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Optimal Sizing of a photovoltaic system: A Case Study of a poultry plant in Ecuador

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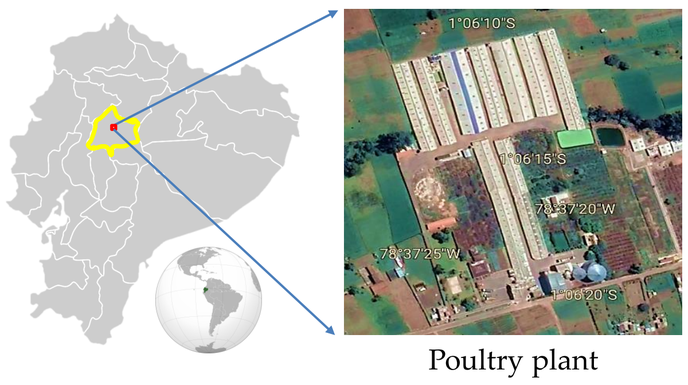
INTRODUCTION & AIM

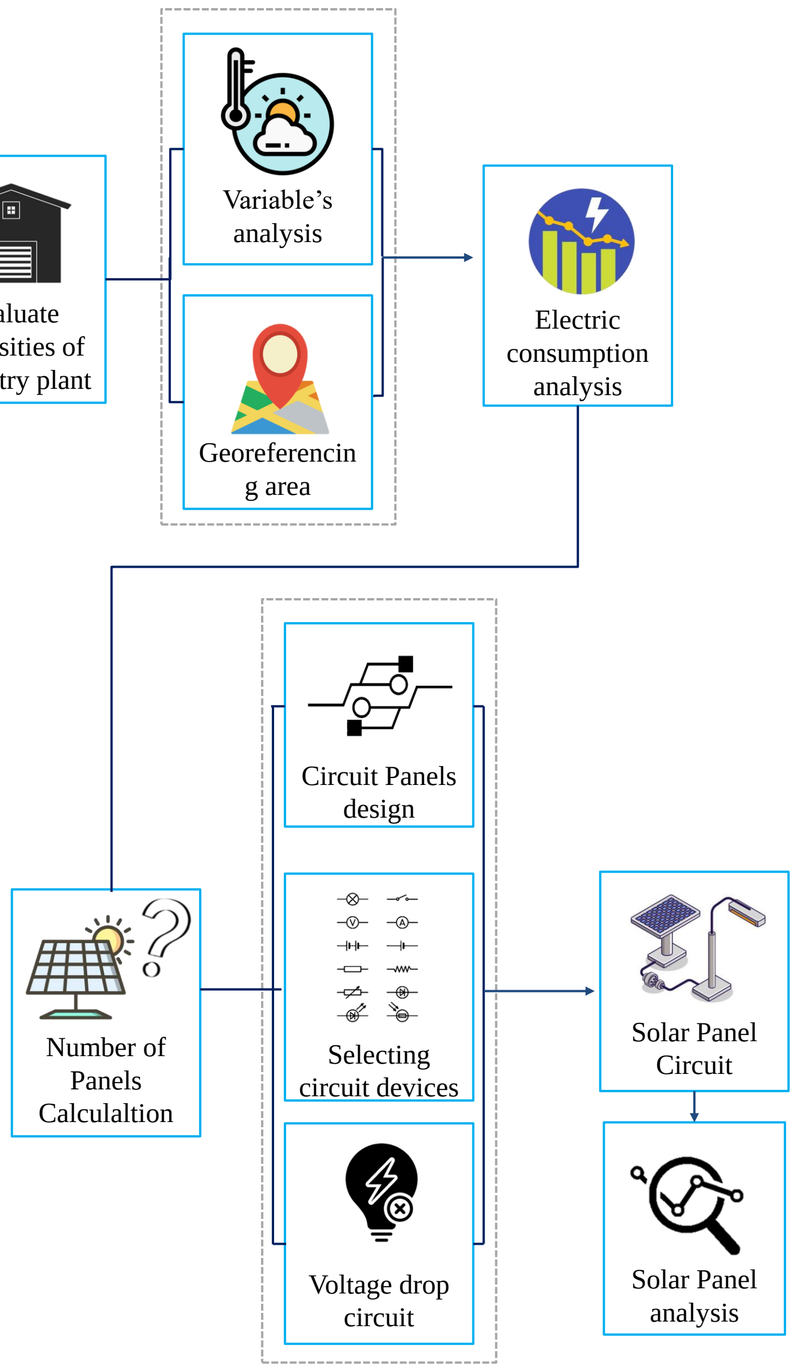
The poultry sector in Ecuador relies heavily on non-renewable energy sources, specifically conventional electricity from the public grid. A typical poultry plant consumes an average of 57.313 MWh per year, resulting in a cost of $7100. The sheds constitute the largest portion of energy consumption, accounting for 36% of the total. The objective of this study is to model an optimal photovoltaic system that can contribute to the energy supply of the area with the highest consumption. The aim is to reduce operating costs and facilitate a transition in the energy matrix. To achieve this, historical and exploratory data were collected, including solar radiation levels, estimation of geographical resources, and energy consumption patterns in the business.



Poultry plant

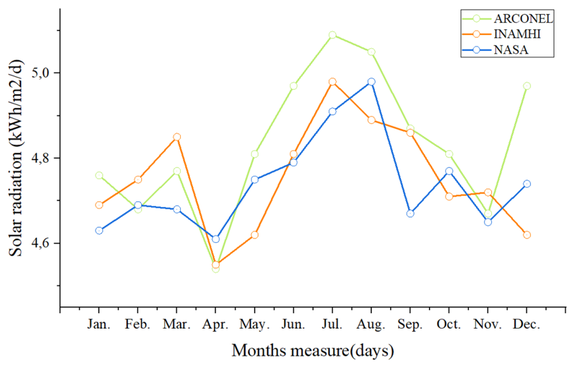
METHOD

Procedure for the design of photovoltaic system.

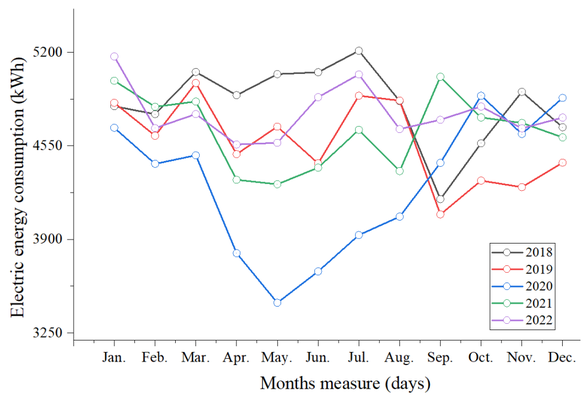


RESULTS & DISCUSSION

Measurements in the area

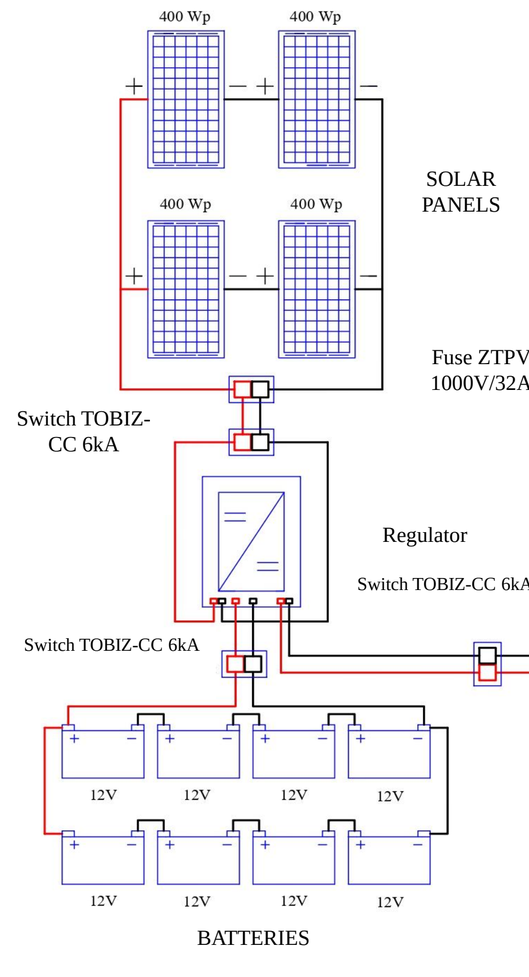


Solar radiation average in the poultry plant

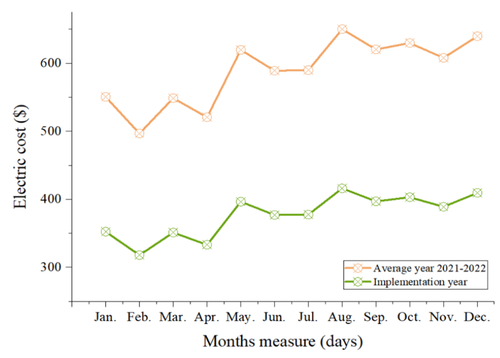


History of electricity consumption

Photovoltaic module



Decreased electricity costs.



The module comprises 4 solar panels, 8 batteries, 1 charge regulator, 1 current inverter, 5 types of conductors, and 3 types of electrical protections. The system was sized to meet the energy requirements of the Type A shed (5.89 kWh) and the Type B shed (6.59 kWh), considering lower annual solar radiation values of 4.58 kWh/m^2.

CONCLUSION

- The isolated photovoltaic system design addresses the poultry plant's high energy demand, reducing annual consumption by 36% and lowering operating costs while promoting renewable energy adoption.
- The plant's geographical conditions, including average solar radiation of 4.67 kWh/m²/day and low cloudiness, ensure optimal solar energy generation for the area.
- Adhering to the system's specifications (equipment, conductors, and protections) minimizes losses and ensures consistent energy production, with future expansions requiring analysis of energy distribution and spatial requirements.

FUTURE WORK / REFERENCES

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