its final report of findings and recommendations in October 2010.

On February 2, 2011, the Secretary of Energy appointed new members to his Ultra-Deepwater Advisory Committee (UDAC), and met with the members on February 23, 2011 to discuss his goals for offshore research and development. Before presenting its final report of findings and recommendations to the Secretary in April 2011, the UDAC established a Subcommittee on Risk Assessment.

The Department of Energy will be continually informed by the UDAC based on the work of its Subcommittee on Risk. In addition, other Federal advisory bodies will help inform the Department. These include the Secretary of Energy Advisory Board (SEAB) which established a Subcommittee on Natural Gas, and the Department of the Interior's Ocean Energy Safety Committee (OESC) which has established four subcommittees including the Spill Prevention Subcommittee, and the Containment Subcommittee. The Department of Energy is a member of the OESC. The Department will take new information into account in the preparation of solicitations and the selection of research projects for the 2011 portfolio.

Issued in Washington, DC, on September 7, 2011.

Christopher A. Smith,

Deputy Assistant Secretary, Office of Oil and Natural Gas, Office of Fossil Energy.

[FR Doc. 2011–23328 Filed 9–12–11; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

[Docket No. EERE–2011–BT–BC–0046]

Building Energy Codes Cost Analysis

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (DOE) is soliciting public input on how it may improve the methodology DOE intends to use for assessing cost effectiveness (which includes an energy savings assessment) of changes to residential building energy codes. DOE supports the development of the International Code Council's (ICC) International Energy Conservation Code (IECC), the national model code adopted by or forming the basis of residential energy codes promulgated by a majority of U.S. states, as well as other voluntary building energy codes. DOE performs a cost effectiveness analysis of proposed modifications to the codes as part of that support. DOE also performs an analysis of cost effectiveness of new code versions. DOE is interested in public input on its methodology, preferred data sources, and parameter assumptions.

DOE is publishing this request for information to allow interested parties to provide suggestions, comments, and other information. This notice identifies several areas in which DOE is particularly interested in receiving information; however, any input and suggestions considered relevant to the topic are welcome.

DATES: Written comments and information are requested by October 13, 2011.

ADDRESSES: Interested persons may submit comments in writing, identified by docket number EERE–2011–BT–BC–0046, by any of the following methods:

E-mail: Res-CEAM-2011-BC-0046@ee.doe.gov. Include EERE–2011–BT–BC–0046 in the subject line of the message.

Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, Building Energy Codes, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Phone (202) 586–2945. Please submit one signed paper original.

Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024. Phone: (202) 586–2945. Please submit one signed paper original.

Internet: http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR+PS;rpp=250;so=DESC;sb=postedDate;po=0;D=EERE-2011-BT-BC-0046. Please use the input form and complete all required fields.

Instructions: All submissions received must include the agency name and docket number.

Docket: For access to the docket to read background documents, or comments received, visit the U.S. Department of Energy, Resource Room of the Building Technologies Program, 950 L'Enfant Plaza, SW., Suite 600, Washington, DC 20024, (202) 586–2945, between 9 a.m. and 4 p.m., Monday through Friday, except Federal holidays. Please call Ms. Brenda Edwards at the above telephone number for additional information regarding visiting the Resource Room.

FOR FURTHER INFORMATION CONTACT: Mr. Robert Dewey, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Mailstop EE–2J, 1000 Independence Avenue, SW., Washington, DC 20585–0121, Telephone: (202) 287–1354, E-mail: *Robert.Dewey@ee.doe.gov.*

Ms. Kavita Vaidyanathan, U.S. Department of Energy, Office of the General Counsel, Forrestal Building, Mailstop GC–71, 1000 Independence Ave., SW., Washington, DC 20585, Telephone: (202) 586–0669, E-mail: *kavita.vaidyanathan@hq.doe.gov.*

SUPPLEMENTARY INFORMATION:

Authority and Background

Section 307(b) of the Energy Conservation and Production Act (ECPA, Public Law 102–486), as amended, directs DOE to support voluntary building energy codes by periodically reviewing the technical and economic basis of the voluntary building energy codes and "seek adoption of all technologically feasible and economically justified energy efficiency measures; and * * * otherwise participate in any industry process for review and modification of such codes." [1]

This Request for Information (RFI) seeks public input on DOE's methodology for assessing the cost effectiveness of proposed changes to residential building energy codes and new editions of such codes. Historically, DOE's analyses have been conducted in an ad hoc manner, with the methodology selected based on the type of code change contemplated and the nature of ongoing stakeholder debates on the topic. Because residential energy codes lagged advances in residential efficiency measures, DOE relied on successes in relevant research, demonstration, and voluntary beyond-code programs (*e.g.,* Building America, ENERGY STAR) rather than directly calculating the cost effectiveness of code changes. However, recent advances in the IECC and other voluntary building energy codes have improved the energy performance of buildings and building components to levels that in many cases rival those of the beyond-code programs. Consequently, for its future efforts advancing and promoting voluntary building energy codes, DOE sees the need for a consistent and transparent methodology for assessing the cost effectiveness of code change proposals and for assessing the cost effectiveness of new code versions.

DOE intends to use the methodology described in this document to address DOE's legislative direction related to

[1] 42 U.S.C. 6836(b)(2) and (3).

building energy codes. DOE also intends to use this methodology to inform its participation in the update processes of the IECC and other building energy codes, both in developing code-change proposals and in assessing the proposals of others when necessary. DOE further intends to use this methodology in assessing the cost effectiveness of new code versions in lieu of prior versions or existing state energy efficiency codes.

The focus of this RFI is residential buildings, which DOE defines in a manner consistent with the IECC—one- and two-family dwellings, townhouses, and low-rise (three stories or less above grade) multifamily residential buildings.

The cost effectiveness methodology is separate from the statutory requirement that DOE issue a determination ''whether such revision would improve energy efficiency in residential buildings'' whenever the IECC (as successor to the 1992 Model Energy Code) is revised (42 U.S.C. 6833(a)(5)). The determinations under 42 U.S.C. 6833 are required only for the IECC, not any other building energy codes; require analysis of only energy savings, not cost effectiveness; and may be based on qualitative assessments of energy efficiency improvements rather than quantitative analysis of energy savings.

DOE's methodology is intended to assess cost effectiveness based on a 30-year period of analysis, assuming a home buyer takes out a 30-year mortgage to purchase the home. This approach is intended to represent the economic perspective of a typical home owner or sequence of owners who own the home over the 30-year analysis period. The perspective of a single 30-year owner allows consideration of economic impacts on home buyers as well as consideration of long-term energy savings.

Steps Included in Assessing Cost Effectiveness of Code Changes

Assessing the cost effectiveness of a proposed code change or a newly revised code involves three primary steps:

1. Estimating the energy savings of the changed code provision(s),
2. Estimating the first cost of the changed provision(s), and
3. Calculation of the corresponding economic impacts of the changed provision(s).

These steps are the focus of this Request for Information and are described in the sections that follow.

Estimating Energy Savings of Code Changes

The first step is estimating the energy savings of code changes. In estimating the energy impact of a code change DOE will usually employ computer simulation analysis (situations in which other analysis approaches might be preferred are discussed later). DOE may also rely on extant studies that directly address the building elements involved in a proposed change if such can be identified. When evaluating code changes proposed by entities other than DOE,[2] DOE may rely on energy estimates provided by the proponent(s) if DOE deems the calculations credible. Where credible energy savings estimates are not available, DOE intends to conduct analysis using an appropriate building energy estimation tool. DOE intends to use the EnergyPlus[3] software for its analyses unless the code change at hand involves a building component or strategy that is outside the scope of that software. Such code changes would be addressed case by case.

Code changes affecting a particular climate zone would be simulated in a weather location representative of that zone. Where a code change affects multiple climate zones, DOE intends to produce an aggregate (national) energy impact estimate based on simulation results from weather locations representative of each zone, weighted to account for estimated housing starts by zone and other factors representing the fraction of homes that would be affected by the code change (building types, foundation types, fuel/equipment types). These methodologies, weighting factors, and other assumptions are described in the sections that follow.

Building Energy Use Simulation Assumptions and Methodology

The energy performance of most energy-efficiency measures in the scope of building energy codes can be estimated by computer simulation. In estimating the energy performance of pre- and post-revision codes, two prototype buildings would be analyzed—one that exactly complies with the pre-revision code and an otherwise identical building that exactly complies with the revised code under analysis.[4] These two buildings would be simulated in a variety of locations to estimate the overall (national average) energy impact of the new code. The inputs and assumptions used in those simulations are discussed in the following sections.

Energy Simulation Tool

DOE intends to use an hour-by-hour simulation tool to calculate annual energy consumption for relevant end uses. For most situations, the EnergyPlus software, developed by DOE, would be the tool of choice. EnergyPlus provides for detailed hour-by-hour simulation of a home's energy consumption throughout a full year, based on typical weather data for a location. It covers almost all aspects of residential envelopes, HVAC equipment and systems, water heating equipment and systems, and lighting systems. Depending on how building energy codes evolve, it may be necessary to identify additional tools to estimate the impacts of some changes.

Prototypes

Separate simulations would be conducted for single-family and multifamily buildings. The prototypes used in the simulations are intended to represent a typical new one- or two-family home or townhouse and a low-rise multifamily building (apartment, cooperative, or condominium). Five foundation types would be examined for single-family homes: Vented crawlspace, unvented (conditioned) crawlspace, slab-on-grade, heated basement with wall insulation, and unheated basement with insulation in the floor above the basement. Table 1 shows the characteristics DOE intends to assume for the single-family prototype. Note that any of these characteristics may be modified if a code change impacts it.

[2] All code change proposals are publicly available and are published by the ICC months before the code hearings (open to the public) that determine whether the code changes are approved for addition to the next edition of the IECC.

[3] *http://www.energyplus.gov/.*

[4] ''Exactly complies'' means that the prototype complies with the primary prescriptive manifestation of the code's requirements. DOE will address codes without such primary requirements (*e.g.*, a purely performance code) on a case by case bais.

TABLE 1—SINGLE-FAMILY PROTOTYPE CHARACTERISTICS

Parameter	Assumption	Notes
Conditioned floor area	2400 ft^2	Characteristics of New Housing, U.S. Census Bureau.
Footprint and height	30 ft by 40 ft, two-story, 8.5 ft high ceilings.	
Area above unconditioned space	1200 ft^2	Over a vented crawlspace or unconditioned basement.
Area below roof/ceilings	1200 ft^2, 70% with attic, 30% cathedral.	
Perimeter length	140 ft.	
Gross wall area	2380 ft^2.	
Window area (relative to gross wall area)	15%.	
Door area	42 ft^2.	
Internal gains	91,436 Btu/day	2006 IECC, Section 404.
Heating system	Natural gas furnace	Efficiency will be based on prevailing federal minimum manufacturing standards. Where relevant code changes impact different heating system types differently, additional types will be simulated (see below for equipment type weightings).
Cooling system	Central electric air conditioning (AC)	Minimum manufacturing standards.
Water heating	Natural gas.	

For the multifamily building prototype, U.S. Census data (2006) [5] show that the size and number of dwelling units per building in new construction varies greatly. The median number of dwelling units per building is in the range of 20 to 29 with the median floor area per unit in the range of 1000 to 1199 ft^2. The multifamily prototype characteristics intended to be used for DOE's analyses are:

- A rectangular two-story building containing dwelling units with 1200 ft^2 of conditioned floor area.
- 600 ft^2 floor area and roof/ceiling area per dwelling unit.
- The average exterior wall perimeter per dwelling unit is 43 ft, which is set to a 20 by 23 ft rectangle in the simulations. With 8.5 ft ceilings, the wall area is 731 ft^2 per dwelling unit. The 43 ft perimeter is based on assuming a 20-unit building that is 30-ft wide and 400-ft long, yielding an 860-ft perimeter, which averages 43 ft per dwelling unit. (The dimensions used here represent average values of both middle and end units, yielding a hypothetical dwelling unit with dimensions that do not exactly match the conditioned floor area.).
- 42 ft^2 of exterior door area per dwelling unit.
- 54668 Btu/day internal gains per dwelling unit (2006 IECC).
- Window area is estimated at 14% of the conditioned floor area.

The heating, cooling, and water heating system characteristics are the same as for the single-family prototype (each dwelling unit is assumed to have its own separate heating and cooling equipment).

Weather Locations

Simulations (and other analyses as appropriate) would be conducted in one weather location per climate zone in the code, including a separate location for each moisture regime, for a total of 15 climate locations.[6] Simulation results from the climate zones would be weighted based on new residential building permit data obtained from the U.S. Census Bureau. Table 2 shows the shares of national construction by IECC primary climate zone based on year-2000 Census data. More than 90% of the construction occurred in climate zones 2 through 5. Climate zones 7 and 8 are combined here, because zone 8 (northern Alaska) represents only a small fraction of the national construction activity.

Within a climate zone, simulation results from different moisture regimes would be weighted based on population densities estimated from USGS Populated Places data. Table 3 shows the climate locations, each of which is represented by a Typical Meteorological Year (TMY2) [7] file. The final column shows the final weight intended to be applied to each TMY2 location, based on a combination of the within-zone weight of the previous column and the by-zone housing starts of Table 2.

TABLE 2—HOUSING START SHARES BY CLIMATE ZONE

Climate zone	Percentage of building permits
1	2
2	19
3	27
4	19
5	27
6	6
7 & 8	0.3

TABLE 3—CLIMATE LOCATIONS USED IN ENERGY SIMULATIONS WITH CLIMATE ZONE AND MOISTURE REGIME WEIGHTS

Climate zone	Moisture regime	Representative location				Regime weight within zone (percent)	Overall location weight (percent)
		State	City	HDD(65) *	CDD(65) **		
1	Moist	Florida	Miami	139	4157	100	2
2	Dry	Arizona	Phoenix	1350	4162	17	3.2
	Moist	Texas	Houston	1371	3012	83	15.8
3	Dry	Texas	El Paso	2708	2094	47	12.7

[5] U.S. Census Bureau. 2006 Characteristics of New Housing. *http://www.census.gov/const/www/charindex.html.*

[6] The IECC has eight temperature-oriented climate zones crossed with three moisture regimes, for a theoretical total of 24 distinct climate zones. However, only 15 of the possible zones occur within the U.S.

[7] See *http://rredc.nrel.gov/solar/old_data/nsrdb/tmy2/.*

TABLE 3—CLIMATE LOCATIONS USED IN ENERGY SIMULATIONS WITH CLIMATE ZONE AND MOISTURE REGIME WEIGHTS—Continued

Climate zone	Moisture regime	Representative location				Regime weight within zone (percent)	Overall location weight (percent)
		State	City	HDD(65) *	CDD(65) **		
	Marine	California	San Francisco	3005	65	13	3.5
	Moist	Tennessee	Memphis	3082	2118	40	10.8
4	Dry	New Mexico	Albuquerque	4562	941	3	0.6
	Marine	Oregon	Salem	4927	247	10	1.9
	Moist	Maryland	Baltimore	4068	1608	87	16.5
5	Dry	Idaho	Boise	5861	754	13	3.5
	Moist	Illinois	Chicago	5753	989	87	23.5
6	Dry	Montana	Helena	8031	386	11	0.7
	Moist	Vermont	Burlington	7771	388	89	5.3
7		Minnesota	Duluth	9169	223	100	0.2
8		Alaska	Fairbanks	13697	44	100	0.1

* HDD = heating degree-days, base 65F.
** CDD = cooling degree-days, base 65F.

The locations in Table 3 were selected to be reasonably representative of their respective climate zones by Briggs *et al.* (2002).[8]

Note that the above assumes that the climate basis of the revised code is the same as that of the previous code. Revisions that change the climate zones or switch to a new climate basis would require development of a custom procedure to capture the impacts on residential energy efficiency.

Default Assumptions

Input values for building components that do not differ between the two subject codes would be set to match a shared code requirement if one exists, to match standard reference design specifications from the code's performance path if the component has such specifications, or to match best estimates of typical practice otherwise. Because such component inputs are used in both pre- and post-revision simulations, their specific values are of secondary importance and it is important only that they be reasonably typical of the construction types being evaluated.

Weighting Factors

Building Types

Building permit data for 2006 through 2010 indicate that 22% of new construction in terms of total dwelling units is multifamily (Census 2011).[9] However, only 60% of these dwelling units are ''low-rise'' units, the other 40% being in buildings of four stories or more in height and therefore falling under the IECC's nonresidential provisions.[10] Therefore, about 13.2% (0.22×0.60) of *all* residential dwelling units are in multifamily buildings that fall under the purview of the residential requirements of the IECC. About 8.8% (0.22×0.4) of all residential dwelling units fall under the nonresidential IECC classification. Thus, low-rise multifamily dwelling units account for about 14.5% ($0.132/(1 - 0.088)$) of dwelling units classified as residential in the IECC. This figure would be used to aggregate results from DOE's single-family and multifamily simulation results.

TABLE 4—BUILDING TYPE SHARES [PERCENT]

Building type	Weighting factor (percent)
Single-Family	84
Multifamily	16

Foundation Types

Simulations would be based on a vented crawlspace foundation except in cases that deal explicitly with changes to requirements for other foundation types. In the latter cases, foundation-specific energy changes would be weighted by an estimate of foundation shares in each climate zone. These shares are estimated from the Census Bureau data for 2004 housing characteristics data (Census 2006) [11] shown in Table 5.

TABLE 5—FOUNDATION TYPE SHARES (PERCENT) BY CENSUS ZONE

Zone	Basement	Slab	Crawlspace
Northeast	84	13	3
Midwest	76	17	6
South	12	70	17
West	15	65	20
Total	31	54	15

The data in Table 5 provide the fraction of new residences having basements, but do not distinguish conditioned from unconditioned basements. DOE estimates the shares of conditioned and unconditioned basements based on data from the DOE Residential Energy Consumption Survey (DOE 2005).[12]

Because foundation share data is available only for census zones, not

[8] Briggs, R. S., R. G. Lucas, and Z. T. Taylor. 2002. *Climate Classification for Building Energy Codes and Standards: Part 2—Zone Definitions, Maps, and Comparisons.* ASHRAE Transactions, Vol. 109, Part 1. Atlanta, Georgia.

[9] http://www.census.gov/const/www/charindex.html.

[10] *Ibid.*

[11] *Ibid.*

[12] U.S. DOE. 2005. Residential Energy Consumption Survey (Table HC5.2). *http://www.eia.doe.gov/emeu/recs2005/hc2005 tables/detailed tables2005.html.*

IECC climate zones, it is necessary to estimate the climate zone shares from census data and general knowledge about regional construction techniques (*e.g.,* basements are almost never used in the far south). Table 6 shows the shares DOE intends to assume.

TABLE 6—FOUNDATION TYPE SHARES (PERCENT) BY 2006 IECC CLIMATE ZONE

Climate zone	Heated basement	Crawlspace	Slab-on-grade	Unheated basement
1	0	0	100	0
2	0	5	95	0
3	10	15	70	5
4	30	20	40	10
5	45	20	20	15
6	65	10	5	20
7 & 8	70	5	5	20

Equipment/Fuel Types and Energy Costs

The impacts of code changes would be estimated for multiple fuel/equipment types and the results weighted by equipment type shares derived from Census construction data for new houses. 55% of new single-family homes in 2010 used natural gas for heating, 39% used electric heat pumps, and 6% used electric resistance furnaces.[13] For new multifamily dwellings, 36% used natural gas for heating, 49% used electric heat pumps, and 15% used electric resistance furnaces. Only 1% of new single-family and multifamily used oil, so this heating type would not be analyzed separately for national-average analyses as it does not have a significant share of the national market. These shares would be used to weight results for all residential buildings. Electric central air conditioning would be assumed in all climates.

Provisions Requiring Special Consideration

Some building components and/or energy conservation measures do not lend themselves to straightforward pre- and post-change simulation of energy consumption. For example, the use of hourly simulation was of dubious value in assessing the energy savings of duct testing required by the 2009 IECC because the prior edition of the IECC had no testing requirement from which a meaningful baseline leakage rate could be established. In this case, the majority of the uncertainty was in the decision of what pre-2009 leakage rate should be used as a baseline. This type of uncertainty arises from any code change that expands the scope of the code. Rather than comparing one code to another, a new code must be compared to an unstated prior condition.[14]

In the case of a scope expansion, it is sometimes inappropriate to compare a new code's requirement against an average or typical pre-code level, because doing so tends to understate the savings of the new requirement. Returning to the example of a new requirement for testing the duct leakage rate, consider Figure 1. The curve represents a hypothetical distribution of leakage rates prior to the code's regulation of leakage rates. Even if the new code requirement were set equal to or worse than the pre-change average rate, savings would accrue from houses that would have had higher leakage rates.[15] DOE intends to evaluate scope expansions case by case to determine the most appropriate way to estimate energy savings. DOE seeks public input on this topic.

[13] *http://www.census.gov/const/www/charindex.html.*

[14] In DOE's proposal to add duct testing requirements to the 2009 IECC energy savings was approximated based on findings from extant post-occupancy studies of duct leakage rather than by simulation. These studies include: Washington State University. 2001. *Washington State Energy Code Duct Leakage Study Report.* WSUCEEP01105. Washington State University Cooperative Extension Energy Program, Olympia, Washington. Hales, D., A. Gordon, and M. Lubliner. 2003. 2003. *Duct Leakage in New Washington State Residences: Findings and Conclusions.* ASHRAE transactions. KC–2003–1–3. Hammon, R. W., and M. P. Modera. 1999. ''Improving the Efficiency of Air Distribution Systems in New California Homes-Updated Report.'' Consol. Stockton, California. Journal of Light Construction. April 2003. ''Pressure-Testing Ductwork.'' Michael Uniacke. Sherman *et al.* 2004. Instrumented HERS and Commissioning. Xenergy. 2001. Impact Analysis Of The Massachusetts 1998 Residential Energy Code Revisions. *http://www.mass.gov/Eeops/docs/dps/inf/inf_bbrs_impact_analysis_final.pdf.*

Where better data on the distribution of actual leakage rates available, a more rigorous analysis might have been contemplated.

[15] Although this is a hypothetical illustration, a similar issue did arise in DOE's proposal to add duct testing requirements to the 2009 IECC described in Footnote 14.

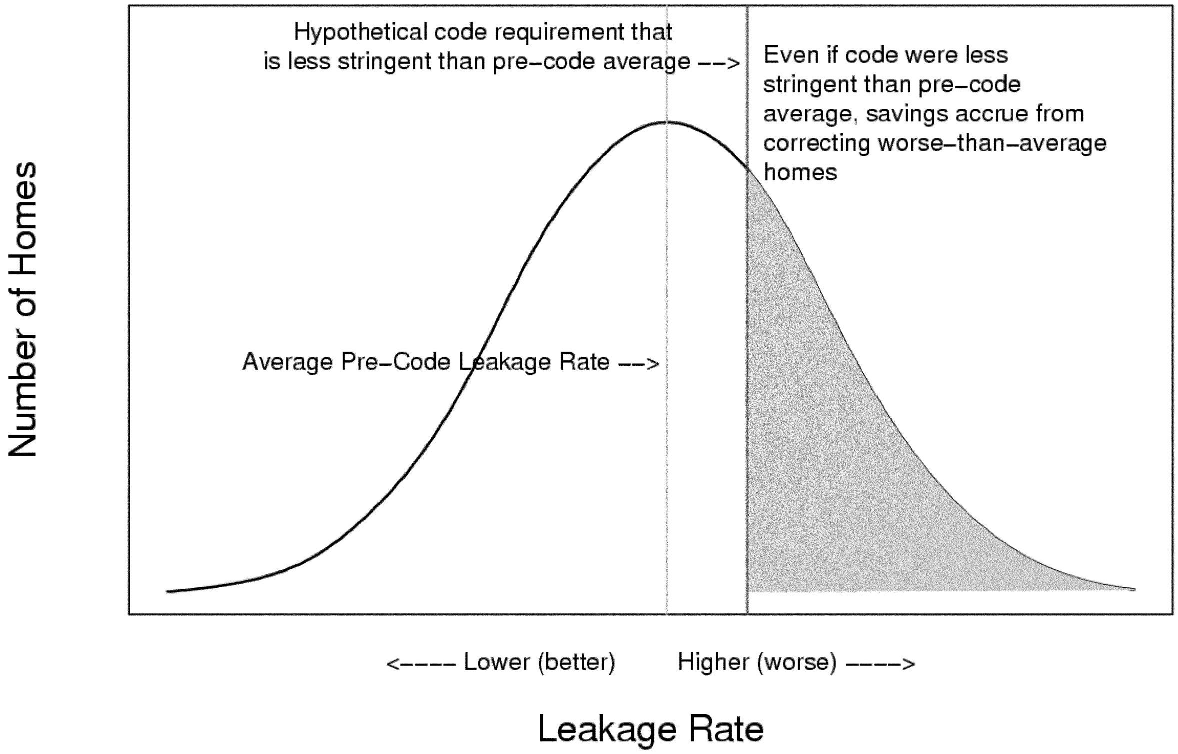

Figure 1. Illustration of Energy Savings from a Code Change that Improves the Worst-Performing Homes

A second situation requiring special consideration is accounting for code changes that induce additional, unwritten requirements. An example is an envelope air tightness requirement that results in leakage rates so low that a home would need supplemental mechanical ventilation to avoid moisture and other air quality problems. In such a case a proper cost effectiveness assessment might require accounting for the cost and energy penalty of the mechanical ventilation system even though the code didn't require it. DOE would evaluate such changes case by case to determine whether implied requirements must be assumed. DOE seeks public input on this topic.

Estimating the First Cost of Code Changes

The second step in assessing the cost effectiveness of a proposed code change or a newly revised code is estimating the first cost of the changed provision(s). The ''first cost'' of a code change refers to the marginal cost of implementing one or more changed code provisions. For DOE's analyses, it refers to the retail cost (the cost to a home buyer) prior to amortizing the cost over multiple years through the home mortgage, and includes the full price paid by the home buyer, including materials, labor, overhead, and profit, minus any tax rebates or other incentives generally available to home buyers when the new code takes effect.

DOE recognizes that estimating the cost of a code change can be challenging, and will attempt to identify credible cost estimates from multiple sources when possible. Judgment is often required to determine an appropriate cost for energy code analysis when multiple credible sources of construction cost data yield a range of first costs. Cost data would be obtained from existing sources such as cost estimating publications such as R.S. Means, industry sources such as Lowes or Home Depot, and other resources including journal articles and research studies. DOE has also issued a subcontract specifically to collect cost data for residential energy efficiency measures. DOE would utilize all of these resources to determine the most appropriate construction cost assumptions based on factors including the applicability and thoroughness of the data source.

Historical Approach to Cost Data Collection

For code changes that impact many insulation and/or construction assembly elements of a home, DOE consults the national construction cost estimation publication *RS Means Residential Cost Data,*[16] which provides a wide variety of construction cost data. This is appropriate for many code changes that impact the construction of the home (*e.g.,* switching from 2x4 to 2x6 walls) such that both materials and labor differ. RS Means, however, covers only a portion of potential code changes. It does not, for example, have detailed costs on improved duct sealing or building envelope sealing, and its costs for fenestration products (windows, doors, and skylights) are focused on aesthetic features rather than energy efficiency.

When a code change impacts only the materials used in a home, without impacting labor, cost data can often be obtained from national home hardware suppliers, such as Home Depot and Lowe's Home Improvement. These sources can have the advantage of providing recent costs and the costs can

[16] *http://www.rsmeans.com/.*

be localized if a state or local analysis is needed. However, these sources do not provide all the specific energy efficiency measure improvements that are typically needed for code improvement analyses.

As needed, DOE conducts literature searches of specialized building science research publications that assess the costs of new or esoteric efficiency measures that are not covered in other data sources. Examples include reports from DOE's own Building America [17] program, those generated from the Environmental Protection Agency's Energy Star [18] program, and buildings-oriented research publications such as ASHRAE Transactions.

A Plan for the Future

DOE anticipates that as building energy codes advance and incorporate more energy features, the traditional cost sources will be less useful in estimating the first costs of code changes. To support analysis of codes going forward, DOE has tasked Pacific Northwest National Laboratory with placing a subcontract for professional cost-estimating services to help populate a publicly available online database of building construction costs. A Request for Proposals (RFP) was issued in May 2011 and calls for the services of a professional cost-estimating firm to provide cost data for equipment and components related to building envelope systems, building lighting systems, building mechanical systems, and building renewable energy systems. The database would differentiate cost data to the extent practicable by building type, building location, and building size, and would provide both national-average and regional/local costs to the extent such are available.

Addressing Code Changes With Multiple Approaches to Compliance

One of the challenges of estimating the costs of energy code changes is selecting an appropriate characterization of new code requirements. A requirement for an improved wall R-value, for example, might be met with higher-density insulation within the between-stud cavities, with standard-density insulation in a thicker wall (*e.g.,* moving from 2x4 to 2x6 construction), adding a layer of insulating sheathing to the wall, or switching to an entirely different construction approach (*e.g.,* straw bale). Each approach will have different costs and may be subject to differing constraints depending on the situation. Some construction approaches, for example, may be inappropriate in regions subject to high winds or high probabilities of seismic activity. Some approaches may open the possibility for new and less expensive construction approaches. A change that forces a move from 2x4 to 2x6 wall construction, for example, opens the possibility of placing wall studs on 24-inch centers rather than the more common 16-inches. This can reduce both material and labor costs, but requires other changes that may exact additional costs or restrict designs, such as ''stack framing,'' in which ceiling joists/rafters are aligned directly over wall studs.

It is difficult for DOE to anticipate either the types of code changes that will emerge in future building energy codes or the manner in which builders will choose to meet the new requirements. It is DOE's intent, however, to evaluate changes on a case by case basis and seek the least-first cost way to achieve compliance unless that approach is deemed inappropriate in a large percentage of new home situations. For code changes that touch on techniques with which there is recent research experience (*e.g.,* through DOE's Building America program), DOE would consult the relevant publications for advice on appropriate construction assumptions. DOE is seeking public input on this matter.

DOE anticipates that some new code provisions may have significantly different first costs depending on unrelated aesthetic choices. For example, a requirement for overhangs on south-facing windows might be more costly on a two-story home than on a one-story home. Limits on west-facing glazing might have substantial effect or no effect depending on the lot orientation. Again, DOE cannot anticipate all future changes, and will address each one individually. DOE is seeking public input on the proper approach to assessing the cost effectiveness of such changes.

Finally, some new code provisions may come with no specific construction changes at all, but rather be expressed purely as a performance requirement. It has been suggested, for example, that a new IECC might require all homes to comply with the energy performance path, with a requirement that calculated energy consumption be shown to be some predetermined percentage below that implied by the prescriptive specifications. It is also conceivable that a code could be expressed simply as an energy use intensity (EUI), in which the requirement is a limit on energy use per square foot of conditioned floor area. DOE intends to evaluate any such code changes on a case by case basis and will search the research literature and/or conduct new analyses to determine the reasonable construction changes that could be expected to emerge in response to such new requirements. DOE is seeking public input on this issue.

Economies of Scale and Market Transformation Effects

Construction costs often show substantial differences between regions, sometimes based primarily on local preferences and the associated economies of scale. Because new code changes may push building construction to new and potentially unfamiliar techniques in some locations, local cost estimates may overstate the long-term costs of implementing the change. Similar issues may arise where manufacturers produce large quantities of a product that just meets a current energy code requirement, giving that product a relatively low price in the market. Should the code requirement increase, it is likely that manufacturers will increase production of a conforming product, lowering its price relative to the current situation.

DOE intends to evaluate new code changes case by case to determine whether it is appropriate to adjust current costs for anticipated market transformation after a new code takes effect. DOE intends to evaluate specific new or proposed code provisions to determine whether and how prices might be expected to follow an experience curve with the passage of time. See, for example, DOE's Notice of Data Availability published in the **Federal Register** on February 22, 2011 (76 FR 9696) (*http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/rf_noda_fr_notice.pdf*) for information on projecting future costs in the manufacture of new refrigeration products. It is noted that site-built construction may involve several types of efficiency improvements. The real cost of code changes requiring new technologies may drop in the future as manufacturers learn to produce them more efficiently. The real cost of code changes that involve new techniques may likewise drop as builders and subcontractors learn to implement them in the field more efficiently and with less labor. Finally, code changes that simply require more of a currently used technology or technique may have relatively stable real costs, with prices generally following inflation over time. DOE is seeking public input on this issue.

[17] *http://www.buildingamerica.gov/.*

[18] *http://www.energystar.gov/.*

Estimating the Cost Effectiveness of Code Changes

Economic Metrics To Be Calculated

The last step in assessing the cost effectiveness of a proposed code change or a newly revised code is calculating the corresponding economic impacts of the changed provision(s). In evaluating code change proposals as part of the IECC consensus process, assessing new editions of the IECC published by the ICC, and participating in the development of other voluntary building energy codes, DOE intends to calculate three metrics.

- Life-cycle cost.
- Simple payback period.
- Cash flow.

Life-cycle cost (LCC) is the primary metric DOE intends to use to evaluate whether a particular code change is cost effective. Any code change that results in a net LCC less than or equal to zero (*i.e.,* monetary benefits exceed costs) will be considered cost effective. The payback period and cash flow analyses provide additional information DOE believes is helpful to other participants in code-change processes and to states and jurisdictions considering adoption of new codes. These metrics are discussed further below.

Life-Cycle Cost

Life-cycle cost (LCC) is a robust cost-benefit metric that sums the costs and benefits of a code change over a specified time period. Sometimes referred to as net present value analysis or engineering economics, LCC is a well-known approach to assessing cost effectiveness. Because the key feature of LCC analysis is the summing of costs and benefits over multiple years, it requires that cash flows in different years be adjusted to a common year for comparison. This is done with a discount rate that accounts for the time value of money. Like most LCC implementations, DOE's sums cash flows in year-zero dollars, which allows the use of standard discounting formulas. Cash flows adjusted to year zero are termed present values. The procedure described herein combines concepts from two ASTM International standard practices, E917 [19] and E1074.[20] The resultant procedure is both straightforward and comprehensive and is in accord with the methodology recommended and used by the National Institute of Standards and Technology (NIST).[21]

Present values can be calculated in either nominal or real terms. In a nominal analysis all compounding rates (discount rate, mortgage rate, fuel escalation rate, etc.) include the effect of inflation, while in a real analysis, inflation is removed from those rates. The two approaches are algebraically equivalent, but DOE intends to generally conduct economic analyses of residential energy codes in nominal terms because accounting for mortgage cash flows and associated income tax effects is more straightforward.

LCC is defined formally as the present value of all costs and benefits summed over the period of analysis. Because it is defined in terms of costs, the LCC of a code change must be zero or negative for the change to be considered cost effective, as shown in Equation 1.

$$LCC = PV(Costs) - PV(Benefits) \qquad (1)$$

A future cash flow (positive or negative) is brought into the present by assuming a discount rate (D). The discount rate is an annually compounding rate [22] by which future cash flows are discounted in value. It represents the minimum rate of return demanded of the investment in energy-saving measures. It is sometimes referred to as an alternative investment rate. Thus the present value, (PV) of a cash flow in year Y (CF_y) is defined as

$$PV = \frac{CF_y}{(1+D)^y} \qquad (2)$$

The present value of a stream of annual cash flows over the period of analysis, L years, is then the sum of all of those discrete cash flows:

$$PV(\text{cashflow stream}) = \sum_{Y=0}^{L}\left(\frac{CF_y}{(1+D)^y}\right) \qquad (3)$$

For an annualized stream of cash flows *A* that is the same from year to year, such as a mortgage payment lasting *L* years, Equation (3) is equivalent to the following.

$$PV(annuity) = A \times \left[\frac{(1+D)^L - 1}{D \times (1+D)^L}\right] \qquad (4)$$

For an annualized stream of cash flows that is escalating with time, such as the energy cost savings *ES* that increases from year to year because of escalations in fuel prices, Equation (5)

[19] ASTM International. ''Practice for Measuring Life-Cycle Costs of Buildings and Building Systems,'' E917, *Annual Book of ASTM Standards: 2010,* Vol. 4.11. West Conshohocken, PA: ASTM International.

[20] ASTM International. ''Practice for Measuring Net Benefits and Net Savings for Investments in Buildings and Building Systems,'' E1074, *Annual Book of ASTM Standards: 2010,* Vol. 4.11. West Conshohocken, PA: ASTM International.

[21] For a detailed discussion of LCC and related economic evaluation procedures specifically aimed at private sector analyses, see Ruegg and Petersen (Ruegg, Rosalie T., and Petersen, Stephen R. 1987. Comprehensive Guide to Least-Cost Energy Decisions, NBS Special Publication 709. Gaithersburg, MD: National Bureau of Standards).

[22] The analysis can be done for other periods of time (*e.g.,* monthly), but for simplicity DOE uses annual periods for the subject analyses.

can be used (E^F is the fuel price escalation rate):

$$PV(escalating\ annuity) = ES \times \left[\frac{1+E_F}{D-E_F}\right] \times \left[1-\left(\frac{1+E_F}{1+D}\right)^L\right] \quad (5)$$

Because DOE intends to compute and publish annual cash flow impacts, Equation (3) will generally be preferred to Equations (4) and (5) because it allows presentation and analysis of all the yearly cash flows during the LCC analysis. Equations (4) and (5) are algebraically equivalent and useful when year-by-year cash flows are not needed.

There are seven primary cash flows that are relevant to LCC analysis of energy code changes, summarized in Table 7. The down payment cost associated with the code changes is the down payment rate (R_D) multiplied by the total cost of the code changes (C) and is incurred at the onset (year 0). On top of the down payment is a mortgage fee, which is the cost of the code changes multiplied by the mortgage fee rate (R_M). Property tax occurs every year, starting on year 1, and is the property tax rate (R_P) multiplied by C, and further adjusted by a factor of $(1+E_H)^Y$ to take into account a compounding home price escalation rate (E_H). This assumes that the tax assessment of the house increases exactly the amount of the code-related cost increase, and that the tax assessment increases in step with the home price. Energy savings occur every year, starting at year 1, and are equal to the modeled energy cost savings at year 0, adjusted by a factor of $(1+E_F)^Y$ to take into account a compounding fuel (electricity and natural gas) price escalation rate (E_F). Mortgage payments occur every year of the term of the mortgage (ML), are constant payments, and is equal to 12 times the monthly payment, as calculated using the industry standard equation shown in Table 7. Tax deductions for mortgage interest payments and property tax payments begin in year 1 and continue through the end of the analysis period L. They are calculated as the marginal income tax rate (R_I) multiplied by the sum of mortgage interest payments and property tax payments each year. Finally, the residual value, incurred at the end of the analysis period, is the cost of the code changes, adjusted for the home's price appreciation, multiplied by the fraction of the lifetime (*i.e.,* value) of the code changes still remaining at resale (R_R). This is a rough number, but is meant to encapsulate an average of the remaining lifetime of all of the components. DOE intends to assume R_R is 50% at the end of 30 years, which would roughly correspond to straight-line depreciation of home features with a 60-year life.

Additional rigor can be required to account for the shorter lifetimes of certain equipment (*e.g.,* 12–15 years for water heaters, 15–20 years for HVAC equipment). However, because the efficiencies of most residential equipment generally are preemptively regulated by federal rulemakings, DOE does not expect the IECC to impose specific equipment efficiency requirements. Nonetheless, high-efficiency equipment is likely to be a common alternative approach to energy code compliance, so the shorter lifetimes of equipment would be accounted for. While equipment will undoubtedly be replaced at the end of its useful life, there is no guarantee that it will be replaced with equipment of comparable efficiency. Because DOE cannot predict either minimum code requirements or homeowner preferences in the future, it will assume that replacement equipment efficiency will be unaffected by the initial efficiency of the equipment—that is, replacement equipment will be the same regardless of the initial efficiency. This implies that the energy savings resulting from high-efficiency equipment will accrue only for the life of the equipment, not the full 30-year period of analysis, and that there will be no equipment replacement costs at the end of its useful life. Thus, when estimating energy savings of high-efficiency equipment, a home would be simulated twice, once with and once without the high-efficiency equipment.

Table 1. Cash flow components

Cash flow	When is it incurred	Equation for Cash flow in year Y (V_y)	Cost or Benefit
Down payment	Year 0	$R_D * C$	Cost
Mortgage Fee	Year 0	$R_M * C$	Cost
Property Tax	Years 1 through L	$R_P * C * (1+ E_H)^Y$	Cost
Energy Savings	Years 1 through L	$ES_0 *(1+ E_F)^Y$	Benefit
Mortgage Payments	Years 1 through ML, except that high-efficiency equipment options will accrue savings only over their useful lifetimes.	$12\left[\frac{C(1-R_D)\cdot(i/12)}{1-\left(1+\frac{i}{12}\right)^{-12ML}}\right]$	Cost
Tax Deduction	Years 1 through ML	R_I * (mortgage interest paid plus property tax paid in year Y[(a)])	Benefit
Residual Value	Year L	$R_R *C *(1+ E_H)^Y$	Benefit

[(a)] Interest paid in a given year is simply the mortgage interest rate multiplied by the loan balance. The loan balance is calculated as the present value in year Y of the remaining stream of loan payments, discounted at the mortgage interest rate (see Equation 1).

Simple Payback Period

The simple payback period is a straightforward metric that includes only the costs and benefits directly related to the implementation of the energy-saving measures associated with a code change. It represents the number of years required for the energy savings to pay for the cost of the measures, without regard for changes in fuel prices, tax effects, measure replacements, resale values, etc. The payback period *P*, which has units of *years,* is defined as the marginal cost of compliance with a new code (*C*, the ‘‘first costs’’ above and beyond the baseline code), divided by the annual marginal benefit from compliance (ES_0, the energy cost savings in year 0), as shown in Equation 6.

$$P = \frac{C}{ES_0} \qquad (6)$$

The simple payback period is a metric useful for its simplicity and ubiquity. Because it focuses on the two primary characterizations of a code change—cost and energy performance—it allows an assessment of cost effectiveness that is easy to compare with other investment options and requires a minimum of input data. The simple payback period is used in many contexts, and is written into some state laws governing the adoption of new energy codes, hence DOE would calculate the payback period when it assesses the cost effectiveness of code changes. However, because it ignores many of the longer-term factors in the economic performance of an energy efficiency investment, DOE does not intend to use the payback period as a primary indicator of cost effectiveness for its own decision making purposes.

Cash Flow Analysis

In the process of calculating LCC, year-by-year cash flows are computed. These can be useful in assessing a code change's impact on consumers and will be shown by DOE for the code changes it analyzes. The cash-flow analysis simply shows each year's net cash flow (costs minus benefits) separately (in nominal dollars), including any time-zero cash flows such as a down payment. By publishing the net cash flow value for each year, reviewers will be able to calculate various metrics of interest, such as net cumulative cash flow, the year in which cumulative benefits exceed cumulative costs, etc. DOE believes this information will be useful to some stakeholders.

Economic Parameters and Other Assumptions

Calculating the metrics described above requires defining various economic parameters. Table 8 shows the primary parameters of interest and how they apply to the three metrics.

TABLE 8—ECONOMIC PARAMETERS FOR COST EFFECTIVENESS METRICS

Parameter	Needed for
First costs	Payback.
Fuel prices	Cash flow. LCC.
Fuel price escalation rates	Cash flow.
Mortgage parameters	LCC.
Inflation rate.	
Tax rates (property, income).	
Period of analysis.	
Residual value.	
Discount rate	LCC.

These parameters are chosen to be representative of a typical home buyer who purchases a home with a 30-year mortgage. DOE intends to consult appropriate sources of information to establish assumptions for each financial, economic, and fuel price assumption. Whenever possible, economic assumptions will be taken from the published sources discussed below. DOE notes that most values vary across time, location, markets, institutions, circumstances, and individuals. Where multiple sources for any parameter are identified, DOE will prefer recent values from sources DOE deems best documented and reliable. DOE intends to update parameters for future analyses to account for changing conditions.

First Cost

As discussed earlier, the first cost represents the full cost of code-related energy features to a home buyer. It represents the full (retail) cost of such features, including materials, labor, builder overhead and profit, etc., but excludes any future costs such as for maintenance.

Mortgage Parameters

The majority of homes purchased are financed. Indeed, the 2010 Characteristics of New Housing report from the Census Bureau reports that 91% of new homes were purchased using a loan while only 9% were purchased with cash. Accordingly, for purposes of the analysis of the economic benefits to the home buyer for improved energy efficiency, DOE intends to assume that a home is purchased using a loan.

Mortgage Interest Rate (i)

DOE intends to use recent mortgage rates in cost/benefit analyses, and would consult Freddie Mac and the Federal Home Finance Administration to determine a representative rate for each analysis. Currently, Freddie Mac reports that conventional 30-year real estate loans have averaged about 5% since the beginning of 2009 (*http://www.freddiemac.com/pmms/pmms30.htm*) though historical rates have been higher. FHFA (*http://www.fhfa.gov/Default.aspx?Page=252*) reports similar rates. Thus DOE intends to use a mortgage rate of 5% for cost/benefit analyses at this time.

An alternative approach would be to evaluate historical mortgage rates and identify a real rate that approximates a long-term average, then use that rate in a real analysis or combine it with a recent (and anticipated future) inflation rate in a nominal analysis. DOE intends to use the former approach on the theory that recent rates are a better indicator of near-term future rates that will be in effect when a new code goes into effect.

Loan Term (ML)

For real estate loans, 30 years is by far the most common term and is the value DOE intends to use in its analyses. According to the 2009 American Housing Survey (U.S. Census), Table 3–15, approximately 75% of all home loans have a term between 28 and 32 years, with 30 being the median.

Down Payment (R_D)

The 2009 American Housing Survey reports a wide range of down payment amounts for loans for new homes (see Table 9). DOE intends to assume a down payment of 10%. Among the possible rates, this is low enough that it is likely to favor the experience of first-time and younger home buyers (who have little significant equity to bring forward from a previous home) and is among the more common rates (the 6–10% block, at 13.6% of all mortgages, is the most populous block except for ''no down payment''). Almost half (47.1%) of all loans have a down payment at or below 10%.

TABLE 9—DOWN PAYMENT—2009 AMERICAN HOUSING SURVEY, TABLE 3–14

Percent of purchase price	Percentage of homes
No down payment	16.3
Less than 3 percent	6.4
3–5 percent	10.8
6–10 percent	13.6
11–15 percent	4.7
16–20 percent	12.2
21–40 percent	10.4
41–99 percent	6.1
Bought outright	6.9
Not reported	12.6

Points and Loan Fees (R_M)

Points represent an up-front payment to buy down the mortgage interest rate. As such they are tax deductible. DOE assumes all interest is accounted for by the mortgage rate, so the points are taken to be zero. The loan fee is likewise paid up front in addition to the down payment and varies from loan to loan. DOE assumes the loan fee to be 0.7% of the mortgage amount, based on recent data from Freddie Mac Weekly Primary Mortgage Market Survey: *http://www.freddiemac.com/pmms/*.

Discount Rate (D)

The purpose of the discount rate is to reflect the time value of money. Because DOE's economic perspective is that of a home buyer, that time value is determined primarily by the consumer's best alternative investment at similar risk to the energy features being considered.

The discount rate is chosen to represent the desired perspective of the economic analysis, in this case a typical home buyer who holds a home throughout a 30-year mortgage term.

DOE intends to set the discount rate to be equivalent to the mortgage interest rate in nominal terms. Because mortgage prepayment is an investment available to consumers who purchase homes using financing, the mortgage interest rate is a reasonable estimate of a consumer's alternative investment rate. That the home buyer has borrowed money at that rate demonstrates that his or her implicit discount rate must be at least that high.

Period of Analysis (L)

DOE's economic analysis is intended to examine the costs and benefits impacting all the consumers who live in the house. Because energy efficiency features generally last longer than the average length of ownership for the initial home buyer, a longer analysis period than the initial ownership period is used. Assuming a single owner keeps the house throughout the analysis period accounts for long-term energy benefits without requiring complex accounting for resale values at home turnover.

Homes will typically last 50 years or more. However, some energy efficiency measures may not last as long as the house does. DOE intends to assume a 30-year lifetime to match the typical mortgage term. Although 30 years is less than the life of the home, some efficiency measures, equipment in particular, may require replacement during that timeframe. As discussed earlier, when equipment efficiencies are analyzed, energy savings will be limited to the life of the equipment. This will impact the present value of energy savings only—all other cash flow streams will accrue over the entire period of analysis. The impact of the selection of an analysis term is significantly moderated by the effect of the discount rate in reducing the value of costs and benefits far into the future.

Property Tax Rate (R_P)

Property taxes vary widely within and among states. The median property tax rate reported by the 2007 [23] American Housing Survey (U.S. Census Bureau 2007, Table 1A–7) for all homes is $9 per $1,000 in home value. Therefore, for purposes of code analysis, DOE intends to assume a property tax rate of 0.9%. For state-level analyses, state-specific rates will be used.

Income Tax Rate (R_I)

The marginal income tax rate paid by the homeowner determines the value of the mortgage tax deduction. The 2009 American Housing Survey (*http://www.census.gov/hhes/www/housing/ahs/ahs09/ahs09.html*) on ''income characteristics'' reports a median income of $70,200 for purchasers of new homes. The Internal Revenue Service SOI Tax Stats, Table 2.1 for 2008 (latest year available) reported that of the tax filers in this income bracket, most itemize deductions. DOE intends to account for income tax deductions for mortgage interest in the cost/benefit analyses. A family earning $70,200 in 2011, with a married-filing-jointly filing status, would have a marginal tax rate of 25%, which is DOE's current assumption. Where state income taxes apply, rates will be taken from state sources or collections of state data such as provided by the Federation of Tax Administrators (*http://www.taxadmin.org*).

Inflation Rate (R_{INF})

The inflation rate R_{INF} is necessary only to give proper scale to the mortgage payments so that interest fractions can be estimated for tax deduction purposes. It does not affect the present values of cash flows because all other rates are expressed in nominal terms (*i.e.,* are already adjusted to match the inflation rate). The assumed inflation rate must be chosen to match the assumed mortgage interest rate (*i.e.,* be estimated from a comparable time period). Estimates of the annual inflation rate would be taken from the most recent Consumer Price Index (CPI) data published by the Bureau of Labor Statistics (*http://www.bls.gov/*), which currently lists the most recent annualized CPI to be 1.6%.

[23] The 2007 survey was used as financial charcteristic data is not available in the 2009 survey.

Residual Value

The residual value of energy features is the value assumed to be returned to the home buyer upon sale of the home (after 30 years). As shown earlier it is calculated from an assumed home price escalation rate and an assumed fraction of the original market value that remains and is recoverable at sale.

Home Price Escalation Rate (E_H)

DOE intends to assume that home prices have a real escalation rate of 0%, which is equivalent to a nominal escalation rate equal to the general rate of inflation. While many homes do experience nonzero increases in value over time, the factors that influence future home prices (location, style, availability of land, etc.) are too varied and situation-specific to warrant direct accounting in this methodology.

Resale Value Fraction (R_R)

DOE intends to assume that 50% of the original value of code-related energy features remains at the end of 30 years (after adjusting for the Home Price Escalation Rate). This is roughly equivalent to assuming straight-line depreciation of features with a 60-year service life.

Fuel Prices

Fuel prices over the length of the period of analysis are needed to determine the energy cost savings from improved energy efficiency. Both current fuel prices and fuel price escalation rates are needed to establish estimated fuel prices in future years.

DOE intends to use the most recently available national average residential fuel prices from the DOE Energy Information Administration. If fuel prices from the most recent year(s) are unusually high or low, DOE may consider using a longer-term average of past fuel prices, such as the average from the past 5 years. However, DOE notes that fuel price escalation rates (see below) may be tied to specific recent-year prices, so departures from the recent-year prices will be approached with caution. For air conditioning, fuel prices from the summer would be used, and for space heating winter prices would be used.

Fuel price escalation rates would be obtained from the most recent Annual Energy Outlook to account for projected changes in energy prices.

TABLE 10—SUMMARY OF CURRENT ECONOMIC PARAMETER ESTIMATES

Parameter	Symbol	Current estimate
Mortgage Interest Rate	I	5%.
Loan Term	M_L	30 years.
Down Payment Rate	R_D	10% of home price.
Points and Loan Fees	R_M	0.7% (nondeductible).
Discount Rate	D	5% (equal to Mortgage Interest Rate).
Period of Analysis	L	30 years.
Property Tax Rate	R_P	0.9% of home price/value.
Income Tax Rate	R_I	25% federal, state values vary.
Home Price Escalation Rate	E_H	Equal to Inflation Rate.
Inflation Rate	R_{INF}	1.6% annual.
Fuel Prices and Escalation Rates		Latest national average prices based on current DOE EIA data and projections[24] (as of July 2011, 12 cents/kwh for electricity, $0.963/therm for natural gas); price escalation rates taken from latest Annual Energy Outlook

Public Participation

A. Submission of Information

DOE will accept information in response to this notice under the timeline provided in the DATES section above. Information submitted to the Department by e-mail should be provided in WordPerfect, Microsoft Word, PDF, or text file format. Those responding should avoid the use of special characters or any form of encryption, and wherever possible, comments should include the electronic signature of the author. Comments submitted to the Department by mail or hand delivery/courier should include one signed original paper copy. No telefacsimiles will be accepted. Comments submitted in response to this notice will become a matter of public records and will be made publicly available.

B. Issues on Which DOE Seeks Information

DOE is particularly interested in receiving information on the following issues/topics:

• General comments on DOE's use of cost effectiveness calculations to evaluate code-change proposals and new code versions.

• The appropriateness of DOE's energy simulation methodology for evaluating the energy savings of code changes.

○ DOE's tool choice (EnergyPlus).

○ The default assumptions to be used in conducting energy simulations.

○ The methodology for assessing climatic/regional variation in code impacts.

○ Approaches to assessing energy savings of code changes that expand the scope of the code, imply the need for additional measures not directly required in the new code, or are otherwise difficult to evaluate in a straightforward pre-post simulation analysis.

• The appropriateness of DOE's approach to assessing the first cost of new code requirements

○ Preferred cost data sources.

○ Arbitrating among differing costs from multiple data sources.

○ Assessing costs where a new or changed requirement can be met by multiple construction approaches with varying cost implications.

○ Desirable features for DOE's planned public cost database.

○ Adjusting current costs for likely market transformation impacts (economies of scale, learning curves, etc.).

• The appropriateness and sufficiency of DOE's cost effectiveness methodology

○ The appropriateness of the economic metrics to be calculated (life-cycle cost, annual cash flows, simple payback period).

○ The appropriateness of life-cycle cost as the primary metric for DOE's cost effectiveness determinations.

○ Whether DOE should consider constraints on payback period and/or cash flow metrics in addition to its life-cycle cost requirement in making decisions on cost effectiveness and, if so, on appropriate threshold values for those metrics

○ The appropriateness of the economic perspective (that of a home buyer with a 30-year loan) of DOE's life-cycle cost analysis and of the economic parameters chosen to represent that perspective.

○ The appropriateness of the identified data sources for economic parameters.

• Input on how DOE's methodology and process should evolve in response to changing economic and social conditions.

Issued in Washington, DC, on September 2, 2011.

Kathleen B. Hogan,

Deputy Assistant Secretary for Energy Efficiency, Office of Technology Development, Energy Efficiency and Renewable Energy.

[FR Doc. 2011–23236 Filed 9–12–11; 8:45 am]

BILLING CODE 6450–01–P

[24] U.S. Department of Energy.2011a. Electric Power Monthly. DOE/EIA–0226. Washington, DC. U.S. Department of Energy.2011b. Natural Gas Monthly. DOE/EIA–0130. Washington, DC.

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Project No. 459–311]

Union Electric Company, dba Ameren Missouri; Notice of Application for Amendment of License and Soliciting Comments, Motions To Intervene, and Protests

Take notice that the following hydroelectric application has been filed with the Commission and is available for public inspection:

a. *Application Type:* Non-project use of project lands and waters.

b. *Project No:* 459–311.

c. *Date Filed:* August 16, 2011.

d. *Applicant:* Union Electric Company, dba Ameren Missouri.

e. *Name of Project:* Osage Hydroelectric Project.

f. *Location:* The proposed non-project use would be located at the Ozark Yacht Club marina which is located at mile marker 0.8 + 0.6 in the Jennings Branch Cove on the Lake of the Ozarks in Camden County, Missouri. The location coordinates are 38.199986 North, −92.645562 West.

g. *Filed Pursuant to:* Federal Power Act, 16 U.S.C. 791a–825r.

h. *Applicant Contact:* Mr. Jeff Green, Shoreline Supervisor, Ameren Missouri,