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Minnesota Residents Buying 2012 IECC Homes Will Save Thousands

An Analysis of Homeowner Profit after Paying Incremental Construction Costs For New Single Family Homes Meeting the Building Energy Code

HIGHLIGHTS

- **Energy cost savings for a 2012 IECC home are estimated at between $848 and $925 per year ($71 - $77 per month), when compared to homes meeting the current energy code.**
- **Break-even on investment — the additional down payment and slight mortgage payment increase — occurs in 8 – 14 months.**
- **After the break-even point, homeowners realize a net profit (energy savings less mortgage costs) of $666 to $800 annually.**
- **2012 IECC home owners pocket $19,197 - $23,479 in net profits over the length of a 30 year mortgage term.**

SUMMARY

Minnesota residents buying new single family homes meeting the 2012 International Energy Conservation Code (IECC) will pocket between $19,197 to $23,479 in net energy savings over a 30 year mortgage term, according to an analysis of energy savings and incremental construction costs by the Building Codes Assistance Project and ICF, International.

This report assesses energy savings and incremental construction cost increases of new, 2,400 square foot single family homes in Minnesota that meet the latest model energy code, the 2012 IECC, compared to the current code in effect, the Minnesota Residential Energy Code. Specifically, this analysis conservatively estimates that an average new home meeting the 2012 IECC will cost an additional $2,682 to $3,959 over the construction costs of meeting the current energy code. **Energy cost savings are significant, however, and are estimated at between $848 and $925 per year, depending on the exterior wall type used by builders.**

The energy savings from the 2012 code are enough to pay back the buyer's additional down payment and slightly increased mortgage cost in approximately 8 to 14 months (*sooner if the homebuyer puts less than 20% down*). **After that date, the owner continues to pocket a profit (energy savings minus mortgage costs) of between $666 and $800 annually—money that would otherwise go to pay higher utility bills.** These net savings will be even greater if energy costs rise over the next 30 years consistent with historical trends.

Stated differently, monthly **utility bill savings to the homeowner are more than four times as much as the additional mortgage payment** needed to cover the added first-cost of energy saving features required by the 2012 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 Minnesota. The home modeled is two stories in height, with exterior dimensions of 30 by 40 feet with wood-framed walls and a full basement foundation. This size and foundation type is based on regional construction practices. The home size modeled is 2,400 square feet—which is also the approximate size of the average new home built nationwide.

For the purposes of this analysis we assume a baseline home that meets the requirements of the current state energy code, which is based on the 2006 IRC with state-specific modifications. Although some leading builders are meeting or exceeding many elements of the 2012 IECC already, for purposes of this analysis we assume a baseline home that exactly meets the requirements of the state code. Also, although we err on the side of good building practice, in an effort to be conservative we have included some incremental costs that may not be necessary. For instance, although it is a good building practice for builders to install conventional "hard ducted" return air ducts, some builders may be using joist cavities (panned floor or enclosed interior wall cavities) in lieu of conventional "hard ducted," metal or other return ducts. In an effort to anticipate this possible cost (and others) for some builders, we include the incremental costs of upgrading to hard ducted return ducts, which are required in the 2012 IECC.

Energy savings were modeled by ICF International (ICFI), an international energy consulting firm with extensive experience in the use of hourly building energy simulation software to estimate energy performance and energy savings of alternative building codes and design concepts. Although the values included in the analysis represent a careful, independent technical judgment by ICFI staff, it should be kept in mind that – like any such analysis – the results depend on a number of assumptions about the physical features of a typical new home, operating practices, energy prices, and other factors.

Both the existing state code and the new 2012 IECC codes allow a builder to choose among a number of alternatives to comply with the code. In this case, ICFI conservatively chose to model energy savings by comparing the results from the prescriptive path of each version of the code. ICFI uses BeaconTM, an hourly simulation model that utilizes DOE-2 or EnergyPlus, and summarizes building performance in terms of estimated annual energy costs, based on long-term average weather conditions in a given climate zone (city), DOE/EIA state level energy costs. ICFI also estimates energy consumption by end-use, fuel type, electricity peak demand, and air conditioner size in each prototype home. More details of the modeling assumptions used in this analysis are available on request.

INCREMENTAL COSTS

Using the 2,400 square foot model home as a baseline, we calculated incremental costs by identifying the building components that would have to be upgraded from the current state code, according to the prescriptive requirements in the 2012 IECC. These costs vary between Minnesota's two climate zones, and are higher in Climate Zone 6, which occupies the southern half of the state. To estimate incremental costs, we rely on construction costs from the well-regarded *2011 RS Means Contractor's Pricing Guide* to approximate actual costs of new home construction. This resource is known to be conservative and is useful for this analysis because all estimated construction costs are inclusive of material costs, labor, and contractor overhead and profit.[1] For this analysis, RS Means data is supplemented by additional calls to local building suppliers and experts.

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[1] RS Means also includes a location factor, which provides an estimate of local costs as a percentage of RS Means national average estimates. For this analysis, the location factor for Minneapolis, 116%, is used for climate zone 6,

INCREMENTAL COSTS SHARED BY CLIMATE ZONES 6 AND 7

Windows

Builders in both of Minnesota's climate zones will need to make window upgrades to meet the 2012 IECC to meet the improved U- factor in the 2012 IECC (.32 from .35). This added cost is conservatively estimated by the Efficient Windows Collaborative (EWC) as no more than $1.00 per square foot of window area. It is important to note that many builders may already install windows that meet the 2012 IECC's slightly-improved requirements, but in an effort to be conservative (and strictly compare the two codes) this analysis assumes that builders are currently using the least-cost window to meet existing code requirements.[2] Total window incremental costs are estimated as $357.

Hard Ducted Returns in Basement Ceilings

For builders in both climate zones that are currently using "panned" floor joists as return air ducts, meeting the 2012 IECC will require an upgrade to conventional "hard ducted" returns in basement ceilings. Many builders already use conventional ducts as returns, but this cost has been included in this analysis regardless. Calculating the cost change between panned and conventional ducts is challenging, as panned ducts are not priced in RS Means and many construction cost sources. After consulting with HVAC contractors, who indicated the cost of panned ducts was roughly half of conventional ducts, incremental costs are estimated in this analysis as one-half of cost of flexible return ducts. We believe this cost is reasonable due to the significant amount of labor required for panned ducts, as contractors must screw sheet metal between two adjacent joists and seal the edges with mastic. RS Means estimates the installed cost of flexible, non-insulated, 6" diameter flexible ducts at $4.58 per linear foot.[3] As such, the cost to upgrade ducts is estimated at $2.29 per linear foot, or $187 to $199, depending on climate zone, for the estimated 75 feet of return duct which some builders will have to upgrade under the 2012 IECC.

Whole House Air Leakage and Ventilation

We estimate that the additional required air sealing in the 2012 IECC and the required testing for whole house air leakage (commonly known as "blower door") and duct leakage will add about $350[4] per new home. Blower door and duct leakage tests are estimated at no more than $250, while the costs of doing additional air sealing are expected to be $100.

As a result of the improved air sealing, new homes will have fewer air and duct leaks to the outside. In many states, this change would require additional mechanical ventilation, at a cost of $180 for upgrading one bathroom vent fan to a unit with an Energy Star rating along with the installation of a simple controller which is set to automatically exhaust indoor air.[5] However, Minnesota has long required mechanical ventilation over and above the national model codes. At present, the state's code prescribes sufficient ventilation that we assume that builders are already meeting the 2012 IECC's ventilation requirement through the current code. In the event some builders have not embraced this requirement, the additional cost should be no more than $180 per new home.

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indicating that construction costs in climate zone 6 are approximately 16% higher than the national average. Likewise, the location factor used in climate zone 7 is Duluth, which is estimated at 109% of the national average.

[2] As a result, many builders will be able to reduce or avoid incremental costs for better windows.

[3] Less expensive duct options are available, but this product matches the modeling assumptions used by ICFI.

[4] $350 is a commonly used as an expected air sealing and testing cost for new single-family detached homes nationwide.

[5] Ventilation system and costs are described in an August 2005 report from Lawrence Berkeley National Laboratory "Review of Residential Ventilation Technologies." Although the costs of these components have decreased in recent years, the 2005 estimate ($180 per new home) is quoted in this analysis.

Hot Water Distribution Lines

An additional 2012 IECC 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.[6] As a result, this cost is estimated at $100 per new home.

Lighting and Programmable Thermostats

Builders will have to install high-efficiency lamps in 75 percent of hard-wired fixtures, up from zero percent in the current code. Usually this requirement is met with compact florescent lights (CFLs). Our analysis estimates that the upgrade of lamps in 75 percent of fixtures will cost no more than $50. Builders will also have to upgrade conventional thermostats to programmable thermostats, a cost which is estimated as $50.

Sealing and Insulating the Attic Hatch

To meet the 2012 IECC we estimate an additional $50 to seal and insulate the attic hatch. This cost varies by home, and depends on whether or not attic access is achieved through a wall opening (such as a door) or via an overhead pull-down stair, or simple hatch. For wall openings, cost is expected to be much lower, as builders can simply weatherstrip around the opening and adhere surplus insulation to the unconditioned side of the door. For attic pull-down stairs, builders can place a variety of kits over the stair hatch, but costs are higher.

Basement Insulation

Additionally, builders will have to upgrade the interior basement insulation in both climate zones. Under the current code, builders are required to insulate basements to R-10 in climate zones 6 and 7. However, section N1102.2.6.4 allows foundation insulation in climate zone 6 to be reduced to R-5, provided an additional R-5 is added to the attic floor insulation. Given the prevalence of this practice, and its favorable cost, we assume that basement walls in climate zone 6 currently meet R-5. By making this assumption, we attempt to capture the maximum cost that would be incurred by a builder in an upgrade to the 2012 IECC.

Additionally, we assume that builders are insulating the exterior of the basement wall, rather than applying insulation to the basement's interior. This choice is supported by leading building scientists, as it reduces moisture problems on the home's interior and adds the basement wall to the home's thermal mass, thereby lowering utility bills. As estimated in RS Means, the cost of moving from R-5 to R-15 exterior extruded polystyrene in climate zone 6 would be $0.91 per square foot, or $1,182 per new house. In climate zone 7, by contrast, where builders will only have to upgrade from R-10 to R-15, the cost is estimated by RS Means at $0.72 per square foot, or $879 per new home. Builders will still have the option to spend less than one-fourth of this cost by installing fiberglass batts on the basement's interior wall, but the higher costs of exterior insulation is included in this analysis in support of the a best practice and in an attempt to present the most conservative incremental cost. [7]

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[6] 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.

[7] It is important to note that builders could substantially reduce the costs of insulating basement walls by instead installing hanging fiberglass batts to the basement's interior walls. This cost is substantially lower than the estimate included in this analysis and is still available as an option for builders. For instance, to meet the 2012 IECC in climate zone 7, we estimate builders would incur no more than $202 in incremental costs through an upgrade from R-10 to R-15 batts, which is less than one-fourth of the cost of exterior insulation. R-15 hanging batts are not priced in RS

INCREMENTAL COSTS UNIQUE TO CLIMATE ZONE 6

Exterior Walls

The 2012 IECC would require builders in climate zone 6 (which takes up the lower half of the state) to make changes to a new home's exterior wall construction. At present, the state's code requires R-19 or R-13 + 5 walls for exterior walls, while the 2012 IECC mandates an insulation upgrade to R-20 + 5 or R-13+10 walls. According to an informal survey of local building experts, most builders are currently meeting requirements by building R-19 walls, which requires 2 x 6 wall construction with R-19 fiberglass batt as cavity insulation. A smaller number of builders, however, use 13 + 5 wood frame walls, which require 2 x 4 framing with R-13 fiberglass batts and structurally insulated sheathing in place of conventional oriented strand board (OSB). Although the R-5 exterior sheathing can be met by adding nonstructural insulation on top of OSB, this analysis assumes builders use structurally insulated sheathing (SIS)—an engineered product that combines structural reinforcement of OSB with insulation equivalent to R-5, thus creating an R-13 + 5 wall.[8]

For the purposes of this analysis, we assume that most builders will elect to meet the 2012 IECC by using R-20+5 walls. The incremental cost of the optional R13+10 wall, therefore, is not estimated in this analysis, as builders nationwide have shown a preference for the 20+5 wall assembly. Building the R-20+5 wall begins with a 2 x 6 wall (used by most builders already) and replaces a layer of conventional OSB sheathing with SIS with an R value of 5. For the majority of builders in climate zone 6 currently building R-19 walls with 2 x 6 framing, an upgrade to the 2012 IECC's R-20+5 walls simply requires builders to replace the current R-19 batts with a high-density R-21 fiberglass batt, and to swap conventional OSB sheathing in favor of the structurally insulated sheathing (SIS) described above, thus delivering an R-20+5 wall assembly.

For the smaller number of builders currently using R-13+5 walls, this analysis assumes that builders can meet the 2012 IECC most easily by upgrading conventional 2 x 4 walls 2 x 6 wall construction.[9] The larger framing allows for R-21 fiberglass batts to be placed between studs instead of the R-13 batts required in the 2009 IECC. Fortunately for these builders, they will likely already be familiar with R-5 SIS, as they are already using SIS or a similar product to meet the current R-13+5 wall requirement.

Window Extension Jambs

Those builders currently meeting the state code with 2 x 4 wall construction will incur an additional cost for window jamb extensions. These jamb extensions are required because the wall thickness increases with a change from 2 x 4 to 2 x 6 framing. While some window manufacturers offer jamb extensions as a factory-built option, most builders prefer to field-fabricate extension jambs, which are attached to the interior jamb of the window and create a consistent wood or drywall transition between the window and wall. These extensions, essentially four pieces of wood or drywall that "frame" the interior window jamb,

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Means, but calls to local building suppliers yielded the cost for R-19 hanging insulation, which is priced at an additional $0.18 per square foot over R-10. Although the R-15 insulation should be less expensive than the quoted R-19, the $0.18 cost per square foot is used in this analysis, which adds only $202 in incremental costs.

[8] Incremental cost for 13+5 walls relies on local building supply estimates for R5 structurally insulated sheathing (SIS). Incremental costs for walls with SIS also take into account savings from eliminating a conventional vapor barrier, a function that is included in SIS panels.

[9] Due to the superior strength of 2 x 6 stud construction, builders can introduce a cost-saving variant of the R-20 wall that increases the space between studs from 16 inches apart to 24 inches—thus saving lumber and dramatically reducing incremental cost. Many builders prefer to retain 16 inch spacing however, and thus this wall assembly is not included in this analysis for clarity.

are estimated at $300 after a brief survey of installers, who expected costs to be $10-12 per window. By contrast, the Ohio HBA estimates this cost as somewhat higher, at $390 per new house.

Extension jambs are not assumed to be an added cost for other wall types, as the 2012 IECC does not increase overall wall thickness more than one quarter inch per wall (SIS vs. OSB). Put differently, because most builders use 2 x 6 walls, they are likely using extension jambs already, and will be unaffected by the 2012 IECC wall requirements. Instead, this change will only affect cost for the small percentage of builders in climate zone 6 who meet the current code with 2 x 4 framing.

Attic Insulation

Additionally, attic insulation would also have to be upgraded to R-49 with the adoption of the 2012 IECC. Although the current code requires R-38 attic floor insulation, we assume builders are instead installing R-43 in attic ceilings—which is required by the current code if they reduce basement insulation from R-10 to R-5. An upgrade from R43 to R-49 blown fiberglass insulation is priced by RS Means at $0.21 per square foot of attic floor area, or $285 per new home.

Cost Savings from Downsized HVAC Equipment

Fortunately, the 2012 IECC will also introduce cost savings for builders. While complying with the 2012 IECC 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 other possible savings, builders will be able to reduce the size of costly mechanical equipment. For the prototype house in climate zone 6, the estimated size of the cooling system falls from an average of 55,000 kBtuh to 42,000 kBtuh or from approximately 4.5 to 3.5 tons. This reduction in air conditioner capacity can result in a conservative first-cost savings of one half ton, which is expected to save approximately $815 for the average new house.[10]

Total Incremental costs for new homes in Minnesota's climate zone 6 are estimated in Table 1, below:

Table 1: 2012 IECC Incremental Costs for Minnesota's Climate Zone 6 (Minneapolis)

[10] 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. 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, thus wasting energy and losing some of its ability to dehumidify indoor air). While additional cost savings could be obtained by downsizing heating equipment, this study does not attempt to calculate those savings.

Building Component	Total Area	Incremental Cost/Square Ft	Total	Location Factor	Adjusted Total
Upgrade from R-19 walls to 20+5	2,380	$0.32	$ 752.67	116%	$873
OR Upgrade from R13+5 walls to 20+5	2,380	$0.67	$1,594.60	116%	**OR** $1,850
Upgrade Ceiling Insulation from R-43 to R-49	1,200	$0.21	$ 246.00	116%	$285
1st Floor Panned Return Ducts Upgraded to Flexible Ducts	75 linear ft	$2.29/lf	$ 171.75	116%	$199
Basement Wall Insulation Upgrade from R-5 to R-15 extruded polystyrene (XPS)	1,120	$0.91	$1,019.20	116%	$1,182
Upgrade Windows from U-.35 to U-.32	357	$1.00	$ 357.00	N/A	$357
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
75% CFLs in hardwired fixtures	N/A	N/A	N/A	N/A	$ 50
Upgrade to Programmable Thermostats	N/A	N/A	N/A	N/A	$ 50
Sealing/Insulating Attic Hatch	N/A	N/A	N/A	N/A	$ 50
Window Extension Jambs (only for builders using R-13+5 walls)	N/A	N/A	N/A	N/A	$300
HVAC System Savings (1 ton)	N/A	N/A	N/A	N/A	$(815)
Incremental Cost (Builders Currently Using 2 x 6 Walls)					**$2,682 OR**
Incremental Cost (Builders Currently Using R-13+5 Walls)					**$3,959***

** Note: Local interviews indicated that few builders are currently building with R-13+5 walls. As a result, most new home buyers in Climate Zone 6 will not incur an incremental cost of this magnitude.*

INCREMENTAL COSTS UNIQUE TO CLIMATE ZONE 7

Exterior Walls

As in climate zone 6, the 2012 IECC would require builders in climate zone 7 (which takes up the upper half of the state) to make changes to a new home's exterior wall construction. At present, the state code requires R-19 exterior walls, while the 2012 IECC mandates an insulation upgrade to R-20 + 5 or R-13+10 walls—the same wall options required under the 2012 code in climate zone 6. To meet the R20+5 requirement, builders will have to replace R-19 fiberglass batts with high-density R-21 batts and replace conventional OSB sheathing with structurally insulated sheathing (SIS). As in climate zone 6, the incremental cost of the optional R13+10 wall is not estimated in this analysis, as builders nationwide have shown a preference for the 20+5 wall assembly.

Attic Insulation

As in climate zone 6, attic insulation would also have to be upgraded to R-49 with the adoption of the 2012 IECC. The current state code requires R-44 insulation. The cost of this upgrade is estimated to similar to the added cost in climate zone 6 of $0.21 per square foot of attic floor area, or $268 per new home.

Cost Savings from Downsized HVAC Equipment

Just as in climate zone 6, the improved building envelope prescribed by the 2012 IECC will introduce cost savings for builders through a downsizing of HVAC equipment. For the prototype house in climate zone 7, the estimated size of the cooling system falls from an average of 52,500 kBtuh to 42,000 kBtuh or from approximately 4.38 to 3.50 tons. This reduction in air conditioner capacity can result in a conservative first-cost savings of one half ton, which is expected to save approximately $408 for the average new house.[11]

[11] Savings for builders may be still greater than the 1/2 ton conservatively estimated in this analysis, as energy modeling indicated that the required system size is reduced by 0.88 tons. Because HVAC equipment is sold in 1/2 ton

Total Incremental costs for new homes in Minnesota's climate zone 7 are estimated in Table 2, below:

Table 2: 2012 IECC Incremental Costs for Minnesota's Climate Zone 7 (Duluth)					
Building Component	Total Area	Incremental Cost/Square Ft	Total	Location Factor	Adjusted Total
Upgrade from R-19 walls to 20+5	2,380	$0.32	$ 752.67	109%	$820
Upgrade Ceiling Insulation from R-44 to R-49	1,200	$0.21	$ 246.00	109%	$268
1st Floor Panned Return Ducts Upgraded to Flexible Ducts	75 linear ft	$2.29/lf	$ 171.75	109%	$187
Basement Wall Insulation Upgrade from R-10 to R-15 extruded polystyrene (XPS)	1,120	$0.72	$ 806.40	109%	$879
Upgrade Windows from U-.35 to U-.32	357	$1.00	$ 357.00	N/A	$357
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
75% CFLs in hardwired fixtures	N/A	N/A	N/A	N/A	$ 50
Upgrade to Programmable Thermostats	N/A	N/A	N/A	N/A	$ 50
Sealing/Insulating Attic Hatch	N/A	N/A	N/A	N/A	$ 50
HVAC System Savings (1/2 ton)	N/A	N/A	N/A	N/A	$(407)
Incremental Cost					**$2,704**

ENERGY COST SAVINGS

NOTE: For two reasons, the energy savings below are likely to be understated: 1) ICF's energy modeling used the 2006 IECC as the baseline, instead of Minnesota's energy code (*which modified the 2006 IRC Energy Chapter with prescriptive requirements for attic, basement wall, and exterior wall insulation that are less stringent than the 2006 IECC*), and 2) The analysis assumes constant energy prices over its 30 year period; if energy prices rise (as they have historically), savings will be greater in future years.

According to the model used in this analysis, **upgrading to the 2012 IECC will result in significant energy cost savings for Minnesota home buyers, resulting in savings of between $848 and $925 per year,** depending on the type of exterior wall type builders select. These energy savings allow homebuyers to quickly recapture their incremental costs. Annual energy savings are presented in Table 3, below, by climate zone and current exterior wall type.

Table 3: 2012 IECC Energy Savings by Climate Zone and Wall Type	
Climate Zone and Wall Types	**Annual Energy Savings**
Climate Zone 6: Houses with R-20+5 Walls (assuming R-19 current practice)	$848
Climate Zone 6: Houses with R-20+5 Walls (assuming R13+5 current practice)	$848
Climate Zone 7: Houses with R-20+5 Walls (assuming R-19 current practice)	$925

MORTGAGE PAYBACK FOR HOMEOWNERS

Homebuyers will be able to include the incremental first-costs of meeting the 2012 IECC in their mortgage, while benefiting from lower utility bills starting on day one. With estimated energy cost

increments, this analysis estimates a reduction of only one half ton, although some builders may be able to reduce by a full-ton depending on their home's size and dimensions.

savings of between $848 and $925 per year, monthly utility bill savings are more than four times as much as the additional mortgage payment needed to cover the added first-cost of energy saving features required by the 2012 code.

This cash-flow difference is enough to pay back the buyer's added down payment in approximately 8 to 14 months after purchase (or sooner if the loan allows a down payment below 20%). After that date, the owner continues to realize a profit of at least $666 annually due to lower utility bills – and even more if energy prices increase.

This payback analysis assumes that homebuyers purchase a new home with 20% down at the current nationwide interest rate of 4.03 percent. This scenario would result in an increased down payment of between $536 to $792 with an additional mortgage cost of between $10 and $15 per month. Taking into account energy savings and lower utility bills, a cash flow analysis indicates that the homebuyer would break even within as little as 8 months. After that break-even date, **homeowners would continue to realize a profit of $666 and $800 annually**, which is calculated by subtracting additional mortgage costs from energy savings. Homebuyers with a lower down payment—such as 5 or 10 percent—will realize payback more quickly. Mortgage payback to homeowners is presented below in Table 4, below.

Table 4: Mortgage Payback for Homebuyers by Climate Zone and Exterior Wall Type

Exterior Wall Type	Incremental Costs	Energy Savings/ Year and Month per home	Down Payment Increase (and Mortgage Increase per Month)	Breakeven Point	Annual Profit for Homeowner after Breakeven Point	Gross Profit over Mortgage Term (Energy Savings Minus Mortgage Costs)
Climate Zone 6, R-20+5 Walls (R-19 current practice)	$2,682	$848/year ($71/ month)	$536 (plus $10/month)	**9 months**	**$724**	**$21,208**
Climate Zone 6, R-20+5 Walls (R-13+5 current practice)	$3,959*	$848/year ($71/month)	$792 (plus $15/month)	**14 months**	**$666**	**$19,197**
Climate Zone 7, R-20+5 Walls (R-19 current practice)	$2,704	$925/year ($77/month)	$541 (plus $10/month)	**8 months**	**$800**	**$23,479**

**Note: Local interviews indicated that few builders are currently building with R-13+5 walls. As a result, most new home buyers in Climate Zone 6 will not incur an incremental cost of this magnitude.*

CONCLUSIONS

- As estimated in this analysis, incremental costs for new 2,400 square foot homes built to the 2012 IECC in Minnesota total $2,682 to $3,959 per new home.
- Annual energy savings for Minnesota homeowners attributable to the 2012 IECC range from $848 to $925, depending on which exterior wall type builders select.
- Assuming a conservative 20% down payment, new home buyers will break even on their initial investment in as few as 8 months and no more than 14 months after purchase.
- Due to Minnesota's unique climate, gross profit to home buyers over a 30 year mortgage term ranges from $19,197 to $23,479.

About BCAP

As an independent judge of the efficacy of energy codes, BCAP strives to use data to address energy code barriers, including the real or perceived construction costs incurred by code changes. To address concern in the building community that upgrading to the latest version of the residential energy code, the 2012 IECC, will result in cost prohibitive increases in construction cost for new single-family homes, BCAP has completed a nationwide incremental cost analysis as well as analysis for states on demand. Funding for this work is provided by the Environmental Protection Agency, the Department of Energy, and the National Association of State Energy Officials. BCAP is a project of the Alliance to Save Energy, a nonprofit organization that promotes energy efficiency worldwide through research, education, and advocacy.

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