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LAMPIRAN

Lampiran 1. Dokumentasi Data Beban Listrik

18.00

18.30

19.00

19.30

20.00

20.30

21.00

21.30

22.00

22.30

23.00

23.30

04.30

05.00

05.30

06.00

Lampiran 2. Spesifikasi/Datasheet Komponen

***Nameplate* Cummins VG300-C/W**

WINSTON®

SERIAL NUMBER	VG22104021	DUTY	CONTINUOUS(S1)
FRAME/CORE	W-444D	EXCITATION VOLTAGE	50
BASE RETING kVA	300 (BR)	EXCITATION CURRENT	2.2
BASE RATING kW	240	INSULATION CLASS	CLASS H
AMPERES BR	456	AMBIENT TEMPERATURE	40°C
FREQUENCY	50 HERTZ	TEMPERATURE RISE	125K
RPM	1500	THERMAL CLASSIFICATION	180 (H)
VOLTAGE	380	ENCLOSURE	IP23
PHASE	3	STATOR WINDING	311
PF	0.80	STATOR CONNECTION	SERIES STAR

BS 5000,PART3 IEC 34-1 ISP8528-3
NEMA MG1-32 BS EN 60034-1

C220 D5e (QSB7G5)

Model: C220 D5e (QSB7G5)
Frequency: 50
Fuel Type: Diesel

» Generator set data sheet

Power Generation

Our energy working for you.™

Spec sheet:	SS22-CPGK
Noise data sheet (Open/enclosed):	ND50-OS550 / ND50-CS550
Airflow data sheet:	AF50-550
Derate data sheet (Open/enclosed):	DD50-OS550 / DD50-CS550
Transient data sheet:	TD50-550

Fuel consumption	Standby				Prime			
	kVA (kW)				kVA (kW)			
Ratings	220 (176)				200 (160)			
Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
gph	3.6	6.4	8.7	10.7	3.3	6.0	8.1	10.0
L/hr	16.40	29.29	39.38	48.83	15.15	27.51	36.78	45.60

Engine	Standby rating	Prime rating
Engine manufacturer	Cummins	
Engine model	QSB7G5	
Configuration	4 Cycle; In-line; 6 Cylinder Diesel	
Aspiration	Turbo Charged and Charge Air Cooled	
Gross engine power output, kWm	213	182
BMEP at set rated load, kPa	2537	2172
Bore, mm	107	
Stroke, mm	124	
Rated speed, rpm	1500	
Piston speed, m/s	6.2	
Compression ratio	17.3:1	
Lube oil capacity, L	15.1-17.4	
Overspeed limit, rpm	1500+15%	
Regenerative power, kW	14	
Governor type	Electronic	
Starting voltage	12V Volts DC	

Fuel flow	
Maximum fuel flow, L/hr	106
Maximum fuel inlet restriction, mm Hg	127-254
Maximum fuel inlet temperature (°C)	71

Air		
Combustion air, m^3/min	12.72	12.30
Maximum air cleaner restriction, kPa	3.7-6.2	

Power Generation

Exhaust

	Standby rating	Prime rating
Exhaust gas flow at set rated load, m^3/min	35.82	34.14
Exhaust gas temperature, °C	561	544
Maximum exhaust back pressure, kPa	10.2	

Standard set-mounted radiator cooling

Ambient design, °C	50	
Fan load, KW_m	6.8	
Coolant capacity (with radiator), L	30.2	
Cooling system air flow, m3/sec @ 12.7mmH2O	5.91	
Total heat rejection, BTU/min	6516	5825
Maximum cooling air flow static restriction mmH2O	8.12	

Open set derating factors kVA (kW)

Note: Standard open genset options running at 400V, 150m above sea level. For enclosed product derates, please refer to datasheet - DD50-CS550.

	27°C	40°C	45°C	50°C	55°C
Standby	220 (176)	212 (169.6)	205.6 (164.5)	199.3 (159.4)	192.9 (154.3)
Prime	200 (160)	192.8 (154.2)	187 (149.6)	181.1 (144.9)	174 (139.2)

Weights*

	Open	Enclosed
Unit dry weight kgs	1544	2698
Unit wet weight kgs	1670	3301

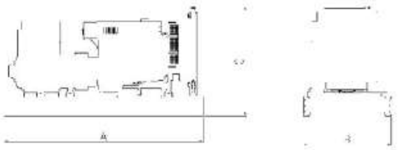
* Weights represent a set with standard features. See outline drawing for weights of other configurations

Dimensions

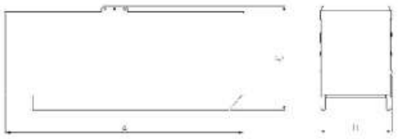
	Length	Width	Height
Standard open set dimensions	2656	1100	1658
Enclosed set standard dimensions	3900	1100	2246

Genset outline

Open set



Enclosed set



Outlines are for illustrative purposes only. Please refer to the genset outline drawing for an exact representation of this model.

Power Generation

Alternator data

Feature code	Connection[1]	Temp rise degrees C	Duty[2]	Alternator	Voltage
B681-2	Wye, 3 Phase	163/125	S/P	UCI274H	380-415V
B726-3	Wye, 3 Phase	125/105	S/P	UCI274J	380-440V
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

Ratings definitions

Emergency Standby Power (ESP)	Limited-Time running Power (LTP):	Prime Power (PRP)	Base Load (Continuous) Power (COP)
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Formulas for calculating full load currents:

Three phase output

$$\frac{kW x 1000}{Voltage x 1.73 x 0.8}$$

Single phase output

$$\frac{kW x SinglePhaseFactor x 1000}{Voltage}$$

See your distributor for more information.

Cummins Power Generation
Manston Park, Columbus Avenue
Manston, Ramsgate
Kent CT12 5BF, UK
Telephone: +44 (0) 1843 255000
Fax: +44 (0) 1843 255902
E-Mail: cpg.uk@cummins.com
Web: www.cumminspower.com

Power Generation

CanadianSolar CS6X-325P

CanadianSolar

MAXPOWER
CS6X-310|315|320|325 P

The high quality and reliability of Canadian Solar's modules is 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 16.94 %
- Outstanding low irradiance performance: 96.0 %
- No. 1 PTC — High PTC rating of up to 91.97%
- IP67 junction box for long-term weather endurance
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa

25 years linear power output warranty

10 years product warranty on materials and workmanship

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2008 / Quality management system
ISO/TS 16949:2009 / The automotive industry quality management system
ISO 14001:2004 / Standards for environmental management system
OHSAS 18001:2007 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

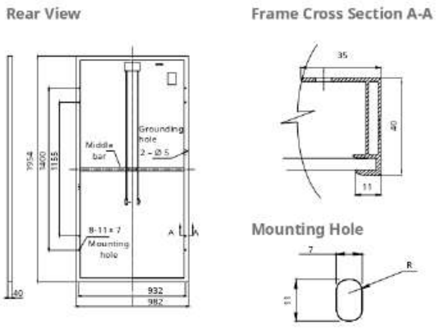
IEC 61215 / IEC 61730: TÜV-Rheinland / VDE / KEMCO / MCS / CE / CEC AU / INMETRO
UL 1703 / IEC 61215 performance: CEC listed (US)
UL 1703: CSA / IEC 61701 ED2: VDE / IEC 62716: VDE / IEC 60068-2-68: SGS
Take-e-way / UNI 9177 Reaction to Fire: Class 1

* 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.

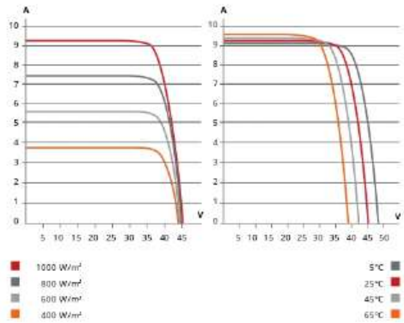
CANADIAN SOLAR INC. is committed to providing high quality solar products, solar system solutions and services to customers around the world. As a leading PV project developer and manufacturer of solar modules with over 15 GW deployed around the world since 2001, Canadian Solar Inc. (NASDAQ: CSIQ) is 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)



CS6X-320P / I-V CURVES



ELECTRICAL DATA | STC*

CS6X	310P	315P	320P	325P
Nominal Max. Power (Pmax)	310 W	315 W	320 W	325 W
Opt. Operating Voltage (Vmp)	36.4 V	36.6 V	36.8 V	37.0 V
Opt. Operating Current (Imp)	8.52 A	8.61 A	8.69 A	8.78 A
Open Circuit Voltage (Voc)	44.9 V	45.1 V	45.3 V	45.5 V
Short Circuit Current (Isc)	9.08 A	9.18 A	9.26 A	9.34 A
Module Efficiency	16.16%	16.42%	16.68%	16.94%
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.

MECHANICAL DATA

Specification	Data
Cell Type	Poly-crystalline, 6 inch
Cell Arrangement	72 (6 × 12)
Dimensions	1954 × 982 × 40 mm (76.9 × 38.7 × 1.57 in)
Weight	22 kg (48.5 lbs)
Front Cover	3.2 mm tempered glass
Frame Material	Anodized aluminium alloy
J-Box	IP67, 3 diodes
Cable	4 mm² (IEC) or 4 mm² & 12 AWG 1000V (UL), 1150 mm
Connector	T4-1000V or PV2 series
Per Pallet	26 pieces, 620 kg (1366.9 lbs)
Per Container (40' HQ)	624 pieces

ELECTRICAL DATA | NOCT*

CS6X	310P	315P	320P	325P
Nominal Max. Power (Pmax)	225 W	228 W	232 W	236 W
Opt. Operating Voltage (Vmp)	33.2 V	33.4 V	33.6 V	33.7 V
Opt. Operating Current (Imp)	6.77 A	6.84 A	6.91 A	6.98 A
Open Circuit Voltage (Voc)	41.3 V	41.5 V	41.6 V	41.8 V
Short Circuit Current (Isc)	7.36 A	7.44 A	7.50 A	7.57 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
Temp. Coefficient (Pmax)	-0.41 % / °C
Temp. Coefficient (Voc)	-0.31 % / °C
Temp. 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 96.0 % from an irradiance of 1000 W/m² to 200 W/m² (AM 1.5, 25°C).

PARTNER SECTION

The specification and key features described in this datasheet may deviate slightly and are not guaranteed. Due to on-going innovation, research and product enhancement, Canadian Solar Inc. reserves the right to make any adjustment to the information described herein at any time without notice. Please always obtain the most recent version of the datasheet which shall be duly incorporated into the binding contract made by the parties governing all transactions related to the purchase and sale of the products described herein.

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

Scan this QR-code to discover solar projects built with this module

Trojan SSIG 12 255

TROJAN
BATTERY COMPANY

DATA SHEET

SOLAR SSIG 12 255

MODEL **SSIG 12 255**
VOLTAGE **12**
CAPACITY **255Ah @ 100Hr**
MATERIAL **Polypropylene**
BATTERY **Deep-Cycle Flooded/Advanced Lead Acid Battery**
COLOR **Maroon**
WATERING **Single-Point Watering Kit (Optional)**

MADE IN THE USA

WITH T2 TECHNOLOGY

"Polyon"™ Case

12 VOLT

PHYSICAL SPECIFICATIONS

MODEL NAME	TERMINAL TYPE[B]	DIMENSIONS[D] INCHES (mm)			WEIGHT[E] LBS. (kg)	HYDROLINK OR SPWK	HANDLES
		LENGTH	WIDTH	HEIGHT[C]			
SSIG 12 255*	6	14.97 (380)	6.91 (176)	14.67 (373)	123 (56)	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
12	211	229	237	247	255	3.06

CHARGING INSTRUCTIONS

CHARGER VOLTAGE SETTINGS (AT 77°F/25°C)			
SYSTEM VOLTAGE	12V	24V	48V
Maximum Charge Current (% of C_{20} Rate)*		13%	
Maximum Absorption Phase Time (hours)		4	
Absorption Voltage **	14.70	29.40	58.80
Float Voltage	13.50	27.00	54.00
Equalization Voltage	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.

RECYCLE RESPONSIBLY

99% RECYCLABLE

12V Flooded

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

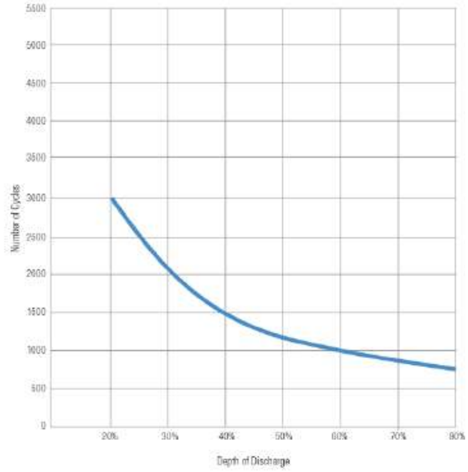
OPERATIONAL DATA

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.

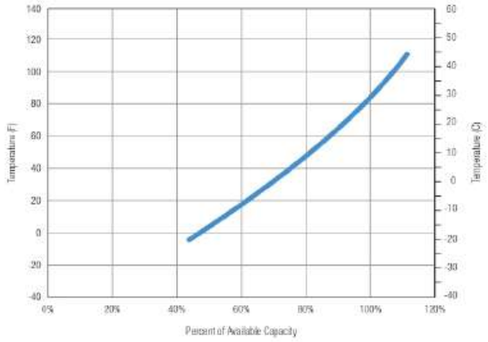
STATE OF CHARGE MEASURE OF OPEN-CIRCUIT VOLTAGE

PERCENTAGE CHARGE	SPECIFIC GRAVITY	CELL	12 VOLT
100	1.277	2.122	12.73
90	1.258	2.103	12.62
80	1.238	2.083	12.50
70	1.217	2.062	12.37
60	1.195	2.040	12.24
50	1.172	2.017	12.10
40	1.148	1.993	11.96
30	1.124	1.969	11.81
20	1.098	1.943	11.66
10	1.073	1.918	11.51

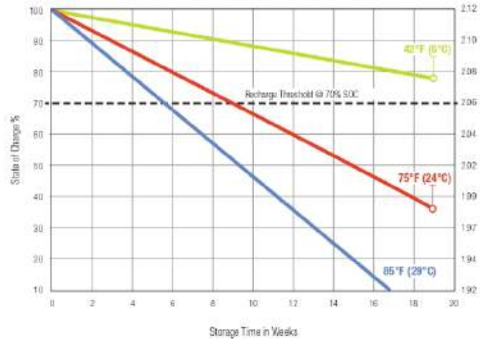
DOD VS CYCLE LIFE IN A STATIONARY APPLICATION



PERCENT CAPACITY VS. TEMPERATURE



SELF DISCHARGE VS. TIME*



EXPECTED LIFE VS. TEMPERATURE

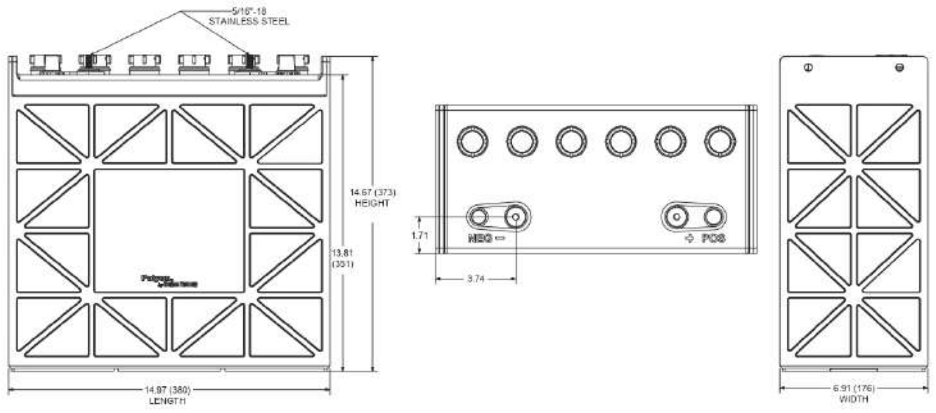
Chemical reactions internal to the battery are driven by voltage and temperature. The higher the battery temperature, the faster chemical reactions will occur. While higher temperatures can provide improved discharge performance the increased rate of chemical reactions will result in a corresponding loss of battery life. As a rule of thumb, for every 10°C increase in temperature the reaction rate doubles. Thus, a month of operation at 35°C is equivalent in battery life to two months at 25°C. Heat is an enemy of all lead acid batteries, FLA, AGM and gel alike and even small increases in temperature will have a major influence on battery life.

*PERIODIC CHARGE

FREQUENCY

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

BATTERY DIMENSIONS (shown with DT)



TERMINAL CONFIGURATIONS[D]

6	DT	AUTOMOTIVE POST & STUD TERMINAL
		**Terminal Height Inches (mm)** 0.79 (20) **Torque Values: in-lb (Nm)** Stud: 95 –105 (11 – 12) / AP: 50 – 70 (6 – 8) **Bolt Size** 5/16" – 18

A. The amount of amp-hours (Ah) a battery can deliver when discharged at a constant rate at 86°F (30°C) for all rates and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.
B. Dimensions may vary depending on type of handle or terminal. Batteries should be mounted with 0.5 inches (12.7 mm) spacing minimum.
C. Height taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.
D. Terminal images are representative only.
E. Weight may vary.

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

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ABB MGS100

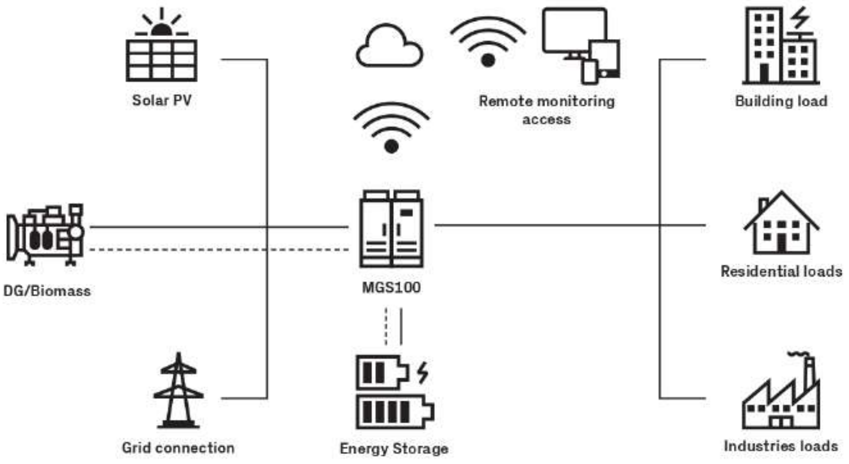
FIMER

Migrogrid solutions MGS100

MGS100 brings together all of the components required for a sustainable microgrid in a single device. Drawing on FIMER's electrical design experience, the product is optimized to provide reliable power in the most efficient way.

The system is formed from an integrated solar PV and battery energy storage converter with an additional AC input. This can incorporate either biofuel or diesel generation, or even an existing grid connection, into the microgrid's energy mix.

MGS100 product diagram



Technical data and types

Model/Rating	MGS100-20/20	MGS100-40/27.6	MGS100-60/50
General Data			
Nominal load power	20 kW	40 kW	60 kW
Max. recommended PV input power	24 kW	32 kW	53 kW
Max. rated PV output power	20 kW	27.6 kW	50 kW
Max. battery charging power	12 kW	24 kW	48 kW
Max. input battery capacity @ C10 charging	138 kW	276 kWh	552 kWh
PV input			
MPPT operating range	440 – 800 V	500 - 800 V	480 - 800 V
Max. PV input DC voltage		1000 V	
No. of independent MPPT	2	2	3
No. of DC input pairs/MPPT	4	5	5
PV input current protection for each input		Yes, DC Fuses, 15 A	
PV input over voltage protection		Yes, Type II	
AC input			
Nominal input voltage		3 × 380/220 V + N 3 × 400/230 V + N 3 × 415/240 V + N	
Voltage tolerance		±15%	
Input frequency		50 / 60 Hz	
Frequency tolerance (Generator operation)		-30% / +40%	
Frequency tolerance (Grid export)		±5%	
Maximum input current	36 A	71 A	108 A
AC input current protection		Yes, MCCB	
Rated short-time withstand current (Icw)		10kA for 1.5 seconds	

Technical data and types

Model/Rating	MGS100-20/20	MGS100-40/27.6	MGS100-60/50
Output			
Nominal rated output voltage		3 x 380/220 V + N 3 x 400/230 V + N 3 x 415/240 V + N	
Output frequency		50 / 60 Hz	
Output rated current (In)	29 A	58 A	87 A
Output short capability on generator (RMS) for 100ms		2.7 x In A	
Output short term overload capability on grid (RMS) for 20ms		10 x In A	
Permissible unbalanced load (□-□)		100%	
Output protection		Yes, MCCB	
Transfer time from Generator←→Battery←→Grid		<5 ms	
Battery			
Nominal battery voltage		504 to 576 V DC	
Battery type		VRLA, Ni-Cd, Li-Ion	
Maximum charging current	24 A	48 A	96 A
Battery protection		Yes, MCB	
Efficiency			
Max. PV to load		>98%	
Max. grid to load		>99%	
Max. generator to load		>95%	
Max. PV to battery		>94%	
Max. grid to battery		>95%	
Environmental			
Humidity (Non-condensing)		<95%	
Ambient temperature		-5 to 45 °C without derating	
Max. Ambient temperature		50 °C	
Temperature derating	-5%/°C after 45 °C	-5%/°C after 45 °C	N.A.
Altitude		1000 m	
Altitude derating		-5%/1000m	
Audible noise at 1 m from front, 100% load		< 70 dB	
Electrical/Mechanical			
Degree of protection		IP31	
Cable entry		Bottom	
Color		RAL 7035	
User interface & remote monitoring			
Graphical touchscreen HMI		Graphical touchscreen display for control & monitoring (Optional)	
Remote monitoring hardware with Web based Remote monitoring solution		Yes (Optional) with GSM/Ethernet adapter	
Communication Protocol for external SCADA integration		MODBUS (Others on request)	
Weight, dimensions			
Weight – Unpacked	620 kg	640 kg	745 kg
Cabinet Dimensions W x H x D (mm)	1500 x 1800 x 800	1500 x 1800 x 800	1200 x 1800 x 800
Separate solar section dimensions W x H x D (mm)	N.A.	N.A.	1491 x 725 x 315

Customized Models Specification

Rating	MGS100-120/100	MGS100-80/100	MGS100-80/77.6
General Data			
Nominal load power	120 kW	80 kW	80 kW
Max. recommended PV input power	105 kWp	105 kWp	85 kWp
Max. battery charging power	72 kW	48 kW	48 kW
PV Input			
MPPT operating range	480 – 800 V		
Max. PV input DC voltage	1000 V		
No. of independent MPPT	6	6	5
No. of DC input pairs/MPPT	5	5	4
PV input current protection	Yes, DC Fuses		
PV input voltage protection	Yes		
AC Input			
Nominal input voltage	3 x 400/230 V + N		
Voltage tolerance	±15%		
Input frequency	50 / 60 Hz		
Frequency tolerance (normal operation)	-30% / +40%		
Frequency tolerance (grid export)	±5%		
Maximum input current	213 A	142 A	142 A
AC input current protection	Yes, MCCB		
Output			
Nominal output voltage	3 x 400/230 V		
Output rated current (In)	174 A	116 A	116 A
Output frequency	50 / 60 Hz		
Overload capability	150% load for 60 sec.		
Short term overload (RMS)	2.7xIn for 100ms		
Permissible unbalanced load	100%		
Output protection	Yes, MCCB		
No. of output breakers	1		
Battery			
Nominal battery voltage	504 to 576 V DC		
Battery type	VRLA, Ni-Cd, Li-ion		
Maximum charging current	144 A	96 A	96 A
Environmental			
Humidity	<95% (Non-condensing)		
Ambient temperature (Without derating)	-5 to 45 °C		
Temperature derating	-5%/°C after 45 °C		
Max. Ambient temperature	50 °C		
Altitude	1000 m		
Altitude derating	-5%/1000 m		
Electrical/Mechanical			
Degree of protection	IP31		
Cable entry	Bottom		
User interface & remote monitoring			
HMI	Graphical display for control & monotoring (optional)		
Local & remote monitoring	Yes (Optional)		
Communication Protocol	MODBUS		
Weight, dimensions			
Weight – Unpacked	990 kg	845 kg	845 kg
Cabinet Dimensions W x H x D (mm)	1600 x 1800 x 800	1200 x 1800 x 800	1200 x 1800 x 800
Separate solar section dimensions W x H x D (mm)	1086 x 869 x 419	1086 x 869 x 419	1491 x 725 x 315 702 x 1061 x 292

FIMER

For more information please contact your local FIMER representative or visit:

fimer.com

MGS100_EN REV. A 19-03.2020

Lampiran 3. Data Hasil Simulasi

Konfigurasi-1

HOMER Pro

System Simulation Report

File: konfigurasi-1.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$1,124,821.00

Levelized Cost of Energy (US$/kWh): US$0.280

Notes: Genset 240 kW & 160 kW beban eksisting

HOMER Pro

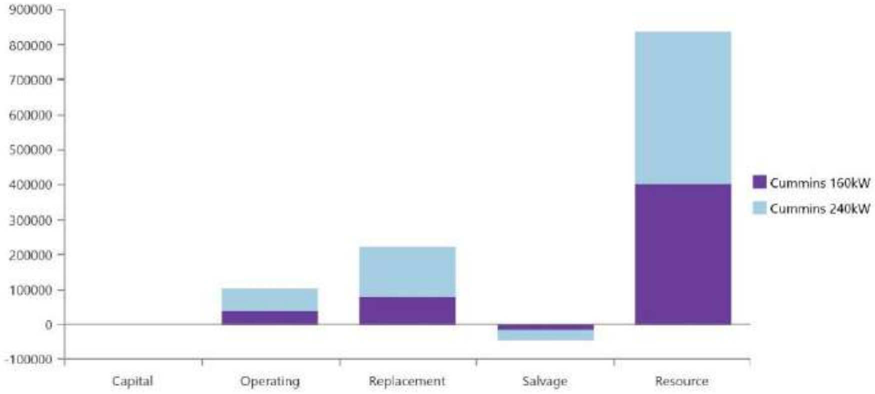
System Architecture

Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
Dispatch strategy	HOMER Cycle Charging		

Schematic

HOMER Pro

Cost Summary



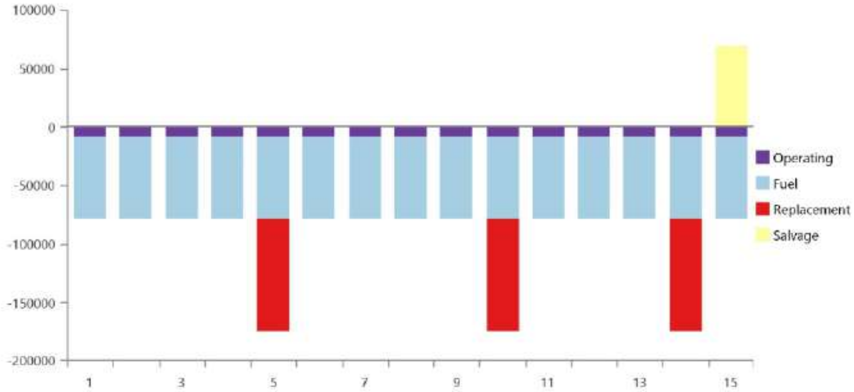
Net Present Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
Cummins 160kW	US$0.00	US$42,249	US$85,107	-US$17,093	US$404,200	US$514,463
Cummins 240kW	US$0.00	US$63,374	US$138,783	-US$27,874	US$436,075	US$610,358
System	US$0.00	US$105,623	US$223,889	-US$44,967	US$840,276	US$1.12M

Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
Cummins 160kW	US$0.00	US$3,504	US$7,058	-US$1,418	US$33,523	US$42,668
Cummins 240kW	US$0.00	US$5,256	US$11,510	-US$2,312	US$36,167	US$50,621
System	US$0.00	US$8,760	US$18,569	-US$3,729	US$69,690	US$93,289

Cash Flow



100000
50000
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1
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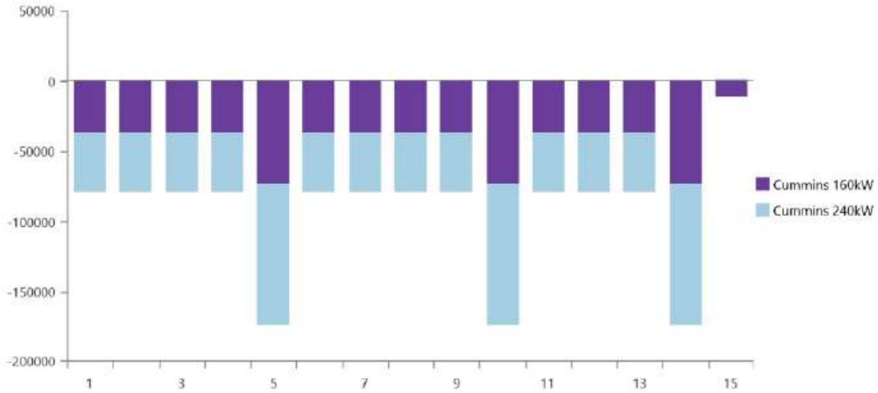
11
13
15
Operating
Fuel
Replacement
Salvage



50000
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-100000
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-200000
1
3
5
7
9
11
13
15
Cummins 160kW
Cummins 240kW

HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	193,474	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Cummins 240kW	315,719	59.9
Cummins 160kW	211,000	40.1
Total	526,719	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	333,245	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	333,245	100

Konfigurasi-2

HOMER Pro

System Simulation Report

File: konfigurasi-2.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$904,737.70

Levelized Cost of Energy (US$/kWh): US$0.225

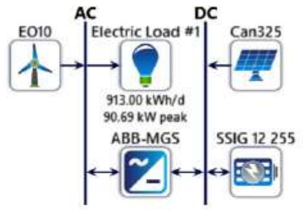
Notes: PV & Turbin Angin beban eksisting

HOMER Pro

System Architecture

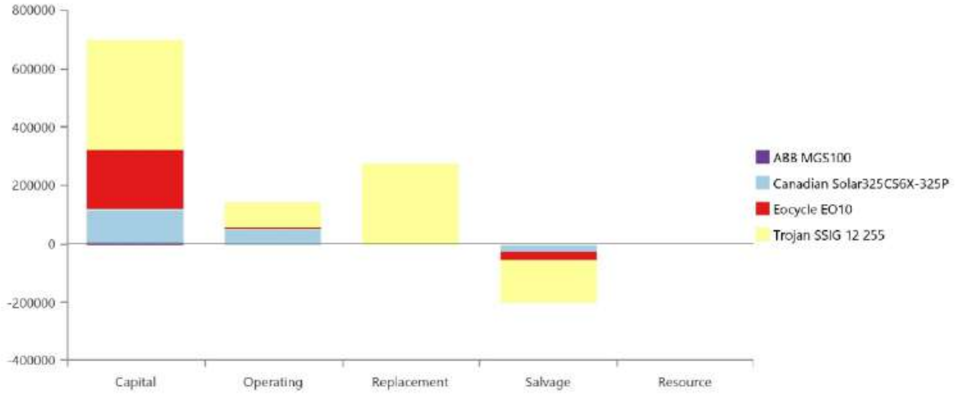
Component	Name	Size	Unit
PV	Canadian Solar325CS6X-325P	190	kW
Storage	Trojan SSIG 12 255	44	strings
Wind turbine	Eocycle EO10	7	ea.
System converter	ABB MGS100	85.7	kW
Dispatch strategy	HOMER Cycle Charging		

Schematic



HOMER Pro

Cost Summary



Net Present Costs

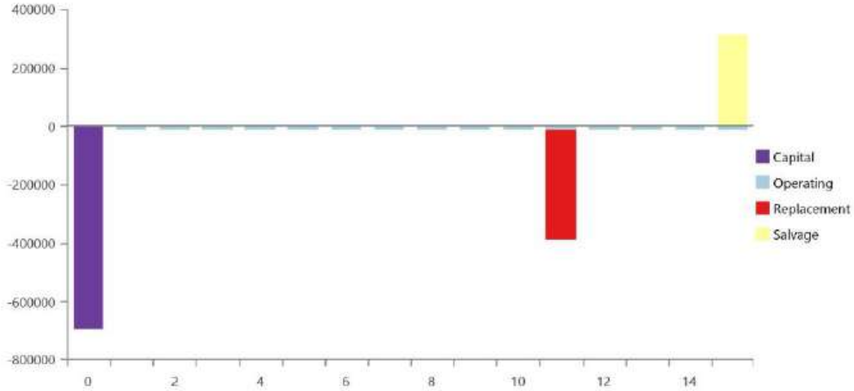
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$8,956	US$103.30	US$0.00	US$0.00	US$0.00	US$9,060
Canadian Solar325CS6X-325P	US$107,917	US$49,234	US$0.00	-US$28,267	US$0.00	US$128,884
Eocycle EO10	US$203,000	US$4,220	US$0.00	-US$28,649	US$0.00	US$178,571
Trojan SSIG 12 255	US$374,176	US$84,884	US$276,461	-US$147,297	US$0.00	US$588,223
System	US$694,049	US$138,442	US$276,461	-US$204,213	US$0.00	US$904,738

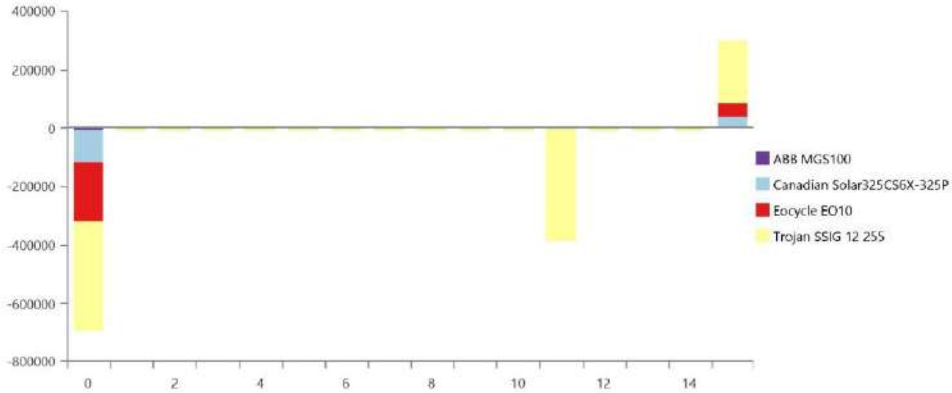
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$742.80	US$8.57	US$0.00	US$0.00	US$0.00	US$751.37
Canadian Solar325CS6X-325P	US$8,950	US$4,083	US$0.00	-US$2,344	US$0.00	US$10,689
Eocycle EO10	US$16,836	US$350.00	US$0.00	-US$2,376	US$0.00	US$14,810
Trojan SSIG 12 255	US$31,033	US$7,040	US$22,929	-US$12,216	US$0.00	US$48,785
System	US$57,562	US$11,482	US$22,929	-US$16,937	US$0.00	US$75,036

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	185,508	kWh/yr
Unmet Electric Load	223	kWh/yr
Capacity Shortage	317	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Canadian Solar325CS6X-325P	318,581	56.6
Eocycle EO10	244,318	43.4
Total	562,898	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	333,022	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	333,022	100

Konfigurasi-3

HOMER Pro

System Simulation Report

File: konfigurasi-3.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$729,348.60

Levelized Cost of Energy (US$/kWh): US$0.182

Notes: PV & Genset beban eksisting

Page 1 of 5 System Simulation Report Generated 11/21/2024 1:47:59 PM

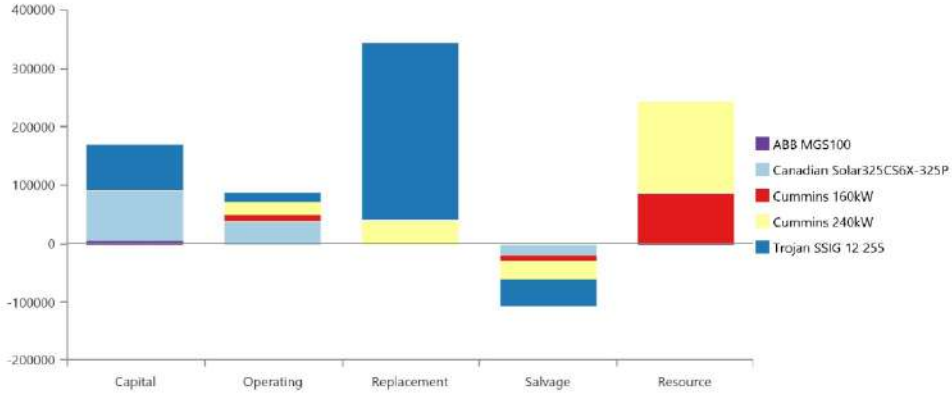
System Architecture

Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
PV	Canadian Solar325CS6X-325P	149	kW
Storage	Trojan SSIG 12 255	9	strings
System converter	ABB MGS100	64.3	kW
Dispatch strategy	HOMER Load Following		

Schematic

HOMER Pro

Cost Summary



Net Present Costs

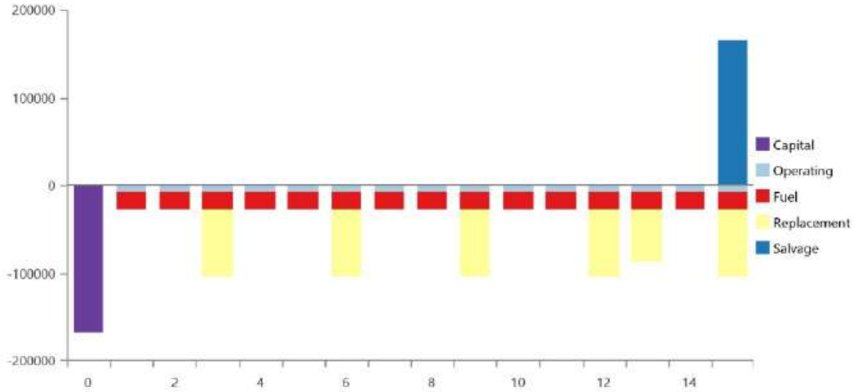
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$6,724	US$77.55	US$0.00	US$0.00	US$0.00	US$6,801
Canadian Solar325CS6X-325P	US$84,690	US$38,638	US$0.00	-US$22,183	US$0.00	US$101,145
Cummins 160kW	US$0.00	US$8,566	US$0.00	-US$7,985	US$86,108	US$86,689
Cummins 240kW	US$0.00	US$22,470	US$41,390	-US$32,562	US$154,785	US$186,083
Trojan SSIG 12 255	US$76,536	US$17,363	US$300,260	-US$45,529	US$0.00	US$348,630
System	US$167,950	US$87,114	US$341,650	-US$108,258	US$240,893	US$729,349

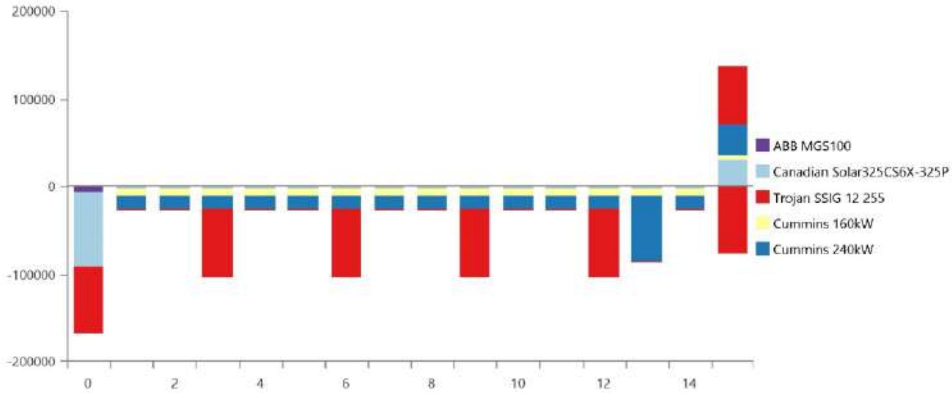
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$557.66	US$6.43	US$0.00	US$0.00	US$0.00	US$564.09
Canadian Solar325CS6X-325P	US$7,024	US$3,205	US$0.00	-US$1,840	US$0.00	US$8,389
Cummins 160kW	US$0.00	US$710.40	US$0.00	-US$662.23	US$7,142	US$7,190
Cummins 240kW	US$0.00	US$1,864	US$3,433	-US$2,701	US$12,837	US$15,433
Trojan SSIG 12 255	US$6,348	US$1,440	US$24,903	-US$3,776	US$0.00	US$28,914
System	US$13,929	US$7,225	US$28,335	-US$8,979	US$19,979	US$60,490

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	37,265	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Canadian Solar325CS6X-325P	250,014	61.3
Cummins 240kW	112,078	27.5
Cummins 160kW	46,044	11.3
Total	408,136	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	333,245	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	333,245	100

Konfigurasi-4

HOMER Pro

System Simulation Report

File: konfigurasi-4.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$752,293.60

Levelized Cost of Energy (US$/kWh): US$0.187

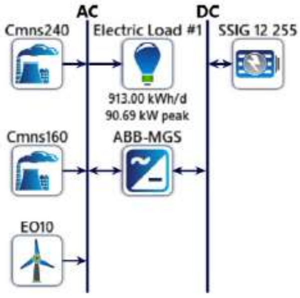
Notes: Turbin Angin & Genset beban eksisting

HOMER Pro

System Architecture

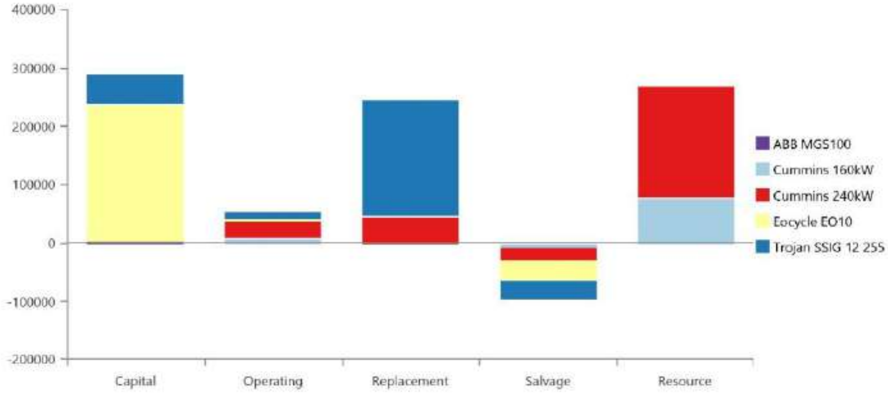
Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
Storage	Trojan SSIG 12 255	6	strings
Wind turbine	Eocycle EO10	8	ea.
System converter	ABB MGS100	42.0	kW
Dispatch strategy	HOMER Load Following		

Schematic



HOMER Pro

Cost Summary



Net Present Costs

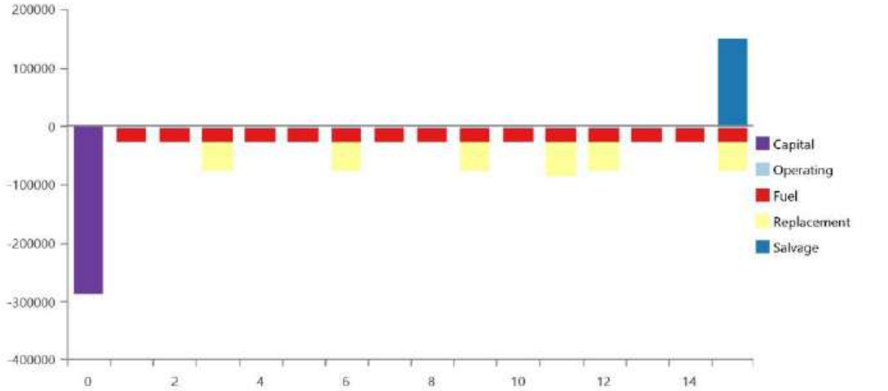
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$4,387	US$50.59	US$0.00	US$0.00	US$0.00	US$4,437
Cummins 160kW	US$0.00	US$7,842	US$0.00	-US$9,330	US$76,851	US$75,363
Cummins 240kW	US$0.00	US$27,607	US$44,286	-US$22,182	US$189,868	US$239,579
Eocycle EO10	US$232,000	US$4,823	US$0.00	-US$32,742	US$0.00	US$204,081
Trojan SSIG 12 255	US$51,024	US$11,575	US$199,386	-US$33,152	US$0.00	US$228,834
System	US$287,411	US$51,897	US$243,672	-US$97,405	US$266,719	US$752,294

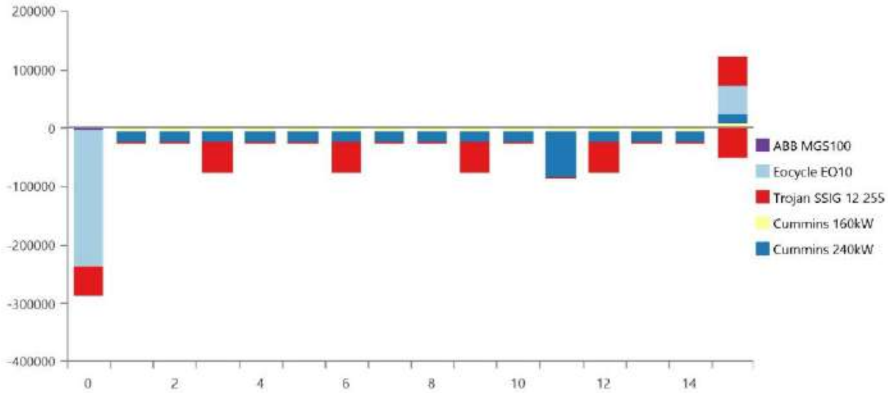
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$363.81	US$4.20	US$0.00	US$0.00	US$0.00	US$368.00
Cummins 160kW	US$0.00	US$650.40	US$0.00	-US$773.76	US$6,374	US$6,250
Cummins 240kW	US$0.00	US$2,290	US$3,673	-US$1,840	US$15,747	US$19,870
Eocycle EO10	US$19,241	US$400.00	US$0.00	-US$2,715	US$0.00	US$16,926
Trojan SSIG 12 255	US$4,232	US$960.00	US$16,536	-US$2,749	US$0.00	US$18,979
System	US$23,837	US$4,304	US$20,209	-US$8,078	US$22,121	US$62,393

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	99,888	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Cummins 240kW	137,457	30.1
Cummins 160kW	40,597	8.88
Eocycle EO10	279,220	61.1
Total	457,275	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	333,245	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	333,245	100

Konfigurasi-5

HOMER
Pro

System Simulation Report

File: konfigurasi-5.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$629,902.70

Levelized Cost of Energy (US$/kWh): US$0.157

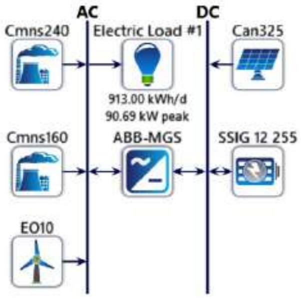
Notes: Genset, PV & Wind Turbine beban eksisting

HOMER Pro

System Architecture

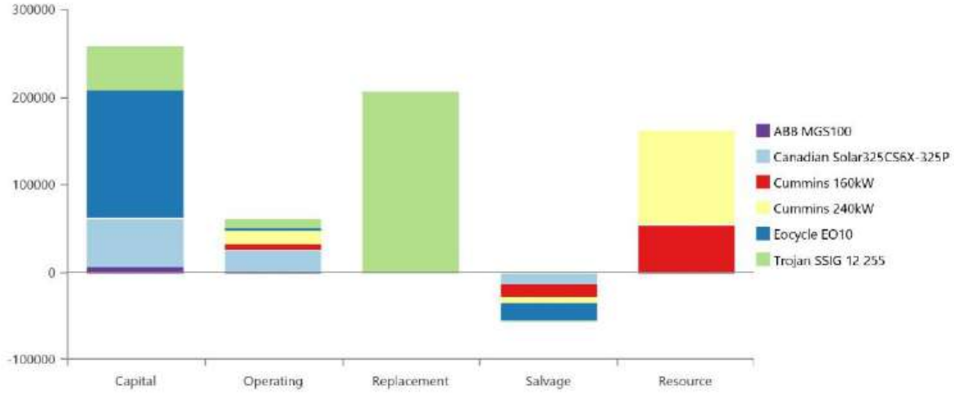
Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
PV	Canadian Solar325CS6X-325P	96.5	kW
Storage	Trojan SSIG 12 255	6	strings
Wind turbine	Eocycle EO10	5	ea.
System converter	ABB MGS100	61.3	kW
Dispatch strategy	HOMER Load Following		

Schematic



HOMER Pro

Cost Summary



Net Present Costs

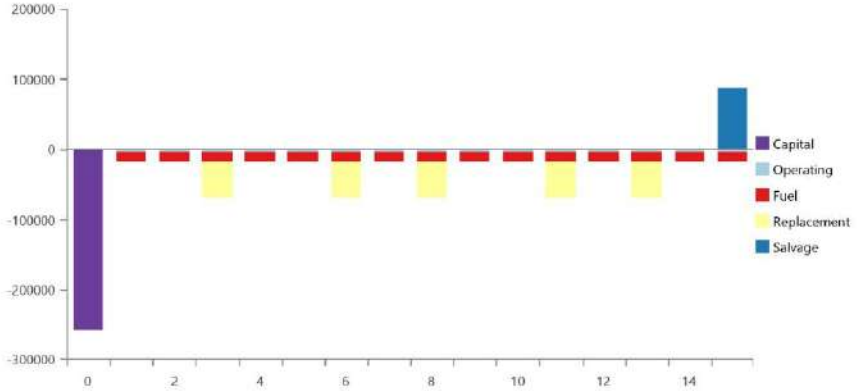
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$6,405	US$73.87	US$0.00	US$0.00	US$0.00	US$6,479
Canadian Solar325CS6X-325P	US$54,906	US$25,050	US$0.00	-US$14,382	US$0.00	US$65,574
Cummins 160kW	US$0.00	US$5,517	US$0.00	-US$13,651	US$54,818	US$46,684
Cummins 240kW	US$0.00	US$15,540	US$0.00	-US$7,582	US$106,929	US$114,886
Eocycle EO10	US$145,000	US$3,014	US$0.00	-US$20,464	US$0.00	US$127,551
Trojan SSIG 12 255	US$51,024	US$11,575	US$207,244	-US$1,114	US$0.00	US$268,729
System	US$257,335	US$60,770	US$207,244	-US$57,192	US$161,746	US$629,903

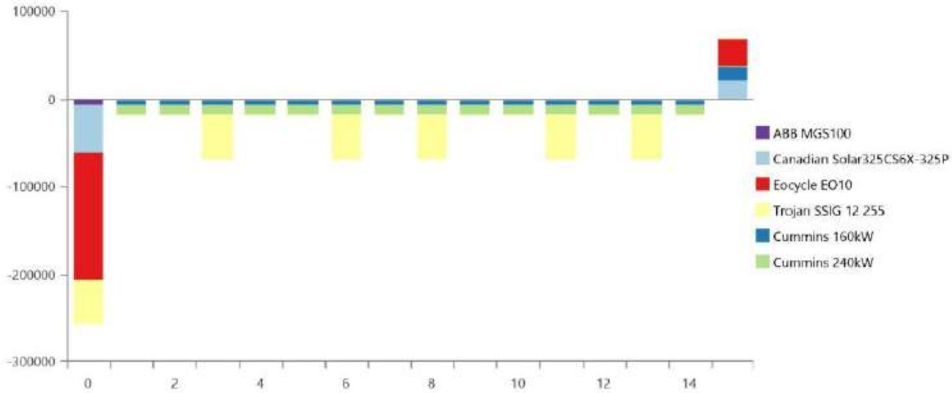
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$531.20	US$6.13	US$0.00	US$0.00	US$0.00	US$537.33
Canadian Solar325CS6X-325P	US$4,554	US$2,078	US$0.00	-US$1,193	US$0.00	US$5,439
Cummins 160kW	US$0.00	US$457.60	US$0.00	-US$1,132	US$4,546	US$3,872
Cummins 240kW	US$0.00	US$1,289	US$0.00	-US$628.86	US$8,868	US$9,528
Eocycle EO10	US$12,026	US$250.00	US$0.00	-US$1,697	US$0.00	US$10,579
Trojan SSIG 12 255	US$4,232	US$960.00	US$17,188	-US$92.36	US$0.00	US$22,288
System	US$21,343	US$5,040	US$17,188	-US$4,743	US$13,415	US$52,242

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	81,796	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Canadian Solar325CS6X-325P	162,088	36.6
Cummins 240kW	77,416	17.5
Cummins 160kW	29,150	6.58
Eocycle EO10	174,513	39.4
Total	443,168	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	333,245	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	333,245	100

Sistem Optimal untuk Pertumbuhan Beban 3%

HOMER Pro

System Simulation Report

File: konfigurasi-5.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$835,346.40

Levelized Cost of Energy (US$/kWh): US$0.133

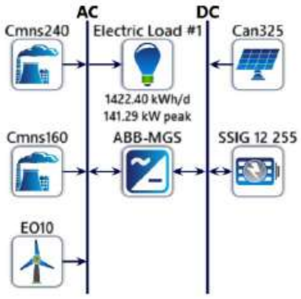
Notes: Genset, PV & Wind Turbine optimum 3 persen

HOMER Pro

System Architecture

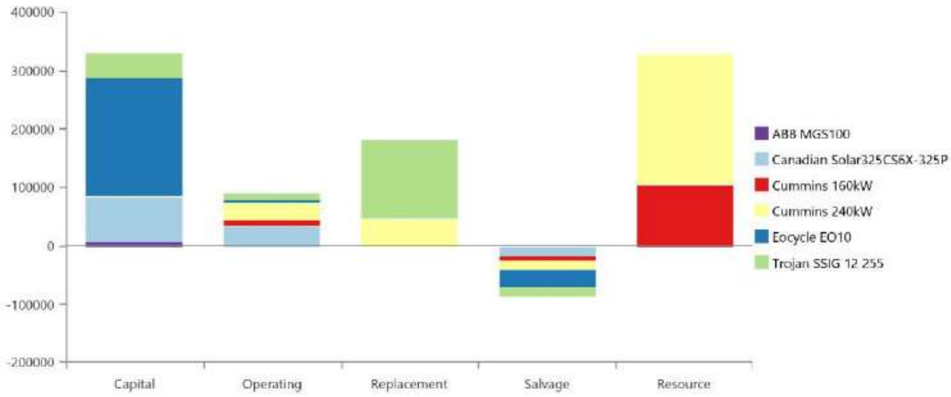
Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
PV	Canadian Solar325CS6X-325P	130	kW
Storage	Trojan SSIG 12 255	5	strings
Wind turbine	Eocycle EO10	7	ea.
System converter	ABB MGS100	90.8	kW
Dispatch strategy	HOMER Load Following		

Schematic



HOMER Pro

Cost Summary



Net Present Costs

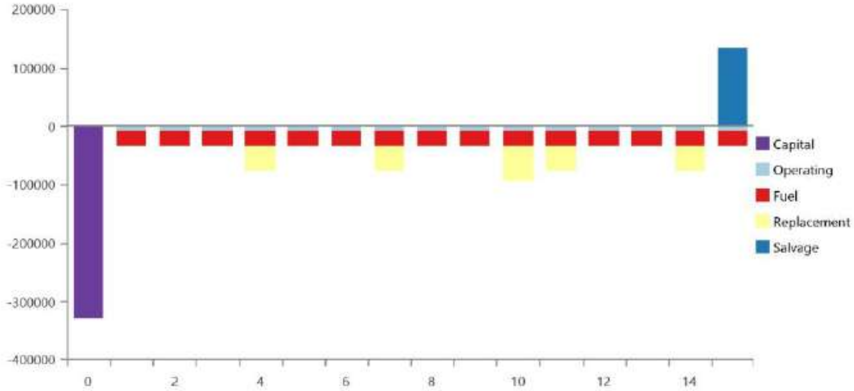
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$9,487	US$109.42	US$0.00	US$0.00	US$0.00	US$9,597
Canadian Solar325CS6X-325P	US$74,103	US$33,807	US$0.00	-US$19,410	US$0.00	US$88,500
Cummins 160kW	US$0.00	US$9,077	US$0.00	-US$7,035	US$105,490	US$107,532
Cummins 240kW	US$0.00	US$30,616	US$45,593	-US$16,100	US$220,870	US$280,979
Eocycle EO10	US$203,000	US$4,220	US$0.00	-US$28,649	US$0.00	US$178,571
Trojan SSIG 12 255	US$42,520	US$9,646	US$134,534	-US$16,532	US$0.00	US$170,168
System	US$329,110	US$87,476	US$180,127	-US$87,726	US$326,360	US$835,346

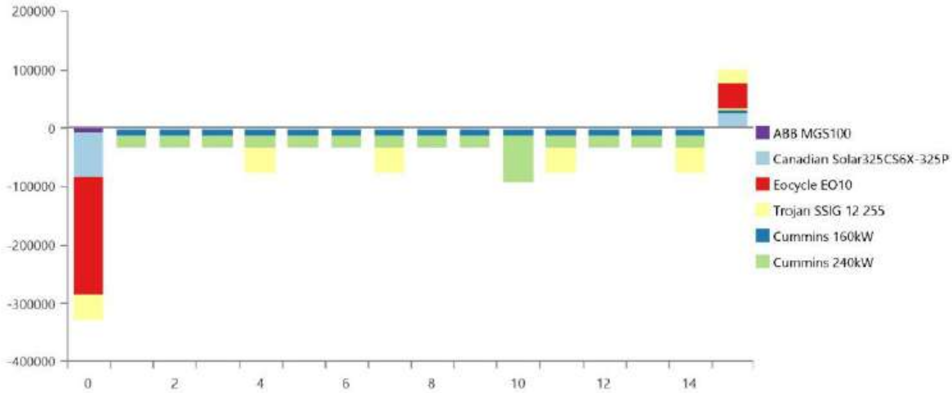
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$786.83	US$9.08	US$0.00	US$0.00	US$0.00	US$795.91
Canadian Solar325CS6X-325P	US$6,146	US$2,804	US$0.00	-US$1,610	US$0.00	US$7,340
Cummins 160kW	US$0.00	US$752.80	US$0.00	-US$583.42	US$8,749	US$8,918
Cummins 240kW	US$0.00	US$2,539	US$3,781	-US$1,335	US$18,318	US$23,303
Eocycle EO10	US$16,836	US$350.00	US$0.00	-US$2,376	US$0.00	US$14,810
Trojan SSIG 12 255	US$3,526	US$800.00	US$11,158	-US$1,371	US$0.00	US$14,113
System	US$27,295	US$7,255	US$14,939	-US$7,276	US$27,067	US$69,281

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	144,705	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Canadian Solar325CS6X-325P	218,758	32.0
Cummins 240kW	160,747	23.5
Cummins 160kW	59,973	8.77
Eocycle EO10	244,318	35.7
Total	683,795	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	519,176	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	519,176	100

Sistem Optimal untuk Pertumbuhan Beban 5%

HOMER Pro

System Simulation Report

File: konfigurasi-5.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$1,017,013.00

Levelized Cost of Energy (US$/kWh): US$0.122

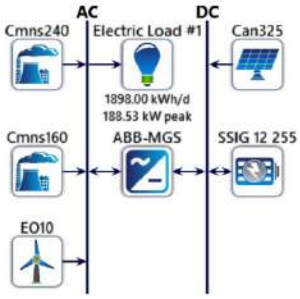
Notes: Genset, PV & Wind Turbine optimum 5 persen

HOMER Pro

System Architecture

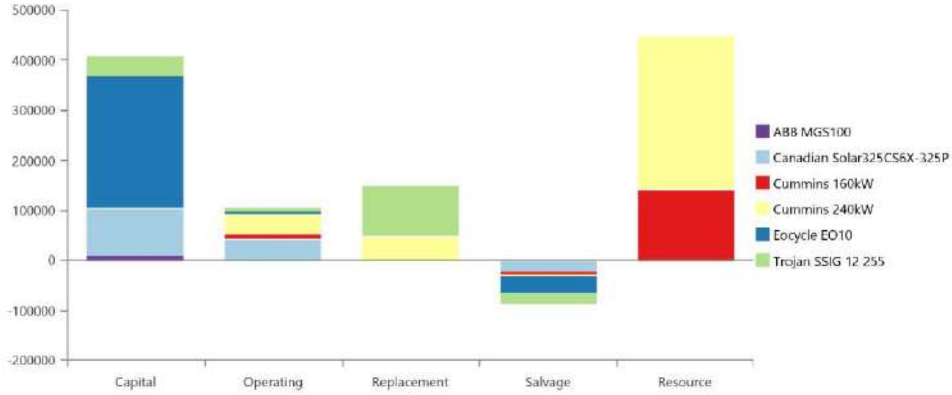
Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
PV	Canadian Solar325CS6X-325P	161	kW
Storage	Trojan SSIG 12 255	5	strings
Wind turbine	Eocycle EO10	9	ea.
System converter	ABB MGS100	118	kW
Dispatch strategy	HOMER Load Following		

Schematic



HOMER Pro

Cost Summary



Net Present Costs

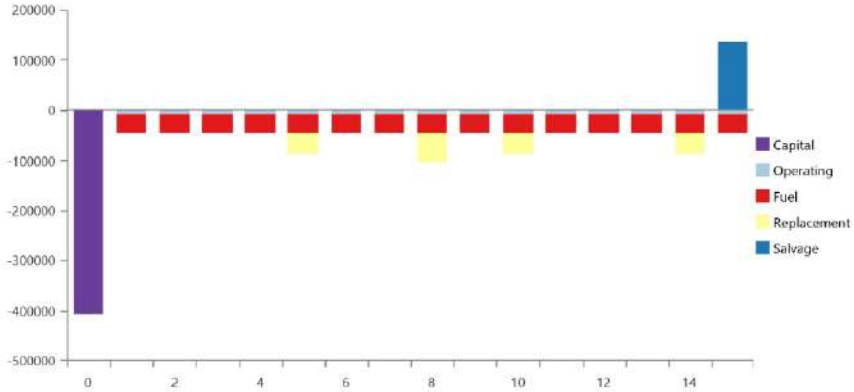
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$12,362	US$142.58	US$0.00	US$0.00	US$0.00	US$12,504
Canadian Solar325CS6X-325P	US$91,865	US$41,911	US$0.00	-US$24,063	US$0.00	US$109,714
Cummins 160kW	US$0.00	US$10,302	US$0.00	-US$4,757	US$141,039	US$146,583
Cummins 240kW	US$0.00	US$37,764	US$47,954	-US$1,657	US$305,346	US$389,407
Eocycle EO10	US$261,000	US$5,426	US$0.00	-US$36,834	US$0.00	US$229,591
Trojan SSIG 12 255	US$42,520	US$9,646	US$98,659	-US$21,612	US$0.00	US$129,213
System	US$407,747	US$105,191	US$146,614	-US$88,923	US$446,385	US$1.02M

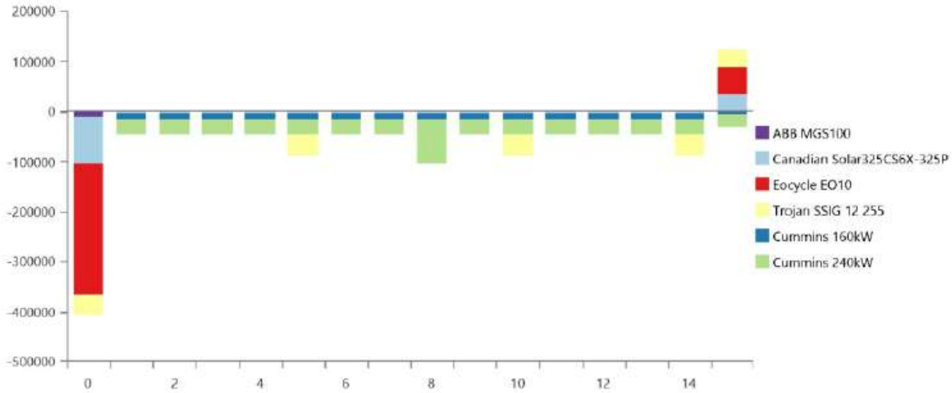
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$1,025	US$11.82	US$0.00	US$0.00	US$0.00	US$1,037
Canadian Solar325CS6X-325P	US$7,619	US$3,476	US$0.00	-US$1,996	US$0.00	US$9,099
Cummins 160kW	US$0.00	US$854.40	US$0.00	-US$394.56	US$11,697	US$12,157
Cummins 240kW	US$0.00	US$3,132	US$3,977	-US$137.41	US$25,324	US$32,296
Eocycle EO10	US$21,647	US$450.00	US$0.00	-US$3,055	US$0.00	US$19,042
Trojan SSIG 12 255	US$3,526	US$800.00	US$8,183	-US$1,792	US$0.00	US$10,717
System	US$33,817	US$8,724	US$12,160	-US$7,375	US$37,022	US$84,348

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	185,424	kWh/yr
Unmet Electric Load	0	kWh/yr
Capacity Shortage	0	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Canadian Solar325CS6X-325P	271,195	30.3
Cummins 240kW	224,801	25.1
Cummins 160kW	84,797	9.48
Eocycle EO10	314,123	35.1
Total	894,916	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	692,770	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	692,770	100

Sistem Optimal untuk Pertumbuhan Beban 10%

HOMER Pro

System Simulation Report

File: konfigurasi-5.homer

Author: Owen Inna

Location: W889+Q5 Barrang Caddi, Makassar City, South Sulawesi, Indonesia (5°5.0'S, 119°19.1'E)

Total Net Present Cost: US$1,854,802.00

Levelized Cost of Energy (US$/kWh): US$0.111

Notes: Genset, PV & Wind Turbine optimum 10 persen

HOMER Pro

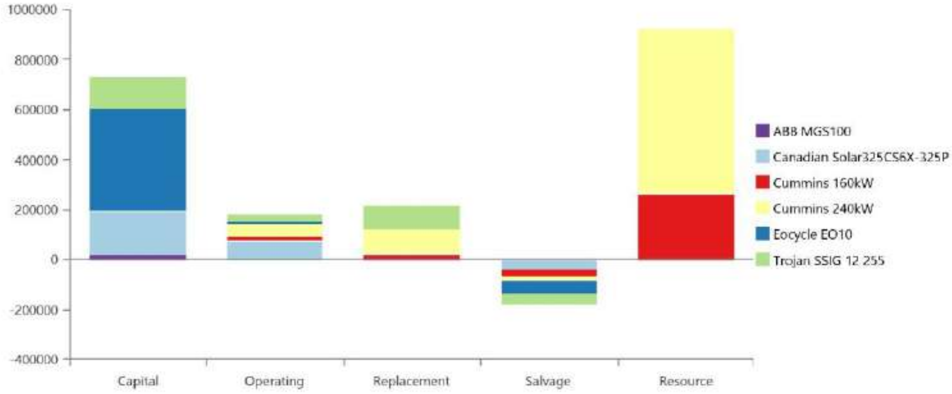
System Architecture

Component	Name	Size	Unit
Generator #1	Cummins 240kW	240	kW
Generator #2	Cummins 160kW	160	kW
PV	Canadian Solar325CS6X-325P	296	kW
Storage	Trojan SSIG 12 255	15	strings
Wind turbine	Eocycle EO10	14	ea.
System converter	ABB MGS100	224	kW
Dispatch strategy	HOMER Load Following		

Schematic

HOMER Pro

Cost Summary



Net Present Costs

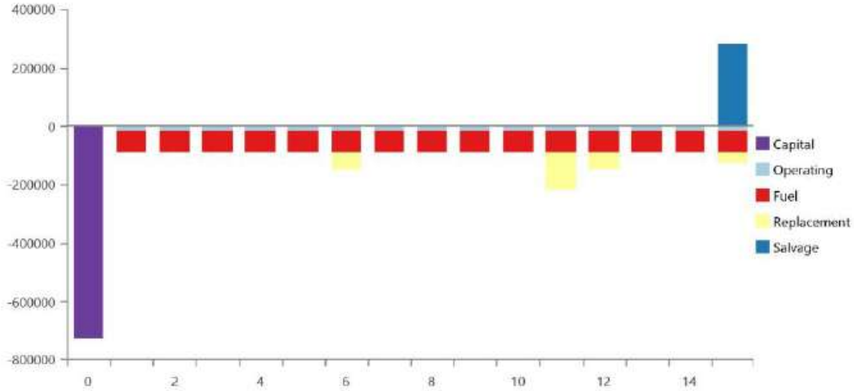
Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$23,413	US$270.03	US$0.00	US$0.00	US$0.00	US$23,683
Canadian Solar325CS6X-325P	US$168,480	US$76,865	US$0.00	-US$44,131	US$0.00	US$201,214
Cummins 160kW	US$0.00	US$13,437	US$24,344	-US$22,837	US$263,290	US$278,234
Cummins 240kW	US$0.00	US$50,265	US$93,619	-US$15,379	US$657,085	US$785,590
Eocycle EO10	US$406,000	US$8,440	US$0.00	-US$57,298	US$0.00	US$357,142
Trojan SSIG 12 255	US$127,560	US$28,938	US$95,835	-US$43,393	US$0.00	US$208,939
System	US$725,452	US$178,214	US$213,798	-US$183,038	US$920,376	US$1.85M

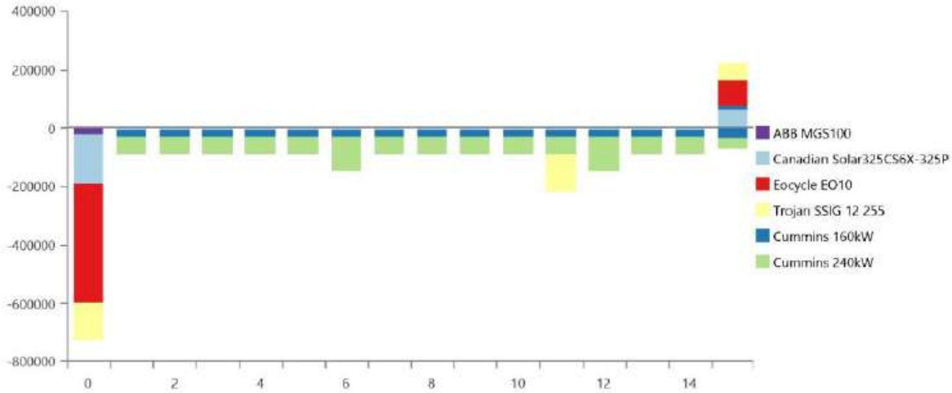
Annualized Costs

Name	Capital	Operating	Replacement	Salvage	Resource	Total
ABB MGS100	US$1,942	US$22.40	US$0.00	US$0.00	US$0.00	US$1,964
Canadian Solar325CS6X-325P	US$13,973	US$6,375	US$0.00	-US$3,660	US$0.00	US$16,688
Cummins 160kW	US$0.00	US$1,114	US$2,019	-US$1,894	US$21,836	US$23,076
Cummins 240kW	US$0.00	US$4,169	US$7,764	-US$1,276	US$54,497	US$65,154
Eocycle EO10	US$33,672	US$700.00	US$0.00	-US$4,752	US$0.00	US$29,620
Trojan SSIG 12 255	US$10,579	US$2,400	US$7,948	-US$3,599	US$0.00	US$17,329
System	US$60,167	US$14,781	US$17,732	-US$15,181	US$76,333	US$153,831

HOMER Pro

Cash Flow





HOMER Pro

Electrical Summary

Excess and Unmet

Quantity	Value	Units
Excess Electricity	242,460	kWh/yr
Unmet Electric Load	601	kWh/yr
Capacity Shortage	1,194	kWh/yr

Production Summary

Component	Production (kWh/yr)	Percent
Canadian Solar325CS6X-325P	497,368	30.0
Cummins 240kW	501,248	30.2
Cummins 160kW	172,877	10.4
Eocycle EO10	488,636	29.4
Total	1,660,129	100

Consumption Summary

Component	Consumption (kWh/yr)	Percent
AC Primary Load	1,391,436	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	1,391,436	100

Lampiran 4. Surat Pengambilan Data

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 : 19059/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 : Owen Inna/D041201057
Judul TA : Studi Optimasi Perencanaan Pembangkit Listrik Sistem Hibdrid di Pulau Barrang Caddi

Dapat diberikan surat pengantar untuk pengambilan Data/Penelitian Skripsi/ tugas akhir pada:
1. Pulau Barrang Caddi

Adapun data/penelitian yang diperlukan Pengambilan data berupa data beban listrik.

Demikian penyampaian kami, atas perhatian dan kerjasamanya diucapkan terima kasih

Gowa, 7 Agustus 2024
Sekretaris Departemen Teknik Elektro

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

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET
DAN TEKNOLOGI
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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	: 19061/UN4.7.7.1/PT.01.06/2024	7 Agustus 2024
Lamp	: -	
Hal	: Pengambilan Data Penelitian Mahasiswa	

Kepada Yth.

Pimpinan Pulau Barrang Caddi

Di –
Pulau Barrang Caddi, Makassar

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 Pimpinan Pulau Barrang Caddi mahasiswa berikut :

Nama/Stambuk	: Owen Inna/D041201057
Judul TA	: Studi Optimasi Perencanaan Pembangkit Listrik Sistem Hibdrid di Pulau Barrang Caddi
Tujuan	: Pengambilan data berupa data beban listrik

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