

# ***A RESTRUCTURED MOROCCAN ELECTRICITY MARKET AND ITS INTERACTION WITH THE IBERIAN POWER MARKET***

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## **Overview**

Unlike many other commodities, the cross-border exchange of electricity usually requires significant investments to establish permanent grid interconnections between the networks of the respective countries, in addition to continuous cooperation among their relevant authorities. It is therefore of crucial importance to determine the expected benefits of these interconnections in order to justify the important investments required. The rules governing the cross-border trade of electricity vary significantly depending on the structure of each country's market and the trade horizon, with implicit auctions through market coupling being the most common short-term capacity allocation method between deregulated markets.

The interconnection between Morocco and the Iberian electricity market is unique as it is currently the only existing connection between Africa and Europe. It has a capacity of 1,400 MW, with plans to extend its capacity over the coming few years, making it of peculiar importance. Despite this, there is currently no literature on the economics of this interconnection. While Escribano (2019) examines some aspects of the interconnection in a geopolitical context, and RES4Africa (2021) covers regulatory aspects, neither delves into the economic aspect. This paper provides an economic analysis of the interconnection by simulating a hypothetical scenario in which the Moroccan electricity market is deregulated and coupled with its Iberian counterpart. This counterfactual scenario represents a plausible future development due to the ongoing liberalization efforts of the Moroccan market and how the interconnection's capacity is currently allocated.

## **Methods**

We analyze how the coupled Moroccan market and the Iberian market would interact under three different scenarios of interconnection capacity. The first is the isolated scenario, where we assume no interconnection capacity and therefore, the independent clearing of each market. The second scenario assumes that the markets are coupled and interconnected with a capacity similar to the current commercial one, which is 900 MW in the MIBEL to Morocco direction, and 600 MW capacity in the reverse direction. The third and final scenario simulates an unlimited interconnection capacity between the two regions, and hence no transmission constraints.

We simulate the functioning of the two markets in the three scenarios in a bilateral context and compute the market clearing prices, utilization rates of the interconnection, the producers' surplus, consumers' surplus, and congestion rents for each market. This enables us to assess how the markets would interact, the estimated welfare benefits from the existing interconnection under market coupling, and the potential gains or losses from increasing its capacity. We carry the simulation for the years 2019 and 2021, the difference in fuel prices between these two years was considerable, which allows us to verify the robustness of our results in different contexts of global fuel prices and market conditions.

## **Results**

In 2019, the existing interconnection resulted in net social welfare benefits amounting to 137.8 million euros, of which 61.4 million euros were derived from congestion rents (compared to the isolated scenario). The unlimited capacity scenario yielded a higher social welfare of 43.55 million euros compared to the current capacity one. Out of the yearly 8,760 hours, the interconnection experienced congestion for 3,812

hours, of which 3,433 hours were in the Spain to Morocco direction. In 2021, the current capacity scenario led to a net welfare increase of 284.47 million euros over the isolated scenario, with congestion rents contributing 177.62 million euros. The unlimited capacity scenario provided even higher net welfare of 162.55 million euros compared to the current capacity one. The interconnection experienced a total of 5,912 hours of congestion, with the majority similarly occurring in the Spain to Morocco direction (4,991 hours).

The higher social welfare generated by the interconnection in the year 2021 as compared to 2019 can largely be explained by the former's greater degree of complementarity between the markets' demand profiles, in addition to more significant price differences across the border, largely due to the disparities in environmental policy between the markets and prevailing marginal technologies. The fact that the interconnection is highly congested in both years in the current capacity scenario, particularly for the Spain to Morocco direction, suggests that higher welfare could be achieved by expanding its capacity, as demonstrated by the unlimited capacity scenario simulation.

## **Conclusion**

The existing interconnection provides significant social welfare for both markets in our hypothetical scenario, with Moroccan consumers and Iberian producers largely benefiting from it as opposed to Moroccan producers and Iberian consumers. Overall, prices in Morocco decrease significantly while Iberian prices see a slight increase. The Moroccan market experiences the largest welfare gain from the interconnection in both the current capacity and the unlimited capacity scenarios, and while the Iberian benefits are smaller comparably, the region similarly collects significant net welfare benefits. Given the relative size of the Iberian power market in comparison to the Moroccan, the former's prices exert a greater influence on the converged prices. Moreover, even with limited grid capacity, Moroccan prices considerably converge towards the unconstrained capacity prices and both markets experience less volatility.

However, our simulations suggest that the results from social welfare analyses carried over a single year, as is common in the literature, cannot necessarily be generalized over longer time horizons. This is due to the sensitivity of the results to substantial changes in market conditions, such as the ones that occurred in 2021 with the energy crunch. Finally, as expected, the benefits from grid interconnections are higher when the interconnected markets exhibit complementarity and price differences are larger.

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