

# MEMORANDUM

## Quantification Approach

To: Michigan RCI Technical Working Group

From: Matthew Brown and Ken Colburn

Re: Approach for the quantification of greenhouse gas (GHG) emission reductions associated with energy efficiency options in Michigan

Date: October 8, 2008

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This memo outlines key elements of the approach we (i.e., CCS) plans to adopt methodology for quantifying the GHG impacts and costs for those TWG policy options that are considered amenable to quantification. The list of topics addressed in memo is summarized below. Feedback from RCI TWG members is encouraged.

### A. Premises

There are a number of key premises upon which the analysis is based, as briefly outlined below.

- *Transparency:* Data sources, methods, key assumptions, and key uncertainties are clearly indicated.
- *Analytical approach:* We adopt the general approach of cost-effectiveness (and NPV) analysis, as widely applied to GHG mitigation policy options.<sup>1</sup> We include direct, economic costs from the perspective of the state as whole (e.g. avoided costs of electricity rather than consumer electricity prices).
- *Bottom-up analysis:* We adopt a bottom-up approach that is amenable to transparency and is capable of reflecting the costs (and cost savings) associated with individual policy options, in contrast to macroeconomic analysis, which aims to capture flows and interactions across all sectors of the economy. Potential macroeconomic impacts, cost or benefits that fall disproportionately on specific groups or actors, as well external costs and benefits, should be noted qualitatively where studies or other information are available.

### B. Outputs

The analysis of mitigation options will be organized so as to produce the following results:

- *Net GHG reduction potential* in million metric tons carbon dioxide equivalent (MMtCO<sub>2e</sub>) using IPCC 100 yr global warming potential, reported annually for the years 2015 and 2025, and cumulatively through 2025 (the implementation period). Where significant additional GHG reductions or costs occur beyond the project period as a direct result of actions taken during the project period, these will be indicated as appropriate.

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<sup>1</sup> See e.g. Section 2.4 of the IPCC Fourth Assessment Report, Working Group III, for more discussion of various economic analysis approaches. [http://www.MDp.nl/ipcc/pages\\_media/AR4-chapters.html](http://www.MDp.nl/ipcc/pages_media/AR4-chapters.html)

- ❑ *Net present value (NPV) cost* (or cost savings) for the implementation period, using a 5% real discount rate.<sup>2</sup> Positive numbers represent options with net costs; negative numbers represent options with net cost savings.
- ❑ *Cost per metric ton of CO<sub>2</sub> equivalent* emissions reduced (or removed) in units of dollar per metric ton of carbon dioxide equivalent (\$/tCO<sub>2</sub>e). This figure represents the NPV cost divided by the cumulative emission reductions, both over the implementation period.

### **C. Methodology and Assumptions**

In order to ensure consistent results across options, common factors and assumptions will be used for items such as:

- ❑ *Electricity avoided costs and emissions:* Common values (\$/MWh and tCO<sub>2</sub>/MWh) are developed based on available studies.
- ❑ *Fuel costs and projected escalation:* Fuel cost estimates will be based on common sources, wherever possible. For example, fossil fuel price escalation is indexed to USDOE projections as indicated in their most recent Annual Energy Outlook.
- ❑ *Floor space and housing data* is gathered from EIA Residential and Commercial Energy Consumption Surveys as well as U.S. Census Bureau data.
- ❑ *Overlap with other TWGs:* There are some ES options that may overlap with options being considered in the RCI TWG. The analysis for these options will take place in close coordination with the assumptions other inputs used in the RCI TWG.
- ❑ *Consumption-based approach:* this approach will be used which aims to reflect the emissions associated with electricity sources used to deliver electricity to consumers in Michigan. It is distinct from a production-basis approach that considers the emissions from Michigan power plants, regardless of where the electricity is delivered.
- ❑ As much as possible, the analysis seeks to rely on data sources that are Michigan or regionally-specific, and which CCS TWG members are in a good position to obtain and provide. Where Michigan-specific information can not be readily obtained, the analysis rely on published data from the US Department of Energy, National Laboratories, and other state climate change processes. Specific assumptions related to data sources and analysis are outlined below.
  - ❑ Discount rate (5%/yr, real basis)
  - ❑ Future rate of inflation (if needed—based on recent trends)
  - ❑ Emission factors for non-electric fuels
  - ❑ Emission factors for electricity generation will be the same across options
  - ❑ Avoided costs for electricity generation from MISO
  - ❑ Avoided costs for natural gas and other fuels derived from US EIA price data
  - ❑ Transmission and distribution losses as a fraction of generation from MISO for transmission and based on other jurisdiction experience for distribution

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<sup>2</sup> Capital investments with lifetimes longer than 2025 are represented in terms of levelized or amortized costs, in order to avoid “end effects”.

## **D. Cost Inclusion**

There are several types of costs that will be explicitly considered in the analysis and several types that we propose to exclude, as summarized below.

- ❑ *Costs included:* Examples include the following:
  - ❑ Capital costs levelized (amortized) where appropriate, e.g. for energy efficiency investments and associated infrastructure
  - ❑ O&M and other labor costs (or incremental costs relative to standard practice),
  - ❑ Fuel and material costs, e.g. for natural gas, electricity, biomass resources, water, fertilizer, material use, electricity transmission and distribution
  - ❑ Other direct costs administrative and other costs (where readily estimated),
- ❑ *Costs excluded:* Examples include the following:
  - External costs such as the monetized environmental or social benefits/impacts (value of damage by air pollutants on structures, crops, etc.), quality-of-life improvements, or improved road safety, or other health impacts and benefits
  - Energy security benefits and energy reliability benefits
  - Macroeconomic impacts related to the impact of reduced or increased consumer spending, shifting of cost and benefits among sectors in the economy