PREPARED FOR:

,

Microgrid Proposal

PREPARED BY:

,

,

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.

Table of Contents

Project Summary

CURRENT SYSTEM

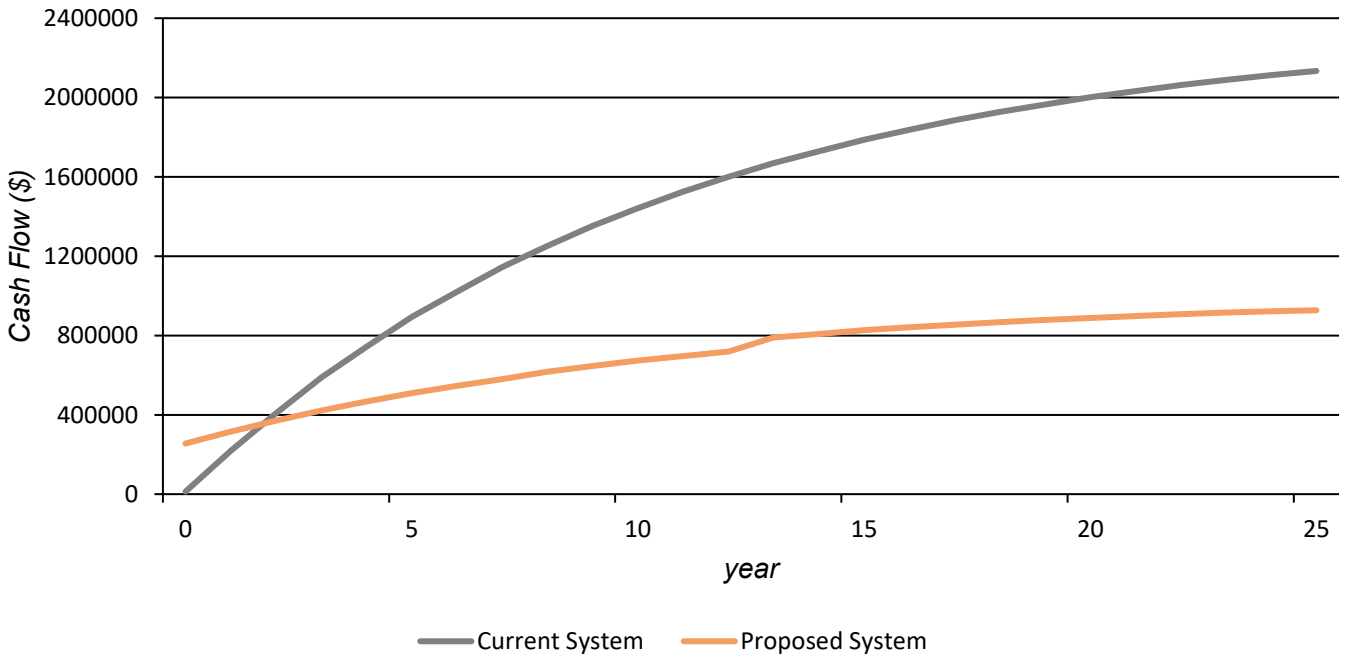
The electric needs of are met with 130 kW of generator capacity. Your operating costs for energy are currently $231,955 per year.

PROPOSED SYSTEM

We propose adding 450 kW of PV and 1,000 kWh of battery capacity. This would reduce your operating costs to $74,595/yr. Your investment has a payback of 1.51 years and an IRR of 67.1%.

Simple payback:	*1.51 yr*	*Net Present Value:*	*$1.21M*
Return on Investment:	*61.0 %*	*Capital Investment:*	*$242,340*
Internal Rate of Return:	*67.1 %*	*Annualized Savings:*	*$158,472*

Cumulative Cash Flow over Project Lifetime



ABOUT

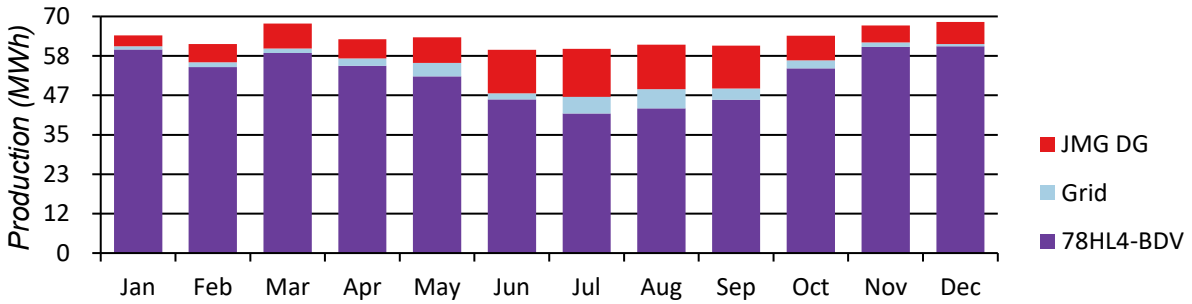
Customer Testimonials

—

Consumption Summary

Electric Consumption

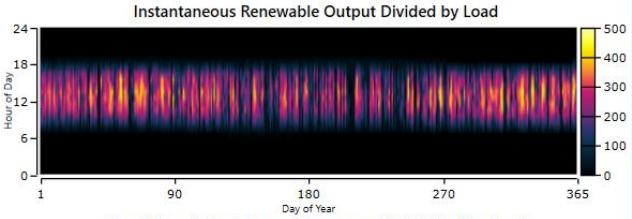
This microgrid requires 1803 kWh/day and has a peak of 112 kW. In the proposed system, the following generation sources serve the electrical load.

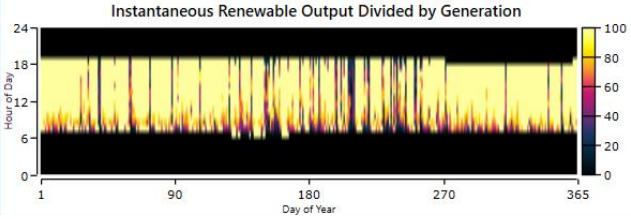


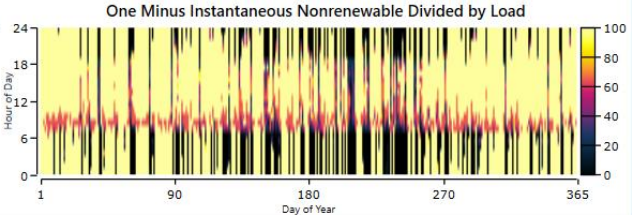
Capacity-based metrics	Value	Units
Nominal renewable capacity divided by total nominal capacity	77.6	%
Usable renewable capacity divided by total capacity	73.5	%

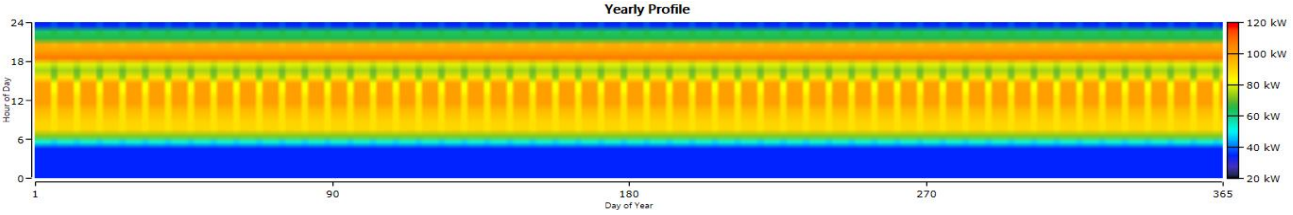
Energy-based metrics	Value	Units
Total renewable production divided by load	96.3	%
Total renewable production divided by generation	82.9	%
One minus total nonrenewable production divided by load	84.6	%

Peak values	Value	Units
Renewable output divided by load (HOMER standard)	442	%
Renewable output divided by total generation	100	%
One minus nonrenewable output divided by total load	100	%







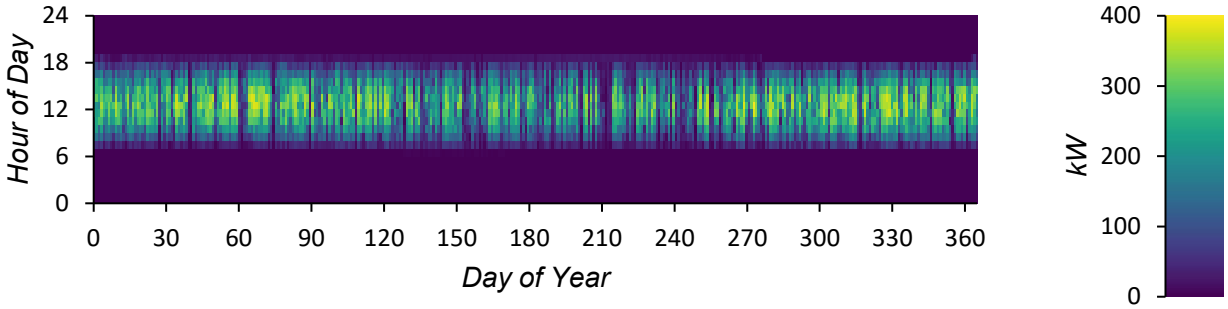


PV: Jinko Tiger Neo N-Type 620W

The LONGi Solar Technology Co., Ltd. PV system has a nominal capacity of 450 kW. The annual production is 633,904 kWh/yr.

Rated Capacity	450 kW
Capital Cost	$48,563
Specific Yield	1,409 kWh/kW
PV Penetration	96.3 %

Total Production	633,904 kW
Maintenance Cost	5,062 $/yr
LCOE	0.0162 $/kWh

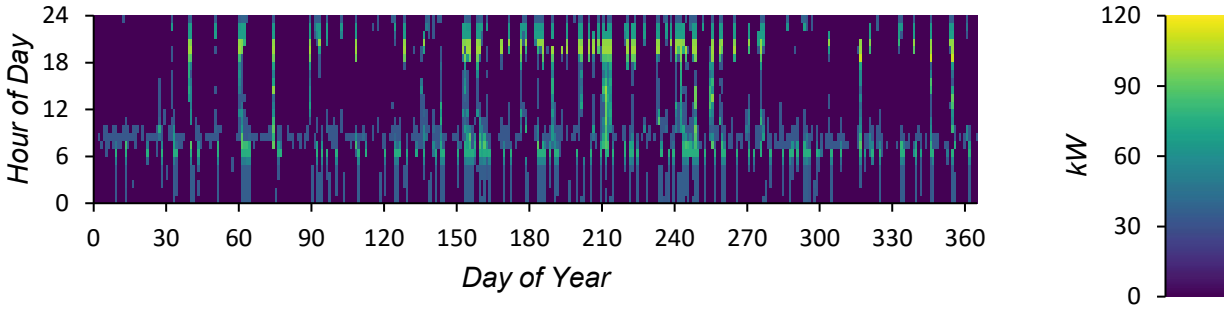


Generator: JMG Diesel Generator (Diesel)

Power output from the Generic generator system, rated at 130 kW using Diesel as fuel, is 101,063 kWh/yr.

Capacity	130 kW
Operational Life	7.12 yr
Capital Cost	$13,000
Fuel Consumption	32,707 L
Hours of Operation	2,106 hrs/yr
Fixed Generation Cost	11.9 $/hr

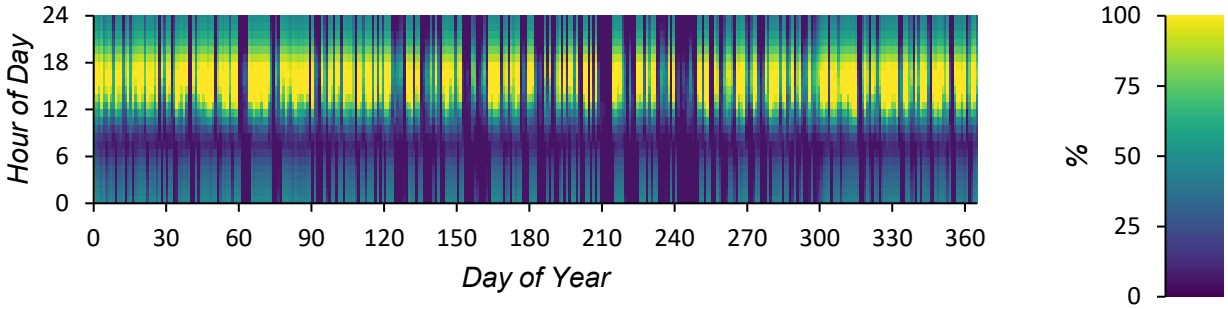
Generator Fuel	Diesel
Generator Fuel Price	1.10 $/L
Maintenance Cost	13,689 $/yr
Electrical Production	101,063 kWh/yr
Marginal Generation Cost	0.260 $/kWh



Storage: Huawei LUNA2000-100KWH

The Generic storage system's nominal capacity is 1,000 kWh. The annual throughput is 239,493 kWh/yr.

Rated Capacity	1,000 kWh	Expected Life	12.5 yr
Annual Throughput	239,493 kWh/yr	Capital Costs	$190,000
Maintenance Cost	10,000 $/yr	Losses	3,614 kWh/yr
Autonomy	12.6 hr		



Grid

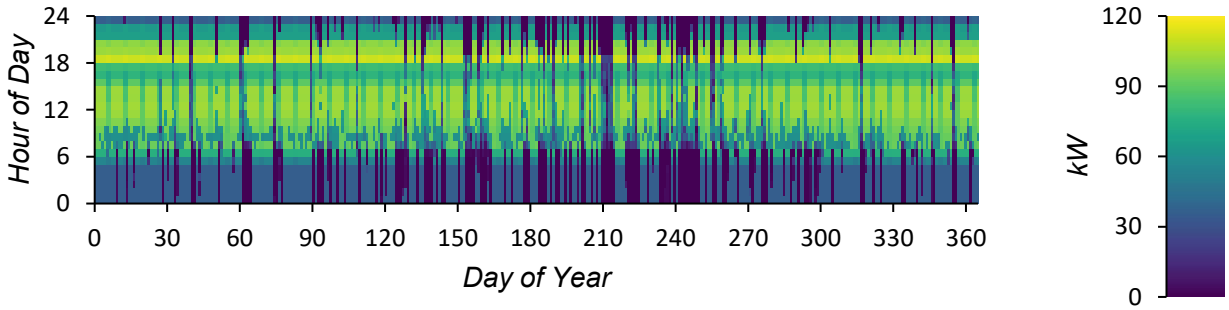
The annual energy purchased from the grid is 29,711 kWh and the annual energy sold to the grid is 0 kWh.

Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Energy Purchased (kWh)	Peak Load (kW)	Energy Charge	Demand Charge	Total
January	901	0	901	101	$90.13	$0.00	$90.13
February	1,425	0	1,425	100	$142.53	$0.00	$142.53
March	1,300	0	1,300	100	$129.98	$0.00	$129.98
April	2,219	0	2,219	76.1	$221.88	$0.00	$221.88
May	3,936	0	3,936	100	$393.55	$0.00	$393.55
June	1,850	0	1,850	100	$185.03	$0.00	$185.03
July	4,873	0	4,873	100	$487.31	$0.00	$487.31
August	5,690	0	5,690	91.0	$569.00	$0.00	$569.00
September	3,266	0	3,266	100	$326.57	$0.00	$326.57
October	2,333	0	2,333	100	$233.30	$0.00	$233.30
November	1,323	0	1,323	100	$132.26	$0.00	$132.26
December	596	0	596	83.1	$59.58	$0.00	$59.58
Annual	29,711	0	29,711	101	$2,971	$0.00	$2,971

Converter: Huawei LUNA2000 Copy

Capacity	150 kW
Mean Output	60.2 kW
Minimum Output	0 kW
Maximum Output	112 kW
Capacity Factor	40.1 %

Hours of Operation	7,647 hrs/yr
Energy Out	527,451 kWh/yr
Energy In	558,741 kWh/yr
Losses	31,289 kWh/yr



Cash Flows

Project Lifetime	*25 years*	*Expected Inflation Rate*	*15.1%*
Nominal Discount Rate	*26.5%*	*Real Interest Rate*	*9.9%*

Year	0	1	2	3	4	5	6	7	8	9
Grid	$0.00	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)
Huawei LUNA2000 Copy	($3,714)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)
Huawei LUNA2000-100KWH	($190,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)
Jinko Tiger Neo N-Type 620W	($48,626)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)
JMG Diesel Generator	($13,000)	($49,667)	($49,667)	($49,667)	($49,667)	($49,667)	($49,667)	($49,667)	($61,367)	($49,667)

Year	10	11	12	13	14	15	16	17	18	19
Grid	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)
Huawei LUNA2000 Copy	($3,093)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)	($21.43)
Huawei LUNA2000-100KWH	($10,000)	($10,000)	($10,000)	($180,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)
Jinko Tiger Neo N-Type 620W	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)
JMG Diesel Generator	($49,667)	($49,667)	($49,667)	($49,667)	($49,667)	($61,367)	($49,667)	($49,667)	($49,667)	($49,667)

Year	20	21	22	23	24	25
Grid	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)	($2,971)
Huawei LUNA2000 Copy	($3,093)	($21.43)	($21.43)	($21.43)	($21.43)	$1,514
Huawei LUNA2000-100KWH	($10,000)	($10,000)	($10,000)	($10,000)	($10,000)	($9,282)
Jinko Tiger Neo N-Type 620W	($3,950)	($3,950)	($3,950)	($3,950)	($3,950)	$3,550
JMG Diesel Generator	($49,667)	($49,667)	($61,367)	($49,667)	($49,667)	($43,934)

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)

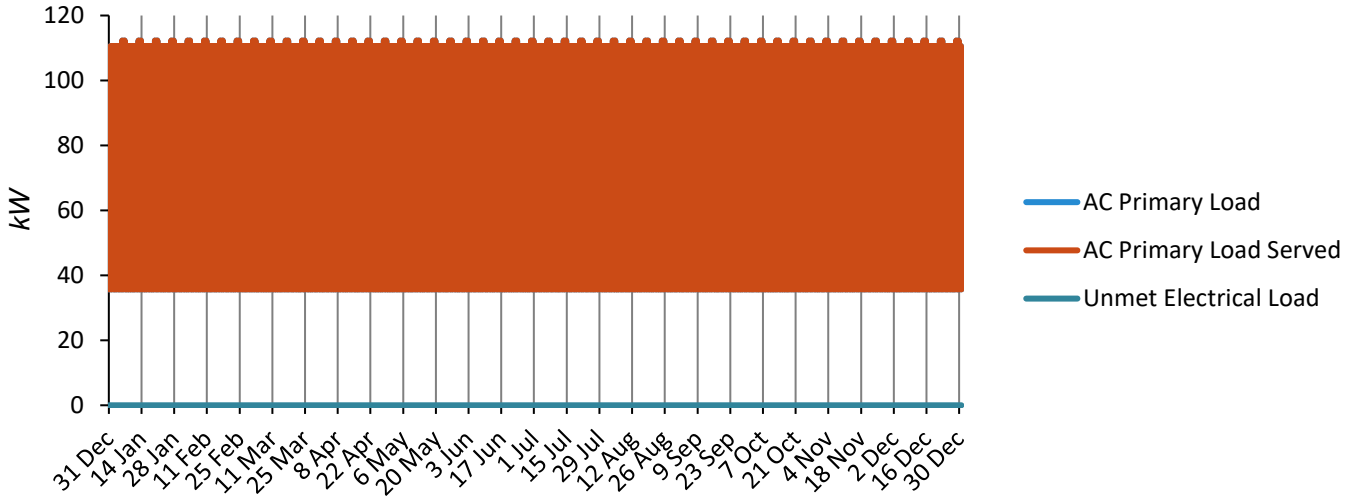
- is the discount rate at which the base case and current system have the same net present cost. HOMER calculates the IRR by determining the discount rate that makes the present value of the difference of the two cash flow sequences equal to zero.

Refer to HOMER Pro Online Help Manual

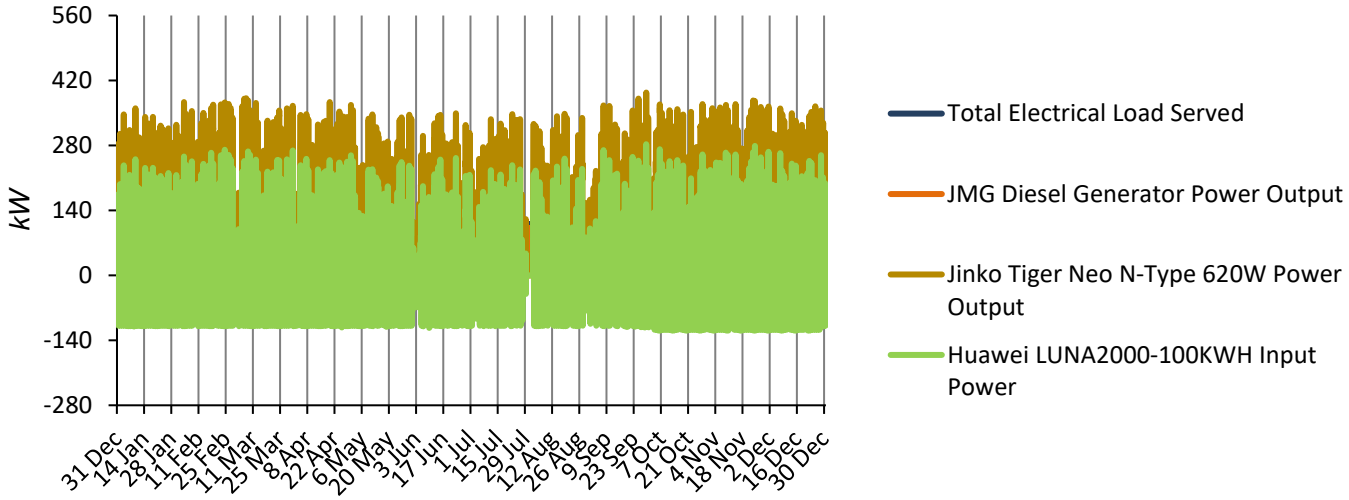
Abbreviations

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

Time series charts:



Time series charts:



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.