

Modelling Heterogeneous Interruption Costs: A Macro-Data-Based & Literature-Informed VoLL Framework for Germany

Jakob Kulawik, Aaron Praktiknjo
RWTH Aachen, Aachen, Germany

Extended Abstract

[Download file](#)

Abstract Summary

The Value of Lost Load (VoLL) is a key parameter in security-of-supply assessment, resource adequacy analysis, and electricity market design. However, VoLL is still often represented by highly aggregated values, even though outage costs vary substantially across regions, sectors, consumer groups, and time. This paper presents a framework for deriving differentiated VoLL estimates for Germany by combining a macro-data-based baseline model with a structured literature-based refinement. The baseline uses macroeconomic, energy consumption, and socioeconomic data to estimate highly resolved reference values across regions, consumer groups, and time periods. It is then complemented by evidence from the empirical VoLL literature to account for additional cost components, behavioural effects, and methodological sources of heterogeneity not fully captured by macro-data alone.

The approach is motivated by both methodological and regulatory challenges. Prior research has shown substantial heterogeneity in how European countries implement VoLL estimation, limiting comparability and raising questions about the use of single national VoLL values in planning and regulation. The proposed framework addresses this gap by combining a transparent baseline with an evidence-based adjustment logic.

The results highlight that aggregate VoLL values conceal significant heterogeneity in interruption costs. More differentiated estimates are particularly valuable in applications that also reflect regional network structure as well as sectoral and temporal variation. The paper thus provides both differentiated VoLL estimates for Germany and a transferable methodological framework that can support future European applications and contribute to improving the representation of interruption costs in regulatory and modelling practice.

Presenting Author Biography

Jakob Kulawik studied Business and Economics at TU Dresden and the University of the West of Scotland. He subsequently studied International Economics at the University of Göttingen and Fudan University, completing his Master's degree in 2021. Since July 2021, he is working as a research associate and doctoral student at the Chair for Energy System Economics, RWTH Aachen University.

His research focuses on resource adequacy and the economic valuation of security of supply, particularly Value of Lost Load and regulatory design. Further interests include energy demand modelling, socio-economic heterogeneity in energy system models, and distributional effects of the energy transition.