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REVIEWER'S REPORT

Manuscript No.: **IJAR-53290** Date:13.08.2025

Title: Contribution of Artificial Intelligence in the Optimization of Energy Consumption in Modern Networks

Recommendation:
Accept after minor revision………………

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

Reviewer Name:Dr.K.Arumuganainar **Date:13.08.2025**

Reviewer's Comment for Publication.

- **Relevance:** ★★★★★ (High applicability to smart grid and building management)
- **Originality:** ★★★★☆ (Strong in operational translation, moderate in modelling novelty)
- **Technical Quality:** ★★★★☆ (Solid methodology, but limited model diversity)
- **Clarity:** ★★★★☆ (Mostly clear, but could improve grammatical polish)
- **Potential Impact:** ★★★★★ (Significant for sustainable energy optimization in IoT-enabled infrastructures)

Final Recommendation: *Accept with Minor Revisions* – The paper is well-structured, relevant, and experimentally strong, but could be enhanced with more model comparisons, real-world trials, and economic/environmental analysis.

Detailed Reviewer's Report

Review Report

Title: *Contribution of Artificial Intelligence in the Optimization of Energy Consumption in Modern Networks*

1. Summary of the Work

The paper addresses the challenge of optimizing energy consumption in smart grids, particularly within smart building and campus-scale contexts. It proposes using Artificial Intelligence (AI)—specifically, Multilayer Perceptron (MLP) and Long Short-Term Memory (LSTM) neural networks—to improve real-time forecasting of energy demand compared to a seasonal ARIMA statistical baseline.

The authors simulate a campus-scale IoT-enabled environment, collect high-frequency data, train models, and translate forecast accuracy into operational benefits, such as reduced energy losses and increased net gains in office buildings.

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2. Strengths

1. **Clear Research Objective** – The research question is well-defined: quantifying the improvement of AI-based forecasting relative to statistical baselines.
2. **Comprehensive Methodology** – Includes realistic IoT sensor setup, rigorous preprocessing, and both statistical and deep learning baselines.
3. **Strong Results** – LSTM achieves 18.6% improvement over ARIMA, 5.8% over MLP, and significant operational benefits (≈14.7% loss reduction, 9.3% net gain).
4. **Robustness Checks** – Addresses missing data, abrupt load changes, and disturbances, which adds practical credibility.
5. **Connection to Literature** – Good alignment with existing work (e.g., Zhang & Liu 2023) and highlights operational translation of improvements.
6. **Reproducibility** – Appendix A provides detailed implementation parameters, which supports replication.

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3. Weaknesses / Areas for Improvement

1. **Simulation-Only Scope** – The test bed is simulated, so the transferability to real-world deployments is uncertain.
2. **Limited Dataset Duration** – Only 90 days of data; longer-term and seasonal variations are not fully captured.
3. **No Cost–Benefit Analysis** – While energy savings are quantified, the economic feasibility and return on investment (ROI) are not discussed.
4. **Model Comparisons** – Only ARIMA, MLP, and LSTM are tested; inclusion of advanced architectures (e.g., GRU, Temporal Convolutional Networks, Transformer-based time-series models) could strengthen findings.
5. **Lack of Carbon Impact Metrics** – The environmental benefit is implicit but not directly calculated (e.g., CO_2 savings from reduced consumption).
6. **Limited Real-time Deployment Strategy** – Although edge computing is mentioned, the paper doesn't present a prototype or field-tested integration.

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4. Technical Evaluation

- **Data Handling:** Appropriate cleaning, normalization, dimensionality reduction (PCA), and sequence windowing.
- **Model Setup:**
  - MLP: 3 layers (64–128–64), dropout 0.2, ReLU.
  - LSTM: 1 layer (100 units), dense output.
  - Both trained with Adam optimizer, learning rate 0.001, batch size 32.
- **Validation:** Strong approach with 5-fold CV and independent 20% test split.
- **Performance Metrics:** RMSE and accuracy are suitable choices; gain over baseline (%) clearly reported.
- **Operational Translation:** Redistribution algorithm is a highlight, connecting model output to real-world energy control.

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5. Clarity and Presentation

- **Writing Style:** Generally clear, with some dense technical sections. Occasional grammatical issues could be improved for fluency.
- **Figures and Tables:** Results are supported by visualizations (RMSE, accuracy, comparative literature benchmarking).
- **References:** Relevant, recent (2023–2024), and credible. Good integration with cited work.

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6. Novelty and Contribution

- Demonstrates that LSTM outperforms MLP and ARIMA for one-hour-ahead campus energy forecasting.
- Bridges the gap between *forecast accuracy* and *operational energy savings* through simulation—a dimension often overlooked in the literature.
- Focus on African campus-scale deployment provides regional relevance.

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7. Recommendations for Improvement

1. **Extend Dataset** – Include multiple seasons to account for long-term variability.
2. **Real-world Deployment Trial** – Validate models with live campus IoT data to assess operational feasibility.
3. **Economic and Environmental Impact Analysis** – Quantify cost savings and CO_2 reduction.
4. **Compare with More Models** – Add GRU, Prophet, or hybrid AI-statistical approaches for a broader performance benchmark.
5. **Integration with Control Systems** – Demonstrate end-to-end integration with smart building management software.
6. **Scalability Analysis** – Address performance for larger-scale city grids beyond campus level.

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8. Overall Assessment

- **Relevance:** ★★★★★ (High applicability to smart grid and building management)
- **Originality:** ★★★★☆ (Strong in operational translation, moderate in modeling novelty)
- **Technical Quality:** ★★★★☆ (Solid methodology, but limited model diversity)
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