Grid-Connected System: Simulation parameters

Project : **MA-12-0121_Lincoln SudBury High School**

Geographical Site	**Boston Logan Int'l Arpt**			Country	**United States**
Situation		Latitude	42.4°N	Longitude	71.0°W
Time defined as		Legal Time	Time zone UT-5	Altitude	6 m
		Albedo	0.20		
Meteo data:	**Boston Logan Int'l Arpt**	TMY - NREL: TMY3 hourly DB (1991-2005)			

Simulation variant : **MA-12-0121_Lincoln SudBury High School**

Simulation date 13/03/14 13h06

Simulation parameters

2 orientations	Tilts/Azimuths	0°/-0° and 5°/179°		
Models used	Transposition	Perez	Diffuse	Imported
Horizon	Free Horizon			
Near Shadings	No Shadings			

PV Arrays Characteristics (2 kinds of array defined)

PV module Si-mono — Model **SE-F330BYC-3Z**; Manufacturer Sun Edison

Sub-array "Type#1"	Orientation	#1	Tilt/Azimuth	0°/-0°
Number of PV modules	In series	20 modules	In parallel	96 strings
Total number of PV modules	Nb. modules	1920	Unit Nom. Power	330 Wp
Array global power	Nominal (STC)	**634 kWp**	At operating cond.	634 kWp (25°C)
Array operating characteristics (50°C)	U mpp	+/-378 V	I mpp	838 A
Sub-array "Type #2"	Orientation	#2	Tilt/Azimuth	5°/179°
Number of PV modules	In series	20 modules	In parallel	93 strings
Total number of PV modules	Nb. modules	1860	Unit Nom. Power	330 Wp
Array global power	Nominal (STC)	**614 kWp**	At operating cond.	614 kWp (25°C)
Array operating characteristics (50°C)	U mpp	+/-378 V	I mpp	812 A
Total Arrays global power	Nominal (STC)	**1247 kWp**	Total	3780 modules
	Module area	**7395 m²**	Cell area	6624 m²

Inverter — Model **Solaron 500**; Manufacturer Advanced Energy Industries, Inc.; Operating Voltage +/-330-550 V; Unit Nom. Power 500 kW AC

Sub-array "Type#1"	Nb. of inverters	1 units	Total Power	500 kW AC
Sub-array "Type #2"	Nb. of inverters	1 units	Total Power	500 kW AC
Total	Nb. of inverters	2	Total Power	1000 kW AC

PV Array loss factors

Array Soiling Losses

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
7.5%	6.0%	2.5%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	5.5%

Thermal Loss factor — Uc (const) 25.0 W/m²K — Uv (wind) 1.5 W/m²K / m/s

Grid-Connected System: Simulation parameters (continued)

Wiring Ohmic Loss	Array#1	14 mOhm	Loss Fraction	1.5 % at STC
	Array#2	14 mOhm	Loss Fraction	1.5 % at STC
	Global		Loss Fraction	1.5 % at STC
LID - Light Induced Degradation			Loss Fraction	2.5 %
Module Quality Loss			Loss Fraction	-0.3 %
Module Mismatch Losses			Loss Fraction	0.5 % at MPP
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.04

System loss factors

	Wires	21 m 3x500 mm²	Loss Fraction	0.5 % at STC
Unavailability of the system	3.6 days, 1 periods		Time fraction	1.0 %

User's needs : Unlimited load (grid)

Grid-Connected System: Main results

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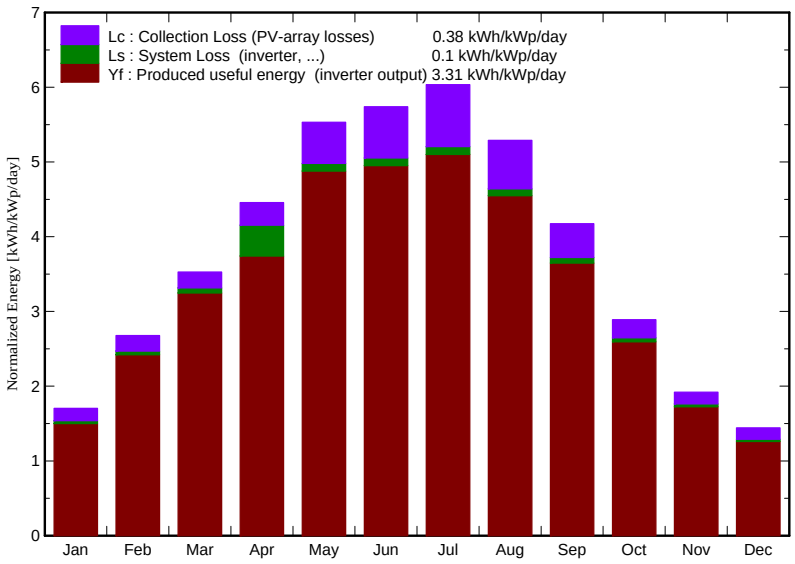
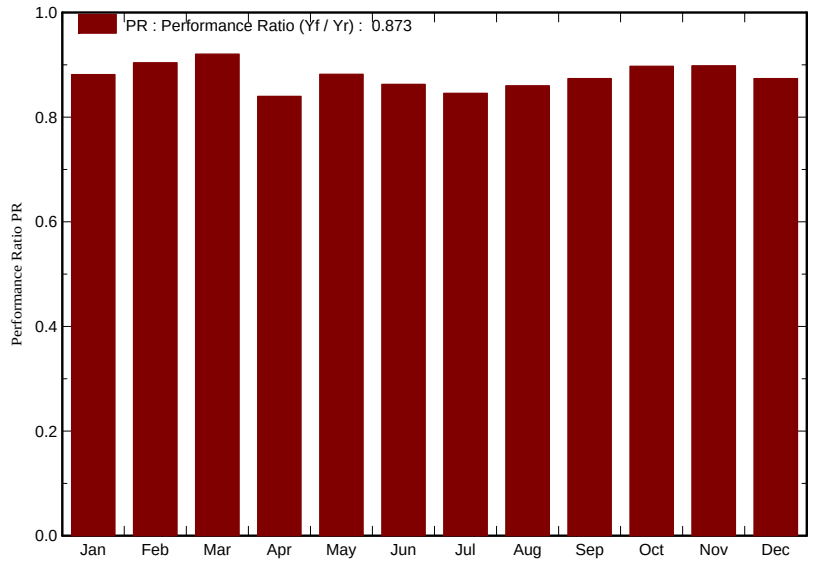
Main system parameters				
System type		**Grid-Connected**		
PV Field Orientation	2 orientations	Tilt/Azimuth = 0°/-0° and 5°/179°		
PV modules	Model	SE-F330BYC-3Z	Pnom	330 Wp
PV Array	Nb. of modules	3780	Pnom total	**1247 kWp**
Inverter	Model	Solaron 500	Pnom	500 kW ac
Inverter pack	Nb. of units	2.0	Pnom total	**1000 kW ac**
User's needs	Unlimited load (grid)			

Main simulation results				
System Production	**Produced Energy**	**1505 MWh/year**	Specific prod.	1207 kWh/kWp/year
	Performance Ratio PR	87.3 %		

Normalized productions (per installed kWp): Nominal power 1247 kWp



Performance Ratio PR



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Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	EffArrR %	EffSysR %
January	55.5	-2.98	52.8	45.7	59.5	58.0	15.23	14.87
February	77.7	-0.52	75.0	66.9	86.3	84.5	15.56	15.25
March	111.9	3.76	109.4	102.6	128.2	125.6	15.86	15.53
April	135.4	8.56	133.7	128.1	155.5	140.1	15.73	14.17
May	172.7	14.89	171.5	165.0	192.6	188.7	15.19	14.88
June	172.9	18.87	172.2	166.0	189.2	185.3	14.86	14.55
July	188.1	23.38	187.1	180.1	201.4	197.3	14.56	14.26
August	165.8	21.68	164.0	157.6	179.5	175.9	14.80	14.51
September	127.7	18.10	125.3	119.6	139.3	136.5	15.04	14.74
October	92.5	12.25	89.6	84.7	102.4	100.3	15.45	15.14
November	60.2	6.26	57.6	53.1	66.0	64.5	15.50	15.15
December	47.4	2.17	44.7	39.3	49.9	48.7	15.10	14.74
Year	1407.8	10.60	1382.6	1308.7	1549.6	1505.4	15.16	14.72

Legends:			
GlobHor	Horizontal global 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	EffArrR	Effic. Eout array / rough area
GlobEff	Effective Global, corr. for IAM and shadings	EffSysR	Effic. Eout system / rough area

Grid-Connected System: Loss diagram

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Loss diagram over the whole year