

**CRA & EIPC RESPONSE TO  
UNANSWERED STAKEHOLDER QUESTIONS  
FROM 8/30/10 CRA MODELING WEBINAR**

**Q #1: Can technological change be modeled in the large as a proxy for the various possible changes over the period studied?**

NEEM can incorporate specific data regarding generation technology characteristics and costs, and how they change over time. Generalized technological changes which affect those characteristics and costs would be part of a scenario developed and supplied by the SSC.

**Q #2: Are construction costs for generation and transmission localized?**

In Task #5, EIPC will provide high-level analysis of the sensitivities of interest to the SSC which will be based on a conceptual assessment made by planning engineers of transmission expansion to support the level of energy exchange identified in the macroeconomic analysis by CRA. Detailed power flow analysis will not be performed at this stage. In Tasks 7, EIPC planning engineers will develop transmission expansion options to support the three scenarios selected by the SSC for detailed analysis. In Task 8, these transmission expansion options will be subject to a detailed reliability analysis on an interconnection-wide basis. In Task 10, EIPC planning engineers with assistance from CRA will provide high-level cost estimates of the capital costs of the transmission and generation resource expansion options based upon generic cost information and not specific route selection or engineering design. These estimates will recognize, to the extent possible, regional differences that may affect such construction costs.

**Q #3: Can options be removed/changed from the roll-up, to the extent they impact scenarios?**

The roll-up of existing regional plans provides the starting point for future scenario analysis. In particular, the roll-up case provides the existing system topography and identifies firm committed transmission and generation resources that are included in the regional plans developed in accordance with Order 890 for the year 2020. To the extent that less firm resources are included in the roll-up case in order to meet system reliability requirements, these resources, as well as resources beyond 2020, are subject to change as agreed to by the SSC in the formulation of future scenarios.

**Q4: Can NEEM be told to maximize only Consumer Surplus instead of Social Welfare?**

No. NEEM minimizes the present value of incremental costs to the electricity sector of meeting electrical demand and complying with specified constraints, thus maximizing overall social welfare (assuming inelastic electricity demand). In the integrated with MRN mode, NEEM explicitly maximizes the sum of consumer and producer surpluses which are coordinated iteratively with the model of the entire economy.

**Q5: Can the MRN regions be changed, or is it only the NEEM regions that are user-defined?**

MRN regions can be changed. We would note, though, that the boundaries of MRN regions are defined by macroeconomic drivers, and are independent of the electric transmission infrastructure. Certain limitations on the flexibility of MRN-NEEM region overlay will apply,

**Q6: CO2 control is assumed to generate benefits to the economy. Can those benefits be fed back into the model to show the impact on the system and the economy?**

TBD

**Q #8: Discussing Slide #22, given a transmission addition, it may make an upstream generator justifiable. Should the transmission cost be considered as part of the upstream generation cost?**

Slide #22 is intended to illustrate the complexity of attempting to optimize transmission in a macroeconomic expansion model. That being said, the NEEM model will identify transmission constraints between regions, and the EIPC planning engineers will provide a high-level transmission assessment in response to those findings (See response to Q #2 above). For the final three scenarios selected by the SSC, EIPC will provide generic cost estimates for the transmission expansion options to support the resource futures( See response to Q #2 above). In some cases, transmission costs could (and should) be considered as part of upstream generation costs. For example, cost of transmission required to interconnect off-shore wind resources with the grid could (and should) be treated in that way.

**Q #9: Does “Business as Usual” include generators or transmission that will come on line during the period over which the model is run—phased in?**

Assuming that the question is referring to the future scenarios by the SSC, resources beyond those existing and firm resources included in the roll-up case may be selected by the SSC in the development of the future scenarios. (See also response to Q #3 above)

**Q10: Does CRA have a representation of the EPA's new proposed Transport Rule?**

Yes, NEEM can incorporate the new proposed Transport rules.

**Q11: Does MRN feed NEEM with the demand forecasts depending on economic assumptions in MRN?**

The demand forecasts for NEEM are user-supplied. MRN provides adjustment factors to be applied to the demand forecasts used in NEEM, which are based on MRN's macroeconomic outputs. The demand and fuel prices in NEEM may be adjusted up or down depending on the inputs to MRN.

**Q12: Does NEEMS consider spinning reserve / operating reserve when matching demand with supply in calculating the energy prices?**

NEEM does not model spinning or operating reserves, although GE MAPS does.

**Q13: Does the model take into account firm power contracts between regions; i.e as "forced" flows or block transfer?**

No, NEEM does not take firm contracts into account. Contracts are considered to be financial instruments which do not influence physical generation dispatch and power flows.

**Q #14: The first bullet of Task #9 references transmission option models to be evaluated. What is the process to develop those options?**

The transmission options to support the three resource expansion scenarios selected by the SSC in Task #6 will be developed by the EIPC planning engineers in Task 7. (See response to Q #2 above)

**Q15: Has NEEM been run against historical data, and, if so, how well has it predicted?**

*TBD*

**Q #16: How do you derive the incremental change in transfer capability between regions that results from a particular transmission scenario, for use in NEEM? Does this require FCITC (power transfer analysis) in Power World for feeding into NEEM?**

The NEEM model used for the macroeconomic analysis will utilize the transfer limits provided by the EIPC's roll-up case for 2010 as its starting point. CRA will then proceed to analyze the resource expansion scenarios identified by the SSC and will determine whether existing system transfer limits may be exceeded. The EIPC planning engineers will develop high level analysis of transmission expansion to support these resource futures—but will not employ power flow modeling at this stage of the project. (See response to Q #2 above)

**Q17: How do you determine the price of lignite since it is not traded in the market?**

*TBD*

**Q18: How do you use NEEM to identify optimal transmission to be built?**

None of CRA's models determine an optimal transmission build-out. The representation of the transmission system within NEEM may change over time, but this must be determined by the SSC. We would point the questioner towards slide 22 in the webinar presentation, where this question is addressed in greater detail, as well as question xx in this document.

**Q #19: How many MAPS runs will there be for each scenario/sensitivity? All 20 years? Year 1, 10, 20?**

The MAPS model is not used for the macroeconomic phase of the Project (Task 5). The MAPS model, will however be utilized during Task 9 to provide production cost analysis, including sensitivity analysis, on each of the three expansion scenarios selected for detailed analysis by the SSC in Task 6.

**Q #20: How will scenarios for GE MAPS modeling be selected from the set of CRA NEEM scenarios with sensitivities? ("CRA NEEM and GE MAPS models are fully synchronized on load and generation data?")**

The SSC will develop a consensus-based process to select the three scenarios for detailed reliability and production cost modeling. To the extent that this question implies that the NEEM and MAPS models will be utilized for this purpose during Task 5—see the response to Q #19 above)

**Q # 21: If the capacity expansion scenarios and power flow characteristics are defined in the absence of transmission constraints, can the proposed analysis provide sufficient guidance for the development of transmission plans and alternatives?**

As noted in response to Q #2 above, the EIPC planning engineers will be providing a high-level analysis of potential transmission expansion to support the levels of energy exchange identified during the macroeconomic analysis. This information will assist the SSC to narrow down the scenarios to the final three—which will be subject to detailed transmission reliability and production cost analyses during Phase II of the project.

**Q #22: If there are significant differences in individual PA assumptions that are then included in the roll-up, how does this propagate through the NEEM model in analyzing futures/scenarios?**

See response to Q #3 above.

**Q23: In regard to wind can the future specify the impact of different levels of subsidy including no subsidy or phasing subsidies out?**

Yes, it is possible to do so to the extent that subsidies are reflected in the operational and capital costs of wind generation.

**Q25: Is DSM / energy efficiency a resource option in NEEM?**

Depending on the assumptions used, DSM, demand response, or energy efficiency measures can be used as a resource in NEEM.

**Q26: Is it possible to import GE-MAPS input data into PROMOD?**

While GE MAPS and PROMOD are functionally similar, GE MAPS data are not directly importable into PROMOD. There are no plans to supply raw GE MAPS input data files to the SSC, although all the key input assumptions will be supplied to the SSC.

**Q27: Is the CRA integrated model weighted toward either the top-down or bottom-up concepts?**

CRA's models incorporate elements of both approaches, but are weighted towards neither.

NEEM simulates the dispatch of the interconnected electrical system. It is a forward-looking model which minimizes the total present value of costs to the electricity sector, so it incorporates both "bottom-up" and "top-down" elements.

MRN also incorporates elements of both approaches; different policies or targets can be specified for emissions, but MRN's output will show the impact of these policies or targets on energy-sector and macroeconomic factors without pre-determining the outcome.

**Q28: Is the purpose of NEEM similar to the Electric Generation Expansion Analysis System (EGEAS) and to Ventyx's Strategist models? How do they differ?**

NEEM is broadly similar to these models in terms of functionality and purpose. While the differences too many to enumerate here, the principal difference is that through its use with MRN, NEEM considers broader macro-economic effects on the electricity industry.

**Q29: It appears that many important aspects of a future are calculated WITHIN the MRN-NEEM models (e.g., generation additions, retirements, CO2 prices). Will this constrain what the SSC can specify in terms of scenario definitions? If so, how?**

The SSC can specify as much or as little information as it prefers. The MRN and NEEM models will adjust those aspects of a future which are not prescribed to address constraints which are placed on the system. The SSC may, for instance, "hardcode" all

capacity additions, retirements and CO2 prices for the next thirty years if it so chooses instead of allowing NEEM to determine capacity additions.

**Q30: Not sure how the model handles wind. Does it calculate the cost of wind to include backup power?**

Not sure what this question means. All resources on the system can be de-rated to represent their contribution towards reserve margins. If the question refers to incremental power that may be necessary to meet reliability criteria versus thermal generation, then the model does calculate the overall system cost of this necessary additional capacity. If the question refers to costs of incremental operating reserve and load following requirements associated with wind penetration, these costs are not endogenously developed in NEEM and should be specified as input assumptions.

**Q31: NEEM does not model transmission constraints within regions. Can we model historic rather than current NEEM regions? For instance PJM (original footprint) vs. ECAR?**

Yes. The SSC can choose to draw the NEEM regional boundaries differently if it wishes.

**Q32: On slide 21 where it describes what NEEM does, are all those features just NEEM or is it MRN and NEEM**

Slide 21 refers to MRN-NEEM. NEEM in a stand-alone mode does not model impact of electricity prices on demand and does not endogenously compute CO2 prices.

**Q33: Please explain how NEEM determines specific benefits for a region's customers considering unique regional market rules, such as use of LMP's.**

NEEM can be configured with rules which represent different regional market rules. It does not calculate nodal LMPs within its regions. Benefits for different regions, or the system as a whole, may be calculated different ways, including production cost, consumer cost benefits, or other metrics that may be defined by the SSC from the available data.

**Q34: Relates to previous question. Can the future specify no subsidies for any fuel to include wind, solar, bio, geo, nuke or whatever? Explain how you would do this?**

The inputs developed by the SSC can specify any, or no, subsidies for different fuels or generation types. For example, the future may assume zero carbon price, no renewable energy standards.

**Q35: Relates to previous question. Can you determine the impact of various moratoriums (nuke or coal) and requirements (RPS)?**

Yes, these can be simulated in our models.

**Q36: So electric sector data not available by state but only by NEEM regions?**

NEEM aggregates most of its output results by state as well as by NEEM region.

**Q37: What constraints govern the expansion of interregional power flow limits and how can those constraints be specified on a regional basis?**

Inter-regional transmission capacities can be specified both on an individual basis, a one-to-many, or many-to-many basis. They can also be varied temporally. Note, however, that NEEM will not modify transmission capacities by itself; these capacities must be provided. There is no particular constraint on the expansion of inter-regional transmission limits; the system can be modeled as a “copper sheet” within NEEM if so desired.

**Q38: Where are the detailed inputs to represent coming environmental regulations going to come from (transport rule? mercury? ash? water? CO2)? Will all scenarios be designed in order to comply with all federal regulations?**

CRA develops its inputs to NEEM based on the best available current outlook on environmental regulations. The design of the scenarios will be the responsibility of the SSC.

**Q39: Will the complete inputs and outputs for the MRN and NEEM models be available for review? Which portions of the inputs and outputs, if any, will be subject to "confidential treatment" and why?**

All of the user-configurable inputs and outputs related to system data will be provided for review. Model-specific configuration data and other proprietary intellectual property may be held confidential.

**Q42: Will the SSC have the right to review the inputs on assumptions for capital costs of new generation by type?**

Yes.

**Q #24: In which Task will the demand forecasts be done for each scenario?**

The demand forecast, and the other key assumptions to be utilized for the macroeconomic analysis will be developed by the SSC in Task 4.

**Q41: Will the production simulation model (GE-MAPS) used by CRA incorporate all the regional differences among the 26 planning authorities; such as MISO not having a capacity market, PJM having a capacity markets, etc.**

The production-cost simulation model (GE MAPS) can incorporate many market differences and idiosyncrasies. The presence or absence of capacity market makes no impact on the optimal economic dispatch simulated by GE MAPS. CRA dataset identifying region-specific information and inter-regional differences will be augmented in Tasks 2 and 3 by input from PA engineers, and reviewed by SSC members.

**Q #41: Will the data sources used by EIPC planners (to run the transmission analysis) and CRA (to run GE/MAPS and NEEM/ MRN) such as load forecasts, current generation fleet and resource adequacy requirements be compared for consistency?**

Yes

**QXX: Also per our discussion today, I would draw your attention to slide 22, which explains that NEEM does not co optimize generation and transmission and why. Also see slide 12, which discusses what transmission considerations will be incorporated into the model, if not as clearly as we'd like. That said, it will be helpful to have a summary explanation from CRA that ties together all of this in a single place and explains where the boundaries are between what transmission assumptions we can incorporate into the various proposed scenarios aside from existing and planned (per the rollup) transmission and regional transfer capabilities vs those that will have to wait until later in the process.**

TBD.

9/17/10