

Energy transition pathways to a low-carbon Europe in 2050: the degree of cooperation and the level of decentralization

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Abstract-

In the framework of the Paris Agreement, the European Union (EU) will have to firmly set decarbonization targets to 2050. However, the viability on these targets is an ongoing discussion. The European Commission has made several propositions for energy and climate “roadmaps”. In this regard, this paper contributes by analyzing alternative pathways derived in a unique modelling process. As part of the SET-Nav project, we defined four pathways to a clean, secure and efficient energy system taking different routes. Two key uncertainties shape the SET-Nav pathways: the level of cooperation (i.e. cooperation versus entrenchment) and the level of decentralization (i.e. decentralization versus path dependency). All four pathways achieve an 85-95% emissions reduction by 2050. We include a broad portfolio of options under distinct framework conditions by comprehensively analyzing all energy-consuming and energy-providing sectors as well as the general economic conditions. We do this by applying a unique suite of linked models developed in the SET-Nav project. By linking more than ten models, we overcome the traditional limitation of models that cover one single sector while at the same time having access to detail sectoral data and expertise. In this paper, we focus on the implications for the energy demand sectors (buildings, transport, and industry) and the electricity supply mix in Europe and compare our insights of the electricity sector to the scenarios of the recent European Commission (2018a) report “A clean Planet for all”.

Index Terms- Energy transition, Model linkage, Pathways, Renewables, EU decarbonization policy, Cooperation

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