



## Energy Efficiency and Conservation (EEC) Subcommittee

### Summary List of Recommended Priority Policy Options for Analysis

Policy No.	Policy Option	CO2 Reduction 2012	CO2 Reduction 2020	Total 2009-2020	Net Present Value 2009-2020 (\$M)	Cost ton (\$/tCO <sub>2</sub> e)	Status of Option
EEC-1	Consumer Education Programs	<i>Not quantified</i>					Unanimous
EEC-2	Demand-Side Management (DSM) Energy Efficiency Programs for Natural Gas	0.08	1.24	5.43	-191.77	-35.29	Supermajority (4 objections)
EEC-3	Financial Mechanisms for Energy Efficiency	1.62	6.11	36.81	-805.05	-21.87	Supermajority (1 objection)
EEC-4	Improved Building Codes for Energy Efficiency	0.05	0.40	1.89	-46.27	-24.44	Supermajority (5 objections)
EEC-5	Incentive Mechanisms for Achieving Energy Efficiency	0.35	3.29	16.33	-350.79	-21.48	Unanimous
EEC-6	Promotion and Incentives for Improved Design and Construction in the Private Sector	0.00	0.12	0.46	-11.36	-24.57	Supermajority (1 objection)
EEC-7	Training and Education for Builders and Contractors	<i>Not quantified</i>					Unanimous
EEC-8	Focus on Specific Residential Market Segments	0.09	0.98	4.83	-122.53	-25.37	Unanimous
EEC-9	Midwestern Governors Association Energy Security and Climate Stewardship Platform	0.13	4.13	17.14	-375.69	-21.92	Majority (9 objections)
EEC-10	Energy Management Training/Training of Building Operators	0.10	1.29	5.48	-129.49	-23.63	Pending
EEC-11	Rate Structures and Technologies To Promote Reductions	0.04	0.21	1.20	-25.73	-21.45	Unanimous
EEC-12	Demand-Side Management (DSM)/Energy Efficiency Programs for Electricity	0.39	4.38	20.33	-444.81	-21.88	Supermajority (4 objections)
EEC-13	Government Lead-by-Example: Improved Design and Construction in New and Existing State and Local Government Buildings	0.08	0.36	1.97	1.04	0.53	Pending
EEC-14	More stringent appliance efficiency standards	0.94	2.20	17.33	-708.15	-40.85	Pending
	<b>Sector Total After Adjusting for Overlaps</b>	<b>1.1</b>	<b>8.6</b>	<b>43.2</b>	<b>-1064.5</b>	<b>-24.7</b>	
	<b>Reductions From Recent Actions: EISA (2007) and Executive Orders #6 and 41</b>	<b>0.44</b>	<b>1.42</b>	<b>9.19</b>			
	<b>Sector Total Plus Recent Actions</b>	<b>1.6</b>	<b>10.0</b>	<b>52.3</b>			

CO2 = carbon dioxide; NPV = net present value; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent; EISA = Energy Independence and Security Act (2007).

## Draft-Overlap Discussion

The ICCAC and the Energy Efficiency and Conservation Subcommittee (EEC SC) have developed 14 policy options to reduce the emissions of greenhouse gases in the residential, commercial, and industrial (RCI) sector. In addition to estimating the impacts of each individual policy recommendations, the *combined* impacts of the policy recommendations in each sector were estimated assuming that all were implemented together. This involved eliminating any overlaps in coverage that would occur to avoid double counting of impacts. Also, some of the policy recommendations in one sector overlapped with policy recommendations in another sector; therefore, these overlaps were identified and the impact analysis was adjusted to eliminate double counting of impacts associated with these intersectoral overlaps. The following section identifies where these overlaps occurred and explains the methods used to adjust the impacts analysis to avoid double counting of impacts.

## EEC Cumulative Impacts Analysis Methodology

To assess the cumulative emission reductions for the policies in the RCI sector, it is necessary to consider any overlaps among the policies that affect similar types of energy use. Specifically, some policies (such as EEC-3) are defined by their goals for reducing energy use, while others (such as EEC-1<sup>2</sup> and EEC-2) are defined by addressing a specific type of energy use. In these cases, it is important to consider whether addressing the specific energy use would add to the overall reductions, or would just be subsumed into the more general reduction goal.

To address this issue, policies were compared in terms of the type of energy use they target and the energy reduction strategies they implement. Overlaps were identified and quantified by sector (RCI or government/institutional), type of energy use targeted (water heating, space heating, etc.), and measure (e.g., solar hot water). If a policy's impact by sector and type of energy use was less than the impact from an overlapping policy for that same sector and type of energy use, it was excluded from the cumulative analysis.

EEC-3 provides tax incentives and other mechanisms that are not covered by utility and non utility energy efficiency programs. Nonetheless, from the perspective of the practical, achievable potential for the deployment of energy efficiency through 2020, there is significant overlap with EEC-1<sup>2</sup>. This option does not overlap with EEC-2 because, as it is written, it does not target natural gas efficiency. In contrast, this option is more aggressive in deploying energy efficiency as it assumes 2% of retail sales are conserved by the year 2010, while this level is not achieved in EEC-1<sup>2</sup> until 2016. For this reason, this option is assumed to overlap with EEC-1<sup>2</sup> by 85% and its delivered reductions in energy and CO<sub>2</sub> are reduced by this amount.

EEC-4 improved building codes don't overlap with EEC-1 and EEC-2, at least in theory, because EEC-1<sup>2</sup> and EEC-2 should be either applied to existing demand or would be for energy efficiency improvements beyond new codes. No overlaps for this option.

EEC-5 includes financial mechanisms such as decoupling utility revenues from sales of electricity or natural gas, allowing utilities to rate-base their energy efficiency expenditures and earn returns on these investments, to allow utilities to earn interest on customer loans for energy

efficiency equipment. In theory, these implementation mechanisms will provide new sources of funding for energy efficiency funding and thus increase the amount of energy efficiency measures deployed. However, this measure targets an incremental 1.5% of retail sales being conserved via energy efficiency by 2012, which, when combined with EEC-12, would exceed achievable levels of programmatic energy efficiency. Furthermore, the load management and time of use measures overlap with EEC-11. This option is assumed to overlap 90% with other options.

EEC-6 looks for ways to improve the efficiency of new buildings and major retrofits beyond existing building codes. Several of the measures that could be used to achieve this are caps on consumption of energy per unit area of floor space for new buildings and encouraging building commissioning and recommissioning, including energy tracking and benchmarking. While these measures might improve energy efficiency, they are largely captured under EEC-4 and EEC-12 and EEC-2. This option is assumed to overlap 90% with other options.

EEC-8 focuses on low income residents that might not receive energy efficiency investments under utility DSM programs. This measure provides new sources of funding for energy efficiency investments. However, well designed DSM programs should target low income residences. This option also targets residential and commercial energy consumers that have significant disincentives for investing in energy efficiency measures due to landlord-tenant market failures. The option targets minimum efficiency goals for rental properties, such as use of CFLs, and use of energy-efficient appliances, with inspections occurring with the departure of current tenants via a pre-rental inspection program before a new tenant takes possession. This option is assumed to overlap 75% with EEC-12 and EEC-2.

EEC-9 adheres to the Midwest Governor's Association target for energy efficiency. It is 100% redundant to EEC-12 and is eliminated from the adjusted cumulative totals.

EEC-10 provides a certification program for building operators. Utilities already have such programs, but their reach isn't as large as envisioned under this policy option. This option is assumed to overlap 90% with EEC-12 and EEC-2.

EEC-11 quantifies the reduced use of electricity due to more rational pricing mechanisms such as real time pricing. Higher prices result in lower energy use overall. The quantification of this option explicitly excludes conservation measures such as high efficiency air conditioners and chillers which are included in EEC-12. This option does not overlap with any other options.

EEC-13 Government high efficiency building standards typically show little overlap with utility programmatic investments and are additional to code improvements. This option does not overlap with any other options.

EEC-14 Deploys Energy Star equipment in government, residential, commercial, and industrial facilities. It also raises appliance efficiency standards for products not covered by federal standards, although the list of products that are eligible for state standards shrunk considerably after the passage of EISA (2007). EEC-12 and EEC-2 also provide incentives for customers to purchase efficient appliances and office equipment. This option is assumed to overlap 75% with EEC-12 and EEC-2 and other options.

## EEC-12. Consumer Education Programs

### Policy Description

The ultimate effectiveness of emissions reduction activities in many cases depends on providing information and education to consumers regarding the energy and GHG emissions implications of consumer choices. Public education and outreach is vital to fostering a broad awareness of climate change issues and effects (including co-benefits, such as clean air and public health) among the state's citizens. Such awareness is necessary to engage citizens in actions to reduce GHG emissions in their personal and professional lives. Public education and outreach efforts should integrate with and build upon existing outreach efforts involving climate change and related issues in the state. Ultimately, public education and outreach will be the foundation for the long-term success of all of the mitigation actions proposed in the climate change planning process, as well as those that may evolve in the future.

This option focuses on public education and outreach to stimulate decisions that yield energy efficiency savings. Consumer education is an integral component of most existing DSM programs offered by investor-owned and consumer-owned utilities.

### Policy Design

**Goals:** Achieve 5% reduction in residential energy consumption.

**Timing:** 1% reduction beginning in 2010 and increased linearly to 5% in 2020

**Implementing Parties:** State energy office, community colleges, secondary schools, building professional trade groups, utilities.

**Other:** TBD

### Implementation Mechanisms

TBD

### Related Policies/Programs in Place

Possible policy mechanisms include

- Evaluate techniques for assessing the impact of various educational efforts and disseminate standard methodology to utilities, the IUB, and others.
- Use the 2007 Iowa Residential Energy Survey to guide educational programs and efforts.
- Implement Energy Districts
- Energy districts are based on the conservation district model of the 1930s and 40s that created a unique local-state-federal partnership to bring conservation technical and financial assistance to every farm. This locally-led process could make energy efficiency a highly-visible local economic development tool. Districts could participate in national programs;

partner with local business for a “distributed efficiency storefront”; develop agricultural energy initiatives with local conservation district, USDA, and Extension partners; develop a local carbon offset program with funds and offsets entirely within county; work with utilities to encourage local distributed generation.

- Work with the Center for Energy and Environmental Education at UNI, the Iowa Department of Education, and other appropriate agencies to better incorporate energy efficiency in education curricula. (If there is an official Iowa entity charged with the responsibility for developing energy-related curricula, it is the Center for Energy and Environmental Education at UNI (Pat Higby). We would be remiss not to include CEEE as a significant mechanism for consumer education.)
- Develop and present/distribute seminars and/or publications aimed at residential consumers about state/federal tax credits for investment in energy efficient technologies and practices, what renters can do to improve energy efficiency, availability of green mortgages, and sources for self-liquidating financing of energy efficiency technologies.
- Develop and present/distribute seminars and/or publications aimed at housing professionals (builders, architects, realtors, appraisers, bankers, landlords and others) to extend information about green mortgages, self-liquidating financing, Energy Star, NAHB and LEED home certification standards, and benefits of efficiency investments by landlords.
- Develop and present/distribute seminars and/or publications aimed at commercial and industrial consumers to extend information about tax credits, best practices (~~such as Google, 3M, Wal-Mart~~), and such available resources as Industrial Assessment Center (ISU), National Building Control Information Program, National Association of Home Builders, Iowa Energy Center, etc.
- Develop and present/distribute seminars and/or publications aimed at HVAC contractors. (Utilities are starting to require really high levels of service that many contractors just can’t provide right now.)
- Display energy efficiency measures in retail outlets and other public settings
- Determine education efforts that will be needed to support other new/expanded energy efficiency initiatives, including but not necessarily limited to: 1) expanded Weatherization Assistance Program to make the homes of low-income Iowans more energy-efficient; 2) develop minimum energy efficiency standards and enforcement mechanism for rental properties; 3) develop financial incentives to more effectively encourage retrofitting of rental properties with energy efficient appliances and weatherization measures; and 4) develop financing mechanisms to make energy-efficient appliances affordable for everyone. [Suggestion: include reference to partnering with the Iowa Department of Economic Development, local conservation districts, USDA, ISU Extension, and the Center for Sustainable Communities, among others.]
- Utilize and promote Iowa State University’s Industrial Assessment Center to extend information about energy efficiency to Iowa business and industry.
- Municipal utilities, through IAMU, have developed a new direct mail energy and environmental magazine called “Eco@Home.” IAMU is also developing an energy-related “town meeting kit” for its members.

While utility energy efficiency plans must be cost-effective, the Iowa General Assembly (2007 session) amended Iowa Code section 476.6(14), which provides that educational programs and assessments of consumers' needs for information to make effective choices regarding energy use and energy efficiency need not be cost-effective. (Laws of the Eighty-Second G.A., H.F. 918).

- Low-income education programs delivered by CAP agencies through investor-owned energy efficiency programs;
- Energy efficiency curriculum developed by MidAmerican Energy;
- School energy efficiency kits (4<sup>th</sup>-6<sup>th</sup> Grade) distributed by Aquila.
- The Iowa Energy Center “shall cooperate with the state board of education in developing a curriculum which promotes energy efficiency and conservation.” Iowa Code § 266.39C(4). After experiencing difficulties implementing a state-wide energy curriculum (see Feasibility issues below), the Energy Center has sponsored Iowa teachers (covering both conference and travel expenses) to attend NEED (National Energy Education Development) training conferences. With a range of sponsors and a core staff, NEED has materials available and continuously up to date. In recent years, the NEED training sponsorship has been extended to 4-H leaders.
- Iowa Energy Center devotes the largest portions of its funds on energy efficiency research, demonstration projects and education projects, addressing energy use in agricultural, industrial, commercial, municipal and residential settings. In the last several years, the Iowa Energy Center has developed the Residential Home Series Booklets, [www.energy.iastate.edu/homeseries/index.htm](http://www.energy.iastate.edu/homeseries/index.htm). The Energy Center has reached cooperative agreements that allow for their reproduction and use in neighboring states.
- USDA's Section 9006 Renewable Energy & Energy Efficiency Program.
- Muscatine Power & Water has an energy efficiency curriculum they have used for several years with local schools.
- Some municipal utilities and RECs have educational programs or comprehensive curriculum in their service territories.
- Independence Municipal Utilities utilizes a new program from its power supplier, Wisconsin Public Power Inc. that may represent an emerging good practice for supporting development of customer-owned small-scale renewable generation.
- Wisconsin has a statewide comprehensive curriculum, KEEP, which could serve as a model for a similar program in Iowa.
- CEEE has many individual programs for encouraging energy education for students.
- Some utilities provide scholarships to Building Operator Certification training.

Additional resources: [www.energystar.gov](http://www.energystar.gov) and [www.energytaxincentives.org](http://www.energytaxincentives.org).

### **Type(s) of GHG Reductions**

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous

~~oxide (N<sub>2</sub>O) emissions. TBD For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced.~~

### Estimated GHG Reductions and Net Costs or Cost Savings

**Data Sources:** Not applicable.

**Quantification Methods:** Not applicable.

**Key Assumptions:** Not applicable.

### Key Uncertainties

~~TBD [as needed and approved by the SCs] None Identified.~~

### Additional Benefits and Costs

~~None Identified.~~

~~TBD [as needed and approved by the SCs]~~

### Feasibility Issues

~~None Identified.~~

~~TBD [as needed and approved by the SCs]~~

### Status of Group Approval

~~Pending [until ICCAC moves to final agreement at ICCAC Meeting #6 or #7] Approved.~~

### Level of Group Support

~~Pending [blank until ICCAC Meeting #6 or #7] Unanimous.~~

### Barriers to Consensus

~~TBD [blank until final vote by the ICCAC] None.~~

## EEC-2. Demand-Side Management (DSM)/Energy Efficiency Programs for Natural Gas

### Policy Description

Demand-side management (DSM)/energy efficiency is a policy approach that requires actions that influence both the quantity and patterns of energy consumed by end users. This option focuses on demand-side management/energy efficiency programs run by gas utilities, and may be designed to work in tandem with other recommended strategies that can also encourage efficiency gains.

The 2008 session of the Iowa General Assembly passed legislation to require the establishment of energy efficiency savings goals for all Iowa's municipal gas utilities and one cooperative gas utility.

### Policy Design

**Goals:** Invest in energy efficiency equal to 1.0% of statewide retail gas sales per year within 3 years; 1.5% per year in 5 years; 2.0% per year in 7 years.

**Timing:** Phase-in beginning in 2010.

### Parties Involved:

- Extend the DSM obligations and goals to all gas utilities in Iowa. IOUs are starting at 0.8%.
- Investor-owned utilities and the Iowa Utility Association, municipal utilities and the Iowa Association of Municipal Utilities, consumer cooperatives

### Implementation Mechanisms

Possible policy mechanisms include the following:

- Iowa Utilities Board establishes DSM goals for investor-owned utilities.
- Revise existing statutes to incorporate prescribed energy efficiency goals.
- Change the determination of DSM cost-effectiveness by accounting for the estimated valuation of CO<sub>2</sub> emissions avoided by programs.
- Extend the EE goals and obligations to all gas utilities in Iowa.
- Expand DSM measures eligible for program incentives.
- Extend investor-owned natural gas program funding requirements and eligibility to natural gas transportation customers.
- Expand the scope of utility activity that can contribute to achieving DSM goals to account for natural gas savings accruing when an electric utility provides incentives for installation of geothermal systems and building shell measures in an area in which natural gas service is available.

- Expand the scope of utility activity that can contribute to achieving DSM goals to include actions that are on the utility side of the meter, so-called “infrastructure” investments to use term adopted in Minnesota in 2007.
- Recognize the contribution of increased building energy codes and equipment energy standards to the achievement of DSM goals.
- Include in the measurement of DSM goals the energy savings from renewable measures that are implemented on the customer side of the meter.

### **Related Policies/Programs in Place**

Natural gas utilities in Iowa must offer cost-effective energy efficiency programs. Iowa Code § 476.6(14). The IUB establishes energy efficiency goals for rate-regulated gas utilities. Iowa Code § 476.6(16). DSM offered by municipal and rural electric cooperative utilities is not regulated. Most natural gas transportation customers served by competitive commodity suppliers do not fund energy efficiency programs mandated in § 476.6(16) and are not eligible to participate in these programs.

#### *Investor-Owned Natural Gas Utilities*

Iowa investor-owned utilities have a long history of conducting DSM/energy efficiency programs, under statutes adopted in 1990 and modified in 1996. The Iowa Utilities Board conducts contested proceedings for the review of plans, programs and energy savings goals developed by investor-owned utilities. New plans will be filed in April of 2008, and the Iowa Utilities Board has directed the investor-owned utilities to include analyses of the effects of goals equivalent to saving 1.5% of retail natural gas sales in Iowa.

#### *Municipal and Cooperative Natural Gas Utilities*

Although municipal gas utilities were required to file biennial energy efficiency plans, and many have conducted DSM programs legislation passed in 2008 requires each utility or group of utilities to assess energy efficiency potential to determine the maximum potential energy and capacity savings available from actual and projected customer usage through cost-effective energy efficiency measures and programs. Based on the assessment, each utility must establish an energy efficiency goal and a set of cost-effective energy efficiency programs designed to meet the energy efficiency goal. The process must be started by July 1, 2008 with a progress report submitted to the IUB by January 1, 2009 and a final report filed by January 1, 2010. The report must include the utility’s cost-effective energy efficiency goal, and for each measure utilized by the utility in meeting the goal, the measure’s description, projected cost, and the analysis of its cost-effectiveness. On January 1 of each even-numbered year, commencing January 1, 2012, utilities must file a report with the board identifying their progress in meeting the energy efficiency goal and any updates or amendments to their energy efficiency plans and goals. This requirement takes the place of the current energy efficiency plan filings.

The assumed incremental (new) statewide natural gas energy efficiency investments are equal to .82% of retail sales over the planning period.

### Type(s) of GHG Reductions

For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. ~~CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users.~~

### Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<b>GHG Emission Reductions</b>	0.08	1.24	MMtCO <sub>2</sub> e
<b>Net Present Value</b>	-6.5	-191.8	\$ Million
<b>Cumulative GHG Reductions</b>	0.15	5.43	MMtCO <sub>2</sub> e
<b>Cost-Effectiveness</b>	-42.62	-35.29	\$/tCO <sub>2</sub> e

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

Assuming incremental energy efficiency investments in Iowa remained unchanged from 2006 levels reported in IUB (2008), Iowa's cumulative natural gas energy efficiency deployment would be approximately 19% of sales in 2020. When using the levelized cost estimate assumptions developed for the EEC sector, total utility and participant spending on energy efficiency/DSM in the reference case is estimated at \$270M in 2020. Under EEC-2, additional energy efficiency spending is estimated at \$113M in 2020 which achieves another cumulative 8.5% of sales.

#### Data Sources:

- Energy Consumption By Sector (billions of Btu) See [EEC-1+EEC-12](#)
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu) See [EEC-1+EEC-12](#)
- Source: Quantec. (2008). Assessment of Energy and Capacity Savings Potential in Iowa. February Vol I.p. ES-3
- IUB. 2008. The Status of Energy Efficiency Programs in Iowa. p. 50.

#### Quantification Methods:

- Heat Rates (Btu/kWh). See [EEC-1+EEC-12](#)
- GHG Emissions Associated with End-Use Consumption (by Sector). See [EEC-1+EEC-12](#)
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See [EEC-1+EEC-12](#)

#### Key Assumptions:

- Levelized costs of gas are \$5.45 MBTU (2008 dollars) from Quantec (2008).
- This figure includes all utility and participant costs. Utility fixed costs are assumed to be 24% of the capital cost, based on MEC EE plan filing Docket # EEP-08-02. Vol II. pA1-8

- Real Escalation rate for cost of energy efficiency programs: 0% annually
- Avoided cost of gas in 2009 is \$9.49 MBTU (2008 dollars). Figure is from 2009–2013 Energy Efficiency Plan Interstate Power and Light Company Docket No. EEP-08-1 p. 31.
- The energy efficiency programs begin in 2010.
- The value used for the real rate at which costs are discounted annually is 5%.
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.
- Energy efficiency costs are expressed as levelized costs over the life of the energy efficiency options. The incremental costs (typically incurred in the first year of program implementation) are spread over all future years of the life of the energy efficiency measures.
- 2008 IOU assessment of potential does not evaluate potential from including natural gas transportation customers in funding and eligibility for DSM programs, nor does it evaluate potential from fuel switching by end users
- Statewide natural gas energy efficiency programs are assumed to be .82% of retail sales over the planning period.
- IOU gas sales comprise approximately 90% of statewide gas sales over the planning period.

#### **Key Uncertainties**

Energy efficiency investments will likely not lead to reductions in utility rates, but does typically result in reduced energy expenditures (customer bills) over the life of the investment compared to no energy efficiency investments being made.

#### **Additional Benefits and Costs**

None currently identified.

#### **Feasibility Issues**

None currently identified.

#### **Status of Group Approval**

~~Pending~~ ~~[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~ Approved.

#### **Level of Group Support**

~~Pending~~ ~~[blank until ICCAC Meeting #6 or #7]~~ Supermajority (four objections).

#### **Barriers to Consensus**

~~TBD~~ ~~[blank until final vote by the ICCAC]~~ Unspecified.

## EEC-3. Financial Mechanisms for Energy Efficiency

### Policy Description

This option refers to financial mechanisms that could increase energy efficiency provided by non-utility entities and investment by providing incentives to a variety of energy consumers to improve energy performance of buildings, equipment and residences. Some of the utilities active in Iowa have offered such financing mechanisms in other states and for specific market segments in Iowa. At least one Iowa utility has a pilot program for a no-interest revolving loan fund. The Iowa Energy Center has offered a revolving loan fund for renewable energy for a number of years.

### Policy Design

**Goals:** Reduced electricity, -natural gas, and heating fuels consumption across all end-user categories by 2% of retail sales annually. End users include; public sector, industrial, commercial, multi-family residential and residential. GHG reductions and costs or benefits from natural gas and heating fuels are not quantified in this option.

**Timing:** Initial 2% realized in 2010, with continued annual decline.

**Implementing Parties:** all public sector, residential, commercial and industrial electricity consumers; non-utility entities delivering financial mechanisms.

~~Other:~~

### Implementation Mechanisms

These mechanisms should include:

- Financial and technical assistance for energy audits
  - Currently the DNR has \$600K to direct to public and non-profit facilities. Will focus on state facilities to provide energy audits and technical assistance to follow up on audit recommendations. New legislation allows for fees, so program should be self funding. Financing for improvements through the Treasurer's office in a lease/purchase agreement.
  - \$1 million—Expand energy audit programs for industrial, commercial, and multi-family residential sectors and offer assistance for building and production facilities owners to follow up on audit recommendations.
  - \$10 million Revolving low- or no-interest loan fund(s) through the Iowa Energy Center or Iowa Finance Authority, for energy efficiency investments, potentially targeted at industrial, commercial, multi-family residential.
  - Performance contracting is a self-financing mechanism for improvements for energy efficiency. The money saved through less energy consumption is leveraged to pay for financing, installing, operating, and maintaining the energy efficiency measures.

- \$10 million tax credits for purchasing appliances that meet Energy Star 2007 requirements.
- \$10 million in income tax credits to non-residential and multi-family buildings of at least 20 K square feet that are constructed or rehabilitated to meet criteria set forth by the USGBC or other criteria. Credits apply to three types of alternative energy sources; photovoltaics, wind turbines and fuel cells. Credits claimed only if they serve a green whole building, a green base building or green tenant space.

### Related Policies/Programs in Place

The Midwest Governors' Stewardship Platform.

[Executive Orders #6 \(Gov. Culver\) and #41 \(Gov. Vilsack\). See EEC-13.](#)

### Type(s) of GHG Reductions

[Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions \(CO<sub>2</sub>\), but also trace amounts of methane \(CH<sub>4</sub>\), and nitrous oxide \(N<sub>2</sub>O\) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane \(CH<sub>4</sub>\) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation.](#)

### Estimated GHG Reductions and Net Costs or Cost Savings

	<u>2012</u>	<u>2020</u>	<u>Units</u>
<u>GHG Emission Reductions</u>	<u>1.62</u>	<u>6.11</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Net Present Value</u>	<u>-103.8</u>	<u>-805.0</u>	<u>\$ Million</u>
<u>Cumulative GHG Reductions</u>	<u>3.27</u>	<u>36.81</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Cost-Effectiveness</u>	<u>-31.75</u>	<u>-21.87</u>	<u>\$/tCO<sub>2</sub>e</u>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

### Data Sources:

- Energy Consumption By Sector (billions of Btu). See [EEC-12](#).
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See [EEC-12](#).

### Quantification Methods:

- Heat Rates (Btu/kWh). See [EEC-12](#).
- GHG Emissions Associated with End-Use Consumption (by Sector). See [EEC-12](#).
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See [EEC-12](#).

**Key Assumptions:**

- GHG reductions and costs or benefits from natural gas and heating fuels are not quantified in this option so actual reductions from this option are likely to be larger than those presented in the analysis.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- The quantification includes only electric energy efficiency measures.
- Levelized costs of energy efficiency and avoided costs come from ~~EEC-1~~EEC-12.
- The energy efficiency programs begin in 2010.
- The value used for the real rate at which costs are discounted annually is 5%.
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.

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**Key Uncertainties**

None currently identified..

**Additional Benefits and Costs**

None currently identified..

**Feasibility Issues**

None currently identified..

**Status of Group Approval**

~~Pending~~ ~~[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~ Approved.

**Level of Group Support**

Supermajority (one objection). ~~Pending~~ ~~[blank until ICCAC Meeting #6 or #7]~~

**Barriers to Consensus**

~~TBD~~ ~~[blank until final vote by the ICCAC]~~ Unspecified.

## EEC-4. Improved Building Codes for Energy Efficiency

### Policy Description

Buildings are significant consumers of energy and other resources. Adoption and enforcement of building energy and related codes can be an effective way to eliminate the least efficient energy approaches in new or renovated buildings. This policy sets a goal for reducing building energy consumption, to be achieved by increasing standards for the minimum performance of new and substantially renovated commercial and residential buildings through the adoption and enforcement of building codes. Building codes would be made more stringent via incorporation of aspects of advanced/next generation building designs and construction standards, such as sustainable design and green building standards.

This policy sets a goal for reducing building energy consumption, to be achieved by increasing standards for the minimum performance of new and substantially renovated commercial and residential buildings through the adoption and enforcement of building codes. Building codes should promote further reduction of greenhouse gas emissions through adoption of sustainable design or green building standards. Other aspects of the policy design include

- Undertaking a comprehensive review of existing State and local building codes in Iowa to determine where increased energy efficiency can be achieved. This review will be undertaken by the new Commission on Energy Efficiency Standards and Practices, established by legislation enacted this year.
- Iowa Energy Code:
  - Residential—2006 International Energy Conservation Code (IECC)
  - Commercial—2006 IECC (including ASHRAE/IESNA [American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illuminating Engineering Society of North America] 90.1-2004).
- Developing a training and certification program for code officials, builders, and contractors on energy efficiency and related sustainable design standards, and in code enforcement.
- Providing tools to state and local governments for measurement and tracking of cost savings.
- Targeting existing buildings for efficiency improvements during both major and minor renovation, through application and enforcement of building codes and with tax rebates or other incentives.
- Allowing compliance flexibility. New and substantially renovated buildings can utilize a combination of increased energy efficiency, switching to low and no carbon based fuels for previously carbon based end-uses, off-site purchases of ~~on~~ grid supplied “green power” and/or installing on-site off-grid low/no CO<sub>2</sub> emitting power generating equipment.
- Setting caps on consumption of energy per unit area of floorspace for new buildings.
- Requiring high-efficiency appliances in new construction and retrofits.

- Providing incentives, such as permitting and fee advantages, tax credits, financing incentives (such as “green mortgages”), or other inducements to encourage retrofit of existing residential and commercial buildings or for the development of non-traditional off-grid low and carbon neutral energy sources. The state can work with financial institutions to develop loan tools for these programs.

Advanced/next-generation building design requirements might include use of specific materials (e.g., local building materials), implementation of specific technologies (e.g., energy-efficient roofing materials and landscaping to lower electricity demand), or attainment of points under an advanced standard (e.g., green building or sustainable design). Energy-reduction targets should be periodically reassessed.

Potential measures supporting this policy can include outreach and public education, public recognition programs, improved enforcement of building codes, encouraging or providing incentives for energy tracking and benchmarking, performance contracting/shared savings arrangements, technical support resources for implementation, development of a clearinghouse for information on and access to software tools to calculate the impact of energy efficiency and solar technologies on building energy performance.

### Policy Design

**Goals:** Reduce energy consumption per square foot of floor space at new construction and renovated buildings by 15% by 2012 and 50% by 2025.

**Timing:** New codes become effective initially in 2010, and final goal is achieved by 2025.

**Implementing Parties:** Department of Public Safety (code adoption, enforcement), Local Governments, Builders, Contractors, Developers, Trade Associations (Master Builders, Home Builders Association, architects, AIA-Iowa chapter, etc.)

### Implementation Mechanisms

- Requiring the periodic and regular (no less than every 3 years) review and adoption of State and local building codes, particularly energy efficiency requirements, to ensure best management practices. At least every three years, the state will review (with opportunity for public comment) and adopt more stringent standards for energy efficiency.
- Develop more effective energy building code enforcement mechanisms and monitor compliance.
- Developing a training and certification program for code officials and contractors on energy efficiency codes and sustainable design standards.

• Develop mechanisms to facilitate enforcement in areas of the state where there is currently no building code enforcement.

• Extension of enhanced tax credits for “green development” of brownfields and grayfields, starting in 2009. The enhanced tax credits will require compliance with the sustainable design standards established by the Building Code Commissioner.

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**Related Policies/Programs in Place**

- Development of sustainable design standards for the state to be adopted by the Building Code Commissioner.
- Development of the Iowa Green Communities Initiative by the Iowa Department for Economic Development, establishing “green development” standards for projects receiving funding from the Community Development Division of IDED.
- ~~Extension of enhanced tax credits for “green development” of brownfields and grayfields, starting in 2009. The enhanced tax credits will require compliance with the sustainable design standards established by the Building Code Commissioner.~~

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**Type(s) of GHG Reductions**

~~Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, natural gas combustion and likely very small amounts of methane(CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.~~

**Estimated GHG Reductions and Net Costs or Cost Savings**

	<u>2012</u>	<u>2020</u>	<u>Units</u>
<u>GHG Emission Reductions</u>	<u>0.05</u>	<u>0.40</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Net Present Value</u>	<u>-3.0</u>	<u>-46.3</u>	<u>\$ Million</u>
<u>Cumulative GHG Reductions</u>	<u>0.10</u>	<u>1.89</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Cost-Effectiveness</u>	<u>-31.45</u>	<u>-24.44</u>	<u>\$/tCO<sub>2</sub>e</u>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

**Data Sources:**

- Energy Consumption By Sector (billions of Btu). See ~~EEC-1~~EEC-12.
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See ~~EEC-1~~EEC-12.

**Quantification Methods:**

- Heat Rates (Btu/kWh). See ~~EEC-1~~EEC-12.
- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-1~~EEC-12.
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-1~~EEC-12.

**Key Assumptions:**

- Levelized costs and avoided costs are from ~~EEC-1~~EEC-12 and EEC-2

- The energy efficiency programs begin in 2010.
- New residential and commercial space grows at 1.3% and 1.2% per year respectively.
- **Building Energy** codes apply to 18.4% of residential electricity use and 54% of commercial electricity **end-use**.
- Transmission and Distribution losses for electricity are 7%.
- Compliance with this policy is assumed to be 50% at the start of the program and rises to 75% by 2020 under the new compliance regime. For the portion of the new buildings (or retrofits) that don't comply, energy use in these structures is assumed to be 20% higher than the policy level.
- Building energy consumption is a function of Iowa's climate. According to the amount of heating degree days (HDD) and cooling degree days (CDD), Iowa is in the Residential Energy Consumption Survey climate zone 2. Source: 2001 RECS <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html#space>
- HDD data from: <http://lwf.ncdc.noaa.gov/oa/documentlibrary/hcs/hdd.200507-200607.pdf>
- CDD data from: <http://lwf.ncdc.noaa.gov/oa/documentlibrary/hcs/cdd.200501-200607.pdf>
- New commercial buildings in climate zone 2 have higher electric intensity relative to existing stock, so are adjusted upwards by 24%. Source: Ratio of 1990–1999 buildings to all buildings total energy use . [http://www.eia.doe.gov/emeu/cbecs/pdf/consumption\\_year\\_const.pdf](http://www.eia.doe.gov/emeu/cbecs/pdf/consumption_year_const.pdf)
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- Code improvements result in differential efficiency gains for natural gas as for electricity.
  - Assumes code or efficiency improvement affects gas and electricity according to fuel usage
  - Residential: Electricity code improvement of x results in 2.23x gas improvement
  - Commercial: Electricity code improvement of x results in .63x gas improvement Source: CEBCS
- In each year, the new building stock is “treated” at the new efficiency goal (less noncompliance) and then joins the existing stock in the next year
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- Energy efficiency costs are expressed as levelized costs over the life of the energy efficiency options. The incremental costs (typically incurred in the first year of program implementation) are spread over all future years of the life of the energy efficiency measures.

- The value used for the real rate at which costs are discounted annually is 5%.

#### **Key Uncertainties**

None currently identified.

#### **Additional Benefits and Costs**

None currently identified.

#### **Feasibility Issues**

None currently identified.

#### **Status of Group Approval**

~~Pending~~ ~~[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~ Approved.

#### **Level of Group Support**

~~Pending~~ ~~[blank until ICCAC Meeting #6 or #7]~~ Supermajority (five objections).

#### **Barriers to Consensus**

~~TBD~~ ~~[blank until final vote by the ICCAC]~~ Unspecified.

## EEC-5. Incentives for Energy Efficiency

### Policy Description

The Iowa Utilities Board (IUB) is charged with responsibility for energy efficiency programs and energy efficiency plans by Iowa utilities. Investor-owned utilities conduct energy efficiency programs under plans which are reviewed and approved by the IUB. Consumer-owned utilities (municipal utilities and electric cooperatives) operate voluntary plans and programs, but must provide reports on their plans to the IUB. The 2008 session of the Iowa General Assembly passed legislation that requires rural electric cooperatives and municipal electric utilities to establish energy efficiency savings goals. Energy efficiency plans in Iowa address both electric and natural gas use through a variety of programs.

Incentive approaches are of three types: (1) incentives offered by governing bodies to utilities to induce superior utility performance in implementing demand side management (DSM)/energy efficiency programs, (2) incentives offered by utilities to customers to induce customers to participate in programs and make investments, and (3) incentives offered to other energy efficiency stakeholders.

### Policy Design

**Goals:** Equivalent of 5% of retail sales improvement in energy efficiency from Type 1 incentives and 5% improvement from Type 2, and 5% for Type 3.

**Timing:** Incentives offered and energy improvements realized beginning 2012.

**Implementing Parties:** Residential and commercial property owners and tenants, government housing and other state and federal government agencies, weatherization and energy service providers, local business associations, community action agencies/human resource development councils, non-governmental organizations such as Habitat for Humanity, HVAC contractors, building contractors/design firms, lenders, retailers of energy efficient products and services, and residential/commercial energy audit contractors.

### Implementation Mechanisms

*Type 1 incentives to utilities.*

Implementation of various incentives to utilities would likely require legislative action to reverse the statutory decision to terminate incentives to investor-owned utilities.

*Type 2 incentives to utility customers.*

Incentives to customers of investor-owned utilities are reviewed and authorized by the Iowa Utilities Board in contested case proceedings for the review of energy efficiency plans. Proceedings are currently underway for the review of new (2009-2013) energy efficiency plans. Incentives to customers or members of municipal utilities and electric cooperatives are solely at the discretion of each customer-owned utility.

*Type 3 incentives to other energy efficiency stakeholders such as retailers, contractors and designers.*

Incentives to these stakeholders from investor-owned utilities are implemented after review and authorization of utility plans by the Iowa Utilities Board. Incentives to these stakeholders that target customers or members of municipal utilities and electric cooperatives are solely at the discretion of each customer-owned utility. Incentives to these stakeholders from other entities such as units of state or local government would require action by those governing bodies.

### **Related Policies/Programs in Place**

*Type 1 incentives to investor-owned utilities.*

Iowa investor-owned utilities (IOUs) have a long history of conducting DSM/energy efficiency programs, under statutes adopted in 1990 and modified in 1996. The original statutes enacted in 1990 authorized the Iowa Utilities Board to approve incentives for IOUs. The Iowa Utilities Board developed rules that permitted the IOUs to seek incentives, including:

- Carrying charges on energy efficiency program costs, which were deferred until final approval.
- Returns on costs approved for recovery, which were earned over a four-year amortization period.
- A reward mechanism based on the net societal benefits results of each IOUs' programs, up to as much as 25% of the net societal benefits.
- Opportunity to apply for recovery of net revenues reduced by DSM programs.

The revision of the energy efficiency statutes in 1996 removed all of these incentive mechanisms, and substituted an automatic adjustment mechanism for cost recovery, which accelerated IOUs' recovery of costs and eliminated the additional costs of incentives. Incentives are now back in discussion, based on the assumption that Iowa IOUs might improve their DSM performance very much beyond current levels of energy and capacity savings if they are given an incentive for doing so.

Potential mechanisms for incentives to IOUs could include the following:

- Decouple IOU revenues from sales of electricity or natural gas.
- Allow IOUs to rate-base their energy efficiency expenditures and earn returns on these investments.
- Allow IOUs to recover revenues which decrease due to DSM, net of utility system cost savings.
- Allow IOUs to implement a revenue normalization mechanism to recognize impacts of declining per customer sales due to DSM and other causes while also recognizing additional sales due to customer growth.
- Allow IOUs to offer all DSM programs as shared-savings or Pay-As-You-Go loan programs, with the interest or earnings on these loans retained as earnings by the IOUs.

- Offer the IOUs some form of monetary reward based on amounts of capacity and energy saved, recoverable from customers as part of DSM costs.
- Evaluate alternative rate regulation structures to better align utility interests with energy efficiency goals. For example, MidAmerican's revenue sharing mechanism incorporates an element of reward for energy efficiency because energy efficiency contributes to the utility's ability to sell electricity in the wholesale market and generate additional revenues that are, pursuant to the revenue sharing arrangement, allocated between the utility and its customers. Thus, the utility and its customers are rewarded for energy efficiency.
- Allow IOUs to "own" all or part of the "carbon credit" impact of capacity and energy saved by DSM programs, and allow the IOUs to retain as earnings any funds received from sale of credits based on these savings, above a certain level.
- Require IOUs to document performance and penalize IOUs which do not meet specific goals by certain dates, to the extent that there is inadequacy in the current Iowa statutes and rules requiring program documentation and allowing the Board to conduct prudence reviews and impose penalties.

*Type 2 incentives, to utility customers.*

Iowa IOUs offer incentives for participation in DSM programs to customers in many forms, including:

- Rate discounts or payments to participants in load management programs, for savings of peak load electric kW.
- Time-of-use rates to electric customers which offer lower rates off-peak and much higher rates during peak electric use periods.
- Free energy audits and simple on-site energy efficiency measures installed during audits.
- Advanced energy efficiency evaluation and design services, typically for nonresidential customers.
- Assistance to residential homebuilders in the form of training, inspection of homes, cash payments for meeting standards and certification/recognition of highly efficiency homes.
- Rebates to customers for purchasing energy-efficient appliances and equipment.
- Loans to customers for purchase of energy-efficient appliances and equipment.
- Customer education and training on energy efficient appliances and measures (including, but not limited to insulation, infiltration, building weatherization measures, and HVAC sizing and maintenance).

Other customer incentives may be possible.

*Type 3 incentives, to other energy efficiency stakeholders*

Another solution to the assumption that Iowa IOUs will not improve their DSM performance very much beyond current levels of energy and capacity savings is to transfer the administration of energy efficiency programs to an independent, third-party administrator. The independent

third-party administrator would be subject to a performance-based compensation structure including incentives for superior performance.

Another means of overcoming the utilities' disincentive to aggressively promote DSM programs and achieve energy efficiency results is to replace the current system of utility administered incentives with a system that provides incentives directly to retailers of energy efficient products and services, energy efficient product lenders, and building contractors/designers. Some utilities currently offer these stakeholders incentives to promote energy efficient products, including training, free publicity and per-item restocking payments to dealers and sales people for promotion of energy efficient appliances and equipment. Similarly, incentives could be paid directly to marketing firms to advertise and educate consumers about energy efficient products and energy efficiency services.

### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.

### Estimated GHG Reductions and Net Costs or Cost Savings

	<u>2012</u>	<u>2020</u>	<u>Units</u>
<u>GHG Emission Reductions</u>	<u>0.35</u>	<u>3.29</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Net Present Value</u>	<u>-10.7</u>	<u>-350.8</u>	<u>\$ Million</u>
<u>Cumulative GHG Reductions</u>	<u>0.35</u>	<u>16.33</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Cost-Effectiveness</u>	<u>-30.68</u>	<u>-21.48</u>	<u>\$/tCO<sub>2</sub>e</u>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

### Data Sources:

- Energy Consumption By Sector (billions of Btu). See ~~EEC-1~~EEC-12.
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See ~~EEC-1~~EEC-12.

### Quantification Methods:

- Heat Rates (Btu/kWh). See ~~EEC-1~~EEC-12.
- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-1~~EEC-12.
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-1~~EEC-12.

### Key Assumptions:

- Only GHG emissions reductions and cost savings from electricity energy efficiency have been quantified.

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- Peak avoided costs and levelized costs are assumed to be the same as from ~~EEC-1~~EEC-12
- The energy efficiency programs begin in 2012 and end after 2030.
- The three types of incentives will each improve efficiency by 5.0% *over the improvements made in* ~~EEC-1~~EEC-12.
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- The value used for the real rate at which costs are discounted annually is 5%.
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- Energy efficiency costs are expressed as levelized costs over the life of the energy efficiency options. The incremental costs (typically incurred in the first year of program implementation) are spread over future years of the life of the energy efficiency measures.

#### **Key Uncertainties**

None currently identified.

#### **Additional Benefits and Costs**

Energy efficiency investments will likely not lead to reductions in utility rates, but does typically result in reduced energy expenditures (customer bills) over the life of the investment compared to no energy efficiency investments being made.

#### **Feasibility Issues**

None currently identified.

#### **Status of Group Approval**

~~Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~Approved.

#### **Level of Group Support**

~~Pending—[blank until ICCAC Meeting #6 or #7]~~Unanimous.

#### **Barriers to Consensus**

~~TBD—[blank until final vote by the ICCAC]~~None.

## EEC-6. Promotion and Incentives for Improved Design and Construction in the Private Sector

### Policy Description

This policy provides incentives and targets to induce the owners and developers of new and reused residential and commercial buildings to improve the efficiency with which energy and other resources are used in those buildings, along with provisions for raising targets periodically and providing resources to building industry professionals to help achieve the desired building performance. This policy can include elements to encourage the improvement and review of energy use goals over time, and to encourage flexibility in contracting arrangements to encourage integrated energy- and resource efficient design and construction.

### Policy Design

**Goals:** Reduce energy consumption by the equivalent of 10% of retail electric sales and natural gas in residential and commercial buildings. Additional savings beyond 10% result in larger CO<sub>2</sub> reductions as identified in the additional costs and benefits section.

**Timing:** Compliance will begin on January 1, 2010.

**Implementing Parties:** Building industry professionals, architects

**Other:** TBD

### Implementation Mechanisms

Incentives for improved building construction are offered by various utilities. Incentives offered by investor-owned utilities are covered in the Types 2 and 3 incentives of EEC-5. Adoption of tax incentives or other government-funded incentives would likely require legislative action.

These incentives to take the form of \_\_\_\_\_

### Related Policies/Programs in Place

The Iowa Building Code Commissioner has initiated a practice of updating the State Energy Code every three years, as new editions of the International Energy Conservation Code are published. In addition, annual revisions have been and will continue to be made to the rules to improve enforcement.

During the 2008 session of the Iowa General Assembly, several pieces of legislation were enacted which will encourage greater energy efficiency, including Senate File 517, which extended the applicability of the State Energy Code, provides for the adoption of sustainable design standards for the state by the Building Code Commissioner, and revises provisions related to the Energy Bank administered by the Department of Natural Resources, and Senate File 2386, which establishes a two-year commission to study and report on ways to improve energy codes and their enforcement in Iowa.

Iowa rate-regulated utilities have a long history of offering energy efficiency programs focusing on new construction practices, under statutes adopted in 1990 and modified in 1996. Programs have differentiated between the residential and non-residential sectors. In this decade the rate-regulated utilities have increased their efforts to offer coordinated programs that offer similar program design and program incentives in both sectors. The residential sector has seen multi-option programs with both builder option and Energy Star emphases. The non-residential sector has seen a multi-tiered approach focusing on design team assistance, design team incentives and owner incentives.

Additional potential elements of this option include:

- Target new, renovated, and/or existing buildings (retrofits).
- Set a cap on consumption of energy per unit area of floor space for new buildings.
- Encourage building commissioning and recommissioning, including energy tracking and benchmarking.
- Set up a “feebate” program to encourage energy efficiency in building design.
- Provide incentives, in the form of tax credits, DSM program support, financing incentives (such as “green mortgages”), or other inducements for retrofit of existing residential and commercial buildings.
- Encourage the use of alternative and local building materials and practices.

#### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.

#### Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<u>GHG Emission Reductions</u>	0.00	0.12	MMtCO <sub>2</sub> e
<u>Net Present Value</u>	-0.3	-11.4	\$ Million
<u>Cumulative GHG Reductions</u>	0.00	0.46	MMtCO <sub>2</sub> e
<u>Cost-Effectiveness</u>	-177.04	-24.57	\$/tCO <sub>2</sub> e

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

#### Data Sources:

- Energy Consumption By Sector (billions of Btu). See ~~EEC-1~~EEC-12.
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See ~~EEC-1~~EEC-12.

**Quantification Methods:**

- Heat Rates (Btu/kWh). See ~~EEC-1~~[EEC-12](#).
- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-1~~[EEC-12](#).
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-1~~[EEC-12](#).

**Key Assumptions:**

- The energy efficiency programs begin in 2010 and continue through 2030.
- New residential and commercial space grows at 1.3% and 1.2% per year respectively.
- ~~Code improvements result in the same efficiency gains for natural gas as for electricity~~
- Energy codes apply to 18.4% of residential electricity use and 54% of commercial electricity use.
- Transmission and Distribution losses for electricity are 7%.
- Compliance with this policy is assumed to be 50% at the start of the program and rises to 75% by 2020 under the new compliance regime. For the portion of the new buildings (or retrofits) that don't comply, energy use in these structures is assumed to be 20% higher than the policy level.
- Building energy consumption is a function of Iowa's climate. According to the amount of heating degree days (HDD) and cooling degree days (CDD), Iowa is in the Residential Energy Consumption Survey climate zone 2. Source: 2001 RECS <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html#space>
- HDD data from: <http://lwf.ncdc.noaa.gov/oa/documentlibrary/hcs/hdd.200507-200607.pdf>
- CDD data from: <http://lwf.ncdc.noaa.gov/oa/documentlibrary/hcs/cdd.200501-200607.pdf>
- New commercial buildings in climate zone 2 have higher electric intensity relative to existing stock, so are adjusted upwards by 24%. Source: Ratio of 1990-1999 buildings to all buildings total energy use . [http://www.eia.doe.gov/emeu/cbecs/pdf/consumption\\_yearconst.pdf](http://www.eia.doe.gov/emeu/cbecs/pdf/consumption_yearconst.pdf)
- ~~Building C~~code improvements result in differential efficiency gains for natural gas as for electricity.
  - Assumes code or efficiency improvement affects gas and electricity according to fuel usage
  - Residential: Electricity code improvement of x results in 2.23x gas improvement
  - Commercial: Electricity code improvement of x results in .63x gas improvement Source: CEBCS
- New residential and commercial space grows at 1.3% and 1.4% per year respectively.
- In each year, the new building stock is "treated" at the new efficiency goal (less noncompliance) and then joins the existing stock in the next year
- Real Escalation rate for cost of energy efficiency programs: 0% annually

- The value used for the real rate at which costs are discounted annually is 5%.
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.

#### Key Uncertainties

~~TBD—[as needed and approved by the SCs]~~None Identified.

#### Additional Benefits and Costs

Doubling the target to 20% by 2020 raises the GHG reduction to .22 MMTCO<sub>2</sub>e. Cost per ton stays the same at \$25.17.~~TBD—[as needed and approved by the SCs]~~

#### Feasibility Issues

None Identified.

~~TBD—[as needed and approved by the SCs]~~

#### Status of Group Approval

~~Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~Approved.

#### Level of Group Support

~~Pending—[blank until ICCAC Meeting #6 or #7]~~Supermajority (one objection).

#### Barriers to Consensus

~~TBD—[blank until final vote by the ICCAC]~~Unspecified.

## EEC-7. Training and Education for Builders and Contractors

### Policy Description

This option refers to an education and outreach program for building professionals, including builders and architects, and code enforcement officials to encourage incorporation of energy-efficiency and greenhouse gas emissions-reduction measures into construction. These programs can train designers, builders contractors and code officials on a variety of relevant energy efficiency issues, such as building shell design, insulation, proper heating and air conditioning sizing and installation, and can be supported by requirements that licensing requirements for design and building trade professionals address knowledge of techniques for reducing energy use and sustainable design.

### Policy Design

**Goals:** Implement training and education of design and building trade professionals to ensure improvements in energy efficiency and conservation in new and existing buildings.

**Timing:** Training and education programs in place by 2010.

**Implementing Parties:** Department of Public Safety, Department of Natural Resources, Office for Energy Independence, local code enforcement agencies; Iowa Association of Building Officials, American Institute of Architects, Iowa Chapter, Iowa Engineering Society, Iowa Building Trades Council,; Master Builders of Iowa, Associated Building Contractors, Iowa Center for Sustainable Communities, code writing bodies, including the International Code Council, organizations sponsoring and promoting sustainable design, such as the U.S. Green Building Council, community colleges; universities.

~~Other: TBD~~

### Implementation Mechanisms

TBD

### Related Policies/Programs in Place

- Extension of energy codes to all commercial construction and all new one and two family residential construction (Senate File 517).
- Regular updating of State Energy Code.

### Type(s) of GHG Reductions

~~Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced.~~TBD

### Estimated GHG Reductions and Net Costs or Cost Savings

Not quantifiable

**Data Sources:** Not applicable.

**Quantification Methods:** Not applicable.

**Key Assumptions:** Not applicable.

### Key Uncertainties

~~TBD—[as needed and approved by the SCs]~~None identified.

### Additional Benefits and Costs

~~None identified. TBD—[as needed and approved by the SCs]~~

### Feasibility Issues

~~None identified. TBD—[as needed and approved by the SCs]~~

### Status of Group Approval

~~Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~Approved.

### Level of Group Support

~~Pending—[blank until ICCAC Meeting #6 or #7]~~Unanimous.

### Barriers to Consensus

~~TBD—[blank until final vote by the ICCAC]~~None.

## EEC-8. Technology Improvements in Targeted Markets

### Policy Description

Energy efficiency programs, funds, or goals, such as improved weatherization and appliances/HVAC, that focus on specific market segments at rental properties and low income residential units. Targeting specific market segments can also be an effective component of a regional market transformation alliance.

### Policy Design

**Goals:** Improvement in energy efficiency equal to 15% of retail sales.

**Timing:** Improvements realized beginning in 2010 at 1% per year for 3 years, then 1.5% for 4 years, then 2% per year until achieved.

**Implementing Parties:** builders, contractors, landlords, and others TBD

### Implementation Mechanisms

None currently identified.

### Related Policies/Programs in Place

Iowa's investor-owned electric and gas utilities since 1990 have been mandated to have separate low-income energy efficiency policies and before that date some companies had done so voluntarily. Another market segment that has unique challenges is rental property (both residential and commercial), where tenants pay energy bills but landlords maintain the facilities. Some policy approaches for these important segments include:

- Expanding Iowa's Weatherization Assistance Program to make the homes of low-income Iowans more energy-efficient.
- Develop minimum efficiency goals for rental properties, such as use of CFLs, and use of energy-efficient appliances. Evaluate each unit with the departure of current tenants via a pre-rental inspection program before a new tenant takes possession.
- Provide financial mechanisms to assist with the retrofitting of rental properties with energy-efficient appliances, insulation, and high efficiency furnaces.
- Establish a shared savings or zero-interest loan program to make energy-efficient appliances affordable for everyone.
- Design policies that allow paying for energy efficient appliances over time on residential utility bills.

Auction any emissions allowances made available in a regional cap-and-trade system and use the proceeds for renewable energy and efficiency investments and assistance for low income families.

### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.

### Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<b>GHG Emission Reductions</b>	0.09	0.98	MMtCO <sub>2</sub> e
<b>Net Present Value</b>	-6.4	-122.5	\$ Million
<b>Cumulative GHG Reductions</b>	0.19	4.83	MMtCO <sub>2</sub> e
<b>Cost-Effectiveness</b>	-34.15	-25.37	\$/tCO <sub>2</sub> e

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

### Data Sources:

- Energy Consumption By Sector (billions of Btu). See [EEC-1EEC-12](#).
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See [EEC-1EEC-12](#).

### Quantification Methods:

- Heat Rates (Btu/kWh). See [EEC-1EEC-12](#).
- GHG Emissions Associated with End-Use Consumption (by Sector). See [EEC-1EEC-12](#).
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See [EEC-1EEC-12](#).

### Key Assumptions:

- The energy efficiency programs begin in 2010, with energy efficiency improvements in rental properties and low-income residential units assumed to be 1% per year for 3 years, 1.5% for 4 years, then 2% per year until a cumulative reduction of 15% is achieved in the targeted buildings. With this trajectory, a 15% cumulative reduction is reached in 2019,
- 31.6% of residential electricity use is eligible for federal assistance, and thus for the program.
- 34% of commercial space is non-owner occupied and thus can benefit from efficiency investments that are likely to have been missed given “owner-tenant” disincentives for efficiency.
- New residential and commercial space grows at 1.3% and 1.2% per year respectively.
- Code improvements result in the same efficiency gains for natural gas as for electricity
- Energy codes apply to 18.4% of residential electricity use and 54% of commercial electricity use.

- Transmission and Distribution losses for electricity are 7%.
- Compliance with this policy is assumed to be 50% at the start of the program and rises to 75% by 2020 under the new compliance regime. For the portion of the new buildings (or retrofits) that don't comply, energy use in these structures is assumed to be 20% higher than the policy level.
- Building energy consumption is a function of Iowa's climate. According to the amount of heating degree days (HDD) and cooling degree days (CDD), Iowa is in the Residential Energy Consumption Survey climate zone 2. Source: 2001 RECS <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html#space>
- HDD data from: <http://wlf.ncdc.noaa.gov/oa/documentlibrary/hcs/hdd.200507-200607.pdf>
- CDD data from: <http://wlf.ncdc.noaa.gov/oa/documentlibrary/hcs/cdd.200501-200607.pdf>
- New commercial buildings in climate zone 2 have higher electric intensity relative to existing stock, so are adjusted upwards by 24%. Source: Ratio of 1990-1999 buildings to all buildings total energy use . [http://www.eia.doe.gov/emeu/cbecs/pdf/consumption\\_yearconst.pdf](http://www.eia.doe.gov/emeu/cbecs/pdf/consumption_yearconst.pdf)
- Code improvements result in differential efficiency gains for natural gas as for electricity.
  - Assumes code or efficiency improvement affects gas and electricity according to fuel usage
  - Residential: Electricity code improvement of x results in 2.23x gas improvement
  - Commercial: Electricity code improvement of x results in .63x gas improvement Source: CEBCS
- New residential and commercial space grows at 1.3% and 1.4% per year respectively.
- In each year, the new building stock is "treated" at the new efficiency goal (less noncompliance) and then joins the existing stock in the next year
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- The value used for the real rate at which costs are discounted annually is 5%.
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2010.

### Key Uncertainties

None currently identified.

### Additional Benefits and Costs

None currently identified.

**Feasibility Issues**

None currently identified.

**Status of Group Approval**

~~Pending~~ ~~[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~ Approved.

**Level of Group Support**

~~Pending~~ ~~[blank until ICCAC Meeting #6 or #7]~~ Unanimous.

**Barriers to Consensus**

~~TBD~~ ~~[blank until final vote by the ICCAC]~~ None.

## EEC-9. Midwestern Governors Association Energy Security and Climate Stewardship Platform

### Policy Description

Electricity use in Iowa has increased at 1.5% from 2000 to 2006 and consequently, efficiency can reduce any increase in demand. Natural gas increases have been greater than 2% recently.

In November 2007, Governor Culver signed on to the Midwestern Governors Association Energy Security and Climate Stewardship Platform. This policy is designed to address the energy efficiency goal of meeting at least 2% of the region's annual retail sales of natural gas and electricity through energy efficiency programs by 2015 and annually thereafter.

This policy option will require all of Iowa's utilities; investor owned, municipal and cooperatives to save at least 2% of their annual retail sales of natural gas and electricity through energy efficiency programs by 2015 and annually thereafter.

### Policy Design

#### Goals:

- Translate regional goal of at least 2% of the region's annual retail sales of natural gas and electricity through energy efficiency by 2015 and annually thereafter into an Iowa-specific goal
- Reduce electricity consumption through efficiency measures in every year after 2015.

**Timing:** See above.

**Implementing Parties:** All electric and gas suppliers; energy related centers at the state Regents institutions

**Other:** TBD

### Implementation Mechanisms

Based on MGA accord and Iowa implementation statutes.

### Related Policies/Programs in Place

See Governor Culver's Executive Order 6 (February 2008) and Governor Vilsack's Executive Order 41 (April 2005).

### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub>

~~from electricity generation, natural gas combustion and likely very small amounts of methane(CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.~~

### Estimated GHG Reductions and Net Costs or Cost Savings

	<u>2012</u>	<u>2020</u>	<u>Units</u>
<u>GHG Emission Reductions</u>	<u>0.13</u>	<u>4.13</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Net Present Value</u>	<u>-4.1</u>	<u>-375.7</u>	<u>\$ Million</u>
<u>Cumulative GHG Reductions</u>	<u>0.13</u>	<u>17.14</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Cost-Effectiveness</u>	<u>-31.32</u>	<u>-21.92</u>	<u>\$/tCO<sub>2</sub>e</u>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

#### Data Sources:

- Energy Consumption By Sector (billions of Btu). See ~~EEC-12~~EEC-12.
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See ~~EEC-12~~EEC-12.

#### Quantification Methods:

- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-12~~EEC-12.
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-12~~EEC-12.

#### Key Assumptions:

- ~~Only GHG emissions reductions and cost savings from electricity energy efficiency have been quantified.~~ ← Formatted: Bullets and Numbering
- See ~~EEC-12~~EEC-12 for levelized and avoided cost assumptions.
- Iowa utilities begin reducing 2% of their annual retail electricity sales in 2015 and continue through 2030.
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- The value used for the real rate at which costs are discounted annually is 5%.
- Net present values are calculated using 2005 dollars.
- Net present value is calculated beginning 2009.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.

#### Key Uncertainties

~~TBD—[as needed and approved by the SCs]~~None Identified.

**Additional Benefits and Costs**

~~None Identified. TBD—[as needed and approved by the SCs]~~

**Feasibility Issues**

~~None Identified. TBD—[as needed and approved by the SCs]~~

**Status of Group Approval**

~~Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~Approved.

**Level of Group Support**

~~Pending—[blank until ICCAC Meeting #6 or #7]~~Majority (nine objections).

**Barriers to Consensus**

~~TBD—[blank until final vote by the ICCAC]~~Unspecified.

## EEC-10. Energy Management Training/Building Operators

### Policy Description

In many facilities, utility bills can be significantly decreased through more efficient equipment and building operation. Administrative and technical training can inform and encourage energy managers, school officials, building operators, and others responsible for facility energy efficiency to utilize methods for minimizing unnecessary energy waste. This policy would increase education and demonstrate the benefits of energy efficient building operation through government “Lead-by-Example” of energy service contracting.

### Policy Design

**Goals:** require energy managers and facility operators in all sectors to obtain certification for successful completion of the training program.

**Timing:** Starting in 2010

**Implementing Parties:** State and local entities, private energy managers and facility operators throughout the state

~~Other: TBD~~

### Implementation Mechanisms

Specifically, this policy involves developing, implementing, and requiring a statewide energy efficiency and conservation education and training program for energy managers and facility operators to learn techniques for improving the efficiency of their steam, process heat, pumping, compressed air, motors, and other systems. Successful completion of this training would be required for energy managers and facility operators in all sectors (residential, commercial, industrial, and institutional) by a licensing or certification requirement, which would need to be established. Continuing education credits would be required annually.

A key organization in implementing EE training for building operators would be BOMA (Building Owners and Managers Association).

### Related Policies/Programs in Place

The Building Operator Certification (BOC) is a program component of the Custom Rebate DSM program offered in partnership by the IOUs and the Midwest Energy Efficiency Alliance. As described by the IOUs, BOC is a nationally recognized competency-based training and certification program for operations and maintenance staff working in commercial, institutional, or industrial buildings. BOC achieves energy savings by training individuals directly responsible for maintenance of energy-using building equipment and day-to-day building operations.

Interstate Power and Light Company (IPL) caps program impacts at a maximum of 10% of the customer’s 12 months’ kWh and therm usage. IOU Building Operator program reports average

energy savings achieved by program participants as 0.18 kWh and 0.71 therms per participant's square foot of facility. Source: Interstate Power and Light DSM Plan, Vol. I, pp. 100-101. No web link available.

### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.

### Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<u>GHG Emission Reductions</u>	0.10	1.29	MMtCO <sub>2</sub> e
<u>Net Present Value</u>	-5.9	-129.5	\$ Million
<u>Cumulative GHG Reductions</u>	0.17	5.48	MMtCO <sub>2</sub> e
<u>Cost-Effectiveness</u>	-34.39	-23.63	\$/tCO <sub>2</sub> e

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

### Data Sources:

- ACEEE. 2008. Energy Efficiency: *The First Fuel for a Clean Energy Future*. Feb. #E082. <http://aceee.org/pubs/e082.pdf?CFID=534012&CFTOKEN=57232379> p. 84

### Quantification Methods:

- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-11~~EEC-12.
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-11~~EEC-12.

### Key Assumptions:

- Building manager certification trains 10% of building operators in year 1 rising to 90% in 2020.
- Training program applies to heating, cooling, and ventilations energy use at commercial buildings which is 41% of energy use.
- Energy savings is equal to 10% of cooling load, 7.5% of heating and ventilation load which equates to 4% of net energy savings.
- Efficiency improvements result in differential efficiency gains for natural gas as for electricity.
  - Assumes code or efficiency improvement affects gas and electricity according to fuel usage

- Commercial: Electricity code improvement of x results in .63x gas improvement Source: CEBCS (2003).
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- The value used for the real rate at which costs are discounted annually is 5%.
- Net present values are calculated using 2005 dollars.
- Net present value is calculated beginning 2009.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.

#### **Key Uncertainties**

~~TBD—[as needed and approved by the SCs]~~None Identified.

#### **Additional Benefits and Costs**

~~None Identified.TBD—[as needed and approved by the SCs]~~

#### **Feasibility Issues**

~~None Identified.TBD—[as needed and approved by the SCs]~~

#### **Status of Group Approval**

Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]

#### **Level of Group Support**

Pending—[blank until ICCAC Meeting #6 or #7]

#### **Barriers to Consensus**

TBD—[blank until final vote by the ICCAC]

## EEC-11. Rate Structures

### Policy Description

This option could include various elements of utility rate design that are geared toward reducing greenhouse gas emissions (GHGs), often with other benefits as well, such as reducing peak power demand. The overall goal is to present rate structures so as to better reflect the actual economic and environmental costs of producing and delivering electricity as those costs vary by time of day, day of the week, season of the year and from year to year. In this way, rates provide consumers with information reflecting the impacts of their consumption choices.

The reduction of GHGs from changes in rate structures can come from two sources. The first is the reduction of absolute levels of energy use by consumers due to higher prices. Real time pricing and smart metering give consumers information about their energy usage that enables them to better rationalize their usage. Time of use pricing or other schemes to reflect rational pricing that result in price increases during peak periods potentially reduces demand by the estimated price elasticity of demand, typically -.20% to -.50% (US EIA, 2003) so that a 10% increase in prices would lead to a 2% to 5% reduction in demand. In a survey of experience with smart metering, Owen and Ward (2006) find energy savings of 0-10%.

The other source of GHG reductions from policies to reduce peak demand are energy efficiency measures that reduce demand during peak periods, such as high efficiency air conditioners and chillers. These measures are included in the existing demand side management (DSM) measures in ~~EEC-4~~EEC-12, and EEC-14 (appliance standards). These measures also reduce new generation capacity investments which is not quantified for GHG reductions. [This element of this option is not quantified as it is covered under other options]

The GHG impacts of other types of rate structures are more difficult to quantify. Curtailment programs that allow loads to be shifted during peak periods might result in different emissions profiles as these loads move from peak to shoulder or baseload periods. Overall CO<sub>2</sub> savings from these programs are also difficult to quantify. [This element of this option is not quantified]

### Policy Design

**Goals:** Reduce electricity consumption through pricing by 2.0% of retail sales.

**Timing:** Compliance will begin on January 1, 2010.

**Implementing Parties:** All Iowa utilities and utility customers.

~~Other: TBD~~

### Implementation Mechanisms

- Programs for customers of investor-owned utilities are reviewed and authorized by the Iowa Utilities Board (Board) in contested case proceedings for the review of energy efficiency plans. Proceedings—labeled EEP proceedings—are currently underway for the review of

new (2009-2013) energy efficiency plans. The current plans of investor-owned utilities include two types of rate programs, residential direct load control programs and nonresidential interruptible programs.

- The relationship of EEP proceedings to traditional rate proceedings—labeled RPU proceedings—for rate and revenue design in programs besides direct load control and interruptible programs, such as those listed in the Related Policies section below, has not been taken up in Iowa. The other rate design options (beyond interruptible and direct load control), to the extent currently available, have been implemented through general rate case proceedings. The Board examines rate-regulated utilities' rate structures in rate proceedings to be sure that the rate structures in place send the appropriate price signals.
- Section 1252 of EPAAct 2005 established PURPA Standard 14 entitled “Time-Based Metering and Communications,” which directed the Board to consider adopting four types of time-based rate schedules: time-of-use pricing, critical peak pricing, real-time pricing, and load management programs. The Board declined to adopt PURPA Standard 14 in its entirety, finding that rate proceedings are the appropriate forum for many of these issues. (IUB Docket No. NOI-06-3 (Mar. 6, 2007). The Board intends to begin informal discussions with interested participants regarding these topics and potential pilot projects.
- Programs for customers or members of municipal utilities and electric cooperatives are solely at the discretion of each customer-owned utility. The Board hopes the consumer-owned utilities will be active in ongoing discussions and potential pilot programs to test other rate design options beyond the well-established load management programs.

### Related Policies/Programs in Place

Rate-regulated utilities have employed two types of rate structures for many years and in some cases for many decades:

- **Seasonal rates**—typically with higher prices in the season of the year when demand and prices are the highest. In Iowa the higher season is typically a summer period of three to four months duration.
- **Time-of-day (TOD) rates**—typically price electricity higher at times of higher power demand, based on either a two- or three-tier time-differentiated structure, and thus better reflect the actual cost of generation, transmission and distribution. Time-of-use rates may or may not have a significant impact on total GHG emissions, but do affect on-peak power demand and thus both the need for peaking capacity and fuel for peaking plants.

Other possible policy mechanisms include several that have been offered on a much more limited basis:

- **Critical peak pricing**—also known as extreme-day pricing, refers to programs aiming to reduce system demand by encouraging customers to reduce their loads for a limited number of hours during the year. CPP programs integrate a pricing structure similar to TOD with the distinction of more extreme pricing signals for the critical events. (A price structure in which the extreme price is fixed by tariff reduces to a multi-tiered time-of-day rate.)

- **Real-time pricing**—a tariff structure for customers to pay electric rates tied to market prices for energy. The prices are typically posted by the utility based on day-ahead hourly prices but couple be posted on a real-time basis.
- **Inverted block pricing**—also known as tiered/increasing peak, where rates for electricity and natural gas use include a rate for some base usage level and increased rates for higher levels of consumption.

### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.

### Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<b>GHG Emission Reductions</b>	0.04	0.21	MMtCO <sub>2</sub> e
<b>Net Present Value</b>	-2.6	-25.7	\$ Million
<b>Cumulative GHG Reductions</b>	0.08	1.20	MMtCO <sub>2</sub> e
<b>Cost-Effectiveness</b>	-32.21	-21.45	\$/tCO <sub>2</sub> e

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

### Data Sources:

- Energy Consumption By Sector (billions of Btu). See [EEC-1EEC-12](#).
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See [EEC-1EEC-12](#).
- Owen and Ward. 2006. Smart meters :commercial, regulatory and policy drivers. Appendix 2. <http://www.sustainabilityfirst.org.uk/docs/smartmeterspdfappendices.pdf>
- US EIA. 2003. Price Responsiveness in the AEO2003 NEMS Residential and Commercial Buildings Sector Models. <http://www.eia.doe.gov/oiaf/analysispaper/elasticity/>

### Quantification Methods:

- Heat Rates (Btu/kWh). See [EEC-1EEC-12](#).
- GHG Emissions Associated with End-Use Consumption (by Sector). See [EEC-1EEC-12](#).
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See [EEC-1EEC-12](#).

### Key Assumptions:

- Peak avoided costs and levelized costs are assumed to be the same as from ~~EEC-1~~EEC-12. A host of measures could fall under this category from smart meters to interruptible load programs. These measures tend to have low capital costs and thus using the levelized costs estimates from Quantec is a conservative assumption.
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- The value used for the real rate at which costs are discounted annually is 5%.
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.
- Demand response measures are assumed to reduce electricity demand by 5%. This number is a midpoint from the survey in Ownes and Ward (2006) find energy savings from smart meters vary from 0-10%. This is consistent with what price elasticity of demand would predict. If peak price tariffs are 10-20% higher than non-peak tariffs, then demand reductions would range from 2.5% to 10% using price elasticities of -.20 to -.5%
- The installation of demand response measures increases from 2% of total sales in the beginning of the program to 40% by 2020 as the program gets implemented. Assuming a 5% demand reduction and 40% participation, then the program reaches the target of 2% of retail sales by year by 2020.
- The program applies only to peak load hours, which are assumed to be Jan-Mar and Apr-Sept 0700-2300 hrs for a total of 44% of total annual hours.
- Residential, commercial, and industrial customers all implement the program at the same rate.
- Existing and planned (BAU) demand response measures are 50% of the total policy reductions (placeholder assumption).
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.

### Key Uncertainties

There is uncertainty as to the benefits and costs of rate options and rate designs that are dependant on utility-wide implementation of real-time metering. IUB Docket No. NOI-06-3.

### Additional Benefits and Costs

Metering and associated infrastructure investments needed to support real-time pricing offers the potential for additional cost savings to the utility.

### Feasibility Issues

Identifying the cost of metering and associated infrastructure investment needed to support various pricing options.

Designing rate programs that customers will embrace.

Quantifying energy impacts associated with various rate options.

Educating customers about pricing options in order to obtain anticipated energy benefits.

#### **Status of Group Approval**

~~Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~Approved.

#### **Level of Group Support**

~~Pending—[blank until ICCAC Meeting #6 or #7]~~Unanimous.

#### **Barriers to Consensus**

~~TBD—[blank until final vote by the ICCAC]~~None.

## EEC-12. Demand-Side Management (DSM)/ Energy Efficiency Programs for Electricity

### Policy Description

Demand-side management (DSM) /energy efficiency is a policy approach that requires actions that influence both the quantity and patterns of energy consumed by end users. This option focuses on demand-side management/energy efficiency programs run by electric utilities, and may be designed to work in tandem with other recommended strategies that can also encourage efficiency gains.

### Policy Design

**Goals:** Invest in energy efficiency equal to 1.0% of retail electricity sales per year within 3 years; 1.5% per year in 5 years; 2.0% per year in 7 years

**Timing:** Phase-in beginning in 2010

### Implementing Parties:

- Extend the DSM obligations and goals to all electric utilities in Iowa. Investor-owned utilities (IOUs) are starting at 0.8% of retail sales; municipal utilities and rural electric cooperatives start at varying levels.
- Investor-owned utilities and the Iowa Utility Association, municipal utilities and the Iowa Association of Municipal Utilities, electric cooperatives and the Iowa Association of Electric Cooperatives.

### Implementation Mechanisms

Possible policy mechanisms include:

- Iowa Utilities Board (IUB) establishes DSM goals for investor-owned utilities.
- Revise existing statutes to incorporate prescribed energy efficiency goals.
- Change the determination of DSM cost-effectiveness by accounting for the estimated valuation of CO<sub>2</sub> emissions avoided by programs.
- Extend the DSM obligations and goals to all to all electric utilities in Iowa.
- Expand DSM measures eligible for program incentives.
- Expand the scope of utility activity that can contribute to achieving DSM goals to include actions that are on the utility side of the meter, so-called “infrastructure” investments to use term adopted in Minnesota in 2007.
- Recognize the contribution of increased building energy codes and equipment energy standards to the achievement of DSM goals.

- Include in the measurement of DSM goals the energy savings from renewable measures that are implemented on the customer side of the meter.

### Related Policies/Programs in Place

Electric utilities in Iowa must offer cost-effective energy efficiency programs. Iowa Code §§ 476.6(14). The Iowa Utilities Board establishes energy efficiency goals for investor-owned electric utilities. Iowa Code § 476.6(16). DSM offered by non-rate-regulated utilities is not regulated. 476.6(16).

#### *Investor-owned Electric Utilities*

Iowa investor-owned utilities have a long history of conducting DSM/energy efficiency programs, under statutes adopted in 1990 and modified in 1996. The Iowa Utilities Board conducts contested proceedings for the review of plans, programs and energy savings goals developed by investor-owned utilities. New plans will be filed in April of 2008, and the Iowa Utilities Board has directed the investor-owned utilities to include analyses of the effects of goals equivalent to saving 1.5% of retail electric sales in Iowa.

#### *Municipal and Cooperative Electric Utilities*

Although the rural electric cooperatives and municipal electric utilities were required to file biennial energy efficiency plans, , and many have historically conducted DSM programs legislation passed in 2008 requires each utility or group of utilities to assess energy efficiency potential to determine the maximum potential energy and capacity savings available from actual and projected customer usage through cost-effective energy efficiency measures and programs. Based on the assessment, each utility must establish an energy efficiency goal and a set of cost-effective energy efficiency programs designed to meet the energy efficiency goal. The process must be started by July 1, 2008 with a progress report submitted to the IUB by January 1, 2009 and a final report filed by January 1, 2010. The report must include the utility's cost-effective energy efficiency goal, and for each measure utilized by the utility in meeting the goal, the measure's description, projected cost, and the analysis of its cost-effectiveness. On January 1 of each even-numbered year, commencing January 1, 2012, utilities must file a report with the board identifying their progress in meeting the energy efficiency goal and any updates or amendments to their energy efficiency plans and goals. This requirement will take the place of the current energy efficiency plan filings.

IOU business-as-usual electric efficiency investments equate to .8% of load in 2008. The assumed incremental (new) statewide electric energy efficiency investments are equal to .69% of retail sales over the planning period. Proposed energy efficiency plans, pending IUB determination, would achieve between 1.3% and 1.5% of retail sales by 2012.

### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation.

**Estimated GHG Reductions and Net Costs or Cost Savings**

	<b>2012</b>	<b>2020</b>	<b>Units</b>
<b>GHG Emission Reductions</b>	<b>0.39</b>	<b>4.38</b>	<b>MMtCO<sub>2</sub>e</b>
<b>Net Present Value</b>	<b>-24.6</b>	<b>-444.8</b>	<b>\$ Million</b>
<b>Cumulative GHG Reductions</b>	<b>0.78</b>	<b>20.33</b>	<b>MMtCO<sub>2</sub>e</b>
<b>Cost-Effectiveness</b>	<b>-31.60</b>	<b>-21.88</b>	<b>\$/tCO<sub>2</sub>e</b>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

Assuming incremental energy efficiency investments in Iowa remained unchanged from 2006 levels reported in IUB (2008), Iowa's cumulative electric energy efficiency deployment would be approximately 15% of sales in 2020. When using the levelized cost estimate assumptions developed for the EEC sector, total utility and participant spending on energy efficiency/DSM in the reference case is estimated at \$270M in 2020. Under ~~EEC-1~~EEC-12, additional energy efficiency spending is estimated at \$178M in 2020 which achieves another cumulative 10% of sales.

**Data Sources:**

- Quantec. 2008. Assessment of Energy and Capacity Savings Potential in Iowa. February Vol I. p. ES-3
- IUB. 2008. The Status of Energy Efficiency Programs in Iowa. p. 50.
- Expert testimony in IUB Interventions filed relative to the Energy Efficiency Plan filings of the regulated utilities.

*Energy Consumption By Sector (billions of Btu)*

- Historical energy consumption in the state, by sector, is from the U.S. DOE Energy Information Administration (EIA) State Energy Data available at <http://www.eia.doe.gov/emeu/states/seds.html>. To calculate future projected energy consumption, growth factors were applied to the historical 2005 data to calculate projections through 2030. The growth factors are based on a combination of two parameters. One accounts for growth within the RCI sectors, with growth factors for residential based on projected population growth (from <http://data.iowadatabase.org/datatables/State/stpopest19002007.xls> and <http://data.iowadatabase.org/browse/projections.html>); growth in the commercial sector based on non-manufacturing employment growth projections; and industrial growth based on manufacturing employment. Employment projections were taken from the Iowa Workforce Information Network, Iowa Industry Projections, 2004–2014 (<http://iwin.iwd.state.ia.us/pubs/statewide/indprojstatewide.pdf>). The other factor is growth in electricity sales, which was calculated based on historical retail sales from 1990 to 2005 obtained from the EIA state electricity profile, in GWh, available from Table 8 at: [http://www.eia.doe.gov/cneaf/electricity/st\\_profiles/iowa.html](http://www.eia.doe.gov/cneaf/electricity/st_profiles/iowa.html).

*Power Station Electricity Generation (GWh) and Fuel Use (BBtu)*

- Gross generation for 2005 was obtained from the EIA database (EIA-906/920) on fuel stocks at all electric power sector generating facilities, broken down by fuel type. Data for later years was projected from the 2005 figure based on projections of growth in generation for the Mid-Continent Area Power Pool (MAPP) region. The projected regional consumption and generation data are from the EIA Annual Energy Outlook (AEO) and can be accessed by downloading the “Electric Generation & Renewable Resource” file at <http://www.eia.doe.gov/oiaf/aeo/supplement/index.html>. On-site usage was subtracted from all generation figures.

**Quantification Methods:***Heat Rates (Btu/kWh)*

- Heat rates indicate how much fuel is used (Btu) to generate a given amount of electricity (kWh), and they vary greatly depending on the type of power stations and the fuel used. Heat rates are used to convert figures for electricity into figures for fuel use so the fuel use can be converted into GHG emissions using GHG emission factors. Heat rates for 2005 for each type of generation and fuel were calculated from 2005 fuel use (in BBtu) divided by 2005 generation (GWh). Projections for 2006 and beyond are based on annual combustion efficiency growth rates for the MAPP region. Combustion efficiency for a given year is calculated for each fuel type as the fuel use (in quadrillion Btu) divided by the electricity generated (in billion kWh), and the combustion efficiency growth rate applied to this value is based on the change in combustion efficiency from the previous year.

*GHG Emissions Associated with End-Use Consumption (by Sector)*

- Historical CO<sub>2</sub> data by sector (and further broken down by fuel type) was calculated by two EPA State Greenhouse Gas Inventory Tool (SIT) software modules: the Fossil Fuel Combustion Module and—for emissions from industrial sources—the SIT module for industry. Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions were calculated by the Stationary Combustion Module and—for emissions from industrial sources—the SIT module for industry.
- Projected emissions through 2030 were based on the 2005 data with growth factors compounded from year to year as discussed above in (A) for energy consumption.

*GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels*

- The projected data for each GHG was calculated for each fuel and generation type (e.g., non-lignite coal in a steam plant) as a direct product of the projected generation data (in GWh) described above in (B). Metric tons of CO<sub>2</sub> are calculated from generation as **tons CO<sub>2</sub> = GWh × (Btu/kWh) × (tons CO<sub>2</sub>/MBtu) × (% of that fuel in the fuel mix)** where (Btu/kWh) is the heat rate and (tons CO<sub>2</sub>/MBtu) is the CO<sub>2</sub> emission factor. Similarly for CH<sub>4</sub> and N<sub>2</sub>O, which are then converted to CO<sub>2</sub> equivalents [CO<sub>2</sub>e] using global warming potentials (GWPs) of 21 for CH<sub>4</sub> and 310 for N<sub>2</sub>O. The emission factors used for each GHG were the same as those used in the EPA State Greenhouse Gas Inventory Tool (SIT) software modules.

### Key Assumptions:

- The levelized costs of energy efficiency measures is \$37.13/MWh (2008 dollars) in 2009. Source for capital costs is from: Quantec/Cadmus. (2008). This figure includes all utility and participant costs. Utility fixed costs are assumed to be 24% of the capital cost, based on MEC EE plan filing Docket # EEP-08-02. Vol. II. pA1-8
- The levelized costs of peak electricity demand response measures is \$37.13/MWh (2008 dollars). This figure includes all utility and participant costs. Utility fixed costs are assumed to be 24% of the capital cost, based on MEC EE plan filing Docket # EEP-08-02. Vol. II. pA1-8
- Avoided cost of electricity in 2009 is \$0.3072/MWh (2008 dollars). Figure is from 2009–2013 Energy Efficiency Plan Interstate Power and Light Company Docket No. EEP-08-1 23-Apr-08, p. 33 Values base case without externality factor.
- Avoided cost of peak electricity in 2009 is \$72/MWh (2008 dollars). Figure is from 2009–2013 Energy Efficiency Plan Interstate Power and Light Company Docket No. EEP-08-1 23-Apr-08, p. 33 Values base case without externality factor.
- Transmission and distribution losses are 7%. From IA\_ES\_Forecast.xls assumptions tab. Net average T&D losses 2005-2030.
- The energy efficiency programs begin in 2010.
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- Energy efficiency costs are expressed as levelized costs over the life of the energy efficiency options. The incremental costs (typically incurred in the first year of program implementation) are spread over all future years of the life of the energy efficiency measures.
- Statewide electricity energy efficiency programs are assumed to be .69% of retail sales over the planning period.
- IOU electric sales comprise approximately 76% of statewide electricity sales over the planning period.
- The value used for the real rate at which costs are discounted annually is 5%.

### Key Uncertainties

Construction of new generation plants, while actively discussed in the state, is not certain. In addition, some existing generation units are likely to be retired.

DRAFT:

There is a risk that GHG reductions are overstated and the costs per ton of CO<sub>2</sub>e reductions are understated if high CO<sub>2</sub> intensity resources are assumed to be redispached or not built due to increased energy efficiency and demand side management investments (the avoided CO<sub>2</sub> methodology).<sup>1</sup> The following sensitivity analysis indicates what would happen with the following assumptions about avoided generation:

Scenario	Avoided Generation Mix		Year 2020 Reductions MMTCO <sub>2</sub> e	Cumulative 2009-2020 Reductions MMTCO <sub>2</sub> e	2009-2020 \$/ton CO <sub>2</sub> e
	2009-2012	2013-2020			
Reference: Marginal then New Build	50% coal, 50% gas	78% coal, 21% renewables, 1% gas	4.4	20.3	\$ (22)
Marginal (Low Gas Case)	50% coal, 50% gas	50% coal, 50% gas	4	18.9	\$ (24)
Marginal (High Gas Case)	35% coal, 65% gas	35% coal, 65% gas	3.6	16.7	\$ (27)

### Additional Benefits and Costs

Energy efficiency investments will likely not lead to reductions in utility rates, but does typically result in reduced energy expenditures (customer bills) over the life of the investment compared to no energy efficiency investments being made.

### Feasibility Issues

None currently identified.

### Status of Group Approval

~~Pending~~ ~~[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]~~ Approved.

### Level of Group Support

~~Pending~~ ~~[blank until ICCAC Meeting #6 or #7]~~ Supermajority (four objections).

### Barriers to Consensus

~~TBD~~ ~~[blank until final vote by the ICCAC]~~ Unspecified.

<sup>1</sup> The Annex to this document defines the rationale behind the assumption used for the avoided CO<sub>2</sub> methodology in these analyses.

## EEC-13. Government Lead by Example: Improved Design and Construction in New and Existing State and Local Government Buildings

### Policy Description

The State of Iowa and Municipal and County Governments can provide leadership in energy efficiency by adopting policies that improve the energy efficiency of new and renovated public buildings. This option provides energy use targets to improve the efficiency of energy use in new and existing State and local government buildings that are much higher than code standards.

### Policy Design

#### Goals:

- Mandate that all new construction and major renovations of government-owned buildings, including schools and publicly-owned hospitals, meet sustainable design standards:
- Starting in 2008: All new state buildings and major renovations shall be designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50% of the regional average for that building type.
- The fossil fuel reduction standard for all new buildings shall be increased to:
  - 60% in 2010
  - 70% in 2015
  - 80% in 2020
  - 90% in 2025

All state buildings shall be carbon-neutral in 2030 (zero net energy, using no fossil fuel GHG emitting energy to operate).

**Timing:** See above.

**Implementing Parties:** State and local governments; Capitol Planning organization, all three Regents institutions, Iowa Association of Counties; League of Cities, Iowa Association of School Boards, Iowa State Education Association, School Administrators organization, private contractors, State Building Trades organization

### Implementation Mechanisms

These goals can be made by a combination of demand reduction measures, on-site carbon neutral generation and grid based green power purchases. Green power purchases shall exceed the amount of green power purchases already provided by the utility.

- Mandate that all new construction and major renovations of government-owned buildings, including schools and publicly-owned hospitals, meet sustainable design standards, with increasingly more stringent requirements:

- **Collect Data on State and Local Government Building and Facilities Energy Use:** A key implementation mechanism for this option will be to first provide a thorough assessment of the status and energy consumption of all existing State and local government buildings, including establishing a database of buildings and building attributes including floor area, insulation level, energy-using equipment, and history of energy consumption. This baseline, or “carbon footprint,” will be used to assess program success.
- **Benchmark State Buildings:** Benchmarking is a process of using the data on building size, use, and energy use to quickly compare a building against others of similar size and use to get an idea of how efficiently the building is operating. It is an important step in identifying opportunities for savings and prioritizing work to be done.
- **Commission State Buildings:** Building commissioning is a process of reviewing and tuning up the operation of building systems and controls much like the tune-up of a vehicle. Potential targets for commissioning might include commissioning of state buildings upon completion of construction or renovation and whenever the energy use in a building shows an unexpected and unexplained increase in energy use.
- **Purchase Green Power:** Enter into agreements to purchase green power for a portion of the states electricity needs as laid out in Iowa Gov. Tom Vilsack’s Executive Order 41 on Energy Efficiency and Renewable Energy on April 22, 2005 and Iowa Governor Chet Culver’s Executive Order 6 on the same topic issued in February 2008. Increase purchases over time until 30% of power needs are met through direct use of renewable energy or green power purchased by 2030.
- **Energy Use Targets:** Set targets for energy use in the operation of state buildings, potentially including capping state and local building and facilities energy use per square foot. Motion sensors are a specific technology for reducing lighting energy use in government buildings that may have broad application.
- **Renovate State and Local Buildings and Facilities Through a Buildings and Facilities Energy Program:** Renovate all state and local buildings and facilities with more than 5,000 square feet and smaller buildings identified through energy benchmark process as having a high potential for energy savings within 5 years. The State and locals buildings and facilities energy program will provide funds for energy audits, engineering analyses, and renovation costs.
- **Develop and Use Renewable Energy Resources:** Evaluate the potential for direct use of solar, wind, biomass, geothermal, and hydro power to meet the needs of state government operations. Take advantage of these renewable resources whenever it is cost-effective to do so, and as a means to lead by example in investing in these systems when it is practical to do so.
- **Carbon-Neutral Bonding:** Climate-neutral bonding will require that any building projects financed with the issuance of state, county, or local/municipal bonds result in no net increase in GHG emissions. If a new construction project is projected to result in an emissions increase, there must be GHG emissions offsets within the state or particular jurisdiction. Offsets could include onsite renewable energy development, renewable energy purchases, energy efficiency (in existing state buildings), carbon sequestration (tree planting), and switching to cleaner or renewable fuels. Any GHGs emitted after the bond-financed project

becomes operational will have to be offset. The new buildings could also offset their emissions by purchasing renewable electricity from their local utility. Paying a premium for what's known as "green pricing" electricity will usually be a more expensive offset option than energy efficiency. A community or state could install their own renewable energy project as a way to offset their GHG emissions.

- **Monitoring and Verification:** conduct periodic reviews of building energy use over time.

### Related Policies/Programs in Place

See Governor Culver's Executive Order 6 which requires State buildings to reduce energy use by 15% by 2015.<sup>2</sup>

Elements of this policy include

- Government buildings, facilities and related operations (please note this to include wastewater and water utilities) will be in operation for many years and should be designed in a manner that meets or exceeds private sector mandated building and trade energy efficiency. When life cycle cost are considered, the discount rate should be smaller and the assumptions of future energy prices should be higher than those commonly considered in the private sector in order that the state be seen as a leader in energy efficiency and workforce efficiency. All new State buildings and facilities, and renovations and additions shall meet sustainable design standards established by the Building Code Commissioner at increasingly stringent levels over time, and meet or exceed the energy efficiency and renewable energy goals below stated.
- Existing State and local government buildings shall be retrofitted for energy efficiency achieving 100% of cost-effective energy efficiency by the year 2015. To meet this goal, the State and local governments shall benchmark all buildings and facilities within the next 3 years.
- Audits of energy performance and operations of State and other government buildings (in tandem with an audit program). Audit results could be used to target and prioritize investments in improving government building energy efficiency.
- Improvement and review of efficiency goals over time, and development of flexibility in contracting arrangements to encourage integrated energy-efficient design and construction.
- Recommendations that the infrastructure for implementation (meters, accounting systems, staff, etc.) be established as soon as possible.
- Establishing "retained savings" policies whereby government agencies are able to retain funds saved by reducing energy bills for further energy efficiency/renewable energy investments or other uses.
- Require carbon neutral bonding for new construction and renovations and additions. A carbon neutral performance standard will require architects and engineers to design buildings to meet a climate-neutral requirement and built to meet or exceed the state's existing

<sup>2</sup> <http://publications.iowa.gov/6275/1/06-080221%5B1%5D.pdf>

sustainable building guidelines and will save the taxpayers money as life-cycle costs will yield lower operational costs.

- Focus incentives on specific technologies, including white roofs, rooftop gardens, and landscaping to lower electricity demand, and solar photovoltaics to provide electricity when demand is highest.

Potential supporting measures for this option include training and certification of building sector professionals but could also include surveys of government energy and water use, energy benchmarking, measurement, and tracking programs for municipal and state buildings.

Executive Order #41 (Gov Vilsack) requires that all state agencies reduce energy consumption per square foot per degree day in all conditioned facilities by an average of 15% by 2010 relative to 2000 levels.<sup>3</sup>

Iowa Code 473.13A Energy conservation measures identified and implemented.

#### Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced. CO<sub>2</sub> from electricity generation, natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users, including electricity generators.

#### Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<u>GHG Emission Reductions</u>	<u>0.08</u>	<u>0.36</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Net Present Value</u>	<u>0.0</u>	<u>1.0</u>	<u>\$ Million</u>
<u>Cumulative GHG Reductions</u>	<u>0.14</u>	<u>1.97</u>	<u>MMtCO<sub>2</sub>e</u>
<u>Cost-Effectiveness</u>	<u>-0.16</u>	<u>0.53</u>	<u>\$/tCO<sub>2</sub>e</u>

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

#### Data Sources:

- Energy Consumption By Sector (billions of Btu). See ~~EEC-1~~EEC-12.
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See ~~EEC-1~~EEC-12.

#### Quantification Methods:

- Heat Rates (Btu/kWh). See ~~EEC-1~~EEC-12.
- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-1~~EEC-12.

<sup>3</sup> [http://publications.iowa.gov/2619/1/EO\\_41.pdf](http://publications.iowa.gov/2619/1/EO_41.pdf)

- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-1~~[EEC-12](#).

**Key Assumptions:**

- The reduced GHGs from state buildings begins in 2008 with new buildings or major renovations emitting 50% less GHGs than older construction. Then emissions are reduced by 60% in 2010, 70% in 2015, 80% in 2020 and 90% in 2025. The reductions in each year are calculated relative to the business-as-usual baseline.
- New government space grows at 1.2% per year.

~~• Code improvements result in the same efficiency gains for natural gas as for electricity~~

- Compliance with this policy is assumed to be 50% at the start of the program and rises to 75% by 2020 under the new compliance regime. For the portion of the new buildings (or retrofits) that don't comply, energy use in these structures is assumed to be 20% higher than the policy level.
- Building energy consumption is a function of Iowa's climate. According to the amount of heating degree days (HDD) and cooling degree days (CDD), Iowa is in the Residential Energy Consumption Survey climate zone 2. Source: 2001 RECS <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html#space>
- HDD data from: <http://lwf.ncdc.noaa.gov/oa/documentlibrary/hcs/hdd.200507-200607.pdf>
- CDD data from: <http://lwf.ncdc.noaa.gov/oa/documentlibrary/hcs/cdd.200501-200607.pdf>
- New commercial buildings in climate zone 2 have higher electric intensity relative to existing stock, so are adjusted upwards by 24%. Source: Ratio of 1990-1999 buildings to all buildings total energy use . [http://www.eia.doe.gov/emeu/cbecs/pdf/consumption\\_yearconst.pdf](http://www.eia.doe.gov/emeu/cbecs/pdf/consumption_yearconst.pdf)
- Energy codes cover 754% of electricity use which is all end uses except appliances (office equipment)-
- Efficiency improvements result in differential efficiency gains for natural gas as for electricity.
  - Assumes code or efficiency improvement affects gas and electricity according to fuel usage
  - Commercial/Government: Electricity code improvement of x results in .63x gas improvement Source: CEBCS (2003).
- State and local governments consume 16.9% of all commercial electricity. Source: Table B5, for Non-mall Buildings in "West South Central" Region for state and local governments. [http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed\\_tables\\_2003/pdf2003/alltables.pdf](http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/pdf2003/alltables.pdf)
- Transmission and Distribution losses for electricity are 7%.
- Wind and biomass are the types of renewables purchased by governments to meet the fossil fuel reduction targets given their relevant abundance in Iowa. Renewables purchases are assumed to be 80% wind and 20% biomass.

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- Renewable electricity costs for wind and biomass in the analysis come from the levelized costs developed by the Iowa Clean and Renewable Energy Subcommittee
- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- The value used for the real rate at which costs are discounted annually is 5%.
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.

### Key Uncertainties

~~TBD—[as needed and approved by the SCs]~~None identified.

### Additional Benefits and Costs

Energy efficiency investments should reduce the bills of utility customers who make the investments, but will probably not lead to absolute reductions in utility rates or bills for all customers. However, cost-effective energy efficiency improvements should reduce overall utility costs and average bills when compared with more expensive alternatives.~~TBD—[as needed and approved by the SCs]~~

### Feasibility Issues

~~None identified.~~~~TBD—[as needed and approved by the SCs]~~

### Status of Group Approval

Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]

### Level of Group Support

Pending—[blank until ICCAC Meeting #6 or #7]

### Barriers to Consensus

TBD—[blank until final vote by the ICCAC]

## EEC-14. More Stringent Appliance Efficiency Standards

### Policy Description

Appliance efficiency standards reduce the market cost of energy efficiency improvements by incorporating technological advances into base appliance models, thereby creating economies of scale. Appliance efficiency standards can be implemented at the state level for appliances not covered by federal standards, or standards can be jointly developed by multiple states.

### Policy Design

**Goals:** achieve 10% reduction in energy consumption from residential consumers, and 5% from commercial and industrial consumers via: **[HTN: Goals A-C achieve 4% of residential and 4.6% of commercial and industrial in 2017 given the assumptions listed below]**

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• **A.** 80% minimum efficiency standards for appliances not covered by federal standards as recommended by Appliance Standards Awareness Program (ASAP)<sup>4</sup> by 2010.

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• **B.** 100% market penetration of Energy Star appliances in purchase transactions in which state funds are involved (e.g., state purchasing contracts, state grants or loans, etc.) by 2012.

• **C.** A doubling of market penetration of Energy Star appliances in purchases made in the residential, commercial and industrial sectors, where applicable, up to 100%, by 2017.

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**Timing:** As noted above.

**Implementing Parties:** As noted above.

### Implementation Mechanisms

In order to ensure that appliances purchased in the state will maximize the cost-effective potential for energy efficiency and minimize greenhouse gas emissions, the following policy prescriptions should be considered:

Improved appliance standards for appliances not regulated by federal standards.

More stringent appliance standards at the federal level. Require the preferential procurement of Energy Star products if available (equipment, appliance or technology) if state funds are involved (e.g., state purchasing contracts, state grants or loans, etc.)

State sales tax exemptions, whether temporary or permanent, for Energy Star certified products.

State income tax credits to reduce the incremental cost of Energy Star appliances relative to standard appliances.

<sup>4</sup> See [http://www.standardsasap.org/documents/a062\\_sc.pdf](http://www.standardsasap.org/documents/a062_sc.pdf). The analysis recommends standards for the following products: bottle-type water dispensers, commercial boilers, commercial hot-food-holding containers, compact audio products, DVD players and recorders, liquid immersion distribution transformers, medium voltage dry-type distribution transformers, metal halide lamp fixtures, pool heaters, portable electric spas, residential furnaces and boilers, residential pool pumps, single voltage external AC to DC power supplies, state-regulated incandescent reflector lamps, and walk-in refrigerators and freezers.

## Related Policies/Programs in Place

There are existing federal standards for 17 residential products and 11 pieces of commercial equipment. Laws require the U.S. Department of Energy (US DOE) to set minimum appliance efficiency standards that are technologically feasible and economically justified. However, there are many appliances not covered by federal standards for which state standards can play a role.

Energy Star is a joint program of the US EPA and the US DOE designed to promote energy efficient products in the market place. Energy Star products and appliances exceed the energy efficiency mandated by minimum federal and state standards.

## Type(s) of GHG Reductions

Avoiding electricity generation from fossil fuel sources results in GHG reductions primarily from carbon dioxide emissions (CO<sub>2</sub>), but also trace amounts of methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) emissions. For direct fuel use, CO<sub>2</sub> from natural gas combustion and likely very small amounts of methane (CH<sub>4</sub>) from the transport of natural gas to end users are reduced.

## Estimated GHG Reductions and Net Costs or Cost Savings

	2012	2020	Units
<b>GHG Emission Reductions</b>	0.94	2.20	MMtCO <sub>2</sub> e
<b>Net Present Value</b>	-110.4	-708.1	\$ Million
<b>Cumulative GHG Reductions</b>	1.94	17.33	MMtCO <sub>2</sub> e
<b>Cost-Effectiveness</b>	-56.95	-40.85	\$/tCO <sub>2</sub> e

GHG = greenhouse gas; MMtCO<sub>2</sub>e = million metric tons of carbon dioxide equivalent; \$/tCO<sub>2</sub>e = dollars per metric ton of carbon dioxide equivalent.

## Data Sources:

- Energy Consumption By Sector (billions of Btu). See [EEC-1EEC-12](#).
- Power Station Electricity Generation (GWh) and Fuel Use (BBtu). See [EEC-1EEC-12](#).
- [List of Energy Star Qualifying Appliances:](http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing)  
[http://www.energystar.gov/index.cfm?c=bulk\\_purchasing.bus\\_purchasing](http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing)
- [Consumer Reports \(2008\). Energy Star has lost some luster.](http://www.consumerreports.org/cro/home-garden/resource-center/energy-star-has-lost-some-luster/overview/energy-star-ov.htm)  
<http://www.consumerreports.org/cro/home-garden/resource-center/energy-star-has-lost-some-luster/overview/energy-star-ov.htm>
- [Webber et al \(2001\). Savings estimates for the ENERGY STAR voluntary labeling program: 2001 status report.](http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1824&context=lbnl)  
<http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1824&context=lbnl>
- [Nexus Market Research. \(2006\). Massachusetts Energy Star® Appliance Program: Market Penetration Tracking And Analysis. June 26. http://www.cee1.org/eval/db\\_pdf/475.pdf](http://www.cee1.org/eval/db_pdf/475.pdf)

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**Quantification Methods:**

- Heat Rates (Btu/kWh). See ~~EEC-1~~[EEC-12](#).
- GHG Emissions Associated with End-Use Consumption (by Sector). See ~~EEC-1~~[EEC-12](#).
- GHG Emissions Associated with Electricity Generation From Different Technologies and Fuels. See ~~EEC-1~~[EEC-12](#).

**Key Assumptions:**

- Demand Side Management/Energy Efficiency programs are assumed to displace marginal sources of generation (50% coal, 50% gas) through 2012. From 2013 on, the programs are assumed to displace the new-build mix of 78% coal, 21% renewables, and 1% gas.
- Improved appliance standards begin to take effect in 2010, with full implementation by 2017. The energy reductions due to improved appliance efficiency is calculated relative to the business-as-usual baseline. For Iowa government operations, the assumed business as usual (BAU) penetration rate of Energy Star appliances is 75% between 2010-2012. For the residential, commercial, and industrial sectors, the assumed BAU penetration rate is 50% in 2010 and rises to 75% in 2017. This is consistent with the 2005 penetration rates for various Energy Star products in Nexus Market Research (2006).
- Energy Star appliances are 30% more efficient than other appliance choices. There are some discrepancies about the relative efficiency of Energy Star products. Webber et al (2001) show efficiency gains ranging from 7% to 90%, but a recent Consumer Reports (2008) article highlights some of the problems with this voluntary program that have a third party verification system and sets efficiency benchmarks for products to qualify that are not realistic with everyday use. The 30% efficiency improvement is a rough estimate given the uncertainties about the product brand.
- 39% of electricity is consumed by appliances in residential buildings which assumes refrigerators and 1/2 of other appliances and lighting apply to this option. Source: Residential Energy Consumption Survey. <http://www.eia.doe.gov/emeu/recs/recs2001/detailcetbls.html#space>
- 26% of electricity is consumed by appliances (Office Equipment) in government and commercial buildings. Source: Commercial Buildings Energy Consumption Survey. Table 3a. Electricity End-Use Consumption by Principal Building Activity, 1999 (Preliminary Estimates)[http://www.eia.doe.gov/emeu/cbecs/enduse\\_consumption/pba.html](http://www.eia.doe.gov/emeu/cbecs/enduse_consumption/pba.html)
- 8% of electricity is consumed by appliances in industrial buildings which assumes one half of HVAC, and facilities support is covered by Energy Star Appliances such as heat pumps and furnaces. Source: Table 5.7 Manufacturing Energy Consumption Survey, national data. <http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/shelltables.html>
- Appliance efficiency improvements result in differential efficiency gains for natural gas as for electricity.
  - Residential: Electricity improvement of x results in 2.23x gas improvement. Source: RECS (2001).

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- Commercial: Electricity improvement of x results in .63x gas improvement Source: CEBCS
- Industrial: Electricity improvement of x results in .84x gas improvement. Source: Gas facility support divided by electricity facility support (in BBTU) in US Table 5.7 of Manufacturers Energy Consumption Survey. <http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/shelltables.html>
- The levelized cost of Appliance Efficiency Standards 2005\$/MWh is \$11.90 / MWh and \$3.49/BBTU. MWh Source: WGA (2005). The Potential for More Efficient Electricity Use in the Western United States Energy Efficiency Task Force Report. Clean and Diversified Energy Advisory Committee of the Western Governors' Association. Nov 18. <http://www.naesco.org/resources/industry/documents/2005-11-18.pdf> Natural Gas cost /BBTU is equivalent to MWh cost at the rate of 1GWh / 3.41BBTU
- The Energy Independence and Security Act of 2007 developed standards, or instructed the Department of Energy to develop standards, for many of the products in the ASAP 2006 model bill. EEC-14 applies only to the following products: Bottle Type Water Dispensers, Commercial hot food holding cabinets, Hot Tubs, Residential furnace fuel efficiency (from 82% in the EISA bill to 90% AFUE in the ASAP model bill), Pool heaters, Commercial Boilers. GWh and BBTU reductions from: [http://www.standardsasap.org/documents/a062\\_ia.pdf](http://www.standardsasap.org/documents/a062_ia.pdf)
- Real Escalation rate for cost of energy efficiency programs: 0% annually
- Rate at which costs are discounted annually: 5%
- Year dollars in which new present value is calculated: 2005.
- Net present value is calculated beginning 2009.

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### Key Uncertainties

~~TBD~~—~~[as needed and approved by the SCs]~~None identified.

### Additional Benefits and Costs

~~None identified.~~~~TBD~~—~~[as needed and approved by the SCs]~~

### Feasibility Issues

~~None identified.~~~~TBD~~—~~[as needed and approved by the SCs]~~

### Status of Group Approval

Pending—[until ICCAC moves to final agreement at ICCAC Meeting #6 or #7]

### Level of Group Support

Pending—[blank until ICCAC Meeting #6 or #7]

**Barriers to Consensus**

TBD—[blank until final vote by the ICCAC]

## APPENDIX

### Avoided Electricity Emissions for the Residential, Commercial, and Industrial (RCI) Sector

To estimate emissions reductions from policy options that are expected to displace conventional grid-supplied electricity (i.e., energy efficiency and conservation) a simple, straightforward approach is used. Through 2012, we assume that these policy options would displace generation from a “marginal” mix of fuel-based electricity sources of 50% coal and 50% gas. (We assume that sources without significant fuel costs would not be displaced, e.g., hydro or other renewable generation). After 2012, we assume that the policy options are likely to avoid a mix of new build capacity additions. The new build mix for the RCI sector is estimated to be 78% coal, 21% renewables, and 1% gas. This mix is what is proposed to be built as part of the Marshelltown (Sutherland) coal plant package which includes wind generation and biomass cofiring requirements, as well as additional wind resources that the Clean and Renewable Energy Subcommittee perceived as being likely to be built as part of the reference case forecast.

There is a risk that GHG reductions are overstated and the costs per ton of CO<sub>2</sub>e reductions are understated if high CO<sub>2</sub> intensity resources are assumed to be redispatched or not built due to increased energy efficiency and demand side management. The following table provides several scenarios for avoided generation mixes. Recall that the NPV of options for the EEC sector are the difference between avoided costs and the levelized costs of the investments, and are unaffected by the CO<sub>2</sub> methodology. The changes in the \$/ton (the last column of the table) are due to changes in total tons of CO<sub>2</sub> mitigated between the scenarios. The cost savings go up as CO<sub>2</sub> reductions decrease because the total cost savings number is constant, but is being spread out amongst fewer tons of CO<sub>2</sub>.

Scenario	Avoided Generation Mix		EEC-12 Outcomes		
	2009-2012	2013-2020	Year 2020 Reductions MMTCO <sub>2</sub> e	Cumulative 2009-2020 Reductions MMTCO <sub>2</sub> e	2009-2020 \$/ton CO <sub>2</sub> e
Reference: Marginal then New Build	50% coal, 50% gas	78% coal, 21% renewables, 1% gas	4.4	20.3	\$ (22)
Marginal (Low Gas Case)	50% coal, 50% gas	50% coal, 50% gas	4	18.9	\$ (24)
Marginal (High Gas Case)	35% coal, 65% gas	35% coal, 65% gas	3.6	16.7	\$ (27)

The reference approach described in the beginning of this appendix is approach provides a transparent way to estimate emissions reductions and to avoid double counting (by ensuring that the same megawatt hours (MWh) from a fossil fuel source is not “avoided” more than once). It can be considered a “first-order” approach; it does not attempt to capture a number of factors

such as the distinction between peak, intermediate, and baseload generation; issues in system dispatch and control; impacts of nondispatchable and intermittent sources such as wind and solar; or the dynamics of regional electricity markets. These relationships are complex and could mean that policy options affect generation and emissions (as well as costs) in a manner somewhat different than estimated here. Nonetheless, this approach provides reasonable first-order approximations of emissions impacts and offers the advantages of simplicity and transparency that are important for stakeholder processes.

### **Existing Energy Efficiency Actions In Iowa**

IOU business-as-usual incremental (new) electric efficiency investments equate to .8% of load in 2008. The assumed incremental statewide electric energy efficiency investments are equal to .69% of retail sales over the planning period (2009-2020). For natural gas, the assumed incremental statewide natural gas energy efficiency investments are equal to .82% of retail sales. These reductions are subtracted from EEC-12 and EEC-2 respectively.

Proposed energy efficiency plans, pending IUB determination, would achieve between 1.3% and 1.5% of retail sales by 2012. These proposals are not included in the analyses as they have not been approved yet. Their inclusion would have simply changed the accounting for reductions from the policy options (eg EEC-12) to the recent actions line in the summary table at the beginning of this document.

The state government is also taking aggressive actions to reduce energy use. Governor Culver's Executive Order 6 which requires State buildings to reduce energy use by 15% by 2015. Also, Executive Order #41 (Gov Vilsack) requires that all state agencies reduce energy consumption per square foot per degree day in all conditioned facilities by an average of 15% by 2010 relative to 2000 levels. The combined effects of these executive orders are shown in the recent actions line in the summary table. The calculations show that these orders save approximately 315 GWh of electricity and 680 BBTU of natural gas by 2015 with accompanying GHG reduction of .29 MMTCO<sub>2</sub>e in 2015.