stakeholder Engagement Plan, first version
Innovation Roadmap, first version
Data collection take-up
Draft Scenario buidling methodologies report

Q1 2025

Demand profiles, EV/Heat pump/RES profiles, additional supply input parameters, carbon budget & GHG calculation methdology, initial version of supply tool, market modelling methodologies, gap-filling methdology,

Q2 2025

16 Jun – Opening public consultation input data & methodologies

23 Jun – SRG workshop economic variants

Q3 2025

01 Jul – Opening public consultation economic variants

04 Jul – Public workshop consultation package and economic variants

14 Jul – DL Public consultation input data & methodologies

29 Jul – DL Public consultation economic variants

Q4 2025

01 Dec – Approx. opening SRG consultation NT+

22 Dec – Approx. opening SRG consultation economic variants

Q1 2026

Delivery datasets & market models for TYNDP CBA and infrastructure gaps identification

Q2 2026

ACER, European Commission, Member States‘ opinion

Q3 2026

European Commission approval

Q4 2026

Publication Scenarios package

entsog entsoe

Thank you for your attention

Contact information:

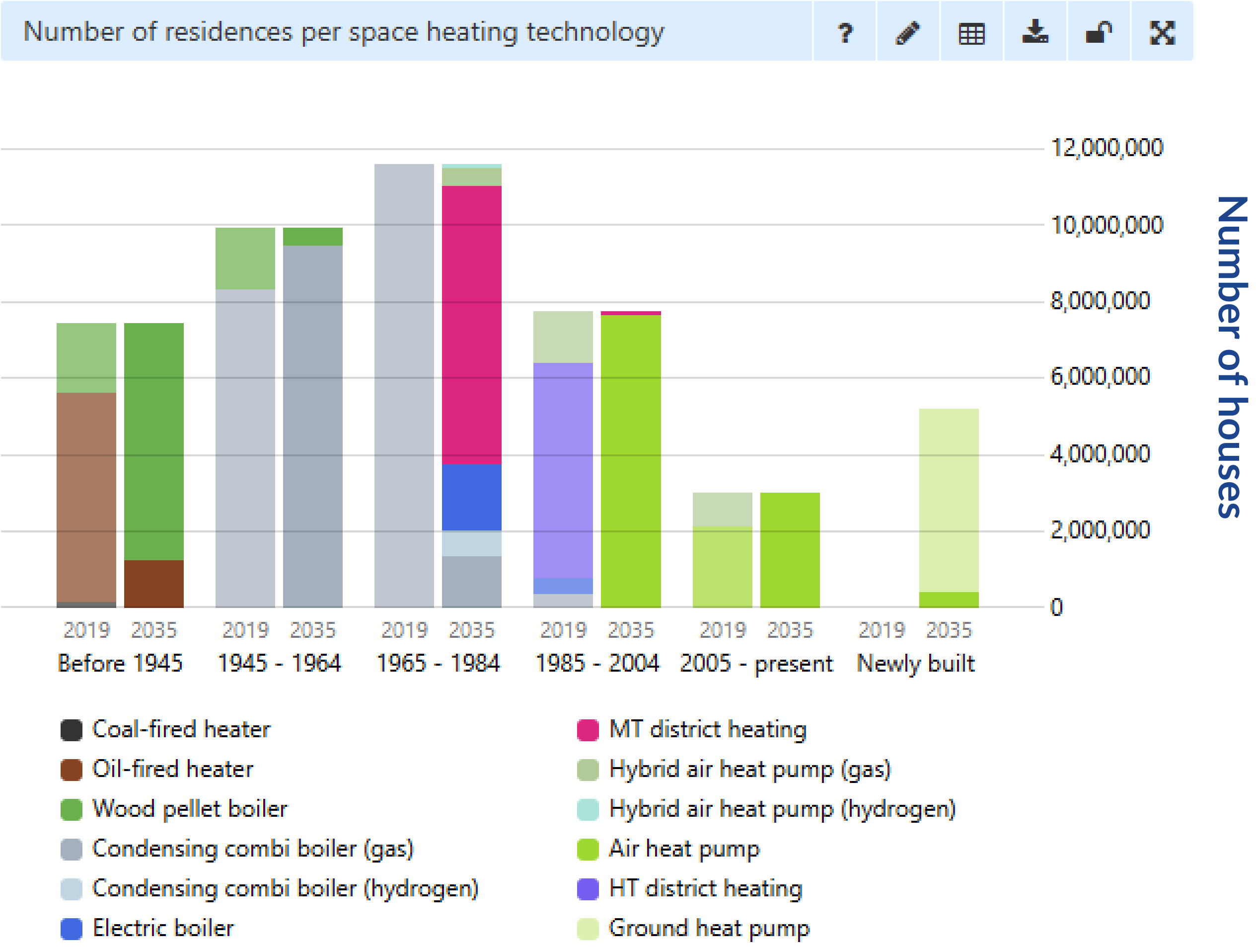
www.entsos-tyndp-scenarios.eu

scenarios@entsos-tyndp-scenarios.eu

Location: Brussels Date: 04.07.2025

entsog entsoe

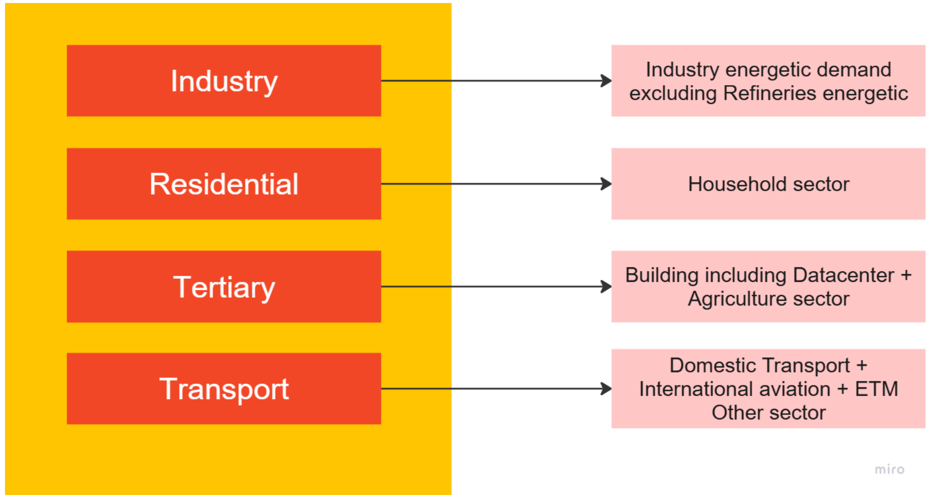
German NT 2035 Scenario

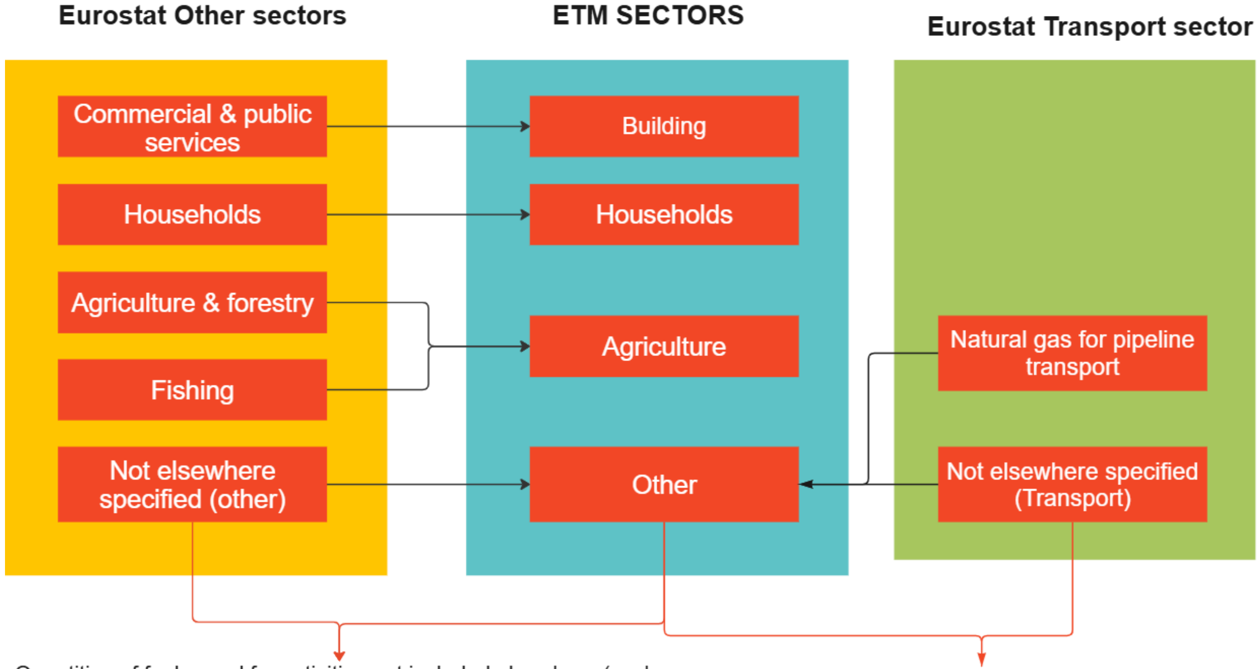


Merit Order
Aquathermal heat pump with Thermal Seasonal Storage (surface water)
Ground heat pump
Air heat pump
PVT heat pump
Low Temperature district heating
Mid Temperature district heating
Hybrid air heat pump (hydrogen)
Hybrid air heat pump (gas)
Hybrid air heat pump (oil)
High Temperature district heating
Electric boiler
Condensing combi boiler (hydrogen)
Condensing combi boiler (gas)
Biomass boiler (wood pellets)
Gas-fired heater
Oil-fired heater
Coal-fired heater

Final Energy Consumption
*targets definition*

EU Energy Efficiency Directive





Quantities of fuels used for activities not included elsewhere (such as NACE Rev. 2 Class 84.22). This category includes military fuel use for all mobile and stationary consumption (e.g. ships, aircraft, road and energy used in living quarters), regardless of whether the fuel delivered is for the military of that country or for the military of another country.

Quantities of fuels used for transport activities not included elsewhere. Includes fuels used by airlines for their road vehicles and fuels used in ports for ships' unloaders, various types of cranes.

miro

Definitions in Annex A of Regulation (EC) No 1099/2008