REVIEWER'S REPORT

Manuscript No.: IJAR-50542   Date: 07-03-2025

Title: DEVELOPMENT OF SOFTWARE FOR SIZING AN STAND-ALONE PHOTOVOLTAIC/BATTERY SYSTEM BASED ON MATHEMATICAL MODELS

Recommendation:
Accept as it is.................**YES.............**
Accept after minor revision.................
Accept after major revision ....
Do not accept (*Reasons below*) ....

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

Reviewer's Name: Mir Tanveer

Reviewer's Decision about Paper: Recommended for Publication.

Comments (*Use additional pages, if required*)
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Reviewer's Comment / Report

Strengths:

1. **Comprehensive Abstract**
   o   The abstract clearly outlines the motivation, objectives, methodology, and key results of the study.
   o   The use of empirical equations and the integration of Java (NetBeans) and SQL (SQLite) for software development is well-articulated.
   o   The practical application of the software, using real-world data from the Kankan Coura health center, enhances the study's relevance.

2. **Well-Defined Introduction**
   o   The introduction effectively sets the context by discussing the global energy crisis, the reliance on fossil fuels, and the need for renewable energy sources.
   o   The significance of photovoltaic (PV) energy in addressing energy security and environmental concerns is clearly established.
   o   The discussion on existing simulation software tools and their limitations provides a strong justification for developing an offline, cost-free alternative.

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3. Clear Research Objective

- o The research aims to develop a standalone PV system sizing software, with specific focus on calculating key system components such as daily energy consumption, peak power, and battery capacity.
- o The objective is well-structured and directly aligned with the methodology and findings.

4. Strong Methodological Approach

- o The methodology is systematically structured into four key parts, ensuring clarity in the approach.
- o The mathematical models used for sizing PV system components are well-documented and supported by relevant equations.
- o The study effectively incorporates RETScreen software to obtain meteorological parameters, ensuring accurate input data for simulations.

5. Detailed Mathematical Formulations

- o The study provides a robust set of mathematical models for sizing the PV array, battery bank, charge controller, and cabling system.
- o Each formula is clearly stated, with appropriate definitions of variables, making the methodology transparent and replicable.
- o The influence of key parameters such as irradiation and system losses is well-articulated.

6. Use of Empirical Data for Validation

- o The software validation process using real-world energy consumption data strengthens the credibility of the study.
- o The results, including the tilt angle, peak power, and battery bank configuration, demonstrate the practical applicability of the developed software.

7. Logical Structure and Coherent Flow

- o The paper follows a clear structure, with the introduction leading into methodology, followed by results and discussions.
- o Each section transitions smoothly, maintaining logical coherence.

8. Strong Technical Justification for Software Development

- o The use of Java (NetBeans) for GUI design and SQLite for database management is well-justified.
- o The integration of the Jasper Report plugin enhances the usability of the software for report generation.

9. Practical Significance

- o The research addresses a crucial gap in accessible PV sizing tools for remote areas.
- o The developed software is positioned as a valuable tool for PV equipment vendors, independent buyers, and installers.

Observations:

1. Strong Justification for Renewable Energy Adoption

- o The discussion on global warming and health risks associated with fossil fuels enhances the study's broader impact.
- o The citation of WHO statistics on air pollution mortality rates strengthens the argument for solar energy adoption.

2. Thorough Coverage of PV System Components

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- o The study effectively details each component's sizing, ensuring a comprehensive understanding of standalone PV systems.
- o The consideration of energy losses, system efficiency, and environmental conditions adds depth to the analysis.

3. Well-Structured Equations and Calculations

- o The mathematical formulations are systematically presented, improving the paper's technical rigor.
- o The integration of site-specific solar irradiation data enhances the accuracy of the proposed sizing approach.