

REVIEWER'S REPORT

Manuscript No.: IJAR- 58386

Title: Assessing the Performance of a Gas Turbine Power Plant for Sustainable Electricity Supply in a Nigerian Faith-Based Community

Recommendation:

Accept

Rating	Excel.	Good	Fair	Poor
Originality	Yes			
Techn. Quality		Yes		
Clarity	Yes			
Significance		Yes		

Reviewer Name: Dr. Ashish Yadav

Detailed Reviewer's Report

Reviewer's Comment for Publication.

Acceptance Comments are mentioned below suitable for the paper titled "Assessing the Performance of a Gas Turbine Power Plant for Sustainable Electricity Supply in a Nigerian Faith-Based Community"

Reviewer Comments: Accept

Reviewer Comments –

1. Introduction

The introduction effectively highlights the persistent electricity supply challenges in Nigeria and clearly establishes the importance of captive power generation for ensuring reliable electricity in large institutional communities. The authors successfully justify the selection of the Redemption City power plant as a unique case study by emphasizing its large resident population and periodic congregation of millions of visitors. The research objectives are well defined and demonstrate both academic relevance and practical significance. Overall, the introduction provides a strong foundation for evaluating sustainable electricity supply through embedded gas turbine generation.

2. Literature Review

The literature review presents a comprehensive discussion of previous research on gas turbine performance, captive power systems, embedded generation, and electricity reliability in developing economies. The authors critically compare utility-scale generation with captive power applications, effectively identifying the research gap addressed in this study. The review establishes the significance of evaluating operational performance using standard power plant indices while linking the study to broader sustainability and energy security objectives. The cited literature provides a solid theoretical basis for the proposed performance assessment.

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3. Solution Approach

The methodology is systematic, transparent, and appropriate for the objectives of the research. The use of sixteen months of operational data collected from the 11 kV distribution control room provides a reliable dataset for evaluating plant performance under real operating conditions. Standard performance indicators, including capacity factor, load factor, peak utilization factor, transmission efficiency, and reserve margin, are appropriately calculated and interpreted. The methodological framework is scientifically sound, reproducible, and suitable for assessing the operational effectiveness of captive gas turbine power plants.

4. Results and Discussion

The results are clearly presented and provide valuable insights into the operational characteristics of the gas turbine power plant. The analysis demonstrates that the plant maintains high transmission efficiency while intentionally operating with a substantial reserve margin to accommodate infrequent but extremely high electricity demand during major religious events. The discussion effectively distinguishes this strategic operational design from the under-utilization commonly reported in conventional utility power plants. The practical recommendations regarding maintenance monitoring, metering improvements, and solar hybridization further enhance the applicability and significance of the findings.

5. Conclusion

The conclusion successfully summarizes the major findings and confirms that the captive gas turbine power plant provides a reliable and sustainable electricity supply model for large faith-based communities. The recommendations for improved operational monitoring, reduction of non-technical losses, and integration of renewable energy sources are practical and aligned with current sustainable energy practices. The conclusions are well supported by the presented analysis and clearly demonstrate the contribution of the study to energy management and embedded generation research. The manuscript offers meaningful insights that can benefit researchers, utility operators, and policymakers.