Three power sector scenarios for Greece in the aftermath of the Ukraine war

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Three power sector scenarios for Greece 2022-2040

Common targets

- Maintain green transition targets for 2030 and specific objectives for CO_2 emissions and Renewables in the power sector (upscaled compared to NECP of 2019)

(GAS) NECP (Business as usual NECP) scenario

- Phase-out of all lignite plants after 2023
- Conversion of Ptolemaida 5 to gas to operate from 2025 onwards
- Mytilinaios' CCGT in 2022 and one additional large-scale CCGT in 2025

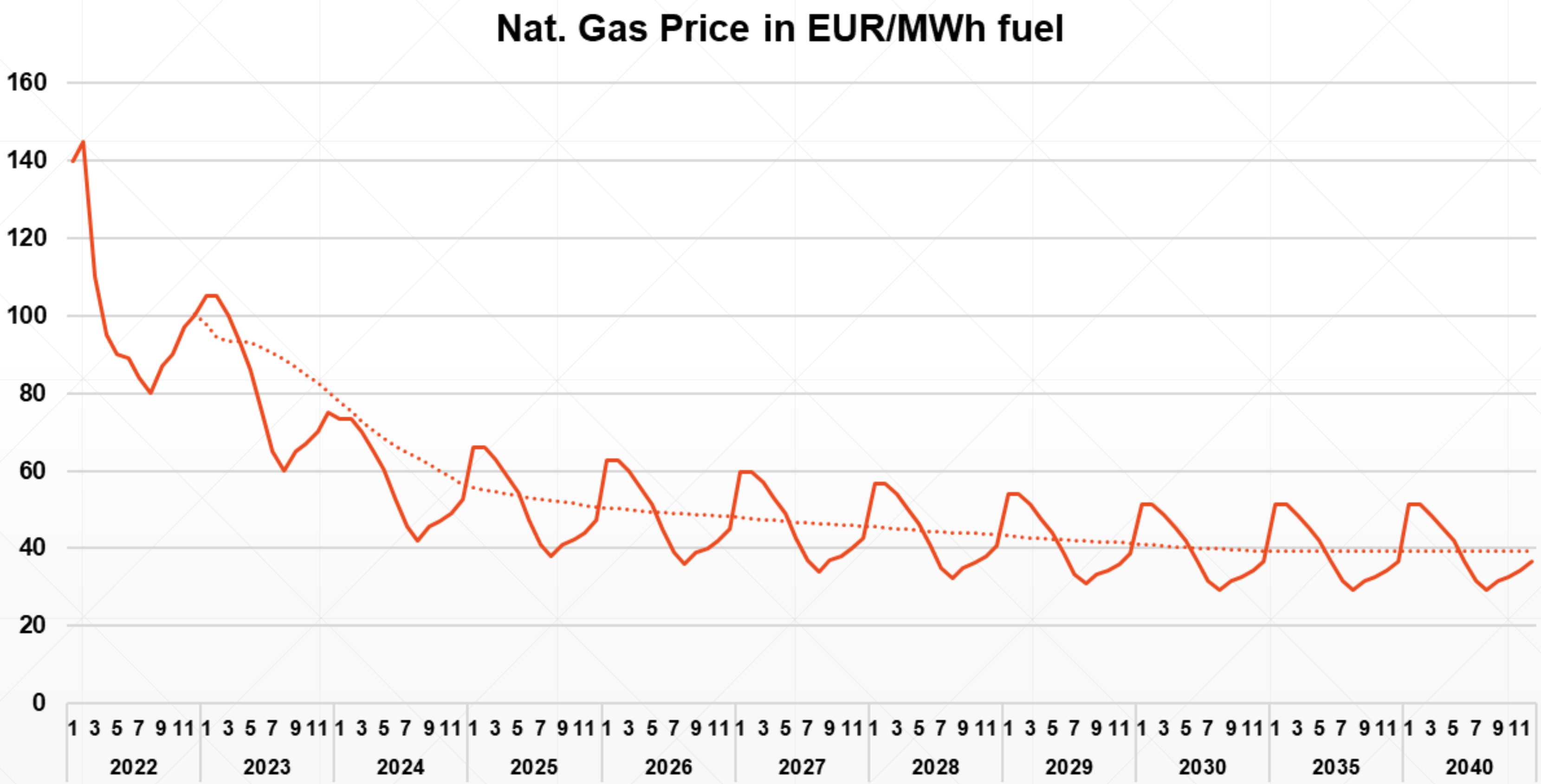
Adjusted **Plan** and Revised **Plan** scenarios

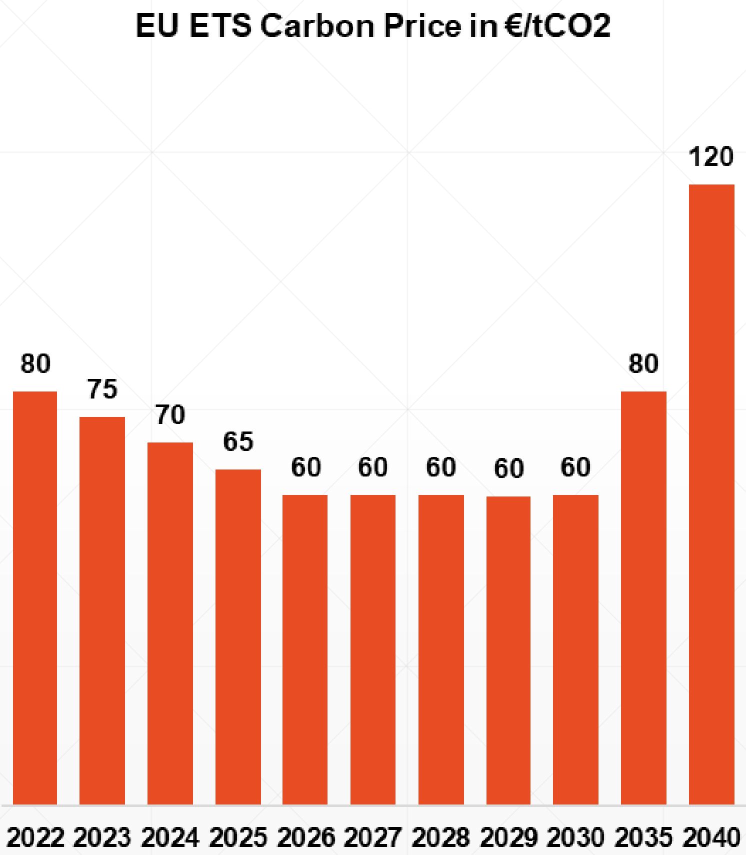
- Reduce dependence on natural gas and Russian energy imports
  - Moderately in the **Adjusted Plan**
  - More in the **Revised Plan**
- Prolong the operation of some of the lignite plants after 2023
  - **Adjusted Plan**: Only for Ag. Dimitrios 5 and Meliti
  - **Revised Plan**: All 5 units of Ag. Dimitrios, Meliti and Megalopoli 4
- Maintain Ptolemaida 5 as lignite plant and convert to gas after 2030 (both scenarios)
- Mytilinaios new CCGT plant in 2022
  - **Adjusted Plan**: One additional CCGT in 2026
  - **Revised Plan**: One additional CCGT after 2030

Assumptions

- Gas prices from >100 €/MWh in 2022, 80 in 2023 and 60 in 2024, stabilizes between 40 and 50 €/MWh after 2024
- ETS prices stabilize at 60-80 €/tCO_2 until 2030 but escalates after 2030
- Full interconnection of islands completed before 2030
- Demand for electricity increased due to electrification and after 2030 also due to green hydrogen
- RES development revised from NECP of 2019 to reflect current trends, such as higher growth paces of solar PV compared to onshore wind, reaching 20GW in 2030, in addition to large hydro
- Battery and pumping storage reach 5GW in 2030

Price scenario

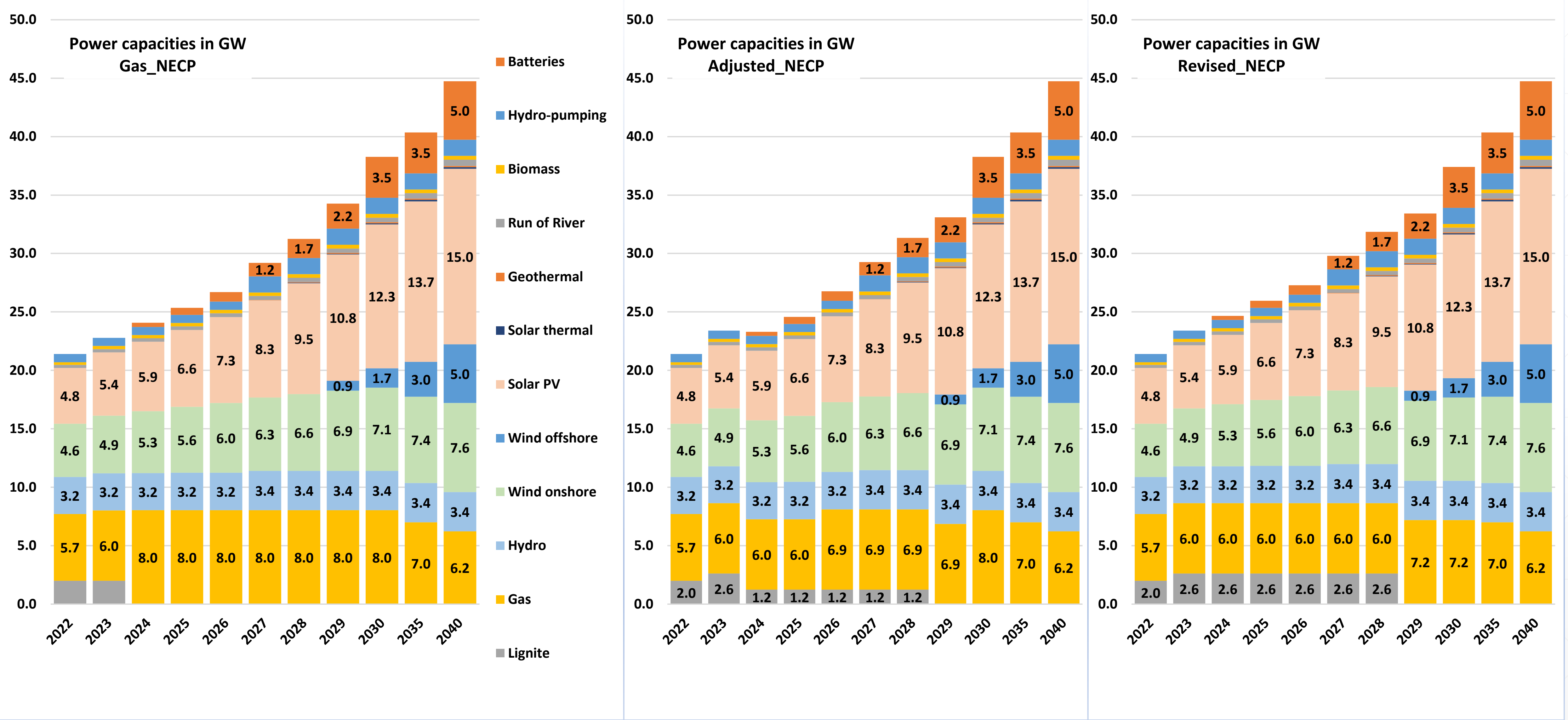




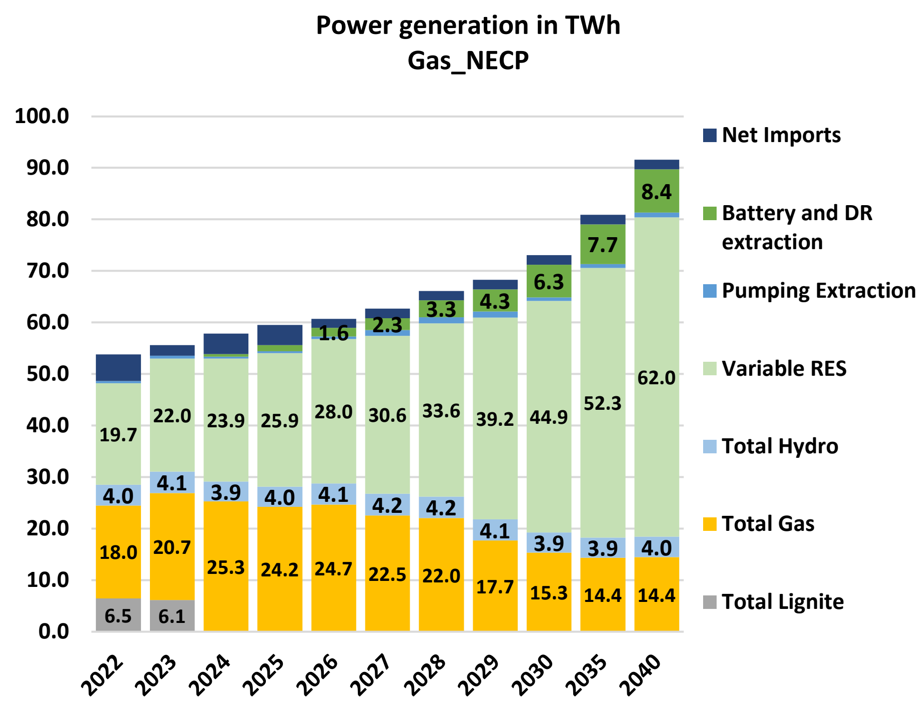
Brief description of the modelling PRIMES model – Unit commitment model

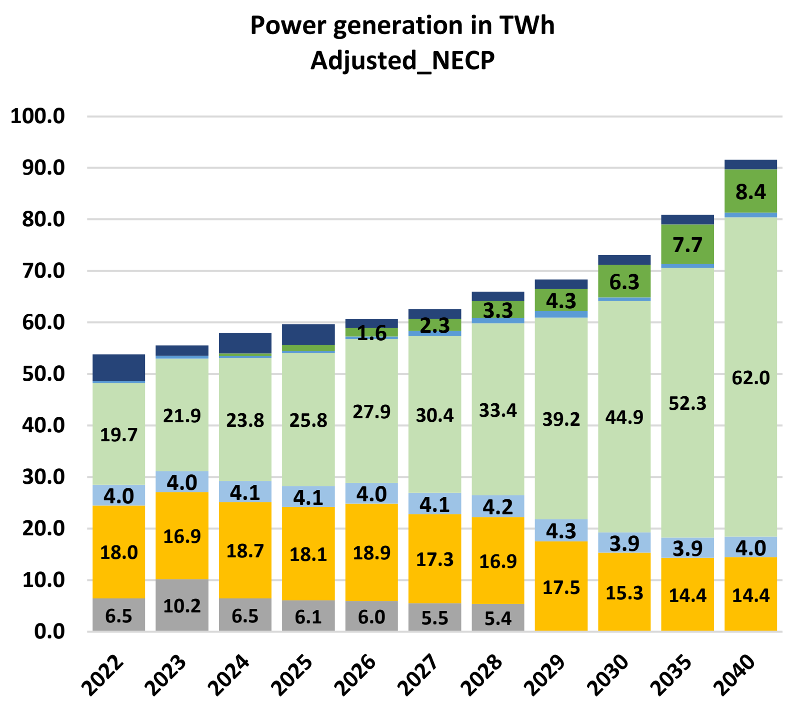
- The simulation minimizes total system costs by considering variable costs of all plants and mark-up bidding at scarcity times
- Merit order, reserve and balancing are co-optimised
- The simulation respects technical constraints and respects all reliability and reserve criteria
- Balancing and flexibility are endogenously met including for storage facilities
- Wholesale market costs include Day Ahead costs, Balancing and ancillary services costs.
- Market clearing prices are endogenous

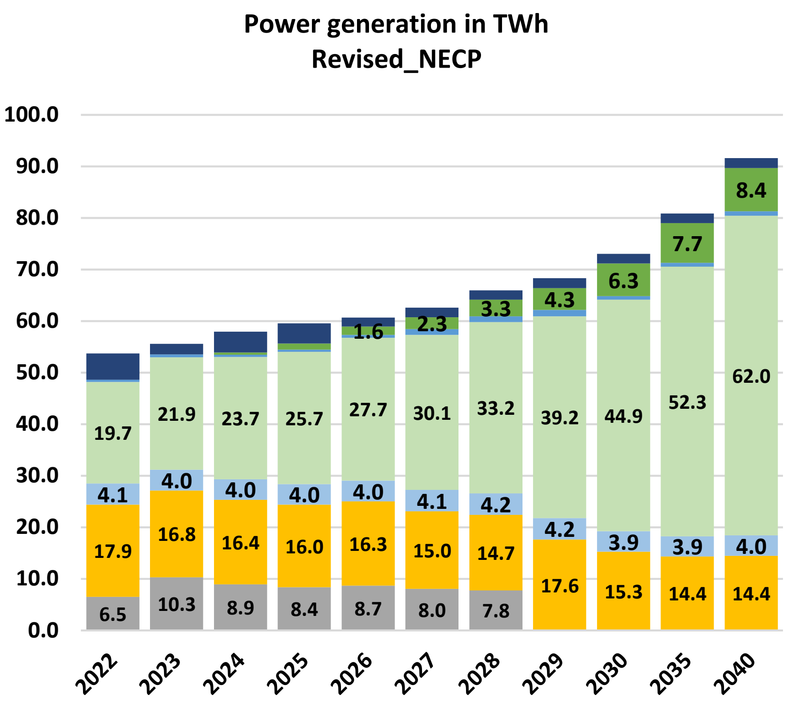
Power generation capacities

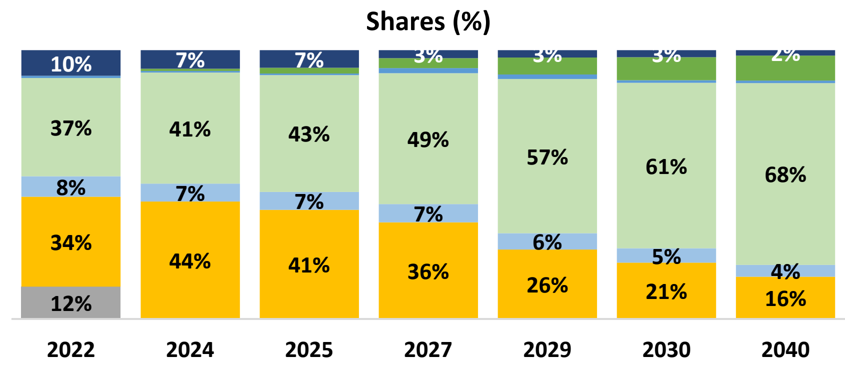


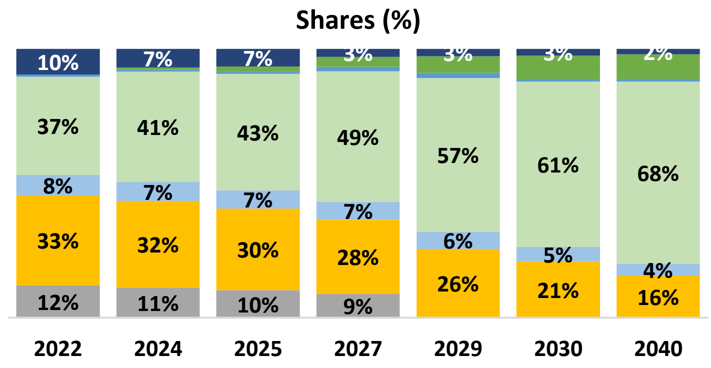
Power generation by source

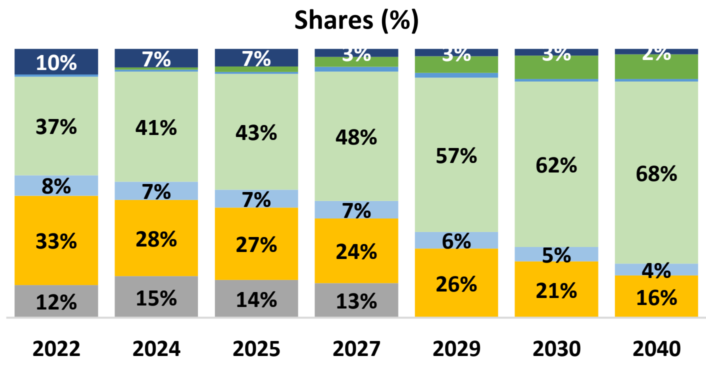




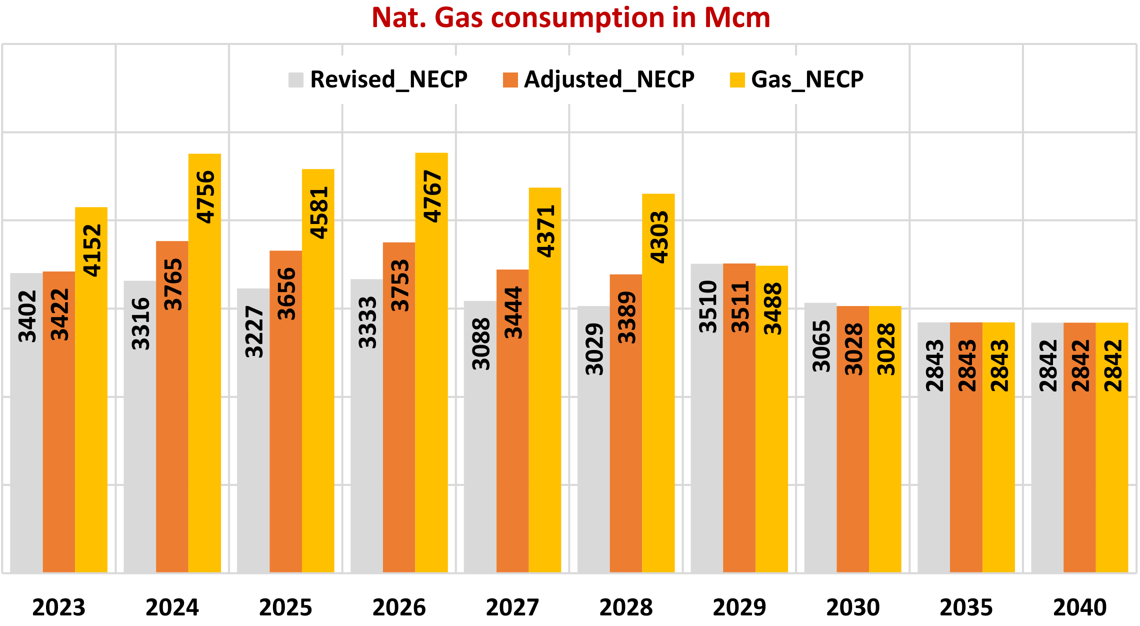


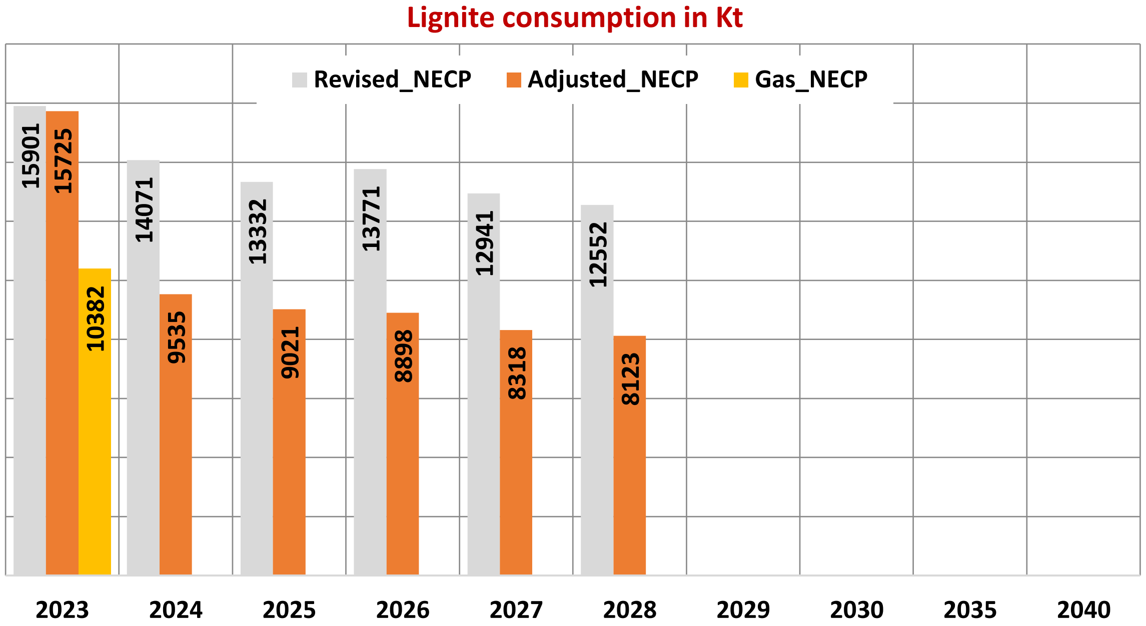


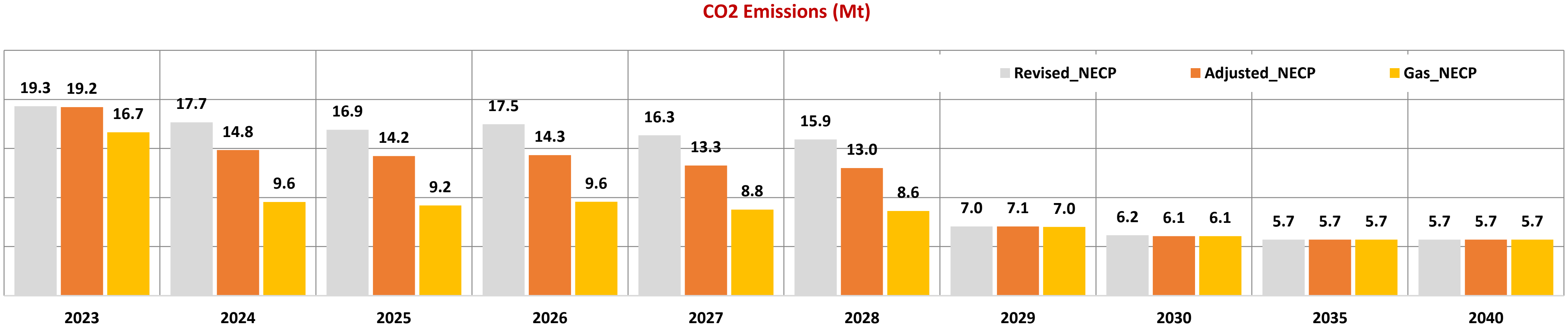




Fuel consumption

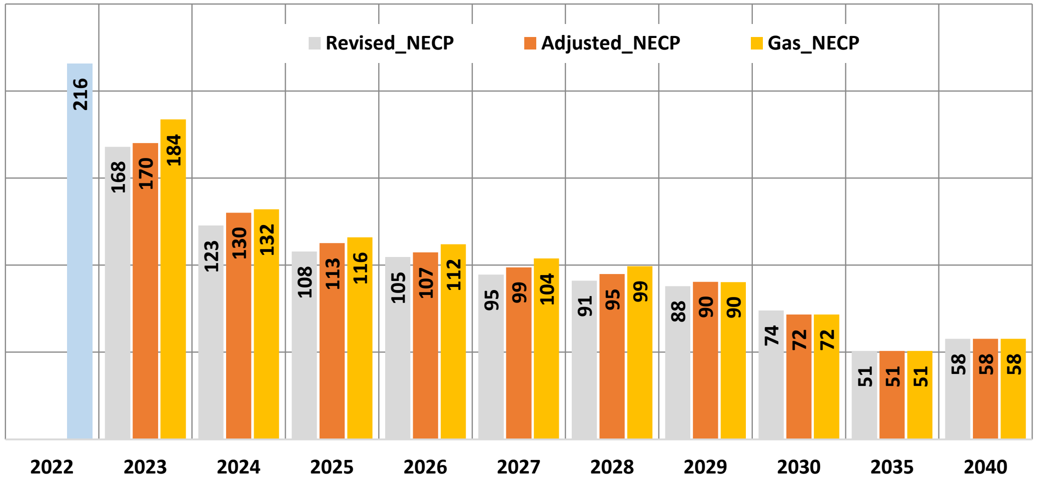




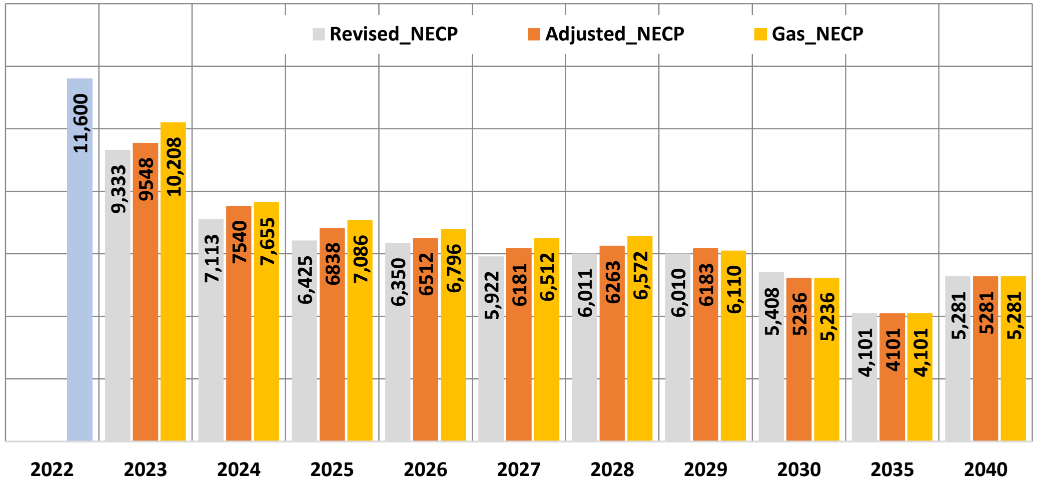


Wholesale market costs

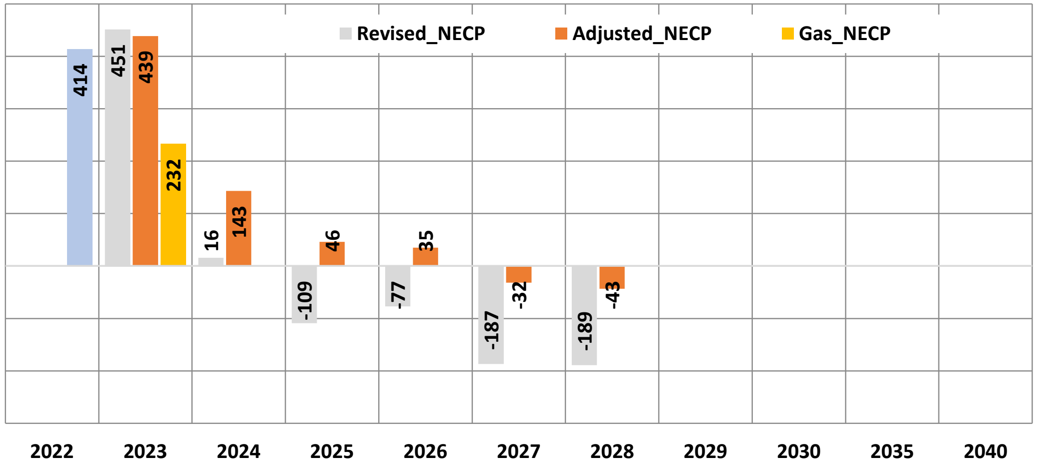
Wholesale market price of electricity
(€'2020/MWh)



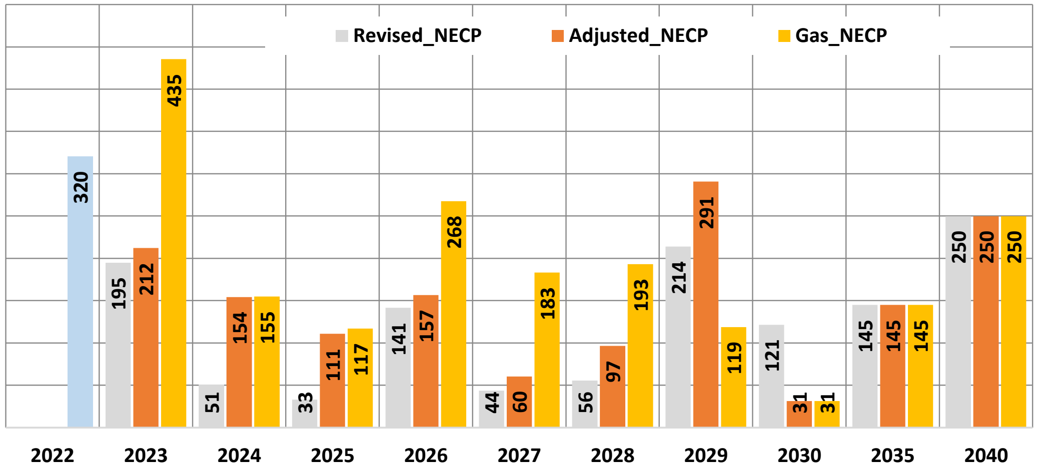
Wholesale market turnover
(m€'2020)



Earnings of lignite plants =
Revenues from Wholesale minus all operation costs (m€'2020)



Earnings of nat. gas plants =
Revenues from Wholesale minus all operation costs (m€'2020)



Summary

All plan variants respect the 2028 termination milestone for lignite

The Adjusted and Revised plans maintain the new lignite plant in operation until 2028 and prolong operation of some of the lignite plants after 2023

Both the Adjusted and the Revised NECP scenario succeed not to increase gas consumption

Total renewables attain shares close to 70% from 2030 onwards, the solar PV exhibiting the fastest growth pace

CO_2 emissions from power generation significantly increase in the Revised and Adjusted Plan compared to the Gas NECP

All scenarios respect the same CO_2 target for 2030

Both the Adjusted and Revised plans reduce wholesale market clearing prices compared to the Gas NECP in the years 2023 to 2028

The lignite plants incur negative earnings from 2024 onwards

The earnings of new gas plants are positive but lower than the Gas NECP in both the Revised and the Adjusted Plans