Capacity Zones:

Boundary Determination, Administration and Design Implementation Considerations

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Overview

- **Background**
- **2013 Determination of New Capacity Zone Boundary**
  - ***Technical Analysis Methodology***
- **Locational Minimum Installed Capacity Requirement (LCR) for the new G-J Locality**
- **Capacity Auctions Overview**
- **Pricing Hierarchy**
- **Capability/Monthly Auctions**
- **Spot Auction**
  - ***ICAP Demand Curve***
- **Market Implementation**

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Boundary Determination

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Background

- **The New York power system is designed to meet the NPCC/NYSRC reliability criterion that the loss of load expectation (LOLE) shall be, on average, no more than 0.1 day/year.**
- **The criterion is met by adequate capacity resources and secure transmission systems.**
- **The 2013/2014 New York power system at the designed criterion:**
  - ***The statewide Installed Capacity Requirement is 117.0%.***
  - ***The LCRs are 86% for Load Zone J (New York City) and 105% for Load Zone K (Long Island).***

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Background

- **Two aspects of bulk power system reliability**
  - ***Adequacy***
    - **Ability to supply aggregate requirements of electricity to consumers with consideration of available capacity resources and transmission facilities.**
  - ***Security***
    - **Ability to withstand disturbances such as unanticipated loss of system components.**

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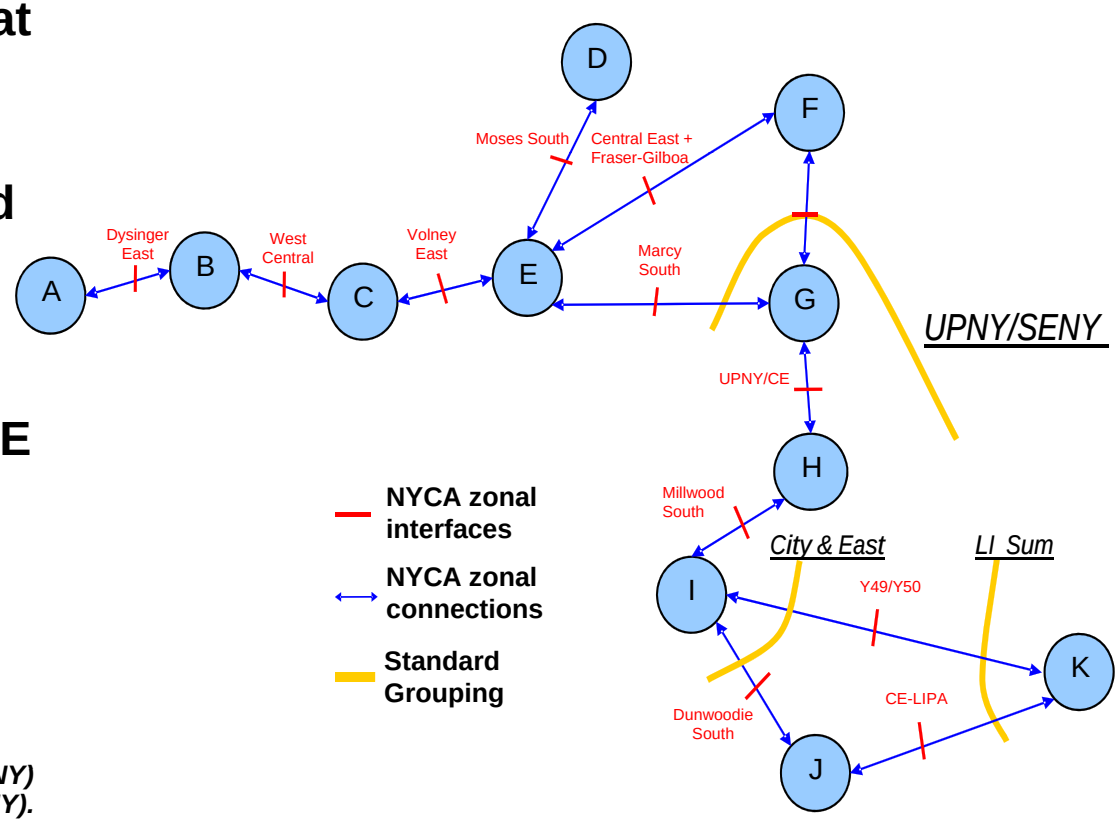
2013 Determination of New Capacity Zone Boundary

- **New York transmission system has a constraint at the UPNY/SENY* interface.**
- **Load Zones G, H, I, J, and K are on the constrained side.**
- **The contribution of capacity to meet the LOLE criterion can be constrained by transmission and is therefore dependent on location.**

This interface is between Load Zones A-F (UPNY) and G-K (Southeast NY).



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Technical Analysis Methodology

- **Aspect 1: Resource adequacy analysis**
  - ***Primary analysis (system at criteria) -- How much capacity can be relocated interchangeably among members of a group of Load Zones?***
  - ***Additional analysis (system better than criteria) -- To what extent can incremental capacity added in one Load Zone benefit its neighboring Load Zones?***
- **Aspect 2: Transmission security analysis**
  - ***Can the zonal capacity be transferred securely over the bulk power transmission system?***

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Aspect 1: Resource Adequacy Analysis

- **The probabilistic analysis starts at the NYCA LOLE criterion of 0.1 day/year.**
- **Primary analysis: Relocate capacity in Load Zones GHI to Load Zone J or K without violating the NYCA LOLE criterion.**
- **Additional analysis: Add incremental capacity to Load Zone J or K and compare the impact on LOLE for Load Zones GHI.**

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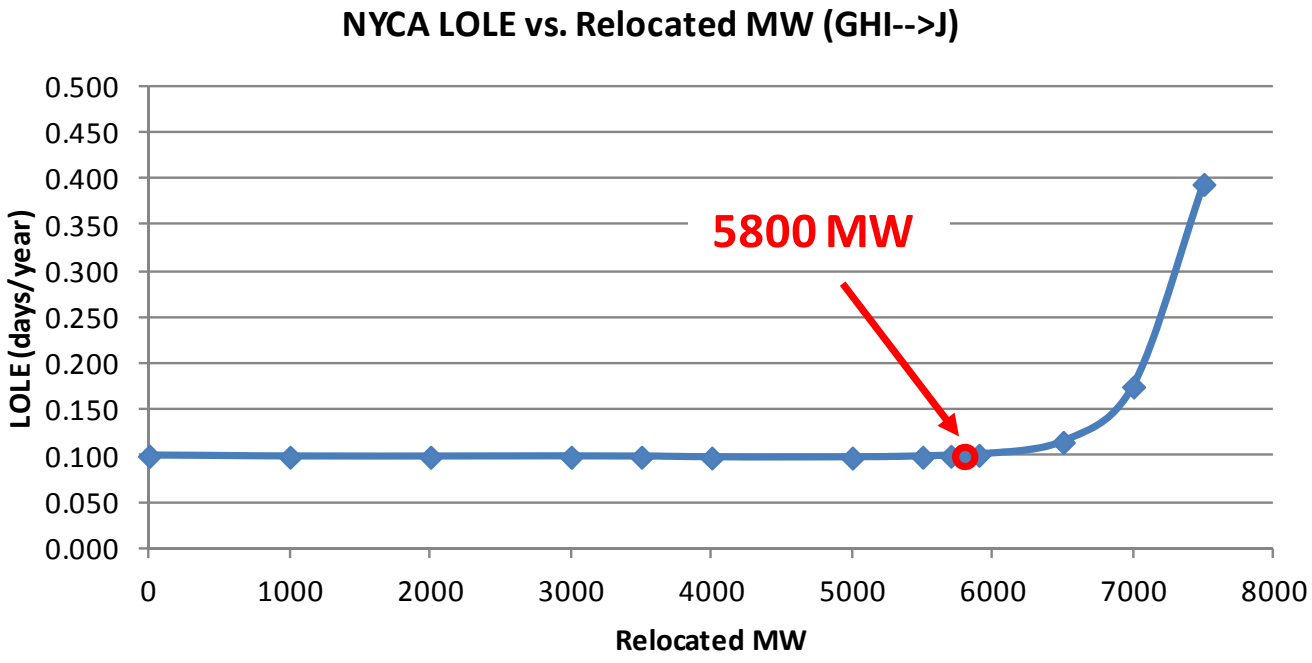
Results of Primary Analysis

- **Up to 5800 MW of capacity in Load Zones GHI can be relocated to Load Zone J.**
  - ***All the existing capacity in Load Zones GHI is "relocatable" with Load Zone J.***



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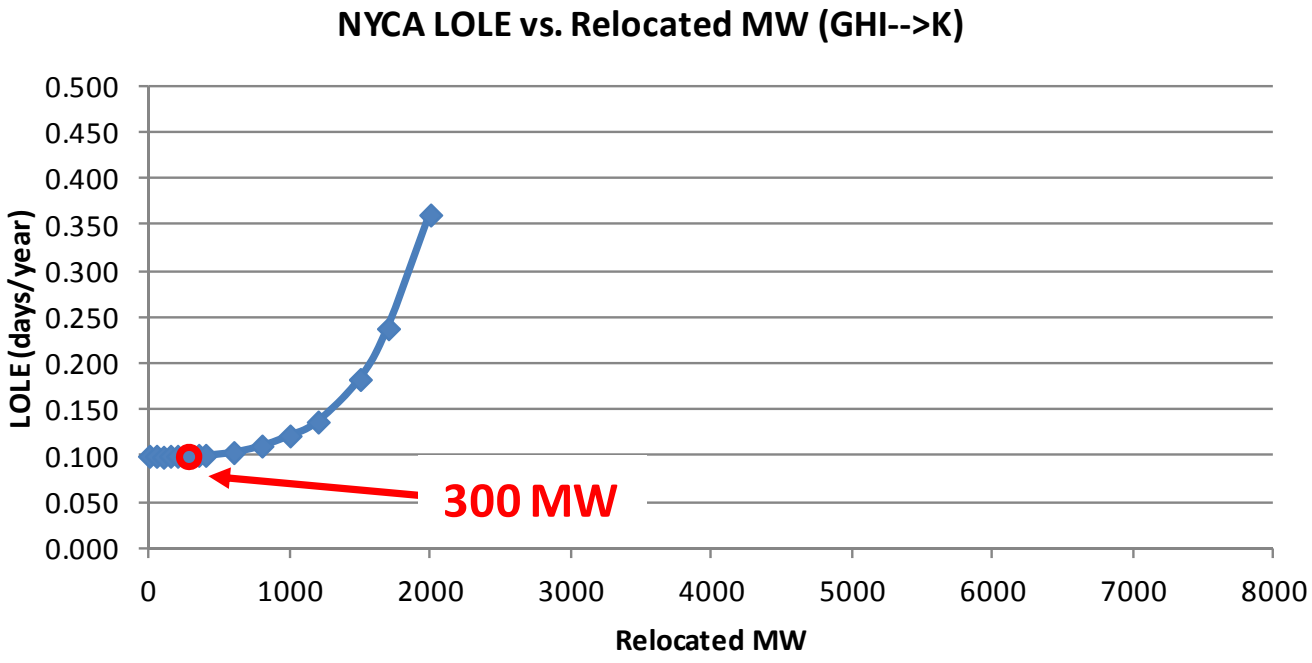
Results of Primary Analysis (Cont.)

- **Up to 300 MW of capacity in Load Zones GHI can be relocated to Load Zone K.**
  - ***Less than 7% of the existing capacity in Load Zones GHI is "relocatable" with Load Zone K.***



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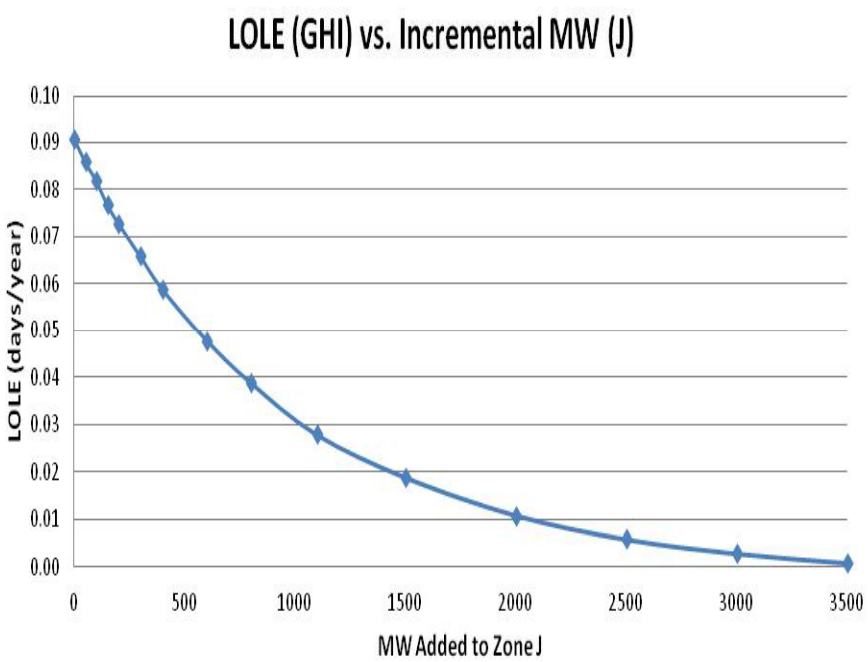
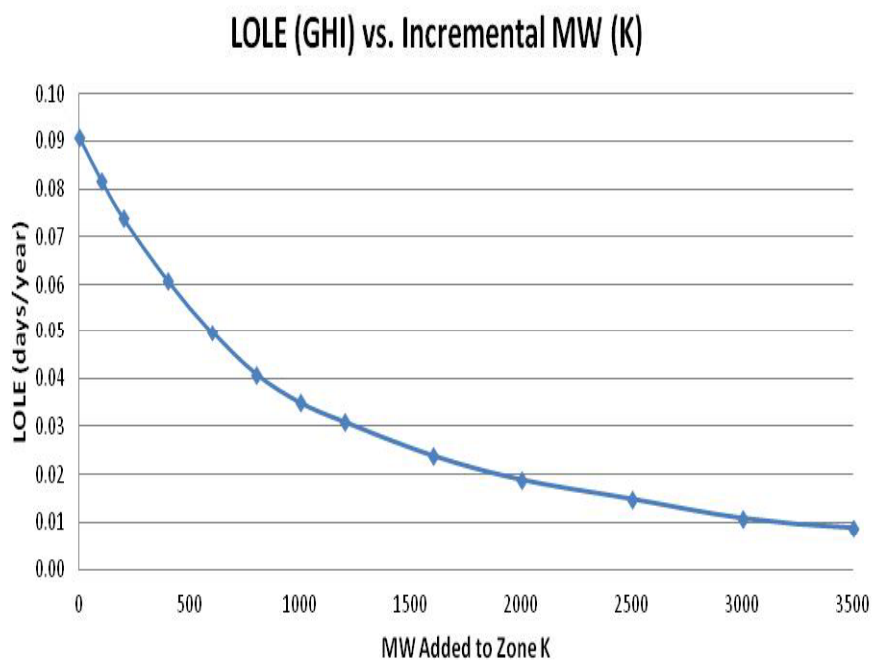
Results of Additional Analysis

- **LOLE for Load Zones GHI was reduced to essentially zero by adding incremental capacity to Load Zone J.**
- **LOLE for Load Zones GHI was reduced to 0.01 day/year and stayed at this level without any further improvement by adding incremental capacity to Load Zone K.**





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Summary of Resource Adequacy Analysis

- **For Load Zone J**
  - ***All existing capacity can be "relocated" from Load Zones GHI to Load Zone J.***
  - ***Incremental capacity in Load Zone J provides benefits to Load Zones GHI throughout the range and the LOLE for Load Zones GHI approaches zero.***
- **For Load Zone K**
  - ***Up to 300 MW of capacity can be "relocated" from Load Zones GHI to Load Zone K.***
  - ***However, incremental capacity in Load Zone K is bottled and it stops providing benefits to Load Zones GHI before the LOLE for Load Zones GHI can approach zero.***

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Aspect 2: Transmission Security Analysis

- **Deterministic analysis**
  - ***NERC/NPCC standards specify the methodology and study system conditions appropriate for evaluating the transfer capability of the transmission system.***
- **Transmission Security Analysis**
  - ***"N-1" analysis***
  - ***"N-1-1" analysis***

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Findings of "N-1" Analysis

- **Maximum power that can be transferred out of Load Zone K to Load Zones GHIJ.**
  - ***Normal transfer conditions: 233 MW***
  - ***Emergency transfer conditions: 344 MW***
- **Transfer limits are sensitive to the load and the generation dispatch under various outage conditions.**

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Findings of "N-1-1" Analysis

- **SENY Load Zones need additional capacity to mitigate the internal N-1-1 violations; however, Load Zone K have limited transmission capability to provide the assistance.**
  - ***Additional capacity in Load Zone J is not transmission constrained and can support Load Zones GHIJ.***
  - ***Additional capacity in Load Zone K cannot mitigate these violations in Load Zones GHIJ due to export transmission limitation of 233 MW from Load Zone K.***

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Observations

- **Capacity in Load Zones GHI is fully "relocatable" with capacity in Load Zone J, but not with Load Zone K.**
- **The boundary for greatest reliability benefit and support for maintaining the system at the LOLE criterion is defined by Load Zones GHIJ (G-J).**
- **Therefore, Load Zone K is not included as nested zone within Locality G-J.**

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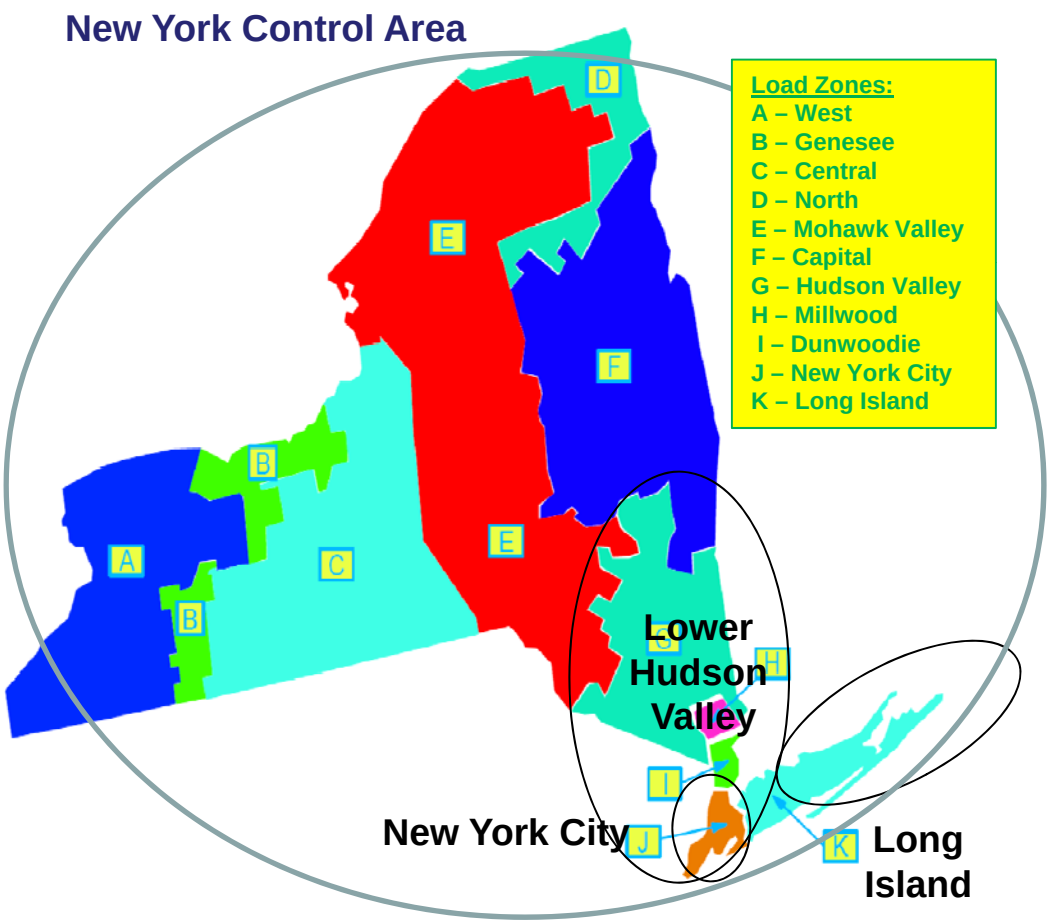
LCR for Locality G-J

- **The LCR for the new G-J Locality:**
  - ***The methodology used to calculate the G-J Locality LCR is an extension of the existing process and is implemented after the steps to calculate the LCRs for J and K Localities.****
  - ***The creation of the G-J Locality does not impact the outcome of the existing methodology used to determine the LCRs for Load Zones J and K.***

* The NYISO's LCR calculation procedure is available at: *http://www.nyiso.com/public/markets_operations/market_data/icap/index.jsp*



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LCR for Locality G-J (Cont.)

- **Start with the existing IRM/LCR approach to find an anchor point (Tan 45) for the IRM and LCRs for the existing Localities (J and K).**
- **Layer a new Locality on top of Load Zones GHI and J at the Tan 45 point.**
- **While freezing Load Zone K at its LCR value, return Load Zone J capacity to its "as found" value.**
- **Relocate capacity from Load Zones G-J to Load Zones A, C, and D until the NYCA LOLE reaches the target value.**
- **Calculate the G-J Locality LCR.**

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Market Administration

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NYISO Capacity Auctions

- **Capability Year begins on May 1**
  - *Divided into the Summer Capability Period, from May through October, and the Winter Capability Period, from November through April.*
- **The NYCA ICAP requirements are translated to Unforced Capacity obligations. Each LSE's obligations are in UCAP.**
- **Load Serving Entities can satisfy their UCAP requirements through:**
  - *Self-supply*
  - *UCAP purchases from other Suppliers via bilateral transactions*
  - *Forward purchases in Capability Period ("Strip") and Monthly Auctions*
  - *Spot auction*
    - **Prior to the opening of the Spot:**
      - *Capacity bought or sold in the Strip or Monthly auction or in a bilateral transaction, and self-supply must be "certified" in order to satisfy obligations.*
      - *ICAP Suppliers must certify capacity to be offered in the Spot.*
      - *Certification is the mechanism by which the NYISO determines what positions need to be balanced in the Spot Market auction.*
    - **Capacity bought and sold in the Spot market is priced on the ICAP Demand Curve, which is translated to UCAP.**
    - **New Demand Curves are reviewed and set every 3 years for each of the next following 3 years.**

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NYISO Capacity Auctions

- **Capability Period Auction**
  - ***Also known as "Strip Auction."***
  - ***Auction solves for a (6) Month strip of UCAP at a single Price/Month .***
  - ***Awarded bids and offers in this auction are for the same MW level and price for the entire Capability Period (6 months).***
- **Monthly Auction**
  - ***May buy/sell for the upcoming obligation month and any other month remaining in the Capability Period.***
- **Spot Market Auction**
  - ***May offer to sell for upcoming obligation month only.***
  - ***Solves using the Demand Curve to satisfy all remaining UCAP purchase requirements for the next obligation month.***

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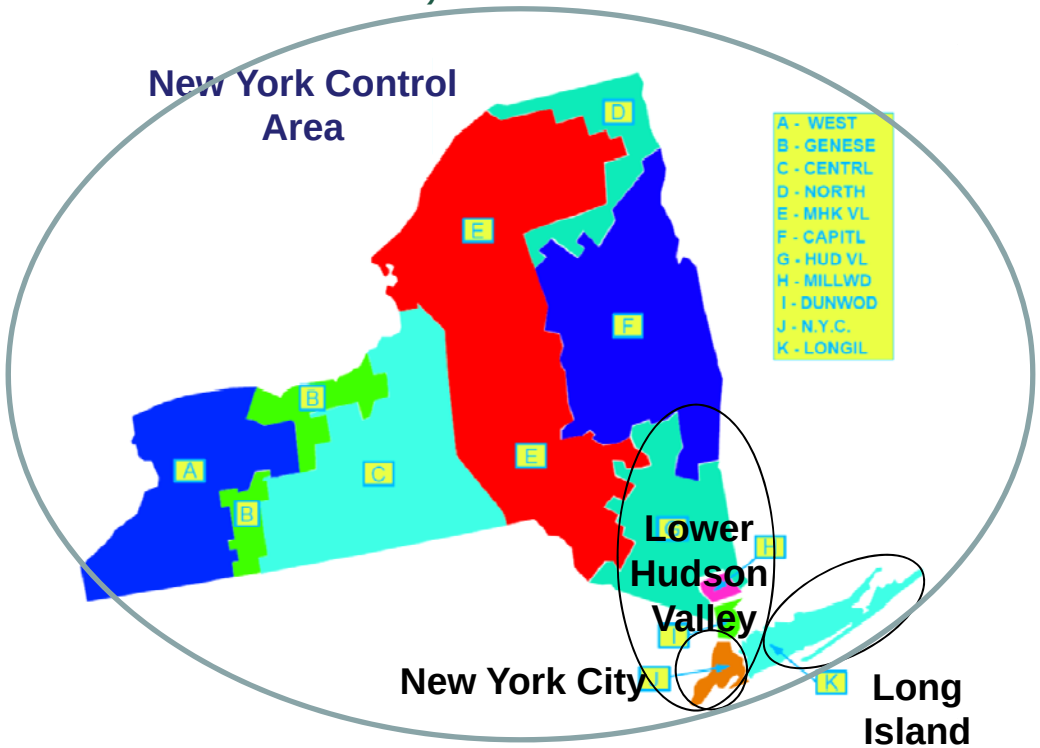
Pricing Hierarchy Rules

- **Hierarchy rules link Market-Clearing Price (MCP) outcomes in the auctions**
  - ***If NYC MCP < G-J* MCP, set NYC MCP = G-J* MCP***
  - ***If G-J MCP < ROS MCP, set G-J MCP = ROS MCP***
  - ***If LI MCP < ROS MCP, set LI MCP = ROS MCP***



* G-J Locality consists of the Lower Hudson Valley (Zones G-I) and New York City (Zone J)

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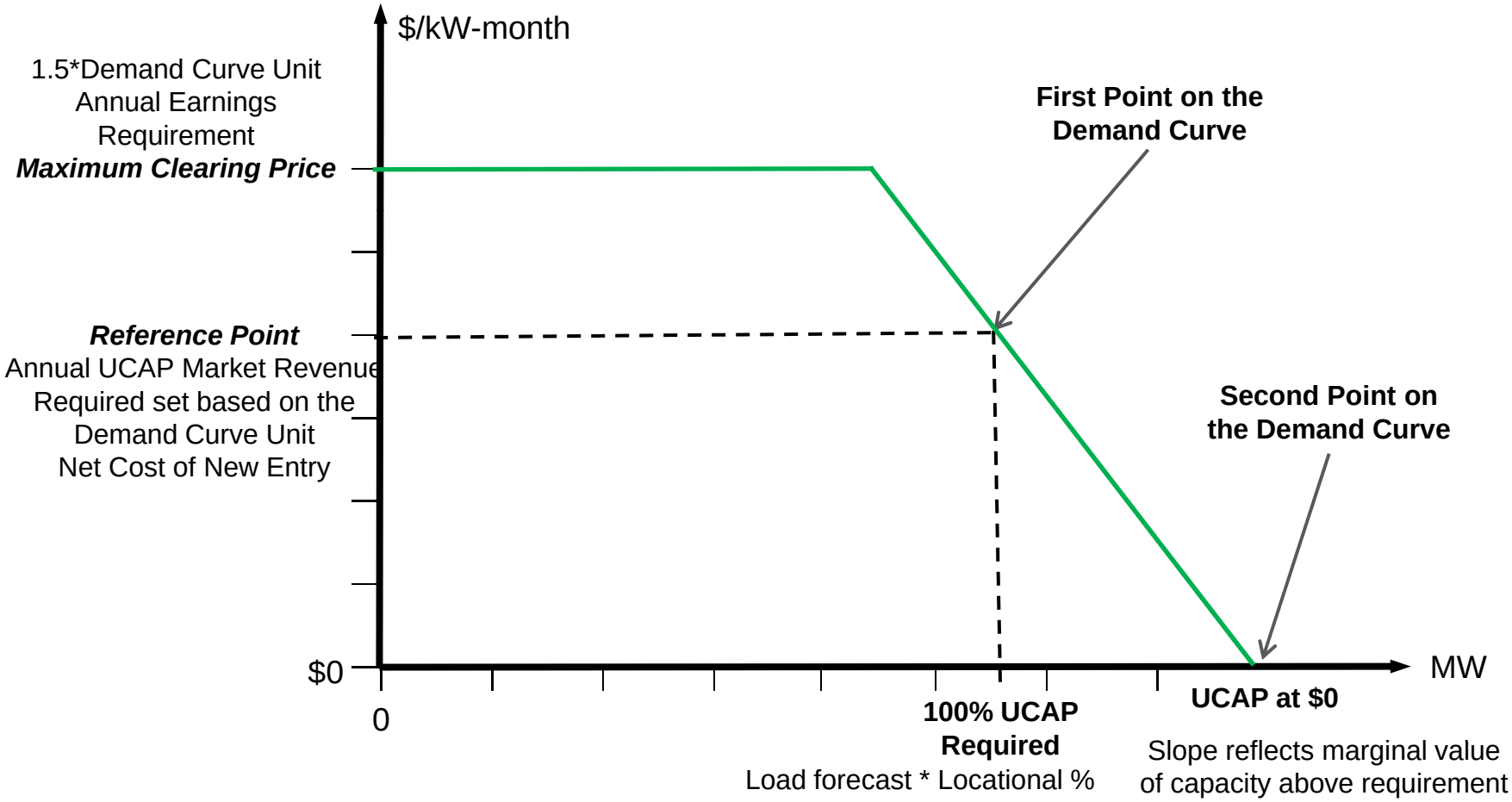
Spot Auctions - Demand Curve



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Design Implementation Considerations

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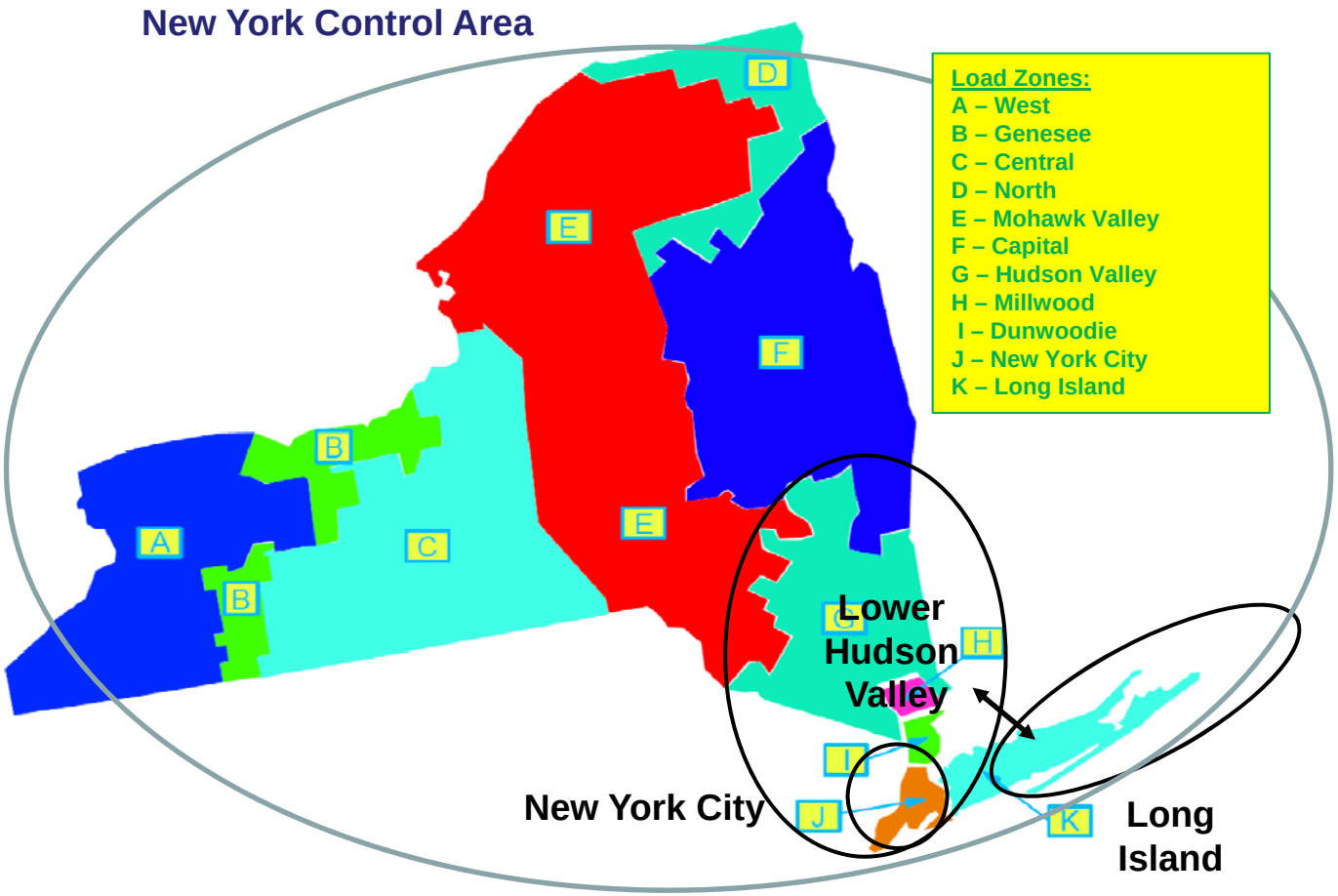
Auction Clearing

Load Zone K (Long Island) Modeled as Export Constrained



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Auction Clearing

Load Zone K (Long Island) Modeled as Export Constrained

- **Conceptual design elements – one export constrained zone**
  - ***Set up rules to ensure equivalent results to a simultaneous solution***
    - **Determination of a cap on Zone K capacity that could be counted in the Loads Zones G, H, and I.**
    - **This cap would stay fixed in the auction processes.**
    - **Model export caps in the Spot Auction.**
    - **Explore mitigation rules and subsequent settlement rules.**
  - ***However, if there was more than one export constrained zone or a zone(s) within it ("nested zone"), there may be significant implementation issues.***

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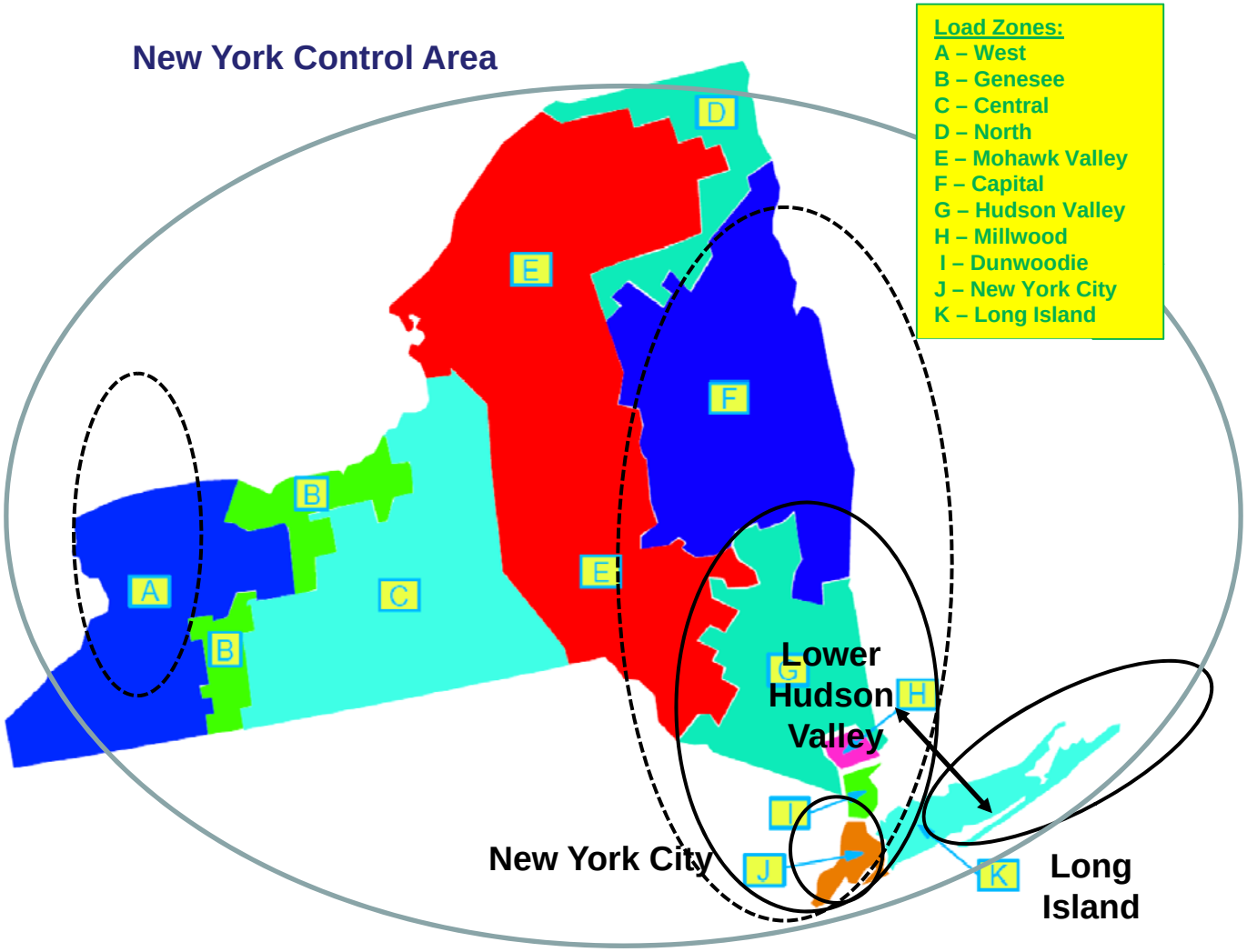
Possible Future Scenarios



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Possible Future Scenarios - Complexity

- **Determination of Transfer Limits**
  - *N-1*
  - *N-1-1*
- **LCRs for different configurations**
  - *Calculation methodology*
  - *IRM*
- **Revisions to Demand Curve Reset Process**
- **ICAP Mitigation Rules**
- **Clearing**
  - *Pricing rules*
  - *Settlement rules*
- **Complete revamp of the auction processes and software**
- **NYISO to explore options with the stakeholders -- along with costs and benefits**

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