ENERGY STAR QUALIFIED HOMES:
Past, Present & Future

Presented by:
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ENERGY STAR Core Principles
[What We Label]

• **Protect the Environment**
  through superior energy efficiency

• **No Tradeoffs**
  in performance or quality

• **Cost Effective**
  cash-flow, investment return, resale value

• **Readily Available**
  established supply/distribution infrastructure
ENERGY STAR Implementation

[How We Label]

- **Voluntary**
  value-based relationships

- **Source of Authority**
  government backed label providing valuable, unbiased information

- **Binary**
  Y/N; Tiers relinquishes ‘brand’ asset to uncontrolled sales force
  Define truly energy efficient

- **Power of Individual**
  you can make a difference
ENERGY STAR Value Proposition
[What Label Offers]

• Differentiation
  truly energy efficient

• Competitive Advantage
  - increased customer satisfaction
  - risk reduction
  - obsolescent competition

• Recognition
  - government-backed label
  - marketing support
Past: 1995 Observations

- Very Leaky Ducts
- Inconsistent Air Tightness
- Minimal Use of Low-E Windows
- Spotty Use of Efficient Equipment
- Poor Quality Control Systems
- No Sales Infrastructure
Past:
Old ENERGY STAR Spec

Tight Ducts
Air Sealing
Advanced Windows
Efficient Equipment
Field Verified
Past: Marketing

- Developing ‘Brand’
- Web Site
- Consumer Fact Sheets/Brochures
- ENERGY STAR Video
- Marketing ToolKit
- Sales Training
Present:
2005 Observations

- Stronger Energy Codes
- Thermal Envelopes Failing
- Bigger is Better
- Still No Sales Infrastructure
Present:
New ENERGY STAR Spec

Insulation Installation
Thermal Bypass
Right Sizing

Reference to 2004 IRC
Present: Marketing

Continuous Improvement:
• ‘Brand’
• Web Site
• Consumer Fact Sheets/Brochures

New:
• Sticker on Every Home
• Outreach Campaign
• Marketing ToolKit for POS
• Sales Training V.2
Future: 2007 Observations
In the world of energy efficient homes...
Myths don’t match reality
Myth No. 1: Sales Agents

Reality: Order Takers
Myth No. 2: Performance Metrics

Reality: Flawed Metrics
Flawed Metrics

- ASHRAE 62.2
- R-Value
- SEER
- AFUE
- Water Heater Energy Factor
- Lighting Watts
- Square Feet
- Code
Myth No. 2 Flawed Metrics:
ASHRAE 62.2

Myth:
Build Tight, Ventilate Right

Reality:
Build Tight, Maximize Source Control, than Ventilate as Needed Effectively
This HRV fresh air intake grill has been plugged for over 2 years! Apparently no one notices the difference!
Leaves can get sucked into grilles

Maintenance required
Ah, another stuck damper,
The saga continues!

Testing findings
Screw pinning damper closed - No airflow

Only testing will find these things
# 2 problem: Very restrictive ductwork

Exit grille is over here!
Soffitt guy doesn’t do pipe

Any problem with a little extra?
This is the reading from a 110 cfm fan: **OUCH!**

Testing tells the story
Source Control

- Moisture [Bulk, Vapor]
- Radon
- Combustion Emissions
- Chemicals [Toxic Building Materials]
- Biological Pollutants

...plus Educate Home Owners!
Myth No. 2 Flawed Metrics: R-Value

Myth:
R-Value

Reality:
Insulation ‘System’
Effective Insulation ‘System’

- Thermal Break
- Zero-Tolerance (Gaps, Voids, Compression)
- Air Tightness
- Six-Sided Air Barrier
Where 4 is good; 5 must be better; and 9 is Great!

Courtesy of Building Science Corp.
Effective Insulation ‘System’: Uninsulated Corners/Intersections

uninsulated corner

uninsulated wall intersection
~48 wall corners and intersections along with boxed out framing
= ~ 80 feet Uninsulated Wall!
Myth No. 2 Flawed Metrics: SEER and AFUE

Myth:
SEER and AFUE = Efficiency

Reality:
Best Practice HVAC = Efficiency
Equipment Right-Sizing

Right-Sized Equipment

Lower Operating Cost

Increase cycle time from 3 to 8 min.

~30% > eff.
## Best Practice HVAC

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Distribution</strong></td>
<td>Air-Tight/Internal Ducts Compact Ducts Static Pressure Flow Across Coil Room-by-Room Air Flow Pressure Balancing Exhaust Fan Flow Rates</td>
</tr>
<tr>
<td><strong>Air Handler</strong></td>
<td>Air-Tight Cabinet High-Efficiency Fan</td>
</tr>
<tr>
<td><strong>Refrigerant Charge</strong></td>
<td>Testing TXV Valve</td>
</tr>
</tbody>
</table>
Myth No. 2 Flawed Metrics:
Energy Factor (Water Heaters)

Myth:
Energy Factor = Efficiency

Reality:
Efficient System = Efficiency
Efficient Water Heating System

- Energy Factor
- Insulated Piping
- Heat Trap Above Tank/Heater
- Distribution
  - Structured Plumbing
  - Core System (Wet Walls)
  - Manifold System
Single Trunk and Branch

Water Heater

Hot Water Piping

1 inch

\( \frac{3}{4} \) inch

\( \frac{1}{2} \) inch

Hot
Structured Plumbing
Dedicated Return Line
Myth No. 2 Flawed Metrics:
Lighting Watts

Myth:
Lighting Watts

Reality:
Effective Lumens
Myth No. 2 Flawed Metrics: Square Feet

Myth:
Square Feet

Reality:
Effective Square Feet
Sources: US Census Bureau, National Association of Home Builders
Effective Square Feet

- Open Layouts
- Built-in Furniture
- Varying Ceiling Heights
- Outdoor/Indoor Linkages
- Finish and Trim
- Good Design
Myth No. 2 Flawed Metrics:
Code

Myth:
% > Code Defines Efficiency

Reality:
% > Code Misses Low Hanging Fruit
Low Hanging Fruit Missed by Code-Based Programs*

- Moisture Control
- Effective R-Value
- Solar Orientation with Thermal Mass
- Efficient Water Distribution
- Best Practice HVAC Systems
- Advanced Lighting
- Not So Big Homes

*some exceptions
Myth No. 3:
Defects Out Of Sight, Out of Mind

Reality:
Defects No Longer Invisible
Defects Out of Sight
Defects No Longer Invisible
Used Homes Obsolete?
New Homes Obsolete?
THE SCIENCE BEHIND HOME PERFORMANCE

WHY COMPLETE AIR BARRIER
CODE NONCOMPLIANCE EXPOSED

Most thermal bypass details required by code but not enforced…

Are builders still liable?
Make the scary man stop! Make the scary man from the government be quiet!! Make the scary man from the government quit talking about making houses more energy efficient!!!

By Richard Mize

Make the scary man go away!

The farmhouse I grew up in, where the wind came sweeping out of the hills, through the walls and across...

My inner child grew up to live in a 22-year-old house, not a new one, and he wants to sell it someday and doesn't want it to be as obsolete as his grandpa's outhouse and wash basin.

Energy Star program. He was a speaker at the Best of Building Science seminar presented Thursday by Guaranteed Watt Saver, which consults on Energy Star homes and other energy-efficient construction.

Energy Star is a program that...
Infrared imaging shows the difference

Our insulated walls . . . . . . . . . . and theirs
Infrared Energy Auditing – How Home Inspectors Gain a Competitive Edge

According to the U.S. Department of Energy, the typical family spends close to $1,500 a year on their home’s utility bills, and unfortunately, a large portion of that energy is wasted due to insufficient insulation and a lack of weather stripping around doors and windows. Professional home inspectors and energy auditors have been using leading-edge infrared technology to perform energy audits of homes and buildings to improve energy efficiency, thus leading to savings on energy costs.

Howard Vics of Building Performance Consulting in Shancocady, NY and Gary Goodman of Energy Construction, LLC in Babylon, NY rely on their FLIR Systems EX30 infrared cameras for home energy auditing assessments. Built for harsh environments, the EX30 is a rugged yet flexible infrared solution featuring interchangeable optics, high-resolution imaging and extreme thermal sensitivity. Feature-rich and affordable, the EX30 is the smallest, smartest infrared camera on the market today.

“We are thrilled to have this instrument,” said Vics. “We use the EX30 on every job, whether it’s for a comprehensive home energy audit, heat loss analysis, or for a quality assurance check of installed insulation. As we complete the assessment, I can easily detect missing insulation in walls and ceilings, or air leakage around doors, windows and along the foundation. We can then develop an insulation and air-sealing strategy to address the problem. By using an infrared camera, I am able to instantly see and diagnose the problem, via a noninvasive method, which is a definite competitive edge for our business.”

Both Vics and Goodman work with the New York State Energy Research and Development Authority (NYSERDA), and have been certified by the Building Performance Institute. The New York Energy smartSM Program and EnergyStar have partnered together to develop a program to assist homeowners to make energy efficiency improvements. Having a qualified home performance inspector, who has been trained in Building Science, performs comprehensive energy audits and reports where there is energy being wasted, so improvements can be made to enhance safety and comfort.

“We also use our FLIR infrared camera for the Energy Star new homes program as well,” Vics explains. First, I do an evaluation of the building plans followed by two or three on-site inspections during critical stages of construction and heating system configuration. It is at these final stages (before and after drywall installations) that the ThermCAM thermal imaging cameras can help because I can “see” duct leaks and inconsistencies of insulation. The final energy audit takes place when the construction is complete, just before the owner gets their certificate. We have found that the IR camera is an invaluable tool when doing building diagnostics of newer homes.”

Goodman, who specializes in the application and installation of insulation and in sealing techniques, uses the infrared camera before starting a job and after installation of insulation as a final quality assurance check, to make sure he hasn’t missed a bay or some other source of cold air.

Infrared thermography is a well-accepted method of imaging and evaluating the thermal efficiency of homes and buildings due to its ability to detect areas that are not operating efficiently.

About FLIR Systems, Inc.: FLIR Systems, Inc. (NASDAQ:FLIR) designs, manufactures and markets infrared imaging systems worldwide. Commercial product applications include non-destructive testing, research and development, manufacturing process control, predictive maintenance/condition monitoring, and broadcast imaging. With over 50 years experience and more than 10,000 employees in over 25 countries, FLIR is the global leader in infrared cameras, software, services, training and support. FLIR ThermCAM thermal imaging cameras are the most widely used IR non-contact temperature measurement systems worldwide. FLIR products also play pivotal roles in such diverse applications as public safety, defense, navigation, and search and rescue. For more information, please visit our website at: www.flirthermography.com or call 1-800-464-6312.

Howard Vics is certified by the Building Performance Institute in Buffalo, NY and is a Certified Thermographer with a specialty in Building Science. He founded Building Performance Consulting in 2004 and serves the greater Capital region providing home energy audits, infrared thermography and building diagnostics. Gary Goodman is a Certified Thermographer by the Building Performance Institute with specialties in Building Analysis, Shell, and Heating Systems and has been inspecting and air-sealing homes in the Capital region for over 20 years. For more information, you can reach Howard Vics at (516) 996-7990 and Gary Goodman can be reached at (516) 796-2000.
“Construction defects can dramatically change the comfort and quality of your home… We can help!...

Over $430,000,000 awarded to our clients!!!”

http://www.kasdansimonds.com/constructiondefects.asp
Myth No. 4:
Minimize Cost During Soft Market

Reality:
Maximize Value During Soft Market
Minimize Cost:
ENERGY STAR Cost: $2,500
100 Home Subdivision Purch. Man. Dilemma:
$2,500 x 100 homes = $.25 million

Maximize Value:
New Home Avg. Cost: $500,000+
<.5% investment
• Visible Quality
• Obsolete Competition
• Reduced Liability
• Increased Satisfaction
• Recognition as Leader
Myth No. 5: Green

Reality: Wild, Wild, West
Point Categories = Complexity:

- Innovation and Design Process
- Location and Linkages
- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Awareness and Education
4 Shades of Green

- Certified
- Silver
- Gold
- Platinum
What Else Do Homebuyers Care About?

- Schools
- Low Maintenance
- Security
- Energy Efficiency
- Indoor Air Quality
- Allergy Resistance
- Disaster Resistance
- Structured Wiring
- Finish Package
- Appliance Package

…and the list goes on

What if every valued attribute was offered in 4 shades?
Does Green Pass the ‘Laugh Test’?

• Truly Energy Efficient?
  [Significantly Better Than Code]
• Truly Healthy?
  [Toxic Material Limitations]
• Truly Durable?
  [Assured Bulk Moisture Control]
• Truly Water Efficient?
  [Indoor and Outdoor Conservation]
• Truly Resource Efficient?
  [Sustainable Products, Job-Site Waste]
Myth No. 6:
Zero Energy Home

Reality:
Low Carbon Home
Example: 600 kWh/month home
Option 1: Zero Energy (2 kW PV System)

<table>
<thead>
<tr>
<th>Revenue:</th>
<th>Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kW x 5 hr./day =</td>
<td>2 kW x $10,000/kW =</td>
</tr>
<tr>
<td>10 kWh/day</td>
<td>$20,000</td>
</tr>
<tr>
<td>X 30 day/mo. =</td>
<td>at 6.5% mortgage =</td>
</tr>
<tr>
<td>300/kWh/month</td>
<td></td>
</tr>
<tr>
<td>X $.13/kWh =</td>
<td>Plus:</td>
</tr>
<tr>
<td>$40/month</td>
<td>Insurance/Maintenance:</td>
</tr>
</tbody>
</table>

What do you think? $10-20/month?
Example: 600 kWh/month home
Option 2: Low Carbon Home

Assumptions:
$.045 renewable power premium from utility

Cost:
300 kWh/mo. x $.045/kWh =
~$15/month = near carbon neutral
600 kWh/mo. x $.045/kWh =
~$30/month = carbon neutral
Example: 600 kWh/month home: Comparison

<table>
<thead>
<tr>
<th>Zero Energy Home:</th>
<th>Low Carbon Home:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kW PV System</td>
<td>$.045/kWh RP premium</td>
</tr>
<tr>
<td>-$100+/month</td>
<td>-$15/month</td>
</tr>
<tr>
<td>300 kWh/month</td>
<td>300 kWh/month</td>
</tr>
<tr>
<td>carbon footprint</td>
<td>carbon footprint</td>
</tr>
<tr>
<td>4 kW PV System</td>
<td></td>
</tr>
<tr>
<td>-$200+/month</td>
<td>-$30/month</td>
</tr>
<tr>
<td>no carbon footprint</td>
<td></td>
</tr>
</tbody>
</table>
Future:
ENERGY STAR for Homes

Respond to Myths…
EPA Indoor Air Plus

Source Control
- Moisture
- Radon
- Biological
- Combustion
- Chemical

Effective Ventilation + Filtration = EPA Indoor Air Plus
Quest for Value: ENERGY STAR Future Spec

- Thermal Bridging
- HVAC System
- Water Distrib.
- Lighting/App.
- Size
- Moisture Control
Quest for Value: EPA ‘Green’ Bundle

Energy Efficiency
• Envelope
• Distribution
• Equipment
• Lighting/Appliances

Indoor Environment
• Bulk Moisture
• Radon
• Pest Control
• HVAC
• Combust. Safety
• Materials

Resource Efficiency
• Water
• Materials
• Waste
EPA ‘Green’ Bundle
Future: Ultra-Low Carbon Home


On-Site Renewable

Carbon Offsets
For More Information:

On the Web at:
http://www.energystar.gov/homes

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