A REVIEW

"THE ECONOMIC RAMIFICATIONS OF RESOURCE ADEQUACY WHITE PAPER[1]"

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Purpose of Paper

The white paper, dated January 2013, was prepared by Astrate Consulting for EISPC and NARUC. My review indicates that the main purpose of the paper was to recommend a method for regulators to assess the reasonableness of a region's resource adequacy plan, LOLE criterion, and IRM. It is recommended in the paper that regulators utilize a method that produces the minimum system costs or an optimal economic reserve margin target.

I provide my observations on how the paper may be of interest to the NYSRC at the end of my review.

Survey of Reliability Criteria and IRM used by Eastern Interconnection Regions

Before presenting a proposed economic methodology, the paper presents the results of a survey of resource adequacy criteria and IRM results from a number of regions and utilities. In Table 1, I have provided a sample of survey results depicted in the paper.

Table 1
Sample of Data from the Paper's Table 2 – Reserve Margin and Assumption Impacts

	PJM	NYISO[2]	ISO-NE	Southern Co. (SERC)	SPP
Reliability Criteria	0.1 LOLE	0.1 LOLE	0.1 LOLE	Economics	2.4 LOLH
System IRM	15.3%	16.1%	11.7%	15.0%	10.2%
Weather Uncertainty (LFU)	+ 8.0%	+7.3%	+10.1%	+7.0%	+5.3%
External Assistance Benefit	-1.9%	-8.6%	-5.5%	-3.0%	0%
Wind Impact	0%	+4.7%	0%	0%	0%

Taken at face value, some of data in Table 1 provides some misleading conclusions. For example, for NE it appears that without LFU the NE-ISO IRM would be only 1.6%. Also, it

[1] Prepared by Astrepe Consulting, January 2013.
[2] This data was taken from the NYSRC 2012-13 IRM report.

appears from the table that the NYISO is the only system whose IRM is impacted by wind. However, the paper notes that the reason for this result is that the other systems in the table derate their IRMs to account for wind or include the effective capacity of wind in their IRMs. Without accounting for the impact of wind for these systems masks the true impact of wind and may lead to the inference that the NYISO may not model wind correctly. Therefore, the data as presented makes this comparison meaningless.

Table 1 also shows the extent to which NYSRC takes into account in its IRM model the reserve value of its interconnections to neighboring systems due to emergency assistance benefits – a reduction of 8.6% (8.7% in the 2015 IRM Study) – compared to lower reserve benefits in the other regions depicted in the table.

The paper does not take issue with any region's IRM studies, study assumptions, models, or criteria, including those used for NYSRC IRM studies. Instead, the paper concludes that its survey comparisons point out significant differences between studies and that work could be performed by regulators to assess the reasonableness of each utility's resource adequacy plan. The paper further suggests that IRM targets should evolve to properly balance the costs and benefits of reliability if the 0.1 LOLE criterion is not justified. Although the paper discusses the LOLE criterion in some detail, it does not take a position as to its appropriateness, only that it should be checked by regulators for reasonableness using an economic model. It should be recognized, as pointed out below, that the NYSRC must adhere to the NPCC LOLE criterion of 0.1 days/year.

Previous Studies that Evaluated Economically Optimal Reserve Margins

The paper next reviewed six economic studies that were conducted between 1973 and 2010. Of interest to me is a study that was performed for EPRI in 1978. The study analyzed the reliability economics for four utilities, one of which was LILCO. From a curve in the paper showing total costs as a function of planning reserve margin, the study determined that the optimal reserve for LILCO was in the range of 25 to 35%. Although it is difficult to make a direct comparison with NY LOLE studies because of the likely inconsistency of study assumptions, this compares to the actual LILCO IRM of 18% that I calculated when I was with NYPP, based on LOLE studies.

Case Study and White Paper Recommendations

Astrape performed an independent case study to determine an economic optimal reserve margin. It used a model called the Strategic Energy and Risk Evaluation Model (SERVM), which is an economic resource model that develops an optimal economic reserve margin using economics as well as LOLE. According to the paper, this model calculates traditional reliability metrics, in addition to economic commitment and dispatch which allows economics to be taken into account. The study simulated a portion of the MAAC region. The base case of the study

determined a base case reserve margin of 9.75% based on a 1 in 10 LOLE, compared to an optimal economic reserve margin of 13.0%.

The white paper proposes that there would be a value for regulators to examine the economics of resource adequacy and the physical reliability metrics of the Eastern Interconnection – as well as individual regions – using a similar approach as in the case study. I don't know the status of this proposal since the paper was published two years ago.

One caution I do have about such a study is the uncertainty of key cost assumptions, i.e., the costs of unserved energy and new capacity. In fact, the paper's authors conceded the same concern in their discussion of methods of assessing reserve margins that evaluate minimum system costs.

How the Astrepe Paper May be of Interest to the NYSRC: The LOLE Criterion

The paper discusses the LOLE criterion as applied by several regions in North America, but takes no position concerning its reasonableness. I believe it would be useful to discuss the evolution of the LOLE criterion as used in New York.

During the 1960's, even before the advent of the NYPP, the New York's utilities conducted joint studies that determined separate IRMs for the upstate and downstate regions. These studies utilized the 0.1 LOLE criterion. Later the NYPP also adopted the same criterion.

During the early 1970's when New York's installed reserve levels were very low, voltage reductions were frequently implemented in NYC by Con Edison. I recall that there were numerous complaints by Con Ed customers as a result and that voltage reduction events were regularly highlighted in the NY Times. As a result, the PSC ordered NY utilities to submit to it expanded operating data reports on a regular basis.

The NYPP and then the NYSRC continually improved the IRM model. Examples of major improvements were the inclusion of emergency assistance from interconnected systems and the recognition of emergency operating procedure steps to the model. Both reduced the IRM. Computer programs have also evolved. The NYPP started with a single area reliability program, moved to a two-area program, and then to the multi-area program (MARS) in use today.

The question as to whether 0.1 days/year is appropriate for New York was raised many years ago by the New York Power Pool (NYPP). LOLE studies at the time showed that when NY was at an IRM providing a LOLE of 0.1, the number of voltage reductions numbered in the range of 3 to 5 per year. Based on the above concerns about the actual number of voltage reductions in NYC, the NYPP Planning Committee agreed that the IRM should be planned to avoid no more than five voltage reductions a year, a value consistent at the time with the 0.1 LOLE criterion. Note

that the 2015 IRM Study's Emergency Operating Procedure (EOP) results in Table 2 below shows that the 2015 base case IRM of 17.3% would result in an expectation of about seven voltage reductions per year. Therefore, the appropriateness of 0.1 can be examined by considering the associated EOPs.

Of course with that said, it should be recognized that the NYSRC LOLE criteria must be consistent, i.e., not less stringent, than the NPCC resource adequacy of criterion of 0.1 days/year.

Table 2
Implementation of EOP steps for the 2015 17.3% IRM (from 2015 IRM Report)

Step	EOP	Expected Implementation (Days/Year)
1	Require SCRs	8.9
2	Require EDRPs	7.1
3	5% manual voltage reduction	6.8
4	30 minute reserve to zero	6.8
5	5% remote controlled voltage reduction	6.7
6	Voluntary load curtailment	4.7
7	Public appeals	3.9
8	Emergency purchases	3.6
9	10 minute reserve to zero	3.5
10	Customer disconnections	0.1