



Welcome to “Making ENERGY STAR Appeal to the Builder’s Bottom Line”

Hillary Tipton, ICF

Elliot Seibert, EPA

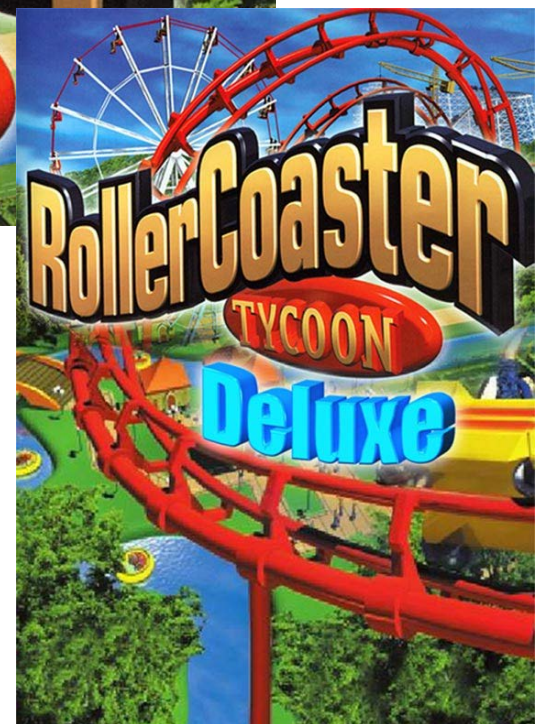
Michelle Yuan, ICF



Part I

Dollars and Sense: Cost-Effective Modeling with ENERGY STAR Homes





There's good design...



and poor design...







What are the benefits of an ENERGY STAR home?

- Consumer awareness and marketing
- Enhanced QA
- Increased incentives, in some cases

Consumer Awareness of ENERGY STAR

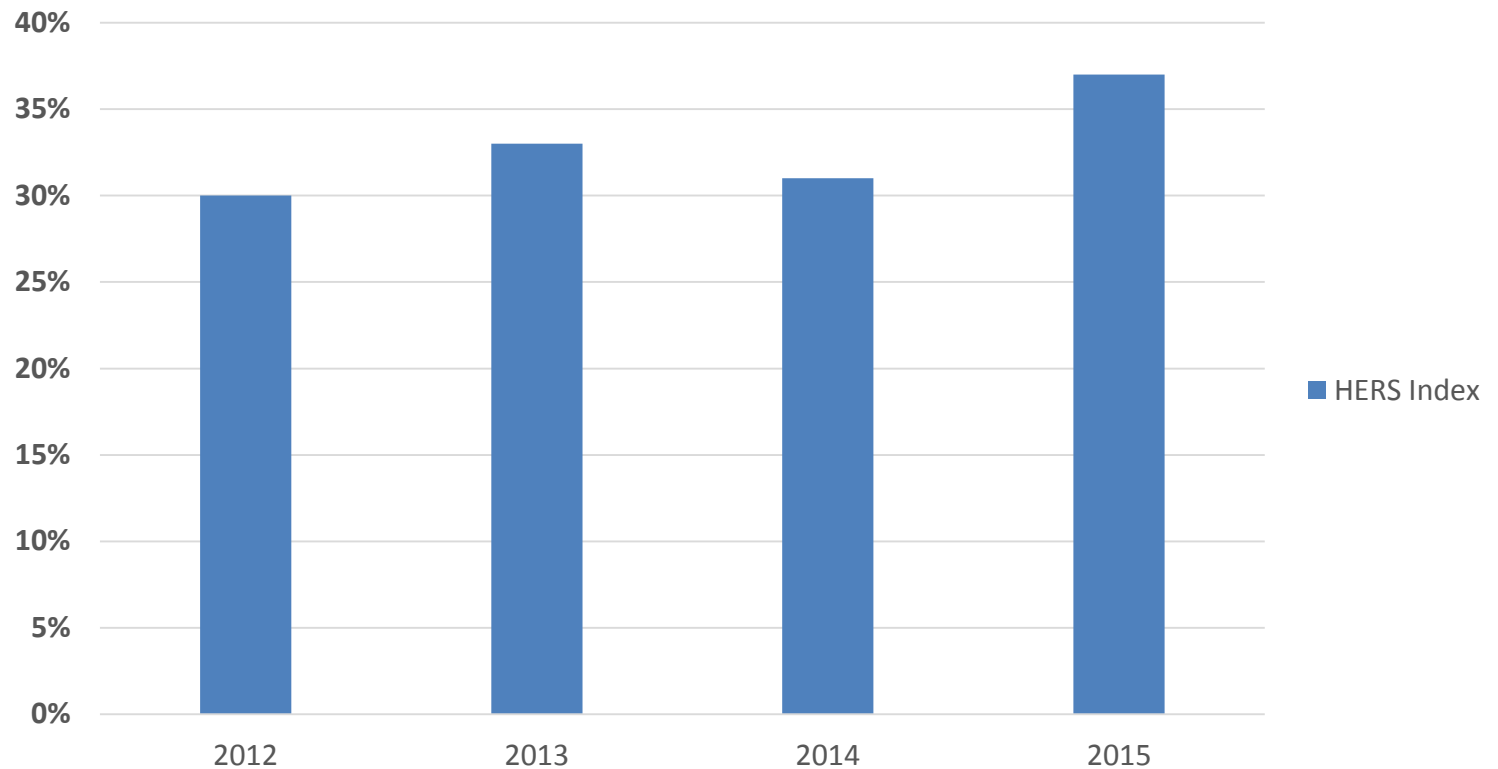
- The ENERGY STAR brand is more recognizable than HERS and other energy rating programs
 - The ENERGY STAR label is recognized by 87% of consumers
 - 92% say that it influences their purchasing decisions
- But what about its marketability to **builders**?





Market penetration of HERS Ratings

- Compared to virtually every other subcontractor, Raters are the lowest cost subcontractor
- But there is still a long way to go for the HERS Index to become the norm when building a new home on the U.S.



Enhanced QA

- Mandatory measures
 - i.e., air sealing
- Additional diagnostic testing
 - HVAC Quality Install (QI)
- The HERS Index does not account for everything: for example, proper equipment sizing has benefits that are not reflected in the HERS score.





ENERGY STAR is more achievable than you think

- Current national average HERS Index is around 63, while the average HERS Index for a home to meet ENERGY STAR Version 3.1 ranges from 60 to 70.
- Many HERS-only homes are at or near ENERGY STAR performance levels.
- We're going to show you three homes inspired by real-world examples, where we'll be able to achieve ENERGY STAR performance level while cutting costs.



Some caveats off the batt:

- Flexibility is key: we offer suggestions and examples, but you should apply your experience and organization's practices
- We are showing screenshots from REM/Rate because it is widely-used rating software, but similar cost-saving techniques can be used in other software.

House 1: “The Alamo”



House Characteristics:

- Built in San Antonio, TX – Climate Zone 2
- 2715 sqft., 4 bedrooms
- 2-story detached, slab-on-grade
- HERS Index = 64
- ENERGY STAR v3.1 Target = 62

Challenges

- Can't move ducts from unconditioned attic

Let's make some costs cuts!



Method: Identify Focus Areas

- Use software ENERGY STAR comparison reports
- Look for:
 - Areas where home under-performs vs. ENERGY STAR
 - Areas where home is performing better that might not be cost-effective

Comparison Reports

Report Selection: ENERGY STAR V3.1 Reports

Group of Reports to Consider: All

Unselected Reports To Consider:

- Action Report (1)
- Air Leakage (1)
- Building File Report
- Component Design Loads
- Emissions
- Equipment Sizing Summary
- Lights & Appliances Summary
- Performance Factors
- Source Energy & Emissions (1)
- 2005 EPAct Tax Credit (1)
- Oklahoma Tax Credit (1)
- Utility Bill Analysis (1)
- DOE Zero Energy Ready Home Certificate (1)
- DOE Zero Energy Ready Home Verification (1)
- Energy Code Inspection Checklist (1)
- ENERGY STAR Inspection Checklist (1)
- ENERGY STAR V2 Home (1)
- ENERGY STAR V2 Summary (1)
- ENERGY STAR V2.5 Home (1)
- ENERGY STAR V2.5 Summary (1)

Note: (1) = 1 Bldg Report Only

Building Selection:

- ENERGY STAR V3.1 Reports
- 1 Building Reports
- 2 Building Reports...
- HERS Reports
- Tax Credit Reports
- ENERGY STAR V2 Reports
- ENERGY STAR V2.5 Reports
- ENERGY STAR V3 Reports
- ENERGY STAR V3.1 Reports**
- ENERGY STAR V3 HI Reports
- LEED For Homes Reports
- DOE Zero Energy Ready Home
- IECC 98 Reports
- IECC 00 Reports
- IECC 01 Reports
- IECC 03 Reports
- IECC 04 Reports
- IECC 06 Reports
- IECC 09 Reports
- IECC 12 Reports
- IECC 15 Reports
- NY-ECCC 2010 Reports
- ECC of NV Reports
- FE PA Savings Reports
- FE PA Qualif Reports
- Iowa 2012 Reports
- Illinois 2015 Reports
- IndECC Reports
- Michigan 2015 Reports
- Minnesota XCEL Reports
- NV Energy Plus Reports
- North Carolina 2012 Reports
- North Carolina HERO
- NC Texas COG Reports
- NGBS Reports

Buttons: Add >>, Add All >>, << Remove, << Remove All, Use A Group, OK



Comparison Reports

Component Loads

Property: , TX
Weather: San Antonio, TX
San Antonio
CZ2 Step 0.blg

Organization: Elliot Selbert
Builder

HERS Projected Rating: 2017-03-01
ID:

Heating Season(MMBtu/yr)	ENERGY STAR V3.1	San Antonio	Savings	%Saved
Ceilings/Roofs	1.7	1.7	0.0	2.0%
Rim/Band Joints	0.2	0.1	0.0	22.9%
Above Grade Walls	6.5	6.0	0.5	7.8%
Foundation Walls	0.0	0.0		
Doors	0.3	0.3	-0.0	-9.0%
Windows/Skylights	4.0	5.5	-1.6	-39.9%
Floors	1.1	0.8	0.2	20.2%
Crawl Space/Unht. Bemt	0.0	0.0		
Slab Floors	6.5	6.1	0.4	6.5%
Infiltration	1.4	1.4	0.0	0.2%
Mechanical Ventilation	3.0	3.0	0.0	0.2%
Ducts	0.0	2.3	-2.3	
Active Solar	0.0	0.0		
Sunspace	0.0	0.0		
Internal Gains	-8.0	-7.9	-0.1	-0.7%
Total	16.5	19.3	-2.8	-16.6%

REhRate - Residential Energy Analysis and Rating Software v15.3
This information does not constitute any warranty of energy cost or savings.
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Performance Report

Property: , TX
Weather: San Antonio, TX
San Antonio
CZ2 Step 0.blg

Organization: Elliot Selbert
Builder

HERS Projected Rating: 2017-03-01
Rater ID:

Annual Load(MMBtu/yr)	ENERGY STAR V3.1	San Antonio	Savings	%Saved
Heating	16.5	19.3	-2.8	-16.6%
Cooling	36.2	47.3	-11.1	-30.6%
Water Heating	11.9	12.2	-0.3	-2.3%
Water Heating w/out Tank Loss	8.1	8.1	-0.0	-0.1%

Annual Consumption(MMBtu/yr)	ENERGY STAR V3.1	San Antonio	Savings	%Saved
Heating	21.3	21.6	-0.4	-1.7%
Cooling	9.6	10.3	-0.7	-7.3%
Water Heating	14.9	15.2	-0.3	-2.3%
Lights & Appliances	24.8	25.7	-1.0	-3.8%
Photovoltaics	-0.0	-0.0		
Total	70.5	72.9	-2.4	-3.4%

Annual Energy Cost (\$/yr)	ENERGY STAR V3.1	San Antonio	Savings	%Saved
Heating	177	182	-5	-2.7%
Cooling	337	361	-25	-7.3%
Water Heating	113	116	-3	-2.3%
Lights & Appliances	871	905	-33	-3.8%
Photovoltaics	-0	-0		
Service Charges	120	120		
Total	1619	1684	-65	-4.0%

Design Loads (kBtu/hr)	ENERGY STAR V3.1	San Antonio	Savings	%Saved
Space Heating	26.4	40.5	-14.1	-53.5%
Space Cooling	24.9	39.1	-14.2	-56.9%

Utility Rates

Electricity	2017 TX Electric*****
Gas	2017 TX Gas*****

REhRate - Residential Energy Analysis and Rating Software v15.3
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Areas of Focus for “The Alamo”

Energy Cost and Features

Energy Features	ENERGY STAR V3.1	San Antonio
Ceiling w/Attic	N/A U=0.030	R-38 Blown, Attic***** U=0.026
Sealed Attic	None	
Vaulted Ceiling	None	
Above Grade Wall	N/A U=0.082	R-15***** U=0.076
Foundation Walls (Cond)	None	
Foundation Walls (Uncond)	None	
Doors	N/A U=0.170	Steel-urth w/brk U=0.187
Windows	UDRH Std U=0.400	0.53/0.35 U=0.530
Floors	N/A U=0.064	R-19***** U=0.050
Slab Floors	N/A U=0.365	Uninsulated U=0.365
Infiltration	Htg: 4.00 Clg: 4.00 ACH50	
Infiltration Measure	Blower door test	
Mechanical Ventilation	Supply Only: 69 cfm, 24.6 watts.	Exhaust Only: 69 cfm, 38.2 watts.
Interior Mass	None	
Mechanical Equipment 1	Heating: Fuel-fired air distribution, 50.1 kBtuh, 80.0 AFUE.	Heating: Fuel-fired air distribution, 64.0 kBtuh, 92.0 AFUE.
Mechanical Equipment 2	Cooling: Air conditioner, 49.5 kBtuh, 15.0 SEER.	Cooling: Air conditioner, 60.0 kBtuh, 19.0 SEER.
Mechanical Equipment 3	Water Heating: Conventional, Gas, 0.61 EF.	Water Heating: Conventional, Gas, 0.60 EF.
Programmable Thermostat	Heat=Yes; Cool=Yes	
Ducts	Uninsulated/Conditioned space	R-8.0Attic, exposed
Duct Leakage to Outside	0.00 CFM25 / CFA	0.04 CFM25 / CFA



1) Equipment Efficiency

Before: High-End AC + Furnace

- 19 SEER
- 92 AFUE

After: Mid-Range AC + Basic Furnace

- 15 SEER
- 80 AFUE

Mechanical Equipment Properties Summary			
#	Type	Htg Eff	Clg Eff
1	80AFUE Gas Furn 64k	80.0 AFUE	
2	15SEER A/C 5 ton		15.0 SEER

HERS Score

Programs	
V3.0 ENERGY...	Fails
V3.0* ENER...	Fails
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	72

Change: +8

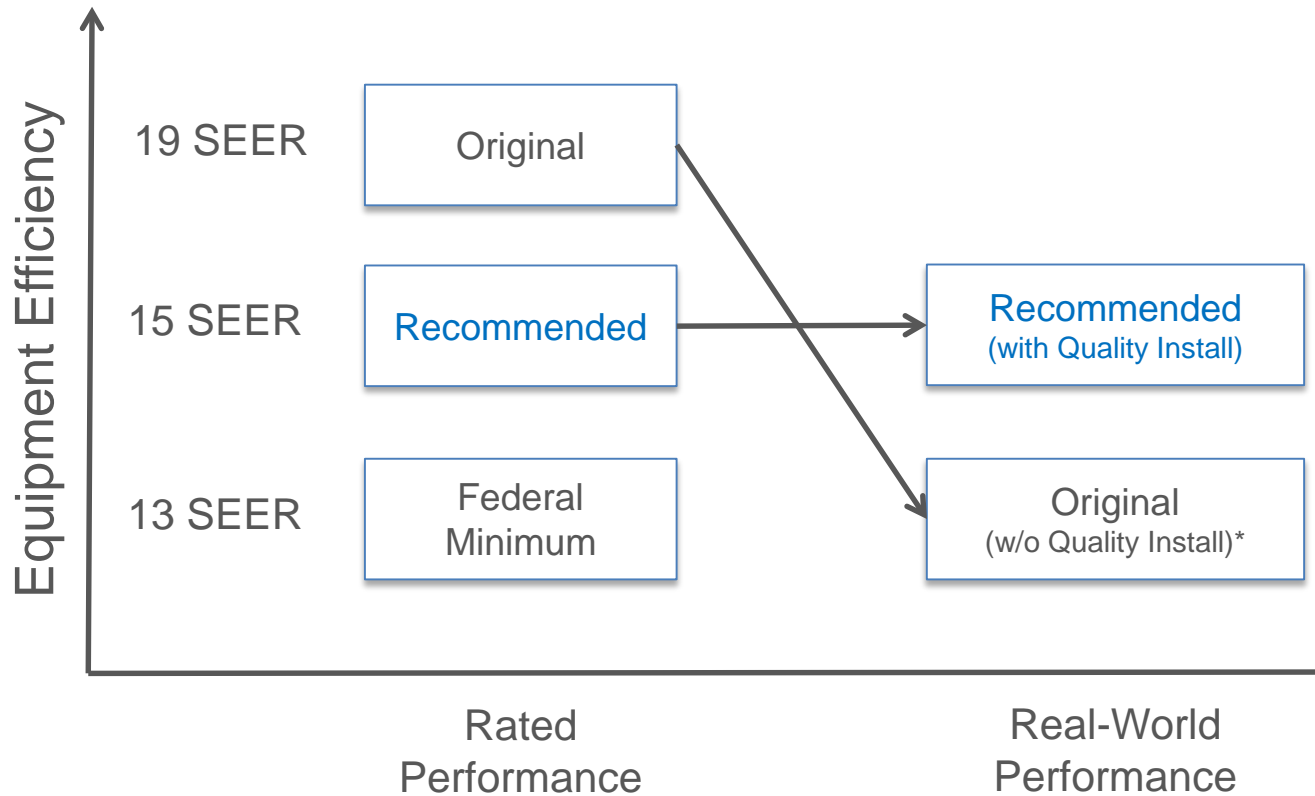
Target: 62

Cost/Savings

Measure	\$2,100 savings
Cumulative	\$2,100



1) Equipment Efficiency



*Per NIST study at:
<https://www.nist.gov/news-events/news/2014/11/underperforming-energy-efficiency-hvac-equipment-suffers-due-poor>



2) Whole-House Ventilation

Before: 36 Watt Bath Fan

Mechanical Ventilation System for IAQ	
Type:	Exhaust Only
Sensible Recovery Efficiency (%):	0.0
Total Recovery Efficiency (%):	0.0
Rate (cfm):	65
Hours/Day:	24.0
Fan watts:	36.0

After: 10 Watt Bath Fan

Fan watts:	10.0
------------	------

HERS Score

Programs	
V3.0 ENERGY...	Fails
V3.0* ENER...	Fails
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	71

Change: **-1**

Target: 62

Cost/Savings

Measure	\$50 cost
Cumulative	\$2,050



3) Lighting

Before: Not taking credit for garage/exterior

Lighting			
CFL (%):	<input type="text" value="100.0"/>	Interior Fixtures	Exterior Fixtures(%): <input type="text" value="0.0"/>
Pin-Based FL (%):	<input type="text" value="0.0"/>		Garage Fixtures(%): <input type="text" value="0.0"/>

After: 100% qualifying throughout

- Note that outdoor fixtures on a photocell also qualify

Lighting			
CFL (%):	<input type="text" value="100.0"/>	Interior Fixtures	Exterior Fixtures(%): <input type="text" value="100.0"/>
Pin-Based FL (%):	<input type="text" value="0.0"/>		Garage Fixtures(%): <input type="text" value="100.0"/>

HERS Score

Programs	
V3.0 ENERGY...	FAILS
V3.0* ENER...	FAILS
V3.1 ENERGY...	FAILS
Tax Credit	FAILS
DOE Zero Ene...	FAILS
HERS Index	70

Change: **-1**
Target: 62

Cost/Savings

Measure	\$40 cost
Cumulative	\$2,010



4) Windows

Before: U-0.53, SHGC-0.35

Type:

After: U-0.40, SHGC-0.25

Type:

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENER...	Passes
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	66

Change: **-4**

Target: 62

Cost/Savings

Measure	\$500 cost
Cumulative	\$1,510



5) Radiant Barrier

Before: No Radiant Barrier

Roof Properties (optional inputs)

Exterior Color: Clay or Concrete Roofing Tiles:

Radiant Barrier: Sub-Tile Ventilation Present:

After: Radiant Barrier Installed

Roof Properties (optional inputs)

Exterior Color: Clay or Concrete Roofing Tiles:

Radiant Barrier: Sub-Tile Ventilation Present:

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERG...	Passes
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	63

Change: **-3**
Target: 62

Cost/Savings

Measure	\$1,000 cost
Cumulative	\$510



6) Water Heater

Before: 0.60 EF Gas Tank

Mechanical Equipment Properties	
Library Type:	Water Heating
Equipment:	40 gal. 0.60EF Gas
Location:	Conditioned area

After: 0.67 EF Gas Tank

- ENERGY STAR-qualified water heater

Mechanical Equipment Properties	
Library Type:	Water Heating
Equipment:	40 gal. 0.67EF Gas
Location:	Garage or open crawl space

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERGY...	Passes
V3.1 ENERGY...	Passes
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	62

Change: **-1**

Target: 62

Cost/Savings

Measure	\$125 cost
Cumulative	\$385

House 2: “The Chesapeake”



House Characteristics:

- Built in Annapolis, MD – Climate Zone 4
- 2322 sqft., 3 bedrooms
- 3-story townhome, end unit
- HERS Index = 76
- ENERGY STAR v3.1 Target = 67

Challenges:

- 50% more window area than baseline

Let's see what we can do!



1) Wall Insulation

Before: R-3 Continuous + R-15 Batt

- ENERGY STAR only requires IECC 2009 level as a mandatory minimum (R-13)

After: R-15 Batt + advanced framing

- Meets local 2012 code via UA alternative path (better ceiling and windows)

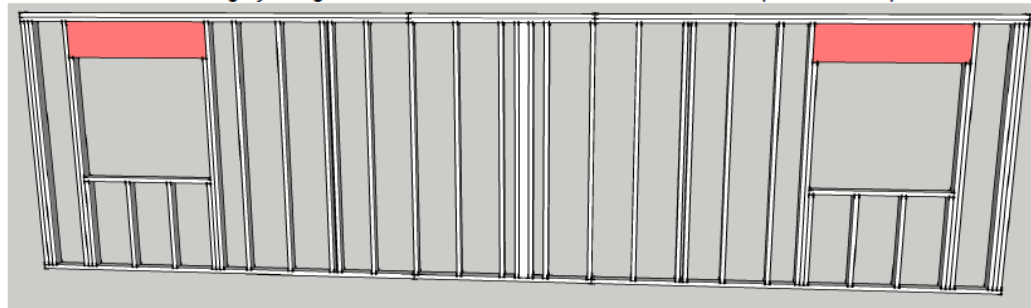




1) Wall Insulation

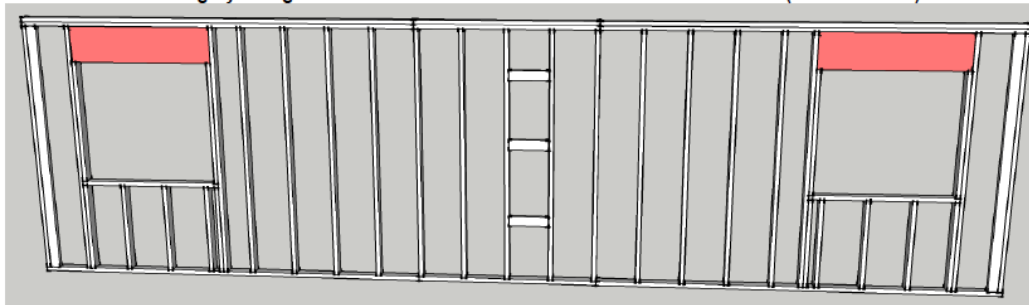
Standard Framing = 23% framing factor

30' Long by 8' High 2x4 16" OC Standard Wall with Two Windows (4'-1" x 3'-8.5")



Advanced Framing = 18% framing factor*

30' Long by 8' High 2x4 16" OC ENERGY STAR Wall with Two Windows (4'-1" x 3'-8.5")





1) Wall Insulation

Before: R-3 Continuous + R-15 Batt

- ENERGY STAR only requires IECC 2009 level as a mandatory minimum (R-13)

After: R-15 Batt + advanced framing

- Meets code via UA alternative path (better ceiling and windows)
- Framing factor = 19%

Continuous Insulation R-Value:	<input type="text" value="0.0"/>	Stud Spacing (in oc):	<input type="text" value="16.0"/>
Frame Cavity Insulation R-Value:	<input type="text" value="15.0"/>	Stud Width (in):	<input type="text" value="1.5"/>
Cavity Insulation Thickness (in):	<input type="text" value="3.5"/>	Stud Depth (in):	<input type="text" value="3.5"/>
Cavity Insulation Grade:	<input type="text" value="1"/>	Framing Factor:	<input type="text" value="0.1900"/>
Block Cavity Insulation R-Value:	<input type="text" value="0.0"/>	Use Default:	<input type="checkbox"/>

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERG...	Passes
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	77

Change: **+1**
Target: 67

Cost/Savings

Measure	\$3,200 savings
Cumulative	\$3,200



2) Lighting

Before: Not taking credit for garage/exterior

Lighting			
CFL (%):	<input type="text" value="100.0"/>	Interior Fixtures	Exterior Fixtures(%): <input type="text" value="0.0"/>
Pin-Based FL (%):	<input type="text" value="0.0"/>		Garage Fixtures(%): <input type="text" value="0.0"/>

After: 100% qualifying throughout

- Note that outdoor fixtures on a photocell also qualify

Lighting			
CFL (%):	<input type="text" value="100.0"/>	Interior Fixtures	Exterior Fixtures(%): <input type="text" value="100.0"/>
Pin-Based FL (%):	<input type="text" value="0.0"/>		Garage Fixtures(%): <input type="text" value="100.0"/>

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENER...	Passes
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	76

Change: **-1**
Target: 67

Cost/Savings

Measure	\$40 cost
Cumulative	\$3,160



3) Infiltration

Before: 5 ACH50

- After reviewing historic scores, end-units consistently performed 30% better

After: 3 ACH50

Whole House Infiltration

Measurement Type: Blower door test

Heating Season Infiltration Value: 3.00

Cooling Season Infiltration Value: 3.00

ACH @ 50 Pascals

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENER...	Passes
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	73

Change: **-3**
Target: 67

Cost/Savings

Measure	No cost
Cumulative	\$3,160



4) Whole-House Ventilation

Before: Exhaust-only bath fan

After: Upgrade to ERV

Mechanical Ventilation System for IAQ

Type:

Sensible Recovery Efficiency (%):

Total Recovery Efficiency (%):

Rate (cfm):

Hours/Day:

Fan watts: ECM Fan Motor?



HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERG...	Passes
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	68

Change: **-5**
Target: 67

Cost/Savings

Measure	\$1500 cost
Cumulative	\$1,660



5) Low-Flow Water Fixtures

Before: No credit taken for water fixtures

DHW Efficiencies

All bath faucets & showers \leq 2 gpm

All DHW pipes fully insulated \geq R-3

Plumbing Design (Enter plan view rectangular distance)

Recirculation:

Farthest fixture to DHW heater (ft):

autocalc vertical, for conditioned floors (ft): +

autocalc vertical, for uncond. bsmt (ft): +

TOTAL Pipelength for longest DHW run (ft):

After: 2 gpm bath faucets and showers

DHW Efficiencies

All bath faucets & showers \leq 2 gpm

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERGY...	Passes
V3.1 ENERGY...	Passes
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	67

Change: **-1**
Target: 67

Cost/Savings

Measure	No cost
Cumulative	\$1,660

House 3: “The Packard”



House Characteristics:

- Built in Detroit, MI – Climate Zone 5
- 2240 sqft., 3 bedrooms
- 1-story detached, conditioned basement
- HERS Index = 66
- ENERGY STAR v3.1 Target = 60

Challenges:

- High infiltration (6 ACH50 vs. 3 in reference home)

Let's go!



1) Wall Insulation

Before: Flash & Batt

Wall Type Name:	R-20 Flash + Batt*		
Wall Construction:	Standard Wood Frame		
Continuous Insulation R-Value:	3.0	Stud Spacing (in oc):	16.0
Frame Cavity Insulation R-Value:	17.0	Stud Width (in):	1.5
Cavity Insulation Thickness (in):	5.5	Stud Depth (in):	5.5

After: R-20 Batt + advanced framing

Wall Type Name:	R-20*		
Wall Construction:	Standard Wood Frame		
Continuous Insulation R-Value:	0.0	Stud Spacing (in oc):	16.0
Frame Cavity Insulation R-Value:	20.0	Stud Width (in):	1.5
Cavity Insulation Thickness (in):	5.5	Stud Depth (in):	5.5
Cavity Insulation Grade:	I	Framing Factor:	0.1900
Block Cavity Insulation R-Value:	0.0	Use Default	<input type="checkbox"/>

HERS Score

Programs	
V3.0 ENERGY...	FAILS
V3.0* ENER...	FAILS
V3.1 ENERGY...	FAILS
Tax Credit	FAILS
DOE Zero Ene...	FAILS
HERS Index	67

Change: **+1**

Target: 60

Cost/Savings

Measure	\$2,000 savings
Cumulative	\$2,000



2) Lighting

Before: Not taking credit for garage/interior

Lighting			
CFL (%):	<input type="text" value="100.0"/>	Interior Fixtures	Exterior Fixtures(%): <input type="text" value="0.0"/>
Pin-Based FL (%):	<input type="text" value="0.0"/>		Garage Fixtures(%): <input type="text" value="0.0"/>

After: 100% qualifying throughout

- Note that outdoor fixtures on a photocell also qualify

Lighting			
CFL (%):	<input type="text" value="100.0"/>	Interior Fixtures	Exterior Fixtures(%): <input type="text" value="100.0"/>
Pin-Based FL (%):	<input type="text" value="0.0"/>		Garage Fixtures(%): <input type="text" value="100.0"/>

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERG...	Fails
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	66

Change: -1
Target: 60

Cost/Savings

Measure	\$40 cost
Cumulative	\$1,960



3) Whole-House Ventilation

Before: Exhaust-only bath fan

- 52 CFM per 62.2-2010
- When infiltration is high, check 2013 rate

Air Leakage

Ventilation			ASHRAE	ASHRAE
	Mechanical	Exhaust Only	62.2-2010	62.2-2013
Sensible Recovery Eff. (%)		0.0		
Total Recovery Eff. (%)		0.0		
Rate (cfm)		52	52	36
Hours/Day		24.0	24.0	24.0
Fan Watts		9.0		
Cooling Ventilation		Natural Ventilation		

After: Lowered rate w/ infiltration credit

- 36 CFM per 62.2-2013

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENER...	Fails
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	66

Change: No change
Target: 60

Cost/Savings

Measure	No cost
Cumulative	\$1,960



4) Low-Flow Water Fixtures

Before: No credit taken for water fixtures

DHW Efficiencies

All bath faucets & showers \leq 2 gpm

All DHW pipes fully insulated \geq R-3

Plumbing Design (Enter plan view rectangular distance)

Recirculation:

Farthest fixture to DHW heater (ft):

autocalc vertical, for conditioned floors (ft): +

autocalc vertical, for uncond. bsmt (ft): +

TOTAL Pipelength for longest DHW run (ft):

After: 2 gpm bath faucets and showers

DHW Efficiencies

All bath faucets & showers \leq 2 gpm

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERG...	Fails
V3.1 ENERGY...	Fails
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	65

Change: **-1**

Target: 60

Cost/Savings

Measure	No cost
Cumulative	\$1,960



5) Water Heater

Before: 0.60 EF Gas Tank

Mechanical Equipment Properties	
Library Type:	Water Heating
Equipment:	40 gal. 0.60EF Gas
Location:	Conditioned area

After: 0.90 EF Instant Gas Water Heater

Mechanical Equipment Properties	
Library Type:	Water Heating
Equipment:	Demand-Gas 0.90EF
Location:	Conditioned area

HERS Score

Programs	
V3.0 ENERGY...	Passes
V3.0* ENERG...	Fails
V3.1 ENERGY...	Passes
Tax Credit	Fails
DOE Zero Ene...	Fails
HERS Index	60

Change: **-5**

Target: 60

Cost/Savings

Measure	\$1,500 cost
Cumulative	\$460

Summary: HERS Improvements with Dollar Savings



- **The Alamo**
 - HERS 66 \Rightarrow 62
 - Savings = \$385



- **The Chesapeake**
 - HERS 76 \Rightarrow 67
 - Savings = \$1,660



- **The Packard**
 - HERS 66 \Rightarrow 60
 - Savings = \$460

There are many ways to meet the ENERGY STAR HERS Target, but some are more cost-effective than others.



To review: How HERS Raters Help Builders

Builders want to save money while meeting customer expectations to keep up sales:

- 1. Explain cost-cutting measures.** For example, advanced framing is less expensive AND more comfortable/efficient.
- 2. Think of cost savings in terms of dollars and cents.** Trimming back on some measures is ok if you end up with a more cost-effective package.
- 3. An instantly-recognized, trusted label is a plus.** Saving money on construction materials helps, but don't forget other value-adds that come with ENERGY STAR partnership: free marketing & educational tools, program support, and brand recognition.



Wrap-Up

- You can send us your energy modeling files for personalized help modeling cost cuts that meet ENERGY STAR requirements.
- For any questions that we did not get to, please e-mail Hillary.Tipton@icf.com.
- As a reminder, RESNET will post this presentation.
- THANK YOU for attending!



The Price Premium of ENERGY STAR Certified® Homes:

A Maryland Analysis



EmPOWER Maryland Act of 2008

- Reduce overall energy consumption 15%
- Utility participation

EmPOWER Maryland (2008-2014)



Reduced consumption by **2,000,000** MWh.
This is equivalent to:



80,000 homes

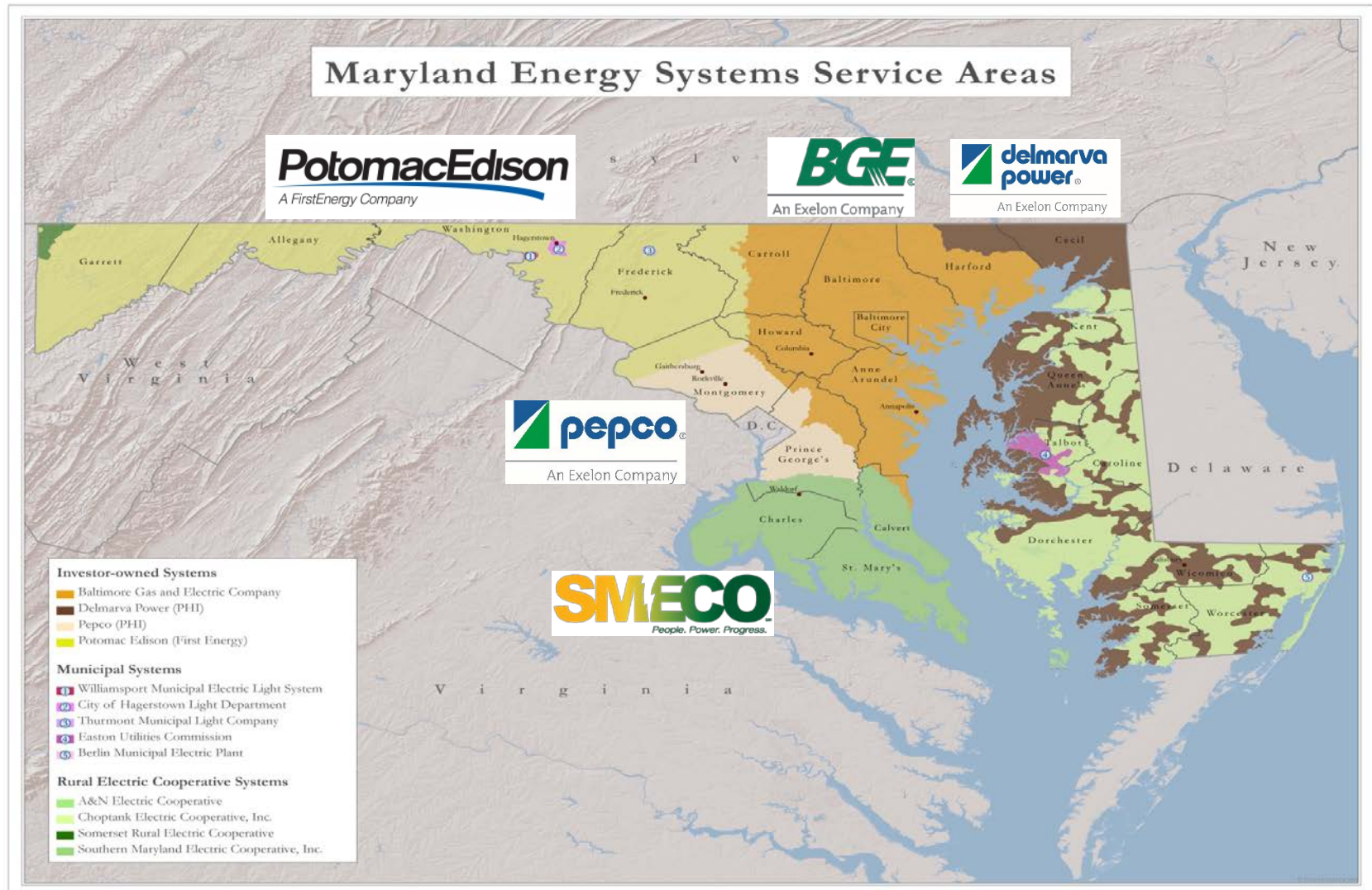


25% of Baltimore City's consumption



2 medium sized power plants

EmPOWER Maryland Utilities





Maryland ENERGY STAR New Homes Program



- 2008:
 - ENERGY STAR New Homes comprised $\approx 6\%$ of the Maryland new homes market
 - Market penetration was 42^{nd} in the nation
- Today:
 - ENERGY STAR New Homes now make up $\approx 40\%$ of new homes built in Maryland in past 3 yrs
 - Now 2^{nd} in nation for market penetration

Maryland ENERGY STAR New Homes Program Results

Program Lifetime:

- \approx 21,000 ENERGY STAR New Homes
- \$27 million in incentives
- 30,000+ MWh saved



Evolution of Program

- Program Launch:
 - Tiered incentive structure based on HERS Scores
 - Introduced 90% high efficiency lighting minimum in 2014
 - Simplified tiered structure in 2015
 - Shift away from HERS Scores to Home Type in 2015

2009-2011 ES v 2	2012-2014 ES v 3 with 2012 Code	2015	After April 1, 2015 ES v 3.1	
HERS 85-81 \$400	HERS 75-71 \$1000	HERS 70-66 \$1000	Multifamily	\$400
HERS 80-76 \$800	HERS 70-66 \$1300	HERS 65-61 \$1300	2-on-2 Condo	\$550
HERS 75- Below \$1000	HERS 65-61 \$1600	HERS 60 - Below \$1600	Townhome	\$750
			Single Family	\$1250

Program Benefits



 **ENERGY STAR® Certified Home Features**
Energy efficiency guidelines set by the U.S. Environmental Protection Agency (EPA)

COMPLETE THERMAL ENCLOSURE SYSTEM



You want your home to be comfortable no matter what room you're in or what the weather is outside. Comprehensive air sealing, properly installed insulation, and high-performance windows work together in an ENERGY STAR certified home to deliver better comfort, better durability, reduced maintenance costs, and lower monthly utility bills. During construction, ENERGY STAR builder partners must meet all of the requirements of EPA's comprehensive thermal enclosure system inspection to ensure that—

- Your new home is tightly sealed to reduce leaks and drafts; and thermal bridging across walls is minimized.
- Correct levels of insulation are selected to provide whole-house comfort.
- Insulation is installed properly to deliver the best performance.

When builders meet these rigorous requirements, you get a home with a complete thermal enclosure system—a better approach to building a better home.

SEALING

A typical home contains a half-mile of cracks and gaps in walls and around windows and doors, along with ends of holes for pipes, vents, ducts, lighting, and wiring. Sealing these openings with a comprehensive air sealing package helps to significantly reduce drafts, moisture, dust, air, pests, and noise. The best time to seal these is during construction process because access to critical areas is limited once the house is completed.

ENERGY STAR builder partners seal the holes using caulks, foams, and other techniques—paying particular attention to the areas between the conditioned (heated or cooled) and unconditioned space of your home. One great example of this is around windows, where ENERGY STAR certified homes feature caulk or foam to seal the space between the window frame and the adjacent wall framing. This is a detail that is commonly missing in many other homes and can have a real impact on your comfort and utility bills.

The energy savings from comprehensive air sealing can quickly add up when you consider all the places hot or cool

air can enter or escape from your home. Having a well-sealed home also means better air quality because dirt, pollen, pests, and moisture can't get in as easily. In addition, good sealing practices help protect your home against mold and moisture damage that can be caused by condensation.

REDUCED THERMAL BRIDGING

Walls in homes are typically built with wood studs, which support the weight of the floors and roof above, help the home stand up to wind, and generally act as the structural "bones" of the home. While these components are critical to making a durable home, they often have a very low R-value (resistance to heat flow) and create thermal "bridges"—uninsulated pathways that compromise the comfort and efficiency of the home. ENERGY STAR builder partners select one of five strategies, such as adding a continuous layer of rigid foam or minimizing excess wood studs, to minimize thermal bridging in walls.

- Marketing support
- Website listing
- Sales training
- Technical training
- QA/QC
- Research: Baseline and price premium studies

Price Premium Study

- Collaboration between the Maryland utilities to quantify the impact of ENERGY STAR Certification on home prices



- Evaluated Maryland home prices between 2010-2016
- Included sample of 2,723 ENERGY STAR homes and 13,065 non-certified homes
- Regression model used to isolate impact of ENERGY STAR Certification on home value (hedonic regression model)



Why did we conduct this study?

- Utility Perspective
 - First steps to capture non-energy benefits
- Builder and Rater Perspective
 - Concrete answer of what is ENERGY STAR Certified New Home worth
- Homeowner Perspective
 - Non-energy benefits are at times more important in driving energy efficiency program for end consumers



Methodology

Characteristics Based On:

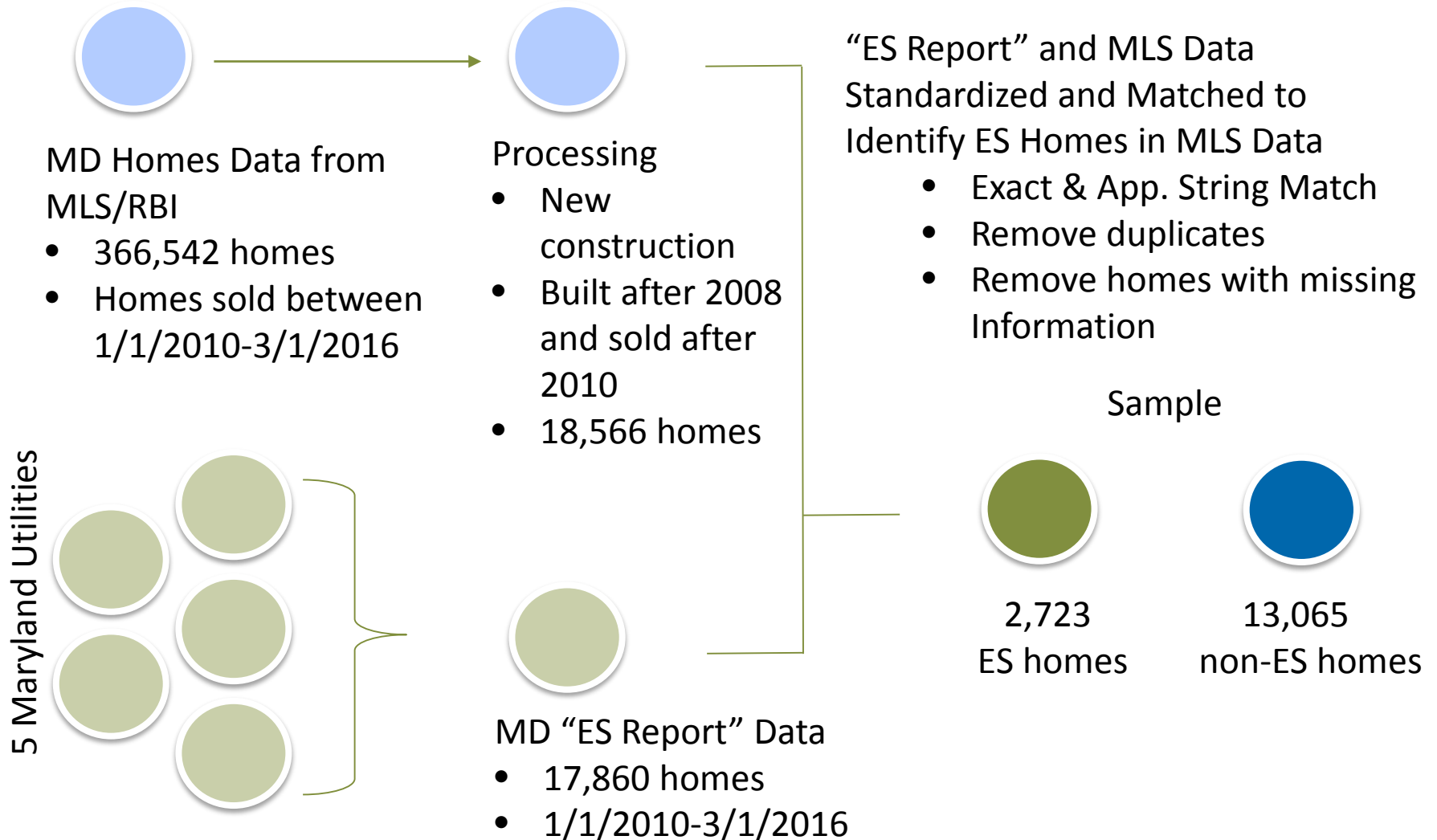
- Impact on Home Value
- Availability of Information
- Feasibility of Analysis

Some of the Home Characteristics Include:

- Location
- Home Type
- Date of Sale
- Sale Price
- Number of Levels
- Year Built
- New Construction
- Number Bedrooms, Bathrooms, Fireplaces
- Lot Size Square Footage
- Living Area Square Footage
- Basement, Attic, Swimming Pool
- Parking
- Water Oriented, View, or Access



Methodology





Exploring the Data

54% single family homes



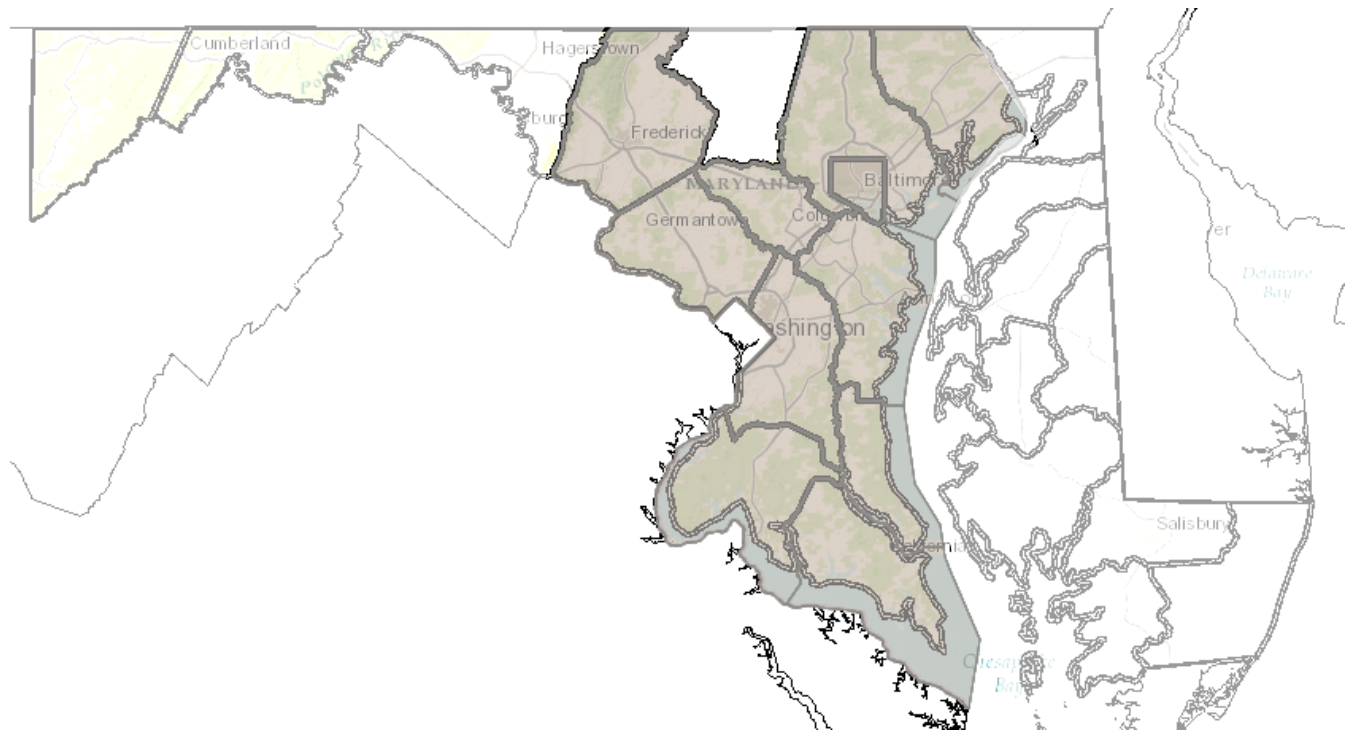
43% townhomes



Most homes (99.5%) were sold in standard sales

Exploratory Data Analysis and Missing Data

Top 10 counties with highest number of new homes accounted for 92.2% of the sample





What's in the data and what does that mean?

Large percentage of data missing for total living area (55%) and lot size (11%)

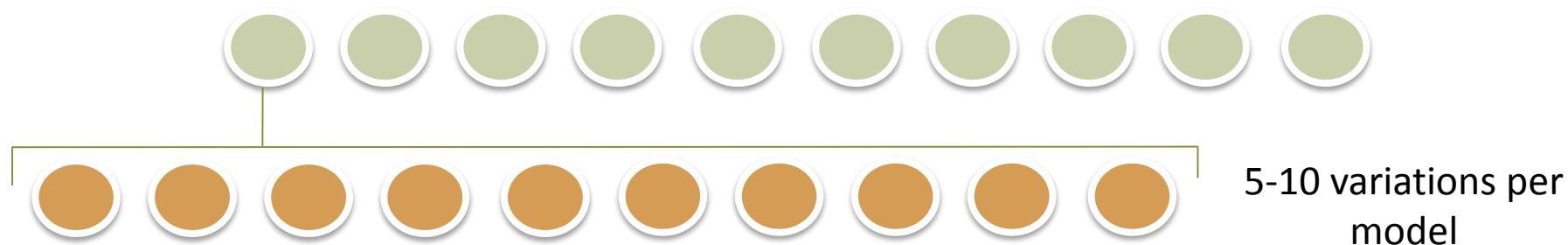
ENERGY STAR Homes and non-ENERGY STAR Homes included in the data were comparable

However, ENERGY STAR Homes sold faster than non-ENERGY STAR Homes!



Data Analysis and Model Selection

10 Models with Different Dependent Variables



- Dependent Variable: Log of sale price
- Primary Independent Variable: ENERGY STAR Certification
- Model fitted separately to each year
- Include 2,811 parameters
 - Parameters only created for terms that are statistically significant at the 5% significance level for 2+ out of 5 years

Results

Model 2G2				
Year	Estimate	StdErr	tValue (T-statistic)	Probt (P-Value)
2011	0.0575	0.0647	0.8892	0.3740
2012	0.0521	0.0166	3.1322	0.0018
2013	0.0327	0.0092	3.5451	0.0004
2014	0.0271	0.0079	3.4375	0.0006
2015	0.0210	0.0078	2.6945	0.0071
2016	0.0351	0.0364	0.9649	0.3359

- Model is a good fit and there is statistically significant price premium for ENERGY STAR New Homes for years 2012-2015 at 1% level
- Not significant for 2011 and 2016 due to insufficient data
- Price premium of 2.1-5.2% for 2012-2015



What this means:

Year	Price Premium
2012	\$24,953
2013	\$15,645
2014	\$12,978
2015	\$10,077

- \$10,077-\$24,953 price premium is attributed to ENERGY STAR New Homes certification per home
- The Maryland ENERGY STAR New Homes Program has delivered 21,000 homes since 2010: \$211,617,000 - \$524,013,000 additional value generated for builders
- Study is first step, imagine quantifying other economic/market impact related to \$211-524 million dollars (job growth, regional impact, etc)

Reception



An ENERGY STAR® New Home helps reduce energy use up to 30% on utility bills and increases **your property value by 2-5%**.



The ENERGY STAR Difference

The ENERGY STAR label on your Craftmark Home means your new home meets strict efficiency guidelines set by the Environmental Protection Agency (EPA) and is third party verified. This verification ensures your home uses less electricity to provide better comfort.

Savings and Home Value

Beyond providing increased savings on your utility bill, ENERGY STAR Certified homes offer a price premium. In a Maryland wide study based on 15,000+ homes, ENERGY STAR Certified Homes were compared to similar non-certified homes and found to sell for 2-5% more. This price premium would mean a difference of \$10,077-\$24,953 based on the average house which costs \$478,913.

CraftmarkHomes.com

Using Less Energy for More Value.

The ENERGY STAR® Difference

The ENERGY STAR label means your new home meets strict efficiency guidelines set by the Environmental Protection Agency (EPA) and is third party verified. This verification ensures your home uses less electricity to increase your utility savings and provide better comfort by:

- Reducing Leaks and Drafts**
All ENERGY STAR homes feature comprehensive air sealing, quality-installed insulation, and high performance windows and doors which help minimize warm and cold spots in the home.
- Maintaining Consistent Temperatures**
High efficiency heating and cooling systems, designed for optimal performance, ensure consistent temperatures in every room and prevents things such as the unnecessary cycling on and off of oversized systems.
- Improving Indoor Air**
A fresh-air system provides a controlled amount of outdoor air. Combined with a high performance filter which reduces dust, pollen, and allergens.
- Ensuring Better Durability**
A comprehensive water management system, including flashing, moisture barriers, and heavy duty membranes, protects roofs, walls and foundations from moisture damage.
- Providing Peace of Mind**
Trained professionals perform independent inspections and testing in the certification process, so you can sleep well knowing things were done right.

www.EastofMarketApts.com



An ENERGY STAR Certified Ryan home helps reduce energy use up to 30% on utility bills and increases **your property value by 2-5%**.



The ENERGY STAR Difference

The ENERGY STAR label means your new Ryan home meets strict efficiency guidelines set by the Environmental Protection Agency (EPA) and is third party verified. This verification ensures your home uses less electricity to provide better comfort.

Savings and Home Value

Beyond providing increased savings on your utility bill, ENERGY STAR Certified homes offer a price premium. In a Maryland wide study based on 15,000+ homes, ENERGY STAR Certified Homes were compared to similar non-certified homes and found to sell for 2-5% more. This price premium would mean a difference of \$10,077-\$24,953 based on the average house which costs \$478,913.



RyanHomes.com



Look for the ENERGY STAR label on your new home to ensure you are getting the most energy efficient home available. The ENERGY STAR label is a mark of certification by the U.S. Environmental Protection Agency (EPA). It indicates that your home meets strict energy efficiency guidelines set by the EPA. For more information on the ENERGY STAR label, visit www.energystar.gov. ©2015 Ryan Homes. All rights reserved.