

To: Power Supply Planning Committee (PSPC)

From: Wayne Coste

Date: March 5, 2009

Subject: Comparison of ISO New England's ICR with New York State Reliability Council's IRM

In response to a request from the Power Supply Planning Committee at their February 19th meeting, a quick comparison of ISO New England's ICR with the New York State Reliability Council's IRM has been developed. These preliminary results will be discussed at the March 12th meeting of the Power Supply Planning Committee.

This request for a comparison originated from a discussion at the February 2009 PSPC meeting relating to the required reserve margins for the two relatively similar Planning Authorities, New York Independent System Operator and ISO New England. It is the purpose of this document to identify, from a high-level perspective, areas of common ground and discuss areas where there are differences and to make estimates of what the New York IRM might be if they were to use the New England methodology and/or assumptions.

This comparison is not a comment on the approach employed by the New York State Reliability Council (NYSRC) or the results of its process. Reliability analyses are complex undertakings that deal with the risk of low probability events. This evaluation of risk is based on judgment and experience over many years. Each area has its own concerns, perspectives and weightings that are then incorporated into its reliability model in their attempt to capture those concerns within a structured modeling framework.

The 2009 NYSRC report, "New York Control Area Installed Capacity Requirements for the Period May 2009 through April 2010 Technical Study Report,"¹ provides the results for a number of sensitivities that are the basis for many of the comparisons presented here. Table 2, Table A-5 and Table B-2 of the Technical Study Report are especially useful in this regard. Another report, "Adjusting For The Overstatement Of The Availability Of Combustion Turbine Capacity In Resource Adequacy Studies For The New York Control Area During the 2008 – 2009 Capability Year, 10/22/2007, Draft #2" was useful in the comparison of the Combustion Turbine derate comparison.²

Comparison:

From the broadest perspective, it has been observed that there is a difference in reserve margins between the New York IRM of 16.2 percent and the ISO New England ICR of 9.9 percent. This comparison will focus on a number of key differences between NYSRC's approach and ISO New England approach.

¹ <http://www.nysrc.org/pdf/Reports/2009%20IRM%20Report%20-%20Final%2012%2005%2008%20V1.pdf>

² http://www.nyiso.com/public/webdocs/committees/bic_icapwg/meeting_materials/2007-11-08/ICAPWG_NYSRC_IRM_GADf_110807.pdf

Effect of Various Components on Reserve Margin (What would the effect on NYSRC IRM be if New York were to use ISO New England based assumptions. Adjustments are estimates and may, or may not, be perfectly additive.)	Approximate Difference (Percent of New York Peak Load)	New York IRM Cumulative Effect after Adjustments (Percent)
Base NYSRC Reserve Margin		16.2
Effect of Internal Transmission Constraints and Localities (Table 2, Case 2 and Table B-2, Case T1)	-1.7	14.5
Rating Wind Generators (Table B-2, Case G4)	-1.2	13.3
Combined Effect of Wind Capacity Adjustment and Localities [Table B-2, Case G4a]	-0.5	12.8
Rating Conventional Hydro [NYSRC's derating of hydro resources increases their IRM by 1.3 percent. A similar derating for ISO New England (during the transition period only) is approximately 0.5 percent. The net adjustment is -0.8 percent.]	-0.9	11.9
Rating Combustion Turbines	-0.3	11.6
Tie Benefit Adjustment [Assumed effect of NYCA's tie benefits if they used the higher 6.6 % amount that NE assumes rather than the 5.5% assumption that NYSRC assumes.]	-1.1	10.5
Difference in EFORd [a difference of 0.25 percent in EFORd should require New York to have more capacity than New England if all else were held constant. Because this is an EFORd, this change could translate into a -0.3 percent change in reserve margin.]	-0.3	10.2
Explicit Summer Period Maintenance (Table A-5)	-0.4	9.8
Effect of Demand Resource Availability Assumptions	+1.5	11.3
Load Forecast Uncertainty Adjustment	Unknown	Unknown

Many of these adjustments are in a direction that suggests that the New York reserve margin would be lower if the assumptions and methodologies used by New England had been employed in their IRM calculation. While the comparisons are illustrative (not developed rigorously), these adjustments seem to be reasonable for discussion purposes. The difference in reserve margins are not due to the difference in the models used. It is believed that the MARS and Westinghouse models incorporate all of the major classes of uncertainty that are typically included in reliability models.

One comparison that could not be quantified at this time is the effect of the load forecast uncertainty. Additionally, it is uncertain how this comparison could be done even if more time were available.

Details of Comparisons

Two of the most significant differences between the New England and the New York approaches to reliability modeling and the development of reported reserve margins have to do with the handling of internal transmission constraints and the representation of resource ratings.

Effect of Internal Transmission Constraints

One of the key characteristics of the NYSRC's approach in establishing the NYSRC reserve margin is the handling of internal transmission constraints. The approach used by NYSRC to manage its capacity requirements in various locations is known as the Tan45 approach. This approach ensures that some of the LOLE is concentrated in zones J and K. Table 2 of the Technical Study Report shows the sensitivity case (Case T1) where there are no internal transmission constraints within New York. This sensitivity case shows that the relaxation of the internal transmission constraints would reduce the IRM by 1.7 percent.

ISO New England assumes that a minimum amount of capacity is distributed in various import and export constrained locations around New England in order to eliminate the effect of internal transmission constraints on the New England's Loss of Load Expectation. The validity of this assumption is enforced by the calculation of Local Sourcing Requirements (LSR) and Maximum Capacity Limits (MCL) that follows the ICR calculation process.

Rating Wind Generators

NYSRC included the wind generators in the reserve margin calculation at nameplate ratings.

“Wind units are rated at their nameplate, or full rated value, in the model. The 2008 NYCA Load and Capacity Report, issued by the NYISO, is the source of those generating units and their ratings included on the capacity model.[p38]”

and

“The total amount of wind in the model is 1208.7 MW (nameplate rating)[p37]”

and

“Characteristics of this data indicate an overall 30% capacity factor with a capacity factor of approximately 11% during the summer peak hours. A total of 1,208.7 MW of installed capacity associated with wind generators is included in this study. [p38]”

and

“The increase in wind resources increases the IRM because wind capacity has a much lower peak period capacity factor than traditional resources. On the other hand, there is a negligible impact on the need for unforced capacity. See Appendix B for a more detailed explanation [p 17].”

To quantify the effect of this, the NYSRC report has a sensitivity case (Case G4) presented on Table 2 that shows the effect of wind capacity nameplate rating is to increase the IRM by 1.2 percent.

Furthermore, Case G4a on Table B-2 shows that the combined effect of decreased transmission constraints associated with slightly higher capacity levels in the import constrained localities combined with excluding the wind resource (to avoid the nameplate vs. summer peak capacity effect) would reduce the New York reserve margin to 12.8 percent.

ISO New England uses the FCM qualified capacity in the ICR calculation and therefore there would not be a significant change in ICR as a result of including or excluding wind capacity in the ICR calculation.

Rating Conventional Hydro

NYSRC derates the capability of the small hydroelectric resources within the reliability modeling process. This capacity derate amounts to 468 MW out of a total of 1040 MW from the 2009 database.³ A 468 MW derate would amount to 1.38 percentage points.

“The small hydroelectric plants which represent an installed capability of slightly in excess of 1000 MW that are scattered around zones A-G normally experience low water levels during the summer months when the New York system peaks. Prior to the 2002 IRM study, these plants were derated by 25% of their DNMC rating to account for this lack of fuel during the system peak. During the summer of 2001, the northeast experienced a drought in which these units could provide only 35% of their ratings on peak. That year it was decided to model a 45% derate for these units. Recent analysis for the 2003 and 2002 system peak days has shown that this value remains valid.”⁴

New England uses a hydro capacity rating that effectively internalizes the effect of summer derates by rating them under the rules for intermittent resources. The adjustment used to correct the 50%-tile and 80%-tile stream flows is approximately 125MW which is added to the ICR MW value. This would increase New England's ICR by approximately 0.44 percent of New England's peak load. The net effect of these two offsetting adjustments would be a 0.9 percent reduction to the New York's IRM, relative to the New England's ICR percentage ($1.38 - 0.44 = 0.94$) if New York were to use the New England approach.

Rating Combustion Turbines

The New York capacity models used in MARS include a derating for combustion turbine technologies that reflect lower capabilities for these technologies when ambient temperatures exceed 92 degrees F. Several NYSRC studies seem to suggest that these ambient derates, across the entire New York system, amount to 80 MW per degree F above 92. They estimate this effect to be worth approximately 93 MW which would increase NYSRC's reserve margin by 0.27 percent. There is no offsetting adjustment for New England although this issue has been discussed in the past. If New York were to use the New England methodology, their IRM would decrease by 0.3 percent.

Tie Benefits:

³ http://www.nysrc.org/pdf/Reports/mif09_C20_Public.txt

⁴ http://www.nysrc2.org/pdf/Reports/NYSRC_IRM_White_Paper5a.pdf

One of the sensitivity cases, presented in Table 2 of the Technical Study Report (Case A1), documents that NYSRC's reserve margin without tie benefits would increase the reserve margin by 5.5 percent. Based on the 2009 projected peak load, this would suggest that tie benefits replace 1855 MW of New York capacity ($33730 \text{ MW} \times 0.055 = 1855 \text{ MW}$). If this 1855 MW of capacity reduction were replaced by a firm capacity equivalent, then the firm capacity equivalent would probably be in the neighborhood of 1600 MW ($1855 / 1.162 = 1597$; where 1.162 represents the New York IRM). This is a smaller amount of tie benefits, on both a percentage basis and an absolute basis than ISO New England assumes (1800 MW).

An equivalent comparison for New England suggests that the difference in ICR without tie benefits would be about 6.6 percent higher. This suggests a change in ICR of 1951 MW. This is approximately equivalent to 1800 MW of firm, capacity equivalent tie benefits ($1951 / 1.099 = 1775 \approx 1800 \text{ MW}$).

If New York were to use a tie benefit value of 6.6 percent of peak load instead of 5.5 percent then their IRM would decrease by approximately 1.1 percent.

EFORd Effect

The weighted EFORd for New York appears to be about 5.25 percent from Figure A-6 which is slightly higher than the 5.0 percent assumed by New England. This quarter point difference in EFORd is estimated to increase the New York IRM by 0.3 percent. If the lower New England EFOR were to be used, the New York IRM would be slightly lower by approximately 0.3 percent. This difference is supported by sensitivity cases G1 and G2 in Table B-2 of the Technical Study Report where increases and decreases in capacity weighted EFOR of approximately 1.5 percent result in results in corresponding increases and decreases in reserve margins of 1.7 percent.

Maintenance at time of Summer Peak Load Conditions

NYSRC has performed an evaluation and has estimated that approximately 150 MW of capacity is scheduled out across the summer season. This 150 MW is calculated to be 0.44 percent of the New York summer peak load. There is no similar allowance for summer maintenance in New England. Adjusting the New York IRM to use the New England methodology that excludes summer maintenance, their IRM would decrease by 0.4 percent.

Load Forecast Uncertainty

This factor cannot be quantified because of the different techniques used by New England and New York to represent Load Forecast Uncertainty. The MARS models could be run with no LFU multipliers for New York and/or New England, but the differences in how those values are developed would provide results that would be ambiguous.

ISO New England's load forecast incorporates weather driven load uncertainty so completely into the forecast of weekday peak load distributions, which are used to develop the expected weekly, monthly and seasonal peak loads that it is not possible to develop a load model to use in a reliability model without including weather driven load uncertainty. The NYSRC solicits estimates of uncertainty bands for their loads from the Load Serving Entities.

Effect of Demand Resource Modeling

The modeling of Demand Resource is becoming more important because the penetration is increasing in both New York and New England. The availability assumptions for New York are that these

resources will operate at about 93 percent availability. According to Table 2 of the Technical Study Report, the presence of these high availability resources decreases the NYSRC IRM by 0.8 percent.

The New England assumptions for Demand Resources assume a lower availability, based on a 21 percent EFORD, that increases New England ICR by approximately 200 MW, or 0.7 percent increase. The net difference would be an approximately 1.5 percent increase in NYSRC's IRM if they used an EFOR similar to New England's assumptions.

Other Factors

Emergency Operating Procedures (Voltage Reductions)

The magnitude of the voltage reduction for New York appears to be 1.76 percent. If Public appeals are considered, then this amounts to 2.4 percent. This is comparable to the New England load and capacity relief from OP4 assumption and methodology. No adjustment is necessary.

External Contracts:

NYSRC assume that there will be 3046 MW of short term capacity purchases. These short-term capacity purchases amount to 9.0 percent of New York's Peak load and are not included in the reserve margin calculation. These purchases have the effect of increasing the NYSRC reserve margin because the amount of transmission available for tie benefits is reduced.

“The base case assumes the following summer external ICAP: 350 MW from Ontario (350 MW HQ wheel), 1200 MW from HQ, 50 MW from New England, 166 MW from Cedars and 1280 MW from PJM. This totals 3,046 MW of expected summer external ICAP.

All firm sales are modeled as listed in the 2008 Gold Book for the year 2009.

In calculating the IRM, all sales are subtracted from the Installed capacity. Purchases are not included.[p48]”

New England includes capacity contracts that have qualified in the current FCA when calculating ICR, subject to total transfer capability limitations and a reservation for tie benefits.

cc: NEPOOL Reliability Committee
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