

Capacity Mechanisms in a Highly Renewable Electricity Market with Flexible Resources

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Overview

After the recent RepowerEU plans, the phase-out of fossil fuels is accelerating towards a nearly 100% renewable energy system. An electricity market with a high concentration of renewables will cause higher uncertainty on the revenues, not only of the intermittent technologies but of all market participants. In this study, we explore whether an energy-only market in the Netherlands, with a high concentration of renewable energies and flexible resources, provides enough incentives for investing in dispatchable generation. Then, we compare reliability indicators of the same future system with capacity mechanisms.

Methods

The present work presents a co-simulation of two agent-based models (ABM). Emlabpy, a new modular ABM inspired in [1], simulates the investments and uses the short-term market results from another ABM, AMIRIS [2]. The latter ABM allows modeling storage and demand side management. The co-simulation is executed in Spinetoolbox, a workflow management application that enables the execution of complex simulation tasks with scenario and data management capabilities. [3]

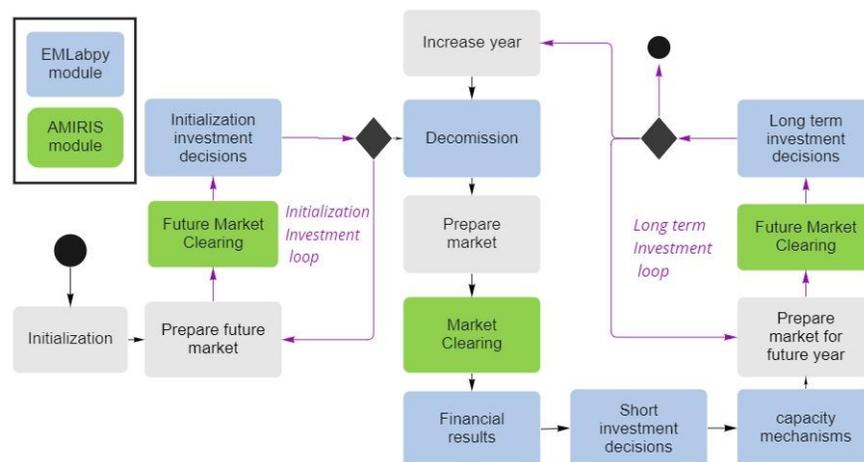
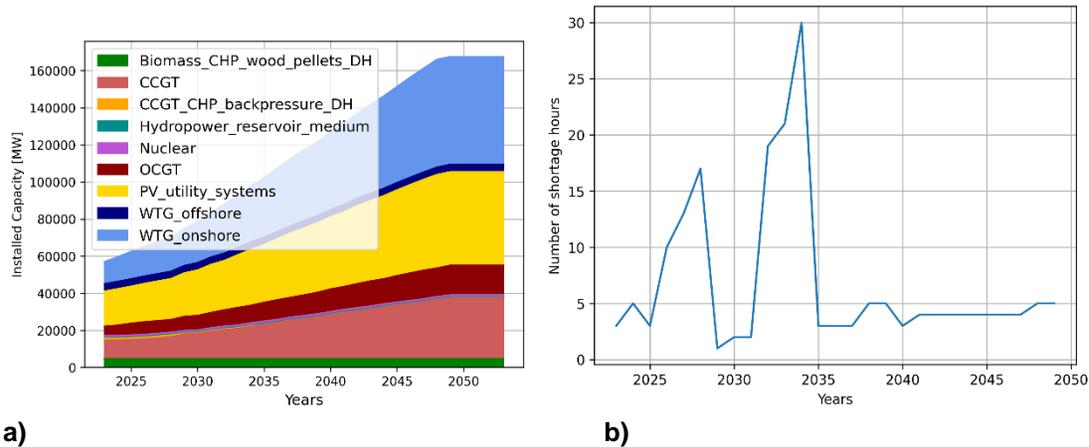


Figure 1 Conceptual workflow of the co-simulation EMLabpy-AMIRIS, which is executed in a yearly loop

Results

In the first simulation, we test an almost 100% renewable market under different weather conditions. We analyze the market-based recovery, the loss of load, and the energy not supplied. Afterwards, we run the simulations with a capacity market and strategic reserve.



a) **b)**
 Figure 2 Exemplary results of the EMLapy-AMIRIS soft-linking a) Installed capacity b) Loss of Load Expectation

Conclusions

We expect that capacity mechanisms can improve the companies' cost recovery and the security of supply, while keeping costs lower than an energy-only-market, as scarcity times are avoided.

References

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