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Canada

RETScreen® International

Clean Energy Project Analysis Software

Solar Water Heating Project Model

Click Here to Start
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- Online Manual

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- Solar Resource & Heating Load
- Cost Analysis
- Greenhouse Gas Analysis
- Financial Summary

Features
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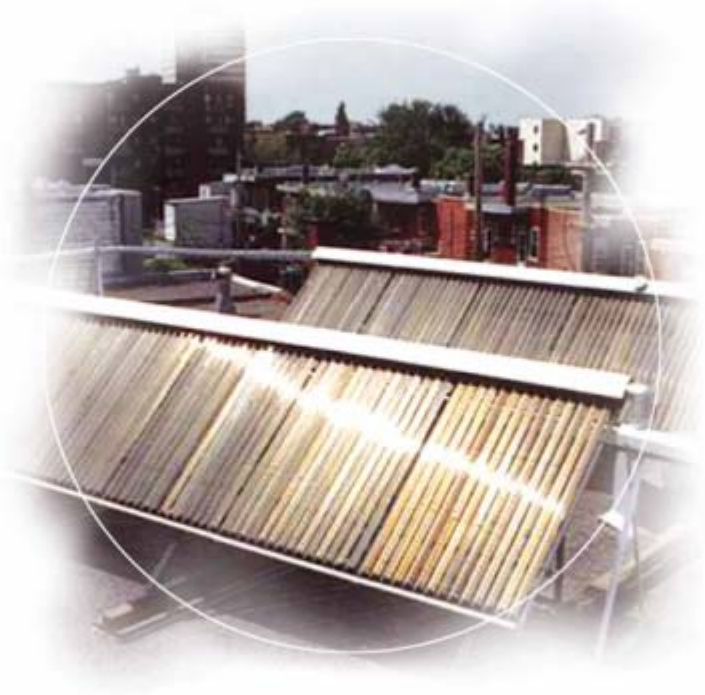

Clean Energy Decision Support Centre

www.retscreen.net

Training & Support
Internet Forums
Marketplace
Case Studies
e-Textbook

Partners

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RETScreen® Energy Model - Solar Water Heating Project

Training & Support

Site Conditions		Estimate	Notes/Range
Project name		Swimming Pool	See Online Manual
Project location		Quebec, Canada	
Nearest location for weather data		St Hubert A, QC	Complete SR&HL sheet
Annual solar radiation (tilted surface)	MWh/m²	1.61	
Annual average temperature	°C	5.9	-20.0 to 30.0
Annual average wind speed	m/s	4.4	
Desired load temperature	°C	27	
Number of months analysed	month	3.50	
Energy demand for months analysed	MWh	16.39	

System Characteristics		Estimate	Notes/Range
Application type		Swimming pool (outdoor)	
Base Case Water Heating System			
Heating fuel type	-	Electricity	
Water heating system seasonal efficiency	%	250%	50% to 190%
Solar Collector			
Collector type	-	Unglazed	See Technical Note 1
Solar water heating collector manufacturer		ABC S.A.	See Product Database
Solar water heating collector model		model XYZ	
Gross area of one collector	m²	4.00	1.00 to 5.00
Aperture area of one collector	m²	4.00	1.00 to 5.00
Fr (tau alpha) coefficient	-	0.85	0.50 to 0.90
Wind correction for Fr (tau alpha)	s/m	0.040	0.030 to 0.050
Fr UL coefficient	(W/m²)/°C	11.56	10.00 to 15.00
Wind correction for Fr UL	(J/m³)/°C	4.37	3.00 to 15.00
Suggested number of collectors		11	
Number of collectors		7	
Total gross collector area	m²	28.0	
Balance of System			
Heat exchanger/antifreeze protection	yes/no	No	
Suggested pipe diameter	mm	31	8 to 25 or PVC 35 to 50
Pipe diameter	mm	38	8 to 25 or PVC 35 to 50
Pumping power per collector area	W/m²	0	3 to 22, or 0
Piping and solar tank losses	%	1%	1% to 10%
Losses due to snow and/or dirt	%	3%	2% to 10%
Horz. dist. from mech. room to collector	m	5	5 to 20
# of floors from mech. room to collector	-	2	0 to 20

Annual Energy Production (3.50 months analysed)		Estimate	Notes/Range
SWH system capacity	kW$_{th}$	20	
	MWth	0.020	
Pumping energy (electricity)	MWh	**0.00**	
Specific yield	kWh/m²	171	
System efficiency	%	28%	
Solar fraction	%	6%	
Renewable energy delivered	MWh	**4.78**	
	GJ	17.22	

Complete Cost Analysis sheet

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Product Database

Collector Type: Any
Region: N. & Central America
Supplier: Aquatherm Industries
Model: Ecosun 16104

Gross area per collector (m²)	4.37
Aperture area per collector (m²)	4.37
Fr (tau alpha) coefficient	0.82
Wind correction (s/m)	0.000
Fr UL coefficient ((W/m²)/°C)	15.76
Wind correction ((J/m³)/°C)	0.00
Temperature coefficient (W/(m·°C)²)	0.00

Help | Paste Data | Close

Supplier Information | Other Information

Contact manufacturer directly:

dsizelove@warmwater.com
http://www.warmwater.com/

Send e mail | Visit Website

Date modified: 2005/08/01

RETScreen® Solar Resource and Heating Load Calculation - Solar Water Heating Project

Site Latitude and Collector Orientation		Estimate	Notes/Range
Nearest location for weather data		St Hubert A, QC	See Weather Database
Latitude of project location	°N	45.5	-90.0 to 90.0
Slope of solar collector	°	25.0	0.0 to 90.0
Azimuth of solar collector	°	0.0	0.0 to 180.0

Monthly Inputs

(Note: 1. Cells in grey are not used for energy calculations; 2. Revisit this table to check that all required inputs are filled if you change system type or solar collector type or pool type, or method for calculating cold water temperature).

Month	Fraction of month used (0 - 1)	Monthly average daily radiation on horizontal surface (kWh/m²/d)	Monthly average temperature (°C)	Monthly average relative humidity (%)	Monthly average wind speed (m/s)	Monthly average daily radiation in plane of solar collector (kWh/m²/d)
January	0.00	1.72	-10.2	72.5	5.0	3.01
February	0.00	2.80	-8.9	72.0	5.0	4.26
March	0.00	4.05	-2.3	69.0	5.0	5.11
April	0.00	4.64	5.6	66.0	4.7	4.99
May	0.25	5.73	12.7	64.0	4.4	5.70
June	1.00	6.11	17.9	67.0	4.2	5.87
July	1.00	6.14	20.6	69.0	3.6	5.99
August	1.00	5.18	19.0	73.5	3.6	5.39
September	0.25	3.85	14.2	75.0	3.9	4.44
October	0.00	2.52	8.0	74.0	4.4	3.38
November	0.00	1.49	1.4	77.0	4.7	2.26
December	0.00	1.34	-7.0	77.0	4.7	2.38

		Annual	Season of Use
Solar radiation (horizontal)	MWh/m²	1.39	0.61
Solar radiation (tilted surface)	MWh/m²	1.61	0.61
Average temperature	°C	5.9	18.4
Average wind speed	m/s	4.4	3.9

RETScreen® Cost Analysis - Solar Water Heating Project

Type of project: 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	0	$ -	$ -		-	-
Sub-total :				$ -	0.0%		
Development							
Other - Development	Cost	0	$ -	$ -		-	
Sub-total :				$ -	0.0%		
Engineering							
Other - Engineering	Cost	0	$ -	$ -		-	-
Sub-total :				$ -	0.0%		
Energy Equipment							
Solar collector	m²	28.0	$ 65	$ 1,820		-	-
Solar storage tank	L	1,285	$ -	$ -		-	-
Solar loop piping materials	m	27	$ 6.00	$ 160		-	-
Circulating pump(s)	W	0	$ -	$ -		-	-
Heat exchanger	kW	0.0	$ -	$ -		-	-
Transportation	project	1	$ 100	$ 100		-	-
Other - Energy equipment	Cost	0	$ -	$ -		-	-
Sub-total :				$ **2,080**	61.9%		
Balance of System							
Collector support structure	m²	28.0	$ -	$ -		-	-
Plumbing and control	project	1	$ 300	$ 300		-	-
Collector installation	m²	28.0	$ 10	$ 280		-	-
Solar loop installation	m	27	$ 2.00	$ 53		-	-
Auxiliary equipment installation	project	1	$ 50	$ 50		-	-
Transportation	project	1	$ 50	$ 50		-	-
Other - Balance of system	Cost	0	$ -	$ -		-	-
Sub-total :				$ **733**	21.8%		
Miscellaneous							
Training	p-h	4	$ 60	$ 240		-	-
Contingencies	%	10%	$ 3,053	$ 305		-	-
Sub-total :				$ **545**	16.2%		
Initial Costs - Total				$ **3,358**	100.0%		

SWH3

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RETScreen® Financial Summary - Solar Water Heating Project

Annual Energy Balance

Project name		Swimming Pool	Electricity required	MWh	-
Project location		Quebec, Canada			
Renewable energy delivered	MWh	4.78			
Heating fuel displaced	-	Electricity			

Financial Parameters

Avoided cost of heating energy	$/kWh	0.060	Debt ratio	%	0.0%
			Income tax analysis?	yes/no	No
Retail price of electricity	$/kWh	-			
Energy cost escalation rate	%	3.0%			
Inflation	%	2.0%			
Discount rate	%	10.0%			
Project life	yr	25			

Project Costs and Savings

Initial Costs			
Feasibility study	0.0%	$	-
Development	0.0%	$	-
Engineering	0.0%	$	-
Energy equipment	61.9%	$	2,080
Balance of system	21.8%	$	733
Miscellaneous	16.2%	$	545
Initial Costs - Total	100.0%	**$**	**3,358**
Incentives/Grants		$	500

Periodic Costs (Credits)			
Valves and fittings	$	250	Schedule yr # 10,20
Pool heat pump compressor	$	(1,200)	Schedule yr # 10,20
	$	-	

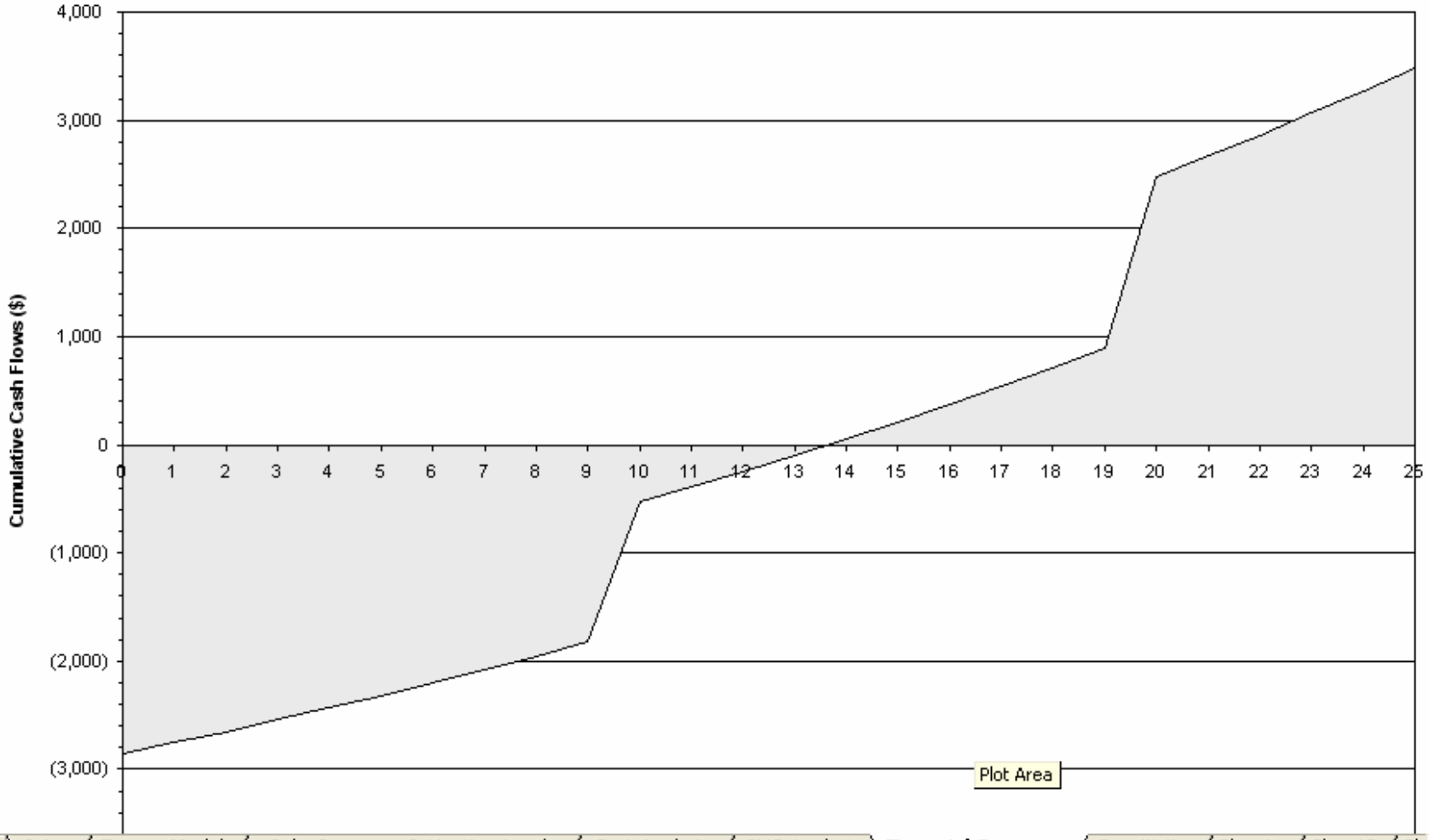
Annual Costs and Debt		
O&M	$	17
Electricity	$	-
Annual Costs and Debt - Total	**$**	**17**
Annual Savings or Income		
Heating energy savings/income	$	115
Annual Savings - Total	**$**	**115**

Yearly Cash Flows

Year #	Pre-tax $	After-tax $	Cumulative $
0	(2,858)	(2,858)	(2,858)
1	101	101	(2,757)
2	105	105	(2,652)
3	108	108	(2,544)
4	111	111	(2,433)
5	115	115	(2,318)
6	118	118	(2,200)
7	122	122	(2,078)
8	126	126	(1,951)
9	130	130	(1,821)
10	1,292	1,292	(529)
11	138	138	(391)
12	143	143	(248)
13	147	147	(101)
14	152	152	51
15	157	157	208
16	162	162	369
17	167	167	536
18	172	172	708
19	177	177	885
20	1,594	1,594	2,479
21	189	189	2,668
22	194	194	2,862
23	201	201	3,063
24	207	207	3,270
25	213	213	3,483

SWH Project Cumulative Cash Flows
Swimming Pool, Quebec, Canada

Renewable energy delivered (MWh/yr): 4.78 **Total Initial Costs: $ 3,358**



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