handling unpackaged organic goods, and the list of permitted substances for crops.

**Authority:** 7 U.S.C. 6501–6522.

Dated: April 30, 2015.

**Rex A. Barnes,**

*Associate Administrator, Agricultural Marketing Service.*

[FR Doc. 2015–10446 Filed 5–5–15; 8:45 am]

**BILLING CODE 3410–02–P**

## DEPARTMENT OF AGRICULTURE

### 7 CFR Chapter 0

**RIN 0575–ZA00**

## DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

### 24 CFR Parts 91 and 93

**[HUD FR–5647–N–02]**

**RIN 2501–ZA01**

## Final Affordability Determination—Energy Efficiency Standards

**AGENCY:** U.S. Department of Housing and Urban Development and U.S. Department of Agriculture.

**ACTION:** Notice of Final Determination.

**SUMMARY:** The U.S. Department of Housing and Urban Development (HUD) and the U.S. Department of Agriculture (USDA) have determined that adoption of the 2009 edition of the International Energy Conservation Code (IECC) for single family homes and the 2007 edition of the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) 90.1 for multifamily buildings will not negatively affect the affordability and availability of certain HUD- and USDA-assisted housing specified in section 481 of the Energy and Independence and Security Act of 2007 (EISA). This determination fulfills a statutory requirement established under EISA that HUD and USDA adopt revisions to the 2006 IECC and ASHRAE 90.1–2004 subject to: A determination that the revised codes do not negatively affect the availability or affordability of new construction of single family and multifamily housing covered by EISA; and a determination by the Secretary of Energy that the revised codes ''would improve energy efficiency.'' For the more recent IECC and ASHRAE codes that have been published since the publication of the 2009 IECC and ASHRAE 90.1–2007, HUD and USDA intend to follow this Notice of Final Determination with an advance notice that addresses the next steps the agencies plan to take on the 2015 IECC and ASHRAE 90.1–2013 codes.

**DATES:** This notice of final determination will be effective according to the implementation schedule described herein that commences no earlier than June 5, 2015.

**FOR FURTHER INFORMATION CONTACT:** HUD: Rachel Isacoff, Office of Economic Resilience, Department of Housing and Urban Development, 451 7th Street SW., Room 10180, Washington, DC 20410; telephone number 202–402–3710 (this is not a toll-free number). Persons with hearing or speech impairments may access this number through TTY by calling the Federal Relay Service toll-free at 800–877–8339. USDA: Meghan Walsh, Rural Housing Service, Department of Agriculture, 1400 Independence Avenue SW., Room 6900–S, Washington, DC 20250; telephone number 202–205–9590 (this is not a toll-free number).

**SUPPLEMENTARY INFORMATION:**



## I. Background

### *A. Statutory Requirements*

HUD and USDA have a statutory responsibility to adopt minimum energy standards for new construction of certain HUD- and USDA-assisted housing, following procedures established in EISA. Section 481 of EISA amended section 109 of the Cranston-Gonzalez National Affordable Housing Act of 1990 (Cranston-Gonzalez) (42 U.S.C. 12709), which establishes procedures for setting minimum energy standards for certain HUD and USDA programs. The two standards referenced in EISA (the IECC and ASHRAE 90.1) apply to different building types: the IECC standard applies to single family homes and low-rise multifamily buildings (up to three stories), while ASHRAE 90.1 applies to multifamily mid- or high-rise residential buildings (four or more stories).[1]

The following HUD and USDA programs are specified in the statute:

(A) New construction of public and assisted housing and single family and multifamily residential housing (other than manufactured homes) subject to

[1] The IECC addresses both residential and commercial buildings. ASHRAE 90.1 covers commercial buildings only, including multifamily buildings four or more stories above grade. The IECC adopts, by reference, ASHRAE 90.1; that is, compliance with ASHRAE 90.1 qualifies as compliance with the IECC for commercial buildings.

mortgages insured under the National Housing Act; [2]

(B) New construction of single family housing (other than manufactured homes) subject to mortgages insured, guaranteed, or made by the Secretary of Agriculture under title V of the Housing Act of 1949; [3] and,

(C) Rehabilitation and new construction of public and assisted housing funded by HOPE VI revitalization grants under section 24 of the United States Housing Act of 1937 (42 U.S.C. 1437v).

In addition to these EISA-specified categories, sections 215(a)(1)(F) and (b)(4) of Cranston-Gonzalez make new construction of rental housing and homeownership housing assisted under the HOME Investment Partnerships Program (HOME) subject to section 109 of Cranston-Gonzalez and, therefore, to section 481 of EISA. From the beginning of the HOME program, the regulation at 24 CFR 92.251 implemented section 109. However, compliance with section 109 of Cranston-Gonzalez was omitted from the July 2013 HOME program final rule because HUD planned to update and implement energy efficiency standards through a separate proposed rule (see the discussion in the preamble to the HOME proposed rule published on December 16, 2011 (76 FR 78344)). Although the energy standards at 24 CFR 92.251(a)(2)(ii) are reserved in the July 2013 HOME final program rule, the statutory requirements of section 109 continue to apply to all newly-constructed housing funded by the HOME program. Therefore, this notice is applicable to the HOME program when the regulations at 24 CFR 92.251 in the 2013 HOME final rule (78 FR 44627) become effective. The HOME program will issue Guidance for HOME Participating Jurisdictions (PJs) that provides notice that the new standard takes effect. A conforming amendment to the HOME regulation will be published at a later date.

Section 109(a) of Cranston Gonzalez, as amended by EISA, required HUD and USDA to collaborate and develop their own energy efficiency building standards if they met or exceeded the 2006 IECC or ASHRAE 90.1–2004, but if the two agencies did not act on this option, EISA specifies that the 2006 IECC and ASHRAE 90.1–2004 standards would apply. The two agencies did not develop independent energy efficiency building standards, and, therefore, the 2006 IECC or ASHRAE 90.1–2004 applied to covered HUD and USDA programs, and the provision of section 109(d) of Cranston-Gonzalez must be followed.

This notice implements section 109(d) of Cranston-Gonzalez, as amended by EISA, which establishes procedures for updating HUD and USDA energy standards, following periodic revisions to the 2006 IECC and ASHRAE 90.1–2004 codes. Specifically, section 109(d) provides that subsequent revisions to the IECC or ASHRAE codes will apply to HUD and/or USDA's programs if: (1) Either agency ''make[s] a determination that the revised codes do not negatively affect the availability or affordability'' of new construction housing covered by the Act, and (2) the Secretary of Energy has made a determination under section 304 of the Energy Conservation and Production Act (42 U.S.C. 6833) that the revised codes would improve energy efficiency (see 42 U.S.C. 12709(d)). Otherwise, the 2006 IECC and ASHRAE 90.1–2004 will continue to apply.

*B. HUD and USDA Preliminary Determination*

On April 15, 2014, at 79 FR 21259, HUD and USDA announced in the **Federal Register** their Preliminary Determination that the 2009 IECC and ASHRAE 90.1–2007 would not negatively affect the affordability and availability of housing covered by the Act. This Preliminary Determination followed the Department of Energy's (DOE) Determination that the 2009 IECC and ASHRAE 90.1–2007 standards would improve energy efficiency.[4] The April 15, 2014, HUD–USDA notice solicited public comment on this Preliminary Determination for a period of 45 days, and the public comment period concluded on May 30, 2014. HUD and USDA convened a conference call for interested parties on May 15, 2014, at which the agencies summarized the key features of the notice and answered several questions from participants.

*C. Public Comments on Preliminary Determination and HUD Responses*

1. Overview of Comments

HUD received 13 public comments, representing 28 organizations or individuals, on this notice. Comments were received from a wide range of stakeholders, including one state (Colorado), the two code bodies represented in this notice (the International Code Council and ASHRAE), as well as several national associations representing mortgage lenders, home builders, environmental and energy efficiency advocates, consumers, State energy offices, insulation and other building product trade associations, and other interested parties. All but two of the comments were from single organizations or individuals. Multiple organizations were represented in two comments, one submitted on behalf of another three organizations, and another on behalf of 16 additional national organizations.

The overwhelming majority of the comments expressed support for HUD's and USDA's Preliminary Determination. Of these supportive comments, most expressed support for HUD's and USDA's methodology and conclusions, but in turn urged HUD and USDA to rapidly move to adopt the more recent IECC or ASHRAE 90.1 codes that have been promulgated since the publication of the 2009 edition of the IECC and the 2007 edition of ASHRAE 90.1 that are addressed in this notice. In addition, several commenters suggested that HUD and USDA allow alternative compliance pathways for these standards through equivalent or higher state standards, or through one or more green building standards that have seen rapid growth in adoption rates in recent years.

Three of the 13 comments expressed concerns or opposition to one or more features of the Preliminary Determination. The concerns raised were in three primary areas: the use of the Social Cost of Carbon (SCC) as an appropriate cost-benefit metric for this determination; the proposed timetable for implementing the proposed standards after a Final Determination is published; and the relatively longer payback periods of 10 or more years estimated by HUD and USDA for adoption of ASHRAE 90.1–2007 in some States.

This discussion of the public comments received on the Preliminary Determination presents the significant issues and questions raised by the commenters.

2. Support for Preliminary Determination

*Comment: Support for Preliminary Determination.* The large majority of comments supported the Preliminary Determination. These comments generally agreed with HUD's and USDA's methodology in arriving at the determination that the 2009 IECC and ASHRAE 90.1–2007 would not negatively impact the affordability and availability of the housing covered by the Determination.

[2] This subsection of EISA refers to HUD programs only. See Appendix 1 for specific HUD programs covered by the Act.

[3] This subsection of EISA refers to USDA programs only. See Appendix 1 for specific USDA programs covered by the Act.

[4] See HUD's April 15, 2014 **Federal Register** notice for additional information about DOE's determination. *http://www.gpo.gov/fdsys/pkg/FR-2014-04-15/pdf/2014-08562.pdf.*

One commenter noted, for example, ''that it is well settled and no longer in dispute that the 2009 IECC, as well as the 2007 ASHRAE 90.1 . . . increase the energy efficiency of homes and buildings constructed to meet them.'' The commenter commended HUD and USDA for ''an exceptionally thorough and comprehensive review of both the available research and literature relating to the cost effectiveness of building homes and multifamily units to the IECC and/or ASHRAE 90.1,'' and pointed out that HUD and USDA had reached the same conclusion as experts and building code authorities in the majority of States: that building single family and multifamily homes to the 2009 IECC is cost-effective, results in greater affordability, and lowers energy use and energy expenses.

The commenter also stressed the importance of assessing affordability on the basis of operating costs as well as the first cost of the home: ''if the monthly utility bill is lowered by 10 or 20 percent, as a result of energy efficient code requirements, the home is more affordable, even if the initial cost increases by several thousand dollars, since the increase in the monthly amortized mortgage cost will be less than the decrease in utility costs.''

Another representative comment characterized the HUD and USDA determination as a ''comprehensive and robust evaluation of the reasons to adopt the current updated standards under consideration based on the Departments' statutory responsibilities under federal law to establish minimum energy standards.'' Another commenter stated that ''HUD and USDA's determination . . . is well supported by law and policy.''

Another commenter indicated that recent experience with the adoption of the 2009 IECC and ASHRAE 90.1–2007 codes, as well as with ''premium'' labels such as ENERGY STAR, offers clear and convincing evidence that the codes do not harm affordability and availability. The commenter noted that ''[i]f builders were unable or unwilling to build homes that meet the codes, or buyers were unable or unwilling to pay for them, there would not be new homes in states that have adopted the codes, or new homes with green labels.''

The commenter also provided national data reflecting housing production in the 32 States and the District of Columbia that have adopted the 2009 IECC or a comparable statewide code as follows: 1.6 million residential building permits were issued between when the 2009 IECC went into effect and the end of 2013, with 538,000 permits issued in the 12 months after the 2009 IECC went into effect, compared to 433,000 beforehand–an increase of 24 percent. For ASHRAE 90.1–2007, the commenter provided similar data: 650,000 units were built since the codes were implemented in 37 States and the District of Columbia, 168,000 of them in the first 12 months after the codes were enacted, compared to 109,000 in the previous 12 months. The commenter concludes that ''codes do not seem to be harming construction in states that have implemented them,'' and also references the significant number of homes (81,000 in 2012 alone) that have been built voluntarily to a higher (ENERGY STAR) standard.

*HUD–USDA Response:* HUD and USDA acknowledge the support expressed by these commenters for the Preliminary Determination. These comments indicate confidence in HUD and USDA's use of DOE's and the Pacific Northwest National Laboratory's (PNNL's) analysis of the subject codes, and in their overall conclusions regarding the lack of a negative impact that these codes would have on the affordability and availability of housing covered by EISA.

*Comment: HUD should proceed quickly to adoption of the more recent IECC/ASHRAE codes.* Several commenters who were supportive of the Preliminary Determination also encouraged HUD and USDA to move quickly to adoption of the next or most recent IECC and ASHRAE codes. One commenter urged HUD and USDA to ''provide a consistent Federal Government approach'' by endorsing ASHRAE 90.1–2010, and to ''promptly update their regulations'' to ASHRAE 90.1–2013 upon a favorable DOE determination. The commenter noted that ''[a] single, consistent U.S. Standard will enable better enforcement and compliance and avoid marketplace confusion, ultimately moving the U.S. toward President Obama's goal of significant improvement in building energy efficiency.''

Another commenter and 16 national consumer, environmental, energy efficiency, or building organizations urged HUD and USDA to finalize this determination and incorporate the codes into their loan processes as soon as possible, and to ''move quickly to complete a determination on the 2012 IECC and ASHRAE 90.1–2010, which have already been determined by DOE to save energy, and which have been shown to be very cost-effective.'' The commenter also urged HUD and USDA to ''help and encourage builders to comply with the new requirements'' through education and quality assurance efforts.

*HUD–USDA Response:* HUD and USDA will address the affordability of the more recent IECC and ASHRAE 90.1 codes in an advance notice in the near future, according to the timetable prescribed in EISA. For adoption or consideration of these codes and future code revisions, HUD and USDA are committed to timely and expeditious compliance with the EISA statutory requirements. However, it is unlikely that HUD and USDA will be able to meet the statutory one-year compliance period prescribed under Cranston-Gonzalez section 109(c) as amended by EISA, because of the time required to do the following: publish a Preliminary Determination, allow for public comments on the Preliminary Determination, and publish a Final Determination along with the requisite clearances by HUD and USDA and the Office of Management and Budget (OMB).

Accordingly, while HUD and USDA will continue to explore ways to comply with the one-year compliance period set forth in section 109(c), HUD and USDA intend to address the next code cycles under the requirements of section 109(d) of Cranston-Gonzalez. Section 109(d) requires that, after failure to comply with section 109(c), the two agencies will conduct an analysis of the impact that the new code will have on the ''affordability and availability'' of covered housing. As is the case for this Final Determination on the 2009 IECC and ASHRAE 90.1–2007, for future code determinations HUD and USDA will rely on the following reports or notices from DOE and PNNL: (1) An efficiency determination required under Title III of the Energy Conservation and Production Act of 2005; and (2) a subsequent cost analysis by PNNL.

3. Objections To or Concerns With Preliminary Determination

*Comment: The payback periods shown for ASHRAE 90.1–2007 that exceed 10 years are too long to require compliance with this standard.* One commenter recommends that, while the 2009 IECC shows payback periods of less than 10 years, this is not the case for ASHRAE 90.1–2007. Appendix 4 in the Preliminary Determination showed that six of the 11 states evaluated for ASHRAE 90.1–2007 have payback periods that exceed this period. The commenter also maintains that multifamily rental property investors expect to see annual rental receipts that are approximately 11 percent of the value of the property. This implies a 100 percent increased first cost/11 percent increase in rental receipts or a 9-year simple payback on energy efficiency

requirements. If that rate of return is not achieved, then the likelihood of a project being built will be reduced. Paybacks of greater than 9 years may therefore reduce the future availability of multifamily rental properties. Given these ''two realities,'' the commenter does not support the HUD–USDA finding that compliance with ASHRAE 90.1–2007 will not negatively affect the affordability and availability of housing covered by EISA—at least in those six States with longer payback periods of more than 10 years.

*HUD–USDA Response:* Note that ASHRAE 90.1–2007 only impacts HUD-insured or -assisted properties; USDA multifamily properties are not covered by EISA. Of the 12 States that have not yet adopted this standard, Appendix 4 of the Preliminary Determination (amended as Table 6 in this Final Determination) showed six States with paybacks of more than 10 years: Hawaii, Colorado, Minnesota, Missouri, Oklahoma, and Tennessee. With the exception of Hawaii, all of these States showed simple paybacks of less than 15 years:

PRELIMINARY DETERMINATION—APPENDIX 4
ESTIMATED COSTS AND BENEFITS PER DWELLING UNIT FROM ADOPTION OF ASHRAE 90.1–2007

| State | Incremental cost/unit ($) | Energy cost savings/unit ($/year)* | Simple payback/unit (years) |
|---|---|---|---|
| AK | 489 | 57.68 | 8.5 |
| AZ | 340 | 52.12 | 6.5 |
| CO | 354 | 31.96 | 11.1 |
| HI | 476 | 8.17 | 58.4 |
| KS | 338 | 59.37 | 5.7 |
| ME | 373 | 42.66 | 8.8 |
| MN | 413 | 33.96 | 12.2 |
| MO | 366 | 26.60 | 14.3 |
| OK | 309 | 21.96 | 14.1 |
| SD | 317 | 34.53 | 9.2 |
| TN | 318 | 25.61 | 12.5 |
| WY | 319 | 33.09 | 9.7 |

The estimated energy cost savings per unit and simple paybacks provided in this table in the Preliminary Determination used national average prices for natural gas of $1.2201 per therm, and $.0939 per kWh for electricity, using the methodology used by PNNL in their cost determination of ASHRAE 90.1–2007.[5] In this Final Determination, HUD and USDA have updated the PNNL methodology by using individualized state-by-state fuel and electricity prices, in order to provide a more current and accurate estimate of cost savings. The updated and revised estimated cost savings and paybacks are now presented in Table 6 of the Final Determination as follows:

FINAL DETERMINATION—TABLE 6.
ESTIMATED COSTS AND BENEFITS PER DWELLING UNIT FROM ADOPTION OF ASHRAE 90.1–2007

| State | Incremental cost/unit ($) | Energy cost savings/unit ($/year)* | Simple payback/unit (years) |
|---|---|---|---|
| AK | 489 | 68.95 | 7.1 |
| AZ | 340 | 76.88 | 4.4 |
| CO | 354 | 28.70 | 12.4 |
| HI | 476 | 31.66 | 15.1 |
| KS | 338 | 80.13 | 4.2 |
| ME | 373 | 62.95 | 5.9 |
| MN | 413 | 31.15 | 13.3 |
| MO | 366 | 36.28 | 10.1 |
| OK | 309 | 31.79 | 9.7 |
| SD | 317 | 32.32 | 9.8 |
| TN | 318 | 30.40 | 10.5 |
| WY | 319 | 33.38 | 9.6 |

Using individual state-by-state fuel and electricity prices, rather than a national average as used by PNNL, of the 12 States that have not yet adopted ASHRAE 90.1–2007, seven States show simple paybacks of less than 10 years (Alaska, Arizona, Kansas, Maine, Oklahoma, South Dakota, and Wyoming) and four States show paybacks of less than 15 years (Colorado, Minnesota, Missouri, Tennessee). One state (Hawaii) shows a payback of more than 15 years (15.1 years).

With regard to the five States with paybacks of more than 10 years, while we agree that shorter paybacks are generally better when considering simple payback periods as a measure of cost-effectiveness or affordability, we believe that the 10-year simple payback limit proposed by the commenter is too limiting for the purpose of this analysis, for two reasons. First, the life of the

[5] Pacific Northwest National Laboratory, *Cost Effectiveness and Impact Analysis of Adoption of ASHRAE 90.1–2007 for New York State.* (U.S. Department of Energy, PNNL–18552, June 2009). http://www.pnl.gov/main/publications/external/technical_reports/PNNL–18552.pdf.

energy efficient equipment or materials installed as a result of complying with ASHRAE 90.1–2007 (*e.g.,* windows, doors, insulation, boilers, etc.) is likely to be significantly longer than 10 years, in some cases for the life of the building; a cost-benefit analysis for these measures indicates a net-positive result over the much longer life of the equipment. Second, as noted in the Preliminary Determination, another important factor is the incremental cost involved; the per-unit costs shown above (in the $300–$400 range) are a small fraction of the Total Development Cost (TDC) per unit.

In addition, the price-ratio measure referenced by the commenter may mix the expected return on an entire property with the expected return on a particular aspect of the property (the upgraded features). In order to cause a development not to be pursued, the new standard would have to violate the return threshold for the entire property. And, it ignores the possibility that efficiency measures, to some extent, would be internalized in rent receipts.

To best understand the profitability of multifamily housing, it may be preferable to examine the capitalization rate (rental income less operating costs divided by the market value of the property) rather than the rent-to-price ratio, since the capitalization rate takes into account operating costs and therefore is more likely to reflect the building's energy efficiency than the rent-to-price ratio. According to the 2012 Rental Housing Finance Survey (RHFS), the median capitalization rate of rental buildings is 6 percent. For some states, the cost savings are close to 6 percent. However, as described in the notice, the return on investment (ROI) is almost always positive, which would increase affordability. Perhaps most important, at an estimated average cost per unit of $441, the cost of compliance is less than 1 percent (0.24%) of the average TDC per unit of $185,000, and is more than offset by the benefits of this notice. Thus, the value of the construction project will not be adversely affected by the higher code adopted as a result of this notice.

*Comment: HUD should ease compliance with the code requirements for single family homes by updating and accepting Form HUD–92541 as evidence of compliance.* One commenter indicated that, while it ''does not disagree with USDA and HUD's estimates about affordability,'' it is concerned about how mortgage lenders should demonstrate compliance for single-family new construction. The commenter noted that this is ''particularly important when underwriting loans for new construction in unincorporated localities, where there may not be public inspectors and other third-party specialists, such as Home Energy Rating System (HERS) rating specialists within several hundred miles, such as in states like Colorado or South Dakota.'' The commenter recommends that HUD modify form HUD–92541 by changing box number four, ''International Energy Conservation Code (IECC) 2006,'' to read ''IECC 2009 or a higher standard,'' and that this form should be available when the Final Determination is issued. The commenter also recommends that the HUD handbook be updated to reflect the single family new construction requirement and that Form HUD–92541 be treated as an acceptable method of certifying the property's minimum energy efficient status.

*HUD–USDA Response:* HUD agrees that Builder's Certification form HUD–92541 will be the primary tool for ensuring compliance of single family FHA-insured properties with the 2009 IECC and intends to update the form to reflect the code (the 2009 IECC) established by this notice. HUD cannot commit to this being completed simultaneously with the publication of the Final Determination, in light of Paperwork Reduction Act requirements; however, it is anticipated that the updated Builder's Certification form HUD–92451, as well as any handbook updates, will be completed during the 180-day implementation period, in order to ensure maximum compliance with the new code requirement.

4. Comments Regarding Data and Methodology

*Comment: The Social Cost of Carbon (SCC) should not be included in this notice.* One commenter objected to the use of the Social Cost of Carbon in this notice, and proposed its deletion. The commenter maintained that the SCC is ''discordant with the best scientific literature on the equilibrium climate sensitivity and the fertilization effect of carbon dioxide—two critically important parameters for establishing the net externality of carbon dioxide emissions.'' The commenter also notes that the SCC [is] ''at odds with existing Office of Management and Budget (OMB) guidelines for preparing regulatory analyses, and founded upon the output of Integrated Assessment Models (IAMs) which encapsulate such large uncertainties as to provide no reliable guidance as to the sign, much less the magnitude of the social cost of carbon.'' The commenter also suggests that the IAMs, as run by the Interagency Working Group (IWG) produce ''illogical results'' that indicate a ''misleading disconnect between a climate change and the SCC value.'' Further, the commenter believes that sea-level rise projections (and thus SCC) of at least one of the IAMs (DICE 2010) cannot be supported by the mainstream climate science.

Based on these objections to the SCC, the commenter proposes that the SCC should be ''barred from use in this and all other federal rulemaking. It is better not to include any value for the SCC in cost/benefit analyses such as these, than to include a value which is knowingly improper, inaccurate and misleading.'' The commenter proposes ''to remove any and all analyses in this Preliminary Determination that makes reference to, or incorporates a value of, the social cost of carbon as determined by the federal Interagency Working Group.'' Specifically, the commenter proposes that HUD–USDA remove Table 8 and related text from the notice.

An alternative, supportive, view of the SCC was provided by another commenter. This commenter strongly argues for the use of the SCC as a measure of nonenergy benefits. This commenter notes that ''SCC calculations are important for evaluating the costs of activities that produce greenhouse gas emissions and contribute to climate change, such as burning fossil fuels to produce energy. The SCC is also important for evaluating the benefits of policies that would reduce the amount of those emissions going into the atmosphere. For example, in order to properly evaluate standards that reduce the use of carbon-intensive energy or that improve energy efficiency—like the proposed updated energy codes—it is important to understand the benefits they will provide, including the benefit of reducing carbon pollution and the harm it causes.''

This commenter also defends the Interagency Working Group's (IWG) analysis as ''science-based, open, and transparent'' and believes that ''the IWG correctly used a global SCC value.'' While conceding that the IWG can improve its SCC methodology, the commenter nevertheless argues that ''HUD and USDA should continue to use the current IWG estimate of the SCC.''

*HUD Response:* HUD and USDA acknowledge the critique of the SCC from the commenter, but believe that the SCC is an important and established element of a regulatory impact analysis for energy-related governmental regulations. Lower energy consumption involving fossil fuels will by default result in lower carbon emissions; there are economic, health and safety costs

associated with these emissions, and, conversely, cost benefits when these emissions are reduced. While the commenter is correct that the SCC is not specifically required for the affordability or availability analysis specified under EISA (the primary analysis for that purpose involves energy and cost savings accruing directly to the property owner or resident) the SCC is relevant to the larger economic costs and benefits required for a regulatory impact analysis. The cost benefits of carbon saved as a result of adopting the higher standards specified in the notice can and should be incorporated in the regulatory impact analysis, and do not affect, or undermine, the underlying affordability or availability findings of the notice.

*Comment: Additional research shows similar results as DOE findings.* One commenter cited a study by the National Association of Home Builders (NAHB) Research Center (now the Home Innovation Research Labs) (Research Center) that shows the national average simple payback for the 2009 IECC of 5.6 years compared to the DOE study cited in the Preliminary Determination of 5.1 years. The commenter notes that the slightly longer payback from the Research Center may be because the initial construction costs were assumed to be about 35 percent higher in the Research Center analysis than in the PNNL analysis for DOE, due to the Research Center's reference home being based on national averages with more wall area than assumed in the PNNL analysis (2,580 vs. 2,380 sq. ft.) while having slightly less floor area (2,352 vs. 2,400 sq. ft.). In addition, the commenter points out that construction costs used in the Research Center study generated by actual builders were higher than those used by PNNL, which were developed by commercial estimators.

*HUD–USDA Response:* HUD and USDA relied on DOE and PNNL analysis of the 2009 IECC and ASHRAE 90.1–2007 in order to maximize alignment of our findings with those of other Federal agencies. We appreciate and recognize the additional independent findings on the 2009 IECC referenced by the commenter in the Research Center report. Despite the differences noted in the characteristics of the assumed reference house, the NAHB Research Center's results show very similar payback periods to those arrived at by DOE and PNNL (5.6 years vs. 5.1 years), thereby confirming and reinforcing HUD and USDA's findings on the cost effectiveness of the 2009 IECC.[6] While the PNNL and Research Center paybacks are similar, the incremental costs for the 2009 IECC in the Research Center report are higher than those determined by PNNL.

These incremental cost differences result from the differences in the reference homes used in each report. The PNNL methodology defines a residential prototype building to be representative of typical new residential construction using data from the U.S. Census Bureau, the American Housing Survey, and NAHB, and establishes typical construction and operating assumptions, whereas the Research Center uses national averages. The assumptions were subjected to a public review through a Request for Information (RFI) process.[7] We believe that the PNNL methodology provides an objective prototype most suitable for a national sample.

*Comment: Updated information in local or statewide adoption of the subject codes.* The Preliminary Determination identified 18 States that have not yet adopted the 2009 IECC and 12 States that have not yet adopted ASHRAE 90.1–2007. Two commenters provided updated information that at least five of these States (Colorado, Arizona, Kansas, Missouri and Maine) have seen significant local adoption of the 2009, or even the 2012, IECC. In Colorado, for example, jurisdictions that have adopted either of these standards represent 90 percent of the statewide population; in Arizona, it is estimated at 70 percent. It was also noted by one commenter that two States (Kentucky and Louisiana) have ''already adopted'' the 2009 IECC or ''almost its equivalent,'' while two additional States are either in the final stages of adopting or are in the process of adopting the 2009 IECC (Minnesota and Arkansas, respectively).

*HUD–USDA Response:* HUD and USDA recognize these updates on State or local adoption of the 2009 or 2012 IECC. Statewide adoption of energy codes is an evolving process, with new States (or home rule municipalities) adopting the more recent codes on an ongoing basis. The 18 states that had not yet adopted the 2009 IECC or ASHRAE 90.1–2007 cited in the Preliminary Determination reflected information posted by DOE's Building Energy Codes Program (BECP) at or near the time of publication of the Preliminary Determination. The updated data on two additional States provided by the commenters does not change the overall affordability and availability finding for the remaining States that have not yet adopted the 2009 IECC or ASHRAE 90.1–2007 (that the subject codes will not negatively impact the affordability and availability of covered housing); rather, these data have the effect of lowering the number of units estimated to be impacted by the adoption of the codes addressed in this notice. Similarly, to the extent that there are local jurisdictions that have adopted higher codes than those adopted by local jurisdictions within States that have not yet adopted the code statewide, this will have the effect of lowering the overall costs (and related benefits) associated with this notice. HUD and USDA have updated the estimated impacts in the Final Determination, in order to reflect the most recent code adoption status reported by the BECP at *http://www.energycodes.gov/adoption/states* (as of May 2014).

5. Alternative Green Standards or Equivalent State or Local Standards

*Comment: HUD and USDA should accept one or more green building standards as alternative compliance paths.* One commenter proposed that the ICC 700 National Green Building Standard (NGBS) should be accepted as an alternative compliance certification, for the following reasons: NGBS certification requirements ensure that all certified buildings achieve a minimum energy efficiency performance 15 percent more efficient than the 2009 IECC, and many homes/buildings that achieve NGBS certification far exceed that baseline; the NGBS is designed to cover all residential construction, and can be applied to all housing types noted in the notice; and NGBS certification offers a quality assurance mechanism, in that all units are verified by an independent, third-party NGBS Green Verifier. Another commenter proposed similar adoption by HUD and USDA of LEED for Homes (Version 8) as a compliance path, and another commenter indicated that the codes referenced in the notice are already included as a minimum requirement in the Enterprise Green Communities standard.

*Comment: Equivalent energy performance.* One commenter suggested that HUD and USDA recognize State and/or local jurisdictions that have established standards that have equal or

[6] NAHB Research Center, *2009 IECC Cost Effectiveness Analysis,* May 2012. *http://www.homeinnovation.com/~/media/Files/Reports/Percent%20Energy%20Savings%202009%20IECC%20Cost%20Effectiveness%20Analysis.PDF.*

[7] The PNNL methodology for the residential prototype is published online at *http://www.energycodes.gov/development/residential/methodology.*

better energy savings. The commenter cites title IV, section 410, of the American Recovery and Reinvestment Act, that provided specific language that dealt with equivalency by considering any energy code that ''achieves equivalent or greater energy savings'' as an acceptable alternative code. This would benefit States such as California that already exceed the 2009 IECC with their independently developed Title 24 energy efficiency standard. The commenter suggests that a reference to energy equivalency be included in the ''Implementation'' section of the notice.

*HUD–USDA Response:* The 2009 IECC and ASHRAE 90.1–2007 codes addressed in this Determination establish a floor, not a ceiling, for HUD- and USDA-covered programs. HUD and USDA recognize that the green building certifications referenced by the commenters, such as the NGBS (Performance Path), LEED for Homes, and Enterprise Green Communities, have incorporated the 2009 IECC or ASHRAE 90.1–2007 as minimum required energy standards. Accordingly, HUD and USDA will accept these standards as evidence of compliance with the 2009 IECC or ASHRAE 90.1–2007. In addition to these standards, these may include LEED for New Construction, ENERGY STAR Certified New Homes or ENERGY STAR for Multifamily High Rise, Enterprise Green Communities, and other regionally or locally recognized green building standards, such as Earth Advantage, Earthcraft, and others.

With regard to State standards that have equivalent or higher standards, there is documented evidence that Title 24 in California exceeds the standards specified in the HUD–USDA notice, so by definition any project in California complying with Title 24 will automatically comply with the 2009 IECC and/or ASHRAE 90.1–2007. If documented evidence is provided to HUD and USDA that a specific state standard equals or exceeds the standards specified in this notice, these State standards will also be accepted as a compliance path.

6. Suggested Changes and Alternatives to Preliminary Determination

*Comment: Hawaii should not be exempted from ASHRAE 90.1–2007.* HUD and USDA solicited comments on whether Hawaii should be exempted from complying with ASHRAE 90.1–2007, as was proposed in the Preliminary Determination. Using average national electricity prices in the Preliminary Determination, Hawaii showed a 58-year payback for adoption of ASHRAE 90.1–2007; however, using Hawaii electricity prices, the payback dropped to 17 years. (As discussed below, this Final Determination uses more recent October 2014 electricity prices, and the resulting payback for Hawaii declines further to 15.1 years.)

Two commenters disagreed with the Preliminary Determination's finding that exempted Hawaii from adopting ASHRAE 90.1–2007 and proposed instead that HUD and USDA require Hawaii compliance with ASHRAE 90.1–2007. The most detailed comment was provided by one commenter. This commenter notes that the Hawaii State Building Code Council has approved the 2009 IECC (roughly equivalent to ASHRAE 90.1–2007) for adoption in its four counties, and one county has already adopted these requirements. The commenter argues that ''if Hawaii has already found the code to be sensible for all residential and commercial buildings in its unique climate zone, we do not see any reason to exclude it from the updated HUD/USDA energy efficiency standard.''

The commenter also maintains that Hawaii's cooling needs are very different from New York's, on which HUD's and USDA's conclusion was based, and that ''a simple payback analysis is [not] a complete enough foundation from which to make a decision on cost-effectiveness.'' The Preliminary Determination found that when Hawaii's average electricity costs are applied to the HUD/USDA analysis (rather than a national average), mid-rise apartment buildings achieved simple payback in 17 years. The commenter suggested that a 17-year payback should not automatically be deemed not cost-effective, considering the expected lifetime of a multifamily building (30 to 100 years). The commenter suggests that a closer consideration of Hawaii will demonstrate a much more rapid payback, but even if the payback period is 17 years, EISA does not set a specific simple payback period or even require a simple payback analysis. The commenter notes that the relevant inquiry is whether the home or dwelling unit is ''affordable,'' and by a life-cycle analysis of 30 years, ''multifamily buildings in Hawaii should be required to meet ASHRAE 90.1–2007.''

Another commenter reached a similar conclusion. The commenter noted Hawaii has exceptionally high energy prices, and Hawaii is in a different climate zone with different requirements and thus will have different costs than New York, on which the Preliminary Determination was based. In fact, the Hawaii Building Code Council adopted the 2009 IECC (roughly equivalent for commercial buildings to ASHRAE 90.1–2007) with amendments, suggesting that the Hawaiians found the code reasonable for their State.

*HUD–USDA Response:* In this Final Determination HUD and USDA are amending the proposed exemption in the Preliminary Determination of HUD-assisted or FHA-insured multifamily properties in Hawaii from compliance with ASHRAE 90.1–2007. HUD acknowledges that the Hawaii Building Code Council has already adopted the 2009 IECC (roughly equivalent to ASHRAE 90.1–2007), as well as the fact that current (October 2014) EIA data show the average cost per kilowatt hour in Hawaii as of October 2014 has risen to 36 cents per kilowatt hour—even higher than the 32 cents cited in the Preliminary Determination, thereby lowering the estimated payback period for Hawaii to 15.1 years. At 36 cents per kilowatt hour, the simple payback of 15.1 years for energy savings in Hawaii is consistent with the other four States shown in table 6 with paybacks that are longer than 10 years; *i.e.,* Colorado, Minnesota, Missouri, and Tennessee, whose paybacks range from 10.1 years to 13.3 years. Accordingly, HUD-assisted or FHA-insured multifamily properties in Hawaii are covered under this Final Determination.

*Comment: Extend implementation period for ASHRAE 90.1–2007 for multifamily buildings from 90 to 180 days.* Two commenters requested that the implementation timetable for multifamily properties be extended to 180 days. The notice currently states that for FHA-insured multifamily programs, the new standard would apply to those properties for which mortgage insurance applications are received by HUD 90 days after the effective date of a final determination. One commenter maintains that multifamily loan applications must include ''almost full'' plans and specifications; the design of the project will therefore have been completed or nearly-completed at the time of the loan application within 90 days. A 90-day notice may therefore result in developers having to modify plans and specs, which could be costly so late in the design process. Similarly, another commenter expressed a concern that multifamily new construction or substantial rehabilitation transactions have a long lead time and, for locations where the new standard represents a change, a longer lead time would ensure that the standard would not affect financings already in the development or application stages.

*HUD Response:* HUD proposes to retain the 90-day implementation period for multifamily properties but, to

address the concerns expressed by the commenters that this could impact projects already in the development or application stages, HUD will clarify that the 90 days refers to the preapplication; *i.e.,* not the application for Firm Commitment. This 90-day period would commence 30 days after the Final Determination is published, thereby effectively providing a 120-day implementation period.[8] Multifamily properties have different compliance dates than single family properties, since the process is different for securing FHA single family mortgage insurance or USDA single family loan guarantees versus multifamily insurance. Multifamily developers submit preapplication proposals to FHA for insurance very early in the application process, whereas there is no such similar preapplication requirement for FHA single family. HUD does not want the implementation to impede or slow down projects in the pipeline, but is also aware that there have been two code cycles since ASHRAE 90.1–2007 and that it is important that this standard be implemented as expeditiously as possible.

*D. Adoption of Preliminary Determination as Final Determination*

After consideration of the public comments on the Preliminary Determination, HUD and USDA adopt the Preliminary Determination as their Final Determination. This Final Determination takes into consideration the public comments received in response to HUD and USDA's Preliminary Determination.

After careful consideration of the issues raised by the comments, HUD and USDA have made five changes as follows:

(1) Modified the implementation schedule for multifamily properties to clarify that the 90-day implementation period commences after the 30-day effective date of the Final Determination, and that the implementation period refers to preapplications received by HUD for multifamily insurance, not the application for Firm Commitment. The Final Determination also includes an implementation schedule for new HOME units covered by the statute;

(2) Provided an alternative compliance path for properties meeting ENERGY STAR Certified Homes, ENERGY STAR for Multifamily High Rise and certain green building standards;

(3) Provided additional detail on administrative and regulatory actions that HUD and USDA will take to implement the code requirements;

(4) Updated the status of code adoption of certain States or localities to reflect the status reported in the comments as confirmed by DOE. These include Louisiana and Kentucky, both of which, as of November 2014, have adopted the 2009 IECC, and adjustments of the estimated number of impacted units in Colorado and Arizona to reflect home rule municipalities' adoption of these codes in the absence of statewide legislation; and,

(5) Removed the exemption proposed in the Preliminary Determination of HUD-assisted or FHA-insured multifamily properties in Hawaii from compliance with ASHRAE 90.1–2007.

This notice does not address the more recent IECC and ASHRAE codes for which DOE has published efficiency determinations:

- Final Determination for the 2010 edition of ASHRAE 90.1 (published October 19, 2011);
- Final Determination for the 2012 edition of the IECC (published May 17, 2012);
- Final Determination for the 2013 edition of ASHRAE 90.1 (published September 26, 2014); [9]
- Preliminary Determination for the 2015 edition of the IECC (published September 26, 2014).[10]

DOE has also completed a cost analysis of the 2012 IECC for 43 of the 50 States and the District of Columbia, a national cost analysis of ASHRAE 90.1–2010, and a cost analysis of the ASHRAE 90.1–2010 for 22 of the 50 States and the District of Columbia.[11] DOE intends to publish a similar national cost-effectiveness analysis for ASHRAE 90.1–2013 in 2015.

The impact of these more recent codes on the affordability and availability of HUD- and USDA-funded new construction is currently being assessed by the two agencies. Since HUD and USDA's affordability determination relies on DOE's analysis, HUD and USDA will address the affordability of these codes in a subsequent notice in the near future. It is HUD's and USDA's intention that while adoption of future IECC and ASHRAE 90.1 standards can be implemented with a Determination such as this one, each program will subsequently update its handbooks, mortgagee letters, relevant forms, or other administrative procedures each time HUD and USDA determine that the new standard will not negatively impact the affordability or availability of housing under the covered programs.

Although HUD and USDA are adopting the 2009 IECC and ASHRAE 90.1–2007 energy codes, as noted in their April 15, 2014, Preliminary Determination, HUD and USDA, along with other Federal agencies, have also adopted the December 2011 energy alignment framework of the interagency Rental Policy Working Group. According to this framework, several HUD competitive grant programs already require or provide incentives to grantees to comply with energy efficiency standards that exceed the 2009 IECC and ASHRAE 90.1–2007 standards outlined in this notice.[12] This standard is typically ENERGY STAR Certified New Homes for single family properties or ENERGY STAR for Multifamily High Rise for multifamily properties. Nothing in this notice will preclude these competitive programs from maintaining these higher standards, or raising them further. A list of current program requirements or incentives prior to publication of this notice is shown in Table 1, below.

TABLE 1—CURRENT ENERGY STANDARDS AND INCENTIVES FOR HUD AND USDA PROGRAMS

[New construction only]

| Program | Type | Current energy efficiency requirements and incentives |
|---|---|---|
| HUD | | |
| Choice Neighborhoods—Implementation. | Competitive Grant | Single family and low-rise multifamily: ENERGY STAR Certified New Homes. Multifamily high-rise (4 or more stories): ENERGY STAR for Multifamily High Rise. Additional 2 rating points for achieving Certified LEED–ND or similar standard; or 1 point if project complies with goal of achieving LEED–ND or similar standard. |

[8] Note that the 90 days applies to *preapplications* for FHA multifamily insurance, whereas the 180 days applies to *building permits* for FHA single family insurance.

[9] U.S. Department of Energy, ''Determination Regarding Energy Efficiency Improvements in ANSI/ASHRAE/IES Standard 90.1–2013: Energy Standard for Buildings Except Low-Rise Residential Buildings,'' **Federal Register** Notice, 79–FR–57900, September 26, 2014. *https://federalregister.gov/a/2014-22882.*

[10] Current status of determinations are listed by DOE at *https://www.energycodes.gov/determinations.*

[11] ASHRAE 90.1 cost-effectiveness analyses are provided at *https://www.energycodes.gov/development/commercial/cost_effectiveness.*

[12] Rental Policy Working Group, *Federal Rental Alignment: Administration Proposals,* December 31, 2011. *www.huduser.org/portal/aff_rental_hsg/rpwg_conceptual_proposals_fall_2011.pdf.*

TABLE 1—CURRENT ENERGY STANDARDS AND INCENTIVES FOR HUD AND USDA PROGRAMS—Continued

[New construction only]

| Program | Type | Current energy efficiency requirements and incentives |
|---|---|---|
| Choice Neighborhoods—Planning. | Competitive Grant | Eligible for Stage 1 Conditional Approval of all or a portion of the neighborhood targeted in their Transformation Plan for LEED for Neighborhood Development from the U.S. Green Building Council. |
| HOPE VI | Competitive Grant | While no new grants are being awarded, the most recent Notice of Funding Availability provided the following rating points: 3 points if new units were certified to one of several recognized green building programs, including Enterprise Green Communities, National Green Building Standard, LEED for Homes, LEED New Construction, or local or regional standards such as Earthcraft; 2 points if new construction was certified to ENERGY STAR for New Homes standard; 1 point if only ENERGY STAR-certified products and appliances were used in new units. |
| Section 202 Supportive Housing for the Elderly. | Competitive Grant | Single family and low-rise multifamily: ENERGY STAR Certified New Homes. Multifamily high-rise (4 or more stories): ENERGY STAR for Multifamily High Rise. Applicants earn additional points if they meet one of several recognized green building standards. *http://archives.hud.gov/funding/2010/202elderly.pdf.* (Note: capital advances for new construction last awarded in FY 2010). |
| Section 811 for Persons with Disabilities Project Rental Assistance. | Competitive Grant | ENERGY STAR Certified New Homes for single family homes, or ENERGY STAR for Multifamily High Rise for multifamily buildings. *http://archives.hud.gov/funding/2012/sec811pranofa.pdf.* (Note that HUD is no longer awarding Section 811 grants for new units.) |
| Rental Assistance Demonstration (RAD). | Conversion of Existing Units | Minimum 2006 IECC or ASHRAE 90.1–2004 for new construction or any successor code adopted by HUD; applicants encouraged to build to ENERGY STAR Certified New Homes or ENERGY STAR for Multifamily High Rise. Minimum WaterSense and ENERGY STAR appliances required and the most cost-effective measures identified in the Physical Condition Assessment (PCA). (Note that most RAD units will be conversions of existing units, not new construction). |
| FHA Multifamily Mortgage Insurance. | Mortgage Insurance | 2006 IECC or ASHRAE 90.1–2004 (Multifamily Accelerated Processing Guide at *http://portal.hud.gov/hudportal/documents/huddoc?id=4430GHSGG.pdf*). |
| FHA Single Family Mortgage Insurance. | Mortgage Insurance | 2006 IECC (See Builder's Certification form HUD–92541 at *http://portal.hud.gov/hudportal/documents/huddoc?id=92541.pdf.*) |
| HOME Investment Partnerships Program. | Formula Grant | Cranston-Gonzalez sections 215(b)(4) and section 215(a)(1)(F) require HOME units to meet minimum energy efficiency standards promulgated by the Secretary in accordance with Cranston Gonzalez section 109 (42 U.S.C. 12745). Final HOME Rule published July 24, 2013 at *www.onecpd.info/home/home-final-rule/reserves* the energy standard for a separate rulemaking at 24 CFR 92.251. |
| Public Housing Capital Fund | Formula Grant | 2009 IECC and ASHRAE 90.1–2010, or successor standards, Capital Final Rule October 24, 2013, at *http://www.gpo.gov/fdsys/pkg/FR-2013-10-24/pdf/2013-23230.pdf.* ENERGY STAR appliances are also required unless not cost effective. |
| USDA | | |
| Section 502 Guaranteed Housing Loans. | Loan Guarantee | 2006 IECC at minimum.* Rural Energy Plus program requires compliance with most recent version of IECC, which is currently IECC 2012. |
| Section 502 Rural Housing Direct Loans. | Loan Guarantee | 2006 IECC at minimum.* A pilot is being created that gives incentive points for participation in ENERGY STAR Certified New Homes, Green Communities, Challenge Home, NAHB National Green Building Standard, and LEED for Homes |
| Section 502 Direct Loans for Section 523 Mutual Self-Help Loan program homeowner participants. | Loan Guarantee | 2006 IECC at minimum.* A pilot is being created that gives incentive points for participation in ENERGY STAR Certified New Homes, Green Communities, Challenge Home, NAHB National Green Building Standard, and LEED for Homes |

* USDA programs updated annually per Administrative Notice.

## II. HUD–USDA Final Affordability Determination

The specific HUD and USDA programs covered by this notice are listed in Appendix I. While not specifically referenced in EISA, the Home Investment Partnerships Program (HOME) is covered, pursuant to a requirement in the HOME statute at section 215(b)(4) (42 U.S.C. 12745(b)(4)) and section 215(a)(1)(F) (42 U.S.C. 12745(a)(1)(f)) of Cranston-Gonzalez, which set the minimum standard for new construction of HOME-funded units at the standard established through this determination under Cranston-Gonzalez section 109.

Several exclusions are worth noting. EISA's application to the ''rehabilitation and new construction of public and assisted housing funded by HOPE VI revitalization grants'' is no longer applicable, since funding for HOPE VI

has been discontinued. HUD's Housing Choice Voucher program, also known as Section 8 Tenant-Based Rental Assistance (TBRA), is excluded since the agency does not have the authority or ability to establish housing standards for properties before they are rented by tenant households under that program; *i.e.,* when they are newly built. Indian housing programs are excluded because they do not constitute assisted housing and are not authorized under the National Housing Act (12 U.S.C. 1701 *et seq.*) as specified in EISA. For instance, the Section 184 Loan Guarantee Program is authorized under section 184 of the Housing and Community Development Act of 1992 (42 U.S.C. 1715z–13a). Similarly, housing financed with Community Development Block Grant (CDBG) funds is not included, since CDBG, which is authorized by the Housing and Community Development Act of 1974 (42 U.S.C. 5301 *et seq.*), is neither an assisted housing program nor a National Housing Act mortgage insurance program. Finally, only single family USDA programs are covered by EISA, whereas both single family and multifamily HUD programs are covered.

*A. Discussion of Market Failures*

Before focusing on the specific costs and benefits associated with adoption of the IECC and ASHRAE codes addressed in this notice, the extent to which market failures or barriers exist in the residential sector that may prompt the need for these higher codes is discussed below. There is a wide body of literature on a range of market failures that have resulted in an ''energy efficiency gap'' between the actual level of investment in energy efficiency and the higher level of investment that would be cost beneficial from the consumer's (*i.e.,* the individual's or firm's) point of view.[13] More broadly, market *failures* involve externalities, market power, and inadequate or asymmetric information. Market *barriers* include capital market barriers and incomplete markets for energy efficiency; *i.e.,* the fact that energy efficiency is generally purchased as an attribute of another product (in this case shelter or a building).

Within this broader world of market failures and barriers, suboptimal energy efficient investment in housing imposes two primary costs: Increased energy expenditures for households and an increase in the negative externalities associated with energy consumption. In addition to complying with the EISA statute, HUD and USDA have two primary motivations in the promulgation of this notice: (1) To reduce the total cost of operating and thereby increasing the affordability of housing by promoting the adoption of cost-effective energy technologies, and (2) to reduce the social costs (negative externalities) imposed by residential energy consumption. The first justification (lowering housing costs) requires that there exist significant market failures or other barriers that deter builders from supplying the energy efficiency demanded by consumers of housing. Alternatively, there may be market barriers that limit consumer demand for energy efficiency, which builders might readily supply if such demand existed. While the gains from cost-effective investments in energy efficiency are potentially very large, the argument that the market will not provide energy efficient housing demanded by households is somewhat complex.

The second justification (reducing social costs) requires that the consumption of energy imposes external costs that are not internalized by the market. There is near universal agreement among scientists and economists that energy consumption leads to indirect costs. The challenge is to measure those costs.

Under Investment in Energy-Saving Technologies

The production of energy efficient housing may be substantial, but if there are market failures or barriers that are not reflected in the return on the investment, the market penetration of energy efficient investments in housing will be less than optimal.

When analyzing energy efficiency standards, the generation of savings is typically the greatest of the different categories of benefits. Using potential private benefits to justify costly energy efficiency standards is often criticized.[14] A skeptic of this approach of measuring the benefits discussed in this notice would indicate that if, indeed, there were net private benefits to energy efficient housing, consumers would place a premium on that characteristic and builders would respond to market incentives and provide energy-efficient homes. The noninterventionist might argue that the analyst who finds net benefits of implementing a standard did not measure the benefits and costs correctly.[15] The existence of unobserved costs (either upfront or periodic) is a potential explanation for low levels of investment in energy-saving technology. Finally, a proponent of the market approach could argue that the very existence of energy efficient homes is ample proof that the market functions well. If developers build energy efficient housing, the theoretical challenge is to explain why there is an undersupply.

Despite the economic argument for nonintervention, there are many compelling economic arguments for the existence of an energy efficiency gap. Thaler and Sunstein attribute the energy efficiency gap to incentive problems that are exaggerated because upfront costs are borne by the builder, whereas the benefits are enjoyed over the long term by tenants.[16] Four justifications deserve special consideration: (1) Imperfect information concerning energy efficiency, (2) inattention to energy efficiency, (3) split incentives for energy efficient investments in the housing market, and (4) lack of financing for energy efficient retrofits.[17]

*(1) Imperfect information.* Assuming information concerning energy efficiency affects investment, one can imagine two scenarios in which imperfect information would lead to an underinvestment in energy efficiency. First, consumers may be unaware of the potential gains from energy efficiency or even of the existence of a particular energy-saving investment. Second, imperfect information may inhibit energy efficient investments. A consumer may be perfectly capable of evaluating energy efficiency and making rational economic decisions but researching the options is costly. Establishing standards reduces search costs: consumers will know that newer housing possesses a minimal level of efficiency. Similarly, because it may be costly for consumers to identify energy efficient housing, the real estate industry may hesitate to invest in energy efficiency.

*(2) Consumer inattention to energy efficiency.* Consumers may be inattentive to long-run operating costs (energy bills) when purchasing durable energy-using goods.[18] Procrastination and self-control also may affect the

[13] The existence of this gap has been documented in many cases. See Marilyn A. Brown, ''Market Failures and Barriers as a Basis for Clean Energy Policies,'' *Energy Policy 29* (2001): 1197–1207.

[14] Hunt Allcott and Michael Greenstone, *Is There An Energy Efficiency Gap?* National Bureau of Economic Research, Working Paper No. 17766, January 2012. *http://www.nber.org/papers/w17766.pdf.*

[15] For a detailed example, see Allcott and Greenstone, *Is There an Energy Efficiency Gap?*

[16] Richard H. Thaler and Cass R. Sunstein, *Nudge: Improving Decisions about Health, Wealth, and Happiness* (New Haven: Yale University Press, 2008).

[17] Allcott and Greenstone, *Is There an Energy Efficiency Gap?*

[18] *Ibid,* 21.

rationality of long-run decisions.[19] These behavioral phenomena may deter energy efficiency choices. Establishing minimal standards that do not impose excessive costs but generate economic gains will benefit consumers who, when making housing choices, concentrate on other characteristics of the property.

*(3) Split incentives.* For owner-occupied homes, the prospect of ownership transfer may create a barrier to energy efficient investment.[20] If owners, builders, or buyers do not believe that they will be able to recapture the value of the investment upon selling their home, they will be deterred from investing in energy efficiency. As indicated by McKinsey and Company in their landmark 2009 report, the length of the payback period and lifetime of the stream of benefits is longer than a large proportion of households' tenure. This concern may lead to the exclusive pursuit of investments for which there is an immediate payback.

For rental housing, split incentives exist that lead to sub-optimal housing.[21] There is an agency problem when the landlord pays the energy bill and cannot observe tenant behavior or when the tenant pays the energy bill and cannot observe the landlord's investment behavior.[22]

*(4) Lack of financing.* Energy efficient investment may require a significant investment that cannot be equity financed. Capital constraints are a formidable barrier to energy efficiency for low-income households.[23] While there is a wide variety of financing alternatives for home purchases, there are not many financing alternatives specifically for undertaking energy retrofits of for-sale housing.[24] Building energy efficiency into housing at the time of construction allows homeowners and landlords to finance the energy-saving improvement with a lower mortgage interest rate, as opposed to a less affordable home improvement loan specifically for energy retrofits.[25]

Nonenergy Benefits

Even if there were no investment inefficiencies and individual consumers who were able to satisfy their need for energy efficiency, nonenergy consumption externalities could justify energy conservation policy. The primary nonenergy co-benefits of reducing energy consumption are the reduction of emissions, and health benefits. The emission of pollutants (such as particulate matter) cause health and property damage. Greenhouse gases (such as carbon dioxide) cause global warming, which imposes a cost on health, agriculture, and other sectors. Greater energy efficiency allows households to afford energy for heating during severe cold or cooling during intense heat, which could have positive health effects for vulnerable populations. For example, studies have found a strong link between health outcomes and indoor environmental quality, of which temperature, lighting, and ventilation are important determinants.[26] Clinch and Healy discuss how to value the effect on mortality and morbidity in a cost-benefit analysis of energy efficiency.[27]

In addition to the direct health benefits for residents of energy efficient housing, there will be indirect public health benefits. First, the local population will gain from reducing emissions of particulate matter that have harmful health effects. Second, there may be a positive safety effect from reducing the probability of fires by eliminating the need for supplemental heating sources.[28]

*B. 2009 IECC Affordability Determination*

The IECC is a model energy code developed by the ICC through a public hearing process involving national experts for single family residential and commercial buildings.[29] The code contains minimum energy efficiency provisions for residential buildings, defined as single family homes and low-rise residential buildings up to three stories, offering both prescriptive and performance-based approaches. Key elements of the code are building envelope requirements for thermal performance and air leakage control.

The IECC is typically published every 3 years, though there are some exceptions. In the last two decades, full editions of its predecessor, the Model Energy Code, came out in 1989, 1992, 1993, and 1995, and full editions of the IECC came out in 1998, 2000, 2003, 2006, 2009, and 2012. Though there were changes in each edition of the IECC from the previous one, the IECC can be categorized into two general eras: 2003 and before, and 2004 and after. The residential portion of the IECC was heavily revised in 2004. The climate zones were completely revised (reduced from 17 zones to 8 primary zones), and the building envelope requirements were restructured into a different format.[30] The post-2004 code became much more concise and simpler to use, but these changes complicate comparisons of State codes based on pre-2004 versions of the IECC to the 2009 IECC.

The 2009 IECC substantially revised the 2006 code as follows: [31]

- The duct system has to be tested and the air leakage out of ducts must be kept to an acceptable maximum level. Testing is not required if all ducts are inside the building envelope (for example in heated basements), though the ducts still have to be sealed.

[19] Dan Ariely, *Predictably Irrational.* Revised and Expanded Edition (New York: Harper Collins, 2009).

[20] McKinsey and Company, *Unlocking Efficiency in the U.S. Economy* (July 2009), p.24. *http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/unlocking_energy_efficiency_in_the_us_economy.*

[21] Kenneth Gillingham, Matthew Harding and David Rapson, ''Split Incentives and Household Energy Consumption,'' *Energy Journal* 33:2 (2012): 37–62.

[22] Such agency problems are not unique to energy. A landlord does not know in advance of extending a lease to what extent a tenant will inflict damage, make an effort to take care of the property, or report urgent problems. The response is to raise rent and lower quality.

[23] McKinsey and Company, *Unlocking Efficiency.*

[24] Alastair McFarlane, ''The Impact of Home Energy Retrofit Loan Insurance: A Pilot Program,'' *Cityscape: A Journal of Policy Development and Research, Volume 13, Number 3.* U.S. Department of Housing and Urban Development Office of Policy Development Research (2011): 237–249.

[25] With the exception of a few programs serving specific markets and a Federal Housing Administration (FHA) pilot program, affordable financing for home energy improvements that reflects sound lending principles is limited. Unsecured consumer loans or credit card products for home improvements typically charge high interest rates. Home equity lines of credit require owners to be willing to borrow against the value of their homes during a period when home values are flat or declining in many markets. Utility ''on bill'' financing (in which a home energy retrofit loan is amortized through an incremental change on a utility bill) serves only a handful of markets on a small scale. Property Assessed Clean Energy (PACE) financing programs have encountered resistance because of their general requirement to have priority over existing liens on a property.

[26] William J. Fisk, ''How IEQ Affects Health, Productivity,'' *ASHRAE Journal* 57 (2002).

[27] Peter J. Clinch and John D. Healy, ''2001 Cost-benefit Analysis of Domestic Energy Efficiency,'' *Energy Policy* 29 (2001): 113–124.

[28] Martin Schweitzer and Bruce Tonn, *Nonenergy Benefits from the Weatherization Assistance Program: A Summary of Findings from the Recent Literature.* ORNL/CON–484 (Oak Ridge National Laboratory, April 2002).

[29] The IECC also covers commercial buildings. States may choose to adopt the IECC for residential buildings only, or may extend the code to commercial buildings (which include multifamily residential buildings of four or more stories).

[30] In the early 2000s, researchers at the U.S. Department of Energy's Pacific Northwest National Laboratory prepared a simplified map of U.S. climate zones. This PNNL-developed map divided the United States into eight temperature-oriented climate zones. *http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/4_3a_ba_innov_buildingscienceclimatemaps_011713.pdf.*

[31] Pacific Northwest National Laboratory for the U.S. Department of Energy, *Impacts of the 2009 IECC for Residential Buildings at State Level* (September 2009). *https://www.energycodes.gov/impacts-2009-iecc-residential-buildings-state-level-0.*

• 50 percent of the lighting (bulbs, tubes, etc.) in a building has to be energy efficient. Compact fluorescent light bulbs qualify; standard incandescent bulbs do not.
• Trade-off credit can no longer be obtained for high-efficiency heating, ventilation, and air conditioning (HVAC) equipment. For example, if a high-efficiency furnace is used, no reduction in wall insulation is allowed.
• Vertical fenestration U-factor requirements are reduced from 0.75 to 0.65 in Climate Zone 2, 0.65 to 0.5 in Climate Zone 3, and 0.4 to 0.35 in Climate Zone 4.
• The maximum allowable solar heat gain coefficient for glazed fenestration (windows) is reduced from 0.40 to 0.30 in Climate Zones 1, 2, and 3.
• R–20 walls in climate zones 5 and 6 (increased from R–19).
• Modest basement wall and floor insulation improvements.
• R–3 pipe insulation on hydronic distribution systems (increased from R–2).
• Limitation on opaque door exemption both size and style (side hinged).
• Improved air-sealing language.
• Controls for driveway/sidewalk snow melting systems.
• Pool covers are required for heated pools.

1. Current Adoption of the 2009 IECC

As of November 2014, 34 States and the District of Columbia have voluntarily adopted the 2009 IECC, its equivalent, or a more recent energy code (Table 2).[32] The remaining 16 States have not yet adopted the 2009 IECC.[33] (In certain cases, cities or counties within a State have a different code from the rest of the State. For example, the cities of Austin and Houston, Texas, have adopted energy codes that exceed the minimum Texas statewide code).[34] [35]

[32] Not shown in Table 2 are the U.S. Territories. The status of IECC code adoption in these jurisdictions is as follows: Guam, Puerto Rico, and the U.S. Virgin Islands have adopted the 2009 IECC for residential buildings. The Northern Mariana Islands have adopted the Tropical Model Energy Code, which is equivalent to the 2003 IECC. American Samoa does not have a building energy code. These territories are all covered by EISA, for any covered HUD and USDA program that operates in these localities.

[33] In addition, there are two territories that have not yet adopted the 2009 IECC: the Northern Mariana Islands and American Samoa. Accordingly, they will be covered by the affordability and availability determinations of this notice.

[34] Pacific Northwest National Laboratory, *Impacts of the 2009 IECC.*

[35] HUD and USDA do not currently maintain a list of local communities that may have adopted a different code than their State code. There are cities and counties that have adopted the 2009 or even the 2012 IECC in States that have not adopted the 2009 IECC or equivalent/better. For example, most major cities or counties in Arizona have adopted the 2009 IECC or better. And Maine has adopted the 2009 IECC but allows towns under 4,000 people to be exempt. The code requirements can also vary. Kentucky, for example, adopted the 2009 IECC for all homes except those that have a basement. The following Web site notes locations that have adopted the 2012 (but not the 2009) IECC: *http://energycodesocean.org/2012-iecc-and-igcc-local-adoptions.*

HUD and USDA are primarily interested in those States that have not yet adopted the 2009 IECC, since it is in these States that any affordability impacts will be felt relative to the cost of housing built to current State codes. As noted, in instances where a local entity has a more stringent standard, the affordability impacts within a State will differ.

An increasing number of States have in recent years adopted, or plan to adopt, the 2009 IECC, in part due to section 410 of the American Recovery and Reinvestment Act of 2009 (ARRA) (Pub L. 111–5, approved February 17, 2009), which established as a condition of receiving State energy grants the adoption of an energy code that meets or exceeds the 2009 IECC (and ASHRAE 90.1–2007), and achievement of 90 percent compliance by 2017. All 50 State governors subsequently submitted letters notifying DOE that the provisions of section 410 would be met.[36]

TABLE 2—CURRENT STATUS OF IECC ADOPTION BY STATE [37]

[As of November 2014]

| 2009 IECC or equivalent or higher (34 states and DC) | Prior codes (16 states) |
|---|---|
| Alabama | 2006 IECC or Equivalent (6 States) |
| California (Exceeds 2012 IECC). | Hawaii. |
| Connecticut | Minnesota. |
| Delaware (2012 IECC). | Oklahoma. |
| District of Columbia (2012 IECC). | Tennessee. |
| Florida | Utah. |
| Georgia | Wisconsin. |
| Idaho | |
| Illinois (2012 IECC) | 2003 IECC or Equivalent (2 States) |
| Indiana | Arkansas. |
| Iowa (2012 IECC) | Colorado. |
| Kentucky | |
| Louisiana | No Statewide Code (8 States) |
| Maryland (2012 IECC). | Alaska. |
| Massachusetts (2012 IECC). | Arizona. |
| Michigan | Kansas. |
| Montana | Maine. |
| Nebraska | Mississippi. |
| Nevada | Missouri. |
| New Hampshire | South Dakota. |
| New Jersey | Wyoming. |
| New Mexico | |
| New York | |
| North Carolina | |
| North Dakota | |
| Ohio | |
| Oregon | |
| Pennsylvania | |
| Rhode Island (2012 IECC) | |
| South Carolina | |
| Texas | |
| Vermont | |
| Virginia (2012 IECC) | |
| Washington (2012 IECC) | |
| West Virginia | |

[36] American Recovery and Reinvestment Act, Pub L. 111–5, division A, section 410(a)(2).

[37] ''Status of State Energy Code Adoption,'' U.S. Department of Energy, *http://www.energycodes.gov/adoption/states.*

2. 2009 IECC Affordability Analysis

In this notice, HUD and USDA address two aspects of housing affordability in assessing the impact that the revised code will have on housing affordability. As described further below, the primary affordability test is a life-cycle cost (LCC) savings test, the extent to which the additional, or incremental, investments required to comply with the revised code are cost effective; *i.e.,* the additional measures pay for themselves with energy cost savings over a typical 30-year mortgage period. A second test is whether the incremental cost of complying with the code as a share of total construction costs—regardless of the energy savings associated with the investment—is affordable to the borrower or renter of the home.

In determining the impact that the 2009 IECC will have on HUD and USDA assisted, guaranteed or insured new homes, the agencies have relied on a cost-benefit analysis of the 2009 IECC completed by PNNL for DOE.[38] This study provides an assessment of both the initial costs and the long-term estimated savings and cost-benefits associated with complying with the 2009 IECC. It offers evidence that the 2009 IECC may not negatively impact the affordability of housing covered by EISA. The financing assumptions used in the LCC analysis prepared by PNNL for DOE contains several variables that may not fully represent the target population of FHA-insured and USDA-guaranteed borrowers relative to borrowers utilizing conventional

[38] U.S. Department of Energy, *National Energy and Cost Savings for New Single- and Multifamily Homes: A Comparison of the 2006, 2009 and 2012 Editions of the IECC* (April 2012). *http://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf.*

financing. For example, it assumes a higher down payment (20 percent) than FHA single family borrowers usually have, and it does not incorporate the Mortgage Insurance Premiums associated with FHA-insured single family mortgages.[39] However, these variables do not change the overall affordability and/or availability findings in this Determination. While FHA average housing prices are lower than the national average, and the down payment requirements are lower for FHA than for conventional financing (3.5 percent vs. as high as 20 percent), these differences do not impact the overall cost-benefit findings, given the very small incremental costs involved. For example, the lower 3.5 percent down payment allowed by FHA will make the ''mortgage payback'' for the incremental cost of the higher energy code somewhat more attractive—in that the increase in the down payment to cover the added construction cost for the new energy code will be lower for FHA than conventional financing. The remaining amount will be amortized over 30 years for the FHA loan and will therefore actually improve cash flow to the consumer.

Note that there may be other benefits associated with energy efficient homes, in addition to positive cash flows. A March 2013 study by the University of North Carolina (UNC) Center for Community Capital and the Institute for Market Transformation (IMT) shows a correlation between greater energy efficiency and lower mortgage default risk for new homes. The UNC study surveyed 71,000 ENERGY STAR-rated homes and found that mortgage default risks are 32 percent lower for these more energy efficient homes than homes without ENERGY STAR ratings.[40]

3. Cost-Effectiveness Analysis and Results

The DOE study, *National Energy and Cost Savings for New Single and Multifamily Homes: A Comparison of the 2006, 2009, and 2012 Editions of the IECC,* published in April 2012 (2012 DOE study), shows positive results for the cost effectiveness of the 2009 IECC for new homes. This national study projects energy and cost savings, as well as LCC savings that assume that the initial costs are mortgaged over 30 years. The LCC method is a ''robust cost-benefit metric that sums the costs and benefits of a code change over a specified time frame. LCC is a well-known approach to assessing cost effectiveness.'' [41] In September 2011, DOE solicited input via **Federal Register** notice on their proposed cost-benefit methodology [42] and this input was incorporated into the final methodology posted on DOE's Web site in April 2012.[43] A further Technical Support Document was published in April 2013.[44]

In summary, DOE calculates energy use for new homes using EnergyPlus™ energy modeling software, Version 5.0. Two buildings are simulated: A 2,400 square foot single family home and an apartment building (a three-story multifamily prototype with six dwelling units per floor) with 1,200 square-foot per dwelling. DOE combines the results into a composite average dwelling unit based on 2010 Census building permit data for each State and eight climate zones. Single family home construction is more common than low-rise multifamily construction; the results are weighted accordingly to reflect this. Census data also is used to determine climate zone and national averages weighted for construction activity.

Four heating systems are considered: Natural gas furnaces, oil furnaces, electric heat pumps, and electric resistance furnaces. The market share of heating system types are obtained from the U.S. Department of Energy Residential Energy Consumption Survey (2009). Domestic water heating systems are assumed to use the same fuel as the space heating system.

For all 50 States, DOE estimates that the 2009 IECC saves 10.8 percent of energy costs for heating, cooling, water heating, and lighting over the 2006 IECC. LCC savings over a 30-year period are significant in all climate zones: Average consumer savings range from $1,944 in Climate Zone 3, to $9,147 in Climate Zone 8 when comparing the 2009 IECC to the 2006 IECC.[45]

The published cost and savings data for all 50 States provides weighted average costs and savings for both single family and low-rise multifamily buildings. For the 16 States impacted by this notice, DOE provided disaggregated data for single family homes and low-rise multifamily housing to HUD and USDA. These disaggregated data are shown in Table 3. Front-end construction costs range from $550 (Kansas) to $1,950 (Hawaii) for the 2009 IECC over the 2006 IECC. On the savings side, average LCC savings over a 30-year period of ownership range from $1,633 in Utah to $6,187 in Alaska when comparing the 2009 IECC to the 2006 IECC.[46]

In addition to LCC savings, the 2012 DOE study also provides simple paybacks and ''net positive cash flows'' for these investments. These are additional measures of cost effectiveness. Simple payback is a measure, expressed in years, of how long it will take for the owner to repay the initial investment with the estimated annual savings associated with that investment. Positive cash flow assumes that the measure will be financed with a 30-year mortgage, and reflects the break-even point—equivalent to the number of months or years after loan closing—at which the cost savings from the incremental energy investment exceeds the combined cost of: (1) The additional down payment requirement and (2) the additional monthly debt service resulting from the added investment.

For example, the average LCC for Minnesota's adoption of the 2009 IECC over its current standard (the 2006 IECC) is estimated at $2,174, with a simple payback of 7.2 years, and a net positive cash flow (mortgage payback) of 2 years. Mississippi homeowners will save $2,674 over 30 years under the 2009 IECC, with a simple payback of 3.8 years, and a positive cash flow of 1 year on the initial investment. As shown in Table 3, below, similar results were obtained for the remaining States analyzed, with simple paybacks ranging from a high of 8.3 years (Louisiana) to a low of 2.6 years (Alaska). The positive cash flow for all 18 impacted States is always 1 or 2 years, while the simple

[39] Pacific Northwest National Laboratory for the U.S. Department of Energy, *Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes* (April 2012), 3–11. *http://www.energycodes.gov/sites/default/files/documents/residential_methodology.pdf.*

[40] University of North Carolina, *Home Energy Efficiency and Mortgage Risks* (March 2013). *http://www.imt.org/uploads/resources/files/IMT_UNC_HomeEEMortgageRisksfinal.pdf.*

[41] U.S. Department of Energy, *National Energy and Cost Savings for new Single- and Multifamily Homes.*

[42] U.S. Department of Energy, *Building Energy Codes Cost Analysis* (**Federal Register** notice 76–FR–56413, September 13, 2011). *https://federalregister.gov/a/2011-23236.*

[43] Pacific Northwest National Laboratory for the Department of Energy *Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes.*

[44] Pacific Northwest National Laboratory for the Department of Energy (V. Mendon, R. Lucas, S. Goel), *Cost-Effectiveness Analysis of the 2009 and 2012 IECC Residential Provisions—Technical Support Document* (April 2013). *http://www.energycodes.gov/sites/default/files/documents/State_CostEffectiveness_TSD_Final.pdf.*

[45] U.S. Department of Energy, *National Energy and Cost Savings,* 3.

[46] Disaggregated single family and low-rise multifamily data provided by DOE to HUD and USDA. Data shows LCC savings disaggregated for single family homes only (subset of LCC savings for both single family and low-rise multifamily shown in an April 2012 DOE study. Data are posted at *www.hud.gov/resilience.*

payback averages 5.1 years, and is always less than 10 years (the longest payback is 8.3 years in Louisiana).

As noted, the costs and savings estimates for the 16 States presented here do not use the composite single family/low-rise multifamily data presented in the 2012 DOE study. Rather, DOE provided HUD and USDA with the unpublished underlying disaggregated data for single family housing, to more accurately reflect the housing type receiving FHA single family mortgage insurance or USDA loan guarantees. These disaggregated data for single family homes are available at *www.hud.gov/resilience*.

TABLE 3—LIFE-CYCLE COST (LCC) SAVINGS, NET POSITIVE CASH FLOW, AND SIMPLE PAYBACK FOR THE 2009 IECC[47]

| State* | Weighted average incremental cost ($ per unit) | Weighted average energy cost savings per year ($) | Life-cycle cost (LCC) savings ($ per unit) | Net positive cash flow (years) | Simple payback (years) |
|---|---|---|---|---|---|
| Alaska | 940 | 357 | 6,187 | 1 | 2.6 |
| Arizona | 1,364 | 242 | 3,411 | 1 | 5.6 |
| Arkansas | 1,090 | 173 | 2,320 | 2 | 6.3 |
| Colorado | 902 | 134 | 1,782 | 2 | 6.7 |
| Hawaii | 1,950 | 393 | 5,861 | 1 | 5.0 |
| Kansas | 550 | 176 | 2,934 | 1 | 3.1 |
| Maine | 910 | 305 | 5,261 | 1 | 3.0 |
| Minnesota | 1,275 | 176 | 2,174 | 2 | 7.2 |
| Mississippi | 643 | 168 | 2,674 | 1 | 3.8 |
| Missouri | 967 | 151 | 2,077 | 2 | 6.4 |
| Oklahoma | 1,293 | 202 | 2,680 | 2 | 6.4 |
| South Dakota | 869 | 196 | 3,070 | 1 | 4.4 |
| Tennessee | 643 | 143 | 2,158 | 1 | 4.5 |
| Utah | 925 | 128 | 1,633 | 2 | 7.2 |
| Wisconsin | 1,027 | 239 | 3,788 | 1 | 4.3 |
| Wyoming | 885 | 155 | 2,215 | 1 | 5.7 |
| Avg. of U.S. | 980 | 203 | 3,069 | 1.4 | 5.1 |
| Avg. of 16 States | 1,019 | 215 | 3,066 | 1.3 | 5.0 |

*Only the 16 States that have not yet adopted the 2009 IECC as of November 2014 are included in this table.

4. Limitations of Cost Benefit Analysis

HUD and USDA are aware of studies that discuss limitations associated with cost-savings models such as these developed by PNNL for DOE. For example, Alcott and Greenstone suggest that ''it is difficult to take at face value the quantitative conclusions of the engineering analyses'' associated with these models, as they suffer from several empirical problems.[48] They cite two problems in particular. First, engineering costs typically incorporate upfront capital costs only and omit opportunity costs or other unobserved factors. For example, one study found that nearly half of the investments that engineering assessments showed would have short payback periods were not adopted due to unaccounted physical costs, risks, or opportunity costs. Second, engineering estimates of energy savings can overstate true field returns, sometimes by a large amount, and some engineering simulation models have still not been fully calibrated to approximate actual returns. Another limitation may be the uncertainty as to the extent to which home rule municipalities have adopted higher energy codes in the absence of statewide adoption.

HUD and USDA nevertheless believe that the PNNL–DOE model used to estimate the savings shown in this notice represents the current state-of-the art for such modeling, is the product of significant public comment and input, and is now the standard for all of DOE's energy code simulations and models.

5. Distributional Impacts on Low-Income Consumers or Low Energy Users

For reasons discussed below, HUD and USDA project that affordability will not decrease for many low-income consumers of HUD- or USDA-funded units as a result of the determination in this notice. The purpose of this regulatory action is to lower gross housing costs. For rental housing, the gross housing cost equals contract rent plus utilities (unless the contract rent includes utilities, in which case gross housing costs equal the contract rent). For homeowners, housing cost equals mortgage payments, property taxes, insurance, utilities, and other maintenance expenditures. Reducing periodic utility payments is achieved through an upfront investment in energy efficiency. The cost of building energy efficient housing will be passed on to residents (either renters or homeowners) through the price of the unit (either rent or sales price). Households will gain so long as the net present value of energy savings to the consumer is greater than the cost to the builder of providing energy efficiency. The 2012 DOE study cited in this notice provides compelling evidence that this is the case for the energy standards in question; *i.e.,* that they would have a positive impact on affordability. In the 16 States impacted by the 2009 IECC, one of two codes addressed in the notice, the average incremental cost of going to the higher standard is just $1,019 per unit, with average annual savings of $215, for a 5.0 year simple payback, and a 1.3 year net positive cash flow.[49]

Households that would gain the most from this regulatory action would be those that consume energy the most intensively. However, it is possible, although unlikely, that a minority of households could experience a net increase in housing costs as a result of the regulatory action. Households that consume significantly less energy than the average household could experience

[47] Data provided by DOE to HUD and USDA showing disaggregated LCC savings for single family homes only (subset of LCC savings for both single family and low-rise multifamily published in April 2012 DOE study). Data are posted at www.hud.gov/resilience.

[48] Allcott and Greenstone, *Is There An Energy Efficiency Gap?*, 3–28.

[49] U.S. Department of Energy, *National Energy and Cost Savings.*

a net gain in housing costs if their energy expenditures do not justify paying the cost of providing energy efficient housing.

There are a few reasons why a significant number of these households are not expected to be inconvenienced. First, in the rare case that a household does not value the benefits of energy efficient housing, much of the preexisting housing stock is available at a lower standard. Those that would lose from the capitalization of energy savings in more efficient housing could choose alternative housing from the large stock of existing and less energy efficient housing.

Second, to the extent that the majority of users of HUD/USDA programs are likely to be lower-income households, these households may suffer more from the ''energy efficiency gap'' than higher income households. Low-income households pay a larger portion of their income on utilities and so are not likely to be adversely affected by requiring energy efficiency rules. According to data from the 2012 Consumer Expenditure Survey, utilities represent almost 10 percent of total expenditures for the lowest-income households, as opposed to just 5 percent for the highest income. A declining expenditure share indicates that utilities are a necessary good. One study of earlier data from the Consumer Expenditure Survey found a short-run income elasticity of demand of 0.23 (indicating that energy is a normal and necessary good).[50] Given these caveats, the expectation is that the overwhelming majority of low-income households will gain from this regulatory action.

TABLE 4—QUINTILES OF INCOME BEFORE TAXES AND SHARES OF AVERAGE ANNUAL EXPENDITURES

| Item | Lowest 20 percent | Second 20 percent | Third 20 percent | Fourth 20 percent | Highest 20 percent | All consumer units (%) |
|---|---|---|---|---|---|---|
| Total Housing* | 40 | 38 | 34 | 31 | 30 | 33 |
| Shelter | 25 | 22 | 20 | 18 | 18 | 19 |
| Utilities, fuels, and public services | 9.8 | 9.1 | 8.3 | 7.0 | 5.4 | 7.1 |
| Natural gas | 0.9 | 0.8 | 0.8 | 0.7 | 0.6 | 0.7 |
| Electricity | 4.3 | 3.7 | 3.2 | 2.5 | 1.9 | 2.7 |
| Fuel oil and other fuels | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.3 |
| Telephone services | 3.0 | 3.0 | 2.9 | 2.5 | 1.8 | 2.4 |
| Water and other public services | 1.3 | 1.3 | 1.2 | 1.0 | 0.8 | 1.0 |

*Housing expenditures are composed of shelter, utilities, household operations, housekeeping expenses, furniture, and appliances.
Source: Consumer Expenditure Survey, 2012, shares calculated by HUD.

Third, as noted above, the standards under consideration in this notice are not overly restrictive and are expected to yield a high benefit-cost return.

Notwithstanding the LCC savings and rapid simple paybacks on the initial investment described in this notice, low-income households face severe capital constraints; as a result there may be a question as to whether low-income families could be adversely impacted by the front-end incremental costs associated with adopting these codes. Based on the analysis provided in this Determination, the incremental costs are not sufficiently large to disadvantage low-income families in relation to the immediate benefits of that cost. Assuming a 3.5 percent down payment for an FHA-insured mortgage, low-income families will be required to pay an additional $35 at closing on the average incremental cost of approximately $1,000 required for the 2009 IECC. In addition, while HUD and USDA recognize the disproportionate burden that the incremental cost associated with higher code adoption has on low-income families, the benefits would also be shared disproportionately (this time positively), as a result of the much higher share of income low-income families spend on utilities relative to other households.

6. Conclusion

For the 34 States and the District of Columbia that have already adopted the 2009 IECC or a stricter code, there will be little or no impact on HUD and USDA's adoption of this standard for the programs covered under EISA, since all housing in these States is already required to meet this standard as a result of state legislation. For the remaining 16 States that have not yet adopted the 2009 IECC, HUD and USDA expect no negative affordability impacts from adoption of the code as a result of the low incremental first costs, the rapid simple payback times, and the LCC savings documented above.

For the States that have not yet adopted the 2009 IECC, the evidence shows that the 2009 IECC is cost effective in all climate zones and on a national basis. Cost effectiveness is based on LCC cost savings estimated by DOE for energy-savings equipment financed over a 30-year period. In addition, simple paybacks on these investments are typically less than 10 years, and positive cash flows are in the 1- to 2-year range. HUD and USDA therefore determine that the adoption of the 2009 IECC code for HUD and USDA assisted and insured new single family home construction does not negatively impact the affordability of those homes.

*C. ASHRAE 90.1–2007 Affordability Determination*

EISA requires HUD to consider the adoption of ASHRAE 90.1 for HUD-assisted multifamily programs (USDA multifamily programs are not covered). ASHRAE 90.1 is an energy code published by the ASHRAE for commercial buildings, which, by definition, include multifamily residential buildings of more than three stories. The standard provides minimum requirements for the energy efficient design of commercial buildings, including high-rise residential buildings (four or more stories). By design of the standard revision process, ASHRAE 90.1 sets requirements for the cost-effective use of energy in commercial buildings.

Beginning with ASHRAE 90.1–2001, the standard moved to a 3-year publication cycle. Substantial revisions to the standard have occurred since 1989. Significant requirements in ASHRAE 90.1–2007 over the previous (2004) code included stronger building insulation, simplified fenestration

[50] Raphael E. Branch, ''Short Run Income Elasticity of Demand for Residential Electricity Using Consumer Expenditure Survey Data,'' *Energy Journal* 14:4 (1993): 111–121.

requirements, demand control ventilation requirements for higher density occupancy, and separate simple and complex mechanical requirements.

ASHRAE 90.1–2007 included 44 changes, or addenda, to ASHRAE 90.1–2004.[51] In an analysis of the code, DOE preliminarily determined that 30 of the 44 would have a neutral impact on overall building efficiency; these included editorial changes, changes to reference standards, changes to alternative compliance paths, and other changes to the text of the standard that may improve the usability of the standard, but do not generally improve or degrade the energy efficiency of the building. Eleven changes were determined to have a positive impact on energy efficiency and two changes to have a negative impact.[52]

The 11 addendums with positive impacts on energy efficiency include: increased requirement for building vestibules, removal of data processing centers from exceptions to HVAC requirements, removal of hotel room exceptions to HVAC requirements, modification of demand-controlled ventilation requirements, modification of fan power limitations, modification of retail display lighting requirements, modification of cooling tower testing requirements, modification of commercial boiler requirements, modification of part load fan requirements, modification of opaque envelope requirements, and modification of fenestration envelope requirements.

1. Current Adoption of ASHRAE 90.1–2007

Thirty-eight States and the District of Columbia have adopted ASHRAE 90.1–2007, its equivalent, or a stronger commercial energy standard (Table 5).[53] In many cases, that standard is adopted by reference through adoption of the commercial buildings section of the 2009 IECC, while in other cases ASHRAE 90.1 is adopted separately. Twelve States either have previous ASHRAE codes in place or no statewide codes. ASHRAE 90.1–2007 was also the baseline energy standard established under ARRA for commercial buildings (including multifamily properties), to be adopted by all 50 States and for achieving a 90 percent compliance rate by 2017.[54]

TABLE 5—CURRENT STATUS OF ASHRAE CODE ADOPTION BY STATE[54]

[as of November 2014]

| ASHRAE 90.1–2007 or higher (38 states and District of Columbia) | Prior or no statewide codes (12 States) |
|---|---|
| Alabama | ASHRAE 90.1–2004 or Equivalent (4 States) |
| Arkansas | Hawaii. |
| California | Minnesota. |
| Connecticut | Oklahoma. |
| Delaware | Tennessee. |
| District of Columbia | |
| Florida | ASHRAE 90.1–2001 or Equivalent (1 State) |
| Georgia | Colorado. |
| Idaho | |
| Illinois | No Statewide Code (7 States) |
| Indiana | Alaska. |
| Iowa | Arizona. |
| Kentucky | Kansas. |
| Louisiana | Maine. |
| Maryland | Missouri. |
| Massachusetts | South Dakota. |
| Michigan | Wyoming. |
| Mississippi (Effective July 1, 2013) | |
| Montana | |
| Nebraska | |
| Nevada | |
| New Hampshire | |
| New Jersey | |
| New Mexico | |
| New York | |
| North Carolina | |
| North Dakota | |
| Ohio | |
| Oregon | |
| Pennsylvania | |
| Rhode Island | |
| South Carolina | |
| Texas | |
| Utah | |
| Vermont | |
| Virginia | |
| Washington | |
| West Virginia | |
| Wisconsin | |

2. ASHRAE 90.1–2007 AffordabilityAnalysis

Section 304(b) of Energy Conservation and Policy Act of 2005 (ECPA) requires the Secretary of DOE to determine whether a revision to the most recent ASHRAE standard for energy efficiency in commercial buildings will improve energy efficiency in those buildings.[55] In its determination of improved energy efficiency for commercial buildings, DOE developed both a ''qualitative'' analysis and a ''quantitative'' analysis to assess increased efficiency of ASHRAE Standard 90.1.[56] The qualitative analysis evaluates the changes from one version of Standard 90.1 to the next and assesses if each individual change saves energy overall. The quantitative analysis estimates the energy savings associated with the change, and is developed from whole building simulations of a standard set of buildings built to the standard over a range of U.S. climates.

3. Energy Savings Analysis

DOE's quantitative analysis for ASHRAE 90.1–2007 concluded that on average for mid-rise apartment buildings nationwide, electric energy use intensity would decrease by 2.1 percent and natural gas energy use intensity would decrease by 11.5 percent, for a total site decrease in energy use intensity of 4.3 percent under ASHRAE 90.1–2007.[57] The energy cost index for this building type was also calculated to decrease by 3 percent.

DOE also completed a state-by-state assessment of the impacts of ASHRAE 90.1–2007 on residential (mid-rise apartments), nonresidential, and semi-heated buildings subject to commercial building codes.[58] This analysis included energy and cost savings over current commercial building codes by both State and climate zone, by comparing each State's base code at the time of the study to ASHRAE standard 90.1–2007. Results of this savings analysis for the 12 States that have not yet adopted Standard 90.1–2007 can be found in Appendix 2. Results are shown for the percent reduction estimated by DOE in both overall site energy use and energy cost resulting from adoption of Standard 90.1–2007 over the base case.[59]

[51] Pacific Northwest National Laboratory for the U.S. Department of Energy, *Impacts of Standard 90.1–2007 for Commercial Buildings at State Level* (September 2009). *https://www.energycodes.gov/impacts-standard-901-2007-commercial-buildings-state-level.*

[52] The two negative impacts on energy efficiency are: (1) Expanded lighting power exceptions for use with the visually impaired, and (2) allowance for louvered overhangs.

[53] Not shown in Table 5 are the U.S. Territories. Guam, Puerto Rico, and the U.S. Virgin Islands have adopted ASHRAE 90.1–2007 for multifamily buildings. The Northern Mariana Islands have adopted the Tropical Model Energy Code, equivalent to ASHRAE 90.1–2001. American Samoa does not have a building energy code.

[54] ''Status of State Energy Code Adoption.''

[55] 42 U.S.C. 6833(b)(2)(A). *http://www.gpo.gov/fdsys/pkg/USCODE-2010-title42/pdf/USCODE-2010-title42-chap81-subchapII-sec6833.pdf.*

[56] U.S. Department of Energy, *Building Energy Standards Program: Determination Regarding Energy Efficiency Improvements in the Energy Standard for Buildings, Except Low-Rise Residential Buildings, ANSI/ASHRAE/IESNA Standard 90.1–2007* (**Federal Register** notice 76–FR–43287, July 20, 2011). *https://www.federalregister.gov/articles/2011/07/20/2011-18251/building-energy-standards-program-determination-regarding-energy-efficiency-improvements-in-the.*

[57] Pacific Northwest National Laboratory, *Impacts of Standard 90.1–2007 for Commercial Buildings at State Level.*

[58] *Ibid,* 9ff. Individual state reports also available at *https://www.energycodes.gov/impacts-standard-901-2007-commercial-buildings-state-level.*

[59] Energy cost savings were estimated using national average energy costs of $0.0939 per kWh for electricity and $1.2201 per therm for natural gas.

ASHRAE 90.1–2007 was projected to generate both energy and cost savings in all States in all climate zones over existing codes.

As shown in Appendix 2, the highest energy and cost savings projected by DOE for residential buildings, for example, was in Topeka, Kansas (Climate Zone 4A), where adoption of ASHRAE 90.1–2007 would provide 10.3 percent energy savings and 6.8 percent cost savings over the current energy code of the State of Kansas. The lowest energy and cost savings estimated by DOE for residential buildings were in Honolulu, Hawaii (Climate Zone 1A), at 0.8 percent in reduced electricity consumption and costs. (Differentials between energy savings and cost savings reflect price differences and varying shares of the total for different fuel sources.)

As shown in Table 6, estimated front-end construction costs for the 12 States that have not yet adopted ASHRAE Standard 90.1–2007 range from $309 (Oklahoma) to $489 (Alaska). On the savings side, the estimated cost savings per unit range from a low of $28.70/year/unit in Colorado, to a high of $80.13/year/unit in Kansas. Simple paybacks on the initial investment range from a low of 4.2 years (Kansas) to a high of 15.1 years (Hawaii).

TABLE 6—ESTIMATED COSTS AND BENEFITS PER DWELLING UNIT FROM ADOPTION OF ASHRAE 90.1–2007 [60]

| State | Incremental cost/unit ($) | Energy cost savings/unit ($/year)* | Simple payback/unit (years) |
|---|---|---|---|
| AK | 489 | 68.95 | 7.1 |
| AZ | 340 | 76.88 | 4.4 |
| CO | 354 | 28.70 | 12.4 |
| HI | 476 | 31.66 | 15.1 |
| KS | 338 | 80.13 | 4.2 |
| ME | 373 | 62.95 | 5.9 |
| MN | 413 | 31.15 | 13.3 |
| MO | 366 | 36.28 | 10.1 |
| OK | 309 | 31.79 | 9.7 |
| SD | 317 | 32.32 | 9.8 |
| TN | 318 | 30.40 | 10.5 |
| WY | 319 | 33.38 | 9.6 |

* Note on Energy Cost Savings: This table uses EIA fuel prices by state.

4. Cost Effectiveness Analysis and Results

As discussed above, while DOE has completed an analysis of projected *savings* that will result from ASHRAE 90.1–2007, an equivalent to the *cost* studies conducted by DOE of the 2009 IECC does not exist for ASHRAE 90.1–2007. However, in 2009 PNNL completed an analysis for DOE of the incremental costs and associated cost benefits of complying with the new standard for the State of New York, and this analysis was used by HUD and USDA as the basis for determining the overall affordability impacts of the new standard.[61] Note, however, a number of limitations exist in this analysis. For their cost analysis, PNNL compared ASHRAE 90.1–2007 to the prevailing code in New York at the time, the 2003 IECC (that references ASHRAE 90.1–2001) whereas the current minimum standard for HUD-assisted multifamily buildings is ASHRAE 90.1–2004. On the other hand, for their benefits analysis (*i.e.,* energy savings) PNNL compared savings that would result from the adoption of ASHRAE 90.1–2007 to prevailing state codes at the time. For the 12 states that have not yet adopted ASHRAE 90.1–2007, the prevailing state codes used by PNNL were equivalent to the current HUD standard, ASHRAE 90.1–2004, in three States. For the remaining States, the prevailing State codes used by PNNL were ASHRAE 90.1–2001 in two States, a State-specific code in one State (Minnesota) and ASHRAE 90.1–1999 in five States in the absence of a statewide code. Despite these limitations as to the baseline codes used by PNNL compared to current minimum HUD standards, the PNNL baseline analysis as used in this Determination is the best available analysis upon which to base a Determination on the costs and benefits associated with the adoption of ASHRAE 90.1–2007.

In its New York analysis, PNNL found that adoption of ASHRAE 90.1–2007 would be cost effective for all commercial building types, including multifamily buildings, in all climate zones in the State. The incremental first cost of adopting the revised standard for a hypothetical 31-unit mid-rise residential prototype building in New York was projected to be $21,083, $10,423, and $9,525 per building for each of three climate zones in New York (Climate Zones 4A, 5A, and 6A, respectively), for an average across all climate zones of $13,677 per building, or $441 per dwelling unit. (Costs in Climate Zone 4A were high because the sample location chosen for construction costs was New York City.)

Annual energy cost savings in New York were projected to be $2,050, $1,234, and $1,185 for Climate Zones 4A, 5A, and 6A per building, respectively, for an average building, yielding cost savings of $1,489 per building for all climate zones, and average savings of $45 per unit. The average simple payback period for this investment in New York is 9.8 years, with a range of approximately 8 to 10 years.

Using New York as a baseline, HUD and USDA used Total Development Cost (TDC) adjustment factors developed by HUD in order to determine an estimate of the incremental costs associated with ASHRAE 90.1–2007 in the 12 States that have not yet adopted this code. HUD develops annual TDC limits for multifamily units for major metropolitan areas in each State. The average TDC for each State was derived by averaging TDCs for walkup- and elevator-style building types in each of

[60] Sources: HUD estimate of incremental costs and cost savings associated with ASHRAE 90.1–2007; incremental costs/unit were estimated by adjusting the New York incremental cost of $441 per unit by Total Development Cost (TDC) adjustment factors in Appendix 2B. Energy cost savings/unit were derived using EIA's Average Retail Price of Electricity in October 2014 (*http://www.eia.gov/electricity/monthly/,* Table 5.6 for October 2014 data from the December 2014 Electric Power Monthly) and October 2014 Natural Gas Prices (*http://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PRS_DMcf_m.htm*).

[61] Pacific Northwest National Laboratory, *Cost Effectiveness and Impact Analysis of Adoption of ASHRAE 90.1–2007 for New York State.*

several metropolitan areas in that State. Note that TDC costs include soft costs, site improvement costs, and management costs, and are derived by a standard adjustment factor applied to hard construction costs, referred to as Housing Construction Costs (HCC). HCC limits are determined by averaging R.S. Means ''average'' and Marshall and Swift ''good'' cost indices. Section 6(b) of the United States Housing Act of 1937 and regulations at 24 CFR 941.306 require HUD to establish TDC limits by multiplying the HCC construction cost guideline by 1.6 for elevator type structures and by 1.75 for non-elevator type structures. For the State of New York, TDCs were averaged for all of the State's metro areas, and arrived at an average New York TDC of $221,607 per unit.[62] HUD and USDA then developed a TDC adjustment factor, which consists of the ratio of the average New York TDC of $221,607 for a two-bedroom unit against the average TDC for a similar unit in other States (Appendix 3). This TDC adjustment factor was then applied to the average cost per unit of $441 for complying with ASHRAE 90.1–2007 in New York, to arrive at an incremental cost per unit for the 12 States that have not yet adopted ASHRAE 90.1–2007 (Table 6).

In developing this adjustment factor, HUD considered whether to use IECC location cost indices developed by PNNL [63] or HCC costs (TDC minus soft and site improvement costs) rather than TDC costs. With regard to possible use of the IECC cost indices, since TDC cost indices were specifically developed for HUD-assisted properties, they are appropriately used here rather than the IECC cost indices. In addition, TDC (and HCC) costs apply to mid- and high-rise multifamily properties, while the IECC cost indices may or may not be transferable since they were developed for a different building type (single family or low-rise multifamily). With regard to using the HCC rather than the TDC, since the TDC is a standard function of the HCC, the adjustment factor will be the same for both the TDC (including soft costs) and the HCC (excluding soft costs).

In their April 15 Preliminary Determination HUD and USDA used national averages for electricity and fuel rates to estimate energy savings. In this Final Determination HUD and USDA use current State average electricity and natural gas rates (October 2014) published by the EIA, and apply those rates to an average of DOE's estimated energy savings across climate zones in each State to generate statewide energy savings estimates and to calculate simple payback periods for the ASHRAE 90.1–2007 investments.[64] For example, as shown in Table 6 and Appendix 2, the average annual cost savings per unit resulting from adopting ASHRAE 90.1–2007 in Arizona is estimated to be 5.5 percent of baseline utility costs of $1,393 per unit per year, or $76.88 in per unit annual energy cost savings. For an estimated average incremental cost of $340 per unit, the simple payback derived from these costs savings in Arizona is 4.4 years.[65] Note that the same baseline code used for the New York incremental cost analysis (the IECC 2003 or ASHRAE 90.1–2001) is assumed for these States; the actual baseline codes in these States may vary from the New York baseline (see Appendix 2).

5. Conclusion

USDA's multifamily programs are not covered by EISA, and therefore will not be impacted by ASHRAE 90.1. For impacted HUD programs in the 38 States and the District of Columbia that have adopted ASHRAE 90.1–2007 or a higher standard, there will, by default, be no adverse affordability impacts of adopting this standard. For the remaining 12 States that have not yet adopted ASHRAE 90.1–2007, HUD and USDA estimate the incremental cost of ASHRAE 90.1–2007 compliance at under $500 per dwelling unit, with the highest incremental cost at $490 per dwelling unit (Alaska), and the lowest cost at $310 per dwelling unit (Oklahoma). This estimate compares favorably to the cost of complying with the 2009 IECC for single family homes, which shows a somewhat higher average incremental cost of $1,019 per dwelling unit. With one exception (Hawaii), simple payback times using the most recent State average energy prices from EIA are 15 years or under.

The estimated payback for Hawaii slightly exceeds 15 years (15.1 years). While the Preliminary Determination had proposed to exempt Hawaii, as a result of this Final Determination, HUD will require Hawaii to comply with ASHRAE 90.1–2007 for HUD-assisted or FHA-insured multifamily properties specified in EISA. This is because the Hawaii Building Code Council has already adopted the 2009 IECC (roughly equivalent to ASHRAE 90.1–2007), as well as the fact that current (October 2014) EIA data show the average cost per kilowatt hour in that State as of February 2014 has risen to 36 cents per kilowatt hour, thereby lowering the payback period to 15.1 years. The payback of 15.1 years is consistent with the other four States shown in Table 6 with paybacks that are longer than 10 years.

Accordingly, given the low incremental cost of compliance with the new standard and the generally favorable simple payback times, HUD and USDA have determined that adoption of ASHRAE 90.1–2007 by the covered HUD programs will not negatively impact the affordability of multifamily buildings built to the revised standard in the 12 States that have not yet adopted this standard.

*D. Impact on Availability of Housing*

EISA requires that HUD and USDA assess both the affordability *and* availability of housing covered by the Act. This section of this notice addresses the impact that the EISA requirements would have on the ''availability'' of housing covered by the Act. ''Affordability'' is assumed to be a measure of whether a home built to the updated energy code is affordable to potential homebuyers or renters, while ''availability'' of housing is a measure associated with whether builders will make such housing available to consumers at the higher code level; *i.e.,* whether the higher cost per unit as a result of complying with the revised code will impact whether that unit is likely to be built or not. A key aspect of determining the impact on availability is the proportion of affected units in relation to total units funded by HUD and USDA or total for-sale units. These issues are discussed below.

1. Impact of Increases in Housing Prices and Hedonic Effects

Though both higher construction costs and hedonic increases in demand for more energy-efficient housing are expected to contribute to an increase in housing prices or contract rents, HUD and USDA do not project such higher prices to decrease the quantity of

[62] ''2011 Unit Total Development Cost (TDC) Limits,'' U.S. Department of Housing and Urban Development, *http://portal.hud.gov/huddoc/2011tdcreport.pdf.*

[63] Pacific Northwest National Laboratory, *Cost-Effectiveness Analysis of the 2009 and 2012 IECC Residential Provisions—Technical Support Document.*

[64] U.S. Energy Information Administration, Independent Statistics and Analysis, October 2014, at *http://www.eia.gov/electricity/monthly/,* Table 5.6 for October 2014 data from the December 2014 Electric Power Monthly, and *http://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PRS_DMcf_m.htm.*

[65] While the 12 States that have not yet adopted ASHRAE 90.1–2007 have a variety of different energy codes, for the purposes of these estimates, the current codes in those States are assumed to be roughly equivalent to those in New York (ASHRAE 90.1–2004) at the time of the DOE study. States that have pre-2004 codes in place are likely to yield greater savings.

affordable housing exchanged in the market. For reasons explained in the above discussion of market failures, improved standards are expected to reduce operating costs per square foot, which will motivate consumers to increase demand for more housing at each rent level, and for developers or builders to respond to such demand with increased supply. Therefore, regulatory action that leads to investments with positive net present value can be expected to maintain or increase the quantity of housing consumed.

Measuring the hedonic value (demand effect) of energy efficiency improvements is fraught with difficulty, and there is little consensus in the empirical literature concerning the degree of capitalization.[66] However, whatever their methodology, studies do suggest a significant and positive influence of energy efficiency on real estate values. One of the most complete studies on the hedonic effects of energy efficiency is on commercial buildings.[67] The results indicate that a commercial building with an ENERGY STAR certification will rent for about 3 percent more per square foot, increase effective rents by 7 percent, and sell for as much as 16 percent more. The authors skillfully disentangle the energy savings required to obtain a label from the unobserved effects of the label itself. Energy savings are important: a 10 percent decrease in energy consumption leads to an increase in value of about 1 percent, over and above the rent and value premium for a labeled building. According to the authors of the study, the ''intangible effects of the label itself'' seem to play a role in determining the value of green buildings.

2. Impact of 2009 IECC on Housing Availability

For the 34 States and the District of Columbia that have already adopted the 2009 IECC, there will be few negative effects on the availability of housing covered by EISA as a result of HUD and USDA establishing the 2009 IECC as a minimum standard. For those 16 States that have not yet adopted the revised codes, HUD and USDA have estimated the number of new construction units built under the affected programs in FY 2011. As detailed in Table 7, in FY 2011, a total of 15,425 units of HUD- and USDA-assisted new single family homes were built in these States, including 11,533 that were FHA-insured new homes, 850 that received USDA Section 502 direct loans, and 2,864 that received Section 502 guaranteed loans. Overall, this represented 4.6 percent of all new single family home sales in the United States, and 0.3 percent of all U.S. single family home sales in FY 2011.[68]

Assuming similar levels of production as in 2011, the share of units estimated as likely to be impacted by the IECC in the 16 States that have not yet adopted this code is likely to be similar; *i.e.,* approximately 4.6 percent of all new single family home sales in those 16 States, and 0.3 percent of all single family home sales in those 16 States.

TABLE 7—ESTIMATED NUMBER OF HUD- AND USDA-SUPPORTED UNITS POTENTIALLY IMPACTED BY ADOPTION OF 2009 IECC

| States not yet adopted 2009 IECC | HOME | FHA Single family | USDA Sec. 502 direct | USDA Sec. 502 guaranteed | Total |
|---|---|---|---|---|---|
| AK | 16 | 207 | 25 | 53 | 301 |
| AR | 10 | 672 | 127 | 412 | 1,221 |
| AZ | 14 | 866 | 28 | 115 | 1,023 |
| CO | 5 | 195 | 5 | 8 | 212 |
| HI | 10 | 109 | 35 | 165 | 319 |
| KS | 5 | 686 | 28 | 52 | 771 |
| ME | 0 | 175 | 50 | 95 | 320 |
| MN | 14 | 1,659 | 20 | 72 | 1,765 |
| MO | 13 | 1,456 | 48 | 284 | 1,801 |
| MS | 10 | 506 | 114 | 361 | 991 |
| OK | 15 | 1,074 | 100 | 275 | 1,464 |
| SD | 6 | 182 | 30 | 80 | 298 |
| TN | 28 | 1,609 | 57 | 349 | 2,043 |
| UT | 14 | 1,224 | 156 | 314 | 1,708 |
| WI | 19 | 743 | 15 | 66 | 843 |
| WY | 0 | 171 | 12 | 163 | 346 |
| Total | 178 | 11,533 | 850 | 2,864 | 15,425 |

Adoption of the 2009 IECC for affected HUD and USDA programs represents an estimated one-time incremental cost increase for new construction single family units of $15 million nationwide, and an estimated annual benefit of $3.0 million in energy cost savings, for an estimated simple payback of 5 years, as shown in Appendix 5.

3. Impact of ASHRAE 90.1–2007 on Housing Availability

ASHRAE 90.1–2007 has been adopted by 38 States and the District of Columbia; the availability of HUD-assisted housing will therefore not be negatively impacted in these States with the adoption of this standard by the two agencies. As shown in Table 8, in the 12 States that have not yet adopted this code, 5,256 new multifamily units were funded or insured through HUD programs in FY 2011. HUD and USDA project that of the units produced in the programs shown in Table 8, only units for which HOME Investment Partnership Program (HOME) funds are committed on or after January 24, 2015, and future units under FHA-insured

[66] Joseph Laquatra *et al,* ''Housing Market Capitalization of Energy Efficiency Revisited,'' (paper presented at the 2002 ACEEE Summer Study on Energy Efficiency in Buildings, 2002). *http://www.eceee.org/library/conference_proceedings/ACEEE_buildings/2002/Panel_8/p8_12/paper.*

[67] P. Eichholz, N. Kok and J. Quigley, ''Doing Well by Doing Good? Green Office Buildings,'' *American Economic Review* 100:5 (2010): 2492–2509.

[68] New single family home sales totaled 333,000 in 2011; all single family home sales totaled 5,236,000. ''FHA Single-Family Activity in the Home-Purchase Market Through November 2011,'' Federal Housing Administration, February 2012, *http://portal.hud.gov/hudportal/documents/huddoc?id=fhamkt1111.pdf.*

multifamily programs will be affected by this Notice of Final Determination. Using FY 2011 unit production as the baseline, HUD and USDA project this to be approximately 3,217 units annually. This total, as well as other totals in Table 8 below, reflect a discount factor for Arizona and Colorado to reflect current home rule adoption of higher codes in those States (70 percent and 90 percent, respectively).

Although covered under EISA, HUD's Public Housing Capital Fund, the Sections 202 and 811 Supportive Housing and the HOPE VI programs are not projected to be covered by the codes addressed in this notice, due to the fact that the Public Housing Capital Fund currently already requires a more recent building energy code for new construction (ASHRAE 90.1–2010); the Sections 202 and 811 Supportive Housing programs no longer fund new construction, and, in any case have established higher standards for new construction in recent notices of funding availability (NOFAs) (ENERGY STAR Certified New Homes and ENERGY STAR Certified Multifamily High Rise buildings); and HOPE VI is no longer active.

TABLE 8—ESTIMATED NUMBER OF HUD-ASSISTED UNITS POTENTIALLY IMPACTED BY ADOPTION OF ASHRAE 90.1–2007

| States not yet adopted ASHRAE 90.1–2007 | Public housing capital fund | Section 202/811 | HOME | HOPE VI | FHA-Multifamily | Total |
|---|---|---|---|---|---|---|
| AK | | 16 | 53 | | 0 | 69 |
| AZ* | | 0 | 175 | | 82 | 257 |
| CO* | | 1 | 15 | | 164 | 181 |
| HI | | 0 | 138 | | 0 | 138 |
| KS | | 24 | 35 | | 0 | 59 |
| ME | | 0 | 0 | | 0 | 0 |
| MN | | 204 | 80 | | 180 | 464 |
| MO | | 134 | 532 | | 144 | 810 |
| OK | | 10 | 215 | | 1,086 | 1,311 |
| SD | | 0 | 79 | | 60 | 139 |
| TN | | 33 | 91 | | 144 | 268 |
| WY | | 0 | 9 | | 72 | 81 |
| Unallocated | 1,155 | | | 323 | | |
| Total Units Produced in FY2011 | 1,155 | 422 | 1,422 | 323 | 1,932 | 5,256 |
| Total Units Projected to be Covered Under this Notice | | | 1,422 | | 1,932 | 3,217 |

*AZ and CO statewide numbers adjusted by 70 percent and 90 percent respectively, to reflect estimated adoption rate of the code by home rule municipalities.

Of the total, approximately 15 new multifamily projects with 1,932 units were endorsed by FHA in 2011 in these States. The 1,932 multifamily units endorsed by FHA in FY 2011 in States that have not yet adopted ASHRAE 90.1–2007 represented approximately 1 percent of a total of 180,367 units receiving FHA multifamily endorsements nationwide in FY 2011. The 15 projects with affected units represented a mortgage value of $187 million, or 1.6 percent of a total FHA-insured mortgage amount of $11.68 billion in FY 2011. Assuming a similar share of impacted units as in FY 2011 in future years, HUD and USDA assume that approximately 1 percent of FHA multifamily endorsements will be impacted by ASHRAE 90.1–2007, and less than 2 percent of total loan volume.

For both HOME and FHA-insured units shown in Table 8 (above) adoption of ASHRAE 90.1–2007 by the covered HUD programs represents an estimated one-time incremental cost increase for new multifamily residential units of $1 million nationwide, and an estimated annual benefit of $93,400 nationwide, resulting in an estimated simple payback time of less than 12 years, as shown in Appendix 5.

4. Conclusion

Given the extremely low incremental costs associated with adopting both the 2009 IECC and ASHRAE 90.1–2007 described above, and that the estimated number of new construction units built under the affected programs in FY 2011 in States that have not yet adopted the revised codes is a small percentage of the total number of new construction units in those programs nationwide, HUD and USDA have determined that adoption of the codes will not adversely impact the availability of the affected units.

*E. Implementation Schedule*

Section 109(d) of Cranston-Gonzalez automatically applies 2009 IECC and ASHRAE 90.1–2007 to all covered programs upon completion of this determination by HUD and USDA, and the previously published energy efficiency determinations by DOE. Accordingly, the adoption of the 2009 IECC or ASHRAE 90.1–2007 new construction standards described in this notice will take effect as follows:

(1) For FHA-insured multifamily programs, to those properties for which mortgage insurance pre-applications are received by HUD 90 days after the effective date of this Final Determination;

(2) For FHA-insured and USDA-guaranteed single family loan programs, to properties for which building permits are issued 180 days after the effective date of a Final Determination.

(3) For the HOME program, the standards set forth by this notice are applicable to projects upon publication of guidance by HUD related to property standard requirements at 24 CFR 92.251.

HUD and USDA will take such administrative actions as are necessary to ensure timely implementation of, and compliance with, the energy codes, to include mortgagee letters, notices, Builder's Certification form HUD–92541, and amendments to relevant handbooks. Conforming rulemaking will also be required for one HUD program to update previous regulatory standards: the Federal Housing Administration's (FHA) single family minimum property standards, for which the regulations are codified at 24 CFR 200.926d. In addition, USDA will update minimum energy requirements codified in USDA regulations at 7 CFR 1924.

*F. Alternative Compliance Paths*

HUD and USDA will accept certifications for a range of energy and green building standards that require energy efficiency levels that meet or exceed the 2009 IECC or ASHRAE 90.1–2007 as evidence of compliance with the standards addressed in this notice. These include the ICC–700 National Green Building Standard (Performance Path), Enterprise Green Communities, ENERGY STAR Certified New Homes, ENERGY STAR Multifamily High Rise, LEED–NC, LEED–H, or LEED–H Midrise, and several regional or local green building standards, such as Earthcraft House, Earthcraft Multifamily, Earth Advantage New Homes, or GreenPoint Rated New Homes. These standards all require energy efficiency levels that meet or exceed the 2009 IECC and ASHRAE 90.1–2007. In addition, several States have adopted energy efficiency codes or standards that exceed the efficiency levels of the 2009 IECC and ASHRAE 90.1–2007, including, for example, the Title 24 California Energy Code in California, and Focus on Energy in Wisconsin. HUD and USDA will accept certifications of compliance with these State codes or standards as well as other State codes or standards for which credible third-party documentation exists that these exceed the 2009 IECC and ASHRAE 90.1–2007.

*G. Cost Benefit Analysis*

1. Energy Costs and Savings

For both single family units complying with the 2009 IECC and multifamily units complying with ASHRAE 90.1–2007, the combined cost of implementing the updated codes is estimated at $16.1 million, with an estimated annual energy cost savings of $3.1 million, yielding a simple payback of 5.2 years. Annualized costs for this initial investment over 10 years are $1.8 million. Over 10 years, the present value of these cost savings, using a discount rate of 3 percent, is $27.0 million, for a net present value savings of $10.9 million over 10 years.

2. Social Benefits of Energy Standards

In addition to energy savings (described above) that will result from adoption of the energy standards addressed in this Determination, additional benefits are realized (in the form of lower social costs) from the resulting reductions in emissions of pollutants (such as particulate matter) that cause health and property damage and greenhouse gases (such as carbon dioxide) ($CO_2$) that cause global warming.

The ''social cost of carbon'' (SCC) is an estimate used by EPA and other Federal agencies to describe the economic damages associated with a small increase in $CO_2$ emissions, conventionally 1 metric ton, in a given year. This dollar figure also represents the value of damages avoided for a small emission reduction (*i.e.,* the benefit of a $CO_2$ reduction).[69] The SCC is meant to be a comprehensive estimate of climate change damages and includes, but is not limited to, changes in net agricultural productivity, human health, and property damages from increased flood risk.[70]

The marginal social cost of carbon is taken from the Interagency Working Group on Social Cost of Carbon (2013) and adjusted by the Gross Domestic Product deflator to the 2012 price level. To calculate the social cost of carbon in any given year, the Interagency Working Group on Social Cost of Carbon estimated the future damages to agriculture, human health, and other market and nonmarket sectors from an additional unit (metric ton) of carbon dioxide emitted in a particular year.[71] The interagency group provides estimates of the damage for every year of the analysis from a future value of $39 in 2013 to $96 in 2027 (a 25-year stream of benefits). A worst-case scenario was presented by the Interagency Working Group with costs starting at $110 in 2013 and rising to $196 by 2037.

The emission rate of metric tons of $CO_2$ for each British thermal unit (BTU) consumed varies by power or fuel source. The primary source for these data is emissions factors developed by the U.S. Energy Information Administration (EIA) and utilized by the EIA Voluntary Reporting of Greenhouse Gases Program, as well as other EIA sources.[72]

HUD uses a range for its emission factor of 0.107 to 0.137 metric tons of $CO_2$ per million BTUs. The lower figure of 0.107 metric tons of $CO_2$ per million BTUs was derived as follows: the most direct method of calculating the $CO_2$ emission rate for the residential sector is to divide total reported $CO_2$ emissions from energy consumption in the energy sector (1,162 million metric tons) by the corresponding energy consumption (10,833 trillion BTUs) including coal, natural gas, petroleum, and retail electricity. The average emission factor would be 107 kg $CO_2$ per million BTUs.

The higher figure of 0.137 metric tons of $CO_2$ per million BTUs was derived using a more detailed and comprehensive analysis for specific power or fuel sources: the emission rates for coal, natural gas, and petroleum[73] are those for the residential and commercial sectors as provided the EIA. Carbon dioxide emission coefficients from the generation of electricity were calculated from the 2012 United States Electricity Profile 2012.[74] HUD included both direct (sales) and indirect (energy losses) emissions using an emission factor of 169.8 metric tons of $CO_2$ per million BTUs for both.[75] HUD found that the weighted average $CO_2$ emission factor is 137.7 metric tons $CO_2$ per million BTUs by weighting the emission coefficient factors by the share of residential energy consumption from each power source except biomass.[76]

Given that both approaches are credible but arrive at a different estimate, HUD and USDA used a range for its emission factor of from 0.107 to 0.137 metric tons of $CO_2$ per million BTUs.

Based on studies by DOE, HUD estimates energy savings of 1.79 million BTUs per housing unit per year from the ASHRAE 90.1–2007 standard and a reduction of 7.3 million BTUs per housing unit per year from the 2009 IECC. The expected aggregate energy

[69] Definition of Social Cost of Carbon at *http://www.epa.gov/climatechange/EPAactivities/economics/scc.html.*

[70] *Ibid.* Given current modeling and data limitations, the SCC does not include all important damages. As noted by the Intergovernmental Panel on Climate Change Fourth Assessment Report, it is ''very likely that [SCC] underestimates'' the damages. The models used to develop SCC estimates, known as integrated assessment models, do not currently include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature because of a lack of precise information on the nature of damages and because the science incorporated into these models naturally lags behind the most recent research. Nonetheless, the SCC is a useful measure to assess the benefits of $CO_2$ reductions.

[71] Interagency Working Group on Social Cost of Carbon, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866,* United States Government, 2010. The interagency group chose a global measure of the social cost of carbon because emissions of most greenhouse gases contribute to damages around the world.

[72] The EIA Voluntary Reporting Greenhouse Gas Reporting Program was discontinued in 2011, but the emissions factors utilized by that program, posted at *http://www.eia.gov/oiaf/1605/emission_factors.html*, and utilized here by HUD and USDA, remain valid.

[73] Petroleum consumption includes distillate fuel oil, kerosene, and liquefied petroleum gases. The emission coefficient is the one for ''Home Heating and Diesel Fuel.''

[74] U.S. Energy Information Administration, ''State Electricity Profiles,'' 2012. *http://www.eia.gov/electricity/state/unitedstates/.*

[75] This estimate is very close to that of *www.carbonfund.org,* which estimates a $CO_2$ emission factor of 173 using EPA eGRID data.

[76] Energy Information Administration, *Annual Energy Review,* 2013, Table 2.1b.

savings (technical efficiency) is approximately 118,300 million BTUs annually.[77]

Whatever the predicted energy savings (technical efficiencies) of an energy efficiency upgrade, the actual energy savings by a household are likely to be smaller due to a behavioral response known as the ''rebound effect.'' A rebound effect has been observed when an energy efficient investment effectively lowers the price of the outputs of energy (heat, cooling, and lighting), which may lead to both income and substitution effects by raising the demand for energy. Increasing energy efficiency reduces the expense of physical comfort and may thus increase the demand for comfort. To account for the wide range of estimates for the scale of the rebound effect and the uncertainty surrounding these estimates, HUD assumes a range of between 10 and 30 percent.[78] The size of the rebound effect does not reduce the benefit to a consumer of energy efficiency but indicates how those benefits are allocated between reduced energy costs and increased comfort. Taking account of the rebound effect, the technical efficiencies provided by the energy standards discussed in this notice produce an estimated energy savings between 82,810 million and 106,470 million BTUs.

Table 9 below summarizes the aggregate social benefits realized from reducing carbon emissions for different marginal social cost scenarios (average and worst case), lifecycles, and scenario assumptions. The highest benefits will be for a high marginal social cost of carbon, long life cycle, low rebound factor, and high emissions factor.

Marginal Social Costs as used here are a measure of the non-energy economic costs associated with carbon emissions. Marginal Social Costs are defined by the Business Dictionary as the ''incremental cost of an activity as viewed by the society and expressed as the sum of marginal external cost and marginal private cost.'' As discussed in more detail above, the Marginal Social Cost of carbon is the social cost of each additional ton of $CO_2$ resulting from energy consumption. As defined by the Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis, ''(t)he SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change.[79]

TABLE 9—ANNUALIZED VALUE OF REDUCTION IN $CO_2$ EMISSIONS

[$2012 million]

| Life cycle | Emission factor of 0.107 | | | | Emission factor of 0.137 | | | |
|---|---|---|---|---|---|---|---|---|
| | Rebound 30% | | Rebound 10% | | Rebound of 30% | | Rebound of 10% | |
| | Median MSC * | High MSC | Median MSC * | High MSC | Median MSC * | High MSC | Median MSC * | High MSC |
| 10 years | 0.39 | 1.14 | 0.49 | 1.45 | 0.49 | 1.45 | 0.64 | 1.86 |
| 15 years | 0.41 | 1.20 | 0.52 | 1.55 | 0.52 | 1.54 | 0.67 | 2.01 |
| 20 years | 0.43 | 1.26 | 0.55 | 1.62 | 0.55 | 1.62 | 0.70 | 2.11 |
| 25 years | 0.44 | 1.33 | 0.57 | 1.70 | 0.57 | 1.70 | 0.72 | 2.18 |

* MSC = Marginal Social Cost.

The annualized value of the social benefits of reducing carbon emissions, discounted at 3 percent, ranges from $390,000 (median MSC over 10 years) to $2.18 million (high MSC over 25 years).[80] The corresponding present values range from $3.4 to $16.3 million over 10 years and from $7.9 million to $39 million over 25 years.

## III. Findings and Certifications

*Environmental Review*

A Finding of No Significant Impact with respect to the environment was made with respect to the preliminary affordability determination in accordance with HUD regulations at 24 CFR part 50, which implement section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)), and remains applicable to this final affordability determination. That finding is posted at *www.regulations.gov* and *www.hud.gov/resilience* and is available for public inspection between the hours of 8 a.m. and 5 p.m., weekdays, in the Regulations Division, Office of General Counsel, Department of Housing and Urban Development, 451 7th Street SW., Room 10276, Washington, DC 20410–0500. Due to security measures at the HUD Headquarters building, please schedule an appointment to review the finding by calling the Regulations Division at 202–402–3055 (this is not a toll-free number).

Dated: April 23, 2015.

**Julián Castro,**

*Secretary, U.S. Department of Housing and Urban Development.*

Dated: April 23, 2015.

**Thomas J. Vilsack,**

*Secretary, U.S. Department of Agriculture.*

## Appendix 1. Covered HUD and USDA Programs

| | Legal authority | Regulations |
|---|---|---|
| HUD Programs: | | |
| Public Housing Capital Fund | Section 9(d) and section 30 of the U.S. Housing Act of 1937 (42 U.S.C. 1437g(d) and 1437z–2). | 24 CFR parts 905, 941, and 968. |

[77] Aggregated energy savings are derived as follows: 1.79 MMBTU × 3,217 multifamily units + 7.3 MMBTU × 15,425 single family units.

[78] Sorrel, Steven, *The Rebound Effect: An Assessment of the Evidence for Economy-Wide Energy Savings from Improved Energy Efficiency,* UK Energy Research Centre, October 2007.

[79] Under Executive Order 12866, Interagency Working Group on Social Cost of Carbon.

[80] Because the Interagency Group used a 3 percent rate to calculate the present value of damage, HUD uses the same rate in order to be consistent with the federally approved estimates of damage.

| | Legal authority | Regulations |
|---|---|---|
| HOPE VI Revitalization of Severely Distressed Public Housing. | Section 24 of the U.S. Housing Act of 1937 (42 U.S.C. 1437v) | 24 CFR part 971. |
| Choice Neighborhoods Implementation Grants. | Section 24 of the U.S. Housing Act of 1937 (42 U.S.C. 1437v) | 24 CFR part 971. |
| Choice Neighborhoods Planning Grants. | Section 24 of the U.S. Housing Act of 1937 (42 U.S.C. 1437v) | 24 CFR part 971. |
| Section 202 Supportive Housing For the Elderly. | Section 202 of the Housing Act of 1959 (12 U.S.C. 1701q), as amended | 24 CFR part 891. |
| Section 811 Supportive Housing for Persons with Disabilities. | Section 811 of the Housing Act of 1959 (12 U.S.C. 1701q), as amended | 24 CFR part 891. |
| HOME Investment Partnerships (HOME). | Title II of the Cranston-Gonzalez National Affordable Housing Act (42 U.S.C. 12742 *et seq.*). | 24 CFR part 92. |
| FHA Single Family Mortgage Insurance Programs. | National Housing Act Sections 203(b) (12 U.S.C. 1709(b)), Section 251 (12 U.S.C. 1715z–16), Section 247 (12 U.S.C. 1715z–12), Section 203(h) (12 U.S.C. 1709(h)), Housing and Economic Recovery Act of 2008 (Pub. L. 110–289), Section 248 of the National Housing Act (12 U.S.C. 1715z–13). | 24 CFR parts 203, Subpart A; 203.18(i); 203.43i; 203; 203.49; 203.43h. |
| FHA Multifamily Mortgage Insurance Programs. | Sections 213, 220, 221, 231, and 232 of the National Housing Act (12 U.S.C.1715e, 12 U.S.C.1715v, 12 U.S.C.1715k, 12 U.S.C.17151, 12 U.S.C.1715w). | 24 CFR parts 200, subpart A, 213; 231; 220;221, subparts C and D; and 232. |
| USDA Programs: | | |
| Section 502 Guaranteed Housing Loans. | Section 502 of Housing Act (42 U.S.C. 1472) | 7 CFR part 1980. |
| Section 502 Rural Housing Direct Loans. | Section 502 of Housing Act (42 U.S.C. 1472) | 7 CFR part 3550. |
| Section 502 Mutual Self Help Loan program, homeowner participants. | Section 502 of Housing Act (42 U.S.C. 1472) | 7 CFR part 3550. |

**Appendix 2. Estimated Energy and Cost Savings from Adoption of ASHRAE 90.1–2007** [81]

| State | Location | Climate zone | Energy savings (%) | Baseline energy costs ($/unit/year) | Energy cost savings ($/unit/year) | Energy cost savings (%) |
|---|---|---|---|---|---|---|
| AK | Anchorage | 7 | 6.5 | 2,202 | 70.40 | 3.3 |
| | Fairbanks | 8 | 4.7 | 2,428 | 67.50 | 2.8 |
| | *Average* | | *5.6* | *2,315* | *68.95* | *3.0* |
| AZ | Phoenix | 2B | 6.6 | 1,385 | 82.55 | 6.0 |
| | Sierra Vista | 3B | 6.1 | 1,342 | 76.29 | 5.7 |
| | Prescott | 4B | 8.7 | 1,407 | 92.76 | 6.6 |
| | Flagstaff | 5B | 5.7 | 1,437 | 55.92 | 3.9 |
| | *Average* | | *6.8* | *1,393* | *76.88* | *5.5* |
| CO | La Junta | 4B | 7.4 | 1,300 | 45.28 | 3.5 |
| | Boulder | 5B | 7.5 | 1,304 | 46.13 | 3.5 |
| | Eagle | 6B | 1.7 | 1,295 | 8.18 | 0.6 |
| | Alamosa | 7B | 2.7 | 1,306 | 15.20 | 1.2 |
| | *Average* | | *4.8* | *1,301* | *28.70* | *2.2* |
| HI | Honolulu | 1A | 0.8 | 3,930 | 31.66 | 0.8 |
| | *Average* | | *0.8* | *3,930* | *31.66* | *0.8* |
| KS | Topeka | 4A | 10.3 | 1,615 | 109.83 | 6.8 |
| | Goodland | 5A | 5.2 | 1,594 | 50.43 | 3.2 |
| | *Average* | | *7.8* | *1,605* | *80.13* | *5.0* |
| ME | Portland | 6A | 4.5 | 1,907 | 47.78 | 2.5 |
| | Caribou | 7 | 5.4 | 2,104 | 78.12 | 3.7 |
| | *Average* | | *5.0* | *2,005* | *62.95* | *3.1* |
| MN | St. Paul | 6A | 2.2 | 1,462 | 12.04 | 0.8 |
| | Duluth | 7 | 5.2 | 1,546 | 50.27 | 3.3 |
| | *Average* | | *3.7* | *1,504* | *31.15* | *2.1* |
| MO | St. Louis | 4A | 3.5 | 1,370 | 36.05 | 2.6 |
| | St. Joseph | 5A | 3.6 | 1,383 | 36.51 | 2.6 |
| | *Average* | | *3.6* | *1,377* | *36.28* | *2.6* |
| OK | Oklahoma City | 3A | 1.5 | 1,325 | 21.27 | 1.6 |

[81] Source: Pacific Northwest National Laboratory (PNNL), Department of Energy, *Impacts of Standard 90.1–2007 for Commercial Buildings at State Level,* September 2009. States for which figures are provided are States that have not yet adopted ASHRAE 90.1–2007. Available at *http://www.energycod5.6es.gov/impacts-standard-901-2007-commercial-buildings-state-level.* This table updates the energy cost savings presented in this report, by utilizing current individual State fuel and electricity prices (as of October 2014), whereas the PNNL report utilizes national average prices.

| State | Location | Climate zone | Energy savings (%) | Baseline energy costs ($/unit/year) | Energy cost savings ($/unit/year) | Energy cost savings (%) |
|---|---|---|---|---|---|---|
| | Guymon | 4A | 3.6 | 1,374 | 42.32 | 3.1 |
| | *Average* | | *2.6* | *1,349* | *31.79* | *2.4* |
| SD | Yankton | 5A | 4.1 | 1,409 | 32.49 | 2.3 |
| | Pierre | 6A | 4.2 | 1,411 | 32.14 | 2.3 |
| | *Average* | | *4.2* | *1,410* | *32.32* | *2.3* |
| TN | Memphis | 3A | 3.4 | 1,174 | 35.68 | 3.0 |
| | Nashville | 4A | 3.2 | 1,221 | 25.12 | 2.1 |
| | *Average* | | *3.3* | *1,198* | *30.40* | *2.5* |
| WY | Torrington | 5B | 4.2 | 1,316 | 31.21 | 2.4 |
| | Cheyenne | 6B | 4.5 | 1,347 | 33.72 | 2.5 |
| | Rock Springs | 7B | 4.7 | 1,372 | 35.20 | 2.6 |
| | *Average* | | *4.5* | *1,345* | *33.38* | *2.5* |

**Appendix 3. TDC Adjustment Factors For States That Have Not Adopted ASHRAE 90.1–2007**

| State | TDC Limit ($) | TDC adjustment factor* |
|---|---|---|
| AK | 245,882 | 1.11 |
| AZ | 171,058 | 0.77 |
| CO | 178,241 | 0.80 |
| HI | 239,412 | 1.08 |
| KS | 170,213 | 0.77 |
| ME | 187,802 | 0.85 |
| MN | 207,475 | 0.94 |
| MO | 184,221 | 0.83 |
| OK | 155,578 | 0.70 |
| SD | 159,576 | 0.72 |
| TN | 160,222 | 0.72 |
| WY | 160,431 | 0.72 |
| Avg. | 185,009 | |

*Uses New York TDC as baseline; assumes average 2–BR multifamily unit.

**Appendix 4. Estimated Total Costs and Energy Cost Savings From Adoption of 2009 IECC**

| State | Total incremental cost per state ($) | Total energy cost savings per state ($ per year) |
|---|---|---|
| AK | 282,940 | 107,457 |
| AR | 1,330,890 | 211,233 |
| AZ* | 1,394,963 | 247,493 |
| CO* | 190,953 | 28,368 |
| HI | 622,050 | 125,367 |
| KS | 424,050 | 135,696 |
| ME | 291,200 | 97,600 |
| MN | 1,840,895 | 432,425 |
| MO | 1,158.043 | 302,568 |
| MS | 1,263,525 | 174,416 |
| OK | 1,892,952 | 295,728 |
| SD | 258,962 | 58,408 |
| TN | 1,313,649 | 292,149 |
| UT | 1,579,900 | 218,624 |
| WI | 865,761 | 201,477 |
| WY | 306,210 | 53,630 |
| Total | 15,016,943 | 2,982,639 |

*AZ and CO statewide estimates were adjusted by 70 percent and 90 percent, respectively, to reflect estimated adoption rate of code by home rule municipalities.

**Appendix 5. Estimated Total Costs and Energy Cost Savings From Adoption of ASHRAE 90.1–2007**

| State | Total incremental cost/state ($) | Total energy cost savings/state ($/year) |
|---|---|---|
| AK | 25,945 | 3,069 |
| AZ* | 87,658 | 13,956 |
| CO* | 63,873 | 5,762 |
| KS | 11,860 | 2,074 |
| ME[82] | 0 | 0 |
| MN | 107,396 | 8,749 |
| MO | 247,930 | 17,948 |
| OK | 402,972 | 28,271 |
| SD | 44,159 | 4,909 |
| TN | 74,960 | 6,009 |
| WY | 25,871 | 2,669 |
| Total | 1,092,624 | 93,416 |

*AZ and CO statewide estimates adjusted by 70 percent and 90 percent, respectively, to reflect estimated adoption rate of code by home rule municipalities.

[FR Doc. 2015–10380 Filed 5–5–15; 8:45 am]

**BILLING CODE 4210–67–P**

## NATIONAL CREDIT UNION ADMINISTRATION

### 12 CFR Part 701

**RIN 3133–AE31**

### Chartering and Field of Membership Manual

**AGENCY:** National Credit Union Administration (NCUA).

**ACTION:** Final rule.

**SUMMARY:** The NCUA Board (Board) is issuing a final regulation to amend the associational common bond provisions of NCUA's chartering and field of membership requirements. Specifically, the amendments establish a threshold requirement which provides that, in order for an association to qualify to be part of a federal credit union's (FCU) field of membership (FOM), the association must not have been formed primarily for the purpose of expanding credit union membership. The amendments also expand the criteria in NCUA's current totality of the circumstances test, which is a regulatory tool used to determine if an association, after satisfying the above-referenced threshold requirement, also satisfies the associational common bond requirements necessary to qualify for inclusion in an FCU's FOM. The amendments will better ensure that FCUs comply with established membership requirements. Additionally, NCUA is granting automatic membership qualification under the associational common bond requirements to certain categories of associations that NCUA has routinely approved for FCU membership in the past. For ease of reading, NCUA uses the terms ''association'' and ''group'' interchangeably in this rulemaking.

**DATES:** This rule is effective July 6, 2015.

**FOR FURTHER INFORMATION CONTACT:** Robert Leonard, Director, Division of Consumer Access, and Rita Woods, Director, Division of Consumer Access—South, Office of Consumer Protection, at 1775 Duke Street, Alexandria, VA 22314, or by telephone (703) 518–1140; or Frank Kressman, Associate General Counsel, Office of General Counsel, at the above address, or by telephone (703) 518–6540.

**SUPPLEMENTARY INFORMATION:**



[82] No units were produced under affected programs in Maine in FY 2011, the baseline year used for this analysis; therefore, no estimated costs or savings are shown for this State.