

# The METIS Model

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Description and Role in Recent Policy Initiatives

# Presentation plan

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1. Background
2. Models & method
3. AMADEUS-METIS
4. Key findings

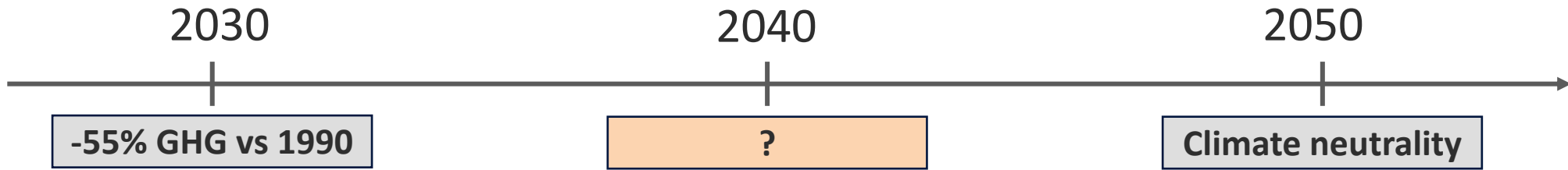


# Background

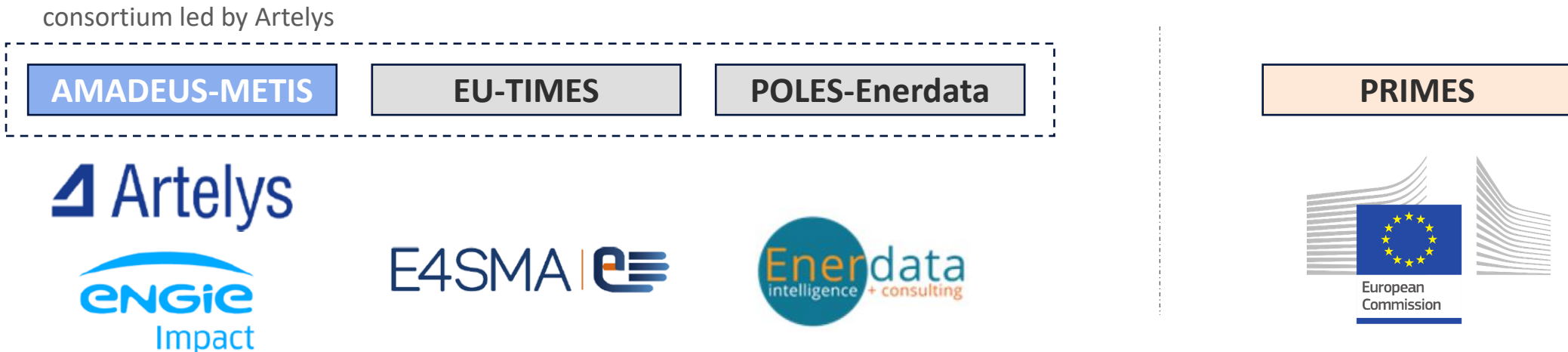
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# Context

Core goal of latest **impact assessment** was to identify interim **2040 climate target**.



**Robust** energy transition **pathways** were identified via **multi-model analysis**.





# Models & method

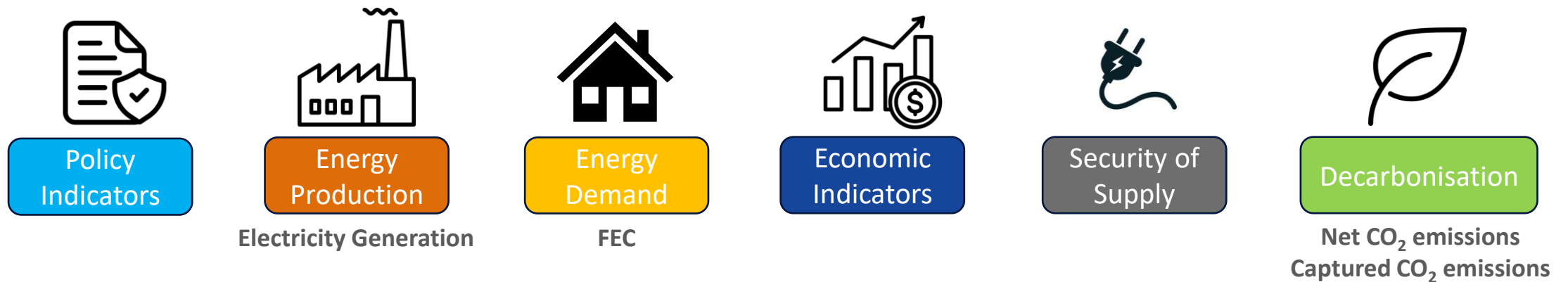
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# Models & method

Model **principles differ** but all represent **emissions** from **energy use** and **industry**:

- | **AMADEUS-METIS**: mixed **simulation-optimization** partial equilibrium model of energy sector.
- | **POLES-Enerdata**: **simulation**-based partial equilibrium model of energy sector.
- | **EU-TIMES**: **optimization**-based partial equilibrium model of energy sector.

Input data were **harmonized** across models, and **shared KPIs** were defined.

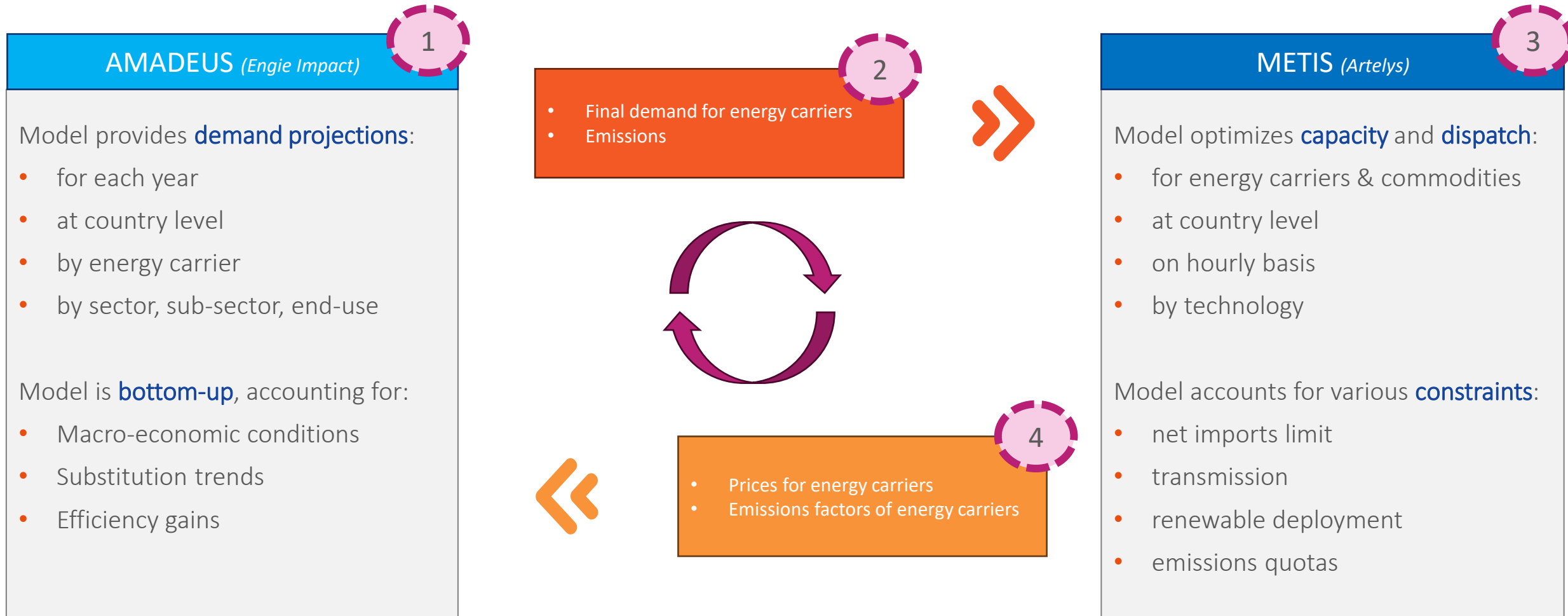




# AMADEUS-METIS

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# The AMADEUS-METIS model cluster





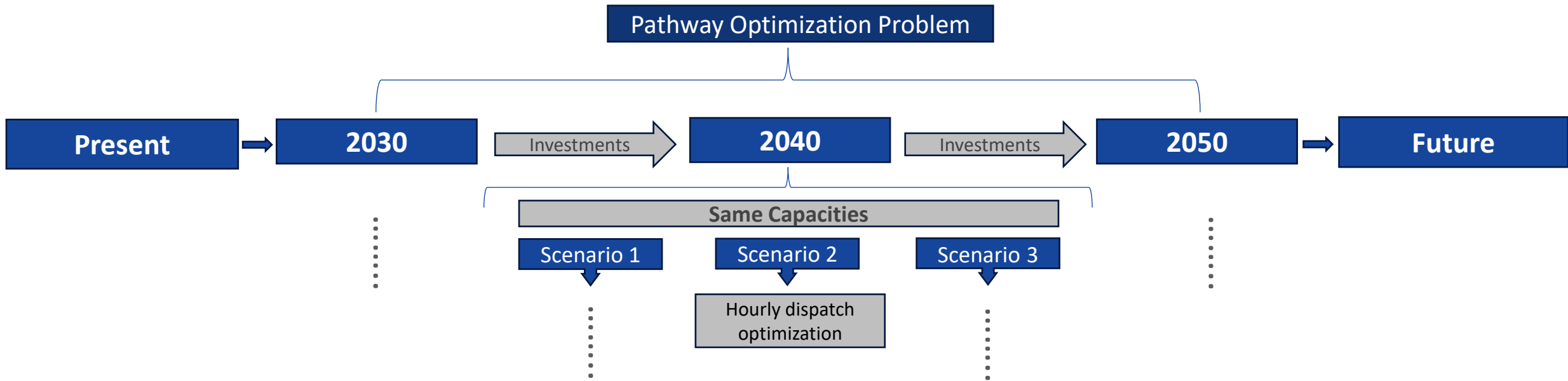
# The METIS model

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▴ METIS has several features that make it well-suited for such analyses:

- | **Multi-commodity**: several energy **carriers** and **commodities** are represented (e.g., power, hydrogen).
- | **Highly granular**: spatial and temporal resolution is **adjustable** (NUTS-2 and sub/hourly resolution).
- | **Transport infrastructure**: energy transport **infrastructure** is explicitly modelled.
- | **Flexibility options**: **storage** and **demand-side** flexibility (e.g., EVs and heat pumps) are modelled.
- | **Emissions** : emissions **quotas** and **targets** can be readily taken into account.
- | **Optimization-based** : primary objective is to **minimize** system **costs**.
- | **Pathway modelling** : energy system **trajectories** can be represented consistently over **several years**.

# Pathway optimization problem



## 4 In this case:

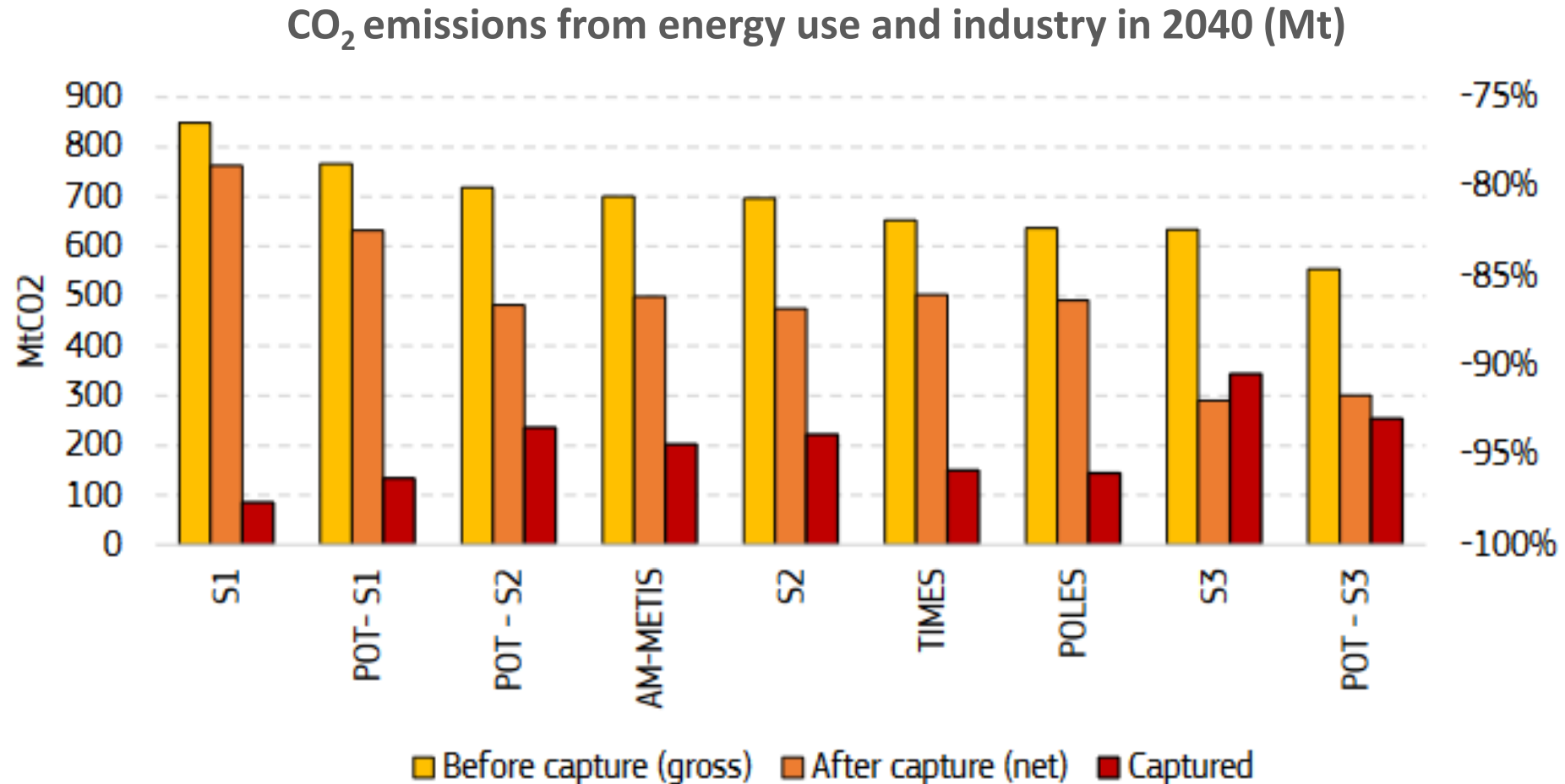
- | **Multi-commodity** model (electricity, methane, hydrogen, CO<sub>2</sub>, biomass, ...)
- | Full **European** energy **system** along with major neighboring countries (e.g., UK, Norway)
- | Capacity **expansion** planning between 2025 and 2050, in **5-year** steps
- | Investment decisions taken based on **hourly** operational decisions



# Key findings

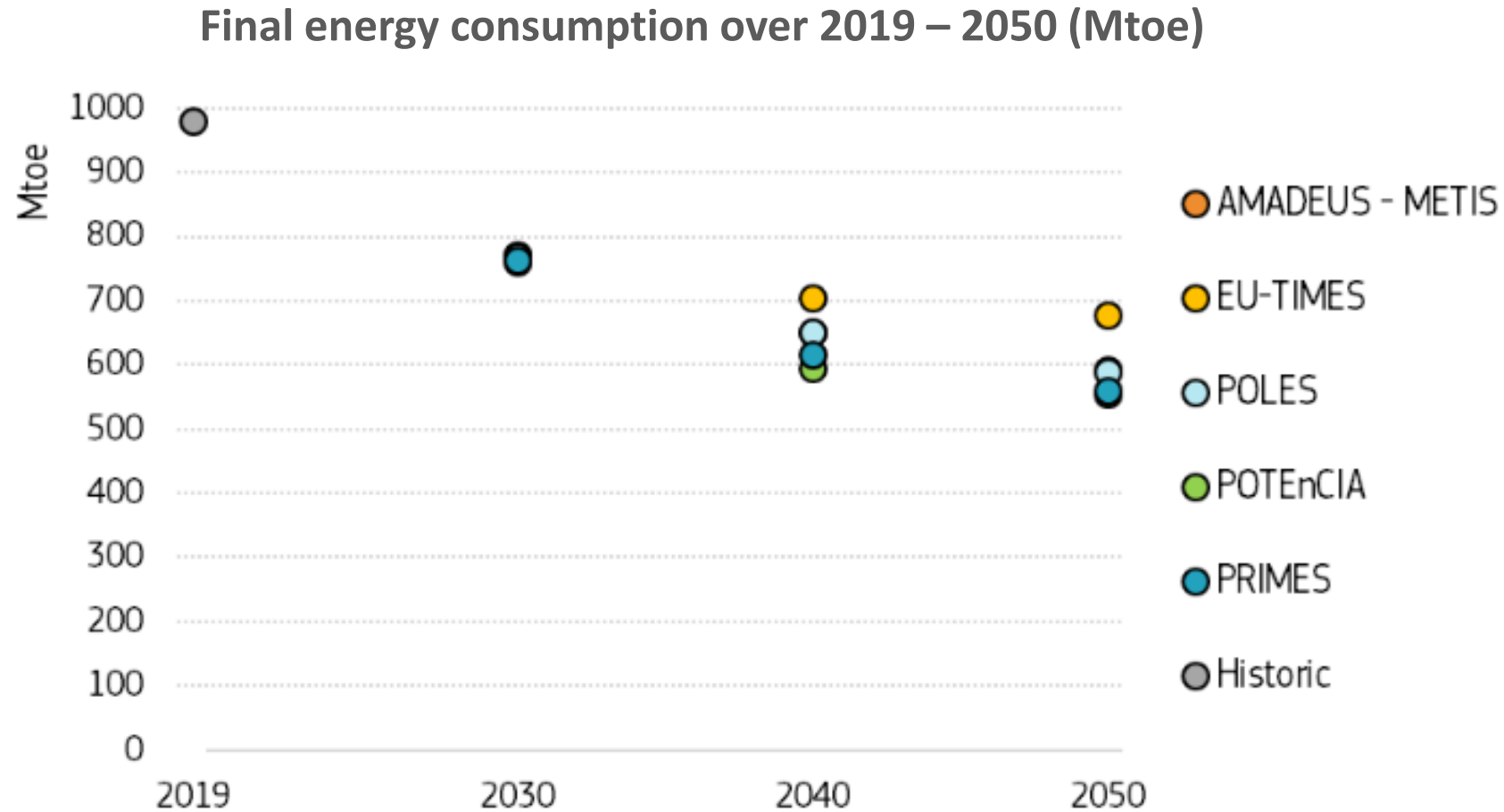
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# Carbon capture plays key role in achieving deep 2040 targets



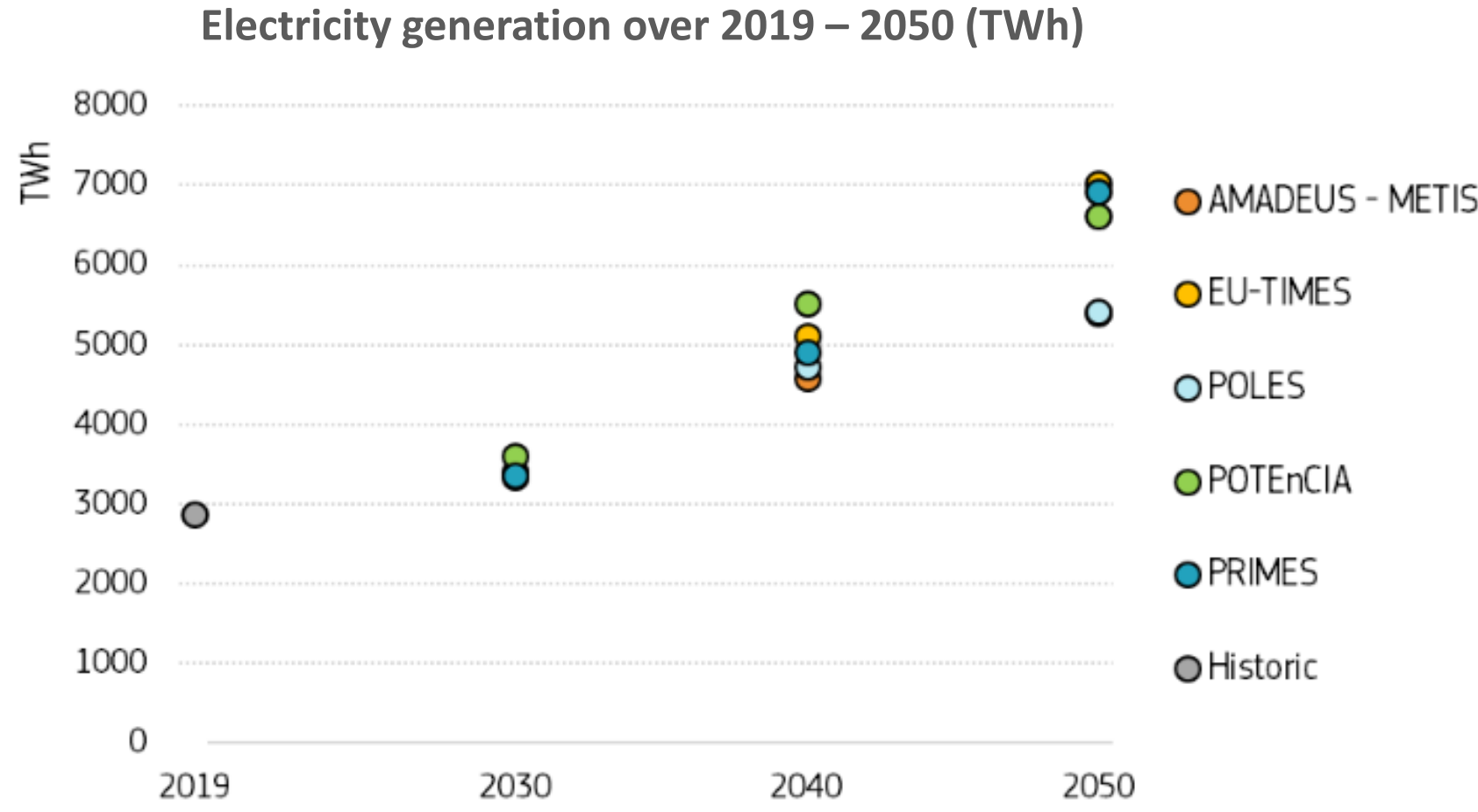
Source: 2040 target impact assessment, Annex 8, Figure 7

# FEC decreases massively, driven by electrification of end-uses



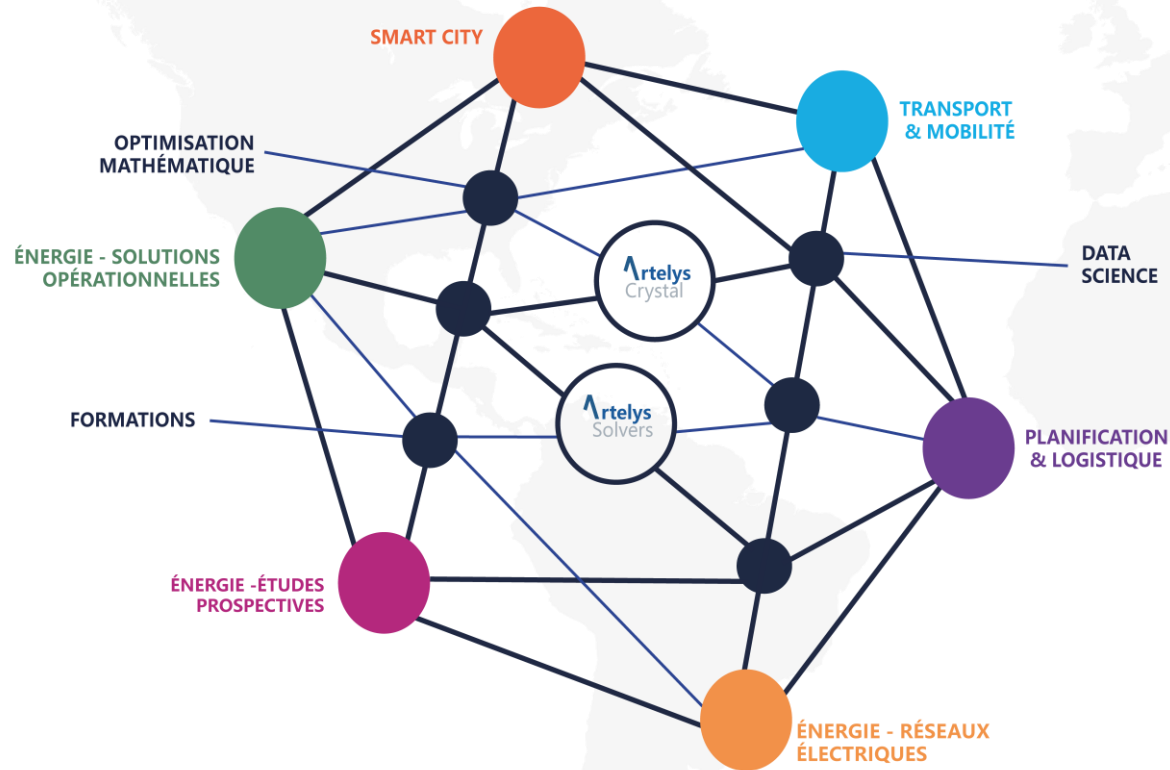
Source: 2040 target impact assessment, Annex 8, Figure 35

# Power production grows strongly, partly driven by e-fuels use



Source: 2040 target impact assessment, Annex 8, Figure 26

# Contact



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