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Managed by the CANMET Energy Technology Centre - Varennes (CETC-Varennes)

English - Anglais

RETScreen Software now has 85547 users in 213 countries around the world.
More than 12000 RETScreen products are downloaded every week.
78 Universities & Colleges around the world are using RETScreen for training.

RETScreen wins international funding from REEEP.

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RETScreen® International

Clean Energy Project Analysis Software

Photovoltaic Project Model

Click Here to Start
- Description & Flow Chart
- Colour Coding
- Online Manual

Worksheets
- Energy Model
- Solar Resource & System Load
- Cost Analysis
- Greenhouse Gas Analysis
- Financial Summary

Features
- Product Data
- Weather Data
- Cost Data
- Currency Options
- Sensitivity Analysis

Clean Energy Decision Support Centre

www.retscreen.net

Training & Support
Internet Forums
Marketplace
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Intro / Energy Model / Solar Resource & System Load / Cost Analysis / GHG Analysis / Financial Summary / Sensitivity / Sheet1 / Sh

RETScreen Photovoltaic Project

File Edit Bookmark Options Help

Contents Index Back Print << >>

Model Flow Chart

Five Step Standard Analysis

1 Energy Model

Sub-Worksheet(s)

2 Cost Analysis

3 GHG Analysis

Optional

click on blue hyperlinks
or floating icon to access data

4 Financial Summary

Project Cash Flows

5 Sensitivity & Risk Analysis

Optional

Ready to make a decision

Integrated Features

Weather Data

Product Data

Online Manual

- Training Course
- Engineering Textbook
- Case Studies
- Online Marketplace
- Internet Forums

RETScreen Model Flow Chart

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RETScreen® Energy Model - Photovoltaic Project

Training & Support

Site Conditions		Estimate	Notes/Range
Project name		Commercial Building	See Online Manual
Project location		Stuttgart, Germany	
Nearest location for weather data	-	Stuttgart	Complete SR&SL sheet
Latitude of project location	°N	48.8	-90.0 to 90.0
Annual solar radiation (tilted surface)	MWh/m²	1.30	
Annual average temperature	°C	8.9	-20.0 to 30.0

System Characteristics		Estimate	Notes/Range
Application type	-	On-grid	
Grid type	-	Central-grid	
PV energy absorption rate	%	100.0%	
PV Array			
PV module type	-	mono-Si	
PV module manufacturer / model #		ABC Inc.	See Product Database
Nominal PV module efficiency	%	11.7%	4.0% to 15.0%
NOCT	°C	45	40 to 55
PV temperature coefficient	% / °C	0.40%	0.10% to 0.50%
Miscellaneous PV array losses	%	5.0%	0.0% to 20.0%
Nominal PV array power	kWp	80.00	
PV array area	m²	603.0	
Power Conditioning			
Average inverter efficiency	%	90%	80% to 95%
Suggested inverter (DC to AC) capacity	kW (AC)	72.0	
Inverter capacity	kW (AC)	72.0	
Miscellaneous power conditioning losses	%	0%	0% to 10%

Annual Energy Production (12.00 months analysed)		Estimate	Notes/Range
Specific yield	kWh/m²	127.5	
Overall PV system efficiency	%	9.0%	
PV system capacity factor	%	12.4%	
Renewable energy collected	MWh	96.837	
Renewable energy delivered	MWh	87.153	
	kWh	87,153	

Intro | Energy Model | Solar Resource & System Load | Cost Analysis | GHG Analysis | Financial Summary | Sensitivit

Ready

Weather Database

Region: N. & Central America
Country: USA
Province / State: NM
Weather Station: Albuquerque
Latitude [°]: 35.05
Longitude [°]: -106.62

	Monthly Solar Radiation [kWh/m²/d]	Monthly Avg. Temperature (°C)
Jan	3.21	0.9
Feb	4.16	4.2
Mar	5.39	8.1
Apr	6.84	13.1
May	7.70	18.1
Jun	8.09	23.6
Jul	7.54	25.3
Aug	6.09	23.8
Sep	5.86	19.9
Oct	4.73	13.7
Nov	3.47	6.6
Dec	2.90	1.5

Visit NASA Satellite Data Site

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Date modified: 2004/11/01

Product Database

User-Defined PV Module Type: mono-Si
Region: N. & Central America
Supplier: BP Solar
Model: BP 5160 S
Nominal PV Module Efficiency (%): 12.7%
PV Module Rating (W): 160
Number of PV Modules: 6
Nominal PV Array Power (kW): 0.96

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Supplier Information | Other Information

Contact manufacturer directly:

info@bpsolar.com
http://www.bpsolar.com/

Send e-mail | Visit Website

Date modified: 2005/06/01

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LocWeather = Stuttgart

RETScreen® Solar Resource and System Load Calculation - Photovoltaic Project

Site Latitude and PV Array Orientation		Estimate	Notes/Range
Nearest location for weather data		Stuttgart	See Weather Database
Latitude of project location	°N	48.8	-90.0 to 90.0
PV array tracking mode	-	Fixed	
Slope of PV array	°	30.0	0.0 to 90.0
Azimuth of PV array	°	0.0	0.0 to 180.0

Monthly Inputs

Month	Fraction of month used (0 - 1)	Monthly average daily radiation on horizontal surface (kWh/m²/d)	Monthly average temperature (°C)	Monthly average daily radiation in plane of PV array (kWh/m²/d)	Monthly solar fraction (%)
January	1.00	0.97	0.0	1.58	-
February	1.00	1.66	1.1	2.38	-
March	1.00	2.67	5.0	3.27	-
April	1.00	4.06	7.8	4.45	-
May	1.00	4.97	12.8	5.01	-
June	1.00	5.41	15.6	5.26	-
July	1.00	5.44	17.8	5.37	-
August	1.00	4.49	17.8	4.75	-
September	1.00	3.64	14.4	4.37	-
October	1.00	2.22	9.4	3.14	-
November	1.00	1.10	3.9	1.70	-
December	1.00	0.76	1.7	1.26	-

		Annual	Season of use
Solar radiation (horizontal)	MWh/m²	1.14	1.14
Solar radiation (tilted surface)	MWh/m²	1.30	1.30
Average temperature	°C	8.9	8.9

Load Characteristics		Estimate
Application type	-	On-grid

Intro / Energy Model / Solar Resource & System Load / Cost Analysis / GHG Analysis / Financial Summary

Ready

Type_of_project = Pre-feasibility

RETScreen® Cost Analysis - Photovoltaic Project

Type of analysis: Pre-feasibility | Currency: $ | Cost references: None

Initial Costs (Credits)	Unit	Quantity	Unit Cost	Amount	Relative Costs	Quantity Range	Unit Cost Range
Feasibility Study							
Other - Feasibility study	Cost	1	$ 10,000	$ 10,000		-	-
Sub-total :				$ 10,000	1.2%		
Development							
Other - Development	Cost	1	$ 15,000	$ 15,000		-	-
Sub-total :				$ 15,000	1.8%		
Engineering							
Other - Engineering	Cost	1	$ 55,000	$ 55,000		-	-
Sub-total :				$ 55,000	6.5%		
Energy Equipment							
PV module(s)	kWp	80.00	$ 5,750	$ 460,000		-	-
Transportation	project	0	$ -	$ -		-	-
Other - Energy equipment	Cost	0	$ -	$ -		-	-
Credit - Energy equipment	Credit	0	$ -	$ -		-	-
Sub-total :				$ 460,000	54.7%		
Balance of Equipment							
Module support structure	m^2	683.8	$ 100	$ 68,376		-	-
Inverter	kW AC	72.0	$ 1,000	$ 72,000		-	-
Other electrical equipment	kWp	80.00	$ -	$ -		-	-
System installation	kWp	80.00	$ 1,500	$ 120,000		-	-
Transportation	project	0	$ -	$ -		-	-
Other - Balance of equipment	Cost	0	$ -	$ -		-	-
Credit - Balance of equipment	Credit	0	$ -	$ -		-	-
Sub-total :				$ 260,376	31.0%		
Miscellaneous							
Training	p-h	6	$ 65	$ 390		-	-
Contingencies	%	5%	$ 800,766	$ 40,038		-	-
Sub-total :				$ 40,428	4.8%		
Initial Costs - Total				$ 840,804	100.0%		

Annual Costs (Credits)	Unit	Quantity	Unit Cost	Amount	Relative Costs	Quantity Range	Unit Cost Range
O&M							
Property taxes/Insurance	project	0	$ -	$ -		-	-
O&M labour	p-h	16	$ 55	$ 880		-	-
Other - O&M	Cost	0	$ -	$ -		-	-
Credit - O&M	Credit	0	$ -	$ -		-	-
Contingencies	%	0%	$ 880	$ -		-	-
Sub-total :				$ 880	100.0%		
Annual Costs - Total				$ 880	100.0%		

Periodic Costs (Credits)		Period	Unit Cost	Amount	Interval Range	Unit Cost Range
Inverter Repair/Replacement	Cost	12 yr	$ 50,000	$ 50,000	-	-
			$ -	$ -	-	-
			$ -	$ -	-	-
End of project life		-	$ -	$ -		Go to GHG Analysis sheet

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RETScreen® Financial Summary - Photovoltaic Project

Annual Energy Balance

Project name		Commercial Building			
Project location		Stuttgart, Germany	Nominal PV array power	kWp	80.00
Renewable energy delivered	MWh	87.153			
Firm RE capacity	kW	-			
Application type		On-grid			

Financial Parameters

Avoided cost of energy	$/kWh	0.050	Debt ratio	%	60.0%
RE production credit	$/kWh	0.750	Debt interest rate	%	6.5%
RE production credit duration	yr	25	Debt term	yr	25
RE credit escalation rate	%	2.0%			
			Income tax analysis?	yes/no	No
Energy cost escalation rate	%	5.0%			
Inflation	%	2.5%			
Discount rate	%	9.0%			
Project life	yr	25			

Project Costs and Savings

Initial Costs				Annual Costs and Debt		
Feasibility study	1.2%	$	10,000	O&M	$	880
Development	1.8%	$	15,000	Fuel	$	-
Engineering	6.5%	$	55,000	Debt payments - 25 yrs	$	49,294
Energy equipment	54.7%	$	460,000	**Annual Costs and Debt - Total**	**$**	**50,174**
Balance of equipment	31.0%	$	260,376			
Miscellaneous	4.8%	$	40,428	**Annual Savings or Income**		
Initial Costs - Total	100.0%	**$**	**840,804**	Energy savings/income	$	74,778
Incentives/Grants		$	-	RE production credit income - 25 yrs	$	65,365
				Annual Savings - Total	**$**	**140,143**
Periodic Costs (Credits)						
Inverter Repair/Replacement		$	50,000	Schedule yr # 12,24		
		$	-			
		$	-			
End of project life -		$	-			

Financial Feasibility

			Calculate energy production cost?	yes/no	No
Pre-tax IRR and ROI	%	33.3%			
After-tax IRR and ROI	%	33.3%			
Simple Payback	yr	6.0			
Year-to-positive cash flow	yr	3.3	Project equity	$	336,322
Net Present Value - NPV	$	1,096,561	Project debt	$	504,483
Annual Life Cycle Savings	$	111,637	Debt payments	$/yr	49,294
Benefit-Cost (B-C) ratio	-	4.26	Debt service coverage	-	2.93

Yearly Cash Flows

Year #	Pre-tax $	After-tax $	Cumulative $
0	(336,322)	(336,322)	(336,322)
1	94,993	94,993	(241,329)
2	100,230	100,230	(141,099)
3	105,689	105,689	(35,410)
4	111,381	111,381	75,970
5	117,316	117,316	193,286
6	123,506	123,506	316,793
7	129,964	129,964	446,756
8	136,700	136,700	583,456
9	143,729	143,729	727,185
10	151,064	151,064	878,249
11	158,720	158,720	1,036,969
12	99,467	99,467	1,136,435
13	175,054	175,054	1,311,489
14	183,765	183,765	1,495,254
15	192,862	192,862	1,688,116
16	202,362	202,362	1,890,478
17	212,285	212,285	2,102,763
18	222,652	222,652	2,325,416
19	233,483	233,483	2,558,899
20	244,800	244,800	2,803,699
21	256,627	256,627	3,060,326
22	268,988	268,988	3,329,314
23	281,908	281,908	3,611,223
24	204,979	204,979	3,816,201
25	309,536	309,536	4,125,738

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Cumulative Cash Flows Graph

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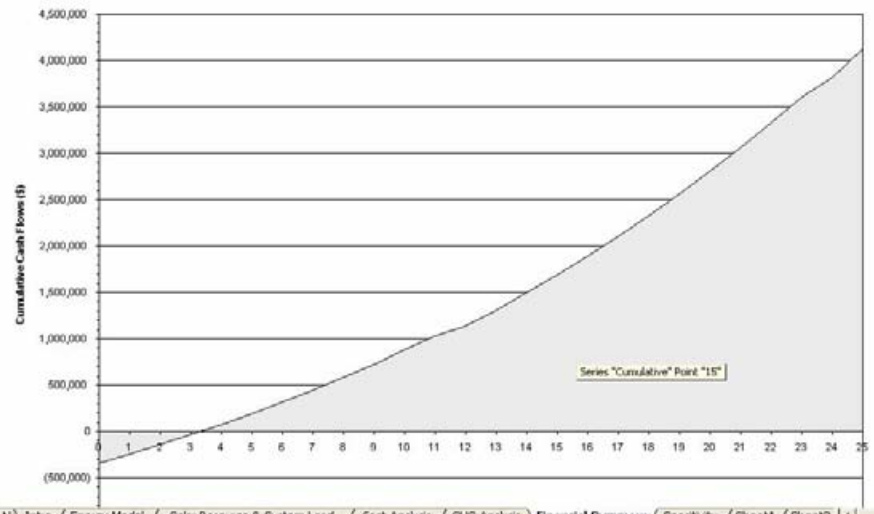

Intro / Energy Model / Solar Resource & System Load / Cost Analysis / GHG Analysis / Financial Summary / Sensitivity / Sheet1 / Sheet2

Ready NUM

RETScreen® Sensitivity and Risk Analysis - Photovoltaic Project

Use sensitivity analysis sheet?	Yes
Perform risk analysis too?	No
Project name	Commercial Building
Project location	Stuttgart, Germany

Perform analysis on	After-tax IRR and ROI
Sensitivity range	20%
Threshold	15.0 %

Click here to Calculate Sensitivity Analysis

Sensitivity Analysis for After-tax IRR and ROI

RE delivered (MWh)		Avoided cost of energy ($/kWh) 0.6864 -20%	0.7722 -10%	**0.8580** 0%	0.9438 10%	1.0296 20%
69.723	-20%	21.0%	23.0%	24.9%	26.8%	28.7%
78.438	-10%	24.8%	27.0%	29.1%	31.3%	33.4%
87.153	0%	28.5%	30.9%	**33.3%**	35.7%	38.0%
95.869	10%	32.3%	34.9%	37.5%	40.1%	42.7%
104.584	20%	36.0%	38.9%	41.7%	44.6%	47.4%

Initial costs ($)		Avoided cost of energy ($/kWh) 0.6864 -20%	0.7722 -10%	**0.8580** 0%	0.9438 10%	1.0296 20%
672,643	-20%	37.8%	40.8%	43.7%	46.7%	49.6%
756,724	-10%	32.6%	35.3%	37.9%	40.6%	43.2%
840,804	0%	28.5%	30.9%	**33.3%**	35.7%	38.0%
924,885	10%	25.2%	27.4%	29.5%	31.7%	33.8%
1,008,965	20%	22.4%	24.4%	26.4%	28.4%	30.4%

Annual costs ($)		Avoided cost of energy ($/kWh) 0.6864 -20%	0.7722 -10%	**0.8580** 0%	0.9438 10%	1.0296 20%
704	-20%	28.6%	31.0%	33.4%	35.7%	38.1%
792	-10%	28.6%	31.0%	33.3%	35.7%	38.1%
880	0%	28.5%	30.9%	**33.3%**	35.7%	38.0%
968	10%	28.5%	30.9%	33.3%	35.6%	38.0%