Energy Codes and Residential Programs: Meeting the Climate Action Plan

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Climate Action Plan

• Recommendations designed by the Climate Action Council to reduce Michigan’s greenhouse gas emissions and develop a more energy efficient state
• Residential, Commercial, and Industrial Working Group developed major recommendations that affect buildings and building codes
• These recommendations have the potential to give Michigan its greatest greenhouse gas savings as existing buildings and new construction consume large amounts of energy
Climate Action Plan RCI-4: New Building Codes

• To meet the initial 2030 Challenge goal of 50% GHG reduction by 2010, Michigan should adopt an energy code that requires 30% energy performance improvement beyond the requirements of the 2006 IECC.

• Thermal envelope inspections should be mandatory for all new building construction to ensure that they are built as designed and energy efficiency performance objectives are met in the completed structures.
Climate Action Plan RCI-2: Existing Buildings

- Encourage energy efficiency upgrades and operating improvements in existing buildings.
- Offer incentives, rebates, and property tax abatements to foster state-wide participation in implementing energy-efficient measures to reduce future energy generation and GHG emissions.
- Implement programs to improve the efficiency of existing homes, buildings, and state facilities.
How is the State addressing RCI-2?

• By offering...
• Tax Credits for Energy Efficient Home Improvements
  – 10% state tax credit for installation of energy efficient home improvements
  – Insulation, water heaters, furnaces, windows, appliances
• State Weatherization Assistance Program
  – Ramped up with ARRA funds
• Michigan Appliance Trade-up Rebate Program
  – Incentives for appliance replacement purchases that meet Energy Star qualifications and beyond
• State Facility Upgrades and Audits
• Commercial Building Property Tax Exemptions
  – Exemptions for the installation of highly efficient renewable systems
• Utility Energy Optimization Programs offer incentives for customers to install energy efficient improvements
A Possible RCI-2 Response: Pending Retrofit Ramp Up

- Goal: Increase uptake of energy efficient measures
- Two part approach:
  - Residential Energy Retrofits in Detroit, Southeast Michigan, Central and West Michigan, and two non-entitlement communities (to be named after grant award)
  - Energy Efficient Upgrades for commercial centers in Detroit
- Neighborhood pilots will test the approach, outreach and marketing, and utilize financing enhancements/incentives such as Michigan Saves
- Multi-stakeholder effort hopes to address nearly 20,000 residences and 1,200 commercial buildings
- An overwhelming number of additional public and private partners will be involved with the project plan
Pending Retrofit Ramp Up

- Major Partners:
  - *Michigan Saves* (a nonprofit specializing in financing energy efficiency)
  - *City of Detroit* (including the Detroit Economic Growth Corporation)
  - *City of Grand Rapids*
  - *Southeastern Michigan Suburbs* (MI Suburbs Alliance & Southeastern Michigan Regional Energy Office)
  - Submitted a comprehensive Michigan Retrofit Ramp up Initiative (MRRI) competitive application to the U.S. Department of Energy
Making the Retrofits Called for in RCI-2 Affordable: Michigan Saves

- Energy retrofit financing options and incentives for both residential and nonresidential installations
- Customers can select “a la carte” improvements or participate in a full audit response financed by a loan serviced by the customer’s utility
- www.michigansaves.org
- Cherryland pilot program (now)
- State roll-out (soon)
- **Proposed** certification requirements for participating auditors:
  - BPI Building Analyst, or
  - RESNET Level III, or
  - Other certification approved by EPA for MI HPwES programs, or
  - Certification approved under State weatherization programs – DHS
What impact could these changes and policy options have on greenhouse games and our climate?
# Building and Code Improvements

## Impact on Greenhouse Gases

### Residential, Commercial and Industrial (RCI) Policy Recommendations

<table>
<thead>
<tr>
<th>Policy Option</th>
<th>GHG Reductions (MMtCO₂)</th>
<th>Net Present Value 2009–2025 (Million $)</th>
<th>Cost-Effectiveness ($/tCO₂)</th>
<th>Level of Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCI-1</strong> Utility Demand-Side Management for Electricity and Natural Gas</td>
<td>0.0 13.6 86.3</td>
<td>1,632</td>
<td>-19</td>
<td>Unanimous</td>
</tr>
<tr>
<td><strong>RCI-2</strong> Existing Buildings Energy Efficiency Incentives, Assistance, Certification, and Financing</td>
<td>17.6 53.8 228.6</td>
<td>-12,107</td>
<td>-28</td>
<td>Unanimous</td>
</tr>
<tr>
<td><strong>RCI-3</strong> Regulatory (PSC) Changes to Remove Disincentives and Encourage Energy Efficiency Investments by IOUs</td>
<td>Not Quantifiable</td>
<td>Unanimous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RCI-4</strong> Adopt More Stringent Building Codes for Energy Efficiency</td>
<td>3.6 6.8 82</td>
<td>-2,885</td>
<td>-35</td>
<td>Unanimous</td>
</tr>
<tr>
<td><strong>RCI-5</strong> MI Climate Challenge &amp; Related Consumer Education Programs</td>
<td>Not Quantifiable</td>
<td>Unanimous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RCI-6</strong> Incentives to Promote Renewable Energy Systems Implementation</td>
<td>0.7 1.5 14.0 1,958 140</td>
<td>Unanimous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RCI-7</strong> Promote and Incentives for Improved Design and Construction in the Private Sector</td>
<td>15.6 47.6 380</td>
<td>-11,693</td>
<td>-31</td>
<td>Unanimous</td>
</tr>
<tr>
<td><strong>RCI-8</strong> Net Metering for Distributed Generation</td>
<td>Fully incorporated into RCI-6</td>
<td>Unanimous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RCI-9</strong> Training &amp; Education for Bldg. Design, Construction, and Operation</td>
<td>Not Quantifiable</td>
<td>Unanimous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RCI-10</strong> Water Use and Management</td>
<td>Not Quantifiable</td>
<td>Unanimous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sector Total After Adjusting for Overlaps</strong></td>
<td>21.8 64.9 523.9</td>
<td>-13,014</td>
<td>-24.8</td>
<td></td>
</tr>
<tr>
<td><strong>Reductions From Recent Actions</strong></td>
<td>Figures adjusted include recent actions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sector Total Plus Recent Actions</strong></td>
<td>21.8 64.9 523.9</td>
<td>-13,014</td>
<td>-24.8</td>
<td></td>
</tr>
</tbody>
</table>

PSC = Public Service Commission; IOU = investor-owned utility.

*The figures listed show totals for the options net of recent legislation. Negative numbers indicate cost savings.*

**GHG Reductions (MMt) by 2025**
Residential, Commercial and Industrial Energy Improvements = The Greatest Reductions
Speaker Introduction

- Tim Mrozowski, AIA, LEED AP
- Professor of Construction Management
  School of Planning, Design, and
  Construction, Michigan State University
Developments in Energy Codes and Green Standards

• Energy Codes
• Association and Voluntary Standards
• Agency Goals and Requirements
Energy Code Systems

• ASHRAE 90.1 American Society of Heating Refrigeration and Air Conditioning Engineers
• International Energy Conservation Code (IECC)
• International Residential Code (IRC)
Voluntary Standards

- LEED Standards of USGBC
- Standard for Design of High Performance Green Buildings
  ANSI/ASHRAE/USGBC/IES 189.1-2009
- International Green Construction Code
  Public version 1.0 available since March 2010 Final publication in 2012
- National Association of Homebuilders-NAHB Model Green Home Building Guidelines
Agency Goals and Requirements

STATE OF MICHIGAN
DEPARTMENT OF MANAGEMENT AND BUDGET
OFFICE OF FACILITIES
DESIGN AND CONSTRUCTION DIVISION

MAJOR PROJECT DESIGN MANUAL

FOR

PROFESSIONAL SERVICE CONTRACTORS,
STATE UNIVERSITIES, COMMUNITY COLLEGES,

BUILDING REQUIREMENTS/DESIGN GUIDE

GREEN BUILDINGS

The State of Michigan has joined the United States Green Building Council (USGBC). All State-supported Major Capital Outlay projects, whether for State Agencies, Universities, or Community Colleges, shall be designed and constructed in accordance with the LEED Green Building Rating System. Projects shall score a minimum of 26 points in the LEED Scorecard, for a minimum “LEED Certified” status. Information on the USGBC and the LEED Scorecard can be obtained from the United States Green Building Council at (202) 828-7422 or at www.usgbc.org

http://www.michigan.gov/dmb/0,1607,7-150-9152-80693--,00.html
1.1 LEED

A. EA Prerequisite 2: Minimum Energy Performance

1. MSU Intent
   The intent of this requirement is to establish the minimum energy efficiency level for projects.

2. Planning Requirements
   a. Meet design requirements of EA Prerequisite 2: Minimum Energy Performance of LEED™ NC for New Construction and Major Renovation Version 2.2 Effective November 15, 2005 with all applicable errata and amendments.
   b. Design and specify in accordance with the mandatory provisions of ASHRAE/IESNA Standard 90.1-2004 (without amendments).
   c. Meet the prescriptive or performance requirements of ASHRAE/IESNA Standard 90.1-2004 (without amendments).

3. Documentation Requirements
   a. Design Team shall submit required MSU Sustainability Documentation showing compliance with this standard in accordance with the MSU Sustainability Documentation Requirements.
   b. For projects which are to be LEED registered and certified submit LEED on-line Design Stage and Post Construction documentation as required showing compliance with this standard.

B. EA Credit 1: Optimize Energy Performance

1. MSU Intent
   The intent of this requirement is to improve on the energy performance level mandated by the ASHRAE/IESNA Standard 90.1-2004 (without amendments).

2. Planning Requirements
   b. Design and specify systems and components such that building energy performance is a minimum of 21% better for new buildings and 14% better for existing buildings than the base requirements of the ASHRAE/IESNA Standard 90.1-2004 (without amendments) using a whole building analysis method allowed under the standard.
   c. Where applicable the designer may alternatively use the other compliance options available in LEED EA Credit 1 to demonstrate the required improved performance percentage.

3. Documentation Requirements
   a. Design Team shall submit required MSU Sustainability Documentation showing compliance with this standard in accordance with the MSU Sustainability Documentation Requirements.
Current Energy Codes In Michigan

- Residential MUEC - based on 2003 IRC with amendments (roughly equivalent to IECC 2006)
  - Prescriptive requirements include R-21 walls, U-.35 windows, R-49 ceiling, R-20 crawl space walls & R-11 basement walls (Zone 1)
  - Performance options provide flexibility including high performance mechanical trade-off for reduced envelope treatment

- Commercial - based on ASHRAE 90.1 (1999)
Proposed Energy Codes In Michigan

- Energy Code Revision Committee (BCC and DLEG) has recommended:

  IECC 2009 for residential and ASHRAE 90.1 2007 for commercial

Will be compliant with DOE target for all states
Status of Energy Codes

http://bcap-energy.org/node/5
Status of Energy Codes

http://bcap-energy.org/node/5
ASHRAE standard stringency improvement

Improvements in stringency from Standard 90-75 to 90.1-2010.

Credit: Mark Halverson, PNNL

Hunn, Bruce D. 35 Years of Standard 90.1. ASHRAE Journal, March 2010
http://www.ashrae.org/docLib/20100331_036047_hunn.pdf
Proposed New Energy Code

- MI’s equivalent to 2009 IECC (residential) and 2007 ASHRAE 90.1 (commercial)
- RESIDENTIAL: General increase with EE over the 2003 MUEC
- High efficiency lighting
- Duct sealing & testing when ducts are located in non-conditioned spaces
- Air sealing – requirements of visual inspection or getting the air sealing tested
Proposed New Energy Code

- RESIDENTIAL cont. - Mechanical trade-offs for envelope measures no longer allowed
- COMMERCIAL – generally positive gains over previous MI code
- AGGREGATE: Not as aggressive with EE savings as outlined in the 2030 Challenge goals
Summary of Compliance Mandate:
DOE Made $ available to states provided that they adopt certain codes or equivalent:

- **Residential**: IECC 2009
- **Commercial**: ASHRAE 90.1—2007
- 90% Code Compliance within 8 years
  - Each state must develop plan to meet mandate and perform annual measurement
  - One-time demonstration of 90% compliance
MSU Energy Code Training

Objectives:
• Improve Customer Relationships
• Increase Understanding
• Improve Compliance
• Reduce Admin time
• Trained Over 3500

Audience: Over 3500 Trained Building Officials, Inspectors, Home Builders, Architects, Engineers, Subcontractors, and Suppliers
New Codes and Directions
ASHRAE 90.1-2010

• Unanimously Approved Work Plan Goal:
  – “A document that has 30% total energy cost savings improvement compared to Standard 90.1-2004”

Schwedler, Mick. 35 Years of Standard 90.1. ASHRAE Journal, March 2010
http://www.ashrae.org/docLib/20100331_036047_hunn.pdf
• Addenda Deals With Subjects Such As:
  – Load Reduction: higher insulation levels, better glass, lower infiltration, reduced lighting loads, required daylightings
  – System and Component efficiencies: lighting power densities, higher equipment efficiencies, energy recovery
  – Integrated Controls: lighting/ daylighting, demand controlled ventilation, HVAC systems
  – Modeling requirements to show greater energy savings

Schwedler, Mick. 35 Years of Standard 90.1. ASHRAE Journal, March 2010
http://www.ashrae.org/docLib/20100331_036047_hunn.pdf
Standard for the Design of High-Performance Green Buildings

Except Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on December 4, 2009; by the ASHRAE Board of Directors on December 4, 2009; by the USGBC Board of Directors on December 1, 2009; by the IES Board of Directors on December 4, 2009; and by the American National Standards Institute on January 22, 2010.

This standard is under continuous maintenance by a Standing Standards Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site (www.ashrae.org), or in paper form from the ASHRAE Manager of Standards.

The latest edition of an ASHRAE Standard may be purchased on the ASHRAE Web site (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2005, telephone: 404-636-8440 (worldwide), or toll free 1-800-527-4723 (for orders in the United States and Canada), or e-mail: orders@ashrae.org. For reprint permission, go to www.ashrae.org/permissions.

ASHRAE STANDARD 189.1

- Developed by (published January 2010):
  - ASHRAE
  - Illuminating Engineering Society (IES)
  - US Green Building Council (USGBC)
  - Additional Expertise Representing: owners, design engineers, architects, equipment manufacturers, water and IAQ experts

- Compliance:
  - Prescriptive: simple option, few calculations
  - Mandatory Provisions
  - Analysis approaches

Peterson, Kent. *Code Green Standard 189.1 Comes at a Crucial Time.* High Performance Building Magazine, Spring 2010
http://www.hpbdmagazine.org/
ASHRAE STANDARD 189.1


- Expected to set foundation for green buildings through its adoption into local codes

Peterson, Kent. *Code Green Standard 189.1 Comes at a Crucial Time.* High Performance Building Magazine, Spring 2010
http://www.hpbmagazine.org/
ASHRAE STANDARD 189.1

• Covers:
  – Sustainable Sites
  – Water Use Efficiency
  – Energy Efficiency
  – Indoor Environmental Quality
  – Impact on Atmosphere, Material, and Resources
  – Construction and Operation Plans

• Benefits:
  – 40% Water Savings Over US EPA Act 1992

Peterson, Kent. *Code Green Standard 189.1 Comes at a Crucial Time.*
High Performance Building Magazine, Spring 2010
http://www.hpbmagazine.org/
International Energy Conservation Code 2012 (IECC)

- US Department of Energy Code close to realize its goal to achieve a 2012 code 30% more stringent than 2006

http://www.energycodes.gov/status/30-30vision.stm
INTERNATIONAL GREEN CONSTRUCTION CODE

• Public version 1.0 available since march
• Final publication in 2012
• Concepts
  – Minimum and advanced levels of performance
  – Overlay to the ICC family of codes
  – Provide a regulatory framework
  – Account for local conditions
  – Reflect the AIA 2030 Challenge
  – Work in tandem with Green rating systems
  – Designed with local, state, and federal law in mind

http://www.iccsafe.org/cs/igcc/Pages/default.aspx
LEED 2009 CREDIT WEIGHTING

• Considers
  – US Environmental Protection Agency’s TRACI environmental impact categories
  – National Institute of Standards and Technology weightings

Basic weighting equation

\[
\text{Relative importance of each impact category} \times \text{Relative contribution of a building activity group to building impacts} \times \text{Association between individual credits and activity groups} = \text{Credit Weight}
\]

LEED 2009 CREDIT WEIGHTING

• Impact Category – Impacts of buildings on environment and occupants (TRACI categories)

• Activity Group – Building related function associated with a group of LEED credits, combination of empirical calculations and Life Cycle Assessment (LCA)

• Association – Relationship indicating whether or not a credit contributes to reducing an impact

TRACI – Tool for the Reduction and Assessment of Chemical and Environmental Impacts

http://www.epa.gov/nrmrl/std/sab/traci/
• Much is happening on the energy code and green standards front. Go Green.

Q and A?