

Understanding Energy Efficiency in New & Existing Homes

Your trainer:

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Logistics

- Cell phones on silent
- Emergency exits
- Restrooms
- Refreshments
- Yes! Please ask clarifying questions during the session!



Introductions

- Your Name
- Your Company
- Why are you here...?
 - A learning objective for today
 - Or your biggest challenge understanding green building and energy efficiency in homes

Which Home is More Energy Efficient?



Activity

Think of some home energy efficiency or high performance features that you are familiar with...



Today's Learning Objectives

1. Know how to recognize energy efficient features in new and existing homes
2. Understand the different labels, programs and tools associated with green & energy efficient homes
3. Be comfortable communicating the benefits of an energy efficient home

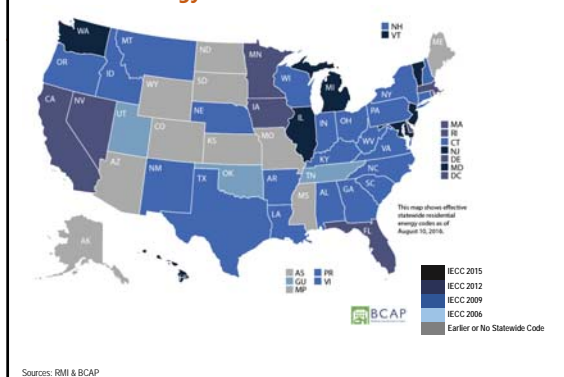
Energy Codes & Why They Matter

- **What's an Energy Code?**
 - First introduced in 1977
- **What's an above-code energy efficiency program?**
 - First introduced in the 1980s

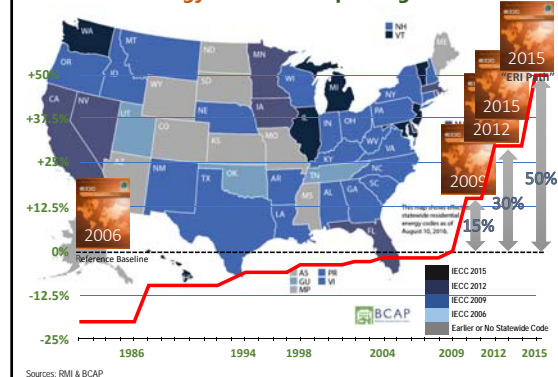
Evolution of Code Compliance

- **The first codes were**
 - Technically "primitive"
 - Manually calculated
 - Involved visual inspections
 - Prescriptive in nature
- **Codes have evolved to be:**
 - Technically sophisticated
 - Computer-based calculations
 - Performance-driven
- **Code thresholds increased gradually over time... until 2006**

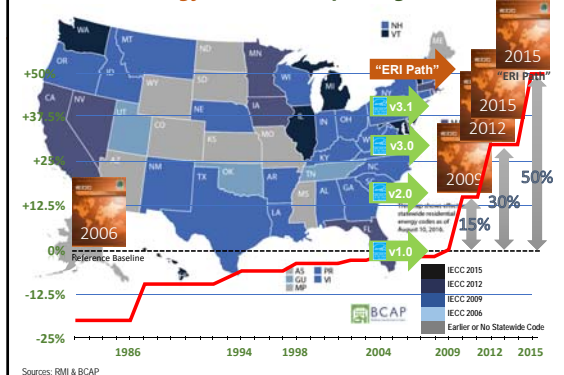
Residential Energy Codes



Residential Energy Codes are Improving Faster!



Residential Energy Codes are Improving Faster!



Residential Energy Codes

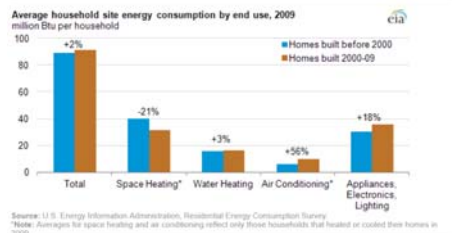
- **What are the key updates?**
 - Better envelope (insulation & windows)
 - Air tightness (air sealing)
 - Duct tightness (duct sealing)
 - **Testing & Verification**



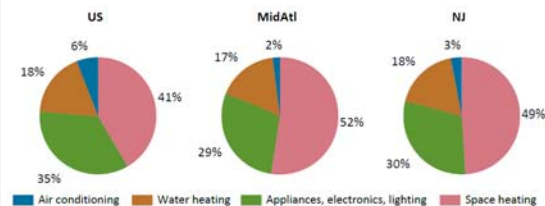
<http://energyconservatory.com/>

What Difference Does it Make?

Newer U.S. homes are 30% larger but consume about as much energy as older homes



Household Energy Use in NJ



http://www.eia.gov/consumption/residential/reports/2009/state_briefs/

Certifications, Logos & Labels



Rising Interest From Consumers

Consumers are increasingly interested in energy efficiency:

- 40% of Americans are interested in buying a green home
- 62% of Americans are interested in buying an energy efficient home

Source: [Shelton Group](#)

Green Homes Deliver

• Key findings of a 2013 study reveal:

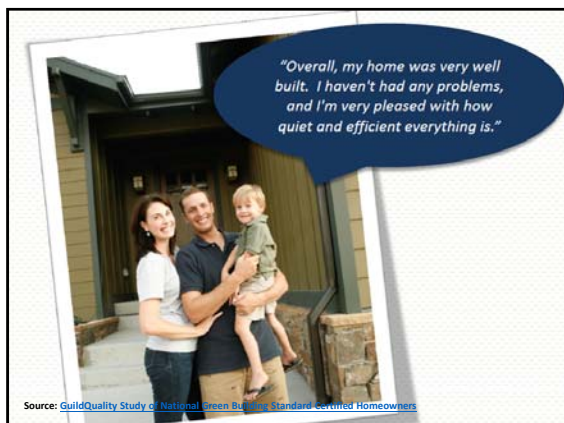
- 94% would recommend a green home to a friend.
- 92% would purchase another green home.
- 71% of respondents believe that green homes are, overall, of higher quality.

Source: [GuildQuality Study of National Green Building Standard Certified Homeowners](#)

Green Homes Deliver

- 55% thought their home may have cost "a bit more" than a non-green home, but believed the benefits outweighed the cost
- And 22% thought their green home did not cost more at all
- 90% were satisfied knowing they "did the right thing" in buying a green home.

Source: [GuildQuality Study of National Green Building Standard Certified Homeowners](#)



Rising Interest From Builders

- More than half of builders nationwide are involved in green building in some way, and energy efficiency is at the heart of "green."
- In New Jersey:
 - 62,864 HERS Rated & ENERGY STAR Certified homes
 - 1,855 year-to-date in 2016
 - 132 builder partners
- Nationally:
 - 1.7m HERS Rated & ENERGY STAR Certified homes
 - 45,000 year-to-date in 2016
 - 3,367 builder partners

Source: [ENERGY STAR](#) & [RESNET](#)

Rising Interest From Builders

- More than half of builders nationwide are involved in green building in some way, and energy efficiency is at the heart of "green."
- In Ohio:
 - 48,750 HERS Rated & ENERGY STAR Certified homes
 - 11,825 HERS Rated & EfficiencyCrafted homes
 - 108 builder partners
- Nationally:
 - 1.7m HERS Rated & ENERGY STAR Certified homes
 - 45,000 year-to-date in 2016
 - 3,367 builder partners

Source: [ENERGY STAR](#), [EfficiencyCrafted](#) & [RESNET](#)

Quick Exercise

Draw a tree!

Steps:

1. Pick any tree
2. Draw in 1 minute



Let's Take a Look...



Perception of Efficiency Features



Understanding the Essentials



1. Effective insulation
2. Tight construction & ducts
3. Efficient heating & cooling
4. High performance windows
5. Efficient lights & appliances
6. Mechanical ventilation

Effective Insulation

- **Function***
 - Slows down heat transfer
 - Keeps your home cool in the summer and warm in the winter
- * **When properly installed**
 - Most common insulation types won't stop air movement on their own
 - Compressions and voids defeat effectiveness

Common Insulation Types

- Batt
- Blown
- Spray Foam

Batt Insulation

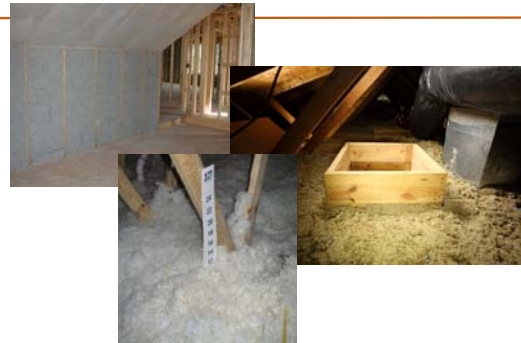


Effective Installation





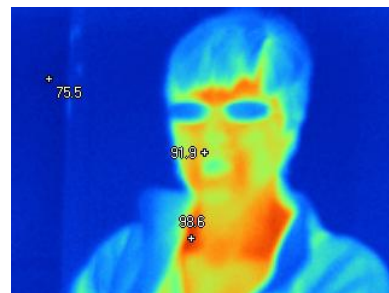
Blown-In Insulation



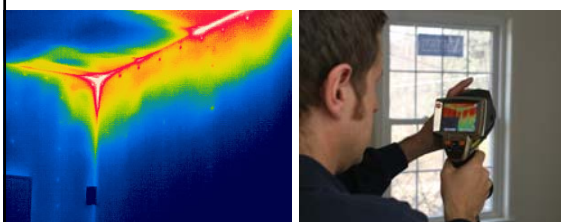
Spray Foam



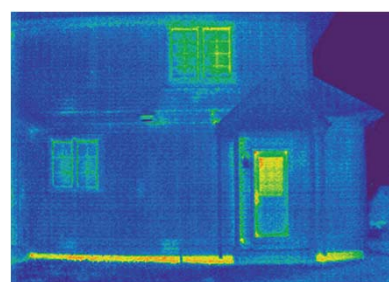
Thermal Imaging



"Seeing Behind the Walls"



"Seeing Behind the Walls"



Effective Insulation

• Benefits

- Enhanced comfort
- Lower utility bills
- Improved durability
- Noise reduction
- Reduced condensation
- Reduced cobwebs
- Reduced dust on surfaces
- Environmentally sustainable

What is Better "Home Performance"?

- Lower Operating Cost
- More Comfortable
- Healthy & Safe
- Durable

Tight Construction and Ducts

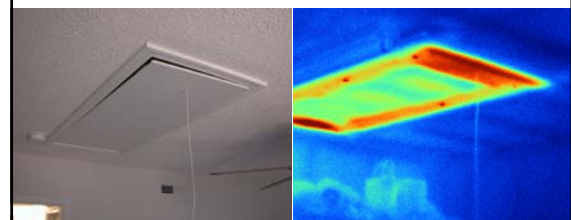
• Function

- Slows down air leakage
- Keeps heated or cooled air inside the house
- Delivers heated or cooled air where it's intended to go
- Minimizes movement of air through "undesirable" spaces

Why Air Sealing Is So Important



Heat & Air Will Find a Way



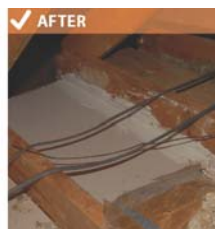
Heat, Air & Moisture Will Find a Way



But Most Often Out of Sight



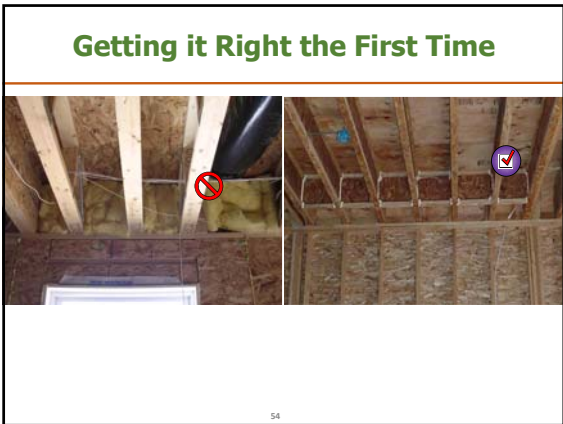
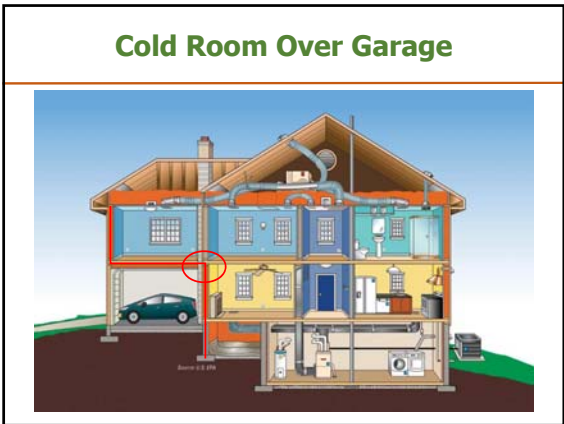
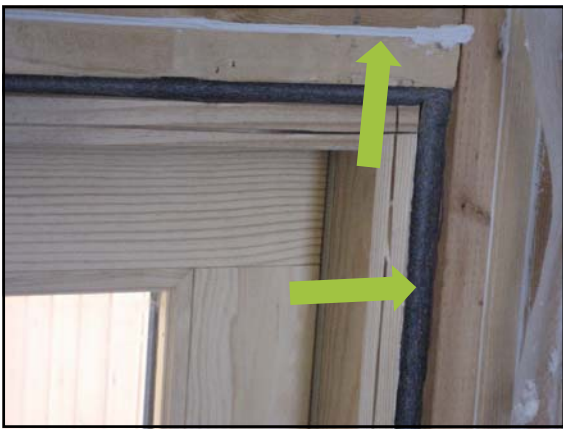
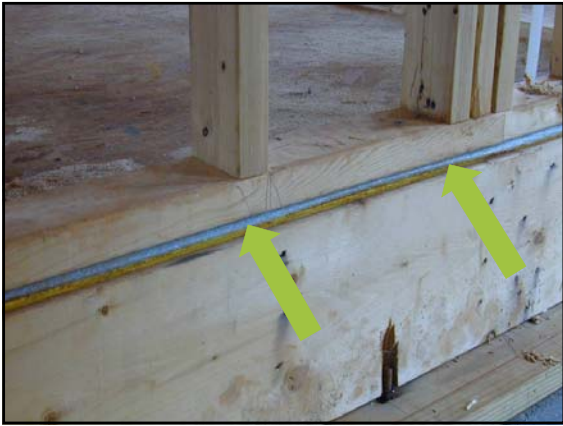
Fixing the Attic Bypasses

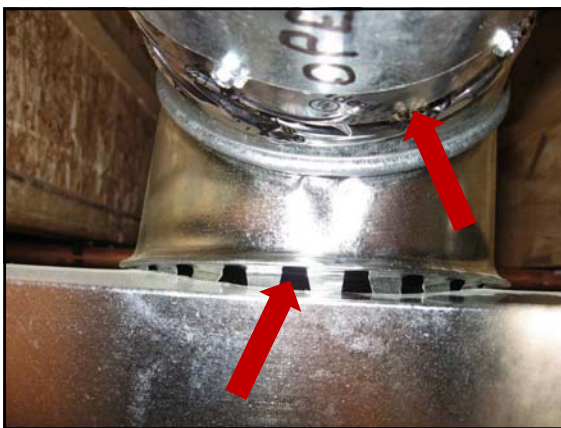
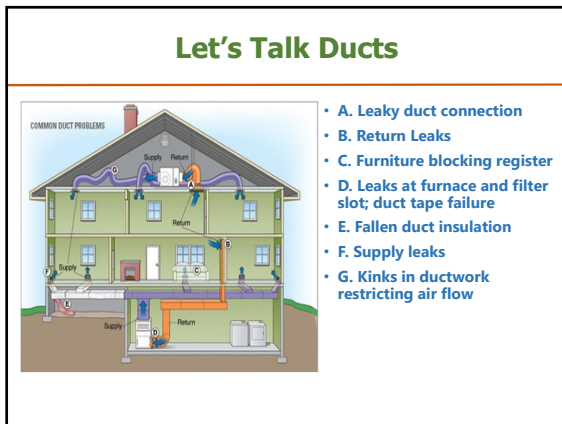


Defining the Thermal Boundary

- Conditioned space fully enclosed
- Continuous alignment of insulation with the air barrier
- Insulation in full contact with the interior air barrier (e.g., sheet rock)
- Heating/cooling and distribution systems within the thermal envelope whenever possible
- New construction – a chance to get it right the first time...!







Tight Construction & Ducts

• Benefits

- Enhanced comfort
- Lower utility bills
- Improved air quality
- Noise reduction
- Lower maintenance
- Fewer critters

What is Better "Home Performance"?

- *Lower Operating Cost*
- *More Comfortable*
- *Healthy & Safe*
- *Durable*

Efficient Heating & Cooling Equipment

• Function

- Heats or cools the house efficiently
- Delivers heated or cooled air into the house and minimizes air leakage to undesired areas

Heating Equipment

- Furnaces
- Heat Pumps
- "Ductless Mini-Splits"
- Boilers

Low Efficiency Furnace



"Highs in the 80s"



High Efficiency Furnace



"Highs in the 90s"



Heat Pump (Conventional)



Ductless Mini-Split Heat Pump



Cooling Equipment

- A/C Units
- Heat Pumps
- "Ductless Mini-Splits"

Conventional Split System A/C



Heat Pump (Conventional)



Ductless Mini-Split Heat Pump



Proper Sizing Matters!

- When it comes to A/C – bigger isn't better
- Oversizing:
 - Uses more energy
 - Doesn't remove humidity
 - Causes comfort issues
 - Costs more
 - Questionable installation quality



Efficient Heating & Cooling Equipment

• Benefits

- Enhanced comfort
- Lower utility bills
- Humidity control in summer
- Combustion safety in winter
- Noise reduction
- Location specific solutions

What is Better "Home Performance"?

- *Lower Operating Cost*
- *More Comfortable*
- *Healthy & Safe*
- *Durable*

What About the Thermostat?

Which of these will save more energy...?

Manual



Programmable



Learning



Ventilation

• Function

- Manages air movement in and out of the house
- Provides fresh air into the house
- Dilute indoor air pollutants
- Exhausts air from certain areas
- Controls moisture

Local Exhaust Ventilation



Whole House Ventilation Options

• Exhaust only

- 1 or more bathroom fans with timing controls

• Supply only

- Brings outside air into the central HVAC system

• Energy or Heat Recovery (ERV/HRV)

- Independent ducted system
- Conserves the energy value of the air

What is ASHRAE 62.2?

• National standard for ventilation and indoor air quality

- Addresses local exhaust and whole-building ventilation
- Referenced by energy efficiency & green building programs



Benefits of Mechanical Ventilation

• Benefits

- Better indoor air quality
- Controls moisture
 - Reduces window condensation
 - Helps avoid mold issues
- Dilutes/removes pollutants
 - Smoke
 - Dust
 - Chemicals
 - Carbon Dioxide
- Acts as a catalyst for a tighter home

What is Better "Home Performance"?

- Lower Operating Cost
- More Comfortable
- Healthy & Safe
- Durable

Water Heating



High Efficiency Water Heating

Heat Pump



95% Gas



Tankless Gas



A Word About Combustion Safety



High Performance Windows

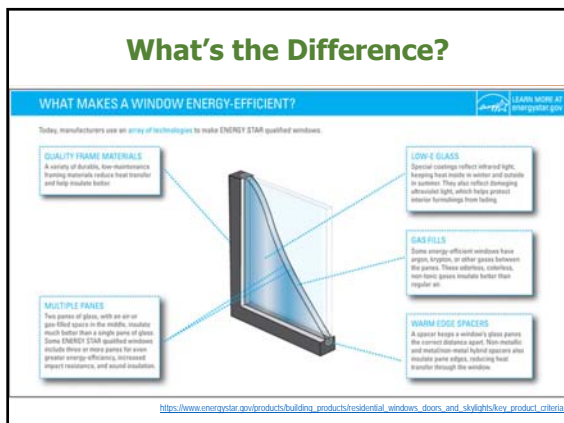
• Function

- Slows down heat transfer
- Keeps your home cool in the summer and warm in the winter

What's the Difference?



What's the Difference?



ENERGY STAR Labeled Windows



High Performance Windows

• Benefits

- Enhanced comfort
- Lower utility bills
- Reduced drafts
- Reduced interior fading
- Noise reduction
- Low maintenance

What is Better "Home Performance"?

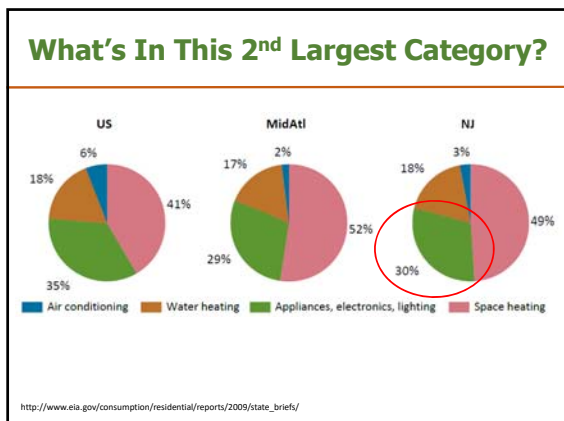
- **Lower Operating Cost**
- **More Comfortable**
- **Healthy & Safe**
- **Durable**

Break

• When we come back...

- Lighting, appliances & renewable energy
- 3rd party verification & programs
- Certification, logos & labels
- Communicating the value

What's In This 2nd Largest Category?



Products

• Function

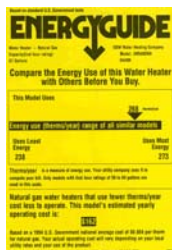
- Lighting
- Appliances
- Everything else you plug in

• Impact

- Direct energy use (mostly electric)
- Indirect energy use (electric or gas water heating)
- Water use

Energy Efficient Products

• How to know?



Products



Energy Efficient Products

• How to know?



- Range of product standards always increasing
- Standards constantly being updated

Products



Efficient Lighting

- LEDs are here!
- Back to the old incandescent features

- Sizes, shapes & bases
- Dimmable
- Instant on

• Plus!

- Great color rendition
- Wide range of "temperature" choices
- Lasts 10+ years with little degradation
- New shapes, colors & applications
- Cost is dropping rapidly



Efficient Lighting

Standard Incandescent bought at \$0.50 every 2 years

$60W \times 5hr/day \times 365 \times \$0.13/kWh = \$14.24 + \$0.50/2 = \$14.49/year$

LED bought at \$3.27 every 10 years

$8.5W \times 5hr/day \times 365 \times \$0.13/kWh = \$5.93 + \$6.54/10 = \$6.58/year$

SAVE: \$7.91 x 20 bulbs = \$158 every year!



Efficient Lighting

• Benefits

- Lower utility bills
- Better light
- Last longer
- More choices
- No mercury
- Safer

What is Better "Home Performance"?

- Lower Operating Cost
- More Comfortable
- Healthy & Safe
- Durable

What About Renewables?

• Photovoltaics

- Purchase
- Lease
- Power Purchase Agreement (PPA)



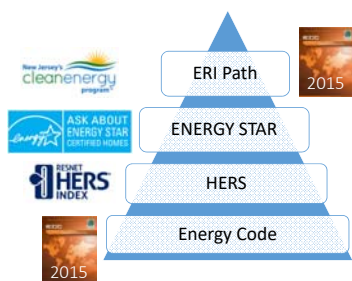
• Solar water heating

• Ground source heat pumps

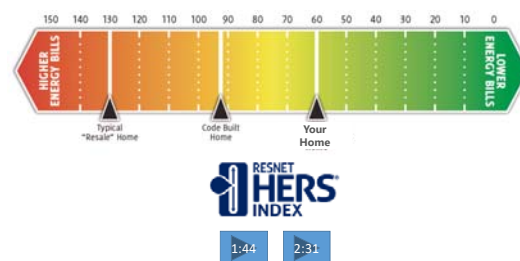
• Windmills

Address energy efficiency and home performance first!

3rd Party Verification



The HERS Index



The HERS Index

• New Construction

- Preliminary energy modeling
- Inspection at pre-drywall
- Inspection & testing at completion
- Final energy modeling & rating
- Program certification/label (if eligible)

• Existing Homes

- Inspection & testing
- Energy model
- Rating

Testing

"Blower Door"



"Duct Blaster"



Verified Energy Efficient Homes

- **Benefits**

- Lower utility bills
- Improved comfort
- Better indoor air quality
- Combustion safety
- House as a system
- Durability
- Easier maintenance

What is Better "Home Performance"?

- *Lower Operating Cost*
- *More Comfortable*
- *Healthy & Safe*
- *Durable*

How to Identify Energy Efficient Homes?

- **Resources you are already familiar with:**

- Regional MLS
- Appraisal Report
- Home Inspection Report
- What the homeowner or seller tells you
- Other agent or agency info
- What you can see for yourself

How to Identify Energy Efficient Homes?

- **Resources to become familiar with:**

- National certifications
- Utility program designations
- Appraisal "Green Addendum"
- Green MLS
- Energy audit report
- Online resources
 - Links provided throughout presentation

Certifications, Logos & Labels

- **Energy Code**



2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Wall _____	0.00
Floor _____	0.00
Ceiling / Roof _____	0.00
Doors & Windows (Estimated average)	
Doors & Glass Rating	U-Factor SHGC
Windows _____	
Doors _____	
Heating & Cooling Systems	Efficiency
Heating System: _____	_____
Cooling System: _____	_____
Water Heater: _____	_____
Name: _____ Date: _____	
Comments _____	



Certifications, Logos & Labels

- **Products**



World's Best Window Co.
 Millennium 2000®
 Most Used Window Frame
 Double Glazing • Argon Gas • Low E
 Patent Pending • Superior Quality
 Phone: 800-368-3333 • Fax: 800-368-3333
 Email: info@wbc.com

ENERGY PERFORMANCE RATINGS

U-Factor (U-5.0 to 9.0)	Solar Heat Gain Coefficient
0.35	0.32

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	Air Leakage (U-5.0 to 9.0)
0.51	0.2

Manufacturer declares the above ratings to be accurate. SEE product literature for information about additional performance ratings. SEE website for a list of all products and performance ratings. See product literature for detailed information on all product performance information.






U-Factor

Solar Heat Gain Coefficient

Visible Transmittance

Air Leakage



Certifications, Logos & Labels

- **New Homes**



What's the Difference?



• LEED (USGBC)

- Highest name recognition among green programs
- Rigorous, consensus based
- Prerequisites! E.g. ENERGY STAR Certified Homes
- Additional non-energy categories for pre-requisites and points



• NGBS (NAHB)

- ANSI approved, uses code language
- Flexible, more points than prerequisites
- Independent from ENERGY STAR
- Additional non-energy categories for pre-requisites and points

What's the Difference?



• Zero Energy Ready Home (DOE)

- Based on ENERGY STAR Certified Homes
- With EPA Indoor AirPLUS
- And high performance envelope & mechanicals



• Passive House

- USA to Germany, now back to USA!
- Similar to ZERH plus:
0.6 ACH50 = SUPER airtight

• No Solar Panels Required!

- Both programs target high efficiency before the addition of on-site renewables

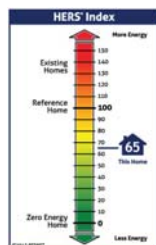
Where's the HERS Label?

• Typically no label

- A score ("HERS Index")
- A report
- A certificate

• May only be embedded in the certification

- ENERGY STAR, LEED, etc.



Certifications, Logos & Labels

• ENERGY STAR – Know the difference...!



ENERGY STAR Certified Homes

• Whole-home performance

- Energy efficient construction
- ≥15% more efficient than energy code

• Additional building science best practices

- Moisture management
- Mechanical ventilation & IAQ
- HVAC design & installation

• HERS rated/third-party verified

• Certifications also available for multifamily, modular & manufactured

• Over 1.6 million homes nationwide!



Does it Really Cost More?

• Payback is a misleading metric:

- \$5000 incremental cost saving \$50/month
- Payback in 8.3 years

• Net Positive Cash Flow:

- \$5000 incremental cost saving \$50/month
- 30 Year mortgage @ 4% = \$24/month
- \$26 cash back every month from the first day!

• Assumes...

- 100% of incremental cost passed along to buyer
- Reality may be less



Local Programs for Existing Homes

NJ Natural Gas/NJ Clean Energy Programs

- **Home Energy Analysis**
 - Online Evaluation of Your Home's Energy Efficiency
- **Home Performance with ENERGY STAR**
 - Comprehensive Assessment & Retrofit
- **WARMAdvantage Program**
 - High-Efficiency Furnace & Water Heater Rebates
- **New Jersey Comfort Partners**
 - Special Assistance for Customers in Need
- **New Jersey ENERGY STAR® Homes Program**
 - Incentives for Homebuilders
- **ENERGY STAR Products and Rebates**
 - Lighting, Washers, Dryers, Refrigerators, Heating & AC

Local Programs for Existing Homes

NJ Natural Gas supplements Home Performance with ENERGY STAR:

- If additional upgrades are implemented, customers may qualify for rebates as high as \$4,000.
- Through [The SAVEGREEN Project](#), eligible customers may also qualify for financing up to \$15,000, including a 0% APR On-Bill Repayment option.
- Contact a participating [certified contractor](#), or call 877-455-NJNG (6564) and speak with a SAVEGREEN representative to learn more and get started

Local Programs for Existing Homes

www.resnet.us

RESNET
RESNET PROFESSIONALS

How to Get a HERS Index Score for Your Home - Infographic

What is a HERS Index Score?

How do you know how energy efficient your home is? By its HERS Index Score, of course! The lower your score, the more energy efficient your home. Check out this infographic to learn how you can get a HERS Index Score for your home.

How to Get a HERS Index Score for Your Home

The HERS Index Score tells you how energy efficient your home is with just one number—it's like a MPG label for houses. In order to get your home HERS-rated, you have to contact a certified RESNET Home Energy Rater for a HERS home energy rating.

What Is a HERS Home Energy Rating?

Find a Local RESNET Professional Member Near You

The Big Picture: Making it all Work



Communicating the Value

- **New construction**
 - Does the home have a program certification?
 - Has it been HERS rated?
- **Existing homes**
 - Does the home have a program certification?
 - Has it participated in an energy assessment?
 - Have improvements been made?
 - Or identify program opportunities

Green MLS – Independent Listings



<http://GreenTheMLS.org>



GREENING YOUR MLS GUIDANCE FOR REAL ESTATE PROFESSIONALS				
Field	Data Type	Sub-Field	Sub-Field Data Type	Agents' Due Diligence
ENERGY STAR® (ES) qualified refrigerator, dishwasher, clothes washer	Yes/no	Year ES qualified	Date range	Look for the ENERGY STAR label on the appliance (usually inside the door) or seek out the EnergyGuide label for that model.
ENERGY STAR qualified furnace, boiler, central air, heat pump, room AC, water heater	Yes/no	Year ES qualified	Date range	Look for the ENERGY STAR label on the equipment or in owner's manual, or find the specifications for that model from the manufacturer.
ENERGY STAR qualified windows*, doors, skylights	Yes/no or a number range	Year ES qualified	Date range	Request receipts for installation including information from manufacturer. Energy audit or HERS* rating recommended ensuring proper installation. Home inspector may be able to advise in certain areas. Proper air sealing is important.
Programmable Thermostat	Yes/no	N/A	N/A	Can usually be verified during showing appointment.

* ENERGY STAR specifications grow more stringent as technologies improve from year to year. It is prudent to include a choice of "Unknown" for the agent.
† For further information or reference, see DOE guidance at http://www.energystar.gov/iaq/iaq_psd_publications/322.
‡ For more information about what makes a window or door energy efficient, visit the National Fenestration Rating Council Web site at <http://www.nfrc.org/about-us>.
§ Find qualified sales or auditors by visiting <http://doe.energystar.org>.

Communicating with Lenders

• Request an Appraiser familiar with green appraisals as a specialty

- Use of the Green Addendum
- "Valuation of Sustainable Buildings Professional Development Program" credential

• Consider the NAR Green Designation credential

- www.greenresourcecouncil.org/

• The "Catch-22"

- But what does the market value?



Understanding the Benefits

For the buyer

- Lower utility costs
- Improved health & safety
- Improved comfort
- Improved durability
- Environmental altruism

For the seller

- Knowledge credibility
- Quicker sales
- More referrals



Recap
Parking Lot
Other Questions

Recap: Today's Learning Objectives

1. Know how to recognize energy efficient features in new and existing homes
2. Understand the different labels, programs and tools associated with green & energy efficient homes
3. Be comfortable communicating the benefits of an energy efficient home

Recap: Understanding the Essentials



1. Effective insulation
2. Tight construction & ducts
3. Efficient heating & cooling
4. High performance windows
5. Efficient lights & appliances
6. (Mechanical ventilation)

Recap: Certifications, Logos & Labels



Recap: Making it all Work

- Appraisal Green Energy Addendum
- Greening the MLS
- Communicating with buyers



Parking Lot/Other Questions?

What two ideas can you use starting....
TODAY?

Thank You!

For technical questions:
Emma Raymont, PE
Director of Engineering
MaGrann Associates
EmmaRaymont@MaGrann.com

For program questions:
Susan Ellman
New Jersey Natural Gas
(732) 378-4924
sellman@njng.com

