

RETScreen

A Powerful Analytical Tool to Assess Renewable Energy and Energy Efficiency Project Economics and Carbon Reduction

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Presentation Objectives

- Make LI solar/wind community aware of free RETScreen analytical tool
- Show what RETScreen can do for
 - Solar PV/Thermal and Wind Installers
 - End Users (of all types)
 - Academics / Workforce Development
- Provide guidance to start using RETScreen
- Solicit/test interest in free RETScreen webinars from the NY Solar Energy Society

Renewable Energy Strategies, LLC

- Provides economic and environmental analysis of proposed renewable energy and energy efficiency projects
- Utilizing RETScreen/other analytical tools
- Across a range of renewable energy/energy efficiency projects (solar pv, solar thermal, fuel cells, hydrokinetic energy, other)

What is RETScreen?

- Free software to analyze project economics and carbon value of a wide variety of renewable energy and energy efficiency projects
- Inputs: Basic project information, technology employed, capital and operating cost/savings, financing structure, incentives, tax situation
- Outputs: pre-tax and post-tax cash flow, financial statistics and carbon value
- Easy use and sensitivity analysis

Who Provides RETScreen?

- RETScreen International, division of Canadian federal government's Natural Resources Canada (NRCan) agency
- Development started shortly after Kyoto, now at Version 4.0
- Software development and support, free of charge

RETScreen Software & Tech Support

- Software
 - Available at www.retscreen.net (free)
 - Operates on Microsoft Excel platform
 - Requires Microsoft Windows (not Mac compatible)

RETScreen Software & Tech Support

- Support from NRCAN's "Clean Energy Decision Support Centre" (www.retscreen.net)
 - Online training courses
 - User manual
 - Engineering e-textbook
 - Courses and seminars
 - Case studies
 - Email tech support

RETScreen Heating/Cooling Applications

Heating

- Boiler
- Furnace
- Thermal fluid heater
- Heating with biomass
- Heat pump
- Waste heat recovery unit
- Solar water heater
- Solar air heater

Cooling

- Compressor
- Heat Pump
- Free Cooling
- Desiccant
- Absorption

RETScreen Power Generation Applications

Conventional

- Steam turbine
- Gas turbine
- Comb cycle gas turbine
- Reciprocating engine

Renewable/Alternative

- Fuel cells
- Microturbines
- Wind turbines
- Hydroelectric
- Geothermal power
- Solar Photovoltaics
- Other

RETScreen Energy Efficiency Applications

- Building Envelope
- Ventilation
- Lighting
- Electrical Equipment
- Hot Water
- Pumps
- Motors
- Process Electricity
- Process Heat
- Process Steam
- Steam Losses
- Heat Recovery
- Compressed Air
- Refrigeration
- Other

RETScreen Software - Overview

The screenshot displays the RETScreen software interface within a Microsoft Excel window. The window title is "RETScreen4-1 - Microsoft Excel non-commercial use". The Excel ribbon is visible at the top, showing tabs for Home, Insert, Page Layout, Formulas, Data, Review, View, Developer, and RETScreen. The RETScreen ribbon includes various tool groups such as Clipboard, Font, Alignment, Number, Styles, Cells, and Editing.

The main interface area is titled "Clean Energy Project Analysis Software" and contains two main sections:

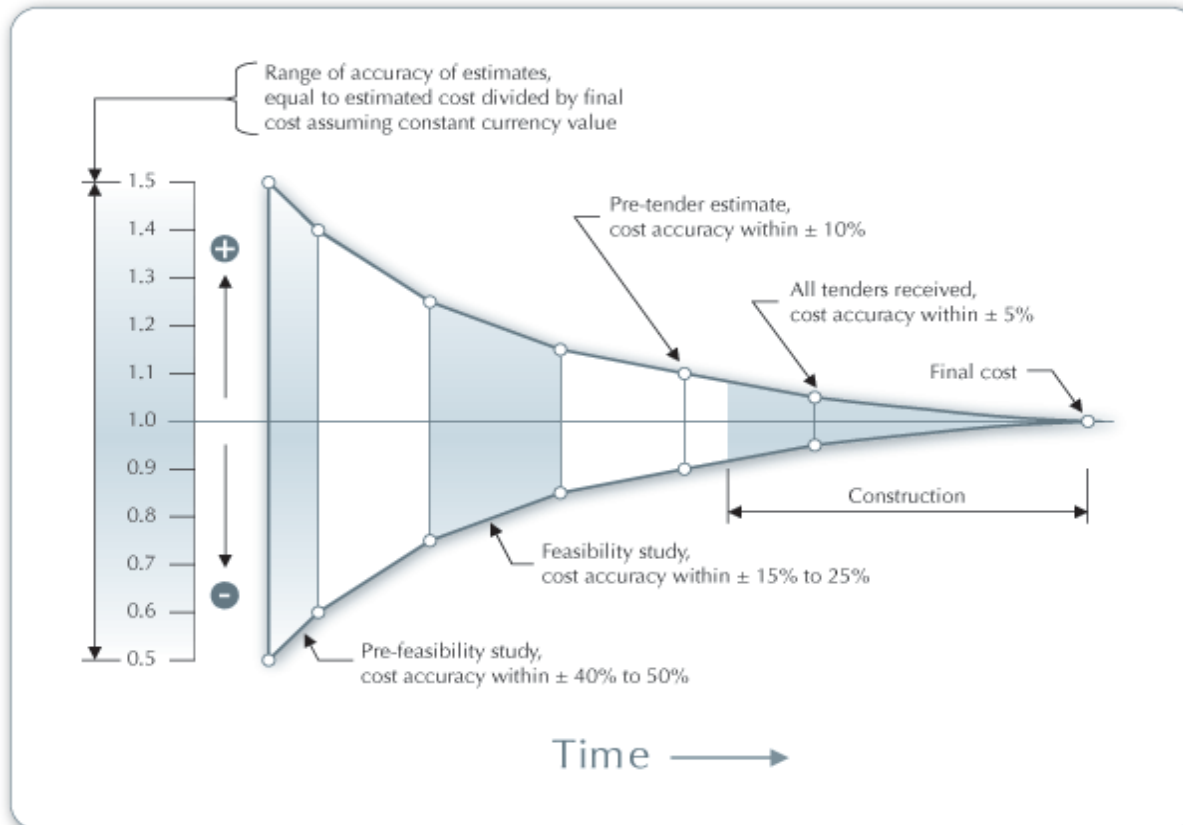
- Project information** (with a link to "See project database"):
 - Project name: NYSES Solar Thermal Natural Gas
 - Project location: Westchester County NY
 - Prepared for: NYSES Training
 - Prepared by: Dan Connors
 - Project type: Heating
 - Technology: Solar water heater
 - Analysis type: Method 2
 - Heating value reference: Higher heating value (HHV)
 - Show settings:
 - Language - Langue: English - Anglais
 - User manual: English - Anglais
 - Currency: \$
 - Units: Imperial units
- Site reference conditions** (with a link to "Select climate data location"):
 - Climate data location: White Plains Westchester
 - Show data:

The background of the interface features a large image of a wind turbine. At the bottom of the window, the Excel status bar shows "Ready" and "90%".

RETScreen

Renewable Energy Technology Screening

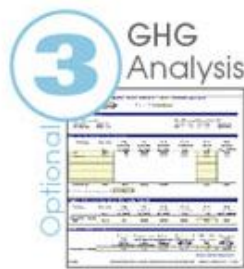
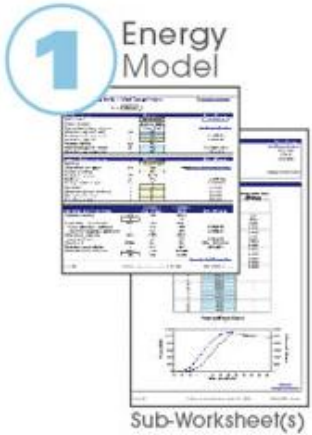
RETScreen



www.retscreen.net

Five Step Standard Analysis

Five Step Standard Analysis ➔



click on blue hyperlinks
or floating icon to access data



➔ Ready to make a decision

RETScreen's Integrated Databases/Tools

- Context sensitive “Help screens”
- Project database
- Climate database
- Supplier database
- Tool sheets
- Language/Currency



RETScreen Example – Project Info

Project information	See project database
Project name	Residential Solar PV Sample Problem
Project location	NY
Prepared for	NYSES Solar PV RETScreen Webinar
Prepared by	Renewable Energy Strategies, LLC
Project type	Power
Technology	Photovoltaic
Grid type	Central-grid
Analysis type	Method 2
Heating value reference	Higher heating value (HHV)
Show settings	<input checked="" type="checkbox"/>
Language - Langue	English - Anglais
User manual	English - Anglais
Currency	\$
Units	Imperial units

Site reference conditions	Select climate data location
Climate data location	White Plains Westchester
Show data	<input checked="" type="checkbox"/>

RETScreen Example – Climate Database

	Unit	Climate data location	Project location
Latitude	'N	41.1	41.1
Longitude	'E	-73.7	-73.7
Elevation	ft	397	397
Heating design temperature	°F	12.0	
Cooling design temperature	°F	86.5	
Earth temperature amplitude	°F	37.6	

Month	Air temperature	Relative humidity	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°F	%	kWh/m ² /d	Inch Hg	mph	°F	°F-d	°F-d
January	29.5	65.2%	1.71	29.4	9.0	24.1	1,083	0
February	32.2	60.5%	2.59	29.4	8.7	27.6	902	0
March	38.8	60.6%	3.51	29.4	9.2	36.2	792	0
April	49.3	62.2%	4.49	29.4	8.7	48.7	454	0
May	59.0	69.2%	5.22	29.4	7.4	60.3	167	279
June	68.4	71.2%	5.65	29.4	6.7	69.9	0	551
July	73.2	72.4%	5.54	29.4	6.3	74.1	0	720
August	71.8	75.1%	4.83	29.4	6.0	71.9	0	675
September	64.4	76.3%	3.85	29.5	6.5	64.3	0	432
October	53.4	72.1%	2.86	29.5	7.2	51.7	340	106
November	44.6	66.8%	1.81	29.5	8.3	40.5	594	0
December	34.9	64.6%	1.51	29.5	8.7	29.8	915	0
Annual	51.7	68.1%	3.64	29.4	7.7	50.0	5,248	2,763
Measured at	ft				32.8	0.0		



[Complete Energy Model sheet](#)

5000 + climate data locations worldwide

RETScreen Example – Energy Model

Technology	Photovoltaic	
Analysis type	<input type="radio"/> Method 1 <input checked="" type="radio"/> Method 2	
Resource assessment		
Solar tracking mode	Fixed	
Slope	41.0	
Azimuth	0.0	
<input type="checkbox"/> Show data		
Photovoltaic		
Type	poly-Si	
Power capacity	5.52 kW	
Manufacturer	Canadian Solar	
Model	poly-Si - CS6P 240W	
Efficiency	14.9%	
Nominal operating cell temperature	45 °C	
Temperature coefficient	0.40% / °C	
Solar collector area	37 m ²	
Miscellaneous losses	2.0%	
Inverter		
Efficiency	92.0%	
Capacity	7.5 kW	
Miscellaneous losses	2.0%	
Summary		
Capacity factor	14.4%	
Electricity exported to grid	6.983 MWh	

Supplier database includes many solar PV supplier's panel specs

RETScreen Example – Capital Costs

RETScreen Cost Analysis - Power project

Settings			
<input checked="" type="radio"/> Method 1	<input checked="" type="radio"/> Notes/Range	Notes/Range	None
<input type="radio"/> Method 2	<input type="radio"/> Second currency		
	<input type="radio"/> Cost allocation		

Initial costs (credits)	Unit	Quantity	Unit cost	Amount	Relative costs
Feasibility study					
Feasibility study	cost			\$ -	
Sub-total:				\$ -	0.0%
Development					
Development	cost			\$ -	
Sub-total:				\$ -	0.0%
Engineering					
Engineering	cost			\$ -	
Sub-total:				\$ -	0.0%
Power system					
Photovoltaic	kW	5.52	\$ 5,500	\$ 30,360	
Road construction	km			\$ -	
Transmission line	km			\$ -	
Substation	project			\$ -	
Energy efficiency measures	project			\$ -	
User-defined	cost			\$ -	
Sub-total:				\$ 30,360	100.0%
Balance of system & miscellaneous					
Spare parts	%			\$ -	
Transportation	project			\$ -	
Training & commissioning	p-d			\$ -	
User-defined	cost			\$ -	
Contingencies	%		\$ 30,360	\$ -	
Interest during construction			\$ 30,360	\$ -	
Sub-total:		Enter number of months		\$ -	0.0%
Total initial costs				\$ 30,360	100.0%

Annual costs (credits)	Unit	Quantity	Unit cost	Amount
O&M				
Parts & labour	project			\$ -
User-defined	cost			\$ -
Contingencies	%		\$ -	\$ -
Sub-total:				\$ -

Periodic costs (credits)	Unit	Year	Unit cost	Amount
User-defined	cost			\$ -
Replacement Inverter	cost	15	\$ 4,858	\$ 4,858
End of project life	cost			\$ -

Regular/Irregular O&M costs can be included

RETScreen Example – Carbon Value

RETScreen Emission Reduction Analysis - Power project

Emission Analysis

Method 1
 Method 2
 Method 3

Base case electricity system (Baseline)

Country - region	Fuel type	GHG emission factor (excl. T&D) tCO2/MWh	T&D losses %	GHG emission factor tCO2/MWh
United States of America	All types	0.544	10.0%	0.604

Baseline changes during project life

Base case system GHG summary (Baseline)

Fuel type	Fuel mix %	Fuel consumption MWh	GHG emission factor tCO2/MWh	GHG emission tCO2
Electricity	100.0%	7	0.604	4.2
Total	100.0%	7	0.604	4.2

Proposed case system GHG summary (Power project)

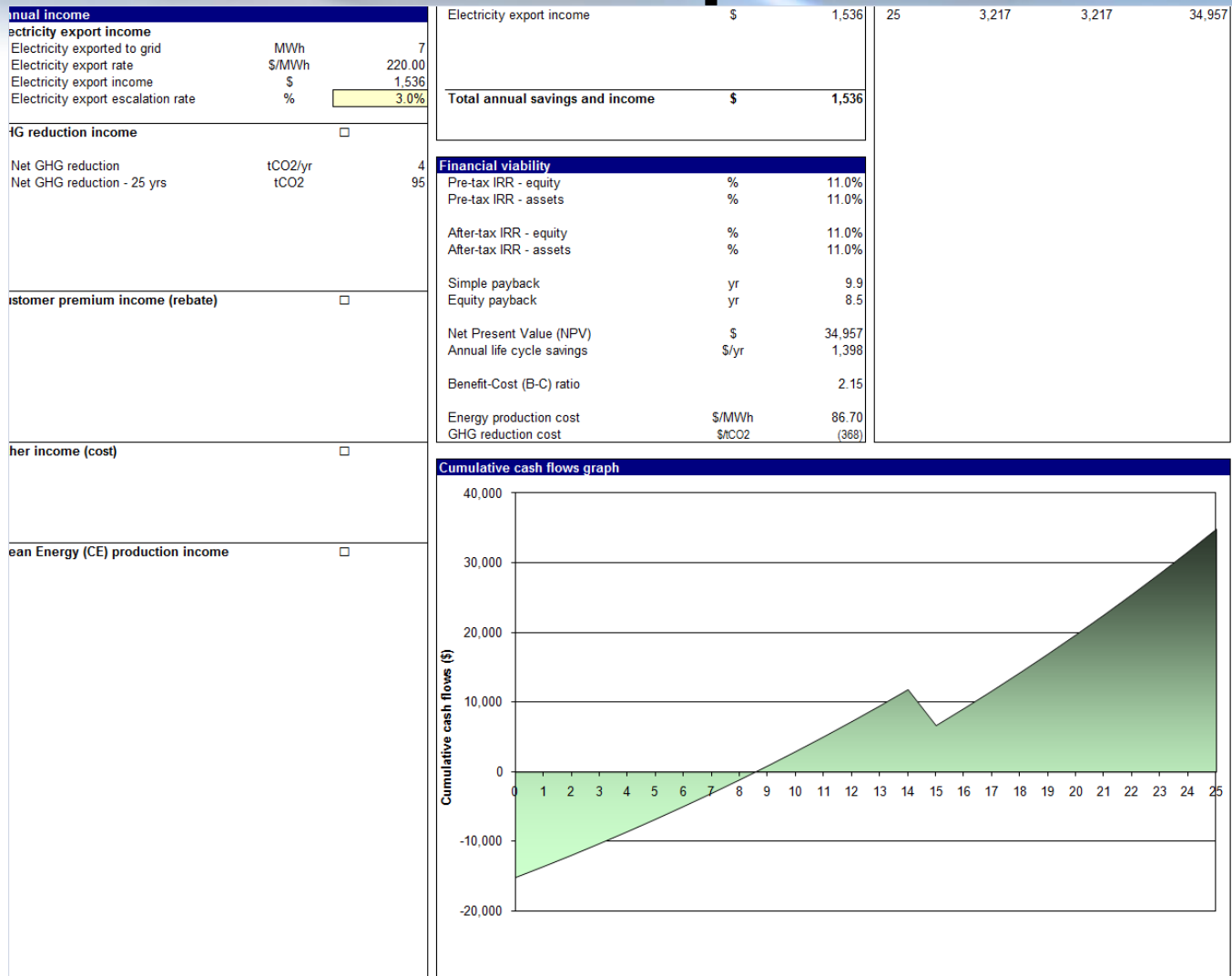
Fuel type	Fuel mix %	Fuel consumption MWh	GHG emission factor tCO2/MWh	GHG emission tCO2
Solar	100.0%	7	0.000	0.0
Total	100.0%	7	0.000	0.0
Electricity exported to grid	MWh	7	T&D losses 10.0%	0.4
				Total 0.4

GHG emission reduction summary

Power project	Base case GHG emission tCO2	Proposed case GHG emission tCO2	Gross annual GHG emission reduction tCO2	GHG credits transaction fee %	Net annual GHG emission reduction tCO2
Power project	4.2	0.4	3.8		3.8
Net annual GHG emission reduction	3.8	tCO2	is equivalent to	0.7	Cars & light trucks not used

Calculates reduced carbon emissions

RETScreen Example – Financial



Output: Project pre-tax and post-tax cash flows

What RETScreen Doesn't Do

- Renewable Energy Technology Screening Software
- Not a Design Tool
- May not be as detailed as other “technology specific tools”
- May not be appropriate for detailed analysis of large commercial and/or utility scale projects with complex financing structures
- Not ready to use “off the shelf” for US investment tax credits, local incentives, accelerated depreciation without some customization

How To Start Using RETScreen

- Download free software at www.retscreen.net
- Review basic info at website including “What is RETScreen”
- Email Renewable Energy Strategies at dan_connors@att.net for copy of earlier webinar tutorial and indicate if you would like to participate in future webinar training sessions.
- Test RETScreen using historical project data and compare to previous analysis. Invest more time in proficiency with RETScreen tool if appropriate.

Follow-Up RETScreen Questions?

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