



Fluctuating wind energy feed-in and resulting specific CO₂-emissions of the conventional power system

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According to the German Feed-in Act system operators have to collect electrical power generated by plant using renewable energy sources at any time and furthermore to compensate their variable power output if necessary. To analyze the influence of fluctuating power feed-in on the operation of the remainder conventional power plant system, the dynamic energy system optimization model *deeco* (dynamic energy, emission and cost optimization) was extended by modules able to capture part load performance and limited dynamic response of coal and gas fired power plant. Based on empirical high resolution time series for the demand of electricity as well as for the feed-in of wind power, *deeco* has been applied to quantify the change in CO₂-emissions of the conventional power plant within the Eastern German energy supply system.

Within a sensitivity analysis, we distinguished between the reduction of conventional power generation through wind energy feed-in (displacement effect) and the wind energy caused change in the temporal course of the charge to cover by conventional power plant (fluctuation effect). The displacement of conventional power generation has a positive effect on the specific CO₂-emissions of the considered conventional power system supposing sufficiently high prices for the CO₂-emission allowances. On the other hand, an increase in specific CO₂-emissions of conventional power plant due to the fluctuation effect is observed, which is totally independent of the CO₂ price. Considering both effects simultaneously with CO₂ prices maintained higher than 5 EUR/tCO₂, one can observe an overall decrease in specific CO₂-emissions within the conventional power system as a consequence of wind power feed-in.