

PVSYST V6.88	Sugs Lloyd Pvt Ltd(India)				09/06/22		Page 1/6																			
<h2 style="text-align: center;">Grid-Connected System: Simulation parameters</h2>																										
<b>Project :</b>		<b>Devbhoomi Cold chain Pvt Ltd</b>																								
<b>Geographical Site</b>		<b>Shimla(HP)</b>				<b>Country</b>		<b>India</b>																		
<b>Situation</b>		Latitude		31.21° N	Longitude		77.40° E																			
Time defined as		Legal Time		Time zone UT+5.5	Altitude		2276																			
		mAlbedo		0.20																						
<b>Meteo data:</b>		<b>Shimla(HP)</b>		Meteonorm 7.2 (1981-2010), Sat=27% (Modified by user) (Modif - Synthetic)																						
<b>Simulation variant :   Adani 540 Wp (S)</b>																										
				Simulation date		09/06/22 12h38																				
				<b>Simulation for the</b>		<b>1st year of operation</b>																				
<b>Simulation parameters</b>			System type		<b>No 3D scene defined, no shadings</b>																					
<b>Collector Plane Orientation</b>			Tilt		10°	Azimuth		20°																		
<b>Models used</b>			Transposition		Perez	Diffuse		Perez, Meteonorm																		
<b>Horizon</b>			Free Horizon																							
<b>Near Shadings</b>			No Shadings																							
<b>User's needs :</b>			Unlimited load (grid)																							
<b>PV Array Characteristics</b>																										
<b>PV module</b>		Si-mono	Model		<b>TSM-540DE18M(II)</b>																					
Original PVsyst database		Manufacturer		Adani Power																						
Number of PV modules		In series		18 modules	In parallel		48 strings																			
Total number of PV modules		Nb. modules		880	Unit Nom. Power		540 Wp																			
Array global power		Nominal (STC)		<b>475 kWp</b>	At operating cond.		475 kWp (50°C)																			
Array operating characteristics (50°C)		U mpp		738 V	I mpp		273 A																			
Total area		Module area		<b>2223 m²</b>	Cell area		2262 m²																			
<b>Inverter</b>		Model		<b>Solar Inverter M100_210/M75</b>																						
Original PVsyst database		Manufacturer		Solis Energy																						
Characteristics		Operating Voltage		590-1000 V	Unit Nom. Power		475 kWac																			
					Max. power (=>40°C)		525 kWac																			
Inverter pack		Nb. of inverters		5 units	Total Power		475 kWac																			
					Pnom ratio		1.1																			
<b>PV Array loss factors</b>																										
Array Soiling Losses				Loss Fraction		3.0 %																				
Thermal Loss factor		Uc (const)		29.0 W/m²K	Uv (wind)		0.0 W/m²K / m/s																			
Wiring Ohmic Loss		Global array res.		29 mOhm	Loss Fraction		2.5 % at STC																			
Serie Diode Loss		Voltage Drop		0.7 V	Loss Fraction		0.1 % at STC																			
LID - Light Induced Degradation				Loss Fraction		2.0 %																				
Module Quality Loss				Loss Fraction		-0.8 %																				
Module Mismatch Losses				Loss Fraction		1.0 % at MPP																				
Strings Mismatch loss				Loss Fraction		0.10 %																				
Module average degradation		Year no		1	Loss factor		0.4 %/year																			
Mismatch due to degradation		Imp RMS dispersion		0.4 %/year	Vmp RMS dispersion		0.4 %/year																			
Incidence effect (IAM): User defined profile																										
<table border="1"> <tr> <td>0°</td> <td>30°</td> <td>50°</td> <td>60°</td> <td>70°</td> <td>75°</td> <td>80°</td> <td>85°</td> <td>90°</td> </tr> <tr> <td>1.000</td> <td>1.000</td> <td>0.998</td> <td>0.993</td> <td>0.968</td> <td>0.926</td> <td>0.825</td> <td>0.583</td> <td>0.000</td> </tr> </table>									0°	30°	50°	60°	70°	75°	80°	85°	90°	1.000	1.000	0.998	0.993	0.968	0.926	0.825	0.583	0.000
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# Grid-Connected System: Simulation parameters

Spectral correction		FirstSolar model. Precipitable water estimated from relative humidity				
Coefficient Set	C0	C1	C2	C3	C4	C5
Monocrystalline Si	0.85914	-0.02088	-0.0058853	0.12029	0.026814	-0.001781

## System loss factors

AC wire loss inverter to transfo	Inverter voltage	475 Vac tri		
	Wires: 3x500.0 mm²	500 m	Loss Fraction	1.8 % at STC
External transformer	Iron loss (24H connexion)	984 W	Loss Fraction	0.2 % at STC
	Resistive/Inductive losses	3.25 mOhm	Loss Fraction	1.0 % at STC

## Grid-Connected System: Main results

**Project** Dev Bhoomi Cold Chain Pvt Ltd

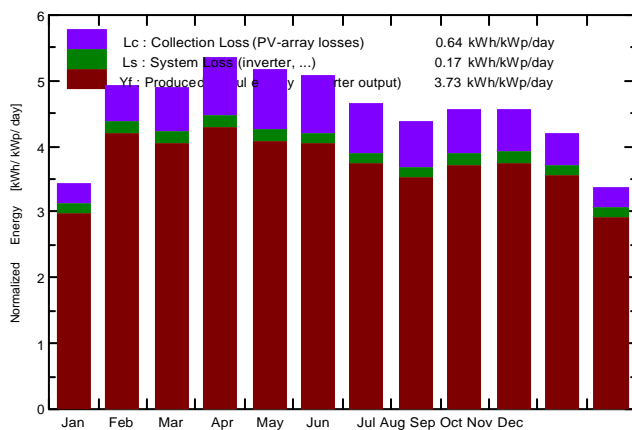
**Simulation variant :** Adani 540 Wp(S)  
Simulation for the 1st year of operation

<b>Main system parameters</b>		System type	<b>No 3D scene defined, no shadings</b>	
PV Field Orientation		tilt	10°	azimuth 20°
PV modules		Model	TSM-540E18M(II)	Pnom 540 Wp
PV Array		Nb. of modules	880	Pnom total <b>475 kWp</b>
Inverter		Model	Solar Inverter M100_100	Pnom 475 kW ac
Inverter pack		Nb. of units	5.0	Pnom total <b>475 kW ac</b>
User's needs		Unlimited load (grid)		

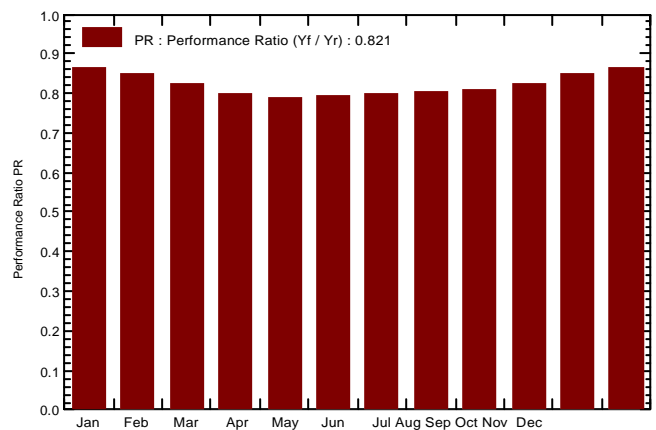
### Main simulation results

System Production **Produced Energy 712.5 MWh/year** Specific prod. 1500 kWh/kWp/year  
Performance Ratio PR 80.18 %

Normalized productions (per installed kWp): Nominal power 475 kWp



Performance Ratio PR



### Adani 540 Wp (S) 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 MWh	E_Grid MWh	PR
<b>January</b>	99.0	44.7	14.00	106.8	102.3	56.34	45.34	0.837
<b>February</b>	128.7	45.4	17.81	138.0	132.4	57.54	46.54	0.820
<b>March</b>	146.2	60.2	23.79	151.8	145.5	57.56	46.63	0.826
<b>April</b>	157.8	69.9	29.71	160.3	153.7	58.56	47.20	0.802
<b>May</b>	159.9	93.3	33.27	160.1	153.4	58.65	47.20	0.789
<b>June</b>	152.7	104.9	32.60	151.9	145.4	59.67	48.45	0.797
<b>July</b>	145.4	94.7	31.63	144.3	138.0	59.86	48.45	0.803
<b>August</b>	134.9	90.3	30.47	135.4	129.6	58.65	48.10	0.805
<b>September</b>	133.9	74.9	29.08	137.2	131.4	58.54	48.05	0.812
<b>October</b>	133.6	59.8	26.37	140.9	135.1	57.65	47.67	0.823
<b>November</b>	116.4	46.0	20.42	125.8	120.4	57.34	47.80	0.809
<b>December</b>	95.0	36.5	15.74	104.5	100.1	57.12	47.45	0.806
<b>Year</b>	1603.5	820.6	25.44	1657.1	1587.4	712.50	570	0.801

Legends:

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

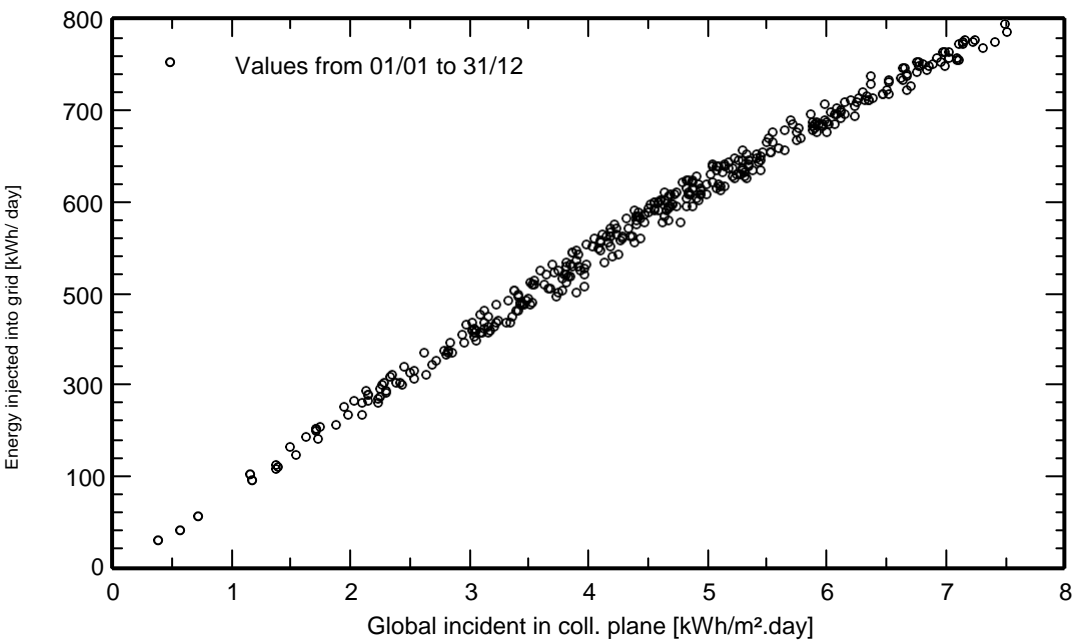
# Grid-Connected System: Special graphs

Project Dev Bhoomi Cold Chain Pvt LTd

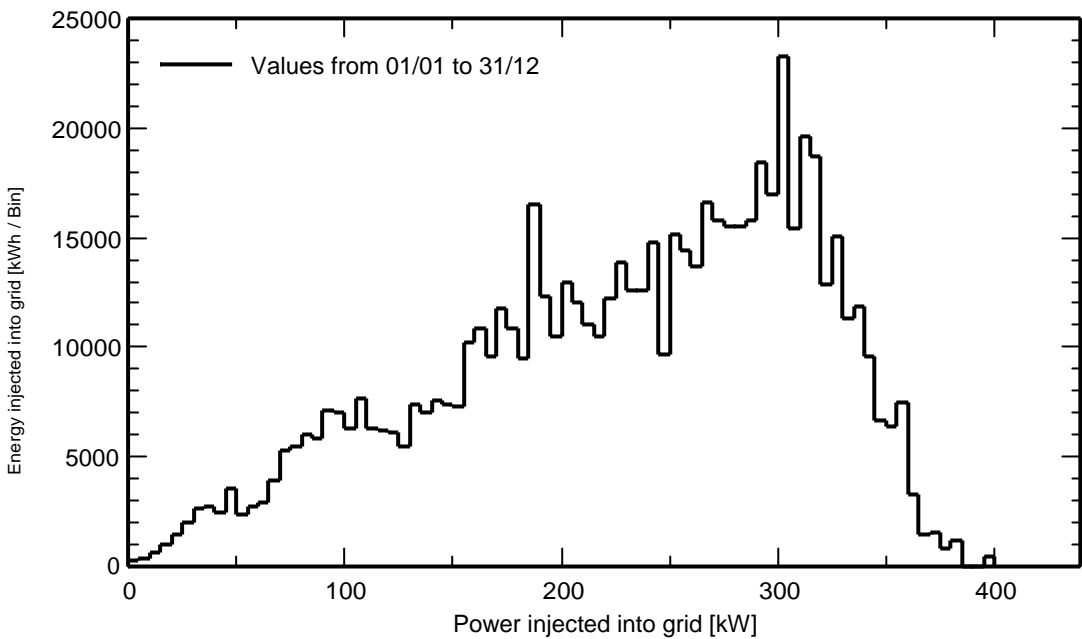
Simulation variant :   **Adani 540 Wp(S)**  
Simulation for the 1st year of operation

<b>Main system parameters</b>	System type	<b>No 3D scene defined, no shadings</b>	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540DE18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total <b>475 kWp</b>
Inverter	Model	Solar Inverter M100_210	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total <b>475 kW ac</b>
User's needs	Unlimited load (grid)		

Daily Input/Output diagram



System Output Power Distribution



## Grid-Connected System: Loss diagram

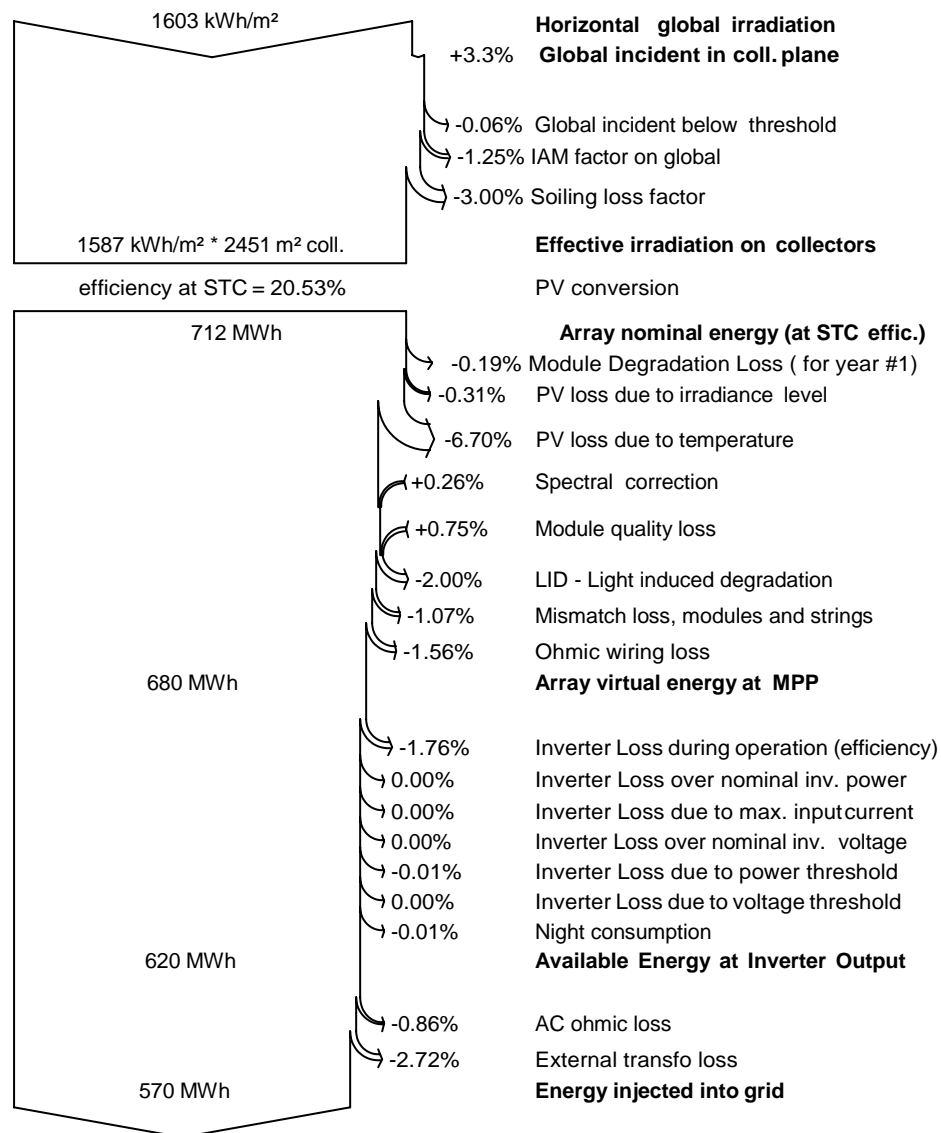
**Project : Dev Bhoomi Cold Chain Pvt Ltd**

**Simulation variant : Adani 540 Wp(S)**

**Simulation for the 1st year of operation**

<b>Main system parameters</b>	System type	<b>No 3D scene defined, no shadings</b>	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540DE18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total <b>475 kWp</b>
Inverter	Model	Solar Inverter M100_210	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total <b>475 kW ac</b>
User's needs	Unlimited load (grid)		

### Loss diagram over the whole year



# Grid-Connected System: P50 - P90 evaluation

**Project : Dev Bhoomi Cold Chain Pvt Ltd**

**Simulation variant : Adani 540 Wp(S)**  
**Simulation for the 1st year of operation**

<b>Main system parameters</b>	System type	<b>No 3D scene defined, no shadings</b>	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540DE18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total <b>475 kWp</b>
Inverter	Model	Solar Inverter M100_210	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total <b>475 kW ac</b>
User's needs	Unlimited load (grid)		

## Evaluation of the Production probability forecast

The probability distribution of the system production forecast for different years is mainly dependent on the meteo data used for the simulation, and depends on the following choices:

Meteo data source	Meteonorm 7.2 (1981-2010), Sat=27% (Modified by user) (Mod		
Meteo data	Kind	Not defined	Year 1995
Specified Deviation	Year deviation from aver.	3 %	
Year-to-year variability	Variance	3.0 %	

The probability distribution variance is also depending on some system parameters uncertainties

Specified Deviation	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)	Variance	3.5 %	(quadratic sum)

Annual production probability	<b>Variability</b>	<b>712 MWh</b>
	<b>P50</b>	<b>820 MWh</b>
	<b>P90</b>	<b>712.5 MWh</b>

## Probability distribution

