Grid-Connected System: Simulation parameters

Project : **Naessundvej**

Geographical Site	**Naessundvej - (Redsted M) - Batch**		Country	**Denmark**
Situation	Latitude	56.75° N	Longitude	8.68° E
Time defined as	Legal Time	Time zone UT+1	Altitude	49 m
	Albedo	0.20		
Meteo data:	**Naessundvej 225**	SolarGISv2.1.22 - 2017		

Simulation variant : **Naessundvej - Fixed Tilt - Split Pitch - 2019-07-01**

	Simulation date	01/07/19 16h17

Simulation parameters	System type	**Sheds on ground**		
Collector Plane Orientation	Tilt	25°	Azimuth	0°
Sheds configuration	Nb. of sheds	75	Identical arrays	
	Sheds spacing	7.41 m	Collector width	4.02 m
Shading limit angle	Limit profile angle	24.3°	Ground cov. Ratio (GCR)	54.3 %
Models used	Transposition	Perez	Diffuse	Imported
Horizon	Free Horizon			
Near Shadings	According to strings		Electrical effect	40 %
Bifacial system	Model	Unlimited sheds, 2D calculation		
	Sheds spacing	7.41 m	Sheds width	4.02 m
	Limit profile angle	24.3°	GCR	54.3 %
	Ground albedo	30.0 %	Height above ground	0.80 m
	Module bifaciality factor	70 %	Rear shading factor	5.0 %
	Module transparency	0.0 %	Rear mismatch loss	10.0 %
User's needs :	Unlimited load (grid)			

PV Arrays Characteristics (2 kinds of array defined)

PV module	Si-mono	Model	**RSM72-6-375BMDG**	
Custom parameters definition		Manufacturer	Risen Energy Co., Ltd	
Sub-array "Phase 1"				
Number of PV modules		In series	26 modules	In parallel 1044 strings
Total number of PV modules		Nb. modules	27144	Unit Nom. Power 375 Wp
Array global power		Nominal (STC)	**10179 kWp**	At operating cond. 9195 kWp (50°C)
Array operating characteristics (50°C)		U mpp	933 V	I mpp 9857 A
Sub-array "Phase 2"				
Number of PV modules		In series	26 modules	In parallel 2040 strings
Total number of PV modules		Nb. modules	53040	Unit Nom. Power 375 Wp
Array global power		Nominal (STC)	**19890 kWp**	At operating cond. 17966 kWp (50°C)
Array operating characteristics (50°C)		U mpp	933 V	I mpp 19261 A
Total	Arrays global power	Nominal (STC)	**30069 kWp**	Total 80184 modules
		Module area	**157812 m²**	Cell area 141040 m²

Inverter		Model	**SUN2000-100KTL-HV-D1-001**	
Custom parameters definition		Manufacturer	Huawei Technologies	
Characteristics		Operating Voltage	880-1300 V	Unit Nom. Power 100 kWac
				Max. power (=>25°C) 110 kWac
Sub-array "Phase 1"		Nb. of inverters	87 units	Total Power 8700 kWac
				Pnom ratio 1.17

Grid-Connected System: Simulation parameters

Sub-array "Phase 2"	Nb. of inverters	170 units	Total Power	17000 kWac
			Pnom ratio	1.17
Total	Nb. of inverters	257	Total Power	25700 kWac

PV Array loss factors

Array Soiling Losses			Loss Fraction	1.0 %
Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Array#1	1.1 mOhm	Loss Fraction	1.0 % at STC
	Array#2	0.81 mOhm	Loss Fraction	1.5 % at STC
	Global		Loss Fraction	1.3 % at STC
LID - Light Induced Degradation			Loss Fraction	1.5 %
Module Quality Loss			Loss Fraction	0.0 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.30 %
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.05

System loss factors

AC wire loss inverter to transfo	Inverter voltage	800 Vac tri		
	Wires: 3x15000.0 mm²	172 m	Loss Fraction	1.0 % at STC
External transformer	Iron loss (Night disconnect)	29670 W	Loss Fraction	0.1 % at STC
	Resistive/Inductive losses	0.216 mOhm	Loss Fraction	1.0 % at STC

Auxiliaries loss	constant (fans)	0 W	... from Power thresh.	0.0 kW

Grid-Connected System: Near shading definition

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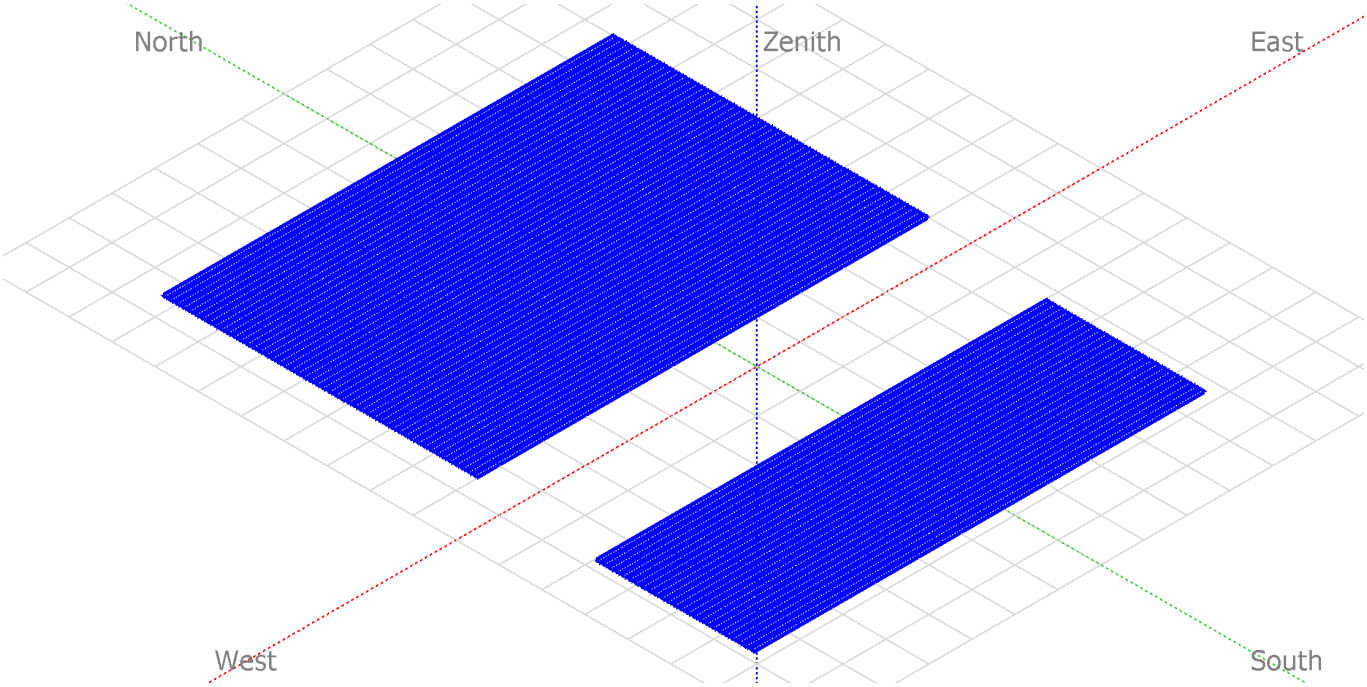
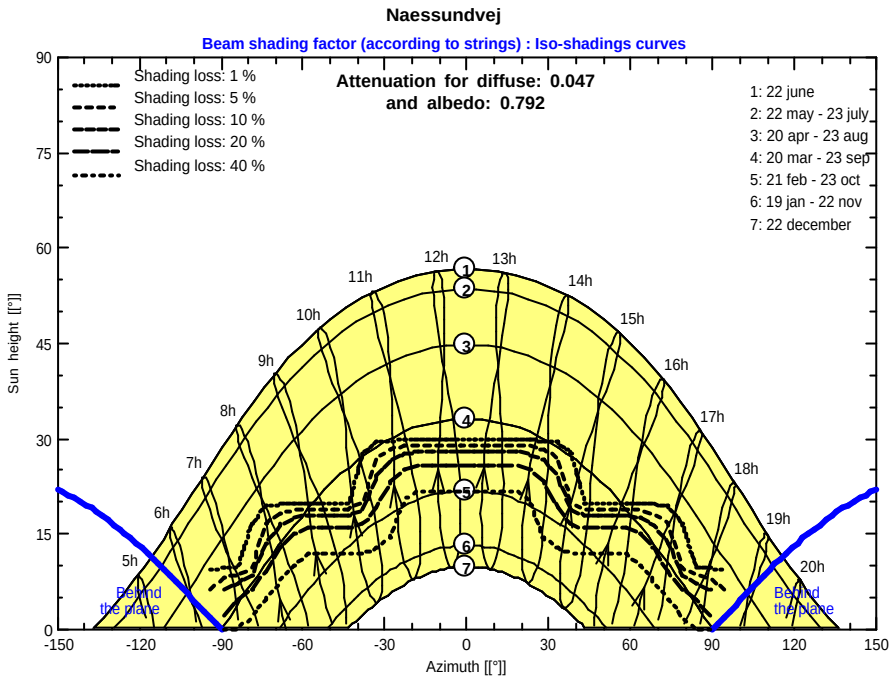
PV Array	Nb. of modules	80184	Pnom total	**30069 kWp**
Inverter	Model	SUN2000-100KTL-HV-D1-001		100 kW ac
Inverter pack	Nb. of units	257.0	Pnom total	**25700 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Main results

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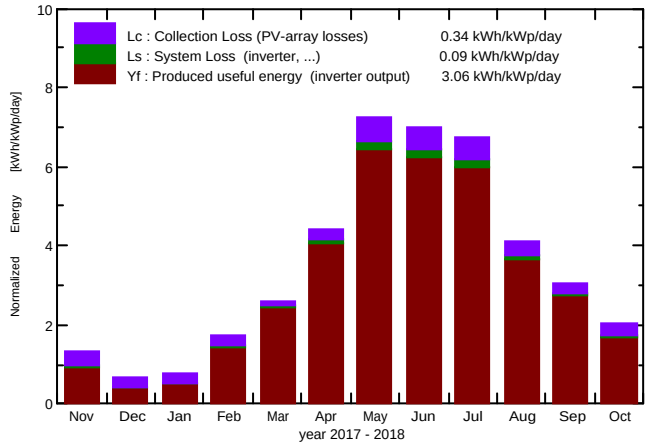
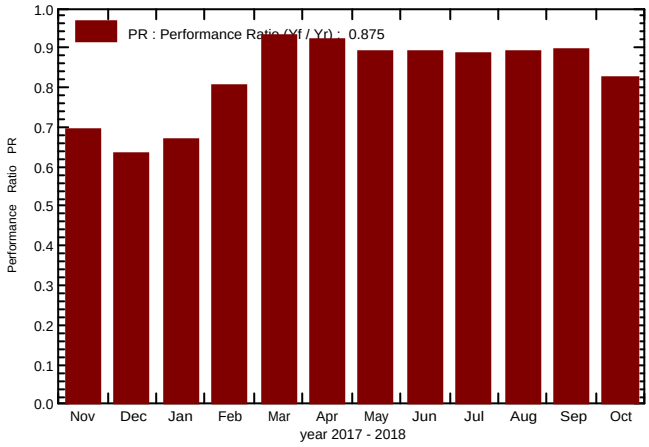
Main simulation results

System Production				
	Produced Energy	**33549 MWh/year**	Specific prod.	1116 kWh/kWp/year
	Performance Ratio PR	87.51 %		

Normalized productions (per installed kWp): Nominal power 30069 kWp



Performance Ratio PR



Naessundvej - Fixed Tilt - Split Pitch - 2019-07-01

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
Nov. 17	21.2	12.34	7.41	40.8	30.6	877	851	0.694
Dec. 17	10.2	7.30	5.40	20.4	13.9	405	388	0.632
Jan. 18	13.3	9.58	3.14	24.0	17.2	502	483	0.670
Feb. 18	31.4	18.63	0.86	49.4	42.7	1233	1199	0.807
Mar. 18	63.6	38.13	1.39	81.1	75.3	2344	2277	0.934
Apr. 18	112.1	59.31	7.03	132.5	123.9	3778	3670	0.921
May 18	202.2	64.97	13.88	224.8	212.3	6208	6021	0.891
June 18	198.0	68.43	15.27	210.5	198.7	5808	5633	0.890
July 18	194.1	78.50	17.33	209.2	196.8	5746	5577	0.887
Aug. 18	113.8	68.18	16.83	126.8	117.9	3492	3393	0.890
Sep. 18	75.0	47.87	14.41	91.7	85.0	2547	2477	0.898
Oct. 18	43.4	26.32	10.84	63.8	57.1	1626	1581	0.824
Year	1078.2	499.55	9.54	1275.0	1171.5	34566	33549	0.875

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: Special graphs

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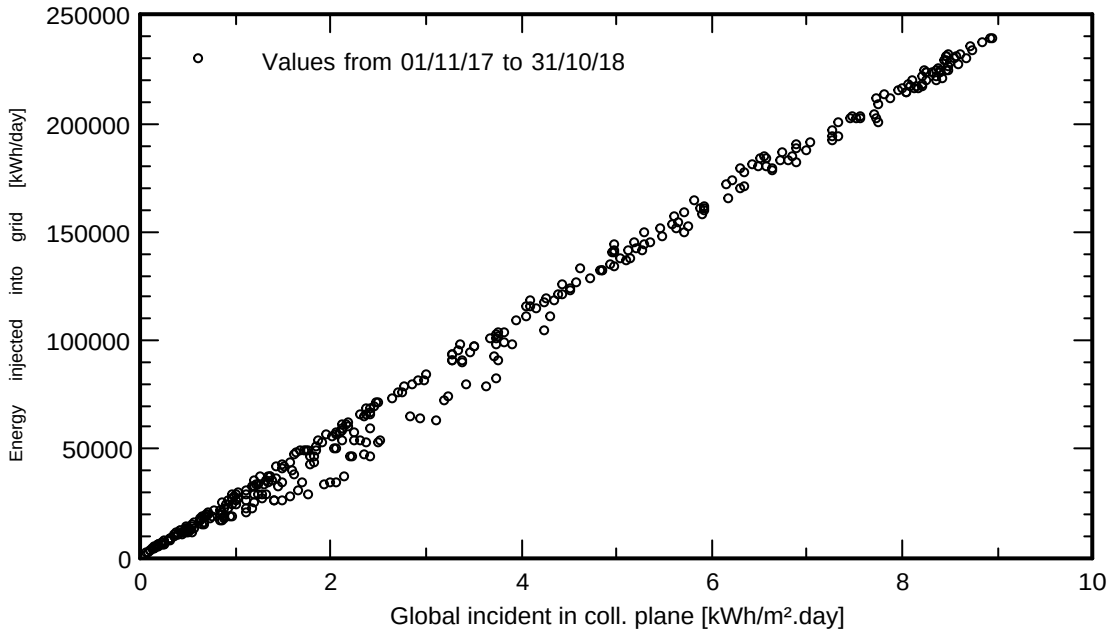
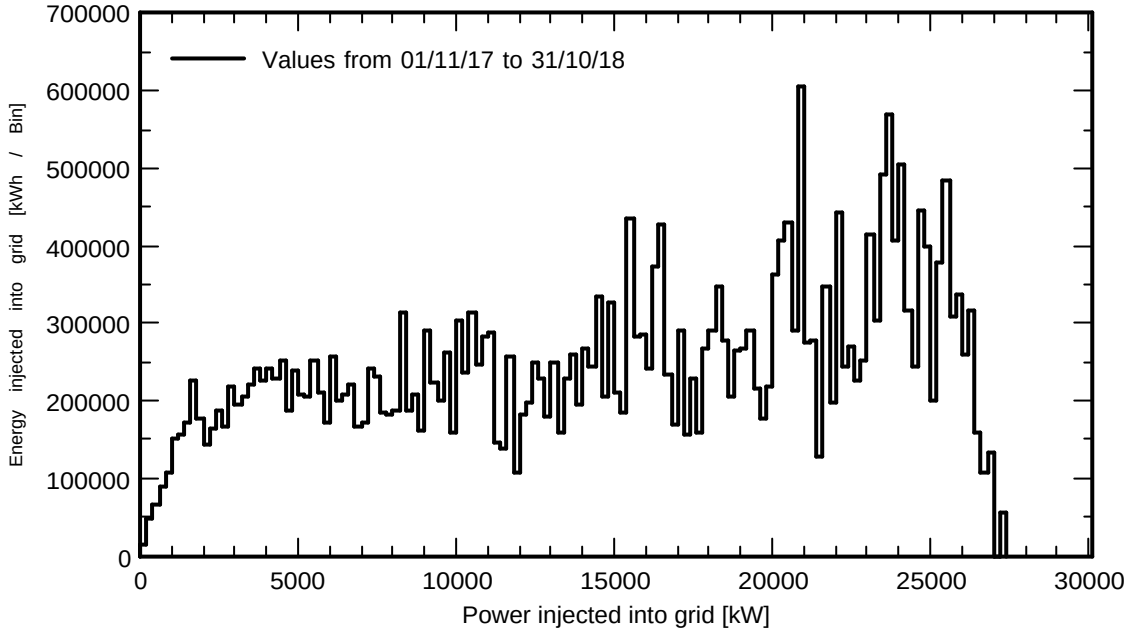
Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

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Loss diagram over the whole year