

LCR Optimizer Enhancements Market Design

John Meyer

Senior Market Solutions Architect

Business Issues Committee

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Agenda

- Background
- Overview of Enhancements
- Proposed Tariff Change
- Next Steps

Background

Previous Discussions

Date	Working Group	Links to Materials
February 7, 2023	ICAPWG/MIWG	https://www.nyiso.com/documents/20142/36079056/3%20LCROpt_MIWG_020723_final.pdf
April 27, 2023	ICAPWG/MIWG	https://www.nyiso.com/documents/20142/37254128/LCROpt_MIWG_042723_1%20(002).pdf
October 19, 2023	ICAPWG/MIWG	https://www.nyiso.com/documents/20142/40696384/LCROpt_MIWG_101923_2.pdf
November 10, 2023	ICAPWG/MIWG	https://www.nyiso.com/documents/20142/41130653/LCR%20Optimizer%20Enhancements%2011102023.pdf
November 10, 2023	ICAPWG/MIWG	https://www.nyiso.com/documents/20142/41130653/LCR%20Optimizer%20Enhancements%20CIA%20Draft%20FOR%20POSTING2.pdf

Background

- Since 2019, the NYISO has utilized an economic optimization software (LCR Optimizer) to establish the Locational Minimum Installed Capacity Requirements (LCRs) for NYC, LI and G-J Locality. The LCR Optimizer is designed to produce least cost LCRs while maintaining the New York State Reliability Council (NYSRC) approved final installed reserve margin (IRM).
- Since implementing the LCR Optimizer, multiple concerns have been raised regarding the year over year stability of the LCRs and the transparency of the optimization function.
- Re-examining this process and the methodology could lead to improvements in the stability and transparency of the LCRs.

Overview of Enhancements

Scope

- **Deliverable: 2023 – Market Design Complete**
- **Investigate the need for enhancements to the LCR Optimizer (and, if warranted, develop the necessary modifications) to improve the stability and transparency of the LCRs, with the following two focuses:**
 - Reviewing the format of cost curves used in the LCR Optimizer
 - Reviewing the appropriateness of the objective function in the LCR Optimizer

Scope (cont.)

Transmission Security Limit (TSL) floors

- Procedures for determining and applying TSL floor values in the LCR Optimization are NOT in scope for this project.
- The proposed changes to the LCR Optimizer in this project assume that TSL floors continue to lower bound the LCR values and may constrain the solution for one or more capacity zones.
- The next steps for addressing transmission security in the capacity market and alignment with NYISO Planning Department studies will be discussed separately from this project.

Recommendation #1

Implement the investment cost (or “area under the curve”) objective function change in the LCR optimizer

This represents local installed capacity as an “investment” (or supply) cost to be minimized versus the current single-buyer “procurement” cost. This also mathematically yields a better conditioned optimization problem and promotes more consistent results from the solver.

Revised Objective Function

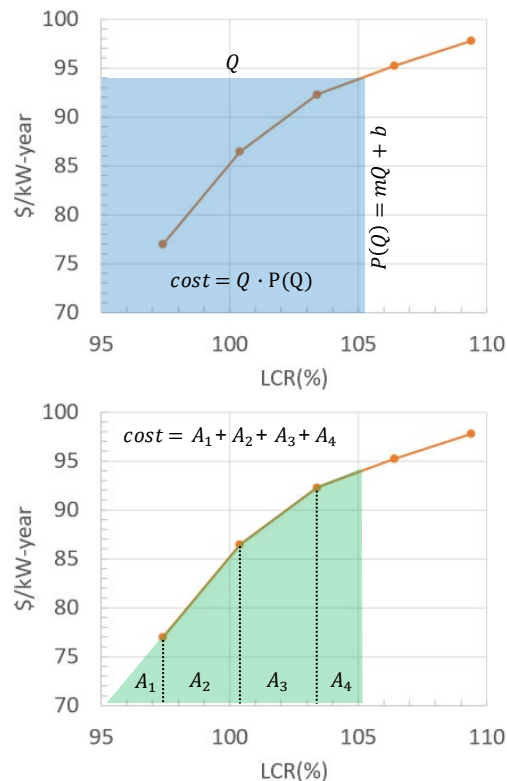
What should the LCR optimization minimize?

- **Current:** Total Procurement Cost – Every MW of capacity is priced like the last MW. The cost from a single buyer perspective is minimized, with potential substitution of the competitive “product” (LCR) with another to minimize those costs to the buyer.
- **Proposed:** Total Investment Cost – A rollup of incremental investment cost (area under the curve). A competitive market form, where the total cost of supply itself is minimized.

The LCR Optimizer minimizes total procurement cost today, but minimizing total investment cost is more appropriate to:

- Solve for LCRs considering the equilibrium marginal investment cost that meets the reliability metric, and
- Improve solver ability to find the global minimum consistently.

An example with Load Zone K is shown here.



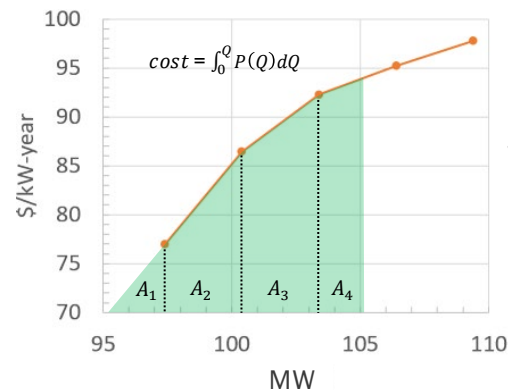
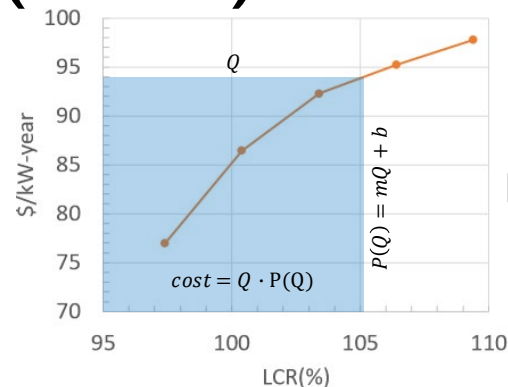
Revised Objective Function (cont.)

The proposed change to the objective function is as follows

$$\begin{aligned}
 & \text{Minimize:} \\
 \text{Cost of Capacity Procurement} &= [Q_J + LOE_J] \times P_J(Q_J + LOE_J) + [Q_K + LOE_K] \times P_K(Q_K + LOE_K) \\
 &+ [Q_{(G-J)} + LOE_{(G-J)} - Q_J - LOE_J] \times P_{(G-J)}(Q_{(G-J)} + LOE_{(G-J)}) \\
 &+ [Q_{NYCA} + LOE_{NYCA} - Q_{(G-J)} - LOE_{(G-J)} - Q_K - LOE_K] \times P_{NYCA}(Q_{NYCA} + LOE_{NYCA})
 \end{aligned}$$



$$\begin{aligned}
 OBJ &= \int_0^{Q_K+LOE_K} NetCONE_K(Q_K) dQ_K + \int_0^{Q_J+LOE_J} NetCONE_J(Q_J) dQ_J \\
 &+ \int_{LOE_J}^{Q_{GHI}+LOE_{GHIJ}} NetCONE_{GHI}(Q_{GHI}) dQ_{GHI} \\
 &+ \int_{LOE_{GHIJ}+LOE_K}^{Q_{ROS}+LOE_{NYCA}} NetCONE_{ROS}(Q_{ROS}) dQ_{ROS}
 \end{aligned}$$



Recommendation #2

Determine the net cost of new entry (CONE) curves without the level of excess (LOE) adder

Omitting the LOE adder from the net CONE curves makes the revised LCR Optimizer formulation simpler.

The timing between the LCR Optimizer software revision deployment and 2025-2029 ICAP Demand Curve reset (DCR) is such that the LCR study for the 2025-2026 Capability Year may be the first to incorporate these changes. An interim solution should not be needed.

Note: Information relating to the net CONE curves for use in the LCR process is developed as part of each quadrennial DCR

Revised Net CONE Curves

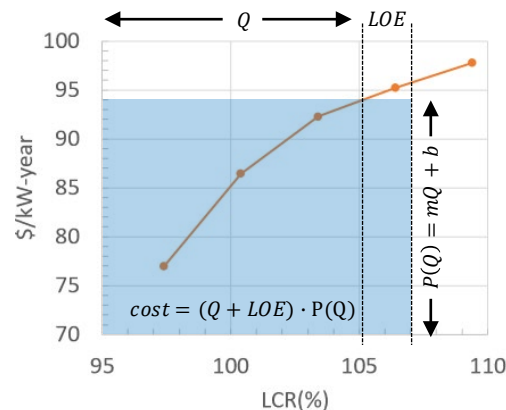
Currently, net CONE curves are defined as a function of %LCR to cost with the LOE MW adder included implicitly.

As a result, some of the LOE MW adder terms in the objective function are implied, but not actually coded, as these are “baked in” to the development of the net CONE points.

In the Load Zone K term, cost is a function of Q (%LCR). The LOE adder is implicit to the curve.

Minimize:

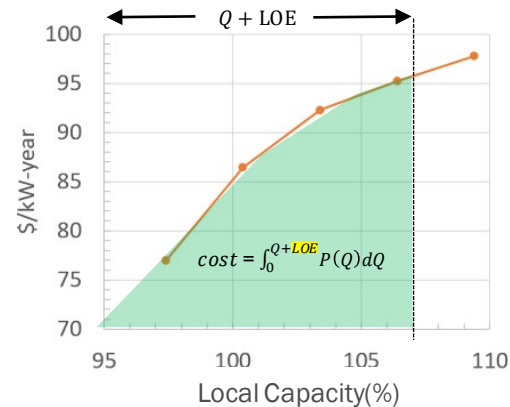
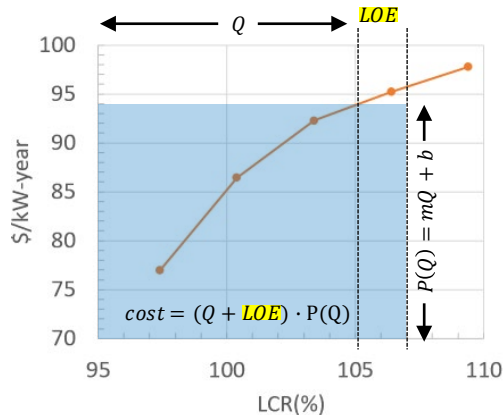
$$\begin{aligned} \text{Cost of Capacity Procurement} = & [Q_J + LOE_J] \times P_J(Q_J + LOE_J) + [Q_K + LOE_K] \times P_K(Q_K + LOE_K) \\ & + [Q_{(G-J)} + LOE_{(G-J)} - Q_J - LOE_J] \times P_{(G-J)}(Q_{(G-J)} + LOE_{(G-J)}) \\ & + [Q_{NYCA} + LOE_{NYCA} - Q_{(G-J)} - LOE_{(G-J)} - Q_K - LOE_K] \times P_{NYCA}(Q_{NYCA} + LOE_{NYCA}) \end{aligned}$$



Revised Net CONE Curves (cont.)

If the net CONE curve LCR points were to exclude the LOE adder in the curve development, the relation to the revised LCR Optimizer objective function is simpler to implement.

This modification is needed because while the current optimization can include the LOE adder in the quantity term and exclude it in the cost lookup, the new method can only include it into the integration bounds.



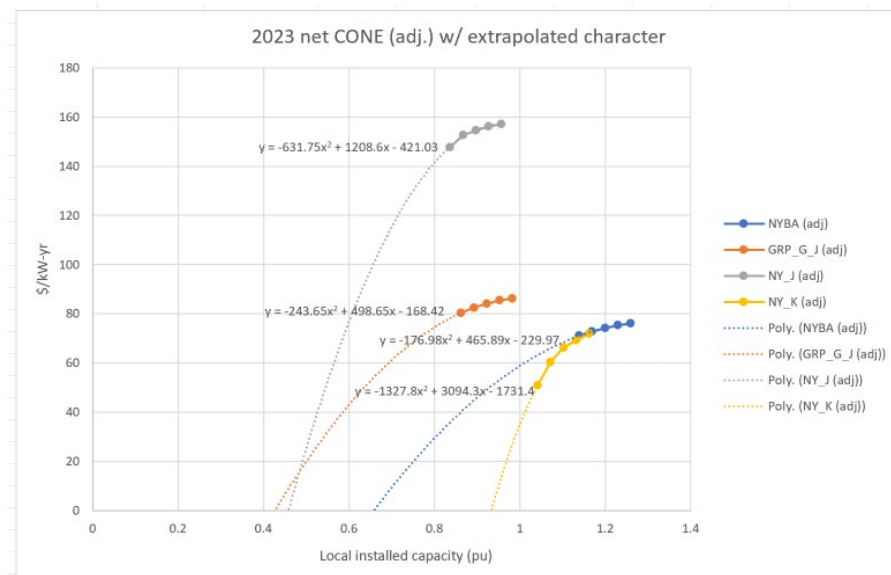
Recommendation #3

Development of additional net CONE test points in the current DCR project

Knowing the character of the net CONE curves beyond the range of plausible LCR values becomes important with the proposed objective function modification as it is a view of total investment.

To best capture this, we plan for additional energy and ancillary services revenue modeling test points to be conducted. This additional modeling would first be performed in connection with the ongoing 2025-2029 DCR

* The figure to the right depicts an example of what the full shape of the net CONE curves may look like.



Caveat

- **This new LCR formulation has not been tested.**
- **The NYISO strives to validate the new formulation meets the goals of this project, however this will need to be confirmed with prototyping and testing.**
 - NYISO will return to stakeholders with an update on these testing efforts at future ICAPWG meetings.

Proposed Tariff Change

Proposed Tariff Change

MST 5.11.4(a) - LSE Locational Minimum Installed Capacity Requirements

- The NYISO proposes a clarifying edit (as shown below and in the tariff redline posted with the meeting material) to account for the proposed change to the objective function (i.e., minimizing of total investment cost instead of procurement cost).

“The ISO shall compute the Locational Minimum Installed Capacity Requirements in accordance with ISO Procedures:

(a) to minimize the total investment cost of capacity at the prescribed level of excess....”

- **The proposed tariff revision is provided for informational purposes as part of reviewing the overall market design proposal.**
 - The NYISO is not seeking an endorsement from BIC to recommend Management Committee (MC) approval of any tariff revisions as part of today’s vote

Next Steps

Next Steps

- **Q1/Q2 2024: currently anticipated timeframe to review test results at ICAPWG**
- **Mid-2024: currently targeted timeframe to seek MC approval of the proposal**
 - A supplemental Consumer Impact Analysis addressing quantitative results will be provided prior to seeking MC approval
- **Subject to obtaining all necessary approvals, currently targeting to implement enhancements for the determination of LCRs applicable for the 2025-2026 Capability Year**