# LCR Optimizer Enhancements- Consumer Impact Analysis: Part 1

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# Agenda

- Background

- Objectives of the LCR Optimizer Enhancement Project

- Consumer Impact Analysis Evaluation Areas

- Cost Impact and Market Efficiency Methodology and Assumptions

- Next Steps

# Background

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- 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 NYSRC's 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.

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# LCR Optimizer Enhancement Presentations

- February 7 ICAP/MIWG: LCR Optimizer Enhancements - Kickoff

- April 27 ICAP/MIWG: LCR Optimizer Enhancements – Update

- June 27 ICAP/MWIG: LCR Optimizer Enhancements- Proposed Consumer Impact Analysis  Methodology

- October 19 ICAP/MIWG:  LCR Optimizer Enhancements- Update

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# LCR Optimization Objectives and Recommendations

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# LCR Optimizer Enhancement Objectives and Progress

- Investigate the need for (and, if warranted, develop the necessary) modifications and enhancements to the LCR Optimizer to improve the stability and transparency of the LCRs.
  - Review the appropriateness of the current objective function in the LCR Optimizer.

- The NYISO has explored a change in the objective function from minimizing total procurement costs to minimizing total production costs.

Note that procedures for determining and applying transmission security limit (TSL) floor values in the LCR Optimization are not in scope for this project. (See April 27 2023 LCR Optimizer Enhancements – Update presentation)

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# Project Recommendation

There are three recommendations for the modifications to the LCR optimization software and process.

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 single-buyer 'procurement' cost. As well, this mathematically yields a better conditioned optimization problem and promotes consistent results from the solver.
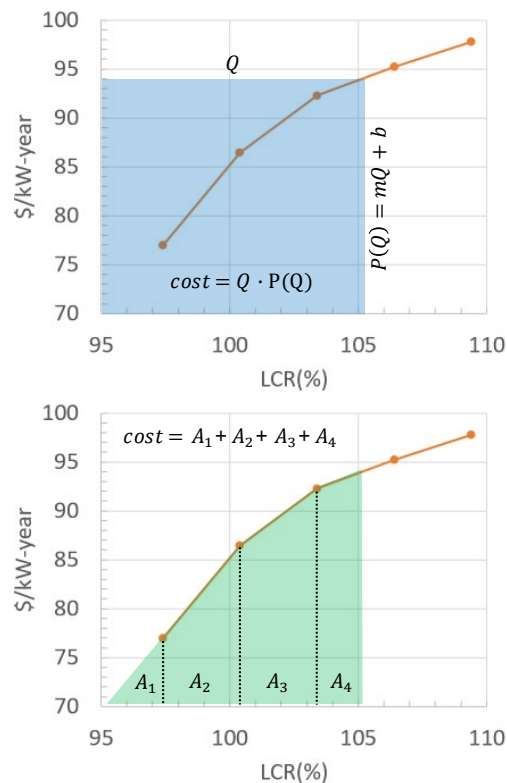
# Procurement vs. Investment Cost

**What should the LCR optimization minimize?**

- **Total Procurement Cost (Current)** – 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.

- **Total Investment Cost (Proposed)** – 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 <u>the equilibrium marginal investment cost that meets the reliability metric</u>, and

- Improve solver ability to find the global minimum consistently.

An example with Load Zone K is shown here.

$cost = Q \cdot P(Q)$

$P(Q) = mQ + b$

$Q$

$cost = A_1 + A_2 + A_3 + A_4$

$A_1$ $A_2$ $A_3$ $A_4$

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# Recommendation

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

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

*Note: Various net CONE curves are developed in connection with each Installed Capacity Demand Curve reset (DCR) for use in the LCR optimization process

The timing between the LCR Optimizer software revision deployment and ongoing 2025-2029 DCR project 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.

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# Proposal

## 3) Additional net CONE test points

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 developed in connection with the 2025-2029 DCR project.

* The full shape of the net CONE may look like this.



2023 net CONE (adj.) w/ extrapolated character

$y = -631.75x^2 + 1208.6x - 421.03$

$y = -243.65x^2 + 498.65x - 168.42$

$y = -176.98x^2 + 465.89x - 229.97$

$y = -1327.8x^2 + 3094.3x - 1731.4$

Legend:
- NYBA (adj)
- GRP_G_J (adj)
- NY_J (adj)
- NY_K (adj)
- Poly. (NYBA (adj))
- Poly. (GRP_G_J (adj))
- Poly. (NY_J (adj))
- Poly. (NY_K (adj))

Axes: $/kW-yr (vertical), Local installed capacity (pu) (horizontal)

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# Update

Comments from the Market Monitoring Unit (MMU) and stakeholders have prompted a revision of the proposed objective function change to better represent nested zones.

- LCRs are determined for zone J, K, and GHIJ locality. The NYCA installed capacity requirement is held constant, set by the NYSRC's IRM.

- 2 nested capacity zones are represented, GHI and rest of state or ROS (the combination of zones A,B,C,D,E,F).

- While the net CONE curves are determined for J, K, GHIJ, and NYCA, the objective function rolls up cost in the non-overlapping areas where capacity is located (J, K, GHI, and ROS).

- The J and K terms are straight-forward in development of the total investment cost objective, but the GHI and ROS terms (nested within GHIJ and NYCA, respectively) require a different approach.

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# Next Steps

- **The NYISO will validate that the new formulation meets the goals of this project. The new formulation will need to be confirmed with prototyping and testing.**

  - NYISO will return to stakeholders with an update on these testing efforts.

  - The NYISO currently anticipates that initial testing data will be available by the end of November/December 2023.

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# Consumer Impact Analysis Evaluation Areas

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# Consumer Impact Analysis Evaluation Areas

- The Consumer Impact Analysis looks to qualitatively and, where possible, quantitively assess the short and long-term impacts of the project.
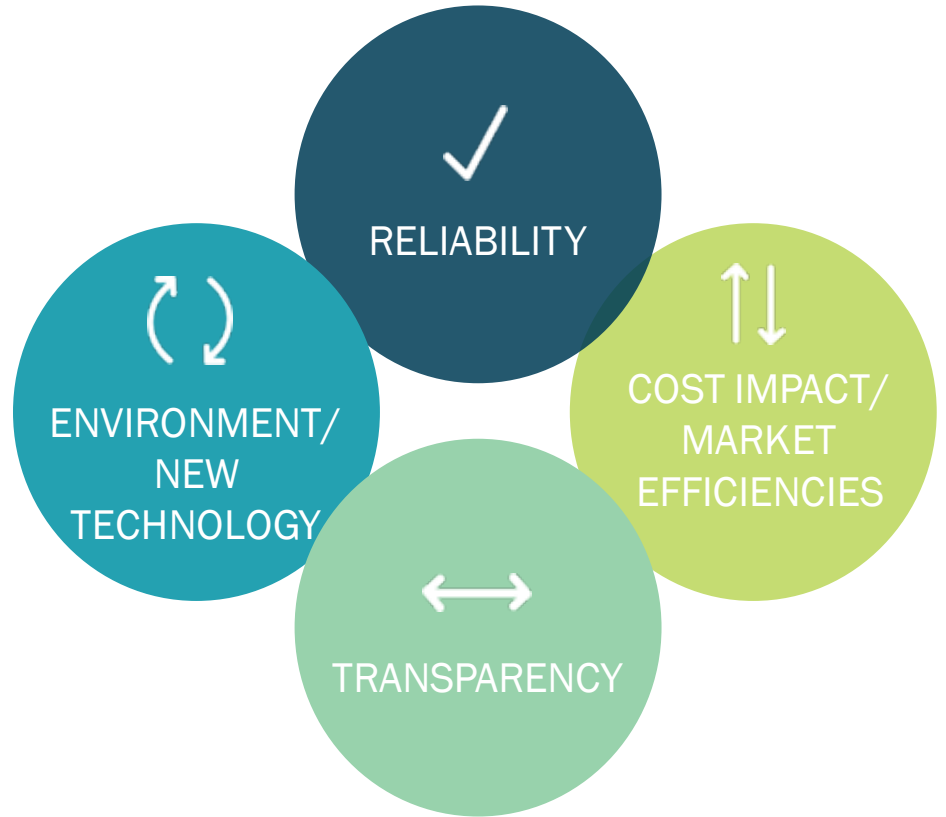
# Consumer Impact/Market Efficiencies Methodology

- **Energy Market Impact:**
  - No Energy Market impact expected.
- **Capacity Market Impact:**
  - Using the GE multi-area reliability simulation (MARS) analysis, evaluate how using the new objective function (based on minimizing production costs) impacts the capacity procurement costs for NYCA.
  - Using the results from the revised LCR Optimizer (employing the new, updated, objective function), the analysis will compare the NYCA capacity procurement costs using the original and revised methods.
  - This is part of the work that the NYISO has contracted with GE Energy Consulting.
  - The analysis uses the Final Base Case (FBC) for the 2023-2024 IRM study.
    - See the NYCA IRM Requirement Study 2023-2024 Final Base Case (FBC) Model Assumptions Matrix for more information about FBC assumptions.
  - The analysis does not include the use of TSL floors to focus the assessment on the impact to LCRs attributable to only the new objective function.

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# Consumer Impact/Market Efficiencies - Results

- Recently developed refinements to the treatment of nested zones in the objective function (described above) have impacted the timeline for producing results.
  - The data is not yet available and is not expected to be available prior to seeking stakeholder approval at the Business Issues Committee (BIC) in December 2023.
- The NYISO will present results at an ICAP/MIWG meeting prior to seeking stakeholder approval of the proposed enhancements at the Management Committee (MC).

# Environmental/New Technology Impacts

- LCRs optimized for economics and reliability anchor the capacity market demand curves such that, by virtue of maximizing utility with respect to reliability, new capacity will be incentivized efficiently based on its reliability contribution.

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# Reliability Impacts

- The proposed enhancements to the LCR Optimizer objective function will enable the solver to determine LCRs that appropriately reflect an equilibrated marginal cost per unit of the reliability metric (LOLE) that meets the NYCA LOLE requirement of no more than 0.1 days/ year (or lower as determined by NYSRC in establishing the IRM).

- Using a production (investment) cost minimization strategy to optimization facilitates the use of net CONE curves that appropriately translate to the same values as marginal cost curves, and is a competitive market structure.

- LCRs optimized for economics and reliability maximize the utility of installed capacity in terms of its reliability contribution.

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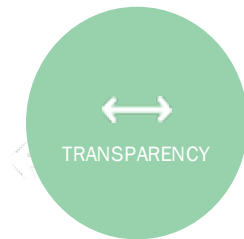
# Impacts on Transparency

- LCRs better optimized for both economics and reliability will provide transparency of the amounts of resources available and where new units should locate.

- More transparent information about the CONE curves
  - CONE curves without the level of excess conditions adder
  - Additional net CONE curve points

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# Next Steps

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# Next Steps

- **December 2023: Expect to seek stakeholder approval at BIC**

- **Future ICAP/MIWG meeting(s): TBD based on availability of results**

  - Presentation of the Consumer Impact Analysis quantitative results prior to seeking stakeholder approval at MC.

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# Our Mission & Vision

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## Mission
Ensure power system reliability and competitive markets for New York in a clean energy future

🔍

## Vision
Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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# Questions?

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