Green deal and carbon neutrality assessment of Czechia

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Motivation

- What is the impact of Fit for 55 package on Czechia?
- Can Czechia achieve climate neutrality on its own?

Tento projekt je spolufinancován se státní podporou Technologické agentury ČR a Ministerstva životního prostředí v rámci Programu Prostředí pro život.
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Modelling suite

TIMES-CZ

- energy system cost optimization model
- covers the entire energy balance of the Czech Republic
- based on the IEA‘s model generator, used by several EU countries
- optimises the entire energy system → aims at the combination of technologies and fuels that meets the demand for energy services at the lowest total costs
- current horizon until 2050

E3ME

- a macro-econometric model based on post-Keynesian economic theory
- regularly used for policy impact analysis by the European Commission and its services
- allows quantification of impacts on key macroeconomic variables (GDP, employment, consumption, foreign trade, energy use)

extensive model suite consisting of sectoral (PRIMES, PRIMES-TREMOVE, CAPRI, GLOBIOM) and macroecon-models (JRC-GEM-E3, E3ME, E-QUEST)

Scenarios

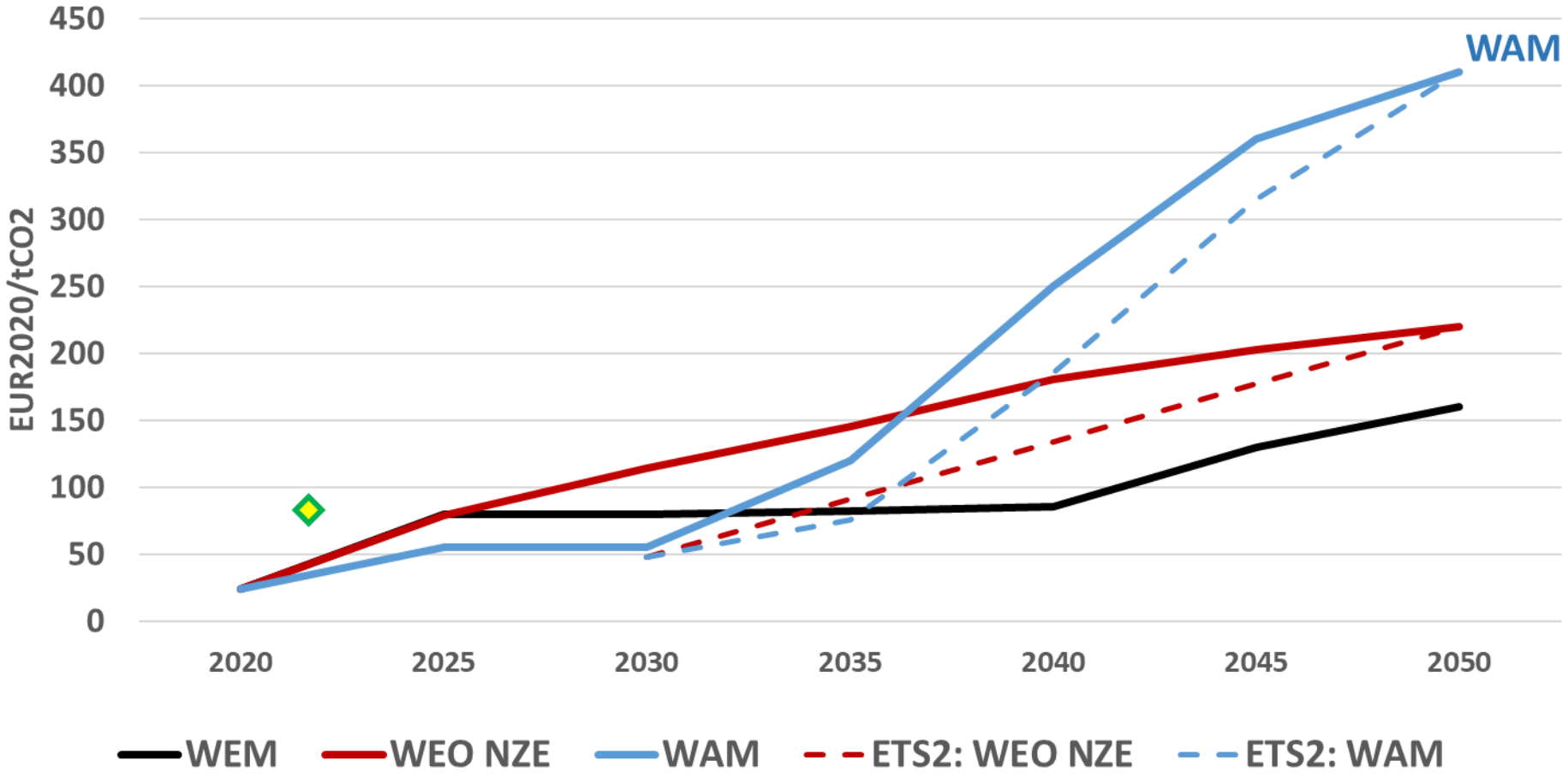
BAU (Business As Usual, „Ref.“ in TIMES)

- ✓ expected development of the economy
- ✓ already implemented measures (4th phase EU ETS)

Policy (counter-factual) scenarios, (**Fit-for-55**)

- **Revised ETS, ETS2** (2026+), **ESR**
  - *(exogenous)* ***price of EUA****: WEM, WEO-NZE, WAM*
  - *(exogenous) carbon emission* ***reduction target***
- **CBAM** *(NACE 2-digits)*
- **Revenue-recycling (→** ***macroeconomic modelling – impacts on GDP, employment, etc.*****)**
- **No import of Hydrogen**

EUA price trajectories (ETS1/ETS2)



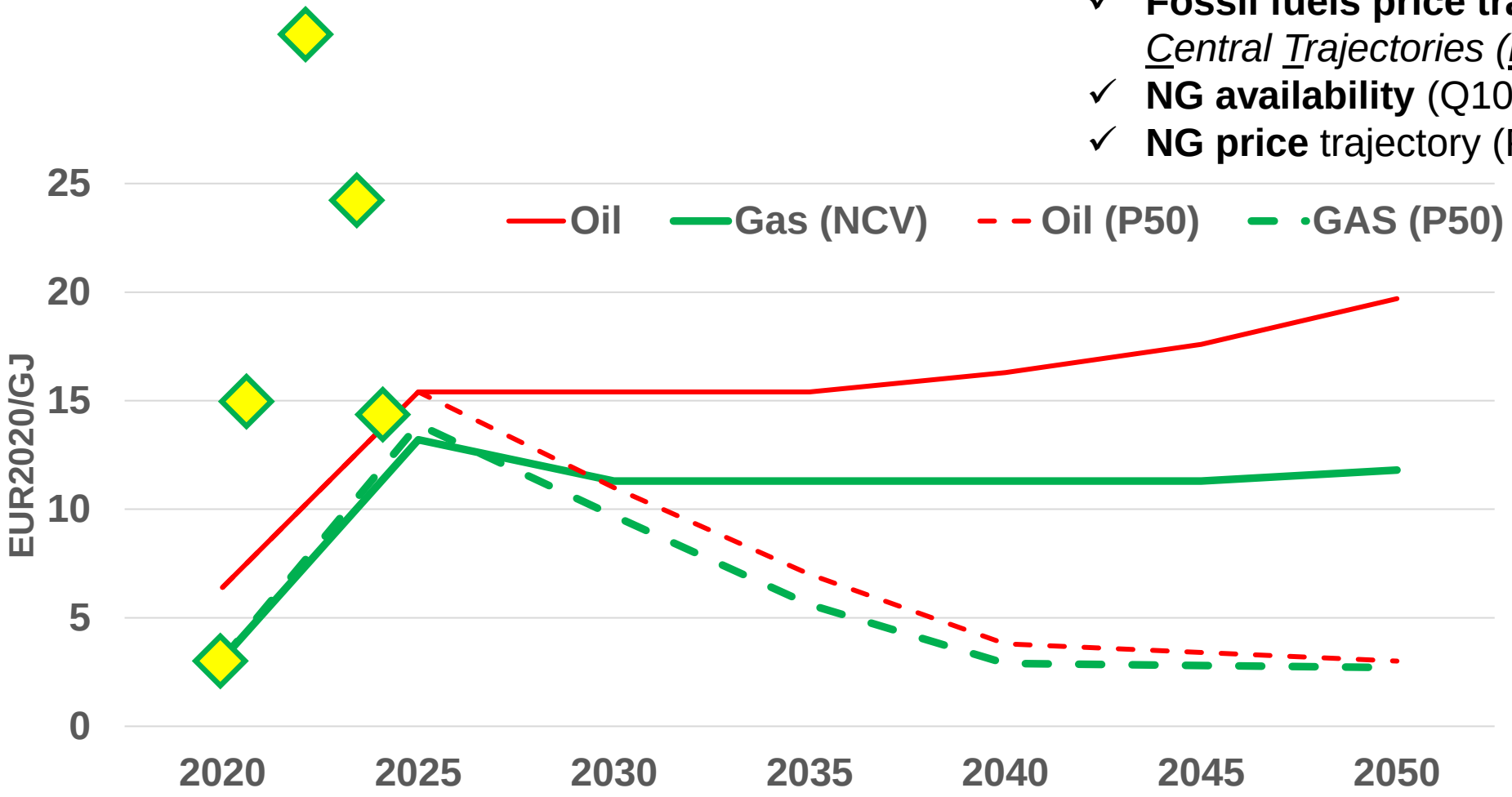
HCT – DG CLIMA‘s recommended parameters for GHG projections reporting in 2023

NZE – IEA‘s Net Zero Emission pathway

Fossil fuel price trajectories

reflection of Russia's war in Ukraine →
embargo on Russian imports

- ✓ **Fossil fuels price trajectory:** *Harmonized Central Trajectories (**HCT**:* EC 2022)
- ✓ **NG availability** (Q100, Q50 | *2019*)
- ✓ **NG price** trajectory (P50, P100)



HCT – DG CLIMA's rrecommended parameters for GHG projections reporting in 2023; P50 – IEA's Net Zero Emission pathway

◆ – Real / projected price of NG 2020-2024 (HCT, DG CLIMA 2022)

Scenarios

REF + 8 policy scenarios distinguished by:

- ***policies adopted****: ETS1+**CBAM** / ETS1+CBAM+**ETS2*** ↓
- ***fossil fuel trajectories*** *(prices, NG availability)*
- ***EUA price trajectories***
- subsidies for RES and energy efficiency
- no new ICE cars and vans registered after 2035
- **RES potential**: MAF CZ 2021 Progressive scenario (Czech TSO adequacy report)
- **availability of natural gas**: 100% / 50% of consumption in 2019
- **coal phase-out**: up to current mining limits / by 2033
- **nuclear**: Dukovany NPP (†2045) + new NPP (2045+ | 2040+ | cost. optim.)

RESULTS - GHG emissions

2 different decarbonisation trajectories projected:

TIMES-CZ

- RES development within the limits of the MAF 2021 Progressive Scenario
- faster decline in GHG emissions (coal phase-out + electricity imports)
- leads to a preference for carbon capture and storage and higher investment in energy savings

E3ME

- increase the share of RES significantly above MAF 2021 after 2030 (mainly PV and CHP)
- higher domestic electricity production maintained (→ net export balance)
- slower decline in GHG emissions → higher revenues from EUA auctions → higher state support for investments

2030 targets

55% reduction target by 2030 (compared to 1990) **is achievable**

- also achieved in the REF scenario (-60%)
- ETS1 tightening with the introduction of CBAM reduces emissions by a further 5 pp (-65%)
- introduction of ETS2 leads to additional reductions of 1.6-3.4 p.p. (i.e. up to -68.4%)
- E3ME (*at EU27 level*) → -55% reduction in the EU27 implies ~47% reduction in Czechia

FF55 in not enough to bring us to „net-zero“ by 2050 → ~90% reduction possible, additional measures needed (agriculture, etc.)

GHG emissions by gases (Mt CO2eq, incl. LULUCF & CCS)

Scenarios:

REF – reference

CBAM - no ETS2

ETS2

N40 – new NPP earlier

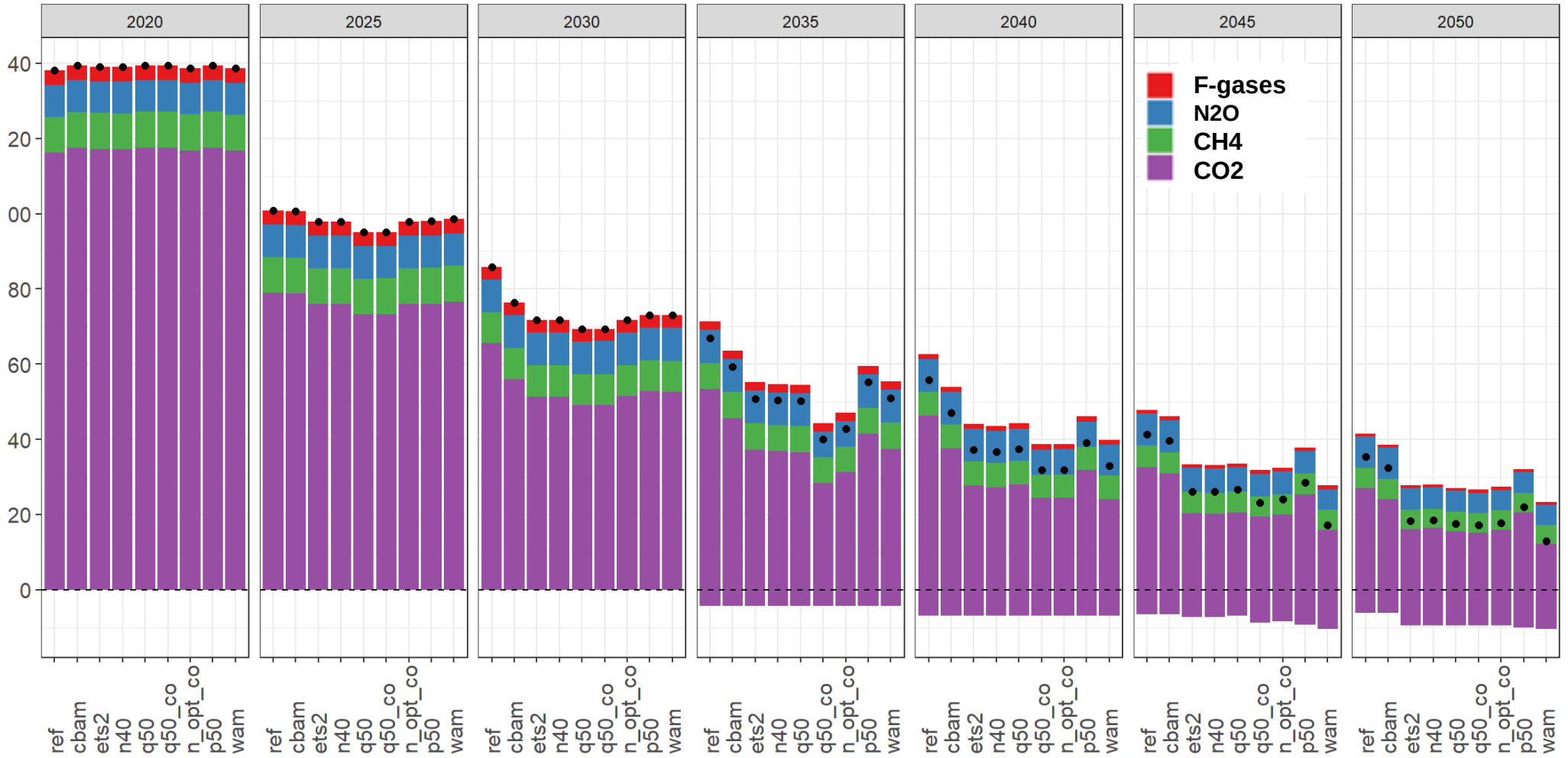
Q50 – 50% NG avail.

Q50_CO – Q50 + coal phase-out by 2033

NO_CO – coal phase-out & cost optim NPP

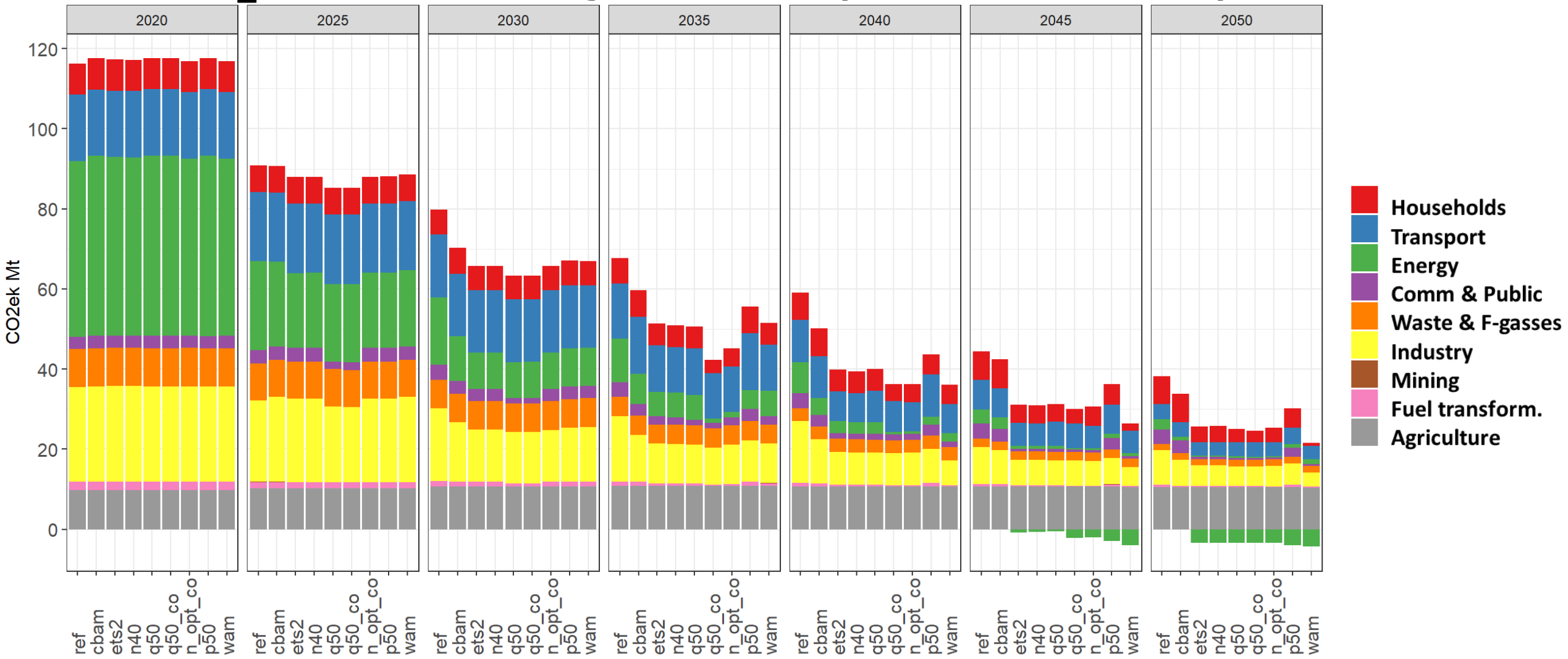
P50 – NG 50% cheaper

WAM – higher EUA prices

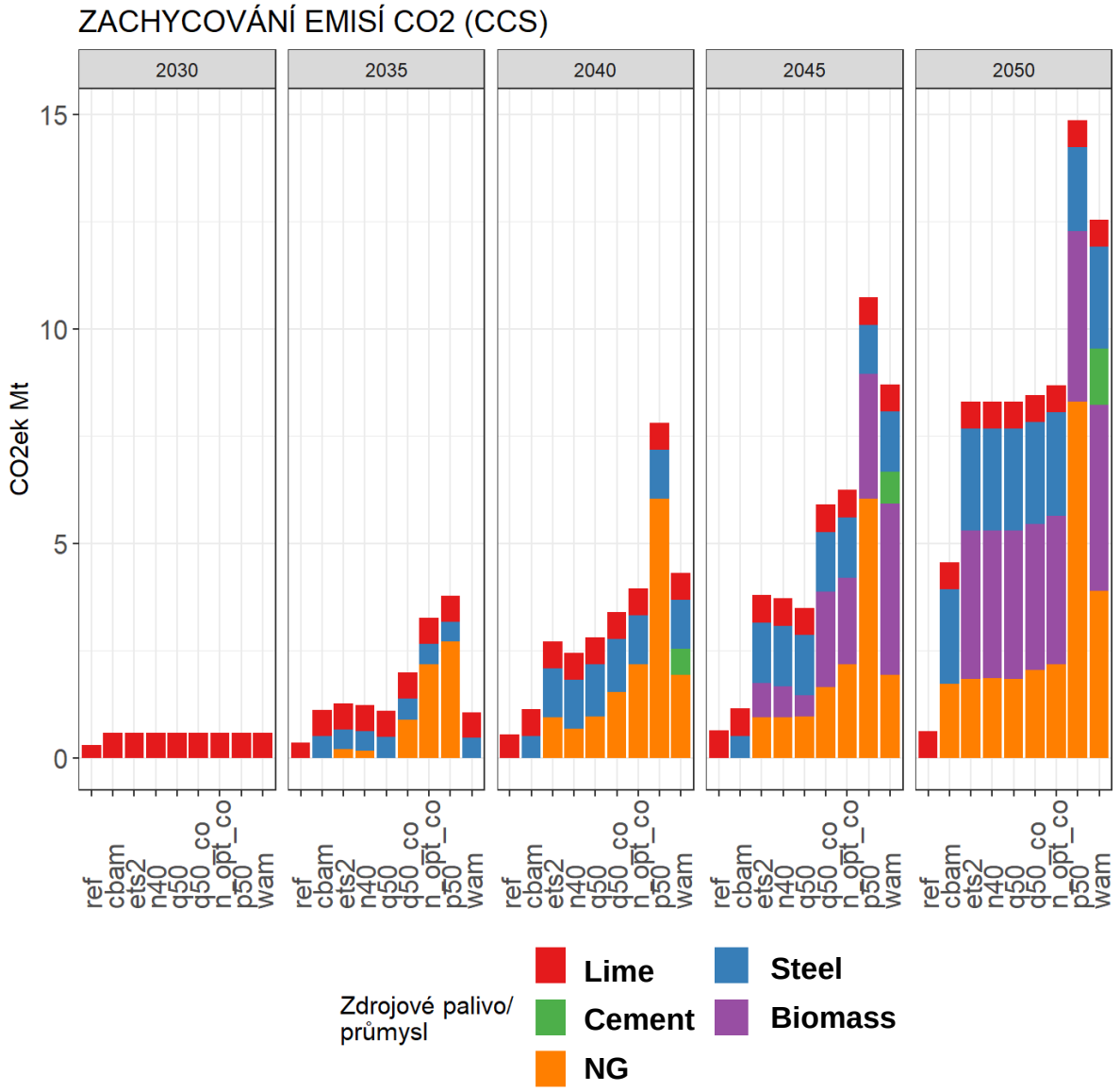


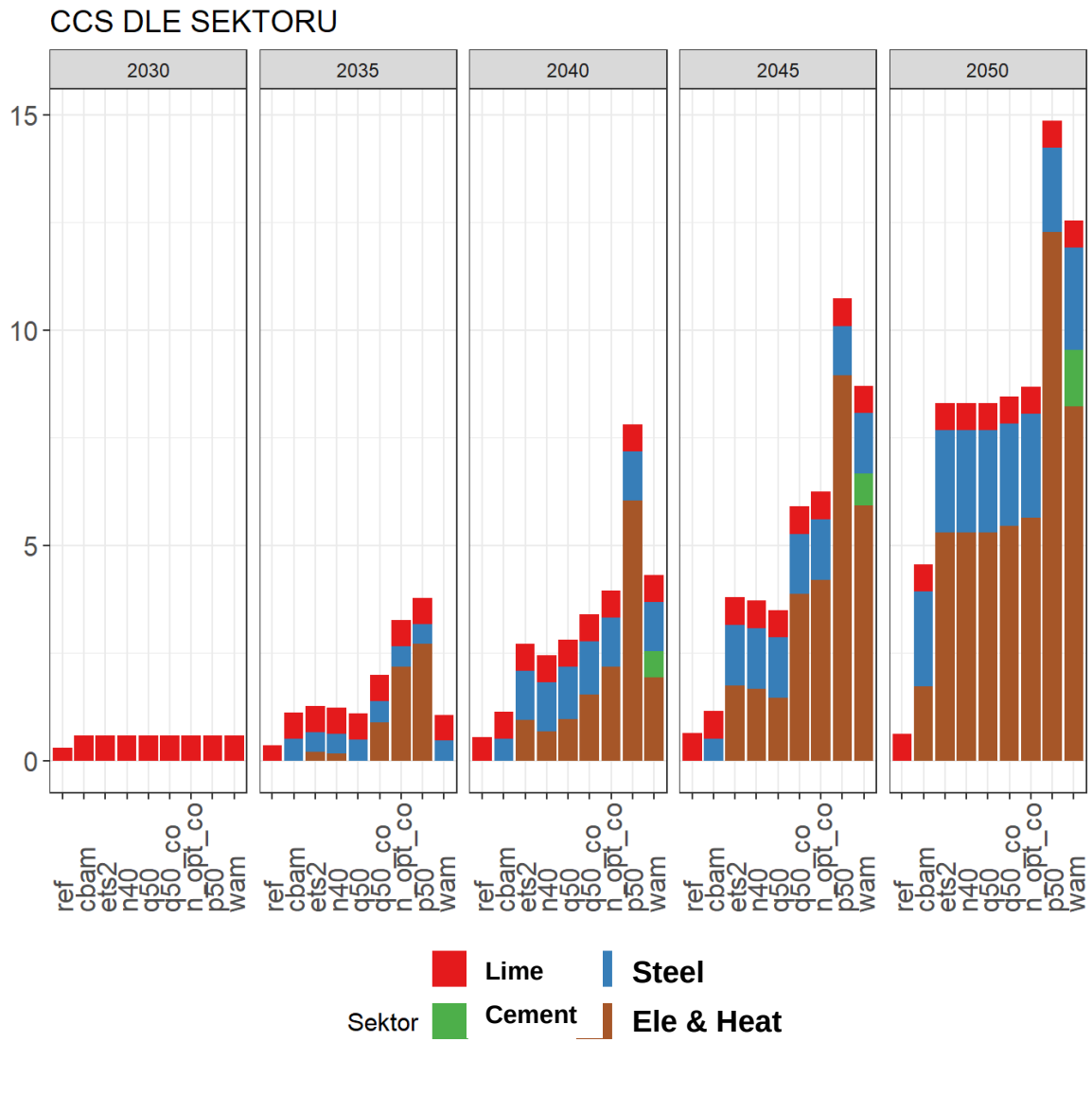
Note: due to bark beetle calamity, ***forestry*** *will be a* ***significant carbon emitter*** *until at least 2032.*

CO_2 emission by sector (excl. LULUCF)



GHG emissions: Carbon Capture and Storage





RESULTS – ENERGY

2030 RES & EE targets

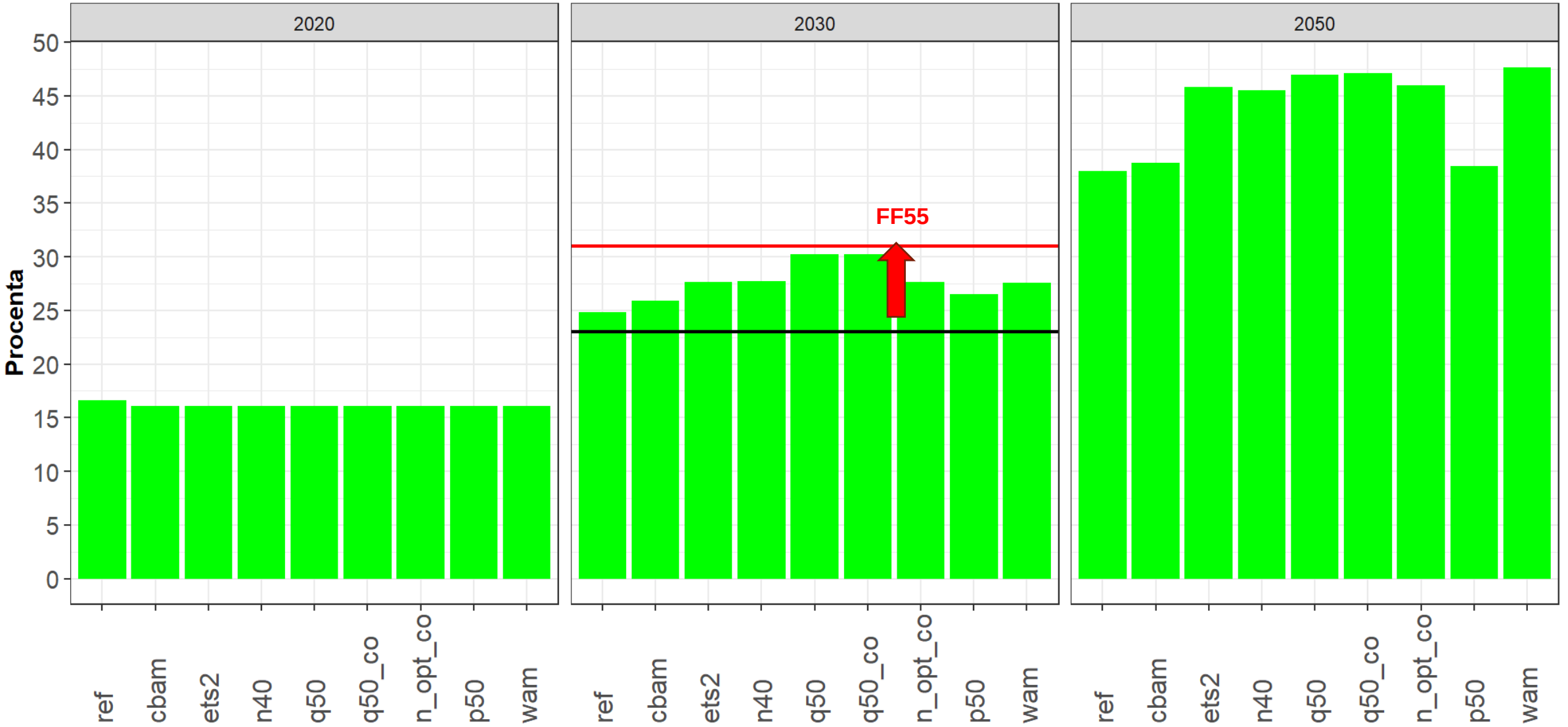
RES

- **31% share in 2030 likely difficult to achieve** (*given assumptions*)
  - scenario with limited NG availability comes closest
  - importance of increasing energy efficiency / savings

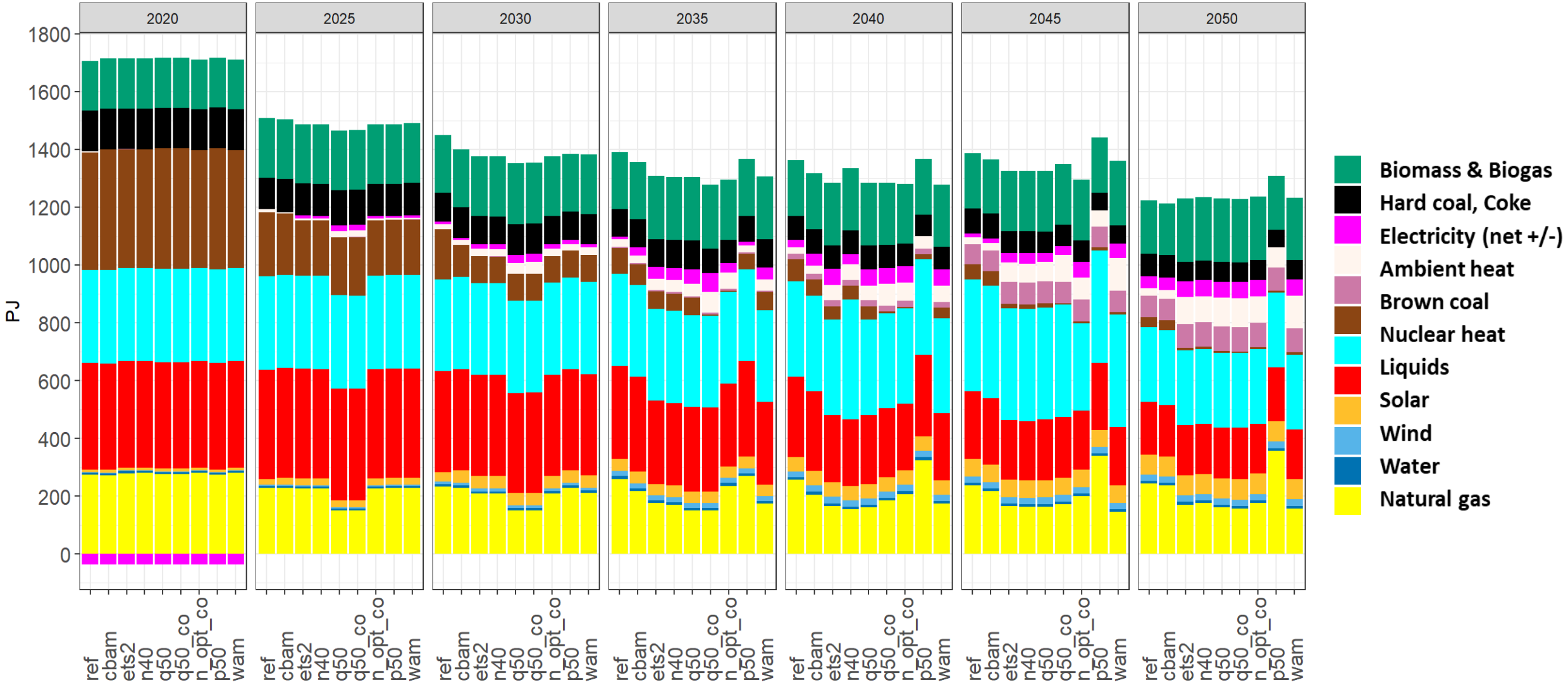
Energy Efficiency

- Consumption of primary energy sources reduced by 14-20 %
- Final use reduced by 2-7 % in 2030 (compared to 2020), much less than the EU targets
  - *PES (2030): 1350-1450 PJ*
  - *FU (2030): 974-1015 PJ*

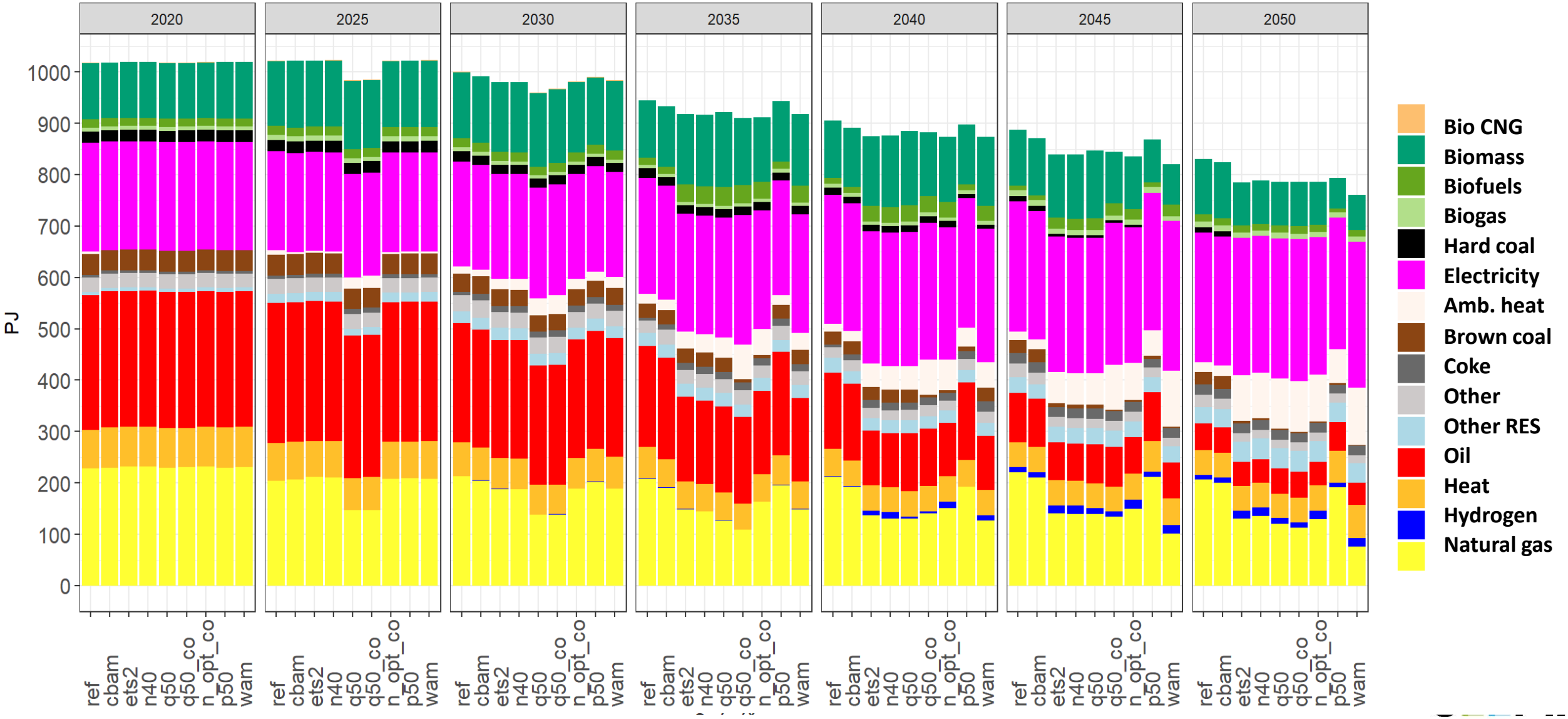
RES share (on gross final use)



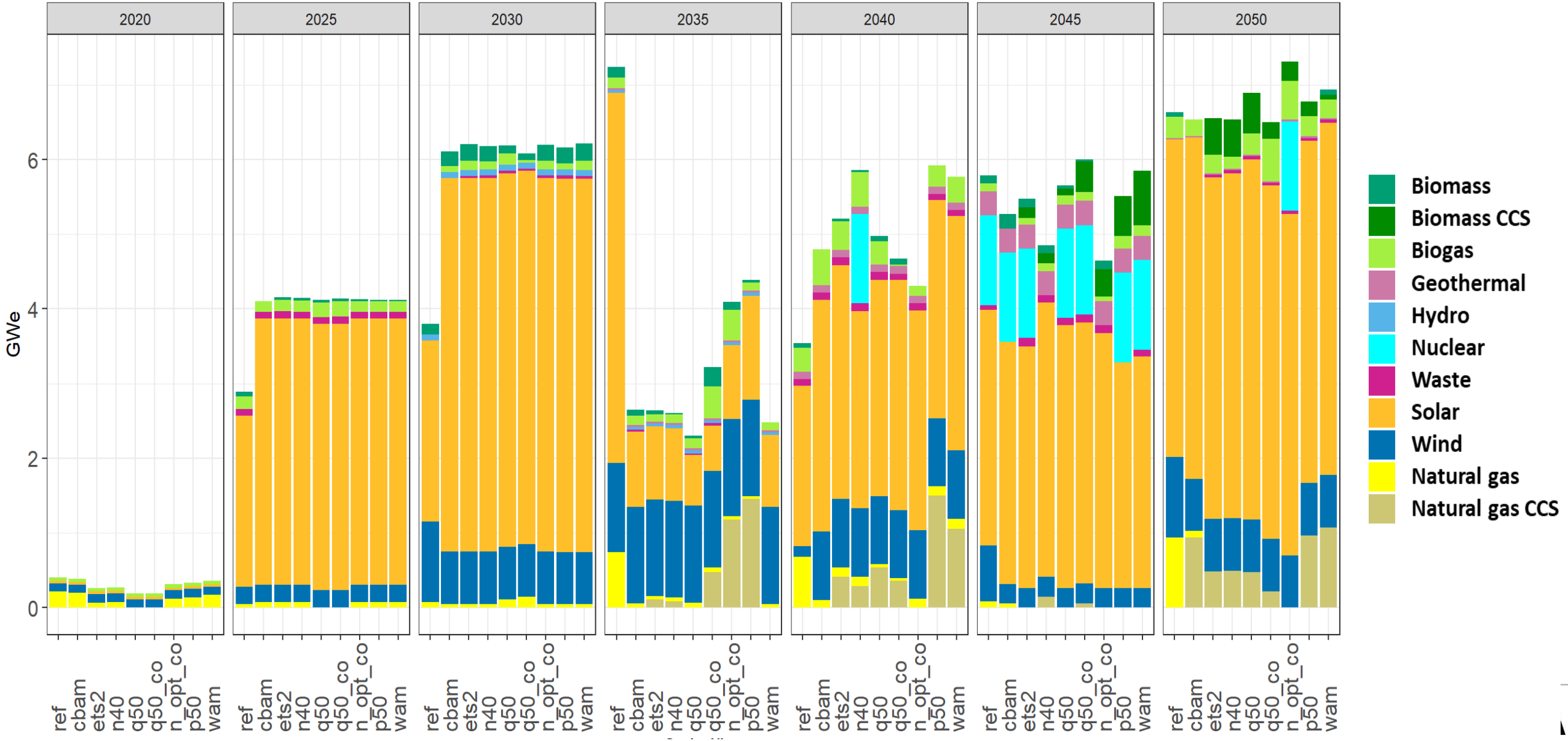
Consumption of primary energy sources (PJ)



Final energy use (PJ)



New installed capacity, electricity generation, GWe



Costs & Investment needs

Investment & Costs of Fit-for-55 (TIMES-CZ)

Investment 2020-2030: **~220 bln. EUR** *in BAU: ~200 bln. EUR*

2031-2050: **~ 540 bln. EUR**

Total Costs = Investment + O&M + Fuels + taxes – bonus + EUA

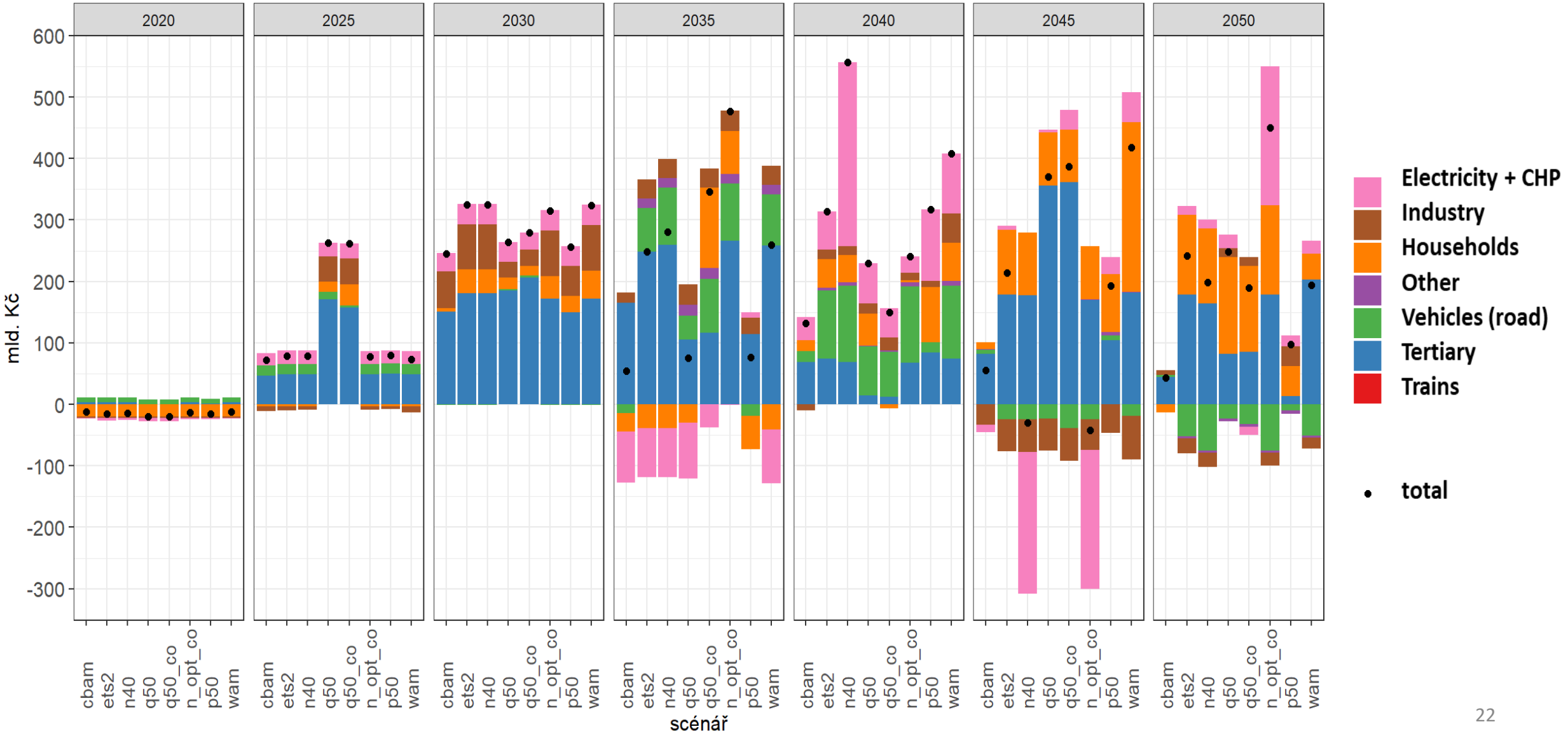
Total annualised costs: 2020-2030: **~44 – 54 bln. EUR**

2031-2050: **~52 – 72 bln. EUR**

Incremental costs should consider investments in BAU, investment support, and financial savings due to energy efficiency!

Incremental costs are 10 - 15 % compared to reference scenario

Investment costs: difference vs. REF (5yr sums, 2020 prices)



Macroeconomic impacts (E3ME model)

GDP

- Slightly **positive** due to investment in innovative (efficient) technologies
- Crucial how **revenues are recycled** back to the economy (investment support superior to lowering PIT, VAT & SSC)
- Can green (any) regulation **boost economy**? → innovation may induce loans (utilising insufficiently used capacities) → **no investment "crowding-out"**

Social impacts

- Negative, but small and depend on behavioural responses (+can be mitigated by targeted revenue recycling)

Employment

- Overall increase, but only if there any free capacities (no in full employment, with "no" unemployment)
- labour demand may increase in construction sector by +4%, +8%, and +12% in 2025, 2030, and 2035 (but labour shortage in RES & EE sectors already today..)

Conclusions 1

What is the impact of Fit for 55 package on Czechia?

- FF55 targets ambitious, but generally feasible (EE the hardest)
- **Incremental costs** are 10- 15 % compared to refrefece scenario
- urgent need to set effective state investment policy and support
- use revenues from GHG pricing wisely
  - climate investments (ETS2 sectors), mitigation of social impacts
  - climate transition can lead to increased economic activity & overall positive effect on GDP, employment etc.

Conclusions 2

Can Czechia achieve climate neutrality on its own?

- Not without additional measures like:
  - Import of Hydrogen
  - Change of agriculture policy

- to be continued: analyses of REPowerEU and update of NECP.

Thank you for your attention!

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