

# Arkansas GapAnalysis

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Prepared by the Building Codes Assistance Project and the Arkansas Energy Office for the United States Department of Energy



## Building Codes Assistance Project (BCAP)

BCAP is a non-profit advocacy organization established in 1994 as a joint initiative of the Alliance to Save Energy, the American Council for an Energy-Efficient Economy, and the Natural Resources Defense Council. BCAP focuses on providing state and local governments in the U.S., as well as stakeholder organizations, with support on code adoption and implementation through direct assistance, research, data analysis, and coordination with other activities and allies. With over sixteen years of experience supporting numerous state energy offices and city building departments, along with tracking code activities across the country, BCAP is well-positioned to assist in local and statewide activity to advance codes. As a trusted resource, BCAP is able to identify and navigate past policy and programmatic pitfalls to help states and jurisdictions put the best possible strategy in place to improve efficiency in both new and existing buildings. Our work pulls together local efforts, identifies national-scale issues, and provides a broad perspective, unbiased by corporate/material interests. BCAP also hosts OCEAN—an online international best practice network for energy codes—and is increasingly working abroad to gather and share best practices that provide value across organizations.

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## Acronyms and Abbreviations

AEO – Arkansas Energy Office  
AEP – American Electric Power  
AHBA – Arkansas Home Builders Association  
AIA – American Institute of Architects  
ARRA/Recovery Act – American Recovery and Reinvestment Act of 2009  
ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers  
BCAP – Building Codes Assistance Project  
BECF – Building Energy Codes Program  
BPI – Building Performance Institute  
CEUs – Continuing education units  
COAR – Code Officials of Arkansas  
DOE – Department of Energy  
ECAP – Energy Code Ambassadors Program  
EDC – Arkansas Economic Development Commission  
EECBG – Energy Efficiency and Conservation Block Grants  
EIA – Energy Information Administration  
EPA – U.S. Environmental Protection Agency  
GCGW – Governor’s Commission on Global Warming  
HERS – Home Energy Rating System  
IBC – International Building Code  
ICC – International Code Council  
IECC – International Energy Conservation Code  
IFGC – International Fuel Gas Code  
IPC – International Plumbing Code  
IRC – International Residential Code  
LEED – Leadership in Energy and Environmental Design  
MEC – Model Energy Code  
NAHB – National Association of Home Builders  
OCEAN – Online Code Environment and Advocacy Network  
PNNL – Pacific Northwest National Laboratory  
PSC – Public Service Commission  
RECA – Responsible Energy Codes Alliance  
RESNET – Residential Energy Services Network  
SEEA – Southeast Energy Efficiency Alliance  
SEO – State Energy Office  
SEP – State Energy Program  
SWEPCO –Southwestern Electric Power Company  
USGBC – United States Green Building Council

## Executive Summary

The purpose of the Arkansas Gap Analysis Report is twofold: 1) document and analyze the strengths and weaknesses of the state's existing energy code adoption and implementation infrastructure and policies; and 2) recommend potential actions state agencies and local jurisdictions can take to achieve 100 percent compliance with the national model energy codes. The report is organized into four sections: **Introduction, Adoption, Implementation, and Conclusion**. The Adoption and Implementation sections both conclude by listing some of the state's current best practices and making multiple recommendations for actions that would improve energy code compliance.

The **Introduction** section provides an overview of relevant state demographics and the impact of the construction boom and subsequent decline. It also covers Arkansas's energy portfolio, emphasizing the state's energy-intensive economy and high per capita energy use, along with the potential savings available through model energy code implementation. For instance, full compliance with the 2009 International Energy Conservation Code (IECC) would yield up to 15 percent savings in residential energy use and up to four percent savings in commercial energy use while saving millions of dollars on utility bills for homeowners and businesses.

The **Adoption** section takes a close look at the federal, state, and local policies regarding building energy codes in the state. This section starting on page 14 covers the legislative and regulatory update process for the Arkansas Energy Code, the statewide minimum energy code currently based on the 2003 IECC and ASHRAE Standard 90.1-2001. After describing the roles of the Arkansas Energy Office (AEO) and the Arkansas General Assembly in policy development, the section highlights the state's energy efficiency standard for state-owned buildings as well as local achievements through voluntary green building and above-code programs. While not necessarily widespread, these programs set an example for other communities to improve their energy-efficient construction practices and help the enforcement, design, and construction industries become accustomed to the requirements of the national model energy codes as they call for greater levels of energy savings.

The Adoption section makes 12 major recommendations, in addition to multiple related recommendations. The core recommendations are listed below.

To improve energy code adoption practices in Arkansas, the state should:

- Vest the sole authority to update and amend the statewide minimum energy code with the Arkansas Energy Office without requiring subsequent legislative approval. This new process should continue to solicit input from all stakeholders;
- Update Arkansas's minimum energy code to reference the 2009 IECC and ASHRAE Standard 90.1-2007;
- Establish a regular and automatic review and update process for its minimum energy code that follows the three-year model energy code development cycles; and
- Continue to limit local jurisdictions from adopting weakening amendments and encourage those that choose to adopt codes stronger than the statewide code.

As the state agencies in charge of state energy policy, AEO should:

- Take on a stronger role providing increased support to local jurisdictions to adopt the model energy codes, as well as green and above-code programs.

Energy codes reduce greenhouse gas emissions and pollution and increase economic and environmental sustainability. Therefore, Arkansas and applicable jurisdictions should also:

- Implement the recommendations regarding energy codes and building energy efficiency from the Governor's Commission on Global Warming by updating state and local climate change action plans to include the 2009 IECC and a regular review and update process.

While enforcing the statewide energy code is nominally mandatory within Arkansas's jurisdictions, compliance levels and local commitment to the intent of the code do not meet the current goals. It is critical that the state advance energy code implementation to capitalize on the energy and financial savings available through compliance with the energy codes. Beginning on page 28 of the report, the **Implementation** section covers the roles of state and local agencies, the design and construction industries, utilities, and other stakeholders in:

- Promoting the adopted energy codes;
- Administering enforcement and compliance infrastructures that are efficient, feasible, and cost-effective; and
- Providing code officials and building professionals the resources to carry out their responsibilities.

This section begins with the state's outreach efforts to local jurisdictions, consumers, and building professionals, particularly through traveling presentations on the energy code by AEO staff and the compliance resources available on the AEO website. While the promotion efforts of local inspection departments range from modest to non-existent, the potential for collaboration through existing partnerships with the state homebuilders association, consumer outreach initiatives by select utilities, and local technical college training programs present some opportunities to raise awareness of building science and energy code enforcement issues.

Code enforcement and building professionals in Arkansas vary in their knowledge of, and attitudes towards, energy codes. As is the case in many code enforcement departments across the country, health/life-safety codes are a much higher priority than energy codes during building inspections (which often do not occur in many areas, even in the larger urban jurisdictions). Some local code enforcement officials appear aware of the general requirements of the energy code when performing inspections, but in most jurisdictions there does not appear to be any formal checklist process or certification of energy code compliance, or general emphasis on strict, consistent enforcement.

While there is generally better energy code implementation in larger cities, code community stakeholders have highlighted the need for better energy code infrastructure and practices in most locations across the state. Enforcement and building professionals alike have struggled in the wake of the recession and the collapse of the housing market as inspection department revenues have fallen and

thousands of homebuilders in the state have left the industry. Major openings exist to develop third party enforcement infrastructure through local technical colleges that have received substantial federal stimulus funding.

Improving compliance levels will also require further work measuring the current compliance level baseline. While previous research by the state energy office estimates higher levels of compliance in the areas outside of northwest Arkansas, homes in the state's colder climate zone are substantially behind. Further complicating this objective is that this research measured compliance with the state code based on the 2003 IECC, making it difficult to conduct a fair, accurate assessment of compliance with the 2009 IECC until some years after a prospective statewide code update.

The Implementation section makes 13 major recommendations, in addition to multiple related recommendations, for a variety of different stakeholder groups.

To improve state efforts to support local jurisdictions with energy code implementation, the state should:

- Take advantage of existing partnerships through the homebuilding community's current communications outlets like [www.arkansashomebuilders.org](http://www.arkansashomebuilders.org) and Arkansas HomeBuilder Magazine to promote future educational opportunities provided by AEO and third parties;
- Help develop regional enforcement programs that pool resources over multiple jurisdictions to provide other options for rural and unincorporated areas to improve enforcement;
- Collaborate with Arkansas's 22 two-year colleges to develop energy code coursework and programs to train participants for careers in the industries of energy efficient building, construction, retrofitting, renewable electric power, and energy efficiency assessment;
- Coordinate with higher learning institutions with architectural programs to include coursework on the state energy code as an opportunity to meet certification and continuing education requirements for sustainable design;
- Explore policy solutions to traditional funding and enforcement issues at the local level;
- Provide clarity, guidance, and resources to local jurisdictions to support implementation;
- Encourage policy changes at the local level to promote uniformity and incentivize energy code compliance;
- Conduct a statewide compliance measurement and verification (M&V) study, building on previous AEO research in the past decade;
- Ensure that upcoming training workshop series emphasizes building science through on-site training and classwork provided by experts; and
- Engage utilities, consumer groups, real estate/appraisal/lending communities, manufacturers, and retailers with presence in Arkansas to encourage greater outreach efforts and involvement in energy code work.



The **Conclusion** section provides a summary of the myriad benefits of energy code adoption and implementation in Arkansas and concludes with Table #2 on pages 48 and 49, a summary list of the most important recommendations made in the report (with page numbers for quick reference). Appendix A offers a list of other energy code resources from the U.S. Department of Energy (DOE) and Pacific Northwest National Laboratory (PNNL).

## Introduction

Energy codes have arrived. As one of the principal instruments in the energy efficiency policy toolbox, codes benefit society in a number of important ways. They reduce energy use, decrease greenhouse gas emissions and pollution, save consumers and businesses money, lessen peak energy demand, increase utility system reliability, and improve indoor air quality.

Recent improvements in the stringency of the model energy codes—not to mention the development of the first green codes—continue to raise the floor and ceiling for energy-efficient design and construction to levels that were almost unimaginable a few short years ago. Meanwhile, the American Recovery and Reinvestment Act of 2009 (Recovery Act) has provided states and cities with unprecedented funding and incentives to adopt the model energy codes, and more places are taking advantage of these opportunities than ever before.

Their ascent is part of a larger transformation in the way advocates, policymakers, industry and utility representatives, and the general public view energy efficiency as a viable and cost-effective component of a comprehensive solution to our current economic, environmental, and energy resource concerns. Energy efficiency is widely considered one of the lowest-hanging fruits since the cheapest and cleanest fuel source is the one we do not burn. Nowhere is this more apparent than in the building sector, which accounts for almost 40 percent of total energy use and 70 percent of electricity use.<sup>1</sup> Moreover, the average lifespan of a building is roughly 50 years, meaning that current building energy policies will affect energy consumption through 2060 and beyond.

Yet, for all of this recent progress and promise, energy codes are still falling well short of their potential. In municipalities across the country, energy code enforcement and compliance remain woefully insufficient if not completely absent. While development and adoption are the necessary first steps of the energy codes process, they alone do not guarantee compliance. To ensure that energy codes accomplish their mission to reduce energy use and save money, states and cities must develop and carry out effective and realistic energy code implementation strategies.

In collaboration with the U.S. Department of Energy, BCAP has undertaken a new program to improve energy code compliance in 15 states, including Arkansas, by analyzing the gaps in the existing energy code infrastructure and practices and providing compliance planning assistance and on-the-ground technical support to energy code stakeholders in the state. The first phase of the program is the Gap Analysis Report, which identifies barriers to successful energy code adoption and implementation, opportunities for improvement, available resources, key stakeholders, and potential partnerships.

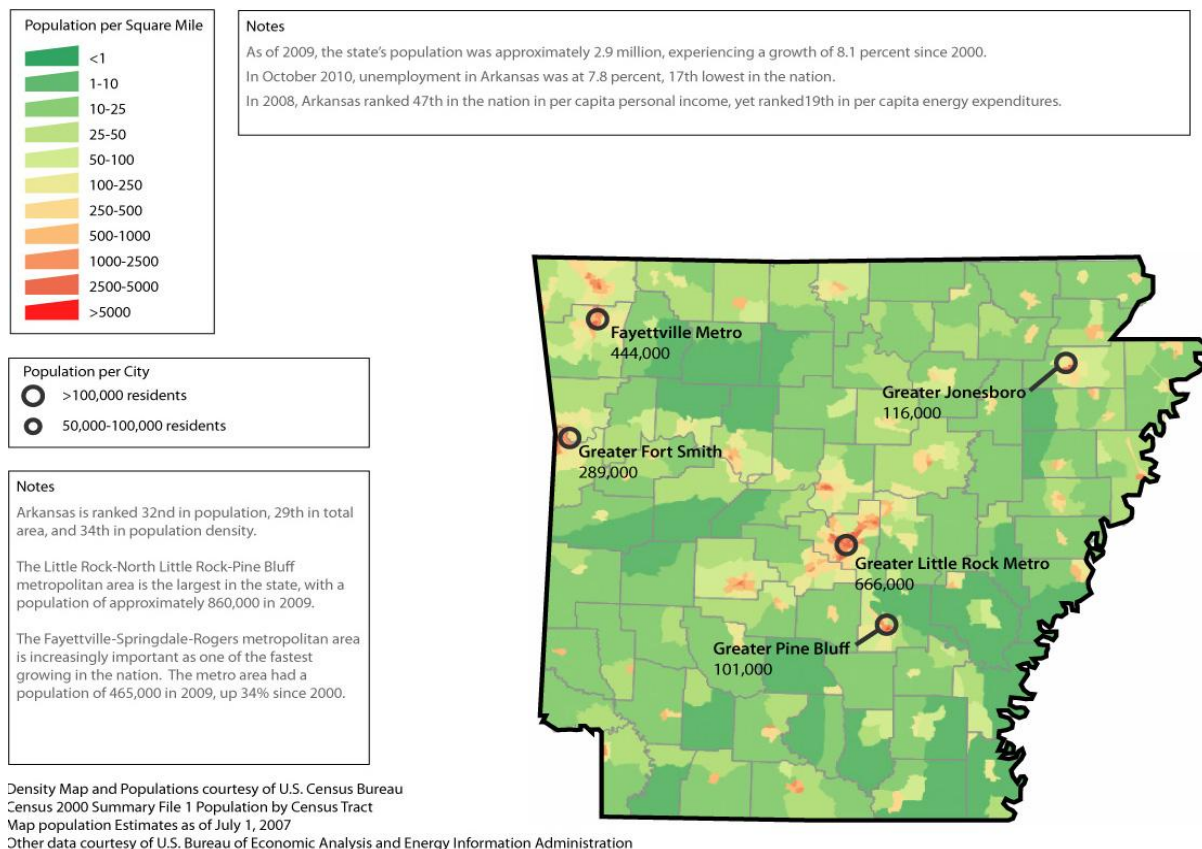
## State Overview

Arkansas is a geographically diverse state ranging from the mountainous regions of the Ozarks and the Ouachita Mountains to the eastern lowlands along the Mississippi River. Like many states, its economy has transitioned to service industries as the largest population centers like Little Rock, Fort Smith, and Fayetteville in the central and northwest portions the state continue to grow. Agriculture and manufacturing, however, remain important economic sectors in the state's large share of rural areas.

The population of Arkansas numbered almost 2.9 million in 2009 and continues to grow, having expanded 8.1 percent during the most recent decade. The median annual household income in 2008 was about \$38,800, significantly less than the national average of about \$52,000.<sup>2</sup> As of October 2010, Arkansas's unemployment rate of 7.8 percent ranked as the 17<sup>th</sup>-lowest in the United States.<sup>3</sup>

According to our research, one major barrier to code implementation in the state is disinterest from various stakeholders as well as a lack of widespread education on the requirements throughout many local jurisdictions. Arkansas is not a home rule state, but localities within it have a similar attitude of disinterest in compliance with a statewide mandate. To make matters even more difficult, many opponents of the code argue that the cost of building a house to updated energy efficiency standards will make those homes unaffordable in a state facing difficult economic conditions even before the recent recession and major construction slowdown.

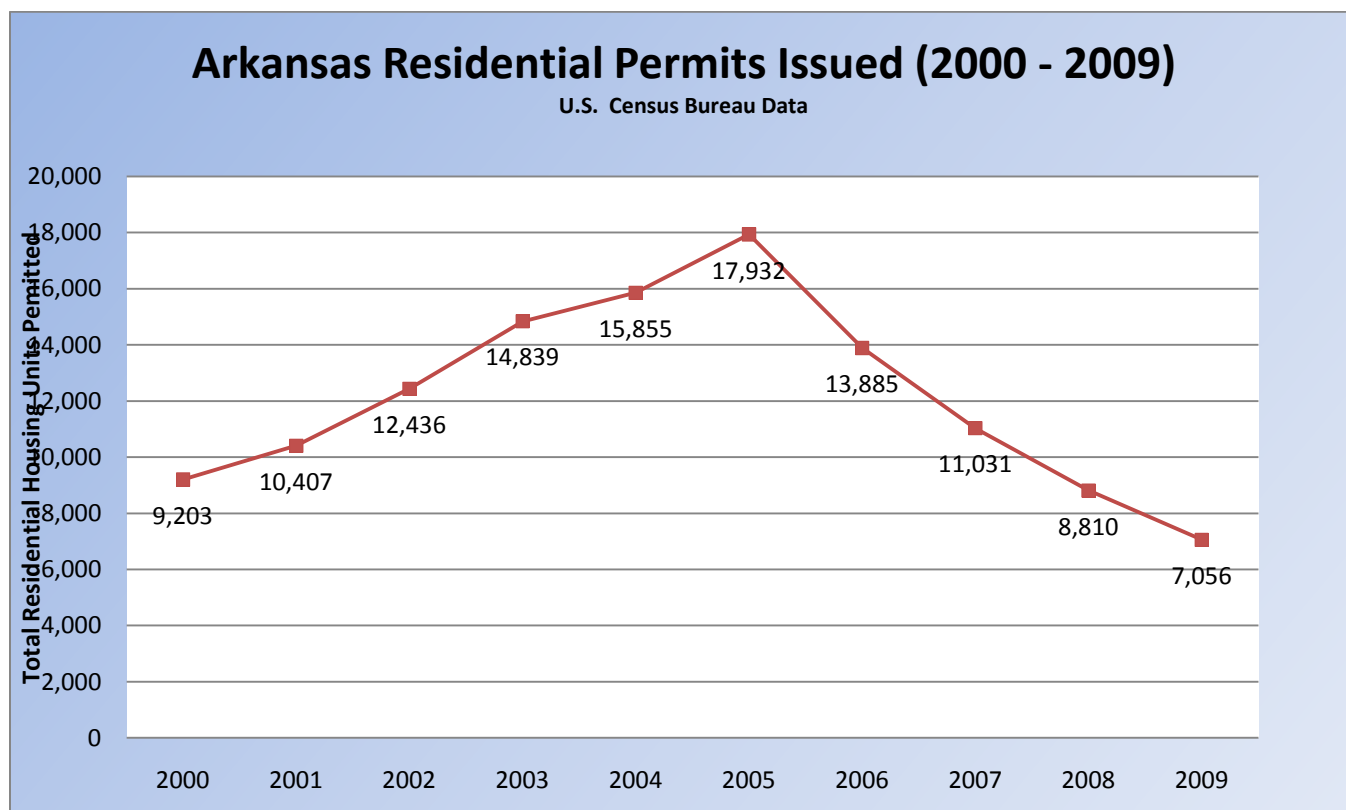
**Figure 1 – Arkansas Population Map**



## Construction Overview

As Arkansas's population expanded over the past two decades, the construction industry enjoyed moderate to strong growth through the mid-2000s (see Figure 2). The sector reached its peak in 2005 as 17,932 residential housing unit permits were issued at a valuation of almost \$2.3 billion. The end of the housing boom and the arrival of the nationwide recession, however, drove construction down precipitously in subsequent years, with housing unit permits falling to just 7,056 in 2009, a drop of more than 60 percent in just four years and the lowest level in almost two decades.<sup>4</sup>

**Figure 2 – Arkansas Residential Building Permits Issued by Year (2000-2009)**



Even though the decline in residential and commercial construction has been detrimental to the state economy, it presents a unique opportunity for the advancement of energy codes in the state. With workloads reduced, building professionals and code officials should have more time to take advantage of available energy code training opportunities through DOE and third parties like BCAP. Reduced construction will also help ease all stakeholders into a new energy code, rather than trying to adjust while construction is high.

## Energy Portfolio

Arkansas has moderate energy resources, including substantial natural gas reserves as well as smaller oil reserves and coal deposits, but the state is not a major energy producer overall. Coal is the dominant

energy source used for electricity generation in Arkansas, accounting for about one half of the electricity produced in state. These power plants rely almost entirely on coal imported from Wyoming.<sup>5</sup>

Despite its average population size (ranked 32<sup>nd</sup> in the United States), Arkansas has a high per capita energy consumption rate (17th)<sup>6</sup> and an energy-intensive economy, ranking comparatively high (11th) in energy consumption per real dollar of GDP.<sup>7</sup> While the latest average residential (8.75 cents/kWh) and commercial (6.87) electricity prices are below the national residential (11.97) and commercial (10.55) averages, the state is still vulnerable to future fluctuations in energy costs and peak demand.<sup>8</sup> By adopting national baseline standards for building energy performance, Arkansas can mitigate the impacts of price uncertainty and become a more efficient state.

Reducing overall energy use through the adoption and implementation of the model energy codes would allow the state to phase its energy production from fossil fuels in favor of renewable energy, rather than having to add both in the short- and medium-term to meet increasingly growing demand. In the long-term, it would also allow the state to achieve its stated goals for greenhouse gas emissions reduction more quickly, as well as decrease its reliance on non-renewable energy produced out of state.

### Potential Savings from Energy Codes

A limited DOE analysis of the changes from Arkansas's current residential code to the 2009 IECC resulted in estimated energy savings of 14 to 15 percent, or about \$242 to \$245 per year for an average new house at recent fuel prices.<sup>9</sup> Another DOE analysis of the changes from the state's current commercial code to ASHRAE Standard 90.1-2007 estimates energy *and* cost savings of 3 to 4 percent.<sup>10</sup>

Energy codes also offer large-scale gains. With energy prices projected to rise sharply over the medium- and long-term, reducing Arkansas's energy demand will enhance the state's energy security and stimulate its economy.

BCAP estimates that if Arkansas began implementing the 2009 IECC and ASHRAE Standard 90.1-2007 statewide in 2011 (making incremental steps toward 90 percent compliance in 2017), it would realize substantial savings over BCAP's business-as-usual scenario:

- By 2030, \$187 million in annual energy cost savings for households and businesses, or \$1.6 billion from 2011 to 2030.
- By 2030, annual CO2 emissions reductions of 900,000 metric tons, or 8.6 million metric tons from 2011 to 2030.
- By 2030, residential sector source energy savings of 6 percent, representing annual savings of 7 trillion Btu.
- By 2030, commercial sector source energy savings of 11 percent, representing annual savings of 10 trillion Btu.<sup>11</sup>

## Adoption

### Federal Policy

Although energy code adoption occurs on the state and local levels, the federal government – through Congress and the U.S. Department of Energy (DOE) – has played a significant role in advancing energy code development, determining the relative effectiveness of national model energy codes, and supporting state- and local-level adoption and implementation.

### EPAct

The Energy Policy Act (EPAct) of 1992 requires DOE to determine whether the most current model energy codes would improve energy efficiency for new and renovated residential and commercial buildings. EPAct also mandated that DOE make a new determination within twelve months for every subsequent revision of these codes. Each state would then have two years to certify that it had revised its own energy code to meet or exceed the requirements of the latest edition of the national models. A state could decline to adopt a residential energy code by submitting a statement to the Secretary of Energy detailing its reasons for doing so.<sup>12</sup>

For commercial buildings, DOE determined in late 2008 that ASHRAE Standard 90.1-2004 for would achieve energy savings of 13.9 percent above the previous Standard 90.1-1999 for national source energy and 11.9 percent above for building energy consumption.<sup>13</sup>

For low-rise residential buildings, EPAct currently references the 2000 IECC.<sup>14</sup> DOE, however, has preliminarily determined that the 2009 IECC would achieve greater energy efficiency in than the 2006 IECC. Also, DOE has preliminarily determined that the 2006 IECC would achieve greater energy efficiency than the 2003 IECC. Finally, although DOE has preliminarily determined that the 2003 IECC would not achieve substantially greater energy efficiency than the 2000 IECC, DOE found that the 2003 IECC is no less energy efficient than the 2000 edition. When that determination is finalized (expected sometime in 2011), the 2009 IECC will become the baseline residential code for EPAct compliance.<sup>15</sup>

#### What's required by the IECC?

- Depending on your location (climate zone) there are requirements for insulating ceilings, walls, and sometimes, floors, foundations, basement walls, and slab edge
- Less insulation is allowed for mass walls, and more is required for steel framing
- Also dependent on climate zone, there are requirements for windows, skylights, and doors
- The building shell, also known as the building envelope, must be caulked and sealed to limit air movement
- Duct insulation
- Pipe insulation
- Duct sealing to reduce air leakage
- Heating, ventilation, air conditioning (HVAC) and water heating equipment efficiencies and control requirements for commercial buildings
- Some residential lighting requirements
- All commercial lighting
- Heated swimming pool covers and controls
- The energy code applies to all new residential and commercial buildings, as well as additions/alterations/renovations to existing buildings
- Compliance paths include prescriptive, total building envelope UA (tradeoff method), and simulated performance

Arkansas is in compliance with the current EAct residential baseline requirements, having adopted the 2003 IECC in October 2004. The state's commercial code referencing ASHRAE Standard 90.1-2001, however, is not in compliance with the law, and with final determinations on the most recent model code editions expected in 2011, the clock will begin ticking for states to adopt the updated baseline codes (the 2009 IECC and ASHRAE Standard 90.1-2007) to remain in compliance with EAct.

**Gap:** The current minimum statewide energy code is not equivalent to the latest national model energy codes (2009 IECC and ASHRAE Standard 90.1-2007).

**Related Gap:** The state code is also not in compliance with EAct for commercial buildings, and will soon lapse out of compliance for residential buildings (pending final determinations issued by DOE).

**Recommendation #1:** After sufficient time to inform stakeholders, collect feedback, and secure buy-in, as well as developing sufficient educational and training programs to support it, the state should update the Arkansas Energy Code to reference the 2009 IECC and Standard 90.1-2007 statewide and certify to DOE the state's compliance with EAct.

## The Recovery Act

In February 2009, the American Recovery and Reinvestment Act – federal legislation appropriating funds for a variety of state economic initiatives – allocated \$3.1 billion for the U.S. DOE State Energy Program (SEP) to assist states with building energy efficiency efforts. As a condition of accepting \$39.4 million in SEP funding, Gov. Mike Beebe certified to DOE<sup>16</sup> that the state would implement energy standards of equal or greater stringency than the 2009 IECC or equivalent for residential construction and ASHRAE Standard 90.1-2007 or equivalent for commercial construction as well as achieve 90 percent compliance in new and renovated residential and commercial building space by 2017.<sup>17</sup>

## State Policy

In the United States, building energy codes are adopted on the state and local levels. This is due, in part, to the diverse range of cultures and climates found across the fifty states, as well as a host of historical political influences that shaped federal-state and state-local relations. The process differs from state to state, but in most cases codes are adopted through a legislative process, a regulatory process, or a combination of both – like Arkansas. A handful of states are strongly home rule and leave the authority to adopt energy codes to local jurisdictions. Every state is unique in how it conducts business and creates policy, and each state requires its own particular strategy for achieving the best possible code for its local governments, citizens, and businesses.

## Political Environment

The first Arkansas Energy Code was enacted in 1979 and was based on the 1977 Model Code for Energy Conservation in New Building Construction (MCEC), which references ASHRAE/IES Standard 90-1975. The Arkansas General Assembly authorized the Arkansas Energy Office (AEO) to promulgate regulations adopting building energy codes in Section 3(B)(2)(c) of Act 7 of 1981. The AEO adopted a code in



October 1994, referencing ASHRAE 90.1-1989 for commercial buildings and the 1992 MEC for residential buildings. The code was revised in May 1995.

Arkansas's current energy code for residential and commercial construction – the 2004 Arkansas Energy Code for New Building Construction – is based on the 2003 IECC with Arkansas Supplements and Amendments and allows compliance with ASHRAE Standard 90.1-2001 for commercial construction. It became effective October 1, 2004.<sup>18</sup>

The Arkansas Energy Code has replaced Chapter 1 of the IECC with a new Chapter 1: Administration and Enforcement, which was amended to integrate Arkansas-specific exceptions, exemptions, enforcement, compliance and an effective date. Chapters 4, 5 and 6 of the 2003 IECC offer different methods to achieve code compliance for low-rise residential construction. Chapters 7 and 8 offer different methods to achieve code compliance for commercial and high-rise residential construction. The code also documents other changes to 2003 IECC.

There was little momentum with the building community or among policymakers to adopt the 2006 IECC during that code's update cycle. While difficult to quantify, prospects to update the code are marginally more favorable during the 2009 IECC cycle, but not by much.

The state energy office has not actively participated in either model code development process, but AEO Buildings and Programs Coordinator Evan Brown has attended code hearings as an observer, including the 2012 IECC Final Action Hearings in Charlotte in October 2010. He has also attended DOE Energy Codes conferences, including the July 2010 event, also in Charlotte, where BCAP initially made contact concerning the Compliance Planning Assistance program.

Arkansas does not have an automatic code review cycle like several other states. A code change must first be initiated by the AEO and is then reviewed by all stakeholders affected by the code. The state then schedules a public hearing for testimony and comments on all changes to the proposed code. After being approved, the proposed change is reviewed by the AEO, two legislative committees, and ultimately the Arkansas General Assembly before the code is updated.<sup>19</sup>

**Gap:** Actions by the Arkansas Energy Office to update the Arkansas Energy Code currently require legislative approval, creating additional procedural barriers to adopting the latest national model energy codes for residential and commercial construction.

**Recommendation #2:** Develop legislation granting sole authority to update the Arkansas Energy Code to the Arkansas Energy Office. This provides a policymaking process with fewer veto points that often produces simpler, uniform codes. While this authority must be granted by the Arkansas General Assembly itself, BCAP believes this change will provide a smoother update path to thoughtful policies informed by the stakeholders in the building codes community.

**Related Gap:** The state does not have an automatic review and update process on a three-year cycle for future iterations of the minimum energy code.



**Recommendation #3:** Legislation regarding AEO should also include a mandatory review and update cycle for future iterations of the minimum energy code to lock in future energy savings and remove speculation after the release of each new model energy code. Reducing information asymmetry among stakeholders about new code requirements during the next code update process will be key to reducing pushback in later code cycles.

### Recent Energy Codes-related Legislation

The Arkansas Economic Development Commission (EDC), which houses the AEO, is not currently engaging stakeholders about potential legislation regarding energy codes, including any legislation to grant AEO rulemaking authority to promulgate changes to the Arkansas Energy Code that would not require subsequent legislative approval. Legislation updating the residential code is also unlikely in the immediate future, as AEO believes that there will be substantial resistance by the Arkansas Home Builders Association (AHBA). In coming years, state officials envision updating and beginning the implementation of new commercial provisions of the state energy code before any update of the residential provisions would occur. Regardless, adopting the 2009 IECC and/or Standard 90.1-2007 will necessitate the resources to develop a significant outreach and enforcement education campaign, which are not currently available to AEO.

Any bills would go before the 88<sup>th</sup> Arkansas General Assembly, which convenes January 10, 2011 and is scheduled to adjourn April 8, 2011. As the General Assembly only meets once every two years, streamlining the code update process to a regulatory one via legislation is especially important.

**Gap:** Resources to develop a significant outreach and enforcement education campaign are not currently available.

**Recommendation #4:** Coordinate with the state about funding that may be available for codes outreach through AEO.

### Other State Building Codes

Most of Arkansas's other construction codes are based on the 2006 International code suite by the International Code Council (ICC) and are intended to be mandatory statewide. The 2007 Arkansas Fire Prevention Code is based on the 2006 editions of the IFC, IBC, and IRC. The 2006 Arkansas Plumbing Code and the 2006 Arkansas Fuel Gas Code are also based on their 2006 ICC counterparts. The 2010 Arkansas Mechanical Code was recently updated to reference the 2009 IMC.<sup>20</sup> These codes are administered by local jurisdictions, generally through building departments or the state fire marshal office.

### Energy Codes for State-funded Facilities

Arkansas has a strong energy code for state buildings, including public universities and colleges. To reduce average annual energy costs of \$100 million, the Sustainable Energy-Efficient Buildings Program was created by the state legislature in April 2009. Act 1494 directs the state to develop a plan for reducing energy use in all existing state buildings by 20 percent by 2014 and a 30 percent reduction by

2017.<sup>21</sup> It establishes performance criteria and goals for sustainable and energy-efficient new and majorly renovated public buildings based on ASHRAE 90.1-2007. Buildings must be designed, constructed, and certified to reduce energy consumption 10 percent below the baseline determined with the performance rating method of Appendix G of ASHRAE 90.1-2007.<sup>22</sup>

**Gap:** The state’s energy code for state-funded buildings, currently based on ASHRAE Standard 90.1-2007, does not achieve the energy savings of the newly released ASHRAE Standard 90.1-2010.

**Recommendation #5:** The Arkansas Energy Office should develop updated energy standards for new and renovated state buildings based on ASHRAE Standard 90.1-2010. While Arkansas’s energy code for state buildings is a model policy, it is important for the state to set the example for other commercial construction and stretch for the substantial energy savings achieved through upcoming model code development cycles.

## Statewide Climate Change Initiatives

Established by Act 696 of the 86<sup>th</sup> Arkansas General Assembly, the Arkansas Governor’s Commission on Global Warming (GCGW) was charged with setting a “global warming pollution reduction goal” for Arkansas and a “comprehensive strategic plan for implementation of the global warming pollution reduction goal.” The Commission issued its final report on November 1, 2008, unveiling the Arkansas Climate Action Plan with recommendations for implementation.<sup>23</sup>

The GCGW final report provides the following key recommendations and accomplishments:<sup>24</sup>

- *A comprehensive set of 54 specific policies to reduce GHG emissions and address climate-, energy-, and commerce-related issues in Arkansas*
- *Emissions reductions goal:* Adopt a statewide, economy-wide global warming pollutant reduction goal to reduce the state’s gross greenhouse gas (GHG) emissions below 2000 levels by 20 percent by 2020, 35 percent by 2025, and 50 percent by 2035. Of the 54 policy recommendations, 31 were analyzed quantitatively to have a cumulative effect of reducing emissions by about 35.5 million metric tons of carbon dioxide equivalent (MMtCO<sub>2</sub>e) in 2020 and 53.3 MMtCO<sub>2</sub>e in 2025.
- *Evaluate the direct costs and direct cost savings of the policy recommendations in*

### Why Climate Change Initiatives Matter

Arkansas is concerned with the potential impacts of climate change on the environment and the economy. Since building energy use accounts for roughly 40 percent of energy use in the nation—and in Arkansas, most of that energy comes from non-renewable sources—energy codes are a vital tool for reducing energy use and, thus, greenhouse gas emissions, not to mention saving money.

Energy savings built into new construction will accrue over the life of the building. Considering that buildings typically last from 50-100 years, adopting energy codes not only impacts new building energy performance, but also the energy performance of existing buildings until 2060 and beyond. This makes energy codes an important long-term policy for mitigating climate change and supporting the Arkansas economy.

*Arkansas:* Although the total net cost associated with the 29 policies analyzed is estimated at about \$3.7 billion between 2009 and 2025, the weighted-average cost-effectiveness of the 29 policies is estimated to be approximately \$8.80/tCO<sub>2</sub>e reduced.

- *Statewide emissions inventory:* Conduct the first comprehensive statewide inventory and forecast of GHG emissions in Arkansas for 1990 through 2025.

The report's chapter on the state's residential, commercial, and industrial (RCI) building sector strongly urges the state to take action to improve the state's building codes. The report notes that updates to the codes need to be made regularly, and code enforcement in the state needs to be strengthened.

By super majority vote, the GCGW report recommends that the state take the following actions to improve building codes:

- Expand statewide adoption and enforcement of existing building codes;
- Follow national codes without Arkansas-specific amendments;
- Update Arkansas codes in concert with the timing of the national codes; and
- Target a 10 percent improvement in energy efficiency through educational programs for builders, building inspectors, and other building industry professionals to ensure that the existing codes are implemented and enforced.

## Overview of Green and Above-Code Programs

Energy efficient construction also brings down the cost of renewable energy options for homeowners and operators of commercial buildings. For residential buildings, when homes are equipped with energy-efficiency measures, the overall energy demands of the home decrease, which means homeowners can lower the size of solar PV and solar hot water equipment on their rooftops. By buying smaller-scale equipment, costs are lowered for homeowners – potentially resulting in increased market penetration for these technologies and lower cost by way of economies of scale for manufacturers. The same principle applies to the provision of on-site energy for commercial buildings. Taken as a whole, renewable energy production at the building level also complements utilities' efforts to meet the renewable portfolio standard goals adopted by many states.

### Why Green and Above-Code Programs Matter

Green and advanced codes and standards help to transform the marketplace by bringing high performing buildings into the mainstream. They also raise awareness of energy- and resource-efficient design for the public, as well as design and building professionals and code officials. Finally, they raise the ceiling for building energy performance, which, in turn, accelerates and shapes the development and adoption of future model codes.

### LEED

On February 25, 2005, then-Gov. Mike Huckabee signed the Arkansas Energy and Natural Resources Conservation Act, which encouraged all state agencies to use green design strategies, including Green Globes and the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. The bill also created the Office of Sustainability within the Arkansas Department of

Environmental Quality and the Legislative Task Force on Sustainable Building Design and Practices which is to meet and continue to review, discuss, and advise on issues related to sustainable building design.<sup>25</sup>

While this legislation is a good start to encouraging LEED-certified buildings, the program has been slow to take hold in the state. As of December 2010, only 37 buildings in Arkansas are LEED-certified with another 90 currently in the LEED application process.<sup>29</sup> As of December 2010, Arkansas has 436 LEED Accredited Professionals (AP) and Green Associates (GA), many of whom of which are located in Little Rock and Fayetteville.

LEED Statistics in Arkansas by Major City

City	Certified Projects <sup>26</sup>	Registered Projects <sup>27</sup>	LEED APs/GAs <sup>28</sup>
Little Rock	12	23	168
N. Little Rock	11	3	11
Fayetteville	7	4	71
Fort Smith	3	5	61
Rogers	2	4	14
Bentonville	1	7	19
Entire State	37	90	436

### *ENERGY STAR for Homes*

ENERGY STAR for Homes is a national above-code building program started by the U.S. Environmental Protection Agency (EPA). To qualify for the ENERGY STAR for Homes label, homes must receive a score of 85 or less on the Home Energy Rating System (HERS) index.

The ENERGY STAR for New Homes program is another important program that can provide major opportunities to improve the efficiency of Arkansas homes and advance building practice statewide. To earn the ENERGY STAR label, a home must meet strict guidelines for energy efficiency set by EPA. These homes are at least 15 percent more energy efficient than homes built to the 2004 International Residential Code supplemental edition, and include additional energy-saving features that typically make them 20 to 30 percent more efficient than standard homes.<sup>30</sup>

In Arkansas, however, the ENERGY STAR for New Homes program has not demonstrated as much success as it has nationally, especially compared to neighboring states Texas and Oklahoma. Arkansas ranked in the bottom third of states in ENERGY STAR for New Homes market index in 2009, well below the national average of 21 percent.<sup>31</sup> The state's ENERGY STAR market penetration rate, however, is comparable to neighbors Missouri, Mississippi, and Louisiana. Among the program indicators for Arkansas:<sup>32</sup>

- 704 ENERGY STAR qualified homes built as of December 2010
- 138 ENERGY STAR qualified homes built 2010 as of December
- 152 ENERGY STAR qualified homes built in 2009
- 59 ENERGY STAR for Homes Partners

### The HERS Index Explained

The HERS Index is a scoring system that provides a scale for measuring the energy efficiency of a new home compared to a reference home that was built to the 2004 IECC, which is assigned the score of 100 points. The lower a home's HERS Index, the more energy efficient it is. Every one point decrease in the HERS Index corresponds to a one percent reduction in energy consumption compared to the HERS reference home. For example, a home that scores an 85 is 15 percent more efficient than the HERS reference home, and a home that scores zero is a net zero building (see [www.resnet.us](http://www.resnet.us) for more details). Both ENERGY STAR for Homes and Building America intend to increase the stringency of their requirements in the coming months.

**Gap:** The market index for ENERGY STAR for New Homes in Arkansas was well below the national average of 21 percent.

**Recommendation #6:** Expand incentives for builders whose projects qualify for ENERGY STAR certification.

RESNET lists only eight qualified HERS raters in the state,<sup>33</sup> though AEO is looking to encourage more through coordination with the Building Performance Institute (BPI) and the possible allocation of funding received through the Recovery Act. Multiple state community and technical colleges are currently administering educational programs to develop future third party enforcement stakeholders, including two to earn certification through BPI (see section “Enforcement Community, Third Party Infrastructure” below).

**Gap:** An insufficient number of qualified HERS raters in the state hinders the development of potential third party enforcement infrastructure.

**Recommendation #7:** Coordinate educational resources and curriculum ideas with contacts from BPI and local higher learning institutions with programs related to construction.

### *Building America*

Since 1994, DOE’s Building America program has been raising the bar for energy efficiency and quality in new and existing homes.<sup>34</sup> Working with national laboratories and the residential building industry, its goal is to improve the quality and performance of today’s homes while continually working towards net-zero energy homes. To qualify, homes must receive a score of 70 or less on the HERS index, though the program’s innovative house-as-a-system approach can reduce a home’s average energy consumption by as much as 40 percent with little or no impact on the cost of new construction. Building America approaches have been used in more than 42,000 homes across the country to date. These homes typically sell within weeks while other new homes sit on the market for months.

Through its Builders Challenge program, new homes that meet stringent qualifications can earn an EnergySmart Home Scale label. Builders Challenge is similar to ENERGY STAR for Homes in that both programs assist and reward builders who build homes more efficiently than standard practice. However, the energy threshold requirements for the Builders Challenge program are different than those of ENERGY STAR.

According to their website, there are no Building America projects currently active in Arkansas.<sup>35</sup>

**Gap:** There are no Building America projects currently active in Arkansas.

**Recommendation #8:** The state energy office should reach out to Building America about opportunities to involve the organization in future projects in the state.

## Local Policy

Local energy code adoption varies greatly from state-to-state. In strong home rule states, local jurisdictions have full authority to adopt energy codes that best fit the needs of their community, while others must meet a statewide minimum first. On the other end, some states mandate a minimum-maximum energy code that prohibits local jurisdictions from diverging from the state code whatsoever. Most states, like Arkansas, fall somewhere in between, mandating a minimum code, but allowing some flexibility to go beyond it in progressive jurisdictions.

Arkansas has 75 counties and more than 500 municipalities. Local government in Arkansas provides many essential services to the citizens of the community, including road construction and maintenance, solid waste disposal, water utilities and waste water treatment, police/fire protection and emergency rescue, land use planning, building inspection, and public education.<sup>36</sup>

### IECC and Standard 90.1

While the state allows jurisdictions to adopt energy codes more stringent than the 2004 Arkansas Energy Code, ICC has recognized only one city having done so as of November 2010 (see “Local Adoption Spotlight” below). ASHRAE does not publish or track jurisdictional adoptions of Standard 90.1, and AEO is not aware of any jurisdictions that had adopted a more stringent commercial code than Standard 90.1-2001 as referenced in the 2003 IECC.

### IBC and IRC

The International Building Code and International Residential Code respectively govern many major elements of commercial and residential construction, including chapters on energy efficiency. These sections, however, contain language that can contradict that of the IECC and does not achieve equivalent energy savings. To avoid confusion and provide a simpler, uniform path for builders, designers, and code officials, it is important that state and local codes remove alternative compliance path language from the IBC and IRC and reference only the IECC.

For nonresidential construction, Chapter 13 of the 2009 IBC references the 2009 IECC which, in turn, references ASHRAE Standard 90.1-2007 as an alternative compliance path. In theory, the IBC is equivalent to the IECC and Standard 90.1. It is difficult, however, to make this claim because municipalities that adopt the IBC may eliminate Chapter 13 or choose not to enforce it by not also adopting the IECC. Therefore, in practice, adopting the IBC is not equivalent to adopting the IECC. Without assurances that a community enforces Chapter 13, it is more accurate to err on the side of caution and assume that it does not.

For one- and two-family residential construction, Chapter 11 of the 2009 IRC references the 2009 IECC. This section, however, contains an alternative prescriptive compliance path that DOE has determined does not achieve the energy savings of the IECC.<sup>37</sup>

**Gap:** IBC and IRC editions that the state adopts in the future contain contradictory alternate compliance paths that are weaker than the compliance paths of their counterpart IECC editions.

**Recommendation #9:** In future adoption cycles for the state’s construction codes, delete Chapter 13 of the IBC and Chapter 11 of the IRC and replace the text with references to the counterpart IECC edition.

### Local Adoption Spotlight

For the most part, municipalities in Arkansas have not chosen to adopt or enforce energy codes more stringent than the state code. As of November 2010, ICC has identified only one jurisdiction that has adopted a code above the 2003 IECC: Lowell, a city of about 8,000 in the Fayetteville metropolitan area of northwest Arkansas, which has adopted the 2006 IECC.<sup>38</sup> ASHRAE does not currently track jurisdictional adoptions of editions of Standard 90.1, but AEO is not aware of any municipality in Arkansas that has done so.

**Gap:** Except Lowell, no local jurisdiction has worked to exceed the state’s minimum energy code requirement by adopting the more recent versions of the national model codes.

**Recommendation #10:** Through AEO, the state should encourage willing and able local jurisdictions to adopt the 2009 IECC to prepare for potential statewide code updates and support them with educational materials on cost and savings data and technical support to code officials and design and building professionals that outlines the changes from the 2003 or 2006 IECC to the 2009 IECC. Lowell, as the only jurisdiction thus far to adopt the 2006 IECC, could be a model municipality to foster above code policies. AEO should continue to provide political support and facilitate stakeholder communication and engagement as needed.

Massachusetts has encouraged local jurisdictions to adopt codes above the statewide minimum code by including a voluntary “stretch code” as an appendix to the state code. Appendix 120AA provides a uniform option for municipalities that seek greater building energy efficiency savings. The state has supported this effort by providing funds through the state energy office for training for enforcement and building professionals in the 59 cities that had adopted the stretch code as of December 2010.<sup>39</sup>

**Gap:** No local jurisdictions are leading the state in adoption of above-code programs beyond the 2009 IECC.

**Recommendation #11:** Encourage local adoption of above codes by developing a voluntary “stretch code” as an appendix and provide incentives for code training funding. AEO should connect interested code officials and policymakers with energy performance champions in their jurisdictions. BCAP’s Online Code Environment and Advocacy Network (OCEAN) provides a wealth state and national resources on policy options and the challenges associated with first-time adoption of green and above-code programs, including technical support, guidance for creating these programs, and a number of case studies on programs across the country.



## Local Climate Change Initiatives

Five cities in Arkansas (Eureka Springs, Fayetteville, Fort Smith, Little Rock, and North Little Rock), including the four largest, have signed onto the U.S. Conference of Mayors' Climate Protection Agreement. Signing this agreement signals an agreement to enact policies and programs that meet or exceed a greenhouse gas emissions reduction target of 7 percent below their 1990 levels by 2012.<sup>40</sup>

Additionally, North Little Rock, Fayetteville, and Pulaski County (the state's largest county and home of Little Rock) are all members of the International Association of Local Governments for Sustainability (ICLEI). ICLEI, which has over 1,100 members in 68 countries, is a collaboration of local governments that have made a commitment to sustainable development. ICLEI provides technical consulting, training, and information services to build capacity, share knowledge, and support local government in the implementation of sustainable development at the local level. Their basic premise is that locally designed initiatives can provide an effective and cost-efficient way to achieve local, national, and global sustainability objectives.<sup>41</sup>

**Gap:** Signing onto the U.S. Conference of Mayors' Climate Protection Agreement or joining ICLEI does not assure that adoption of improved energy codes is included in strategy to reach goals.

**Recommendation #12:** Local jurisdictions that have made these voluntary agreements on climate change should emphasize energy codes as a priority by adopting the latest national model energy codes and setting an example for other Arkansas municipalities.

## Overview of Local Green and Above-Code Building Programs

By requiring stricter standards for public buildings, jurisdictions demonstrate their commitment to energy-efficient construction, create a more conducive environment for stricter energy code adoption for private construction, and give themselves leverage in negotiating with stakeholder groups that are hesitant to upgrade the baseline energy code. They also save taxpayer dollars with lower energy bills, further reduce their environmental impact, and improve the air quality and comfort of public buildings.

USGBC lists only one city in Arkansas – Fayetteville – as having established green building requirements. Substantial opportunities are available for jurisdictions to adopt progressive policies to incorporate certification through LEED and other green building programs.<sup>42</sup>

### *Fayetteville*

On October 2, 2007, the Fayetteville City Council adopted Resolution #176-07, requiring all new city-owned facilities greater than 5,000 square feet to achieve a minimum of LEED Silver certification. The bill also requires all other new construction in the city to submit a LEED checklist with application for permit, stressing an emphasis on energy and water efficiency.<sup>43</sup>



## Adoption Summary: Best Practices and Recommendations

### Current Best Practices

- The Arkansas Energy Code is nominally mandatory statewide and does not allow local jurisdictions to adopt or enforce weaker standards. Municipalities are, however, allowed to adopt and implement codes stronger than the state code.
- The Sustainable Energy-Efficient Buildings Program (Act 1494) directs the state to develop a plan for reducing energy use in all existing state buildings by 20 percent by 2014 and 30 percent by 2017. It establishes performance criteria and goals for sustainable and energy-efficient new public buildings and major renovations based on ASHRAE Standard 90.1-2007. Buildings must be designed, constructed, and certified to reduce energy consumption 10 percent below the baseline determined with the performance rating method of Appendix G of ASHRAE 90.1-2007.
- The Arkansas Governor's Commission on Global Warming set a global warming pollution reduction goal for Arkansas and developed recommendations for a comprehensive Arkansas Climate Action Plan to implement that goal.
- Five cities in Arkansas (Eureka Springs, Fayetteville, Fort Smith, Little Rock, and North Little Rock), including the four largest, have signed onto the U.S. Conference of Mayors' Climate Protection Agreement.
- North Little Rock, Fayetteville, and Pulaski County (the state's largest county and home of Little Rock) are all members of the international Association Local Governments for Sustainability.
- The Arkansas Energy and Natural Resources Conservation Act encourages all state agencies to use green design strategies, including LEED and Green Globes.
- Fayetteville, having adopted LEED standards for public buildings and construction over 5,000 square feet, could be a model municipality to foster green building codes and incentives.
- Lowell, as the only jurisdiction thus far to adopt the 2006 IECC, could be a model municipality to foster above code policies.

### Gaps and Recommendations

#### *State Adoption Policy*

**Gap:** The current minimum statewide energy code is not equivalent to the latest national model energy codes (2009 IECC and ASHRAE Standard 90.1-2007).

**Related Gap:** The state code is also not in compliance with EAct for commercial buildings, and will soon lapse out of compliance for residential buildings (pending final determinations issued by DOE).

**Recommendation #1:** After sufficient time to inform stakeholders, collect feedback, and secure buy-in, as well as developing sufficient educational and training programs to support it, the state should update the Arkansas Energy Code to reference the 2009 IECC and Standard 90.1-2007 statewide and certify to DOE the state's compliance with EAct.

**Gap:** Actions by the Arkansas Energy Office to update the Arkansas Energy Code currently require legislative approval, creating additional procedural barriers to adopting the latest national model energy codes for residential and commercial construction.

**Recommendation #2:** Develop legislation granting sole authority to update the Arkansas Energy Code to the Arkansas Energy Office. This provides a policymaking process with fewer veto points that often produces simpler, uniform codes. While this authority must be granted by the Arkansas General Assembly itself, BCAP believes this change will provide a smoother update path to thoughtful policies informed by the stakeholders in the building codes community.

**Related Gap:** The state does not have an automatic review and update process on a three-year cycle for future editions of the minimum energy code.

**Recommendation #3:** Legislation regarding AEO should also include a mandatory review and update cycle for future editions of the minimum energy code to lock in future energy savings and remove speculation after the release of each new model energy code. Reducing information asymmetry among stakeholders about new code requirements during the next code update process will be key to reducing pushback in later code cycles.

**Gap:** Resources to develop a significant outreach and enforcement education campaign are not currently available.

**Recommendation #4:** Coordinate with the state about funding that may be available for codes outreach through AEO.

**Gap:** The state's energy code for state-funded buildings, currently based on ASHRAE Standard 90.1-2007 does not achieve the energy savings of the newly released ASHRAE Standard 90.1-2010.

**Recommendation #5:** The Arkansas Energy Office should develop updated energy standards for new and renovated state buildings based on ASHRAE Standard 90.1-2010. While Arkansas's energy code for state buildings is a model policy, it is important for the state to set the example for other commercial construction and stretch for the substantial energy savings achieved through upcoming model code development cycles.

**Gap:** The market index for ENERGY STAR for New Homes in Arkansas is well below the national average of 21 percent.

**Recommendation #6:** Expand incentives for builders whose projects qualify for ENERGY STAR certification.

**Gap:** An insufficient number of qualified HERS raters in the state hinders the development of potential third party enforcement infrastructure.

**Recommendation #7:** Coordinate educational resources and curriculum ideas with contacts from BPI and local higher learning institutions with programs related to construction.

**Gap:** There are no Building America projects currently active in Arkansas.

**Recommendation #8:** The state energy office should reach out to Building America about opportunities to involve the organization in future projects in the state.

#### *Local Adoption Policy*

**Gap:** IBC and IRC editions that the state adopts in the future contain contradictory alternate compliance paths that are weaker than the compliance paths of their counterpart IECC editions.

**Recommendation #9:** In future adoption cycles for the state's construction codes, delete Chapter 13 of the IBC and Chapter 11 of the IRC and replace the text with references to the counterpart IECC edition.

**Gap:** Except Lowell, no local jurisdiction has worked to exceed the state's minimum energy code requirement by adopting the more recent versions of the national model codes.

**Recommendation #10:** Through AEO, the state should encourage willing and able local jurisdictions to adopt the 2009 IECC to prepare for potential statewide code updates and support them with educational materials on cost and savings data and technical support to code officials and design and building professionals that outlines the changes from the 2003 or 2006 IECC to the 2009 IECC. Lowell, as the only jurisdiction thus far to adopt the 2006 IECC, could be a model municipality to foster above code policies. AEO should continue to provide political support and facilitate stakeholder communication and engagement as needed.

**Gap:** No local jurisdictions are leading the state in adoption of above-code programs beyond the 2009 IECC.

**Recommendation #11:** Encourage local adoption of above codes by developing a voluntary "stretch code" as an appendix and provide incentives for code training funding. AEO should connect interested code officials and policymakers with energy performance champions in their jurisdictions. BCAP's Online Code Environment and Advocacy Network (OCEAN) provides a wealth state and national resources on policy options and the challenges associated with first-time adoption of green and above-code programs, including technical support, guidance for creating these programs, and a number of case studies on programs across the country.

**Gap:** Signing onto the U.S. Conference of Mayors' Climate Protection Agreement or joining ICELI does not assure that adoption of improved energy codes is included in strategy to reach goals.

**Recommendation #12:** Local jurisdictions that have made these voluntary agreements on climate change should emphasize energy codes as a priority by adopting the latest national model energy codes and setting an example for other Arkansas municipalities.

## Implementation

While energy code adoption is the necessary first step in the energy codes process, it does not guarantee compliance. To achieve the desired energy and financial savings available through energy codes, states and cities must carry out energy code implementation, a term used to describe all of the activities needed to prepare state energy offices, local building departments, the building industry, and other stakeholders to comply fully with the energy code. It includes outreach to stakeholder groups, on-site, classroom, and web-based training, establishing and utilizing enforcement infrastructure, tools, and systems, and other educational and organizational efforts.

### Overview of State and Local Implementation Policies

The administration and enforcement of the 2004 Arkansas Energy Code is left to local jurisdictions. While the code applies to all new and renovated residential and commercial construction statewide, it is difficult to ensure that all jurisdictions are enforcing the energy codes or even have the capacity to do so. This is done almost entirely at the municipal level, though one county (Benton County) does issue building permits. The level of staffing and professionalization of local permitting offices, however, varies widely throughout the state, often correlated to the size of the city. Gaps exist in the dissemination of information about code compliance issues and training. There is moderate outreach from the state energy office to promote the codes, but gaps exist where local governments, stakeholders, and outside parties could participate to raise awareness of the code and its requirements, especially in rural areas. Our research has also shown that the priority of energy code enforcement also varies greatly depending on the building department.

**Gap:** Administration and enforcement of the state energy code is left to local jurisdictions – many of which have little means to do so effectively – leaving the state without a mechanism to ensure compliance.

**Recommendation #13:** Even with limited influence over local matters, AEO should increase their energy code activity to support local jurisdictions, particularly for smaller cities. The state energy office could request funding or find another source, such as a small tax on permit fees, to establish voluntary enforcement services.

### Outreach

Energy codes have come a long way, but there are still many people unaware of their benefits, including most consumers and some policymakers. Many code officials and building and design professionals are also uneducated about energy code requirements. Outreach involves all of the activities states and local jurisdictions can undertake to raise awareness of the need for energy codes, promote their adoption and implementation, and identify opportunities for training, technical assistance, and other support. Given the diversity of the energy codes community across the country, execution of strategic outreach campaigns can improve understanding of code changes, create buy-in, and can lead to greater levels of compliance.

## State's Role in Promoting Codes

The state's role in promoting energy codes has been limited in recent years due to various constraints, though opportunities for an enhanced state energy office profile and increased participation from other building codes community stakeholders do exist.

The Arkansas Energy Office is the main entity promoting energy codes in the state. AEO provides the 2004 Arkansas Energy Code for free online as well as links to free compliance tools from DOE and AEO.

Buildings & Programs Coordinator Evan Brown is a key conduit to local building departments and homebuilder associations, delivering custom-tailored PowerPoint presentations on energy codes around the state. Brown is also the main author of the two major pieces of compliance research conducted in Arkansas (see section on Compliance Measurement and Verification). Budget and time constraints, however, prevent AEO from reaching broader audiences through more in-depth outreach activities. A greater willingness to participate in long-form educational sessions, such as classroom training courses, from local builders will also be necessary to justify enhanced outreach programs.

One visible educational resource has been AEO's "Code Cards," small quick-reference guides for the requirements of the Arkansas Energy Code for each climate zone.<sup>44</sup> AEO has provided this resource free online, and has distributed thousands to homebuilders and code officials throughout the state. AEO has encouraged local code departments to distribute Code Cards to new builders in their areas.

Other past state outreach programs include a voluntary code compliance sticker campaign during the late 1990s. Promoted through big box retailers and building supply stores as well as television and radio advertisements, stickers recognizing new homes achieving a minimum energy standard were placed in

Figure 3 – Arkansas Energy Office "Code Card" for Zone 7B

### Additional Code Facts

**Compliance** with this Code applies statewide and shall be the responsibility of the licensed homebuilder.

**Enforcement** of this Code shall be the responsibility of the local government (if adopted).

**Exempt buildings** include the following: (1) Unconditioned buildings that are neither heated nor cooled; (2) mobile homes and temporary use structures such as hunting and fishing camps; and (3) boat houses and remote cabins that are not defined as "dwelling units."

**HVAC Equipment:** The Arkansas Mechanical Code requires a heating and cooling load analysis (Air Conditioning Contractors of America (ACCA) Manual J or other approved calculation method) to match the appropriate capacity of the systems to the load of the house in your climate. Request a Manual J load analysis from your HVAC company to verify that the systems have been properly sized.

**Duct Insulation:** Supply and return-air metal ducts in crawlspaces, uninsulated basements, attics and framed wall cavities must be vapor sealed and insulated to R-5.6. Ductwork located on the exterior must be insulated to R-8.

**Duct Construction:** All joints, seams and connections must be securely fastened and sealed with mastic, gaskets, mastic (adhesives), mastic-plus-embedded fabric or UL-approved tapes. Standard duct tape is not permitted.


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### Helpful Resources

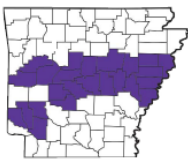
**REScheck™ for Arkansas**  
The compliance options in this brochure are not all-inclusive and may not reflect your construction practices, product choices or unique designs. As an alternative approach to code compliance, the Arkansas Energy Office offers the REScheck™ for Arkansas program—an easy-to-use code compliance software tool that can evaluate any home with any combination of R-values, window U-factors and specific component areas. For example, depending on window type, a two-story home might comply with the code with a slightly greater window percentage. The computer program provides the flexibility for tradeoffs between all envelope components, window efficiencies and higher-than-minimum heating/cooling equipment.

**Energy Performance Tune-up**  
This booklet provides Arkansas's builders with many helpful tips on building better-performing new homes. Improving performance increases comfort, improves longevity and reduces builder callbacks. Ask the Arkansas Energy Office (see below) for a free copy of the *Energy Performance Tune-up*.

**Code Materials and Assistance**  
All Energy Code materials and compliance tools are free. Call 1-800-658-2633 or 501-682-1370 to request a DVD or hard copies. Also, you can view and download materials at [www.arkansasenergy.org](http://www.arkansasenergy.org) by clicking on the "Residential" tab, then on the left click on "Builders" then "Energy Code."



**Arkansas 2004 Residential Energy Code**



**ARKANSAS**  
**Zone 7B**  
(HDD range is: 3000-3499)

Conway • Crittenden • Cross  
Faulkner • Garland  
Hempstead • Hot Spring  
Howard • Lee • Logan  
Lonoke • Monroe • Perry  
Phillips • Pike • Prairie  
Pulaski • Saline • Scott  
Sevier • St. Francis • White  
Woodruff • Yell

### Code Compliance

The 2004 Arkansas Energy Code for new home construction helps to ensure that the state's housing stock continues to retain its value, quality and affordability. This simplified code brochure has been developed for builders to more easily understand, use and comply with the Arkansas Energy Code.

A new home in ZONE 7 complies with the standards for the 2004 Arkansas Energy Code for New Construction if the following conditions are met:

- Ceiling insulation is R-30. If R-38 is used, add 1 percent to allowable window area.
- Exterior walls are R-13. With an additional R-3 exterior sheathing, add 1 percent to allowable window area.
- The percentage of double-glazed window area to gross wall area does not exceed values in the Maximum Allowable Window Percentages table.
- Floors over crawlspaces are R-19. If slab insulation is to be installed, then a minimum of R-4 is required. See the "Slab Insulation" section in this brochure.
- The heating and cooling system efficiencies are at least national minimums.

**Ceiling:** R-30. One percent of maximum allowable window area can be added to any of the above window percentages if the ceiling insulation is increased to R-38 or if a mixed-heel truss or other construction technique is used that allows the full R-30 to extend over the top plate of the exterior walls.

**Walls:** Exterior walls are R-13. With an additional R-3 exterior sheathing, add 1 percent to maximum allowable window percentage.

### Maximum Allowable Window Percentages

Window frame type	R-0 slab	R-4 slab or R-19 floor
Wood or vinyl with low-e and gas filled (U-0.41*)	17%	25%
Vinyl or wood (U-0.56*)	12%	17%
Thermal break aluminum (U-0.65*)	10%	14%
Aluminum—non-thermal (U-0.87*)	7%	10%

\* These U-factors are recognized default values for each window type. The maximum allowable window percentage may increase if a more efficient window (lower U-factor) is used.

**Percentage Window Area:** Estimate percent window in the wall by dividing the total rough opening of the window area by the gross wall area. The window percentage is a ratio of the window area in the heated and cooled space to the gross wall area. This includes, but is not limited to, decorative windows, glass doors and basement windows but excludes opaque doors and skylights.

**Percent Window Area Example:** The total rough opening window area is 180 square feet. The building's perimeter is 150 feet, and the walls are 10 feet high. Therefore, the gross wall area is 150 x 10 = 1,500 square feet. For this example, the percent of window in the wall is: 180 / 1,500 = 0.12 or 12 percent.

**Floor R-Value:** R-19. Requirements apply to floors over unconditioned spaces (unconditioned crawl spaces, basements and garages). Floors over outside air (patioes, bay windows, etc.) must meet the ceiling requirements.

**Slab Insulation:** R-4 or greater. Slab insulation is not required to meet minimum thermal code compliance. However, if slab insulation is installed, the code requires a total of twenty-four (24) inches of insulation. The first four (4) inches are critical and should be placed vertically around the perimeter of the slab. The remaining twenty (20) inches can run horizontally or vertically under the slab. Any exposed insulation shall be protected.

For most slab foundation types, there is a slab insulation technique that meets these specifications. If perimeter slab insulation is under consideration, check with a pest control company for approved methods in your area.

**National Minimums:** The national minimum system efficiency for cooling is 13 SEER (Seasonal Energy Efficiency Ratio); for heating it is 78 AFUE (Annual Fuel Utilization Efficiency) and for heat pumps it is 7.7 HSPF (Heating Season Performance Factor).

**Air Leakage:** All penetrations to the building envelope must be sealed, caulked, gasketed, weatherstripped or otherwise sealed. This includes, but is not limited to, areas around windows, doors, HVAC ductwork, plumbing pipe, electrical penetrations, etc.

For questions, call the Energy Code Hotline at 1-800-658-2633 or 501-682-1370, or e-mail your question to [EnergyInfo@ArkansasEDC.com](mailto:EnergyInfo@ArkansasEDC.com).

the house's electrical panel to signal discerning homebuyers. The expense of this pilot program limited its duration to only six months, though its voluntary status was also a notable weakness.

### Local Government's Role in Promoting Codes

Local governments generally have not taken an active role in promoting building energy codes. Resource issues often hamper their ability to perform their main tasks of plan review, inspection, and permit approval efficiently, even in the most professionalized building departments in the largest cities, so expectations of wide scale energy code outreach efforts are unrealistic at this time.

**Gap:** Many local jurisdictions have not considered or taken appropriate steps to improve energy code implementation.

**Recommendation #14:** Local jurisdictions should initiate action on their own or work with the state to initiate many of the recommendations above that deal with state support or encouragement of local policies.

AEO continues to encourage local inspectors to distribute the Code Cards to new and current builders in their areas. The impact of these resources, however, has decreased in recent years as decreasing revenues from permits fees have led to widespread layoffs of local code officials. This situation is worsened by the hundreds of builders that have left the industry while very few have entered to replace them. Estimates show that the membership of the Arkansas Homebuilders Association - as high as roughly 2,400 in 2005 – has declined to roughly 1,700 in 2010.<sup>45</sup> Code communities in the northwest, especially those surrounding Fayetteville and Springdale, have been hit particularly hard.

Fayetteville, however, has shown some innovation in promoting construction standards through its 'Code Ranger' Program, which includes a Code Activity Book, a Code Education Program, and Program Guide.<sup>46</sup> This code compliance program currently does not emphasize the energy code but is a resourceful strategy for making compliance with city codes easier and more understandable for city residents both young and old. Growth into energy codes is certainly possible for this program.

### Stakeholders' Role in Promoting Codes

Current stakeholder involvement in codes outreach in Arkansas is limited, though one current promotional resource and one prospective activity can provide some starting points for future growth. These groups can raise awareness of energy efficiency issues, often directly to energy consumers. When consumers start caring about energy issues, it increases demand for energy-efficient construction, which creates an environment in which improved construction materials and techniques required to meet the provisions of the latest energy codes become standard practice. This, in turn, allows for the adoption and implementation of even more efficient energy codes.

**Gap:** Disinterest from various stakeholders and lack of widespread energy code education hinders the formation of a culture of code compliance.



**Related Gap:** The state has not tapped into its full potential for building a broad energy codes coalition.

**Recommendation #15:** The state should expand its role as facilitator by working with non-governmental actors, such as the Southeast Energy Efficiency Alliance (SEEA), utilities, trade associations, manufacturers, environmental organizations, and others, to build a stronger coalition of interested parties that can influence changes that lead to stronger energy code implementation. Pressure – and incentives – from multiple parties coordinated at the state level can motivate the enforcement, design, and construction professionals in ways that the state cannot achieve through mandates.

**Related Recommendation:** AEO should consider available information from BCAP on the incremental cost of constructing a new home to the 2009 IECC, which would help builders understand that more efficient homes are not cost-prohibitive, as well as give jurisdictions an additional argument for implementing the latest model energy codes. BCAP’s weighted incremental cost analysis identified a simple payback period of less than four years for homeowners in most states if they were to update their energy code to the 2009 IECC. Rolled into a standard thirty-year mortgage, the added costs equate to a few dollars extra on monthly mortgage payments. These estimates are conservative and represent the upper bound on incremental cost (while BCAP has not performed this analysis specifically for the state of Arkansas yet, it is an important potential project).

**Table #1 – Incremental Cost of Building to the 2009 IECC (U.S. Average)**

Weighted Average Incremental Cost	Median Energy Savings	Simple Payback
\$818.72 per home	\$243.37 per year	3.36 years

Source: Estimated Energy Savings,<sup>47</sup> Building Codes Assistance Project<sup>48</sup>

Arkansas HomeBuilder Magazine may present one of the most powerful outreach tools already in place given buy-in from AHBA. The publication reaches every member homebuilder in the state as well as many trade practitioners.<sup>49</sup> Evan Brown of AEO writes columns for this monthly magazine and has composed articles on energy code and green building topics in the past.<sup>50</sup> Although no classes or educational offerings are currently listed on the AHBA website,<sup>51</sup> the network already established with the building community could be a major resource for outreach coordination.

AEO has previously contacted Arkansas Southwestern Electric Power Company (SWEPCO), a division of American Electric Power (AEP), about collaboration on code compliance. While receptive to the goals of greater lifetime energy efficiency, reduced peak power loads, and greater business certainty, SWEPCO and other utilities generally keep a distance from the code enforcement realm due to an uncomfortable perception of industry involvement. Utility involvement in compliance would also require the approval of the Arkansas Public Service Commission,<sup>52</sup> which stakeholders view as unlikely.

Interviews revealed that the state’s utilities are not active in energy code promotion, and it is unlikely they would be interested in becoming involved in code implementation. Arkansas has 41 gas and electric

utilities: four investor-owned electric utilities, one generation and transmission cooperative utility, and 18 cooperatives that make up the Electric Cooperatives of Arkansas. Arkansas also has four companies that sell natural gas. All of these utilities are regulated by PSC. There are also 15 municipal utilities PSC does not regulate. PSC also manages a home energy audit fund supported by utilities in the state.

Entergy, a major gas and electric utility, has launched its Residential Energy Solutions Program, whose benefits include:

- Providing customers with access to an Energy Efficiency Solutions Center representative, who may guide the customer to energy solution tips;
- An online calculator to determine potential home energy savings in their home;
- The opportunity for a walk-through home energy assessment of their home for those customers resolved to taking quick action by investing their money in energy efficiency improvements;
- Cash incentives to offset a portion of the upgrades if customers act within the 45-day period after the assessment occurs; and
- Providing a list of Partnering Contractors who have committed to promote high efficiency standards and can perform the work in the required timeframe.<sup>53</sup>

**Gap:** Utilities do not take a more active role in promoting and supporting energy code implementation.

**Recommendation #16:** Utilities should do more to support energy code implementation by beginning or expanding their outreach efforts on energy efficiency and energy codes to consumers and businesses. Utilities can develop messaging and marketing campaigns that connect their targeted audiences to resources that make energy efficiency an easy and practical tool for saving energy and lowering rates. One example of an effective campaign is Entergy's Residential Energy Solutions Program.

Other informal discussions with local architects and engineers have yielded some support for a delayed implementation period should the state update its commercial energy code in the future to focus on code education and training for continuing education units (CEUs) toward necessary licensing and professional certification. This would bridge the gap on stakeholder education on ASHRAE Standard 90.1-2001 to Standard 90.1-2007, providing a smoother transition. One possible alternative would be a "grace period," a common inclusion in code adoptions around the nation that allows builders to use either the previous code or the new code for some amount of time before the full implementation of the new code.

**Gap:** Stakeholder pushback to potential code updates in the next few years due to limited time to receive education and training on a new code.

**Recommendation #17:** Allow and promote a delayed implementation phase, or "grace period" for a future energy code updates that allows builders to use either the previous code or the new code for some amount of time before the full implementation of the new code.



Arkansas's growing technical/community colleges are another potential seed for developing energy code and building energy efficiency stakeholders to improve the state's enforcement infrastructure (see section "Enforcement Community, Third Party Infrastructure" below).

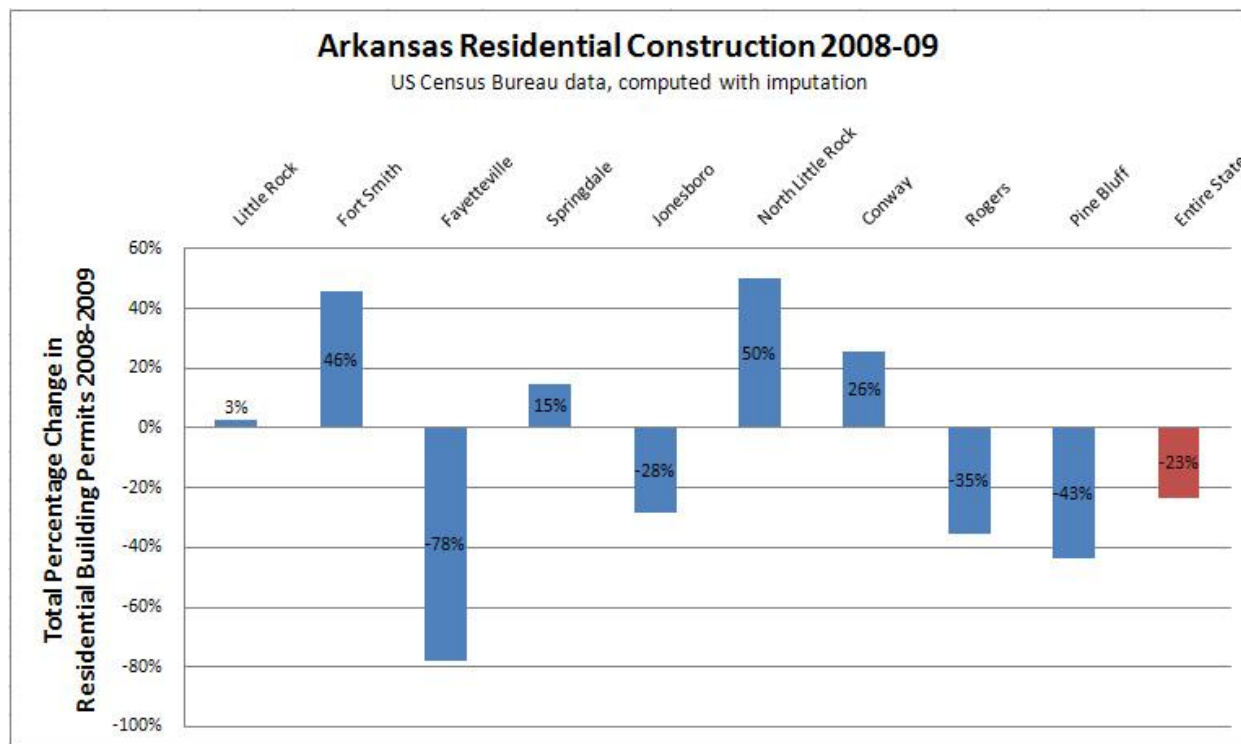
## Enforcement Community

The enforcement community provides the teeth behind adopted codes, as it is their responsibility to ensure that design and building professionals comply with the provisions of the energy code. While enforcement is most commonly a local issue, states play a crucial role in providing municipalities with the resources and support they need to establish effective enforcement infrastructures and practices. As codes are a moving target, it is also incumbent on states and cities to provide the enforcement community with access to sufficient energy code training.

## Overview of Enforcement Infrastructure

The administration of the state energy code is the responsibility of local jurisdictions. Most cities handle this through local building departments, although one county – Benton County in northwest Arkansas – issues permits in the municipalities it encompasses. The state energy office has no involvement in enforcement at the plan review/inspection level. Substantial issues with energy code compliance from individual building inspections are to be referred to AEO, which frequently receives code compliance failure reports from homebuyers and home inspectors.

**Figure 3 – Construction Decline in Communities of 50,000 or More**



As is the case in many building departments across the country, health/life-safety codes are a much higher priority than energy codes during building inspections. According to BCAP's research, most local code enforcement officials are aware of the general requirements of the energy code when performing inspections, but in most jurisdictions there is no formal checklist process or certification of energy code compliance. In fact, the actual performance of inspections – even in jurisdictions with more funding and resources – is considered the exception to the rule, and energy efficiency is typically not on the radar of most code officials.

**Gap:** Many local jurisdictions do not make energy codes a priority. Inspections are often not performed at all.

**Recommendation #18:** Local decision-makers should examine or reevaluate where energy codes stand in their list of priorities. It is important for the state to emphasize the building science behind energy codes so that others understand the interrelated nature of building systems and employ an integrated approach to design, construction, and enforcement. Messaging should stress that energy codes are integral to life, health, and safety and should, therefore, be viewed as an equal priority.

No formal assessment of the enforcement infrastructure in Arkansas has been conducted by the state energy office or outside parties. From our interviews with members of the building community, stakeholders reveal a general lack of emphasis on the energy code throughout the local enforcement organizations in the state. While this ranges from cursory spot checks to complete disregard depending on the city, major support is needed to raise the importance of energy codes along the spectrum of stakeholders and provide the education and tools for effective enforcement by the state's 343 code inspectors (as of 2009).<sup>54</sup>

**Gap:** No formal assessment of the enforcement infrastructure in Arkansas has been conducted by the state energy office or outside parties.

**Related Gap:** Local jurisdictions have different standards and expectations for energy code implementation.

**Recommendation #19:** The state should use its reach and influence to encourage uniformity for energy code implementation requirements and practices, which would reduce the patchwork nature of energy codes and practices in the state that add confusion to the market and reduce compliance.

Regional enforcement programs – the pooling of resources over multiple jurisdictions – present one option for improving enforcement in rural and unincorporated areas, but remain unlikely in the absence of broad, long-term support. Newton County, a sparsely populated area in northwest Arkansas, currently has no cities that issue building permits.<sup>55</sup> This would be a logical candidate for enforcement by the county government or through a regional program, but resource issues like funding and staffing as well as a disinterest in assuming that role (short of a state mandate) remain major barriers.

**Gap:** Newton County, a sparsely populated area in northwest Arkansas, currently has no cities that issue building permits.

**Recommendation #20:** The state should encourage the development of regional enforcement programs that pool resources over multiple jurisdictions to provide other options for rural and unincorporated areas to improve energy code enforcement.

### Certification and/or Licensing

The state of Arkansas does not certify code enforcement officials, leaving this to individual municipalities. The reality of local requirements, however, does create somewhat of a de facto uniform certification standard throughout the state. Almost all permitting jurisdictions require code officials to retain certification through the International Code Council, which remains valid for three years. During the three-year period prior to the renewal application date, code officials must accrue the number of CEUs required for each certificate. The number of CEUs per certificate range from 1.5 to 4.5, with a variety of ways to earn credits. A common path is 0.1 CEUs per hour of participation in a seminar or technical session delivered by ICC or other approved organization. Certification fees are generally under \$100. Most jurisdictions do not require certification in energy inspection categories.<sup>56</sup>

**Gap:** Most jurisdictions do not require certification for code enforcement officials in energy code inspection categories.

**Related Recommendation (see #19):** The state should use its reach and influence to encourage uniformity for energy code implementation requirements and practices, which would reduce the patchwork nature of energy codes and practices in the state that add confusion to the market and reduce compliance.

### Training and CEUs

The Arkansas Energy Office has been the only energy code training presence in the state during the past decade. Evan Brown is well known throughout the building codes community as a dedicated energy efficiency advocate. He has made frequent presentations on the building energy performance and green building topics to meetings of the Code Officials of Arkansas (COAR) and the Arkansas Home Builders Association throughout the state.

COAR hosts three code training conferences per year, generally two-day events in the spring, summer, and early winter. ICC typically provides half-day instruction courses for each event. Energy codes, however, are not topics addressed in these trainings. Code officials believe their colleagues would be receptive to energy code training – including third party training – if it were provided, especially if such sessions offered CEUs recognized by ICC.

Frequently occurring barriers of state funding and staffing constraints continue to cast doubt on future training opportunities. Large-scale activities will likely be dependent on updating the state energy code. State energy officials envision multiple sessions in each of the populous northwest and central regions as well as sessions in the northeast and rural south. Webinars and online content would also be useful in updated commercial code training.

### Third Party Infrastructure

Arkansas does appear to have a burgeoning technical/community college population that has the potential to engrain firsthand knowledge about energy codes and building energy efficiency as they train the green collar workers of tomorrow.

In May 2010, the Arkansas Energy Sector Partnership was established through a \$4.8 million Recovery Act grant to develop curricula and programs through Arkansas's 22 two-year colleges to train participants for careers in three targeted industries: energy efficient building, construction and retrofitting; renewable electric power; and energy efficiency assessment. Training will include on-the-job training, classroom training, customized training with an existing registered apprenticeship program or labor-management partnership, technology-based learning, and other appropriate strategies.

Three Energy Centers of Excellence located at Pulaski Technical College in North Little Rock, Phillips Community College of the University of Arkansas at Helena, and Northwest Arkansas Community College at Bentonville have been recognized as leaders in developing training programs targeting green jobs. The centers will assist with developing the curriculum to train workers for energy efficiency industries, energy auditors, energy raters, and weatherization workers. The centers will provide training to the rest of the two-year colleges, labor organizations, and apprenticeship programs.<sup>57</sup> Pulaski Technical College<sup>58</sup> and Northwest Arkansas Community College<sup>59</sup> were also named BPI training affiliates in 2010.

**Gap:** Available state technical and community college programs involving energy efficiency, green building practice, and sustainability do not include courses or materials on the state energy code.

**Related Gap:** More energy code and building science training is needed to ensure that enforcement officials and design and building professionals have the knowledge and skills needed to understand the provisions of the model energy codes and their application in the field, as well as green and above-code standards.

**Recommendation #21:** The state should build on the existing infrastructure by supporting and collaborating with community colleges, technical schools, and the state university system to increase training for energy efficiency professionals with expertise in building science and energy codes. The state could also subsidize tuition for energy efficiency-related training and classes. One AHBA leader noted the success of a scholarship fund created through the Recovery Act that subsidized \$1,000 of the \$1,500 total cost of a one week HERS rater certification course for a handful of prospective students.

ENERGY STAR for New Homes remains another potential stepping stone to update state energy codes, as those homes already meet the energy savings of the 2009 IECC. One Benton homebuilder has constructed over 100 ENERGY STAR rated homes, roughly one out of every seven currently recognized in the state.

## Design/Construction Community

The design and construction community—made up of designers, architects, engineers, developers, builders, and subcontractors—are in charge of conceiving and constructing the built environment. It is ultimately their responsibility to comply with the requirements of the adopted energy codes. However, state and local agencies, energy code advocates, and other stakeholder groups share in this responsibility. They should provide the training, tools, educational materials, and support to understand and be able to comply with the code, including how to correctly install materials and use testing equipment. They should also work with the design and construction community to establish a workable compliance process that is accountable, yet flexible, and accommodates local practices and circumstances.

### Overview of Design/Construction Community Infrastructure

The Arkansas Home Builders Association is the state chapter of the National Association of Homebuilders (NAHB). It has about 1,700 members and 16 local affiliate chapters representing all aspects of the residential construction industry. Chartered in April 1966, the AHBA “represents the merchant homebuilder and speaks for the residential construction industry voice of the subcontractor, supplier, manufacturer, and the other business interests that serve the industry.”<sup>60</sup>

The Arkansas Chapter of the American Institute of Architects (AIA) organizes architects in the state with the mission “to advance the science and art of planning and building by advancing the standards of architectural education, training and practice.”<sup>61</sup> Sustainability of the built environment is a tenet of the national goals of AIA, and this is reflected in the licensing requirements for its members.

### Certification, Licensing, and Continuing Education

The Arkansas State Board of Architects regulates licensing for the profession in the state. Each Arkansas registered architect is required to complete a minimum of 12 continuing education hours along with a \$100 license renewal fee each fiscal year. Eight CEHs (minimum) shall include the study of relevant technical and professional architectural subjects related to safeguarding life, health, property, and promoting public welfare. Four CEHs (maximum) may consist of elective topics related to any other area in the practice or architecture, including sustainable design. The Board accepts continuing education programs from the neighboring states of Oklahoma, Texas, Louisiana, and Tennessee.<sup>62</sup>

The AIA Board of Directors recently modified the AIA-member continuing education requirement to include four hours of education in sustainable design as part of the existing 18-hour annual requirement (see Figure 4). This sustainable design requirement became effective in calendar year 2009 and extends through 2012.<sup>63</sup>

**Figure 4 – AIA Member Continuing Education Requirements**

HSW	HSW	HSW SD	HSW SD	HSW SD	HSW SD
HSW	HSW	LU	LU	LU	LU
LU	LU	LU	LU	LU	LU

- 18-hour annual continuing education requirement
- 8 learning units (LU) must address health, safety, and welfare (HSW), of which
- 4 learning units (LU) must address sustainable design (SD)

## Training

Training of the building community in recent years has been limited. While state energy officials believe the construction community would be receptive to training depending on the format as well as time and financial commitments, training geared specifically towards the state energy code may not be met as positively.

Arkansas HomeBuilder Magazine could be a major voice advertising future code training sessions and resources. While the AHBA website did not list any upcoming education opportunities as of December 2010,<sup>64</sup> the publication reaches every member homebuilder in the state as well as many trade practitioners. As mentioned before, Evan Brown of AEO has been a fixture in recent years through his columns in the magazine as well as at local HBA luncheons and dinner programs providing presentations on the state energy code.

**Gap:** Education and training programs for the building professional community on the state energy code have been limited.

**Recommendation #22:** Take advantage of the outreach capable through the homebuilding community's current communications outlets Arkansas HomeBuilder Magazine and [www.arkansashomebuilders.org](http://www.arkansashomebuilders.org) to promote future educational opportunities provided by AEO and third parties.

As previously mentioned, the burgeoning technical and community colleges of Arkansas are already providing programs related to green building and energy efficiency, including home energy rating certification (see section on Implementation: Enforcement Community, Third Party Infrastructure). These are ready-made opportunities to create educational resources for the state energy code.

According to a Fort Smith code official, the University of Arkansas at Fort Smith has an architectural training program, though currently it only addresses the electrical code. Curriculum involving the energy code and energy efficiency topics could represent room for growth in training within the design community.

**Gap:** Local architectural programs do not provide training on the state energy code for students.

**Recommendation #23:** The state should coordinate with higher learning institutions with architectural programs to include coursework on the state energy code as an opportunity to meet certification and continuing education requirements for sustainable design.

## Compliance Measurement and Verification

The Arkansas Energy Office permits the use of the Department of Energy software *REScheck for Arkansas* to demonstrate compliance with the thermal shell requirements of the 2004 Arkansas Energy Code. *REScheck* allows trade-offs to be made between all envelope components as well as trade-offs for higher than minimum heating and cooling equipment.<sup>65</sup> AEO also recognizes *COMcheck-EZ* as a "deem to comply" software tool to determine compliance with ASHRAE Standard 90.1-2001.<sup>66</sup>

A simplified code compliance tool was also developed to evaluate compliance with the 2004 Arkansas Energy Code based on current Arkansas building practices, technologies, and product availability.

The 2003 IECC identifies four climate zones in Arkansas. AEO developed a simplified compliance tool for each of the four zones. Each climate zone's compliance tool prescribes efficiency levels for walls and ceilings. When these prescribed insulation levels are used with an allowable window percentage (of the gross wall area) for a particular window frame type, then the building will comply with the thermal requirements.

Online users can select the appropriate compliance tool by county:

- *Climate Zone 6B:* Arkansas, Ashley, Bradley, Calhoun, Chicot, Clark, Cleveland, Columbia, Dallas, Desha, Drew, Grant, Jefferson, Lafayette, Lincoln, Little River, Miller, Nevada, Ouachita, and Union counties
- *Climate Zone 7B:* Conway, Crittenden, Cross, Faulkner, Garland, Hempstead, Hot Spring, Howard, Lee, Logan, Lonoke, Monroe, Perry, Phillips, Pike, Prairie, Pulaski, Saline, Scott, Sevier, St. Francis, White, Woodruff, and Yell counties
- *Climate Zone 8:* Clay, Cleburne, Craighead, Crawford, Franklin, Fulton, Greene, Independence, Izard, Jackson, Johnson, Lawrence, Mississippi, Montgomery, Poinsett, Polk, Pope, Randolph, Sebastian, Sharp, and Van Buren counties
- *Climate Zone 9B:* Baxter, Benton, Boone, Carroll, Madison, Marion, Newton, Searcy, Stone, and Washington counties

**Gap:** An energy code with four different climate zones requires education for, and builder awareness of, four different sets of requirements.

**Recommendation #24:** Adopt the 2009 IECC statewide, which has reduced the number of climate zones in Arkansas to two, simplifying requirements for enforcement and building professionals.

With energy codes becoming ever more stringent, it is increasingly important for the enforcement and building communities to take extra steps to ensure that buildings achieve their desired energy savings,



as many buildings that comply with site plans and pass on-site inspections still do not live up to their potential. The solution to underperforming buildings is measurement and verification (M&V), or the process of measuring energy performance and verifying that it matches the expected outcome. On the micro level, this process—known as commissioning for large commercial construction and performance testing for residential construction—involves blower door tests, duct blaster tests, and other performance measurements. On the macro level, it can involve state agencies, utilities, building science professionals, advocacy organizations, and other stakeholders compiling and analyzing building performance statistics to measure compliance and gauge implementation effectiveness.

### Past and Current Activities

The first evaluation of homes in Arkansas was a 1998-1999 survey of 100 new homes built in central and northwest Arkansas. The survey's observations were published in the 1999 report "Energy Performance Evaluation of New Homes in Arkansas." Although this study did touch upon code compliance, it is not a main subject area, as its emphasis was on building performance as a means to encourage code compliance:<sup>67</sup>

*To encourage builders to build more energy efficient homes, the Arkansas Energy Office (AEO) has conducted a study of a performance-based approach to energy code compliance. This project has monitored the complete construction process of 100 newly built homes in central and northwest Arkansas, the two distinct climate zones that comprise the major building areas in this state.*

*After the homes were completed, a blower door test was used to estimate each home's air and, by subtraction, duct leakage and fireplace leakage. The energy efficiency of the home has been expressed to the builder, and potentially to prospective buyers, by comparing its estimated utility costs with the costs associated with just meeting the Code.*

*Ultimately, the buyer can use this information to comparison shop, and the builder will hopefully be encouraged to optimize energy efficiency as a competitive marketing strategy. Builders will be able to get credit for important items such as air leakage reduction that current Code compliance methods are unable to effectively address.*

Two AEO companion publications followed this study. The first was a paper titled, "Energy Performance Evaluation (Circuit Rider Report)," which was a summary of the much larger initial report. The second, a booklet titled "Energy Performance Tune-up—Builder Tips for New Home Construction," was completed in June 2001 by Evan Brown of AEO. The Tune-up was concerned with improving building performance based on the results of the 1998-1999 survey. The booklet's introduction identified several areas where compliance improvement would yield myriad benefits of better home construction:

*A close evaluation of the construction process, from bottom to top, from beginning to end, indicated that there were several areas where small changes or improvements could be made that would enhance energy performance, lengthen a building's lifetime, reduce call-backs, increase comfort levels, add to the value of the homebuilder's product, and reduce the cost of construction.<sup>68</sup>*



Among the major findings of the 1998-1999 survey:

- Only about half of new homes surveyed passed the Arkansas Energy Code requirements. Many of the homes that failed came close to passing.
- The selection of solid aluminum frame windows (no thermal break) kept many homes from passing the Code.
- Many ceilings were under-insulated-or inconsistently insulated. Insulation certificates were found in only a few homes.
- Fireplaces caused additional air leakage ranging from 5 percent to almost 20 percent of the total air leakage of the house.
- Heating and cooling systems were oversized, and most ducts were sealed with temporary (duct) tape, not mastic. Oversized cooling systems cost builders an average of \$600 in unnecessary expenditures for excess capacity.
- Homemade return ducts caused excessive duct leakage.

The only significant residential compliance study conducted by AEO under the current 2004 Arkansas Energy Code was detailed in the 2006 report “Code Compliance: Then and Now.” Since the IECC codes that appeared after the 2003 edition have simplified Arkansas’s four climate zones into only two, a division was made between homes in the northwest and “outside of the northwest” to study the state’s code compliance:

*In the 1999 survey, 53 percent of homes in northwest Arkansas met code compliance and 47 percent failed. The 2006 survey indicates that 57 percent of northwest homes are passing the code and 43 percent are failing. This indicates that in a period of seven years the improvement in code compliance is about 4 percent. While this looks like this is slow progress, comparing these rates to homes outside of the northwest shows a great discrepancy.*

*In the 1999 survey, 56 percent of homes outside of northwest Arkansas complied with the energy code and 44 percent failed. The 2006 survey found that 95 percent of homes outside of the northwest passed the code and only 5 percent failed! Therefore, in that same seven year period, code compliance outside the northwest improved by 39 percent.<sup>69</sup>*

The study also found that homes outside the northwest that passed the code performed substantially better (about 12 percent above code) than those that passed the code in the northwest (about 1 percent above code). The report noted that builders in the northwest used the same efficiency levels (some are actually lower) that were used in the warmer zones in the state. The most common areas of code failure were floor insulation, too much window area given a particular window type, slab insulation, and ceiling insulation. The report also estimated that about half of all HVAC systems in both regions were oversized.<sup>70</sup> It recommended that builders in the northwest zone need to apply improved standards that are consistent with their colder climate.

AEO is eager to conduct more compliance studies in the future. Estimates of the current compliance rate for areas outside of northwest Arkansas remain high as building practice (as perceived by AEO) has not declined. Small, incremental gains in the compliance rate in northwest Arkansas were probable as aluminum window cladding has gradually been replaced by vinyl as a common product choice by builders. Larger gains are possible through higher levels of the installation of floor insulation over crawlspaces.

No other compliance studies in Arkansas were known within the state energy office, utilities, code officials, or the building community. Serious concerns were raised about meeting the compliance goals of the Recovery Act. Cost barriers of measuring compliance in new and renovated commercial building stock, which could require the services of professional engineers, were especially troublesome. Some estimated costs of one quarter of a million dollars or even much higher depending on the final number of new buildings and major renovations measured.

Ongoing, sustainable funding levels for compliance activities in the future appear unlikely as well. The largest funding source through the Recovery Act transmitted \$39.4 million in DOE State Energy Program appropriations through the Arkansas Economic Development Commission. While many worthy programs were approved, including several incentivizing homeowner, green building, and building energy efficiency projects, no funding was allocated for energy codes efforts.<sup>71</sup> AEO has no access to EDC funding made available through the Recovery Act or otherwise and must therefore look for other opportunities. Arkansas also did not receive one of the 24 Building Energy Code Adoption, Training, and Compliance grants awarded by DOE/PNNL in November 2010.<sup>72</sup>

**Gap:** No local jurisdictions have conducted comprehensive measurement and verification studies.

**Recommendation #25:** All local jurisdictions should consider conducting a comprehensive measurement and verification study in their areas to better understand and improve energy code enforcement and compliance practices and techniques. This is particularly important for larger cities with more new construction. In the absence of sufficient funding, jurisdictions should consider collaborating with local utilities.

## Implementation Summary: Best Practices and Recommendations

### Current Best Practices

- The Arkansas Energy Office is the main entity promoting energy codes in the state. AEO provides the 2004 Arkansas Energy Code for free online as well as links to free compliance tools from DOE and AEO.
- Evan Brown of AEO has been a fixture in energy code promotion in recent years through his columns in the AHBA magazine as well as providing presentations on the state energy code at local HBA luncheons and dinner programs and meetings of COAR.
- AEO's "Code Cards" – small quick-reference guides for the requirements of the Arkansas Energy Code – have been a major, visible educational resource.
- One Benton homebuilder has constructed over 100 ENERGY STAR rated homes, roughly one out of every seven currently recognized in the state.
- Fayetteville's "Code Ranger" program has been an innovation outreach tool promoting construction standards through a Code Activity Book, a Code Education Program, and Program Guide.
- Entergy, a major gas and electric utility, has launched its Residential Energy Solutions Program, a consumer outreach program incentivizing home energy efficiency.
- One AHBA leader noted the success of a scholarship fund created through the Recovery Act that subsidized \$1,000 of the \$1,500 total cost of a one week HERS rater certification course for a handful of prospective students.
- AEO's two previous compliance studies "Energy Performance Tune-up" (1999) and "Code Compliance: Then and Now" (2006) are solid models for future studies measuring compliance with an updated Arkansas Energy Code
- The Arkansas Energy Sector Partnership was established through a \$4.8 million Recovery Act grant to develop curricula and programs through Arkansas's 22 two-year colleges to train participants for careers in the three targeted construction industries.
- Three Energy Centers of Excellence located at Pulaski Technical College in North Little Rock, Phillips Community College of the University of Arkansas at Helena, and Northwest Arkansas Community College at Bentonville have been recognized as leaders in developing training programs targeting green jobs.

### Gaps and Recommendations

#### *Outreach*

**Gap:** Administration and enforcement of the state energy code is left to local jurisdictions – many of which have little means to do so effectively – leaving the state without a mechanism to ensure compliance.

**Recommendation #13:** Even with limited influence over local matters, AEO should increase their energy code activity to support local jurisdictions, particularly for smaller cities. The state energy

office could request funding or find another source, such as a small tax on permit fees, to establish voluntary enforcement services.

**Gap:** Many local jurisdictions have not considered or taken appropriate steps to improve energy code implementation.

**Recommendation #14:** Local jurisdictions should initiate action on their own or work with the state to initiate many of the recommendations above that deal with state support or encouragement of local policies.

### *Training*

**Gap:** Disinterest from various stakeholders and a lack of widespread energy code education hinders the formation of a culture of code compliance.

**Related Gap:** The state has not tapped into its full potential for building a broad energy codes coalition.

**Recommendation #15:** The state should expand its role as facilitator by working with non-governmental actors, such as SEEA, utilities, trade associations, manufacturers, environmental organizations, and others, to build a stronger coalition of interested parties that can influence changes that lead to stronger energy code implementation. Pressure—and incentives—from multiple parties coordinated at the state level can motivate enforcement, design, and construction professionals in ways that the state cannot achieve through mandates.

**Related Recommendation:** AEO should consider available information from BCAP on the incremental cost of constructing a new home to the 2009 IECC, which would help builders understand that more efficient homes are not cost-prohibitive, as well as give jurisdictions an additional argument for implementing the latest model energy codes. BCAP's weighted incremental cost analysis identified a simple payback period of less than four years for homeowners in most states if they were to update their energy code to the 2009 IECC. Rolled into a standard thirty-year mortgage, the added costs equate to a few dollars extra on monthly mortgage payments. These estimates are conservative and represent the upper bound on incremental cost (while BCAP has not performed this analysis specifically for the state of Arkansas yet, it is an important potential project).

**Gap:** Utilities do not take a more active role in promoting and supporting energy code implementation.

**Recommendation #16:** Utilities should do more to support energy code implementation by beginning or expanding their outreach efforts on energy efficiency and energy codes to consumers and businesses. Utilities can develop messaging and marketing campaigns that connect their targeted audiences to resources that make energy efficiency an easy and practical tool for saving energy and lowering rates. One example of an effective campaign is Entergy's Residential Energy Solutions Program.

**Gap:** Stakeholder pushback to potential code updates will be heavy in the next few years due to limited time to receive education and training on a new code.

**Recommendation #17:** Allow and promote a delayed implementation phase, or “grace period” for a future energy code updates that allows builders to use either the previous code or the new code for some amount of time before the full implementation of the new code.

#### *Enforcement Community*

**Gap:** Many local jurisdictions do not make energy codes a priority. Inspections are often not performed at all.

**Recommendation #18:** Local decision-makers should examine or reevaluate where energy codes stand in their list of priorities. It is important for the state to emphasize the building science behind energy codes so that others understand the interrelated nature of building systems and employ an integrated approach to design, construction, and enforcement. Messaging should stress that energy codes are integral to life, health, and safety and should, therefore, be viewed as an equal priority.

**Gap:** No formal assessment of the enforcement infrastructure in Arkansas has been conducted by the state energy office or outside parties.

**Related Gap:** Local jurisdictions have different standards and expectations for energy code implementation.

**Recommendation #19:** The state should use its reach and influence to encourage uniformity for energy code implementation requirements and practices, which would reduce the patchwork nature of energy codes and practices in the state that add confusion to the market and reduce compliance.

**Gap:** Newton County, a sparsely populated area in northwest Arkansas, currently has no cities that issue building permits.

**Recommendation #20:** The state should encourage the development of regional enforcement programs that pool resources over multiple jurisdictions to provide other options for rural and unincorporated areas to improve energy code enforcement.

**Gap:** Most jurisdictions do not require certification for code enforcement officials in energy code inspection categories.

**Related Recommendation (see #19):** The state should use its reach and influence to encourage uniformity for energy code implementation requirements and practices, which would reduce the patchwork nature of energy codes and practices in the state that add confusion to the market and reduce compliance.

### *Design/Construction Community*

**Gap:** Available state technical and community college programs involving energy efficiency, green building practice, and sustainability do not include courses or materials on the state energy code.

**Related Gap:** More energy code and building science training is needed to ensure that enforcement officials and design and building professionals have the knowledge and skills needed to understand the provisions of the model energy codes and their application in the field, as well as green and above-code standards.

**Recommendation #21:** The state should build on the existing infrastructure by supporting and collaborating with community colleges, technical schools, and the state university system to increase training for energy efficiency professionals with expertise in building science and energy codes. The state could also subsidize tuition for energy efficiency-related training and classes. One AHBA leader noted the success of a scholarship fund created through the Recovery Act that subsidized \$1,000 of the \$1,500 total cost of a one week HERS rater certification course for a handful of prospective students.

**Gap:** Education and training programs for the building professional community on the state energy code have been limited.

**Recommendation #22:** Take advantage of the outreach capable through the homebuilding community's current communications outlets Arkansas HomeBuilder Magazine and [www.arkansashomebuilders.org](http://www.arkansashomebuilders.org) to promote future educational opportunities provided by AEO and third parties.

**Gap:** Local architectural programs do not provide training on the state energy code for students.

**Recommendation #23:** The state should coordinate with higher learning institutions with architectural programs to include coursework on the state energy code as an opportunity to meet certification and continuing education requirements for sustainable design.

### *Compliance Measurement & Verification*

**Gap:** An energy code with four different climate zones requires education for, and builder awareness of, four different sets of requirements.

**Recommendation #24:** Adopt the 2009 IECC statewide, which has reduced the number of climate zones in Arkansas to two, simplifying requirements for enforcement and building professionals.

**Gap:** No local jurisdictions have conducted comprehensive measurement and verification studies.

**Recommendation #25:** All local jurisdictions should consider conducting a comprehensive measurement and verification study in their areas to better understand and improve energy code enforcement and compliance practices and techniques. This is particularly important for larger cities with more new construction. In the absence of sufficient funding, jurisdictions should consider collaborating with local utilities.

## Conclusion

Energy efficiency – through the adoption and enforcement of strong building energy codes – is the quickest, cheapest, and cleanest way to reduce energy consumption and help achieve a sustainable, prosperous future for Arkansas. Compliance with the code not only helps consumers and businesses save money on their energy bills, it also reduces pollution and peak loads, resulting in a cleaner environment and a more stable and diverse energy supply. Improving the tools of the state energy office to adopt updated codes, empowering local jurisdictions to effectively enforce them, and creating demand for code compliance will help Arkansas continue in the right direction toward greater energy efficiency in the built environment.

Working with local governments and energy code advocates and stakeholders in the state, the Arkansas Energy Office plays a pivotal role in raising awareness of energy efficiency issues and promoting the uniform implementation of the Arkansas Energy Code in jurisdictions across the state. AEO can also provide the state-level coordination, resources, expertise, and training necessary to support local enforcement professionals as well as the design and construction communities to keep them up-to-date with the model energy code and its requirements. The state can also analyze gaps in the enforcement infrastructure to find to improve compliance for all types of construction in Arkansas. Even in a state that values jurisdictional independence, there is much the state government can do to ensure that its citizens benefit from the widespread adoption and successful implementation of the model energy codes.

The recommendations made in this Gap Analysis, summarized below in Table #2, are meant to guide state officials and other Arkansas stakeholders as they work to support improved code adoption and implementation and begin the process of developing a compliance action plan. Though some recommendations may require increased funding over an extended period, a careful and comprehensive action plan that leverages existing infrastructure and provides the state with realistic funding mechanisms will help ensure that new construction and major renovations in the state achieve 100 percent compliance with the model energy codes now and in the future.



**Table #2 – Recommendations Chart**

<b>Adoption</b>
<b>State Policy</b>
Adopt the 2009 IECC and ASHRAE Standard 90.1-2007 statewide and certify to DOE the state’s compliance with EAct (p. 15)
Develop legislation granting sole authority to update the Arkansas Energy Code to the Arkansas Energy Office along with directions creating regular review cycles (p. 16)
Develop legislation creating automatic energy code review cycles concurrent with the three-year model code development cycles (p. 16-17)
Coordinate with the state about funding that may be available for codes outreach through AEO (p. 17)
Develop updated energy standards for new and renovated state buildings based on ASHRAE Standard 90.1-2010 (p. 18)
Expand incentives for builders whose projects qualify for ENERGY STAR certification (p. 21)
Coordinate educational resources and curriculum ideas with contacts from BPI and local higher learning institutions with programs related to construction (p. 21)
Reach out to Building America about opportunities to involve the organization in future projects in the state (p. 21)
<b>Local Policy</b>
In future adoption cycles for the state’s construction codes, delete Chapter 13 of the IBC and Chapter of the IRC and replace the text with references to the counterpart IECC edition (p. 23)
Encourage willing and able local jurisdictions to adopt the 2009 IECC to prepare for potential statewide code updates (p. 23)
Encourage local adoption of above codes by developing a voluntary “stretch code” as an appendix and provide incentives for code training funding (p. 23)
Local jurisdictions that have made voluntary agreements on climate change should emphasize energy codes as a priority by adopting the latest national model energy codes and setting an example for other Arkansas municipalities. (p. 24)

<b>Implementation</b>
<b>Outreach</b>
Increase AEO energy code activity to support local jurisdictions, particularly for smaller cities (p. 28)
Local jurisdictions should initiate action on their own or work with the state to initiate energy code recommendations (p. 30)
<b>Training</b>
The state should expand its role as facilitator by working with non-governmental actors to build a stronger coalition of interested parties that can influence changes that lead to stronger energy code implementation (p. 30-31)
Utilities should do more to support energy code implementation by beginning or expanding their outreach efforts on energy efficiency and energy codes to consumers and businesses (p. 32)
Allow and promote a delayed implementation phase, or “grace period” for a future energy code updates that allows builders to use either the previous code or the new code for some amount of time before the full implementation of the new code (p. 32)
<b>Enforcement Community</b>
Local decision-makers should examine or reevaluate where energy codes stand in their list of priorities among other construction codes (p. 34)
The state should use its reach and influence to encourage uniformity for energy code implementation requirements and practices (p. 34)
The state should encourage the development of regional enforcement programs that pool resources over multiple jurisdictions to provide other options for rural and unincorporated areas to improve energy code enforcement (p. 34-35)

<b>Design/Construction Community</b>
The state should build on the existing higher learning infrastructure by supporting and collaborating with community colleges, technical schools, and the state university system to increase training (p. 36)
Take advantage of the outreach capable through the homebuilding community's current communications outlets (p. 38)
The state should coordinate with higher learning institutions offering architectural programs to include coursework on the state energy code (p. 39)
<b>Compliance Measurement &amp; Verification</b>
Reduce the number of climate zones and simplify requirements by adopting the 2009 IECC statewide (p. 39)
Local jurisdictions should consider conducting a comprehensive measurement and verification study in their areas (p. 42)

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## Appendix A – Additional PNNL Resource List

The U.S. Department of Energy provides a number of useful resources that can assist states and local governments in their efforts to achieve code compliance. Many of these resources are available at [www.energycodes.gov](http://www.energycodes.gov). Materials include training presentations and background on DOE-sponsored software programs, REScheck and COMcheck, which evaluate compliance for residential and commercial buildings, respectively. These software programs, which present prescriptive code requirements and calculate compliance tradeoffs, simplify the process of evaluating a building's code compliance. By explaining requirements, these software programs can help designers, builders, and code officials streamline efforts to achieve code compliance.

### Resource Guides for Code Officials

1. ICC/DOE BECP Resource Guide for Code Officials: a comprehensive and easy to read collection of the best resources available from ICC and DOE.

<http://www.energycodes.gov/publications/resourceguides/>

### Energy Code Compliance Training Materials:

1. Commercial PowerPoint Training with links to videos  
[http://www.energycodes.gov/becu/documents/Commercial\\_90\\_Percent\\_Eval\\_Inspect\\_Training.pdf](http://www.energycodes.gov/becu/documents/Commercial_90_Percent_Eval_Inspect_Training.pdf)
2. Residential PowerPoint Training with links to videos  
[http://www.energycodes.gov/becu/documents/Residential\\_90\\_Percent\\_Eval\\_Inspect\\_Training.pdf](http://www.energycodes.gov/becu/documents/Residential_90_Percent_Eval_Inspect_Training.pdf)

### Primer on REScheck and COMcheck

1. Commercial Compliance  
<http://www.energycodes.gov/comcheck/>
2. Residential Compliance  
<http://www.energycodes.gov/rescheck/>

### Available Downloads

1. Commercial Basic Requirements Download  
<http://www.energycodes.gov/comcheck/download.stm>
2. Residential Basic Requirements Download  
<http://www.energycodes.gov/rescheck/download.stm>

### Users Guides

1. COMcheck Software Guide  
[http://www.energycodes.gov/comcheck/documents/com\\_software\\_users\\_guide\\_2004\\_2006\\_and\\_2009\\_IECC.pdf](http://www.energycodes.gov/comcheck/documents/com_software_users_guide_2004_2006_and_2009_IECC.pdf)
2. REScheck Software Guide  
[http://www.energycodes.gov/rescheck/documents/rescheck\\_users\\_guide\\_1008.pdf](http://www.energycodes.gov/rescheck/documents/rescheck_users_guide_1008.pdf)

### **Plan Check and Field Inspection**

1. Commercial Plan Review Quick Reference Guide  
[http://www.energycodes.gov/training/pdfs/comm\\_review\\_guide1.pdf](http://www.energycodes.gov/training/pdfs/comm_review_guide1.pdf)
2. Residential Plan Review Quick Reference Guide  
[http://www.energycodes.gov/rescheck/documents/res\\_review\\_guide.pdf](http://www.energycodes.gov/rescheck/documents/res_review_guide.pdf)
3. Code Notes  
<http://www.energycodes.gov/help/notes.stm>

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- <sup>2</sup> <http://quickfacts.census.gov/qfd/states/05000.html>
- <sup>3</sup> <http://www.bls.gov/web/laus/laumstrk.htm>
- <sup>4</sup> <http://www.census.gov/const/www/C40/annualhistorybystate.xls>
- <sup>5</sup> [http://www.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=AR](http://www.eia.doe.gov/state/state_energy_profiles.cfm?sid=AR)
- <sup>6</sup> [http://www.eia.doe.gov/states/sep\\_sum/html/pdf/rank\\_use\\_per\\_cap.pdf](http://www.eia.doe.gov/states/sep_sum/html/pdf/rank_use_per_cap.pdf)
- <sup>7</sup> [http://www.eia.doe.gov/states/sep\\_sum/html/pdf/rank\\_use\\_gdp.pdf](http://www.eia.doe.gov/states/sep_sum/html/pdf/rank_use_gdp.pdf)
- <sup>8</sup> [http://www.eia.gov/cneaf/electricity/epm/epmxmlfile5\\_6\\_a.xls](http://www.eia.gov/cneaf/electricity/epm/epmxmlfile5_6_a.xls)
- <sup>9</sup> [http://www.energycodes.gov/publications/techassist/residential/Residential\\_Arkansas.pdf](http://www.energycodes.gov/publications/techassist/residential/Residential_Arkansas.pdf)
- <sup>10</sup> [http://www.energycodes.gov/publications/techassist/commercial/Commercial\\_Arkansas.pdf](http://www.energycodes.gov/publications/techassist/commercial/Commercial_Arkansas.pdf)
- <sup>11</sup> BCAP Code Estimator
- <sup>12</sup> <http://www.energycodes.gov/codedevelop/determinations.stm>
- <sup>13</sup> <http://bcap-ocean.org/energy-policy-act-epact-compliance-commercial>
- <sup>14</sup> <http://bcap-ocean.org/energy-policy-act-epact-compliance-residential>
- <sup>15</sup> <http://bcap-ocean.org/news/2010/september/08/doe-issues-preliminary-determination-2009-iecc-residential-energy-savings>
- <sup>16</sup> [http://www.energy.gov/media/Beebe\\_Arkansas.pdf](http://www.energy.gov/media/Beebe_Arkansas.pdf)
- <sup>17</sup> [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111\\_cong\\_bills&docid=f:h1enr.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h1enr.pdf)
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- <sup>22</sup> <http://bcap-ocean.org/code-information/arkansas-sustainable-energy-efficient-buildings-program>
- <sup>23</sup> <http://www.arclimatechange.us/>
- <sup>24</sup> <http://www.arclimatechange.us/ewebeditpro/items/O94F20342.PDF>
- <sup>25</sup> <http://www.arkansas.gov/lobbyist/arliab/src/public/bills/2005/html/HB2445.html>
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- <sup>27</sup> <http://www.usgbc.org/LEED/Project/RegisteredProjectList.aspx>
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- <sup>30</sup> [http://www.energystar.gov/index.cfm?c=new\\_homes.hm\\_index](http://www.energystar.gov/index.cfm?c=new_homes.hm_index)
- <sup>31</sup> <http://www.energystar.gov/index.cfm?fuseaction=ghmi.showHomesMarketIndex>
- <sup>32</sup> [http://www.energystar.gov/index.cfm?fuseaction=new\\_homes\\_partners.showStateResults&s\\_code=AR](http://www.energystar.gov/index.cfm?fuseaction=new_homes_partners.showStateResults&s_code=AR)
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