# Portugal microgrid economics

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Markowski, J.; Leszczy?ski, J.; Ferreira, P.F.V.; Dranka, G.G.; Grybo?, D. Analysis of Electricity Supply and Demand Balance in Residential Microgrids Integrated with Micro-CAES in Northern Portugal. Energies 2024, 17, 5005. https://doi /10.3390/en17195005

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Markowski, Jan, Jacek Leszczy?ski, Paula Fernanda Varandas Ferreira, G?remi Gilson Dranka, and Dominik Grybo?. 2024. "Analysis of Electricity Supply and Demand Balance in Residential Microgrids Integrated with Micro-CAES in Northern Portugal" Energies 17, no. 19: 5005. https://doi /10.3390/en17195005

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Challenge prevailing notions on short-term uncertainty, advocating for robust methodologies leveraging machine learning and decision theory in 100% renewable energy grids.

The power industry faces significant risks from climate change, impacting fuel resources, energy generation, physical resilience of energy infrastructure, and energy demand. Escalating extreme weather events, such as cyclones, wildfires, heatwaves, floods, and cold spells, pose a growing threat, disrupting energy generation and complicating demand management [4]. Recent blackouts in Australia, California, Japan, and Korea, caused by wildfires, heatwaves, and cyclones, underscore the vulnerability of energy systems to climate-related risks.

According to [8], US emissions experienced a 35% reduction from 2000 to 2022, measured in metric tons of CO2 per capita. The Intergovernmental Panel on Climate Change (IPCC) sets the targeted reduction range for carbon dioxide CO2 emissions by 2050, relative to the year 2000, between 50 and 85% per capita. In contrast, China"s emissions increased by a significant 350%. Overall, estimated global emissions rose by 12.5% during the same period.

A microgrid (MG) is a self-sufficient system designed to generate electricity through renewable energy sources (RES) and energy storage systems (ESSs), capable of functioning independently or connected to the primary power grid. The utilization of microgrids is often described as distributed, scattered, decentralized, district, or embedded generation. Microgrids have emerged as a preferred solution to address the inherent variability and uncertainty associated with RES, significantly mitigating the risk of blackouts and enhancing the overall reliability of the power supply [9].