TAKING THE BS OUT OF HOME PERFORMANCE

Explaining Home Energy Use that Building Science Misses

John Laun, Apogee Interactive
Howard Katzman, GreenChoice Consulting

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Solving Home Performance Problems

How many here think one of these alone will solve common complaints:

- Weatherstripping?
- CFLs?
- Thermostat setback?
- Repairing ductwork?
- Repairing or replacing HVAC equipment?

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Getting the “Mileage” from a HP Home

- Do occupants get the performance they expect? If not, why not?
- Does homeowner know how to operate home to maximize performance?
- There is work to be done after they move in?

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Do You Get What You Expect?

- Studies point to wide range of energy use in same and similar homes, up to 2:1
- Occupant behavior is a large part
- How can raters and home performance specialists affect behavior?

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Energy Monitor

Every Prius includes an information screen that shows how Hybrid Synergy Drive® directs the flow of energy in your Prius.

1 of 6 ↗NEXT

Consumption

The Consumption screen gives immediate and average miles-per-gallon information.

2 of 6 ↗NEXT

The Prius Dashboard

- Educates the driver
- Provides instant feedback to driving habits – The Prius Effect
- Would mileage vary if there were no feedback?
- Maybe, but feedback gives greater opportunity to alter behavior

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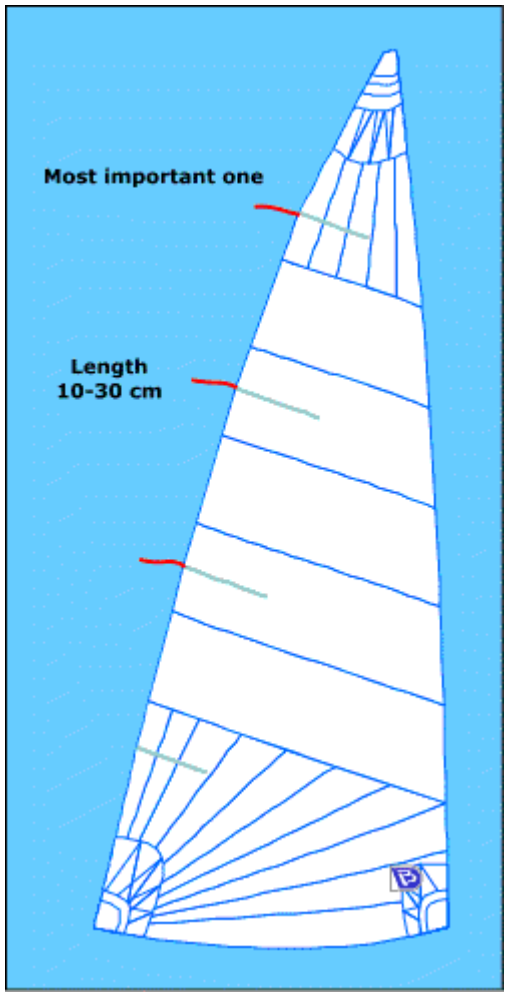
Feedback matters

- Even simple “indicators” work
- Simple is better than complex because they break less often
- But, you have to know how to read them and what to do
- They should provide indication that you’re moving in the right direction



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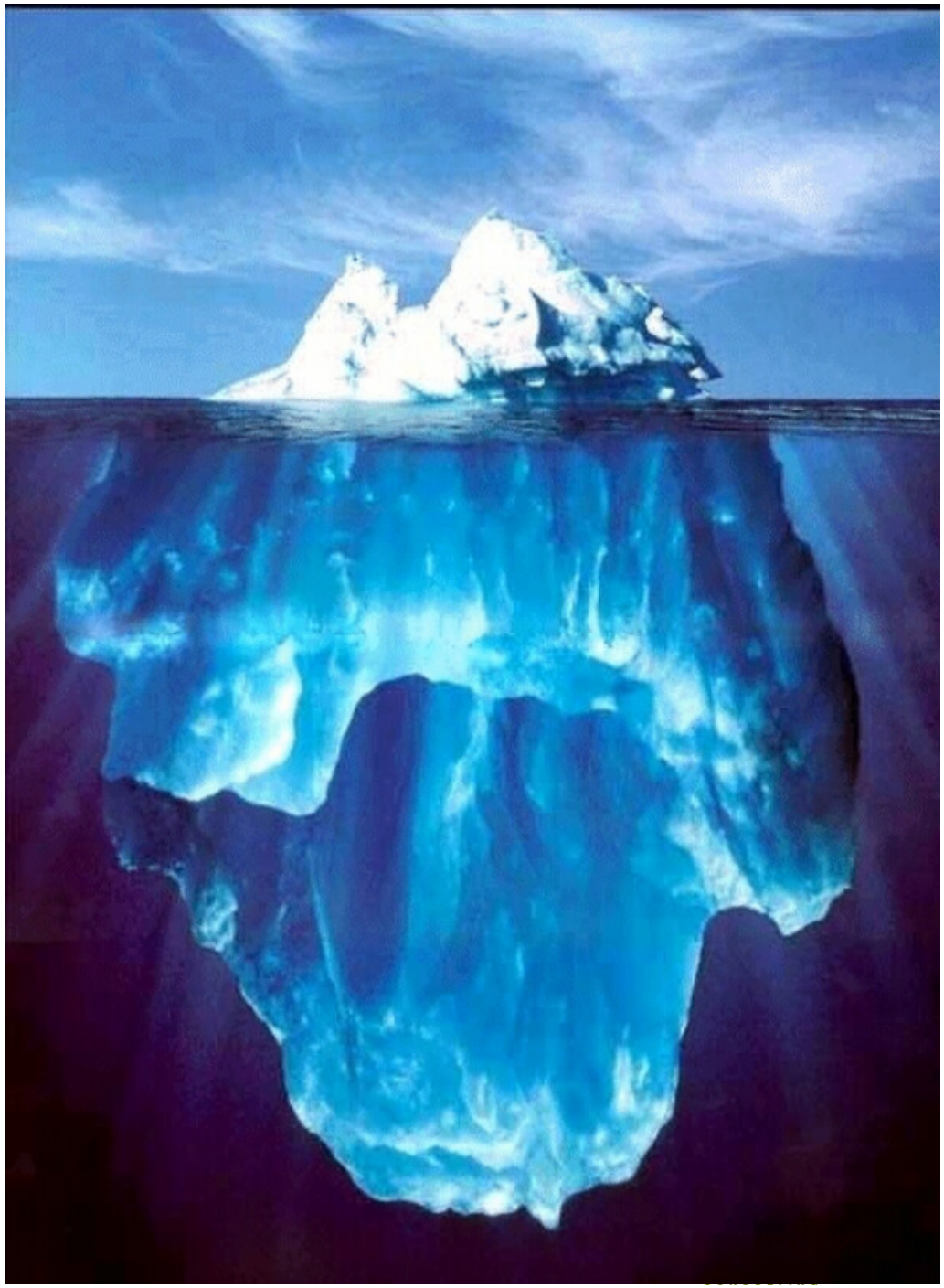

Thermodynamics
(Building Science)

Human Dynamics
(Comfort, Safety,
Stewardship, Peer
Pressure)

Consumer Behavior

- Will energy use ↑ when prices ↓?
  - Current recession an exception?
  - Without compelling feedback behavior doesn't change or persist
- Comfort can drives decision, more than economics
- Peer pressure drives people to imitate neighbors
- Carbon sensitivity is driving market like never before
- But, will current hard times elevate economics?

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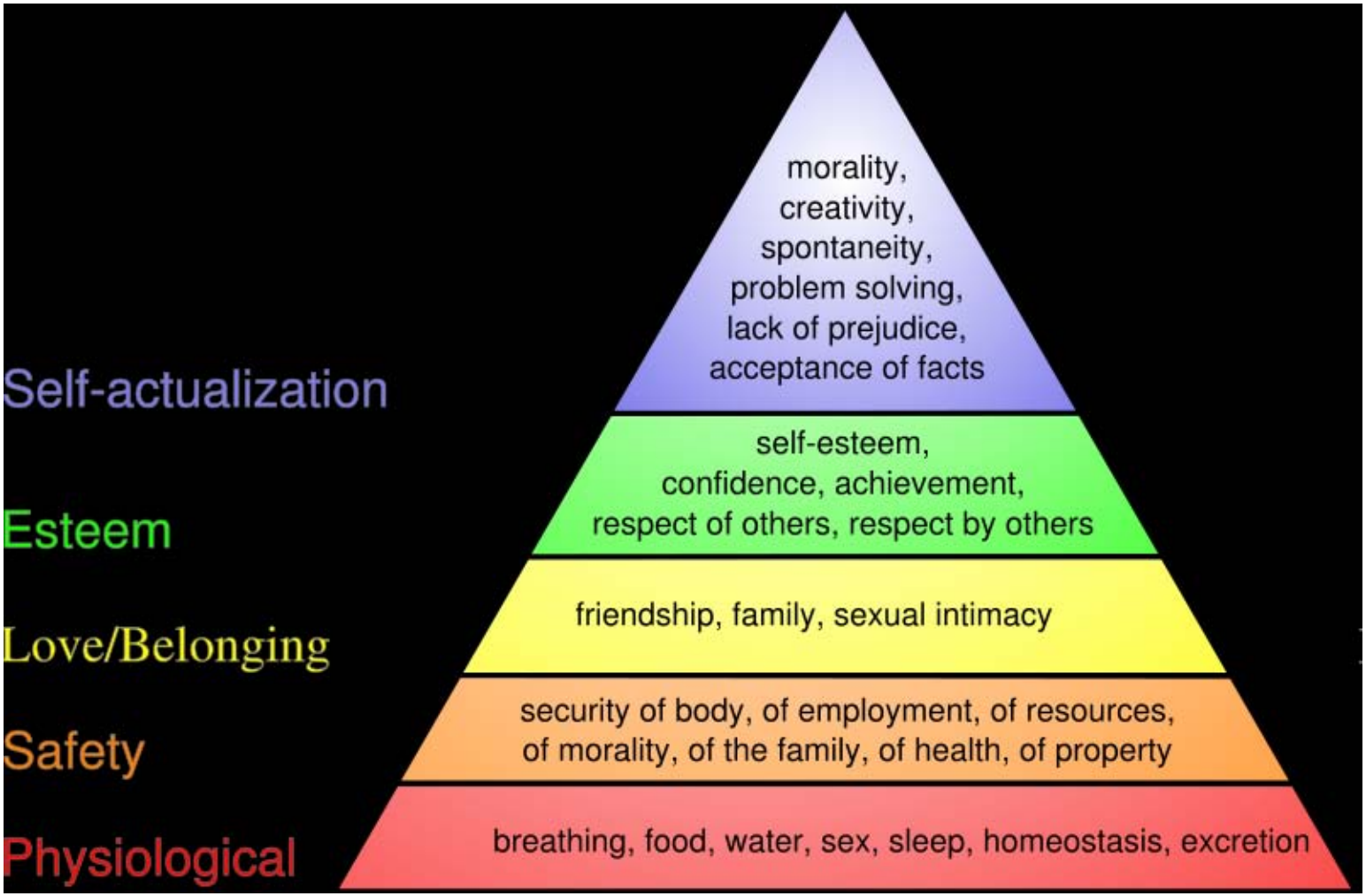
Maslow's Hierarchy



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The Real World for Homeowners

- Purchasers of high performance new home
- Homeowners making performance upgrades to existing home

Can they expect higher performance without changing their behavior?

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Current Feedback Mechanism

- Utility bill, provided 10-40 days after energy was used
- Bill disaggregation – who does that?
- Who remembers weather from last month or that they set the t-stat warmer than normal? Climate varies substantially from year to year.

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Smart Grid, what's changed

- AMR – data for utility
- AMI – enables feedback to the homeowner
- Smart Grid – enables control for the homeowner

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Smart Metering Enables

- Two-way communication with utility
- Display of daily utility price fluctuations
- Enables systems that learns personal patterns to help control usage
- Comparison of consumption footprint to similar households

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Energy Dashboards - Better Feedback

- GridWise Demonstration Project
  - 112 homeowners
  - Could view instant energy use and adjust power consumption via online controls
  - Electricity use reduced 10%
- Powercost Monitor
  - 7-12% electricity usage drop
- Home Area Networks

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HAN Preferences Interface

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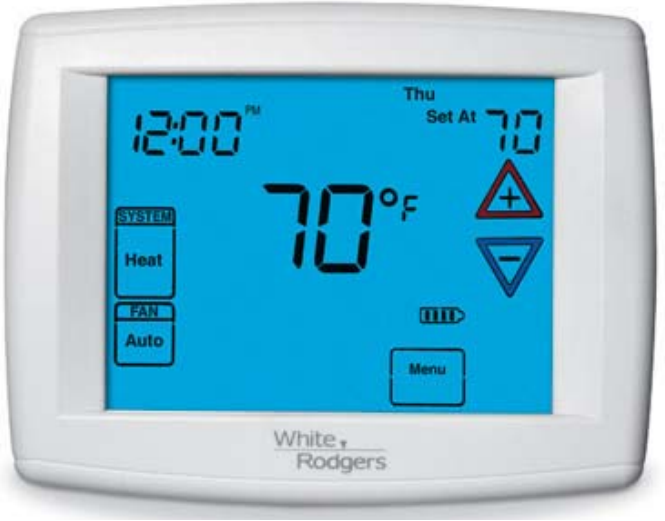
Will Homeowners Use It?

- ESO often rules
- Programmable Thermostats
  - How often overridden or simply not used
  - Digital easier to read – The Bifocal Effect?
  - How many here:
    - have one
    - use one
    - know how to program
    - know what optimal settings are



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LATEST HEADLINES ◂▸ WSJ: Who Should Foot the Bill of a Lawsuit?

What's News —

BUSINESS & FINANCE

Madoff Probe Eyes Audit Files

Investigators are looking at a lieutenant at Madoff's firm and issued a subpoena to the accountant who audited the firm's statements, seeking documents going back to 2000.

- Investor Seeks Relief From SEC
- After Madoff, Donors Grow Wary of Giving
- Complete Coverage: News, victims list, more

GDP Unrevised for Third Quarter

The U.S. government left its estimate for economic deterioration last summer unchanged at a decline of 0.5% at an annual rate.

- U.K. Economy Contracts
- Recession Slows Migration in U.S.

Backdated Cash to IndyMac Probed

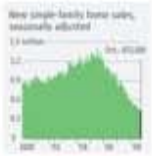
A senior bank regulator was removed from his job after being accused of helping IndyMac alter its records so it appeared to be in better shape -- weeks before it was seized by the U.S.

A Not-So-Jolly Season for eBay

EBay is suffering a slide in visitor traffic and

Before the Bell

Seeking Signs of a Recovery for Housing



Key data on home sales for November are due out Tuesday, and economists expect that sales fell as economic activity generally came to a screeching halt.

Futures Stall, Volume Low

Asia Stocks: Shanghai Falls 4.6%

Banks Lift Europe; FTSE Up 0.8%

U.K. Economy Contracts

Financial Crisis ›

Houses of Worship Turn to Chapter 11

During these hard times, not even houses of God have been spared. Lenders believe more churches than ever have fallen behind and some have filed for bankruptcy.

TPG to Let Clients Trim Pledges

Derivatives Losses Spread Globally

The Game: Ailing Firms Need Capital

Market Data Center ›

8:37 a.m. est 12/23/08

▼ DJIA*	8519.77	-59.34	-0.69%	▼ Nasdaq*	1532.35	-31.97	-2.04%
▼ S&P 500*	871.63	-16.25	-1.83%	▲ Global Dow	1491.49	2.26	0.15%

Customize markets * At close Source: Dow Jones, Reuters

Careers ›

1/7

Avoiding the Ax: Where the Jobs Are

While the employment landscape looks sparse right now, the outlook for 2009 isn't uniformly bleak -- and is downright bright in some recession-resistant industries.

willyoujoinus

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Global oil/gas consumption during this visit: 0 0 0 0 0 3 8 3 0 1 BARRELS

Welcome to Energyville

This is your city. How will you power it?

Play now >

Save Gas With the MPG Optimizer >

In a world where we need all the energy we can find, how do we do more with less?

Latest Post

Sorry mr. Mark, I've been outbound training by my office from 17 until 21dec at...

- Posted by adam pondaaga on 12/22/2008

Join the Discussion >

Resource Center Learn more ways to get involved.

E-cards Remind your friends to use less.

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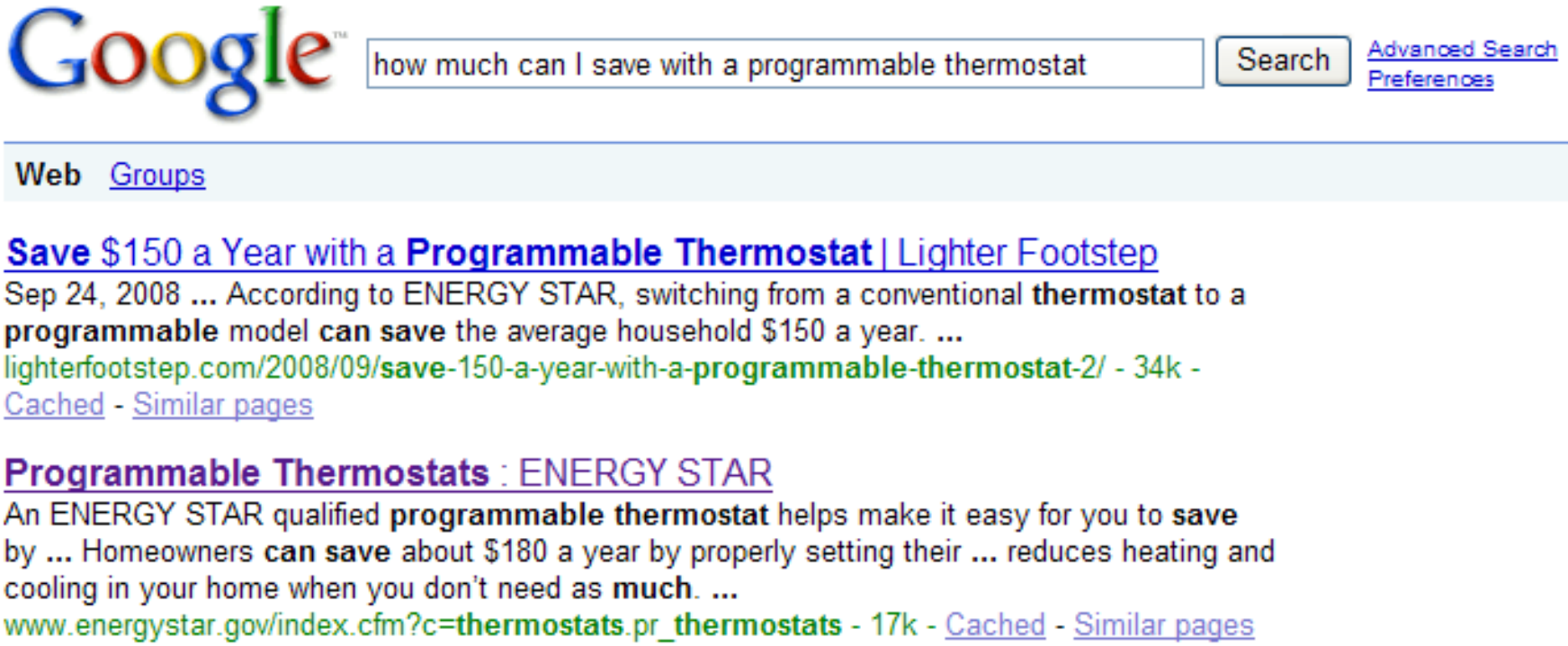
After finding nothing about Tstats . . .

- Chevron has gotten my curiosity
- So, I asked Google the question:



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Programmable Thermostats

Did you know that properly using a programmable thermostat in your home is one of the easiest ways you can save energy, money, and help fight global warming? An ENERGY STAR qualified programmable thermostat helps make it easy for you to save by offering four pre-programmed settings to regulate your home's temperature in both summer and winter — when you are asleep or away.

The average household spends more than $2,000 a year on energy bills — nearly half of which goes to heating and cooling. Homeowners can save about $180 a year by properly setting their programmable thermostats and maintaining those settings. The pre-programmed settings that come with ENERGY STAR qualified programmable thermostats are intended to deliver savings without sacrificing comfort. Depending on your family's schedule, you can see significant savings by sticking with those settings or adjust them as appropriate for your family. The key is to establish a program that automatically reduces heating and cooling in your home when you don't need as much. Use the ENERGY STAR Programmable Thermostat Calculator to see what you can save with set-back temperatures that work for your family. The pre-programmed settings for an ENERGY STAR qualified programmable thermostat are:

Programmable Thermostat Setpoint Times & Temperatures

Setting	Time	Setpoint Temperature (Heat)	Setpoint Temperature (Cool)
Wake	6:00 a.m.	≤ 70° F	≥ 78° F
Day	8:00 a.m.	Setback at least 8° F	Setup at least 7° F
Evening	6:00 p.m.	≤ 70° F	≥ 78° F
Sleep	10:00 p.m.	Setback at least 8° F	Setup at least 4° F

Set and Save

LAUNCH VIDEO PODCAST

- Special Offers
- Find a Store
- What you need to know to save on cooling and heating (2.6MB)
- en espanol — Guía para la Eficiencia de Energía en la Calefacción y el Aire Acondicionado (2.5MB)

For Consumers

- Product List Excel
- Manufacturer List
- Savings Calculator

For Business

- Purchasing & Procurement

So let me get this straight . . .

- During the day you want me to be at 85 in summer and 62 in winter?
- And, you want me to sleep at 82 summer and 62 winter?
- And, you expect me to go and buy a thermostat automatically programmed with these settings and be happy about it?
- What are my choices, please …
- And, how can I be sure these savings are real?

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What Does the Software Tell Us?

- Simple house modeled in REM/*Rate* shows $38 savings with programmable thermostat ($55 if located in NJ)
- REM/*Rate* makes these assumptions:
  - Heating setback 11am-7pm, 5 degrees
  - Cooling setback 9am-3pm, 5 degrees
  - Per RESNET standard
- Is this enough control over settings?

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What Homeowners Need

- Help understanding the concepts
- Help implementing the right feedback mechanisms

A business opportunity for raters?

- Work after the rating is complete
- Commissioning the systems
- Will the owner pay for this?

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Where is the Market Heading?

Performance benchmarking

- AB 1103 in CA
  - Performance rating requirement at the time of sale
- Title 24 in CA
- Energy Star labeling of entire HVAC system, not just equipment

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Another Software Approach

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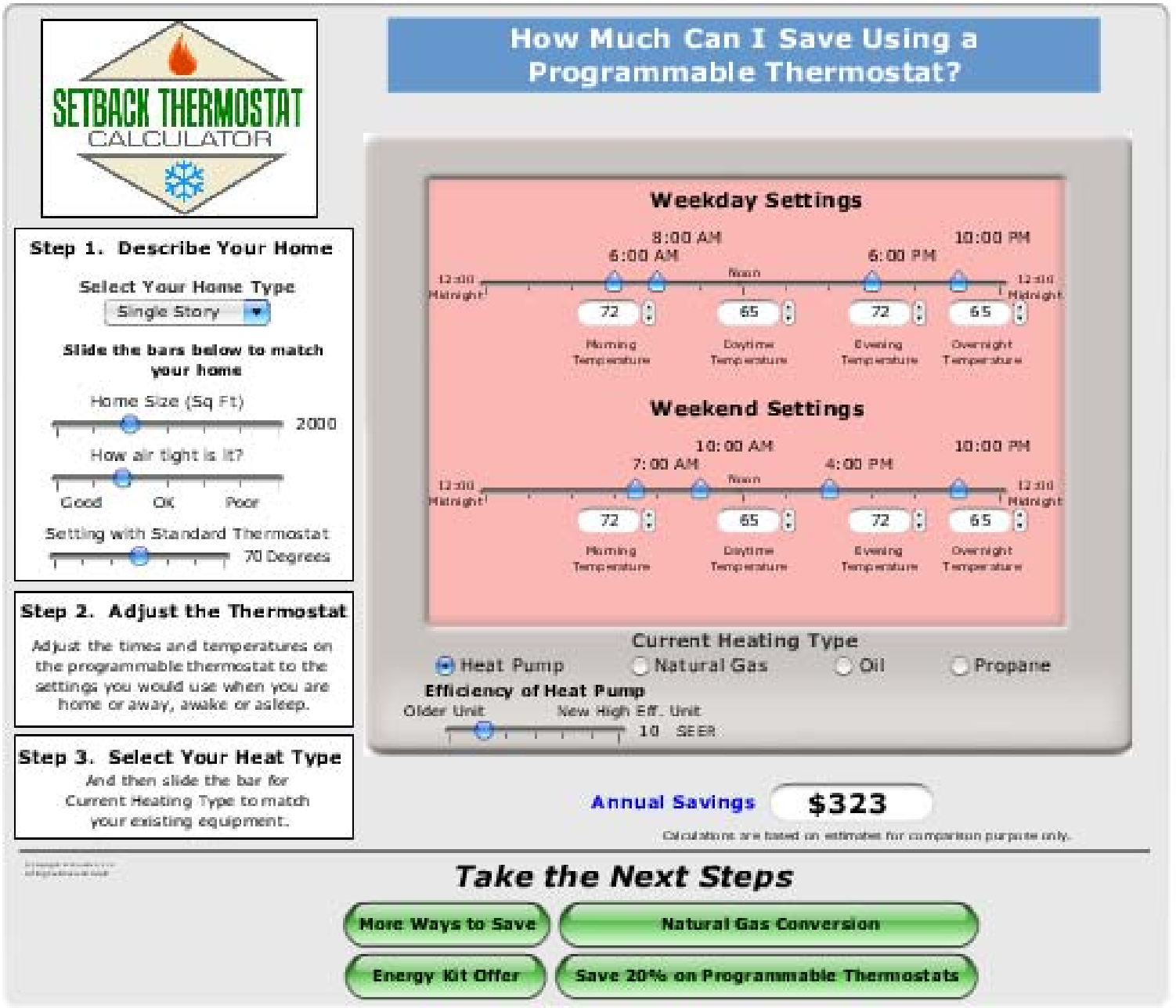
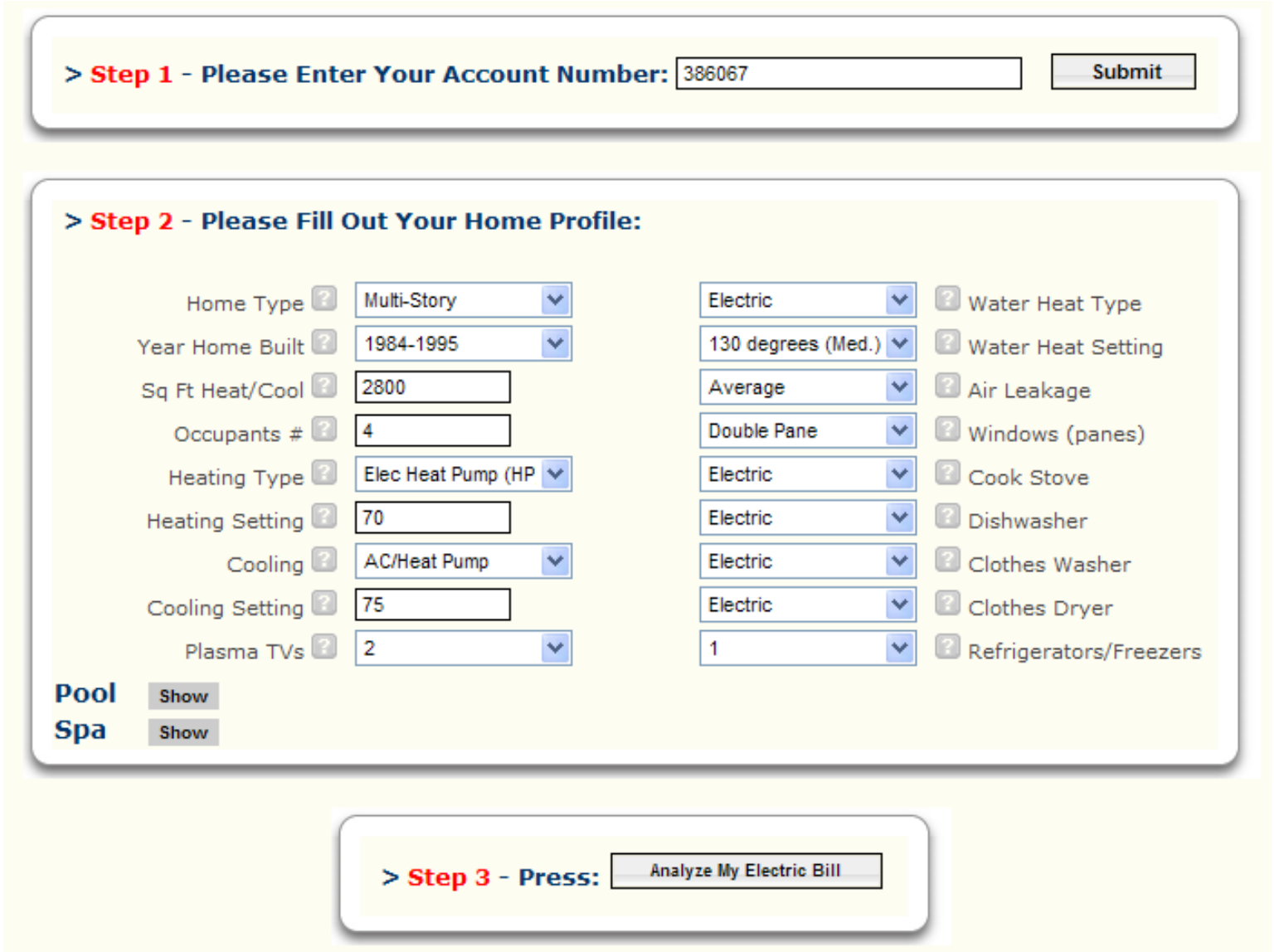

SETBACK THERMOSTAT
CALCULATOR
How Much Can I Save Using a Programmable Thermostat?
Step 1. Describe Your Home
Select Your Home Type
Single Story
Slide the bars below to match your home
Home Size (Sq Ft)
2000
How air tight is it?
Good
OK
Poor
Setting with Standard Thermostat
70 Degrees
Step 2. Adjust the Thermostat
Adjust the times and temperatures on the programmable thermostat to the settings you would use when you are home or away, awake or asleep.
Step 3. Select Your Heat Type
And then slide the bar for Current Heating Type to match your existing equipment.
Weekday Settings
8:00 AM
6:00 AM
10:00 PM
6:00 PM
Noon
12:00 Midnight
72
65
72
65
Morning Temperature
Daytime Temperature
Evening Temperature
Overnight Temperature
Weekend Settings
10:00 AM
7:00 AM
4:00 PM
10:00 PM
Current Heating Type
Heat Pump
Natural Gas
Oil
Propane
Efficiency of Heat Pump
Older Unit
New High Eff. Unit
10 SEER
Annual Savings
$323
Calculations are based on estimates for comparison purpose only.
Take the Next Steps
More Ways to Save
Natural Gas Conversion
Energy Kit Offer
Save 20% on Programmable Thermostats



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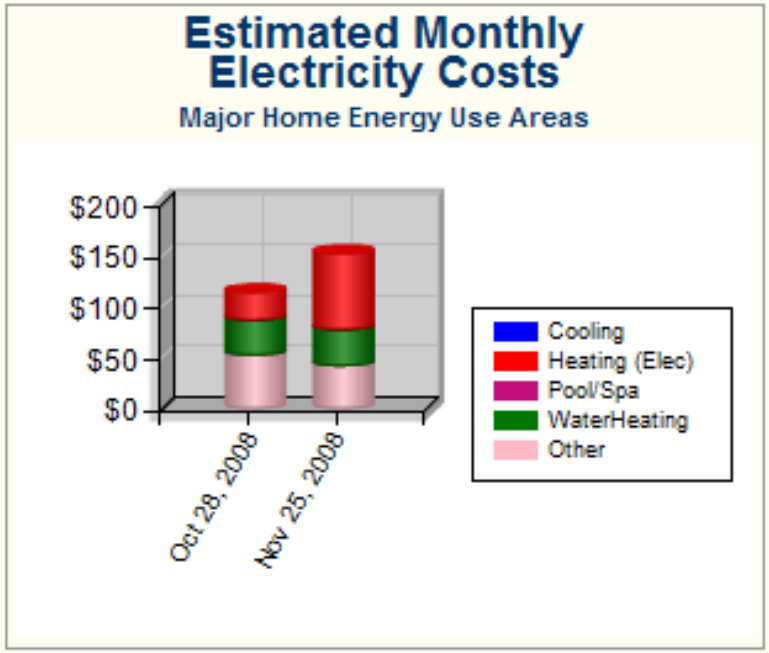
Why Is My Bill Different?

Click on the months to compare

Compare This Bill: Oct 28, 2008 | Click to Compare | To This Bill: Nov 25, 2008

Bill Comparison		
Oct 28, 2008	**Meter Read Date**	**Nov 25, 2008**
60.8 F	**Avg. Temp**	48.5 F
$114	**Cost**	$152
1,137	**kWh**	1,736



Monthly kWh Summary: The Nov 25, 2008 usage was about 599 kWh higher than the Oct 28, 2008 period.

Monthly Cost Summary: The Nov 25, 2008 costs were about $38 higher than the Oct 28, 2008 period.

Billing Cycle Length Impact: The Nov 25, 2008 billing period was 1 day shorter than the Oct 28, 2008 period.

Weather Impact: The average temperature for the Nov 25, 2008 period was 48.5 F.

This is 12.2 F colder than Oct 28, 2008 and 3.7 F colder than the same time last year.

Based upon the way you described your home, these weather and billing cycle length differences would increase your kWh use by 674 kWh and increase your bill by about $49.

Electricity Price Impact: The price* in Oct 28, 2008 changed from $0.1003 per kWh to $0.0878 per kWh in Nov 25, 2008

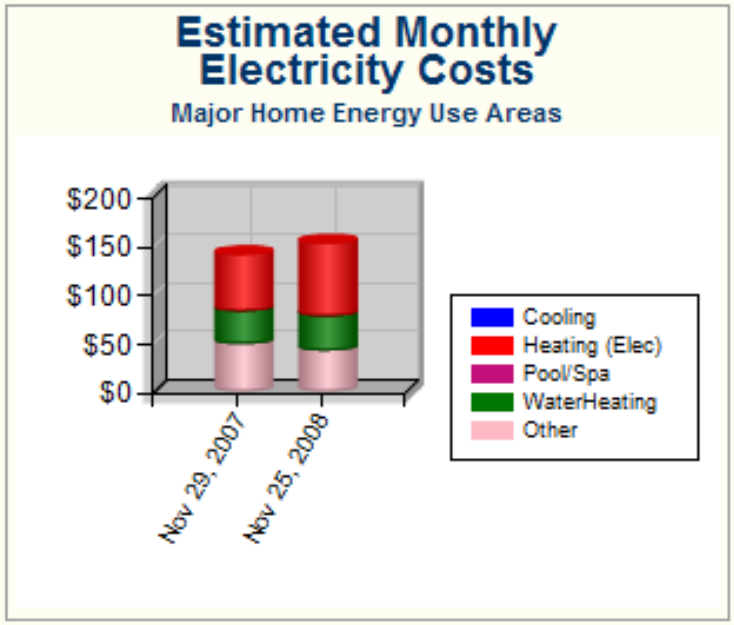
* Price is total bill divided by the total kWh for that period and averages the block rates.

Why Is My Bill Different?

Click on the months to compare

Compare This Bill: Nov 29, 2007 | Click to Compare | To This Bill: Nov 25, 2008

Bill Comparison		
Nov 29, 2007	**Meter Read Date**	**Nov 25, 2008**
52.3 F	**Avg. Temp**	48.5 F
$141	**Cost**	$152
1,975	**kWh**	1,736



Monthly kWh Summary: The Nov 25, 2008 usage was about 239 kWh lower than the Nov 29, 2007 period.

Monthly Cost Summary: The Nov 25, 2008 costs were about $12 higher than the Nov 29, 2007 period.

Billing Cycle Length Impact: The Nov 25, 2008 billing period was 7 days shorter than the Nov 29, 2007 period.

Weather Impact: The average temperature for the Nov 25, 2008 period was 48.5 F.

This is 3.8 F colder than a year ago.

Based upon the way you described your home, these weather and billing cycle length differences would decrease your kWh use by 44 kWh and decrease your bill by about $19.

Electricity Price Impact: The price* in Nov 29, 2007 changed from $0.0712 per kWh to $0.0878 per kWh in Nov 25, 2008

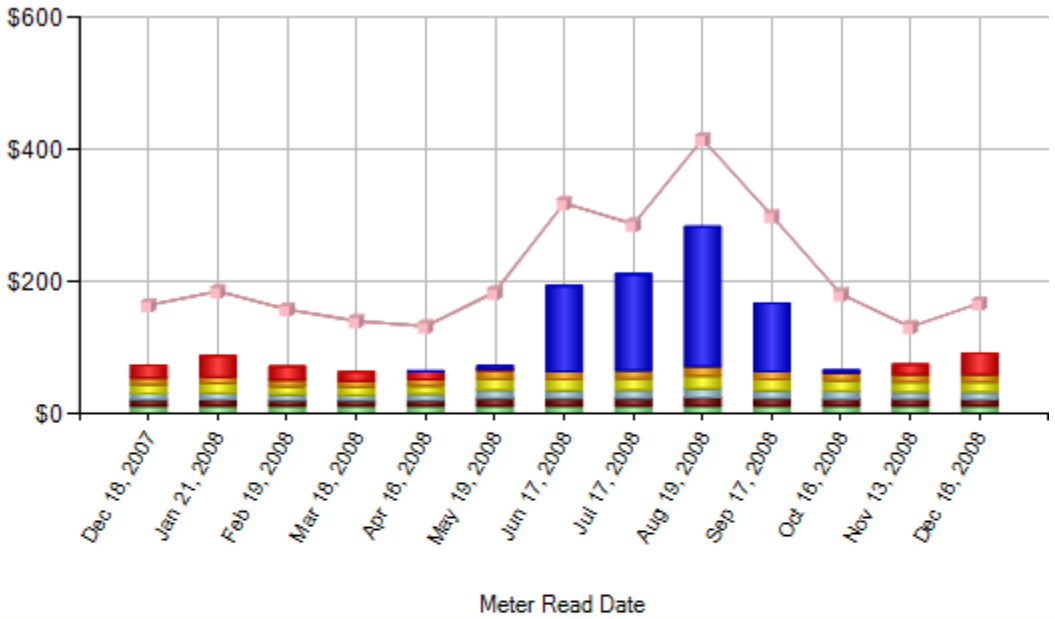
* Price is total bill divided by the total kWh for that period and averages the block rates.

Other Factors: There seems to be something besides the weather causing a difference in consumption.

Describe Your Home

Instructions

Account Number	253412		Meter ID (if multiple meters)
Sq Ft Heat/Cool	3500	Natural Gas	Water Heat Type
Occupants #	5	1	Refrigerators/Freezers
Heating Setting	68	Electric	Clothes Dryer
Cooling Setting	75	0	Plasma TVs

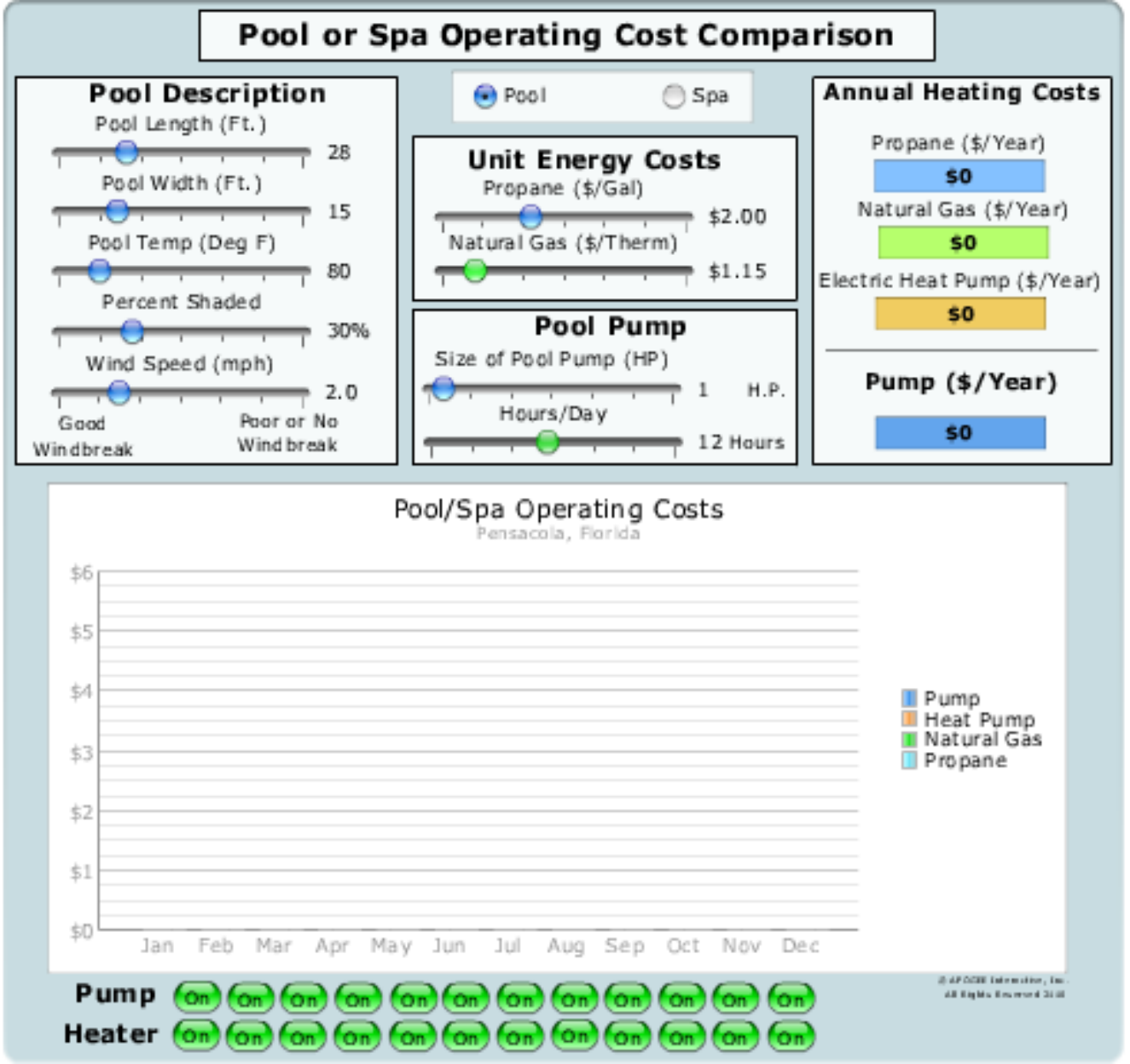


PLEASE NOTE - Actual (bill) annual usage is 92% higher than typical home electricity use and 80% more expensive than the typical home with these inputs. Something else is probably consuming electricity in this home that is not captured by the inputs. There may be savings opportunities.
The most recent bill is higher due to a much longer billing period (33 days in this period compared to 28 days in the prior period)
The most recent bill is higher due to colder weather.
Your use since Thanksgiving appears higher than normal even based upon the weather. This could be due to added holiday guests, Christmas lights, and other related activities?

kWh Energy Usage

Read Date	Avg. Temp.	Days	Cooling	Heating	Refrig.	Lights	Cooking	Water Heating	Appl.	Big Screen TV	Pool/Spa	Typical Home Total	Bill Total
Dec 16, 08	43.2° F	33	0	409	142	193	136	0	142	0	0	1,021	2,004
Nov 13, 08	53.4° F	28	0	167	120	164	115	0	121	0	0	687	1,305
Oct 16, 08	66.2° F	29	31	7	125	170	119	0	125	0	0	577	1,804
Sep 17, 08	74.1° F	29	1,043	0	125	170	119	0	125	0	0	1,582	2,930
Aug 19, 08	78.4° F	33	2,165	0	142	193	136	0	142	0	0	2,778	4,134
Jul 17, 08	76.3° F	30	1,491	0	129	175	123	0	129	0	0	2,048	2,819
Jun 17, 08	75.3° F	29	1,326	0	125	170	119	0	125	0	0	1,864	3,150
May 19, 08	64.1° F	33	47	27	142	193	136	0	142	0	0	687	1,948
Apr 16, 08	54.5° F	29	8	160	125	170	119	0	125	0	0	707	1,611
Mar 18, 08	50.0° F	28	0	187	120	164	115	0	121	0	0	707	1,758
Feb 19, 08	47.4° F	29	0	282	125	170	119	0	125	0	0	820	2,005
Jan 21, 08	42.1° F	34	0	444	146	199	140	0	147	0	0	1,075	2,472
Dec 18, 07	49.8° F	33	0	273	142	193	136	0	142	0	0	885	2,195
Total*		**364**	**6,111**	**1,683**	**1,566**	**2,129**	**1,496**	**0**	**1,569**	**0**	**0**	**14,554**	**27,940**
Monthly*		**30**	**509**	**140**	**130**	**177**	**125**	**0**	**131**	**0**	**0**	**1,213**	**2,328**

*For the most recent twelve months.



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So, in summary

- Educate homeowners and help them make the best choices
- To help the homeowner, raters need tools that explain actual behavior
- Assist the homeowner to find the proper balance
  - If possible, automate the right behavior
  - If ESO is likely, provide telltales and simple ways for them to trim their sails

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