Environment & Energy Commission
City of Columbia & County of Boone

City Hall, Conference Room 1A

July 23, 2013

Dear Mr. Mayor and Members of the City Council:

The EEC (Environment and Energy Commission) has recommended adoption of the 2012 Energy code with a few changes. Upon request we provide additional information clarifying and supporting our recommendations.

The EEC referred the matter to a sub-committee, chaired by a Licensed Professional Engineer and including a residential builder with several ENERGY STAR certified homes. Thus we had the expertise to properly evaluate the benefits and costs of the changes between the current code and the 2012 energy code. The 2012 International Residential Code is an accepted international standard for construction. Many jurisdictions adopt this code verbatim.

This letter is a follow-up to our pre-Council meeting presentation on June 17, 2013. It includes a comparison of cost data from the BCCC (Building Construction Codes Commission) presentation as well as source information for the cost data in the EEC presentation.

We believe the EEC recommendations are cost effective and based on readily available materials and proven technology. The homeowner gets a positive economic return based on discounted cash flow analysis.

In joint discussions with the BCCC, the EEC and BCCC made joint compromise recommendations. Three areas of disagreement remain. These discrepancies were detailed by both commissions in the presentations on June 17.

The three areas of disagreement included:

- Wall insulation
- Attic Insulation
- Slab-on-grade edge insulation

Two sets of data were presented to Council that may appear contradictory. Review of the source documents in the BCCC data analysis shows that some

cost numbers were incorrectly applied by BCCC. The primary reference source document used by BCCC was produced by Building Codes Assistance Project (BCAP) and is referenced here:
http://energycodesocean.org/sites/default/files/resources/Kansas%20City%202012%20IECC%20True%20Cost_0.pdf

Both EEC and BCCC agree that this study by BCAP is a reliable source for information about the economics of the 2012 Energy Code.

The BCCC analysis is flawed in three ways. Making these errors inflated calculated costs and produced skewed payback calculation. First, cost numbers from the BCAP paper were misapplied in exterior wall insulation, and second, simple paybacks were incorrectly calculated for two cases - both wall insulation and attic insulation. When these numbers are properly applied, the BCCC referenced source costs are very close to those used in the EEC analysis. These errors are detailed below.

A cost of $2293 was used (from the BCAP paper) as the cost of exterior wall insulation by BCCC. This is the highest estimate of total construction costs for all measures in the 2012 IECC fully implemented ($1460-$2293). Total construction cost for all new measures in the code is not the same as wall insulation cost, which is estimated in the same source document at $613-$1446, not $2293. The correct cost for wall insulation is very close to the $847-$1268 cited in the EEC analysis. BCAP's study is based on a house that is 20% larger than the typical 2000 square foot house used in EEC's analysis. EEC cost numbers came from current quotes from local contractors, such as Nemow Insulation and Boone County Lumber. The cost number for wall insulation used by BCCC was incorrectly applied.

The other flaw in the analysis was an incorrect simple payback calculation. The correct equation for simple payback is:

Simple Payback = Initial cost / Annual savings

Here are corrected calculations for simple payback, using the correct costs for insulation form the BCAP paper, and the correct formula for simple payback. These data are presented in the same format as in the BCCC document for clarity:

R-20 Insulation in Exterior Walls in lieu of 2X4 walls			
Additional Cost of Construction	$613.00 to	$1,446.00	(Per BCAP study based on Kansas City Mo)
Energy Savings	2.75 MMBTU/Yr		(3.3% energy reduction based on residences in Texas)
Energy Savings	807 kWh/yr		
Energy Savings	$76.18 /yr		
Simple Payback	8.05 to	18.98 Years (not Never)	Payback = Initial Cost / Annual Savings

R-49 Attic Insulation (using R-49 in lieu of R-38)			
Additional Cost of Construction	$507.00		(Per BCAP study based on Kansas City Mo)
Energy Savings	1.58 MMBTU/Yr		(3.3% energy reduction based on residences in Texas)
Energy Savings	463 kWh/yr		
Energy Savings	$43.71 /yr		
Simple Payback	11.60 Year (not 47)		Payback = Initial Cost / Annual Savings

The correct simple payback for wall insulation, using the BCAP source document cited by BCCC ranges from 8 to 19 years (not "never" as in the BCCC analysis), and the correct simple payback for attic insulation is 12 years, (not 47).

The error made in the BCCC analysis was using net savings after the amortized costs were deducted from annual savings. This is not the same as simple payback.

The BCAP study for Kansas City shows that using discounted cash flow (mortgage amortization) the homeowner will break even on energy savings vs. mortgage cost in 7-11 months. The EEC's analysis showed a similar break-even point of 8-10 months. This is consistent with the conclusions in the BCAP document.

The sources and methods cited by the BCCC, properly applied, produce results generally consistent with the recommendations of the EEC. The sources and methods employed by the EEC in its analysis are detailed in the appendices below. See also the BCAP study cited by BCCC.

From a community perspective, financial benefits to the homeowner should not be the only consideration. The City should keep in mind related issues and concerns. Quality of life is also an important consideration. Cost cannot be the only factor in evaluating recommendations. We need to consider the

side effects of increased energy use, including impacts on public health, global climate change and other intangible costs when creating city policy.

The EEC has recommended adoption of the 2012 Energy code with a few changes. As requested we provide additional information clarifying and supporting our recommendations. We have shown there are three deficiencies in the BCCC analysis. The cost numbers used in the BCAP documents referenced by BCCC are consistent with EEC's analysis. The EEC recommends adopting the 2012 with the recommended modifications.

Respectfully Yours,

Lawrence Lile, PE

Chair

Energy Environment Commission

EEC 2012 Energy Code Compliance Cost Analysis

2000 sq ft ranch slab on grade/9' walls:
187 LF exterior wall (60'x33.5'=2010 sq ft)
187 LF (linear feet) slab perimeter
1683 sq ft wall insulation (9' high X 187 LF)

All costs based on quotes from local suppliers

Nemow	**wall insulation (2x6 blown vs 2x4 blown): $0.10/ sq ft**	**$168**
Nemow	**attic insulation (R-49 instead of R-38): $0.25 per sq f**	**$500**
Boone County Lumber	**Wall framing/lumber (2x6 vs 2x4): $3.63/LF**	**$679**
	slab perimeter insulation:	**$1,829**
Boone County Lumber	R-10 foam (24" width): 1.52/sq ft ($3.04/ LF)	$569
Designer Home Builders	Foam labor ($1.50/LF	$281
Boone County Lumber	Trim coil foam cover: $1.73/LF	$324
Jody Carmichael	Labor to install trim coil: $$3.50/LF	$655
	Total Installation Cost for Slab home	**$3,176**
Nemow	blower door test	$400
Nemow	duct leakage test	$200
	Total Cost with 3rd Party testing	**$3,776**

Annualized Cost with 3rd party testing		**Amortized payback**
annual cost: Amortized into 30 yr mortgage: 4%	**$218**	**9 months**
annual cost: Amortized into 30 yr mortgage: 5%	**$245**	**10 months**
annual cost: Amortized into 30 yr mortgage: 6%	**$273**	**11 months**
annual Utility savings (MEEA)	**$294**	**Simple Payback**
Simple payback ($3776/$294)		**12.84 years**

MEEA: Midwest Energy Efficiency Alliance (Chicago)

2000 sq ft unfinished ranch walkout/9' walls both levels:
280 LF exterior wall (187 LF main plus 93 LF basement)
80 LF slab perimeter (basement on grade)
2520 sq ft wall insulation (280 Lf X 9' high)

Nemow	**wall insulation (2x6 blown vs 2x4 blown): $0.10/ sq ft**	**$252**
Nemow	**attic insulation (R-49 instead of R-38): $0.25 per sq f**	**$500**
Boone County Lumber	**Wall framing/lumber (2x6 vs 2x4): $3.63/LF**	**$1,016**
	slab perimeter insulation:	**$781**
Boone County Lumber	R-10 foam (24" width): 1.52/sq ft ($3.04/ LF)	$243
Designer Home Builders	Foam labor ($1.50/LF	$120
Boone County Lumber	Trim coil foam cover: $1.73/LF	$138
Jody Carmichael	Labor to install trim coil: $$3.50/LF	$280
	Total Cost for Slab home	**$2,549**
Nemow	blower door test	$400
Nemow	duct leakage test	$200
	Total Cost with 3rd Party testing	**$3,149**

Annualized cost with 3rd Party testing		**Amortized payback**
annual cost: Amortized into 30 yr mortgage: 4%	**$183**	**9.5 months**
annual cost: Amortized into 30 yr mortgage: 5%	**$206**	**10.7 months**
annual cost: Amortized into 30 yr mortgage: 6%	**$230**	**I year**
annual Utility savings (MEEA)	**$230**	
Simple payback ($3149/230		**13.7 years**

2012 ENERGY CODE PAYBACK:

FOR NEW HOMES IN
KANSAS CITY, MO

YOUR HOME, MORE AFFORDABLE WITH THE 2012 IECC

Homes are the biggest investment we make—and everyone deserves a home that meets national minimum energy efficiency standards. While it's true that homeowners can always improve the efficiency of their homes, it is far more cost-effective to upgrade building components during construction, putting in better windows or swapping out one grade of insulation for a better one. Here's what buyers get with the 2012 IECC:

KANSAS CITY
CLIMATE ZONE **4**

High-efficiency Lighting
$50

Window Upgrades
$179

Whole-house Sealing and Testing
$350

Programmable Thermostat
$50

Hot Water Insulation
$100

Insulation Upgrades
$613–1,446 WALL
$507 CEILING

Additional Upgrades:

Hard-Ducted Returns	$177
Sealed & Insulated Attic Hatch	$100
Improved Bathroom Ventilation	$150
HVAC System Savings	+$815

HOMES BUILT TO THE 2012 IECC COULD YIELD A
$43 PROFIT EVERY MONTH
AND $15,000 OVER 30 YEARS.

For additional Incremental Cost Analysis, please visit energycodesocean.org

BCAP Dedicated to the adoption, implementation, and advancement of building energy codes

TRUE COST OF THE

2012 INTERNATIONAL ENERGY CONSERVATION CODE

FOR NEW HOMES IN
KANSAS CITY, MO

Upgrading new homes in Kansas City, Missouri to the 2012 International Energy Conservation Code (IECC) will reduce out-of-pocket expenses for homeowners – paying off their initial investment in a matter of months.

For the average new home, the 2012 IECC will only increase construction costs by $1,460-2,293. When this amount is rolled into the average mortgage, real costs to homebuyers will mean a down payment increase of only $292-459, and $6-9 extra on monthly mortgage bills.

The added mortgage costs will be offset by monthly energy savings of $51.73, helping homebuyers pay off their initial investment in only seven to eleven months. After breaking even during that time, the home will return buyers a profit of at least $43 per month—for a total return of $516 every year. This return on investment is shown in balance sheet below.

For additional Incremental Cost Analysis, please visit energycodesocean.org.

7-11 MONTHS
Break-Even Point

$582.25
2-year Profit

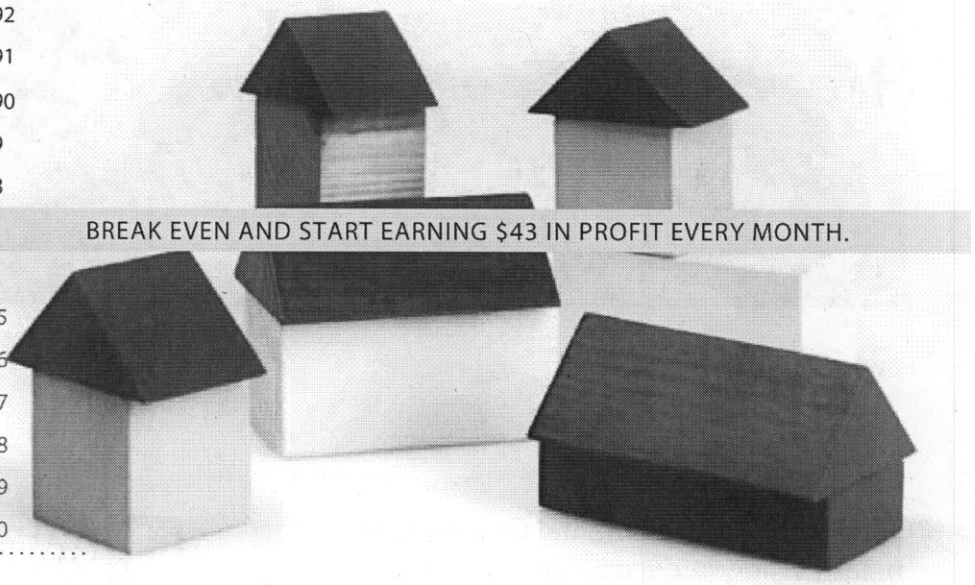
25%
Annual Energy Reduction

$2,130.60
5-year Profit

ENERGY CODE PAYBACK FOR KANSAS CITY SINGLE FAMILY HOMES

Month	Mortgage Increase	Monthly Energy Savings	Cumulative Cost/Benefit
1	$458.70	$51.73	-$406.97
2	$8.72	$51.73	-$363.96
3	$8.72	$51.73	-$320.95
4	$8.72	$51.73	-$277.94
5	$8.72	$51.73	-$234.93
6	$8.72	$51.73	-$191.92
7	$8.72	$51.73	-$148.91
8	$8.72	$51.73	-$105.90
9	$8.72	$51.73	-$62.89
10	$8.72	$51.73	-$19.88
11	$8.72	$51.73	$23.13
12	$8.72	$51.73	$66.14
13	$8.72	$51.73	$109.15
14	$8.72	$51.73	$152.16
15	$8.72	$51.73	$195.17
16	$8.72	$51.73	$238.18
17	$8.72	$51.73	$281.19
18	$8.72	$51.73	$324.20

This model assumes a 2,400 square foot home. The mortgage is conservatively set at 30 years, with 20% down and the current average nationwide interest rate of 4.03%. With a lower down payment—such as 10% down—consumers will break even on their investment even sooner.



BREAK EVEN AND START EARNING $43 IN PROFIT EVERY MONTH.