

HOMER Economic Models – US Navy

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February 2016



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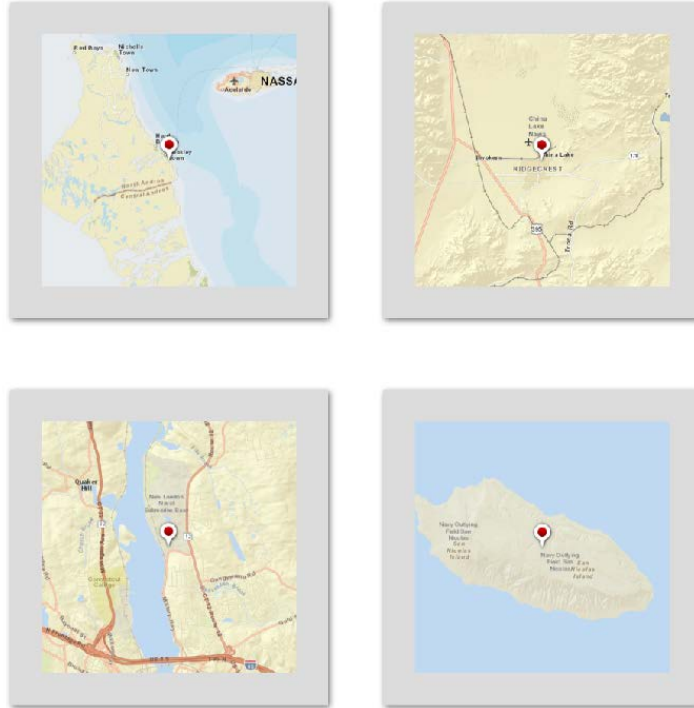
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HOMER Economic Models – US Navy

1. Introduction

Figure 1: Navy locations modeled in HOMER



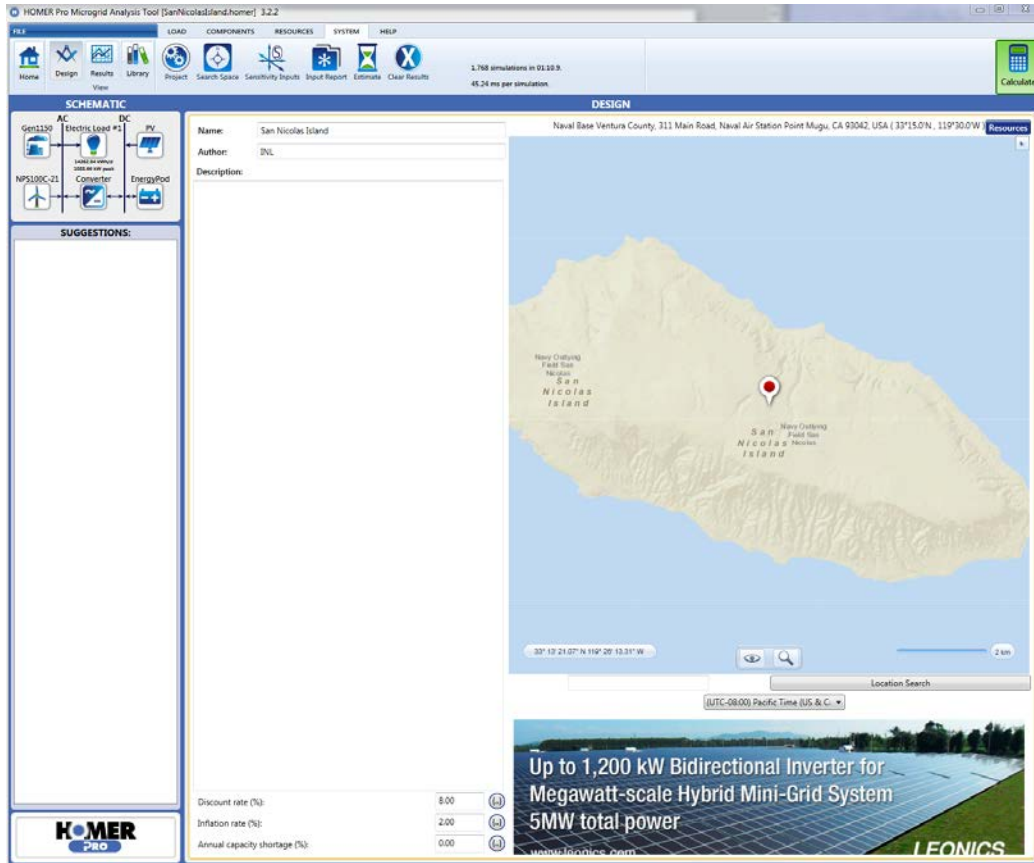
This LETTER REPORT has been prepared by Idaho National Laboratory for US Navy NAVFAC EXWC to support in testing pre-commercial SIREN (Simulated Integration of Renewable Energy Networks) computer software models. In the logistics mode SIREN software simulates the combination of renewable power sources (solar arrays, wind turbines, and energy storage systems) in supplying an electrical demand. NAVFAC EXWC will create SIREN software logistics models of existing or planned renewable energy projects at five Navy locations (San Nicolas Island, AUTECH, New London, & China Lake), and INL will deliver additional HOMER computer models for comparative analysis. In the transient mode SIREN simulates the short time-scale variation of electrical parameters when a power outage or other destabilizing event occurs. In the HOMER model, a variety of inputs are entered such as location coordinates, Generators, PV arrays, Wind Turbines, Batteries, Converters, Grid costs/usage, Solar resources, Wind resources, Temperatures, Fuels, and Electric Loads. HOMER's optimization and sensitivity analysis algorithms then evaluate the economic and technical feasibility of these technology options and account for variations in technology costs, electric load, and energy resource availability. The Navy can then use HOMER's optimization and sensitivity results to compare to those of the SIREN model.

The U.S. Department of Energy (DOE) Idaho National Laboratory (INL) possesses unique expertise and experience in the software, hardware, and systems design for the integration of renewable energy into the electrical grid. NAVFAC EXWC will draw upon this expertise to complete mission requirements.

2. San Nicholas Island

2.1 HOMER Analysis

Figure 2: San Nicholas Island HOMER



The HOMER (Hybrid Optimization of Multiple Energy Resources) model greatly simplifies the task of designing hybrid renewable microgrids, whether remote or attached to a larger grid. HOMER's optimization and sensitivity analysis algorithms allow you to evaluate the economic and technical feasibility of a large number of technology options and to account for variations in technology costs, electric load, and energy resource availability.

For San Nicholas Island inputs we have included:

- 1 – 1150kW Generator
- 7 – 100kW Northern Power Wind Turbines
- Flat panel fixed PV up from 250kW up to 2000kW
- 280kW/1MWh Primus Power EnergyPod Battery (allowed up to 4)
- System Converter up to 2000kW

This model used the location coordinates of 33° 15.05' N, 119° 29.97' W and wind resource data from the 50m NREL Met tower. The solar resource was downloaded from the NREL Solar database and the electrical load data was analysis of spreadsheet data provided for Dec13, Jan14, Feb14, Jun14, Jul14, & Aug14. Homer requires 1 year of hourly/monthly data so a linear interpolation algorithm was used to fill

in the missing months. A temperature resource was also included and was downloaded from NASA's surface and solar database. Refer to following figures:

Figure 3: San Nicholas Generator Component

GENERATOR Name: Generic1150kW Prime Pow Abbreviation: Gen115 Remove Copy To Library

Properties
 Name: Generic1150kW Prime Power
 Abbreviation: Gen1150
 Manufacturer: Generic
 Website:

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/hr)
3100	\$2,000,000.00	\$2,000,000.00	\$11.50
12400	\$8,000,000.00	\$8,000,000.00	\$34.50

Multiplier: (---) (---) (---)

Site Specific Input
 Minimum Load Ratio (%): 30.00 (---) Heat Recovery Ratio (%): 0.00 (---)
 Lifetime (Hours): 15,000.00 (---) Minimum Runtime (Minutes): 0.00 (---)

Fuel Resource Fuel Curve Biogas Emissions Maintenance Schedule
 SELECT FUEL: Diesel Manage Fuels

PROPERTIES
 Lower Heating Value (MJ/kg): 43.2
 Density (kg/m3): 820
 Carbon Content (%): 88
 Sulfur Content (%): 0.33

Diesel Fuel Price (\$/L): 1.00 (---) Limit Consumption (L): 5,000.00 (---)

Electrical Bus: ☒ AC ☐ DC

Figure 4: San Nicholas PV Component

PV Name: Generic flat plate PV Abbreviation: PV Remove Copy To Library

Properties
 Name: Generic flat plate PV
 Abbreviation: PV
 Panel Type: Flat plate
 Rated Capacity (kW): 0
 Manufacturer: Generic
 Weight (lbs): 160
 Footprint (in2): 9000
 Website: www.homerenergy.com

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$3,000.00	\$3,000.00	\$20.00

Click here to add new item

Multiplier: (---) (---) (---)

Site Specific Input
 Lifetime (years): 25.00 (---)
 Derating Factor (%): 80.00 (---)

MPPT Advanced Input Temperature
☒ Ignore dedicated converter
 Lifetime (years): 15.00 (---)

Search Space

Size (kW)
500
1000
1500
2000
250


Click here to add new item

☐ Use Efficiency Table?
 Efficiency (%): 95

Input Percentage (%)	Efficiency (%)
Click here to add new item	

Figure 5: San Nicholas Wind Turbine Component

WIND TURBINE



Name: Northern Power NPS100C-
Abbreviation: NPS10C

Remove

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Properties

Name: Northern Power NPS100C-
Abbreviation: NPS100C-21
Rated Capacity (kW): 100
Manufacturer: Northern Power Sys

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$800,000.00	\$800,000.00	\$20,000.00
7	\$5,530,000.00	\$5,530,000.00	\$120,000.00

Multiplier: {...} {...} {...}

Search Space

Quantity: 7

Site Specific Input

Lifetime (years): 20.00 {...}
Hub Height (m): 37.00 {...}
☐ Consider ambient temperature effects?

Electrical Bus
☒ AC
☐ DC

Power Curve

Turbine Losses

Maintenance

Wind Speed (m/s)	Power Output (kW)
1	0
2	0
3	0.5
4	4.1
5	10.5

Wind Turbine Power Curve

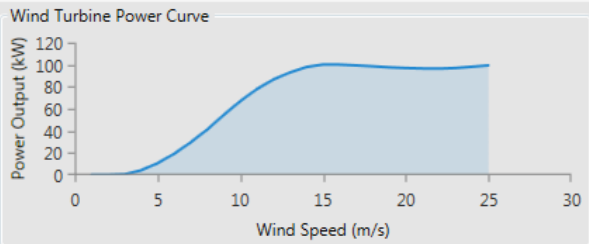



Figure 6: San Nicholas Battery Component

BATTERY



Name: GS200 flow
Abbreviation: GS200 f

Remove

Copy To Library

Properties

Name: GS200 flow
Abbreviation: GS200 flow
Manufacturer:
Zinc Battery Model
Nominal Voltage (V): 100
Nominal Capacity (Ah): 6,000
Nominal Capacity (kWh): 600
Round Trip Efficiency (%): 70.0
Float Life (years): 25.0
Cell stack replacement interval (yrs): 10.0
Electrolyte replacement interval (yrs): 125
Max. Charge Rate (A/Ah): 0.250
Max. Charge Current (A): 1,500
Max. Discharge Current (A): 2,200
Website:
Notes:

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$324,589.00	\$32,489.00	\$2,400.00
6	\$1,947,535.00	\$194,753.00	\$14,400.00

Click here to add new item

Multiplier: {...} {...} {...}

Search Space


Batteries: 0, 6, 8, 10, 12, 18

Site Specific Input

Batteries per string: 1 (100 V bus)
Initial State of Charge (%): 100.00 {...}
Cell stack cost (% of total replacement cost): 25.00 {...}

Figure 7: San Nicholas Converter Component

CONVERTER



Name:
Abbreviation:

Remove
Copy To Library

System Converter

Properties

Name: System Converter

Abbreviation: Converter

Manufacturer: Generic

Weight (lbs): 1500

Footprint (in2): 2000

Website: www.homerenergy.com

Notes:

This is a generic system converter.

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$300.00	\$300.00	\$0.0

Click here to add new item

Multipliers:

Search Space

Size (kW)

0
500
750
1000
1500
2000
3000

Inverter Input

Lifetime (years):

Efficiency (%):

☒ Parallel with AC generator?

Rectifier Input

Relative Capacity (%):

Efficiency (%):

Figure 8: San Nicholas Solar Resource

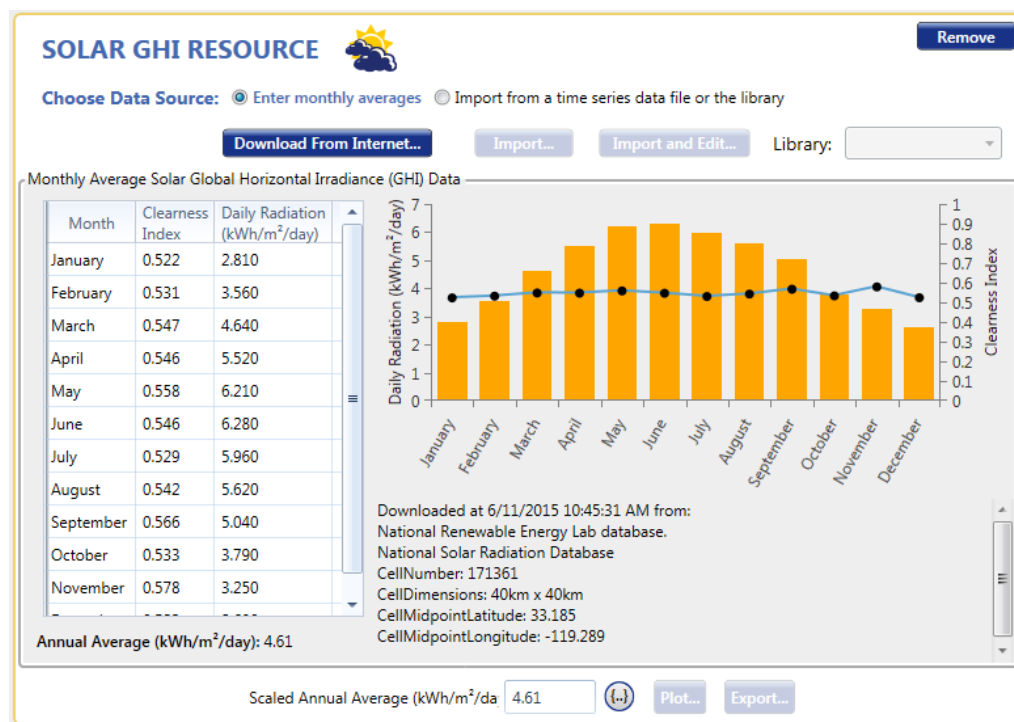


Figure 9: San Nicholas Temperature Resource

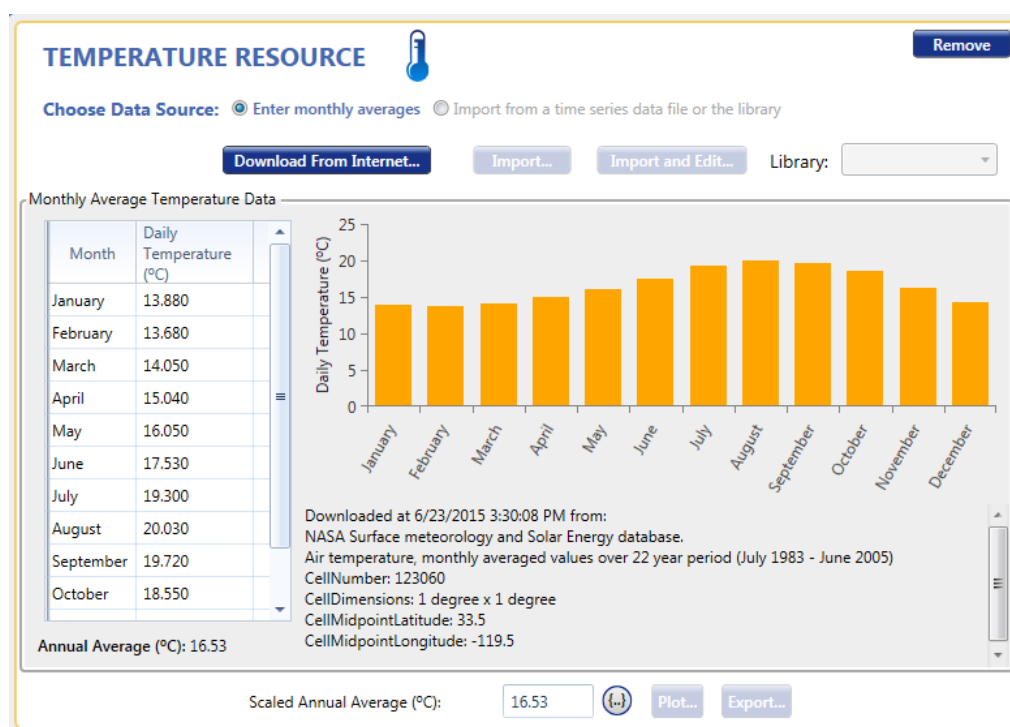


Figure 10: San Nicholas Wind Resource

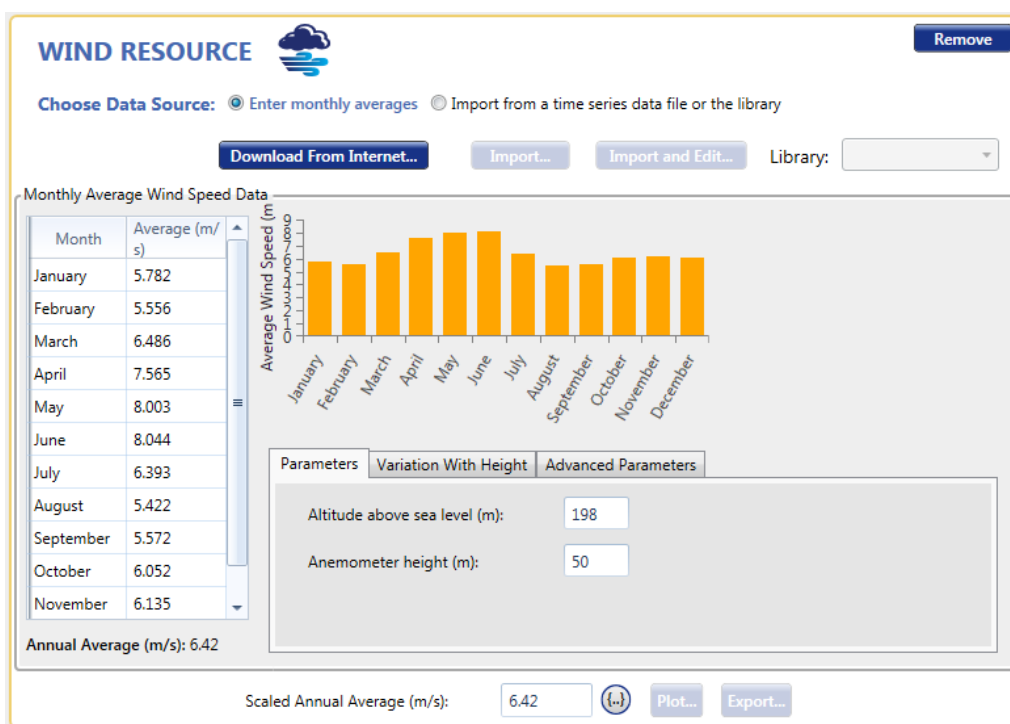


Figure 11: San Nicholas Fuel Resource

FUEL RESOURCE

You may add a fuel from the library to model:

Diesel

Add

FUELS AVAILABLE IN MODEL

Name	LHV	Density	Carbon	Sulfur	Special
Diesel	43.2	820	88	0.33	X

Selected Fuel

Name: Diesel

PROPERTIES

Lower Heating Value (MJ/kg): 43.20

Density (kg/m3): 820.00

Carbon Content (%): 88.00

Sulfur Content (%): 0.33

Fuel Type

☒ Conventional
☐ Stored Hydrogen
☐ Uses biomass resource

Limits and Prices

Diesel Fuel Price (\$/L): 1.00

☐ Limit Consumption (L): 5,000.00

Units: L

Copy To Library

Figure 12: San Nicholas Electrical Load



Table 1: San Nicholas Weekday Electrical Load Profile

Yearly Load Data													
Weekdays		Weekends											
Hour	January	February	March	April	May	June	July	August	September	October	November	December	
0	547.974	593.185	579.855	566.525	553.195	539.865	558.336	549.486	554.771	560.056	565.341	570.625	
1	536.561	574.664	561.702	548.740	535.777	522.815	532.095	535.680	543.881	552.082	560.283	568.484	
2	528.984	564.099	553.209	542.320	531.430	520.541	521.476	528.633	540.315	551.996	563.678	575.359	
3	531.363	558.677	548.350	538.023	527.696	517.369	513.492	530.260	542.844	555.429	568.014	580.599	
4	530.971	558.768	548.596	538.424	528.252	518.080	509.861	524.630	539.118	553.607	568.095	582.584	
5	535.177	559.591	550.432	541.273	532.113	522.954	508.847	523.279	538.722	554.166	569.609	585.053	
6	566.447	592.180	579.653	567.127	554.600	542.073	528.058	540.901	558.313	575.726	593.139	610.552	
7	621.372	652.066	633.398	614.731	596.064	577.397	562.712	571.472	593.012	614.552	636.092	657.631	
8	647.760	679.646	663.181	646.717	630.252	613.788	603.834	610.988	626.580	642.171	657.763	673.354	
9	616.697	653.596	643.884	634.172	624.461	614.749	588.493	597.899	609.116	620.332	631.549	642.765	
10	623.293	650.785	641.238	631.691	622.144	612.598	585.485	603.180	613.907	624.633	635.359	646.086	
11	642.215	665.117	653.712	642.307	630.901	619.496	605.651	629.669	636.235	642.801	649.367	655.932	
12	642.929	676.620	667.304	657.989	648.673	639.357	635.024	665.564	663.608	661.652	659.696	657.740	
13	648.937	673.879	665.867	657.855	649.843	641.831	637.781	666.824	662.937	659.050	655.163	651.277	
14	644.339	668.228	659.934	651.640	643.346	635.053	635.613	666.025	660.212	654.399	648.586	642.773	
15	618.877	642.911	633.265	623.619	613.973	604.328	620.501	649.403	642.084	634.764	627.445	620.125	
16	614.892	633.473	621.834	610.196	598.557	586.919	608.213	629.635	624.982	620.328	615.674	611.020	
17	614.732	637.849	623.467	609.085	594.703	580.320	609.035	624.901	623.809	622.717	621.624	620.532	
18	633.123	655.364	640.364	625.364	610.364	595.364	626.838	623.064	628.366	633.669	638.971	644.273	
19	655.368	674.115	655.186	636.257	617.329	598.400	616.953	619.647	631.032	642.417	653.802	665.187	
20	634.487	681.723	659.610	637.496	615.383	593.269	604.133	617.679	622.950	628.222	633.493	638.764	
21	619.023	668.705	648.587	628.468	608.349	588.230	605.152	611.252	616.093	620.934	625.775	630.616	
22	599.282	643.063	625.564	608.065	590.566	573.066	589.937	602.057	605.869	609.681	613.493	617.305	
23	561.628	613.245	601.882	590.520	579.158	567.795	579.781	574.229	577.893	581.556	585.219	588.882	

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Table 2: San Nicholas Weekend Electrical Load Profile

Yearly Load Data													
Weekdays		Weekends											
Hour	January	February	March	April	May	June	July	August	September	October	November	December	
0	521.548	552.183	546.781	541.378	535.976	530.573	528.584	536.952	539.526	542.100	544.673	547.247	
1	511.065	544.158	537.420	530.683	523.946	517.209	516.618	521.070	527.131	533.192	539.254	545.315	
2	515.503	541.581	539.825	538.070	536.315	534.559	502.502	527.886	532.936	537.986	543.036	548.086	
3	517.982	537.755	537.078	536.401	535.724	535.046	493.722	518.403	528.345	538.287	548.229	558.172	
4	516.477	536.902	535.253	533.605	531.956	530.308	493.641	514.692	526.537	538.381	550.226	562.071	
5	521.076	540.541	537.638	534.735	531.832	528.929	493.844	517.242	529.979	542.716	555.453	568.190	
6	522.805	544.183	540.044	535.905	531.766	527.627	499.341	519.443	531.565	543.686	555.808	567.929	
7	560.405	586.549	576.304	566.059	555.815	545.570	518.776	542.684	558.737	574.790	590.843	606.896	
8	580.648	614.698	601.145	587.591	574.037	560.483	543.720	564.504	577.724	590.943	604.162	617.381	
9	566.482	605.066	591.585	578.103	564.622	551.140	545.782	549.294	563.756	578.218	592.680	607.142	
10	576.372	604.093	591.928	579.764	567.599	555.435	548.890	556.145	567.406	578.667	589.927	601.188	
11	586.738	622.021	609.331	596.641	583.951	571.261	556.520	577.658	585.580	593.501	601.423	609.344	
12	588.687	621.252	610.891	600.531	590.170	579.810	573.959	604.749	605.136	605.524	605.912	606.300	
13	589.631	618.273	610.498	602.724	594.950	587.176	589.559	622.669	617.058	611.447	605.835	600.224	
14	591.387	609.637	603.624	597.612	591.600	585.587	585.476	614.707	611.477	608.248	605.018	601.788	
15	578.782	582.011	578.908	575.805	572.703	569.600	570.193	605.148	599.632	594.116	588.601	583.085	
16	572.696	572.222	567.661	563.100	558.540	553.979	560.823	590.843	589.283	587.722	586.162	584.601	
17	579.169	583.577	574.766	565.955	557.145	548.334	568.954	586.138	585.128	584.117	583.107	582.097	
18	602.498	598.488	589.503	580.518	571.534	562.549	593.119	598.467	598.632	598.797	598.962	599.127	
19	617.345	608.893	597.921	586.949	575.977	565.005	590.041	605.509	608.685	611.860	615.035	618.211	
20	601.853	597.068	587.580	578.092	568.605	559.117	579.619	595.764	599.770	603.776	607.782	611.789	
21	586.771	593.199	585.131	577.064	568.997	560.930	565.808	587.582	590.137	592.692	595.247	597.801	
22	574.425	586.270	576.272	566.275	556.278	546.280	547.099	573.936	575.310	576.685	578.059	579.434	
23	537.357	566.938	558.271	549.604	540.937	532.270	544.220	541.962	544.237	546.512	548.787	551.062	

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Two of the components are already at SNI (Wind Turbines & Generator). Inputs for these two components were set so HOMER always looks at using the 7 wind turbines and the 1 genset. HOMER then has the option to consider different amounts of PV & batteries, and different size system converter. These are the simulation results produced for the optimization cases:

Table 3: San Nicholas Sensitivity & Optimization Results

RESULTS

Export... Column Choices...

Sensitivity Cases: Left Click on sensitivity case to see optimization cases.

Architecture					Cost						System							Gen1150							
					PV (kW)	NPS100C-21	Gen1150 (kW)	GS200 flow	Converter (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Fuel cost (\$)	OBM (\$)	Ren Frac (%)	Total Fuel (L)	Cap Short (kWh/yr)	Elec Prod (kWh/yr)	Elec Cons (kWh/yr)	Excess Elec (kWh/yr)	Unmet load (kWh/yr)	Hours	Production	Fuel (\$)
					750	7	1,150	6	1,000	\$0.406	\$27.3M	\$1.28M	\$10.8M	\$870,316	\$175,449	36	870315.8	0	6074329	5205935	132564.9	0.01486206	3,901	3,347,365	870,316

Export...

Optimization Cases: Left Double Click on simulation to examine details.

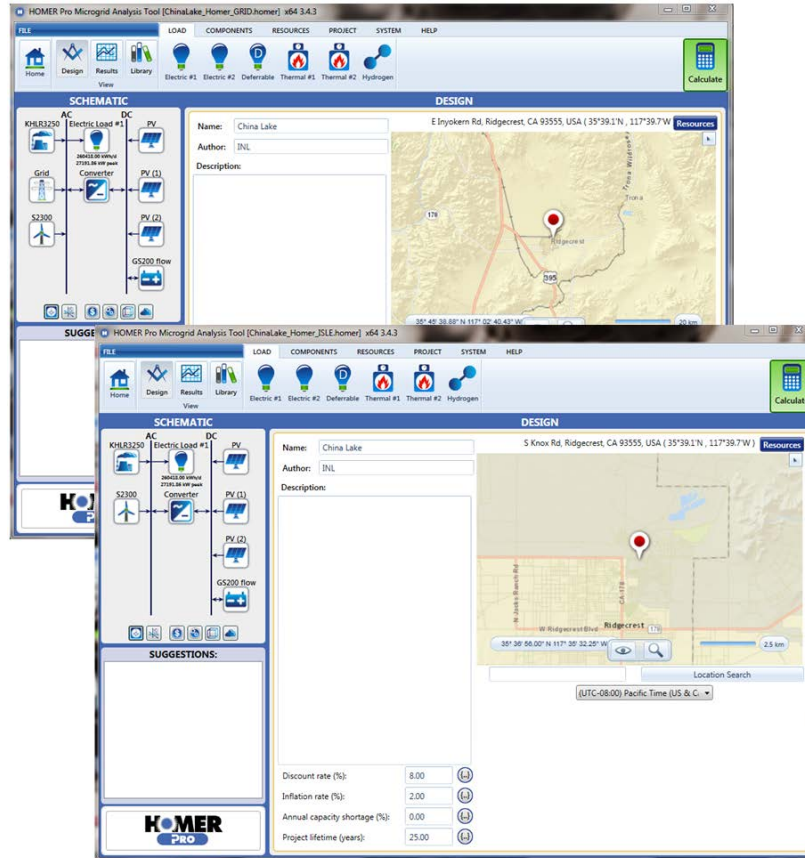
Architecture					Cost						System							Gen1150							
					PV (kW)	NPS100C-21	Gen1150 (kW)	GS200 flow	Converter (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Fuel cost (\$)	OBM (\$)	Ren Frac (%)	Total Fuel (L)	Cap Short (kWh/yr)	Elec Prod (kWh/yr)	Elec Cons (kWh/yr)	Excess Elec (kWh/yr)	Unmet load (kWh/yr)	Hours	Production	Fuel (\$)
					750	7	1,150	6	1,000	\$0.406	\$27.3M	\$1.28M	\$10.8M	\$870,316	\$175,449	36	870315.8	0	6074329	5205935	132564.9	0.01486206	3,901	3,347,365	870,316
					750	7	1,150	6	750	\$0.424	\$28.5M	\$1.55M	\$8.44M	\$1.03M	\$175,747	24	1028686	0	5558297	5205935	12119.36	0.01719666	6,192	3,956,489	1,028,686
					250	7	1,150		500	\$0.425	\$28.6M	\$1.73M	\$6.27M	\$1.08M	\$178,481	20	1080623	0	5758145	5205935	552204.1	0.022215576	8,758	4,156,337	1,080,622
					250	7	1,150		500	\$0.432	\$29.1M	\$1.69M	\$7.17M	\$1.04M	\$182,434	23	1035697	0	5960437	5205935	735565.8	0.0256958	8,751	3,983,576	1,035,697

The top case (HOMER optimized selection) includes 750 kW PV, 7 - 100kW wind turbines, 1150kW Genset, 6 Vizn GS200 Flow batteries (1MW) and a 1MW system converter. For this case the cost of energy is calculated at \$0.406 and the renewable fraction is 36%. With the input parameters HOMER was given the above cases were the only ones found feasible. See case pdf's for further details on each simulation.

3. China Lake

3.1 HOMER Analysis

Figure 13: China Lake HOMER



The HOMER (Hybrid Optimization of Multiple Energy Resources) model greatly simplifies the task of designing hybrid renewable microgrids, whether remote or attached to a larger grid. HOMER's optimization and sensitivity analysis algorithms allow you to evaluate the economic and technical feasibility of a large number of technology options and to account for variations in technology costs, electric load, and energy resource availability.

Multiple inputs are entered into the HOMER model such as location coordinates of $35^{\circ} 39.1' N$, $117^{\circ} 39.7' W$ which is near Naval Air Weapons Station China Lake's main gate. Resources and components are the main inputs that are needed to make a HOMER model. For China Lake the components used consist of Generator, PV, Wind Turbine, Battery, Converter and the Grid. INL has created cost inputs for these components based on vendor/market data and past experience. The resource inputs created for China Lake consist of Solar, Wind, Temperature, Fuels, and Electric Load. Refer to figures (1 - 11). The solar, wind, & temperature resources were downloaded from the NASA Surface meteorology and Solar Energy database and contained monthly averaged values for a 10 to 22 year period (1983 – 2005). The fuel resource consists of a Diesel profile that was generated from current market information. The electrical load data was an analysis of naval power load spreadsheet data provided for the year 2010. Based on the power data HOMER estimates annual peak load as 27,191.86 kW. Grid purchase inputs are then set as 12000, 15000, 20000, 25000, & 27200 kW with grid sales set as 0 kW. Note in the China Lake model; both the grid-tied and off-grid (island) systems are modeled.

Figure 14: China Lake Generator Component

GENERATOR

Name:
Abbreviation:

Properties

Name: Kohler 3250 Prime Power
Abbreviation: KHLR3250
Manufacturer: Kohler
Website:

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/hr)
1	\$1,000.00	\$1,000.00	\$0.015
1000	\$1,000,000.00	\$1,000,000.00	\$15.00

Multiplier:

Search Space

Size (kW)
2800
5600
8400
11200
14000
0

Site Specific Input

Minimum Load Ratio (%):
Heat Recovery Ratio (%):

Lifetime (Hours):
Minimum Runtime (Minutes):

Electrical Bus
☒ AC ☐ DC

Fuel Resource
Fuel Curve
Biogas
Emissions
Maintenance
Schedule

SELECT FUEL:

PROPERTIES

Lower Heating Value (MJ/kg): 43.2
Density (kg/m3): 820
Carbon Content (%): 88
Sulfur Content (%): 0.33

Diesel Fuel Price (\$/L):
☐ Limit Consumption (L):

Figure 15: China Lake Sun Power PV Component

PV

Name:
Abbreviation:

Properties

Name: SunPower PV
Abbreviation: PV
Panel Type: Flat plate
Rated Capacity (kW): 13780
Manufacturer: Generic
Weight (lbs): 160
Footprint (in2): 9000
Website: www.homerenergy.com

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
2000	\$6,000.00	\$6,000,000.00	\$30,000.0
5000	\$14,750.0	\$14,750,000.00	\$55,000.0

Multiplier:

Search Space

Size (kW)
13780

Site Specific Input

Lifetime (years):
Derating Factor (%):

Electrical Bus
☐ AC ☒ DC

MPPT
Advanced Input
Temperature

☒ Ignore dedicated converter

Lifetime (years):

☐ Use Efficiency Table?

Efficiency (%):

Costs

Size (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$300.00	\$300.00	\$0.00

Click here to add new item

Search Space

Size (kW)
1000
1500

Input Percentage (%)
Efficiency (%)

Click here to add new item

Figure 16: China Lake PV Distributed Component

Name: Remaining Generic flat pla
Abbreviation: PV (1)

Remove
Copy To Library

Properties
Name: Remaining Generic flat plate PV
Abbreviation: PV (1)
Panel Type: Flat plate
Rated Capacity (kW): 1546.9
Manufacturer: Generic
Weight (lbs): 160
Footprint (in2): 9000
Website: www.homerenergy.com

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
2000	\$6,000.00	\$6,000,000.00	\$30,000.0
5000	\$14,750.0	\$14,750,000.00	\$55,000.0

Multiplier:

Search Space
Size (kW)
1546.9

Site Specific Input
Lifetime (years): 25.00
Derating Factor (%): 80.00

Electrical Bus
AC
DC

MPPT
Advanced Input
Temperature

☒ Ignore dedicated converter
Lifetime (years): 15.00

Costs

Size (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$300.00	\$300.00	\$0.00

Click here to add new item

Search Space
Size (kW)
50
100
300
500
1000

☐ Use Efficiency Table?
Efficiency (%): 95

Input Percentage (%)
Efficiency (%)
Click here to add new item

Figure 17: China Lake Additional PV Component

Name: Solar World 320W flat plat
Abbreviation: PV (2)

Remove
Copy To Library

Properties
Name: Solar World 320W flat plate PV Copy
Abbreviation: PV (2)
Panel Type: Flat plate
Rated Capacity (kW): 1000
Manufacturer: Generic
Weight (lbs): 160
Footprint (in2): 9000
Website: www.homerenergy.com

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
2000	\$6,000.00	\$6,000,000.00	\$30,000.0
5000	\$14,750.0	\$14,750,000.00	\$55,000.0

Multiplier:

Search Space
Size (kW)
1000
2000
3000
4000
0

Site Specific Input
Lifetime (years): 25.00
Derating Factor (%): 80.00

Electrical Bus
AC
DC

MPPT
Advanced Input
Temperature

☒ Ignore dedicated converter
Lifetime (years): 15.00

Costs

Size (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
2000	\$500,000	\$500,000.00	\$5,000.00

Click here to add new item


Search Space
Size (kW)
0
2000
3000
4000

☐ Use Efficiency Table?
Efficiency (%): 95

Input Percentage (%)
Efficiency (%)
Click here to add new item

Figure 18: China Lake Wind Turbine Component

WIND TURBINE



Name: Siemens 2.3 MW - 108
Abbreviation: S2300

Remove
Copy To Library

Properties

Name: Siemens 2.3 MW - 108
Abbreviation: S2300
Rated Capacity (kW): 2300.00
Manufacturer: Siemens

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$6,000,000.00	\$6,000,000.00	\$75,000.00
3	\$17,850,000.00	\$17,850,000.00	\$85,000.00

Multiplier:

Search Space

Quantity
0
1
2
3

Site Specific Input

Lifetime (years): 20.00
Hub Height (m): 80.00
☐ Consider ambient temperature effects?

Electrical Bus

☒ AC
☐ DC

Power Curve
Turbine Losses
Maintenance


Wind Speed (m/s)	Power Output (kW)
0	0
3.5	35
4	140
5	290
6	550

Wind Turbine Power Curve



Figure 19: China Lake Battery Component

BATTERY



Name: GS200 flow
Abbreviation: GS200 f

Remove
Copy To Library

Properties

Name: GS200 flow
Abbreviation: GS200 flow
Manufacturer:
Zinc Battery Model
Nominal Voltage (V): 100
Nominal Capacity (Ah): 6,000
Nominal Capacity (kWh): 600
Round Trip Efficiency (%): 70.0
Float Life (years): 25.0
Cell stack replacement interval (yrs): 10.0
Electrolyte replacement interval (yrs): 125
Max. Charge Rate (A/Ah): 0.250
Max. Charge Current (A): 1,500
Max. Discharge Current (A): 2,200
Website:
Notes:

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$324,589.00	\$32,489.00	\$2,400.00
6	\$1,947,535.00	\$194,753.00	\$14,400.00

Click here to add new item
Multiplier:


Search Space

Batteries
0
1
2
3
4
5
6

Site Specific Input

Batteries per string: 1 (100 V bus)
Initial State of Charge (%): 100.00
Cell stack cost (% of total replacement cost): 25.00

Figure 20: China Lake Converter Component



CONVERTER

Name:
Abbreviation:

Remove
Copy To Library

System Converter

Properties

Name: System Converter

Abbreviation: Converter

Manufacturer: Generic

Weight (lbs): 1500

Footprint (in2): 2000

Website: www.homerenergy.com

Notes:

This is a generic system converter.

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$300.00	\$300.00	\$0.0

Click here to add new item

Multiplier:

Search Space

Size (kW)

2000

5000

10000

15000

20000

Inverter Input

Lifetime (years):

Efficiency (%):


☒ Parallel with AC generator?

Rectifier Input

Relative Capacity (%):

Efficiency (%):

Figure 21: China Lake Grid Component



ADVANCED GRID

Name:
Abbreviation:

Remove
Copy To Library

☐ Simple Rates
☐ Real Time Rates
☒ Scheduled Rates
☐ Grid Extension

Grid

Scheduled Rates

Parameters
Rate Definition
Demand Rates
Reliability
Emissions

Sale capacity (kW):

Purchase Capacity

☒ Annual Purchase Capacity

Search Space

27200

25000

20000

15000

12000

☐ Monthly Purchase Capacity

Monthly

Distributed Generation Costs

Interconnection charge (\$)

Standby charge (\$/yr):

Systems to consider

☐ Simulate systems with and without the grid

☒ Include the grid in all simulations

☐ Net Metering

☒ Net purchases calculated monthly.

☐ Net purchases calculated annually.

Maximum net grid purchases:

☐ Limit (kWh/yr)

Grid Extension Costs

Grid capital cost (\$/km)

Distance (km):

Figure 22: China Lake Solar Resource

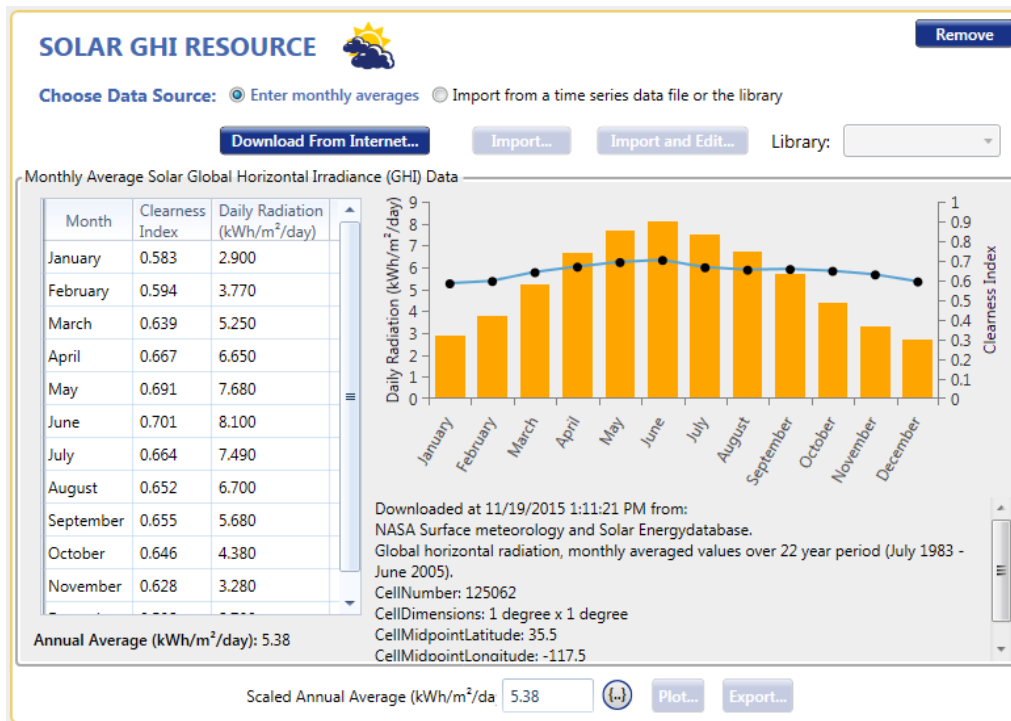


Figure 23: China Lake Wind Resource

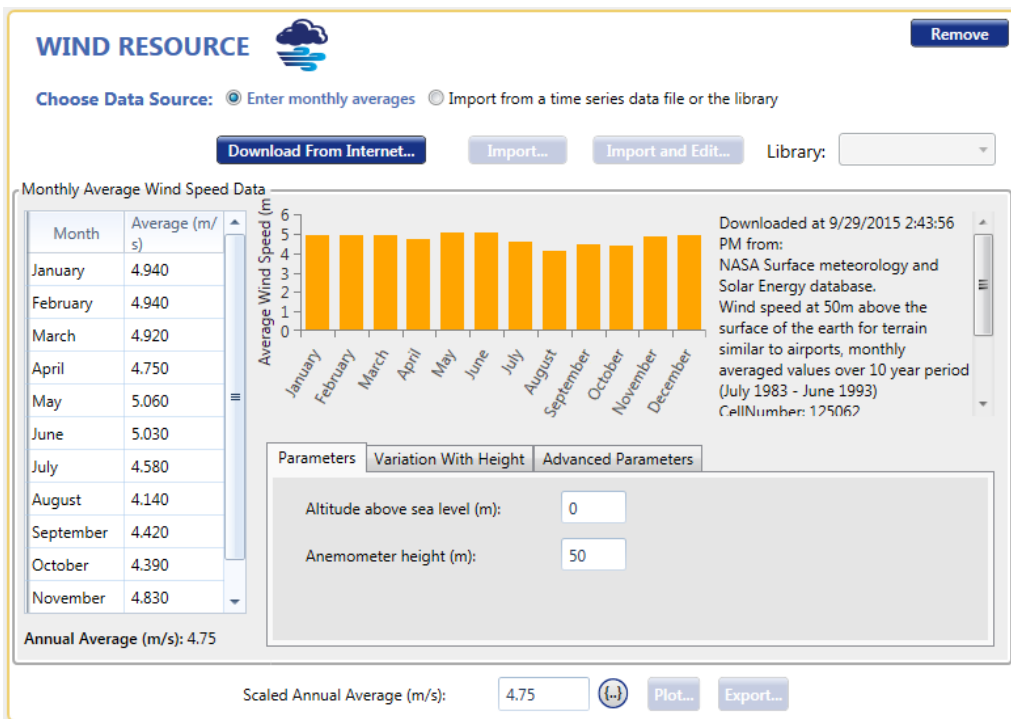


Figure 24: China Lake Temperature Resource

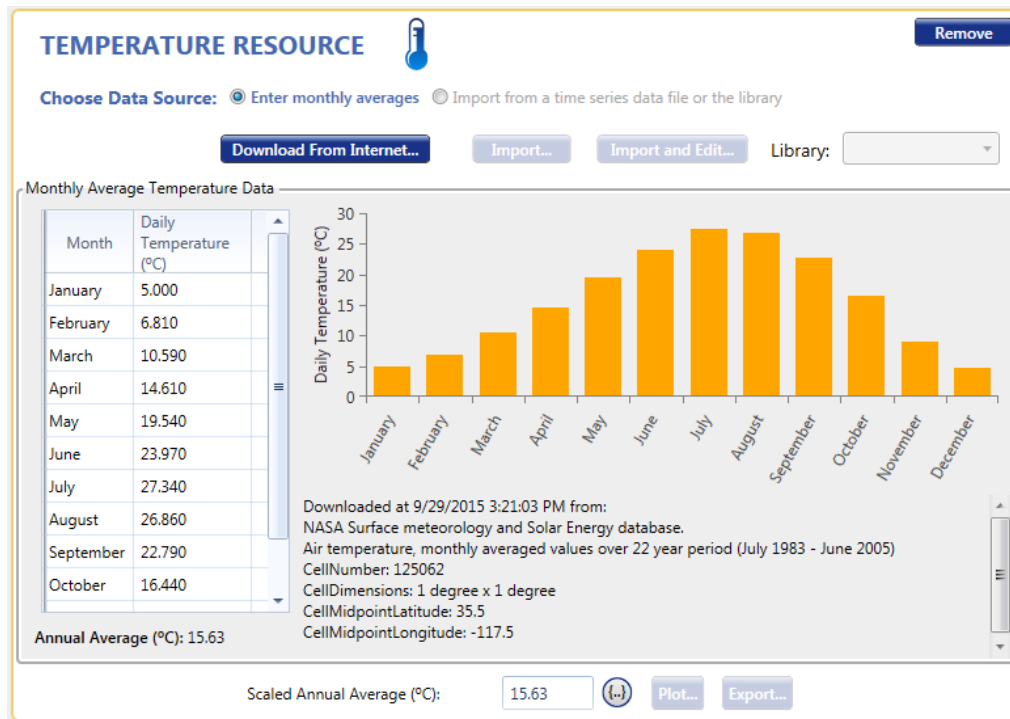




Figure 25: China Lake Fuel Resource

FUEL RESOURCE 

You may add a fuel from the library to model:

[Add](#)

FUELS AVAILABLE IN MODEL

Name	LHV	Density	Carbon	Sulfur	Special
Diesel	43.2	820	88	0.33	

Selected Fuel

Name:

PROPERTIES

Lower Heating Value (MJ/kg):

Density (kg/m3):

Carbon Content (%):

Sulfur Content (%):

Fuel Type

☒ Conventional

☐ Stored Hydrogen

☐ Uses biomass resource

Limits and Prices

Diesel Fuel Price (\$/L): [Plot...](#)

☐ Limit Consumption (L): [Plot...](#)

Units:

[Copy To Library](#)

Figure 26: China Lake Electric Load

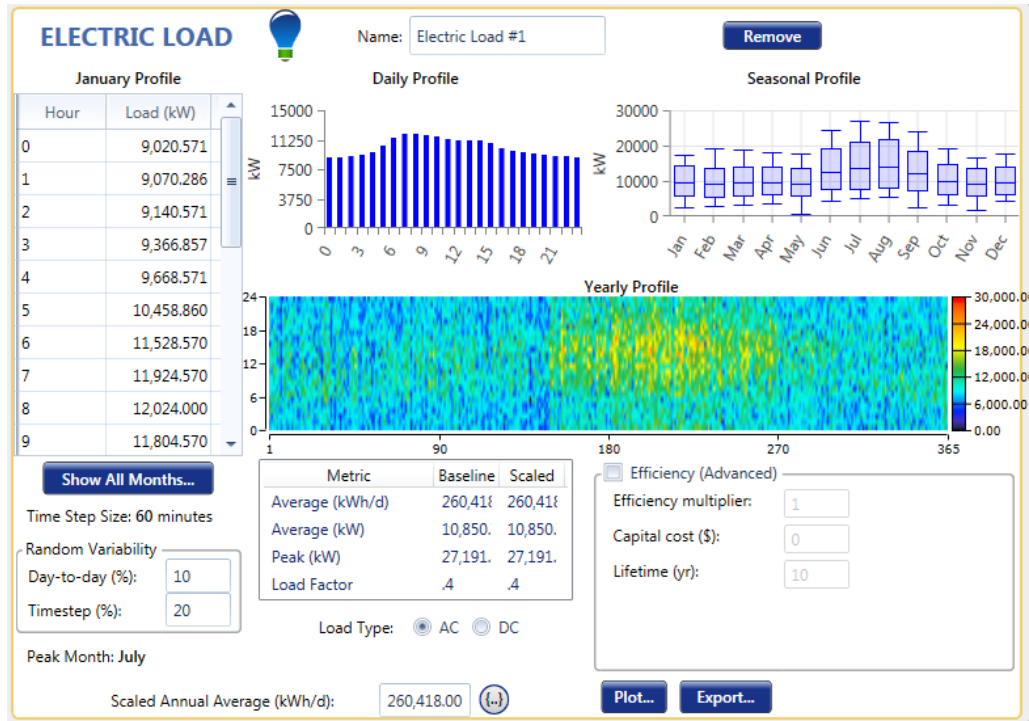


Table 4: China Lake Weekday Electrical Load Profile

Yearly Load Data												
Weekdays	Weekends											
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	9,020.571	8,722.800	8,481.913	8,914.286	8,698.909	10,526.730	12,197.140	11,487.130	10,562.730	9,078.857	8,928.000	9,325.637
1	9,070.286	8,726.400	8,416.174	8,873.143	8,604.000	10,340.180	11,893.710	11,216.350	10,287.820	9,082.286	8,985.272	9,358.363
2	9,140.571	8,793.000	8,399.454	8,857.714	8,599.091	10,165.090	11,670.860	11,073.910	10,183.090	9,042.857	9,048.272	9,423.818
3	9,366.857	9,041.400	8,503.826	8,878.286	8,620.363	10,129.090	11,540.570	11,042.610	10,271.450	9,087.429	9,093.272	9,515.454
4	9,668.571	9,379.800	8,733.913	9,066.857	8,769.272	10,148.730	11,516.570	11,134.960	10,346.730	9,118.286	9,227.454	9,806.728
5	10,458.860	10,146.600	9,325.565	9,502.286	9,032.728	10,261.640	11,770.290	11,524.700	10,749.270	9,526.286	9,780.546	10,453.090
6	11,528.570	11,170.800	10,438.430	10,208.570	9,625.091	11,236.910	12,660.000	12,197.740	11,560.910	10,364.570	10,556.180	11,178.000
7	11,924.570	11,631.600	11,000.350	10,861.710	10,253.450	12,418.360	13,868.570	13,152.520	12,136.910	10,793.140	10,924.360	11,488.910
8	12,024.000	11,703.600	11,147.480	11,158.290	10,706.730	13,267.640	14,617.710	13,972.700	12,835.640	11,014.290	10,947.270	11,425.090
9	11,804.570	11,511.000	11,034.780	11,089.710	10,899.820	13,892.730	15,324.000	14,683.300	13,388.730	11,240.570	10,840.910	11,178.000
10	11,593.710	11,370.600	11,008.170	11,137.710	11,138.730	14,346.000	15,949.710	15,404.870	14,064.550	11,535.430	10,809.820	10,953.820
11	11,391.430	11,179.800	10,914.260	11,067.430	11,300.730	14,951.450	16,582.290	15,941.740	14,612.730	11,715.430	10,683.820	10,744.360
12	11,177.140	11,048.400	10,900.170	11,098.290	11,484.000	15,329.450	17,014.290	16,478.610	15,124.910	11,914.290	10,706.730	10,592.180
13	11,213.140	11,064.600	11,003.480	11,237.140	11,796.550	15,792.550	17,550.860	17,023.300	15,725.450	12,327.430	10,965.270	10,659.270
14	11,134.290	10,990.800	11,017.570	11,247.430	11,970.000	16,059.270	17,900.570	17,328.520	16,002.000	12,514.290	11,071.640	10,708.360
15	10,861.710	10,719.000	10,876.700	11,093.140	11,857.090	16,011.820	17,862.860	17,290.960	15,915.270	12,349.710	11,050.360	10,670.730
16	10,217.140	10,049.400	10,186.430	10,421.140	11,223.820	15,262.360	17,237.140	16,635.130	15,264.000	11,751.430	10,665.820	10,345.090
17	9,848.571	9,441.000	9,344.348	9,552.000	10,282.910	13,900.910	15,901.710	15,389.220	14,072.730	10,786.290	10,268.180	10,150.360
18	9,593.143	9,318.600	9,059.479	9,065.143	9,656.182	13,028.730	15,053.140	14,533.040	13,102.360	10,409.140	9,942.546	9,918.000
19	9,469.714	9,205.200	9,109.565	9,013.714	9,261.818	12,377.450	14,338.290	13,733.220	12,457.640	10,105.710	9,652.909	9,723.272
20	9,257.143	8,971.200	8,924.869	8,958.857	9,191.454	11,785.090	13,642.290	13,091.480	11,840.730	9,716.571	9,394.363	9,546.546
21	9,202.286	8,843.400	8,763.652	8,898.857	9,055.637	11,369.450	13,234.290	12,570.260	11,268.000	9,413.143	9,224.182	9,458.182
22	9,120.000	8,746.200	8,671.305	8,796.000	8,839.637	10,934.180	12,694.290	11,995.830	10,804.910	9,152.571	9,072.000	9,315.818
23	9,042.857	8,649.000	8,655.652	8,857.714	8,757.818	10,819.640	12,426.860	11,751.650	10,677.270	9,020.571	9,026.182	9,302.728

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Table 5: China Lake Weekend Electrical Load Profile

Yearly Load Data												
Weekdays		Weekends										
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	8,881.200	8,410.500	8,482.500	8,524.000	8,580.000	10,048.500	12,027.600	11,547.000	10,075.500	9,097.200	8,901.000	9,236.000
1	8,935.200	8,433.000	8,455.500	8,516.000	8,496.000	9,891.000	11,790.000	11,272.500	9,841.500	9,126.000	8,923.500	9,252.000
2	8,989.200	8,437.500	8,460.000	8,480.000	8,424.000	9,733.500	11,491.200	11,065.500	9,697.500	9,187.200	8,941.500	9,312.000
3	9,122.400	8,613.000	8,392.500	8,536.000	8,552.000	9,765.000	11,322.000	11,002.500	9,738.000	9,291.600	9,022.500	9,468.000
4	9,266.400	8,766.000	8,563.500	8,548.000	8,724.000	9,828.000	11,235.600	11,011.500	9,814.500	9,338.400	9,238.500	9,720.000
5	9,514.800	8,950.500	8,901.000	8,912.000	8,800.000	9,783.000	11,268.000	11,250.000	10,053.000	9,615.600	9,517.500	10,016.000
6	9,730.800	8,991.000	9,166.500	9,052.000	8,692.000	9,927.000	11,520.000	11,191.500	10,197.000	9,637.200	9,670.500	10,324.000
7	9,388.800	8,577.000	9,256.500	9,092.000	8,712.000	10,354.500	12,315.600	11,709.000	10,053.000	9,482.400	9,549.000	10,236.000
8	9,025.200	8,424.000	9,319.500	9,112.000	8,840.000	10,737.000	12,805.200	12,163.500	10,426.500	9,511.200	9,387.000	9,980.000
9	8,571.600	8,253.000	9,193.500	8,996.000	8,968.000	11,133.000	13,320.000	12,618.000	10,813.500	9,576.000	9,148.500	9,664.000
10	8,312.400	8,122.500	9,036.000	8,980.000	9,124.000	11,592.000	13,874.400	13,207.500	11,479.500	9,741.600	9,009.000	9,484.000
11	8,110.800	8,023.500	8,914.500	8,956.000	9,268.000	11,952.000	14,439.600	13,743.000	12,109.500	9,882.000	9,004.500	9,364.000
12	8,125.200	7,996.500	8,842.500	8,980.000	9,408.000	12,303.000	14,896.800	14,215.500	12,703.500	10,080.000	8,977.500	9,280.000
13	8,092.800	7,992.000	8,770.500	9,072.000	9,616.000	12,609.000	15,332.400	14,490.000	13,167.000	10,458.000	9,148.500	9,232.000
14	8,067.600	8,032.500	8,833.500	9,136.000	9,740.000	12,798.000	15,516.000	14,737.500	13,459.500	10,713.600	9,333.000	9,264.000
15	8,215.200	8,037.000	8,815.500	9,084.000	9,712.000	12,838.500	15,555.600	14,814.000	13,549.500	10,713.600	9,297.000	9,264.000
16	8,308.800	8,122.500	8,649.000	8,924.000	9,540.000	12,577.500	15,393.600	14,607.000	13,428.000	10,555.200	9,256.500	9,292.000
17	8,690.400	8,347.500	8,361.000	8,708.000	9,256.000	12,127.500	14,936.400	14,170.500	13,081.500	10,296.000	9,315.000	9,512.000
18	8,798.400	8,631.000	8,365.500	8,492.000	9,016.000	11,700.000	14,490.000	13,626.000	12,442.500	10,033.200	9,225.000	9,440.000
19	8,881.200	8,734.500	8,383.500	8,444.000	8,732.000	11,245.500	13,924.800	12,910.500	11,848.500	9,867.600	9,099.000	9,392.000
20	8,834.400	8,739.000	8,356.500	8,440.000	8,688.000	10,791.000	13,305.600	12,505.500	11,344.500	9,565.200	8,964.000	9,252.000
21	8,856.000	8,662.500	8,343.000	8,444.000	8,616.000	10,552.500	12,891.600	12,078.000	10,863.000	9,360.000	8,959.500	9,204.000
22	8,827.200	8,509.500	8,262.000	8,376.000	8,432.000	10,165.500	12,416.400	11,673.000	10,444.500	9,093.600	8,829.000	9,084.000
23	8,830.800	8,428.500	8,262.000	8,440.000	8,404.000	10,003.500	12,193.200	11,466.000	10,201.500	8,895.600	8,784.000	9,088.000

In both the grid-tied and island mode scenarios the two PV components (PV & PV (1)) are already installed at China Lake (13.78 MW project and various other solar projects that total 1,546.9 kW). Inputs for these two components were set so HOMER always looks at using the currently installed PV generation. HOMER then has the option to consider other amounts of generation such as additional PV, wind, gensets, & batteries, as well as different size system converter. These are the simulation results produced for the optimization cases:

- 1) Grid-tied:
 - a) 0 -3250kW Generators
 - b) 0 – 2.3MW Siemens 108 Wind Turbines
 - c) 13,780 kW Existing Flat Panel PV
 - d) 1,547 kW Existing Flat Panel PV
 - e) 0 MW Additional Flat panel fixed PV
 - f) 0 - GS200 Flow Battery (0 kW)
 - g) 10,000 kW System Converter
 - h) 27, 200 kW Grid Purchases
 - i) COE = \$0.169
- 2) Island:
 - a) 6 –3250kW Generator
 - b) 6 – 2.3MW Siemens 108 Wind Turbines
 - c) 13,780 kW Existing Flat Panel PV
 - d) 1,547 kW Existing Flat Panel PV

- e) 6 MW Additional Flat panel fixed PV
- f) 70 - ViZn GS200 Flow Battery ()
- g) 20,000 kW System Converter
- h) COE = \$0.272

Figures 12 & 13 show the complete simulation results produced for the optimization cases:

Grid-tied:

Table 6: China Lake Grid-tied Sensitivity & Optimization Results

Export...																			
Optimization Cases: Left Double Click on simulation to examine details.																			
Architecture										Cost					System				
PV (1) (kW)	PV (2) (kW)	PV (3) (kW)	PV (4) (kW)	PV (5) (kW)	PV (6) (kW)	PV (7) (kW)	PV (8) (kW)	PV (9) (kW)	PV (10) (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Fuel cost (\$)	Ren. Frac. (%)	Total Fuel (kWh/yr)	Cap Short (kWh/yr)	Elec. Prod. (kWh/yr)	Unmet Load (kWh/yr)
13,780	1,547									0.169	\$207M	\$12.3M	\$48.2M	\$0.00	12.2M	24	0	9,924,626E+07	0
13,780	1,547									0.169	\$207M	\$12.3M	\$48.2M	\$0.00	12.2M	25	0	9,915,634E+07	0.04443359
13,780	1,547									0.169	\$207M	\$12.1M	\$50.6M	\$14,058	12.1M	24	17795.16	9,924,35E+07	2762.584
13,780	1,547									0.169	\$207M	\$11.9M	\$54.2M	\$0.00	11.7M	29	0	9,967,618E+07	0.1772461
13,780	1,547									0.169	\$208M	\$12.1M	\$50.9M	\$15,919	12.1M	25	20150.56	9,915,783E+07	2496.965
13,780	1,547									0.169	\$208M	\$11.8M	\$54.5M	\$0.00	11.7M	29	0	9,957,862E+07	0.3132224
13,780	1,547									0.169	\$208M	\$11.7M	\$56.6M	\$10,587	11.6M	29	13401.65	9,967,518E+07	989.0249
13,780	1,547									0.169	\$208M	\$11.7M	\$56.9M	\$11,963	11.6M	29	15143.59	9,958,081E+07	989.1433
13,780	1,547									0.170	\$209M	\$12.2M	\$51.3M	\$0.00	12.1M	25	0	1,002,01E+08	0
13,780	1,547									0.170	\$209M	\$12.2M	\$51.4M	\$0.00	12.1M	26	0	9,999,441E+07	0.02665547
13,780	1,547									0.170	\$209M	\$12.0M	\$53.5M	\$13,054	12.0M	25	16524.47	1,000,988E+08	2334.002
13,780	1,547									0.170	\$209M	\$11.2M	\$64.0M	\$0.00	11.0M	34	0	94840.05	7341.188
13,780	1,547									0.170	\$209M	\$11.8M	\$56.3M	\$235,195	11.5M	25	297714.6	1,000,868E+08	16213.83
13,780	1,547									0.170	\$209M	\$11.8M	\$57.1M	\$0.00	11.6M	30	0	1,005,709E+08	0.1740723
13,780	1,547									0.170	\$209M	\$11.4M	\$61.9M	\$218,601	11.0M	30	276709.6	1,005,631E+08	7554.627
13,780	1,547									0.171	\$210M	\$11.4M	\$62.3M	\$207,444	11.0M	30	262587.3	1,005,658E+08	6236.274

Island:

Table 7: China Lake Island Sensitivity & Optimization Results

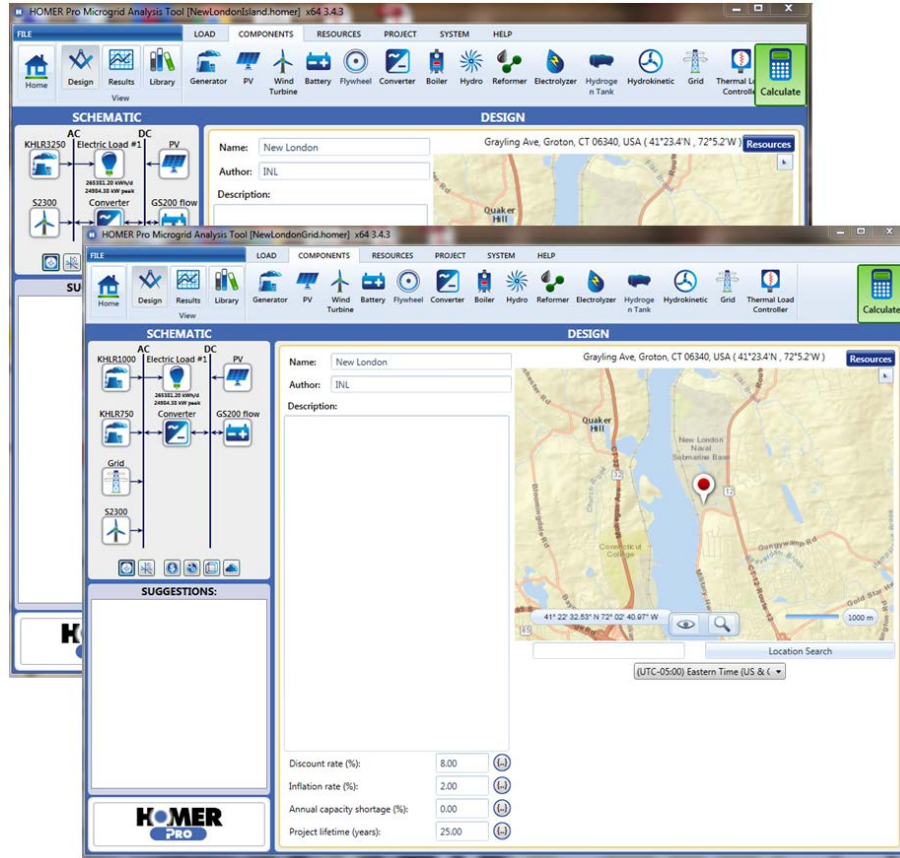
Export...																			
Optimization Cases: Left Double Click on simulation to examine details.																			
Architecture										Cost					System				
PV (1) (kW)	PV (2) (kW)	PV (3) (kW)	PV (4) (kW)	PV (5) (kW)	PV (6) (kW)	PV (7) (kW)	PV (8) (kW)	PV (9) (kW)	PV (10) (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Fuel cost (\$)	Ren. Frac. (%)	Total Fuel (kWh/yr)	Cap Short (kWh/yr)	Elec. Prod. (kWh/yr)	Unmet Load (kWh/yr)
13,780	1,547	6,000	6	16,800	70	20,000				\$0.272	\$334M	\$14.8M	\$142M	\$0.00	49	1.161886E+07	0	1.184274E+08	0.1479492
13,780	1,547		8	16,800	70	20,000				\$0.274	\$337M	\$15.5M	\$136M	\$0.00	47	1.202655E+07	624,5313	1.177493E+08	0.1203613

With the input parameters HOMER was given these were the only cases it found feasible. See case pdf's in appendix for further details on each simulation.

4. New London

4.1 HOMER Analysis

Figure 27: New London HOMER



The HOMER (Hybrid Optimization of Multiple Energy Resources) model greatly simplifies the task of designing hybrid renewable microgrids, whether remote or attached to a larger grid. HOMER's optimization and sensitivity analysis algorithms allow you to evaluate the economic and technical feasibility of a large number of technology options and to account for variations in technology costs, electric load, and energy resource availability.

Multiple inputs are entered into the HOMER model such as location coordinates of $41^{\circ} 23.4' N$, $72^{\circ} 5.2' W$ which is near Grayling Ave on Naval Submarine Base New London. Resources and components are the main inputs that are needed to make a HOMER model. For New London the components used consist of Generator, PV, Wind Turbine, Battery, Converter and the Grid. INL has created cost inputs for these components based on vendor/market data and past experience. The resource inputs created consist of Solar, Wind, Temperature, Fuels, and Electric Load. Refer to figures (1 - 9). The solar, wind, & temperature resources were downloaded from the NASA Surface meteorology and Solar Energy database and contained monthly averaged values for a 10 to 22 year period (1983 – 2005). The fuel resource consists of a Diesel profile that was generated from current market information. The electrical load data was an analysis of naval power load spreadsheet data provided for the year 2013. Based on the power data HOMER estimates annual peak load as 24,984.38 kW. Grid purchase inputs are then set as 12000, 15000, 20000, 25000, & 27200 kW with grid sales set as 0 kW. Note in the New London model; both the grid-tied and off-grid (island) systems are modeled.

Figure 28: New London Generator Component 1

GENERATOR

Name:
Abbreviation:

Remove
Copy To Library

Properties
Name: Kohler 1000 Prime Power
Abbreviation: KHLR1000
Manufacturer: Kohler
Website:

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/hr)
1	\$1,000.00	\$1,000.00	\$0.015
1000	\$1,000,000.00	\$1,000,000.00	\$15.00

Multiplier:

Search Space
Size (kW)
925
1850
2775
3700
0

Site Specific Input
Minimum Load Ratio (%): Heat Recovery Ratio (%):
Lifetime (Hours): Minimum Runtime (Minutes):

Electrical Bus
☒ AC ☐ DC

Fuel Resource
Fuel Curve
Biogas
Emissions
Maintenance
Schedule

SELECT FUEL: Manage Fuels

PROPERTIES
Lower Heating Value (MJ/kg): 43.2
Density (kg/m3): 820
Carbon Content (%): 88
Sulfur Content (%): 0.33

Diesel Fuel Price (\$/L): Limit Consumption (L):

Figure 29: New London Generator Component 2

GENERATOR

Name:
Abbreviation:

Remove
Copy To Library

Properties
Name: Kohler 750 Prime Power
Abbreviation: KHLR750
Manufacturer: Kohler
Website:

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/hr)
1	\$1,000.00	\$1,000.00	\$0.015
1000	\$1,000,000.00	\$1,000,000.00	\$15.00

Multiplier:

Search Space
Size (kW)
690
1380
2070
2760
0

Site Specific Input
Minimum Load Ratio (%): Heat Recovery Ratio (%):
Lifetime (Hours): Minimum Runtime (Minutes):

Electrical Bus
☒ AC ☐ DC


Fuel Resource
Fuel Curve
Biogas
Emissions
Maintenance
Schedule

SELECT FUEL: Manage Fuels

PROPERTIES
Lower Heating Value (MJ/kg): 43.2
Density (kg/m3): 820
Carbon Content (%): 88
Sulfur Content (%): 0.33

Diesel Fuel Price (\$/L): Limit Consumption (L):

Figure 30: New London PV Component



Name:
Abbreviation:

Remove

Copy To Library

Properties

Name: Solar World 320W flat plate PV Copy
Abbreviation: PV
Panel Type: Flat plate
Rated Capacity (kW): 0
Manufacturer: Generic
Weight (lbs): 160
Footprint (in2): 9000
Website: www.homerenergy.com

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$3,000.00	\$3,000.00	\$15.00

Click here to add new item

Multiplier:

Site Specific Input

Lifetime (years):

Derating Factor (%):

Search Space ☆

Size (kW)

0

1000

1500

2000

Electrical Bus

☐ AC ☒ DC

MPPT Advanced Input Temperature

☒ Ignore dedicated converter

Lifetime (years):

Costs

Size (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
2000	\$500,000	\$500,000.00	\$5,000.00

Click here to add new item

Search Space

Size (kW)

0

4000

9000

14000

17000


☐ Use Efficiency Table?

Efficiency (%):

Input Percentage (%) Efficiency (%)

Click here to add new item

Figure 31: New London Wind Turbine Component



Name:
Abbreviation:

Remove

Copy To Library

Properties

Name: Siemens 2.3 MW - 108
Abbreviation: S2300
Rated Capacity (kW): 2300.00
Manufacturer: Siemens

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$4,500,000.00	\$4,500,000.00	\$75,000.00

Click here to add new item

Multiplier:

Site Specific Input

Lifetime (years):

Hub Height (m):

☐ Consider ambient temperature effects?

Search Space ☆

Quantity

0

5

10

Electrical Bus

☒ AC ☐ DC


Power Curve Turbine Losses Maintenance

Wind Speed (m/s)	Power Output (kW)
0	0
3.5	35
4	140
5	290
6	550

Wind Turbine Power Curve



Figure 32: New London Battery Component

BATTERY


Name:
Abbreviation:

Remove
Copy To Library

Properties

Name: GS200 flow
Abbreviation: GS200 flow
Manufacturer:
Zinc Battery Model
Nominal Voltage (V): 100
Nominal Capacity (Ah): 6,000
Nominal Capacity (kWh): 600
Round Trip Efficiency (%): 70.0
Float Life (years): 25.0
Cell stack replacement interval (yrs): 10.0
Electrolyte replacement interval (yrs): 125
Max. Charge Rate (A/Ah): 0.250
Max. Charge Current (A): 1,500
Max. Discharge Current (A): 2,200
Website:
Notes:

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)	
1	\$324,589.00	\$32,489.00	\$2,400.00	✕
6	\$1,947,535.00	\$194,753.00	\$14,400.00	✕

Click here to add new item

Multiplier:

{...}
{...}
{...}

Search Space

Batteries
0
1
2
3
4
5
6


Site Specific Input

Batteries per string: (100 V bus)

Initial State of Charge (%): {...}

Cell stack cost (% of total replacement cost): {...}

Figure 33: New London Converter Component

CONVERTER


Name:
Abbreviation:

Remove
Copy To Library

System Converter

Properties

Name: System Converter
Abbreviation: Converter
Manufacturer: Generic
Weight (lbs): 1500
Footprint (in2): 2000
Website: www.homerenergy.com
Notes:
This is a generic system converter.

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)	
1	\$300.00	\$300.00	\$0.0	✕

Click here to add new item

Multiplier:

{...}
{...}
{...}

Search Space ☆

Size (kW)
250
500
750
1000
1500
2000
0

Inverter Input

Lifetime (years): {...}

Efficiency (%): {...}


☒ Parallel with AC generator?

Rectifier Input

Relative Capacity (%): {...}

Efficiency (%): {...}

Figure 34: New London Grid Component

ADVANCED GRID


Name:
Abbreviation:


Remove

Copy To Library

☒ Simple Rates
☐ Real Time Rates
☒ Scheduled Rates
☐ Grid Extension

Scheduled Rates

Parameters
Rate Definition
Demand Rates
Reliability
Emissions

Sale capacity (kW): 

Purchase Capacity
☒ Annual Purchase Capacity



☐ Monthly Purchase Capacity

Monthly

Search Space


25000
20000
10000

☒ Monthly Purchase Capacity

Distributed Generation Costs
Interconnection charge (\$) 
Standby charge (\$/yr): 

Systems to consider
☐ Simulate systems with and without the grid
☒ Include the grid in all simulations

Net Metering
☒ Net purchases calculated monthly.
☐ Net purchases calculated annually.

Maximum net grid purchases:
☐ Limit (kWh/yr) 



Grid Extension Costs
Grid capital cost (\$/km) 
Distance (km): 

Figure 35: New London Solar Resource

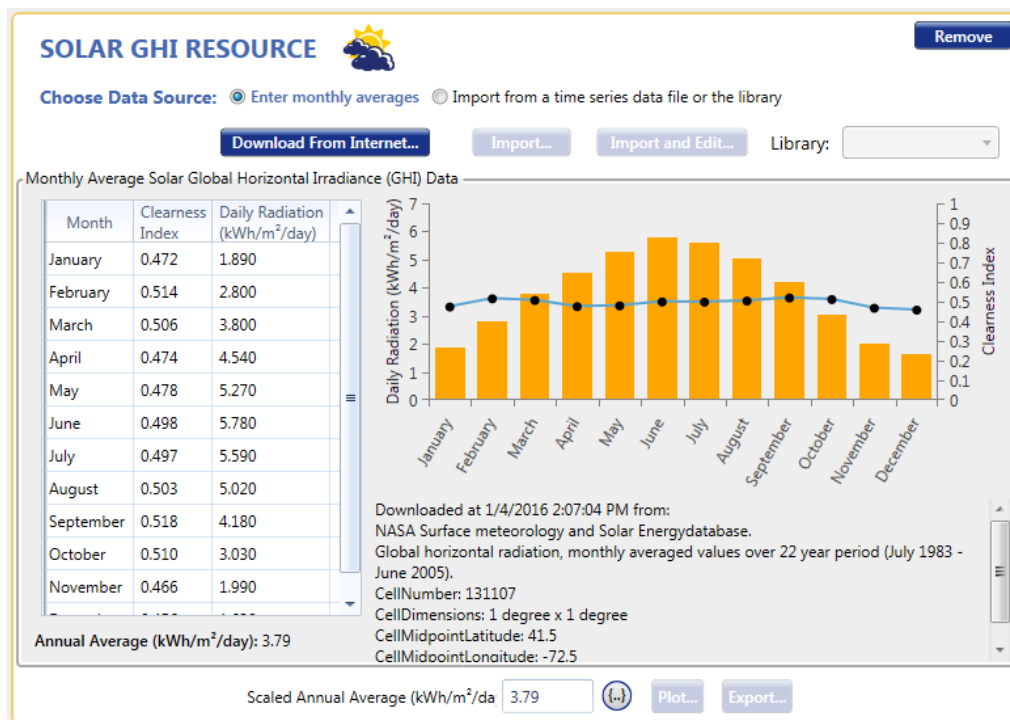


Figure 36: New London Wind Resource

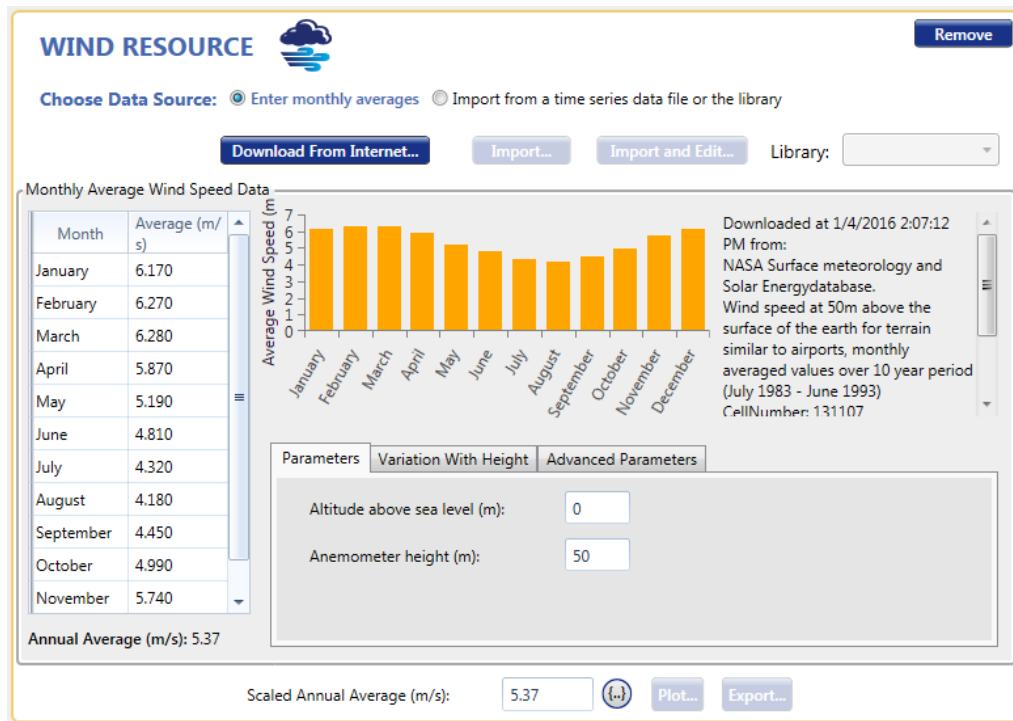


Figure 37: New London Temperature Resource

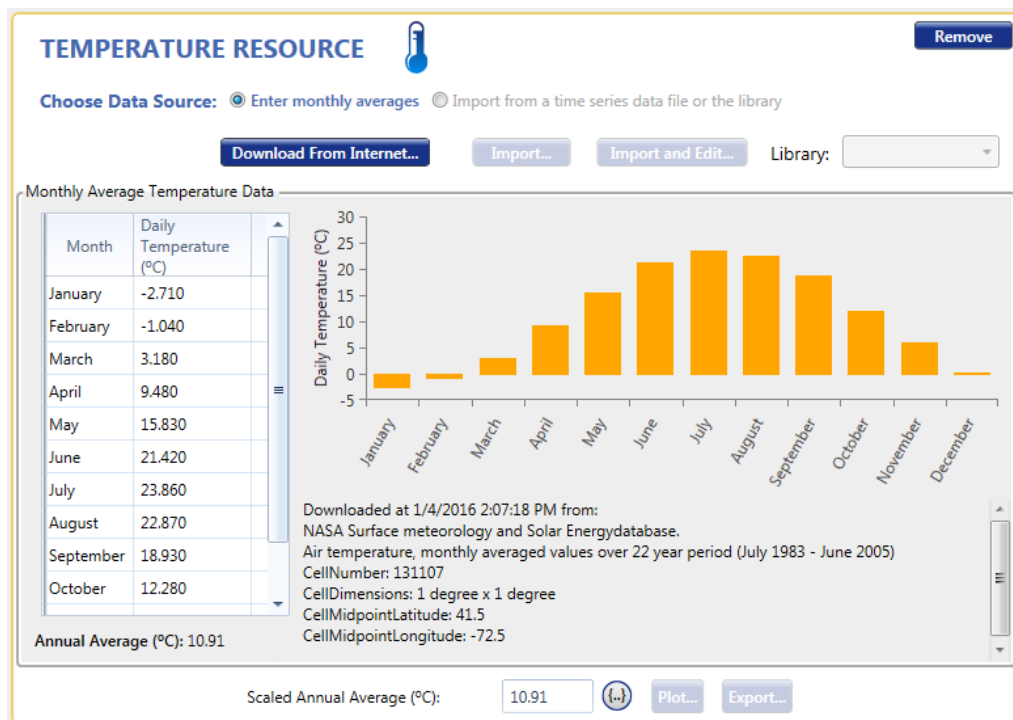


Figure 38: New London Fuel Resource

FUEL RESOURCE

You may add a fuel from the library to model:

Diesel

Add

FUELS AVAILABLE IN MODEL

Name	LHV	Density	Carbon	Sulfur	Special
Diesel	43.2	820	88	0.33	X
Natural Gas	45	0.790	67	0.33	X

Selected Fuel

Name:

Diesel

PROPERTIES

Lower Heating Value (MJ/kg):

43.20

Density (kg/m3):

820.00

Carbon Content (%):

88.00

Sulfur Content (%):

0.33

Fuel Type

☒ Conventional

☐ Stored Hydrogen

☐ Uses biomass resource

Limits and Prices

Diesel Fuel Price (\$/L):

0.79

(...)

☐ Limit Consumption (L):

5,000.00

(...)

Units:

L

Copy To Library

Figure 39: New London Electric Load

ELECTRIC LOAD

Name:

Electric Load #1

Remove

January Profile

Hour	Load (kW)
0	10,548.950
1	10,480.900
2	10,513.710
3	10,545.620
4	10,777.810
5	11,171.480
6	11,623.140
7	11,976.620
8	12,047.670
9	12,075.480

Show All Months...

Time Step Size: 60 minutes

Random Variability

Day-to-day (%):

10

Timestep (%):

20

Peak Month: July

Daily Profile

Seasonal Profile

Yearly Profile

Metric

Metric	Baseline	Scaled
Average (kWh/d)	265,38	265,38
Average (kW)	11,057	11,057
Peak (kW)	24,984	24,984
Load Factor	.44	.44

Load Type:

☒ AC ☐ DC

Efficiency (Advanced)

Efficiency multiplier:

1

Capital cost (\$):

0

Lifetime (yr):

10

Scaled Annual Average (kWh/d):

265,381.20

(...)

Plot...

Export...

26

Table 8: New London Weekday Electrical Load Profile

Yearly Load Data												
Weekdays		Weekends										
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	10,548.950	8,816.211	8,614.460	12,555.890	10,260.110	12,639.290	12,729.090	12,094.470	8,525.784	8,649.141	8,014.484	10,986.810
1	10,480.900	8,794.685	8,614.220	12,499.820	10,244.900	12,554.810	12,713.100	12,172.010	8,457.144	8,585.270	8,054.577	10,992.240
2	10,513.710	8,824.895	8,565.250	12,509.650	10,308.810	12,489.190	12,643.670	12,075.600	8,421.048	8,541.089	8,006.444	10,979.100
3	10,545.620	8,871.685	8,605.750	12,578.090	10,225.890	12,527.980	12,650.590	12,089.720	8,431.512	8,594.223	8,033.735	11,022.670
4	10,777.810	9,033.947	8,801.370	12,746.140	10,281.830	12,776.900	12,818.360	12,366.280	8,597.568	8,722.007	8,195.457	11,142.570
5	11,171.480	9,409.632	9,205.890	13,107.960	10,553.400	12,979.800	13,275.790	12,916.210	8,983.992	9,157.773	8,498.191	11,460.710
6	11,623.140	9,755.315	9,929.370	13,689.320	11,211.810	13,385.570	13,559.300	13,157.080	9,428.016	9,639.610	9,034.333	12,035.950
7	11,976.620	10,153.160	10,181.120	13,989.960	11,781.390	13,992.860	14,126.890	13,639.960	9,695.664	9,741.631	9,270.720	12,222.760
8	12,047.670	10,304.050	10,390.110	14,310.170	12,017.880	14,390.570	14,742.370	14,031.360	10,035.140	9,824.933	9,463.459	12,362.760
9	12,075.480	10,325.790	10,277.770	14,272.750	12,165.600	14,434.510	14,650.130	14,107.700	10,148.830	9,847.325	9,555.240	12,511.000
10	11,960.480	10,208.370	10,244.210	14,251.670	12,183.930	14,325.410	14,714.970	13,852.100	10,144.130	9,893.416	9,539.375	12,396.380
11	11,799.290	10,111.260	10,187.840	14,163.160	12,111.120	14,550.460	14,940.360	13,707.080	10,206.170	9,890.171	9,513.195	12,254.860
12	11,606.760	9,912.211	10,065.440	13,972.820	11,692.400	14,546.350	14,755.610	13,677.230	10,132.750	9,790.560	9,498.184	12,201.570
13	11,388.480	9,840.895	10,127.300	14,006.420	11,616.120	14,472.120	14,840.240	13,674.200	10,125.670	9,947.082	9,470.046	12,059.290
14	11,261.330	9,681.368	10,011.470	14,023.730	11,586.520	14,453.620	14,471.170	13,796.420	10,086.500	9,880.508	9,438.195	11,979.710
15	11,112.240	9,689.947	9,750.930	13,929.220	11,532.440	14,316.050	14,599.450	13,778.680	10,013.330	9,709.732	9,081.960	11,809.100
16	11,328.430	9,566.000	9,380.400	13,593.470	11,200.830	14,068.970	14,358.270	13,581.560	9,820.512	9,496.435	9,022.067	11,753.620
17	11,323.570	9,669.000	9,219.700	13,383.090	11,007.360	13,857.070	14,210.110	13,538.810	9,567.288	9,417.871	9,136.049	11,808.760
18	11,192.100	9,698.421	9,246.460	13,085.350	10,642.070	13,457.400	13,822.650	13,180.320	9,274.920	9,455.655	9,061.144	11,686.480
19	11,003.190	9,457.211	9,375.330	13,135.750	10,570.700	13,307.210	13,650.660	13,108.840	9,311.568	9,363.214	8,859.031	11,549.480
20	10,902.570	9,436.211	9,181.930	13,144.690	10,658.420	13,211.620	13,562.690	13,020.410	9,065.784	9,176.974	8,740.263	11,415.140
21	10,816.520	9,304.053	9,011.450	12,958.560	10,500.690	13,102.920	13,429.070	12,779.410	8,881.608	9,044.306	8,571.006	11,289.760
22	10,633.950	9,155.579	8,867.450	12,785.640	10,307.020	12,849.310	13,111.370	12,527.630	8,672.112	8,948.640	8,316.354	11,136.570
23	10,400.950	9,065.105	8,703.710	12,619.580	10,108.460	12,534.290	12,799.320	12,235.640	8,503.296	8,745.559	8,094.771	10,987.240

Table 9: New London Weekend Electrical Load Profile

Yearly Load Data												
Weekdays		Weekends										
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	10,835.100	8,882.333	7,808.020	12,255.000	9,646.400	12,669.840	12,567.350	11,872.850	9,578.928	8,598.060	8,790.609	11,570.600
1	10,837.800	8,887.667	7,721.710	12,196.740	9,652.960	12,641.710	12,562.930	11,864.110	9,567.792	8,718.960	8,774.051	11,562.700
2	10,845.500	8,929.000	7,680.700	12,166.620	9,509.813	12,530.590	12,498.140	11,733.970	9,495.024	8,631.300	8,731.383	11,535.300
3	10,864.300	8,939.333	7,693.250	12,201.900	9,439.627	12,586.610	12,496.170	11,710.190	9,454.176	8,564.700	8,693.264	11,430.200
4	10,956.100	8,968.333	7,730.780	12,267.000	9,567.520	12,632.300	12,545.890	11,727.200	9,445.200	8,810.400	8,735.921	11,573.400
5	11,013.100	9,112.000	7,837.920	12,357.360	9,493.173	12,501.650	12,709.370	11,865.810	9,583.488	8,917.200	8,847.538	11,671.800
6	11,123.900	9,122.333	7,873.340	12,316.560	9,518.400	12,582.050	12,796.150	12,025.440	9,672.192	8,951.820	9,112.105	11,848.200
7	11,092.000	9,033.556	7,652.280	12,220.560	9,473.600	12,640.370	13,044.730	11,839.680	9,642.624	8,751.960	8,902.909	11,708.200
8	10,824.200	9,068.556	7,647.500	12,367.140	9,811.520	13,130.500	13,558.880	12,225.280	9,995.952	8,746.680	8,996.866	11,674.600
9	11,037.400	9,154.777	7,752.960	12,526.020	9,796.054	13,201.780	13,209.020	12,490.610	10,225.820	8,883.720	9,067.521	11,671.300
10	11,117.300	9,142.000	7,888.180	12,574.680	9,799.360	12,529.730	13,316.680	12,590.030	10,543.340	8,982.840	9,004.919	11,503.400
11	11,035.900	9,099.667	7,837.560	12,634.260	9,881.066	12,767.470	13,623.350	12,237.600	10,653.980	8,996.580	9,244.971	11,370.700
12	11,010.100	9,042.223	7,954.800	12,638.640	10,042.770	13,117.390	13,519.900	12,325.390	10,466.350	9,013.740	9,293.459	11,466.600
13	11,018.000	8,822.889	7,935.550	12,611.880	10,444.850	13,714.370	13,780.220	12,496.110	10,342.320	9,098.520	9,326.939	11,556.800
14	11,110.100	8,803.889	7,886.420	12,608.040	10,259.360	13,929.070	13,570.620	12,650.770	10,383.740	9,150.240	9,329.352	11,620.100
15	11,125.500	8,791.111	7,923.380	12,474.660	9,984.267	14,162.110	13,834.160	12,599.310	10,398.050	9,136.860	9,365.419	11,679.900
16	11,269.600	8,764.111	7,737.480	12,468.240	9,870.026	14,077.250	13,694.950	12,505.440	10,276.320	8,894.700	9,541.868	11,786.100
17	11,346.500	8,931.333	7,613.160	12,286.440	10,058.030	14,029.820	13,438.510	12,415.730	9,910.080	8,781.300	9,717.438	11,797.900
18	11,231.200	9,005.777	7,554.340	12,151.260	9,914.880	13,907.470	13,211.940	12,185.760	9,849.792	8,942.760	9,753.354	11,859.400
19	11,133.600	8,932.777	7,685.040	12,306.900	9,977.173	13,788.770	13,020.070	12,139.630	9,889.824	8,913.840	9,648.579	11,705.000
20	10,961.300	8,935.111	7,726.680	12,474.600	10,259.630	13,921.970	13,168.140	12,173.330	9,859.344	8,911.020	9,654.831	11,570.600
21	10,908.700	8,879.223	7,751.090	12,411.180	10,242.190	13,928.780	13,118.930	12,143.040	9,825.120	8,850.000	9,546.783	11,493.000
22	10,784.100	8,780.333	7,722.430	12,327.540	10,156.690	13,788.190	12,957.660	11,978.720	9,678.624	8,795.460	9,385.551	11,417.300
23	10,714.600	8,665.333	7,736.380	12,253.860	10,055.040	13,680.720	12,744.470	11,903.570	9,583.584	8,685.600	9,255.792	11,288.200

These are the simulation results produced for the optimization cases:

3) Grid-tied:

- 1 -1000kW Generators
- 5 – 2.3MW Siemens 108 Wind Turbines
- 0 MW Flat panel fixed PV
- 0 - GS200 Flow Battery (0 kW)
- 20, 000 kW Grid Purchases
- COE = \$0.145

4) Island:

- 6 –3250kW Generator
- 15 – 2.3MW Siemens 108 Wind Turbines
- 0 MW Flat panel fixed PV
- 60 - ViZn GS200 Flow Battery ()
- 24,000 kW System Converter
- COE = \$0.263



Figures 10 & 11 show the complete simulation results produced for the optimization cases:
Grid-tied:

Table 10: New London Grid-tied Sensitivity & Optimization Results

Export...	Optimization Cases: Left Double Click on simulation to examine details.																	* Categorized Overall		
																	Grid			
Architecture																	System			
Cost																	Energy Purchased			
		PV (kW)	GH2000 (kW)	GH20750 (kW)	GH2000 (kW)	Grid (kW)	Converter (kW)	COE (\$/kW)	NPC (\$/kW)	Operating cost (\$/kW)	Initial capital (\$)	Fuel cost (\$/kW)	GBM (\$/kW)	Ren. Frac. (%)	Total Fuel (\$/kW)	Cap Short (kW)	Dec Prod. (kW)	Dec Costs (\$/kW)	Access Elec. (\$/kW)	Unmet load (\$/kW)
		5	925			20,000		\$0.145	\$18.1M	\$12.2M	\$23.4M	\$7.693	\$12.0M	29	9737.486	80731.37	9.859783E+07	9.855564E+07	1742167	8503.789
		5		690	1	20,000	250	\$0.145	\$18.1M	\$12.2M	\$23.6M	\$10.772	\$12.0M	30	13635.63	96779.44	9.853322E+07	9.853678E+07	1607580	10486.18
		5		1380		20,000		\$0.145	\$18.2M	\$12.2M	\$23.8M	\$11.265	\$12.0M	29	14259.01	55202.52	9.860118E+07	9.858916E+07	1742167	5237.221
		5	925		1	20,000		\$0.145	\$18.2M	\$12.2M	\$23.8M	\$12.517	\$12.0M	30	15844.13	80317.84	9.853542E+07	9.855768E+07	1607580	8390.948
		5	925	690		20,000		\$0.145	\$18.2M	\$12.2M	\$24.1M	\$10.312	\$12.0M	29	13093.02	44901.96	9.860238E+07	9.866014E+07	1742167	4013.096
		5				20,000		\$0.145	\$18.2M	\$12.3M	\$22.5M	\$0.00	\$12.1M	29	0	1839.842	9.860634E+07	9.866014E+07	1742167	0
		5	925	690	1	20,000		\$0.145	\$18.2M	\$12.2M	\$24.5M	\$15.130	\$12.0M	30	19152.22	44676.05	9.853987E+07	9.866014E+07	1607580	4013.205
		5				20,000	750	\$0.146	\$18.2M	\$12.3M	\$22.9M	\$0.00	\$12.1M	30	0	1839.842	9.853381E+07	9.866014E+07	1607580	0.08691406
		1,000	5			20,000	750	\$0.146	\$18.3M	\$12.3M	\$26.4M	\$5.223	\$11.8M	30	6611.431	87707.77	9.887491E+07	9.855492E+07	1907658	9237.43
		1,000	5	925		20,000	750	\$0.146	\$18.3M	\$12.3M	\$26.7M	\$6.802	\$11.8M	30	8610.696	73139.27	9.887679E+07	9.855769E+07	1907658	7357.435
		1,000	5			20,000	750	\$0.146	\$18.3M	\$12.3M	\$26.7M	\$8.417	\$11.8M	31	10654.95	87907.08	9.880198E+07	9.855502E+07	1772971	9137.071
		1,000	5	925		20,000	750	\$0.146	\$18.3M	\$12.3M	\$27.0M	\$10.122	\$11.8M	31	12612.47	72688.56	9.880413E+07	9.855966E+07	1772971	7257.077
		1,000	5	925	690	20,000	750	\$0.146	\$18.3M	\$12.3M	\$27.3M	\$9.177	\$11.8M	30	11617.08	39956.25	9.888075E+07	9.866076E+07	1907658	3394.517
		1,000	5			20,000	750	\$0.147	\$18.4M	\$12.3M	\$25.7M	\$0.00	\$12.0M	30	0	1535.458	9.888415E+07	9.866416E+07	1907658	0.3271484
		1,000	5	925	690	20,000	750	\$0.147	\$18.4M	\$12.3M	\$27.7M	\$12.421	\$11.8M	31	15723.33	39755.55	9.880788E+07	9.866076E+07	1772971	3394.71
		1,000	5			20,000	750	\$0.147	\$18.4M	\$12.2M	\$26.0M	\$0.00	\$12.0M	31	0	1535.458	9.880563E+07	9.866416E+07	1772971	0.5434857
			1,850			20,000	750	\$0.157	\$19.7M	\$15.1M	\$1.64M	\$27.859	\$15.1M	0.0	35264.98	82792.02	9.885413E+07	9.885413E+07	0	10031.82
				2,070		20,000	750	\$0.158	\$19.7M	\$15.1M	\$1.80M	\$30.604	\$15.1M	0.0	38738.63	68805.59	9.885626E+07	9.885616E+07	0	7996.955
			925	690	1	20,000	250	\$0.158	\$19.8M	\$15.1M	\$2.01M	\$21.625	\$15.1M	0.0	27372.83	87613.56	9.885565E+07	9.885334E+07	0.004242509	10815.67
			925	1,380		20,000	250	\$0.158	\$19.8M	\$15.1M	\$2.21M	\$25.623	\$15.1M	0.0	32433.83	57093.63	9.885806E+07	9.885802E+07	0	6127.338
			1,850			20,000	250	\$0.158	\$19.8M	\$15.1M	\$2.04M	\$27.241	\$15.1M	0.0	34482.55	72099.72	9.885754E+07	9.885572E+07	0.004969724	8431.689
				1,380	2	20,000	500	\$0.158	\$19.8M	\$15.0M	\$2.08M	\$22.642	\$15.1M	0.0	28661.15	92541.62	9.885802E+07	9.885246E+07	0.006664301	11700.9
			1,000	925	690	20,000	500	\$0.158	\$19.8M	\$15.0M	\$4.84M	\$19.389	\$15.0M	1.2	24543.1	88586.93	9.888773E+07	9.885411E+07	\$224.867	10039.62
			1,000	1,850		20,000	500	\$0.158	\$19.8M	\$15.0M	\$4.88M	\$26.619	\$15.0M	1.2	32429.19	73015.91	9.888994E+07	9.885433E+07	\$224.868	7631.263
				1,380	1	20,000	750	\$0.158	\$19.8M	\$15.0M	\$4.83M	\$20.646	\$15.0M	1.2	26134.13	93641.59	9.888838E+07	9.885336E+07	\$244.611	10817.62
				2,070		20,000	750	\$0.158	\$19.8M	\$15.0M	\$5.03M	\$28.200	\$15.0M	1.2	35696.14	60343.67	9.899158E+07	9.885796E+07	\$224.868	6192.279
			925	690	1	20,000	750	\$0.159	\$19.9M	\$15.0M	\$5.16M	\$19.379	\$15.0M	1.2	24530.83	77683.47	9.899021E+07	9.885788E+07	\$244.647	8388.762
				1,850		20,000	750	\$0.159	\$19.9M	\$15.0M	\$5.19M	\$24.616	\$15.0M	1.2	31159.62	63346.73	9.899186E+07	9.885758E+07	\$244.653	6572.67
						20,000		\$0.159	\$19.9M	\$15.4M	\$0.00	\$0.00	\$15.4M	0.0	0	4251.588	9.886419E+07	9.886416E+07	0	0
					1	20,000		\$0.159	\$19.9M	\$15.4M	\$399.589	\$0.00	\$15.4M	0.00043	0	4251.588	9.886374E+07	9.886416E+07	0.001051581	0
				1,000		20,000		\$0.159	\$20.0M	\$15.2M	\$3.23M	\$0.00	\$15.2M	1.2	0	3418.201	9.899778E+07	9.886416E+07	\$224.871	0
					1	20,000		\$0.160	\$20.0M	\$15.2M	\$3.55M	\$0.00	\$15.2M	1.2	0	3418.2	9.899402E+07	9.886416E+07	9.885695	0.01025391

Island:

Table 11: New London Island Sensitivity & Optimization Results

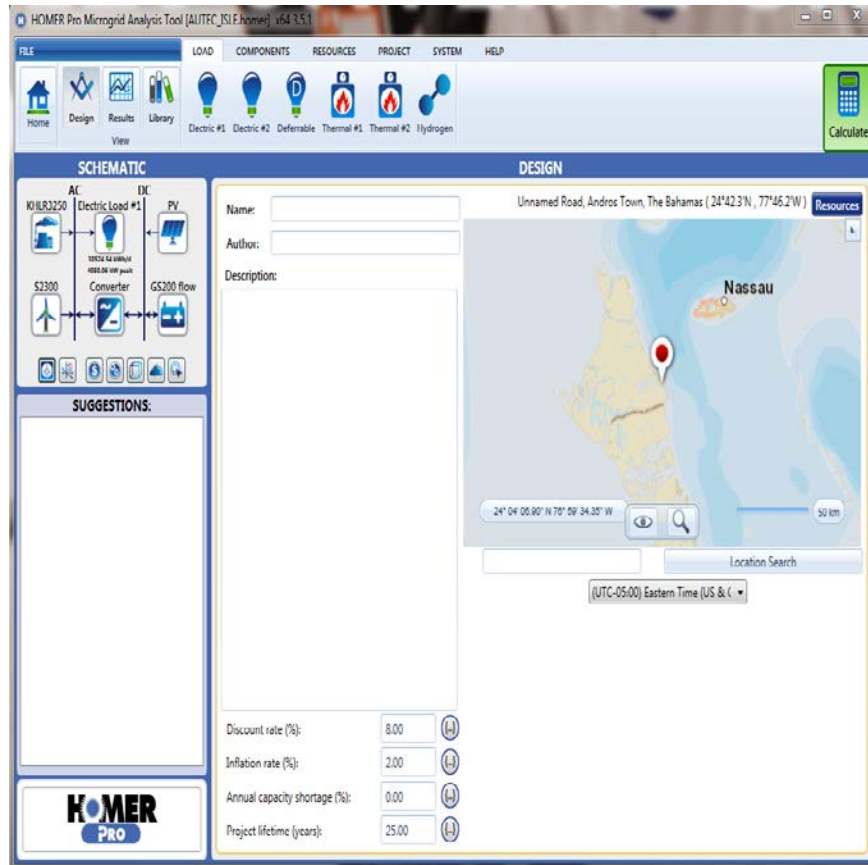
Export...		Optimization Cases: Left Double Click on simulation to examine details.															Categorized Overall		
Architecture					Cost					System									
	PV (kW)	S2300 (kW)	KHLR3250 (kW)	GS200 flow	Converter (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Fuel cost (\$)	O&M (\$)	Ren. Frac. (%)	Total Fuel (L)	Cap Short (kWh/yr)	Elec Prod (kWh/yr)	Elec Cons (kWh/yr)	Excess Elec (kWh/yr)	Unmet load (kWh/yr)	
   		5,000	15	16,800	60	24,000	\$0.265	\$331M	\$16.0M	\$124M	\$8.61M	\$3.74M	52	1.090267E+07	2328.557	1.436092E+08	9.686416E+07	3.824639E+07	0.15625
		30,000	16,800	80	24,000	\$0.342	\$428M	\$22.4M	\$138M	\$14.3M	\$3.90M	20	1.81035E+07	27528.73	1.58162E+08	9.685917E+07	1.550152	4992.927	
		5,000	15	19,600		24,000	\$0.354	\$443M	\$26.0M	\$107M	\$10.2M	\$7.18M	44	1.297352E+07	95672.95	1.516524E+08	9.68563E+07	5.455211E+07	7857.158
   		30	19,600				\$0.363	\$454M	\$23.3M	\$152M	\$8.50M	\$7.20M	53	1.075634E+07	94180.11	2.267195E+08	9.685589E+07	1.298635E+08	8263.7
			16,800	80	24,000	\$0.370	\$463M	\$32.1M	\$48.0M	\$20.8M	\$4.93M	0.0	2.634808E+07	95012.64	1.122919E+08	9.682149E+07	0.2796204	42667.16	
			22,400				\$0.405	\$507M	\$37.7M	\$19.8M	\$18.2M	\$8.56M	0.0	2.301123E+07	52841.31	9.703326E+07	9.685865E+07	174600.8	5506.633
   		5,000	22,400		24,000	\$0.415	\$520M	\$37.0M	\$42.0M	\$17.2M	\$8.63M	5.5	2.174392E+07	28735.8	9.801737E+07	9.686281E+07	547356.5	1350.797	

With the input parameters HOMER was given these were the only cases it found feasible. See case pdf's in appendix for further details on each simulation.

5. AUTC

5.1 HOMER Analysis

Figure 40: AUTC HOMER



The HOMER (Hybrid Optimization of Multiple Energy Resources) model greatly simplifies the task of designing hybrid renewable microgrids, whether remote or attached to a larger grid. HOMER's optimization and sensitivity analysis algorithms allow you to evaluate the economic and technical feasibility of a large number of technology options and to account for variations in technology costs, electric load, and energy resource availability.

For Autec inputs we have included:

- Up to 5 – 3250kW Generator
- Up to 3 – 2300kW Siemens 108 Wind Turbines
- Flat panel fixed PV up to 4000kW
- 1MW/3MWh Primus Power EnergyPod Battery (allowed up to 20)
- System Converter up to 5000kW

This model used the location coordinates of 24° 42.3' N, 77° 46.2' W and wind & solar resource data from NASA's surface and solar database. The electrical load data was not provided for Autec so an interpolated load was created from other similar military base average load data. Needless to say, the more accurate the data a model has, the more accurate the results are; any actual Autec load data could

improve model accuracy. A temperature resource was included and was also downloaded from NASA's surface and solar database. Refer to following figures:

Figure 41: AUTECH Generator Component

GENERATOR

Name:
Abbreviation:

Properties

Name: Kohler 3250 Prime Power
Abbreviation: KHLR3250
Manufacturer: Kohler
Website:

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/hr)
3000	\$1,800,000.00	\$1,800,000.00	\$11.50
12000	\$7,000,000.00	\$7,000,000.00	\$34.50

Multiplier: (..) (..) (..)

Search Space

Size (kW)

3250
6500
9750
13000
16250
0

Site Specific Input

Minimum Load Ratio (%): (..)
Heat Recovery Ratio (%): (..)

Lifetime (Hours): (..)
Minimum Runtime (Minutes): (..)

Electrical Bus

☒ AC
☐ DC

Fuel Resource

Fuel Curve
Biogas
Emissions
Maintenance
Schedule

SELECT FUEL:

PROPERTIES

Lower Heating Value (MJ/kg): 43.2
Density (kg/m3): 820
Carbon Content (%): 88
Sulfur Content (%): 0.33

Diesel Fuel Price (\$/L): (..)
☐ Limit Consumption (L): (..)

Figure 42: AUTECH PV Component

PV

Name:
Abbreviation:

Properties

Name: Solar World 320W flat plate PV Copy
Abbreviation: PV
Panel Type: Flat plate
Rated Capacity (kW): 0
Manufacturer: Generic
Weight (lbs): 160
Footprint (in2): 9000
Website: www.homerenergy.com

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$3,000.00	\$3,000.00	\$15.00

Click here to add new item
Multiplier: (..) (..) (..)

Site Specific Input

Lifetime (years): (..)
Derating Factor (%): (..)

Search Space

Size (kW)

0
2000
3000
4000

Electrical Bus

☐ AC
☒ DC

MPPT

Advanced Input
Temperature

☒ Ignore dedicated converter

Lifetime (years): (..)

Costs

Size (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
2000	\$500,000	\$500,000.00	\$5,000.00

Click here to add new item


☐ Use Efficiency Table?

Efficiency (%):

Input Percentage (%)	Efficiency (%)
Click here to add new item	

Figure 43: AUTECH Wind Turbine Component

WIND TURBINE



Name: Siemens 2.3 MW - 108
Abbreviation: S2300
Remove
Copy To Library

Properties
Name: Siemens 2.3 MW - 108
Abbreviation: S2300
Rated Capacity (kW): 2300.00
Manufacturer: Siemens

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$4,500,000.00	\$4,500,000.00	\$75,000.00

Click here to add new item
Multiplier:

Search Space
Quantity
0
1
2
3

Site Specific Input
Lifetime (years): 20.00
Hub Height (m): 80.00
Consider ambient temperature effects?
Electrical Bus: AC DC

Power Curve
Turbine Losses
Maintenance

Wind Speed (m/s)	Power Output (kW)
0	0
3.5	35
4	140
5	290
6	550

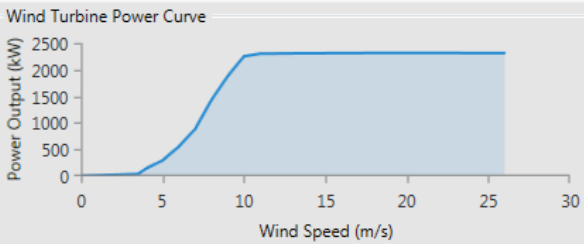

Wind Turbine Power Curve


Figure 44: AUTECH Battery Component

BATTERY



Name: GS200 flow
Abbreviation: GS200 f
Remove
Copy To Library

Properties
Name: GS200 flow
Abbreviation: GS200 flow
Manufacturer:
Zinc Battery Model
Nominal Voltage (V): 100
Nominal Capacity (Ah): 6,000
Nominal Capacity (kWh): 600
Round Trip Efficiency (%): 70.0
Float Life (years): 25.0
Cell stack replacement interval (yrs): 10.0
Electrolyte replacement interval (yrs): 125
Max. Charge Rate (A/Ah): 0.250
Max. Charge Current (A): 1,500
Max. Discharge Current (A): 2,200
Website:
Notes:

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$324,589.00	\$32,489.00	\$2,400.00
6	\$1,947,535.00	\$194,753.00	\$14,400.00


Click here to add new item
Multiplier:

Search Space
Batteries
0
6
8
10
12
15
20

Site Specific Input
Batteries per string: 1 (100 V bus)
Initial State of Charge (%): 100.00
Cell stack cost (% of total replacement cost): 25.00

Figure 45: AUTECH Converter Component

CONVERTER



Name:
Abbreviation:

Remove
Copy To Library

System Converter

Properties

Name: System Converter

Abbreviation: Converter

Manufacturer: Generic

Weight (lbs): 1500

Footprint (in2): 2000

Website: www.homerenergy.com

Notes:

This is a generic system converter.

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$300.00	\$300.00	\$0.0

Click here to add new item

Multiplier:

Search Space

Size (kW)

- 100
- 500
- 1000
- 2000
- 3000
- 5000

Inverter Input

Lifetime (years):

Efficiency (%):

☒ Parallel with AC generator?

Rectifier Input

Relative Capacity (%):

Efficiency (%):

Figure 46: AUTECH Solar Resource

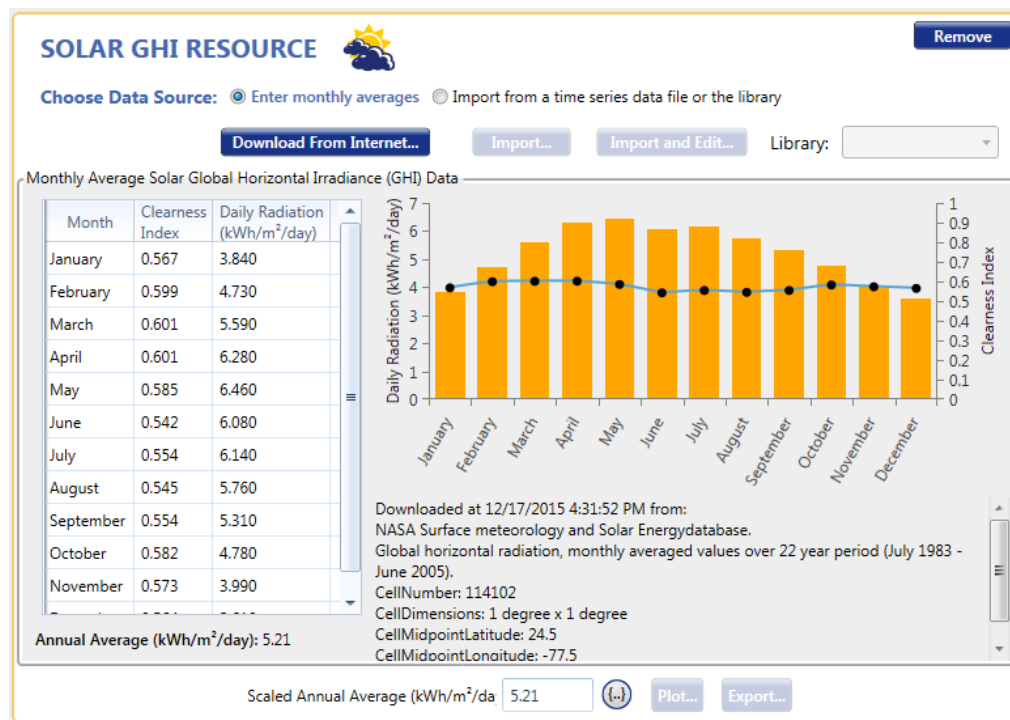


Figure 47: AUTEC Wind Resource

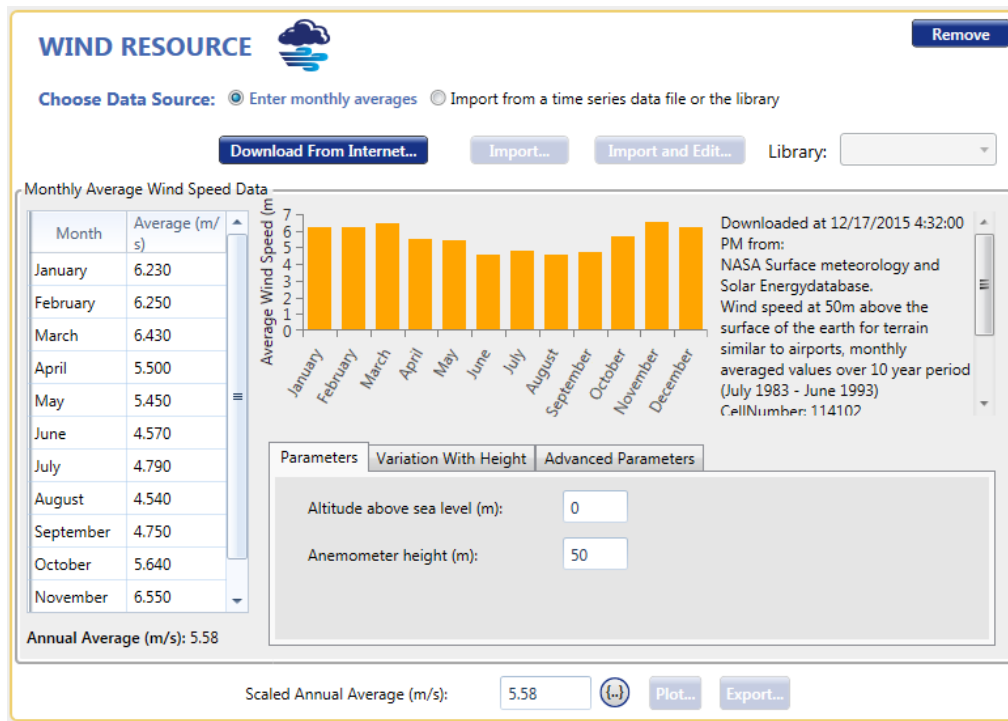


Figure 48: AUTEC Temperature Resource

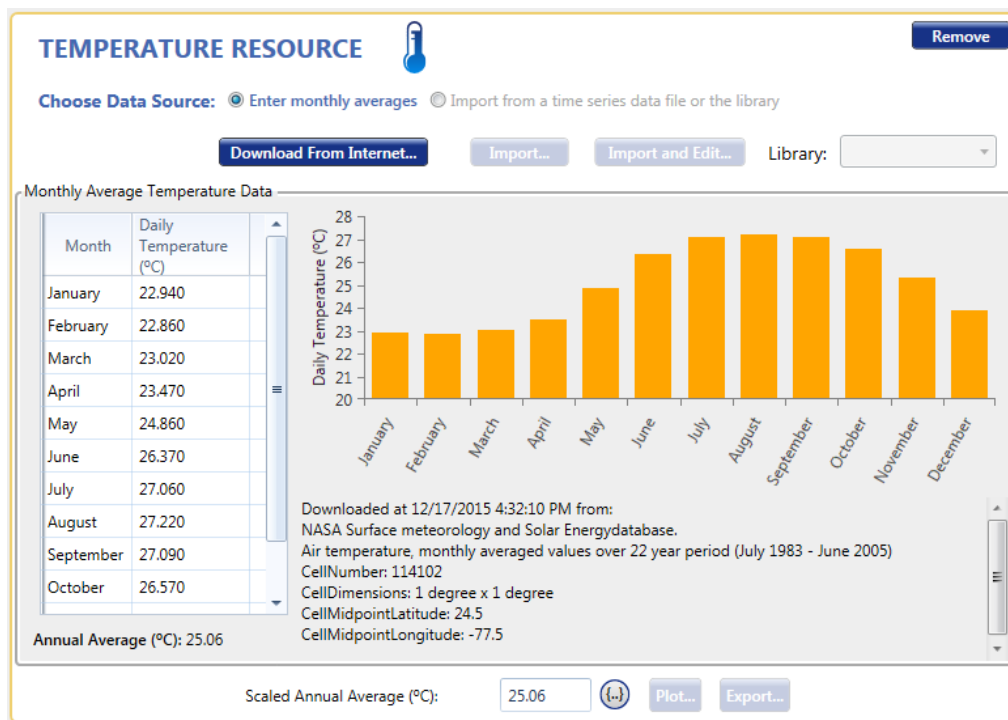


Figure 49: AUTECH Fuel Resource

FUEL RESOURCE

You may add a fuel from the library to model:

Diesel

Add

FUELS AVAILABLE IN MODEL

Name	LHV	Density	Carbon	Sulfur	Special
Diesel	43.2	820	88	0.33	

Selected Fuel

Name:

Diesel

PROPERTIES

Lower Heating Value (MJ/kg):

43.20

Density (kg/m3):

820.00

Carbon Content (%):

88.00

Sulfur Content (%):

0.33

Fuel Type

☒ Conventional

☐ Stored Hydrogen

☐ Uses biomass resource

Limits and Prices

Diesel Fuel Price (\$/L):

1.00

☐ Limit Consumption (L):

5,000.00

Units:

L

Copy To Library

Figure 50: AUTECH Electric Load

ELECTRIC LOAD

Name: Electric Load #1

Remove

January Profile

Hour	Load (kW)
0	898.000
1	875.000
2	907.000
3	923.000
4	967.000
5	1,026.000
6	1,084.000
7	1,151.000
8	1,195.000
9	1,204.000

Daily Profile

Seasonal Profile

Yearly Profile

Time Step Size: 60 minutes

Random Variability

Day-to-day (%):

1

Timestep (%):

20

Peak Month: July

Scaled Annual Average (kWh/d):

38,524.54

Metric

Baseline

Scaled

Average (kWh/d)

38,524.

38,524.

Average (kW)

1,605.1

1,605.1

Peak (kW)

4,050.0

4,050.0

Load Factor

.4

.4

Load Type:

☒ AC

☐ DC

Efficiency (Advanced)

Efficiency multiplier:

1

Capital cost (\$):

0

Lifetime (yr):

10

Plot...

Export...

35

Table 12: AUTECH Weekday Electrical Load Profile

Yearly Load Data												
Weekdays		Weekends										
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	898.000	878.000	865.000	884.000	1,911.000	2,111.000	2,211.000	2,161.000	2,098.000	2,086.000	1,492.000	1,192.000
1	875.000	865.000	852.000	871.000	1,817.000	2,017.000	2,117.000	2,067.000	2,004.000	1,992.000	1,434.000	1,134.000
2	907.000	896.000	883.000	902.000	1,681.000	1,881.000	1,981.000	1,931.000	1,868.000	1,856.000	1,381.000	1,081.000
3	923.000	913.000	900.000	919.000	1,605.000	1,805.000	1,905.000	1,855.000	1,792.000	1,780.000	1,352.000	1,052.000
4	967.000	956.000	943.000	962.000	1,401.000	1,601.000	1,701.000	1,651.000	1,588.000	1,576.000	1,271.000	971.000
5	1,026.000	1,015.000	1,002.000	1,021.000	1,256.000	1,456.000	1,556.000	1,506.000	1,443.000	1,431.000	1,228.000	928.000
6	1,084.000	1,074.000	1,061.000	1,080.000	1,414.000	1,614.000	1,714.000	1,664.000	1,601.000	1,589.000	1,337.000	1,037.000
7	1,151.000	1,141.000	1,128.000	1,147.000	1,695.000	1,895.000	1,995.000	1,945.000	1,882.000	1,870.000	1,511.000	1,211.000
8	1,195.000	1,184.000	1,171.000	1,190.000	1,976.000	2,176.000	2,276.000	2,226.000	2,163.000	2,151.000	1,673.000	1,373.000
9	1,204.000	1,194.000	1,181.000	1,200.000	2,089.000	2,289.000	2,389.000	2,339.000	2,276.000	2,264.000	1,734.000	1,434.000
10	1,182.000	1,172.000	1,159.000	1,178.000	2,099.000	2,299.000	2,399.000	2,349.000	2,286.000	2,274.000	1,728.000	1,428.000
11	1,162.000	1,151.000	1,138.000	1,157.000	2,100.000	2,300.000	2,400.000	2,350.000	2,287.000	2,275.000	1,718.000	1,418.000
12	1,140.000	1,130.000	1,117.000	1,136.000	2,100.000	2,300.000	2,400.000	2,350.000	2,287.000	2,275.000	1,708.000	1,408.000
13	1,118.000	1,107.000	1,094.000	1,113.000	2,114.000	2,314.000	2,414.000	2,364.000	2,301.000	2,289.000	1,703.000	1,403.000
14	1,125.000	1,105.000	1,092.000	1,111.000	2,115.000	2,315.000	2,415.000	2,365.000	2,302.000	2,290.000	1,708.000	1,408.000
15	1,115.000	1,105.000	1,092.000	1,111.000	2,112.000	2,312.000	2,412.000	2,362.000	2,299.000	2,287.000	1,701.000	1,401.000
16	1,080.000	1,070.000	1,057.000	1,076.000	2,100.000	2,300.000	2,400.000	2,350.000	2,287.000	2,275.000	1,678.000	1,378.000
17	1,085.000	1,075.000	1,062.000	1,081.000	2,056.000	2,256.000	2,356.000	2,306.000	2,243.000	2,231.000	1,658.000	1,358.000
18	1,099.000	1,079.000	1,066.000	1,085.000	2,000.000	2,200.000	2,300.000	2,250.000	2,187.000	2,175.000	1,637.000	1,337.000
19	1,107.000	1,100.000	1,087.000	1,106.000	1,997.000	2,197.000	2,297.000	2,247.000	2,184.000	2,172.000	1,639.000	1,339.000
20	1,110.000	1,099.000	1,086.000	1,105.000	2,083.000	2,283.000	2,383.000	2,333.000	2,270.000	2,258.000	1,684.000	1,384.000
21	1,090.000	1,080.000	1,067.000	1,086.000	2,045.000	2,245.000	2,345.000	2,295.000	2,232.000	2,220.000	1,655.000	1,355.000
22	1,025.000	1,015.000	1,002.000	1,021.000	2,005.000	2,205.000	2,305.000	2,255.000	2,192.000	2,180.000	1,603.000	1,303.000
23	991.000	981.000	968.000	987.000	1,911.000	2,111.000	2,211.000	2,161.000	2,098.000	2,086.000	1,539.000	1,239.000

Table 13: AUTECH Weekend Electrical Load Profile

Yearly Load Data												
Weekdays		Weekends										
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	884.000	847.000	865.000	845.000	1,899.000	2,063.000	2,194.000	2,167.000	2,049.000	2,088.000	1,489.000	1,183.000
1	862.000	836.000	856.000	835.000	1,806.000	1,972.000	2,107.000	2,073.000	1,960.000	1,997.000	1,428.000	1,123.000
2	892.000	860.000	889.000	864.000	1,663.000	1,838.000	1,963.000	1,930.000	1,819.000	1,870.000	1,370.000	1,070.000
3	899.000	870.000	889.000	885.000	1,598.000	1,769.000	1,883.000	1,851.000	1,739.000	1,801.000	1,345.000	1,047.000
4	927.000	895.000	926.000	910.000	1,396.000	1,569.000	1,673.000	1,639.000	1,535.000	1,598.000	1,272.000	963.000
5	931.000	895.000	960.000	962.000	1,232.000	1,408.000	1,505.000	1,478.000	1,373.000	1,440.000	1,202.000	884.000
6	905.000	856.000	934.000	964.000	1,321.000	1,483.000	1,600.000	1,564.000	1,465.000	1,517.000	1,248.000	951.000
7	898.000	836.000	954.000	970.000	1,541.000	1,689.000	1,840.000	1,801.000	1,674.000	1,739.000	1,373.000	1,085.000
8	895.000	856.000	988.000	985.000	1,789.000	1,923.000	2,094.000	2,045.000	1,922.000	2,000.000	1,517.000	1,228.000
9	881.000	868.000	997.000	991.000	1,896.000	2,013.000	2,189.000	2,133.000	2,019.000	2,098.000	1,565.000	1,283.000
10	854.000	847.000	962.000	962.000	1,898.000	2,024.000	2,192.000	2,130.000	2,028.000	2,095.000	1,548.000	1,281.000
11	834.000	835.000	938.000	946.000	1,896.000	2,000.000	2,185.000	2,130.000	2,036.000	2,091.000	1,550.000	1,280.000
12	835.000	825.000	911.000	924.000	1,892.000	1,997.000	2,188.000	2,124.000	2,045.000	2,092.000	1,535.000	1,276.000
13	806.000	800.000	871.000	896.000	1,896.000	1,995.000	2,192.000	2,110.000	2,045.000	2,102.000	1,521.000	1,260.000
14	819.000	809.000	874.000	900.000	1,892.000	1,989.000	2,177.000	2,106.000	2,048.000	2,110.000	1,534.000	1,263.000
15	850.000	837.000	886.000	910.000	1,898.000	1,995.000	2,181.000	2,114.000	2,062.000	2,123.000	1,526.000	1,260.000
16	889.000	877.000	903.000	926.000	1,932.000	2,032.000	2,216.000	2,147.000	2,104.000	2,156.000	1,537.000	1,272.000
17	969.000	966.000	964.000	997.000	1,954.000	2,079.000	2,260.000	2,184.000	2,144.000	2,182.000	1,563.000	1,294.000
18	1,020.000	1,010.000	997.000	1,028.000	1,936.000	2,067.000	2,244.000	2,160.000	2,121.000	2,138.000	1,565.000	1,289.000
19	1,048.000	1,053.000	1,014.000	1,049.000	1,944.000	2,084.000	2,256.000	2,165.000	2,123.000	2,148.000	1,584.000	1,306.000
20	1,067.000	1,076.000	1,029.000	1,053.000	2,032.000	2,183.000	2,349.000	2,274.000	2,220.000	2,242.000	1,641.000	1,354.000
21	1,056.000	1,062.000	1,025.000	1,041.000	2,001.000	2,164.000	2,311.000	2,246.000	2,192.000	2,215.000	1,629.000	1,330.000
22	996.000	991.000	961.000	979.000	1,964.000	2,128.000	2,277.000	2,223.000	2,156.000	2,174.000	1,578.000	1,280.000
23	970.000	959.000	929.000	945.000	1,876.000	2,030.000	2,188.000	2,133.000	2,051.000	2,074.000	1,515.000	1,217.000

HOMER has the option to consider different amounts of generator, wind, PV, batteries, and different size system converter. These are the simulation results produced for the optimization cases:

Table 14: AUTECH Sensitivity & Optimization Results

RESULTS															
Sensitivity Results: Left Click on a sensitivity case to see its Optimization Results															
Architecture				Cost				System		KHLR3250					
PV (kW)	S2300	KHLR3250 (kW)	GS200 flow	Converter (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Ren Frac (%)	Hours	Production	Fuel (L)	O&M Cost	Fuel Cost	
	2	3,250	12	2,000	\$0.261	\$47.4M	\$2.44M	\$15.8M	48	3,261	7,356,060	1,697,178	32,973	1,697,178	
Optimization Results: Left Double Click on a particular system to see its detailed Simulation Results															
Architecture				Cost				System		KHLR3250					
PV (kW)	S2300	KHLR3250 (kW)	GS200 flow	Converter (kW)	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Ren Frac (%)	Hours	Production	Fuel (L)	O&M Cost	Fuel Cost	
	2	3,250	12	2,000	\$0.261	\$47.4M	\$2.44M	\$15.8M	48	3,261	7,356,060	1,697,178	32,973	1,697,178	
	2,000	2	3,250	15	3,000	\$0.267	\$48.6M	\$1.97M	\$23.1M	62	2,777	5,318,756	1,256,194	28,079	1,256,194
	4,000		3,250	10	3,000	\$0.323	\$58.8M	\$3.12M	\$18.5M	24	4,051	10,696,306	2,419,964	40,961	2,419,964
	2,000	2	3,250		1,000	\$0.331	\$60.1M	\$3.29M	\$17.6M	46	6,585	7,640,236	1,984,332	66,583	1,984,332
		3,250	6	1,000	\$0.362	\$65.8M	\$4.73M	\$4.59M	0.0	7,834	14,686,122	3,480,112	79,212	3,480,112	
	3,000		3,250	2,000	\$0.362	\$65.9M	\$4.17M	\$11.9M	20	8,245	11,192,983	2,809,968	83,368	2,809,968	

The top case (HOMER optimized selection) includes 2 - 2300kW wind turbines, 1 - 3250kW Genset, 12 Vizn GS200 Flow batteries and a 2MW system converter. For this case the cost of energy is calculated at \$0.261 and the renewable fraction is 48%. With the input parameters HOMER was given the several other cases were found feasible. See each cases pdf's for further details on each simulation.

Appendix A – San Nicholas Scenarios

11/1/2016

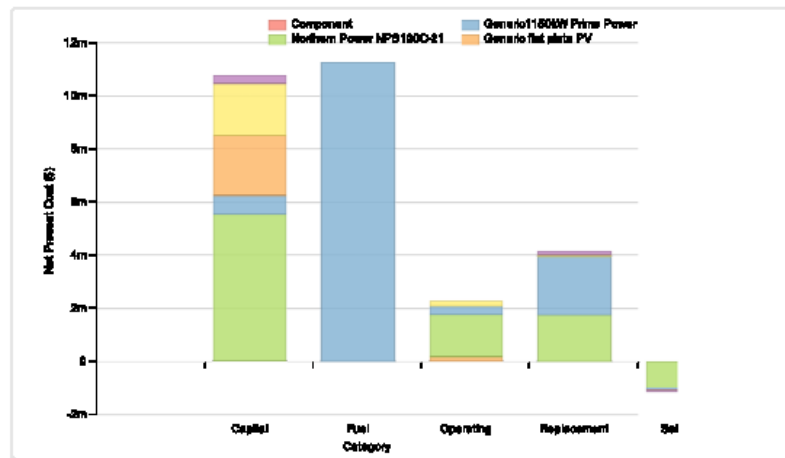
Detail

System Report

System architecture

PV	Generic flat plate PV	750	kW
Wind Turbine	Northern Power NPS100C-21	7	
Generator	Generic1150kW Prime Power	1,150	kW
Battery	GS200 flow	8	strings
Converter	System Converter	1,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	27320988	\$
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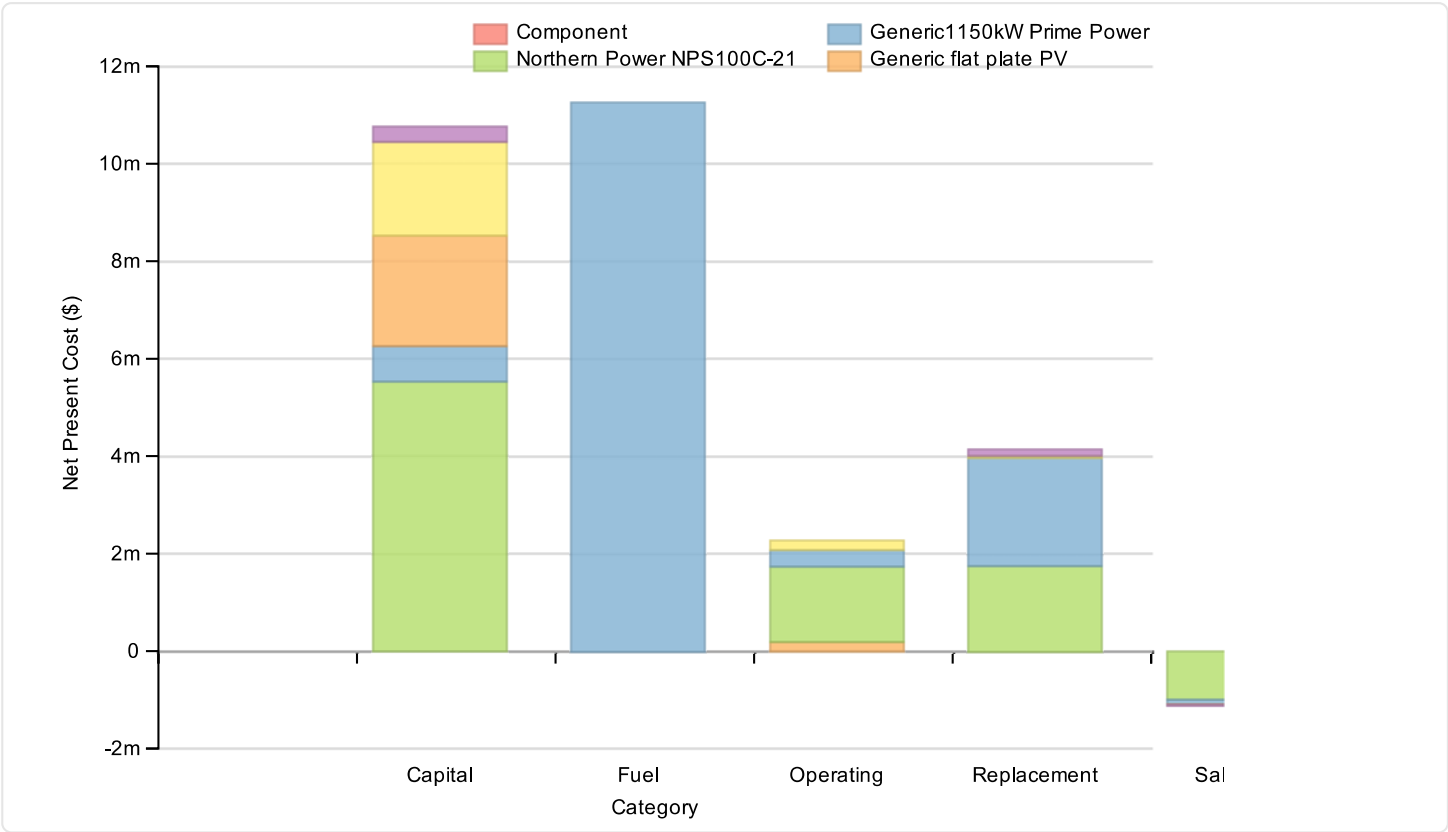
18

System Report

System architecture

PV	Generic flat plate PV	750	kW
Wind Turbine	Northern Power NPS100C-21	7	
Generator	Generic1150kW Prime Power	1,150	kW
Battery	GS200 flow	6	strings
Converter	System Converter	1,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	27320988	\$
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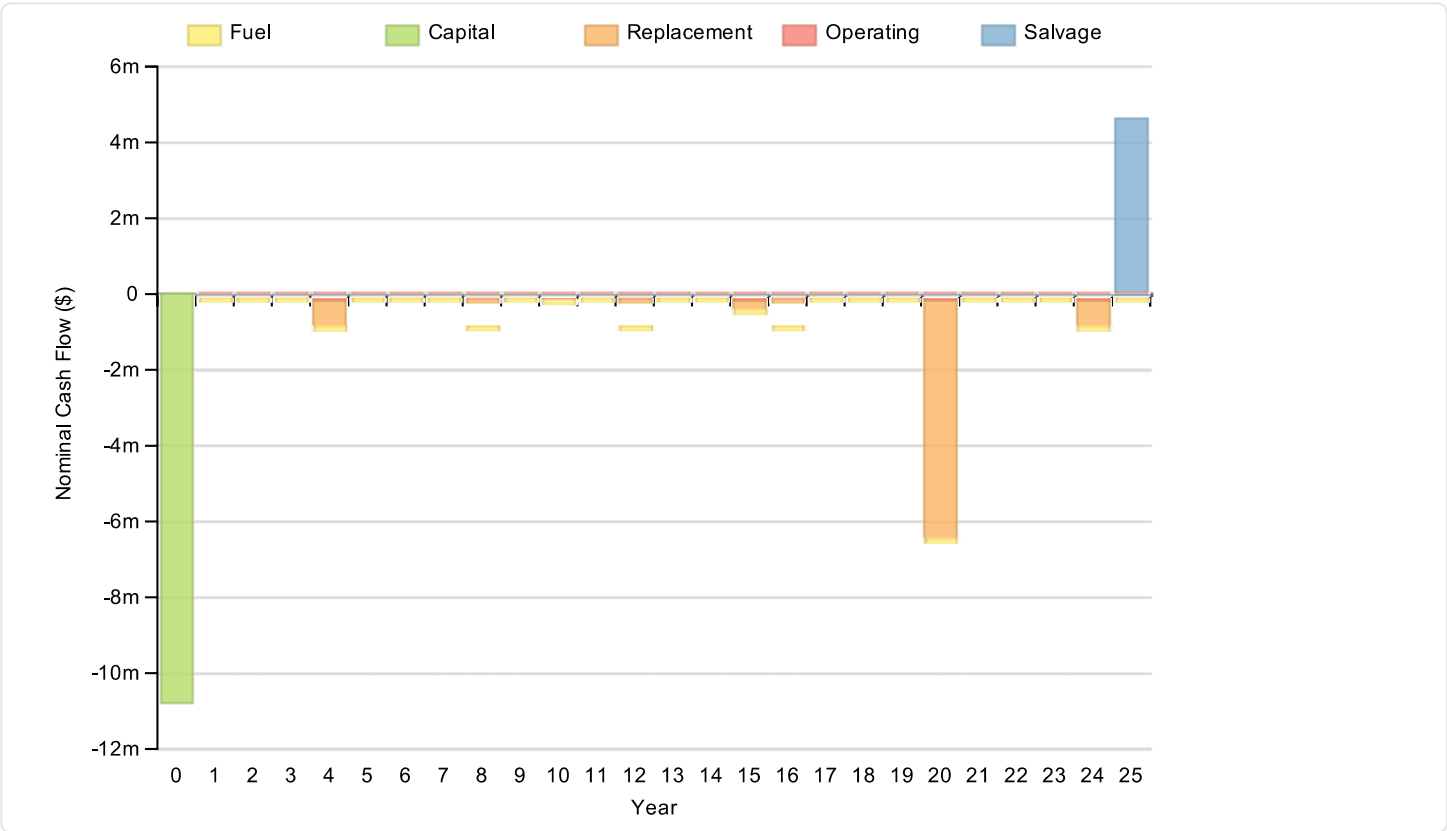
Levelized cost of energy	0.406	\$/kWh
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Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Generic flat plate PV	2,250,000	0	193,913	0	0	2,443,913
Northern Power NPS100C-21	5,530,000	1,763,003	1,551,301	0	-993,565	7,850,739
Generic1150kW Prime Power	741,936	2,211,004	336,744	11,251,017	-88,572	14,452,129
GS200 flow	1,947,535	43,013	186,156	0	-5,832	2,170,872
Converter	300,000	127,282	0	0	-23,956	403,326
System	10,769,471	4,144,301	2,268,114	11,251,017	-1,111,924	27,320,979

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Generic flat plate PV	174,047	0	15,000	0	0	189,047
Northern Power NPS100C-21	427,770	136,376	120,000	0	-76,857	607,289
Generic1150kW Prime Power	57,392	171,031	26,049	870,315	-6,851	1,117,936
GS200 flow	150,650	3,327	14,400	0	-451	167,926
Converter	23,206	9,846	0	0	-1,853	31,199
System	833,066	320,580	175,449	870,315	-86,012	2,113,398



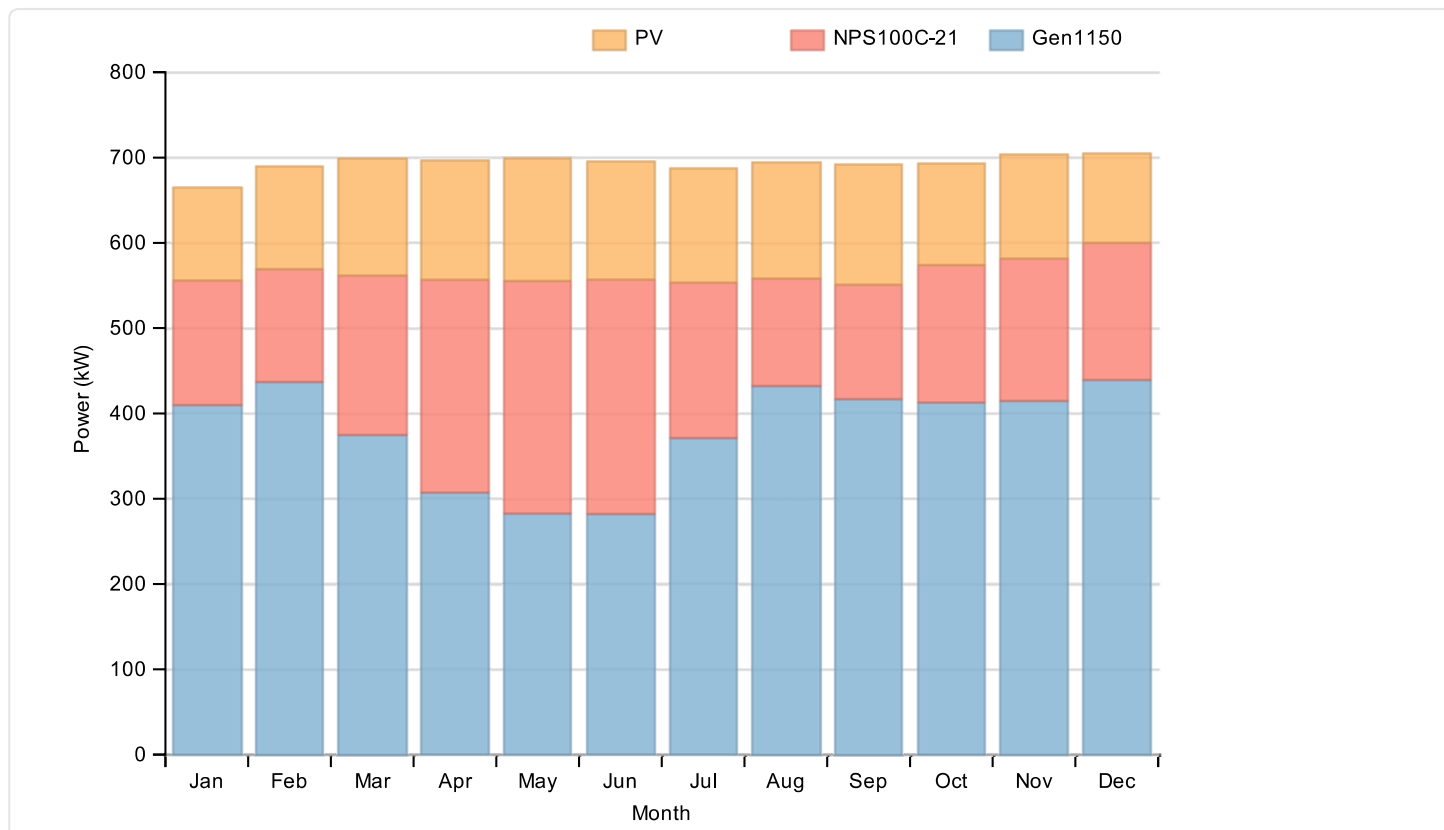
Electrical

Quantity	Value	Units
Excess electricity	132565	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	1,125,156	19
Generator	3,347,365	55
Wind Turbine	1,601,808	26
Total	6,074,329	100

Load	Consumption(kWh/yr)	Fraction (%)
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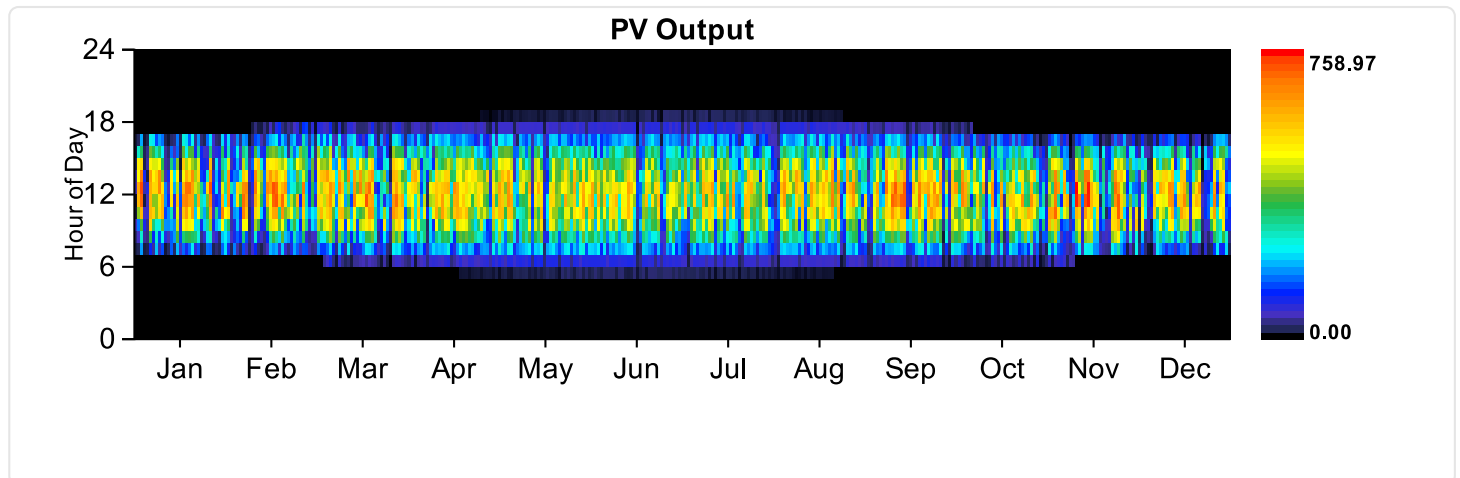
AC primary load	5,205,935	100
DC primary load	0	0
Total	5,205,935	100



PV:Generic flat plate PV

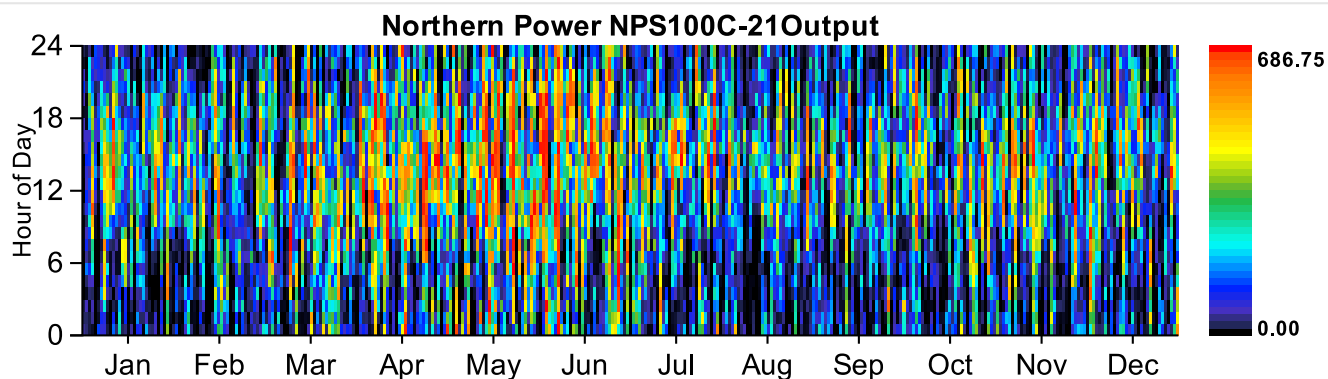
Quantity	Value	Units
Rated capacity	750	kW
Mean output	128	kW
Mean output	3082.60	kWh/d
Capacity factor	17.13	%
Total production	1125156	kWh/yr
Minimum output	0.00	kW
Maximum output	758.97	kW

PV penetration	21.61	%
Hours of operation	4386	hrs/yr
Levelized cost	0.168	\$/kWh



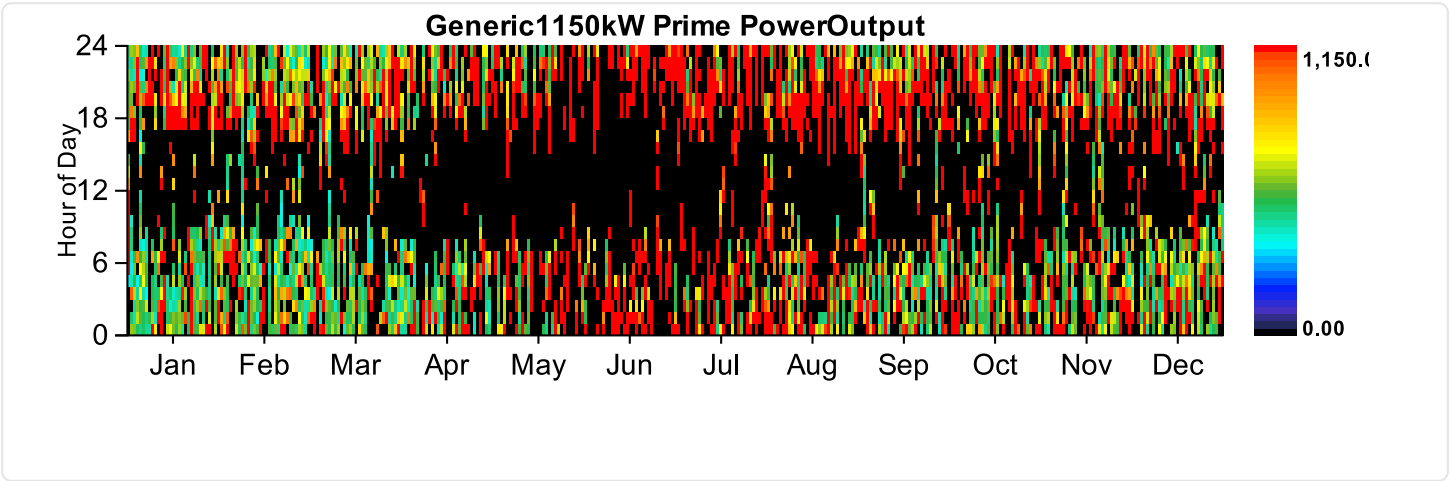
Wind Turbine:Northern Power NPS100C-21

Quantity	Value	Units
Total rated capacity	700	kW
Mean output	183	kW
Capacity factor	26.12	%
Total production	1601808	kWh/yr
Minimum output	0.00	kW
Maximum output	686.75	kW
Wind penetration	30.77	%
Hours of operation	8108	hrs/yr
Levelized cost	0.379	\$/kWh



Generator:Generic1150kW Prime Power

Quantity	Value	Units
Hours of operation	3901	hrs/yr
Number of starts	950	starts/yr
Operational life	4	yr
Fixed generation cost	56.14	\$/hr
Marginal generation cost	0.26	\$/kWh
Electrical production	3347365	kWh/yr
Mean electrical output	858	kW
Min. electrical output	345	kW
Max. electrical output	1150	kW
Fuel consumption	870316	L/yr
Specific fuel consumption	0.26	L/kWh
Fuel energy input	8563909	kWh/yr
Mean electrical efficiency	39	%

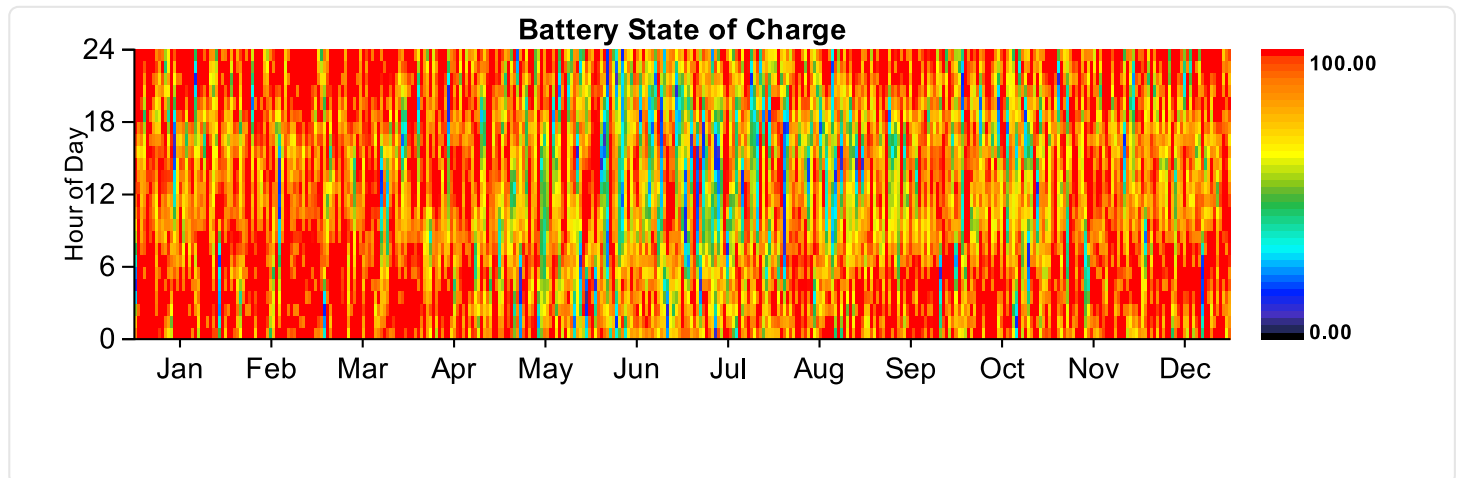


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	6
Batteries	6
Bus voltage	100

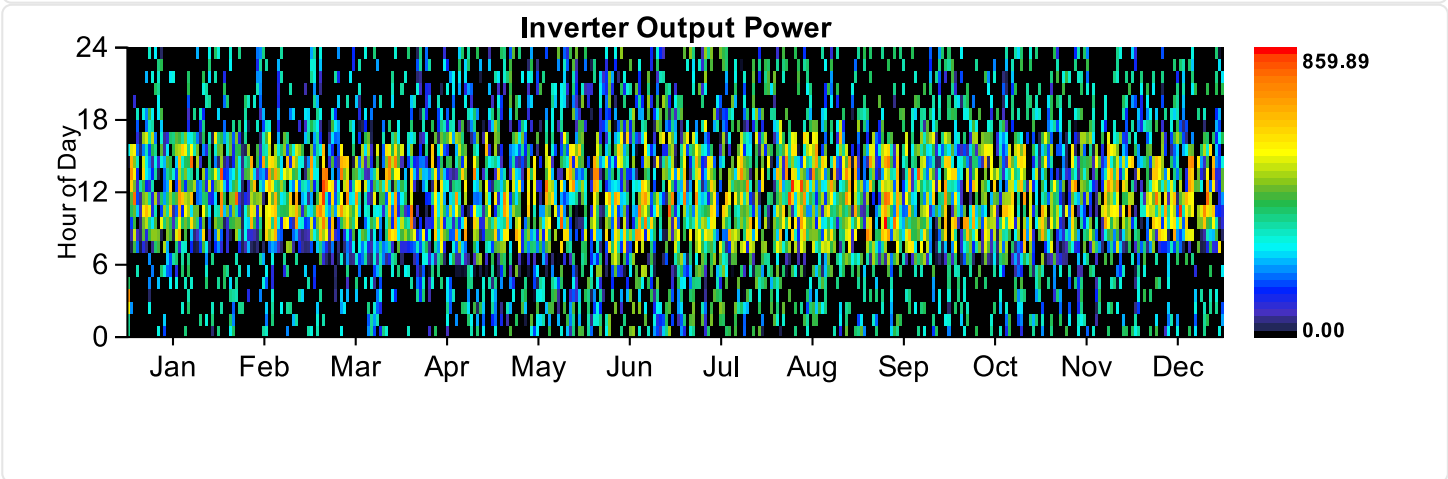
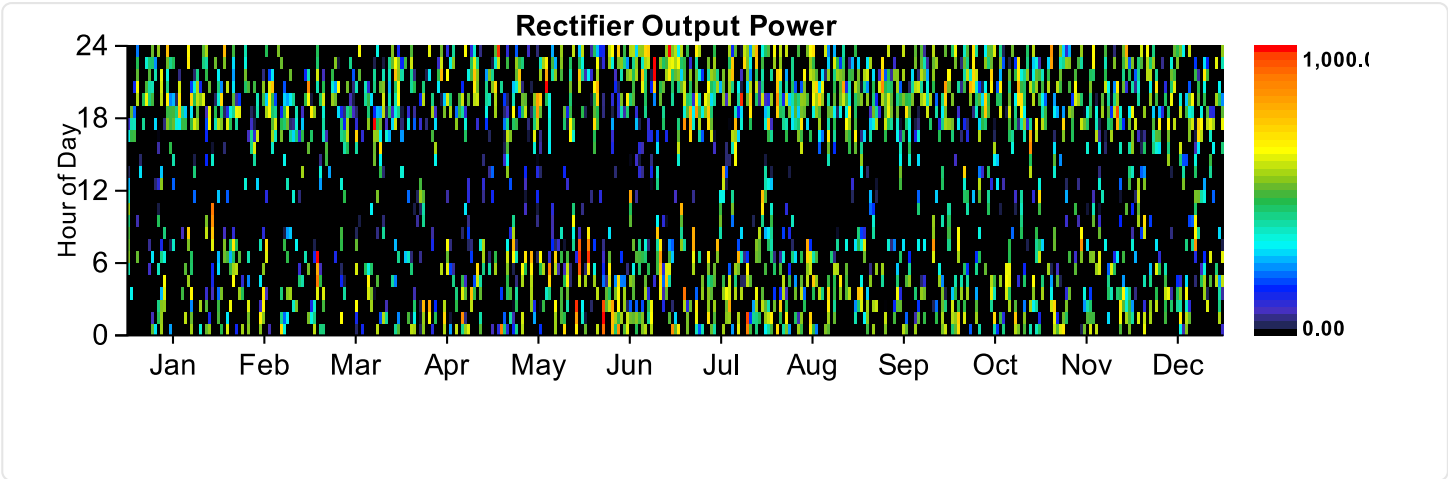
Quantity	Value	Units
Nominal capacity	3600	kWh
Usable nominal capacity	3600	kWh
Autonomy	6	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.356	\$/kWh
Energy in	1282096	kWh/yr
Energy out	897551	kWh/yr
Storage depletion	101	kWh/yr

Losses	384444	kWh/yr
Annual throughput	1072780	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	1,000	900	kW
Mean output	172	119	kW
Minimum output	0	0	kW
Maximum output	860	1,000	kW
Capacity factor	17	12	%
Hours of operation	4,730	2,572	hrs/yr
Energy in	1,673,117	1,226,471	kWh/yr
Energy out	1,505,805	1,042,500	kWh/yr
Losses	167,312	183,971	kWh/yr



Emissions

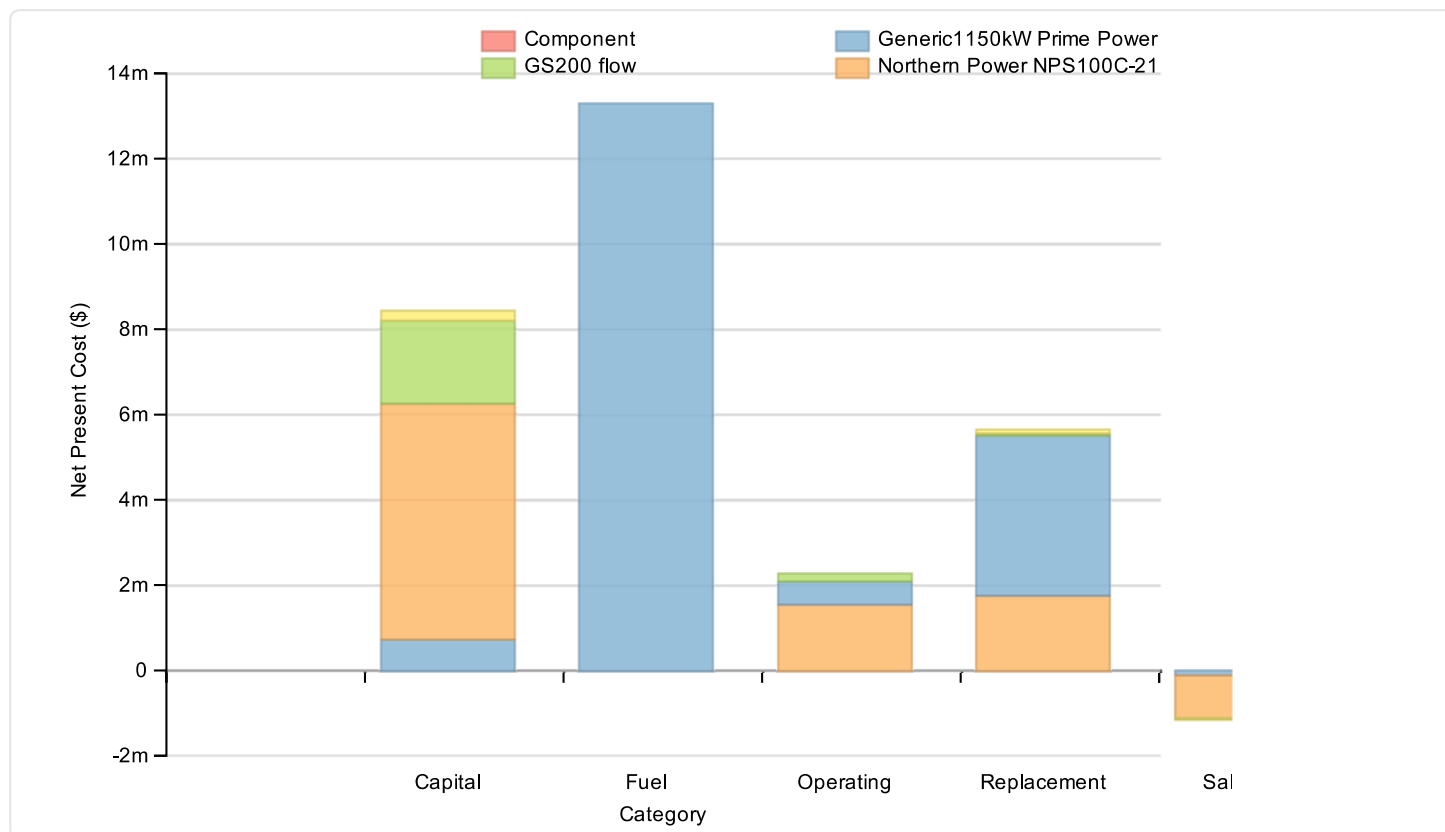
Pollutant	Emissions	Units
Carbon dioxide	2284157	kg/yr
Carbon monoxide	9574	kg/yr
Unburned hydrocarbons	1097	kg/yr
Particulate matter	274	kg/yr
Sulfur dioxide	4703	kg/yr
Nitrogen oxides	9574	kg/yr

System Report

System architecture

Wind Turbine	Northern Power NPS100C-21	7	
Generator	Generic1150kW Prime Power	1,150	kW
Battery	GS200 flow	6	strings
Converter	System Converter	750	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	28522898	\$
Levelized cost of energy	0.424	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Northern Power NPS100C-21	5,530,000	1,763,003	1,551,301	0	-993,565	7,850,739
Generic1150kW Prime Power	741,936	3,744,850	534,508	13,298,348	-120,861	18,198,781
GS200 flow	1,947,535	43,013	186,156	0	-5,832	2,170,872
Converter	225,000	95,462	0	0	-17,967	302,495
System	8,444,470	5,646,327	2,271,966	13,298,348	-1,138,224	28,522,887

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Northern Power NPS100C-21	427,770	136,376	120,000	0	-76,857	607,289
Generic1150kW Prime Power	57,392	289,681	41,347	1,028,685	-9,349	1,407,756
GS200 flow	150,650	3,327	14,400	0	-451	167,926
Converter	17,405	7,384	0	0	-1,390	23,400
System	653,217	436,768	175,746	1,028,685	-88,047	2,206,369



Electrical

Quantity	Value	Units
Excess electricity	12119	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

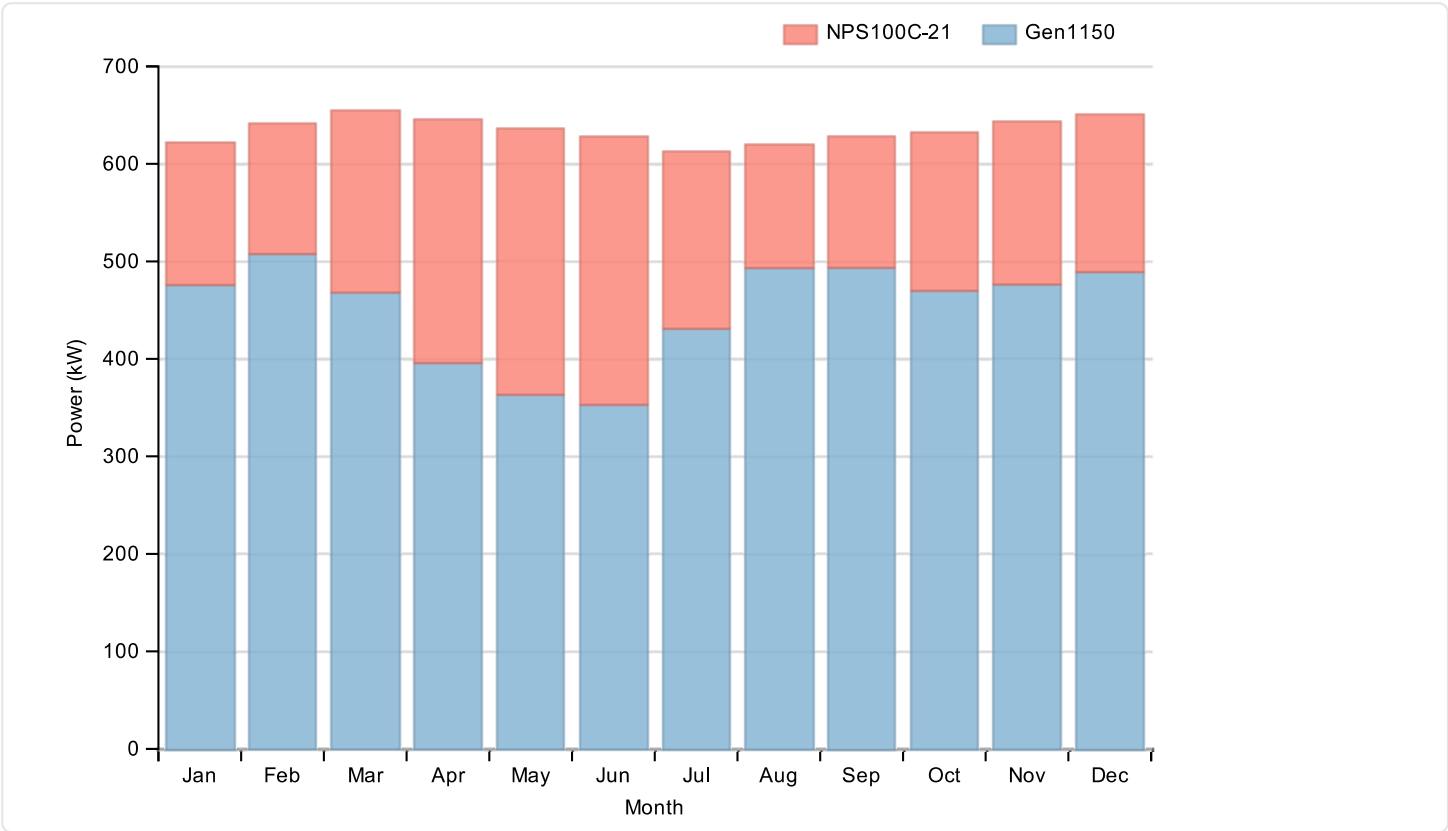
Component	Production(kWh/yr)	Fraction (%)
Generator	3,956,489	71
Wind Turbine	1,601,808	29
Total	5,558,297	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	5,205,935	100

11/17/2015

Detail

DC primary load	0	0
Total	5,205,935	100

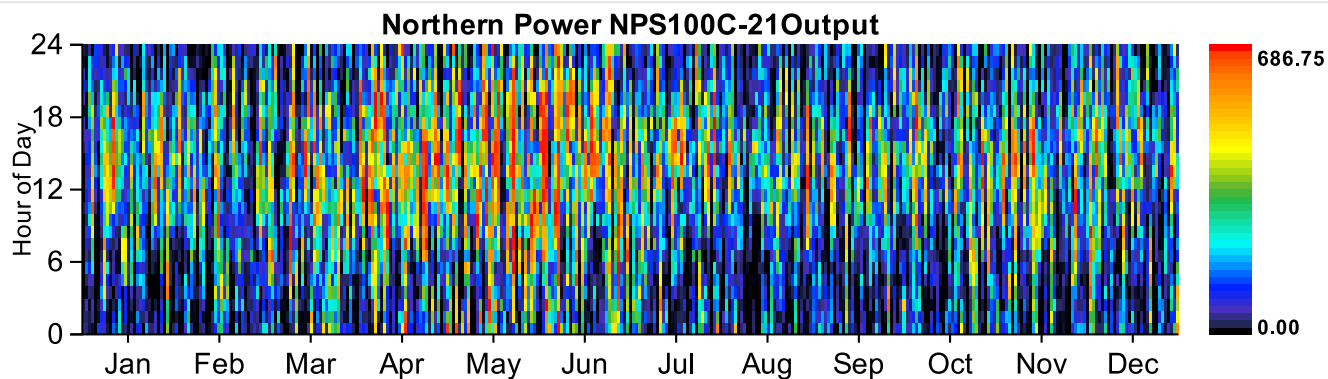


Wind Turbine:Northern Power NPS100C-21

Quantity	Value	Units
Total rated capacity	700	kW
Mean output	183	kW
Capacity factor	26.12	%
Total production	1601808	kWh/yr
Minimum output	0.00	kW
Maximum output	686.75	kW
Wind penetration	30.77	%
Hours of operation	8108	hrs/yr

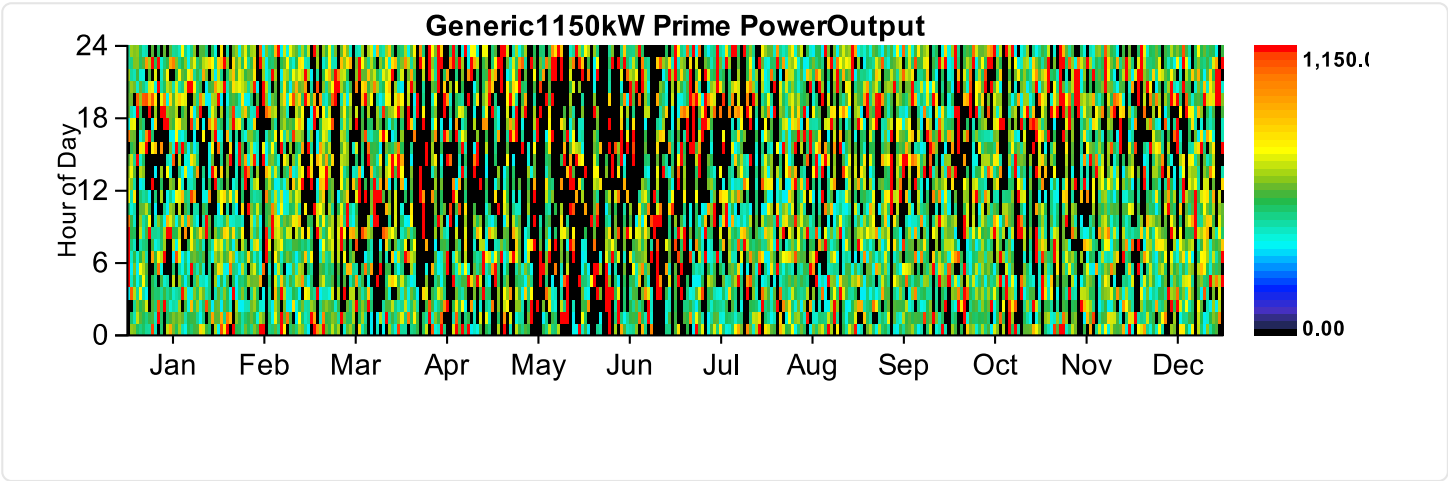
Levelized cost

0.379 \$/kWh



Generator:Generic1150kW Prime Power

Quantity	Value	Units
Hours of operation	6192	hrs/yr
Number of starts	883	starts/yr
Operational life	2	yr
Fixed generation cost	56.14	\$/hr
Marginal generation cost	0.26	\$/kWh
Electrical production	3956489	kWh/yr
Mean electrical output	639	kW
Min. electrical output	345	kW
Max. electrical output	1150	kW
Fuel consumption	1028686	L/yr
Specific fuel consumption	0.26	L/kWh
Fuel energy input	10122272	kWh/yr
Mean electrical efficiency	39	%

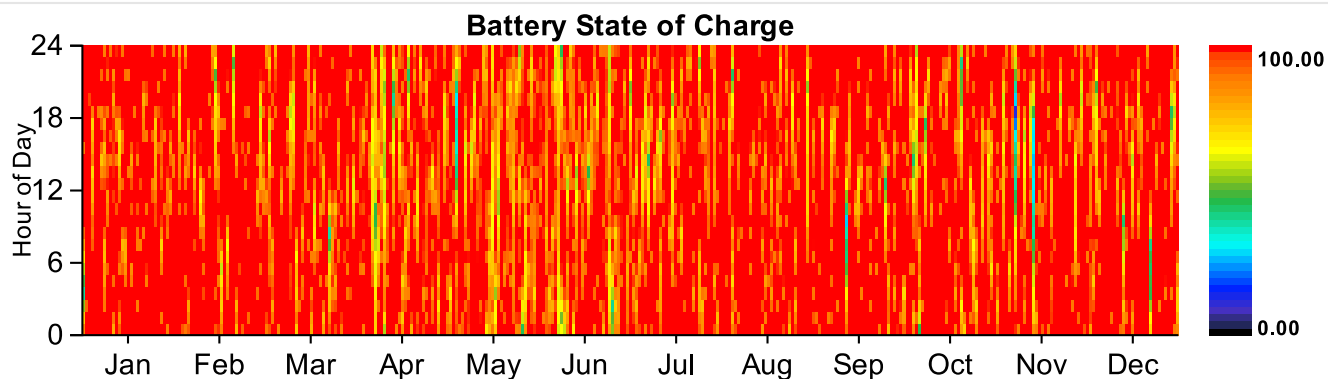


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	6
Batteries	6
Bus voltage	100

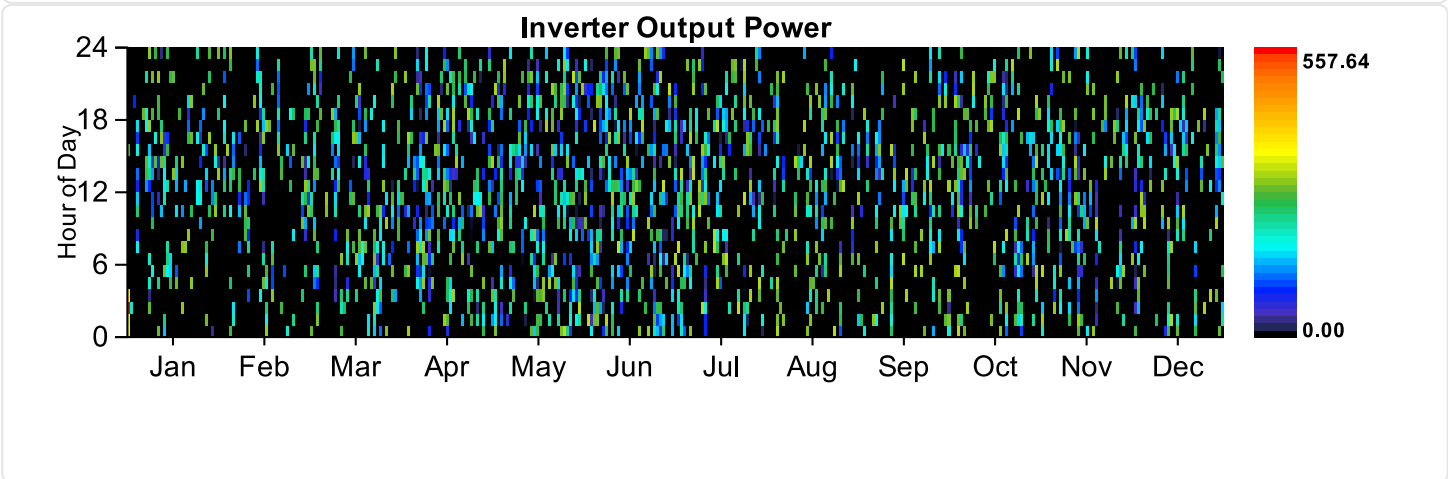
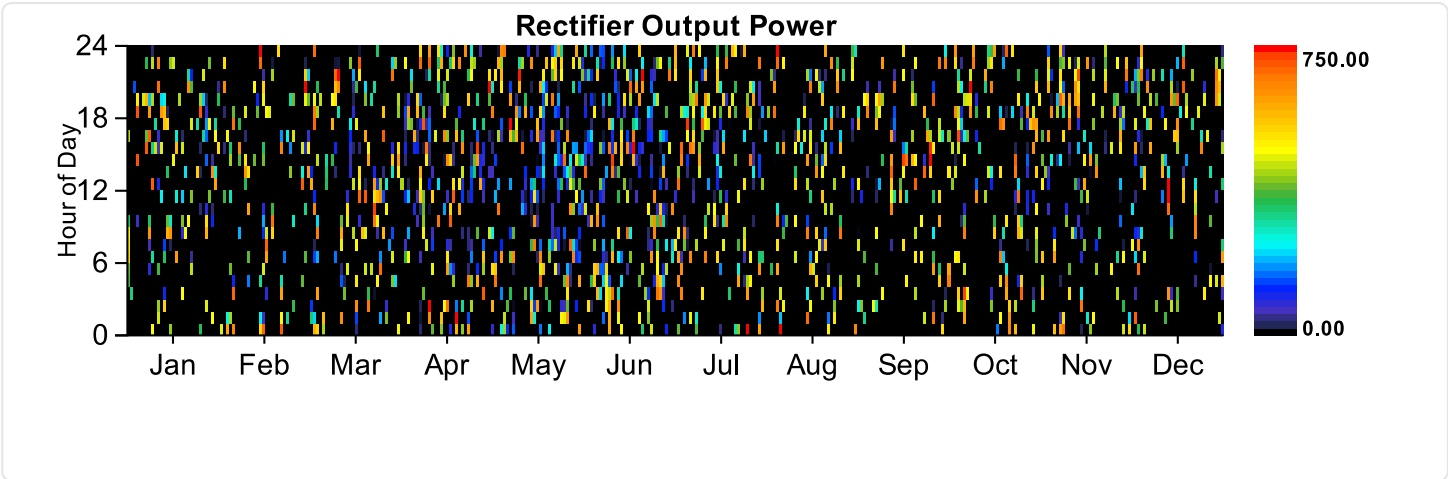
Quantity	Value	Units
Nominal capacity	3600	kWh
Usable nominal capacity	3600	kWh
Autonomy	6	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.410	\$/kWh
Energy in	622609	kWh/yr
Energy out	435826	kWh/yr
Storage depletion	0	kWh/yr

Losses	186782	kWh/yr
Annual throughput	520912	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	45	71	kW
Minimum output	0	0	kW
Maximum output	558	750	kW
Capacity factor	6	9	%
Hours of operation	2,074	1,771	hrs/yr
Energy in	435,826	732,481	kWh/yr
Energy out	392,244	622,609	kWh/yr
Losses	43,583	109,872	kWh/yr



Emissions

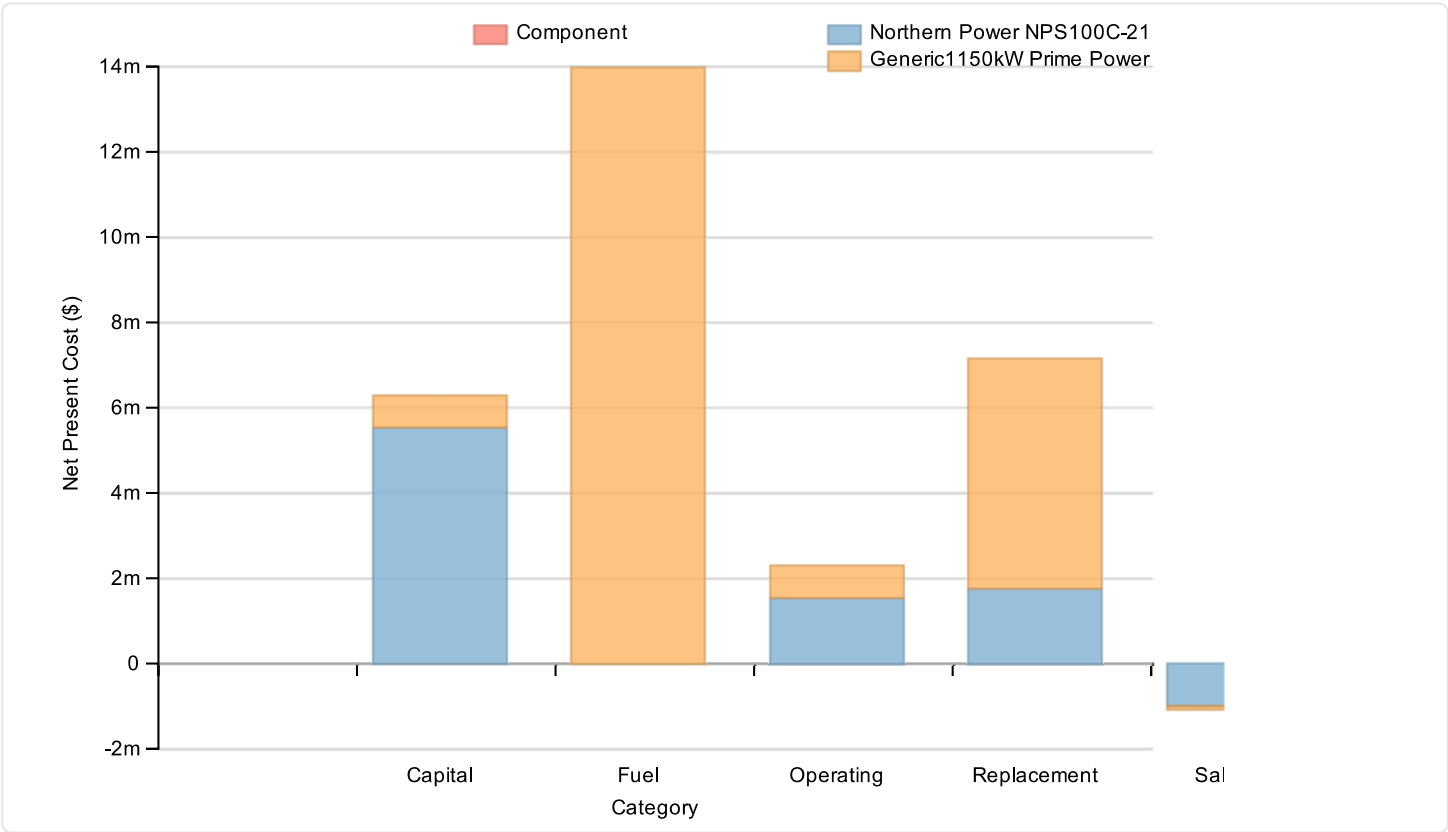
Pollutant	Emissions	Units
Carbon dioxide	2699802	kg/yr
Carbon monoxide	11316	kg/yr
Unburned hydrocarbons	1296	kg/yr
Particulate matter	324	kg/yr
Sulfur dioxide	5559	kg/yr
Nitrogen oxides	11316	kg/yr

System Report

System architecture

Wind Turbine	Northern Power NPS100C-21	7	
Generator	Generic1150kW Prime Power	1,150	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	28628548	\$
Levelized cost of energy	0.425	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Northern Power	5 520 000	1 762 000	1 551 204	0	002 565	7 835 769

11/17/2015

Detail

Northern Power NPS100C-21	5,530,000	1,763,003	1,551,301	0	-993,563	7,850,739
Generic1150kW Prime Power	741,936	5,381,779	756,012	13,969,756	-71,687	20,777,796
System	6,271,936	7,144,782	2,307,313	13,969,756	-1,065,251	28,628,536

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Northern Power NPS100C-21	427,770	136,376	120,000	0	-76,857	607,289
Generic1150kW Prime Power	57,392	416,304	58,481	1,080,622	-5,545	1,607,254
System	485,162	552,680	178,481	1,080,622	-82,402	2,214,543



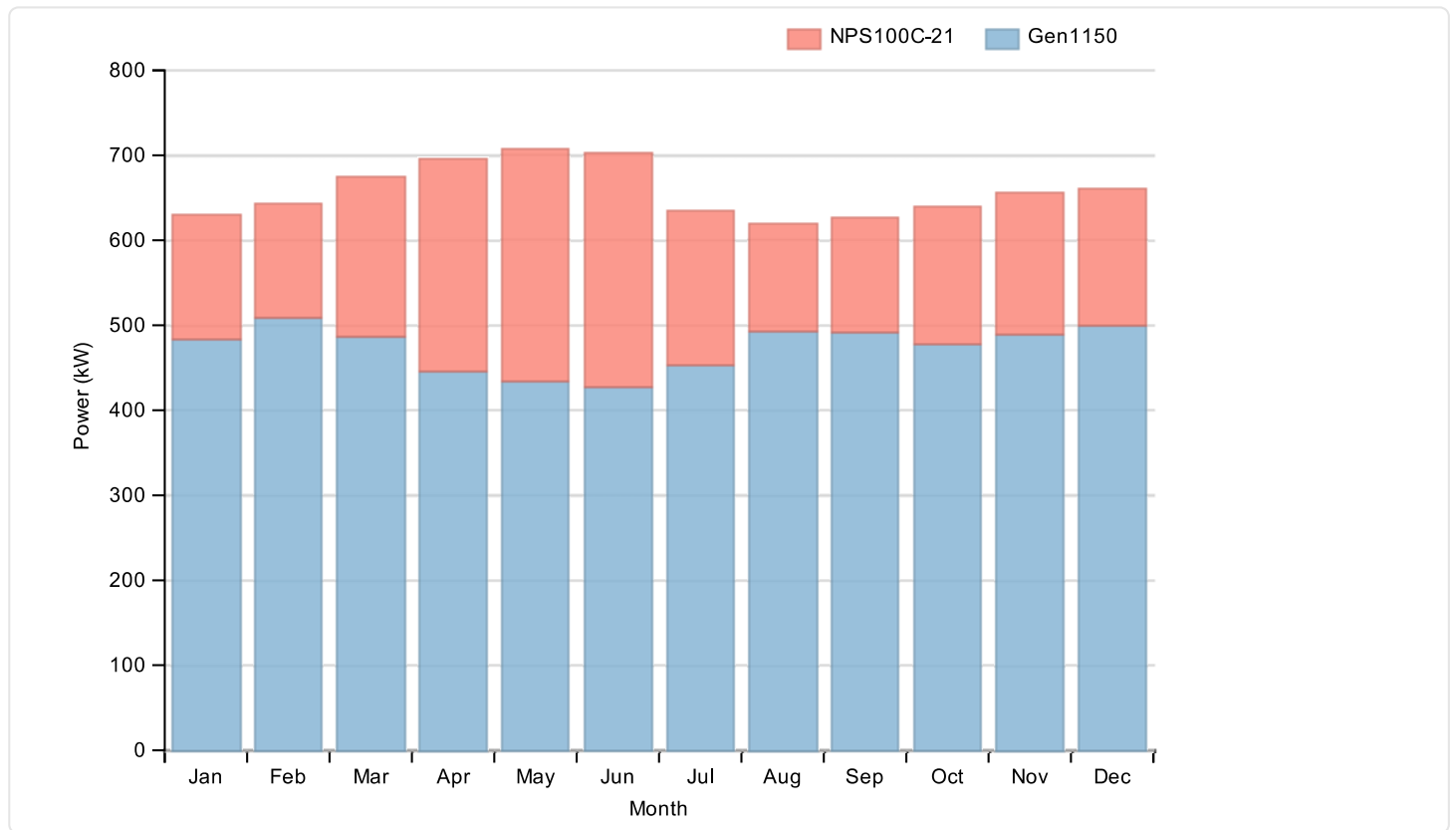
Electrical

Quantity	Value	Units

Excess electricity	552204	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

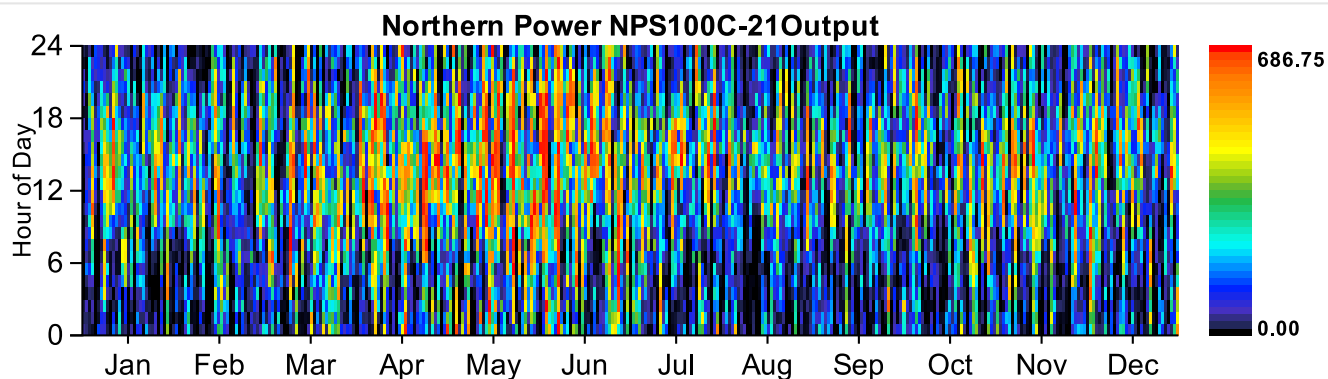
Component	Production(kWh/yr)	Fraction (%)
Generator	4,156,337	72
Wind Turbine	1,601,808	28
Total	5,758,145	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	5,205,935	100
DC primary load	0	0
Total	5,205,935	100



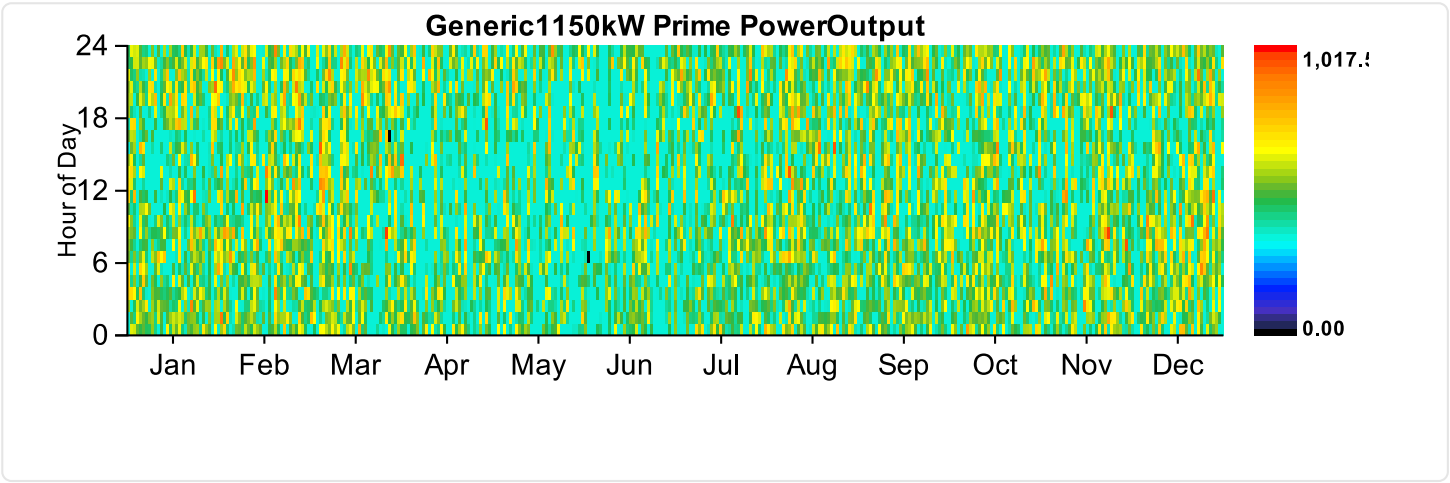
Wind Turbine:Northern Power NPS100C-21

Quantity	Value	Units
Total rated capacity	700	kW
Mean output	183	kW
Capacity factor	26.12	%
Total production	1601808	kWh/yr
Minimum output	0.00	kW
Maximum output	686.75	kW
Wind penetration	30.77	%
Hours of operation	8108	hrs/yr
Levelized cost	0.379	\$/kWh



Generator:Generic1 150kW Prime Power

Quantity	Value	Units
Hours of operation	8758	hrs/yr
Number of starts	3	starts/yr
Operational life	2	yr
Fixed generation cost	56.14	\$/hr
Marginal generation cost	0.26	\$/kWh
Electrical production	4156337	kWh/yr
Mean electrical output	475	kW
Min. electrical output	345	kW
Max. electrical output	1018	kW
Fuel consumption	1080623	L/yr
Specific fuel consumption	0.26	L/kWh
Fuel energy input	10633327	kWh/yr
Mean electrical efficiency	39	%



Emissions

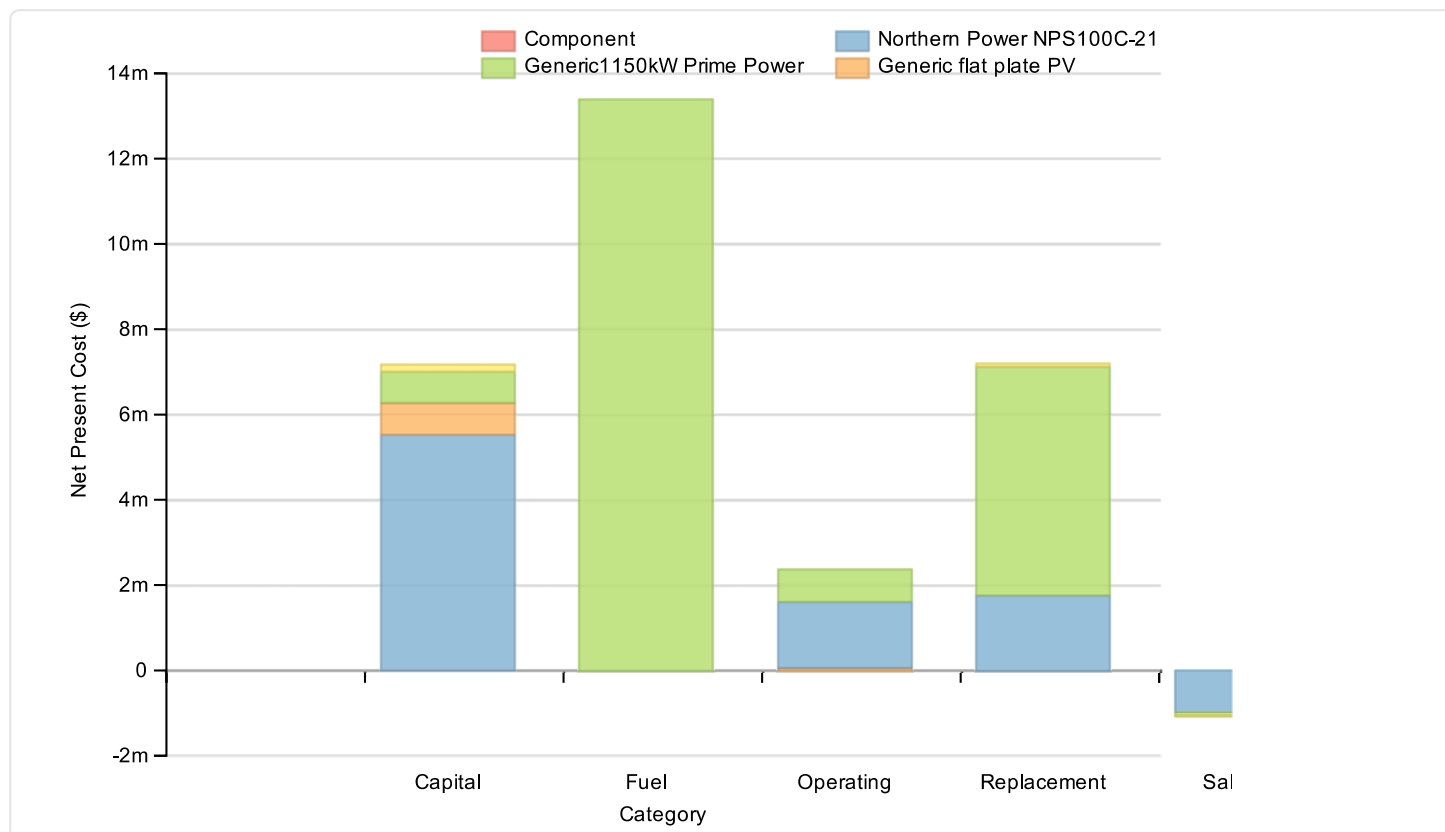
Pollutant	Emissions	Units
Carbon dioxide	2836110	kg/yr
Carbon monoxide	11887	kg/yr
Unburned hydrocarbons	1362	kg/yr
Particulate matter	340	kg/yr
Sulfur dioxide	5839	kg/yr
Nitrogen oxides	11887	kg/yr

System Report

System architecture

PV	Generic flat plate PV	250	kW
Wind Turbine	Northern Power NPS100C-21	7	
Generator	Generic1150kW Prime Power	1,150	kW
Converter	System Converter	500	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

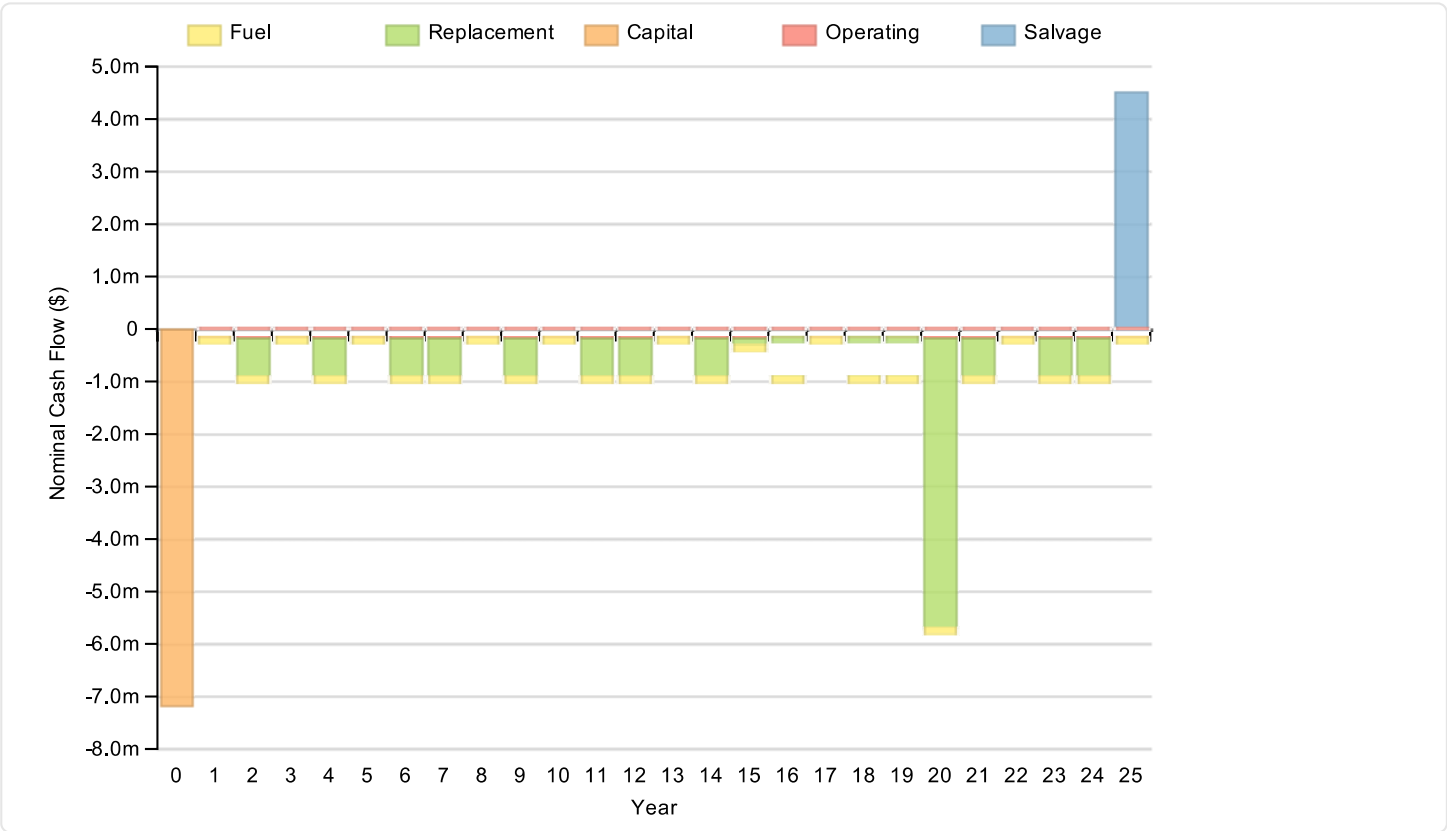
Total net present cost	29058882	\$
Levelized cost of energy	0.432	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Generic flat plate PV	750,000	0	64,638	0	0	814,638
Northern Power NPS100C-21	5,530,000	1,763,003	1,551,301	0	-993,565	7,850,739
Generic1150kW Prime Power	741,936	5,379,269	755,407	13,388,983	-73,761	20,191,834
Converter	150,000	63,641	0	0	-11,978	201,663
System	7,171,936	7,205,913	2,371,346	13,388,983	-1,079,304	29,058,874

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Generic flat plate PV	58,016	0	5,000	0	0	63,016
Northern Power NPS100C-21	427,770	136,376	120,000	0	-76,857	607,289
Generic1150kW Prime Power	57,392	416,110	58,434	1,035,696	-5,706	1,561,926
Converter	11,603	4,923	0	0	-927	15,599
System	554,781	557,409	183,434	1,035,696	-83,489	2,247,831



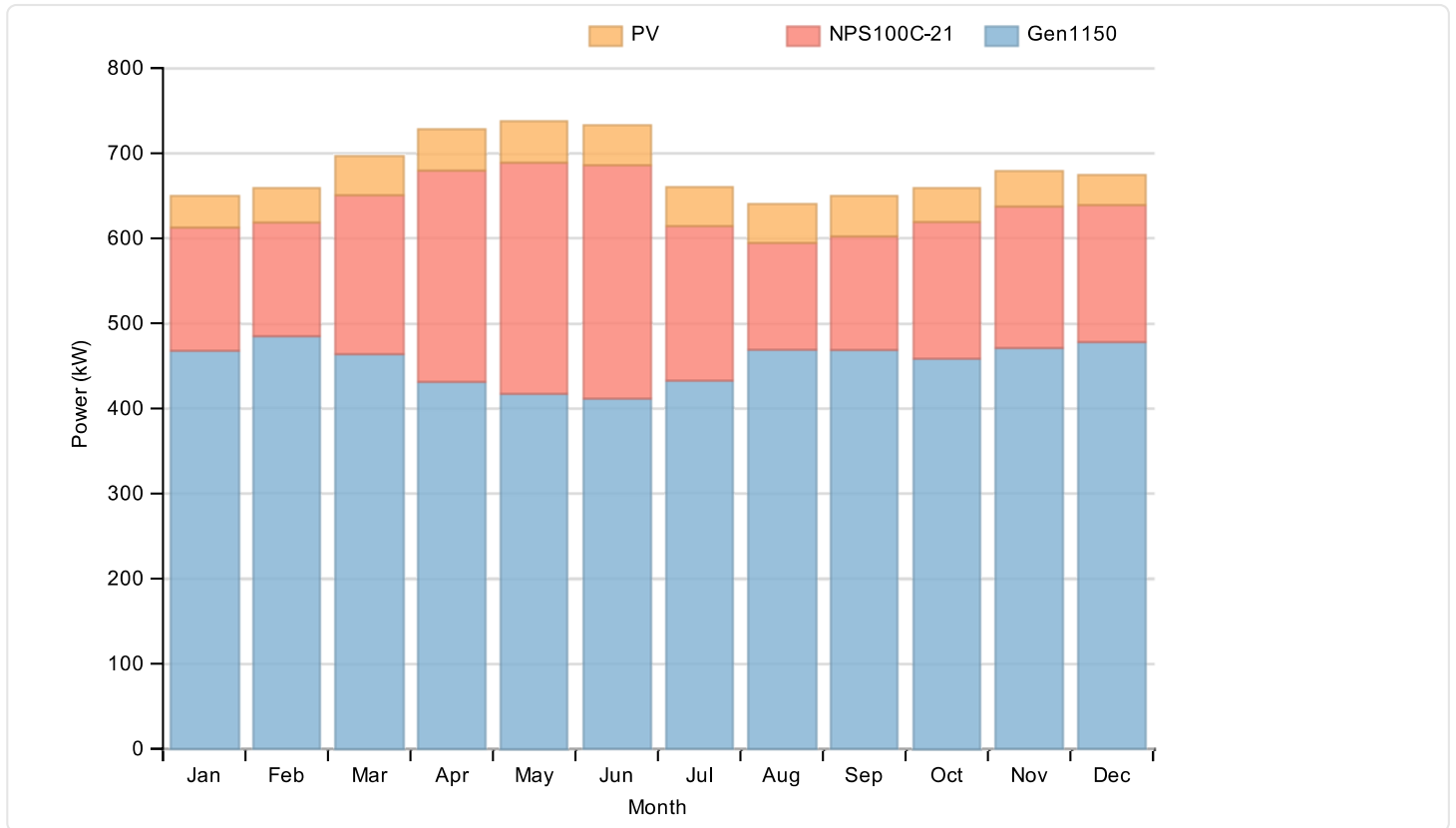
Electrical

Quantity	Value	Units
Excess electricity	735566	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	375,052	6
Generator	3,983,576	67
Wind Turbine	1,601,808	27
Total	5,960,437	100

Load	Consumption(kWh/yr)	Fraction (%)
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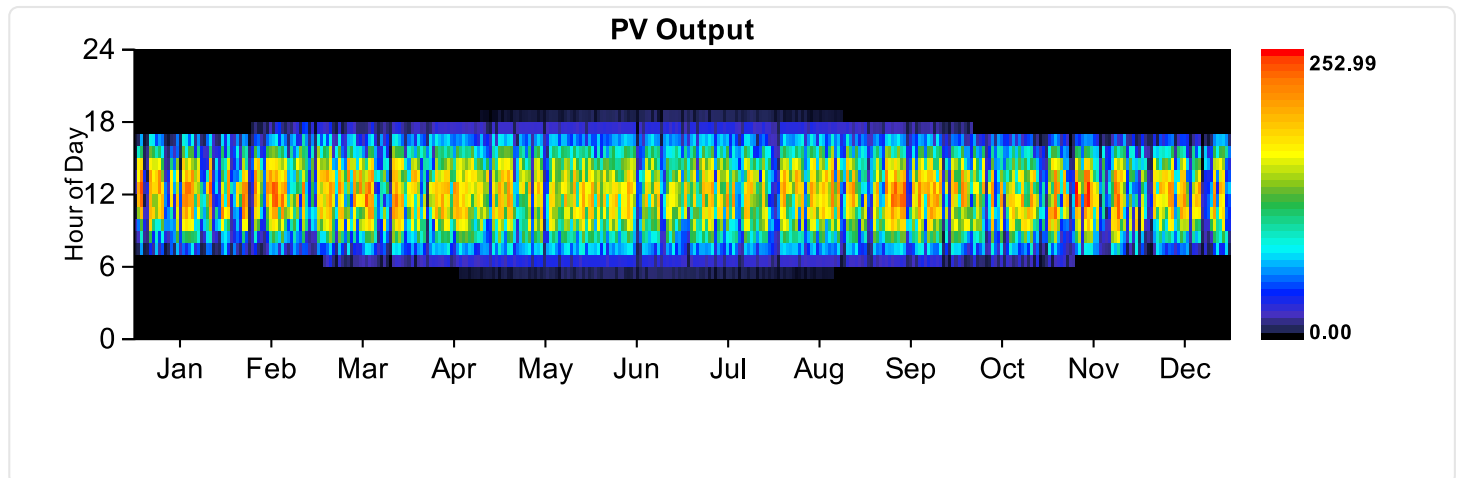
AC primary load	5,205,935	100
DC primary load	0	0
Total	5,205,935	100



PV:Generic flat plate PV

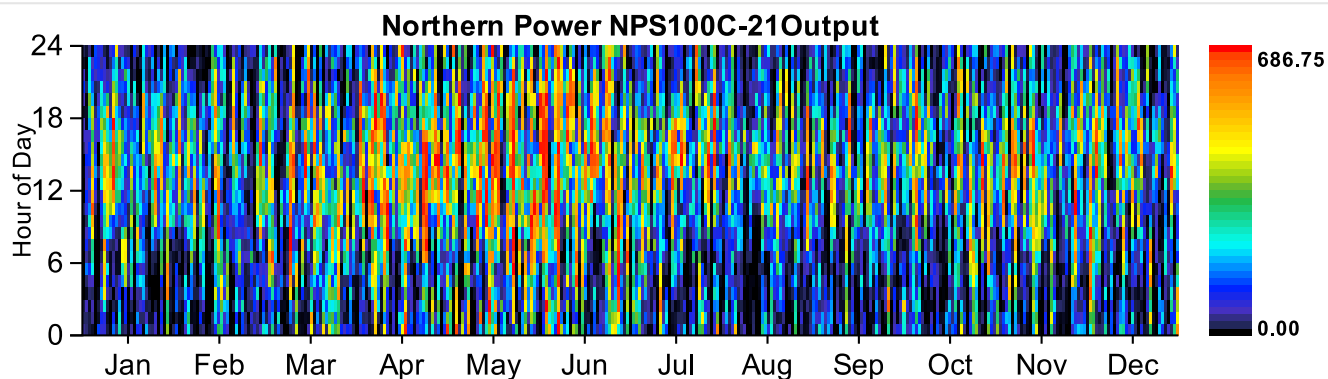
Quantity	Value	Units
Rated capacity	250	kW
Mean output	43	kW
Mean output	1027.50	kWh/d
Capacity factor	17.13	%
Total production	375052	kWh/yr
Minimum output	0.00	kW
Maximum output	252.99	kW

PV penetration	7.20	%
Hours of operation	4386	hrs/yr
Levelized cost	0.168	\$/kWh



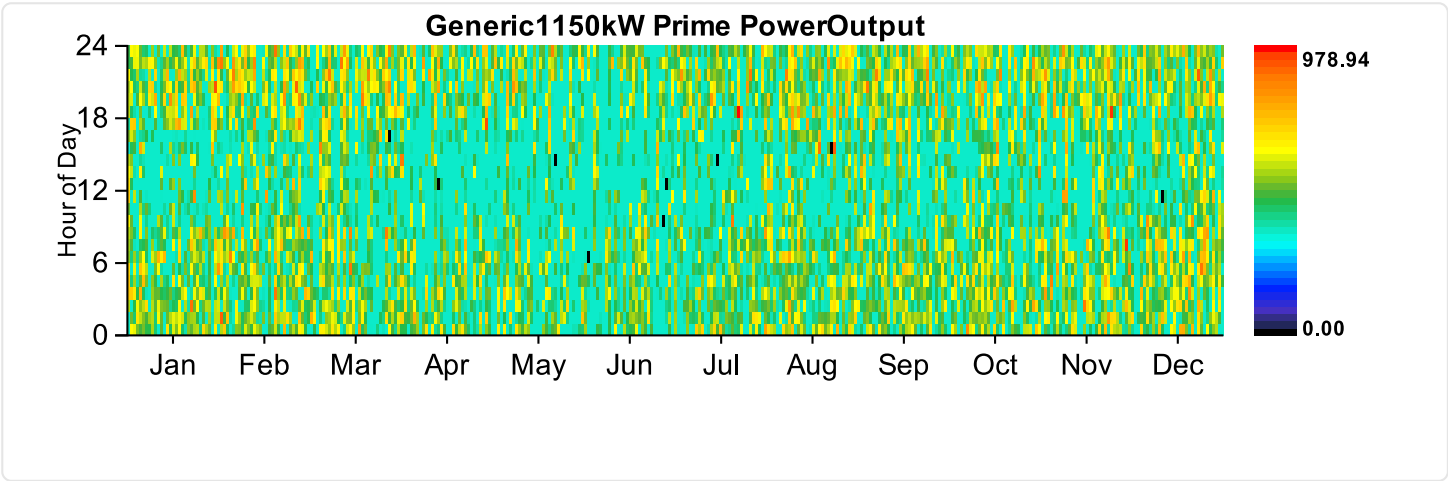
Wind Turbine:Northern Power NPS100C-21

Quantity	Value	Units
Total rated capacity	700	kW
Mean output	183	kW
Capacity factor	26.12	%
Total production	1601808	kWh/yr
Minimum output	0.00	kW
Maximum output	686.75	kW
Wind penetration	30.77	%
Hours of operation	8108	hrs/yr
Levelized cost	0.379	\$/kWh



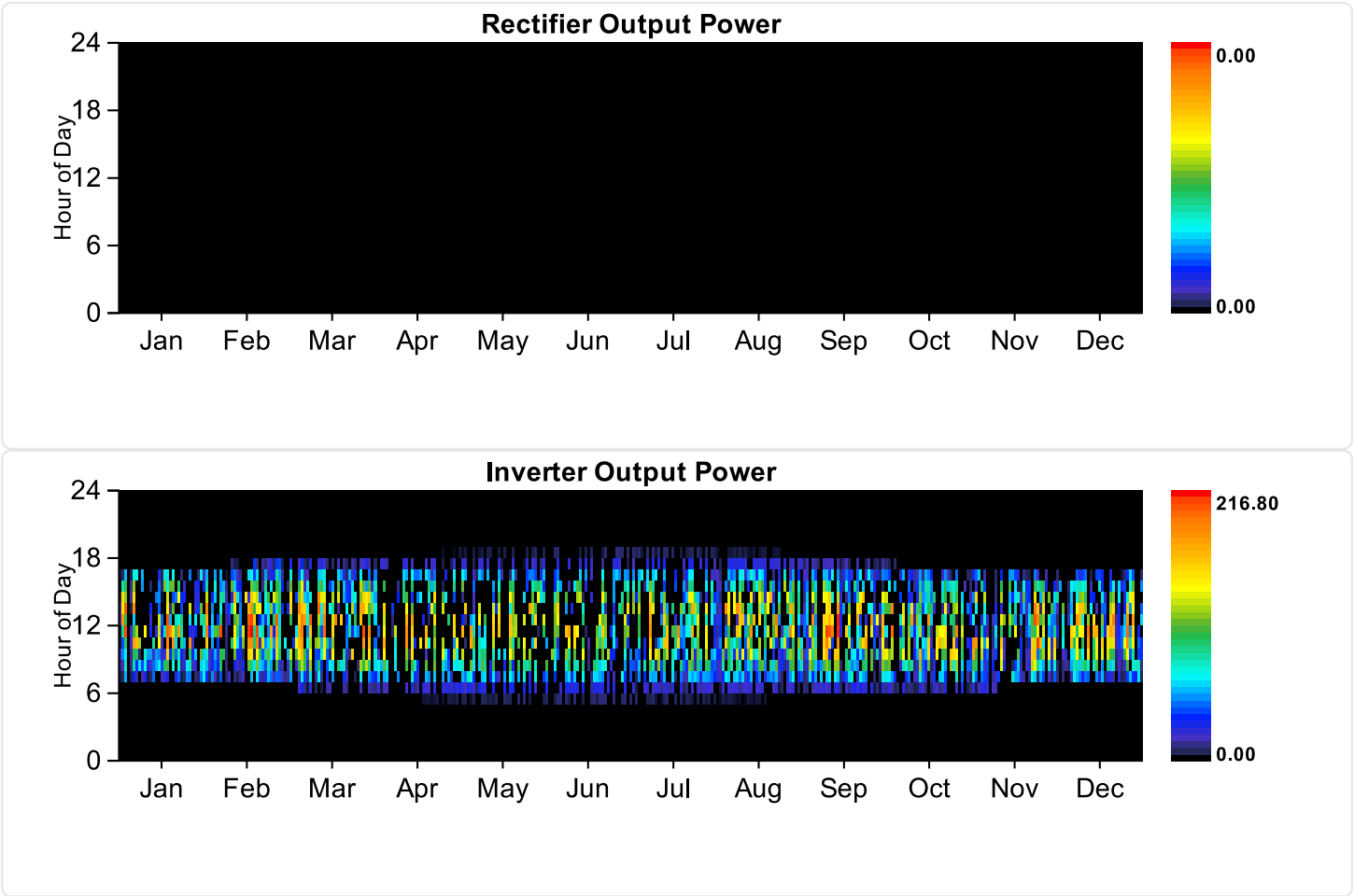
Generator:Generic1150kW Prime Power

Quantity	Value	Units
Hours of operation	8751	hrs/yr
Number of starts	10	starts/yr
Operational life	2	yr
Fixed generation cost	56.14	\$/hr
Marginal generation cost	0.26	\$/kWh
Electrical production	3983576	kWh/yr
Mean electrical output	455	kW
Min. electrical output	345	kW
Max. electrical output	979	kW
Fuel consumption	1035697	L/yr
Specific fuel consumption	0.26	L/kWh
Fuel energy input	10191258	kWh/yr
Mean electrical efficiency	39	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	500	450	kW
Mean output	19	0	kW
Minimum output	0	0	kW
Maximum output	217	0	kW
Capacity factor	4	0	%
Hours of operation	2,661	0	hrs/yr
Energy in	189,274	0	kWh/yr
Energy out	170,347	0	kWh/yr
Losses	18,927	0	kWh/yr



Emissions

Pollutant	Emissions	Units
Carbon dioxide	2718202	kg/yr
Carbon monoxide	11393	kg/yr
Unburned hydrocarbons	1305	kg/yr
Particulate matter	326	kg/yr
Sulfur dioxide	5597	kg/yr
Nitrogen oxides	11393	kg/yr

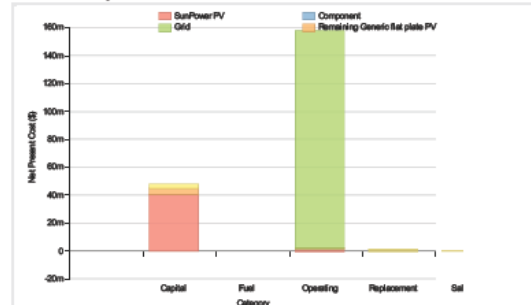
Appendix B – China Lake Scenarios

System Report

System architecture

PV	SunPower PV	13,780 kW
PV #2	Remaining Generic flat plate PV	1,547 kW
Converter	System Converter	10,000 kW
Grid	Grid	27,200 kW
Dispatch Strategy	Cycle Charging	

Cost summary



Cost Summary

Total net present cost	207103792 \$
Levelized cost of energy	0.169 \$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Grid	0	0	155,698,736	0	0	155,698,736
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	48,036,792	1,272,821	157,694,624	0	-239,558	206,764,679

Annualized Costs

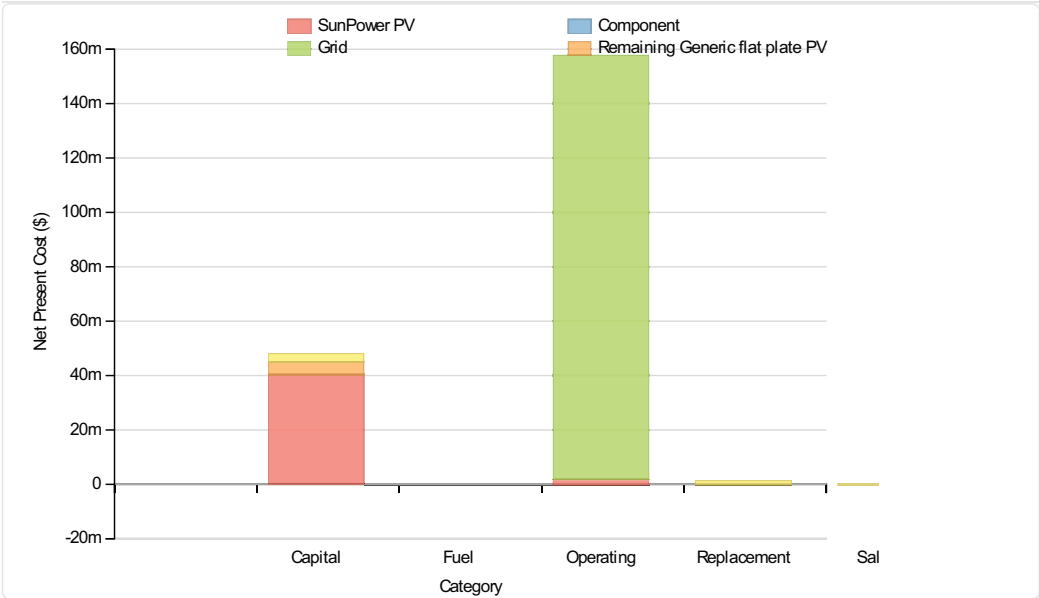
Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Grid	0	0	12,043,979	0	0	12,043,979

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	207103792	\$
Levelized cost of energy	0.169	\$/kWh

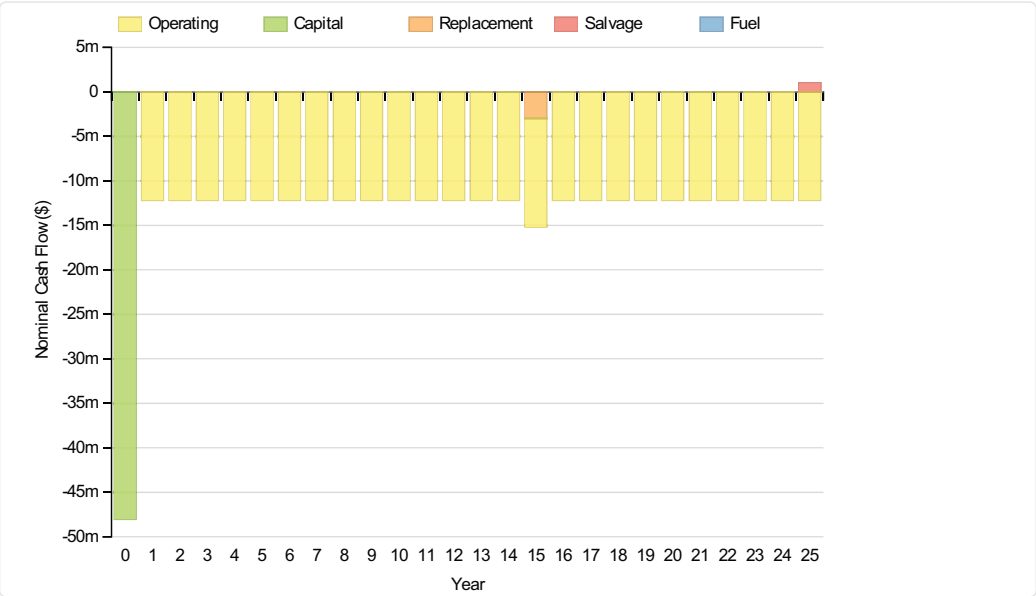
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Grid	0	0	155,698,736	0	0	155,698,736
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	48,036,792	1,272,821	157,694,624	0	-239,558	206,764,679

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Grid	0	0	12,043,979	0	0	12,043,979

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Converter	232,063	98,458	0	0	18,531	311,990
System	3,715,856	98,458	12,198,370	0	-18,531	15,994,153

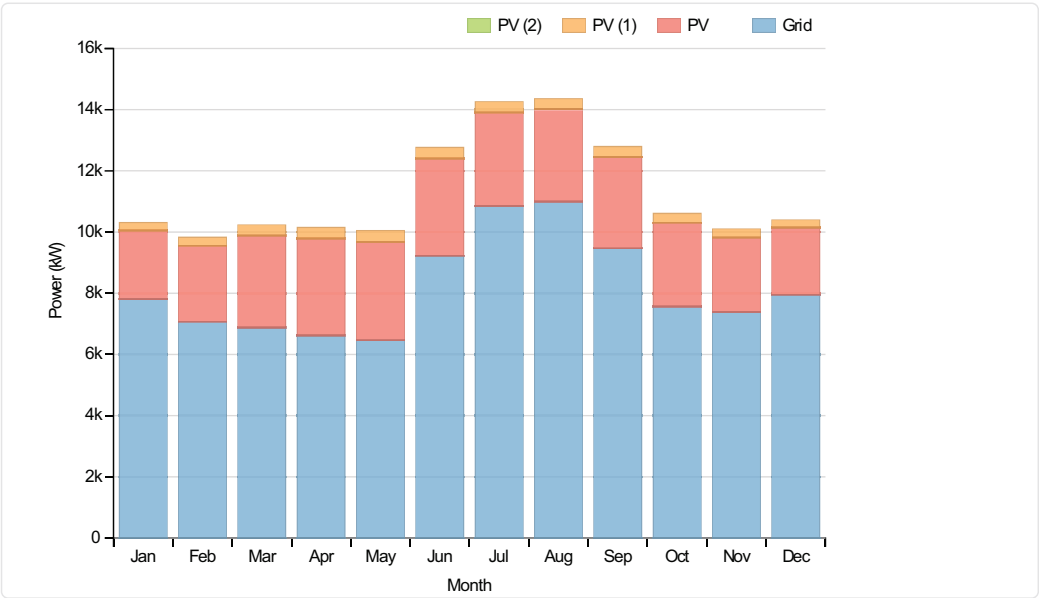


Electrical

Quantity	Value	Units
Excess electricity	1613916	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

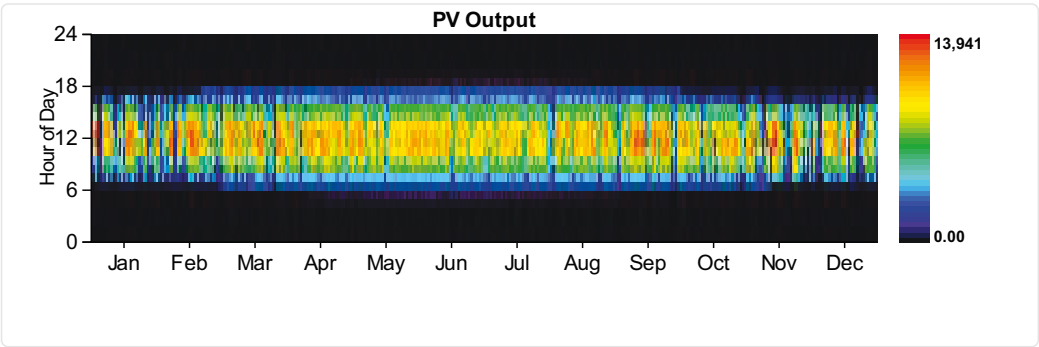
Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Grid Purchases	71,835,160	72
Total	99,246,256	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0
Total	95,052,456	100



PV:SunPower PV

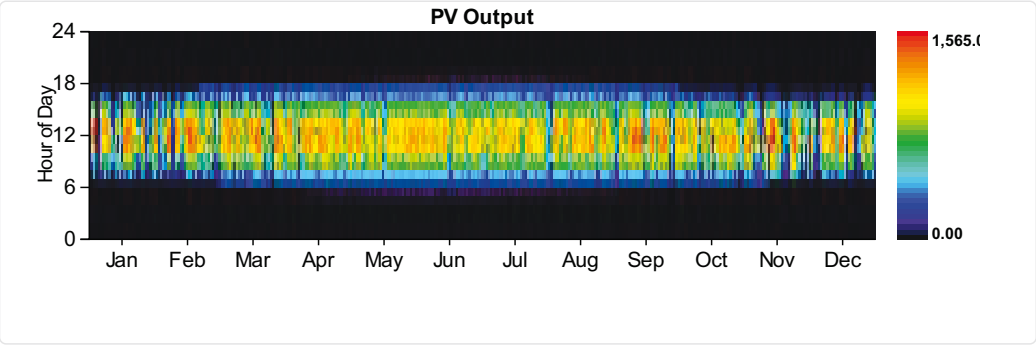
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

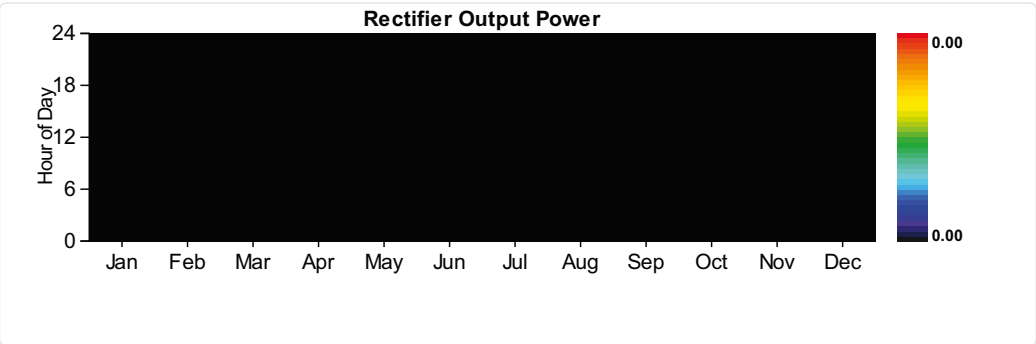
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%

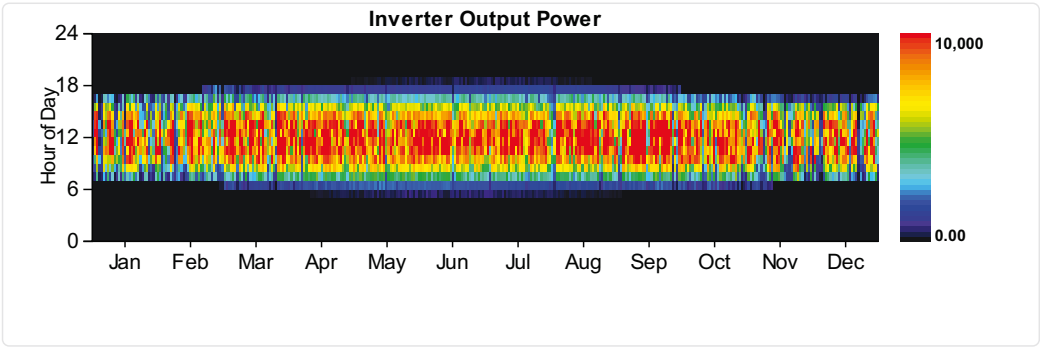
Quantity	Value	Units
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,650	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	27	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	25,797,274	0	kWh/yr
Energy out	23,217,452	0	kWh/yr
Losses	2,579,822	0	kWh/yr





Grid

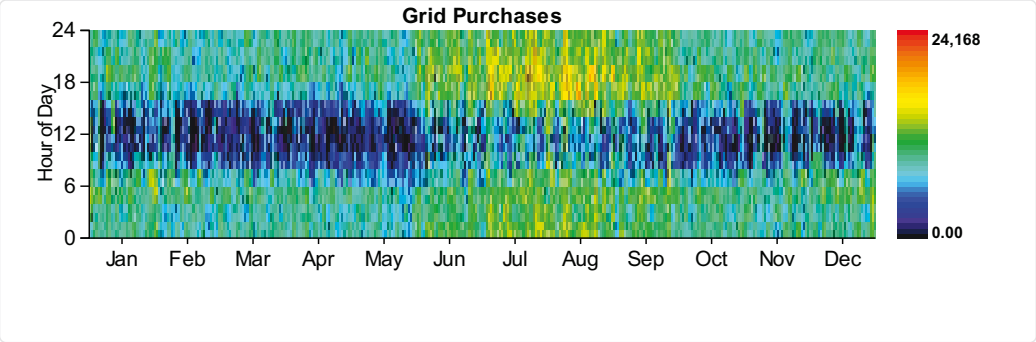
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685
March	0	0	0	17,075	0	273,199
April	0	0	0	14,394	0	230,299
May	0	0	0	14,850	0	237,602
June	0	0	0	20,019	0	320,305
July	0	0	0	24,169	0	386,703
August	0	0	0	22,951	0	367,211
September	0	0	0	18,833	0	301,321
October	0	0	0	16,050	0	256,794
November	0	0	0	15,751	0	252,018
December	0	0	0	17,148	0	274,366
Annual	0	0	0	24,169	0	3,423,765

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,808,431	0	5,808,431	0	697,012	0
February	4,748,350	0	4,748,350	0	569,802	0
March	5,124,164	0	5,124,164	0	614,900	0
April	4,760,968	0	4,760,968	0	571,316	0
May	4,811,302	0	4,811,302	0	577,356	0
June	6,639,290	0	6,639,290	0	796,715	0
July	8,073,620	0	8,073,620	0	968,834	0
August	8,188,394	0	8,188,394	0	982,607	0

September	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
October	5,631,799	0	5,631,799	0	675,816	0
November	5,318,139	0	5,318,139	0	638,177	0
December	5,911,110	0	5,911,110	0	709,333	0
Annual	71,835,160	0	71,835,160	0	8,620,220	0



Emissions

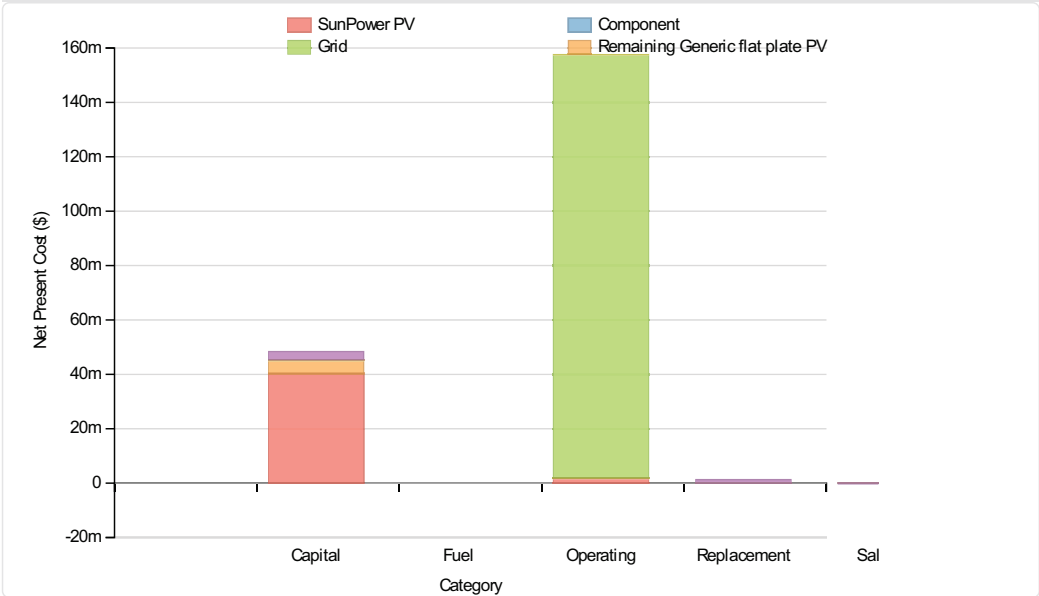
Pollutant	Emissions	Units
Carbon dioxide	45399820	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	196828	kg/yr
Nitrogen oxides	96259	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	207291696	\$
Levelized cost of energy	0.169	\$/kWh

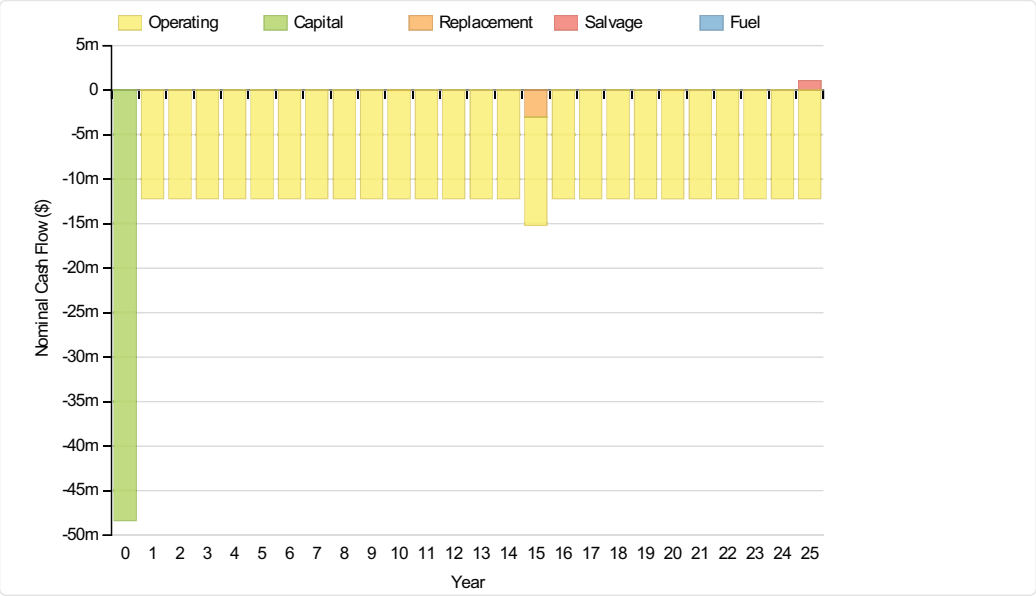
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Grid	0	0	155,524,832	0	0	155,524,832
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	48,361,380	1,279,996	157,551,744	0	-240,530	206,952,590

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061

Component	Remaining Generic flat plate PV	Capital 361,899	Replacement 0	O&M 26,224	Fuel 0	Salvage 0	Total 388,123
Grid		0	0	12,030,527	0	0	12,030,527
GS200 flow		25,108	555	2,400	0	-75	27,988
Converter		232,063	98,458	0	0	-18,531	311,990
System		3,740,965	99,013	12,187,317	0	-18,606	16,008,689

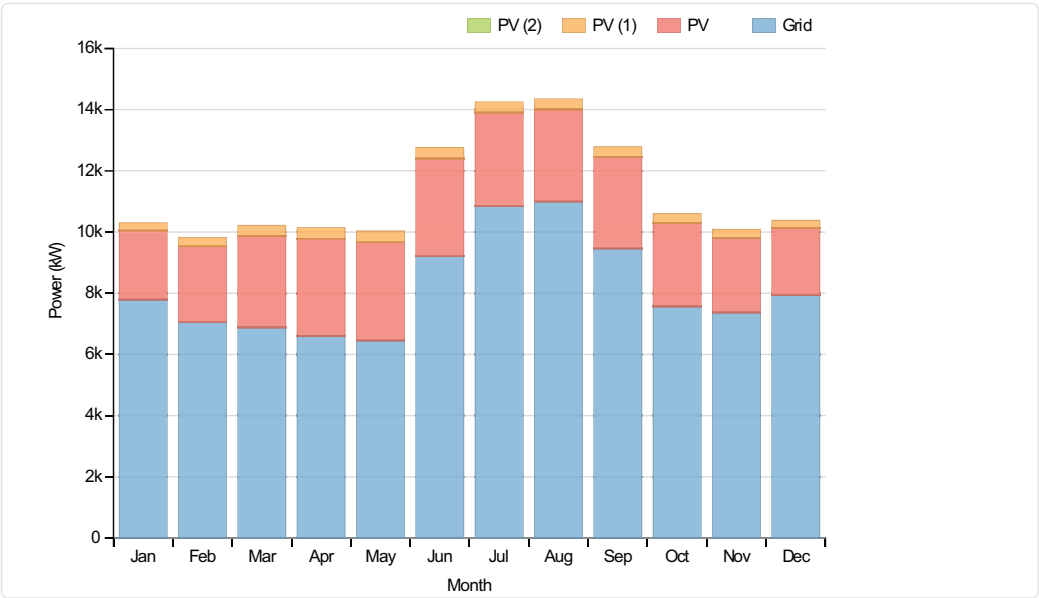


Electrical

Quantity	Value	Units
Excess electricity	1471749	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

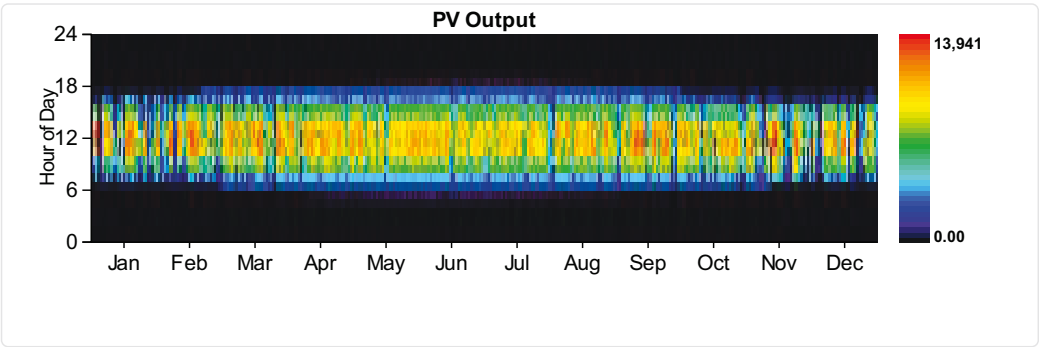
Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Grid Purchases	71,745,144	72
Total	99,156,240	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0
Total	95,052,456	100



PV:SunPower PV

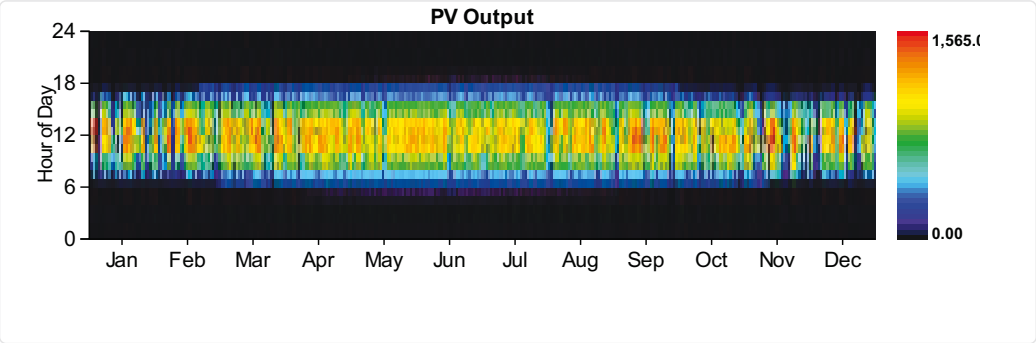
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%

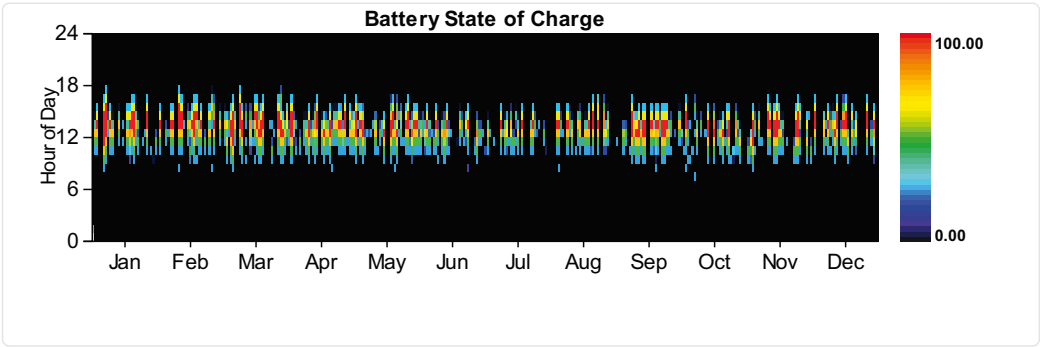
Quantity	Value	Units
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



Battery:GS200 flow

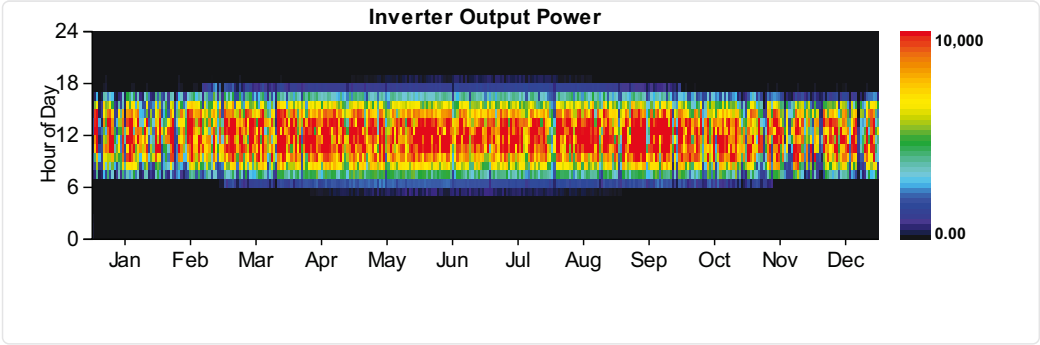
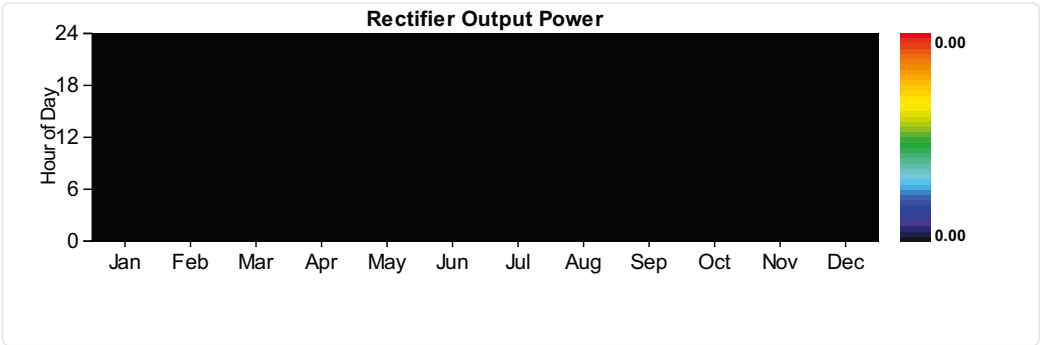
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	142166	kWh/yr
Energy out	100019	kWh/yr
Storage depletion	600	kWh/yr
Losses	41547	kWh/yr
Annual throughput	119545	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,661	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	27	0	%
Hours of operation	4,471	0	hrs/yr
Energy in	25,897,278	0	kWh/yr
Energy out	23,307,446	0	kWh/yr
Losses	2,589,832	0	kWh/yr



Grid

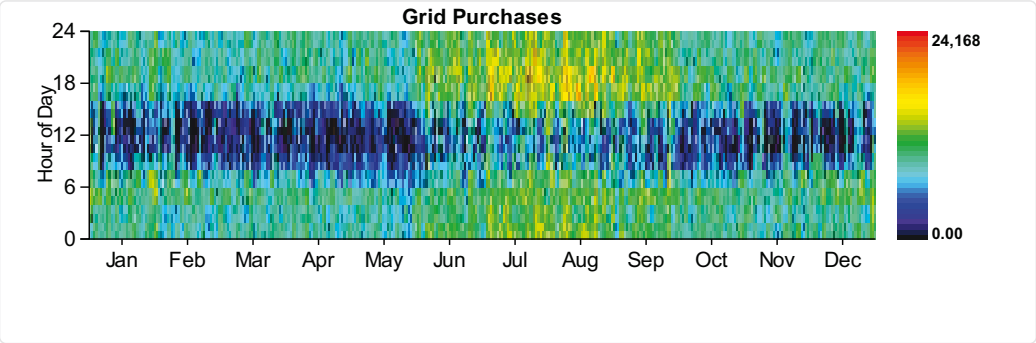
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685

March	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	0	0	0	17,075	0	273,199
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
May	0	0	0	14,850	0	237,602
June	0	0	0	20,019	0	320,305
July	0	0	0	24,169	0	386,703
August	0	0	0	22,785	0	364,561
September	0	0	0	18,833	0	301,321
October	0	0	0	16,050	0	256,794
November	0	0	0	15,751	0	252,018
December	0	0	0	17,148	0	274,366
Annual	0	0	0	24,169	0	3,421,115

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,801,195	0	5,801,195	0	696,143	0
February	4,740,909	0	4,740,909	0	568,909	0
March	5,114,871	0	5,114,871	0	613,785	0
April	4,751,667	0	4,751,667	0	570,200	0
May	4,801,942	0	4,801,942	0	576,233	0
June	6,632,296	0	6,632,296	0	795,875	0
July	8,068,444	0	8,068,444	0	968,213	0
August	8,182,007	0	8,182,007	0	981,841	0
September	6,811,501	0	6,811,501	0	817,380	0
October	5,624,914	0	5,624,914	0	674,990	0
November	5,310,932	0	5,310,932	0	637,312	0
December	5,904,472	0	5,904,472	0	708,537	0
Annual	71,745,144	0	71,745,144	0	8,609,417	0



Emissions

EMISSIONS

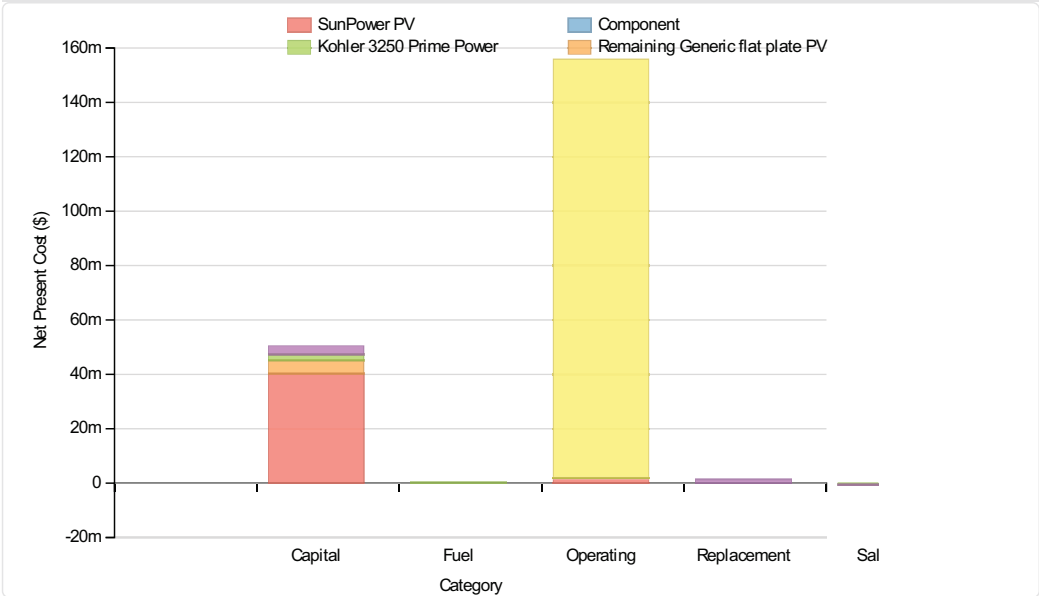
Pollutant	Emissions	Units
Carbon dioxide	45342932	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	196582	kg/yr
Nitrogen oxides	96138	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Generator	Kohler 3250 Prime Power	2,800	kW
Converter	System Converter	10,000	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	207309664	\$
Levelized cost of energy	0.169	\$/kWh

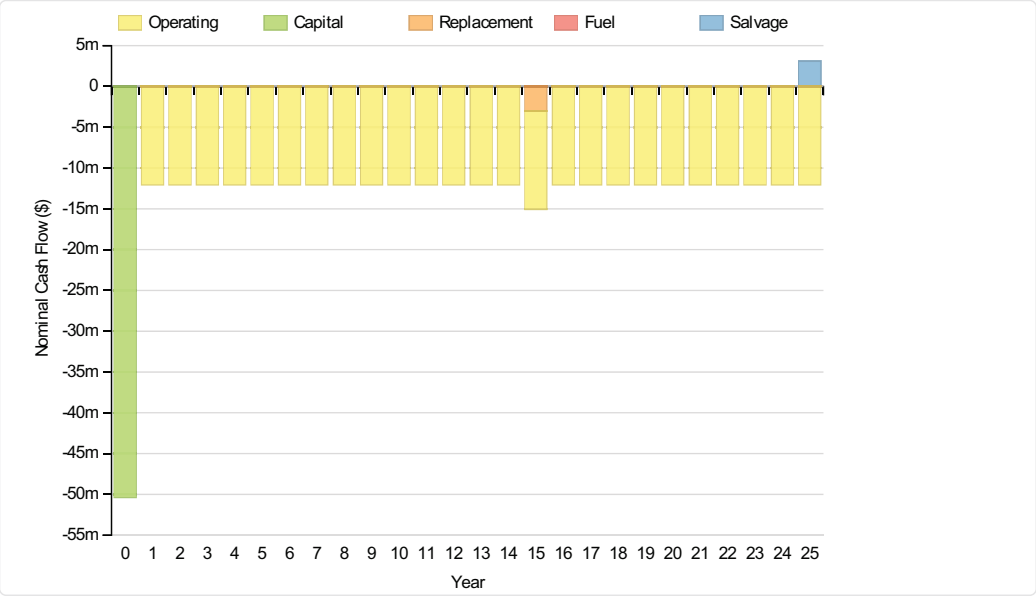
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Kohler 3250 Prime Power	2,350,000	0	41,055	181,737	-488,837	2,083,955
Grid	0	0	153,820,640	0	0	153,820,640
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	50,386,792	1,272,821	155,857,632	181,737	-728,395	206,970,587

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061

Component	Generic flat plate PV	Capital 261,899	Replacement 0	O&M 26,224	Fuel 0	Salvage 0	Total 388,123
	Kohler 3250 Prime Power	181,783	0	3,176	14,058	-37,814	161,203
	Grid	0	0	11,898,700	0	0	11,898,700
	Converter	232,063	98,458	0	0	-18,531	311,990
	System	3,897,639	98,458	12,056,270	14,058	-56,345	16,010,080

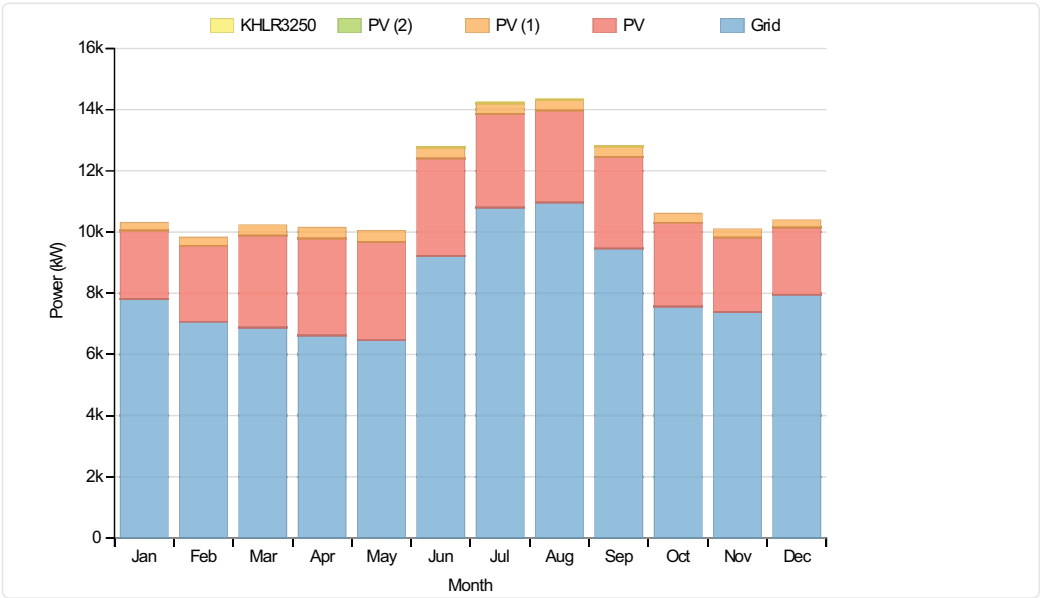


Electrical

Quantity	Value	Units
Excess electricity	1613916	kWh/yr
Unmet load	2763	kWh/yr
Capacity shortage	35688	kWh/yr
Renewable fraction	0	

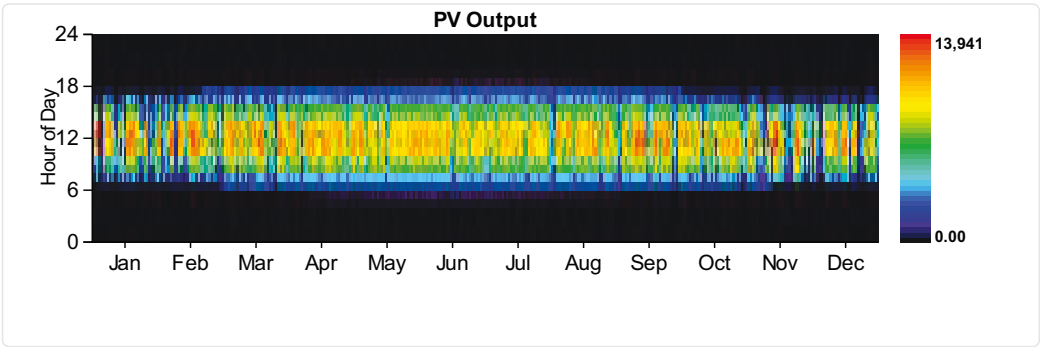
Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Generator	71,939	0
Grid Purchases	71,760,464	72
Total	99,243,496	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,049,688	100
DC primary load	0	0
Total	95,049,688	100



PV:SunPower PV

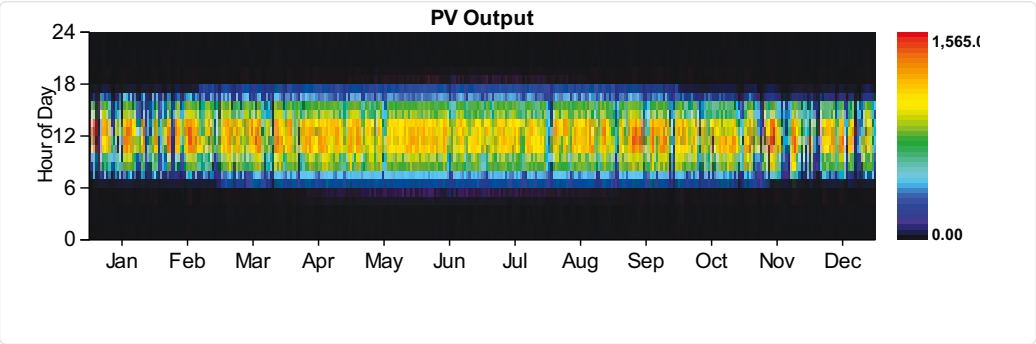
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

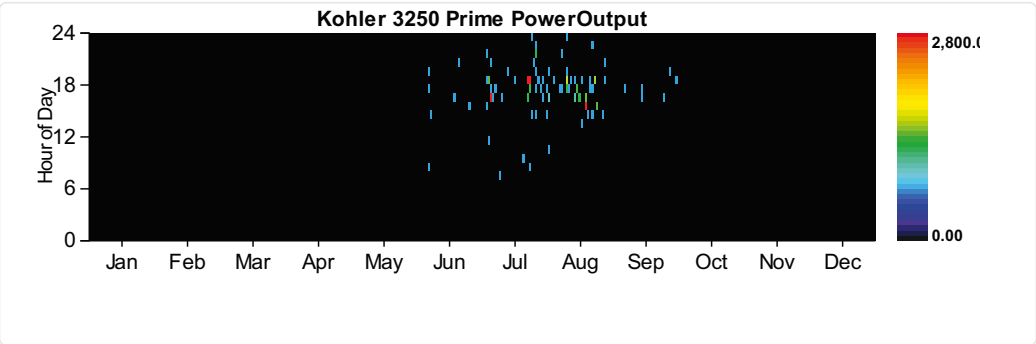
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%

Quantity	Value	Units
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



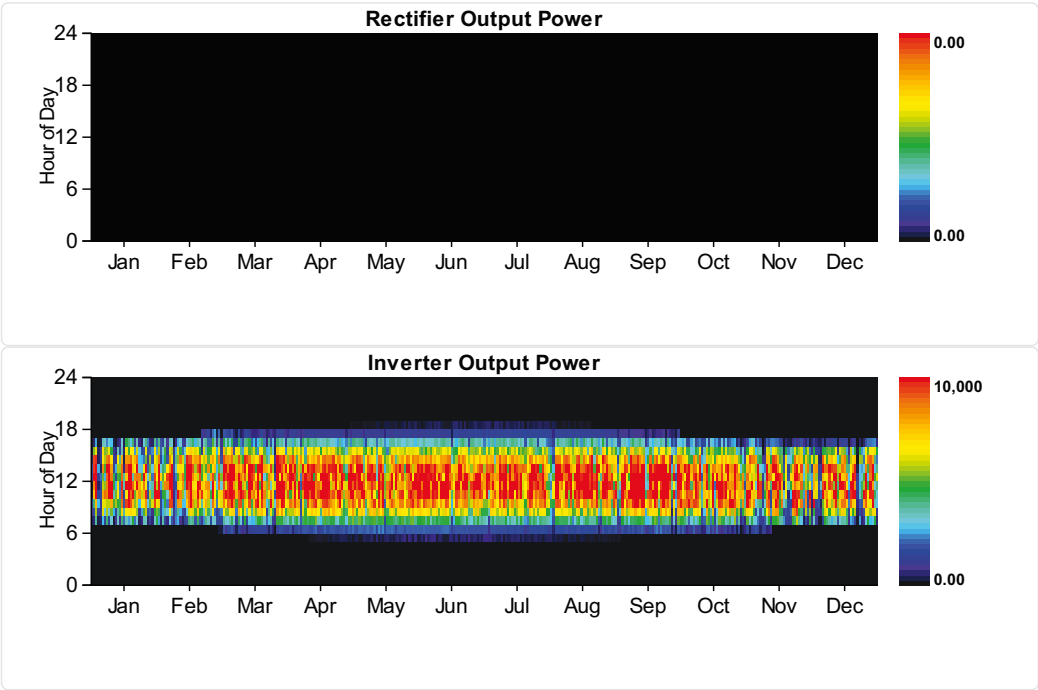
Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	79	hrs/yr
Number of starts	71	starts/yr
Operational life	190	yr
Fixed generation cost	207.82	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	71939	kWh/yr
Mean electrical output	911	kW
Min. electrical output	700	kW
Max. electrical output	2800	kW
Fuel consumption	17795	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	175104	kWh/yr
Mean electrical efficiency	41	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,650	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	27	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	25,797,274	0	kWh/yr
Energy out	23,217,452	0	kWh/yr
Losses	2,579,822	0	kWh/yr



Grid

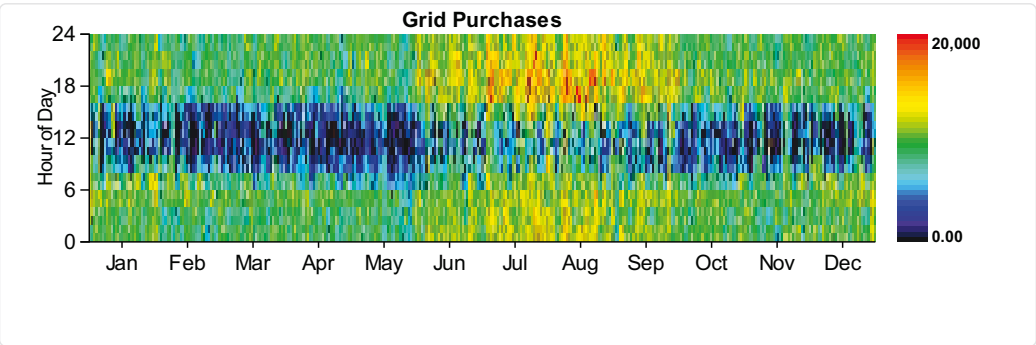
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685
March	0	0	0	17,075	0	273,199
April	0	0	0	14,394	0	230,299
May	0	0	0	14,850	0	237,602
June	0	0	0	19,319	0	309,105
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000

September	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	18,133	Energy Charge (\$)	0	Demand Charge (\$)	290,121
October	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	16,950	Energy Charge (\$)	0	Demand Charge (\$)	156,794
November	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	15,751	Energy Charge (\$)	0	Demand Charge (\$)	252,018
December	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	17,148	Energy Charge (\$)	0	Demand Charge (\$)	274,366
Annual	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	20,000	Energy Charge (\$)	0	Demand Charge (\$)	3,287,451

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,808,431	0	5,808,431	0	697,012	0
February	4,748,350	0	4,748,350	0	569,802	0
March	5,124,164	0	5,124,164	0	614,900	0
April	4,760,968	0	4,760,968	0	571,316	0
May	4,811,302	0	4,811,302	0	577,356	0
June	6,634,390	0	6,634,390	0	796,127	0
July	8,039,810	0	8,039,810	0	964,777	0
August	8,156,603	0	8,156,603	0	978,792	0
September	6,815,398	0	6,815,398	0	817,848	0
October	5,631,799	0	5,631,799	0	675,816	0
November	5,318,139	0	5,318,139	0	638,177	0
December	5,911,110	0	5,911,110	0	709,333	0
Annual	71,760,464	0	71,760,464	0	8,611,256	0



Emissions

Pollutant	Emissions	Units
Carbon dioxide	45399316	kg/yr
Carbon monoxide	196	kg/yr
Unburned hydrocarbons	22	kg/yr
Particulate matter	6	kg/yr
Sulfur dioxide	196720	kg/yr

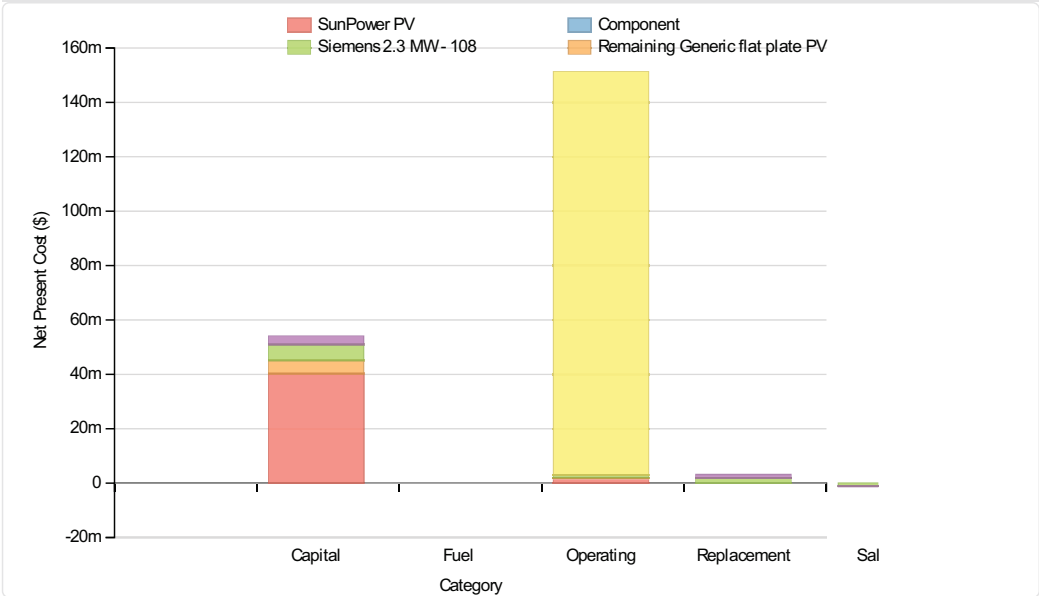
Pollutant	Emissions	Units
Refrigerant	96355	kg

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	207496480	\$
Levelized cost of energy	0.169	\$/kWh

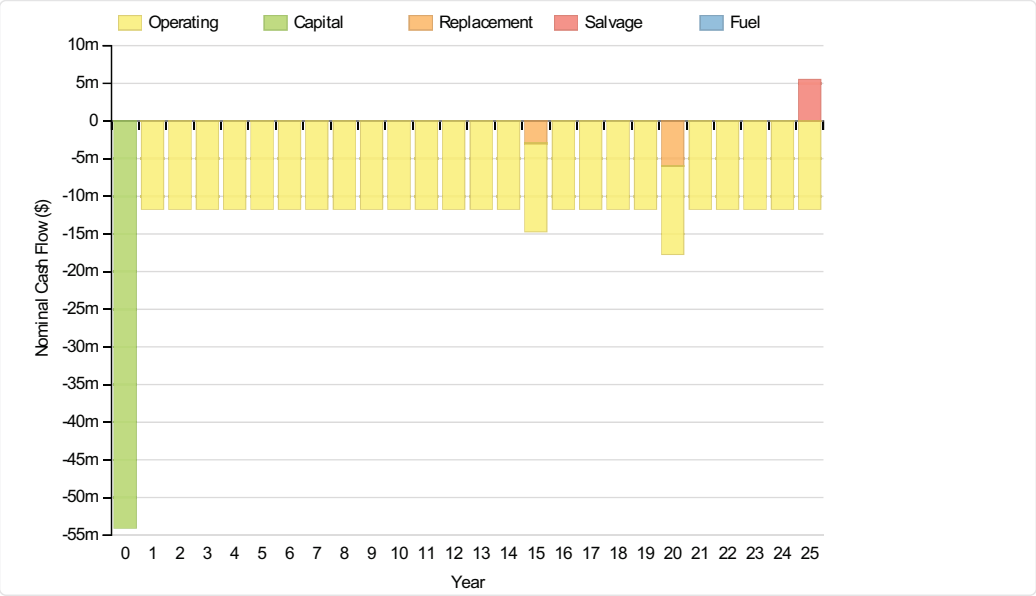
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Grid	0	0	148,287,040	0	0	148,287,040
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	54,036,792	3,185,663	151,252,480	0	-1,317,567	207,157,368

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Grid	0	0	11,470,652	0	0	11,470,652
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,179,983	246,425	11,700,042	0	-101,920	16,024,530

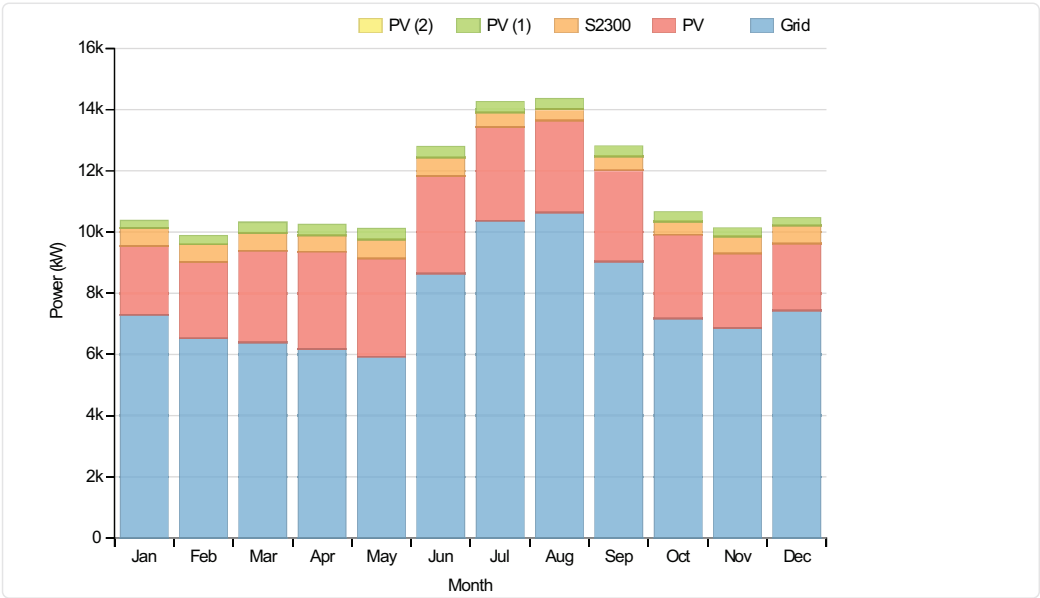


Electrical

Quantity	Value	Units
Excess electricity	2091590	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

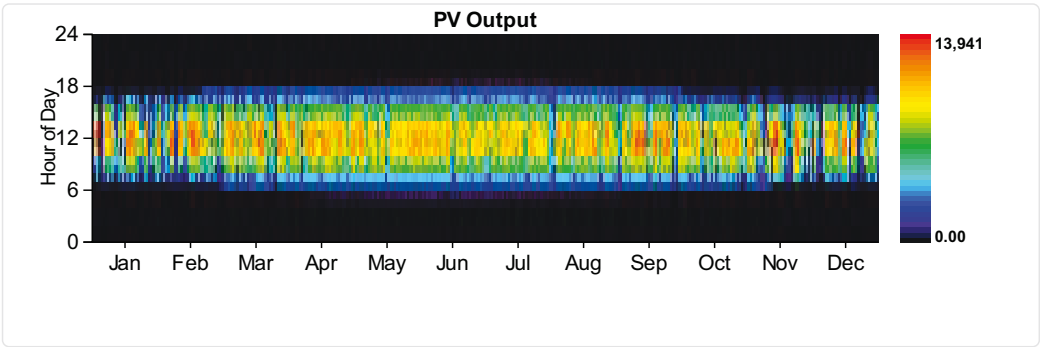
Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Wind Turbine	4,674,352	5
Grid Purchases	67,590,728	68
Total	99,676,176	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0
Total	95,052,456	100



PV:SunPower PV

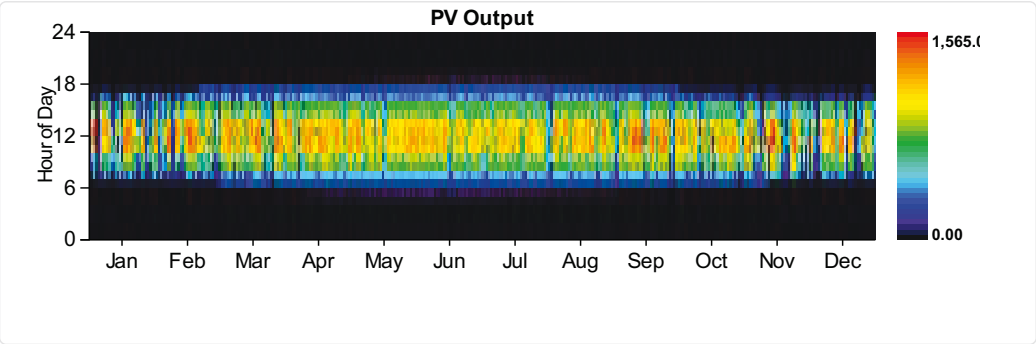
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%

Quantity	Value	Units
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



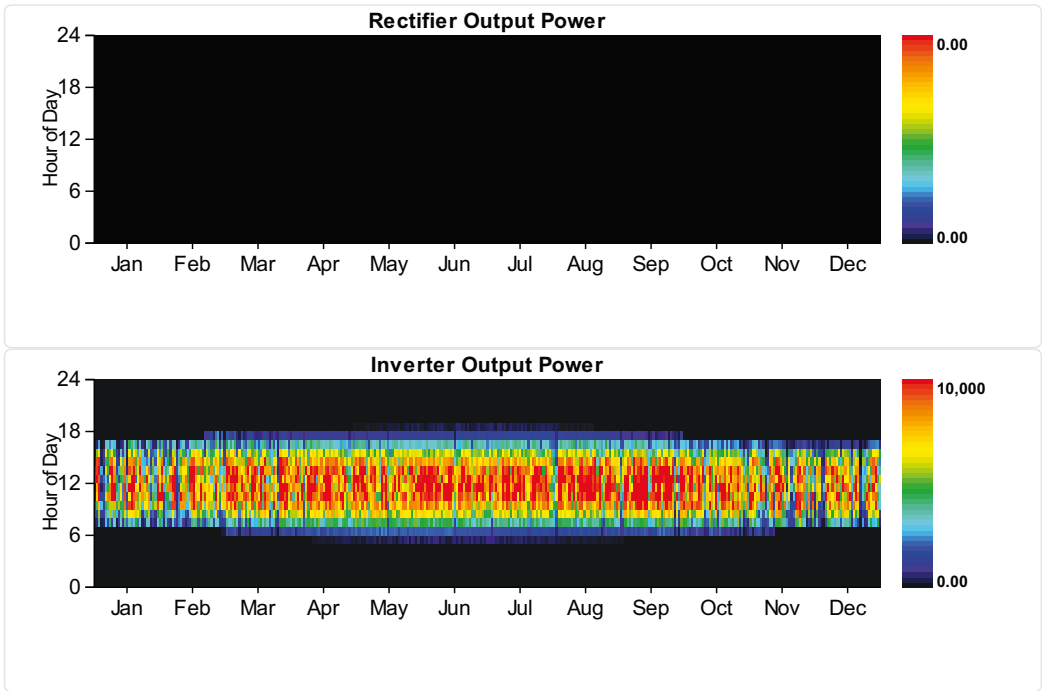
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,601	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	26	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	25,319,570	0	kWh/yr
Energy out	22,787,530	0	kWh/yr

Quantity	Inverter	2,532,040	Rectifier	0	Units
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Grid

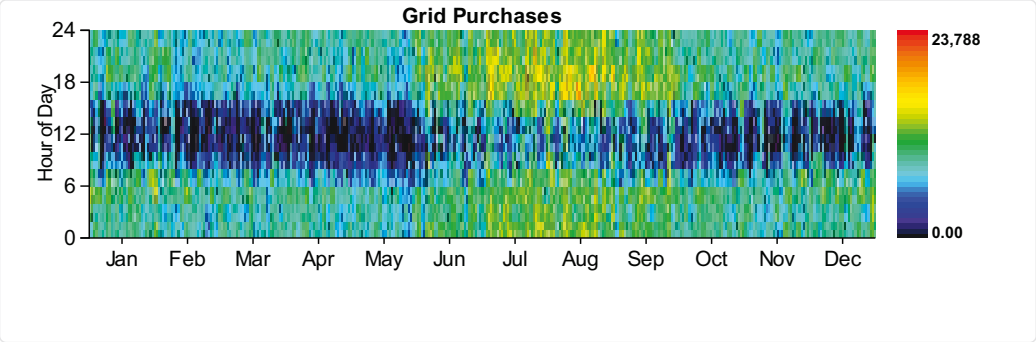
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	16,288	0	260,605
February	0	0	0	15,654	0	250,459
March	0	0	0	17,043	0	272,688
April	0	0	0	14,366	0	229,856
May	0	0	0	13,700	0	219,202
June	0	0	0	20,004	0	320,060
July	0	0	0	23,789	0	380,622
August	0	0	0	22,424	0	358,782
September	0	0	0	18,548	0	296,765
October	0	0	0	16,023	0	256,374
November	0	0	0	15,278	0	244,445
December	0	0	0	16,870	0	269,913
Annual	0	0	0	23,789	0	3,359,769

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,427,674	0	5,427,674	0	651,321	0
February	4,390,087	0	4,390,087	0	526,810	0

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
March	4,752,956	0	4,752,956	0	570,355	0
April	4,446,749	0	4,446,749	0	533,610	0
May	4,404,201	0	4,404,201	0	528,504	0
June	6,220,404	0	6,220,404	0	746,448	0
July	7,713,463	0	7,713,463	0	925,616	0
August	7,915,288	0	7,915,288	0	949,835	0
September	6,504,741	0	6,504,741	0	780,569	0
October	5,341,487	0	5,341,487	0	640,978	0
November	4,942,436	0	4,942,436	0	593,092	0
December	5,531,241	0	5,531,241	0	663,749	0
Annual	67,590,728	0	67,590,728	0	8,110,888	0



Emissions

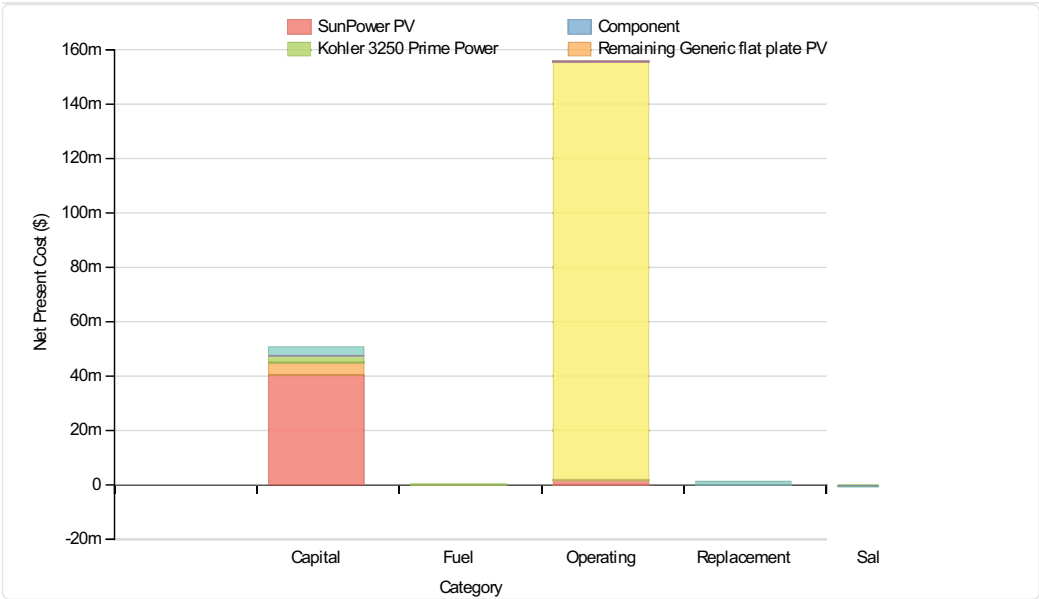
Pollutant	Emissions	Units
Carbon dioxide	42717340	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	185199	kg/yr
Nitrogen oxides	90572	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Generator	Kohler 3250 Prime Power	2,800	kW
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

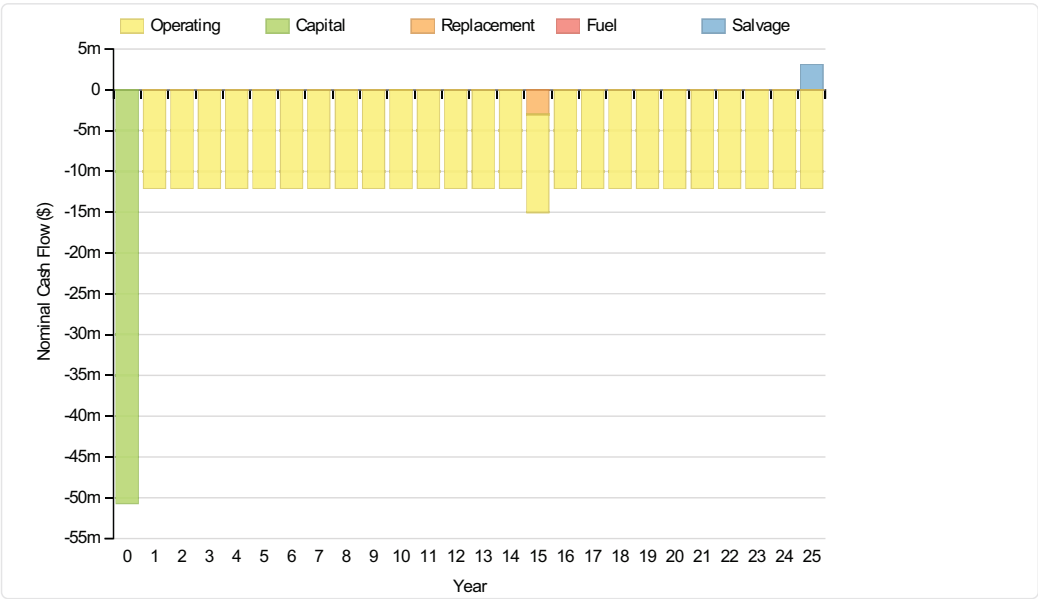
Total net present cost	207545360	\$
Levelized cost of energy	0.169	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Kohler 3250 Prime Power	2,350,000	0	40,535	205,792	-489,775	2,106,552
Grid	0	0	153,671,936	0	0	153,671,936
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	50,711,380	1,279,996	155,739,392	205,792	-730,306	207,206,254

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Kohler 3250 Prime Power	181,783	0	3,136	15,919	-37,886	162,952
Grid	0	0	11,887,197	0	0	11,887,197
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	232,063	98,458	0	0	-18,531	311,990
System	3,922,747	99,013	12,047,124	15,919	-56,492	16,028,311



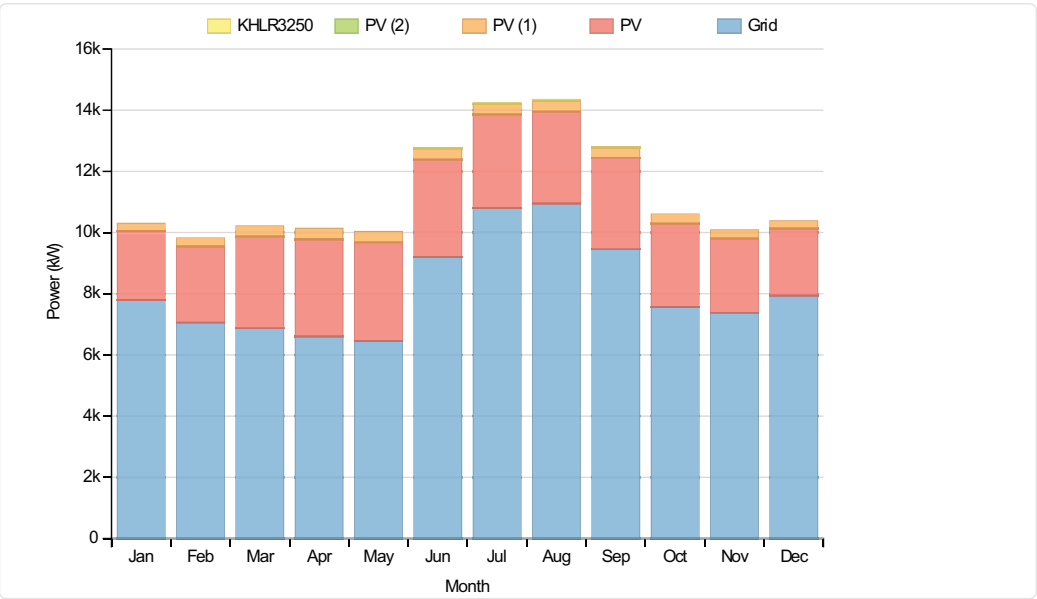
Electrical

Quantity	Value	Units
Excess electricity	1471749	kWh/yr
Unmet load	2499	kWh/yr
Capacity shortage	35008	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Generator	82,145	0
Grid Purchases	71,664,592	72
Total	99,157,832	100

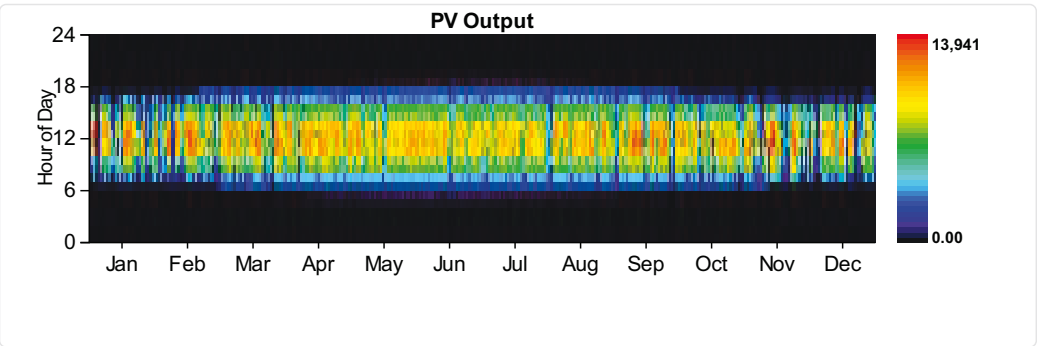
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,049,952	100
DC primary load	0	0

Total	Consumption(kWh/yr)	95,049,952	Fraction (%)	100
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PV:SunPower PV

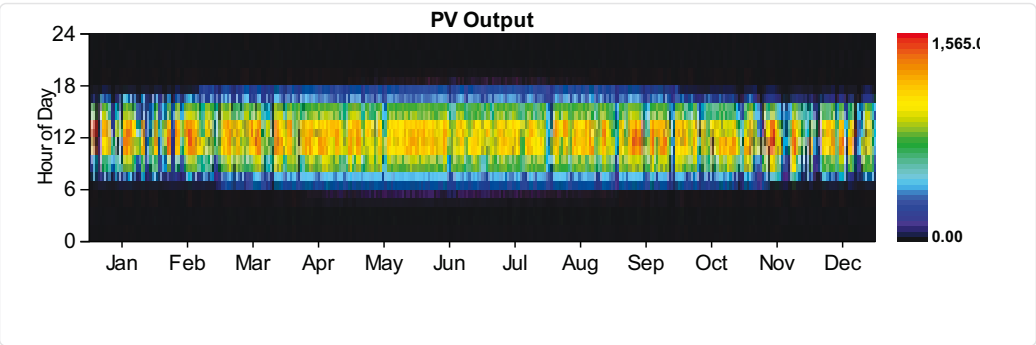
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

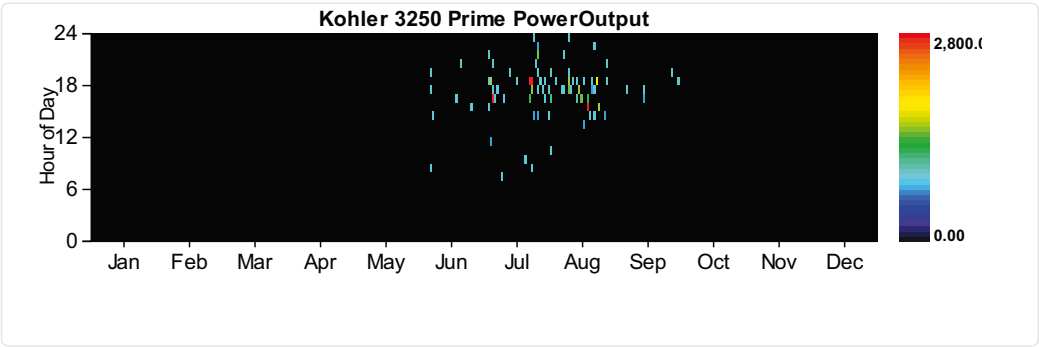
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d

Quantity	Value	Units
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



Generator:Kohler 3250 Prime Power

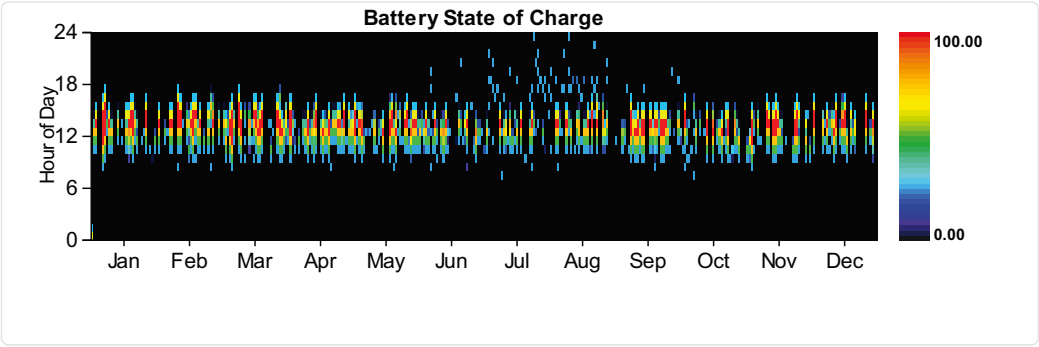
Quantity	Value	Units
Hours of operation	78	hrs/yr
Number of starts	70	starts/yr
Operational life	192	yr
Fixed generation cost	207.82	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	82145	kWh/yr
Mean electrical output	1053	kW
Min. electrical output	700	kW
Max. electrical output	2800	kW
Fuel consumption	20151	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	198282	kWh/yr
Mean electrical efficiency	41	%



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

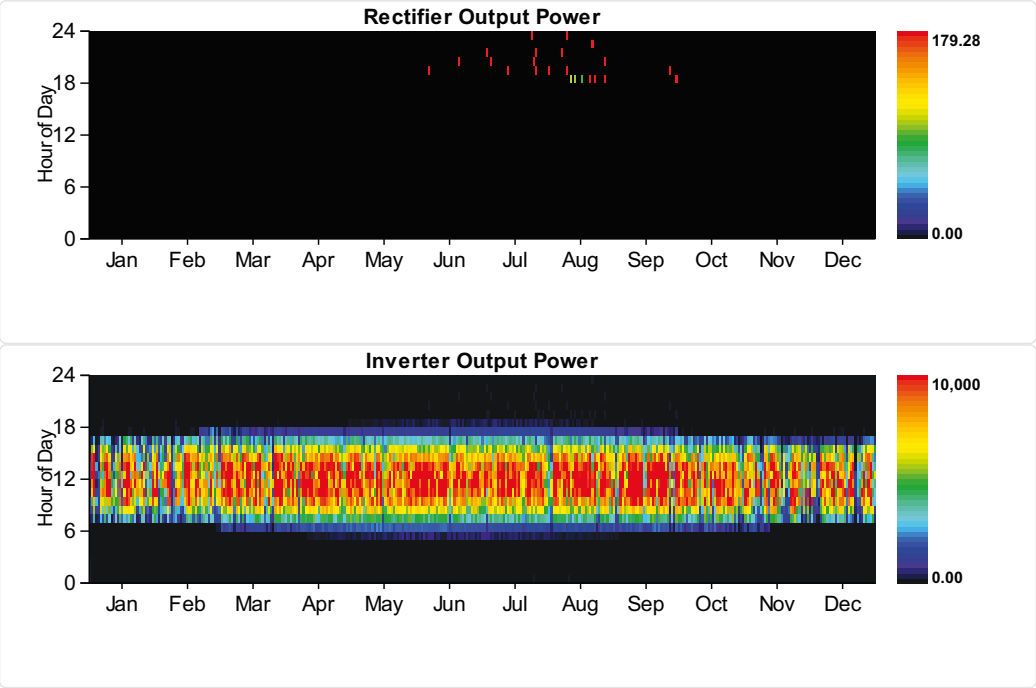
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.010	\$/kWh
Energy in	153371	kWh/yr
Energy out	107862	kWh/yr
Storage depletion	600	kWh/yr
Losses	44909	kWh/yr
Annual throughput	128920	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW

Mean output	Inverter	2,661	Rectifier	0	kW
Minimum output		0		0	kW
Maximum output		10,000		179	kW
Capacity factor		27		0	%
Hours of operation		4,491		23	hrs/yr
Energy in		25,897,782		4,561	kWh/yr
Energy out		23,307,908		3,877	kWh/yr
Losses		2,589,874		684	kWh/yr



Grid

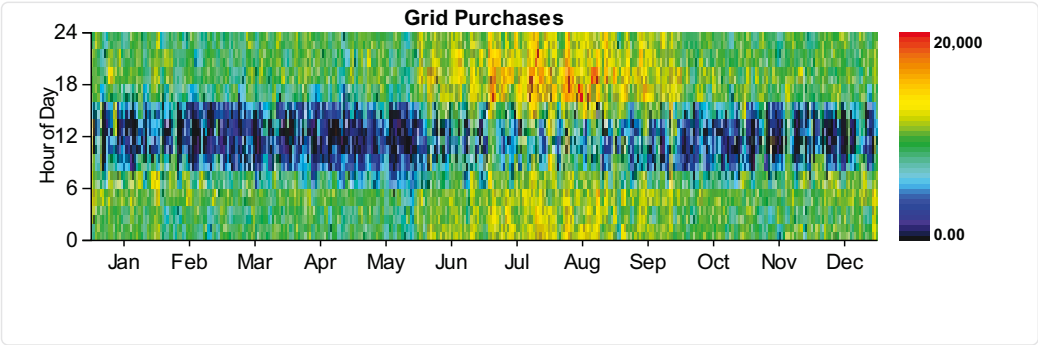
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685
March	0	0	0	17,075	0	273,199
April	0	0	0	14,394	0	230,299
May	0	0	0	14,850	0	237,602
June	0	0	0	19,319	0	309,105
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	18,133	0	290,121
October	0	0	0	16,050	0	256,794

November	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
December	0	0	0	15,751	0	252,018
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
Annual	0	0	0	20,000	0	3,287,451

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,801,195	0	5,801,195	0	696,143	0
February	4,740,909	0	4,740,909	0	568,909	0
March	5,114,871	0	5,114,871	0	613,785	0
April	4,751,667	0	4,751,667	0	570,200	0
May	4,801,942	0	4,801,942	0	576,233	0
June	6,626,605	0	6,626,605	0	795,193	0
July	8,031,922	0	8,031,922	0	963,831	0
August	8,147,624	0	8,147,624	0	977,715	0
September	6,807,550	0	6,807,550	0	816,906	0
October	5,624,914	0	5,624,914	0	674,990	0
November	5,310,932	0	5,310,932	0	637,312	0
December	5,904,472	0	5,904,472	0	708,537	0
Annual	71,664,592	0	71,664,592	0	8,599,752	0



Emissions

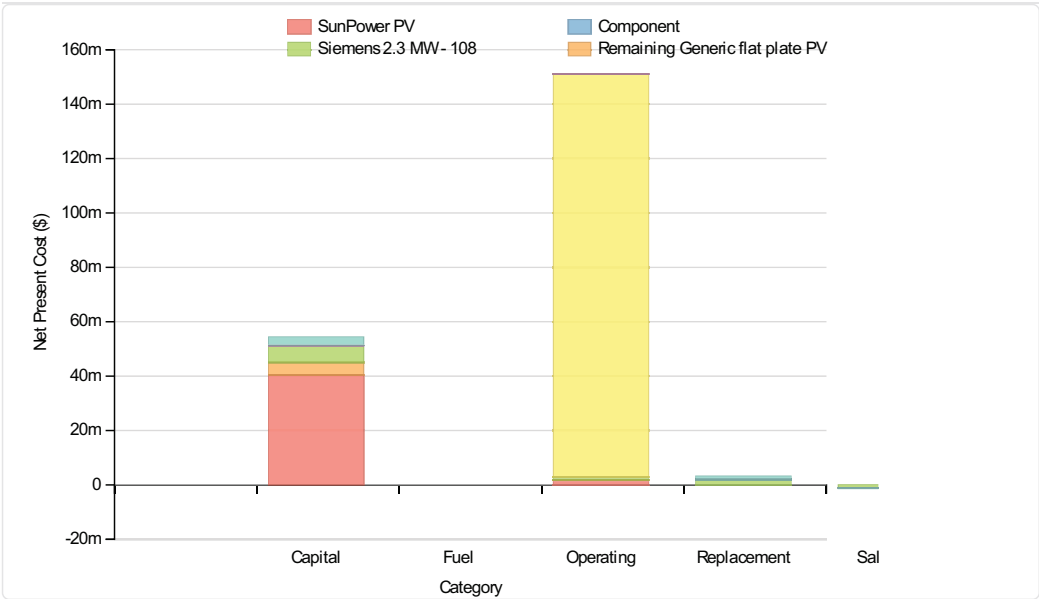
Pollutant	Emissions	Units
Carbon dioxide	45344908	kg/yr
Carbon monoxide	222	kg/yr
Unburned hydrocarbons	25	kg/yr
Particulate matter	6	kg/yr
Sulfur dioxide	196470	kg/yr
Nitrogen oxides	96252	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

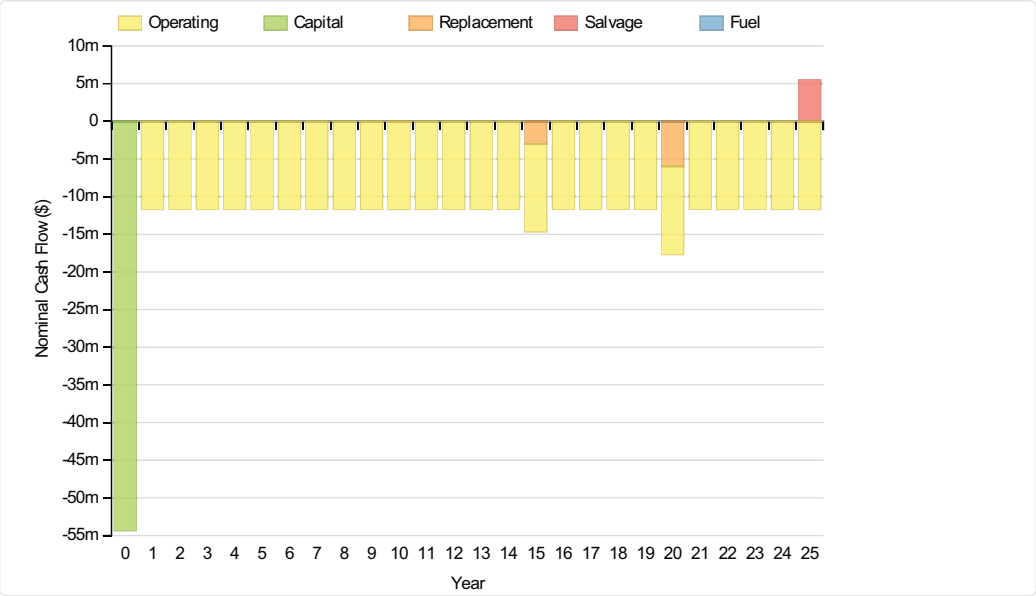
Total net present cost	207672672	\$
Levelized cost of energy	0.169	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Grid	0	0	148,101,408	0	0	148,101,408
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	54,361,380	3,192,838	151,097,872	0	-1,318,539	207,333,551

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Grid	0	0	11,456,292	0	0	11,456,292
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,205,091	246,980	11,688,082	0	-101,995	16,038,158



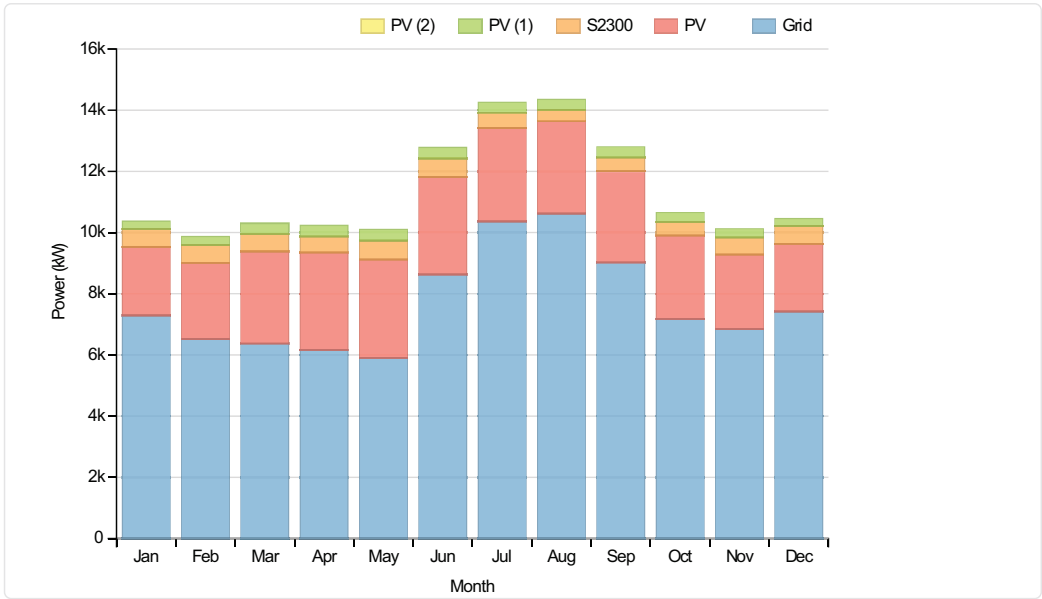
Electrical

Quantity	Value	Units
Excess electricity	1937470	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Wind Turbine	4,674,352	5
Grid Purchases	67,493,176	68
Total	99,578,624	100

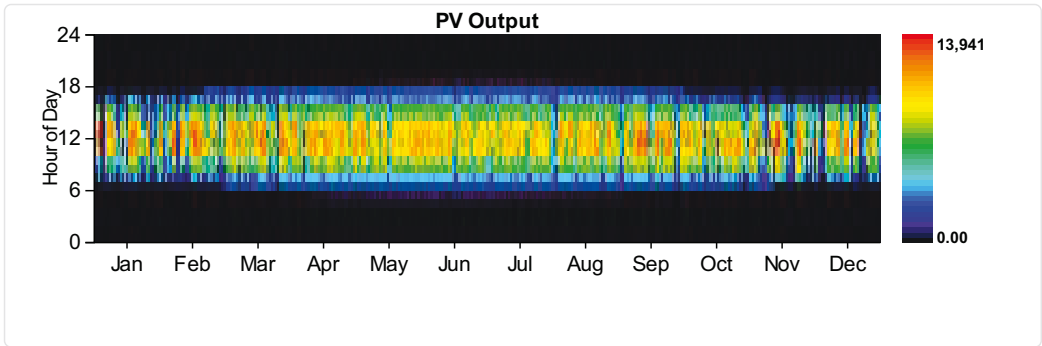
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0

Total	Consumption(kWh/yr)	95,052,456	Fraction (%)	100
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PV:SunPower PV

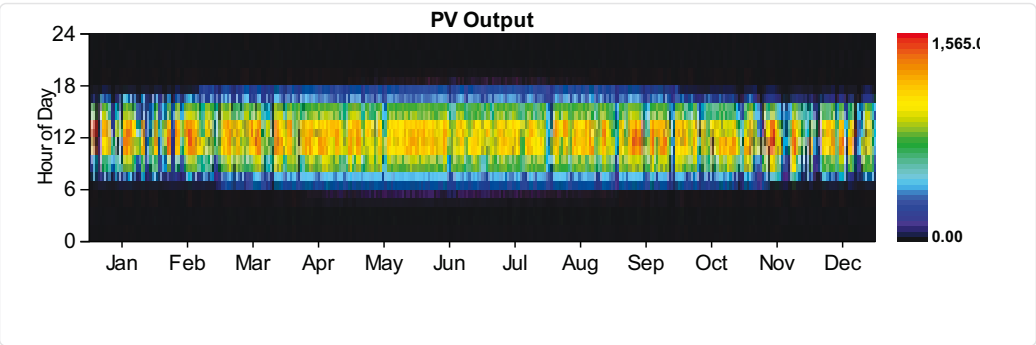
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d

Quantity	Value	Units
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



Wind Turbine:Siemens 2.3 MW - 108

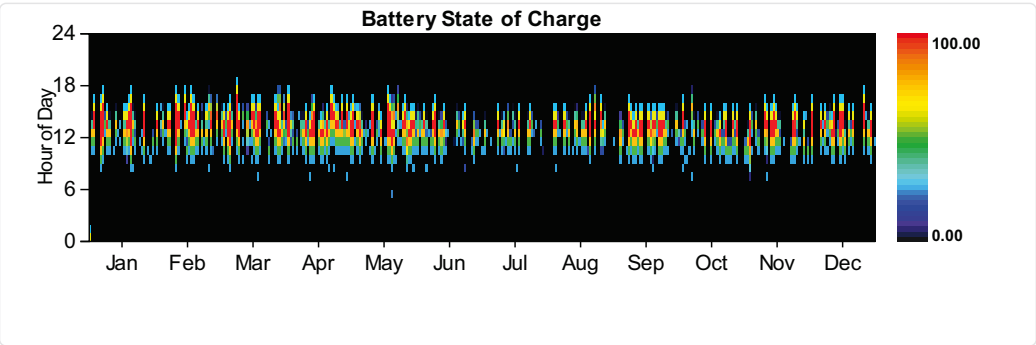
Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

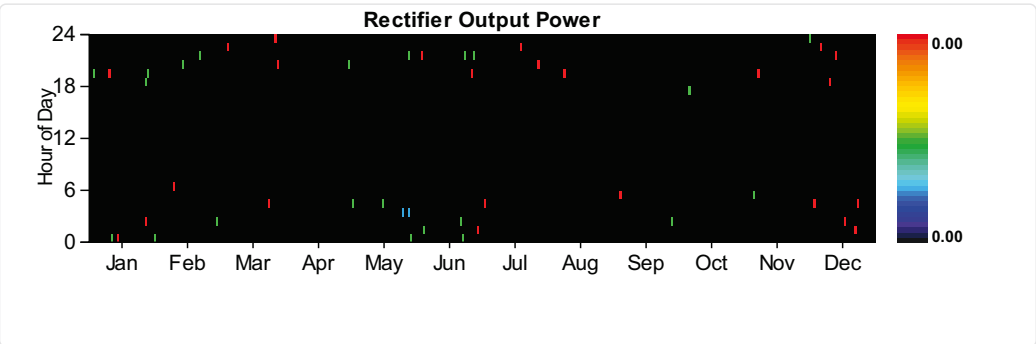
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh

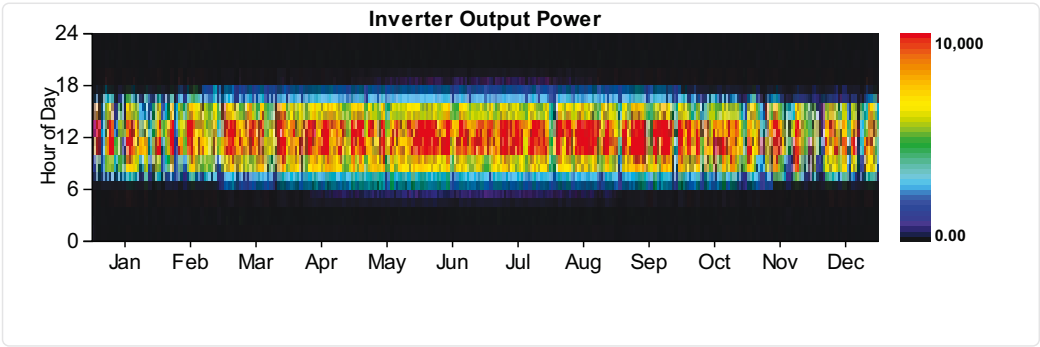
Quantity	Value	Units
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	154117	kWh/yr
Energy out	108384	kWh/yr
Storage depletion	600	kWh/yr
Losses	45132	kWh/yr
Annual throughput	129544	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,612	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	26	0	%
Hours of operation	4,575	48	hrs/yr
Energy in	25,427,954	0	kWh/yr
Energy out	22,885,056	0	kWh/yr
Losses	2,542,898	0	kWh/yr





Grid

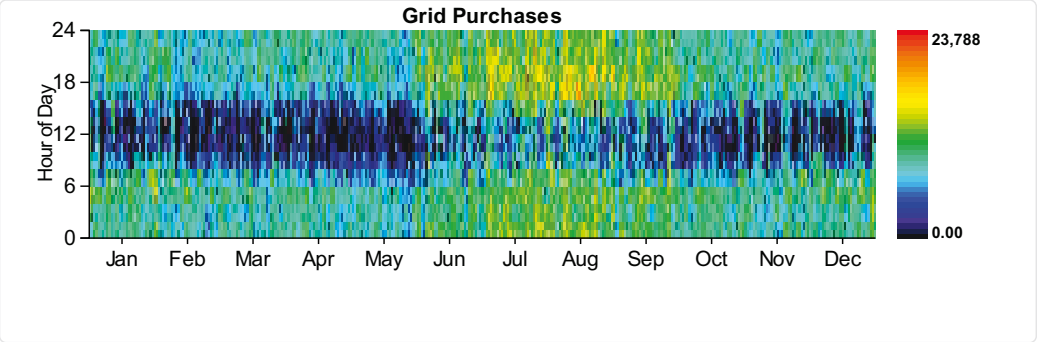
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	16,288	0	260,605
February	0	0	0	15,654	0	250,459
March	0	0	0	17,043	0	272,688
April	0	0	0	14,366	0	229,856
May	0	0	0	13,700	0	219,202
June	0	0	0	20,004	0	320,060
July	0	0	0	23,789	0	380,622
August	0	0	0	22,258	0	356,132
September	0	0	0	18,548	0	296,765
October	0	0	0	16,023	0	256,374
November	0	0	0	15,278	0	244,445
December	0	0	0	16,870	0	269,913
Annual	0	0	0	23,789	0	3,357,119

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,419,880	0	5,419,880	0	650,386	0
February	4,381,999	0	4,381,999	0	525,840	0
March	4,743,226	0	4,743,226	0	569,187	0
April	4,435,979	0	4,435,979	0	532,317	0
May	4,393,103	0	4,393,103	0	527,172	0
June	6,213,113	0	6,213,113	0	745,574	0
July	7,708,083	0	7,708,083	0	924,970	0
August	7,908,765	0	7,908,765	0	949,052	0

September	Energy Purchased 6,496,302 (kWh)	Energy Sold 0 (kWh)	Net Purchases 6,496,302 (kWh)	Peak Demand 0 (kW)	Energy Charge 779,556 (\$)	Demand Charge 0 (\$)
October	5,333,870	0	5,333,870	0	640,064	0
November	4,934,859	0	4,934,859	0	592,183	0
December	5,523,998	0	5,523,998	0	662,880	0
Annual	67,493,176	0	67,493,176	0	8,099,180	0



Emissions

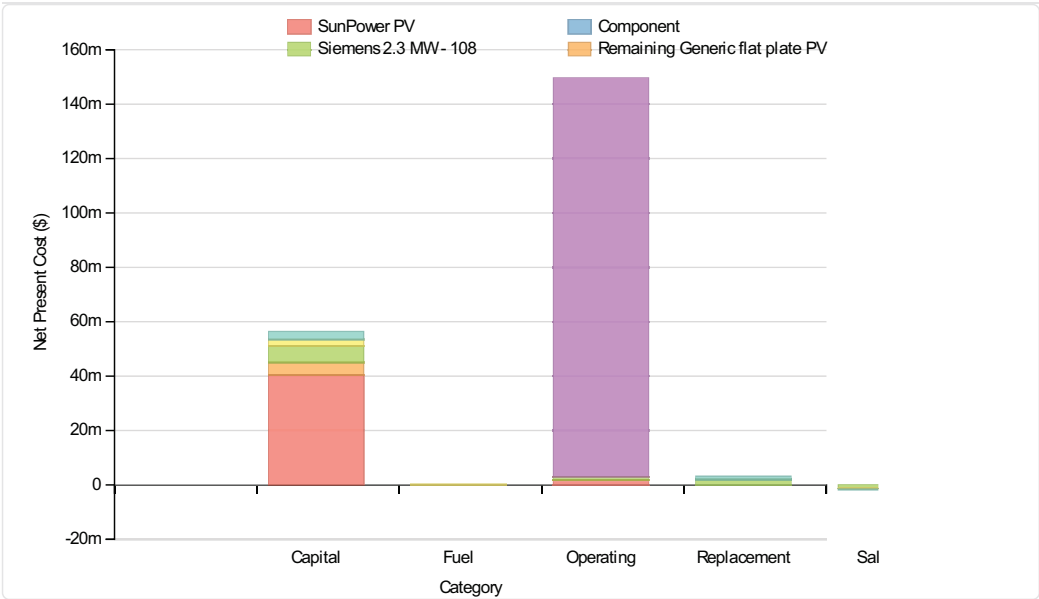
Pollutant	Emissions	Units
Carbon dioxide	42655688	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	184931	kg/yr
Nitrogen oxides	90441	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Generator	Kohler 3250 Prime Power	2,800	kW
Converter	System Converter	10,000	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

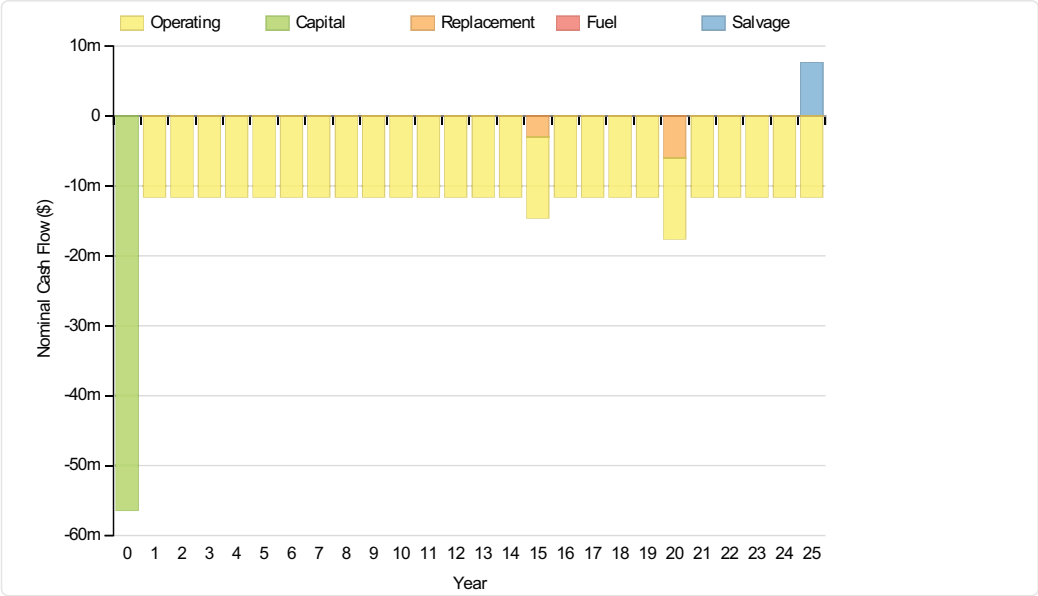
Total net present cost	207858560	\$
Levelized cost of energy	0.169	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Kohler 3250 Prime Power	2,350,000	0	34,819	136,867	-500,096	2,021,590
Grid	0	0	146,627,520	0	0	146,627,520
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	56,386,792	3,185,663	149,627,760	136,867	-1,817,663	207,519,419

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Kohler 3250 Prime Power	181,783	0	2,693	10,587	-38,685	156,378
Grid	0	0	11,342,281	0	0	11,342,281
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,361,766	246,425	11,574,362	10,587	-140,604	16,052,536



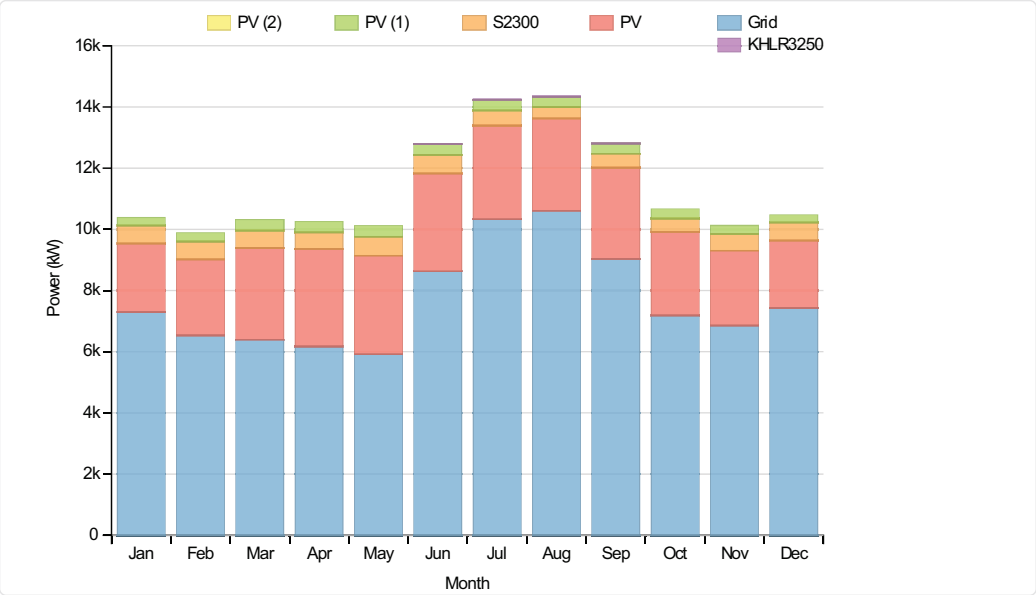
Electrical

Quantity	Value	Units
Excess electricity	2091590	kWh/yr
Unmet load	989	kWh/yr
Capacity shortage	26452	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Generator	53,730	0
Wind Turbine	4,674,352	5
Grid Purchases	67,536,008	68
Total	99,675,184	100

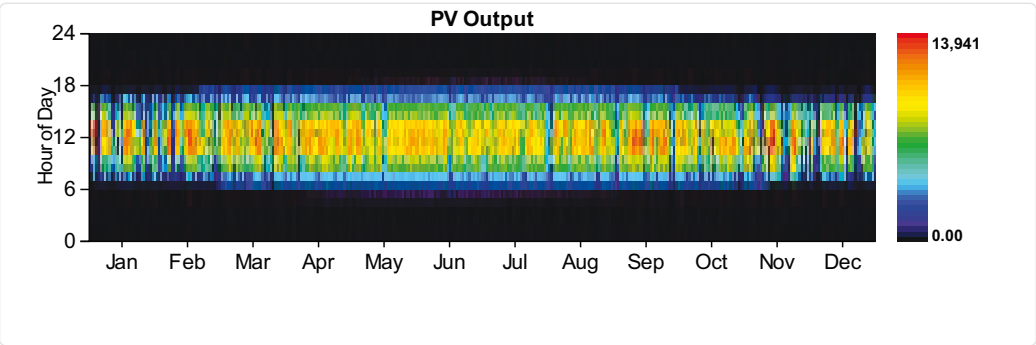
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,051,464	100

DC primary load	Consumption(kWh/yr)	0	Fraction (%)	0
Total		95,051,464		100



PV:SunPower PV

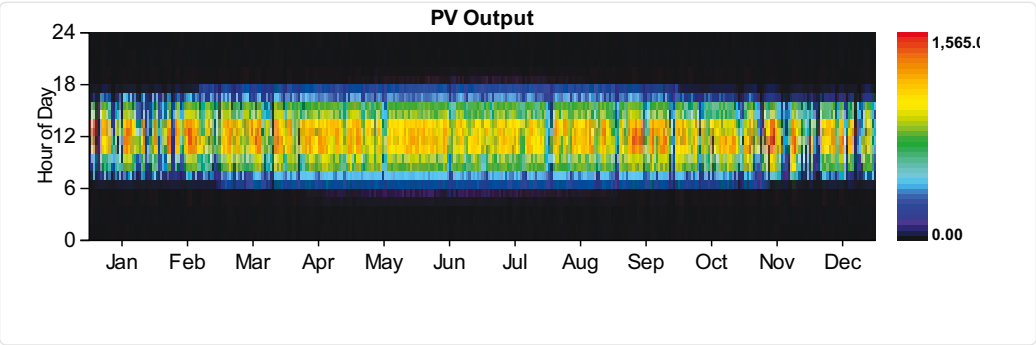
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW

Quantity	Value	Units
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



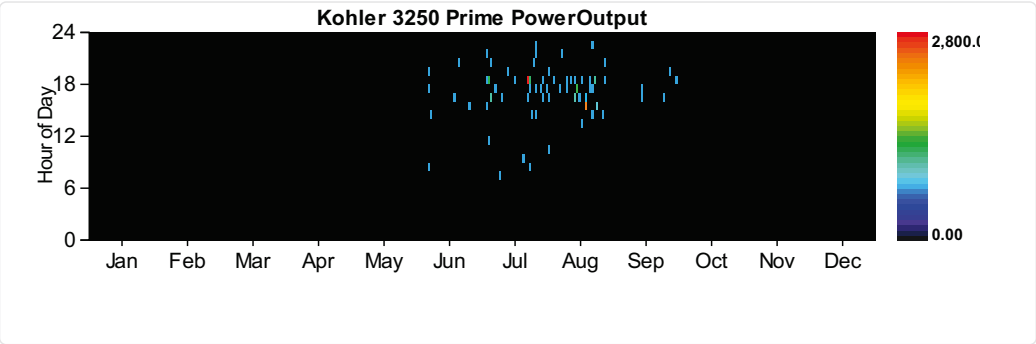
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Generator:Kohler 3250 Prime Power

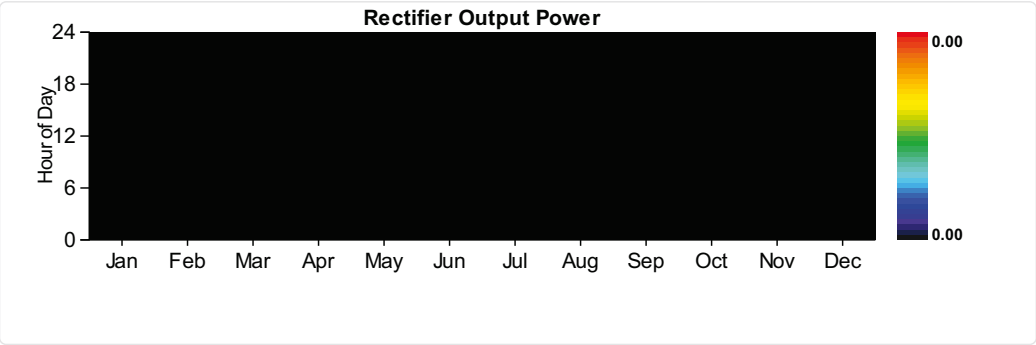
Quantity	Value	Units
Hours of operation	67	hrs/yr
Number of starts	61	starts/yr
Operational life	224	yr
Fixed generation cost	207.82	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	53730	kWh/yr

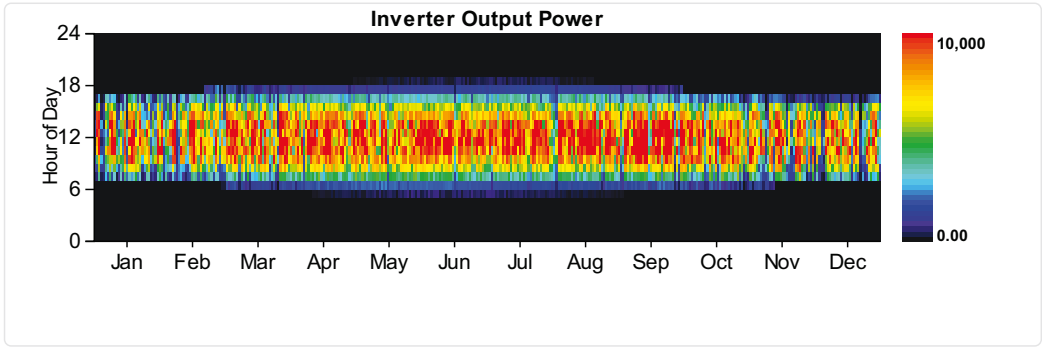
Quantity	Value	Units
Mean electrical output	802	kW
Min. electrical output	700	kW
Max. electrical output	2800	kW
Fuel consumption	13402	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	131872	kWh/yr
Mean electrical efficiency	41	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,601	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	26	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	25,319,570	0	kWh/yr
Energy out	22,787,530	0	kWh/yr
Losses	2,532,040	0	kWh/yr





Grid

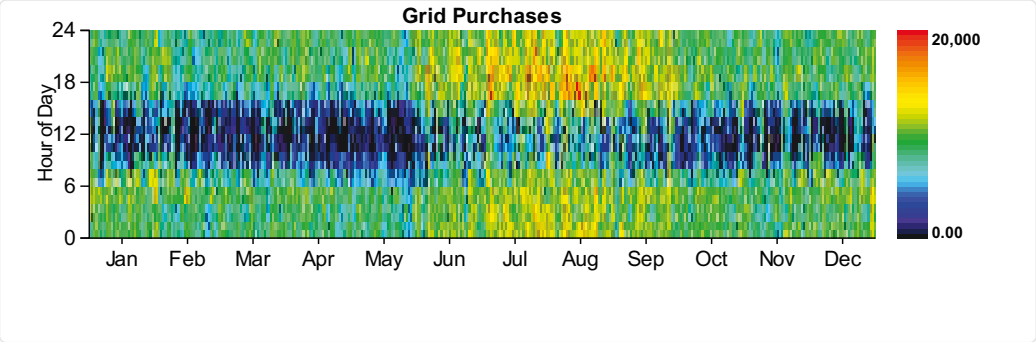
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	16,288	0	260,605
February	0	0	0	15,654	0	250,459
March	0	0	0	17,043	0	272,688
April	0	0	0	14,366	0	229,856
May	0	0	0	13,700	0	219,202
June	0	0	0	19,304	0	308,860
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	17,848	0	285,565
October	0	0	0	16,023	0	256,374
November	0	0	0	15,278	0	244,445
December	0	0	0	16,870	0	269,913
Annual	0	0	0	20,000	0	3,237,966

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,427,674	0	5,427,674	0	651,321	0
February	4,390,087	0	4,390,087	0	526,810	0
March	4,752,956	0	4,752,956	0	570,355	0
April	4,446,749	0	4,446,749	0	533,610	0
May	4,404,201	0	4,404,201	0	528,504	0
June	6,215,504	0	6,215,504	0	745,860	0
July	7,689,997	0	7,689,997	0	922,800	0
August	7,892,434	0	7,892,434	0	947,092	0

September	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
October	5,341,487	0	5,341,487	0	640,978	0
November	4,942,436	0	4,942,436	0	593,092	0
December	5,531,241	0	5,531,241	0	663,749	0
Annual	67,536,008	0	67,536,008	0	8,104,321	0



Emissions

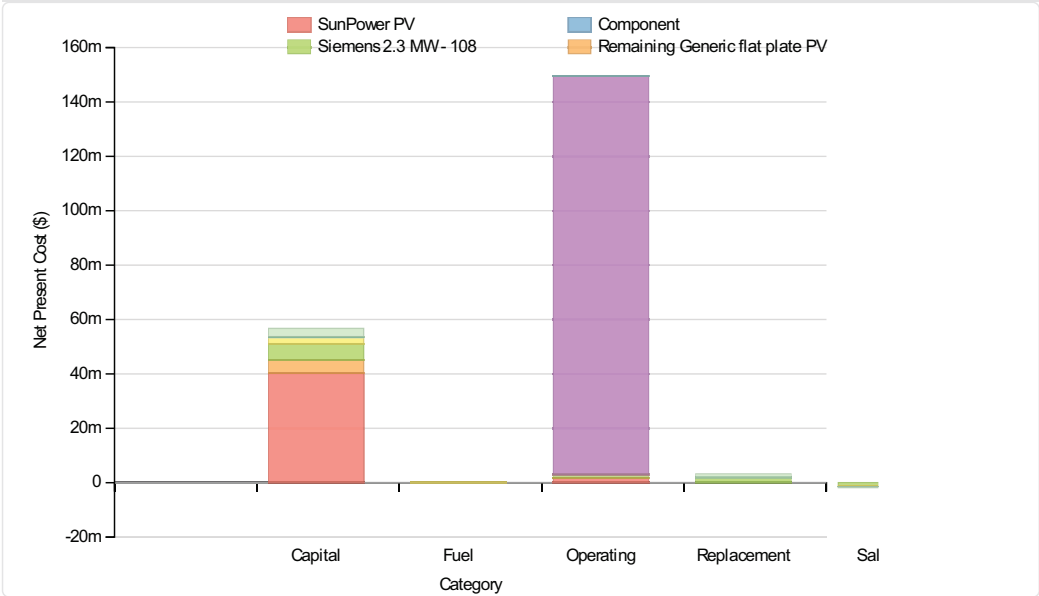
Pollutant	Emissions	Units
Carbon dioxide	42717928	kg/yr
Carbon monoxide	147	kg/yr
Unburned hydrocarbons	17	kg/yr
Particulate matter	4	kg/yr
Sulfur dioxide	185121	kg/yr
Nitrogen oxides	90646	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Generator	Kohler 3250 Prime Power	2,800	kW
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	208078544	\$
Levelized cost of energy	0.169	\$/kWh

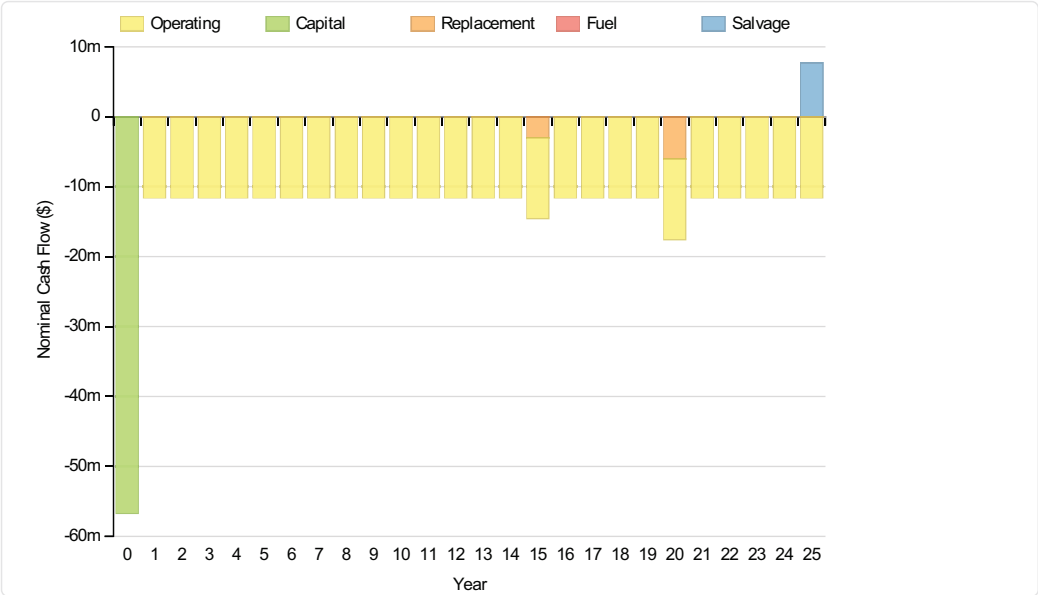
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Kohler 3250 Prime Power	2,350,000	0	34,299	154,657	-501,035	2,037,921
Grid	0	0	146,469,344	0	0	146,469,344
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263

System	56,711,380	3,192,838	119,500,144	154,657	1,819,574	207,739,445
Component	Capital	Replacement	O&M	Fuel	Salvage	Total

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Kohler 3250 Prime Power	181,783	0	2,653	11,963	-38,757	157,642
Grid	0	0	11,330,045	0	0	11,330,045
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,386,874	246,980	11,564,491	11,963	-140,752	16,069,556



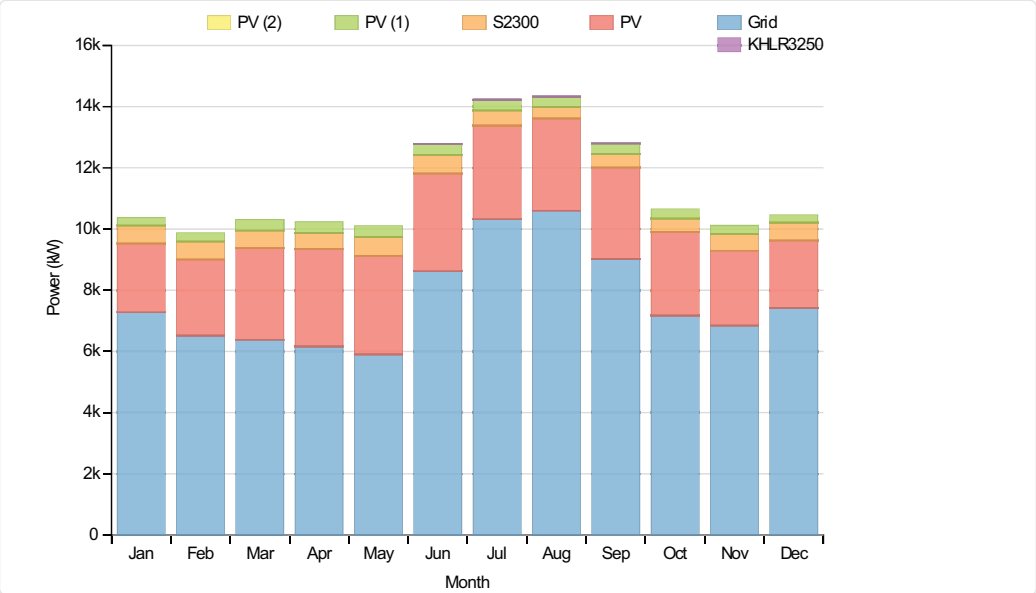
Electrical

Quantity	Value	Units
Excess electricity	1937470	kWh/yr
Unmet load	989	kWh/yr
Capacity shortage	25705	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
Generator	61,293	0
Wind Turbine	4,674,352	5
Grid Purchases	67,434,064	68

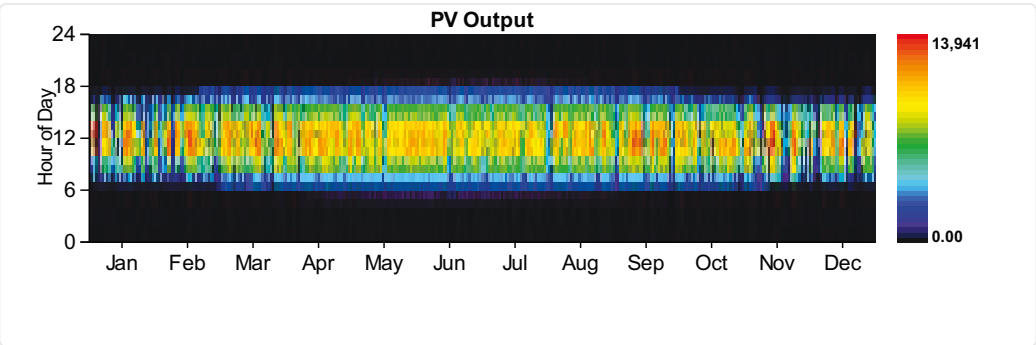
Total	Component	Production(kWh/yr)	99,580,808	Fraction (%)	100
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Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,051,464	100
DC primary load	0	0
Total	95,051,464	100



PV:SunPower PV

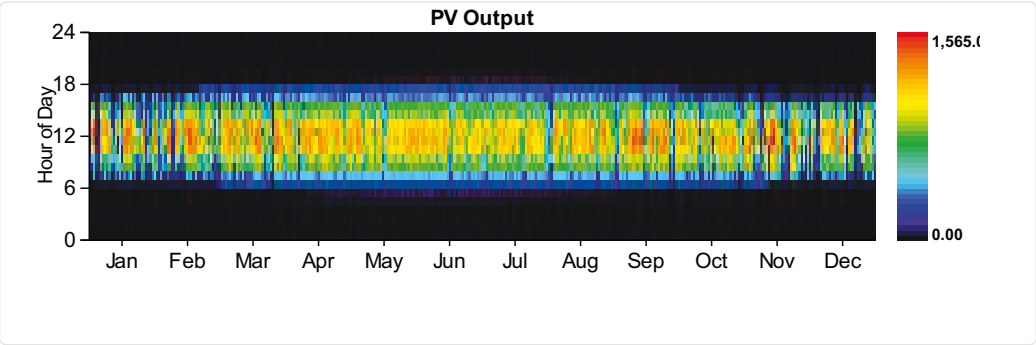
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.119	\$/kWh



PV:Remaining Generic flat plate PV

... PV remaining capacity not plotted.

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.014	\$/kWh



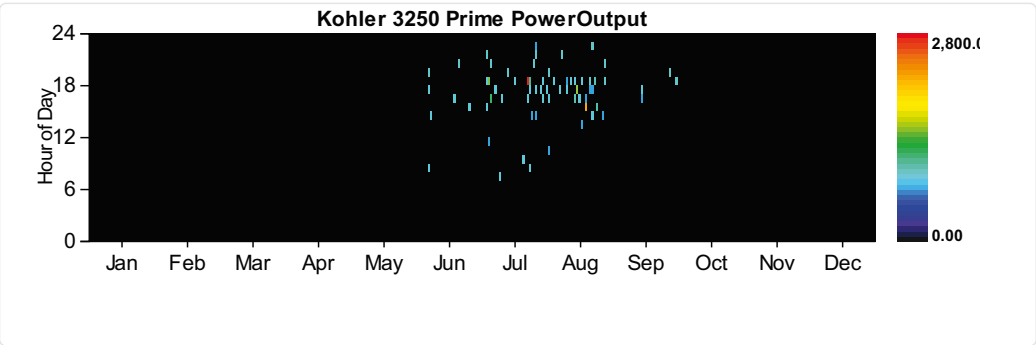
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	66	hrs/yr
Number of starts	60	starts/yr
Operational life	227	yr

Quantity	Value	Units
Fixed generation cost	207.82	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	61293	kWh/yr
Mean electrical output	929	kW
Min. electrical output	700	kW
Max. electrical output	2800	kW
Fuel consumption	15144	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	149013	kWh/yr
Mean electrical efficiency	41	%

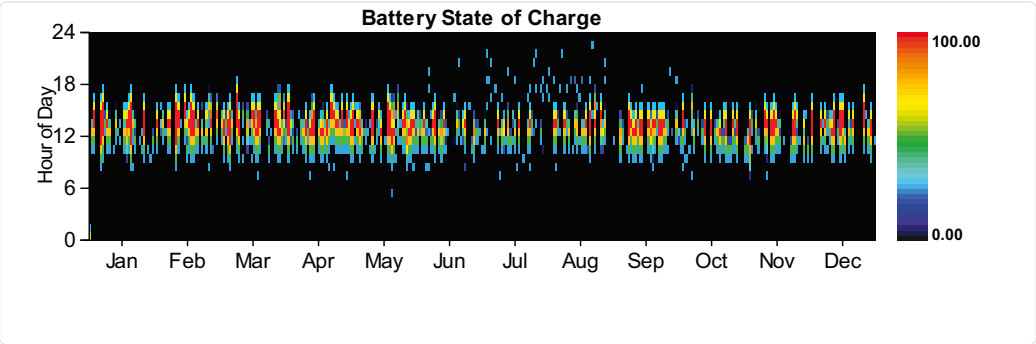


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

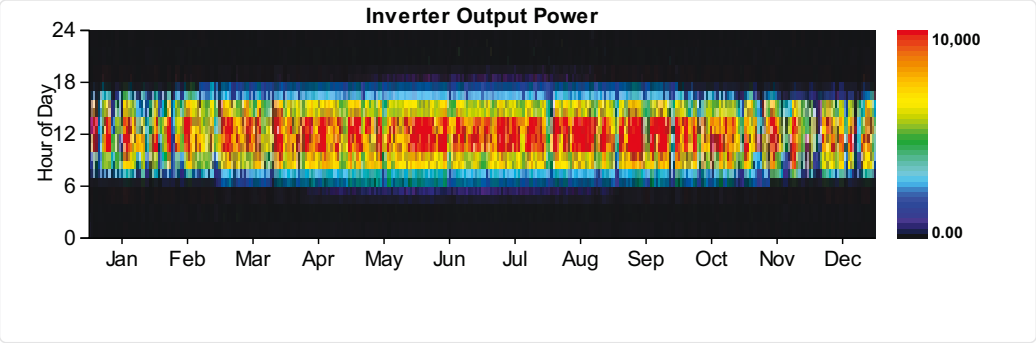
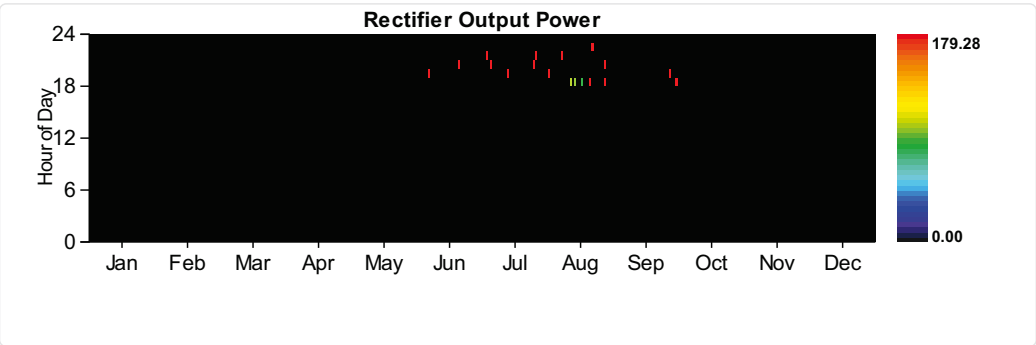
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.008	\$/kWh
Energy in	162812	kWh/yr
Energy out	114471	kWh/yr
Storage depletion	600	kWh/yr
Losses	47741	kWh/yr

Annual throughput	Value	136820	Units
Expected life		25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,613	0	kW
Minimum output	0	0	kW
Maximum output	10,000	179	kW
Capacity factor	26	0	%
Hours of operation	4,588	66	hrs/yr
Energy in	25,428,318	3,506	kWh/yr
Energy out	22,885,384	2,980	kWh/yr
Losses	2,542,934	526	kWh/yr



Grid

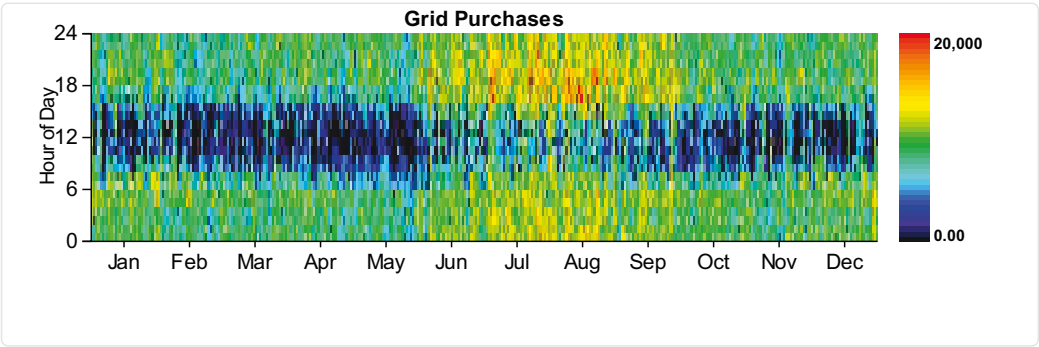
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)

January	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	16,288	Energy Charge (\$)	0	Demand Charge (\$)	260,605
February	Resources.ReportingService_GenerateInputsReport_Month	0	0	0	0	0	15,654	0	0	0	250,459	
March		0	0	0	0	0	17,043	0	0	0	272,688	
April		0	0	0	0	0	14,366	0	0	0	229,856	
May		0	0	0	0	0	13,700	0	0	0	219,202	
June		0	0	0	0	0	19,304	0	0	0	308,860	
July		0	0	0	0	0	20,000	0	0	0	320,000	
August		0	0	0	0	0	20,000	0	0	0	320,000	
September		0	0	0	0	0	17,848	0	0	0	285,565	
October		0	0	0	0	0	16,023	0	0	0	256,374	
November		0	0	0	0	0	15,278	0	0	0	244,445	
December		0	0	0	0	0	16,870	0	0	0	269,913	
Annual		0	0	0	0	0	20,000	0	0	0	3,237,966	

Rate: Rate 1

	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
Resources.ReportingService_GenerateInputsReport_Month						
January	5,419,880	0	5,419,880	0	650,386	0
February	4,381,999	0	4,381,999	0	525,840	0
March	4,743,226	0	4,743,226	0	569,187	0
April	4,435,979	0	4,435,979	0	532,317	0
May	4,393,103	0	4,393,103	0	527,172	0
June	6,207,422	0	6,207,422	0	744,891	0
July	7,682,359	0	7,682,359	0	921,883	0
August	7,884,209	0	7,884,209	0	946,105	0
September	6,493,163	0	6,493,163	0	779,180	0
October	5,333,870	0	5,333,870	0	640,064	0
November	4,934,859	0	4,934,859	0	592,183	0
December	5,523,998	0	5,523,998	0	662,880	0
Annual	67,434,064	0	67,434,064	0	8,092,087	0



Emissions

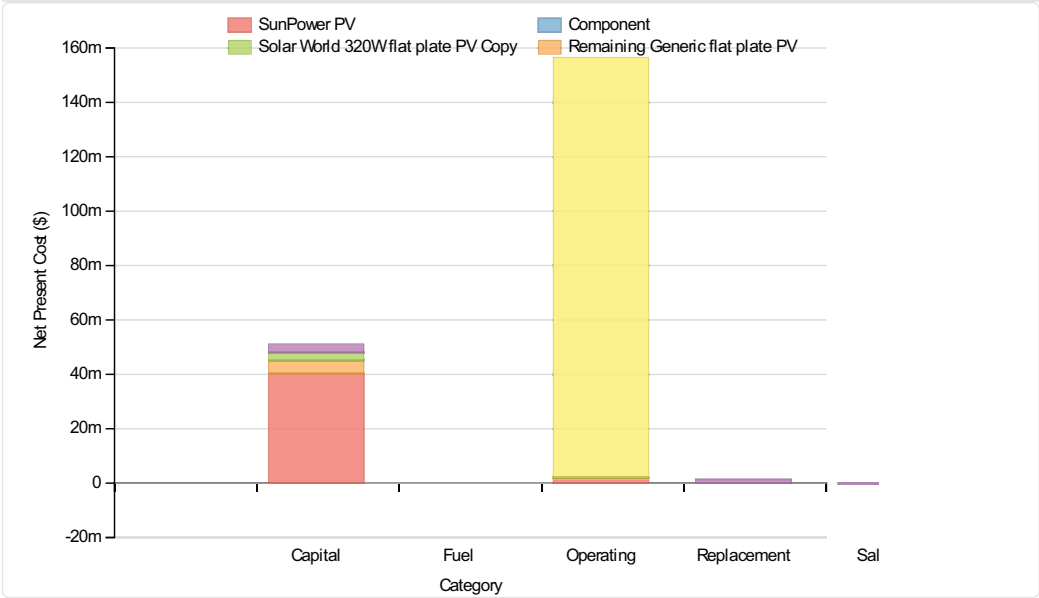
Pollutant	Emissions	Units
Carbon dioxide	42658072	kg/yr
Carbon monoxide	167	kg/yr
Unburned hydrocarbons	19	kg/yr
Particulate matter	5	kg/yr
Sulfur dioxide	184851	kg/yr
Nitrogen oxides	90528	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	208627504	\$
Levelized cost of energy	0.170	\$/kWh

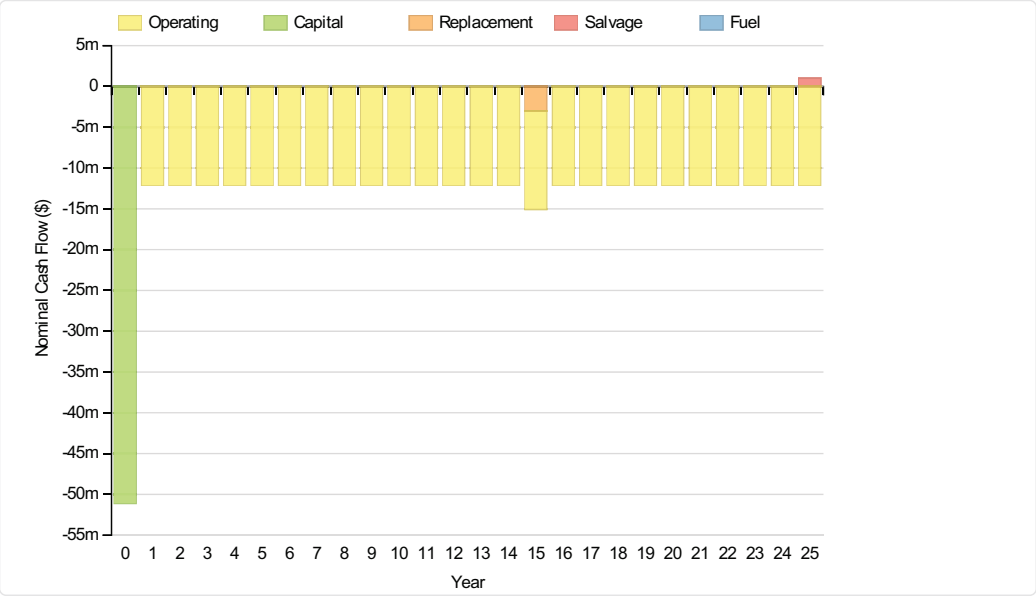
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Grid	0	0	154,198,048	0	0	154,198,048
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	51,120,124	1,272,821	156,474,048	0	-239,558	208,627,435

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Grid	0	0	11,927,894	0	0	11,927,894
Converter	232,063	98,458	0	0	-18,531	311,990
System	3,954,366	98,458	12,103,953	0	-18,531	16,138,246

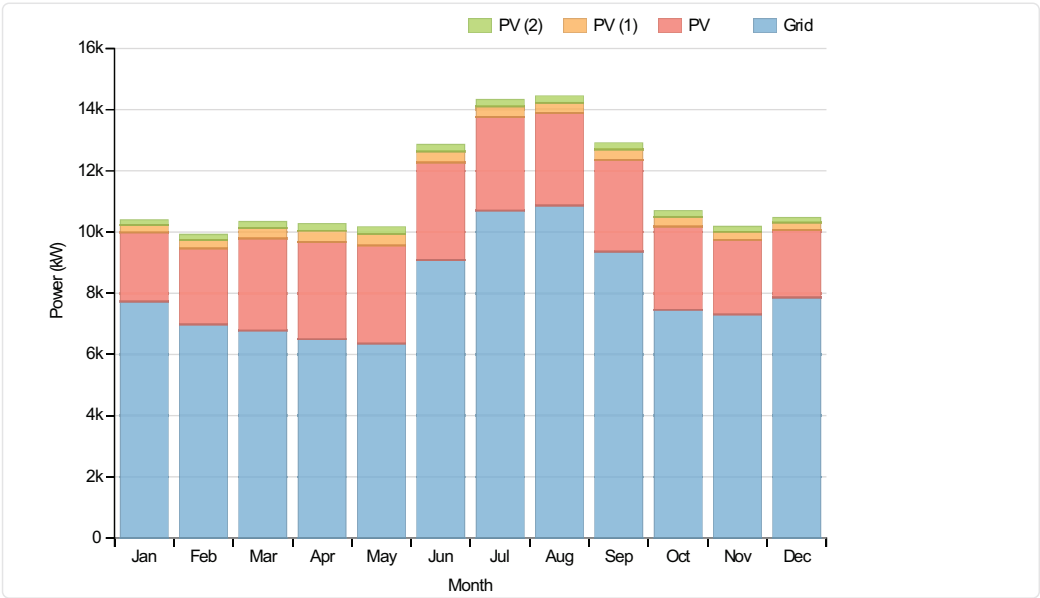


Electrical

Quantity	Value	Units
Excess electricity	2364865	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

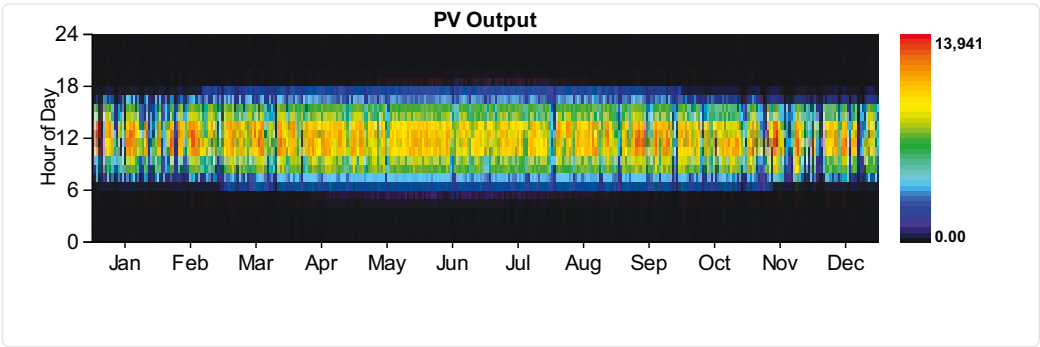
Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
PV	1,788,429	2
Grid Purchases	70,901,448	71
Total	100,100,976	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0
Total	95,052,456	100



PV:SunPower PV

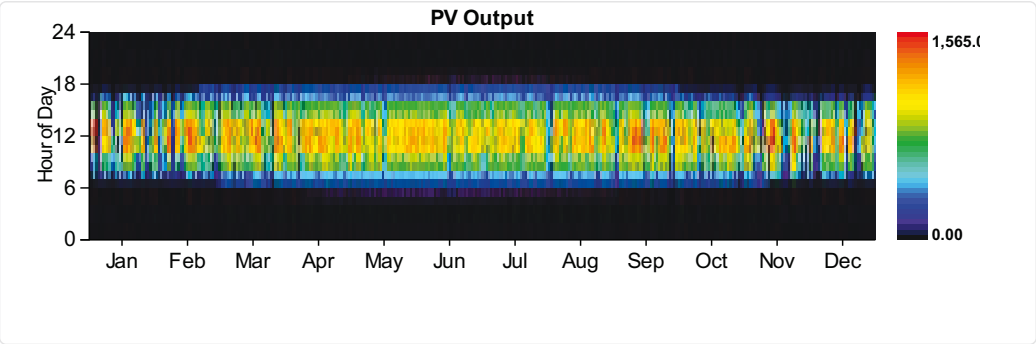
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

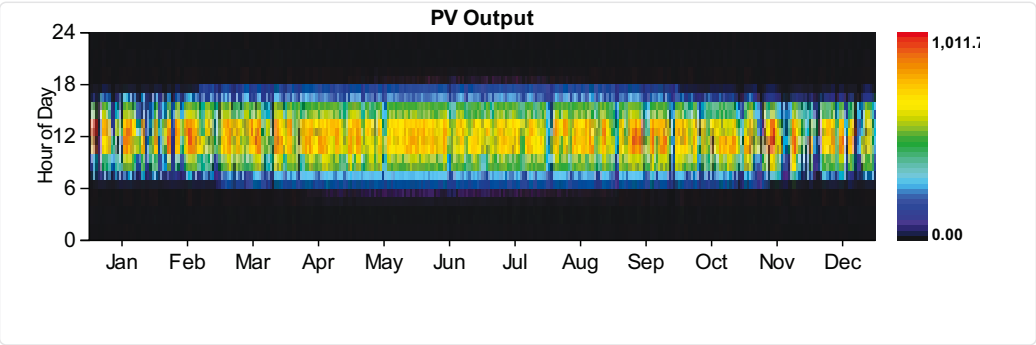
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%

Quantity	Value	Units
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

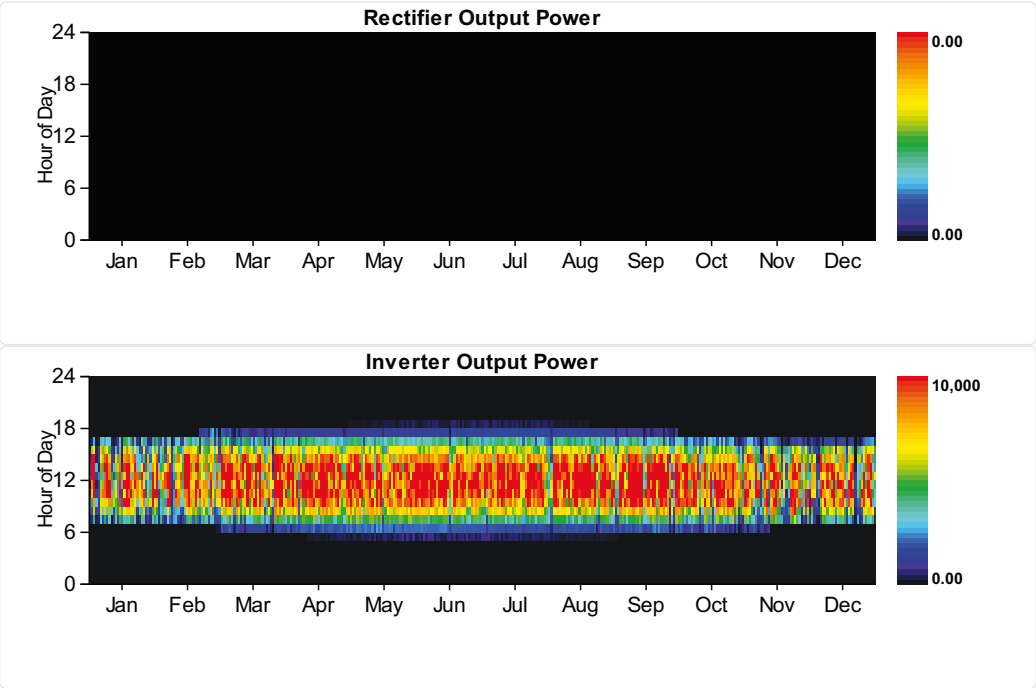
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,757	0	kW

Quantity	Inverter	Rectifier	Units
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	28	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	26,834,786	0	kWh/yr
Energy out	24,151,150	0	kWh/yr
Losses	2,683,636	0	kWh/yr



Grid

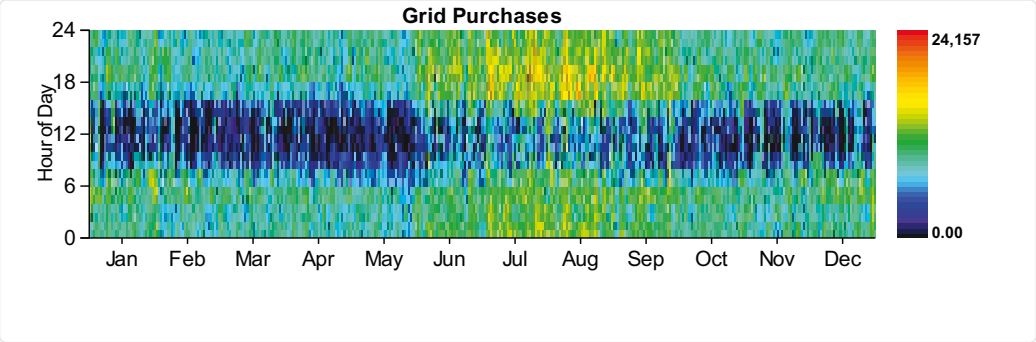
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685
March	0	0	0	17,075	0	273,199
April	0	0	0	14,394	0	230,299
May	0	0	0	14,850	0	237,602
June	0	0	0	20,019	0	320,305
July	0	0	0	24,158	0	386,525
August	0	0	0	22,709	0	363,351
September	0	0	0	18,833	0	301,321
October	0	0	0	16,050	0	256,794
November	0	0	0	15,751	0	252,018

December	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	17,148	Energy Charge (\$)	0	Demand Charge (\$)	274,366
Annual Resources.ReportingService_GenerateInputsReport_Month												26

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,751,815	0	5,751,815	0	690,218	0
February	4,692,684	0	4,692,684	0	563,122	0
March	5,049,504	0	5,049,504	0	605,940	0
April	4,681,443	0	4,681,443	0	561,773	0
May	4,726,141	0	4,726,141	0	567,137	0
June	6,541,892	0	6,541,892	0	785,027	0
July	7,964,076	0	7,964,076	0	955,689	0
August	8,092,122	0	8,092,122	0	971,055	0
September	6,744,112	0	6,744,112	0	809,293	0
October	5,548,274	0	5,548,274	0	665,793	0
November	5,255,797	0	5,255,797	0	630,696	0
December	5,853,593	0	5,853,593	0	702,431	0
Annual	70,901,448	0	70,901,448	0	8,508,174	0



Emissions

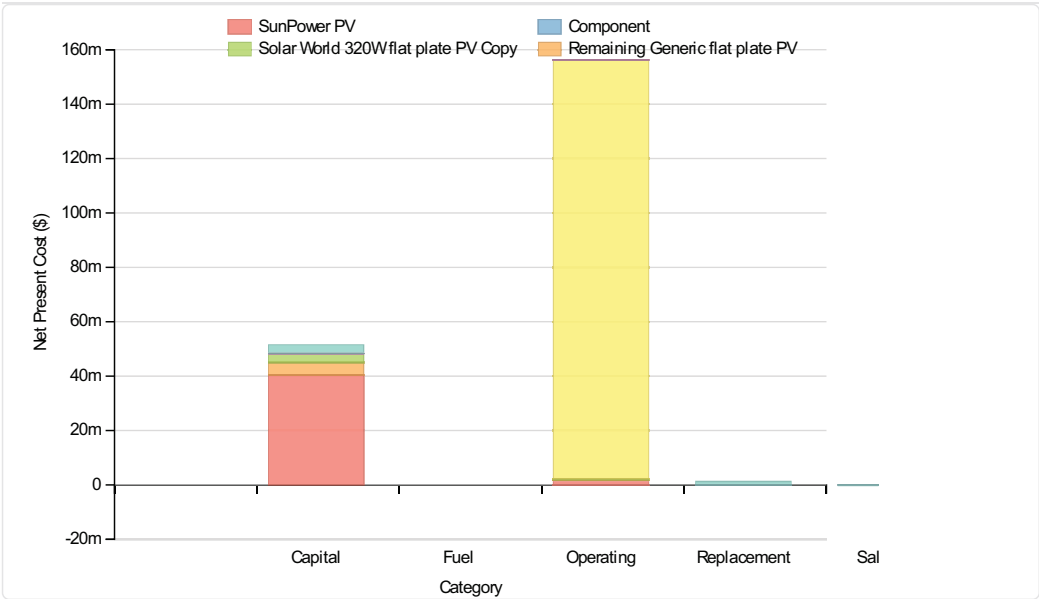
Pollutant	Emissions	Units
Carbon dioxide	44809716	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	194270	kg/yr
Nitrogen oxides	95008	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

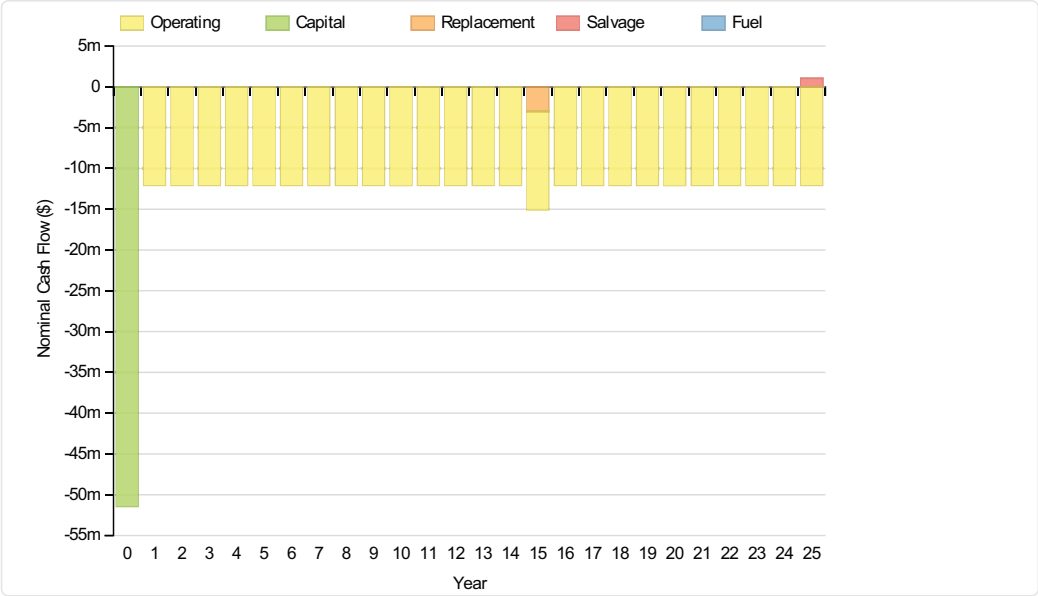
Total net present cost	208789744	\$
Levelized cost of energy	0.170	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Grid	0	0	153,998,464	0	0	153,998,464
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	51,444,712	1,279,996	156,305,472	0	-240,530	208,789,650

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Grid	0	0	11,912,456	0	0	11,912,456
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	232,063	98,458	0	0	-18,531	311,990
System	3,979,474	99,013	12,090,913	0	-18,606	16,150,794



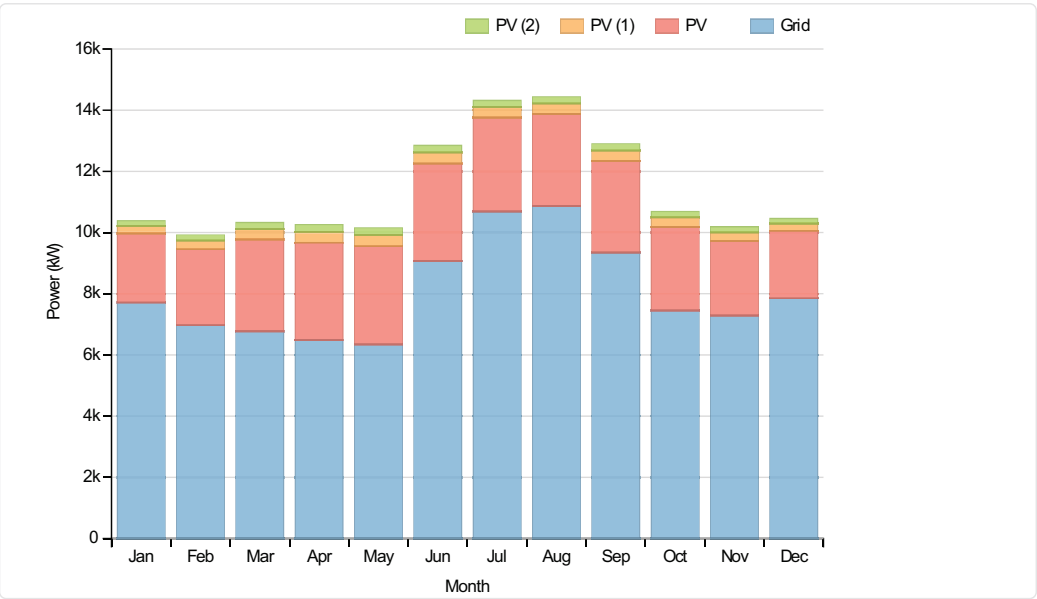
Electrical

Quantity	Value	Units
Excess electricity	2196428	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
PV	1,788,429	2
Grid Purchases	70,794,880	71
Total	99,994,408	100

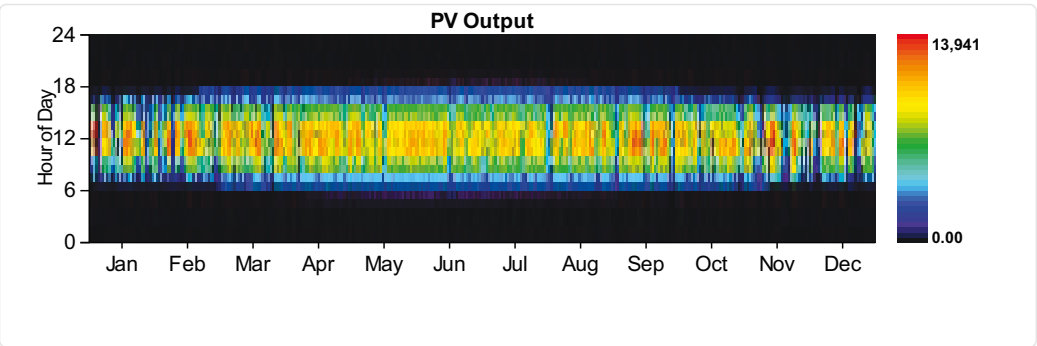
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0

Total	Consumption(kWh/yr)	95,052,456	Fraction (%)	100
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PV:SunPower PV

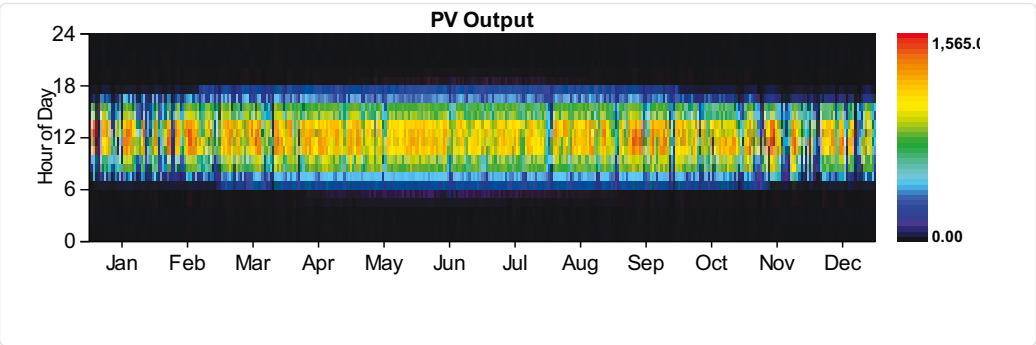
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

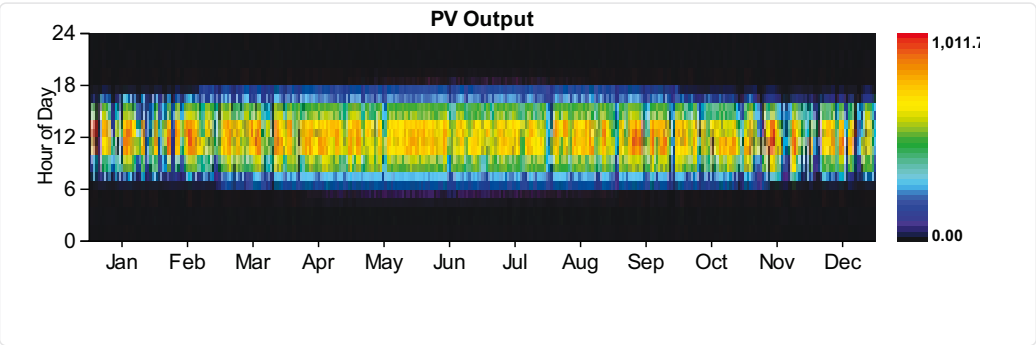
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d

Quantity	Value	Units
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh

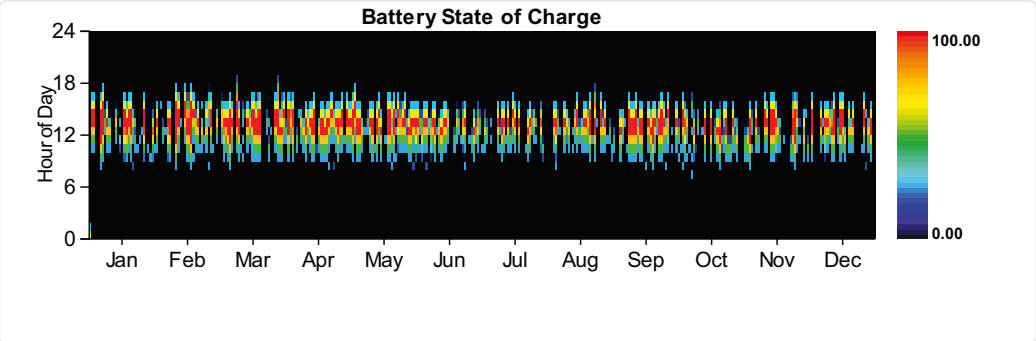


Battery:GS200 flow

Quantity	Value
String size	1

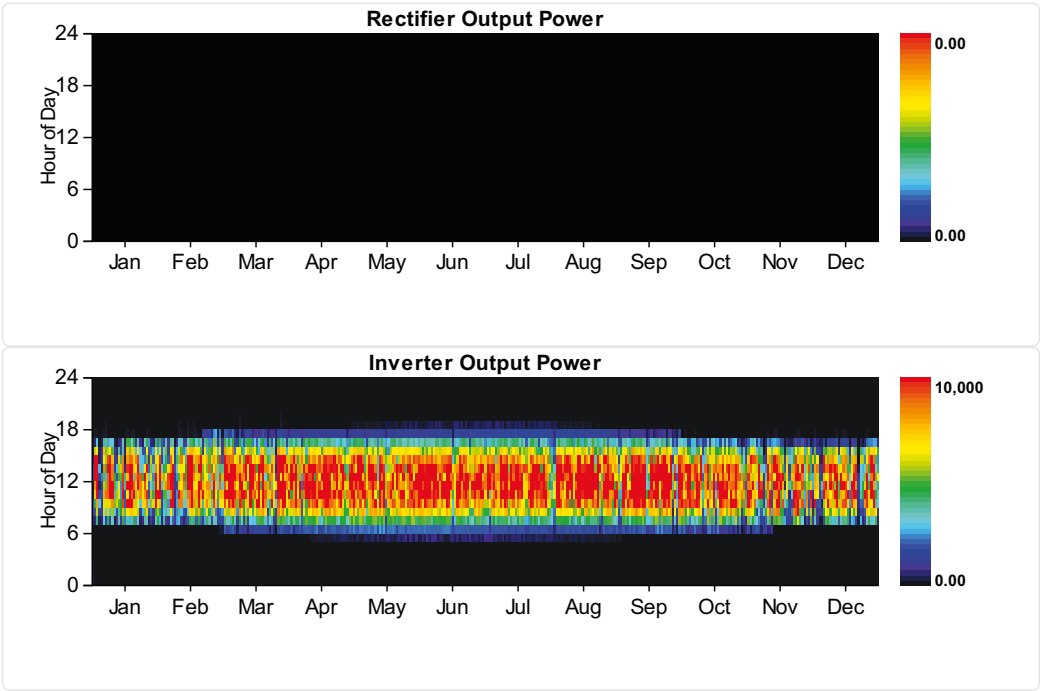
Quantity	Value	Units
Strings in parallel	1	
Batteries	1	
Bus voltage	100	

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	168438	kWh/yr
Energy out	118409	kWh/yr
Storage depletion	600	kWh/yr
Losses	49429	kWh/yr
Annual throughput	141526	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,769	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	28	0	%
Hours of operation	4,479	0	hrs/yr
Energy in	26,953,204	0	kWh/yr
Energy out	24,257,696	0	kWh/yr
Losses	2,695,508	0	kWh/yr



Grid

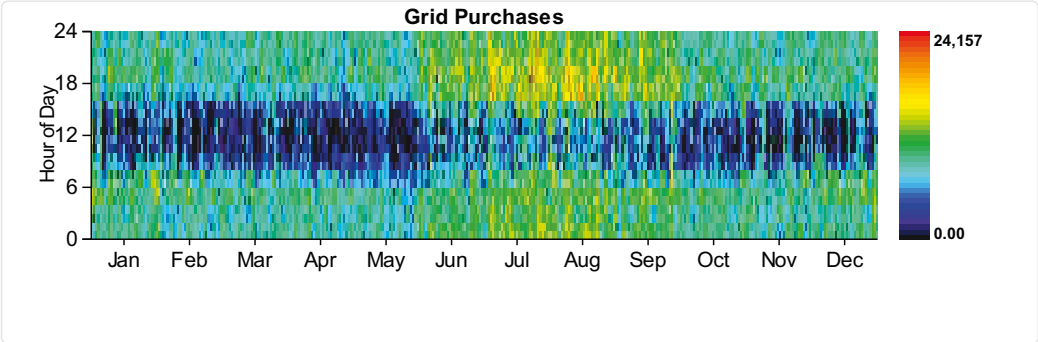
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685
March	0	0	0	17,075	0	273,199
April	0	0	0	14,394	0	230,299
May	0	0	0	14,850	0	237,602
June	0	0	0	20,019	0	320,305
July	0	0	0	24,158	0	386,525
August	0	0	0	22,544	0	360,700
September	0	0	0	18,833	0	301,321
October	0	0	0	16,050	0	256,794
November	0	0	0	15,751	0	252,018
December	0	0	0	17,148	0	274,366
Annual	0	0	0	24,158	0	3,417,076

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,743,823	0	5,743,823	0	689,259	0
February	4,684,560	0	4,684,560	0	562,147	0
March	5,039,282	0	5,039,282	0	604,714	0

April	Energy Purchased 4,670,348 (kWh)	Energy Sold 0 (kWh)	Net Purchases 4,670,348 (kWh)	Peak Demand 0 (kW)	Energy Charge 560,442 (\$)	Demand Charge 0 (\$)
Resources.ReportingService_GenerateInputsReport_Month	4,714,417	0	4,714,417	0	565,730	0
May						
June	6,532,493	0	6,532,493	0	783,899	0
July	7,956,805	0	7,956,805	0	954,817	0
August	8,083,955	0	8,083,955	0	970,075	0
September	6,734,741	0	6,734,741	0	808,169	0
October	5,540,203	0	5,540,203	0	664,824	0
November	5,248,187	0	5,248,187	0	629,782	0
December	5,846,067	0	5,846,067	0	701,528	0
Annual	70,794,880	0	70,794,880	0	8,495,386	0



Emissions

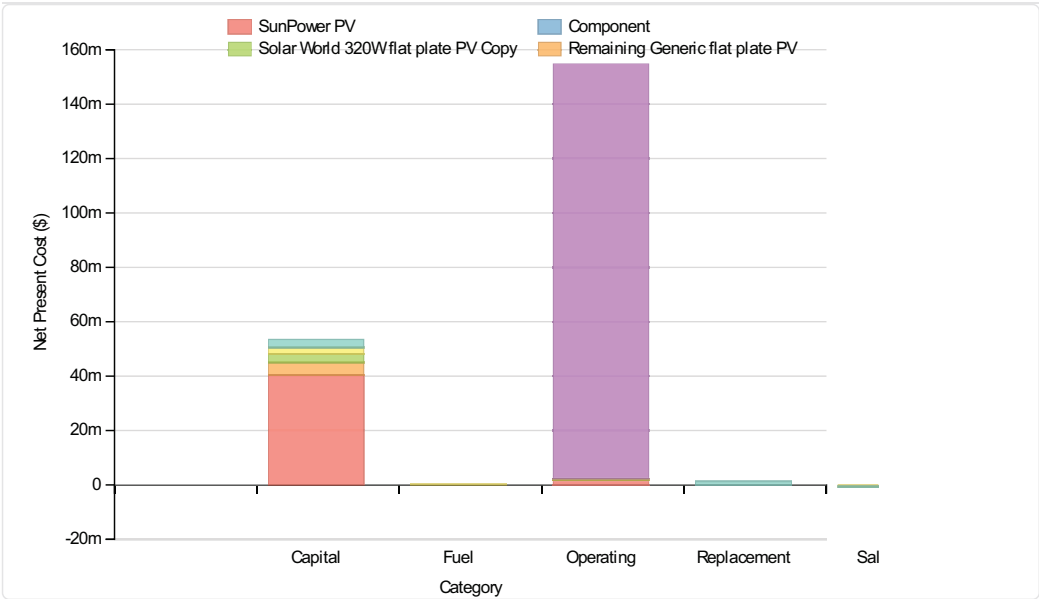
Pollutant	Emissions	Units
Carbon dioxide	44742364	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	193978	kg/yr
Nitrogen oxides	94865	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Generator	Kohler 3250 Prime Power	2,800	kW
Converter	System Converter	10,000	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

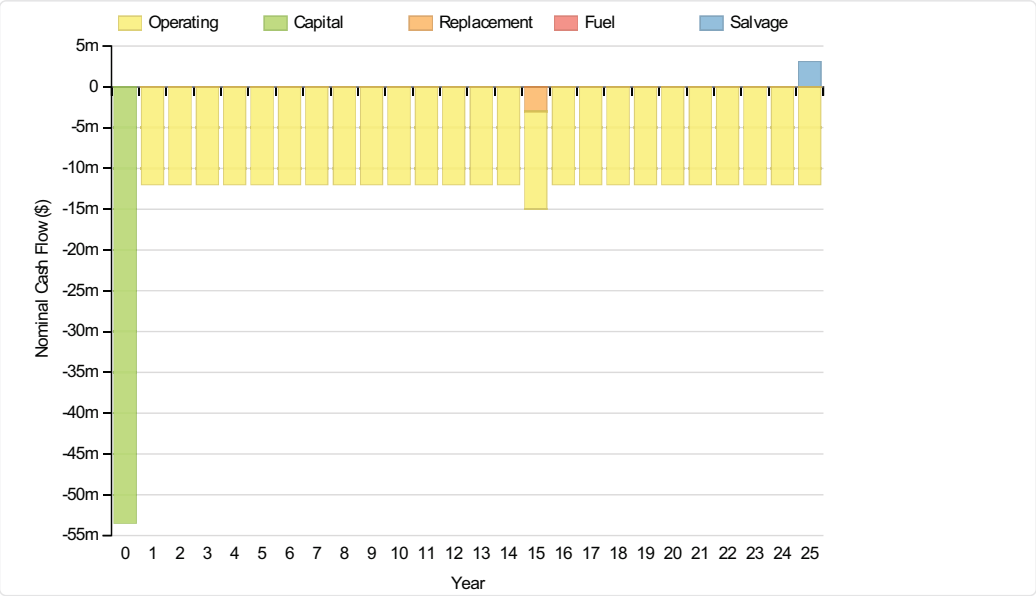
Total net present cost	208874000	\$
Levelized cost of energy	0.170	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Kohler 3250 Prime Power	2,350,000	0	38,457	168,760	-493,528	2,063,689
Grid	0	0	152,380,880	0	0	152,380,880
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	53,470,124	1,272,821	154,695,296	168,760	-733,086	208,873,915

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Kohler 3250 Prime Power	181,783	0	2,975	13,054	-38,177	159,635
Grid	0	0	11,787,328	0	0	11,787,328
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,136,148	98,458	11,966,359	13,054	-56,707	16,157,312



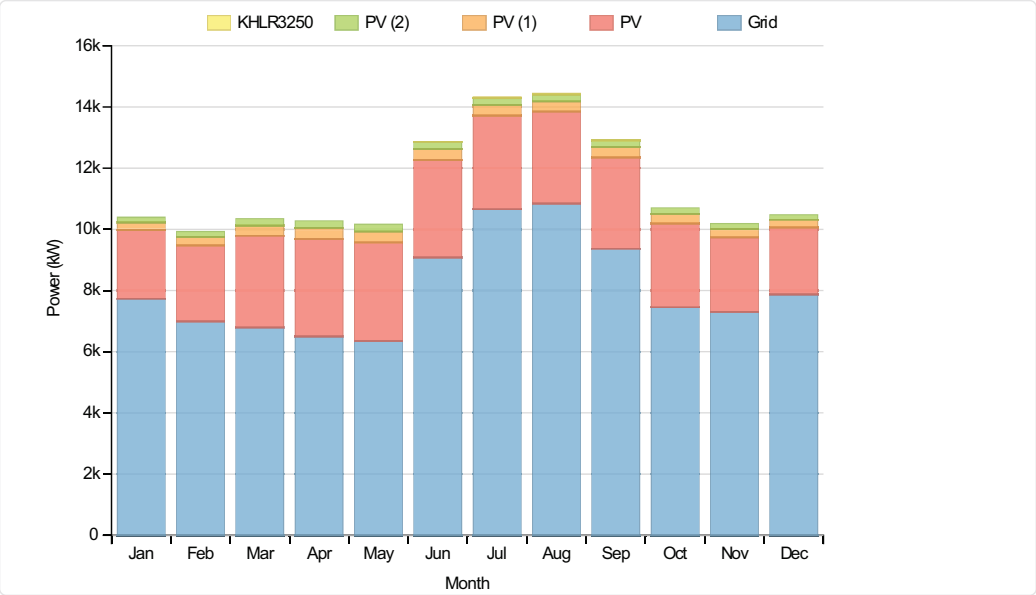
Electrical

Quantity	Value	Units
Excess electricity	2364865	kWh/yr
Unmet load	2334	kWh/yr
Capacity shortage	33532	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
PV	1,788,429	2
Generator	66,764	0
Grid Purchases	70,832,352	71
Total	100,098,648	100

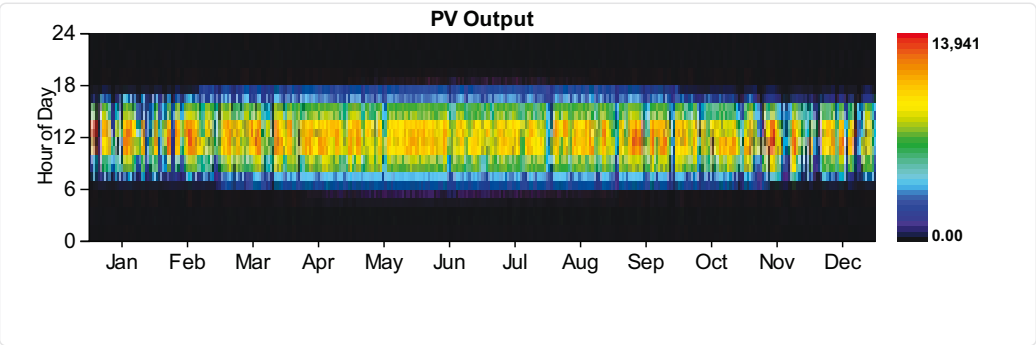
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,050,112	100

DC primary load	Consumption(kWh/yr)	0	Fraction (%)	0
Total		95,050,112		100



PV:SunPower PV

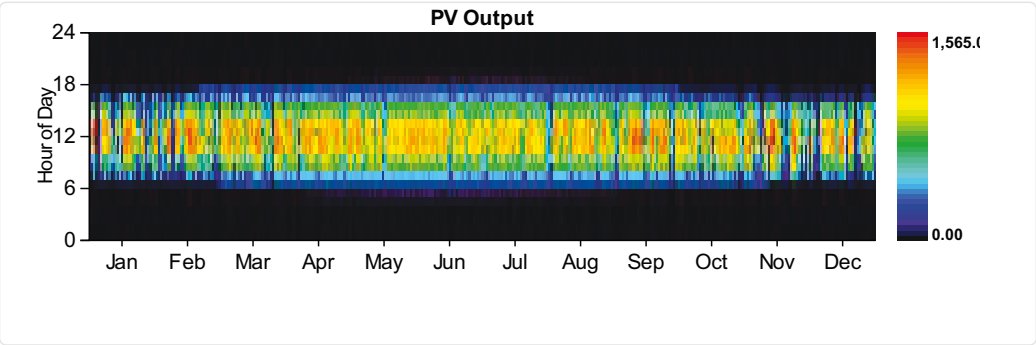
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

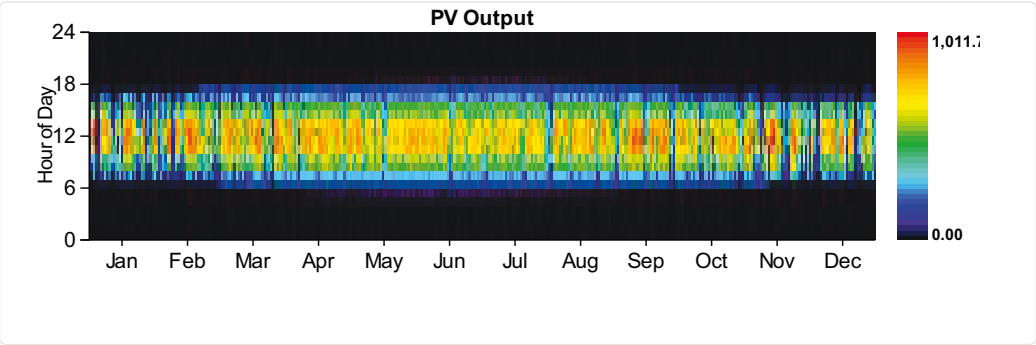
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW

Quantity	Value	Units
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

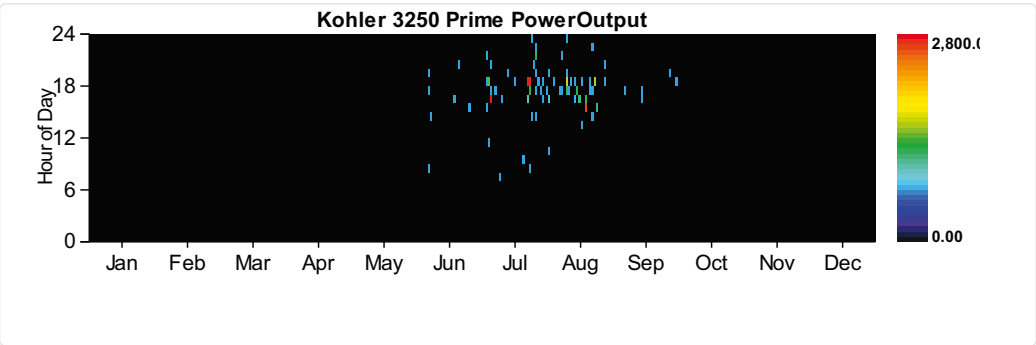
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh



Generator:Kohler 3250 Prime Power

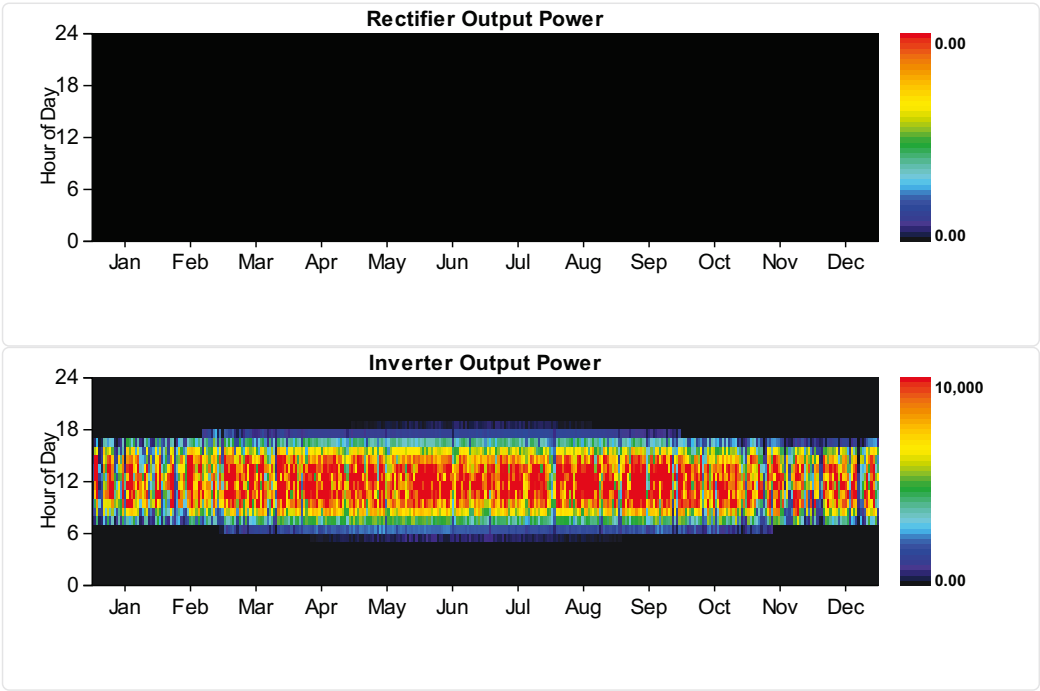
Quantity	Value	Units

Quantity	Value	Units
Hours of operation	74	hrs/yr
Number of starts	66	starts/yr
Operational life	203	yr
Fixed generation cost	207.82	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	66764	kWh/yr
Mean electrical output	902	kW
Min. electrical output	700	kW
Max. electrical output	2800	kW
Fuel consumption	16524	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	162601	kWh/yr
Mean electrical efficiency	41	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,757	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	28	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	26,834,786	0	kWh/yr
Energy out	24,151,150	0	kWh/yr
Losses	2,683,636	0	kWh/yr



Grid

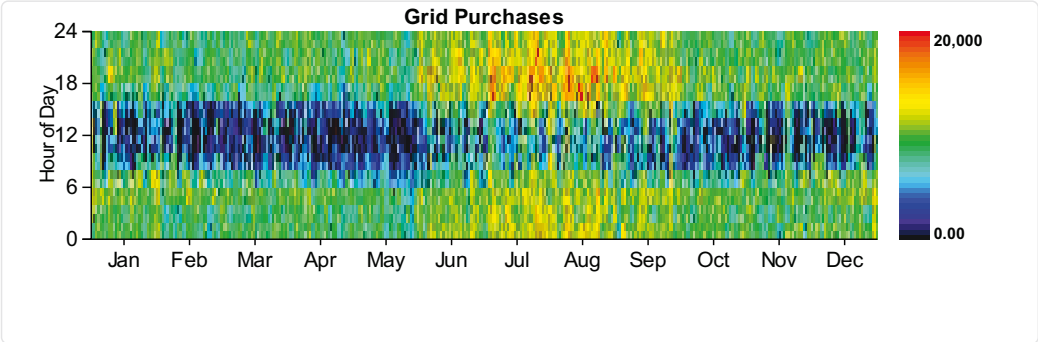
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	17,079	0	273,262
February	0	0	0	15,668	0	250,685
March	0	0	0	17,075	0	273,199
April	0	0	0	14,394	0	230,299
May	0	0	0	14,850	0	237,602
June	0	0	0	19,319	0	309,105
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	18,133	0	290,121
October	0	0	0	16,050	0	256,794
November	0	0	0	15,751	0	252,018
December	0	0	0	17,148	0	274,366
Annual	0	0	0	20,000	0	3,287,451

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,751,815	0	5,751,815	0	690,218	0
February	4,692,684	0	4,692,684	0	563,122	0
March	5,049,504	0	5,049,504	0	605,940	0

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	4,681,443	0	4,681,443	0	561,773	0
May	4,726,141	0	4,726,141	0	567,137	0
June	6,536,992	0	6,536,992	0	784,439	0
July	7,931,617	0	7,931,617	0	951,794	0
August	8,063,882	0	8,063,882	0	967,666	0
September	6,740,612	0	6,740,612	0	808,873	0
October	5,548,274	0	5,548,274	0	665,793	0
November	5,255,797	0	5,255,797	0	630,696	0
December	5,853,593	0	5,853,593	0	702,431	0
Annual	70,832,352	0	70,832,352	0	8,499,882	0



Emissions

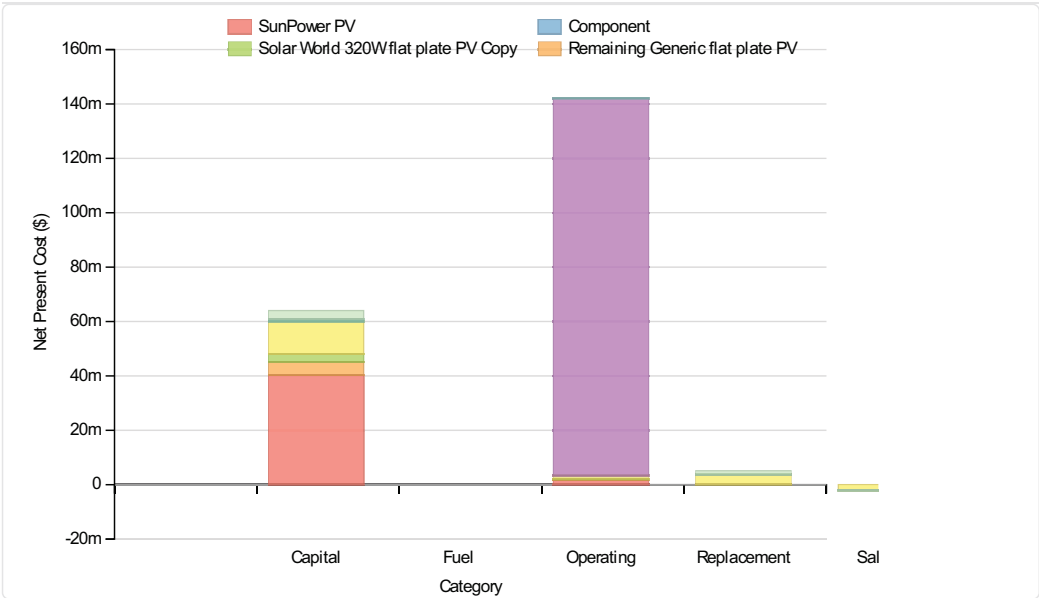
Pollutant	Emissions	Units
Carbon dioxide	44809416	kg/yr
Carbon monoxide	182	kg/yr
Unburned hydrocarbons	21	kg/yr
Particulate matter	5	kg/yr
Sulfur dioxide	194170	kg/yr
Nitrogen oxides	95097	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	2	
Battery	GS200 flow	3	strings
Converter	System Converter	10,000	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	208878272	\$
Levelized cost of energy	0.170	\$/kWh

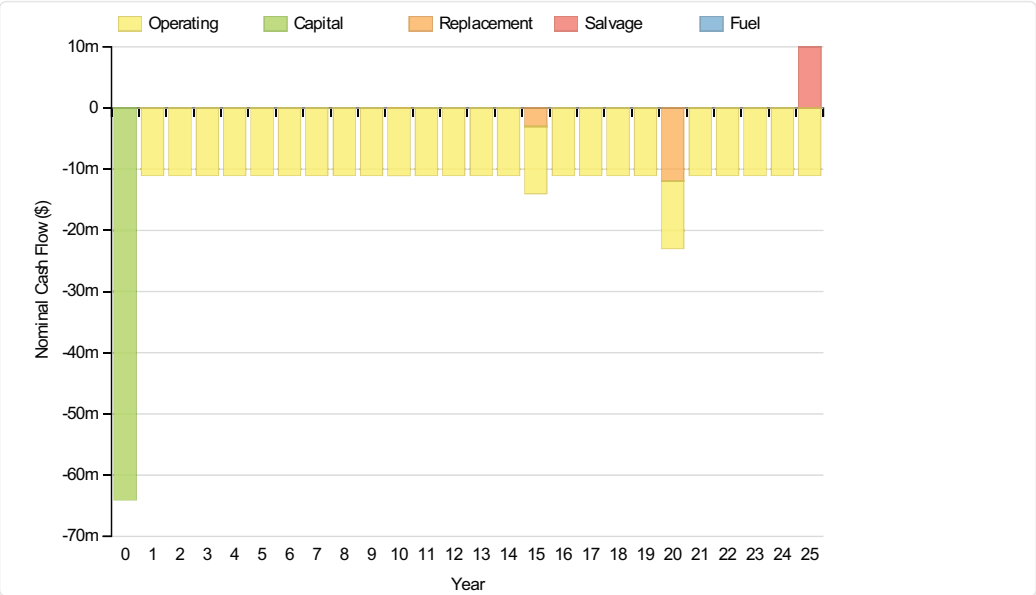
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Siemens 2.3 MW - 108	11,925,000	3,801,774	1,034,201	0	-2,142,543	14,618,432
Grid	0	0	138,744,976	0	0	138,744,976
GS200 flow	973,767	21,510	93,078	0	-2,917	1,085,439
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263

System	64,018,892	5,096,105	112,148,240	0	2,385,017	208,878,220
Component	Capital	Replacement	O&M	Fuel	Salvage	Total

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Siemens 2.3 MW - 108	922,451	294,084	80,000	0	-165,735	1,130,800
Grid	0	0	10,732,531	0	0	10,732,531
GS200 flow	75,325	1,664	7,200	0	-226	83,963
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,952,142	394,206	10,995,789	0	-184,491	16,157,646



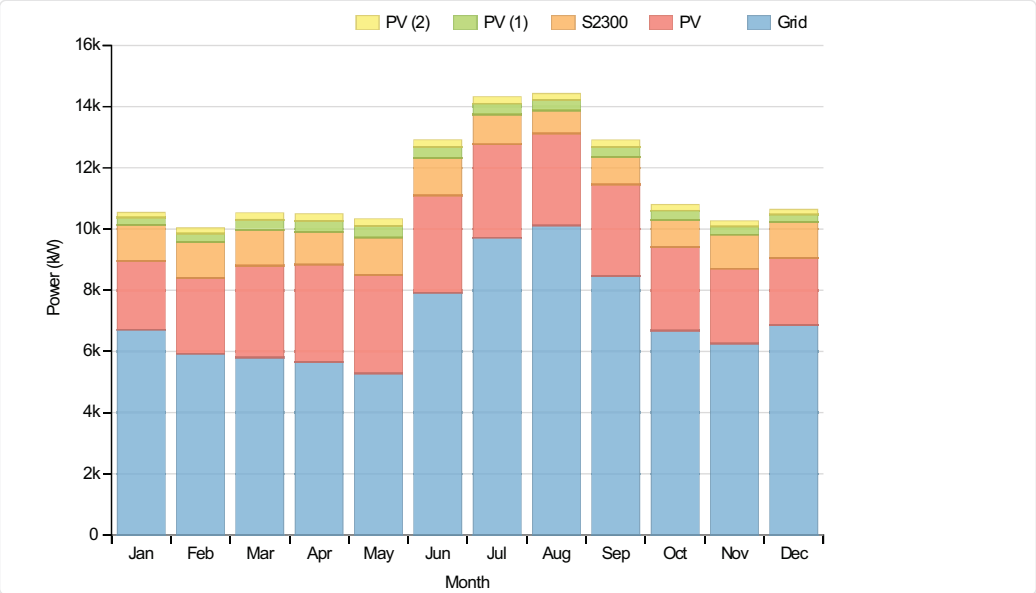
Electrical

Quantity	Value	Units
Excess electricity	3171029	kWh/yr
Unmet load	7341	kWh/yr
Capacity shortage	94840	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	24
PV	2,766,525	3
PV	1,788,429	2
Wind Turbine	9,348,703	9
Grid Purchases	62,415,532	62

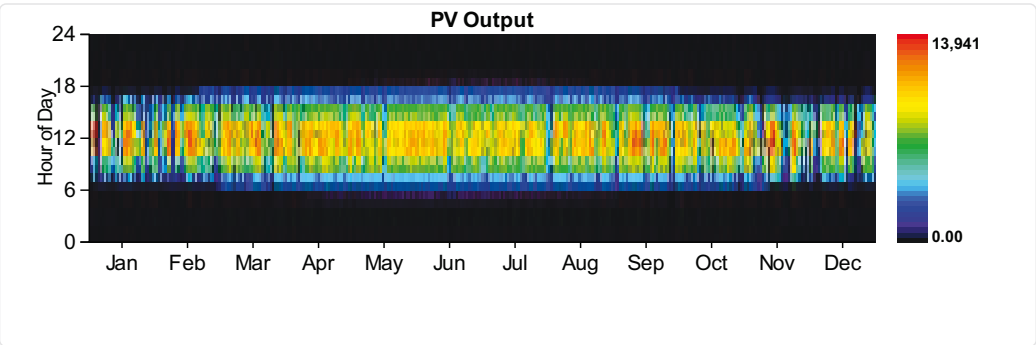
Component	Production(kWh/yr)	Fraction (%)
Total	100,963,760	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,045,120	100
DC primary load	0	0
Total	95,045,120	100



PV:SunPower PV

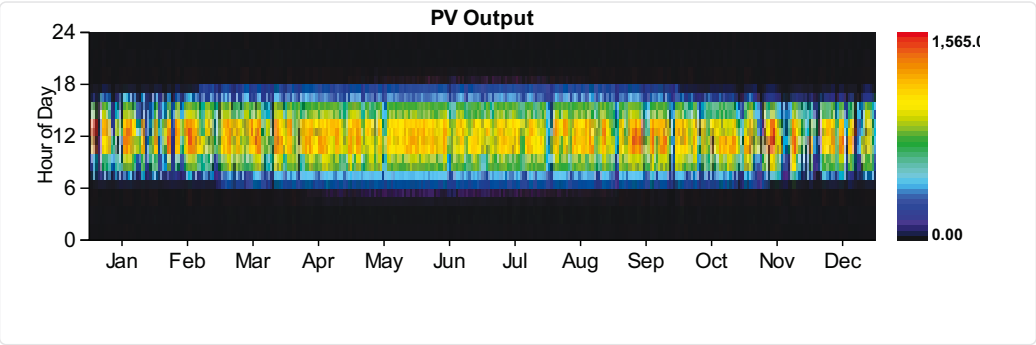
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

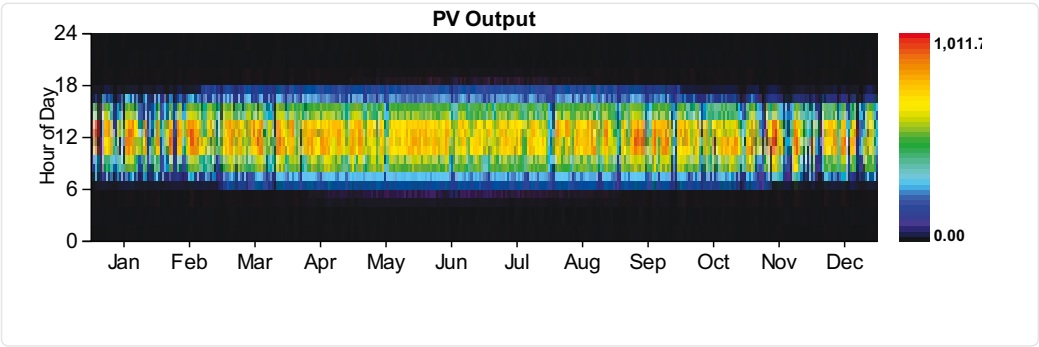
... PV remaining capacity flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh



Wind Turbine:Siemens 2.3 MW - 108

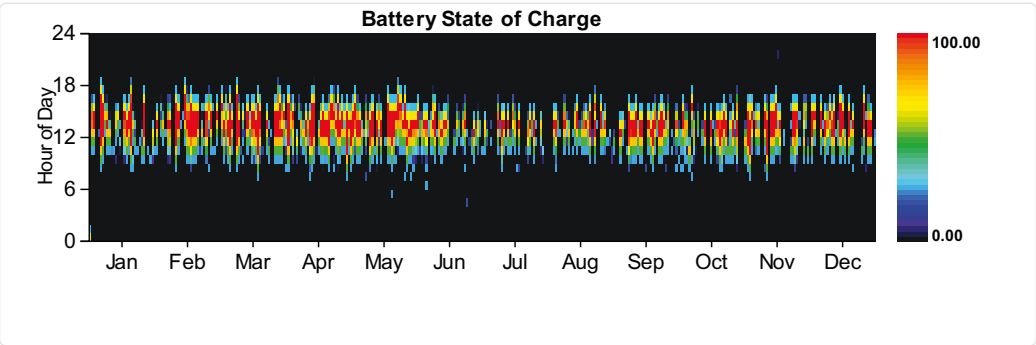
Quantity	Value	Units
Total rated capacity	4600	kW
Mean output	1067	kW
Capacity factor	23.20	%
Total production	9348703	kWh/yr
Minimum output	0.99	kW
Maximum output	4625.40	kW
Wind penetration	9.84	%
Hours of operation	8760	hrs/yr
Levelized cost	0.121	\$/kWh

Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	3
Batteries	3
Bus voltage	100

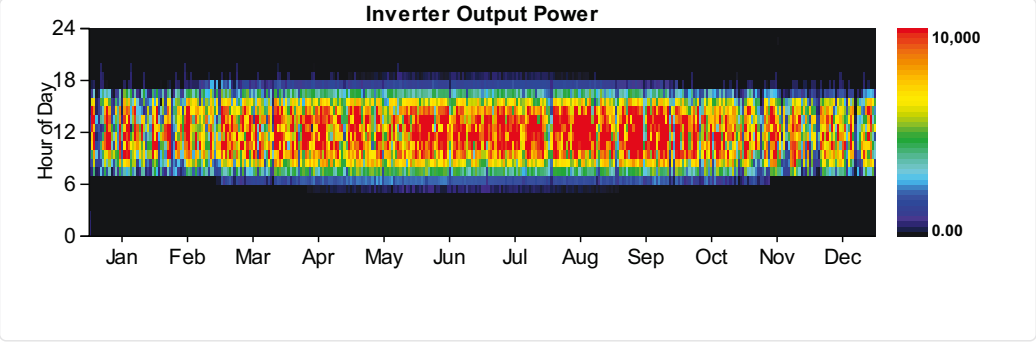
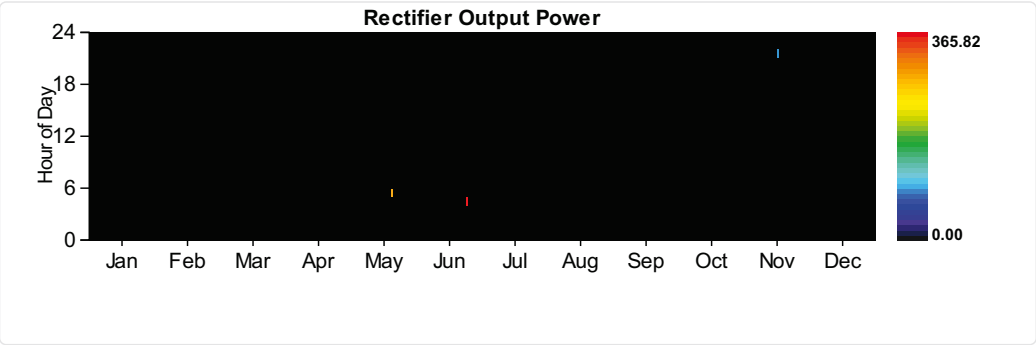
Quantity	Value	Units
Nominal capacity	1800	kWh
Usable nominal capacity	1800	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	539759	kWh/yr
Energy out	379338	kWh/yr
Storage depletion	1800	kWh/yr
Losses	158620	kWh/yr

Quantity	Value	Units
Annual throughput	453396	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,658	0	kW
Minimum output	0	0	kW
Maximum output	10,000	366	kW
Capacity factor	27	0	%
Hours of operation	4,618	83	hrs/yr
Energy in	25,868,908	873	kWh/yr
Energy out	23,281,934	742	kWh/yr
Losses	2,586,974	131	kWh/yr



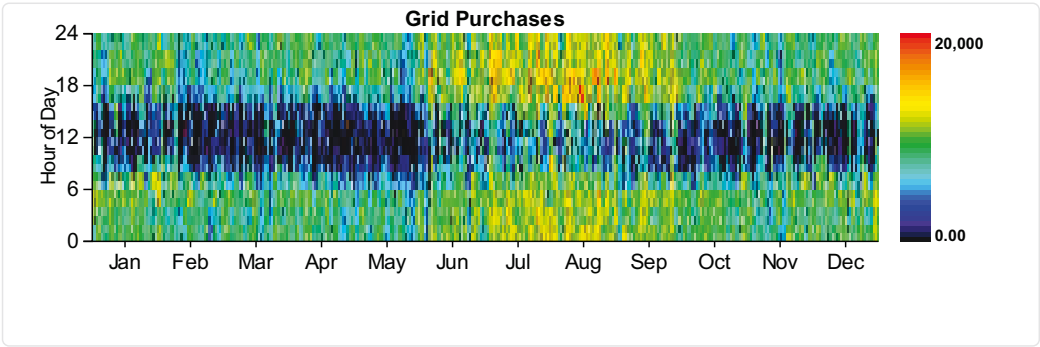
Grid

Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	15,872	0	253,957
February	0	0	0	15,640	0	250,233
March	0	0	0	17,011	0	272,176
April	0	0	0	14,338	0	229,412
May	0	0	0	13,482	0	215,718
June	0	0	0	19,988	0	319,816
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	18,527	0	296,432
October	0	0	0	15,997	0	255,953
November	0	0	0	15,220	0	243,516
December	0	0	0	16,591	0	265,460
Annual	0	0	0	20,000	0	3,242,673

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,990,218	0	4,990,218	0	598,826	0
February	3,978,615	0	3,978,615	0	477,434	0
March	4,319,255	0	4,319,255	0	518,311	0
April	4,071,989	0	4,071,989	0	488,639	0
May	3,927,020	0	3,927,020	0	471,242	0
June	5,697,224	0	5,697,224	0	683,667	0
July	7,227,189	0	7,227,189	0	867,263	0
August	7,524,698	0	7,524,698	0	902,964	0
September	6,095,000	0	6,095,000	0	731,400	0
October	4,969,575	0	4,969,575	0	596,349	0
November	4,508,634	0	4,508,634	0	541,036	0
December	5,106,119	0	5,106,119	0	612,734	0
Annual	62,415,532	0	62,415,532	0	7,489,864	0



Emissions

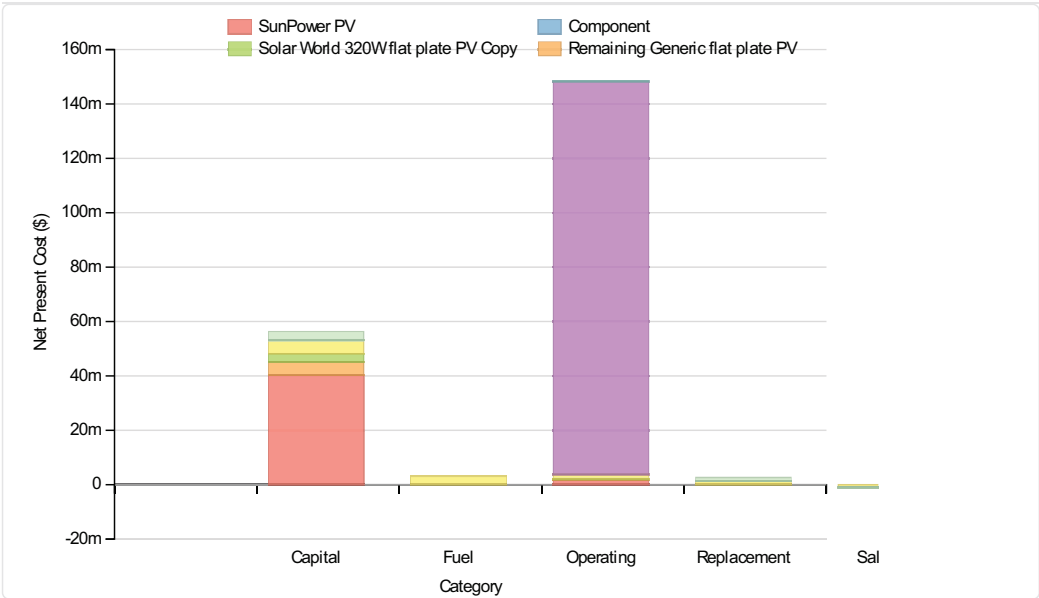
Pollutant	Emissions	Units
Carbon dioxide	39446616	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	171019	kg/yr
Nitrogen oxides	83637	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Generator	Kohler 3250 Prime Power	5,600	kW
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	15,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	209014160	\$
Levelized cost of energy	0.170	\$/kWh

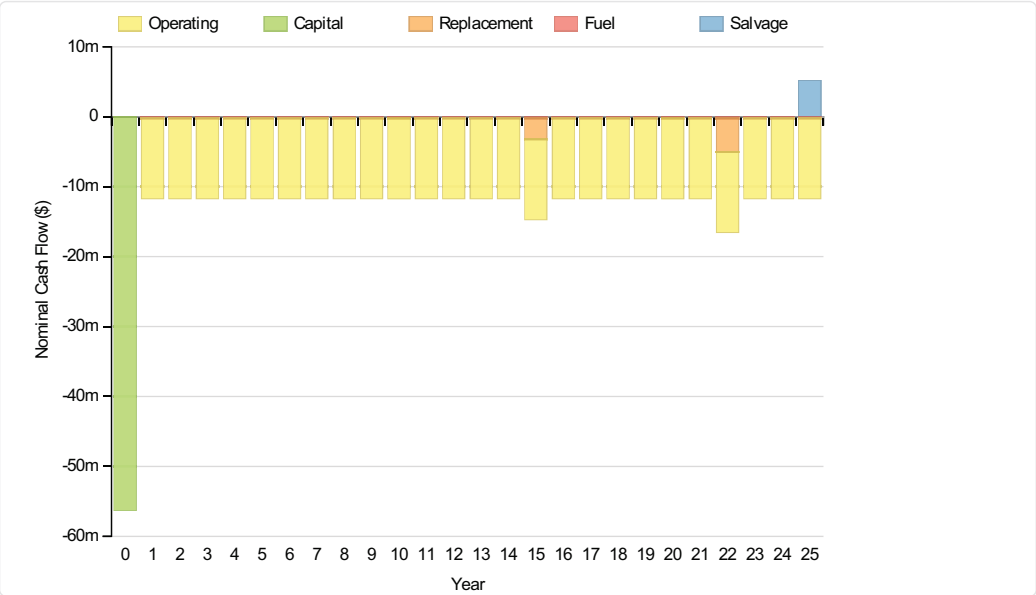
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Kohler 3250 Prime Power	4,821,429	1,386,639	1,495,738	3,040,480	-985,608	9,758,678
Grid	0	0	144,464,208	0	0	144,464,208
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263

System	56,266,140	2,666,635	149,266,944	3,040,480	1,226,139	209,014,060
Component	Capital	Replacement	O&M	Fuel	Salvage	Total

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Kohler 3250 Prime Power	372,959	107,263	115,702	235,194	-76,241	754,877
Grid	0	0	11,174,939	0	0	11,174,939
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,352,433	206,276	11,469,097	235,194	-94,847	16,168,153



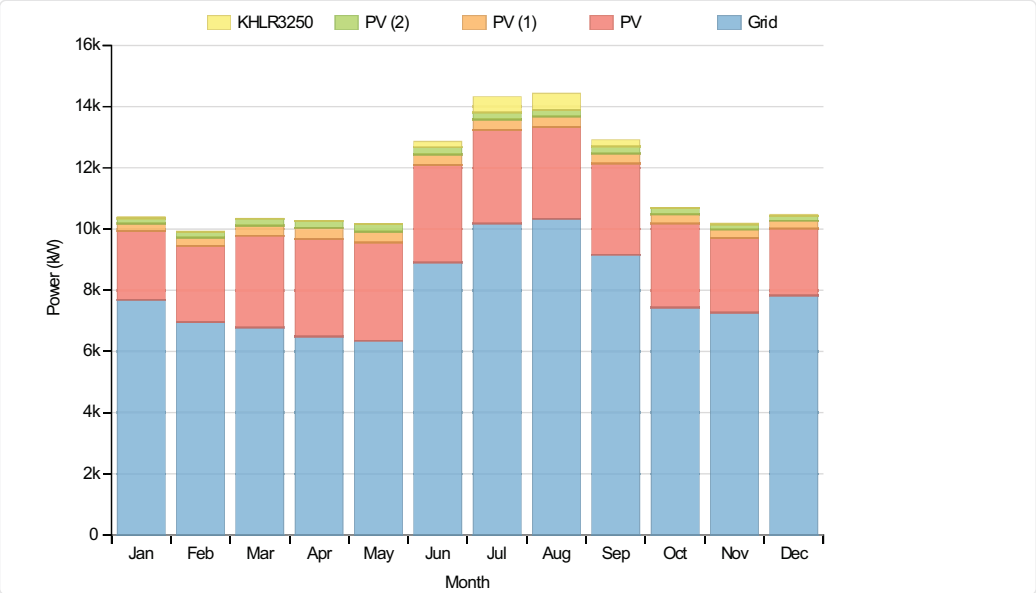
Electrical

Quantity	Value	Units
Excess electricity	2364608	kWh/yr
Unmet load	16214	kWh/yr
Capacity shortage	91448	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
PV	1,788,429	2
Generator	1,200,312	1
Grid Purchases	69,686,976	70

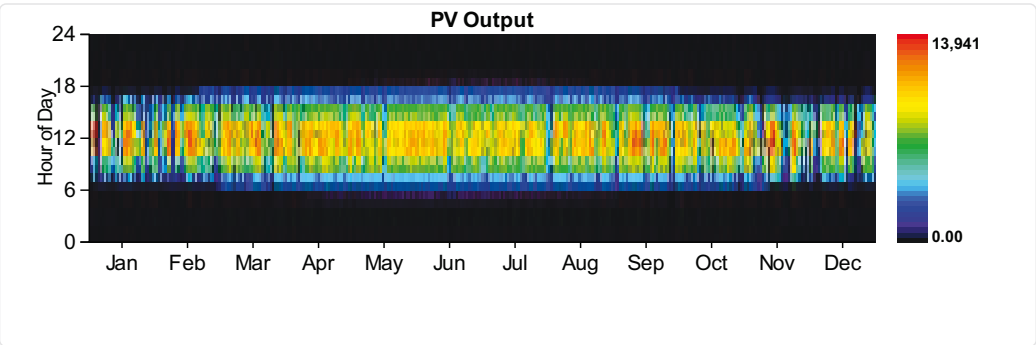
Total	Component	Production(kWh/yr)	100,086,816	Fraction (%)	100
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Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,036,248	100
DC primary load	0	0
Total	95,036,248	100



PV:SunPower PV

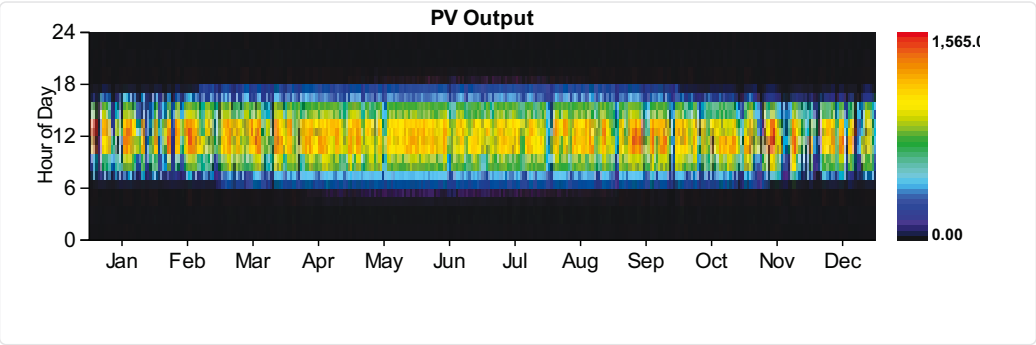
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

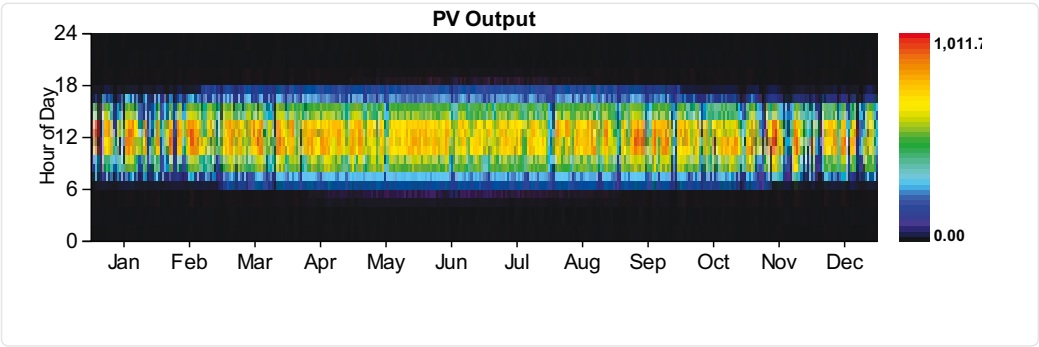
... PV remaining capacity flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



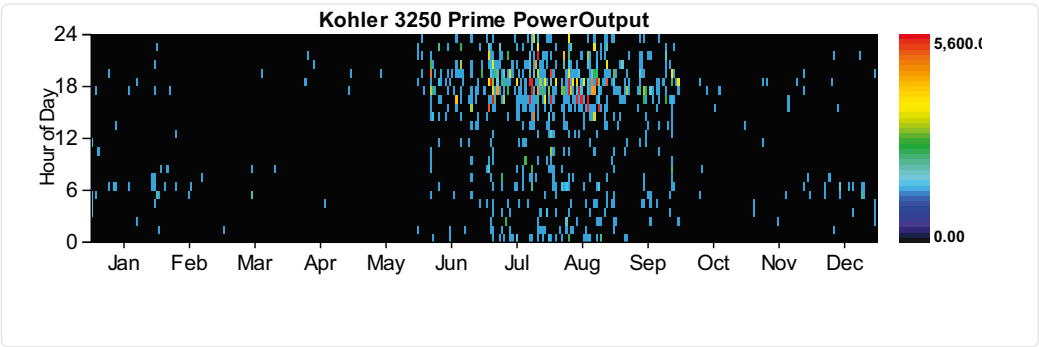
PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh



Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	688	hrs/yr
Number of starts	438	starts/yr
Operational life	22	yr
Fixed generation cost	511.50	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	1200312	kWh/yr
Mean electrical output	1745	kW
Min. electrical output	1400	kW
Max. electrical output	5600	kW
Fuel consumption	297715	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	2929512	kWh/yr
Mean electrical efficiency	41	%

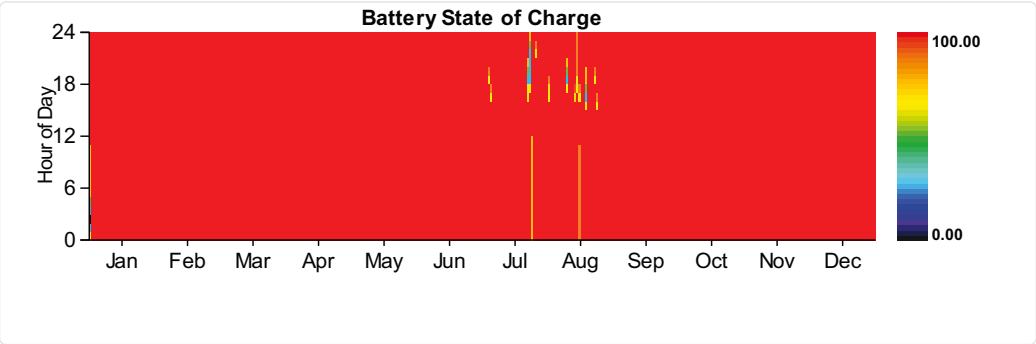


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

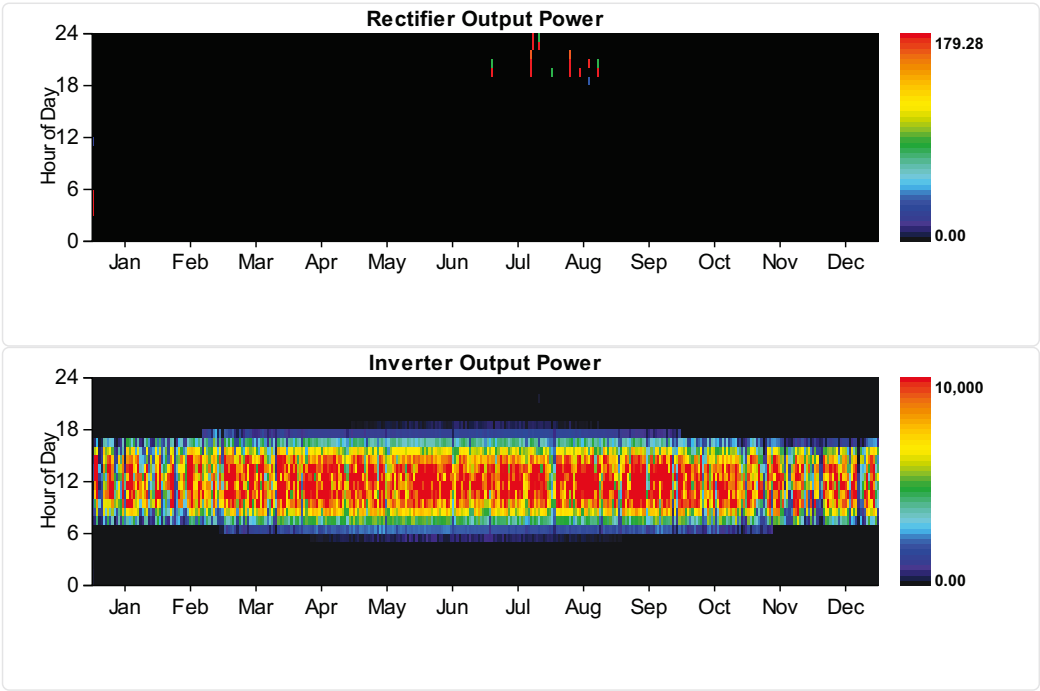
Quantity	Value	Units

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.281	\$/kWh
Energy in	5137	kWh/yr
Energy out	3596	kWh/yr
Storage depletion	0	kWh/yr
Losses	1541	kWh/yr
Annual throughput	4298	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,757	0	kW
Minimum output	0	0	kW
Maximum output	10,000	179	kW
Capacity factor	28	0	%
Hours of operation	4,389	25	hrs/yr
Energy in	26,836,728	3,795	kWh/yr
Energy out	24,152,896	3,225	kWh/yr
Losses	2,683,832	569	kWh/yr



Grid

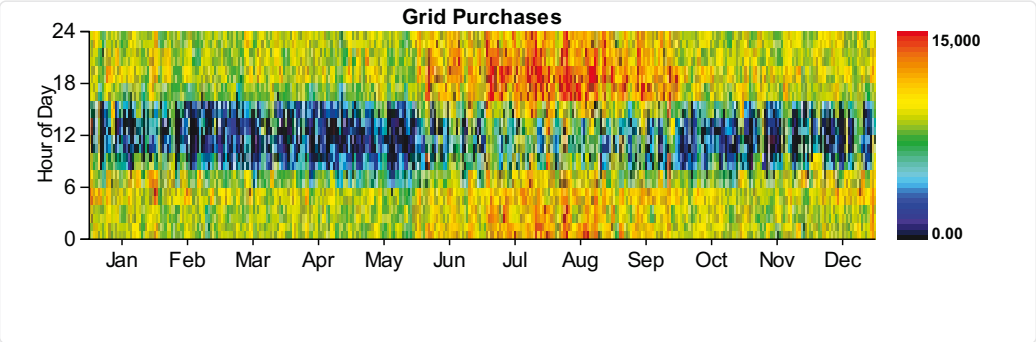
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	15,000	0	240,000
February	0	0	0	14,268	0	228,285
March	0	0	0	15,000	0	240,000
April	0	0	0	13,781	0	220,501
May	0	0	0	13,732	0	219,711
June	0	0	0	15,000	0	240,000
July	0	0	0	15,000	0	240,000
August	0	0	0	15,000	0	240,000
September	0	0	0	15,000	0	240,000
October	0	0	0	14,650	0	234,394
November	0	0	0	14,351	0	229,618
December	0	0	0	15,000	0	240,000
Annual	0	0	0	15,000	0	2,812,509

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,715,638	0	5,715,638	0	685,877	0
February	4,677,284	0	4,677,284	0	561,274	0
March	5,041,829	0	5,041,829	0	605,019	0

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	4,674,443	0	4,674,443	0	560,933	0
May	4,723,341	0	4,723,341	0	566,801	0
June	6,407,944	0	6,407,944	0	768,953	0
July	7,575,564	0	7,575,564	0	909,068	0
August	7,684,806	0	7,684,806	0	922,177	0
September	6,589,743	0	6,589,743	0	790,769	0
October	5,538,475	0	5,538,475	0	664,617	0
November	5,234,798	0	5,234,798	0	628,176	0
December	5,823,112	0	5,823,112	0	698,773	0
Annual	69,686,976	0	69,686,976	0	8,362,437	0



Emissions

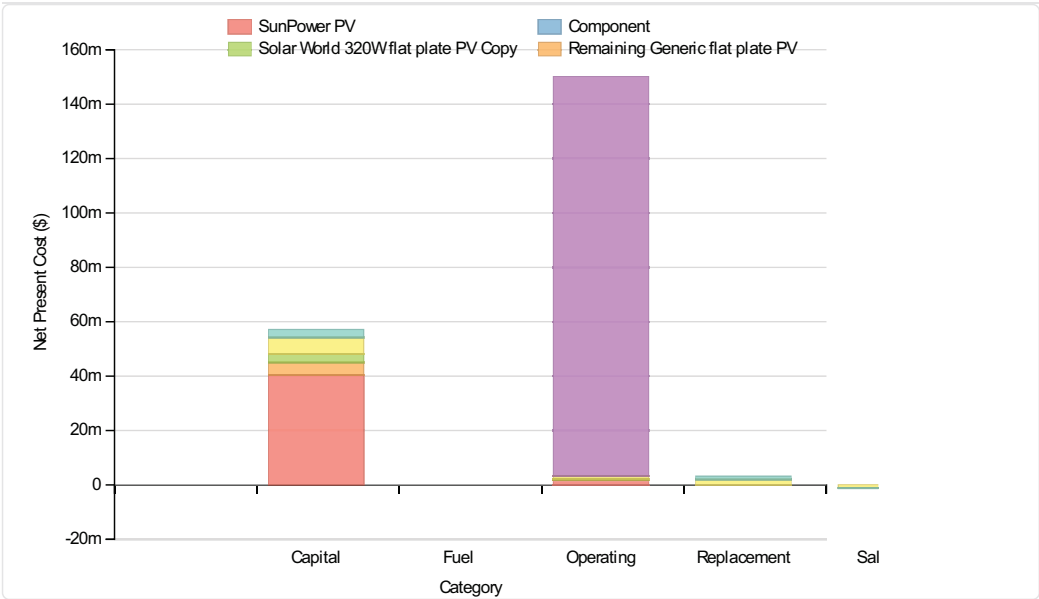
Pollutant	Emissions	Units
Carbon dioxide	44823524	kg/yr
Carbon monoxide	3275	kg/yr
Unburned hydrocarbons	375	kg/yr
Particulate matter	94	kg/yr
Sulfur dioxide	192551	kg/yr
Nitrogen oxides	96655	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Converter	System Converter	10,000	kW
Grid	Grid	27,200	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

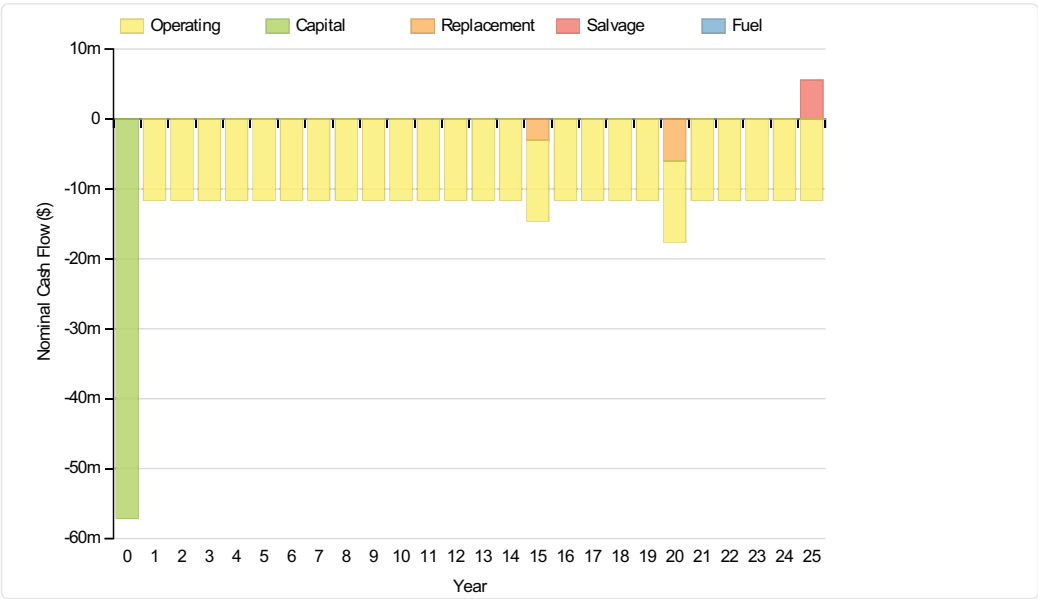
Total net present cost	209074208	\$
Levelized cost of energy	0.170	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Grid	0	0	146,840,352	0	0	146,840,352
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	57,120,124	3,185,663	150,085,920	0	-1,317,567	209,074,140

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Grid	0	0	11,358,744	0	0	11,358,744
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,418,492	246,425	11,609,803	0	-101,920	16,172,800



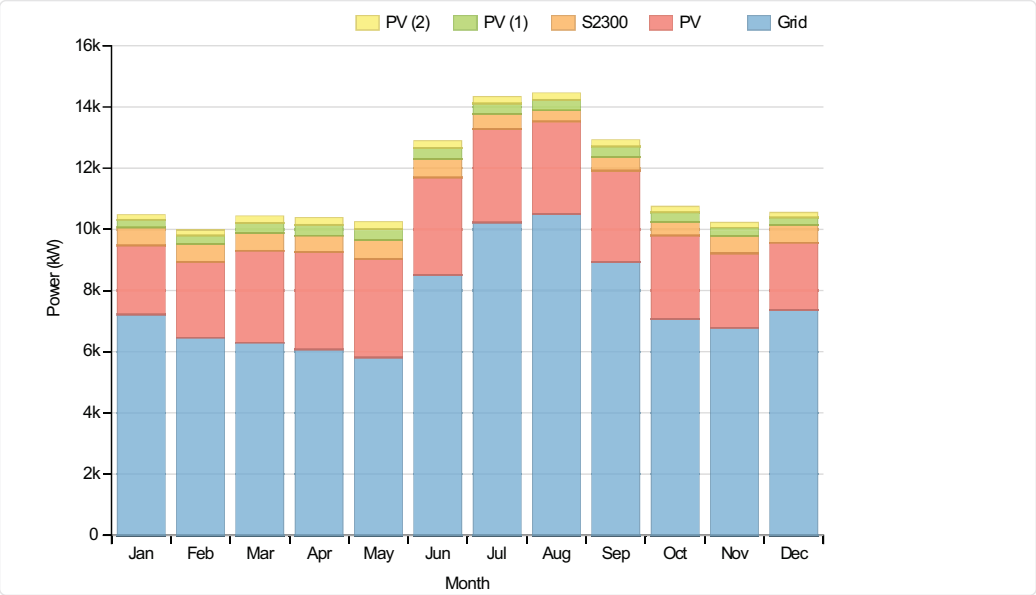
Electrical

Quantity	Value	Units
Excess electricity	2886962	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
PV	1,788,429	2
Wind Turbine	4,674,352	5
Grid Purchases	66,696,980	66
Total	100,570,864	100

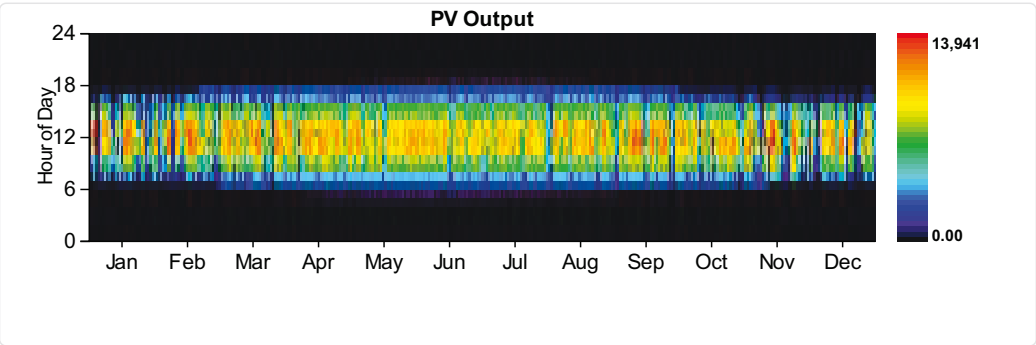
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100

DC primary load	Consumption(kWh/yr)	0	Fraction (%)	0
Total		95,052,456		100



PV:SunPower PV

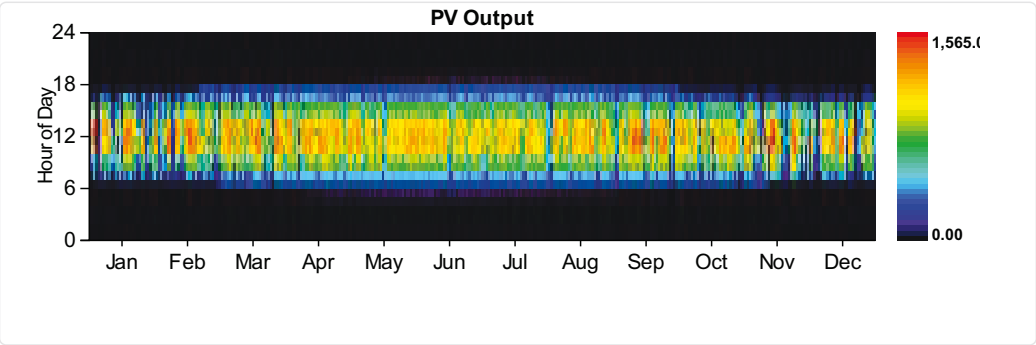
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

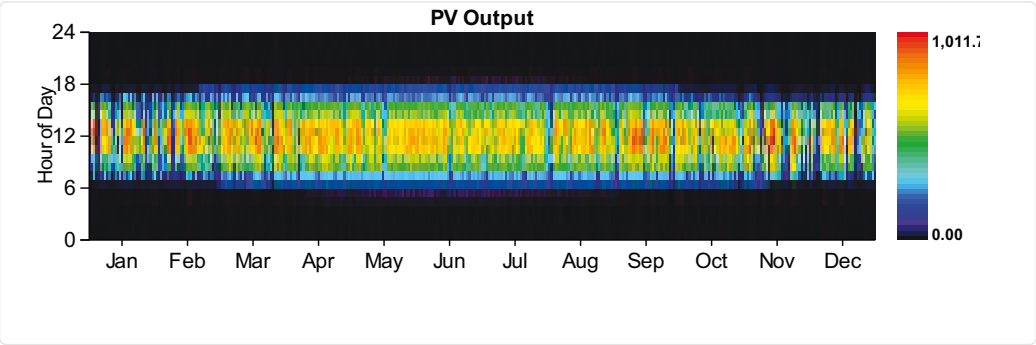
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW

Quantity	Value	Units
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh



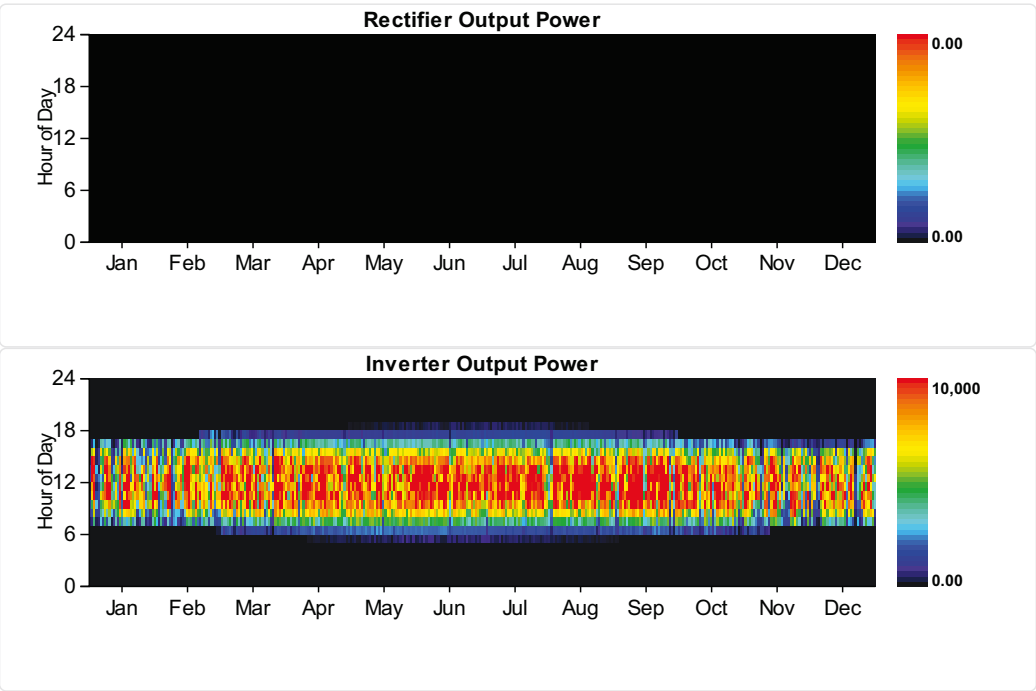
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
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Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,703	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	27	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	26,312,666	0	kWh/yr
Energy out	23,681,260	0	kWh/yr
Losses	2,631,406	0	kWh/yr



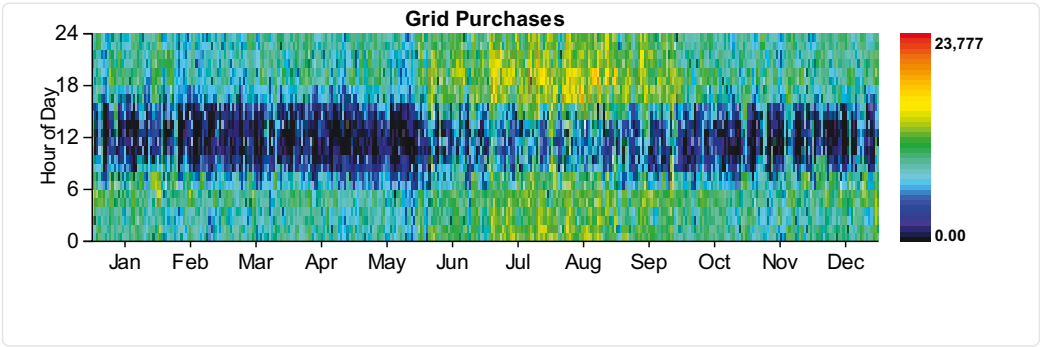
Grid

Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	16,288	0	260,605
February	0	0	0	15,654	0	250,459
March	0	0	0	17,043	0	272,688
April	0	0	0	14,366	0	229,856
May	0	0	0	13,700	0	219,202
June	0	0	0	20,004	0	320,060
July	0	0	0	23,778	0	380,443
August	0	0	0	22,183	0	354,921
September	0	0	0	18,548	0	296,765
October	0	0	0	16,023	0	256,374
November	0	0	0	15,239	0	243,828
December	0	0	0	16,870	0	269,913
Annual	0	0	0	23,778	0	3,355,113

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,374,291	0	5,374,291	0	644,915	0
February	4,338,702	0	4,338,702	0	520,644	0
March	4,682,773	0	4,682,773	0	561,933	0
April	4,374,337	0	4,374,337	0	524,920	0
May	4,326,311	0	4,326,311	0	519,157	0
June	6,124,817	0	6,124,817	0	734,978	0
July	7,604,342	0	7,604,342	0	912,521	0
August	7,819,220	0	7,819,220	0	938,306	0
September	6,429,440	0	6,429,440	0	771,533	0
October	5,262,241	0	5,262,241	0	631,469	0
November	4,884,078	0	4,884,078	0	586,089	0
December	5,476,427	0	5,476,427	0	657,171	0
Annual	66,696,980	0	66,696,980	0	8,003,638	0



Emissions

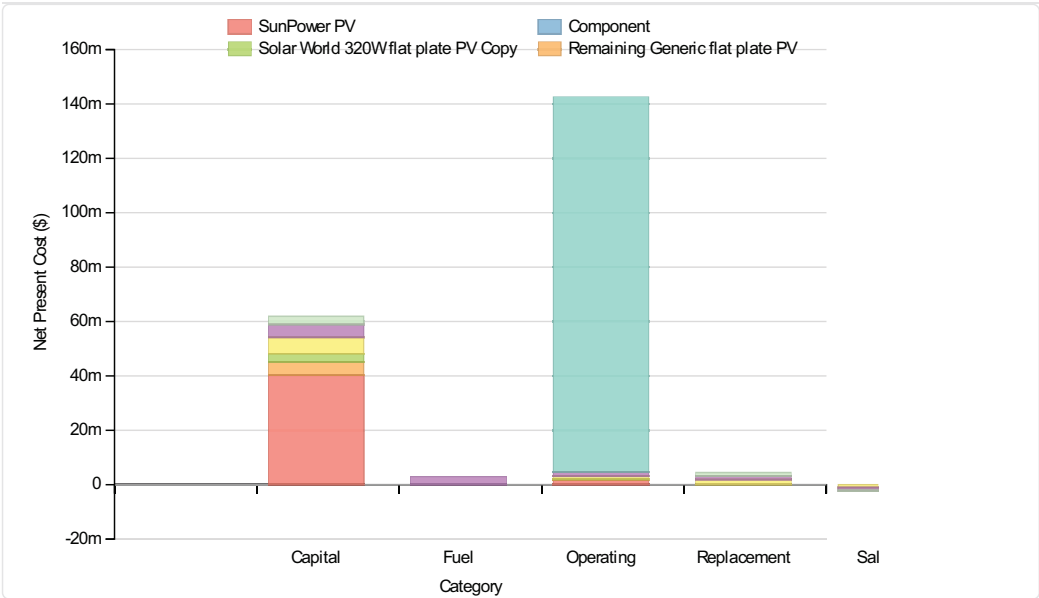
Pollutant	Emissions	Units
Carbon dioxide	42152492	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	182750	kg/yr
Nitrogen oxides	89374	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Generator	Kohler 3250 Prime Power	5,600	kW
Converter	System Converter	10,000	kW
Grid	Grid	15,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	209445488	\$
Levelized cost of energy	0.170	\$/kWh

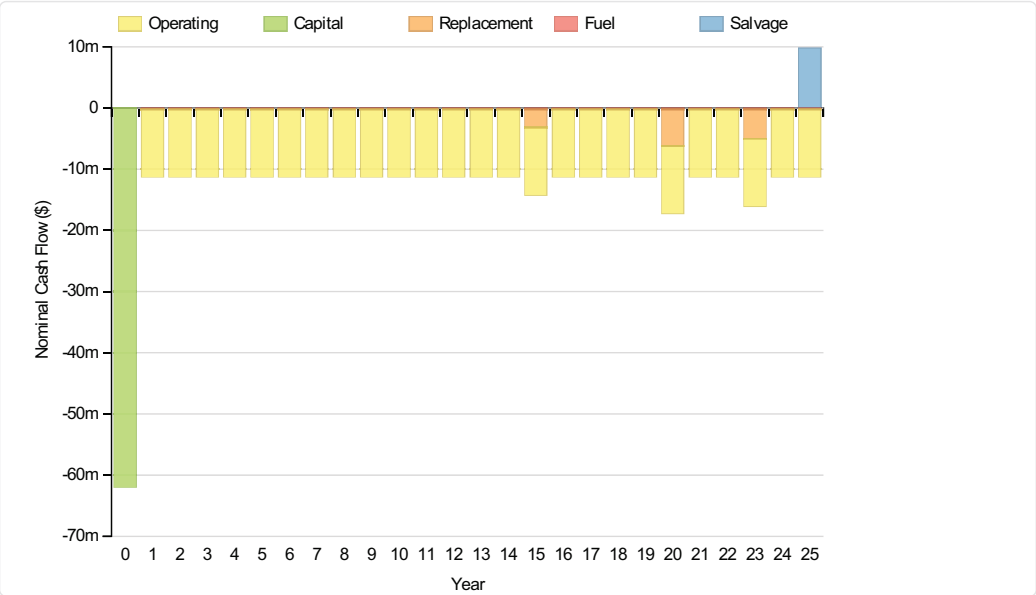
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Kohler 3250 Prime Power	4,821,429	1,335,855	1,452,257	2,825,962	-1,024,108	9,411,395
Grid	0	0	137,800,256	0	0	137,800,256
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263

System	Capital	Replacement	O&M	Fuel	Salvage	Total
Component	61,941,552	4,521,518	11,498,032	2,825,962	-2,341,675	209,445,389

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Kohler 3250 Prime Power	372,959	103,334	112,338	218,601	-79,219	728,013
Grid	0	0	10,659,453	0	0	10,659,453
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,791,451	349,759	11,022,847	218,601	-181,139	16,201,519



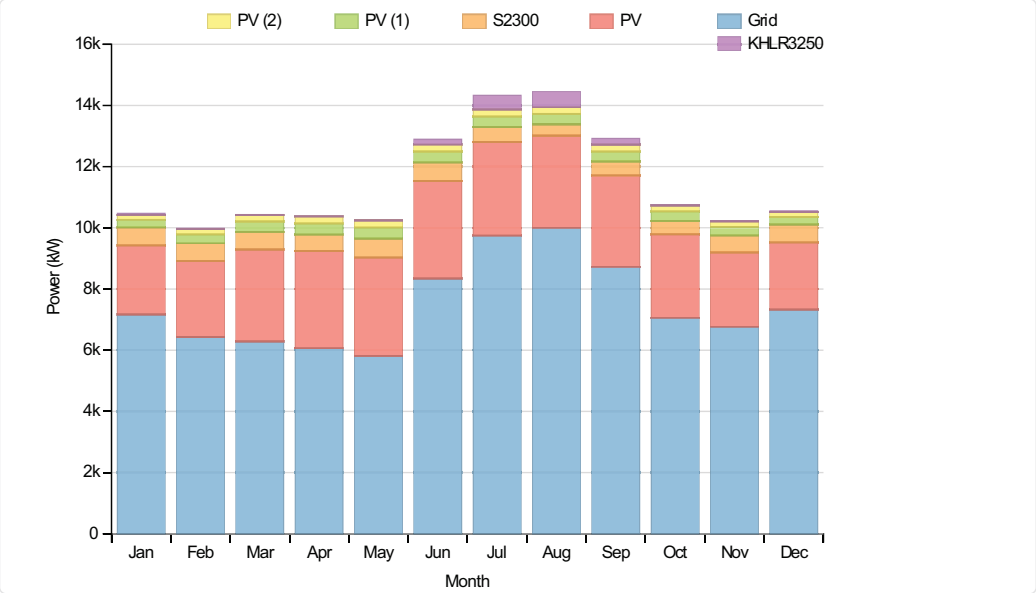
Electrical

Quantity	Value	Units
Excess electricity	2886962	kWh/yr
Unmet load	7555	kWh/yr
Capacity shortage	83283	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3
PV	1,788,429	2
Generator	1,112,217	1
Wind Turbine	4,674,352	5

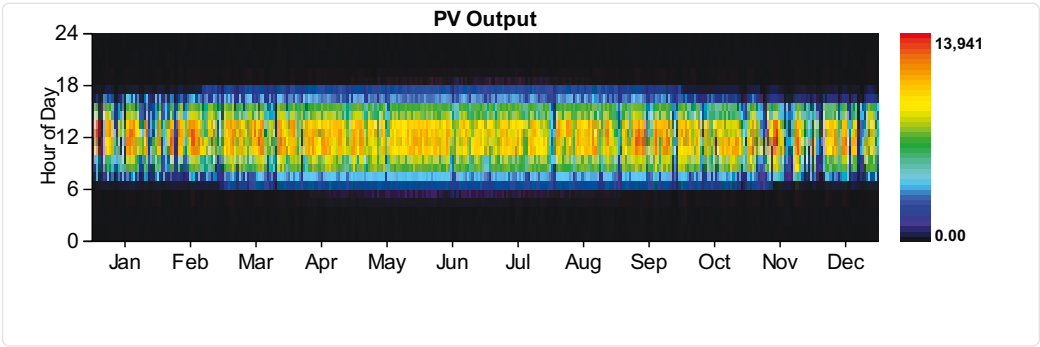
Grid Purchases Component	Production(kWh/yr)	65,577,200	Fraction (%)	65
Total		100,563,296		100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,044,912	100
DC primary load	0	0
Total	95,044,912	100



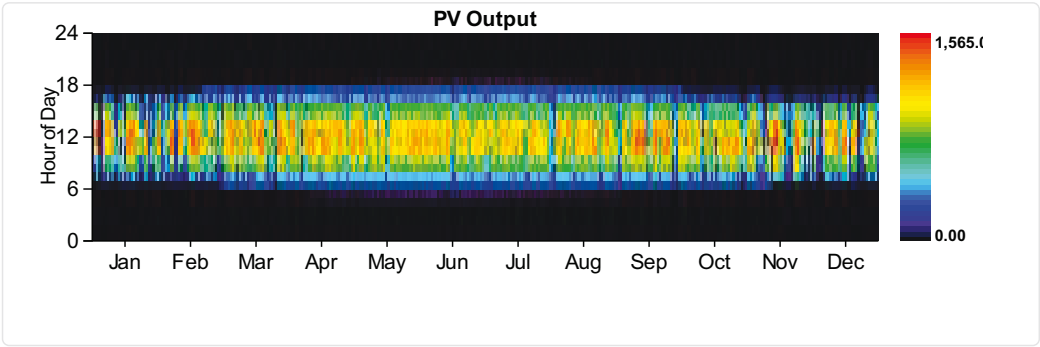
PV:SunPower PV

Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

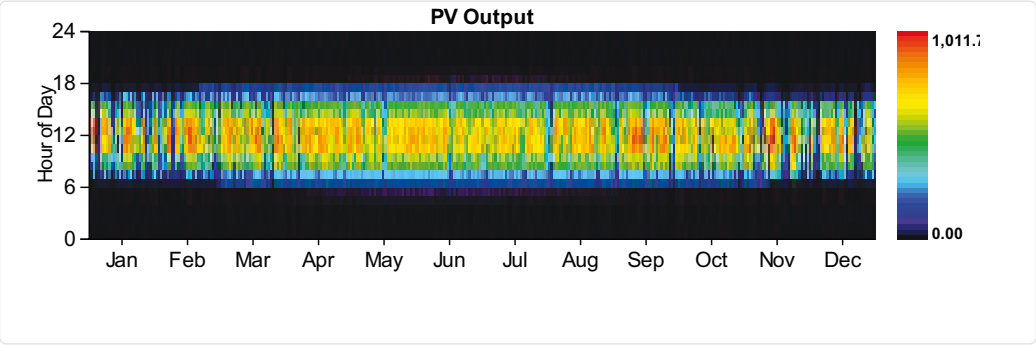
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%

Quantity	Value	4386	Units
Levelized cost		0.009	\$/kWh



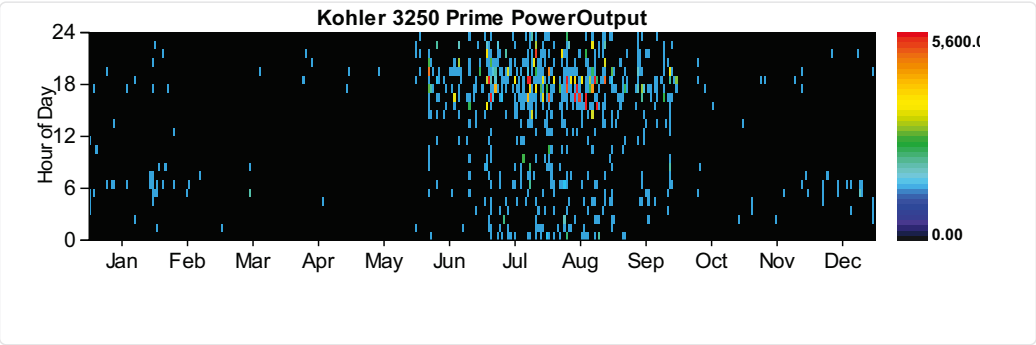
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Generator:Kohler 3250 Prime Power

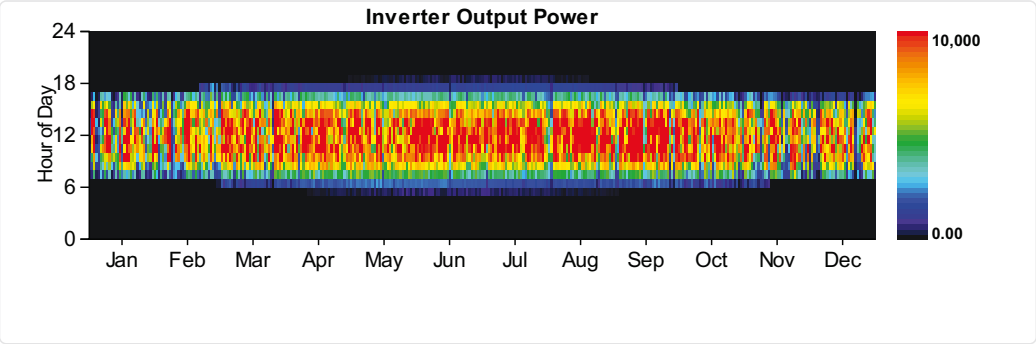
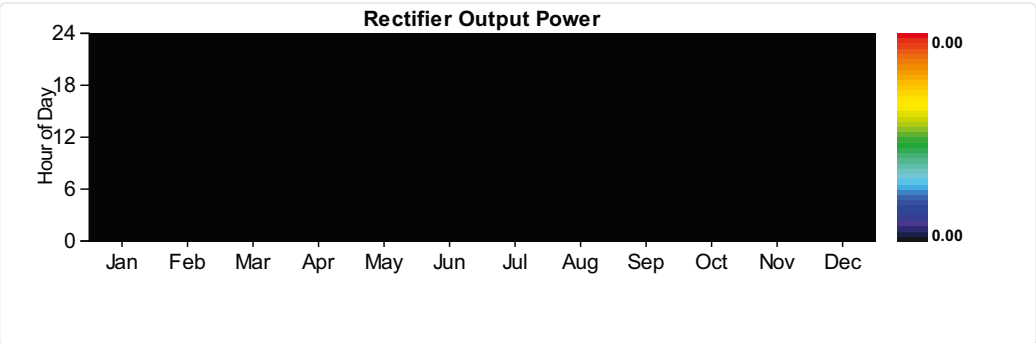
Quantity	Value	Units
Hours of operation	668	hrs/yr
Number of starts	424	starts/yr
Operational life	22	yr
Fixed generation cost	511.50	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	1112217	kWh/yr
Mean electrical output	1665	kW
Min. electrical output	1400	kW
Max. electrical output	5600	kW
Fuel consumption	276710	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	2722823	kWh/yr
Mean electrical efficiency	41	%

Quantity	Value	Units
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Converter

Quantity	Inverter	Rectifier	Units
Capacity	10,000	9,000	kW
Mean output	2,703	0	kW
Minimum output	0	0	kW
Maximum output	10,000	0	kW
Capacity factor	27	0	%
Hours of operation	4,386	0	hrs/yr
Energy in	26,312,666	0	kWh/yr
Energy out	23,681,260	0	kWh/yr
Losses	2,631,406	0	kWh/yr



Grid

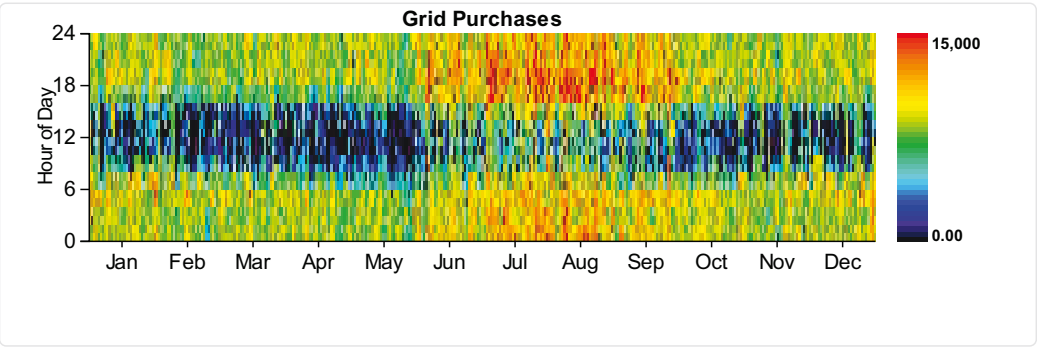
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	14,888	0	238,205

February	Energy 0	Energy 0	Net 0	Peak 14,254	Energy 0	Demand 228,059
March	Purchased 0	Sold 0	Purchases 0	Demand 15,000	Charge 0	Charge 140,000
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
April	0	0	0	13,267	0	212,265
May	0	0	0	13,516	0	216,263
June	0	0	0	15,000	0	240,000
July	0	0	0	15,000	0	240,000
August	0	0	0	15,000	0	240,000
September	0	0	0	15,000	0	240,000
October	0	0	0	14,623	0	233,974
November	0	0	0	13,839	0	221,428
December	0	0	0	15,000	0	240,000
Annual	0	0	0	15,000	0	2,790,194

Rate: Rate 1

	Energy	Energy	Net	Peak	Energy	Demand
Resources.ReportingService_GenerateInputsReport_Month	Purchased	Sold	Purchases	Demand	Charge	Charge
	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
January	5,337,892	0	5,337,892	0	640,547	0
February	4,320,502	0	4,320,502	0	518,460	0
March	4,676,530	0	4,676,530	0	561,184	0
April	4,367,337	0	4,367,337	0	524,080	0
May	4,323,511	0	4,323,511	0	518,821	0
June	6,005,034	0	6,005,034	0	720,604	0
July	7,253,835	0	7,253,835	0	870,460	0
August	7,440,888	0	7,440,888	0	892,907	0
September	6,284,002	0	6,284,002	0	754,080	0
October	5,251,041	0	5,251,041	0	630,125	0
November	4,867,278	0	4,867,278	0	584,073	0
December	5,449,358	0	5,449,358	0	653,923	0
Annual	65,577,200	0	65,577,200	0	7,869,265	0



Emissions

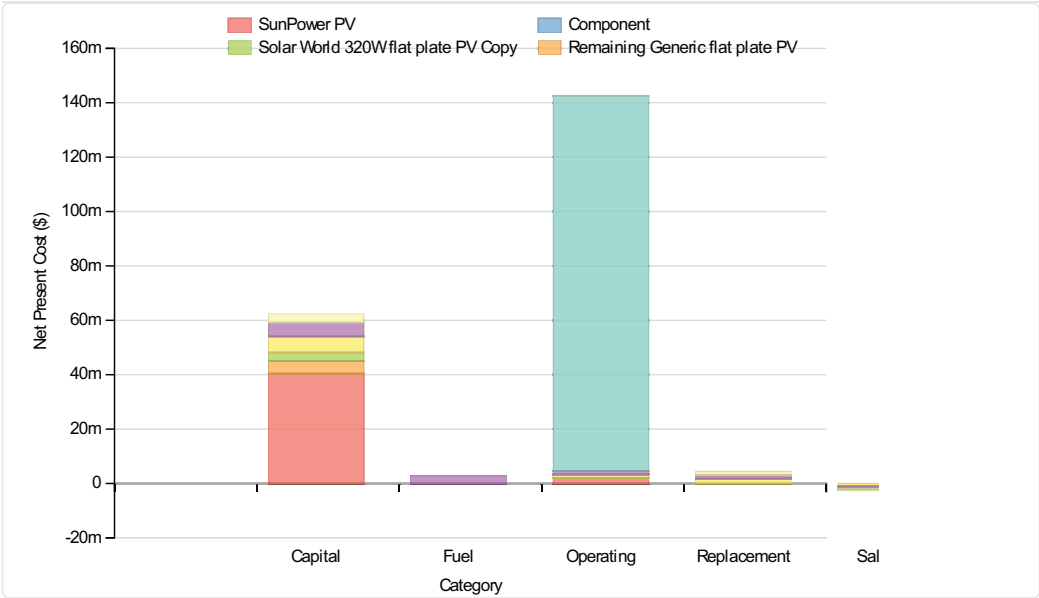
Pollutant	Emissions	Units
Carbon dioxide	42171020	kg/yr
Carbon monoxide	3044	kg/yr
Unburned hydrocarbons	349	kg/yr
Particulate matter	87	kg/yr
Sulfur dioxide	181177	kg/yr
Nitrogen oxides	90917	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	1	
Generator	Kohler 3250 Prime Power	5,600	kW
Battery	GS200 flow	1	strings
Converter	System Converter	10,000	kW
Grid	Grid	15,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	209549552	\$
Levelized cost of energy	0.171	\$/kWh

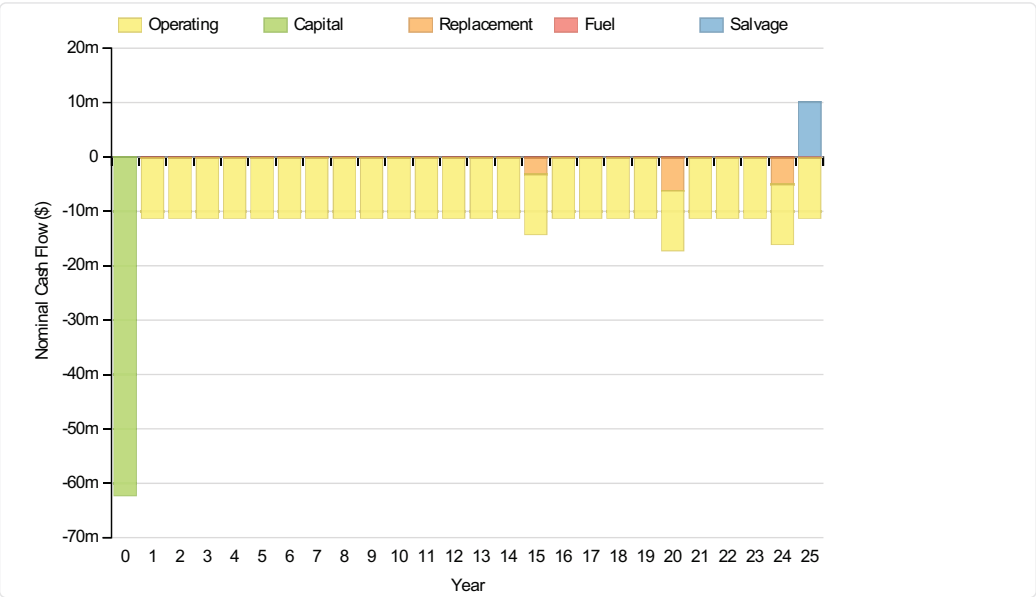
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	3,083,333	0	280,096	0	0	3,363,429
Siemens 2.3 MW - 108	6,000,000	1,912,842	969,563	0	-1,078,009	7,804,396
Kohler 3250 Prime Power	4,821,429	1,225,634	1,360,948	2,681,734	-1,104,959	8,984,786
Grid	0	0	137,969,088	0	0	137,969,088

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
GS200 flow	324,589	7,176	31,026	0	973	361,818
Converter	3,000,000	1,272,821	0	0	-239,558	4,033,263
System	62,266,140	4,418,472	142,606,624	2,681,734	-2,423,499	209,549,471

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	238,509	0	21,667	0	0	260,176
Siemens 2.3 MW - 108	464,126	147,967	75,000	0	-83,389	603,704
Kohler 3250 Prime Power	372,959	94,808	105,275	207,444	-85,473	695,013
Grid	0	0	10,672,513	0	0	10,672,513
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	232,063	98,458	0	0	-18,531	311,990
System	4,816,559	341,788	11,031,247	207,444	-187,468	16,209,570



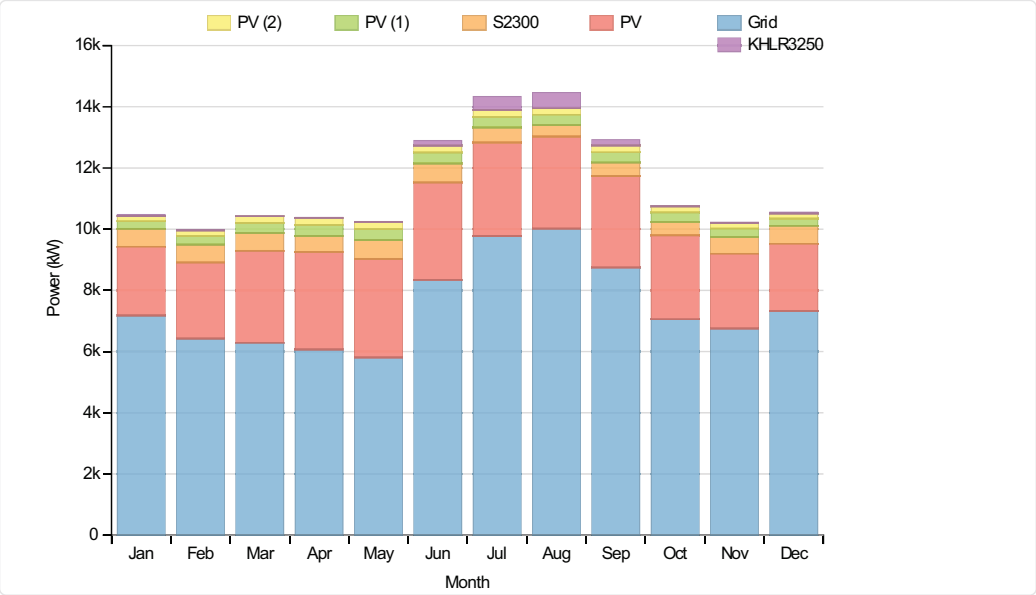
Electrical

Quantity	Value	Units
Excess electricity	2886873	kWh/yr
Unmet load	6236	kWh/yr
Capacity shortage	76596	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	24,644,568	25
PV	2,766,525	3

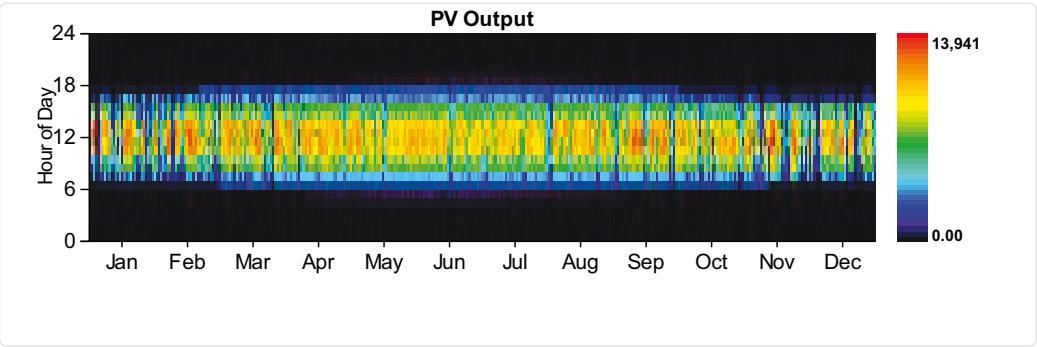
Component	Production(kWh/yr)	Fraction (%)
Generator	1,056,398	1
Wind Turbine	4,674,352	5
Grid Purchases	65,635,548	65
Total	100,565,824	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,046,216	100
DC primary load	0	0
Total	95,046,216	100



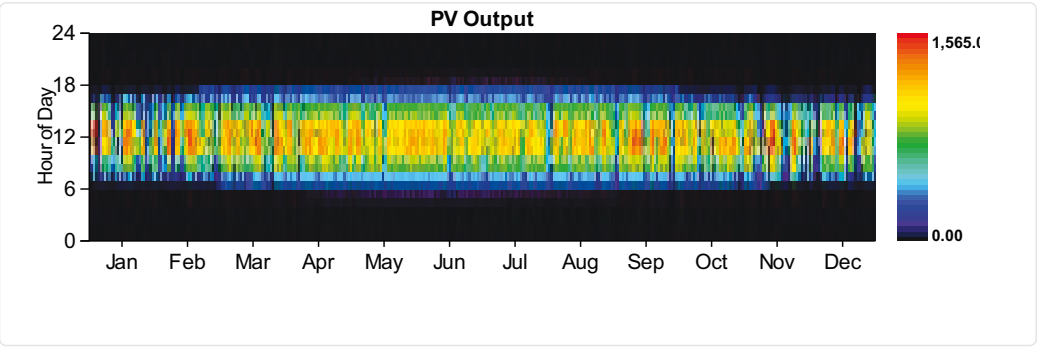
PV:SunPower PV

Quantity	Value	Units
Rated capacity	13780	kW
Mean output	2813	kW
Mean output	67519.00	kWh/d
Capacity factor	20.42	%
Total production	24644568	kWh/yr
Minimum output	0.00	kW
Maximum output	13941.00	kW
PV penetration	25.93	%
Hours of operation	4386	hrs/yr
Levelized cost	0.111	\$/kWh



PV:Remaining Generic flat plate PV

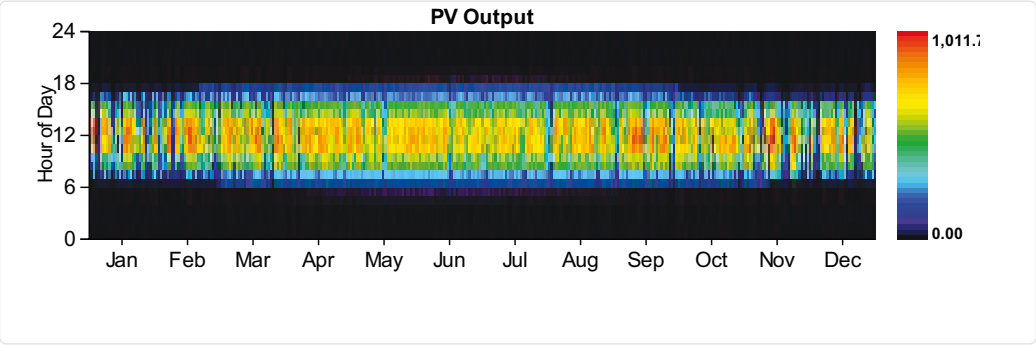
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766525	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	204	kW
Mean output	4899.80	kWh/d
Capacity factor	20.42	%
Total production	1788429	kWh/yr
Minimum output	0.00	kW
Maximum output	1011.70	kW
PV penetration	1.88	%

Hours of operation	Value	4386	Units
Levelized cost		0.009	\$/kWh



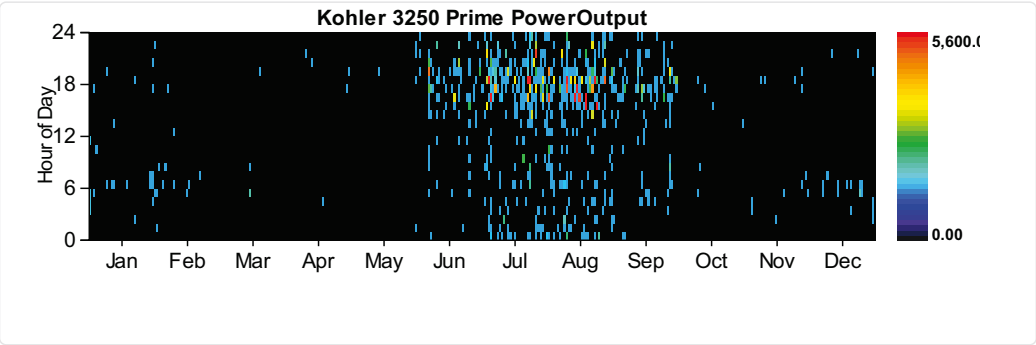
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	2300	kW
Mean output	534	kW
Capacity factor	23.20	%
Total production	4674352	kWh/yr
Minimum output	0.49	kW
Maximum output	2312.70	kW
Wind penetration	4.92	%
Hours of operation	8760	hrs/yr
Levelized cost	0.129	\$/kWh

Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	626	hrs/yr
Number of starts	410	starts/yr
Operational life	24	yr
Fixed generation cost	511.50	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	1056398	kWh/yr
Mean electrical output	1688	kW
Min. electrical output	1400	kW
Max. electrical output	5600	kW
Fuel consumption	262587	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	2583860	kWh/yr
Mean electrical efficiency	41	%

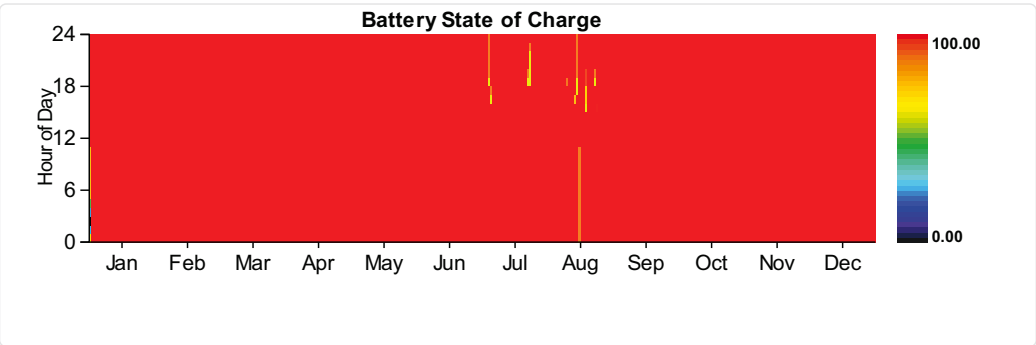
Quantity	Value	Units
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Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

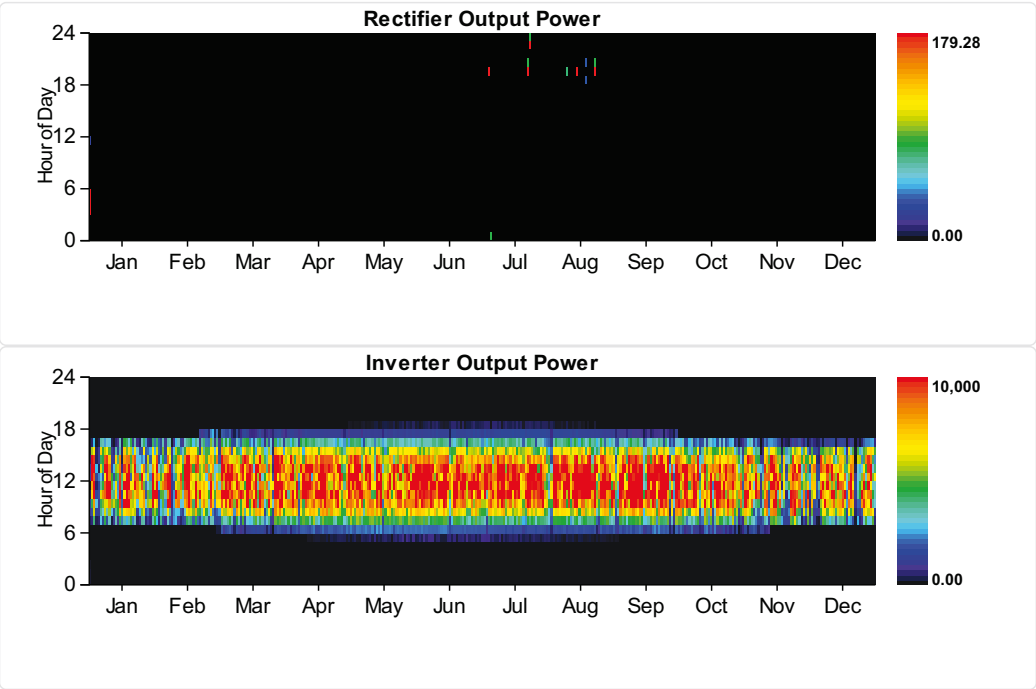
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.285	\$/kWh
Energy in	2810	kWh/yr
Energy out	1967	kWh/yr
Storage depletion	0	kWh/yr
Losses	843	kWh/yr
Annual throughput	2351	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units

Capacity Quantity	Inverter	10,000	Rectifier	9,000	Units
Mean output		2,704		0	kW
Minimum output		0		0	kW
Maximum output		10,000		179	kW
Capacity factor		27		0	%
Hours of operation		4,388		18	hrs/yr
Energy in		26,313,838		2,263	kWh/yr
Energy out		23,682,316		1,924	kWh/yr
Losses		2,631,522		339	kWh/yr



Grid

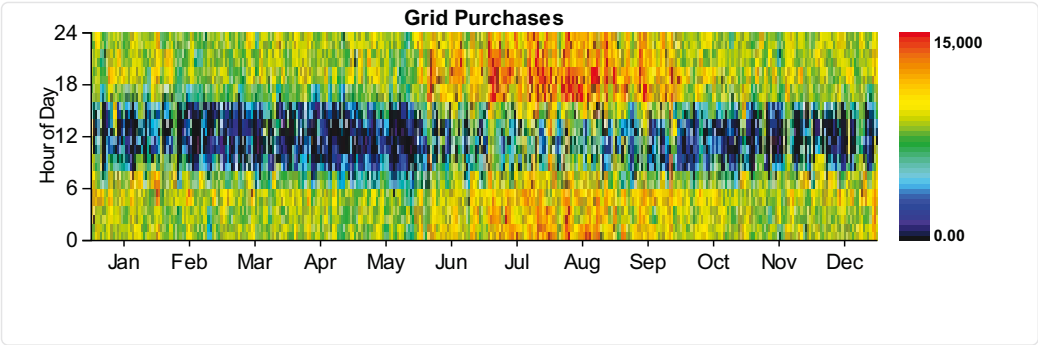
Rate: Rate 1 Demand

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	14,888	0	238,205
February	0	0	0	14,254	0	228,059
March	0	0	0	15,000	0	240,000
April	0	0	0	13,645	0	218,325
May	0	0	0	13,516	0	216,263
June	0	0	0	15,000	0	240,000
July	0	0	0	15,000	0	240,000
August	0	0	0	15,000	0	240,000
September	0	0	0	15,000	0	240,000

October	Energy Purchased	0	Energy Sold	0	Net Purchases	0	Peak Demand	14,623	Energy Charge	0	Demand Charge	233,974
November	Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)				
December		0	0	0	0	15,000	0	240,000				
Annual		0	0	0	0	15,000	0	2,796,253				

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,340,240	0	5,340,240	0	640,829	0
February	4,323,302	0	4,323,302	0	518,796	0
March	4,677,930	0	4,677,930	0	561,352	0
April	4,368,737	0	4,368,737	0	524,248	0
May	4,323,511	0	4,323,511	0	518,821	0
June	6,009,234	0	6,009,234	0	721,108	0
July	7,273,435	0	7,273,435	0	872,812	0
August	7,452,088	0	7,452,088	0	894,251	0
September	6,295,202	0	6,295,202	0	755,424	0
October	5,253,841	0	5,253,841	0	630,461	0
November	4,867,278	0	4,867,278	0	584,073	0
December	5,450,758	0	5,450,758	0	654,091	0
Annual	65,635,548	0	65,635,548	0	7,876,267	0



Emissions

Pollutant	Emissions	Units
Carbon dioxide	42170832	kg/yr
Carbon monoxide	2889	kg/yr
Unburned hydrocarbons	331	kg/yr
Particulate matter	83	kg/yr
Sulfur dioxide	181260	kg/yr
Nitrogen oxides	90840	kg/yr

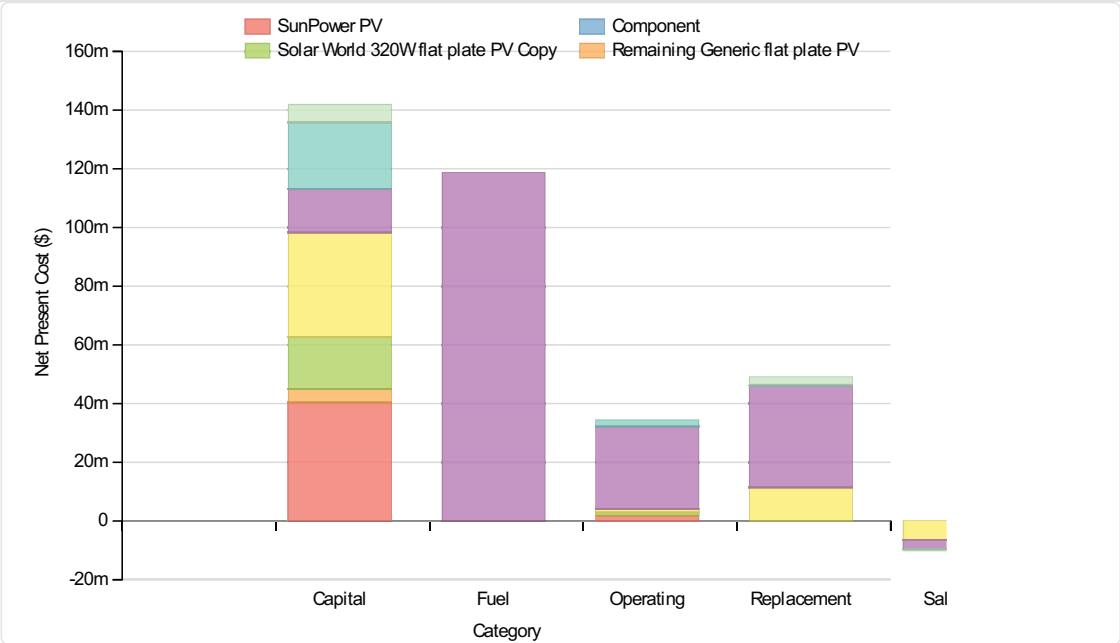
Pollutant	Emissions	Units
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System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
PV #3	Solar World 320W flat plate PV Copy	6,000	kW
Wind Turbine	Siemens 2.3 MW - 108	6	
Generator	Kohler 3250 Prime Power	16,800	kW
Battery	GS200 flow	70	strings
Converter	System Converter	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	333824096	\$
Levelized cost of energy	0.272	\$/kWh

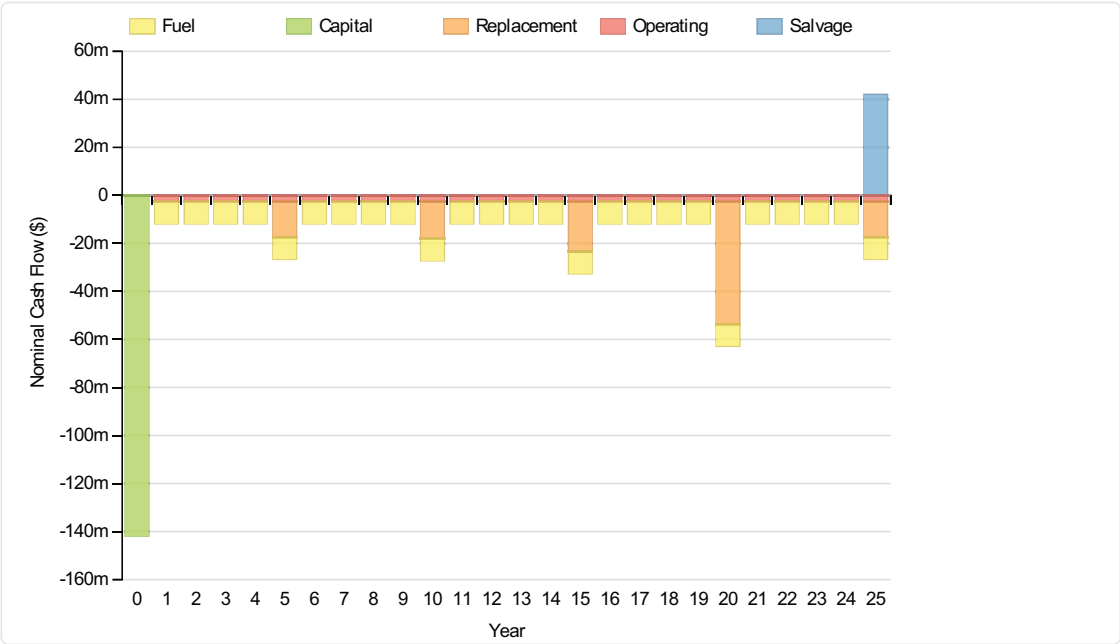
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Solar World 320W flat plate PV Copy	17,666,668	0	818,742	0	0	18,485,410
Siemens 2.3 MW - 108	35,625,000	11,357,500	1,292,751	0	-6,400,678	41,874,573
Kohler 3250 Prime Power	14,821,428	34,618,928	28,073,770	118,660,264	-3,136,350	193,038,040

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
GS200 flow	22,721,244	501,733	2,171,822	0	-68,026	25,326,773
Converter	6,000,000	2,545,641	0	0	-479,115	8,066,526
System	141,871,136	49,023,804	34,352,980	118,660,264	-10,084,170	333,824,014

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Solar World 320W flat plate PV Copy	1,366,594	0	63,333	0	0	1,429,927
Siemens 2.3 MW - 108	2,755,750	878,552	100,000	0	-495,120	3,239,182
Kohler 3250 Prime Power	1,146,502	2,677,926	2,171,629	9,178,891	-242,610	14,932,338
GS200 flow	1,757,588	38,811	168,000	0	-5,262	1,959,137
Converter	464,126	196,916	0	0	-37,062	623,980
System	10,974,354	3,792,206	2,657,354	9,178,891	-780,055	25,822,750



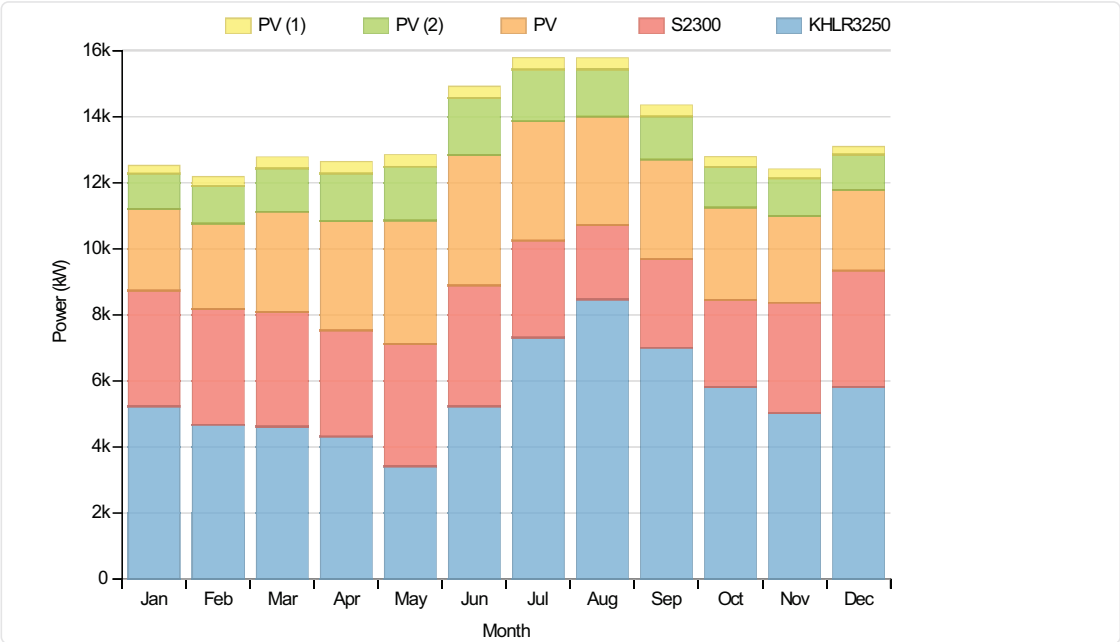
Electrical

Quantity	Value	Units
Excess electricity	8502696	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)

PV Component	Production(kWh/yr)	26,935,180	Fraction (%)	23
PV		2,766,526		2
PV		11,727,956		10
Generator		48,951,668		41
Wind Turbine		28,046,112		24
Total		118,427,440		100

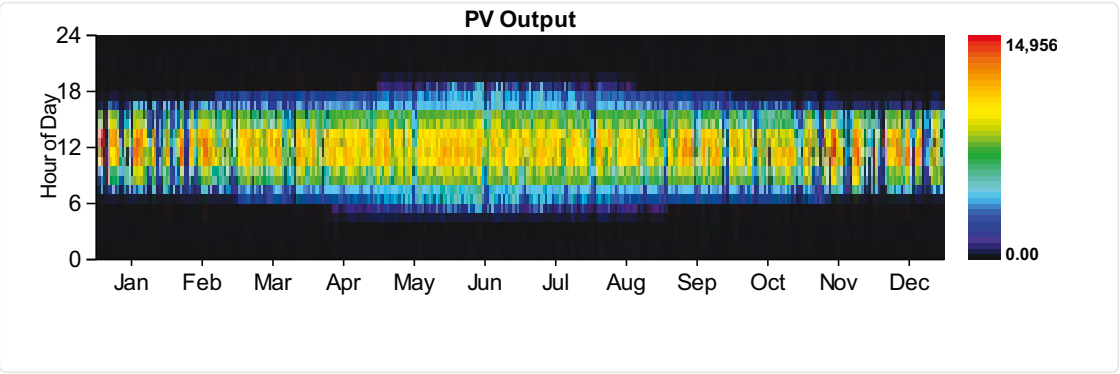
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0
Total	95,052,456	100



PV:SunPower PV

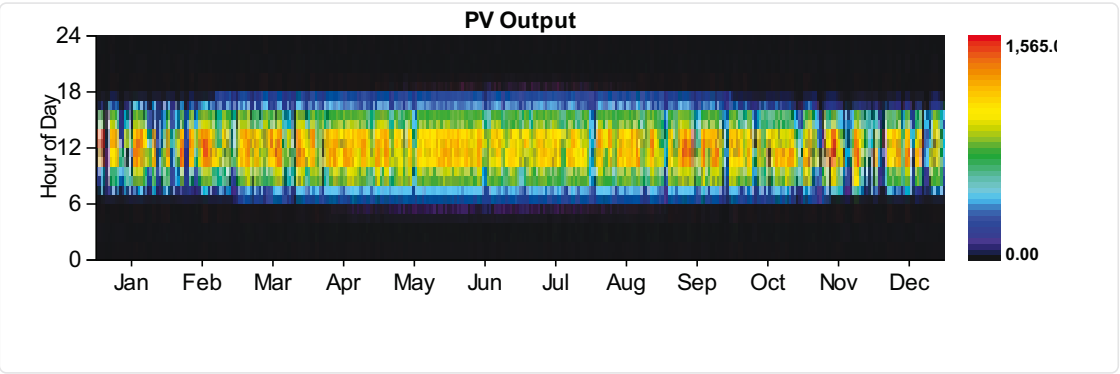
Quantity	Value	Units
Rated capacity	13780	kW
Mean output	3075	kW
Mean output	73795.00	kWh/d
Capacity factor	22.31	%
Total production	26935180	kWh/yr
Minimum output	0.00	kW
Maximum output	14957.00	kW
PV penetration	28.34	%
Hours of operation	4386	hrs/yr

Quantity	Value	Units
Levelized cost	0.078	\$/kWh



PV:Remaining Generic flat plate PV

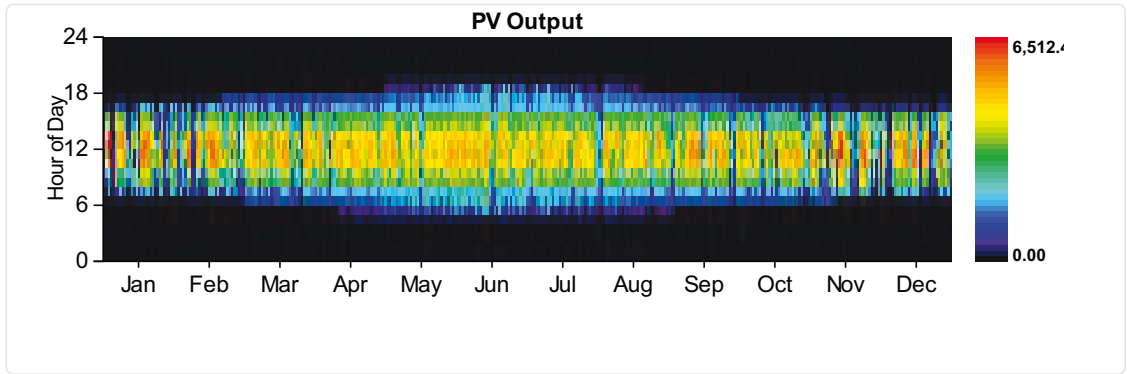
Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766526	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.009	\$/kWh



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	6000	kW
Mean output	1339	kW
Mean output	32131.00	kWh/d
Capacity factor	22.31	%

Quantity	Value	Units
Total production	11727956	kWh/yr
Minimum output	0.00	kW
Maximum output	6512.50	kW
PV penetration	12.34	%
Hours of operation	4386	hrs/yr
Levelized cost	0.035	\$/kWh



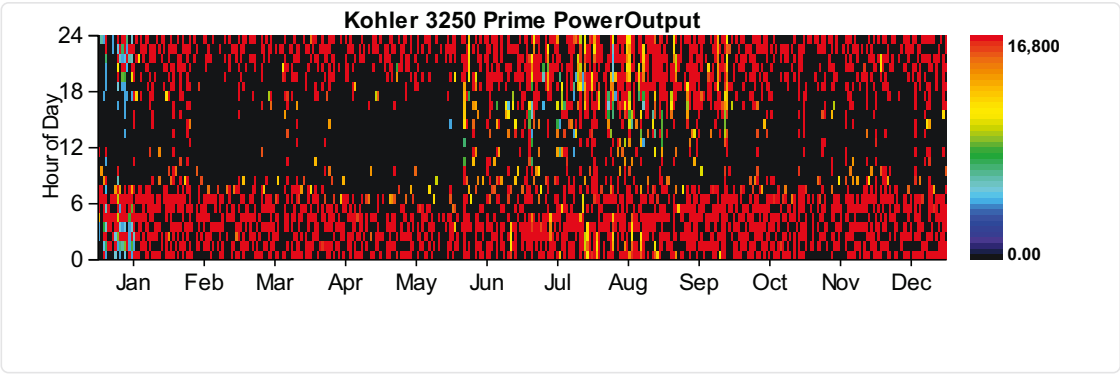
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	13800	kW
Mean output	3202	kW
Capacity factor	23.20	%
Total production	28046112	kWh/yr
Minimum output	2.96	kW
Maximum output	13876.00	kW
Wind penetration	29.51	%
Hours of operation	8760	hrs/yr
Levelized cost	0.115	\$/kWh

Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	3070	hrs/yr
Number of starts	1604	starts/yr
Operational life	5	yr
Fixed generation cost	1761.20	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	48951668	kWh/yr

Quantity	Value	Units
Mean electrical output	15945	kW
Min. electrical output	4200	kW
Max. electrical output	16800	kW
Fuel consumption	11618855	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	114329544	kWh/yr
Mean electrical efficiency	43	%

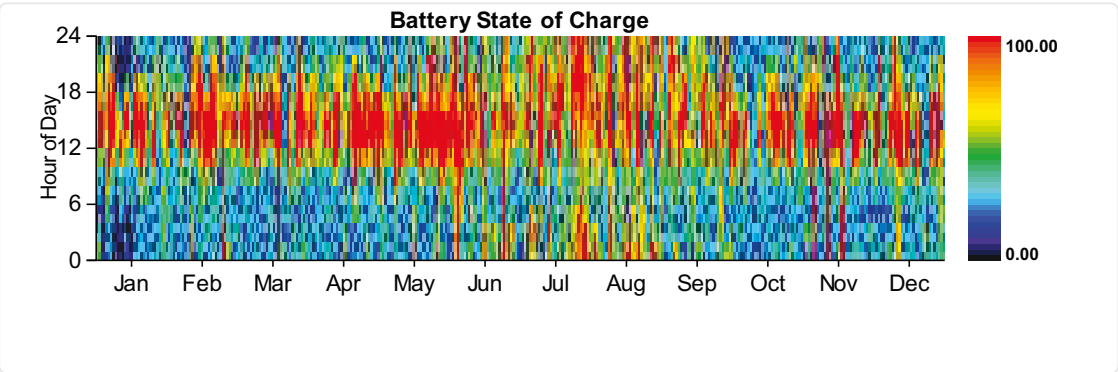


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	70
Batteries	70
Bus voltage	100

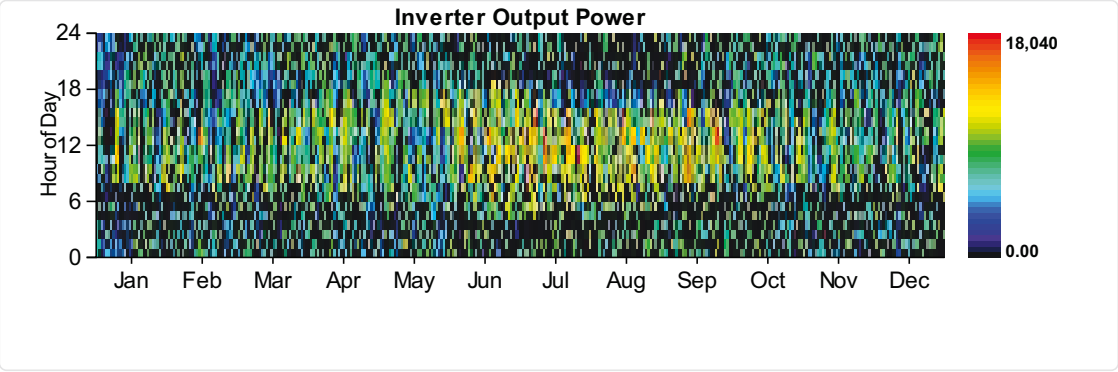
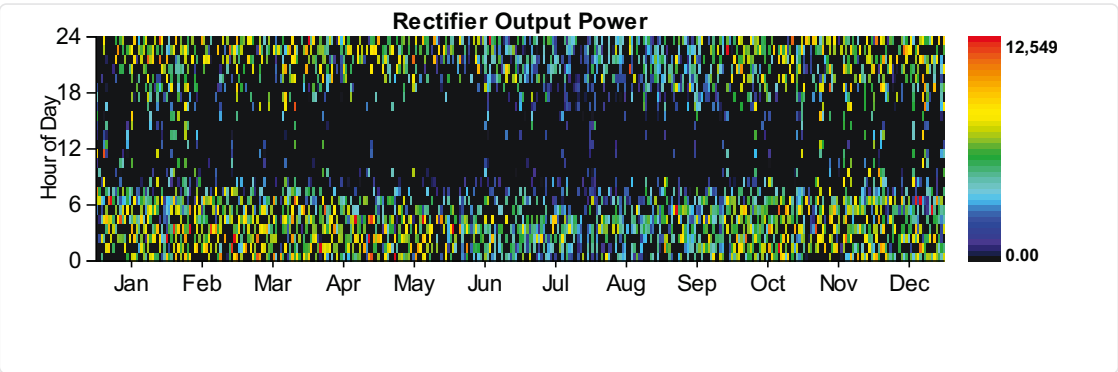
Quantity	Value	Units
Nominal capacity	42000	kWh
Usable nominal capacity	42000	kWh
Autonomy	4	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.184	\$/kWh
Energy in	26938554	kWh/yr
Energy out	18877262	kWh/yr
Storage depletion	24254	kWh/yr
Losses	8037038	kWh/yr
Annual throughput	22562632	kWh/yr

Quantity	Value	Units
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	20,000	18,000	kW
Mean output	4,263	1,722	kW
Minimum output	0	0	kW
Maximum output	18,041	12,550	kW
Capacity factor	21	9	%
Hours of operation	5,216	2,988	hrs/yr
Energy in	41,488,572	17,746,810	kWh/yr
Energy out	37,339,740	15,084,814	kWh/yr
Losses	4,148,832	2,661,996	kWh/yr



Emissions

Pollutant	Emissions	Units
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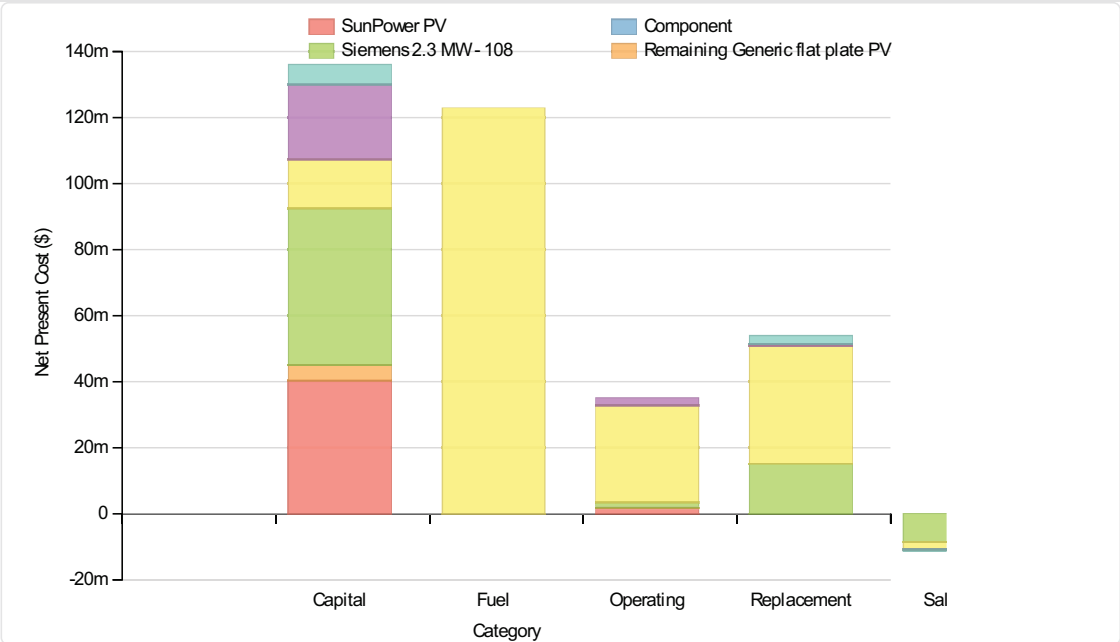
Pollutant	Emissions	Units
Carbon dioxide	30493862	kg/yr
Carbon monoxide	127807	kg/yr
Unburned hydrocarbons	14640	kg/yr
Particulate matter	3660	kg/yr
Sulfur dioxide	62785	kg/yr
Nitrogen oxides	127807	kg/yr

System Report

System architecture

PV	SunPower PV	13,780	kW
PV #2	Remaining Generic flat plate PV	1,547	kW
Wind Turbine	Siemens 2.3 MW - 108	8	
Generator	Kohler 3250 Prime Power	16,800	kW
Battery	GS200 flow	70	strings
Converter	System Converter	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	336949504	\$
Levelized cost of energy	0.274	\$/kWh

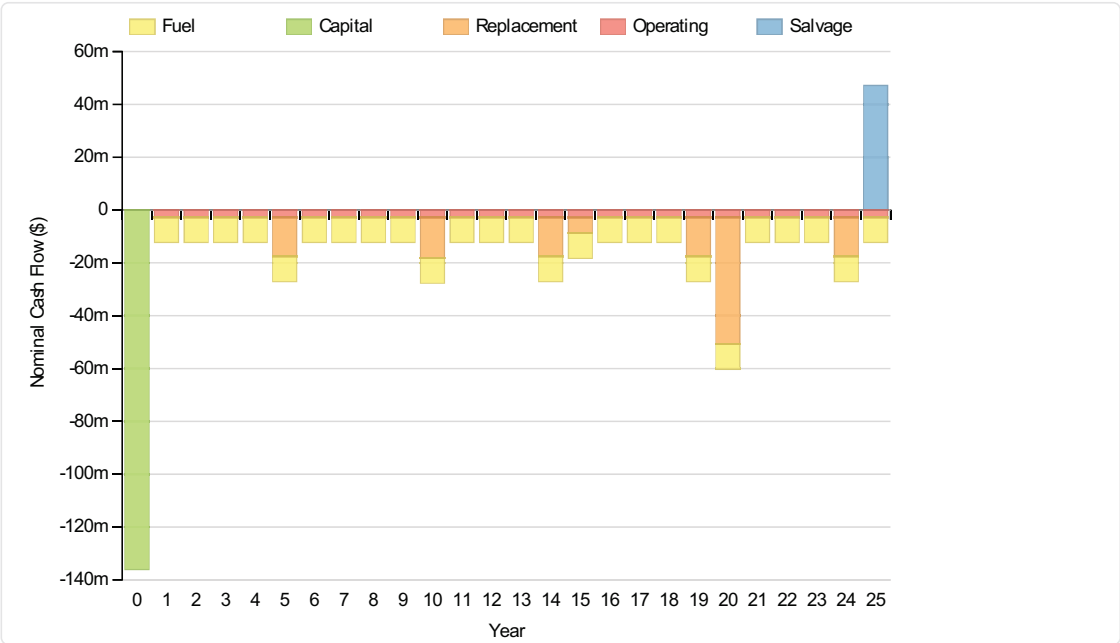
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	40,358,332	0	1,656,876	0	0	42,015,208
Remaining Generic flat plate PV	4,678,459	0	339,013	0	0	5,017,472
Siemens 2.3 MW - 108	47,475,000	15,135,363	1,422,026	0	-8,529,745	55,502,644
Kohler 3250 Prime Power	14,821,428	35,779,392	29,482,028	122,823,920	-2,225,033	200,681,735
GS200 flow	22,721,244	501,733	2,171,822	0	-68,026	25,326,773
Converter	6,000,000	2,545,641	0	0	-479,115	8,066,526

System	136,054,464	53,962,128	35,071,768	122,823,920	11,301,920	336,610,360
Component	Capital	Replacement	O&M	Fuel	Salvage	Total

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
SunPower PV	3,121,894	0	128,167	0	0	3,250,061
Remaining Generic flat plate PV	361,899	0	26,224	0	0	388,123
Siemens 2.3 MW - 108	3,672,399	1,170,787	110,000	0	-659,813	4,293,373
Kohler 3250 Prime Power	1,146,502	2,767,693	2,280,564	9,500,968	-172,116	15,523,611
GS200 flow	1,757,588	38,811	168,000	0	-5,262	1,959,137
Converter	464,126	196,916	0	0	-37,062	623,980
System	10,524,409	4,174,207	2,712,955	9,500,968	-874,253	26,038,286



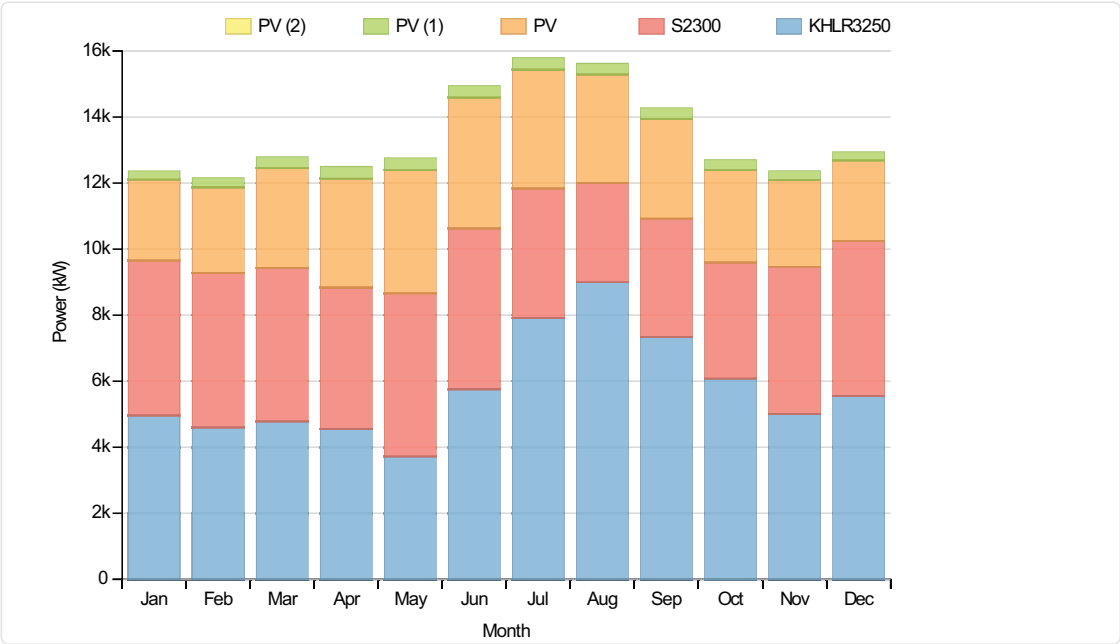
Electrical

Quantity	Value	Units
Excess electricity	8300497	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	625	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	26,935,180	23
PV	2,766,526	2
Generator	50,652,748	43
Wind Turbine	37,394,812	32

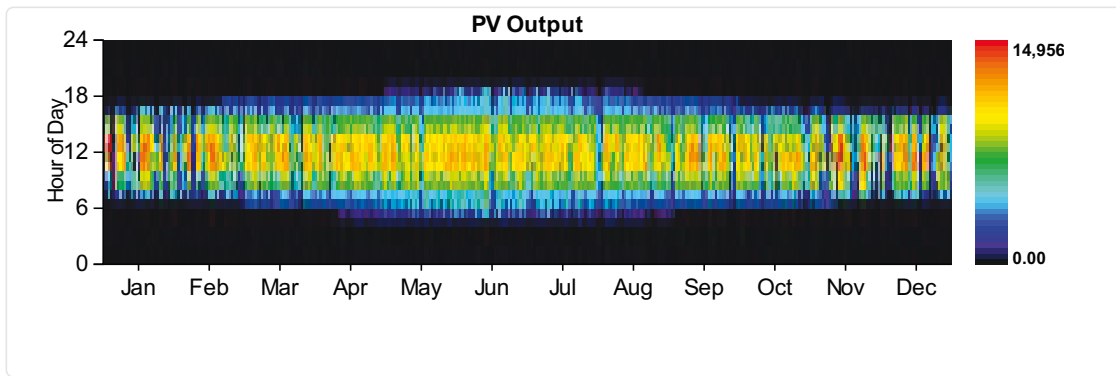
Component	Production(kWh/yr)	Fraction (%)
Total	117,749,264	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	95,052,456	100
DC primary load	0	0
Total	95,052,456	100



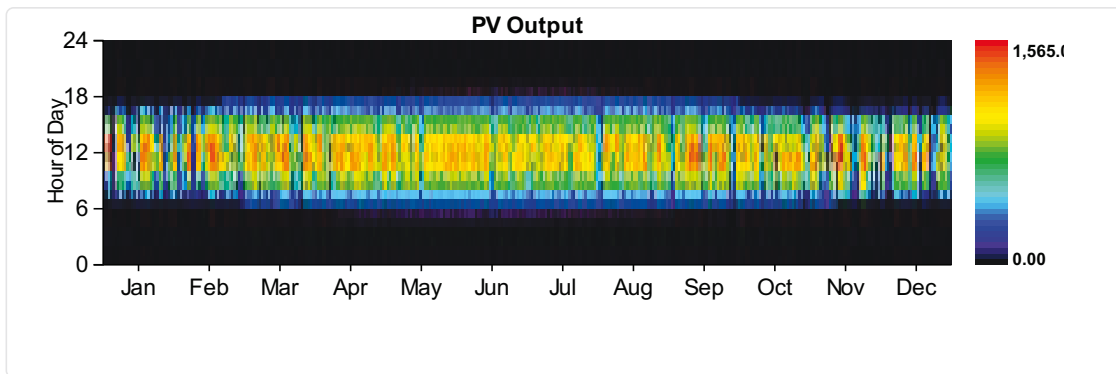
PV:SunPower PV

Quantity	Value	Units
Rated capacity	13780	kW
Mean output	3075	kW
Mean output	73795.00	kWh/d
Capacity factor	22.31	%
Total production	26935180	kWh/yr
Minimum output	0.00	kW
Maximum output	14957.00	kW
PV penetration	28.34	%
Hours of operation	4386	hrs/yr
Levelized cost	0.109	\$/kWh



PV:Remaining Generic flat plate PV

Quantity	Value	Units
Rated capacity	1547	kW
Mean output	316	kW
Mean output	7579.50	kWh/d
Capacity factor	20.42	%
Total production	2766526	kWh/yr
Minimum output	0.00	kW
Maximum output	1565.00	kW
PV penetration	2.91	%
Hours of operation	4386	hrs/yr
Levelized cost	0.013	\$/kWh



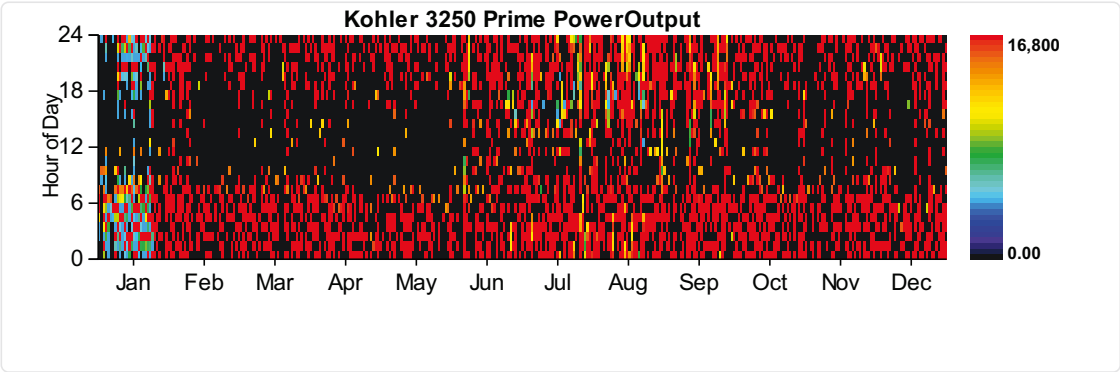
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	18400	kW
Mean output	4269	kW
Capacity factor	23.20	%
Total production	37394812	kWh/yr
Minimum output	3.95	kW
Maximum output	18502.00	kW

Wind penetration	Value	39.34	Units
Hours of operation		8760	hrs/yr
Levelized cost		0.115	\$/kWh

Generator:Kohler 3250 Prime Power

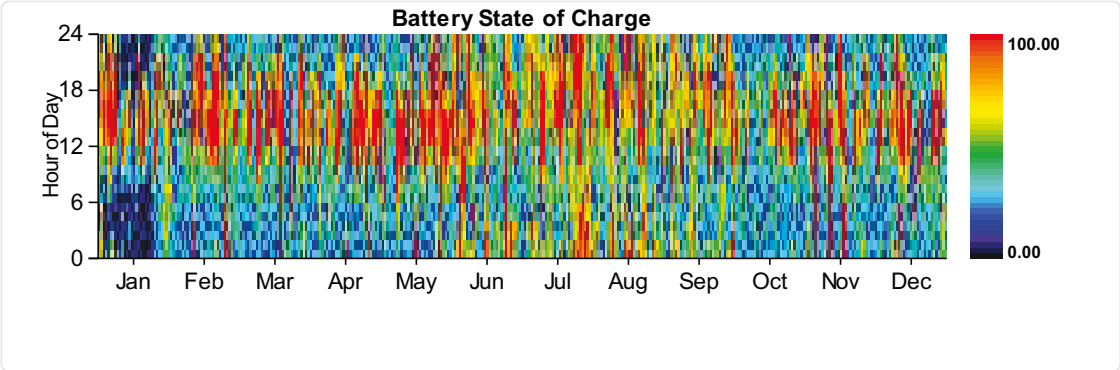
Quantity	Value	Units
Hours of operation	3224	hrs/yr
Number of starts	1621	starts/yr
Operational life	5	yr
Fixed generation cost	1761.20	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	50652748	kWh/yr
Mean electrical output	15711	kW
Min. electrical output	4200	kW
Max. electrical output	16800	kW
Fuel consumption	12026548	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	118341248	kWh/yr
Mean electrical efficiency	43	%



Battery:GS200 flow

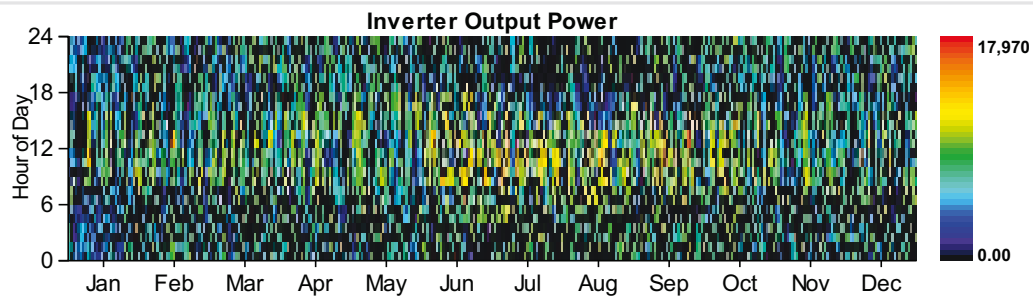
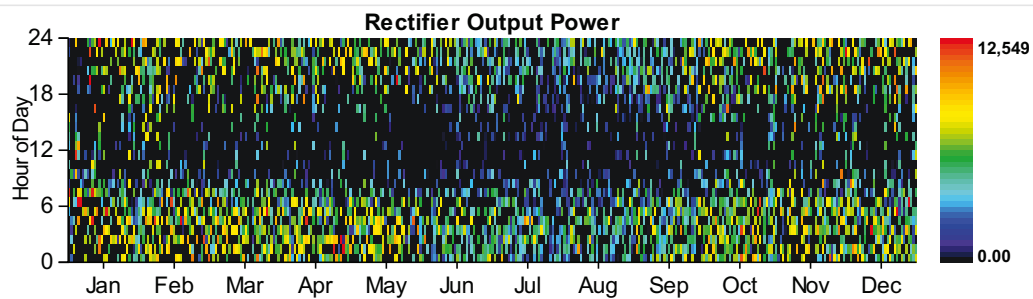
Quantity	Value
String size	1
Strings in parallel	70
Batteries	70
Bus voltage	100

Quantity	Value	Units
Nominal capacity	42000	kWh
Usable nominal capacity	42000	kWh
Autonomy	4	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.189	\$/kWh
Energy in	26827478	kWh/yr
Energy out	18808224	kWh/yr
Storage depletion	34694	kWh/yr
Losses	7984560	kWh/yr
Annual throughput	22480140	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	20,000	18,000	kW
Mean output	3,518	1,910	kW
Minimum output	0	0	kW
Maximum output	17,970	12,550	kW
Capacity factor	18	10	%
Hours of operation	4,697	3,337	hrs/yr
Energy in	34,241,788	19,685,400	kWh/yr
Energy out	30,817,560	16,732,604	kWh/yr
Losses	3,424,228	2,952,796	kWh/yr



Emissions

Pollutant	Emissions	Units
Carbon dioxide	31563860	kg/yr
Carbon monoxide	132292	kg/yr
Unburned hydrocarbons	15153	kg/yr
Particulate matter	3788	kg/yr
Sulfur dioxide	64988	kg/yr
Nitrogen oxides	132292	kg/yr

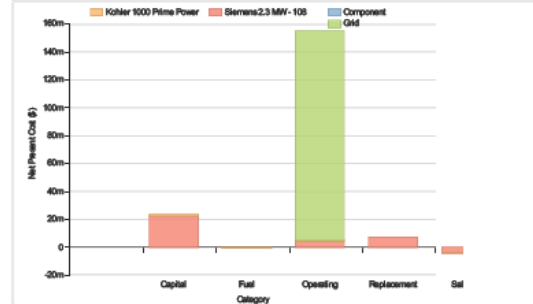
Appendix C – New London Scenarios

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	181204688	\$
Levelized cost of energy	0.145	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	20,807	99,446	-178,750	866,503
Grid	0	0	149,859,664	0	0	149,859,664
System	23,425,000	7,173,158	154,728,304	99,446	-4,221,283	181,204,625

Annualized Costs

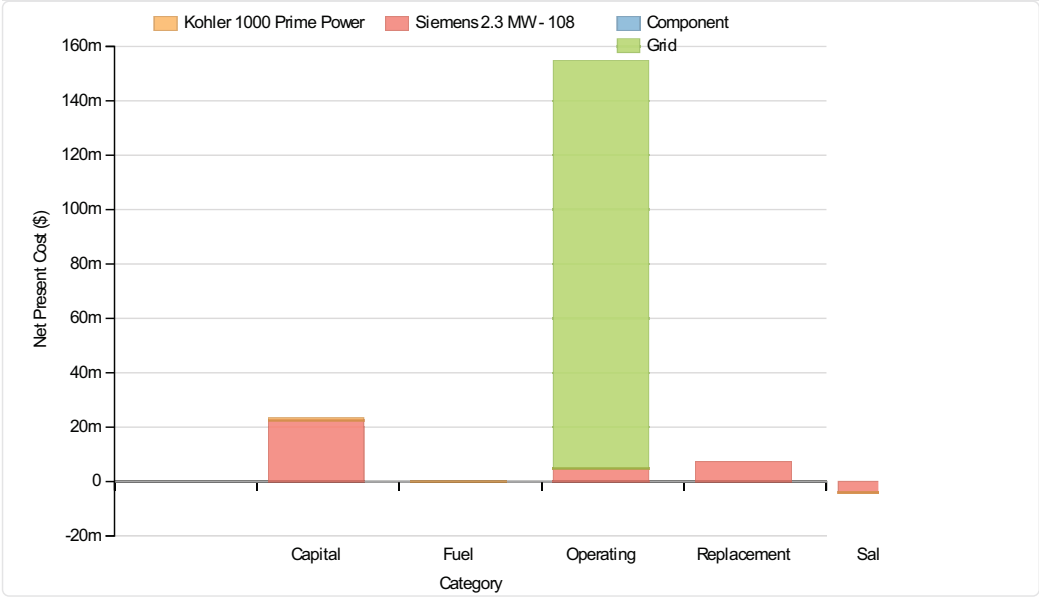
Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	1,610	7,693	-13,827	67,028
Grid	0	0	11,592,301	0	0	11,592,301
System	1,812,026	554,875	11,968,912	7,693	-326,535	14,016,971

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

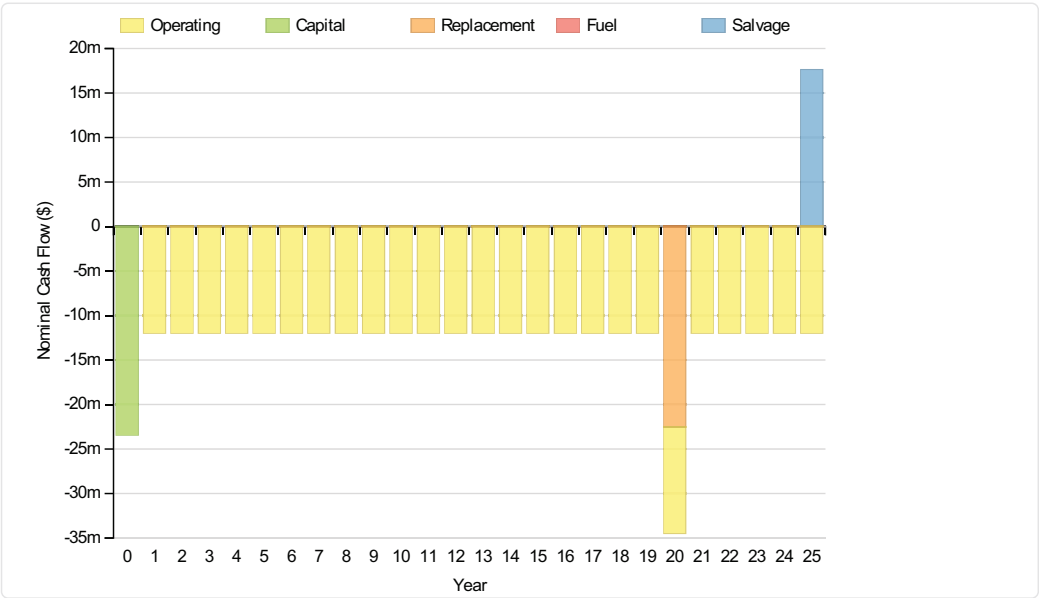
Total net present cost	181204688	\$
Levelized cost of energy	0.145	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	20,807	99,446	-178,750	866,503
Grid	0	0	149,859,664	0	0	149,859,664
System	23,425,000	7,173,158	154,728,304	99,446	-4,221,283	181,204,625

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	1,610	7,693	-13,827	67,028
Grid	0	0	11,592,301	0	0	11,592,301
System	1,812,026	554,875	11,968,912	7,693	-326,535	14,016,971

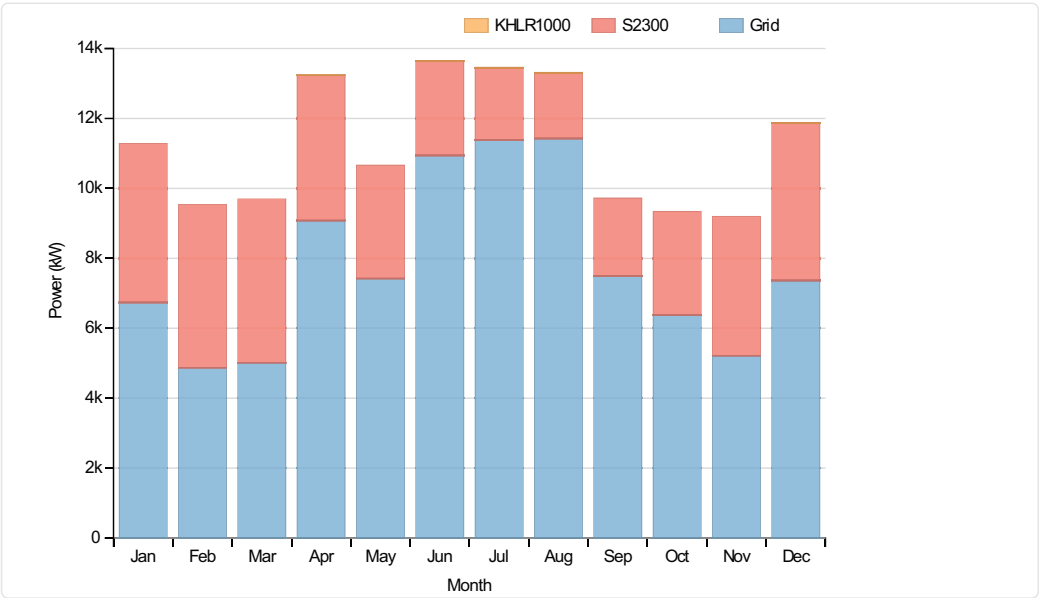


Electrical

Quantity	Value	Units
Excess electricity	1742167	kWh/yr
Unmet load	8504	kWh/yr
Capacity shortage	80731	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	33,608	0
Wind Turbine	30,268,832	31
Grid Purchases	68,295,392	69
Total	98,597,832	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,855,648	100
DC primary load	0	0
Total	96,855,648	100



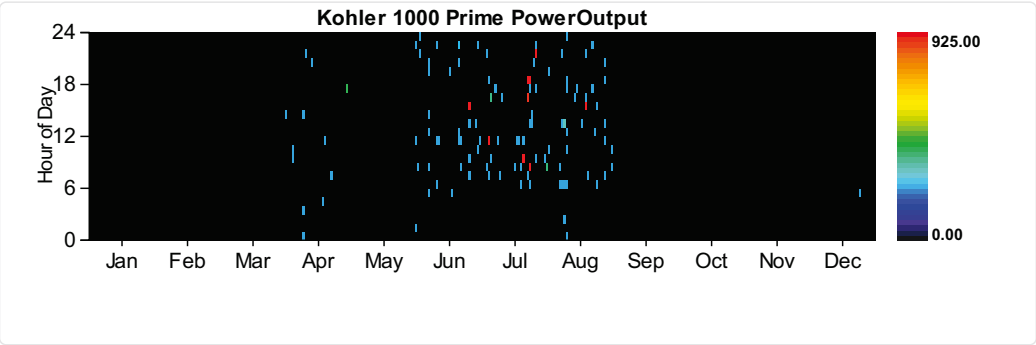
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

Quantity	Value	Units
Hours of operation	116	hrs/yr
Number of starts	108	starts/yr
Operational life	129	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	33608	kWh/yr
Mean electrical output	290	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	9738	L/yr
Specific fuel consumption	0.29	L/kWh

Quantity	Value	Units
Fuel energy input	95817	kWh/yr
Mean electrical efficiency	35	%



Grid

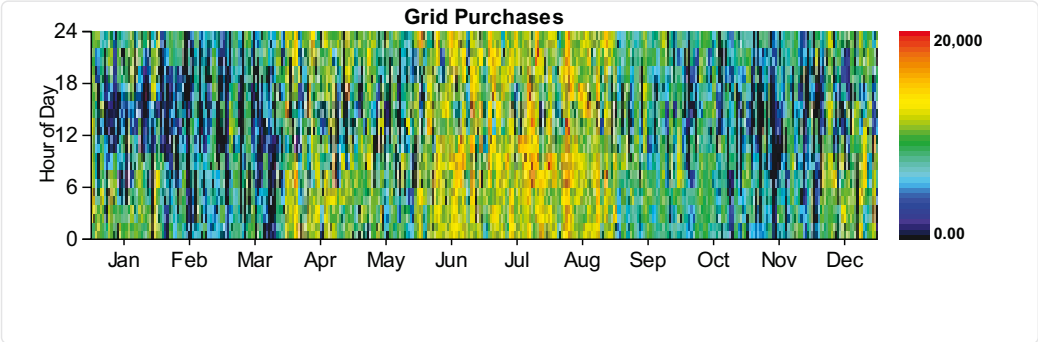
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,784	0	284,539
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,890	0	254,236
October	0	0	0	13,843	0	221,494
November	0	0	0	15,876	0	254,021
December	0	0	0	18,431	0	294,896
Annual	0	0	0	20,000	0	3,396,860

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,015,457	0	5,015,457	0	601,855	0
February	3,272,783	0	3,272,783	0	392,734	0
March	3,728,512	0	3,728,512	0	447,421	0
April	6,542,809	0	6,542,809	0	785,137	0
May	5,524,917	0	5,524,917	0	662,990	0

June	Energy Purchased (kWh)	7,873,156	Energy Sold (kWh)	0	Net Purchases (kWh)	7,873,156	Peak Demand (kW)	0	Energy Charge (\$)	16,281	Demand Charge (\$)	0
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	8,498,816	(kWh)	0	(kWh)	8,498,816	(kW)	0	(\$)	16,281	(\$)	0
July		8,498,816		0	8,498,816		0	1,019,858				0
August		5,395,241		0	5,395,241		0	647,429				0
September		4,744,924		0	4,744,924		0	569,391				0
October		3,750,403		0	3,750,403		0	450,048				0
November		5,479,366		0	5,479,366		0	657,524				0
December		68,295,392		0	68,295,392		0	8,195,448				0
Annual												



Emissions

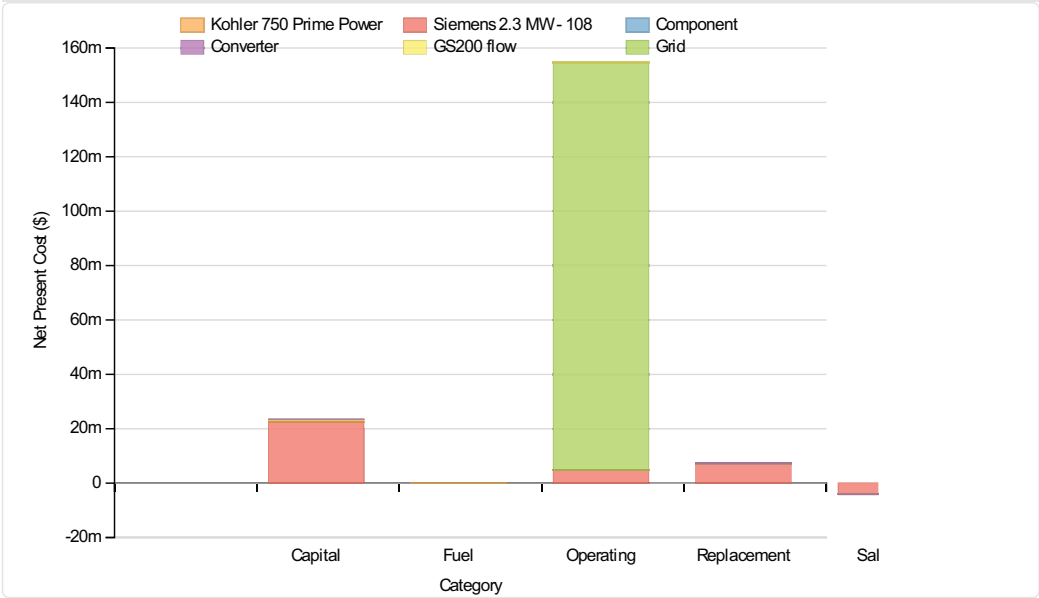
Pollutant	Emissions	Units
Carbon dioxide	43188244	kg/yr
Carbon monoxide	107	kg/yr
Unburned hydrocarbons	12	kg/yr
Particulate matter	3	kg/yr
Sulfur dioxide	187182	kg/yr
Nitrogen oxides	91623	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator #2	Kohler 750 Prime Power	690	kW
Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	181403424	\$
Levelized cost of energy	0.145	\$/kWh

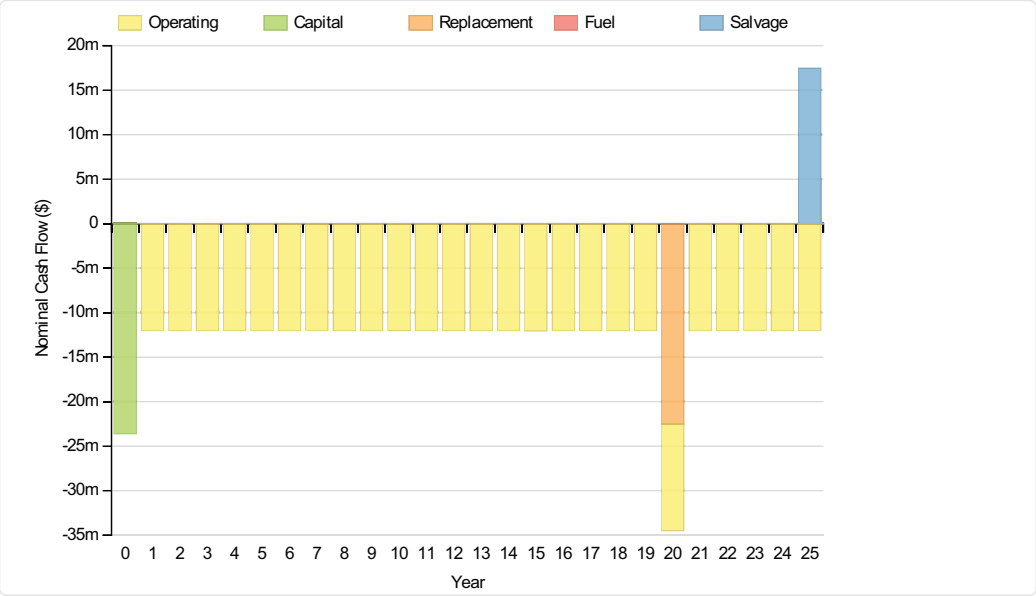
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 750 Prime Power	690,000	0	15,387	139,257	-133,613	711,031
Grid	0	0	149,751,216	0	0	149,751,216
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	23,589,588	7,212,154	154,645,456	139,257	-4,183,109	181,403,346

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641

Component	Kobler 750 Prime Power Capital	Replacement	O&M	Fuel	Salvage	Total
	53,375	0	1,190	10,772	10,336	55,001
Grid	0	0	11,583,912	0	0	11,583,912
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	5,802	2,462	0	0	-463	7,800
System	1,824,758	557,892	11,962,503	10,772	-323,582	14,032,343

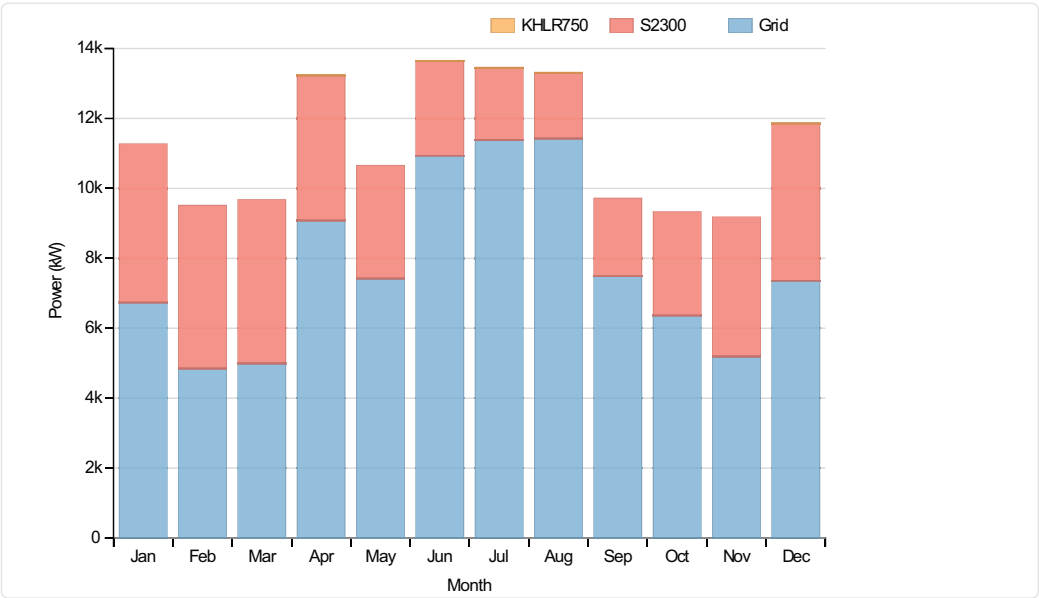


Electrical

Quantity	Value	Units
Excess electricity	1607580	kWh/yr
Unmet load	10486	kWh/yr
Capacity shortage	96779	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	46,728	0
Wind Turbine	30,268,832	31
Grid Purchases	68,217,656	69
Total	98,533,216	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,853,672	100
DC primary load	0	0
Total	96,853,672	100



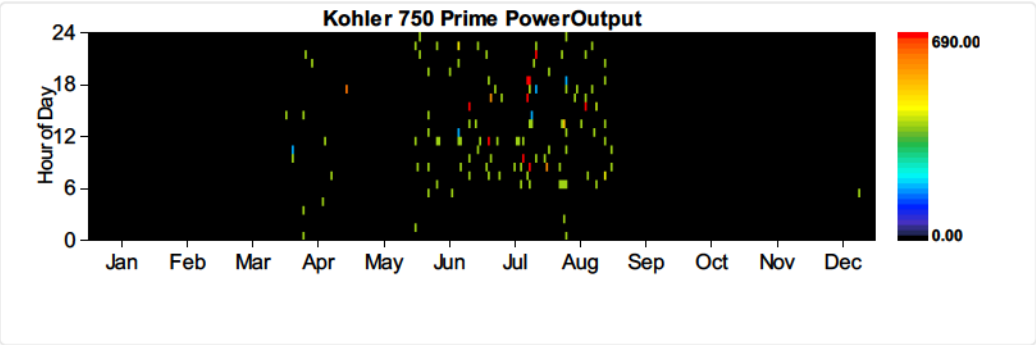
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	115	hrs/yr
Number of starts	108	starts/yr
Operational life	130	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	46728	kWh/yr
Mean electrical output	406	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	13636	L/yr
Specific fuel consumption	0.29	L/kWh

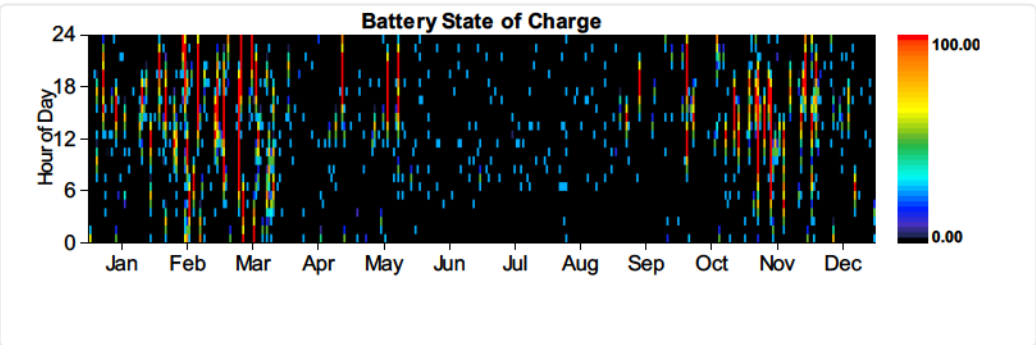
Quantity	Value	Units
Fuel energy input	134175	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

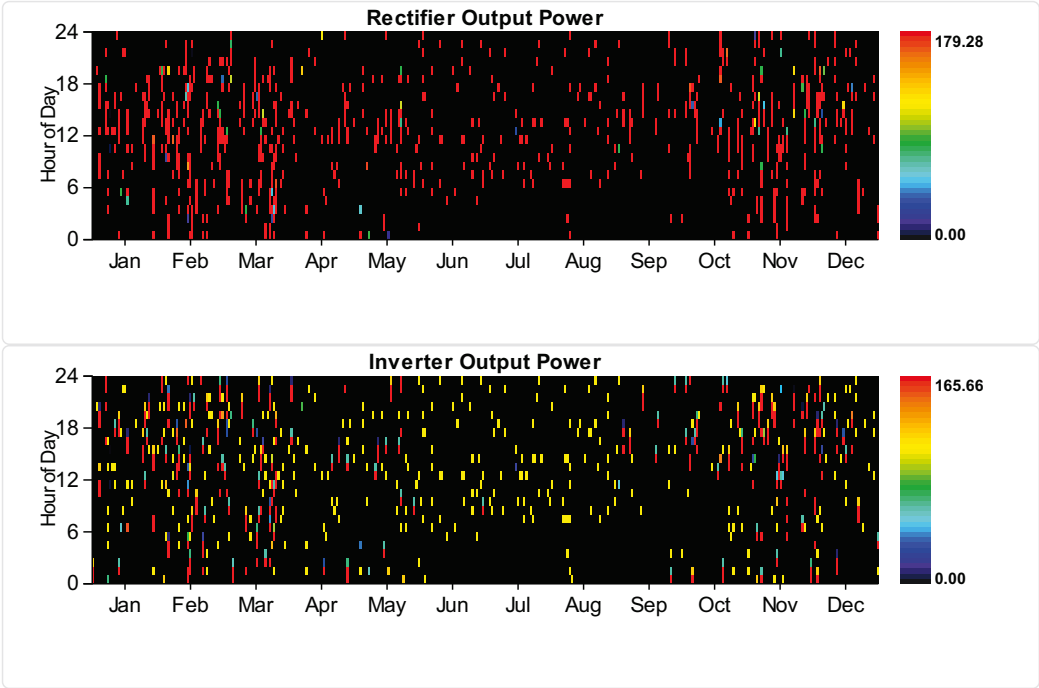
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.035	\$/kWh
Energy in	132507	kWh/yr
Energy out	93257	kWh/yr
Storage depletion	600	kWh/yr
Losses	38649	kWh/yr
Annual throughput	111464	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	10	15	kW
Minimum output	0	0	kW
Maximum output	166	179	kW
Capacity factor	4	6	%
Hours of operation	872	1,014	hrs/yr
Energy in	93,257	155,891	kWh/yr
Energy out	83,931	132,507	kWh/yr
Losses	9,326	23,384	kWh/yr



Grid

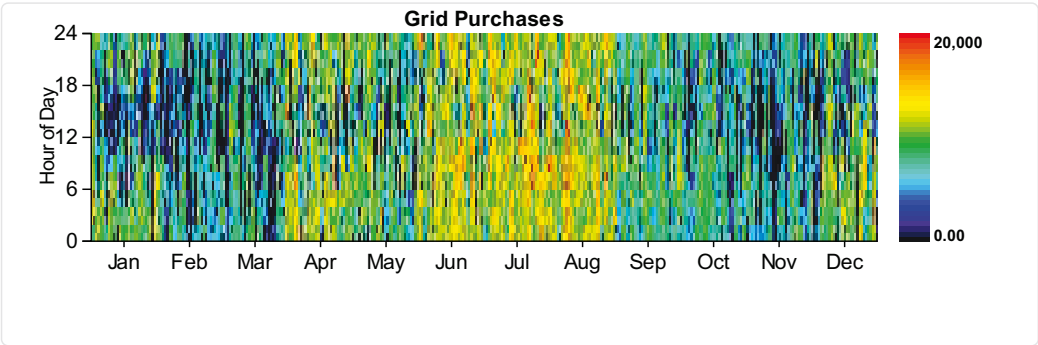
Rate: Demand 1

	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
Resources.ReportingService_GenerateInputsReport_Month						
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,784	0	284,539
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
September	0	0	0	15,890	0	254,236
November	0	0	0	15,876	0	254,021
December	0	0	0	18,490	0	295,836
Annual	0	0	0	20,000	0	3,397,800

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,007,178	0	5,007,178	0	600,861	0
February	3,260,560	0	3,260,560	0	391,267	0
March	3,715,573	0	3,715,573	0	445,869	0
April	6,538,779	0	6,538,779	0	784,653	0
May	5,519,575	0	5,519,575	0	662,349	0
June	7,870,852	0	7,870,852	0	944,502	0
July	8,467,073	0	8,467,073	0	1,016,049	0
August	8,496,675	0	8,496,675	0	1,019,601	0
September	5,392,027	0	5,392,027	0	647,043	0
October	4,738,349	0	4,738,349	0	568,602	0
November	3,739,770	0	3,739,770	0	448,772	0
December	5,471,249	0	5,471,249	0	656,550	0
Annual	68,217,656	0	68,217,656	0	8,186,120	0



Emissions

Pollutant	Emissions	Units
Carbon dioxide	43149348	kg/yr
Carbon monoxide	150	kg/yr
Unburned hydrocarbons	17	kg/yr
Particulate matter	4	kg/yr

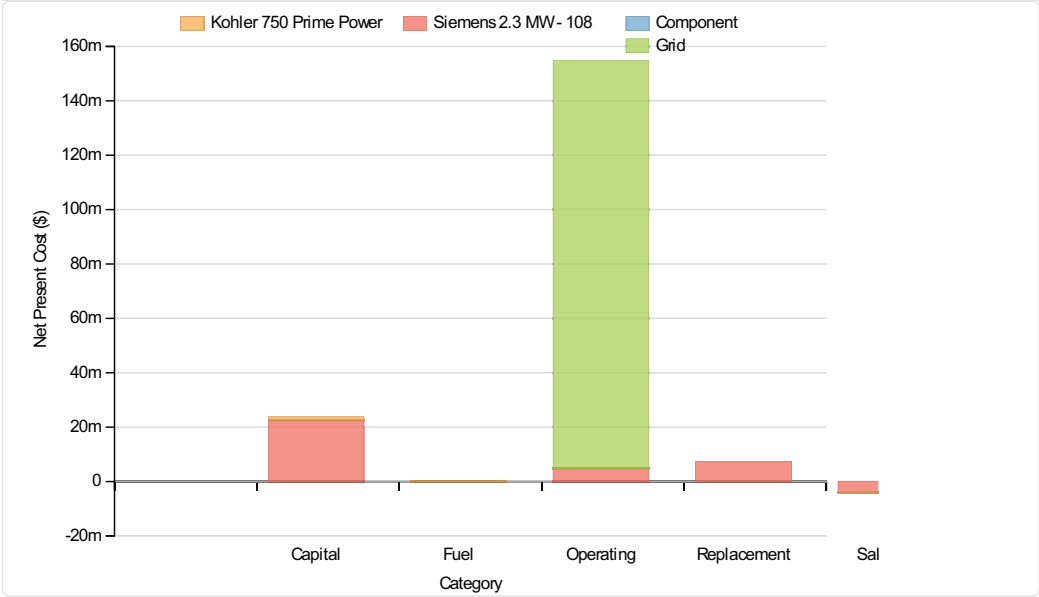
Pollutant	Emissions	Units
Carbon dioxide	186990	kg/yr
Nitrogen oxides	91562	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator #2	Kohler 750 Prime Power	1,380	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

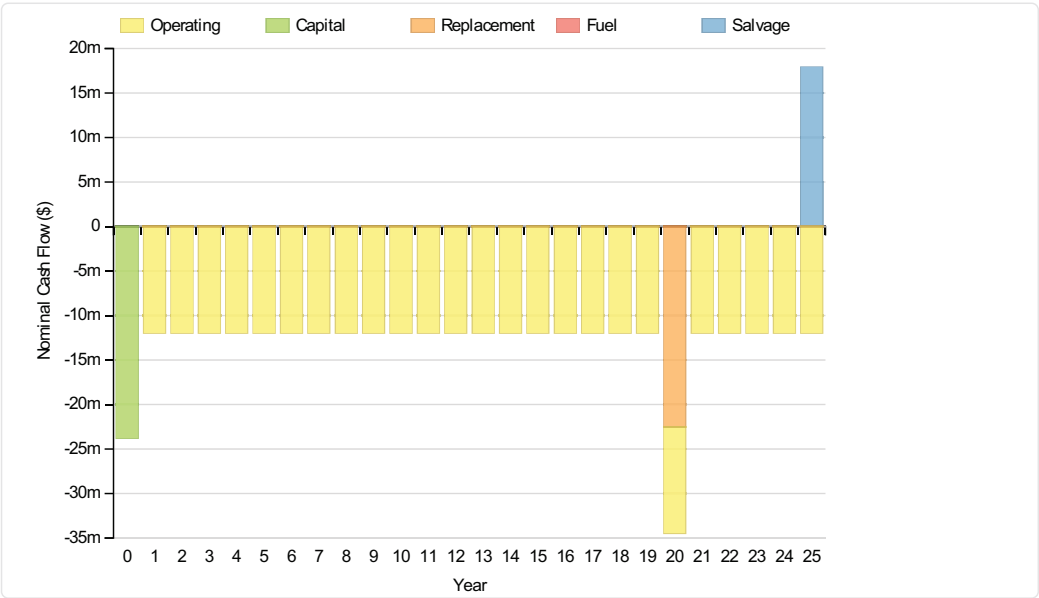
Total net present cost	181509216	\$
Levelized cost of energy	0.145	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 750 Prime Power	1,285,000	0	30,472	145,623	-248,317	1,212,778
Grid	0	0	149,817,920	0	0	149,817,920
System	23,785,000	7,173,158	154,696,192	145,623	-4,290,851	181,509,122

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 750 Prime Power	99,400	0	2,357	11,265	-19,208	93,814
Grid	0	0	11,589,072	0	0	11,589,072
System	1,839,874	554,875	11,966,428	11,265	-331,916	14,040,526

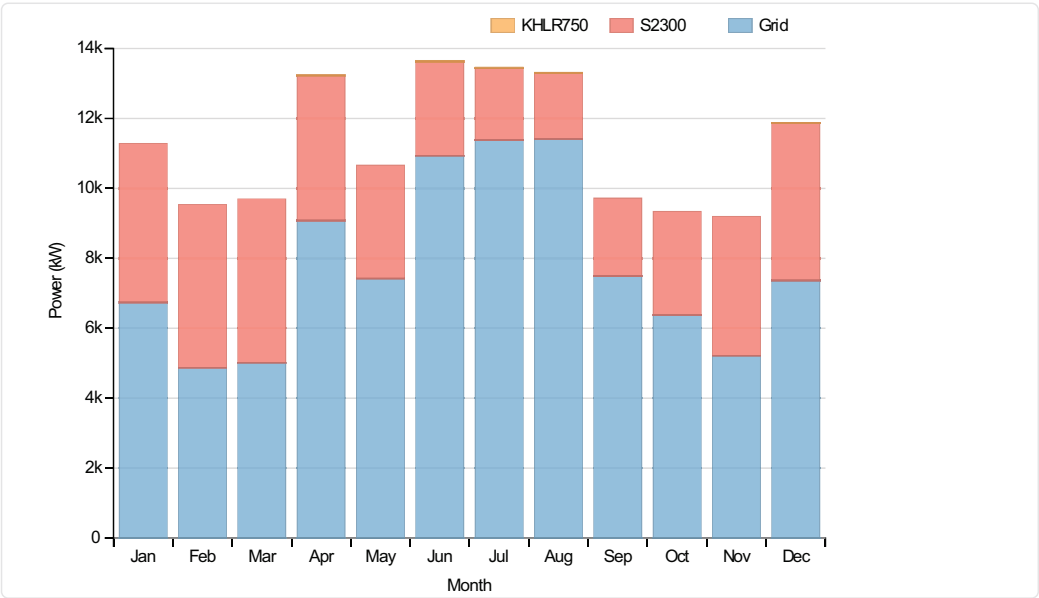


Electrical

Quantity	Value	Units
Excess electricity	1742167	kWh/yr
Unmet load	5237	kWh/yr
Capacity shortage	55203	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	48,613	0
Wind Turbine	30,268,832	31
Grid Purchases	68,283,648	69
Total	98,601,096	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,858,912	100
DC primary load	0	0
Total	96,858,912	100



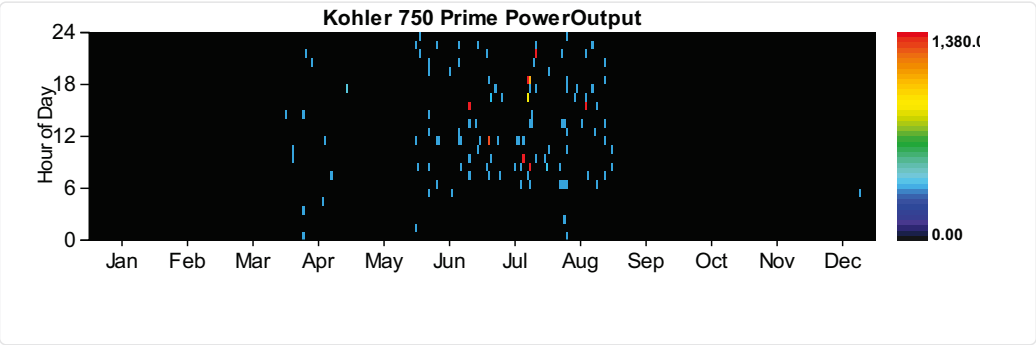
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	116	hrs/yr
Number of starts	108	starts/yr
Operational life	129	yr
Fixed generation cost	107.02	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	48613	kWh/yr
Mean electrical output	419	kW
Min. electrical output	345	kW
Max. electrical output	1380	kW
Fuel consumption	14259	L/yr
Specific fuel consumption	0.29	L/kWh

Quantity	Value	Units
Fuel energy input	140309	kWh/yr
Mean electrical efficiency	35	%



Grid

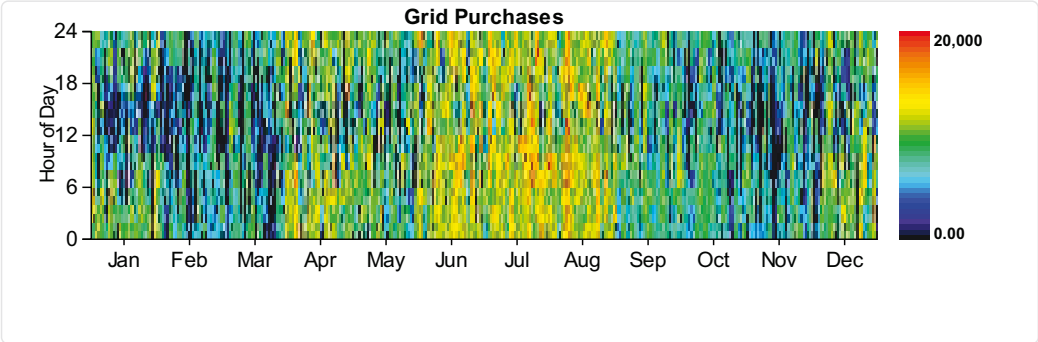
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,784	0	284,539
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,890	0	254,236
October	0	0	0	13,843	0	221,494
November	0	0	0	15,876	0	254,021
December	0	0	0	18,317	0	293,076
Annual	0	0	0	20,000	0	3,395,040

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,015,457	0	5,015,457	0	601,855	0
February	3,272,783	0	3,272,783	0	392,734	0
March	3,728,512	0	3,728,512	0	447,421	0
April	6,541,557	0	6,541,557	0	784,987	0
May	5,524,917	0	5,524,917	0	662,990	0

June	Energy Purchased (kWh)	7,969,754	Energy Sold (kWh)	0	Net Purchases (kWh)	7,969,754	Peak Demand (kW)	0	Energy Charge (\$)	0	Demand Charge (\$)	0
July	Energy Purchased (kWh)	8,494,914	Energy Sold (kWh)	0	Net Purchases (kWh)	8,494,914	Peak Demand (kW)	0	Energy Charge (\$)	1,019,390	Demand Charge (\$)	0
August	Energy Purchased (kWh)	5,395,241	Energy Sold (kWh)	0	Net Purchases (kWh)	5,395,241	Peak Demand (kW)	0	Energy Charge (\$)	647,429	Demand Charge (\$)	0
September	Energy Purchased (kWh)	4,744,924	Energy Sold (kWh)	0	Net Purchases (kWh)	4,744,924	Peak Demand (kW)	0	Energy Charge (\$)	569,391	Demand Charge (\$)	0
October	Energy Purchased (kWh)	3,750,403	Energy Sold (kWh)	0	Net Purchases (kWh)	3,750,403	Peak Demand (kW)	0	Energy Charge (\$)	450,048	Demand Charge (\$)	0
November	Energy Purchased (kWh)	5,479,252	Energy Sold (kWh)	0	Net Purchases (kWh)	5,479,252	Peak Demand (kW)	0	Energy Charge (\$)	657,510	Demand Charge (\$)	0
December	Energy Purchased (kWh)	68,283,648	Energy Sold (kWh)	0	Net Purchases (kWh)	68,283,648	Peak Demand (kW)	0	Energy Charge (\$)	8,194,038	Demand Charge (\$)	0
Annual	Energy Purchased (kWh)		Energy Sold (kWh)		Net Purchases (kWh)		Peak Demand (kW)		Energy Charge (\$)		Demand Charge (\$)	



Emissions

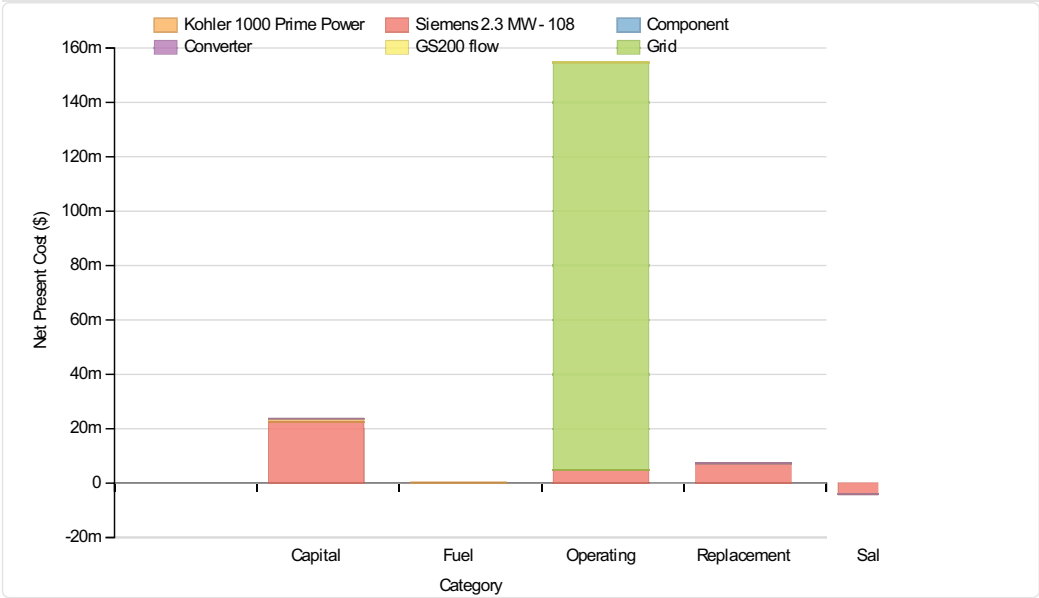
Pollutant	Emissions	Units
Carbon dioxide	43192688	kg/yr
Carbon monoxide	157	kg/yr
Unburned hydrocarbons	18	kg/yr
Particulate matter	4	kg/yr
Sulfur dioxide	187174	kg/yr
Nitrogen oxides	91657	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	181599280	\$
Levelized cost of energy	0.145	\$/kWh

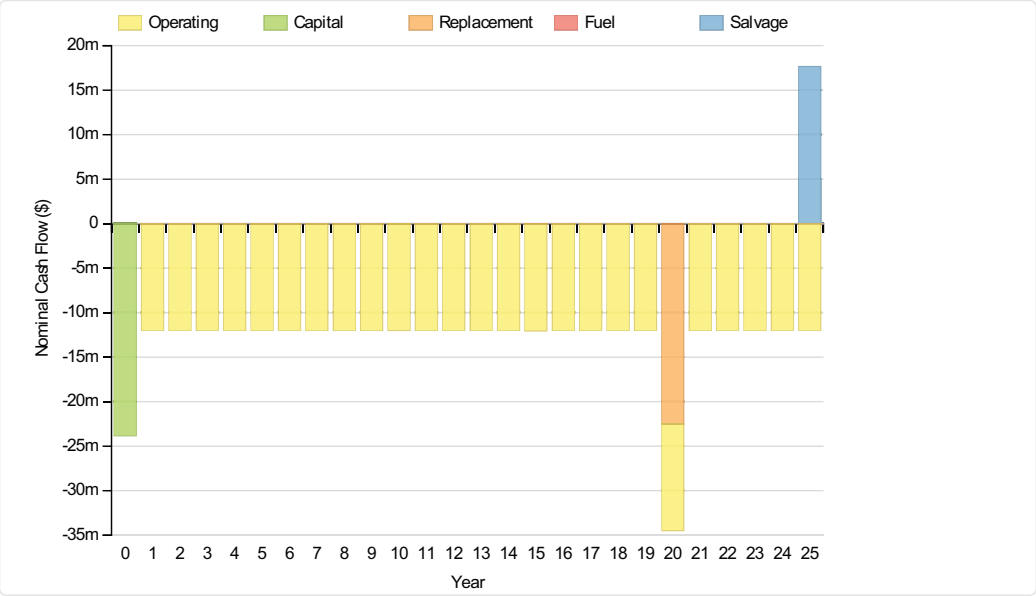
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	20,627	161,812	-179,119	928,320
Grid	0	0	149,729,776	0	0	149,729,776
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	23,824,588	7,212,154	154,629,264	161,812	-4,228,615	181,599,203

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641

Component	Prime Power	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000		71,553	0	1,596	12,517	-13,856	71,810
Grid		0	0	11,582,254	0	0	11,582,254
GS200 flow		25,108	555	2,400	0	-75	27,988
Converter		5,802	2,462	0	0	-463	7,800
System		1,842,936	557,892	11,961,251	12,517	-327,102	14,047,494

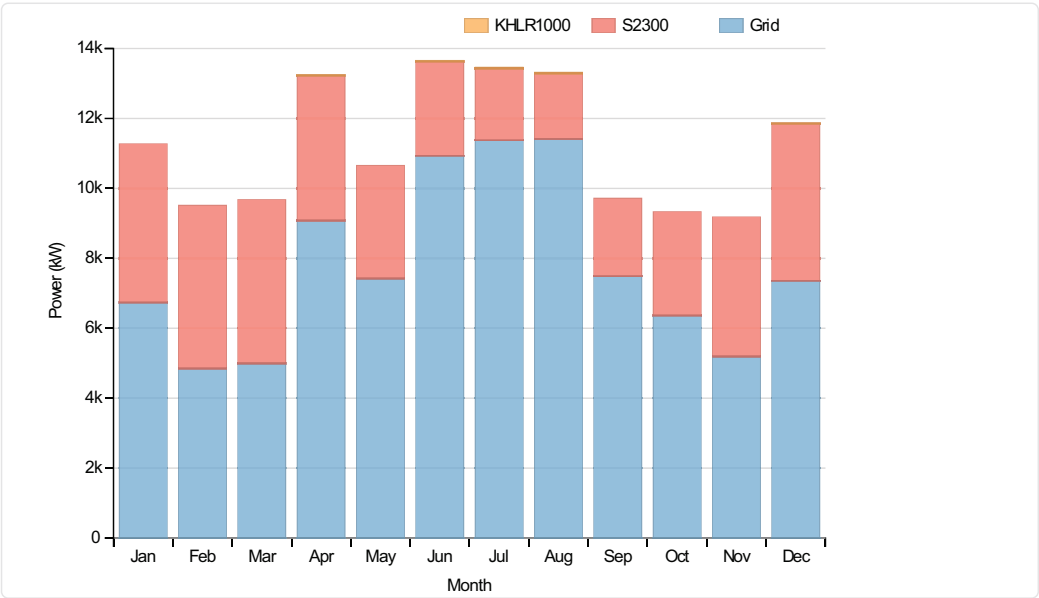


Electrical

Quantity	Value	Units
Excess electricity	1607580	kWh/yr
Unmet load	8391	kWh/yr
Capacity shortage	80318	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	54,910	0
Wind Turbine	30,268,832	31
Grid Purchases	68,211,680	69
Total	98,535,424	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,855,760	100
DC primary load	0	0
Total	96,855,760	100



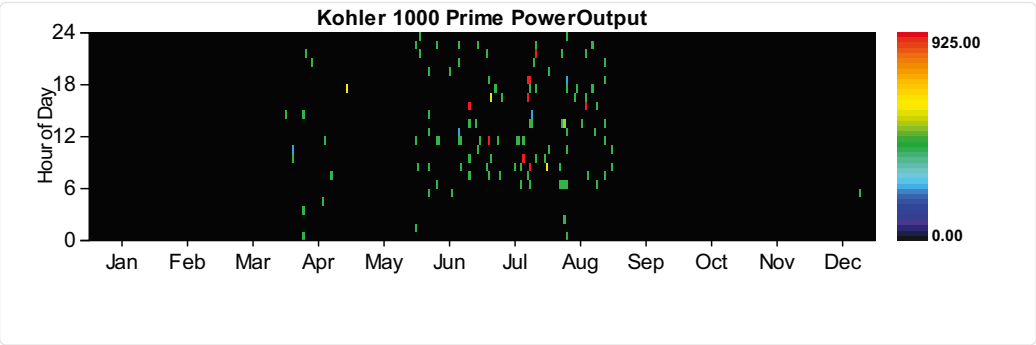
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

Quantity	Value	Units
Hours of operation	115	hrs/yr
Number of starts	108	starts/yr
Operational life	130	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	54910	kWh/yr
Mean electrical output	477	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	15844	L/yr
Specific fuel consumption	0.29	L/kWh

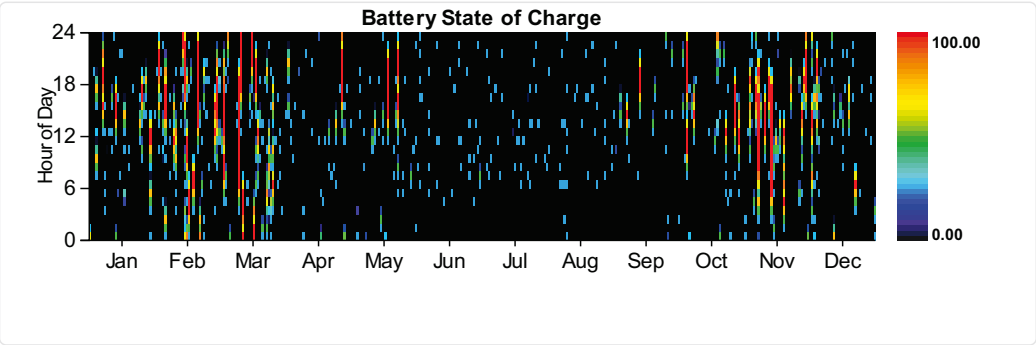
Quantity	Value	Units
Fuel energy input	155906	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

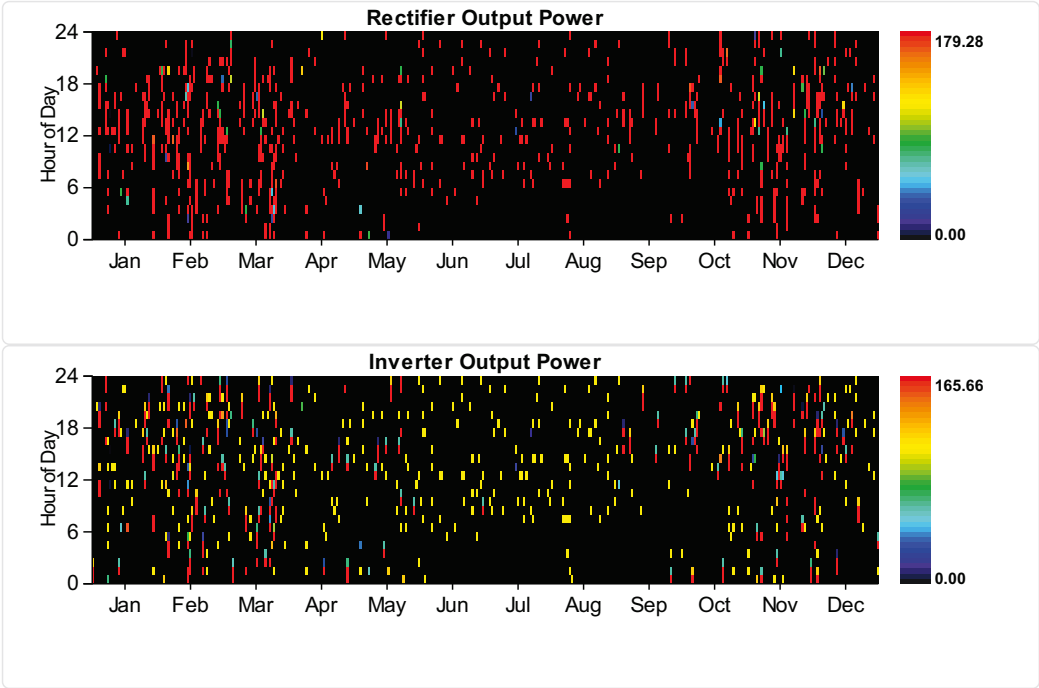
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.035	\$/kWh
Energy in	132703	kWh/yr
Energy out	93395	kWh/yr
Storage depletion	600	kWh/yr
Losses	38708	kWh/yr
Annual throughput	111628	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	10	15	kW
Minimum output	0	0	kW
Maximum output	166	179	kW
Capacity factor	4	6	%
Hours of operation	873	1,017	hrs/yr
Energy in	93,394	156,121	kWh/yr
Energy out	84,055	132,703	kWh/yr
Losses	9,340	23,419	kWh/yr



Grid

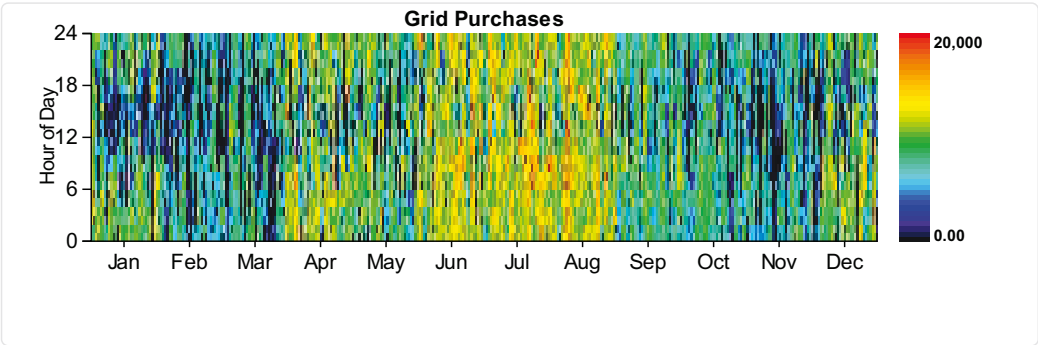
Rate: Demand 1

	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
Resources.ReportingService_GenerateInputsReport_Month						
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,784	0	284,539
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
September	0	0	0	15,890	0	254,236
November	0	0	0	15,876	0	254,021
December	0	0	0	18,431	0	294,896
Annual	0	0	0	20,000	0	3,396,860

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,007,178	0	5,007,178	0	600,861	0
February	3,260,560	0	3,260,560	0	391,267	0
March	3,715,573	0	3,715,573	0	445,869	0
April	6,538,133	0	6,538,133	0	784,576	0
May	5,519,575	0	5,519,575	0	662,349	0
June	7,869,208	0	7,869,208	0	944,305	0
July	8,465,368	0	8,465,368	0	1,015,844	0
August	8,494,749	0	8,494,749	0	1,019,370	0
September	5,392,027	0	5,392,027	0	647,043	0
October	4,738,349	0	4,738,349	0	568,602	0
November	3,739,770	0	3,739,770	0	448,772	0
December	5,471,190	0	5,471,190	0	656,543	0
Annual	68,211,680	0	68,211,680	0	8,185,402	0



Emissions

Pollutant	Emissions	Units
Carbon dioxide	43151364	kg/yr
Carbon monoxide	174	kg/yr
Unburned hydrocarbons	20	kg/yr
Particulate matter	5	kg/yr

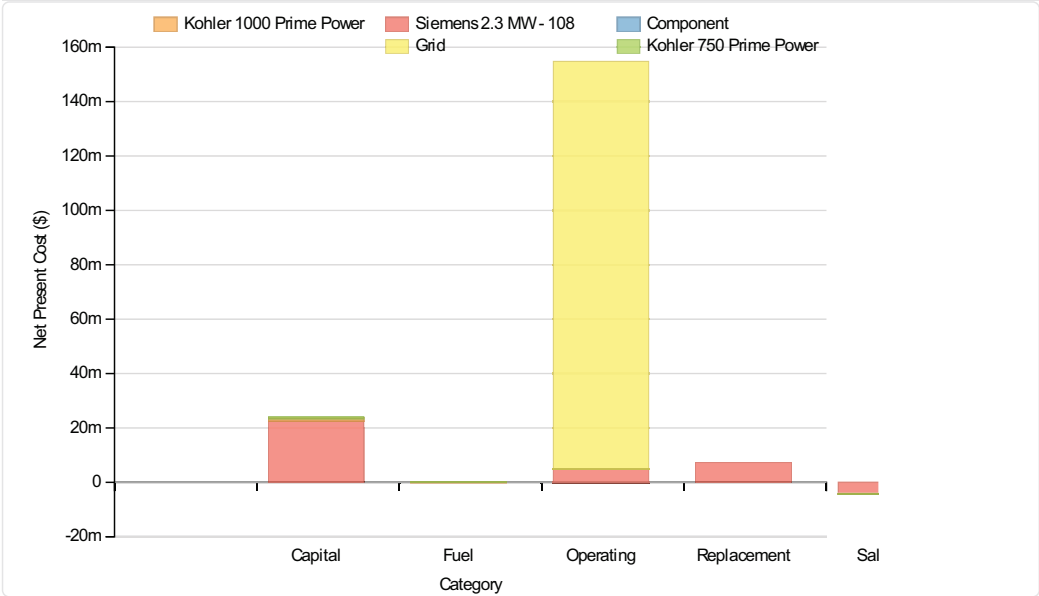
Pollutant	Emissions	Units
Carbon dioxide	186986	kg/yr
Nitrogen oxides	91578	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	181785888	\$
Levelized cost of energy	0.145	\$/kWh

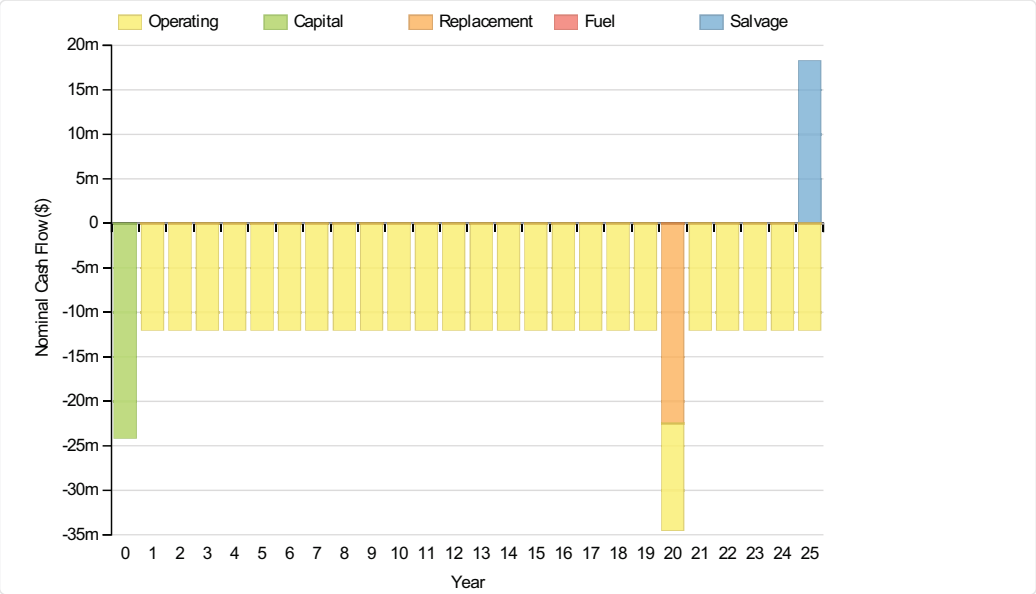
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	13,991	71,206	-192,784	817,413
Kohler 750 Prime Power	690,000	0	13,648	62,102	-137,195	628,555
Grid	0	0	149,861,392	0	0	149,861,392
System	24,115,000	7,173,158	154,736,864	133,307	-4,372,512	181,785,817

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	1,082	5,508	-14,913	63,230
Kohler 750 Prime Power	53,375	0	1,056	4,804	-10,613	48,622

Grid Component	Capital ⁰	Replacement ⁰	O&M ^{1,592,435}	Fuel ⁰	Salvage ⁰	Total ^{11,592,435}
System	1,865,401	554,875	11,969,574	10,312	-338,233	14,061,929

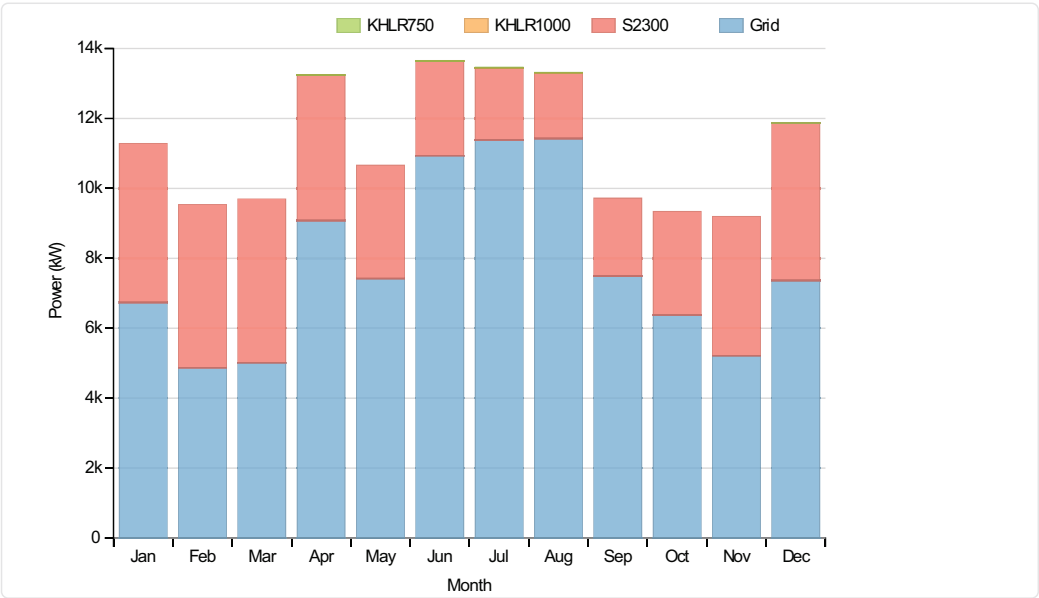


Electrical

Quantity	Value	Units
Excess electricity	1742167	kWh/yr
Unmet load	4013	kWh/yr
Capacity shortage	44902	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	24,079	0
Generator	20,724	0
Wind Turbine	30,268,832	31
Grid Purchases	68,288,688	69
Total	98,602,328	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,860,144	100
DC primary load	0	0
Total	96,860,144	100



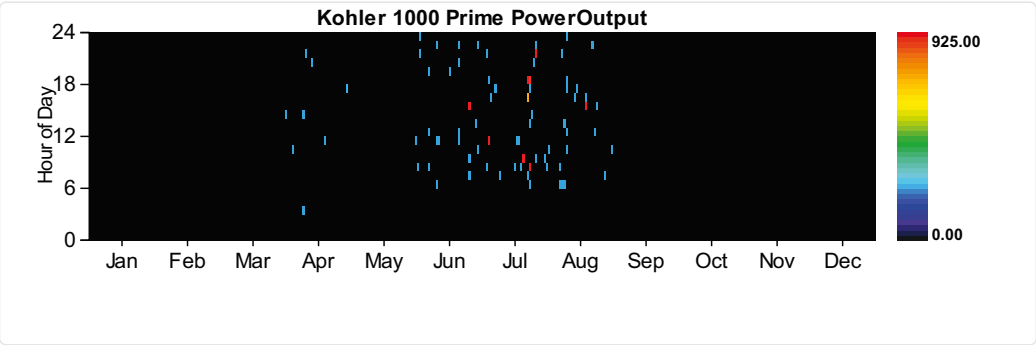
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

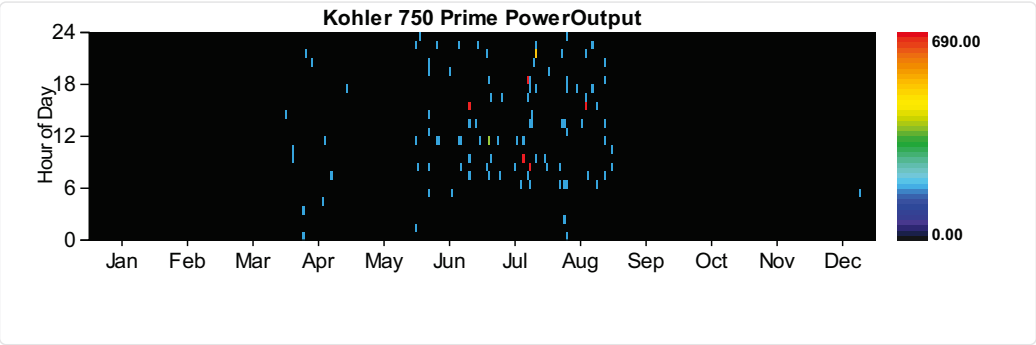
Quantity	Value	Units
Hours of operation	78	hrs/yr
Number of starts	73	starts/yr
Operational life	192	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	24079	kWh/yr
Mean electrical output	309	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	6972	L/yr
Specific fuel consumption	0.29	L/kWh

Quantity	Value	Units
Fuel energy input	68607	kWh/yr
Mean electrical efficiency	35	%



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	102	hrs/yr
Number of starts	95	starts/yr
Operational life	147	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	20724	kWh/yr
Mean electrical output	203	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	6081	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	59835	kWh/yr
Mean electrical efficiency	35	%



Grid

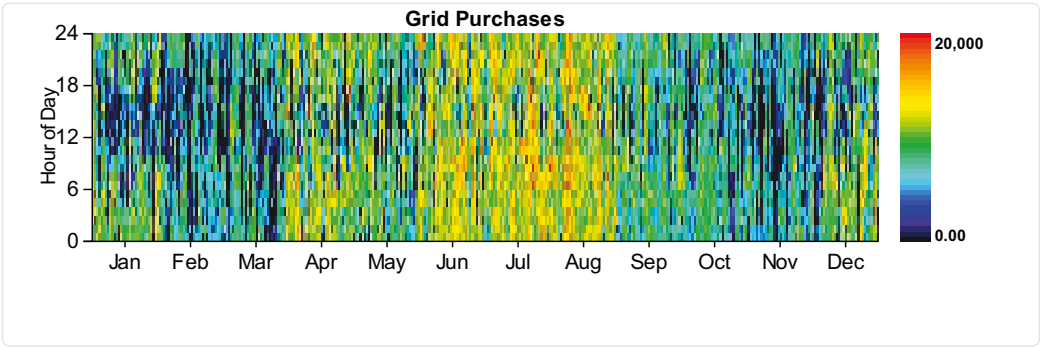
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519

February	Energy Purchased (kWh)	0	Energy Sold (kWh)	0	Net Purchases (kWh)	0	Peak Demand (kW)	15,686	Energy Charge (\$)	0	Demand Charge (\$)	250,977
Resources.ReportingService_GenerateInputsReport_Month												
March		0		0		0		16,699		0		267,178
April		0		0		0		20,000		0		320,000
May		0		0		0		17,784		0		284,539
June		0		0		0		20,000		0		320,000
July		0		0		0		20,000		0		320,000
August		0		0		0		20,000		0		320,000
September		0		0		0		15,890		0		254,236
October		0		0		0		13,843		0		221,494
November		0		0		0		15,876		0		254,021
December		0		0		0		18,490		0		295,836
Annual		0		0		0		20,000		0		3,397,800

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,015,457	0	5,015,457	0	601,855	0
February	3,272,783	0	3,272,783	0	392,734	0
March	3,728,512	0	3,728,512	0	447,421	0
April	6,542,009	0	6,542,009	0	785,041	0
May	5,524,917	0	5,524,917	0	662,990	0
June	7,870,936	0	7,870,936	0	944,512	0
July	8,466,915	0	8,466,915	0	1,016,030	0
August	8,497,167	0	8,497,167	0	1,019,660	0
September	5,395,241	0	5,395,241	0	647,429	0
October	4,744,924	0	4,744,924	0	569,391	0
November	3,750,403	0	3,750,403	0	450,048	0
December	5,479,425	0	5,479,425	0	657,531	0
Annual	68,288,688	0	68,288,688	0	8,194,643	0



Emissions

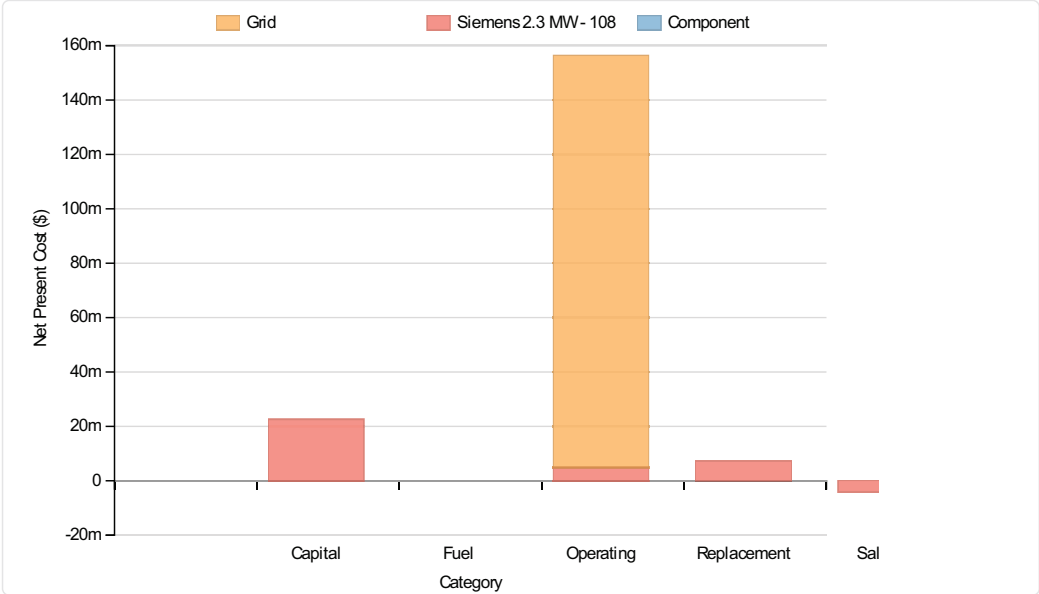
Pollutant	Emissions	Units
Carbon dioxide	43192712	kg/yr
Carbon monoxide	144	kg/yr
Unburned hydrocarbons	16	kg/yr
Particulate matter	4	kg/yr
Sulfur dioxide	187182	kg/yr
Nitrogen oxides	91650	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

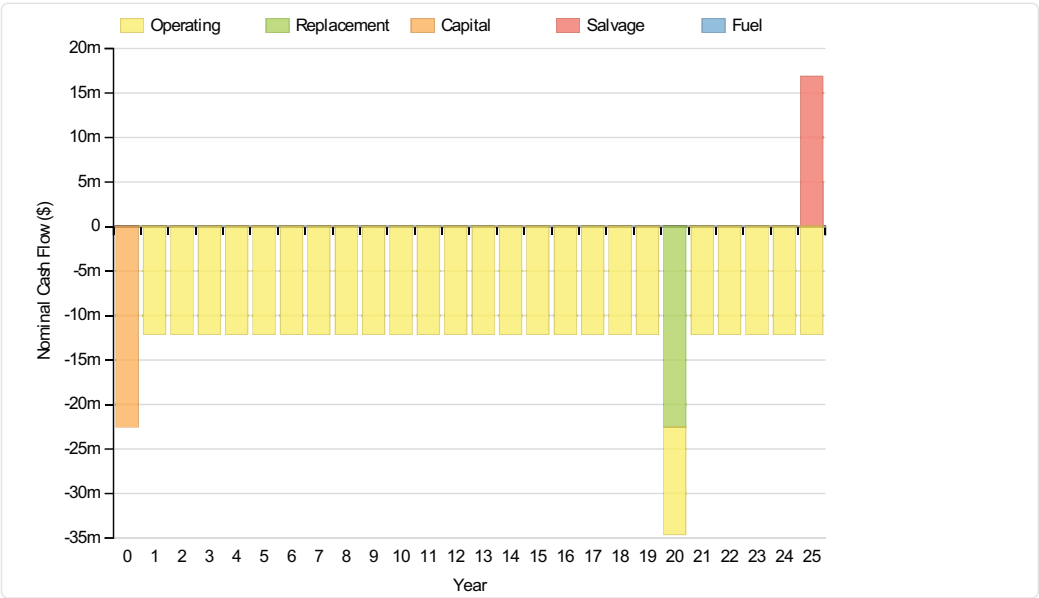
Total net present cost	182065680	\$
Levelized cost of energy	0.145	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Grid	0	0	151,587,152	0	0	151,587,152
System	22,500,000	7,173,158	156,434,976	0	-4,042,534	182,065,600

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Grid	0	0	11,725,930	0	0	11,725,930
System	1,740,474	554,875	12,100,930	0	-312,708	14,083,571

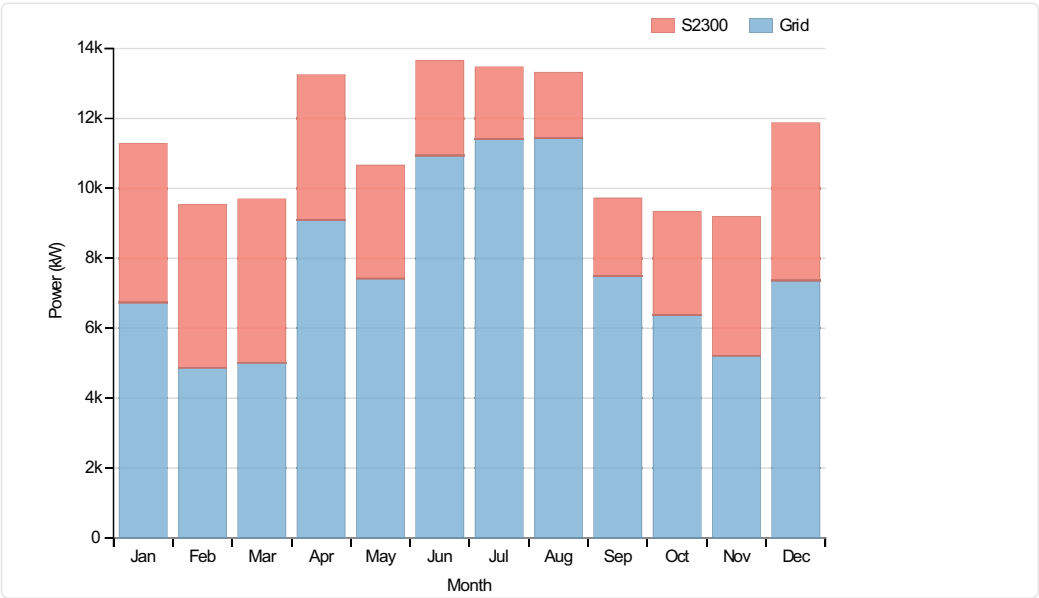


Electrical

Quantity	Value	Units
Excess electricity	1742167	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	1840	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Wind Turbine	30,268,832	31
Grid Purchases	68,337,504	69
Total	98,606,336	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Grid

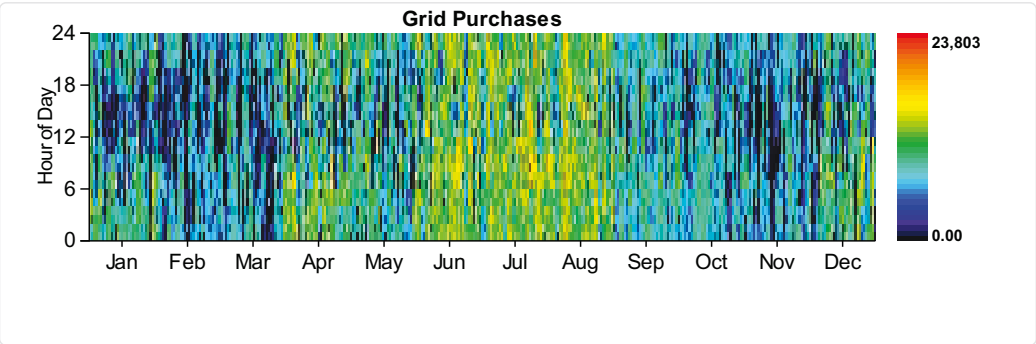
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,413	0	326,604
May	0	0	0	17,784	0	284,539
June	0	0	0	21,607	0	345,713
July	0	0	0	23,804	0	380,861
August	0	0	0	21,981	0	351,699
September	0	0	0	15,890	0	254,236

October	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
November	0	0	0	13,843	0	221,494
Resources.ReportingService_GenerateInputsReport_Month	0	0	0	15,876	0	254,021
December	0	0	0	18,662	0	298,596
Annual	0	0	0	23,804	0	3,525,437

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,015,457	0	5,015,457	0	601,855	0
February	3,272,783	0	3,272,783	0	392,734	0
March	3,728,512	0	3,728,512	0	447,421	0
April	6,545,765	0	6,545,765	0	785,492	0
May	5,524,917	0	5,524,917	0	662,990	0
June	7,881,712	0	7,881,712	0	945,805	0
July	8,488,840	0	8,488,840	0	1,018,661	0
August	8,509,350	0	8,509,350	0	1,021,122	0
September	5,395,241	0	5,395,241	0	647,429	0
October	4,744,924	0	4,744,924	0	569,391	0
November	3,750,403	0	3,750,403	0	450,048	0
December	5,479,597	0	5,479,597	0	657,552	0
Annual	68,337,504	0	68,337,504	0	8,200,500	0



Emissions

Pollutant	Emissions	Units
Carbon dioxide	43189304	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	187245	kg/yr
Nitrogen oxides	91572	kg/yr

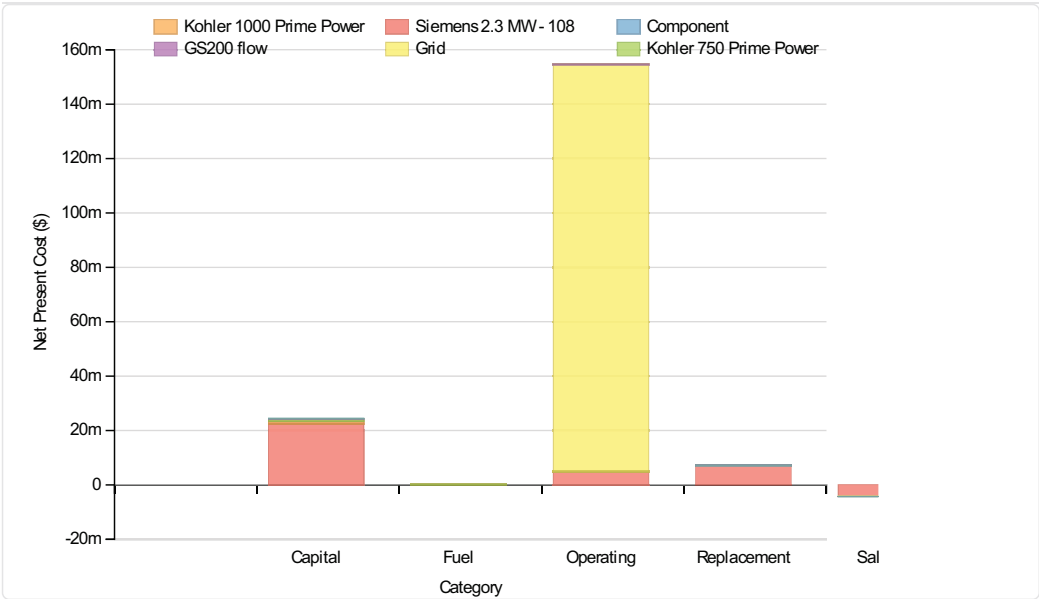
Pollutant	Emissions	Units
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System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

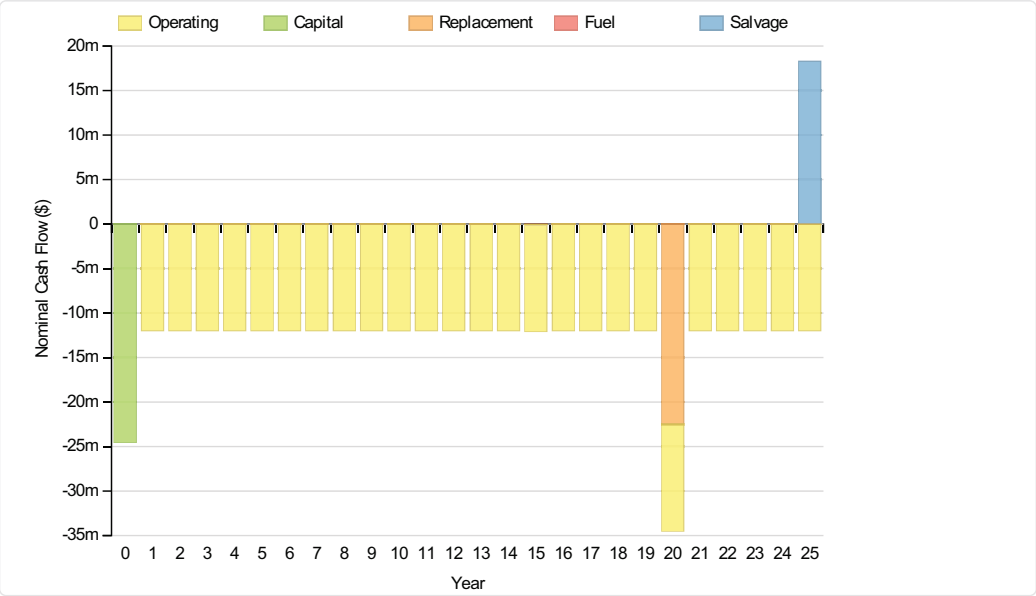
Total net present cost	182180144	\$
Levelized cost of energy	0.145	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	13,811	110,277	-193,153	855,935
Kohler 750 Prime Power	690,000	0	13,514	85,319	-137,470	651,363
Grid	0	0	149,731,712	0	0	149,731,712
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	24,514,588	7,212,154	154,637,856	195,597	-4,380,119	182,180,076

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	1,068	8,530	-14,941	66,211
Kohler 750 Prime Power	53,375	0	1,045	6,600	-10,634	50,386
Grid	0	0	11,582,404	0	0	11,582,404
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	5,802	2,462	0	0	-463	7,800
System	1,896,311	557,892	11,961,915	15,130	-338,821	14,092,427



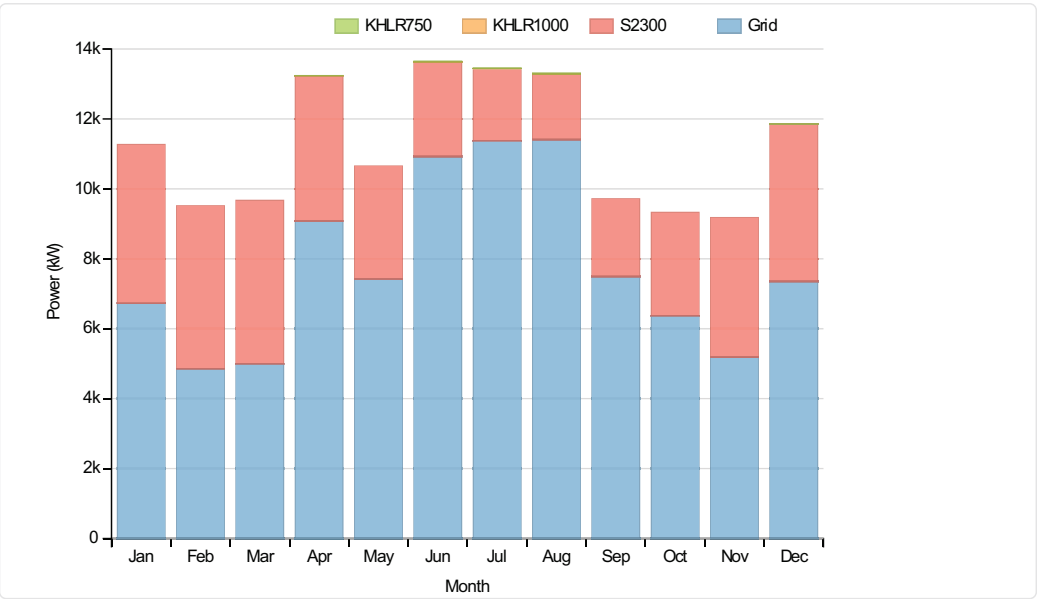
Electrical

Quantity	Value	Units
Excess electricity	1607580	kWh/yr
Unmet load	4013	kWh/yr
Capacity shortage	44676	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	37,426	0
Generator	28,561	0
Wind Turbine	30,268,832	31
Grid Purchases	68,205,056	69
Total	98,539,872	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,860,144	100
DC primary load	0	0

Total	Consumption(kWh/yr)	96,860,144	Fraction (%)	100
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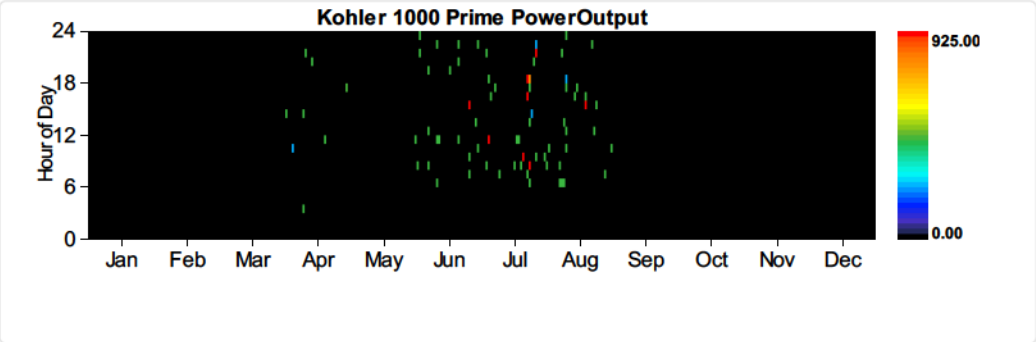
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

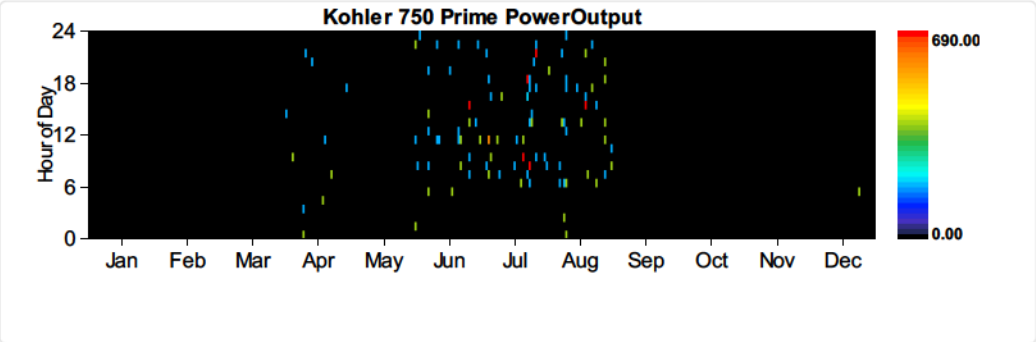
Quantity	Value	Units
Hours of operation	77	hrs/yr
Number of starts	73	starts/yr
Operational life	195	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	37426	kWh/yr
Mean electrical output	486	kW
Min. electrical output	231	kW
Max. electrical output	925	kW

Fuel consumption	Value	10798	Units
Specific fuel consumption		0.29	L/kWh
Fuel energy input		106252	kWh/yr
Mean electrical efficiency		35	%



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	101	hrs/yr
Number of starts	95	starts/yr
Operational life	149	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	28561	kWh/yr
Mean electrical output	283	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	8354	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	82206	kWh/yr
Mean electrical efficiency	35	%

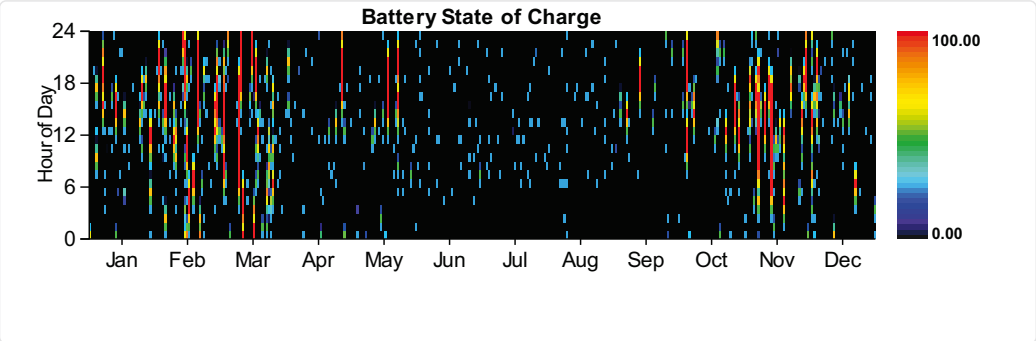


Battery:GS200 flow

Quantity	Value
String size	1

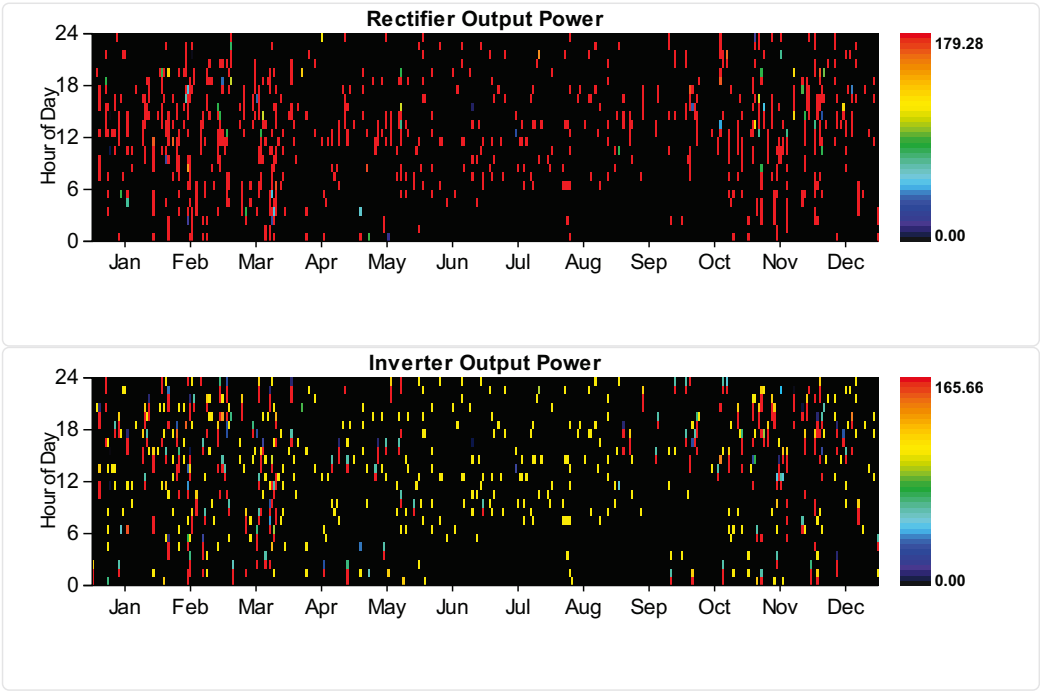
Strings in parallel	Value	1
Batteries		1
Bus voltage		100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.036	\$/kWh
Energy in	132844	kWh/yr
Energy out	93493	kWh/yr
Storage depletion	600	kWh/yr
Losses	38751	kWh/yr
Annual throughput	111746	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	10	15	kW
Minimum output	0	0	kW
Maximum output	166	179	kW
Capacity factor	4	6	%
Hours of operation	874	1,016	hrs/yr
Energy in	93,493	156,288	kWh/yr
Energy out	84,144	132,844	kWh/yr
Losses	9,350	23,444	kWh/yr



Grid

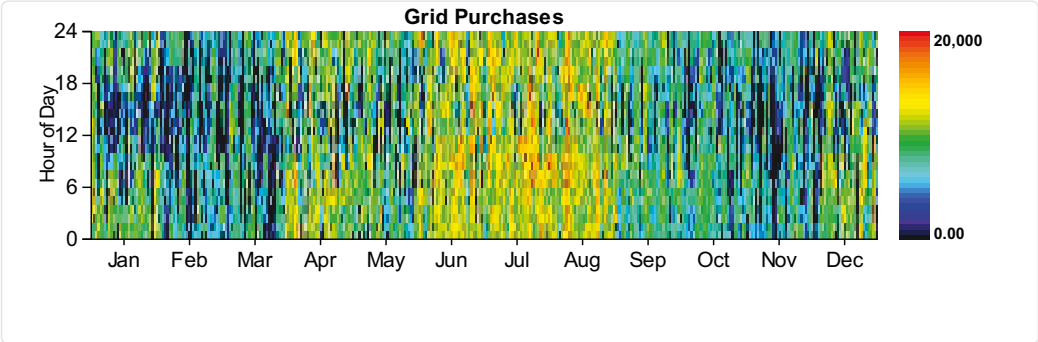
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,784	0	284,539
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,890	0	254,236
October	0	0	0	13,843	0	221,494
November	0	0	0	15,876	0	254,021
December	0	0	0	18,490	0	295,836
Annual	0	0	0	20,000	0	3,397,800

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,007,178	0	5,007,178	0	600,861	0
February	3,260,560	0	3,260,560	0	391,267	0
March	3,715,573	0	3,715,573	0	445,869	0

April	6,537,505	Energy Purchased	0	Energy Sold	6,537,505	Peak Demand	0	Energy Charge	784,301	Demand Charge	0
May	5,519,575	(kWh)	0	(kWh)	5,519,575	(kW)	0	(\$)	662,349	(\$)	0
June	7,866,983		0		7,866,983		0		944,038		0
July	8,463,189		0		8,463,189		0		1,015,583		0
August	8,493,100		0		8,493,100		0		1,019,172		0
September	5,392,027		0		5,392,027		0		647,043		0
October	4,738,349		0		4,738,349		0		568,602		0
November	3,739,770		0		3,739,770		0		448,772		0
December	5,471,249		0		5,471,249		0		656,550		0
Annual	68,205,056		0		68,205,056		0		8,184,608		0



Emissions

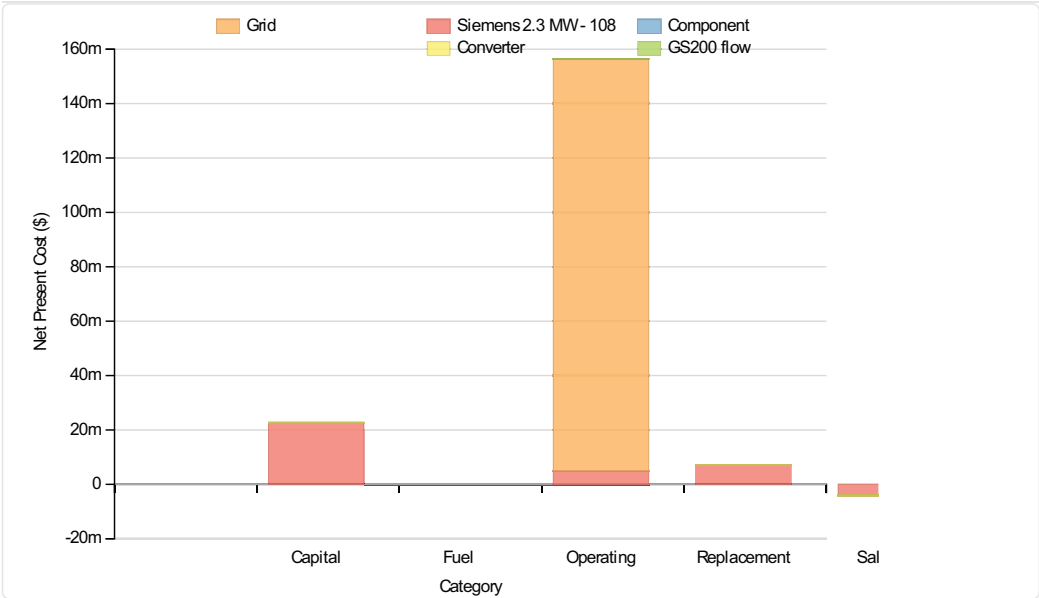
Pollutant	Emissions	Units
Carbon dioxide	43155860	kg/yr
Carbon monoxide	211	kg/yr
Unburned hydrocarbons	24	kg/yr
Particulate matter	6	kg/yr
Sulfur dioxide	186985	kg/yr
Nitrogen oxides	91605	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	5	
Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	182415824	\$
Levelized cost of energy	0.146	\$/kWh

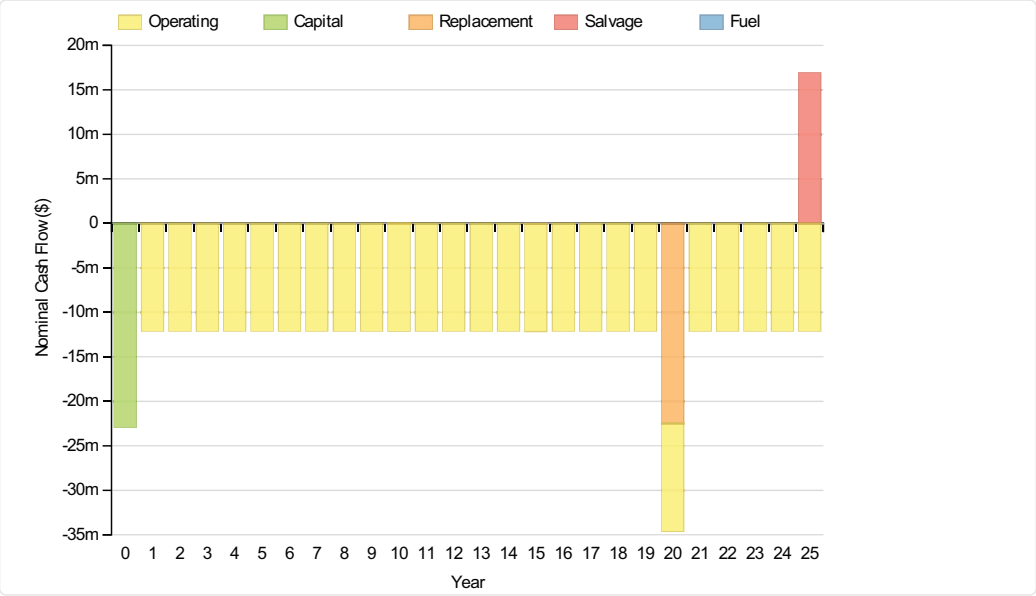
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Grid	0	0	151,474,640	0	0	151,474,640
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	22,899,588	7,212,154	156,353,488	0	-4,049,496	182,415,734

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Grid	0	0	11,717,227	0	0	11,717,227
GS200 flow	25,108	555	2,400	0	-75	27,988

Component	Capital 5,802	Replacement 2,462	O&M 0	Fuel 0	Salvage -463	Total 7,800
System	1,771,383	557,892	12,094,627	0	-313,246	14,110,656

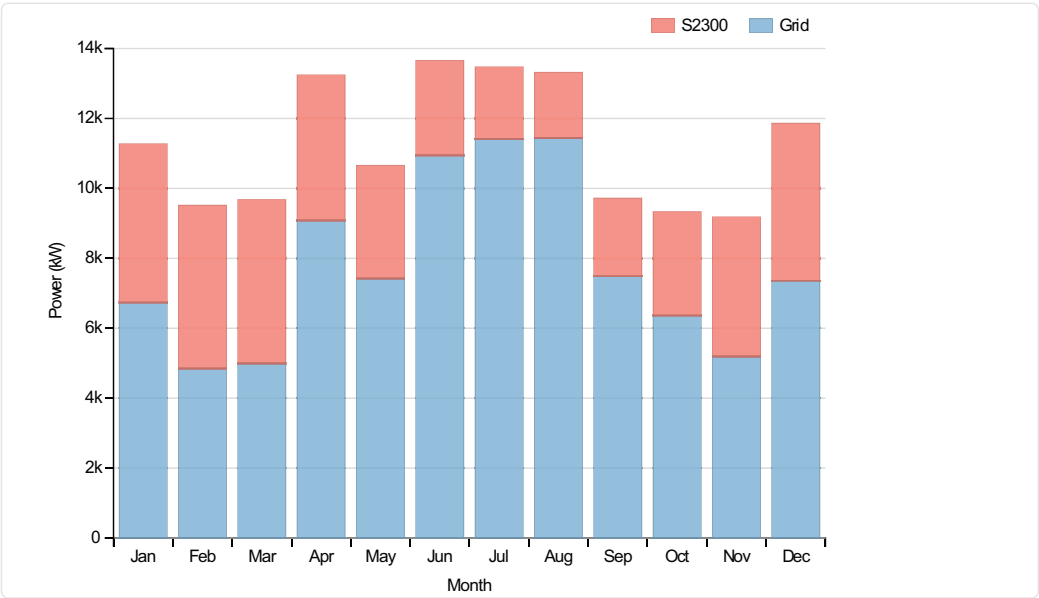


Electrical

Quantity	Value	Units
Excess electricity	1607580	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	1840	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Wind Turbine	30,268,832	31
Grid Purchases	68,264,976	69
Total	98,533,808	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



Wind Turbine:Siemens 2.3 MW - 108

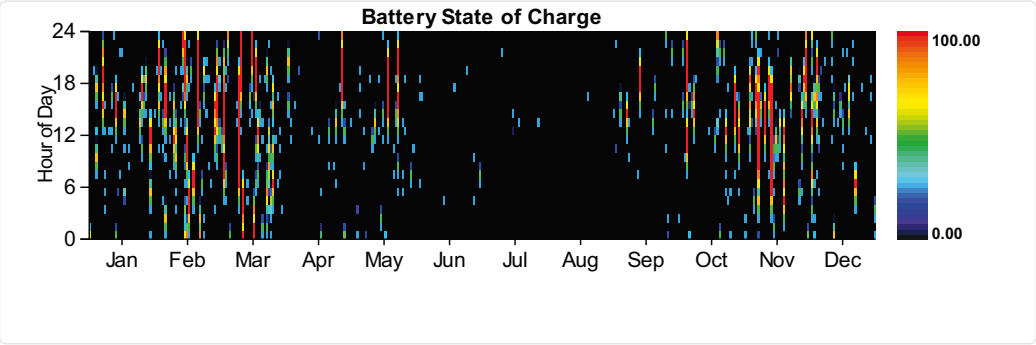
Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

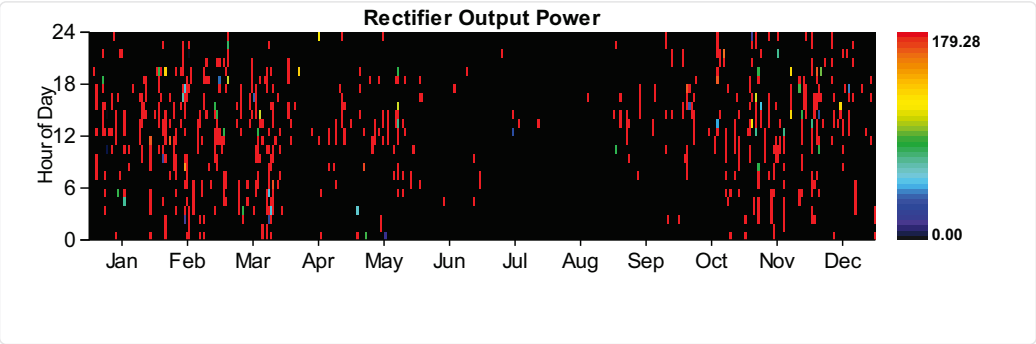
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh

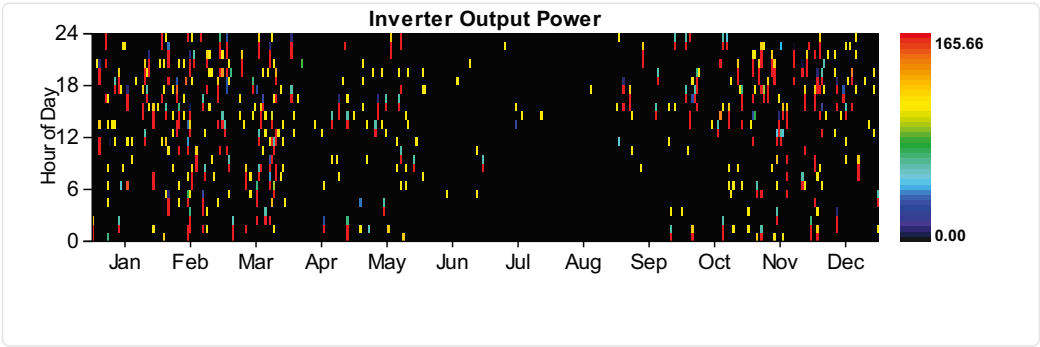
Quantity	Value	Units
Energy in	114399	kWh/yr
Energy out	80582	kWh/yr
Storage depletion	600	kWh/yr
Losses	33217	kWh/yr
Annual throughput	96314	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	8	13	kW
Minimum output	0	0	kW
Maximum output	166	179	kW
Capacity factor	3	5	%
Hours of operation	777	917	hrs/yr
Energy in	80,582	134,588	kWh/yr
Energy out	72,523	114,399	kWh/yr
Losses	8,058	20,188	kWh/yr





Grid

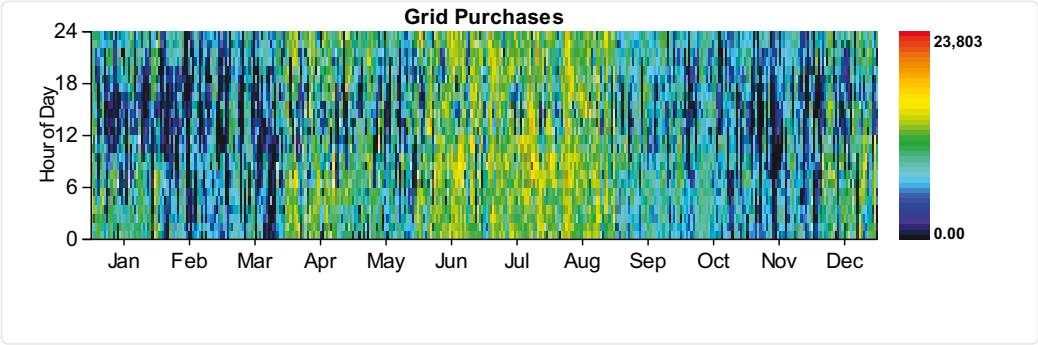
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	15,686	0	250,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,413	0	326,604
May	0	0	0	17,784	0	284,539
June	0	0	0	21,607	0	345,713
July	0	0	0	23,804	0	380,861
August	0	0	0	21,981	0	351,699
September	0	0	0	15,890	0	254,236
October	0	0	0	13,843	0	221,494
November	0	0	0	15,876	0	254,021
December	0	0	0	18,662	0	298,596
Annual	0	0	0	23,804	0	3,525,437

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	5,007,178	0	5,007,178	0	600,861	0
February	3,260,560	0	3,260,560	0	391,267	0
March	3,715,573	0	3,715,573	0	445,869	0
April	6,542,332	0	6,542,332	0	785,080	0
May	5,519,575	0	5,519,575	0	662,349	0
June	7,880,695	0	7,880,695	0	945,683	0
July	8,488,147	0	8,488,147	0	1,018,578	0
August	8,509,237	0	8,509,237	0	1,021,108	0

September	Energy Purchased (kWh) 3,392,027	Energy Sold (kWh) 0	Net Purchases (kWh) 3,392,027	Peak Demand (kW) 0	Energy Charge (\$) 1,194,433	Demand Charge (\$) 0
Resources.ReportingService_GenerateInputsReport_Month	(kWh) 3,392,027	(kWh) 0	(kWh) 3,392,027	(kW) 0	(\$ 1,194,433)	(\$ 0)
November	3,739,770	0	3,739,770	0	448,772	0
December	5,471,535	0	5,471,535	0	656,584	0
Annual	68,264,976	0	68,264,976	0	8,191,798	0



Emissions

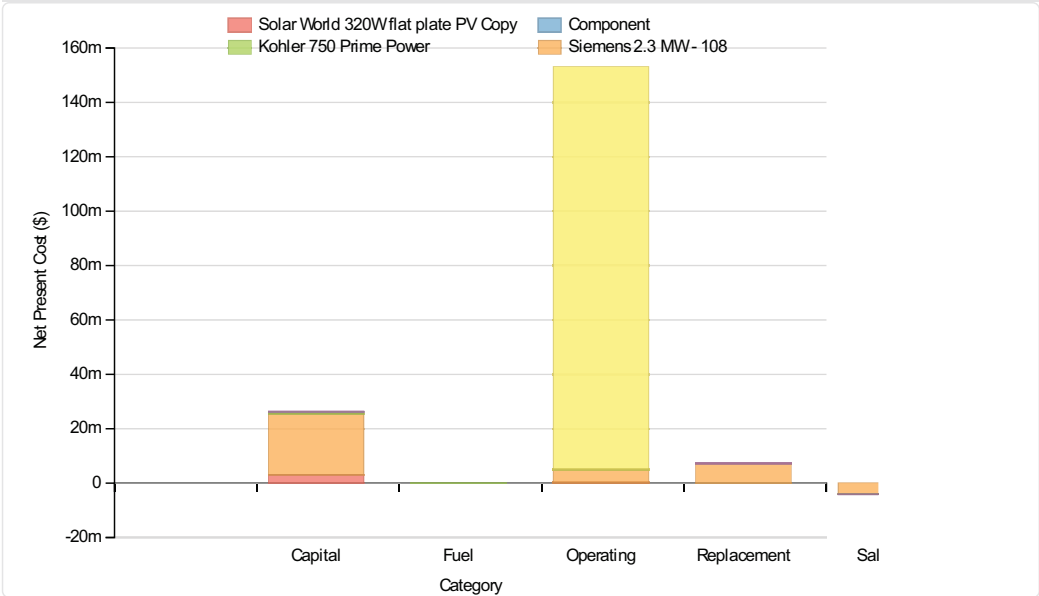
Pollutant	Emissions	Units
Carbon dioxide	43143464	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	187046	kg/yr
Nitrogen oxides	91475	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Generator #2	Kohler 750 Prime Power	690	kW
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	182618288	\$
Levelized cost of energy	0.146	\$/kWh

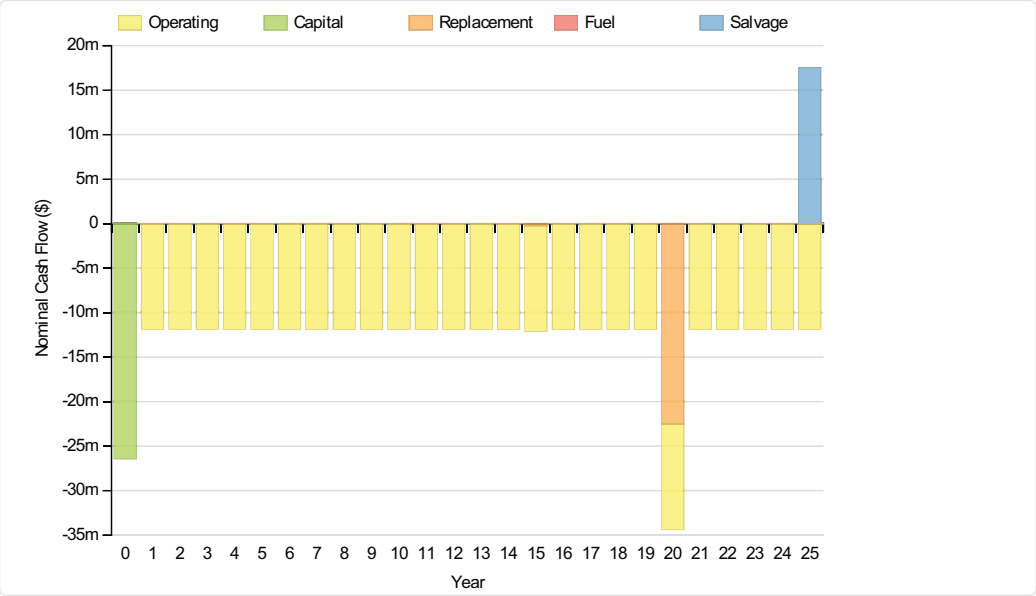
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 750 Prime Power	690,000	0	13,648	67,521	-137,195	633,974
Grid	0	0	148,009,376	0	0	148,009,376
Converter	225,000	95,462	0	0	-17,967	302,495
System	26,415,000	7,268,619	153,064,752	67,521	-4,197,695	182,618,197

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	812,708	2,357,641
Kohler 750 Prime Power	53,375	0	1,056	5,223	-10,613	49,041
Grid	0	0	11,449,173	0	0	11,449,173
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,043,316	562,260	11,840,229	5,223	-324,710	14,126,318

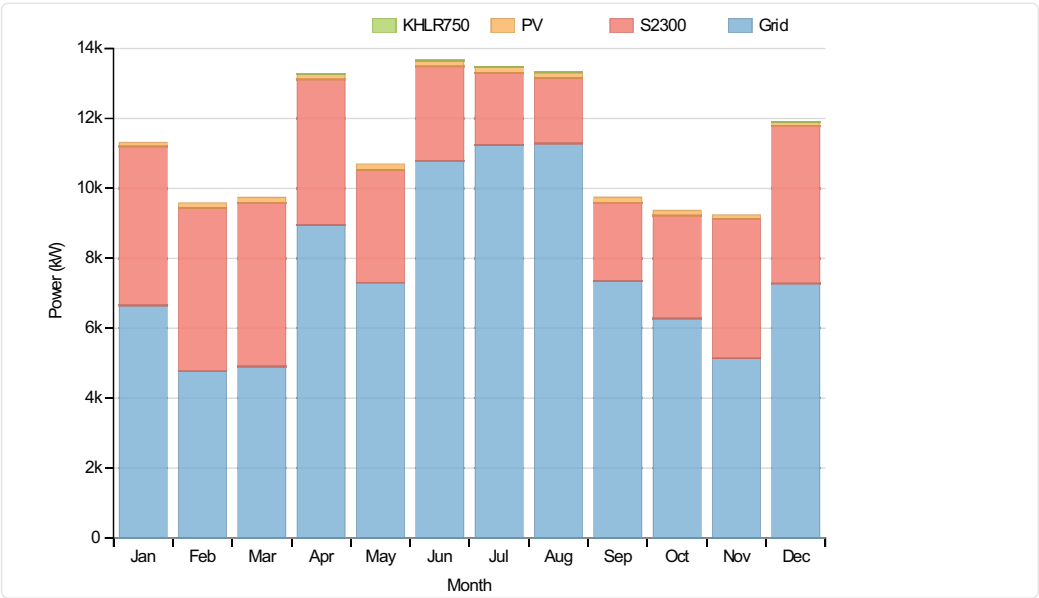


Electrical

Quantity	Value	Units
Excess electricity	1907658	kWh/yr
Unmet load	9237	kWh/yr
Capacity shortage	87708	kWh/yr
Renewable fraction	0	

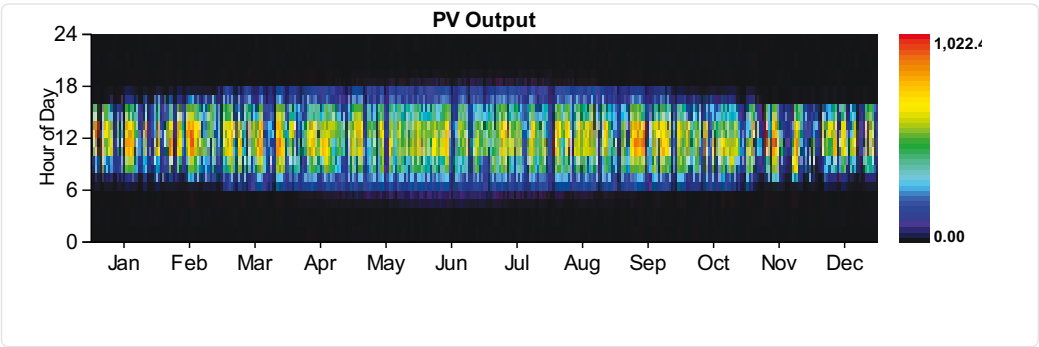
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	22,553	0
Wind Turbine	30,268,832	31
Grid Purchases	67,294,856	68
Total	98,874,912	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,854,920	100
DC primary load	0	0
Total	96,854,920	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



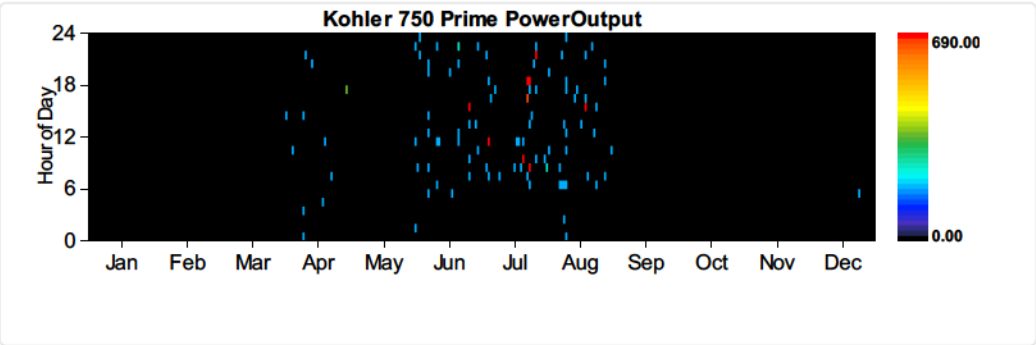
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr

Minimum output	Value	7.19	Units
Maximum output		11574.00	kW
Wind penetration		31.25	%
Hours of operation		8760	hrs/yr
Levelized cost		0.078	\$/kWh

Generator:Kohler 750 Prime Power

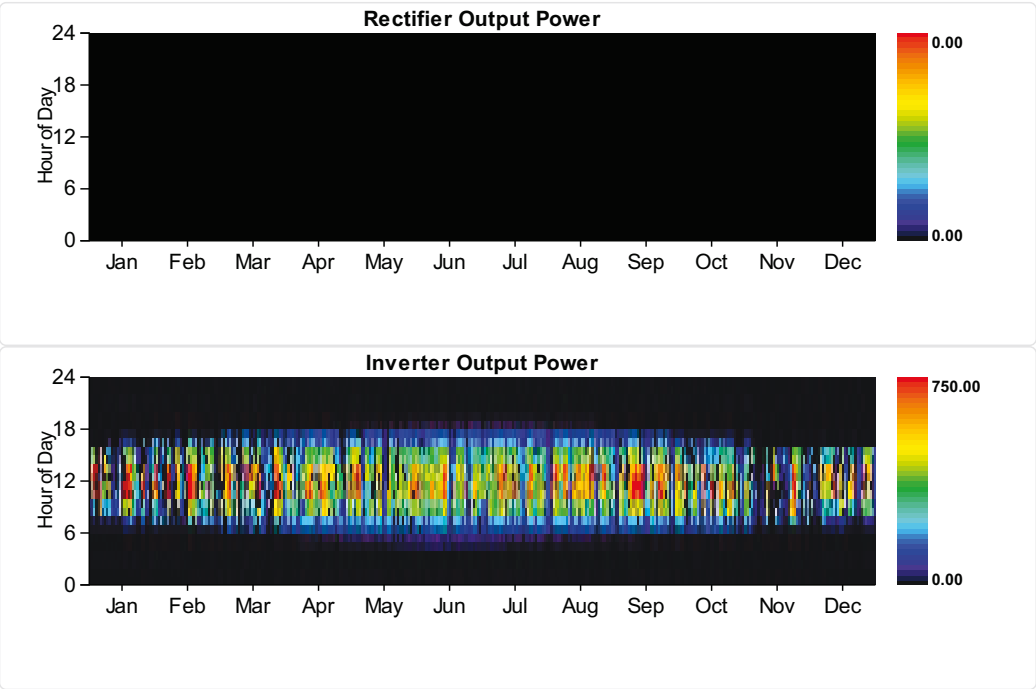
Quantity	Value	Units
Hours of operation	102	hrs/yr
Number of starts	96	starts/yr
Operational life	147	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	22553	kWh/yr
Mean electrical output	221	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	6611	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	65056	kWh/yr
Mean electrical efficiency	35	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	115	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	15	0	%

Hours of operation	Inverter	3,902	Rectifier	0	Units
Energy in		1,123,182		0	kWh/yr
Energy out		1,010,865		0	kWh/yr
Losses		112,317		0	kWh/yr



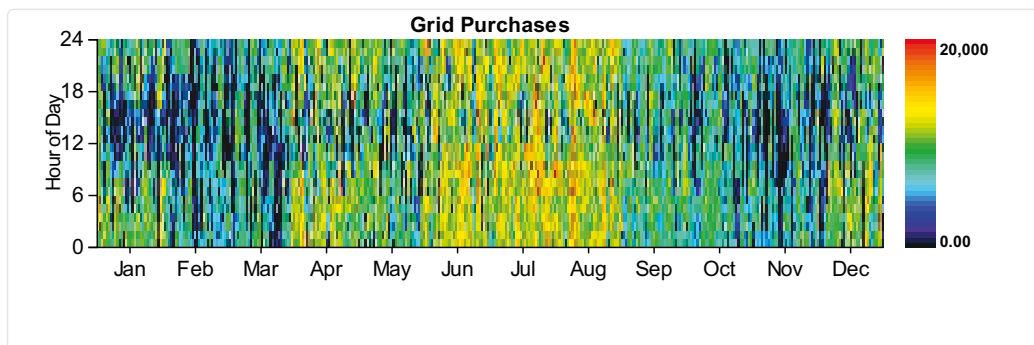
Grid

Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,572	0	281,151
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,490	0	295,836
Annual	0	0	0	20,000	0	3,373,798

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,952,182	0	4,952,182	0	594,262	0
February	3,207,647	0	3,207,647	0	384,918	0
March	3,646,840	0	3,646,840	0	437,621	0
April	6,450,498	0	6,450,498	0	774,060	0
May	5,429,449	0	5,429,449	0	651,534	0
June	7,766,616	0	7,766,616	0	931,994	0
July	8,362,597	0	8,362,597	0	1,003,512	0
August	8,391,706	0	8,391,706	0	1,007,005	0
September	5,297,231	0	5,297,231	0	635,668	0
October	4,667,008	0	4,667,008	0	560,041	0
November	3,703,306	0	3,703,306	0	444,397	0
December	5,419,775	0	5,419,775	0	650,373	0
Annual	67,294,856	0	67,294,856	0	8,075,382	0



Emissions

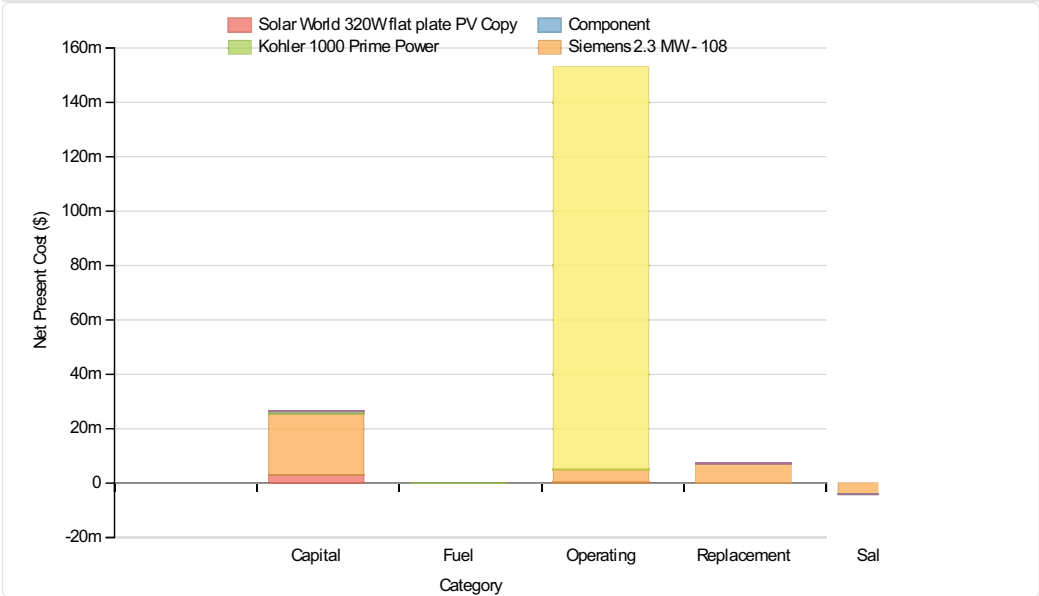
Pollutant	Emissions	Units
Carbon dioxide	42547700	kg/yr
Carbon monoxide	73	kg/yr
Unburned hydrocarbons	8	kg/yr
Particulate matter	2	kg/yr
Sulfur dioxide	184424	kg/yr
Nitrogen oxides	90248	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	182811264	\$
Levelized cost of energy	0.146	\$/kWh

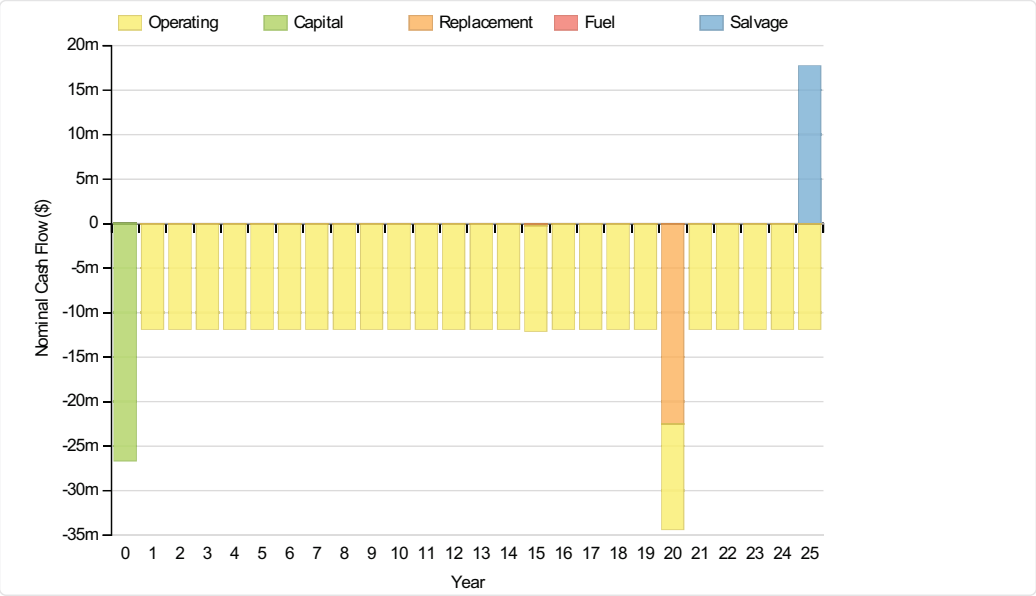
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	18,296	87,939	-183,920	847,315
Grid	0	0	147,989,040	0	0	147,989,040
Converter	225,000	95,462	0	0	-17,967	302,495
System	26,650,000	7,268,619	153,049,056	87,939	-4,244,421	182,811,193

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3MW - 108	1,740,474	554,875	375,000	0	812,708	2,357,641
Kohler 1000 Prime Power	71,553	0	1,415	6,802	-14,227	65,544
Grid	0	0	11,447,600	0	0	11,447,600
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,061,494	562,260	11,839,015	6,802	-328,325	14,141,246

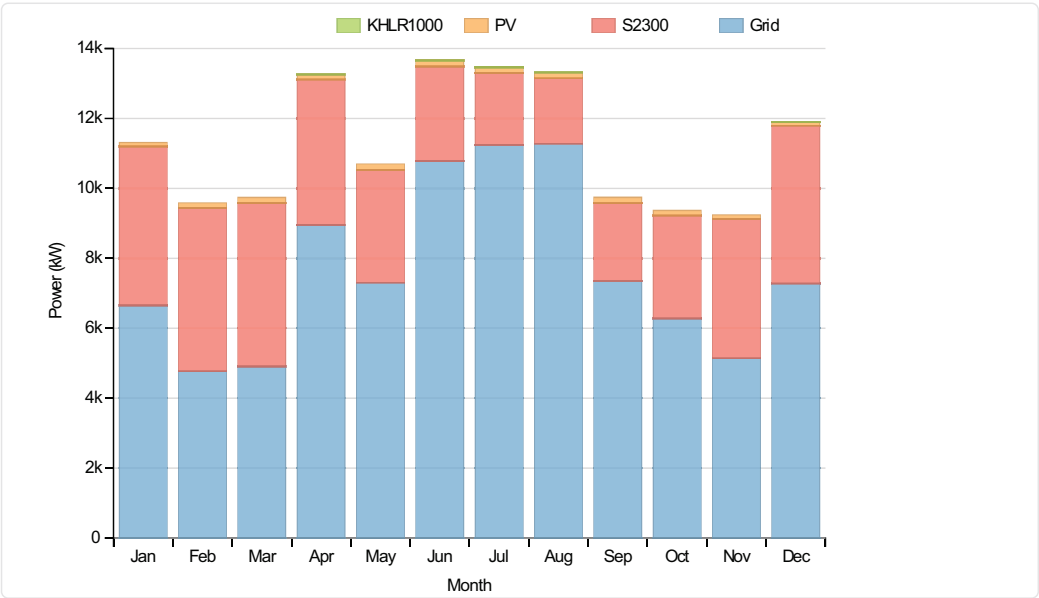


Electrical

Quantity	Value	Units
Excess electricity	1907658	kWh/yr
Unmet load	7357	kWh/yr
Capacity shortage	73139	kWh/yr
Renewable fraction	0	

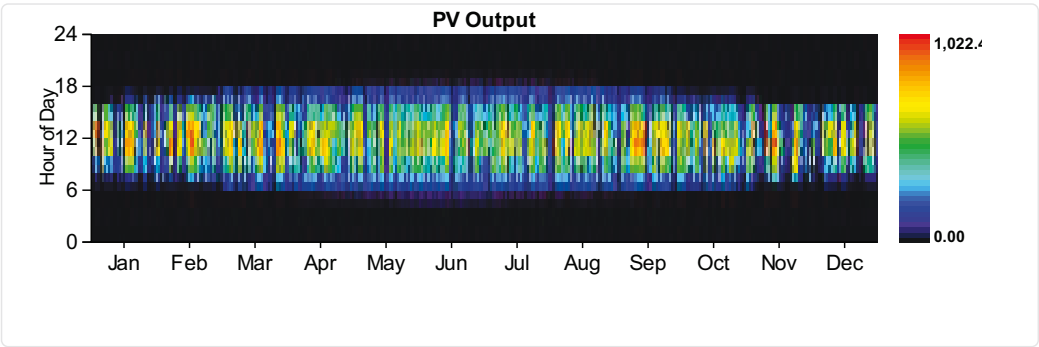
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	29,720	0
Wind Turbine	30,268,832	31
Grid Purchases	67,289,568	68
Total	98,876,792	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,856,792	100
DC primary load	0	0
Total	96,856,792	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



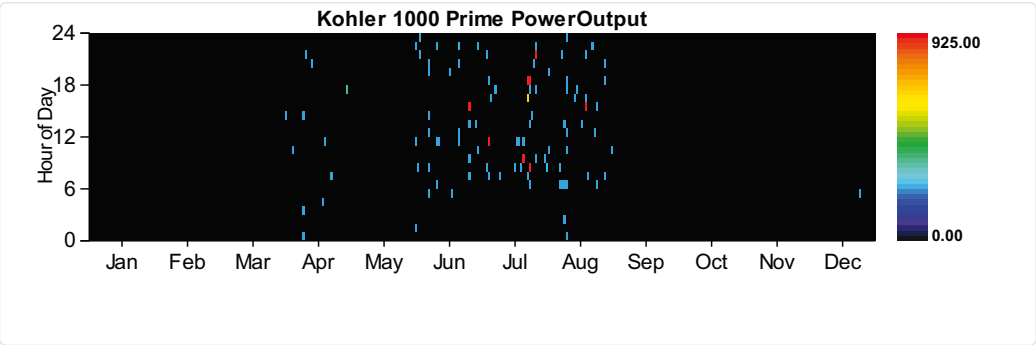
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr

Quantity	Value	Units
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

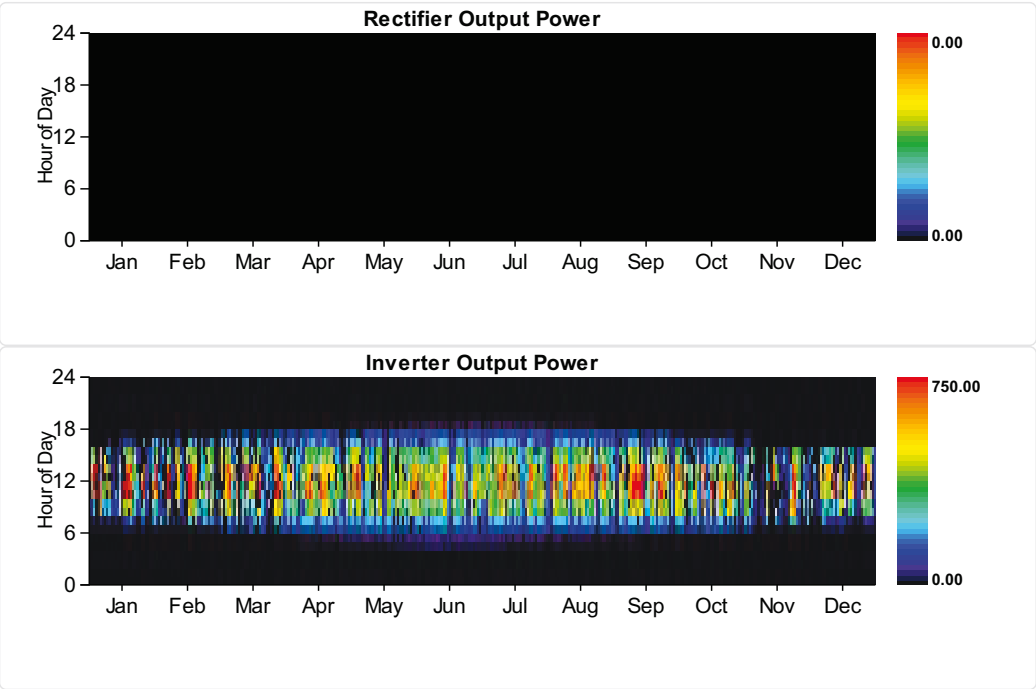
Quantity	Value	Units
Hours of operation	102	hrs/yr
Number of starts	96	starts/yr
Operational life	147	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	29720	kWh/yr
Mean electrical output	291	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	8611	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	84729	kWh/yr
Mean electrical efficiency	35	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	115	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	15	0	%

Quantity	Hours of operation	Inverter3,902	Rectifier0	Units
Energy in		1,123,182	0	kWh/yr
Energy out		1,010,865	0	kWh/yr
Losses		112,317	0	kWh/yr



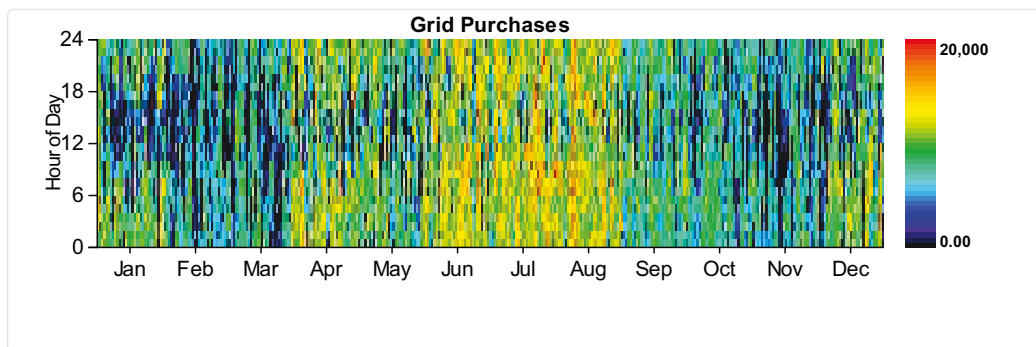
Grid

Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,572	0	281,151
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,431	0	294,896
Annual	0	0	0	20,000	0	3,372,858

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,952,182	0	4,952,182	0	594,262	0
February	3,207,647	0	3,207,647	0	384,918	0
March	3,646,840	0	3,646,840	0	437,621	0
April	6,449,910	0	6,449,910	0	773,989	0
May	5,429,449	0	5,429,449	0	651,534	0
June	7,765,030	0	7,765,030	0	931,804	0
July	8,361,306	0	8,361,306	0	1,003,357	0
August	8,389,944	0	8,389,944	0	1,006,793	0
September	5,297,231	0	5,297,231	0	635,668	0
October	4,667,008	0	4,667,008	0	560,041	0
November	3,703,306	0	3,703,306	0	444,397	0
December	5,419,716	0	5,419,716	0	650,366	0
Annual	67,289,568	0	67,289,568	0	8,074,748	0



Emissions

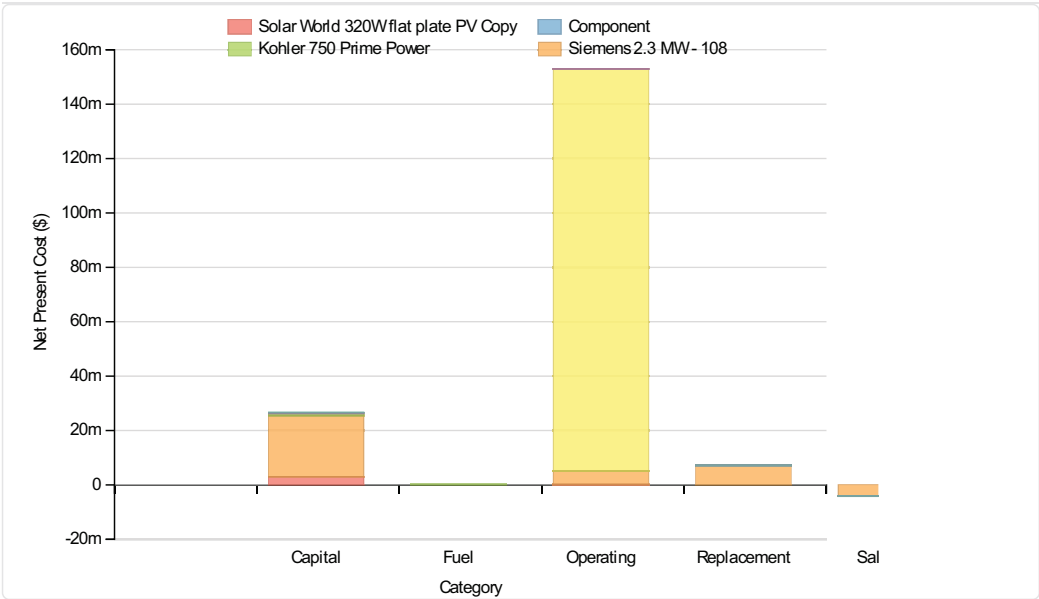
Pollutant	Emissions	Units
Carbon dioxide	42549608	kg/yr
Carbon monoxide	95	kg/yr
Unburned hydrocarbons	11	kg/yr
Particulate matter	3	kg/yr
Sulfur dioxide	184420	kg/yr
Nitrogen oxides	90263	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Generator #2	Kohler 750 Prime Power	690	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

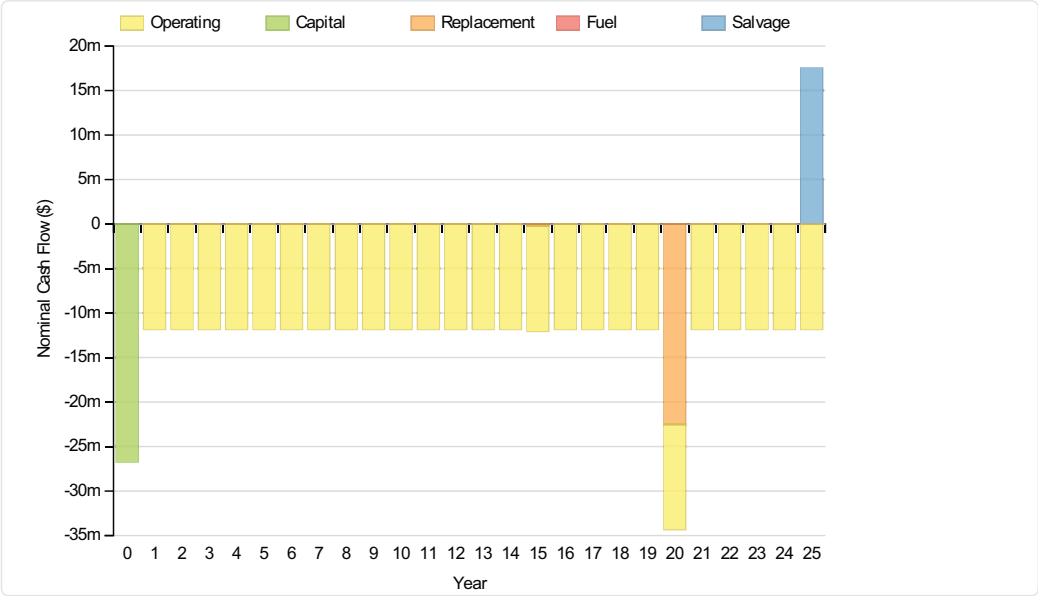
Total net present cost	182886224	\$
Levelized cost of energy	0.146	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 750 Prime Power	690,000	0	13,514	108,816	-137,470	674,860
Grid	0	0	147,874,608	0	0	147,874,608
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	26,739,588	7,275,795	152,960,896	108,816	-4,198,944	182,886,151

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 750 Prime Power	53,375	0	1,045	8,417	-10,634	52,204
Grid	0	0	11,438,748	0	0	11,438,748
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,068,424	562,815	11,832,195	8,417	-324,807	14,147,044



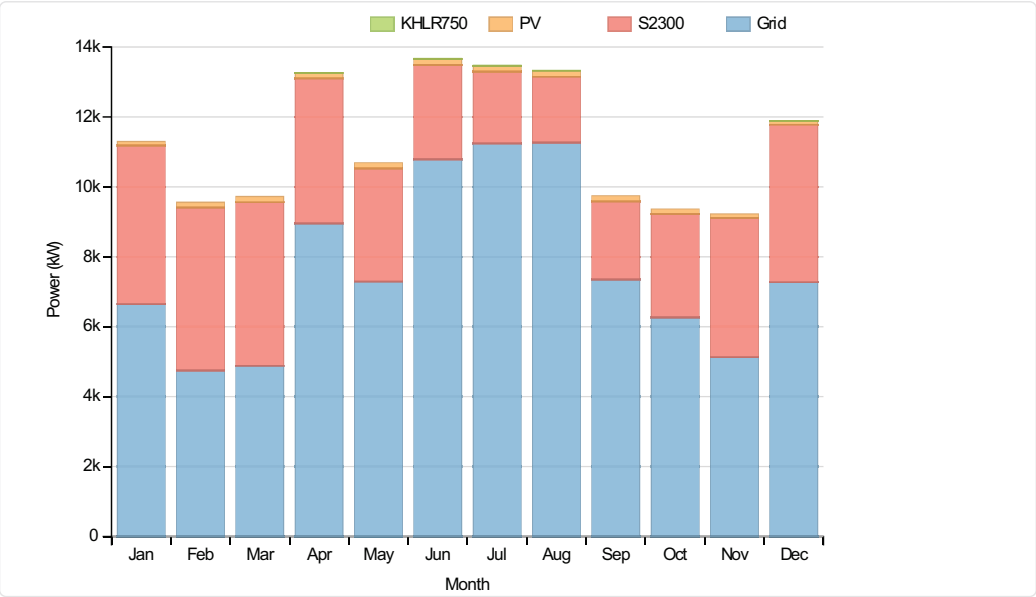
Electrical

Quantity	Value	Units
Excess electricity	1772971	kWh/yr
Unmet load	9137	kWh/yr
Capacity shortage	87507	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	36,489	0
Wind Turbine	30,268,832	31
Grid Purchases	67,207,992	68
Total	98,801,984	100

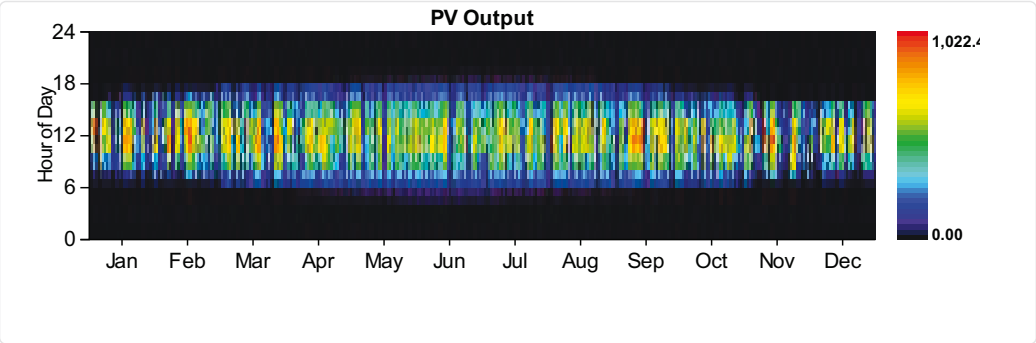
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,855,016	100
DC primary load	0	0

Total	Consumption(kWh/yr)	96,855,016	Fraction (%)	100
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PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



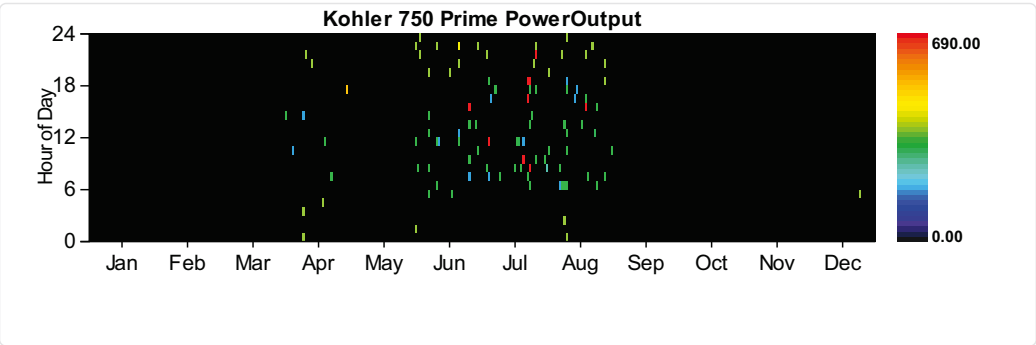
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%

Quantity	Value	Units
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 750 Prime Power

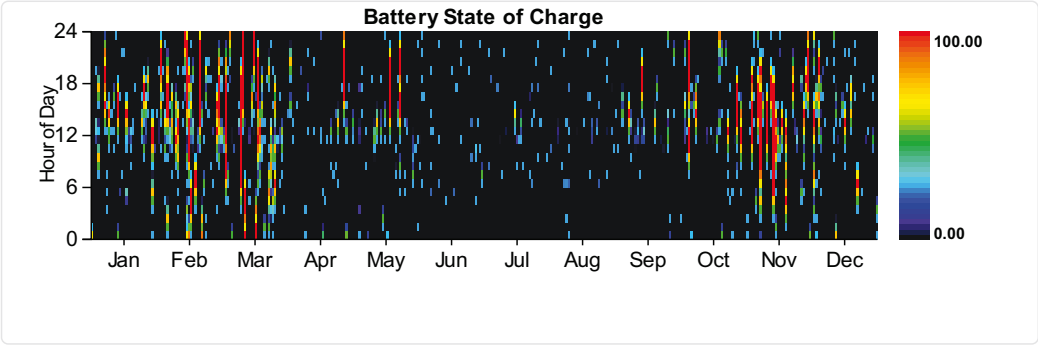
Quantity	Value	Units
Hours of operation	101	hrs/yr
Number of starts	96	starts/yr
Operational life	149	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	36489	kWh/yr
Mean electrical output	361	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	10655	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	104845	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

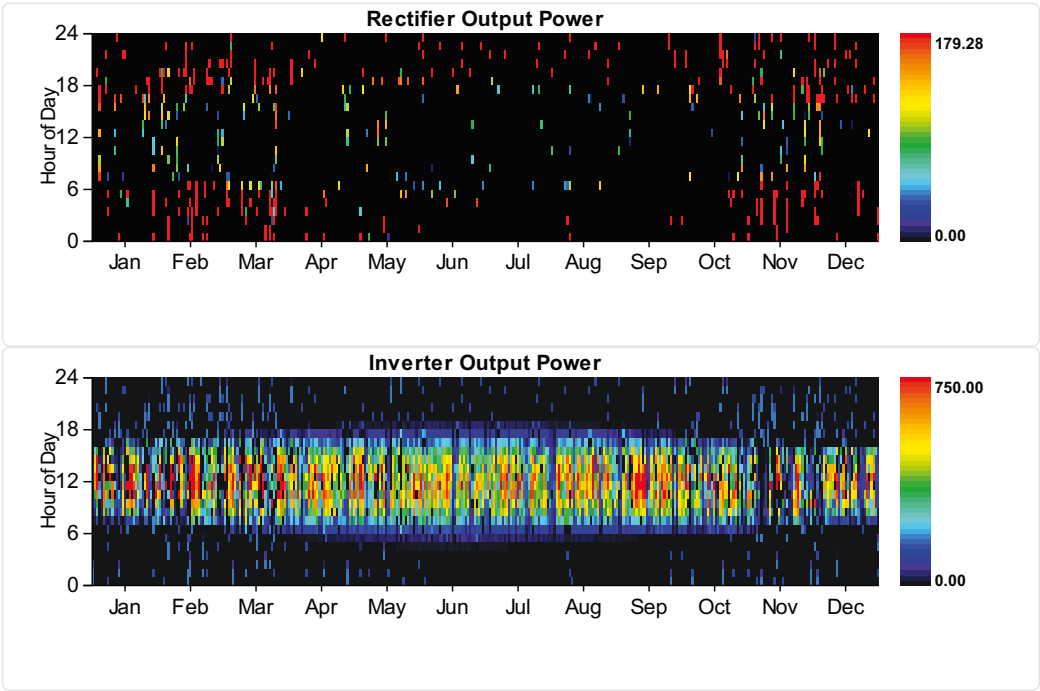
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.023	\$/kWh
Energy in	137578	kWh/yr
Energy out	96807	kWh/yr
Storage depletion	600	kWh/yr
Losses	40171	kWh/yr
Annual throughput	115706	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	125	8	kW
Minimum output	0	0	kW
Maximum output	750	179	kW
Capacity factor	17	1	%
Hours of operation	4,379	585	hrs/yr
Energy in	1,212,861	79,536	kWh/yr
Energy out	1,091,576	67,606	kWh/yr
Losses	121,286	11,930	kWh/yr



Grid

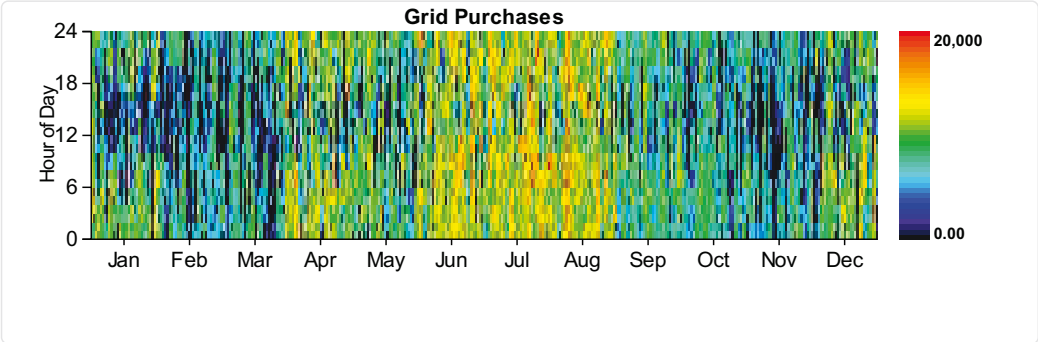
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,572	0	281,151
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,490	0	295,836
Annual	0	0	0	20,000	0	3,373,798

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,942,838	0	4,942,838	0	593,141	0
February	3,194,187	0	3,194,187	0	383,302	0
March	3,633,528	0	3,633,528	0	436,023	0

April	6,445,753	0	6,445,753	0	773,490	0
May	5,423,759	0	5,423,759	0	650,851	0
June	7,763,009	0	7,763,009	0	931,561	0
July	8,359,714	0	8,359,714	0	1,003,166	0
August	8,388,528	0	8,388,528	0	1,006,623	0
September	5,293,275	0	5,293,275	0	635,193	0
October	4,660,071	0	4,660,071	0	559,209	0
November	3,692,188	0	3,692,188	0	443,063	0
December	5,411,146	0	5,411,146	0	649,338	0
Annual	67,207,992	0	67,207,992	0	8,064,959	0



Emissions

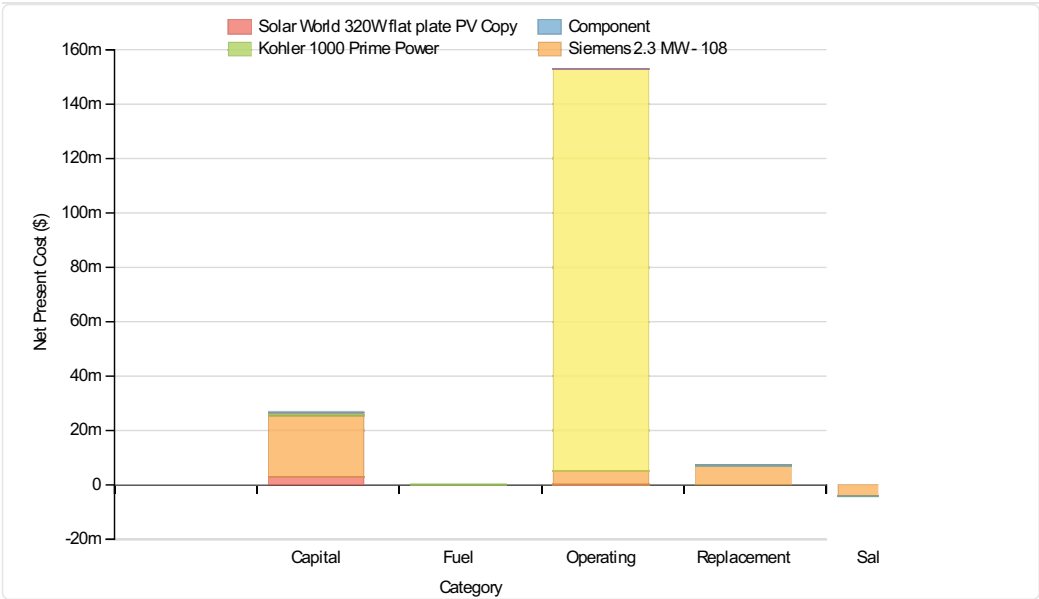
Pollutant	Emissions	Units
Carbon dioxide	42503416	kg/yr
Carbon monoxide	117	kg/yr
Unburned hydrocarbons	13	kg/yr
Particulate matter	3	kg/yr
Sulfur dioxide	184207	kg/yr
Nitrogen oxides	90176	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

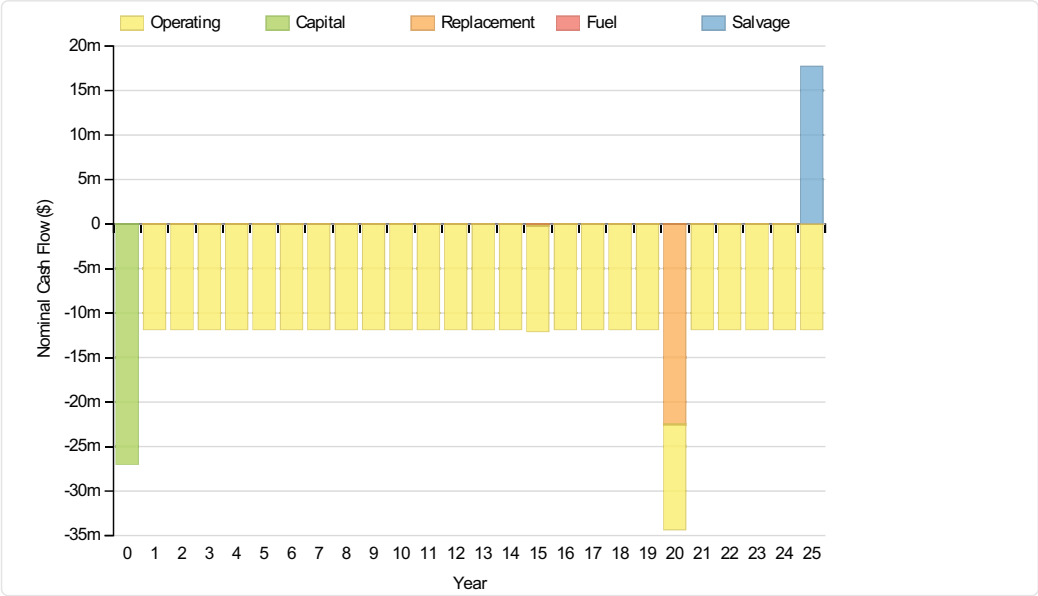
Total net present cost	183079984	\$
Levelized cost of energy	0.146	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	18,116	130,850	-184,290	889,676
Grid	0	0	147,853,584	0	0	147,853,584
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	26,974,588	7,275,795	152,944,432	130,850	-4,245,763	183,079,902

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	1,401	10,122	-14,256	68,820
Grid	0	0	11,437,122	0	0	11,437,122
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,086,603	562,815	11,830,922	10,122	-328,428	14,162,034



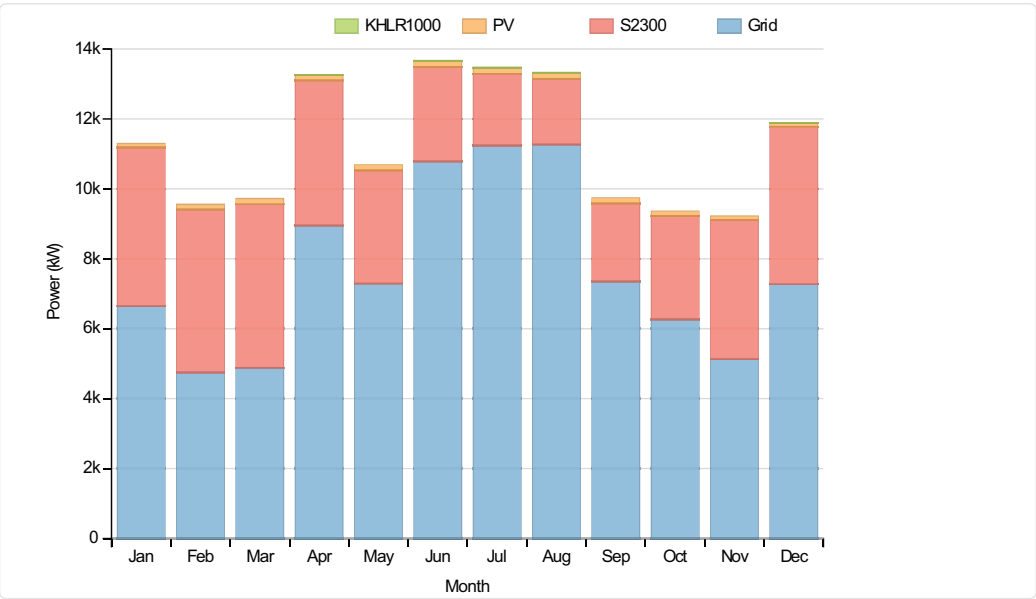
Electrical

Quantity	Value	Units
Excess electricity	1772971	kWh/yr
Unmet load	7257	kWh/yr
Capacity shortage	72939	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	44,379	0
Wind Turbine	30,268,832	31
Grid Purchases	67,202,248	68
Total	98,804,128	100

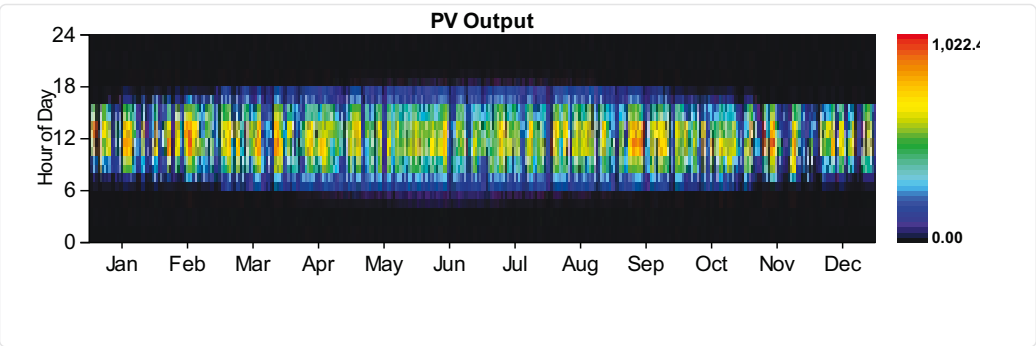
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,856,896	100
DC primary load	0	0

Total	Consumption(kWh/yr)	96,856,896	Fraction (%)	100
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PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



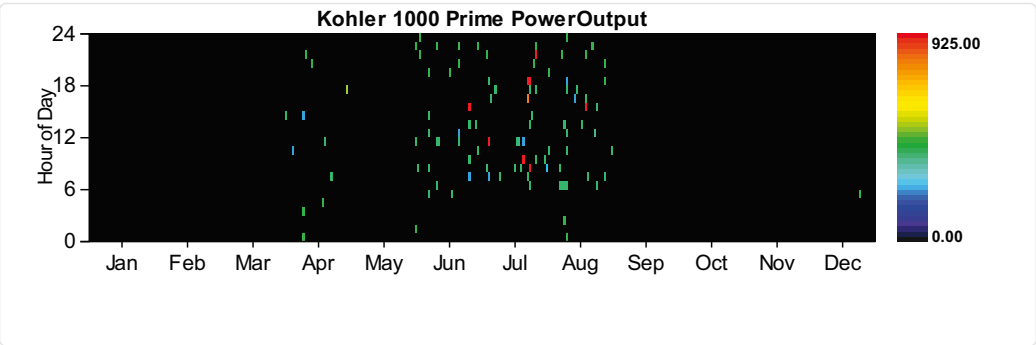
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%

Quantity	Value	Units
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

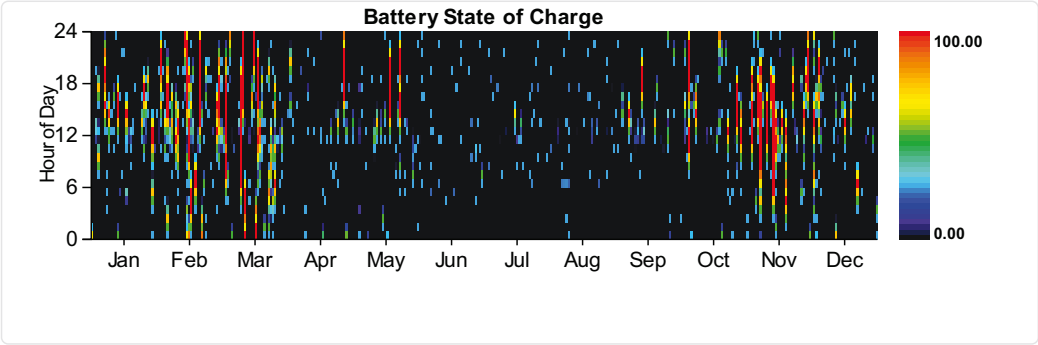
Quantity	Value	Units
Hours of operation	101	hrs/yr
Number of starts	96	starts/yr
Operational life	149	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	44379	kWh/yr
Mean electrical output	439	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	12812	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	126075	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

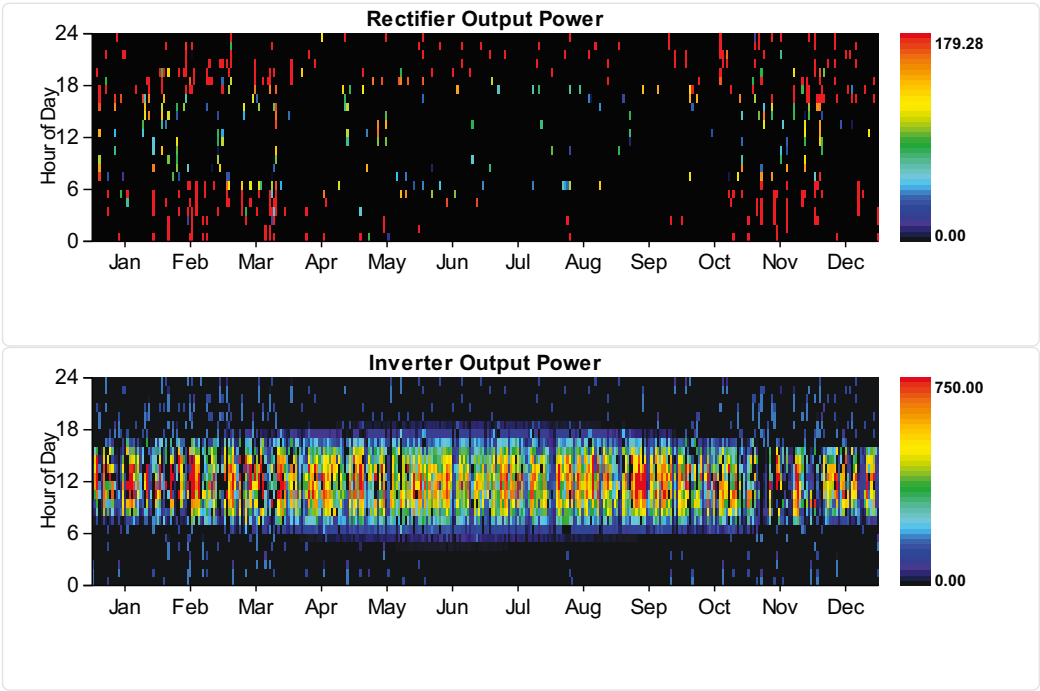
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.024	\$/kWh
Energy in	138406	kWh/yr
Energy out	97387	kWh/yr
Storage depletion	600	kWh/yr
Losses	40419	kWh/yr
Annual throughput	116400	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	125	8	kW
Minimum output	0	0	kW
Maximum output	750	179	kW
Capacity factor	17	1	%
Hours of operation	4,377	587	hrs/yr
Energy in	1,212,743	79,690	kWh/yr
Energy out	1,091,470	67,737	kWh/yr
Losses	121,274	11,953	kWh/yr



Grid

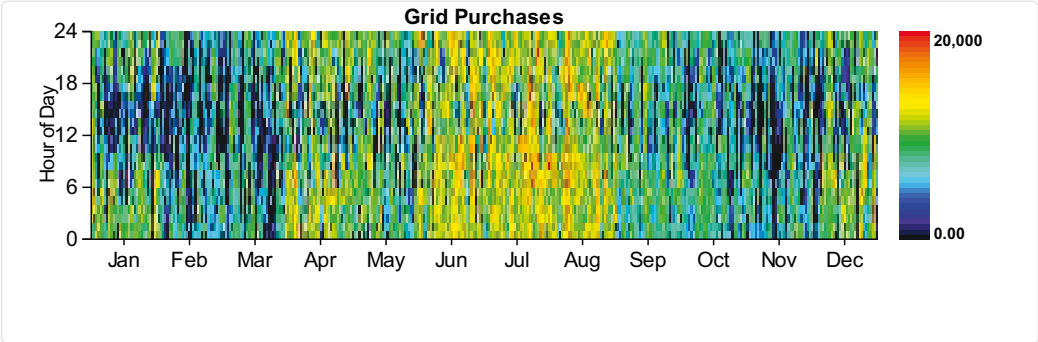
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,000	0	320,000
May	0	0	0	17,572	0	281,151
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,431	0	294,896
Annual	0	0	0	20,000	0	3,372,858

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,942,838	0	4,942,838	0	593,141	0
February	3,194,187	0	3,194,187	0	383,302	0
March	3,633,528	0	3,633,528	0	436,023	0

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	6,445,165	0	6,445,165	0	773,420	0
May	5,423,759	0	5,423,759	0	650,851	0
June	7,761,369	0	7,761,369	0	931,364	0
July	8,358,215	0	8,358,215	0	1,002,986	0
August	8,386,565	0	8,386,565	0	1,006,388	0
September	5,293,275	0	5,293,275	0	635,193	0
October	4,660,071	0	4,660,071	0	559,209	0
November	3,692,188	0	3,692,188	0	443,063	0
December	5,411,088	0	5,411,088	0	649,331	0
Annual	67,202,248	0	67,202,248	0	8,064,269	0



Emissions

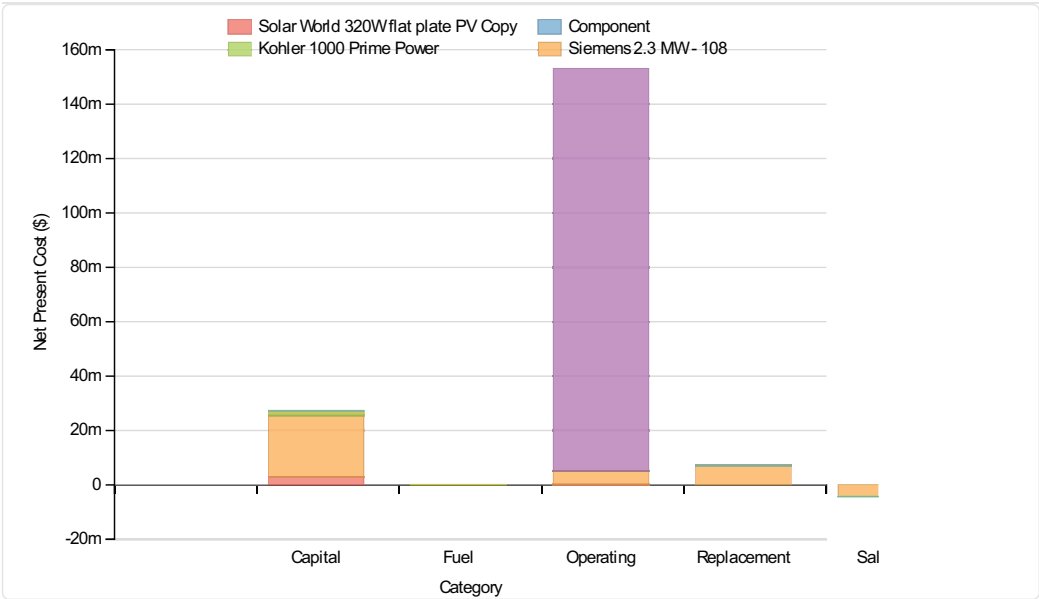
Pollutant	Emissions	Units
Carbon dioxide	42505448	kg/yr
Carbon monoxide	141	kg/yr
Unburned hydrocarbons	16	kg/yr
Particulate matter	4	kg/yr
Sulfur dioxide	184203	kg/yr
Nitrogen oxides	90192	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

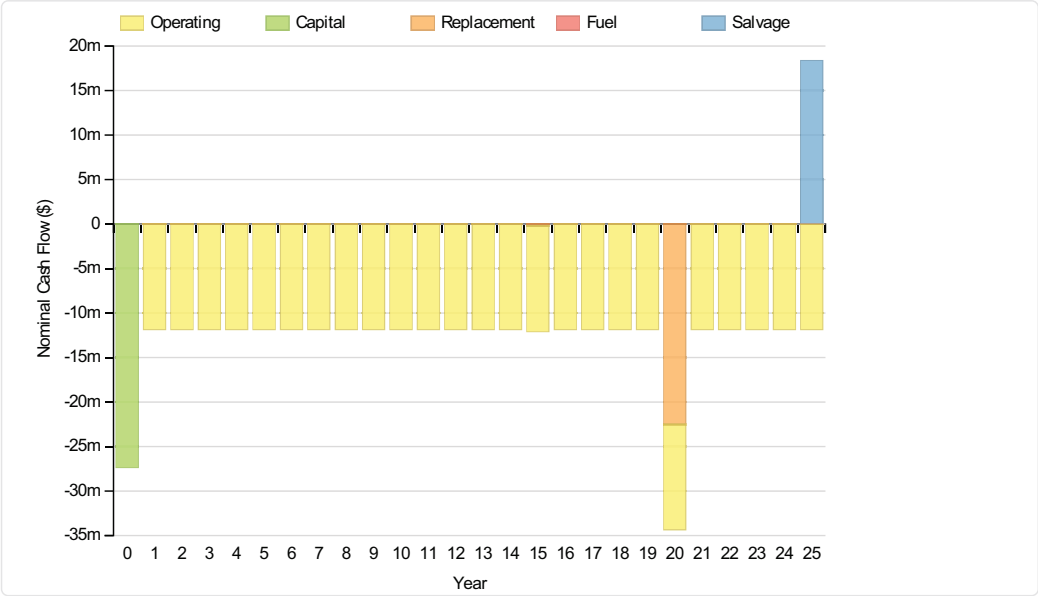
Total net present cost	183377696	\$
Levelized cost of energy	0.146	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	11,838	61,768	-197,216	801,390
Kohler 750 Prime Power	690,000	0	12,577	56,875	-139,399	620,053
Grid	0	0	147,981,344	0	0	147,981,344
Converter	225,000	95,462	0	0	-17,967	302,495
System	27,340,000	7,268,619	153,047,488	118,642	-4,397,115	183,377,634

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	916	4,778	-15,256	61,991
Kohler 750 Prime Power	53,375	0	973	4,400	-10,783	47,964
Grid	0	0	11,447,005	0	0	11,447,005
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,114,869	562,260	11,838,893	9,178	-340,136	14,185,064



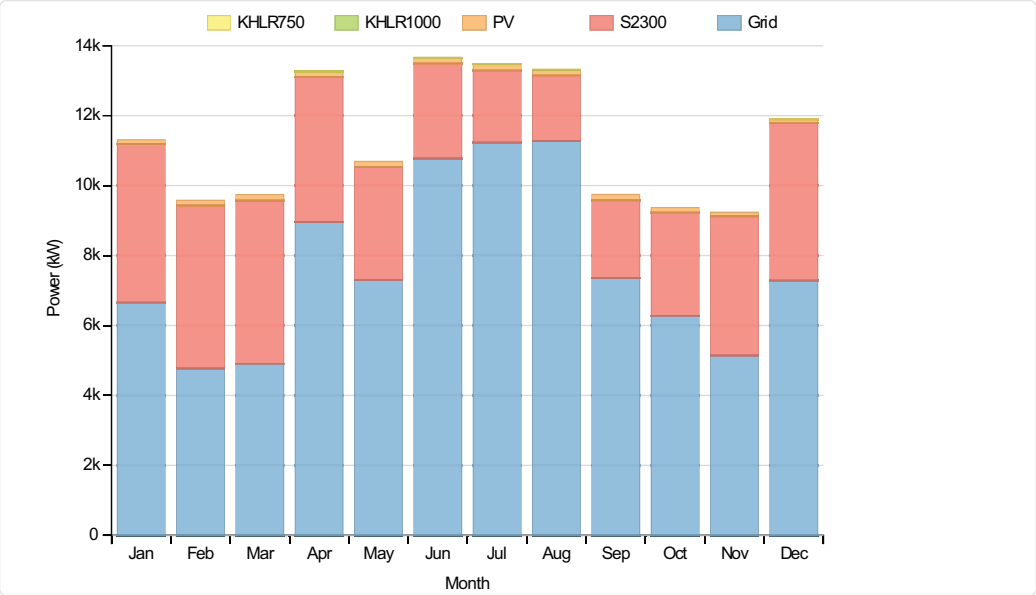
Electrical

Quantity	Value	Units
Excess electricity	1907658	kWh/yr
Unmet load	3395	kWh/yr
Capacity shortage	39956	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	20,893	0
Generator	18,979	0
Wind Turbine	30,268,832	31
Grid Purchases	67,283,376	68
Total	98,880,752	100

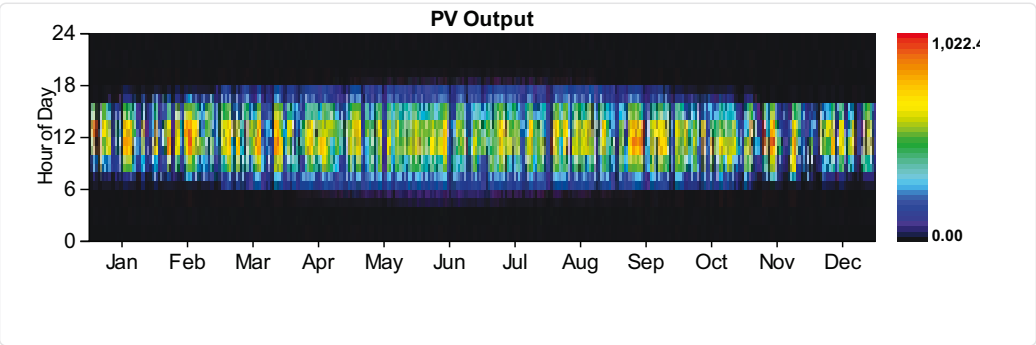
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,860,760	100

DC primary load	Consumption(kWh/yr)	0	Fraction (%)	0
Total		96,860,760		100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



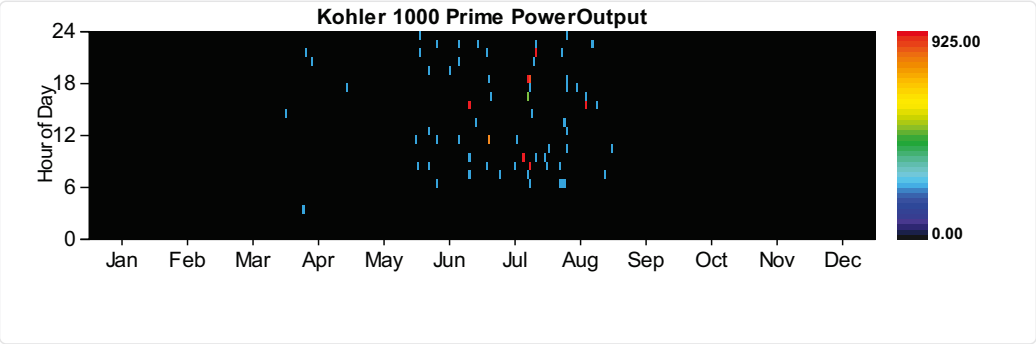
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW

Quantity	Value	Units
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

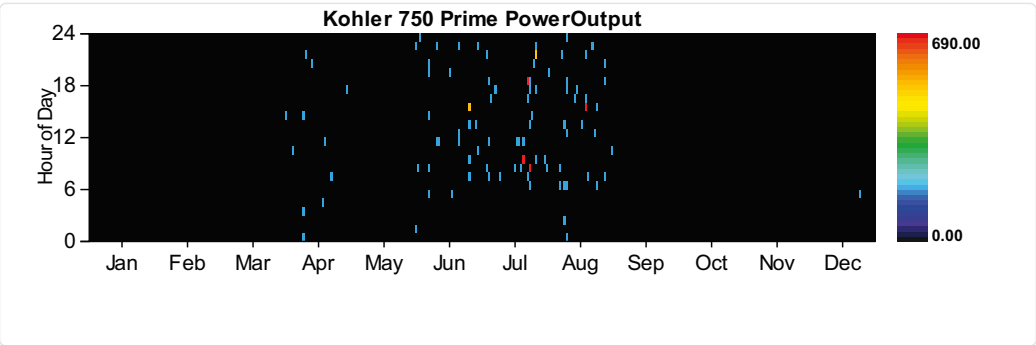
Quantity	Value	Units
Hours of operation	66	hrs/yr
Number of starts	62	starts/yr
Operational life	227	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	20893	kWh/yr
Mean electrical output	317	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	6048	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	59513	kWh/yr
Mean electrical efficiency	35	%



Generator:Kohler 750 Prime Power

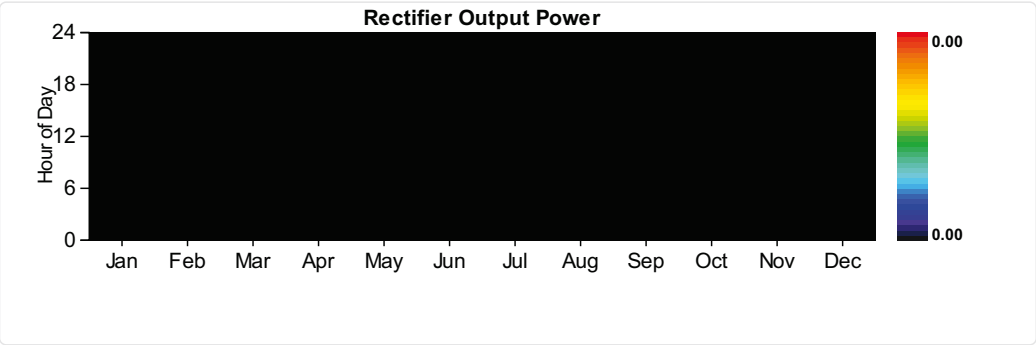
Quantity	Value	Units
Hours of operation	94	hrs/yr
Number of starts	88	starts/yr
Operational life	160	yr

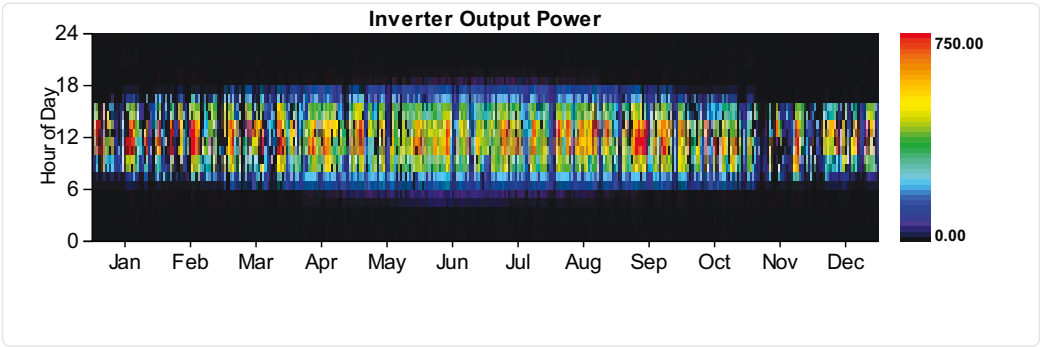
Quantity	Value	Units
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	18979	kWh/yr
Mean electrical output	202	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	5569	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	54799	kWh/yr
Mean electrical efficiency	35	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	115	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	15	0	%
Hours of operation	3,902	0	hrs/yr
Energy in	1,123,182	0	kWh/yr
Energy out	1,010,865	0	kWh/yr
Losses	112,317	0	kWh/yr





Grid

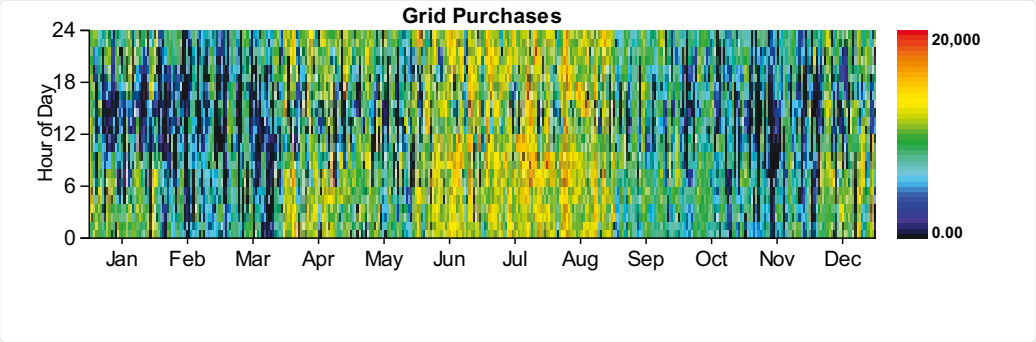
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	19,950	0	319,208
May	0	0	0	17,572	0	281,151
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,490	0	295,836
Annual	0	0	0	20,000	0	3,373,005

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,952,182	0	4,952,182	0	594,262	0
February	3,207,647	0	3,207,647	0	384,918	0
March	3,646,840	0	3,646,840	0	437,621	0
April	6,449,524	0	6,449,524	0	773,943	0
May	5,429,449	0	5,429,449	0	651,534	0
June	7,763,387	0	7,763,387	0	931,606	0
July	8,359,129	0	8,359,129	0	1,003,095	0
August	8,387,901	0	8,387,901	0	1,006,548	0

September	5,297,231	Energy Purchased (kWh)	0	Energy Sold (kWh)	5,297,231	Peak Demand (kW)	0	Energy Charge (\$)	635,668	Demand Charge (\$)	0
October	4,667,008	Energy Purchased (kWh)	0	Energy Sold (kWh)	4,667,008	Peak Demand (kW)	0	Energy Charge (\$)	560,041	Demand Charge (\$)	0
November	3,703,306	Energy Purchased (kWh)	0	Energy Sold (kWh)	3,703,306	Peak Demand (kW)	0	Energy Charge (\$)	444,397	Demand Charge (\$)	0
December	5,419,775	Energy Purchased (kWh)	0	Energy Sold (kWh)	5,419,775	Peak Demand (kW)	0	Energy Charge (\$)	650,373	Demand Charge (\$)	0
Annual	67,283,376	Energy Purchased (kWh)	0	Energy Sold (kWh)	67,283,376	Peak Demand (kW)	0	Energy Charge (\$)	8,074,005	Demand Charge (\$)	0



Emissions

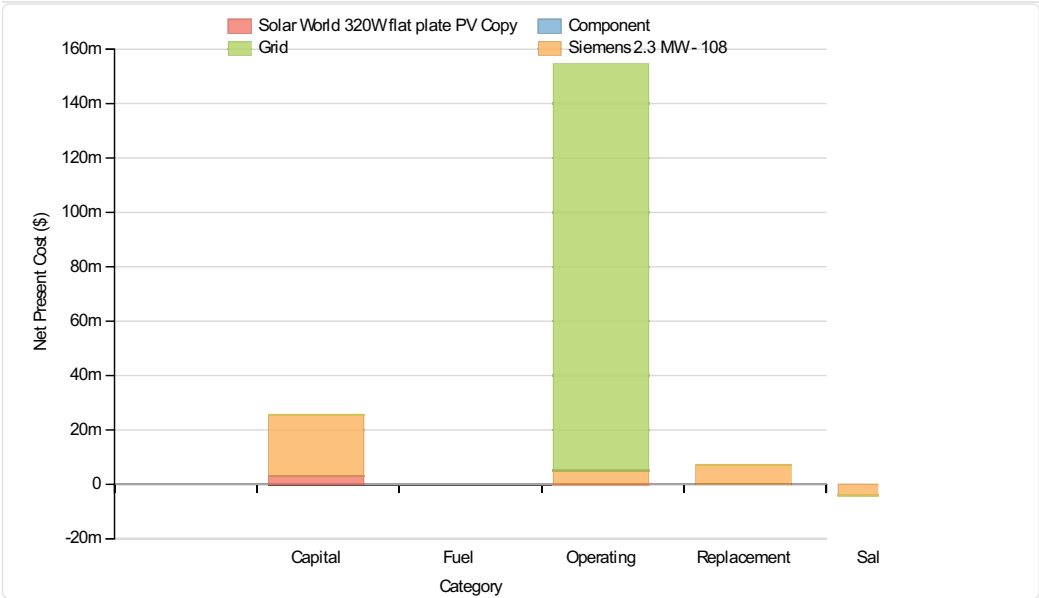
Pollutant	Emissions	Units
Carbon dioxide	42553580	kg/yr
Carbon monoxide	128	kg/yr
Unburned hydrocarbons	15	kg/yr
Particulate matter	4	kg/yr
Sulfur dioxide	184419	kg/yr
Nitrogen oxides	90288	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Converter	System Converter	750	kW
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	183534320	\$
Levelized cost of energy	0.147	\$/kWh

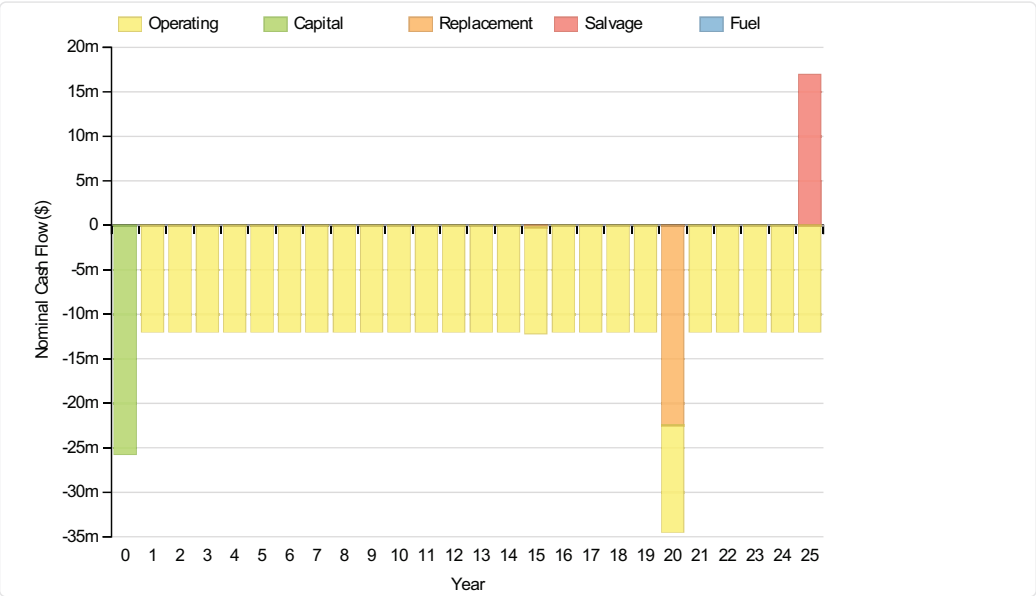
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Grid	0	0	149,559,376	0	0	149,559,376
Converter	225,000	95,462	0	0	-17,967	302,495
System	25,725,000	7,268,619	154,601,104	0	-4,060,500	183,534,223

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Grid	0	0	11,569,073	0	0	11,569,073

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
System	1,989,941	562,260	11,959,072	0	-314,097	14,197,176

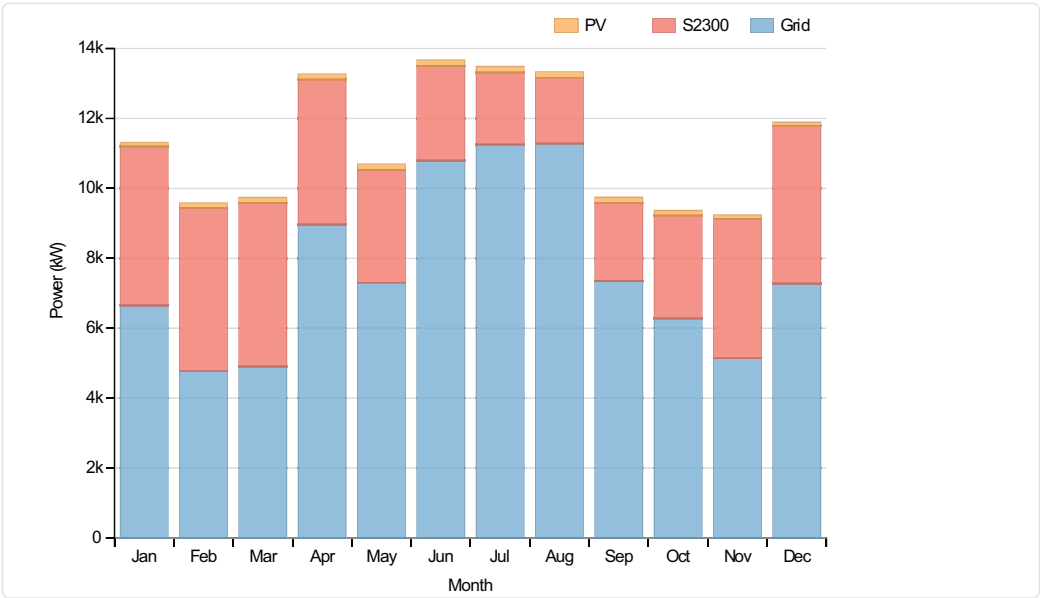


Electrical

Quantity	Value	Units
Excess electricity	1907658	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	1536	kWh/yr
Renewable fraction	0	

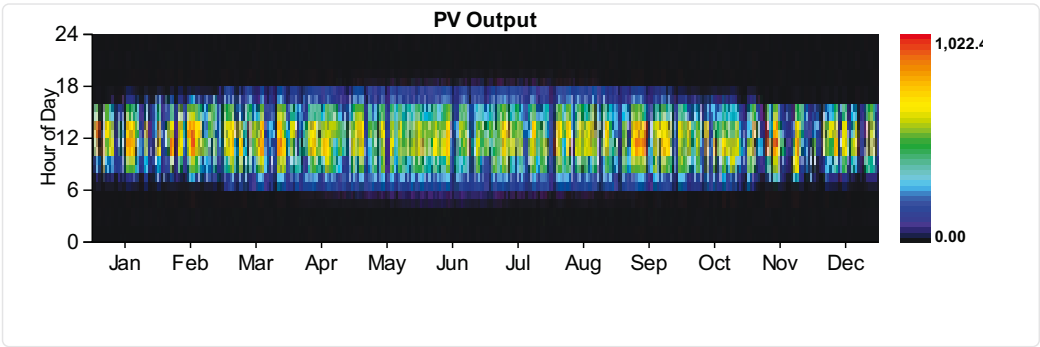
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Wind Turbine	30,268,832	31
Grid Purchases	67,326,648	68
Total	98,884,152	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



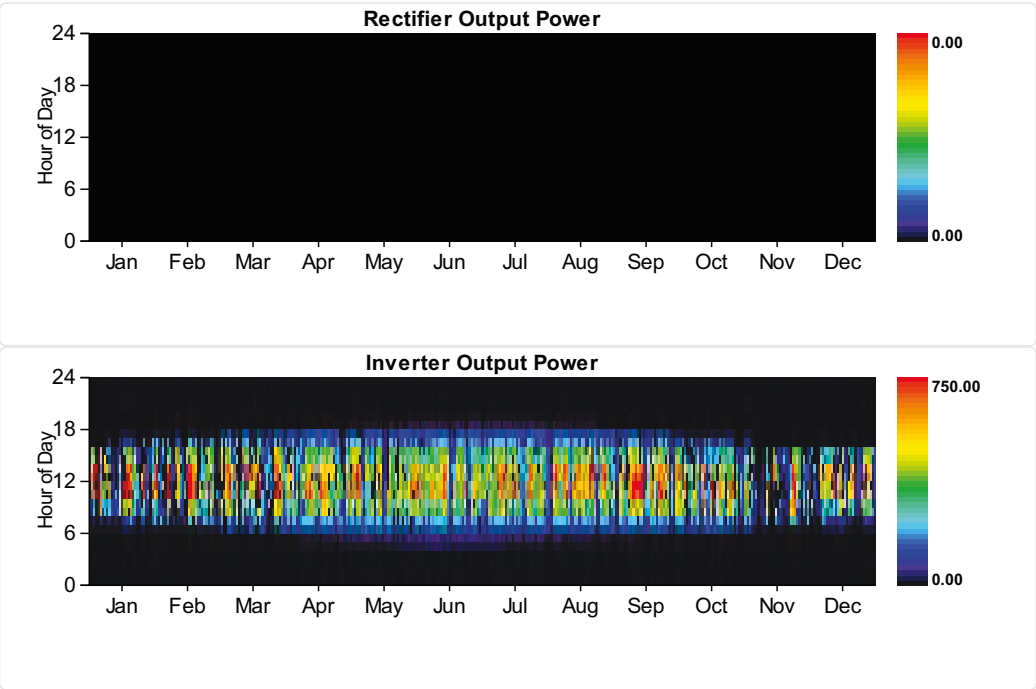
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr

Quantity	Value	Units
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	115	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	15	0	%
Hours of operation	3,902	0	hrs/yr
Energy in	1,123,182	0	kWh/yr
Energy out	1,010,865	0	kWh/yr
Losses	112,317	0	kWh/yr



Grid

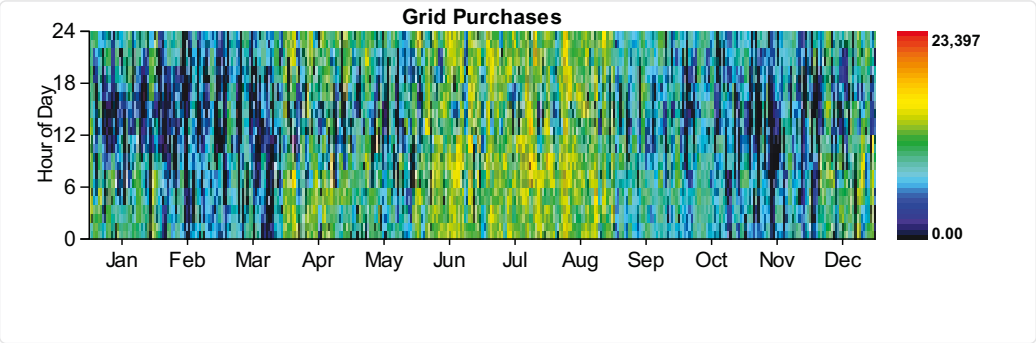
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977

March	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	0	0	0	16,699	0	267,178
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
May	0	0	0	17,572	0	281,151
June	0	0	0	21,452	0	343,228
July	0	0	0	23,398	0	374,367
August	0	0	0	21,879	0	350,064
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,662	0	298,596
Annual	0	0	0	23,398	0	3,489,884

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,952,182	0	4,952,182	0	594,262	0
February	3,207,647	0	3,207,647	0	384,918	0
March	3,646,840	0	3,646,840	0	437,621	0
April	6,452,577	0	6,452,577	0	774,309	0
May	5,429,449	0	5,429,449	0	651,534	0
June	7,772,968	0	7,772,968	0	932,756	0
July	8,378,485	0	8,378,485	0	1,005,418	0
August	8,399,006	0	8,399,006	0	1,007,881	0
September	5,297,231	0	5,297,231	0	635,668	0
October	4,667,008	0	4,667,008	0	560,041	0
November	3,703,306	0	3,703,306	0	444,397	0
December	5,419,948	0	5,419,948	0	650,394	0
Annual	67,326,648	0	67,326,648	0	8,079,197	0



Emissions

EMISSIONS

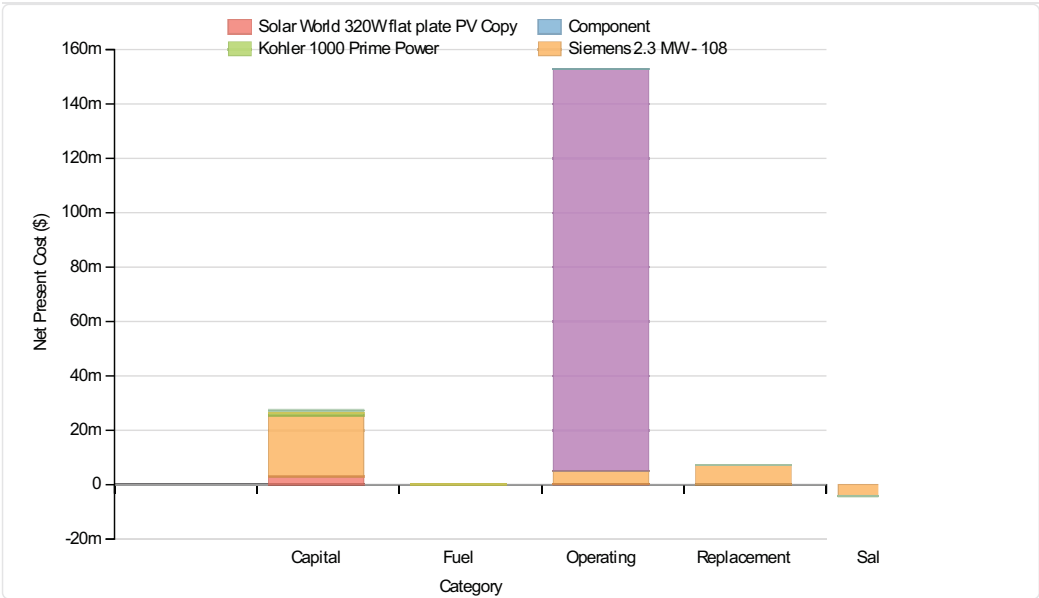
Pollutant	Emissions	Units
Carbon dioxide	42550440	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	184475	kg/yr
Nitrogen oxides	90218	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	183645824	\$
Levelized cost of energy	0.147	\$/kWh

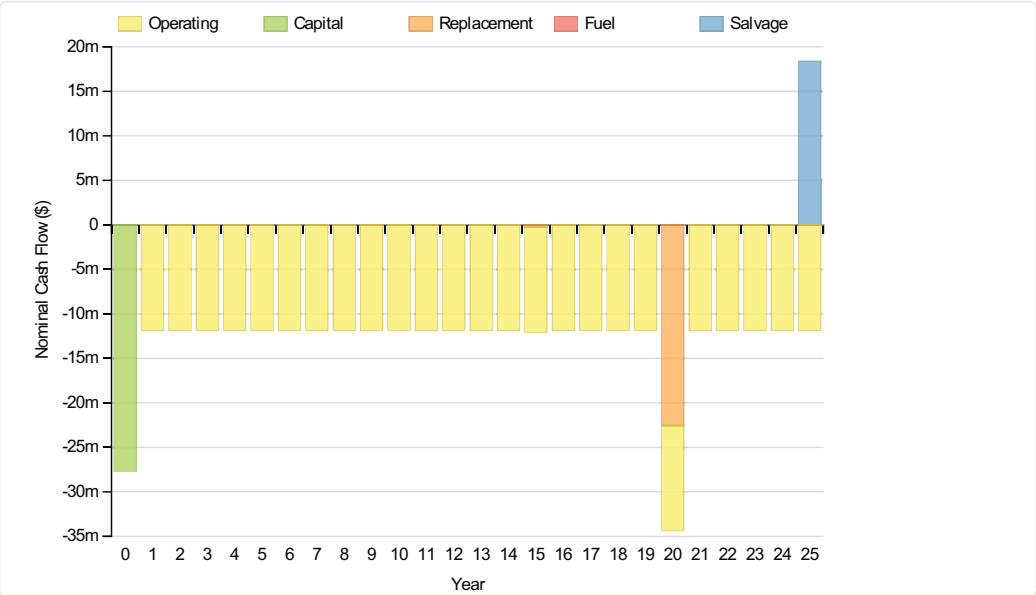
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Kohler 1000 Prime Power	925,000	0	11,838	88,287	-197,216	827,909
Kohler 750 Prime Power	690,000	0	12,443	72,292	-139,674	635,061
Grid	0	0	147,846,112	0	0	147,846,112
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495

System	27,664,588	7,275,795	152,943,152	160,578	4,398,363	188,645,750
Component	Capital	Replacement	O&M	Fuel	Salvage	Total

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Siemens 2.3 MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Kohler 1000 Prime Power	71,553	0	916	6,829	-15,256	64,042
Kohler 750 Prime Power	53,375	0	963	5,592	-10,804	49,126
Grid	0	0	11,436,544	0	0	11,436,544
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,139,977	562,815	11,830,823	12,421	-340,233	14,205,803



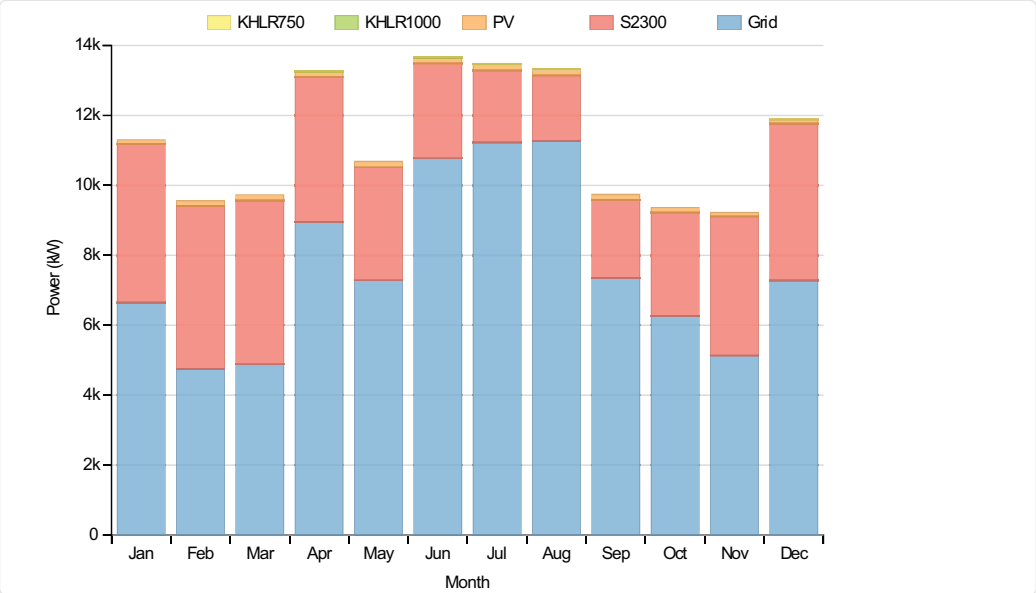
Electrical

Quantity	Value	Units
Excess electricity	1772971	kWh/yr
Unmet load	3395	kWh/yr
Capacity shortage	39756	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	29,950	0
Generator	24,183	0
Wind Turbine	30,268,832	31
Grid Purchases	67,196,216	68

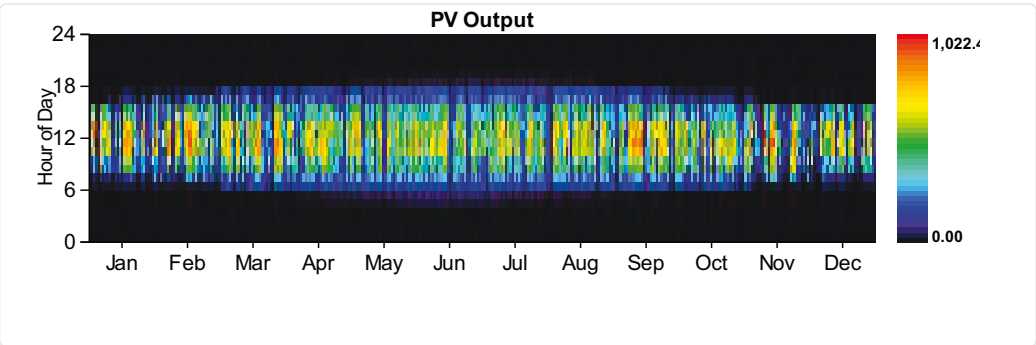
Total	Component	Production(kWh/yr)	98,807,856	Fraction (%)	100
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Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,860,760	100
DC primary load	0	0
Total	96,860,760	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



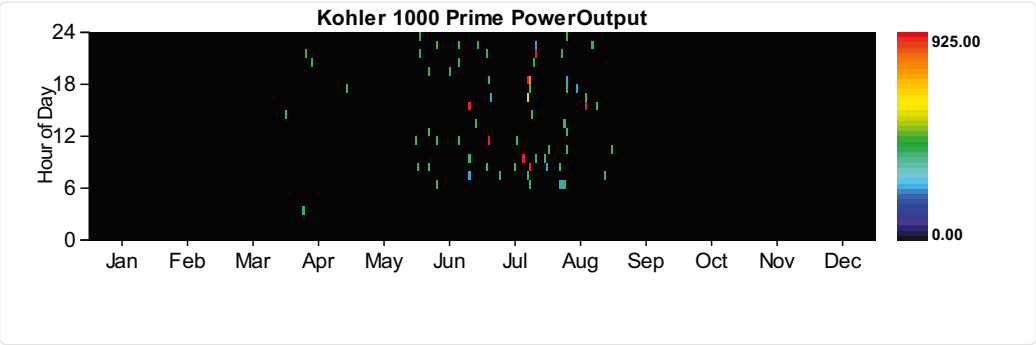
Wind Turbine:Siemens 2.3 MW - 108

Wind Parameters: 210 MW 100

Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 1000 Prime Power

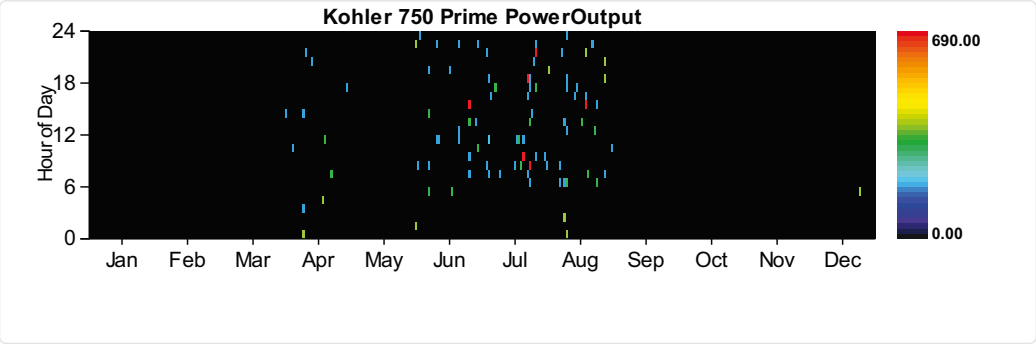
Quantity	Value	Units
Hours of operation	66	hrs/yr
Number of starts	62	starts/yr
Operational life	227	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	29950	kWh/yr
Mean electrical output	454	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	8645	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	85064	kWh/yr
Mean electrical efficiency	35	%



Generator:Kohler 750 Prime Power

Quantity	Value	Units

Quantity	Value	Units
Hours of operation	93	hrs
Number of starts	88	starts/yr
Operational life	161	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	24183	kWh/yr
Mean electrical output	260	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	7079	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	69653	kWh/yr
Mean electrical efficiency	35	%

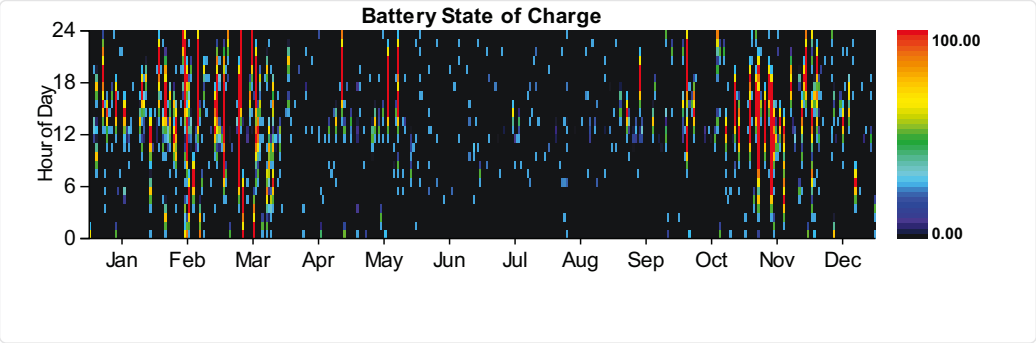


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

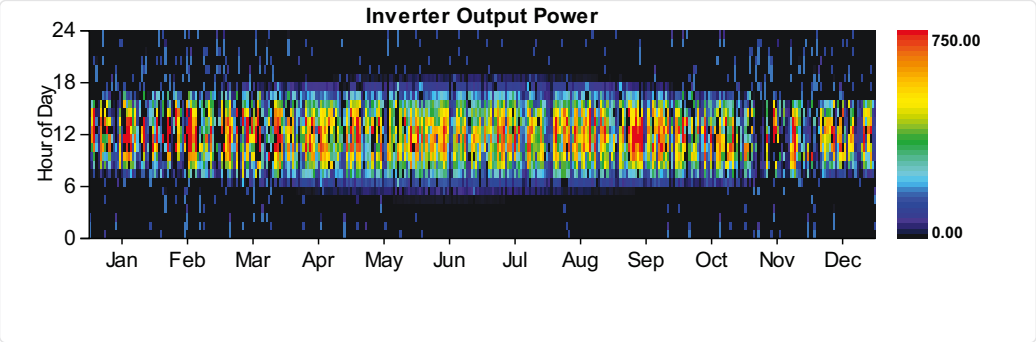
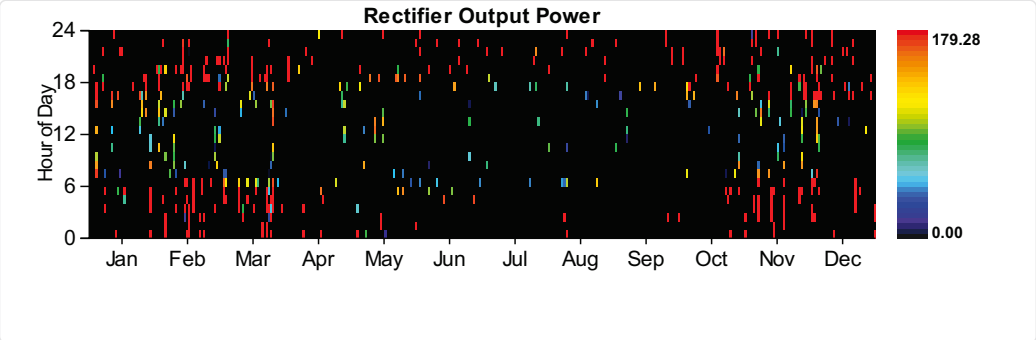
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.023	\$/kWh
Energy in	138058	kWh/yr

Quantity	Value	Units
Energy out	97143	kWh/yr
Storage depletion	600	kWh/yr
Losses	40315	kWh/yr
Annual throughput	116108	kWh/yr
Expected life	25	yr



Converter

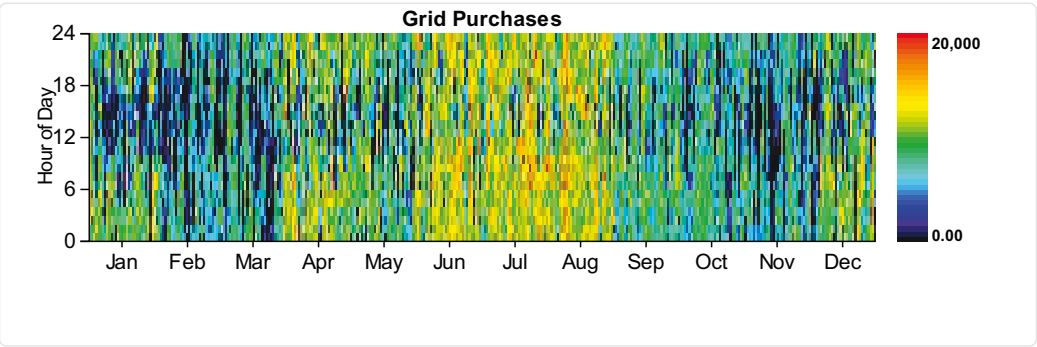
Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	125	8	kW
Minimum output	0	0	kW
Maximum output	750	179	kW
Capacity factor	17	1	%
Hours of operation	4,378	586	hrs/yr
Energy in	1,212,694	79,509	kWh/yr
Energy out	1,091,425	67,583	kWh/yr
Losses	121,269	11,926	kWh/yr



Grid

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	19,950	0	319,208
May	0	0	0	17,572	0	281,151
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623
November	0	0	0	15,876	0	254,021
December	0	0	0	18,490	0	295,836
Annual	0	0	0	20,000	0	3,373,005

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,942,838	0	4,942,838	0	593,141	0
February	3,194,187	0	3,194,187	0	383,302	0
March	3,633,528	0	3,633,528	0	436,023	0
April	6,444,779	0	6,444,779	0	773,373	0
May	5,423,759	0	5,423,759	0	650,851	0
June	7,759,668	0	7,759,668	0	931,160	0
July	8,356,055	0	8,356,055	0	1,002,727	0
August	8,384,725	0	8,384,725	0	1,006,167	0
September	5,293,275	0	5,293,275	0	635,193	0
October	4,660,071	0	4,660,071	0	559,209	0
November	3,692,188	0	3,692,188	0	443,063	0
December	5,411,146	0	5,411,146	0	649,338	0
Annual	67,196,216	0	67,196,216	0	8,063,546	0



Emissions

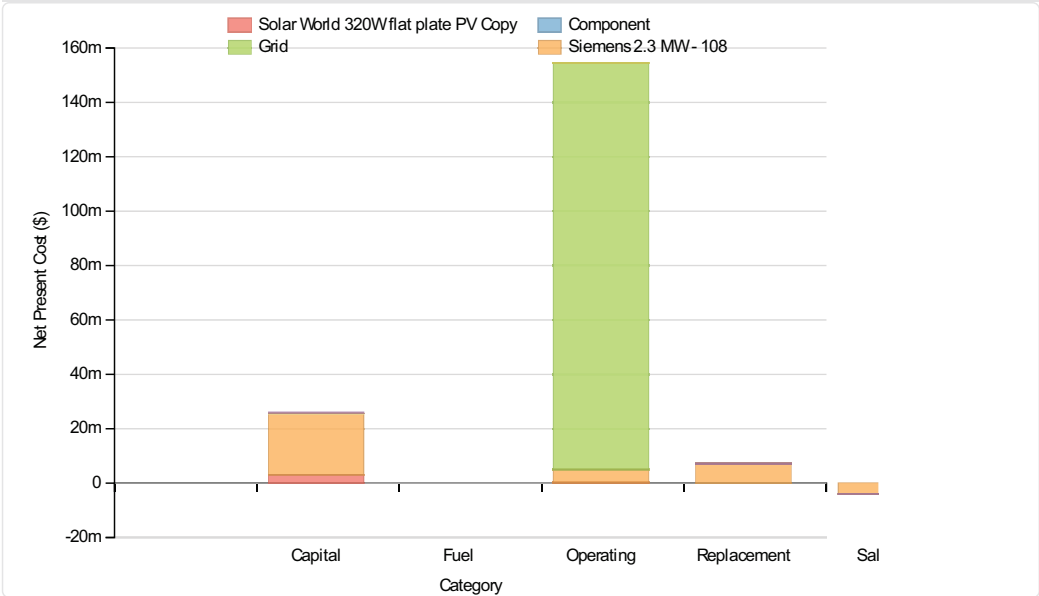
Pollutant	Emissions	Units
Carbon dioxide	42509272	kg/yr
Carbon monoxide	173	kg/yr
Unburned hydrocarbons	20	kg/yr
Particulate matter	5	kg/yr
Sulfur dioxide	184203	kg/yr
Nitrogen oxides	90216	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Wind Turbine	Siemens 2.3 MW - 108	5	
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	183774336	\$
Levelized cost of energy	0.147	\$/kWh

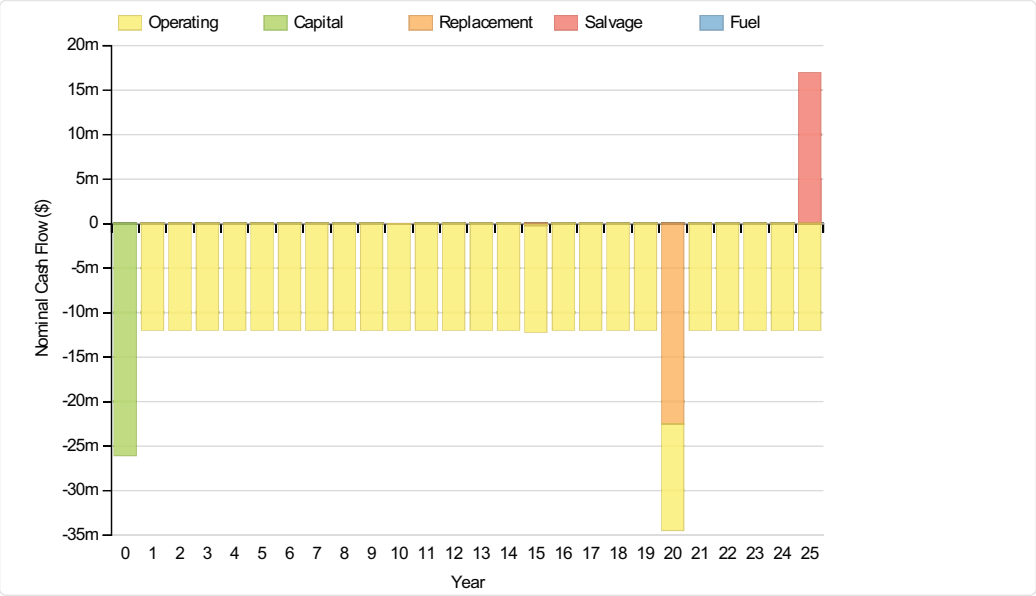
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Siemens 2.3 MW - 108	22,500,000	7,173,158	4,847,816	0	-4,042,534	30,478,440
Grid	0	0	149,437,584	0	0	149,437,584
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	26,049,588	7,275,795	154,510,368	0	-4,061,473	183,774,278

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3MW - 108	1,740,474	554,875	375,000	0	-312,708	2,357,641
Grid	0	0	11,559,652	0	0	11,559,652
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	2,015,050	562,815	11,952,054	0	-314,173	14,215,746

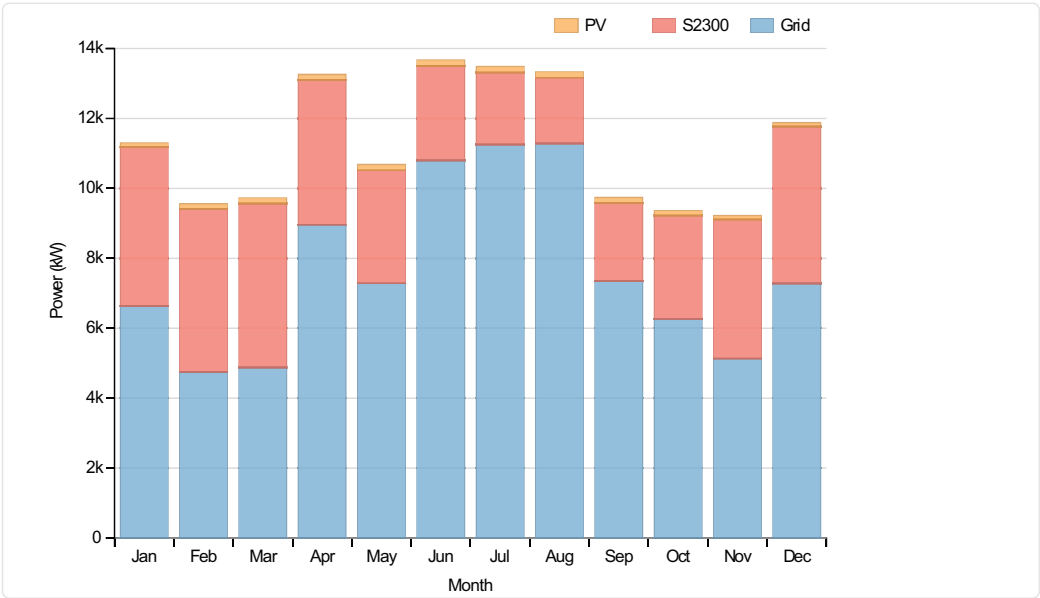


Electrical

Quantity	Value	Units
Excess electricity	1772971	kWh/yr
Unmet load	1	kWh/yr
Capacity shortage	1536	kWh/yr
Renewable fraction	0	

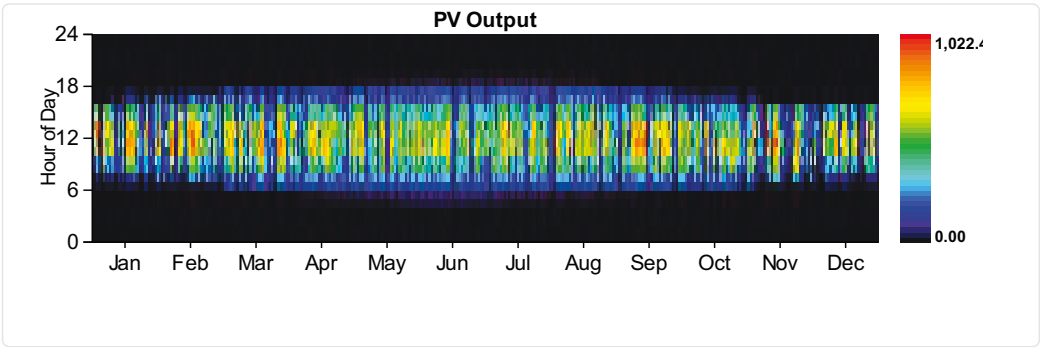
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Wind Turbine	30,268,832	31
Grid Purchases	67,248,128	68
Total	98,805,632	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Wind Turbine:Siemens 2.3 MW - 108

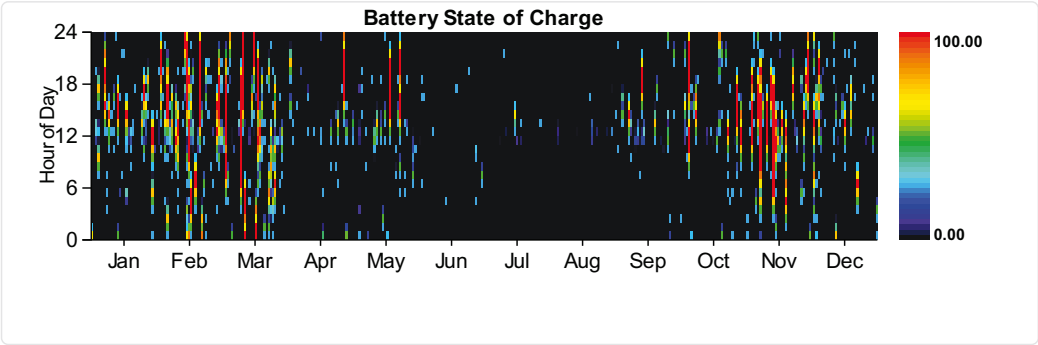
Quantity	Value	Units
Total rated capacity	11500	kW
Mean output	3455	kW
Capacity factor	30.05	%
Total production	30268832	kWh/yr

Quantity	Value	Units
Minimum output	7.19	kW
Maximum output	11574.00	kW
Wind penetration	31.25	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

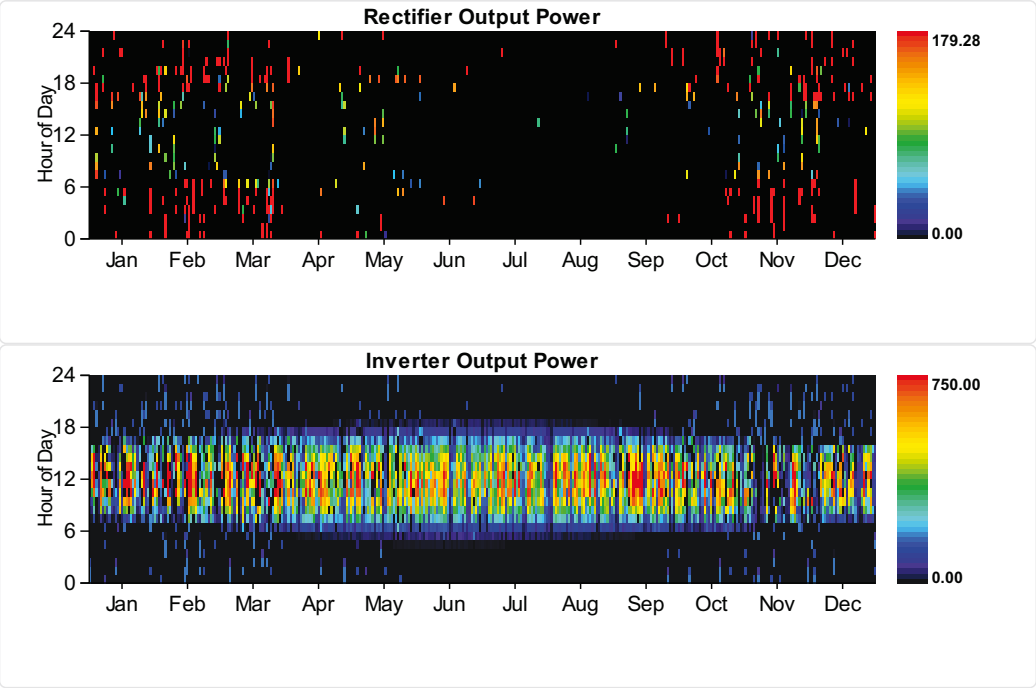
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	123910	kWh/yr
Energy out	87240	kWh/yr
Storage depletion	600	kWh/yr
Losses	36070	kWh/yr
Annual throughput	104271	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW

Quantity	Inverter	124	Rectifier	7	Units
Mean output		0		0	kW
Minimum output		0		0	kW
Maximum output		750		179	kW
Capacity factor		17		1	%
Hours of operation		4,378		536	hrs/yr
Energy in		1,210,425		71,846	kWh/yr
Energy out		1,089,383		61,070	kWh/yr
Losses		121,042		10,777	kWh/yr



Grid

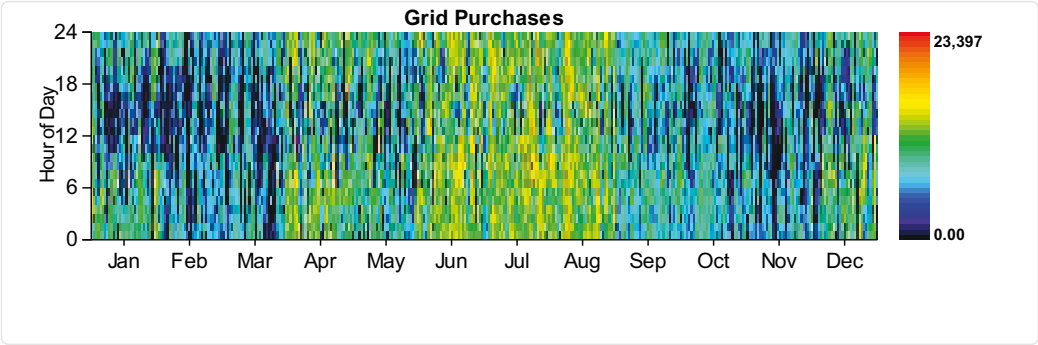
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,095	0	289,519
February	0	0	0	14,936	0	238,977
March	0	0	0	16,699	0	267,178
April	0	0	0	20,354	0	325,668
May	0	0	0	17,572	0	281,151
June	0	0	0	21,452	0	343,228
July	0	0	0	23,398	0	374,367
August	0	0	0	21,879	0	350,064
September	0	0	0	15,468	0	247,493
October	0	0	0	13,726	0	219,623

November	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
December	0	0	0	15,876	0	254,021
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
Annual	0	0	0	23,398	0	3,489,884

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	4,942,838	0	4,942,838	0	593,141	0
February	3,194,187	0	3,194,187	0	383,302	0
March	3,633,528	0	3,633,528	0	436,023	0
April	6,448,824	0	6,448,824	0	773,859	0
May	5,423,759	0	5,423,759	0	650,851	0
June	7,771,824	0	7,771,824	0	932,619	0
July	8,377,567	0	8,377,567	0	1,005,308	0
August	8,398,634	0	8,398,634	0	1,007,836	0
September	5,293,275	0	5,293,275	0	635,193	0
October	4,660,071	0	4,660,071	0	559,209	0
November	3,692,188	0	3,692,188	0	443,063	0
December	5,411,432	0	5,411,432	0	649,372	0
Annual	67,248,128	0	67,248,128	0	8,069,775	0



Emissions

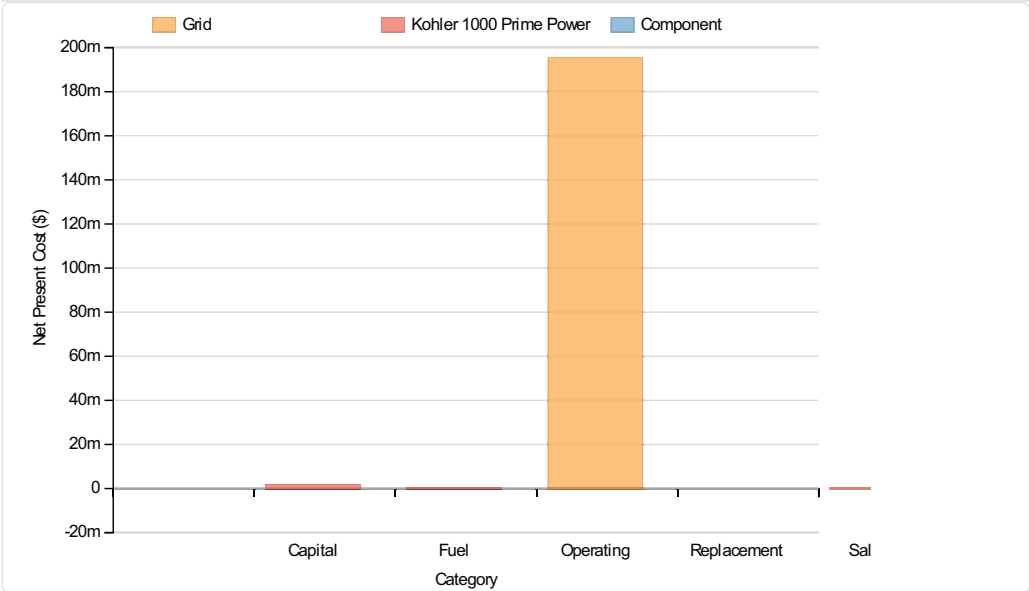
Pollutant	Emissions	Units
Carbon dioxide	42500816	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	184260	kg/yr
Nitrogen oxides	90112	kg/yr

System Report

System architecture

Generator	Kohler 1000 Prime Power	1,850	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

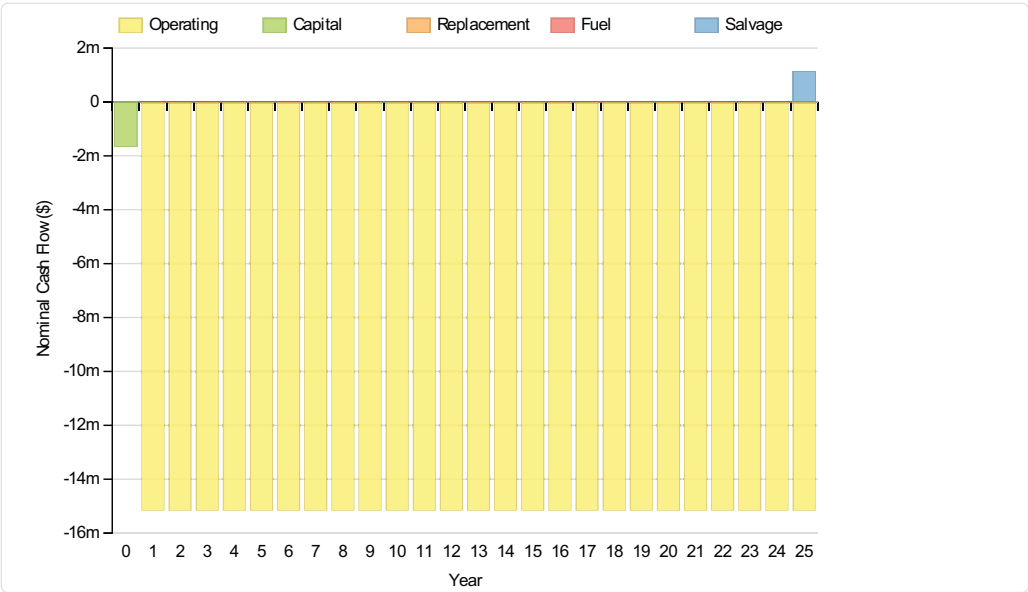
Total net present cost	197132240	\$
Levelized cost of energy	0.157	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	1,637,500	0	66,073	360,152	-268,055	1,795,670
Grid	0	0	195,336,464	0	0	195,336,464
System	1,637,500	0	195,402,544	360,152	-268,055	197,132,141

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	126,668	0	5,111	27,859	-20,735	138,903
Grid	0	0	15,110,131	0	0	15,110,131
System	126,668	0	15,115,242	27,859	-20,735	15,249,034

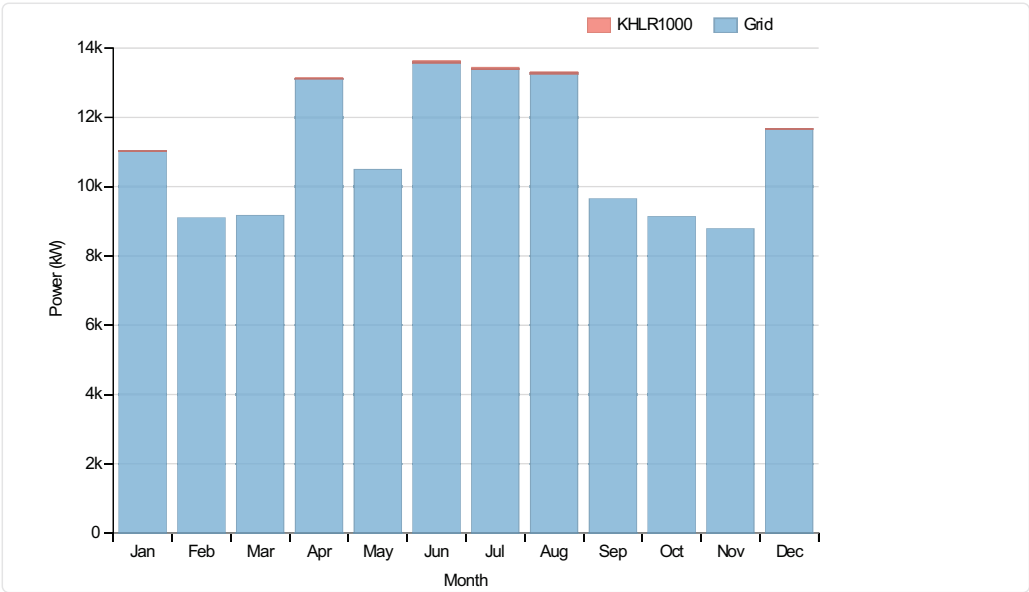


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	10032	kWh/yr
Capacity shortage	82792	kWh/yr
Renewable fraction	0	

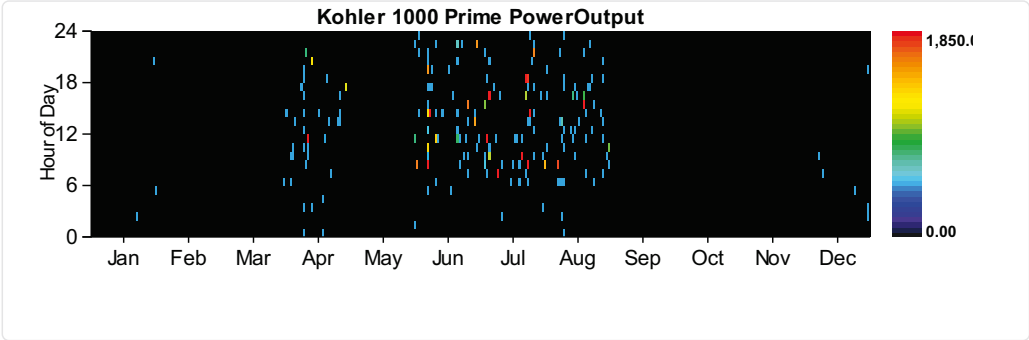
Component	Production(kWh/yr)	Fraction (%)
Generator	121,836	0
Grid Purchases	96,732,328	100
Total	96,854,160	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,854,128	100
DC primary load	0	0
Total	96,854,128	100



Generator:Kohler 1000 Prime Power

Quantity	Value	Units
Hours of operation	190	hrs/yr
Number of starts	170	starts/yr
Operational life	79	yr
Fixed generation cost	137.46	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	121836	kWh/yr
Mean electrical output	641	kW
Min. electrical output	463	kW
Max. electrical output	1850	kW
Fuel consumption	35265	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	347008	kWh/yr
Mean electrical efficiency	35	%



Grid

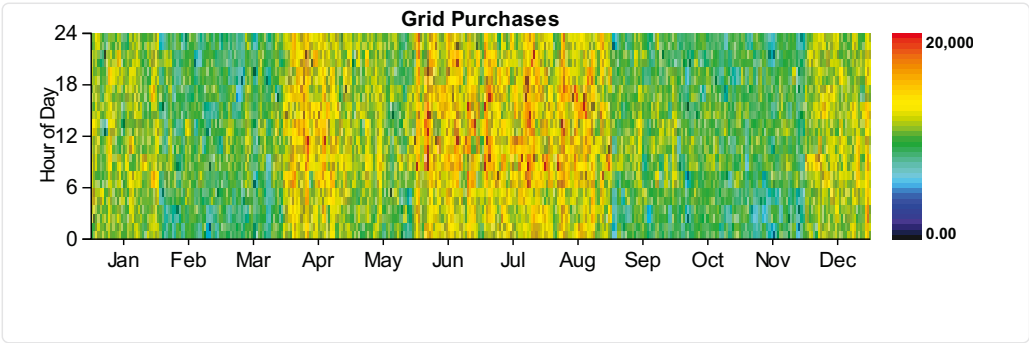
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)

January	Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased	Energy Sold	Net Purchases	Peak Demand	Energy Charge	Demand Charge
February		(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
March		0	0	0	17,425	0	278,807
April		0	0	0	20,000	0	320,000
May		0	0	0	17,869	0	285,902
June		0	0	0	20,000	0	320,000
July		0	0	0	20,000	0	320,000
August		0	0	0	20,000	0	320,000
September		0	0	0	16,926	0	270,820
October		0	0	0	14,895	0	238,325
November		0	0	0	16,518	0	264,286
December		0	0	0	19,606	0	313,698
Annual	0	0	0	20,000	0	3,502,259	

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,208,348	0	8,208,348	0	985,002	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0
April	9,441,886	0	9,441,886	0	1,133,026	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,779,835	0	9,779,835	0	1,173,580	0
July	9,962,285	0	9,962,285	0	1,195,474	0
August	9,872,852	0	9,872,852	0	1,184,742	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,677,315	0	8,677,315	0	1,041,278	0
Annual	96,732,328	0	96,732,328	0	11,607,880	0



Emissions

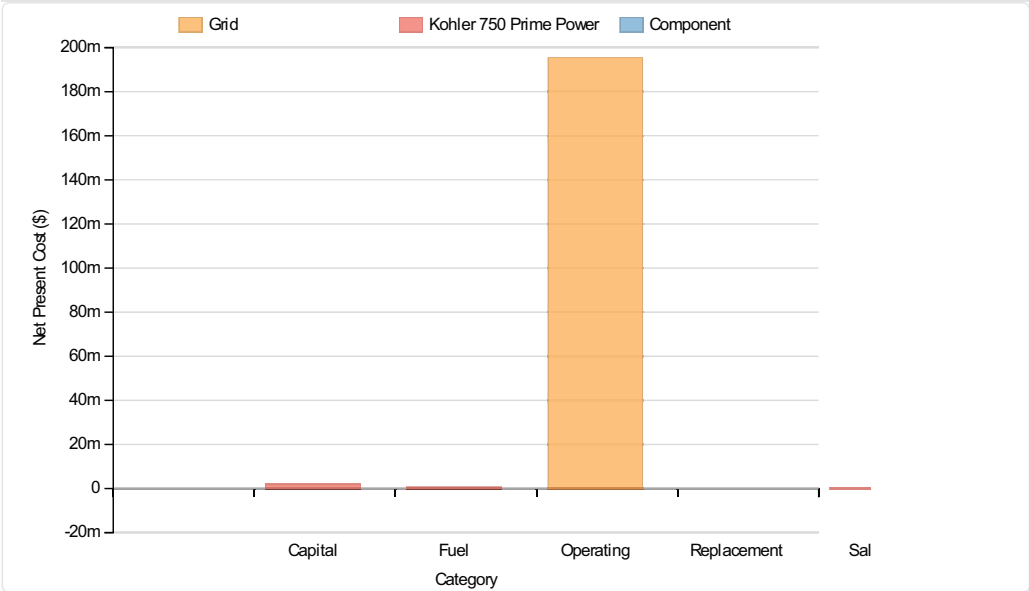
Pollutant	Emissions	Units
Carbon dioxide	61227384	kg/yr
Carbon monoxide	388	kg/yr
Unburned hydrocarbons	44	kg/yr
Particulate matter	11	kg/yr
Sulfur dioxide	265237	kg/yr
Nitrogen oxides	130009	kg/yr

System Report

System architecture

Generator #2	Kohler 750 Prime Power	2,070	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

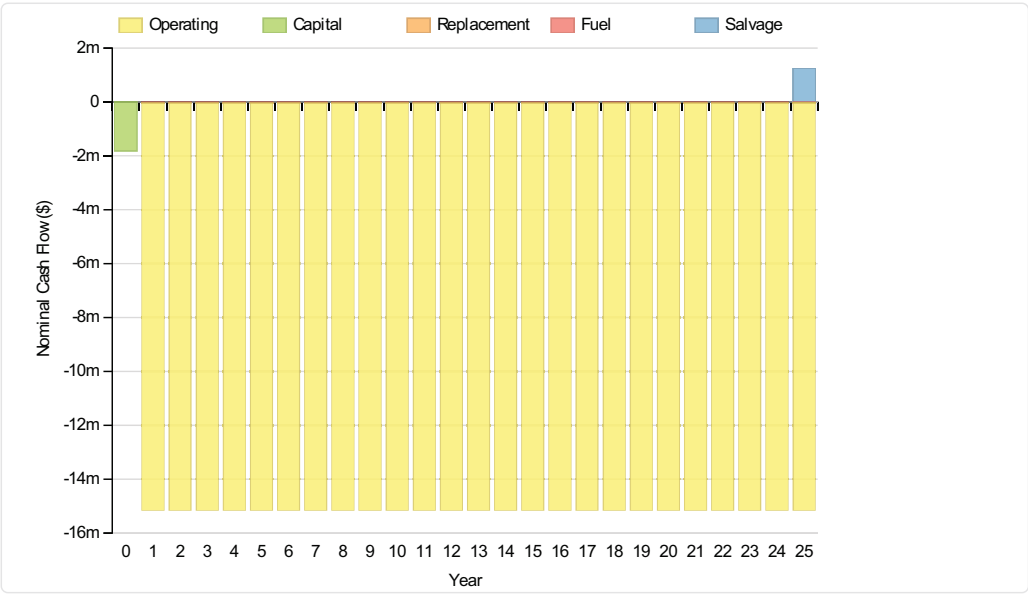
Total net present cost	197277584	\$
Levelized cost of energy	0.158	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 750 Prime Power	1,802,500	0	73,638	395,627	-295,065	1,976,700
Grid	0	0	195,300,800	0	0	195,300,800
System	1,802,500	0	195,374,432	395,627	-295,065	197,277,494

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 750 Prime Power	139,431	0	5,696	30,604	-22,825	152,906
Grid	0	0	15,107,372	0	0	15,107,372
System	139,431	0	15,113,068	30,604	-22,825	15,260,278

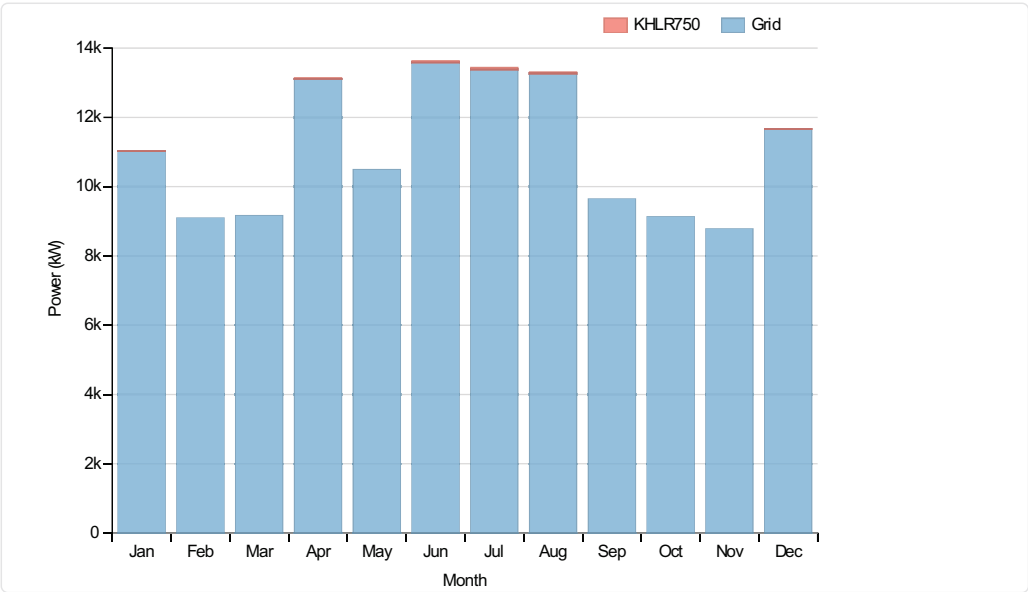


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	7997	kWh/yr
Capacity shortage	68806	kWh/yr
Renewable fraction	0	

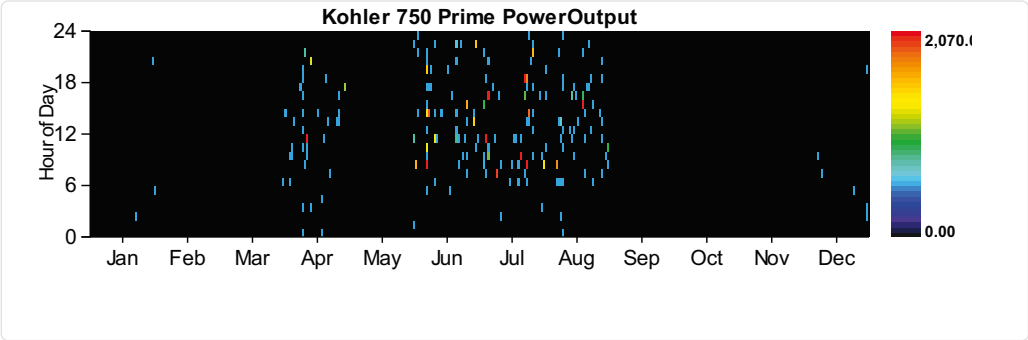
Component	Production(kWh/yr)	Fraction (%)
Generator	132,207	0
Grid Purchases	96,723,992	100
Total	96,856,200	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,856,160	100
DC primary load	0	0
Total	96,856,160	100



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	190	hrs/yr
Number of starts	170	starts/yr
Operational life	79	yr
Fixed generation cost	151.69	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	132207	kWh/yr
Mean electrical output	696	kW
Min. electrical output	518	kW
Max. electrical output	2070	kW
Fuel consumption	38739	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	381188	kWh/yr
Mean electrical efficiency	35	%



Grid

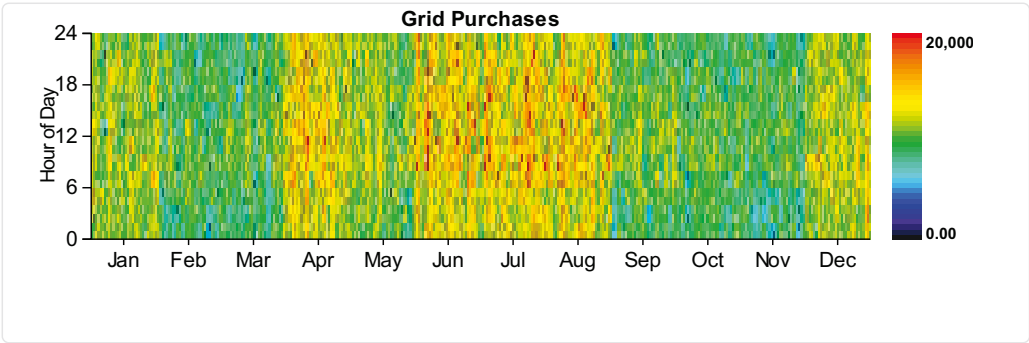
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)

January	Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased	Energy Sold	Net Purchases	Peak Demand	Energy Charge	Demand Charge
February		(kWh)	(kWh)	(kWh)	(kW)	(\$)	(\$)
March		0	0	0	17,425	0	278,807
April		0	0	0	20,000	0	320,000
May		0	0	0	17,869	0	285,902
June		0	0	0	20,000	0	320,000
July		0	0	0	20,000	0	320,000
August		0	0	0	20,000	0	320,000
September		0	0	0	16,926	0	270,820
October		0	0	0	14,895	0	238,325
November		0	0	0	16,518	0	264,286
December		0	0	0	19,551	0	312,818
Annual	0	0	0	20,000	0	3,500,499	

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,208,183	0	8,208,183	0	984,982	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0
April	9,440,184	0	9,440,184	0	1,132,822	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,777,930	0	9,777,930	0	1,173,352	0
July	9,960,415	0	9,960,415	0	1,195,250	0
August	9,870,487	0	9,870,487	0	1,184,458	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,676,985	0	8,676,985	0	1,041,238	0
Annual	96,723,992	0	96,723,992	0	11,606,880	0



Emissions

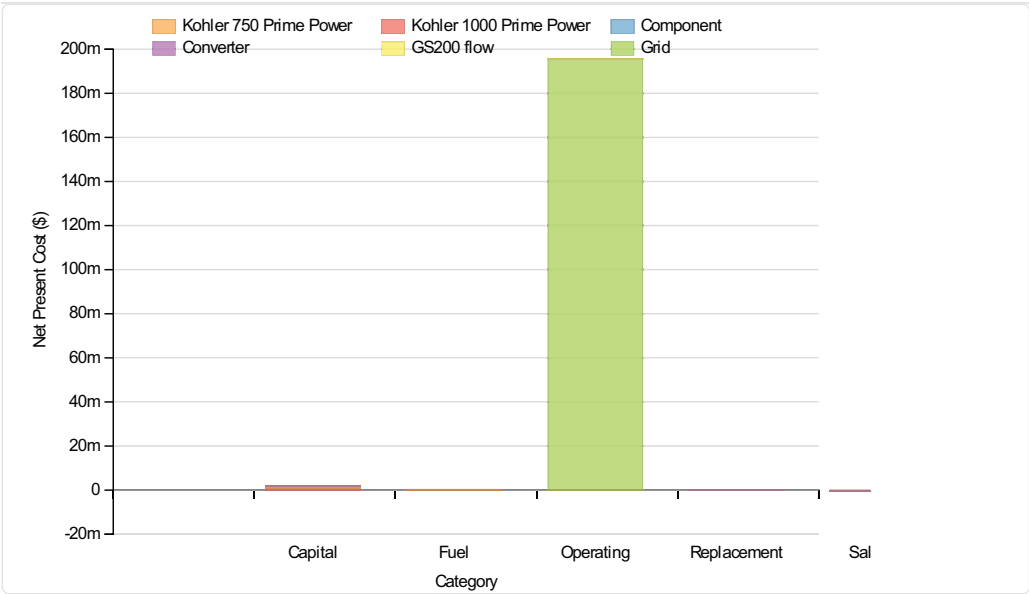
Pollutant	Emissions	Units
Carbon dioxide	61231236	kg/yr
Carbon monoxide	426	kg/yr
Unburned hydrocarbons	49	kg/yr
Particulate matter	12	kg/yr
Sulfur dioxide	265233	kg/yr
Nitrogen oxides	130036	kg/yr

System Report

System architecture

Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	197556960	\$
Levelized cost of energy	0.158	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	925,000	0	22,421	159,833	-175,426	931,828
Kohler 750 Prime Power	690,000	0	21,007	119,719	-122,043	708,683
Grid	0	0	195,453,680	0	0	195,453,680
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	2,014,589	38,996	195,528,160	279,551	-304,430	197,556,866

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	71,553	0	1,734	12,364	-13,570	72,081
Kohler 750 Prime Power	53,375	0	1,625	9,261	-9,441	54,820

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	15,119,198	0	0	15,119,198
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	5,802	2,462	0	0	-463	7,800
System	155,837	3,017	15,124,959	21,625	-23,549	15,281,889

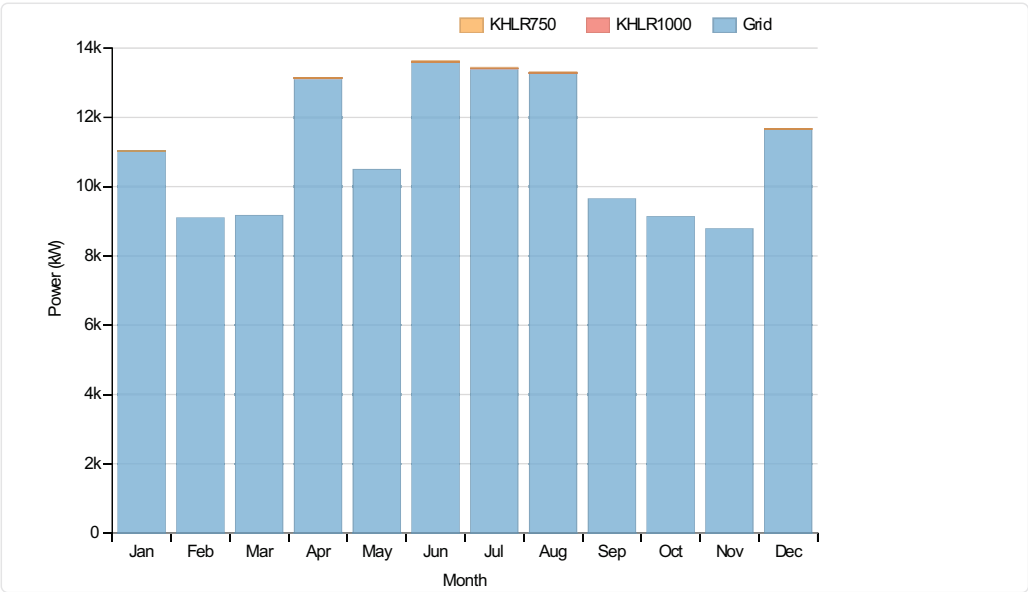


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	10816	kWh/yr
Capacity shortage	87614	kWh/yr
Renewable fraction	0	

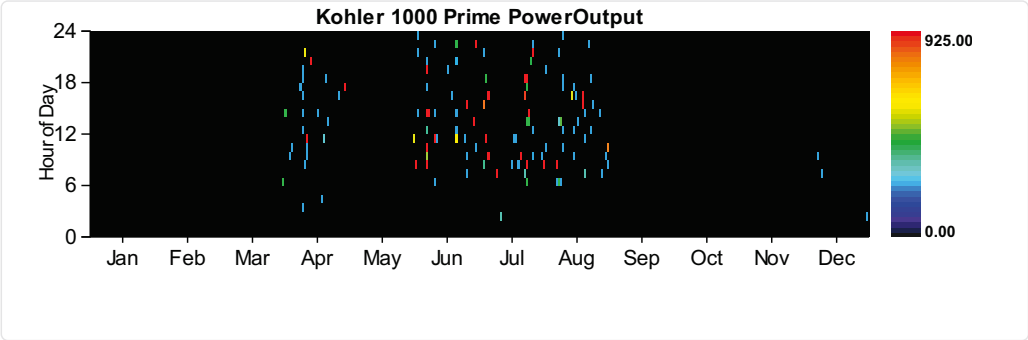
Component	Production(kWh/yr)	Fraction (%)
Generator	54,204	0
Generator	40,041	0
Grid Purchases	96,761,408	100
Total	96,855,648	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,853,336	100
DC primary load	0	0
Total	96,853,336	100



Generator:Kohler 1000 Prime Power

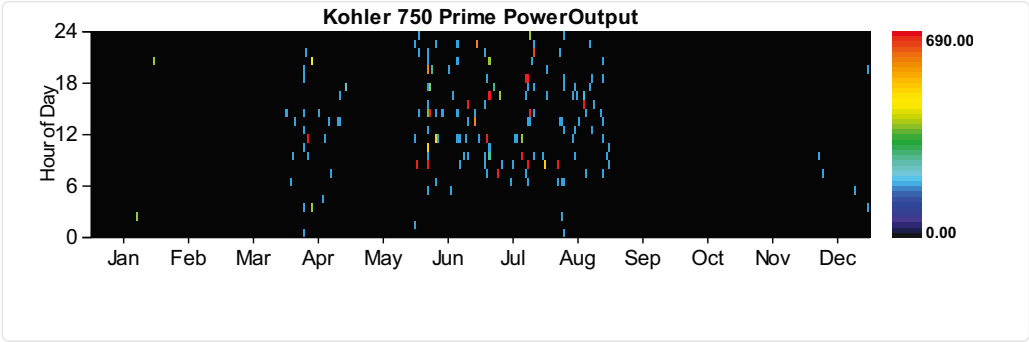
Quantity	Value	Units
Hours of operation	125	hrs/yr
Number of starts	113	starts/yr
Operational life	120	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	54204	kWh/yr
Mean electrical output	434	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	15650	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	153999	kWh/yr
Mean electrical efficiency	35	%



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	157	hrs/yr
Number of starts	143	starts/yr

Quantity	Value	Units
Operational life	96	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	40041	kWh/yr
Mean electrical output	255	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	11723	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	115350	kWh/yr
Mean electrical efficiency	35	%

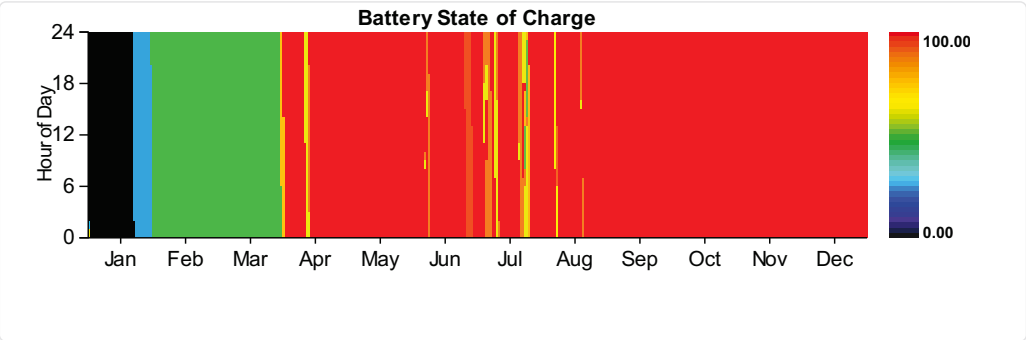


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

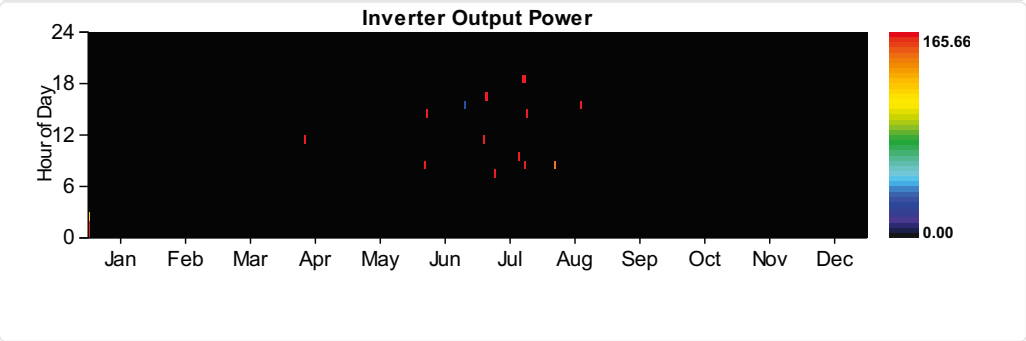
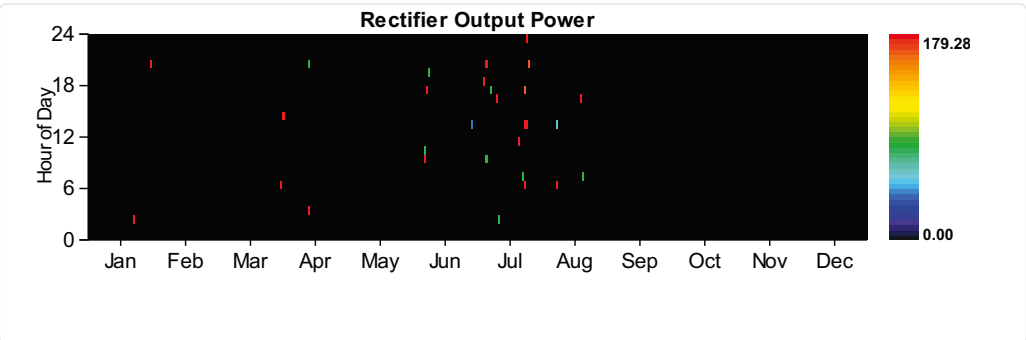
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.361	\$/kWh
Energy in	4149	kWh/yr
Energy out	2905	kWh/yr
Storage depletion	0	kWh/yr

Quantity	Value	Units
Annual throughput	1245	kWh/yr
Expected life	3472	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	0	0	kW
Minimum output	0	0	kW
Maximum output	166	179	kW
Capacity factor	0	0	%
Hours of operation	17	30	hrs/yr
Energy in	2,905	4,881	kWh/yr
Energy out	2,614	4,149	kWh/yr
Losses	290	732	kWh/yr



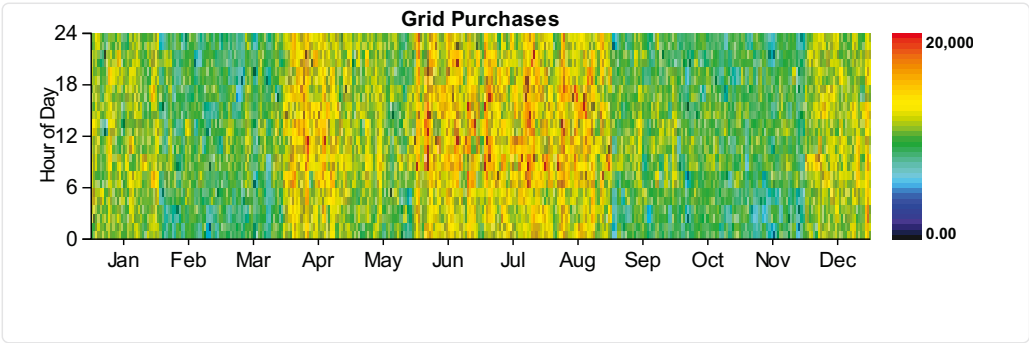
Grid

Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,380	0	294,083
February	0	0	0	17,561	0	280,978
March	0	0	0	17,425	0	278,807
April	0	0	0	20,000	0	320,000
May	0	0	0	17,869	0	285,902
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,926	0	270,820
October	0	0	0	14,895	0	238,325
November	0	0	0	16,518	0	264,286
December	0	0	0	19,665	0	314,638
Annual	0	0	0	20,000	0	3,507,839

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,208,939	0	8,208,939	0	985,073	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0
April	9,447,916	0	9,447,916	0	1,133,750	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,786,386	0	9,786,386	0	1,174,366	0
July	9,969,422	0	9,969,422	0	1,196,331	0
August	9,880,399	0	9,880,399	0	1,185,648	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,678,534	0	8,678,534	0	1,041,424	0
Annual	96,761,408	0	96,761,408	0	11,611,368	0



Emissions

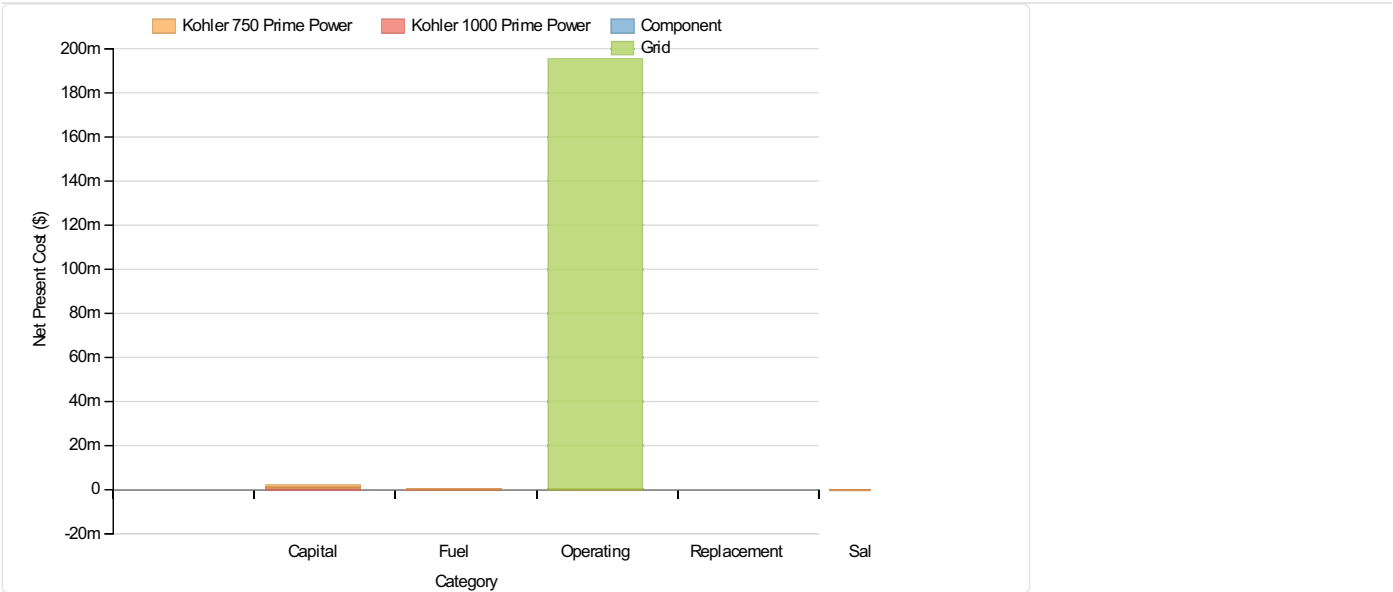
Pollutant	Emissions	Units
Carbon dioxide	61225048	kg/yr
Carbon monoxide	301	kg/yr
Unburned hydrocarbons	34	kg/yr
Particulate matter	9	kg/yr
Sulfur dioxide	265274	kg/yr
Nitrogen oxides	129961	kg/yr

System Report

System architecture

Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	1,380	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

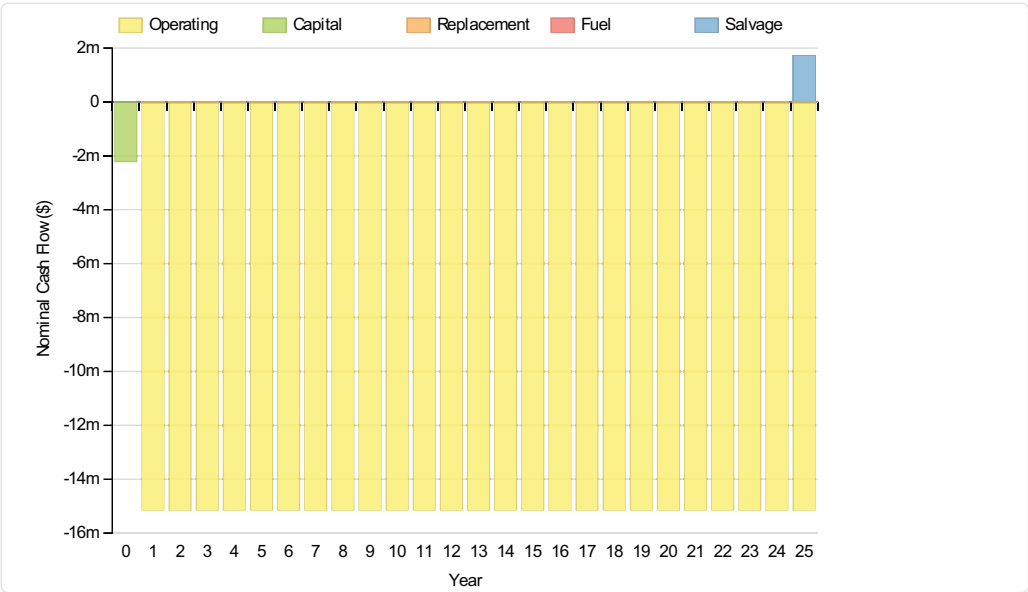
Total net present cost	197574432	\$
Levelized cost of energy	0.158	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	925,000	0	28,520	168,299	-162,869	958,950
Kohler 750 Prime Power	1,285,000	0	31,260	162,939	-246,778	1,232,421
Grid	0	0	195,382,944	0	0	195,382,944
System	2,210,000	0	195,442,736	331,238	-409,647	197,574,327

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	71,553	0	2,206	13,019	-12,599	74,179
Kohler 750 Prime Power	99,400	0	2,418	12,604	-19,089	95,333
Grid	0	0	15,113,726	0	0	15,113,726
System	170,953	0	15,118,351	25,623	-31,688	15,283,239

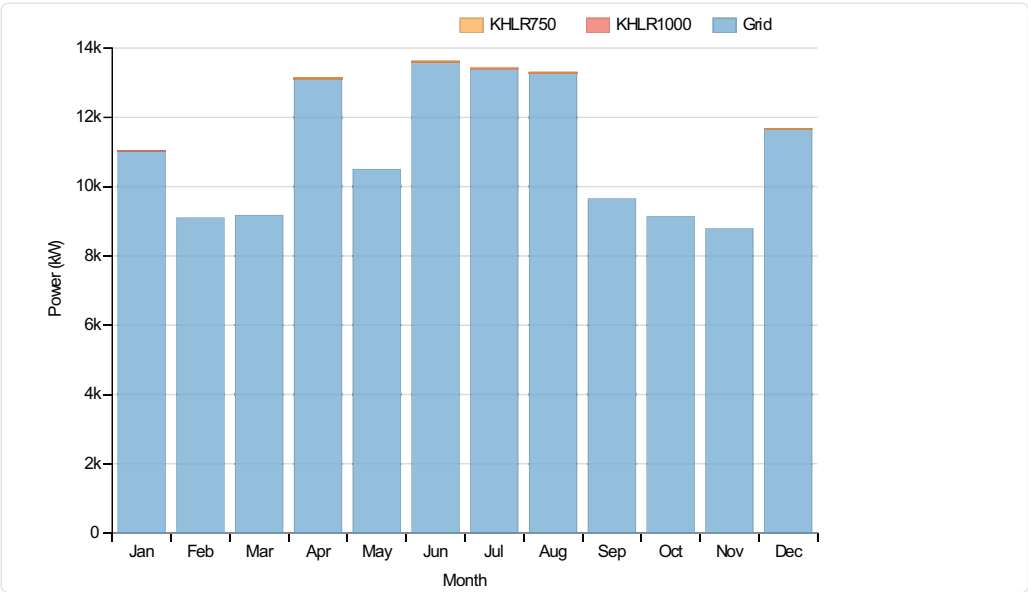


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	6127	kWh/yr
Capacity shortage	57094	kWh/yr
Renewable fraction	0	

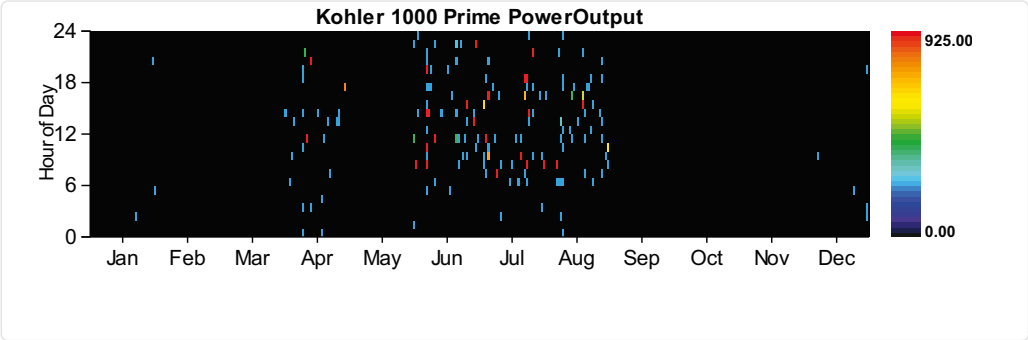
Component	Production(kWh/yr)	Fraction (%)
Generator	56,991	0
Generator	54,442	0
Grid Purchases	96,746,632	100
Total	96,858,064	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,858,024	100
DC primary load	0	0
Total	96,858,024	100



Generator:Kohler 1000 Prime Power

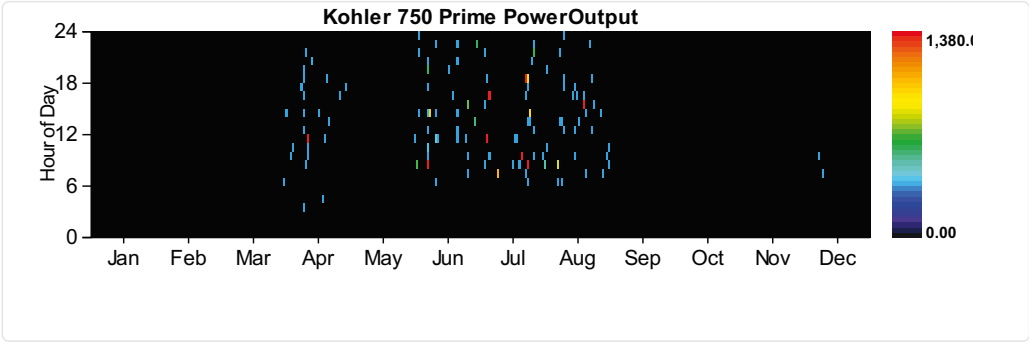
Quantity	Value	Units
Hours of operation	159	hrs/yr
Number of starts	144	starts/yr
Operational life	94	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	56991	kWh/yr
Mean electrical output	358	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	16479	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	162156	kWh/yr
Mean electrical efficiency	35	%



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	119	hrs/yr
Number of starts	107	starts/yr

Quantity	Value	Units
Operational life	126	yr
Fixed generation cost	107.02	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	54442	kWh/yr
Mean electrical output	458	kW
Min. electrical output	345	kW
Max. electrical output	1380	kW
Fuel consumption	15955	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	156993	kWh/yr
Mean electrical efficiency	35	%

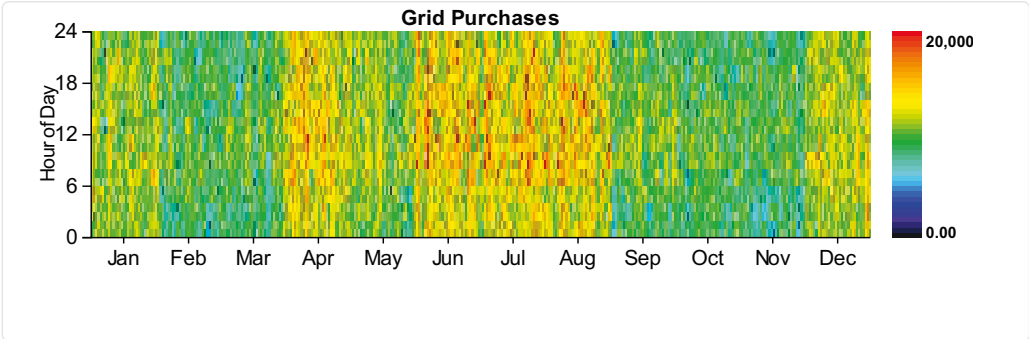


Grid

Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,321	0	293,143
February	0	0	0	17,561	0	280,978
March	0	0	0	17,425	0	278,807
April	0	0	0	20,000	0	320,000
May	0	0	0	17,869	0	285,902
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,926	0	270,820
October	0	0	0	14,895	0	238,325
November	0	0	0	16,518	0	264,286
December	0	0	0	19,492	0	311,878

Annual	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
Rate: Rate 1	0	0	0	20,000	0	8,504,139
Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,209,042	0	8,209,042	0	985,085	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0
April	9,444,701	0	9,444,701	0	1,133,364	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,782,846	0	9,782,846	0	1,173,942	0
July	9,966,205	0	9,966,205	0	1,195,945	0
August	9,875,789	0	9,875,789	0	1,185,095	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,678,243	0	8,678,243	0	1,041,389	0
Annual	96,746,632	0	96,746,632	0	11,609,597	0



Emissions

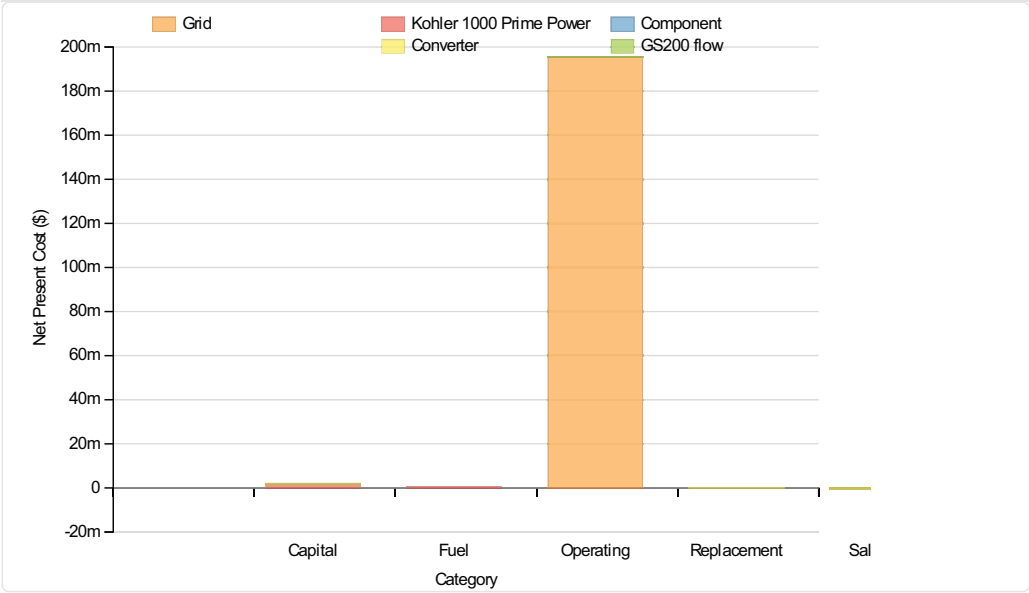
Pollutant	Emissions	Units
Carbon dioxide	61228996	kg/yr
Carbon monoxide	357	kg/yr
Unburned hydrocarbons	41	kg/yr
Particulate matter	10	kg/yr
Sulfur dioxide	265261	kg/yr
Nitrogen oxides	129997	kg/yr

System Report

System architecture

Generator	Kohler 1000 Prime Power	1,850	kW
Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	197614656	\$
Levelized cost of energy	0.158	\$/kWh

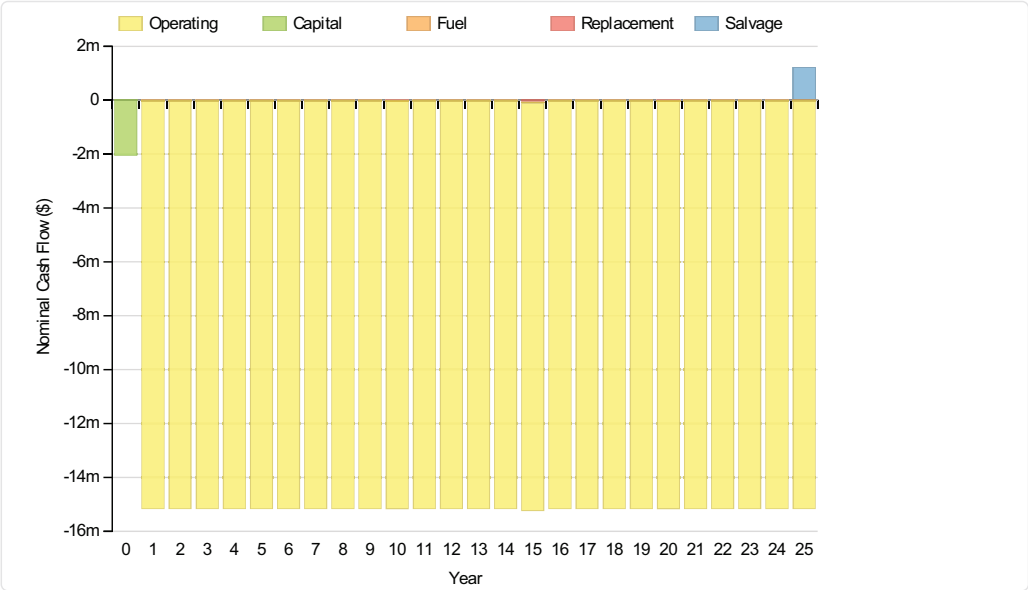
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	1,637,500	0	61,204	352,161	-277,208	1,773,657
Grid	0	0	195,378,288	0	0	195,378,288
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	2,037,089	38,996	195,470,464	352,161	-284,170	197,614,540

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 1000 Prime Power	126,668	0	4,734	27,241	-21,443	137,200
Grid	0	0	15,113,366	0	0	15,113,366
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	5,802	2,462	0	0	-463	7,800

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
System	157,578	3,017	15,120,496	27,241	-21,982	15,286,350

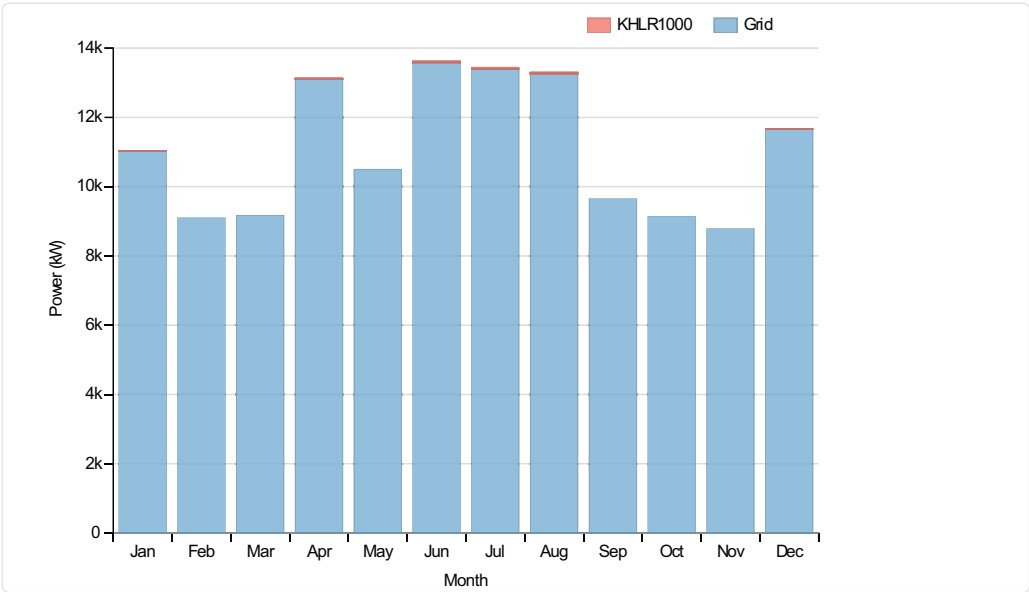


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	8432	kWh/yr
Capacity shortage	72100	kWh/yr
Renewable fraction	0	

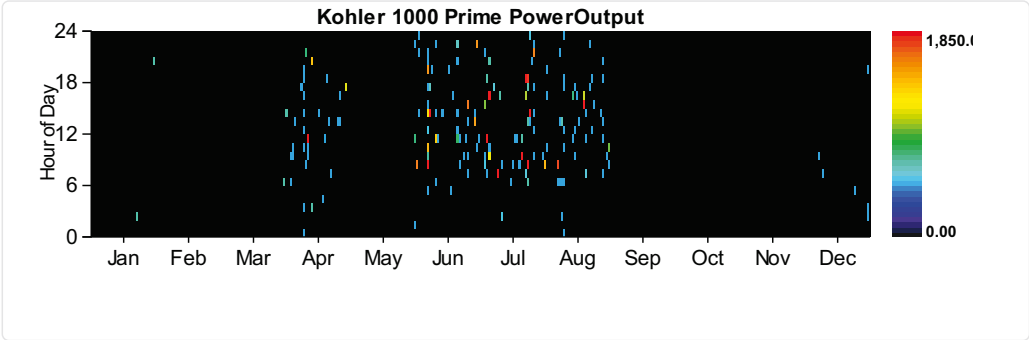
Component	Production(kWh/yr)	Fraction (%)
Generator	119,192	0
Grid Purchases	96,738,344	100
Total	96,857,536	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,855,720	100
DC primary load	0	0
Total	96,855,720	100



Generator:Kohler 1000 Prime Power

Quantity	Value	Units
Hours of operation	176	hrs/yr
Number of starts	157	starts/yr
Operational life	85	yr
Fixed generation cost	137.46	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	119192	kWh/yr
Mean electrical output	677	kW
Min. electrical output	463	kW
Max. electrical output	1850	kW
Fuel consumption	34483	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	339308	kWh/yr
Mean electrical efficiency	35	%

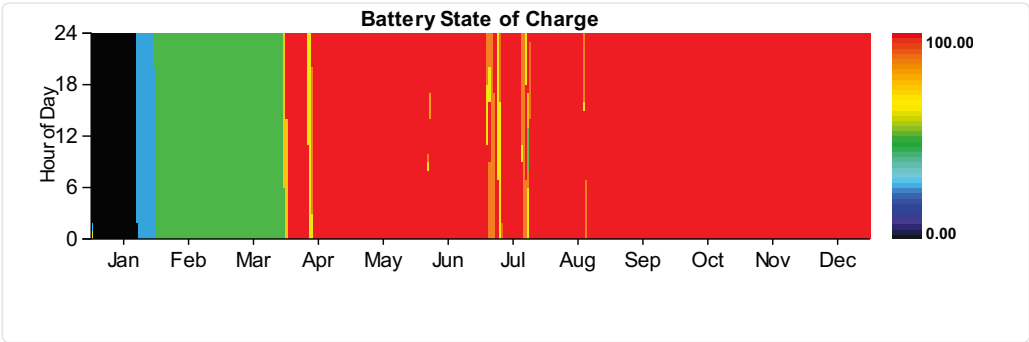


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1

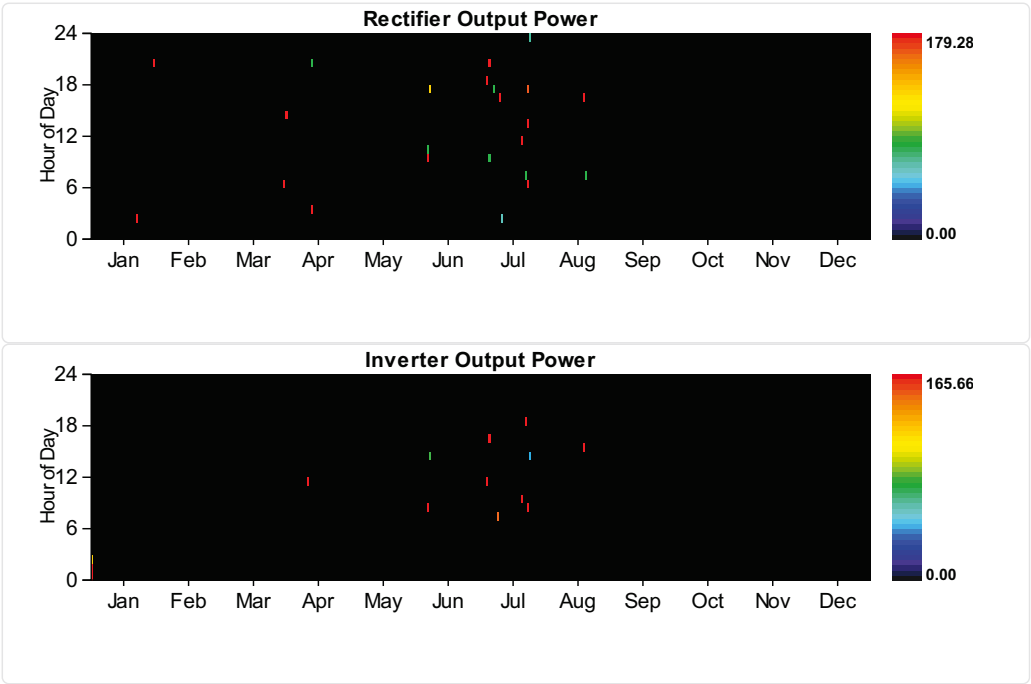
Quantity	Value
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.359	\$/kWh
Energy in	3257	kWh/yr
Energy out	2280	kWh/yr
Storage depletion	0	kWh/yr
Losses	977	kWh/yr
Annual throughput	2725	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	0	0	kW
Minimum output	0	0	kW
Maximum output	166	179	kW
Capacity factor	0	0	%
Hours of operation	14	24	hrs/yr
Energy in	2,280	3,832	kWh/yr
Energy out	2,052	3,257	kWh/yr
Losses	228	575	kWh/yr



Grid

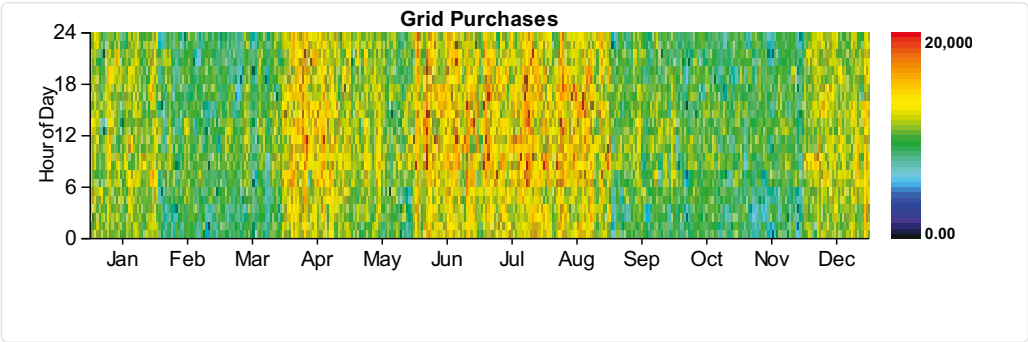
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,247	0	291,953
February	0	0	0	17,561	0	280,978
March	0	0	0	17,425	0	278,807
April	0	0	0	20,000	0	320,000
May	0	0	0	17,869	0	285,902
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,926	0	270,820
October	0	0	0	14,895	0	238,325
November	0	0	0	16,518	0	264,286
December	0	0	0	19,606	0	313,698
Annual	0	0	0	20,000	0	3,504,769

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,208,359	0	8,208,359	0	985,003	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0

April	9,442,810	Energy Purchased (kWh)	0	Energy Sold (kWh)	9,442,810	Peak Demand (kW)	0	1,133,137	Demand Charge (\$)	0
May	7,805,883	Resources.ReportingService_GenerateInputsReport_Month	0	Net Purchases (kWh)	7,805,883	Energy Charge (\$)	0	936,706		0
June	9,780,760		0		9,780,760		0	1,173,691		0
July	9,964,135		0		9,964,135		0	1,195,696		0
August	9,875,164		0		9,875,164		0	1,185,020		0
September	6,943,139		0		6,943,139		0	833,177		0
October	6,792,313		0		6,792,313		0	815,078		0
November	6,321,105		0		6,321,105		0	758,533		0
December	8,677,315		0		8,677,315		0	1,041,278		0
Annual	96,738,344		0		96,738,344		0	11,608,602		0



Emissions

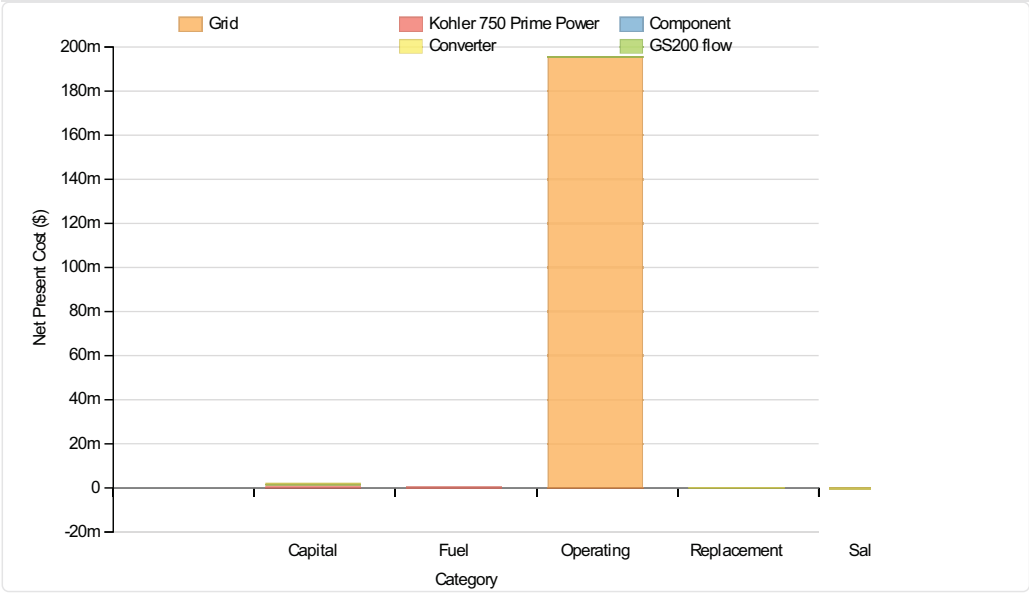
Pollutant	Emissions	Units
Carbon dioxide	61229132	kg/yr
Carbon monoxide	379	kg/yr
Unburned hydrocarbons	43	kg/yr
Particulate matter	11	kg/yr
Sulfur dioxide	265249	kg/yr
Nitrogen oxides	130009	kg/yr

System Report

System architecture

Generator #2	Kohler 750 Prime Power	1,380	kW
Battery	GS200 flow	2	strings
Converter	System Converter	500	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	197753920	\$
Levelized cost of energy	0.158	\$/kWh

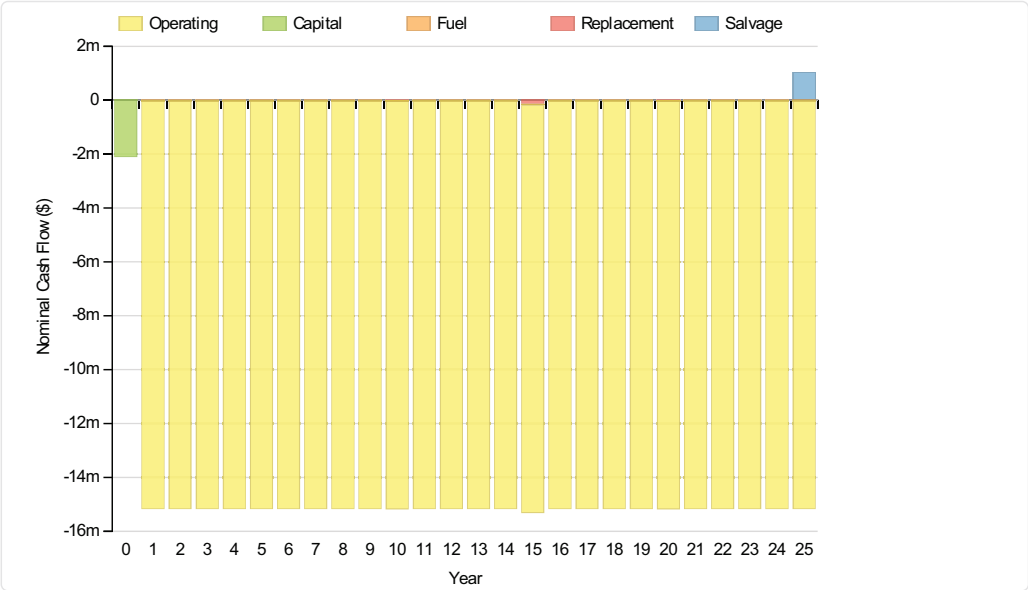
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 750 Prime Power	1,285,000	0	41,505	292,709	-226,769	1,392,445
Grid	0	0	195,436,096	0	0	195,436,096
GS200 flow	649,178	14,343	62,052	0	-1,945	723,628
Converter	150,000	63,641	0	0	-11,978	201,663
System	2,084,178	77,984	195,539,664	292,709	-240,692	197,753,843

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 750 Prime Power	99,400	0	3,211	22,642	-17,542	107,711
Grid	0	0	15,117,838	0	0	15,117,838
GS200 flow	50,217	1,110	4,800	0	-150	55,976
Converter	11,603	4,923	0	0	-927	15,599

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
System	161,220	6,032	15,125,849	22,642	-18,619	15,297,124

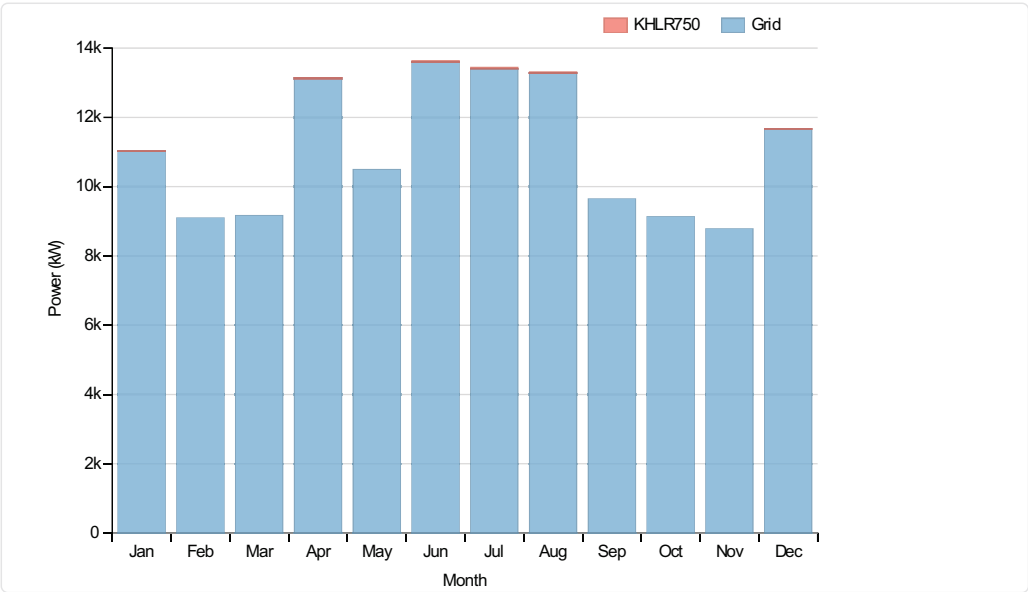


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	11701	kWh/yr
Capacity shortage	92542	kWh/yr
Renewable fraction	0	

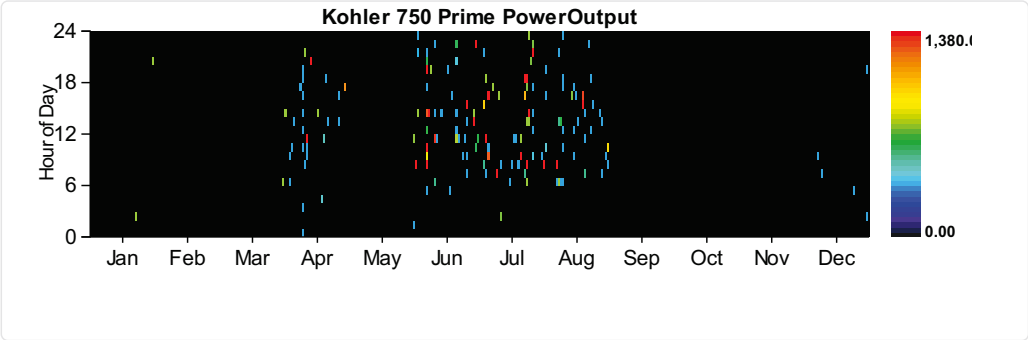
Component	Production(kWh/yr)	Fraction (%)
Generator	98,052	0
Grid Purchases	96,759,968	100
Total	96,858,024	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,852,464	100
DC primary load	0	0
Total	96,852,464	100



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	158	hrs/yr
Number of starts	143	starts/yr
Operational life	95	yr
Fixed generation cost	107.02	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	98052	kWh/yr
Mean electrical output	621	kW
Min. electrical output	345	kW
Max. electrical output	1380	kW
Fuel consumption	28661	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	282026	kWh/yr
Mean electrical efficiency	35	%

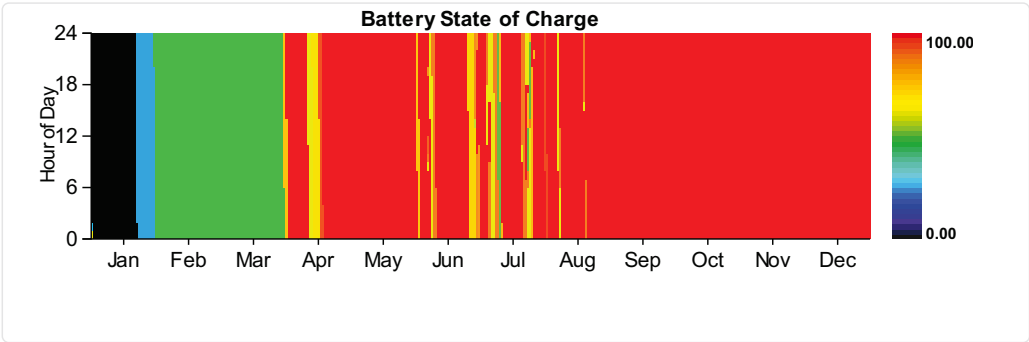


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	2

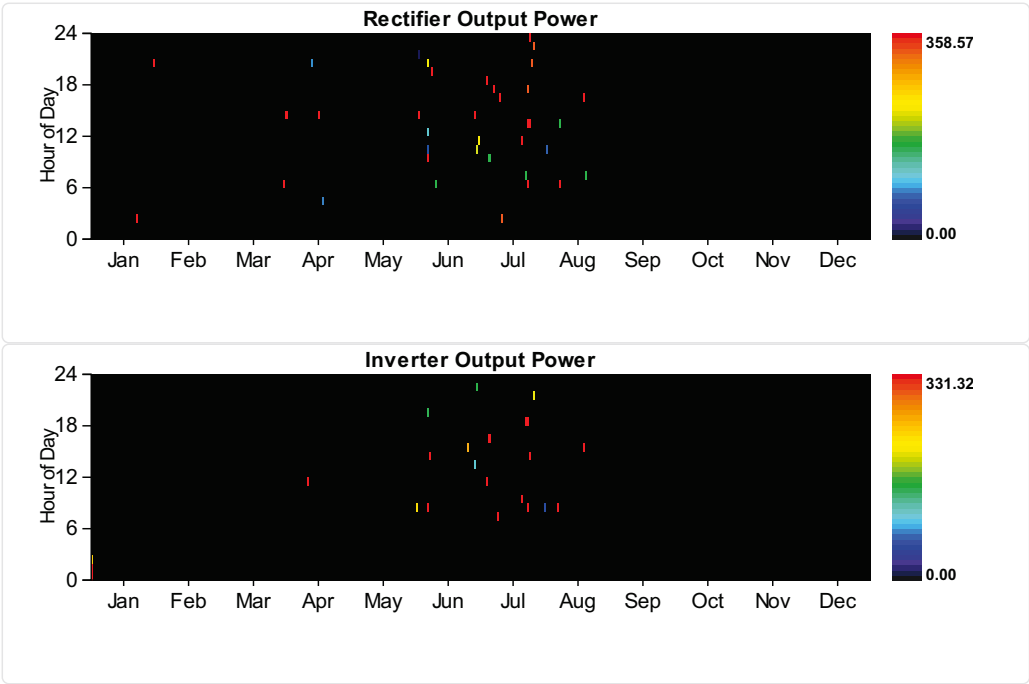
Quantity	Value
Batteries	2
Bus voltage	100

Quantity	Value	Units
Nominal capacity	1200	kWh
Usable nominal capacity	1200	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.363	\$/kWh
Energy in	10100	kWh/yr
Energy out	7070	kWh/yr
Storage depletion	0	kWh/yr
Losses	3030	kWh/yr
Annual throughput	8451	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	500	450	kW
Mean output	1	1	kW
Minimum output	0	0	kW
Maximum output	331	359	kW
Capacity factor	0	0	%
Hours of operation	23	38	hrs/yr
Energy in	7,070	11,883	kWh/yr
Energy out	6,363	10,100	kWh/yr
Losses	707	1,782	kWh/yr



Grid

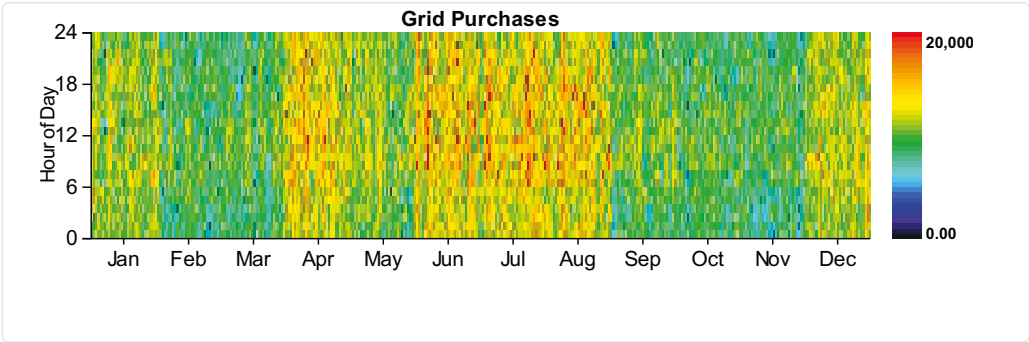
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,247	0	291,953
February	0	0	0	17,561	0	280,978
March	0	0	0	17,425	0	278,807
April	0	0	0	20,000	0	320,000
May	0	0	0	17,869	0	285,902
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,926	0	270,820
October	0	0	0	14,895	0	238,325
November	0	0	0	16,518	0	264,286
December	0	0	0	19,724	0	315,578
Annual	0	0	0	20,000	0	3,506,649

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,208,142	0	8,208,142	0	984,977	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0

April	9,447,481	0	9,447,481	0	1,133,698	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,785,834	0	9,785,834	0	1,174,300	0
July	9,968,291	0	9,968,291	0	1,196,195	0
August	9,882,045	0	9,882,045	0	1,185,845	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,678,365	0	8,678,365	0	1,041,404	0
Annual	96,759,968	0	96,759,968	0	11,611,196	0



Emissions

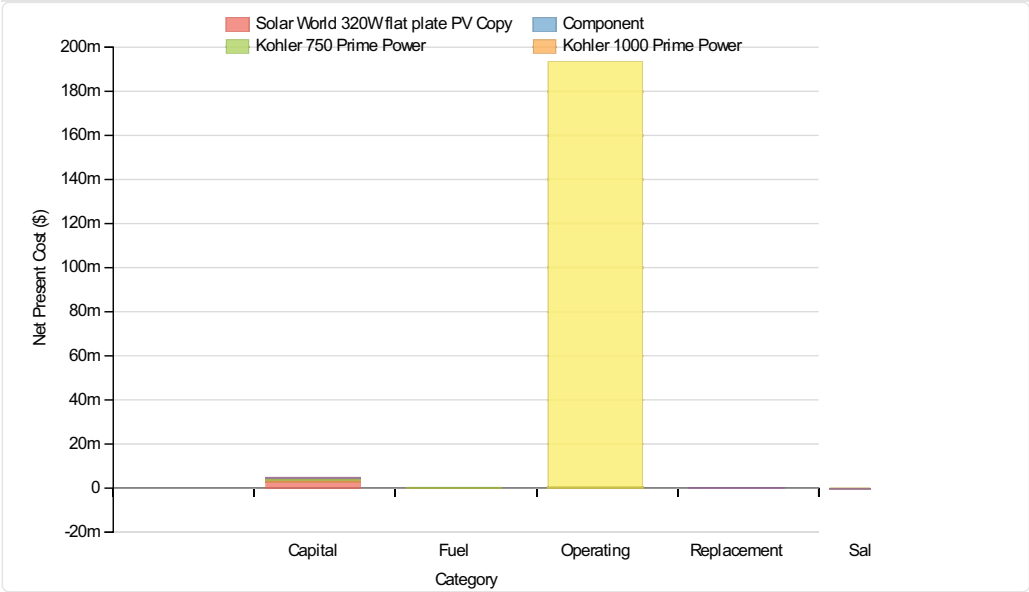
Pollutant	Emissions	Units
Carbon dioxide	61227520	kg/yr
Carbon monoxide	315	kg/yr
Unburned hydrocarbons	36	kg/yr
Particulate matter	9	kg/yr
Sulfur dioxide	265277	kg/yr
Nitrogen oxides	129974	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	198261296	\$
Levelized cost of energy	0.158	\$/kWh

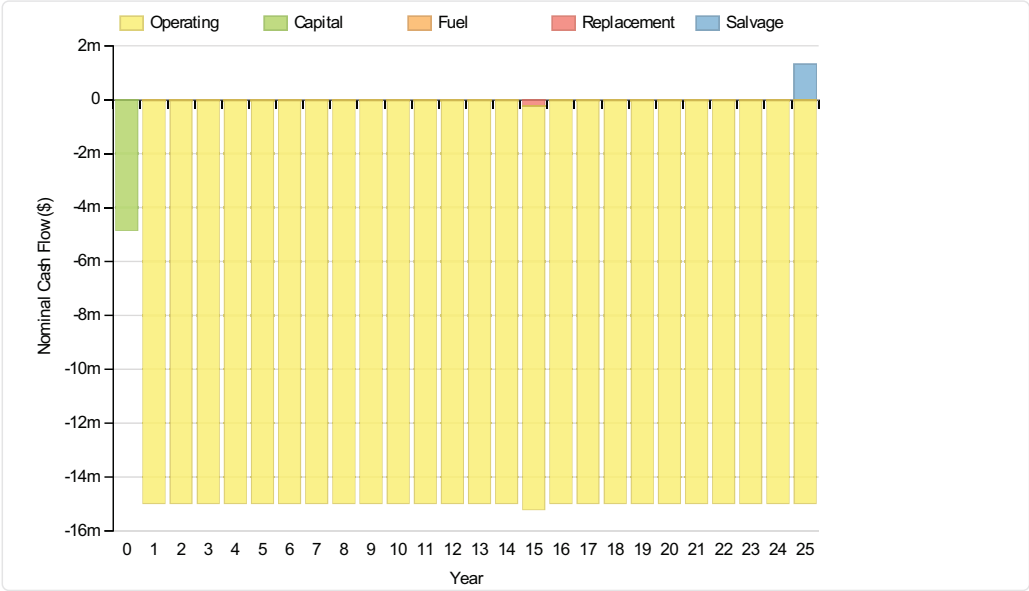
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Kohler 1000 Prime Power	925,000	0	22,242	141,871	-175,795	913,318
Kohler 750 Prime Power	690,000	0	21,408	108,781	-121,216	698,973
Grid	0	0	193,152,480	0	0	193,152,480
Converter	225,000	95,462	0	0	-17,967	302,495
System	4,840,000	95,462	193,390,064	250,652	-314,978	198,261,200

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Kohler 1000 Prime Power	71,553	0	1,721	10,974	-13,599	70,649

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 750 Prime Power	53,375	0	1,656	8,415	-9,377	54,069
Grid	0	0	14,941,190	0	0	14,941,190
Converter	17,405	7,384	0	0	-1,390	23,400
System	374,395	7,384	14,959,568	19,389	-24,365	15,336,371

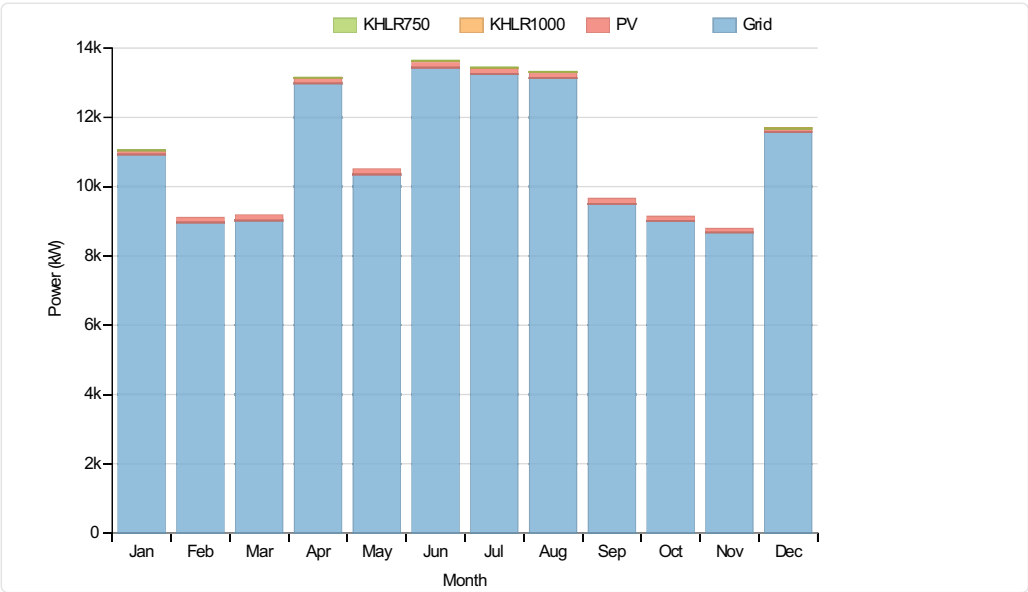


Electrical

Quantity	Value	Units
Excess electricity	5225	kWh/yr
Unmet load	10040	kWh/yr
Capacity shortage	88587	kWh/yr
Renewable fraction	0	

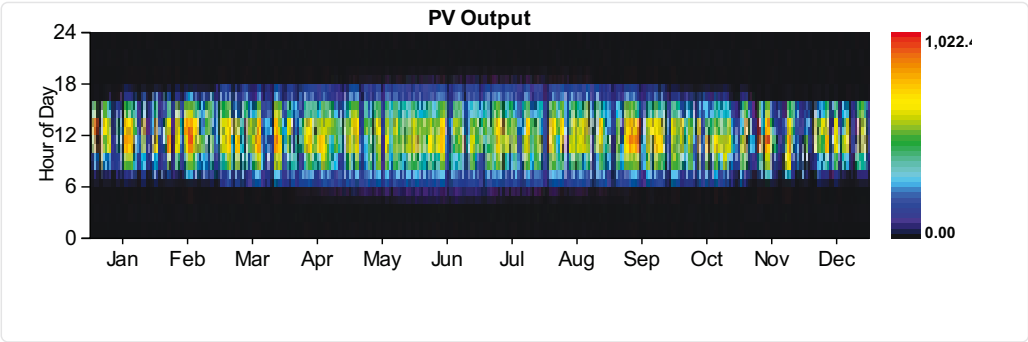
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	48,072	0
Generator	36,344	0
Grid Purchases	95,614,640	99
Total	96,987,728	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,854,112	100
DC primary load	0	0
Total	96,854,112	100



PV:Solar World 320W flat plate PV Copy

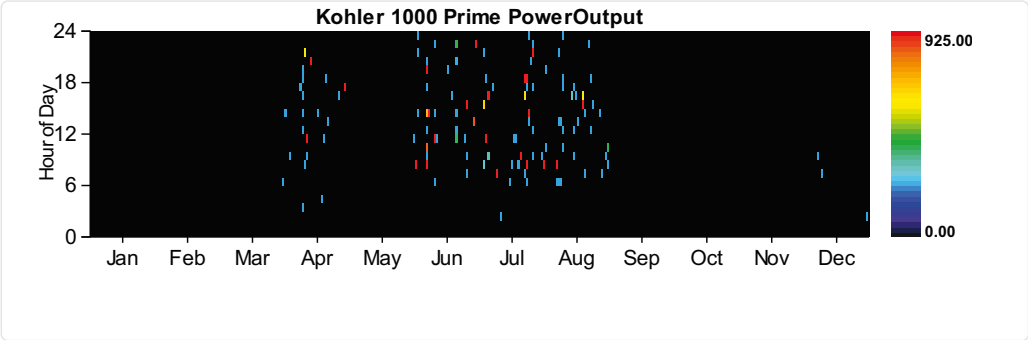
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 1000 Prime Power

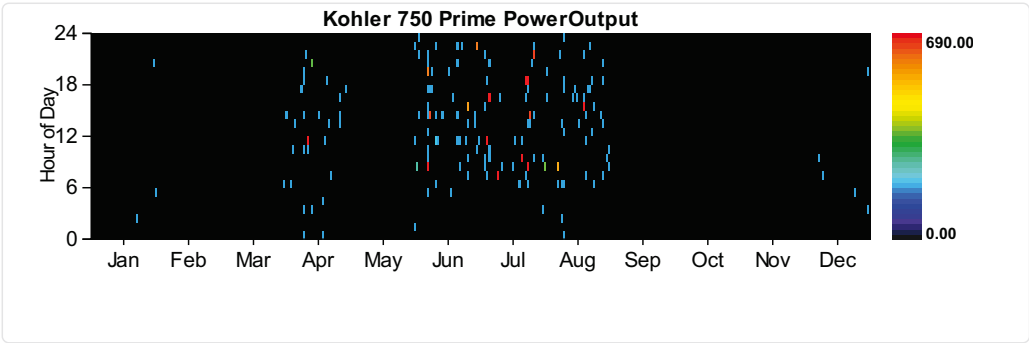
Quantity	Value	Units
Hours of operation	124	hrs/yr
Number of starts	114	starts/yr
Operational life	121	yr
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh

Quantity	Value	Units
Electrical production	48072	kWh/yr
Mean electrical output	388	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	13892	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	136693	kWh/yr
Mean electrical efficiency	35	%



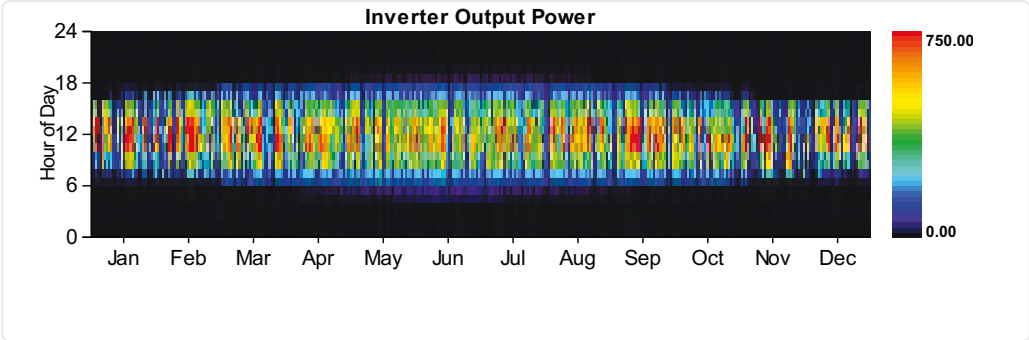
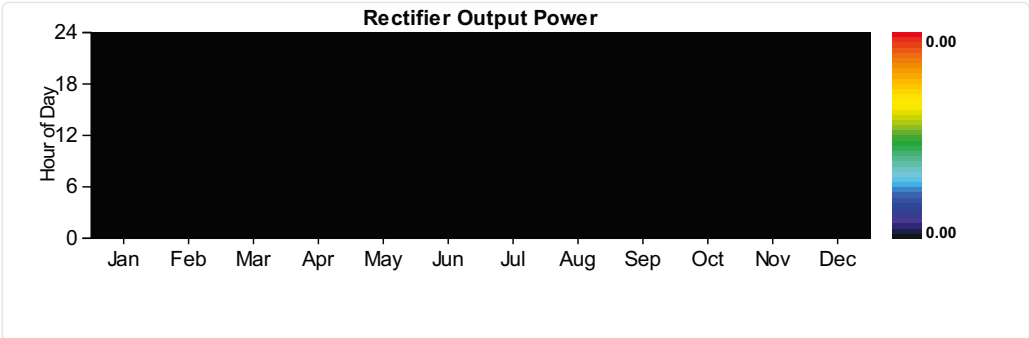
Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	160	hrs/yr
Number of starts	144	starts/yr
Operational life	94	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	36344	kWh/yr
Mean electrical output	227	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	10652	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	104811	kWh/yr
Mean electrical efficiency	35	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	18	0	%
Hours of operation	4,377	0	hrs/yr
Energy in	1,283,450	0	kWh/yr
Energy out	1,155,104	0	kWh/yr
Losses	128,346	0	kWh/yr



Grid

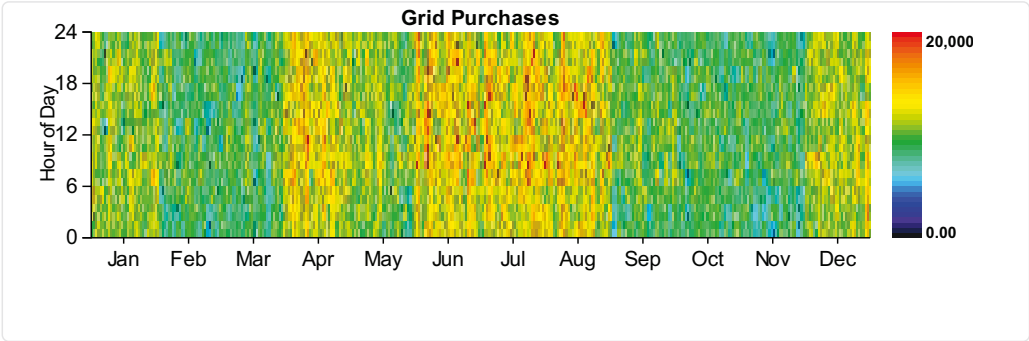
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,380	0	294,083
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	0	0	0	20,000	0	320,000
May	0	0	0	17,657	0	282,514
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,488	0	311,800
Annual	0	0	0	20,000	0	3,467,443

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,131,761	0	8,131,761	0	975,811	0
February	6,023,890	0	6,023,890	0	722,867	0
March	6,708,956	0	6,708,956	0	805,075	0
April	9,347,045	0	9,347,045	0	1,121,645	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,679,243	0	9,679,243	0	1,161,509	0
July	9,859,910	0	9,859,910	0	1,183,189	0
August	9,771,679	0	9,771,679	0	1,172,602	0
September	6,837,491	0	6,837,491	0	820,499	0
October	6,699,125	0	6,699,125	0	803,895	0
November	6,249,541	0	6,249,541	0	749,945	0
December	8,608,863	0	8,608,863	0	1,033,064	0
Annual	95,614,640	0	95,614,640	0	11,473,756	0



Emissions

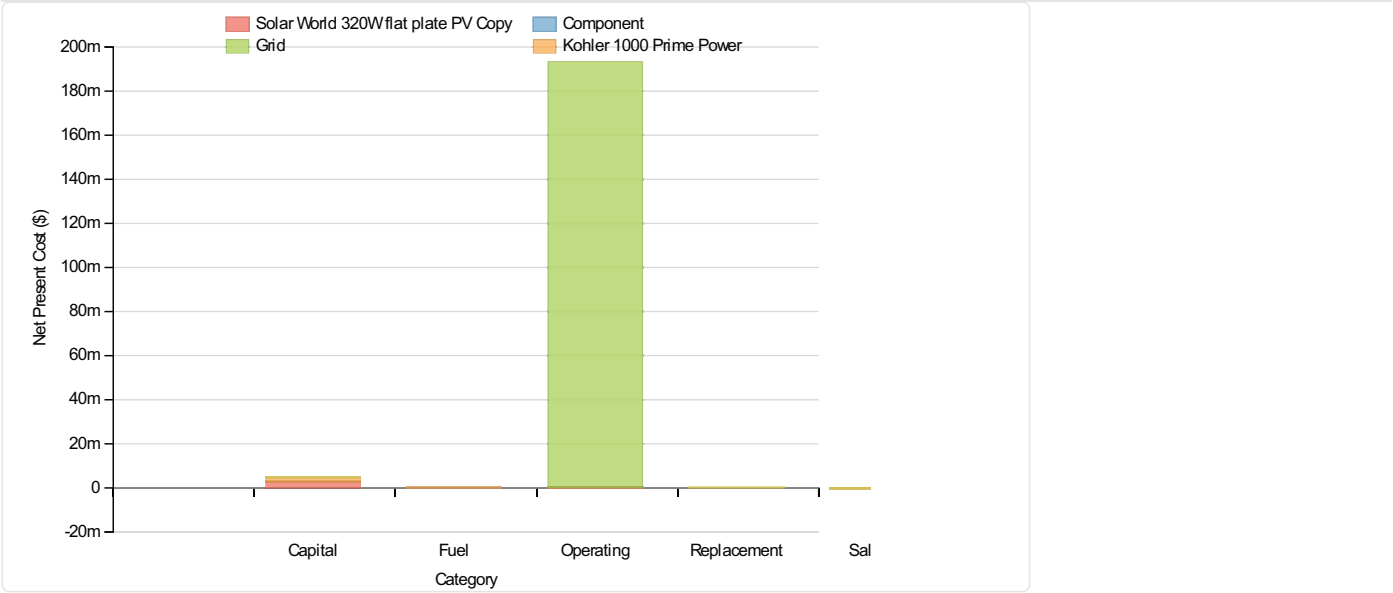
Pollutant	Emissions	Units
Carbon dioxide	60492868	kg/yr
Carbon monoxide	270	kg/yr
Unburned hydrocarbons	31	kg/yr
Particulate matter	8	kg/yr
Sulfur dioxide	262117	kg/yr
Nitrogen oxides	128394	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Generator	Kohler 1000 Prime Power	1,850	kW
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	198295184	\$
Levelized cost of energy	0.158	\$/kWh

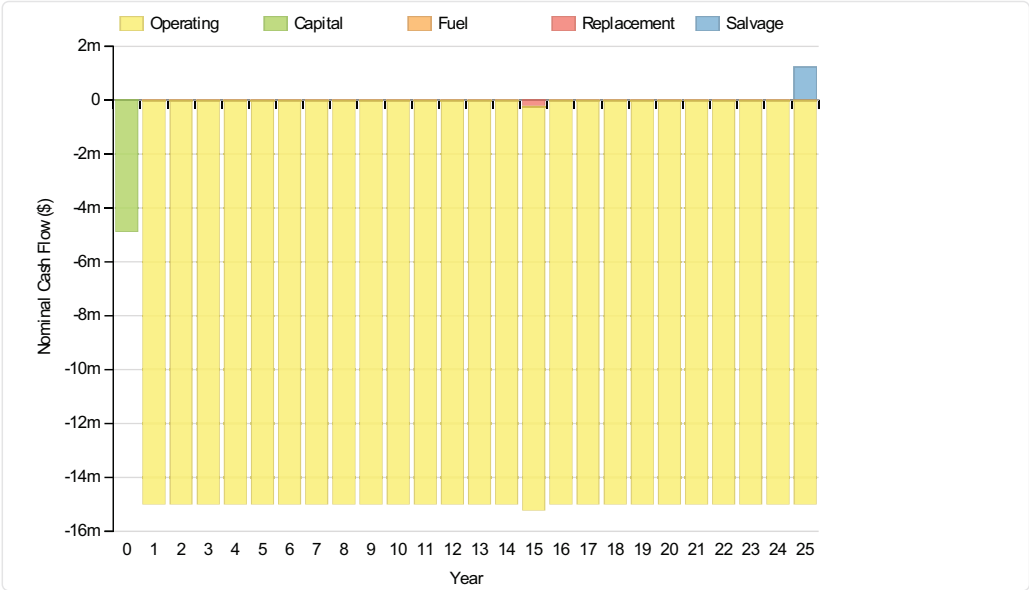
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Kohler 1000 Prime Power	1,637,500	0	62,943	331,191	-273,939	1,757,695
Grid	0	0	193,040,976	0	0	193,040,976
Converter	225,000	95,462	0	0	-17,967	302,495
System	4,862,500	95,462	193,297,856	331,191	-291,906	198,295,103

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Kohler 1000 Prime Power	126,668	0	4,869	25,619	-21,190	135,966
Grid	0	0	14,932,565	0	0	14,932,565
Converter	17,405	7,384	0	0	-1,390	23,400

Component System	Capital	Replacement	O&M	Fuel	Salvage	Total
	376,136	7,384	14,952,436	25,619	-22,580	15,338,995

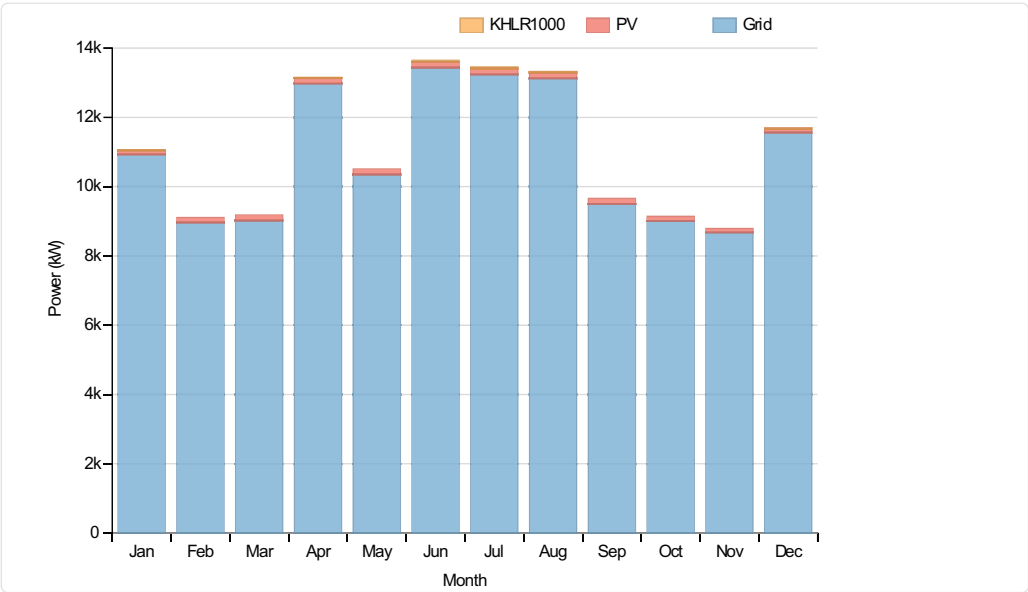


Electrical

Quantity	Value	Units
Excess electricity	5225	kWh/yr
Unmet load	7831	kWh/yr
Capacity shortage	73016	kWh/yr
Renewable fraction	0	

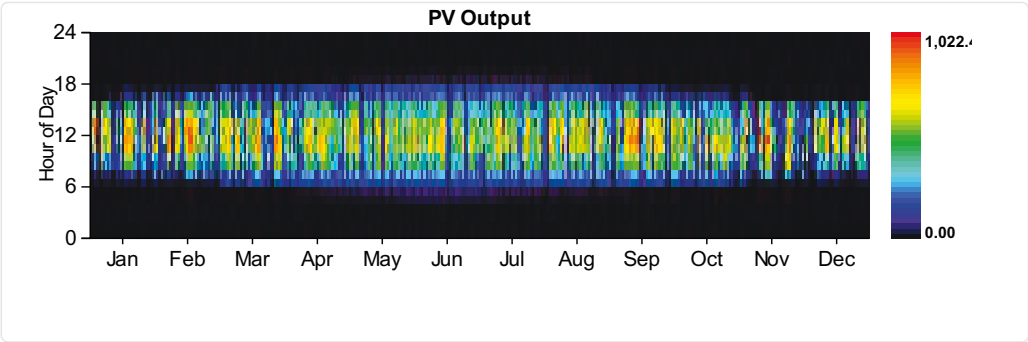
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	112,000	0
Grid Purchases	95,589,264	99
Total	96,989,936	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,856,328	100
DC primary load	0	0
Total	96,856,328	100



PV:Solar World 320W flat plate PV Copy

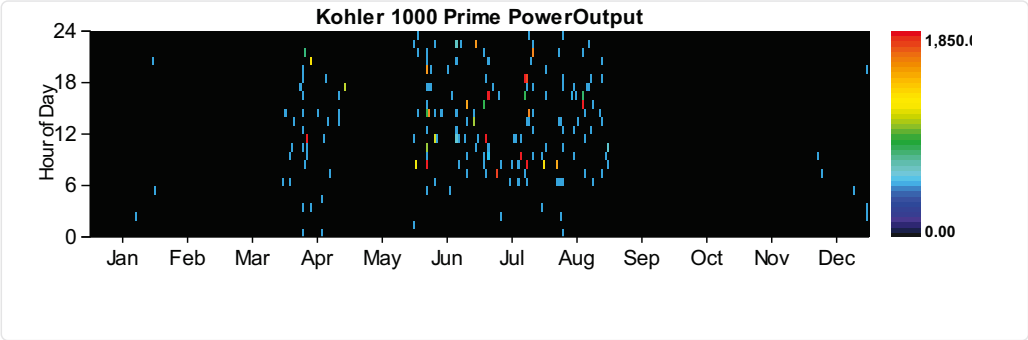
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 1000 Prime Power

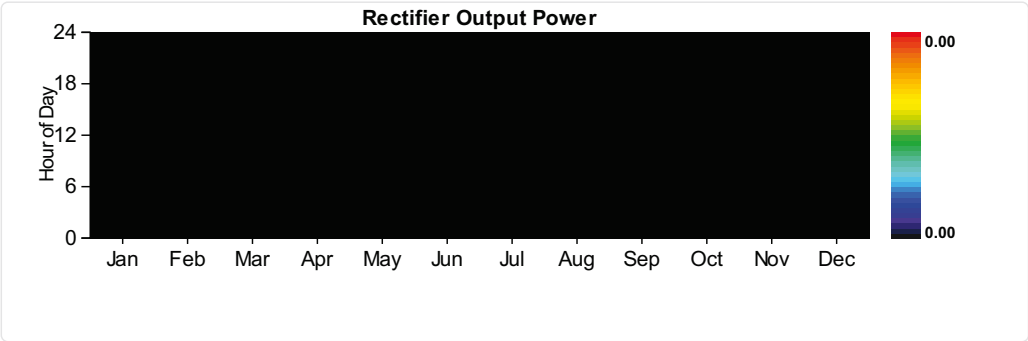
Quantity	Value	Units
Hours of operation	181	hrs/yr
Number of starts	162	starts/yr
Operational life	83	yr
Fixed generation cost	137.46	\$/hr
Marginal generation cost	0.23	\$/kWh

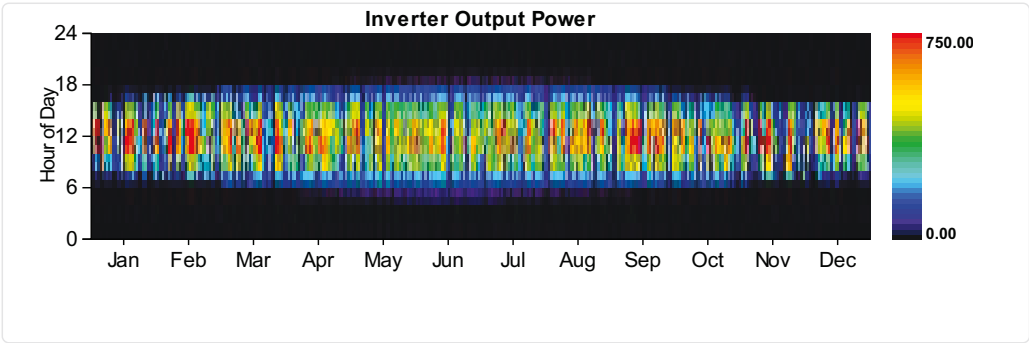
Quantity	Value	Units
Electrical production	112000	kWh/yr
Mean electrical output	619	kW
Min. electrical output	463	kW
Max. electrical output	1850	kW
Fuel consumption	32429	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	319103	kWh/yr
Mean electrical efficiency	35	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	18	0	%
Hours of operation	4,377	0	hrs/yr
Energy in	1,283,450	0	kWh/yr
Energy out	1,155,104	0	kWh/yr
Losses	128,346	0	kWh/yr





Grid

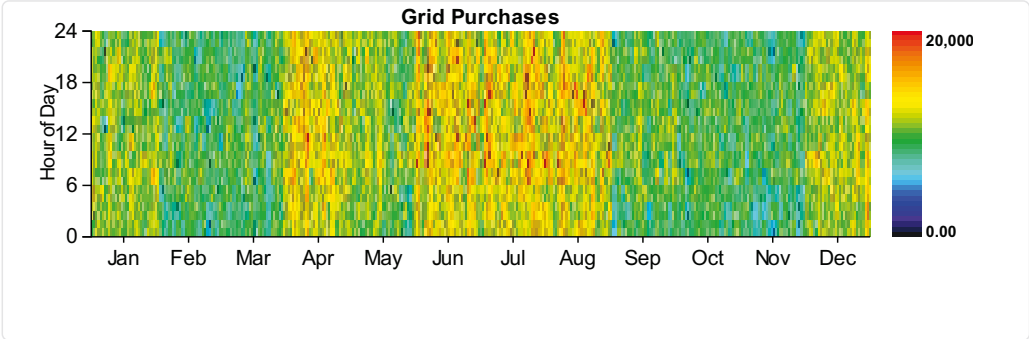
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,090	0	289,443
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062
April	0	0	0	20,000	0	320,000
May	0	0	0	17,657	0	282,514
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,429	0	310,860
Annual	0	0	0	20,000	0	3,461,863

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,130,891	0	8,130,891	0	975,707	0
February	6,023,890	0	6,023,890	0	722,867	0
March	6,708,956	0	6,708,956	0	805,075	0
April	9,341,935	0	9,341,935	0	1,121,032	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,673,265	0	9,673,265	0	1,160,792	0
July	9,853,874	0	9,853,874	0	1,182,465	0
August	9,765,519	0	9,765,519	0	1,171,862	0

September	6,837,491	Energy Purchased (kWh)	0	Energy Sold (kWh)	6,837,491	Peak Demand (kW)	0	820,499	Energy Charge (\$)	0	Demand Charge (\$)
October	6,699,125	Energy Purchased (kWh)	0	Energy Sold (kWh)	6,699,125	Peak Demand (kW)	0	803,895	Energy Charge (\$)	0	Demand Charge (\$)
November	6,249,541	Energy Purchased (kWh)	0	Energy Sold (kWh)	6,249,541	Peak Demand (kW)	0	749,945	Energy Charge (\$)	0	Demand Charge (\$)
December	8,607,644	Energy Purchased (kWh)	0	Energy Sold (kWh)	8,607,644	Peak Demand (kW)	0	1,032,917	Energy Charge (\$)	0	Demand Charge (\$)
Annual	95,589,264	Energy Purchased (kWh)	0	Energy Sold (kWh)	95,589,264	Peak Demand (kW)	0	11,470,711	Energy Charge (\$)	0	Demand Charge (\$)



Emissions

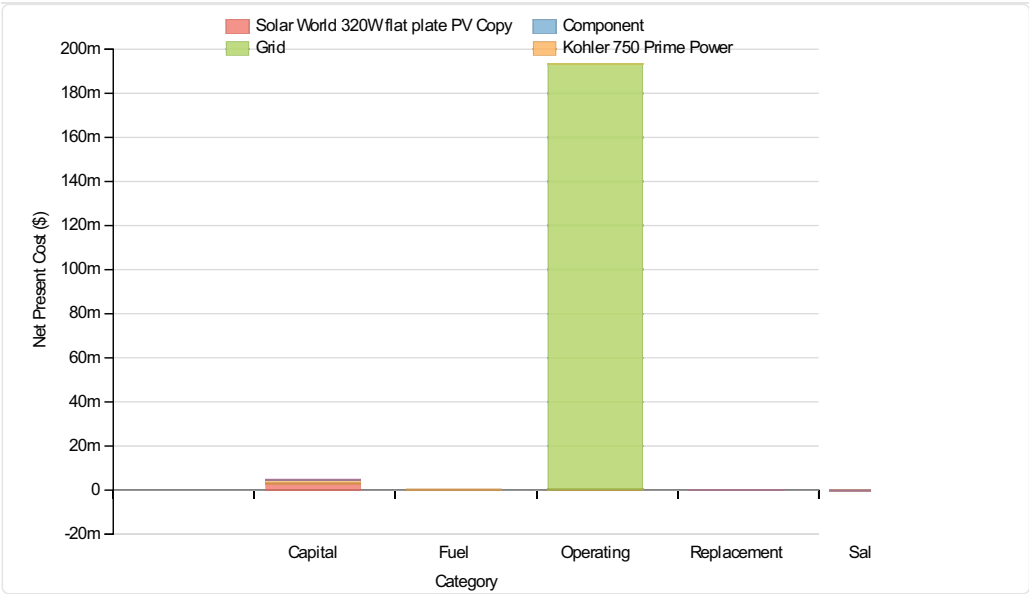
Pollutant	Emissions	Units
Carbon dioxide	60497528	kg/yr
Carbon monoxide	357	kg/yr
Unburned hydrocarbons	41	kg/yr
Particulate matter	10	kg/yr
Sulfur dioxide	262090	kg/yr
Nitrogen oxides	128446	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Generator #2	Kohler 750 Prime Power	1,380	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	198358448	\$
Levelized cost of energy	0.158	\$/kWh

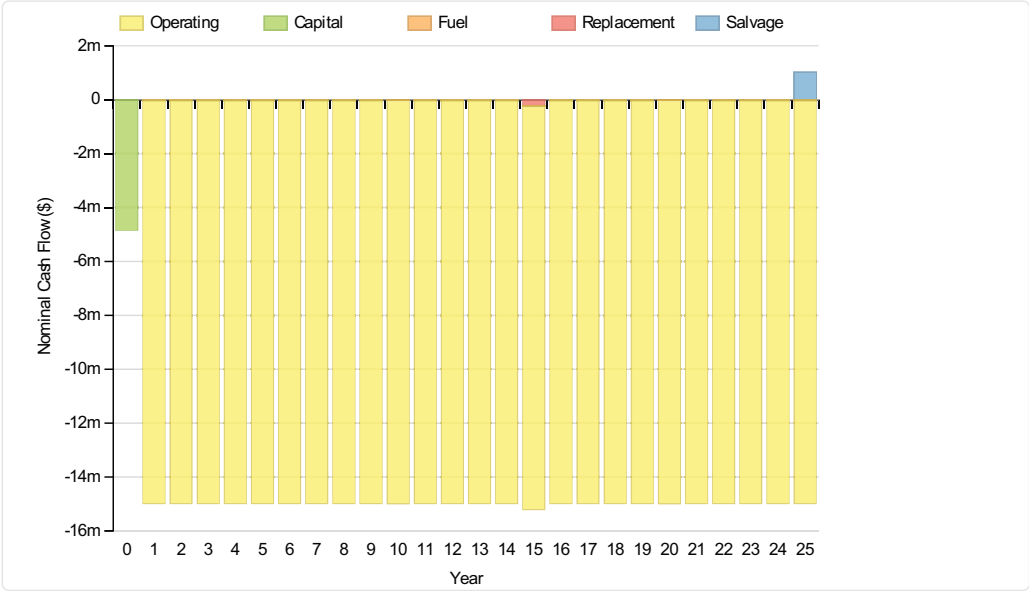
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Kohler 750 Prime Power	1,285,000	0	42,555	266,901	-224,717	1,369,739
Grid	0	0	193,130,400	0	0	193,130,400
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	4,834,589	102,637	193,397,920	266,901	-243,657	198,358,390

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Kohler 750 Prime Power	99,400	0	3,292	20,646	-17,383	105,955

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	14,939,482	0	0	14,939,482
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	373,977	7,939	14,960,176	20,646	-18,848	15,343,890

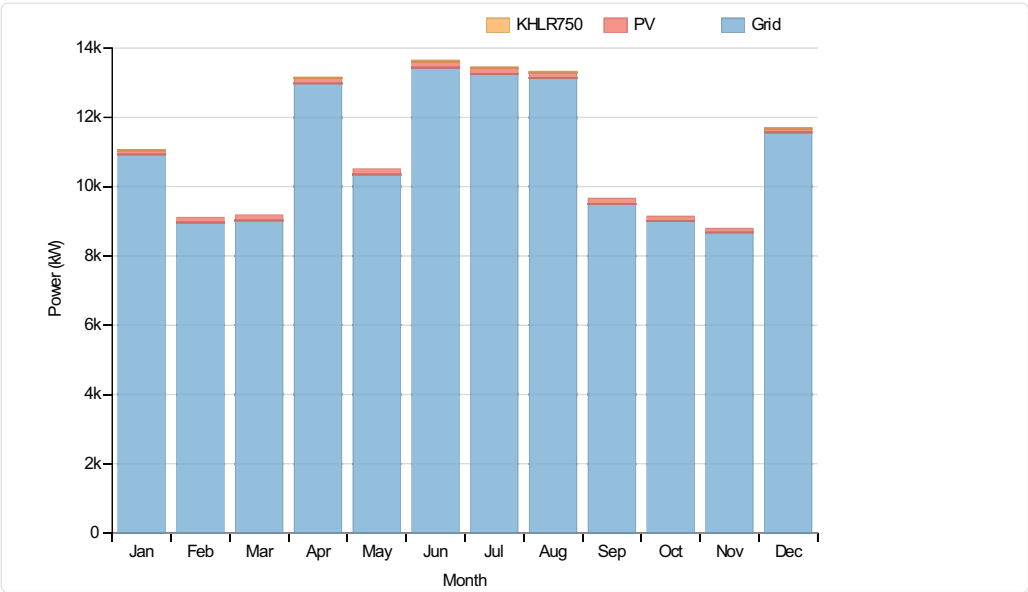


Electrical

Quantity	Value	Units
Excess electricity	2745	kWh/yr
Unmet load	10858	kWh/yr
Capacity shortage	93644	kWh/yr
Renewable fraction	0	

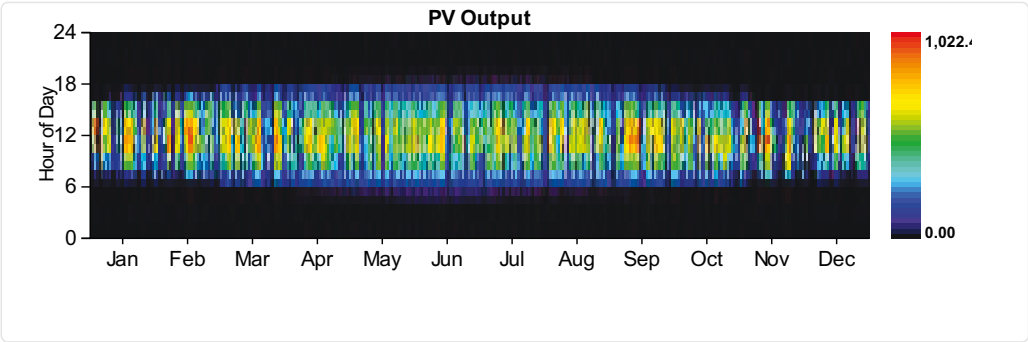
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	89,327	0
Grid Purchases	95,610,304	99
Total	96,988,304	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,853,304	100
DC primary load	0	0
Total	96,853,304	100



PV:Solar World 320W flat plate PV Copy

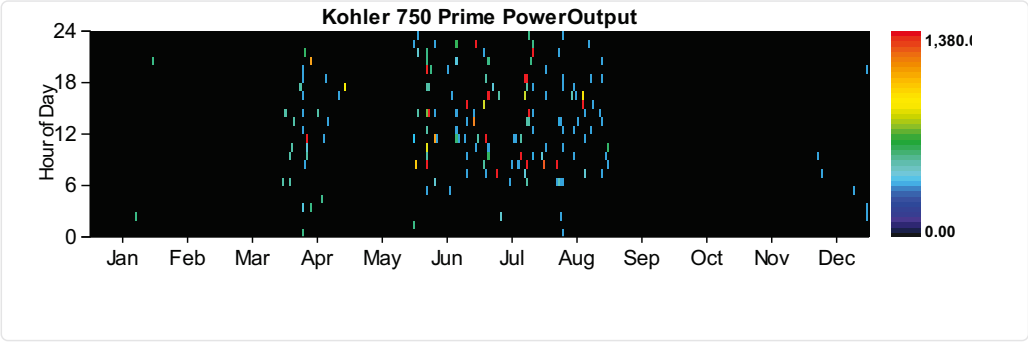
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 750 Prime Power

Quantity	Value	Units
Hours of operation	162	hrs/yr
Number of starts	146	starts/yr
Operational life	93	yr
Fixed generation cost	107.02	\$/hr
Marginal generation cost	0.23	\$/kWh

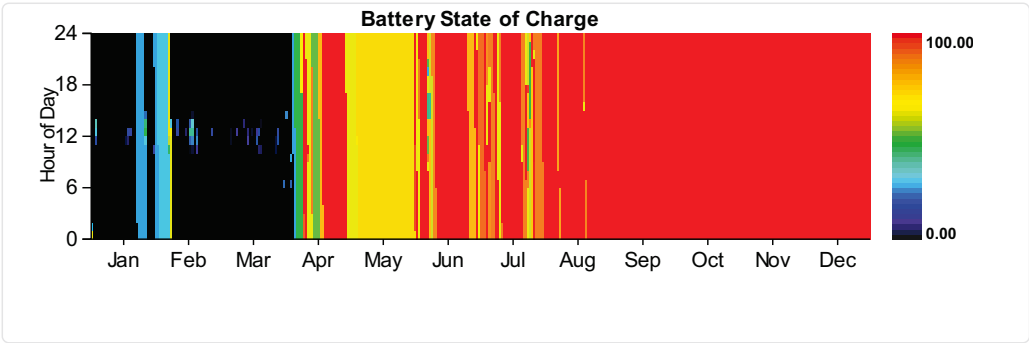
Quantity	Value	Units
Electrical production	89327	kWh/yr
Mean electrical output	551	kW
Min. electrical output	345	kW
Max. electrical output	1380	kW
Fuel consumption	26134	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	257160	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

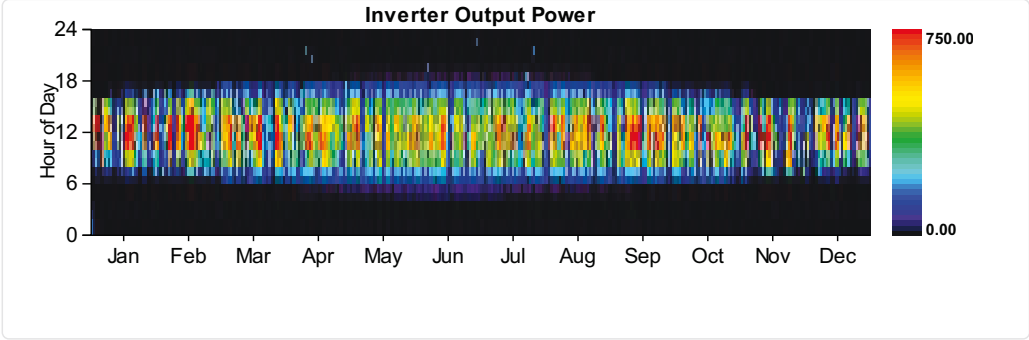
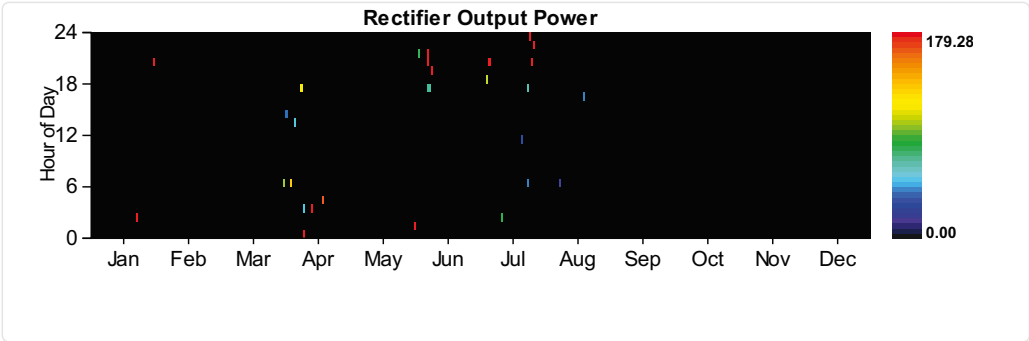
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.184	\$/kWh
Energy in	9945	kWh/yr
Energy out	6961	kWh/yr
Storage depletion	0	kWh/yr
Losses	2983	kWh/yr
Annual throughput	8320	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	179	kW
Capacity factor	18	0	%
Hours of operation	4,390	29	hrs/yr
Energy in	1,286,347	4,001	kWh/yr
Energy out	1,157,711	3,401	kWh/yr
Losses	128,636	600	kWh/yr



Grid

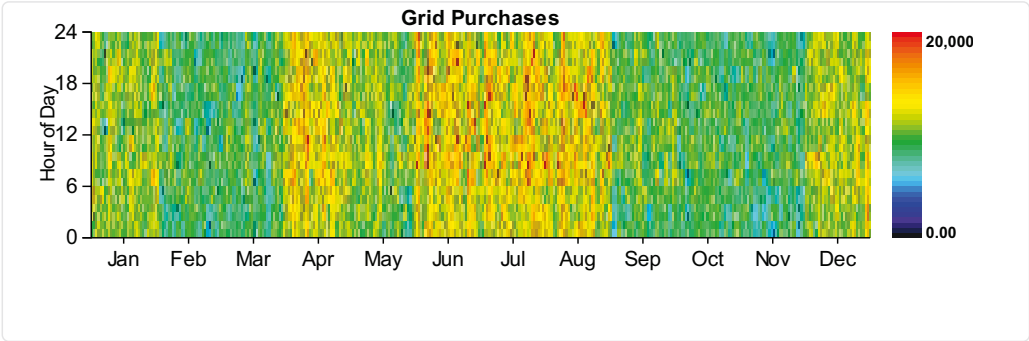
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,247	0	291,953
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	0	0	0	20,000	0	320,000
May	0	0	0	17,657	0	282,514
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,546	0	312,740
Annual	0	0	0	20,000	0	3,466,253

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,130,624	0	8,130,624	0	975,675	0
February	6,023,001	0	6,023,001	0	722,760	0
March	6,708,603	0	6,708,603	0	805,032	0
April	9,346,668	0	9,346,668	0	1,121,600	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,679,151	0	9,679,151	0	1,161,498	0
July	9,859,018	0	9,859,018	0	1,183,082	0
August	9,771,599	0	9,771,599	0	1,172,592	0
September	6,837,491	0	6,837,491	0	820,499	0
October	6,699,125	0	6,699,125	0	803,895	0
November	6,249,541	0	6,249,541	0	749,945	0
December	8,608,349	0	8,608,349	0	1,033,002	0
Annual	95,610,304	0	95,610,304	0	11,473,236	0



Emissions

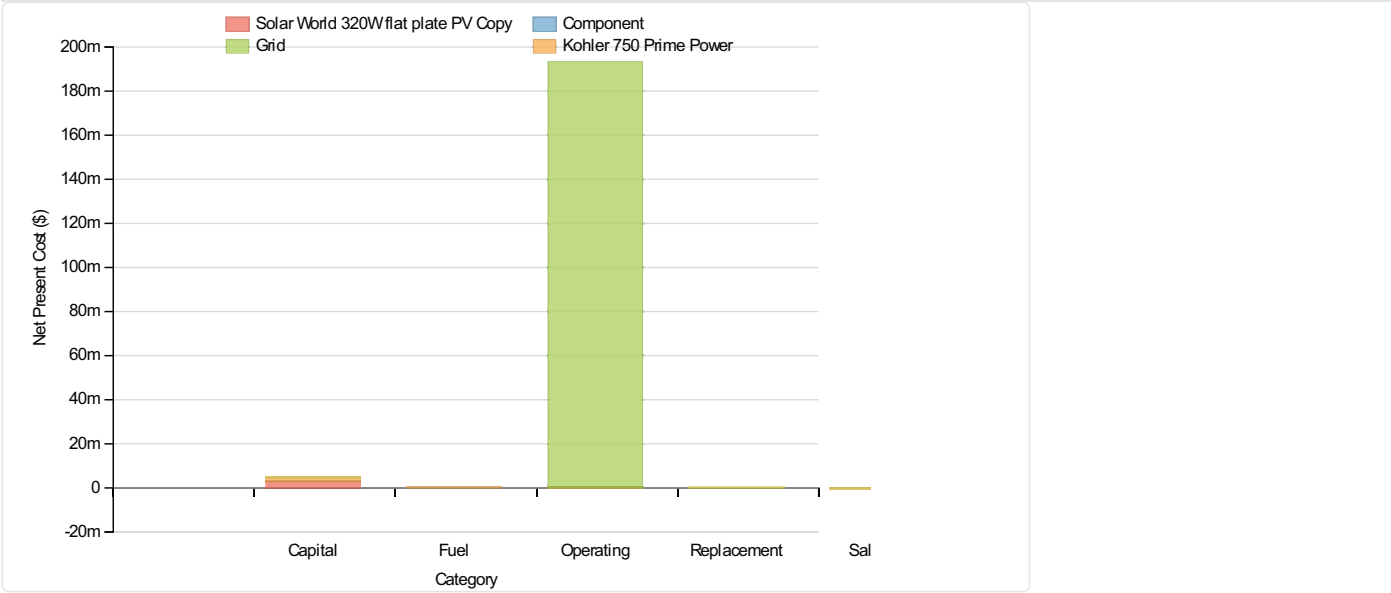
Pollutant	Emissions	Units
Carbon dioxide	60494300	kg/yr
Carbon monoxide	287	kg/yr
Unburned hydrocarbons	33	kg/yr
Particulate matter	8	kg/yr
Sulfur dioxide	262113	kg/yr
Nitrogen oxides	128405	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Generator #2	Kohler 750 Prime Power	2,070	kW
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	198437776	\$
Levelized cost of energy	0.158	\$/kWh

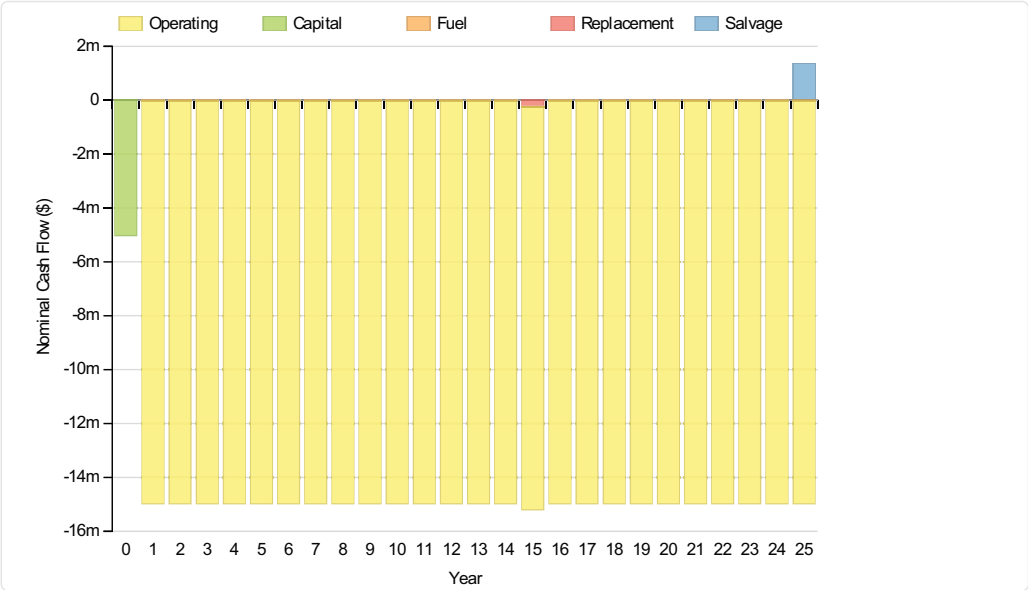
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Kohler 750 Prime Power	1,802,500	0	70,150	364,555	-301,542	1,935,663
Grid	0	0	193,005,632	0	0	193,005,632
Converter	225,000	95,462	0	0	-17,967	302,495
System	5,027,500	95,462	193,269,680	364,555	-319,509	198,437,688

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Kohler 750 Prime Power	139,431	0	5,426	28,200	-23,326	149,731
Grid	0	0	14,929,831	0	0	14,929,831
Converter	17,405	7,384	0	0	-1,390	23,400

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
System	388,899	7,384	14,950,256	28,200	-24,715	15,350,024

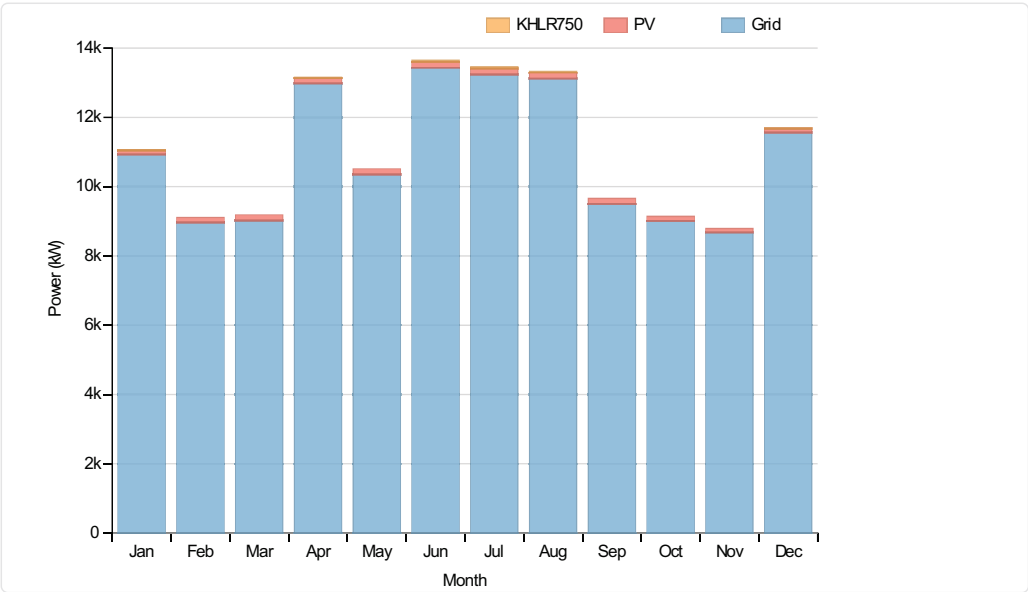


Electrical

Quantity	Value	Units
Excess electricity	5225	kWh/yr
Unmet load	6192	kWh/yr
Capacity shortage	60344	kWh/yr
Renewable fraction	0	

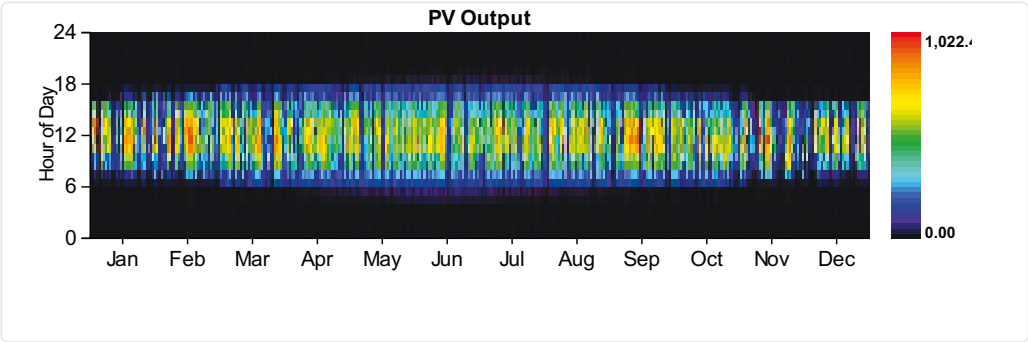
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	121,784	0
Grid Purchases	95,581,120	99
Total	96,991,576	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,857,960	100
DC primary load	0	0
Total	96,857,960	100



PV:Solar World 320W flat plate PV Copy

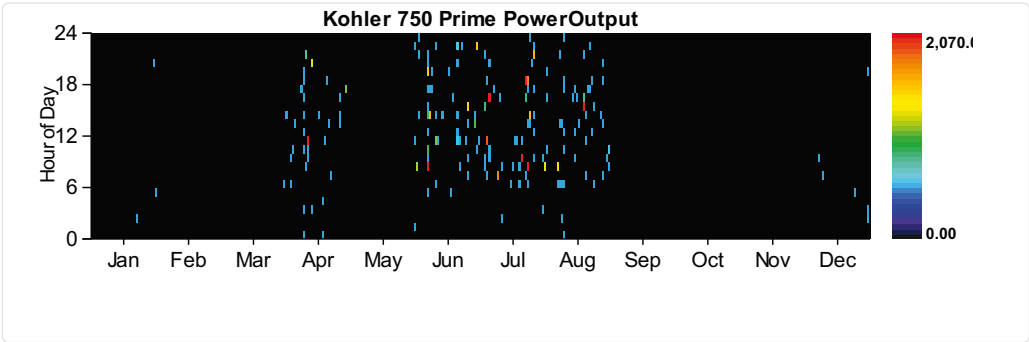
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 750 Prime Power

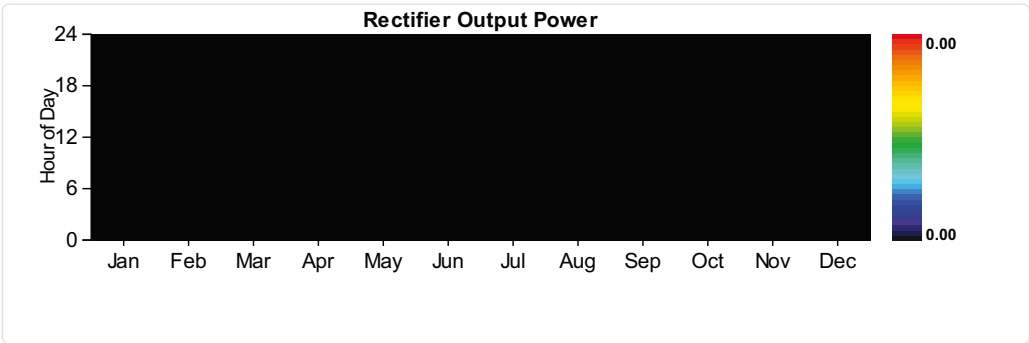
Quantity	Value	Units
Hours of operation	181	hrs/yr
Number of starts	162	starts/yr
Operational life	83	yr
Fixed generation cost	151.69	\$/hr
Marginal generation cost	0.23	\$/kWh

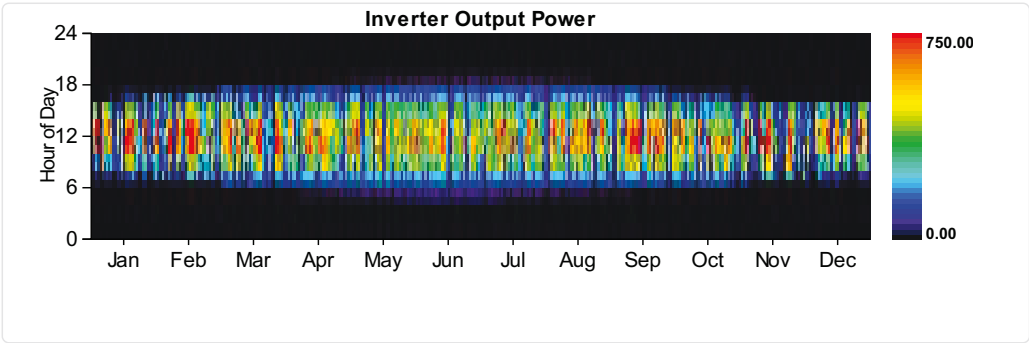
Quantity	Value	Units
Electrical production	121784	kWh/yr
Mean electrical output	673	kW
Min. electrical output	518	kW
Max. electrical output	2070	kW
Fuel consumption	35696	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	351250	kWh/yr
Mean electrical efficiency	35	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	18	0	%
Hours of operation	4,377	0	hrs/yr
Energy in	1,283,450	0	kWh/yr
Energy out	1,155,104	0	kWh/yr
Losses	128,346	0	kWh/yr





Grid

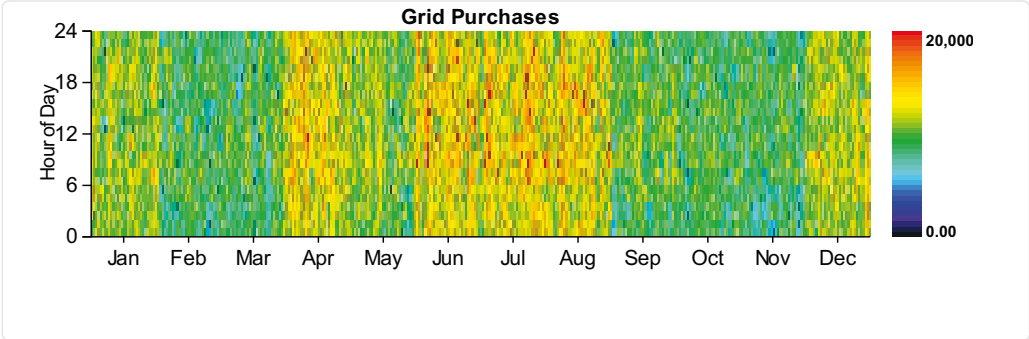
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,035	0	288,563
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062
April	0	0	0	20,000	0	320,000
May	0	0	0	17,657	0	282,514
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,374	0	309,980
Annual	0	0	0	20,000	0	3,460,103

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,130,726	0	8,130,726	0	975,687	0
February	6,023,890	0	6,023,890	0	722,867	0
March	6,708,956	0	6,708,956	0	805,075	0
April	9,340,340	0	9,340,340	0	1,120,841	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,671,285	0	9,671,285	0	1,160,554	0
July	9,852,042	0	9,852,042	0	1,182,245	0
August	9,763,277	0	9,763,277	0	1,171,593	0

September	Energy Purchased (kWh)	6,837,491	Energy Sold (kWh)	0	Net Purchases (kWh)	6,837,491	Peak Demand (kW)	0	Energy Charge (\$)	820,499	Demand Charge (\$)	0
October	Energy Purchased (kWh)	6,699,125	Energy Sold (kWh)	0	Net Purchases (kWh)	6,699,125	Peak Demand (kW)	0	Energy Charge (\$)	803,895	Demand Charge (\$)	0
November	Energy Purchased (kWh)	6,249,541	Energy Sold (kWh)	0	Net Purchases (kWh)	6,249,541	Peak Demand (kW)	0	Energy Charge (\$)	749,945	Demand Charge (\$)	0
December	Energy Purchased (kWh)	8,607,314	Energy Sold (kWh)	0	Net Purchases (kWh)	8,607,314	Peak Demand (kW)	0	Energy Charge (\$)	1,032,878	Demand Charge (\$)	0
Annual	Energy Purchased (kWh)	95,581,120	Energy Sold (kWh)	0	Net Purchases (kWh)	95,581,120	Peak Demand (kW)	0	Energy Charge (\$)	11,469,734	Demand Charge (\$)	0



Emissions

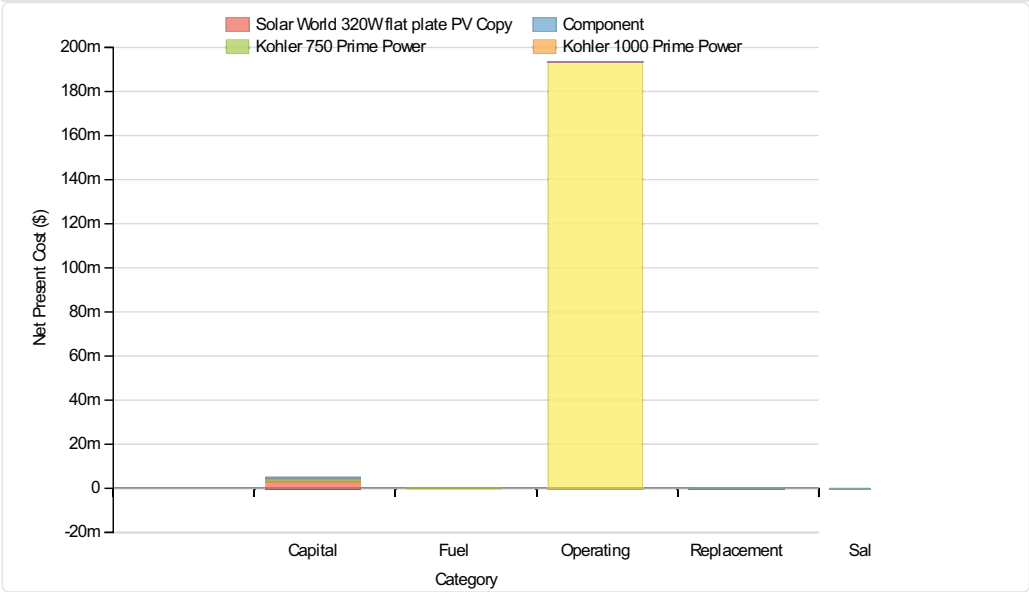
Pollutant	Emissions	Units
Carbon dioxide	60500952	kg/yr
Carbon monoxide	393	kg/yr
Unburned hydrocarbons	45	kg/yr
Particulate matter	11	kg/yr
Sulfur dioxide	262085	kg/yr
Nitrogen oxides	128471	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Generator	Kohler 1000 Prime Power	925	kW
Generator #2	Kohler 750 Prime Power	690	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

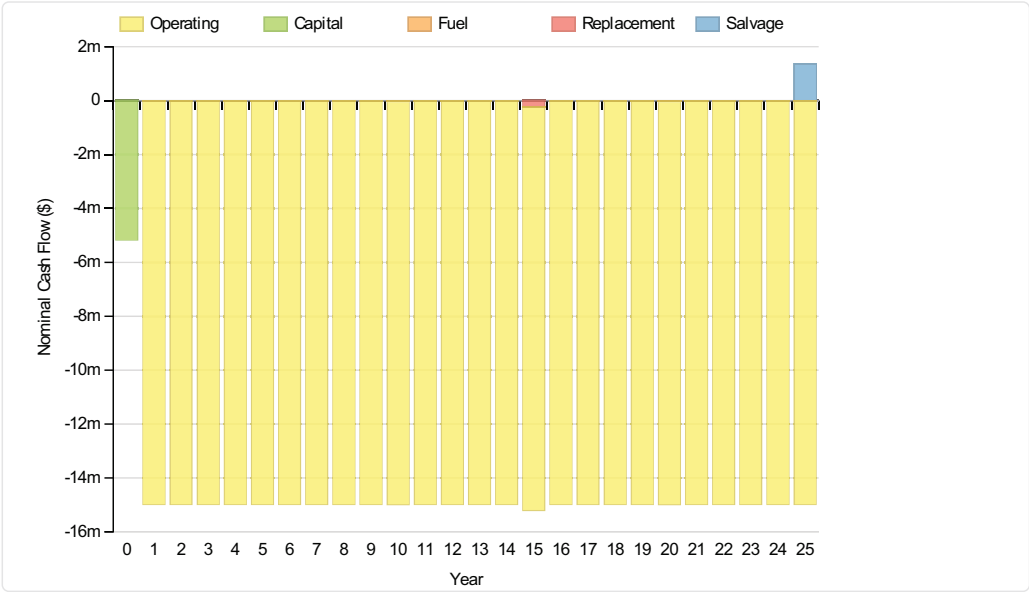
Total net present cost	198614768	\$
Levelized cost of energy	0.159	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Kohler 1000 Prime Power	925,000	0	19,910	140,672	-180,596	904,986
Kohler 750 Prime Power	690,000	0	19,802	109,855	-124,522	695,135
Grid	0	0	193,156,336	0	0	193,156,336
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	5,164,589	102,637	193,420,960	250,527	-324,058	198,614,655

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Kohler 1000 Prime Power	71,553	0	1,540	10,882	-13,970	70,005
Kohler 750 Prime Power	53,375	0	1,532	8,498	-9,632	53,772
Grid	0	0	14,941,488	0	0	14,941,488
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	399,504	7,939	14,961,958	19,379	-25,067	15,363,713



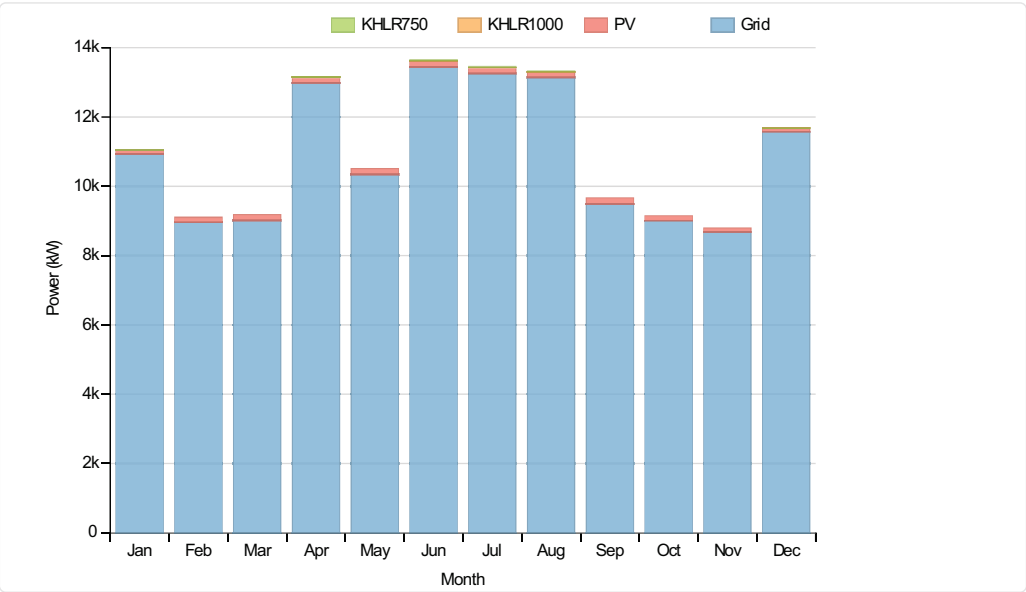
Electrical

Quantity	Value	Units
Excess electricity	2745	kWh/yr
Unmet load	8389	kWh/yr
Capacity shortage	77683	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	47,703	0
Generator	36,734	0
Grid Purchases	95,617,096	99
Total	96,990,208	100

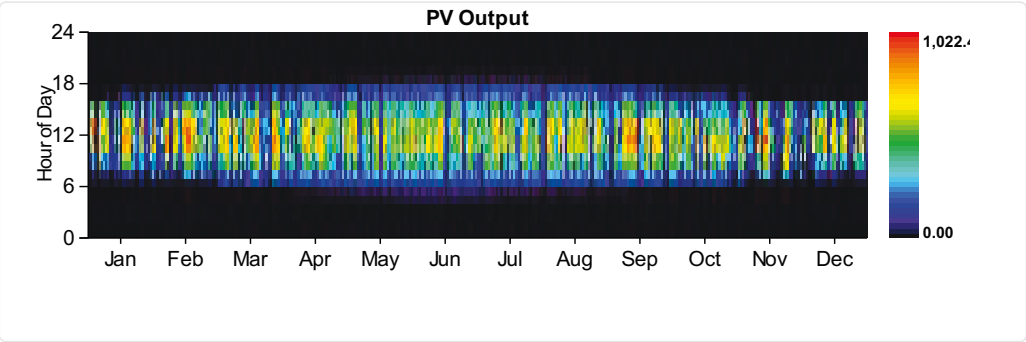
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,855,776	100
DC primary load	0	0

Total	Consumption(kWh/yr)	96,855,776	Fraction (%)	100
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PV:Solar World 320W flat plate PV Copy

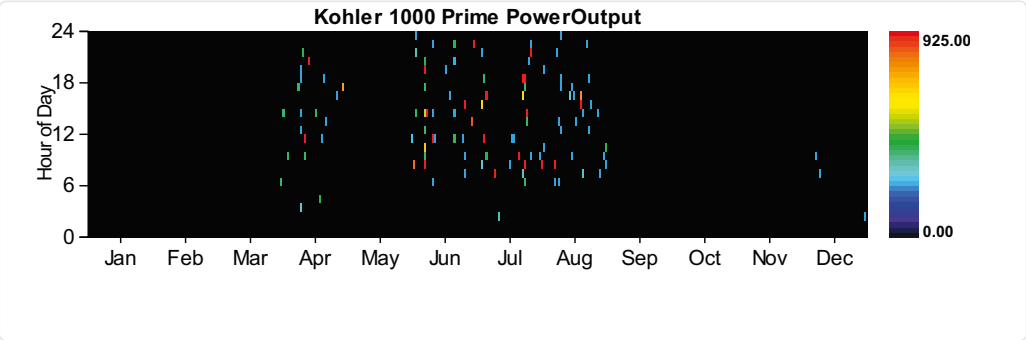
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 1000 Prime Power

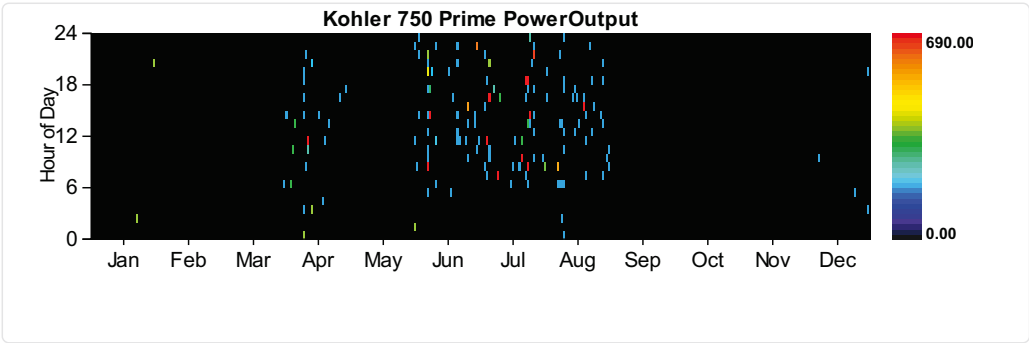
Quantity	Value	Units
Hours of operation	111	hrs/yr
Number of starts	102	starts/yr
Operational life	135	yr

Quantity	Value	Units
Fixed generation cost	76.24	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	47703	kWh/yr
Mean electrical output	430	kW
Min. electrical output	231	kW
Max. electrical output	925	kW
Fuel consumption	13774	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	135538	kWh/yr
Mean electrical efficiency	35	%



Generator:Kohler 750 Prime Power

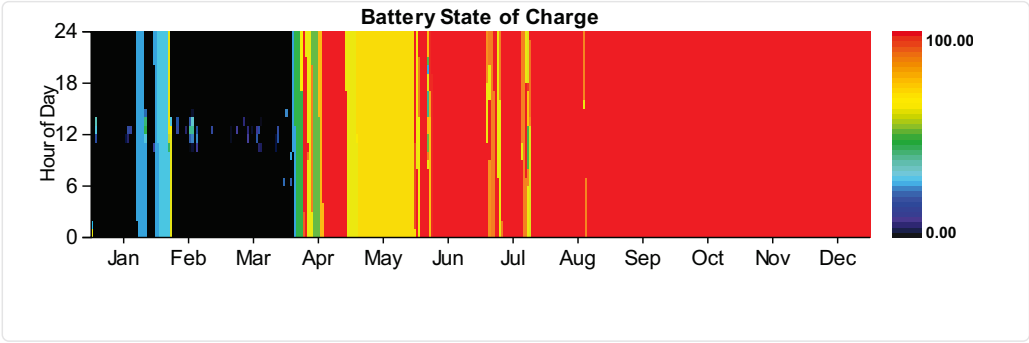
Quantity	Value	Units
Hours of operation	148	hrs/yr
Number of starts	134	starts/yr
Operational life	101	yr
Fixed generation cost	56.87	\$/hr
Marginal generation cost	0.23	\$/kWh
Electrical production	36734	kWh/yr
Mean electrical output	248	kW
Min. electrical output	173	kW
Max. electrical output	690	kW
Fuel consumption	10757	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	105846	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

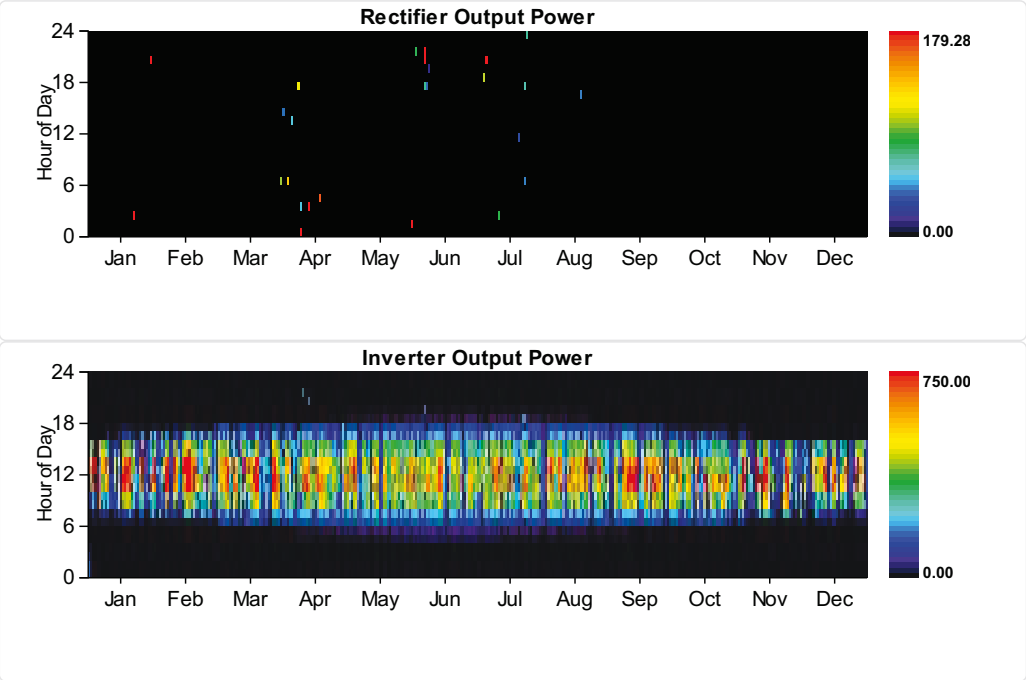
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.176	\$/kWh
Energy in	8596	kWh/yr
Energy out	6017	kWh/yr
Storage depletion	0	kWh/yr
Losses	2579	kWh/yr
Annual throughput	7192	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW

Quantity	Inverter	Rectifier	Units
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	179	kW
Capacity factor	18	0	%
Hours of operation	4,389	26	hrs/yr
Energy in	1,286,067	3,196	kWh/yr
Energy out	1,157,460	2,716	kWh/yr
Losses	128,608	479	kWh/yr



Grid

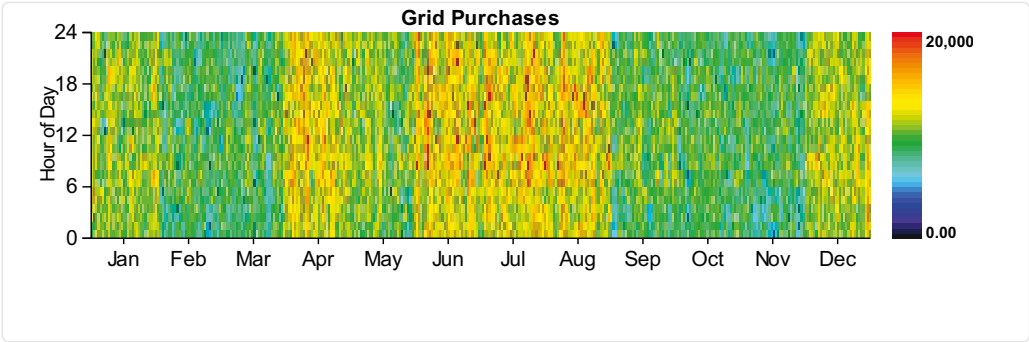
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,380	0	294,083
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062
April	0	0	0	20,000	0	320,000
May	0	0	0	17,657	0	282,514
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286

December	Energy Purchased 0 (kWh)	Energy Sold 0 (kWh)	Net Purchases 0 (kWh)	Peak Demand 19,488 (kW)	Energy Charge 0 (\$)	Demand Charge 311,800 (\$)
Resources.ReportingService_GenerateInputsReport_Month Annual	0	0	0	20,000	0	3,467,443

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,130,969	0	8,130,969	0	975,716	0
February	6,023,001	0	6,023,001	0	722,760	0
March	6,708,603	0	6,708,603	0	805,032	0
April	9,347,970	0	9,347,970	0	1,121,756	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,680,682	0	9,680,682	0	1,161,682	0
July	9,860,954	0	9,860,954	0	1,183,315	0
August	9,772,604	0	9,772,604	0	1,172,713	0
September	6,837,491	0	6,837,491	0	820,499	0
October	6,699,125	0	6,699,125	0	803,895	0
November	6,249,541	0	6,249,541	0	749,945	0
December	8,609,035	0	8,609,035	0	1,033,084	0
Annual	95,617,096	0	95,617,096	0	11,474,052	0



Emissions

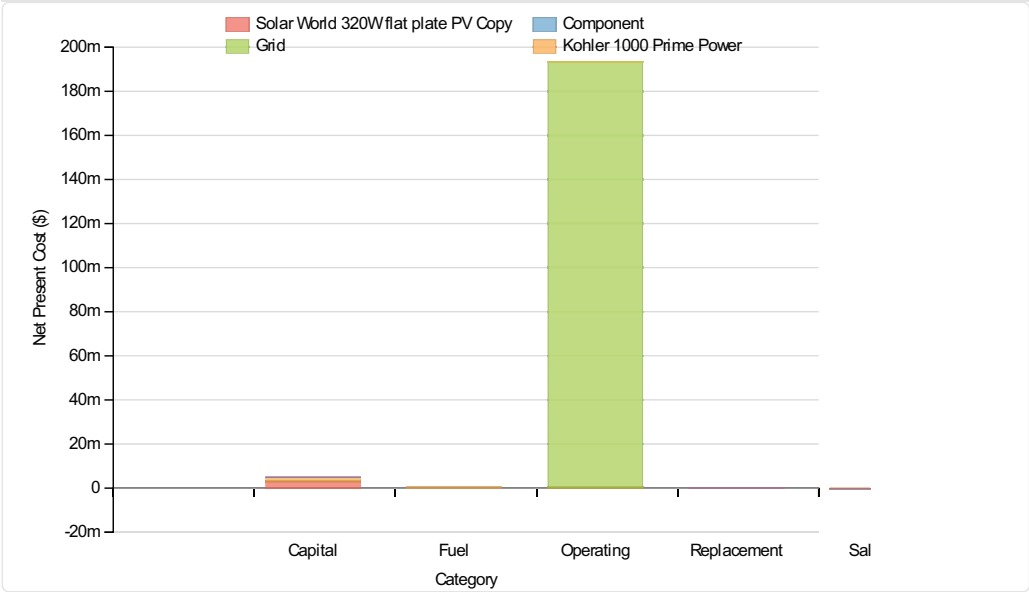
Pollutant	Emissions	Units
Carbon dioxide	60494388	kg/yr
Carbon monoxide	270	kg/yr
Unburned hydrocarbons	31	kg/yr
Particulate matter	8	kg/yr
Sulfur dioxide	262123	kg/yr
Nitrogen oxides	128397	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Generator	Kohler 1000 Prime Power	1,850	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	20,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	198667040	\$
Levelized cost of energy	0.159	\$/kWh

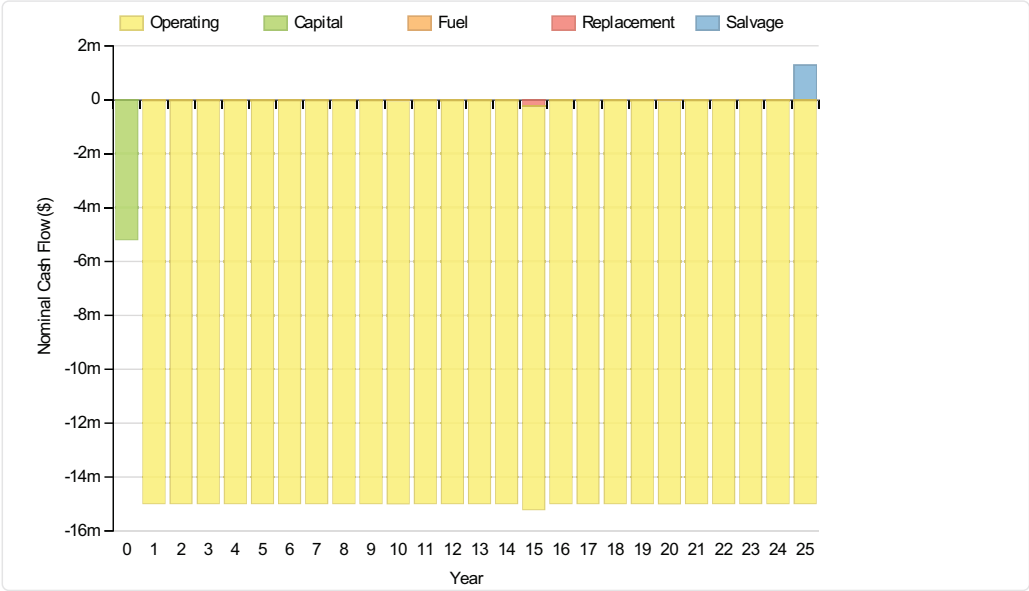
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Kohler 1000 Prime Power	1,637,500	0	56,336	318,225	-286,361	1,725,700
Grid	0	0	193,083,040	0	0	193,083,040
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	5,187,089	102,637	193,364,304	318,225	-305,301	198,666,954

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Kohler 1000 Prime Power	126,668	0	4,358	24,616	-22,151	133,491

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	14,935,819	0	0	14,935,819
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400
System	401,244	7,939	14,957,576	24,616	-23,616	15,367,759

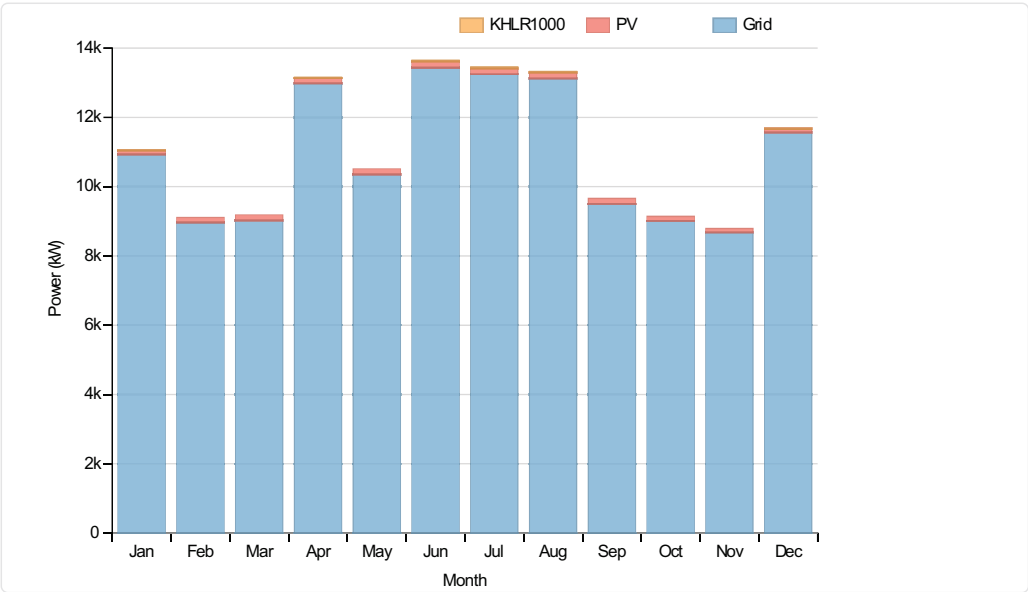


Electrical

Quantity	Value	Units
Excess electricity	2745	kWh/yr
Unmet load	6573	kWh/yr
Capacity shortage	63347	kWh/yr
Renewable fraction	0	

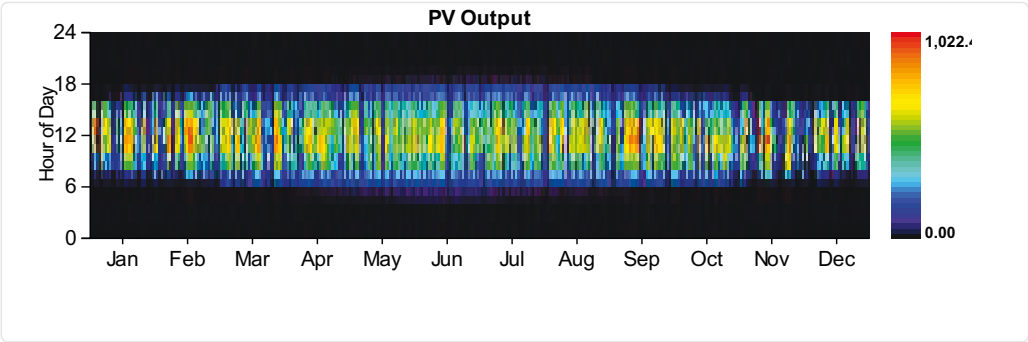
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Generator	107,688	0
Grid Purchases	95,595,440	99
Total	96,991,800	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,857,576	100
DC primary load	0	0
Total	96,857,576	100



PV:Solar World 320W flat plate PV Copy

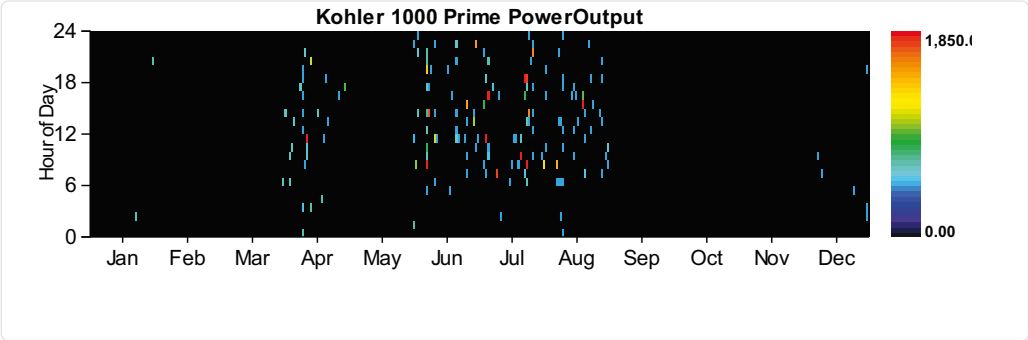
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 1000 Prime Power

Quantity	Value	Units
Hours of operation	162	hrs/yr
Number of starts	146	starts/yr
Operational life	93	yr
Fixed generation cost	137.46	\$/hr
Marginal generation cost	0.23	\$/kWh

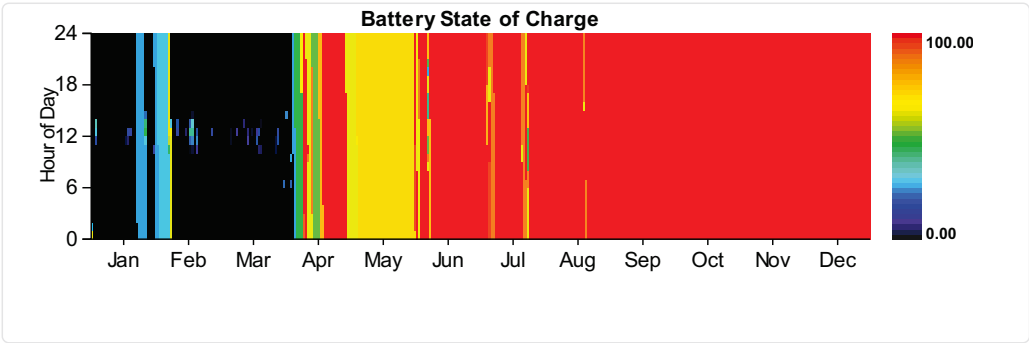
Quantity	Value	Units
Electrical production	107688	kWh/yr
Mean electrical output	665	kW
Min. electrical output	463	kW
Max. electrical output	1850	kW
Fuel consumption	31160	L/yr
Specific fuel consumption	0.29	L/kWh
Fuel energy input	306611	kWh/yr
Mean electrical efficiency	35	%



Battery:GS200 flow

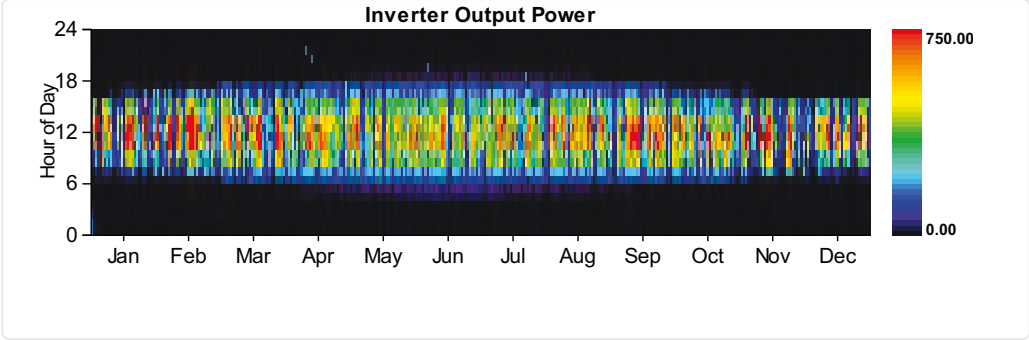
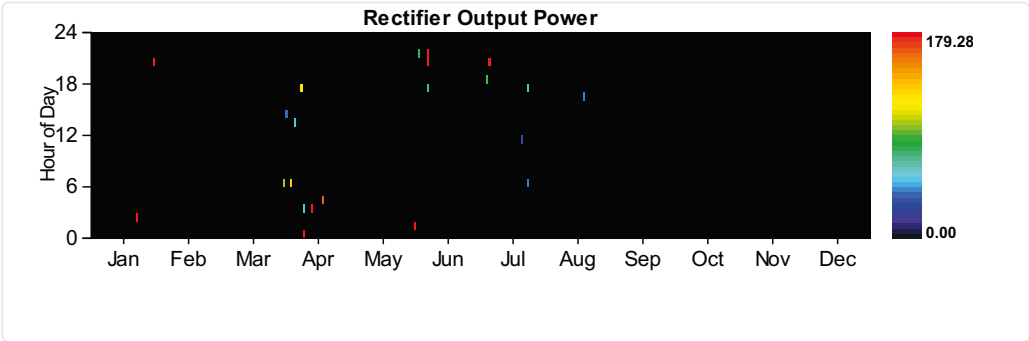
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.172	\$/kWh
Energy in	7974	kWh/yr
Energy out	5582	kWh/yr
Storage depletion	0	kWh/yr
Losses	2392	kWh/yr
Annual throughput	6671	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	179	kW
Capacity factor	18	0	%
Hours of operation	4,390	22	hrs/yr
Energy in	1,286,038	2,942	kWh/yr
Energy out	1,157,434	2,501	kWh/yr
Losses	128,605	441	kWh/yr



Grid

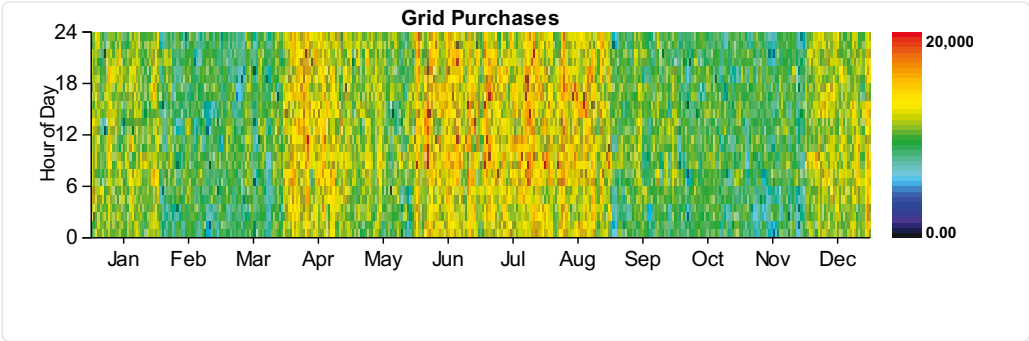
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,247	0	291,953
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
April	0	0	0	20,000	0	320,000
May	0	0	0	17,657	0	282,514
June	0	0	0	20,000	0	320,000
July	0	0	0	20,000	0	320,000
August	0	0	0	20,000	0	320,000
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,429	0	310,860
Annual	0	0	0	20,000	0	3,464,373

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,130,389	0	8,130,389	0	975,647	0
February	6,023,001	0	6,023,001	0	722,760	0
March	6,708,603	0	6,708,603	0	805,032	0
April	9,343,847	0	9,343,847	0	1,121,262	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,675,577	0	9,675,577	0	1,161,069	0
July	9,855,724	0	9,855,724	0	1,182,687	0
August	9,767,369	0	9,767,369	0	1,172,084	0
September	6,837,491	0	6,837,491	0	820,499	0
October	6,699,125	0	6,699,125	0	803,895	0
November	6,249,541	0	6,249,541	0	749,945	0
December	8,607,644	0	8,607,644	0	1,032,917	0
Annual	95,595,440	0	95,595,440	0	11,471,452	0



Emissions

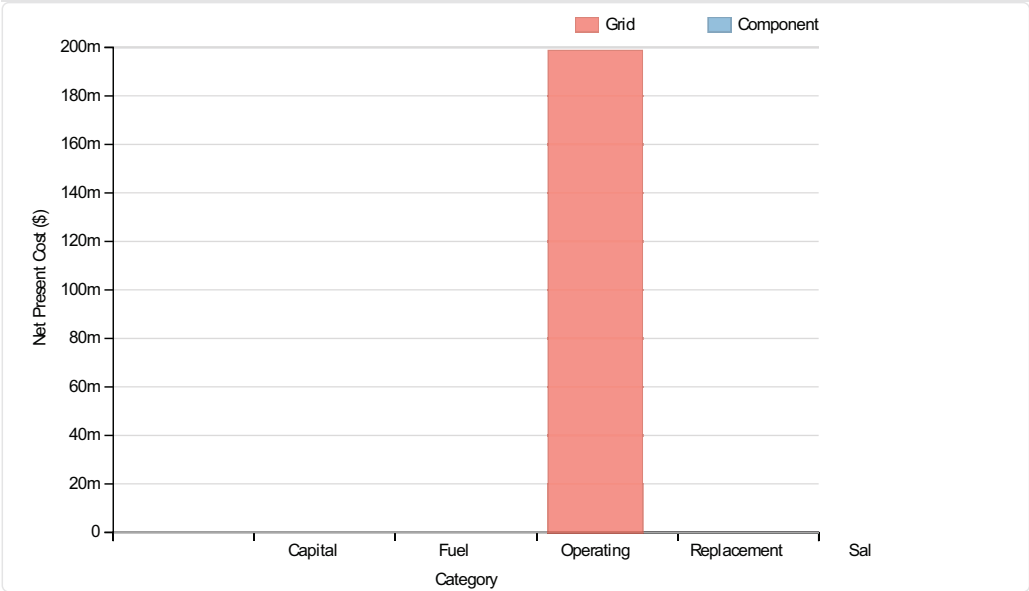
Pollutant	Emissions	Units
Carbon dioxide	60498100	kg/yr
Carbon monoxide	343	kg/yr
Unburned hydrocarbons	39	kg/yr
Particulate matter	10	kg/yr
Sulfur dioxide	262100	kg/yr
Nitrogen oxides	128441	kg/yr

System Report

System architecture

Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

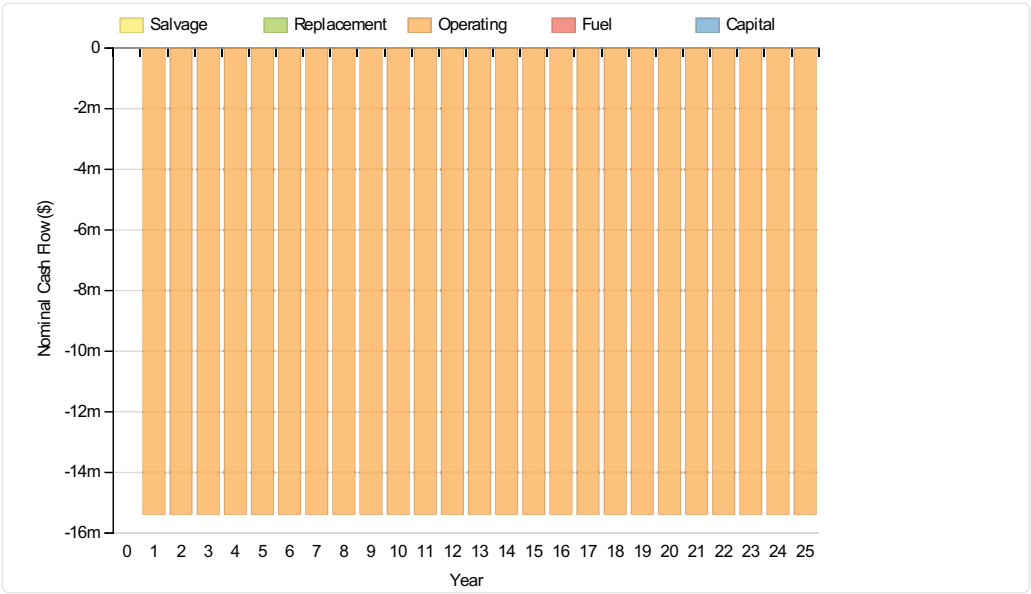
Total net present cost	198776640	\$
Levelized cost of energy	0.159	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	198,776,528	0	0	198,776,528
System	0	0	198,776,528	0	0	198,776,528

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	15,376,235	0	0	15,376,235
System	0	0	15,376,235	0	0	15,376,235

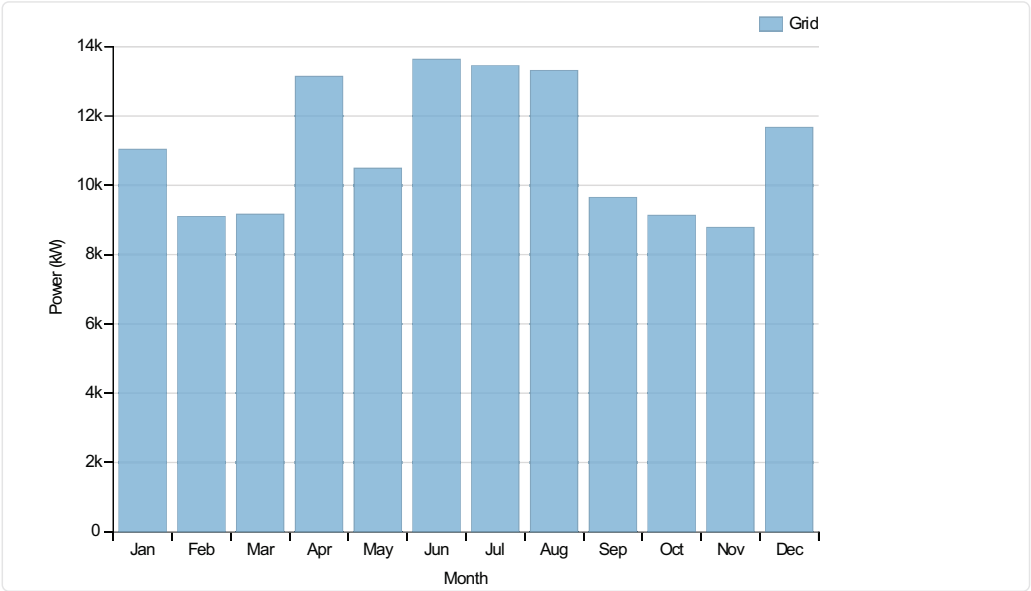


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	4252	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Grid Purchases	96,864,192	100
Total	96,864,192	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



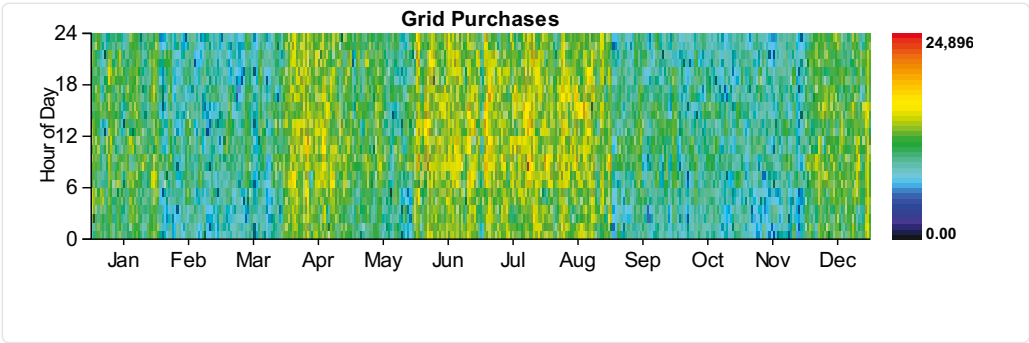
Grid

Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,553	0	296,843
February	0	0	0	17,561	0	280,978
March	0	0	0	17,425	0	278,807
April	0	0	0	23,104	0	369,666
May	0	0	0	17,869	0	285,902
June	0	0	0	24,046	0	384,739
July	0	0	0	24,897	0	398,345
August	0	0	0	22,671	0	362,729
September	0	0	0	16,926	0	270,820
October	0	0	0	14,895	0	238,325
November	0	0	0	16,518	0	264,286
December	0	0	0	20,069	0	321,098
Annual	0	0	0	24,897	0	3,752,539

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,209,736	0	8,209,736	0	985,168	0
February	6,110,456	0	6,110,456	0	733,255	0
March	6,816,916	0	6,816,916	0	818,030	0
April	9,462,522	0	9,462,522	0	1,135,503	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,816,466	0	9,816,466	0	1,177,976	0
July	10,003,713	0	10,003,713	0	1,200,446	0
August	9,901,865	0	9,901,865	0	1,188,224	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,680,090	0	8,680,090	0	1,041,611	0
Annual	96,864,192	0	96,864,192	0	11,623,705	0



Emissions

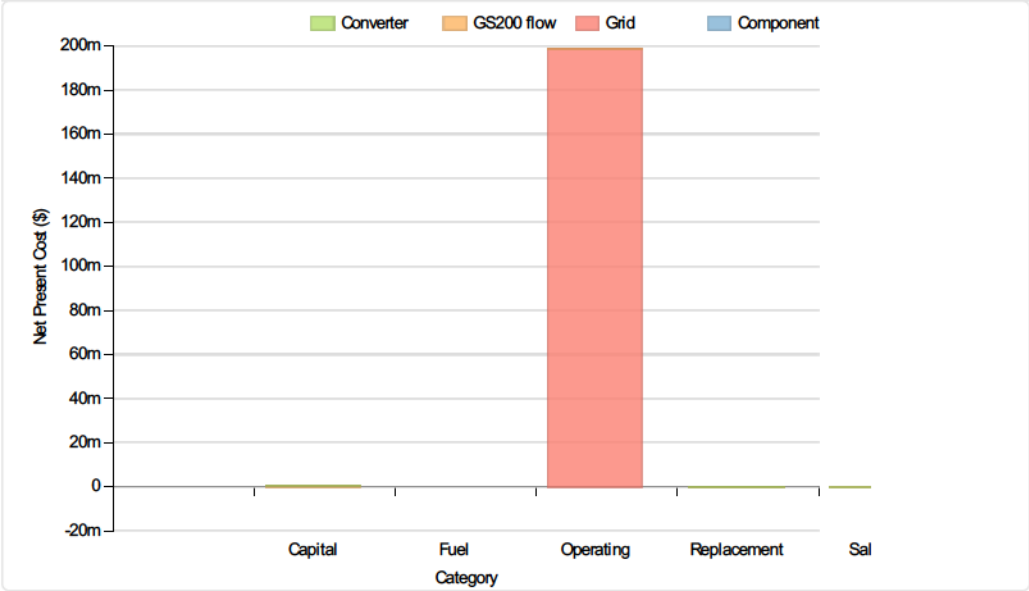
Pollutant	Emissions	Units
Carbon dioxide	61218168	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	265408	kg/yr
Nitrogen oxides	129798	kg/yr

System Report

System architecture

Battery	GS200 flow	1	strings
Converter	System Converter	250	kW
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

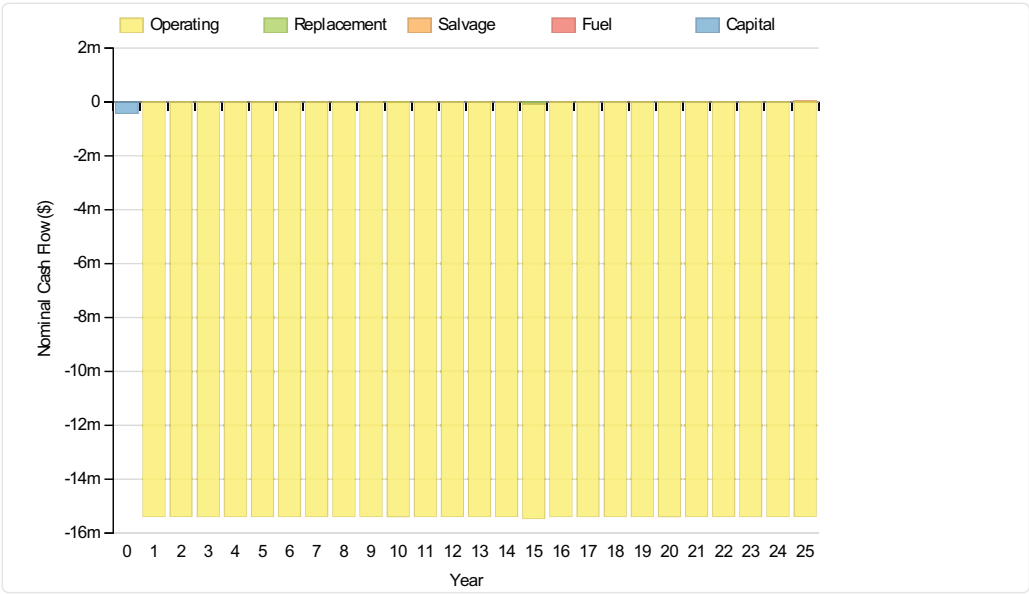
Total net present cost	199238592	\$
Levelized cost of energy	0.159	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	198,775,856	0	0	198,775,856
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	75,000	31,821	0	0	-5,989	100,832
System	399,589	38,996	198,806,896	0	-6,962	199,238,519

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Grid	0	0	15,376,183	0	0	15,376,183
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	5,802	2,462	0	0	-463	7,800
System	30,910	3,017	15,378,584	0	-539	15,411,972

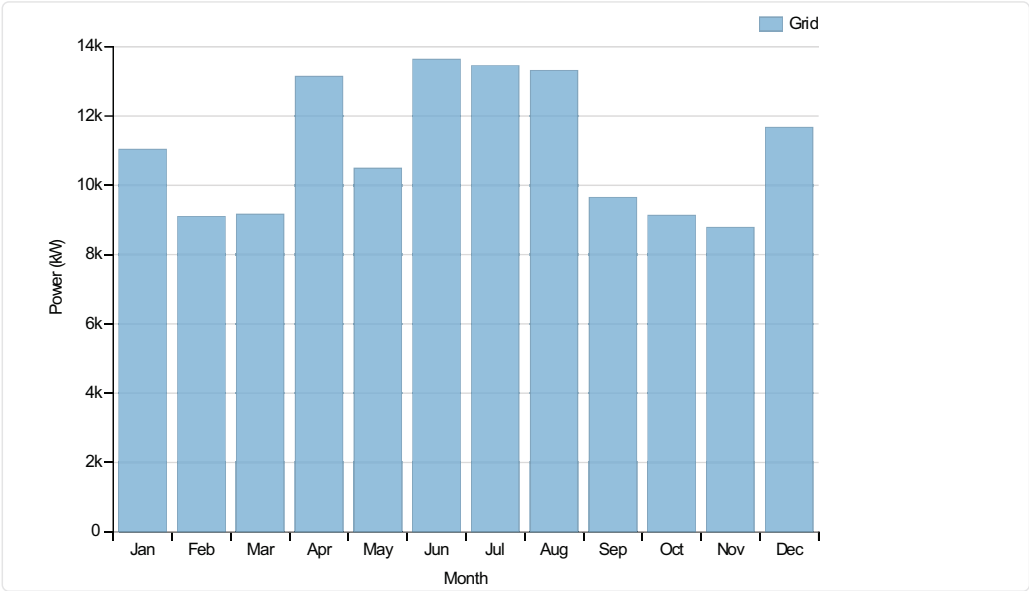


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	4252	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Grid Purchases	96,863,744	100
Total	96,863,744	100

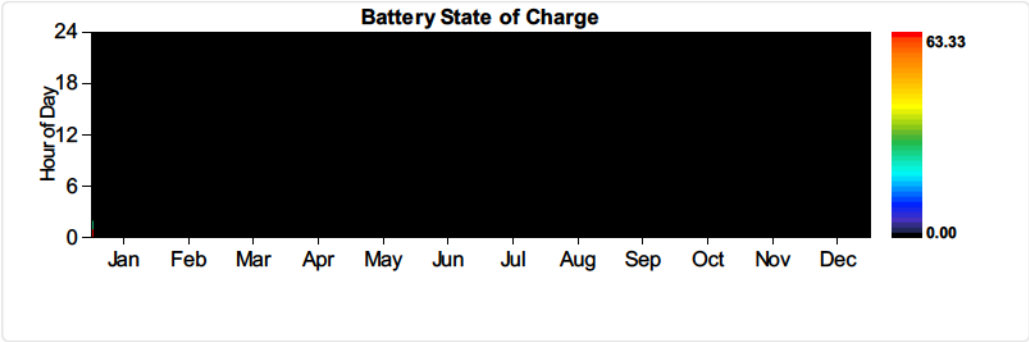
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

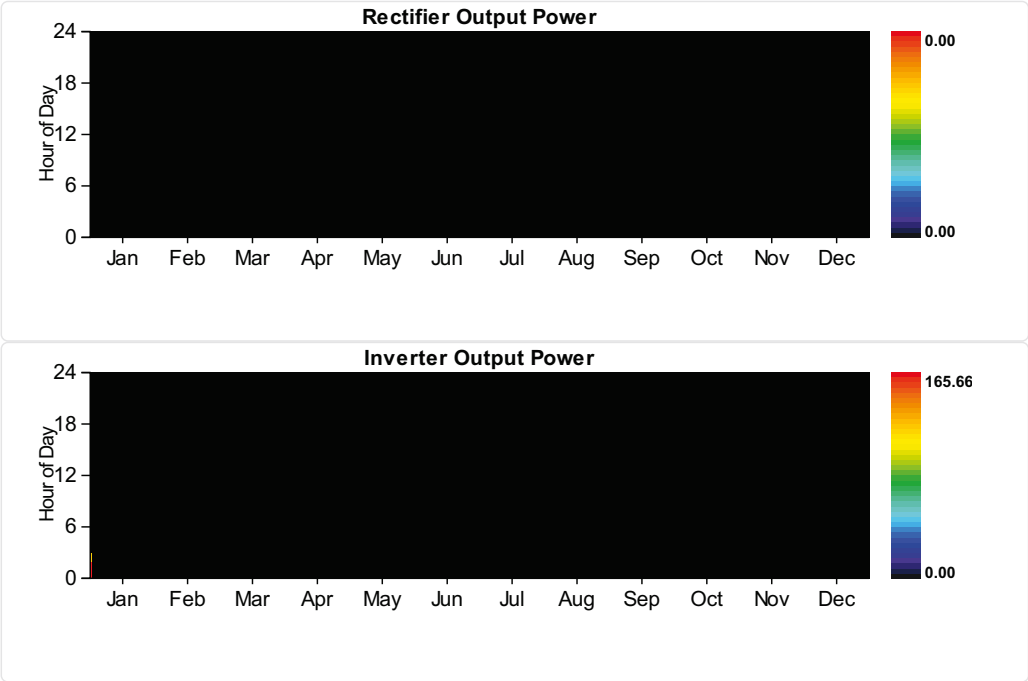
Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	0	kWh/yr
Energy out	502	kWh/yr
Storage depletion	600	kWh/yr
Losses	-1102	kWh/yr
Annual throughput	600	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	250	225	kW
Mean output	0	0	kW
Minimum output	0	0	kW
Maximum output	166	0	kW
Capacity factor	0	0	%
Hours of operation	3	0	hrs/yr
Energy in	502	0	kWh/yr

Energy Out	Inverter	452	Rectifier	0	Units
Losses		50		0	kWh/yr



Grid

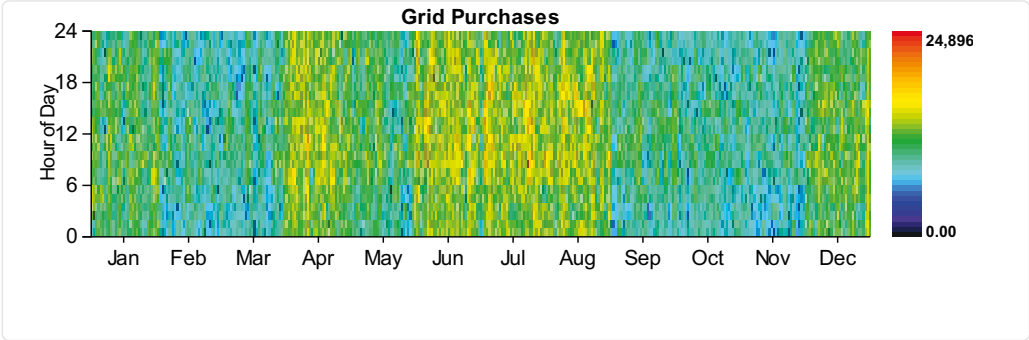
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,553	0	296,843
February	0	0	0	17,561	0	280,978
March	0	0	0	17,425	0	278,807
April	0	0	0	23,104	0	369,666
May	0	0	0	17,869	0	285,902
June	0	0	0	24,046	0	384,739
July	0	0	0	24,897	0	398,345
August	0	0	0	22,671	0	362,729
September	0	0	0	16,926	0	270,820
October	0	0	0	14,895	0	238,325
November	0	0	0	16,518	0	264,286
December	0	0	0	20,069	0	321,098
Annual	0	0	0	24,897	0	3,752,539

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)

January	8,209,284	0	8,209,284	0	985,114	0
February	6,110,456	0	6,110,456	0	723,255	0
Resources.ReportingService_GenerateInputsReport_Month	(kWh)	(kWh)	(kWh)	(kW)	Charge (\$)	Demand Charge (\$)
March	6,816,916	0	6,816,916	0	818,030	0
April	9,462,522	0	9,462,522	0	1,135,503	0
May	7,805,883	0	7,805,883	0	936,706	0
June	9,816,466	0	9,816,466	0	1,177,976	0
July	10,003,713	0	10,003,713	0	1,200,446	0
August	9,901,865	0	9,901,865	0	1,188,224	0
September	6,943,139	0	6,943,139	0	833,177	0
October	6,792,313	0	6,792,313	0	815,078	0
November	6,321,105	0	6,321,105	0	758,533	0
December	8,680,090	0	8,680,090	0	1,041,611	0
Annual	96,863,744	0	96,863,744	0	11,623,651	0



Emissions

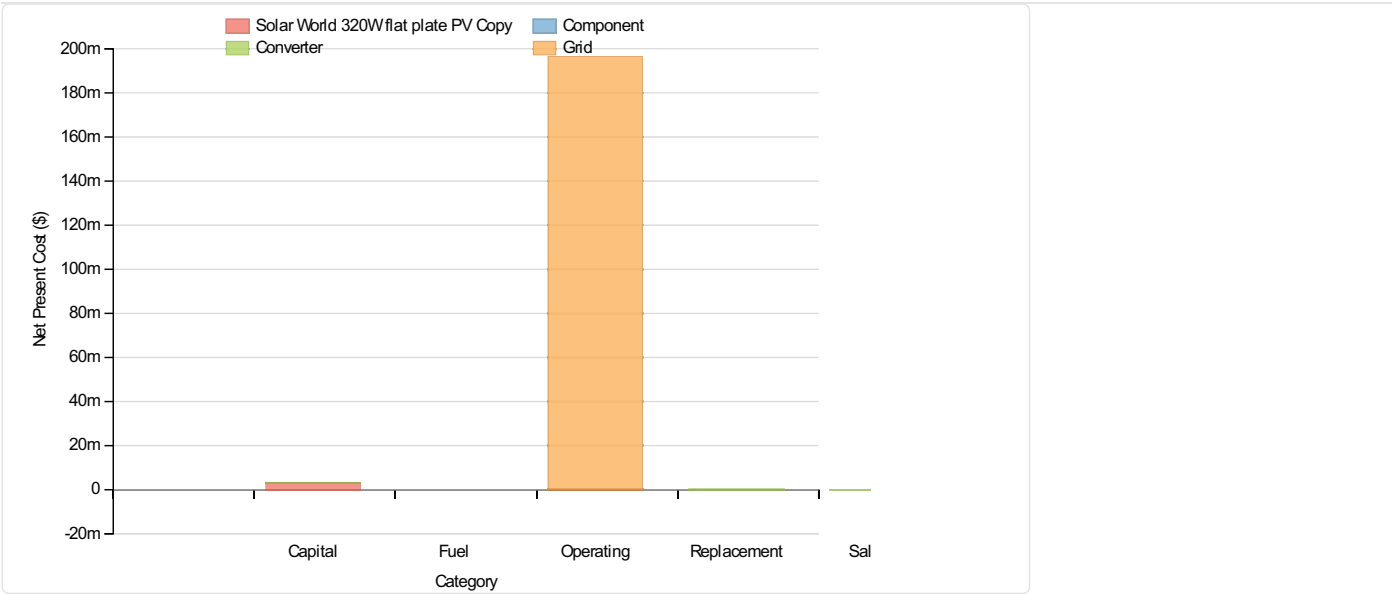
Pollutant	Emissions	Units
Carbon dioxide	61217888	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	265407	kg/yr
Nitrogen oxides	129797	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Converter	System Converter	750	kW
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

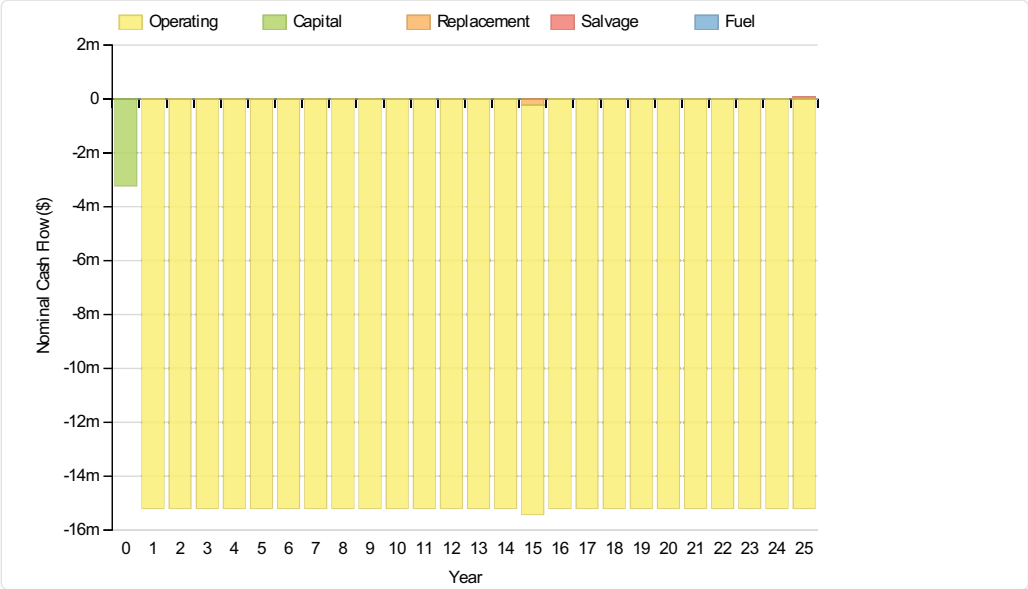
Total net present cost	199704592	\$
Levelized cost of energy	0.159	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Grid	0	0	196,208,096	0	0	196,208,096
Converter	225,000	95,462	0	0	-17,967	302,495
System	3,225,000	95,462	196,401,968	0	-17,967	199,704,463

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Grid	0	0	15,177,555	0	0	15,177,555
Converter	17,405	7,384	0	0	-1,390	23,400
System	249,468	7,384	15,192,552	0	-1,390	15,448,015

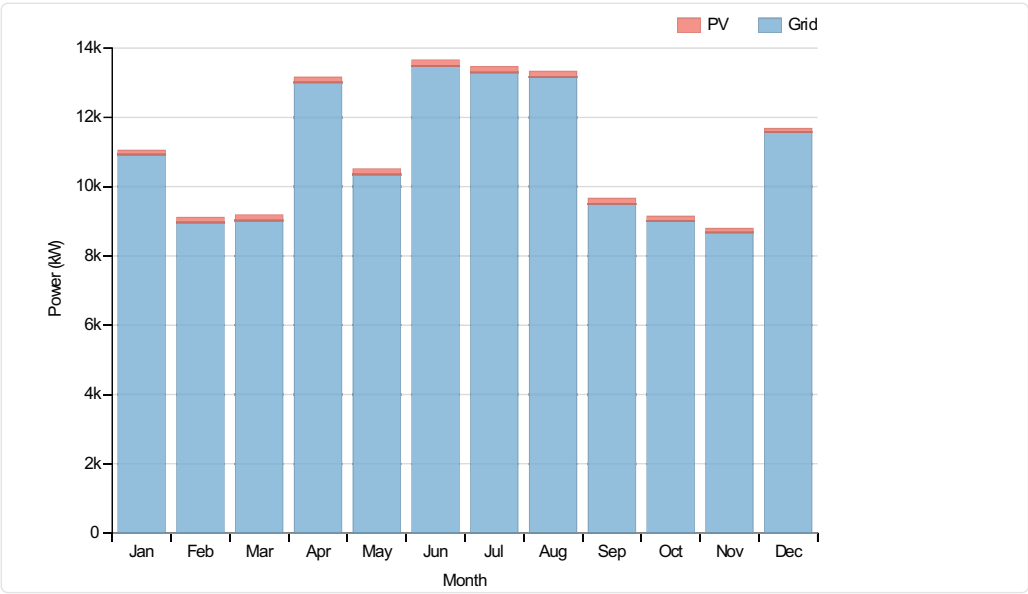


Electrical

Quantity	Value	Units
Excess electricity	5225	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	3418	kWh/yr
Renewable fraction	0	

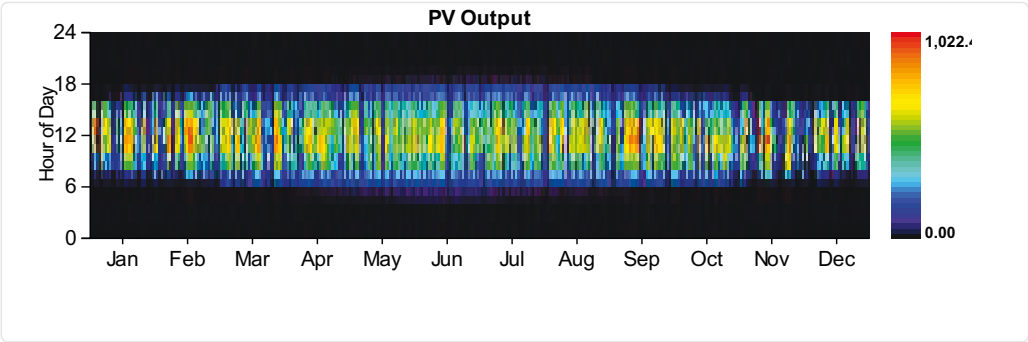
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Grid Purchases	95,709,088	99
Total	96,997,760	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



PV:Solar World 320W flat plate PV Copy

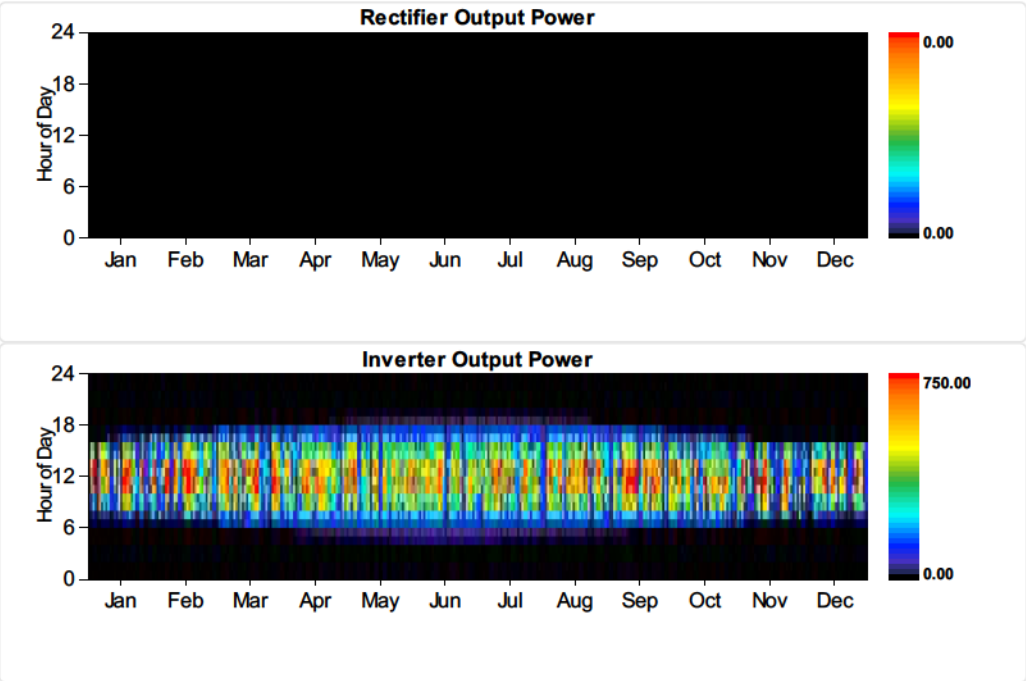
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	18	0	%

Quantity	Inverter	Rectifier	Units
Hours of Operation	4,377	0	hrs/yr
Energy in	1,283,450	0	kWh/yr
Energy out	1,155,104	0	kWh/yr
Losses	128,346	0	kWh/yr



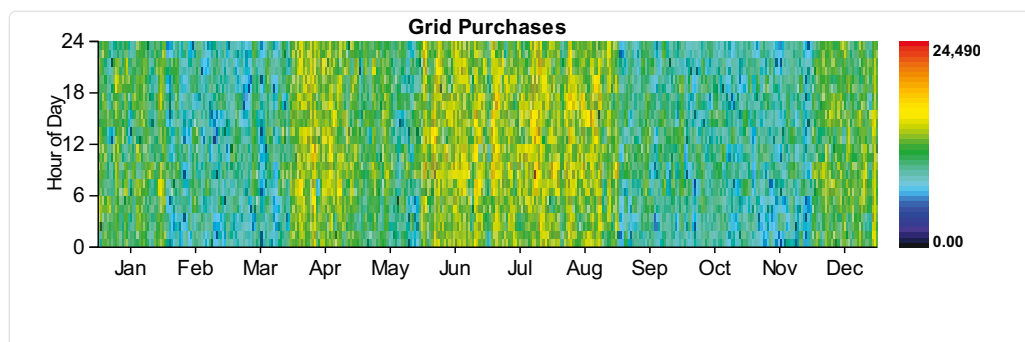
Grid

Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,553	0	296,843
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062
April	0	0	0	22,535	0	360,567
May	0	0	0	17,657	0	282,514
June	0	0	0	23,894	0	382,297
July	0	0	0	24,491	0	391,852
August	0	0	0	22,568	0	361,094
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,891	0	318,260
Annual	0	0	0	24,491	0	3,692,473

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,132,278	0	8,132,278	0	975,873	0
February	6,023,890	0	6,023,890	0	722,867	0
March	6,708,956	0	6,708,956	0	805,075	0
April	9,361,015	0	9,361,015	0	1,123,322	0
May	7,697,129	0	7,697,129	0	923,655	0
June	9,706,376	0	9,706,376	0	1,164,765	0
July	9,891,672	0	9,891,672	0	1,187,001	0
August	9,791,200	0	9,791,200	0	1,174,944	0
September	6,837,491	0	6,837,491	0	820,499	0
October	6,699,125	0	6,699,125	0	803,895	0
November	6,249,541	0	6,249,541	0	749,945	0
December	8,610,419	0	8,610,419	0	1,033,250	0
Annual	95,709,088	0	95,709,088	0	11,485,090	0



Emissions

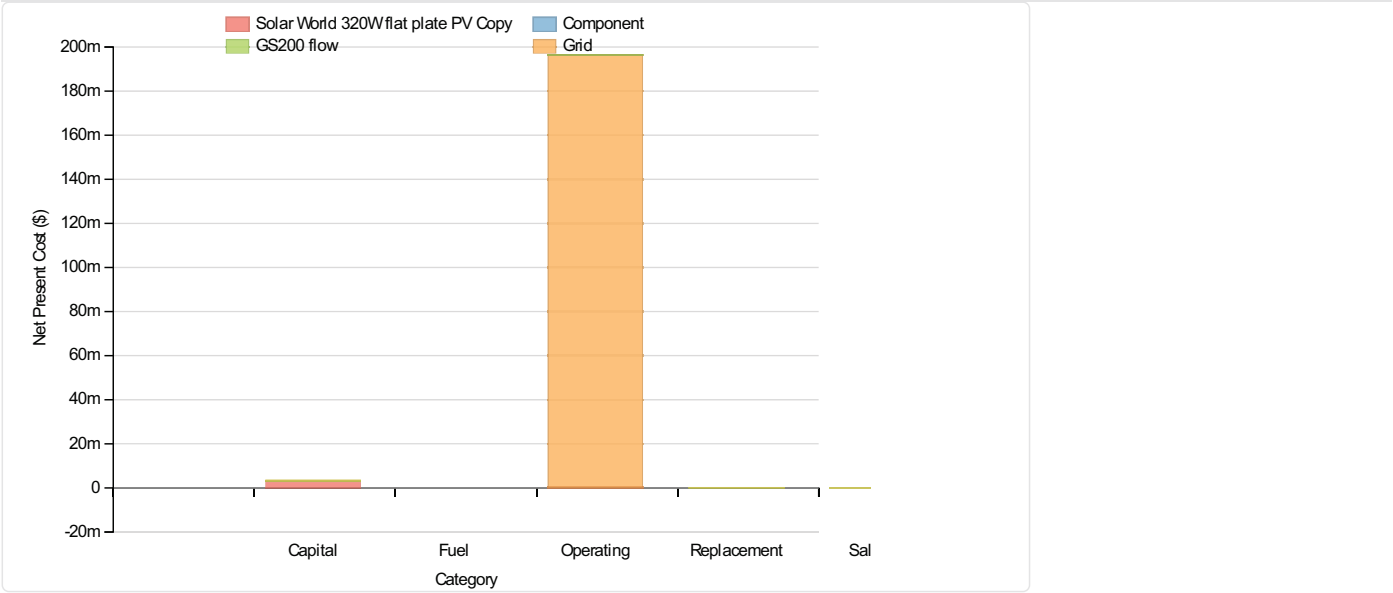
Pollutant	Emissions	Units
Carbon dioxide	60488144	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	262243	kg/yr
Nitrogen oxides	128250	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	1,000	kW
Battery	GS200 flow	1	strings
Converter	System Converter	750	kW
Grid	Grid	25,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	200060624	\$
Levelized cost of energy	0.160	\$/kWh

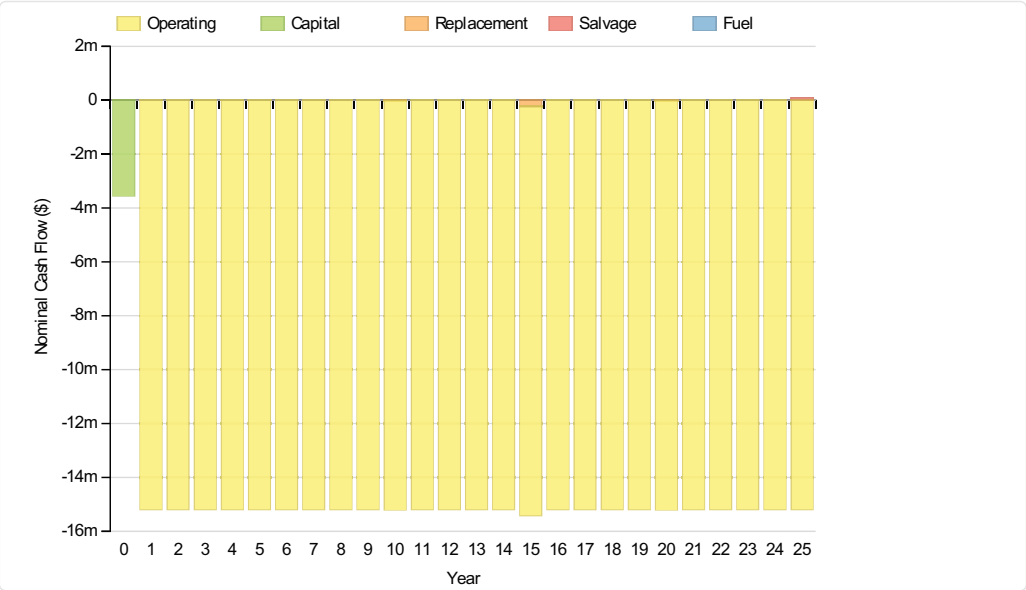
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	3,000,000	0	193,913	0	0	3,193,913
Grid	0	0	196,202,320	0	0	196,202,320
GS200 flow	324,589	7,176	31,026	0	-973	361,818
Converter	225,000	95,462	0	0	-17,967	302,495
System	3,549,589	102,637	196,427,248	0	-18,940	200,060,534

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	232,063	0	15,000	0	0	247,063
Grid	0	0	15,177,109	0	0	15,177,109
GS200 flow	25,108	555	2,400	0	-75	27,988
Converter	17,405	7,384	0	0	-1,390	23,400

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
System	274,576	7,939	15,194,508	0	-1,465	15,475,558

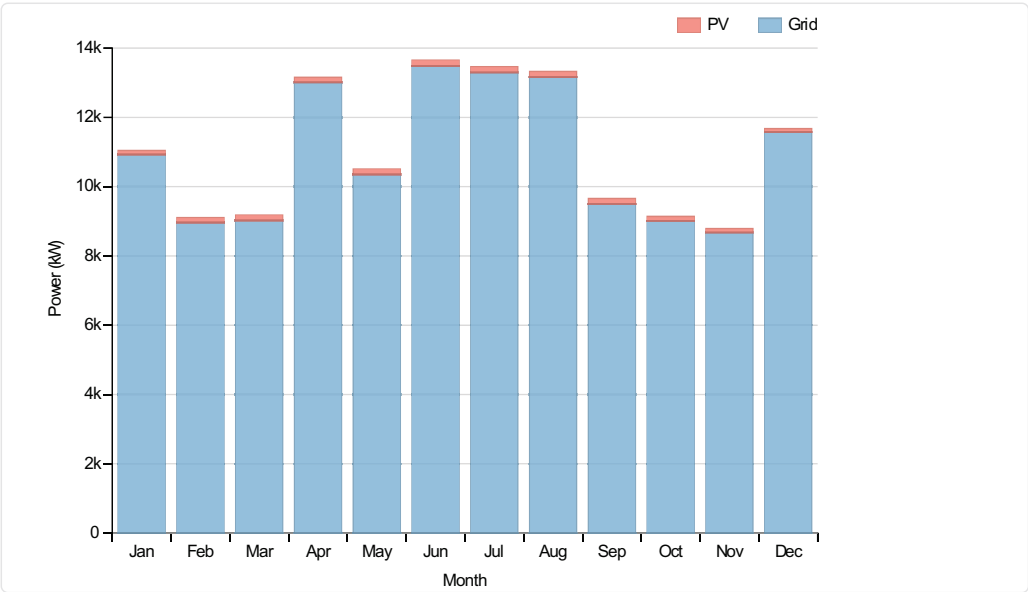


Electrical

Quantity	Value	Units
Excess electricity	10	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	3418	kWh/yr
Renewable fraction	0	

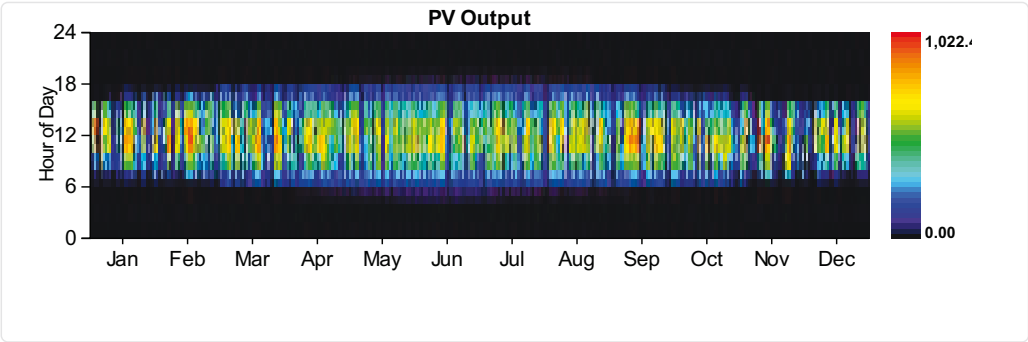
Component	Production(kWh/yr)	Fraction (%)
PV	1,288,675	1
Grid Purchases	95,705,352	99
Total	96,994,024	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



PV:Solar World 320W flat plate PV Copy

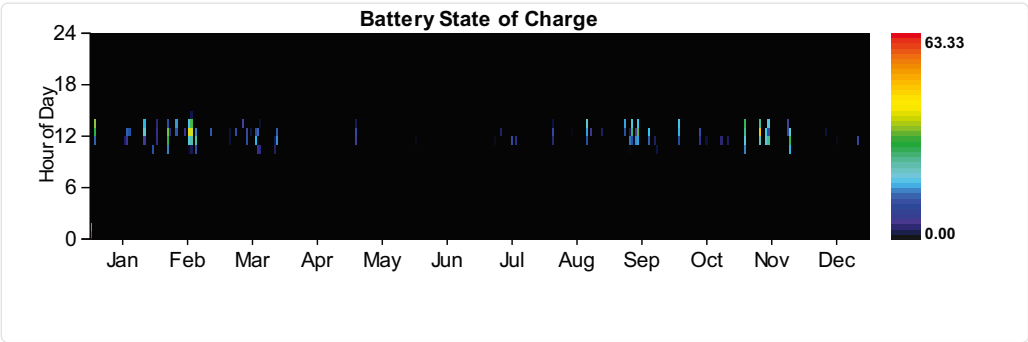
Quantity	Value	Units
Rated capacity	1000	kW
Mean output	147	kW
Mean output	3530.60	kWh/d
Capacity factor	14.71	%
Total production	1288675	kWh/yr
Minimum output	0.00	kW
Maximum output	1022.50	kW
PV penetration	1.33	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Battery:GS200 flow

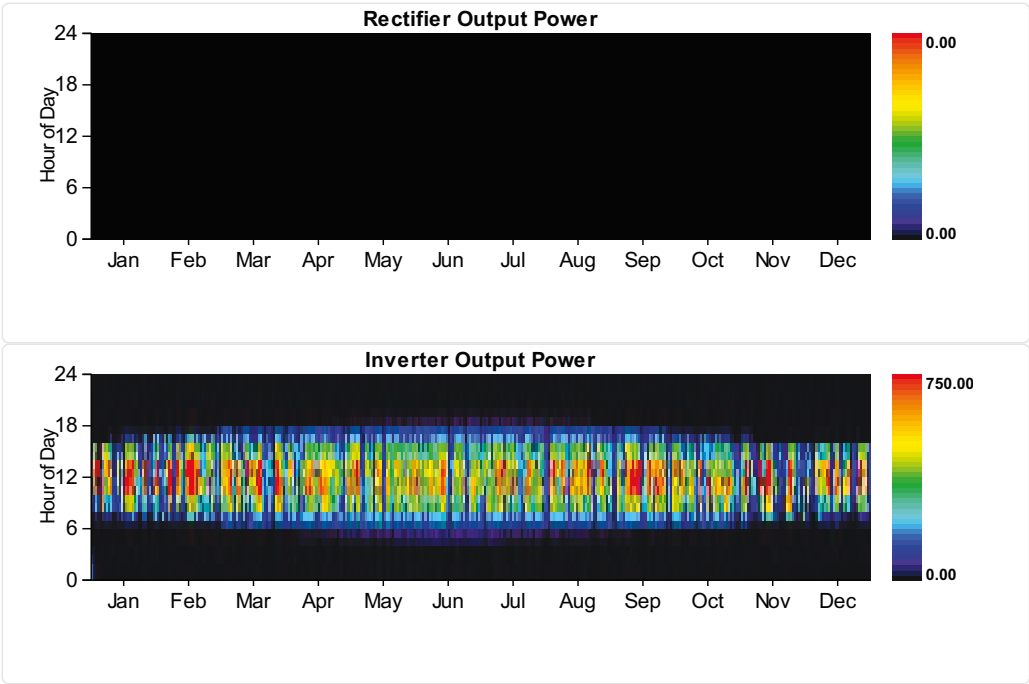
Quantity	Value
String size	1
Strings in parallel	1
Batteries	1
Bus voltage	100

Quantity	Value	Units
Nominal capacity	600	kWh
Usable nominal capacity	600	kWh
Autonomy	0	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.000	\$/kWh
Energy in	5215	kWh/yr
Energy out	4152	kWh/yr
Storage depletion	600	kWh/yr
Losses	462	kWh/yr
Annual throughput	4963	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	750	675	kW
Mean output	132	0	kW
Minimum output	0	0	kW
Maximum output	750	0	kW
Capacity factor	18	0	%
Hours of operation	4,463	0	hrs/yr
Energy in	1,287,602	0	kWh/yr
Energy out	1,158,841	0	kWh/yr
Losses	128,761	0	kWh/yr



Grid

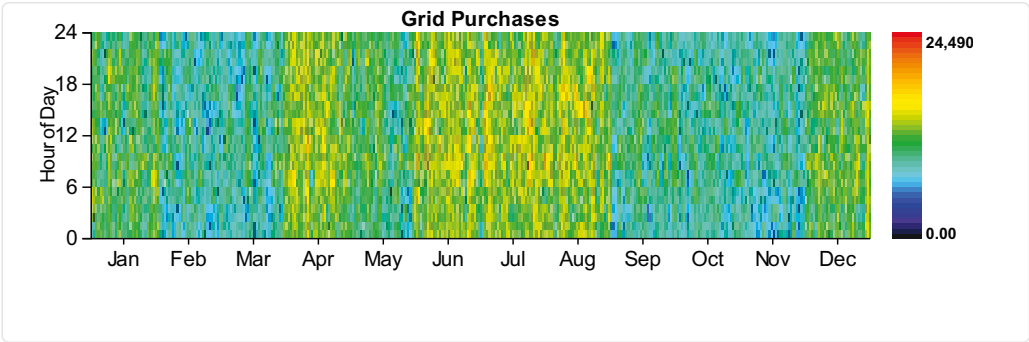
Rate: Demand 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	0	0	0	18,553	0	296,843
February	0	0	0	16,811	0	268,978
March	0	0	0	16,941	0	271,062
April	0	0	0	22,535	0	360,567
May	0	0	0	17,657	0	282,514
June	0	0	0	23,894	0	382,297
July	0	0	0	24,491	0	391,852
August	0	0	0	22,568	0	361,094
September	0	0	0	16,176	0	258,820
October	0	0	0	14,744	0	235,900
November	0	0	0	16,518	0	264,286
December	0	0	0	19,891	0	318,260
Annual	0	0	0	24,491	0	3,692,473

Rate: Rate 1

Resources.ReportingService_GenerateInputsReport_Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Purchases (kWh)	Peak Demand (kW)	Energy Charge (\$)	Demand Charge (\$)
January	8,131,427	0	8,131,427	0	975,771	0
February	6,023,114	0	6,023,114	0	722,774	0
March	6,708,603	0	6,708,603	0	805,032	0

April	9,361,015	Energy Purchased (kWh)	0	Energy Sold (kWh)	9,361,015	Peak Demand (kW)	0	1,123,322	Demand Charge (\$)	0
May	7,697,097	Energy Purchased (kWh)	0	Energy Sold (kWh)	7,697,097	Peak Demand (kW)	0	923,653	Demand Charge (\$)	0
June	9,706,373	Energy Purchased (kWh)	0	Energy Sold (kWh)	9,706,373	Peak Demand (kW)	0	1,164,765	Demand Charge (\$)	0
July	9,891,607	Energy Purchased (kWh)	0	Energy Sold (kWh)	9,891,607	Peak Demand (kW)	0	1,186,993	Demand Charge (\$)	0
August	9,791,049	Energy Purchased (kWh)	0	Energy Sold (kWh)	9,791,049	Peak Demand (kW)	0	1,174,926	Demand Charge (\$)	0
September	6,836,924	Energy Purchased (kWh)	0	Energy Sold (kWh)	6,836,924	Peak Demand (kW)	0	820,431	Demand Charge (\$)	0
October	6,698,983	Energy Purchased (kWh)	0	Energy Sold (kWh)	6,698,983	Peak Demand (kW)	0	803,878	Demand Charge (\$)	0
November	6,248,778	Energy Purchased (kWh)	0	Energy Sold (kWh)	6,248,778	Peak Demand (kW)	0	749,853	Demand Charge (\$)	0
December	8,610,384	Energy Purchased (kWh)	0	Energy Sold (kWh)	8,610,384	Peak Demand (kW)	0	1,033,246	Demand Charge (\$)	0
Annual	95,705,352	Energy Purchased (kWh)	0	Energy Sold (kWh)	95,705,352	Peak Demand (kW)	0	11,484,642	Demand Charge (\$)	0



Emissions

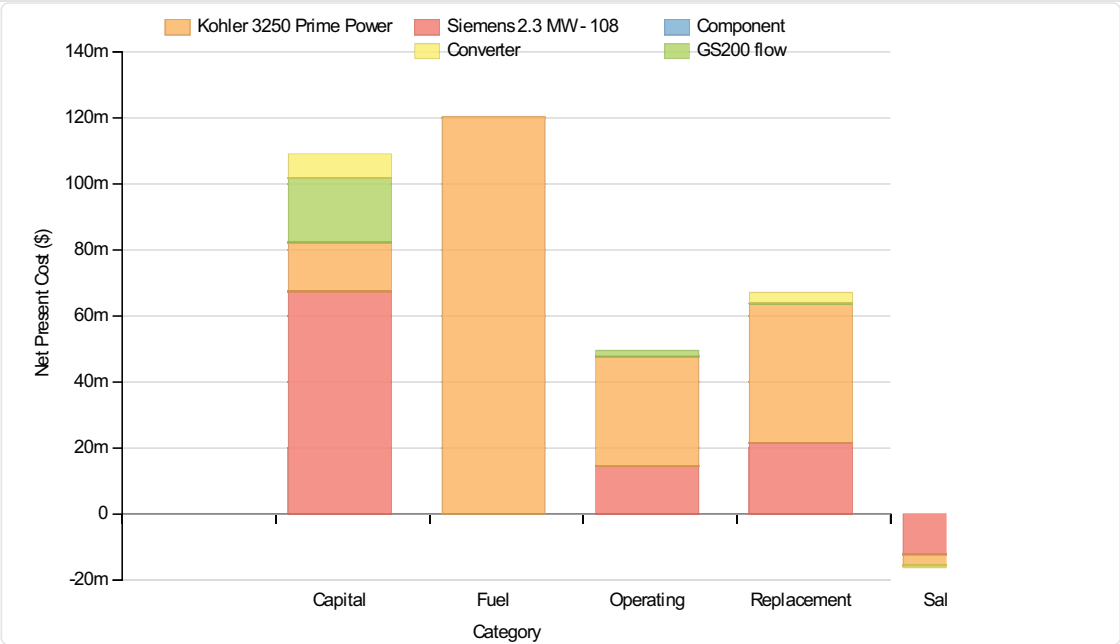
Pollutant	Emissions	Units
Carbon dioxide	60485784	kg/yr
Carbon monoxide	0	kg/yr
Unburned hydrocarbons	0	kg/yr
Particulate matter	0	kg/yr
Sulfur dioxide	262233	kg/yr
Nitrogen oxides	128245	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	15	
Generator	Kohler 3250 Prime Power	16,800	kW
Battery	GS200 flow	60	strings
Converter	System Converter	24,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	329803680	\$
Levelized cost of energy	0.263	\$/kWh

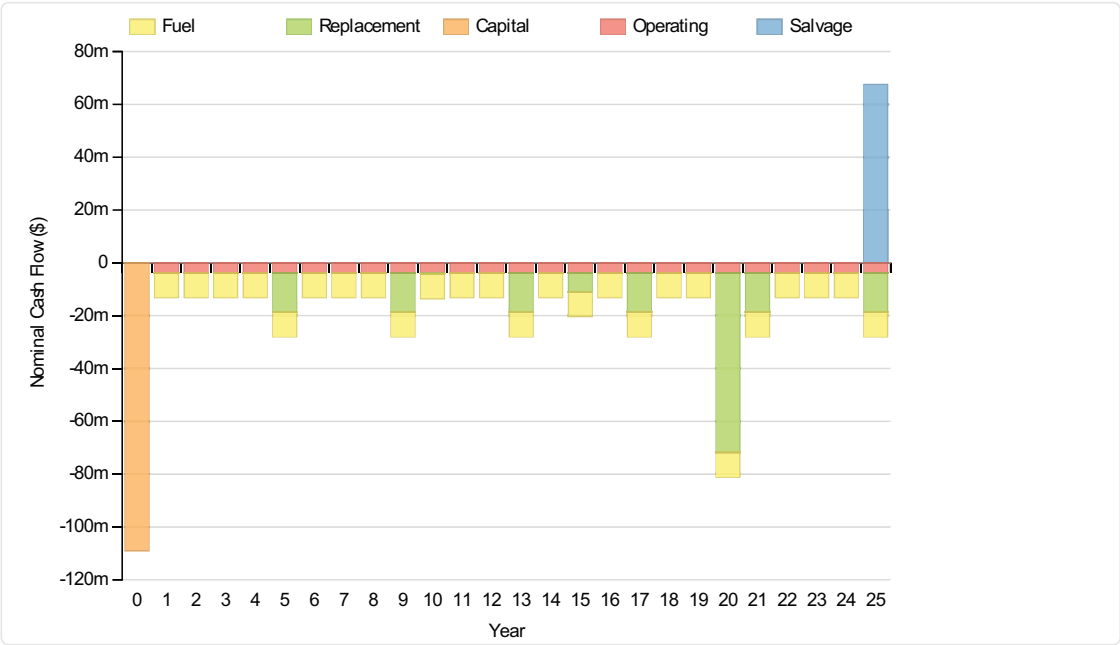
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	67,500,000	21,519,472	14,543,448	0	-12,127,600	91,435,320
Kohler 3250 Prime Power	14,821,428	42,092,420	33,130,706	120,349,664	-3,414,479	206,979,739
GS200 flow	19,475,352	430,058	1,861,562	0	-58,308	21,708,664
Converter	7,200,000	3,054,769	0	0	-574,938	9,679,831
System	108,996,776	67,096,720	49,535,724	120,349,664	-16,175,325	329,803,559

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	5,221,421	1,664,625	1,124,999	0	-938,123	7,072,922

Component	Prime Power	Capital	Replacement	O&M	Fuel	Salvage	Total
GS200 flow		1,506,504	33,267	144,000	0	-4,510	1,679,261
Converter		556,952	236,300	0	0	-44,474	748,778
System		8,431,378	5,190,225	3,831,805	9,309,574	-1,251,232	25,511,750

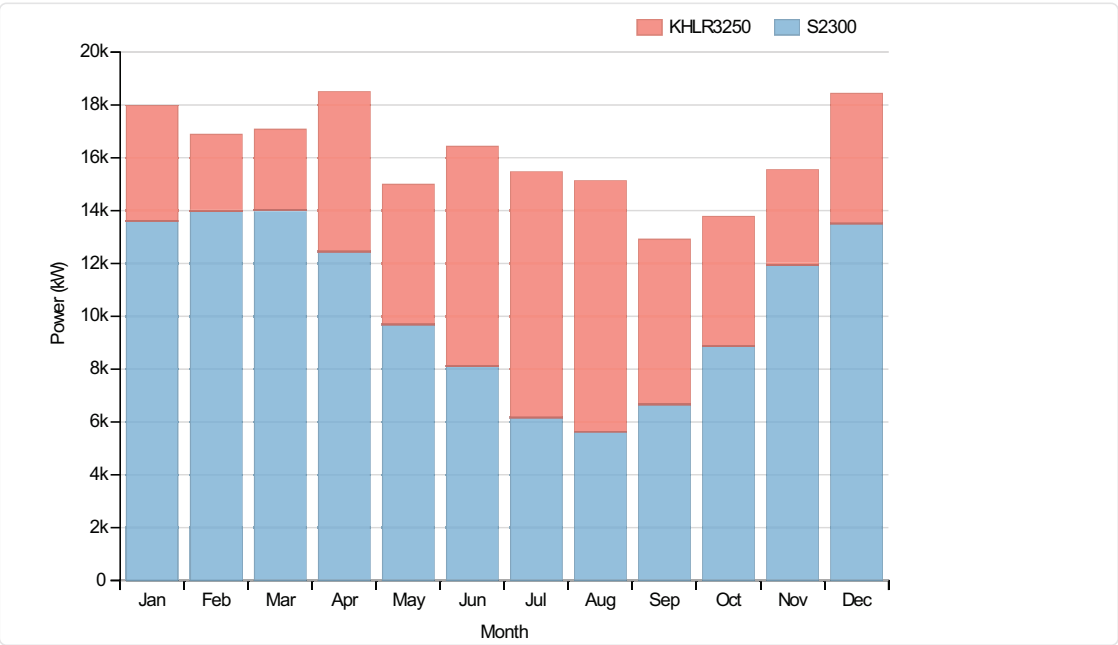


Electrical

Quantity	Value	Units
Excess electricity	35579732	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	2329	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	50,113,132	36
Wind Turbine	90,806,648	64
Total	140,919,776	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100
DC primary load	0	0
Total	96,864,160	100



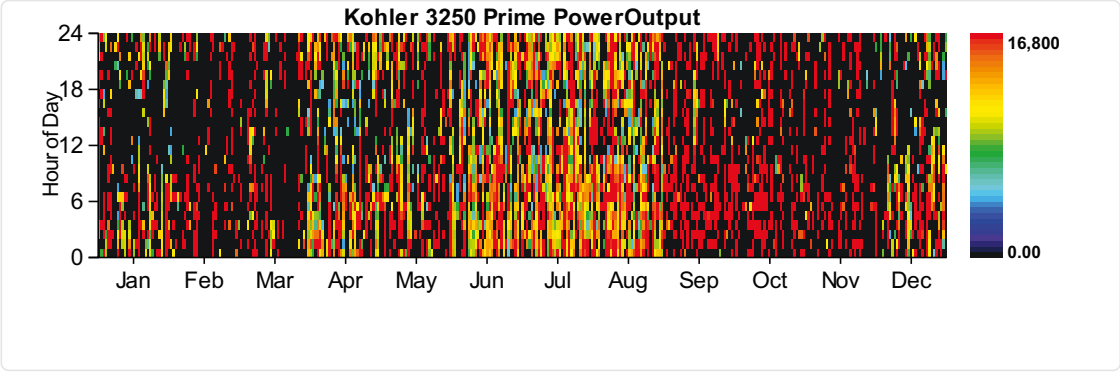
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	34500	kW
Mean output	10366	kW
Capacity factor	30.05	%
Total production	90806648	kWh/yr
Minimum output	21.57	kW
Maximum output	34723.00	kW
Wind penetration	93.75	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	3623	hrs/yr
Number of starts	1209	starts/yr
Operational life	4	yr
Fixed generation cost	1728.30	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	50113132	kWh/yr
Mean electrical output	13832	kW
Min. electrical output	4200	kW

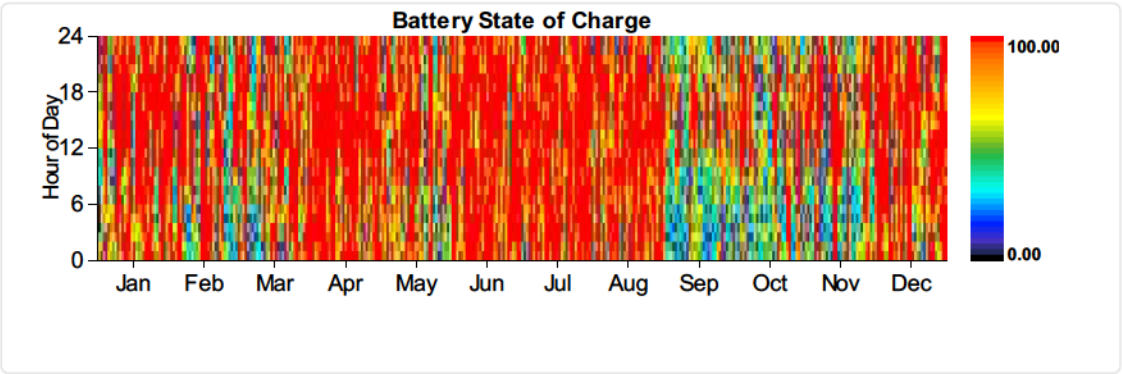
Quantity	Value	Units
Max. electrical output	16800	kW
Fuel consumption	11784276	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	115957288	kWh/yr
Mean electrical efficiency	43	%



Battery:GS200 flow

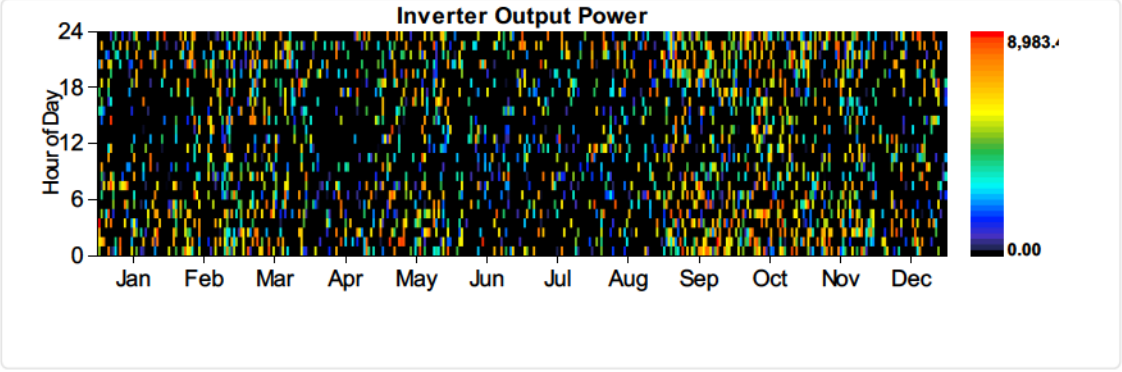
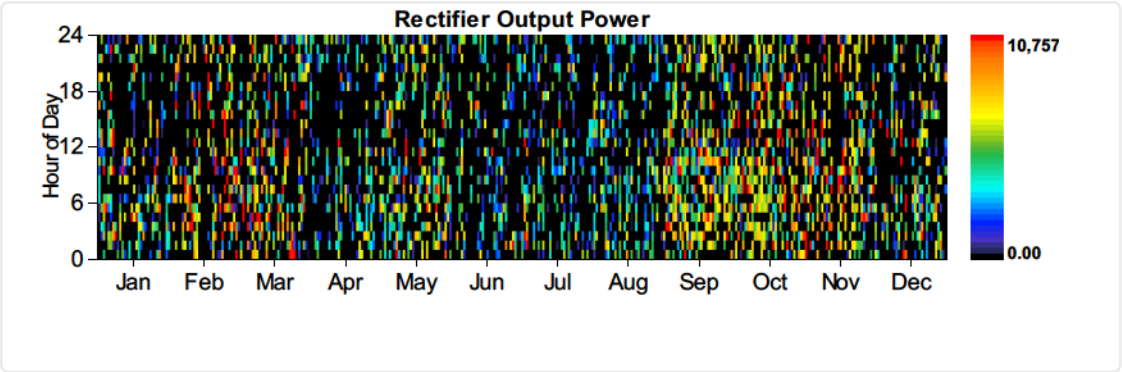
Quantity	Value
String size	1
Strings in parallel	60
Batteries	60
Bus voltage	100

Quantity	Value	Units
Nominal capacity	36000	kWh
Usable nominal capacity	36000	kWh
Autonomy	3	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.202	\$/kWh
Energy in	15509890	kWh/yr
Energy out	10856936	kWh/yr
Storage depletion	0	kWh/yr
Losses	4652954	kWh/yr
Annual throughput	12976515	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	24,000	21,600	kW
Mean output	1,115	1,771	kW
Minimum output	0	0	kW
Maximum output	8,983	10,757	kW
Capacity factor	5	7	%
Hours of operation	2,201	2,998	hrs/yr
Energy in	10,856,936	18,246,954	kWh/yr
Energy out	9,771,234	15,509,890	kWh/yr
Losses	1,085,702	2,737,064	kWh/yr



Emissions

Pollutant	Emissions	Units
Carbon dioxide	30928012	kg/yr
Carbon monoxide	129627	kg/yr

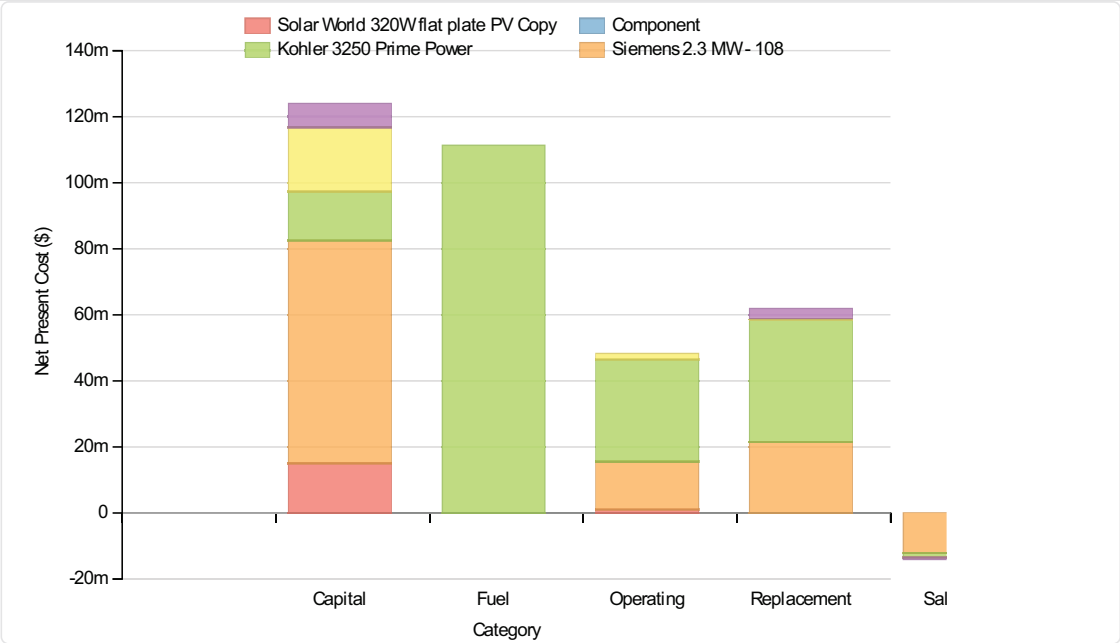
Pollutant	Emissions	Units
Unburned hydrocarbons	14848	kg/yr
Particulate matter	3712	kg/yr
Sulfur dioxide	63679	kg/yr
Nitrogen oxides	129627	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	5,000	kW
Wind Turbine	Siemens 2.3 MW - 108	15	
Generator	Kohler 3250 Prime Power	16,800	kW
Battery	GS200 flow	60	strings
Converter	System Converter	24,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

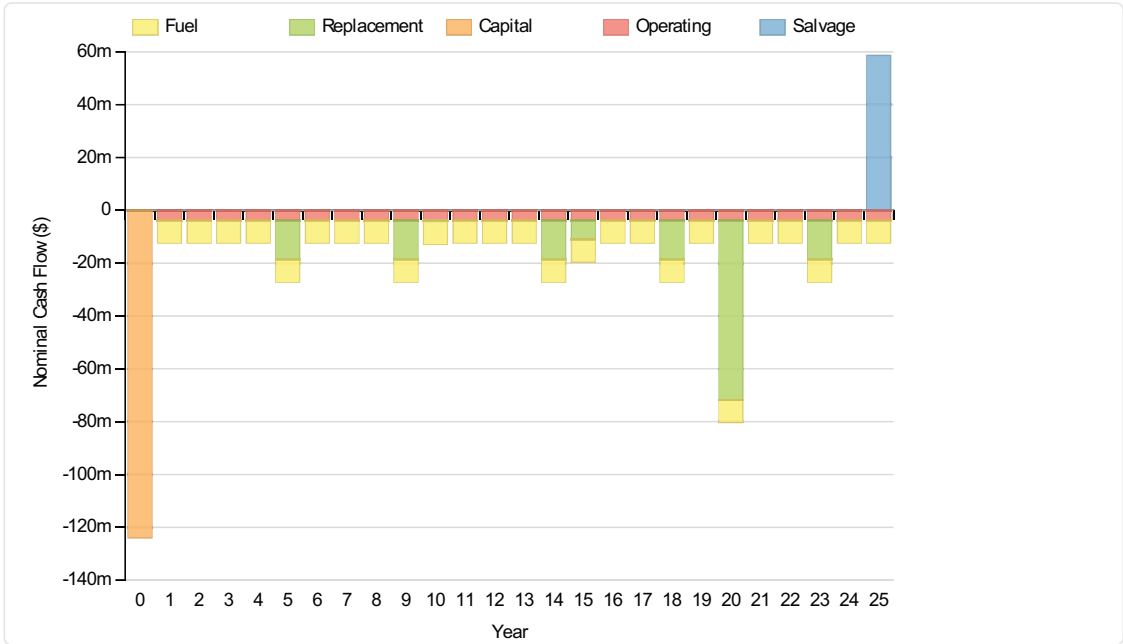
Total net present cost	331481728	\$
Levelized cost of energy	0.265	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	15,000,000	0	969,563	0	0	15,969,563
Siemens 2.3 MW - 108	67,500,000	21,519,472	14,543,448	0	-12,127,600	91,435,320
Kohler 3250 Prime Power	14,821,428	36,898,980	30,917,726	111,346,072	-1,295,964	192,688,242
GS200 flow	19,475,352	430,058	1,861,562	0	-58,308	21,708,664
Converter	7,200,000	3,054,769	0	0	-574,938	9,679,831
System	123,996,776	61,903,280	48,292,304	111,346,072	-14,056,811	331,481,621

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	1,160,316	0	75,000	0	0	1,235,316
Siemens 2.3 MW - 108	5,221,421	1,664,625	1,124,999	0	-938,123	7,072,922
Kohler 3250 Prime Power	1,146,502	2,854,298	2,391,622	8,613,106	-100,249	14,905,279
GS200 flow	1,506,504	33,267	144,000	0	-4,510	1,679,261
Converter	556,952	236,300	0	0	-44,474	748,778
System	9,591,694	4,788,490	3,735,621	8,613,106	-1,087,356	25,641,555



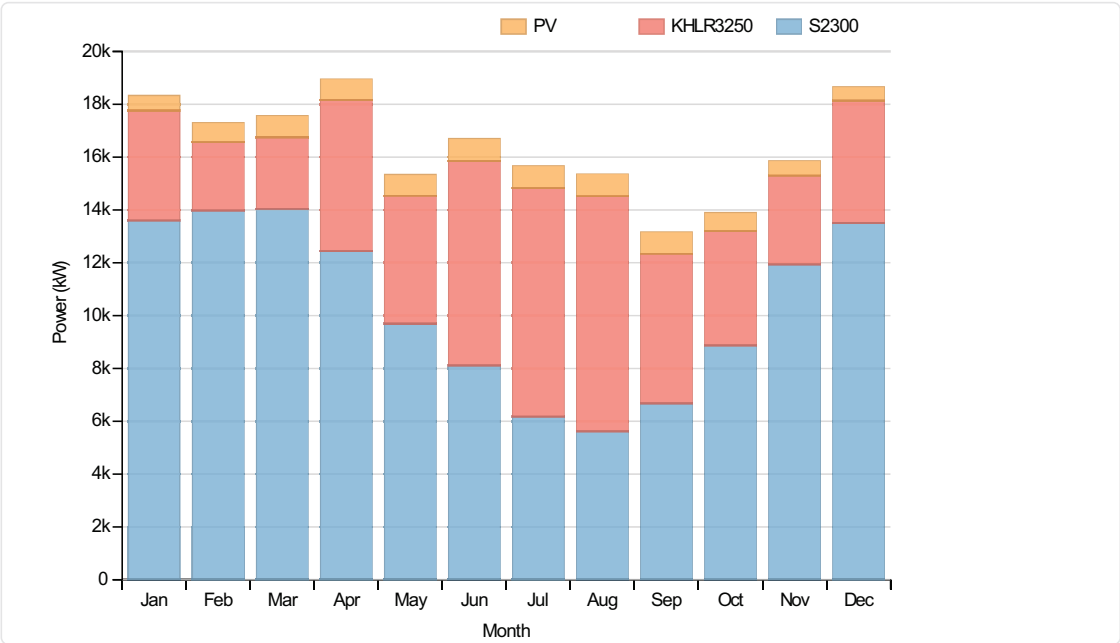
Electrical

Quantity	Value	Units
Excess electricity	38246392	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	2329	kWh/yr
Renewable fraction	1	

Component	Production(kWh/yr)	Fraction (%)
PV	6,443,367	4
Generator	46,359,196	32
Wind Turbine	90,806,648	63
Total	143,609,216	100

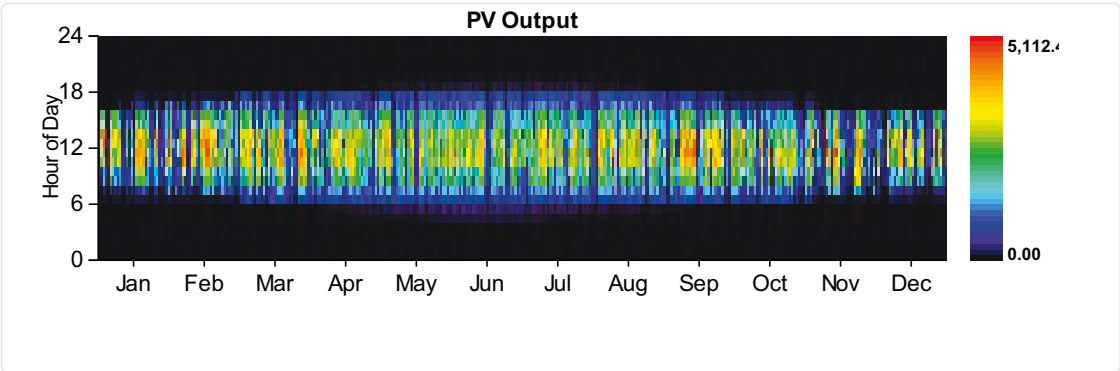
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,864,160	100

DC primary load	Consumption(kWh/yr)	0	Fraction (%)	0
Total		96,864,160		100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	5000	kW
Mean output	736	kW
Mean output	17653.00	kWh/d
Capacity factor	14.71	%
Total production	6443367	kWh/yr
Minimum output	0.00	kW
Maximum output	5112.50	kW
PV penetration	6.65	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh

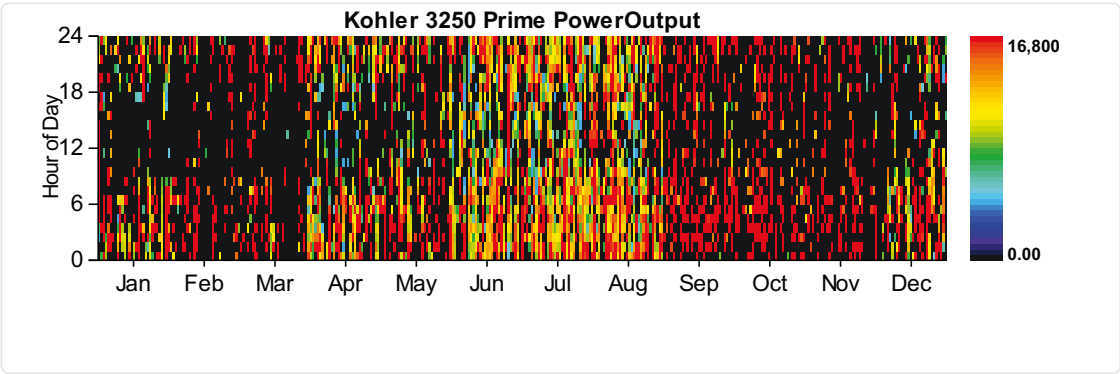


Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	34500	kW
Mean output	10366	kW
Capacity factor	30.05	%
Total production	90806648	kWh/yr
Minimum output	21.57	kW
Maximum output	34723.00	kW
Wind penetration	93.75	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 3250 Prime Power

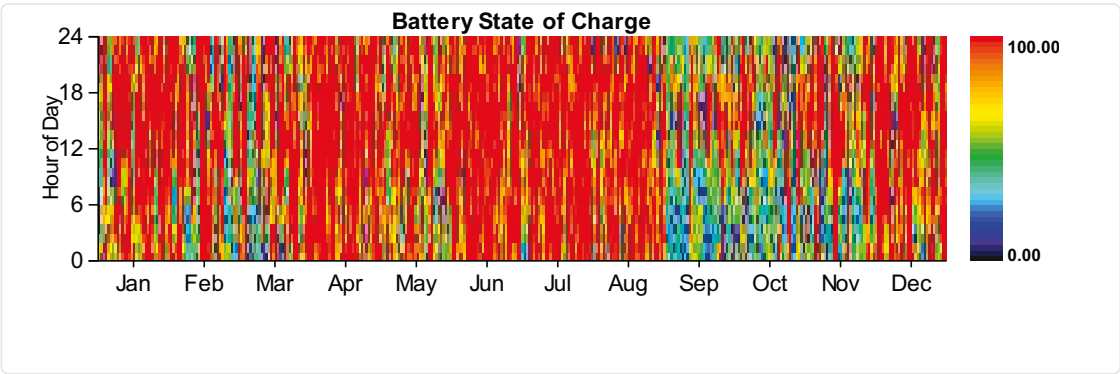
Quantity	Value	Units
Hours of operation	3381	hrs/yr
Number of starts	1209	starts/yr
Operational life	4	yr
Fixed generation cost	1728.30	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	46359196	kWh/yr
Mean electrical output	13712	kW
Min. electrical output	4200	kW
Max. electrical output	16800	kW
Fuel consumption	10902671	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	107282296	kWh/yr
Mean electrical efficiency	43	%



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	60
Batteries	60
Bus voltage	100

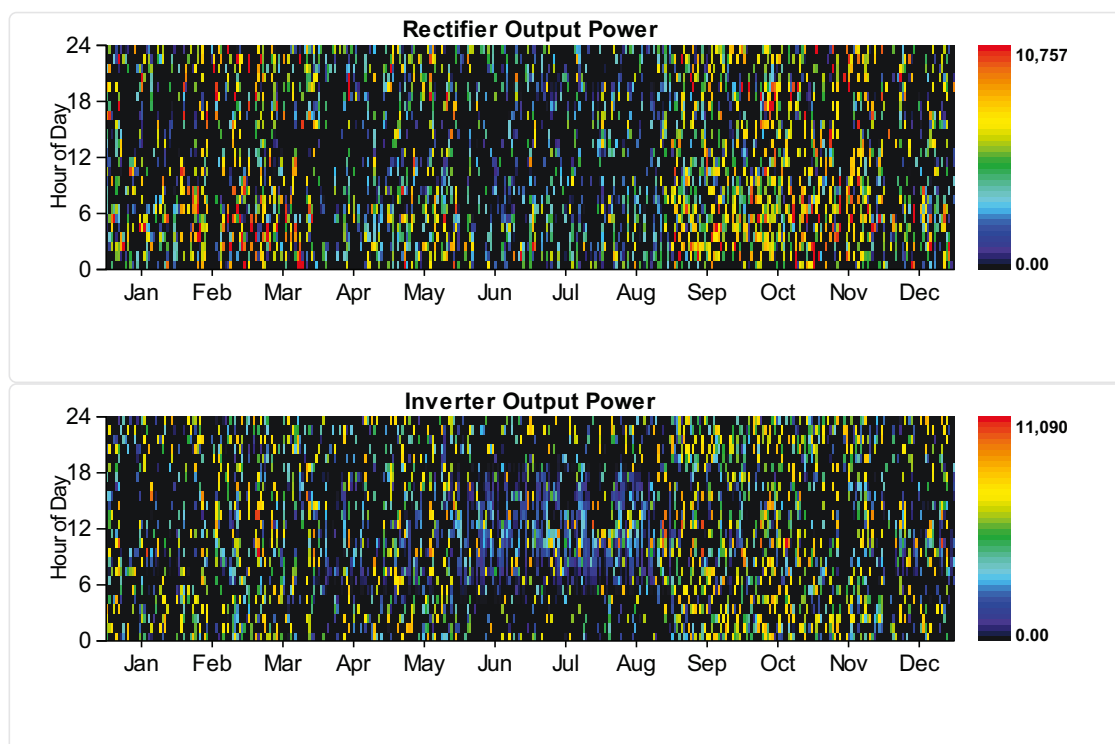
Quantity	Value	Units
Nominal capacity	36000	kWh
Usable nominal capacity	36000	kWh
Autonomy	3	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.193	\$/kWh
Energy in	15720101	kWh/yr
Energy out	11004080	kWh/yr
Storage depletion	0	kWh/yr
Losses	4716021	kWh/yr
Annual throughput	13152383	kWh/yr
Expected life	25	yr



Converter

Converter

Quantity	Inverter	Rectifier	Units
Capacity	24,000	21,600	kW
Mean output	1,381	1,577	kW
Minimum output	0	0	kW
Maximum output	11,091	10,757	kW
Capacity factor	6	7	%
Hours of operation	3,031	2,856	hrs/yr
Energy in	13,443,823	16,254,018	kWh/yr
Energy out	12,099,451	13,815,923	kWh/yr
Losses	1,344,372	2,438,095	kWh/yr



Emissions

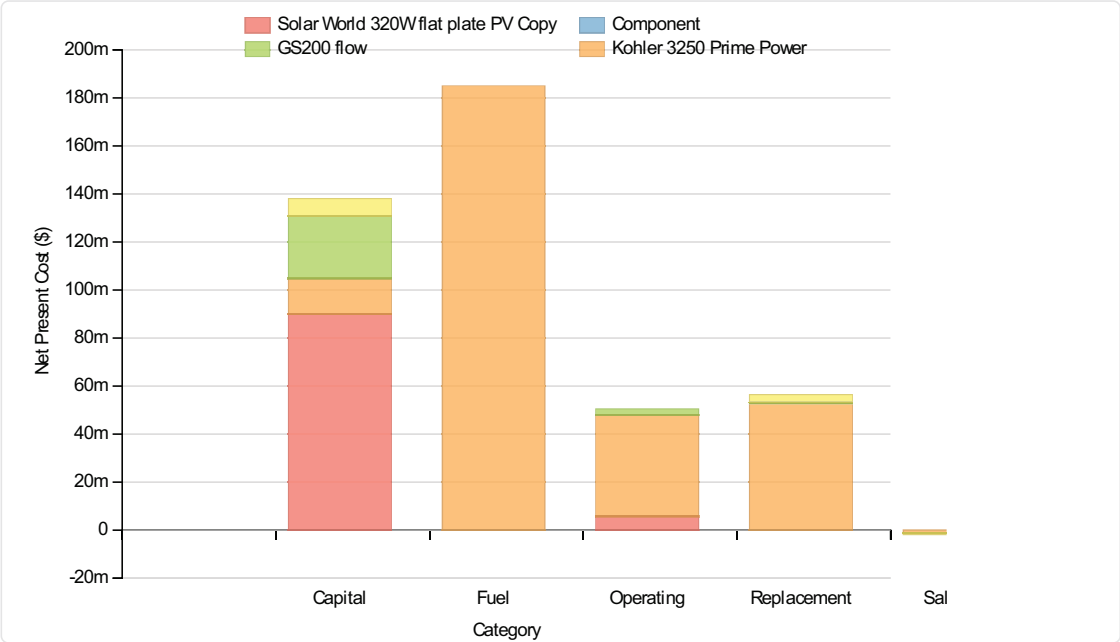
Pollutant	Emissions	Units
Carbon dioxide	28614226	kg/yr
Carbon monoxide	119929	kg/yr
Unburned hydrocarbons	13737	kg/yr
Particulate matter	3434	kg/yr
Sulfur dioxide	58915	kg/yr
Nitrogen oxides	119929	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	30,000	kW
Generator	Kohler 3250 Prime Power	16,800	kW
Battery	GS200 flow	80	strings
Converter	System Converter	24,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	427814592	\$
Levelized cost of energy	0.342	\$/kWh

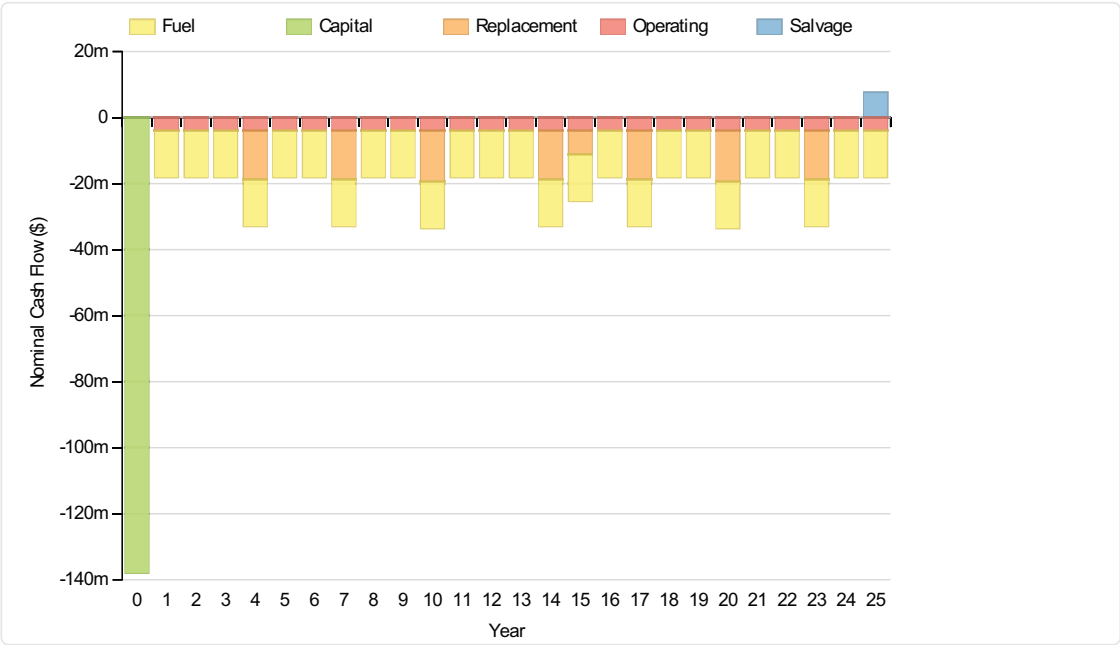
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	90,000,000	0	5,817,379	0	0	95,817,379
Kohler 3250 Prime Power	14,821,428	52,738,052	42,092,368	184,886,256	-1,165,772	293,372,332
GS200 flow	25,967,136	573,408	2,482,082	0	-77,744	28,944,882
Converter	7,200,000	3,054,769	0	0	-574,938	9,679,831
System	137,988,560	56,366,228	50,391,828	184,886,256	-1,818,454	427,814,418

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	6,961,894	0	450,000	0	0	7,411,894

Component	Prime Power	Capital	Replacement	Operating	Fuel	Salvage	Total
GS200 flow		2,008,672	44,356	192,000	0	-6,014	2,239,014
Converter		556,952	236,300	0	0	-44,474	748,778
System		10,674,019	4,360,175	3,898,029	14,301,762	-140,665	33,093,320

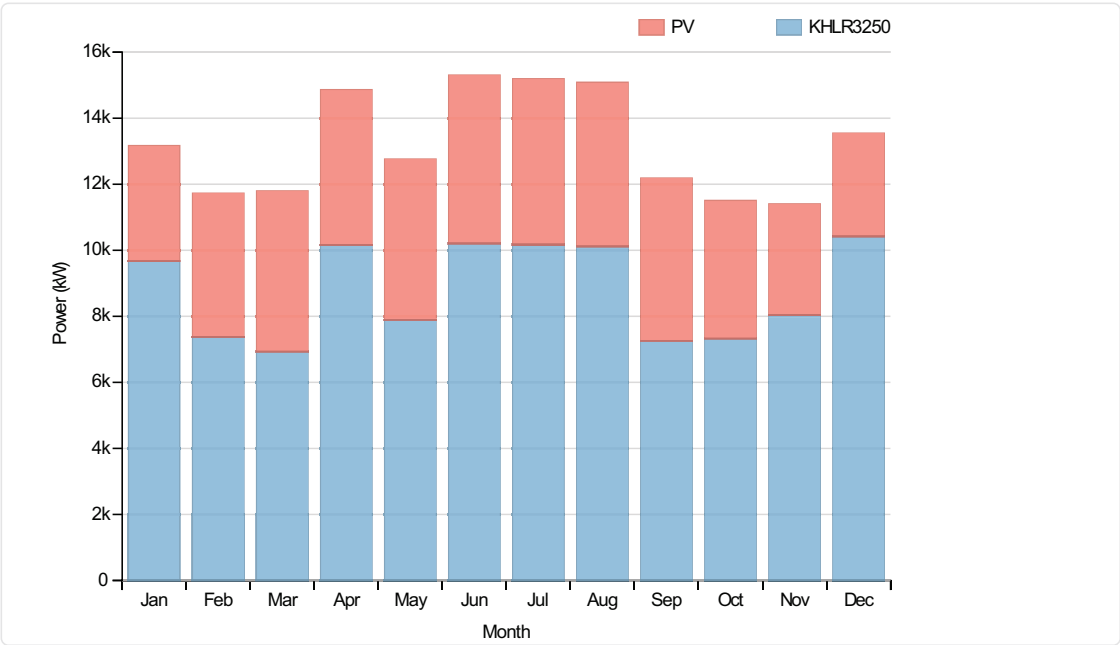


Electrical

Quantity	Value	Units
Excess electricity	1550152	kWh/yr
Unmet load	4993	kWh/yr
Capacity shortage	27529	kWh/yr
Renewable fraction	0	

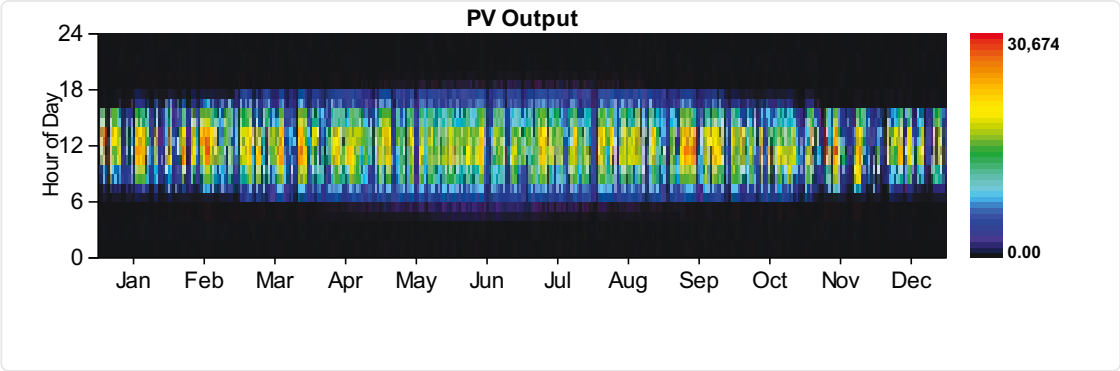
Component	Production(kWh/yr)	Fraction (%)
PV	38,660,180	33
Generator	77,155,992	67
Total	115,816,176	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,859,168	100
DC primary load	0	0
Total	96,859,168	100



PV:Solar World 320W flat plate PV Copy

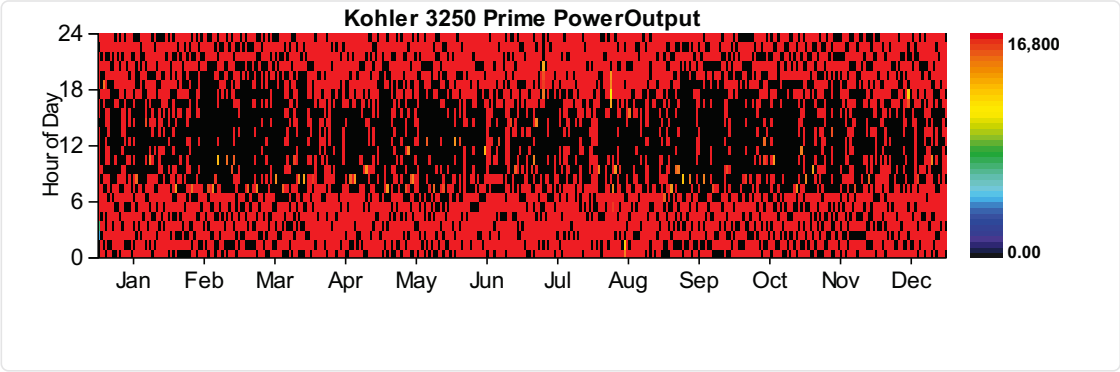
Quantity	Value	Units
Rated capacity	30000	kW
Mean output	4413	kW
Mean output	105918.00	kWh/d
Capacity factor	14.71	%
Total production	38660180	kWh/yr
Minimum output	0.00	kW
Maximum output	30675.00	kW
PV penetration	39.91	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	4603	hrs/yr
Number of starts	1922	starts/yr

Quantity	Value	Units
Fixed generation cost	1728.30	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	77155992	kWh/yr
Mean electrical output	16762	kW
Min. electrical output	4200	kW
Max. electrical output	16800	kW
Fuel consumption	18103504	L/yr
Specific fuel consumption	0.23	L/kWh
Fuel energy input	178138496	kWh/yr
Mean electrical efficiency	43	%

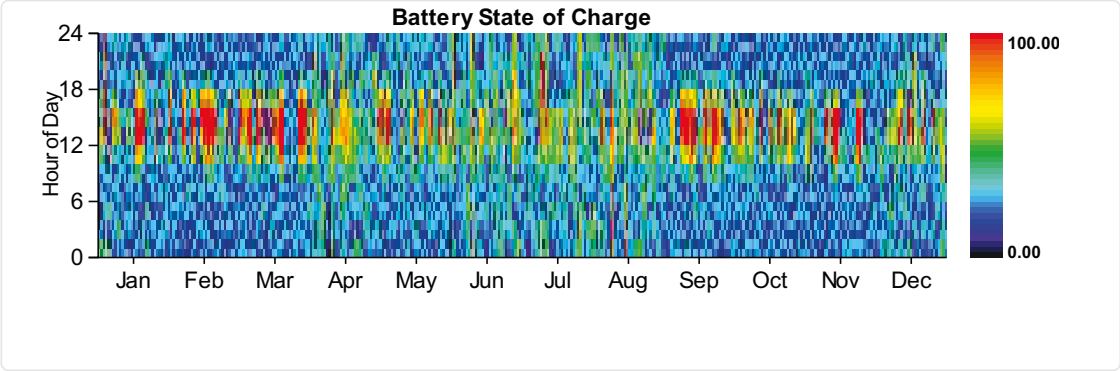


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	80
Batteries	80
Bus voltage	100

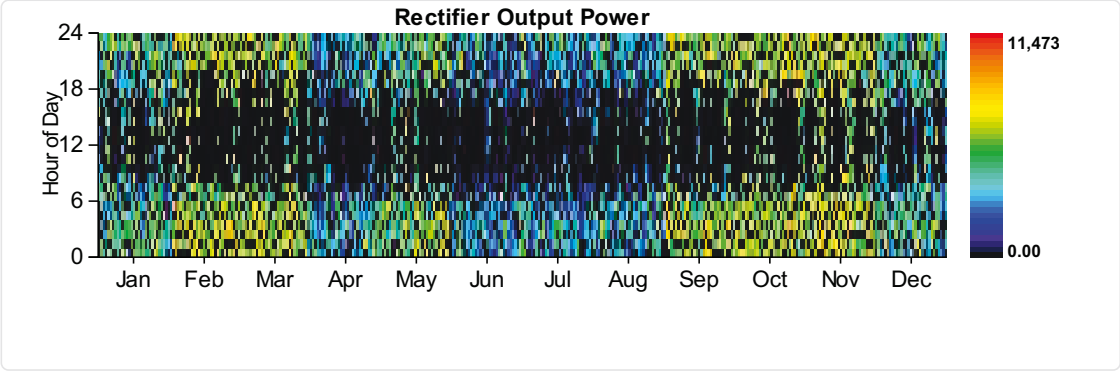
Quantity	Value	Units
Nominal capacity	48000	kWh
Usable nominal capacity	48000	kWh
Autonomy	4	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.227	\$/kWh
Energy in	30960144	kWh/yr

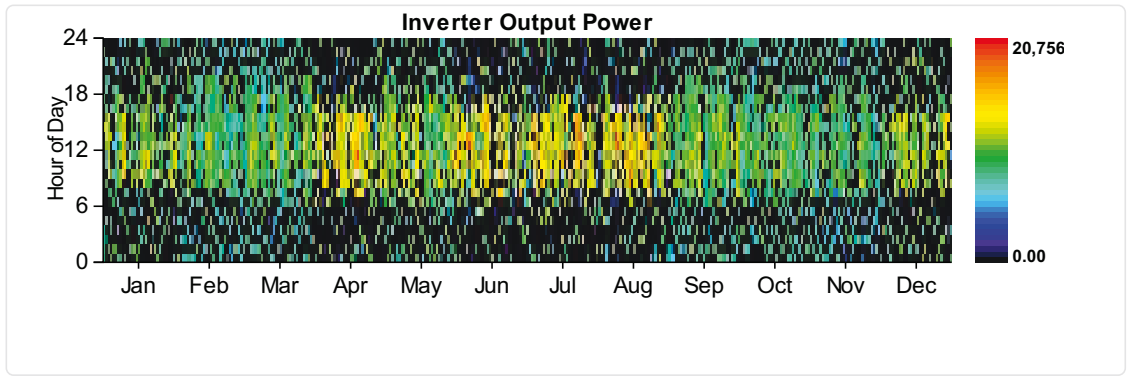
Quantity	Value	Units
Energy out	21708802	kWh/yr
Storage depletion	43801	kWh/yr
Losses	9207541	kWh/yr
Annual throughput	25946942	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	24,000	21,600	kW
Mean output	4,858	2,217	kW
Minimum output	0	0	kW
Maximum output	20,756	11,474	kW
Capacity factor	20	9	%
Hours of operation	4,498	4,255	hrs/yr
Energy in	47,280,436	22,849,226	kWh/yr
Energy out	42,552,432	19,421,814	kWh/yr
Losses	4,728,004	3,427,412	kWh/yr





Emissions

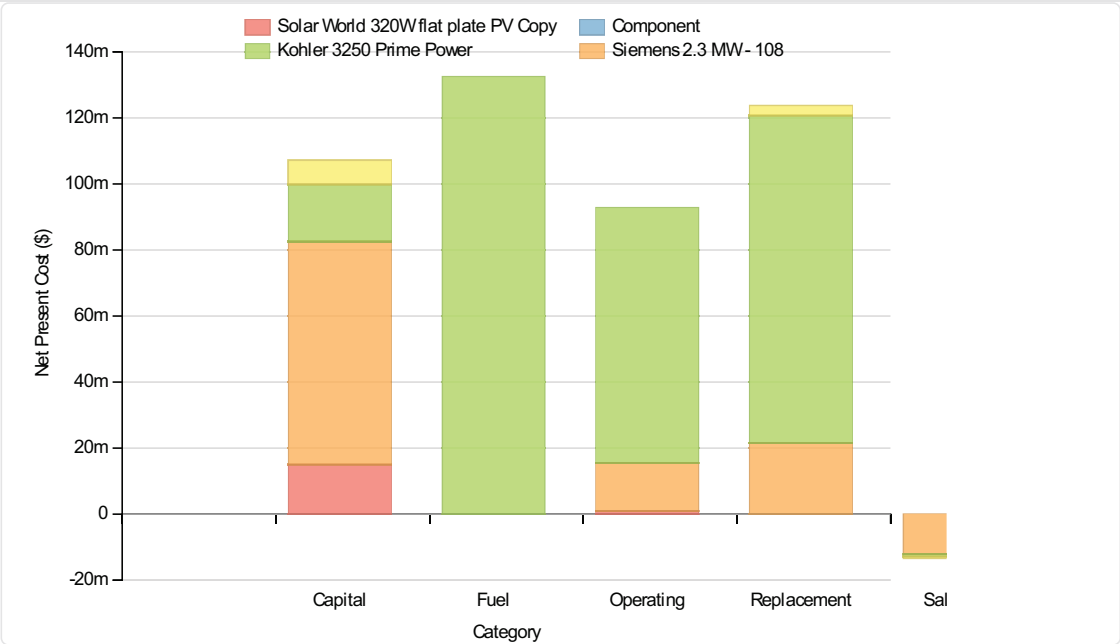
Pollutant	Emissions	Units
Carbon dioxide	47512924	kg/yr
Carbon monoxide	199139	kg/yr
Unburned hydrocarbons	22810	kg/yr
Particulate matter	5703	kg/yr
Sulfur dioxide	97826	kg/yr
Nitrogen oxides	199139	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	5,000	kW
Wind Turbine	Siemens 2.3 MW - 108	15	
Generator	Kohler 3250 Prime Power	19,600	kW
Converter	System Converter	24,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	442710560	\$
Levelized cost of energy	0.354	\$/kWh

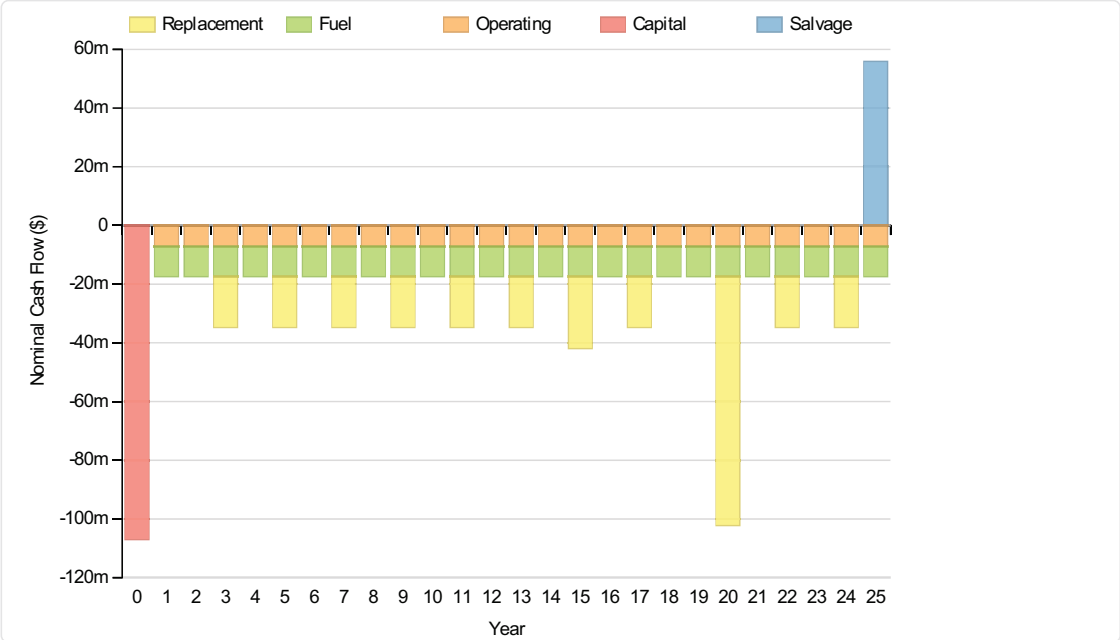
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	15,000,000	0	969,563	0	0	15,969,563
Siemens 2.3 MW - 108	67,500,000	21,519,472	14,543,448	0	-12,127,600	91,435,320
Kohler 3250 Prime Power	17,321,428	99,201,744	77,298,968	132,495,112	-691,588	325,625,664
Converter	7,200,000	3,054,769	0	0	-574,938	9,679,831
System	107,021,424	123,775,984	92,811,984	132,495,112	-13,394,126	442,710,378

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	1,160,816	0	75,000	0	0	1,235,316
Siemens 2.3 MW - 108	5,221,421	1,664,625	1,124,999	0	-938,123	7,072,922
Kohler 3250 Prime Power	1,339,888	7,673,690	5,979,414	10,249,077	-53,497	25,188,572
Converter	556,952	236,300	0	0	-44,474	748,778
System	8,278,576	9,574,614	7,179,414	10,249,077	-1,036,094	34,245,587

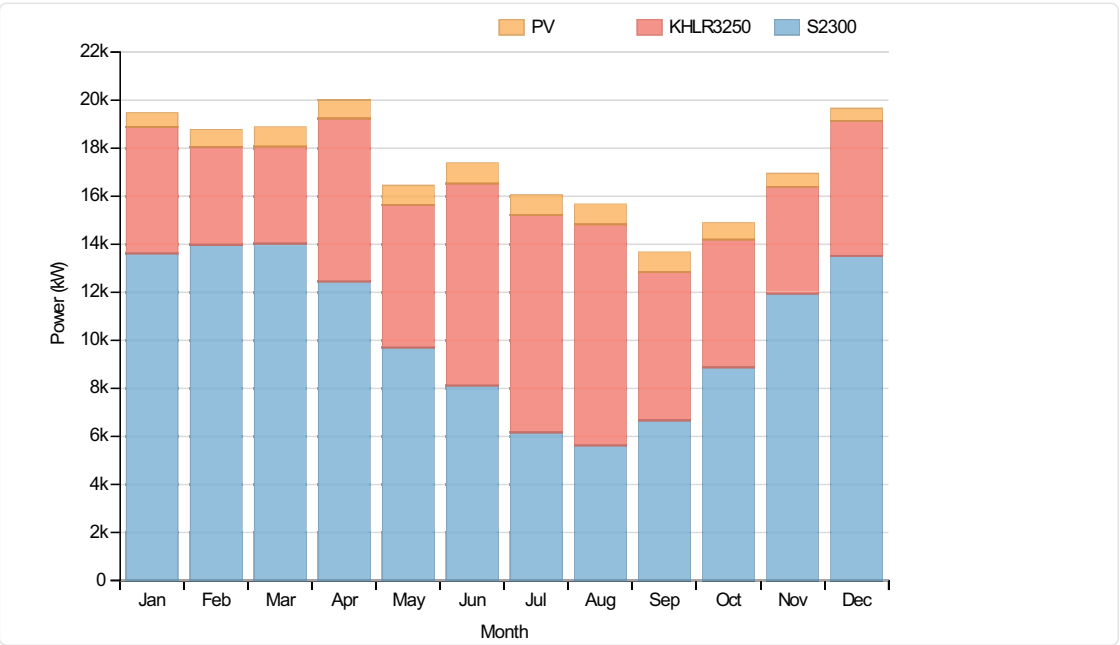


Electrical

Quantity	Value	Units
Excess electricity	54552108	kWh/yr
Unmet load	7857	kWh/yr
Capacity shortage	95673	kWh/yr
Renewable fraction	0	

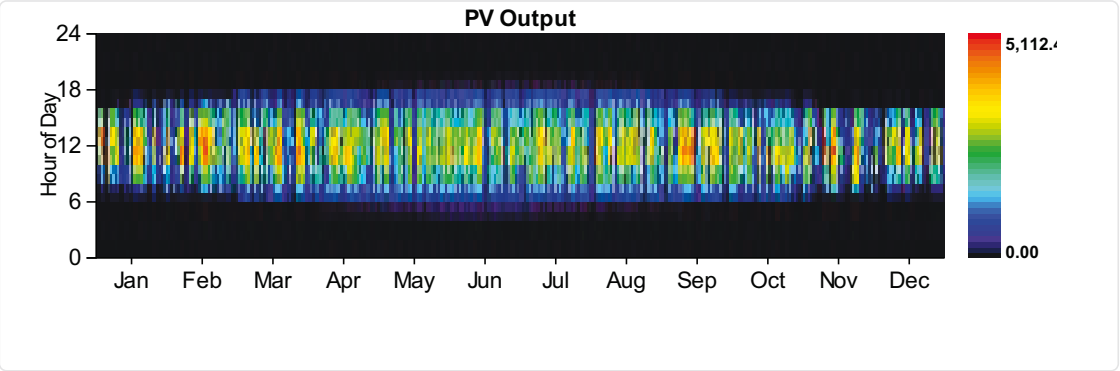
Component	Production(kWh/yr)	Fraction (%)
PV	6,443,367	4
Generator	54,402,400	36
Wind Turbine	90,806,648	60
Total	151,652,416	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,856,296	100
DC primary load	0	0
Total	96,856,296	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	5000	kW
Mean output	736	kW
Mean output	17653.00	kWh/d
Capacity factor	14.71	%
Total production	6443367	kWh/yr
Minimum output	0.00	kW
Maximum output	5112.50	kW
PV penetration	6.65	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



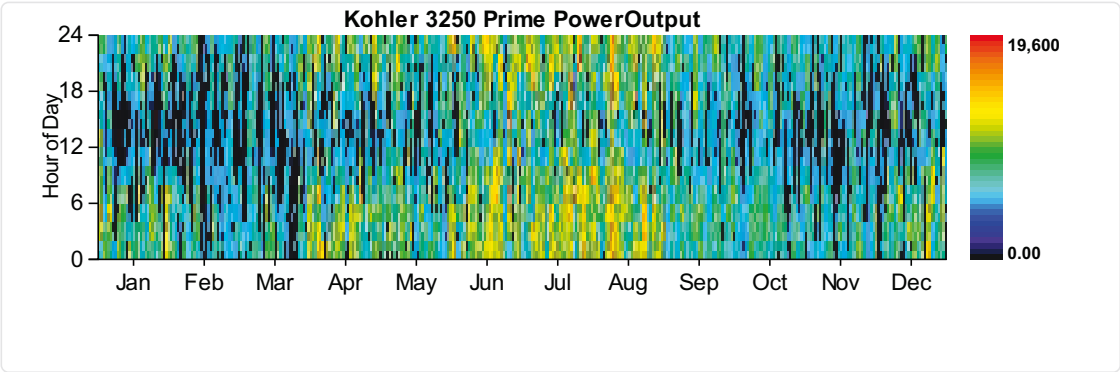
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	34500	kW
Mean output	10366	kW

Quantity	Value	Units
Capacity factor	30.05	%
Total production	90806648	kWh/yr
Minimum output	21.57	kW
Maximum output	34723.00	kW
Wind penetration	93.75	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 3250 Prime Power

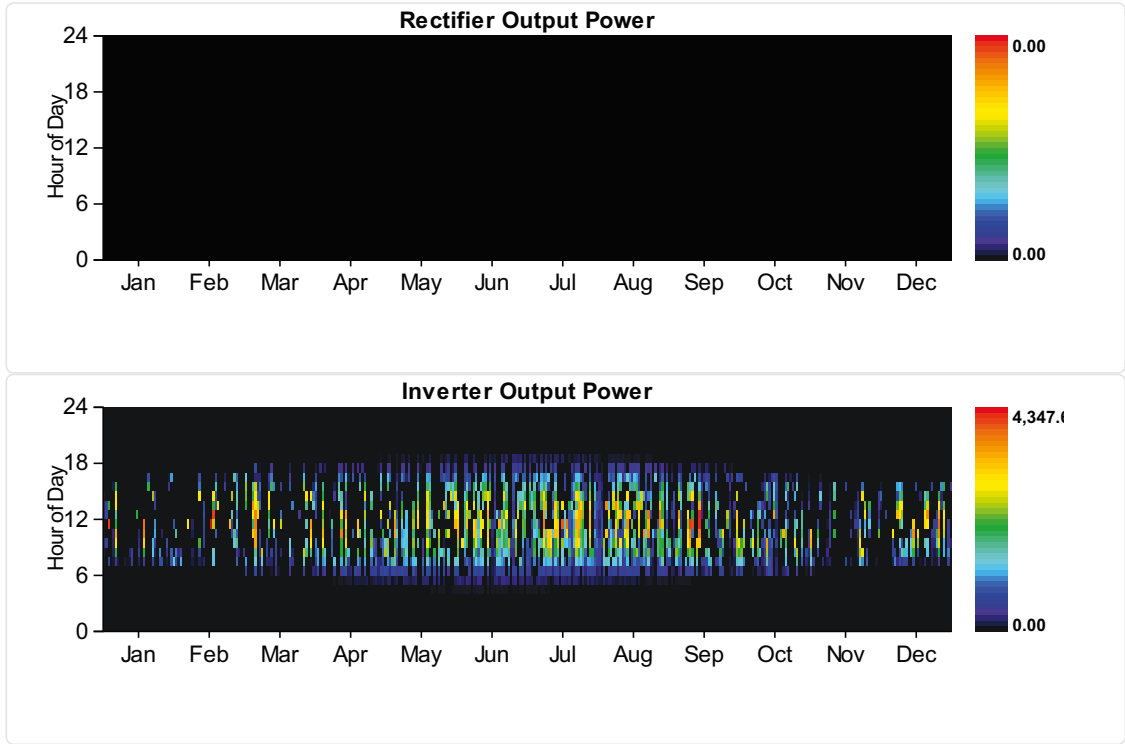
Quantity	Value	Units
Hours of operation	7100	hrs/yr
Number of starts	512	starts/yr
Operational life	2	yr
Fixed generation cost	2035.30	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	54402400	kWh/yr
Mean electrical output	7662	kW
Min. electrical output	4900	kW
Max. electrical output	19600	kW
Fuel consumption	12973523	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	127659480	kWh/yr
Mean electrical efficiency	43	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	24,000	21,600	kW

Quantity	Inverter	Rectifier	Units
Mean output	251	0	kW
Minimum output	0	0	kW
Maximum output	4,348	0	kW
Capacity factor	1	0	%
Hours of operation	1,972	0	hrs/yr
Energy in	2,439,241	0	kWh/yr
Energy out	2,195,318	0	kWh/yr
Losses	243,924	0	kWh/yr



Emissions

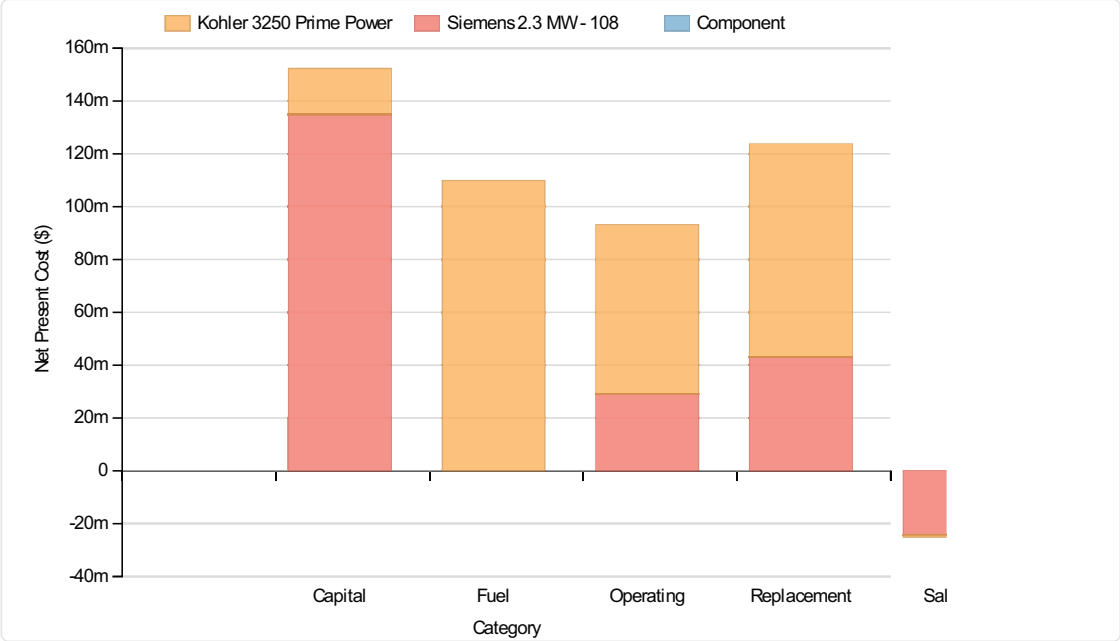
Pollutant	Emissions	Units
Carbon dioxide	34049208	kg/yr
Carbon monoxide	142709	kg/yr
Unburned hydrocarbons	16347	kg/yr
Particulate matter	4087	kg/yr
Sulfur dioxide	70105	kg/yr
Nitrogen oxides	142709	kg/yr

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	30	
Generator	Kohler 3250 Prime Power	19,600	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

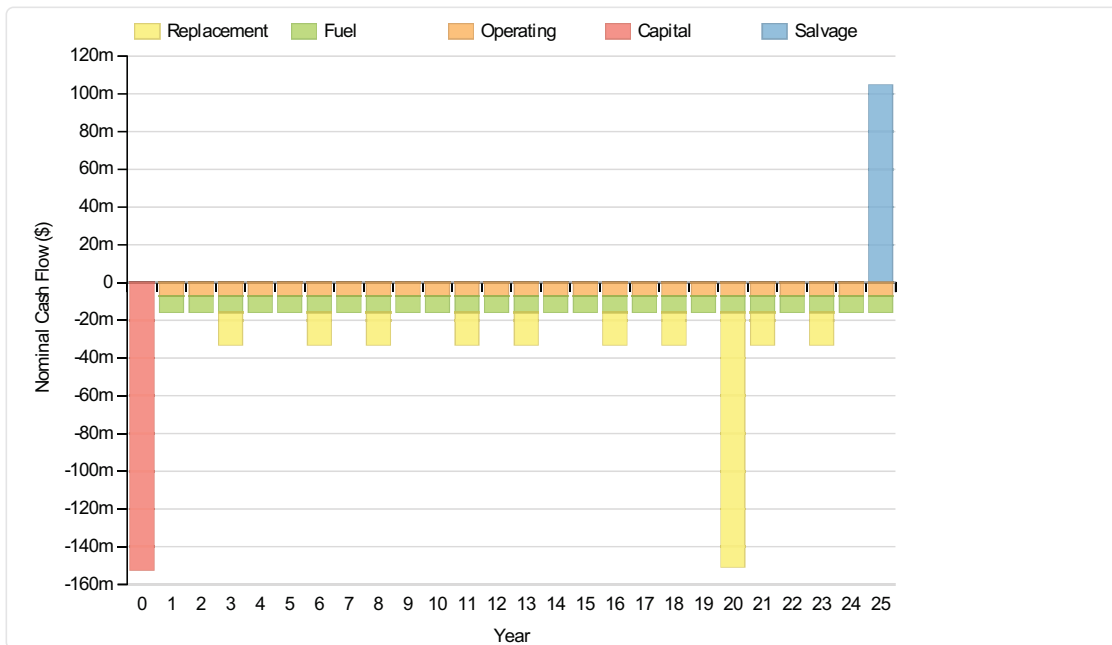
Total net present cost	453894880	\$
Levelized cost of energy	0.363	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	135,000,000	43,038,944	29,086,896	0	-24,255,200	182,870,640
Kohler 3250 Prime Power	17,321,428	80,646,536	64,027,496	109,851,592	-822,981	271,024,071
System	152,321,424	123,685,480	93,114,384	109,851,592	-25,078,182	453,894,698

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	10,442,841	3,329,251	2,249,999	0	-1,876,246	14,145,845
Kohler 3250 Prime Power	1,339,888	6,238,363	4,952,807	8,497,502	-63,661	20,964,899
System	11,782,729	9,567,613	7,202,806	8,497,502	-1,939,907	35,110,743

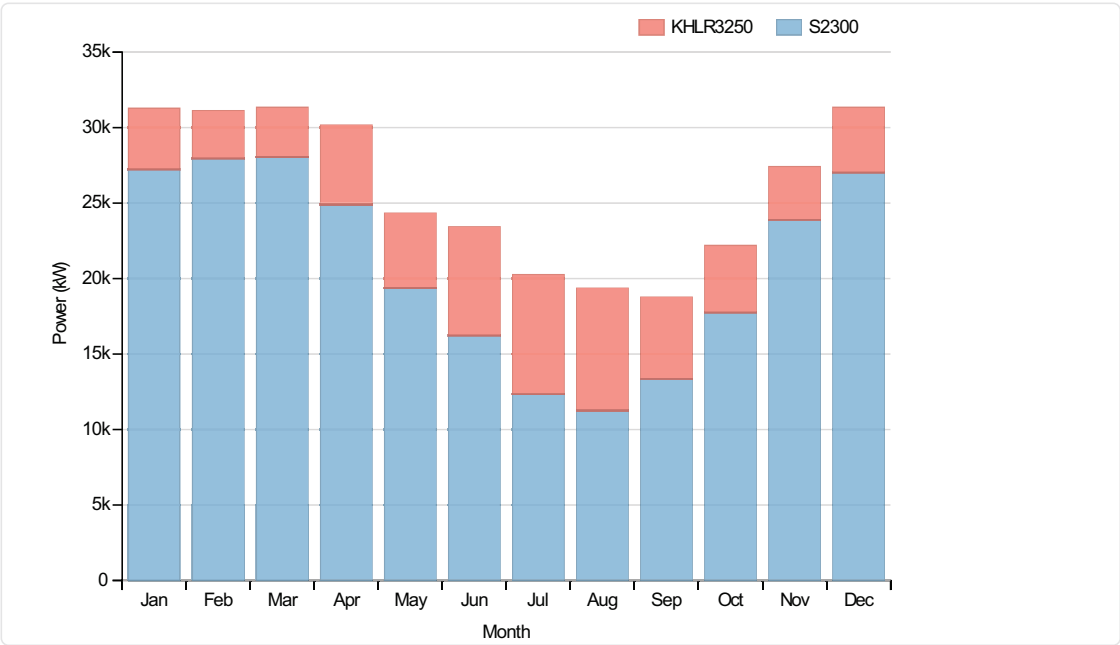


Electrical

Quantity	Value	Units
Excess electricity	129863544	kWh/yr
Unmet load	8264	kWh/yr
Capacity shortage	94180	kWh/yr
Renewable fraction	1	

Component	Production(kWh/yr)	Fraction (%)
Generator	45,106,168	20
Wind Turbine	181,613,296	80
Total	226,719,456	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,855,888	100
DC primary load	0	0
Total	96,855,888	100



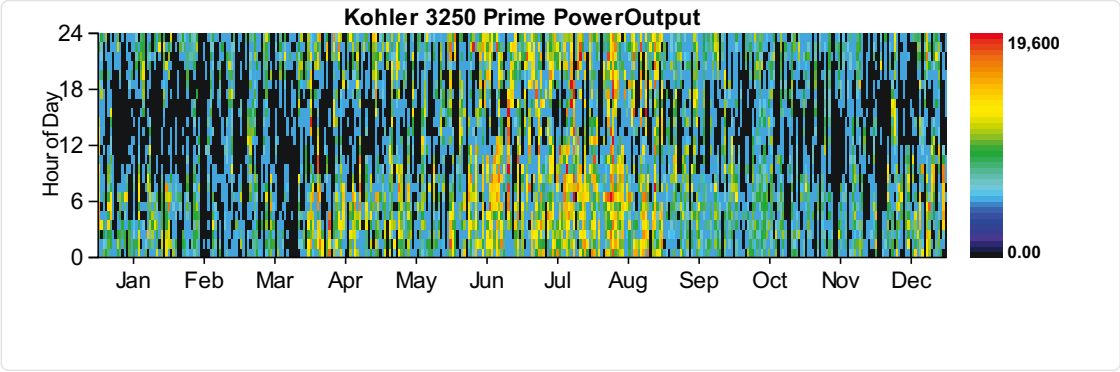
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	69000	kW
Mean output	20732	kW
Capacity factor	30.05	%
Total production	181613296	kWh/yr
Minimum output	43.13	kW
Maximum output	69447.00	kW
Wind penetration	187.49	%
Hours of operation	8760	hrs/yr
Levelized cost	0.078	\$/kWh

Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	5881	hrs/yr
Number of starts	643	starts/yr
Operational life	3	yr
Fixed generation cost	2035.30	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	45106168	kWh/yr
Mean electrical output	7670	kW
Min. electrical output	4900	kW

Quantity	Value	Units
Max. electrical output	19600	kW
Fuel consumption	10756336	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	105842360	kWh/yr
Mean electrical efficiency	43	%



Emissions

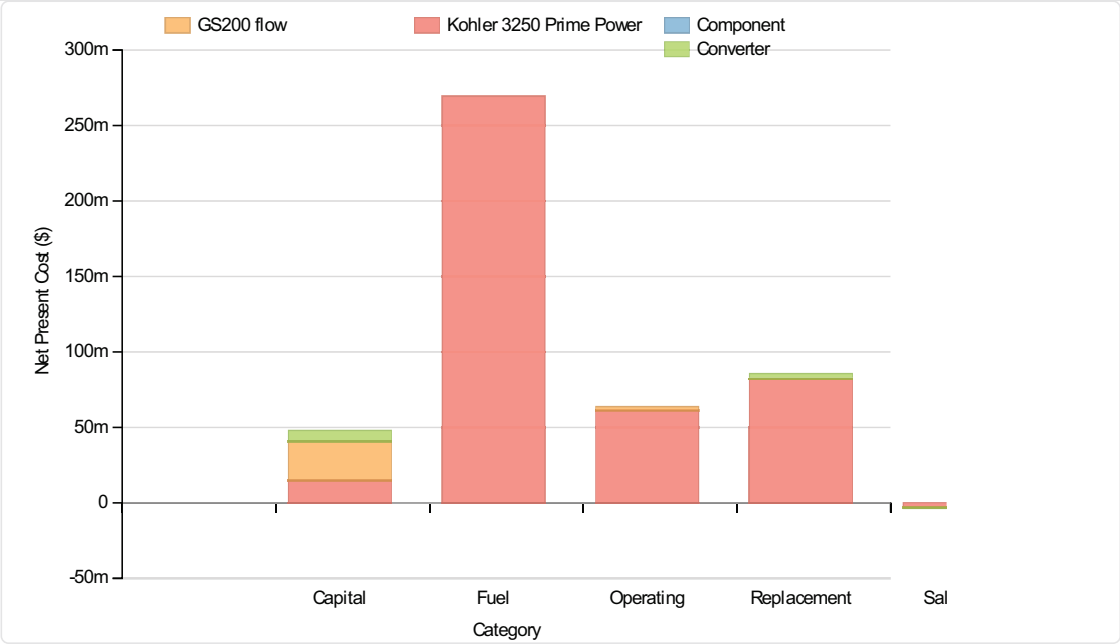
Pollutant	Emissions	Units
Carbon dioxide	28230168	kg/yr
Carbon monoxide	118320	kg/yr
Unburned hydrocarbons	13553	kg/yr
Particulate matter	3388	kg/yr
Sulfur dioxide	58124	kg/yr
Nitrogen oxides	118320	kg/yr

System Report

System architecture

Generator	Kohler 3250 Prime Power	16,800	kW
Battery	GS200 flow	80	strings
Converter	System Converter	24,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	462819808	\$
Levelized cost of energy	0.370	\$/kWh

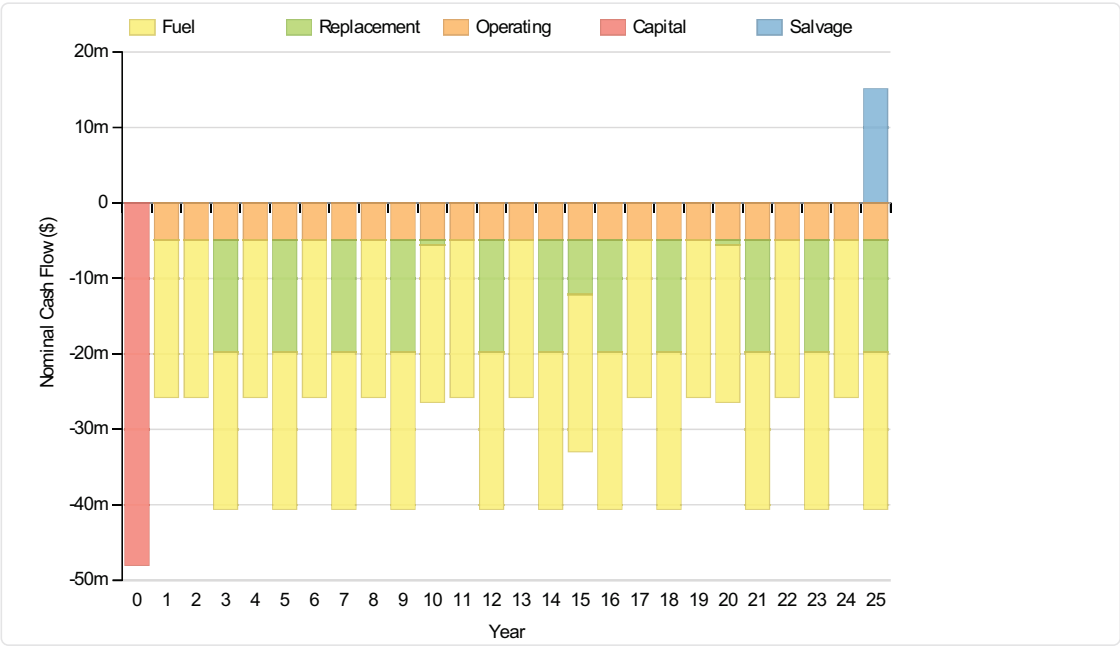
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 3250 Prime Power	14,821,428	81,992,984	61,259,348	269,085,888	-2,964,737	424,194,911
GS200 flow	25,967,136	573,408	2,482,082	0	-77,744	28,944,882
Converter	7,200,000	3,054,769	0	0	-574,938	9,679,831
System	47,988,564	85,621,160	63,741,424	269,085,888	-3,617,419	462,819,617

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 3250 Prime Power	1,146,502	6,342,517	4,738,679	20,814,972	-229,335	32,813,335
GS200 flow	2,008,672	44,356	192,000	0	-6,014	2,239,014
Converter	556,952	236,300	0	0	-44,474	748,778

Component	Capital,126	Replacement,69,172	O&M,30,679	Fuel,814,972	Salvage,23	Total,801,126

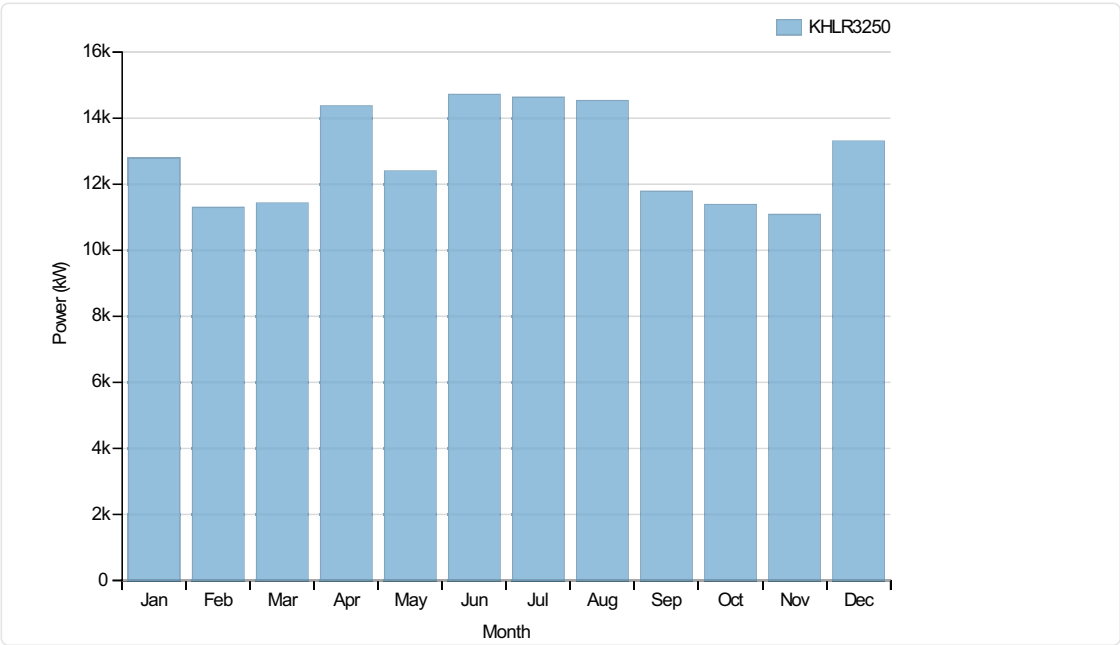


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	42667	kWh/yr
Capacity shortage	95013	kWh/yr
Renewable fraction	0	

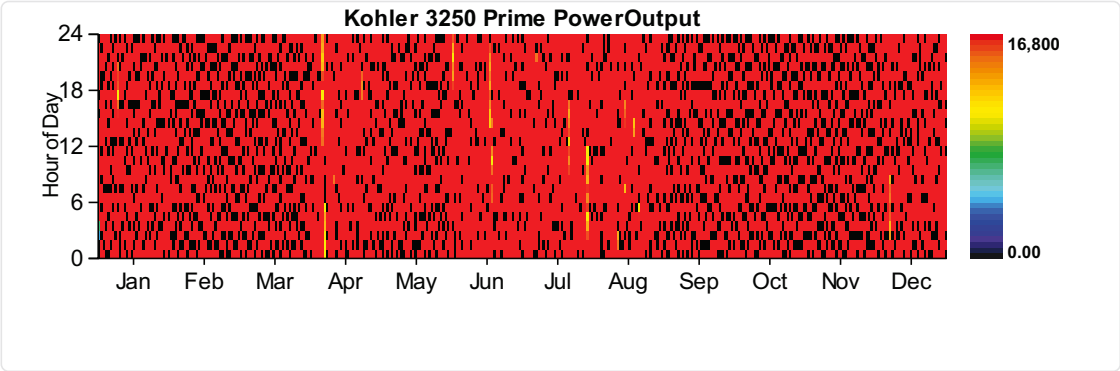
Component	Production(kWh/yr)	Fraction (%)
Generator	112,291,864	100
Total	112,291,864	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,821,488	100
DC primary load	0	0
Total	96,821,488	100



Generator:Kohler 3250 Prime Power

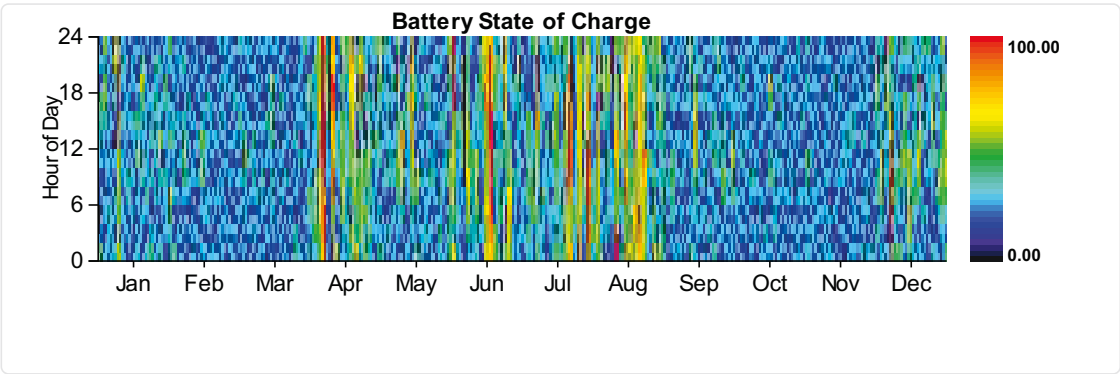
Quantity	Value	Units
Hours of operation	6699	hrs/yr
Number of starts	1948	starts/yr
Operational life	2	yr
Fixed generation cost	1728.30	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	112291864	kWh/yr
Mean electrical output	16762	kW
Min. electrical output	4200	kW
Max. electrical output	16800	kW
Fuel consumption	26348078	L/yr
Specific fuel consumption	0.23	L/kWh
Fuel energy input	259265120	kWh/yr
Mean electrical efficiency	43	%



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	80
Batteries	80
Bus voltage	100

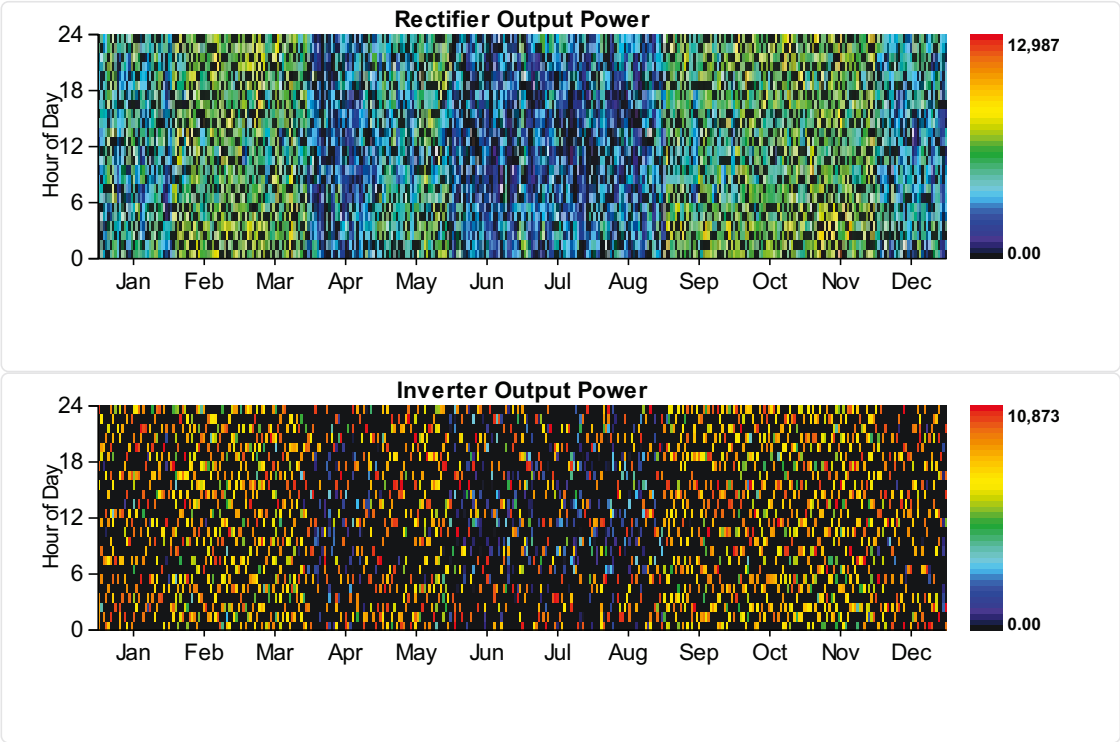
Quantity	Value	Units
Nominal capacity	48000	kWh
Usable nominal capacity	48000	kWh
Autonomy	4	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.308	\$/kWh
Energy in	28359858	kWh/yr
Energy out	19882438	kWh/yr
Storage depletion	36487	kWh/yr
Losses	8440933	kWh/yr
Annual throughput	23764098	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	24,000	21,600	kW
Mean output	2,043	3,237	kW
Minimum output	0	0	kW
Maximum output	10,874	12,988	kW
Capacity factor	9	13	%

Quantity	Inverter	Rectifier	Units
Hours of operation	2,471	6,211	hrs/yr
Energy in	19,882,438	33,364,564	kWh/yr
Energy out	17,894,204	28,359,858	kWh/yr
Losses	1,988,234	5,004,706	kWh/yr



Emissions

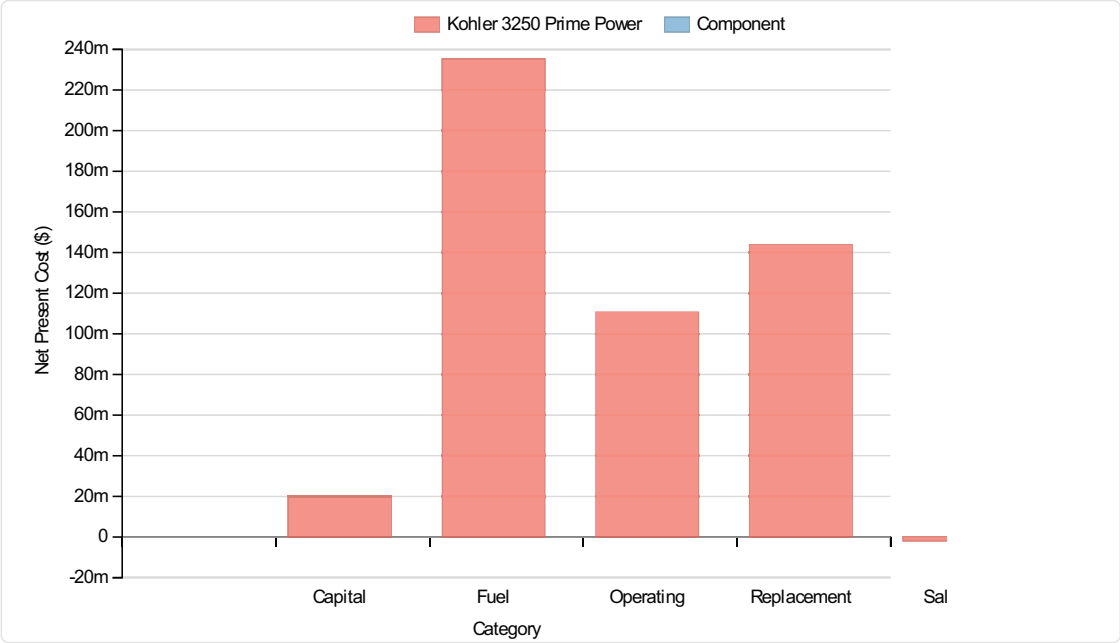
Pollutant	Emissions	Units
Carbon dioxide	69150936	kg/yr
Carbon monoxide	289829	kg/yr
Unburned hydrocarbons	33199	kg/yr
Particulate matter	8300	kg/yr
Sulfur dioxide	142377	kg/yr
Nitrogen oxides	289829	kg/yr

System Report

System architecture

Generator	Kohler 3250 Prime Power	22,400	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

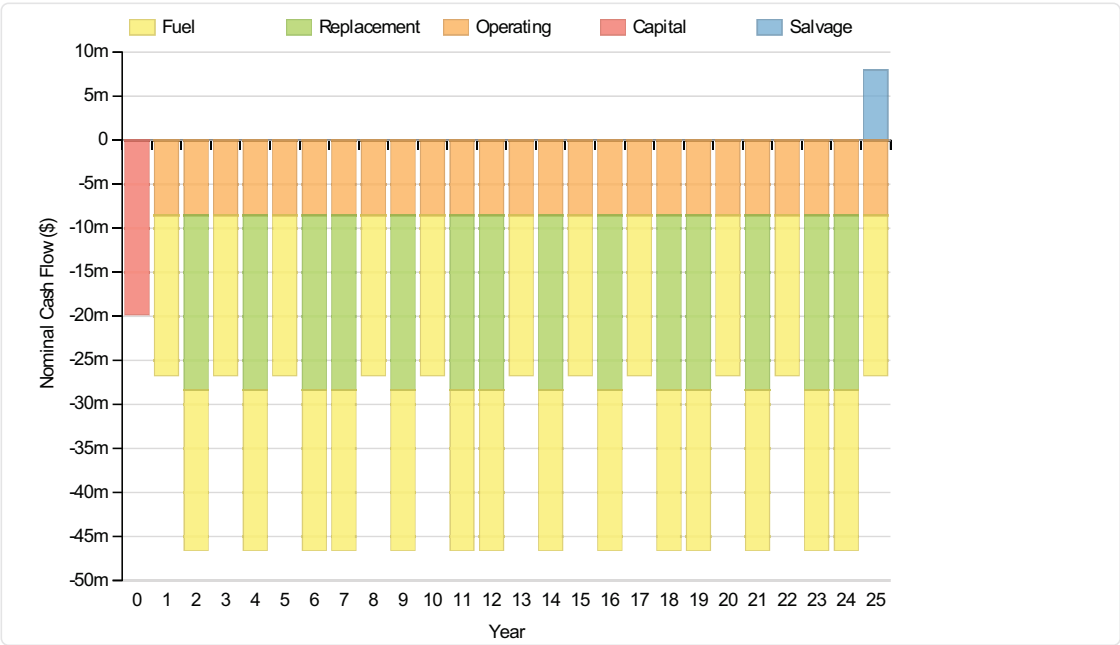
Total net present cost	507364928	\$
Levelized cost of energy	0.405	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 3250 Prime Power	19,821,428	143,797,872	110,637,144	235,007,568	-1,899,339	507,364,673
System	19,821,428	143,797,872	110,637,144	235,007,568	-1,899,339	507,364,673

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 3250 Prime Power	1,533,274	11,123,395	8,558,268	18,178,864	-146,922	39,246,879
System	1,533,274	11,123,395	8,558,268	18,178,864	-146,922	39,246,879

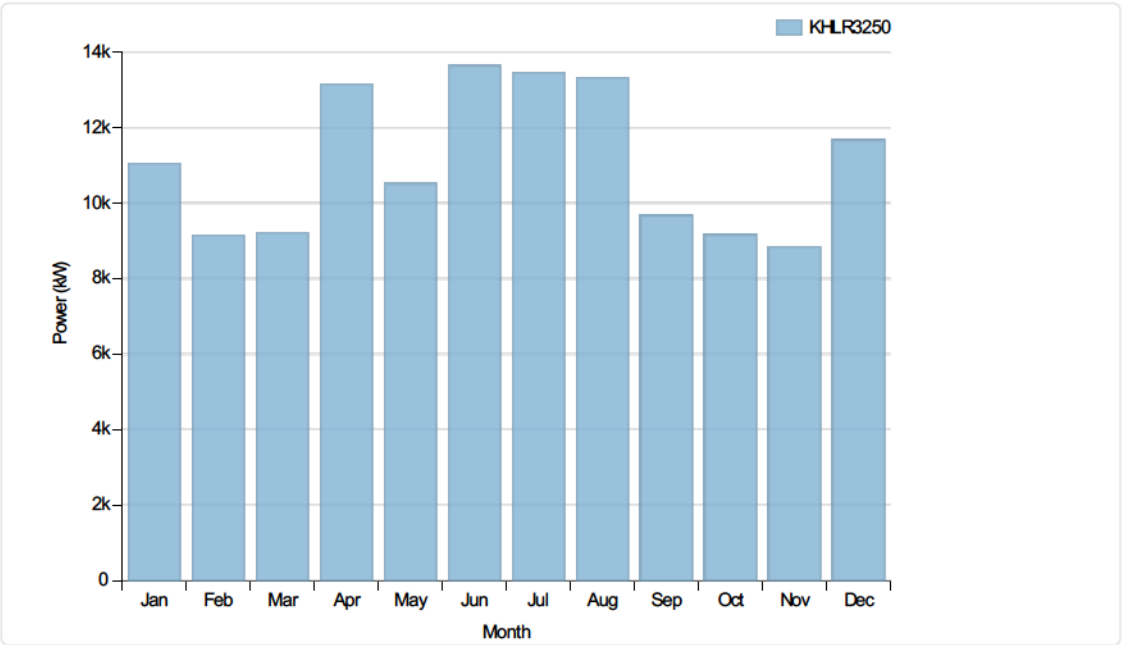


Electrical

Quantity	Value	Units
Excess electricity	174601	kWh/yr
Unmet load	5507	kWh/yr
Capacity shortage	52841	kWh/yr
Renewable fraction	0	

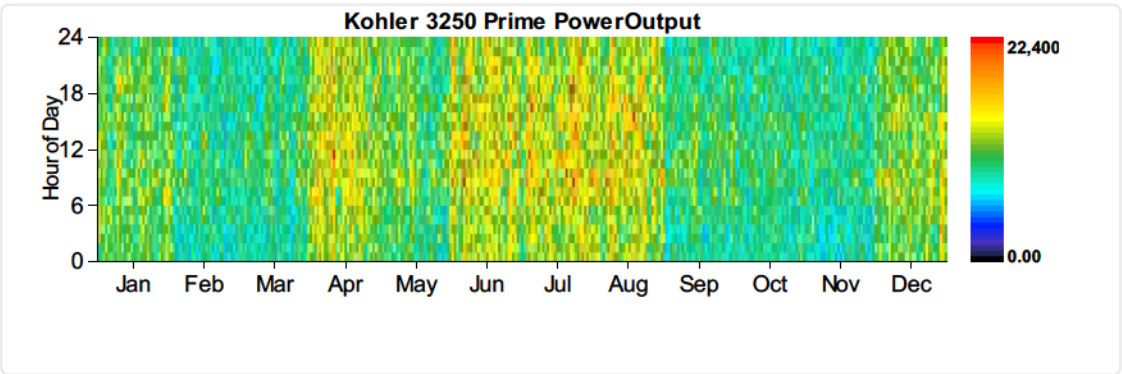
Component	Production(kWh/yr)	Fraction (%)
Generator	97,033,256	100
Total	97,033,256	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,858,648	100
DC primary load	0	0
Total	96,858,648	100



Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	8760	hrs/yr
Number of starts	1	starts/yr
Operational life	2	yr
Fixed generation cost	2342.20	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	97033256	kWh/yr
Mean electrical output	11077	kW
Min. electrical output	5600	kW
Max. electrical output	22400	kW
Fuel consumption	23011234	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	226430576	kWh/yr
Mean electrical efficiency	43	%



Emissions

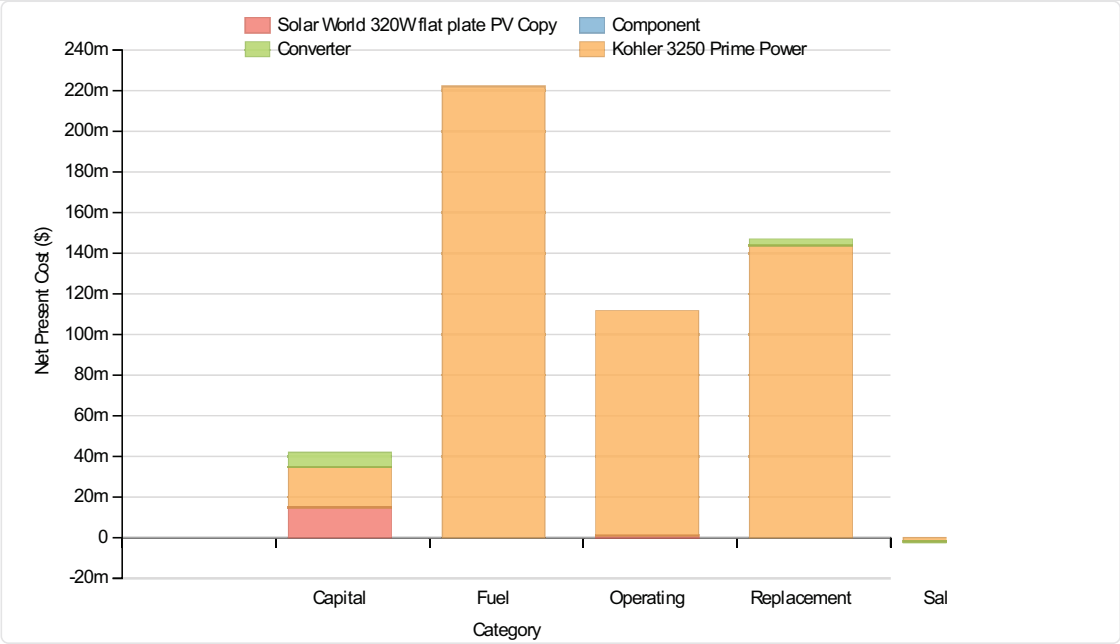
Pollutant	Emissions	Units
Carbon dioxide	60393336	kg/yr
Carbon monoxide	253124	kg/yr
Unburned hydrocarbons	28994	kg/yr
Particulate matter	7249	kg/yr
Sulfur dioxide	124345	kg/yr
Nitrogen oxides	253124	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	5,000	kW
Generator	Kohler 3250 Prime Power	22,400	kW
Converter	System Converter	24,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	520071488	\$
Levelized cost of energy	0.415	\$/kWh

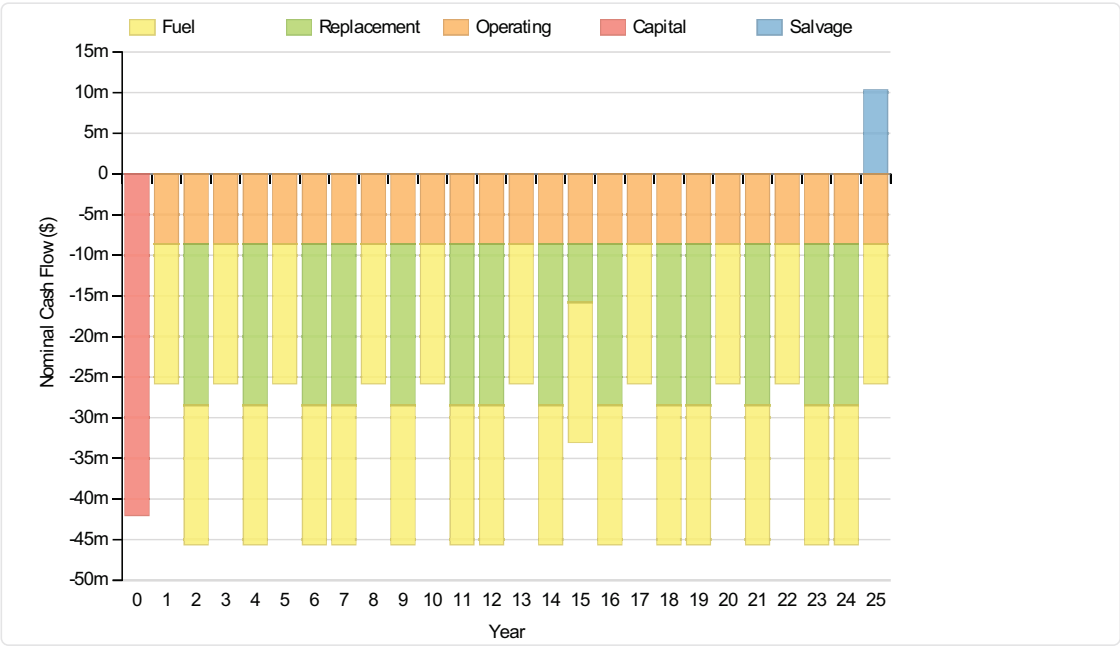
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	15,000,000	0	969,563	0	0	15,969,563
Kohler 3250 Prime Power	19,821,428	143,797,872	110,637,144	222,064,784	-1,899,339	494,421,889
Converter	7,200,000	3,054,769	0	0	-574,938	9,679,831
System	42,021,428	146,852,640	111,606,664	222,064,784	-2,474,277	520,071,239

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	1,160,316	0	75,000	0	0	1,235,316
Kohler 3250 Prime Power	1,533,274	11,123,395	8,558,268	17,177,684	-146,922	38,245,699
Converter	556,952	236,300	0	0	-44,474	748,778

Component	Capital	Replacement	Operating	Fuel	Salvage	Total
	261,542	256,915	881,264	177,684	1,366	1,29,789

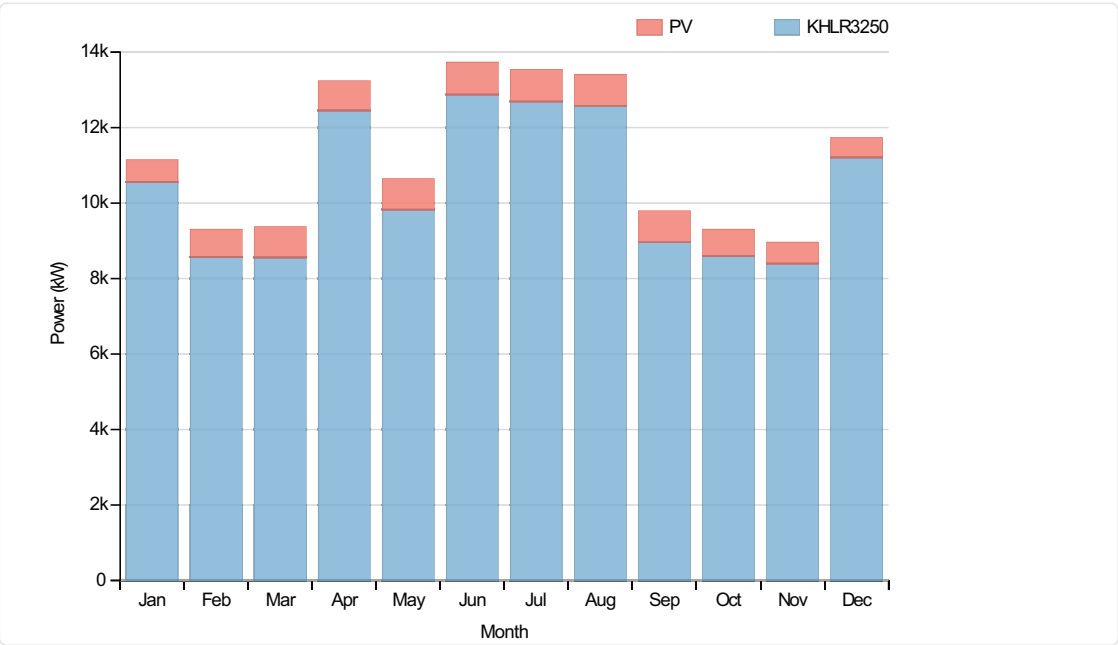


Electrical

Quantity	Value	Units
Excess electricity	547357	kWh/yr
Unmet load	1351	kWh/yr
Capacity shortage	28736	kWh/yr
Renewable fraction	0	

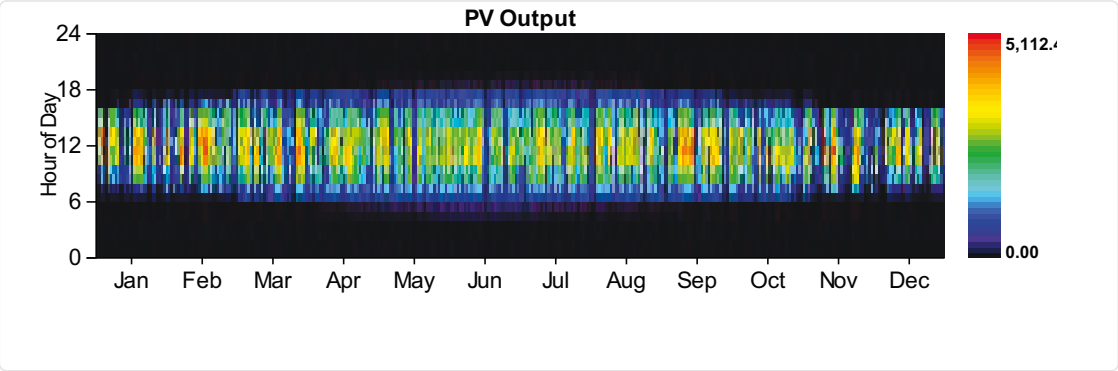
Component	Production(kWh/yr)	Fraction (%)
PV	6,443,367	7
Generator	91,574,000	93
Total	98,017,368	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	96,862,808	100
DC primary load	0	0
Total	96,862,808	100



PV:Solar World 320W flat plate PV Copy

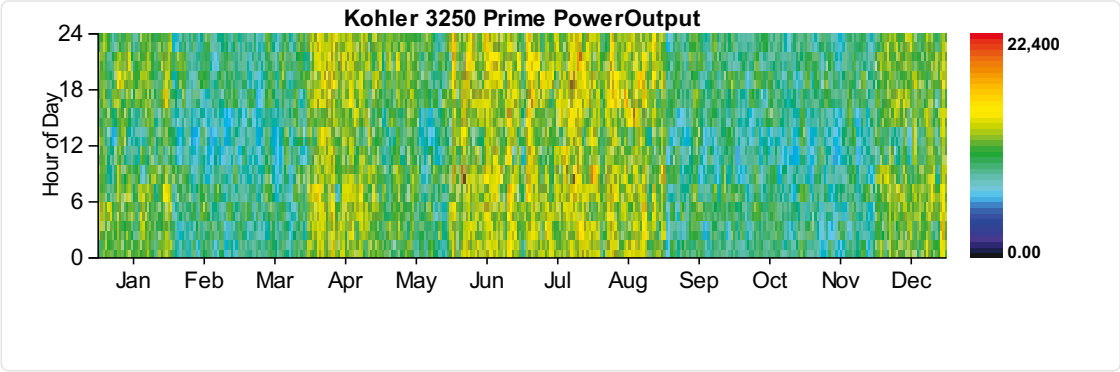
Quantity	Value	Units
Rated capacity	5000	kW
Mean output	736	kW
Mean output	17653.00	kWh/d
Capacity factor	14.71	%
Total production	6443367	kWh/yr
Minimum output	0.00	kW
Maximum output	5112.50	kW
PV penetration	6.65	%
Hours of operation	4377	hrs/yr
Levelized cost	0.192	\$/kWh



Generator:Kohler 3250 Prime Power

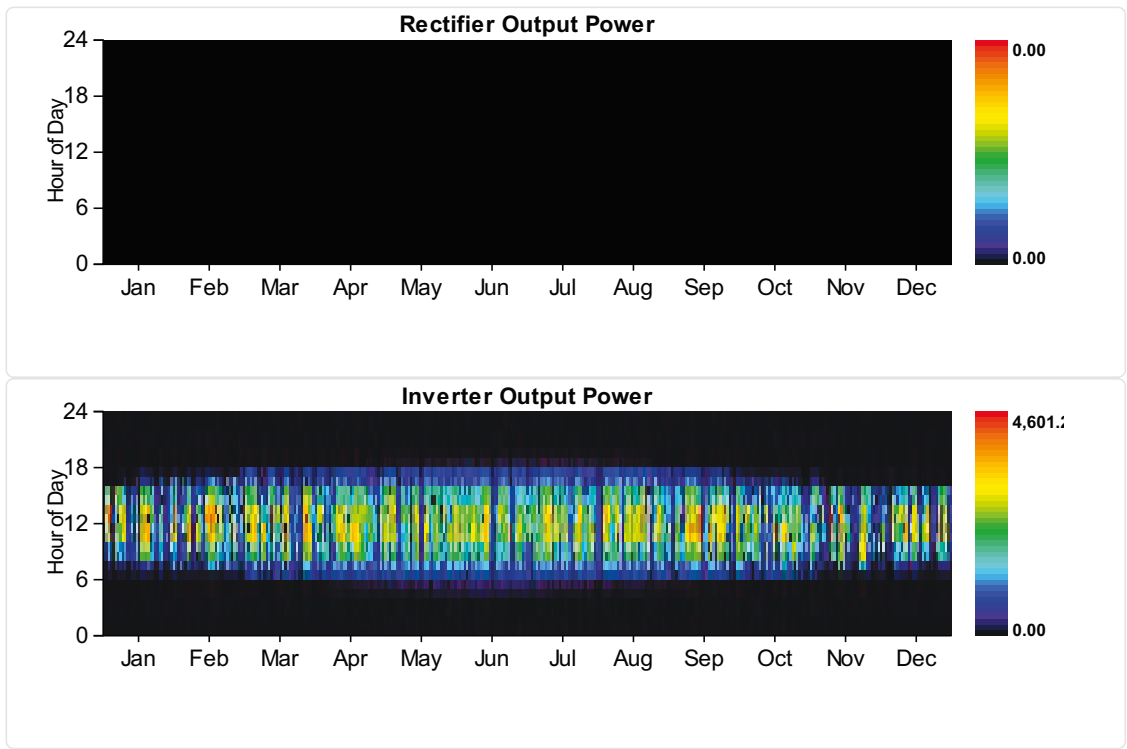
Quantity	Value	Units
Hours of operation	8760	hrs/yr
Number of starts	1	starts/yr

Quantity	Value	Units
Fixed generation cost	2342.20	\$/hr
Marginal generation cost	0.18	\$/kWh
Electrical production	91574000	kWh/yr
Mean electrical output	10454	kW
Min. electrical output	5600	kW
Max. electrical output	22400	kW
Fuel consumption	21743916	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	213960160	kWh/yr
Mean electrical efficiency	43	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	24,000	21,600	kW
Mean output	624	0	kW
Minimum output	0	0	kW
Maximum output	4,601	0	kW
Capacity factor	3	0	%
Hours of operation	4,311	0	hrs/yr
Energy in	6,070,614	0	kWh/yr
Energy out	5,463,549	0	kWh/yr
Losses	607,065	0	kWh/yr



Emissions

Pollutant	Emissions	Units
Carbon dioxide	57067240	kg/yr
Carbon monoxide	239183	kg/yr
Unburned hydrocarbons	27397	kg/yr
Particulate matter	6849	kg/yr
Sulfur dioxide	117497	kg/yr
Nitrogen oxides	239183	kg/yr

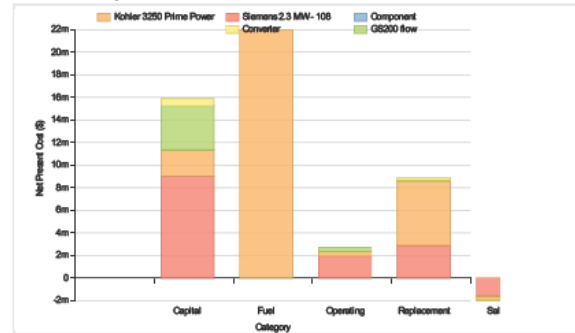
Appendix D – AUTECH Scenarios

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	2	
Generator	Kohler 3250 Prime Power	3,250	kW
Battery	GS200 flow	12	strings
Converter	System Converter	2,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	47442712	\$
Levelized cost of energy	0.261	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	9,000,000	2,869,263	1,939,126	0	-1,617,013	12,191,376
Kohler 3250 Prime Power	2,346,591	5,707,372	426,261	21,940,282	-317,611	30,102,895
GS200 flow	3,895,070	86,018	372,312	0	-11,663	4,341,737
Converter	600,000	254,564	0	0	-47,912	806,652
System	15,841,661	8,917,217	2,737,699	21,940,282	-1,994,198	47,442,661

Annualized Costs

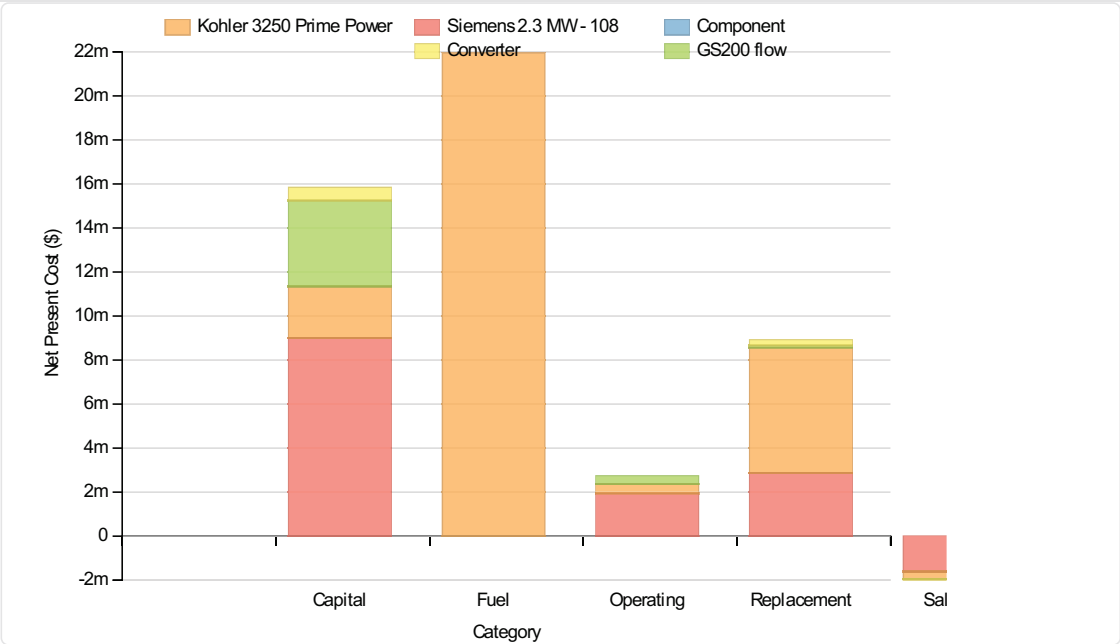
Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	696,189	221,950	150,000	0	-125,083	943,056

System Report

System architecture

Wind Turbine	Siemens 2.3 MW - 108	2	
Generator	Kohler 3250 Prime Power	3,250	kW
Battery	GS200 flow	12	strings
Converter	System Converter	2,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	47442712	\$
Levelized cost of energy	0.261	\$/kWh

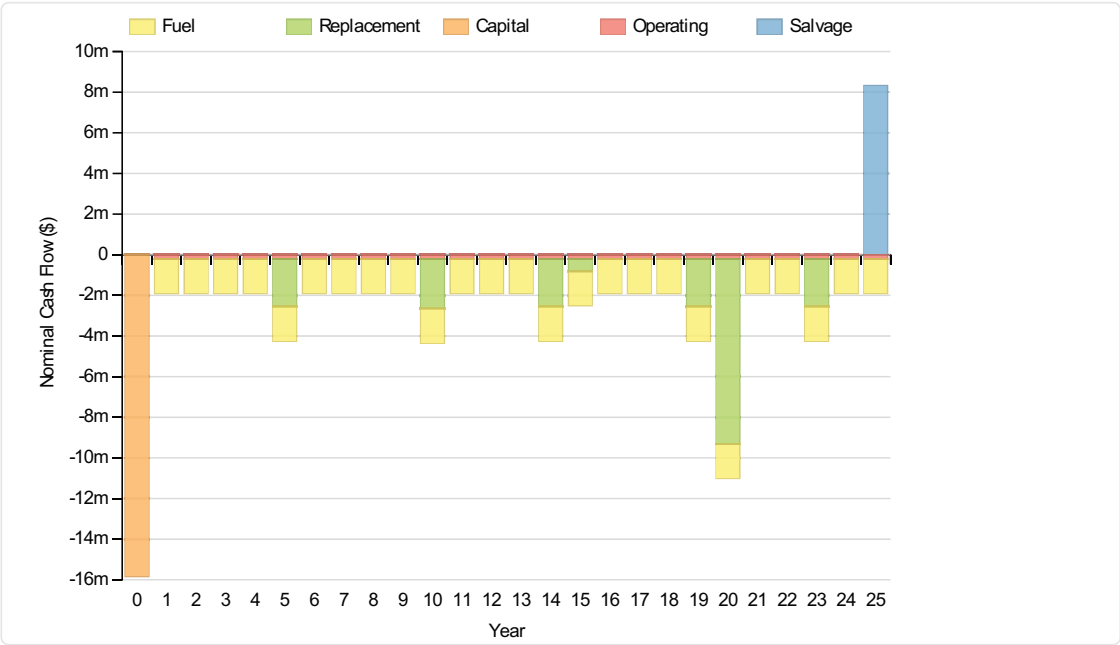
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	9,000,000	2,869,263	1,939,126	0	-1,617,013	12,191,376
Kohler 3250 Prime Power	2,346,591	5,707,372	426,261	21,940,282	-317,611	30,102,895
GS200 flow	3,895,070	86,018	372,312	0	-11,663	4,341,737
Converter	600,000	254,564	0	0	-47,912	806,652
System	15,841,661	8,917,217	2,737,699	21,940,282	-1,994,198	47,442,661

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Siemens 2.3 MW - 108	696,189	221,950	150,000	0	-125,083	943,056

Component	Prime Power	Capital	Replacement	O&M	Fuel	Salvage	Total
GS200 flow		301,301	6,654	28,800	0	-902	335,853
Converter		46,413	19,692	0	0	-3,706	62,399
System		1,225,422	689,786	211,773	1,697,177	-154,260	3,669,898

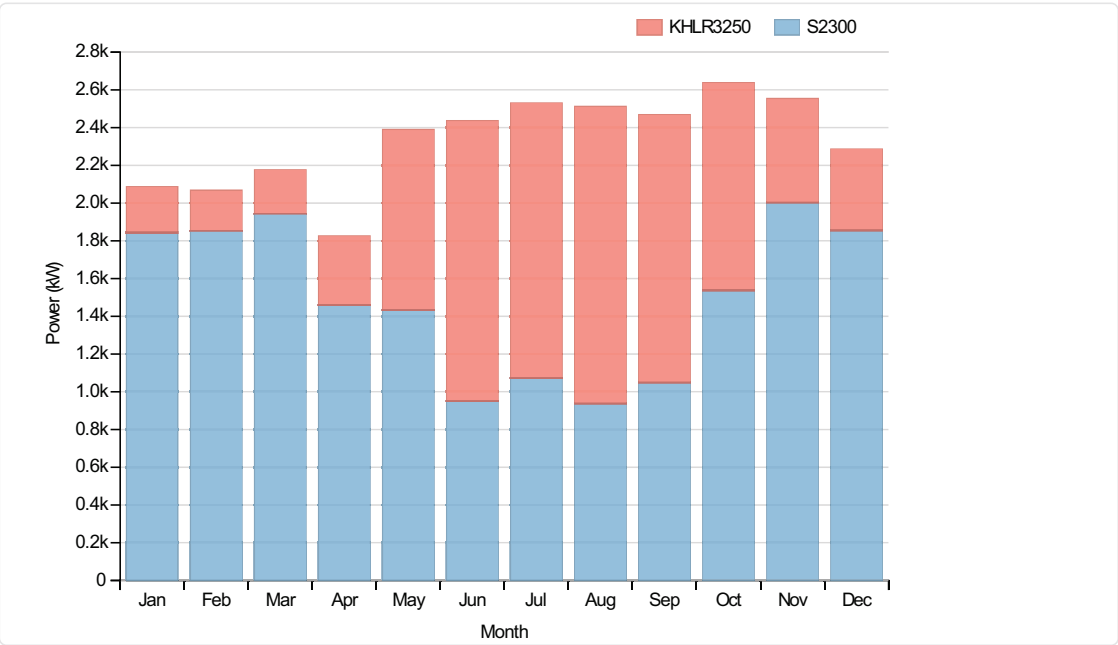


Electrical

Quantity	Value	Units
Excess electricity	4217891	kWh/yr
Unmet load	488	kWh/yr
Capacity shortage	3675	kWh/yr
Renewable fraction	0	

Component	Production(kWh/yr)	Fraction (%)
Generator	7,356,061	36
Wind Turbine	13,081,490	64
Total	20,437,550	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	14,060,971	100
DC primary load	0	0
Total	14,060,971	100



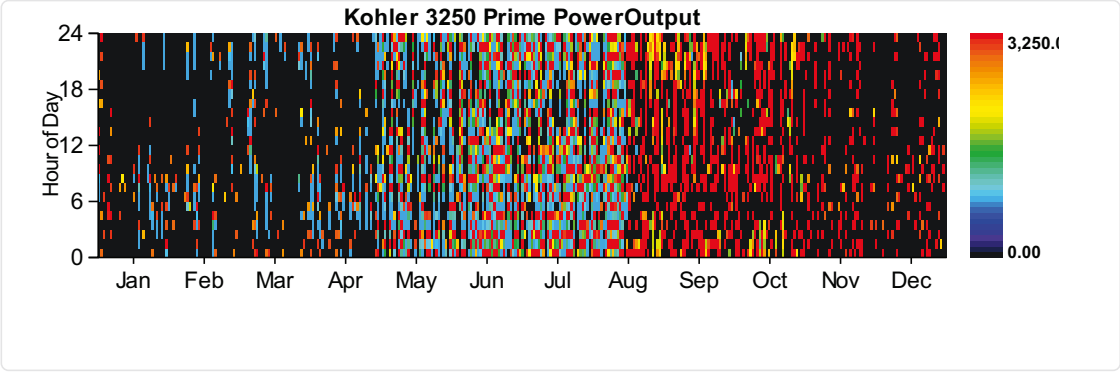
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	4600	kW
Mean output	1493	kW
Capacity factor	32.46	%
Total production	13081490	kWh/yr
Minimum output	3.12	kW
Maximum output	4629.60	kW
Wind penetration	93.03	%
Hours of operation	8760	hrs/yr
Levelized cost	0.072	\$/kWh

Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	3261	hrs/yr
Number of starts	911	starts/yr
Operational life	5	yr
Fixed generation cost	235.85	\$/hr
Marginal generation cost	0.20	\$/kWh
Electrical production	7356061	kWh/yr
Mean electrical output	2256	kW
Min. electrical output	813	kW

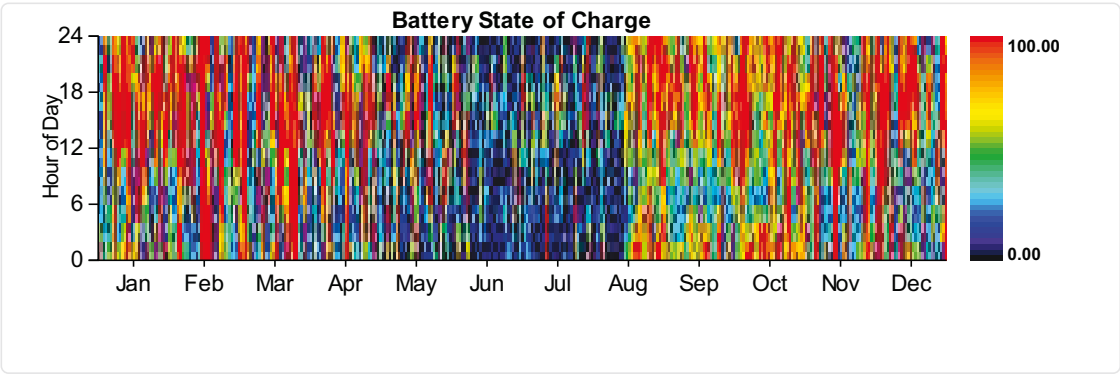
Quantity	Value	Units
Max. electrical output	3250	kW
Fuel consumption	1697178	L/yr
Specific fuel consumption	0.23	L/kWh
Fuel energy input	16700232	kWh/yr
Mean electrical efficiency	44	%



Battery:GS200 flow

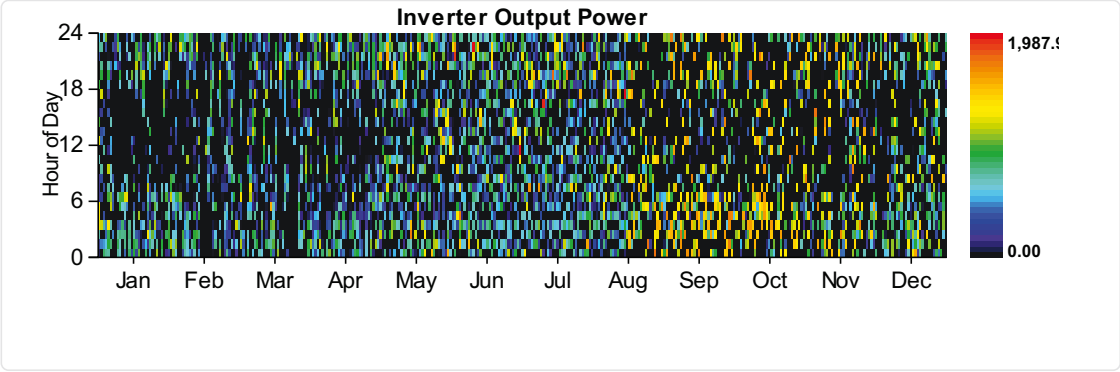
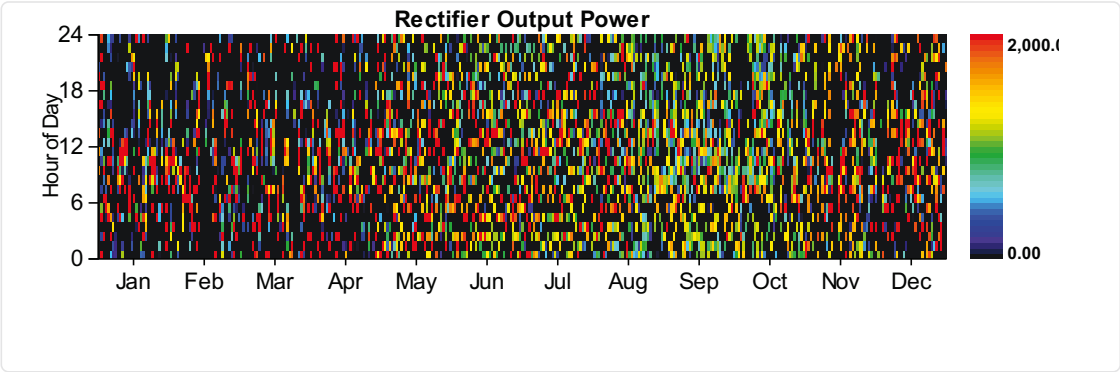
Quantity	Value
String size	1
Strings in parallel	12
Batteries	12
Bus voltage	100

Quantity	Value	Units
Nominal capacity	7200	kWh
Usable nominal capacity	7200	kWh
Autonomy	4	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.159	\$/kWh
Energy in	3953248	kWh/yr
Energy out	2769061	kWh/yr
Storage depletion	2134	kWh/yr
Losses	1182053	kWh/yr
Annual throughput	3309657	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	2,000	1,800	kW
Mean output	284	451	kW
Minimum output	0	0	kW
Maximum output	1,988	2,000	kW
Capacity factor	14	23	%
Hours of operation	3,651	3,335	hrs/yr
Energy in	2,769,061	4,650,904	kWh/yr
Energy out	2,492,151	3,953,248	kWh/yr
Losses	276,910	697,656	kWh/yr



Emissions

Pollutant	Emissions	Units
Carbon dioxide	4454270	kg/yr
Carbon monoxide	18669	kg/yr

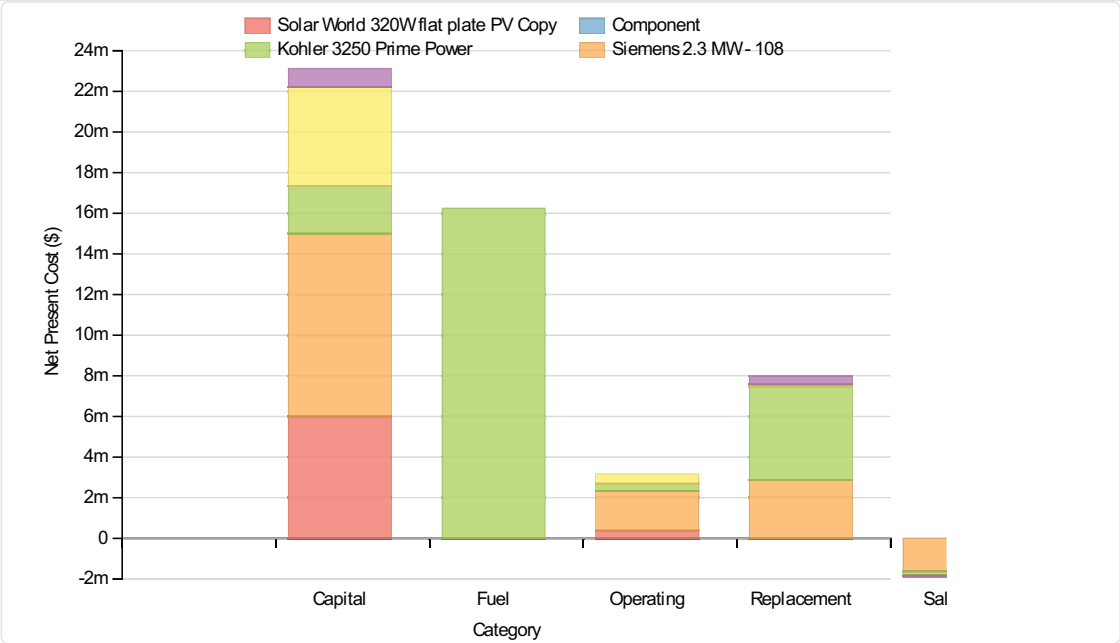
Pollutant	Emissions	Units
Unburned hydrocarbons	2138	kg/yr
Particulate matter	535	kg/yr
Sulfur dioxide	9171	kg/yr
Nitrogen oxides	18669	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	2,000	kW
Wind Turbine	Siemens 2.3 MW - 108	2	
Generator	Kohler 3250 Prime Power	3,250	kW
Battery	GS200 flow	15	strings
Converter	System Converter	3,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

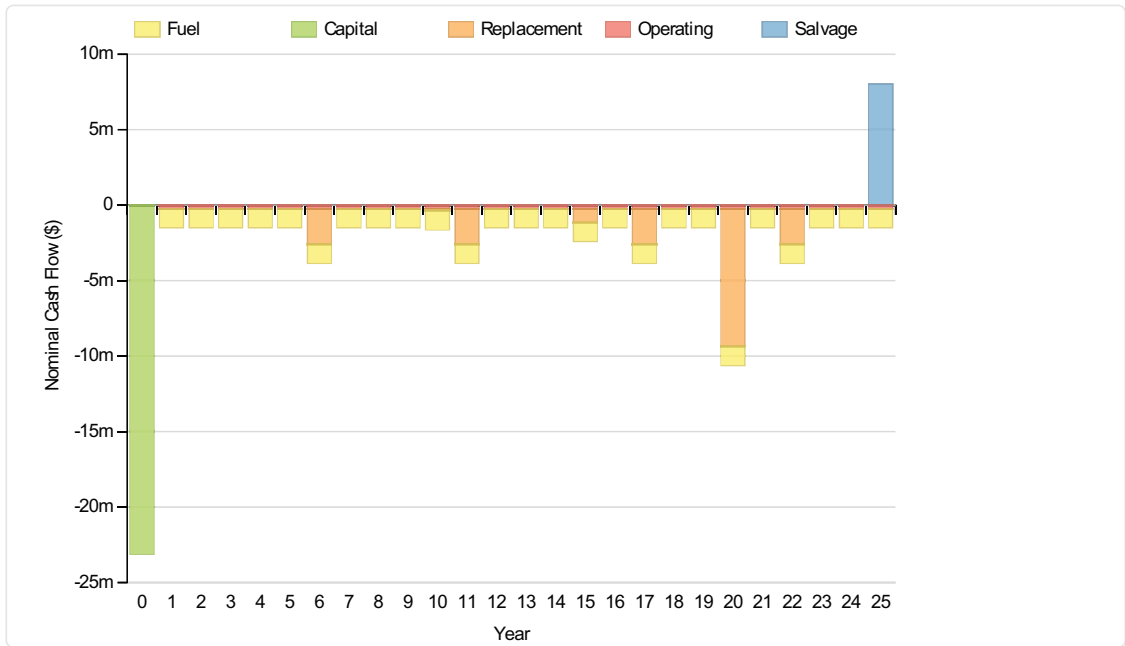
Total net present cost	48557108	\$
Levelized cost of energy	0.267	\$/kWh

Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	6,000,000	0	387,825	0	0	6,387,825
Siemens 2.3 MW - 108	9,000,000	2,869,263	1,939,126	0	-1,617,013	12,191,376
Kohler 3250 Prime Power	2,346,591	4,600,629	362,995	16,239,458	-208,930	23,340,743
GS200 flow	4,868,838	107,521	465,390	0	-14,578	5,427,171
Converter	900,000	381,846	0	0	-71,867	1,209,979
System	23,115,428	7,959,259	3,155,337	16,239,458	-1,912,389	48,557,093

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	464,126	0	30,000	0	0	494,126
Siemens 2.3 MW - 108	696,189	221,950	150,000	0	-125,083	943,056
Kohler 3250 Prime Power	181,519	355,879	28,079	1,256,193	-16,162	1,805,508
GS200 flow	376,626	8,317	36,000	0	-1,128	419,816
Converter	69,619	29,537	0	0	-5,559	93,597
System	1,788,080	615,684	244,079	1,256,193	-147,932	3,756,104



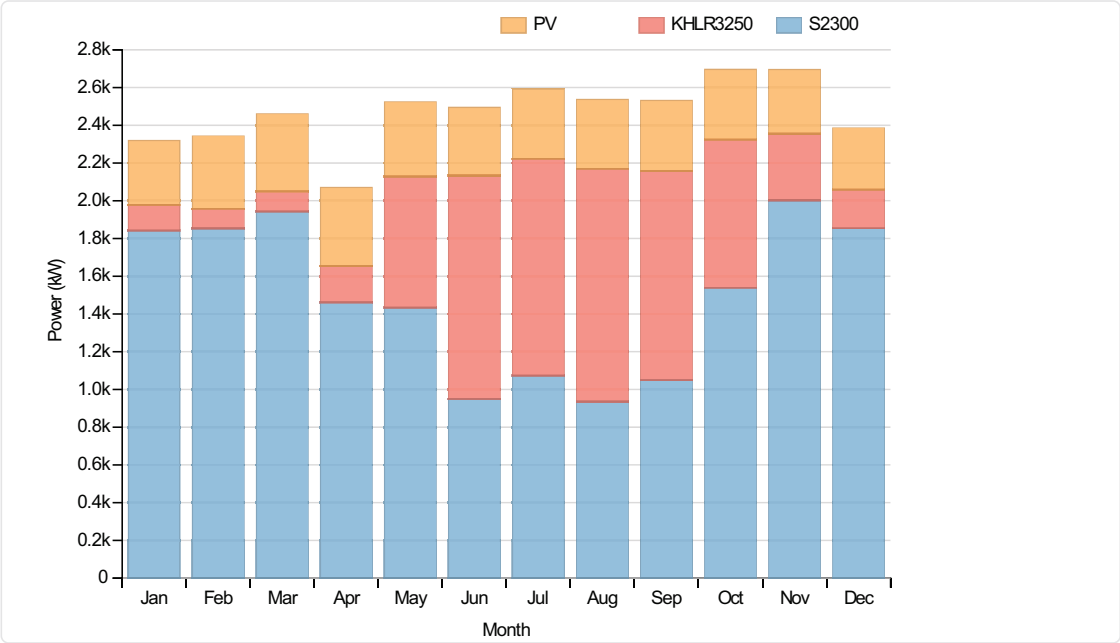
Electrical

Quantity	Value	Units
Excess electricity	5480098	kWh/yr
Unmet load	157	kWh/yr
Capacity shortage	2506	kWh/yr
Renewable fraction	1	

Component	Production(kWh/yr)	Fraction (%)
PV	3,250,128	15
Generator	5,318,757	25
Wind Turbine	13,081,490	60
Total	21,650,376	100

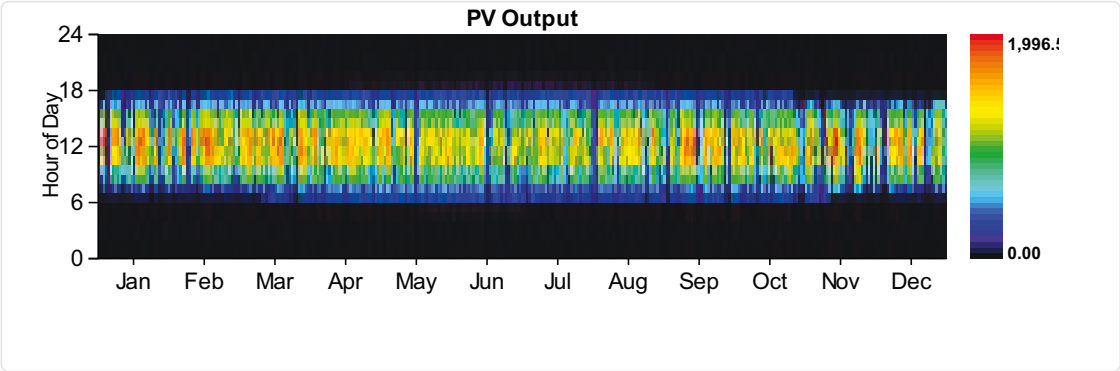
Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	14,061,302	100
DC primary load	0	0

Load	Consumption(kWh/yr)	Fraction (%)
Total	14,061,302	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	2000	kW
Mean output	371	kW
Mean output	8904.50	kWh/d
Capacity factor	18.55	%
Total production	3250128	kWh/yr
Minimum output	0.00	kW
Maximum output	1996.60	kW
PV penetration	23.11	%
Hours of operation	4370	hrs/yr
Levelized cost	0.152	\$/kWh



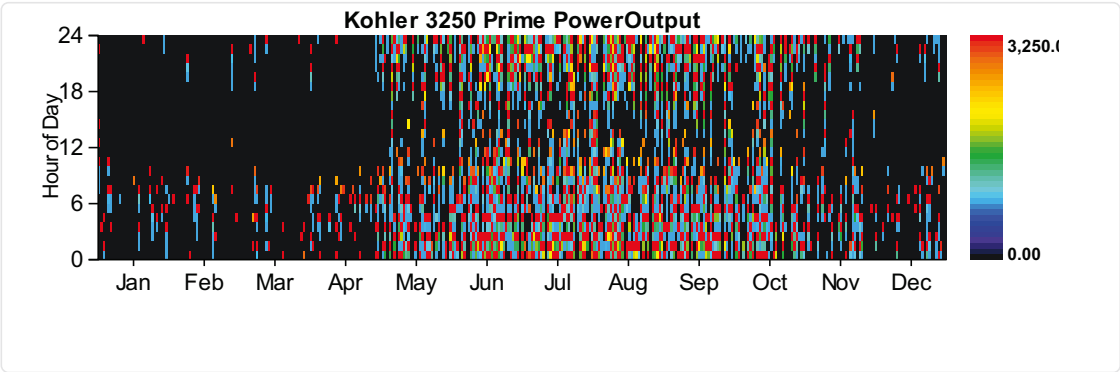
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units

Quantity	Value	Units
Total rated capacity	4600	kW
Mean output	1493	kW
Capacity factor	32.46	%
Total production	13081490	kWh/yr
Minimum output	3.12	kW
Maximum output	4629.60	kW
Wind penetration	93.03	%
Hours of operation	8760	hrs/yr
Levelized cost	0.072	\$/kWh

Generator:Kohler 3250 Prime Power

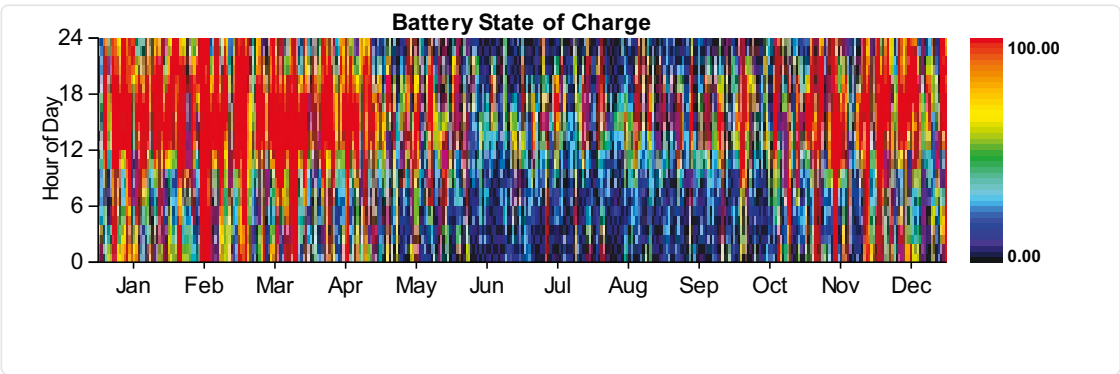
Quantity	Value	Units
Hours of operation	2777	hrs/yr
Number of starts	532	starts/yr
Operational life	5	yr
Fixed generation cost	235.85	\$/hr
Marginal generation cost	0.20	\$/kWh
Electrical production	5318757	kWh/yr
Mean electrical output	1915	kW
Min. electrical output	813	kW
Max. electrical output	3250	kW
Fuel consumption	1256194	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	12360949	kWh/yr
Mean electrical efficiency	43	%



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	15
Batteries	15
Bus voltage	100

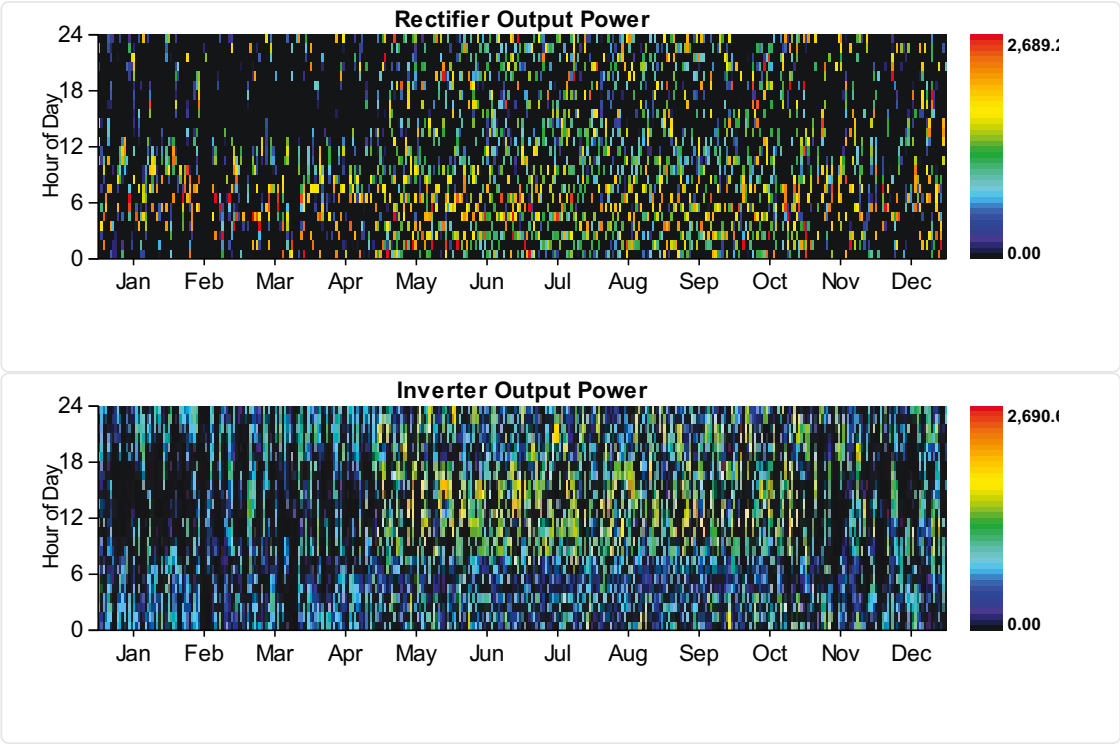
Quantity	Value	Units
Nominal capacity	9000	kWh
Usable nominal capacity	9000	kWh
Autonomy	6	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.111	\$/kWh
Energy in	4010070	kWh/yr
Energy out	2808839	kWh/yr
Storage depletion	2134	kWh/yr
Losses	1199097	kWh/yr
Annual throughput	3357196	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	3,000	2,700	kW
Mean output	408	330	kW
Minimum output	0	0	kW
Maximum output	2,691	2,689	kW
Capacity factor	14	11	%

Quantity	Inverter	Rectifier	Units
Hours of operation	4,446	2,426	hrs/yr
Energy in	3,975,608	3,401,441	kWh/yr
Energy out	3,578,049	2,891,229	kWh/yr
Losses	397,560	510,212	kWh/yr



Emissions

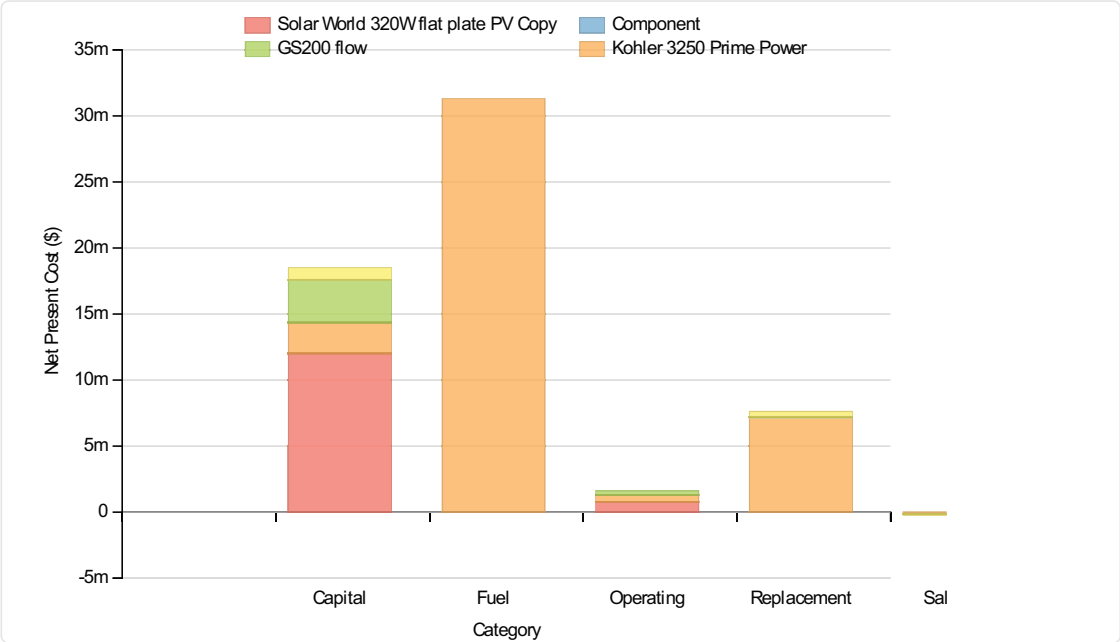
Pollutant	Emissions	Units
Carbon dioxide	3296900	kg/yr
Carbon monoxide	13818	kg/yr
Unburned hydrocarbons	1583	kg/yr
Particulate matter	396	kg/yr
Sulfur dioxide	6788	kg/yr
Nitrogen oxides	13818	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	4,000	kW
Generator	Kohler 3250 Prime Power	3,250	kW
Battery	GS200 flow	10	strings
Converter	System Converter	3,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	58783660	\$
Levelized cost of energy	0.323	\$/kWh

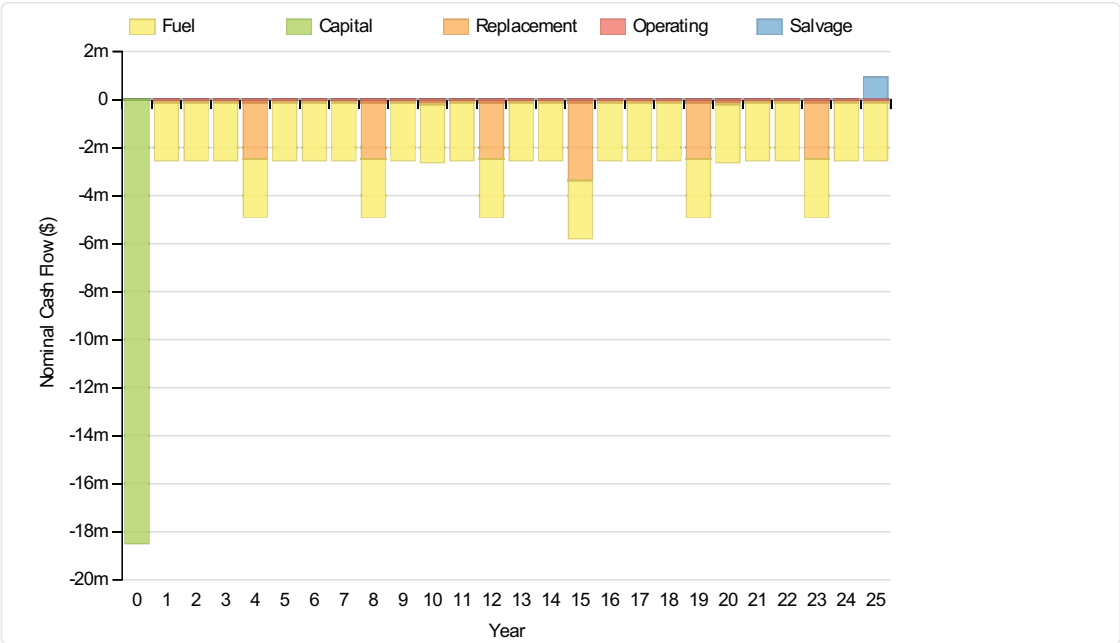
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	12,000,000	0	775,651	0	0	12,775,651
Kohler 3250 Prime Power	2,346,591	7,159,266	529,525	31,284,102	-139,599	41,179,885
GS200 flow	3,245,892	71,683	310,260	0	-9,719	3,618,116
Converter	900,000	381,846	0	0	-71,867	1,209,979
System	18,492,482	7,612,796	1,615,436	31,284,102	-221,185	58,783,631

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	928,253	0	60,000	0	0	988,253

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
2500 Prime Power	1,519	558,883	124,961	2,419,962	-17,110	2,544
GS200 flow	251,084	5,545	24,000	0	-752	279,877
Converter	69,619	29,537	0	0	-5,559	93,597
System	1,430,475	588,883	124,961	2,419,962	-17,110	4,547,171

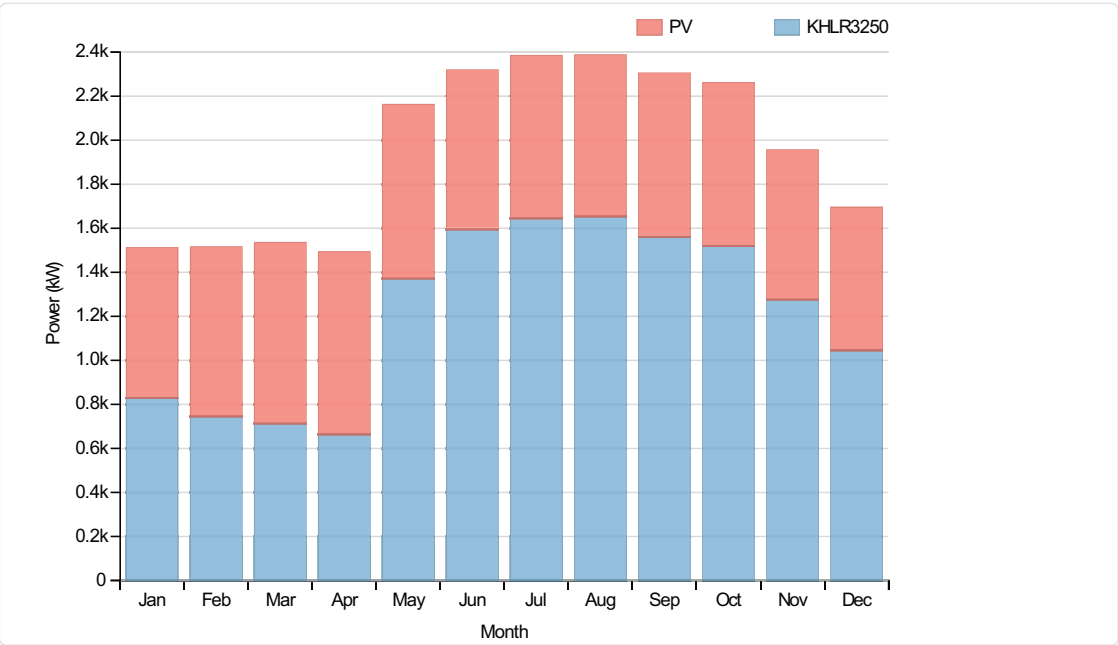


Electrical

Quantity	Value	Units
Excess electricity	604374	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

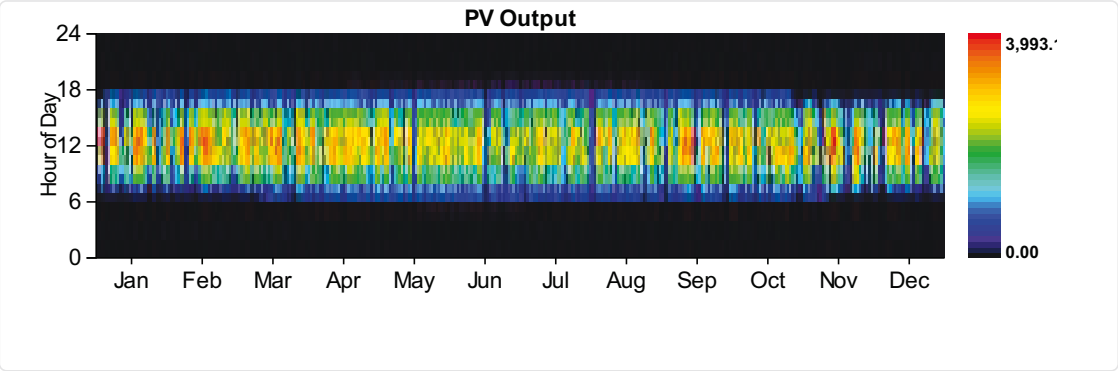
Component	Production(kWh/yr)	Fraction (%)
PV	6,500,257	38
Generator	10,696,306	62
Total	17,196,562	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	14,061,459	100
DC primary load	0	0
Total	14,061,459	100



PV:Solar World 320W flat plate PV Copy

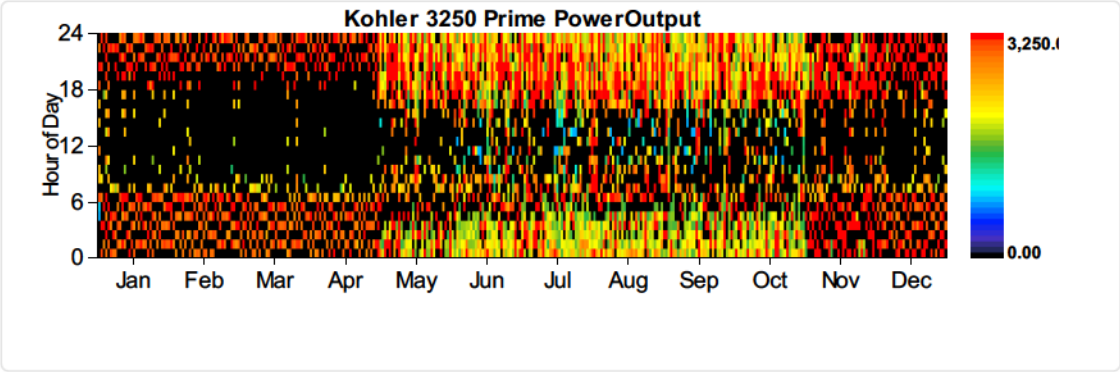
Quantity	Value	Units
Rated capacity	4000	kW
Mean output	742	kW
Mean output	17809.00	kWh/d
Capacity factor	18.55	%
Total production	6500257	kWh/yr
Minimum output	0.00	kW
Maximum output	3993.10	kW
PV penetration	46.23	%
Hours of operation	4370	hrs/yr
Levelized cost	0.152	\$/kWh



Generator:Kohler 3250 Prime Power

Quantity	Value	Units
Hours of operation	4051	hrs/yr
Number of starts	1758	starts/yr

Quantity	Value	Units
Fixed generation cost	235.85	\$/hr
Marginal generation cost	0.20	\$/kWh
Electrical production	10696306	kWh/yr
Mean electrical output	2640	kW
Min. electrical output	813	kW
Max. electrical output	3250	kW
Fuel consumption	2419964	L/yr
Specific fuel consumption	0.23	L/kWh
Fuel energy input	23812448	kWh/yr
Mean electrical efficiency	45	%

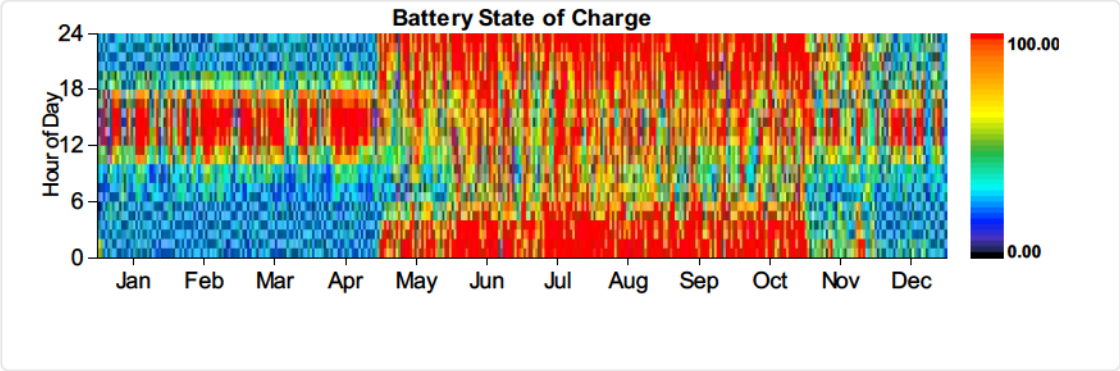


Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	10
Batteries	10
Bus voltage	100

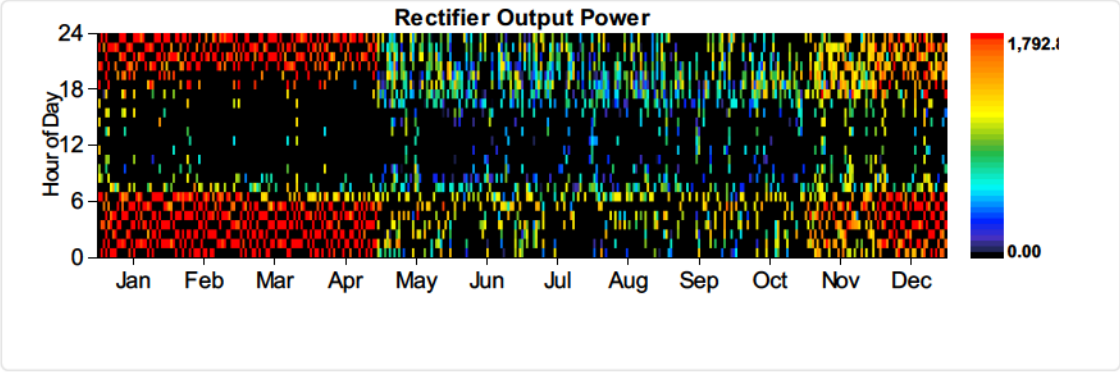
Quantity	Value	Units
Nominal capacity	6000	kWh
Usable nominal capacity	6000	kWh
Autonomy	4	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.241	\$/kWh
Energy in	4366512	kWh/yr

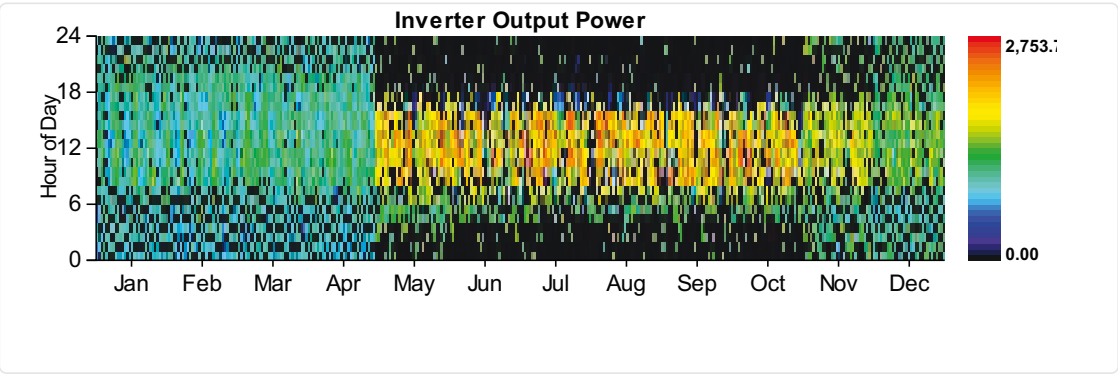
Quantity	Value	Units
Energy out	3060535	kWh/yr
Storage depletion	4746	kWh/yr
Losses	1301230	kWh/yr
Annual throughput	3658050	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	3,000	2,700	kW
Mean output	756	316	kW
Minimum output	0	0	kW
Maximum output	2,754	1,793	kW
Capacity factor	25	11	%
Hours of operation	5,168	2,482	hrs/yr
Energy in	7,359,752	3,258,656	kWh/yr
Energy out	6,623,762	2,769,838	kWh/yr
Losses	735,990	488,819	kWh/yr





Emissions

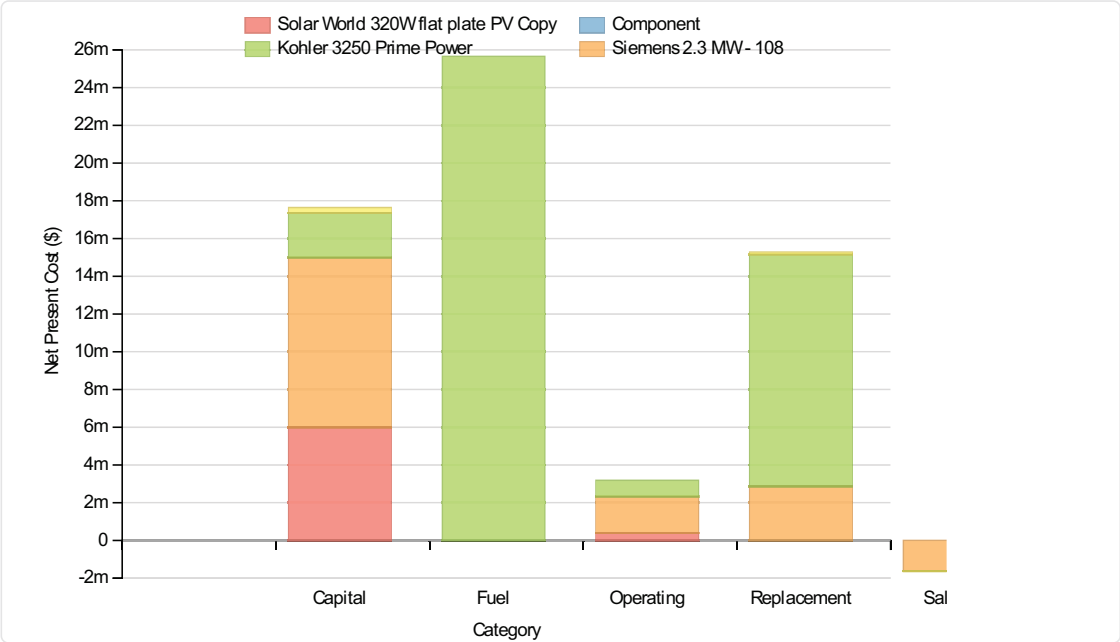
Pollutant	Emissions	Units
Carbon dioxide	6351233	kg/yr
Carbon monoxide	26620	kg/yr
Unburned hydrocarbons	3049	kg/yr
Particulate matter	762	kg/yr
Sulfur dioxide	13077	kg/yr
Nitrogen oxides	26620	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	2,000	kW
Wind Turbine	Siemens 2.3 MW - 108	2	
Generator	Kohler 3250 Prime Power	3,250	kW
Converter	System Converter	1,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	60113544	\$
Levelized cost of energy	0.331	\$/kWh

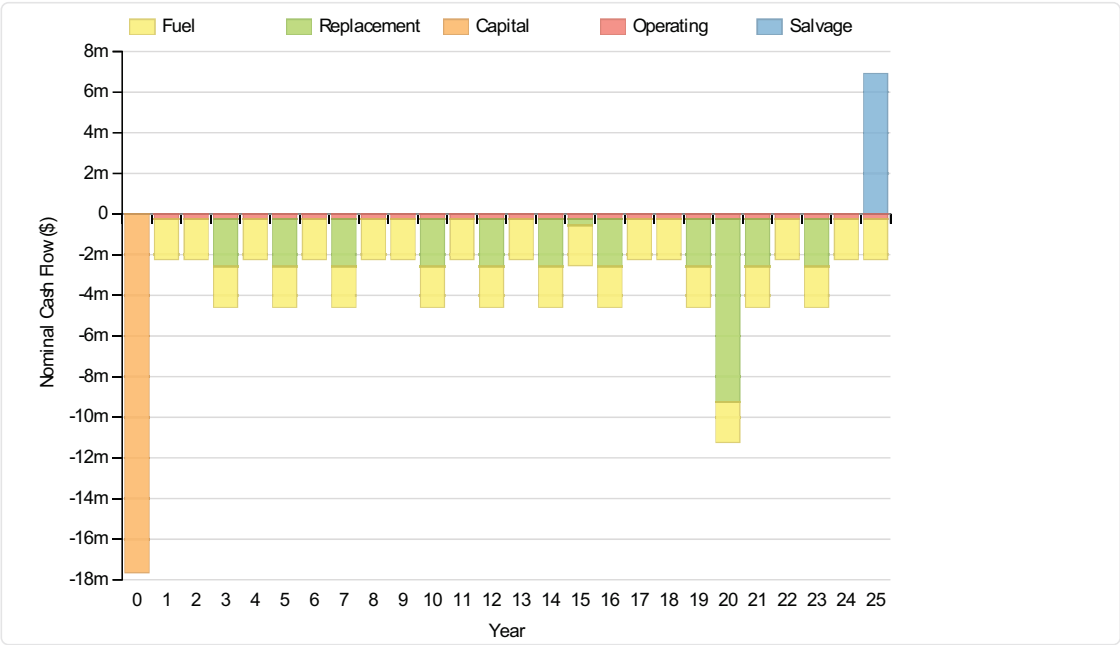
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	6,000,000	0	387,825	0	0	6,387,825
Siemens 2.3 MW - 108	9,000,000	2,869,263	1,939,126	0	-1,617,013	12,191,376
Kohler 3250 Prime Power	2,346,591	12,285,225	860,757	25,652,476	-14,054	41,130,995
Converter	300,000	127,282	0	0	-23,956	403,326
System	17,646,590	15,281,769	3,187,708	25,652,476	-1,655,023	60,113,520

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	464,126	0	30,000	0	0	494,126

Component	Capital	Replacement	Operating	Fuel	Salvage	Total
108 MW - 108	181,189	950,316	66,583	1,984,331	-1,087	3,181,662
Kohler 3250 Prime Power	181,519	950,316	66,583	1,984,331	-1,087	3,181,662
Converter	23,206	9,846	0	0	-1,853	31,199
System	1,365,041	1,182,112	246,583	1,984,331	-128,023	4,650,044

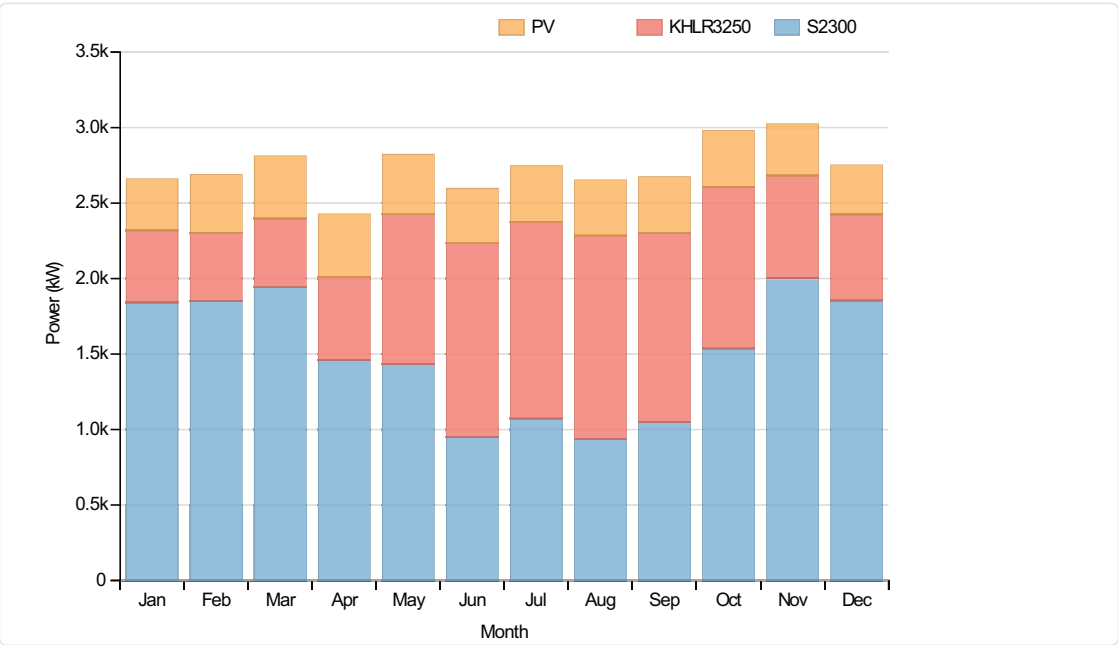


Electrical

Quantity	Value	Units
Excess electricity	9828963	kWh/yr
Unmet load	716	kWh/yr
Capacity shortage	6247	kWh/yr
Renewable fraction	0	

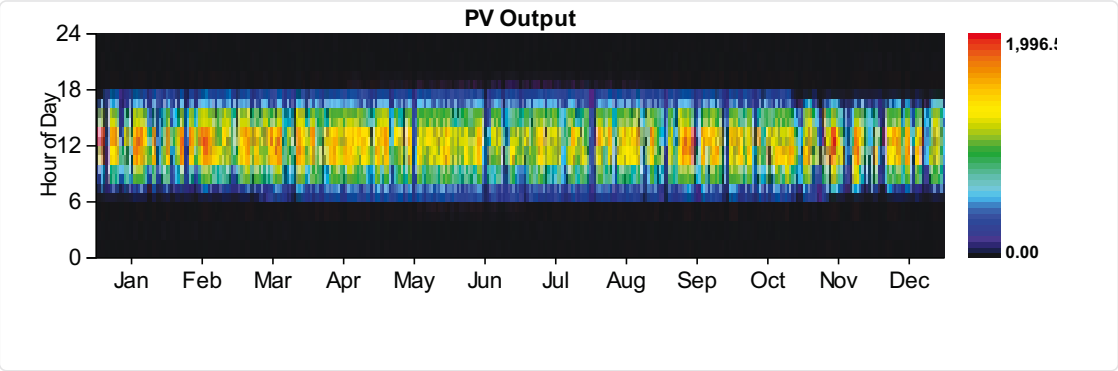
Component	Production(kWh/yr)	Fraction (%)
PV	3,250,128	14
Generator	7,640,236	32
Wind Turbine	13,081,490	55
Total	23,971,854	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	14,060,743	100
DC primary load	0	0
Total	14,060,743	100



PV:Solar World 320W flat plate PV Copy

Quantity	Value	Units
Rated capacity	2000	kW
Mean output	371	kW
Mean output	8904.50	kWh/d
Capacity factor	18.55	%
Total production	3250128	kWh/yr
Minimum output	0.00	kW
Maximum output	1996.60	kW
PV penetration	23.11	%
Hours of operation	4370	hrs/yr
Levelized cost	0.152	\$/kWh



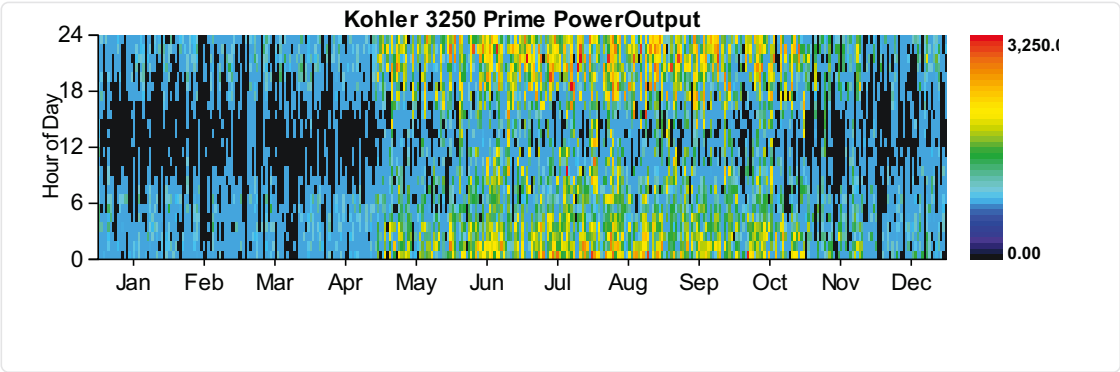
Wind Turbine:Siemens 2.3 MW - 108

Quantity	Value	Units
Total rated capacity	4600	kW
Mean output	1493	kW

Quantity	Value	Units
Capacity factor	32.46	%
Total production	13081490	kWh/yr
Minimum output	3.12	kW
Maximum output	4629.60	kW
Wind penetration	93.03	%
Hours of operation	8760	hrs/yr
Levelized cost	0.072	\$/kWh

Generator:Kohler 3250 Prime Power

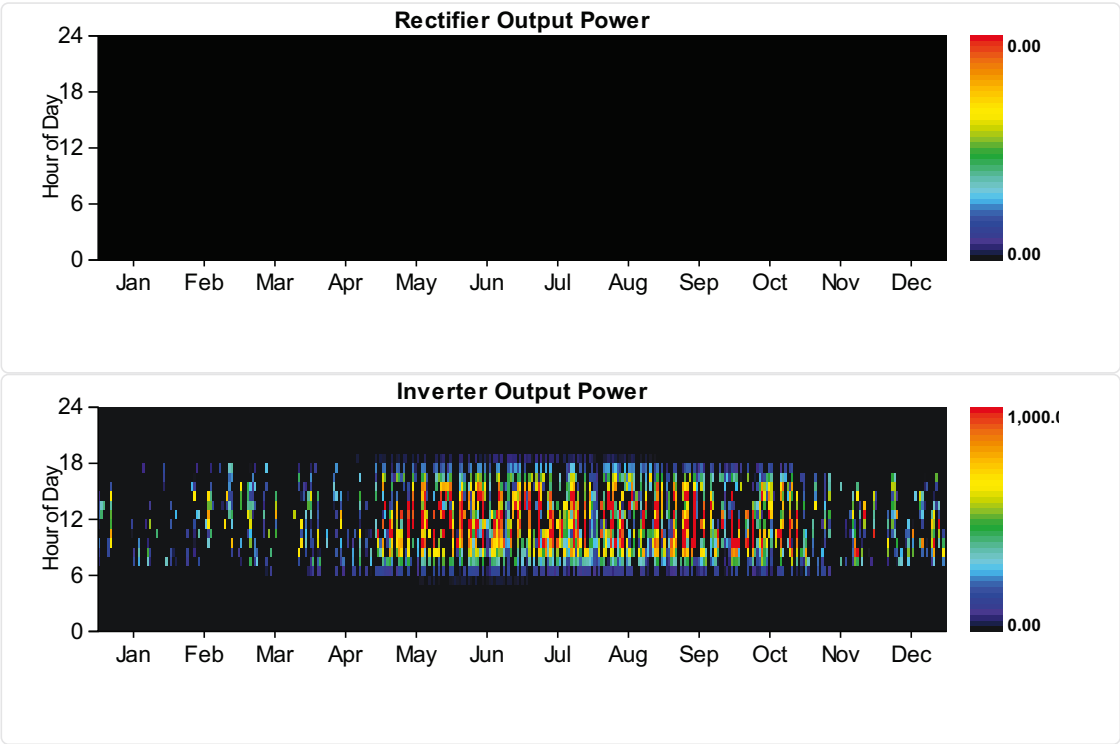
Quantity	Value	Units
Hours of operation	6585	hrs/yr
Number of starts	550	starts/yr
Operational life	2	yr
Fixed generation cost	235.85	\$/hr
Marginal generation cost	0.20	\$/kWh
Electrical production	7640236	kWh/yr
Mean electrical output	1160	kW
Min. electrical output	813	kW
Max. electrical output	3250	kW
Fuel consumption	1984332	L/yr
Specific fuel consumption	0.26	L/kWh
Fuel energy input	19525830	kWh/yr
Mean electrical efficiency	39	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	1,000	900	kW

Quantity	Inverter	Rectifier	Units
Mean output	84	0	kW
Minimum output	0	0	kW
Maximum output	1,000	0	kW
Capacity factor	8	0	%
Hours of operation	1,813	0	hrs/yr
Energy in	821,853	0	kWh/yr
Energy out	739,666	0	kWh/yr
Losses	82,186	0	kWh/yr



Emissions

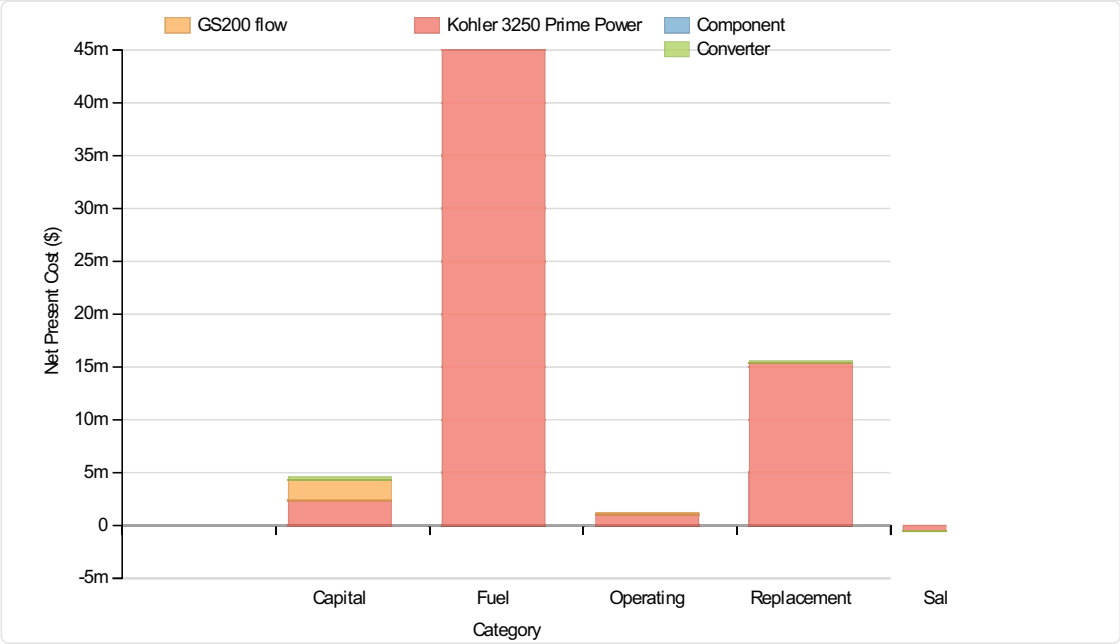
Pollutant	Emissions	Units
Carbon dioxide	5207910	kg/yr
Carbon monoxide	21828	kg/yr
Unburned hydrocarbons	2500	kg/yr
Particulate matter	625	kg/yr
Sulfur dioxide	10723	kg/yr
Nitrogen oxides	21828	kg/yr

System Report

System architecture

Generator	Kohler 3250 Prime Power	3,250	kW
Battery	GS200 flow	6	strings
Converter	System Converter	1,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	65802344	\$
Levelized cost of energy	0.362	\$/kWh

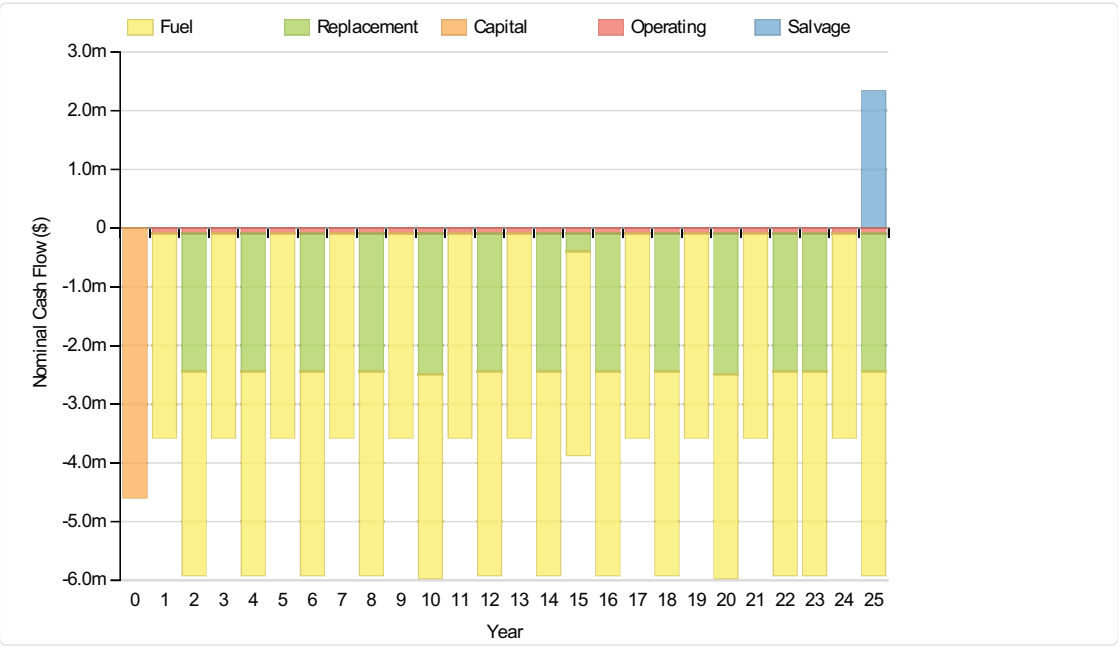
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 3250 Prime Power	2,346,591	15,398,611	1,024,020	44,989,192	-530,288	63,228,126
GS200 flow	1,947,535	43,013	186,156	0	-5,832	2,170,872
Converter	300,000	127,282	0	0	-23,956	403,326
System	4,594,126	15,568,906	1,210,175	44,989,192	-560,076	65,802,323

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Kohler 3250 Prime Power	181,519	1,191,150	79,212	3,480,111	-41,020	4,890,972
GS200 flow	150,650	3,327	14,400	0	-451	167,926
Converter	23,206	9,846	0	0	-1,853	31,199

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
	65,376	1,204,323	81,612	1,480,111	18,224	1,090,098

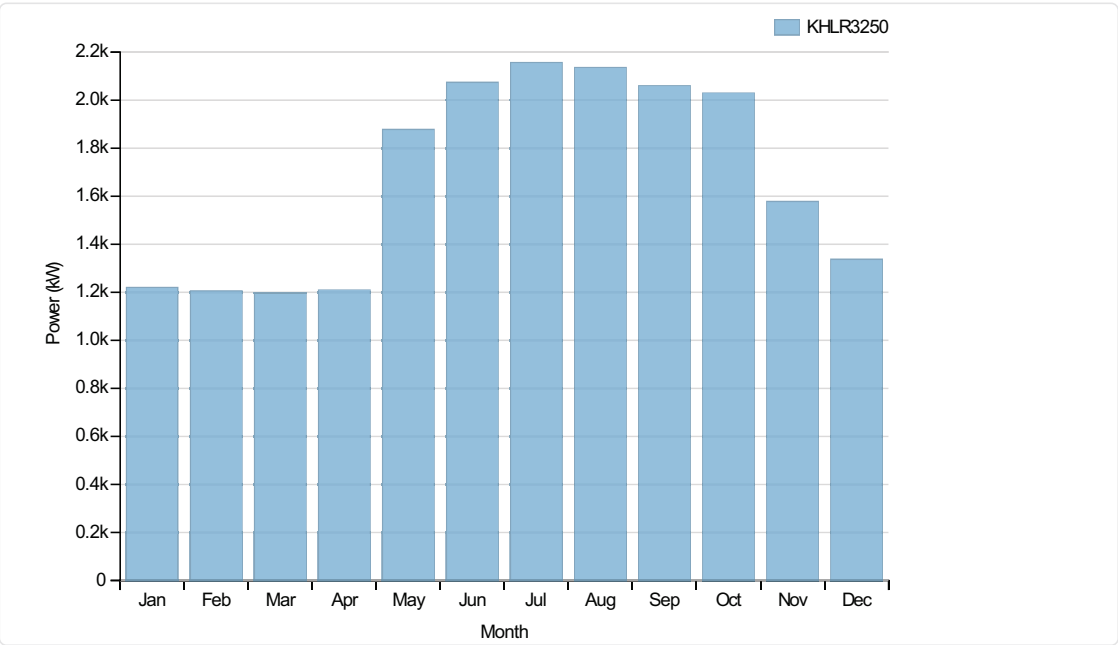


Electrical

Quantity	Value	Units
Excess electricity	0	kWh/yr
Unmet load	0	kWh/yr
Capacity shortage	0	kWh/yr
Renewable fraction	0	

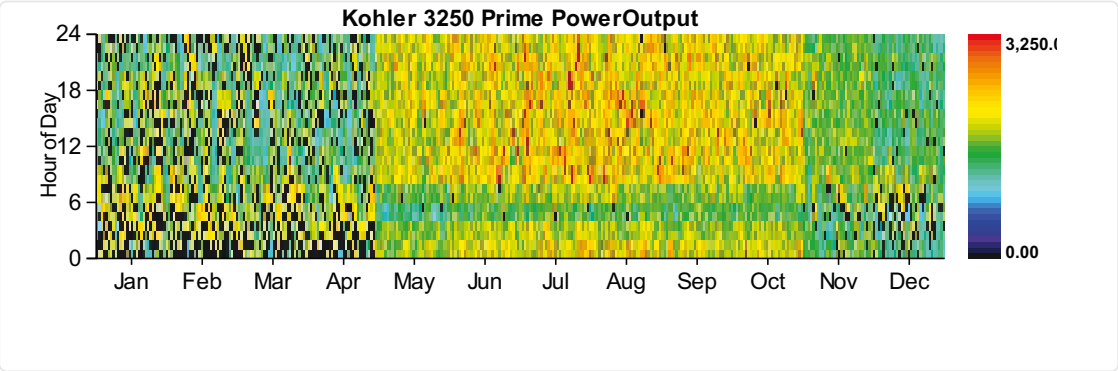
Component	Production(kWh/yr)	Fraction (%)
Generator	14,686,122	100
Total	14,686,122	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	14,061,459	100
DC primary load	0	0
Total	14,061,459	100



Generator:Kohler 3250 Prime Power

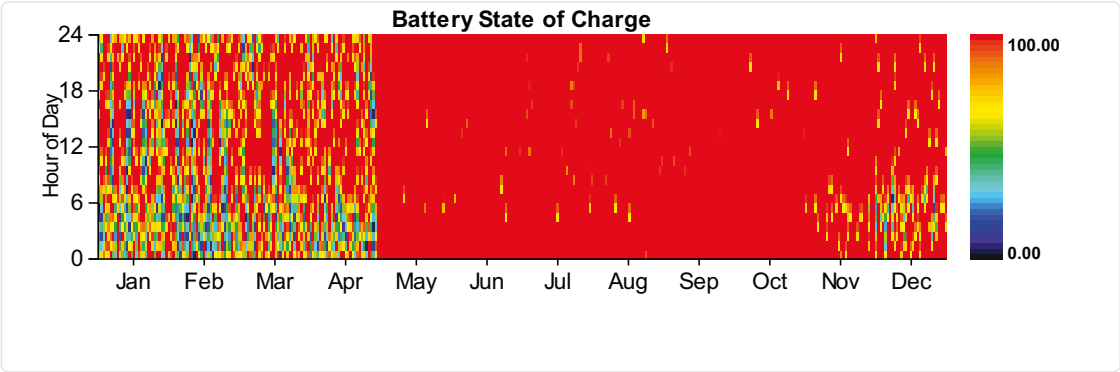
Quantity	Value	Units
Hours of operation	7834	hrs/yr
Number of starts	694	starts/yr
Operational life	2	yr
Fixed generation cost	235.85	\$/hr
Marginal generation cost	0.20	\$/kWh
Electrical production	14686122	kWh/yr
Mean electrical output	1875	kW
Min. electrical output	813	kW
Max. electrical output	3250	kW
Fuel consumption	3480113	L/yr
Specific fuel consumption	0.24	L/kWh
Fuel energy input	34244312	kWh/yr
Mean electrical efficiency	43	%



Battery:GS200 flow

Quantity	Value
String size	1
Strings in parallel	6
Batteries	6
Bus voltage	100

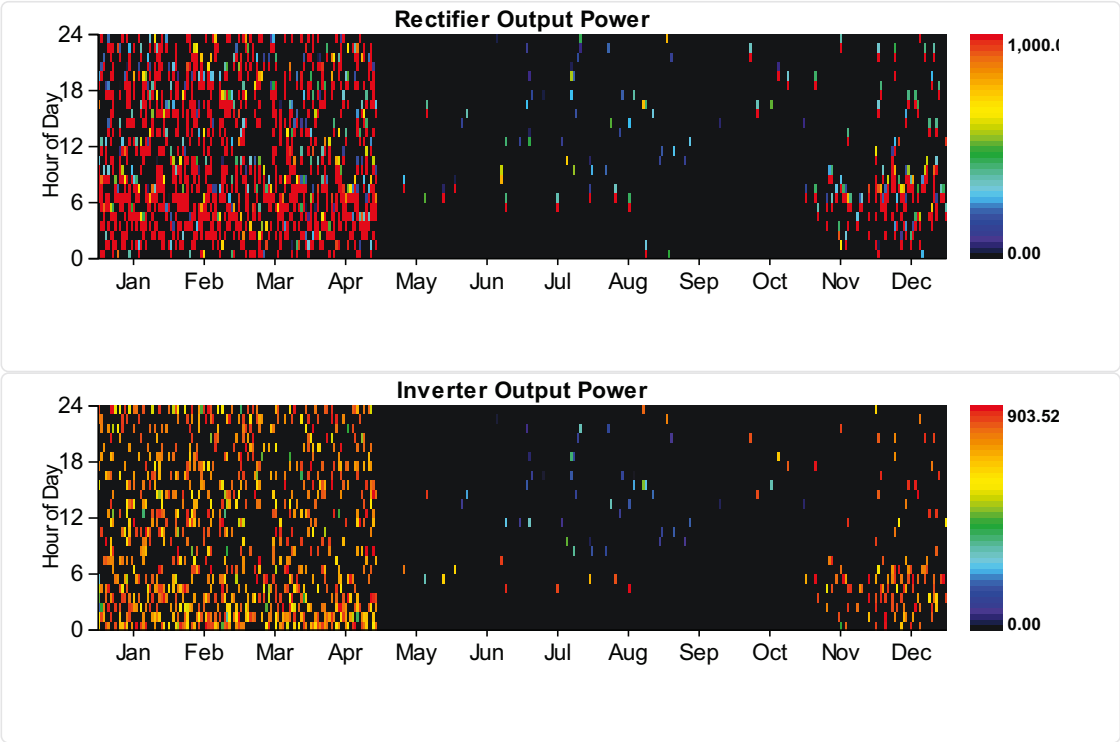
Quantity	Value	Units
Nominal capacity	3600	kWh
Usable nominal capacity	3600	kWh
Autonomy	2	hr
Lifetime throughput	0	
Battery wear cost	0.000	\$/kWh
Average energy cost	0.334	\$/kWh
Energy in	1143102	kWh/yr
Energy out	800171	kWh/yr
Storage depletion	0	kWh/yr
Losses	342931	kWh/yr
Annual throughput	956387	kWh/yr
Expected life	25	yr



Converter

Quantity	Inverter	Rectifier	Units
Capacity	1,000	900	kW
Mean output	82	130	kW
Minimum output	0	0	kW
Maximum output	904	1,000	kW
Capacity factor	8	13	%

Quantity	Inverter	Rectifier	Units
Hours of operation	971	1,411	hrs/yr
Energy in	800,171	1,344,841	kWh/yr
Energy out	720,153	1,143,102	kWh/yr
Losses	80,017	201,739	kWh/yr



Emissions

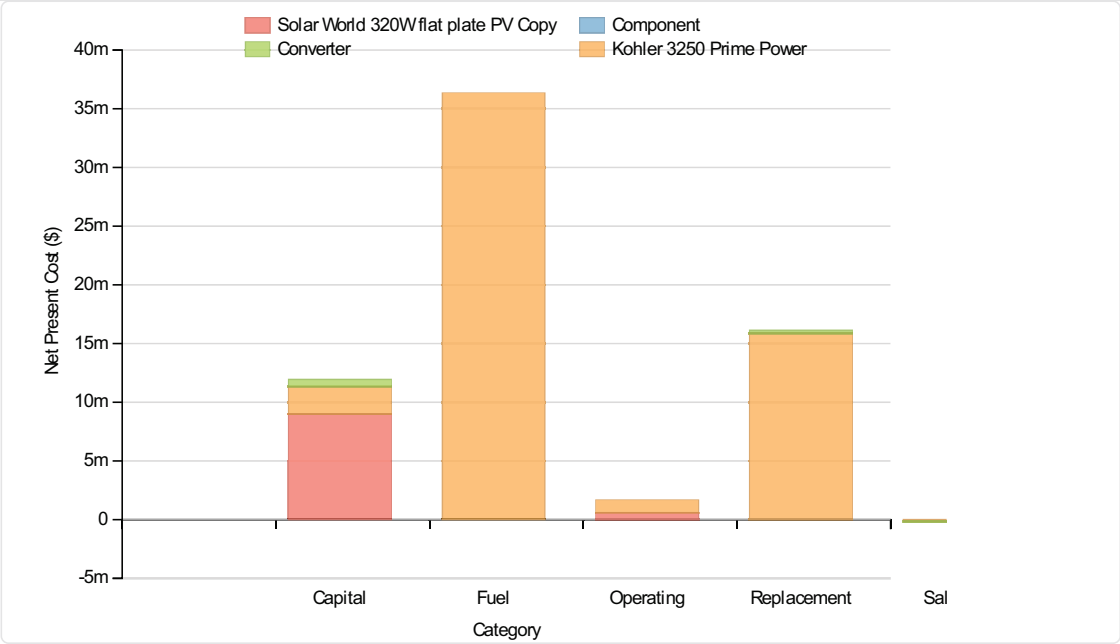
Pollutant	Emissions	Units
Carbon dioxide	9133608	kg/yr
Carbon monoxide	38281	kg/yr
Unburned hydrocarbons	4385	kg/yr
Particulate matter	1096	kg/yr
Sulfur dioxide	18805	kg/yr
Nitrogen oxides	38281	kg/yr

System Report

System architecture

PV	Solar World 320W flat plate PV Copy	3,000	kW
Generator	Kohler 3250 Prime Power	3,250	kW
Converter	System Converter	2,000	kW
Dispatch Strategy	Cycle Charging		

Cost summary



Cost Summary

Total net present cost	65865580	\$
Levelized cost of energy	0.362	\$/kWh

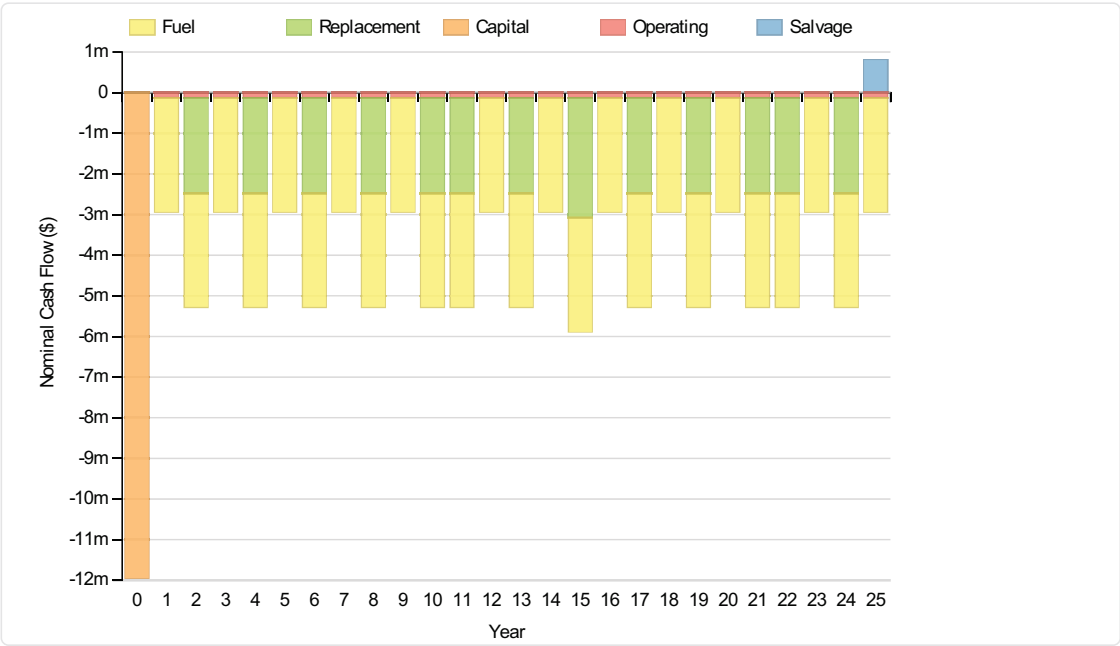
Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	9,000,000	0	581,738	0	0	9,581,738
Kohler 3250 Prime Power	2,346,591	15,872,167	1,077,743	36,325,876	-145,221	55,477,156
Converter	600,000	254,564	0	0	-47,912	806,652
System	11,946,591	16,126,731	1,659,481	36,325,876	-193,132	65,865,547

Annualized Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
Solar World 320W flat plate PV Copy	696,189	0	45,000	0	0	741,189
Kohler 3250 Prime Power	181,519	1,227,782	83,368	2,809,966	-11,233	4,291,402
Converter	46,413	19,692	0	0	-3,706	62,399

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
	121	17,173	21,368	109,966	40	149,988

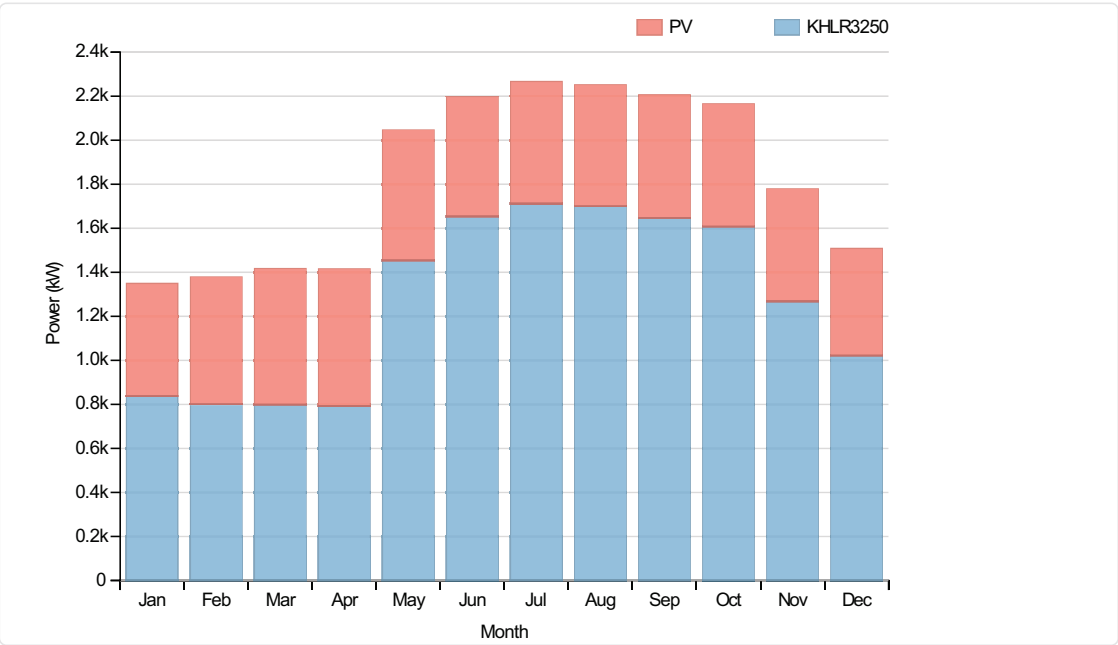


Electrical

Quantity	Value	Units
Excess electricity	1683896	kWh/yr
Unmet load	1122	kWh/yr
Capacity shortage	11288	kWh/yr
Renewable fraction	0	

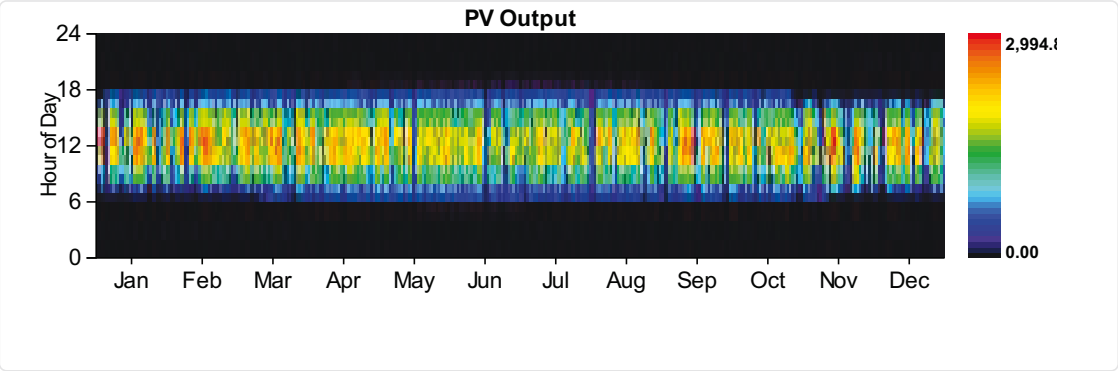
Component	Production(kWh/yr)	Fraction (%)
PV	4,875,192	30
Generator	11,192,983	70
Total	16,068,174	100

Load	Consumption(kWh/yr)	Fraction (%)
AC primary load	14,060,337	100
DC primary load	0	0
Total	14,060,337	100



PV:Solar World 320W flat plate PV Copy

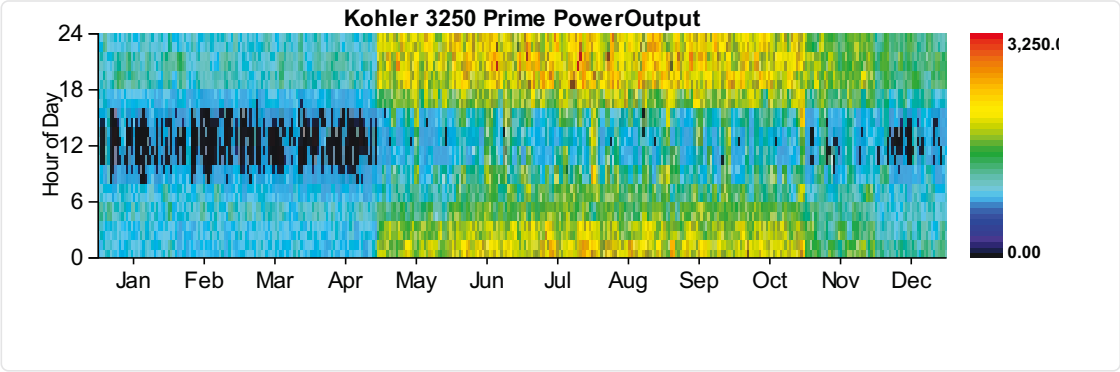
Quantity	Value	Units
Rated capacity	3000	kW
Mean output	557	kW
Mean output	13357.00	kWh/d
Capacity factor	18.55	%
Total production	4875192	kWh/yr
Minimum output	0.00	kW
Maximum output	2994.80	kW
PV penetration	34.67	%
Hours of operation	4370	hrs/yr
Levelized cost	0.152	\$/kWh



Generator:Kohler 3250 Prime Power

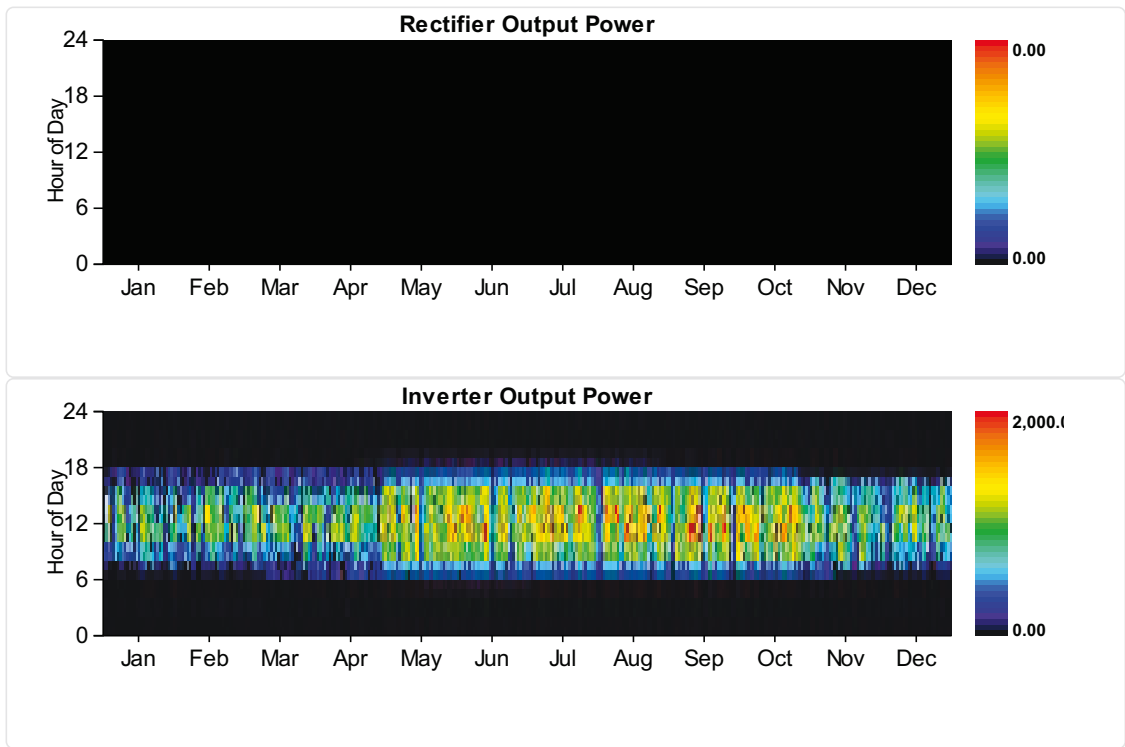
Quantity	Value	Units
Hours of operation	8245	hrs/yr
Number of starts	191	starts/yr

Quantity	Value	Units
Fixed generation cost	235.85	\$/hr
Marginal generation cost	0.20	\$/kWh
Electrical production	11192983	kWh/yr
Mean electrical output	1358	kW
Min. electrical output	813	kW
Max. electrical output	3250	kW
Fuel consumption	2809968	L/yr
Specific fuel consumption	0.25	L/kWh
Fuel energy input	27650084	kWh/yr
Mean electrical efficiency	40	%



Converter

Quantity	Inverter	Rectifier	Units
Capacity	2,000	1,800	kW
Mean output	333	0	kW
Minimum output	0	0	kW
Maximum output	2,000	0	kW
Capacity factor	17	0	%
Hours of operation	4,247	0	hrs/yr
Energy in	3,241,253	0	kWh/yr
Energy out	2,917,129	0	kWh/yr
Losses	324,124	0	kWh/yr



Emissions

Pollutant	Emissions	Units
Carbon dioxide	7374803	kg/yr
Carbon monoxide	30910	kg/yr
Unburned hydrocarbons	3541	kg/yr
Particulate matter	885	kg/yr
Sulfur dioxide	15184	kg/yr
Nitrogen oxides	30910	kg/yr