MinnesotaGapAnalysis

October 2014

Building Codes Assistance Project
Building Codes Building Communities

Building Codes Assistance Project (BCAP) would like to acknowledge the financial support of the Energy Foundation, which made this report possible.

We appreciate the collaboration, insights, and reviews of our work by the Minnesota Department of Commerce, Division of Energy Resources, and the Minnesota Department of Labor and Industry, Construction Codes and Licensing Division.

In addition, we appreciate the Midwest Energy Efficiency Alliance (MEEA), which provided support and a thoughtful review of the report. We are thankful for the many code officials, design and construction professionals, utility and trade association representatives, and others who provided us with crucial insights that contributed to our efforts to document and analyze energy code issues in Minnesota.

Any opinions, findings, conclusions, or recommendations expressed herein are solely those of the author(s) and do not necessarily reflect the views of the state, individuals, organizations, or institutions included herein.

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ACRONYMS & ABBREVIATIONS

AELSLAGID or "the board" – Minnesota Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design
AIA – American Institute of Architects
AIA-MN – AIA Minnesota Chapter
AMBO – Association of Minnesota Building Officials
ARRA – American Recovery and Reinvestment Act of 2009
ASHRAE – American Society of Heating, Refrigeration, and Air-Conditioning Engineers
B3 – State of Minnesota Buildings, Benchmarks & Beyond Guidelines
BAM – Builders Association of Minnesota
BCAP – Building Codes Assistance Project
BECP – Building Energy Codes Program
BPI – Building Performance Institute
CCAC – Minnesota Construction Codes Advisory Council
CCLD – Minnesota Construction Codes and Licensing Division
CE – Continuing education
CPA – BCAP Compliance Planning Assistance Program
DLI – Minnesota Department Labor and Industry
DOE – U.S. Department of Energy
DOER – Minnesota Department of Commerce, Division of Energy Resource
ECAP – Energy Code Ambassadors Program
EECBG – Energy Efficiency and Conservation Block Grants
EERS – Energy efficiency resource standard
EIA – U.S. Energy Information Administration
EPA – U.S. Environmental Protection Agency
EPAct – Energy Policy Act (EPAct) of 1992
FHA – Federal Housing Administration
HERS – Home Energy Rating Score
HPwES – Home Performance with ENERGY STAR
HSW – health, safety, and welfare
IBC – International Building Code
ICC – International Code Council
IRC – International Residential Code
IECC – International Energy Conservation Code
LEED – Leadership in Energy and Environmental Design
MBPA – Minnesota Building Performance Association
MCCAG –Minnesota Climate Change Advisory Group
MEEA – Midwest Energy Efficiency Alliance
MLS – multiple listing service(s)
OCEAN – Online Code Environment & Advocacy Network
Recovery Act – American Recovery and Reinvestment Act of 2009
RESNET – Residential Energy Services Network
SEP – DOE State Energy Program
USGBC – U.S. Green Building Council
VA – Veterans Affairs
WAP – Weatherization Assistance Program

EXECUTIVE SUMMARY

This Minnesota Gap Analysis Report was prepared as part of the **BCAP Compliance Planning Assistance Program**.

The purpose of this report is twofold: 1) to document and analyze the unique strengths and weaknesses of the state's existing building energy code adoption and implementation infrastructure and policies; and 2) to recommend actions that state agencies, local jurisdictions, and other stakeholders can take to support and encourage local jurisdictions to adopt, enforce, and improve compliance with model energy codes. The report also details some of the **state's current best practices** and offers Minnesota-specific recommendations for actions that would improve the energy efficiency of its built environment.

Well-coordinated policies can make energy efficiency a state's "first fuel" – an abundant, accessible, and affordable energy resource to reduce demand, spur economic growth, and protect the environment. Building energy codes are a key policy tool to help achieve these goals.

Minnesota already has an impressive energy code infrastructure in comparison to most U.S. states. The state adopted one of the nation's first standards for building energy efficiency more than 40 years ago, and it has established a dedicated revenue stream for energy code support, which has facilitated the evolution of such key components as licensing and continuing education requirements. The state provides a great deal of assistance in the form of training, technical assistance, and outreach not only to local code enforcement officials but also builders, contractors, architects, realtors, and homebuyers. Several key stakeholder groups have demonstrated a high level of buy-in for building performance not often seen elsewhere in the country. In addition, voluntary programs that go beyond the minimum energy code requirements are gaining ground and becoming an important piece of Minnesota's commitment to a sustainable future.

The state and its communities, however, must remain dedicated to confronting the challenges ahead. With a long-standing building code update process slated to finish this year, stakeholder groups must learn about the new requirements and receive training in the months prior to the 2015 construction season. While a recent statewide study of energy code compliance found high rates of compliance with a previous energy code edition (*see Compliance Verification section of this report*), the state must plan for achieving full compliance as it progresses with adopting new codes. A key recommendation is to establish an energy code compliance collaborative, a long-term advisory group to serve as a forum for representatives from diverse stakeholder groups to work toward common goals that will improve energy code compliance in Minnesota.

To gain insights for this report, BCAP conducted in-depth interviews with state officials, home builders, code enforcement professionals, municipal representatives, and other key stakeholders. That information is woven throughout the report, which is organized in the following sections: (note: electronic readers of this report can quickly jump to other areas in the report by clicking on italicized text).

Introduction (page 5) provides an overview of the amount of energy residential and commercial buildings consume, the amount of money Minnesota spends on imported energy, and a broad perspective on the status and importance of energy code adoption, enforcement, and compliance.

National Perspective on Energy Codes (page 7) provides a comparison of Minnesota's energy code adoption status to other states in the United States. It describes the role of the U.S. Department of Energy (DOE) in the policy process and provides information on federal funding provided to Minnesota through the American Recovery and Reinvestment Act of 2009 (Recovery Act).

State Overview (page 11) provides an overview of Minnesota's important demographic and economic indicators: population growth; permitting trends in major cities and counties; energy production and consumption; and the inclusion of energy codes as part of city, county, and state climate plans.

Minnesota's Energy Code (page 16) outlines the process of adoption of energy and other building codes in the state, offering key political insights gleaned from numerous interviews with state and local officials and code enforcement personnel. This section also describes the potential energy and financial savings available to owners and occupants of new buildings if the state were to achieve substantial compliance with the national model energy codes. Finally, it includes legislation and rules that impact this policy arena in Minnesota.

Administration & Enforcement (page 21) details the division of responsibilities particular to Minnesota's state and local governments and other stakeholder groups. It details implementation activities like training and outreach as well as the certification, licensing, and education requirements for enforcement, construction, and design professionals. Finally, it highlights the beyond code programs conducted throughout the state and best practices from across the country.

Compliance Verification (page 39) provides and analyzes examples and past activities in the state such as a 2013 compliance evaluation study and explains the benefits of the process.

The *Conclusion* (page 42) summarizes the key findings within the report.

Appendix A (page 43) offers a list of DOE energy code resources.

Appendix B (pages 44-48) features two tools developed by BCAP to help policymakers assess the impacts on energy code adoption and compliance both on the individual homeowner level and on the macro statewide level.

SUMMARY OF GAPS AND RECOMMENDATIONS

This section summarizes this report's main findings: the gaps identified in Minnesota's energy code infrastructure and recommendations to address them and begin developing a strategic compliance plan.

NOTE: While Gap Analysis Reports generally recommend adoption of the latest model energy code in states that have not done so, the progress of Minnesota's 2012 IECC adoption process, stakeholder buy-in, and the timeline expressed by state officials allow this report to forgo that specific formal recommendation here (see the *2012 IECC Adoption Process* subsection for more).

Gap #1: Local jurisdictions lack options for adopting mandatory standards beyond the state energy code.

Recommendation #1: Provide municipalities flexibility and progressive options by adopting beyond code policy tools like stretch energy codes, reach codes, and green construction standards like the B3 Guidelines. The Online Code Environment & Advocacy Network (OCEAN) Beyond Code webpage highlights several programs pioneered by other states, local jurisdictions, and nonprofit organizations. → *See page 18*

Gap #2: Minnesota does not require design professionals to earn continuing education credit related to energy efficiency or the state energy code.

Recommendation #2: While the state may wish to maintain flexibility for design professionals and lessen the burden of oversight for the AELSLAGID board, licensees in the state should have minimum continuing education requirements related to the state's construction codes (and energy code), particularly during transition periods following code updates. → *See page 30*

Gap #3: There is a need at the local government level for individuals to "champion" energy codes. BCAP has found that areas that have a local champion (whether within a building department, or a mayor, or other political figure) are much more successful in implementing the energy code.

Recommendation #3: Consider launching an Energy Code Ambassadors Program whereby key regional building code officials or builders would be engaged to advocate for energy codes regionally and support local building departments as they transition to a new, more efficient code.→ *See page 32*

Gap #4: Outreach to the Minnesota architecture community about the importance and benefits of being leaders in building energy performance design and energy code advocacy should be more robust and consistent.

Recommendation #4: The state should engage the architecture community about energy codes and performance in the design process more frequently and qualitatively through existing outreach opportunities through AIA-MN such as *Architecture Minnesota Magazine*, its annual convention, and training and social events. → *See page 33*

Gap #5: Sustained public outreach and education on home energy efficiency and energy codes to consumers is needed, especially given the challenges presented by the changes in the pending state energy code update.

Recommendation #5: The state should update and refresh its public outreach and education efforts on

home buying and home improvement to include more information on the state energy code, particularly addressing issues unique to the pending 2012 IECC update. This push should integrate resources found through partnerships with local governments, nonprofits, educational institutions, and utilities. Current efforts like the BCAP Consumers Energy Code Awareness campaign, its Consumers Take Action tool, and press releases to local media outlets can be tailored for Minnesota. → *See page 35*

Gap #6: The state has not yet achieved full energy code compliance in residential building space.

Recommendation #6: While the state's accomplishments thus far are commendable, more work is needed. Rolling out a 2012 IECC-based state energy code over the next two years will bring new challenges. Minnesota should use 2014 and 2015 to implement the recommendations from this Gap Analysis Report and the state's baseline compliance assessment. This should include providing adequate documentation related to proper HVAC equipment sizing and commissioning as well as additional energy code education for code officials, contractors, and design professionals. → *See page 40*

Gap #7: The state does not currently have plans to conduct a follow-up compliance assessment before 2017.

Recommendation #7: Minnesota will need to plan and secure funding to assess compliance in both commercial and residential building space. This would likely need to take place in the first half of 2016 to coincide with the building season. Besides conventional funding sources, the state should explore alternative approaches that may reduce costs, such as the service learning university course the Nebraska Energy Office is piloting in early 2014. DOE also provides resources and recommendations for "off-year" compliance activities like jurisdictional surveys in between formal evaluations that can be cost-effective and inform other state efforts. → *See page 40*

Gap #8: Minnesota has not formed an energy code compliance collaborative to serve as a forum for stakeholders to work towards common interests and goals and provide support for energy code compliance activities.

Recommendation #8: BCAP can assist the state to form a compliance collaborative based on its experience doing so in seven other states. The Compliance Collaboratives webpage on the OCEAN website features the program and hosts webpages for some of the collaboratives. BCAP also employs an annual information-sharing webinar and quarterly news bulletin to foster dialogue and share new ideas among the collaboratives. → *See page 41*

INTRODUCTION

A large amount of energy is used to power and maintain buildings, which account for nearly 49 percent of total energy consumption[1] and 72 percent of electricity use in the United States.[2] Buildings are also responsible for at least 56 percent of U.S. greenhouse gas emissions.[3] Moreover, buildings last a long time. Today's building energy policies will affect energy consumption through the year 2060 and beyond.

Reducing the energy demand in buildings through energy codes benefits Minnesota citizens in these ways:

- Saves homeowners and businesses hundreds or thousands of dollars each year;
- Retains dollars in-state that would otherwise be spent purchasing energy from out-of-state sources;
- Strengthens local economies, generating economic growth that creates jobs;
- Decreases demand for imported energy;
- Decreases peak energy demand, which improves grid reliability and defers the cost of constructing expensive new power generation plants;
- Improves indoor thermal comfort and air quality, reduces noise, and helps ensure quality construction;
- Reduces greenhouse gas emissions and air and water pollution; and
- Improves the living standards of Minnesota families.

Some claim that energy codes will result in higher upfront building costs or that an energy-efficient building or home is too costly. However, there are two costs that should always be considered when purchasing a building: (1) the upfront (first) cost; and (2) the long-term (operational) cost over the life of the building. Design and construction costs for buildings account for just five to ten percent of the total occupant spending over the span of a building's serviceable lifetime. Ongoing operation and maintenance costs account for 60 to 85 percent of the total lifecycle costs.[4] When these costs are considered together from the beginning of a building's life, energy codes prove to be advantageous to the owner of the facility or home.

Recent improvements in the stringency of the model energy codes—and the development of the first green building codes—continue to raise the bar for energy-efficient design and construction to levels that were almost unimaginable a few years ago. Retail and office buildings constructed to meet the requirements of the **2012 International Energy Conservation Code (IECC)** can be at least 15 percent more energy efficient than those constructed to meet the 2009 IECC.[5]

The **American Recovery and Reinvestment Act of 2009** (Recovery Act) provided states and cities with unprecedented funding and incentives to adopt the 2009 IECC. This push from the federal government is part of a larger transformation in the way policymakers, utilities, and the general public increasingly views energy codes as a cost-effective solution to our current economic, environmental, and energy concerns.

Yet despite this recent progress, energy code enforcement and compliance remain woefully insufficient in municipalities across the country. While code development and adoption are the necessary first steps of the energy codes process, adoption alone does not guarantee compliance. To ensure that such codes result in the energy reduction and cost savings they are designed to achieve, states and cities must design and carry

out effective and realistic energy code implementation strategies.

The goals of this report are to:

- Document Minnesota's energy codes infrastructure, existing gaps, and best practices; and
- Provide initial recommendations for actions the state, local jurisdictions, and involved third-party organizations can take to fill these gaps and begin to move towards full compliance with the adopted codes and standards of the State of Minnesota.

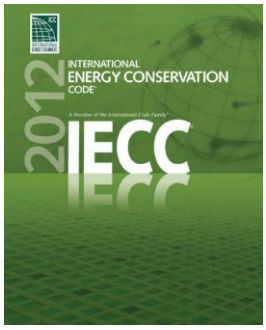
NATIONAL PERSPECTIVE ON ENERGY CODES

The IECC and ASHRAE Standard 90.1 are developed and published every three years by consensus-based non-governmental organizations: the International Code Council (ICC) and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), respectively. While there is no federally mandated minimum standard for energy efficiency in private residential or commercial buildings, both organizations release national model codes (currently ASHRAE Standard 90.1-2010 and 2012 IECC) every three years that establish baselines for residential and commercial development. States that want to ensure that construction within their boundaries meets national minimum standards will adopt the national model codes. The responsibility for adopting energy codes is generally left to state governments.

STATE CODE STATUS

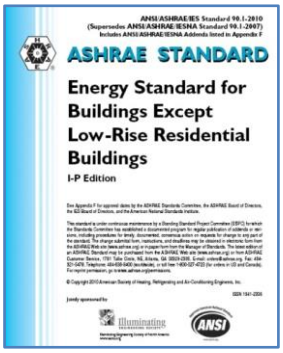
The following *Code Status Maps* in Figure 1 shows the status of residential and commercial energy code adoptions as of September 1, 2014 and is summarized here.

Residential Energy Codes



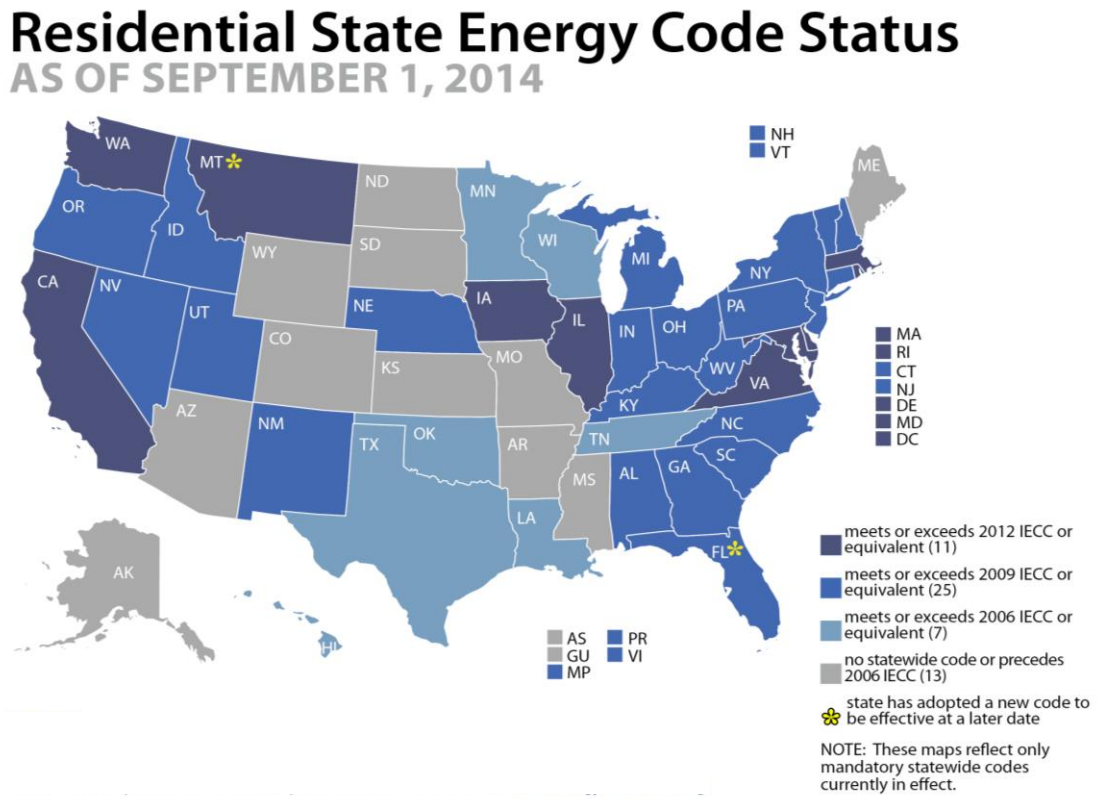
As of September 1, 2014, 39 states and U.S. territories have residential codes that meet or exceed the efficiency of the 2009 IECC. To date, 11 states and the District of Columbia have implemented the 2012 IECC. Dozens of *local jurisdictions* across the nation have also adopted the 2012 IECC, and others are pending.

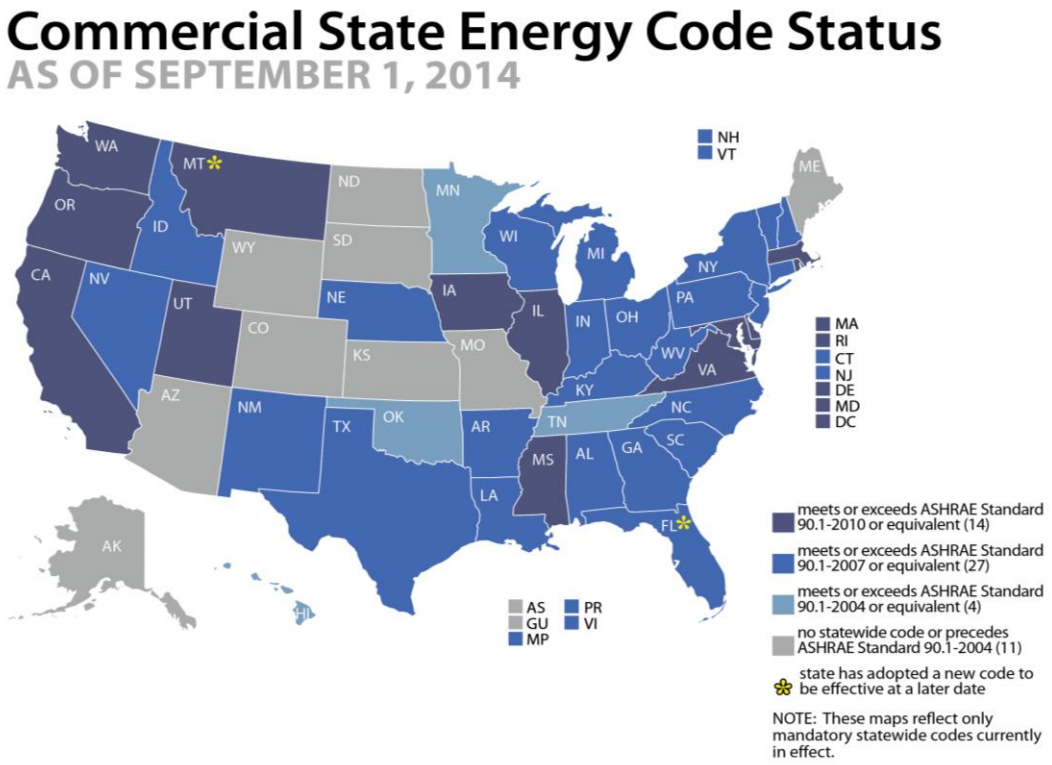
Commercial Energy Codes



As of September 1, 2014, 44 states and U.S. territories have mandatory statewide commercial energy codes in effect that meet or exceed the efficiency of ASHRAE Standard 90.1-2007. Fourteen states, the District of Columbia, and dozens of local jurisdictions have already implemented a commercial energy code that meets or exceeds ASHRAE Standard 90.1-2010, and others are pending.

Figure 1 – Code Status Maps





FEDERAL POLICY

Although energy code adoption occurs on the state and local levels, the federal government—through Congress and DOE—has played a significant role in advancing energy code development, determining the relative energy savings 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 mandates that DOE make a new determination within 12 months for every subsequent revision of these codes. Each state then has two years to certify that it has revised its own energy code to meet or exceed the requirements of the latest edition of the national models. A state can decline to adopt a residential energy code by submitting a statement to DOE detailing its reasons for doing so.[6]

For commercial buildings, DOE issued a final determination in October 2011 that ASHRAE Standard 90.1-2010 would achieve greater energy efficiency in buildings subject to the standard than if they were built to ASHRAE Standard 90.1-2007, specifically national source energy savings of 18.2 percent and 18.5 percent above for site energy consumption.[7]

For low-rise residential buildings, DOE issued a final determination in May 2012 that the 2012 IECC would achieve greater energy efficiency in buildings subject to the code than if they were built to the 2009 IECC. The determination details the various code changes and subsequent energy savings gains that move the code towards DOE's stated goal of 30 percent energy savings beyond the baseline established in the 2006 IECC.[8]

In May 2013, DOE transmitted letters to all 50 state executives, including Gov. Mark Dayton, reminding states of their obligations under EPAct to certify that they have reviewed and updated their energy codes within two years of DOE's positive determination or request an extension.[9] For commercial code review and adoption of ASHRAE Standard 90.1-2010, this deadline was October 18, 2013. For residential code review of the 2012 IECC, this deadline was May 17, 2014.

RECOVERY ACT

In February of 2009, Congress passed the Recovery Act, which had three immediate goals: create new jobs and save existing ones, spur economic activity and invest in long-term growth, and foster unprecedented levels of accountability and transparency in government spending.[10] To help achieve these goals, the Recovery Act provided states with stimulus funds through the State Energy Program (SEP) and the Energy Efficiency and Conservation Block Grants (EECBG) contingent upon the adoption of codes that meet or exceed the energy savings of the 2009 IECC (or equivalent) for residential construction and ASHRAE Standard 90.1-2007 (or equivalent) for commercial construction. States must also develop and implement plans to achieve and demonstrate 90 percent compliance with the codes by 2017.[11]

As a condition for receiving SEP funds, then-Governor Tim Pawlenty submitted a letter to DOE in March 2009 assuring that state officials would begin actions to achieve these goals.[12] Based on the governor's assurance and the State Energy Plan submitted, DOE awarded $54.2 million of SEP funds to the state for energy efficiency and renewable energy programs.[13] DOE also approved the state's EECBG program plan and awarded a $38.5 million formula grant, a portion of which was intended for the state to use to adopt, implement, and conduct trainings to meet the 90 percent compliance goal.[14] Additionally, in 2009, DOE allocated $131.9 million in Weatherization Assistance Program (WAP) funds to improve the energy efficiency of existing low-income housing in Minnesota.[15]

STATE OVERVIEW

Minnesota is the 21st largest state in America with a population of 5.4 million people that is expanding faster than the national U.S. growth rate.[16] While a significant percentage of the population and construction occurs in the Twin Cities metropolitan area (comprised of 182 municipalities, including Minneapolis and the state capital Saint Paul), Minnesota also maintains a rural identity with a population density below the national average (67 people per square mile).[17] Minnesota is ranked as an average state in energy consumption and expenditures per capita (see Figure 2).

Figure 2 – Minnesota U.S. Rankings in Energy Consumption, Expenditures, Production, and Prices (2011)

Consumption	
Total Energy per Capita	18
Expenditures	
Total Energy per Capita	23
Production	
Total Energy	34
Crude Oil	--
Natural Gas	--
Coal	--
Electricity	29
Prices	
Natural Gas	44
Electricity	20
Environment	
Carbon Dioxide Emissions	24

Source: EIA State Energy Data System

Like much of the upper Midwest, Minnesota experiences temperature extremes through cold, snowy winters and hot, humid summers. The state is a leader in wind and biomass power potential, but it has no traditional fuel resources such as coal, petroleum, or natural gas. Minnesota relies on coal transported primarily from Wyoming and Montana to produce over 60 percent of its electricity generation. The state also depends heavily on natural gas from Canada and the Dakotas as its main fuel source for home heating.[18]

With a generally harsh climate and heavy dependence on out-of-state energy resources, however, the state is still vulnerable to future fluctuations in energy costs and peak demand. Minnesotans need consistent and reliable energy performance and costs. Reducing local demand for electricity and natural gas will decrease costs for consumers and increase profits for businesses.

STATE ENERGY PORTFOLIO

PRODUCTION

Minnesota has no fossil fuel production. It does have substantial renewable resource potential through the wind energy facilities on its rolling plains. Minnesota is a top ethanol and biomass producer due to its fertile agriculture sector. The state is an important part of the Midwest's energy resource transportation network through the Mississippi River and Port of Duluth on Lake Superior.[19] Coal-fired power plants provide almost half of Minnesota's net electricity generation. The state's two nuclear plants on the Mississippi River provide about one quarter. The remainder is fueled by wind power, natural gas, biomass, and conventional hydroelectric power.[20]

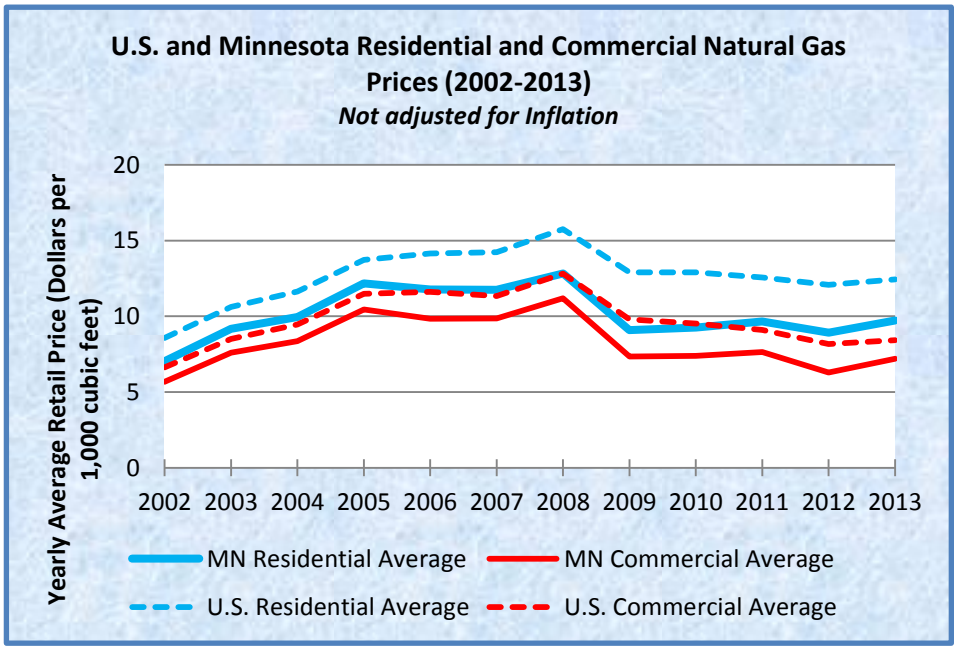
Minnesota's buildings use 40 percent of the energy consumed in the state: 21 percent for residential dwellings and 19 percent for commercial buildings.[21] This is comparable to national energy consumption data (see the *Introduction* section of this report).

Natural gas prices in Minnesota are among the lowest in the country (see Figure 3). Electricity prices are also very affordable - at or below the national average (see Figures 4 and 5).

Minnesota established a best practice with the adoption of an energy efficiency resource standard (EERS). The **Next Generation Energy Act of 2007** established an energy savings goal of 1.5 percent of average retail sales for each state electric and gas utility beginning in 2010. This led to utilities developing Conservation Improvement Program (CIP) incentives for energy-related improvements in homes, businesses, agricultural buildings, and manufacturing facilities.[22]

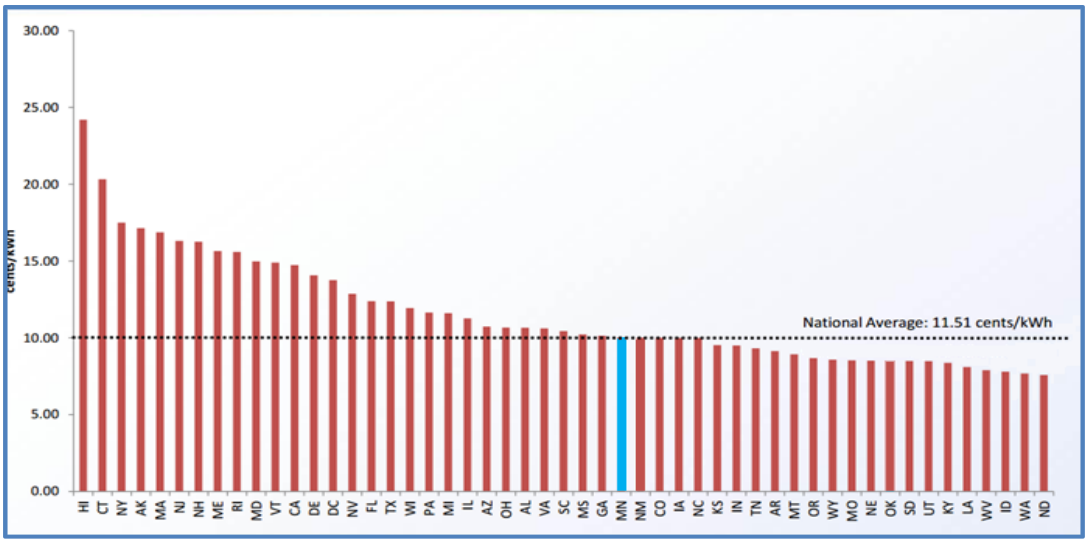
Over 2009 and 2010, these programs saved enough electricity and natural gas to power and heat 140,000 and 83,000 Minnesota homes for one year, respectively. These savings translate to about 1.7 million tons of avoided carbon dioxide emissions, or the equivalent of removing the emissions from about 300,000 cars from the road for one year. Utilities estimate these programs will save consumers $2.6 billion over the average 15-year life of the measures and prevent 25 million tons of carbon dioxide emissions. For every $1 invested in CIP programs, Minnesotans profit from a $5.46 return on investment. CIP initiatives also result in reduced stress on Minnesota's aging power delivery grid system that delivers power to homes and businesses, and they create jobs for firms that offer energy-efficient solutions.[23]

Figure 3 – U.S. and Minnesota Residential and Commercial Natural Gas Prices (2002-2013)



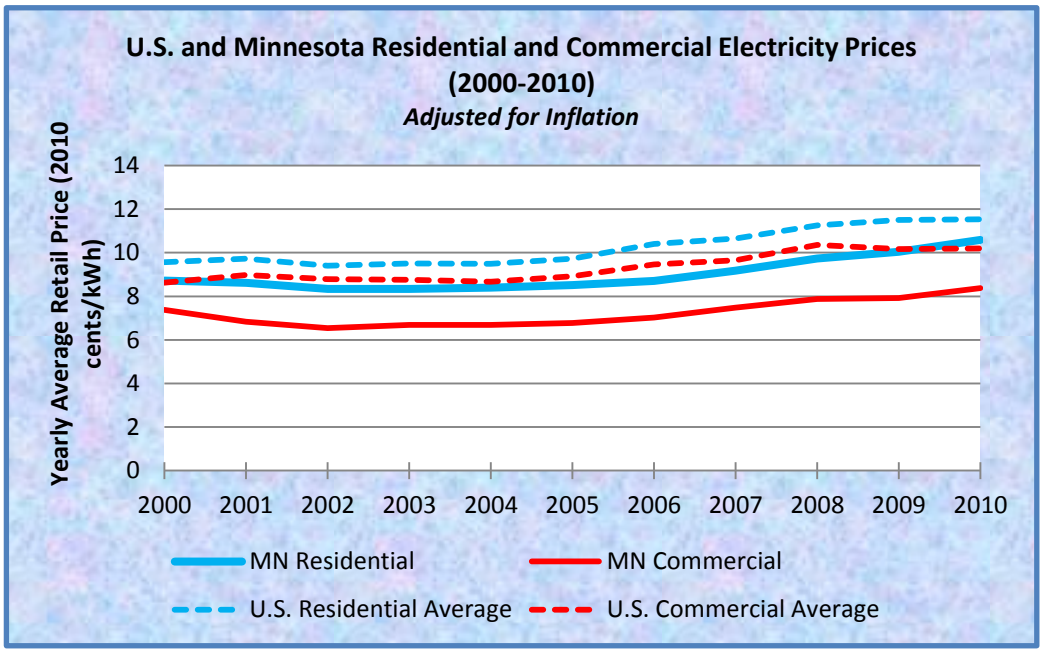
Source: EIA. Natural Gas. *Natural Gas Prices*
Data derived from annual price history tables provided for U.S. and MN

Figure 4 – Minnesota Residential Electricity Prices Compared to Other U.S. States (2011)



Source: Oklahoma First Energy Plan (2011), pg 23.
Adapted to highlight Minnesota electricity prices

Figure 5 – U.S. and Minnesota Residential and Commercial Electricity Prices (2000-2010)

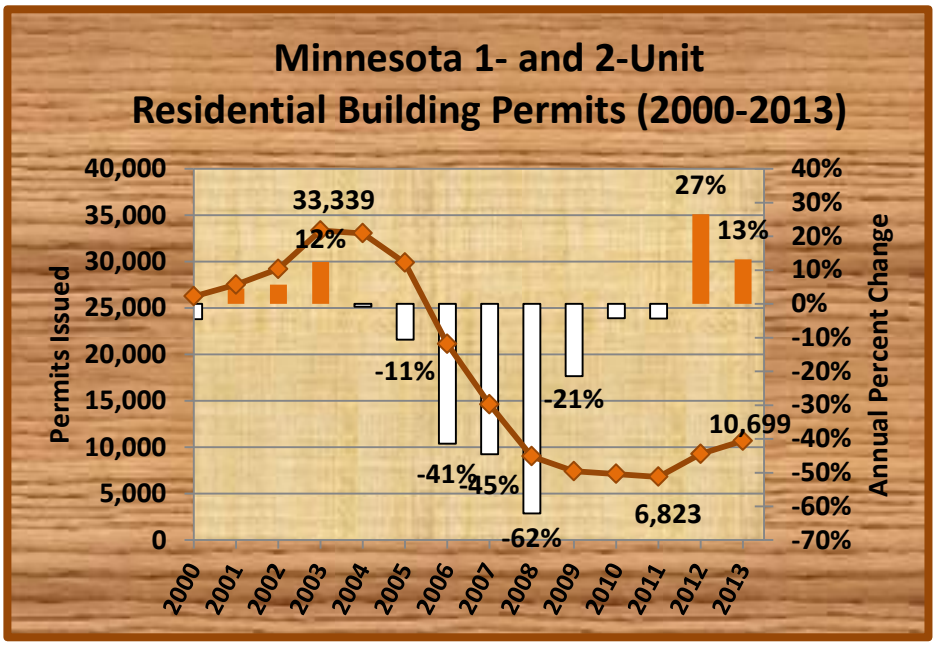


Source: EIA. State Electricity Profiles. *United States Electricity Profile, 2010*.
Table 8. Retail Sales, Revenue, and Average Retail Price by Sector, 1990 Through 2010

CONSTRUCTION OVERVIEW

Like most states, new construction in Minnesota has decreased significantly since the previous decade and the start of the economic downturn. As Figure 6 illustrates, one- and two-family residential housing permits rose steadily during the beginning of the 2000s, reaching an apex of over 33,000 permits in 2003. Following a national housing market crisis, permits dropped to fewer than 7,000 in 2001. After eight consecutive years of decline, the Minnesota housing market grew to more than 10,000 permits by 2013 - a 68 percent decrease from the state industry's 2003 peak. The reduced demand for new construction caused many builders to go out of business or leave the market entirely, both in large urban areas and suburbs.

Figure 6 – Minnesota One- and Two-Unit Residential Building Permits



Source: U.S. Census Bureau. Building Permits Survey. *Annual History by State*

Comprehensive commercial construction and real estate data can be difficult to obtain, but one 2014 assessment from Integra Realty Resources (IRR) shows that real estate markets throughout the United States are generally continuing to recover since the economic downturn. The "Minneapolis metro area" was included in the commercial real estate markets considered in the report, which shows that American office and retail markets are evenly split between cycles of recession and recovery, and that industrial sector construction markets appear to be further into the recovery phase. The multifamily housing sector appears to have recovered the most of the sectors considered in the report.[24]

The Minneapolis area's nonresidential construction markets in 2013 tracked closely to many other cities in the rest of the country. The area's central business district (CBD) and suburban office markets were still in the last stage of the recovery phase, characterized by decreasing vacancy rates, low rates of new construction, and low or negative rental rate growth. The markets for apartment, multi-family residential, retail, and industrial real estate markets have moved into the expansion phase, marked by decreasing

vacancy rates, moderate to high levels of new construction, and medium to high rental rate growth.[25]

Although the decline in residential and commercial construction has been detrimental to the economy, it presents a unique opportunity for the advancement of energy codes in Minnesota. When the market is slow, it may present the opportunity for code officials, and building and design professionals to seek training to become more familiar with codes and standards encountered daily in their trade. Some professionals may take the time to acquire additional certifications and/or training on beyond code programs. Reduced construction activity also helps ease all stakeholders into the new energy code, rather than trying to adjust while construction is high.

CLIMATE ACTION PLANS

A growing number of states are developing climate change task forces to develop state climate action plans.[26] Members typically include state and local policymakers, policy analysts, environmentalists, and other stakeholders from the energy, industry, transportation, agriculture, forestry, and waste sectors.

Minnesota's first efforts at developing such a plan came in 2003 through the Minnesota Pollution Control Agency's climate plan framework.[27] Later, Governor Tim Pawlenty's Next Generation Energy Initiative established the **Minnesota Climate Change Advisory Group (MCCAG)** to evaluate and compile recommended policy options to aggressively reduce greenhouse gas emissions in the state.[28] In 2008, the group submitted its final report to the Minnesota Legislature.[29] Among the unanimous recommendations at the time was the implementation of what would become the current Minnesota State Building Code.

Climate efforts also occur at the local level. The U.S. Conference of Mayors Climate Protection Agreement is one example. Inspired by the Kyoto Protocol in 2005, Seattle Mayor Greg Nickels launched an initiative to advance the goals of the Kyoto Protocol through local level leadership. As of January 2014, 1,060 American cities have signed the agreement, including 45 in Minnesota, including Minneapolis, St. Paul, and Duluth.[30] Another local climate initiative is Sierra Club's Cool Cities Program, a collaborative project led by volunteers from community members to local leaders and businesses to implement clean energy solutions that save money, create jobs, and help curb global warming.[31]

Minneapolis has developed its own local Climate Action Plan.[32] Adopted by the Minneapolis City Council in June 2013, the plan proposed a comprehensive set of emissions reduction strategies in three areas: buildings and energy, transportation and land use, and waste and recycling. Among its goals, the plan seeks to improve residential building energy efficiency by 15 percent and commercial building energy efficiency by 20 percent (compared to the growth baseline) by 2025. Recommendations include:

- Support the state's update of the state energy code and explore the adoption of a green building code locally if not pursued at the state level.
- Implement a Building Energy Disclosure policy ("benchmarking") for medium and large commercial buildings.
- Create time-of-sale and time-of-rent energy label disclosure for residential buildings.

MINNESOTA'S ENERGY CODE

In the United States, building codes are adopted at the state and local levels. The process differs from state to state, but typically codes are adopted through a legislative process, a regulatory process, or some combination of both. A few states are considered "home rule," meaning codes are adopted at the local level.

RESIDENTIAL AND COMMERCIAL BUILDINGS

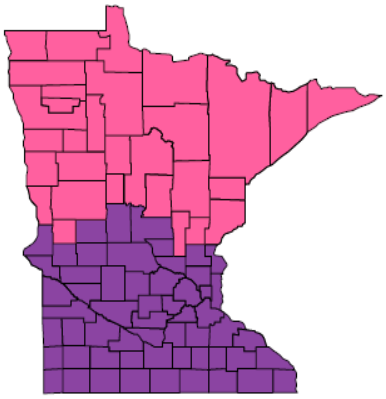
The Minnesota state statute 326B.02 delegates the authority to administer the Code to the Department of Labor and Industry (DLI), Construction Codes and Licensing Division (CCLD). Effective June 1, 2009, the 2007 Minnesota State Building Code contains provisions regulating energy efficiency, including:

- **Minnesota Residential Energy Code** (Chapter 1322), which incorporates by reference Chapter 11 of the 2006 IRC as amended within the chapter.[33]
- **Minnesota Commercial Energy Code** (Chapter 1323), which incorporates by reference ASHRAE Standard 90.1-2004 as amended within the chapter.[34]

Minnesota has two climate zones according to the IECC (see figure 7).[i] The code is mandatory statewide. With few exceptions, it is applicable to all residential and commercial construction including new buildings, additions, repairs, alterations, and demolitions.[35]

While CPA Gap Analysis Reports generally recommend adoption of the latest model energy code in states that have not done so, the progress of Minnesota's 2012 IECC adoption process, stakeholder buy-in, and the timeline expressed by state officials allow this report to forgo that specific formal recommendation here (see the *2012 IECC Adoption Process* subsection below for more).

Figure 7 - Minnesota Climate Zone Map and County List



CLIMATE ZONE 7			
Aitkin	Grant	Mahnomen	Roseau
Becker	Hubbard	Marshall	St. Louis
Beltrami	Itasca	Mille Lacs	Wadena
Carlton	Kanabec	Norman	Wilkin
Cass	Kittson	Otter Tail	
Clay	Koochiching	Pennington	
Clearwater	Lake	Pine	
Cook	Lake of the Woods	Polk	
Crow Wing		Red Lake	

CLIMATE ZONE 6			
Anoka	Goodhue	Murray	Steele
Benton	Hennepin	Nicollet	Stevens
Big Stone	Houston	Nobles	Swift
Blue Earth	Isanti	Olmsted	Todd
Brown	Jackson	Pipestone	Traverse
Carver	Kandiyohi	Pope	Wabasha
Chippewa	Lac Qui Parle	Ramsey	Waseca
Chisago	Le Sueur	Redwood	Washington
Cottonwood	Lincoln	Renville	Watonwan
Dakota	Lyon	Rice	Winona
Dodge	Martin	Rock	Wright
Douglas	McLeod	Scott	Yellow Medicine
Faribault	Meeker	Sherburne	
Fillmore	Morrison	Sibley	
Freeborn	Mower	Stearns	

Source: RECA. (2012). IECC Compliance Guide for Homes in MN

[i] *NOTE:* The current MN code renames IRC Climate Zone 6 as the Southern Zone and Climate Zone 7 as the Northern Zone. Also, the Northern Zone has been amended to include four counties: Douglas, Morrison, Todd, and Traverse.

STATE BUILDINGS

State projects include public buildings and state licensed facilities that fall under the authority of CCLD:

- ***Public building***: Any structure and attached grounds for which the cost is paid for by the state or a state agency as well as school district building projects costing $100,000 or more.
- ***State licensed facility***: Any structure and attached grounds that are licensed by the state as a "hospital, nursing home, supervised living facility, free-standing outpatient surgical center, correctional facility, boarding care home, or residential hospice."[36]

In 2000, the Minnesota Legislature required the Departments of Administration and Commerce to develop sustainable building design guidelines mandatory for all new buildings receiving state bond funding after January 2004. The Legislature expanded these requirements in 2008 to include development of sustainable building guidelines mandatory for all major renovations[ii] receiving state bond funding after January 2009.[37]

Among other goals, the legislation required that the guidelines:

- Exceed the state energy code by at least 30 percent;
- Focus on achieving the lowest possible lifetime costs; and
- Encourage continual energy conservation improvements

To achieve these goals, the **State of Minnesota Buildings, Benchmarks & Beyond (B3) Guidelines** are designed to be:

- "Clear, simple, and easily monitored with explicit documentation that will record progress";
- "Compatible with national guidelines such as LEED™ while maintaining regional values, priorities and requirements"; and
- Able to "set up a process that will eventually lead to a full accounting of the actual costs and benefits of sustainable building design." [38]

BEST PRACTICE
B3 Guidelines for State Buildings

One way states "lead by example" is by adopting a more efficient energy code for state-owned and/or state-funded facilities. By raising the bar for public buildings, the state demonstrates fiscal responsibility with taxpayer dollars, helps hedge against uncertain energy availability and costs, creates jobs, and stimulates the local economy. In addition, more stringent requirements familiarize and train the construction industry and code enforcement officials as well as increase demand for "greener" products from suppliers, manufacturers, and providers.

Minnesota's B3 Guidelines go well beyond the state energy code and can be applied to the design of any new buildings or renovations to meet sustainability goals for site, water, energy, indoor environmental quality, materials, and waste.

[ii] "Major renovations" are defined as: "at least 10,000 square feet and including the replacement of the mechanical, ventilation, or cooling system of the building or a section of the building."

Certain state code chapters (e.g. elevators, electrical requirements, accessibility, and manufactured homes) have specific statutory authority and, with limited exception, are mandatory throughout the state.[39] While the Minnesota State Building Code is mandatory statewide, metro areas with populations over 2,500 and seven counties in the Minneapolis/St. Paul metro area are required to adopt the codes locally. If other local jurisdictions want to enforce building codes, they must first locally adopt the Minnesota State Building Code in its entirety. They may not adopt mandatory standards different than the state building code.[40] Enforcement is mandatory for almost all chapters of the code (with the exception of three optional chapters unrelated to energy efficiency).

CCLD provides a comprehensive directory of information for municipalities, including whether the local jurisdiction has adopted the state building code and contact information for local building officials.[41]

Many builders throughout Minnesota, however, choose more efficient and green construction methods. Some local building departments recognize the need to support and promote these practices and provide financing information and technical resources for builders to do so. For example, the City of Minneapolis Construction Code Services has procedures for reviewing alternative building methods not found in the state building code and multiple staffers with Leadership in Energy and Environmental Design (LEED) accreditation.[42]

While uniformity has advantages, the state should consider allowing municipalities to adopt more progressive energy efficiency requirements for buildings in their communities. New state policy tools that have emerged in recent years include the "stretch code" and "reach code" (see the text box at right):[43]

Gap #1: Local jurisdictions lack options for adopting mandatory programs beyond the state energy code.

Stretch Codes and Reach Codes

Stretch and Reach Codes are beyond-code, optional codes that:

- Advance the construction market, and prime the industry for changes that could be part of the next state code update.
- Provide certainty and consistency for the construction sector by using the same public process as other statewide code adoptions.
- Avoid the pitfalls created by allowing a patchwork of different codes to be adopted by individual local jurisdictions.

A **stretch code** is a voluntary appendix that allows municipalities to adopt a uniform beyond-code option to achieve greater levels of energy efficiency. For example, the Massachusetts stretch code offers 20% more efficiency than the state's minimum code. As of October 2013, 134 municipalities (comprising 51% of the state's 6.5 million people), have adopted the stretch code.

A **reach code** is an optional set of above-code standards that builders can choose. Reach codes may cover a number of code areas (lighting design, structural design, mechanical systems, envelope) and can be aligned with federal, state, and local financial incentives. For example, the state of Oregon created residential and commercial reach codes options based on the 2012 IgCC.

Recommendation #1: Provide municipalities flexibility and progressive options by adopting beyond code policy tools like stretch energy codes, reach codes, and green construction standards like the B3

Guidelines. The Online Code Environment & Advocacy Network (OCEAN) Beyond Code webpage highlights several programs pioneered by other states, local jurisdictions, and nonprofit organizations.[44]

CODE ADOPTION HISTORY

Minnesota was one of the first states in America to adopt energy efficiency requirements for buildings in 1976, incorporating the code into the state building code first adopted in 1972. The codes applied to any municipality that had adopted a building code and those that would do so thereafter.[45] The state codified its first requirements based on national uniform standards with the adoption of the 1983 Model Energy Code in 1984. Several energy code editions through the 1990s would come without major gains in energy efficiency.

After authority over energy codes was transferred to CCLD in the Department of Labor & Industry (DLI), significant effort was made to transition the Minnesota building community from a purely state-developed code to one aligned more closely to the national model codes. The state began adopting editions of today's current national model construction codes–the International Building Code (IBC) and International Residential Code (IRC) – with state amendments in 2003. The reference codes for the current Minnesota State Building Code–the 2006 IBC and 2006 IRC–were adopted in July 2007. Chapters 1322 and 1323 created the state's separate residential and commercial energy codes based on the 2006 IRC and ASHRAE Standard 90.1-2004 with state amendments effective June 1, 2009.

2012 IECC ADOPTION PROCESS

Most chapters of the Minnesota State Building Code (including the energy chapters) have been updated on a roughly six-year cycle in the new millennium. The code update process can last 18 months or more as the state follows a thorough administrative rulemaking process[46] followed by extensive implementation activities by CCLD and other stakeholder groups.

CCLD uses technical advisory committees for most rule adoptions, including the Residential Energy Code Committee[47] and Commercial Energy Code Committee.[48] In accordance with the CCLD Transparent Rule Adoption Process Policy, CCLD maintains a webpage for each rule to be adopted posting all information required by the state Administrative Procedures Act (APA), including committee rosters, proposals, rule drafts, meeting schedules, agendas, minutes, and notes.[49]

In 2008, the Minnesota Legislature established the **Construction Codes Advisory Council (CCAC)** to "review laws, codes, rules, standards, and licensing requirements relating to building construction." Members are appointed by the commissioner of DLI from relevant industries and trades.[50] CCAC's charge also includes review and comment for all current and proposed rules to promote coordination and consistency among state agencies and make construction code rules easier for jurisdictions to understand, administer, and enforce.[51]

The two CCLD energy code committees were charged with reviewing the 2012 IECC and proposing amendments. They conducted the stakeholder input process in late 2011 and early 2012. In October 2012,

they published draft rules for the residential and commercial energy codes,[52] requesting public comments in the State Register in November 2012.[53] CCAC later approved revised draft rules in 2013. Among the amendments to the 2012 IECC:[54]

- *Commercial:* IECC commissioning requirements were incorporated into ASHRAE 90.1-2010 so there is consistency between the code and standard.

- *Residential:*
  - R-21 cavity insulation is allowed for above-grade walls (instead of requiring R-20+5 and R-13+10 walls with insulated sheathing); the 2012 IECC U-value table remains.
  - Mechanical ventilation requirements were strengthened and based on the state's own code language.
  - R-10 exterior insulation is allowed for basement walls (instead of requiring R-15 continuous insulation), but those homes must achieve 2.5 ACH_{50} via blower door test.
  - Elements to ensure basement walls are waterproofed to mitigate moisture damage.

DLI intends to implement all construction code updates together (to avoid confusion and synchronize training activities) in early 2015.[55]

POLITICAL ENVIRONMENT

Minnesota and its local communities have a long history of civic engagement in governance. The state has authorized CCLD to update the state building code, and CCLD considers code changes thoroughly, involving stakeholders throughout the processes. State officials interviewed for this report cited the state's long history with energy codes as a major factor in helping to improve implementation and compliance. They also noted that Minnesota's cold climate raises market demand for energy-efficient buildings, resulting in the homebuilding industry building more energy-efficient homes. In fact, it was the state homebuilder association's initiative that led to the Legislature authorizing CCLD to require builders to be licensed and obtain continuing education (see the *Certification and Licensing* subsection).

POTENTIAL SAVINGS IMPACT

Many states and local governments often do not fully understand the return on investment associated with updating an energy code. By identifying and putting a cost to specific energy code upgrades, and comparing those against the anticipated energy savings, we begin to address concerns about the costs that home builders—and eventually home buyers—will encounter if a new code is adopted. Reliable information empowers consumers to make smart energy decisions.

Appendix B: COST-ANALYSIS Resources, features two tools developed by BCAP to help policymakers assess the impacts on energy code adoption and compliance both on the individual homeowner level and on the statewide level:

- **Incremental Cost Analyses** to explain costs and profits from energy codes.
- **Code Calculator** to estimate state-level energy, utility cost, and emissions savings.

ADMINISTRATION & ENFORCEMENT

As previously noted, energy code adoption does not guarantee compliance. To achieve the desired energy and financial savings available through energy codes, Minnesota and its municipalities must carry out energy code implementation, a term used to describe all of the activities carried out by the state, local, and regional building departments, the building industry, and other stakeholders for compliance with the energy code. Such activities include establishing enforcement infrastructure, providing training and educational opportunities, outreach to various stakeholder groups, and other organizational efforts.

Enforcement provides the teeth behind adopted codes, and it is the responsibility of code officials and third-party inspectors to ensure that design and construction professionals comply with the provisions of the construction codes. While enforcement occurs at the local level in Minnesota, the state plays a crucial role in providing municipalities with the resources and support they need to establish effective enforcement infrastructures and practices. As codes are updated, it is incumbent upon the state, municipalities, and involved third-party organizations to provide the enforcement community with access to sufficient energy code training.

DIVISION OF RESPONSIBILITIES

Local building departments in municipalities that have adopted the state building code and have **designated building officials** are responsible for enforcing the code for new private residential and commercial construction and applicable existing building modifications.

The **Construction Codes Licensing Division** is responsible for developing and adopting most chapters of the Minnesota State Building Code, including the energy codes. Its staff conducts inspections and plan review for state-owned buildings and industrialized modular buildings as well as review and inspection for all buildings under the plumbing, electrical, and elevator codes. CCLD also administers and enforces licensing requirements for several stakeholder groups, including enforcement officials, residential building contractors, manufactured home manufacturers, electricians, and plumbers.[56]

The **Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience, and Interior Design** administers exams, licenses, and regulates the practice of architecture, professional engineering, land surveying, landscape architecture, geoscience, and interior design.[57]

The **Department of Public Safety Fire Marshal Division** supports local authorities performing most fire inspections, investigations, and plan review through materials, assistance, and staff training. The Division also develops and adopts the state fire code, licenses and certifies contractors and designers, and conducts fire inspections in public and charter schools, hotels/motels, and health care facilities.[58]

LOCAL BUILDING DEPARTMENTS

Minnesota has regulated building officials' qualifications since the establishment of the state's building code in 1972.[59] To date, over 500 municipalities (cities, townships, and counties) have local officials who have been designated by the commissioner of DLI to oversee code administration (see Figure 9).

Ultimately, legal responsibility for compliance with the state building code (and energy code) lies with the construction permit applicant.[60] While the Minnesota State Building Code is mandatory statewide, it is not enforced uniformly statewide. Of the state's 87 counties, 21 administer the state building code throughout the county (shaded in purple on the map, Figure 9); in five of these, city building officials have been charged to administer the code throughout the whole county. Of the remaining 66 counties, the code is only enforced by certain cities and townships within each county (counties shown in white).

Each municipality that adopts a construction code must designate a certified building official to administer the code and issue building permits (see the *Certification and Licensing* subsection). Multiple municipalities may combine to designate a single building official for those communities. In communities for which no building official has been designated, or where a vacancy has not yet been filled, the commissioner of DLI "may use whichever state employees are necessary to perform the duties of the building official until the municipality makes a temporary or permanent designation" and the municipalities are responsible for the costs for the services.[61]

Besides a directory of municipal adoption information, the CCLD website maintains a list of designated building code officials (certified by the commissioner of DLI) responsible for all local enforcement activities for the cities and townships that have adopted the state building code (see screen shot in Figure 8).

BEST PRACTICE
Regional Enforcement Option

Building departments in rural and unincorporated areas often face constraints such as staff and budget shortfalls, training accessibility, and long travel distances to job sites. Regional enforcement programs – the pooling of resources over multiple jurisdictions – present one option for improving enforcement outcomes.

Figure 8 – Minnesota State Building Code Jurisdiction Directory

Local Code Lookup
Minnesota State Building Code Jurisdiction Directory

Use the search tool below to display jurisdiction directory information for a specific city or township and county.

Select city name MINNEAPOLIS OR Select township name -- SELECT A TOWNSHIP --
AND
Select county name HENNEPIN

Search Reset

Results per page: 1

CITY: MINNEAPOLIS TOWNSHIP: N/A COUNTY: HENNEPIN BUILDING OFFICIAL: PATRICK JOSEPH HIGGINS B.O. PHONE: (612) 673-5826

BUILDING CODES

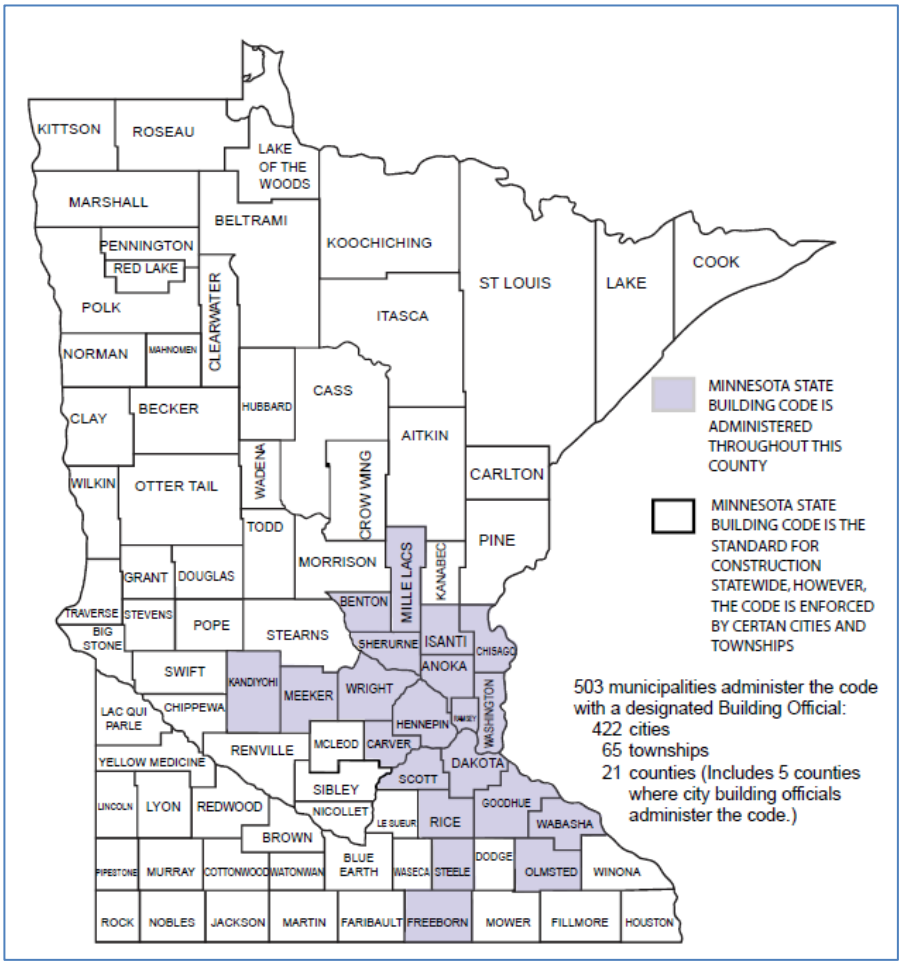
HAS ADOPTED THE BUILDING CODE: YES
JURISDICTION USING OPTIONAL BUILDING CODES: 1306 SUB PART 2: NO
1306 SUB PART 3: NO

For construction projects other than those listed below under "STATE PROJECTS" contact your local Building Department for regulations and/or requirements. View a list of all Minnesota Designated Building Officials at http://www.dli.mn.gov/CCLD/pdf/bc_bo_list.pdf.

ACCESSIBILITY ENFORCED: LOCAL
BLEACHER SAFETY ENFORCED: LOCAL

Source: MN Department of Labor and Industry, CCLD

Figure 9 – Minnesota State Building Code Enforcement by County



Source: MN Department of Labor and Industry, CCLD *Minnesota State Building Code*

FUNDING

DLI's enforcement and oversight authority is funded through revenue streams, including a surcharge on local building permit fees and licensing fees for regulated professions. In 2007, the Legislature created a Construction Code Fund to consolidate all CCLD revenue and expenditures. Other revenue collected by the fund includes permit, plan review, inspection, and license and bond filing fees for the five agencies consolidated into CCLD.[62]

Since 1971, the state has imposed a surcharge on the fees municipalities collect through issuing construction permits.[63] Effective July 1, 2010 through June 30, 2015, if the local permit fee is fixed, the surcharge is equivalent to 0.05% of the permit fee or $5, whichever is greater. For all other permit fees based on project valuation, the surcharge is 0.05% from projects with a valuation under $1 million and escalating amounts for succeeding valuation levels.[64]

Each municipality issuing permits is responsible for collecting the surcharge and remitting it to the state.

Those larger than 20,000 people must report to DLI every month on the fees and surcharge receipts collected. These localities may keep up to 2% of the surcharge amount collected to cover administrative expenses related to this reporting. Smaller municipalities must report to DLI every quarter and retain up to 4% to cover administrative expenses.[65]

By statute, revenues collected through this surcharge must roughly equal the department's administration costs. DLI reports to the state legislature and executive branch every November 30 on surcharge revenues and any changes in the surcharge levied. DLI may use any surplus in surcharge collections to award grants for construction code research, development, and education.[66]

DLI also collects fees through issuing licenses to local code enforcement officials and certain construction professionals. License renewal fees include a $20 continuing education fee that funds the administration of DLI's continuing education sponsor and course content review and approval program. A separate Contractor Recovery Fee based on business volume is collected through residential contractor and remodeler licensing fees to compensate property owners who have suffered damages through industry malpractice (see the *Certification and Licensing* subsection for more details).

COMPLIANCE TOOLS

Builders typically use DOE software called *REScheck* and *COMcheck* to demonstrate energy code compliance for residential and commercial projects, respectively. The typical process is as follows: building plans include details on insulation levels and other energy features, and code inspectors take a copy of the plans with them onsite to ensure that what's installed matches the approved plans.

The state has simplified the residential energy code such that in most cases, software programs like *REScheck* are not needed to show compliance. The state statute lists alternatives to *REScheck*.[67]

COMcheck is not available for the current Minnesota energy code, but tools are available to help determine commercial building envelope and lighting compliance. The envelope requirements can be determined from the two tables (one for northern and the other for southern Minnesota) listed in the code (see Figure 9). The lighting requirements are identical to ASHRAE 90.1-2004, with an additional requirement for exterior building grounds and parking lot lighting. To demonstrate interior lighting compliance, designers may use *COMcheck* by selecting "Code: 90.1 (2004) Standard."

The **Builders Association of Minnesota (BAM)** provides an energy code toolkit, designed to help building professionals understand the residential energy code.[68] It includes a field guide, material on the top changes for both new and existing projects from the previous code edition, and a compliance certificate.

PUBLIC BUILDINGS

CCLD is responsible for building code enforcement (plan review and inspections) for structures defined as public buildings and state-licensed facilities (see the *State Buildings* subsection). CCLD may enter into agreements with municipalities that have adopted the state building code for building plan review and/or inspections of these projects within their jurisdiction.[69]

CERTIFICATION AND LICENSING

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 and have a responsibility to comply with the requirements of the adopted energy code. Moreover, state and local agencies, energy code advocates, and other stakeholder groups share in this responsibility. These groups have the opportunity to 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 can 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.

Like the Minnesota State Building Code Jurisdiction Directory detailed in the previous subsection, the state provides a comprehensive directory to find all personal and business licenses, bonds, certifications, and registrations issued by DLI.[70]

CODE ENFORCEMENT PROFESSIONALS

DLI is responsible for maintaining the state's building official certification and recertification program. This includes reviewing qualification applications, administering certification exams, and reviewing and approving building official continuing education units.

Prospective building officials must meet statutory qualifying prerequisites and pass a written exam (which contains content on the state energy codes). Applicants receive a certification card listing one of the three certification categories below. Applicants for the "building official-limited" and "accessibility specialist" are required to attend a training course administered solely by DLI.[71]

- ***Certified building official:*** A person with this certification may serve as the designated building official for any municipality. Code administration for all buildings other than those specified below must be performed by a certified building official.
- ***Certified building official-limited:*** A person with this certification may perform code administration for one- and two-family dwellings, their accessory structures, and "exempt classes of buildings"(as defined by AELSLAGID), and "facilities for persons with physical disabilities" that are governed by the State Building Code. A certified building official-limited is permitted to perform inspections for other regulated structures not listed above under the direction of a designated certified building official or the state building official. Subject to the above limitations, individuals with this certification may serve as the designated building official for any municipality.
- ***Accessibility specialist:*** A person with this classification is limited to the administration of those provisions of the State Building Code that provide access for persons with disabilities.

To be recertified, the individual must complete the required continuing education hours or credits during the certification period and then submit the requisite renewal fee to DLI. All continuing education hours and credits must be approved by DLI before they can be used to renew the certification (see the *Training and Continuing Education* subsection).

In 1992, in part due to the efforts of BAM, the Minnesota Legislature approved licensing requirements for "contractors who build or improve residential real estate" to "provide a measure of consumer protection and to enhance the professionalism of the home building and remodeling industry" in Minnesota. Prior to this, residential contractors were regulated by municipalities, if at all.[72]

DLI issues licenses and maintains continuing education requirements for residential building contractors, remodelers, roofers, and manufactured home installers. Owners working on their own property must also be licensed if they build or remodel for the sole purpose of speculation or resale. All residential building contractor and remodeler licenses expire March 31, with about one half facing renewal deadlines in even-numbered years and the rest in odd-numbered years. Licenses expire one year after the March 31 following its issuance.

Only companies and individual proprietorships are required to obtain a license. Each company, however, must designate one person to serve as a "qualifying person" for the individual proprietorship, partnership, or corporation. The qualifying person must pass the required examination(s) and complete the requirements for continuing education (see the *Training and Continuing Education* subsection for more).[73]

DLI assesses fees for construction professional licenses. Initial costs include a first-time license fee of $200 plus a $20 surcharge for online processing. License renewals cost an additional $20 that funds the state's continuing education program. Fees are not prorated and are the same no matter when the license is issued relative to its March 31 expiration.

The **Contractor Recovery Fund** "compensates owners or lessees of residential property in Minnesota who have suffered an actual and direct out-of-pocket loss due to a licensed contractor's fraudulent, deceptive or dishonest practices, conversion of funds or failure of performance."[74] A separate fee for the Contractor Recovery Fund ranges from $470 to $670 per two-year period based on the applicant's business volume (see Table 1).

Table 1– License Fee Structure for Residential Building Contractor and Remodeler Firms

If gross receipts are:	Recovery fund fee	License fee	New license fee total	Renewal license fee total
Less than $1 million	$470	$220	**$670**	**$690**
$1 million to $5 million	$570	$220	**$770**	**$790**
More than $5 million	$670	$220	**$870**	**$890**

Source: CCLD. *Licensing requirements for a building contractor license*

DESIGN PROFESSIONALS

Design professionals have the opportunity to reduce building costs and decrease a building's energy demand from its inception through the design process. Architects and engineers should be familiar with the state's energy code and receive training on updates to ensure that buildings are designed to achieve compliance.

The **Minnesota Board of Architecture, Engineering, Land Surveying Landscape Architecture, Geoscience and Interior Design (AELSLAGID)** is charged with protecting public health, safety, and welfare by establishing standards of practice for the design professionals under its purview.

Like CCLD, the Board provides a comprehensive directory of professional licenses issued. As of June 2013, there were 3,419 licensed architects and 12,800 licensed professional engineers in Minnesota.[75]

Depending on the individual license, fees included $25-100 for Board application, exam fees paid directly to testing companies and $132 each for initial Board licensure and renewal. Licenses expire on June 30 of the even-numbered year following issuance.[76]

TRAINING AND CONTINUING EDUCATION

Training and education for all stakeholder groups is essential for successful building code implementation and compliance. Minnesota has placed a high priority on continuing education for enforcement, construction, and design professionals and providing opportunities through its **State Building Code Educational Programs**.[77] CCLD offers these programs in two ways:

- ***Regularly scheduled division seminars:*** Open to anyone to attend, these events are offered twice a year around the state (generally in the spring and fall) by CCLD staff. Participant fees are based on the amount needed to cover the state's costs for the programs.

- ***Requested educational offerings:*** Outside organizations, individuals, and course sponsors may request CCLD staff participation in their educational events based on availability, subject matter, and audience impact. Staff may be made available without a fee for panel participation or workshop presentations shorter than three hours. For seminar events longer than three hours, CCLD will charge a small fee for half-day ($300) and full-day ($600) programs for staff preparation and presentation time.

BEST PRACTICE
State Building Educational Programs

"The State Building Code provides basic and uniform construction standards and establishes reasonable safeguards for health, safety, welfare, comfort and security for Minnesotans. Knowledge of the code by architects, engineers, contractors, installers, building officials, inspectors, and material suppliers is critical for compliance to be achieved in their work. CCLD has determined that education is the most cost effective way to achieve compliance."

– Minnesota CCLD

Like the comprehensive directories of municipal code adoption information, building officials, and construction industry licensees, DLI maintains a comprehensive listing of courses approved for continuing education credit.[78] As of February 2014, the directory listed over 1,000 approved courses through the end of the year, including many online courses offered every day through professional education services such as Kaplan.

Individuals and organizations seeking approval for a course offering, course sponsorship, or credit for a course not on the approved listings may obtain CCLD review and approval of courses on a case-by-case basis by request. The burden of demonstrating that courses "impart appropriate and related knowledge in the regulated industry" falls to the individual or organization making the request.[79]

The most visible state event focused on the core principles of energy-efficient building and responsible design is the **Minnesota Energy Design Conference and Expo**. Host Minnesota Power and a broad set of partners–including the state government (Minnesota Division of Energy Resources), utilities, (Great Rivers Energy), design professionals, (AIA Northern Minnesota), and others–coordinated the 24th annual event over two days in Duluth in February 2014.[80] Entire day-long tracks were dedicated to codes (presented by DLI staff), building science, home performance, design, marketing, and beyond code programs. Continuing education credits were availability for most licensed professionals in the field, including code officials, builders, architects, engineers, and home energy raters. State officials estimated over 1,000 construction professionals attended the 2014 event.

In a first for the state, DLI and other government agencies teamed with several construction industry partners to host the first-ever **Minnesota Construction Industry Conference** in February 2014 in Bloomington at the Mall of America.[81] Attracting more than 350 participants, the one-day event provided educational and networking opportunities for contractors in commercial building, residential building, and highway/heavy sectors as well as general information sessions for all members of the construction industry. State officials and subject matter experts updated the conference on current and upcoming industry regulations and participated in group interactions and one-on-one sessions where attendees shared ideas and feedback on "how to build a better Minnesota."

The agenda[82] featured DLI staff presentations approved for CE hours on the changes proposed for the upcoming 2014 Minnesota State Building Code–including sessions on the commercial code and 2012 IECC for residential buildings[83]–and forums for officials to brief industry professionals and encourage dialogue on licensing requirements and the state's philosophy and goals for its enforcement infrastructure.

CODE ENFORCEMENT PROFESSIONALS

Since October 2011, statutory changes have required that building official seminars and institute courses must receive preliminary approval by DLI. Those offering approved CE courses will log participant attendance for individuals' certification records. Individuals attending approved courses will have their attendance reported to DLI to be logged on their certification record. Once CE requirements have been met for the reporting period, individuals can renew their certification simply by paying the prescribed fee. Once an

individual's CE requirements have been met for recertification, the individual will be able to renew the certification simply by paying the renewal fee.

DLI also instituted changes to the certified building officials licensing program to align with other licenses issued by DLI so that participants earn "hours" for continuing education requirements instead of the “units” previously used (state statute defines each hour as 0.42 units).[84] Below are some of the main requirements for each certification category:

- ***Certified building officials*** must obtain 57 CE hours (previously 24 units) every three years.
- ***Certified building officials-limited*** must obtain 19 CE hours in each year of their first two years after receiving their certification cards, then 38 hours (previously 16 units) for each subsequent two-year reporting period.
- ***Accessibility specialists*** holding a three-year certification card must obtain nine CE hours (previously four units) within that time; those holding two-year certification cards must obtain six CE hours (previously 2.5 units) within that period.

The state’s ICC chapter-the **Association of Minnesota Building Officials (AMBO)**[85]-and its five regional chapters[86] also offer educational opportunities and professional support for members.

Association of Minnesota Building Officials

CONSTRUCTION PROFESSIONALS

Licensed residential building contractor and remodeling firms designate one “qualifying person” for all required examinations and continuing education (CE). Licenses must be renewed bi-annually, and the individual must have completed 14 hours of approved CE courses. DLI maintains a comprehensive listing of courses approved for continuing education credit, including those for construction professionals.[87]

State events like the Energy Design Conference and Expo and the Minnesota Construction Industry

Conference provide opportunities for construction professionals to earn CE credits and engage state officials about the current state of industry regulation and the impact upcoming code updates will have on their work.[88]

DESIGN PROFESSIONALS

Professional engineers and architects are required to be licensed and renew their license every two-years. They need to have complete 24 professional development hours (PDHs) prior to renewal (one PDH is equivalent to one hour of qualifying activity). Requirements for continuing education are not tied to those prescribed by national member organizations like the **American Institute of Architects** which requires a set amount of continuing education (CE) credit on health, safety, and welfare (HSW) topics–and could include sustainable design courses.[89]

The Minnesota Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design (AELSLAGID or “the board”) does not pre-approve or reference any particular areas of study for continuing education (including energy efficiency, sustainability, or the state energy code). Rather, the

board states that qualifying continuing education must consist of "learning experiences which enhance and expand the skills, knowledge, and abilities of practicing professionals to remain current and render competent professional services" that "directly benefit the health, safety, or welfare of the public."[90] The board created a Continuing Education Assessment Form to help licensees and certificate holders become familiar with state statutory requirements and to help them determine whether or not a particular course or activity meets those requirements.[91]

Gap #2: Minnesota does not require design professionals to earn continuing education credit related to energy efficiency or the state energy code.

Recommendation #2: While the state may wish to maintain flexibility for design professionals and lessen the burden of oversight for the AELSLAGID board, licensees in the state should have minimum CE requirements related to the state's construction codes (and energy code), particularly during transition periods following code updates.

OUTREACH

There are still many stakeholders unaware of the benefits of energy codes, such as consumers and policymakers. While the state's code officials have a robust education and training infrastructure, individual construction and design professionals can fall through the cracks given the state's current licensing and CE requirements for those fields.

State-level energy code outreach to inspection departments and local decision-makers is critical, due in large part to the Minnesota State Building Code serving as the minimum code statewide. State outreach helps building inspectors and local policymakers understand the public policy aspect of energy codes and their role in the life, health, and safety of building occupants. Primary state outreach includes training, educational events, and technical assistance provided through DLI, particularly when a new code has been adopted.

BEST PRACTICE
State Codes Outreach Bulletin

Since 2006, DLI has published **CCLD Review**, a quarterly newsletter that informs construction and code professionals about the purpose, plans, and progress of the state codes authority. Recent editions have briefed readers on the pending state building code update, upcoming license renewal dates, and changes in fees related to plan review, inspection, and certification.

Outreach involves all of the activities governments and non-governmental organizations 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. Execution of strategic education and awareness campaigns can improve understanding of code changes, create buy-in, and help lead to greater levels of compliance.

The CCLD website (http://www.dli.mn.gov/Ccld.asp) is exemplary in providing multiple avenues to check the status of enforcement actions, file complaints, and seek code opinions and interpretations.

NONPROFIT ADVOCATES

The **Midwest Energy Efficiency Alliance (MEEA)** is a nonprofit organization launched in 2000 working to advance energy efficiency in 13 states in the region. MEEA promotes the adoption and implementation of energy efficient building energy codes through policy advocacy, data analysis, utility programs, education, and training initiatives. It members include state and local governments, building professionals, utilities, research institutes, manufacturers, energy service providers, and advocates.

Every year, MEEA hosts the **Midwest Regional Building Energy Codes Conference**, providing an opportunity for stakeholders from various fields to meet, network, and discuss the various approaches and strategies needed for improved energy code adoption and compliance. MEEA also hosts a quarterly teleconference and distributes a biweekly email bulletin to update stakeholders on regional energy code news.

Fresh Energy is also a nonprofit organization founded in 1990 to "launch Minnesota into the global arena as a leader on clean energy issues," including energy efficiency and sustainable building. Its ambitious vision aims to push government and industry to not just imagine, but "rise to the reality" of transforming the energy system.

Fresh Energy has made energy codes a visible public issue in Minnesota for the past few years, consistently reporting on the ongoing state code update process, its potential cost savings impact, and resources supporting consumers. The organization has also been an active participant in state and local policy forums, including the efforts to require large commercial buildings in Minneapolis to disclose their energy use, include green building and energy efficiency data fields in real estate listings, and adopt a statewide decoupling policy to help separate the amount of energy a utility sells from the revenue it makes to cover fixed costs.

CODE ENFORCEMENT PROFESSIONALS

One barrier to code compliance is the lack of local experience in enforcing energy codes (especially with new provisions such as air and duct leakage testing). Using national and regional energy code experts as mentors to assist states and local code officials in developing and implementing effective enforcement and compliance approaches provides peer-to-peer needed support and technical assistance. Mentors may also provide support for code adoption and updates.

BCAP partnered with the International Code Council (ICC) to develop and pilot an energy code support initiative called the **Energy Code Ambassadors Program (ECAP)**. Through ECAP, the program partners have recruited, trained, and placed Code Ambassadors in seven states–Alabama, Idaho, Nevada, Ohio, Utah, Texas, and Wyoming–in coordination with state energy offices and ICC chapters. The Ambassadors provide support and energy code expertise, including in-field guidance and/or training to the code enforcement community. Ambassadors are adept in using ICC, BCAP, DOE, and other resources.

MEEA also cites a similar best practice from Illinois to complement the work of Code Ambassadors called "jurisdiction assistance"–a group of highly-qualified individuals who proactively reach out to all building industry stakeholder groups on a regular basis.

Gap #3: There is a need at the local government level for individuals to "champion" energy codes. BCAP has found that areas that have a local champion (whether within a building department, or a mayor, or other political figure) are much more successful in implementing the energy code.

Recommendation #3: Consider launching an Energy Code Ambassadors Program whereby key regional building code officials or builders would be engaged to advocate for energy codes regionally and support local building departments as they transition to a new, more efficient code.

BUILDING INDUSTRY PROFESSIONALS

Established in 1974, the **Builders Association of Minnesota** (BAM) and its 13 local chapters are the primary source for code news, educational events, learning materials, and issue advocacy for the state's construction professionals. BAM members have access to a number of exclusive benefits including code guides authored by experts, newsletters, discounted insurance, and events like the BAM Annual Convention and Builder Day at the Capitol.

DESIGN PROFESSIONALS

Architects bear tremendous responsibility in the development of the built environment, being tasked with delivering safety, functionality, and artistry in their designs. Though their licensure makes them responsible for health, safety, and welfare through construction code compliance, architects are surprisingly passive in code development and advocacy. A 2013 AIA survey of its membership revealed an alarming lack of awareness, understanding, and involvement in the building code development process.[92] Increased awareness of the environmental impact of buildings has broadened the responsibilities of architects. The AIA's 2030 Commitment–which calls for buildings to be carbon neutral by 2030, reinforces the profession's dedication to energy efficiency and sustainable design.

The **AIA-Minnesota (AIA-MN)** state chapter is comprised of 2,200 members–the majority of whom are registered architects–across three local chapters.[93] The chapter does provide some resources and opportunities on this topic:

- A building codes brochure.[94]
- A convention event on the top changes in the 2012 residential energy code.
- A Building Codes Committee that meets monthly and provides a forum for guest speakers, roundtable discussions, project case studies, and updates on future code changes.

Engagement with the state's architecture community, however, could be much more robust. Leaders should express to their membership how building energy performance must be integrated into the community's definition of design, how it aligns with their goals, and how it addresses their needs. Advocates must provide

resources to overcome implementation challenges such as the lack of clarity about code content, code compliance efforts not being valued by clients, and the necessary resources required for code compliance efforts.

The OCEAN Compliance webpage hosts a "design professionals" page with resources to help seize this opportunity, including promotional flyers, a DOE resource guide for commercial building architects, and a gap analysis report with recommendations to engage the community.[95] The state should also consider outreach opportunities through existing AIA-MN outlets, such as: (1) Architecture Minnesota Magazine, the primary outreach tool of AIA-MN; (2) the annual AIA Minnesota Annual Convention & Exposition–about 1,500 attendees are projected for the 2014 Convention in November in Minneapolis; (3) several events each year advertised as partnership opportunities.

Gap #4: Outreach to the Minnesota architecture community about the importance and benefits of being leaders in building energy performance design and code advocacy should be more robust and consistent.

Recommendation #4: The state should engage the architecture community about energy codes and performance in the design process more frequently and qualitatively through existing outreach opportunities through AIA-MN like *Architecture Minnesota Magazine*, its annual convention, and training and social events.

REAL ESTATE PROFESSIONALS

In most communities, energy code education for real estate professionals such as realtors, appraisers, lenders, and insurers has been limited or non-existent, although DLI staff has worked with the state realtor association and other organizations to provide training events on the state energy code.

The knowledge gap that exists among these professionals is a main barrier to code compliance, as these individuals serve as the front-line for consumers during the buying process, and typically don't know how to sell energy code features to customers.

Integrating energy code information into existing processes can help raise demand and market values for energy efficient homes and buildings.

BEST PRACTICE
Northstar MLS Provides Energy Info to Buyers

Since 2013, realtors and homebuyers in the Twin Cities area have the ability to seek out green-certified or energy-efficient homes using the **NorthStar Multiple Listing Service (MLS)**, a searchable database for residential sales in Minnesota. Two fields in the MLS can be searched independently or in conjunction with other home features. The "Green Building Certification" field identifies whether the home complies with third-party green building standards. The second field, "Energy Efficiency Rating," will allow listing of a home's HERS score (see the *Beyond Codes* subsection for more on these programs). Advocates like MEEA, Fresh Energy, and the Builders Association of the Twin Cities were instrumental in the achievement of this best practice.

NorthstarMLS
For your Information. For your Success.

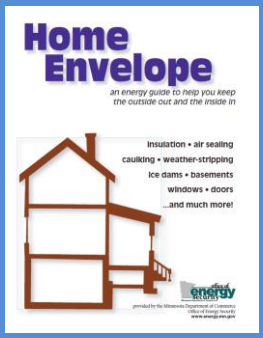
CONSUMERS

Consumers should be empowered with information regarding the benefits of energy codes to raise demand for more efficient houses and buildings.

The **Minnesota Department of Commerce Division of Energy Resources** offers useful information for consumers on home energy efficiency. Its series of *Consumer Energy Guides* covers topics like insulation, air-sealing, and lighting to help general homeowners ask the right questions of their contractors.[96] Other state agencies such as the Minnesota Office of the Attorney General and DLI have published resources like the "Citizen's Guide to Home Building and Remodeling" and the "Consumer's Guide to Hiring a Residential Building Contractor,"[97] respectively.

To assist states, BCAP created the **Consumer Energy Code Awareness campaign** in partnership with Consumers Union (see Figure 10). Energy code checklists and easy-to-use guides for prospective homebuyers are available to help buyers understand energy code requirements and make informed decisions. Other beneficial partnerships could be made with local governments, nonprofits, advocates, educational institutions, and utilities to educate consumers on the benefits of energy codes.

BEST PRACTICE
State Consumer Guides



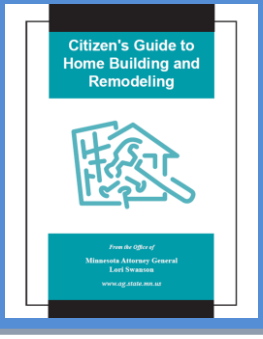


Figure 10 – Consumer Resources from BCAP and Consumers Union

Source: BCAP. energycodesocean.org/consumers-take-action

Gap #5: Sustained public outreach and education on home energy efficiency and energy codes to consumers is needed, especially given the challenges presented by the changes in the pending state energy code update.

Recommendation #5: The state should update and refresh its public outreach and education efforts on home buying and home improvement to include more information on the state energy code, particularly addressing issues unique to the pending 2012 IECC update. This push should integrate resources found through partnerships with local governments, nonprofits, educational institutions, and utilities. Current efforts like the BCAP Consumers Energy Code Awareness campaign, its Consumers Take Action tool, and press releases to local media outlets can be tailored for Minnesota.

BEYOND CODE PROGRAMS

There are progressive options for municipalities and individual projects to choose to go beyond the state's baseline requirements and achieve greater levels of energy performance and sustainability. The OCEAN **Beyond Code webpage** highlights several programs pioneered by other states, local jurisdictions, and nonprofit organizations.

Why Beyond Code Programs Matter

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

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

Started in 1998, the U.S. Green Building Council's (USGBC) **Leadership in Energy and Environmental Design (LEED)** rating systems are a nationally accepted benchmark for the design, construction, and operation of high-performance green buildings and neighborhoods. Using third-party verification to maintain assurance and integrity of the rating system, a project is designed and built using strategies aimed at achieving high performance in key areas of human and environmental health and measuring operating performance. In addition to assuring energy efficiency of a project, LEED also provides a framework that gives project teams the ability to choose solutions that are innovative and contribute to aggregate environmental progress in the long run.

As of January 2014, USGBC lists 552 LEED projects in Minnesota that have achieved LEED certification or are registered as pursuing certification.[98] In 2011, the state's nearly 10 million square feet of LEED construction ranked 10th in the nation at almost two square feet per person.[99] The Minnesota Chapter of USGBC is a volunteer-driven organization promoting the benefits of sustainable building and helping local stakeholders pursue their own LEED projects.

Two other residential green building programs in Minnesota are:

- **Minnesota Green Communities** is the largest green building program in the state with more than 4,000 units completed, under construction, or in development. It sets minimum standards across all aspects of sustainable housing with an emphasis on affordability. Providing thoughtful design and innovations rather than expensive technological approaches, this program can apply to new or existing single-family and multi-family housing.[100]
- **Minnesota GreenStar** provides green strategies and best practices to promote healthy, durable, high-performance design and construction for both new and existing homes.[101]

ENERGY STAR FOR HOMES

New **ENERGY STAR** qualified homes are at least 15 percent more efficient than typical new homes. According to the ENERGY STAR website, there are eight vendors that serve Minnesota and conduct ENERGY STAR ratings in Minnesota as well as two lenders that offer energy improvement mortgages and/or loans from federal programs through the Department of Housing and Urban Development (HUD), the Federal Housing Administration (FHA), and Veterans Affairs (VA). As of January 2014, 8,419 ENERGY STAR certified homes have been built in Minnesota. However, with only six ENERGY STAR builder partners, the state ranked near the bottom in market penetration for the program in 2012, well below 5 percent.[102]

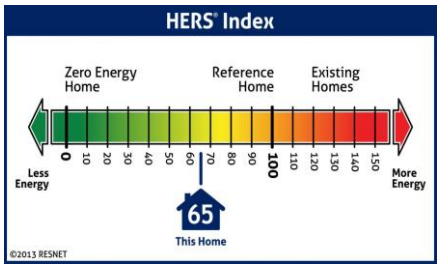
Within ENERGY STAR for Homes is another program called the **Home Performance with ENERGY STAR (HPwES)**. HPwES is an energy efficiency home improvement program sponsored and promoted by a partnership between the Environmental Protection Agency (EPA), DOE, and local program sponsors; local sponsors are usually utilities, state energy offices, and other interested organizations. With the core mission to help homeowners save energy and money and improve the quality of their homes, it is available to all eligible Minnesota consumers.

BUILDERS CHALLENGE

The U.S. DOE's Builders Challenge program works with builders to advance residential building energy practices.[103] The DOE's Zero Energy Home program (formerly DOE Challenge Home) incorporates innovative solutions and best practices proven by Building America in addition to the ENERGY STAR for Homes Version 3 requirements. This program has resulted in more than 14,000 energy-efficient homes and millions of dollars of energy savings.[104]

In Minnesota, there are currently 40 organizations participating in the program: eight builders, 23 verifier organizations, and nine training partners.[105] The Builders Challenge program could help Minnesota builders improve the housing stock by exceeding minimum energy codes and encourage builders to embrace high-performance building approaches and technologies.

HOME ENERGY RATING SYSTEM (HERS) INDEX



The **Residential Energy Services Network (RESNET)** has established the Home Energy Rating System (HERS) Index as a nationally recognized measure of home energy performance.[106]

Home energy raters evaluate new and existing homes and input data into software that compares the rated home to a "reference home" of the same size and one that is as energy efficient as a home built to the 2006 IECC. The software generates a score that helps homeowners understand how efficient their home is. If the score is 100, the home is as efficient as a home built to IECC 2006 standards. For each one point drop in the HERS score, the home is one percent more efficient (the lower the score, the more energy efficient the home).

The **Minnesota Building Performance Association (MBPA)** is a collaborative nonprofit organization of industry stakeholders dedicated to the promotion of safe, comfortable, durable, and energy efficient homes. Its members include contracting companies that have been accredited by the Building Performance Institute (BPI) and professionals certified through BPI or RESNET as Certified Home Energy Raters.

MBPA lists companies staffing energy experts in various home performance services in seven different regions, ranging from four such firms in the rural northwest to 22 in the Twin Cities metro area.[107] RESNET lists 12 companies in the state that are Certified Home Energy Raters. BPI lists over 40 companies that serve Minnesota with BPI certified professionals on staff.

UTILITY PROGRAMS

Multiple public and private utilities in Minnesota offer financial incentive programs related to residential and commercial energy efficiency, including rebates, loans, and grants. Visit the website **DSIRE** to view the complete list of programs.[108] Examples include:

- Xcel Energy's HPwES Program offers up to $1,000 in rebates for home improvement projects like adding insulation, replacing furnaces, and installing programmable thermostats. Xcel provides tips for completing a preliminary home energy audit and a list of participating installation contractors.[109]
- Minnesota Power's Triple E New Construction Program offers homeowners and builders up to $2,000 in incentives by meeting specific thermal and performance standards.[110]

BENCHMARKING & DISCLOSURE

In February 2013, the City of Minneapolis approved an ordinance creating **benchmarking and disclosure requirements** for energy and water use for its public buildings and large private commercial buildings. A large coalition of advocates, including Fresh Energy and MEEA, helped lead the charge for Minneapolis to be the

first Midwestern city to adopt such a policy, following similar laws in Austin, Boulder, Boston, New York, Philadelphia, San Francisco, Seattle, and Washington, D.C.[111]

Beginning in June 2013, existing public buildings larger than 25,000 square feet owned by the City of Minneapolis, Hennepin County, Minneapolis Public Schools, and the Minneapolis Park Board were to benchmark and disclose energy and water consumption data as prescribed by the State of Minnesota B3 Guidelines (see the *State Buildings* subsection) in order to direct improvements where they are most needed and most cost-effective.

Owners of private commercial buildings larger than 100,000 square feet are to begin reporting in June 2014 and publicly disclosing the results in 2015. Owners of buildings larger than 50,000 square feet are to begin reporting in June 2015 and publicly disclosing data in 2016. All information is to be captured using the Environmental Protection Agency's "ENERGY STAR Portfolio Manager."

ENERGY STAR Portfolio Manager is free software that measures a building's energy and water performance and uses information such as building age, operating hours, workers per square foot, occupancy rates, and space usage to generate a score similar to a fuel economy rating on a vehicle. A study of 35,000 buildings using Portfolio Manager showed that benchmarking programs saved a total average of seven percent in energy over three years.

With commercial buildings accounting for roughly 35 percent of greenhouse gas emissions in Minneapolis, the ordinance will also help the city and Minnesota meet carbon reduction goals.[112] The city will help building owners find any available rebates and loans for retrofits.

BEST PRACTICE

Minneapolis Energy & Water Benchmarking & Disclosure

Several leading American cities have adopted benchmarking and disclosure requirements for energy and water consumption that use market forces, rather than performance or design mandates, to motivate building owners, managers, and tenants to invest in efficiency improvements, ultimately saving energy, lowering energy costs, reducing pollution, and creating local green jobs.

COMPLIANCE VERIFICATION

It is important for states to regularly assess energy code compliance in order to understand the areas in which compliance is lacking and to develop enforcement and compliance strategies that address these deficiencies. To save states the resources and funding that would be required to design a verification study from scratch, DOE provides states with a methodology, suggested procedures, and tools to help measure and report compliance with building energy codes.[iii] A list of state compliance studies can be found on BCAP's webpage called "State Compliance Studies."[iv]

COMPLIANCE VERIFICATION IN MINNESOTA

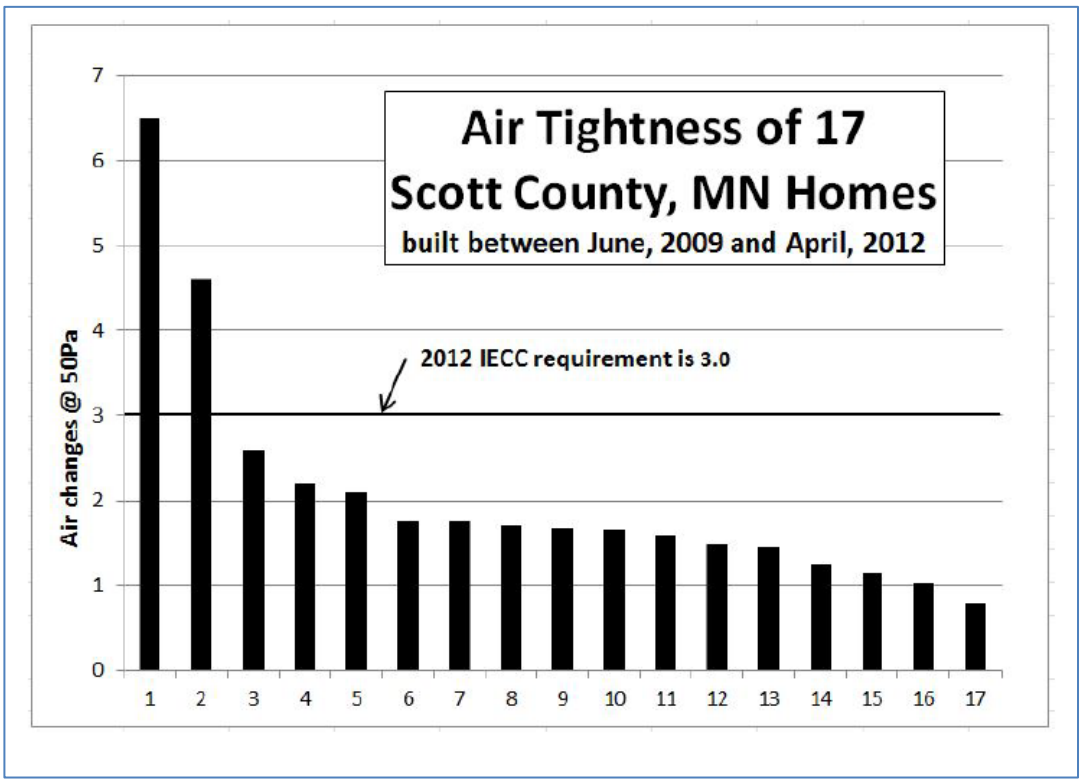
In September 2013, DLI published a report for the Department of Commerce on a building energy codes compliance assessment from May 2012 through June 2013 utilizing the methodology and tools for assessing compliance developed by DOE.

Serving as a baseline measurement, the study found impressive compliance rates across the sample statewide, especially considering the buildings were evaluated against the requirements of the 2009 IECC and ASHRAE 90.1-2007 while the Minnesota State Building Code is based on the 2006 IRC and ASHRAE 90.1-2004. Report authors found compliance in commercial buildings above 90 percent, while residential buildings lagged behind at about 75 percent. The report attributes much of the residential shortfall to the differences between the target codes and the state codes in place at that time.

One interesting observation from the report's Appendix A (see Figure 11) came from a 2011 Department of Commerce program that provided grants to Scott County and the City of Woodbury to conduct energy code self-assessments using the same procedures above on buildings permitted under the current state energy code. The Scott County residential sample of 17 homes showed an 84 percent compliance rate with the 2009 IECC. Blower door tests conducted on the homes showed an averages air infiltration rate of 2.1 air changes per hour at 50 Pascals (2.1 ACH_{50}). Every home scored below the 2009 IECC optional requirement of 7.0 ACH_{50}, and all but two passed the 2012 IECC mandatory threshold of 3.0 ACH_{50}. It was not immediately clear if any underlying bias (e.g., all the homes were constructed by the same builder or developer) contributed to this observation.

[iii] See DOE's Building Energy Codes Program webpage "Compliance" at https://www.energycodes.gov/compliance
[iv] See BCAP's OCEAN webpage "State Compliance Studies ." http://energycodesocean.org/state-compliance-studies

Figure 11 – Scott County, MN Compliance Study Blower Door Result



Source: Minnesota CCLD

The study also sought to identify procedural changes in code enforcement and training needed to improve compliance rates, including "providing adequate documentation related to proper heating and cooling equipment sizing, HVAC commissioning, and updating the Minnesota energy code to include enforced standards." The report also recommended additional education on building energy codes for building officials, design professionals, contractors, and other groups.[113]

Gap #6: The state has not yet achieved full energy code compliance in residential building space.

Recommendation #6: While the state's accomplishments thus far are commendable, more work is needed. Rolling out a 2012 IECC-based state energy code over the next two years will bring new challenges. Minnesota should use 2014 and 2015 to implement the recommendations from this Gap Analysis Report and the state's baseline compliance assessment. This should include providing adequate documentation related to proper HVAC equipment sizing and commissioning as well as additional energy code education for code officials, contractors, and design professionals.

Gap #7: The state does not currently have plans to conduct a follow-up compliance assessment before 2017.

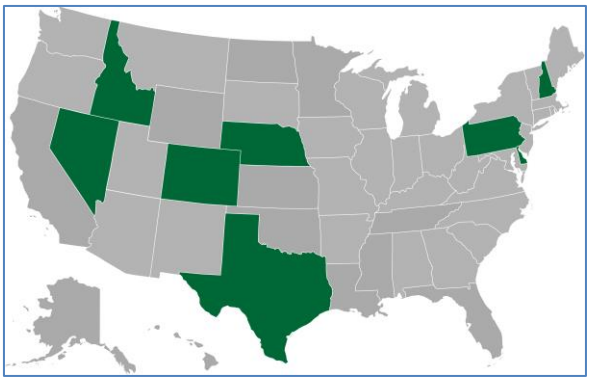
Recommendation #7: Minnesota will need to plan and secure funding to assess compliance in both commercial and residential building space. This would likely need to take place in the first half of 2016 to

coincide with the building season. Besides conventional funding sources, the state should explore alternative approaches that may reduce costs. DOE also provides resources and recommendations for "off-year" compliance activities like jurisdictional surveys in between formal evaluations that can be cost-effective and inform other state efforts.[114]

One common gap states face is the lack of a central source for information and conversations about energy code compliance. An **energy code compliance collaborative** is a forum for experts from diverse stakeholder groups impacted by energy codes to come together and work toward common interests and goals. As a longer-term initiative, a collaborative can advise states that are struggling with reduced budgets, limited resources, and contracted staff. This group could be central to the implementation of the recommendations in this Gap Analysis and the Minnesota Strategic Compliance Plan.

Working from the model developed by stakeholders in Idaho a decade ago, BCAP has helped form compliance collaboratives in seven new states since 2012: Colorado, Delaware, Nebraska, Nevada, New Hampshire, Pennsylvania, and Texas (see Figure 12).

Figure 12 – Map of Existing State Energy Code Compliance Collaboratives



Gap #8: Minnesota has not formed an energy code compliance collaborative to serve as a forum for stakeholders to work towards common interests and goals and provide support for energy code compliance activities.

Recommendation #8: BCAP can assist the state to form a compliance collaborative based on its experience in seven other states.[115] The Compliance Collaboratives webpage on the OCEAN website features the program and hosts webpages for some of the collaboratives. BCAP also employs an annual information-sharing webinar[116] and quarterly news bulletin to foster dialogue and share new ideas among the collaboratives.

CONCLUSION

Building energy codes is one of the most cost-effective tools for Minnesota to secure its energy future. Achieving full compliance with the state energy code will help consumers and businesses save money, strengthen the economy, create jobs, reduce pollution, and decrease peak loads and the demand for new power generation capacity–all resulting in a cleaner environment and a more stable and diverse energy supply.

The state is making progress to improve energy code use and compliance in Minnesota. It is expected to soon implement the 2012 IECC and ASHRAE Standard 90.1-2010 for residential and commercial buildings. CCLD has the funding sources, staff experience, and mission to provide training, technical assistance, and outreach to a variety of stakeholder groups, especially local code enforcement officials and construction industry professionals. Those individuals must also meet requirements for certification, licensing, and continuing education. Even though the current state energy code is not equivalent to the 2009 IECC, a large majority of the state's homes and commercial buildings already comply with its energy efficiency standards and those of the Recovery Act.

Full compliance with the state energy code is the most important goal in this field for Minnesota. Moving forward on the state energy code update has raised awareness among local municipalities and already spurred local code officials and design and construction professionals to find training opportunities on the upcoming requirements. The state, municipalities, and other interested third parties must expand and evolve these efforts to prepare communities for the new challenges of the 2012 IECC.

The recommendations made in this gap analysis (summarized on pages 3 and 4) are meant to guide state and local officials and other interested stakeholders as they work to support improved energy code adoption and implementation policies and begin the process of developing a strategic compliance plan for Minnesota that leverages existing infrastructure and funding mechanisms.

APPENDIX A: RESOURCES AVAILABLE FROM DOE

The U.S. Department of Energy's Building Energy Code Program (BECP) provides technical assistance and important resources to assist states and local governments and other code users: energycodes.gov

An example of key BECP resources for improving code compliance include:

- **Energy code compliance evaluation guidance** for states. http://www.energycodes.gov/compliance-evaluation

- **DOE-sponsored software programs Res*check* and Com*check***, which simplify the process of evaluating energy code compliance in residential and commercial buildings and can help designers, builders, and code officials streamline code compliance efforts. http://www.energycodes.gov/software-and-web-tools

- **Resource guides** that provide custom information for specific code users such as: architects and designers, policy-makers, and code officials (including sample inspection checklists); and information on specific topics such as air leakage, lighting, beyond code, and HVAC controls. http://www.energycodes.gov/resource-center/resource-guides

- **Training modules** on energy code topics. http://www.energycodes.gov/resource-center/training

APPENDIX B: COST-ANALYSIS RESOURCES

Many states and local governments often do not understand the energy savings and incremental construction costs that are associated with updating their energy code. By identifying and putting a price tag on specific energy code upgrades, and comparing them against the anticipated energy savings, it begins to address concerns about the costs that home builders—and eventually home buyers—will encounter if a new code is adopted. Reliable information will empower consumers to make smart energy decisions, taking advantage of efficiency opportunities that are economically feasible, minimize life-cycle energy costs, maintain comfort and services, and reduce the need for new power generation capacity.

Appendix B features two tools developed by BCAP to help policymakers assess the impacts on energy code adoption and compliance both on the individual homeowner level and on the macro statewide level:

- **Incremental Cost Analyses** published for select states and cities for both the 2009 IECC[117] and the 2012 IECC.[118] This resource helps explain how the modest construction costs added by updated energy codes are amortized within a homebuyer's mortgage and actually earn thousands of dollars in profits over the average mortgage term.[119]
- **Code Calculator** tool to estimate energy, utility cost, and carbon emissions savings through the adoption and implementation of updated residential and commercial energy codes over the next three decades at the state level. To illustrate the significant savings potential codes have for Minnesota households and businesses, BCAP compared a "business-as-usual" baseline scenario to the version of the 2012 IECC that state is considering and compliance rates based on Minnesota's recent evaluation study to supplement information available to policymakers.[120]

BCAP INCREMENTAL COST ANALYSIS : RESIDENTIAL BUILDINGS

BCAP has developed resources that help explain construction costs that are amortized within a homebuyer's mortgage.[121] BCAP has published **Incremental Cost Analyses** for select states and cities for both the 2009 IECC[122] and the 2012 IECC.[123] DOE has also created national and state analyses assessing the cost-effectiveness of residential energy codes based on a life-cycle approach, balancing first costs against longer-term energy savings over the life of the home.[124] These resources help to cultivate conversations–and support those already going on–in states and cities considering an update to their energy code.

Month	Mortgage Increase	Monthly Energy Savings	Cumulative Cost/Benefit	
1	$374.60	$26.25	-$348.35	
2	$8.09	$26.25	-$330.19	
3	$8.09	$26.25	-$312.03	
4	$8.09	$26.25	-$293.87	
5	$8.09	$26.25	-$275.71	
6	$8.09	$26.25	-$257.55	
7	$8.09	$26.25	-$239.39	
8	$8.09	$26.25	-$221.23	
9	$8.09	$26.25	-$203.07	
10	$8.09	$26.25	-$184.91	
11	$8.09	$26.25	-$166.75	
12	$8.09	$26.25	-$148.59	
19	$8.09	$26.25	-$21.47	
20	$8.09	$26.25	-$3.31	
21	**$8.09**	**$26.25**	**$14.85**	**Break Even**
22	$8.09	$26.25	$33.01	$18 profit every month
23	$8.09	$26.25	$51.17	
24	$8.09	$26.25	$69.33	

According to BCAP's analysis, building a standard home in Minnesota to the 2012 IECC (as compared to the 2006 IECC) will conservatively add about $2,600 to $4,000 to the cost of the average new home, depending on climate zone and exterior wall type. This represents an average down payment increase of $536-792, and an additional $10-15 to the monthly mortgage cost. The analysis estimates a break-even point for homebuyers of 8-14 months, after which those homebuyers would enjoy a $666-800 profit each year, adding up to as much as $23,000 gross profit (energy savings minus mortgage costs) over the life of a standard 30-year mortgage.[v]

Table B-1 – 2012 IECC Mortgage Payback for Homebuyers in Minnesota by Climate Zone & Exterior Wall Type[vi]

Exterior Wall Type	Incremental Costs	Energy Savings per home	Down Payment Increase (and mortgage increase per month)	Breakeven Point	Annual Profit for Homeowner after Breakeven Point	Profit over 30-Year Mortgage Term
Climate Zone 6: R-20+5 Walls (R-19 current practice)	$2,682	$848/year ($71/ month)	$536 (plus $10/month)	**9 months**	**$724**	**$21,208**
Climate Zone 6: R-20+5 Walls (R-13+5 current practice)*	$3,959*	$848/year ($71/month)	$792 (plus $15/month)	**14 months**	**$666**	**$19,197**
Climate Zone 7: R-20+5 Walls (R-19 current practice)	$2,704	$925/year ($77/month)	$541 (plus $10/month)	**8 months**	**$800**	**$23,479**

Source: BCAP

**Note: Local interviews indicated that few builders are currently building with R-13+5 walls. As a result, most new home buyers in Climate Zone 6 will not incur an incremental cost of this magnitude.*

It is worth noting this conservative break-even scenario is subject to significant fluctuations in input variables. For example, facing the prospect of rising energy costs, both payback and break-even on the incremental cost

[v] This model assumes a 2,400 square foot home. The mortgage is conservatively set at 30 years, with 20% down and the average nationwide interest rate of 4.03% at the time of publication in March 2012. With a lower down payment (such as 10% down) and/or lower interest rate, consumers will break even on their investment even sooner.

[vi] For more details on the methodology behind incremental cost estimates for the 2009 IECC, see: http://bcap-ocean.org/resource/incremental-cost-analysis.

of code improvements would be accelerated. Similarly, variations in lending interest rates and required money down can alter this projection.

DOE LIFE-CYCLE COST ANALYSIS

In mid-2012, DOE released national and statewide analyses of the IECC.[125] The estimates assume the statewide baseline or current practice is equivalent to the prescriptive code requirements of the Minnesota Residential Energy Code adopted in 2009. The customized analysis for Minnesota asserts that the 2012 IECC average life-cycle cost savings[126] over 30 years would be over $9,000 in the southern half of the state and over $13,000 in the northern half.[127] The data suggests that homebuyers in Minnesota would enjoy an average 34 percent energy savings[128] and save an average of $450 per year (see next page).[129]

Table A.6. Total Construction Cost Increase for the 2009 and 2012 IECC Compared to the Minnesota State Code

	2,400 ft² House			1,200 ft² Apartment/Condo		
	Unheated Basement or Crawlspace	Heated Basement	Slab on Grade	Unheated Basement or Crawlspace	Heated Basement	Slab on Grade
2009 IECC						
Zone 6	$1,224	$1,495	$1,224	$630	$669	$630
Zone 7	$1,336	$1,301	$1,030	$667	$604	$565
2012 IECC						
Zone 6	$4,189	$4,459	$4,189	$1,994	$2,033	$1,994
Zone 7	$4,300	$4,265	$3,995	$2,031	$1,968	$1,929

Table A.7. Life-Cycle Cost Savings Compared to the Minnesota State Code

	Zone 6	Zone 7	State Average
2009 IECC	$1,211	$1,608	$1,277
2012 IECC	$9,031	$13,502	$9,873

Source: DOE

BCAP CODE CALCULATOR – STATE-LEVEL SAVINGS PROJECTIONS

In October 2013, BCAP developed the latest version (v.4.9) of its **Code Calculator**, a tool to estimate energy, utility cost, and carbon emissions savings at a state level through the adoption and implementation of updated residential and commercial energy codes. The tool provides estimates for a variety of scenarios input by the user. The Calculator compares the desired target code scenario to the "business-as-usual" baseline scenario based on the 2013 Annual Energy Outlook (AEO) reference case published by the U.S. Energy Information Administration. Details on the methodology behind the tool are available in the BCAP Code Savings Estimator Primer on the OCEAN website.[130]

To illustrate the significant savings potential codes have for Minnesota households and businesses, BCAP compared the business-as-usual scenario based on Minnesota's recent compliance evaluation to supplement information available to policymakers:[131]

- In the business-as-usual scenario, the state has achieved a weighted average compliance rate of 92 percent with ASHRAE Standard 90.1-2007 and 77% with the 2009 IECC for commercial and residential

buildings, respectively. These assumptions are based on the results of the DLI compliance study completed in September 2013.[132]

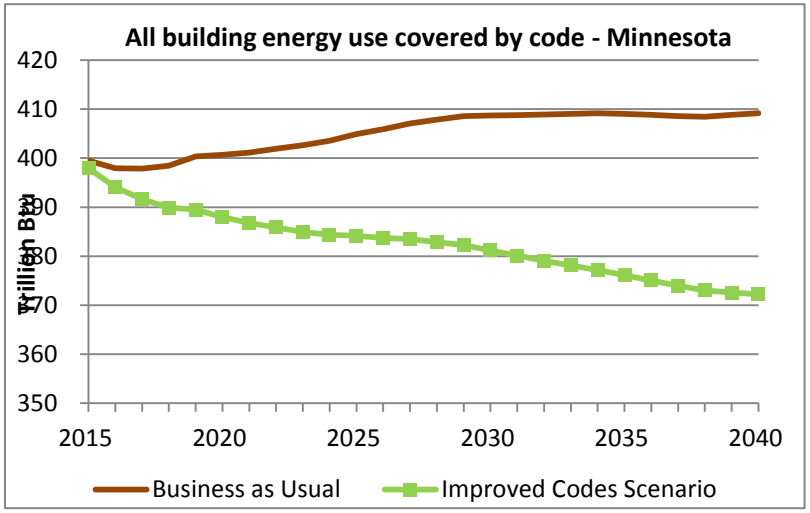
- In the target code scenario, the state adopts and implements ASHRAE Standard 90.1-2010 and the 2012 IECC as planned beginning in 2014 and achieves 100% compliance with the new codes as opposed to the assumed baseline compliance rates.

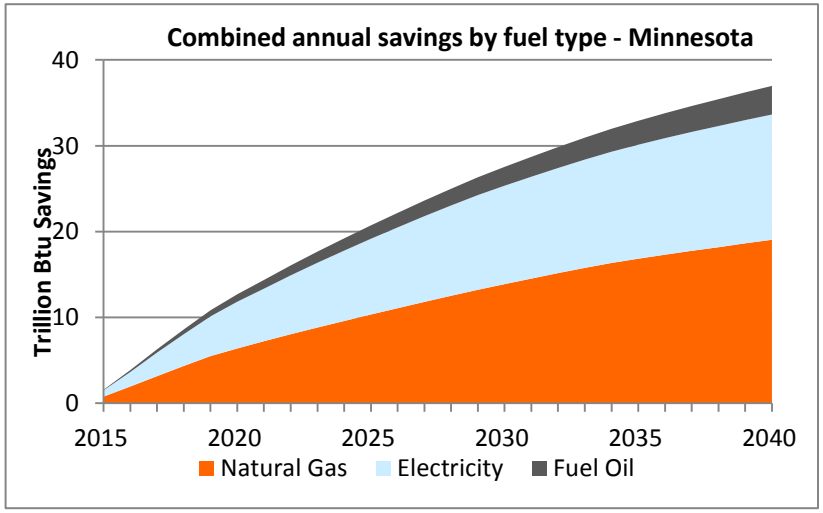
Using this 2012 IECC target scenario (see Table B-2), the Code Calculator estimates combined residential and commercial cumulative savings (through 2040) of:

- 588 trillion Btu of source energy production (5.6% percent below the business-as-usual scenario);
- About $6.6 billion in energy utility costs, and
- Over 31 million metric tons in carbon emissions reductions – **equivalent to one year of emissions from:**[133]
    - Over 6.5 million passenger vehicles;
    - The energy use of 2.8 million Minnesota homes;
    - Almost nine coal-fired power plants.

Table B-2 – BCAP Code Calculator – Selected Savings Estimates for Implementing ASHRAE 90.1-2010 & 2012 IECC Statewide in Minnesota in 2014 [134]

Selected savings estimates - Minnesota	Annual savings by year…					Cumulative savings through year…				
	2015	2020	2025	2030	2040	2015	2020	2025	2030	2040
Residential										
Overall source energy savings (trillion Btu)	0	6	12	16	25	0	21	68	141	351
Percent of business-as-usual energy use	0.2%	2.8%	5.0%	7.0%	10.4%	0.0%	1.0%	2.1%	3.2%	5.2%
Energy cost savings (millions of 2011 dollars)	$ 4	$ 73	$ 139	$ 205	$ 358	$ 4	$ 230	$ 792	$ 1,685	$ 4,554
CO_2 emissions reduction (million metric tons)	0.0	0.4	0.6	0.9	1.3	0.0	1.1	3.7	7.6	19.1
Commercial										
Overall source energy savings (trillion Btu)	1	6	9	11	12	1	23	63	116	237
Percent of business-as-usual energy use	0.7%	3.6%	5.3%	6.4%	7.1%	0.2%	1.5%	2.6%	3.5%	4.7%
Energy cost savings (millions of 2011 dollars)	$ 8	$ 49	$ 75	$ 94	$ 123	$ 8	$ 179	$ 505	$ 939	$ 2,048
CO_2 emissions reduction (million metric tons)	0.1	0.3	0.5	0.6	0.6	0.1	1.2	3.3	6.0	12.4
Residential and commercial combined										
Overall source energy savings (trillion Btu)	2	13	21	28	37	2	44	132	256	588
Percent of business-as-usual energy use	1.6%	4.0%	5.8%	7.3%	8.5%	0.1%	1.0%	2.1%	3.0%	5.6%
Energy cost savings (millions of 2011 dollars)	$ 13	$ 122	$ 213	$ 299	$ 481	$ 13	$ 409	$ 1,297	$ 2,624	$ 6,602
CO_2 emissions reduction (million metric tons)	0.1	0.7	1.1	1.5	2.0	0.1	2.3	7.0	13.7	31.5





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[131] NOTE: Among the many assumptions detailed in the Primer for the BCAP Code Calculator, these two scenarios assumed a current baseline compliance rate of 60% with the state's current energy codes. While achieving 100% compliance rates with the codes in the first year of implementation is unlikely, for the sake of simplicity and clarity of explanation, these figures were chosen for illustrative purposes to highlight the great potential savings impact of energy code adoption and implementation for non-technical audiences including policymakers.

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