econPOL POLICY BRIEF

58
2024

May
Vol. 8

Energy and Climate Policy: Quantifying the Benefits of a European Approach

Mathias Mier

Key Messages

- The European Union Emissions Trading System has considerable monetary and environmental advantages over national systems.
- I compare three different policy scenarios to examine the impact of joint European efforts beyond 2030: Rapid Decarbonization, 2050 Climate Neutrality, and a Break scenario.
- A common European Union approach leads to monetary advantages generated by lower electricity prices and reduced need for subsidies.
- The simulations quantify the total benefits for Europe over the period 2024–2050 at EUR 248 billion, for Germany at EUR 66 billion.

CESifo ifo INSTITUTE

EconPol Europe is CESifo's economic policy platform. With key support from the ifo Institute, it seeks to leverage CESifo's globe-spanning network of more than 2,000 high-ranked economists – at least a dozen of whom have won the Nobel Prize – and ifo's decades-deep research expertise to provide well-founded advice to European policymakers and to facilitate informed decisions. Drawing on the wide range of specializations of its members, EconPol's mission is to contribute to the crafting of evidence-based, effective economic policy in the face of the rapidly evolving challenges faced by the European economies and their global partners.

EconPol POLICY BRIEF
A publication of the CESifo Research Network

Publisher and distributor: CESifo GmbH
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 89 9224-0, Email office@cesifo.de
Shipping not included
Editor of this issue: Clemens Fuest, Florian Dorn

EconPol Europe: www.econpol.eu

Energy and Climate Policy: Quantifying the Benefits of a European Approach[1]

*Mathias Mier**

The European Union aims to be carbon neutral by 2050. Political pressure is mounting from various sides to water down ambitious climate action and energy policies. A cornerstone of the EU climate policy is the European Union Emissions Trading System (EU ETS), which puts a price on greenhouse gas emissions. With the "Fit for 55" package, the EU has tightened the rules to meet a new target of a 55 percent emissions reduction by 2030. This means that the development of the EU ETS is set until then. However, it is unclear what will happen afterwards. This article looks at three different scenarios and their impact on electricity prices, subsidy volumes and CO_2 prices from 2030 onwards.

Policy Scenarios

The study considers three scenarios[2] that differ in terms of assumptions about the continuation of the EU ETS[3] after 2030 and the potential grid expansion, with the latter correlating with the intensity of Europe's climate change efforts:

Rapid Decarbonization: This scenario continues the EU ETS beyond 2030 in accordance with prior years' developments. The linear reduction factor, which reduces greenhouse gas emissions by a certain percentage every year, is 90 million allowances, with the last allowances (43.07 million) issued as early as 2039. After 2040, no more allowances will be auctioned or issued. Unused certificates can be used until the end of 2045. Additional CO_2 emissions of 90 million tons from sectors outside the EU ETS, such as transport or heating, are even offset in 2050 making this the most ambitious scenario.

[1] The policy brief summarizes the key findings of a study commissioned by the Munich and Upper Bavarian Chamber of Industry and Commerce (Mier, 2024).

* Mathias Mier: ifo Insitute, Munich, mier@ifo.de

[2] The scenarios are developed with the help of the EUREGEN model ((Weissbart and Blanford, 2019, Mier and Azarova, 2024, Mier et al., 2024), whose existing calibration (Siala et al., 2022, Mier et al., 2023, Mier, 2023) was specially tailored to the questions investigated in this study.

[3] All results refer to EU ETS 1.

Strong political collaboration makes it possible to triple the international capacity of the international transmission grid between 2035 and 2050.

2050 Climate Neutrality: The EU ETS is regulated in such a way that all sectors covered by the EU ETS (electricity generation, large parts of industrial production, intra-European aviation, parts of shipping) are climate-neutral by 2050. The EU ETS changes the linear reduction factor to 53.32 million in 2031 and auctions the last 53.32 million allowances in 2045. Unused allowances can still be used until the end of 2045. This scenario is less ambitious than the Rapid Decarbonization scenario. Medium political collaboration makes it possible to double the international capacity of the transmission grid between 2035 and 2050.

Break: Political upheaval in the EU leads to the collapse of the EU ETS. From 2031, there are no more EU ETS allowances. Instead, each EU country aims to achieve climate neutrality until 2050 (in the sectors previously covered by the EU ETS). Unused allowances will be distributed according to country size and can be reused in national emissions trading. Low political cooperation does not allow for an expansion of international transmission grid capacity between 2035 and 2050. The Break scenario is the national counterpart to 2050 Climate Neutrality. Here, the EU ETS is replaced by national emissions trading systems from 2031 onwards. Total CO_2 emissions remain unchanged until 2050.

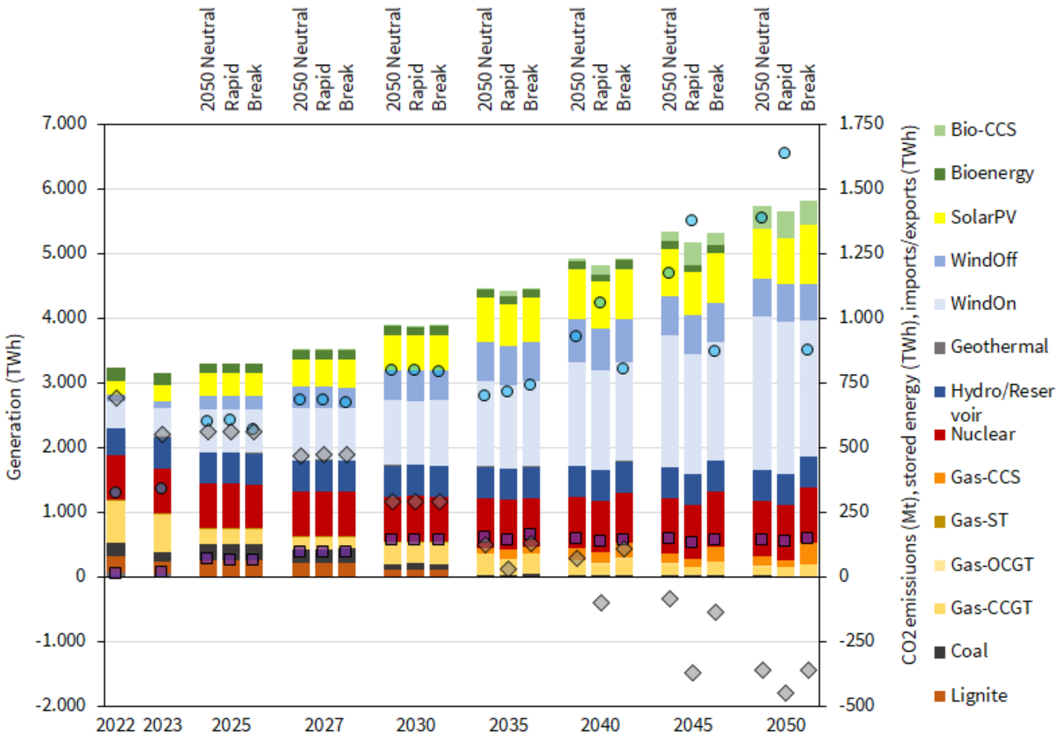
The monetary benefit can be calculated by comparing the **2050 Climate Neutrality** with the **Break** scenario. In addition, the EU could enable even more climate protection and grid expansion; the monetary advantage is then derived from the comparison between **Rapid Decarbonization** and **2050 Climate Neutrality**. The advantage of joint or intensified climate protection and grid expansion is primarily in the electricity price. Declining electricity prices are an advantage, while falling ones are a disadvantage. However, to determine the monetary advantage, not only electricity prices are considered, but also the amount of subsidies, as overlapping support policies for renewable energies (generation and expansion targets) and nuclear power (state-subsidized construction) are relevant in the European electricity and energy sector. Nevertheless, it is also necessary to look at the other sectors regulated by the EU ETS. If the CO_2 price rises as a result of more climate protection, the direct CO_2 costs of the remaining EU ETS sectors will also increase.

The Scenarios' Effects

Figure 1 displays the generation mix of the European power system from 2022 to 2050 for each of the scenarios. The years are shown on the lower horizontal axis and scenarios on the upper one. Generation by technology is shown on the left axis, and CO_2 emissions, stored energy, and imports/exports are shown on the left one.

Nuclear (678 TWh) and natural gas (640 TWh) dominate the technology mix in 2022. Also, lignite (245 TWh) and coal (221 TWh) contribute considerable shares. Among renewables, hydro power (423 TWh, including generation from no-pump reservoirs) has the largest share. Additionally, there is generation from onshore (416 TWh) and offshore wind (96 TWh), solar PV (214 TWh), and biomass (205 TWh). In total, 689 Mt CO_2 were emitted and 323 TWh were traded internationally. The amount of stored energy is small (10 TWh).

Figure 1: Generation Mix, CO_2 Emissions, Stored Electricity and Export Volume



© ifo Institute

Nuclear energy continues to contribute a major share, mainly because France maintains its nuclear focus and several nuclear power plants are already planned or under construction.[4] Lignite and coal are almost phased out by 2035, while the contribution of

[4] No nuclear power plant is added endogenously by the optimization as nuclear power requires substantial subsidies.

natural gas experiences a renaissance in 2030 and beyond, mainly because of the combination with carbon capture and storage (CCS). Wind power is expanded excessively, but solar power sees only small increases. Bio-CCS becomes part of the technology mix in 2035 (Rapid Decarbonization). The differences in the possible expansion of transmission line capacity become relevant from 2040 onwards, when considerable amounts are traded (almost one in four units of electricity), while electricity storage is important but still a niche compared to the total amount of electricity traded internationally.

Figure 2: Electricity Prices and Total Costs of Climate Protection

© ifo Institute

Electricity Prices and Total Costs

Figure 2 shows the electricity price (left, in EUR/MWh) and the total costs of climate protection (right, in billion EUR). The total costs of climate protection result from the electricity prices (multiplied by the amount of electricity demanded), the subsidies to be paid to ensure the expansion of renewable energies in accordance with regulatory requirements, as well as higher or lower CO_2 costs for the remaining sectors regulated in the EU ETS. The subsidies result on the one hand from the defined expansion targets for photovoltaics and wind turbines (on land and in water) and on the other hand from general renewable targets (e.g. 80 percent by 2030). In Germany, the expansion targets for photovoltaics require considerable subsidies. In 2025, for example, Germany will have to spend more money on subsidies (almost EUR 29 billion) than the total electricity demanded would cost at wholesale prices (EUR 22 billion). Although the subsidy volumes decrease slightly over time, the enormous subsidy volumes contribute significantly to the costs of climate protection. However, this is the same for all scenarios considered.

Advantages for Europe and Germany

For Europe as a whole, joint climate action (and more grid expansion) will bring a monetary benefit of EUR 248 billion or 2.35 EUR/MWh over the period 2024–2050. This is more than 5 percent of the average electricity price, which amounts to 52.09 EUR/MWh in the **2050 Climate Neutrality** scenario. This benefit is roughly generated by lower electricity prices and a lower subsidy requirement. The need for subsidies is reduced because the higher CO_2 prices mean that certain investments become economically viable anyway and do not need to be subsidized as much or at all. Investments (in renewable energy) are also preferred and no longer need to be subsidized. The CO_2 costs of the remaining EU ETS sectors will fall, but only to a very small extent.

The European benefit is calculated by comparing the **2050 Climate Neutrality** with the **Break** scenario. In the **Break** scenario, starting in 2031 each country in Europe carries out its own climate action without the EU with a view to becoming climate neutral by 2050. The total costs in the EU then amount to EUR 8.629 trillion, while in the **2050 Climate Neutrality** scenario, the costs drop to EUR 8.381 trillion in total. If the EU member states succeed in becoming climate neutral even faster – as in **Rapid Decarbonization** by 2039, the costs would be further reduced to EUR 8.310 trillion for the EU.

The German advantage amounts to EUR 66 billion or 3.63 EUR/MWh. In the **Break** scenario, Germany incurs total costs of EUR 1.882 trillion, in the 2050 Climate Neutrality scenario, the costs drop to EUR 1.816 trillion. The subsidy volume in the **Break** scenario is only EUR 2.47 billion higher than in the **2050 Climate Neutrality** scenario. The only minimal change in the subsidy volume is an indication of misdirected (in the sense of ineffective) subsidies (in photovoltaics) in Germany. If subsidies were aligned with actual climate goals (i.e., CO_2 mitigation), the need for subsidies would decrease. In addition, Germany's CO_2 price is slightly lower after 2030 in the **Break** scenario (182 EUR/tonne in Break and 211 EUR/tonne in **2050 Climate Neutrality**), so that industrial production, intra-European aviation, and parts of shipping are burdened with a total of EUR 3.63 billion less. Ultimately, it is the electricity price that determines whether joint climate protection is beneficial for Germany or not. As the figure shows, the electricity price in the **2050 Climate Neutrality** scenario falls below the level of the **Break** scenario in 2030. In 2050 (averaged over the years 2024 to 2050), joint climate protection (as in **2050 Climate Neutrality**) even leads to lower electricity prices of 9.2 (3.68) EUR/MWh.

More climate protection and significantly more grid expansion will bring Europe a benefit of EUR 71 billion or 0.67 EUR/MWh, with falling electricity prices dominating this effect and the higher CO_2 costs of the remaining EU ETS sectors actually having an impact. The benefit for Germany is EUR 16 billion or 0.87 EUR/MWh. However, this is dominated by a lower subsidy volume that absorbs the significant additional costs of the other sectors. The increased climate protection is therefore more in line with the direction of the subsidies, even if the massive promotion of photovoltaics must still be regarded as ineffective.

Policy Conclusion

The study shows not only that joint climate protection is better than national climate protection, but that even more climate protection can be achieved without increasing the relevant overall costs of electricity supply and decarbonization of the EU ETS. In fact, electricity prices are even falling. Interestingly, large parts of the wind and photovoltaic capacity currently installed in Europe would pay off even without subsidies due to higher CO_2 prices. The scenarios underline the responsibility of power generation for decarbonizing Europe. There will be no CO_2-neutral Europe without negative CO_2 emissions. Policymakers must therefore develop sensible approaches to decarbonize aviation and shipping. Ships and aircraft have a lifespan of more than 25 years. The majority of the current fleet will still be in operation by the time Europe aims to be CO_2-neutral. The same applies to large parts of industry.

The study shows that Germany is one of the countries in Europe that benefits enormously from joint and potentially even higher climate protection efforts. CO_2 certificates could become a new export hit, but only if Germany faces up to the challenges and sets the right regulatory course. Here, too, the focus must be on negative emissions. Germany is already considering hydrogen as a future energy carrier; the most relevant aspect is the development of a functioning infrastructure for transporting and storing CO_2 as well as possibly even exporting it. From 2040, CCS must be ready for large-scale use. To achieve this, a biomass import structure must also be created, as Germany's biomass energy potential will not be sufficient for this. Germany is relatively densely populated and has a very high demand for electricity relative to its land area. At the same time, the sun shines 60 percent more in Spain or Portugal than in Germany and the good wind areas in northern Germany or the North Sea are also rare. Current regulations on wind power expansion do not make the problem any easier and only push Germany further into dependence on CCS. However, Despite the expansion of renewable energies and massive subsidies for photovoltaics, Germany will remain a net importer in the long term. Germany and other net-importing countries must therefore pay attention to further intensifying European cooperation in the context of international grid expansion.

References

Mier, M. (2024), Energie- und Klimapolitik: Effekte eines europäischen Ansatzes auf Preise, Versorgungssicherheit und CO2-Emissionen in Deutschland, 21 April 2024. Available at SSRN: https://ssrn.com/abstract=4802185 (accesssed 30 April 2024)

Mier, M. (2023). European electricity prices in times of multiple crises. Technical report, *ifo Working Paper*.

Mier, M., J. Adelowo, and C. Weissbart (2024). Complementary taxation of carbon emissions and local air pollution. *Energy Economics*, 107460.

Mier, M. and V. Azarova (2024). Investment cost specifications revisited. *Energy Policy* 188, 114058.

Mier, M., K. Siala, K. Govorukha, and P. Mayer (2023). Collaboration, decarbonization, and distributional effects. *Applied Energy* 341, 121050.

Siala, K., M. Mier, L. Schmidt, L. Torralba-Díaz, S. Sheykhha, and G. Savvidis (2022). Which model features matter? An experimental approach to evaluate power market modeling choices. *Energy* 245, 123301.

Weissbart, C. and G. J. Blanford (2019). A framework for modeling the dynamics of power markets-The EUREGEN model. *ifo Working Paper* No. 307.