Isolated Microgrids in Colombia: Desing and Implementation

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INTRODUCTION

Colombia is one of the countries with a large amount of energy resources, such as coal, gas, solar radiation, wind, among others. However, some regions have a lack of energy deployment because of their geographic, economic, and cultural characteristics.

La Guajira is located in the north of the country. It has several renewable resources, but the region economy is very poor. Indeed, there are several issues related to lack of water and basic needs. The Wayuu community lives in the region-.

In this research, we look for a feasible energy solution, that considers the energy potential in the region and the specific characteristics of the Wayuu community.

METHODOLOGY

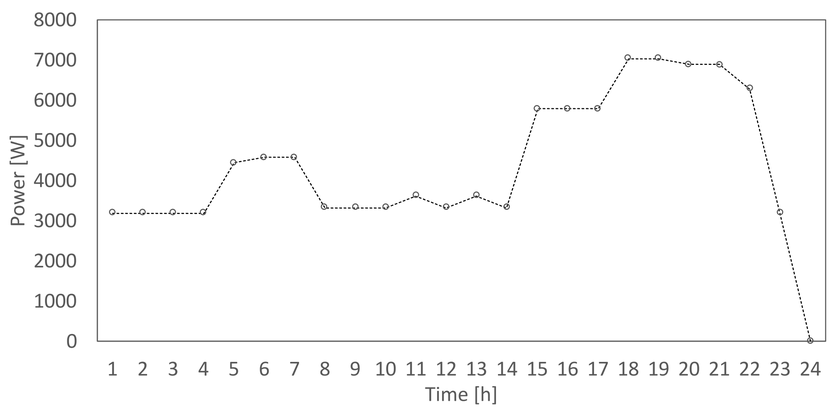
In order to develop the energy solution, it is necessary to understand the Wayuu community, the renewables potential, and expected operation of the solution.

A. Communities analysis

- Literature and state of the art analysis
- Building trust: visits to the communities from the society, technical, and management teams
- Information gathering: development of workshops with the communities
- Issues identified: location access and coordination with the communities

B. Energy assessment

- Data analysis: processing information from the workshops
- Population estimates: from 50 to 200 people
- Load characterization: lightning, mobile devices, entertainment, cooling, among others.
- Renewable potential: literature review and information analysis from official sources such as IDEAM, UPME, among others

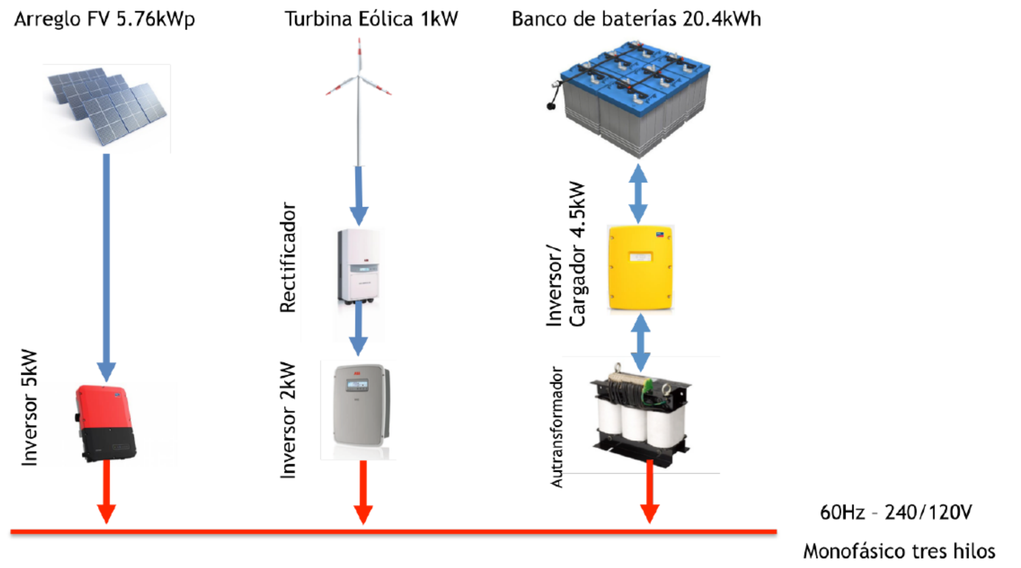


C. Operative evaluation

- Load curve: from the load characterization, identify the specific time of energy requirements
- Power plants: generation composition by using the Homer software

DESIGN AND IMPLEMENTATION

From the results obtained in the methodology, the proposed architecture considers a wind power plant, solar photovoltaics, an energy storage system, and the required equipment (inverters, transformers) to provide energy to the loads.



- The solution was successfully deployed in the communities of Flor de la Sabana and Amalipa.
- Equipment were installed inside a wood warehouse in order to protect them from wind, dust, and direct sunlight.
- Although communications were considered from the beginning of the project, its installation has not been possible because of service unavailability in the region.

CONCLUSIONS

- Although the projects have started their operation recently, they have had positive impacts within the communities. For instance, people is now able to drink cold water and to charge their cell phones.
- Lack of communications in the region have affected negatively the remote supervision of the system.
- Sometimes, the energy storage system is not enough to comply with the energy requirements. Thus, it is necessary to overestimate the solution from its design stage.
- It is necessary to consider a temperature isolation system for the wood warehouse since its temperature might be to high for the batteries.
- Microgrid-based solutions can represent a very big opportunity to increase energy coverage in isolated areas

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