Microgrid For Remote Islanded Communities in Indonesia

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Publication date:
2024

Document Version
Publisher's PDF, also known as Version of record

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Project Description and Objectives

This study explores, develops, and assesses viable microgrid solutions for isolated islands, using Indonesia as an example. In this case study, we discuss and assess six possible microgrid options, and the two are the most practical, affordable, and environmentally friendly for distant island microgrids by using Homer Pro Software. The first system is photovoltaic cells (PV), a battery energy storage system (BESS), and a diesel generator (DG), and the second is photovoltaic cells and a battery energy storage system.

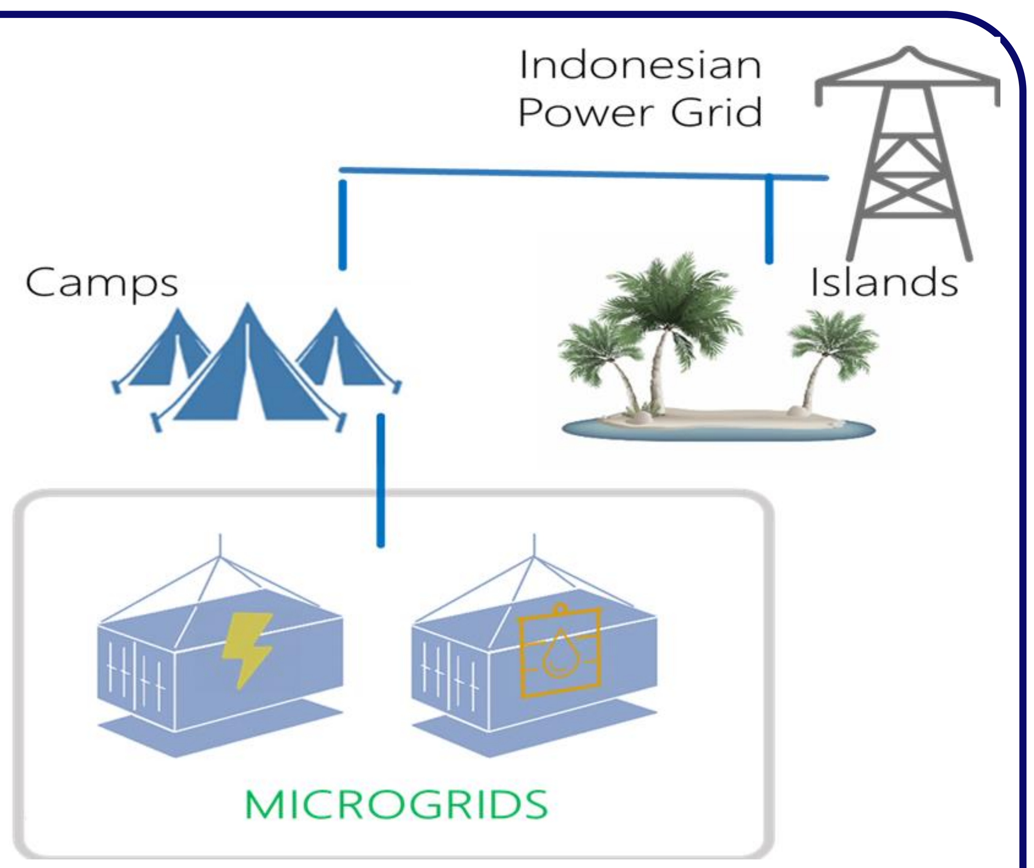
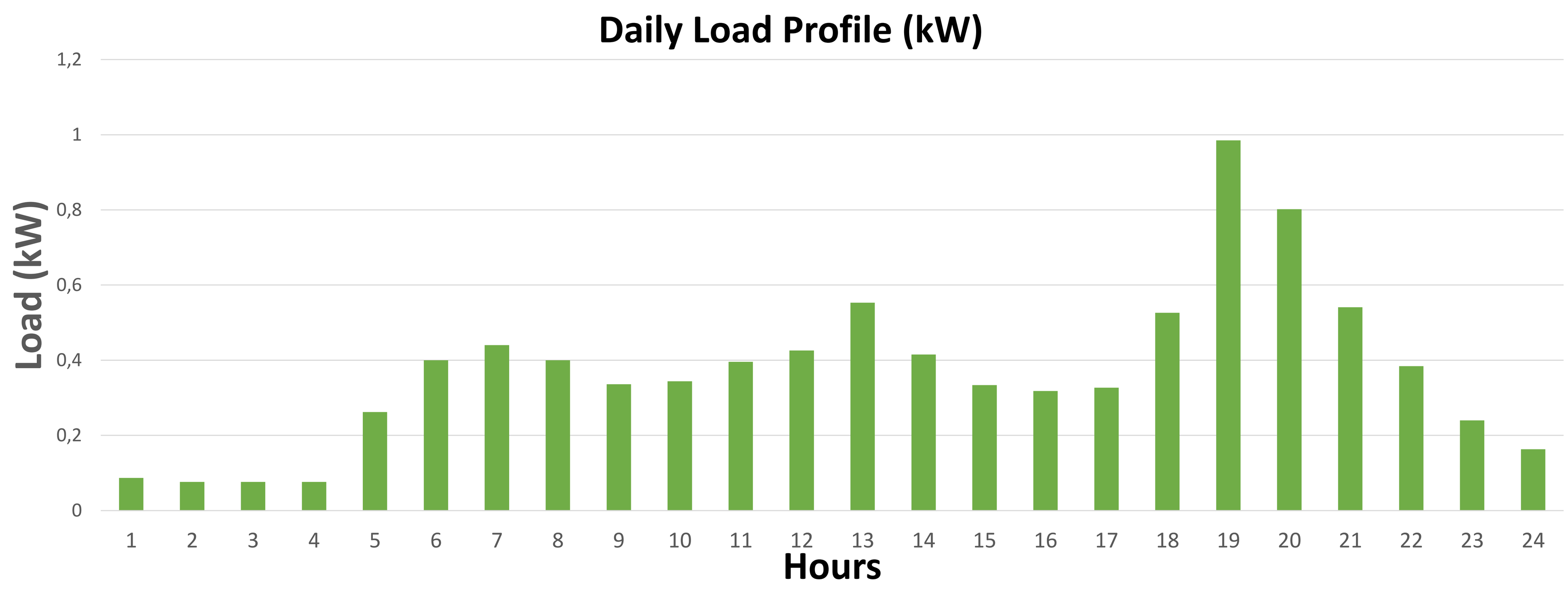


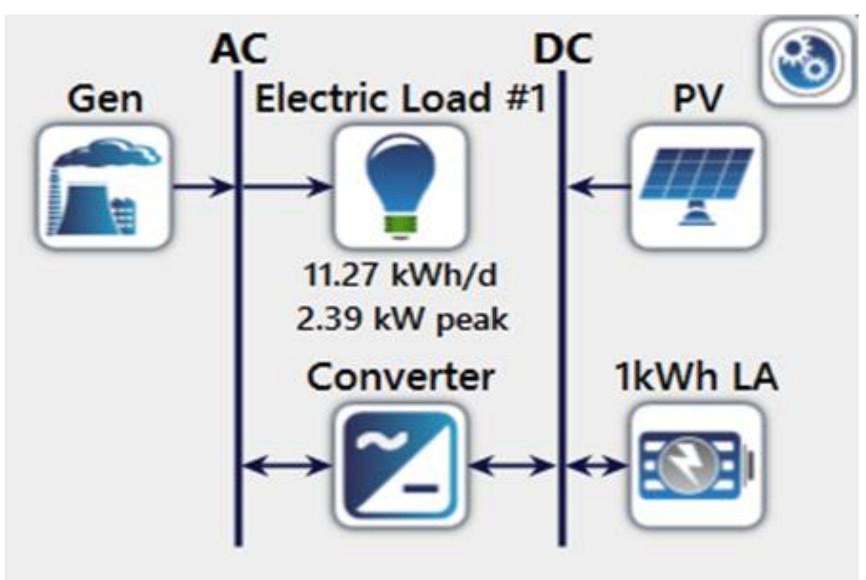
TABLE I: Different Solutions for Island Microgrid

S. #	Key Solution	Description
1	DG	An independent diesel generator might be the solution.
2	DG+BES	The preceding solution might be improved economically by including a battery.
3	PV+BES	A significant battery capacity in conjunction with a relatively big PV capacity is required to supply electricity during the night.
4	DG+BES+PV	Adding a diesel generator, reduced the number of batteries and solar panels.
5	WT+BES	A huge battery and relatively large capacity of wind turbines are required to meet the demand in hours or even days without wind.
6	DG+BES+WT	A diesel generator generates the required electricity when there is no wind or battery charge.

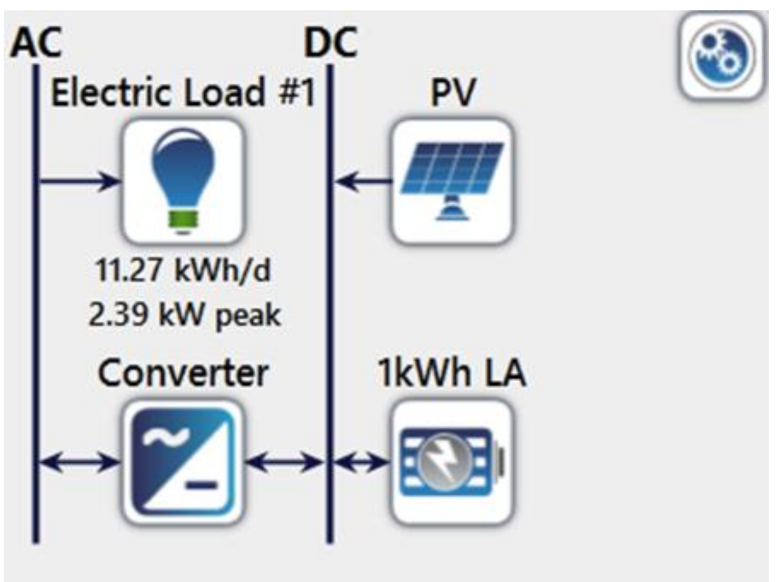
Methodology

- The HOMER Grid offered the best technology, system size, and smallest net present cost (NPC) possible.
- The NPC cost is the whole cost of the system, including 1) capital costs, 2) replacement costs, 3) operation and maintenance (O&M) costs, 4) fuel costs, 5) emission costs, and 6) the cost of grid power purchases.
- The project life of 25 years is considered. The 10% increase in electricity cost and operation and maintenance cost per year is considered for simulations.
- An 8% discount rate and 2.8% inflation rate is used by HOMER Grid for simulation





Winning solution 1 (S4) :- DG + BES + PV



Winning solution 2 (S3) :- PV + BES

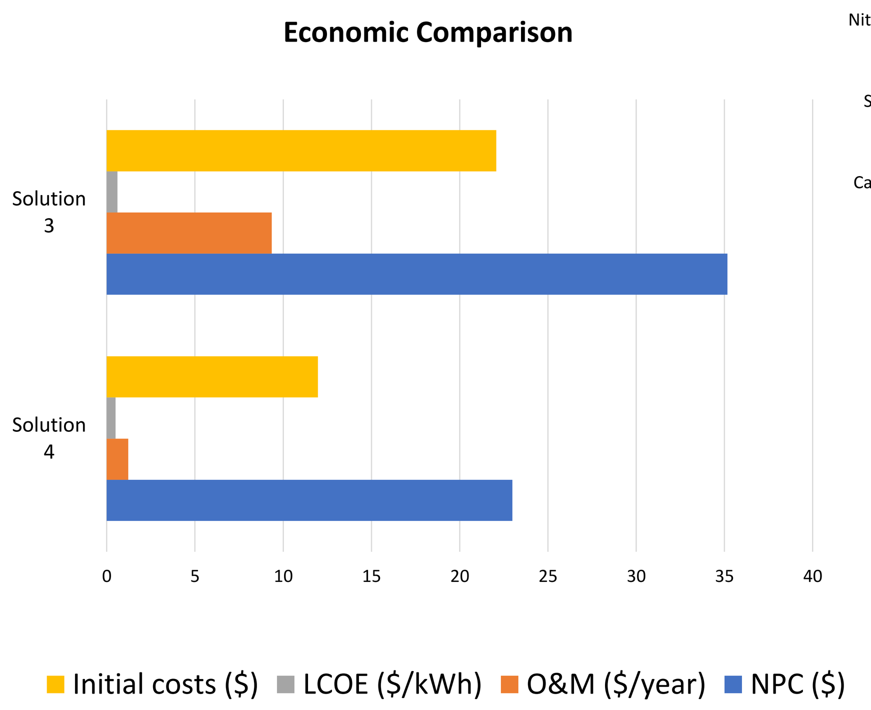
Results

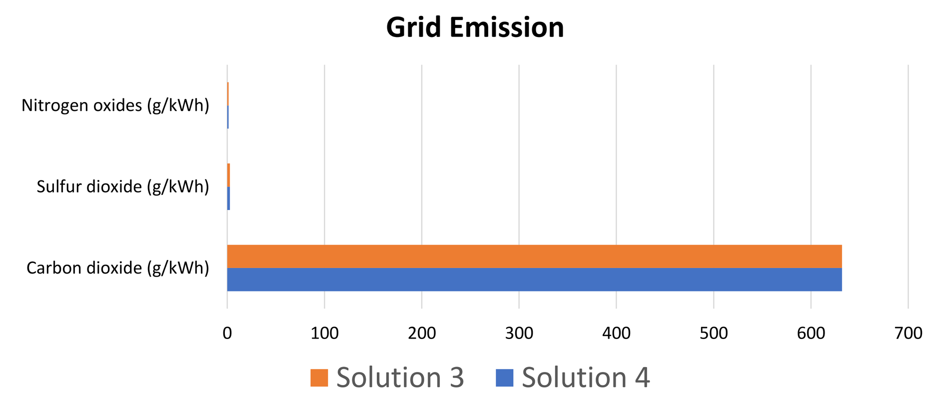
Specification	Data
DG Size (kW)	2.70
PV (kW)	2.69
BES (1kWh)	12 (String)
Converter(kW)	0.985
NPC ($)	22,981.09
O&M ($/year)	1,214.43
LCOE ($/kWh)	0.5029
Initial costs ($)	11,965

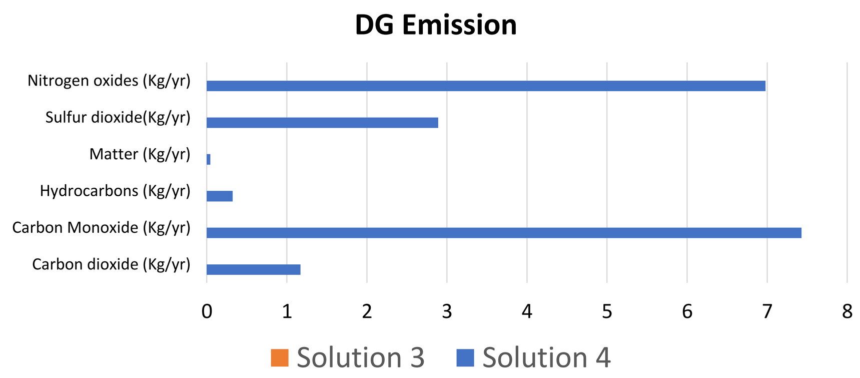
Numerical Results For Winning Solution 1 (S4)

Specification	Data
PV (kW)	5.18
BES (1kWh)	28 (String)
Converter(kW)	2.39
NPC ($)	35,172.29
O&M ($/year)	935
LCOE ($/kWh)	0.6107
Initial costs ($)	22,068

Numerical Results For Winning Solution 2 (S3)







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Supported by the Ministry of Foreign Affairs of Denmark (MFA) – DANIDA Fellowship Centre - under grant # 20-M06-AAU.

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