Final Report on Building Energy Codes
Presented by the Maine Public Utilities Commission
To the Joint Standing Committee on Utilities and Energy January 26, 2004

Executive Summary

Background

P.L. 2003 ch. 497 requires the Maine Public Utilities Commission (Commission) to examine building energy codes and standards and to report its findings and recommendations to the Joint Standing Committee on Utilities and Energy by February 1, 2004. This report contains the Commission's findings and discussion of issues associated with building energy code adoption in Maine.

Our investigation parallels other statewide investigations of a wider spectrum of building construction and operation practices. We have monitored some, but not all, of these investigations, but we have not contributed to their recommendations. We believe that the Legislature expects us to develop findings that are independent from the findings of the broader investigations, and we have generally done so.

The Commission has significant expertise in energy policy and its impacts on Maine's electric and natural gas ratepayers. We have more limited expertise in the impacts of energy use associated with building construction and operations. We present our findings within the context of our own unique expertise. We expect that the Legislature will consider our findings in the context of the broader investigation and that decisions regarding energy codes will complement and be consistent with these broader decisions.

With this perspective in mind, we viewed our first task as identifying the goals that energy codes can achieve, to assist the Legislature in deciding whether some form of energy codes should be adopted in Maine. We next identified the issues to address and the advantages of available approaches in meeting energy-related goals, to assist the Legislature in establishing the most effective procedures in the event it decides to pursue energy code adoption.

Findings

The Commission finds that, by reducing the energy and thereby the electricity, oil, or natural gas used in a building, energy codes provide the following advantages:

- Reduced emissions attributable to electricity generation
- Guaranteed "reasonable" minimal building practices

- Reduced need for public incentives
- Financial savings for building owner over the life of the building
- Consistency for contractors

The Commission finds that the International Energy Conservation Code (IECC) – the energy component of the I-Codes - is an effective, usable, and widely adopted energy code that results in reasonably efficient energy use in buildings constructed according to its specifications.[1] The I-Codes and the IECC have the following advantages:

- The I-Codes are supported by the majority of stakeholders who commented in our proceeding and by the Statewide Building Code Working Group (although the Group did not explicitly address the energy component of the I-Codes)
- The I-Codes or their predecessors (including the Model Energy Code or MEC, which is the energy component of the BOCA codes) have been adopted for residential construction in most other states and many municipalities in Maine
- The I-Codes adopt the ASHRAE 90.1 standard for commercial construction, which is the standard currently established in Maine law and the requirements of most other states
- Other national codes offer no apparently significant improvement over the IECC with respect to energy
- The Department of Energy supports the IECC and offers funding and support to assist compliance

The report examines an economic analysis that determined that, over time, the energy savings resulting from meeting IECC standards as opposed to Maine's current statutory residential building efficiency standards outweigh increased construction costs.

The report summarizes three models of code adoption:

- Mandatory (codes are applicable in all locations in the State)
- Voluntary (a municipality may choose to adopt or not, but it may only adopt the state-sanctioned code)
- No codes

Six enforcement models are discussed and adoption in other states is summarized:

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[1] In addition to the IECC, commercial building construction should be required to comply with ASHRAE 62-2001 standards that address building ventilation and result in adequate indoor air quality, as required by Maine law. Further investigation must occur to decide whether residential construction should comply with ASHRAE 62.2-2003 standards.

- Local building code inspectors
- State agency enforcement
- Privatization
- Self-certification and disclosure to homeowner
- Self-certification to a state agency
- Civil penalties

The Commission recommends against retaining the current state model, under which energy codes are mandatory, but no enforcement occurs and many builders may be unaware of statutory requirements.

Finally, the Commission makes the following findings:

- If the Legislature concludes that building energy codes should be adopted, the Commission finds that mandatory energy codes – i.e., codes that are required in all municipalities in the State – are most effective at realizing the advantages that codes produce. To the extent that codes apply to only a portion of construction projects, environmental benefits are diluted, some citizens may not benefit from the financial advantages, the advantage to contractors of consistency is diminished, and there is less positive market effect of economies of scale.

However, the ideal practice will not be successful if it cannot be implemented effectively, and there is a financial cost to mandatory adoption. It is not within the Commission's authority to decide how best to spend the State's or municipalities' limited funds. However, mandatory codes should only be adopted if an effective enforcement method is established.

- The Commission finds that, if available State and municipal funds are not adequate to support enforcement of mandatory energy codes, alternative enforcement models exist that could result in relatively effective enforcement at a lower cost.

- The Commission finds that privatizing enforcement procedures may be an effective way to reduce the level of public funds and resources needed to provide adequate enforcement of building energy codes. Under this enforcement model, a municipality could choose one of four options: support a codes enforcement officer at town expense (as many do now), consolidate with a group of municipalities to hire or contract with a single enforcement officer, use the state-certified enforcement officers for a fee paid through municipal funds, or require its citizens to obtain, at their own expense, the services of a state-certified inspector.

- The Commission finds that, if the adoption of voluntary codes is the only means of attaining acceptance among the entities that must support and implement energy codes, some limited benefits will result. However, municipalities might adopt health and safety codes while not adopting energy codes, and voluntary adoption might have the unintended consequence of deterring a town from adopting any energy code, because it is prohibited from adopting the code that the town prefers. Thus, voluntary adoption may be less effective in introducing energy codes than in introducing other building codes to Maine.

I. Background

Legislative Activity

During the First Regular Session of the 121st Legislature, the Legislature enacted P.L. 2003 ch. 497, "An Act to Promote Energy Conservation." Section 4 of Chapter 497 requires the Maine Public Utilities Commission (Commission) to examine building energy codes and standards, including above-standard guidelines, and to report its findings and recommendations to the Joint Standing Committee on Utilities and Energy (U&E) by February 1, 2004.

Concurrently, the Joint Standing Committee on Business, Research and Economic Development (BRED) considered bills that would govern other issues associated with building construction. Two bills – one that would establish State-licensed building code inspectors and one that would require residential construction contractors to be licensed by the State - have been held over for consideration during 2004.

As a result of discussions before the BRED committee, persons with interest in the State's building codes formed the Statewide Building Code Working Group (BCWG) to consider and recommend a family of codes that would govern a wide range of building operations, including areas as diverse as accessibility, elevators, fire, and plumbing. The BCWG voted to recommend that Maine adopt the International Residential Code (IRC) and the International Building Code (IBC), which are part of the so-called family of I-Codes. In addition, the BCWG recommended that building codes be mandatory only if the State provides adequate funding for enforcement. The full text of the recommendation may be found on the Commission's web site: www.state.me.us/mpuc/legislat.

Finally, the Attorney General's Office has coordinated a working group to address licensing issues and the Department of Professional and Financial Regulation has conducted a review, pursuant to its statutory authority and procedures, of the advantages and impacts of requiring contractors to be licensed.

Existing State and Federal Energy Code Laws

Maine law, at 10 M.R.S.A. Chapter 214,[2] contains requirements that govern energy efficiency standards that must be attained during the construction of certain new residential buildings and all new commercial buildings. The residential standards are quite limited. Chapter 214 establishes prescriptive

[2] Chapter 214 and its revision (P.L. 2003 ch. 151, which clarifies references to ASHRAE standards) may be found at http://janus.state.me.us/legis/ros/meconlaw.htm.

standards governing new residential building envelope insulation levels, but contains no standards for other building practices, such as heating and mechanical processes, that influence energy use. In addition, it exempts from the requirements new single-family residential buildings constructed under contract with the resident and new log cabins. The Chapter's requirements are more comprehensive for commercial structures, in that it requires new construction and renovation of these buildings to conform to ASHRAE energy conservation and ventilation standards.[3]

Chapter 214 also establishes administrative procedures for implementing these energy standards. It requires the Department of Economic and Community Development (DECD) to administer and enforce the standards and to revise a Manual of Accepted Practices for residential energy efficiency practices, and it allows the "Director of the Energy Conservation Division" to adopt rules establishing performance-based compliance procedures for residential buildings. It does not, however, explicitly establish procedures for enforcing the energy standards.

Since 1980, the State has maintained a Manual of Accepted Practices that contains practical descriptions of construction practices that will result in compliance with the residential standards contained in Chapter 214 as well as practices that go beyond those standards. These practices are based on commonly accepted approaches that currently are effective in Maine.

However, enforcement of these statutory energy codes has been problematic. Prior to the First Session of the 121st Legislature, limited resources prohibited DECD from implementing meaningful enforcement procedures. Through P.L. 2003 ch. 20, the Energy Conservation Division and its "powers, duties and functions" were transferred to the Public Utilities Commission, but some of Chapter 214 remained unchanged, thereby apparently leaving DECD with the responsibility for enforcing standards. The current Legislative Session provides an opportunity to resolve this ambiguity.

Approximately 15% of Maine's municipalities (representing more than 50% of Maine's citizens) have voluntarily adopted and enforce building codes. These municipalities have generally adopted BOCA codes (which will be discussed later in this report) and generally enforce the codes with local or shared building code enforcement officers that perform post-construction inspections. However, municipalities generally do *not* enforce the energy component of their adopted family of codes, but focus on health and safety codes. Thus, it is likely that there

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[3] ASHRAE is the American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., an organization that establishes widely-used building standards. The standards referred to in this section of Maine law are ASHRAE 90.1 and ASHRAE 62-2001. The standards may be found at ASHRAE's web site, www.ashrae.org.

is minimal municipal infrastructure addressing energy standards and their enforcement.

Finally, the federal Energy Policy Act (EPAct) of 1992[4] authorizes the federal Department of Energy (DOE) to determine an energy code that will improve efficiency in residential buildings. Each state must determine whether it is appropriate to revise its residential code to meet the DOE designated standard. DOE designated the energy component of the I-Codes, called the International Energy Conservation Code (IECC), as its designated standard. Maine is considered to be one of only ten states that have not explicitly complied with the EPAct requirement to review and revise their residential energy codes.

II. Process

To carry out its directive, the Commission first monitored the meetings of the BCWG. It was our belief that the decisions made in that group regarding the complete family of building codes would form a basis upon which to consider the narrower category of energy codes. Upon the conclusion of that group's activities, the Commission opened a formal inquiry of energy codes, solicited written comments from interested persons, and held a public hearing. Appendix A lists the persons who provided comments.[5] This list indicates that we received significant input from groups interested in accomplishing the environmental improvements that can be attained with building codes and from persons representing commercial building constructors, but we received no input from residential building constructors.[6] On January 12, 2004, we issued a draft report to assist the Legislature in its consideration of bills and to allow comments from interested persons.

In addition, we researched other states' activities, believing that maintaining consistency among states would result in more effective and less costly implementation of codes ultimately adopted in Maine.

III. Goals of Building Energy Codes

Most building codes address health and safety concerns such as fire protection and electrical safety. Energy codes reduce the use of energy used in a building, thereby reducing the consumption of electricity, oil, or natural gas.

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[4] Section 304 of the Energy Policy and Conservation Act (PCA, Public Law 94-163), as amended by the Energy Policy Act of 1992 (EPACT, Public Law 102-486).

[5] The enabling legislation directs the Commission to form a "working group." Because a statewide working group had already been formed, we monitored and drew information from the work of that group. We then solicited input from all members in that group, plus other stakeholders who were interested, to complement the working group's conclusions and produce our own independent findings.

[6] We received comment from the Maine State Housing Authority, and residential contractors were represented in the statewide Building Code Working Group.

The advantages of reducing energy can be categorized into two broad categories – environmental and financial. Some of the advantages (e.g., environmental improvement or consumer protection) may form policy goals that drive the adoption of codes. Other advantages (e.g., long-term financial benefit to a building owner or consumer comfort) may not, in themselves, provide the basis for adopting codes, but may make imposing codes on Maine's citizens more attractive and acceptable.

Reduced emissions attributable to electricity generation. Burning or using fuels to produce energy creates emissions that can be harmful to human health. According to the Natural Resources Council of Maine (NRCM), 30% of US greenhouse gases come from buildings and building construction.[7] In response to a question by the Commission, the representative of the Building Codes Assistance Project (BCAP) estimated that 1.25 Million metric tons of CO_2 emissions could be saved in Maine if construction followed the I-Codes as opposed to likely current construction practices.[8] The Independent System Operator in New England (ISO-NE), estimates that 1393.9 pounds of CO_2, 1.7 pounds of NO_x, and 4.9 pounds of SO_X emissions are created when one incremental MWh of electricity is generated, and fuel oil and natural gas consumption also create emissions. Saving energy through more efficient building construction results in a reduction in these emissions.[9]

Guaranteed "reasonable" minimal building practices. Many homeowners or commercial building tenants have minimal expertise in construction practices and are thus dependent upon their builder for good decision-making. If policy makers believe that homeowners have an expectation and assumption that buildings are constructed to some "reasonable" standard, just as electricity and plumbing is installed safely,[10] codes are a way to ensure that this occurs. Furthermore, should a consumer believe that a building has been constructed in a shoddy or unacceptable manner, the existence of codes will facilitate evaluation of the complaint by the consumer and by enforcement agencies.

Reduced need for public incentives. In contrast to publicly-funded programs that offer financial incentives to citizens who construct efficient buildings, codes internalize energy efficiency into the building market. Once enacted, their consistency ensures that appropriate products are manufactured and sold and procedures followed. The cost of these products and procedures reduces through economies of scale, and the market is transformed faster than

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[7] Testimony of Sue Jones, NRCM in Docket No. 2003-697.
[8] Follow-up comments of David Weitz, BCAP, December 1, 2003, in Docket No. 2003-697.
[9] The Commission does not claim expertise in the effect of emissions on human health or the priorities that society should place on emissions reduction. The Legislature may wish to ask the Department of Environmental Protection for information on environmental matters.
[10] We have no study that confirms this assumption.

through a rebate incentive approach. Not only is the result more consistent, but the costs are borne by the "right" people, namely those that benefit from the lower energy costs, rather than by the body of ratepayers or the public as a whole, many of whom will not benefit because they have not constructed a building themselves or because the public funding comes from taxing one type of fuel (e.g., electricity) to save another (e.g., oil).

Financial savings for the building owner or tenant. Constructing a building using energy-efficient design and materials usually costs more than constructing a less efficient building.[11] However, over the lifetime of the building, energy savings usually offset the higher construction costs. High up-front costs and lack of customer knowledge or focus on life cycle financial analysis may be leading causes of inefficient practices by consumers. This effect is magnified when the building is constructed on speculation or is a rental unit, and the developer does not pay the energy bill. Similarly, to the extent that future owners do not consider energy costs (and we have not studied the extent to which this happens), the savings on construction costs do not offset the additional energy expense of the building owner. Finally, renovating a building to improve its efficiency is more costly than building it efficiently to begin with. The fact that many consumers make short-term decisions is the basis for many government programs whose goals are to increase the efficiency of the public's energy practices.

Consistency for contractors. When codes differ from town to town, contractors must investigate and learn the applicable requirements each time they construct a building, adding time and expense and risking misinterpretation. Furthermore, under the current situation in which codes exist but are not enforced, contractors are placed in a difficult position – if they build to code, they may lose jobs to contractors who do not because of higher up-front quotes, and if they do not build to code they are in conflict with Maine law. Well-enforced, consistent codes make construction easier and fairer for contractors.

IV. Existing Building Energy Codes

There are two generally-accepted families of current building codes and a variety of older codes that are merging to various degrees into the two current codes. If policy makers decide to adopt codes, it is reasonable to choose between the first two; however, the fact that some municipalities currently operate under the older codes must be considered in implementing required codes.

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[11] According to the U. S. Census Bureau, over 6,000 single-family residential homes, or 7,200 residential homes of all sizes, are built in Maine annually. According to the Planning Decisions report to the Maine Attorney General in November 2003, 73,000 homes are repaired or improved annually.

ICC I-Codes. The International Code Council (ICC) is an organization composed of a variety of stakeholders that establishes widely used building standards called the I-Codes. The I-Codes may be considered a family of codes that addresses functional areas of building construction and operation, including fire protection, elevator safety, mechanical systems, and energy. Codes exist for each functional area separately, but consistency in approach and practices exists across the functional areas. In the area of energy, the I-Codes contain the International Energy Conservation Code (IECC), which in turn incorporates ASHRAE 90.1[12] (adopted in Statute as Maine's energy standards for commercial buildings) and ASHRAE 90.2 (energy standards for residential buildings).[13] The IECC adds flexibility to builders' means of complying with the ASHRAE standards by including prescriptive standards (e.g., specific R-values) and performance standards (e.g., maximum kWh use for buildings of a particular size). IECC standards are differentiated into climate zones. The I-Codes are described in a series of publications.

NFPA Codes. Like ICC, the National Fire Protection Association (NFPA) is a group of stakeholders that has developed a family of codes addressing many functional areas of building construction and operation. The NFPA codes exist separately but are consistent in approach and practices across the functional areas. The NFPA codes contain the NFPA 5000 Building and Construction Code, which in turn incorporates but expands upon ASHRAE 90.1 and ASHRAE 90.2.

Earlier Versions of Codes. Finally, nationally accepted codes exist that are being superceded by IECC or NFPA, but that were adopted years ago by various states and municipalities. These include the widely used Model Energy Code or MEC (produced by the Council of American Building Officials, or CABO), the Southern Building Codes (SBC), the National Building Codes (codes produced by the Building Officials and Code Administrators International or BOCA), and the Uniform Building Codes (UBC). In turn, BOCA (which is the code adopted by most Maine communities that have adopted codes) incorporates the MEC. All these codes are described as being similar to, or consistent with, the more recently-emerging I-Codes. BOCA, SBC and UBC have merged to become the ICC. The MEC, which is still the adopted energy

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[12] Aside from understanding the different available codes, policy makers should understand how ASHRAE standards differ from these codes. ASHRAE is a standard for engineers. ASHRAE standards are approved through ANSI procedures. ANSI procedures include stringent rules to ensure a non-biased voting committee and full public input, so results are respected nationally as unbiased. On the other hand, IECC is a code for designers. IECC sets forth ways of meeting ASHRAE 90.1 and sets forth performance measures that are a means for determining that the building meets the ASHRAE standards.

[13] The I-Codes includes the International Residential Code (IRC) for residential buildings, which addresses functional areas beyond energy and incorporates the IECC and the International Building Code (IBC) for commercial buildings, which also addresses functional areas beyond energy and incorporates the IECC.

code in approximately 16 states, may be considered simply an earlier version of the IECC energy code.

Comments Related to all Codes. All the codes we studied are developed through some sort of consensus process. Stakeholders consider a diverse array of issues before adopting a code, including technical efficiency, practicality, and cost-effectiveness. Because of the accommodation made to differing perspectives, adopted codes are considered by some to result in buildings that have less than ideal energy efficiency. However, the stakeholder process ensures that the results are useable and reasonable within the building community as a whole. Above-code guidelines like Energy Star®, E-Benchmark, and LEED standards act to identify the next generation of efficiency practices that, after considerable experimentation and adoption, may become code through a stakeholder process.

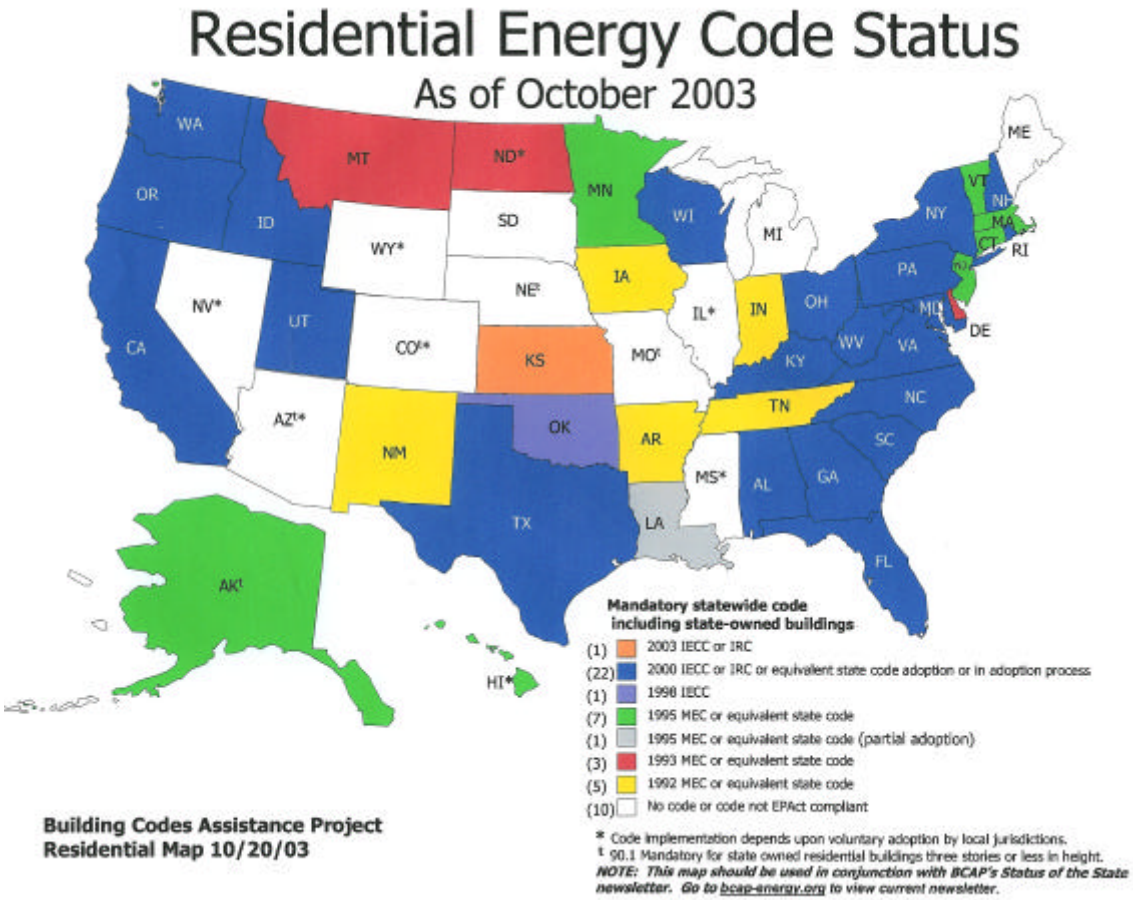
In addition, codes generally are living documents, with a process whereby stakeholders can recommend changes and all interested persons comment before incorporation into the codes. The Model Energy Codes (MEC) and now the I-Codes are on a three-year revision cycle, whereby the adopting organization amends the codes and states in turn decide whether to adopt the newest version. MEC has 1995 and 1998 versions. The I-Codes have 2000 and 2003 versions.

The table and map below display the residential codes adopted by other states (minor differences are due to timing). They show that 40 states have adopted, at some level, a nationally recognized energy code that is either a version of IECC or its predecessor, the MEC.

Code Adopted	No. of States	States Adopting
2000 IECC, IRC or equivalent state code adopted or under review for adoption.	24	AL,KS,CA,DC,OR,WA,ID,NE,FL,KY,MD,NC,SC,NH, NY,PA,LA,TX,UT,GA,WI,WV,RI,VA
1998 IECC	1	OK
1995 MEC	7	AK,CT,MA[1],MN,NJ,OH,VT,HI
1993 MEC	3	DE,ND, MT
1992 MEC	5	AR,IA,IN,TN,NM
No statewide residential code or code is not EPAct compliant	10	AZ,CO,IL,ME,MI,MO,MS,NV,SD,WY

Source: DOE

1/ MA appears to be adopting the IECC



V. Cost Effectiveness of Energy Codes

The Commission has found credible studies indicating that, over the life of a residential building, the savings in energy costs outweigh the higher construction cost associated with IECC code compliance. The most useful study was performed by R. J. Karg Associates for the Maine State Planning Office, in cooperation with the Maine Department of Economic and Community Development, using funding from the U. S. Department of Energy, and published in May 2002. The Karg study is useful to current decision making because it examined buildings modeled specifically for conditions in northern and southern Maine, and it considered the costs and benefits of improving a building from efficiencies required by Maine law to efficiencies required by the current version of the IECC.[14] We conclude that the study results are reasonable because the

[14] The Karg study targeted IECC-2000 efficiency levels. The IECC-2003 has been released recently and is in the early stages of study by those we spoke to. It does not appear that EICC-2003 differs significantly from IECC-2000.

study used fuel and building cost assumptions that remain reasonable today[15] and it analyzed savings using a widely accepted software package called REM*/Rate.* The REM*/Rate* produces a Home Energy Rating (HERS) that is used nationally by many builders to verify a home's efficiency to the homeowner and that has been adopted by U.S. Department of Energy (DOE) to verify Energy Star® home compliance.

The Karg study modeled one-story and two-story houses with 6 glazing percentages, under Portland weather conditions. It modeled the same 12 buildings under Caribou weather conditions, for a total of 24 model buildings. It analyzed 7 energy saving measures individually and as a bundle. Measures included reducing air leakage, increasing foundation insulation, upgrading windows, increasing ceiling insulation, and improving central boiler efficiency. It measured non-interactive savings (i.e., savings that would occur if just one measure were undertaken) and interactive savings (i.e., it accounted for the fact that each measure might reduce the savings of the following measure). The study assumed that the building was heated with fuel oil, and both electricity and fuel oil savings were calculated. All measures were more cost effective in the colder climate of Caribou than Portland. The most cost effective measure for all buildings was the reduction of air leakage, with simple payback periods of 2.7 to 4.7 years. The least cost effective measure was window upgrades, which were not cost effective in the Portland modeled homes. Wall insulation upgrade was cost effective in all homes, while ceiling insulation upgrade was cost effective in some homes and not others. A bundled upgrade, in which all measures were undertaken, was cost effective in all modeled homes.

Because the Karg study analyzed improvement from current statutory insulation levels to IECC-2000 levels, it may be conservative. To the extent homes do not comply with required efficiency levels, the savings from improvement may be greater. We have no studies that describe whether Maine's building stock is generally more or less efficient than the efficiency level required by Maine law.

The Karg study identified two other economic analyses of building efficiency. The Energy Efficiency and Renewable Energy Network (EREN), a division of the U.S. DOE, has published insulation levels that it has determined to be cost effective in Maine, New Hampshire, Vermont, and New York. These levels are consistent with IECC-2000 levels. In addition, Energy Star®, created by the U.S. DOE and the Environmental Protection Agency, has performed economic analyses of Energy Star® homes and has determined that life cycle

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[15] Fuel and building material costs can vary significantly over time. The study assumed $0.13 per kWh for electricity, $1.20 for fuel oil, and mortgage interest rates of 8%. Some of these assumptions are conservative when compared to current prices. Building material cost assumptions may be found in the Karg report. Karg learned that some assumptions – e.g., a rise in oil prices – resulted in significant increase in the economic benefit of efficiency measures.

benefits outweigh costs. Of the 24 buildings in the Karg study, 13 would qualify as Energy Star® compliant after meeting IECC-2000 efficiency levels. This reinforces the cost-effectiveness findings of the Karg study.

Finally, the Karg study determined that homeowners with IECC-compliant efficiency levels could obtain favorable mortgage rates and higher resale values for their homes. While we have not independently verified these findings, they nonetheless reveal a potential additional value that decision makers may consider when evaluating building codes.

The Karg study may be found on the Commission's web page, and we will provide it to the Legislative committees considering this report. The study displays annual energy savings, payback periods, and benefit-cost ratios of all measures analyzed.

We have not studied analyses of whether commercial codes are likely to result in cost-beneficial results when compared to less efficient practices. Maine law requires commercial construction to comply with ASHRAE 90.1, which is the efficiency level required by the IECC. Thus, to the extent that builders are complying with the law, the adoption of codes would not incur a cost. On the contrary, IECC could make codes easier to understand for some builders, thereby lowering initial construction costs when compared with current practices.

When considering the results of this study, the question arises – if building an energy efficient building saves money, why doesn't everyone do it? The likely answer is familiar: consumers may make short-term decisions, thus choosing less costly upfront construction (and thus less efficient buildings); they focus on other building features; and the savings from energy efficiency are perceived as small compared with the magnitude of dollars being considered for construction overall.

In our investigation, some parties asserted that many consumers are not aware of the tradeoffs in costs and benefits and that codes would provide value to such consumers in the long run. An opposing point of view is that consumers should have the freedom to make such a personal financial decision for themselves. The latter point of view might argue for developing a means to guarantee that, at the time a consumer makes a construction decision, he or she is made aware of the life cycle impact of construction alternatives.

VI. Commission Findings and Analysis - Energy Codes

The Commission finds that the IECC is an effective, useable, and widely adopted energy code that results in reasonably efficient energy use in buildings

constructed according to its specifications.[16] *The I-Codes and their energy component, the IECC, have the following advantages:*

I-Codes are supported by the majority of Maine's stakeholders, including the BCWG. Most commenters in the Commission's investigation endorsed the IECC as the most appropriate code for Maine. The NFPA supported its NFPA code, and some commenters objected to specific, non-energy portions of the I-Codes. It has been difficult for us to determine the position of codes enforcement officers, as comments have varied. This group was represented on the BCWG, which endorsed the I-Codes. However, officers in our investigation have commented that the I-Codes are complicated, that towns should be free to adopt codes of their own choice, or that the I-Codes are acceptable but funds must be available for enforcement.

In addition, as described in the first section of this report, the statewide Building Code Working Group reached a consensus recommendation to support the I-Codes as Maine's building standards. The BCWG did not focus on the energy codes specifically, and it is our understanding that members intentionally concluded that energy codes should be addressed at a later date. However, their support for the I-Codes lends credence to our opinion that the I-Codes are the most appropriate family of codes to adopt. Finally, the federal Department of Energy supports the IECC.

The I-Codes or their predecessors have been adopted for residential construction in most other states and many municipalities in Maine. As displayed earlier in this report, 25 states have adopted the IECC for residential buildings, 15 have adopted MEC codes (which are predecessors to IECC), and all New England and Middle Atlantic states except Maine have adopted either IECC or MEC. As discussed earlier, although Maine has not adopted a statewide comprehensive residential code, the municipalities that have adopted codes generally follow BOCA codes, whose MEC energy component is similar to IECC codes (although, as discussed earlier, municipalities have generally not enforced the energy component). Our investigation leads us to believe that a movement toward the I-Codes is generally pervasive nationally. Consistency across states will result in manufacturers producing only materials that comply with the prevailing code, will lower the cost of materials through the effect of high volume production, and will allow contractors to operate across state lines without the additional cost of differing construction practices. This advantage is especially important in a small state like Maine.

The I-Codes incorporate ASHRAE 90.1 for commercial construction. Maine statute requires commercial construction to comply with ASHRAE 90.1 energy requirements. Most states accept the ASHRAE 90.1 standards for

[16] We will discuss later in this report enforcement methods and buildings that should be required to comply with the IECC.

commercial buildings, rather than expand their requirements to include the IECC. We suspect that this is because commercial buildings are typically designed by engineers who are accustomed to dealing with codes developed with engineers in mind, whereas residential construction is performed by a wider variety of individuals who are well-served by the less technical and more flexible performance compliance procedures that the IECC provides. We believe that Maine could follow this approach and retain its current adoption of ASHRAE 90.1 for commercial buildings, but that adoption of the IECC would be equally appropriate and would offer more flexibility and assistance to designers of smaller commercial buildings.

Other national codes apparently offer no significant improvements. When asked during the course of our investigation, no commenter, including the NFPA, could describe any significant differences between the IECC and NFPA energy codes. Indeed, both incorporate ASHRAE 90.1 and ASHRAE 90.2 as core energy standards. Thus, we could find no compelling reason to follow a course that differed from virtually every state in the northeast.

NFPA appears to claim that their consensus decision-making process is more open than is ICC's process, and that the codes thus reflect a less biased view of building construction. We did not find this claim to be compelling.

DOE provides support and compliance tools. The federal government's support has resulted in DOE's development of resources to assist builders in meeting IECC requirements, including training, computer software (the RES*check*® program is widely used to measure building performance), and financial assistance.

The I-Codes should be supplemented with ASHRAE 62 standards. A number of participants in our proceeding assert that the I-Codes do not contain guidelines adequate to guarantee appropriate indoor air quality, such as ASHRAE 62 or comparable standards. Maine law currently requires that new commercial construction comply with ASHRAE 62-2001, which contains ventilation standards for commercial buildings, and we have been presented with no reason to change this requirement. Maine law does not currently require residential construction to conform to ASHRAE 62.2-2003 standards, and we cannot make a finding as to whether Maine should adopt these standards. However our investigation suggests that, whether or not the IECC is adopted, further investigation should be done to determine whether ASHRAE 62.2-2003 should be adopted.

VII. Compliance and Enforcement

Perhaps the more difficult decision to make regarding energy code adoption is the enforcement method the State should use to ensure their use.

This decision encompasses two issues: (1) whether codes are "mandatory" or "voluntary," and (2) how compliance is enforced.

Mandatory vs. Voluntary Adoption. For those unfamiliar with the building code lexicon, the commonly used terms "mandatory" and "voluntary" have misleading definitions. Three primary code adoption models exist:

1. Mandatory: Under mandatory adoption, a state adopts a code that applies to all locations in the state. Enforcement may be done by municipalities, by a state agency, through private but licensed officials, or through self-certification, as discussed later in this report.

2. Voluntary: Under voluntary adoption, each municipality may choose to adopt or not adopt a code, but if it adopts a code it may only adopt the state's chosen code. In most states, if a municipality adopts a code, it must enforce the code. However, state or private enforcement and self-certification are also options. In many states, municipalities may adopt features that are more stringent than the state code. In no instance may an individual builder choose which code (if any) to adopt.

3. No codes: Under this model, each builder chooses the practices that will be followed during building construction. In some states, municipalities choose to adopt codes, but the code is not consistent among adopting towns.

Most participants in the Commission investigation support mandatory adoption *in theory.*[17] They believe that allowing towns the discretion to refuse to adopt a code weakens the effectiveness of the code and maintains the inconsistency that builders face now. However, members of the BCWG and many of those who commented in our investigation recognize that mandatory adoption would require enforcement infrastructure and cost that far exceeds current levels. In particular, the Maine Municipal Association has made it clear that imposing an enforcement function on towns that do not now have one, or significantly increasing enforcement requirements for towns, is unacceptably costly. In response to this concern, the BCWG conditioned its support for mandatory code adoption on the existence of funding for enforcement, and commenters in our investigation suggested enforcement models that would ease municipalities' and the state's administrative and financial burden. These suggestions are discussed later in this report.

Enforcement Methods. There are six methods typically used for enforcement of a state's building codes. They are not mutually exclusive, are used in combination in some states, and each can be used with either mandatory or voluntary codes.

[17] Many building code enforcement officers do not hold this view.

Local code enforcement officers: This approach is used in the vast majority of states and in Maine today among municipalities that have adopted building codes. Virtually all states that adopt voluntary codes use this compliance method. A municipality employs (or contracts with) a code enforcement official. Communities may consolidate their enforcement responsibility and share a single official, or statewide officials may serve all communities upon request. Typically, a builder provides the building design to the official, who must approve the design before construction may begin. The official then inspects the building after construction and must approve before the owner may occupy.

State agency enforcement: A State agency carries out the role of the local building inspector. Under this model, the agency reviews the design and may or may not perform a post-construction inspection. The agency usually oversees code development and revision and provides information to builders.

Privatization: A State agency or some other entity certifies private individuals (or a privately-owned company) to carry out design review and inspection. The builder or a municipality employs these private individuals, usually at the builder's expense.

Self-certification or disclosure to homeowner: The builder affixes a sticker in the building, certifying that the building complies with code or explaining the extent to which it does not. The builder informs the building owner if the building does not comply with code.

Self-certification to government agency: The builder sends a certification to the enforcing agency, certifying that the building complies with code. The government agency has the authority to inspect, and does so at its discretion.

Civil penalties for non-compliance: The owner of a substandard building may take the builder to court.

It is unclear from our research what actions most typically occur if a builder has constructed a building that does not comply with codes.

The following table summarizes the features of each compliance method:

Local Building Inspector	State Agency	Privatization	Self-certification to homeowner	Self-certification to state agency	Civil penalties
Local inspectors responsible for other codes and know what is happening in their towns	Significant government infrastructure must be established	State-supported certification process must be established	No administration required	Some government infrastructure must be established.	Court involvement required
Significant cost, borne by town (local taxes)	Significant cost, borne by State (state taxes)	Cost, borne by builder/owner	No cost unless homeowner wants to verify	Lower cost than other state-supported methods	Significant effort required by owner
Inspection quality varies	Consistent inspection quality	Consistent inspection quality	Requires knowledgeable builders	Requires knowledgeable builders	Requires knowledgeable owners
High likelihood of compliance: procedures already in place	Likelihood of compliance	Likelihood of compliance	Risk of intentional non-compliance if homeowner does not desire efficient building and no oversite	Some risk of intentional non-compliance	Risk of consumer difficulty in bringing and winning suit
Responsibility borne by town	Responsibility borne by State	Responsibility borne by State	Responsibility borne by builder	Responsibility borne primarily by builder	Responsibility borne by building owner

Additional methods for improving energy efficiency in building construction. If codes are adopted voluntarily, or not at all, the need to have consumers who are educated in and focused on building practices is more pronounced. There are a variety of tools for raising the level of consumer knowledge. Policy makers could fund some or all of these tools, or could establish some of these tools as legally acceptable means of verifying compliance. The are described in the following table.

Consumer education	Builder/designer education	Verification using HERS	Builder/designer certification or licensing
Difficult and costly to reach all homeowners	Finite number of builders makes this method more effective than educating consumers	Builders may voluntarily use this method to improve their service	Ensures knowledgeable builders throughout the State
Responsibility borne by building owner	Responsibility borne by builders`		
	Education opportunities are well-developed by DOE and others	Software and training are well-developed and available	Significant State infrastructure must be developed.

Compliance and Enforcement Procedures in Other States.

Appendix B displays enforcement models used in other states.

VIII. Commission Findings and Analysis - Enforcement Mechanisms

The Commission recommends against the current state model, under which energy codes are mandatory, but no enforcement occurs and many builders may be unaware of statutory requirements.

Mandatory Adoption

If the Legislature concludes that building energy codes should be adopted, the Commission finds that mandatory energy codes – i.e., codes that are required in all municipalities in the State – are most effective at realizing the advantages that codes produce.

The advantages of energy codes, discussed earlier in this report, are most effectively achieved if codes apply throughout Maine. The environmental benefit, which is a policy goal that some believe to be the most important basis for energy codes, is diluted for all citizens if codes encompass fewer construction sites. Financial and consumer protection advantages are equally relevant in all communities. The advantage to contractors of known and consistent requirements is significantly reduced if required practices are not uniform, and the economies of scale that will encourage manufacturers, retailers, and designers to provide only compliant materials and procedures will be diminished.

The most common agents of enforcement are State agencies or a combination of municipal and State inspection procedures – procedures that are not now in place at the state or municipal levels in Maine.

The ideal practice will not be successful if it cannot be implemented effectively, and there is a financial cost to mandatory adoption. It is not within the Commission's authority to decide how best to spend the State's or municipalities' limite funds.[18] However, mandatory codes should only be adopted if an effective enforcement method is established.

The Commission finds that, if available State and municipal funds for new programs are not adequate to support enforcement of mandatory energy codes, alternative enforcement models exist that could result in relatively effective enforcement at a lower cost.

Privatized enforcement

[18] Some energy efficiency programs can be funded by Efficiency Maine, an organization that is part of the Public Utilities Commission and was formed by the Conservation Act, Title 35-A §3211-A. However, enforcing or developing building energy codes would not be eligible for Efficiency Maine funding because savings are primarily a result of fuel oil rather than electricity savings.

The Commission finds that privatizing enforcement procedures may be an effective way to reduce the level of public funds and resources needed to provide adequate enforcement of building energy codes.

Privatization of the enforcement function may avoid the problem of imposing an unfounded mandate on local building code enforcement offices and municipalities. Under this model, the State would certify individuals to approve construction designs and perform post-construction inspections.[19] Building inspection would be done in one of four ways, at the option of the municipality:

1. a municipality could support a codes enforcement officer at town expense, as they do now;

2. a group of municipalities could hire or contract with a single enforcement officer, as they may now;

3. a municipality could use the state-certified enforcement officers, paying a fee for this service through municipal funds; or

4. a municipality could require its citizens to obtain the services of a state-certified inspector at their own expense.

Privatization also mitigates, but does not avoid, problems stemming from the absence in Maine of a State agency that oversees code or building policy, and that would logically carry out enforcement of building codes. Creating an agency infrastructure to enforce codes throughout the state would require a significant amount of effort and funds. Funding could come from the general fund or from an assessment on fuel industries (e.g., an assessment on electric ratepayers and on oil sales), but would require an infrastructure not currently in existence outside the electric industry. The cost of developing a program to certify private inspectors would be more manageable. A State agency would oversee certification, monitor private companies' activities, perform quality control, resolve disputes, and perhaps provide for training. If the I-Codes are adopted, the existing ICC certification process could be used, as it is in Massachusetts and Ohio, minimizing the state's effort for that function. The Legislature would have to determine which agency would best perform that function and provide funding and resources. We have not studied the precise level of funds or resources that would be required under this model.

When the cost is borne by the builder, this model adds to the cost of constructing the building. Commenters have quoted $250-$300 as likely fees for residential inspections, with commercial construction inspection being higher. We have not independently verified these figures. While charging a fee may be

[19] The Legislature must determine which state agency should certify the inspectors.

unpopular with building owners, placing the cost on the individual incurring it rather than on all Maine's citizens is a reasonable policy approach.

Voluntary Adoption

The Commission finds that, if the adoption of voluntary codes is the only means of attaining acceptance among the entities that must support and implement energy codes, some limited benefits will result.

If privatization (or any other enforcement mechanism) cannot be funded at this time, voluntary adoption of energy codes would be a reasonable alternative. Under this model, a town may adopt the energy code or not. If it adopts a code, it must adopt IECC and it must enforce the codes.[20]

This approach is consistent with the BCWG recommendation, and the Legislature could endorse it for the same reasons we understand the BCWG to have endorsed it. It directly solves the difficulty of enforcement funding, by making the activity elective instead of mandatory. When compared with mandatory adoption, it will produce slower statewide adoption of efficient building practices and will retain some level of inconsistency for designers and builders. However, the existence of a single code statewide that is well enforced in towns that choose to do so would encourage more consistent building practices and attract more consistent manufactured materials (although more slowly than if codes were mandatory statewide). It would facilitate training programs by agencies such as DOE and ICC, allow builders to all learn similar practices, and establish a definition of "good practices" that could be used to judge substandard construction. While a second-best option in the long run, a voluntary approach is an improvement over today's circumstances and may provide a basis upon which improvements can be made in the future.

Voluntary adoption may have two disadvantages that that may make voluntary adoption far less effective in introducing energy codes into statewide practice than in introducing health and safety codes. First, we have no reason to believe that municipalities would change their current practice of adopting health and safety codes but not energy codes. If energy codes are voluntary, municipalities that currently enforce building (but not energy) codes are not likely to add energy codes because of the expense of doing so. Second, voluntary adoption may have the unintended consequence of deterring a town from adopting any energy code, because it prohibits adoption of the energy code that the town prefers. This problem would be most likely to occur if a town wished to adopt a code it currently uses, such as the Model Energy Code. If this is thought

[20] Privatization of inspectors is possible under a voluntary model, but it is less typical and appears to create the risk of creating a State infrastructure that neither municipalities nor builders choose to use.

to be a problem, it might be minimized by exempting towns that currently have an energy code from having to change to the IECC.

Additional Actions. Regardless of whether the Legislature chooses mandatory or voluntary adoption or no codes at all, additional actions or requirements could improve the efficiency of Maine's newly constructed buildings.

Training. The State could support or provide training for designers. The Commission, through Efficiency Maine and through its recently obtained Energy Programs staff, is supporting some construction training now and DOE funding is available for such training. Examples are:

- Training in the state-endorsed code. R.J. Karg Associates will conduct training for residential builders during February.
- Training of school designers and administrative decision makers. Efficiency Maine's new school construction program currently supports such training.
- Training in above-code standards offered by organizations such as LEED and the DOE.
- Support of the MAP, a useful tool for designers that should be maintained.
- Training in the HERS rating system, a widely used method for dmonstrating to homeowners that they will save money.

Disclosure to building owner. The model in which designers and contractors must affix a sticker in the building asserting compliance with energy codes as well as provide a disclosure statement to building owners when construction does not meet some specified level of efficiency appears to be a reasonable practice regardless of the enforcement method chosen (if any). As the only means of enforcement, this method is unlikely to be effective because it provides no means of ensuring the validity of the sticker. In addition, a homeowner may prefer that the builder construct a sub-standard building, a fact that the sticker would not address. However, the practice goes a long way to meeting consumer protection goals, by ensuring that current and future building owners are made aware of the efficiency of the building.

IX. Building Types to which Codes Apply

If the Legislature concludes that building energy codes should be adopted, the Commission finds that energy codes that apply to all types of construction in the State are most effective at realizing the advantages that codes produce, for all the reasons discussed in the section of this report that addresses mandatory adoption. However, the Commission's expertise does not encompass the issues or problems that differentiate commercial from residential construction, or the

construction of single-family homes from multi-family or manufactured homes. The Commission anticipates that such issues will be presented during the broader statewide working groups' and participants' discussions.

Current statutory residential energy codes apply to multi-family homes and homes built "on spec" (i.e., by builders who are not contracted by the person who will subsequently live in the home). Statutory commercial energy codes apply to all non-residential construction. We have been presented with no policy reason for changing the applicability of the commercial codes, and participants in our investigation did not explicitly address problems associated with building single-family homes.

X. Draft Legislation

The Commission will work with the Joint Standing Committee on Utilities and Energy to draft legislation to accomplish the actions that the Committee wishes to enact.

XI. Above-Code Standards

P.L. 2003 ch. 497 also requires the Commission to examine and report on above-code standards. The Commission is reporting on this study in a separate document.

Appendix A

The following interested persons submitted written or oral comments in the Commission's investigation:

American Plastics Council
Associated Constructors of Maine
Atofina Chemicals
Building Codes Assistance Project
Daniel Thayer, P.E. (Thayer Corporation and ASHRAE)
Helen Watts, P.E.
International Code Council
International Association of Plumbing and Mechanical Officials
Maine Codes Administrators Association
Maine Indoor Air Quality Council
Maine Municipal Association
Maine State Housing Authority
Mid-Maine Code Enforcement Officers Association
Natural Resources Council of Maine
New Buildings Institute
National Fire Protection Association (NFPA)
Northeast Energy Efficiency Partnerships, Inc.
Pilkington
Responsible Energy Codes Alliance
R. J. Karg Associates
Town of Greenville

Appendix B
Enforcement of Building Codes in Other States
Source: DOE Web Page

State	Mandatory/Vol.	Compliance	Enforcement	Responsible State Agency, if Any
AL	Res: Voluntary - city may adopt or not	Design review and inspection by local official - part of normal permit process	Local	
	State-owned: Mandatory	AL Bldg Commission reviews plans	Designer works with AL Bldg Comm	Alabama Building Commission
Alaska	State-financed res'l: Mandatory	Standardized form submitted with mortgage application. Certification & inspection done by: 1) registered architect, engineer, or ICBO certified building inspector, 2) state-approved home energy rating methods, 3) local building code official when local energy code at least as stringent as the BEES requirements, or 4) builder who has taken the appropriate Building Science Training.	Local bldg officials, banks, or Alaska Housing Finance Corp	
	State-owned: Mandatory			
AZ	Res: Voluntary - city may adopt or not	Determined by the city	Local	
	Com: Voluntary - city may adopt or not	Determined by the city	Local	
	State-owned: Mandatory			
ARK	Res & Com: Voluntary - city may adopt or not	Self-certification by builder whether or not city adopts codes. Sticker afixed in bldg.	If city adopts code: Normal inspection process. If city does not adopt code: state enforcement staff makes spot inspections	Seems to be Arkansas Energy Office
CA	Res & Com: Mandatory - cities can adopt more-stringent code		Local officials review plans during permit process and inspect before occupancy	
	State-owned: Mandatory		Dept of General Services	
CO	Hotels, motels, multi-family: Mandatory or city can adopt its own	Determined by the city	Local	
	State-owned: City determines	Determined by the city	Local	
	Res: Seems to be voluntary - city may adopt or not	Determined by the city	Local	
	Commercial: No state-determined codes	Determined by the city	Local	
CT	Res'l & Com'l - Mandatory		State-owned bldgs: State building inspector and codes & standards	Codes and Standards Committee maintains codes.
DE	Res'l & Comm'l: Mandatory; cities may revise	Determined by city or county	Certification by licensed architect/engineer (& alternatives)	
	Agricultural bldg - exempt			
	State-owned: size exemptions			Dept of Administrative Services
DC	Res'l & Com'l - Mandatory			DC Dept of Consumer & Regulatory Affairs
FL	Res'l & Com'l - Mandatory	Owner certifies to local officials during permitting process. Local officials submit to Dept of Community Affairs quarterly	Local officials may inspect	FL Building Commission maintains codes
GA	Res'l & Com'l - Mandatory	Architect/engineer certifies to city or city inspects - city determines method.	Local officials if town chooses to enforce. Town may choose not to enforce.	GA Dept of Community Affairs maintains codes
HA	All buildings - Mandatory in some counties, not others	Architect/engineer certifies to city. Varies. State bldgs overseen by State department.		
	Agricultural bldgs, air conditioned bldgs, industrial process bldgs (somewhat complex & varies) - exempt			
Idaho	Res'l & Comm'l: Mandatory; cities may revise	Contractors certifies to owner (& local officials if town chooses to enforce). May have to provide plans as well as after-the-fact certification.		
IL	State- or town-owned - mandatory under directive			
	Res'l and comm'l - appear to be no codes			

Appendix B (Continued)
Enforcement of Building Codes in Other States

IND	Res'l & Comm'l: Mandatory; cities may revise	Architect/engineer certifies to Dept of Bldg/Fire Svc for all except 1- and 2-family residences. Architects may have to submit plans of 1- and 2-family residences to city.	IN Dept of Building and Fire Services	IN Dept of Building and Fire Services
	Agricultural - exempt			
Iowa	Res'l & Comm'l: Mandatory; cities may adopt more stringent codes	Bldgs over a certain size, architect/engineer certifies to Bldg Code Bureau. Otherwise, none. Some cities set own procedures	Local and IO Building Code Bureau	IO Building Code Bureau maintains codes
KA	Res'l & Com'l - Mandatory	Comply or disclose. Architect/engineer certifies to owner of res'l bldgs.	No local or state enforcement. Consumer must litigate.	
KEN	Res'l & Comm'l - Mandatory; minor alternatives	Design review and inspection by local official - part of normal permit process	Local or KE Dept of Housing, Bldgs & Construction	KE Dept of Housing, Bldgs, & Construction maintains codes
LA	Com'l and 3-story-or-less res'l: mandatory	Architect/engineer sends plans and final certification to Office of State Fire Marshall.	Of. Of St. Fire Marshall sends letter of approval	LA Office of State Fire Marshall maintains codes
	> 3-story res'l - city chooses its own code			
	State-owned bldgs - Mandatory	Div. Of Admin determines		LA Div. Of Administration
ME	Res'l & Com'l - Mandatory	Some cities inspect as part of normal permitting procedures. Contractor certifies to utility	DECD	
	Single-family homes built by owner, log cabins, manufactured housing - exempt			
MD	Res'l & Com'l - Mandatory; cities may modify	If city adopts code, contractor certifies to city. If city does not adopt, arch/eng certifies to utility	Local inspection if city adopts code. Utility inspection if city does not.	
MA	Res'l & Com'l - Mandatory	Design review and inspection by local official - part of normal permit process	Local	MA Board of Building Regulations Standards maintains code
MICH	Res'l & Com'l - Mandatory	Design review and inspection by local official - part of normal permit process	Local	
MINN	Res'l & Com'l - Mandatory for large towns, voluntary for small towns	If city adopts code, contractor certifies submits plans and certification to city. City inspects.	Local	Local. MI Dept of Administration, Bldg Codes & Standards Divison maintains codes
MISS	Res: Voluntary - city may adopt or not	Design review and inspection by local official - part of normal permit process	Local	
	State-owned, public, highrises: Mandatory	State-owned or -funded: designer works with B of B. High rises: local	Bureau of Buildings for state-owned or -funded	
Missouri	State-owned res'l or comm'l - Mandatory.	Designer works with Div. Of Design & Construction	Div. Of Design & Construction	State-owned bldgs: Div. Of Design and Construction
	All other bldgs - no statewide codes; city may adopt its own	Local	Local	
MONT	Res'l & Com'l - Voluntary	Contractor puts sticker in home. In addition: if town adopts, locals determine process. Not clear what happens if town does not adopt.	Local or MO Building Codes Bureau	MO Building Codes Bureau
NEB	Res'l & Com'l - Voluntary	Determined by the city	Local officials	
NEV	Res: Voluntary	City or county determines	Local	
	State-owned: Mandatory	Registered designer certifies to PWB	Nev Public Wks Bd	NEV Public Works Board
NH	Res'l & Comm'l - Mandatory; cities may adopt more stringent	Plans and certification of complaince sent to local official if one exists, or to PUC.		PUC maintains codes
NJ	Res'l & Com'l - Mandatory; cities may not modify	Design review and inspection by local official - part of normal permit process	Locally, official licensed by Bureau of Codes and Standards. If no local official, Dept of Community Affairs	
NMex	Res'l & Com'l - Mandatory; cities may adopt more stringent	Local officials if they exist. If no local official, CID.	Construction Industries Division	
NY	Res'l & Com'l - Mandatory	Normal permit process - contractor submits plans and local official inspects. If no local official, not clear what is required.	Local or NY Dept of State	State Energy Office

Appendix B (Continued)
Enforcement of Building Codes in Other States

NC	Res'l & Com'l - Mandatory	Design review and inspection by local official - part of normal permit process	Local. NC Commissioner of Insurance oversees process statewide	NC State Building Code Council maintains codes
NDak	Res'l & Com'l - Voluntary. Cities may adopt or not	City determines.	Local	ND Div. Of Community Service maintains codes
	State-owned - Mandatory	Overseen by agency building the building	Agency building	
Ohio	Res'l & Com'l - Mandatory	Local officials review plans and inspect bldg. If no local official, OH Dept of Commerce Div of Industrial Compliance reviews and inspects com'l bldgs; no inspection of res'l bldgs.	Local or OH Dept of Com. Div. Of Ind. Compliance. OH Bd of Bldg Standards certifies local officials to enforce codes	OH Board of Building Standards maintains codes
OK	Res'l & Com'l - Voluntary. Cities may adopt state's code or other code.			
	State-owned - Mandatory	Dept of Central Svcs reviews plans and inspects bldgs	Dept. of Central Services	Fire marshalls appear to
OR	Res'l & Com'l - Mandatory. More stringent than ASHRAE.	Plans and certification of complaince sent to city or county official if one exists, or the State	City or county, or Bldg Codes Div.	OR Building Codes Division maintains codes
PA	Res'l & Com'l - Mandatory. Cities cannot modify	Com'l - designer certifies to DLI or DCED; no inspection. Res'l - designer certifies to DLI or DCED, who may inspect.		PA Dept of Labor & Industry and PA Dept of Community and Economic Development maintain codes
RI	Res'l & Com'l - Mandatory.	Design review and inspection by local official - part of normal permit process		RI Building Codes Standards Committee maintains codes
	State-owned - Mandatory	State Building Commissioner certifies	State Building Commisioner	
SC	Res'l & Com'l - Voluntary	Local officials review plans and inspect bldg. If no local official, fire or other local official may act as enforcement officer	Local	SC Residential Builders Commission maintains codes
SDak	None. Cities may adopt their own	City determines.	Local	
Tenn	Res'l - Voluntary	City determines. Plan review and inspection in some cities; self-certification by designer in other cities.	Local. If not adopted, there is no enforcement	
	Com'l - Voluntary			
Tex	Res'l & Com'l - Voluntary	City determines. Usually plan review and inspection.	Local	
	State-owned - Mandatory	Designer certifies to State agency	State agency	
Utah	Res'l & Com'l - Mandatory. Cities may revise	City determines.	Local	Uniform Building Code Commission maintains codes
	State-owned - Mandatory		Div of Occupational and Professional Licensing	
VT	Res'l - Mandatory.	Regional District Environmental Commissions determine. Designer self-certifies, must afix certification in the bldg and send to DPS	District Env. Commissions	VT Dept of Public Service and Efficiency VT active in determining codes, though not responsible
	Com'l - Voluntary	Uncertain		
	State-owned - Uncertain	VT Dept of Labor and Industry determines	VT Dept of Labor and Industry determines	
VA	Res'l & Com'l - Mandatory.	Design review and inspection by local official - part of normal permit process.		VA Board of Housing and Community Development maintains codes
	State-owned - Mandatory	Dept of General Service conducts plan reviews and inspections		
WA	Res'l and Com'l - Mandatory	Design review and building inspection, done by city or county. Apparently inspectors are also privatized.	WA Association of Building Officials certifies local com'l building inspectors	State Building Code Council maintains codes
WVir	Res'l and Com'l - Voluntary	Design review and inspection by local officials if town adopts. Otherwise, not clear whether there's enforcement.	Local or State Fire Marshalls (not clear what SFMs do)	State Fire Marshalls maintain codes
WI	Res'l and Com'l - Mandatory	Design review and inspection by local officials if town adopts. Otherwise, Dept of Commerce inspects.	Dept of Commerce licenses private inspectors for res'l rental units	WI Dept of Commerce maintains codes
WY	Res'l and Com'l - "Voluntary. Citites may adopt or not, or may adopt stricter codes	Design review and inspection by local officials if town adopts. Otherwise, Dept of Commerce inspects.	Local	WY Dept of Fire Protection and Safety maintains codes

Notes:

1. Many states have a state agency that does enforcement if no local officials exist. However, it is usually not clear exactly what the state agency does - e.g., whether the state agency receives plans or inspects.
2. The term "mandatory" and "voluntary" are used inconsistently. Almost all states have codes that must be accepted if a town accepts any code. However, many state have "voluntary" codes that a town may choose not to adopt.
   And, many states have "mandatory" codes and make provisions for towns that don't have enforcement agencies.
3. Data appears to be up-to-date through 2001-2002 for some states, older for others.