



Energy communities: technologies, regulations, and economics. The Spanish case



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Energy communities are collective initiatives in which citizens, local authorities, and small businesses jointly produce, manage, and consume energy, supporting a decentralized, low-carbon, and socially inclusive energy system. Rooted in early cooperative and rural electrification movements, they have re-emerged due to renewable energy diffusion, digitalization, and growing interest in energy democracy. These communities rely on distributed technologies such as solar photovoltaics, wind power, battery storage, smart meters, and digital energy management platforms, enabling local balancing and peer-to-peer exchange. Regulation is a critical enabler, with recent frameworks—particularly in Europe—formally recognizing energy communities and granting rights to self-consumption and market participation, though barriers remain. Economically, energy communities foster local value creation, cost reduction, and resilience, while facing challenges related to financing, scalability, and long-term sustainability. This conference aims to provide a multidisciplinary forum to discuss the evolution, opportunities, and challenges of energy communities, integrating perspectives from technology, regulation, economics, and social innovation to support their effective deployment and replication, including some examples on weather forecasts and optimization on generation/consumption management. Moreover, the current state of the art of Spain's energy communities is to be reviewed.