Version 7.2.7

# PVsyst - Simulation report

## Grid-Connected System

Project: Proyecto conectado a la red

Variant: Nueva variante de simulación

No 3D scene defined, no shadings

System power: 5.95 kWp

Bogotá - Colombia



**Author**

**PVsyst V7.2.7**
VC0, Simulation date:
22/10/21 18:02
with v7.2.7

## Project summary

**Geographical Site**
**Bogotá**
Colombia

**Situation**

| | |
|---|---|
| Latitude | 4.61 °N |
| Longitude | -74.08 °W |
| Altitude | 2593 m |
| Time zone | UTC-5 |

**Project settings**

| | |
|---|---|
| Albedo | 0.20 |

**Meteo data**
Bogotá
Meteonorm 8.0 (2010-2014), Sat=100% - Sintético

## System summary

**Grid-Connected System**

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

**PV Field Orientation**
Fixed plane
Tilt/Azimuth 15 / 0 °

**Near Shadings**
No Shadings

**User's needs**
Monthly values

**System information**

**PV Array**

| | |
|---|---|
| Nb. of modules | 14 units |
| Pnom total | 5.95 kWp |

**Inverters**

| | |
|---|---|
| Nb. of units | 1 Unit |
| Pnom total | 7.50 kWac |
| Pnom ratio | 0.793 |

## Results summary

| | | | | | |
|---|---|---|---|---|---|
| Produced Energy | 8.25 MWh/year | Specific production | 1387 kWh/kWp/year | Perf. Ratio PR | 87.03 % |
| Used Energy | 48.42 MWh/year | | | Solar Fraction SF | 17.00 % |

## Table of contents

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## General parameters

**Grid-Connected System** — **No 3D scene defined, no shadings**

**PV Field Orientation**

| Orientation | Sheds configuration | Models used |
|---|---|---|
| Fixed plane | No 3D scene defined | Transposition Perez |
| Tilt/Azimuth 15 / 0 ° | | Diffuse Perez, Meteonorm |
| | | Circumsolar separate |

**Horizon**
Free Horizon

**Near Shadings**
No Shadings

**User's needs**
Monthly values

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Year | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.38 | 3.39 | 3.85 | 3.77 | 4.12 | 4.03 | 3.96 | 4.27 | 4.08 | 4.18 | 4.00 | 4.39 | 48.4 | MWh/mth |

## PV Array Characteristics

**PV module**

| | |
|---|---|
| Manufacturer | Hanwha Q Cells |
| Model | Q Peak Duo L-G8-425 |
| (Original PVsyst database) | |
| Unit Nom. Power | 425 Wp |
| Number of PV modules | 14 units |
| Nominal (STC) | 5.95 kWp |
| Modules | 2 Strings x 7 In series |
| **At operating cond. (25°C)** | |
| Pmpp | 5.95 kWp |
| U mpp | 289 V |
| I mpp | 21 A |

**Inverter**

| | |
|---|---|
| Manufacturer | Generic |
| Model | 7.5 kWac inverter |
| (Custom parameters definition) | |
| Unit Nom. Power | 7.50 kWac |
| Number of inverters | 2 * MPPT 50% 1 unit |
| Total power | 7.5 kWac |
| Operating voltage | 150-750 V |
| Max. power (=>25°C) | 8.00 kWac |
| Pnom ratio (DC:AC) | 0.79 |

**Total PV power**

| | |
|---|---|
| Nominal (STC) | 6 kWp |
| Total | 14 modules |
| Module area | 30.0 m² |

**Total inverter power**

| | |
|---|---|
| Total power | 7.5 kWac |
| Nb. of inverters | 1 Unit |
| Pnom ratio | 0.79 |

## Array losses

**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. 211 mΩ
Loss Fraction 1.5 % at STC

**Module Quality Loss**
Loss Fraction -0.8 %

**Module mismatch losses**
Loss Fraction 2.0 % at MPP

**Strings Mismatch loss**
Loss Fraction 0.1 %

**IAM loss factor**
Incidence effect (IAM): Fresnel AR coating, n(glass)=1.526, n(AR)=1.290

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

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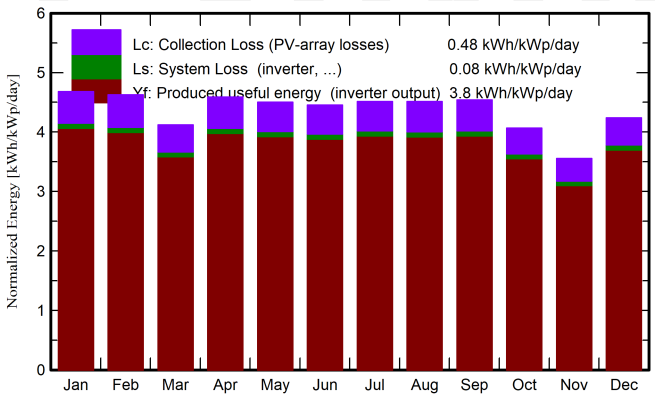
## Main results

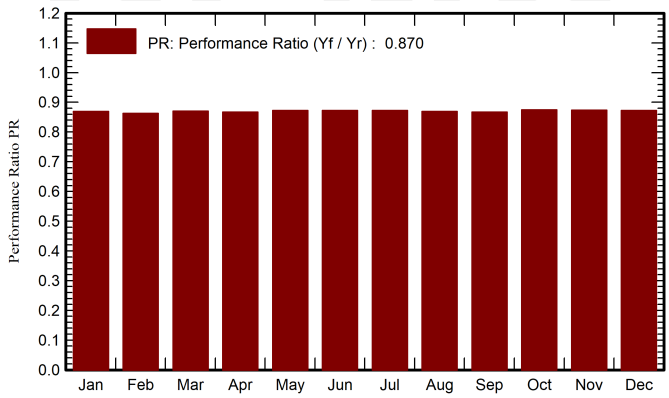
### System Production

| | | | |
|---|---|---|---|
| Produced Energy | 8.25 MWh/year | Specific production | 1387 kWh/kWp/year |
| Used Energy | 48.42 MWh/year | Performance Ratio PR | 87.03 % |
| | | Solar Fraction SF | 17.00 % |

**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_User MWh | E_Solar MWh | E_Grid MWh | EFrGrid MWh |
|---|---|---|---|---|---|---|---|---|---|---|
| **January** | 134.5 | 73.59 | 13.18 | 145.0 | 141.5 | 0.766 | 4.381 | 0.749 | 0.001 | 3.632 |
| **February** | 123.7 | 53.81 | 13.49 | 129.6 | 126.8 | 0.680 | 3.391 | 0.655 | 0.010 | 2.736 |
| **March** | 128.0 | 68.83 | 13.74 | 127.7 | 124.4 | 0.677 | 3.849 | 0.658 | 0.003 | 3.191 |
| **April** | 145.4 | 65.39 | 13.77 | 137.7 | 133.5 | 0.726 | 3.770 | 0.707 | 0.003 | 3.063 |
| **May** | 154.0 | 71.79 | 13.94 | 139.6 | 134.8 | 0.740 | 4.120 | 0.724 | 0.000 | 3.396 |
| **June** | 150.6 | 69.31 | 13.48 | 133.6 | 128.8 | 0.709 | 4.030 | 0.694 | 0.000 | 3.336 |
| **July** | 157.0 | 71.56 | 13.58 | 140.0 | 134.6 | 0.742 | 3.958 | 0.726 | 0.000 | 3.232 |
| **August** | 149.4 | 70.49 | 13.51 | 139.9 | 135.4 | 0.739 | 4.268 | 0.723 | 0.000 | 3.545 |
| **September** | 138.8 | 69.41 | 13.16 | 136.3 | 132.7 | 0.719 | 4.075 | 0.701 | 0.001 | 3.374 |
| **October** | 123.1 | 68.05 | 13.43 | 126.1 | 122.8 | 0.671 | 4.184 | 0.655 | 0.001 | 3.529 |
| **November** | 102.2 | 64.11 | 13.38 | 106.6 | 103.7 | 0.568 | 4.004 | 0.552 | 0.002 | 3.452 |
| **December** | 122.1 | 68.77 | 13.35 | 131.5 | 128.3 | 0.698 | 4.393 | 0.683 | 0.000 | 3.710 |
| **Year** | 1628.9 | 815.12 | 13.50 | 1593.4 | 1547.4 | 8.435 | 48.423 | 8.230 | 0.021 | 40.193 |

### Legends

| | | | |
|---|---|---|---|
| GlobHor | Global horizontal irradiation | EArray | Effective energy at the output of the array |
| DiffHor | Horizontal diffuse irradiation | E_User | Energy supplied to the user |
| T_Amb | Ambient Temperature | E_Solar | Energy from the sun |
| GlobInc | Global incident in coll. plane | E_Grid | Energy injected into grid |
| GlobEff | Effective Global, corr. for IAM and shadings | EFrGrid | Energy from the grid |

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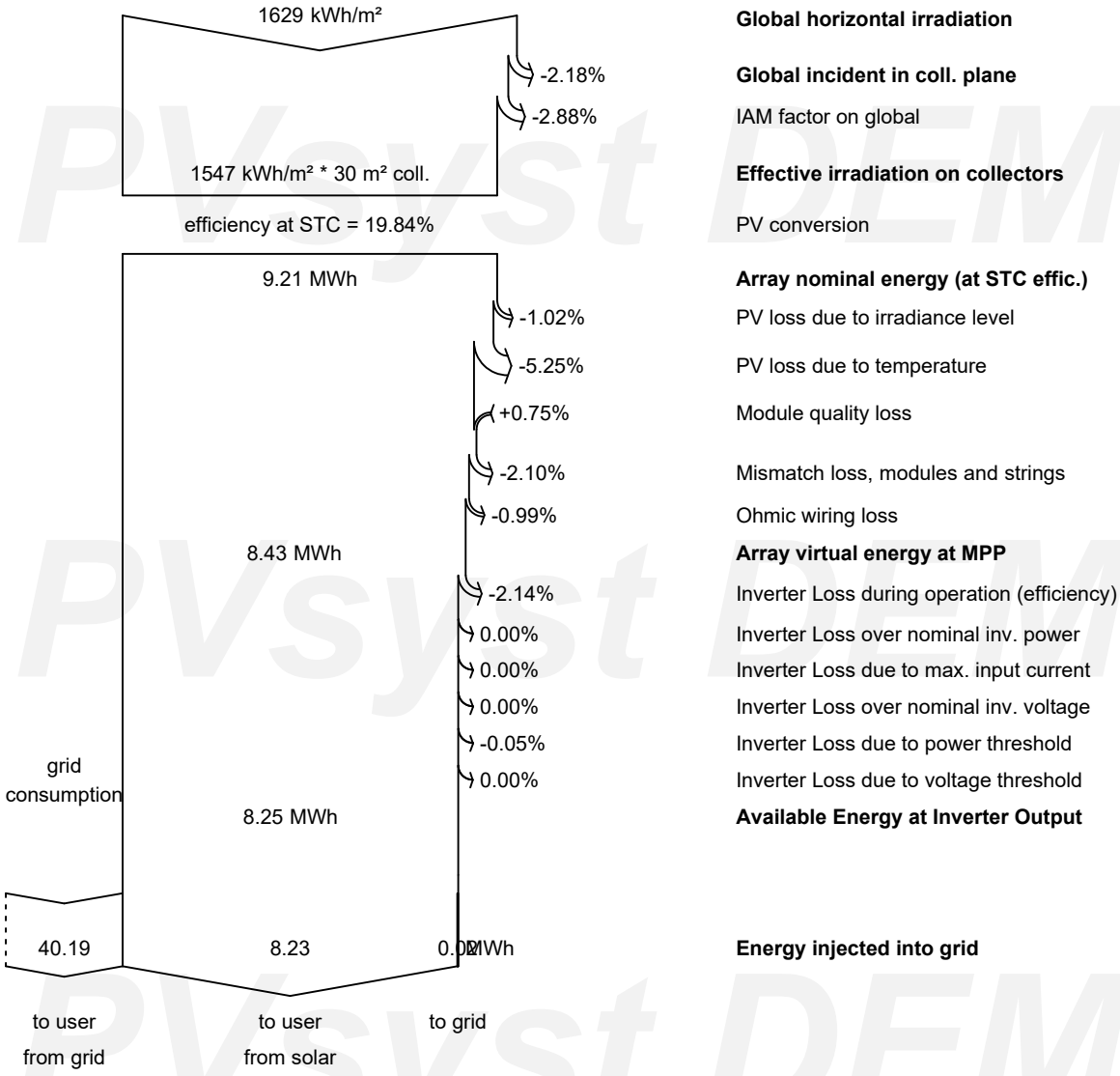
## Loss diagram



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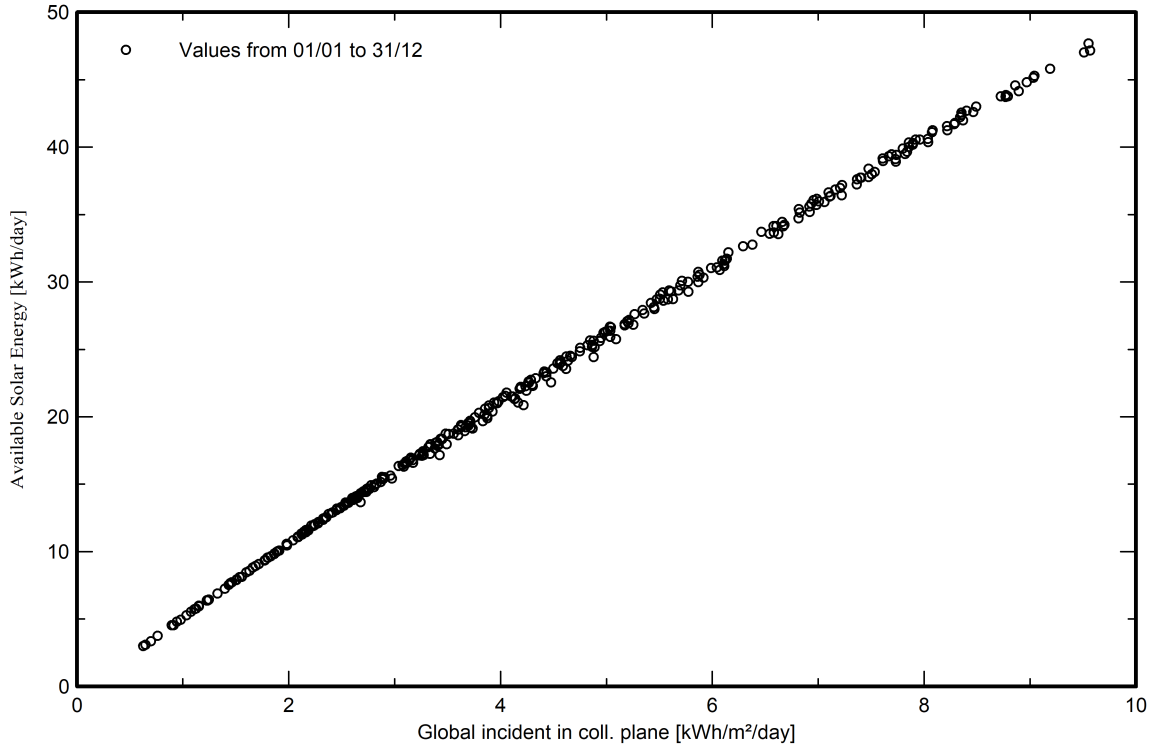
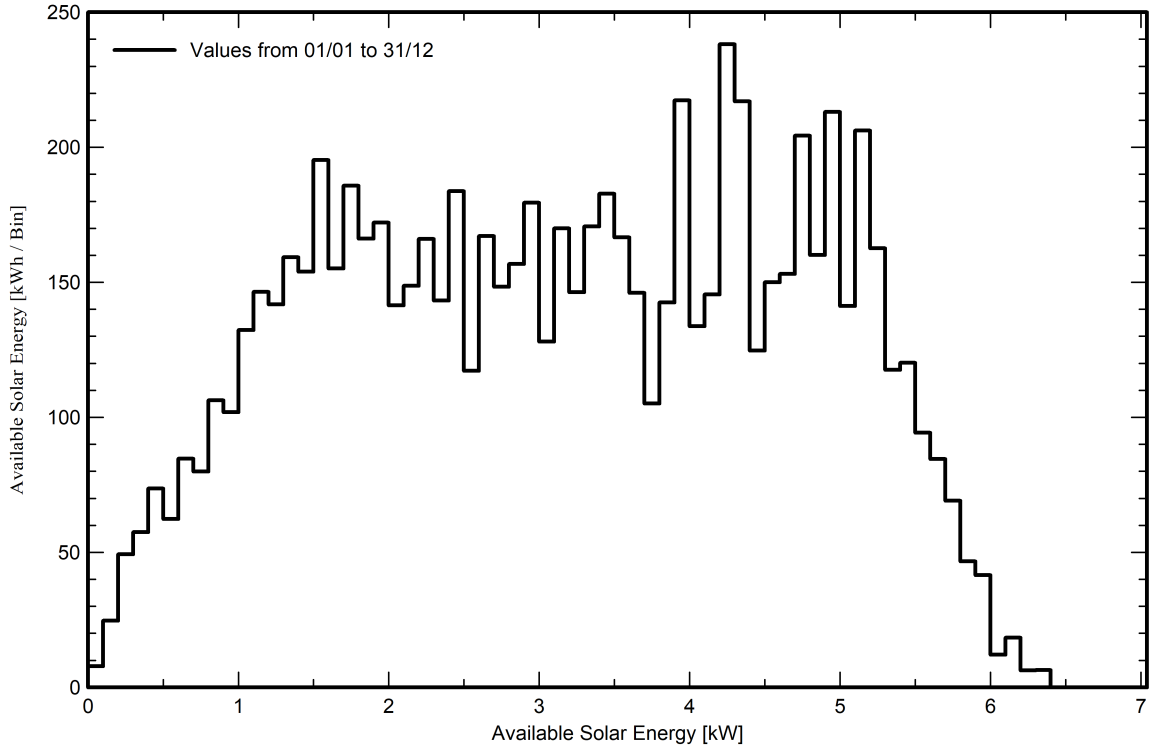
## Special graphs

### Diagrama entrada/salida diaria




### Distribución de potencia de salida del sistema



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## P50 - P90 evaluation

### Meteo data

| | |
|---|---|
| Source | Meteonorm 8.0 (2010-2014), Sat=100% |
| Kind | Not defined |
| Year-to-year variability(Variance) | 0.5 % |
| **Specified Deviation** | |

### Simulation and parameters uncertainties

| | |
|---|---|
| PV module modelling/parameters | 1.0 % |
| Inverter efficiency uncertainty | 0.5 % |
| Soiling and mismatch uncertainties | 1.0 % |
| Degradation uncertainty | 1.0 % |

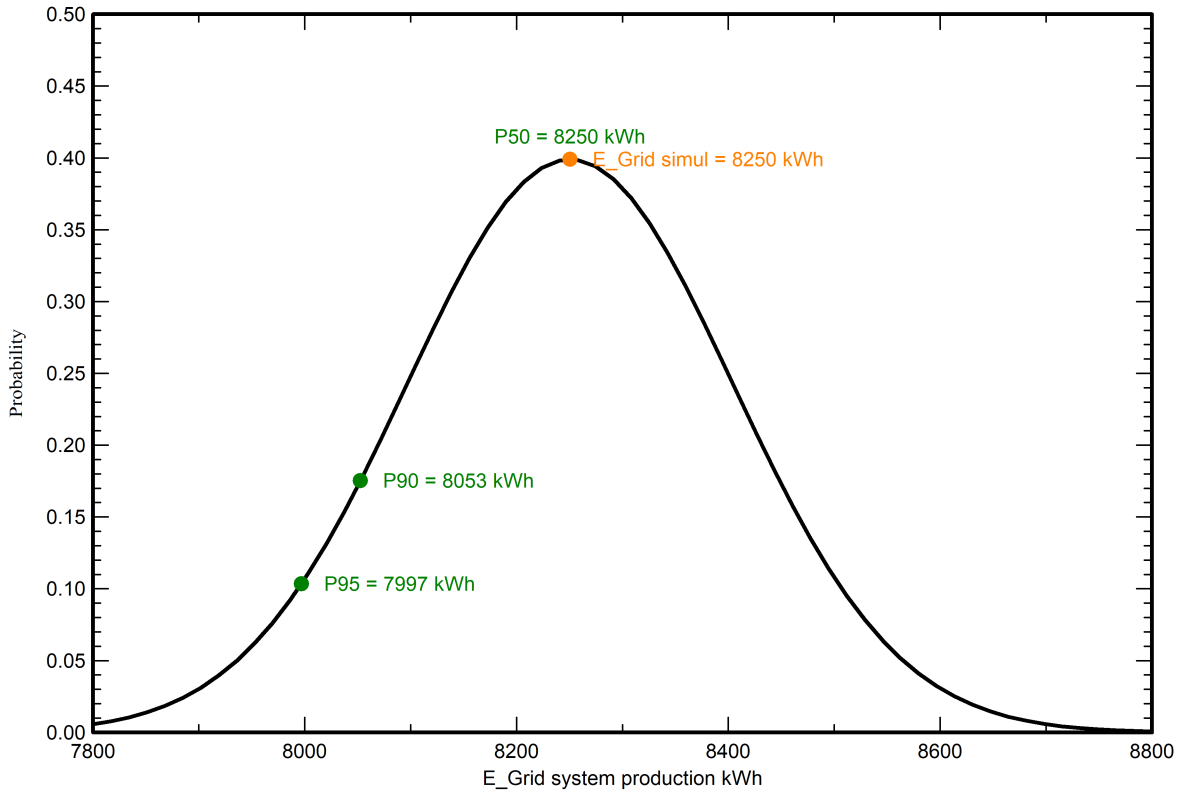
### Global variability (meteo + system)

| | |
|---|---|
| Variability (Quadratic sum) | 1.9 % |

### Annual production probability

| | |
|---|---|
| Variability | 154 kWh |
| P50 | 8250 kWh |
| P90 | 8053 kWh |
| P95 | 7997 kWh |

### Probability distribution



## Cost of the system

### Installation costs

| Item | Quantity units | Cost USD | Total USD |
|---|---|---|---|
| Total | | | 0.00 |
| Depreciable asset | | | 0.00 |

### Operating costs

| Item | Total USD/year |
|---|---|
| Total (OPEX) | 0.00 |

### System summary

| | |
|---|---|
| Total installation cost | 0.00 USD |
| Operating costs | 0.00 USD/year |
| Unused energy | 8230 kWh/year |
| Energy sold to the grid | 20.9 kWh/year |
| Cost of produced energy (LCOE) | 0.000 USD/kWh |

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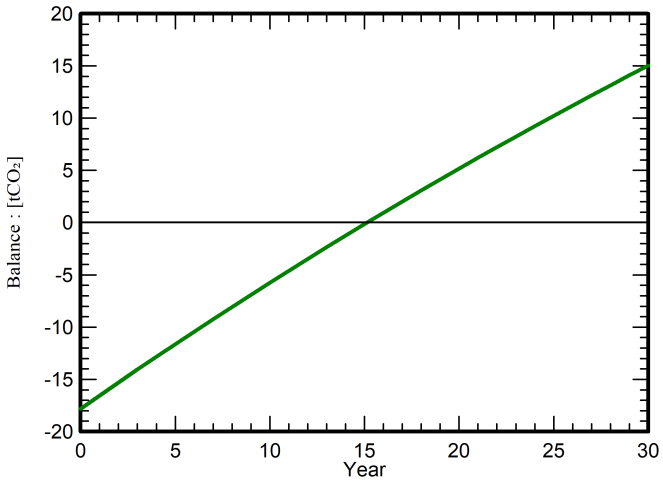
## $CO_2$ Emission Balance

Total: 15.0 $tCO_2$

**Generated emissions**
Total: 17.82 $tCO_2$
Source: Detailed calculation from table below:

**Replaced Emissions**
Total: 37.9 $tCO_2$
System production: 8250.47 kWh/yr
Grid Lifecycle Emissions: 153 $gCO_2/kWh$
Source: IEA List
Country: Colombia
Lifetime: 30 years
Annual degradation: 1.0 %

**Saved $CO_2$ Emission vs. Time**




**System Lifecycle Emissions Details**

| Item | LCE | Quantity | Subtotal |
|---|---|---|---|
| | | | [$kgCO_2$] |
| Modules | 1713 kgCO2/kWp | 10.2 kWp | 17470 |
| Supports | 1.02 kgCO2/kg | 240 kg | 245 |
| Inverters | 101 kgCO2/ | 1.00 | 101 |