Solar Thermal Energy Production: The Next Generation

Southeast Solar Summit
October 24-25, 2007
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Jeff Curry
Lakeland Electric

Utility Portrait

- Florida's 3rd largest municipal utility
- 120,000 metered customers
- Inland, non-resort community
- 12,000 snowbird accounts
- All electric housing stock
- Winter peak @ 745 MW
- Metered solar water heaters
- Net-metered & utility-owned PV

Lightningland, Florida

Cost-Effective Solar Water Heating Program

Original Goals:

- Accurate metering of thermal energy
- Profitable sale of solar energy
- Demonstrate SHW as DG
- Utilize SHW as “supply side” device
- Provide green energy option to customers
- Produce & sell SREC’s
- Can solar thermal KWh compete with fossil fuel KWh ?

Key Program Features

- Metered solar thermal energy
- Utility-owned
- Residential only
- Separate line item on monthly bill
- Offer energy price stability

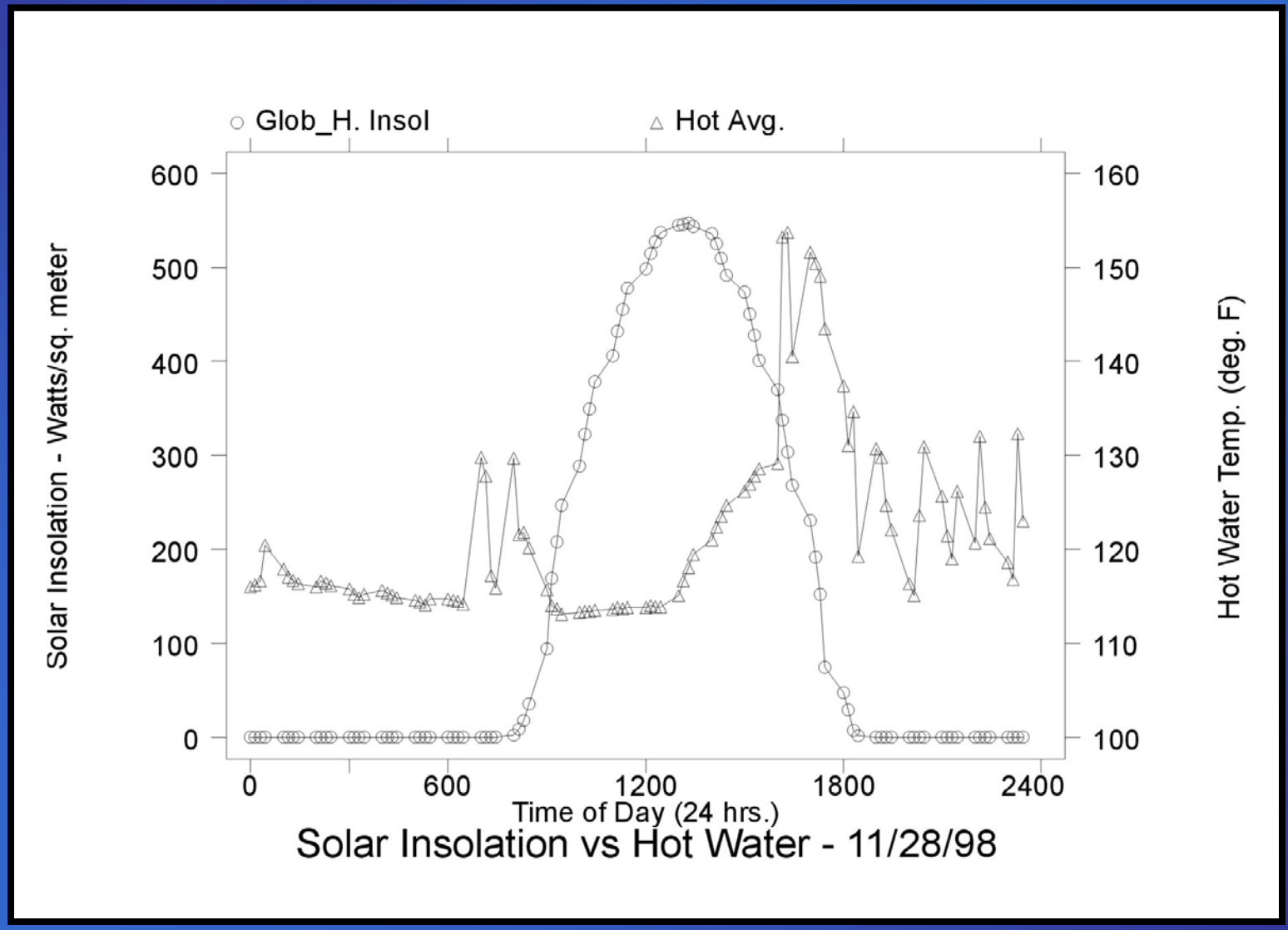
- ***Newest form of energy generation***

Benefits to Customer

- No investment risk
- Increased DHW volume
- Brand new water heater
- Cost savings of stand-by heating
- No maintenance costs
- Hedge against future price increases
- Non-business reason: green choice

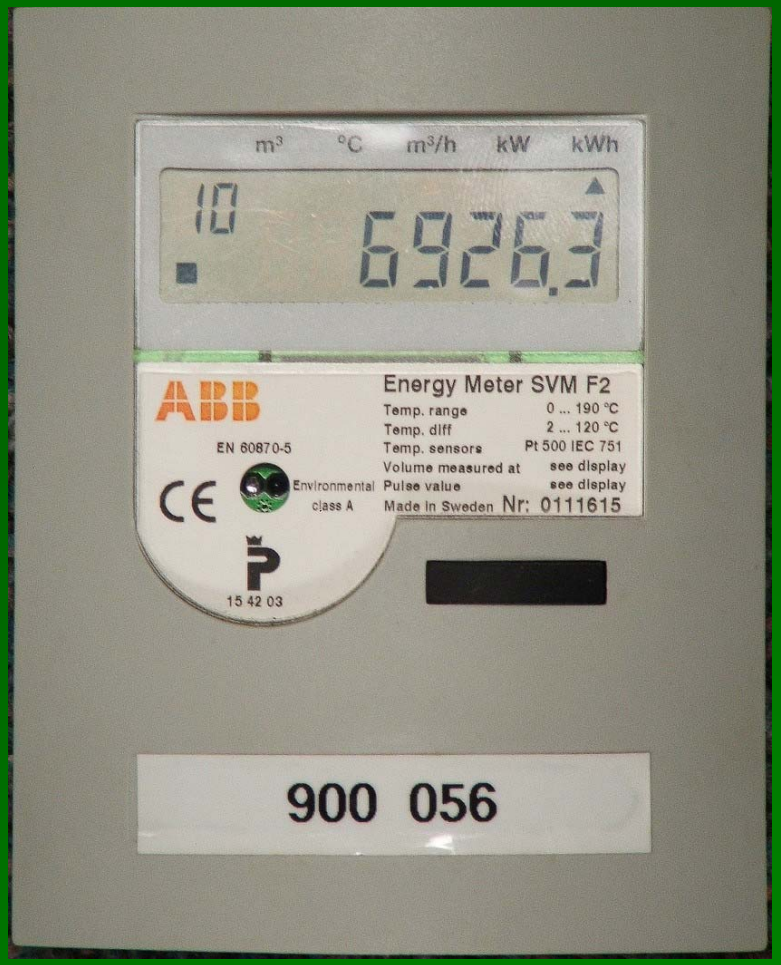

7331

Daily SHW Consumption



Solar Thermal Meter

- Hot Temp Probe
- Cold Temp Probe
- 1 Pulse/Liter Input
- Captures BTU's
- Displays KWH's



SHW Monthly Bill

LAKELAND ELECTRIC
Your Essential Link to a Quality Life
Retain This Portion For Your Records

Service Location:
2642 HIGHLANDS VUE PY
LAKELAND, FL 33813

0
Billing Date: 04/07/05
Page: 1
Account No. 3247313

Payment History

Previous Balance	$	140.71
Payments	$	140.71-
Credits	$	0.00

Current Charge Summary

Electric Service	$	143.50
(Includes Fuel Charge of $60.79)		
Solar Hot Water Program	$	32.51
Water Service	$	35.42
TOTAL CURRENT CHARGES	$	**211.43**

TOTAL AMOUNT SUBJECT TO PENALTY AFTER 05/02/05 $ **211.43**

All charges above include all taxes.

Solar Meter History

Read Date	Days	Read Type	Entry Code	Read Amount	Multiplier	Consumption Amount
Sep-07-2005 10:07:48	34	RR	HH	7170.000000	1.000000	302.000000
Aug-04-2005 11:21:51	28	RR	HH	6868.000000	1.000000	256.000000
Jul-07-2005 10:55:31	34	RR	HH	6612.000000	1.000000	296.000000
Jun-03-2005 11:15:00	30	RR	HH	6316.000000	1.000000	347.000000
May-04-2005 09:58:28	27	RR	HH	5969.000000	1.000000	322.000000
Apr-07-2005 10:46:02	34	RR	HH	5647.000000	1.000000	409.000000
Mar-04-2005 09:11:17	28	RR	HH	5238.000000	1.000000	339.000000
Feb-04-2005 09:06:50	29	RR	HH	4899.000000	1.000000	399.000000
Jan-06-2005 08:32:48	34	RR	HH	4500.000000	1.000000	415.000000
Dec-03-2004 08:58:21	31	RR	HH	4085.000000	1.000000	308.000000
Nov-02-2004 09:14:48	28	RR	HH	3777.000000	1.000000	215.000000
Oct-05-2004 12:37:17	28	RR	SY	3562.000000	1.000000	248.000000
Sep-07-2004 12:00:00	33	RR	SY	3314.000000	1.000000	279.000000
Aug-05-2004 09:02:13	34	RR	HH	3035.000000	1.000000	315.000000
Jul-02-2004 09:07:42	29	RR	HH	2720.000000	1.000000	218.000000
Jun-03-2004 09:06:33	28	RR	HH	2502.000000	1.000000	332.000000
May-06-2004 08:57:14	30	RR	HH	2170.000000	1.000000	307.000000
Apr-06-2004 08:12:46	34	RR	HH	1863.000000	1.000000	331.000000
Mar-03-2004 08:49:26	28	RR	HH	1532.000000	1.000000	286.000000
Feb-04-2004 09:07:20	28	RR	HH	1246.000000	1.000000	304.000000
Jan-07-2004 09:22:52	34	RR	HH	942.000000	1.000000	344.000000
Dec-04-2003 08:38:47	33	RR	HH	598.000000	1.000000	245.000000
Nov-01-2003 08:34:10	29	RR	HH	353.000000	1.000000	149.000000
Oct-03-2003 08:52:57	30	RR	HH	204.000000	1.000000	167.000000
Sep-03-2003 12:00:00	6	RR	MA	37.000000	1.000000	37.000000

Public Power Weekly
November 1, 2004

- Headline: "Utility sells 'green tags' based on solar water heaters."
- "Lakeland Electric in Florida...is the first utility ever to produce and trade renewable energy credits derived from solar water heaters."
- "The 50 MWh were sold to Keys Energy Services of Key West and the Democratic National Convention" for $40/megawatt-hour.

CERTIFICATE

OF ENVIRONMENTAL STEWARDSHIP

LAKELAND ELECTRIC AND STERLING PLANET PROUDLY PROVIDE

20,000 KILOWATT HOURS

100% SOLAR ENERGY

50% SOLAR HOT WATER - 50% SOLAR PHOTOVOLTAICS

TO

AMERICAN SOLAR ENERGY SOCIETY

SOLAR 2007 CONFERENCE

JULY 7-12, 2007

STERLING PLANET PRESIDENT

JULY 2007
DATE

SPI-2007-0700000
SERIAL NUMBER

STERLING PLANET, INC. AND LAKELAND ELECTRIC ATTEST THAT 20,000 KILOWATT HOURS OF 100% RENEWABLE ENERGY IN A 50-50 BLEND OF SOLAR HOT WATER AND SOLAR PHOTOVOLTAICS FROM FLORIDA PROJECTS ARE OFFSETTING CARBON DIOXIDE EMISSIONS IN AN AMOUNT THAT APPROXIMATES THE CARBON DIOXIDE EMISSIONS PRODUCED BY TOUR BUSES DURING THE ASES SOLAR 2007 CONFERENCE. THIS RENEWABLE ENERGY ALSO CONTRIBUTES TO SUSTAINABILITY, ENERGY SECURITY AND INDEPENDENCE, AND U.S. ECONOMIES. WWW.STERLINGPLANET.COM

The F.I.R.E. Model

(Florida Integrated Resource Evaluator)

Participant Test (PT)

...determines customer benefit

Total Resource Test (TRT)

...determines benefit to society

Rate Impact Measure (RIM)

...determines benefit to utility

Interpreting RIM

A value of *less than one* indicates an upward pressure on rates as a result of the program.

The Rate Impact Test is the primary test for determining the cost-effectiveness of a DSM measure on a utility's system.

RIM is a legislative requirement in some states.

Note: RIM test results are **not** transferable!

F.I.R.E. Sample from LE's 2005 IRP

Table 14-2 (continued). FIRE Model Cost-Effectiveness Results for New and Existing Residential Conservation and DSM Measures

Measure	RIM	PT	TRT
Heating, Ventilation, and Air Conditioning Efficiency Measures	0.367	1.644	0.603
High Efficiency Central AC - Existing - Residential	0.391	1.040	0.407
High Efficiency Central AC - New - Residential	0.425	2.869	1.182
High Efficiency Room AC - Existing - Residential	0.310	0.648	0.209
High Efficiency Room AC - New - Residential	0.343	2.020	0.612
Lighting Measures Average	0.451	8.945	2.292
Compact Fluorescent Lights - Existing - Residential	0.472	14.816	3.735
Compact Fluorescent Lights - New - Residential	0.476	16.239	3.914
High Pressure Sodium (Outdoor) - Existing - Residential	0.421	2.382	0.753
High Pressure Sodium (Outdoor) - New - Residential	0.435	2.341	0.764
Water Heating Efficiency Measures Average	0.410	1.353	0.582
Add-On Heat Pump Water Heater - Existing - Residential	0.468	1.735	0.801
Add-On Heat Pump Water Heater - New - Residential	0.499	1.685	0.831
DWH Pipe Insulation - Existing - Residential	0.295	0.961	0.286
DWH Pipe Insulation - Existing - Residential	0.295	0.961	0.286
Heat Recovery Water Heater - Existing - Residential	0.467	2.332	1.054
Heat Recovery Water Heater - New - Residential	0.467	2.332	1.054
High Efficiency Electric Water Heater - Existing - Residential	0.395	0.265	0.110
High Efficiency Electric Water Heater - New - Residential	0.396	0.556	0.230
Lakeland Solar Water Heater – with assumed peak reduction	1.020	1.000	1.770
Lakeland Solar Water Heater – no peak reduction	0.980	1.000	1.710

DSM Program	PT	RIM
Insulation (R19-R30)	2.046	0.303
Water Heater Jacket	9.810	0.420
Compact Flourescents	14.816	0.472
Low-flow Showerhead	39.735	0.412
Remove 2nd Refrigerator	1.000	0.479
AC Rebate	1.040	0.391
Lakeland Electric SHW	1.000	1.070

The Next Generation : 2008 Program Expansion

Approved revenue sources:

- Integrated Resource Plan
  ...annual budget
- Conservation Benefits Fund
  ...$ 0.25 monthly charge
- Voluntary Green Pricing
  ...$ 5.00 / 100 KWH block

Integrated Resource Plan

- "The customers are protected from rising fossil fuel prices for the portion of their electric bill that is derived from SHW."
- "Lakeland currently sells RECs from its existing renewable energy installations, including solar hot water... The program has been nationally recognized for its innovative combination of solar hot water and solar electric."
- "Quite simply stated, in the Lakeland Electric business model, these (hot water) systems are utility-owned, on-site energy generators."

Black & Veatch, 8-26-05

Conservation Benefits Fund

- $ 0.25 / month
- $2 million over 5 years
- Resides in monthly service charge
- Approved in 2007 rate study
- Reliable funding source
- Shared with other conservation measures
- Can be increased every three years

Utility General Fund

- Created as a result of passing RIM
- Totals $2 million during five years
- Subject to annual review
- Cannot be spent on non-solar projects

Voluntary Green Pricing

- $5 / 100 KWh block
- Maximum 4 blocks / customer
- Residential only in year one
- Scheduled to launch in 2007
- Hinges on market interest level
- Steady revenue stream over time
- Dedicated to solar hardware only

Lakeland Electric's Solar Hot Water Story :

Solar Thermal Generation

for the Next Generation