

Assessing the Impact of Climate Change on European Electricity Markets Using Climate Projections Under Different Global Emission Pathways

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Extended Abstract

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Abstract Summary

During the transition to a carbon-free energy system, electricity markets are subject to several risks. Besides regulatory and technological uncertainties, future energy systems will be increasingly exposed to weather variations as they will be dominated by weather-dependent electricity supply. Therefore, they will be particularly affected by the undetermined pathways of global warming, exposing market actors to significant climate risk. We assess the impact of climate change on electricity markets across multiple future climate scenarios, each for two different designs of a sector-coupled, fully decarbonised European power system. The scenarios include projections of weather data retrieved from three climate models for the years 2046-2055 across three global greenhouse gas (GHG) emission pathways. One system design is highly electrified, while the other design considers more demand to be covered by hydrogen. We analyse the results in terms of the distribution of resulting electricity prices, generation and consumption patterns, profitability of investments in renewable power plants as well as consumer costs. The purpose of the analysis is to assess how the risk induced by uncertain climate futures drives the volatility of these variables as a measure of market risk. We compare the induced volatility to historic weather variations and other uncertainties, such as technology costs or import prices. Furthermore, we aim to compare differences between emission pathways and system designs to assess the impact of climate and energy policy on electricity markets.

Presenting Author Biography

Silke Johanndeiter is group leader for energy market design at Ruhr University Bochum's Chair of Energy Systems and Energy Economics. She holds a PhD in economics from Ruhr University Bochum and has previous work experience at EnBW.