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Microgrid Proposal

This proposal was generated using HOMER Pro, a dynamic software engine that runs complex simulations of your hybrid electrical system's energy data and system components to determine the least-cost solution and most effective risk-mitigation strategies. Originally developed at the US Department of Energy's National Renewable Energy Laboratory (NREL), HOMER software set the global standard for optimizing microgrid design. More than 200,000 HOMER Pro users worldwide have produced economic feasibility studies, system design, engineering insight, and energy cost savings.

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Project Summary

CURRENT SYSTEM



The electric needs of are met with 610 kW of generator capacity. Your operating costs for energy are currently \$546,469 per year.

PROPOSED SYSTEM

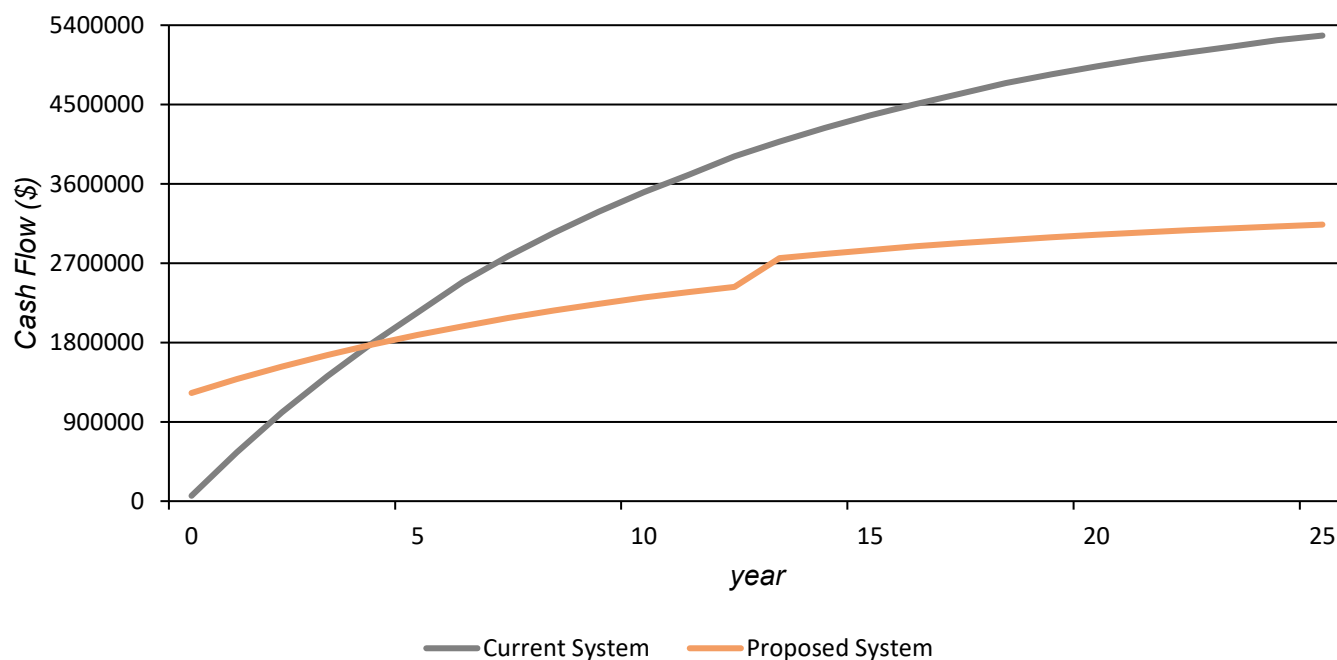


We propose adding 2,200 kW of PV and 5,001 kWh of battery capacity. This would reduce your operating costs to \$199,915/yr. Your investment has a payback of 3.16 years and an IRR of 31.3%.

Simple payback:	3.16 yr
Return on Investment:	25.4 %
Internal Rate of Return:	31.3 %

Net Present Value:	\$2.14M
Capital Investment:	\$1.17M
Annualized Savings:	\$346,554

Cumulative Cash Flow over Project Lifetime



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ABOUT

Customer Testimonials

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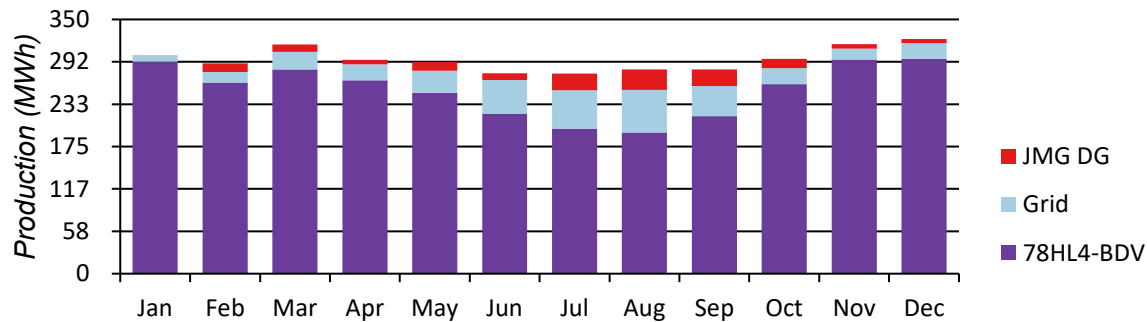
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Consumption Summary

Electric Consumption

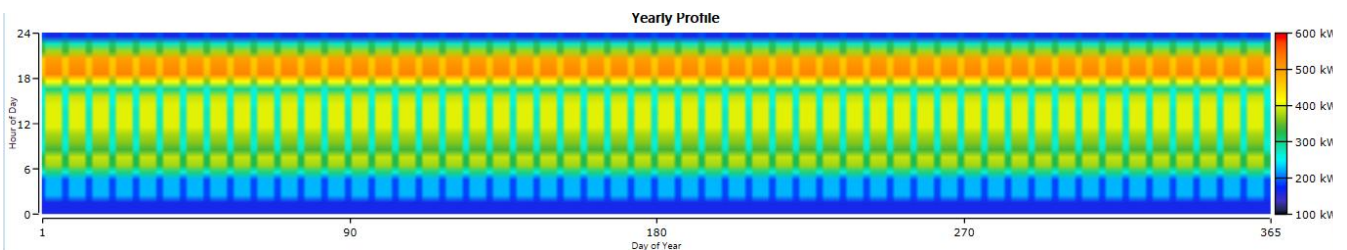
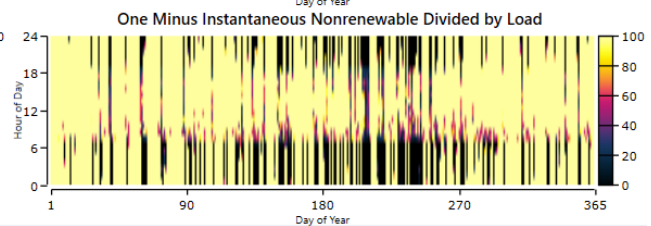
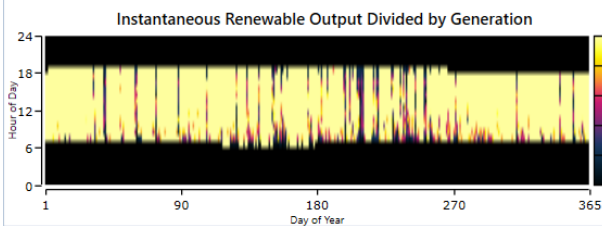
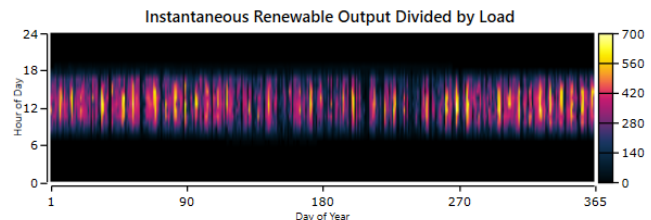
This microgrid requires 8103 kWh/day and has a peak of 546 kW. In the proposed system, the following generation sources serve the electrical load.



Capacity-based metrics	Value	Units
Nominal renewable capacity divided by total nominal capacity	78.3	%
Usable renewable capacity divided by total capacity	74.3	%

Peak values	Value	Units
Renewable output divided by load (HOMER standard)	683	%
Renewable output divided by total generation	100	%
One minus nonrenewable output divided by total load	100	%

Energy-based metrics	Value	Units
Total renewable production divided by load	103	%
Total renewable production divided by generation	85.7	%
One minus total nonrenewable production divided by load	94.9	%



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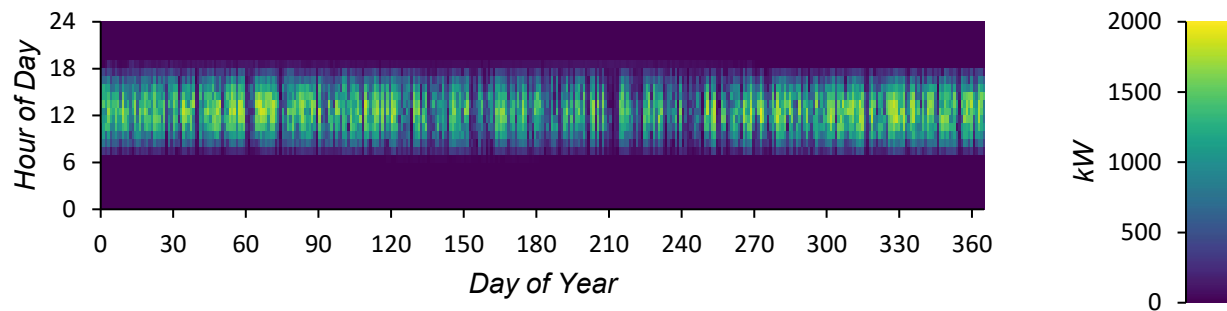


Engineering Details

PV: Jinko Tiger Neo N-Type 620W

The LONGi Solar Technology Co., Ltd. PV system has a nominal capacity of 2,200 kW. The annual production is 3,033,933 kWh/yr.

Rated Capacity	2,200 kW	Total Production	3,033,933 kWh
Capital Cost	\$229,270	Maintenance Cost	19,800 \$/yr
Specific Yield	1,379 kWh/kW	LCOE	0.0143 \$/kWh
PV Penetration	103 %		



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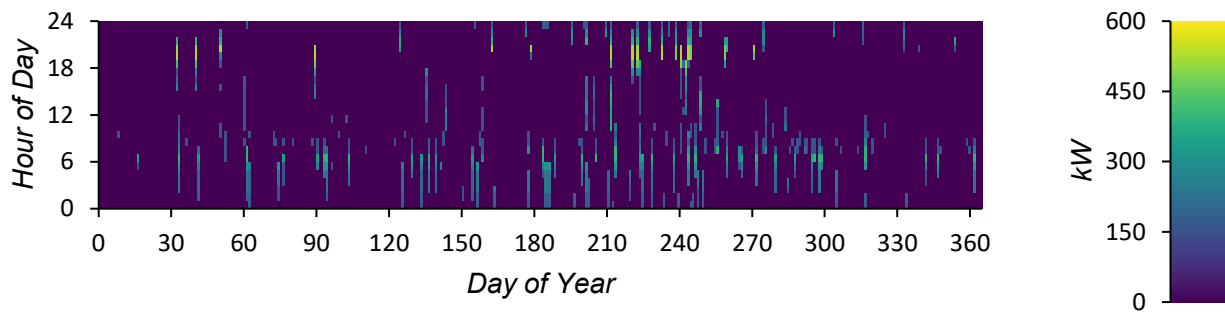
Engineering Details

Generator: JMG Diesel Generator (Diesel)

Power output from the Generic generator system, rated at 610 kW using Diesel as fuel, is 150,027 kWh/yr.

Capacity	610 kW
Operational Life	24.0 yr
Capital Cost	\$61,000
Fuel Consumption	42,030 L
Hours of Operation	624 hrs/yr
Fixed Generation Cost	45.8 \$/hr

Generator Fuel	Diesel
Generator Fuel Price	1.10 \$/L
Maintenance Cost	19,032 \$/yr
Electrical Production	150,027 kWh/yr
Marginal Generation Cost	0.260 \$/kWh



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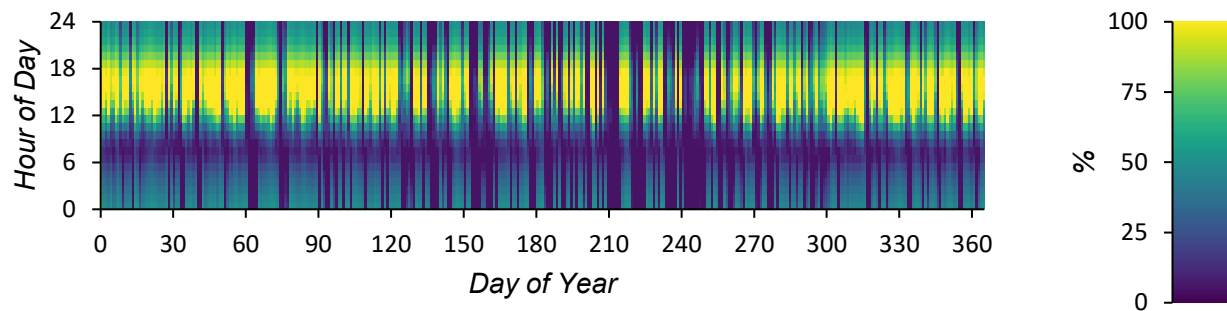
Engineering Details

Storage: Huawei LUNA2000-100KWH

The Generic storage system's nominal capacity is 5,001 kWh. The annual throughput is 1,225,537 kWh/yr.

Rated Capacity	5,001 kWh
Annual Throughput	1,225,537 kWh/yr
Maintenance Cost	50,000 \$/yr
Autonomy	14.1 hr

Expected Life	12.2 yr
Capital Costs	\$927,778
Losses	18,503 kWh/yr



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Engineering Details

Grid

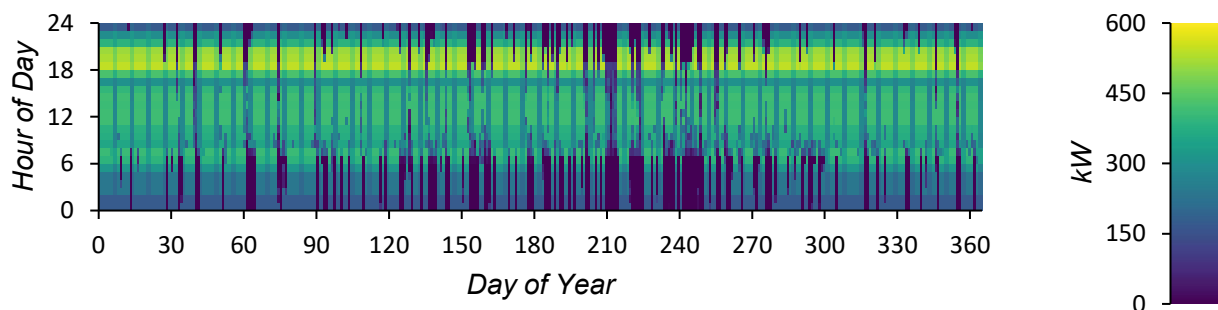
The annual energy purchased from the grid is 356,167 kWh and the annual energy sold to the grid is 0 kWh.

Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Energy Purchased (kWh)	Peak Load (kW)	Energy Charge	Demand Charge	Total
January	7,844	0	7,844	472	\$784.43	\$0.00	\$784.43
February	14,287	0	14,287	525	\$1,429	\$0.00	\$1,429
March	24,086	0	24,086	525	\$2,409	\$0.00	\$2,409
April	21,975	0	21,975	525	\$2,197	\$0.00	\$2,197
May	30,359	0	30,359	525	\$3,036	\$0.00	\$3,036
June	45,972	0	45,972	525	\$4,597	\$0.00	\$4,597
July	52,876	0	52,876	525	\$5,288	\$0.00	\$5,288
August	58,522	0	58,522	525	\$5,852	\$0.00	\$5,852
September	41,290	0	41,290	525	\$4,129	\$0.00	\$4,129
October	22,190	0	22,190	546	\$2,219	\$0.00	\$2,219
November	15,036	0	15,036	546	\$1,504	\$0.00	\$1,504
December	21,731	0	21,731	546	\$2,173	\$0.00	\$2,173
Annual	356,167	0	356,167	546	\$35,617	\$0.00	\$35,617

Converter: Huawei LUNA2000 Copy

Capacity	606 kW
Mean Output	280 kW
Minimum Output	0 kW
Maximum Output	546 kW
Capacity Factor	46.2 %

Hours of Operation	7,796 hrs/yr
Energy Out	2,451,338 kWh/yr
Energy In	2,491,197 kWh/yr
Losses	39,859 kWh/yr



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Cash Flows

Project Lifetime 25 years

Expected Inflation Rate 15.7%

Nominal Discount Rate 26.5%

Real Interest Rate 9.3%

Year	0	1	2	3	4	5	6	7	8	9
Grid	\$0.00	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)
Huawei LUNA2000 Copy	(\$9,483)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)
Huawei LUNA2000-100KWH	(\$927,778)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)
Jinko Tiger Neo N-Type 620W	(\$229,270)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)
JMG Diesel Generator	(\$61,000)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)

Year	10	11	12	13	14	15	16	17	18	19
Grid	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)
Huawei LUNA2000 Copy	(\$8,116)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)
Huawei LUNA2000-100KWH	(\$50,000)	(\$50,000)	(\$50,000)	(\$855,556)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)
Jinko Tiger Neo N-Type 620W	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)
JMG Diesel Generator	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)

Year	20	21	22	23	24	25
Grid	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)	(\$35,617)
Huawei LUNA2000 Copy	(\$8,116)	(\$56.36)	(\$56.36)	(\$56.36)	(\$56.36)	\$3,973
Huawei LUNA2000-100KWH	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$50,000)	(\$84,286)
Jinko Tiger Neo N-Type 620W	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	(\$19,800)	\$16,867
JMG Diesel Generator	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$65,265)	(\$67,461)

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Glossary and Abbreviations

Net Present Value

The total net present cost (NPC) of a system is the present value of all the costs the system incurs over its lifetime, minus the present value of all the revenue it earns over its lifetime. Costs include capital costs, replacement costs, O & M costs, fuel costs, emissions penalties, and the costs of buying power from the grid. Revenues include salvage value and grid sales revenue. HOMER calculates the total NPC by summing the total discounted cash flows in each year of the project lifetime.

Total Annualized Cost

- is the annualized value of the total net present cost. The annualized cost of a component is the cost that, if it were to occur equally in every year of the project lifetime, would give the same net present cost as the actual cash flow sequence associated with that component. HOMER calculates annualized cost by first calculating the net present cost, then multiplying it by the capital recovery factor.

Simple payback

- is the number of years at which the cumulative cash flow of the difference between the current system and base case system switches from negative to positive. The payback is an indication of how long it would take to recover the difference in investment costs between the current system and the base case system.

Return on Investment (ROI)

- is the yearly cost savings relative to the initial investment. The ROI is the average yearly difference in nominal cash flows over the project lifetime, divided by the difference in capital cost.

Internal rate of return (IRR)

- is the discount rate at which the base case and current system have the same net present cost. HOMER calculates the IRR by determining the discount rate that makes the present value of the difference of the two cash flow sequences equal to zero.

Refer to HOMER Pro Online Help Manual

Abbreviations

JMG DG JMG Diesel Generator
ESS 100 Huawei LUNA2000-100KWH
kwh
78HL4- Jinko Tiger Neo N-Type 620W
BDV
LUNA Huawei LUNA2000 Copy

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About HOMER Pro

HOMER® Pro simulates engineering and economic feasibility of microgrid or distributed energy systems that are off-grid or tied to an unreliable grid and enables the design of least-cost electrical systems and risk-mitigation strategies. The software provides insight into cost-effectively combining conventional and renewable energy, storage, grid resources (where available), and load management.

In a single data run, HOMER Pro simulates the operation of a hybrid microgrid or distributed energy system for an entire year, evaluating and optimizing the electrical system design, load profiles, components, fuel costs, and environmental variables. The simulation produces key information on technical performance, risk-mitigation, and projected cost-savings to inform system design and optimization. Results are presented in a succinct Microgrid Proposal. For more information, visit HomerEnergy.com.

About HOMER Energy by UL



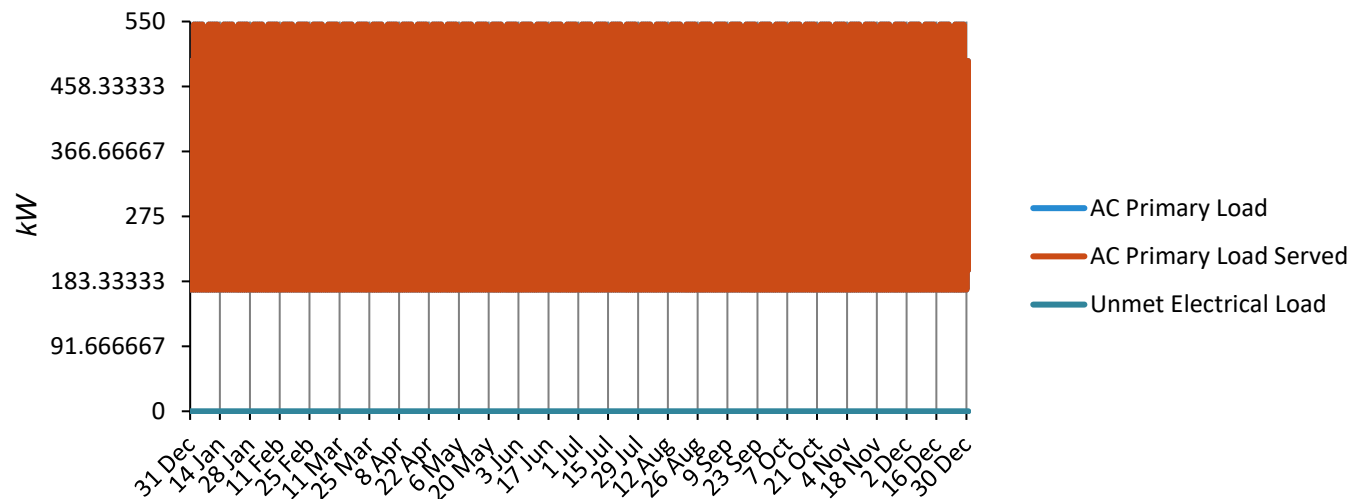
HOMER software is used by more than 200,000 users in 193 different countries.

HOMER Energy by UL is the developer and distributor of HOMER software, a global standard for energy modeling tools that analyze solar-plus-storage, microgrids, and other distributed energy projects.

HOMER software helps engineers and project developers navigate the complexities of designing cost-effective and reliable microgrids that combine traditional and renewable generation sources. The company makes two software platforms: HOMER Pro for the design of least-cost hybrid microgrid or distributed energy systems for use off-grid or when tied to an unreliable grid; and HOMER Grid, which helps design behind-the-meter solar-plus-storage systems to reduce costs and lower carbon footprints.

Since its founding in Boulder, Colorado in 2009, HOMER Energy software has proven effective for analyzing complex distributed energy systems, including grid-tied hybrid renewable microgrids and situations where the grid is insufficiently reliable, such as islands and remote communities. In 2019, HOMER Energy was acquired by UL. More than 200,000 HOMER Pro users in over 190 countries have produced economic feasibility studies, system design, engineering insight, and energy cost savings. Learn more at www.homerenergy.com.

Time series charts:

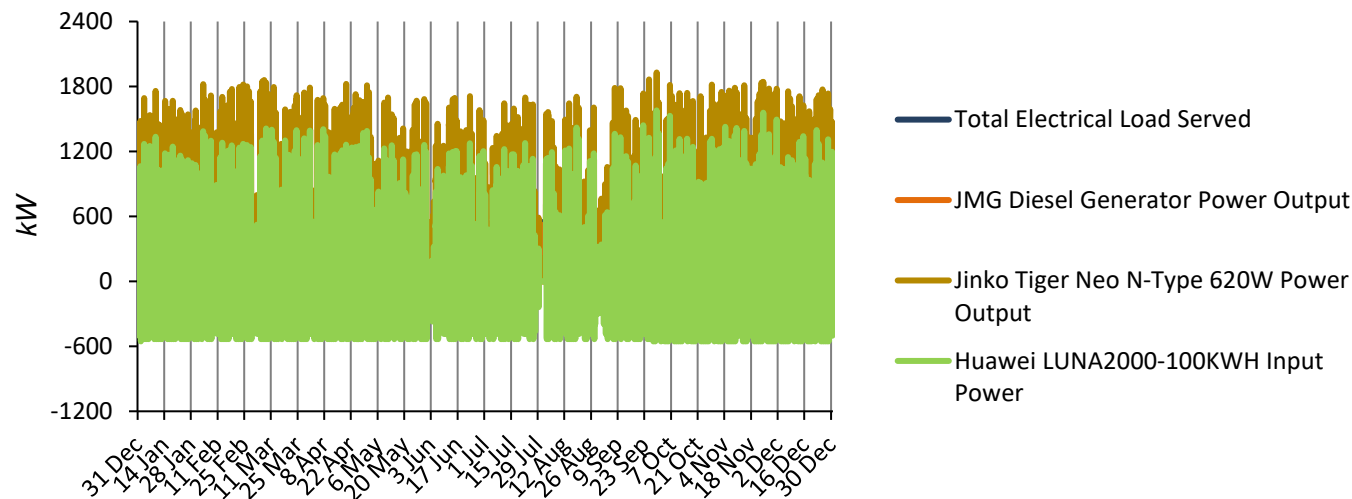


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Time series charts:



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