

Towards a carbon-free future: impacts of regulatory and market-based instruments in Germany

Overview

Both regulatory and market-based emission-reduction mechanisms are in use in Germany. The legal framework implemented to limit greenhouse gas emissions spans a number of industries. The Coal Phase-out Act is a part of Germany's efforts to close both lignite and hard coal power facilities since coal-fired production is a source for the system that emits a lot of pollution. On the market side, the European Emissions Trading System acts as a mechanism to put a cap on the overall amount of allowable emissions, which is gradually declining each year. We investigate the impact of both instruments on three outlooks: the coal power plants decommissioning, the employment in Lusatia and the development of carbon emissions.

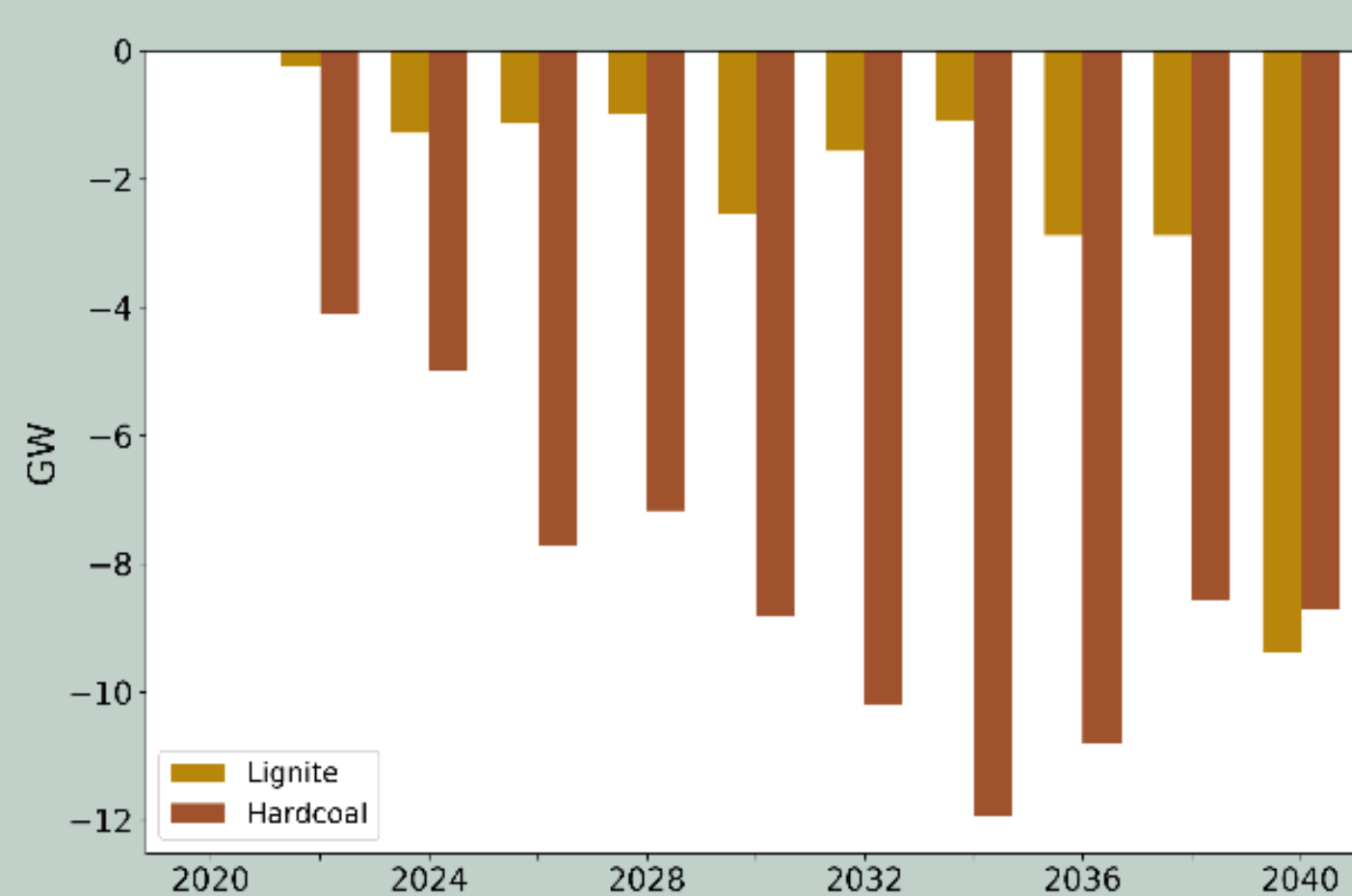
Methodology

- We analyze the impact of the regulatory and market-driven mechanisms on the German coal phase-out using an energy system model EM.POWER INVEST.
- The model determines investment and dispatch in partial equilibrium for the European electricity market.
- The model is formulated as a linear optimization problem that determines the lowest-cost development of conventional facilities until 2040.

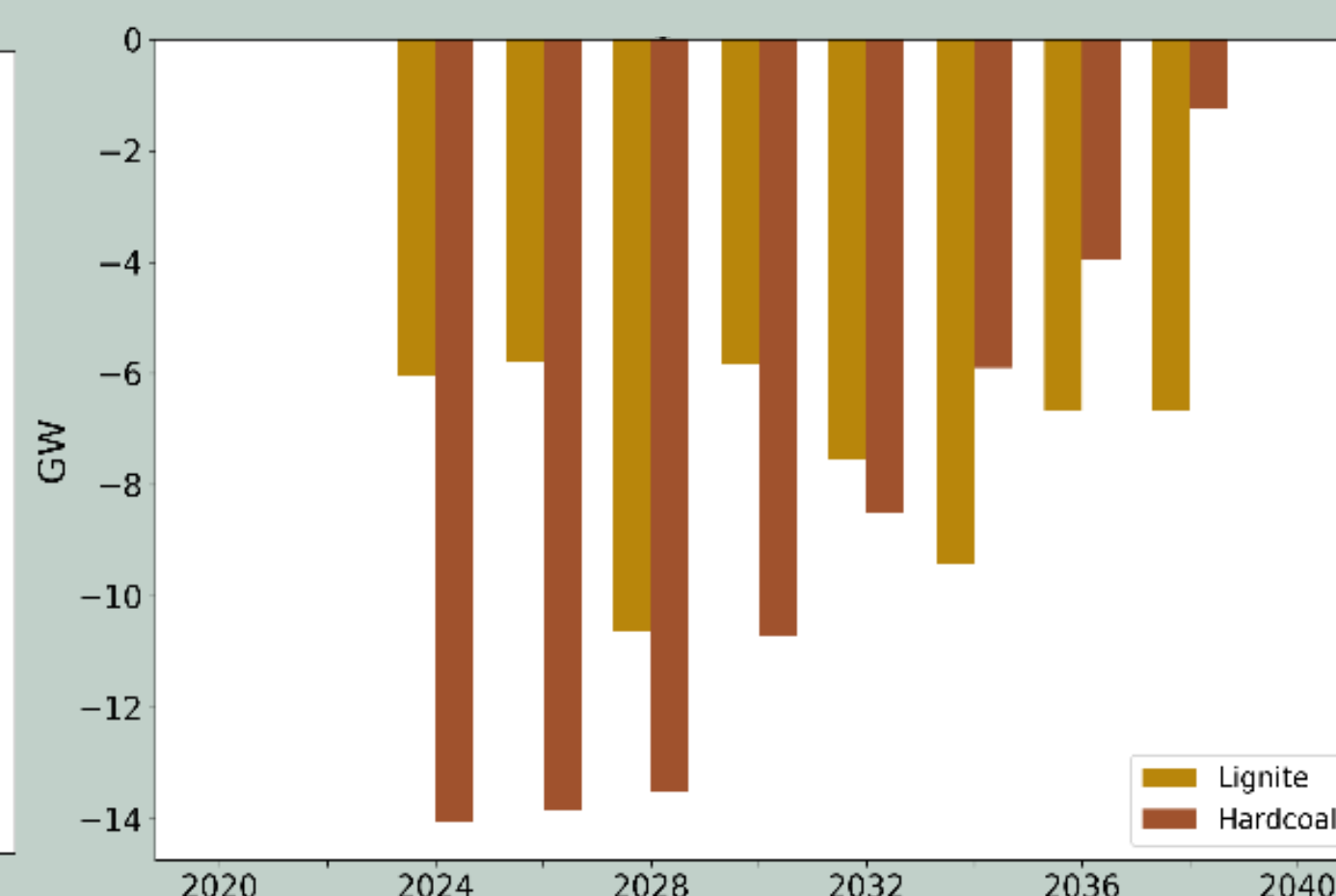
A quantitative analysis^[1]

Impacts on the decommissioning of coal power plants

Impacts of the Coal Phase-out Act on the development of coal capacity in Germany

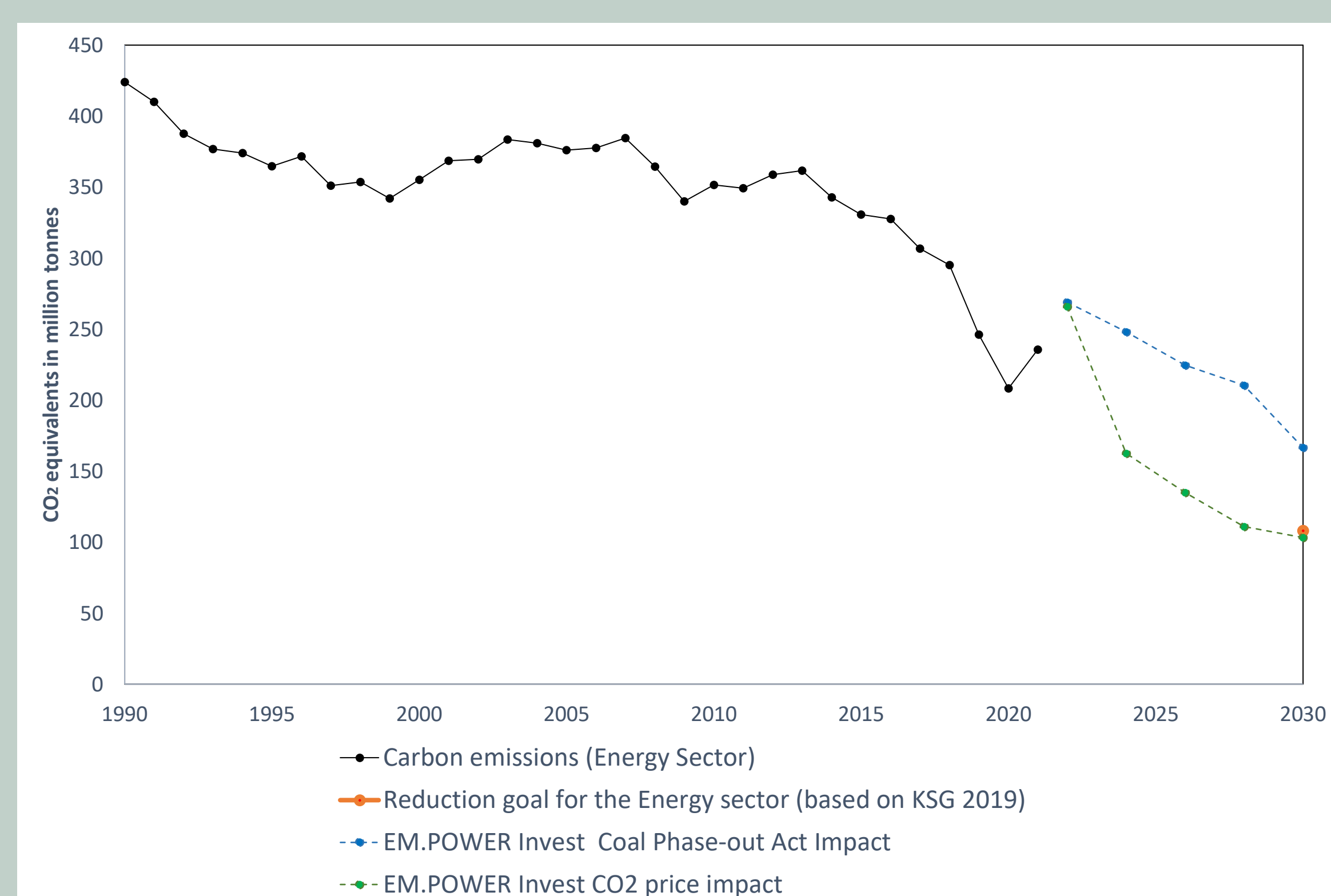


Impacts of the CO2 price on the development of conventional capacity in Germany



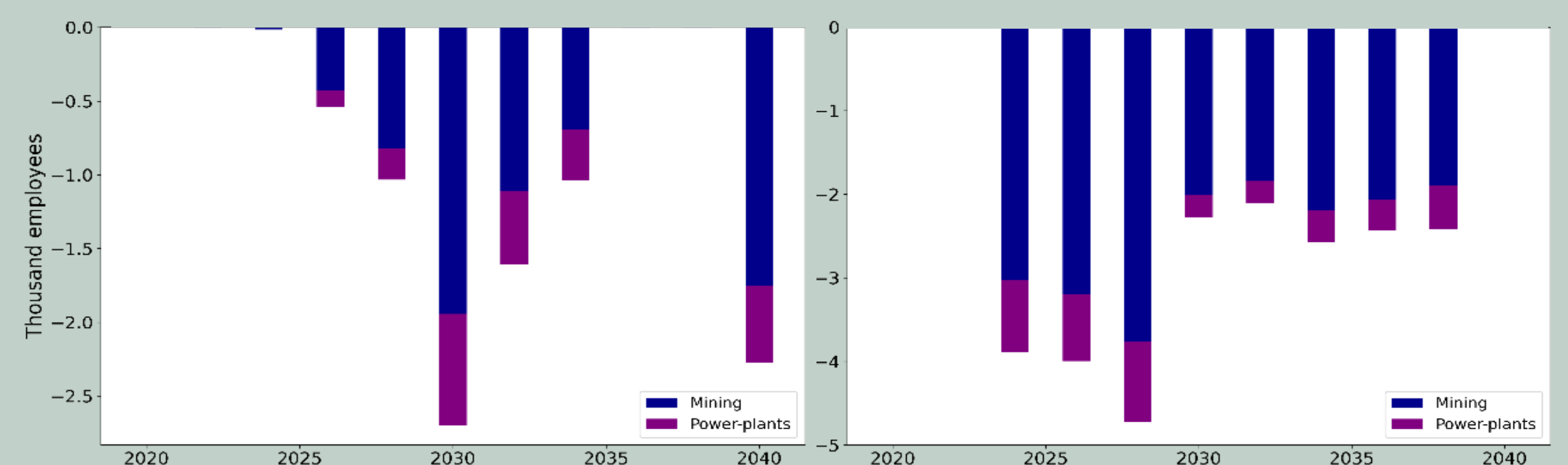
The implementation of the Coal Phase-out Act reduces coal capacity by 24 GW in 2040. With higher CO₂ prices, hard coal capacity leaves the German market in 2028 and marginal lignite capacities are left by 2038.

Impacts on the carbon emissions development

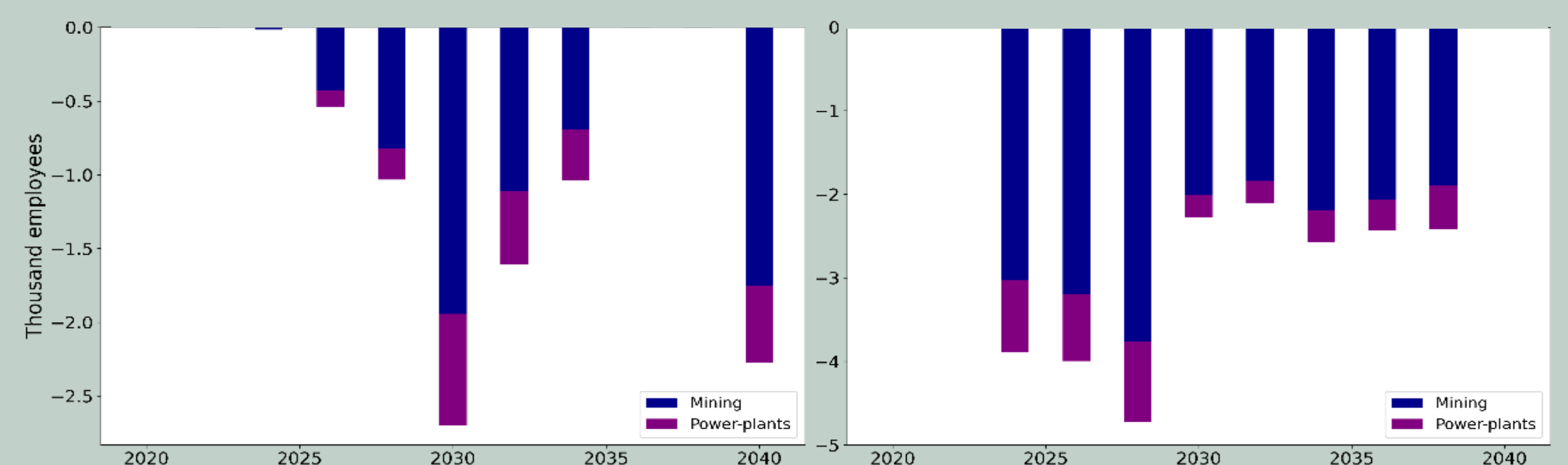


Impacts on the employment in Lusatia

Impacts of the Coal Phase-out on the employment in Lusatia



Impacts of the CO2 price on the employment in Lusatia



The greatest employment impact caused by the Coal Phase-out Act in Lusatia occurs in 2030, amounting to approximately 2,700 less employees in both the mining and power plants. The increase in CO₂ prices leads to 3,900 fewer employees in 2026 and 4,700 fewer employees in 2028.

A quantitative analysis^[2]

Impacts caused by the energy crisis

Coal generation in 2022

- Coal generation has increased by 17% in Germany in the first half of 2022 with respect to the same period in 2021.
- This dynamic brings additional uncertainty regarding how CO₂ emissions in the German energy sector will develop until 2030.

Higher shares of renewables

- Considering the latest amendment of the Renewable Energy Sources Act, at least 80 % of electricity consumption in Germany is expected to be generated from renewable energies in 2030.
- The Easter Package seeks to increase 22 GW in solar capacity on an annual basis between 2026 and 2035. The expansion rates for onshore wind will be stepped up between 2025 and 2035 to 10 GW per year.

Policy recommendation

- An option to ensure that coal would be phased out “in time” is a national carbon price floor.
- This measure was also considered in the coalition agreement, at a price of 60 €/t.
- Empirical evidence from UK shows that this instrument reduced emissions substantially between 2013 and 2017.
- A carbon price floor could be a remedy for certain Emission Trading System market distortions and design flaws.

