Solar Hot Water Overview
Washington DC Office Building

April, 2017

ECOTERMIC

SOLAR UNLIMITED

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Solar Hot Water Concepts - Introduction

Three Building Blocks of Solar Thermal

- Solar Collectors – 4’x8’ or 4’x10’
  - Each Solar Collector is rated by the International Energy Agency at 2 to 2.5 KW-thermal.
  - Each Solar Collector Reduces CO2 by 2000 to 3000Kilograms per Year
- Heat Transfer Station
  - Heat Transfer Stations Contain Pumps, Heat Exchangers, and Controls to Transfer Heat and Manage the System.
  - Scalable from 10 to 200 KW-thermal.
- Solar Tank – **Atmospheric** Stainless Solar Tanks are the Preferred Long-Lasting Solar Tank
- Made in the USA

Solar Thermal Applications

- Office Buildings
- Dormitories and Hotels
- Schools
- ***Hospitals***
- Cafeterias
- Fitness Centers and Child Care Centers
- Maintenance Facilities
- Dairy Farms

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Solar Hot Water Concepts – the Solar Collector

Solar Collectors

SolarHot Solstice Collector – 4’x8’ or 4’x10’

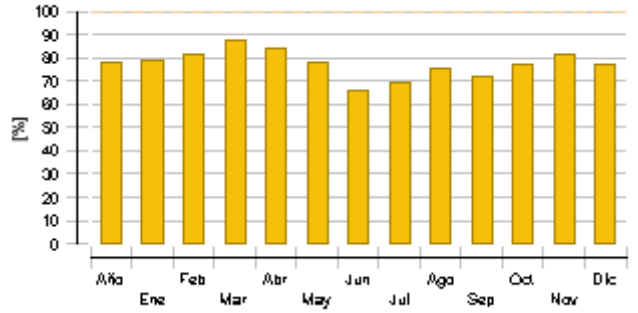
- Designed Specifically for Hot Water Heating
- Highly Rated By SRCC
- Made in USA

Hospital Hot Water - Example

- Example – Hospital, Mexico City
- 30 SolarHot Solstice 4X8 Solar Collectors Projected to Provide over 75% of Yearly Hot Water for both the Childrens and the Nursing Buildings.
- Reduce the consumption of gas by the Hospital’s Steam Boilers by 1 Million Megajoules each Year.
- Reduce Production of CO2 by the Steam Boilers by 200,000 Kilograms (441,000 lbs) each Year.

Month By Month Solar Contribution

Fracción solar: porcentaje de energía solar al sistema [SFn]



72 Roof Mounted SolarHot Solstice 4X10s

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Solar Hot Water Concepts – the Large Facility Solar Heat Transfer Station

Unique Commercial and Industrial Solar Heat Transfer Stations

- Unique in Solar Thermal Industry
- Three Scalable Sizes
- Customizable
- Made in USA

This Heat Transfer Station Will Manage up to 100 Solar Collectors

Solar Collector Interface

- Two Top Facing Pipes Connect to Solar Tank
- Two Top Facing Pipes Connect to Solar Collectors on Roof

Solar Hot Water Interface

- Two Side Facing Pipes Connect to Solar Tank
- Two Side Facing Pipes Connect to Building Hot Water System

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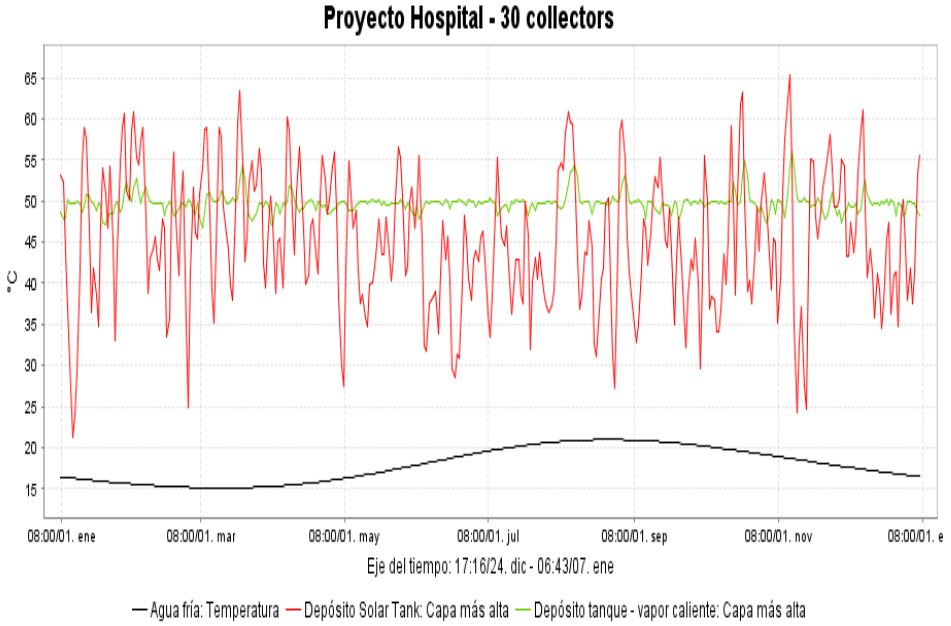
Solar Hot Water Concepts – the Solar Tank

Atmospheric Solar Tanks

- 14 gage of 16 gage stainless steel
- Customizable – any size or shape
- Cost is 65% less than a pressurized storage tank. Made in USA

Picture Customized Atmospheric Solar Tank Waiting For Shipment from SolarHot. The Tank Shown is 11,000 Liters (2,900 gals). The most common size is 2,500 (660 Gals) to 5,000 (1,320 gals) Liters.



Dormitory Example

- Black Line – Ground Water Temperature in Mexico City
- Red Line – Atmospheric Solar Tank Temperature – shows the contribution of solar hot water over a full year
- Green Line – Existing Hot Water Tank Temperatures – Note that The Solar Tank Can be Hotter than the Conventional Tank

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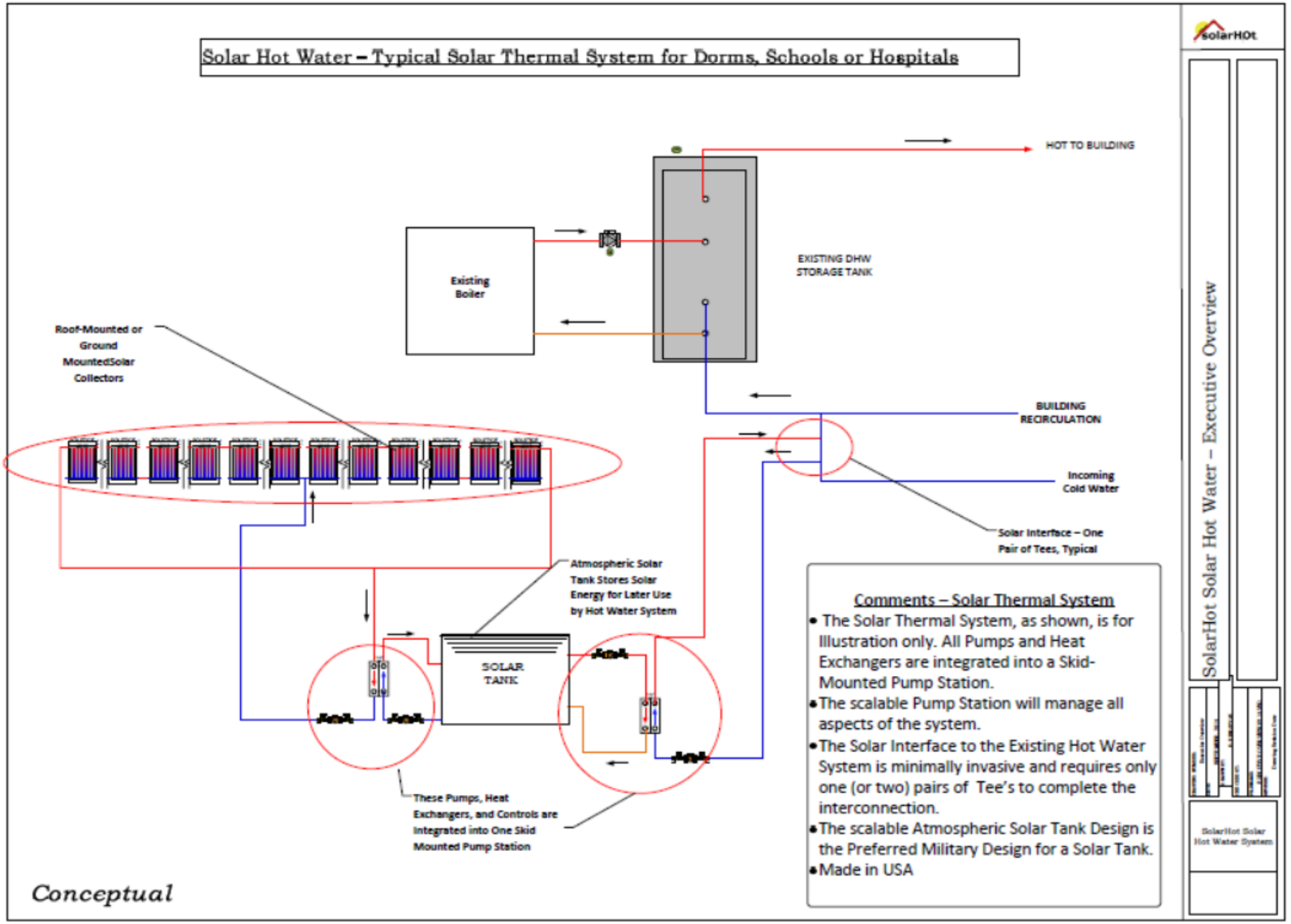
Pulling the Components into a Solar Hot Water System



What is the Financial Story?

SOLAR UNLIMITED North America Inc.

Washington DC Non-Profit Office Building Solar Domestic Hot Water Project -- Example

	1	2	3	4	5	6	7	8	12	16	20
Total System Price [1]	$175,000										
Net Investment	$175,000	$106,959	$38,248	-$31,343	-$101,829	-$171,978	-$244,307	-$317,584	-$582,132	-$753,174	-$939,058
Annual Solar Maintenance [4]	$0	$200	$208	$215	$1,473	$232	$240	$249	$289	$335	$388
Energy Savings Per Year											
Renewable Energy Credits [2]	-$35,441										
Energy Savings from CHP [3]	-$14,600										
Projected total Savings/Year	-$50,041	-$50,416	-$50,794	-$51,175	-$51,559	-$51,946	-$52,335	-$52,728	-$17,898	-$18,441	-$19,001
Steam Maintenance Savings [6]	-$18,000	-$18,495	-$19,004	-$19,526	-$20,063	-$20,615	-$21,182	-$21,764	-$24,259	-$27,040	-$30,139
Annual Cost/(Savings):	$106,959	-$68,711	-$69,591	-$70,486	-$70,149	-$72,329	-$73,277	-$74,243	-$41,868	-$45,146	-$48,752
Cumulative Cost/(Savings):	$106,959	$38,248	-$31,343	-$101,829	-$171,978	-$244,307	-$317,584	-$391,827	-$624,000	-$798,320	-$987,810

	Solar Energy Projection (BTU's)	PCT Solar Applied to SRECs [2]	SREC's per Year	Price per SREC [2]
SREC Calculator:	268,800,000	100%	78.8	$450

The cumulative savings over 20 years -$987,810

Financial Foot Notes

1. The solar thermal system consists of 25 rooftop solar collectors connected to solar heat storage and heat transfer stations in the mechanical room. The cost estimate shown is an example only.

2. Solar Energy Production and SREC Calculator - The solar energy production is projected by the Polysun simulation tool. The Polysun simulator is created by VelaSolaris, a subsidiary of SPF. SPF is the independent European rating agency for solar thermal equipment. SPF uses local environmental factors to project performance of a solar thermal system. The building hot water consumption profile is the primary factor in sizing the solar thermal system and the resulting solar energy performance. The solar thermal system increases or reduces solar production in response to changes in actual hot water demand. As a result, the actual hot water consumption, as opposed to planned hot water consumption, will determine the actual solar energy production. SREC calculator inputs:

- PCT Solar applied to SRECs - Enter the Percent of solar energy production that will be contributed to recognition of SRECs. Factors such as changes in building usage, system losses, and location of SREC measurement points can affect SREC totals. We recommend not exceeding 80%.

- Price per SREC - Enter the SREC dollar value that you expect.

3. Central Heating Plant Energy Savings - The Central Heating Plant provides steam at approximatly $41 per 1,000 pounds of low pressure steam, which is approximately 1,000,000 BTUs. The steam heat exchanger that generates building hot water is estimated t be 75% efficient. At this level of efficiency, Polysun projects 358.4 Million BTU's of steam savings in an average year, or $14,600/year. Different efficiency levels can raise or lower the energy savings.

4. Maintenance -
- Yearly - system monitoring, backflush of the hot water heat exchanger, and testing the solar loop for proper PH.
- Every 5 years - assumes replacement of all four pumps on the heat transfer skid.
- 10 years - Replacement of the propylene glycol in the solar loop.

The above are typical frequencies. Comments: 1) The four pumps have a typical life expectancy of 5 to 10 years. 2) Maintaining a proper PH is important to longevity of the propylene glycol solution. Minor changes in PH can be remedied by adding minor quantities of fresh inhibitor to the solar solution. This approach can cost-effectively extend the life of the propylene glycol. Failure to maintain the ph within recommended range can lead to premature replacement of the glycol solution.

5. The solar collectors and major mechical room components are made in the USA by SolarHot, LTD in Raleigh, NC. SolarHot is a nationally known solar energy company. SolarHot has supplied collectors, heat transfer stations, and atmospheric stainless steel storage tanks in Federal and military installations. Solar Unlimited NA, Inc. was featured for this work in the Delaware Governor's State of the State speech January 21, 2016.

6. Steam Equipment Maintenance - The solar thermal system can be expected to reduce the number of cycles of the facility steam hot water heating equipment. This will result in less frequent replacemnt of steam components due to weare, and, due to accumulating dirt within the steam components. The result will be less frequent maintenance and less frequent replacement of steam components such as the control valve, steam trap, and heat exchanger. Component replacement can be especcially expensive. Average savings for this facility can range from a low of $1,000 per month to a high of $2,000 per month. This scenario uses a mid point average of $1,500 per month.