Florida Solar Energy Center

Creating Energy Independence Since 1975

Solar Water Heating Systems

Second Annual Green Lodging and Hospitality Conference
"Greener Roads Ahead"
Rosen Centre, Orlando FL
Dec. 9-11, 2009
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Florida Solar Energy Center

A Research Institute of the University of Central Florida

Service Water

- What is the use for the solar system?
  - Service hot water
    - Rooms
    - Laundry
    - Kitchen
    - Health facility

Pool Heating

- What is the use for the solar system?
  - Swimming pools
  - Spas

Project Planning

- What size system do I need?
- Will one fit on my property?
- What about the economics?
- How do I go about it?

What size system do I need?

- Pre solar energy conservation measures
  - Critical
    - Often inexpensive – cheaper than increased solar system size
      - Flow reducing devices
      - Leaking faucets
      - Un-insulated components (piping, auxiliary tanks)
    - Reduce all possible hot water usage and waste
  - Do these first

What size system do I need?

Commercial Loads

Facility	Load
Restaurant (commercial kitchen, dining hall)	2.4 gallons per meal
Fast food	.79 gallons per meal
Office building	1 gallon per person per day
Laundry (each machine)	45 gallons per day per load
Hospital	52 gallons per day per bed
Dormitory (university and jails)	8 – 10 gallons per day
Hotel (Business)	14 gallons per day per room
Hotel (Resort)	20 gallons per day per room

Will it fit on my property?

- System location
  - Is there room to install collectors?
    - Roof
    - Ground
    - Adjacent building
  - Is there suitable solar access?
    - 9 am to 3 pm
- Storage tank location
  - Suitable space
  - Access to existing boiler

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Economics
Hotel Example

- ✓ 40 room hotel
- ✓ 80% Occupancy rate
- ✓ Operating 7 days a week
- ✓ 100 meals per day at restaurant
- ✓ 120 F water temperature

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Hotel Example

- Using the RETScreen software and other load references, we determine that:
  - Estimated daily hot water use is 881gallons
    - Hotel and restaurant
  - Ratio of storage capacity to collector area is set to 2 gal/ft^2
  - Total number of collectors required is 12 (at 40 ft^2 per collector)

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Hotel Example

- Factors are included in the program for heat exchanger efficiency, pump usage, miscellaneous losses
  - Leads to realistic projection
- In the end the solar system is sized to provide 70% of the hot water load requirement
  - 70% of hot water is made by the solar system
- Calculations based on $0.13/kWh

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Hotel Example

- System cost is $110/ft^2 – $52,800
- Incentives and grants = $29,840 total
  - Florida State Rebate
  - SunCatcher Program
  - Federal Tax Credit
- Utility Production Incentive ($0.03/kWh) = $789/year
- Net cost = $ 22,960 (57% reduction)
- Simple payback is approximately 5.3 years

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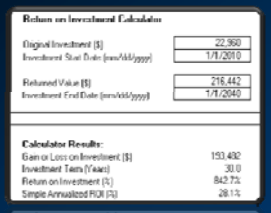
Hotel Example



Return on Investment Calculator	
Original Investment ($)	22,960
Investment Start Date (mm/dd/yyyy)	1/1/2010
Returned Value ($)	216,442
Investment End Date (mm/dd/yyyy)	1/1/2040
Calculator Results:	
Gain or Loss on Investment ($)	193,482
Investment Term (Years)	30.0
Return on Investment (%)	842.7%
Simple Annualized ROI (%)	28.1%

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Design and Procurement

- System Design
  - Experienced system designer
- Solar Industry Contractors
  - Experience with commercial system installations
- Solar Equipment Manufacturers
  - Certified products

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Conclusions

- Don't oversize the system
  - Aim for reasonable solar fraction
- Do it right - no short cuts
  - Well designed and installed system
  - Proper system for loads and climatic area
- Use local labor
  - For future maintenance and service
- Train facility personnel for periodic checks
  - O& M manual for hotel facility staff

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