# Wind Energy Integration into Gabonese National Grids: Technical Challenges and Solutions

**Ebolie Mamboundou**[1]**, Mbongwe Emye André**[1,2]**, Mba Ngouabi Aline**[1,2]**, Ngueu Ntep Élie**[1]

[1] University of Science and Technology of Masuku (USTM)

[2] Omar Bongo University, Libreville

**Correspondence:** emamboundou@outlook.com

**Author notes**

*Ebolie Mamboundou is affiliated with University of Science and Technology of Masuku (USTM) and focuses on Energy research in Africa.*
*Mbongwe Emye André is affiliated with Omar Bongo University, Libreville and focuses on Energy research in Africa.*
*Mba Ngouabi Aline is affiliated with Omar Bongo University, Libreville and focuses on Energy research in Africa.*
*Ngueu Ntep Élie is affiliated with University of Science and Technology of Masuku (USTM) and focuses on Energy research in Africa.*

## Abstract

Wind energy integration into national grids in Gabon has been a focus of technological and logistical challenges due to varying climatic conditions and existing power infrastructure. Qualitative ethnographic methods were employed to conduct interviews with stakeholders including government officials, power utility companies, and local communities. Data collection involved semi-structured interviews and field observations to understand the practical implications of wind energy integration. A thematic analysis revealed that technical challenges predominantly revolve around grid stability and intermittency issues, with a notable proportion (45%) indicating difficulties in integrating variable wind power into existing static grid configurations. The findings highlight the critical need for robust monitoring systems and flexible grid management strategies to accommodate intermittent renewable energy sources effectively. Recommendations include the implementation of advanced forecasting models to predict wind patterns, upgrading substations with smart technologies to manage variable power inputs, and fostering community engagement to address socio-economic impacts. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *African Geography, Rural Electrification, Techno-economic Analysis, Participatory Methods, Anthropology of Energy Systems*

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