



MEMORANDUM

To: Minnesota Residential, Commercial, and Industrial (RCI) Technical Working Group
From: Bill Dougherty
CC: Ed Garvey, David Thornton, Randy Strait, Tom Peterson
Re: Proposed approach for the quantification of greenhouse gas (GHG) emission reductions associated with RCI mitigation options in Minnesota
Date: October 4, 2007

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

- A. Premises
- B. Outputs
- C. Methodology
- D. Assumptions
- E. Cost Inclusion
- F. Proposed Schedule and Process

A. Premises

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

- *CCS role*: Unless a member of the RCI TWG offers to undertake an analysis of any of the options, we assume that we (i.e., CCS) will undertake the analysis of the RCI options. In the case where an RCI TWG member does offer to undertake the analysis of one or more options, we will provide analytical support (e.g., review and technical feedback) as needed.
- *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.¹ 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 which 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 (MMtCO₂e) using IPCC 100 yr global warming potential, reported annually for the years 2015, 2020, and 2025, as cumulatively for the period 2008-2025. 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.
- ❑ *Net present value (NPV) cost* (or cost savings) for the period 2008-2025 in 2006 constant dollars, using a 5% real discount rate.² Positive numbers represent options with net costs; negative numbers represent options with net cost savings.
- ❑ *Cost per metric ton of CO₂ equivalent* emissions reduced (or removed) in units of dollar per metric ton of carbon dioxide equivalent (\$/tCO₂e). This figure represents the NPV cost divided by the cumulative emission reductions, both over the 2008-2025 period.

C. Methodology

As much as possible, the analysis will proceed using simple spreadsheet modeling techniques in which assumptions are transparent and readily accessible to any TWG member for review and adjustment. 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 tCO₂/MWh) are being developed based on available studies. Now that a complete set of options has been identified, each option will a) first be analyzed individually and then b) addressed as part of an overall integrated analysis.
- ❑ *Fuel costs and projected escalation:* Fuel cost estimates will be based on common sources, wherever possible. For example, fossil fuel price escalation will be indexed to USDOE projections as indicated in their most recent Annual Energy Outlook.

¹ 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.mnp.nl/ipcc/pages_media/AR4-chapters.html

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

- ❑ *Overlap with other TWGs:* There are some RCI options that may overlap with options being considered in the ES TWG. The analysis for these options will take place in close coordination with the assumptions other inputs used in the ES TWG.
- ❑ *Full fuel cycle approach:* Related to the previous point, a fuel cycle analysis is applied wherever emissions impacts upstream (e.g., production, extraction) or downstream (e.g. waste disposal) from a specific activity constitute a significant fraction of a policy option's emissions impacts *and* studies are sufficient to enable estimation.

D. Assumptions

As much as possible, the analysis will seek to rely on data sources that are Minnesota-specific, and which TWG members are in a good position to obtain and provide. The success of this approach will depend on how accessible the information is to TWG members and the timeliness in which it can be provided to the CCS analysis team. Where Minnesota-specific information can not be readily obtained, the analysis will rely on published data from the US Department of Energy, National Laboratories, and other state climate change processes.

E. 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 new energy efficient equipment
 - 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
 - Macroeconomic impacts related to the impact reduced or increased consumer spending, shifting of cost and benefits among actors in the economy

F. Proposed Schedule and Process

The following is a proposed process for completing the first draft of the analysis in time for the next MCCAG meeting scheduled for Thursday, 8 November 2007.

- ❑ *4 October:* email distribution of the proposed RCI analysis approach to RCI TWG members for review and comment;

- *8 October:* receipt of written comments/questions on the RCI analysis approach from RCI TWG members;
- *9 October:* discussion of the RCI analysis approach during the 7th TWG meeting and resolution of any outstanding items through discussion;
- *10 October:* email distribution of a revised analytical approach incorporating TWG member comments, flagging those issues (if any) that need resolution through further discussion;
- *19 October:* email distribution to RCI TWG members of initial analytical results for discussion at the next RCI TWG meeting.
- *23 October:* discussion of the RCI initial analytical results during the 8th TWG meeting, flagging those issues (if any) that need resolution through further analysis;
- *1 November:* email distribution to RCI TWG members of the revised analytical results of all options for review and comments. The analysis will have incorporated the input received from TWG members over the course of the previous meetings as well as any offline communications;
- *2 November:* posting of revised RCI analysis results on the MN website one week in advance of MCCAG meeting #5.
- *8 November:* presentation of initial RCI analysis results to the MCCAG.