EU CLIMATE AND ENERGY POLICY BEYOND 2020: ARE ADDITIONAL TARGETS AND INSTRUMENTS FOR RENEWABLES ECONOMICALLY REASONABLE?

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Overview

The European Commission has recently proposed to focus on a greenhouse gas (GHG) emissions reduction target for 2030 climate and energy strategy and to scrap binding targets for renewable energy sources (RES) at the Member State level. In this article, we examine whether this decision is economically reasonable.

Many studies have shown that a RES policy implemented in addition to a GHG policy leads to economic excess costs as it impairs the cost-effective reduction of GHG emissions (e.g., Böhringer et al. 2009, Möst and Fichtner 2010, Jägemann et al. 2013). We aim to complement these analyses by examining the costs and benefits of a RES policy in a second-best setting with multiple market failures - including the GHG externality as well as technology market failures, other environmental externalities from using fossil and nuclear fuels (e.g., air pollution, land use effects, nuclear hazards), and externalities related to fossil fuel imports – which cannot efficiently be addressed by first-best policies for diverse reasons. In addition, we also take into account policy objectives that are beyond allocative efficiency but may nevertheless be relevant for practical policy-making, such as job creation or democratic energy supply (for an overview of rationales for RES policies, see Lehmann and Gawel 2013). Our hypothesis is that in such a setting, RES targets and instruments may be justified (1) if they actually help to address the market failure or policy objective, and (2) if they are more cost-effective than other feasible policy approaches.

Method

We quantify the costs and benefits of separate RES targets and instruments. For this purpose, we employ Cambridge Econometrics' combined 'E3MG-FTT:Power' model. E3MG is top-down, global macro-economic model which uses econometric estimations for projections and allows for inequilibria in markets (in contrast to optimization models). FTT:Power is bottom-up, global electricity sector model. It is helpful to simulate technology diffusion and accounts for interia and path dependencies. The models are calibrated using PRIMES 2009 projections baseline scenario (for EU data) and the IEA's World Energy Outlook 2012 „Current Policies Scenario" (for non-EU data).

We use the combined model to assess four policy scenarios:

- S1: GHG target (40% reduction by 2030) addressed by EU Emissions Trading Scheme (ETS)
- S2: GHG target and an additional RES target (40% RES share in electricity consumption) addressed by EU ETS
- S3: GHG target and RES target addressed by EU ETS and technology-neutral RES subsidy
- S4: GHG target and RES target addressed by EU ETS and technology-specific RES subsidy

Results

The economic impacts of implementing a RES target in addition to the GHG target hinges crucially on the instruments chose to address the RES target. The comparison between scenarios S1 and S3 can be considered the reference case for two reasons: First, conventional economic insight typically suggests that multiple targets can only be attained cost-effectively by multiple instruments. Second, if RES technologies are subsidized, it is often argued that the subsidy should be technology-neutral in order for the cheapest RES technologies to be deployed first. Nevertheless, these findings may be challenged in a second-best world where multiple market failures and policy objectives are to be attained by a limited set of targets and instruments. Therefore, we additionally discuss (1) how the instrument mix compares with a stand-alone ETS in the presence of two targets (comparison of scenarios S2 to S3), and (2) how a technology-neutral RES instrument compares to a technology-specific RES instrument (comparison of S4 to S3).

If an additional RES target is implemented by a technology-neutral RES subsidy, changes in macro-economic impacts are quite small (< 0.05 percentage points loss in GDP), and may even be positive because the model allows for unemployed economic resources which may be stimulated by policy measures. Power sector results are ambiguous: If carbon costs and RES subsidies are excluded, average levelized costs of electricity increase, otherwise they decrease. As to potential second-best benefits, our analysis yields the following results: While not changing GHG emissions in the electricity sector, an additional RES target brings down the carbon price from 100 to 53 Euro/ton CO_2 in 2030. Therefore, having both targets simultaneously may make the actual attainment of an ambitious GHG target politically much more likely. Benefits of a RES target related to other environmental benefits beyond GHG mitigation are again ambiguous: On the one hand, nuclear power generation (and associated hazards) is clearly reduced. On the other hand, natural gas is substituted by coal, which may increase local damages from fossil fuels use such as air pollution. Correspondingly an additional RES target also leads to lower imports of natural gas but increasing imports of coal. This may be beneficial in terms of energy security as natural gas is primarily imported from politically sensitive regions. Our analysis hardly suggests benefits in terms of promoting (green) jobs as the effect of an additional RES target is practically zero.

Attaining the RES target by the EU ETS alone rather than by an additional RES subsidy – i.e. by tightening the EU ETS cap beyond the level in S1 – significantly increases macro-economic and power sector costs. This is primarily due to the fact that the carbon price would be 440 Euro/ton CO_2 in 2030. Nevertheless, it is worthwhile to mention that this scenario may also bring about benefits that are significantly higher than in the other scenarios. Next to the assumed stronger reduction in GHG emissions, tightening the EU ETS will also lead to the strongest reduction in fossil fuel use and imports of all scenarios. It may be considered a downside to these results that nuclear power generation would increase. Employment effects of this scenario are again negligible.

Finally, promoting RES deployment by a technology-specific subsidy instead of technology neutral support improves the overall macro-economic performance of the policy mix but also results in higher power sector costs. Moreover, the effects of attaining a RES target by a RES subsidy (reduction of nuclear, substitution of natural gas by coal, and associated environmental and non-environmental benefits) are further aggravated as compared to technology-neutral support schemes.

Conclusions

Our analysis suggests that it may be worthwhile to consider benefits beyond GHG mitigation when carrying out a cost-benefit analysis for RES targets implemented in addition to a GHG target. We only provide physical measures for these benefits and abstain from monetary assessments. We are also aware that monetary assessments would be hampered by strong uncertainties and complexities as well as the heterogeneity of personal risk preferences. Therefore, it can only be determined in a political decision-making process whether or not an additional RES target should be maintained (or strengthened) in the EU. Yet, it is important to take into account all relevant cost and benefit components.

References

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