TO: ISO-NE Scenario Analysis Team

FROM: Clifton Below, NHPUC

DATE: 11/14/06

RE: Follow-up on Initial Stakeholder Meeting

I have a number of observations and suggestions:

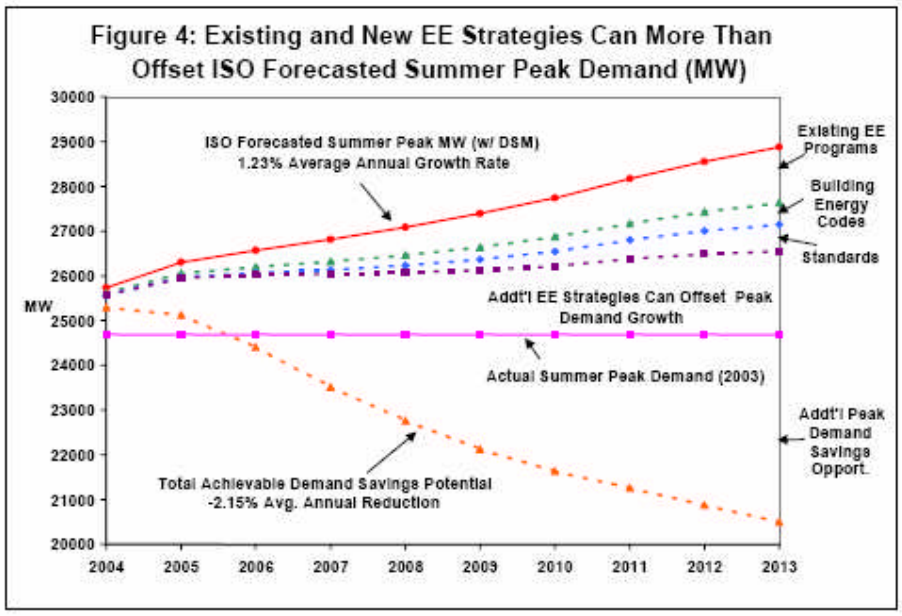
1. Although the timetable leading to presentation of modeling results at the June NEG/ECP annual meeting (which only 2 governors attended last year) suggests that NE Governors are the primary policy maker / political leader audience, I recommend that state legislatures, esp. energy/utility (and also economic development and environment) committee members and legislative leaders also be considered as an equally important audience. Another presentation opportunity might be the CSG/ERC annual meeting, as well as taking presentations directly to committee meetings in states. Some legislators are much more focused on these issues than Governors and also see themselves as the primary policy makers for states. State legislative policy can greatly effect how the future develops, such as whether new generation might be rate-based or the output subject to long term contracts, RPS, siting, climate change issues such as RGGI, and a whole myriad of policies that might affect how much new EE (energy efficiency) and DSM might be required or adopted. Some legislators will ask a lot of questions about assumptions, the modeling, potential bias, etc. A few may even be relatively sophisticated about modeling* and some rather skeptical ("garbage in, garbage out" is a common refrain among legislators). Of course state commissions, energy, environmental, and economic development agencies are additional audiences, along with various stakeholders and civic groups that might influence policy decision makers. I would hope that this process and the results will have a high degree of credibility with all these parties.

2. At the outset, both the written materials and oral introductory remarks described this endeavor as a scenario analysis of ***supply*** options for meeting future ***electric demand***. I'd like to suggest that a more productive characterization and way of thinking about this process and future refinements and follow-up work would be as an analysis of ***resource*** options for meeting future ***electric energy needs.*** Many, if not most, political/ policy leaders have already made this kind of shift toward a more holistic way of thinking that should lead to lower costs and more economically and environmentally efficient solutions. For example, it might be that combo space heat/hot water systems integrated with a solar hot water supplement for spring and summer needs could be a lower cost and lower carbon means to meet future energy needs of many current electric hot water and heat systems then system power, reducing the need for new generation. On the other hand, looking at the larger resource/ energy need issues, including transportation, the least cost / lower carbon means of meeting a chunk of future transportation needs might be a steady ramping up of PHEVs (plug-in hybrid electric vehicles) that could substantially increase system generation needs, although perhaps in a way, if the correct retail price signals are present, that tends to level loads and improve system load factors to everyone's advantage (spreading fixed capacity costs over more kwh sold). Thinking about ***resource options to meet electric energy needs*** leads me to my third point:

3. I agree with MA DTE Chair Judson that the 5th straw man scenario, renewables and EE should be separated into 2 scenarios. Perception, especially initial impressions, can be as or more important than reality. Having heard a bit about the IREMM model, I can see why it has

been suggested that high levels of EE could simply be modeled through sensitivity analysis as lower load growth levels, since IREMM really is an electric generation dispatch model, that doesn't really generate particular information about aggressive EE as a scenario, compared with simply assuming lower rates of load growth, even if there are costs to aggressive EE, not to mention various barriers and obstacles, that need to be taken into account in the overall scenario analysis. However that is a model artifact subtlety that will tend to be lost on most folks.* I think audiences need to see aggressive EE as separate scenario analysis for a number of reasons, not the least of which is the overall credibility of the endeavor (i.e. is 5,400 MW of new nuclear or coal really more plausible than 5,400 MW of new EE and DR?):

- NEEP has widely circulated their May 2005 updated paper on *Economically Achievable Energy Efficiency Potential in New England,* which suggested that existing and new EE strategies could more than offset future growth in summer peak demand. Although that study is already a few years old, and a couple of years have passed without implementation of polices that would be needed to get us on a path to achieve its all or even most of its projections of potential, it did suggest an economically achievable potential peak load reduction of about 8,383 MW by 2013 (compared with what had been forecast – also out of date). Extrapolated out to 2025, this analysis would suggest a potential load reduction from BAU of well over 16,000 MW, or about ten times the amount of incremental EE suggested in the 5th straw man scenario (of 1,650 MW) (and that doesn't even include distributed generation or some load shifting DR options such as off peak cooling through cool thermal energy storage).



At the outset, one might argue about how realistic or achievable this really is, but that's not the point, since up front it has been stated that:

- "scenarios should highlight differences rather than 'forecast' reality"
- each scenario is a deliberate exaggeration of possibilities,
- scenarios should be at the far ends of various axes of possibilities,

- we need to bracket the discussion with racially different options,
- in blending options in a scenario, the policy implications of different options get lost in the noise; we need to see large differences to appreciate the implications of various options, etc. etc.

You don't want ISO-NE to be widely perceived by some constituencies (including legislators) as giving short shrift to EE and DR and being biased toward supply options at the outset.

Furthermore, both a substantial increase in Canadian imports and increased renewable generation in New England, share some similar attributes (such as increased need for transmission), that are different from EE and that might confuse the modeling results of each option when modeling together compared with being considered separately. As there may be up to 6,000 MW of new import capacity from Canada potentially available within the scenario time frame, such imports could be modeled at a higher level, so a renewable/import scenario could stand separately from aggressive EE.

4. A pure EE scenario could be a 6th scenario, since it would be simple to model (though I'd suggest it should still share the addition of the 2,600 MW queue mix for the early time period, common to all scenarios), or if you really want to keep the number to 5, I'd suggest the queue fuel mix for the 5,400 MW expansion could dropped, as it is 77% natural gas fueled, similar to the NGCC scenario, and it is otherwise arbitrary and not likely to tell us much useful information compared with the NGCC scenario. To the extent that any of these scenarios might leave the system with a severe imbalance in the proportion of base vs. peaking generation capacity, that may need to be adjusted or corrected, otherwise the model results might be telling us more about the consequences of such an imbalance than the attributes of a particular generation option for expansion.

5. There seemed to some confusion about existing EE programs at the stakeholder meeting. As noted, the results of historic and ongoing EE programs are reflected in the demand forecast. I think at the meeting a couple of EE advocates were suggesting that there are some new, recently enacted/ adopted EE initiatives that aren't historic programs, and aren't necessarily reflected in the demand forecast, but that might be considered as additional expected resources, like the queue mix for the first 2,600 MW phase. This might merit at least a review to see if they might be of a magnitude that might merit inclusion as an quantifiable resource for the initial period.

5. DR/ DG/ CHP/ OPC CTES modeling issues: None of the scenarios really includes the possibility of significant demand resources/ response like distributed generation, CHP or off peak cooling through cool thermal energy storage (OPC CTES). These have at least the theoretical potential to provide very large contributions to both winter and summer peaks (though through different resources in some cases) which are primarily driven by heating and cooling needs. As on the order of 1/3 of summer peak is for air conditioning and cooling loads, OPC CTES has some very large potential as a resource. Although it can have some characteristics of EE (including actual reduction in total kwh produced, lost, and consumed) it is primarily a load shifting strategy. This and other load side DG could be modeled as part of an EE scenario (although without uniform load reduction across all hours) or it could be modeled as an add-on policy possibility across all options through load shifting and an improvement in load factors as a part of sensitivity analysis, although from a pure modeling standpoint it's not necessarily sensitivity analysis as much as a policy variant.

6. "Sensitivity analysis" issues: Somewhat higher or lower load "forecasts" would be useful for all scenarios, without varying the assumed amount of resources deployed, both for sensitivity as well as the impact of policy variants, even for a pure EE/DR scenario, as one "what if" is what if demand peaks are higher than forecast (a very tight market) or lower creating more of a surplus (including in the case of EE, what if it significantly over or under performs from the base assumption). Also, it might be nice to layer onto that varying assumptions about the demand response elasticity which would tend to indicate the value of policy variants that either aggressively enable demand response under various scenarios or not.

7. Transmission, zero is a number issue: While there are real limitations to model and this process, it is important to note what is in and what is out, and how that might limit the analysis. While we know that several thousand MW of new import capability will require significant new transmission, which can be cost estimated, at least to the border, we also can presume that significant new wind, nuclear, coal, and even NGCCT will also require some degree of transmission. It's important not to have results that suggest that they are comparable when by default, not realistic expectations, zero is a cost value in some situations and significant in others. Perhaps, with out getting geographically specific, some range values might be assumed for new transmission for all new centralized or remote (vs. highly distributed) generation options. While some sites, like Seabrook, might have available transmission, there probably aren't 5400 MW worth of such sites.

8. Likewise with CO2, it's important to recognize what is in and what is out. The IREMM model might only produce results for smoke stack emissions, but that doesn't tell the whole story. While virtually all manufactured/ constructed goods/facilities have some carbon footprint, that's probably beyond the scope of this analysis, though there might be some data out there that could be noted. This limitation should at least be noted. Likewise there are usually carbon emissions associated with the fuel cycle that should be noted. For example, biomass as a fuel is often characterized as carbon neutral, assuming sustainable practices are used in growing the biomass (such as wood chips). However there are some carbon emissions also associated with harvesting and transporting biomass, usually from burning diesel. The smokestack emissions only of burning sustainably harvested biomass would overstate its carbon impact, while saying that is carbon neutral would understate it. Likewise with nuclear fuel, which has both coal fired electric plant emissions associated with enrichment and other fossil fuel emissions associated with mining and transport. Both biomass and nuclear fuels are better characterized as low carbon or maybe even very low carbon, but not "no carbon" in their impact.

9. Capacity (capital) costs beyond FCM payments: A topic for another day.

*I don't presume to be an expert in modeling, but I do have some background in understanding both the potential value of modeling as an aid in policy development and decision making as well as some of the limitations of modeling and how it can be misused as modeling has long been an interest of mine. Academically, once upon a time, I did study the theory and practice of modeling complex system dynamics and I was more recently involving in evaluating and trying to procure the development of a complex tax policy mircosimulation model with an economic analysis module.