Increasing Renewable Energy Integration in European Islands with Storage Stakes

A Case Study of Evia, Greece

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Outline

1. **Project Background**
2. **Focus and purpose of the study**
3. **Evia's energy system**
4. **Main results**
5. **Conclusions**

Project Goals

The main objective of the GIFT (Geographical Islands FlexibiliTy) project is to **decarbonise the energy mix of islands**.

1: Allow a high level of **local renewable energy** sources penetration

2: Provide visibility of the energy grid to better manage its **flexibility and plan its evolutions**

3: Develop **synergies** between the electricity, heating, cooling, water and, transport networks

4: **Reduce** the use of **hydrocarbon-based energies**

5: Ensure the **sustainability** of the solutions and their **replicability** in other islands

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Focus and purpose of the study

- Research questions
  - ➢Impact of storage systems to the island's self-sufficiency
  - ➢Impact of Renewable Energy Sources to the island's electricity exports / imports
- Focus
  - ➢Electricity sector
  - ➢Year : 2050

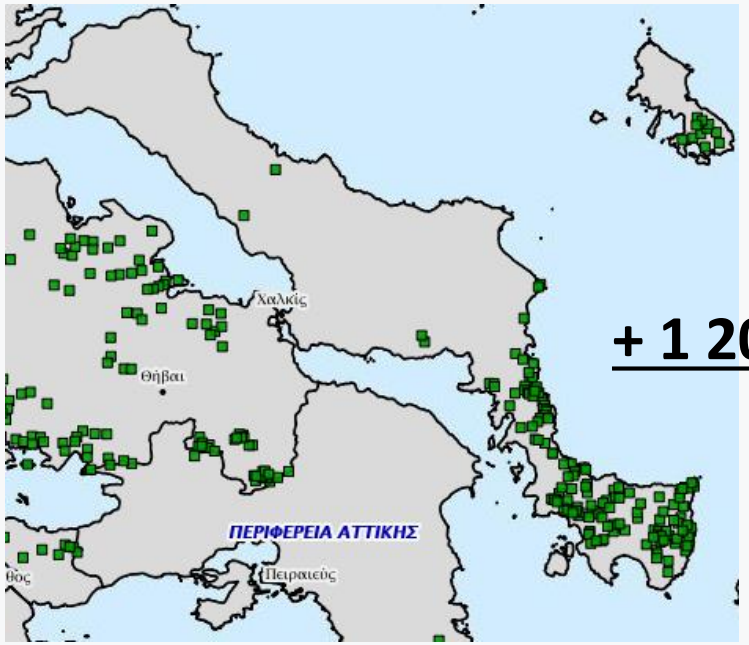
Evia – Follower island

Evia's Electric grid and interconnections
Source : ADMIE

- ❑ RES Plant

- Tranmission
- Distribution
- Submarine cable

Future
Interconnections



+ 1 200 MW

Installed and/or licensed RES plants, source : CRES

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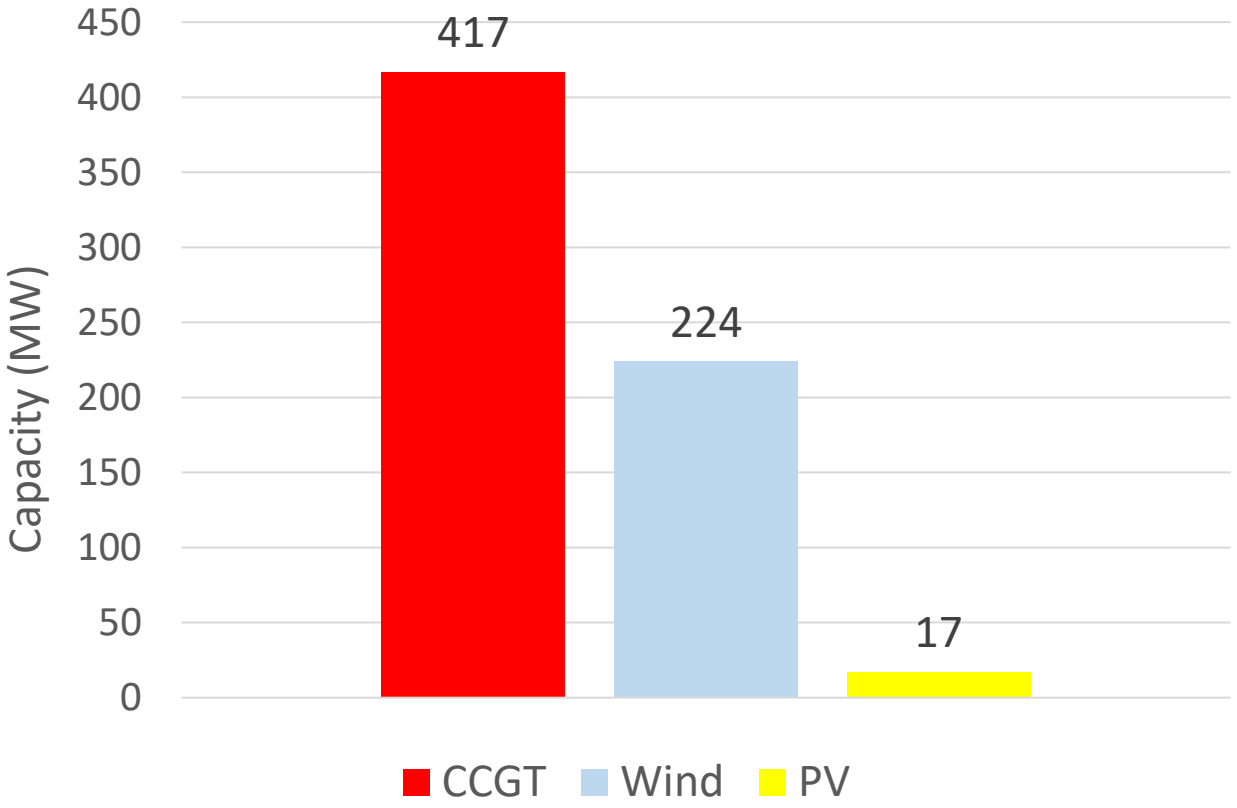
Evia – Energy Profile

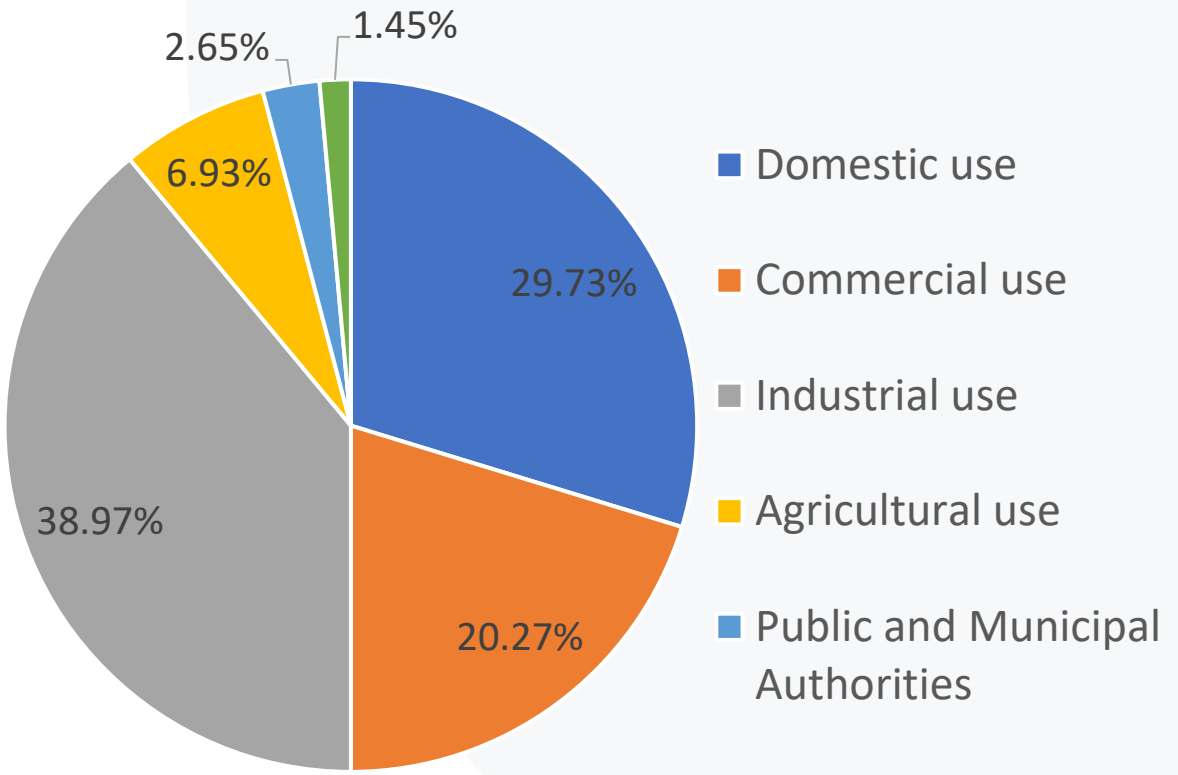
Electricity supply

656MW



Electricity consumption

1 380 GWh



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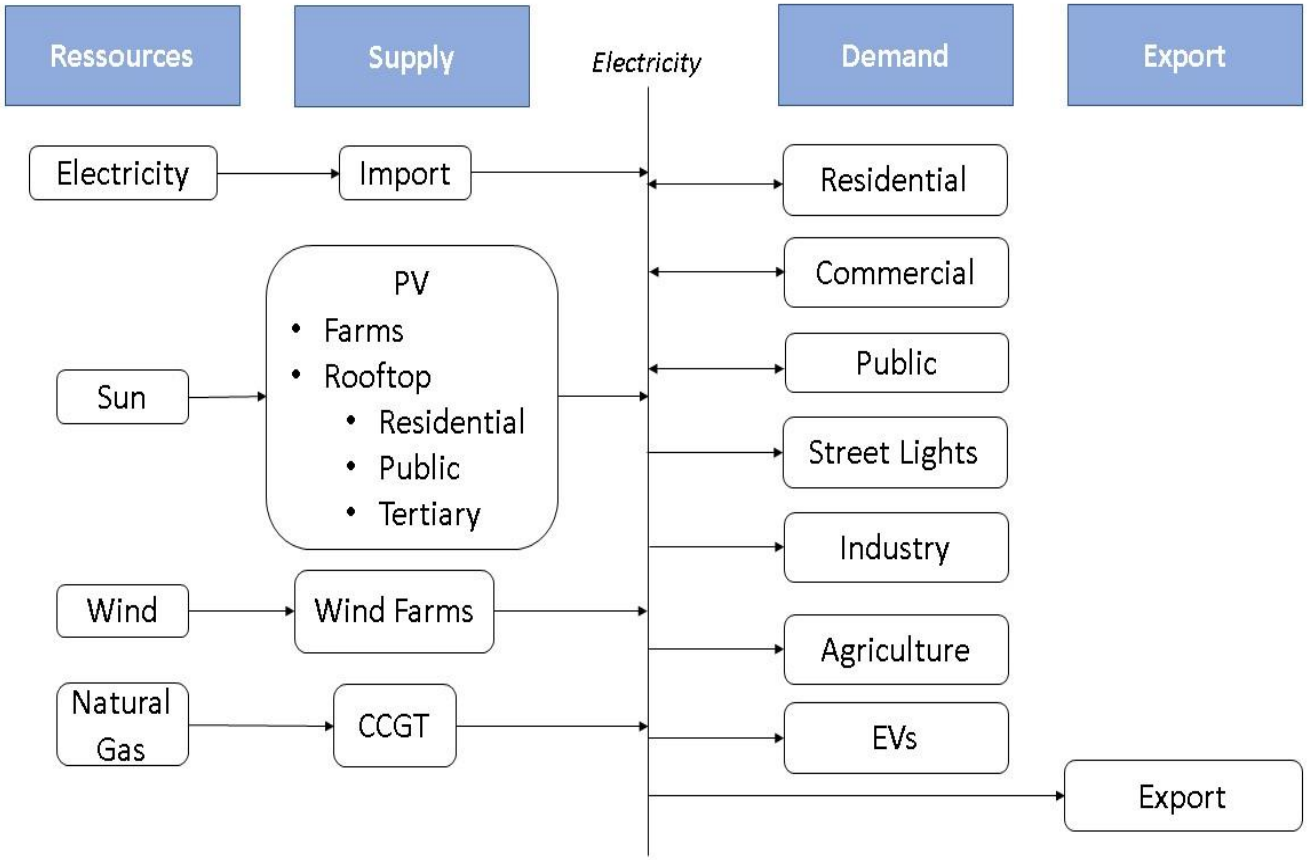
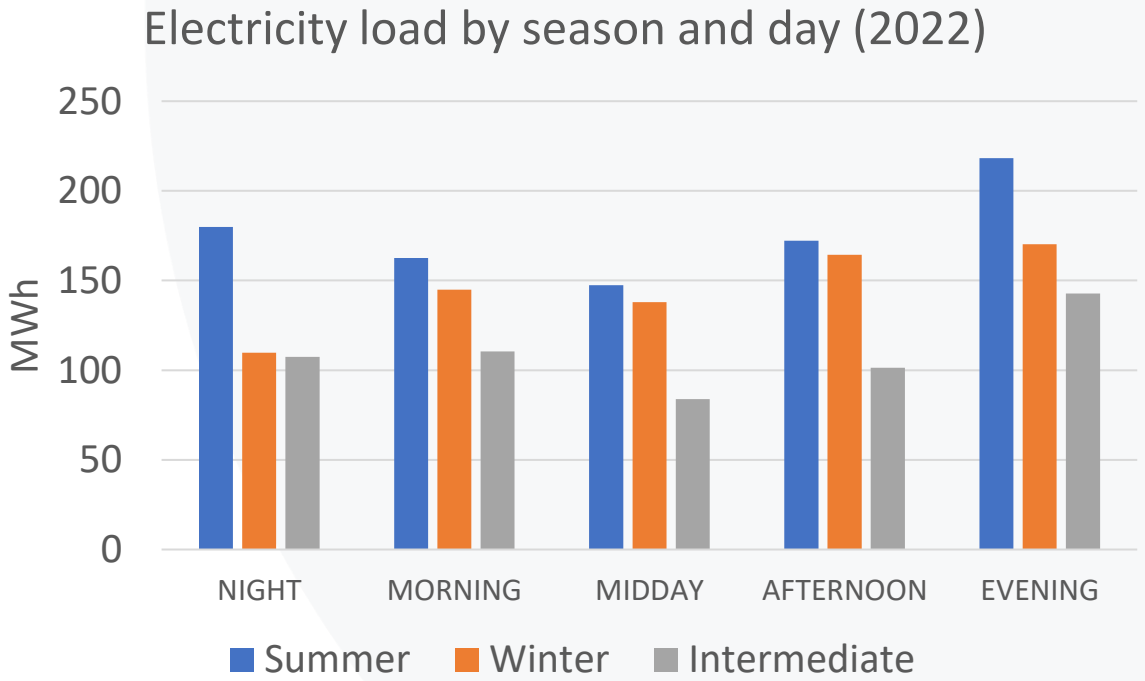
Modelling Framework





Reference energy system (RES) of TIMES - EVIA

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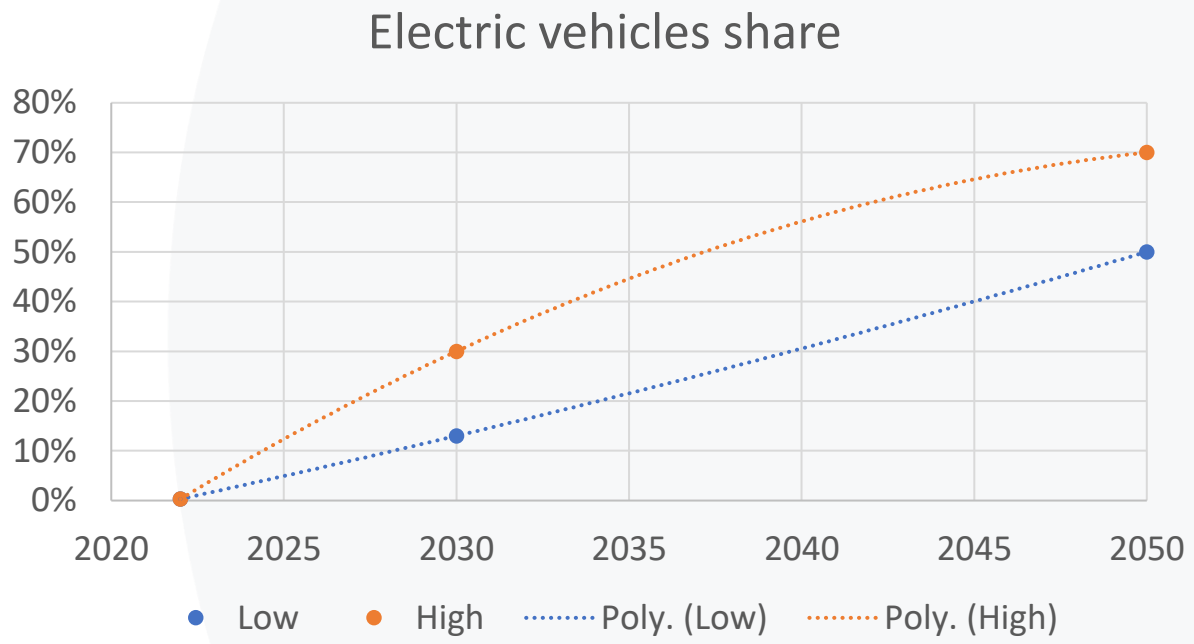
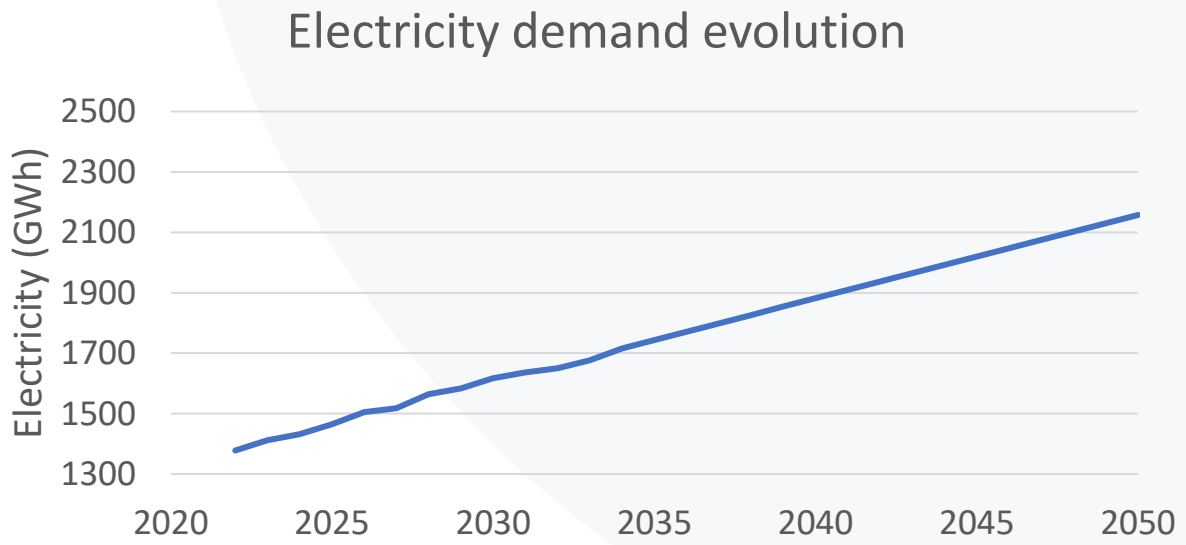
TIMES-EVIA Scenarios

Scenario Name	Description
BAU	Current policies Low demand EV.
LOW	Low renewables development scenario. Low demand EV.
HIGH	High renewables development scenario. High demand EV.
HIGH_STG	High renewables development scenario. Deployment of Storage technologies. High demand EV.





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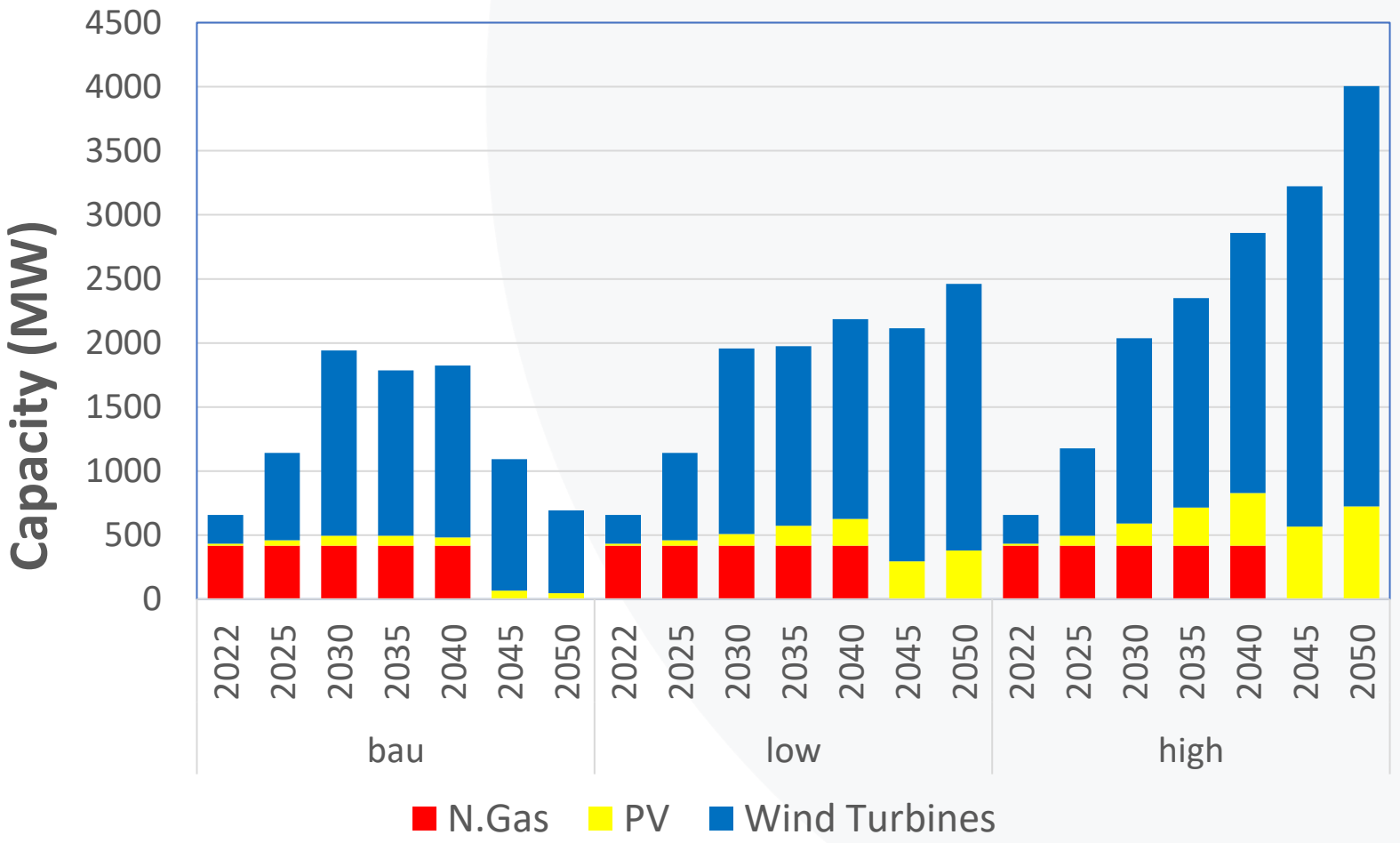
TIMES-EVIA RESULTS

System's capacity evolution

2040 : Phase out of n.gas plant

- **BAU** :
  - 1.5 GW RES in 2030
  - 700 MW in 2050
- **LOW in 2050 :**
  - 380 MW PV
  - 2 GW wind
- **HIGH in 2050 :**
  - 750 MW PV,
  - 3.28 GW wind



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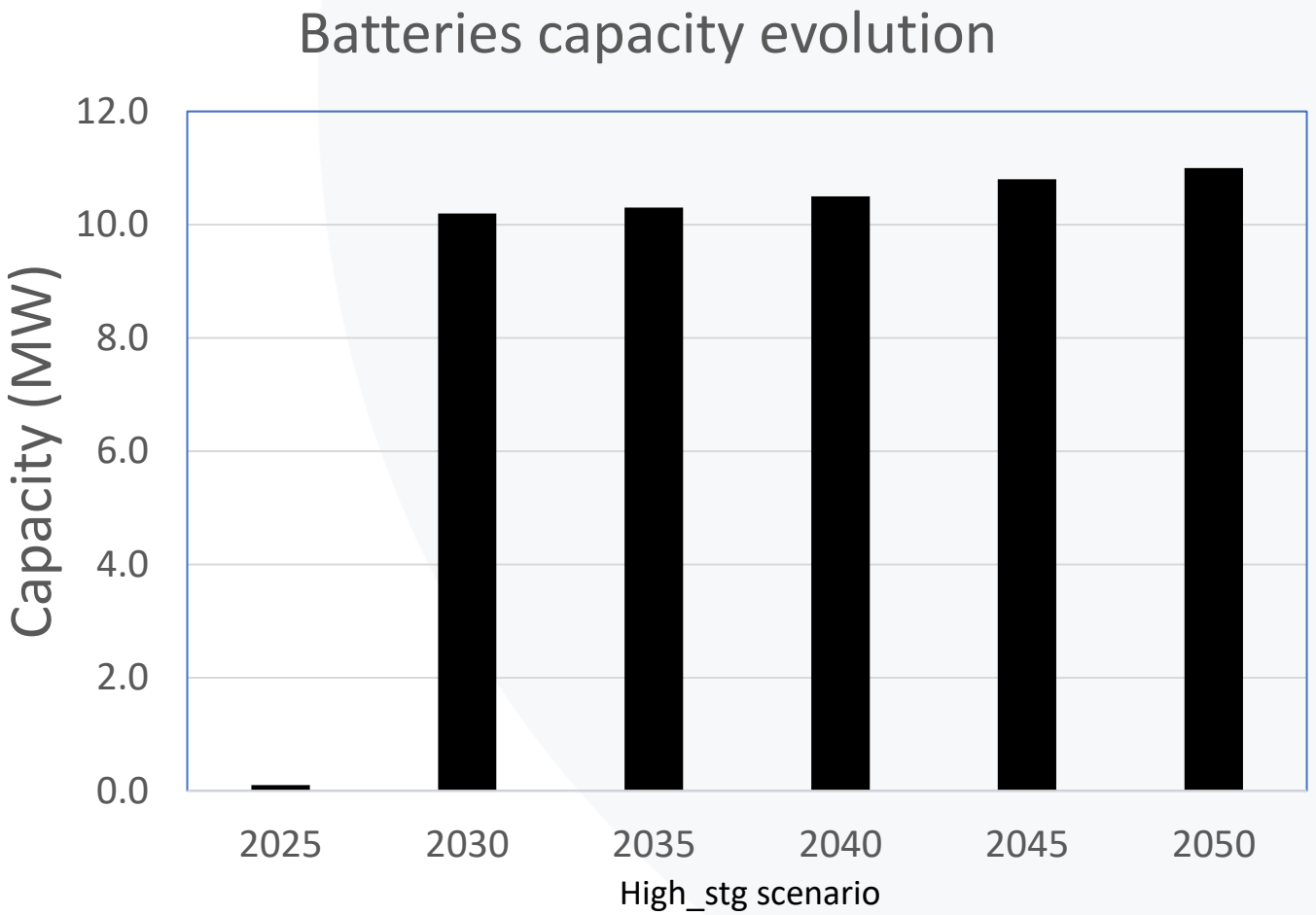
Storage systems

High_stg scenario

11 MW batteries

- 10 MW electric grid battery
- Building batteries
  - Residential : 0,8 MW
  - Tertiary : 0,15 MW
  - Public : 0,05 MW



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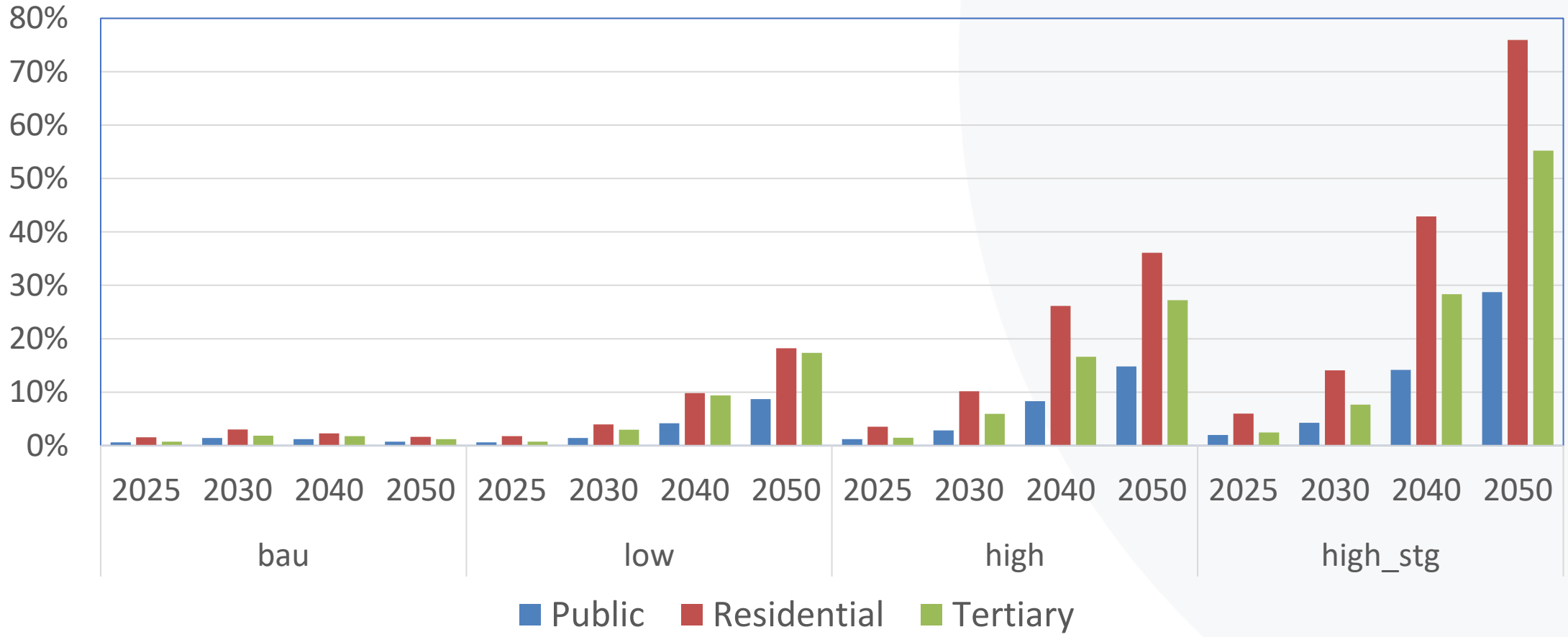
Electricity self-sufficiency by sector



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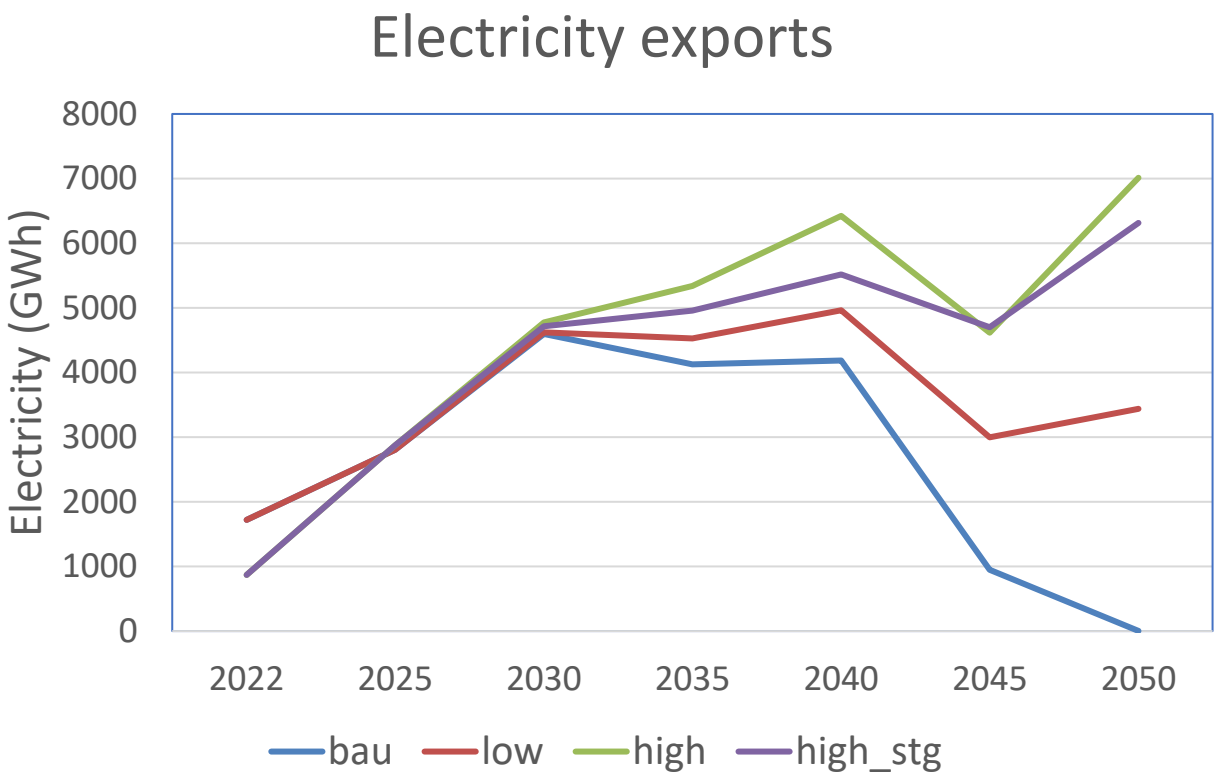
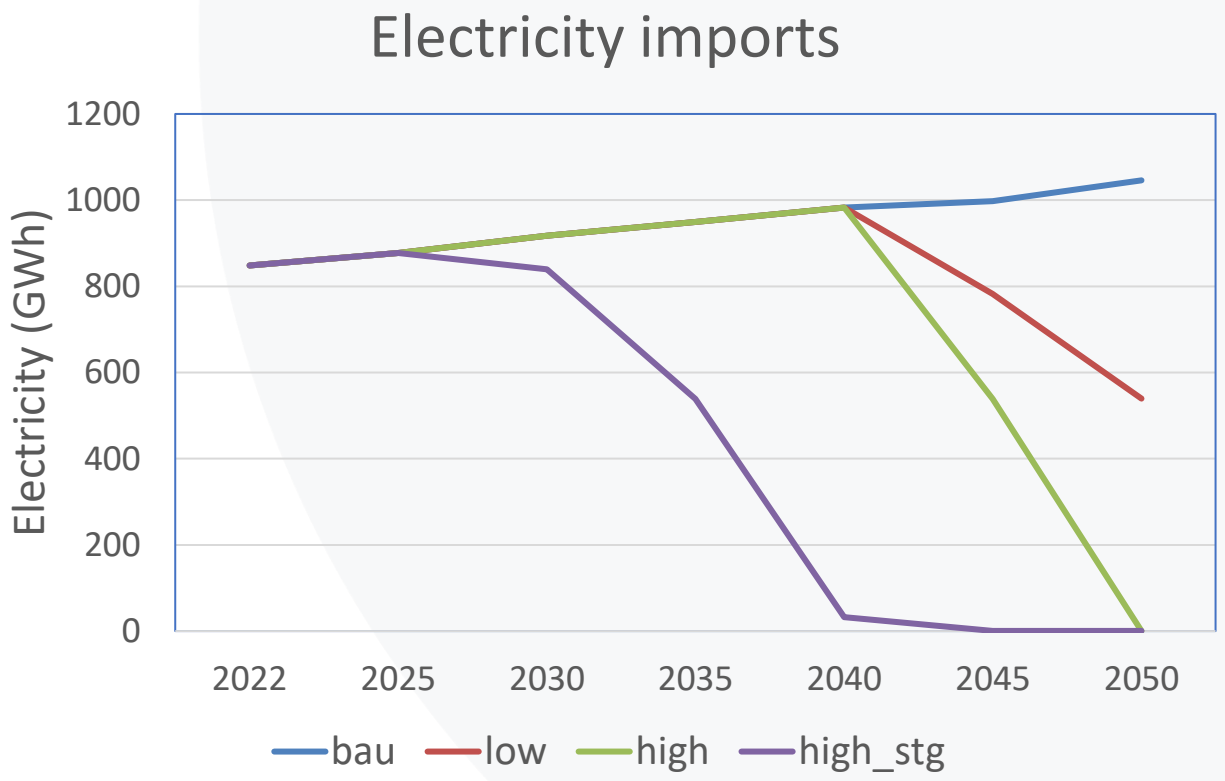
Electricity exports & imports





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Conclusions & Lessons learned

- Exploitation of wind potential can provide :
  - Significant quantities of electricity exports
- Storage integration can provide :
  - High shares of sectorial self-consumption
  - Less electricity imports

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Thank you for your attention !

Q&A

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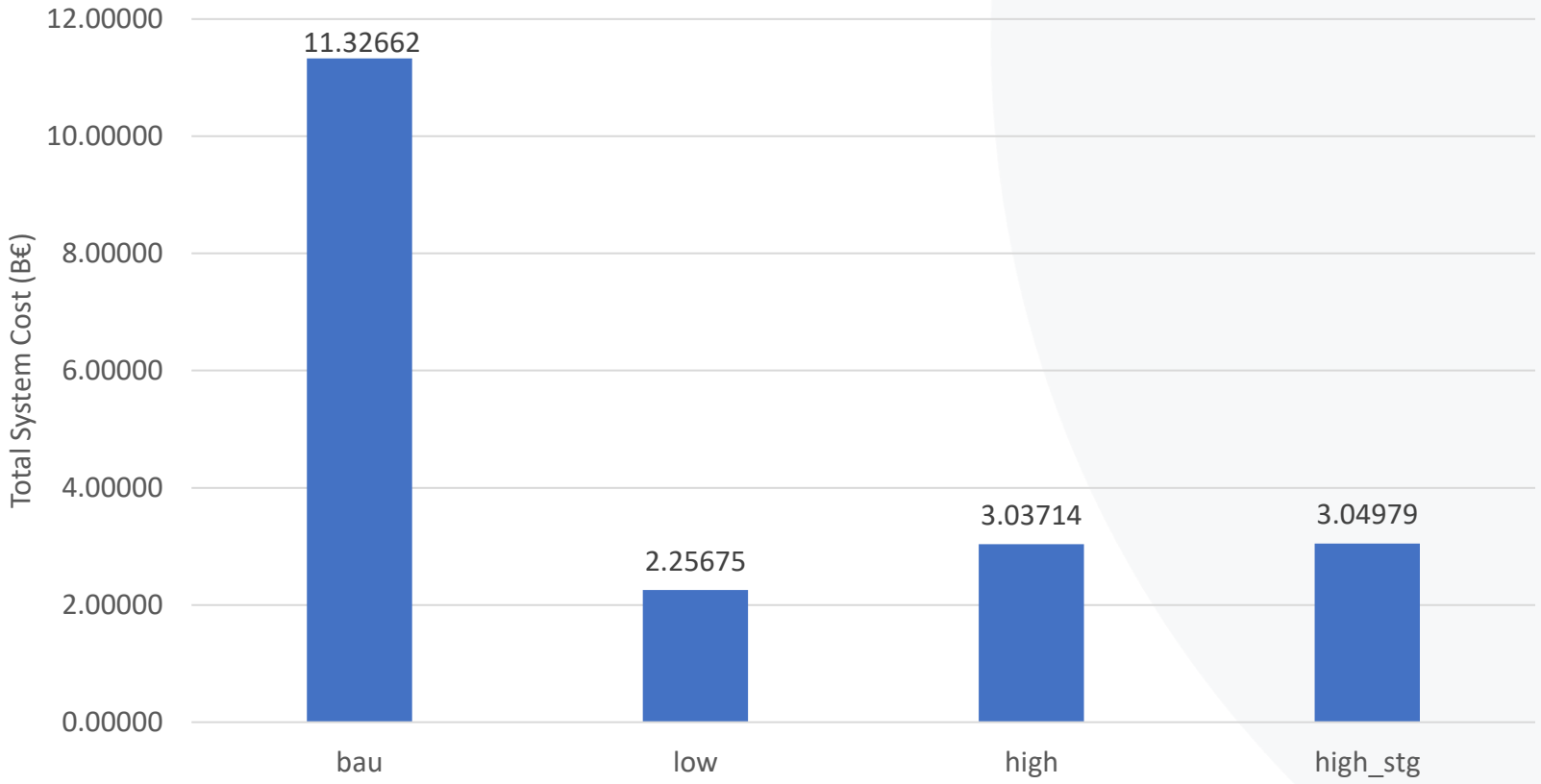
Annex

Total discounted system cost



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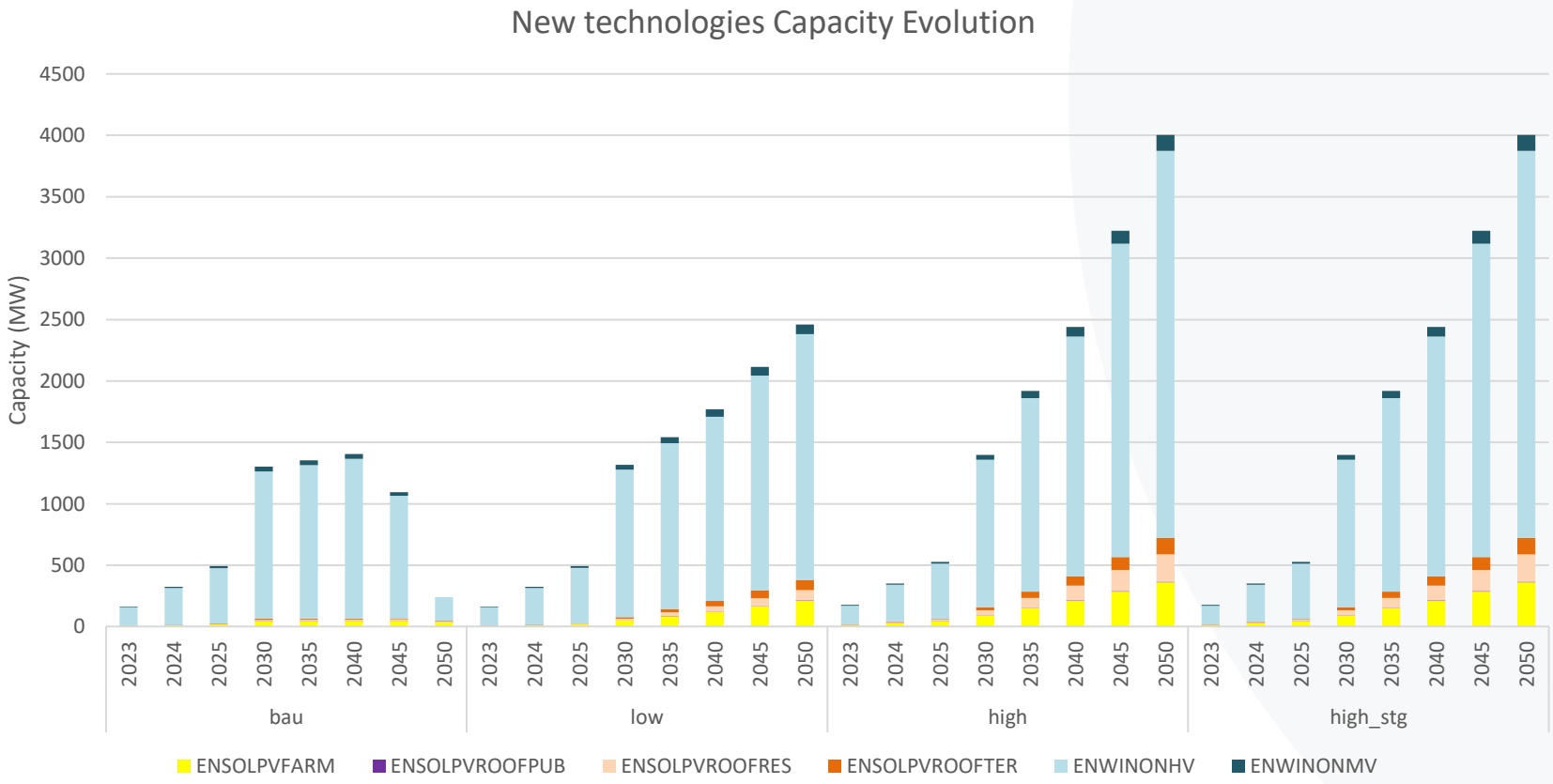

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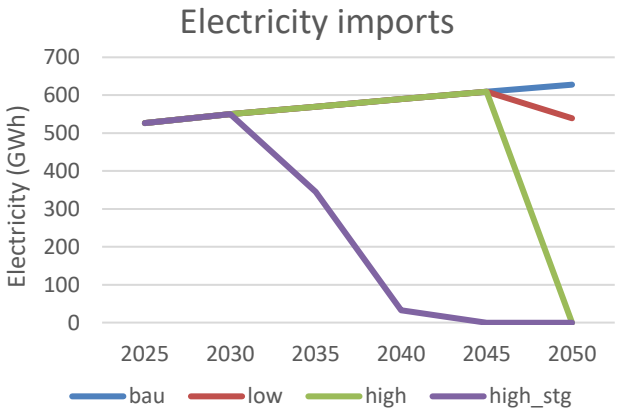
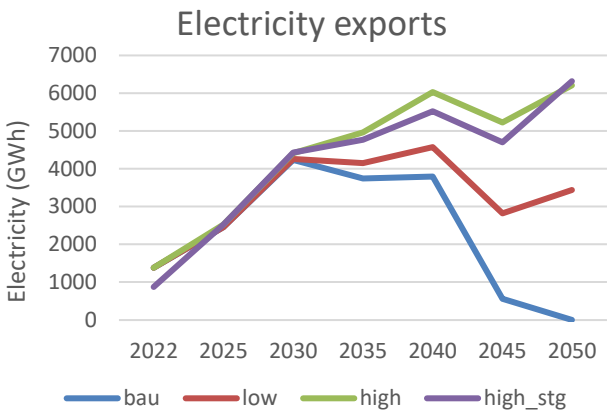
25% imports

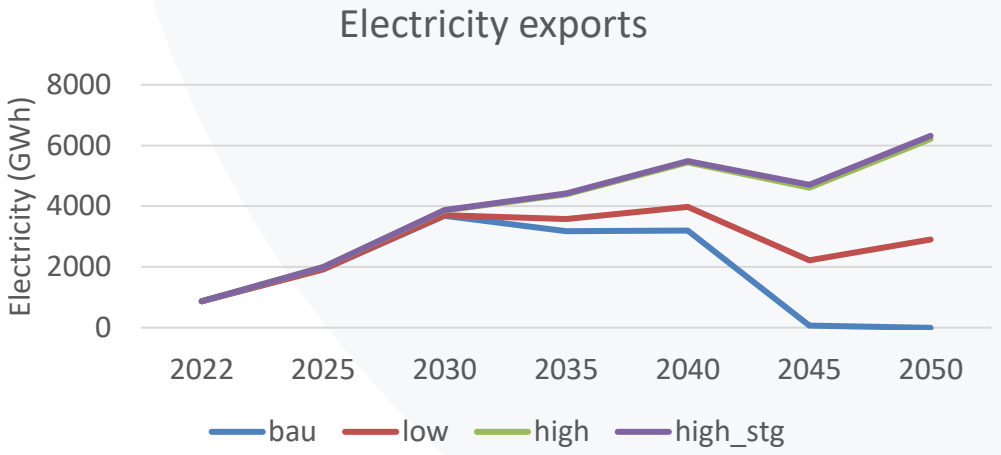
- BAU : Addition of 200 MW wind => + 3 b.Euro
- Low: same electricity exports
- High : -1000 GWh exports
- High stg: same electricity exports





0% imports

- BAU: Addition of 400 MW wind => + 9 b.Euro
- Low : -500 GWh exports
- High : -1000 GWh exports
- High stg : same electricity exports



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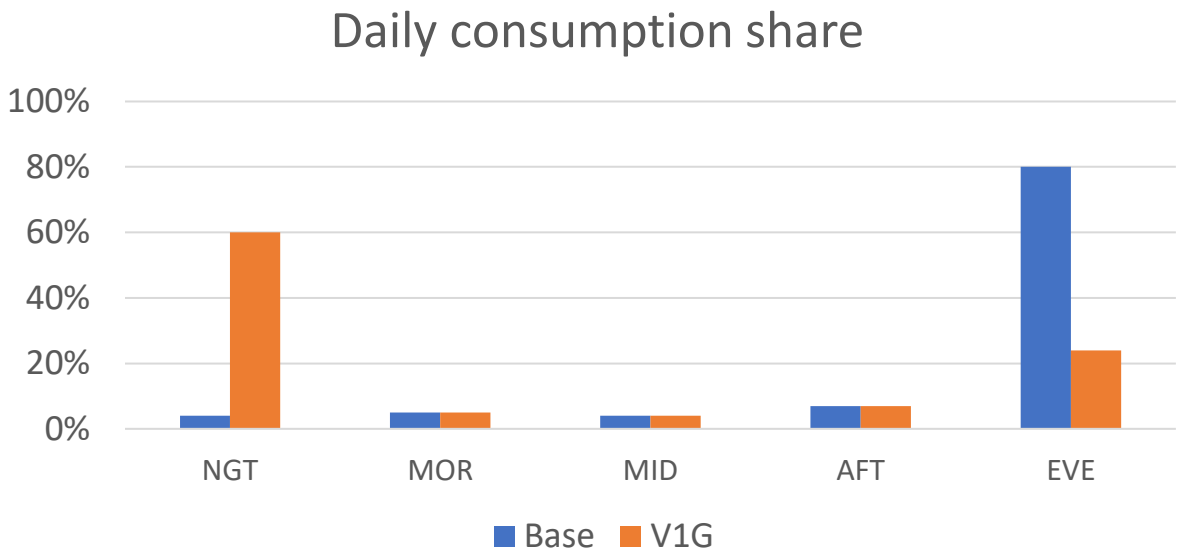
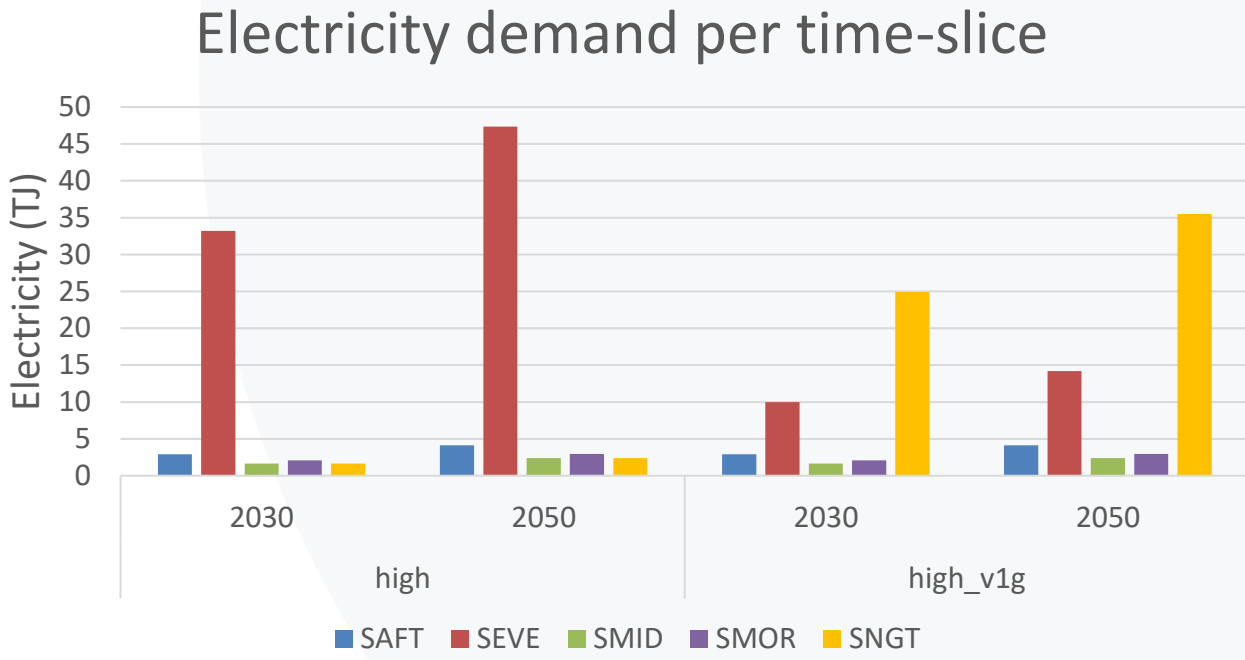
Modelling of EV charge demand



- Total fleet dimension
- Technical parameters
- Human behavior

Results



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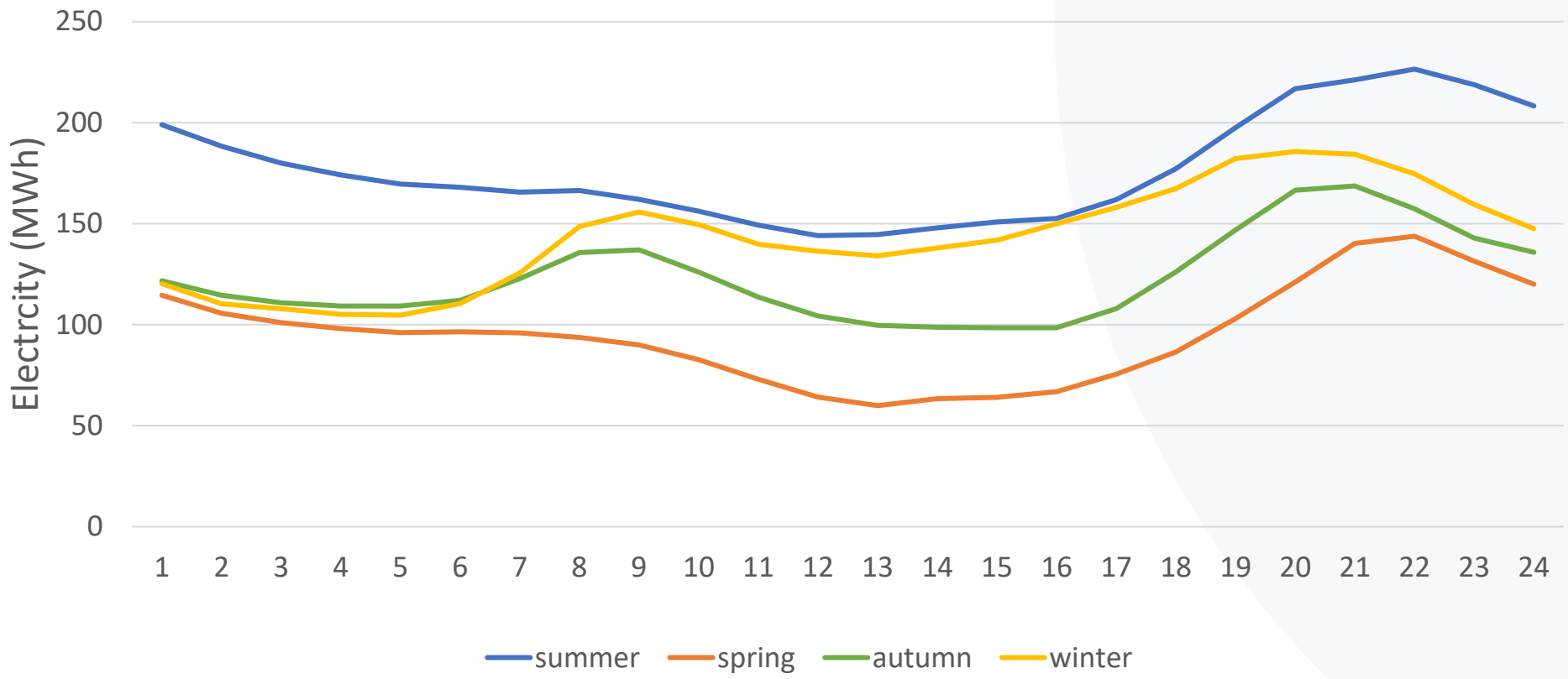
Load curve of Evia



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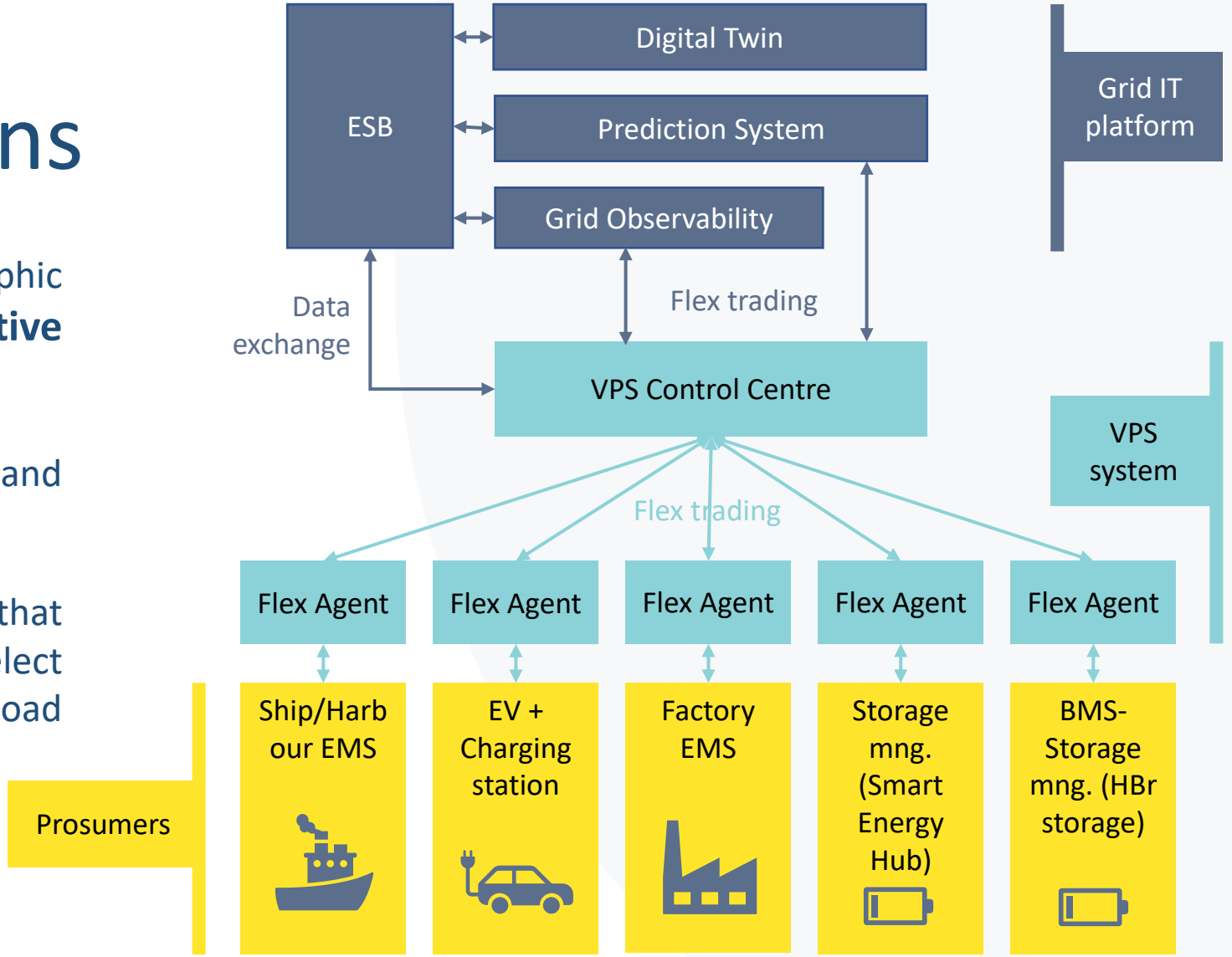
The project's solutions

- Grid IT platform for KPI visualisation, geographic visualisation, grid observability, **prospective modelling and long-term assessment.**
- VPS system, a decentralised automatic demand response trading platform
- Prosumers or smart energy consumers that postpone energy demanding tasks or select alternate sources for energy to reduce the load on the power grid, thus providing flexibility.



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