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Elena Benedetti is a PhD candidate in Engineering and Applied Science for Energy and Industry at Sapienza University of Rome, where she focuses on the role of renewable energy in the energy transition and long-term scenario planning. Her research combines historical data analysis, forecasting methods, and scenario modelling to evaluate the integration of renewable sources into sustainable energy systems.

She has presented her work in international conferences and contributed to interdisciplinary projects dealing with energy security, sustainability, and climate change mitigation. Her expertise includes time-series forecasting, scenario planning, and the development of data-driven approaches for long-term energy policy assessment.

In parallel, she works full-time at Terna, the Italian Transmission System Operator, as a project engineer for the design and implementation of electrical substations.

177 – Decarbonization of the civil sector through utility-scale PV and related grid improvements: assessment of economic and carbon impact in an Italian case study

This study investigates the economic and environmental implications of deploying utility-scale photovoltaic systems to support the decarbonization of the civil sector in the Tuscany Region, Italy. By combining regional data, policy targets, and technical simulations, this paper compares the BAU scenario with two contrasting scenarios: one based on traditional fossil generation, and one supported by the adoption of utility-scale PV and battery energy storage systems. The analysis integrates electricity demand projections from full electrification of heating in residential and tertiary sectors, assesses photovoltaic potential using updated GIS and legislative data, and evaluates impacts on the regional transmission grid as defined by the Italian Transmission System Operator. The study concludes that investment in utility-scale PV and BESS infrastructure is a strategic and sustainable pathway for achieving regional decarbonization goals, even if CAPEX is still more expensive than providing electricity to the civil sector using fossil sources, due to lower capacity factors and higher generation and grid costs.