

ภาคผนวก 2-2

---

ผลการคำนวณประสิทธิภาพการผลิตไฟฟ้า

# PVsyst - Simulation report

## Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Coating and Finishing (Right)

No 3D scene defined, no shadings

System power: 3822 kWp

UACJ, Rayong, Thailand - Thailand



**PVsyst V7.2.6**

VC9, Simulation date:  
22/09/21 12:28  
with v7.2.6

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Coating and Finishing (Right)

### Project summary

<b>Geographical Site</b>		<b>Situation</b>	<b>Project settings</b>
UACJ, Rayong, Thailand		Latitude	12.95 °N
Thailand		Longitude	101.10 °E
		Altitude	109 m
		Time zone	UTC+7
<b>Meteo data</b>			Albedo 0.20
UACJ, Rayong, Thailand			
Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic			

### System summary

<b>Grid-Connected System</b>		<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>		<b>Near Shadings</b>	<b>User's needs</b>
Fixed planes 2 orientations		No Shadings	Unlimited load (grid)
Tilts/azimuths 3 / -165 °			
<b>System Information</b>			
<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	8400 units	Nb. of units	30 units
Pnom total	3822 kWp	Pnom total	3000 kWac
		Pnom ratio	1.274

### Results summary

Produced Energy	5299319 kWh/year	Specific production	1387 kWh/kWp/year	Perf. Ratio PR	79.95 %
-----------------	------------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7

Author



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right)



PVsyst V7.2.6

VC9, Simulation date:  
22/09/21 12:28  
with v7.2.6

### General parameters

#### Grid-Connected System

No 3D scene defined, no shadings

#### PV Field Orientation

**Orientation**  
Fixed planes 2 orientations  
Tilts/azimuths 3 / -165 °  
3 / 15 °

#### Sheds configuration

No 3D scene defined

#### Models used

Transposition Perez  
Diffuse Perez, Meteonorm  
Circumsolar with diffuse

#### Horizon

Free Horizon

#### Near Shadings

No Shadings

#### User's needs

Unlimited load (grid)

### PV Array Characteristics

#### PV module

Manufacturer Next Energy & Resources  
Model NER144M455L-MC  
(Custom parameters definition)  
Unit Nom. Power 455 Wp  
Number of PV modules 8400 units  
Nominal (STC) 3822 kWp  
Modules 420 Strings x 20 In series  
**At operating cond. (50°C)**  
Pmpp 3509 kWp  
U mpp 753 V  
I mpp 4662 A

#### Inverter

Manufacturer Sungrow  
Model SG110CX  
(Custom parameters definition)  
Unit Nom. Power 100 kWac  
Number of inverters 30 units  
Total power 3000 kWac  
Operating voltage 200-1000 V  
Max. power (≥45°C) 110 kWac  
Pnom ratio (DC:AC) 1.27

#### Total PV power

Nominal (STC) 3822 kWp  
Total 8400 modules  
Module area 16258 m²  
Cell area 16584 m²

#### Total inverter power

Total power 3000 kWac  
Nb. of inverters 30 units  
Pnom ratio 1.27

### Array losses

#### Array Soiling Losses

Loss Fraction 3.0 %

#### Thermal Loss factor

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

#### DC wiring losses

Global array res. 4.5 mΩ  
Loss Fraction 2.5 % at STC

#### LID - Light Induced Degradation

Loss Fraction 3.2 %

#### Module Quality Loss

Loss Fraction 0.0 %

#### Module mismatch losses

Loss Fraction 1.0 % at MPP

#### Strings Mismatch loss

Loss Fraction 0.3 %

#### IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right)



PVsyst V7.2.6

VC9, Simulation date:  
22/09/21 12:28  
with v7.2.6

### AC wiring losses

#### Inv. output line up to MV transfo

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC

#### Inverter: SG110CX

Wire section (30 Inv.) Copper 30 x 3 x 70 mm²  
Average wires length 48 m

#### MV line up to Injection

MV Voltage 6.6 kV  
Wires Copper 3 x 185 mm²  
Length 115 m  
Loss Fraction 0.10 % at STC

### AC losses in transformers

#### MV transfo

Grid voltage 6.6 kV  
**Operating losses at STC**  
Nominal power at STC 3757 kVA  
Iron loss (24/24 Connexion) 3.76 kW  
Loss Fraction 0.10 % at STC  
Coils equivalent resistance 3 x 0.38 mΩ  
Loss Fraction 0.90 % at STC



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right)



PVsyst V7.2.6  
VC9, Simulation date:  
22/09/21 12:28  
with v7.2.6

### Main results

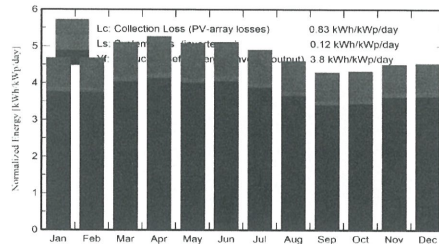
#### System Production

Produced Energy 5299319 kWh/year

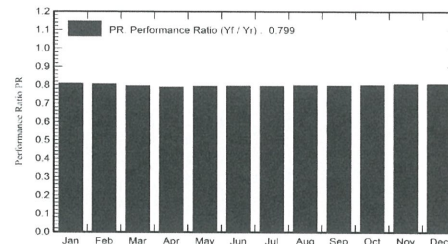
Specific production  
Performance Ratio PR

1387 kWh/kWp/year  
79.95 %

#### Normalized productions (per installed kWp)



#### Performance Ratio PR



### Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	144.9	140.0	462064	447910	0.809
February	132.6	75.29	27.26	130.9	126.3	415721	403048	0.806
March	159.1	82.71	28.44	158.0	152.7	495917	480554	0.796
April	158.0	81.74	29.19	157.9	152.5	491769	476268	0.789
May	156.3	82.31	29.31	157.2	151.8	491972	476771	0.794
June	151.9	82.14	28.78	153.1	147.9	480984	466059	0.796
July	151.1	83.52	28.84	152.0	146.8	477092	462039	0.796
August	142.3	85.59	28.70	142.4	137.5	449145	435017	0.799
September	129.4	71.97	27.66	128.8	124.4	405988	392890	0.798
October	135.3	73.41	27.48	133.9	129.4	423278	409699	0.800
November	137.4	65.56	26.71	134.9	130.3	429725	416146	0.807
December	143.5	59.53	26.53	140.2	135.5	446861	432919	0.808
Year	1745.0	910.76	27.93	1734.3	1675.1	5470515	5299319	0.799

#### Legends

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

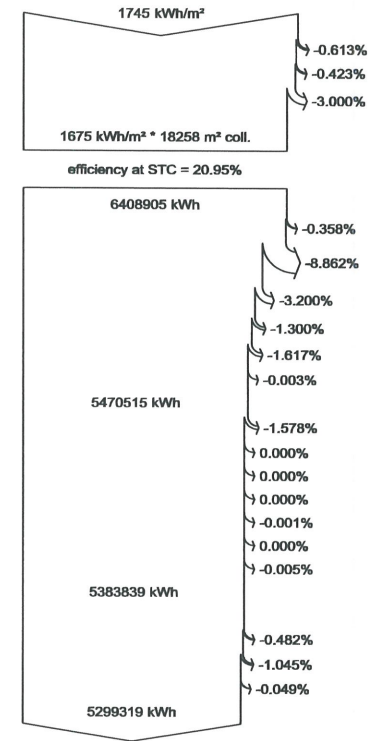


Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right)



PVsyst V7.2.6  
VC9, Simulation date:  
22/09/21 12:28  
with v7.2.6

### Loss diagram



Global horizontal irradiation	1745 kWh/m²
Global incident in coll. plane	-0.613%
IAM factor on global	-0.423%
Soiling loss factor	-3.000%
Effective irradiation on collectors	1675 kWh/m² * 18258 m² coll.
PV conversion	efficiency at STC = 20.95%
Array nominal energy (at STC effic.)	6408905 kWh
PV loss due to irradiance level	-0.358%
PV loss due to temperature	-8.862%
LID - Light induced degradation	-3.200%
Mismatch loss, modules and strings	-1.300%
Ohmic wiring loss	-1.617%
Mixed orientation mismatch loss	-0.003%
Array virtual energy at MPP	5470515 kWh
Inverter Loss during operation (efficiency)	-1.578%
Inverter Loss over nominal inv. power	0.000%
Inverter Loss due to max. input current	0.000%
Inverter Loss over nominal inv. voltage	0.000%
Inverter Loss due to power threshold	-0.001%
Inverter Loss due to voltage threshold	0.000%
Night consumption	-0.005%
Available Energy at Inverter Output	5383839 kWh
AC ohmic loss	-0.482%
Medium voltage transfo loss	-1.045%
MV line ohmic loss	-0.049%
Energy injected into grid	5299319 kWh





PVsyst V7.2.6  
VC9, Simulation date:  
22/09/21 12:28  
with v7.2.6

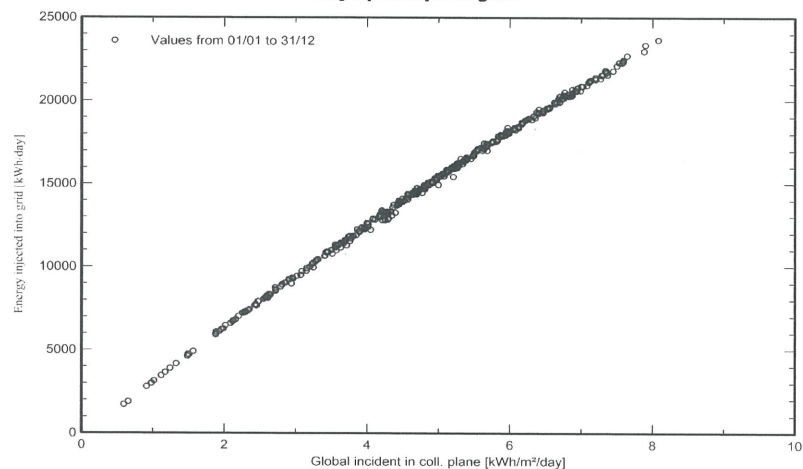
Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right)



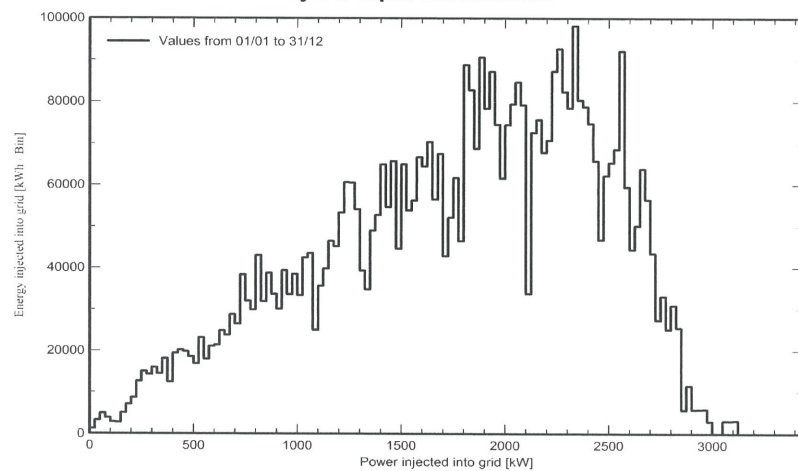
Version 7.2.6

### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution



## PVsyst - Simulation report

### Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Cold Rolling (Left)

No 3D scene defined, no shadings

System power: 2548 kWp

UACJ, Rayong, Thailand - Thailand

Author



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Cold Rolling (Left)



PVsyst V7.2.6

VC2, Simulation date:  
22/09/21 12:46  
with v7.2.6

Project summary			
<div>Geographical Site</div> <div>UACJ, Rayong, Thailand</div> <div>Thailand</div>	<div>Situation</div> <div>Latitude</div> <div>Longitude</div> <div>Altitude</div> <div>Time zone</div>	12.95 °N	<div>Project settings</div> <div>Albedo</div> <div>0.20</div>
		101.10 °E	
		109 m	
		UTC+7	
<div>Meteo data</div> <div>UACJ, Rayong, Thailand</div> <div>Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic</div>			

System summary			
Grid-Connected System		No 3D scene defined, no shadings	
PV Field Orientation		Near Shadings	User's needs
Fixed plane		No Shadings	Unlimited load (grid)
Tilt/Azimuth	3 / 105 °		
System information			
PV Array		Inverters	
Nb. of modules	5600 units	Nb. of units	20 units
Pnom total	2548 kWp	Pnom total	2000 kWac
		Pnom ratio	1.274

Results summary				
Produced Energy	3542692 kWh/year	Specific production	1390 kWh/kWp/year	Perf. Ratio PR
				79.91 %

Table of contents	
Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Cold Rolling (Left)



PVsyst V7.2.6

VC2, Simulation date:  
22/09/21 12:46  
with v7.2.6

General parameters		
<b>Grid-Connected System</b>	<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b> Orientation Fixed plane Tilt/Azimuth	<b>Sheds configuration</b> No 3D scene defined	<b>Models used</b> Transposition Diffuse Circumsolar
		Perez Perez, Meteonorm with diffuse
<b>Horizon</b> Free Horizon	<b>Near Shadings</b> No Shadings	<b>User's needs</b> Unlimited load (grid)

PV Array Characteristics			
<b>PV module</b>		<b>Inverter</b>	
Manufacturer	Next Energy & Resources	Manufacturer	Sungrow
Model	NER144M455L-MC	Model	SG110CX
(Custom parameters definition)			
Unit Nom. Power	455 Wp	Unit Nom. Power	100 kWac
Number of PV modules	5600 units	Number of inverters	20 units
Nominal (STC)	2548 kWp	Total power	2000 kWac
Modules	280 Strings x 20 In series	Operating voltage	200-1000 V
<b>At operating cond. (50°C)</b>		Max. power (=>45°C)	110 kWac
Pmpp	2339 kWp	Pnom ratio (DC:AC)	1.27
U mpp	753 V		
I mpp	3108 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	2548 kWp	Total power	2000 kWac
Total	5600 modules	Nb. of inverters	20 units
Module area	12172 m²	Pnom ratio	1.27
Cell area	11056 m²		

Array losses			
<b>Array Soiling Losses</b>		<b>Thermal Loss factor</b>	
Loss Fraction	3.0 %	Module temperature according to irradiance	
		Uc (const)	20.0 W/m²K
		Uv (wind)	0.0 W/m²K/m/s
<b>LID - Light Induced Degradation</b>		<b>Module Quality Loss</b>	
Loss Fraction	3.2 %	Loss Fraction	0.0 %
<b>Strings Mismatch loss</b>		<b>Module mismatch losses</b>	
Loss Fraction	0.3 %	Loss Fraction	1.0 % at MPP
<b>IAM loss factor</b>			
Incidence effect (IAM): User defined profile			
0°	30°	50°	60°
1.000	1.000	1.000	1.000
			0.999
			0.974
			0.935
			0.859
			0.000



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Cold Rolling (Left)



PVsyst V7.2.6

VC2, Simulation date:  
22/09/21 12:46  
with v7.2.6

### AC wiring losses

#### Inv. output line up to MV transfo

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC  
Inverter: SG110CX  
Wire section (20 Inv.) Copper 20 x 3 x 70 mm<sup>2</sup>  
Average wires length 48 m

#### MV line up to Injection

MV Voltage 6.6 kV  
Wires Copper 3 x 70 mm<sup>2</sup>  
Length 66 m  
Loss Fraction 0.10 % at STC

### AC losses in transformers

MV transfo  
Grid voltage 6.6 kV  
Operating losses at STC  
Nominal power at STC 2505 kVA  
Iron loss (24/24 Connexion) 2.50 kW  
Loss Fraction 0.10 % at STC  
Coils equivalent resistance 3 x 0.57 mΩ  
Loss Fraction 0.90 % at STC



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Cold Rolling (Left)



PVsyst V7.2.6

VC2, Simulation date:  
22/09/21 12:46  
with v7.2.6

### Main results

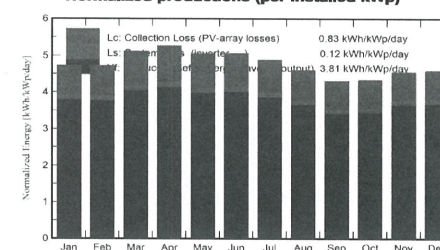
#### System Production

Produced Energy 3542692 kWh/year

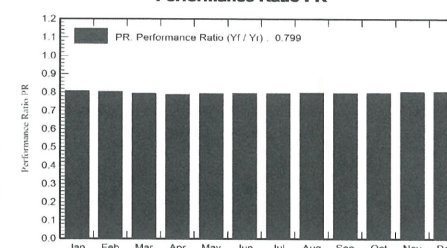
Specific production  
Performance Ratio PR

1390 kWh/kWp/year  
79.91 %

#### Normalized productions (per installed kWp)



#### Performance Ratio PR



### Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	146.7	141.7	311342	301788	0.808
February	132.6	75.29	27.26	132.1	127.6	279577	271047	0.805
March	159.1	82.71	28.44	158.4	153.0	331215	320953	0.795
April	158.0	81.74	29.19	157.9	152.6	327899	317564	0.789
May	156.3	82.31	29.31	156.4	151.1	326404	316313	0.794
June	151.9	82.14	28.78	151.7	146.5	317803	307945	0.797
July	151.1	83.52	28.84	151.4	146.2	316842	306833	0.796
August	142.3	85.59	28.70	142.5	137.6	299657	290240	0.799
September	129.4	71.97	27.66	129.3	124.8	271479	262730	0.798
October	135.3	73.41	27.48	134.6	130.0	283318	274221	0.800
November	137.4	65.56	26.71	136.6	132.0	289783	280603	0.806
December	143.5	59.53	26.53	142.3	137.5	301897	292454	0.807
Year	1745.0	910.76	27.93	1739.8	1680.6	3657216	3542692	0.799

#### 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

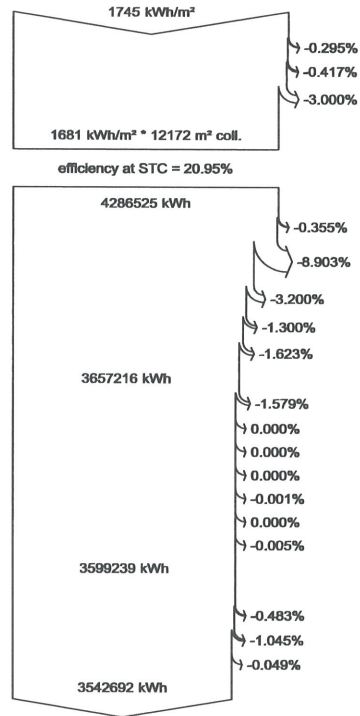


PVsyst V7.2.6  
VC2, Simulation date:  
22/09/21 12:46  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Cold Rolling (Left)



### Loss diagram



Global horizontal irradiation

Global incident in coll. plane

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Mismatch loss, modules and strings

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

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

Energy injected into grid



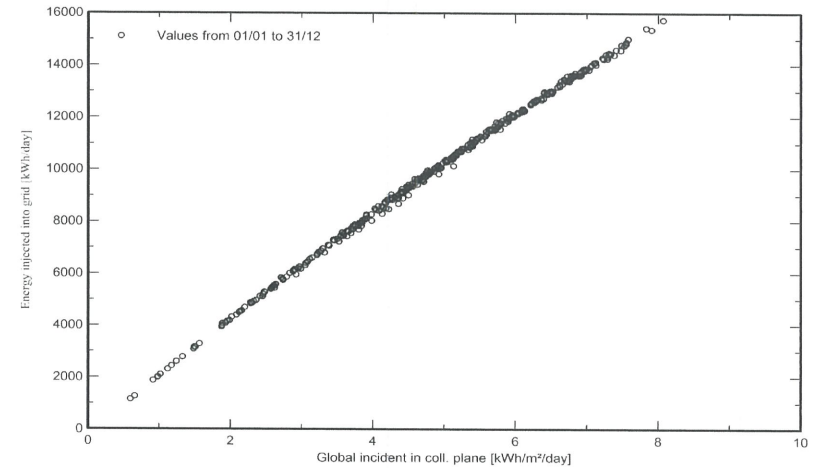
PVsyst V7.2.6  
VC2, Simulation date:  
22/09/21 12:46  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Cold Rolling (Left)

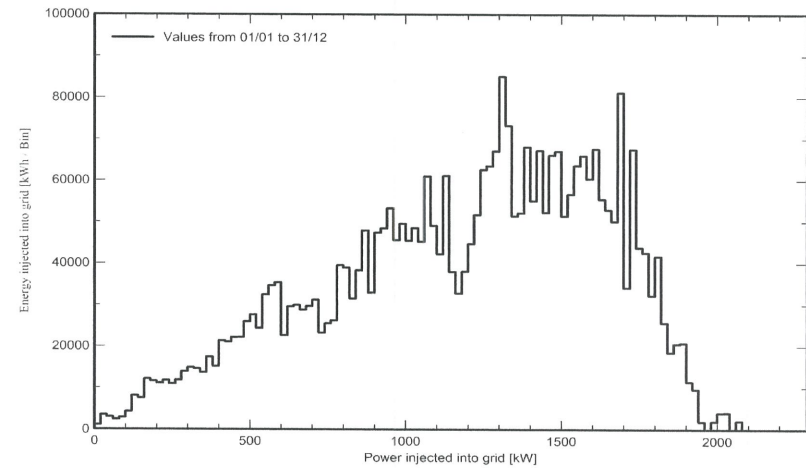


### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution





# PVsyst - Simulation report

## Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Hot Rolling (Left)

No 3D scene defined, no shadings

System power: 2930 kWp

UACJ, Rayong, Thailand - Thailand

### Project summary

<b>Geographical Site</b> UACJ, Rayong, Thailand Thailand	<b>Situation</b>		<b>Project settings</b>	
	Latitude	12.95 °N	Albedo	0.20
	Longitude	101.10 °E		
	Altitude	109 m		
	Time zone	UTC+7		
<b>Meteo data</b> UACJ, Rayong, Thailand Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic				

### System summary

<b>Grid-Connected System</b>		<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>		<b>Near Shadings</b>	<b>User's needs</b>
Fixed planes	2 orientations	No Shadings	Unlimited load (grid)
Tilts/azimuths	3 / 105 °		
	3 / -75 °		
<b>System Information</b>			
<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	6440 units	Nb. of units	23 units
Pnom total	2930 kWp	Pnom total	2300 kWac
		Pnom ratio	1.274

### Results summary

Produced Energy	4079614 kWh/year	Specific production	1392 kWh/kWp/year	Perf. Ratio PR	79.91 %
-----------------	------------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7

Author





Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Left)



**PVsyst V7.2.6**

VC3, Simulation date:  
22/09/21 12:48  
with v7.2.6

**General parameters**

**Grid-Connected System**

No 3D scene defined, no shadings

**PV Field Orientation**

**Orientation**  
Fixed planes 2 orientations  
Tilts/azimuths 3 / 105 °  
3 / -75 °

**Sheds configuration**

No 3D scene defined

**Models used**

Transposition Perez  
Diffuse Perez, Meteonorm  
Circumsolar with diffuse

**Horizon**

Free Horizon

**Near Shadings**

No Shadings

**User's needs**

Unlimited load (grid)

**PV Array Characteristics**

**PV module**

Manufacturer Next Energy & Resources  
Model NER144M455L-MC  
(Custom parameters definition)

Unit Nom. Power 455 Wp  
Number of PV modules 6440 units  
Nominal (STC) 2930 kWp  
Modules 322 Strings x 20 In series

**At operating cond. (50°C)**

Pmpp 2690 kWp  
U mpp 753 V  
I mpp 3574 A

**Total PV power**

Nominal (STC) 2930 kWp  
Total 6440 modules  
Module area 13998 m²  
Cell area 12714 m²

**Inverter**

Manufacturer Sungrow  
Model SG110CX  
(Custom parameters definition)

Unit Nom. Power 100 kWac  
Number of inverters 23 units  
Total power 2300 kWac  
Operating voltage 200-1000 V  
Max. power (=>45°C) 110 kWac  
Pnom ratio (DC:AC) 1.27

**Total inverter power**

Total power 2300 kWac  
Nb. of inverters 23 units  
Pnom ratio 1.27

**Array losses**

**Array Soiling Losses**

Loss Fraction 3.0 %

**Thermal Loss factor**

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

**DC wiring losses**

Global array res. 5.9 mΩ  
Loss Fraction 2.5 % at STC

**LID - Light Induced Degradation**

Loss Fraction 3.2 %

**Module Quality Loss**

Loss Fraction 0.0 %

**Module mismatch losses**

Loss Fraction 1.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.3 %

**IAM loss factor**

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Left)



**PVsyst V7.2.6**

VC3, Simulation date:  
22/09/21 12:48  
with v7.2.6

**AC wiring losses**

**Inv. output line up to MV transfo**

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC

**Inverter: SG110CX**

Wire section (23 Inv.) Copper 23 x 3 x 70 mm²  
Average wires length 48 m

**MV line up to Injection**

MV Voltage 6.6 kV  
Wires Copper 3 x 70 mm²  
Length 57 m  
Loss Fraction 0.10 % at STC

**AC losses in transformers**

**MV transfo**

Grid voltage 6.6 kV

**Operating losses at STC**

Nominal power at STC 2880 kVA  
Iron loss (24/24 Connexion) 2.88 kW  
Loss Fraction 0.10 % at STC  
Coils equivalent resistance 3 x 0.50 mΩ  
Loss Fraction 0.90 % at STC





PVsyst V7.2.6

VC3, Simulation date:  
22/09/21 12:48  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Left)



PVsyst V7.2.6  
VC3, Simulation date:  
22/09/21 12:48  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Left)



### Main results

#### System Production

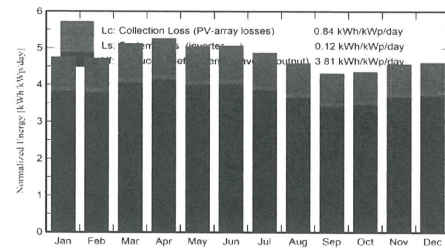
Produced Energy

4079614 kWh/year

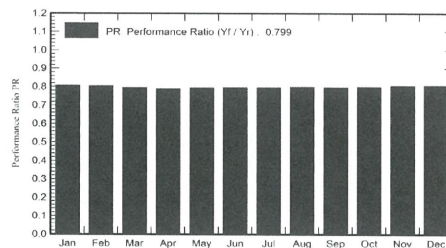
Specific production  
Performance Ratio PR

1392 kWh/kWp/year  
79.91 %

#### Normalized productions (per installed kWp)



#### Performance Ratio PR



### Balances and main results

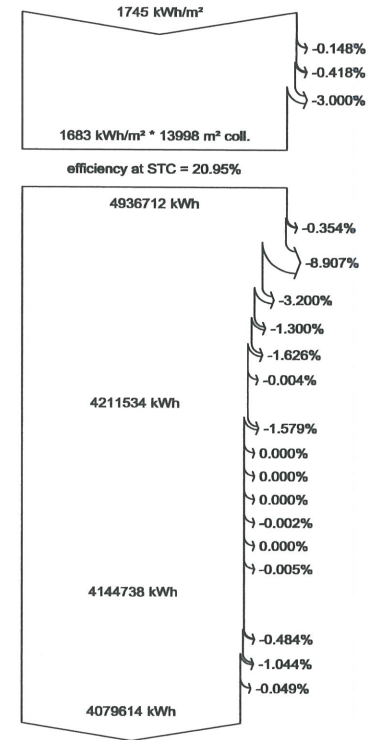
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	147.4	142.4	359751	348710	0.807
February	132.6	75.29	27.26	132.4	127.8	322065	312235	0.805
March	159.1	82.71	28.44	158.8	153.4	381705	369871	0.795
April	158.0	81.74	29.19	157.9	152.6	377039	365150	0.789
May	156.3	82.31	29.31	156.3	151.0	375164	363569	0.794
June	151.9	82.14	28.78	151.8	146.6	365710	354359	0.797
July	151.1	83.52	28.84	151.2	146.0	363965	352468	0.796
August	142.3	85.59	28.70	142.3	137.4	344123	333304	0.799
September	129.4	71.97	27.66	129.3	124.9	312246	302175	0.798
October	135.3	73.41	27.48	134.9	130.4	326620	316126	0.799
November	137.4	65.56	26.71	137.0	132.4	334309	323718	0.806
December	143.5	59.53	26.53	143.0	138.2	348837	337929	0.807
Year	1745.0	910.76	27.93	1742.4	1683.0	4211534	4079614	0.799

#### 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

### Loss diagram



Global horizontal irradiation  
Global incident in coll. plane  
IAM factor on global  
Soiling loss factor  
Effective irradiation on collectors  
PV conversion  
Array nominal energy (at STC effic.)  
PV loss due to irradiance level  
PV loss due to temperature  
LID - Light induced degradation  
Mismatch loss, modules and strings  
Ohmic wiring loss  
Mixed orientation mismatch 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  
AC ohmic loss  
Medium voltage transfo loss  
MV line ohmic loss  
Energy injected into grid



**PVsyst V7.2.6**  
VC3, Simulation date:  
22/09/21 12:48  
with v7.2.6

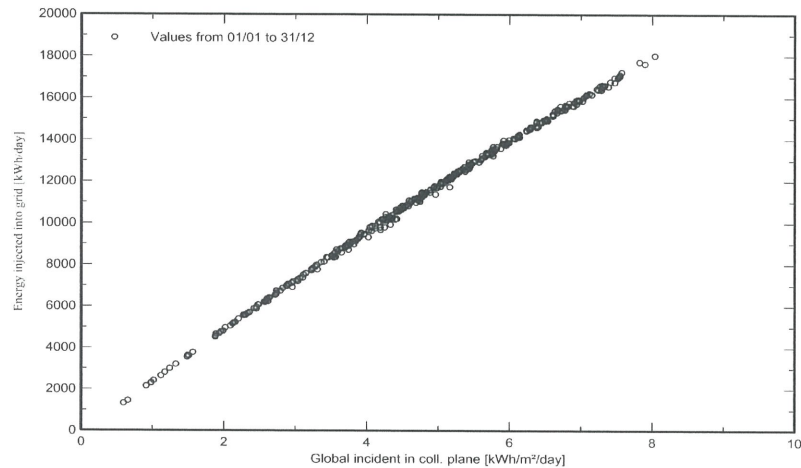
Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Left)



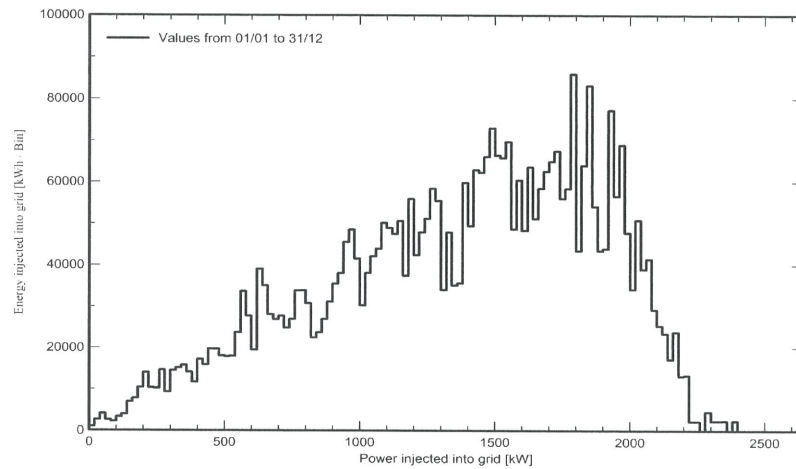
Version 7.2.6

### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution



## PVsyst - Simulation report

### Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Hot Rolling (Right)

No 3D scene defined, no shadings

System power: 1274 kWp

UACJ, Rayong, Thailand - Thailand

Author



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Right)



PVsyst V7.2.6

VC4, Simulation date:  
22/09/21 12:49  
with v7.2.6

Project summary			
<b>Geographical Site</b> UACJ, Rayong, Thailand Thailand	<b>Situation</b>		
	Latitude	12.95 °N	
	Longitude	101.10 °E	
	Altitude	109 m	
<b>Meteo data</b> UACJ, Rayong, Thailand Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic	Time zone	UTC+7	
	<b>Project settings</b>		
	Albedo	0.20	

System summary			
Grid-Connected System		No 3D scene defined, no shadings	
PV Field Orientation		Near Shadings	
Fixed planes            2 orientations		No Shadings	
Tilts/azimuths            3 / 105 °		User's needs Unlimited load (grid)	
3 / -75 °			
System information			
PV Array		Inverters	
Nb. of modules	2800 units	Nb. of units	10 units
Pnom total	1274 kWp	Pnom total	1000 kWac
		Pnom ratio	1.274

Results summary				
Produced Energy	1795979 kWh/year	Specific production	1410 kWh/kWp/year	Perf. Ratio PR 80.78 %

Table of contents	
Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Right)



PVsyst V7.2.6

VC4, Simulation date:  
22/09/21 12:49  
with v7.2.6

General parameters			
<b>Grid-Connected System</b>		<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>		<b>Sheds configuration</b>	
Orientation		No 3D scene defined	
Fixed planes 2 orientations		<b>Models used</b>	
Tilts/azimuths 3 / 105 °		Transposition Perez	
3 / -75 °		Diffuse Perez, Meteonorm	
		Circumsolar with diffuse	
<b>Horizon</b>		<b>Near Shadings</b>	
Free Horizon		No Shadings	
		<b>User's needs</b>	
		Unlimited load (grid)	

PV Array Characteristics			
<b>PV module</b>		<b>Inverter</b>	
Manufacturer	Next Energy & Resources	Manufacturer	Sungrow
Model	NER144M455L-MC	Model	SG110CX
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	455 Wp	Unit Nom. Power	100 kWac
Number of PV modules	2800 units	Number of inverters	10 units
Nominal (STC)	1274 kWp	Total power	1000 kWac
Modules	140 Strings x 20 In series	Operating voltage	200-1000 V
At operating cond. (50°C)		Max. power (=>45°C)	110 kWac
Pmpp	1170 kWp	Pnom ratio (DC:AC)	1.27
U mpp	753 V		
I mpp	1554 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	1274 kWp	Total power	1000 kWac
Total	2800 modules	Nb. of inverters	10 units
Module area	6086 m²	Pnom ratio	1.27
Cell area	5528 m²		

Array losses								
<b>Array Soiling Losses</b>			<b>Thermal Loss factor</b>			<b>DC wiring losses</b>		
Loss Fraction		3.0 %	Module temperature according to irradiance			Global array res.		13 mΩ
			Uc (const)		20.0 W/m²K	Loss Fraction		2.5 % at STC
			Uv (wind)		0.0 W/m²K/m/s			
<b>LID - Light Induced Degradation</b>			<b>Module Quality Loss</b>			<b>Module mismatch losses</b>		
Loss Fraction		3.2 %	Loss Fraction		0.0 %	Loss Fraction		1.0 % at MPP
<b>Strings Mismatch loss</b>								
Loss Fraction		0.3 %						
<b>IAM loss factor</b>								
Incidence effect (IAM): User defined profile								
0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Right)



PVsyst V7.2.6

VC4, Simulation date:  
22/09/21 12:49  
with v7.2.6

AC wiring losses

Inv. output line up to injection point

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC  
Inverter: SG110CX  
Wire section (10 Inv.) Copper 10 x 3 x 70 mm<sup>2</sup>  
Average wires length 48 m



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Right)



PVsyst V7.2.6

VC4, Simulation date:  
22/09/21 12:49  
with v7.2.6

Main results

System Production

Produced Energy

1795979 kWh/year

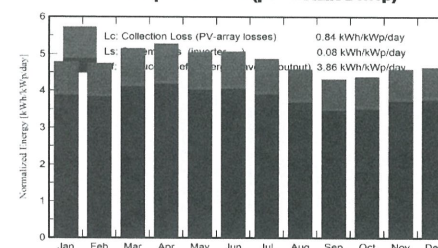
Specific production

1410 kWh/kWp/year

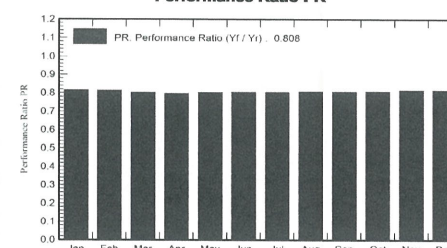
Performance Ratio PR

80.78 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	148.2	143.2	157221	154059	0.816
February	132.6	75.29	27.26	132.7	128.1	140287	137491	0.814
March	159.1	82.71	28.44	159.2	153.8	166338	162927	0.803
April	158.0	81.74	29.19	157.9	152.6	163905	160457	0.797
May	156.3	82.31	29.31	156.2	150.9	163019	159691	0.802
June	151.9	82.14	28.78	151.9	146.7	159118	155835	0.805
July	151.1	83.52	28.84	151.0	145.8	158052	154738	0.805
August	142.3	85.59	28.70	142.1	137.2	149389	146300	0.808
September	129.4	71.97	27.66	129.3	124.9	135781	132930	0.807
October	135.3	73.41	27.48	135.3	130.8	142391	139407	0.809
November	137.4	65.56	26.71	137.5	132.9	145855	142808	0.815
December	143.5	59.53	26.53	143.8	138.9	152460	149336	0.815
Year	1745.0	910.76	27.93	1745.2	1685.7	1833816	1795979	0.808

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



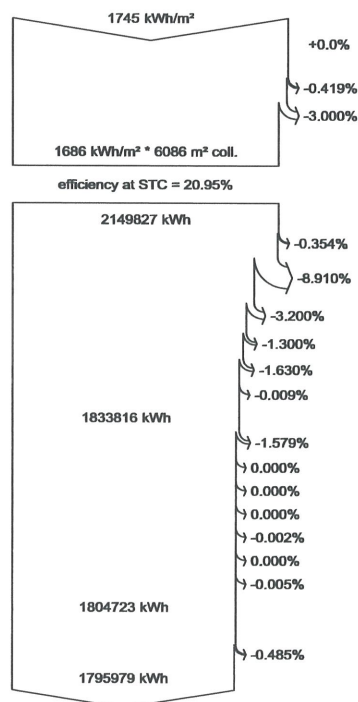
PVsyst V7.2.6

VC4, Simulation date:  
22/09/21 12:49  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Right)



### Loss diagram



**Global horizontal irradiation**  
**Global incident in coll. plane**

IAM factor on global  
Soiling loss factor

**Effective irradiation on collectors**  
PV conversion

**Array nominal energy (at STC effic.)**  
PV loss due to irradiance level  
PV loss due to temperature

LID - Light induced degradation  
Mismatch loss, modules and strings  
Ohmic wiring loss  
Mixed orientation mismatch 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**

AC ohmic loss  
**Energy injected into grid**



PVsyst V7.2.6

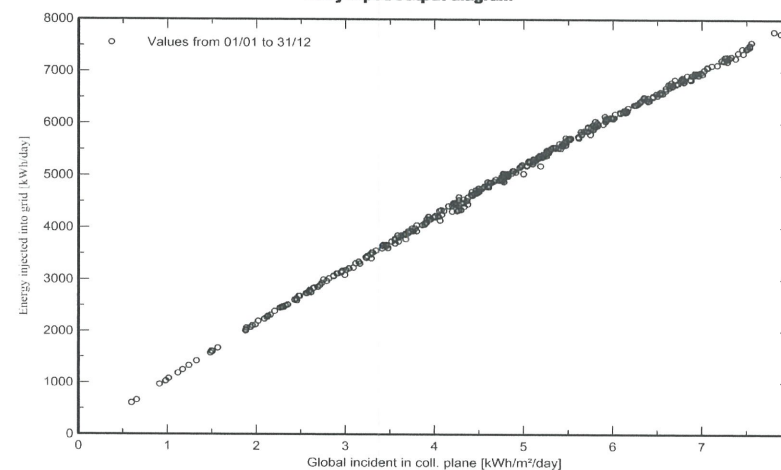
VC4, Simulation date:  
22/09/21 12:49  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Hot Rolling (Right)

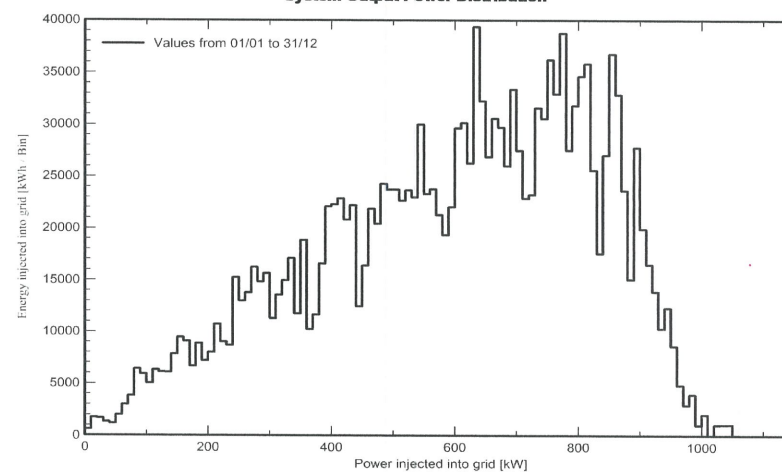


### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution





# PVsyst - Simulation report

## Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Office

No 3D scene defined, no shadings

System power: 127 kWp

UACJ, Rayong, Thailand - Thailand



**PVsyst V7.2.6**

VC7, Simulation date:  
22/09/21 12:28  
with v7.2.6

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Office

### Project summary

<b>Geographical Site</b>		<b>Situation</b>	<b>Project settings</b>
UACJ, Rayong, Thailand		Latitude	12.95 °N
Thailand		Longitude	101.10 °E
		Altitude	109 m
		Time zone	UTC+7
<b>Meteo data</b>			Albedo 0.20
UACJ, Rayong, Thailand			
Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic			

### System summary

<b>Grid-Connected System</b>		<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>		<b>Near Shadings</b>	<b>User's needs</b>
Fixed plane		No Shadings	Unlimited load (grid)
Tilt/Azimuth			
3 / 105 °			
<b>System information</b>			
<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	280 units	Nb. of units	1 Unit
Pnom total	127 kWp	Pnom total	100 kWac
		Pnom ratio	1.274

### Results summary

Produced Energy	178366 kWh/year	Specific production	1400 kWh/kWp/year	Perf. Ratio PR	80.47 %
-----------------	-----------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7

Author





# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Office



## PVsyst V7.2.6

VC7, Simulation date:  
22/09/21 12:26  
with v7.2.6

### General parameters

#### Grid-Connected System

No 3D scene defined, no shadings

#### PV Field Orientation

Orientation  
Fixed plane  
Tilt/Azimuth 3 / 105 °

Sheds configuration  
No 3D scene defined

#### Models used

Transposition Perez  
Diffuse Perez, Meteonorm  
Circumsolar with diffuse

#### Horizon

Free Horizon

Near Shadings  
No Shadings

#### User's needs

Unlimited load (grid)

### PV Array Characteristics

#### PV module

Manufacturer Next Energy & Resources  
Model NER144M455L-MC  
(Custom parameters definition)

Unit Nom. Power 455 Wp  
Number of PV modules 280 units  
Nominal (STC) 127 kWp  
Modules 20 Strings x 14 In series  
At operating cond. (50°C)  
Pmpp 117 kWp  
U mpp 527 V  
I mpp 222 A

#### Total PV power

Nominal (STC) 127 kWp  
Total 280 modules  
Module area 609 m²  
Cell area 553 m²

#### Inverter

Manufacturer Sungrow  
Model SG110CX  
(Custom parameters definition)

Unit Nom. Power 100 kWac  
Number of Inverters 1 unit  
Total power 100 kWac  
Operating voltage 200-1000 V  
Max. power (⇒45°C) 110 kWac  
Pnom ratio (DC:AC) 1.27

#### Total inverter power

Total power 100 kWac  
Nb. of inverters 1 Unit  
Pnom ratio 1.27

### Array losses

#### Array Soiling Losses

Loss Fraction 3.0 %

#### Thermal Loss factor

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

#### DC wiring losses

Global array res. 66 mΩ  
Loss Fraction 2.5 % at STC

#### LID - Light Induced Degradation

Loss Fraction 3.2 %

#### Module Quality Loss

Loss Fraction 0.0 %

#### Module mismatch losses

Loss Fraction 1.0 % at MPP

#### Strings Mismatch loss

Loss Fraction 0.3 %

#### IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Office



## PVsyst V7.2.6

VC7, Simulation date:  
22/09/21 12:26  
with v7.2.6

### AC wiring losses

#### Inv. output line up to injection point

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC  
Inverter: SG110CX  
Wire section (1 Inv.) Copper 1 x 3 x 70 mm²  
Wires length 48 m



PVsyst V7.2.6

VC7, Simulation date:  
22/09/21 12:28  
with v7.2.6

## Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Office



PVsyst V7.2.6

VC7, Simulation date:  
22/09/21 12:28  
with v7.2.6

## Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Office



### Main results

#### System Production

Produced Energy

178366 kWh/year

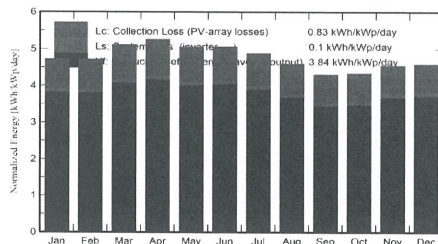
Specific production

1400 kWh/kWp/year

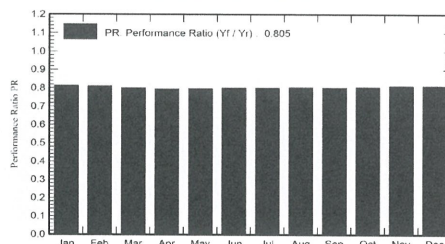
Performance Ratio PR

80.47 %

#### Normalized productions (per installed kWp)



#### Performance Ratio PR



### Balances and main results

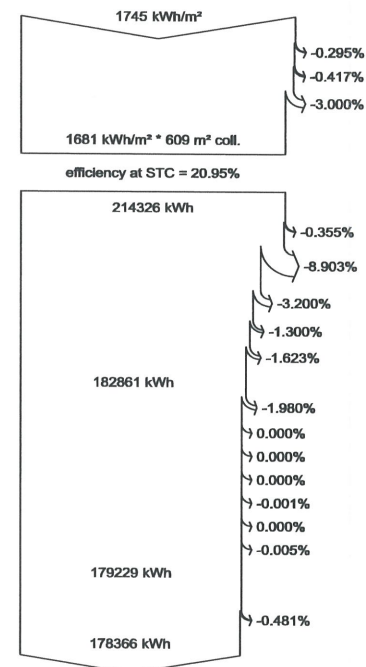
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	146.7	141.7	15567	15196	0.813
February	132.6	75.29	27.26	132.1	127.6	13979	13647	0.811
March	159.1	82.71	28.44	158.4	153.0	16561	16156	0.801
April	158.0	81.74	29.19	157.9	152.6	16395	15983	0.794
May	156.3	82.31	29.31	156.4	151.1	16320	15919	0.799
June	151.9	82.14	28.78	151.7	146.5	15890	15499	0.802
July	151.1	83.52	28.84	151.4	146.2	15842	15445	0.801
August	142.3	85.59	28.70	142.5	137.6	14983	14613	0.805
September	129.4	71.97	27.66	129.3	124.8	13574	13232	0.804
October	135.3	73.41	27.48	134.6	130.0	14166	13812	0.805
November	137.4	65.56	26.71	136.6	132.0	14489	14132	0.812
December	143.5	59.53	26.53	142.3	137.5	15095	14730	0.813
Year	1745.0	910.76	27.93	1739.8	1680.6	182961	178366	0.805

#### 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

### Loss diagram



Global horizontal irradiation  
Global incident in coll. plane  
IAM factor on global  
Soiling loss factor  
Effective irradiation on collectors  
PV conversion  
Array nominal energy (at STC eff.)  
PV loss due to irradiance level  
PV loss due to temperature  
LID - Light induced degradation  
Mismatch loss, modules and strings  
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  
AC ohmic loss  
Energy injected into grid



PVsyst V7.2.6  
VC7, Simulation date:  
22/09/21 12:26  
with v7.2.6

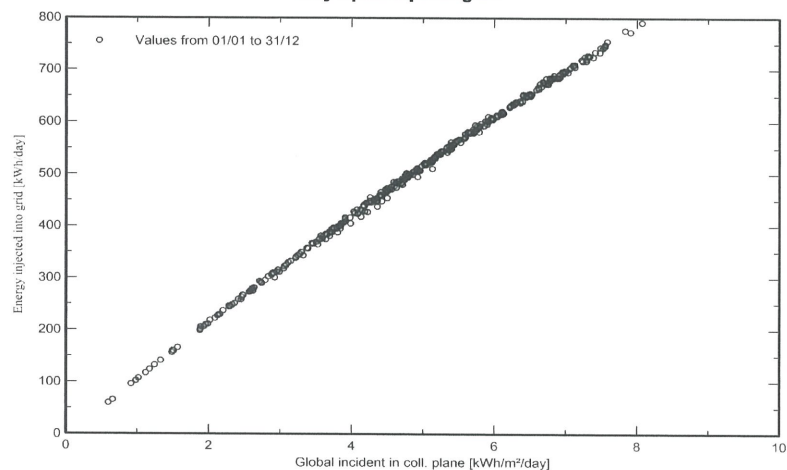
Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Office



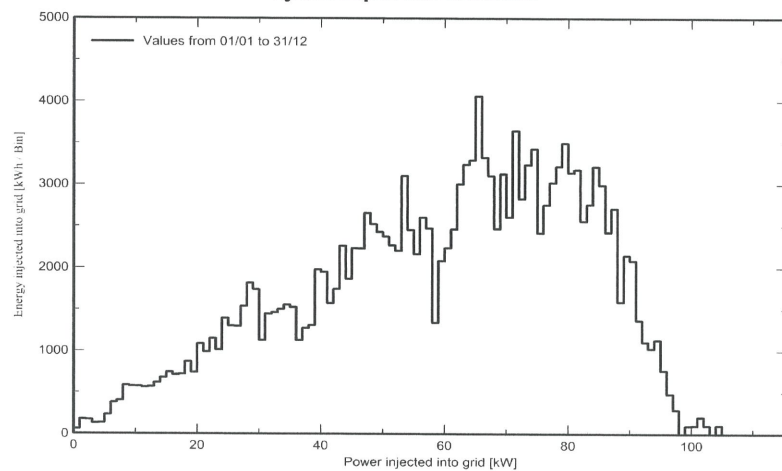
Version 7.2.6

### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution



## PVsyst - Simulation report

### Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - UT1

No 3D scene defined, no shadings

System power: 127 kWp

UACJ, Rayong, Thailand - Thailand

Author



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - UT1



## PVsyst V7.2.6

VC8, Simulation date:  
22/09/21 12:27  
with v7.2.6

### Project summary

<b>Geographical Site</b> UACJ, Rayong, Thailand Thailand	<b>Situation</b>		<b>Project settings</b>	
	Latitude	12.95 °N	Albedo	0.20
	Longitude	101.10 °E		
	Altitude	109 m		
	Time zone	UTC+7		

**Meteo data**  
UACJ, Rayong, Thailand  
Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic

### System summary

Grid-Connected System		No 3D scene defined, no shadings	
PV Field Orientation		Near Shadings	User's needs
Fixed plane		No Shadings	Unlimited load (grid)
Tilt/Azimuth	3 / 105 °		
System information			
PV Array		Inverters	
Nb. of modules	280 units	Nb. of units	1 Unit
Pnom total	127 kWp	Pnom total	100 kWac
		Pnom ratio	1.274

### Results summary

Produced Energy	178366 kWh/year	Specific production	1400 kWh/kWp/year	Perf. Ratio PR	80.47 %
-----------------	-----------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - UT1



## PVsyst V7.2.6

VC8, Simulation date:  
22/09/21 12:27  
with v7.2.6

### General parameters

<b>Grid-Connected System</b>	<b>No 3D scene defined, no shadings</b>		
<b>PV Field Orientation</b>	<b>Sheds configuration</b>	<b>Models used</b>	
Orientation	No 3D scene defined	Transposition	Perez
Fixed plane		Diffuse	Perez, Meteonorm
Tilt/Azimuth	3 / 105 °	Circumsolar	with diffuse
<b>Horizon</b>	<b>Near Shadings</b>	<b>User's needs</b>	
Free Horizon	No Shadings	Unlimited load (grid)	

### PV Array Characteristics

<b>PV module</b>	<b>Next Energy &amp; Resources</b>	<b>Inverter</b>	<b>Sungrow</b>
Manufacturer		Manufacturer	
Model	NER144M455L-MC	Model	SG110CX
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	455 Wp	Unit Nom. Power	100 kWac
Number of PV modules	280 units	Number of inverters	1 unit
Nominal (STC)	127 kWp	Total power	100 kWac
Modules	20 Strings x 14 In series	Operating voltage	200-1000 V
<b>At operating cond. (50°C)</b>		Max. power (=>45°C)	110 kWac
Pmpp	117 kWp	Pnom ratio (DC:AC)	1.27
U mpp	527 V		
I mpp	222 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	127 kWp	Total power	100 kWac
Total	280 modules	Nb. of inverters	1 Unit
Module area	609 m²	Pnom ratio	1.27
Cell area	553 m²		

### Array losses

<b>Array Soiling Losses</b>	<b>Thermal Loss factor</b>	<b>DC wiring losses</b>
Loss Fraction	3.0 %	Global array res.
		Loss Fraction
		2.5 % at STC
<b>LID - Light Induced Degradation</b>	<b>Module Quality Loss</b>	<b>Module mismatch losses</b>
Loss Fraction	3.2 %	Loss Fraction
		1.0 % at MPP
<b>Strings Mismatch loss</b>		
Loss Fraction	0.3 %	
<b>IAM loss factor</b>		
Incidence effect (IAM): User defined profile		

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - UT1



PVsyst V7.2.6

VC8, Simulation date:  
22/09/21 12:27  
with v7.2.6

## AC wiring losses

### Inv. output line up to injection point

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC  
Inverter: SG110CX  
Wire section (1 Inv.) Copper 1 x 3 x 70 mm<sup>2</sup>  
Wires length 48 m



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - UT1



PVsyst V7.2.6

VC8, Simulation date:  
22/09/21 12:27  
with v7.2.6

## Main results

### System Production

Produced Energy

178366 kWh/year

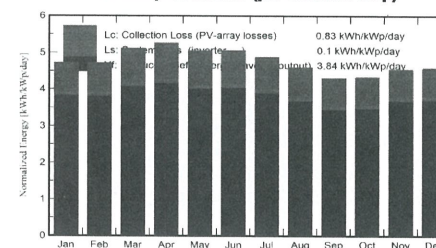
Specific production

1400 kWh/kWp/year

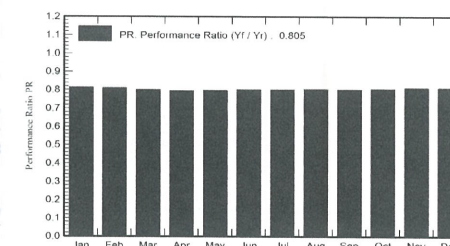
Performance Ratio PR

80.47 %

### Normalized productions (per installed kWp)



### Performance Ratio PR



## Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	146.7	141.7	15567	15196	0.813
February	132.6	75.29	27.26	132.1	127.6	13979	13647	0.811
March	159.1	82.71	28.44	158.4	153.0	16561	16156	0.801
April	158.0	81.74	29.19	157.9	152.6	16395	15983	0.794
May	156.3	82.31	29.31	156.4	151.1	16320	15919	0.799
June	151.9	82.14	28.78	151.7	146.5	15890	15499	0.802
July	151.1	83.52	28.84	151.4	146.2	15842	15445	0.801
August	142.3	85.59	28.70	142.5	137.6	14983	14613	0.805
September	129.4	71.97	27.66	129.3	124.8	13574	13232	0.804
October	135.3	73.41	27.48	134.6	130.0	14166	13812	0.805
November	137.4	65.56	26.71	136.6	132.0	14489	14132	0.812
December	143.5	59.53	26.53	142.3	137.5	15095	14730	0.813
Year	1745.0	910.76	27.93	1739.8	1680.6	182861	178366	0.805

### 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



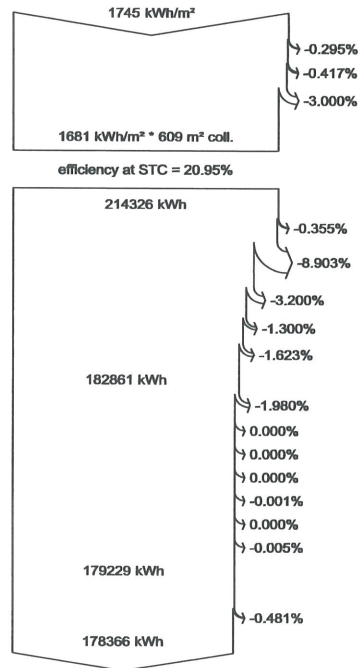


PVsyst V7.2.6  
VC8, Simulation date:  
22/09/21 12:27  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT1



### Loss diagram



Global horizontal irradiation

Global incident in coll. plane

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effc.)

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Mismatch loss, modules and strings

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

AC ohmic loss

Energy injected into grid



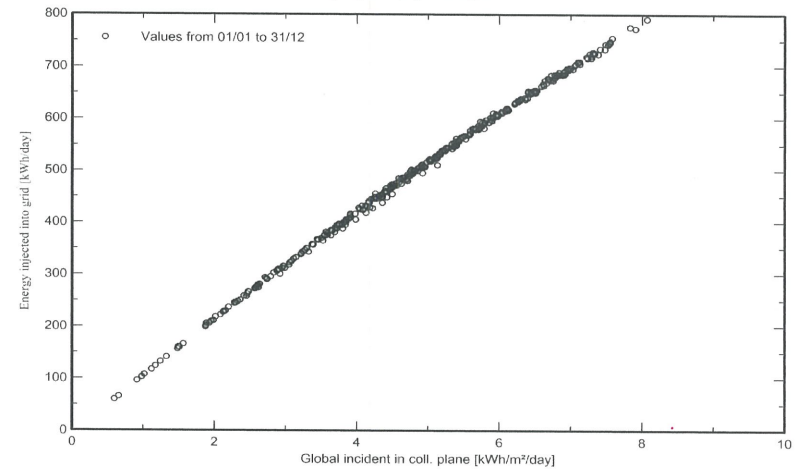
PVsyst V7.2.6  
VC8, Simulation date:  
22/09/21 12:27  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT1

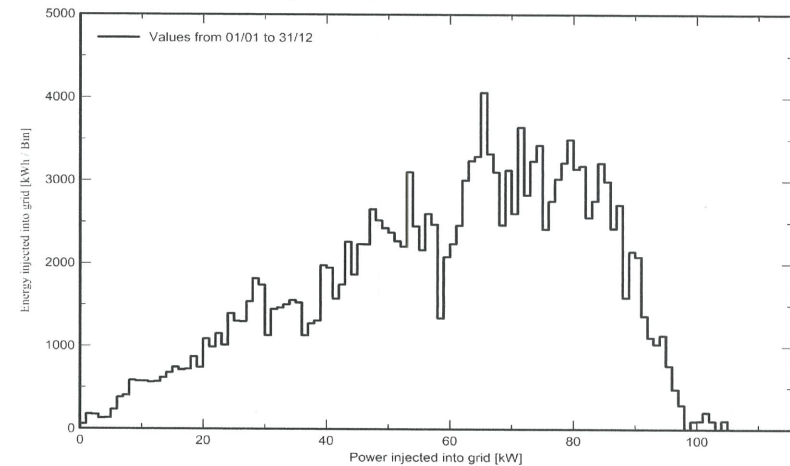


### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution





# PVsyst - Simulation report

## Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - UT2 & Waste Storage

No 3D scene defined, no shadings

System power: 382 kWp

UACJ, Rayong, Thailand - Thailand



PVsyst V7.2.6

VC6, Simulation date:  
22/09/21 12:25  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT2 & Waste Storage

### Project summary

<b>Geographical Site</b>	<b>Situation</b>	<b>Project settings</b>
UACJ, Rayong, Thailand	Latitude 12.95 °N	Albedo 0.20
Thailand	Longitude 101.10 °E	
	Altitude 109 m	
	Time zone UTC+7	
<b>Meteo data</b>		
UACJ, Rayong, Thailand		
Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic		

### System summary

<b>Grid-Connected System</b>	<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>	<b>Near Shadings</b>	<b>User's needs</b>
Fixed planes 2 orientations	No Shadings	Unlimited load (grid)
Tilts/azimuths 3 / 105 °		
3 / -75 °		
<b>System information</b>		
<b>PV Array</b>	<b>Inverters</b>	
Nb. of modules 840 units	Nb. of units 3 units	
Pnom total 382 kWp	Pnom total 300 kWac	
	Pnom ratio 1.274	

### Results summary

Produced Energy	538155 kWh/year	Specific production	1408 kWh/kWp/year	Perf. Ratio PR	80.79 %
-----------------	-----------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7

Author



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT2 & Waste Storage



**PVsyst V7.2.6**

VC6, Simulation date:  
22/09/21 12:25  
with v7.2.6

**General parameters**

**Grid-Connected System**

No 3D scene defined, no shadings

**PV Field Orientation**

**Orientation**  
Fixed planes 2 orientations  
Tilts/azimuths 3 / 105 °  
3 / -75 °

**Sheds configuration**

No 3D scene defined

**Models used**

Transposition Perez  
Diffuse Perez, Meteonorm  
Circumsolar with diffuse

**Horizon**

Free Horizon

**Near Shadings**

No Shadings

**User's needs**

Unlimited load (grid)

**PV Array Characteristics**

**PV module**

Manufacturer Next Energy & Resources  
Model NER144M455L-MC

(Custom parameters definition)

Unit Nom. Power 455 Wp  
Number of PV modules 840 units  
Nominal (STC) 382 kWp  
Modules 42 Strings x 20 In series

**At operating cond. (50°C)**

Pmpp 351 kWp  
U mpp 753 V  
I mpp 468 A

**Total PV power**

Nominal (STC) 382 kWp  
Total 840 modules  
Module area 1826 m²  
Cell area 1658 m²

**Inverter**

Manufacturer Sungrow  
Model SG110CX

(Custom parameters definition)

Unit Nom. Power 100 kWac  
Number of inverters 3 units  
Total power 300 kWac  
Operating voltage 200-1000 V  
Max. power (⇒45°C) 110 kWac  
Pnom ratio (DC:AC) 1.27

**Total inverter power**

Total power 300 kWac  
Nb. of inverters 3 units  
Pnom ratio 1.27

**Array losses**

**Array Soiling Losses**

Loss Fraction 3.0 %

**Thermal Loss factor**

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

**DC wiring losses**

Global array res. 45 mΩ  
Loss Fraction 2.5 % at STC

**LID - Light Induced Degradation**

Loss Fraction 3.2 %

**Module Quality Loss**

Loss Fraction 0.0 %

**Module mismatch losses**

Loss Fraction 1.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.3 %

**IAM loss factor**

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT2 & Waste Storage



**PVsyst V7.2.6**

VC6, Simulation date:  
22/09/21 12:25  
with v7.2.6

**AC wiring losses**

**Inv. output line up to Injection point**

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC

**Inverter: SG110CX**

Wire section (3 Inv.) Copper 3 x 3 x 70 mm²  
Average wires length 48 m



PVsyst V7.2.6

VC6, Simulation date:  
22/09/21 12:25  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT2 & Waste Storage



Main results

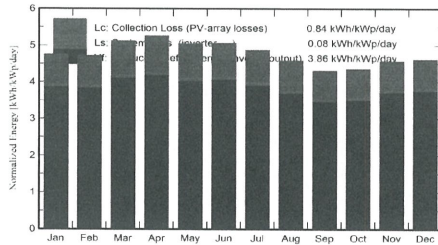
System Production  
Produced Energy

538155 kWh/year

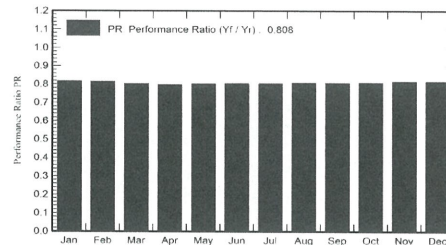
Specific production  
Performance Ratio PR

1408 kWh/kWp/year  
80.79 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	147.5	142.5	46971	46027	0.816
February	132.6	75.29	27.26	132.4	127.9	42027	41190	0.814
March	159.1	82.71	28.44	158.8	153.4	49813	48793	0.804
April	158.0	81.74	29.19	157.9	152.6	49183	48148	0.798
May	156.3	82.31	29.31	156.3	151.0	48930	47930	0.802
June	151.9	82.14	28.78	151.8	146.6	47707	46724	0.805
July	151.1	83.52	28.84	151.1	146.0	47464	46469	0.804
August	142.3	85.59	28.70	142.3	137.4	44874	43947	0.808
September	129.4	71.97	27.66	129.3	124.9	40729	39874	0.807
October	135.3	73.41	27.48	135.0	130.4	42622	41728	0.809
November	137.4	65.56	26.71	137.1	132.5	43631	42719	0.815
December	143.5	59.53	26.53	143.1	138.3	45539	44607	0.815
Year	1745.0	910.76	27.93	1742.8	1683.5	549489	538155	0.808

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



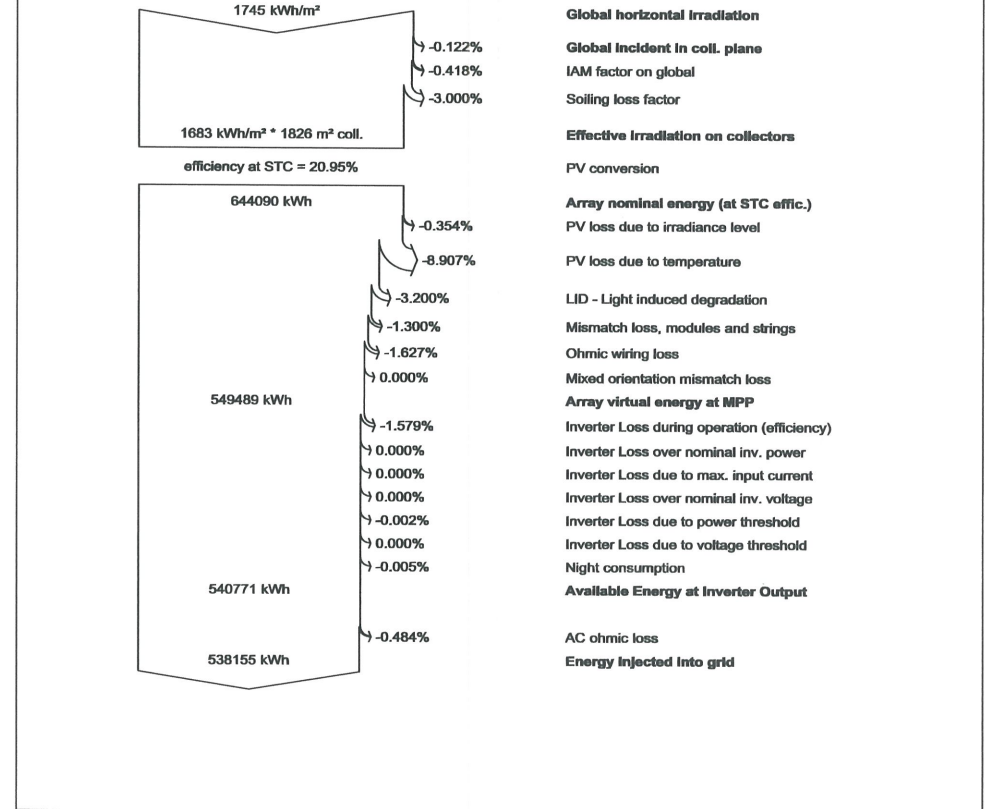
PVsyst V7.2.6

VC6, Simulation date:  
22/09/21 12:25  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT2 & Waste Storage



Loss diagram





PVsyst V7.2.6

VC6, Simulation date:  
22/09/21 12:25  
with v7.2.6

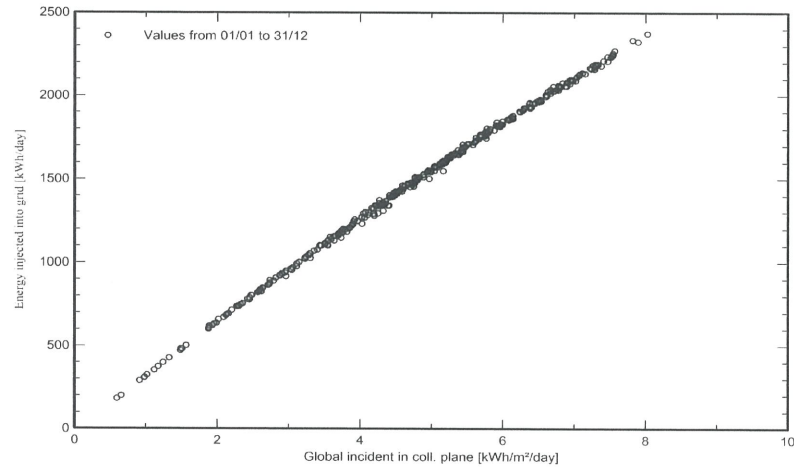
Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - UT2 & Waste Storage



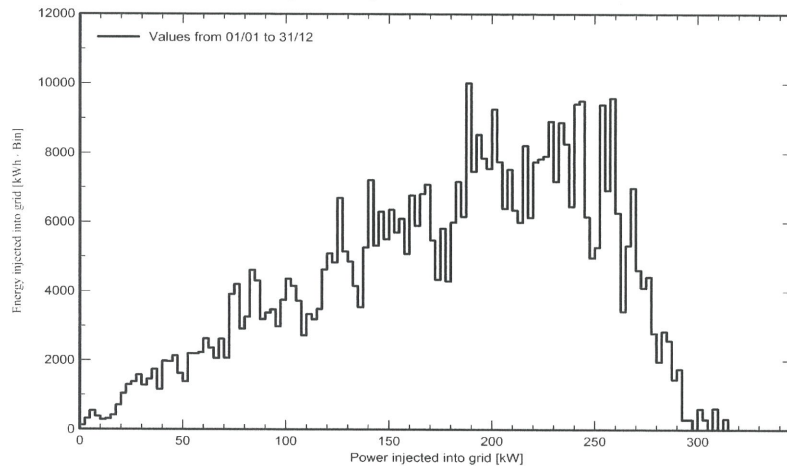
Version 7.2.6

### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution



## PVsyst - Simulation report

### Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Warehouse

No 3D scene defined, no shadings

System power: 1019 kWp

UACJ, Rayong, Thailand - Thailand

Author



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Warehouse



## PVsyst V7.2.6

VC5, Simulation date:  
22/09/21 12:23  
with v7.2.6

### Project summary

**Geographical Site**  
UACJ, Rayong, Thailand  
Thailand

**Situation**  
Latitude 12.95 °N  
Longitude 101.10 °E  
Altitude 109 m  
Time zone UTC+7

**Project settings**  
Albedo 0.20

**Meteo data**  
UACJ, Rayong, Thailand  
Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic

### System summary

**Grid-Connected System**

**No 3D scene defined, no shadings**

**PV Field Orientation**  
Fixed planes 2 orientations  
Tilts/azimuths 3 / -165 °  
3 / 15 °

**Near Shadings**  
No Shadings

**User's needs**  
Unlimited load (grid)

#### System information

<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	2240 units	Nb. of units	8 units
Pnom total	1019 kWp	Pnom total	800 kWac
		Pnom ratio	1.274

### Results summary

Produced Energy	1410206 kWh/year	Specific production	1384 kWh/kWp/year	Perf. Ratio PR	79.57 %
-----------------	------------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7



# Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Warehouse



## PVsyst V7.2.6

VC5, Simulation date:  
22/09/21 12:23  
with v7.2.6

### General parameters

**Grid-Connected System**

**No 3D scene defined, no shadings**

#### PV Field Orientation

**Orientation**  
Fixed planes 2 orientations  
Tilts/azimuths 3 / -165 °  
3 / 15 °

**Sheds configuration**  
No 3D scene defined

**Models used**  
Transposition Perez  
Diffuse Perez, Meteonorm  
Circumsolar with diffuse

**Horizon**  
Free Horizon

**Near Shadings**  
No Shadings

**User's needs**  
Unlimited load (grid)

### PV Array Characteristics

#### PV module

Manufacturer	Next Energy & Resources
Model	NER144M455L-MC
(Custom parameters definition)	
Unit Nom. Power	455 Wp
Number of PV modules	2240 units
Nominal (STC)	1019 kWp
Modules	112 Strings x 20 In series
<b>At operating cond. (50°C)</b>	
Pmpp	936 kWp
U mpp	753 V
I mpp	1243 A

#### Inverter

Manufacturer	Sungrow
Model	SG110CX
(Custom parameters definition)	
Unit Nom. Power	100 kWac
Number of inverters	8 units
Total power	800 kWac
Operating voltage	200-1000 V
Max. power (=>45°C)	110 kWac
Pnom ratio (DC:AC)	1.27

#### Total PV power

Nominal (STC)	1019 kWp
Total	2240 modules
Module area	4869 m²
Cell area	4422 m²

#### Total inverter power

Total power	800 kWac
Nb. of inverters	8 units
Pnom ratio	1.27

### Array losses

#### Array Soiling Losses

Loss Fraction	3.0 %
---------------	-------

#### Thermal Loss factor

Module temperature according to irradiance	
Uc (const)	20.0 W/m²K
Uv (wind)	0.0 W/m²K/m/s

#### DC wiring losses

Global array res.	17 mΩ
Loss Fraction	2.5 % at STC

#### LID - Light Induced Degradation

Loss Fraction	3.2 %
---------------	-------

#### Module Quality Loss

Loss Fraction	0.0 %
---------------	-------

#### Module mismatch losses

Loss Fraction	1.0 % at MPP
---------------	--------------

#### Strings Mismatch loss

Loss Fraction	0.3 %
---------------	-------

#### IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000





PVsyst V7.2.6

VC5. Simulation date:  
22/09/21 12:23  
with v7.2.6

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Warehouse



GREENENERGY

THE ENERGY CONSULTANTS

#### AC wiring losses

##### Inv. output line up to MV transfo

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC  
Inverter: SG110CX  
Wire section (8 Inv.) Copper 8 x 3 x 70 mm<sup>2</sup>  
Average wires length 48 m

##### MV line up to injection

MV Voltage 6.6 kV  
Wires Copper 3 x 50 mm<sup>2</sup>  
Length 1169 m  
Loss Fraction 1.01 % at STC

#### AC losses in transformers

##### MV transfo

Grid voltage 6.6 kV  
Operating losses at STC  
Nominal power at STC 1002 kVA  
Iron loss (24/24 Connexion) 1.00 kW  
Loss Fraction 0.10 % at STC  
Coils equivalent resistance 3 x 1.44 mΩ  
Loss Fraction 0.90 % at STC



PVsyst V7.2.6

VC5. Simulation date:  
22/09/21 12:23  
with v7.2.6

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Warehouse



GREENENERGY

THE ENERGY CONSULTANTS

#### Main results

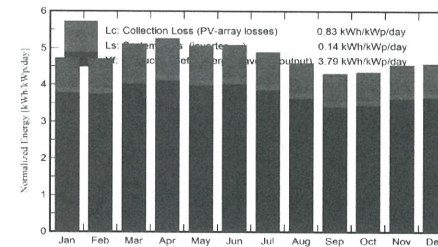
##### System Production

Produced Energy 1410206 kWh/year

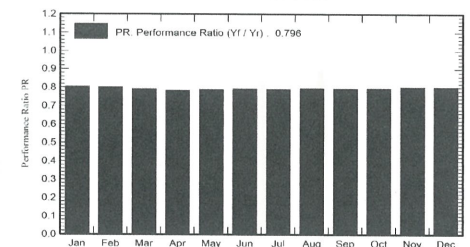
Specific production  
Performance Ratio PR

1384 kWh/kWp/year  
79.57 %

##### Normalized productions (per installed kWp)



##### Performance Ratio PR



#### Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	146.3	141.3	124272	119940	0.804
February	132.6	75.29	27.26	131.6	127.1	111439	107575	0.802
March	159.1	82.71	28.44	158.5	153.1	132566	127866	0.791
April	158.0	81.74	29.19	157.9	152.6	131131	126400	0.785
May	156.3	82.31	29.31	156.8	151.4	130851	126239	0.790
June	151.9	82.14	28.78	152.6	147.4	127808	123288	0.793
July	151.1	83.52	28.84	151.5	146.4	126892	122342	0.792
August	142.3	85.59	28.70	142.3	137.4	119883	115423	0.796
September	129.4	71.97	27.66	129.0	124.6	108432	104476	0.794
October	135.3	73.41	27.48	134.5	130.0	113314	109202	0.796
November	137.4	65.56	26.71	136.0	131.4	115493	111362	0.803
December	143.5	59.53	26.53	141.7	137.0	120356	116092	0.804
Year	1745.0	910.76	27.93	1738.9	1679.6	1462237	1410206	0.796

##### 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



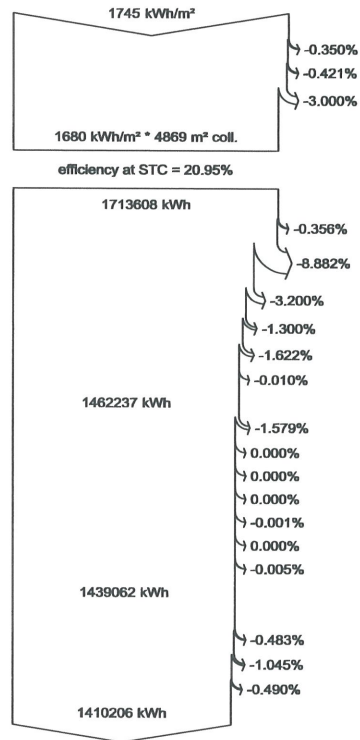


**PVsyst V7.2.6**  
VC5, Simulation date:  
22/09/21 12:23  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Warehouse



### Loss diagram



**Global horizontal irradiation**

**Global incident in coll. plane**

IAM factor on global

Soiling loss factor

**Effective irradiation on collectors**

PV conversion

**Array nominal energy (at STC effic.)**

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Mismatch loss, modules and strings

Ohmic wiring loss

Mixed orientation mismatch 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**

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

**Energy injected into grid**



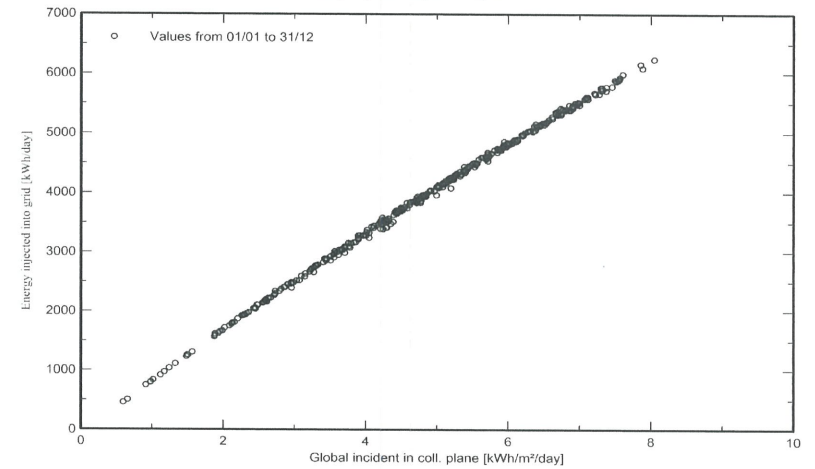
**PVsyst V7.2.6**  
VC5, Simulation date:  
22/09/21 12:23  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Warehouse

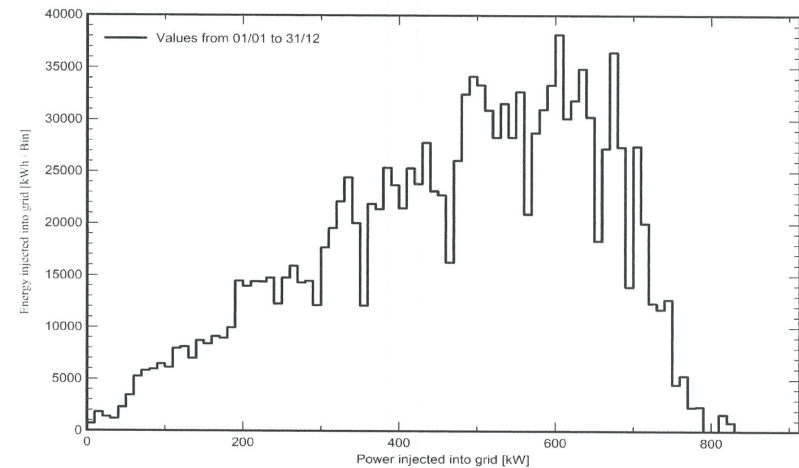


### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution



# PVsyst - Simulation report

## Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Coating and Finishing (Left)

No 3D scene defined, no shadings

System power: 2166 kWp

UACJ, Rayong, Thailand - Thailand



**PVsyst V7.2.6**  
VC0, Simulation date:  
22/09/21 12:16  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Left)

### Project summary

<b>Geographical Site</b> UACJ, Rayong, Thailand Thailand	<b>Situation</b>		<b>Project settings</b>	
	Latitude	12.95 °N	Albedo	0.20
	Longitude	101.10 °E		
	Altitude	109 m		
	Time zone	UTC+7		
<b>Meteo data</b> UACJ, Rayong, Thailand Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic				

### System summary

<b>Grid-Connected System</b>		<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>		<b>Near Shadings</b>	
Fixed planes	2 orientations	<b>User's needs</b>	
Tilts/azimuths	3 / -165 ° 3 / 15 °	Unlimited load (grid)	
<b>System information</b>			
<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	4760 units	Nb. of units	17 units
Pnom total	2166 kWp	Pnom total	1700 kWac
		Pnom ratio	1.274

### Results summary

Produced Energy	3079607 kWh/year	Specific production	1422 kWh/kWp/year	Perf. Ratio PR	81.81 %
-----------------	------------------	---------------------	-------------------	----------------	---------

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Special graphs	7

Author



**PVsyst V7.2.6**

VC0, Simulation date:  
22/09/21 12:16  
with v7.2.6

**General parameters**

**Grid-Connected System**

No 3D scene defined, no shadings

**PV Field Orientation**

**Orientation**  
Fixed planes 2 orientations  
Tilts/azimuths 3 / -165 °  
3 / 15 °

**Sheds configuration**  
No 3D scene defined

**Models used**  
Transposition Perez  
Diffuse Perez, Meteorom  
Circumsolar with diffuse

**Horizon**  
Free Horizon

**Near Shadings**  
No Shadings

**User's needs**  
Unlimited load (grid)

**PV Array Characteristics**

**PV module**

**Manufacturer** Next Energy & Resources  
**Model** NER144M455L-MC  
(Custom parameters definition)

Unit Nom. Power 455 Wp  
Number of PV modules 4760 units  
Nominal (STC) 2166 kWp  
Modules 238 Strings x 20 In series  
**At operating cond. (50°C)**  
Pmpp 1988 kWp  
U mpp 753 V  
I mpp 2642 A

**Total PV power**

Nominal (STC) 2166 kWp  
Total 4760 modules  
Module area 10346 m²  
Cell area 9397 m²

**Inverter**

**Manufacturer** Sungrow  
**Model** SG110CX  
(Custom parameters definition)

Unit Nom. Power 100 kWac  
Number of inverters 17 units  
Total power 1700 kWac  
Operating voltage 200-1000 V  
Max. power (≥45°C) 110 kWac  
Pnom ratio (DC:AC) 1.27

**Total inverter power**

Total power 1700 kWac  
Nb. of inverters 17 units  
Pnom ratio 1.27

**Array losses**

**Array Soiling Losses**

Loss Fraction 3.0 %

**Thermal Loss factor**

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

**DC wiring losses**

Global array res. 7.9 mΩ  
Loss Fraction 2.5 % at STC

**LID - Light Induced Degradation**

Loss Fraction 2.0 %

**Module Quality Loss**

Loss Fraction 0.0 %

**Module mismatch losses**

Loss Fraction 1.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.3 %

**IAM loss factor**

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000



**PVsyst V7.2.6**

VC0, Simulation date:  
22/09/21 12:16  
with v7.2.6

**AC wiring losses**

**Inv. output line up to injection point**

Inverter voltage 400 Vac tri  
Loss Fraction 1.01 % at STC  
**Inverter: SG110CX**  
Wire section (17 Inv.) Copper 17 x 3 x 70 mm²  
Average wires length 48 m



Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Left)



PVsyst V7.2.6

VC0, Simulation date:  
22/09/21 12:16  
with v7.2.6

Main results

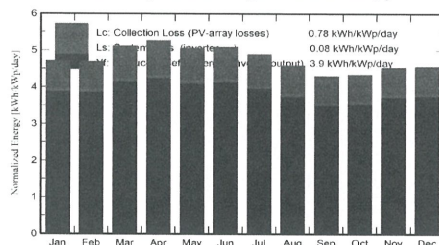
System Production  
Produced Energy

3079607 kWh/year

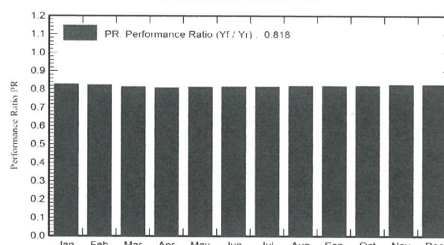
Specific production  
Performance Ratio PR

1422 kWh/kWp/year  
81.81 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray kWh	E_Grid kWh	PR ratio
January	147.9	66.99	26.16	146.1	141.1	266998	261624	0.827
February	132.6	75.29	27.26	131.5	127.0	239559	234774	0.824
March	159.1	82.71	28.44	158.4	153.0	285108	279246	0.814
April	158.0	81.74	29.19	157.9	152.6	282131	276176	0.808
May	156.3	82.31	29.31	156.8	151.5	281630	275854	0.812
June	151.9	82.14	28.78	152.7	147.4	275125	269434	0.815
July	151.1	83.52	28.84	151.6	146.4	273109	267368	0.814
August	142.3	85.59	28.70	142.3	137.4	257512	252170	0.818
September	129.4	71.97	27.66	129.0	124.6	233214	228306	0.817
October	135.3	73.41	27.48	134.4	129.9	243617	238508	0.819
November	137.4	65.56	26.71	135.8	131.2	248138	242953	0.826
December	143.5	59.53	26.53	141.5	136.7	258492	253194	0.826
Year	1745.0	910.76	27.93	1738.1	1678.8	3144631	3079607	0.818

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



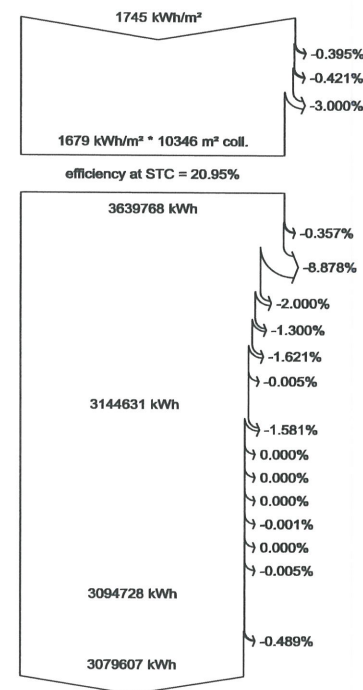
Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Left)



PVsyst V7.2.6

VC0, Simulation date:  
22/09/21 12:16  
with v7.2.6

Loss diagram



Global horizontal irradiation

Global incident in coll. plane

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Mismatch loss, modules and strings

Ohmic wiring loss

Mixed orientation mismatch 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

AC ohmic loss

Energy injected into grid



PVsyst V7.2.6

VC0, Simulation date:  
22/09/21 12:16  
with v7.2.6

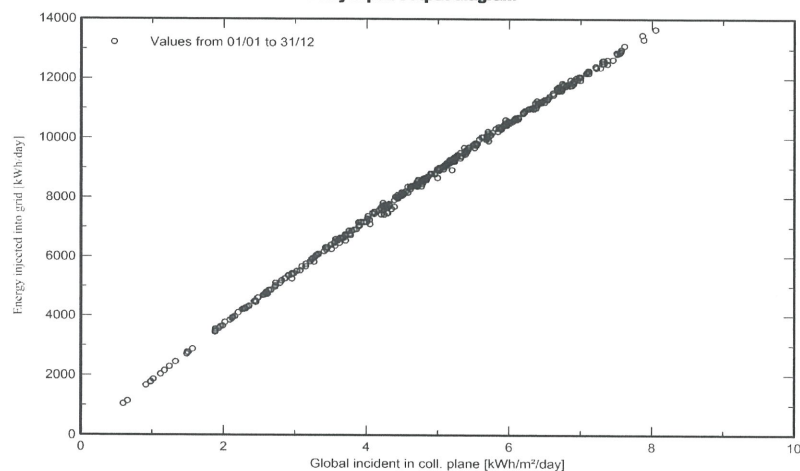
Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Left)



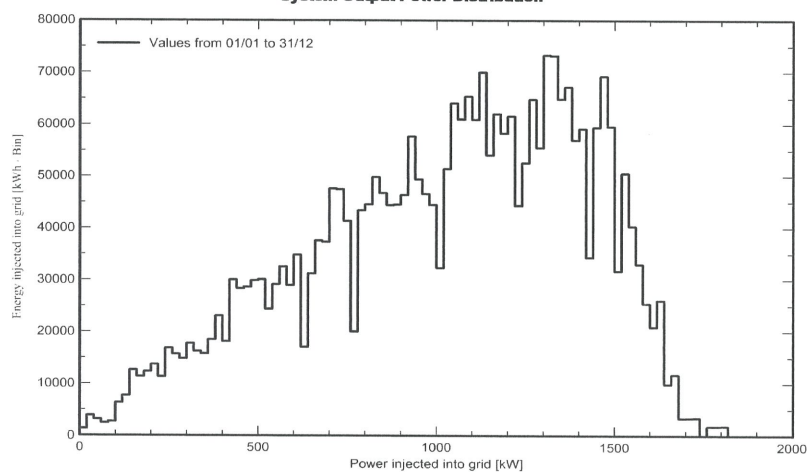
Version 7.2.6

### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution



## PVsyst - Simulation report

### Grid-Connected System

Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling (Right)

No 3D scene defined, no shadings

System power: 3793 kWp

UACJ, Rayong, Thailand - Thailand

Author





## Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling (Right)



PVsyst V7.2.6

VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

Project summary			
<b>Geographical Site</b> UACJ, Rayong, Thailand Thailand	<b>Situation</b>		
	Latitude	12.95 °N	
	Longitude	101.10 °E	
	Altitude	109 m	
<b>Meteo data</b> UACJ, Rayong, Thailand Meteonorm 7.3 (1991-2010), Sat=62% - Synthetic	Time zone	UTC+7	
	<b>Project settings</b>	Albedo	0.20

System summary			
Grid-Connected System		No 3D scene defined, no shadings	
PV Field Orientation		Near Shadings	User's needs
Fixed planes	3 orientations	No Shadings	Unlimited load (grid)
Tilts/azimuths	3 / -165 °		
	3 / 105 °		
	3 / -75 °		
System information			
PV Array		Inverters	
Nb. of modules	8400 units	Nb. of units	30 units
Pnom total	3793 kWp	Pnom total	3000 kWac
		Pnom ratio	1.264

Results summary				
Produced Energy	5103 MWh/year	Specific production	1346 kWh/kWp/year	Perf. Ratio PR 77.40 %

Table of contents	
Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	7
Loss diagram	8
Special graphs	9



## Project: UACJ Solar Rooftop Project

Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling (Right)



PVsyst V7.2.6

VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

General parameters			
<b>Grid-Connected System</b>		<b>No 3D scene defined, no shadings</b>	
<b>PV Field Orientation</b>		<b>Sheds configuration</b>	
Orientation		No 3D scene defined	
Fixed planes	3 orientations	<b>Models used</b>	
Tilts/azimuths	3 / -165 °	Transposition	Perez
	3 / 105 °	Diffuse	Perez, Meteonorm
	3 / -75 °	Circumsolar	with diffuse
<b>Horizon</b>		<b>Near Shadings</b>	
Free Horizon		No Shadings	
		<b>User's needs</b>	
		Unlimited load (grid)	

PV Array Characteristics			
<b>Array #1 - Coating (Right) &amp; Cold Rolling (Right)</b>			
Orientation	#1	<b>Inverter</b>	
Tilt/Azimuth	3/-165 °	Manufacturer	Sungrow
<b>PV module</b>		Model	SG110CX
Manufacturer		(Custom parameters definition)	
Model		Next Energy & Resources	
(Custom parameters definition)		NER144M455L-MC	
Unit Nom. Power	455 Wp	Unit Nom. Power	100 kWac
Number of PV modules	2500 units	Number of inverters	80 * MPPT 11% 9 units
Nominal (STC)	1138 kWp	Total power	900 kWac
Modules	125 Strings x 20 In series	Operating voltage	200-1000 V
<b>At operating cond. (50°C)</b>		Max. power (=>45°C)	110 kWac
Pmpp	1044 kWp	Pnom ratio (DC:AC)	1.26
U mpp	753 V		
I mpp	1388 A		
<b>PV module</b>			
Manufacturer	Next Energy S&S Resources	Manufacturer	Sungrow
Model	NER144M445C-MC	Model	SG110CX
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	450 Wp	Unit Nom. Power	100 kWac
Number of PV modules	5900 units	Number of inverters	21 units
Nominal (STC)	2655 kWp	Total power	2100 kWac
<b>Array #2 - Cold Rolling (Right) No.1</b>			
Orientation	#2	<b>Inverter</b>	
Tilt/Azimuth	3/105 °	Manufacturer	Sungrow
Number of PV modules	4340 units	Model	SG110CX
Nominal (STC)	1953 kWp	(Custom parameters definition)	
Modules	217 Strings x 20 In series	Unit Nom. Power	100 kWac
<b>At operating cond. (50°C)</b>		Number of inverters	140 * MPPT 11% 15.4 units
Pmpp	1786 kWp	Total power	1544 kWac
U mpp	762 V	Operating voltage	200-1000 V
I mpp	2344 A	Max. power (=>45°C)	110 kWac
		Pnom ratio (DC:AC)	1.26
<b>Array #3 - Cold Rolling (Right) No.1</b>			
Orientation	#3	<b>Inverter</b>	
Tilt/Azimuth	3/-75 °	Manufacturer	Sungrow
Number of PV modules	1560 units	Model	SG110CX
Nominal (STC)	702 kWp	(Custom parameters definition)	
Modules	78 Strings x 20 In series	Unit Nom. Power	100 kWac
		Number of inverters	50 * MPPT 11% 5.6 units
		Total power	556 kWac



PVsyst V7.2.6  
VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

#### PV Array Characteristics

<b>At operating cond. (50°C)</b>		<b>Operating voltage</b>	200-1000 V
Pmpp	642 kWp	Max. power (=>45°C)	110 kWac
U mpp	762 V	Pnom ratio (DC:AC)	1.26
I mpp	843 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	3793 kWp	Total power	3000 kWac
Total	8400 modules	Nb. of inverters	30 units
Module area	18468 m²	Pnom ratio	0.0 unused 1.26



PVsyst V7.2.6  
VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

#### Array losses

<b>Array Soiling Losses</b>		<b>Thermal Loss factor</b>	<b>LID - Light Induced Degradation</b>
Loss Fraction	3.0 %	Module temperature according to irradiance	Loss Fraction
		Uc (const)	3.2 %
		Uv (wind)	
		20.0 W/m²K	
		0.0 W/m²K/m/s	
<b>Module Quality Loss</b>		<b>Module mismatch losses</b>	<b>Strings Mismatch loss</b>
Loss Fraction	0.0 %	Loss Fraction	1.0 % at MPP
			0.3 %

#### IAM loss factor - Array #1

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.999	0.974	0.935	0.859	0.000

#### IAM loss factor - Array #2

Incidence effect (IAM): Fresnel smooth glass, n = 1.526

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.998	0.981	0.948	0.862	0.776	0.636	0.403	0.000

#### IAM loss factor - Array #3

Incidence effect (IAM): Fresnel smooth glass, n = 1.526

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.998	0.981	0.948	0.862	0.776	0.636	0.403	0.000

#### DC wiring losses

Global wiring resistance	3.1 mΩ		
Loss Fraction	1.7 % at STC		
<b>Array #1 - Coating (Right) &amp; Cold Rolling (Right)</b>		<b>Array #2 - Cold Rolling (Right) No.1</b>	
Global array res.	15 mΩ	Global array res.	5.4 mΩ
Loss Fraction	2.5 % at STC	Loss Fraction	1.5 % at STC
<b>Array #3 - Cold Rolling (Right) No.1</b>			
Global array res.	15 mΩ		
Loss Fraction	1.5 % at STC		

#### AC wiring losses

<b>Inv. output line up to MV transfo</b>	
Inverter voltage	400 Vac tri
Loss Fraction	0.30 % at STC
<b>Inverter: SG110CX</b>	
Wire section (30 Inv.)	Copper 30 x 3 x 70 mm²
Average wires length	14 m
<b>MV line up to Injection</b>	
MV Voltage	6.6 kV
Wires	Copper 3 x 185 mm²
Length	115 m
Loss Fraction	0.10 % at STC



PVsyst V7.2.6

VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling  
(Right)



GREENENERGY  
THE PERFECT COMBINATION OF QUALITY

#### AC losses in transformers

<b>MV transfo</b>	
Grid voltage	6.6 kV
<b>Operating losses at STC</b>	
Nominal power at STC	3728 kVA
Iron loss (24/24 Connexion)	3.73 kW
Loss Fraction	0.10 % at STC
Coils equivalent resistance	3 x 0.39 mΩ
Loss Fraction	0.90 % at STC



PVsyst V7.2.6

VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling  
(Right)



GREENENERGY  
THE PERFECT COMBINATION OF QUALITY

#### Main results

##### System Production

Produced Energy

5103 MWh/year

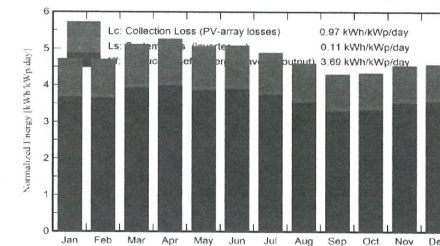
Specific production

1346 kWh/kWp/year

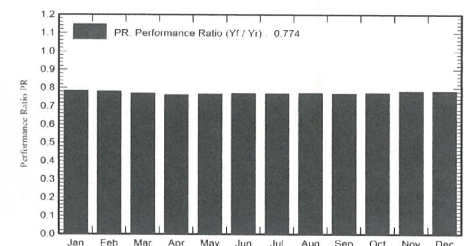
Performance Ratio PR

77.40 %

##### Normalized productions (per installed kWp)



##### Performance Ratio PR



#### Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	147.9	66.99	26.16	146.2	137.3	447.1	434.6	0.784
February	132.6	75.29	27.26	131.7	123.8	401.3	390.2	0.781
March	159.1	82.71	28.44	158.4	149.2	476.9	463.6	0.772
April	158.0	81.74	29.19	157.9	149.0	470.2	456.8	0.763
May	156.3	82.31	29.31	156.7	147.6	469.1	456.0	0.767
June	151.9	82.14	28.78	152.4	143.5	458.8	445.9	0.772
July	151.1	83.52	28.84	151.5	142.8	455.7	442.6	0.770
August	142.3	85.59	28.70	142.4	134.0	430.2	417.8	0.774
September	129.4	71.97	27.66	129.1	121.5	388.4	376.9	0.770
October	135.3	73.41	27.48	134.5	126.7	406.8	394.8	0.774
November	137.4	65.56	26.71	136.0	127.8	415.5	403.5	0.782
December	143.5	59.53	26.53	141.7	133.1	433.0	420.7	0.783
Year	1745.0	910.76	27.93	1738.5	1636.4	5252.9	5103.4	0.774

#### 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 V7.2.6

VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling  
(Right)



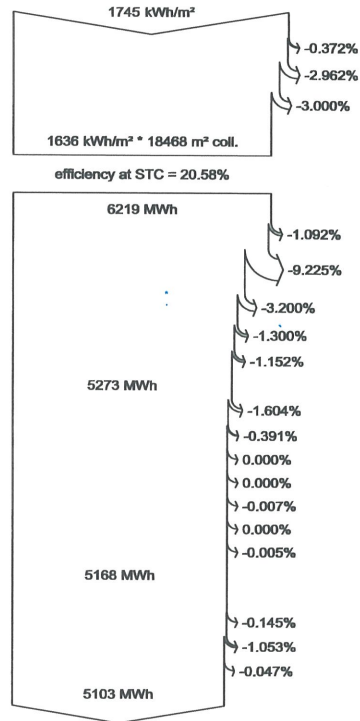
PVsyst V7.2.6

VCA, Simulation date:  
22/09/21 12:30  
with v7.2.6

Project: UACJ Solar Rooftop Project  
Variant: UACJ Solar Rooftop - Coating and Finishing (Right) & Cold Rolling  
(Right)



### Loss diagram



Global horizontal irradiation

Global incident in coll. plane

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Mismatch loss, modules and strings

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

AC ohmic loss

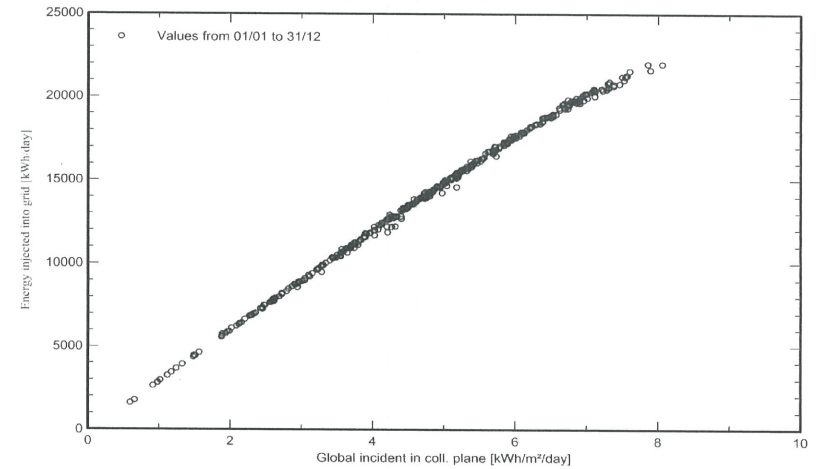
Medium voltage transfo loss

MV line ohmic loss

Energy injected into grid

### Special graphs

#### Daily Input/Output diagram



#### System Output Power Distribution

