PREPARED FOR:

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Microgrid Proposal

PREPARED BY:

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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

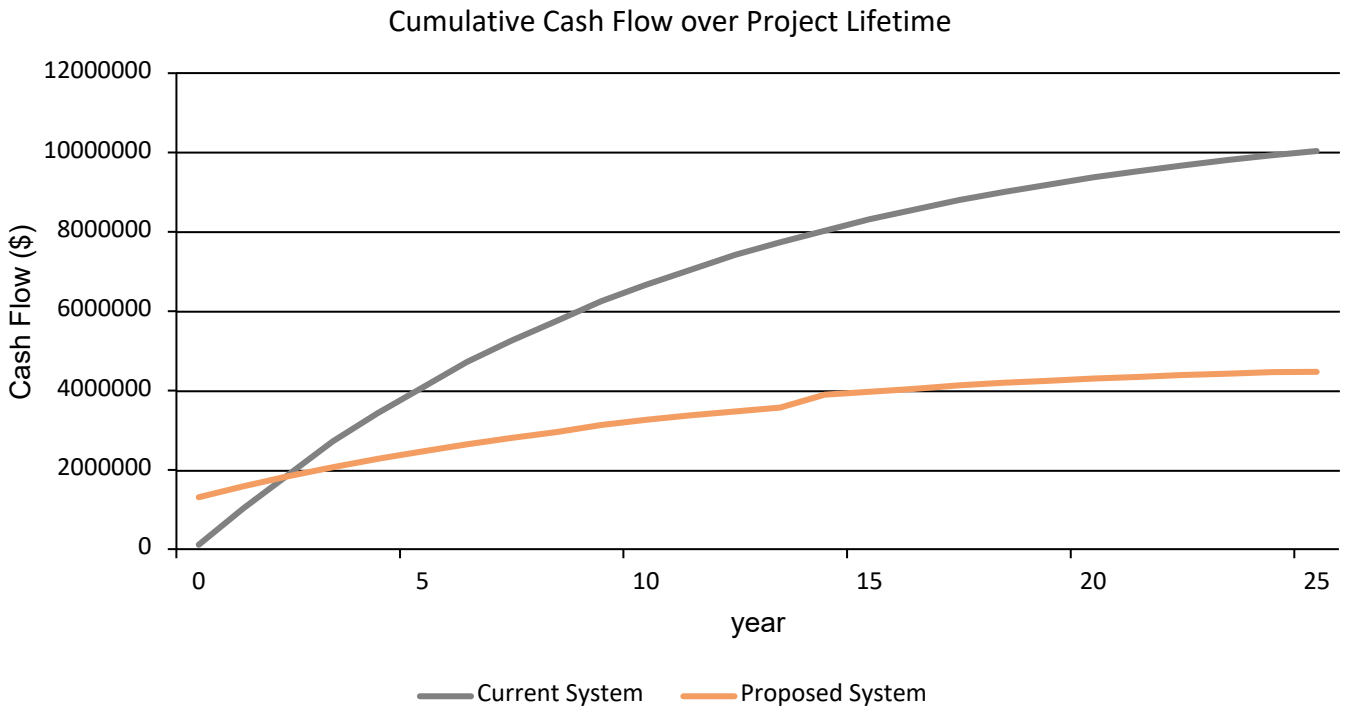
CURRENT SYSTEM

The electric needs of are met with 1,080 kW of generator capacity. Your operating costs for energy are currently $1.04M per year.

PROPOSED SYSTEM

We propose adding 2,500 kW of PV and 5,101 kWh of battery capacity. This would reduce your operating costs to $328,138/yr. Your investment has a payback of 1.72 years and an IRR of 59.6%.

Simple payback:	1.72 yr	Net Present Value:	$5.57M
Return on Investment:	54.0 %	Capital Investment:	$1.22M
Internal Rate of Return:	59.6 %	Annualized Savings:	$709,909



ABOUT

Customer Testimonials

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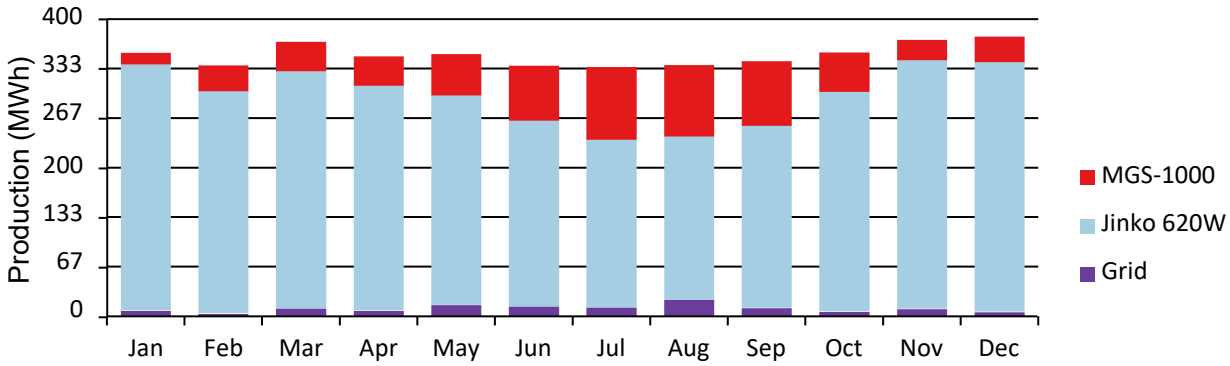
Consumption Summary

Electric Consumption

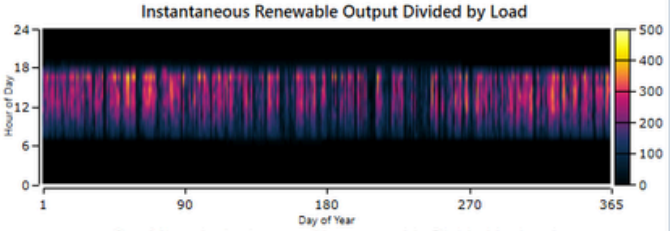
This microgrid requires 10177 kWh/day and has a peak of 826 kW. In the proposed system, the following generation sources serve the electrical load.

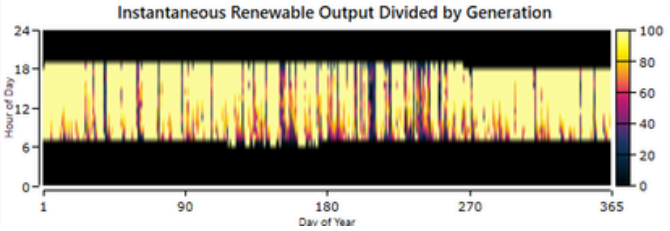


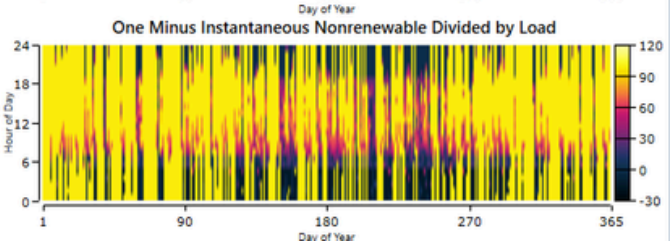
Capacity-based metrics	Value	Units
Nominal renewable capacity divided by total nominal capacity	69.8	%
Usable renewable capacity divided by total capacity	64.9	%

Energy-based metrics	Value	Units
Total renewable production divided by load	92.8	%
Total renewable production divided by generation	81.7	%
One minus total nonrenewable production divided by load	82.5	%

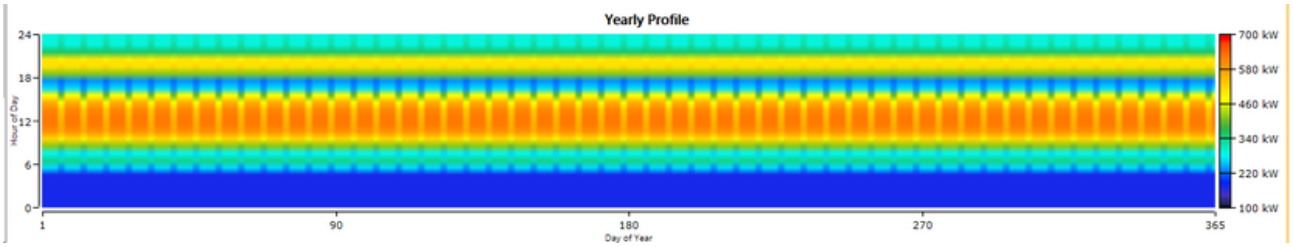
Peak values	Value	Units
Renewable output divided by load (HOMER standard)	465	%
Renewable output divided by total generation	100	%
One minus nonrenewable output divided by total load	100	%







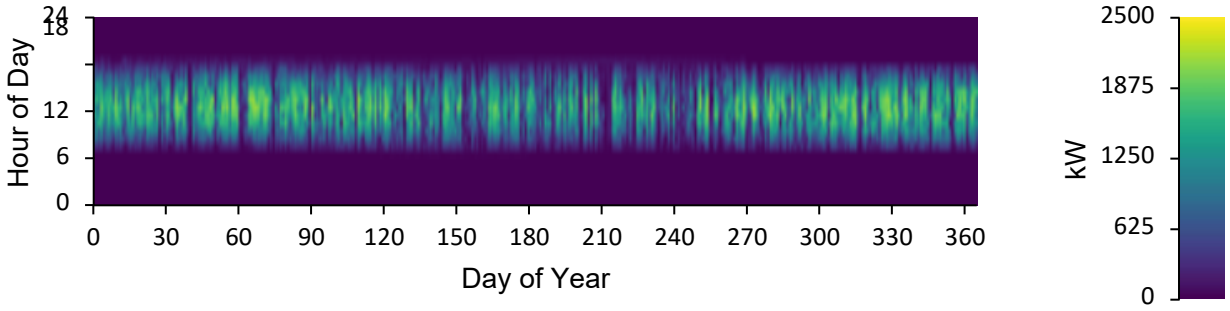
Renewable Energy Fraction



PV: Jinko Tiger Neo N-Type 620W

The LONGi Solar Technology Co., Ltd. PV system has a nominal capacity of 2,500 kW. The annual production is 3,448,690 kWh/yr.

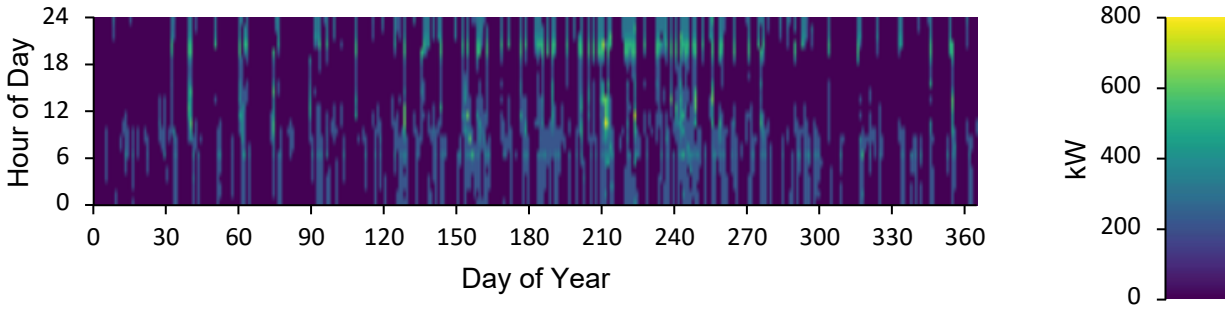
Rated Capacity	2,500 kW	Total Production	3,448,690 kW
Capital Cost	$260,204	Maintenance Cost	22,500 $/yr
Specific Yield	1,379 kWh/kW	LCOE	0.0143 $/kWh
PV Penetration	102 %		



Generator: JMG-FGWilson-P1500-1 (Diesel)

Power output from the Caterpillar Inc. generator system, rated at 1,080 kW using Diesel as fuel, is 649,454 kWh/yr.

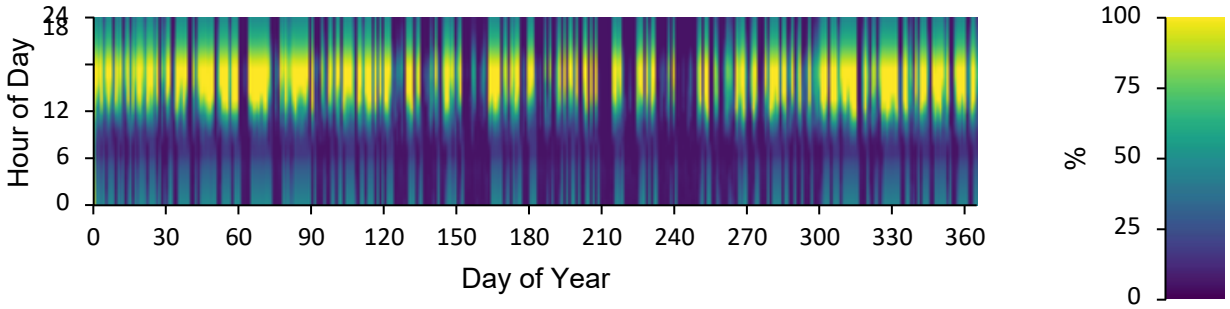
Capacity	1,080 kW	Generator Fuel	Diesel
Operational Life	8.31 yr	Generator Fuel Price	1.20 $/L
Capital Cost	$108,000	Maintenance Cost	120 $/yr
Fuel Consumption	176,628 L	Electrical Production	649,454 kWh/yr
Hours of Operation	2,408 hrs/yr	Marginal Generation Cost	0.293 $/kWh
Fixed Generation Cost	13.9 $/hr		



Storage: Huawei LUNA2000-100KWH

The Generic storage system's nominal capacity is 5,101 kWh. The annual throughput is 1,097,275 kWh/yr.

Rated Capacity	5,101 kWh	Expected Life	13.9 yr
Annual Throughput	1,097,275 kWh/yr	Capital Costs	$946,222
Maintenance Cost	51,000 $/yr	Losses	16,551 kWh/yr
Autonomy	11.4 hr		



Grid

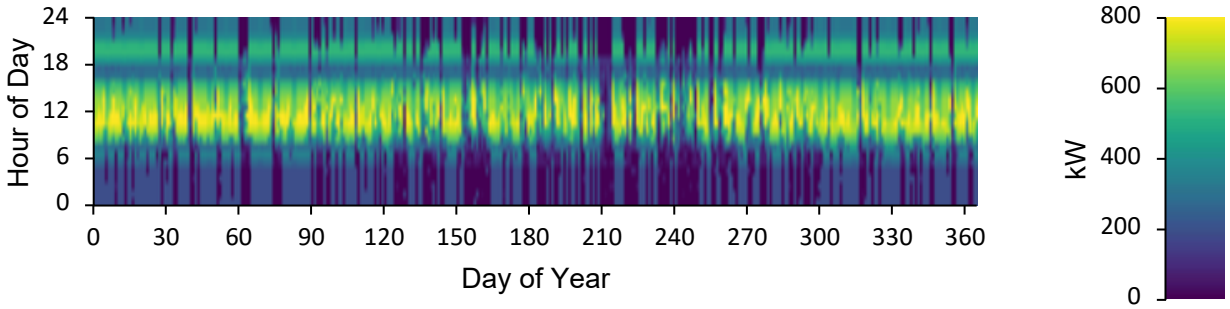
The annual energy purchased from the grid is 124,036 kWh and the annual energy sold to the grid is 0 kWh.

Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Energy Purchased (kWh)	Peak Load (kW)	Energy Charge	Demand Charge	Total
January	7,622	0	7,622	533	$762.25	$0.00	$762.25
February	3,878	0	3,878	527	$387.76	$0.00	$387.76
March	10,402	0	10,402	533	$1,040	$0.00	$1,040
April	7,638	0	7,638	418	$763.79	$0.00	$763.79
May	14,829	0	14,829	533	$1,483	$0.00	$1,483
June	13,362	0	13,362	533	$1,336	$0.00	$1,336
July	11,766	0	11,766	637	$1,177	$0.00	$1,177
August	21,745	0	21,745	527	$2,174	$0.00	$2,174
September	10,837	0	10,837	538	$1,084	$0.00	$1,084
October	6,187	0	6,187	527	$618.66	$0.00	$618.66
November	9,758	0	9,758	527	$975.81	$0.00	$975.81
December	6,012	0	6,012	527	$601.22	$0.00	$601.22
Annual	124,036	0	124,036	637	$12,404	$0.00	$12,404

Converter: Huawei LUNA2000

Capacity	800	kW
Mean Output	338	kW
Minimum Output	0	kW
Maximum Output	800	kW
Capacity Factor	42.2	%

Hours of Operation	7,555	hrs/yr
Energy Out	2,957,208	kWh/yr
Energy In	3,132,636	kWh/yr
Losses	175,428	kWh/yr



Cash Flows

Project Lifetime 25 years

Expected Inflation Rate15.7%

Nominal Discount Rate 26.5%

Real Interest Rate9.3%

Year	0	1	2	3	4	5	6	7	8	9
Grid	$0.00	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)
Huawei LUNA2000	($12,200)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)
Huawei LUNA2000-100KWH	($946,222)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)
Jinko Tiger Neo N-Type 620W	($260,204)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)
JMG-FGWilson-P1500-1	($108,000)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($3 09, 27 4)

Year	10	11	12	13	14	15	16	17	18	19
Grid	($12,404)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)
Huawei LUNA2000	($10,068)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)
Huawei LUNA2000-100KWH	($51,000)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($8 72, 44 4)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)
Jinko Tiger Neo N-Type 620W	($22,500)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)
JMG-FGWilson-P1500-1	($212,074)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($3 09, 27 4)	($2 12, 07 4)	($2 12, 07 4)

Year	20	21	22	23	24	25
Grid	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)	($1 2,4 04)
Huawei LUNA2000	($1 0,0 68)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	($6 8.0 0)	$4, 932
Huawei LUNA2000-100KWH	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	($5 1,0 00)	$11 9,0 94
Jinko Tiger Neo N-Type 620W	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	($2 2,5 00)	$19 ,16 7
J MG -FGW ilson-P1500-1	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 12, 07 4)	($2 13, 04 6)

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 ofthe 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 itby the capital recovery factor.

Simple payback

-isthe 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)

-istheyearly costsavings relativeto 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)

-isthe discountrateat 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

MGS-1000	JMG-FGWilson-P1500-1
ESS 100kwh	Huawei LUNA2000-100KWH
Jinko 620W	Jinko Tiger Neo N-Type 620W
LUNA	Huawei LUNA2000

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

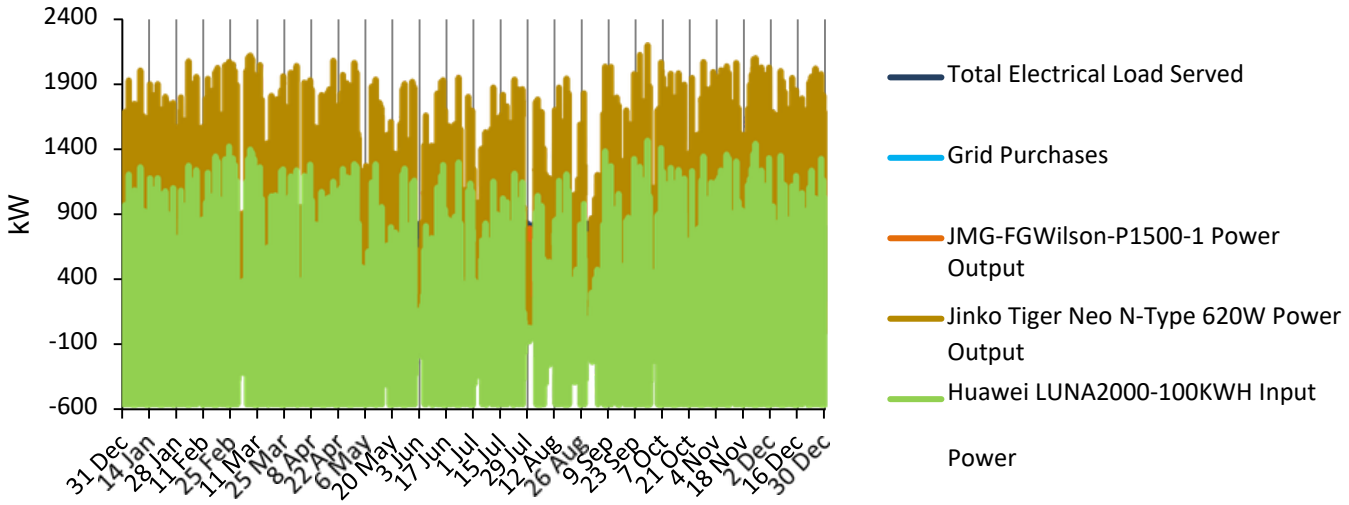
HOMER software is used by more than 200,000 users in 193 different countries.

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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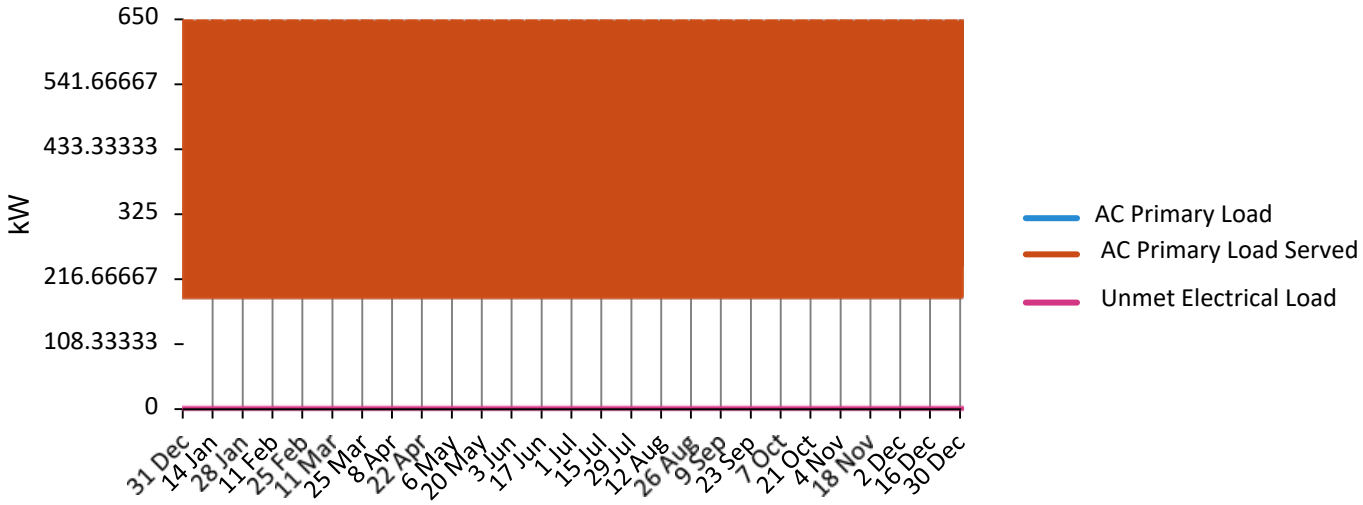

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