



Action Lab: Utility Cost-effectiveness Tests – Tips for Success

October 27, 2016





Introduction





EPA support for utilities

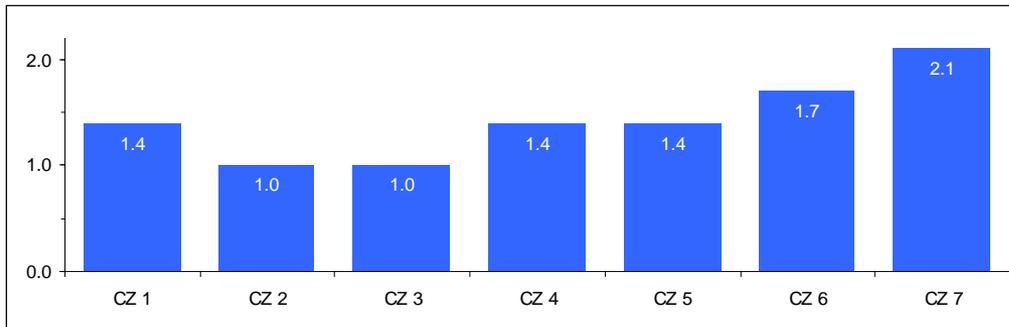


1. Capital & Programmatic Assumptions

Measure Life (Years)	29
Company Discount Rate	4.5%
Capital Recovery Factor	6.2%
Participant Discount Rate	8.5%
Societal Discount Rate	2.8%
Avoided Electric Energy Escalation Rate	1.5%
Avoided Electric Demand Escalation Rate	0.3%
Avoided Gas Energy Escalation Rate	1.1%
Net to Gross Ratio (NTGR)	90%
Program Administrator Costs (% of Incentive Cost)	75%

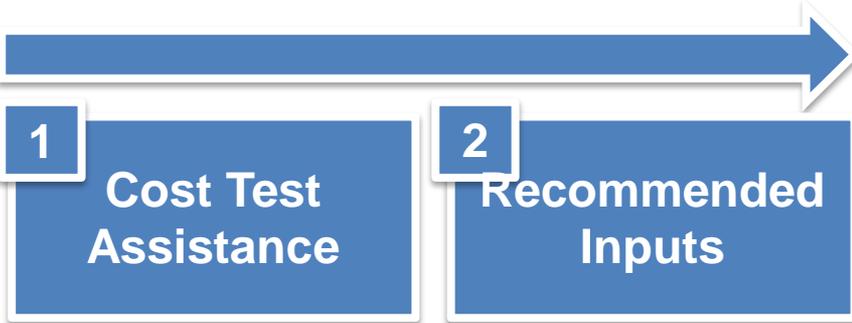
- Developed a standardized Cost-effectiveness calculator (Excel-based) to aid utilities.

	CZ 1	
	Electricity Slab	Gas Slab
	CZ 1 (E)	CZ 1 (G)
TRC Total Resource Cost	1.3	1.4
SCT Societal Cost Test	1.8	1.9
RIM Rate Impact Measure	n/a	n/a
PCT Participant Cost Test	1.3	1.4
UCT Utility Cost Test	6.3	6.2





EPA support for utilities



- Created the ENERGY STAR Cost & Savings document.
 - Lists component and total incremental costs.
- REM/Rate files available by Climate Zone.
 - Can be easily modified to represent utility service territory.
 - Available for v3 and v3.1.

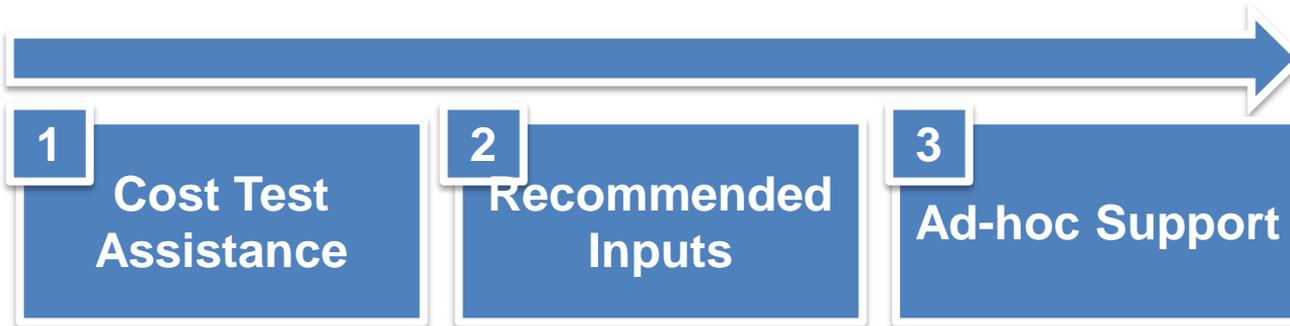
ENERGY STAR Certified Homes, Version 3
Cost & Savings Estimates

Exhibit 4: ENERGY STAR v3 Certified Home vs 2009 IECC Home - CZ 1 - Config. A - Electric

Measure	2009 IECC Baseline	ENERGY STAR v3	Inc. Cost	Unit Qty	Cost Unit	Inc. Cost
Measures Not Required by Checklists & Used to Meet ENERGY STAR HERS Index Target						
Radiant Barrier	No Radiant Barrier	Radiant Barrier	\$19.03	13	Rad. Barrier (100 ft ²)	\$240
Infiltration	7.0 ACH50	6.0 ACH50	\$0.13	2,400	CFA (ft ²)	\$312
Cooling Equipment	(See Heating Equipment)	(See Heating Equipment)	-	-	-	-
Heating Equipment	7.7 HSPF / 13 SEER	8.2 HSPF / 14.5 SEER	\$132.00	3	Tons	\$396
Water Heater	0.92 EF Electric DHW, 40 Gallons	0.93 EF Electric DHW, 40 Gallons	\$16.00	1	Water Heater	\$16
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	\$2.00	14	Lamps	\$40
Thermostat	Programmable Thermostat	Programmable Thermostat	-	-	-	-
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	\$10.00	1	Dishwasher	\$10
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	\$40.00	1	Refrigerator	\$40
Sub-Total of Measures Not Required by Checklists & Used to Meet ENERGY STAR HERS Index Target						\$1,054
Thermal Enclosure System Rater Checklist						
Ceiling Insulation	R-30	R-30	-	-	-	-
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	\$0.07	1,200	Ins. Surface Area (ft ²)	\$85
Above-Grade Wall Insulation	R-13	R-13	-	-	-	-
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	\$0.09	2,160	Ins. Surface Area (ft ²)	\$204
Foundation Insulation	No Slab Insulation	No Slab Insulation	-	-	-	-
Foundation Insulation Installation	Grade I Installation	Grade I Installation	-	-	-	-
Windows	U-value: 0.65 / SHGC: 0.30	U-value: 0.60 / SHGC: 0.27	\$0.10	360	Window Area (ft ²)	\$36
Doors	R-1.5	R-4.8	\$64.71	2	Door	\$129
Additional Checklist Measures: Reduced Lumber from Advanced Framing, Rater Verification						-\$26
Sub-Total of Thermal Enclosure System Rater Checklist						\$429
HVAC System Quality Installation Contractor Checklist						
Ventilation	None	Supply Ventilation System	\$307.80	1	Ventilation System	\$308
HVAC Equipment Right-Sizing	3.5 Tons	3.0 Tons	-\$672.00	0.5	Tons	-\$336
Additional Checklist Measures: Credential Fee, HVAC Commissioning, Contractor Completion of Checklist						\$200
Sub-Total of HVAC System QI Contractor Checklist						\$232
HVAC System Quality Installation Rater Checklist						
Duct Sealing - Total Leakage	12 CFM per 100 ft ² of CFA Total Leakage	8 CFM per 100 ft ² of CFA Total Leakage	\$0.17	576	Duct Surface Area (ft ²)	\$98
Duct Insulation	R-8 Attic, R-6 Other Uncond. Spaces	R-8 Attic, R-6 Other Uncond. Spaces	-	-	-	-
Additional Checklist Measures: Document Collection & Review, Bedroom Pressure Balancing, MERV 6 Filter, Rater Verification						\$350
Sub-Total of HVAC System QI Rater Checklist						\$448
Water Management System Builder Checklist						
Sub-Total of Water Management System Builder Checklist: Builder Completion of Checklist						\$25
Total Incremental Cost for the Home						\$2,187



EPA support for utilities



- Type of support can vary greatly between utilities:
 - Some simply need more refined savings values.
 - For others, extra guidance is needed for:
 - What's included in their specific code.
 - How to calculate location-specific savings.
 - Other program-specific nuances.



1. Cost Test Assistance

- Two types of inputs that we see:
 - Utility-level inputs (likely out of your control)
 - Program-level inputs (some are in your control)



1. Cost Test Assistance: Key utility-level inputs

- **Escalation Rate:**
 - Electric Energy
 - Electric Demand
 - Gas Energy
- **Discount Rate:**
 - Utility Discount Rate
 - Participant Discount Rate
 - Societal Discount Rate
- **Transmission & Distribution Losses**
- **Utility Reserve Margin**
- **Avoided Costs:**
 - per kWh
 - per kW / Capacity Building Costs
 - per Therm
- **Retail Rate:**
 - per kWh
 - per kW
 - per Therm
- **Economic Benefits Rate (\$/kWh)**
- **Other Benefits Rate (\$/kWh)**



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- **Other Benefits Rate (\$/kWh)**



1. Cost Test Assistance: Key program-level inputs

- Incremental cost of upgrade
- Incentive amount
- Measure life
- Program administrator costs
- Net to gross ratio

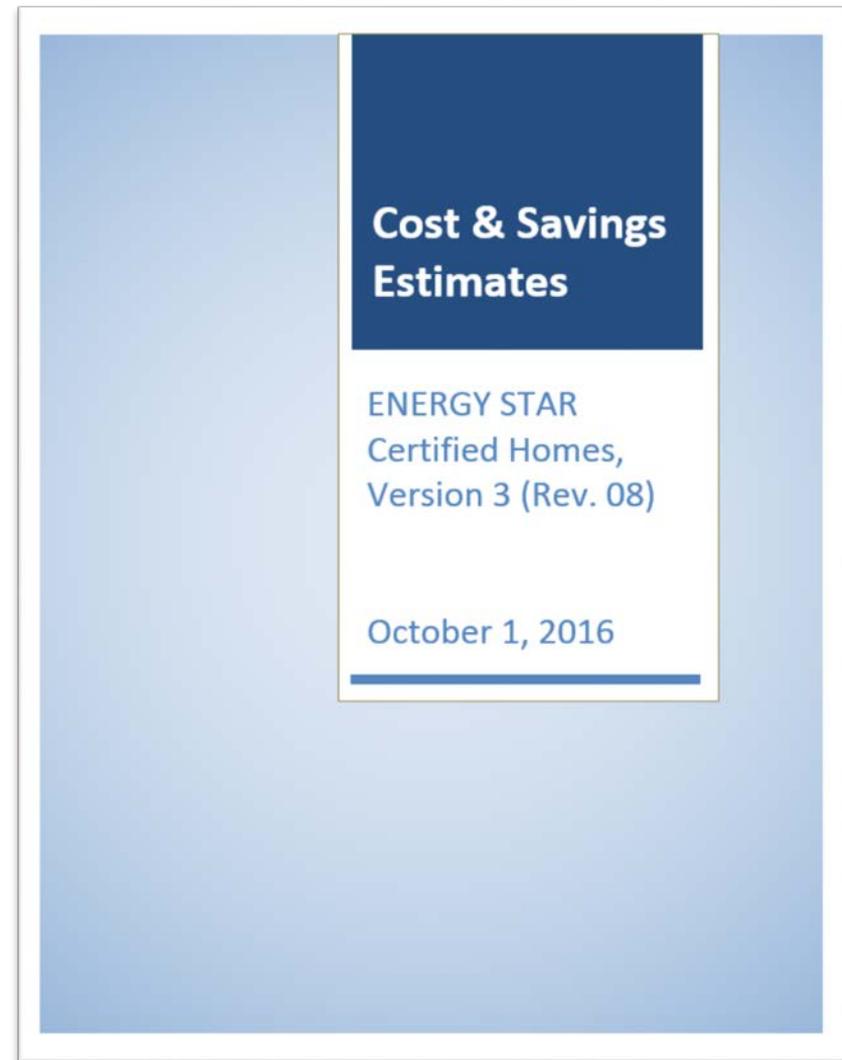


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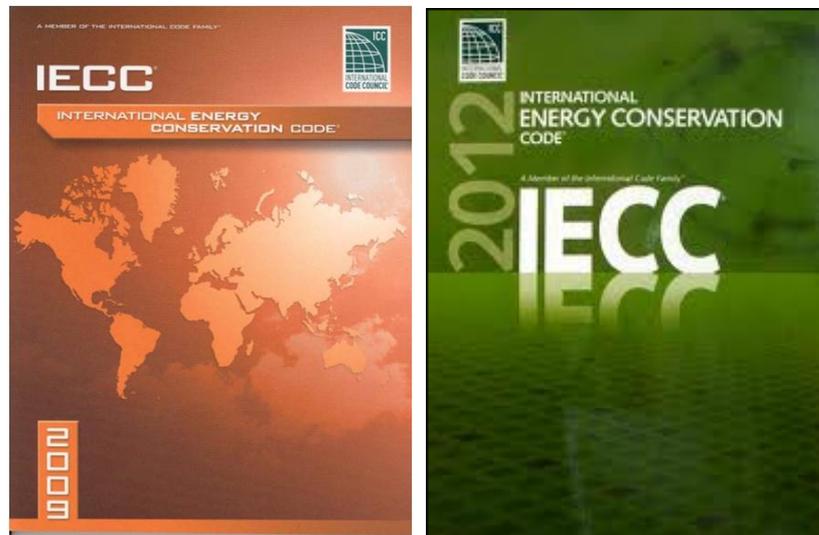
2. Recommended Inputs: Cost & Savings Documents

- Cost input assistance!



2. Recommended Inputs: Cost & Savings Documents

- The challenge: Not one right answer, lots of right answers.
- The purpose of the cost & savings document is to give new builder partners and utility sponsors one right answer that can be used as a starting point for their needs.



2. Recommended Inputs: Cost & Savings Documents

- Cost estimates to get to Version 3 from 2009 IECC

#	CZ	Location	Found.	HVAC Equipment Type	2009 IECC	ENERGY STAR Version 3						
					Annual Purchased Energy Costs	Annual Purchased Energy Costs	Annual Purchased Energy Savings	Total Upgrade Cost	Monthly Purchased Energy Savings	Monthly Mortgage Upgrade Cost	Net Cash Flow	
1	1	Miami, FL	Slab	Elec. Air-Source HP	\$1,865	\$1,571	\$294	16%	\$1,463	\$25	\$8	\$17
2	1	Miami, FL	Slab	Gas Furnace / Elec. AC	\$1,750	\$1,462	\$288	16%	\$1,517	\$24	\$8	\$16
3	2	Tampa, FL	Slab	Elec. Air-Source HP	\$1,912	\$1,636	\$276	14%	\$1,463	\$23	\$8	\$15
4	2	Tampa, FL	Slab	Gas Furnace / Elec. AC	\$1,782	\$1,496	\$285	16%	\$1,517	\$24	\$8	\$16
5	3	Fort Worth, TX	Slab	Elec. Air-Source HP	\$2,322	\$1,821	\$502	22%	\$1,696	\$42	\$9	\$33
6	3	Fort Worth, TX	Slab	Gas Furnace / Elec. AC	\$2,069	\$1,709	\$360	17%	\$1,750	\$30	\$9	\$21
7	4	St. Louis, MO	Bsmt.	Elec. Air-Source HP	\$2,823	\$2,359	\$464	16%	\$1,589	\$39	\$9	\$30
8	4	St. Louis, MO	Bsmt.	Gas Furnace / Elec. AC	\$2,215	\$1,852	\$362	16%	\$1,915	\$30	\$10	\$20
9	5	Indianapolis, IN	Bsmt.	Elec. Air-Source HP	\$3,080	\$2,347	\$732	24%	\$2,059	\$61	\$11	\$50
10	5	Indianapolis, IN	Bsmt.	Gas Furnace / Elec. AC	\$2,295	\$1,824	\$471	21%	\$2,117	\$39	\$11	\$28
11	6	Burlington, VT	Bsmt.	Elec. Air-Source HP	\$3,760	\$2,732	\$1,028	27%	\$2,155	\$86	\$12	\$74
12	6	Burlington, VT	Bsmt.	Gas Furnace / Elec. AC	\$2,438	\$1,902	\$535	22%	\$2,117	\$45	\$11	\$33
13	7	Duluth, MN	Bsmt.	Gas Furnace / Elec. AC	\$2,843	\$2,142	\$701	25%	\$2,117	\$58	\$11	\$47

2. Recommended Inputs: Cost & Savings Documents

Exhibit 8: ENERGY STAR v3 Certified Home vs 2009 IECC Home - CZ 3 - Config. A - Electric

Measure	2009 IECC Baseline	ENERGY STAR v3	Inc. Unit		Inc. Cost
			Cost	Cost Qty	
Measures Not Required by Checklists & Used to Meet ENERGY STAR HERS Index Target					
Radiant Barrier	No Radiant Barrier	Radiant Barrier	\$6.56	13	Rad. Barrier (100 ft ²) \$83
Infiltration	7.0 ACH50	5.0 ACH50	\$0.22	2,400	CFA (ft ²) \$528
Cooling Equipment	(See Heating Equipment)	(See Heating Equipment)	-	-	-
Heating Equipment	8.2 HSPF / 14 SEER	8.2 HSPF / 14.5 SEER	\$24.00	3	Tons \$72
Water Heater	0.95 EF Electric DHW, 40 Gallons	0.95 EF Electric DHW, 40 Gallons	\$0.00	1	Water Heater \$0
Lighting	50% Fluorescent Lighting	80% ENERGY STAR CFLs	\$2.80	14	Lamps \$40
Thermostat	Programmable Thermostat	Programmable Thermostat	-	-	-
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	\$10.00	1	Dishwasher \$10
Refrigerator	Standard Efficiency Refrigerator	ENERGY STAR Refrigerator	\$5.00	1	Refrigerator \$5
Sub-Total of Measures Not Required by Checklists & Used to Meet ENERGY STAR HERS Index Target					\$738
Rater Field Checklist: Thermal Enclosure System					
Ceiling Insulation	R-30	R-30	-	-	-
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	\$0.07	1,200	Ins. Surface Area (ft ²) \$89
Above-Grade Wall Insulation	R-13	R-13	-	-	-
A-G Wall Insulation Installation	Grade III Installation	Grade I Installation	\$0.10	2,118	Ins. Surface Area (ft ²) \$209
Foundation Insulation	No Slab Insulation	No Slab Insulation	-	-	-
Foundation Insulation Installation	Grade I Installation	Grade I Installation	-	-	-
Windows	U-value: 0.50 / SHGC: 0.30	U-value: 0.35 / SHGC: 0.30	\$0.27	360	Window Area (ft ²) \$97
Doors	R-2.0	R-4.8	\$42.65	2	Door \$85
Additional Checklist Measures: Reduced Lumber from Advanced Framing, Rater Verification					-\$50
Sub-Total of Thermal Enclosure System Checklist					\$431
Rater Field Checklist: HVAC System					
Duct Sealing - Total Leakage	12 CFM per 100 ft ² of CFA Total Leakage	8 CFM per 100 ft ² of CFA Total Leakage	\$0.17	576	Duct Surface Area (ft ²) \$98
Duct Insulation	R-8 Attic, R-6 Other Uncond. Spaces	R-8 Attic, R-6 Other Uncond. Spaces	-	-	-
Additional Checklist Measures: Rater Verification of Equipment Model Numbers, Static Pressure, Bedroom Pressure Balancing, Ventilation System, and Filter					\$250
Sub-Total of HVAC System Checklist					\$348
Rater Design Review Checklist					
Sub-Total of Rater Design Review Checklist: Rater Collection of HVAC Design Report, Rater Review of Design, Partnership, & Credential					\$25
HVAC Design Report					
Ventilation	None	Supply Vent. System with Exhaust Backup	\$410.52	1	Ventilation System \$411
HVAC Equipment Right-Sizing	3.5 Tons	3.0 Tons	-\$672.00	0.5	Tons -\$336
Additional Checklist Measures: Checklist Completion by Designer					\$5
Sub-Total of HVAC Design Report					\$80
HVAC Commissioning Checklist					
Sub-Total of HVAC Commissioning Checklist: Credential Cost, Refrigerant Charge Check, Air Handler Airflow Check, Completion of Checklist					\$75
Water Management System Builder Requirements					
Sub-Total of Water Management System Builder Requirements: Relative to Code, No Incremental Tasks are Required					\$0
Total Incremental Cost for the Home					\$1,696

2. Recommended Inputs: Cost & Savings Documents

- The challenge: Not one right answer, lots of right answers.



Local Amendments!

2. Recommended Inputs: Cost & Savings Documents

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Thermostat	Programmable Thermostat	Programmable Thermostat	-	-	-
Dishwasher	Standard Efficiency Dishwasher	ENERGY STAR Dishwasher	\$10.00	1	Dishwasher \$10
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Ceiling Insulation	R-30	R-30	-	-	-
Ceiling Insulation Installation	Grade II Installation	Grade I Installation	\$0.07	1,200	Ins. Surface Area (ft ²) \$89
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Foundation Insulation	No Slab Insulation	No Slab Insulation	-	-	-
Foundation Insulation Installation	Grade I Installation	Grade I Installation	-	-	-
Windows	U-value: 0.30 / SHGC: 0.30	U-value: 0.30 / SHGC: 0.30	\$0.27	300	Window Area (ft ²) \$81
Doors	R-2.0	R-4.8	\$42.65	2	Door \$85
Additional Checklist Measures: Reduced Lumber from Advanced Framing, Rater Verification					-\$50
Sub-Total of Thermal Enclosure System Checklist					\$431
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HVAC Equipment Right-Sizing	3.5 Tons	3.0 Tons	-\$672.00	0.5	Tons -\$336
Additional Checklist Measures: Checklist Completion by Designer					\$5
Sub-Total of HVAC Design Report					\$80
HVAC Commissioning Checklist					
Sub-Total of HVAC Commissioning Checklist: Credential Cost, Refrigerant Charge Check, Air Handler Airflow Check, Completion of Checklist					\$75
Water Management System Builder Requirements					
Sub-Total of Water Management System Builder Requirements: Relative to Code, No Incremental Tasks are Required					\$0
Total Incremental Cost for the Home					\$1,696



Audience Poll

- What cost are you using for ENERGY STAR Certified Homes?
 - A. Above ENERGY STAR estimates of ~\$1,500 - \$2,000
 - B. About the same as ENERGY STAR Estimates
 - C. Less than \$1,000
 - D. I don't know - I'll have to look it up!



ENERGY STAR Certified Homes

Web:

Main: www.energystar.gov/newhomespartners
Technical: www.energystar.gov/newhomesguidelines
Training: www.energystar.gov/newhomestraining
HVAC: www.energystar.gov/newhomesHVAC

Contacts:

Charlie Haack

ICF

Manager

Charlie.Haack@icfi.com

Email:

energystarhomes@energystar.gov

Social Media:



@energystarhomes



facebook.com/energystar

