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Toward the Decarbonisation of EU Transport Sector: Impacts and Challenges of the Diffusion of Electric Vehicles

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Abstract : In order to achieve the targeted emission reductions for the decarbonisation of the European economy by 2050, fundamental contributions are required from both energy and transport sectors. The objective of this paper is to analyse the impacts of a largescale diffusion of e-vehicles, either battery-based or fuel cells, together with the implementation of transport policies aiming at decreasing the use of motorised private modes in order to achieve greenhouse gas emission reduction goals, in the context of a future high share of renewable energy. The analysis of the impacts and challenges of future scenarios on transport sector is performed with the ASTRA (ASsessment of TRAnsport Strategies) model. ASTRA is a strategic system-dynamic model at European scale (EU28 countries, Switzerland and Norway), consisting of different sub-modules related to specific aspects: the transport system (e.g. passenger trips, tonnes moved), the vehicle fleet (composition and evolution of technologies), the demographic system, the economic system, the environmental system (energy consumption, emissions). A key feature of ASTRA is that the modules are linked together: changes in one system are transmitted to other systems and can feed-back to the original source of variation. Thanks to its multidimensional structure, ASTRA is capable to simulate a wide range of impacts stemming from the application of transport policy measures: the model addresses direct impacts as well as second-level and third-level impacts. The simulation of the different scenarios is performed within the REFLEX project, where the ASTRA model is employed in combination with several energy models in a comprehensive Modelling System. From the transport sector perspective, some of the impacts are driven by the trend of electricity price estimated from the energy modelling system. Nevertheless, the major drivers to a low carbon transport sector are policies related to increased fuel efficiency of conventional drivetrain technologies, improvement of demand management (e.g. increase of public transport and car sharing services/usage) and diffusion of environmentally friendly vehicles (e.g. electric vehicles). The final modelling results of the REFLEX project will be available from October 2018. The analysis of the impacts and challenges of future scenarios is performed in terms of transport, environmental and social indicators. The diffusion of e-vehicles produces a consistent reduction of future greenhouse gas emissions, although the decarbonisation target can be achieved only with the contribution of complementary transport policies on demand management and supporting the deployment of low-emission alternative energy for non-road transport modes. The paper explores the implications through time of transport policy measures on mobility and environment, underlying to what extent they can contribute to a decarbonisation of the transport sector. Acknowledgements: The results refer to the REFLEX project which has received grants from the European Union’s Horizon 2020 research and innovation program under Grant Agreement No. 691685.
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