Grid-Connected System: Simulation parameters

Project : **Kalmykskaya**

Geographical Site	**Sterlibashevo**		Country	**Russia**
Situation	Latitude	53.44° N	Longitude	55.23° E
Time defined as	Legal Time	Time zone UT+5	Altitude	258 m
	Albedo	0.20		
Meteo data:	**Sterlibashevo**	Meteonorm 7.2 (1991-2010), Sat=100% - Synthetic		

Simulation variant : **New simulation variant**

	Simulation date	09/07/20 13h51		

Simulation parameters	System type	**Ground system (tables) on a hill**		
Collector Plane Orientation	Tilt	38°	Azimuth	3°
Sheds configuration	Nb. of sheds	418		
	Sheds spacing	14.0 m	Collector width	3.96 m
Shading limit angle	Limit profile angle	12.6°	Ground cov. Ratio (GCR)	28.2 %
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	Linear shadings			
User's needs :	Unlimited load (grid)			

PV Array Characteristics

PV module	Si-poly	Model	**STP 325_24/Vfw_1500V_19V01**	
Custom parameters definition		Manufacturer	Suntech	
Number of PV modules		In series	19 modules	In parallel 800 strings
Total number of PV modules		Nb. modules	15200	Unit Nom. Power 325 Wp
Array global power		Nominal (STC)	**4940 kWp**	At operating cond. 4474 kWp (50°C)
Array operating characteristics (50°C)		U mpp	636 V	I mpp 7030 A
Total area		Module area	**29554 m²**	Cell area 26889 m²
Inverter		Model	**GSL1000**	
Original PVsyst database		Manufacturer	KStar	
Characteristics		Operating Voltage	580-850 V	Unit Nom. Power 1000 kWac
				Max. power (=>45°C) 1100 kWac
Inverter pack		Nb. of inverters	4 units	Total Power 4000 kWac
				Pnom ratio 1.24

PV Array loss factors

Array Soiling Losses			Loss Fraction	5.0 %
Thermal Loss factor	Uc (const)	20.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	1.5 mOhm	Loss Fraction	1.5 % at STC
LID - Light Induced Degradation			Loss Fraction	1.0 %
Module Quality Loss			Loss Fraction	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.03

Grid-Connected System: Near shading definition

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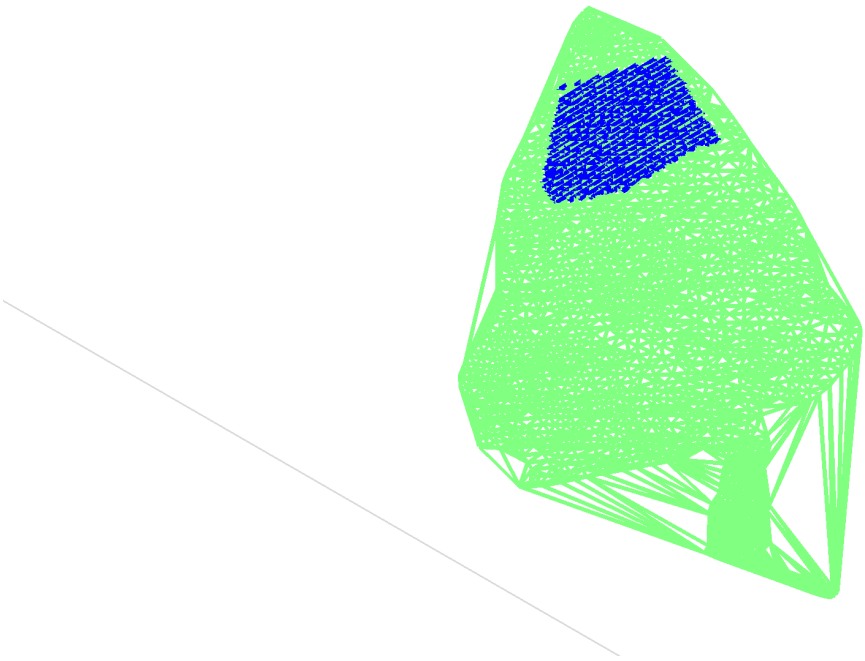
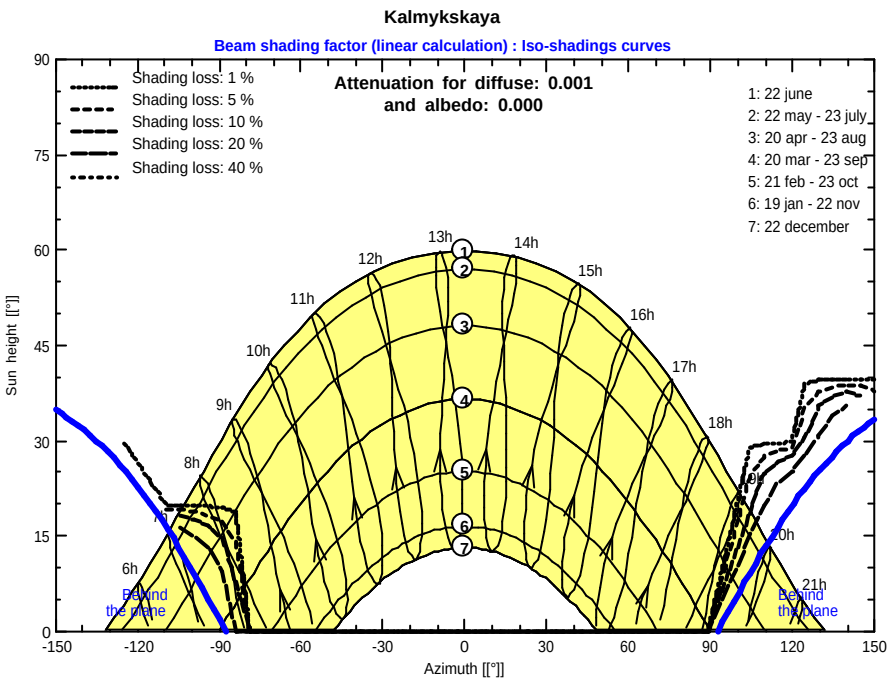
Simulation variant : **New simulation variant**

Main system parameters	System type	**Ground system (tables) on a hill**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	38°	azimuth	3°
PV modules	Model	STP 325_24/Vfw_1500V_19V01		325 Wp
PV Array	Nb. of modules	15200	Pnom total	**4940 kWp**
Inverter	Model	GSL1000	Pnom	1000 kW ac
Inverter pack	Nb. of units	4.0	Pnom total	**4000 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Main results

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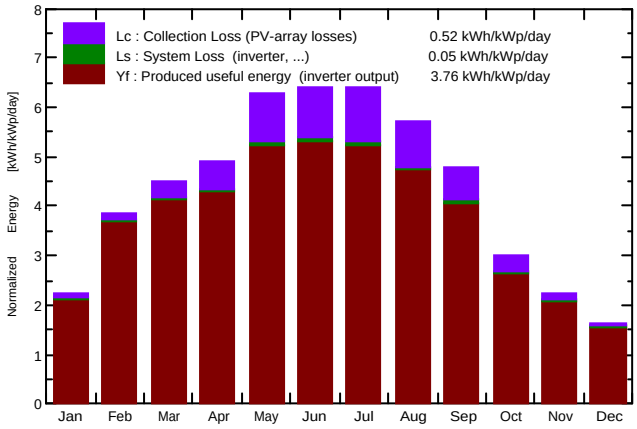
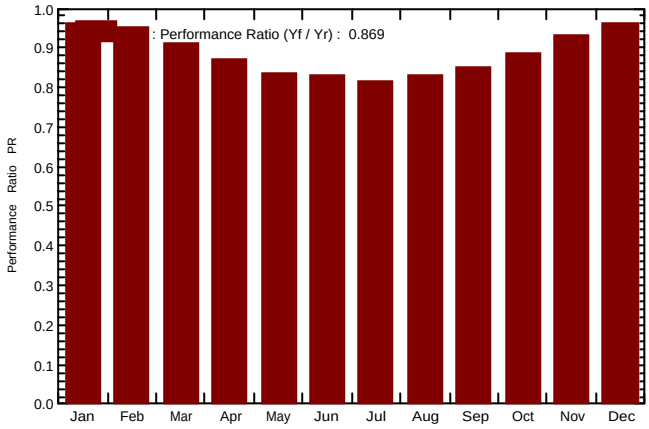
Main simulation results

System Production	**Produced Energy**	**6785 MWh/year**	Specific prod.	1373 kWh/kWp/year
	Performance Ratio PR	86.88 %		

Normalized productions (per installed kWp): Nominal power 4940 kWp



Performance Ratio PR



New simulation variant

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
January	27.9	12.83	-10.92	68.9	64.5	330.9	326.9	0.960
February	53.8	20.02	-10.77	108.0	101.1	514.5	508.7	0.953
March	95.4	39.84	-3.55	140.1	130.9	639.8	632.0	0.913
April	123.4	55.98	6.05	147.4	137.4	644.6	636.3	0.874
May	185.3	70.59	14.30	194.3	180.7	814.3	804.0	0.838
June	195.6	79.70	17.49	192.0	178.6	798.6	788.3	0.831
July	195.3	73.02	20.49	198.7	184.9	811.1	800.8	0.816
August	156.6	71.65	18.50	176.9	164.7	735.4	726.3	0.831
September	106.3	45.55	12.43	143.5	133.9	611.5	603.8	0.852
October	57.7	28.99	4.92	93.2	87.1	413.7	408.2	0.887
November	30.7	15.95	-2.67	67.1	62.8	312.5	308.4	0.930
December	20.0	10.95	-10.44	50.7	47.4	244.2	240.9	0.961
Year	1248.0	525.06	4.74	1580.9	1474.0	6871.2	6784.7	0.869

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	Ambient Temperature	E_Grid	Energy injected into grid
GlobInc	Global incident in coll. plane	PR	Performance Ratio

Grid-Connected System: Loss diagram

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Loss diagram over the whole year