

FEEDBACK EFFECTS OF PROSUMER INVESTMENTS ON PRODUCER INVESTMENTS AND WHOLESALE MARKET PRICES – AN ITERATIVE APPROACH

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Extended Abstract

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Abstract Summary

This work is based on an iterative, soft-linked prosumer and wholesale electricity market approach to investigate the feedback effects of prosumer decisions on the wholesale market within the context of a zero-emission and highly decentralised electricity system. These decisions include investments in decentralised energy technologies such as rooftop PV, battery storage, electric vehicles or heat pumps, as well as cost-minimising demand and generation patterns. It covers Germany and France and all neighbouring countries, with Germany and France forming the core of the study. First, we conduct a cost-optimising investment and dispatch run for the wholesale electricity market model for a full year. The resulting initial price timeseries are translated into electricity tariffs and passed to the prosumer model, where household costs are minimised through the optimisation of investments, demand and generation. The optimised demand and production timeseries are in turn fed back into the wholesale market model. This iterative process is carried out until convergence is achieved.

The framework is designed to identify feedback effects of prosumer behaviour on generation investments and wholesale electricity prices. In particular, increasing household adoption of rooftop PV may reduce incentives for utility-scale PV deployment and thereby alter the generation mix. At the same time, the effect on wholesale price dynamics remains uncertain, since the decentralised optimisation of many households introduces substantial additional complexity, while storage investments at both household and system level may dampen price fluctuations. A systematic comparison of Germany and France further allows us to assess how structural differences between electricity systems shape these feedback effects.