



## Decarbonization of Electricity Systems in Europe: Market Design Challenges

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### Summary

Driven by climate change concerns, Europe has taken significant initiatives toward the decarbonization of its energy system. The European Commission (EC) has set targets for 2030 to achieve at least 40% reduction in greenhouse gas emissions with respect to the 1990 baseline level and cover at least 32% of the total energy consumption in the European Union (EU) through renewable energy sources, predominantly wind and solar generation. However, these technologies are inherently characterized by high variability, limited predictability and controllability, and lack of inertia, significantly increasing the balancing requirements of the system with respect to historical levels. The flexibility burden is currently carried by flexible fossil-fueled conventional generators (mainly gas), which are required to produce significantly less energy (as low operating cost and CO<sub>2</sub>-free renewable and nuclear generation are prioritized in the merit order) and operate part loaded with frequent startup and shut-down cycles, with devastating effects on their cost efficiency.

### Highlights

- Europe aims to reduce greenhouse gas emissions by 40% and achieve 32% renewable energy by 2030, focusing on wind and solar.
- High variability and low predictability of renewables increase system balancing needs, burdening flexible fossil-fuel generators.



Info

The TradeRES project will develop and test innovative electricity market designs that can meet society's needs of a (near) 100% renewable power system. The market design will be tested in a sophisticated simulation environment in which real-world characteristics such as actors' limited foresight into the future and risk aversion are included.



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