Cofán Tribal Energy Resilience: FSC Building Clean Energy Design

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The Cofán Tribe

- The Cofán people are an Indigenous community in the Amazon region of Ecuador who have long protected their land and autonomy.
- **One of their key community buildings, operated by the Cofán Survival Foundation, faces frequent power outages that disrupt daily activities for families.**
- The community wants greater sovereignty over their energy sources but lacks access to affordable technical support to evaluate renewable energy options.

Cofan Survival Fund

Co-Design Goals

- **Explore design options for renewable energy** generation and storage to support resilience goals
- **Estimate impacts** of energy upgrades on total energy costs and capital investments needed
- **Support Tribal energy sovereignty**, expansion, and capacity building

Methodology

- **Electricity Usage Analysis & Synthetic Load Profile Development –** Simulation of various scenario-based demand profiles of the building based on known appliances, electricity bill data, and consumption behavior
- **Site PV Potential Assessment –** Analysis of the maximum on-site solar generation with the site location and size of available rooftop space
- **System Design & Resilience Analysis –** Use of an optimization tool such as REOpt to evaluate the optimal design of a solar array and battery storage based on the representative one-year hourly model the critical load, resilience goals for the site, and financial parameters
- **Economic Feasibility –** Exploration of the long-term economic impact of installing systems of different through a cost-benefit analysis
- **Capacity Building & Continued Support -** Co-development of a workshop program aimed at different audiences to educate the community about the system, build technical knowledge on system operation and maintenance, and build internal capacity to navigate future energy projects and expansion

Energy Use Analysis & Synthetic Load Profile Scenarios

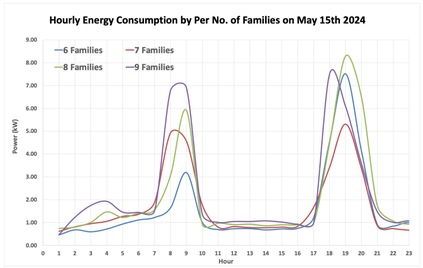
The electricity bills show monthly consumption of around **700-1100 kWh**. However, the building frequently **experiences outages up to 12 hours/day**.

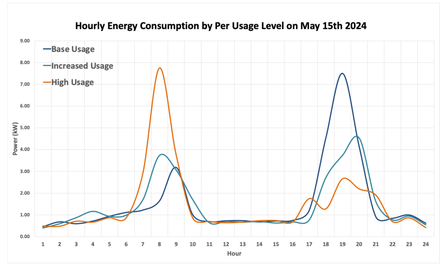
The community building currently houses **6 families with 1-3 kids** each, with the goal of housing more families in the future. The appliances each family has are:

- Washer & dryer
- Microwave
- Laptop computers
- TV
- Lights
- Refrigerator

To simulate the building's current and future energy consumption and account for uncertainty, we used the known building occupancies and appliances to construct 6 different demand scenarios:

- 6 families occupying the building with Base, Increased, and High Energy Consumption levels
- 7-9 families occupying the building at Base consumption





Site Potential Assessment

- Using the site location and information about the roof structure, the PVWatts software developed by the National Laboratory of the Rockies (NRL) provides information on the maximum available solar generation
- **Our results showed that there is an annual potential for about 73,000 kWh's of generation, and that the roof-space could support a maximum of about 48 kW worth of panels**
- As our highest estimated consumption was around 20,000 kWh's, this confirmed that **the site location could sustain enough solar panels to meet the demand scenarios we had created using RAMP**

Preliminary Design Scenarios

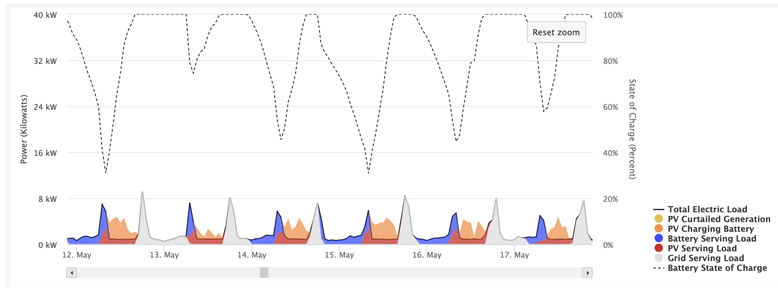
Each of the 6 demand scenarios was optimized along 2 different resilience goal potentials, leading to **12 preliminary design options**

The resilience goal potentials are:

- System survives a 12-hour outage
- System survives a 24-hour outage

PV Sizes	Base	Base, 7 Families	Base, 8 Families	Base, 9 Families	Increased	High
12 hr outage	5 kW	6 kW	6 kW	7 kW	5 kW	5 kW
24 hr outage	6 kW	8 KW	7 kW	10 kW	6 kW	6 kW

Battery kW/kWh	Base	Base, 7 Families	Base, 8 Families	Base, 9 Families	Increased	High
12 hr outage	10/25	11/23	13/29	13/28	9/25	10/24
24 hr outage	10/26	11/30	13/35	13/40	9/28	10/26



REOpt's PV, Battery, & Grid response for 7 family demand scenario and 12-hour outage resilience scenario

Future Work, References, and Acknowledgments

- Consultation & feedback sessions with Tribal partners to support assumptions made, scenarios created
- Detailed economic cost-benefit analysis for design options
- Final system recommendations
- Co-development of capacity building & system management plan

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Community Partners:
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