An Alternative Approach for Calculating Locality Exchange Factors

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Agenda

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- Appendices
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  - Impact of Changes from Year to Year in the IRM Base Case

Background

MMU Recommendation

- In its 2015 State of the Market report, issued in May 2016, the MMU recommended changes to the NYISO's procedures for clearing capacity markets when capacity provided by resources in Localities is exported.
  - The resource that is providing the capacity remains in the Locality, and helps to meet the locational capacity requirement (LCR) for that Locality.
  - But the procedures in place at that time effectively assumed that the generator no longer existed.

Timeframe for Changes

- The NYISO had to develop and implement changes in these procedures quickly.
  - Due to changes in ISO-NE market rules, capacity could have been exported from a Locality to New England during the 2017-18 capability year.
- This significantly limited the scope of the alternatives that the NYISO could consider.

Current Procedure

- In November 2016, the NYISO filed the procedure that is in effect today.
  - Under this procedure, if capacity is exported from a Locality to an external control area, the NYISO reduces the LCR for that Locality by the product of:
    - The amount of capacity exported and
    - The Locality Exchange Factor (LEF) for exports from that Locality to the importing control area.
  - LEFs are calculated annually for each Locality and each importing control area.

Deterministic Approach

- Currently, LEFs are calculated using a single power flow, in which a modified version of the UPNY/SENY interface binds.
  - Because it only considers this single power flow, this is called the "deterministic approach."
  - Basing the LEF on a single power flow was necessitated by the tight timeframe available for developing and implementing tariff changes.
  - This approach tacitly assumes that whenever there is a loss of load event in New York, there is also a loss of load event in the importing control area.

Probabilistic Approach

- In reality, that single power flow does not reflect conditions that will always prevail whenever there is a loss of load event in New York.
  - Therefore, the NYISO, in conjunction with GE, has been evaluating a probabilistic approach.
  - This is more consistent with the procedures for determining the statewide installed reserve margin (IRM) and LCRs for each Locality, which also use a probabilistic approach.

Results of ISO/GE Study

- Their preliminary results indicate that the LEF for exports from the Lower Hudson Valley (LHV) to New England should be about 59 percent.
  - In contrast, the LEF that was calculated using the deterministic approach was 47.8 percent.
  - This is a significant difference.
  - It indicates that something better than the deterministic approach is needed.
- However, the ISO has indicated concerns with using the probabilistic approach going forward.
  - It takes a lot of time.
  - And it relies upon a lot of assumptions.

Proposal

Objectives

- The alternative approach is intended to produce LEFs that more realistically reflect the extent to which the NYISO can meet LCRs by relying upon resources in Localities that are exporting their capacity.
- It is also intended to address the ISO's other concerns:
  - It is much simpler to implement than the probabilistic approach.
  - And it does not require the NYISO to make any additional assumptions.

Non-Simultaneous Loss of Load Events

- An importing control area will not always experience a loss of load event whenever New York experiences such an event.
  - Because it is based on a single power flow in which both New York and the importing control area experience a loss of load event, the deterministic approach does not account for this.
  - In contrast, the alternative approach accounts for this.
    - This is similar to the probabilistic approach.
    - But the alternative approach accounts for this more simply than does the probabilistic approach.

The Alternative Approach

- Under the alternative approach, the NYISO would differentiate between two types of loss of load events for New York.
  - In the first type, New York and the importing control area simultaneously experience a loss of load event.
  - In the second type, New York experiences a loss of load event, but the importing control area does not experience a loss of load event.
- The NYISO would determine an LEF for each type of loss of load event.
  - The LEF reflects the degree to which the NYISO, during that kind of loss of load event, can rely on capacity provided by resources in a Locality that have exported their capacity.
- The NYISO would then calculate an effective LEF, which is the weighted average of the LEFs for each type of load event.
  - The weights reflect the probability that each type of loss of load event will occur.
- LCRs would be based on the effective LEFs.

LEFs During Simultaneous Loss of Load Events

- First, consider how to calculate the LEF during the first type of loss of load event.
  - In this case, both New York and the importing control area both experience a simultaneous loss of load event.
  - The current deterministic approach produces an estimate of the LEF would be **for this type of loss of load event.**

LEFs During Non-Simultaneous Loss of Load Events

- But this is not a reasonable estimate of what the LEF would be in the second type of loss of load event.
  - In this case, New York has a loss of load event and the importing control area does not.
  - In this case, there is no obligation for the NYISO to send energy to the importing control area.
  - **All** of the capacity provided by resources in Localities should count towards meeting the LCR for that Locality, so the LEF should be 100% for this type of loss of load event.
    - Moreover, if the importing control area experiences a loss of load event, the NYISO would be required to send it energy only if the importing control area needs that energy.

Calculating the Effective LEF

- Using the alternative approach would have produced an effective LEF of 61.4 percent for 2017-18 for exports from the LHV to New England.
  - When New York experienced a loss of load event in the 2017-18 IRM base case:
    - There was a 74% chance that New England also experienced a loss of load event.
    - There was a 26% chance that New England did not experience such an event.
  - Inserting these probabilities into the equation above, along with LEFs for the two types of loss of load events, yields:

$$74\% \times 47.8\% + 26\% \times 100\% = 61.4\%.$$

- This is much closer to the 59 percent preliminary result reported for the probabilistic approach.

Meeting the LOLE Criterion

- The deterministic approach sets LCRs higher than needed to meet the 0.1 days per year LOLE criterion.
  - As a result, consumers incur unnecessary capacity costs.
- The alternative approach should produce LCRs that (together with the IRM) meet that criterion, without exceeding it.
  - Suppose that a generator in the LHV exports 100 MW of capacity to New England.
    - In 74 percent of the loss of load events in New York, 47.8 MW of that capacity can count towards that requirement.
    - In the remaining loss of load events, all 100 MW can count towards that requirement.
    - Therefore, on average, 61.4 MW of that capacity should count towards the G-J capacity requirement.

Meeting the LOLE Criterion (cont.)

- In this example, the deterministic approach would reduce the requirement by only 47.8 MW.
  - Therefore, the requirement is 61.4 – 47.8 =13.6 MW higher than necessary.
- In contrast, the alternative approach would reduce the requirement by 61.4 MW.
  - It recognizes that when there are simultaneous loss of load events in New York and New England, only 47.8 MW of LHV capacity provided by the exported resource can be replaced by ROS capacity.
  - Consequently, the flow on the modified UPNY-SENY interface in such a loss of load event is the same as in the deterministic analysis.

Conclusion

Conclusion

- The alternative approach will produce effective LEFs and LCRs that:
  - Recognize that the importing control area will not always experience a loss of load event whenever New York experiences such an event.
  - Can be calculated easily.
  - Do not require the NYISO to make assumptions in addition to those made in the IRM base case.
  - Should meet the 0.1 days per year LOLE criterion, without exceeding it.
- In addition, the appendices demonstrate that the alternative approach:
  - Does not require generator-specific data.
  - Should not produce effective LEFs that fluctuate excessively from year to year.

Appendix A:
Accounting for Resources That Are Not Always Available

Potential Resource-Specific Adjustments

- The preceding calculations are based on the probability that the importing control area experiences a loss of load event when New York has a loss of load event.
  - Suppose that a given resource is not always available.
    - Then the probability that the importing control area will experience a loss of load event when New York has a loss of load event **and the generator is available** could differ from the probability used above.
  - Accounting for this would affect the effective LEFs—but not by much.

Impact of Resource-Specific Adjustments

- For example, consider a generator in the LHV that is exporting to New England, and consider 100 loss of load events in New York.
  - As we know, in the IRM base case, there will also be a loss of load event in New England in about 74 of those events.
- Also assume this generator is available during 95 percent of loss of load events in New York.
  - In that case, the generator will be available in about 95 of those 100 loss of load events.
- Finally, assume that generator is **always** available during simultaneous loss of load events in New York and New England.
  - Then, during the 95 loss of load events in New York in which the generator was available, there was also a loss of load event in New England in 74 of those events.

Impact of Resource-Specific Adjustments (cont.)

- Therefore the probability that New England will experience a loss of load event when New York experiences such an event **and the generator is available** is 74 out of 95, or 77.9%.
  - Modifying the effective LEF calculation to account for this would cause it to fall to:

    $$77.9\% \times 47.8\% + 22.1\% \times 100\% = 59.3\%.$$

  - Alternatively, if the generator is **always** available when there is a loss of load event in New York but not in New England, its effective LEF would rise to:

    $$72.6\% \times 47.8\% + 27.4\% \times 100\% = 62.1\%.$$

Recommendation

- In reality, it is unlikely that **all** of a given resource's outages would occur when there are simultaneous loss of load events.
  - It is also unlikely that they would **all** occur when New York experiences a loss of load event and the importing control area does not.
  - So accounting for this would produce even less of an impact on effective LEFs than was shown on the preceding slide.
- This does not seem to be a large enough impact to justify the additional complexity of calculating generator-specific LEFs.

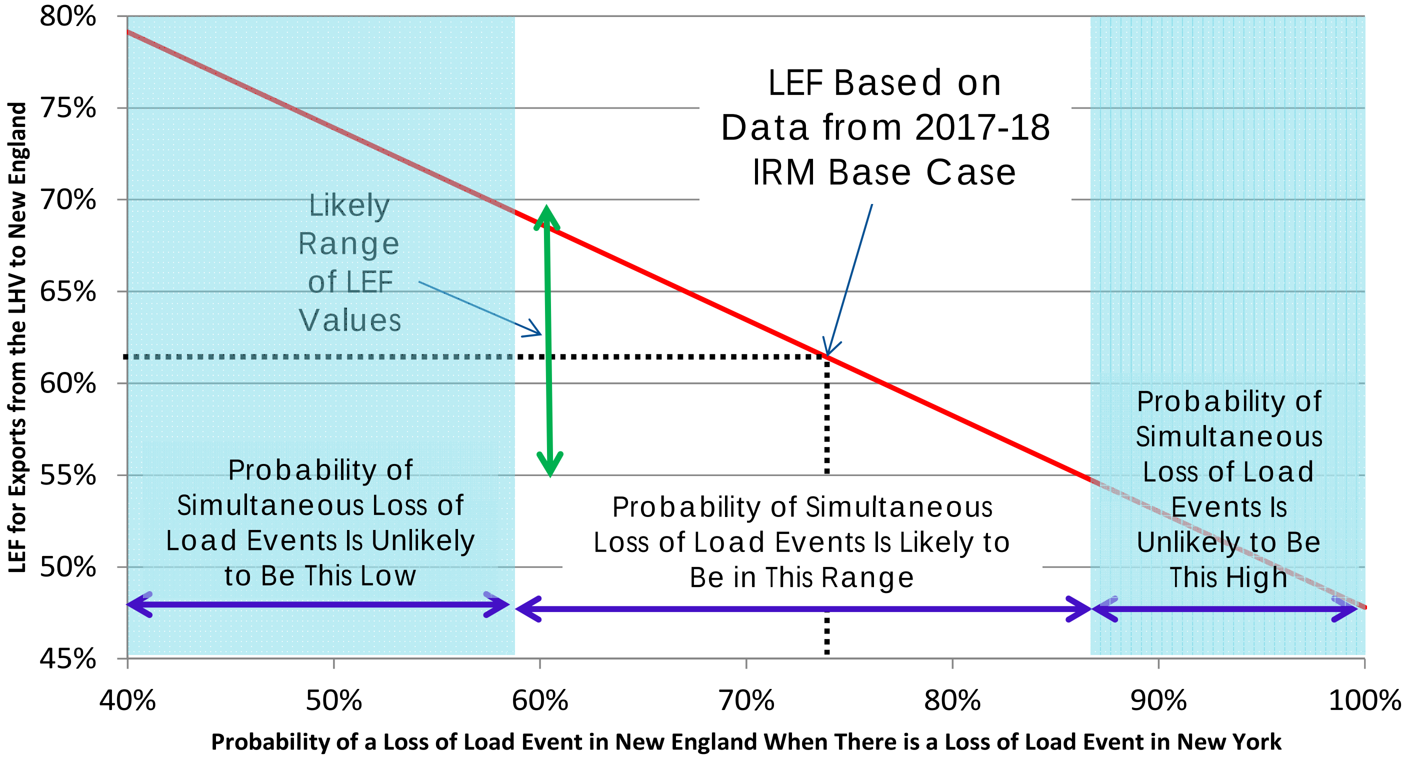
Appendix B: Impact of Changes from Year to Year in the IRM Base Case

Changes in the Probability of Simultaneous Loss of Load Events

- The NYISO will recalculate effective LEFs every year.
  - The probability that the importing control area will experience a loss of load event when New York experiences one may not be the same in every IRM base case.
  - The LEFs would change from year to year as a result.
- However, this should not produce large changes in effective LEFs from year to year.
  - The graph on the following slide shows how the LEF for exports from the LHV to New England would be affected by changes in the probability that New England has a loss of load event when New York has one.

Likely Range of LEFs

- The effective LEF for exports from the LHV to New England should fall between 55 percent and 70 percent.



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