Grid-Connected System: Simulation parameters

Project : **EcoSmart SunMine**

Geographical Site **Cranbrook** **Country** **Canada**

Situation Latitude 49.6°N Longitude 115.8°W
Time defined as Legal Time Time zone UT-8 Altitude 940 m
Monthly albedo values

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Albedo	0.50	0.50	0.35	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.35	0.50

Meteo data : Cranbrook, Canada EPW

Simulation variant : **SunMine Pilot 2MWp**

Simulation date 20/11/12 19h40

Simulation parameters

Tracking plane, Vertical Axis Plane Tilt 57°
Rotation Limitations Minimum Azimuth -120° Maximum Azimuth 120°

Models used Transposition Perez Diffuse Measured

Horizon Average Height 2.4°

Near Shadings Linear shadings

PV Array Characteristics

PV module Si-poly Model **TSM-290PC14 APP01**
Manufacturer Trina Solar
Number of PV modules In series 12 modules In parallel 572 strings
Total number of PV modules Nb. modules 6864 Unit Nom. Power 290 Wp
Array global power Nominal (STC) **1991 kWp** At operating cond. 1767 kWp (50°C)
Array operating characteristics (50°C) U mpp 388 V I m pp 4552 A
Total area Module area **13319 m²** Cell area 12029 m²

Inverter Model **SGI500-480V APP01**
Manufacturer Solectria
Characteristics Operating Voltage 300-500 V Unit Nom. Power 500 kW AC
Inverter pack Number of Inverter 4 units Total Power 2000 kW AC

PV Array loss factors
Thermal Loss factor Uc (const) 25.0 W/m²K Uv (wind) 1.2 W/m²K / m/s
=> Nominal Oper. Coll. Temp. (G=800 W/m², Tamb=20°C, Wind=1 m/s.) NOCT 47 °C
Wiring Ohmic Loss Global array res. 1.4 mOhm Loss Fraction 1.4 % at STC
Array Soiling Losses

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
9.0%	4.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	3.0%	8.0%

Module Quality Loss Loss Fraction 1.8 %
Module Mismatch Losses Loss Fraction 0.4 % at MPP
Incidence effect, ASHRAE parametrization IAM = 1 - bo (1/cos i - 1) bo Parameter 0.05

Grid-Connected System: Simulation parameters (continued)

User's needs : Unlimited load (grid)

Grid-Connected System: Horizon definition

Project : **EcoSmart SunMine**

Simulation variant : **SunMine Pilot 2MWp**

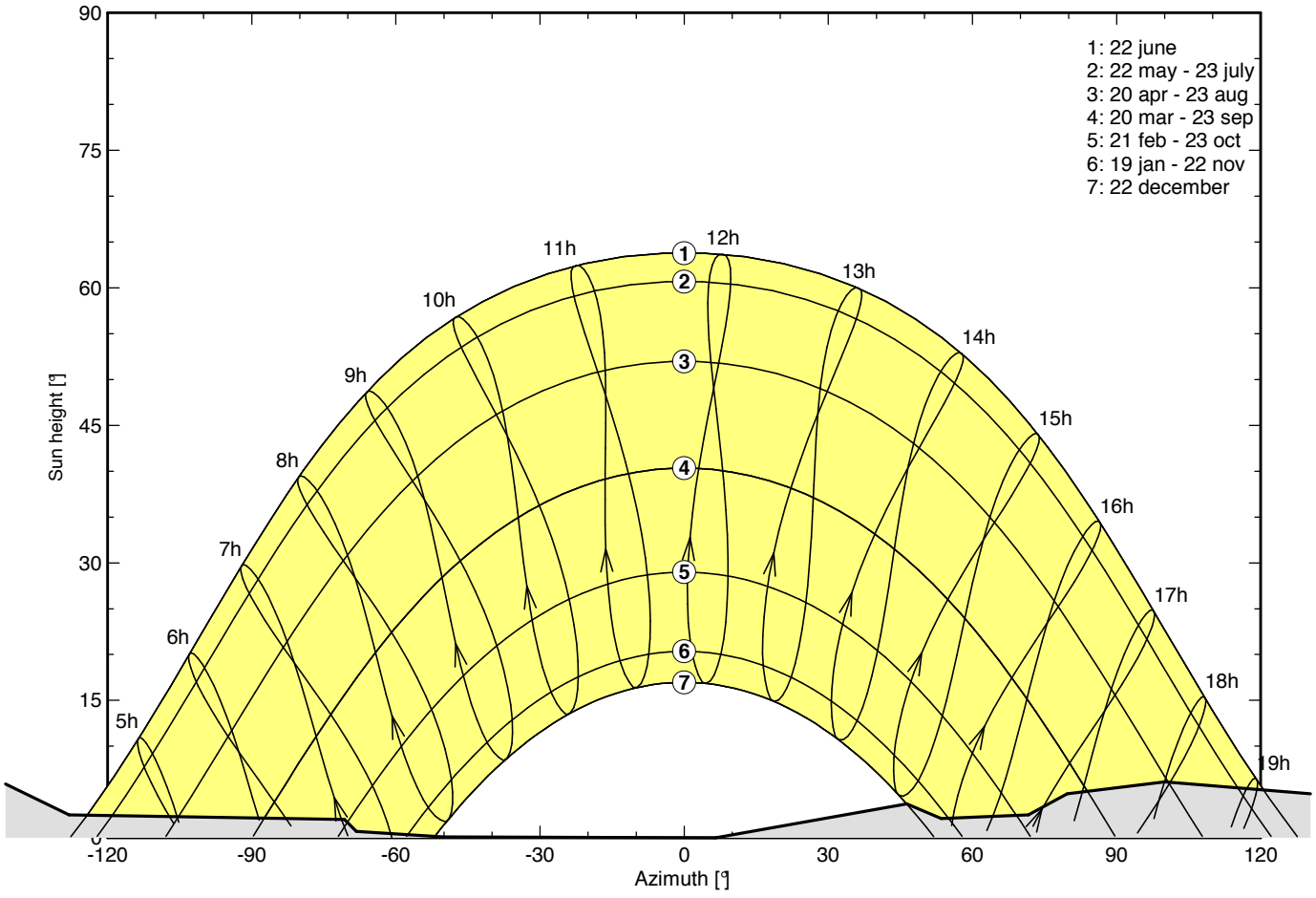
Main system parameters	System type	**Grid-Connected**			
Horizon	Average Height	2.4°			
Near Shadings	Linear shadings				
PV Field Orientation	Tracking plane, Vertical Axis, Plane Tilt	57°			
PV modules	Model	TSM-290PC14 APP01	Pnom	290 Wp	
PV Array	Nb. of modules	6864	Pnom total	**1991 kWp**	
Inverter	Model	SGI500-480V APP01	Pnom	500 kW ac	
Inverter pack	Nb. of units	4.0	Pnom total	**2000 kW ac**	
User's needs	Unlimited load (grid)				

Horizon

Average Height	2.4°	Diffuse Factor	0.99
Albedo Factor	100 %	Albedo Fraction	0.95

Height [°]	6.6	2.5	2.0	0.7	0.1	0.0	3.7	2.1	2.5	4.8	6.1	4.6
Azimuth [°]	-144	-128	-71	-68	-50	6	46	53	72	80	100	135

SunMine Horizon Line



Grid-Connected System: Near shading definition

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Simulation variant : **SunMine Pilot 2MWp**

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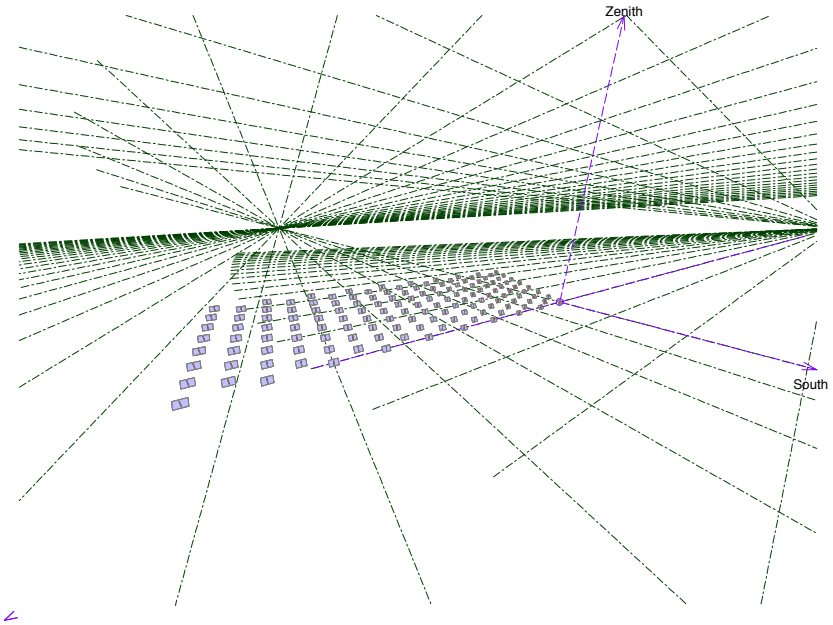
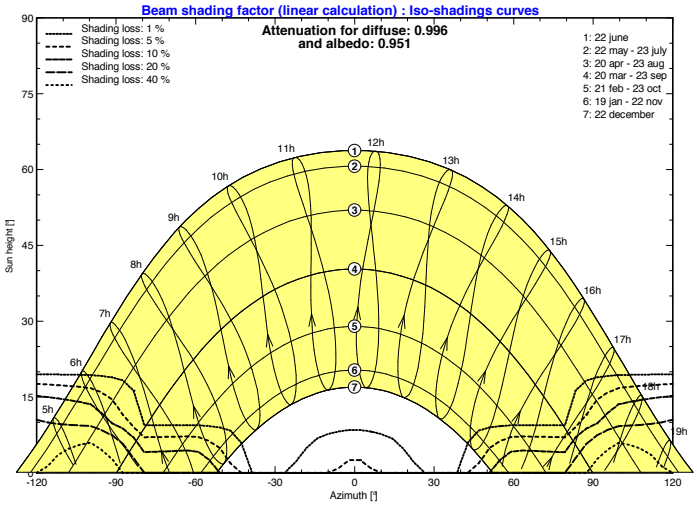
Inverter pack	Nb. of units	4.0	Pnom total	**2000 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

EcoSmart SunMine: SunMine_RealCase_01



Grid-Connected System: Main results

Project : **EcoSmart SunMine**

Simulation variant : **SunMine Pilot 2MWp**

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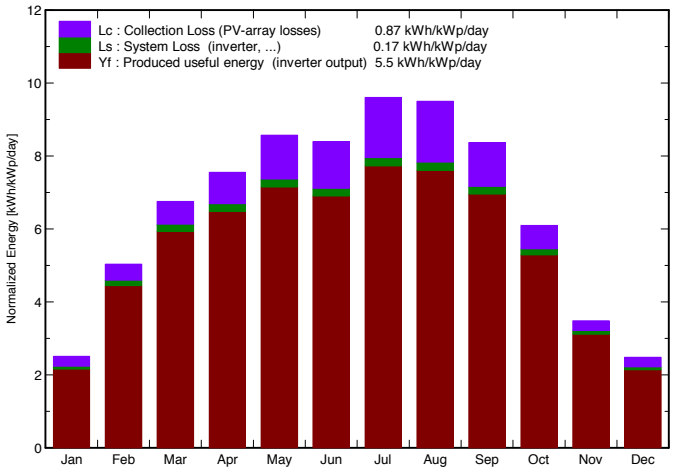
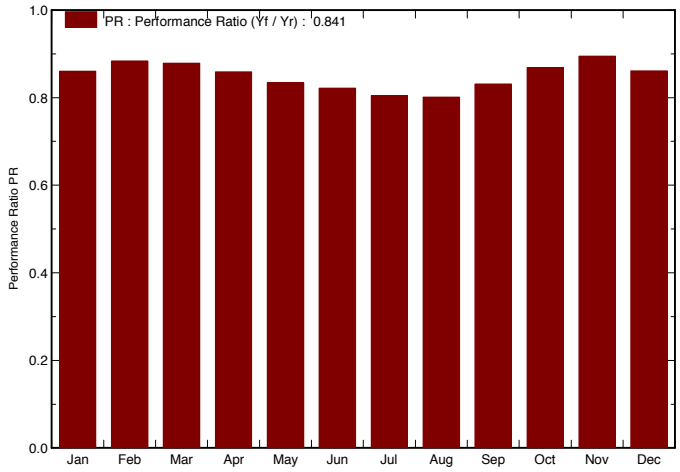
Main simulation results

System Production	**Produced Energy**	**3996 MWh/year**	Specific prod.	2008 kWh/kWp/year
	Performance Ratio PR	84.1 %		

Normalized productions (per installed kWp): Nominal power 1991 kWp



Performance Ratio PR



SunMine Pilot 2MWp

Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	EffArrR %	EffSysR %
January	36.1	-7.90	78.0	74.8	138.3	133.6	13.32	12.86
February	66.2	-3.23	141.1	135.2	256.2	248.2	13.64	13.21
March	109.5	2.41	209.5	201.2	378.4	366.5	13.56	13.13
April	143.0	5.99	226.7	214.3	399.7	387.4	13.24	12.83
May	178.4	10.54	265.8	248.2	454.8	441.4	12.85	12.47
June	175.6	14.36	251.9	236.8	424.9	412.2	12.66	12.29
July	197.8	18.66	297.7	280.1	491.1	476.8	12.39	12.03
August	182.3	17.29	294.4	277.7	483.6	469.6	12.33	11.98
September	132.1	11.66	251.1	240.3	428.3	415.6	12.80	12.42
October	86.0	5.40	188.9	181.5	336.9	326.7	13.39	12.98
November	39.9	-2.03	104.6	100.8	192.6	186.4	13.82	13.38
December	29.3	-6.56	77.1	73.7	136.9	132.1	13.34	12.87
Year	1376.0	5.60	2386.7	2264.7	4121.7	3996.4	12.97	12.57

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