New York ISO
Independent System Operator

Internal Controllable Lines: Energy Market Updates

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Agenda

- Review of Energy Market Design for ICL
- Out-of-Market Payments
- Contingency Analysis
- Appendix: Previous Project Presentations

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Review

- **Energy Market Design Concept presented June 7th**
  - Internal Controllable Lines (ICL) proposed to be optimized for Day-Ahead and real-time energy dispatch
- **Today's presentation covers outstanding questions from stakeholders, including**
  - Example of cost guarantees
  - Example of contingency analysis

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Review, continued

- **Some questions cannot be answered until the full physical and operating characteristics of ICL are known**
  - The ability to perform cost-based ancillary services will be partly dependent upon the specific technologies chosen by the developer
    - "*The use of several advanced functionalities must be coordinated in all timeframes, from design to real-time operations, between the parties and equipment involved.*"
    - For more details, see "HVDC Links in System Operations" published by the European Network of Transmission System Operators www.entsoe.eu/publications/system-operations-reports

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Bid Production Cost Guarantees

- DAM and RT BPCG are paid to resources committed and dispatched by the NYISO that do not recover their as-bid or mitigated costs in their energy and ancillary service market revenues
- DAM BPCG based on the sum of hourly settlements in day
- To be eligible for DAM BPCG, bid mode cannot be “self-schedule” in any hour

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Bid Production Cost Guarantees, cont.

- **RT BPCG are paid to resources committed and dispatched by the NYISO as Out-of-Merit to ensure NYCA or local reliability**
  - Resources committed Out-of-Merit for reliability are eligible for BPCG without regard to bid mode
- **An ICL may also be eligible for Day-Ahead Margin Assurance Payments (DAMAP)**
  - DAMAP protects a resource's Day-Ahead margin in the event it is scheduled out of economic merit order in real-time in response to a NYISO or Transmission Owner system security need

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Example ICL Cost Guarantee

- **Simplified BPCG Scenario:**
  - An ICL bids at $5 in the DAM and receives an energy schedule of 900 MW, and maintains that bid in the RTM
  - In real-time NYISO instructs the ICL to operate at 1,000 MW via Out-of-Merit (OOM) action due to NYISO Reliability, and the LBMP spread is $3
  - In concept, and ignoring losses, the ICL would be eligible for a Real-Time BPCG payment calculated as follows:
    - Day RT BPCG Settlement ($) = Max {Day RT Total Net Cost ($)* , 0}
      = ($5/MWh - $3/MWh) * 100 MW
      = $200 per hour of OOM

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Contingency Analysis

- In Security Constrained Unit Commitment and Dispatch, the system is secured against the normal NYISO contingency set so that secured facilities do not become overloaded
- Transmission violation if:
  - Pre-contingency loading exceeds Normal Rating
  - Post-contingency loading would exceed STE or LTE rating
- Sufficient system reserve capability must be available to meet load adjustments and contingencies

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AC Power Distribution Case Assumptions

- **Line Distribution Factors (DFAX) are used to determine the redistribution of power flows in a network when an element is taken out of service**
- **In the examples:**
  - Three parallel lines A/B/C are free flowing (AC)
  - All lines are rated for 100 MW
  - Lines A/B have the same impedances
  - Line C has twice the impedance of Lines A/B
  - All violations are in reference to pre-contingency loading
  - GenX is more expensive than GenGroup

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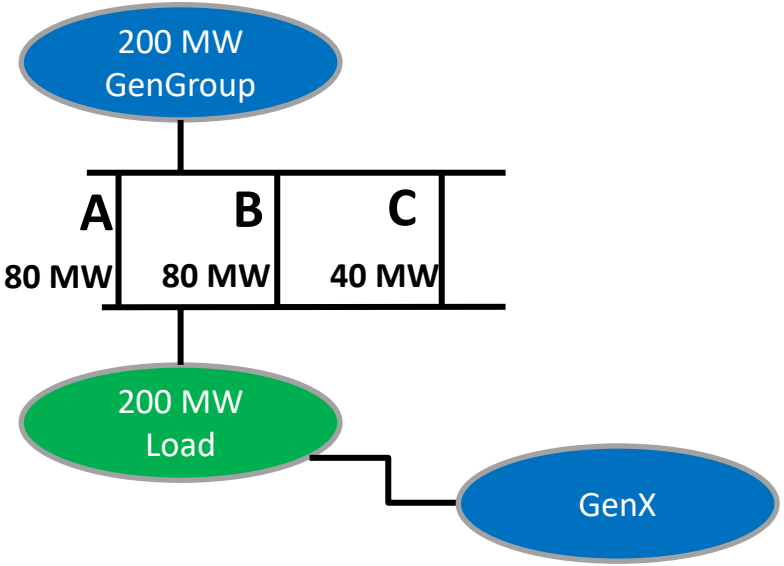
System Security (3 lines, with violation)



Pick up on	For the Loss of A	For the Loss of B	For the Loss of C
A	0.0	.667	0.5
B	.667	0.0	0.5
C	.333	.333	0.0

Contingency violation for loss of A or B. Resolve by dispatching GenX.

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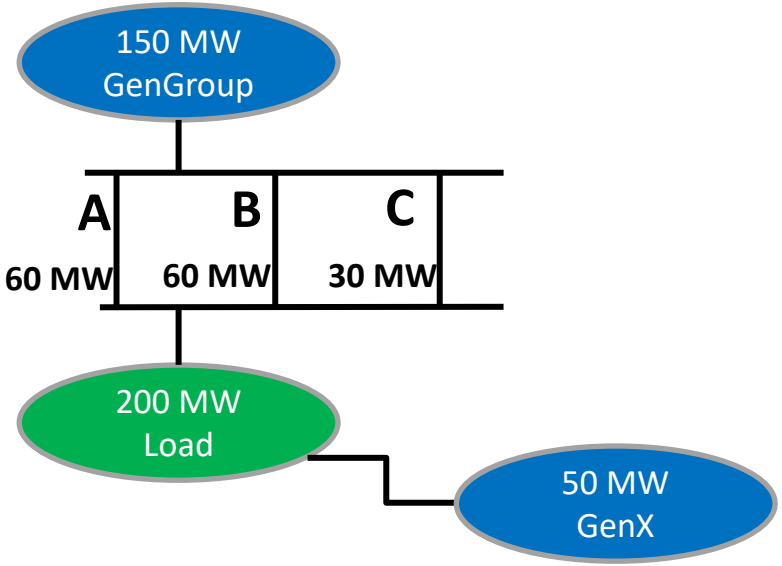
System Security (3 lines, secure)



Pick up on	For the Loss of A	For the Loss of B	For the Loss of C
A	0.0	.667	0.5
B	.667	0.0	0.5
C	.333	.333	0.0

Secure for the loss of A, B or C. GenX is constrained "on" for security.

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ICL Cases Assumptions

- ICL is economically committed and “on control”
- ICL maximum flow = 120MW

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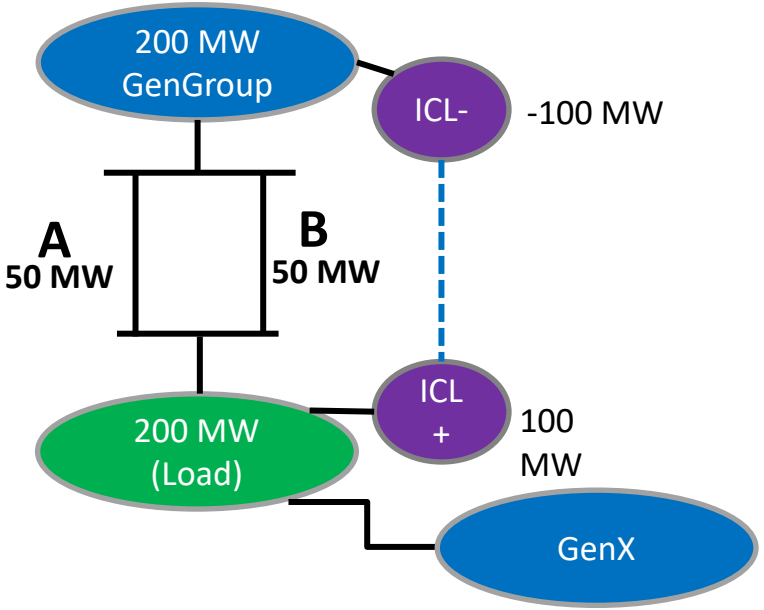
System Security (with ICL, secure)



Pick up on	For the Loss of A	For the Loss of B	For the Loss of ICL
A	0.0	1.0	0.5
B	1.0	0.0	0.5

All lines secure for the loss of any single element.

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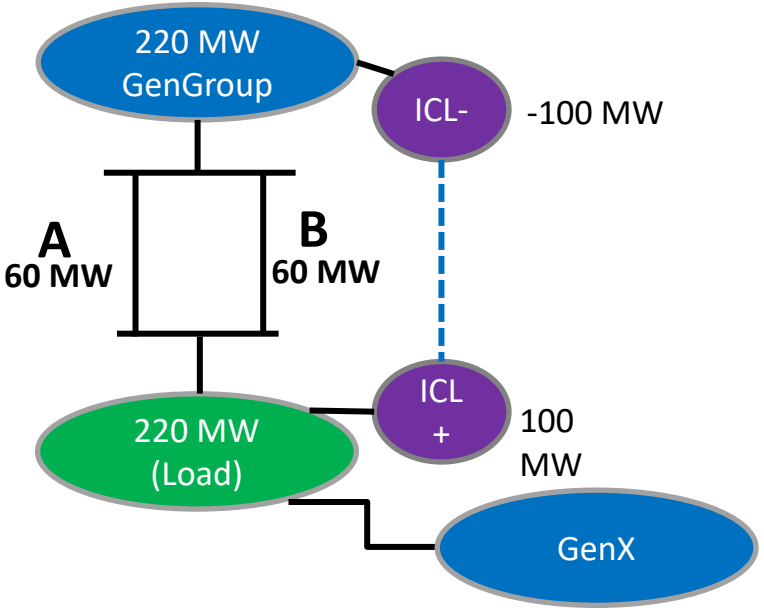
System Security (Inc. load, multiple violations)



For the Loss of

Pick up on	A	B	ICL
A	0.0	1.0	0.5
B	1.0	0.0	0.5

A and B cannot pick up the load securely for the loss of any single element.

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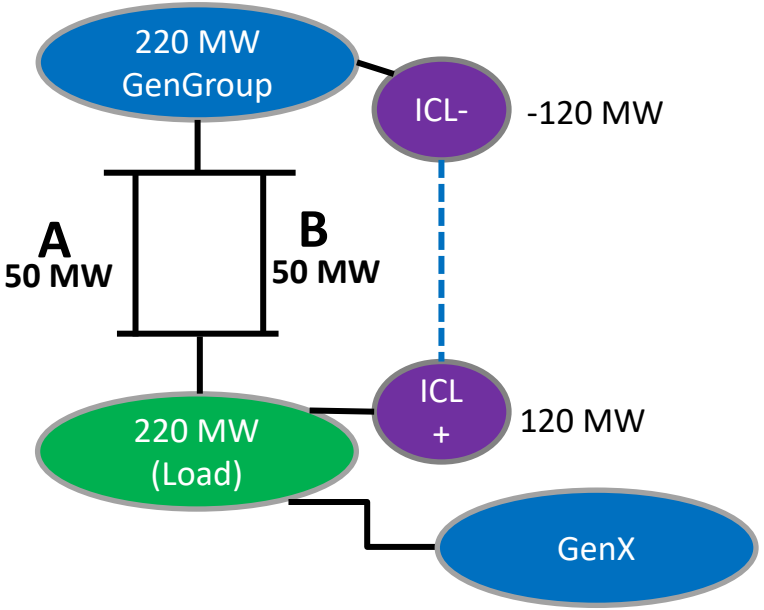
System Security (ICL contingency)



Pick up on	For the Loss of A	For the Loss of B	For the Loss of ICL
A	0.0	1.0	0.5
B	1.0	0.0	0.5

ICL cannot pick up the load as A and B not secure for the loss of ICL

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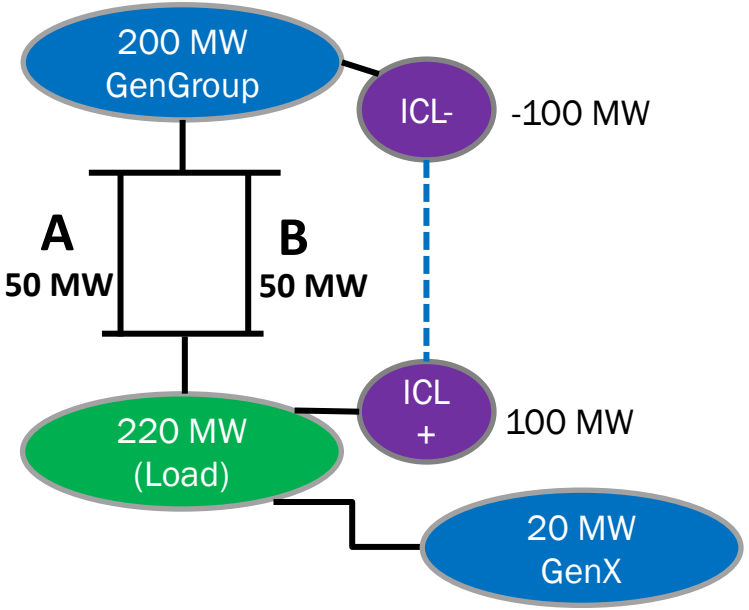
System Security (secure solution)



For the Loss of

Pick up on

	A	B	ICL
A	0.0	1.0	0.5
B	1.0	0.0	0.5

GenX needed to resolve the contingency violation. Least cost solution

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Appendix

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Previous Project Presentations

- 2/3/22: Kick-Off presentation discussing project scope and timeline
  - 2/3/22 MIWG Presentation
- 3/16/22: Energy Market Design Real-Time Scheduling and Settlement Examples
  - 3/16/22 MIWG Presentation
- 4/19/22: Energy Market Two-Settlement Examples
  - 4/19/22 MIWG Presentation
- 6/07/22: Energy Market Design Proposal
  - 6/07/22 MIWG Presentation

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Our Mission & Vision

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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