

Short-term effects of PV integration on global welfare and CO₂ emissions. An application to the Iberian electricity market

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This work analyses the effect on the daily electricity market of the authorisation of 3909 MW of new photovoltaic (PV) power in Spain in 2017 as a contribution to the EU environmental objectives for 2030. To estimate the impact of this additional offer, we use real data from the supply and demand curves of the Iberian (Spain and Portugal) daily electricity market. Our data is available for all the hours of the full year between August 1, 2016 and July 31, 2017. In this period, more than 800 agents have participated in the market, generating more than 15 million operations. In order to calculate the new supply function for each hour, the hourly production of these new facilities is added to the offer at zero price, since their marginal costs are very close to zero and correspond to the offers that are being made by the current PV bidders. By using static and dynamic (multilevel) analyses, the variations of prices, quantities, emissions and surpluses of buyers and sellers are calculated. As the economic theory foresees, the new supply curve causes a decrease in average prices of 2.7 €/MWh in daylight hours (or 1.5€/MWh considering all the hours of the year), and an 8% reduction in the income of the PV plants currently in operation (incumbents). The substitution of combined cycle energy (the technology expelled) by PV energy brings about a saving of 2.2 million Mt of CO₂ eq. In terms of economic welfare, the incorporation of PV power produces an increase in the total surplus of about 300 M€ each year. © 2020

CO₂ emissions

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