HOW GOOD ARE ENERGY SCENARIOS? ASSESSING 63 ENERGY OUTLOOKS IN A NOVEL MULTI-DIMENSIONAL FRAMEWORK

Dawud Ansari, German Institute for International and Security Affairs, dawud.ansari@swp-berlin.org
Sabire Seyma Evli - ÖKOTEC Energiemanagement GmbH, sabire@evli.de
Wassim Brahim, Energy Access and Development Program, wassim.brahim@eadp.eu
Anna Broughel, Johns Hopkins University, abrough3@jhu.edu

Overview

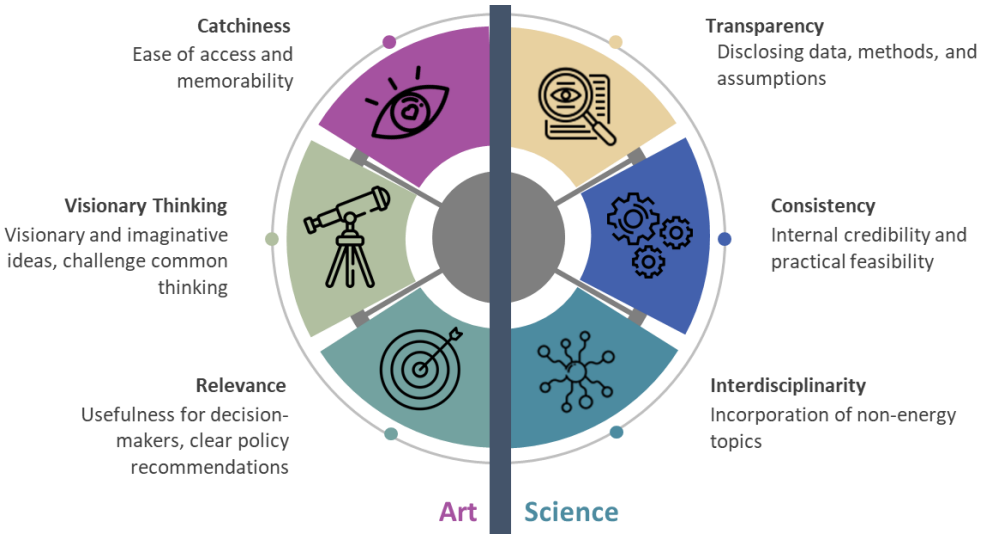
Energy outlooks, a form of grey literature, drive decision-making in energy policy and the industry, but their quality has not been extensively assessed. In the past years, academic criticism about the quality of those outlooks has gotten more and more pronounced, including their failure to include interdisciplinary insights (Sharmina et al., 2019), missing standards of scientific foresight criteria (Schmidt-Scheele, 2020), intransparency and dogmatism (Junne et al., 2019), and missing methodological standards (Laugs & Moll, 2017). Some first examples of systematic evaluations of energy scenarios—especially Ansari et al. (2019), Evli et al. (2022), and Junne et al. (2019)—draw a dismal picture but lack in sample size and systematisation of the analysis.

This study is the first large-scale, systematic, quantitative evaluation of energy outlooks. We aim to assess the state of outlooks and their quality, analyse their current landscape, identify major trends, and assess the level of quality among different types of organizations. We develop, define, and operationalise six assessment criteria for energy outlooks, split into 22 metrics that we evaluate both manually and using machine learning techniques. Our sample comprises 63 global energy outlooks from the period 2019—2021, including both popular organisations (e.g. IEA, Shell, BP) as well as less-popular, independent projects.

We find that the overall status quo is dismal, with only five out of the 63 outlooks receiving a passing score. Aside from the criteria and indicators we develop, the study contributes to the crucial discourse on "energy futures". Particularly, we outline what drives high-quality scenarios, in which areas most scenarios fall behind, and how energy scenarios can be improved. The findings are of central importance to both academics and decision-makers.

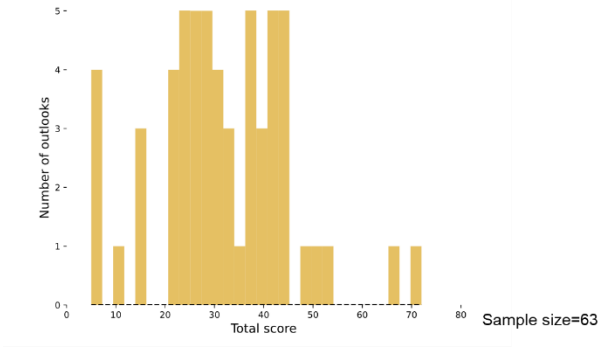
Methods

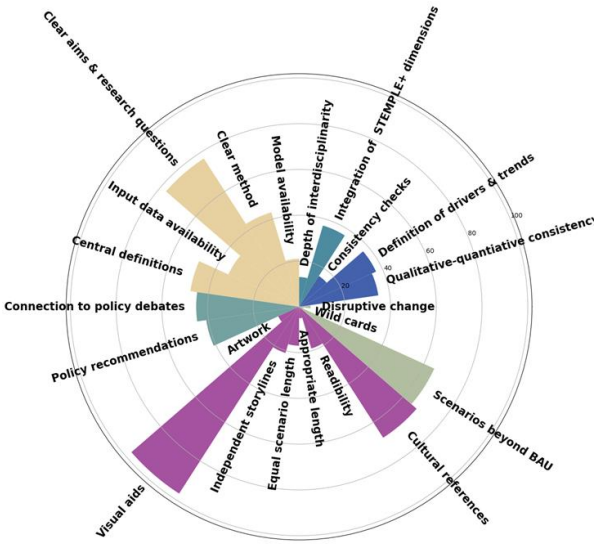
The study builds on and extends the scenario evaluation framework developed in Evli et al. (2022). We use the scenario foresight literature to develop and define six dimensions of scenario quality—Catchiness, Transparency, Visionary Thinking, Consistency, Relevance, and Interdisciplinarity—as well as 22 metrics to measure those dimensions. We evaluate each of those metrics individually for each outlook, some of them manually and some of them using natural language processing (NLP) algorithms. Based on these metrics we create aggregate scores each dimension and scenario quality as a whole (weighted average method) on a scale of 0 to 100. Our sample contains 63 energy outlooks from 2019 to 2021, encompassing 230 scenarios from both Western and non-Western sources.



Results

All but five energy outlooks score below 50/100, indicating that all six dimensions need to be strengthened. Transparency, relevance, and catchiness dimensions are more developed, while consistency, visionary thinking, and interdisciplinarity need better integration. Art and science dimensions are correlated, implying that high-quality scenarios perform well in both fields. Hydrogen is often mentioned, but its role is limited to below 5% in the primary energy mix, even in net-zero visions. Geopolitics is a significant blind spot, and security is rarely covered. Interdisciplinarity, on the of blind spots, also shows very common patterns: Most scenarios integrate economic and environmental factors, but almost no scenario considers military and security factors. Only two outlooks (DIW and Equinor) integrate wild cards, suggesting that scenarios fail to prepare for unexpected events.





Conclusions

The quality of energy outlooks needs to be improved across all six dimensions, with consistency, visionary thinking, and interdisciplinarity requiring the most attention. Our research shows that there is a substantial gap between how energy outlooks are perceived and how they should be perceived—the substantial lack in methodological standards draws their suitability to guide decision-making into question. Many of the outlooks lack the ability to anticipate the future, with potentially devastating results for decision-making. We therefore advocate for a broad program to enhance the quality of outlooks while also sharpening the awareness of scenario users. To these ends, our research provides hints the precise points that need improvement as well as what may drive respective shortcomings. Moreover, the study provides insights into aggregated trends in energy outlooks which are of interest to academics and decision-makers.

References

Ansari, Dawud, Franziska Holz, and Hashem Al-Kuh Lani. "Energy Outlooks Compared: Global and Regional Insights." Economics of Energy & Environmental Policy 9, no. 1 (2020): 21-43.

Evli, S. S., Broughel, A., & Ansari, D. (2022). Evaluation of Net-Zero Carbon and 100% Renewable Energy Scenarios for 2050 and Beyond. In The Palgrave Handbook of Zero Carbon Energy Systems and Energy Transitions (pp. 1-25). Cham: Springer International Publishing.

Junne, T., Xiao, M., Xu, L., Wang, Z., Jochem, P., & Pregger, T. (2019). How to assess the quality and transparency of energy scenarios: Results of a case study. Energy Strategy Reviews, 26, 100380.

Laugs, G. A., & Moll, H. C. (2017). A review of the bandwidth and environmental discourses of future energy scenarios: Shades of green and gray. Renewable and Sustainable Energy Reviews, 67, 520-530.

Schmidt-Scheele, R. (2020). 'Plausible'energy scenarios?! How users of scenarios assess uncertain futures. Energy Strategy Reviews, 32, 100571.

Sharmina, M., Abi Ghanem, D., Browne, A. L., Hall, S. M., Mylan, J., Petrova, S., & Wood, R. (2019). Envisioning surprises: How social sciences could help models represent 'deep uncertainty'in future energy and water demand. Energy Research & Social Science, 50, 18-28.