

Optimising Italian Electricity and Gas Sectors Coupling in a 2030 Decarbonized Energy System

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Abstract. The need to mitigate climate change by reducing greenhouse gas emissions requires installing in power systems large shares of non-programmable renewable energy sources (NP-RES), which will require major overhauls of flexibility resources to ensure the secure operation of the system. In such a context, the Power-to-X (PtX) technology could play a key role in mitigating the stochasticity of the NP-RES production by converting surplus renewable generation into gas fuel, which can be stored locally to be used later or injected in the natural gas network. The deployment of PtX plants increases the interconnection between electricity and gas systems and requires an integrated planning framework that could accurately consider this coupling. The aim of this contribution is twofold: (i) to present a novel medium-term simulation tool for the operational planning of integrated systems with bi-directional energy conversion; and (ii) to present the results of the application of this tool to a case study focused on Italy challenges exploring the decarbonization pathways. Specifically, the tool here introduced simulates the operation of the power and of the gas systems to supply the hourly demand for electricity and gas at minimum total cost, while respecting all the technical constraints of the considered systems.

Keywords: Integrated systems; Power-to-X; Decarbonization

References

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