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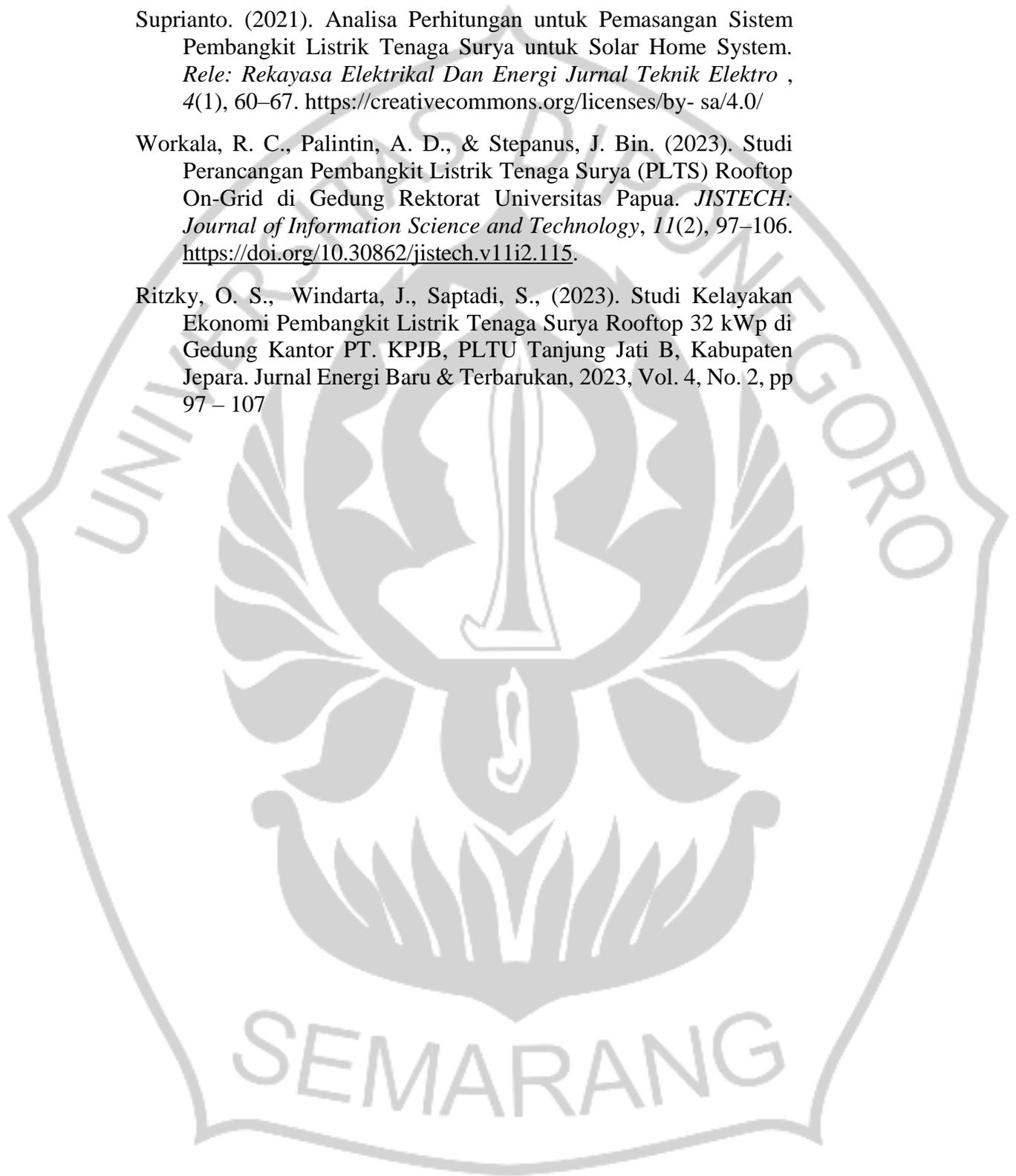
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LAMPIRAN

Foto Lokasi, Harga Komponen PLTS dan Hasil simulasi pakai Pvsyst V7.4.0 Pada atap On-grid Demin dan Off-grid It.10



Foto Lokasi Pengambilan Data



Area SWGR B Unit #3



Area SWGR B Unit 1&2



Area Lantai 10



Lampu Penerangan Lantai 9



Atap area Demin



Atap area Elektik Shop



Atap area SWGR C unit #3



Area Cooling Tower dan SWGR D

Harga Komponen PLTS

PRICE LIST

PLTS Atap Hybrid Batteryless



1 KW

INVERTER HYBRID 1 KW
2 LEMBAR SOLAR MODEL 540 WP
MOUNTING
AC CABLE & PV CABLE
ACCESORIES INSTALASI

mulai dari **24** juta *Belain Diskon



2 KW

INVERTER HYBRID 2 KW
4 LEMBAR SOLAR MODEL 540 WP
MOUNTING
AC CABLE & PV CABLE
ACCESORIES INSTALASI

mulai dari **42** juta *Belain Diskon



3 KW

INVERTER HYBRID 3 KW
6 LEMBAR SOLAR MODEL 540 WP
MOUNTING
AC CABLE & PV CABLE
ACCESORIES INSTALASI

mulai dari **53** juta *Belain Diskon



4 KW

INVERTER HYBRID 4 KW
8 LEMBAR SOLAR MODEL 540 WP
MOUNTING
AC CABLE & PV CABLE
ACCESORIES INSTALASI

mulai dari **80** juta *Belain Diskon



5 KW

INVERTER HYBRID 5 KW
10 LEMBAR SOLAR MODEL 540 WP
MOUNTING
AC CABLE & PV CABLE
ACCESORIES INSTALASI

mulai dari **90** juta *Belain Diskon



6 KW

INVERTER HYBRID 6 KW 3PHASE
12 LEMBAR SOLAR MODEL 540 WP
MOUNTING
AC CABLE & PV CABLE
ACCESORIES INSTALASI

mulai dari **152** juta *Belain Diskon



7 KW

INVERTER HYBRID 8 KW 3 PHASE
14 LEMBAR SOLAR MODEL 540 WP
MOUNTING
PV CABLE & AC CABLE
ACCESORIES INSTALASI

mulai dari **140** juta *Belain Diskon



10 KW

INVERTER HYBRID 10 KW 3 PHASE
20 LEMBAR SOLAR MODEL 540 WP
MOUNTING
PV CABLE AC CABLE
ACCESORIES INSTALASI

mulai dari **250** juta *Belain Diskon

Harga Paket

SEMARANG



SOLAR PANEL 100 WP mulai dari **999.999** *Belum Diskon

SOLAR PANEL 200 WP mulai dari **2.199.999** *Belum Diskon

SOLAR PANEL 300 WP mulai dari **2.999.000** *Belum Diskon

SOLAR PANEL 400 WP mulai dari **3.499.000** *Belum Diskon

SOLAR PANEL 500 WP mulai dari **3.999.000** *Belum Diskon

Harga Panel Surya



INVERTER 1 KW mulai dari **8.999.000** *Belum Diskon

INVERTER 2 KW mulai dari **14.299.000** *Belum Diskon

INVERTER 3 KW mulai dari **20.999.000** *Belum Diskon

INVERTER 5 KW mulai dari **29.999.000** *Belum Diskon

INVERTER 6 KW 3 PHASE mulai dari **74.999.000** *Belum Diskon

INVERTER 8 KW 3 PHASE mulai dari **67.999.000** *Belum Diskon

INVERTER 10 KW 3 PHASE mulai dari **82.499.000** *Belum Diskon

Harga Inverter

**VRLA 12V
100AH**

Mulai dari **2** 499.000
*Belum Diskon

**VRLA 12V
200AH**

Mulai dari **6** 999.000
*Belum Diskon

**LiFePo4
48V 100AH**

Mulai dari **40** 299.000
*Belum Diskon

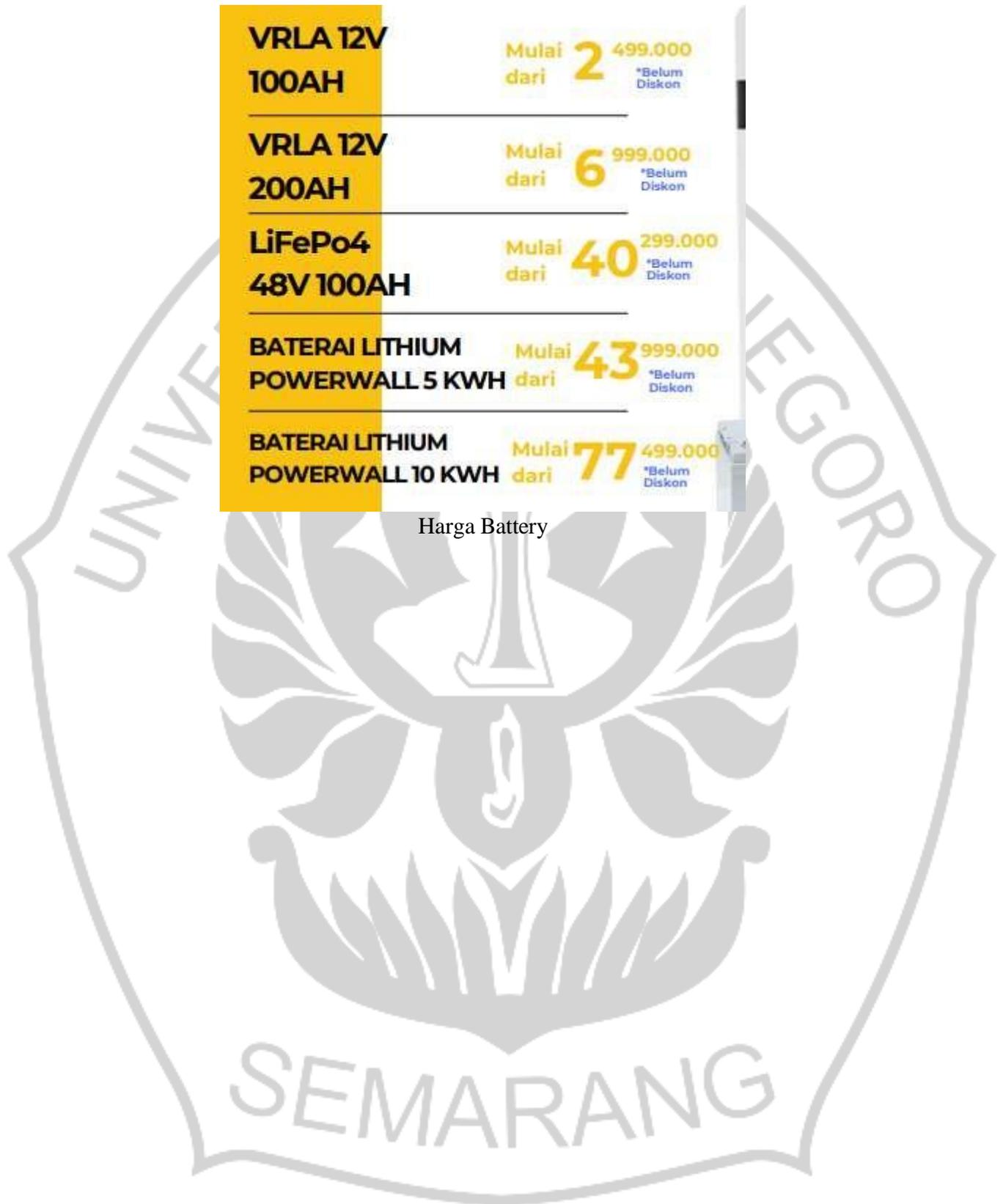
**BATERAI LITHIUM
POWERWALL 5 KWH**

Mulai dari **43** 999.000
*Belum Diskon

**BATERAI LITHIUM
POWERWALL 10 KWH**

Mulai dari **77** 499.000
*Belum Diskon

Harga Battery



Hasil simulasi pakai Pvsyst V7.4.0
Pada atap On-grid Demin dan Off-grid lt.10



PVsyst - Simulation report

Grid-Connected System

Project: Demin Atap

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 5.44 kWp

Amamapare swgr B - Indonesia





Project: Demin Atap

Variant: New simulation variant

PVsyst V7.4.0

VC0, Simulation date:

04/20/24 03:11

with v7.4.0

Project summary

Geographical Site

Amamapare swgr B

Indonesia

Situation

Latitude -4.83 °S

Longitude 136.84 °E

Altitude 8 m

Time zone UTC+9

Project settings

Albedo

0.20

Meteo data

Amamapare swgr B

Meteonorm 8.1 (2016-2021), Sat=100% - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Fixed plane

Tilt/Azimuth 7 / 0 °

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

Pnom total

16 units

5.44 kWp

Inverters

Nb. of units

Pnom total

Pnom ratio

1 unit

4950 W

1.099

Results summary

Produced Energy 8236.64 kWh/year

Apparent energy 8236.64 kVAh/year

Specific production 1514 kWh/kWp/year

Perf. Ratio PR

84.92 %

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PVsyst V7.4.0

VC0, Simulation date:
04/20/24 03:11
with v7.4.0

General parameters

Grid-Connected System		No 3D scene defined, no shadings	
PV Field Orientation		Sheds configuration	Models used
Orientation		No 3D scene defined	Transposition Perez
Fixed plane			Diffuse Perez, Meteonom
Tilt/Azimuth	7 / 0 °		Circumsolar separate
Horizon		Near Shadings	User's needs
Free Horizon		No Shadings	Unlimited load (grid)
Grid injection point			
Power factor			
Cos(phi) (lagging)	1.000		

PV Array Characteristics

PV module		Inverter	
Manufacturer	Auxin Solar	Manufacturer	Huawei Technologies
Model	AXNG1M340C	Model	SUN2000-4.95KTL-JPL1
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	340 Wp	Unit Nom. Power	4.95 kWac
Number of PV modules	16 units	Number of inverters	2 * MPPT 50% 1 unit
Nominal (STC)	5.44 kWp	Total power	5.0 kWac
Modules	2 Strings x 8 In series	Operating voltage	90-560 V
At operating cond. (50°C)		Max. power (=>40°C)	5.21 kWac
Pmpp	5.52 kWp	Number of MPPTs between MPPTs	1.10
I mpp	20 A		
Total PV power		Total inverter power	
Nominal (STC)	5 kWp	Total power	5 kWac
Total	16 modules	Number of inverters	1 unit
Module area	26.7 m²	Pnom ratio	1.10
Cell area	15.2 m²		

Array losses

Thermal Loss factor		DC wiring losses		Module Quality Loss	
Module temperature according to irradiance		Global array res.	94 mΩ	Loss Fraction	-0.2 %
Uc (const)	29.0 W/m²K	Loss Fraction	0.7 % at STC		
Uv (wind)	0.0 W/m²K/m/s				
Module mismatch losses					
Loss Fraction	2.0 % at MPP				
IAM loss factor					
Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290					

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000



Project: Demin Atap

Variant: New simulation variant

PVsyst V7.4.0

VC0, Simulation date:
04/20/24 03:11
with v7.4.0

Main results

System Production

Produced Energy 8236.64 kWh/year Specific production 1514 kWh/kWp/year
Apparent energy 8236.64 kVAh/year Perf. Ratio PR 84.92 %

Economic evaluation

Investment

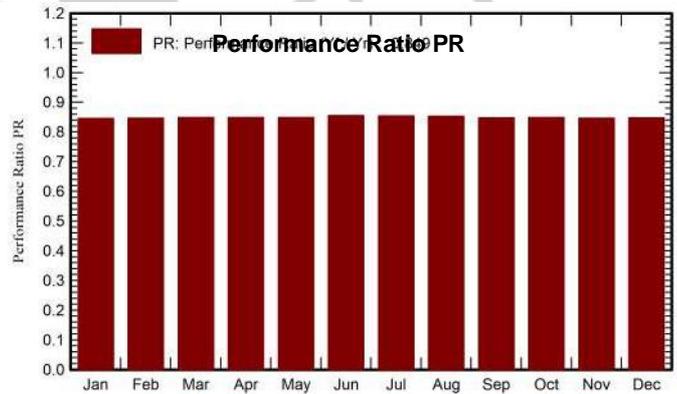
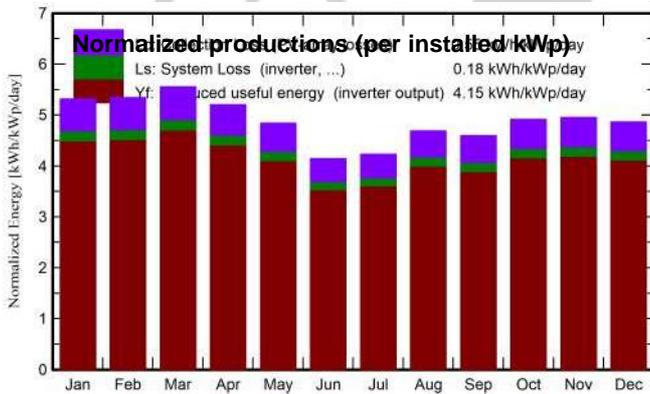
Global 141,886,080.00 IDR
Specific 26082 IDR/Wp

Yearly cost

Annuities 0.00 IDR/yr
Run. costs 2,828,800.00 IDR/yr
Payback period Unprofitable

LCOE

Energy cost 783 IDR/kWh



Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray kWh	E_Grid kWh	PR ratio
January	171.7	83.11	27.10	164.8	160.1	791.1	758.4	0.846
February	152.8	72.84	26.97	149.6	145.9	719.2	689.1	0.847
March	171.7	79.85	27.01	172.1	168.3	828.9	794.5	0.849
April	152.5	72.87	26.84	156.1	152.4	752.6	721.2	0.849
May	143.2	61.58	27.29	150.1	146.6	723.3	692.7	0.848
June	119.0	72.03	26.63	124.2	121.0	603.4	577.7	0.855
July	126.0	72.93	26.96	131.1	128.1	636.2	609.0	0.854
August	140.8	75.24	26.93	145.3	142.2	704.4	674.6	0.854
September	136.8	70.24	26.78	137.9	134.5	664.7	636.3	0.848
October	154.3	87.59	27.31	152.3	148.5	733.5	703.0	0.848
November	153.6	75.26	26.95	148.6	144.8	714.8	684.8	0.847
December	157.6	81.23	27.22	150.9	146.5	725.7	695.3	0.847
Year	1780.2	904.76	27.00	1782.9	1738.8	8597.9	8236.6	0.849

Legends

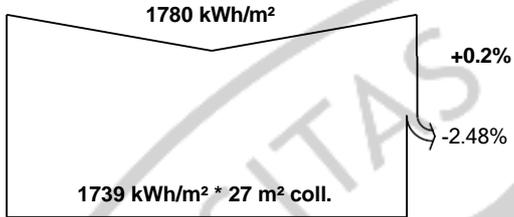
GlobHor Global horizontal irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temperature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio



PVsyst V7.4.0

VCO, Simulation date:
04/20/24 03:11
with v7.4.0

Loss diagram



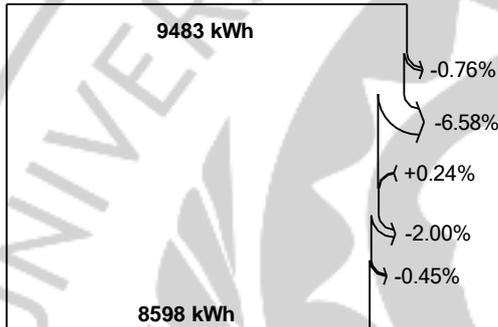
Global horizontal irradiation
Global incident in coll. plane

IAM factor on global

Effective irradiation on collectors

efficiency at STC = 20.43%

PV conversion



Array nominal energy (at STC effic.)

PV loss due to irradiance level

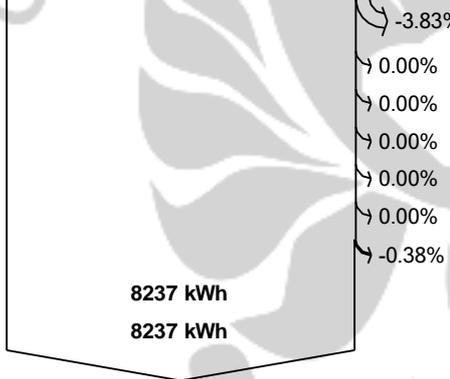
PV loss due to temperature

Module quality loss

Module array mismatch loss

Ohmic wiring loss

Array virtual energy at MPP



Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

Active Energy injected into grid

0 kVARh
8237 kVAh

Reactive energy to the grid: Aver. cos(phi) = 1.000

Apparent energy to the grid

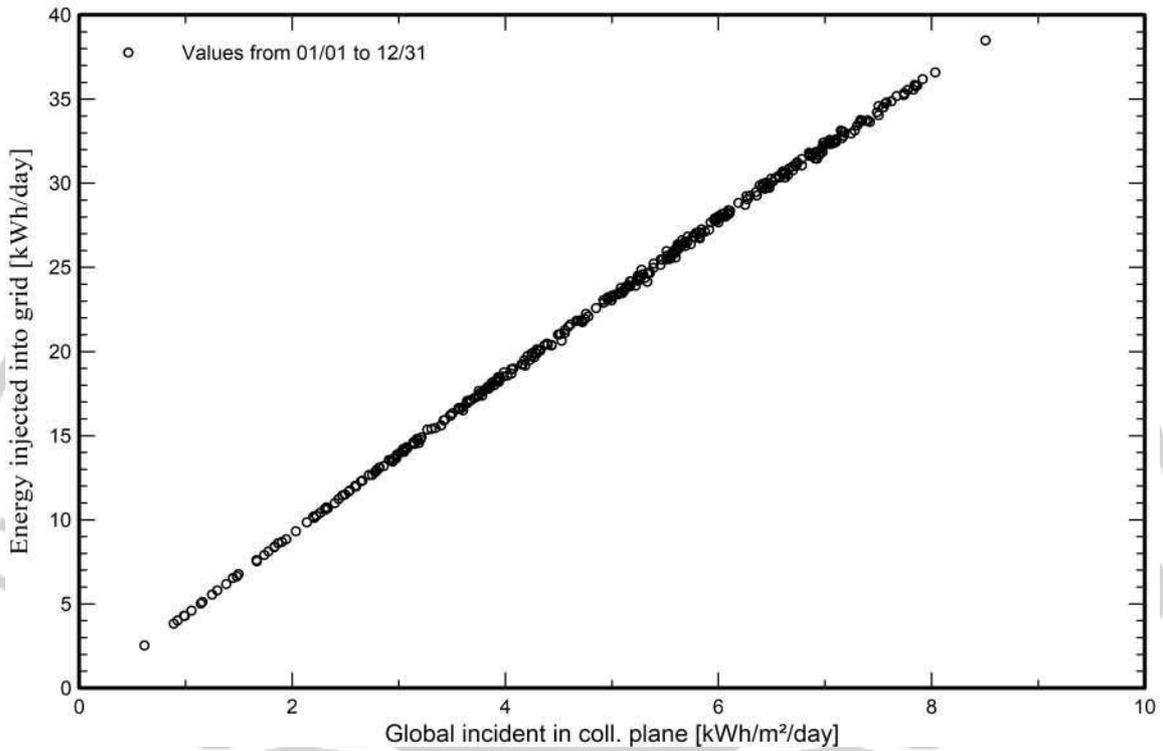


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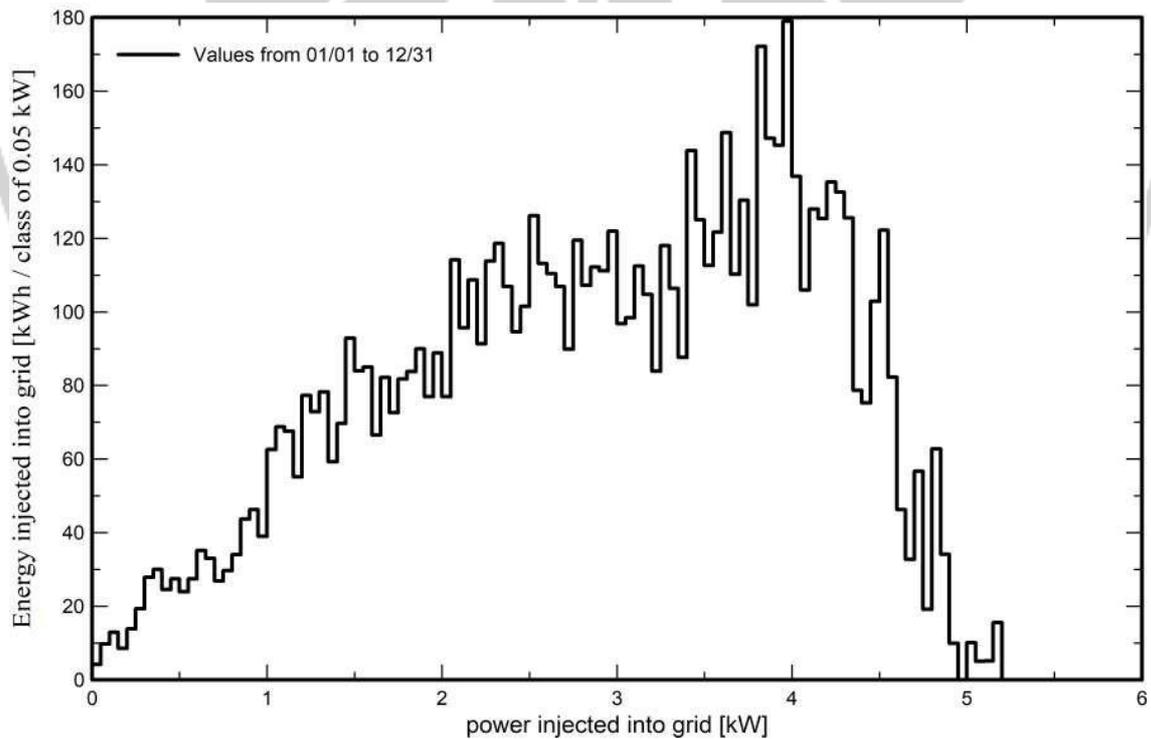
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Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

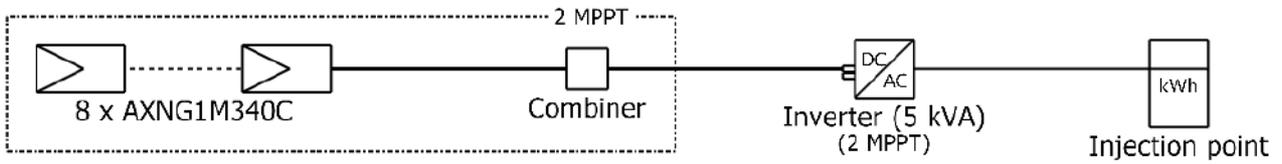




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Single-line diagram



PV module	AXNG1M340C
Inverter	SUN2000-4.95KTL-JPL1
String	8 x AXNG1M340C

Demin Atap

VC0 : New simulation variant

04/20/24



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Cost of the system

Installation costs

Item	Quantity units	Cost IDR	Total IDR
PV modules			
AXNG1M340C	16	4,080,000.00	65,280,000.00
Supports for modules	16	102,000.00	1,632,000.00
Inverters			
SUN2000-4.95KTL-JPL1	1	48,960,000.00	48,960,000.00
Other components			
Accessories, fasteners	1	5,440,000.00	5,440,000.00
Wiring	1	5,440,000.00	5,440,000.00
Combiner box	1	544,000.00	544,000.00
Monitoring system, display screen	1	544,000.00	544,000.00
Measurement system, pyranometer	1	544,000.00	544,000.00
Surge arrester	1	544,000.00	544,000.00
Studies and analysis			
Engineering	1	544,000.00	544,000.00
Permitting and other admin. Fees	1	544,000.00	544,000.00
Environmental studies	1	544,000.00	544,000.00
Economic analysis	1	544,000.00	544,000.00
Installation			
Global installation cost per module	16	68,000.00	1,088,000.00
Global installation cost per inverter	1	1,088,000.00	1,088,000.00
Transport	1	1,088,000.00	1,088,000.00
Settings	1	1,632,000.00	1,632,000.00
Grid connection	1	5,440,000.00	5,440,000.00
Insurance			
Building insurance	1	446,080.00	446,080.00
		Total	141,886,080.00
		Depreciable asset	121,312,000.00

Operating costs

Item	Total IDR/year
Maintenance	
Provision for inverter replacement	272,000.00
Salaries	1,088,000.00
Repairs	816,000.00
Cleaning	544,000.00
Security fund	54,400.00
Bank charges	54,400.00
Total (OPEX)	2,828,800.00

System summary

Total installation cost	141,886,080.00 IDR
Operating costs	2,828,800.00 IDR/year
Produced Energy	8268 kWh/year
Cost of produced energy (LCOE)	782.849 IDR/kWh



Project: Demin Atap

Variant: New simulation variant

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CO₂ Emission Balance

Total: 155.0 tCO₂

Generated emissions

Total: 2.38 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 181.4 tCO₂

System production: 8236.64 kWh/yr

Grid Lifecycle Emissions: 734 gCO₂/kWh

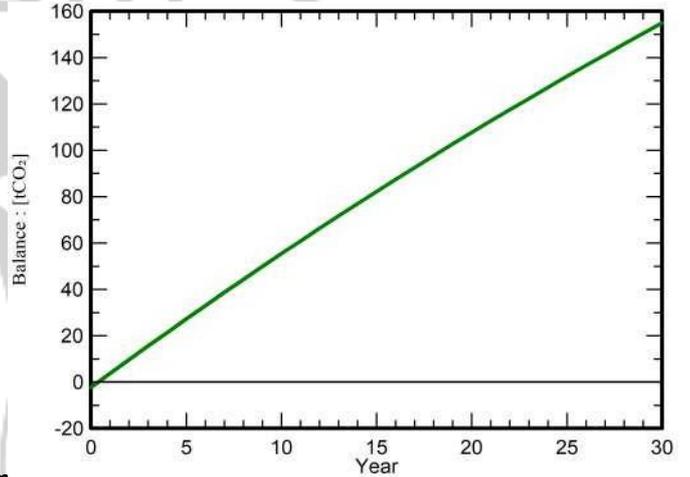
Country: IEA List

Country: Indonesia

Lifetime: 30 years

Annual degradation: 1.0 %

Saved CO₂ Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal [kgCO ₂]
Modules	1713 kgCO ₂ /kWp	1.02 kWp	1747
Supports	4.90 kgCO ₂ /kg	30.0 kg	147
Inverters	485 kgCO ₂ /	1.00	485

PVsyst - Simulation report

Standalone system

Project: Turbin Lt. 10 offgrid

Variante: New simulation variant

Standalone system with batteries

System power: 47.6 kWp

Amamapare - Indonesia





PVsyst V7.4.0

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Project summary

Geographical Site Amamapare Indonesia	Situation Latitude -4.83 °S Longitude 136.84 °E Altitude 14 m Time zone UTC+9	Project settings Albedo 0.20
Meteo data PLTU PJP Amamapare Meteonorm 8.1 (2016-2021), Sat=100% - Synthetic		

System summary

Standalone system PV Field Orientation Fixed plane Tilt/Azimuth 7 / 0 °	Standalone system with batteries User's needs Daily household consumers Constant over the year Average 193 kWh/Day	Battery pack Technology Lead-acid, sealed, Gel Nb. of units 180 units Voltage 120 V Capacity 2400 Ah
System information PV Array Nb. of modules 140 units Pnom total 47.6 kWp		

Results summary

Useful energy from solar 60029 kWh/year	Specific production 1261 kWh/kWp/year	Perf. Ratio PR 70.72 %
Missing Energy 10264 kWh/year	Available solar energy 63467 kWh/year	Solar Fraction SF 85.40 %
Excess (unused) 1313 kWh/year		

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Detailed User's needs	4
Main results	5
Loss diagram	6
Predef. graphs	7
Cost of the system	8



PVsyst V7.4.0

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General parameters

Standalone system	Standalone system with batteries	
PV Field Orientation	Sheds configuration	
Orientation	No 3D scene defined	Models used
Fixed plane		Transposition Perez
Tilt/Azimuth 7 / 0 °		Diffuse Perez, Meteonorm
		Circumsolar separate
User's needs		
Daily household consumers		
Constant over the year		
Average 193 kWh/Day		

PV Array Characteristics

PV module	Auxin Solar	Battery	Narada
Manufacturer		Manufacturer	
Model AXNG1M340W		Model	EosG 800
(Original PVsyst database)		Technology	Lead-acid, sealed, Gel
Unit Nom. Power 340 Wp		Nb. of units	3 in parallel x 60 in series
Number of PV modules 140 units		Discharging min. SOC	20.0 %
Nominal (STC) 47.6 kWp		Stored energy	231.0 kWh
Modules 35 Strings x 4 In series		Battery Pack Characteristics	
At operating cond. (50°C)		Voltage	120 V
Pmpp 43.9 kWp		Nominal Capacity	2400 Ah (C10)
U mpp 127 V		Temperature	Fixed 20 °C
I mpp 347 A			
Controller		Battery Management control	
Universal controller		Threshold commands as	SOC calculation
Technology MPPT converter		Charging approx.	SOC = 0.92 / 0.75
Temp coeff. -5.0 mV/°C/Elem.		Discharging approx.	137.5 / 125.4 V
Converter			SOC = 0.20 / 0.45
Maxi and EURO efficiencies 97.0 / 95.0 %			117.8 / 122.2 V
Total PV power			
Nominal (STC) 48 kWp			
Total 140 modules			
Module area 234 m ²			
Cell area 133 m ²			

Array losses

Thermal Loss factor	DC wiring losses	Serie Diode Loss
Module temperature according to irradiance	Global array res. 70 mΩ	Voltage drop 0.7 V
Uc (const) 29.0 W/m ² K	Loss Fraction 17.4 % at STC	Loss Fraction 0.5 % at STC
Uv (wind) 0.0 W/m ² K/m/s		
Module Quality Loss	Module mismatch losses	Strings Mismatch loss
Loss Fraction -0.2 %	Loss Fraction 2.0 % at MPP	Loss Fraction 0.2 %
IAM loss factor	Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290	

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000



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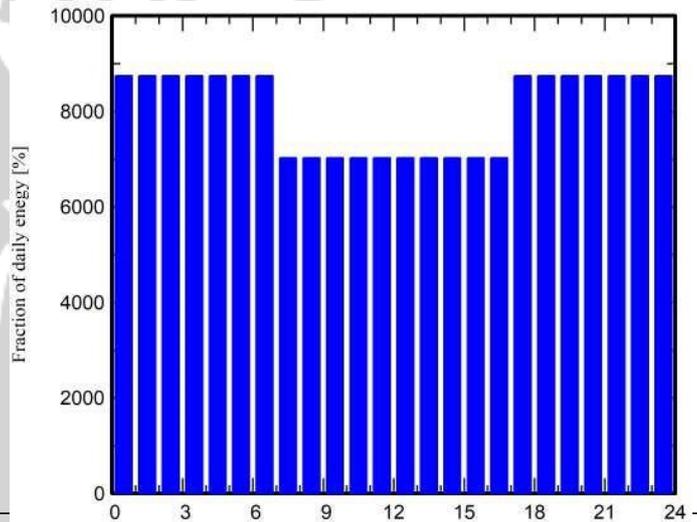
Detailed User's needs

Daily household consumers, Constant over the year, average = 193 kWh/day

Annual values

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	12	130/lamp	24.0	37440
Lamps (LED tangga)	43	40/app	14.0	24080
Lamps (LED or fluo)	33	80/app	24.0	63360
Lamps (LED or fluo)	6		24	30240
Lamps (LED or fluo)	24	65 tot	24.0	37440
Stand-by consumers			24.0	24
Total daily energy				192584

Hourly distribution





PVsyst V7.4.0

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Main results

System Production

Useful energy from solar	60029 kWh/year	Perf. Ratio PR	70.72 %
Available solar energy	63467 kWh/year	Solar Fraction SF	85.40 %
Excess (unused)	1313 kWh/year		

Loss of Load

Time Fraction	15.0 %	Battery aging (State of Wear)	
Missing Energy	10264 kWh/year	Cycles SOW	91.1 %
		Static SOW	93.3 %

Economic evaluation

Investment

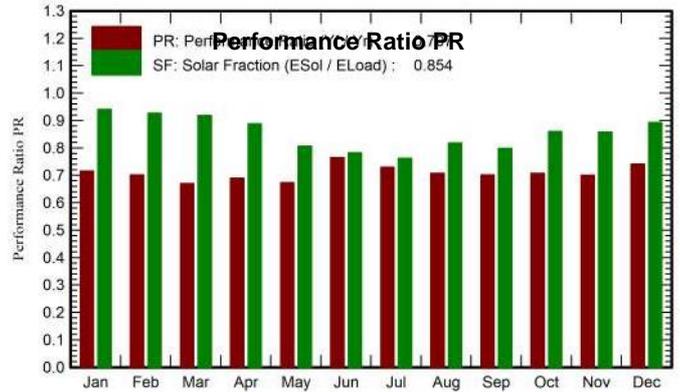
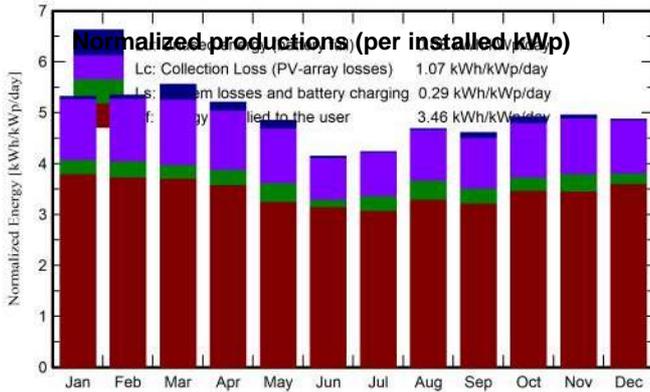
Global	2,185,792,000.00 IDR
Specific	45920 IDR/Wp

Yearly cost

Annuities	0.00 IDR/yr
Run. costs	39,032,000.00 IDR/yr
Payback period	Unprofitable

LCOE

Energy cost	650 IDR/kWh
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Balances and main results

	GlobHor kWh/m ²	GlobEff kWh/m ²	E_Avail kWh	EUunused kWh	E_Miss kWh	E_User kWh	E_Load kWh	SolFrac ratio
January	171.7	160.1	5823	50.8	354	5616	5970	0.941
February	152.9	145.9	5245	71.4	397	4995	5392	0.926
March	171.7	168.3	6058	415.2	484	5486	5970	0.919
April	152.5	152.4	5525	212.9	646	5131	5778	0.888
May	143.2	146.6	5322	197.0	1159	4811	5970	0.806
June	119.0	121.0	4532	25.6	1262	4515	5778	0.782
July	126.0	128.0	4751	0.3	1417	4553	5970	0.763
August	140.7	141.8	5189	0.3	1087	4883	5970	0.818
September	137.0	134.8	4922	120.4	1164	4614	5778	0.799
October	154.3	148.6	5431	149.3	835	5135	5970	0.860
November	153.6	144.7	5272	70.0	822	4956	5778	0.858
December	157.6	146.7	5397	0.0	638	5333	5970	0.893
Year	1780.1	1738.8	63467	1312.9	10264	60029	70293	0.854

Legends

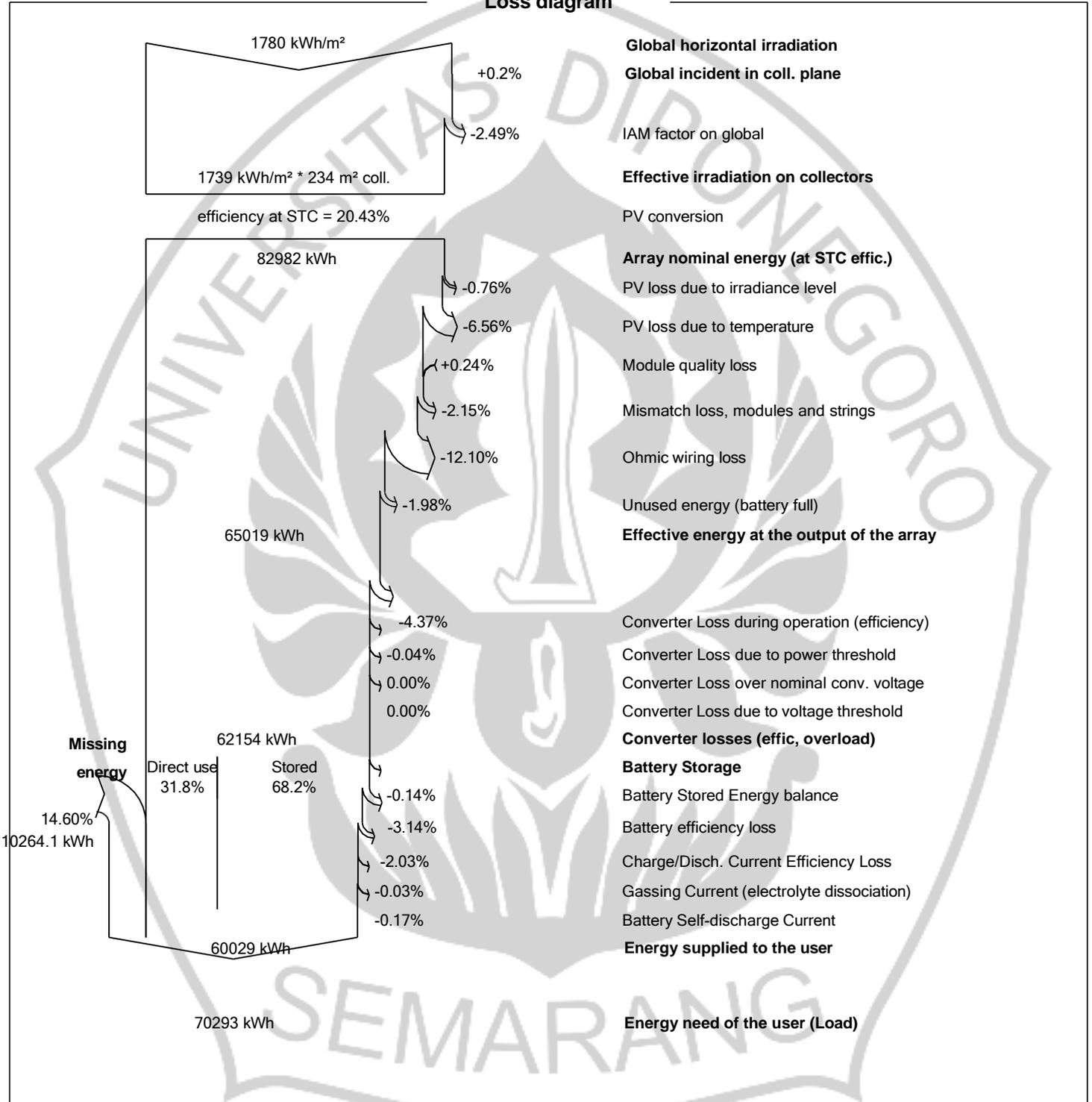
GlobHor	Global horizontal irradiation	E_User	Energy supplied to the user
GlobEff	Effective Global, corr. for IAM and shadings	E_Load	Energy need of the user (Load)
E_Avail	Available Solar Energy	SolFrac	Solar fraction (EUsed / ELoad)
EUunused	Unused energy (battery full)		
E_Miss	Missing energy		



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with v7.4.0

Loss diagram



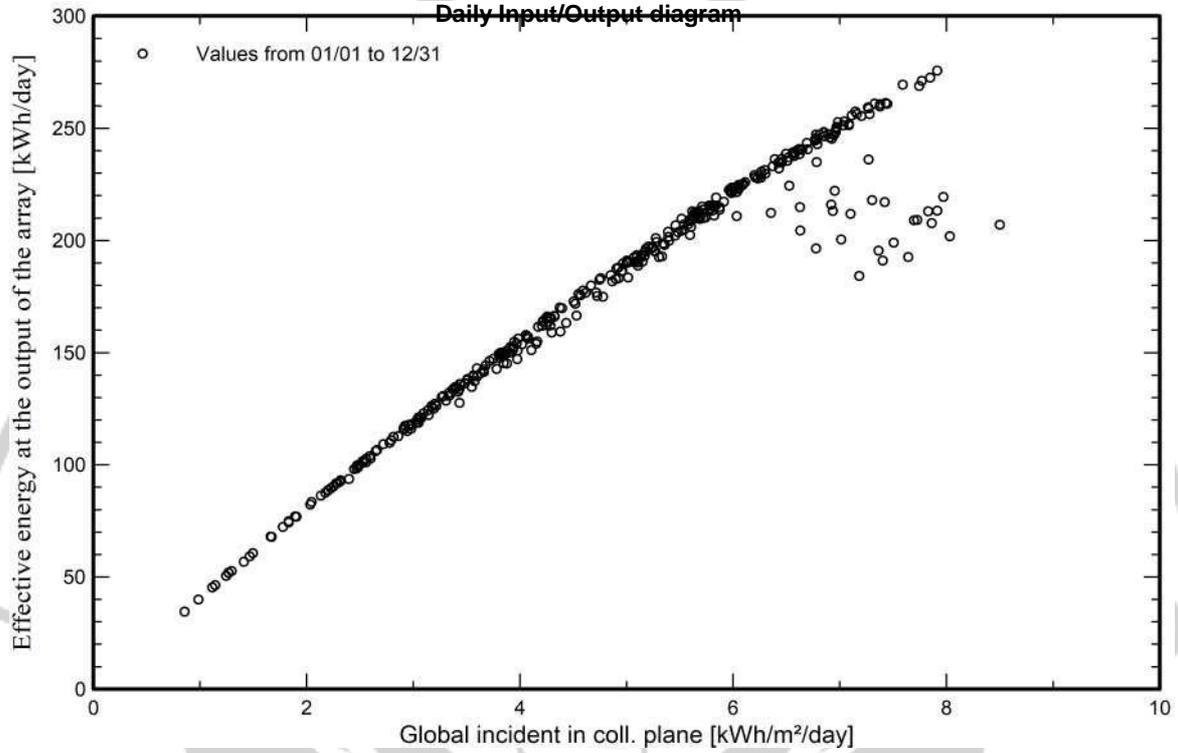


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Predef. graphs

Daily Input/Output diagram



SEMARANG



PVsyst V7.4.0

VC0, Simulation date:
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with v7.4.0

Cost of the system

Installation costs

Item	Quantity units	Cost IDR	Total IDR
PV modules			
AXNG1M340W	140	4,080,000.00	571,200,000.00
Supports for modules	140	340,000.00	47,600,000.00
Batteries	180	2,644,444.44	476,000,000.00
Controllers			428,400,000.00
Other components			
Accessories, fasteners	1	95,200,000.00	95,200,000.00
Wiring	1	142,800,000.00	142,800,000.00
Combiner box	1	23,800,000.00	23,800,000.00
Monitoring system, display screen	1	23,800,000.00	23,800,000.00
Measurement system, pyranometer	1	23,800,000.00	23,800,000.00
Surge arrester	1	23,800,000.00	23,800,000.00
Studies and analysis			
Engineering	1	4,760,000.00	4,760,000.00
Permitting and other admin. Fees	1	4,760,000.00	4,760,000.00
Environmental studies	1	4,760,000.00	4,760,000.00
Economic analysis	1	4,760,000.00	4,760,000.00
Installation			
Global installation cost per module	140	510,000.00	71,400,000.00
Global installation cost per inverter	1	47,600,000.00	47,600,000.00
Global installation cost per battery	180	264,444.44	47,600,000.00
Transport	1	71,400,000.00	71,400,000.00
Settings	1	71,400,000.00	71,400,000.00
Insurance			
Building insurance	1	952,000.00	952,000.00
		Total	2,185,792,000.00
		Depreciable asset	1,618,400,000.00

Operating costs

Item	Total IDR/year
Maintenance	
Salaries	9,520,000.00
Repairs	23,800,000.00
Cleaning	4,760,000.00
Security fund	476,000.00
Bank charges	476,000.00
Total (OPEX)	39,032,000.00

System summary Total installation cost Operating costs
Excess energy (battery full) Used solar energy
Used energy cost



