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LAMPIRAN

HOMER Pro

System Simulation Report

File: 12. 20% PLTS and 80% PLTD.homer

Author: Jorgio Zafanya

Location: 7XX7+9J2, Mattiro Ujung, Liukang Tupabbiring, Pangkajene and Islands Regency, South Sulawesi, Indonesia (4°42.2'S, 118°57.8'E)

Total Net Present Cost: $9,334,540.00

Levelized Cost of Energy ($/kWh): $0.218

Notes: KENAIKAN BEBAN 3%

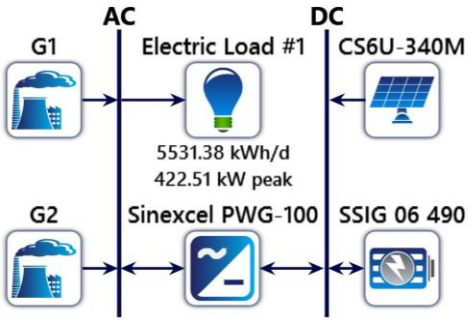
PLTS 20%

PLTD 80%

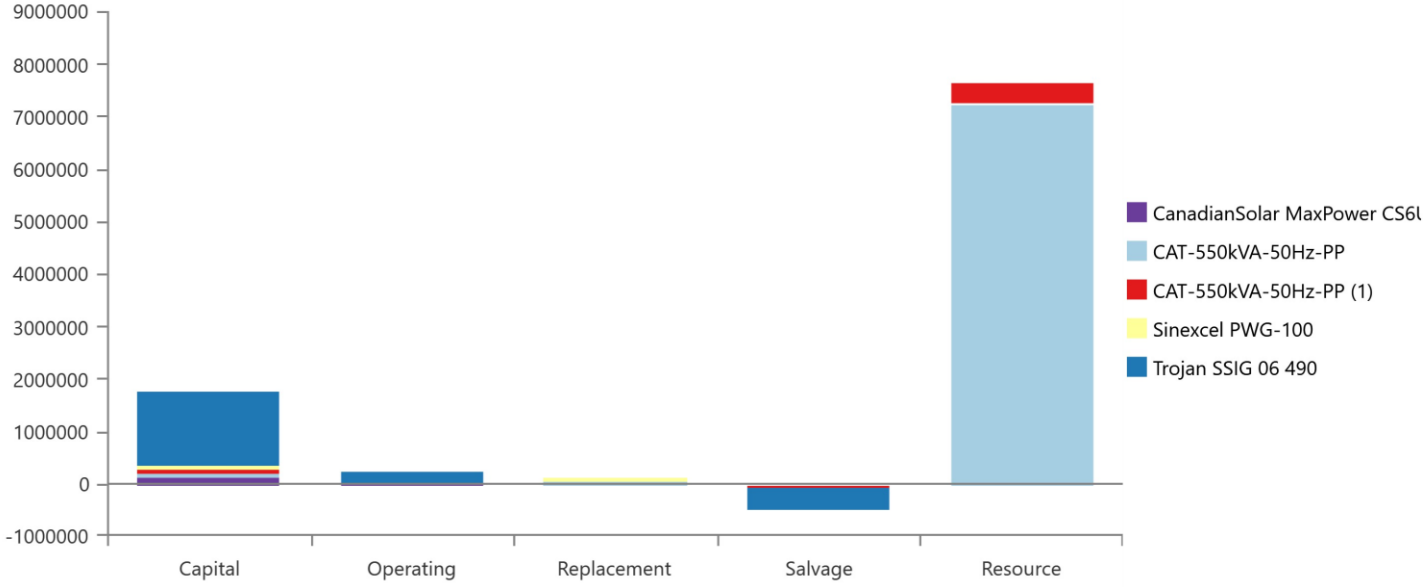
System Architecture

Component	Name	Size	Unit
Generator #1	CAT-550kVA-50Hz-PP	440	kW
Generator #2	CAT-550kVA-50Hz-PP (1)	440	kW
PV	CanadianSolar MaxPower CS6U-340M	558	kW
Storage	Trojan SSIG 06 490	40	strings
System converter	Sinexcel PWG-100	700	kW
Dispatch strategy	HOMER Load Following		

Schematic



Cost Summary



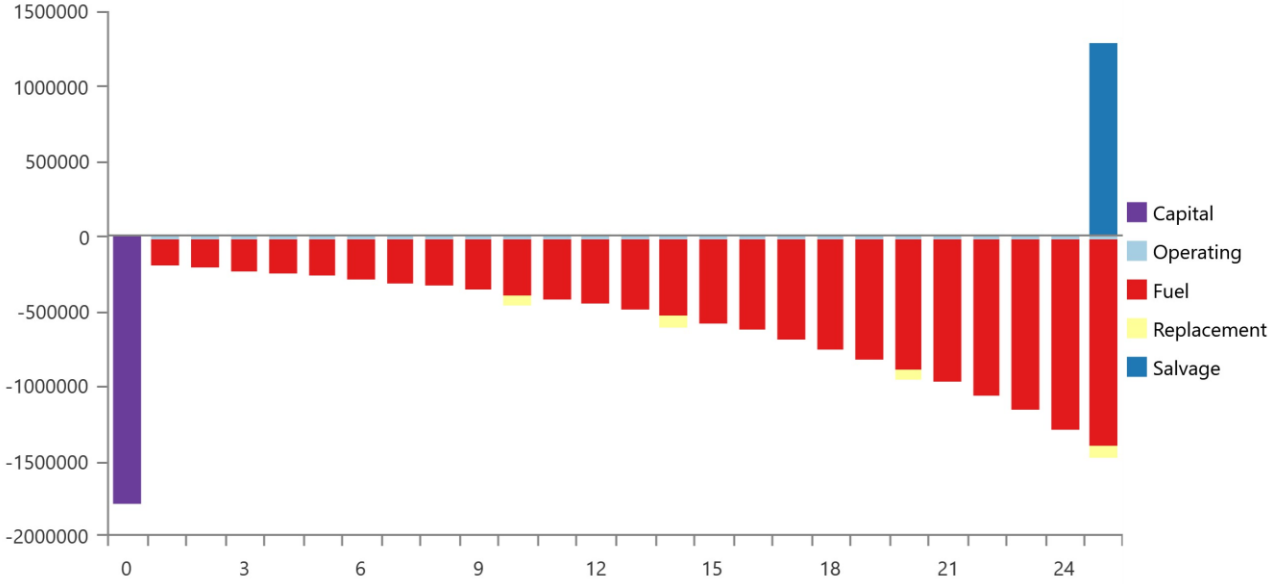
Net Present Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
CanadianSolar MaxPower CS6U-340M	$154,980	$23,995	$0.00	$0.00	$0.00	$178,975
CAT-550kVA-50Hz-PP	$72,225	$5,489	$69,038	-$26,014	$7.25M	$7.37M
CAT-550kVA-50Hz-PP (1)	$72,225	$340.57	$0.00	-$21,486	$357,335	$408,415
Sinexcel PWG-100	$70,000	$10,838	$78,336	-$12,864	$0.00	$146,310
Trojan SSIG 06 490	$1.42M	$219,915	$0.00	-$411,992	$0.00	$1.23M
System	$1.79M	$260,579	$147,373	-$472,355	$7.61M	$9.33M

Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
CanadianSolar MaxPower CS6U-340M	$10,010	$1,550	$0.00	$0.00	$0.00	$11,560
CAT-550kVA-50Hz-PP	$4,665	$354.54	$4,459	-$1,680	$468,374	$476,172
CAT-550kVA-50Hz-PP (1)	$4,665	$22.00	$0.00	-$1,388	$23,079	$26,378
Sinexcel PWG-100	$4,521	$700.00	$5,059	-$830.86	$0.00	$9,450
Trojan SSIG 06 490	$91,738	$14,204	$0.00	-$26,609	$0.00	$79,332
System	$115,598	$16,830	$9,518	-$30,508	$491,453	$602,892

Cash Flow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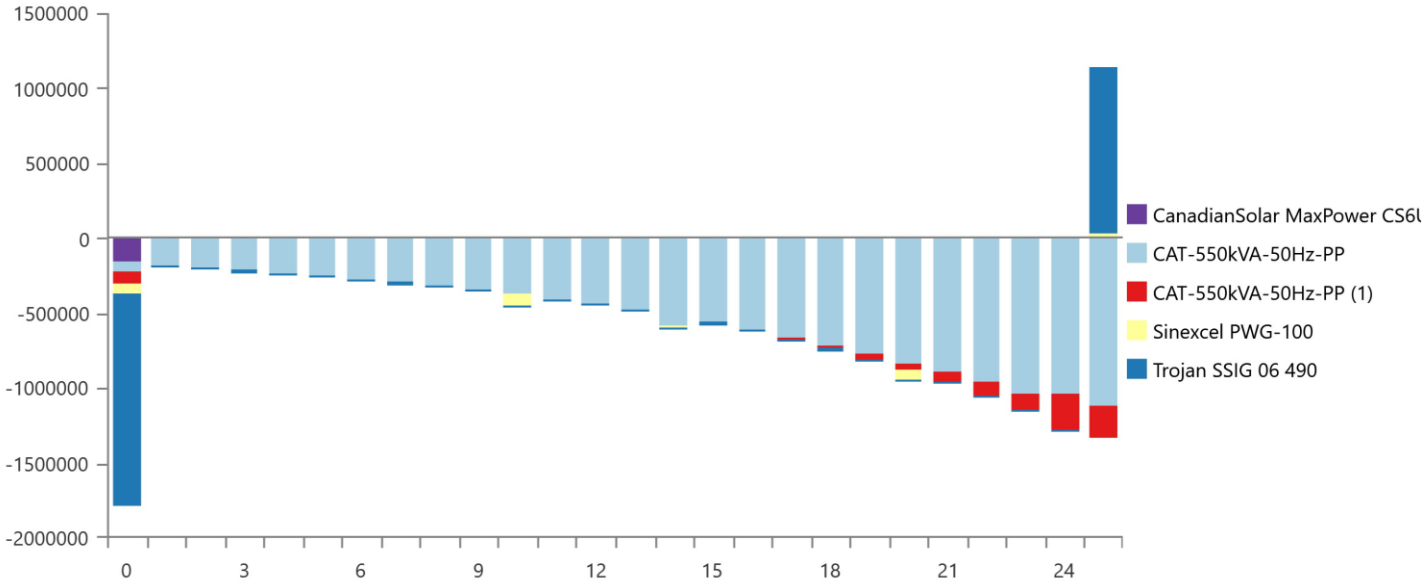
Capital
Operating
Fuel
Replacement
Salvage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CanadianSolar MaxPower CS6L
CAT-550kVA-50Hz-PP
CAT-550kVA-50Hz-PP (1)
Sinexcel PWG-100
Trojan SSIG 06 490

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	211,893	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
CanadianSolar MaxPower CS6U-340M	918,330	40.5
CAT-550kVA-50Hz-PP	1,347,220	59.5
CAT-550kVA-50Hz-PP (1)	0	0
Total	2,265,551	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	2,018,954	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	2,018,954	100

Generator: CAT-550kVA-50Hz-PP (Diesel)

CAT-550kVA-50Hz-PP Electrical Summary (First Year)

Quantity	Value	Units
Electrical Production	1,347,220	kWh/yr
Mean Electrical Output	209	kW
Minimum Electrical Output	110	kW
Maximum Electrical Output	423	kW

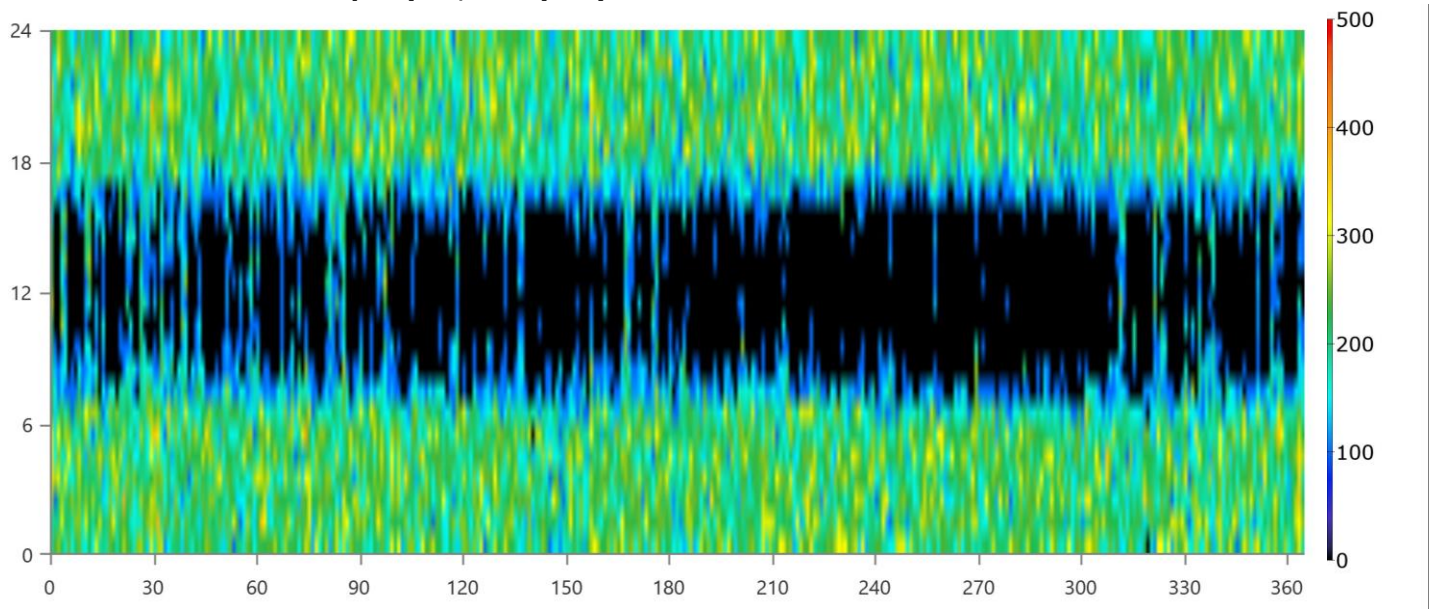
CAT-550kVA-50Hz-PP Fuel Summary (First Year)

Quantity	Value	Units
Fuel Consumption	365,397	L
Specific Fuel Consumption	0.271	L/kWh
Fuel Energy Input	3,595,505	kWh/yr
Mean Electrical Efficiency	37.5	%

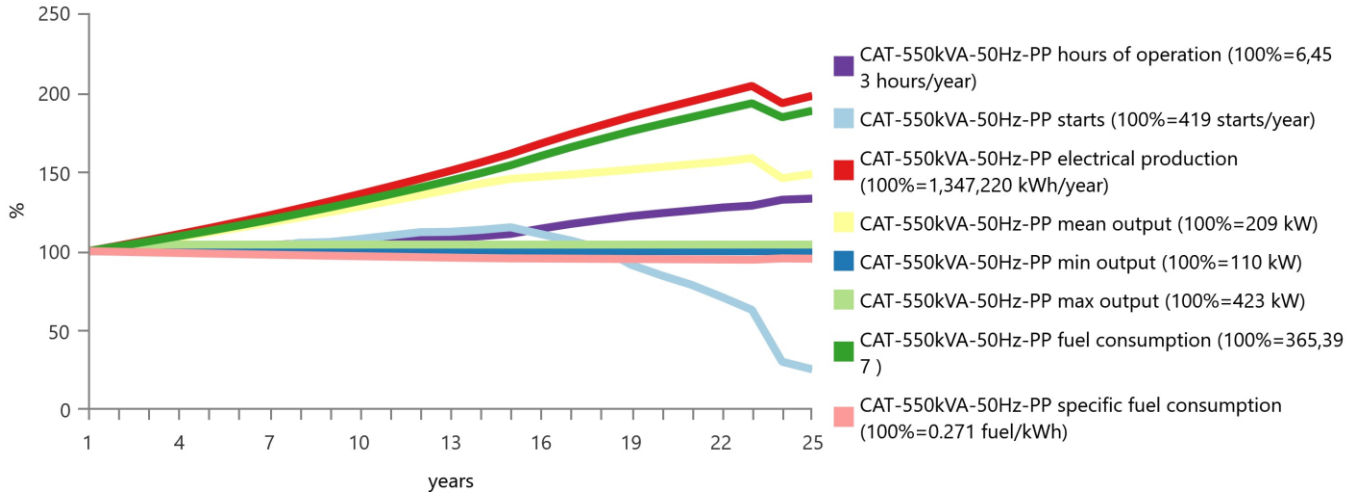
CAT-550kVA-50Hz-PP Statistics (First Year)

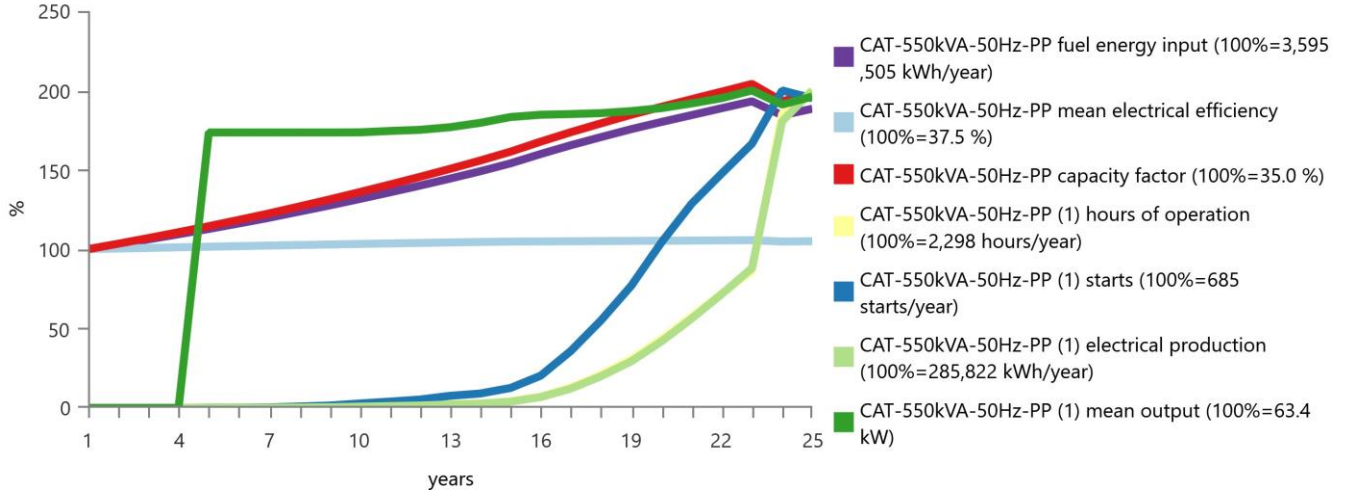
Quantity	Value	Units
Hours of Operation	6,453	hrs/yr
Number of Starts	419	starts/yr
Operational Life	13.9	yr
Capacity Factor	35.0	%
Fixed Generation Cost	4.96	$/hr
Marginal Generation Cost	0.116	$/kWh

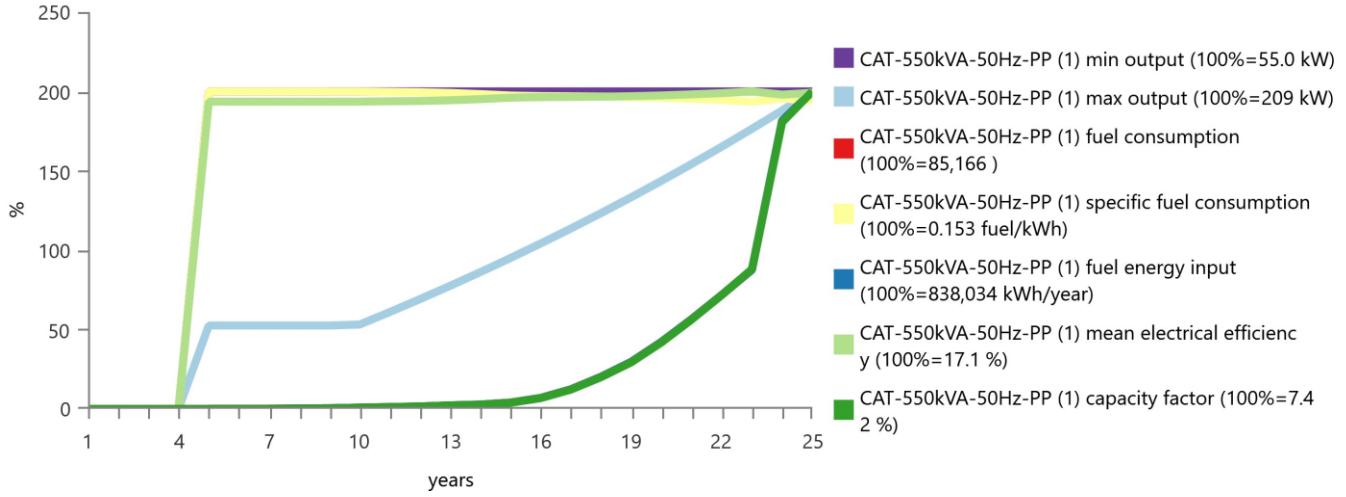
CAT-550kVA-50Hz-PP Output (kW, first year)



CAT-550kVA-50Hz-PP Multiyear Trends (Percent of First Year Value)







Generator: CAT-550kVA-50Hz-PP (1) (Diesel)

CAT-550kVA-50Hz-PP (1) Electrical Summary (First Year)

Quantity	Value	Units
Electrical Production	0	kWh/yr
Mean Electrical Output	0	kW
Minimum Electrical Output	0	kW
Maximum Electrical Output	0	kW

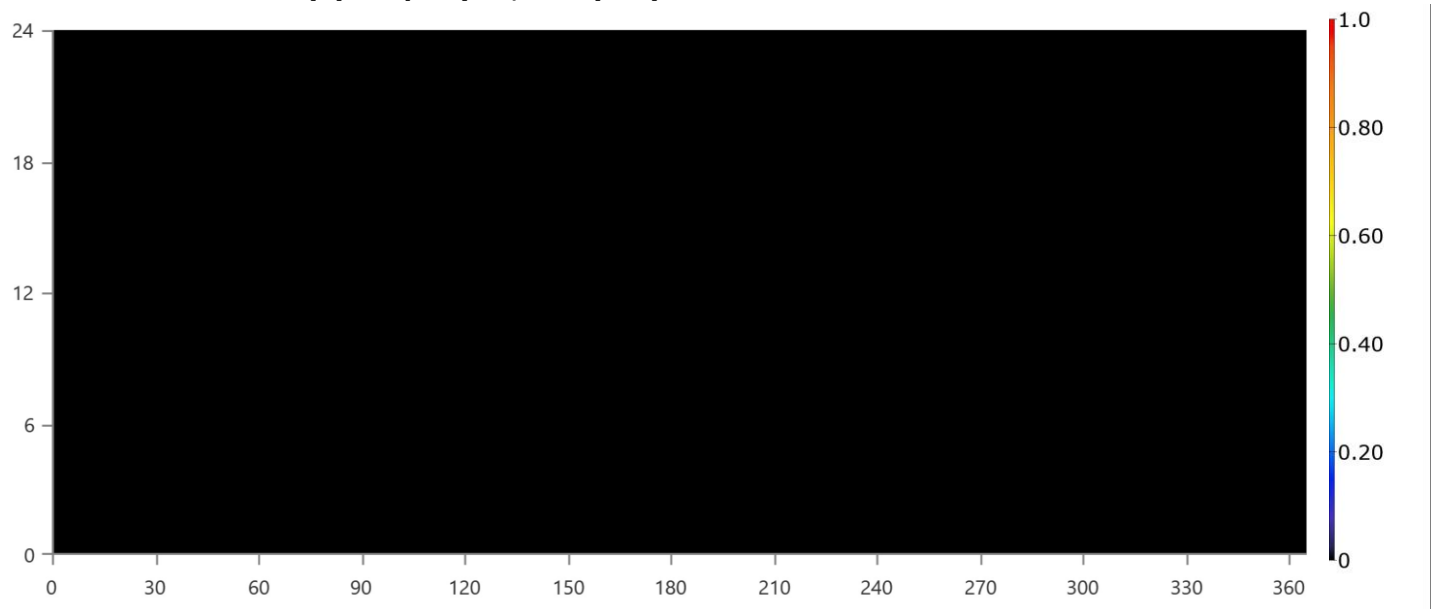
CAT-550kVA-50Hz-PP (1) Fuel Summary (First Year)

Quantity	Value	Units
Fuel Consumption	0	L
Specific Fuel Consumption	0	L/kWh
Fuel Energy Input	0	kWh/yr
Mean Electrical Efficiency	0	%

CAT-550kVA-50Hz-PP (1) Statistics (First Year)

Quantity	Value	Units
Hours of Operation	0	hrs/yr
Number of Starts	0	starts/yr
Operational Life	1,000	yr
Capacity Factor	0	%
Fixed Generation Cost	4.96	$/hr
Marginal Generation Cost	0.116	$/kWh

CAT-550kVA-50Hz-PP (1) Output (kW, first year)



PV: CanadianSolar MaxPower CS6U-340M

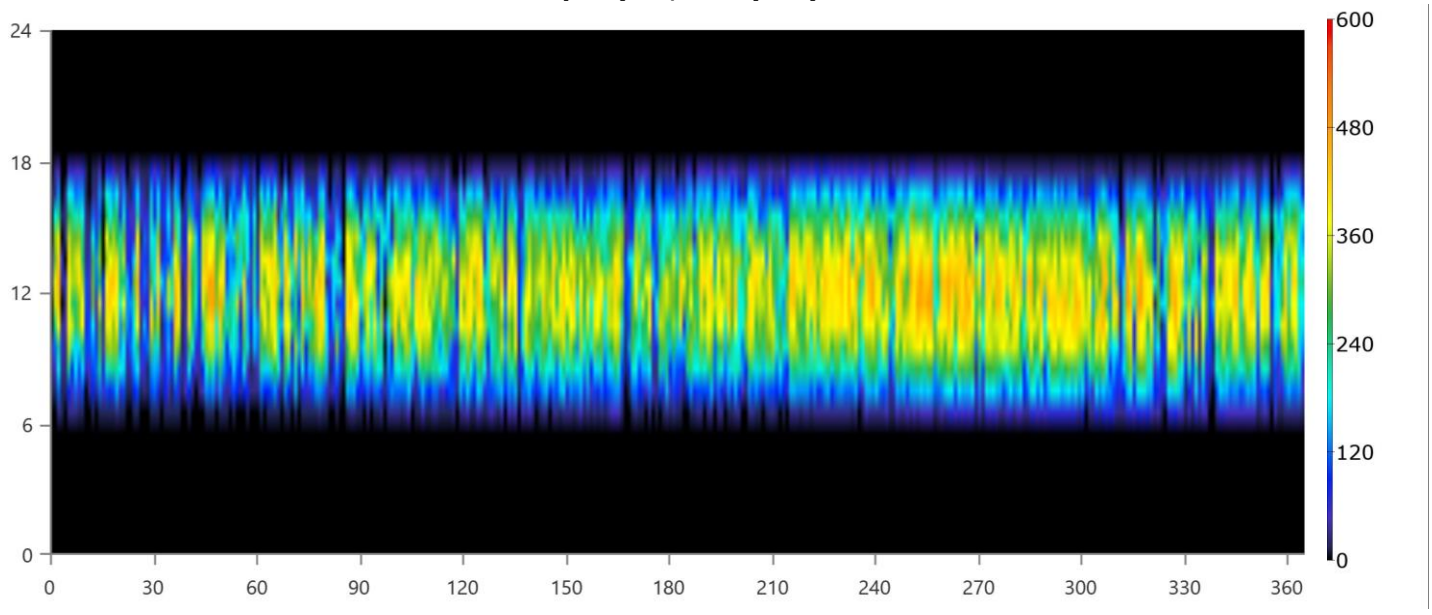
CanadianSolar MaxPower CS6U-340M Electrical Summary (First Year)

Quantity	Value	Units
Minimum Output	0	kW
Maximum Output	503	kW
PV Penetration	45.5	%
Hours of Operation	4,380	hrs/yr
Levelized Cost	0.0126	$/kWh

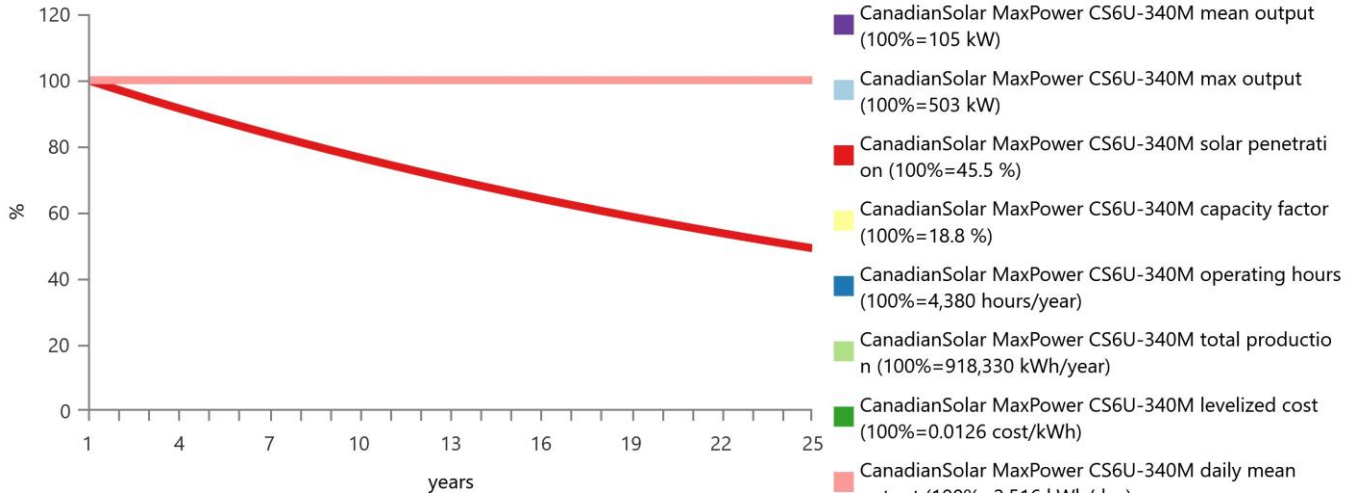
CanadianSolar MaxPower CS6U-340M Statistics (First Year)

Quantity	Value	Units
Rated Capacity	558	kW
Mean Output	105	kW
Mean Output	2,516	kWh/d
Capacity Factor	18.8	%
Total Production	918,330	kWh/yr

CanadianSolar MaxPower CS6U-340M Output (kW, first year)



CanadianSolar MaxPower CS6U-340M Multiyear Trends (Percent of First Year Value)



Storage: Trojan SSIG 06 490

Trojan SSIG 06 490 Properties (First Year)

Quantity	Value	Units
Batteries	2,680	qty.
String Size	67.0	batteries
Strings in Parallel	40.0	strings
Bus Voltage	402	V

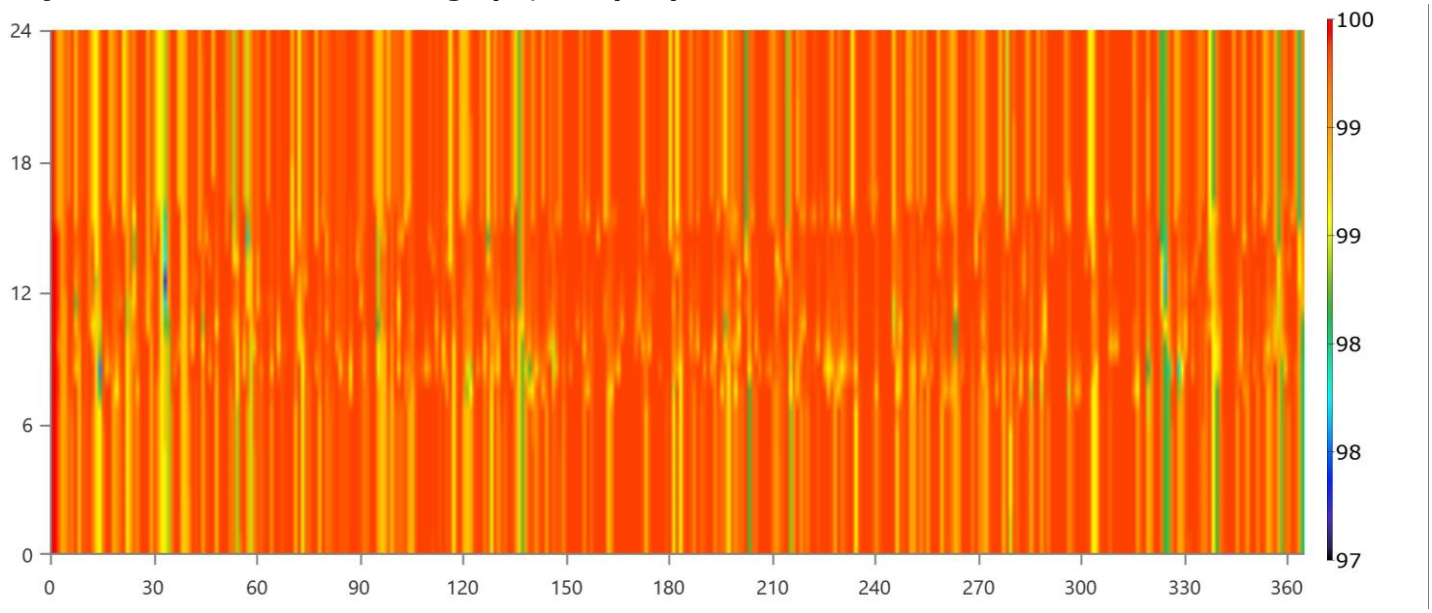
Trojan SSIG 06 490 Result Data (First Year)

Quantity	Value	Units
Average Energy Cost	0	$/kWh
Energy In	15,158	kWh/yr
Energy Out	12,152	kWh/yr
Storage Depletion	29.1	kWh/yr
Losses	3,035	kWh/yr
Annual Throughput	13,586	kWh/yr

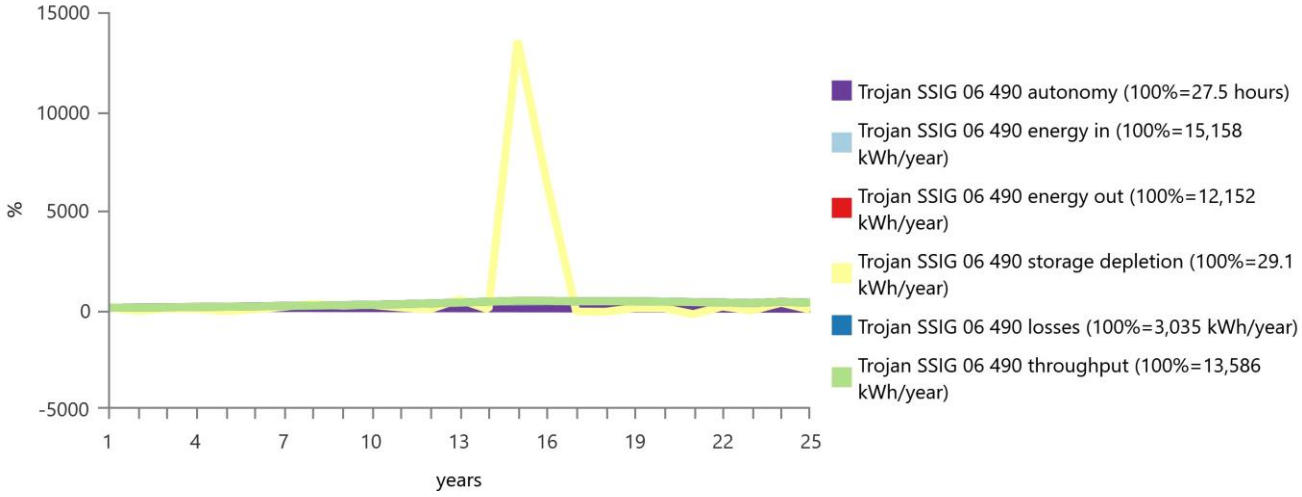
Trojan SSIG 06 490 Statistics (First Year)

Quantity	Value	Units
Autonomy	27.5	hr
Storage Wear Cost	0.335	$/kWh
Nominal Capacity	7,909	kWh
Usable Nominal Capacity	6,328	kWh

Trojan SSIG 06 490 State of Charge (%, first year)



Trojan SSIG 06 490 Multiyear Trends (Percent of First Year Value)



Converter: Sinexcel PWG-100

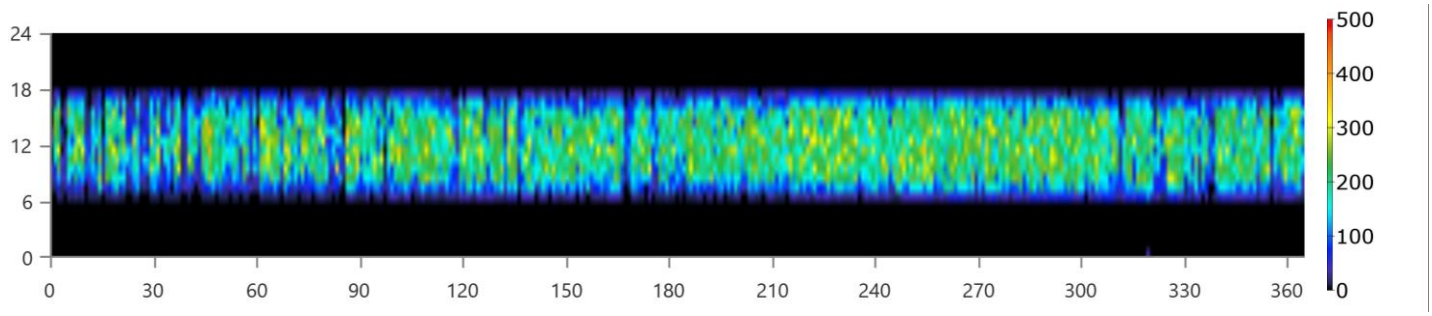
Sinexcel PWG-100 Electrical Summary (First Year)

Quantity	Value	Units
Hours of Operation	4,373	hrs/yr
Energy Out	672,476	kWh/yr
Energy In	704,163	kWh/yr
Losses	31,687	kWh/yr

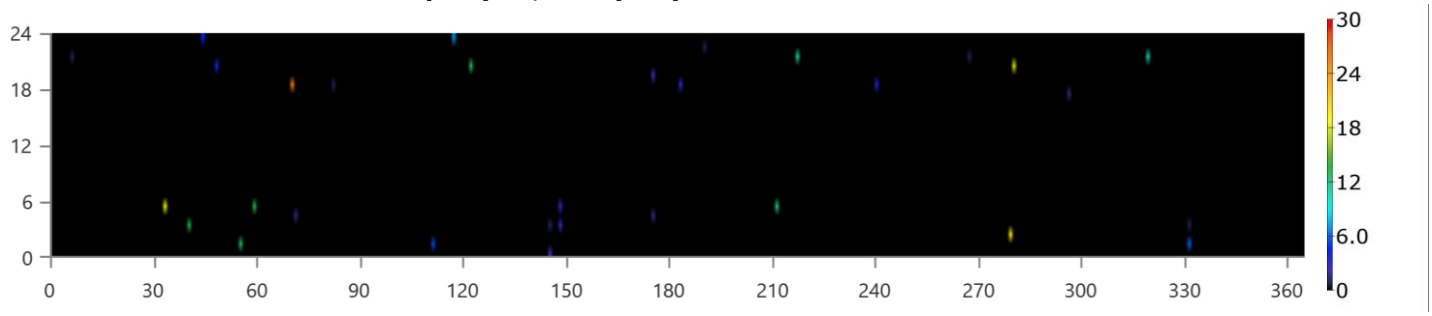
Sinexcel PWG-100 Statistics (First Year)

Quantity	Value	Units
Capacity	700	kW
Mean Output	76.8	kW
Minimum Output	0	kW
Maximum Output	401	kW
Capacity Factor	11.0	%

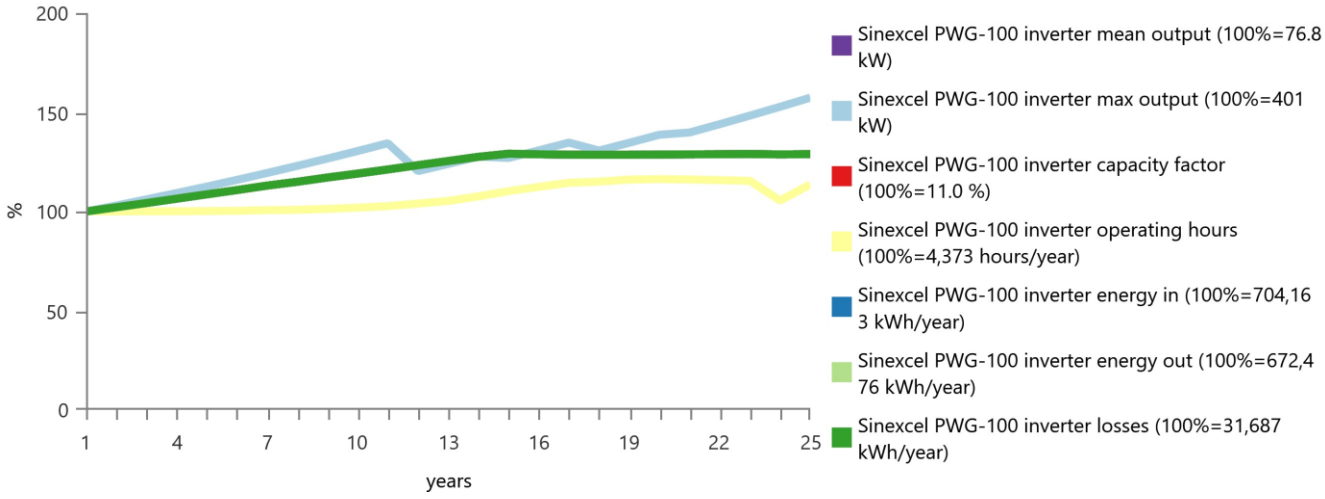
Sinexcel PWG-100 Inverter Output (kW, first year)

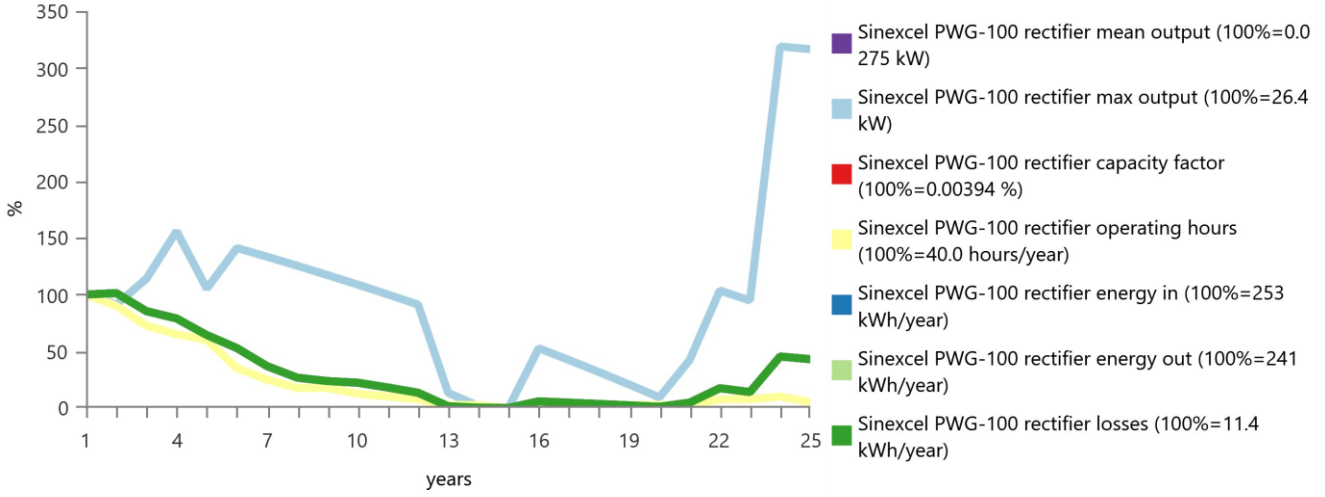


Sinexcel PWG-100 Rectifier Output (kW, first year)



Sinexcel PWG-100 Multiyear Trends (Percent of First Year Value)



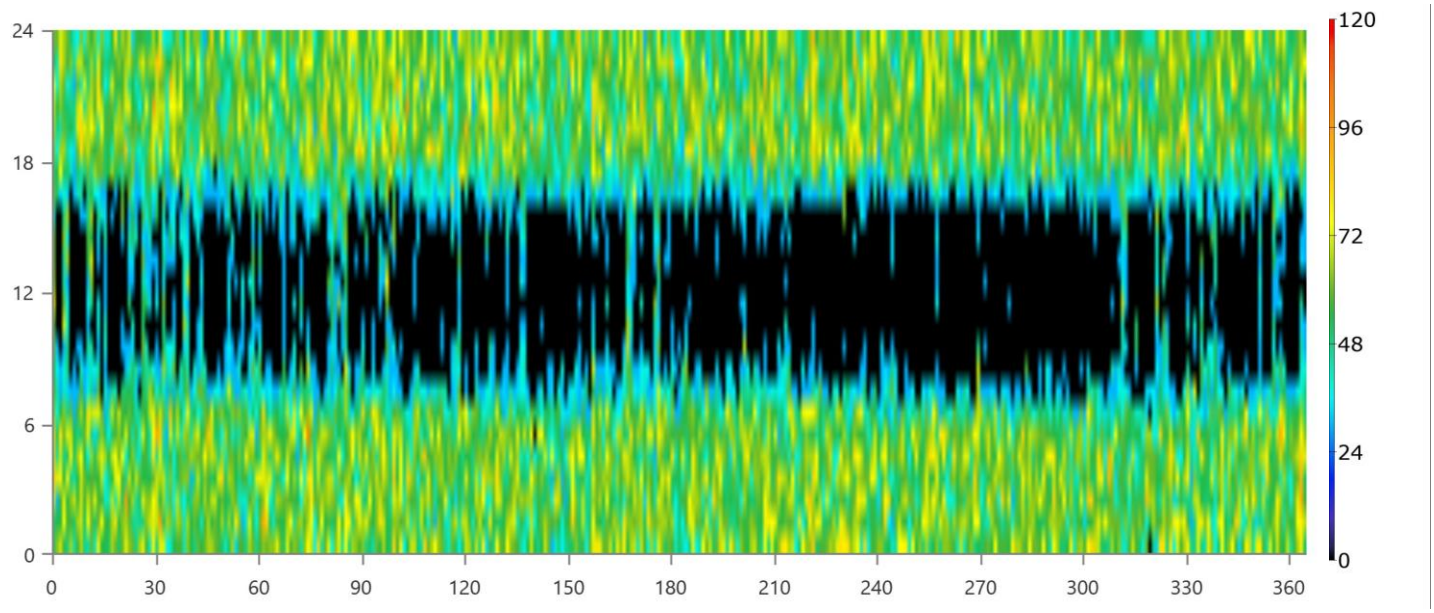


Fuel Summary

Diesel Consumption Statistics

Quantity	Value	Units
Total fuel consumed	365,397	L
Avg fuel per day	1,001	L/day
Avg fuel per hour	41.7	L/hour

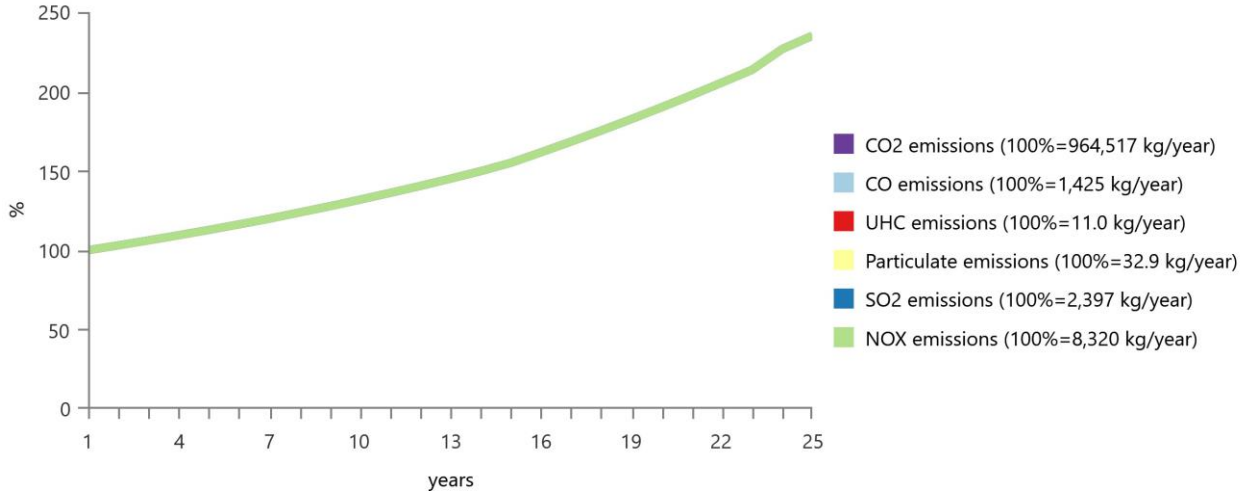
Diesel Consumption (L/hr)



Emissions

Pollutant	Quantity	Unit
Carbon Dioxide	964,517	kg/yr
Carbon Monoxide	1,425	kg/yr
Unburned Hydrocarbons	11.0	kg/yr
Particulate Matter	32.9	kg/yr
Sulfur Dioxide	2,397	kg/yr
Nitrogen Oxides	8,320	kg/yr

emissions Multiyear Trends (Percent of First Year Value)



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
Jalan Poros Malino KM.6 Bontomarannu (92171) Gowa Sulawesi Selatan
Telepon +62811 4420 909, e-mail: teknik@unhas.ac.id
Laman : https://eng.unhas.ac.id

Nomor : 20710/UN4.7.7.1/PT.01.06/2024
Lamp : -
Hal : Usulan Pengambilan Data Penelitian

Kepada Yth.
Wakil Dekan Bidang Akademik dan Kemahasiswaan

Di –
Fakultas Teknik,
Jl. Malino No.8 F, Romang Lompoa, Kec. Bontomarannu, Kabupaten Gowa, Sulawesi Selatan 92171

Dengan Hormat,
Kiranya Mahasiswa tersebut dibawah ini

Nama/Stambuk	:	Jorgio Zafanya/D041201120
Judul TA	:	Perencanaan Sistem Berbasis Hybrid pada Pembangkit Listrik Energi Terbarukan di Pulau Kapoposang

Dapat diberikan surat pengantar untuk pengambilan Data/Penelitian Skripsi/ tugas akhir pada:

1. Pulau Kapoposang

Adapun data/penelitian yang diperlukan Pengambilan data berupa data beban listrik di Pulau Kapoposang.

Demikian penyampaian kami, atas perhatian dan kerjasamanya diucapkan terima kasih

Gowa, 28 Agustus 2024
Sekretaris Departemen Teknik Elektro

Dr. Ir. Ikhlas Kitta, S.T., M.T.
NIP. 197609142008011006

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
Jalan Poros Malino KM.6 Bontomarannu (92171) Gowa Sulawesi Selatan
Telepon +62811 4420 909, e-mail: teknik@unhas.ac.id
Laman : https://eng.unhas.ac.id

Nomor : 20711/UN4.7.7.1/PT.01.06/2024 28 Agustus 2024
Lamp : -
Hal : Pengambilan Data Penelitian Mahasiswa

Kepada Yth.

Pimpinan Pulau Kapoposang

Di –
Pulau Kapoposang

Dengan hormat, kami sampaikan bahwa dalam rangka penyelesaian skripsi/tugas akhir pada Departemen Teknik Elektro Fakultas Teknik Universitas Hasanuddin, maka kami mohon atas kebijaksanaan Bapak/Ibu kiranya berkenan memberikan kesempatan melakukan pengambilan data di Pulau Kapoposang mahasiswa berikut :

Nama/Stambuk	: Jorgio Zafanya/D041201120
Judul TA	: Perencanaan Sistem Berbasis Hybrid pada Pembangkit Listrik Energi Terbarukan di Pulau Kapoposang
Tujuan	: Pengambilan data berupa data beban listrik di Pulau Kapoposang

Atas perhatian dan kerjasama yang baik kami sampaikan terima kasih.

a.n. Dekan,
Wakil Dekan Bidang Akademik dan Kemahasiswaan

Dr. Amil Ahmad Ilham, S.T., M.IT.
NIP 19731010 199802 1 001

Tembusan: 1. Dekan FT-UH
2. Ketua Departemen Teknik Elektro FT-UH

Data Beban Listrik Pulau Kapoposang

Nama : Iccang

Umur : 18 Tahun

Hobi : Badminton

Pekerjaan : Melaut

Nama Bangunan: Masjid/Musholla

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (Wh/hari)
Lampu 20 Watt	10	20	05.00, 12.00, 15.00, 18.00, 19.00	6	1200
Lampu 5 Watt	8	5	05.00, 12.00, 15.00, 18.00, 19.00	6	240
Kipas Angin	8	50	05.00, 12.00, 15.00, 18.00, 19.00	6	2400
Kipas Angin Gantung	6	40	05.00, 12.00, 15.00, 18.00, 19.00	6	1440
Sound Syster	1	250	05.00, 12.00, 15.00, 18.00, 19.00	6	1500
Speaker Aktif	1	120	05.00, 12.00, 15.00, 18.00, 19.00	6	720
Pompa Air	1	125	05.00, 12.00, 15.00, 18.00, 19.00	6	750

Data Beban Listrik Pulau Kapoposang

Nama : Iccang

Umur : 18 Tahun

Hobi : Badminton

Pekerjaan : Melaut

Nama Bangunan: Sekolah

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (Wh/hari)
Lampu 20 Watt	12	20	07.00 - 13.00	6	1440
Lampu 5 Watt	4	5	07.00 - 13.00	6	120
Komputer	2	300	07.00 - 13.00	6	3600
Kipas Angin Gantung	12	40	07.00 - 13.00	6	2880
Sound System	1	250	07.00 - 13.00	6	500
Pompa Air	1	125	07.00 - 13.00	6	750

Data Beban Listrik Pulau Kapoposang

Nama : Hasrul

Umur : 24

Hobi : Badminton

Pekerjaan : Melaut

Nama Bangunan: Rumah

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (kWh/hari)
Lampu	6	9	18.00 - 06.00	12	648
TV	1	50	18.00 - 20.00	2	100
Setrika	1	400	20.00	1	400
Pompa Air	1	125	06.00 & 18.00	2	250
Rice Cooker	1	400	06.00, 10.00, 18.00	1,5	600
Kipas Angin	2	50	14.00-16.00 & 23.00-02.00	5	500

Data Beban Listrik Pulau Kapoposang

Nama : Hasan

Umur : 29 Tahun

Hobi : Badminton

Pekerjaan : Melaut

Nama Bangunan: Rumah

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (Wh/hari)
Lampu	7	9	18.00 - 06.00	12	756
Setrika	1	400	21.00	1	400
Pompa Air	1	125	06.00 & 17.00	2	250
Rice Cooker	1	400	06.00, 11.00, 18.00	1,5	600
Mesin Cuci	1	400	07.00	1	400
Kipas Angin	3	50	14.00 - 17.00	3	450

Data Beban Listrik Pulau Kapoposang

Nama : Ahmad

Umur : 19 Tahun

Hobi : Main Game

Pekerjaan : Melaut

Nama Bangunan: ~~Bangunan~~ Rumah

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (kWh/hari)
Lampu	8	9	18.00 - 06.00	12	864
TV	1	50	09.00 - 13.00	4	200
Pompa Air	1	125	06.00 & 18.00	2	250
Setrika	1	400	20.00	1	400
Rice Cooker	1	400	06.00, 11.00, 18.00	1,5	600
Mesin Cuci	1	400	09.00	1	400
Kipas Angin	2	50	14.00 - 16.00	2	200

Data Beban Listrik Pulau Kapoposang

Nama : Sul

Umur : 14

Hobi : Badminton

Pekerjaan : Pelajar

Nama Bangunan: Rumah

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (Wh/hari)
Lampu	6	9	18.00 - 06.00	12	648
Pompa Air	1	125	06.00 & 18.00	2	250
Setrika	1	400	20.00	1	400
Rice Cooker	1	400	06.00, 11.00, 17.00	1,5	600
Kipas Angin	2	50	22.00 - 06.00	8	800

Data Beban Listrik Pulau Kapoposang

Nama : Iccang

Umur : 18 tahun

Hobi : Badminton

Pekerjaan : Melaut

Nama Bangunan: Rumah

Nama Peralatan	Jumlah (Unit)	Daya (Watt)	Waktu Pemakaian	Lama Pemakaian (Jam/hari)	Konsumsi Energi Listrik Harian (Wh/hari)
Lampu	10	9	18.00 - 06.00	12	1080
TV	1	50	09.00-13.00 dan 18.00-2200	8	400
Setrika	1	400	20.00	1	400
Pompa air	1	125	06.00 dan 18.00	2	250
Kulkas	1	80	-	-	-
Kipas Angin	3	50	4.00-16.00 dan 22.00-06.00	10	1500

Trojan BATTERY COMPANY

DATA SHEET

SOLAR
TRUE DEEP-CYCLE SIGNATURE

MODEL **SSIG 06 490**
VOLTAGE **6V**
CAPACITY **490Ah @ 100Hr**
MATERIAL **Polypropylene**
DIMENSIONS **Inches (mm)**
BATTERY **Deep-Cycle Flooded/Lead Acid Battery**
COLOR **Maroon**
WATERING **Single-Point Watering Kit (Optional)**

Polyon™ Case

PRODUCT + PHYSICAL SPECIFICATIONS

Model	Terminal Type [D]	Dimensions [B] Inches (mm)			Weight [E] Lbs. (kg)	HydroLink or SPWK	Handles
		Length	Width	Height [C]			
SSIG 06 490	5	11.66 (296)	6.94 (176)	17.55 (446)	125 (57)	SPWK	Braided Rope

ELECTRICAL SPECIFICATIONS

Voltage	Capacity [A] Amp-Hours (Ah)					Energy (kWh)
	10-Hr	20-Hr	48-Hr	72-Hr	100-Hr	100-Hr
6V	407	443	455	474	490	2.94

CHARGING INSTRUCTIONS

Charger Voltage Settings (at 77°F/25°C)				
System Voltage	6V	12V	24V	48V
Maximum Charge Current (% of C_{20} Rate)*	13%			
Maximum Absorption Phase Time (hours)	4			
Absorption Voltage **	7.35	14.70	29.40	58.80
Float Voltage	6.75	13.50	27.00	54.00
Equalization Voltage	8.10	16.20	32.40	64.80

Do not install or charge batteries in a sealed or non-ventilated compartment. Constant under or overcharging will damage the battery and shorten its life as with any battery.
*If charging time is limited contact Trojan Technical Support for assistance.
**In cases where controller has a bulk voltage setting, use absorption voltage setting above.

MADE IN USA · LONG CYCLE LIFE IEC 61427 · TRUE DEEP CYCLE · TROJAN SINCE 1925 QUALITY

Designed in compliance with applicable BCI, DIN, BS and IEC standards. Tested in compliance to BCI and IEC standards.

IEC · Battery Council International

TROJAN BATTERY COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001:2008 =

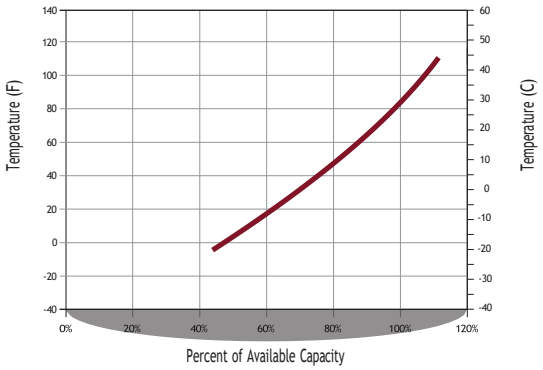
CHARGING TEMPERATURE COMPENSATION

Add	Subtract
0.005 volt per cell for every 1°C below 25°C 0.0028 volt per cell for every 1°F below 77°F	0.005 volt per cell for every 1°C above 25°C 0.0028 volt per cell for every 1°F above 77°F

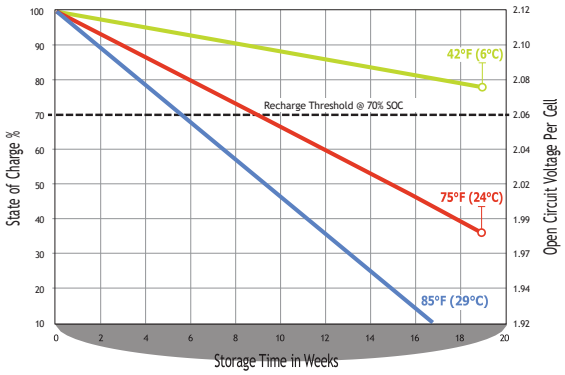
OPERATIONAL DATA

Operating Temperature	Self Discharge
-4°F to 113°F (-20°C to +45°C). At temperatures below 32°F (0°C) maintain a state of charge greater than 60%.	5 - 15% per month depending on storage temperature conditions.

PERCENT CAPACITY VS. TEMPERATURE



SELF DISCHARGE VS. TIME*



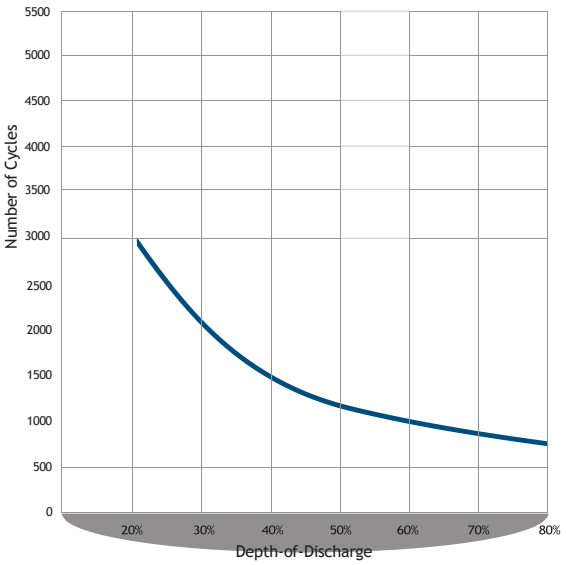
*PERIODIC CHARGE

FREQUENCY
Provide a periodic freshening charge to maintain a SOC greater than the threshold of 70%.

STATE OF CHARGE MEASURE OF OPEN-CIRCUIT VOLTAGE

Percentage Charge	Specific Gravity	Cell	6-Volt
100	1.277	2.122	6.37
90	1.258	2.103	6.31
80	1.238	2.083	6.25
70	1.217	2.062	6.19
60	1.195	2.040	6.12
50	1.172	2.017	6.05
40	1.148	1.993	5.98
30	1.124	1.969	5.91
20	1.098	1.943	5.83
10	1.073	1.918	5.75

DOD VS CYCLE LIFE IN A STATIONARY APPLICATION



Cat® C15 DIESEL GENERATOR SETS

Standby & Prime: 50Hz

Image shown might not reflect actual configuration

Engine Model	Cat® C15 ACERT™ In-line 6, 4-cycle diesel
Bore x Stroke	137mm x 171mm (5.4in x 6.8in)
Displacement	15.2 L (928 in^3)
Compression Ratio	16.1:1
Aspiration	Turbocharged Air-to-Air Aftercooled
Fuel Injection System	MEUI
Governor	Electronic ADEM™ A4

Model	Standby	Prime	Emission Strategy
DE550E0	550 kVA, 440 ekW	500 kVA, 400 ekW	Non-Certified Emissions

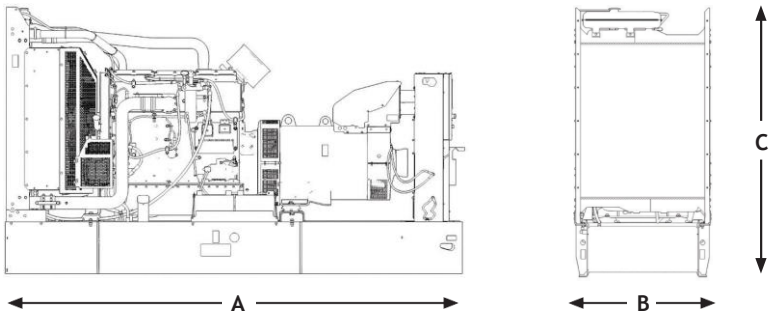
PACKAGE PERFORMANCE

Performance	Standby	Prime
Frequency	50 Hz	
Genset Power Rating	550 kVA	500 kVA
Genset power rating with fan @ 0.8 power factor	440 ekW	400 ekW
Emissions	Non-Certified Emissions	
Performance Number	DM8495	DM8494
Fuel Consumption		
100% load with fan, L/hr (gal/hr)	112.5 (29.7)	102.0 (26.9)
75% load with fan, L/hr (gal/hr)	84.1 (22.2)	76.2 (20.1)
50% load with fan, L/hr (gal/hr)	59.1 (15.6)	54.0 (14.3)
25% load with fan, L/hr (gal/hr)	35.6 (9.4)	32.7 (8.6)
Cooling System[1]		
Radiator air flow restriction (system), kPa (in. Water)	0.12 (0.48)	0.12 (0.48)
Radiator air flow, m^3/min (cfm)	476 (16810)	476 (16810)
Engine coolant capacity, L (gal)	20.8 (5.5)	20.8 (5.5)
Radiator coolant capacity, L (gal)	27 (7.1)	27 (7.1)
Total coolant capacity, L (gal)	47.8 (12.6)	47.8 (12.6)
Inlet Air		
Combustion air inlet flow rate, m^3/min (cfm)	29.9 (1056.8)	28.1 (992.2)
Max. Allowable Combustion Air Inlet Temp, °C (°F)	48 (118)	40 (105)
Exhaust System		
Exhaust stack gas temperature, °C (°F)	527.0 (980.5)	511.3 (952.4)
Exhaust gas flow rate, m^3/min (cfm)	86.0 (3037.7)	79.2 (2797.7)
Exhaust system backpressure (maximum allowable) kPa (in. water)	10.0 (40.0)	10.0 (40.0)
Heat Rejection		
Heat rejection to jacket water, kW (Btu/min)	166 (9441)	149 (8458)
Heat rejection to exhaust (total) kW (Btu/min)	398 (22635)	360 (20485)
Heat rejection to aftercooler, kW (Btu/min)	83 (4715)	75 (4272)
Heat rejection to atmosphere from engine, kW (Btu/min)	70 (3975)	46 (2605)

Emissions (Nominal)[2]	Standby	Prime
NOx, mg/Nm³ (g/hp-hr)	3689.6 (7.3)	3438.4 (6.8)
CO, mg/Nm³ (g/hp-hr)	168.2 (0.3)	170.2 (0.3)
HC, mg/Nm³ (g/hp-hr)	5.8 (0.0)	5.3 (0.0)
PM, mg/Nm³ (g/hp-hr)	7.0 (0.0)	7.9 (0.0)

Alternator[3]			
Voltages	**415V**	**400V**	**380V**
Motor starting capability @ 30% Voltage Dip	1391 skVA	1033 skVA	1165 skVA
Current	Standby: 765A, Prime: 626A	Standby: 794A, Prime: 722A	Standby: 830A, Prime: 722A
Frame Size	A2985L4	A2985L4	A2985L4
Excitation	SE	SE	SE
Temperature Rise	SB: 163˚C, PP: 125˚C	SB: 163˚C, PP: 125˚C	SB: 163˚C, PP: 125˚C

WEIGHTS & DIMENSIONS



Note: General configuration not to be used for installation. See general dimension drawings for detail.

Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Dry Weight kg (lb)
3830 (151)	**1130 (44)**	**2255 (89)**	**3700 (8157)**

APPLICABLE CODES AND STANDARDS:

AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2006/95/EC, 2006/42/EC, 2004/108/EC.
Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

PRIME: Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year

RATINGS: Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

DEFINITIONS AND CONDITIONS

[1] For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.

[2] Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77˚ F, 28.42 in HG and number 2 diesel fuel with 35˚ API and LHV of 18,390 BTU/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

[3] UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40˚ C ambient per NEMA MG1-32.

LET'S DO THE WORK.™

www.Cat.com/electricpower

LEHE1638-01 (05/20)

PWG2-50/100K-NA

PWG2-50/100K-EX

Sinexcel

Features

- Modular design and wide power range in single cabinet
- Bi-directional Power Conversion System
- Built-in transformer
- Grid-support functions
- Flexible configuration
- Support PV access

Supported Battery Types:

- Lithium-ion based battery
- Lead-carbon battery

Specification

Model	PWG2-50K-NA	PWG2-100K-NA	PWG2-50K-EX	PWG2-100K-EX
Utility-interactive Mode				
Battery voltage range	400V(250~520V)		400V(250~520V)	
Batter DC Max Current	150A	300A	150A	300A
PV Voltage Range	520~900V (MPPT 520V~800V)		520~900V (MPPT 520V~800V)	
PV DC. Max Current (in case of completely consumption)	192A	384A	192A	384A
AC voltage	480V(423V~528V)		400V(340V~460V)	
AC current	60A	120A	72A	144A
Nominal power	50kW	100kW	50kW	100kW
AC frequency	60Hz(59.5Hz~60.5Hz)		50/60Hz(±2.5Hz)	
Output THDI	≤3%	≤3%	≤3%	≤3%
AC PF	Listed: 0.8~1 leading or lagging (Controllable)		Listed: 0.8~1 leading or lagging (Controllable)	
	Actual: 0.1~1 leading or lagging (Controllable)		Actual: 0.1~1 leading or lagging (Controllable)	

Stand-alone Mode				
Battery voltage range	250~520V		250~520V	
Battery DC Max Current	150A	300A	150A	300A
PV Voltage Range	520~900V (MPPT 520V~800V)		520~900V (MPPT 520V~800V)	
PV DC. Max Current (in case of completely consumption)	192A	384A	192A	384A
AC output voltage	480V(±10% configurable)		400V(±10% configurable)	
AC output current	60A(Max 66A)	120A(Max 132A)	72A(Max 79A)	144A(Max 159A)
Nominal AC output power	50kW	100kW	50kW	100kW
AC Max Power	55kW	110kW	55kW	110kW
Output THDu	≤2%	≤2%	≤2%	≤2%
AC frequency	60Hz		50/60Hz	
AC PF	Listed: 0.8~1 leading or lagging (Load-depend)		Listed: 0.8~1 leading or lagging (Load-depend)	
	Actual: 0.1~1 leading or lagging (Load-depend)		Actual: 0.1~1 leading or lagging (Load-depend)	
Overload Capability	105%~115% 10min;		105%~115% 10min;	
	115%~125% 1min;		115%~125% 1min;	
	125%~150% 200ms		125%~150% 200ms	
Physical				
Cooling	Forced air cooling		Forced air cooling	
Noise	70dB		70dB	
Enclosure	NEMA / IP20		IP20	
Max elevation	3000m/10000feet (> 2000m/6500feet derating)		3000m/10000feet (> 2000m/6500feet derating)	
Operating temp.	-20°C to 50°C (De-rating over 45°C）		-20°C to 50°C (De-rating over 45°C）	
Humidity	0~95% (No condensing)		0~95% (No condensing)	
Size (W*H*D)	800*2160*800mm		800*2160*800mm	
	31.5*85*31.5 inches		31.5*85*31.5 inches	
Weight	520kg	750kg	520kg	750kg
Installation	Floor standing		Floor standing	
Other				
Peak efficiency	95.50%	95.50%	95.50%	95.50%
CEC efficiency	-	-	-	-
Protection	OTP, AC OVP/UVP, OFP/UFP, EPO, AC Phase Reverse,		OTP, AC OVP/UVP, OFP/UFP, EPO, AC Phase Reverse,	

NEW

CanadianSolar

MAXPOWER (1500 V)
CS6U-325|330|335|340M

Canadian Solar's new 1500 V module is a product for high voltage systems, which can increase the string length of solar systems by up to 50%, saving BOS costs.

25 years linear power output warranty

10 years product warranty on materials and workmanship

KEY FEATURES

- 1500 V — Designed for high voltage systems of up to 1500 V_{DC}, saving on BoS costs
- Cell efficiency of up to 20.0 %
- Outstanding low irradiance performance: 96.5 %
- No.1 PTC — High PTC rating of up to 91.7 %
- IP67 — IP67 junction box for long-term weather endurance
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa

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
UL 1703 / IEC 61215 performance: CEC listed (US)
UL 1703: CSA / IEC 61701 ED2: VDE / IEC 62716: VDE / Take-e-way

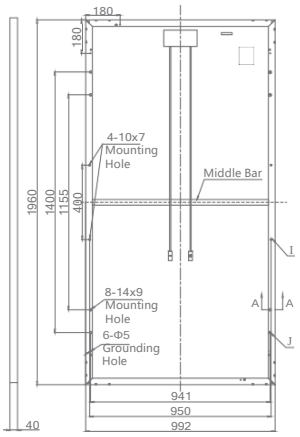
* As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

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 15 GW deployed around the world since 2001, Canadian Solar Inc. (NASDAQ: CSIQ) is one of the most bankable solar companies worldwide.

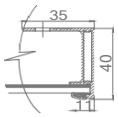
CANADIAN SOLAR INC.
545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada, www.canadiansolar.com, support@canadiansolar.com

ENGINEERING DRAWING (mm)

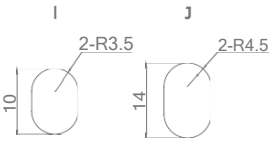
Rear View



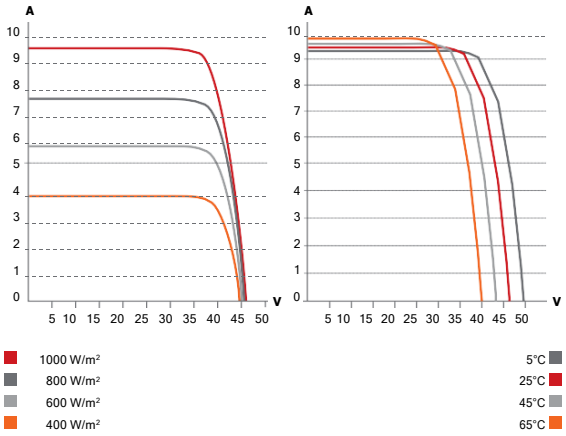
Frame Cross Section A-A



Mounting Hole



CS6U-335M / I-V CURVES



ELECTRICAL DATA | STC*

CS6U	325M	330M	335M	340M
Nominal Max. Power (Pmax)	325 W	330 W	335 W	340 W
Opt. Operating Voltage (Vmp)	37.4 V	37.5 V	37.8 V	37.9 V
Opt. Operating Current (Imp)	8.69 A	8.80 A	8.87 A	8.97 A
Open Circuit Voltage (Voc)	45.8 V	45.9 V	46.1 V	46.2 V
Short Circuit Current (Isc)	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	1500 V (IEC) or 1500 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.

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	PV1500DC-F1 4 mm2 (IEC) & 12 AWG 2000 V (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

ELECTRICAL DATA | NOCT*

CS6U	325M	330M	335M	340M
Nominal Max. Power (Pmax)	235 W	238 W	242 W	245 W
Opt. Operating Voltage (Vmp)	34.1 V	34.2 V	34.5 V	34.6 V
Opt. Operating Current (Imp)	6.88 A	6.96 A	7.01 A	7.10 A
Open Circuit Voltage (Voc)	42.0 V	42.1 V	42.3 V	42.4 V
Short Circuit Current (Isc)	7.46 A	7.54 A	7.62 A	7.67 A

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

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.41 % / °C
Temperature Coefficient (Voc)	-0.31 % / °C
Temperature Coefficient (Isc)	0.053 % / °C
Nominal Operating Cell Temperature	45±2 °C

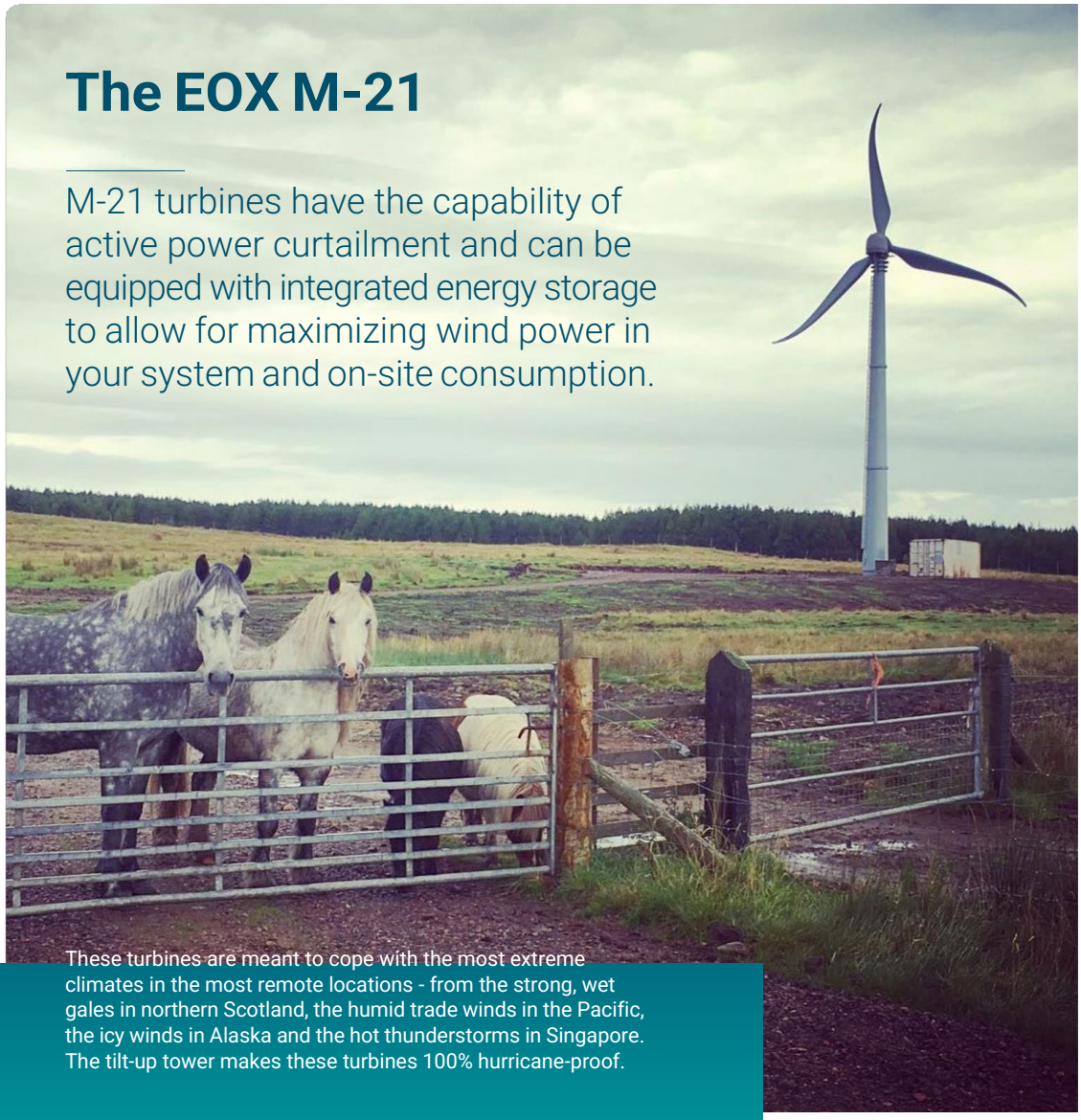
PERFORMANCE AT LOW IRRADIANCE

Outstanding performance at low irradiance, average relative efficiency of 96.5 % from an irradiance of 1000 W/m² to 200 W/m² (AM 1.5, 25°C).

PARTNER SECTION

The EOX M-21

M-21 turbines have the capability of active power curtailment and can be equipped with integrated energy storage to allow for maximizing wind power in your system and on-site consumption.



These turbines are meant to cope with the most extreme climates in the most remote locations - from the strong, wet gales in northern Scotland, the humid trade winds in the Pacific, the icy winds in Alaska and the hot thunderstorms in Singapore. The tilt-up tower makes these turbines 100% hurricane-proof.

	CHARACTERISTIC	SPECIFICATION
Main Data	Model	EOX M-21
	Design class	IEC Class IA wind turbine
	Design life	30 years without major component replacement
	Rated power	100kW
	Rated wind speed	Average annual wind speed: 10m/s (36 km/h) (22 mph)
	Cut-in | Cut-out wind speed	2.75 m/s (9.9 km/h) (6 mph) | 20 m/s (72 km/h) (45 mph)
	Extreme wind speed	70m/s (252 km/h) (157 mph), 3-second average
	Operating temperature	-20 °C to 40 °C (-4 °F to 104 °F)
	Lightning protection	Lightning rod, surge protection devices, grounding system
Rotor	Rotor diameter	21m (69 ft)
	Swept area	346.4m² (3727 ft²)
	Rotor speed	Variable, up to 57 rpm
Generator	Type	PM Generator
	Model	3-phase
	Generator	100 kW, 400 V, 42.4 Hz, 1.25 service factor
	Drivetrain	Direct drive (no gearbox)
	Generator enclosure and insulation	Totally enclosed, weather-proof, class F insulation, IP55, maintenance free
Power Converter	Type	Grid-tied / utility-interactive
	Converter output	3-phase, 380 V to 500 V, 50/60 Hz, 144A, Power Factor 0.99
Control System	Controller model	Siemens PLC
	Advanced features	Data logging and direct integration with safety system
	SCADA/Monitoring system	EOX SCADA, web and mobile application
	Control strategy	Maintenance free active stall-regulated
	Weather sensors	Wind speed, wind direction, temperature
Yaw System	Type	Electric auto-yaw
Materials	Steel components	High quality, as per ASTM standards
	Corrosion protection	Hot-dip galvanized or zinc-coated, as per ASTM standards
Braking System	Normal operation	Combination: 1) generator 2) stall blade design 3) yaw-assist
	Emergency rotor brake	Fail-safe hydraulic disk brake
Blade	Model	Eocycle
	Design	Fixed-pitch (no moving parts)
	Length	10 m (33 ft)
	Tower - hub height	22m (105 ft) free-standing and tilt-up
	[illegible]aint	

AVERAGE WIND SPEED (M/S)	GROSS OUTPUT (MWH/YEAR)	AVERAGE WIND SPEED (M/S)	GROSS OUTPUT (MWH/YEAR)
4.5	120.5	7.0	332.0
5.0	161.1	7.5	369.9
5.5	204.2	8.0	404.2
6.0	248.0	8.5	434.2
6.5	291.0	9.0	459.8

Note: Measured and certified per IEC 61400-12 standard.