POLICIES AND PROCEDURES
Of the New York State Reliability Council
Installed Capacity Subcommittee

POLICY/PROCDURE NUMBER: ICS-1 **REVISION:** 1 **DATE:** 3/1/06

TITLE: Developing Locational Capacity Requirements versus Installed Reserve Margin Curves (LCR-IRM curves).

Policy Statement

The New York State Reliability Council has determined that Locational Installed Capacity Requirements (LCRs) must be consistent with the Installed Capacity Requirements (ICR) for the New York Control Area (NYCA). As such, the Council, with the agreement of NYISO staff, has adopted the use of the LCR-IRM curve to establish the relationship between these two sets of requirements. This procedure details the steps used to develop that curve.

Implementation and Responsibilities

Section 3.03 of the New York State Reliability Council (NYSRC) Agreement states that the NYSRC shall establish the annual statewide Installed Capacity Requirements (ICR) for the New York Control Area (NYCA) consistent with North American Electric Reliability Council (NERC) and Northeast Power Coordinating Council (NPCC) standards. The NYISO's Market Administration and Control Area Services Tariff and the NYSRC Reliability Rules require the NYISO to establish locational installed capacity requirements also known as Locational Capacity Requirements (LCRs). The Operating Committee is responsible, per the ISO agreement, to develop LCR requirements.

References

New York State Reliability Council (NYSRC) Agreement
NPCC Resource Adequacy Standard – Document A-2
NYSRC Reliability Rules A-R1 and A-R2
ISO Agreement, dated 9/13/04
ISO Market Administration and Control Area Service Tariff, 2/23/05

1.0 Introduction

1.1. This document describes a procedure to develop the Locational Capacity Requirements (LCRs) versus statewide Installed Reserve Margins (IRMs) curves. Within the New York Control Area (NYCA) there are currently two zones identified as localities to which this procedure would apply. They are the New York City and Long Island zones.

1.2. This procedure will develop two coincident LCR-IRM curves for the two currently identified localities.

2.0 Initial Conditions

2.1. A Multi-Area Reliability Simulation (MARS) base case database exists for the upcoming capability year.

2.2. Localities in the NYCA have been identified.

2.3. Any capacities that have been removed or shifted as a result of arriving at a base case for the IRM study should be reset for purposes of procedure. This procedure should start with ‘as forecast’ capacities and ‘as forecast’ loads.

3.0 Procedure for setting starting capacities

3.1. Using the ‘mod-mdmw’ table in MARS, remove perfect capacity from zones west of the Total East Interface that have excess capacity reserves (capacity rich zones), proportional to their existing excess capacity, until the statewide real capacity to peak load ratio equals a desired IRM study point.

3.1.1. The conversion of perfect to real capacity is done on a zonal basis and the real capacity is calculated as perfect capacity divided by one minus the Equivalent Forced Outage Rate (WeightedEFORd) from the MARS Model.

3.1.1.1. The WeightedEFORd is the weighted average EFORd of the units modeled in the zone of interest.. [Comment: why not use “as found” case in the IRM study for the upcoming capability year?]

3.1.2. The statewide capacity is the “as forecast” statewide capacity minus the sum of the real capacities removed from the zones that have excess capacity reserves.

3.2. The following equations can be use to calculate the amount of perfect capacity that needs to be removed from the NYCA when Areas A, C, and D are identified as capacity rich zones.

$$TotalPerfectCapacityToRemove_{NYCA} = \frac{(G_{NYCA} - L_{NYCA} \times IRM) \times TotalExcess_{Gen\_A\_C\_D}}{\left(\frac{(G_A - L_A)}{(1 - WeightedEFORd_A)} + \frac{(G_C - L_C)}{(1 - WeightedEFORd_C)} + \frac{(G_D - L_D)}{(1 - WeightedEFORd_D)}\right)}$$

$$PerfectCapacityToRemove_A = (G_A - L_A) \times \frac{(G_{NYCA} - L_{NYCA} \times IRM)}{\left(\frac{(G_A - L_A)}{(1 - WeightedEFORd_A)} + \frac{(G_C - L_C)}{(1 - WeightedEFORd_C)} + \frac{(G_D - L_D)}{(1 - WeightedEFORd_D)}\right)}$$

$$PerfectCapacityToRemove_C = (G_C - L_C) \times \frac{(G_{NYCA} - L_{NYCA} \times IRM)}{\left(\frac{(G_A - L_A)}{(1 - WeightedEFORd_A)} + \frac{(G_C - L_C)}{(1 - WeightedEFORd_C)} + \frac{(G_D - L_D)}{(1 - WeightedEFORd_D)}\right)}$$

$$PerfectCapacityToRemove_D = (G_D - L_D) \times \frac{(G_{NYCA} - L_{NYCA} \times IRM)}{\left(\frac{(G_A - L_A)}{(1 - WeightedEFORd_A)} + \frac{(G_C - L_C)}{(1 - WeightedEFORd_C)} + \frac{(G_D - L_D)}{(1 - WeightedEFORd_D)}\right)}$$

$$G = GeneratingCapacity + SCRs - ExternalSales$$

3.3. Simulate the year for as many replications as needed until the LOLE converges within one standard error of 0.005 days/year. (Note: Based on previous studies the NYCA model converges in around 1500 replications)

3.3.1. Note the total NYCA LOLE risk and the risk in all NYCA zones.

4.0 Find the initial target capacity for the first locality

4.1. Using the case from Section 3.2, remove a trial amount of perfect capacity from the locality in question by entering a negative value on the ‘mod-mdmw’ table of MARS.

4.2. Add perfect capacity equal to the above trial capacity that was removed from the subject locality to the capacity rich zones identified above in section 3.1, proportional to their existing excess capacity. This is accomplished by entering positive values on the ‘mod-mdmw’ table.

4.3. Simulate the year for 1500 iterations and note the results.

4.4. If the NYCA system LOLE is below 0.100, remove more capacity from the subject locality (adding it to the capacity rich zones) and repeat the steps in Sections 4.1 through 4.3, until the NYCA system LOLE approaches 0.100 days/year.

4.5. If the NYCA system LOLE is above the 0.100, remove less capacity from the subject locality (adding less to the capacity rich zones) and repeat the steps in Sections 4.1 through 4.3, until the NYCA system LOLE approaches 0.100 days/year.

4.6. Once the LOLE has reached 0.100 days/year within one standard error of 0.005 days/year, note the amount of capacity removed. This is the initial target capacity.

$$Capacity\,\mathrm{Re}\,movedIn4.0_{Locality} = \text{Amount of Capacity Shifted from the Locality to Reach and LOLE of 0.1 days/year}$$

5.0 Find the initial target capacity for the second locality

[Comment: Don’t need this if Section 4.1 starts with the case from Section 3.2 as noted in edits above.]

Repeat the steps in Section 4 for the second locality and note the amount of capacity removed as the initial target capacity for that locality. (Note: Prior to proceeding to the next step, reset any capacities added or removed during the above step.)

6.0 Determine the capacity multiplier for each locality

6.1. The capacity multiplier is the initial target capacity of the locality in question divided by the sum of the initial target capacities of the two localities. For example, if the NYCA LOLE reaches 0.100 within one standard error of 0.005 days/year when 300 MW are removed from the New York City locality or when 100 MW are removed from the Long Island locality instead, then the capacity multiplier for New York City is 300/400 or 0.75, while the capacity multiplier for Long Island is 100/400 or 0.25.

7.0 Find the final adjusted capacities

7.1. Prior to proceeding to the next step, reset any capacities added or removed during the above step, i.e., use the case from Section 3.2.

7.2. Estimate a total amount of (trial) perfect capacity to remove from the two localities.

7.3. Use the capacity multipliers to divide the above trial capacity between the two localities. For example, if the two localities are the Areas J and Kthen the following equations apply:

$$TrialCapacity_J = \frac{TotalTrialCapacity_{J\_and\_K} \times CapacityRemovedIn4.0_J}{\left(CapacityRemovedIn4.0_J + CapacityRemovedIn4.0_K\right)}$$

$$TrialCapacity_K = \frac{TotalTrialCapacity_{J\_and\_K} \times CapacityRemovedIn4.0_K}{\left(CapacityRemovedIn4.0_J + CapacityRemovedIn4.0_K\right)}$$

7.3.1. Enter these as negative values on the ‘mod-mdmw’ table.

7.4. Add the above trial capacity to the capacity rich zones, proportional to the existing capacity in the capacity rich zones.

7.4.1. Enter these as positive values on the ‘mod-mdmw’ table.

7.5. Simulate the year for as many replications as needed until the LOLE converges within one standard error of 0.005 days/year. (Note: Based on previous studies the NYCA model converges in around 1500 replications).

7.6. If the NYCA system LOLE is below 0.100, remove more capacity from the locality zones (adding it to the capacity rich zones) and repeat the steps in Sections 7.1 through 7.5, until the NYCA system LOLE approaches 0.100 days/year.

7.7. If the NYCA system LOLE is above the 0.100, remove less capacity from the locality zones (adding less to the capacity rich zones) and repeat the steps in Sections 7.1 through 7.5, until the NYCA system LOLE approaches 0.100 days/year.

7.8. Once the LOLE reaches 0.100 days/year within one standard error of 0.005 days/year, note the amount of capacity removed from each identified locality. These are the final target capacities.

7.9. These final target capacities are expressed in terms of perfect capacity. Translate to real capacity by using an appropriate translation factor.

7.9.1. An appropriate translation factor for this case is based on the Equivalent Forced Outage Rate (EFORd) of a combined cycle power plant. For these purposes the latest published NERC five year class average should be used. [Comment: I don't think it is appropriate to use a combined cycle power plant EFORd, because it does not represent the generating fleet's performance in the locality. The weighted average New York City and Long Island EFORds should be used to be more consistent with how locational ICAP is translated into locational UCAP in the market.]

7.10. The final adjusted capacity for each identified locality is its initial capacity less any (real) capacity that was removed above.

8.0 Determining the minimum locational ICAP requirements (LCRs)

8.1. For each identified locality, divide its final adjusted capacity by its peak load forecast. This, expressed as a percentage, is its locational ICAP requirement (LCR) for the IRM being studied.

9.0 Determining more points on the LCR-IRM curve

9.1. Repeat the steps in Sections 3 through 8 for each IRM point desired.

10.0 The LCR-IRM curves

10.1. Graph the LCR-IRM curves for the points studied above.