Consumer Impact Analysis: Distributed Energy Resources (DER) Participation Model

Reposted in Response to Stakeholder Feedback

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Agenda

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- Overview
- Energy Market Impacts
- Capacity Market Impacts
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- Appendix II
- Feedback
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Project Description

- Although DER can currently participate in the NYISO-administered wholesale markets in limited ways, market enhancements to further integrate DER will benefit the system as a whole.
- The main objective of the DER Roadmap and resulting market design is to integrate existing and emerging DER technologies[1]
- This presentation addresses the consumer impact of DERs in the wholesale energy and capacity markets

1. Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets, A Report by the New York Independent System Operator, January 2017 https://www.nyiso.com/documents/20142/3067339/Distributed_Energy_Resources_Roadmap.pdf/a890c599-d7c3-6ba5-d10e-0001775bf061

Background

- **The NYISO's goal is to Develop a Dispatchable DER Participation Model for the NYISO-administered wholesale markets[2]**
  - Create a model that supports the NYISO Market Design Vision - Attract and retain the most efficient resources to meet NY's reliability needs[2]
- **As part of developing a DER participation model, the NYISO has commenced on a process of evaluating the capacity value of resources with varying duration limitations**
  - The NYISO retained GE Energy Consulting to evaluate the capacity value of various resources in the NYISO market with the objective of aligning payments with the capacity value provided by each resource
- **This is a new approach shifting away from the one-size-fits-all approach used currently**
  - Payment to resources based on the value they provide to the capacity market

2. DER Market Design Updates and Energy Market Bid to Bill Examples, Presentation of Michael Lavillotti to the July 26 MIWG
https://www.nyiso.com/documents/20142/2180936/DER%20Market%20Design%20-%20Updates%20and%20Energy%20Market%20Bid%20to%20Bill_V9.pdf/34bed692-5e91-7d50-762f-95a348b73f89

Overview

- To compute consumer impacts, a spreadsheet analysis was conducted to test the impact of DER penetration on energy market LBMPs
- Due to a lack of experience with actual DERs in operation, sensitivities were run on the amount of DER penetration, the impact of DERs on LBMPs and the availability of DERs in the real-time market
- With regards to duration, we computed the impact of 4, 6 and 8 hour duration DERs separately
- For the capacity market, in addition to the sensitivities discussed above, we also provide a sensitivity analysis for the assumed comparability of DER with traditional Resources to account for the impact of DER on IRM and LCRs (50% and 100% impact on capacity requirements)
- Uncertainty remains with respect to where DERs will locate, how they will bid, their penetration and availability.
    - These factors and others will ultimately shape the impact that DERs have on consumer costs
- The purpose of this analysis is to provide a range of possible outcomes based on those sensitivities

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Consumer Impact Analysis (IA) Evaluation Areas

- Present the potential impact on all four evaluation areas

RELIABILITY

From an operational perspective, additional supply could be a reliability benefit, however, properly determining the capacity value of DERs and their impact on IRM/LCRs is important to avoid unintended adverse impacts to reliability

COST IMPACT/ MARKET EFFICIENCIES

The wholesale energy market consumer impact varies widely from an estimated savings of roughly $15 million to $180 million based on DER penetration, duration and availability.

The short-term analysis shows significant capacity market savings, however, these savings may not be sustainable as retirements and other changes will result from the influx of large amounts of DER penetration.

The long-term analysis shows no capacity market savings as the market moves towards equilibrium

ENVIRONMENT/ NEW TECHNOLOGY

The increase in use of DER , especially during system peak times may reduce emissions

TRANSPARENCY

No impact expected

Energy Market Impact Assumptions

- **The impact to representative upstate and downstate historical energy prices for all intervals in 2017 was calculated using the assumptions outlined on this and the next slide.**
  - The short run energy market impact of DERs was approximated using:
    - Hourly Day-Ahead load
    - Real time 5-minute level prices (DERs dispatchable on a 5-minute basis)
- **To analyze consumer impacts, an analysis was conducted to test the impact that Energy supplied by DERs could have on energy market LBMPs.**
  - Pricing data from two Generator buses with high price volatility selected:
    - Upstate node: 9-Mile 2
    - Downstate node: Ravenswood 3
- **The consumer impact of DER resources for both upstate (Zones A-F) and downstate (Zones G-K) was estimated for multiple scenarios as shown in the table below.**

MW	LBMP Impact	Incremental Percent per 100 MW
600	-6%	-1% (-1%x600) = -6%
1200	-9%	-0.5% (-0.5%x600)+-6% = -9%
2000	-11%	-0.25% (-0.25%x800)+-9% = -11%

Energy Market Impact Methodology

- **The study considered 4, 6, or 8 hour duration for DERs.**
  - DER injections were assumed to take place during two sets of seasonal hours:
    - Summer (May through October) from HB12:00 to HB19:00
    - Winter (November through April) from HB14:00 to HB21:00
  - The consecutive hours of production with the highest revenue were used in the analysis for the 4 and 6 hour duration calculations.
- **The hourly average price impact was multiplied by its respective hourly average load for both upstate and downstate.**
  - A constant resource availability factor of 20%, 50%, or 80% was then applied to provide the estimated consumer impact range.

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Energy Market Analysis

- **Compute the hours expected to be impacted by DER MW for each day**
  - For example, if the highest revenue 4 hour range on one summer day was 13, 14, 15, 16, then this set of hours for the given day was included when calculating the impact from a 4 hour duration DER.
- **Adjust the prices of the impacted 5-minute intervals based on the amount of DER MW (600 MW, 1200 MW or 2000 MW) and average them into hourly values**
  - See slide 6
  - This calculates a price delta (for example, -6% times a $30 price equals a savings of $1.80).
- **Multiply the price delta with its respective hourly average load value to compute the consumer impact for both upstate and downstate locations**
- **Apply an availability factor (20%, 50%, or 80%) to the above calculation**

Energy Market Impact

- The tables and graphs that follow show the Energy market impact for various levels of DER MW additions (600MW, 1200MW, or 2000MW)
- Existing Resources are assumed to remain in the Energy market at these DER MW addition levels
- The Statewide, Upstate, and Downstate impacts are shown separately for different levels of assumed availability (20%, 50% & 80%)

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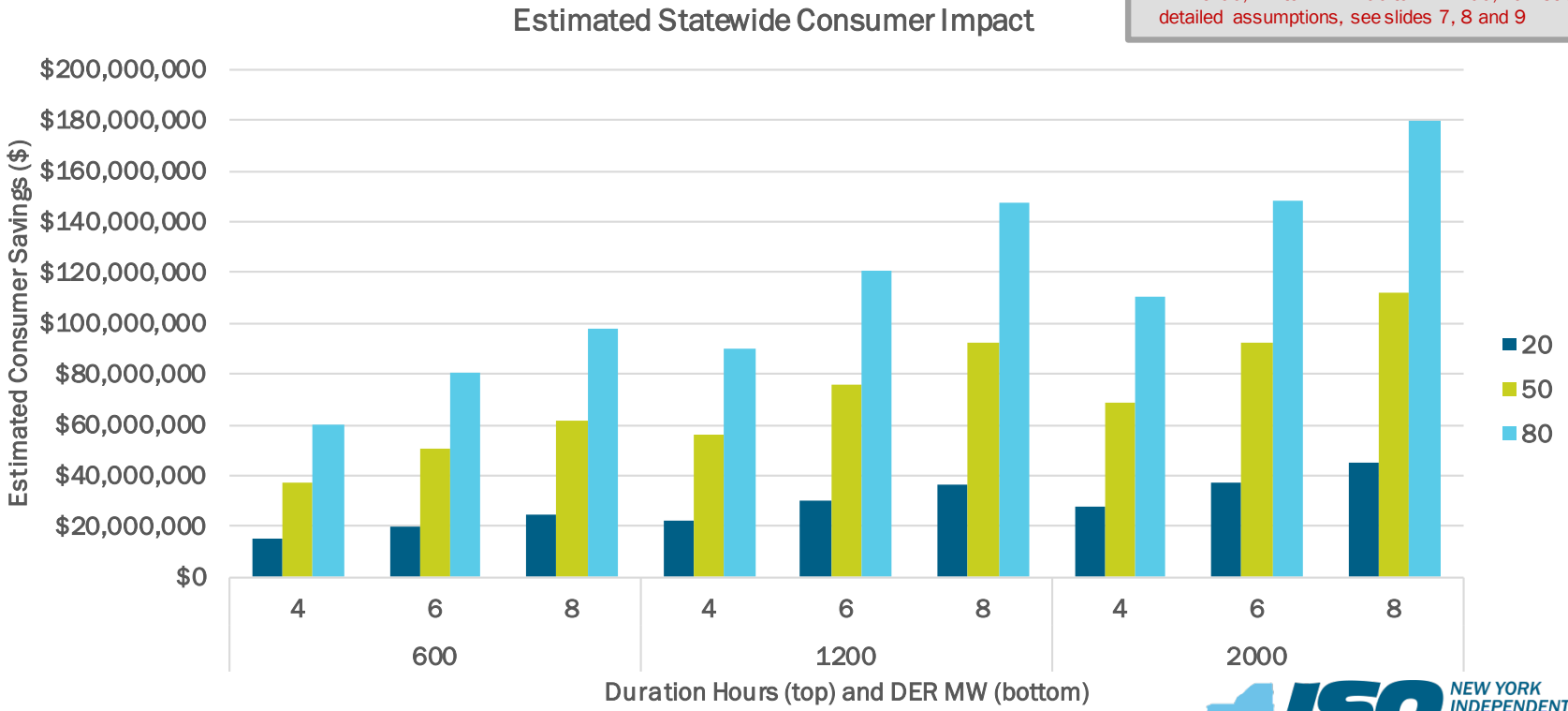
Energy Market Results - Statewide

- Statewide estimate with Availability: 20%, 50%, or 80%

Based on Pricing Data from 9-Mile 2 (Zones A-F) and Ravenswood 3 (Zones G-K); Assumed prices drop by 6% (600 MW), 9% (1200 MW) and 11% (2000 MW); DER Injections: Summer HB12:00 to HB:19:00, Winter HB14:00 to HB21:00; For list of detailed assumptions, see slides 7, 8 and 9



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Energy Market Results - Statewide

Based on Pricing Data from 9-Mile 2 (Zones A-F) and Ravenswood 3 (Zones G-K); Assumed prices drop by 6% (600 MW), 9% (1200 MW) and 11% (2000 MW); DER Injections: Summer HB12:00 to HB:19:00, Winter HB14:00 to HB21:00; For list of detailed assumptions, see slides 7, 8 and 9.

ESTIMATED STATEWIDE (A-K) CONSUMER IMPACT				
Availability	% Shaved	Capacity [MW]	Duration Hours	Est. Annual Savings ($)
20%	6	600	4, 6, 8	15 million to 25 million
	9	1200	4, 6, 8	23 million to 37 million
	11	2000	4, 6, 8	28 million to 45 million
50%	6	600	4, 6, 8	38 million to 61 million
	9	1200	4, 6, 8	56 million to 92 million
	11	2000	4, 6, 8	69 million to 112 million
80%	6	600	4, 6, 8	60 million to 98 million
	9	1200	4, 6, 8	90 million to 147 million
	11	2000	4, 6, 8	110 million to 180 million

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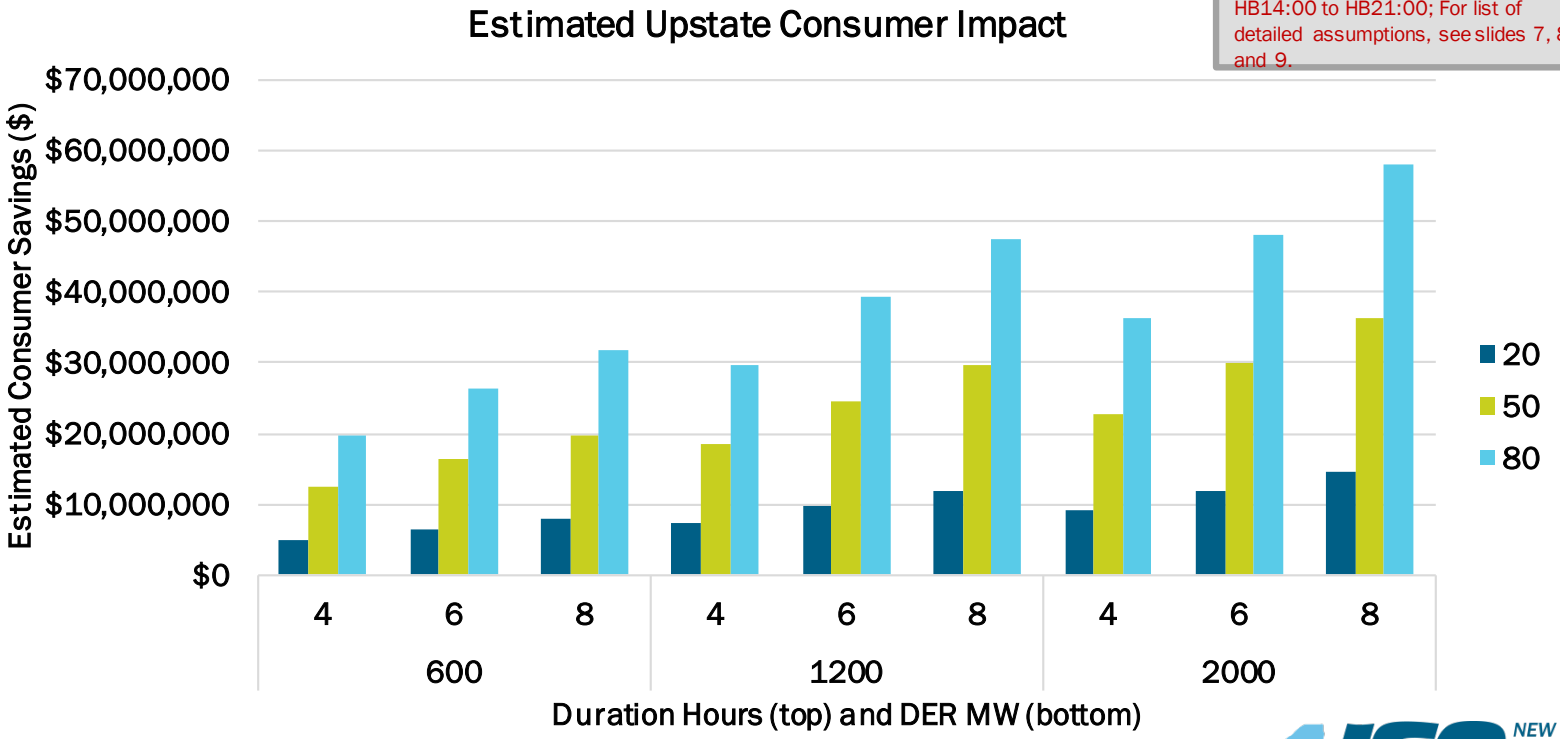
Energy Market Results - Upstate

- Upstate estimate with Availability: 20%, 50%, or 80%

Based on Pricing Data from 9-Mile 2 (Zones A-F) and Ravenswood 3 (Zones G-K); Assumed prices drop by 6% (600 MW), 9% (1200 MW) and 11% (2000 MW); DER Injections: Summer HB12:00 to HB:19:00, Winter HB14:00 to HB21:00; For list of detailed assumptions, see slides 7, 8 and 9.



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Energy Market Results - Upstate

Based on Pricing Data from 9-Mile 2 (Zones A-F) and Ravenswood 3 (Zones G-K); Assumed prices drop by 6% (600 MW), 9% (1200 MW) and 11% (2000 MW); DER Injections: Summer HB12:00 to HB:19:00, Winter HB14:00 to HB21:00; For list of detailed assumptions, see slides 7, 8 and 9

ESTIMATED UPSTATE (A-F) CONSUMER IMPACT				
Availability	% Shaved	Capacity [MW]	Duration Hours	Est. Annual Savings ($)
20%	6	600	4, 6, 8	5 million to 8 million
	9	1200	4, 6, 8	7 million to 12 million
	11	2000	4, 6, 8	9 million to 14 million
50%	6	600	4, 6, 8	12 million to 20 million
	9	1200	4, 6, 8	18 million to 30 million
	11	2000	4, 6, 8	23 million to 36 million
80%	6	600	4, 6, 8	20 million to 32 million
	9	1200	4, 6, 8	30 million to 47 million
	11	2000	4, 6, 8	36 million to 58 million

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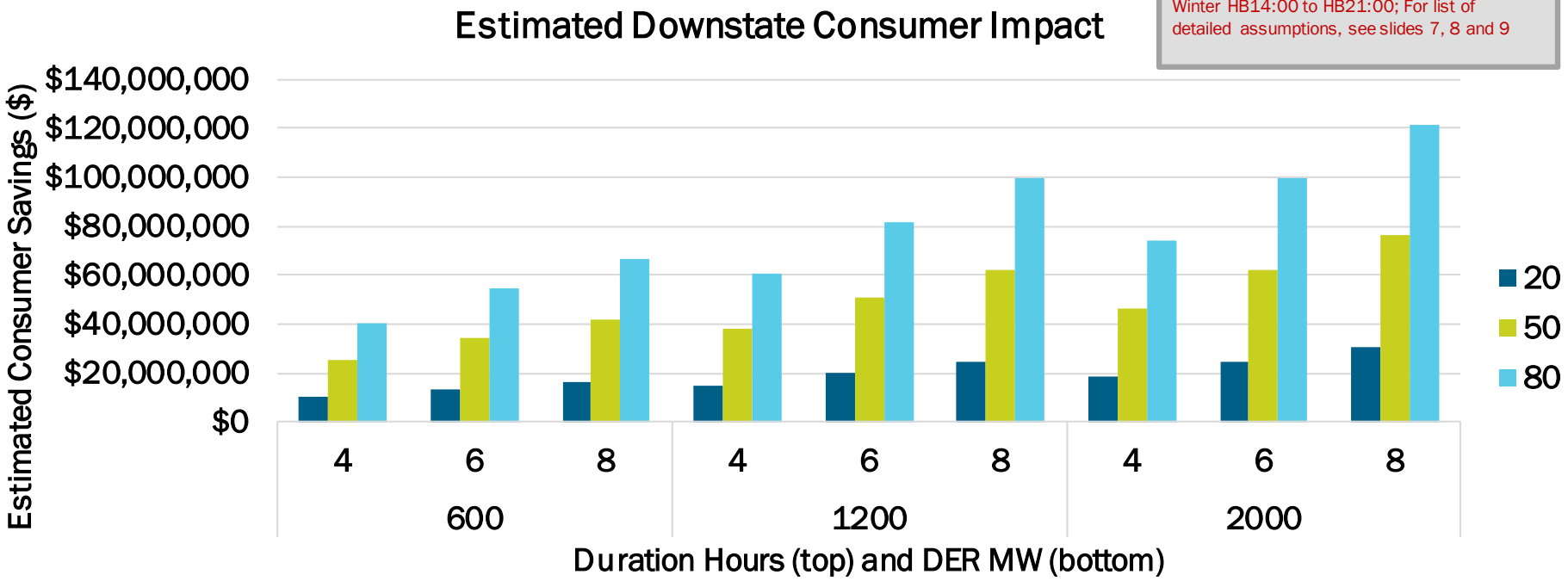
Energy Market Results - Downstate

- Downstate estimate with Availability: 20%, 50%, or 80%

Based on Pricing Data from 9-Mile 2 (Zones A-F) and Ravenswood 3 (Zones G-K); Assumed prices drop by 6% (600 MW), 9% (1200 MW) and 11% (2000 MW); DER Injections: Summer HB12:00 to HB:19:00, Winter HB14:00 to HB21:00; For list of detailed assumptions, see slides 7, 8 and 9



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Energy Market Results - Downstate

Based on Pricing Data from 9-Mile 2 (Zones A-F) and Ravenswood 3 (Zones G-K); Assumed prices drop by 6% (600 MW), 9% (1200 MW) and 11% (2000 MW); DER Injections: Summer HB12:00 to HB:19:00, Winter HB14:00 to HB21:00; For list of detailed assumptions, see slides 7, 8 and 9.

ESTIMATED DOWNSTATE (G-K) CONSUMER IMPACT				
Availability	% Shaved	Capacity [MW]	Duration Hours	Est. Annual Savings ($)
20%	6	600	4, 6, 8	10 million to 17 million
	9	1200	4, 6, 8	15 million to 25 million
	11	2000	4, 6, 8	18 million to 30 million
50%	6	600	4, 6, 8	25 million to 42 million
	9	1200	4, 6, 8	38 million to 62 million
	11	2000	4, 6, 8	46 million to 76 million
80%	6	600	4, 6, 8	40 million to 66 million
	9	1200	4, 6, 8	61 million to 100 million
	11	2000	4, 6, 8	74 million to 122 million

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Energy Market Results- Conclusion

- Considering availability, total DER MW, and duration, the estimated statewide consumer impact varies widely from an estimated savings of roughly $15 million to $180 million.
- Higher availability will lead to higher consumer impact for DERs.

Capacity Market Impact

- **Since we don't know how much DER will be available, we provide estimates over a range of expected values**
  - Assumed a range of DER 600MW, 1200 MW and 2000MW added to the fleet
  - The penetration of DERs are not modelled with an offer floor
- **Assumed that 70 percent of DER will be located in Zone J and 30 percent in ROS**
  - 20% of the of the original SCR capacity was assumed to be resources moving from the SCR program to the DER program
  - 15% of original SCRs was assumed to have left the market
  - This was represented in the analysis by simultaneously removing 35% of SCR MW from the Capacity Market while adding DER MW to the Change Cases[3]
- **DERs were modeled with a 10% derating factor**
- **Sensitivities were run with DER having a 50% and 100% impact on capacity requirements to account for the impact of DER on IRM/LCRs**
- **The IRM/LCR values from as found system were assumed**
- **DERs were modeled consistent with the capacity supplier payment structure proposed in the DER project as part of the stakeholder process**
- **Assumed that all of the DER will participate in the wholesale market as capacity providers**

3. Appendix II shows the short-term Capacity Costs Case with 35% SCR MW removed prior to DER MW penetration as requested by the New York Department of Public Service staff (NYDPS)

Short-term Capacity Cost Impact Methodology

- Used the 2018 as found system as a base case, for both short-term and long-term consumer impact analysis
  - 2018 as found system with additions of 600MW, 1200MW and 2000MW of DER penetration
- The short-term impact analysis assumed no additional changes to generation
- The impacts shown in the short-term may not be sustainable, as retirements and other changes will result from the influx of large amounts of capacity additions. We address this in the long-term analysis, that assumes a supply level based on the historic level of excess

Short-term Capacity Cost Impact

- The tables and graphs that follow show the short-run capacity cost impact of various levels of DER MW additions (600MW, 12000MW & 2000MW)
- Both the state-wide impact and the impact on individual Localities, LI, NYC, GHI and ROS are shown separately
- We also provide a sensitivity analysis for the assumed comparability of DER with traditional Resources to account for the impact of DER on IRM and LCRs for all the different levels of DER discussed above (50% and 100% impact on capacity requirements)

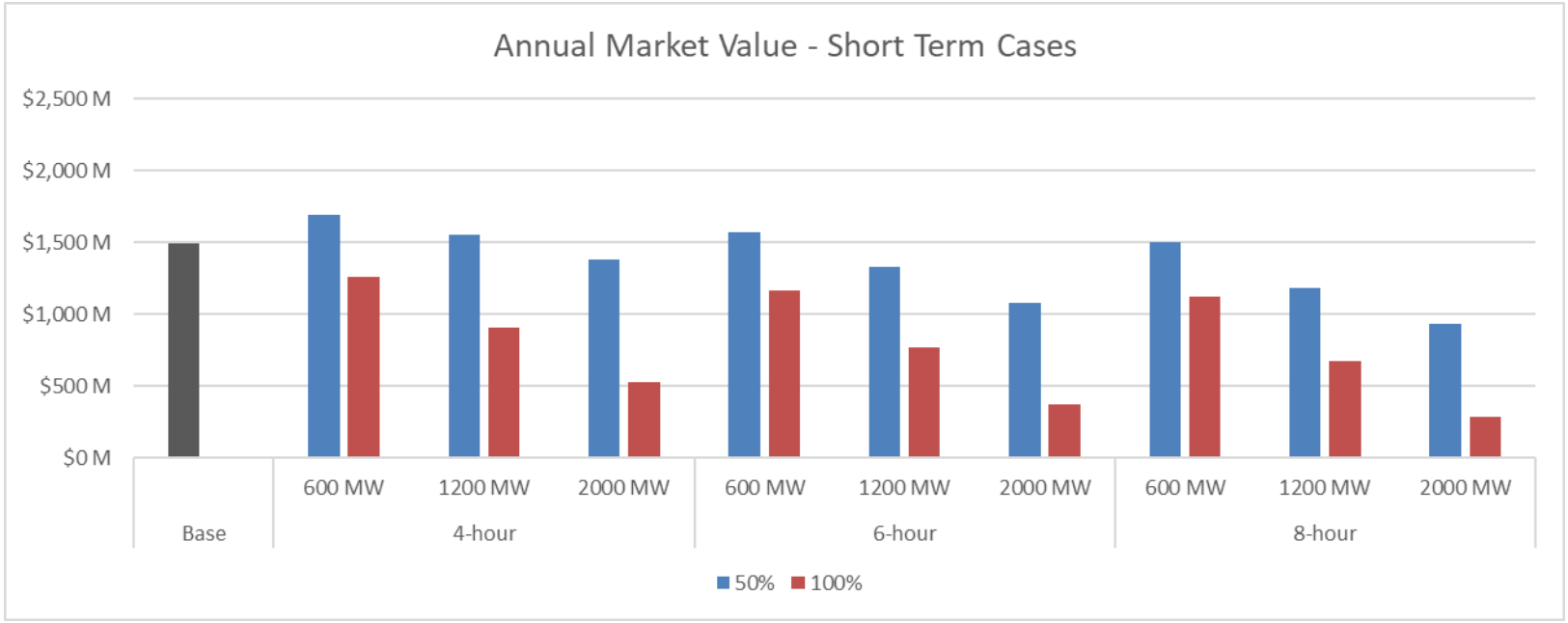
Short-term Capacity Cost Impact, Contd.

- The last three columns of slides 24 and 25 show the MW impact of 4, 6 and 8 hour duration DERs for different levels of DER penetration
- The MW impacts determine the change in capacity market impacts relative to the base case
- For Example, in slide 24 the second row shows an increase of 300 MW in capacity requirement reflecting the 50% comparability case (600 MW*.5)
- Supply on the other hand, increases by only 22 MW, which is the net of removing 35% of SCRs from the capacity market (428 MW) and accounting for 4 hour duration DERs that have a 75% capacity value (600 MW*.75 – 428 MW)
- The increase in capacity requirements exceeds the increase in supply (22 MW – 300 MW) resulting in an increase in cost of $ 203 million relative to the base case

Short-term Capacity Cost Impact, Contd.

- Another example looks at a 6 hour duration DER with 2000 MW penetration on slide 24
- Capacity requirement increases by 1000 MW reflecting the 50% comparability case (2000 MW*.5)
- Supply on the other hand, increases by 1372 MW, which is the net of removing 35% of SCRs from the capacity market (428 MW) and accounting for the 6 hour duration DERs that have a 90% capacity value (2000 MW*.9 – 428 MW)
- The increase in capacity requirements is less than the increase in supply (1372 MW – 1000 MW) resulting in a decrease in cost of $ 412 million relative to the base case

Short-Term Capacity Cost Impact



The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18 and 19. **Short-term impacts not sustainable as retirements and other changes will result from the large influx of DER additions.**

Short-Term Capacity Cost Impact

Short Term, 50% Comparability Cases

Short Term Cases ($M)									MW Impacts		
Comp	Duration	Penetration	ROS	GHI	NYC	LI	Total	Δ to Base	Requirement	Supply	Total
Base Case			$203	$372	$649	$266	**$1,490**	-	-	-	-
50%	4	600	$280	$404	$728	$280	**$1,693**	**$203**	300	22	**278**
50%	4	1200	$250	$362	$661	$280	**$1,553**	**$63**	600	472	**128**
50%	4	2000	$211	$307	$579	$280	**$1,377**	**($113)**	1000	1072	**-72**
50%	6	600	$258	$372	$664	$280	**$1,574**	**$85**	300	112	**188**
50%	6	1200	$206	$298	$548	$280	**$1,332**	**($158)**	600	652	**-52**
50%	6	2000	$135	$228	$434	$280	**$1,077**	**($412)**	1000	1372	**-372**
50%	8	600	$242	$350	$627	$280	**$1,500**	**$10**	300	172	**128**
50%	8	1200	$175	$256	$472	$280	**$1,183**	**($306)**	600	772	**-172**
50%	8	2000	$85	$193	$373	$280	**$931**	**($558)**	1000	1572	**-572**

The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18 and 19. **Short-term impacts not sustainable as retirements and other changes will result from the large influx of DER additions.**

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Short-Term Capacity Cost Impact

Short Term, 100% Comparability Cases

Short Term Cases ($M)									MW Impacts		
Comp	Duration	Penetration	ROS	GHI	NYC	LI	Total	Δ to Base	Requirement	Supply	Total
Base Case			$203	$372	$649	$266	**$1,490**	-	-	-	-
100%	4	600	$196	$285	$501	$280	**$1,262**	**($228)**	0	22	**-22**
100%	4	1200	$80	$193	$349	$280	**$903**	**($587)**	0	472	**-472**
100%	4	2000	$2	$85	$159	$280	**$526**	**($963)**	0	1072	**-1072**
100%	6	600	$173	$258	$455	$280	**$1,166**	**($324)**	0	112	**-112**
100%	6	1200	$34	$160	$293	$280	**$768**	**($722)**	0	652	**-652**
100%	6	2000	$2	$30	$58	$280	**$371**	**($1,118)**	0	1372	**-1372**
100%	8	600	$158	$247	$438	$280	**$1,123**	**($367)**	0	172	**-172**
100%	8	1200	$2	$139	$255	$280	**$677**	**($813)**	0	772	**-772**
100%	8	2000	$2	$1	$1	$280	**$285**	**($1,205)**	0	1572	**-1572**

The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18 and 19. **Short-term impacts not sustainable as retirements and other changes will result from the large influx of DER additions.**

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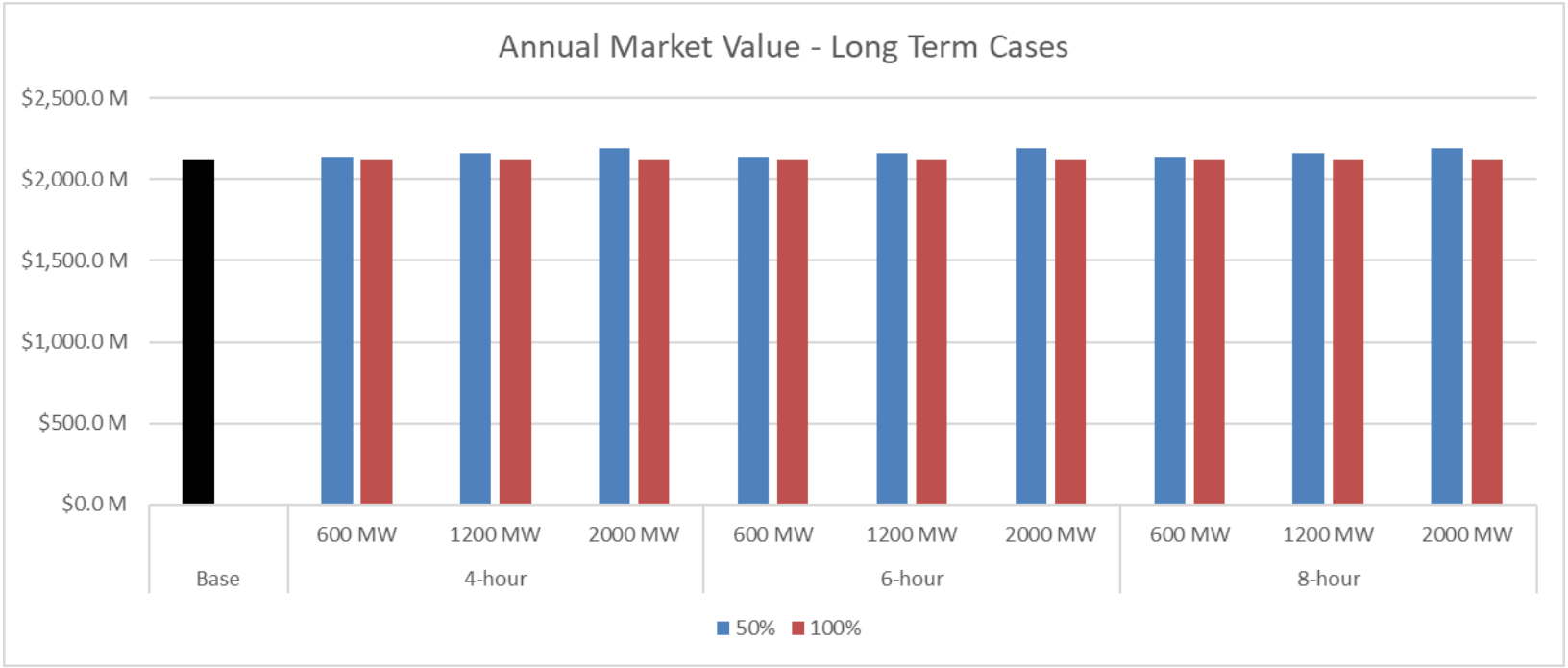
Long-Term Cost Capacity Impact Methodology

- Used the 2018 as found system as a base case
  - the same MW additions and requirement percentages developed in the short term impact analysis
  - the 2018 Demand Curve values
- For the 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

Long-Term Capacity Cost Impact

- For the supply level, we use 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
- The tables and graphs for the long-run analysis follow the same format as the short-run analysis
- We provide the cost impact for different levels of DER MWs and show the impacts both on a state-wide and individual Locality basis
- We also provide a sensitivity analysis based on different levels of assumed impact of DER on capacity requirements

Long-Term Capacity Cost Impact



The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18 ,19 and 26.

Long-Term Capacity Cost Impact

Long Term, 50% Comparability Cases

Long Term Cases ($M)								
Comp	**Duration**	**Penetration**	**ROS**	**GHI**	**NYC**	**LI**	**Total**	**Δ to Base**
Long-Term Base Case			$439	$500	$886	$296	**$2,121**	-
50%	4	600	$441	$499	$906	$296	**$2,143**	**$21**
50%	4	1200	$443	$499	$926	$296	**$2,164**	**$43**
50%	4	2000	$446	$499	$952	$296	**$2,194**	**$73**
50%	6	600	$441	$499	$906	$296	**$2,142**	**$21**
50%	6	1200	$443	$499	$926	$296	**$2,165**	**$44**
50%	6	2000	$447	$499	$952	$296	**$2,195**	**$74**
50%	8	600	$441	$499	$906	$296	**$2,142**	**$21**
50%	8	1200	$443	$499	$926	$296	**$2,165**	**$44**
50%	8	2000	$448	$499	$952	$296	**$2,195**	**$74**

The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18, 19 and 26.

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Long-Term Capacity Cost Impact

Long Term, 100% Comparability Cases

Long Term Cases ($M)								
Comp	**Duration**	**Penetration**	**ROS**	**GHI**	**NYC**	**LI**	**Total**	**Δ to Base**
Long-Term Base Case			$439	$500	$886	$296	**$2,121**	-
100%	4	600	$439	$500	$886	$296	**$2,121**	**($0)**
100%	4	1200	$439	$500	$886	$296	**$2,121**	**($0)**
100%	4	2000	$439	$500	$886	$296	**$2,121**	**$0**
100%	6	600	$439	$500	$886	$296	**$2,121**	**($1)**
100%	6	1200	$439	$500	$886	$296	**$2,121**	**$0**
100%	6	2000	$440	$500	$886	$296	**$2,122**	**$1**
100%	8	600	$439	$500	$886	$296	**$2,121**	**($1)**
100%	8	1200	$439	$500	$886	$296	**$2,121**	**$0**
100%	8	2000	$440	$500	$885	$296	**$2,122**	**$1**

The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18, 19 and 26.

Additional Analysis

- **At the October 9, 2018 Joint ICAP/MIWG/PRLWG meeting, several stakeholders requested that the NYISO compute the consumer impact of SCRs leaving the wholesale market as a results of potential changes from the current compensation regime**
  - Specifically, compute the impact of all SCRs leaving the market
- **The NYISO is providing that analysis as requested by stakeholders**
  - We provide the impact of SCRs leaving the market as a stand alone analysis, separate from the consumer impact of DERs discussed earlier in the presentation

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SCR Case Cost Impact

Short Term Cases ($M)						
Case	**ROS**	**GHI**	**NYC**	**LI**	**Total**	**Δ to Base**
Base Case	$203	$372	$649	$266	**$1,490**	
No SCRs & No EDRPs	$240	$441	$750	$275	**$1,706**	**$217**
No SCRs & No EDRPs - back to Base Prices	$175	$342	$584	$236	**$1,336**	**-$153**
No SCRs & No EDRPs - back to Base LOE	$195	$376	$628	$264	**$1,463**	**-$27**

Historic LOE Cases ($M)						
Case	**ROS**	**GHI**	**NYC**	**LI**	**Total**	**Δ to Base**
Historic LOE Base Case	$439	$500	$886	$296	**$2,121**	
No SCRs & No EDRPs - back to Historic LOE	$428	$505	$857	$295	**$2,083**	**-$38**

No SCRs & No EDRP Cases based on IRM/LCRs developed by the New York State Reliability Council.

Other Impacts

- **Evaluated other impacts:**
  - Reliability Impact
  - Environmental Impact
  - Impact on Transparency

Environmental Impacts

- The increase in use of DER , especially during system peak times may reduce emissions
  - It is anticipated that DERs will provide energy to the grid at times of high load volumes which could displace higher cost, likely higher emitting units.
- DERs should enable greater adoption of renewables and that should further increase decarbonization
- Pairing DERs with renewables should also reduce renewable curtailment and have a positive environmental impact
- Increased use of DERs to provide ancillary services may add to carbon reduction

Reliability Impacts

- From an operational perspective, additional supply could be a reliability benefit, however, properly determining the capacity value of DERs and their impact on IRM/LCRs is important to avoid unintended adverse impacts to reliability
- Depending on location within the system, DERs may be in a position to provide local reliability services
- The flexibility of DERs could be a reliability benefit

Impact on Transparency

- No impact expected

Appendix I

Calculated Energy Market Consumer Impact Estimate

ESTIMATED STATEWIDE (A-K) CONSUMER IMPACT				
Availability	% Shaved	Capacity [MW]	Duration Hours	Est. Annual Savings ($)
20%	6	600	4	15,014,377
			6	20,161,868
			8	24,512,934
	9	1200	4	22,521,565
			6	30,242,801
			8	36,769,401
	11	2000	4	27,526,357
			6	36,963,424
			8	44,940,378
50%	6	600	4	37,535,942
			6	50,404,669
			8	61,282,334
	9	1200	4	56,303,913
			6	75,607,004
			8	91,923,501
	11	2000	4	68,815,893
			6	92,408,560
			8	112,350,946
80%	6	600	4	60,057,507
			6	80,647,471
			8	98,051,735
	9	1200	4	90,086,260
			6	120,971,206
			8	147,077,602
	11	2000	4	110,105,429
			6	147,853,696
			8	179,761,514

ESTIMATED UPSTATE (A-F) CONSUMER IMPACT				
Availability	% Shaved	Capacity [MW]	Duration Hours	Est. Annual Savings ($)
20%	6	600	4	4,930,304
			6	6,552,531
			8	7,900,958
	9	1200	4	7,395,456
			6	9,828,796
			8	11,851,437
	11	2000	4	9,038,891
			6	12,012,973
			8	14,485,089
50%	6	600	4	12,325,760
			6	16,381,327
			8	19,752,395
	9	1200	4	18,488,640
			6	24,571,990
			8	29,628,592
	11	2000	4	22,597,227
			6	30,032,432
			8	36,212,724
80%	6	600	4	19,721,216
			6	26,210,123
			8	31,603,832
	9	1200	4	29,581,825
			6	39,315,184
			8	47,405,747
	11	2000	4	36,155,563
			6	48,051,891
			8	57,940,358

ESTIMATED DOWNSTATE (G-K) CONSUMER IMPACT				
Availability	% Shaved	Capacity [MW]	Duration Hours	Est. Annual Savings ($)
20%	6	600	4	10,084,073
			6	13,609,337
			8	16,611,976
	9	1200	4	15,126,109
			6	20,414,006
			8	24,917,964
	11	2000	4	18,487,466
			6	24,950,451
			8	30,455,289
50%	6	600	4	25,210,182
			6	34,023,343
			8	41,529,939
	9	1200	4	37,815,272
			6	51,035,014
			8	62,294,909
	11	2000	4	46,218,666
			6	62,376,128
			8	76,138,222
80%	6	600	4	40,336,291
			6	54,437,348
			8	66,447,903
	9	1200	4	60,504,436
			6	81,656,022
			8	99,671,855
	11	2000	4	73,949,866
			6	99,801,805
			8	121,821,156

Appendix II

Calculated Capacity Cost Case with 35% SCR MW Removed Prior to DER Entry

Short Term, 50% Comparability Case

Short Term Cases ($M)									
Comp	Duration	Penetration	ROS	GHI	NYC	LI	Total	Δ to Base	Δ to 35% SCR MW Removed Case
Base Case			$203	$372	$649	$266	$1,490		
35% SCR MW Removed Case			$310	$447	$808	$280	$1,846		
50%	4	600	$280	$404	$728	$280	$1,693	$203	($153)
50%	4	1200	$250	$362	$661	$280	$1,553	$63	($293)
50%	4	2000	$211	$307	$579	$280	$1,377	($113)	($469)
50%	6	600	$258	$372	$664	$280	$1,574	$85	($272)
50%	6	1200	$206	$298	$548	$280	$1,332	($158)	($514)
50%	6	2000	$135	$228	$434	$280	$1,077	($412)	($769)
50%	8	600	$242	$350	$627	$280	$1,500	$10	($346)
50%	8	1200	$175	$256	$472	$280	$1,183	($306)	($663)
50%	8	2000	$85	$193	$373	$280	$931	($558)	($914)

The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW, The "35% SCR MW Removed Case" removed SCR MW before adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18 and 19. **Short-term impacts not sustainable as retirements and other changes will result from the large influx of DER additions.**

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Short Term, 100% Comparability Case

Short Term Cases ($M)									
Comp	Duration	Penetration	ROS	GHI	NYC	LI	Total	Δ to Base	Δ to 35% SCR MW Removed Case
Base Case			$203	$372	$649	$266	$1,490		
35% SCR MW Removed Case			$310	$447	$808	$280	$1,846		
100%	4	600	$196	$285	$501	$280	$1,262	($228)	($584)
100%	4	1200	$80	$193	$349	$280	$903	($587)	($943)
100%	4	2000	$2	$85	$159	$280	$526	($963)	($1,320)
100%	6	600	$173	$258	$455	$280	$1,166	($324)	($680)
100%	6	1200	$34	$160	$293	$280	$768	($722)	($1,078)
100%	6	2000	$2	$30	$58	$280	$371	($1,118)	($1,475)
100%	8	600	$158	$247	$438	$280	$1,123	($367)	($723)
100%	8	1200	$2	$139	$255	$280	$677	($813)	($1,169)
100%	8	2000	$2	$1	$1	$280	$285	($1,205)	($1,561)

The Change Cases simultaneously removed 35% of SCR MW from the capacity market while adding DER MW, The "35% SCR MW Removed Case" removed SCR MW before adding DER MW; Assumed 70% DER located in Zone J and 30% in ROS; Capacity supplier payment based on: 4 hour duration (75%), 6 hour duration (90%), 8 hour duration (100%); Assumed 50% and 100% impact of DER on capacity requirements to account for impact on IRM/LCR; Complete list of assumptions on slides 18 and 19. **Short-term impacts not sustainable as retirements and other changes will result from the large influx of DER additions.**

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Feedback?

- Email additional feedback to:
- deckels@nyiso.com

Questions?

We are here to help. Let us know if we can add anything.

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- 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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