Version 7.3.4

PVsyst - Simulation report

Grid-Connected System

Project: CLP 375MW RAJASTHAN

Variant: Inverter 1 MPPT Power sharing on
Unlimited sheds

System power: 294 kWp

Bhuraj - India

Author
GENSOL ENGINEERING LIMITED (India)

PVsyst V7.3.4
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with v7.3.4

GENSOL ENGINEERING LIMITED (India)

Project summary

Geographical Site
Bhuraj
India

Situation

Latitude	27.43 °N
Longitude	72.05 °E
Altitude	202 m
Time zone	UTC+5.5

Project settings

Albedo	0.20

Meteo data
Bhuraj
SolarGIs Monthly - Synthetic

System summary

Grid-Connected System
Simulation for year no 1

Unlimited sheds

PV Field Orientation

Sheds	
Tilt	18 °
Azimuth	0 °

Near Shadings
Mutual shadings of sheds
Electrical effect

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	540 units
Pnom total	294 kWp

Inverters

Nb. of units	1 unit
Pnom total	200 kWac
Grid power limit	200 kWac
Grid lim. Pnom ratio	1.472

Results summary

Produced Energy	505.11 MWh/year	Specific production	1716 kWh/kWp/year	Perf. Ratio PR	77.85 %

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General parameters

Grid-Connected System

Unlimited sheds

PV Field Orientation

Orientation	
Sheds	
Tilt	18 °
Azimuth	0 °

Sheds configuration	
Nb. of sheds	999 units
Unlimited sheds	
Sizes	
Sheds spacing	7.50 m
Collector width	3.94 m
Ground Cov. Ratio (GCR)	52.5 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m
Shading limit angle	
Limit profile angle	18.1 °
Shadings electrical effect	
Cell size	15.6 cm
Strings in width	2 units

Models used	
Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon
Free Horizon

Near Shadings
Mutual shadings of sheds
Electrical effect

User's needs
Unlimited load (grid)

Grid power limitation

Active power	200 kWac
Pnom ratio	1.472

PV Array Characteristics

PV module

Manufacturer	Trina Solar
Model	TSM-545DE19
(Custom parameters definition)	
Unit Nom. Power	545 Wp
Number of PV modules	540 units
Nominal (STC)	294 kWp

Inverter

Manufacturer	Sungrow
Model	SG250HX-IN
(Custom parameters definition)	
Unit Nom. Power	200 kWac
Number of inverters	1 unit
Total power	200 kWac

Array #1 - PV Array

Number of PV modules	216 units	Number of inverters	3 * MPPT 8% 0.3 unit
Nominal (STC)	118 kWp	Total power	50.0 kWac
Modules	6 Strings x 36 In series		
At operating cond. (50°C)		Operating voltage	600-1500 V
Pmpp	108 kWp	Max. power (=>30°C)	250 kWac
U mpp	1019 V	Pnom ratio (DC:AC)	2.35
I mpp	106 A		

Array #2 - Sub-array #2

Number of PV modules	324 units	Number of inverters	9 * MPPT 8% 0.8 unit
Nominal (STC)	177 kWp	Total power	150 kWac
Modules	9 Strings x 36 In series		
At operating cond. (50°C)		Operating voltage	600-1500 V
Pmpp	162 kWp	Max. power (=>30°C)	250 kWac
U mpp	1019 V	Pnom ratio (DC:AC)	1.18
I mpp	159 A		

PV Array Characteristics

Total PV power

Nominal (STC)	294 kWp
Total	540 modules
Module area	1411 m²
Cell area	1310 m²

Total inverter power

Total power	200 kWac
Number of inverters	1 unit
Pnom ratio	1.47
Power sharing defined	

Array losses

Array Soiling Losses
Loss Fraction 0.5 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation
Loss Fraction 1.5 %

Module Quality Loss
Loss Fraction -0.6 %

Module mismatch losses
Loss Fraction 0.5 % at MPP

Module average degradation
Year no 1
Loss factor 1 %/year
Mismatch due to degradation
Imp RMS dispersion 0.4 %/year
Vmp RMS dispersion 0.4 %/year

IAM loss factor
Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.999	0.996	0.978	0.944	0.856	0.622	0.000

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 0.5 % at STC

Array #1 - PV Array

Global array res.	53 mΩ
Loss Fraction	0.5 % at STC

Array #2 - Sub-array #2

Global array res.	35 mΩ
Loss Fraction	0.5 % at STC

System losses

Unavailability of the system
Time fraction 0.7 %
2.5 days,
3 periods

Auxiliaries loss
Proportionnal to Power 2.0 W/kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo
Inverter voltage 800 Vac tri
Loss Fraction 1.38 % at STC

Inverter: SG250HX-IN
Wire section (1 Inv.) Copper 1 x 3 x 2500 mm²
Wires length 2755 m

Inverter: SG250HX-IN
Wire section (1 Inv.) Copper 1 x 3 x 185 mm²
Wires length 354 m

MV line up to Injection
MV Voltage 33 kV
Wires Copper 3 x 500 mm²
Length 499590 m
Loss Fraction 0.50 % at STC

AC losses in transformers

MV transfo

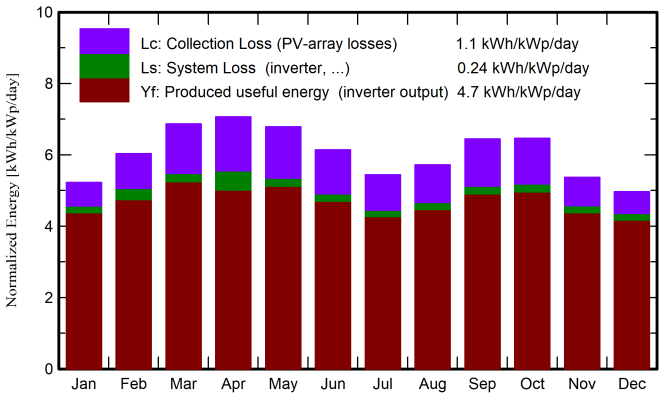
Medium voltage	33 kV
Transformer parameters	
Nominal power at STC	290 kVA
Iron Loss (24/24 Connexion)	0.58 kVA
Iron loss fraction	0.20 % at STC
Copper loss	3.48 kVA
Copper loss fraction	1.20 % at STC
Coils equivalent resistance	3 x 26.50 mΩ

Main results

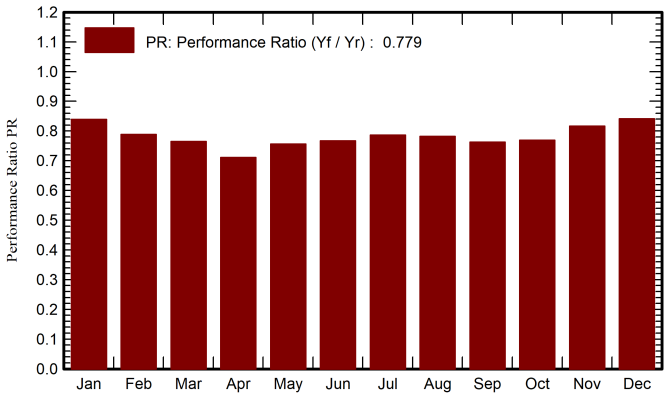
System Production

Produced Energy	505.11 MWh/year	Specific production	1716 kWh/kWp/year
		Perf. Ratio PR	77.85 %

Normalized productions (per installed kWp)



Performance Ratio PR



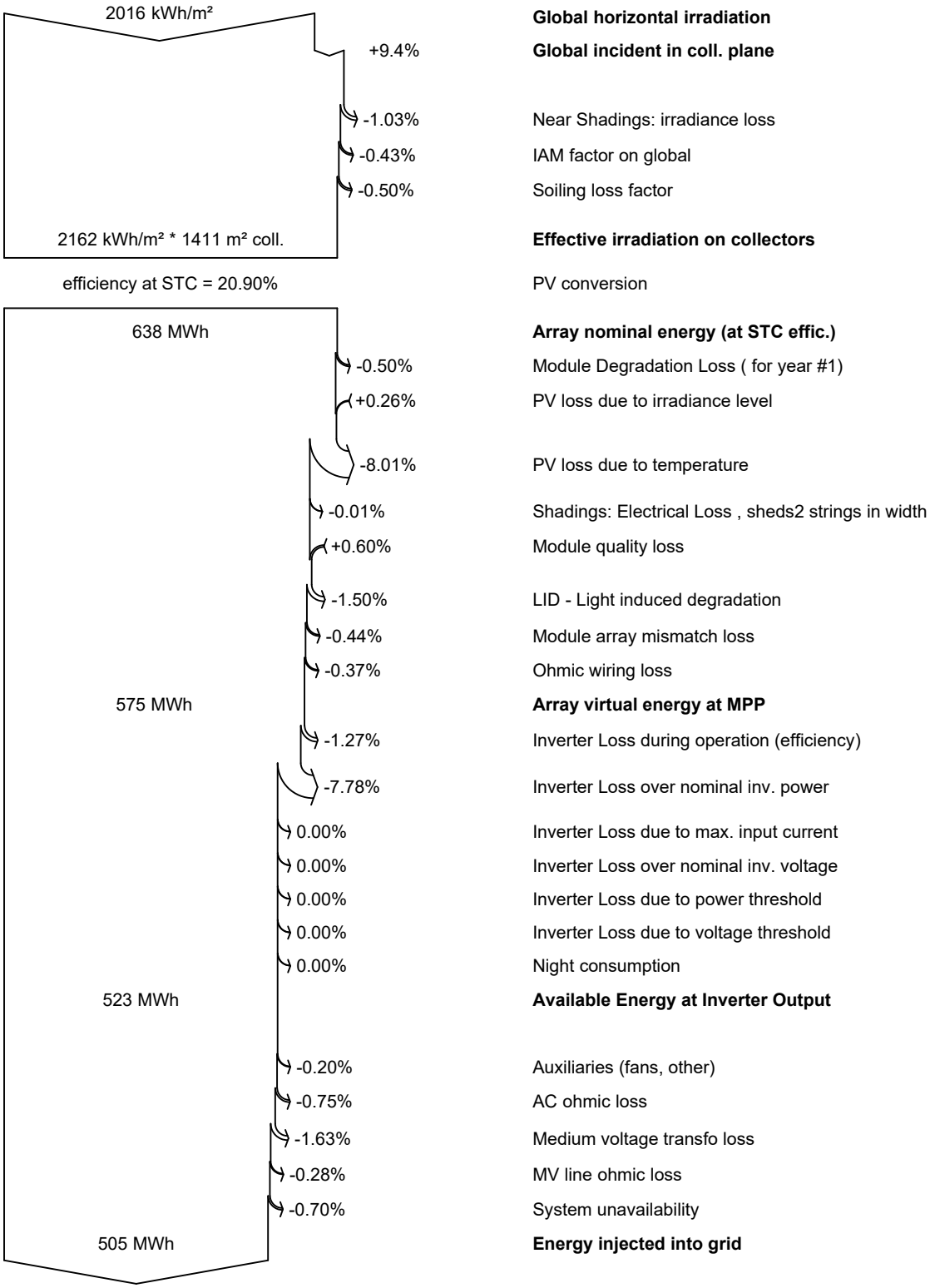
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	126.3	47.7	13.70	162.0	159.1	41.74	40.00	0.839
February	140.0	49.0	17.30	168.8	166.1	41.72	39.17	0.788
March	190.8	68.5	23.60	212.8	209.2	50.05	47.93	0.765
April	204.7	85.8	29.40	212.0	207.9	49.08	44.33	0.711
May	214.1	107.3	34.20	210.3	205.7	48.78	46.78	0.756
June	191.7	104.1	35.90	184.1	179.8	43.34	41.57	0.767
July	173.9	103.5	34.60	168.6	164.3	40.67	38.99	0.786
August	176.1	92.4	33.40	177.4	173.3	42.56	40.79	0.782
September	179.6	72.9	32.10	193.4	189.8	45.28	43.39	0.762
October	171.0	58.9	27.20	200.3	196.9	47.33	45.33	0.769
November	129.2	51.6	20.30	161.0	158.3	40.45	38.71	0.817
December	118.2	44.9	15.08	153.9	151.3	39.80	38.11	0.842
Year	2015.6	886.6	26.44	2204.6	2161.7	530.80	505.11	0.779

Legends

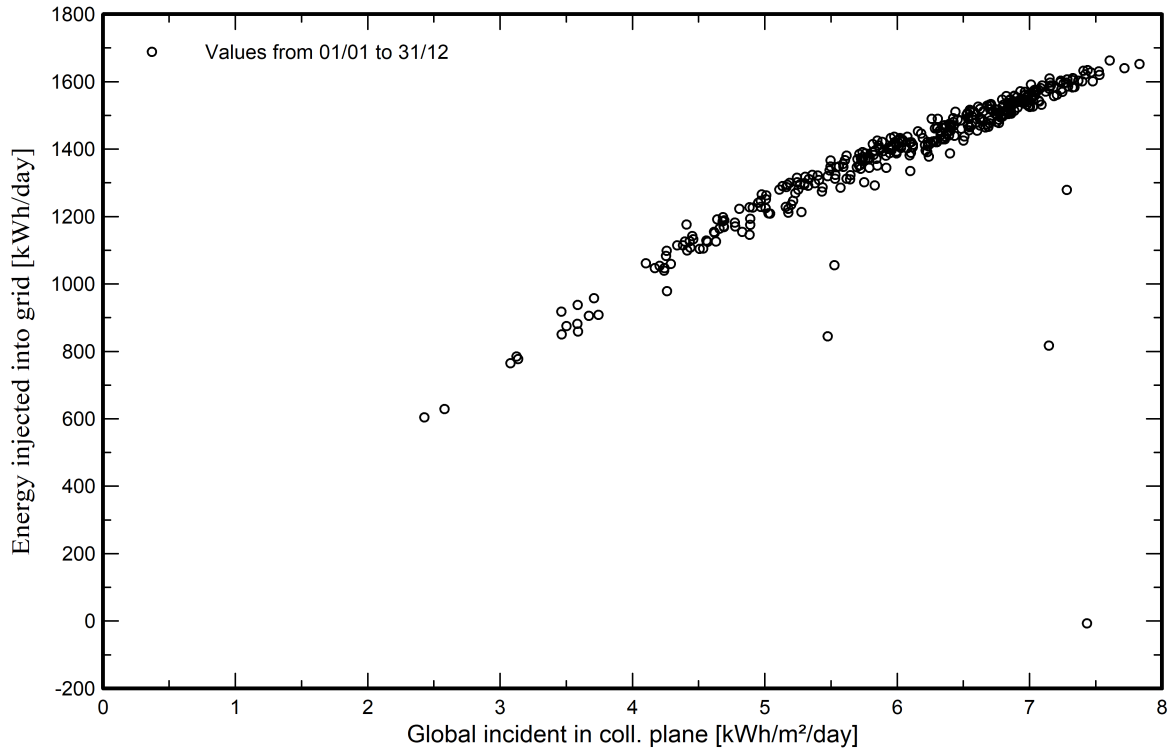
GlobHor	Global horizontal irradiation
DiffHor	Horizontal diffuse irradiation
T_Amb	Ambient Temperature
GlobInc	Global incident in coll. plane
GlobEff	Effective Global, corr. for IAM and shadings
EArray	Effective energy at the output of the array
E_Grid	Energy injected into grid
PR	Performance Ratio

Loss diagram

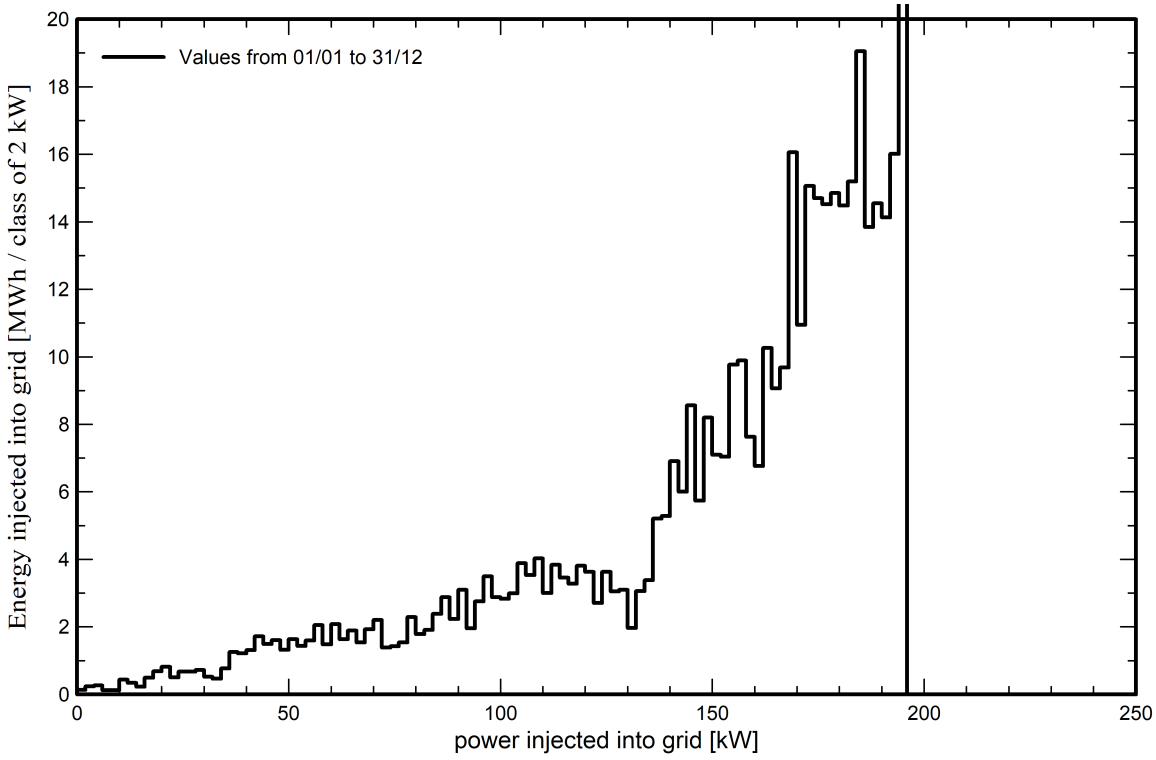


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



P50 - P90 evaluation

Meteo data

Source	SolarGIs Monthly
Kind	Monthly averages
Synthetic - Multi-year average	
Year-to-year variability(Variance)	5.4 %

Specified Deviation

Climate change	0.0 %

Global variability (meteo + system)

Variability (Quadratic sum)	5.7 %

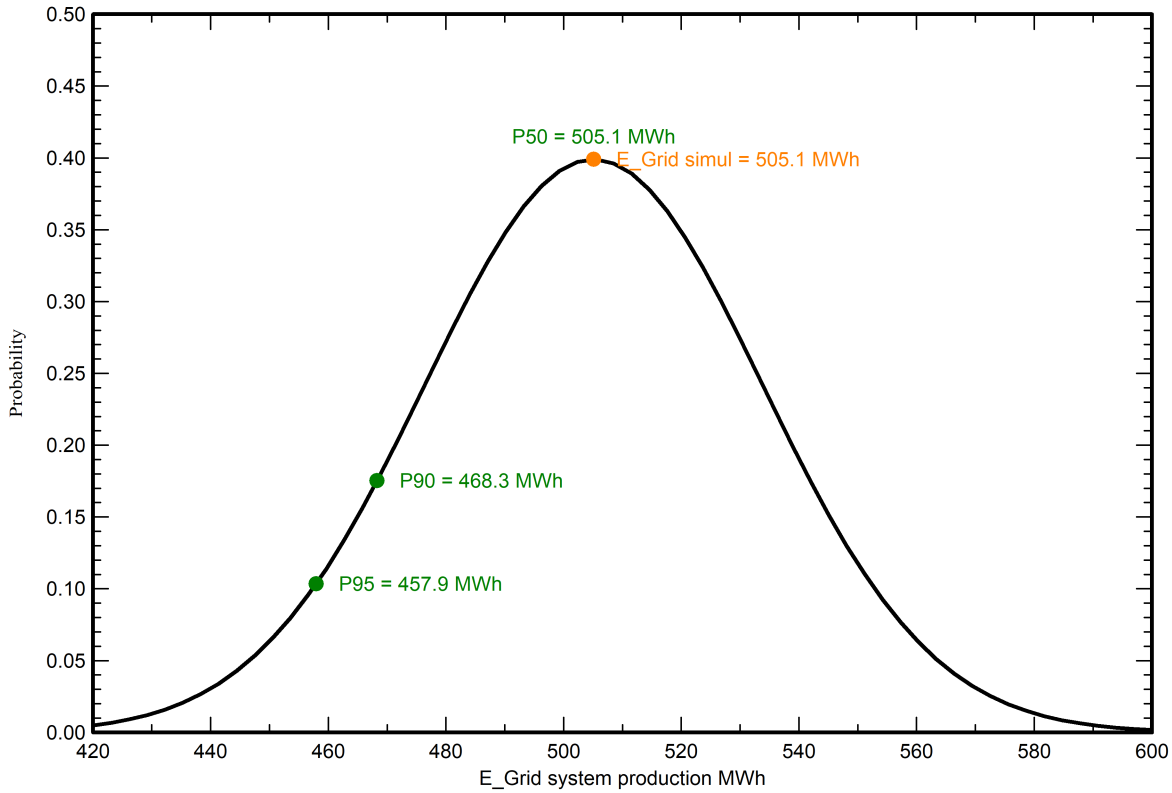
Simulation and parameters uncertainties

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

Annual production probability

Variability	28.7 MWh
P50	505.1 MWh
P90	468.3 MWh
P95	457.9 MWh

Probability distribution



Single-line diagram

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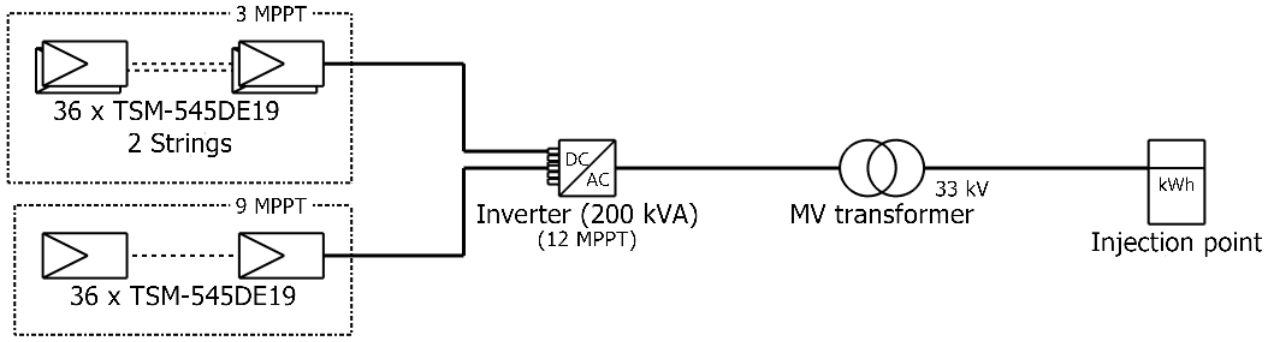

PV module	TSM-545DE19
Inverter	SG250HX-IN
String	36 x TSM-545DE19

	CLP 375MW RAJASTHAN	GENSOL ENGINEERING LIMITED (In
	VEK : Inverter 1 MPPT Power sharing on	01/11/23