

# PVsyst - Simulation report

## Grid-Connected System

Project: Shioya Funyu LV ABCD

Variant: Shioya Funyu LV A sig4 1440 960BTR Peakshave155/200 BF

Tables on a building

System power: 389 kWp

Takatoku - Japan

**Author**

Nanoenergy (Japan)



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## PVsyst V8.1.4

VR1, Simulation date:  
30/07/26 17:00  
with V8.1.4

Nanoenergy (Japan)

### Project summary

#### Geographical Site

**Takatoku**  
Japan

#### Situation

Latitude 36.7938 °(N)  
Longitude 139.7530 °(E)  
Altitude 353 m  
Time zone UTC+9

#### Project settings

Albedo 0.40

#### Weather data

Takatoku  
Meteonorm 8.2 (1991-2002), Sat=12% - Synthetic

### System summary

#### Grid-Connected System

##### Orientation #1

##### Fixed plane

Tilt/Azimuth 20 / 0 °

#### System information

##### PV Array

Nb. of modules 720 units  
Pnom total 389 kWp

#### Tables on a building

##### Near Shadings

Linear shadings : Fast (table)

##### Inverters

Nb. of units 4 units  
Total power 200 kWac  
Grid power limit 200 kWac  
Grid lim. Pnom ratio 1.944

##### User's needs

Unlimited load (grid)

##### Battery pack

Storage strategy: Peak shaving  
Nb. of units 80 units  
Voltage 154 V  
Capacity 6500 Ah

### Results summary

Simulation step Hourly

Produced Energy 483910 kWh/year Specific production 1245 kWh/kWp/year Perf. Ratio PR 85.23 %  
Bifacial perf. ratio 80.30 %

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### General parameters

#### Grid-Connected System

##### Simulation step

Hourly

##### Orientation #1

###### Fixed plane

Tilt/Azimuth 20 / 0 °

#### Tables on a building

##### Sheds configuration

Nb. of sheds 4 units

Set of tables

##### Shading limit angle

Limit profile angle 48.6 °

##### Sizes

Sheds spacing 11.4 m

Sensitive width 9.16 m

GCR Shading 80.5 %

##### Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

##### Horizon

Average Height 3.3 °

##### Near Shadings

Linear shadings : Fast (table)

##### Bifacial system definition

###### Orientation #1

###### Bifacial system

Model Unlimited Sheds 2D Model

###### Bifacial model geometry

Sheds spacing 16.00 m

Sheds width 9.16 m

Limit profile angle 48.6 °

GCR Bifacial 57.2 %

Height above ground 1.50 m

Nb. of sheds 4 units

###### Bifacial model definitions

Ground albedo 0.40

Bifaciality factor 70 %

Rear shading factor 5.0 %

Rear mismatch loss 10.0 %

Shed transparent fraction 0.0 %

##### Storage

Kind Peak shaving

##### User's needs

Unlimited load (grid)

##### Grid power limitation

Active power 200 kWac

Pnom ratio 1.944

Limit applied at the injection point

### PV Array Characteristics

#### Array #1 - PV Array

##### PV module

Manufacturer Jinkosolar

Model JKM-540M-72HL4-BDVP

(Original PVsyst database)

Unit Nom. Power 540 Wp

Number of PV modules 180 units

Nominal (STC) 97.2 kWp

Modules 9 units x 20 In series

##### At operating cond. (50°C)

Pmpp 88.7 kWp

U mpp 746 V

I mpp 119 A

##### Inverter

Manufacturer Sigenergy

Model Sigen PV 100M1-HYB JP pre

(Custom parameters definition)

Unit Nom. Power 50.0 kWac

Number of inverters 1 unit

Total power 50.0 kWac

Operating voltage 160-1000 V

Max. power (=>40°C) 112.0 kWac

Pnom ratio (DC:AC) 1.94

Power sharing within this inverter



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### PV Array Characteristics

#### PV module

Manufacturer Jinkosolar  
Model JKM-540M-72HL4-BDVP  
(Original PVsyst database)  
Unit Nom. Power 540 Wp

#### Array #2 - Sub-array #2

Number of PV modules 180 units  
Nominal (STC) 97.2 kWp  
Modules 9 units x 20 In series  
**At operating cond. (50°C)**  
Pmpp 88.7 kWp  
U mpp 746 V  
I mpp 119 A

#### Array #3 - Sub-array #3

Number of PV modules 180 units  
Nominal (STC) 97.2 kWp  
Modules 9 units x 20 In series  
**At operating cond. (50°C)**  
Pmpp 88.7 kWp  
U mpp 746 V  
I mpp 119 A

#### Array #4 - Sub-array #4

Number of PV modules 180 units  
Nominal (STC) 97.2 kWp  
Modules 9 units x 20 In series  
**At operating cond. (50°C)**  
Pmpp 88.7 kWp  
U mpp 746 V  
I mpp 119 A

#### Total PV power

Nominal (STC) 389 kWp  
Total 720 modules  
Module area 1857 m<sup>2</sup>  
Cell area 1717 m<sup>2</sup>

#### Inverter

Manufacturer Sigenergy  
Model Sigen PV 100M1-HYB JP pre  
(Custom parameters definition)  
Unit Nom. Power 50.0 kWac

Number of inverters 1 unit  
Total power 50.0 kWac

Operating voltage 160-1000 V  
Max. power (=>40°C) 112.0 kWac  
Pnom ratio (DC:AC) 1.94  
Power sharing within this inverter

Number of inverters 1 unit  
Total power 50.0 kWac

Operating voltage 160-1000 V  
Max. power (=>40°C) 112.0 kWac  
Pnom ratio (DC:AC) 1.94  
Power sharing within this inverter

Number of inverters 1 unit  
Total power 50.0 kWac

Operating voltage 160-1000 V  
Max. power (=>40°C) 112.0 kWac  
Pnom ratio (DC:AC) 1.94  
Power sharing within this inverter

#### Total inverter power

Total power 200 kWac  
Max. power 448 kWac  
Number of inverters 4 units  
Pnom ratio 1.94

### Grid storage - Peak shaving

#### Battery

Manufacturer Sigenergy  
Model Sigenstack BAT 12 V2  
**Battery pack**  
Nb. of units 4 in series x 20 in parallel  
Voltage 154 V  
Nominal Capacity (C10) 6500 Ah  
Nominal energy 998 kWh  
Operating SOC limits 95.0 / 20.0 %  
Useable energy 749 kWh  
Operating temperature Fixed 20 °C

#### Battery input charger

Model Generic  
Max. charging power 155 kWdc  
Max./Euro effic. 97.0 / 95.0 %

#### Battery to Grid inverter

Model Generic  
Max. discharging power 200 kWac  
Max./Euro effic. 97.0 / 95.0 %



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Nanoenergy (Japan)

### Array losses

#### Array Soiling Losses

Average loss Fraction 0.5 %

| Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.9% |

#### Thermal Loss factor

Module temperature according to irradiance  
Uc (const) 20.0 W/m<sup>2</sup> K  
Uv (wind) 0.0 W/m<sup>2</sup> K/m/s

#### DC wiring losses

Global array res. 131 mΩ  
Global wiring resistance 33 mΩ  
Loss Fraction 1.89 % at STC

#### Serie Diode Loss

Voltage drop 0.7 V  
Loss Fraction 0.1 % at STC

#### Module Quality Loss

Loss Fraction -0.75 %

#### Module mismatch losses

Loss Fraction 2.00 % 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 | 0.963 | 0.892 | 0.814 | 0.679 | 0.438 | 0.000 |

### System losses

#### Unavailability of the system

Time fraction 0.1 %  
0.5 days,  
1 periods

#### Auxiliary losses

Night aux. cons. 1000 W

### AC wiring losses

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

Inverter voltage 400 Vac tri  
Loss Fraction 0.00 % at STC

#### Inverter: Sigen PV 100M1-HYB JP pre

Wire section (4 Inv.) Alu 4 x 3 x 70 mm<sup>2</sup>  
Average wires length 0 m



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### Horizon definition

Horizon from PVGIS website API, Lat=40° 17'25", Long=141° 26'24", Alt=416m

|                |       |                 |       |
|----------------|-------|-----------------|-------|
| Average Height | 3.3 ° | Albedo Factor   | 0.90  |
| Diffuse Factor | 0.99  | Albedo Fraction | 100 % |

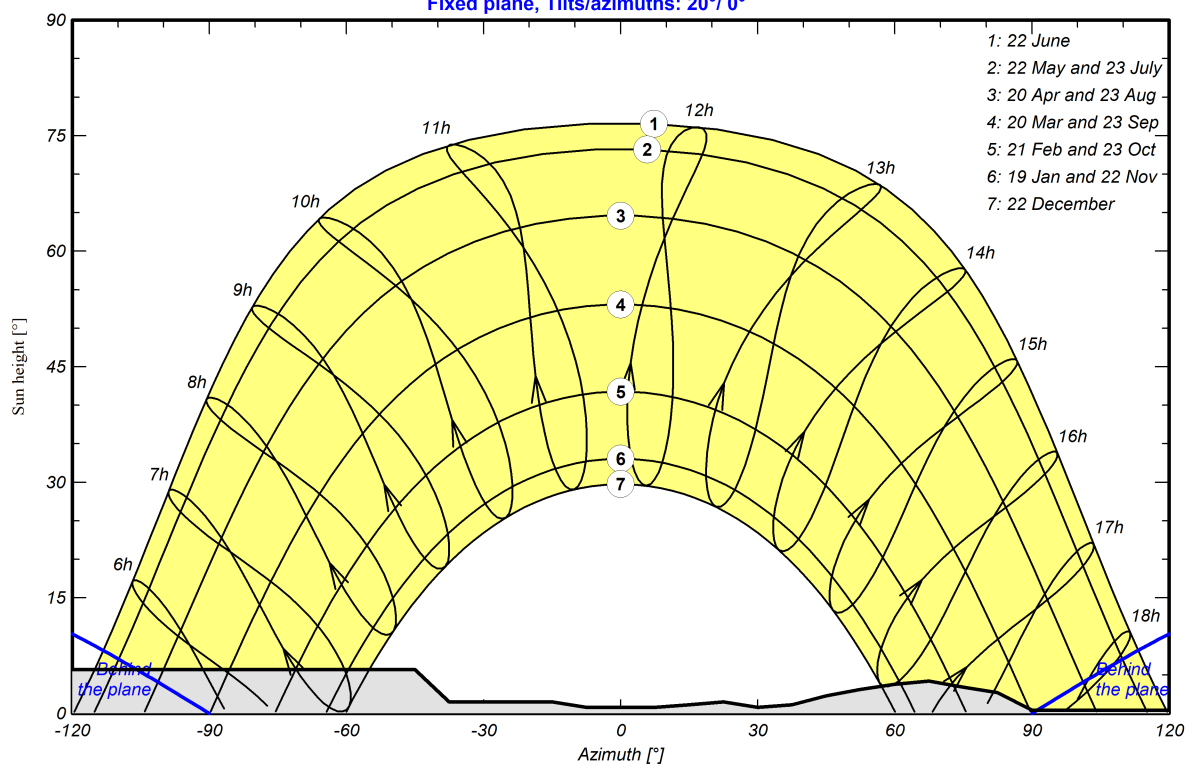
### Horizon profile

|             |      |      |      |      |     |     |     |     |     |     |     |     |     |
|-------------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Azimuth [°] | -180 | -150 | -143 | -135 | -45 | -38 | -15 | -8  | 8   | 15  | 23  | 30  | 38  |
| Height [°]  | 5.0  | 5.0  | 3.8  | 5.7  | 5.7 | 1.5 | 1.5 | 0.8 | 0.8 | 1.1 | 1.5 | 0.8 | 1.1 |
| Azimuth [°] | 45   | 53   | 60   | 68   | 75  | 83  | 90  | 120 | 128 | 143 | 150 | 180 |     |
| Height [°]  | 2.3  | 3.1  | 3.8  | 4.2  | 3.4 | 2.7 | 0.4 | 0.4 | 0.8 | 0.0 | 5.0 | 5.0 |     |

### Sun Paths (Height / Azimuth diagram)

#### Orientation #1

Fixed plane, Tilts/azimuths: 20°/ 0°



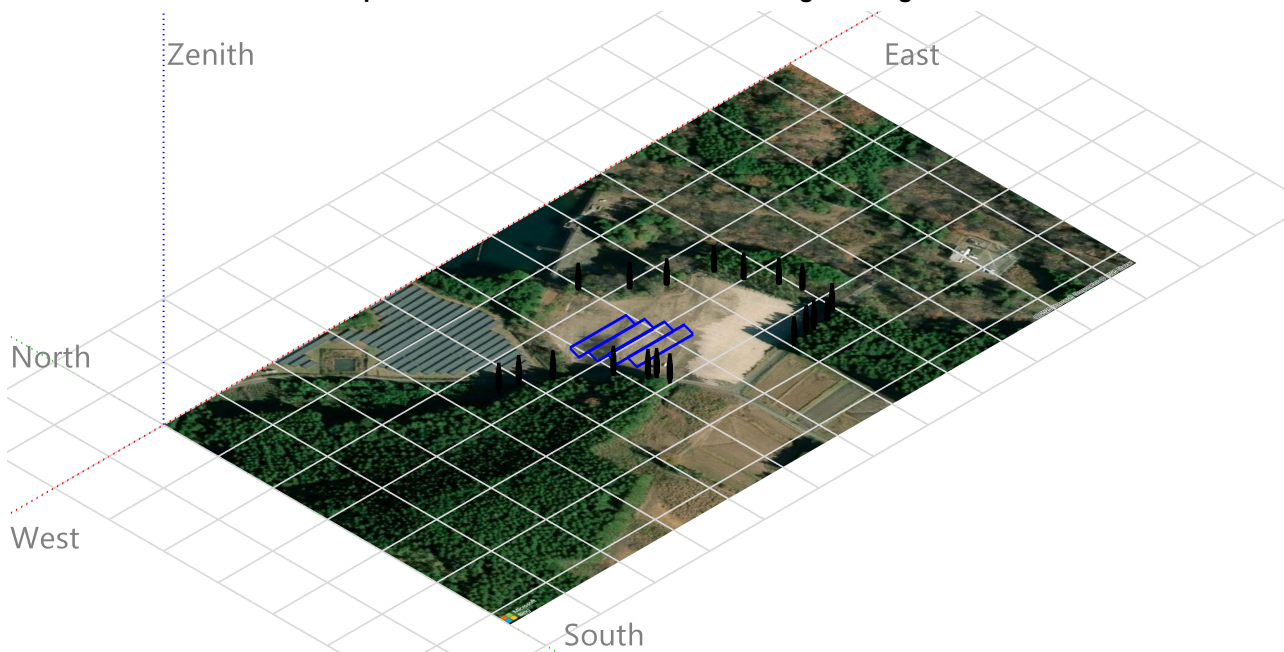


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**Near shadings parameter**

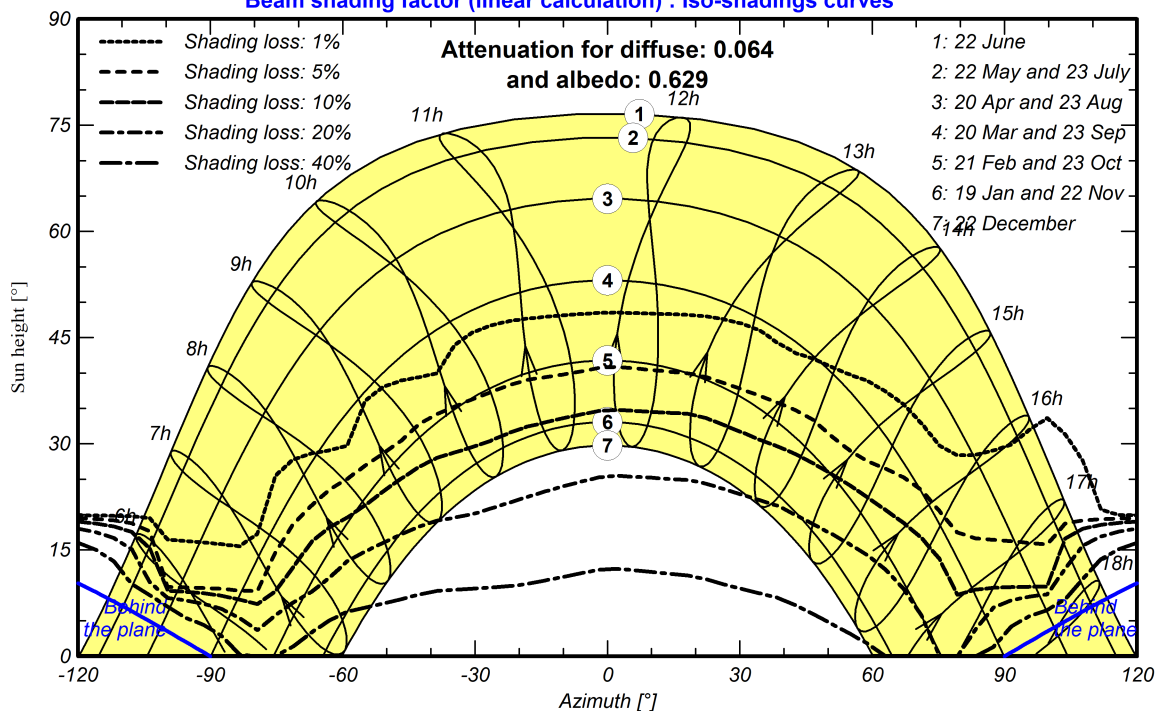
**Perspective of the PV-field and surrounding shading scene**



**Iso-shadings diagram**

**Orientation #1 - Fixed plane, Tilts/azimuths: 20° / 0°**

**Beam shading factor (linear calculation) : Iso-shadings curves**





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Nanoenergy (Japan)

### Main results

#### Simulation step

Hourly

#### System Production

|                 |                 |                      |                   |
|-----------------|-----------------|----------------------|-------------------|
| Produced Energy | 483910 kWh/year | Specific production  | 1245 kWh/kWp/year |
|                 |                 | Perf. Ratio PR       | 85.23 %           |
|                 |                 | Bifacial perf. ratio | 80.30 %           |

#### Battery ageing (State of health)

|                               |         |
|-------------------------------|---------|
| Final battery state of health | 99.9 %  |
| Battery age                   | 1. year |

#### Economic evaluation

##### Investment

|          |                    |
|----------|--------------------|
| Global   | 145,744,800.00 JPY |
| Specific | 375 JPY/Wp         |

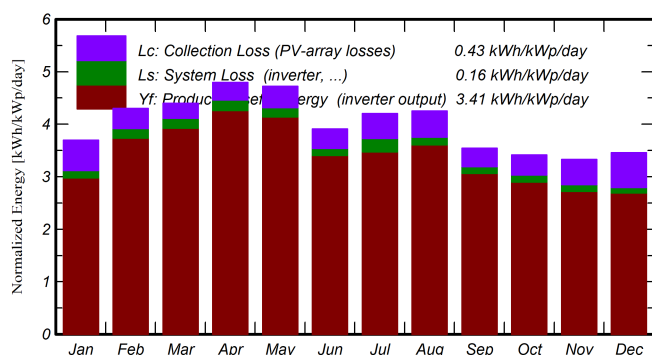
##### Yearly cost

|                |                     |
|----------------|---------------------|
| Annuities      | 0.00 JPY/yr         |
| Run. costs     | 5,320,000.00 JPY/yr |
| Payback period | Unprofitable        |

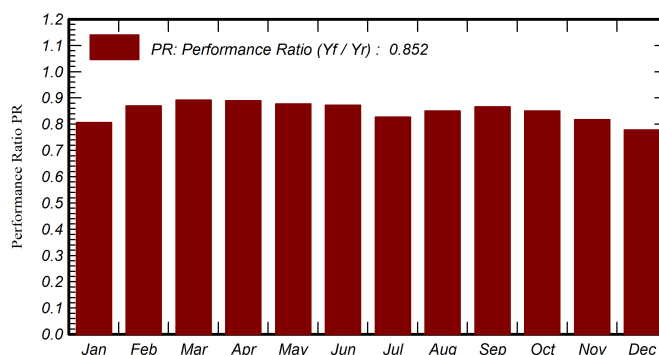
##### LCOE

|             |              |
|-------------|--------------|
| Energy cost | 25.8 JPY/kWh |
|-------------|--------------|

Normalized productions (per installed kWp)



Performance Ratio PR



### Balances and main results

|           | GlobHor<br>kWh/m <sup>2</sup> | DiffHor<br>kWh/m <sup>2</sup> | T_Amb<br>°C | GlobInc<br>kWh/m <sup>2</sup> | GlobEff<br>kWh/m <sup>2</sup> | EArray<br>kWh | E_Grid<br>kWh | EBatDis<br>kWh | PR<br>ratio |
|-----------|-------------------------------|-------------------------------|-------------|-------------------------------|-------------------------------|---------------|---------------|----------------|-------------|
| January   | 80.1                          | 31.10                         | 0.81        | 114.6                         | 94.3                          | 37617         | 35926         | 2726           | 0.806       |
| February  | 94.1                          | 40.30                         | 1.54        | 120.4                         | 107.8                         | 42722         | 40705         | 5756           | 0.869       |
| March     | 119.8                         | 65.10                         | 5.13        | 136.4                         | 127.4                         | 49630         | 47316         | 6829           | 0.892       |
| April     | 135.3                         | 71.60                         | 10.78       | 143.9                         | 135.9                         | 52060         | 49765         | 6771           | 0.889       |
| May       | 145.4                         | 88.39                         | 16.31       | 146.4                         | 137.5                         | 52084         | 49931         | 6063           | 0.877       |
| June      | 120.2                         | 85.95                         | 19.71       | 117.2                         | 108.6                         | 41311         | 39755         | 2963           | 0.872       |
| July      | 131.9                         | 92.67                         | 23.64       | 130.3                         | 121.3                         | 45016         | 41916         | 4304           | 0.828       |
| August    | 128.9                         | 84.97                         | 24.51       | 131.7                         | 123.0                         | 45306         | 43541         | 3977           | 0.850       |
| September | 98.1                          | 63.50                         | 20.30       | 106.4                         | 99.1                          | 37286         | 35807         | 2617           | 0.866       |
| October   | 89.7                          | 54.98                         | 14.59       | 105.9                         | 96.0                          | 36578         | 35005         | 3176           | 0.851       |
| November  | 75.2                          | 35.50                         | 8.48        | 99.9                          | 85.6                          | 33282         | 31786         | 2881           | 0.818       |
| December  | 71.3                          | 25.30                         | 3.41        | 107.2                         | 85.4                          | 33739         | 32458         | 1389           | 0.779       |
| Year      | 1290.0                        | 739.35                        | 12.50       | 1460.3                        | 1322.0                        | 506631        | 483910        | 49452          | 0.852       |

#### 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                          | EBatDis | Battery Discharging Energy                  |
| GlobInc | Global incident in coll. plane               | PR      | Performance Ratio                           |
| GlobEff | Effective Global, corr. for IAM and shadings |         |                                             |





## Project: Shioya Funyu LV ABCD

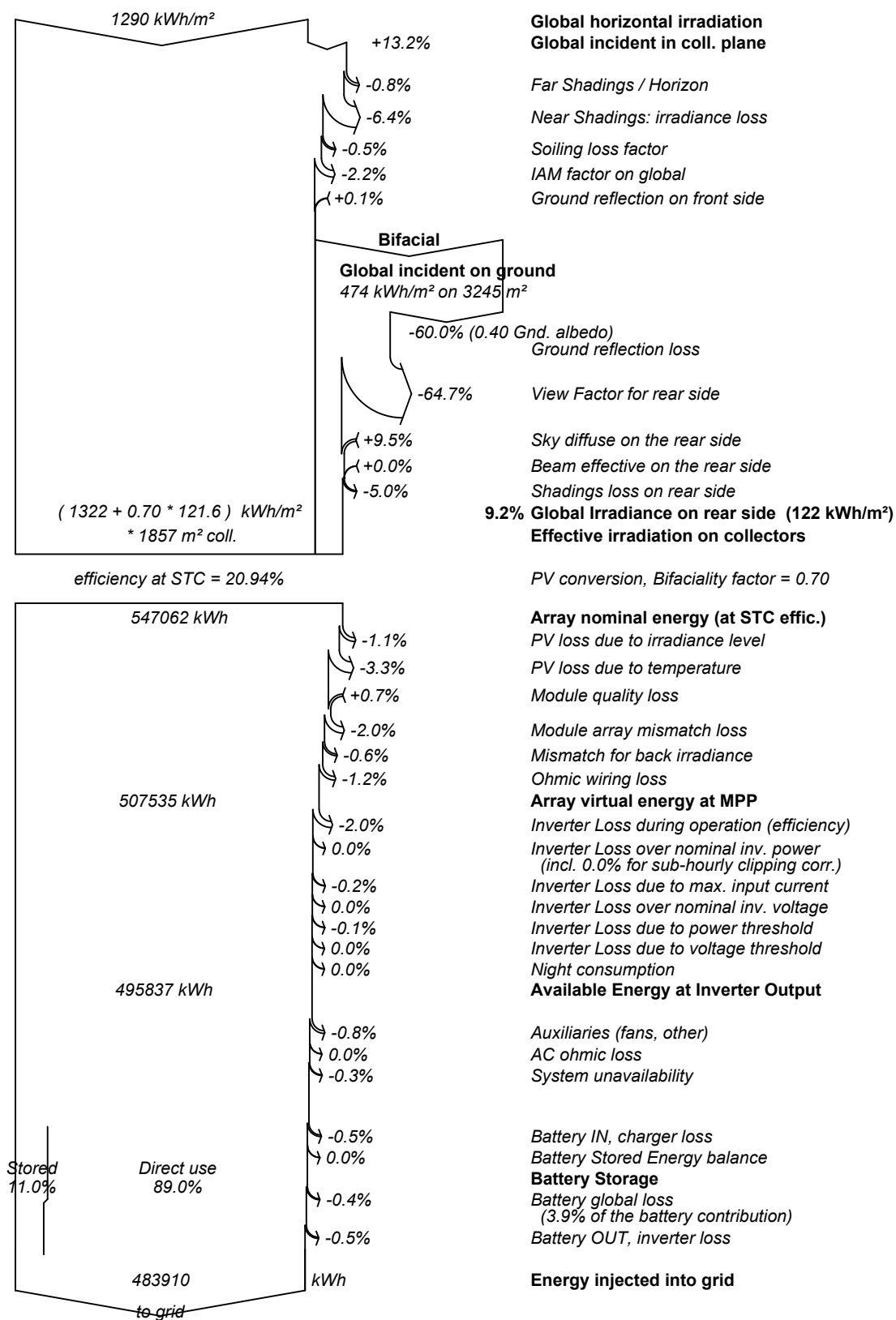
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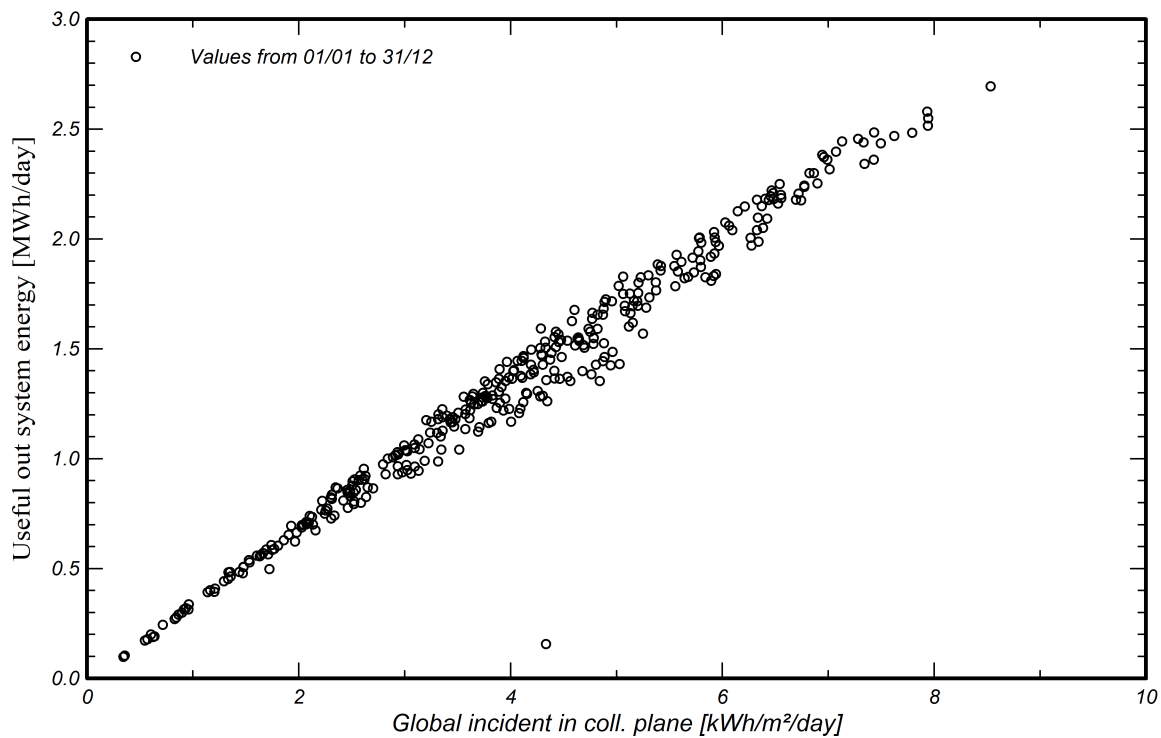
### Loss diagram



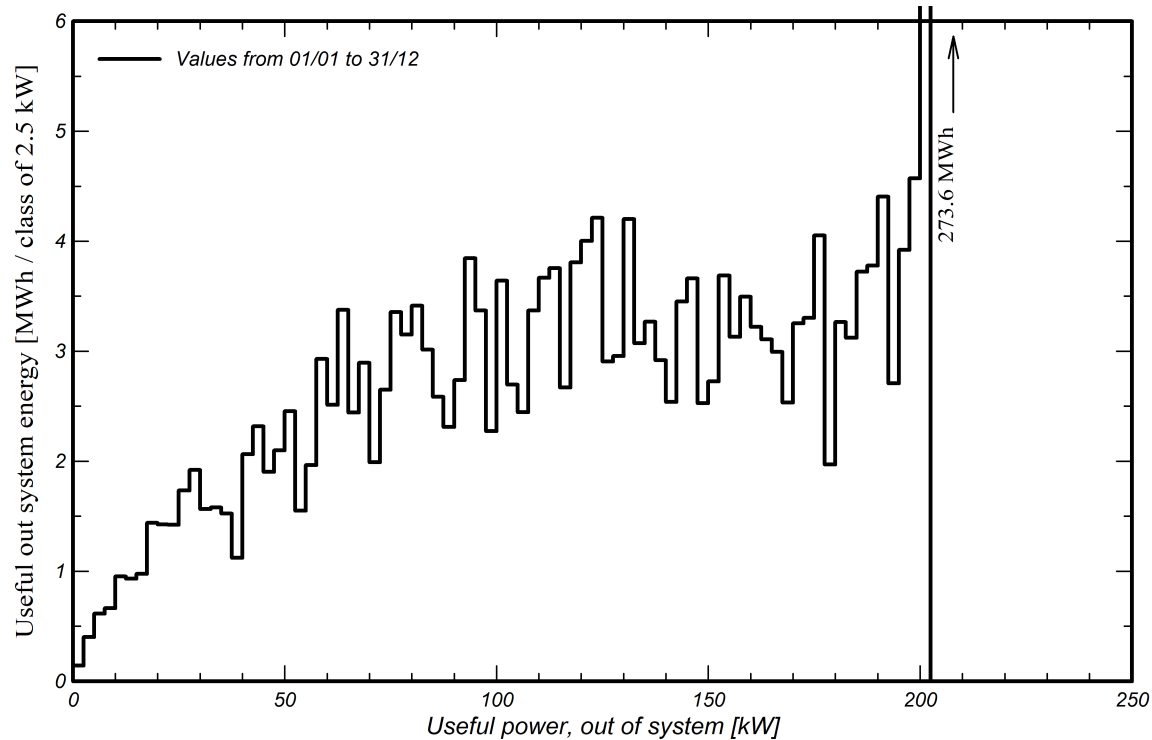


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

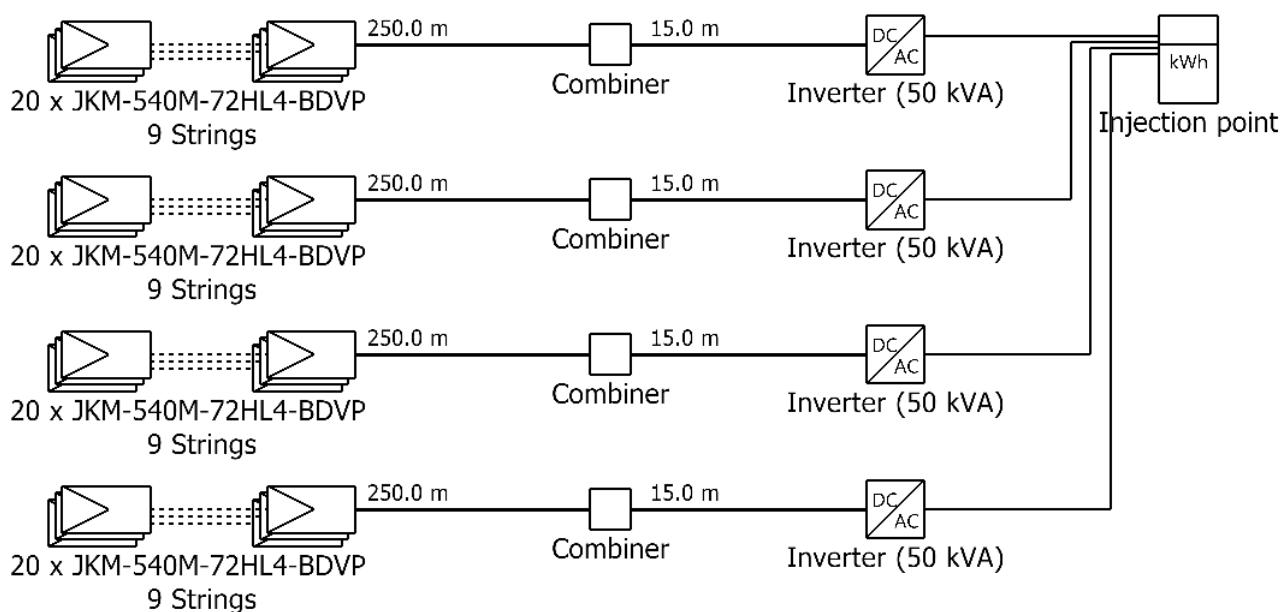




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## Single-line diagram



|           |                           |
|-----------|---------------------------|
| PV module | JKM-540M-72HL4-BDVP       |
| Inverter  | Sigen PV 100M1-HYB JP pre |
| String    | 20 x JKM-540M-72HL4-BDVP  |

Shioya Funyu LV ABCD

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OBTR Peakshave155/200 BF

31/08/26