Consumer Impact Analysis: Internal Controllable Lines

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Agenda

- Background / Market Design Concept
- Energy Market CIA Methodology
- Potential Energy Market Impact
- Capacity Market CIA Methodology
- Potential Capacity Market Impact
- Other Impacts
- Summary

Background/Market Design Concept

Background

- Currently, there are no internal controllable lines (ICL) in operation within the New York Control Area (NYCA)
- NYSERDA's Tier 4 REC initiative has driven the prioritization of this project to develop market participation rules for ICL
- The NYISO's proposed design is intended to accommodate ICL for a range of different project structures, provided that the source of an ICL must physically locate in ROS, and the sink of an ICL must physically locate in a Locality
- A full description of the market design concept is posted at: Internal Controllable Lines Market Design Concept (nyiso.com)
- The CIA Methodology was presented to ICAP/MIWG August 4, 2022

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Energy Market Scheduling

- **The NYISO will optimize ICL flows based on economic dispatch, meeting New York State load at least as-bid cost, while taking into account incremental bids and incremental losses of ICL operation**
  - Scheduling of the line would occur simultaneously with the scheduling of resources
  - Revisions to NYISO Tariffs and Manuals are necessary to incorporate rules for scheduling and pricing of ICL

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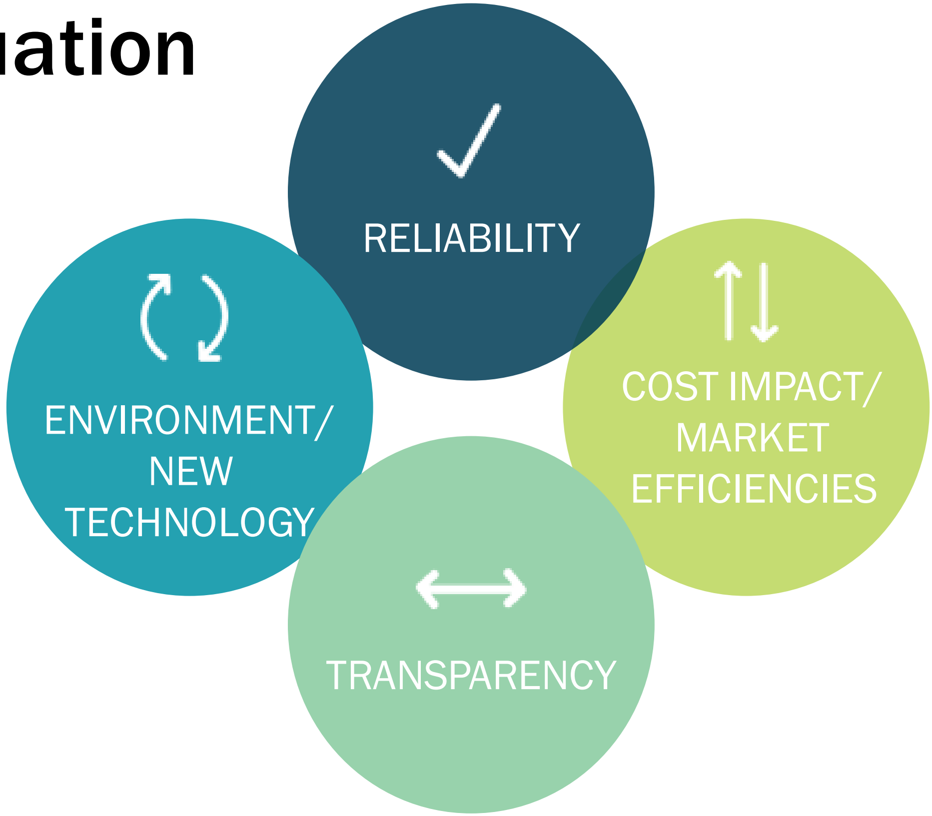
Energy Market Participation

- The ICL will buy power at the source LBMP and sell the power it delivers at the sink LBMP
- Internal controllable lines (ICL) will be able to reflect operating characteristics and costs in the NYISO's Day-Ahead (DAM) and Real-Time (RT) Markets
- The NYISO design will accommodate unidirectional or bi-directional operation

Capacity Market Participation

- Consistent with the proposed Energy Market design for an ICL, the Capacity Market Design will not tie supply to specific generators
  - This structure aims to enable the market design to work for any ICL that may seek to enter NYISO markets
- An ICL ("Internal UDR") will participate in the Capacity market as Installed Capacity (ICAP) Suppliers via an updated and revised market construct, under which they will transmit pooled capacity, sourcing in NYCA and sinking in a Locality
  - For example, an ICL connecting Zone E and Zone J and selling Unforced Capacity (UCAP) into Zone J will be required to purchase pooled NYCA Capacity to fulfill its ICAP Supply obligation in Zone J

Consumer Impact Analysis (CIA) Evaluation Areas



Cost Impact/ Market Efficiencies

- **Energy Market**
  - CIA Methodology
  - Potential Energy Market Impact
- **Capacity Market**
  - CIA Methodology
  - Potential Capacity Market Impact

Energy Market CIA Methodology

Methodology

COST IMPACT/
MARKET
EFFICIENCIES

- **The Consumer Impact Analysis compares the results of a simulation of economically optimized flows over an ICL (the NYISO's market design concept proposed) versus schedules based on intermittent output logic**
  - "Economic" here means the simulation is using the line to minimize total production cost
  - The "intermittent output" logic assumes the line is scheduled (and block loaded) as a positive function of wind and solar output in Zones A – F, regardless of whether the flow is economic
  - For brevity, the intermittent output-based flows are termed "Fixed" flows in this presentation

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Modeling

COST IMPACT/
MARKET
EFFICIENCIES

- The 2021-2040 Outlook Study Policy cases include Clean Path New York (CPNY), which is used as the ICL in the CIA
- The Outlook Study has low (contract) and high (policy) cases for renewable energy development in New York going out to 2040
  - This analysis uses “policy S2” case for 2035
- A complete description of the Outlook Study can be found at:
  - 2021-2040 Outlook Report (nyiso.com)

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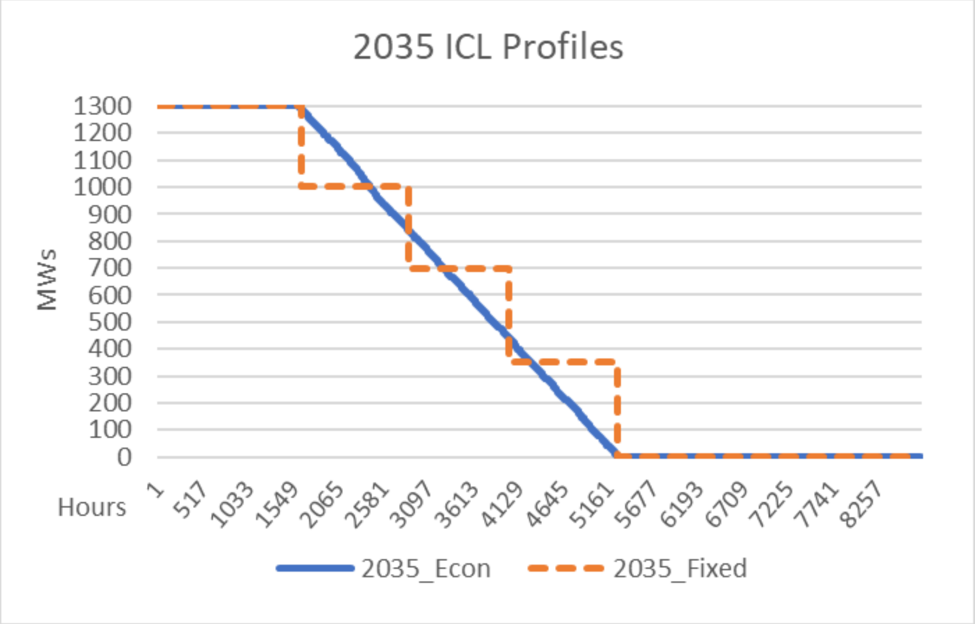
Modeling, continued

COST IMPACT/ MARKET EFFICIENCIES

- The Economic case was developed from the Outlook Study
- The Fixed case was modeled as fixed flow blocks from 0 MW to 1,300 MW based on wind and solar output
    - Flows and capacity factors scaled to roughly match the Outlook Study case so that differences in costs and emissions are based on flow optimization and not volume



Modeling Caveats

COST IMPACT/ MARKET EFFICIENCIES

- The model used for the Outlook study (MAPS) does not calculate power flows and wholesale prices in the same manner as NYISO's market software
- Renewable output, fuel costs, loads and other inputs in the model are estimates and forecasts, and may change over time
- Therefore, model results should be viewed as "directional" only, and not a forecast of outcomes or future wholesale prices and wholesale consumer costs

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Potential Energy Market Impact

Summary

COST IMPACT/ MARKET EFFICIENCIES

- Difference between economic and fixed flow production costs and emissions
- Production cost and emissions are reduced through economic optimization of ICL flows

	2035
Production Cost Change ($)	$ (19,415,881.00)
Production Cost Change %	-0.5%
CO_2 Emissions Change (tons)	$ (90,279.00)
Emissions Change %	-0.5%

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Wholesale Consumer Costs

COST IMPACT/ MARKET EFFICIENCIES

- The optimization minimizes total production cost
- Wholesale consumers of energy pay the weighted average zonal LBMP ($) x Load (MW)
- In the economic cases, relative to the fixed cases, zonal prices generally increase in source zones and decrease in sink zones

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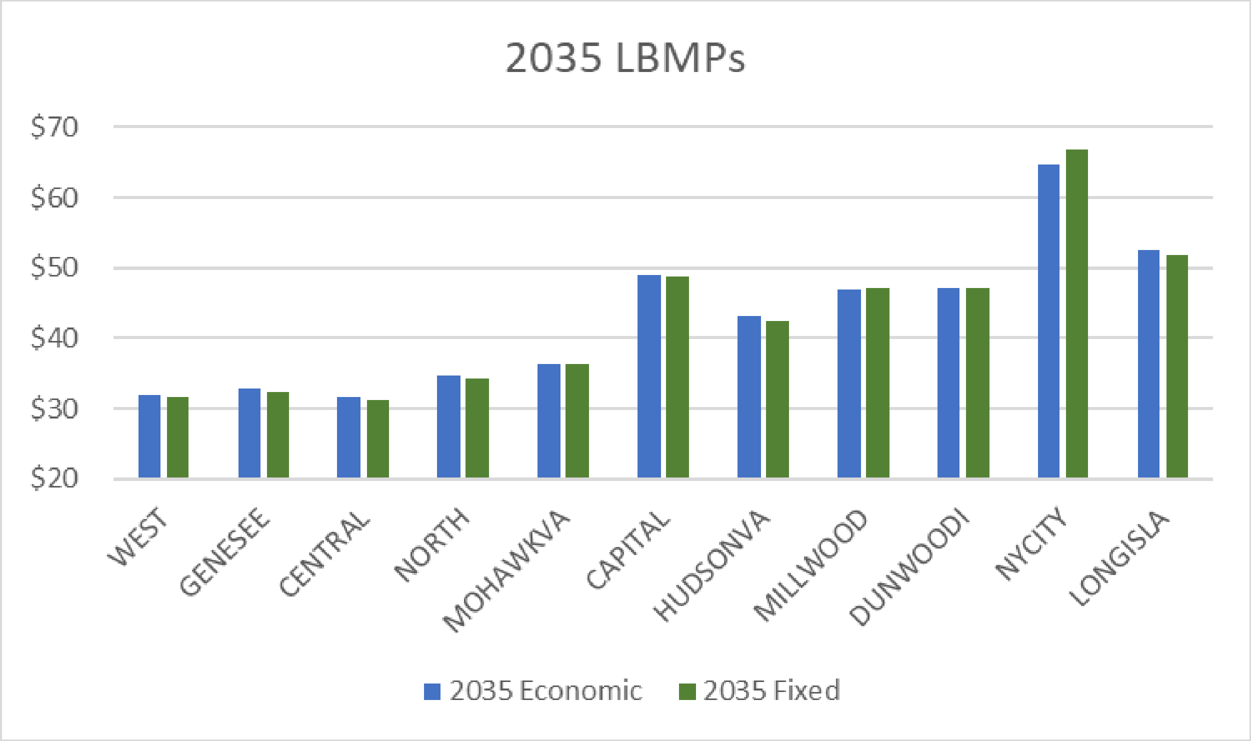
2035 Zonal Consumer Price Impacts

COST IMPACT/
MARKET
EFFICIENCIES



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Zonal Change in Consumer Cost

COST IMPACT/ MARKET EFFICIENCIES

($ Millions)	WEST	GENESEE	CENTRAL	NORTH	MOHAWKV/	CAPITAL	HUDSONVA	MILLWOOD	DUNWOODI	NYCITY	LONGISLA	TOTAL
2035 Econ	$ 654.20	$ 473.70	$ 671.89	$ 276.29	$ 368.41	$ 774.91	$ 545.58	$ 175.18	$ 372.39	$ 4,442.54	$ 1,452.76	**$ 10,207.85**
2035 Fixed	$ 650.34	$ 469.09	$ 661.23	$ 272.33	$ 366.71	$ 770.47	$ 538.49	$ 175.23	$ 373.31	$ 4,594.00	$ 1,434.54	**$ 10,305.74**
Change	$ 3.86	$ 4.61	$ 10.66	$ 3.96	$ 1.70	$ 4.44	$ 7.09	$ (0.06)	$ (0.92)	$ (151.46)	$ 18.23	**$ (97.89)**
% Change	0.6%	1.0%	1.6%	1.5%	0.5%	0.6%	1.3%	0.0%	-0.2%	-3.3%	1.3%	-0.9%

Note: The level of TOTAL costs are mostly due to forecast increases in load and/or increases in the cost of fuel, operation and maintenance represented in the Outlook study. For full detail of assumptions in the Outlook see: Appendices 2021-2040 System & Resource Outlook (nyiso.com)

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Capacity Market CIA Methodology

Capacity Market Cost Impact Assumptions

COST IMPACT/ MARKET EFFICIENCIES

- Consistent with the energy market cost impact analysis, we have focused this analysis on the CPNY project as an example of the potential impact
  - Note that the cost impact of ICL on energy market and capacity market prices will depend on the amount of any additional MW available through ICL facilities to the wholesale market
- The demand curve information from the 2022-2023 Capability Year was used
- Leveraged the load forecast and ICAP supply mix from the 2030 S2 Policy Case from the NYISO's 2022 System and Resource Outlook Study ("Outlook Study")
- Leveraged estimated 2030 IRM and LCRs from the Capacity Accreditation project, which models CPNY in-service as transmission
  - Simulations reflect at-criteria conditions, which are sufficient to indicate directionality of consumer impacts, but they do not represent fully optimized conditions, as discussed during the 10/19/22 Capacity Accreditation Presentation
- We assumed that ICL facilities will elect to participate in the NYISO capacity market to the greatest extent possible

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Capacity Market Cost Impact Assumptions (cont'd)

COST IMPACT/ MARKET EFFICIENCIES

- Assumed derating factors for existing resource types were based on historic 3-year averages for each resource type
- Assumed derating factors for storage resources leveraged the applicable Duration Adjustment Factors and the NERC class average EFORd for pumped storage
- Assumed derating factors for offshore wind were based on the approximate average ELCC values that we used for the status quo case in the Comprehensive Mitigation Review consumer impact analysis
- Assumed derating factors for Dispatchable Emissions Free Resources (DEFR) mirror the 3-year historic average derating factor for existing combined cycle resources
- The ICL derating factor was modeled as 5%, recognizing that expected derating factors for ICL are uncertain since ICL is a new construct

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COST IMPACT/ MARKET EFFICIENCIES

Capacity Cost Impact Approach

- **Used the 2030 policy case from the Outlook Study as a base case, for both short-term and long-term analysis**
  - For the Transmission Case (Base Case), the ICL is modeled as transmission, thereby impacting capacity requirements, and the ICL is not added to the capacity market supply stack
    - G-J and J capacity requirements are lower in the transmission case compared to the Supply Case
  - For the Supply Case (Change Case), the ICL is added to the capacity market supply stack, and no impact of the ICL on capacity requirements is modeled
- **Comparison between these cases indicates the potential difference in magnitude of capacity market costs between the scenario where an ICL enters operation and is treated as transmission, versus the scenario where an ICL participates in the capacity market under the NYISO's proposed design**

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Capacity Cost Impact Approach (cont'd)

COST IMPACT/ MARKET EFFICIENCIES

- The short run cost impact analysis will assume no additional changes to generation
- The impacts shown in the short run may not be sustainable, as retirements and other changes may result from the influx of large amounts of capacity additions
  - We address this dynamic in the long run analysis, which assumes a supply level based on the historic level of excess
- For the long run supply level, we used the historic excess defined as a percentage of excess above the requirement observed within the last three Capability Years in each of the different Localities
  - Returning to historic levels of excess can result in either higher or lower levels of excess as compared to the short term cases
  - Capacity Requirements are held constant between each respective short term and long term case

Potential Capacity Market Impact

Potential Estimated Capacity Cost Impact

COST IMPACT/ MARKET EFFICIENCIES

	NYCA Annual Cost ($M)	GHI Annual Cost ($M)	J Annual Cost ($M)	K Annual Cost ($M)
Transmission Case (Base Case): Short Term (A)	1,378	132	266	402
Supply Case: Short Term (B)	1,389	131	317	402
Short Term Delta (B – A)	**11**	**0**	**51**	**0**
Transmission Case (Base Case): Long Term (C)	1,609	85	682	271
Supply Case: Long Term (D)	1,678	85	789	271
Long Term Delta (D – C)	**69**	**0**	**107**	**0**

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Potential Capacity Cost Impact Discussion

COST IMPACT/ MARKET EFFICIENCIES

- **While this analysis estimates some increases in capacity market costs with an ICL treated as supply instead of transmission, consumer costs are expected to be similar in either case**
  - Under the Transmission Case (base case), consumers would expectedly fulfill ICL funding requirements via transmission rate charges instead of market charges
  - Under the Supply Case (change case), consumers provide funding for the ICL through the capacity market instead of transmission charges
    - The higher amount of capacity procured in this case drives higher capacity market costs
    - This approach results in higher transparency of consumer costs
  - The cost of the remaining cleared capacity (all cleared capacity less the ICL) are similar in both the base case and change case, which highlights the comparable impact to consumers

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Other Impacts

Environmental Impacts

ENVIRONMENT/ NEW TECHNOLOGY

- As shown in Slide 14, there will be a positive environmental impacts of economically dispatching the ICL compared to the alternate ("fixed") dispatch logic
    - A 0.01% reduction in CO2 emissions in 2030
    - A 0.5% reduction in CO2 emissions in 2035

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Reliability Impacts

RELIABILITY

- ICLs will be included in the network model with a transfer limit and become an additional contingency in the Network Security Analysis
- ICLs will be required to comply with NYISO outage scheduling requirements
- ICLs will be required to operate consistent with operator out-of-merit (OOM) instructions to protect system or local reliability
- ICLs will have a ramp rate constraint to avoid detrimental impacts on nearby transmission lines
- ICLs will increase resilience

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TRANSPARENCY

Impacts on Transparency

- Will post ATC and TTCs for ICLs as they are posted for other internal interfaces.

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Summary

Summary – Energy Market

- **Wholesale consumer impact from the NYISO's proposed market design for Internal Controllable Lines was modeled in MAPS, using the 2035 Policy S2 case from the Outlook Study**
- **Comparing economic scheduling to fixed scheduling:**
  - Total production cost decrease
  - Emissions decrease
  - Wholesale consumer costs decrease as the amount of renewable energy on the system increases
  - Wholesale consumer costs generally increase in sending zones and decrease in receiving zones

Summary – Capacity Market

- Consumer impact from the NYISO's proposed capacity market design for Internal Controllable Lines was modeled in a spreadsheet analysis, incorporating data from the 2030 policy case from the NYISO's 2022 System and Resource Outlook Study and Capacity Accreditation work
- Comparing ICL treatment as transmission versus treatment as supply:
  - Some increases in capacity cost appeared in the change cases driven by compensating the ICL in the capacity market
  - Consumer costs are expected to be similar whether the ICL is funded via transmission rates or market charges

Questions?

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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