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LAMPIRAN

Lampiran 1. Kuisisioner Penelitian

KUISISIONER KAJIAN PLTH PULAU-PULAU

A. Sosiodemografi Responden

1. Nama :
 2. Umur :
 3. Pendidikan :
 4. Pekerjaan :
 5. Jumlah anggota keluarga:.....
 6. Status anggota keluarga
 - a. Masih sekolah : orang
 - b. Sudah bekerja : orang
- Alamat :

Petunjuk pengisian:

- Sebelum melakukan wawancara, pewawancara harus menjelaskan tujuan survei ini
- Pernyataan-pernyataan dalam kuisisioner harus disampaikan dengan jelas
- Lingkarilah jawaban yang tersedia sesuai dengan jawaban/keterangan responden.

B. SUMBER ENERGI LISTRIK SAAT INI

1. Sebutkan sumber energi setara listrik yang bapak/ibu gunakan selama ini

- | | |
|------------------------------|--------------------------|
| ✓ Genset | ✓ Lampu tempel (lentera) |
| ✓ Lampu Petromaks | ✓ Sel surya |
| ✓ Sehen (super hemat energi) | ✓ Biogas |
| ✓ Senter | ✓ Lainnya,sebutkan..... |
| ✓ Aki | |

2. Untuk setiap sumber energi yang bapak/ibu gunakan, berapa banyak rata-rata penggunaan bensin, minyak tanah, baterai dan charger dalam seminggu. (*frekuensi dan satuan disesuaikan dgn jawaban responden*)

- a) Genset, bensin.....ltr(botol)/minggu
- b) Lampu petromaks, minyak tanah.....ltr (botol)/minggu
- c) Sehen (lampu hemat energi), charger..... kali/minggu
- d) Senter, bateraibuah/minggu
- e) Aki, strom aki kali/minggu
- f) Lampu tempel (lentera), minyak tanah.....ltr/minggu

Lampiran 1. Kuisisioner Penelitian

3. Berapa harga bensin, minyak tanah, baterai, charger lampu seken, biaya strom aki, charger di tempat bapak/ibu
 - a) Bensin, Rp/litr (botol)
 - b) Minyak tanah, Rp.....litr (botol)
 - c) Biaya charger lampu seken, Rp..... /sekali
 - d) Baterai, Rp/buah
 - e) Strom aki, Rp/sekali
 - f) Lainnya, sebutkan.....

4. Pendapatan rata-rata per bulan kepala keluarga dan anggota keluarga (istri dan anak).
 - a)< Rp 1 jt
 - b) Rp 1 jt s/d Rp 2 jt
 - c) Rp 2 jt s/d Rp 3 jt
 - d) Rp 3 jt s/d Rp 4 jt
 - e) ...> Rp 4jt

5. Upaya mendapatkan pelayanan listrik PLN?
 - Pernah bermohon
 - Belum ada jaringan
 - Tidak ada tanggapan
 - Sudah ada jaringan tetapi belum lengkap
 - Sudah tersedia jaringan

6. Alasan kesediaan memperoleh pelayanan listrik PLN
 1. Anak-anak bisa belajar dengan lebih baik
 2. Bisa menonton televisi lebih baik
 3. Bisa mendengarkan radio dengan lebih baik
 4. Bisa memakai peralatan rumah tangga lebih banyak (setrika, kulkas, komputer dll)
 5. Lainnya, sebutkan.....

7. Ketersediaan pelayanan publik di daerah ini (bisa lebih dari satu jawaban)
 1. Poliklinik desa
 2. Administrasi pemerintahan
 3. Ketertiban dan keamanan
 4. Sekolah
 5. Keagamaan
 6. Lainnya, sebutkan.....

8. Ketersediaan pelayanan produksi dan peningkatan kualitas produksi
 1. Penggilingan padi
 2. Pengembangan bibit ternak
 3. Pelelangan ikan
 4. Pabrik-pabrik
 5. Lainnya, sebutkan

9. Ketersediaan pelayanan jasa komersial
 1. Bank (BPR)
 2. Pengiriman barang
 3. Pengiriman surat
 4. Telekomunikasi
 5. Pasar
 6. Koperasi
 7. Lainnya, sebutkan.....

Lampiran 1. Kuisisioner Penelitian

10. Barang-barang yang membutuhkan penggunaan listrik yang anda miliki:

1. TV
- 2.. Kulkas
3. Radio
4. HP

Catatan: Tulis nama dan jumlah peralatan listrik

11. Jika PLN menyediakan layanan listrik tanpa batas waktu, maka bapak/ibu:

1. Pasti menambah penggunaan listrik
2. Kemungkinan menambah penggunaan listrik
3. Kemungkinan tidak menambah penggunaan listrik
4. Pasti tidak menambah penggunaan listrik

TERIMA KASIH ATAS PARTISIPASINYA

Lampiran 2. Dokumentasi



Lampiran 3. Data Interest rate dan inflasi Indonesia

Indonesia	Last	Unit	Reference	Previous	Highest	Lowest
Interest Rate	3.50	percent	Oct/21	3.50	12.75	3.50
Interbank Rate	3.75	percent	Oct/21	3.75	57.79	3.75
Money Supply M1	3905266.40	IDR Billion	Aug/21	1933381.20	3905266.40	317.90
Money Supply M0	739104.62	IDR Billion	Jun/21	743654.60	760044.64	2983.00
Money Supply M2	7287300.00	IDR Billion	Sep/21	7198900.00	7287300.00	5156.00
Foreign Exchange Reserves	146900.00	USD Million	Sep/21	144800.00	146900.00	27404.30
Loans to Private Sector	4915787.00	IDR Billion	Jun/21	4864763.00	4987079.00	286724.00
Deposit Interest Rate	2.75	percent	Oct/21	2.75	56.00	2.75
Lending Rate	4.25	percent	Oct/21	4.25	15.75	4.25
Cash Reserve Ratio	3.00	percent	Sep/21	3.00	8.00	3.00
Loan Growth	2.21	percent	Sep/21	1.16	90.50	-59.90

(Indonesia Interest Rate / 2021 Data / 2022 Forecast / 2005-2020 Historical / Calendar,)

Tanggal	Data Inflasi
September 2021	1.6 %
Agustus 2021	1.59 %
Juli 2021	1.52 %
Juni 2021	1.33 %
Mei 2021	1.68 %
April 2021	1.42 %
Maret 2021	1.37 %
Februari 2021	1.38 %
Januari 2021	1.55 %
Desember 2020	1.68 %

<https://www.bi.go.id/id/statistik/indikator/data-inflasi.aspx>



Lampiran 4. Komponen PLH

1. Spesifikasi Panel Surya

MAXPOWER CS6U-325 | 330 | 335 | 340M

Canadian Solar's modules use the latest innovative cell technology, increasing module power output and system reliability, ensured by 15 years of experience in module manufacturing, well-engineered module design, stringent BOM quality testing, an automated manufacturing process and 100% EL testing.

KEY FEATURES



Excellent module efficiency of up to 17.49 %



Outstanding low irradiance performance of up to 96.5 %



High PTC rating of up to 92.17 %



IP67 junction box for long-term weather endurance



Heavy snow load up to 5400 Pa, wind load up to 2400 Pa



linear power output warranty



product warranty on materials and workmanship

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2008 / Quality management system

ISO 14001:2004 / Standards for environmental management system

OHSAS 18001:2007 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730: VDE / CE / CQC / MCS / INMETRO / CEC AU

UL 1703 / IEC 61215 performance: CEC listed (US) / FSEC (US Florida)

UL 1703: CSA / IEC 61701 ED2: VDE / IEC 62716: VDE

UNI 9177 Reaction to Fire: Class 1

IEC 60068-2-68: SGS

Take-e-way

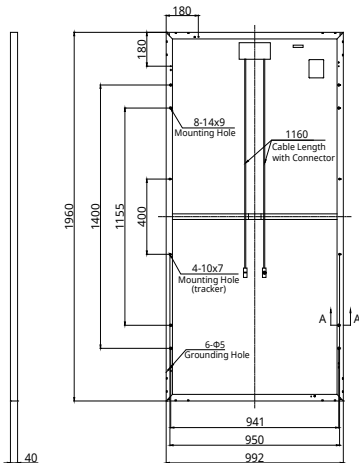


* Please contact your local Canadian Solar sales representative for the specific product certificates applicable in your market.

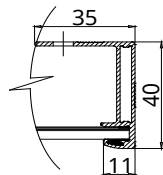
CANADIAN SOLAR INC. is committed to providing high quality solar products, solar system solutions and services to customers around the world. As a leading PV project developer and manufacturer of solar modules with over 20 GW deployed around the world since 2001, Canadian Solar Inc. (NASDAQ: CSIQ) is one of the most bankable solar companies worldwide.

ENGINEERING DRAWING (mm)

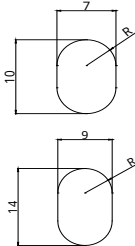
Rear View



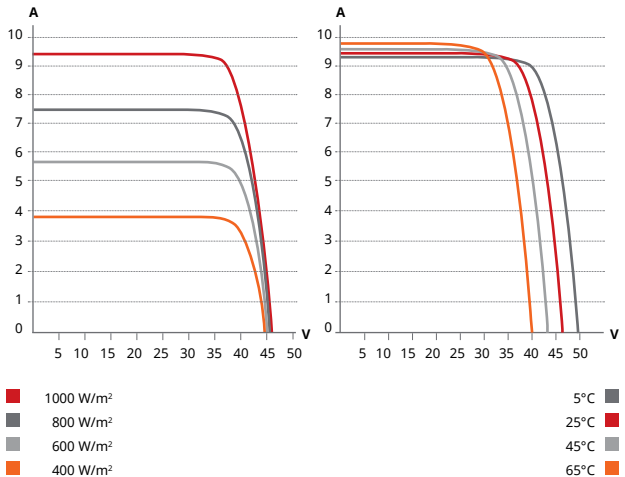
Frame Cross Section A-A



Mounting Hole



CS6U-335M / I-V CURVES



ELECTRICAL DATA | STC*

CS6U	325M	330M	335M	340M
Nominal Max. Power (P _{max})	325 W	330 W	335 W	340 W
Opt. Operating Voltage (V _{mp})	37.4 V	37.5 V	37.8 V	37.9 V
Opt. Operating Current (I _{mp})	8.69 A	8.80 A	8.87 A	8.97 A
Open Circuit Voltage (V _{oc})	45.8 V	45.9 V	46.1 V	46.2 V
Short Circuit Current (I _{sc})	9.21 A	9.31 A	9.41 A	9.48 A
Module Efficiency	16.72%	16.97%	17.23%	17.49%
Operating Temperature	-40°C ~ +85°C			
Max. System Voltage	1000 V (IEC) or 1000 V (UL)			
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC 61730)			
Max. Series Fuse Rating	15 A			
Application Classification	Class A			
Power Tolerance	0 ~ + 5 W			

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS6U	325M	330M	335M	340M
Nominal Max. Power (P _{max})	239 W	242 W	246 W	250 W
Opt. Operating Voltage (V _{mp})	34.4 V	34.5 V	34.8 V	34.9 V
Opt. Operating Current (I _{mp})	6.94 A	7.03 A	7.08 A	7.16 A
Open Circuit Voltage (V _{oc})	42.6 V	42.7 V	42.9 V	43.0 V
Short Circuit Current (I _{sc})	7.44 A	7.52 A	7.60 A	7.66 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

PERFORMANCE AT LOW IRRADIANCE

Outstanding performance at low irradiance, with an average relative efficiency of 96.5 % for irradiances between 200 W/m² and 1000 W/m² (AM 1.5, 25°C).

The aforesaid datasheet only provides the general information on Canadian Solar products and, due to the on-going innovation and improvement, please always contact your local Canadian Solar sales representative for the updated information on specifications, key features and certification requirements of Canadian Solar products in your region.

Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline, 6 inch
Cell Arrangement	72 (6×12)
Dimensions	1960×992×40 mm (77.2×39.1×1.57 in)
Weight	22.4 kg (49.4 lbs)
Front Cover	3.2 mm tempered glass
Frame Material	Anodized aluminium alloy
J-Box	IP67, 3 diodes
Cable	4 mm ² (IEC) or 4 mm ² & 12 AWG 1000V (UL), 1160 mm (45.7 in)
Connector	T4 series or PV2 series
Per Pallet	26 pieces, 635 kg (1400 lbs)
Per Container (40' HQ)	624 pieces

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (P _{max})	-0.41 % / °C
Temperature Coefficient (V _{oc})	-0.31 % / °C
Temperature Coefficient (I _{sc})	0.053 % / °C
Nominal Module Operating Temperature (NMOT)	43±2 °C

PARTNER SECTION



2. Spesifikasi Inverter

THREE-PHASE STRING INVERTER 125 KW CSI-125KTL-GI-E

Canadian Solar's grid-tied, transformer-less string inverters help accelerate the use of three-phase string architecture for commercial rooftop and small ground-mount applications. An NRTL approved, cost-effective alternative to central inverters, these inverters are modular design building blocks that provide high yield and enable significant BoS cost savings. They provide up to 98.8 % conversion efficiency, and a wide operating range for maximum energy harvest.



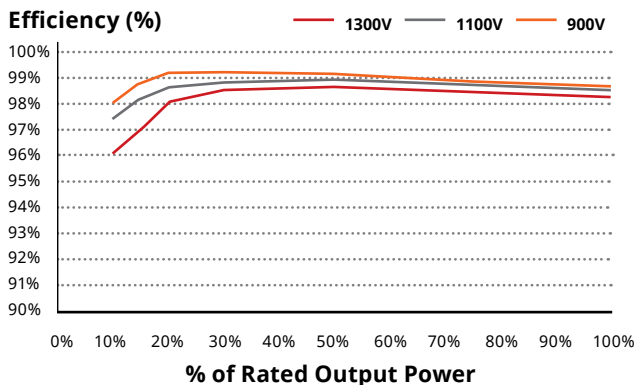
Standard warranty, extension up to 20 years

KEY FEATURES

- Maximum efficiency of 99.1%, CEC efficiency of 98.6%
- Single MPPT for higher conversion efficiency
- Transformerless design
- PID mitigation capability

EFFICIENCY CURVE

CSI-125KTL-GI-E @ 900 V



HIGH RELIABILITY

- Advanced thermal design with variable speed fans
- Ground-fault detection and interruption circuit

BROAD ADAPTIBILITY

- NEMA 4X (IP65), outdoor application
- Utility interactive controls: active power derating, reactive power control and over frequency derating
- Integrated wiring box design
- Integrated DC and AC load rated disconnects
- Wide MPPT range for flexible string sizing
- AC terminals compatible with copper and aluminum conductors
- Supports up to 20 DC string inputs

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*For detailed information, please refer to the Installation Manual.

CANADIAN SOLAR INC.

545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada | www.canadiansolar.com

SYSTEM/TECHNICAL DATA	
MODEL NAME	CSI-125KTL-GI-E
DC INPUT	
Max. PV Power	187.5kW
Max. DC Input Voltage	1500 V _{DC}
Operating DC Input Voltage Range	860-1450 V _{DC}
Start-up DC Input Voltage	900 V _{DC}
Number of MPP Trackers	1
MPPT Full Power Voltage Range	860-1450 V _{DC}
Operating Current (Imp)	150 A
Max. Input Current (Isc)	300 A
Number of DC Inputs	20
DC Disconnection Type	Load rated DC switch
AC OUTPUT	
Rated AC Output Power	125 kW
Max. AC Output Power	125 kW
Rated Output Voltage	600 V _{AC}
Output Voltage Range*	528-660 V _{AC}
Grid Connection Type	3/N/PE
Nominal AC Output Current	120 A
Rated Output Frequency	50/60 Hz
Output Frequency Range*	47-62 Hz
Power Factor	1 default (±0.8 adjustable)
Current THD	< 3 %
AC Disconnection Type	Load rated AC switch
SYSTEM	
Topology	Transformerless
Max. Efficiency	99.1 %
EU Efficiency	98.6 %
Night Consumption	< 2 W
ENVIRONMENT	
Protection Degree	NEMA 4X (IP65)
Cooling	Intelligent Redundant Cooling
Operating Temperature Range	-25 ° C to +60 ° C
Storage Temperature Range	-40 ° C to +70 ° C
Operating Humidity	0 - 100 %
Operating Altitude	4000 m
Audible Noise	<55 dBA @ 1 m
DISPLAY AND COMMUNICATION	
Display	LED
Communication	Standard: RS485 (Modbus RTU), AND either MODBUS or ETHERNET
MECHANICAL DATA	
Dimensions (W / H / D)	1176 x 713.5 x 315 mm
Weight	84 kg
Installation Angle	Back title up to 15 degrees
DC Inputs	MC4/ T4
DC Fuse Rating	20A
SAFETY	
Safety and EMC Standard	IEC62109-1/-2, IEC/EN 61000-2/-4
Grid Standard	VDE0126-1-1, IEC61683 or EN50530
Smart-Grid Features	Voltage-Ride Thru, Frequency-Ride Thru, Soft-Start, Volt-Var, Frequency-Watt, Volt-Watt

*The "Output Voltage Range" and "Output Frequency Range" may differ according to specific grid standard.

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. Canadian Solar Inc. reserves the right to make necessary adjustment to the information described herein at any time without further notice.

Caution: For professional use only. The installation and handling of PV equipment requires professional skills and should only be performed by qualified professionals. Please read the safety and installation instructions before using the product.

CDC200-6

6V 200AH

Deep Cycle Battery



CDC200-6



3. Spesifikasi Baterai

Physical Specification

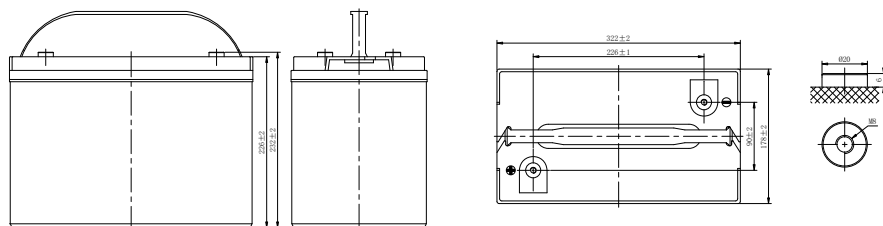
Part Number:	CDC200-6
Length:	322 ± 2 mm (12.05 inches)
Width:	178 ± 2 mm (7.01 inches)
Container Height:	226 ± 2 mm (8.90 inches)
Total Height (with terminal):	232 ± 2 mm (9.13 inches)
Approx Weight:	30.3 Kg (66.8 lbs)

Specifications

	Nominal Voltage	6V	
	Nominal Capacity (10HR)	200AH	
Terminal Option	M8		
Container Material	Standard Option	ABS	
	Flame Retardant Option (FR)	ABS (UL94:VO)	
Rated Capacity	C20(10.4A, 1.80V/cell)	208.0 Ah	
	C10(20.0A, 1.80V/cell)	200.0 Ah	
	C5(34.4A, 1.75V/cell)	172.0 Ah	
	C3(52.0A, 1.75V/cell)	156.0 Ah	
	C1(122.0A, 1.60V/cell)	122.0 Ah	
Max Discharge Current (5s)	2000 A		
Internal Resistance	Approx. 1.5mΩ		
Discharge Characteristics	Operating Temp. Range	Discharge: -15°C~50°C (5°F~122°F)	
		Charge: 0°C~40°C (32°F~104°F)	
		Storage: -15°C~40°C (5°F~104°F)	
	Nominal Operating Temp. Range	25 ± 3°C (77 ± 5°F)	
	Cycle Use	Initial Charging Current less than 60.0A. Voltage 7.2V~7.5V at 25°C (77°F) Temp. Coefficient -15mV/°C	
	Self Discharge	No limit on Initial Charging Current Voltage 6.75V~6.9 V at 25°C (77°F) Temp. Coefficient -10mV/°C	
	Capacity affected by Temperature	40°C (104°F)	103%
		25°C (77°F)	100%
0°C (32°F)		86%	
Design Floating Life at 20°C	20+ Years		
Self Discharge	Canbat deep cycle batteries may be stored for up to 6 months at 25°C (77°F) and then a refresh charge is required. For higher temperatures the time interval will be shorter. Self-discharge is less than 2%		

Dimensions

M8 Terminal



To ensure safe and efficient operation always refer to the latest edition of our datasheets, as published on our website www.canbat.com. Canbat Technologies Inc. All rights reserved. All trademarks are the property of their respective owners. All data subject to change without notice. E&O.E

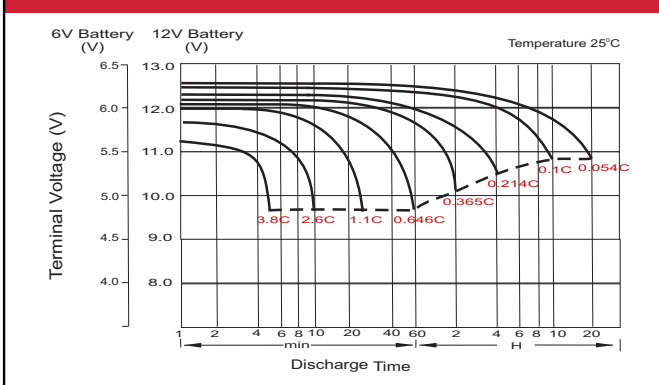
Constant Current Discharge (Amperes) at 25 °C (77°F)

F.V/Time	5min	10min	15min	20min	30min	45min	1h	1.5h	2h	3h	4h	5h	6h	8h	10h	20h
1.85V/cell	342.3	269.1	228.8	191.5	152.1	115.2	94.3	70.5	60.0	47.5	38.8	31.3	27.2	22.1	18.9	10.31
1.80V/cell	459.5	343.9	276.5	226.3	179.5	133.9	105.6	78.1	65.6	51.1	41.5	33.6	29.2	23.5	20.0	10.40
1.75V/cell	518.0	377.9	302.0	243.5	186.4	138.9	110.5	81.4	68.0	52.0	42.4	34.4	30.0	23.9	20.1	10.51
1.70V/cell	570.5	411.9	322.4	255.9	194.0	144.5	114.0	83.7	70.7	53.5	43.5	35.3	30.7	24.1	20.4	10.71
1.67V/cell	629.1	444.4	342.9	271.7	204.7	148.1	117.9	86.4	72.7	55.7	44.9	36.3	31.3	24.5	20.8	10.8
1.60V/cell	/	482.5	366.7	289.5	216.0	154.4	122.0	89.0	75.1	57.5	46.4	37.5	32.0	24.8	21.1	10.9

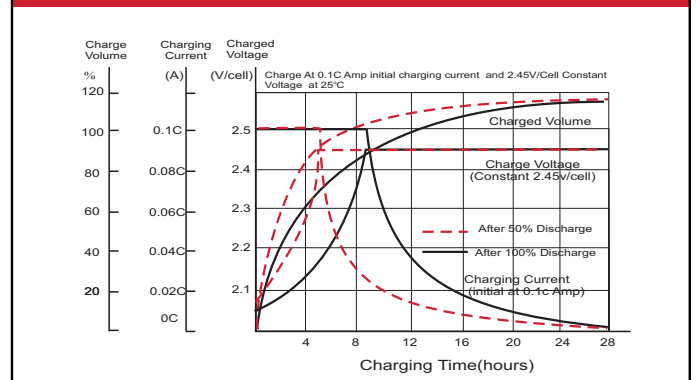
Constant Power Discharge (Watts/cell) at 25 °C (77°F)

F.V/Time	5min	10min	15min	20min	30min	45min	1h	1.5h	2h	3h	4h	5h	6h	8h	10h	20h
1.85V/cell	625.9	497.1	427.1	360.8	290.0	221.3	181.9	136.0	116.7	92.5	75.9	61.3	53.5	43.6	37.3	20.4
1.80V/cell	831.2	627.7	509.1	420.3	336.9	255.5	202.7	149.8	126.4	99.1	80.5	65.5	57.2	46.1	39.5	20.5
1.75V/cell	917.2	678.7	549.2	447.7	346.9	262.5	211.1	155.5	130.7	100.5	82.0	67.1	58.5	46.8	39.9	20.8
1.70V/cell	982.0	722.9	578.1	467.1	359.1	272.0	216.9	159.4	135.6	103.1	84.0	68.5	59.7	47.5	40.3	21.1
1.67V/cell	1067.5	773.1	610.0	492.4	375.7	276.3	222.7	163.1	138.5	106.9	86.7	70.3	60.8	48.1	40.9	21.3
1.60V/cell	/	820.1	641.6	518.9	393.9	286.4	229.3	167.4	142.5	109.7	89.1	72.3	62.0	48.4	41.3	21.5

Discharge Characteristics



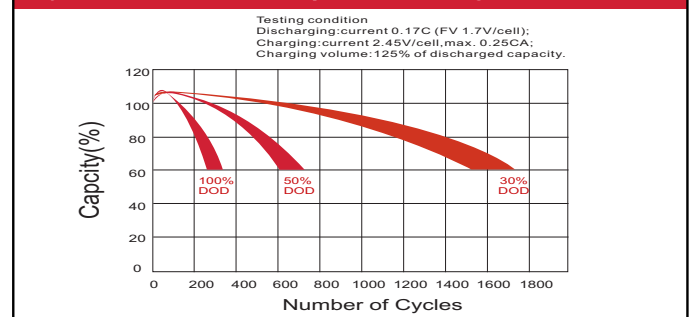
Float Charging Characteristics



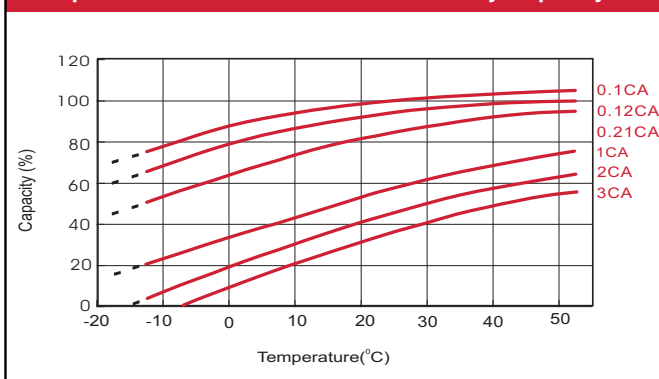
Deep Cycle Batteries

Sealed lead acid batteries are engineered to provide reliable power in a compact design. They are spill-proof and require zero maintenance, as adding water is never necessary. The acid in the battery is suspended in a glass mat separator, which makes the cells leak-proof during normal battery operation. Our batteries are proudly designed in Canada with quality and performance in mind, offering one of the highest cycle life among other sealed lead acid battery brands. Canbat AGM batteries are manufactured with pure lead to ensure a low self-discharge rate of less than 2%, meaning stored batteries are only required a recharge once every six months. The series also features an outer container made from ABS material.

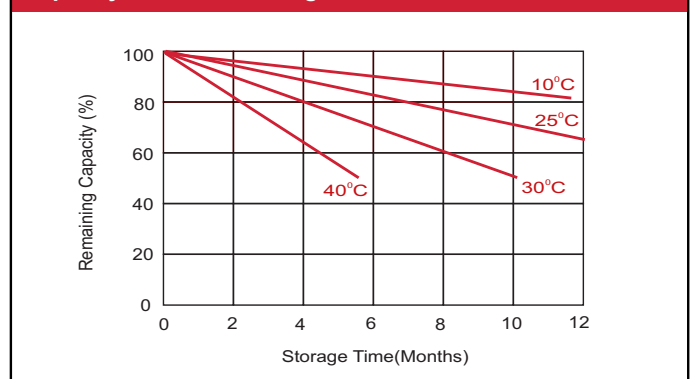
Cycle Life Relation to Depth of Discharge



Temperature Effects in Relation to Battery Capacity



Capacity Based on Storage Time





System Simulation Report



File: Hybrid with storage.homer

Author:

Location: X82H+R5 Barang Lompo, Makassar City, South Sulawesi, Indonesia (5°2.9'S, 119°19.7'E)

Total Net Present Cost: \$4,894,737.00

Levelized Cost of Energy (\$/kWh): \$0.248

Notes: Eksisting+PV+Storage



Table of Contents

System Architecture..... 3

Cost Summary 4

Cash Flow..... 5

Electrical Summary 6

Generator: CAT-250kVA-50Hz-PP (Diesel) 7

Generator: CAT-250kVA-50Hz-PP (1) (Diesel)..... 8

PV: Generic flat plate PV..... 9

Storage: Generic 1kWh Li-Ion 10

Converter: System Converter 11

Fuel Summary 12

Renewable Summary 13

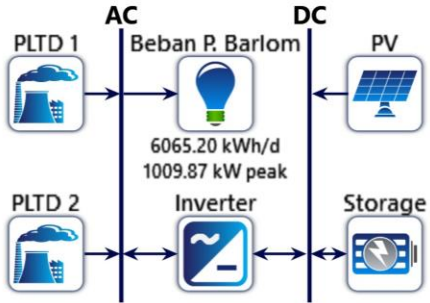
Compare Economics..... 14



System Architecture

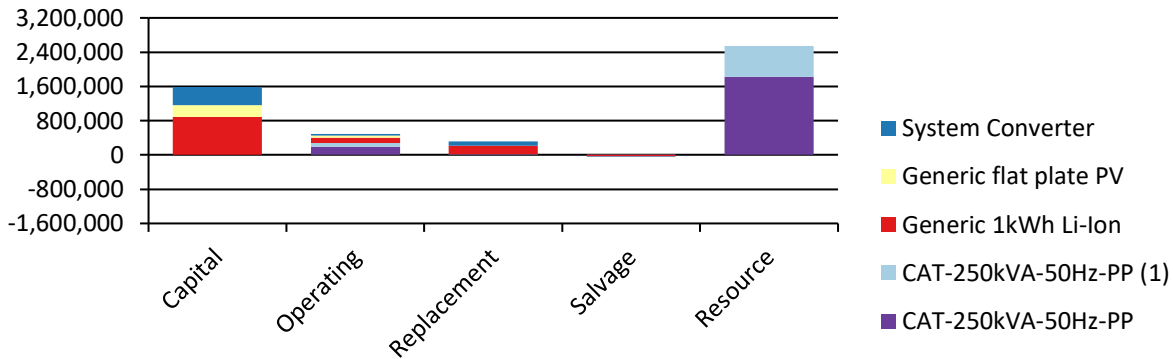
Component	Name	Size	Unit
Generator #1	CAT-250kVA-50Hz-PP	200	kW
Generator #2	CAT-250kVA-50Hz-PP (1)	200	kW
PV	Generic flat plate PV	800	kW
Storage	Generic 1kWh Li-Ion	1,422	strings
System converter	System Converter	615	kW
Dispatch strategy	HOMER Cycle Charging		

Schematic





Cost Summary



Net Present Costs

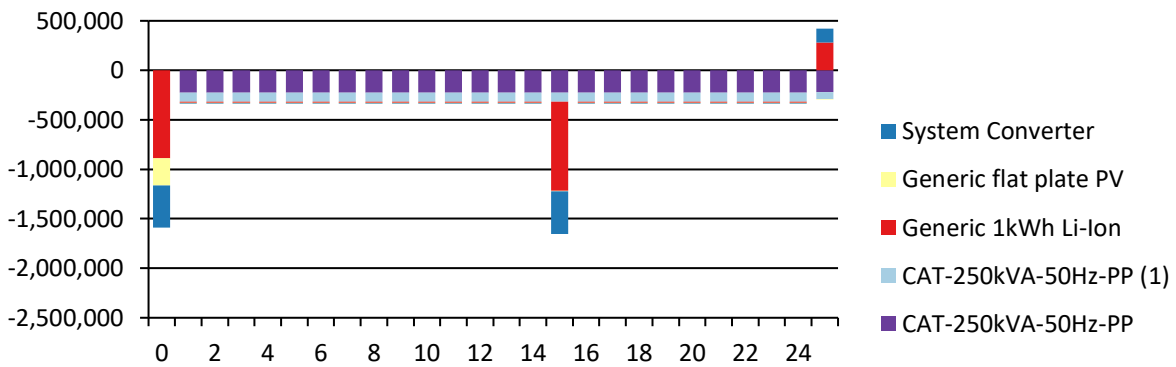
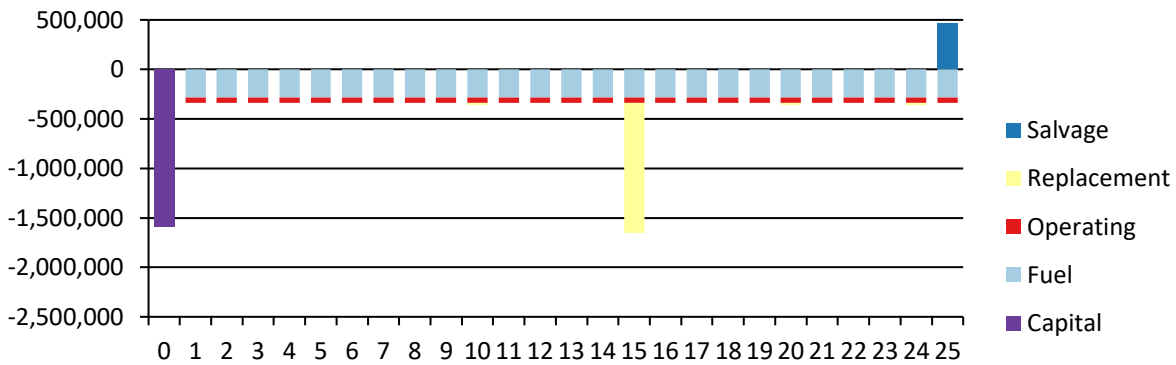
Name	Capital	Operating	Replacement	Salvage	Resource	Total
CAT-250kVA-50Hz-PP	\$0.00	\$193,038	\$10,643	-\$783.90	\$1.83M	\$2.03M
CAT-250kVA-50Hz-PP (1)	\$0.00	\$80,312	\$2,009	-\$1,638	\$713,814	\$794,496
Generic 1kWh Li-Ion	\$888,750	\$126,662	\$205,719	-\$25,851	\$0.00	\$1.20M
Generic flat plate PV	\$277,120	\$51,306	\$0.00	\$0.00	\$0.00	\$328,426
System Converter	\$423,120	\$39,442	\$97,939	-\$12,307	\$0.00	\$548,194
System	\$1.59M	\$490,759	\$316,310	-\$40,581	\$2.54M	\$4.89M

Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
CAT-250kVA-50Hz-PP	\$0.00	\$21,672	\$1,195	-\$88.01	\$204,938	\$227,716
CAT-250kVA-50Hz-PP (1)	\$0.00	\$9,016	\$225.55	-\$183.93	\$80,138	\$89,196
Generic 1kWh Li-Ion	\$99,778	\$14,220	\$23,095	-\$2,902	\$0.00	\$134,191
Generic flat plate PV	\$31,112	\$5,760	\$0.00	\$0.00	\$0.00	\$36,872
System Converter	\$47,503	\$4,428	\$10,995	-\$1,382	\$0.00	\$61,544
System	\$178,392	\$55,096	\$35,511	-\$4,556	\$285,076	\$549,519



Cash Flow





Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	635,181	kWh/yr
Unmet Electric Load	695	kWh/yr
Capacity Shortage	2,023	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Generic flat plate PV	1,381,959	47.4
CAT-250kVA-50Hz-PP	1,106,512	37.9
CAT-250kVA-50Hz-PP (1)	428,137	14.7
Total	2,916,608	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	2,213,103	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	2,213,103	100

Generator: CAT-250kVA-50Hz-PP (Diesel)

CAT-250kVA-50Hz-PP Electrical Summary

Quantity	Value	Units
Electrical Production	1,106,512	kWh/yr
Mean Electrical Output	181	kW
Minimum Electrical Output	50.0	kW
Maximum Electrical Output	200	kW

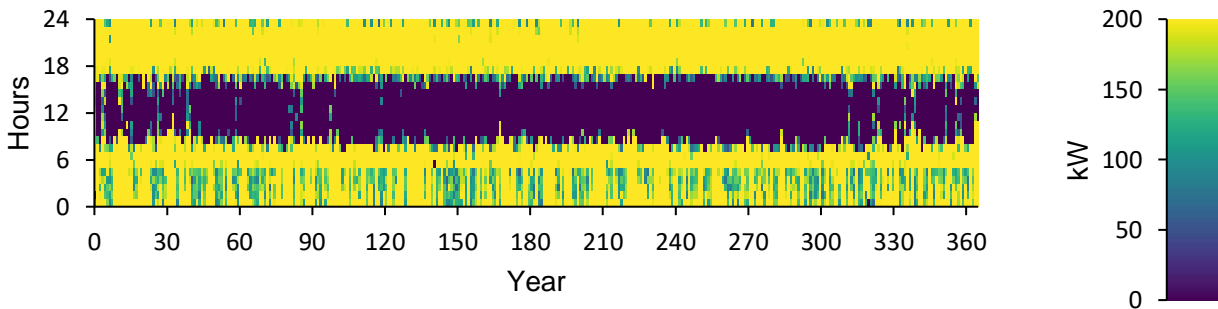
CAT-250kVA-50Hz-PP Fuel Summary

Quantity	Value	Units
Fuel Consumption	289,460	L
Specific Fuel Consumption	0.262	L/kWh
Fuel Energy Input	2,848,288	kWh/yr
Mean Electrical Efficiency	38.8	%

CAT-250kVA-50Hz-PP Statistics

Quantity	Value	Units
Hours of Operation	6,122	hrs/yr
Number of Starts	386	starts/yr
Operational Life	9.80	yr
Capacity Factor	63.2	%
Fixed Generation Cost	8.60	\$/hr
Marginal Generation Cost	0.159	\$/kWh

CAT-250kVA-50Hz-PP Output (kW)



Generator: CAT-250kVA-50Hz-PP (1) (Diesel)

CAT-250kVA-50Hz-PP (1) Electrical Summary

Quantity	Value	Units
Electrical Production	428,137	kWh/yr
Mean Electrical Output	168	kW
Minimum Electrical Output	50.0	kW
Maximum Electrical Output	200	kW

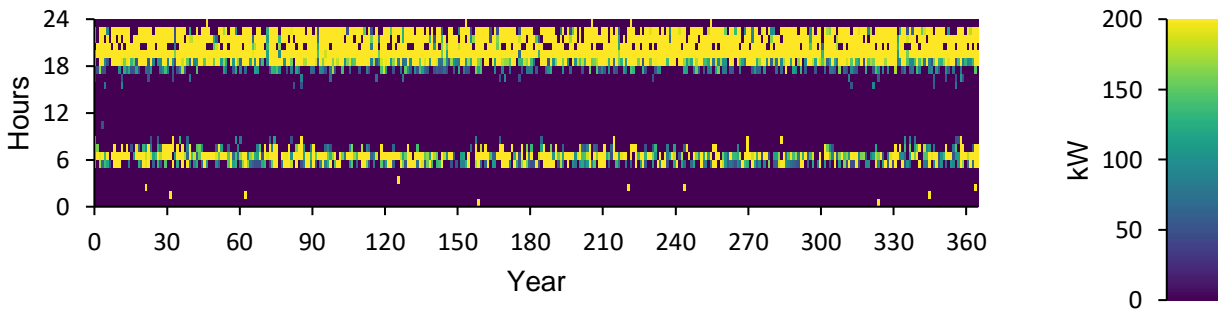
CAT-250kVA-50Hz-PP (1) Fuel Summary

Quantity	Value	Units
Fuel Consumption	113,189	L
Specific Fuel Consumption	0.264	L/kWh
Fuel Energy Input	1,113,782	kWh/yr
Mean Electrical Efficiency	38.4	%

CAT-250kVA-50Hz-PP (1) Statistics

Quantity	Value	Units
Hours of Operation	2,547	hrs/yr
Number of Starts	874	starts/yr
Operational Life	23.6	yr
Capacity Factor	24.4	%
Fixed Generation Cost	8.60	\$/hr
Marginal Generation Cost	0.159	\$/kWh

CAT-250kVA-50Hz-PP (1) Output (kW)



PV: Generic flat plate PV

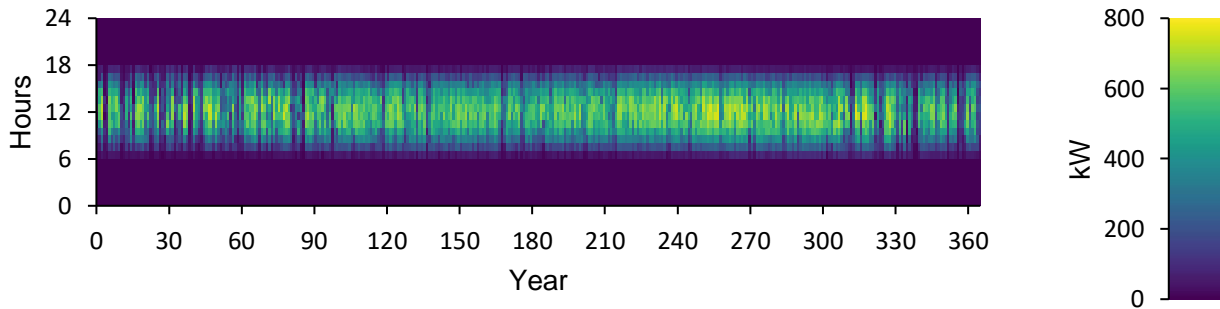
Generic flat plate PV Electrical Summary

Quantity	Value	Units
Minimum Output	0	kW
Maximum Output	769	kW
PV Penetration	62.4	%
Hours of Operation	4,380	hrs/yr
Levelized Cost	0.0267	\$/kWh

Generic flat plate PV Statistics

Quantity	Value	Units
Rated Capacity	800	kW
Mean Output	158	kW
Mean Output	3,786	kWh/d
Capacity Factor	19.7	%
Total Production	1,381,959	kWh/yr

Generic flat plate PV Output (kW)



Storage: Generic 1kWh Li-Ion

Generic 1kWh Li-Ion Properties

Quantity	Value	Units
Batteries	1,422	qty.
String Size	1.00	batteries
Strings in Parallel	1,422	strings
Bus Voltage	6.00	V

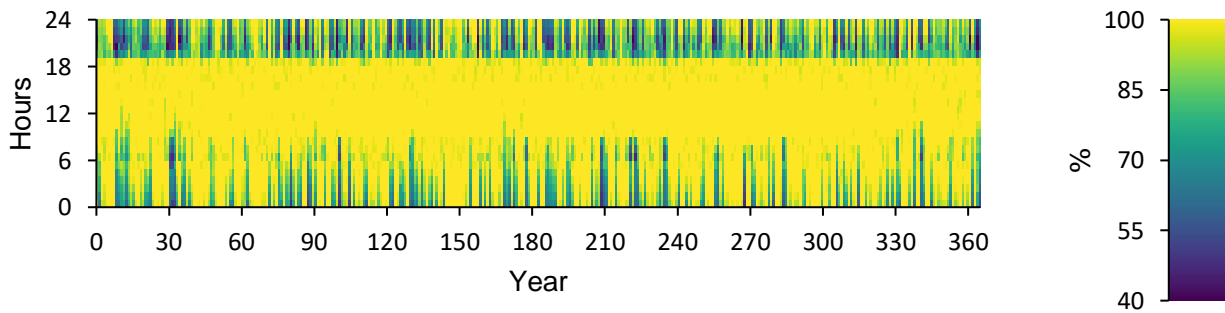
Generic 1kWh Li-Ion Result Data

Quantity	Value	Units
Average Energy Cost	0.167	\$/kWh
Energy In	179,542	kWh/yr
Energy Out	161,985	kWh/yr
Storage Depletion	419	kWh/yr
Losses	17,976	kWh/yr
Annual Throughput	170,747	kWh/yr

Generic 1kWh Li-Ion Statistics

Quantity	Value	Units
Autonomy	3.38	hr
Storage Wear Cost	0.220	\$/kWh
Nominal Capacity	1,422	kWh
Usable Nominal Capacity	853	kWh
Lifetime Throughput	2,561,204	kWh
Expected Life	15.0	yr

Generic 1kWh Li-Ion State of Charge (%)



Converter: System Converter

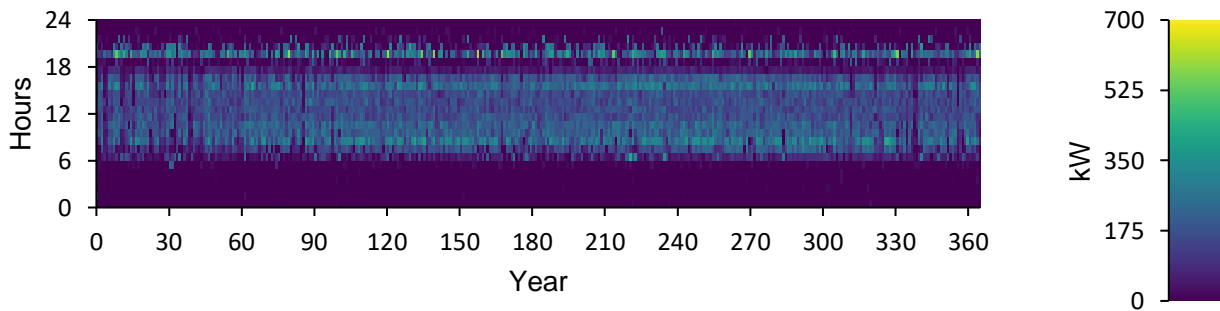
System Converter Electrical Summary

Quantity	Value	Units
Hours of Operation	5,272	hrs/yr
Energy Out	825,190	kWh/yr
Energy In	868,621	kWh/yr
Losses	43,431	kWh/yr

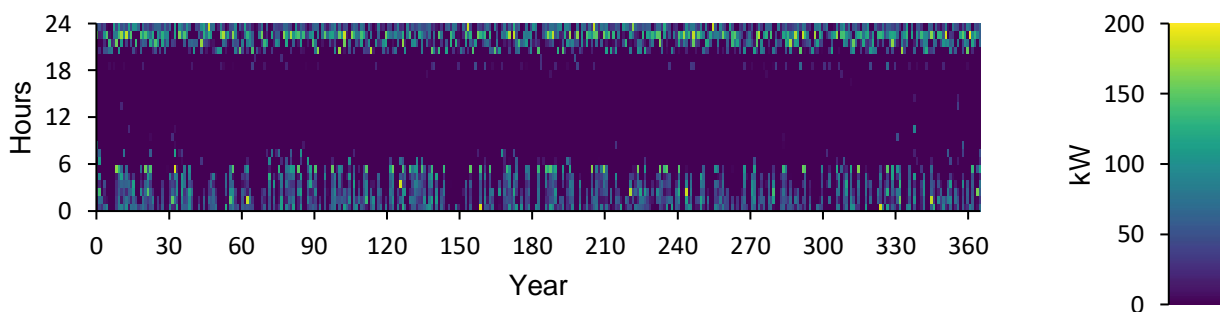
System Converter Statistics

Quantity	Value	Units
Capacity	615	kW
Mean Output	94.2	kW
Minimum Output	0	kW
Maximum Output	610	kW
Capacity Factor	15.3	%

System Converter Inverter Output (kW)



System Converter Rectifier Output (kW)



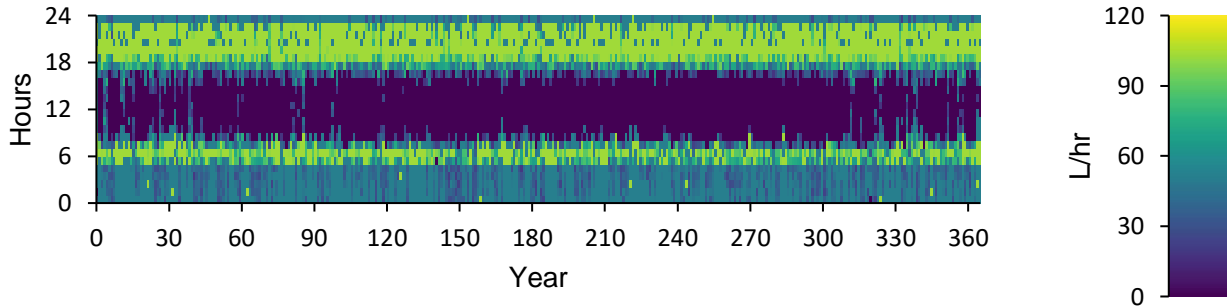


Fuel Summary

Diesel Consumption Statistics

Quantity	Value	Units
Total fuel consumed	402,649	L
Avg fuel per day	1,103	L/day
Avg fuel per hour	46.0	L/hour

Diesel Consumption (L/hr)



Emissions

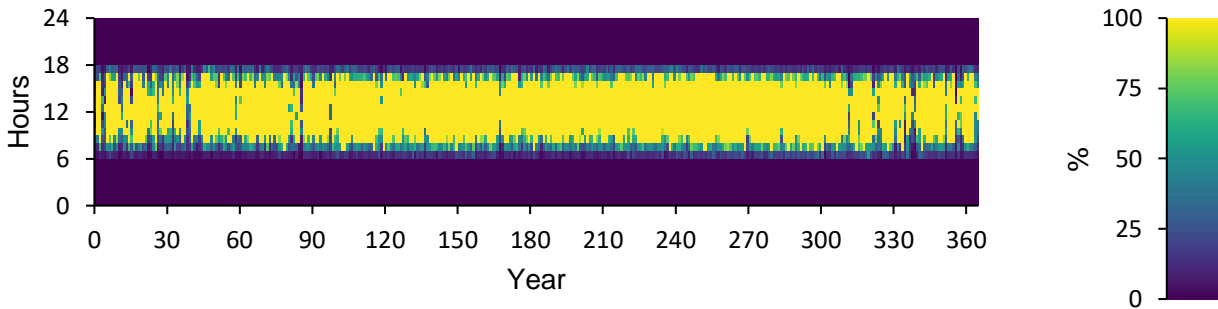
Pollutant	Quantity	Unit
Carbon Dioxide	1,062,012	kg/yr
Carbon Monoxide	2,037	kg/yr
Unburned Hydrocarbons	44.3	kg/yr
Particulate Matter	105	kg/yr
Sulfur Dioxide	2,641	kg/yr
Nitrogen Oxides	10,561	kg/yr



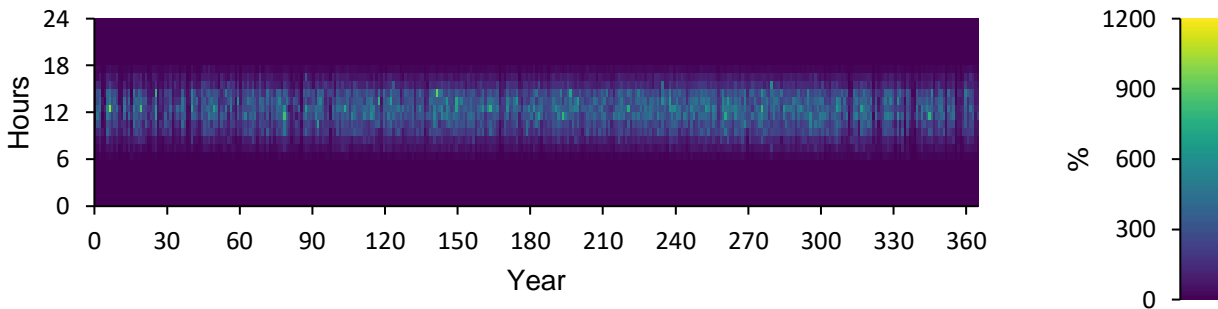
Renewable Summary

Capacity-based metrics	Value	Unit
Nominal renewable capacity divided by total nominal capacity	66.7	%
Usable renewable capacity divided by total capacity	61.5	%
Energy-based metrics		Value
Total renewable production divided by load	62.4	%
Total renewable production divided by generation	47.4	%
One minus total nonrenewable production divided by load	30.7	%
Peak values		Value
Renewable output divided by load (HOMER standard)	1,026	%
Renewable output divided by total generation	100	%
One minus nonrenewable output divided by total load	100	%

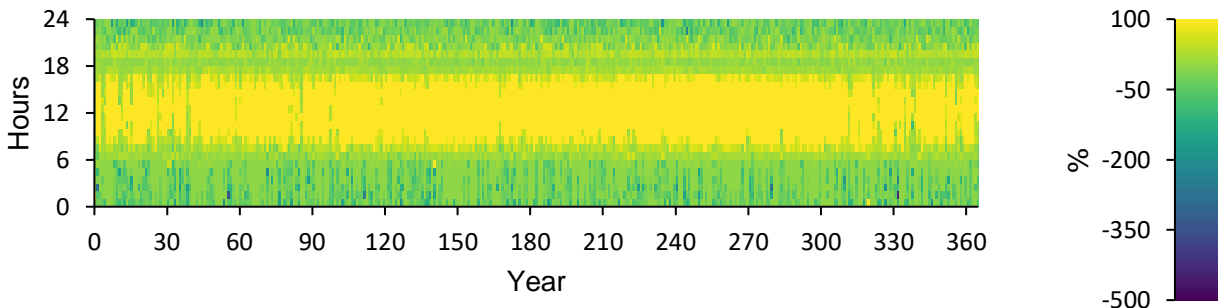
Instantaneous Renewable Output Percentage of Total Generation



Instantaneous Renewable Output Percentage of Total Load



100% Minus Instantaneous Nonrenewable Output as Percentage of Total Load





Compare Economics

IRR (%): **51.2**

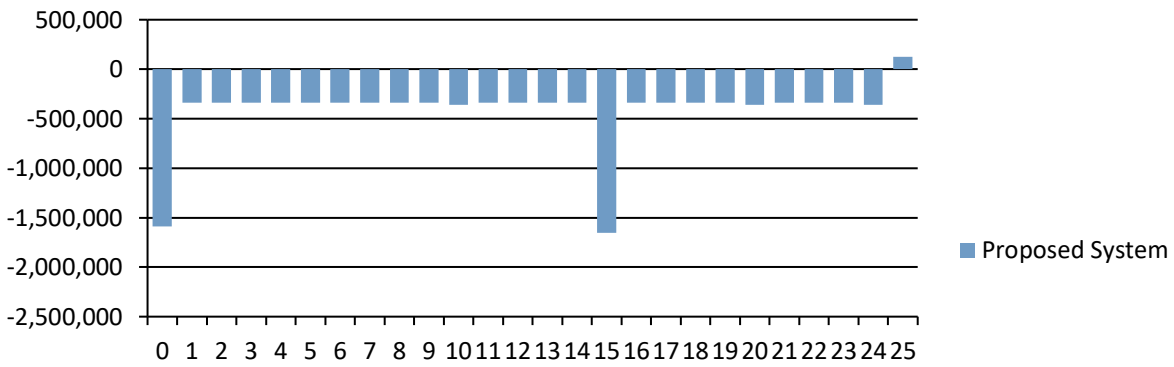
Discounted payback (yr): **2.31**

Simple payback (yr): **1.96**

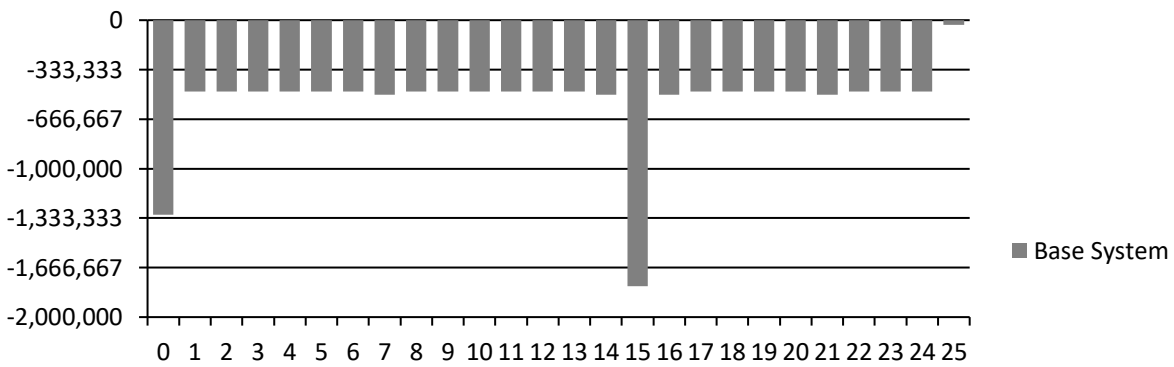
	Base System	Proposed System
Net Present Cost	\$5.89M	\$4.89M
CAPEX	\$1.31M	\$1.59M
OPEX	\$513,854	\$371,127
LCOE (per kWh)	\$0.299	\$0.248
CO2 Emitted (kg/yr)	1,557,606	1,062,012
Fuel Consumption (L/yr)	590,548	402,649



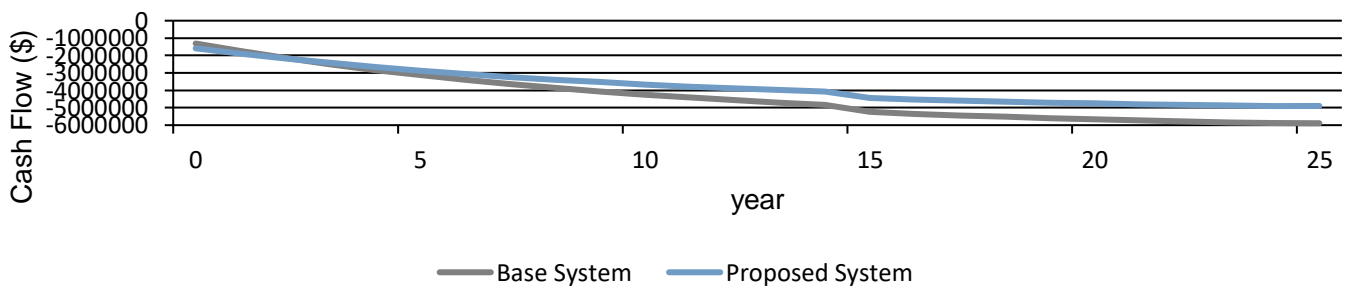
Proposed Annual Nominal Cash Flows



Base System Annual Nominal Cash Flows



Cumulative Discounted Cash Flows





System Simulation Report



File: S3 Optimisasi.homer

Author:

Location: X82H+R5 Barang Lompo, Makassar City, South Sulawesi, Indonesia (5°2.9'S, 119°19.7'E)

Total Net Present Cost: \$4,933,879.00

Levelized Cost of Energy (\$/kWh): \$0.250

Notes: HOMER Optimize



Table of Contents

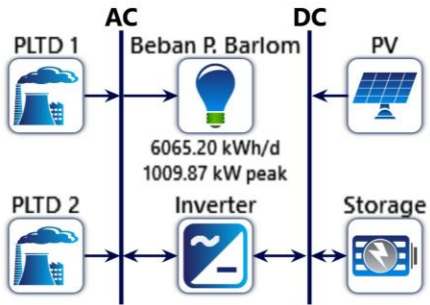
System Architecture.....	3
Cost Summary	4
Cash Flow.....	5
Electrical Summary	6
Generator: CAT-250kVA-50Hz-PP (Diesel)	7
Generator: CAT-250kVA-50Hz-PP (1) (Diesel).....	8
PV: Generic flat plate PV.....	9
Storage: Generic 1kWh Li-Ion	10
Converter: System Converter	11
Fuel Summary	12
Renewable Summary	13
Compare Economics.....	14



System Architecture

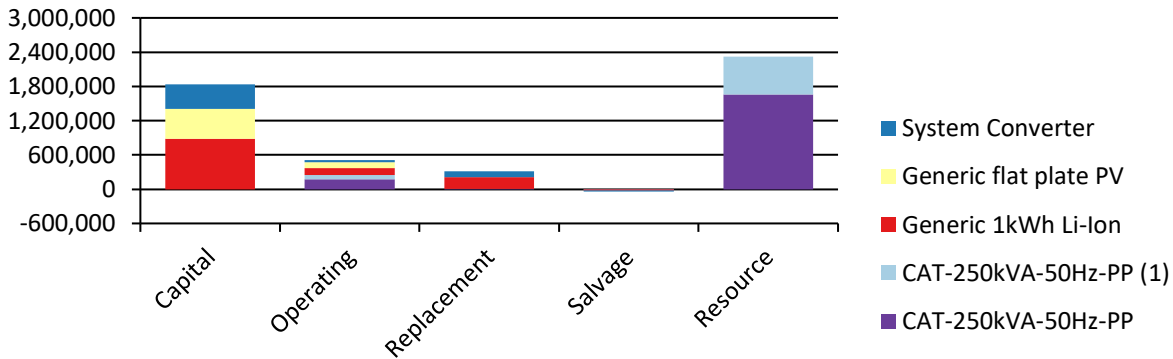
Component	Name	Size	Unit
Generator #1	CAT-250kVA-50Hz-PP	200	kW
Generator #2	CAT-250kVA-50Hz-PP (1)	200	kW
PV	Generic flat plate PV	1,509	kW
Storage	Generic 1kWh Li-Ion	1,420	strings
System converter	System Converter	615	kW
Dispatch strategy	HOMER Cycle Charging		

Schematic





Cost Summary



Net Present Costs

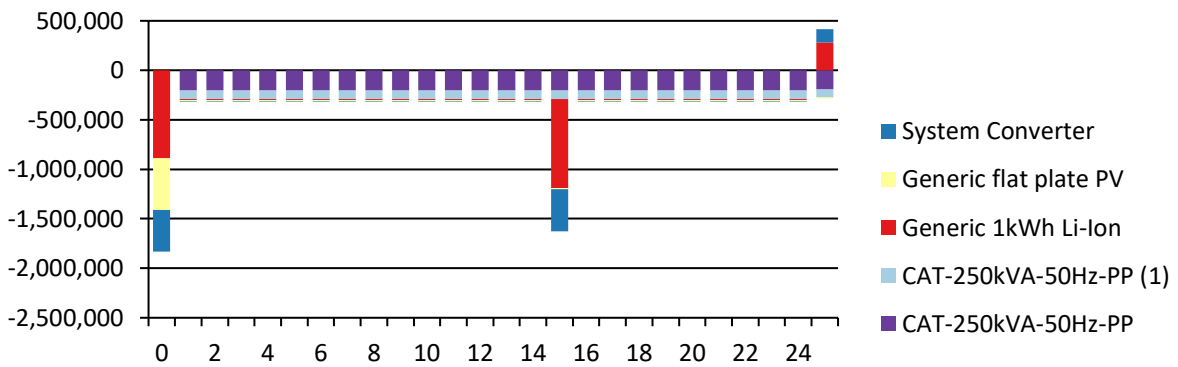
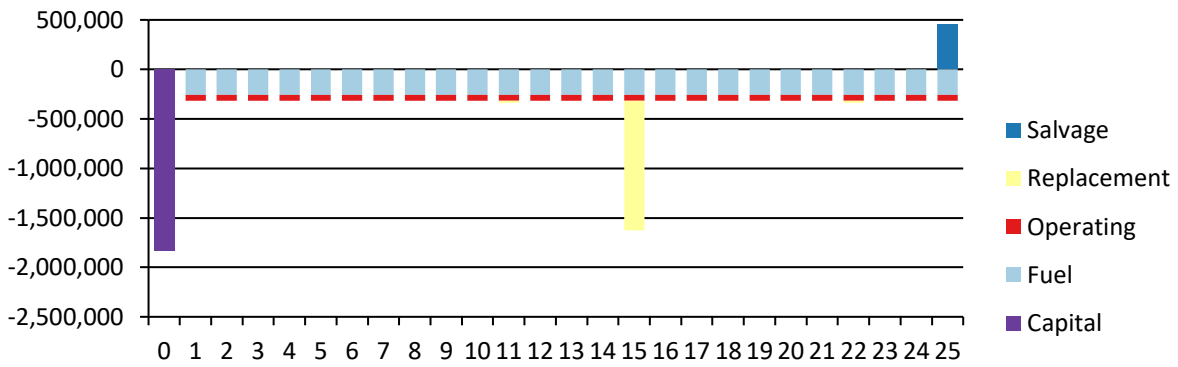
Name	Capital	Operating	Replacement	Salvage	Resource	Total
CAT-250kVA-50Hz-PP	\$0.00	\$174,056	\$9,325	-\$1,222	\$1.66M	\$1.84M
CAT-250kVA-50Hz-PP (1)	\$0.00	\$72,555	\$0.00	-\$71.99	\$656,008	\$728,491
Generic 1kWh Li-Ion	\$887,500	\$126,484	\$205,429	-\$25,815	\$0.00	\$1.19M
Generic flat plate PV	\$522,870	\$96,804	\$0.00	\$0.00	\$0.00	\$619,674
System Converter	\$423,124	\$39,442	\$97,940	-\$12,308	\$0.00	\$548,199
System	\$1.83M	\$509,341	\$312,695	-\$39,416	\$2.32M	\$4.93M

Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
CAT-250kVA-50Hz-PP	\$0.00	\$19,541	\$1,047	-\$137.15	\$186,561	\$207,012
CAT-250kVA-50Hz-PP (1)	\$0.00	\$8,146	\$0.00	-\$8.08	\$73,648	\$81,786
Generic 1kWh Li-Ion	\$99,637	\$14,200	\$23,063	-\$2,898	\$0.00	\$134,002
Generic flat plate PV	\$58,701	\$10,868	\$0.00	\$0.00	\$0.00	\$69,569
System Converter	\$47,503	\$4,428	\$10,996	-\$1,382	\$0.00	\$61,545
System	\$205,842	\$57,182	\$35,105	-\$4,425	\$260,209	\$553,913



Cash Flow





Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	1,723,704	kWh/yr
Unmet Electric Load	701	kWh/yr
Capacity Shortage	2,095	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Generic flat plate PV	2,607,479	65.0
CAT-250kVA-50Hz-PP	1,008,866	25.2
CAT-250kVA-50Hz-PP (1)	394,647	9.84
Total	4,010,992	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	2,213,097	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	2,213,097	100

Generator: CAT-250kVA-50Hz-PP (Diesel)

CAT-250kVA-50Hz-PP Electrical Summary

Quantity	Value	Units
Electrical Production	1,008,866	kWh/yr
Mean Electrical Output	183	kW
Minimum Electrical Output	50.0	kW
Maximum Electrical Output	200	kW

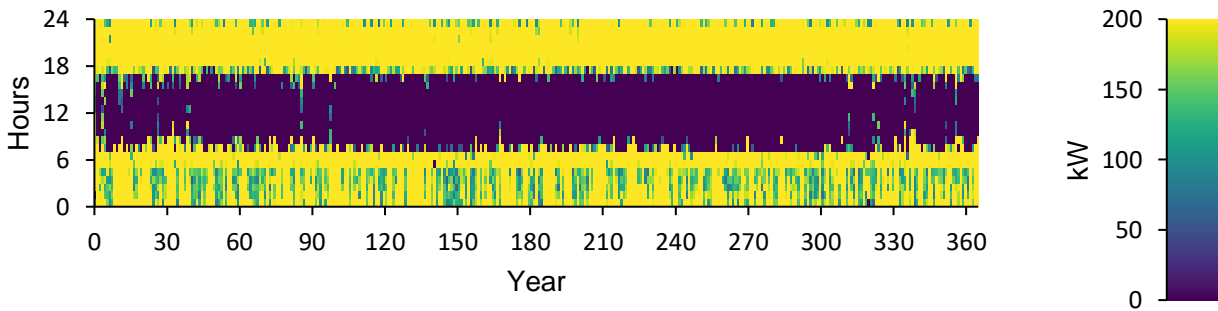
CAT-250kVA-50Hz-PP Fuel Summary

Quantity	Value	Units
Fuel Consumption	263,504	L
Specific Fuel Consumption	0.261	L/kWh
Fuel Energy Input	2,592,881	kWh/yr
Mean Electrical Efficiency	38.9	%

CAT-250kVA-50Hz-PP Statistics

Quantity	Value	Units
Hours of Operation	5,520	hrs/yr
Number of Starts	393	starts/yr
Operational Life	10.9	yr
Capacity Factor	57.6	%
Fixed Generation Cost	8.60	\$/hr
Marginal Generation Cost	0.159	\$/kWh

CAT-250kVA-50Hz-PP Output (kW)



Generator: CAT-250kVA-50Hz-PP (1) (Diesel)

CAT-250kVA-50Hz-PP (1) Electrical Summary

Quantity	Value	Units
Electrical Production	394,647	kWh/yr
Mean Electrical Output	172	kW
Minimum Electrical Output	50.0	kW
Maximum Electrical Output	200	kW

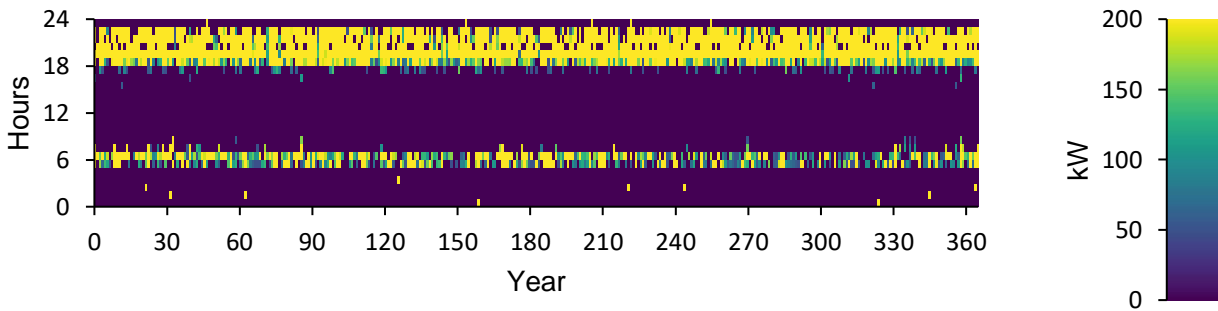
CAT-250kVA-50Hz-PP (1) Fuel Summary

Quantity	Value	Units
Fuel Consumption	104,023	L
Specific Fuel Consumption	0.264	L/kWh
Fuel Energy Input	1,023,586	kWh/yr
Mean Electrical Efficiency	38.6	%

CAT-250kVA-50Hz-PP (1) Statistics

Quantity	Value	Units
Hours of Operation	2,301	hrs/yr
Number of Starts	835	starts/yr
Operational Life	26.1	yr
Capacity Factor	22.5	%
Fixed Generation Cost	8.60	\$/hr
Marginal Generation Cost	0.159	\$/kWh

CAT-250kVA-50Hz-PP (1) Output (kW)



PV: Generic flat plate PV

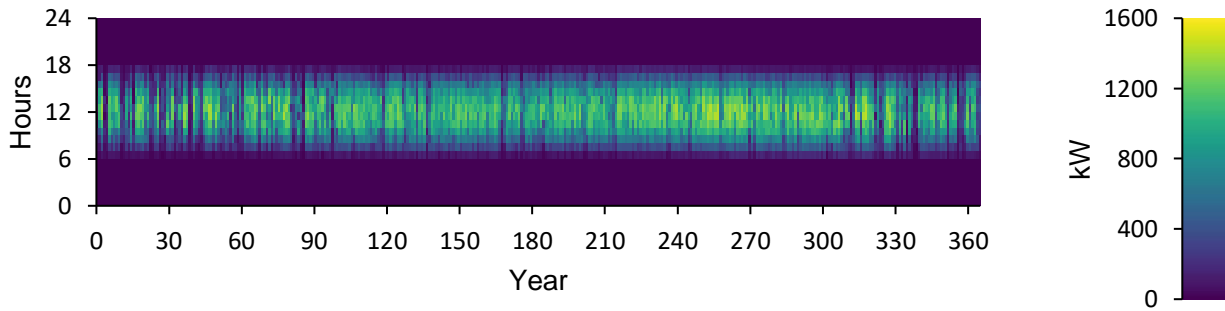
Generic flat plate PV Electrical Summary

Quantity	Value	Units
Minimum Output	0	kW
Maximum Output	1,451	kW
PV Penetration	118	%
Hours of Operation	4,380	hrs/yr
Levelized Cost	0.0267	\$/kWh

Generic flat plate PV Statistics

Quantity	Value	Units
Rated Capacity	1,509	kW
Mean Output	298	kW
Mean Output	7,144	kWh/d
Capacity Factor	19.7	%
Total Production	2,607,479	kWh/yr

Generic flat plate PV Output (kW)



Storage: Generic 1kWh Li-Ion

Generic 1kWh Li-Ion Properties

Quantity	Value	Units
Batteries	1,420	qty.
String Size	1.00	batteries
Strings in Parallel	1,420	strings
Bus Voltage	6.00	V

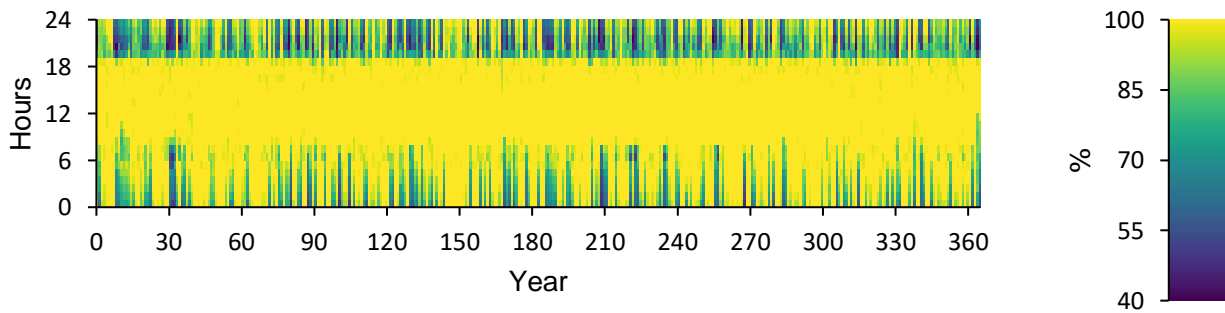
Generic 1kWh Li-Ion Result Data

Quantity	Value	Units
Average Energy Cost	0.164	\$/kWh
Energy In	171,589	kWh/yr
Energy Out	154,807	kWh/yr
Storage Depletion	397	kWh/yr
Losses	17,179	kWh/yr
Annual Throughput	163,181	kWh/yr

Generic 1kWh Li-Ion Statistics

Quantity	Value	Units
Autonomy	3.37	hr
Storage Wear Cost	0.220	\$/kWh
Nominal Capacity	1,420	kWh
Usable Nominal Capacity	852	kWh
Lifetime Throughput	2,447,717	kWh
Expected Life	15.0	yr

Generic 1kWh Li-Ion State of Charge (%)



Converter: System Converter

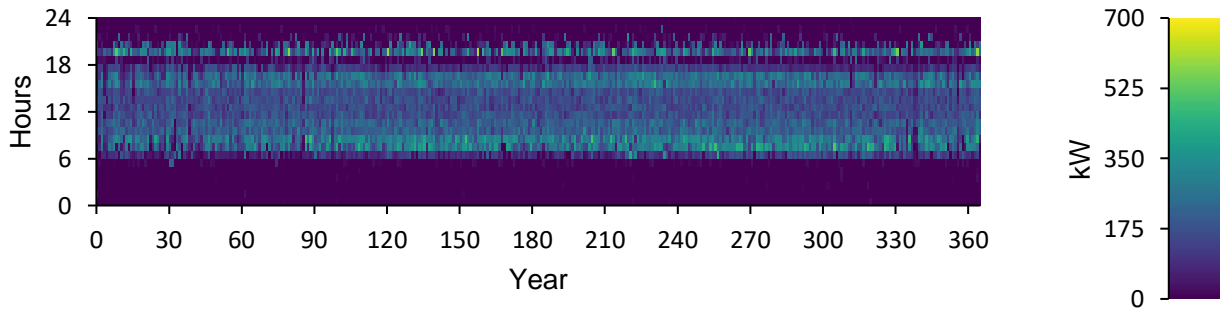
System Converter Electrical Summary

Quantity	Value	Units
Hours of Operation	5,319	hrs/yr
Energy Out	953,779	kWh/yr
Energy In	1,003,978	kWh/yr
Losses	50,199	kWh/yr

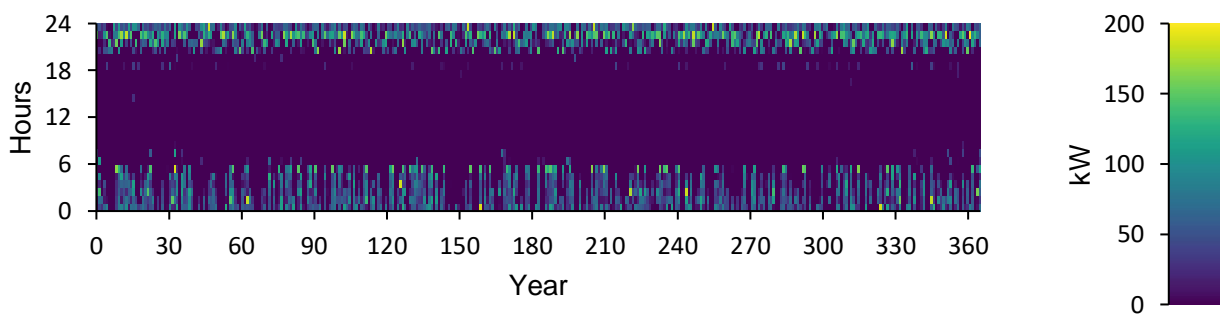
System Converter Statistics

Quantity	Value	Units
Capacity	615	kW
Mean Output	109	kW
Minimum Output	0	kW
Maximum Output	610	kW
Capacity Factor	17.7	%

System Converter Inverter Output (kW)



System Converter Rectifier Output (kW)



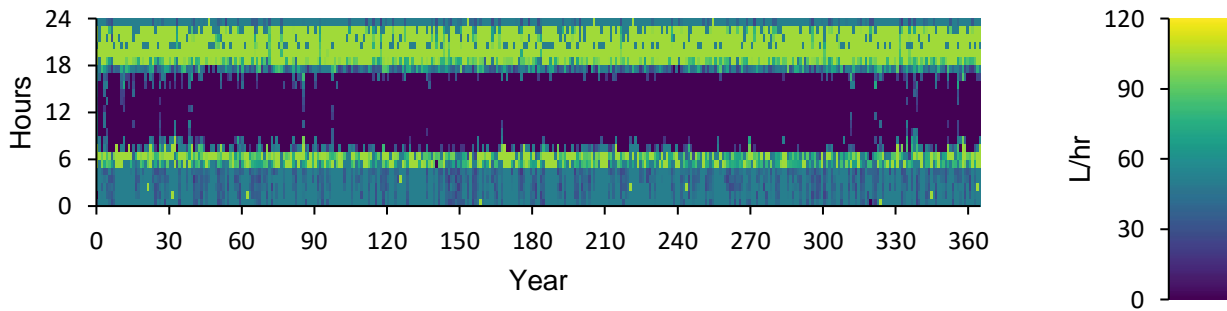


Fuel Summary

Diesel Consumption Statistics

Quantity	Value	Units
Total fuel consumed	367,527	L
Avg fuel per day	1,007	L/day
Avg fuel per hour	42.0	L/hour

Diesel Consumption (L/hr)



Emissions

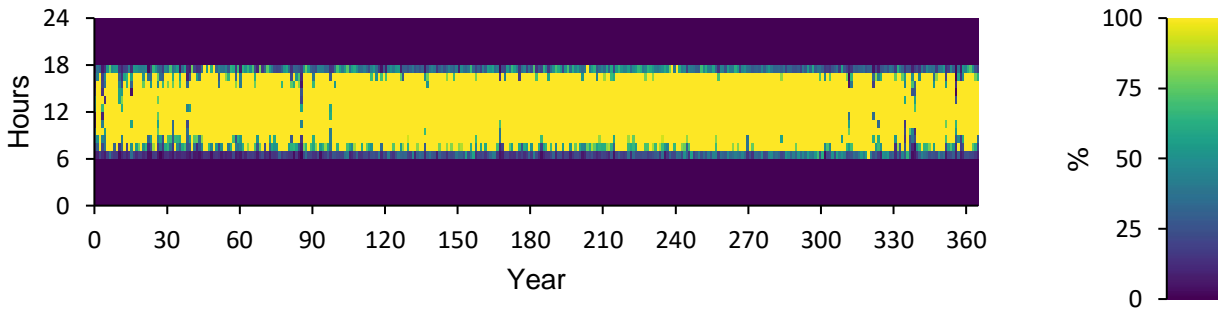
Pollutant	Quantity	Unit
Carbon Dioxide	969,375	kg/yr
Carbon Monoxide	1,860	kg/yr
Unburned Hydrocarbons	40.4	kg/yr
Particulate Matter	95.6	kg/yr
Sulfur Dioxide	2,411	kg/yr
Nitrogen Oxides	9,640	kg/yr



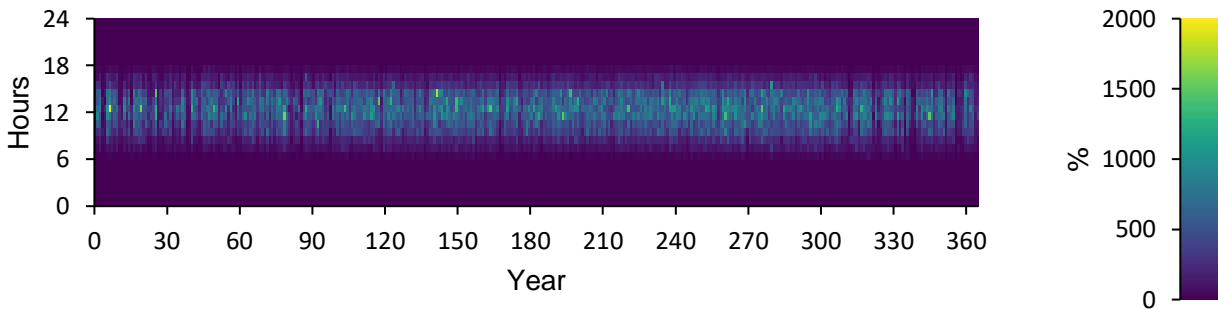
Renewable Summary

Capacity-based metrics	Value	Unit
Nominal renewable capacity divided by total nominal capacity	79.1	%
Usable renewable capacity divided by total capacity	75.1	%
Energy-based metrics		Unit
Total renewable production divided by load	118	%
Total renewable production divided by generation	65.0	%
One minus total nonrenewable production divided by load	36.6	%
Peak values		Unit
Renewable output divided by load (HOMER standard)	1,937	%
Renewable output divided by total generation	100	%
One minus nonrenewable output divided by total load	100	%

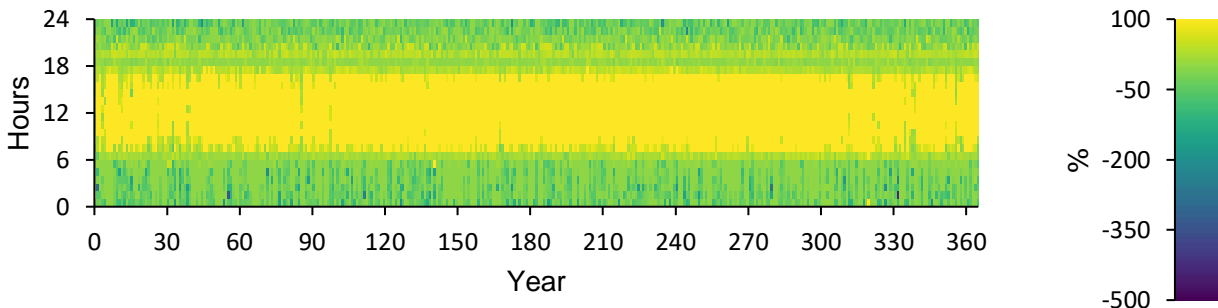
Instantaneous Renewable Output Percentage of Total Generation



Instantaneous Renewable Output Percentage of Total Load



100% Minus Instantaneous Nonrenewable Output as Percentage of Total Load





Compare Economics

IRR (%):**33.1**

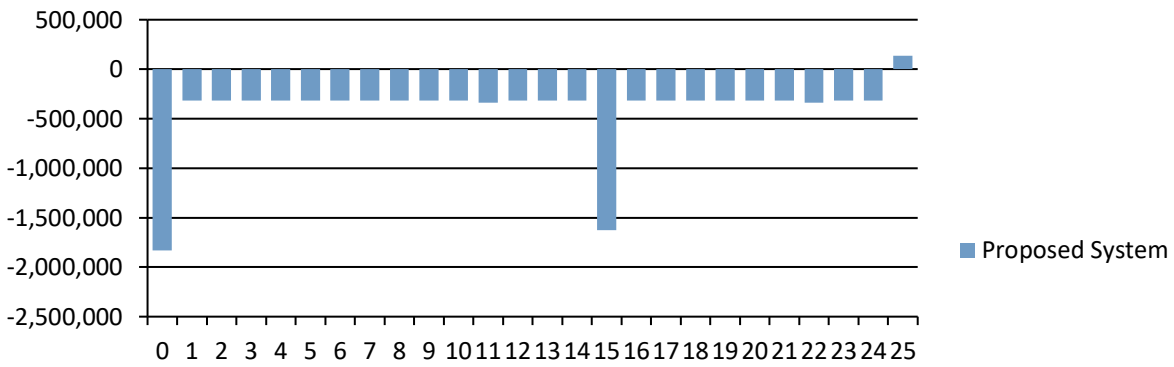
Discounted payback (yr):**3.82**

Simple payback (yr):**3.03**

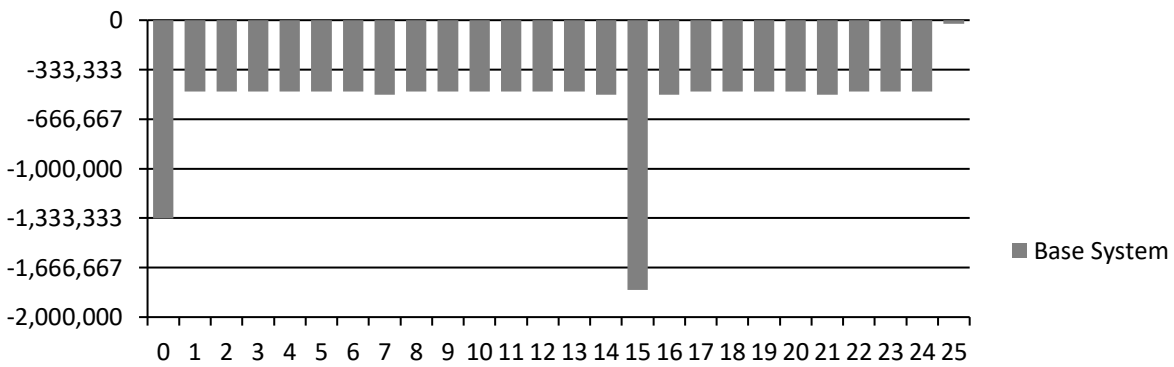
	Base System	Proposed System
Net Present Cost	\$5.92M	\$4.93M
CAPEX	\$1.33M	\$1.83M
OPEX	\$514,776	\$348,072
LCOE (per kWh)	\$0.300	\$0.250
CO2 Emitted (kg/yr)	1,557,754	969,375
Fuel Consumption (L/yr)	590,604	367,527



Proposed Annual Nominal Cash Flows



Base System Annual Nominal Cash Flows



Cumulative Discounted Cash Flows

