

Prescriptive, Performance, and ERI: Perspectives on the 2015 IECC and HERS Provider Risks, Responsibilities and Opportunities

Presented by:
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Asheville, NC

Acknowledgements

Bridget Herring
Ben Edwards

**Context
Content
Controversy
Cooperation

Opportunities**

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The End in Mind...

- **The Importance of What You Do**
 - Some scale on the importance of buildings...
 - New and existing
- **Some Unexpected Responsibilities**
 - The expanding role of HERS providers in commerce
 - Especially in a changing code landscape
- **Perspectives on the 2015 IECC**
 - Dialog on Liabilities and Opportunities
 - “Risks and Rewards”

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Hypothesis:

RESNET (and HERS providers) stand at the forefront of one of the the greatest potential opportunities the building industry has ever seen.

**The challenge before us is:
*What are we going to DO with this opportunity?***

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Who am I?

- **Building scientist for 35+years**
 - How buildings and building products perform
- **Member of RESNET Quality Assurance Committee (SD900)**
 - How do we protect the integrity of the program?
 - How do we expand the value of HERS in commerce?
- **Codes and Standards developer and educator**
 - ASHRAE, IECC, State Codes, etc.
 - Work with builders, architects, engineers, code officials and utilities on energy code compliance

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Books, Technical Papers, etc.



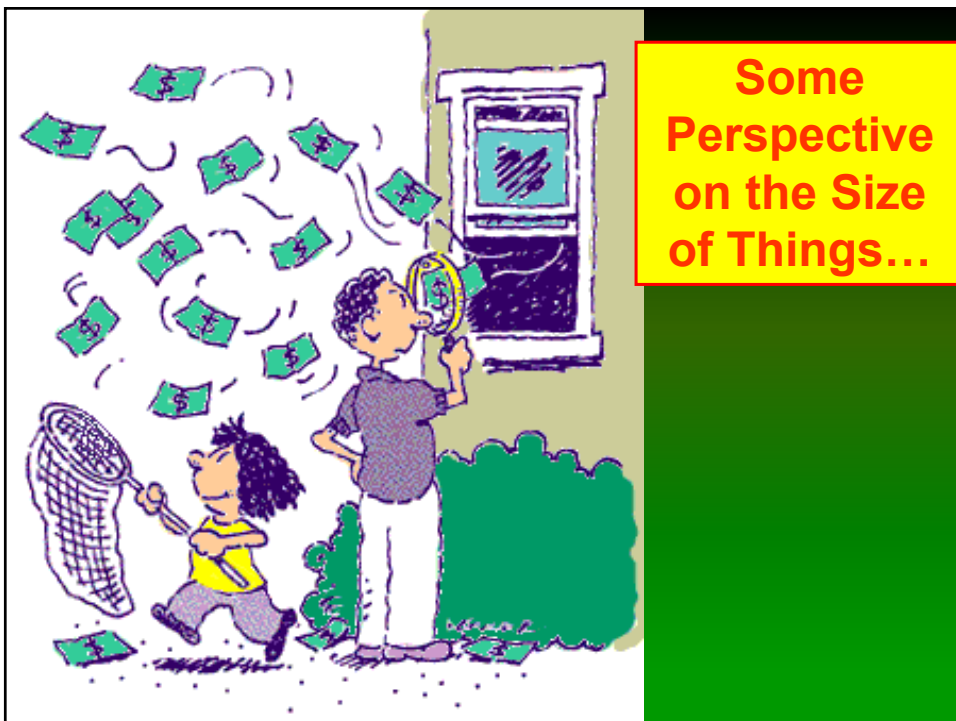
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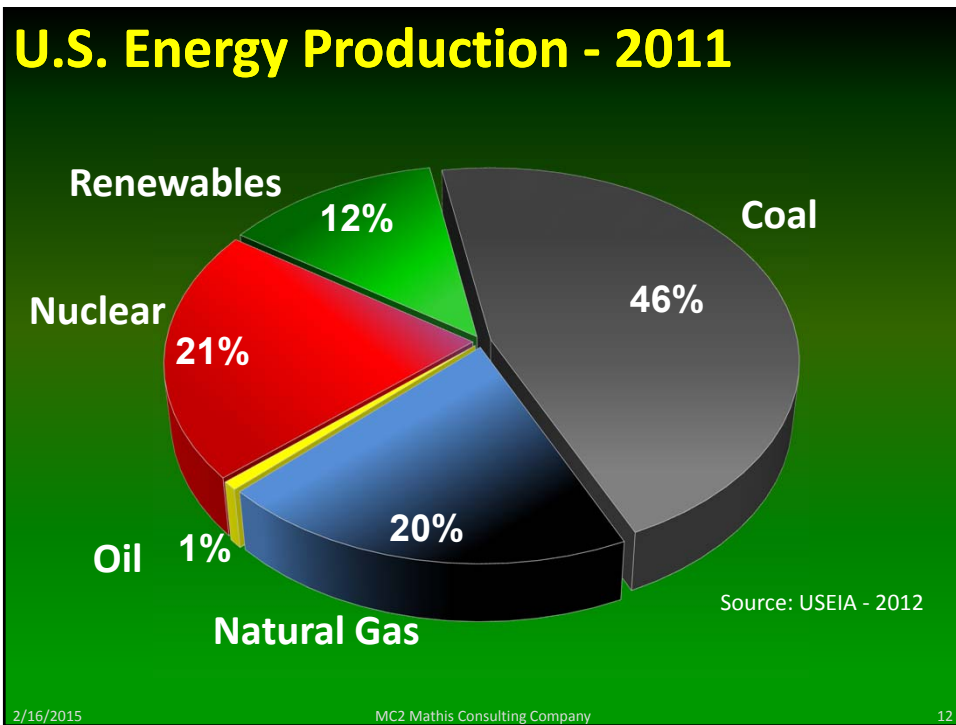
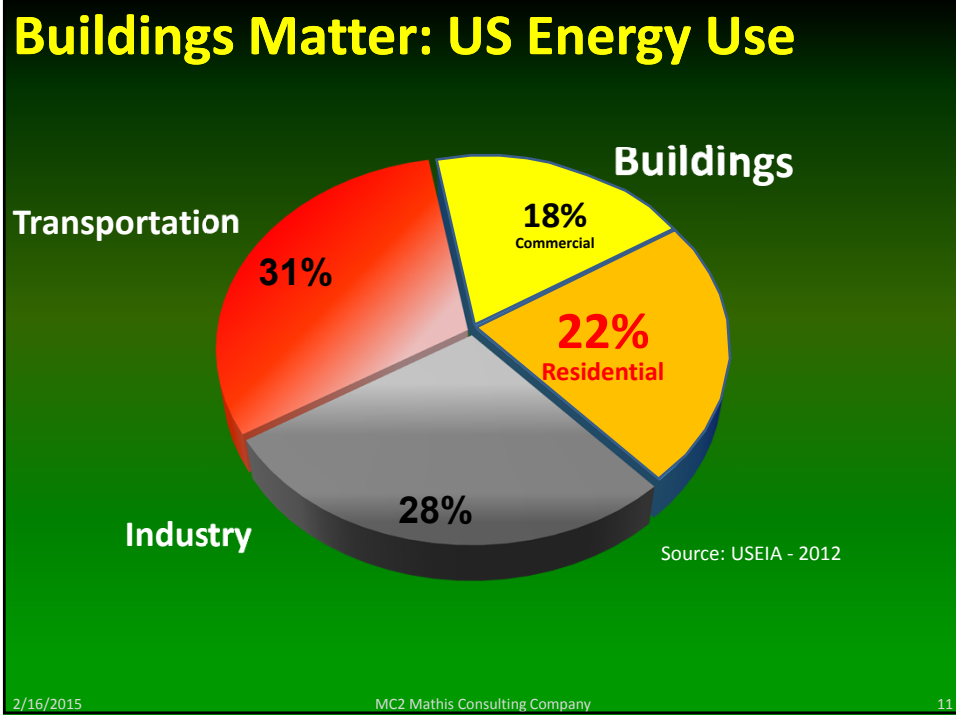
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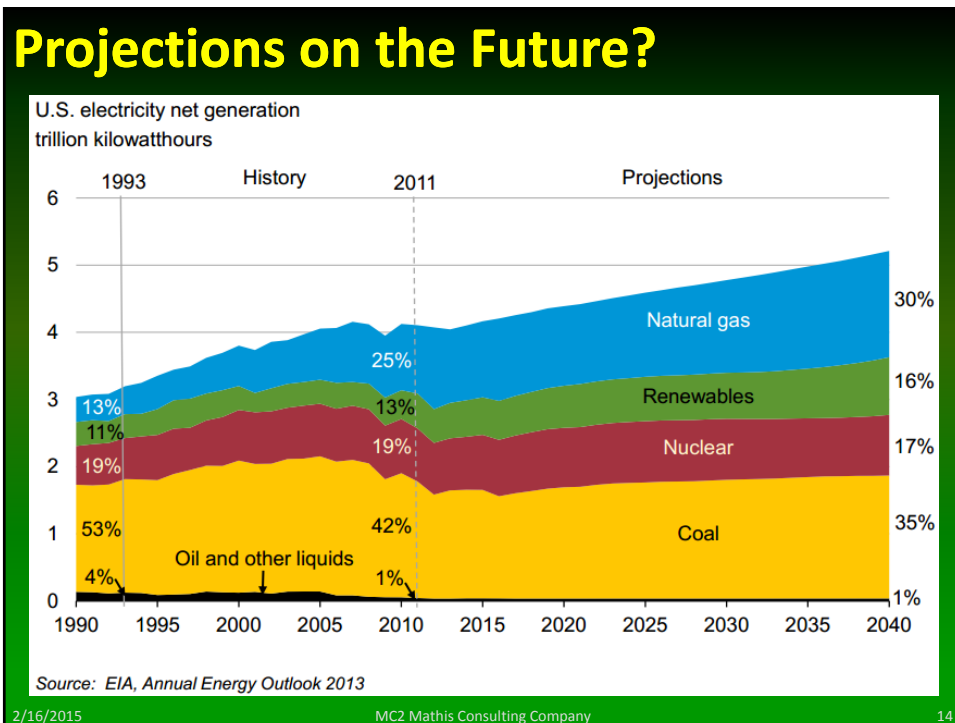
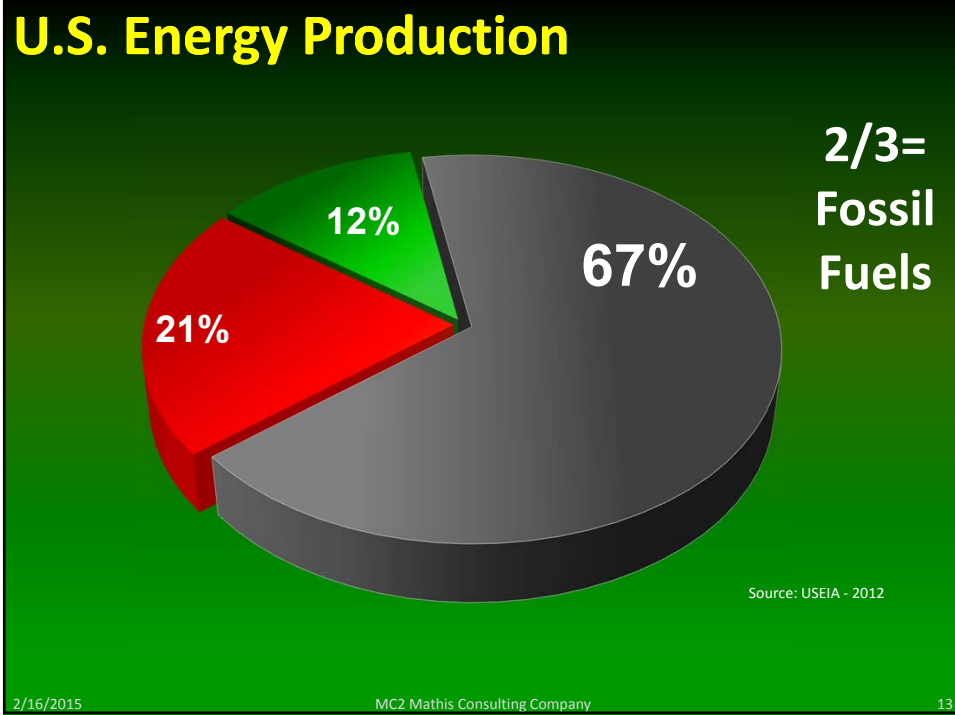
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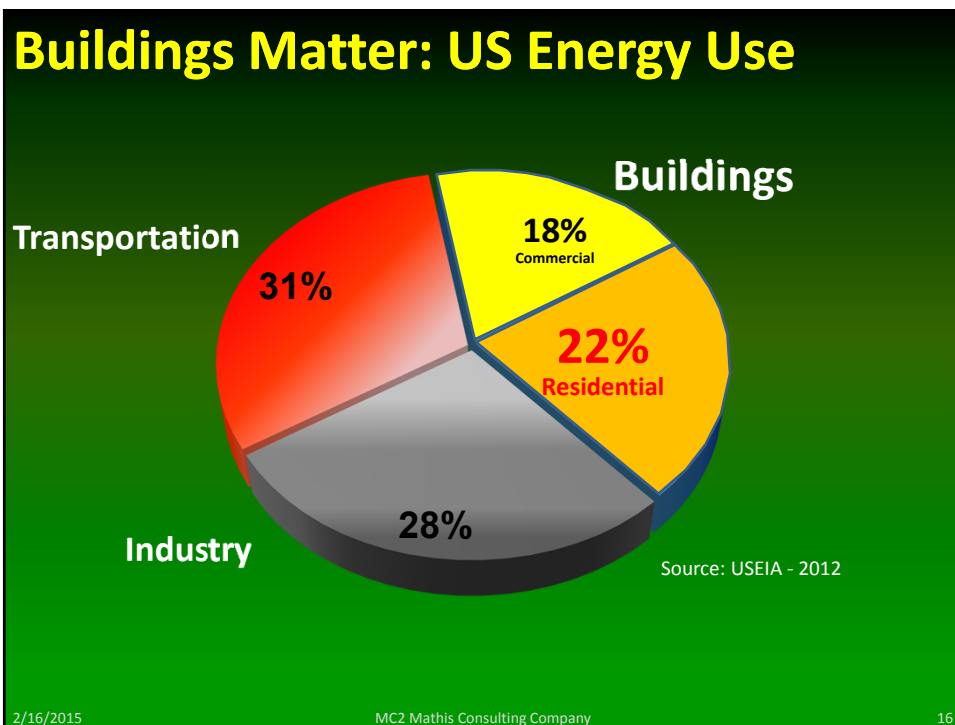
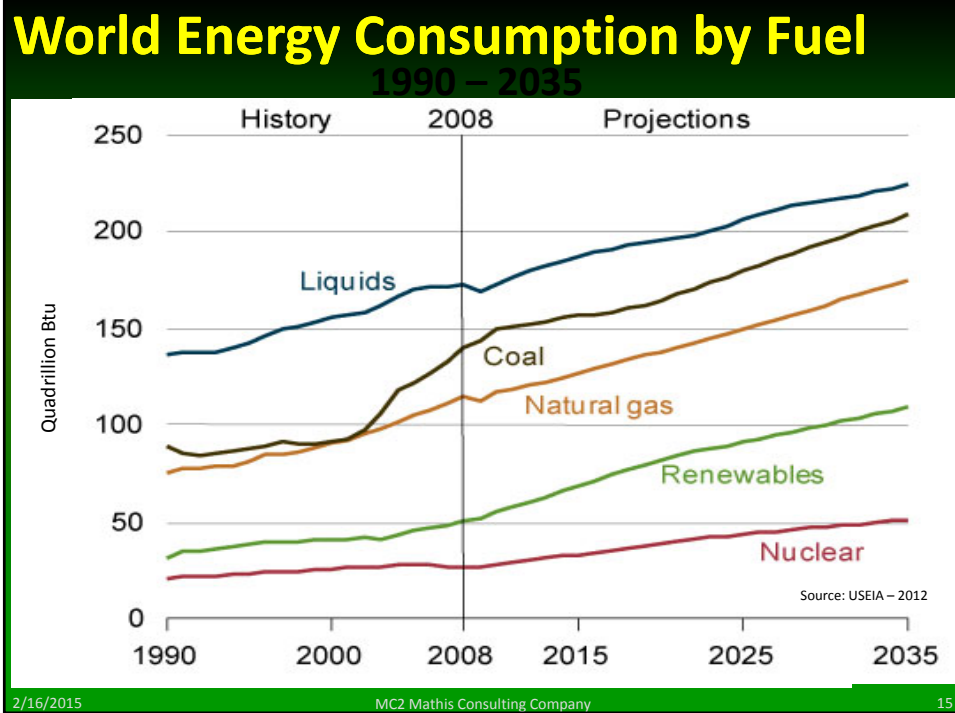


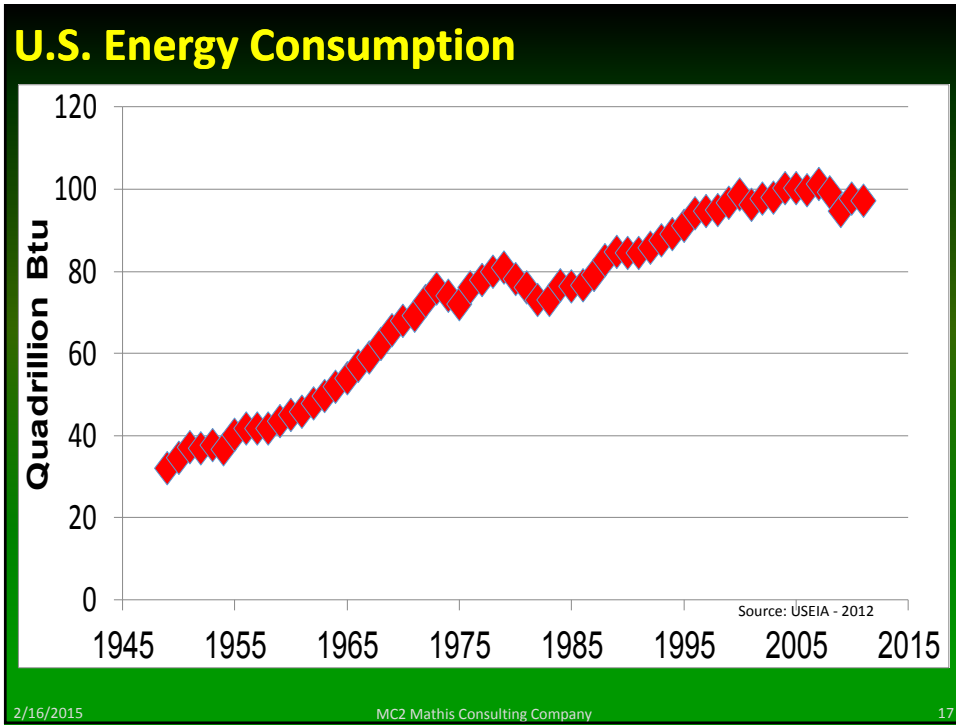
Audience Survey: Who's Here?

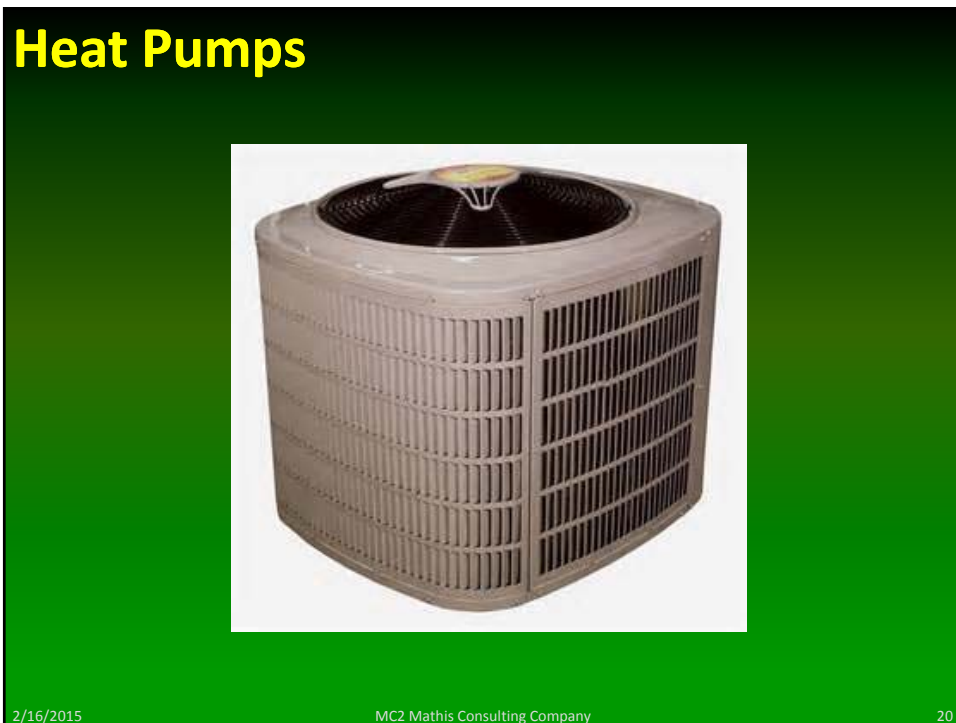
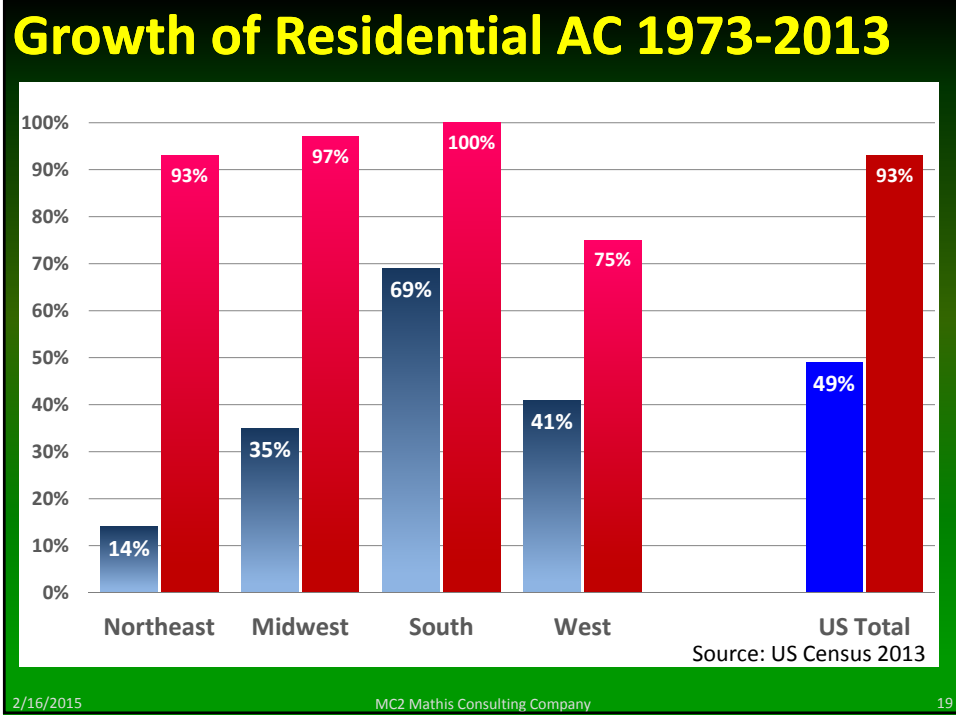








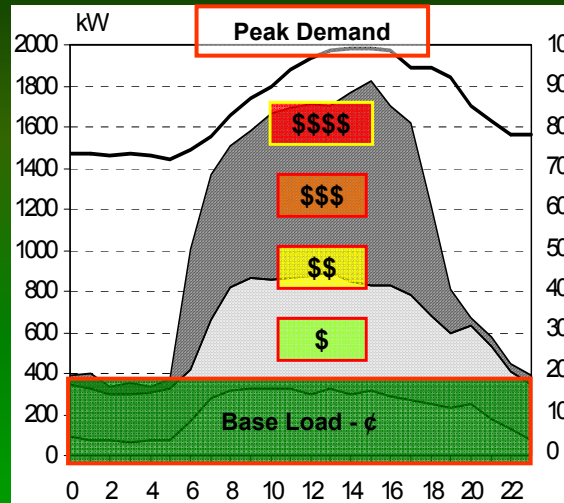




Utility Concerns: Meeting the Demand

➤ Peak Loads

- Cooling Driven
 - Simultaneous
- Plug Loads
- Lighting
- Heating
 - Especially now



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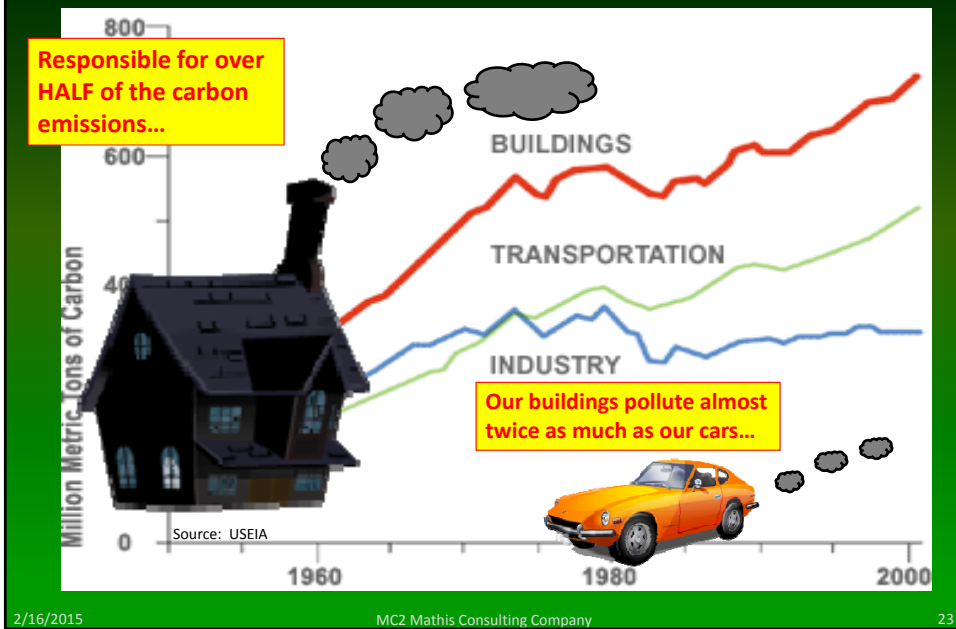
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The Energy Megatrend

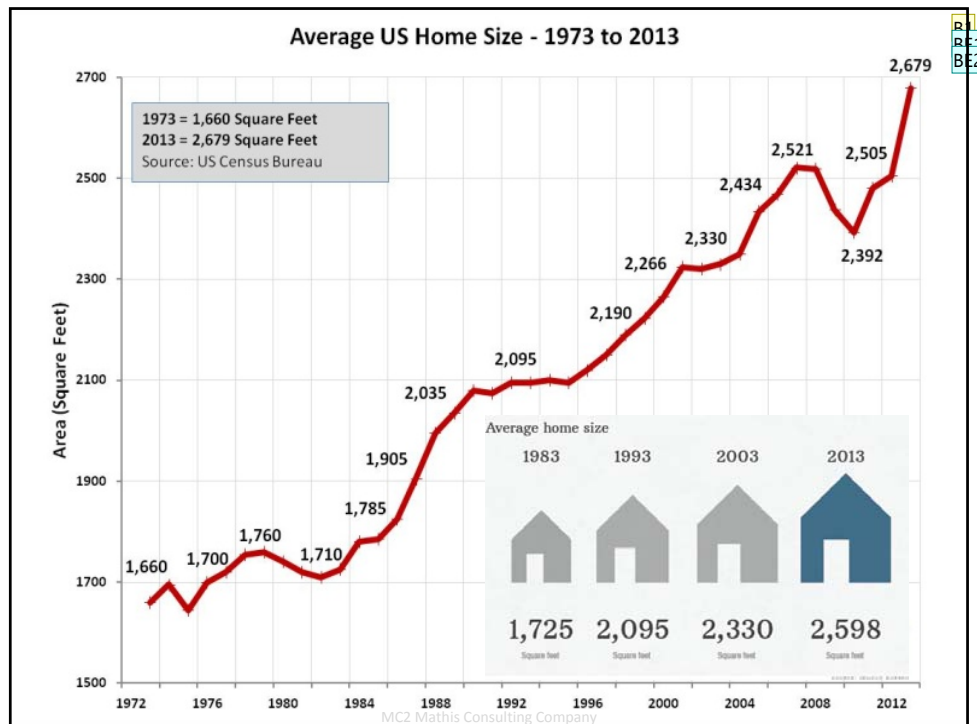
- **Growing demand**
 - More...
- **Simultaneous demand**
 - Peak power issues...
- **Energy security**
 - Enough for us?
 - Reliability?
- **Economic security**
 - Our economy?
 - World economy?

Climate Change? Buildings Matter!

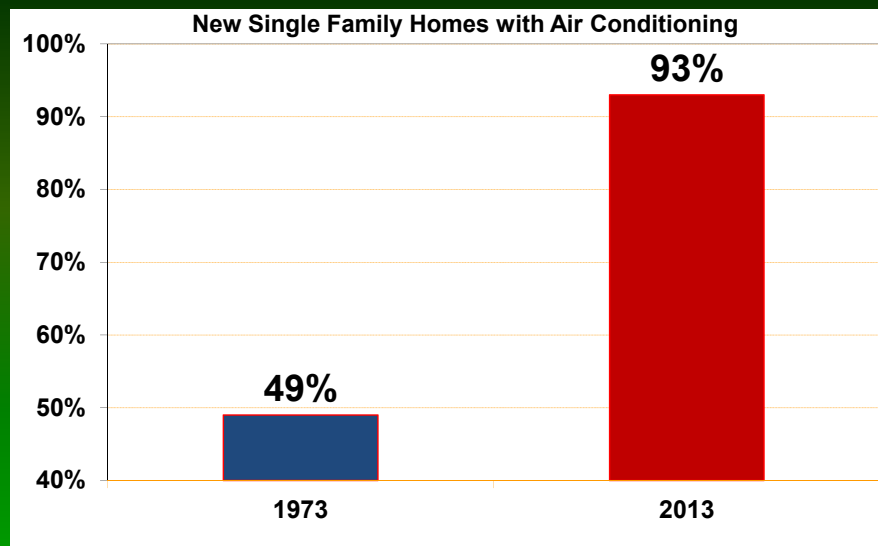


Homes Have Changed...





Homes Have Changed...



Source: US Census 2014

Slide 25

B1 Did not have slide on hand. Update.

Bridget, 1/18/2015

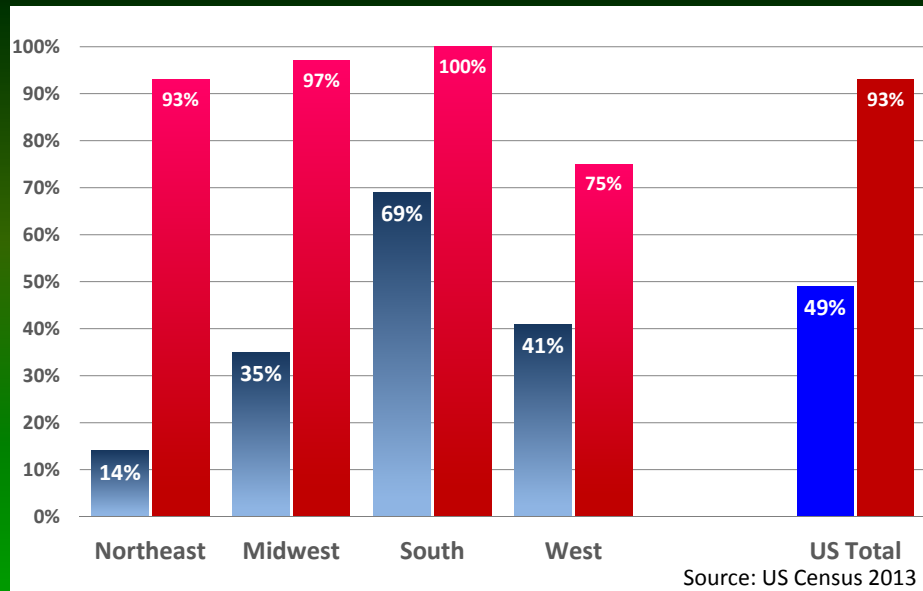
BE1 This ok?

Ben Edwards, 1/18/2015

BE2 It's from CNN

Ben Edwards, 1/18/2015

Growth of Residential AC 1973-2013



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Energy Codes Have Changed...

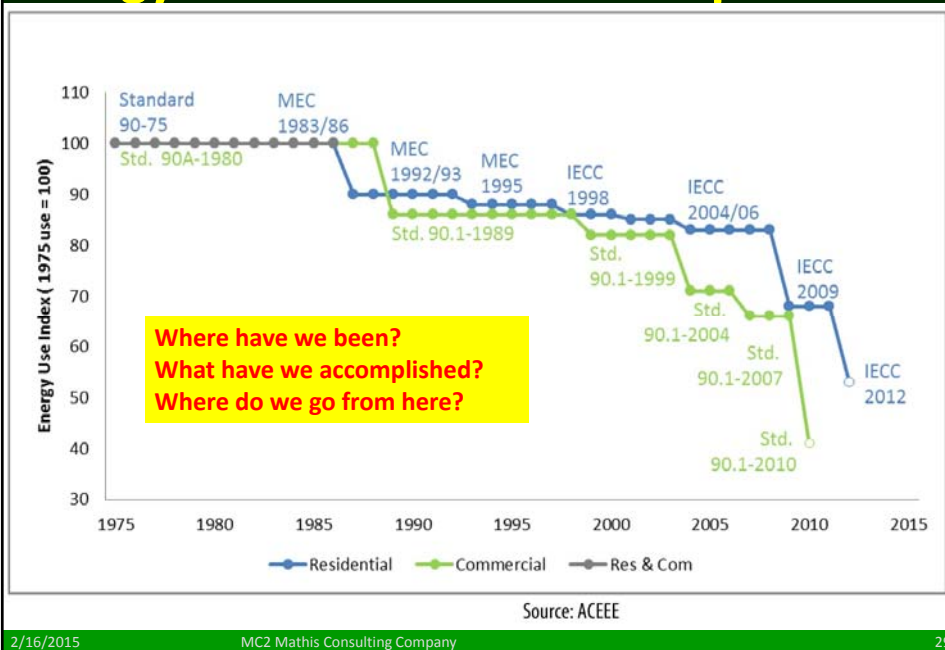


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Energy Codes: Historical Perspective

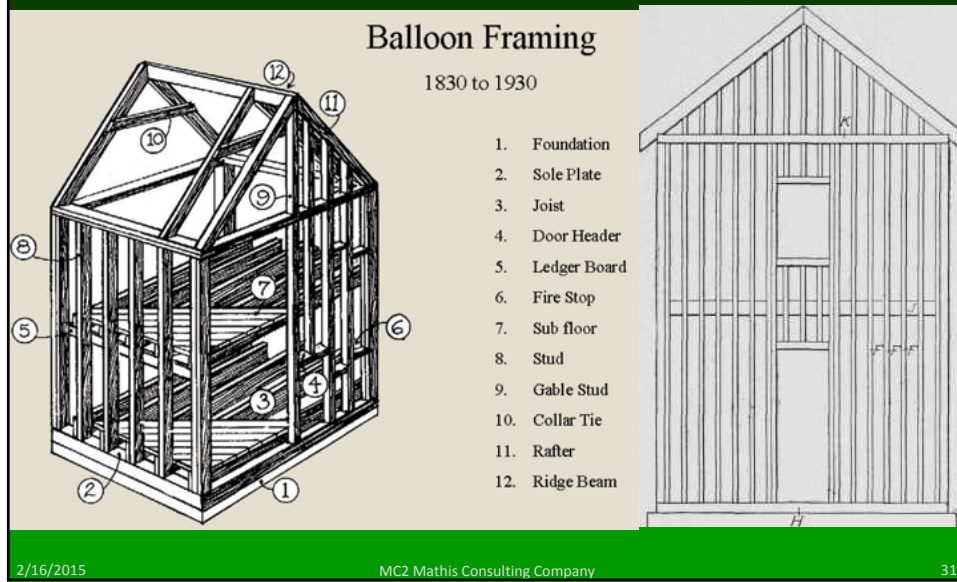


What Have We Achieved Since 1975?

- **Better Building Envelopes**
 - Insulation, Windows, Glazing, Air Leakage Control
- **Better Equipment**
 - Heating, Cooling, Hot Water
- **Better Controls**
 - Sensors, Measurement, Control
- **Better Safety**
 - Structural, Electrical, Fire, IEQ, Etc.
- **The Building Industry has delivered BETTER BUILDINGS!**

Building Industry = Builders, Manufacturers, Code Professionals, Regulators, Architects, HVAC professionals, Scientists, Advocates, Consumers, Lenders, Insurers, etc.

Change... 1830s...





More Tools...

- Envelope Leakage
- Thermal Imaging
- Duct Leakage
- HVAC T&B
- IEQ
- Checklists



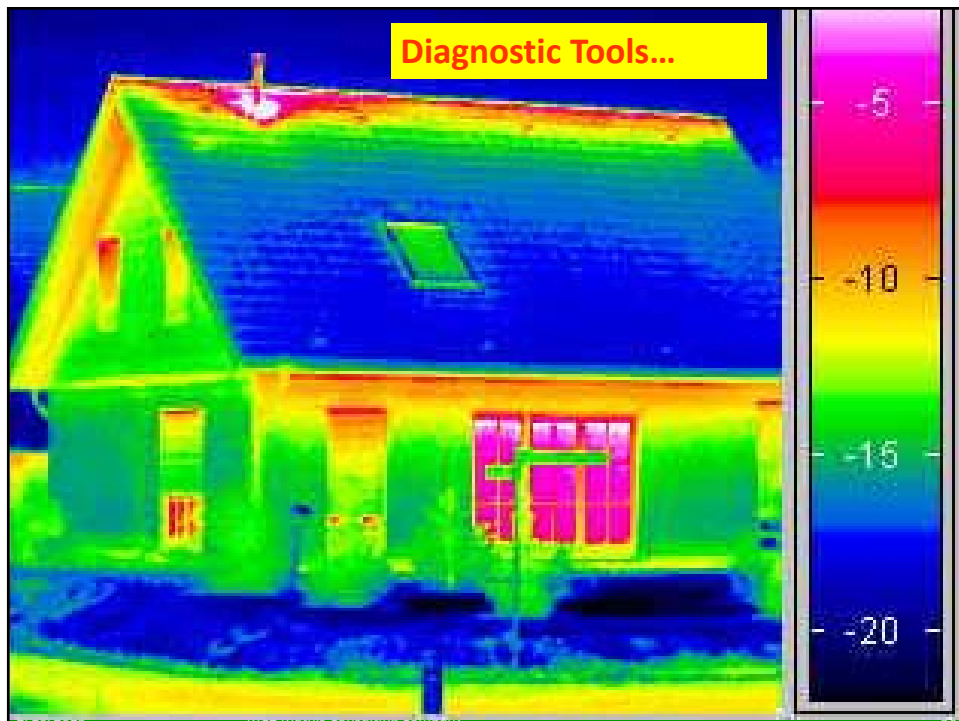
Find Holes... Plug Holes...



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Built Environment Trends

- **More severe climate events**
 - “Superstorms”
 - Extreme cold - “Polar Vortex”
 - Extreme heat – New climate zones?
- **Increased expectations for building performance**
 - Energy, Durability, Health, IEQ, Resilience, etc.
 - Commissioning, testing, verification, compliance
 - What is “sustainable”? “Green Building”? “Net Zero”
 - For how long?

Today's Paper

But we've got the building codes to handle that... right?

What is the Code?

- Least safe...
- Least strong...
- Least energy efficient...
- ...building allowed by law.

We're not allowed to build it any crappier...

RECAP: Since 1975...

- **Better Building Envelopes**
 - Insulation, Windows, Glazing, Air Leakage Control
- **Better Equipment**
 - Heating, Cooling, Hot Water
- **Better Controls**
 - Sensors, Measurement, Control
- **Better Safety**
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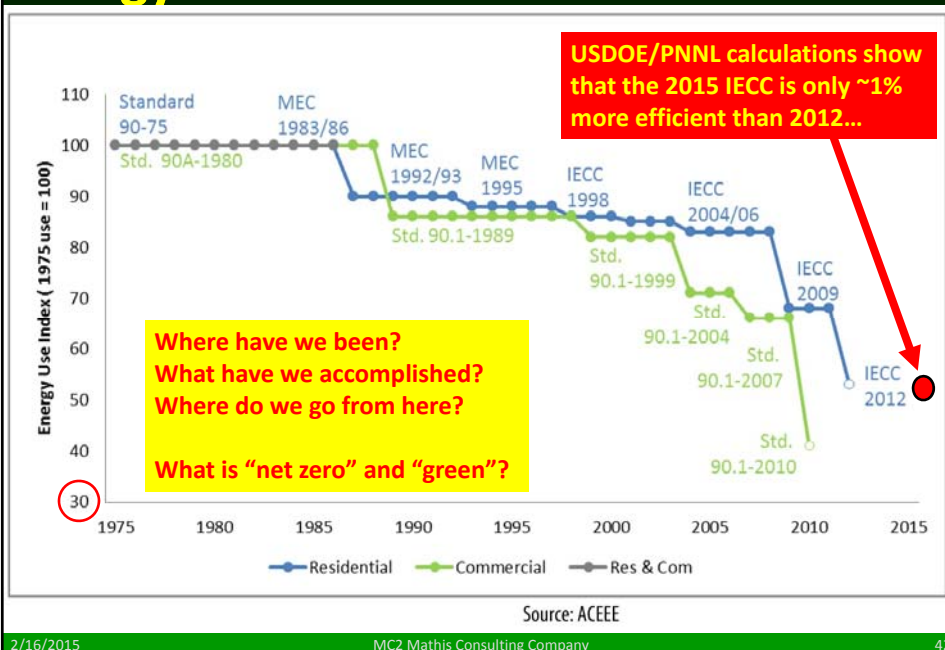
Today's Minimum Code is a MUCH better building!

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Energy Codes: So Where IS 2015?

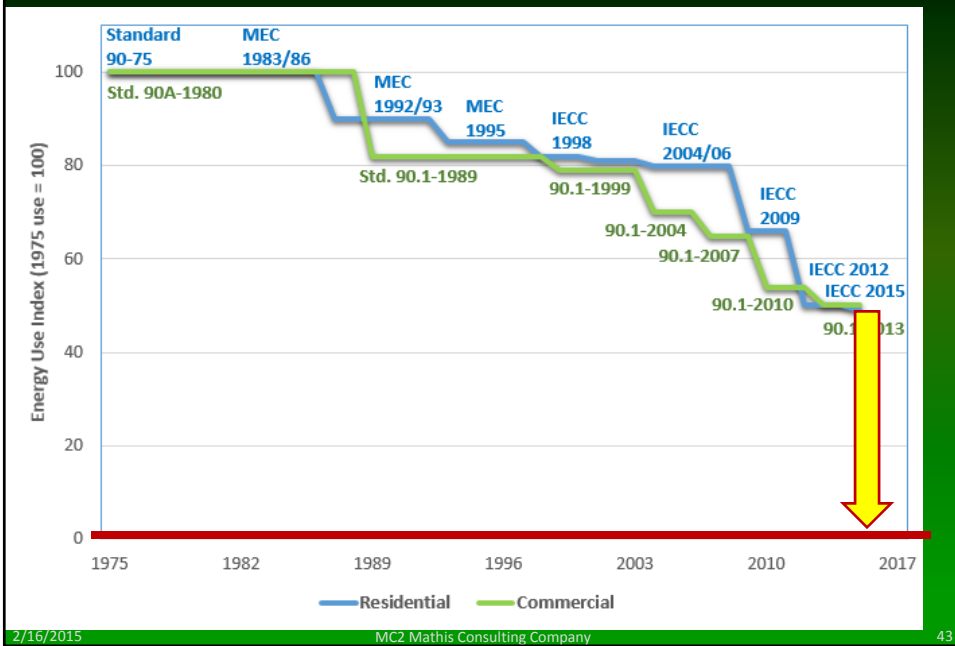


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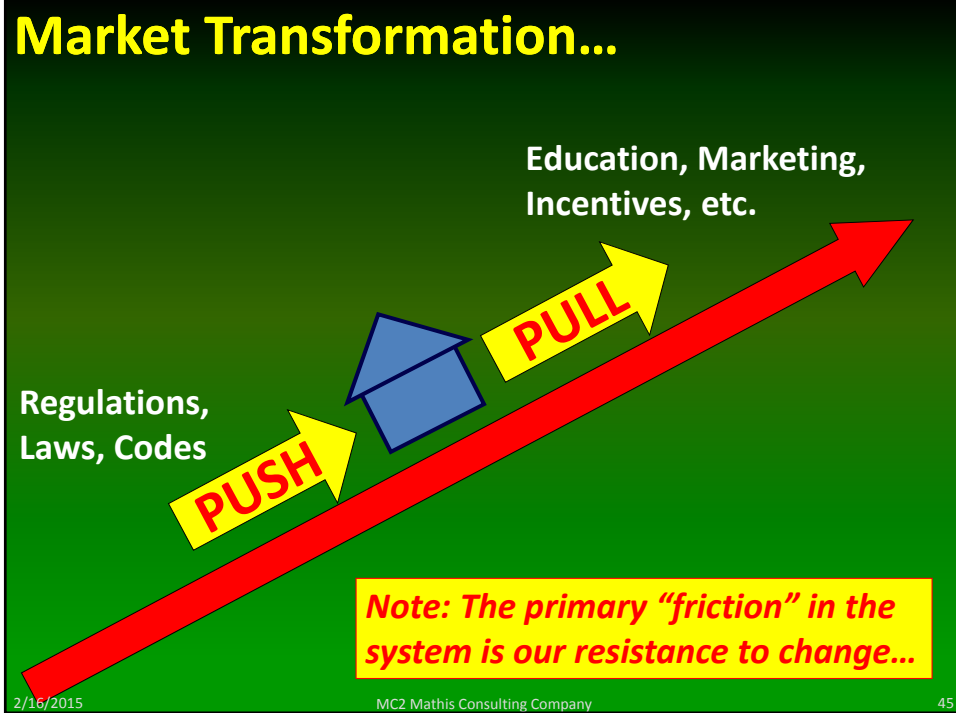
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Clarity of Scale...



IECC 2015

- **The latest MINIMUM residential energy code**
 - One- and two-family dwellings
- **Multiple compliance options**
 - Prescriptive, Performance, ERI
- **SIGNIFICANT opportunities for HERS professionals**
 - (Potentially significant risks too)
- **Represents a CHANGE in the role of HERS providers – Market Transformation**

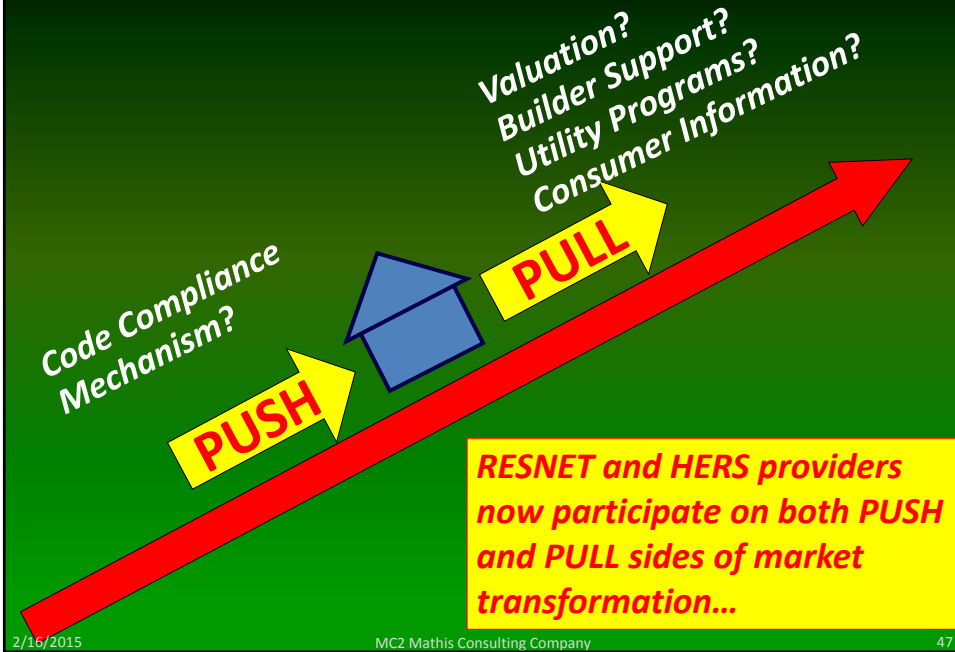


“Be A Change Agent”

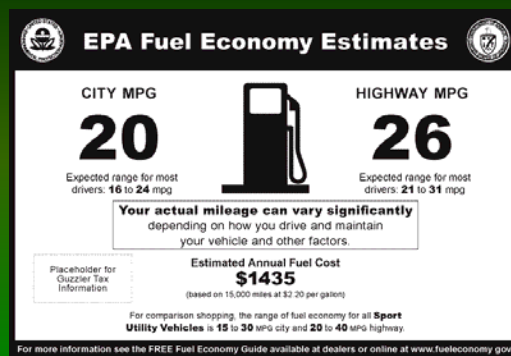
John Tooley

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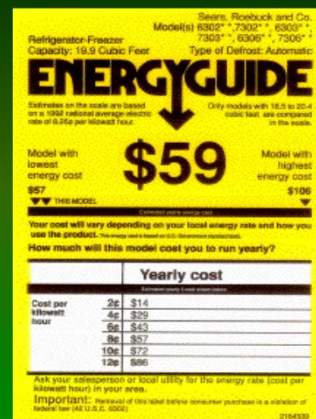
RESNET and Market Transformation



The Past as Prologue...



A Means of Comparison...



Energy “Signals”

- **For builders**
 - Seeking compliance
- **For code officials**
 - Enforcing compliance
- **For homebuyers**
 - Seeking/shaping performance expectations
- **For lenders**
 - Seeking loan risk reduction
- **For utilities**
 - Seeking to better know the energy demands of buildings over their lifetime

**More “customers” for
reliable home energy
performance information!**

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**What do all these new customers
mean for HERS providers under the
2015 IECC?**

Let's ask the tough questions even if
we don't know all the answers yet...

Market Expansion?

- New?
- Existing?
- Energy?
- Power?
- Water?
- IEQ?
- Green?
- Comfort?
- Performance?
- Ratings?



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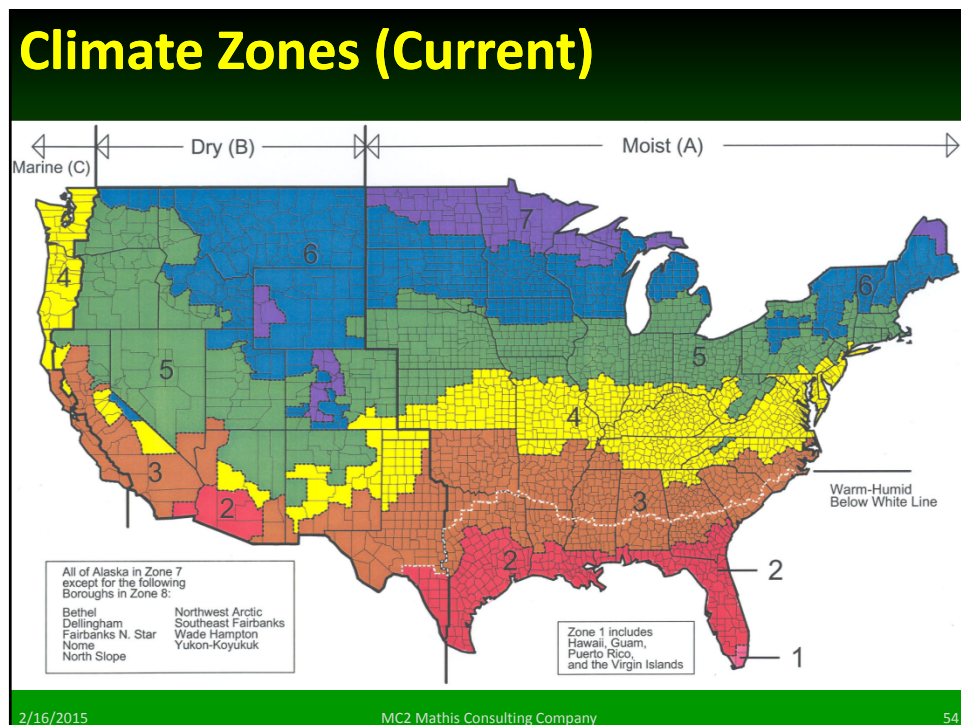
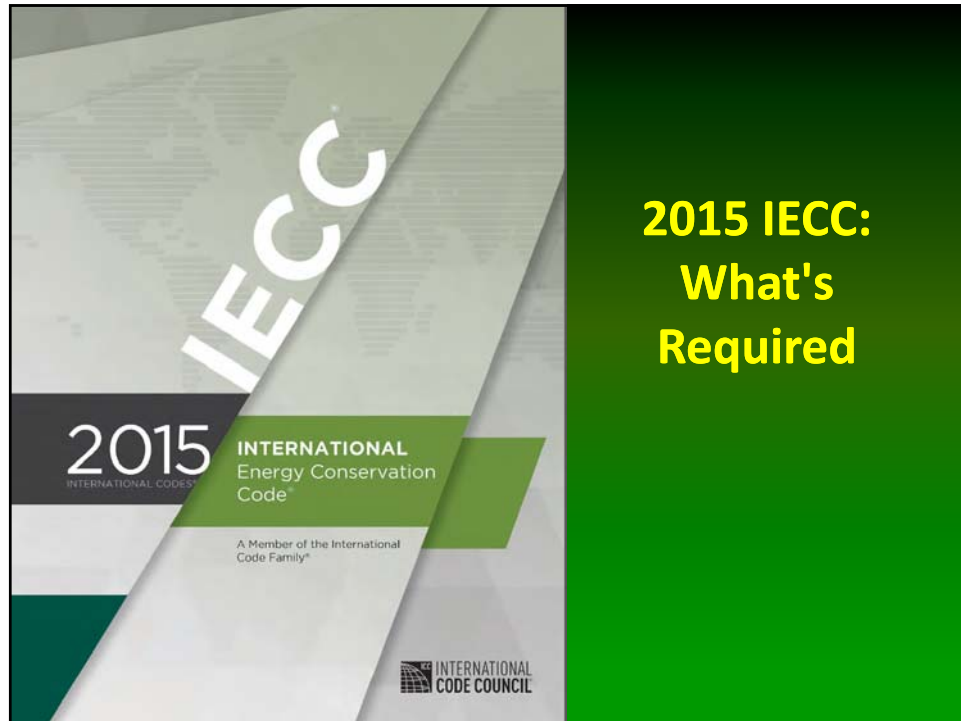
Market Expansion = More Responsibilities

- More builder demand
- Potential code services demand?
- More utility program opportunities?
- More real estate industry engagement?
- More demand from lenders?
- More professional opportunities?
- More liability exposure?
- More responsibility...

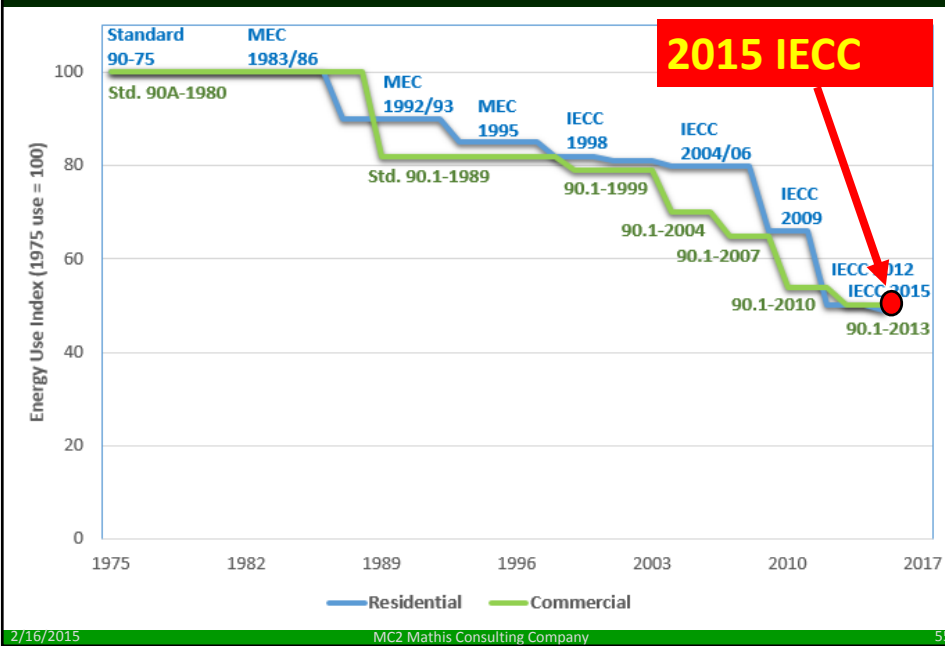
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Energy Codes: So Where IS 2015?



Multiple Compliance Options

- Simple Prescriptive Tables
- Energy Performance Modeling
- Energy Rating Index
 - (The focus of our discussions today)

2015 Prescriptive Tables

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^a	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, c}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^e	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 ^j	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 ^j	0.65	0.30	30	13	5/8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13/17	30 ^g	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15/19	30 ^g	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 ^g	15/19	10, 4 ft	10/13

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Energy Performance Modeling



Compares the energy performance of a **Proposed Design** to the energy performance of a code-compliant **Standard Reference Design**.

The Proposed Design must use less energy than the SRD.

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2015 IECC ERI Compliance Path

➤ Mandatory Provisions:

- R401.2 Compliance
- R403.5.3 Hot Water Pipe Insulation
- Supply and return ducts outside of thermal envelope (conditioned space) shall be insulated to no less than R-6
- The ERI Reference Design must meet all of the prescriptive requirements of the 2006 IECC
- Building Envelope efficiency levels no worse than prescriptive Tables 402.1.1 and 402.1.3 of the **2009 IECC**

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2009 IECC Envelope Limits

TABLE 402.1.3
EQUIVALENT U-FACTORS^a

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR ^c
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50	0.65	0.035	0.082	0.141	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.028	0.050	0.065

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, c}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^d	FLOOR R-VALUE	BASEMENT ^e WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 ^f	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 ^f	0.65	0.30	30	13	5/8	19	5/13 ^g	0	5/13
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2015 IECC ERI Requirements

Table R406.4 (N1106.4) Maximum Energy Rating Index	
Climate Zone	Energy Rating Index
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

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Minimum Performance and Beyond...

- **IECC 2015 is new MINIMUM code**
 - Prescriptive Envelope Limits from 2009 IECC
- **Implications for New Construction**
 - Building to the minimum (to meet code)
 - How to do better than the minimum?
 - Differentiation
 - Marketing
 - Compliance
 - Qualification for additional recognitions
 - Green building (ICC 700, LEED, etc.)

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2015 IECC ERI Requirements

Compliance Report:

- ✓ Project Address
- ✓ Inspection Checklist
- ✓ Rater Information
- ✓ Name and Version of Software Tool
- ✓ Inputs Necessary to "Reproduce the Results"
- ✓ Results of *Reference* and *Rated Home*
 - ✓ Exception: Identical buildings may be reproduced if you can show its rated score in each of the four cardinal orientations



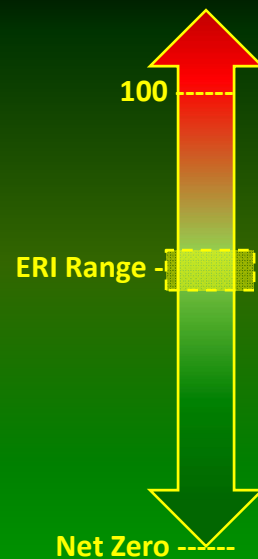
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2015 IECC ERI Requirements

Table R406.4 (N1106.4) Maximum Energy Rating Index	
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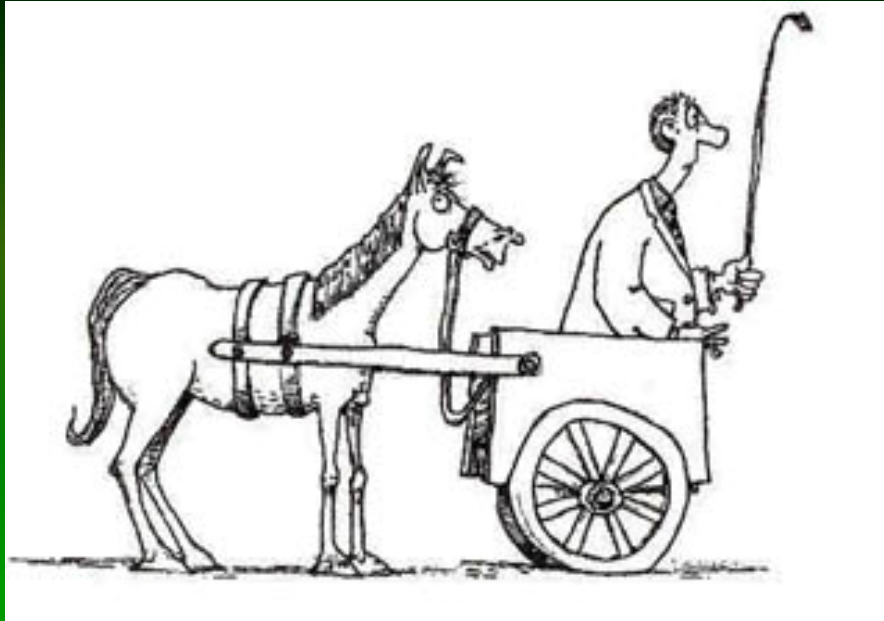


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But that's not all...



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Additional 2015 IECC ERI Requirements

- **3rd party MUST be approved by local jurisdiction!**
 - Just because you CAN provide a rating does NOT mean that a state or locality will accept it for code compliance
 - The emerging relationship between ICC and RESNET should help
 - ICC recognition, professional code training, etc.



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What else does the code imply?



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What are your responsibilities to your local code official?



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Code Compliance Obligations?

- **As a de facto code compliance officer you will likely have some additional responsibilities and obligations**
 - Do your due diligence on the compliance report!
 - Keep it clear, concise, organized, and legible
 - It has a long life!
 - Recognize that you are getting something that many code officials may not yet have – EDUCATION
 - Increase your local value by assisting in education about the requirements of the energy code

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Unintended Consequences?



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Increase Your Value to Your Builder Client



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Get Engaged Earlier!

- **Help keep first costs down by getting involved sooner!** PC-1
B2
- Most code compliance issues can be solved more easily and more cost effectively during plan review
- Provide innovative and durable solutions to deliver the intended performance!
 - Many good resources including the EEBA Guides, the NIBS Whole Building Design Guide, the USDOE website, the Energy Star Home website, manufacturer websites, etc.
 - Your builder may not have seen some of the tools and options available – SHARE! TEACH!

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Slide 72

BE1 Where is this going? Better be careful re 100=2006

Ben Edwards, 2/13/2015

B2 Showing a lower number does not always equal improved performance

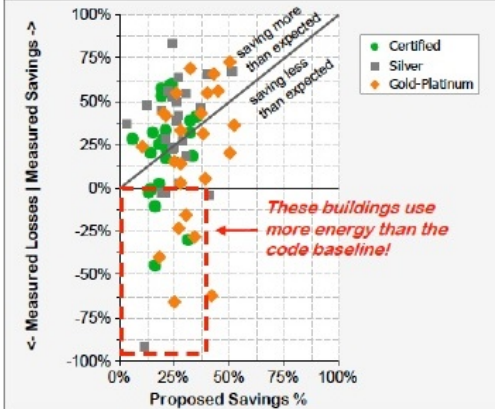
Bridget, 2/14/2015

Caution: Chasing Points

- Be cautious about the “chasing points” game.

BC1
B2

- A lower number may not be better if it increases builder risk (or your risk)!
- Take a lesson from the past
- DURABLE performance solutions protect against many of these risks



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What is your responsibility to home buyers?



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Slide 73

BE1 Where is this going? Better be careful re 100=2006

Ben Edwards, 2/13/2015

B2 Showing a lower number does not always equal improved performance

Bridget, 2/14/2015

Buying a Home...

- The largest investment that most people will ever make
 - Durable long-term operating costs are a key to affordability!
 - Many of the decisions made about that home will be with it for a long time!
 - How long?



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Audience Survey: How Long?

...about 100 years...

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What are your responsibilities to the mortgage industry?



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How long will it last?

- **Lenders seek to minimize the risk associated with their loans.** B3
 - Will the rated performance last?
 - Did I give my builder good durable performance advice?
 - How do I improve the likelihood that a HERS 51 today be the same when that starter home is put on the market in a few years?

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Slide 78

B3

Don't we have some LCA slides already generated comparing envelope to equipment, etc.?

Bridget, 2/14/2015

Easiest Risk Reduction Strategy?

➤ Measure stuff...

- Inspect the Installation of the durable elements!
 - Building Envelope – Insulation, Windows, Air Sealing, etc.
 - Duct Insulation and air sealing
- Measure performance!
 - Air Sealing/Leakage, HVAC systems, etc.
- Help your builder deliver the rated performance!

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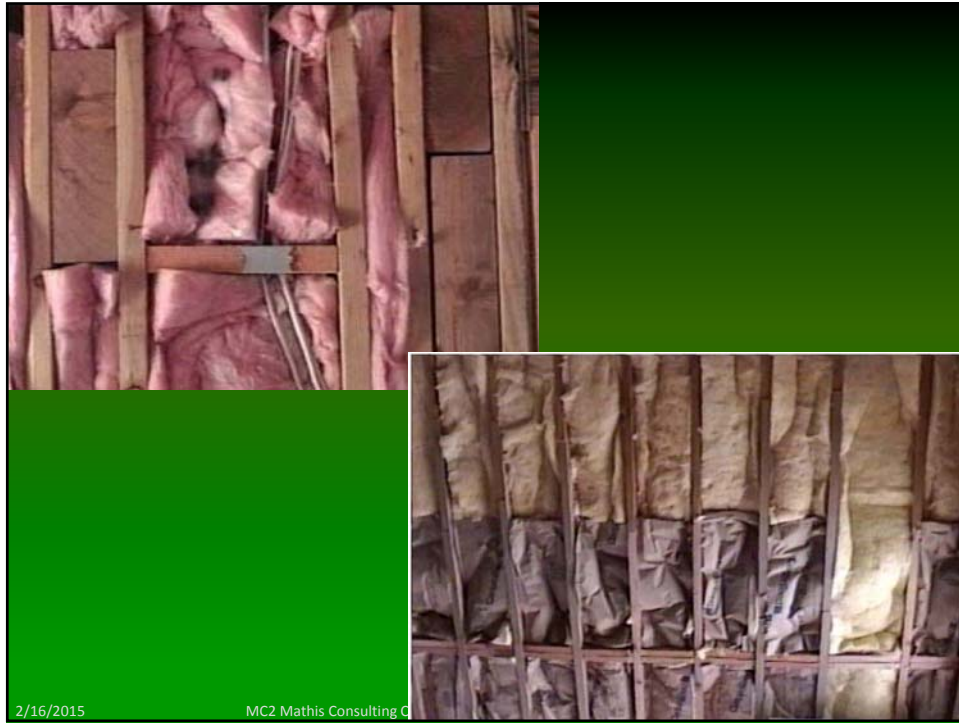
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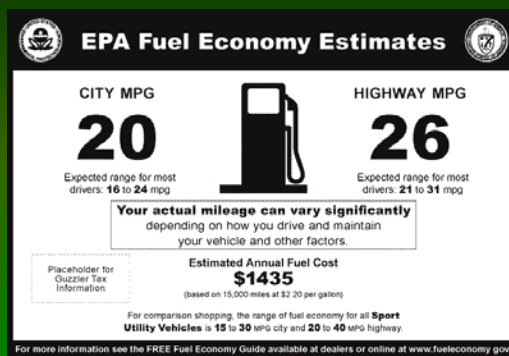
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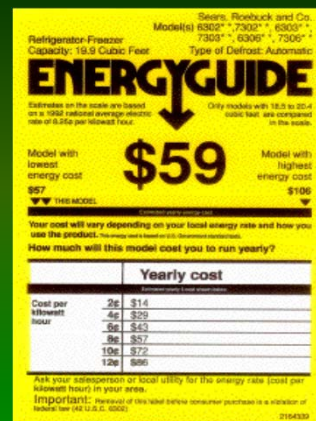


HERS Index Scores: Expanding the Field of Energy Performance Commerce

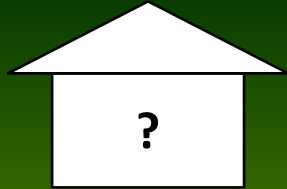
The Past as Prologue...



A Means of Comparison...



How Much Energy? Cost? For How Long?



- **More customers for energy performance information**
 - Builders, consumers, code officials, lenders, utilities, etc.
- **Historically no “efficient” means of delivering energy performance or energy cost expectations**
 - Once-a-month utility bill?

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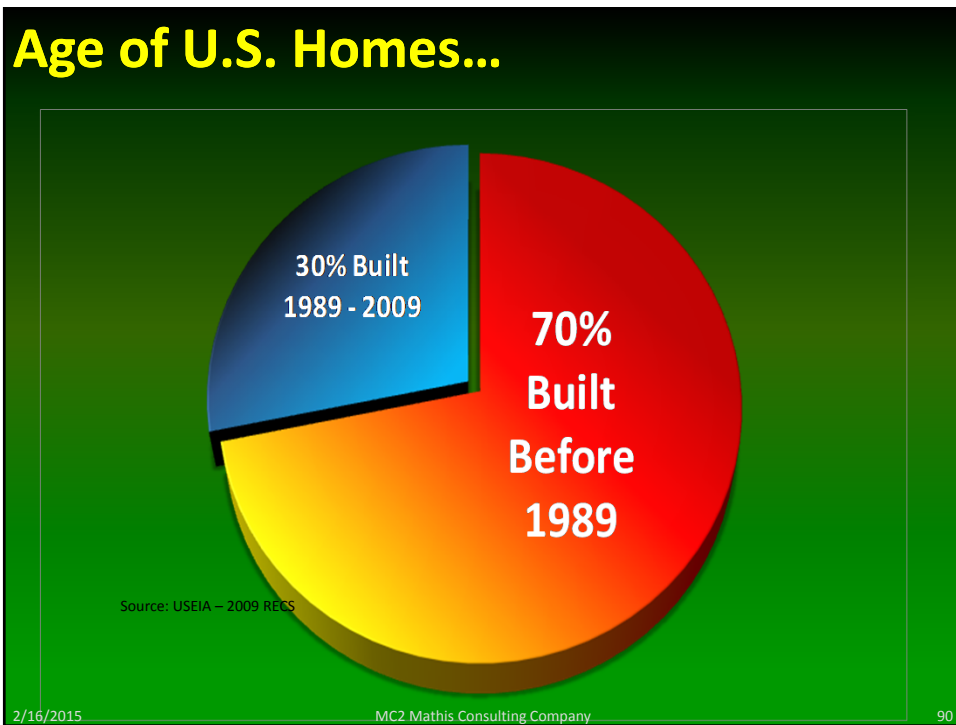
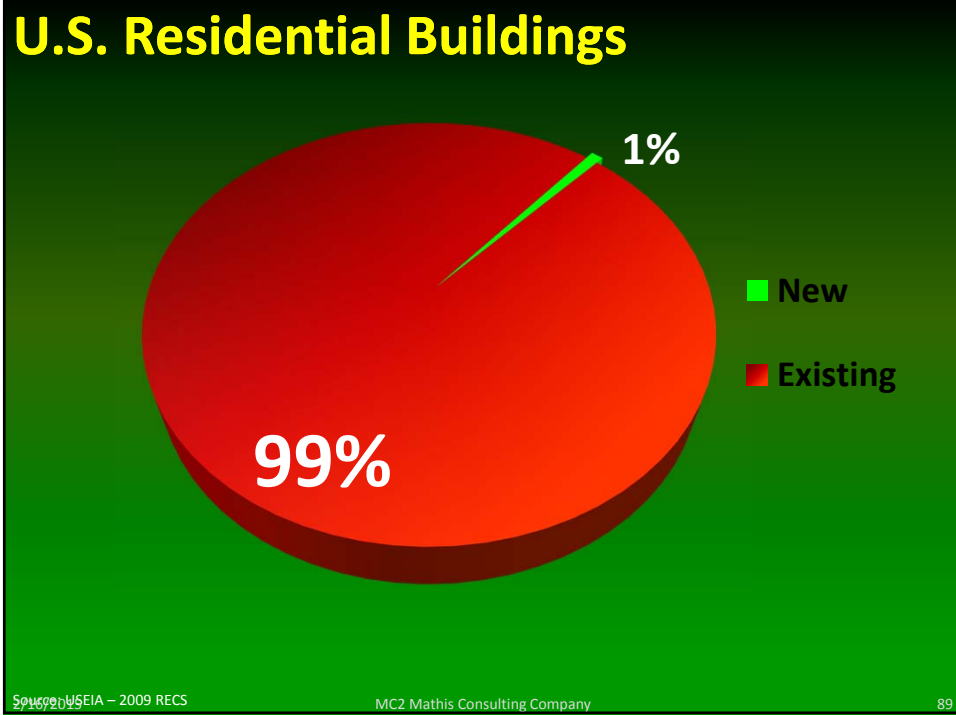
Size of the Opportunity - 1

- **146,000 homes rated in 2014**
 - ~120,000,000 existing homes (~0.1%)
 - ~70,000,000 existing single family homes (~0.2%)

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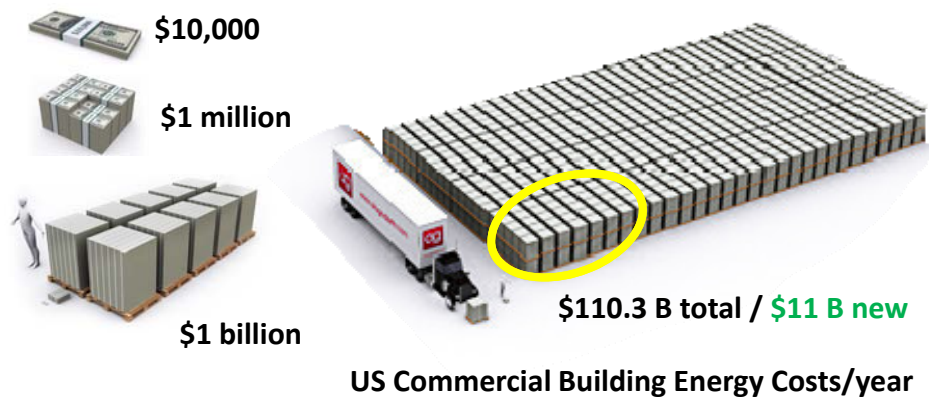
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Comparative Analogy: Commercial Building Energy Costs

- **U.S. commercial building floor area 2013:**
 - Total: 82.9 billion square feet (EIA Energy Data Book)
 - New: 8.2 billion square feet (2003-2007 Dodge reports)



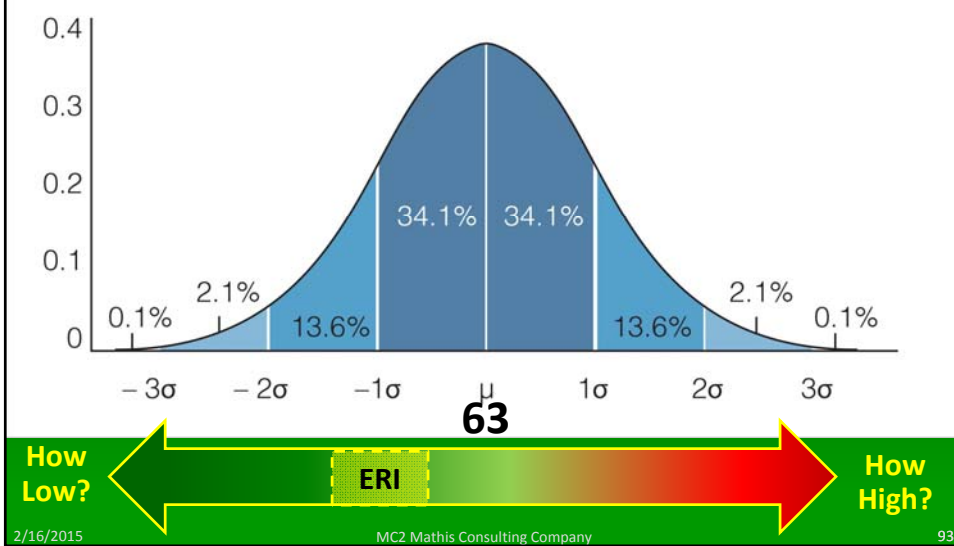
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Source: PNNL 2015

Size of the Opportunity - 2

➤ The Average HERS Score in 2014 was **63**



**These Expanding Opportunities
Come With
Expanded Responsibilities**

Unexpected Responsibilities - 1

- **De facto “Code Official”**
 - Delivering PROOF that a building meets code
- **Responsibilities? Risks?**
 - Assurance of compliance? What if...?
 - Professional liability insurance?
 - For how long? What is the statute of limitations?
 - Continuing education?
 - Delivering code interpretations?
 - How do you interact with the building department?
 - Does your builder client assume all responsibilities?

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Unexpected Responsibilities - 2

- **Partner in Loan Qualification?**
 - What happens when lenders base their lending practice on what YOU say about a home's energy use?
- **Responsibilities? Risks?**
 - Do you have any responsibilities to the lending institution?
 - What if you get it wrong?
 - What of the owner qualifies based on your projections?
 - Does your builder client assume all responsibilities?

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Unexpected Responsibilities - 3

- **Partner in Real Estate Transactions?**
 - What's IN that Real Estate sale/purchase packet?
- **Responsibilities? Risks?**
 - What shows up in the MLS?
 - Is the Realtor's information about the property accurate?
 - Does the transaction packet include your name?
 - Any liability exposure among all the parties involved?
 - Disclosure requirements?

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Unexpected Responsibilities - 4

- **Responsibilities to the Home Buyer?**
 - What happens when buyers base their purchase decision – in part – on YOUR information?
- **Responsibilities? Risks?**
 - Do you have any responsibilities to the buyer?
 - If so, for how long? Disclaimers?
 - What if you get it wrong?
 - What if a buyer defaults? Are you a party in that process?
 - Does your client assume all “downstream” risks and responsibilities?

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Unexpected Responsibilities - 5

- **Partner in Utility Program Qualification?**
 - What happens when utilities base inclusion in their efficiency and load management programs on your ratings?
- **Responsibilities? Risks?**
 - Utilities are pretty good at “measuring stuff” ...
 - What’s the risk?
 - Utilities have to show the PUC “proof” of the accomplishments of their programs?
 - Any liability exposure due to non-compliance?

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Still Some Issues to Address

Rating ≠ Performance?



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Quality Assurance Imperative

- **MUST** protect the integrity of:
 - The standard
 - Constant improvement
 - The rating profession
 - Certification
 - The marketplace
 - Trust is!
- We Must Continue to Build and Earn Marketplace Trust!**
- Realtor
 - Home Owner
 - Code Official
 - Etc.

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Ratings Marketplace Confusion

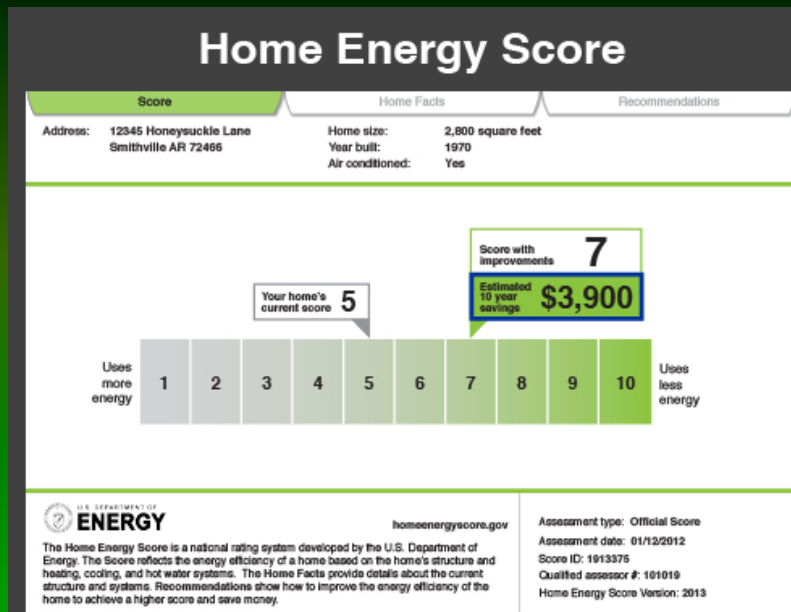
- Energy Rating Index versus HERS Score?
- California versus HERS score?
- Home Energy Score versus HERS score?
- 5-Star Ratings versus HERS score?
- International energy ratings versus HERS score?

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Which Ratings? Comparable? ERI?



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More Examples...

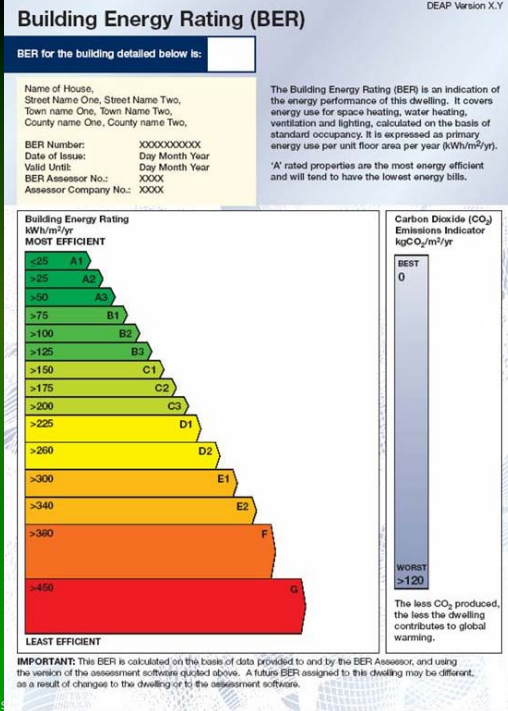
How do we compare?

Will we have multiple rating systems?

Multiple code compliance systems?

Marketing versus Code Compliance?

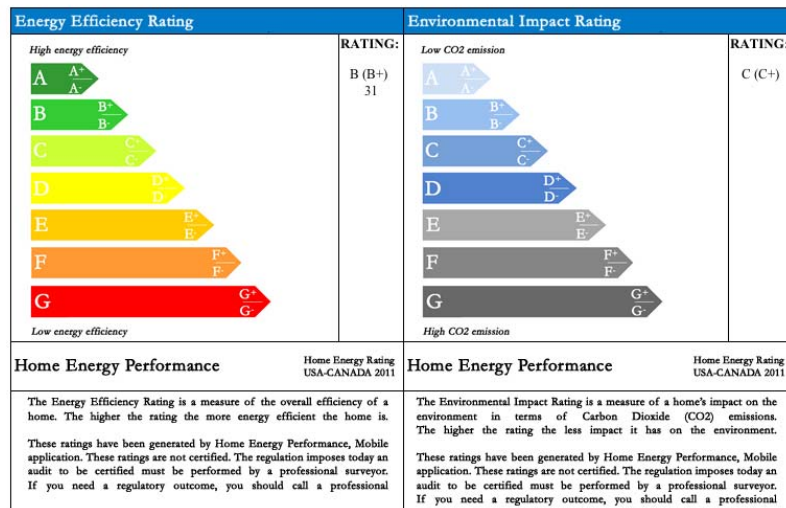
Marketing AND Code Compliance?



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Multiple Ratings?

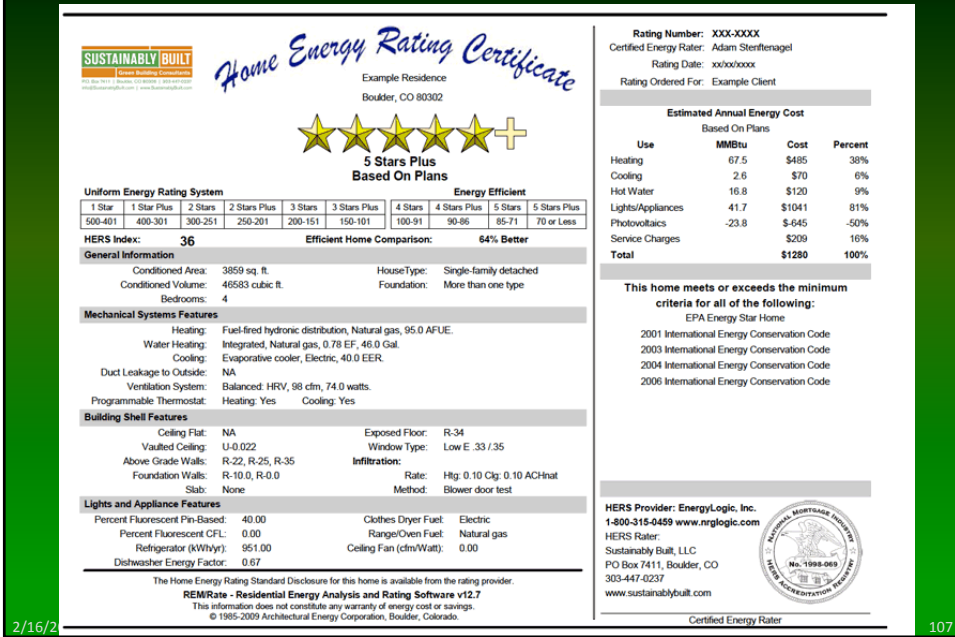


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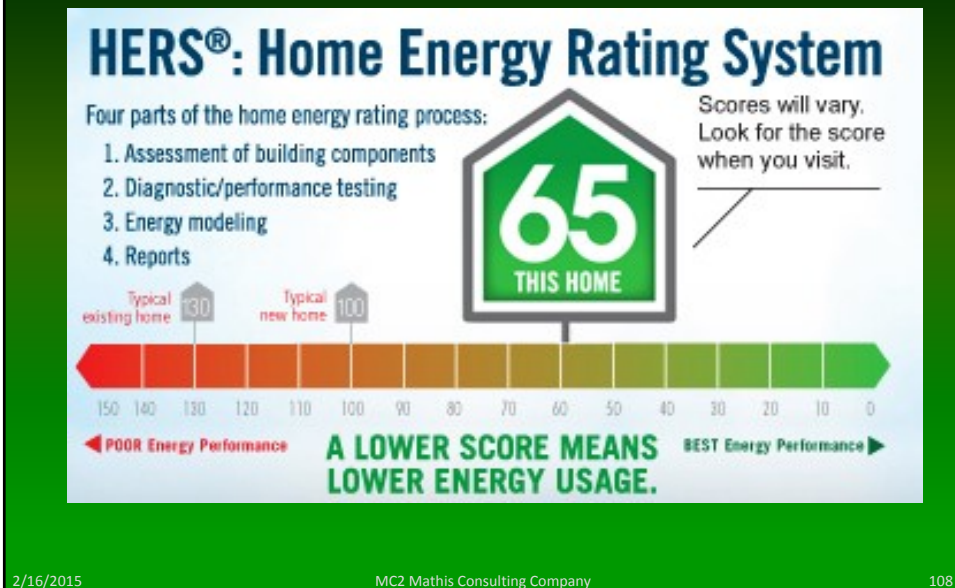
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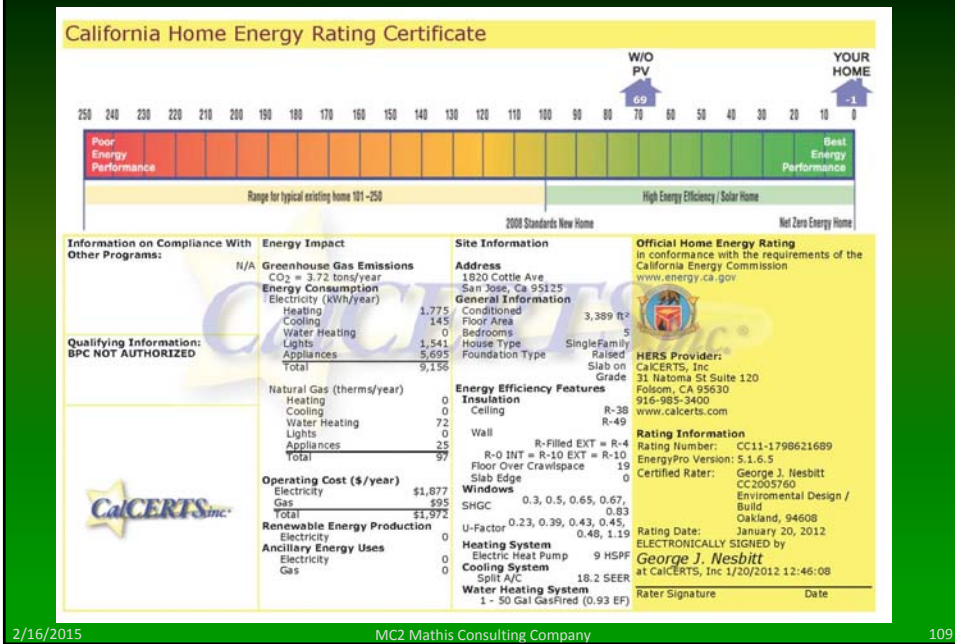
How Much Information? For Whom?



What Delivery Mechanism?



State-Specific Needs?



The End in Mind...

- **The Importance of What You Do**
 - Some scale on the importance of buildings...
 - New and existing
- **Some Unexpected Responsibilities**
 - The expanding role of HERS providers in commerce
 - Especially in a changing code landscape
- **Perspectives on the 2015 IECC**
 - Dialog on Liabilities and Opportunities
 - "Risks and Rewards"

Hypothesis:

RESNET (and HERS providers) stand at the forefront of one of the the greatest potential impacts the building industry has ever seen.

The challenge before us is:
What are we going to DO with this opportunity?

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The Future is in Our Hands

Thank you!