Согласовано

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Взам. инв. №

Подпись и дата

Инв. № подл.

Результаты моделирования в ПО PVsyst V6.66

Изм.	Кол.уч.	Лист	№ док.	Подпись	Дата	2018-01/СК-ПР		
Разраб.		Грумеза			12.17	«Строительство солнечной электростанции (СЭС) «Волгоградская солнечная электростанция №1, вторая очередь», установленной мощностью 25 МВт»	Стадия	Лист	Листов
Проверил		Осоргин			12.17		Р	1	5
							ООО «Сервисная компания»		
Н. контр.		Павлов			12.17				
ГИП		Соколов			12.17				

Grid-Connected System: Simulation parameters

Project :	**New Project**			
Geographical Site	**Ivanovka Volgograd**		Country	**Russia**
Situation	Latitude	48.50° N	Longitude	44.38° E
Time defined as	Legal Time	Time zone UT+3	Altitude	101 m
	Albedo	0.20		
Meteo data:	**Ivanovka Volgograd**	Meteonorm 7.1 (1986-2009), Sat=100% - Synthetic		

Simulation variant : **New simulation variant**

Simulation date 13/12/17 09h38

Simulation parameters

Collector Plane Orientation	Tilt	29°	Azimuth	0°
50 Sheds	Pitch	13.0 m	Collector width	4.00 m
Inactive band	Top	0.02 m	Bottom	1.00 m
Shading limit angle	Gamma	11.61 °	Occupation Ratio	30.8 %
Shadings electrical effect	Cell size	15.0 cm	Strings In width	4

Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	Mutual shadings of sheds	Electrical effect		

PV Array Characteristics

PV module	Si-mono	Model	**STP280S-20/Wfw**	
Custom parameters definition		Manufacturer	Suntech	
Number of PV modules		In series	22 modules	In parallel 4060 strings
Total number of PV modules		Nb. modules	89320	Unit Nom. Power 280 Wp
Array global power		Nominal (STC)	**25010 kWp**	At operating cond. 22449 kWp (50°C)
Array operating characteristics (50°C)		U mpp	623 V	I mpp 36005 A
Total area		Module area	**146199 m²**	Cell area 130925 m²

Inverter		Model	**GSL0750mod**	
Custom parameters definition		Manufacturer	KSTAR	
Characteristics		Operating Voltage	450-850 V	Unit Nom. Power 750 kWac
Inverter pack		Nb. of inverters	28 units	Total Power 21000 kWac

PV Array loss factors

Thermal Loss factor		Uc (const)	29.0 W/m²K	Uv (wind) 0.0 W/m²K / m/s
Wiring Ohmic Loss		Global array res.	0.50 mOhm	Loss Fraction 2.6 % 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 %
Incidence effect, ASHRAE parametrization		IAM =	1 - bo (1/cos i - 1)	bo Param. 0.04

User's needs : Unlimited load (grid)

Grid-Connected System: Main results

Project : **New Project**

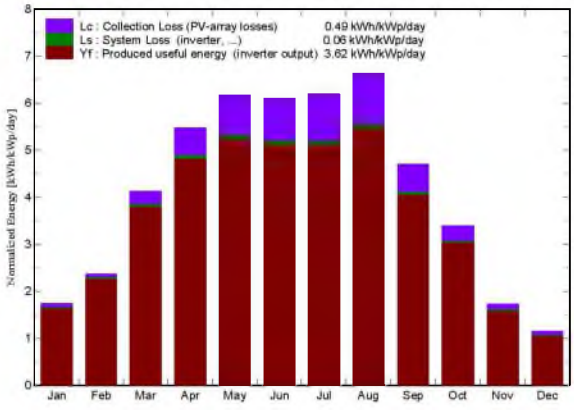
Simulation variant : **New simulation variant**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	Sheds disposition, tilt	29°	azimuth	0°
PV modules	Model	STP280S-20/Wfw	Pnom	280 Wp
PV Array	Nb. of modules	89320	Pnom total	**25010 kWp**
Inverter	Model	GSL0750mod	Pnom	750 kW ac
Inverter pack	Nb. of units	28.0	Pnom total	**21000 kW ac**
User's needs	Unlimited load (grid)			

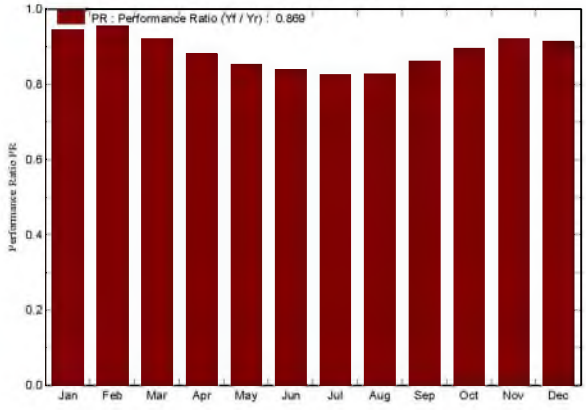
Main simulation results

System Production	**Produced Energy**	**33025 MWh/year**	Specific prod.	1321 kWh/kWp/year
	Performance Ratio PR	86.90 %		

Normalized productions (per installed kWp): Nominal power 25010 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	31.2	17.25	-5.34	53.9	51.2	1298	1275	0.946
February	48.0	31.84	-5.08	66.5	63.3	1616	1590	0.956
March	98.2	46.07	1.30	128.0	122.5	2997	2952	0.922
April	141.8	54.37	9.39	164.2	157.4	3678	3622	0.882
May	183.7	65.73	15.84	191.4	183.1	4146	4084	0.853
June	184.2	91.97	19.99	183.1	173.9	3911	3851	0.841
July	188.2	85.81	24.10	192.4	183.1	4037	3976	0.826
August	181.5	59.29	23.23	205.7	197.5	4323	4258	0.828
September	114.5	52.61	16.15	141.4	135.3	3092	3046	0.861
October	72.2	33.50	8.76	105.2	100.9	2393	2357	0.896
November	31.7	18.14	1.53	51.8	49.3	1218	1194	0.921
December	21.1	14.14	-4.71	35.9	33.3	840	821	0.913
Year	1296.4	570.70	8.84	1519.6	1450.7	33551	33025	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

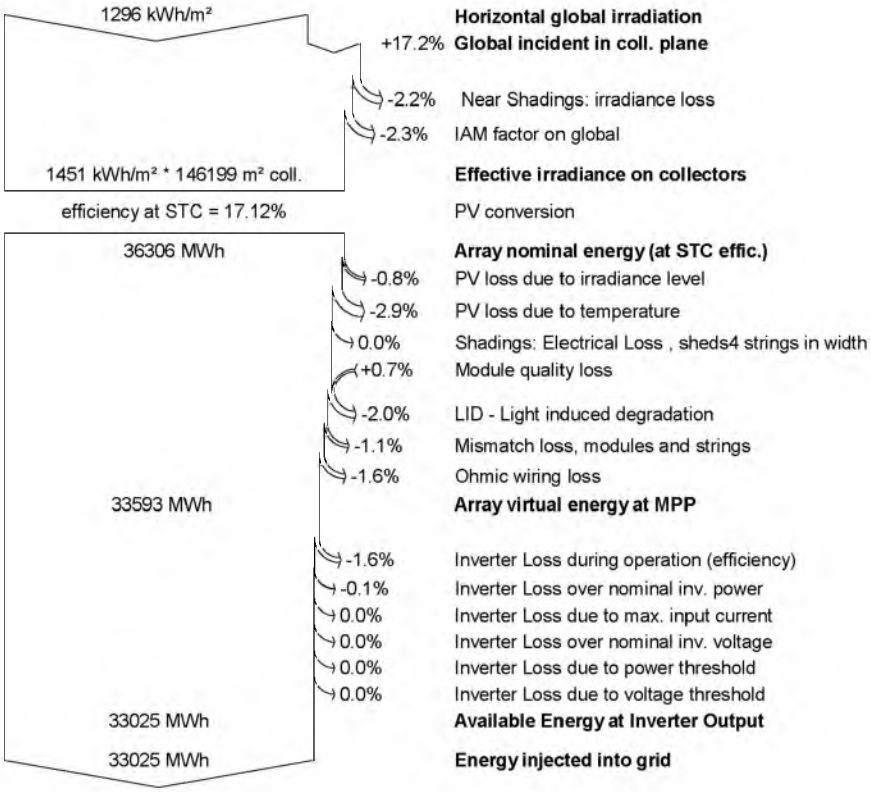
Grid-Connected System: Loss diagram

Project : **New Project**

Simulation variant : **New simulation variant**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	Sheds disposition, tilt	29°	azimuth	0°
PV modules	Model	STP280S-20/Wfw	Pnom	280 Wp
PV Array	Nb. of modules	89320	Pnom total	**25010 kWp**
Inverter	Model	GSL0750mod	Pnom	750 kW ac
Inverter pack	Nb. of units	28.0	Pnom total	**21000 kW ac**
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



Коэффициент использования установленной мощности (КИУМ) составит:

$$\text{КИУМ} = \frac{33025 \cdot 10^6}{280 \cdot 89320 \cdot 24 \cdot 365} \cdot 100\% = 15{,}07\%$$