

Energy Scenarios for Ukraine 2050

Alexander Sicheneder

Helmholtz Zentrum, Berlin, Germany

Extended Abstract

[Download file](#)

Abstract Summary

This working paper develops and quantifies long-term energy transition scenarios for Ukraine to 2050 under conditions of deep political, economic, and technological uncertainty. Building on a structured scenario methodology and participatory expert workshops in Kyiv, we identify key drivers shaping Ukraine's energy future using a PESTE framework and classify them into critical trends, critical uncertainties, and wild cards.

The analysis focuses on a central uncertainty: the pace and depth of Ukraine's integration into the European Union. Based on this axis, we construct two internally consistent scenarios - *"The Rising Partner"* and *"The Waiting Nation"* - which represent alternative pathways of institutional convergence, investment conditions, and technological diffusion.

The developed qualitative narratives are translated into a quantified scenario framework using the Long-range Energy Alternatives Planning (LEAP) model that parameterises key socio-economic, technological, and policy variables for both scenarios. This enables the systematic comparison of energy system outcomes, including renewable energy shares, investment needs, and emissions trajectories.

By linking qualitative scenario development with quantitative energy modelling, this paper provides a structured framework for European policymakers to assess how political and institutional trajectories shape Ukraine's decarbonization pathway. It thereby contributes to a more informed and forward-looking debate on EU enlargement as a key determinant of energy transition outcomes in Ukraine.

Presenting Author Biography

Alexander holds an M.Sc. in Politics and Technology from the Technical University of Munich and a B.A. in Political Science and Economics from LMU Munich. He is a Research Associate in the *Green Deal Ukraine* project at Helmholtz Zentrum Berlin. His research focuses on carbon pricing and climate finance, and includes scenario-based analysis of Ukraine's energy system. He previously worked in the Energy Unit of the European

Economic and Social Committee, contributed to hydrogen consultancy projects at Ludwig-Bölkow Systemtechnik, and interned at the German Federal Ministry for Economic Cooperation and Development.