



# Grid Services from Renewable Generators: Consumer Impact Analysis

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# Background

- **Some recent industry studies indicated the ability of renewable generators to potentially provide additional grid services such as fast frequency response, inertial response, and ramping services<sup>1,2</sup>**
  - Based on the findings of those studies, stakeholders (NYSERDA) requested that the NYISO study the potential of renewable generators to provide grid services in New York by including Grid Services from Renewable Generators as a 2021 project
- **The NYISO conducted a study that investigated the ability of renewable generators to provide the Ancillary Services that it currently procures. NYISO also looked at other services renewable generators could potentially provide in the future.**

1. Demonstration of Essential Reliability Services by a 300-MW Solar Photovoltaic Power Plant. <https://www.nrel.gov/docs/fy17osti/67799.pdf>.

2. AvangridRenewables Tule Wind Farm: Demonstration of Capability to Provide Essential Grid Services. 11 March 2020. <https://www.caiso.com/Documents/WindPowerPlantTestResults.pdf>

# Background (cont'd)

- The study conducted by the NYISO was presented at the May 19, 2021 ICAP/MIWG meeting. The results of the study indicated that the only additional grid service that renewable generators could potentially provide is regulation “down” service
  - The creation of separate regulation “up” and “down” products would increase accessibility for renewable generators, since it would be easier to qualify and provide regulation “down” than the current bi-directional product
- **Based on the study results, NYISO conducted a consumer impact analysis of bifurcating the regulation market**
  - Currently, regulation “up” and “down” is a single service
  - The NYISO expects that creating separate regulation “up” and “down” products would decrease consumer costs, as this market change would increase supplier eligibility
    - Not only would renewable generators have greater ability to participate in a regulation “down” market, but other resources that are currently precluded from receiving regulation schedules due to inability to move both up or down could now be able to provide regulation service in only one direction
    - For example, a Generator sitting at Mingen (would not be able to provide Regulation Service today) might become able to provide regulation “up”

# Consumer Impact Analysis (IA) Evaluation Areas

- The potential impact on all four evaluation areas

<b>RELIABILITY</b>  Increased participation by suppliers who are unable to move in both the “up” and “down” directions may reduce the frequency of regulation shortages and improve system reliability	<b>COST IMPACT/ MARKET EFFICIENCIES</b>  Average Annual Consumer Savings Ranging from \$0.09M to \$1.0M
<b>ENVIRONMENT/ NEW TECHNOLOGY</b>  More renewable resources providing regulation would potentially decrease the cost of renewable integration while decarbonizing the provision of essential reliability services	<b>TRANSPARENCY</b>  Separate “up” and “down” products would result in prices that more accurately reflect when a shortage or tradeoff occurs in the provision of each product respectively

# Potential Energy Market Impact

# Regulation Market

- **The NYISO regulation market is relatively small**

- Requirements are static for the year and vary both hourly and seasonally, typically ranging between 150MW to 300MW with roughly 1,000MW of suppliers offering in the current market
- Average annual costs of the regulation market are on the order of \$15M-\$20M, compared with annual energy and capacity market costs on the order of \$5B<sup>1</sup>

<sup>1</sup> Information on costs of NYISO markets can be found in the monthly Market Operations Reports presented at the Business Issues Committee. Meeting materials can be found at: <https://www.nyiso.com/business-issues-committee-bic->

# Consumer Impact Proposed Approach and Assumptions

- **To estimate the consumer impact of bifurcating the regulation market, the NYISO calculated the potential savings resulting from lower prices during “high-priced” regulation intervals**
  - The NYISO expects that the increase in regulation suppliers enabled by separating regulation into “up” and “down” products will potentially result in lower prices during “high-priced” regulation intervals, and therefore in lower consumer costs
  - To conduct the analysis, the NYISO considered the 3-year period from June 2018 through May 2021:
    - Status quo annual regulation market costs
    - Annual regulation market cost with a 5% reduction in “high-priced” regulation intervals, and
    - Annual regulation market cost with a 20% reduction in “high priced” regulation intervals
- **The analysis focused on the savings from procuring regulation capacity and assumed that the quantity of regulation capacity procured will remain the same or will be similar to the existing requirements**
  - Savings from payments for regulation movement are not estimated in this analysis, as the amount of movement required by the system to control Area Control Error (ACE) is not expected to change
  - These payments have been approximately \$4M over the 3-year period considered in this analysis
- **There are no expected capacity market consumer impacts for this project since the ICAP demand curve proxy unit does not provide regulation service**

# Energy Market Methodology

- The NYISO examined historic real-time regulation prices from June 2018 through May 2021
- Assumed several possible levels of price reductions during “high-priced” regulation intervals to provide multiple estimates of consumer impact rather than focus on a single estimate:
  - Observed historic regulation costs,
  - -5% during “high-priced” regulation intervals
  - -20% during “high-priced” regulation intervals
- Determined price deltas for each high-priced interval
- The annual consumer impact was estimated by multiplying the regulation clearing price deltas by the actual regulation capacity procured during the historic three-year period



# Energy Market Methodology (cont'd)

- **The NYISO used two methods for identifying “high-priced” regulation intervals in order to provide a range of potential impacts**
  - Method 1: Regulation shortage intervals
    - Intervals identified by a regulation capacity clearing price  $\geq$  \$25/MWh
  - Method 2: Pricing intervals in the top 10% of regulation capacity prices
    - Intervals identified by a regulation capacity clearing price  $\geq$  \$13.87/MWh
    - Based on observations that the majority of regulation capacity bids are low, prices in this range are more likely to reflect limited supply or tradeoffs with energy and other products

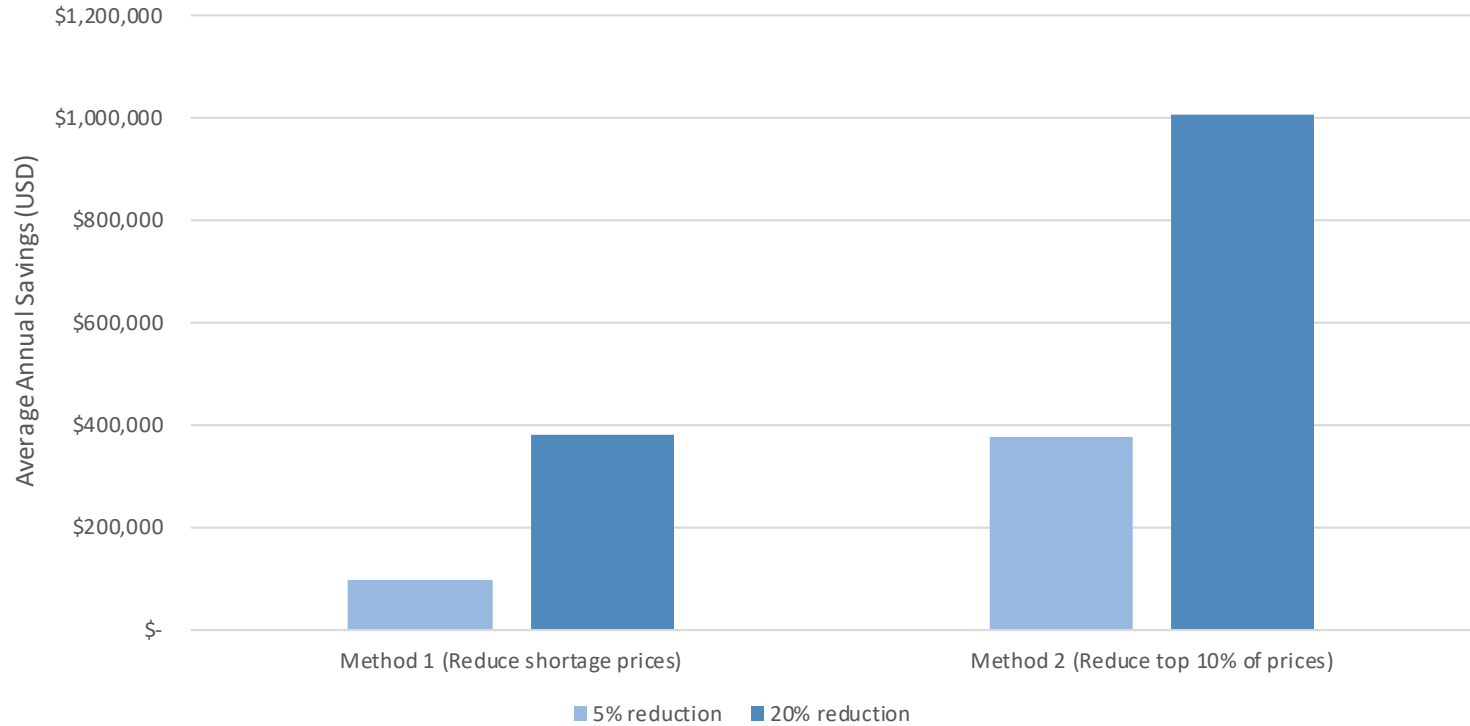
# Energy Market Methodology (cont'd)

- **Cost reduction estimates were calculated based on historic regulation data**
  - Price delta = Historic regulation capacity price (\$/MWh) x Percentage reduction (-5% or -20%)
  - Interval cost reduction = Price delta (\$/MWh) x Historic regulation capacity procured (MW) x Interval duration (h)
  - Example
    - Price delta = \$15/MWh x -5% reduction = -\$0.75/MWh
    - Interval cost reduction = -\$0.75/MWh x 225 MW x 1 h = -\$168.75 cost reduction
  - Cost reductions for “high-priced” intervals were summed to determine total annual savings
- **The NYISO expects the majority of consumer savings to be seen in the Day-Ahead Market. Therefore, this analysis focuses on day-ahead regulation capacity prices.**

# Annual Savings (Day-Ahead Market)

		Year 1 (June 2018-May 2019)	Year 2 (June 2019-May 2020)	Year 3 (June 2020-May 2021)	Average
Historic regulation capacity market cost		\$ 22,012,226.38	\$ 12,581,316.02	\$ 12,916,088.84	\$ 15,836,543.75
Method 1 Savings (from reducing shortage prices)	5% reduction	\$ 241,199.05	\$ 23,076.61	\$ 19,010.75	\$ 94,428.80
	20% reduction	\$ 964,796.20	\$ 92,306.44	\$ 76,042.99	\$ 377,715.21
Method 2 Savings (from reducing top 10% of prices)	5% reduction	\$ 586,769.27	\$ 73,684.51	\$ 93,680.65	\$ 377,067.21
	20% reduction	\$ 2,347,077.09	\$ 294,738.02	\$ 374,722.60	\$ 1,005,512.57

## Average Annual Consumer Savings in the Day-Ahead Regulation Market (June 2018-May 2021)



# Summary of Consumer Cost Impact

- **The NYISO expects consumer savings to occur during “high-priced” day-ahead regulation intervals**
  - \$0.09M to \$0.38M average annual savings (or 0.48% to 1.9% average annual reduction in DAM regulation capacity costs) from reducing prices in shortage intervals
  - \$0.38M to \$1.0M average annual savings (or 1.4% to 5.3% average annual reduction in DAM regulation capacity costs) from reducing the top 10% of pricing intervals
  - Overall, these savings range from 0.002% to 0.02% of annual energy and capacity market costs
- **Actual savings might be greater based on the possibility for an increase in regulation suppliers to reduce prices during “low-priced” intervals**
  - The NYISO has observed that tradeoffs between regulation and other products may also occur during low-priced intervals
- **Additionally, further consumer savings could potentially result from a reduction in energy market prices which reflect tradeoffs with regulation**
  - Creating separate “up” and “down” regulation products reduces the need to move generators at Mingen or UOL off of their economic energy schedule in order to provide bi-directional regulation, and could therefore result in lower energy prices

# Additional Impacts

# Reliability Impacts

- **Increased participation from suppliers who are unable to move in both the “up” and “down” directions may reduce the frequency of regulation shortages and improve system reliability**
- **Further benefits could result from the ability to establish different “up” and “down” regulation requirements based on system needs**

# Environmental Impacts

- **Expanding the opportunity for renewable resources to provide regulation could decrease the cost of renewable integration while decarbonizing the provision of essential reliability services**



# Impact on Transparency

- **Bifurcating the regulation market into distinct “up” and “down” products would result in prices that more accurately reflect when a shortage or tradeoff occurs in the provision of each product respectively**

# Feedback?

- Email additional feedback to: [deckels@nyiso.com](mailto:deckels@nyiso.com)

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- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system



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