Boyle, Douglas J (DHS)

From: Fay, Bill <BFay@ase.org>
Sent: Monday, July 16, 2018 7:13 PM
To: Boyle, Douglas J (DHS)
Subject: URGENT: New BCAP Analysis - Hoosiers Owning 2018 IRC Homes Will Pocket Thousands In Energy Bill Savings
Attachments: 2018-07-16 EECC Letter to Indiana RCC.pdf; 2018 IRC BCAP Savings Analysis for Indiana.pdf

Importance: High

Mr. Boyle, I would deeply appreciate your distribution of both of these attachments and my cover e-mail to Chairman Furnish and the IRCC.

Mr. Chairman, by strengthening one of the weakest residential energy codes in our nation on Wednesday, Indiana will substantially reduce the energy costs of new homes over their 100-year lives. I have attached:

- **A letter from the broad based Energy Efficient Codes Coalition urging the IRCC to adopt the 2018 IRS Energy Chapter without amendments, and**
- **An analysis released today by the Building Codes Assistance Program that documents the cost and cumulative homeowner profit for new single-family homes meeting the 2018 IRC Building Energy Chapter.**

If the IRCC votes to adopt the 2018 IRC Energy Chapter without amendments, *Hoosiers living in 2018 IECC homes will pocket thousands of dollars in utility bill savings after quickly recouping the incremental cost of the efficiency improvements, according to three important Indiana-specific analyses*:

1. **An Energy & Cost Saving Analysis by the Midwest Energy Efficiency Alliance:**

	Reduced Energy Use Per Home	Annual Energy Cost Savings Per Unit	Simple Payback Period[2]	Net Positive Cash Flow[2]	Life-cycle Cost Savings[2]
Climate Zone 4	24%	$427	5.2 years	10 months	$5,670
Climate Zone 5	25%	$491	4.4 years	8 months	$6,825
	Annual Statewide Economic Gain:[3] $ 6,600,000/yr Annual Statewide Energy Savings: 607,000 MMBTU				

2. **The attached Building Codes Assistance Program analysis "Hoosiers Buying 2018 Homes Will Save Thousands," being released today. Its Highlights:**
   - **Break-even on the slightly higher additional down payment occurs in 5 – 13 months.**
   - **After the break-even point for paying off the initial down payment, homeowners realize a net profit (energy savings less mortgage costs) of $248 to $376 annually.**
   - **After the 30-year mortgage is paid off, energy cost savings are estimated at between $397 and $466 per year ($33 - $38 per month), when compared to homes meeting the current 2009 IECC energy code.**
   - **2018 IRC home owners pocket $6,768 - $9,356 in net profits over the length of a 30-year mortgage term.**

3. **A February 2016 US Department of Energy Analysis, "Cost-Effectiveness Analysis of the Residential Provisions of the 2015 IECC for Indiana" found the following if Indiana adopted the 2015 IECC (which is virtually identical to the 2018 IRC Energy Chapter):**
   ***Cost-effectiveness against a 2009 IECC baseline*:**

- **Life-cycle cost savings, averaged across climate zones and building types, are $5,826.05 for the 2015 IECC**
- **Simple payback period is 3.8 years for the 2015 IECC**

***Consumer savings compared to a 2009 IECC baseline*:**

- **Households save an average of $330 per year on energy costs with the 2015 IECC**
- **Net annual consumer savings, including energy savings, mortgage cost increases, and other associated costs in the first year of ownership, average $411.22 for the 2012 IECC**
- **Energy costs, on average, are 21.1% lower for the 2015 IECC**

Moving to the 2018 IECC unamended will protect Indiana's residential building owners and tenants by:

- **Saving thousands of dollars on energy bills *after monthly savings quickly recoup incremental cost! (100-year old home receives 1,200 energy bills over its lifespan)***
- **Reducing foreclosures *(after losing your job, inability to pay energy bills is the leading cause of foreclosure; Energy is highest cost of home ownership after mortgage P&I)***
- **Improving construction quality, indoor comfort *(fewer drafts)*, and resale value *(in addition to lower bills, another way the investment is returned)***
- **Stabilizing power grids; Reducing pollution and associated health problems *(buildings use 42% of all U.S. energy, 54% of natural gas, and 71% of electricity). OH is also one of the top-10 highest CO2 emitting states.)***

Please call me if you have questions or need further information.
Bill

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July 15, 2018

Mr. Gregory Furnish, Chairman
Indiana Residential Code Committee
Indiana Government Center South
302 West Washington Street
Indianapolis, IN 46204
Delivered via e-mail: Doug Boyle <doboyle@dhs.in.gov>

RE: EECC Supports Adopting the 2018 IRC Energy Chapter Without Amendments . . . Which Pays for Itself (and Then Some) with Thousands of Dollars in Reduced Energy Bills for Indiana's Homebuying Families

Dear Mr. Chairman:

On behalf of the broad-based Energy Efficient Codes Coalition, **I am writing to strongly encourage the IRCC to adopt Chapter 11 the 2018 International Residential Code (IRC) *without amendments*.**

In enacting tax cut legislation last year, Congress and the President argued that American families can spend their hard-earned money better than government can. The same logic certainly would certainly apply to the energy bills Hoosier families pay to utilities. Not only is energy the highest cost of home maintenance – higher than taxes or insurance – energy bills are the least predictable cost of home ownership because they are determined by weather, not mortgage underwriters, local governments, or insurance companies. With strong data showing that the leading cause of foreclosure – after "loss of income" – is "inability to pay energy bills," it's not surprising that low-income advocates like Habitat for Humanity support the construction of homes that meet the strongest energy codes.

By ensuring that new homes are built to perform during the peak demands of long cold snaps and heat waves, the Residential Code Committee has a very real opportunity to help Indiana residents reduce and stabilize their energy bills. And because many of the efficiency measures included in the 2018 IRC Energy Chapter are permanent, they will lower all 1,200 monthly energy bills that owners and occupants will pay over the 100 years the home stands.

The incremental construction costs of efficiency measures are often rolled into the mortgage, where they are quickly recouped and surpassed by monthly energy bill savings that begin on move-in day. Three important independent analyses document the thousands of dollars Hoosier homeowners will save over a typical 30-year mortgage term after fully recouping added outlays for efficiency improvements:

1. 2018 IRC homeowners in Indiana will pocket between $6,768 - $9,356 after breaking even with outlays in just 5-13 months, according to a Building Codes Assistance Project analysis released today.

2. The Midwest Energy Efficiency Alliance (MEEA) shows energy bills for homes built to 2018 IRC will be $5,670 or $6,826 lower than bills for homes meeting Indiana's current code. The payback period for these homes will only be 4.4-5.2 years, and net positive mortgage cash flow will be reached in 8-10 months. and
3. A US DOE analysis found that Hoosiers owning homes meeting the nearly identical 2015 IRC will pocket $5,826.05 in lower energy bills, the result of a 21.1% drop in energy costs.

All three analyses tell a single story: That the IRCC can put thousands of dollars in energy savings in the wallets of Indiana families – real money that will either be paid to a utility or be available for those families to add to college funds, make home improvements, or help make ends meet.

Americans understand the importance of efficient homes. A poll by the National Association of Homebuilders found that 9 out of 10 Americans will pay 2-3% more for a home that has permanent efficiency features. They recognize the wisdom of investing in more efficient homes, but here's the rub – and your opportunity: because home buyers are seldom involved in the design or construction of their homes, the principal way to ensure that they have the permanent features Americans want is through a strong building energy code like the 2015 IECC. Indiana residents need you to help ensure that the homes they buy are efficient (and safe).

The good news is that because many of the 2015 IECC efficiency measures are permanent, the energy bill savings will continue far beyond the initial 30-year mortgage, totaling tens of thousands of dollars for the families that own or occupy the home over its 80- to 100-year life.

But there are other compelling reasons for you to include the 2018 IRC Energy Chapter 11, un-amended, in Indiana's suite of 2015 "I-Codes":

- <u>Bankrolling Other I-Codes</u>. As the only I-Code that generates hard cash for home owners and occupants, the IECC's $8,556 in energy savings will indirectly help bankroll the added cost of vital fire and safety improvements from the other 14 I-Codes. Weakening amendments will increase energy waste and energy bills.

- <u>Reducing Foreclosures.</u> The six national low-income housing groups in EECC support strong building energy codes because: 1) energy is the highest cost of home ownership outside of mortgage principal and interest, 2) energy bills can consume up to one-third of a low-income family budget, and 3) consequently, significant data shows that "inability to pay energy bills" is the leading reason for foreclosure outside of "loss of income." National Housing Institute President Harold Simon testified before ICC that "one of the greatest tragedies I see is a low-income family that realizes its dream of home ownership, but loses their home because they can't pay their energy bills.

- <u>Stabilizing Grids</u>. Buildings are the largest energy consuming sector in America, accounting for 71% of electricity, 54% of natural gas, and 42% of overall energy use. Because energy efficient homes perform best during energy peaks – especially long cold snaps or heat waves, when energy use and bills skyrocket – Ohio homes built to the 2018 IRC Energy Chapter will flatten peak usage and stabilize power grids. And since utilities

must have enough generating capacity to meet these peaks and avoid black- or brown-outs, flattening those peaks delays the need to build costly new generating facilities.

The Energy Efficient Codes Coalition is a unique, broad-based alliance supported by longstanding energy efficiency advocates – including government, low-income and energy consumer groups, businesses, environmental organizations, utilities, regional energy efficiency networks, architects, and others – working for the development and adoption of the most energy efficient residential and commercial model energy code that's achievable using current "state of the shelf" technology.

We stand ready to assist you as you undertake your review of the IECC and other I-Codes.

With best wishes.

Sincerely,

William D. Fay

Building Codes Assistance Project

Dedicated to the adoption, implementation, and advancement of building energy codes for over 20 years.

Hoosiers Buying 2018 IRC Homes Will Save Thousands

An Analysis of the Cost and Cumulative Homeowner Profit for New Single-Family Homes Meeting 2018 IRC Building Energy Chapter

HIGHLIGHTS

- **Break-even on the slightly higher additional down payment occurs in 5 – 13 months.**
- **After the break-even point for paying off the initial down payment, homeowners realize a net profit (energy savings less mortgage costs) of $248 to $376 annually.**
- **After the 30-year mortgage is paid off, energy cost savings are estimated at between $397 and $466 per year ($33 - $38 per month), when compared to homes meeting the current 2009 IECC energy code.**
- **2018 IRC home owners pocket $6,768 - $9,356 in net profits over the length of a 30-year mortgage term.**

SUMMARY

This analysis calculates the energy savings and incremental construction costs of new, 2,400 square foot single family homes in Indiana that meet the latest energy code, the 2018 International Residential Code's energy conservation chapter, compared to the state's current code, the 2009 IECC.

Hoosiers buying new single-family homes meeting the 2018 IRC will pocket between $6,768 and $9,356 in net energy savings over the mortgage term, according to an analysis of energy savings and incremental construction costs by the Building Codes Assistance Project. *The differences in energy bill savings and added construction costs depend on the type of insulation used for the walls, and where the home is located: there are two climate zones in Indiana – Climate Zone 5 (62 counties) and Climate Zones 4 (30 counties in southern Indiana).*

The energy savings are enough to pay back the buyer's additional down-payment (about $256 for climate zone 4 and $154 for climate zone 5) in as little as 5 months and no more than 1 year and 1 months (sooner if the loan allows less than 10% down payment). After the additional down-payment is recouped via energy savings**, the owner continues to pocket between $248 and $376 in estimated energy bill savings annually until the full mortgage is paid off, when annual savings increase to between $466 in climate zone 5 and $397 in climate zone 4. Of course**, the savings are even greater if energy costs rise over the next 30 years.

Specifically, this analysis finds an average new home meeting the 2018 IRC will cost an additional $1,542 in Climate Zone 5 and between $802 to $3,611 in Climate Zone 4 (depending on wall insulation type) over the construction costs of meeting the state's current 2009 IECC energy code. Estimated energy cost savings range from $363 to $379 per year depending on climate zone and wall type.

Stated differently**, monthly utility bill savings to the homeowner are more than two times as much as the additional mortgage payment needed to cover the added first-cost of energy saving features required by the 2018 code.**

Energy Savings and Construction Cost Methodology

To calculate energy savings and incremental construction costs, this analysis defined a "typical" single family house to represent new residential development in Indiana. The home modeled is two stories in height, with exterior dimensions of 30 by 40 feet with wood-framed walls and a basement foundation. This size and foundation type is based on regional construction practices. In Indiana (as nationally) the average new home is approximately 2,400 square feet—which is the size used in this analysis.

For the purposes of this analysis we assume a baseline home that meets the requirements of the 2009 IECC, which is the state's current code. Although some leading builders in Indiana are already building to a higher standard than the 2018 IRC, for purposes of this analysis we assume a baseline home that exactly meets the requirements of the 2009 IECC. We also err on the side of good building practice, and assume builders are installing return air ducts, although some builders may currently be using floor joist cavities in lieu of conventional return ducts.[1]

Using this model home as a baseline, we identified the building components that would have to be upgraded from the current 2009 IECC code, according to the prescriptive requirements in the 2018 IRC. These changes differed by climate zone, but in both climate zones code changes include increased ceiling insulation from R-38 to R-49 blown-in insulation, an increase from 50 to 90 percent compact florescent bulbs in hard-wired fixtures, R-3 insulation on hot water pipes from the hot water heater to kitchen, improved house air sealing and testing, bathroom and kitchen vent fan upgrades, and increased sealing around air handlers and furnaces. Additionally, meeting the latest code, houses in climate zone 4 will require an upgrade from R-13 to R-20 or R13 + 5 exterior walls while houses in climate zone 5 will require an upgrade of basement wall insulation from R10 to R15.[2]

Energy savings were calculated using the U.S. Department of Energy's *Methodology for Evaluating the Cost-Effectiveness of Residential Energy Code Changes*. Both the existing 2009 IECC code and the new 2018 IRC code allow a builder to choose among a number of alternative paths to comply with the code. The National Renewable Energy Laboratory's Building Energy Optimization software (BEopt), an EnergyPlus-based simulation engine, was used to compare building performance for homes built using the prescriptive path. and long-term average weather conditions in Indiana cities in each climate zone. Using DOE/EIA state-level energy costs, the estimated annual energy expenses were derived for each model. For homes built in Indiana, the lifetime estimated savings ($6,768 and $9,356) takes into account fuel escalation rates, inflation and present value of dollars over the thirty-year mortgage term.

Incremental Costs

To estimate incremental costs, we rely on construction costs from the well-regarded *2017 RS Means Contractor's Pricing Guide* to approximate actual costs of new home construction. While this resource is

[1] As a result of this assumption, some builders currently using floor joists as ducts ("panned ducts") may incur incremental costs under the 2018 IRC Energy Chapter, which will require them to install conventional return ducts.

[2] For the purposes of this analysis, we chose to model a two-story house with a basement. By contrast, house with a slab foundation would have a lower total incremental cost.

known to be conservative, it is useful for this analysis as RS Means estimated construction costs include material costs, labor, and contractor overhead and profit.[3]

Costs Shared by New Homes in Climate Zones 4 and 5:

Among other changes, the 2018 IRC requires builders to upgrade ceiling (attic) insulation from R-38 to R-49, which is estimated by RS Means to range from an additional $707 per new home. As well, we estimate that the additional required air sealing in the 2018 IRC and the required whole house "blower door" testing will add about $350 per new home.[4] To improve ventilation, an additional $100 is estimated for upgrading two bathroom vent fans to units with an Energy Star rating. Finally, builders will need to install high-efficiency lights in 90 percent of hard-wired fixtures, up from 50 percent in the 2009 IECC. Usually, this requirement is met with compact florescent lights (CFLs). Our analysis estimates that the upgrade of 25 percent of fixtures will cost $25. An additional 2018 IRC code change will require builders to insulate hot water distribution lines to kitchens. We believe the cost impact of this change is small, as R-3 insulation costs less than 50 cents per linear foot and most insulation products can be "clipped" around supply pipes after the plumbing rough-in.[5] As a result, this cost is estimated at $100 per new home. Finally, due to additional language in the 2018 IRC requiring sealing around air handlers and furnaces, we have added an additional $100 for sealing.

Incremental Costs Unique to Climate Zones 4

To meet the 2018 IRC in Climate Zone 4 (CZ 4), builders have flexibility in the type of exterior wall assembly they choose to build. At present, the 2009 IECC requires R-13 walls (CZ 4) and R-20 or 13+5 (CZ 5), while the 2018 IRC provides an insulation upgrade to R-13 + 5 or R-20 for both Climate Zones 4 and 5. To build an R-13 + 5 wood frame wall, builders retain 2 x 4 framing with R-13 fiberglass batts as cavity insulation and simply apply an insulated sheathing material (various types) over conventional wood sheathing (e.g., OSB), a process commonly known as 'over-sheathing'. Note that such continuous insulation (ci) minimizes thermal bridging through framing and also provides moisture control, comfort, and air-control benefits --these benefits are not accounted for in a simple energy code economic analysis alone. In addition, there are a growing number of code-compliant structural insulating composite sheathing products available in the market today that can further lower total construction costs, but these cost-saving advancements are not considered in this analysis. However, the ability to use qualified foam sheathing materials and tape/flashing products as a water-resistive barrier that replaces the cost of a separate water-resistive barrier material layer is taken into account in the lower range of costs for adding R-5 continuous insulation to a traditional R13, 2x4 wall.

Alternately, if builders choose to meet the R-20 requirement, 2 x 4 walls are upgraded to 2 x 6 wall construction. The larger framing allows for R-21 fiberglass batts to be placed between studs instead of the R-13 batts (as required in the 2009 IECC). Additionally, because of the superior strength of 2 x 6 construction, builders can reduce costs by increasing the spacing between studs from 16 inches apart to

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[3] RS Means also includes a location factor, which indicates an estimate of local costs as a percentage of RS Means national average estimates. In an effort to be conservative, for this analysis we have chosen the highest location factor available in RS Means in each climate zone: 121% of the national average in Climate Zone 5 (Chicago) and 101% of the national average in Climate Zone 4 (East St. Louis).

[4] $350 is a commonly used as an expected air sealing and testing cost for new single-family detached homes nationwide. By following the air sealing visual checklist already required by the 2009 IECC, builders should be able to reduce air changes to the required three air changes per hour required in the 2018 IRC Energy Chapter.

[5] It is difficult to determine what combination of redesign, resizing, and/or partial insulation of hot water lines would be done in a typical new home. Insulating distribution lines to the kitchen and very long runs would add costs while downsizing lines would reduce costs; in any case we believe the net effect would be small.

24 inches—thus reducing the amount of lumber needed and significantly reducing the overall incremental cost of the R-20 wall. Many builders prefer to retain 16-inch spacing however, and thus all three wall framing alternatives are presented in **Table 1**, which summarizes incremental costs for Climate Zone 4.

Table 1: Climate Zone 4 Incremental Costs

Building Component	Affected Area	Incremental Cost/Ft^2	Total	Location Factor	Adjusted Total
Wall Option 1: R-13 + 5 (including labor, material, overhead & profit (including 10% customary increase to installer/subcontractor cost for General Contractor mark-up)[6]	2,380	$1.08-1.39	$2,570.40-$3,308.20	92%	$2,365- $3,044
Wall Option 2: R-20 Walls with Studs Spaced 16" on Center (2x6 instead of 2x4 and R20 instead of R13)[7]	2,380	$0.74-.91	$1,761.20-$2,165.80	92%	$1,620- $1,993
Wall Option 3: R-20 Walls with Studs Spaced 24" on Center[8]	2,380	$0.43-58	$1,023.40-$1,380.40	92%	$942-$1,270
Upgrade Ceiling insulation (from R38) to R-49	1,200	$0.64	$ 768.00	92%	$707
Increased Air Sealing and Testing	N/A	N/A	N/A	N/A	$350
Insulating Hot Water Pipes	N/A	N/A	N/A	N/A	$100
90% CFLs in hardwired fixtures (from 50% in 2009 IECC)	N/A	N/A	N/A	N/A	$25
Bathroom Vent Fan Upgrade	N/A	N/A	N/A	N/A	$100
Increased Sealing at Air Handlers and Furnaces	N/A	N/A	N/A	N/A	$100
HVAC System Savings (downsizing 1 ton)	N/A	N/A	N/A	N/A	-$815
Total Incremental Costs (Varies Based on Wall Type Above)					**$802 to $ 3,611**

While complying with the 2018 IRC increases first-cost in some areas, the new code also presents opportunities to **reduce** costs for HVAC equipment as a result of an improved building envelope. Among

[6] The cost ranges from ($1.08 to $1.39) and covers range of foam sheathing materials that can be used as over-sheathing (over structural sheathing) so that there are no additional costs associated with re-design of building bracing and potential wall opening allowances for windows and doors to provide room for bracing. The lower range ($1.08/sf) includes use of foam sheathing as the water-resistive barrier material (thus eliminating a separate WRB/wrap material, but then also requiring foam sheathing joints to be taped/flashed for a net $0.20/sf deduct per professional estimate based on field data/observation). NOTE: while Options 2 and 3 are less costly on a first cost basis (per RS Means data), there are other benefits to Option 1: improved moisture control, air-leakage control, improved comfort, and durability.

[7] Assuming R20 vs R13 and 2x4 vs 2x6 at 16"oc, 2017 RS Means yields the following incremental cost difference: $0.74 to $0.91/sf of opaque wall area ($0.44/sf is attributed to difference in framing alone; the variation above that is for change in insulation and varies for use of cellulose in cavity and use of Class III vapor retarder latex paint on interior or Kraft faced FG batt insulation which are two common options).

[8] The incremental cost difference is estimated at: $0.43 to $0.58/sf of opaque wall area ($0.19 is attributed to framing change from 2x4@16"oc to 2x6@24"oc plus variation in cavity insulation costs to change from R13 to R20 minimum. (No correction was made for variation in 15" vs. 23" wide cavity insulation cost; it's considered a wash since for fiberglass batt it might cost $0.05/sf less but the costs difference for cellulose would be very little (so it would only tend to narrow the range but not decrease the lower end of the range).

other possible savings, builders will be able to reduce the size of costly mechanical equipment. For the prototype house in Climate Zone 4, builders are able to reduce the cooling system capacity from 61,500 kBtuh to 49,500 kBtuh or from 5.125 to 4.125 tons. This reduction in air conditioner capacity can result in first-cost savings of one ton, which is expected to save approximately $815 for each new house.[9]

Taking into account both incremental costs and savings, **this study estimates that *net* incremental costs for Climate Zone 4 will range from $802 to $3,611, depending on which wall construction type is selected by builders.** These options are, on average: $2,705 for R-13 + 5 wall; $1,807 for R-20 wall with 16" spacing between studs; and $1,106 for R-20 wall with 24" spacing between studs.

Incremental Costs Unique to Climate Zones 5

Unlike Climate Zone 4, to meet the 2018 in climate zone 5, no change is required for exterior walls. However, basement walls insulation will have to be upgraded from R-10 continuous insulation to R-15 insulation. Assuming a basement with eight-foot ceilings and 140 feet in exterior perimeter, the difference in price for extruded polystyrene is estimated by RS Means at $0.55 per square foot, for a total of $567 per new home. The cooling system is also reduced from an estimated 54,000 kBtuh to 44,400 kBtuh (from 4.5 to 3.7 tons) allowing a one-half ton reduction in system size. **In total, the incremental costs for new homes built in Climate Zone 5 are estimated at $1,542 per new home.** A summary of incremental costs for Climate Zone 5 is displayed below in **Table 2**.

Table 2: Climate Zone 5 Incremental Costs

Building Component	Total Area	Incremental Cost/ Square Ft	Total	Location Factor	Adjusted Total
Increase Basement Insulation from R-10 to R-15[10]	1,120	$0.55	$ 616	92%	$567
Upgrade Ceiling insulation from R38 to R-49	1,200	$0.64	$ 768	92%	$707
Increased Air Sealing and Testing	N/A	N/A	N/A	N/A	$350
Insulating Hot Water Pipes	N/A	N/A	N/A	N/A	$100
90% CFLs in hardwired fixtures (from 50% in 2009 IECC)	N/A	N/A	N/A	N/A	$25
Bathroom Vent Fan Upgrade	N/A	N/A	N/A	N/A	$100
Increased Sealing at Air Handlers and Furnaces	N/A	N/A	N/A	N/A	$100
HVAC System Savings (Downsizing 1/2 ton)	N/A	N/A	N/A	N/A	-$407.50
Total Incremental Costs					**$1,542**

[9] EPA conservatively estimates for their Energy Star Homes Version 3 that first-cost savings for downsizing a 13 SEER air conditioner are $815 per ton. It should be noted that because HVAC systems are usually sold in half-ton increments, to meet the 5.125 tons of needed cooling capacity estimated for the baseline home, builders would have to install the next size up, a 5.5 ton unit and a 4.5 ton unit for a 2012 home. By 'right-sizing' the HVAC equipment, building occupants will also benefit from a reduction in equipment short-cycling (i.e., where equipment is too large for the cooling load and cycles on and off frequently; wasting energy and losing some of its ability to dehumidify indoor air). Note that additional cost savings could be obtained by downsizing heating equipment, but this study does not attempt to calculate those savings. Estimated heating requirements decline from 80,000 to 70,000 kBtuh in Climate Zone 4 and from 78,000 to 70,000 kBtuh in Climate Zone 5.

[10] Other means of achieving the R-value may be less expensive (such as a combined/hybrid wall with R5 foam board plus R13 frame wall – particularly if the basement is to be finished); it may also be possible to use a thicker blanket insulation for unfinished basements. This estimate does not consider cost of going from an unfinished to finished basement.

Energy Cost Savings

According to the model used in this analysis, **upgrading to the 2018 IRC will result in significant energy cost savings for homeowners in Indiana, ranging from $466 per year in Climate Zone 5 to $397 in Climate Zone 4.**[11] Annual energy savings for each climate zone (and wall type) is presented in Table 3, below. It is noteworthy that these savings assume constant energy prices; if energy prices continue to rise consistent with historical trends, savings will be greater in future years.

Mortgage Payback for Homeowners

Homebuyers that include in their mortgage the incremental first-costs of meeting the 2018 IRC, will benefit from lower utility bills starting on day one. This cash-flow difference is enough to pay back the buyer's added down-payment in no more than one year, one month and as little as five months (or sooner if the loan allows a down payment below 10%). After that date, the owner continues to save at least $248 annually in lower utility bills – and even more if energy prices increase.

This payback analysis assumes that homebuyers purchase a new home with 10% down at the standard nationwide interest rate of 5 percent. This scenario would result in an increased down payment of $154 to $256 with additional monthly mortgage cost of $7 to $12. Taking into account energy savings and lower utility bills, a cash flow analysis indicates that the homebuyer would break even within as little as five months. After that break-even date, **home owners would continue to save between $248 and $376 in annual energy costs until the mortgage is paid off**. Homebuyers with a lower down payment—such as 5 or 10 percent—will realize payback much more quickly. After the mortgage is fully paid, estimated energy cost savings range from $397 to $466 per year. Stated differently, energy bill savings are at least 2 times as much as the additional mortgage payment needed to cover the added first-cost of energy saving features required by the 2018 code. Mortgage payback to homeowners is presented below in **Table 3**.

Table 3: Mortgage Payback for Homebuyers by Climate Zone

Climate Zone and Wall Type	Incremental Costs	Energy Savings/ Month per home,	Down Payment Increase (and Mortgage Increase per Month)	Breakeven Point	Annual Profit for Homeowner after Breakeven Point
Climate Zone 4: R-20 Walls	$2,560	$33.06	$256 ($12.37/month)	**1 year, 1 month**	**$248**
Climate Zone 5: R-20 Walls	$1,542	$38.82	$154 ($7.45/month)	**5 months**	**$376**

Conclusions

- As estimated in this analysis, incremental costs for new 2,400 square foot homes built to the 2018 IRC in Indiana range from $802 - $3,611 per new home.
- Annual energy savings for Indiana homeowners attributable to the 2018 IRC range from $397 to $466 per new home for the lifetime of the home, assuming constant energy prices; if energy prices continue to rise consistent with historical trends, savings will be greater in future years.
- Assuming a 10% down payment, new home buyers will break even on their initial investment in as few as seven months and no more than one year and two months after purchase.

[11] The estimated ranges represent an average within each Climate Zone of the two different wall types: R-20 and R-13+5.

About BCAP

The Building Codes Assistance Project (BCAP) is a nonprofit advocacy organization that promotes the adoption, implementation and advancement of building energy codes on the state, local, and international levels.

With over twenty years of experience, BCAP has established itself as a trusted, non-partisan U.S. leader for energy code advocacy, research and analysis, technical support, training, and code status tracking. From its national platform, BCAP facilitates increased communication and collaboration between allies, identifies and navigates past policy and structural pitfalls, and helps state and local decision-makers design strategies to improve building energy efficiency.

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