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EMERGENCY ASSISTANCE MODELING IN NYSRC IRM STUDIES

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Introduction

The New York Power Pool began the recognition of emergency assistance from neighboring control areas (NCAs) in IRM studies with the introduction of the GE Two-Area Reliability Program during the early 1970s. The principle of the emergency assistance (EA) representation in the Two-Area Program is basically unchanged since then: excess generation capacity is delivered as emergency assistance from the NCAs to NYCA – recognizing interconnection limits – to avoid load shedding in the NYCA. The modeling of EA permits NYCA to operate at an installed reserve lower than otherwise required. The very first IRM study conducted by the NYSRC in 1999 determined that EA reduced NYCA's IRM by 11.2%. Since then the annual EA impact has varied between 4% and 10%, with an EA impact in 2016 of 8.5%.

In 2015 NYISO operating staff approached ICS with a concern that emergency transfers from NCAs in GE-MARS studies may be excessive considering actual operating conditions. Further review revealed that a portion of NCA excess generation identified by MARS could be off-line when needed for emergency support to NYCA, and therefore unavailable to timely provide assistance. Accordingly, ICS prepared a scope to review EA modeling in NYSRC IRM studies. The scope included a request for the NYISO Operations Department to recommend maximum EA levels from an operating prospective.

On June 23, 2016 NYISO Operations submitted the report, *Modeling of Emergency Assistance for the NYCA in NYSRC IRM Studies* (NYISO report) to ICS. The report was discussed at the June 29 ICS meeting. This primary purpose of this study was to examine the amount of emergency assistance that can be reasonably relied on for establishing the NYCA IRM. The NYISO study recommended that EA be limited to a value of 2,620 MW on a grouped interface basis. My paper reviews this finding and recommends consideration of an alternate method of modeling EA.

The NYISO Report

The NYISO report covers a review of several issues related to EA modeling, including:

- Historical trends of NYCA EA benefits from past NYSRC IRM studies.
- EA benefit comparisons, NYCA vs. NCAs.
- NYCA interconnection interface transfer capability analysis.

- An analysis of excess 10 minute resources above required operating reserves in Ontario, Quebec, New England, and PJM during NYCA's top five hours during 2013 to 2015. I will discuss this analysis later in my paper.
- A recommendation that the maximum level of EA be capped at 2,620 MW, the NYISO operating reserve level. My review of the NYISO report below will cover this issue.

Alternate Methods of Modeling EA

On Table A I have expanded the NYISO report's Table 6 (page 18) to include additional columns to show Expected EA, EA Impact, and IRM for alternative EA modeling methods discussed below.

Line 1 is ICS's present Policy 5 method for modeling EA which shows the base case 2016 IRM value of 17.4% and an EA impact of 8.5%, as reported in the 2016-17 IRM report and the NYISO report.

NYISO Recommendation for Limiting the Amount of EA

NYISO Operations concluded in its report that the levels of EA presently determined by ICS from its GE-MARS studies are excessive and unrealistic from an operations perspective. As an alternative, NYISO Operations recommends that EA be limited to a value of 2,620 MW. This recommendation is based on its view that the neighbors' excess resources should only replenish NYCA's loss of the NYCA operating reserve and not to serve NYCA load. From the NYISO report on page 2:

> "…..the NYISO recommends using the NYCA Total Operating Reserve of 2,620 MW as the maximum level (limit) of EA for setting the NYCA minimum IRM. Understanding that the GE MARS simulation model already exhausts emergency procedures before calling upon EA, the NYISO Operations' perspective is that NYCA should only rely on its neighbors' excess reserves to replenish NYCA operating reserves and not rely on its neighbors' excess reserves to serve NYCA load directly in an emergency."

From the NYISO report, application of this criterion would require an 18.8% IRM, an increase of 1.4% over the 2016 base case IRM (see line 4 of Table A). Also as shown, the EA impact is 7.1%.

I have two concerns with the above recommendation. First, in accordance with the EOP process, only the 10 minute portion (1310 MW assumed in 2016-17 IRM Study) of the operating reserve can be replenished by emergency assistance. The 30 minute reserve portion is allowed to decrease to zero in a prior EOP step. Second, and more importantly, the level of NYCA operating reserve is not a measure of – and unrelated to – the amount of excess NCA resources that could potentially provide assistance to NYCA during emergency conditions. Accordingly,

there is no automatic guarantee that the required NCA excess reserves necessary to replenish NYCA operating reserves, e.g., 2,620 MW, will actually be available.

Alternative EA Limit Method – NCA Excess 10-Minute Reserve

From the NYISO report on page 17:

> "…..the study evaluated the excess 10-minute resources of neighboring systems on top of their required reserves. The capability from those 10-minute resources could reasonably be in a position to provide assistance to the NYCA during emergency conditions. The average of this capability over the NYCA's top three (five?) peak load days yielded a value of 2,970 MW."

This evaluation is described in some detail in the NYISO report on pages 8-9. I commend the NYISO staff for coming up with this valuable analysis. I believe that it provides a more reasonable basis for limiting the EA than the above NYISO operating reserve method proposed by the NYISO. See Figure A below taken from the NYISO report's Figure 5. This figure shows the reported amount of resources, in excess of required 10 minute operating reserves for Ontario, Quebec, New England, and PJM (Mid Atlantic) that had the potential of being used to provide emergency assistance to NYCA. This analysis captures NYCA's top five hours for the 2013-15 period, a total of 15 hours.

I estimate that if the NYSRC adopted an EA modeling method, using data from this analysis, the 2016 base case IRM would increase by roughly 0.4%, to 17.8% based on the historical data reported in the NYISO report. See Table A, line 3.

If it is decided to use this method for a sensitivity case, I recommend that following further discussion with operating staff as to the basis, and to get a better understanding, of the data in Figure A:

1. Add at least two additional years of NCA excess reserve data – for the five top hours – to the 2013 to 2015 data base reported in the NYISO report.
2. With input from NYISO operating staff, "throw out" any hours from the data base and make other data adjustments – considering actual load or other conditions – that would be deemed appropriate for the analysis.

Recommendation

I propose that an EA sensitivity case be prepared, for inclusion in the 2017-18 IRM Study, an examination the IRM impact of the NCA Excess 10-Minute Reserve method as discussed above. ICS should also decide whether the NYISO's recommended 2,620 MW EA limit should also be

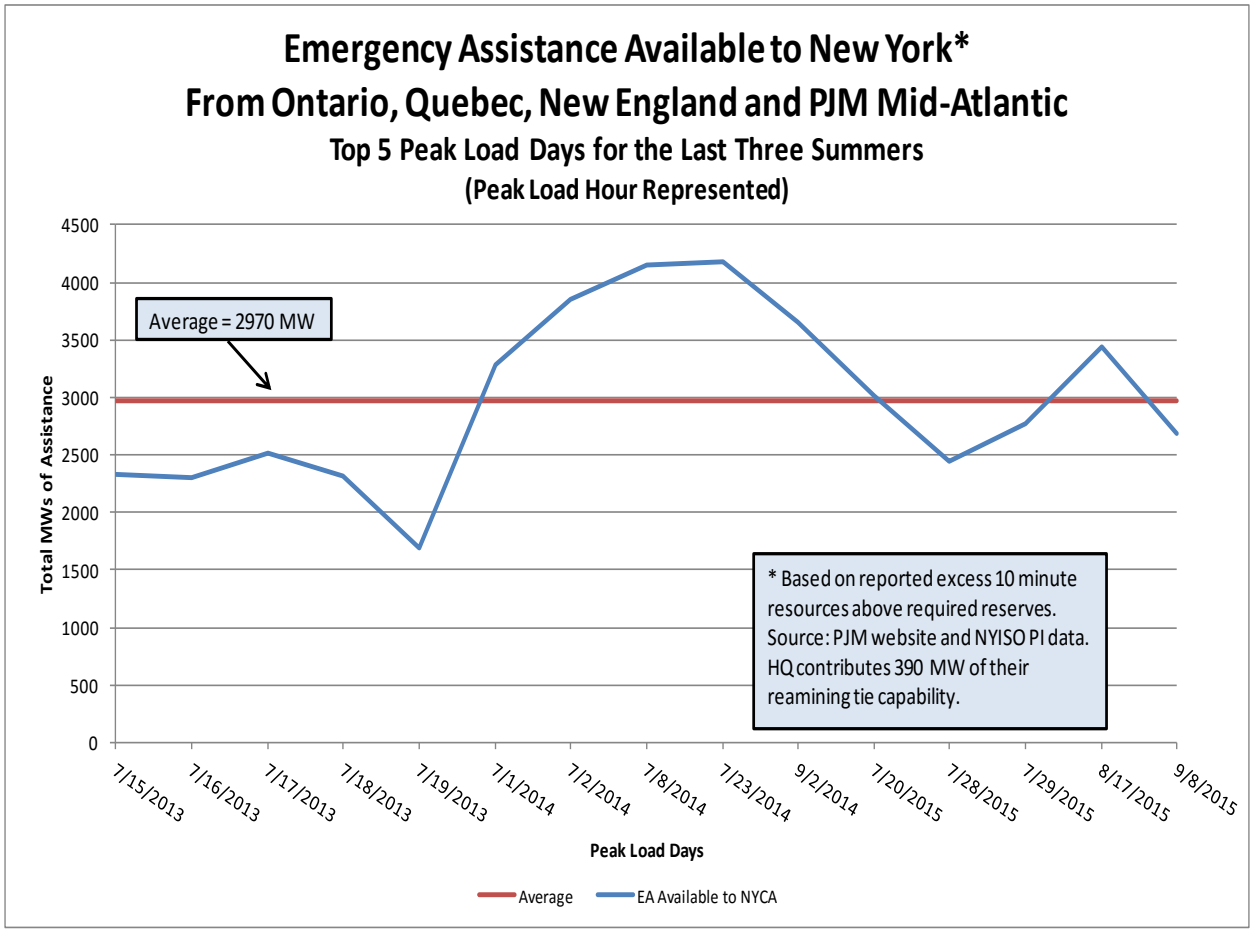
included as an additional sensitivity. Following these sensitivity cases, ICS should continue to evaluate and recommend an EA modeling method for the 2018-19 IRM base case.

Table A
Emergency Assistance Modeling Methods

	EA Modeling Method	EA Limit	Expected EA[1]	EA Impact	IRM
1	Last 5 years' average (present Policy 5 EA method)	6,400 MW[2]	2,850 MW[3]	8.5%[2]	17.4%[4]
2	Operators on Floor	2,200 MW[5]			
3	Neighbor's reported excess reserve margin[6]	2,970 MW[7]	2,700 MW[8]	8.1%[6]	17.8%[6]
4	NYISO operation reserves	2,620 MW[9]	2,380 MW[10]	7.1%[11]	18.8%[12]

[1] Calculation of the Expected EA in this table assumes a 33,500 MW peak load forecast for 2016, consistent with the value stated in the NYISO report (see page 17). This compares to 33,378 MW shown in the 2016-17 IRM Report.
[2] From "Modeling of Emergency Assistance for the NYCA in NYSRC Studies" (NYISO report), Figures 3&4. Excludes total interface transfer capability used for ICAP.
[3] From NYISO report, Table 6. However, Table 6 lists 2850 MW as an "EA limit" – should be an "expected EA."
[4] From NYSRC 2016 IRM report. (Isolated IRM = 25.9%)
[5] From Table 6, but not discussed in the NYISO report.
[6] The EA results shown for this method are based on the excess operating reserve data reported in the NYISO report. Expansion of the data base as recommended in this paper will likely change these results.
[7] From NYISO report, Figure 5 and Table 6.
[8] Estimate.
[9] From Table 6 (NYISO staff recommended EA limit).
[10] 0.071 x 33,500 MW = 2380 MW.
[11] 25.9% (isolated IRM) – 18.8% IRM (from NYISO report) = 7.1%. (This compares to about 7.6% from Fig. 8 of NYISO report.)
[12] From NYISO report.

Figure A: Emergency Assistance from NYCA's Neighbors on Top Five Peak Days[13]



[13] From Figure 5 of the NYISO report, *Modeling of Emergency Assistance for the NYCA in NYSRC IRM Studies.*