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How can the renewables targets be reached cost-effectively? Policy options for the development of renewables and the transmission grid

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Abstract— Increasing the share of renewable energy sources in the electricity sector (RES-E) contributes to achieving the European energy and climate targets including a 27% share of renewables in final energy consumption by 2030. We assess the future costs of the power sector for different RES-target levels and support schemes including generation costs, system operation costs and transmission grid development costs based on three power sector models. The results show similar power system costs for different target levels. RES-E shares below 70% involve limited infrastructure costs that are below 2.6% of the overall system costs. The impacts of the modelled RES-E policies, an EU quota and national feed-in premiums on transmission costs are ambiguous: Contrary to expectations, the costs of transmission network development under quota obligations are lower than under technology-specific feed-in premiums for RES-E penetration levels up to 50%. The drivers of transmission costs include not only a concentration of renewable capacity, but also the exact location of RES-E capacity with respect to existing power plants and the strength of the existing infrastructure. Quota obligations lead to higher grid costs than feed-in premiums if the RES-E share amounts to 70% due to the stronger regional concentration of RES power plants.

Index Terms— Renewables development; Support policies; Transmission grid development; Power system

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