

Project description

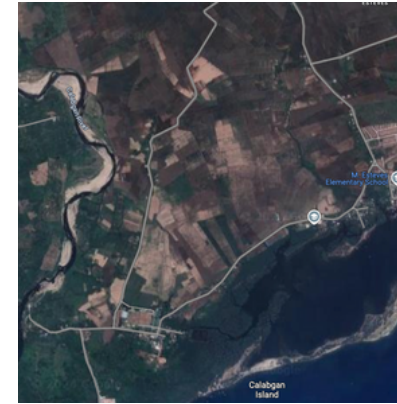
Location and Disaster Description

Cyclone Haiyan (Typhoon Yolanda), which struck the Philippines in November 2013, stands as one of the most powerful tropical cyclones ever recorded. The widespread destruction of infrastructure highlighted the critical need for resilient and adaptable energy solutions in disaster-prone regions. A community with 3000 people in the Philippines was chosen in this project to certify the Energy emergency model (EEM).



Objective

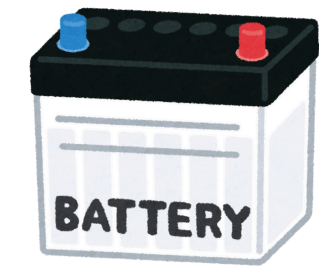
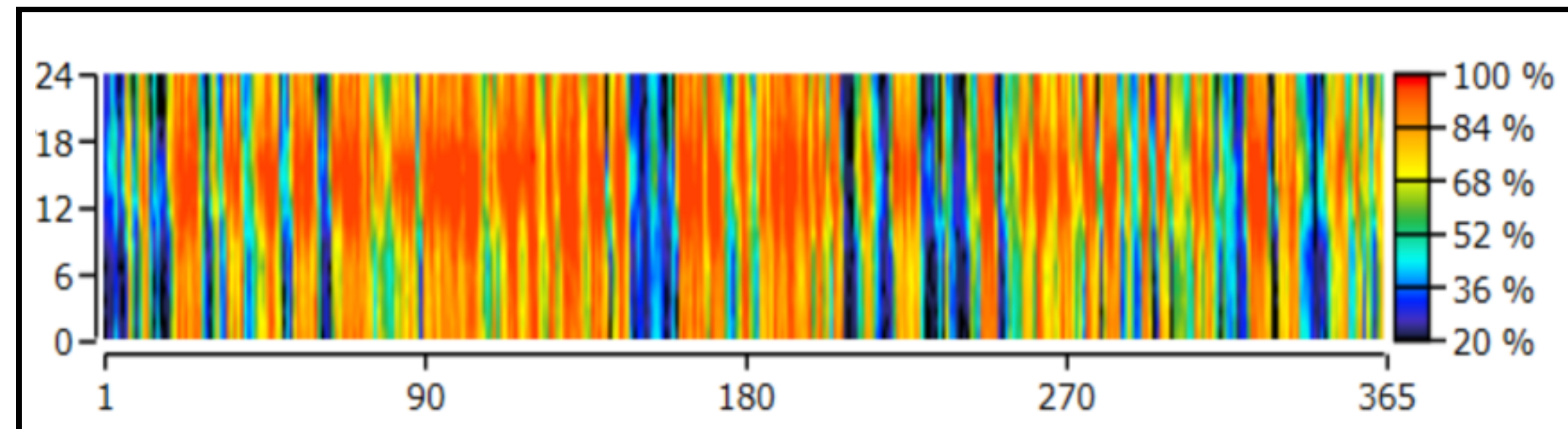
1. Essential Services Provision: Design a polygeneration system capable of delivering electricity, cooling, potable water, and cooking energy.
2. Renewable Energy Utilization: Achieve over 90% reliance on locally available renewable resources to ensure sustainability and reduce environmental impact.
3. Modularity and Scalability: Develop a system that is modular and scalable to adapt to varying demands and facilitate deployment in different regions.
4. Transportability: Ensure the entire system fits within a standard 40-foot shipping container for ease of transportation and rapid deployment.



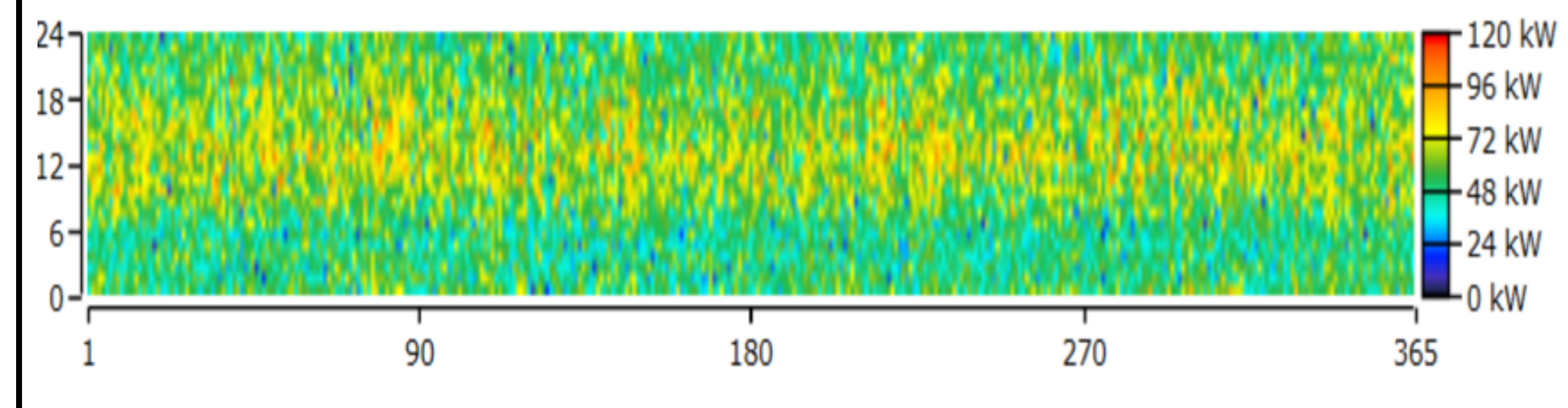
Resources

- Solar Energy: The Philippines has an average solar irradiance of 4.5–5.5 kWh/m²/day, making solar PV a viable option.
- Biomass Resources: Abundant agricultural residues (e.g., rice husks, human waste, and coconut shells) provide significant biomass potential for energy production.
- Natural gas: The Natural gas will be used for 15 days before the production of biogas

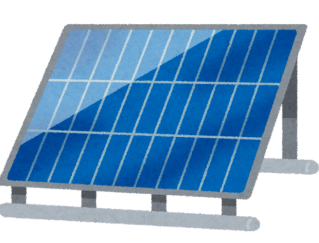
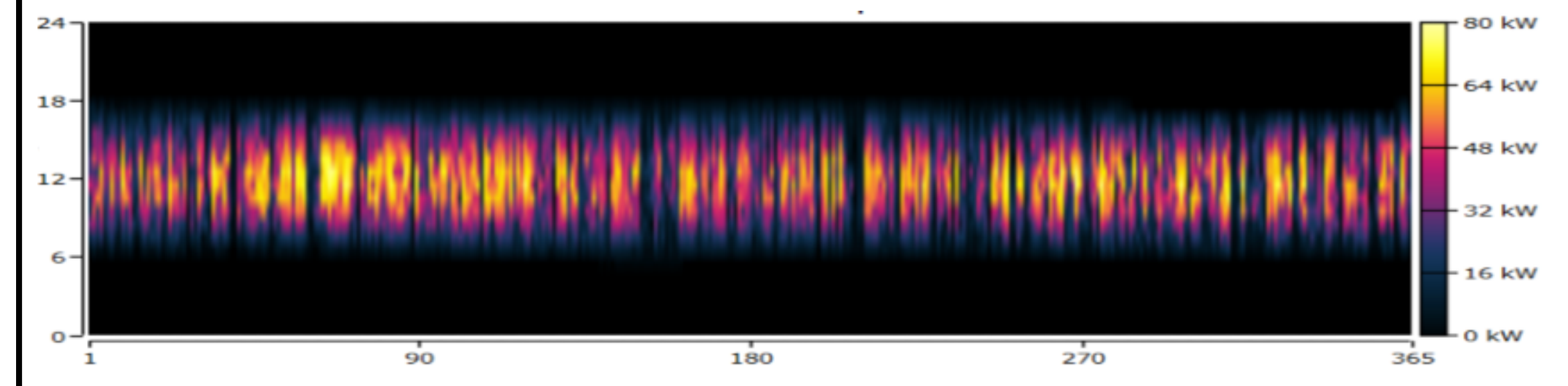
Technologies



10% of total Volume

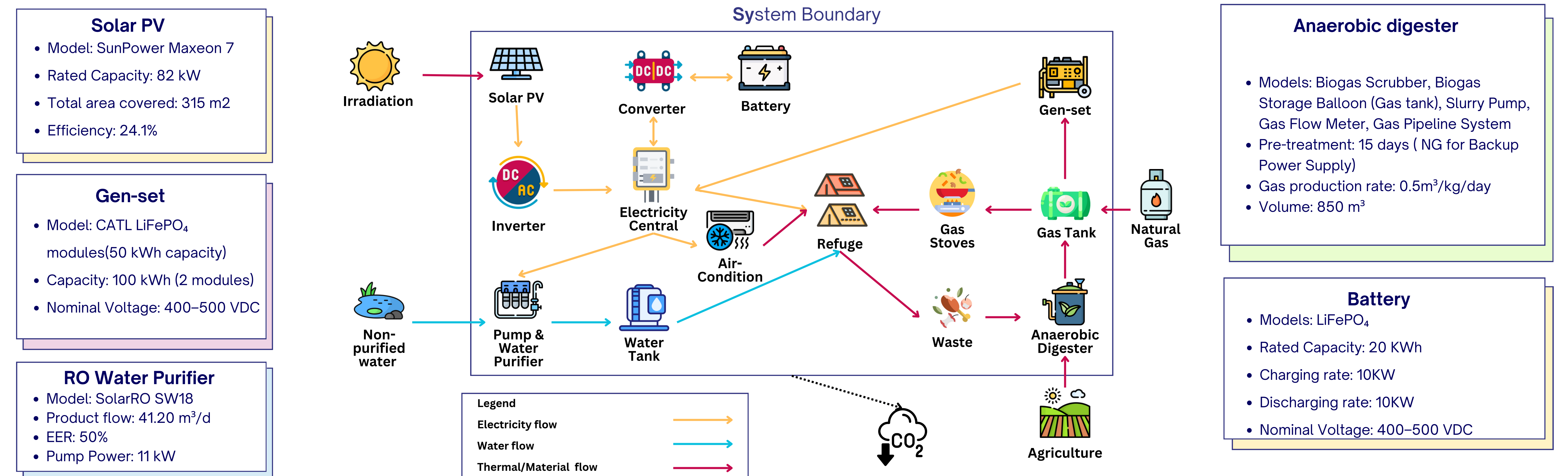


50% of total Volume



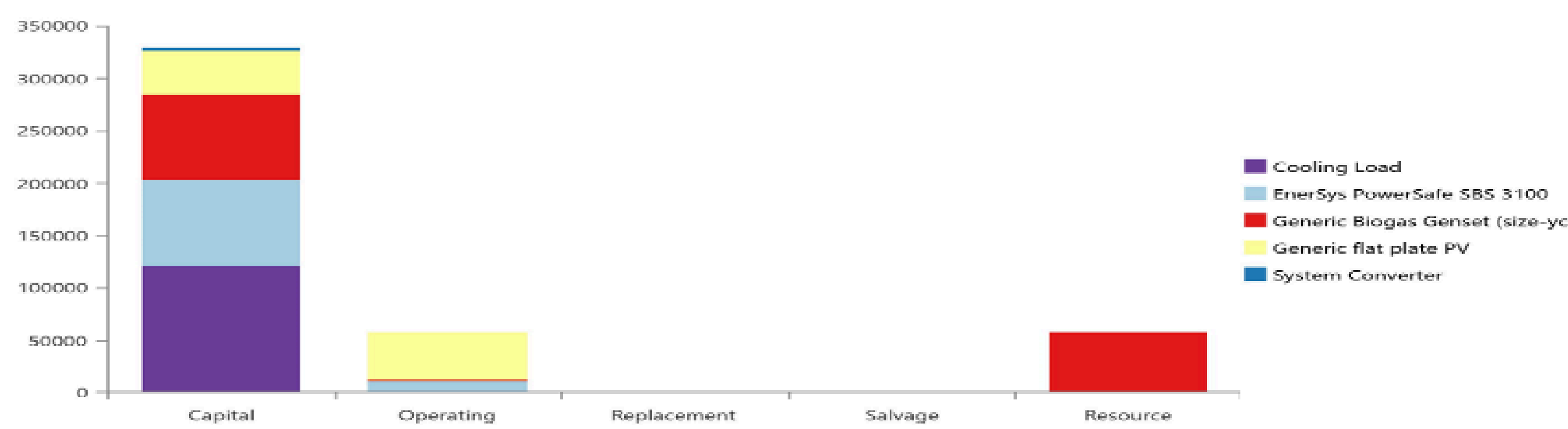
35% of total Volume

Polygeneration system

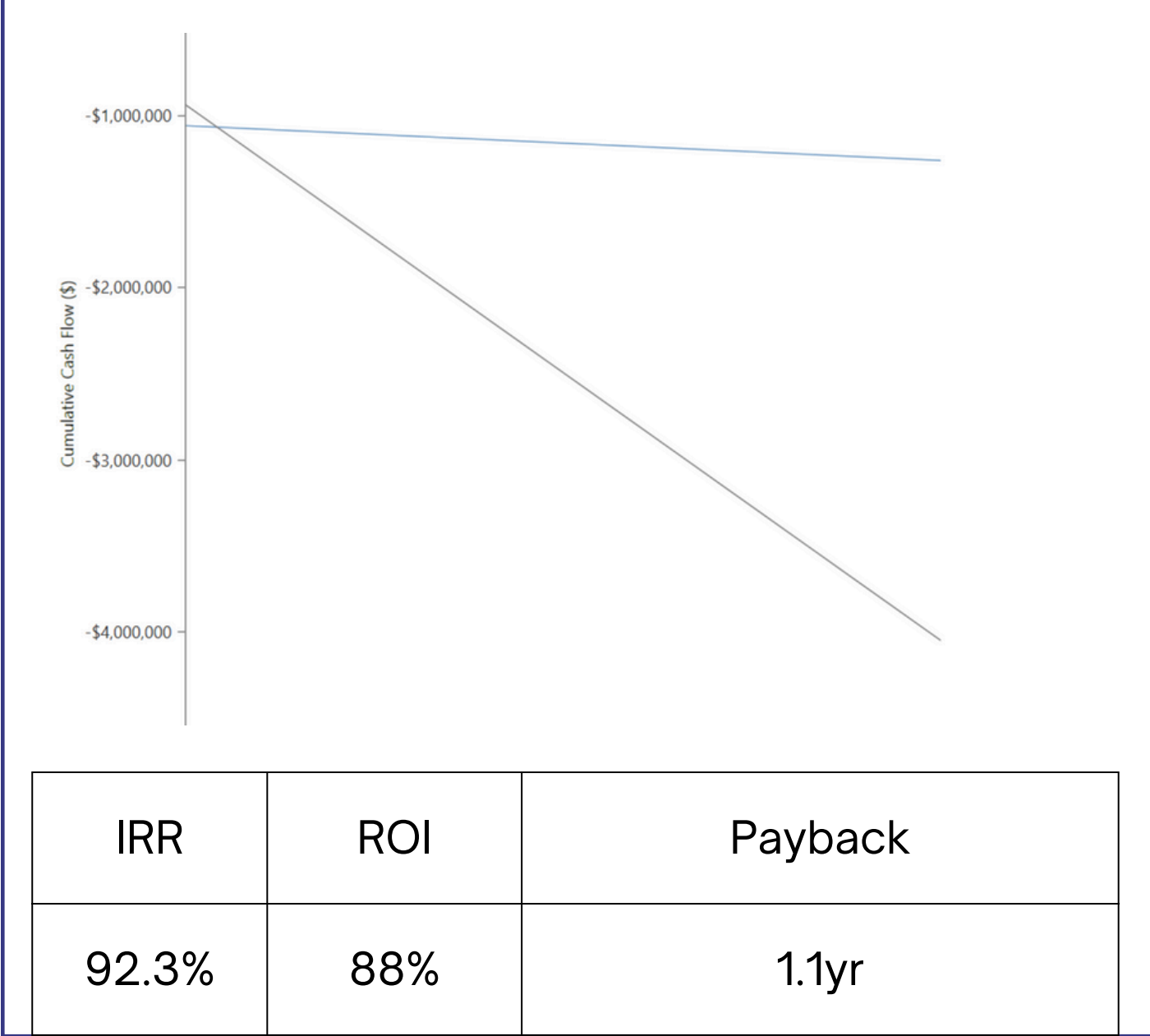


Analysis and Assessment

Economic assessment



Payback Period

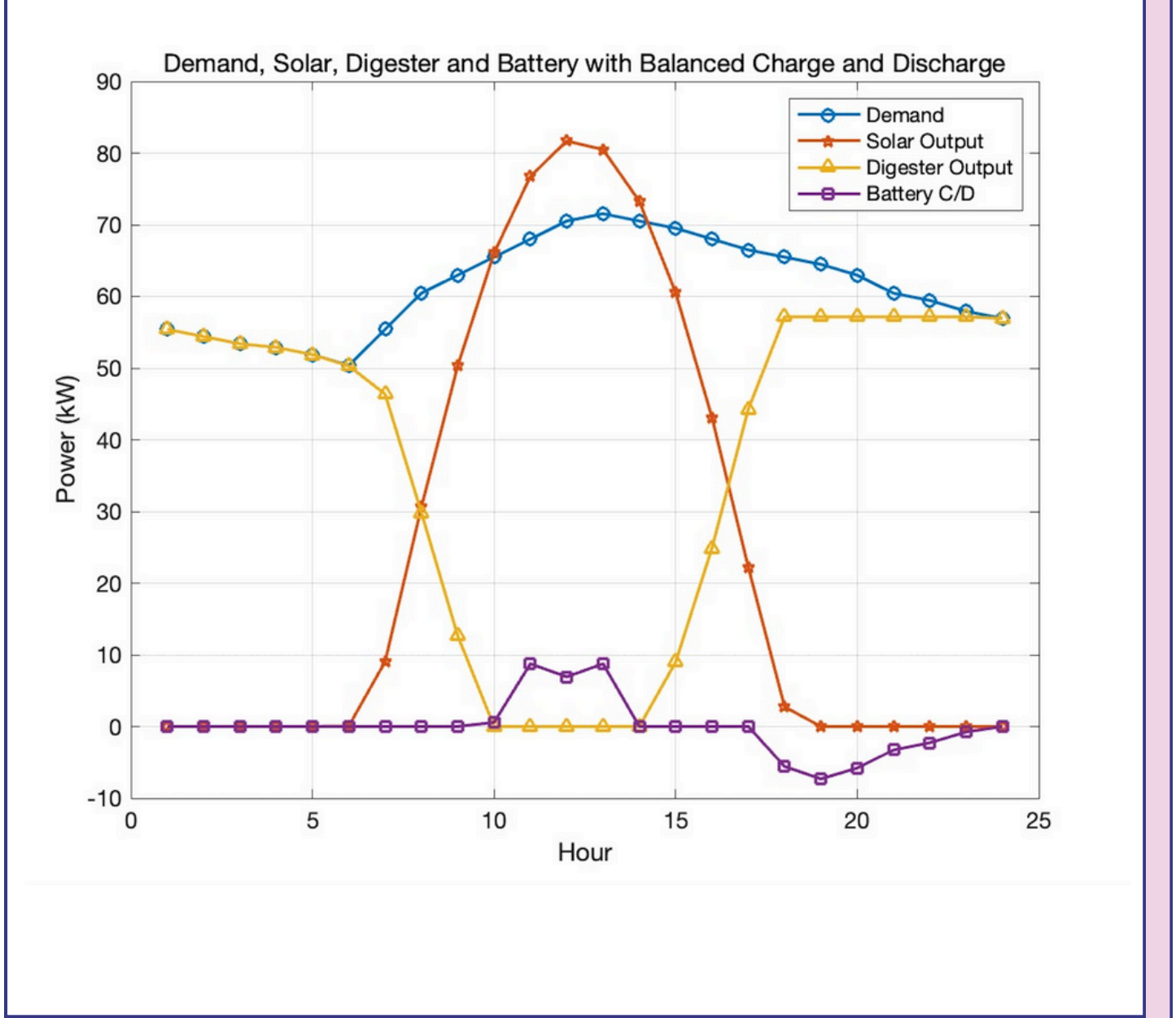


	Base case	Comparison Case
NPC	\$444,031	\$1.84M
initial capital	\$328,660	\$202,831
O&M	\$8,769	\$124,873
LCOE	\$0.0628 /KWh	\$0.263 /KWh

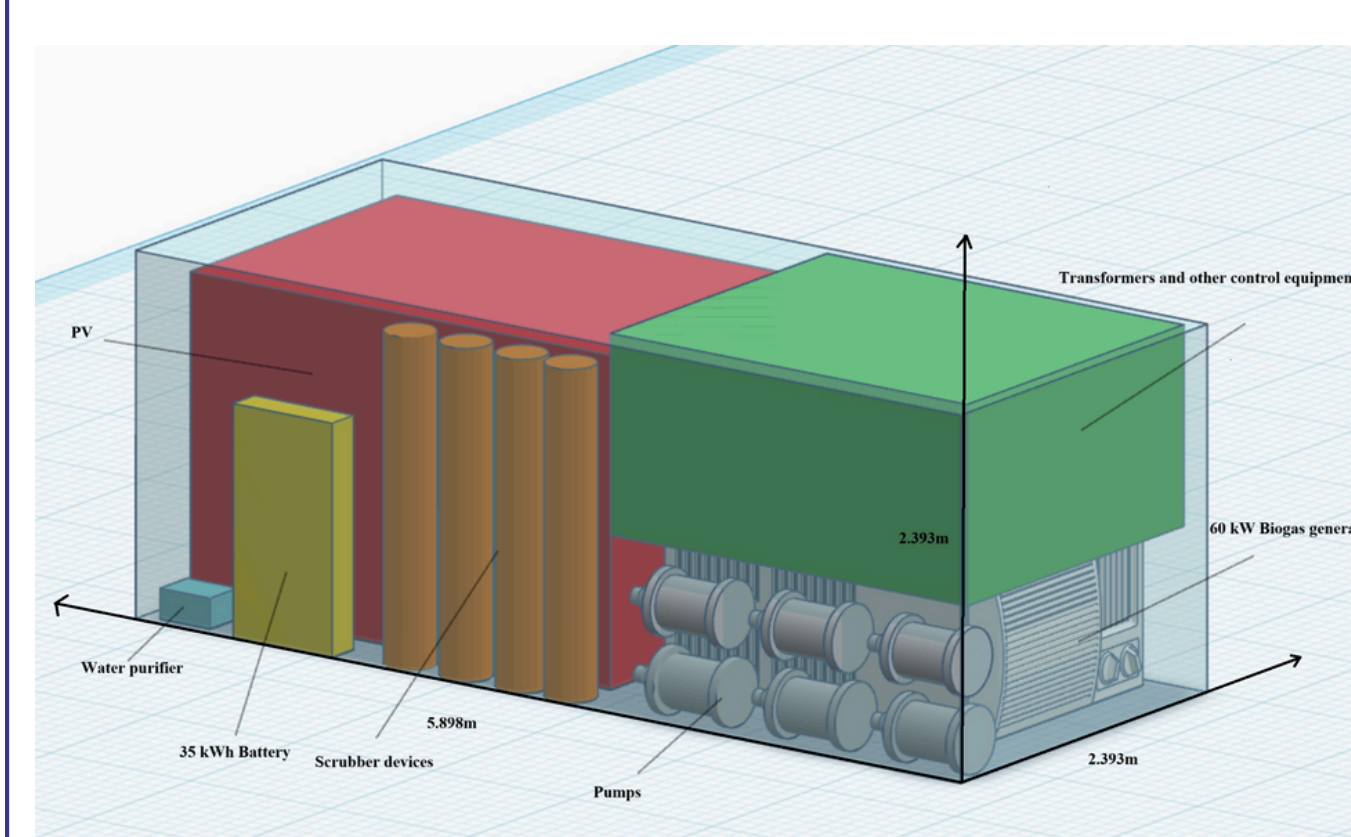
Control Strategy

- Able to provide electricity for 3,000 people.
- Use battery regulation to reduce digester output and peaks.
- Cooking using only biogas produced by digester.
- Use natural gas instead before generating biogas.
- More than 90 per cent of energy is provided by renewable sources

Control Strategy



System Layout



40-foot container

Sustainability assessment



- Ensure the availability of potable water
- By using renewable sources, PV and biomass, ensuring energy access
- Reducing inequalities among countries
- Prioritize sustainable consumption and production to take urgent action to combat climate change and its impacts