DOE Zero Energy Ready Home

Savings & Cost Estimate Summary



October 2015

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DOE Zero Energy Ready Home Savings & Cost Estimate Summary October 2015

INTRODUCTION

In considering the business strategy for constructing and selling Zero Energy Ready Homes through the DOE Zero Energy Ready Home program, builders and other program partners understandably want to know about the added costs. Upgrades in insulation, air sealing, mechanical equipment and other systems will mean both energy savings and added costs above code-minimum specifications. Therefore, this document presents an analysis-based cost estimate for building to DOE Zero Energy Ready Home levels relative to:

- A 2009 International Energy Conservation Codes baseline house
- A 2012 International Energy Conservation Codes baseline house

The purpose of this analysis is to give builders, contractors, utilities, energy programs, and other stakeholders a general sense of 1) the magnitude and type of added costs, and 2) how these costs compare to the energy savings. It is critical to understand that both sets of findings are heavily dependent on several factors, including the following:

- The "real" baseline house. In this analysis, the baseline is a bare minimum IECC house (either 2009 or 2012). In many "real world" cases the baseline home will be somewhat above code.
- How a home actually complies. DOE Zero Energy Ready Home affords great flexibility to reach the required
 performance targets, and the data in this analysis are based on a very small set of design solutions. Different
 design approaches will incur different added costs.
- Assigned costs for upgrades. As described below this analysis utilizes recognized cost data sources and
 maintains a methodology consistent with a similar study for ENERGY STAR Homes V3. In actual projects the
 cost impacts for various upgrades will vary.
- Project location. Specifications and pricing for actual projects are a function of the project location.

METHODOLOGY

DOE evaluated 3-bedroom, 2,200 ft² detached single-family prototype homes in Climate Zones 3 and 5 to provide estimates for a warmer and a colder climate zone. Window area to floor area ratio was 15% with windows evenly distributed on all four sides of the home. The Climate Zone 3 models assumed a slab on grade foundation with ducts in unconditioned space for the baseline home, while the zone 5 homes were modeled with a basement foundation and ducts in conditioned space for the baseline home. In each climate zone, an all-electric prototype was modeled along with a prototype using natural gas for space and water heating.

The energy efficiency features of the baseline homes were aligned with the 2009 IECC and 2012 IECC prescriptive paths, respectively, though Grade III insulation installation was assumed for walls and Grade II insulation installation was assumed for ceilings. The assumption of degraded insulation installation reflects DOE Zero Energy Ready Home experience with typical homes built to code.

The DOE Zero Energy Ready Home prototype models were designed based on a combination of prescriptive measures drawn from the Target Home and performance-based measures which optimized cost versus performance. The DOE Zero Energy Ready Home prototype models were confirmed to meet the energy threshold of the program through the use of REM/Rate Version 14.3 software.

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A large part of the "delta" between a DOE Zero Energy Ready Home and a minimally compliant IECC home is the jump to ENERGY STAR Homes Version 3 qualification, which is a prerequisite for DOE Zero Energy Ready Home qualification. Therefore, this savings and cost estimate is designed to be consistent with a concurrent savings/cost analysis for ENERGY STAR Homes V3¹ in the following ways:

- Consistent costs for the same changes in building systems. In cases where a DOE Zero Energy Ready Home
 implements the same measure as does an ENERGY STAR Home, then the added cost for that measure is the
 same as stated in the ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary (cited in
 the footnote below and often referred to as the "ENERGY STAR Analysis" in this report). This is the case for the
 ENERGY STAR checklists.
- Consistent data sources for similar changes in measures. In cases where a DOE Zero Energy Ready Home implemented a similar measure as did the ENERGY STAR Home relative to code, then the DOE Zero Energy Ready Home adopted the same cost data source and applied it in a similar fashion. For instance, in evaluating the cost to move from an 80 AFUE furnace to a 95 AFUE furnace in the Climate Zone 5 model, the DOE analysis uses the same cost data source (National Residential Efficiency Measures Database²) as the ENERGY STAR analysis used for an 80 to 90 AFUE upgrade, and applies the cost data in a consistent manner.
- Consistent energy savings from the 4 ENERGY STAR checklists. The ENERGY STAR analysis accounts for the
 impacts of the quality-control checklists that are not currently credited in the RESNET standards (i.e., FullyAligned Air Barrier and Air Sealing Sections of the Thermal Enclosure System Rater checklist and HVAC System
 Quality Installation Contractor and Rater checklists). These serve to increase energy savings for DOE Zero
 Energy Ready Homes. The detailed adjustments are explained fully in the ENERGY STAR analysis.

For DOE Zero Energy Ready Home measures not related to ENERGY STAR qualification, such as locating ducts within conditioned space, installing renewable-ready features, or installing renewable-ready features, industry data sources were used to estimated the added costs. These costs and associated data sources are noted in the summary tables which follow. Notable assumptions include:

- The cost to install the renewable readiness features required by DOE Zero Energy Ready Home was estimated to be \$350, based on DOE experience. In many circumstances, including all project sites where the average solar radiation is less than 5 kWh/m²/day, the renewable ready checklist is not mandatory. The \$350 cost is included in all models in this study, so sites where these measures are not required will not incur this cost.
- The cost to comply with the indoor air quality provisions of the EPA Indoor airPLUS is estimated at \$1000. The
 actual cost of complying will vary based on house, site, and climate characteristics, baseline building practices,
 and numerous other factors. It should also be noted that many provisions of the Indoor airPLUS specification are
 already included within the ENERGY STAR checklists and the costs for those measures are not included within
 the \$1000 estimate.

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¹ "ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. Available online at: http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/EstimatedCostandSavings.pdf

² National Renewable Energy Laboratory, National Residential Efficiency Measures Database. Last accessed October 2013. Available online at: http://www.nrel.gov/ap/retrofits/



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In terms of economic assumptions, energy rates used in this analysis were \$0.11/kWh and \$1.06/therm of natural gas. Monthly net cash flow calculations assumed a 30-year fixed rate mortgage with a 5% interest rate.

RESULTS

Table 1 below provides a summary of the HERS Index, energy savings, incremental costs for upgrades, and net monthly cash flow for the DOE Zero Energy Ready Home models compared to a 2009 IECC baseline home. Table 2 shows the same information for DOE Zero Energy Ready Home relative to a 2012 IECC baseline.

Appendix A, which follows Tables 1 and 2, contains the detailed cost estimating models for the 2009 and 2012 baseline homes, for both the all-electric prototype and the gas-electric prototype (for a total of 8 models). These tables are arranged into 3 main sections of specifications: the Mandatory DOE Zero Energy Ready Home provisions; measures used to meet the Performance Path of compliance; and the 4 ENERGY STAR checklists. Appendix B summarizes the cost estimating data sources which were utilized.

Table 1: DOE Zero Energy Ready Home Energy & Cost Comparison to 2009 IECC Baseline

| Climate Zone | Space & Water Heating Energy Source | 09 IECC - HERS Index | ZERH - HERS Index | Monthly Energy Cost Savings for ZERH House vs. 09 IECC House (\$) | Estimated Marginal First Cost for ZERH House (\$) | Amortized Marginal First Cost for ZERH House (\$) | • |
|--------------|---|----------------------------|-------------------------|--|--|--|------|
| 3 | Electric | 88 | 57 | \$66 | \$7,291 | \$39 | \$26 |
| 3 | Gas | 86 | 54 | \$66 | \$6,868 | \$37 | \$29 |
| 5 | Electric | 78 | 53 | \$101 | \$5,590 | \$30 | \$71 |
| 5 | Gas | 72 | 49 | \$70 | \$5,083 | \$27 | \$43 |

Table 2: DOE Zero Energy Ready Home Energy & Cost Comparison to 2012 IECC Baseline

| Climate Zone | Space & Water Heating Energy Source | 12 IECC - HERS Index | ZERH - HERS Index | Monthly Energy Cost Savings for ZERH House vs. 12 IECC House (\$) | Estimated Marginal First Cost for ZERH House (\$) | Amortized Marginal First Cost for ZERH House (\$) | · · · · · · |
|--------------|---|----------------------------|-------------------------|--|--|--|-------------|
| 3 | ELECTRIC | 74 | 57 | \$37 | \$4,663 | \$25 | \$12 |
| 3 | GAS | 72 | 54 | \$37 | \$4,216 | \$23 | \$14 |
| 5 | ELECTRIC | 61 | 53 | \$40 | \$4,403 | \$24 | \$16 |
| 5 | GAS | 59 | 49 | \$33 | \$3,896 | \$21 | \$12 |

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APPENDIX A: DETAILED COST ESTIMATING TABLES FOR 8 MODELS

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| COTHADIO CUMATE TONE 2. ALL FLECTRIC 2 | OOO IFEC DASTILLIE | | | | | |
|---|--|---|--------------------|-------------------|------------------------------|-----------------------|
| SCENARIO: CLIMATE ZONE 3; ALL ELECTRIC; 2 | | | | | | |
| Baseline Home: | 2200 SF prototype, compliant with 2009 IECC (pres | | | | | |
| Design Home: | 2200 SF prototype, compliant with DOE Challenge F | iome (performance) | | | | |
| Foundation Type: | Slab on Grade | | | | | |
| City: | Ft. Worth , TX | | | | | |
| Climate Zone: | 3 | | | | | |
| Space & Water Fuel: | Electric | | | | | |
| Cost | | | | | | T |
| INCREMENTAL COSTS | | | | | | \$7,291 |
| MONTHLY PAYMENT | | | | | | \$39.14 |
| MONTHLY UTILITY SAVINGS | | | | | | \$66 |
| ASSUMED INTEREST RATE (same as V3 analys | is) | | | | | 5.00% |
| NET MONTHLY CASHFLOW | | | | | | \$26.49 |
| DOE Challenge Home Mandatory Requirement | nts: Exhibit 1 | | | | | |
| | | | | | | Marginal Cost |
| Measure | 2009 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | for Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| | | | | | Window Area | |
| Fenestration meets ENERGY STAR criteria | U=0.50; SHGC=0.30 | U=0.30; SHGC=0.27 | \$0.91 | 330 | (ft ²) | \$301 |
| | , | BEDS: K-38 Attic Assembly: 1.5" of CCSPF over K-8 | | | Buried | |
| | | Duct Work and 2" of CCSPF over R-6 Duct Work, | Ć1 140 40 | 1 | | Ć1 140 |
| | | encapsulating duct work with R-8 of blownin FG | \$1,148.40 | 1 | Encapsulated Ducts (BEDs) | \$1,148 |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R30 blown-in | added to the existing R-30. | | | | |
| Above Grade Wall Insulation (2012 IECC) | Wall: R13 | Wall: R13+5 | \$0.83 | 1531 | Sq. Ft. | \$1,271 |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | - | - | - | - |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | - | - | - | - |
| Foundation Insulation, Wall (2012 IECC) | n/a | n/a | - | - | - | - |
| Duct location | Attic (100% of supply & return) | Ducts inside conditioned space | - | - | - | - |
| | | | \$0.17 | 814 | Duct Surface | \$138 |
| Total duct leakage | Total Leakage ≤ 12 cfm per 100 SF of CFA | Total Leakage < 8 cfm per 100 SF of CFA | J0.17 | 014 | Area | ÿ130 |
| | | | 4 | _ | Structured | 4 |
| Water Efficiency | NI/A | Meets EPA Water Sense Requirements for Hot | \$193.00 | 1 | Plumbing | \$193 |
| Water Efficiency | N/A | Water Distribution | ¢10.00 | | System | 640 |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | Dishwasher | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | - | - | - | - |
| Lighting | 50% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 10.00 | Lamps | \$28 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | 2 | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home | \$1,000 |
| | | | | | Homes with | |
| Consolidated Renewable Energy Ready | | | \$350.00 | 1 | Checklists | \$350 |
| Checklist | - | - | | | Applied | |
| DOE Challenge Home PERFORMANCE PATH | | | | | | |
| Cooling | - 7.7 HCDE / 42 CEED / 44 EED ACUS EL | 0.0 HCDE / 16 CEED / 12 FED ACUED Floated Dr. 1 | \$384.00 | - | ÷ | ć760 |
| Heating | 7.7 HSPF / 13 SEER / 11 EER ASHP; Electric Backup | 9.0 HSPF / 16 SEER / 13 EER ASHP; Electric Backup | \$384.00 | 2 | Tons | \$768 |
| Radiant Barrier | None | None | - | - | - | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | | - |
| Ceiling Insulation Installation | Grade II | Grade I | \$0.07 | 2750 | Insulated | \$193 |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | _ | | Ceiling SF | _ |
| | THE TEST HOUSE AND A STATE OF THE STATE OF T | TIT III I I I I I I I I I I I I I I I I | | | Insulated AGW | 4 |
| AGW Insulation Installation | Grade III | Grade I | \$0.09 | 1531 | SF | \$138 |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| Foundation Insulation Installation | Grade II | Grade I | - | - | - | - |
| Infiltration | 7.0 ACH50 | 2.5 ACH50 | \$0.44 | 2200 | CFA | \$968 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | - | - | | - |
| Doors | R-2.0 | R-2.9 | \$2.17 | 2 | Door | \$4 |
| Water Heater | 0.92 EF electric storage; 50 gal. | 0.95 EF electric storage; 50 gal. | \$1.20 | 50 | Gallons | \$60 |
| Thermostat | Programmable | Programmable | - | - | - | - |
| Duct Sealing | See Total Duct Leakage above | See Total Duct Leakage above | _ | _ | | _ |
| Duct Insulation | supplies R-8; returns R-6 | supplies R-8; returns R-6 | _ | | | _ |
| ENERGY STAR CHECKLISTS | зарраез и од гесита и о | supplies it o, recuiris it o | | | _ | |
| ENERGY STAR CHECKESTS | Cost includes reduced lumber from Advanced Fram | ing & Rater Verification; Other associated costs listed | elsewhere includ | le the home's ins | ulation, | |
| Thermal Enclosure System - Rater | windows and door improvements. | | | | | -\$25 |
| | Cost includes Credential Fee, HVAC Commissioning, | Contractor Completion of Checklist. Other costs asso | ciated with the re | equirement are r | eflected above | \$200 |
| HVAC Sys. Quality Install Contractor | in the WHMV system and in reduced capacity for H | | accociated | the recuire | ara raflaat | 3200 |
| HVAC Sys. Quality Install Rater | | om Pressure Balancing, Rater Verification. Other cost | associated with t | ille requirement | are remected | \$350 |
| | in Duct Sealing and Duct Insulation. | | | | | |

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| SCENARIO: CLIMATE ZONE 3; GAS SPACE & W | /ATER HEATING; 2009 IECC BASELINE | | | | | |
|---|--|---|--------------------|------------------|----------------------|---|
| Baseline Home: | 2200 SF prototype, compliant with 2009 IECC (p | prescriptive) | | | | |
| Design Home: | 2200 SF prototype, compliant with DOE Challen | | | | | |
| Foundation Type: | Slab on Grade | Se nome (penormance) | | | | |
| City: | Ft. Worth , TX | | | | | |
| Climate Zone: | 3 | | | | | |
| Space & Water Fuel: | | | | | | |
| · | Gas | | | | | |
| Cost | | | | | | ¢c oco |
| INCREMENTAL COSTS | | | | | | \$6,868 |
| MONTHLY PAYMENT | | | | | | \$36.87 |
| MONTHLY UTILITY SAVINGS | | | | | | \$66 |
| ASSUMED INTEREST RATE (same as V3 analys | is) | | | | | 5.00% |
| NET MONTHLY CASHFLOW | | | | | | \$29.02 |
| DOE Challenge Home Mandatory Requireme | nts: Exhibit 1 | | | | | |
| Measure | 2009 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | MARGINAL COST FOR Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| | | | \$0.91 | 330 | Window Area | \$301 |
| Fenestration meets ENERGY STAR criteria | U=0.50; SHGC=0.30 | U=0.30; SHGC=0.27 | \$0.51 | 550 | (ft ²) | 7-02 |
| | | BEDS: K-38 ATTIC ASSEMBLY: 1.5" OT CCSPF OVER K-8 Duct Work and 2" of CCSPF over R-6 Duct Work | | | Buried | |
| | | Duct Work and 2" of CCSPF over R-6 Duct Work, | \$1,148.40 | 1 | | \$1,148 |
| Coiling (Attic Insulation (2012 IECO) | Coilings B20 blown in | encapsulating duct work with R-8 of blownin FG | . , | - | Ducts (BEDs) | , , |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R30 blown-in | added to the existing R-30. | ć0.02 | 1521 | | ć1 271 |
| Above Grade Wall Insulation (2012 IECC) | Wall: R13 | Wall: R13+5 | \$0.83 | 1531 | Sq. Ft. | \$1,271 |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | - | - | - | - |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | - | - | - | - |
| Foundation Insulation, Wall (2012 IECC) | n/a | n/a | - | - | - | - |
| Duct location | Attic (100% of supply & return) | Ducts inside conditioned space | - | - | - | - |
| Total duct leakage | Total Leakage ≤ 12 cfm per 100 SF of CFA | Total Leakage < 8 cfm per 100 SF of CFA | \$0.17 | 814 | Duct Surface Area | \$138 |
| | | | | | Structured | |
| | | Meets EPA Water Sense Requirements for Hot | \$193.00 | 1 | Plumbing | \$193 |
| Water Efficiency | N/A | Water Distribution | | | System | |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | Dishwasher | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | - | - | - | - |
| Lighting | 50% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 10.00 | Lamps | \$28 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | 2 | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home | \$1,000 |
| | | | | | Homes with | |
| Consolidated Renewable Energy Ready | | | \$350.00 | 1 | Checklists | \$350 |
| Checklist | | · | | | Applied | |
| DOE Challenge Home PERFORMANCE PATH | | | | | | |
| Cooling | 13 SEER A/C | 15 SEER A/C | \$156.00 | 2 | Tons | \$312 |
| Heating | 80 AFUE | 90 AFUE | \$6.60 | 24 | kBtu/hr | \$158 |
| Radiant Barrier | None | None | - | - | - | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| | | | \$0.07 | 2750 | Insulated | \$193 |
| Ceiling Insulation Installation | Grade II | Grade I | | | Ceiling SF | |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | _ | - | Inculated ACI | - |
| AGW Insulation Installation | Grade III | Grade I | \$0.09 | 1531 | Insulated AGW | \$138 |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | _ | | SF - | |
| Foundation Insulation Installation | Grade II | Grade I | _ | | _ | |
| Infiltration | 7.0 ACH50 | 2.5 ACH50 | \$0.44 | 2200 | CFA | \$968 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | - | - | - | - |
| Doors | R-2.0 | R-2.9 | \$2.17 | 2 | Door | \$4 |
| | | | | | | • |
| Water Heater | 0.59 EF (0.71 RE) gas storage; 50 gal. | 0.67 EF (0.76 RE) gas storage; 50 gal. | \$0.70 | 50 | Gallons | \$35 |
| Thermostat | Programmable | Programmable | - | - | - | - |
| Duct Sealing | See Total Duct Leakage above | See Total Duct Leakage above | - | - | - | - |
| Duct Insulation | supplies R-8; returns R-6 | supplies R-8; returns R-6 | - | - | - | - |
| ENERGY STAR CHECKLISTS | | | | | | |
| | | raming & Rater Verification; Other associated costs listed | elsewhere includ | e the home's in: | sulation, | -\$25 |
| Thermal Enclosure System - Rater | windows and door improvements. | ing Contractor Completion of Charlet Other contractor | ciated with the | auiroment ar- | offeeted shave | 723 |
| HVAC Sys. Quality Install Contractor | in the WHMV system and in reduced capacity for | ing, Contractor Completion of Checklist. Other costs asso | ciated with the re | quirement die f | enected above | \$200 |
| | | or HVAC Equipment. Edroom Pressure Balancing, Rater Verification. Other cost | associated with t | the requirement | are reflected | |
| HVAC Sys. Quality Install Rater | in Duct Sealing and Duct Insulation, Elimination | = | | | | \$250 |

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| SCENARIO: CLIMATE ZONE 5; ALL ELECTRIC; 2 | 009 IECC BASELINE | | | | | |
|---|---|---|--------------------|-------------------|--------------------|-------------------------------|
| Baseline Home: | 2200 SF prototype, compliant with 2009 IECC (pres | criptive) | | | | |
| Design Home: | 2200 SF prototype, compliant with DOE Challenge F | lome (performance) | | | | |
| Foundation Type: | Conditioned Basement | | | | | |
| City: | Indianapolis, IN | | | | | |
| Climate Zone: | 5 | | | | | |
| Space & Water Fuel: | Electric | | | | | |
| Cost | | | | | T | |
| INCREMENTAL COSTS | | | | | | \$5,590 |
| MONTHLY PAYMENT | | | | | | \$30.01 |
| MONTHLY UTILITY SAVINGS | | | | | | \$101 |
| ASSUMED INTEREST RATE (same as V3 analys | is) | | | | | 5.00% |
| NET MONTHLY CASHFLOW | | | | | | \$71.07 |
| DOE Challenge Home Mandatory Requirement | nts: Exhibit 1 | 1 | | | | MARGINAL |
| Measure | 2009 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | COST FOR Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| | | | \$0.69 | 330 | Window Area | \$227 |
| Fenestration meets ENERGY STAR criteria | U=0.35; SHGC=0.45 | U=0.30; SHGC=0.27 | , | | (ft²) | |
| | | | 63.50 | 92 | Top Plate Area | ćana |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R38 blown-in | Ceiling: R38 blown-in | \$3.50 | 92 | (SF) | \$322 |
| Above Grade Wall Insulation (2012 IECC) | Wall: R21 | Wall: R21 | | | _ | - |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | _ | - | - | - |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | _ | _ | _ | - |
| | 5.05. 0 | 5.05. 0 | | | Material Cost | |
| Foundation Insulation, Wall (2012 IECC) | R-10 | R-15 | \$0.22 | 1501 | (SF) | \$330 |
| rodinación insulación, van (2012 1200) | | 15 | | | , , | |
| | Ducts in conditioned space: basement and interior | | - | - | - | - |
| Duct location | walls | Ducts inside conditioned space | | | | |
| Total duct leakage | Total Leakage ≤ 12 cfm per 100 SF of CFA | Total Leakage < 8 cfm per 100 SF of CFA | \$0.19 | 1221 | Duct Surface | \$232 |
| Total duct leakage | Total Leakage 3 12 cm per 100 51 of cr A | Total Leakage v o citi per 100 51 01 CFA | | | Area Structured | |
| | | Meets EPA Water Sense Requirements for Hot | \$193.00 | 1 | Plumbing | \$193 |
| Water Efficiency | N/A | Water Distribution | | | System | |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | Dishwasher | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | - | - | - | - |
| Lighting | 50% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 10.00 | Lamps | \$28 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | 2 | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home | \$1,000 |
| Consolidated Renewable Energy Ready | | | ¢250.00 | | Homes with | 6350 |
| Checklist | = | - | \$350.00 | 1 | Checklists | \$350 |
| DOE Challenge Home PERFORMANCE PATH | * | • | | | Applied | |
| Cooling | - | - | - | - | - | - |
| Heating | 7.7 HSPF / 13 SEER / 11 EER ASHP; Electric Backup | 9.2 HSPF / 15 SEER / 13 EER ASHP; Electric Backup | \$345.84 | 2 | Tons | \$692 |
| Radiant Barrier | None | None | - | - | - | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| | | | \$0.07 | 2200 | Insulated | \$154 |
| Ceiling Insulation Installation | Grade II | Grade I | 30.07 | 2200 | Ceiling SF | Ģ134 |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | | - |
| AGW Insulation Installation | Grade III | Grade I | \$0.04 | 1531 | Insulated AGW | \$61 |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | _ | _ | SF - | - |
| | | | | | Insulated | |
| | | | \$0.15 | 1501 | Foundation | \$225 |
| Foundation Insulation Installation | Grade II | Grade I | | | Wall SF | |
| Infiltration | 7.0 ACH50 | 2.0 ACH50 | \$0.48 | 2200 | CFA | \$1,056 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | - | - | - | - |
| Doors | R-2.9 | R-3.1 | \$2.17 | 2 | Door | \$4 |
| Water Heater | 0.92 EF electric storage; 50 gal. | 0.95 EF electric storage; 50 gal. | \$1.20 | 50 | Gallons | \$60 |
| Thermostat | Programmable | Programmable | - | - | - | - |
| Duct Sealing | See Total Duct Leakage above | See Total Duct Leakage above | - | - | - | - |
| Duct Insulation | R-0 | R-0 | - | - | - | - |
| ENERGY STAR CHECKLISTS | Cost includes reduced lumber from Advanced Fram | ing & Rater Verification; Other associated costs listed | elsewhere includ | le the home's inc | sulation. | |
| Thermal Enclosure System - Rater | windows and door improvements. | | . alaconnere menut | and nomic 3 fills | | -\$100 |
| HVAC Suc Quality Install Contractor | Cost includes Credential Fee, HVAC Commissioning | Contractor Completion of Checklist. Other costs asso | ciated with the re | equirement are r | eflected above | ė ann |
| HVAC Sys. Quality Install Contractor | in the WHMV system and in reduced capacity for H | VAC Equipment. | accordated | the requirement | are reflected | \$200 |
| HVAC Sys. Quality Install Rater | in Duct Sealing and Duct Insulation. | om Pressure Balancing, Rater Verification. Other cost | . associated with | ine requirement | are renected | \$350 |
| <u> </u> | Date Scaning and Date Insulation. | | | | | |

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| SCENARIO: CLIMATE ZONE 5; GAS SPACE & WATE | R HEATING: 2009 IECC BASELINE | | | | | |
|---|---|---|----------------------|-------------------|---------------------------|---|
| Baseline Home: | 2200 SF prototype, compliant with 2009 IECC | (prescriptive) | | | | |
| Design Home: | 2200 SF prototype, compliant with DOE Challe | | | | | |
| Foundation Type: | Conditioned Basement | , | | | | |
| City: | Indianapolis, IN | | | | | |
| Climate Zone: | 5 | | | | | |
| Space & Water Fuel: | Gas | | | | | |
| Cost | | | | | | |
| INCREMENTAL COSTS | | | | | | \$5,083 |
| MONTHLY PAYMENT | | | | | | \$27.29 |
| MONTHLY UTILITY SAVINGS | | | | | | \$70 |
| ASSUMED INTEREST RATE (same as V3 analysis) | | | | | | 5.00% |
| NET MONTHLY CASHFLOW | | | | | | \$42.77 |
| DOE Challenge Home Mandatory Requirements: | Exhibit 1 | | | | | |
| Measure | 2009 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | MARGINAL COST FOR Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| | | • | | | Window Area | |
| Fenestration meets ENERGY STAR criteria | U=0.35; SHGC=0.45 | U=0.30; SHGC=0.27 | \$0.69 | 330 | (ft²) | \$227 |
| elestration meets energy STAR Criteria | 0-0.33, 31100-0.43 | 0-0.30, 311GC-0.27 | | | , , | |
| | | | \$3.50 | 92 | Top Plate Area | \$322 |
| | | | \$3.50 | 92 | (SF) | \$322 |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R38 blown-in | Ceiling: R38 blown-in | | | | |
| Above Grade Wall Insulation (2012 IECC) | Wall: R21 | Wall: R21 | - | - | - | - |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | - | - | - | - |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | - | | - Matarial Cost | - |
| Foundation Inculation, Wall (2012 IECC) | R-10 | R-15 | \$0.22 | 1501 | Material Cost (SF) | \$330 |
| Foundation Insulation, Wall (2012 IECC) Duct location | walls | Ducts inside conditioned space | | | (3F) | |
| Duct location | walls | bucts inside conditioned space | 1 | _ | Duct Surface | |
| Total duct leakage | Total Leakage ≤ 12 cfm per 100 SF of CFA | Total Leakage < 8 cfm per 100 SF of CFA | \$0.19 | 1221 | Area Structured | \$232 |
| | | Meets EPA Water Sense Requirements for Hot | \$193.00 | 1 | Plumbing | \$193 |
| Water Efficiency | N/A | Water Distribution | | | System | |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | Dishwasher | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | - | - | | - |
| Lighting | 50% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 13.00 | Lamps | \$36 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | 2 | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home Homes with | \$1,000 |
| | | | \$350.00 | 1 | | \$350 |
| Consolidated Renewable Energy Ready Checklist | - | - | \$330.00 | - | Applied | Ų330 |
| DOE Challenge Home PERFORMANCE PATH | | | • | | | |
| Cooling | 13 SEER | 13 SEER | - | - | - | - |
| Heating | 80 AFUE | 95 AFUE | \$7.17 | 42 | kBtu/hr | \$301 |
| Radiant Barrier | None | None | - | - | - | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| | | | \$0.07 | 2200 | Insulated | \$154 |
| Ceiling Insulation Installation | Grade II | Grade I | | | Ceiling SF | |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | 1 | - | Innulated Action | - |
| AGW Insulation Installation | Grade III | Grade I | \$0.04 | 1531 | Insulated AGW SF | \$61 |
| NOW Insulation installation | Grade III | Grade i | | | 31 | |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| | | | | | Insulated | |
| Foundation Insulation Installation | Grade II | Grade I | \$0.15 | 1501 | Foundation | \$225 |
| | | | ćn 40 | 2200 | Wall SF CFA | \$1 nec |
| Infiltration | 7.0 ACH50 | 2.0 ACH50 | \$0.48 | 2200 | CFA | \$1,056 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | 63.47 | - | Da | - ć 4 |
| Doors Water Heater | R-2.9 | R-3.1 | \$2.17 \$0.70 | 2 50 | Door Gallons | \$4 \$35 |
| | 0.59 EF (0.71 RE) gas storage; 50 gal. | 0.67 EF (0.76 RE) gas storage; 50 gal. | \$0.70 | 30 | Gallotis | 222 |
| Thermostat Duct Sealing | Programmable See Total Duct Leakage above | Programmable See Total Duct Leakage above | | - | - | - |
| Duct Insulation | R-0 | R-0 | | | | |
| ENERGY STAR CHECKLISTS | | | | | | |
| | Cost includes reduced lumber from Advanced l | Framing & Rater Verification; Other associated costs liste | ed elsewhere includ | le the home's in: | sulation, | 4 |
| Thermal Enclosure System - Rater | windows and door improvements. | | | | | -\$100 |
| HVAC Sys. Quality Install Contractor | | ning, Contractor Completion of Checklist. Other costs ass | sociated with the re | equirement are r | eflected above | \$200 |
| | in the WHMV system and in reduced capacity Cost includes Document Collection & Review, E | for HVAC Equipment. Bedroom Pressure Balancing, Rater Verification. Other co | st associated with | the requirement | are reflected | |
| HVAC Sys. Quality Install Rater | in Duct Sealing and Duct Insulation, Elimination | =- | | | | \$250 |

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| SCENARIO: CLIMATE ZONE 3; ALL ELECTRIC; 2 | 2012 IECC BASELINE | | | | | |
|---|--|---|--------------------|-----------------|-----------------------------------|-------------------------------|
| Baseline Home: | 2200 SF prototype, compliant with 2012 IECC (pres | crintive) | | | | |
| Design Home: | 2200 SF prototype, compliant with DOE Challenge H | | | | | |
| Foundation Type: | Slab on Grade | ionic (periormance) | | | | |
| City: | Ft. Worth , TX | | | | | |
| Climate Zone: | 3 | | | | | |
| Space & Water Fuel: | Electric | | | | | |
| Cost | Electric | • | | | | |
| INCREMENTAL COSTS | | | | | | \$4,663 |
| MONTHLY PAYMENT | | | | | | \$25.03 |
| MONTHLY UTILITY SAVINGS | | | | | | \$37 |
| ASSUMED INTEREST RATE (same as V3 analys | sis) | | | | | 5.00% |
| NET MONTHLY CASHFLOW | · <i>1</i> | | | | | \$12.44 |
| DOE Challenge Home Mandatory Requireme | nts: Exhibit 1 | | | | | · |
| , , | | | | | | MARGINAL |
| Measure | 2012 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | COST FOR Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | | - |
| Fenestration meets ENERGY STAR criteria | U=0.35; SHGC=0.25 | U=0.30; SHGC=0.27 | \$0.63 | 330 | Window Area (ft ²) | \$208 |
| | | BEDs: R-38 Attic Assembly: 1.5" of CCSPF | | | Buried | |
| | | encapsulating supply side and 2" of CCSPF on | \$708.40 | 1 | Encapsulated | \$708 |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R38 blown-in | return side. | | | Ducts (BEDs) | |
| Above Grade Wall Insulation (2012 IECC) | Wall: R13+5 | Wall: R13+5 | - | | - | - |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | - | - | - | - |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | - | | - | - |
| Foundation Insulation, Wall (2012 IECC) | n/a | n/a | - | - | - | - |
| Duct location | Attic (100% of supply & return) | Ducts inside conditioned space | - | | - | |
| | Total Leakage ≤ 4 cfm per 100 SF of CFA (Not | Total Leakage < 8 cfm per 100 SF of CFA (Met via | | | | |
| Total duct leakage | applicable-ducts are in conditoned space) Assume | encapsulated duct work, see above) | - | - | - | - |
| | | | | | Structured | |
| | | Meets EPA Water Sense Requirements for Hot | \$193.00 | 1 | Plumbing | \$193 |
| Water Efficiency | N/A | Water Distribution | | | System | |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | - | - | - | - |
| Lighting | 75% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 10.00 | Lamps | \$28 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | 2 | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home | \$1,000 |
| | | | | | Homes with | |
| Consolidated Renewable Energy Ready | | | \$350.00 | 1 | Checklists | \$350 |
| Checklist | | - | | | Applied | |
| DOE Challenge Home PERFORMANCE PATH Cooling | | | | | _ | |
| Heating | 7.7 HSPF / 13 SEER / 11 EER ASHP; Electric Backup | 9.0 HSPF / 16 SEER / 13 EER ASHP; Electric Backup | \$384.00 | 2 | Tons | \$768 |
| Radiant Barrier | None | None | , 50 mos | - | | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | _ | | _ | |
| ceiling insulation | See 2012 leed insulation above | See 2012 feet institution above | | | Insulated | |
| Ceiling Insulation Installation | Grade II | Grade I | \$0.07 | 2750 | Ceiling SF | \$193 |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| | | | \$0.09 | 1531 | Insulated AGW | \$138 |
| AGW Insulation Installation | Grade III | Grade I | Ç0.05 | 1331 | SF | 7130 |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| Foundation Insulation Installation | Grade II | Grade I | - | - | - | - |
| Infiltration | 3.0 ACH50 | 2.5 ACH50 | \$0.13 | 2200 | CFA | \$286 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | - | - | - | - |
| Doors | R-2.9 | R-2.9 | - | - | - | - |
| Water Heater | 0.92 EF electric storage; 50 gal. | 0.95 EF electric storage; 50 gal. | \$1.20 | 50 | Gallon | \$60 |
| Thermostat | Programmable | Programmable | - | - | - | - |
| Duct Sealing | See Total Duct Leakage above | See Total Duct Leakage above | - | - | - | - |
| Duct Insulation | supplies R-8; returns R-6 | supplies R-8; returns R-6 | - | - | - | - |
| ENERGY STAR CHECKLISTS | Cost includes reduced lumber from Advan | ing 9 Pater Varification, Others and a series | alsouthors in a | o tho ho '- ' | culation | |
| Thermal Enclosure System - Rater | | ing & Rater Verification; Other associated costs listed | eisewnere includ | e the nome's in | sulation, | -\$25 |
| | windows and door improvements. Cost includes Credential Fee. HVAC Commissioning. | , Contractor Completion of Checklist. Other costs asso | ciated with the re | quirement are | reflected above | |
| HVAC Sys. Quality Install Contractor | in the WHMV system and in reduced capacity for H | • | mar and the | , | | \$200 |
| HVAC Svc. Quality Install Pater | Cost includes Document Collection & Review, Bedro | nom Pressure Balancing, Rater Verification. Other cost | associated with t | the requirement | t are reflected | ¢2F0 |
| HVAC Sys. Quality Install Rater | in Duct Sealing and Duct Insulation. | | | | | \$350 |
| · | | | | | | |

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| COENIADIO, CUBARTE ZONE 2, CAS SDACE 9 M | MATER HEATING, 2012 HEAT PASSIBLE | | | | | |
|---|--|---|---------------------|------------------|---------------------------|-------------------------------|
| SCENARIO: CLIMATE ZONE 3; GAS SPACE & W Baseline Home: | 2200 SF prototype, compliant with 2012 IECC (pres | crintive) | | | | |
| Design Home: | 2200 SF prototype, compliant with 2012 IEEE (pres 2200 SF prototype, compliant with DOE Challenge F | | | | | |
| Foundation Type: | Slab on Grade | nome (periormance) | | | | |
| City: | Ft. Worth , TX | | | | | |
| Climate Zone: | 3 | | | | | |
| Space & Water Fuel: | Gas | | | | | |
| Cost | | | | | | |
| INCREMENTAL COSTS | | | | | | \$4,216 |
| MONTHLY PAYMENT | | | | | | \$22.63 |
| MONTHLY UTILITY SAVINGS | | | | | | \$37 |
| ASSUMED INTEREST RATE (same as V3 analys | is) | | | | | 5.00% |
| NET MONTHLY CASHFLOW | | | | | | \$13.95 |
| DOE Challenge Home Mandatory Requirement | nts: Exhibit 1 | | · | · | | |
| | | | | | | MARGINAL |
| Measure | 2012 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | COST FOR Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| | | | 40.50 | 222 | Window Area | 4200 |
| Fenestration meets ENERGY STAR criteria | U=0.35; SHGC=0.25 | U=0.30; SHGC=0.27 | \$0.63 | 330 | (ft ²) | \$208 |
| | • | | | | Buried | |
| | | BEDs: R-38 Attic Assembly: 1.5" of CCSPF | \$708.40 | 1 | Encapsulated | \$708 |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R38 blown-in | encapsulating supply side and 2" of CCSPF on return side. | | - | Ducts (BEDs) | |
| Above Grade Wall Insulation (2012 IECC) | Wall: R13+5 | Wall: R13+5 | | | . " | _ |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | | | | |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | _ | | | |
| Foundation Insulation, Wall (2012 IECC) | n/a | n/a | | | | |
| Duct location | Attic (100% of supply & return) | Ducts inside conditioned space | _ | | | |
| Duct location | Total Leakage ≤ 4 cfm per 100 SF of CFA (Not | Total Leakage < 8 cfm per 100 SF of CFA (Met via | | | | |
| Total duct leakage | applicable-ducts are in conditoned space) Assume | encapsulated duct work, see above) | - | - | - | - |
| | | | | | Structured | |
| | | Meets EPA Water Sense Requirements for Hot | \$193.00 | 1 | Plumbing | \$193 |
| Water Efficiency | N/A | Water Distribution | 440.00 | | System | 440 |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | Dishwasher | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | - ć2.00 | - | | - |
| Lighting | 75% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 10.00 | Lamps | \$28 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 2 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home Homes with | \$1,000 |
| Consolidated Renewable Energy Ready | | | \$350.00 | 1 | Checklists | \$350 |
| Checklist | = | - | | | Applied | |
| DOE Challenge Home PERFORMANCE PATH | | | - | · | | |
| Cooling | 13 SEER A/C | 15 SEER A/C | \$144.00 | 2 | Tons | \$288 |
| Heating | 80 AFUE | 90 AFUE | \$6.60 | 24 | kBtu/hr | \$158 |
| Radiant Barrier | None | None | - | - | - | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| Coiling Insulation Installation | Crade II | Crada | \$0.07 | 2750 | Insulated | \$193 |
| Ceiling Insulation Installation | Grade II | Grade I | | | Ceiling SF | |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | _ | - | - Insulated AGW | - |
| AGW Insulation Installation | Grade III | Grade I | \$0.09 | 1531 | SF | \$138 |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| Foundation Insulation Installation | Grade II | Grade I | - | - | - | - |
| Infiltration | 3.0 ACH50 | 2.5 ACH50 | \$0.13 | 2200 | CFA | \$286 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | - | | - | - |
| Doors | R-2.9 | R-2.9 | - | - | - | - |
| Water Heater | 0.59 EF (0.71 RE) gas storage; 50 gal. | 0.67 EF (0.76 RE) gas storage; 50 gal. | \$0.70 | 50 | Gallons | \$35 |
| Thermostat | Programmable | Programmable | - | - | - | - |
| Duct Sealing | See Total Duct Leakage above | See Total Duct Leakage above | - | | - | - |
| Duct Insulation | supplies R-8; returns R-6 | supplies R-8; returns R-6 | _ | - | - | - |
| ENERGY STAR CHECKLISTS | | | | | | |
| Thermal Enclosure System - Rater | | ing & Rater Verification; Other associated costs listed | d elsewhere includ | e the home's ins | ulation, | -\$25 |
| | windows and door improvements. Cost includes Credential Fee, HVAC Commissioning. | , Contractor Completion of Checklist. Other costs asso | ociated with the re | guirement are n | eflected above | |
| HVAC Sys. Quality Install Contractor | in the WHMV system and in reduced capacity for H | VAC Equipment. | | | | \$200 |
| HVAC Sys. Quality Install Rater | Cost includes Document Collection & Review, Bedro | oom Pressure Balancing, Rater Verification. Other cos | t associated with t | the requirement | are reflected | \$250 |
| nivac bys. Quanty install Natel | in Duct Sealing and Duct Insulation, Elimination of B | 3-Vent | | | | ب <u>د</u> عر |

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| SCENARIO: CLIMATE ZONE 5; ALL ELECTRIC; 2 | | antination) | | | | |
|---|---|--|--------------------|------------------|----------------------------------|-------------------------------|
| Baseline Home: | 2200 SF prototype, compliant with 2012 IECC (pres | | | | | |
| Design Home: | 2200 SF prototype, compliant with DOE Challenge H | nome (performance) | | | | |
| Foundation Type: | Conditioned Basement | | | | | |
| City: | Indianapolis, IN | | | | | |
| Climate Zone: | | | | | | |
| Space & Water Fuel: | Electric | | | | | |
| LINCREMENTAL COSTS | | | | | | ¢4.402 |
| INCREMENTAL COSTS | | | | | | \$4,403 \$23.64 |
| MONTHLY LITHEY SAVINGS | | | | | | \$40 |
| MONTHLY UTILITY SAVINGS | 4-3 | | | | | |
| ASSUMED INTEREST RATE (same as V3 analys NET MONTHLY CASHFLOW | is) | | | | | 5.00% \$15.99 |
| DOE Challenge Home Mandatory Requireme | nts: Evhihit 1 | | | | | Ş13.33 |
| DOE Chanenge Home Manuatory Requireme | III.S. EXHIBIT I | | | | | MARGINAL |
| Measure | 2012 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | COST FOR Challenge Home |
| Home is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| Fenestration meets ENERGY STAR criteria | U=0.32; SHGC=0.45 | U=0.30; SHGC=0.27 | \$0.44 | 330 | Window Area (ft²) | \$144 |
| | | | \$3.50 | 92 | Top Plate Area (SF) | \$322 |
| Ceiling/Attic Insulation (2012 IECC) | Ceiling: R38 blown-in | Ceiling: R38 blown-in | | | | |
| Above Grade Wall Insulation (2012 IECC) | Wall: R21 | Wall: R21 | - | - | - | - |
| Floor Insulation (2012 IECC) | Floor: n/a | Floor: n/a | - | - | - | - |
| Foundation Insulation, Slab (2012 IECC) | Slab: 0 | Slab: 0 | - | - | - | - |
| Foundation Insulation, Wall (2012 IECC) | R-15 | R-15 | - | - | - | - |
| Duct location | walls | Ducts inside conditioned space | - | - | - | - |
| Total duct leakage | Total Leakage ≤ 4 cfm per 100 SF of CFA (Not applicable-ducts are in conditoned space) Assume | Total Leakage < 8 cfm per 100 SF of CFA | \$0.19 | 1221 | Duct Surface Area | \$232 |
| Water Efficiency | N/A | Meets EPA Water Sense Requirements for Hot Water Distribution | \$193.00 | 1 | Structured Plumbing System | \$193 |
| Dishwasher | Standard Efficiency Dishwasher | ENERGY STAR Dishwasher | \$10.00 | 1 | Dishwasher | \$10 |
| Refrigerator | Standard Efficiency Refrigerator | ENERGY STAR Refrigerator | \$40.00 | 1 | Refrigerator | \$40 |
| Clothes Washer | Not Provided by Builder | Not Provided by Builder | | _ | - | - |
| Lighting | 75% of lighting is high efficacy | 80% of lighting is high efficacy | \$2.80 | 10.00 | Lamps | \$28 |
| Bath Fans (WHMV) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan w/controller | \$94.00 | 1 | Bath Fan | \$94 |
| Bath Fan (Local Exhaust) | Standard Efficiency Bath Fans | ENERGY STAR Bath Fan | \$31.00 | 2 | Bath Fan | \$62 |
| EPA Indoor airPLUS Verification Checklist | - | Comply with EPA Indoor airPLUS | \$1,000.00 | 1 | IAPlus Home | \$1,000 |
| Consolidated Renewable Energy Ready | | Comply with EFA indoor all FEO3 | \$350.00 | 1 | Homes with | \$350 |
| Checklist | - | - | 3330.00 | 1 | Checklists Applied | 2220 |
| DOE Challenge Home PERFORMANCE PATH | | | | | Annieur | |
| Cooling | - | - | - | - | - | - |
| Heating | 7.7 HSPF / 13 SEER / 11 EER ASHP; Electric Backup | 9.2 HSPF / 15 SEER / 13 EER ASHP; Electric Backup | \$345.84 | 2 | Tons | \$692 |
| Radiant Barrier | None | None | - | - | - | - |
| Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - Inculated | - |
| Ceiling Insulation Installation | Grade II | Grade I | \$0.07 | 2200 | Insulated Ceiling SF | \$154 |
| AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | | - Centile 3F | - |
| | | | \$0.04 | 1531 | Insulated AGW | \$61 |
| AGW Insulation Installation | Grade III | Grade I | \$0.04 | 1331 | SF | |
| Foundation Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | | - |
| Foundation Insulation Installation | Grade II | Grade I | \$0.15 | 1501 | Insulated | \$225 |
| Infiltration | 3.0 ACH50 | 2.0 ACH50 | \$0.13 | 2200 | Foundation CFA | \$286 |
| Windows | see Energy Star fenestration above | see Energy Star fenestration above | | - | 5.7 | - |
| Doors | R-3.1 | R-3.1 | | | | - |
| Water Heater | 0.92 EF electric storage; 50 gal. | 0.95 EF electric storage; 50 gal. | \$1.20 | 50 | Gallons | \$60 |
| Thermostat | Programmable | Programmable | - | - | | - |
| Duct Sealing | See Total Duct Leakage above | See Total Duct Leakage above | _ | | | |
| Duct Insulation | R-0 | R-0 | | | | |
| ENERGY STAR CHECKLISTS | _ | ···• | | | | |
| Thermal Enclosure System - Rater | Cost includes reduced lumber from Advanced Fram windows and door improvements. | ing & Rater Verification; Other associated costs listed | elsewhere includ | e the home's ins | sulation, | -\$100 |
| HVAC Sys. Quality Install Contractor | | , Contractor Completion of Checklist. Other costs asso VAC Equipment. | ciated with the re | quirement are r | eflected above | \$200 |
| HVAC Sys. Quality Install Rater | | oom Pressure Balancing, Rater Verification. Other cost | associated with t | he requirement | are reflected | \$350 |
| | | | | | | |

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| SEASONED INTEREST RATE (same as of an analysis) SEASONED INTEREST RATE (same as of an analys | SCENARIO CUINATE ZONE E CAS SPACE & U | WATER LIFATING, 2012 IFCC PASSURE | | | | | |
|---|---|---|--|---------------------|------------------|--------------------|-------------------------------|
| Section | · · · · · · · · · · · · · · · · · · · | | crintival | | | | |
| Conditioned December Conditioned Section | | | | | | | |
| Mainted Enterlie 5 | = | | Home (performance) | | | | |
| Sept | | | | | | | |
| MICHAELINET COSTS | | | | | | | |
| MORTHAN PARTMENT | | | | | | | |
| SIXEMENTATION COSTS MONTHLY PAYMENT MONTHLY PAYMENT MESSAGE RESIDENCE STARK 93 callelized N/A 2012 RECC Buseline DOE Chailenge Nemeripre. 03) UNIT COST What Costs Message DOE Chailenge Nemeripre. 03) UNIT COST What Costs Message DOE Chailenge Nemeripre. 03) UNIT COST What Costs Message DOE Chailenge Nemeripre. 03) UNIT COST What Costs DOE Chailenge Nemeripre. 03) UNIT COST What Costs Message DOE Chailenge Nemeripre. 03) UNIT COST UNIT COST What Costs DOE Chailenge Nemeripre. 03) What Costs Message DOE Chailenge Nemeripre. 03) UNIT COST UNIT COST What Costs What Costs DOE Chailenge Nemeripre. 03) UNIT COST UNIT COST What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs What Costs DOE Chailenge Nemeripre. 03) What Costs What Costs DOE Co | · | Gas | | | | | |
| SUMMENTERST FAIT (some as Value) SUMMENTERST FA | | | | - | | | ¢2.00¢ |
| SMOTHER UTILITY SAME TO SERVICE Specifies **PATRICIPATE Cost Holder **Measure*** **POST Confidence Mandatory Requirements: Shibbit 1 **PATRICIPATE Cost Holder **Measure*** **POST Confidence Mandatory Requirements: Shibbit 1 **PATRICIPATE Cost Holder **Measure*** **POST Confidence Mandatory Requirements: Shibbit 1 **PATRICIPATE Cost Holder **PATRICIPATE HONGRAPH COST HOLDER **PATRICIPATE COST HOLDER | | | | | | | \$3,896 |
| | | | | | | | \$20.92 |
| Note Challenge Home Mandatory Regulerements: Exhibit 1 2012 IECC Baseline 2013 IECC Baseline 2013 IECC Baseline 2014 IECC Baseline 2014 IECC Baseline 2015 IECC Baseline 2015 IECC Baseline 2015 IECC Baseline 2016 IECC Baseline 2017 IECC Baseline 2018 IECC | | :-1 | | | | | \$33 |
| Messure 2012 IECC Baseline N/A V1 Cost Impacts Reflected in Items Below Unit COST UNIT QTV | | is) | | | | | 5.00% |
| Measure 2012 IECC Baseline DOE Challenge Home(Rev. 93) UNIT COST UNIT QTY UNIT COST UNIT QTY UNIT COST UNIT QTY UNIT COST Claim Cla | | usa. Fubibis 1 | | | | | \$11.97 |
| Measure 2012 IECC Baseline DOC Challenge Home Rev. 03) UNIT COST UNIT QTV UNIT QTV COST COST COST COST COST COST COST COST | OCE Challenge Home Mandatory Requireme | nts: exhibit 1 | | | | | MARGINAL |
| Femeristration meets ENERGY STAR criteria U=0.32; SHGC-0.45 U=0.30; SHGC-0.27 U=0.00; SHGCC-0.27 U=0.00; SHGCC-0.27 U=0.00; SHGCC-0.27 U=0.00; SHGC-0.27 U=0.00; SHGCC-0.27 U= | Measure | 2012 IECC Baseline | DOE Challenge Home(Rev. 03) | UNIT COST | UNIT QTY | UNIT | COST FOR Challenge Home |
| ### Seenestration meets ENERGY STAR criteria U-0.32; SHGC-0.85 | lome is ENERGY STAR V3 Qualified | N/A | V3 Cost Impacts Reflected in Items Below | - | - | - | - |
| Celling Attic Insulation (2012 ECC) Celling: R38 blown-in Celling: R38 blown-in S3.50 92 Top Plate Area S4.50 S9 Top Plate Area S4.50 Top S4 | | | | \$0.44 | 220 | Window Area | \$144 |
| Celling: R38 blown-in Cell | enestration meets ENERGY STAR criteria | U=0.32; SHGC=0.45 | U=0.30; SHGC=0.27 | 30.44 | 330 | (ft ²) | 3144 |
| Celling: R38 blown-in Cell | | | | | | Top Plate Area | |
| Campright Camp | Calling (Astria Inscription (2012 IECC) | Callings B20 blasses in | Callings B30 blasses in | \$3.50 | 92 | | \$322 |
| Pictor P | = : | v | = | | | (2.) | |
| Sabe 0 Sabe 0 Oundation Insulation, Sibb (2012 LECC) Sabr 0 Sabr 0 Out Surface Sabr 15 R-15 R-15 R-15 R-15 R-15 R-15 R-15 R | | | | - | - | - | - |
| such docation insulation, Wall (2012 IECC) walls walls walls will rotated leakage 4 d rim per 100 SF of CFA (Not value) walls walls as a papilizable-ducts are in conditioned space has walls applicable-ducts are in conditioned space) Assume was applicable-ducts are in conditioned space and was applicable-ducts are in conditioned space and such as a space of CFA (Not value) was applicable-ducts are in conditioned space and such as a space of CFA (Not value) was applicable-ducts are in conditioned space and such as a space of CFA (Not value) was applicable-ducts are in conditioned space and such as a space of CFA (Not value) was a space of | , , | | | - | - | - | - |
| walt location walls walls always 4 cfm per 100 SF of CFA (Not Total Leakage 8 d cfm per 100 SF of CFA (Not Total Leakage 4 d cfm per 100 SF of CFA (Not Total Leakage 4 d cfm per 100 SF of CFA (Not Total Leakage 4 d cfm per 100 SF of CFA (Not Total Leakage 4 d cfm per 100 SF of CFA (Not See SPA Water Serve Requirements for Hot Spa 300 1 Pulmbing 5 Statement Space) Assume Meets FPA Water Serve Requirements for Hot Spa 300 1 Pulmbing 5 Statement Space 1 Standard Efficiency Dehiwasher Standard Efficiency Refrigerator ENERGY STAR Dehiwasher Space 1 Standard Efficiency Refrigerator Not Provided by Builder Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provided by Builder Space 1 Standard Efficiency Refrigerator Not Provi | | | | - | - | - | - |
| Total Leakage < 4 cm per 100 \$F of CFA (Not applicable ducts are in conditioned space) Assume Total Leakage < 8 cm per 100 \$F of CFA So.19 1221 Duct Surface Structured Struc | | | | - | - | - | - |
| orlal duct leakage applicable-ducts are in conditioned space) Assume Total Leakage < 8 cfm per 100 SF of CFA SUB- SUB- Action of CFA SUB- SUB- Control OF CFA SUB- CONTROL OF CF | Ouct location | | Ducts inside conditioned space | - | - | | - |
| Mets EFR Water Sense Requirements for Hot S133.00 1 Plumbing Sostem Place of Market Stribution Sustained Ffficiency Dichwasher Standard Efficiency Dichwasher ENERGY STAR Dichwasher \$10.00 1 Dichwasher Standard Efficiency Dichwasher ENERGY STAR Dichwasher \$10.00 1 Dichwasher \$10.00 1 Refrigerator Standard Efficiency Dichwasher Not Provided by Builder Not Provided by Builder \$1.00 1 Refrigerator Standard Efficiency Bath Fan Not Provided by Builder \$1.00 1 Refrigerator \$10.00 1 Refr | otal duct leakage | - · · · · · · · · · · · · · · · · · · · | Total Leakage < 8 cfm per 100 SF of CFA | \$0.19 | 1221 | Area | \$232 |
| Schwasher Standard Efficiency Dishwasher ENERGY STAR Dishwasher \$10.00 1 Dishwasher \$10.00 Dishw | Vater Efficiency | N/A | · · · · · · · · · · · · · · · · · · · | \$193.00 | 1 | Plumbing | \$193 |
| Lefrigerator Standard Efficiency Refrigerator ENERGY STAR Refrigerator \$40.00 1 Refrigerator Schew Sharker Not Provided by Builder Not Provided by Builder \$75.00 1 Shifting is high efficacy \$80.00 1 Shifting Shigh efficacy \$5.280 13.00 Lamps \$2.80 13.00 Lamps \$3.80 Fair Shifting is high efficacy \$5.280 13.00 Lamps \$3.80 Fair Shifting is high efficacy \$5.280 13.00 1 Bath Fair \$4.00 Fair Fair Shifting Shift | • | | | \$10.00 | 1 | | \$10 |
| Sighting 75% of lighting is high efficacy 80% of lighting is high efficacy 52.80 13.00 Lamps 12.80 from 75% of lighting is high efficacy 80% of lighting is high efficacy 52.80 13.00 1 Lamps 12.80 from 75% of lighting is high efficacy 80% of lighting is high efficacy 52.80 13.00 1 Bath Fan 5.80 from 75% of lighting is high efficacy 80% of lighting is high efficacy 52.80 13.00 1 Bath Fan 5.80 from 75% of lighting is high efficacy 80% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 from 75% of lighting is high efficacy 52.80 13.00 2 Bath Fan 5.80 from 75% of lighting is high efficacy 52.80 from 75% of lighting is high efficacy of lighting is high efficacy 52.80 from 75% of lighting is high efficacy of lighting is high efficacy 52.80 from 75% of lighting is high efficacy 10.80 from 75% of lighting is high efficacy 10.80 from 75% of lighting is high efficacy 10.80 from 75% of lighting | | | | | | | \$40 |
| Lighting 75% of lighting is high efficacy 80% of lighting is high efficacy 52.80 13.00 Lamps 5.5 start Fars (WHMV) standard Efficiency Bath Fars ENERGY STAR Bath Fars (Notroller 594.00 1 Bath Far 5.5 start Far (Local Endaust) Standard Efficiency Bath Fars ENERGY STAR Bath Far 5.5 standard Efficiency Bath Fars ENERGY STAR Bath Far 5.5 standard Efficiency Bath Fars ENERGY STAR Bath Far 5.5 standard Efficiency Bath Fars ENERGY STAR Bath Far 5.5 standard Efficiency Bath Fars 5.5 st | = | · = | = | | _ | | |
| Sath Fan (WHMV) Standard Efficiency Bath Fans Standard Efficiency | | · | | \$2.80 | 13.00 | Lamns | \$36 |
| Standard Efficiency Bath Fan (Local Exhaust) Standard Efficiency Bath Fan Standard Fan | | | | | | • | \$94 |
| PA Indoor airPLUS Verification Checklist - Comply with EPA Indoor airPLUS S1,000.00 1 IAPlus Home PROSESTION 1 INDOOR S1,000.00 | | | | | | | \$62 |
| Consolidated Renewable Energy Ready Checklist | | Standard Efficiency Batti Fails | | | | | \$1,000 |
| Checklist | | | Comply with EFA muoof an FLOS | | | Homes with | \$350 |
| Cooling 13 SEER 13 SEER 13 SEER 5 | | <u></u> | <u>-</u> | | | | |
| Reating 80 AFUE 95 AFUE \$7.17 42 kBtu/hr \$3. Addint Barrier None None See 2012 IECC insulation above See 2012 IECC insulatio | DOE Challenge Home PERFORMANCE PATH | | | | | | |
| Radiant Barrier None None None None None None None None | Cooling | 13 SEER | 13 SEER | - | - | - | - |
| see 2012 IECC insulation above | Heating | 80 AFUE | 95 AFUE | \$7.17 | 42 | kBtu/hr | \$301 |
| Grade II Grade I Sp. 2200 Insulated Ceiling Insulation Installation see 2012 IECC insulation above see 2012 IECC insulation | Radiant Barrier | None | None | - | - | - | - |
| AGW Insulation Installation see 2012 IECC insulation above see 2012 IECC insulation above | Ceiling Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | - | - |
| AGW Insulation installation see 2012 IECC insulation above see | | | | \$0.07 | 2200 | Insulated | \$154 |
| AGW Insulation Installation See 2012 IECC insulation above see Energy Star Star Star Star Star Star Star Star | | | | 7 | | Ceiling SF | 7 |
| AGW Insulation Installation Grade III Grade I Su.04 1531 S.F. | AGW Insulation | see 2012 IECC insulation above | see 2012 IECC insulation above | - | - | Included Laborat | - |
| see 2012 IECC insulation above see 2012 IECC insulation above | AGW Insulation Installation | Grade III | Grade I | \$0.04 | 1531 | | \$61 |
| Foundation Insulation Grade II Grade I Grade I Sp. 1501 Foundation Sp. 1501 Foundation Sp. 1501 Foundation Sp. 1501 Sp. 1 | | | | | | SF - | |
| Foundation Installation Grade II Grade II Grade I 3.0 ACH50 3 | | THE PERSON NAMED OF GROOM | THE TALL ISSUE INSUIGION ABOVE | | | Insulated | |
| Foundation Installation Grade II J.O ACH50 \$0.13 \$2.00 CFA \$0.13 \$2.00 CFA \$0.13 \$2.00 CFA \$0.20 | | | | \$0.15 | 1501 | | \$225 |
| ACH50 2.0 ACH50 \$0.13 2200 CFA \$0.10 \$0.00 \$0.13 \$0.00 \$0.13 \$0.00 \$0.13 \$0.00 | oundation Insulation Installation | Grade II | Grade I | , , , , , | | | |
| Noors R-3.1 R-3.1 | nfiltration | 3.0 ACH50 | 2.0 ACH50 | \$0.13 | 2200 | CFA | \$286 |
| Noors R-3.1 R-3.1 R-3.1 | Vindows | see Energy Star fenestration above | see Energy Star fenestration above | - | - | - | - |
| thermostat Programmable Programmable | Doors | | | - | - | - | - |
| hermostat Programmable Programmable | Vater Heater | 0.59 EF (0.71 RE) gas storage; 50 gal. | 0.67 EF (0.76 RE) gas storage; 50 gal. | \$0.70 | 50 | Gallons | \$35 |
| Duct Sealing See Total Duct Leakage above See Total Duct Leakage above | | | | - | | - | - |
| Duct Insulation R-0 R-0 R-0 | Ouct Sealing | = | = | - | | - | - |
| Cost includes reduced lumber from Advanced Framing & Rater Verification; Other associated costs listed elsewhere include the home's insulation, windows and door improvements. Cost includes Credential Fee, HVAC Commissioning, Contractor Completion of Checklist. Other costs associated with the requirement are reflected above in the WHMV system and in reduced capacity for HVAC Equipment. Cost includes Document Collection & Review, Bedroom Pressure Balancing, Rater Verification. Other cost associated with the requirement are reflected | = | • | = | - | | - | - |
| Cost includes reduced lumber from Advanced Framing & Rater Verification; Other associated costs listed elsewhere include the home's insulation, windows and door improvements. Cost includes Credential Fee, HVAC Commissioning, Contractor Completion of Checklist. Other costs associated with the requirement are reflected above in the WHMV system and in reduced capacity for HVAC Equipment. Cost includes Document Collection & Review, Bedroom Pressure Balancing, Rater Verification. Other cost associated with the requirement are reflected | | | | • | | | |
| windows and door improvements. Cost includes Credential Fee, HVAC Commissioning, Contractor Completion of Checklist. Other costs associated with the requirement are reflected above in the WHMV system and in reduced capacity for HVAC Equipment. Cost includes Document Collection & Review, Bedroom Pressure Balancing, Rater Verification. Other cost associated with the requirement are reflected | | Cost includes reduced lumber from Advanced Fram | ing & Rater Verification; Other associated costs liste | d elsewhere includ | le the home's in | sulation, | Ć100 |
| IVAC Sys. Quality Install Contractor in the WHMV system and in reduced capacity for HVAC Equipment. Cost includes Document Collection & Review, Bedroom Pressure Balancing, Rater Verification. Other cost associated with the requirement are reflected | nermai Enciosure System - Kater | | , | | | | -\$100 |
| in the writin's system and in Treduced capacity for make Equipment. Cost includes Document Collection & Review, Bedroor, Pressure Balancing, Rater Verification. Other cost associated with the requirement are reflected | HVAC Sys. Quality Install Contractor | - · · · · · · · · · · · · · · · · · · · | • | ociated with the re | equirement are i | reflected above | \$200 |
| , , , , , , , , , , , , , , , , , , , | A | | | t associated with | the requirement | t are reflected | |
| tVAC Sys. Quality Install Rater in Duct Sealing and Duct Insulation, Elimination of B-Vent \$ | IVAC Sys. Quality Install Rater | | - | | | | \$250 |

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APPENDIX B: DATA SOURCES

| System | Cost Estimating Data Source(s) |
|--|---|
| Fenestration | NREL National Residential Efficiency Measures Database* |
| Ceiling/Attic Insulation | RS Means Residential Cost Data 2013 |
| Ceiling Insulation Installation | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Above Grade Wall Insulation | RS Means Residential Cost Data 2013 |
| AGW Insulation Installation | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Foundation Insulation, Wall | RS Means Residential Cost Data 2013 |
| Foundation Insulation Installation | RS Means Residential Cost Data 2013 |
| Total duct leakage | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Water Efficiency | Toolbase.org; Topic areas; PEX water supply; manifold distribution systems; accessed online June 2013. |
| Dishwasher | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Refrigerator | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Clothes Washer | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Lighting | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Whole House Mechanical Ventilation | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Bath Fan (Local Exhaust) | Based on Internet pricing for intermittent timer controls (5 Manufacturers, Averaged cost); Completed 9/12/2013. |
| EPA Indoor airPLUS Verification Checklist | DOE Estimate |
| Renewable Energy Ready Checklist | DOE Estimate |
| Cooling | NREL National Residential Efficiency Measures Database *(equipment only) |
| Heating | NREL National Residential Efficiency Measures Database* (equipment only) + Additional estimate for elimination of B-vent flue |
| Radiant Barrier | Not used |
| Infiltration | NREL National Residential Efficiency Measures Database (equipment only)* |
| Doors | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| Water Heater | NREL National Residential Efficiency Measures Database* |
| Thermal Enclosure System - Rater | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| HVAC Sys. Quality Install Contractor | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |
| HVAC Sys. Quality Install Rater | ENERGY STAR Qualified Homes, Version 3 Savings & Cost Estimate Summary." November 2013. |

^{*}Because this database represents retrofit costs, the low-end of the cost range was used to approximate the costs for new construction

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