

January 14, 2011

To: Roy Thilly and Kevin Dunn
From: EIPC Modeling Working Group
Subject: Update Report for January 18, 2011 SSC

The Modeling Working Group (MWG) is charged with developing an understanding of the capabilities, inputs and assumptions, and outputs for the CRA MRN/NEEM model, and for making recommendations for the values and assumptions to be used in the models to the SSC. To manage these responsibilities, the MWG divided into subteams to review the MRN-NEEM inputs and to consider alternative sources if necessary.¹ The proposed modeling inputs are being captured as they are developed in a central document that is accessible to stakeholders. The subteams are in-process of reviewing and proposing model inputs, with a focus first on the those for the Business-as-Usual Future and sensitivities, with consideration of the full eight Futures.

This report focuses on describing the topics covered by the MWG subteams, areas where there is consensus, and areas requiring further discussions. The SSC will be approving all the modeling inputs at the February 7 & 8 meeting. The proposed re-configuration of the NEEM regions is a complicating factor to the schedule for developing the inputs. Once the NEEM regions are approved by the SSC, CRA will be modifying the modeling template and its data to reflect the new NEEM regions. Consequently, the subteams will review their work products developed to date and make adjustments to be consistent with the revised NEEM regions.

As this report indicates, there is a great breadth of modeling areas for review and development within an ambitious timeframe. The co-chairs of the Modeling Workgroup would like to acknowledge the on-going efforts of the Modeling workgroup members. We would also like to acknowledge Stan Hadley and John Buechler for all their support through this effort. Stan has provided data, points of contact, and insight on various studies that have been valuable to this data review. John has been effectively coordinating numerous questions between CRA and the subteams. We look forward to continuing to develop the required modeling inputs for the EIPC effort.

Should the SSC have any questions that are not addressed at January 18th meeting, please forward the questions to the MWG co-chairs, Erin Hogan and Mary Ellen Paravalos.

¹ Guiding principles for selecting data sources are based on the data being relevant (reflecting current market conditions and projections rather than academic or theoretical studies), public, and unbiased.

NEEM Regions and Transmission Subteam

The NEEM Regions and Transmission subteam is focusing on the proposal for configuration of the NEEM regions, wheeling charges, hurdle rates, reserve margins, representation of Hydro Quebec and the Canadian Maritime, and proposed approach to transmission capacity adjustments. The subteam concluded the proposed re-configuration of the NEEM regions is appropriate. The Planning Authorities (PAs) are still reviewing the wheeling charges, hurdle rates, and reserve margins which will be adjusted based on the new NEEM region configuration. HQ and the Canadian Maritime are not NEEM regions. Consequently, they will be modeled via an energy interchange metric which will take into effect expected future energy transfers and transmission capacity. The subteam is working to propose appropriate assumptions for both the starting point and 2030 for the Futures, given the outcome of the Baseline Infrastructure.

Environmental Policies Subteam

The Environmental Policy subteam reviewed the data for states' RPS, EPA regulations, and RGGI. It is likely that the SSC will need to determine whether or not to model Voluntary RPSs and if so, how. Additionally it may be necessary for the SSC to decide for both the Production Tax Credit (PTC) and the Investment Tax Credit (ITC) whether or not they should be allowed to sunset as currently legislated or whether they should be renewed. If the SSC decides to renew the policies, it needs to decide when the policies will sunset. The Modeling workgroup will provide any additional information/discussion on these issues as needed to help the SSC reach a decision on how to treat these RPS issues in the NEEM model.

State RPS - CRA has provided its assumptions on mandated state RPS percent targets by year as well as information on the percentage of each state load covered by the RPS and the corresponding Alternative Compliance Payment (ACP) or a proxy ACP for the unique mandated RPS designs.² CRA has made numerous judgment calls in assembling this data and the Sub-Team is seeking assistance from the States in determining if these judgment calls are appropriate. The Sub-Team has also assembled an up-to-date database of state RPS information based on the Database of State Incentives for Renewable Energy that will be provided to CRA as they assemble the data.

CRA has indicated that it will also model the unique aspects of each state RPS (qualifying resources and geography, REC multipliers, etc.) but it has not provided information that allows for Sub-team review. The Sub-team has determined that a thorough review of all modeling aspects for each state RPS would require extensive work by CRA and the Sub-team and is likely not possible given current time frames.

² In general, state RPS policies are satisfied when a utility (or another designated purchasing entity) purchases enough Renewable Energy Credits ("RECs" – credits for each MWh of renewable energy generated) to satisfy the yearly renewable target. If RECs are not available at a low enough price, the utility can alternatively choose to pay an Alternative Compliance Payment ("ACP") for MWh it is short of the target. CRA's MRN-NEEM model will either build renewables to produce enough RECs to satisfy state RPS or it will pay ACP to satisfy state RPSs depending upon which option is cheaper. For mandated state RPSs, legislation determines the ACP price which acts as a REC ceiling price for modeling purposes.

CRA does not model voluntary state RPSs goals/objectives. The Sub-team has assembled basic data on these voluntary RPSs programs that can be expanded as necessary should the SSC decide to explicitly reflect these programs in the NEEM model.

EPA Regulations - CRA has provided an outline of how it intends to model prospective non-Carbon EPA regulations (Transport Rule, Utility MACT Rule, Cooling Water Intake Rule, and Coal Combustion Residuals Rule). The only objection currently raised by the sub-team is that some small cost should be added to coal facilities to account for the increased marginal costs created by the Coal Combustion Residuals Rule. The Sub-team is still waiting for a more detailed assessment of CRA's methodology from the EPA but no major objections are anticipated.³

Policy Sunsets - The Federal Production Tax Credit provides a production incentive (~\$22/MWh) to wind and other forms of renewable energy for a period of 10 years that are placed into service before 2013. The Federal Investment Tax Credit provides a tax credit for 30% of the capital cost of solar energy systems and other forms of renewable energy (excluding large wind) for systems placed into service before 2017. CRA currently does not model either tax credit due to their early sunsets. No other relevant policy sunsets have been identified by the sub-team.

RGGI - CRA has indicated that they model RGGI by applying a \$1.86/ton CO₂ emissions charge. This is consistent with RGGI futures modeling conducted for the Nov 2010 RGGI stakeholder meeting. The sub-team recommends approval of CRA's methodology.

Fuel & Emission Price Subteam

The Fuel & Emissions Price subteam focused on natural gas and oil price prices since the NEEM model calculates the coal price endogenously. The subteam reviewed multiple sources including AEO 2011 and 2010, NYMEX Henry Hub futures (December 23, 2010), RGGI (November 2010), EPA (September 2010), and two proprietary sources. Attached is the graph that compares the price forecast from these various sources. The subteam recommends using the AEO 2011 natural gas and oil prices because the AEO 2011 fell within the range of the other forecasts. For the natural gas basis, the subteam recommends using the CRA NEEM data which is based on historical data. The subteam will have further discussions on the appropriate range of data for high and low sensitivities.

The SO₂ and NO_x prices are calculated endogenously in the NEEM model based on the currently proposed EPA regulations. Since the BAU assumed no Federal CO₂ policy over the planning horizon, the subteam recommends that the current price remains at \$2/metric ton (real).

Demand, Energy Efficiency, Demand Response Subteam

The Demand, EE, DR subteam initially developed baseline forecasts without EE and DR using various sources including CRA, FERC 714, ISO/RTO, AEO 2010/2011, NERC Long Term Assessment, FERC National Assessment of Demand Response Potential. Yet some planning areas forecast may have

³ EPA has indicated that the timing of the rule implementation suggested by CRA is aggressive. However, since the model runs in 5-year increments, this is unlikely to be a major issue.

continued to have EE/DR embedded in their forecasts due to inconsistencies among PAs. Consequently, the subteam requested that the PAs provide baseline forecasts by January 12th. Once the subteam receives the information from the PAs, the BAU forecast for the newly proposed NEEM regions will be updated.

MRN Economic Subteam

The MRN Economic subteam reviewed the factors that influence the MRN model including initial tax representation, elasticity assumptions, value shares of inputs, baseline energy prices, and growth rate assumptions. The initial tax representation and elasticity assumptions influence the model the most. The subteam concluded that the CRA approach seems reasonable given limitation of the model. For example, the MRN assumes a balanced Federal budget over the planning horizon by adjusting the tax rate. For the purposes of this project, assessing and proposing adjustments to government spending rather than raising taxes does not seem practical given the project schedule.

One item the SSC should be aware of is the scaling factor MRN uses for technological progress to reflect autonomous energy efficiency improvements. This factor is an exogenous scaling parameter that decreases energy use per dollar of output overtime. The MRN subteam will be coordinating with CRA and the Demand, EE, and DR subteam, to better understand this feature.

Existing Generation

The Existing Generation Subteam has reviewed unit aggregation, their characteristics, operations and maintenance. Additionally, the subteam has reviewed renewable characteristics, installed capacity by region, forced new builds and planned retirements, and retrofit costs.

The subteam has requested more information such as the meaning of installed capacity versus reserve capacity and sources of wind data. Additionally, the subteam members with a Ventyx license will have an opportunity to review the details of CRA's data. Once the revised NEEM regions have been approved and CRA revises the respective tables, the Existing Generation will review the appropriate tables. Additionally, EPA will be providing retrofit costs for the subteam's review. The subteam is in the process identifying questions and recommendations on the setup of the sensitivity cases.

The subteam may request that specific table and exhibits be combined, add additional information, and/or revised to make the data more usable across subteams areas. It is unclear if this requires an SSC decision.

New Generation

The New Generation subteam has reviewed new build capital costs, operating costs, characteristics, learning parameters, regional cost multipliers, real fixed charge rates, new resource limits, wind resource limits and capacity factors, variable generation penetration limits, and capacity value of variable generation. Attached is the subteam report with the data reviewed and alternative sources. The New Generation subteam recently had discussions with NREL on an alternative approach

to limit renewable resources reserve margin contribution. NREL and CRA will be having discussion on this approach and the New Generation subteam will provide an update at the February meeting.

Canadian Modeling

The Canadian subteam has been very helpful in providing data that will help CRA reflect the Canadian system in the MRN-NEEM. The Canadian economy is not explicitly modeled in MRN and as mentioned before, HQ and the Canadian Maritimes are not included as NEEM regions. The Canadian subteam has provided hydro potential in Ontario and the assumed capital costs for hydro, hourly forecast for off-shore wind farms in Ontario, and historical hourly energy transfer between Ontario and Quebec. The Canadian subteam is in the process of collecting more interchange information among other provinces.

Fuel and Emissions Prices Subteam Review of Natural Gas (Henry Hub) Price Forecasts

- AEO 2011
- NYMEX Henry Hub (Dec. 23, 2010)
- Proprietary Source (Sept 2010)
- AEO 2010
- Proprietary Source 1 (Dec 2010)
- RGGI (Nov 2010)

