

Aligning storage operation with the environmental goal of reducing carbon emissions

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Extended Abstract

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Abstract Summary

Energy storage is crucial for integrating intermittent renewables, but its operation does not always align with the environmental goal of reducing carbon emissions. This paper proposes and evaluates a novel carbon-aware mechanism designed to steer storage operations towards emission reduction within the context of Italy's new time-shifting (TS) market. We introduce a system of financial rewards and penalties for TS contract holders based on the grid's average carbon intensity at the time of charging and discharging. Using a detailed model of the Italian electricity market and real-world data, we simulate the impact of this mechanism. The results show that the proposed scheme can help reduce carbon emissions, achieving a 3.5% decrease at the national level and reductions of up to 13% in specific high-emission zones. These findings demonstrate that incorporating explicit carbon pricing signals into storage market mechanisms is an effective strategy to ensure that energy storage assets contribute positively to decarbonisation efforts.

Presenting Author Biography

I hold a Marie Skłodowska-Curie Research grant on investigating how the increasing presence of energy storage can cannibalise its market.

Previously, I was a postdoc at the Universities of Edinburgh, Oxford, and Bath, working on Energy Market Design. I have an interdisciplinary background with a PhD in Engineering, an MS in Finance, and a BS in Economics. I taught Energy Market at the University of Oxford and Siena.

Since 2024, I am an Affiliated Scientist at the Euro-Mediterranean Centre on Climate Change