

# PVsyst - Simulation report

## Grid-Connected System

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Project: Test\_Houston\_customMeteo

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 10.80 kWp

Test\_Houston\_NASA - United States



# Project: Test\_Houston\_customMeteo

Variant: New simulation variant

## PVsyst V7.4.0

VCO, Simulation date:  
07/07/23 12:36  
with v7.4.0

### Project summary

|  |  |  |
|--|--|--|
| <b>Geographical Site</b><br>Test_Houston_NASA<br>United States     | <b>Situation</b><br>Latitude 29.81 °N<br>Longitude -95.42 °W<br>Altitude 24 m<br>Time zone UTC-6 | <b>Project settings</b><br>Albedo 0.20 |
| <b>Meteo data</b><br>Test_Houston_custom<br>Custom file - Imported |  |  |

### System summary

|   |   |                  |  |
|---|---|------------------|--|
| <b>Grid-Connected System</b>                    | <b>No 3D scene defined, no shadings</b> |                  |  |
| <b>PV Field Orientation</b><br>horizontal plane | <b>Near Shadings</b><br>No Shadings     |                  | <b>User's needs</b><br>Unlimited load (grid) |
| <b>System information</b>                       |   |                  |  |
| <b>PV Array</b>                                 |   | <b>Inverters</b> |  |
| Nb. of modules                                  | 20 units                                | Nb. of units     | 1 unit                                       |
| Pnom total                                      | 10.80 kWp                               | Pnom total       | 10.00 kWac                                   |
|   |   | Pnom ratio       | 1.080  |

### Results summary

|                 |                   |                     |                   |                |         |
|-----------------|-------------------|---------------------|-------------------|----------------|---------|
| Produced Energy | 17381.98 kWh/year | Specific production | 1609 kWh/kWp/year | Perf. Ratio PR | 89.43 % |
|-----------------|-------------------|---------------------|-------------------|----------------|---------|

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**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<br>horizontal plane | No 3D scene defined                     | Transposition         | Perez    |
|                                 |   | Diffuse               | Imported |
|                                 |   | Circumsolar           | separate |
| <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>Inverter</b>                    |                     |
| Manufacturer                     | Longi Solar             | Manufacturer                       | Huawei Technologies |
| Model                            | LR5-72HPH-540M G2       | Model                              | SUN2000-10KTL-M1    |
| (Original PVsyst database)       |                         | (Original PVsyst database)         |                     |
| Unit Nom. Power                  | 540 Wp                  | Unit Nom. Power                    | 10.00 kWac          |
| Number of PV modules             | 20 units                | Number of inverters                | 1 unit              |
| Nominal (STC)                    | 10.80 kWp               | Total power                        | 10.0 kWac           |
| Modules                          | 1 String x 20 In series | Operating voltage                  | 140-980 V           |
| <b>At operating cond. (50°C)</b> |                         | Max. power (=>48°C)                | 11.00 kWac          |
| Pmpp                             | 9.90 kWp                | Pnom ratio (DC:AC)                 | 1.08                |
| U mpp                            | 748 V                   | Power sharing within this inverter |                     |
| I mpp                            | 13 A                    |                                    |                     |
| <b>Total PV power</b>            |                         | <b>Total inverter power</b>        |                     |
| Nominal (STC)                    | 11 kWp                  | Total power                        | 10 kWac             |
| Total                            | 20 modules              | Max. power                         | 11 kWac             |
| Module area                      | 51.7 m <sup>2</sup>     | Number of inverters                | 1 unit              |
| Cell area                        | 48.0 m <sup>2</sup>     | Pnom ratio                         | 1.08                |

**Array losses**

|  |                         |                            |       |       |       |       |       |       |
|--|-------------------------|----------------------------|-------|-------|-------|-------|-------|-------|
| <b>Thermal Loss factor</b>                   | <b>DC wiring losses</b> | <b>Module Quality Loss</b> |       |       |       |       |       |       |
| Module temperature according to irradiance   | Global array res.       | Loss Fraction              |       |       |       |       |       |       |
| Uc (const)                                   | 0.000 mΩ                | 0.0 %                      |       |       |       |       |       |       |
| Uv (wind)                                    | Loss Fraction           | 0.0 % at STC               |       |       |       |       |       |       |
| 29.0 W/m <sup>2</sup> K                      |                         |                            |       |       |       |       |       |       |
| 0.0 W/m <sup>2</sup> K/m/s                   |                         |                            |       |       |       |       |       |       |
| <b>Module mismatch losses</b>                |                         |                            |       |       |       |       |       |       |
| Loss Fraction                                |                         |                            |       |       |       |       |       |       |
| 0.0 % at MPP                                 |                         |                            |       |       |       |       |       |       |
| <b>IAM loss factor</b>                       |                         |                            |       |       |       |       |       |       |
| Incidence effect (IAM): User defined profile |                         |                            |       |       |       |       |       |       |
| 0°   | 25°                     | 45°                        | 60°   | 65°   | 70°   | 75°   | 80°   | 90°   |
| 1.000  | 1.000                   | 0.995                      | 0.962 | 0.936 | 0.903 | 0.851 | 0.754 | 0.000 |



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**Main results**

**System Production**

Produced Energy 17381.98 kWh/year

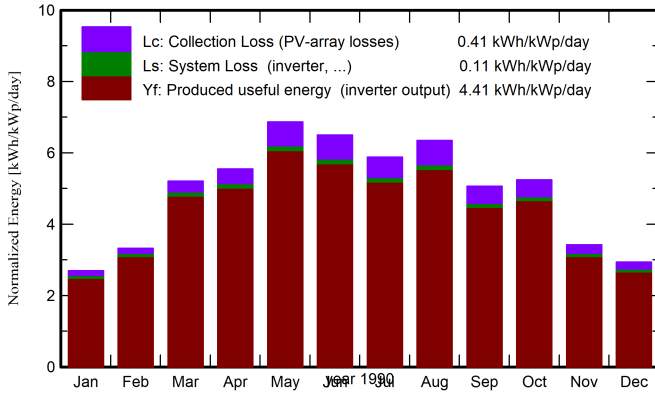
Specific production

1609 kWh/kWp/year

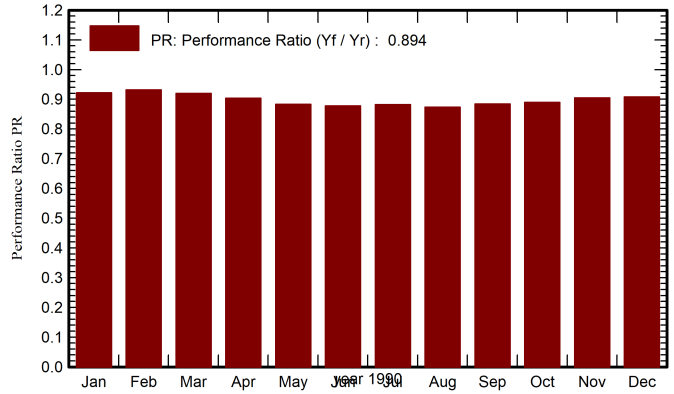
Perf. Ratio PR

89.43 %

**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 | PR<br>ratio |
|---------|-------------------------------|-------------------------------|-------------|-------------------------------|-------------------------------|---------------|---------------|-------------|
| Jan. 90 | 83.7                          | 29.51                         | 8.06        | 83.6                          | 79.6                          | 859           | 832           | 0.922       |
| Feb. 90 | 93.1                          | 31.40                         | 7.35        | 93.1                          | 90.0                          | 965           | 937           | 0.932       |
| Mar. 90 | 161.5                         | 46.72                         | 12.87       | 161.4                         | 157.5                         | 1645          | 1604          | 0.920       |
| Apr. 90 | 166.5                         | 68.13                         | 19.40       | 166.5                         | 162.8                         | 1666          | 1625          | 0.904       |
| May 90  | 212.8                         | 73.20                         | 25.53       | 212.8                         | 208.9                         | 2078          | 2031          | 0.884       |
| June 90 | 195.0                         | 74.01                         | 28.20       | 194.9                         | 191.1                         | 1892          | 1848          | 0.878       |
| July 90 | 182.5                         | 77.53                         | 27.56       | 182.4                         | 178.7                         | 1780          | 1738          | 0.882       |
| Aug. 90 | 196.8                         | 68.40                         | 29.31       | 196.8                         | 193.0                         | 1899          | 1856          | 0.873       |
| Sep. 90 | 152.0                         | 58.53                         | 26.28       | 152.0                         | 148.4                         | 1488          | 1451          | 0.884       |
| Oct. 90 | 162.6                         | 37.83                         | 21.59       | 162.5                         | 157.7                         | 1601          | 1563          | 0.890       |
| Nov. 90 | 102.8                         | 31.34                         | 15.63       | 102.7                         | 98.5                          | 1033          | 1004          | 0.905       |
| Dec. 90 | 91.1                          | 31.73                         | 11.93       | 91.0                          | 86.5                          | 920           | 893           | 0.908       |
| Year    | 1800.4                        | 628.34                        | 19.54       | 1799.7                        | 1752.7                        | 17825         | 17382         | 0.894       |

**Legends**

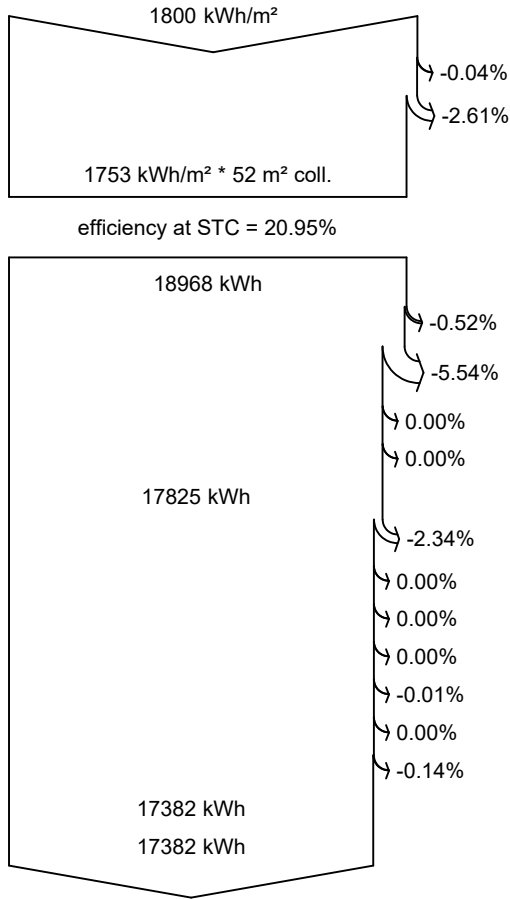
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T\_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E\_Grid Energy injected into grid
- PR Performance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



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**Loss diagram**



- Global horizontal irradiation**
- Global incident in coll. plane**
  - IAM factor on global
- Effective irradiation on collectors**
  - PV conversion
- Array nominal energy (at STC effic.)**
  - PV loss due to irradiance level
  - PV loss due to temperature
  - Module array mismatch loss
  - Ohmic wiring loss
- Array virtual energy at MPP**
  - Inverter Loss during operation (efficiency)
  - Inverter Loss over nominal inv. power
  - Inverter Loss due to max. input current
  - Inverter Loss over nominal inv. voltage
  - Inverter Loss due to power threshold
  - Inverter Loss due to voltage threshold
  - Night consumption
- Available Energy at Inverter Output**
- Energy injected into grid**

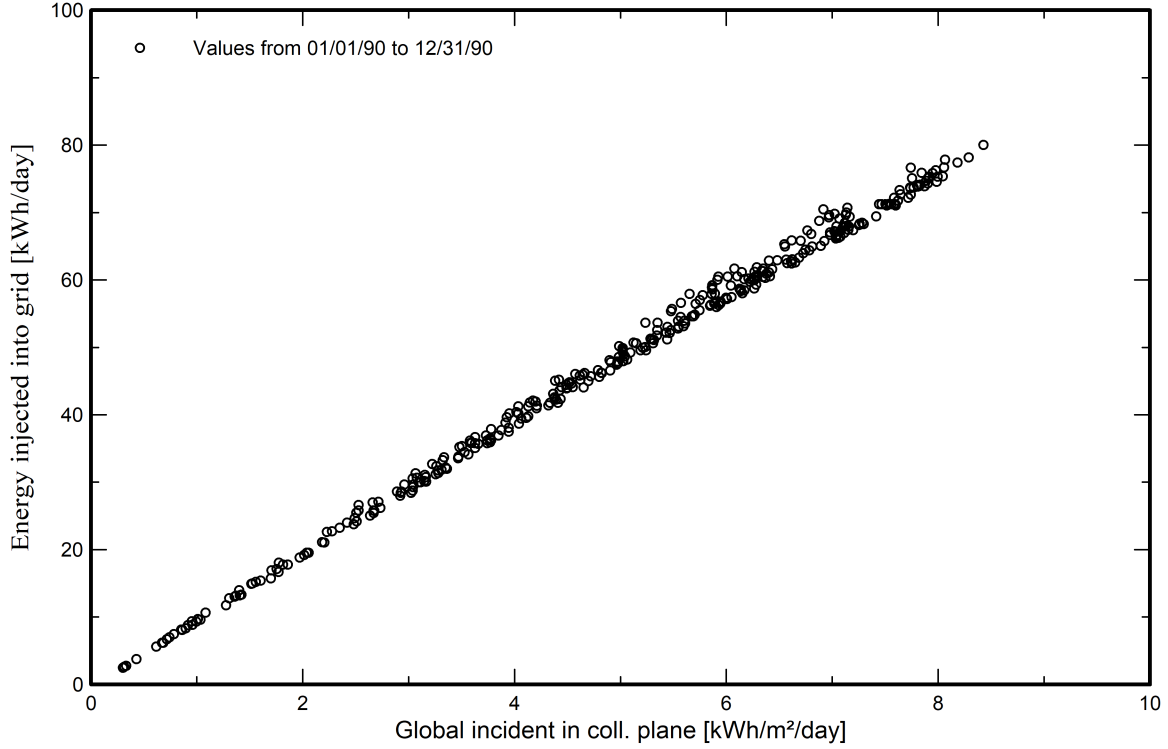


**PVsyst V7.4.0**

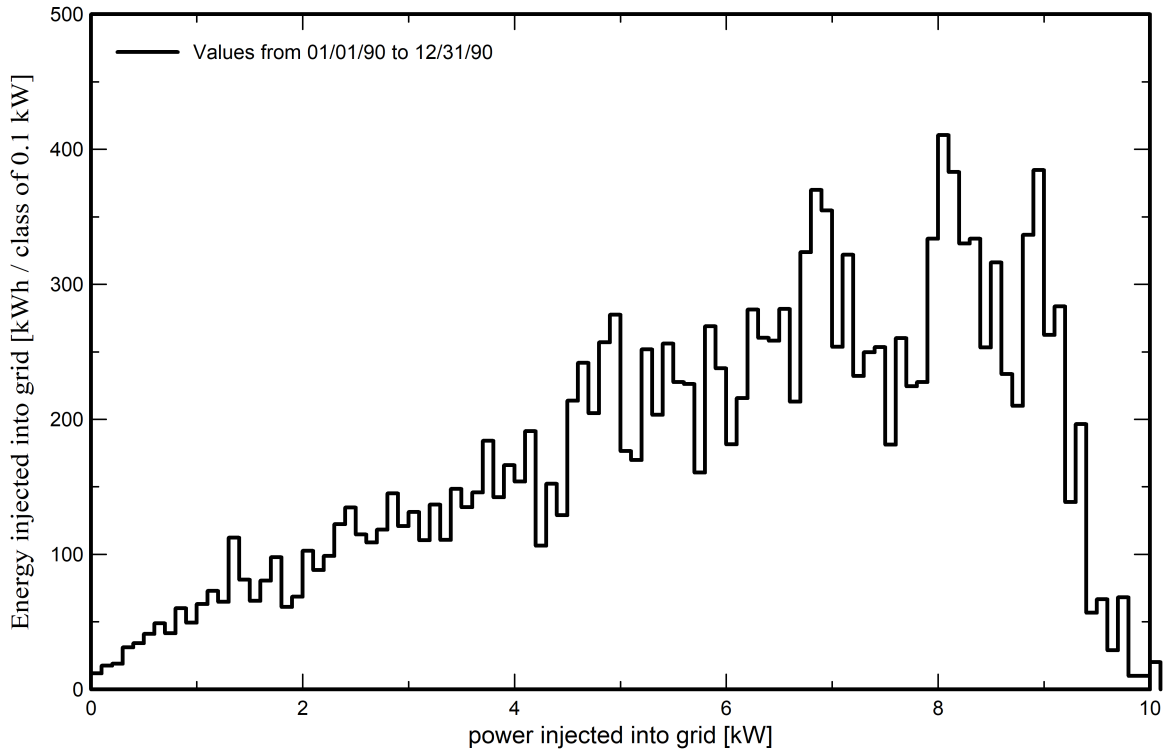
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**Predef. graphs**

**Daily Input/Output diagram**



**System Output Power Distribution**

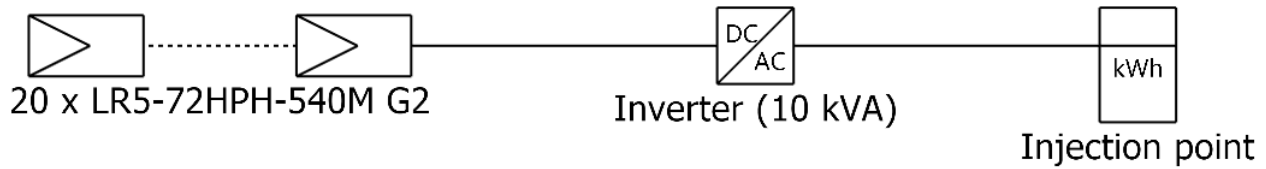




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# Single-line diagram



|           |                        |
|-----------|------------------------|
| PV module | LR5-72HPH-540M G2      |
| Inverter  | SUN2000-10KTL-M1       |
| String    | 20 x LR5-72HPH-540M G2 |

Test\_Houston\_customMeteo

VC0 : New simulation variant

08/01/23