



## RES.Trade: An open-access simulator to assess the impact of different designs on balancing electricity markets

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### Summary

This article introduces the open-access Multi-agent Trading of Renewable Energy Sources (RES.Trade) system, which incorporates. A novel imbalance settlement (IS) mechanism is also proposed. It also introduces new designs tailored to the behavior of variable renewable energy sources, enabling their participation in balancing markets while minimizing IS penalties. These designs incorporate adjustments to: 1) gate closures, 2) rolling time horizons, 3) time granularities, and 4) bidding formats, such as block or flexible bids,

RES.Trade enables users to conduct sensitivity analyses of various market designs, customized to the specific characteristics of their power systems. The capabilities of RES.Trade are demonstrated through two case studies based on projected 2030 scenarios: the first evaluates four imbalance settlement mechanisms in Portugal, achieving a 43% reduction in penalties with the new method; the second examines five procurement mechanisms for secondary power reserves in the Spanish power system, leading to a 34% cost reduction for dynamic reserves.

### Highlights

- Different market designs for imbalance settlement as well as secondary and tertiary reserves;
- A novel imbalance settlement mechanism;
- A model for asymmetrical dynamic capacity procurement of secondary reserves;
- The practical work includes a study to test the models within Portugal and Spain for the year 2030. Analyzing the benefits of implementing asymmetrical dynamic capacity procurement for secondary reserves in the Spanish power system highlights potential improvements in resource allocation, system flexibility, and economic efficiency;



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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