Establishing Zone J Operating Reserves

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Reposted – Revisions in Red Font

March 4, 2019, Rensselaer, NY

NEW YORK INDEPENDENT SYSTEM OPERATOR

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Agenda

- Introduction
- Background
- Estimated Impact Overview
- Estimated Energy Market Impact – Approach 1
- Estimated Energy Market Impact – Approach 2
- Estimated Capacity Market Impact
- Next Steps
- Appendix

Introduction

Introduction

- **During the January 8, 2019 working group meeting, stakeholders requested that the NYISO provide information on the potential consumer cost implications for including Zone J Operating Reserve requirements within the energy market.**
  - The NYISO agreed to provide an informal impact analysis.
    - The results of this analysis will be discussed today.

Previous Presentations

Date	Working Group	Discussion points and links to materials
01-08-19	ICAPWG/MIWG	Proposed schedule for accelerating implementation of Zone J operating reserves
01-15-19	ICAPWG/MIWG	Establishing a new Zone J reserve region with a 500 MW 10-minute and 1,000 MW 30-minute reserve requirement
01-24-19	ICAPWG/MIWG	Proposed operating reserve demand curve prices for the Zone J reserve products and the proposed tariff revisions for this initiative

Background

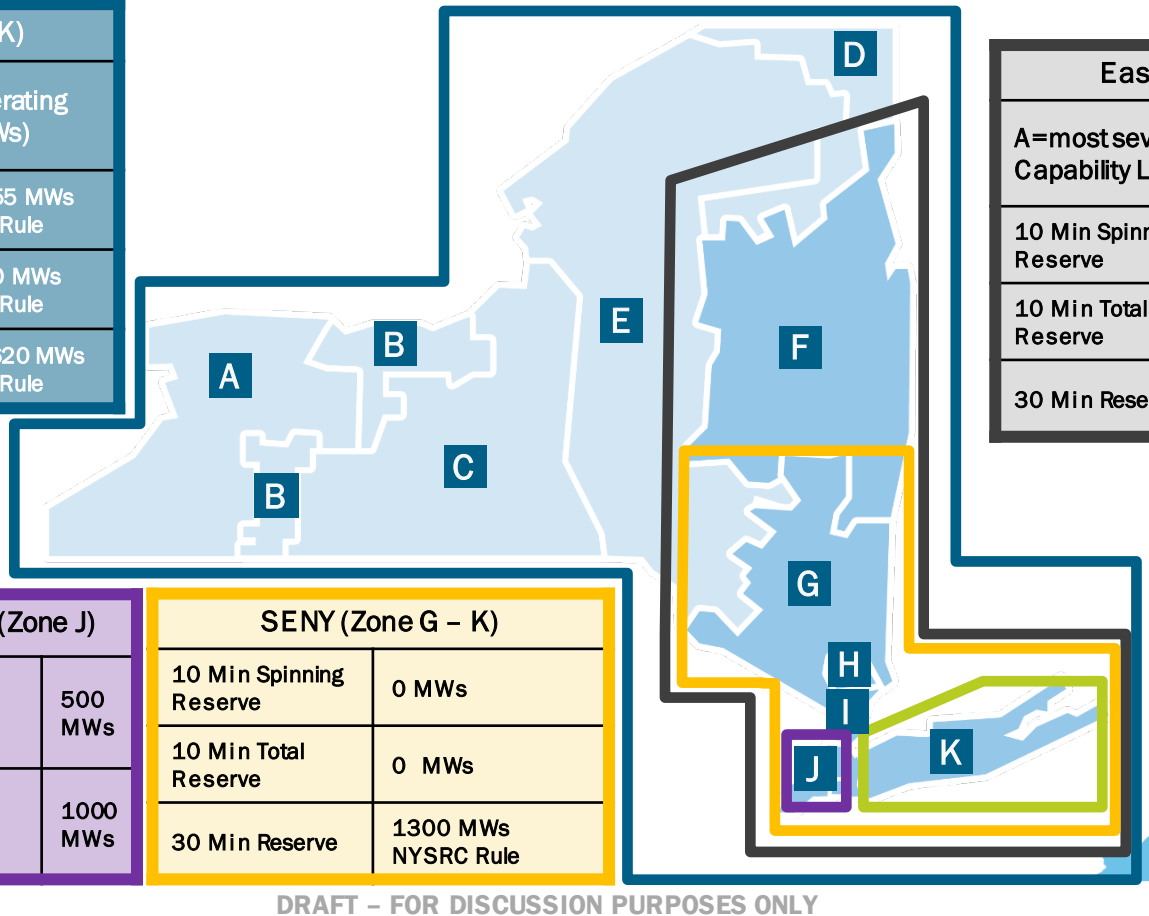
Zone J Operating Reserve Procurement

- The NYISO proposes to establish a new NYC reserve region and procure 500 MW of 10-minute reserves and 1,000 MW of 30-minute reserves in Zone J, consistent with NYSRC reliability rules for NYCA reliability.
- The NYISO is proposing to establish operating reserve demand curves that assign a $25/MWh value to the proposed reserve requirements for Zone J.
- Creating a Zone J reserve region and associated reserve requirements has the potential to provide:
  - More efficient scheduling and procurement of resources
  - Locationally specific market price signals for the necessary resource availability and flexibility to meet system reliability needs
  - More efficient price signals during SCR/EDRP activations
  - Produce incentive for investment in resources that can supply 10-minute and 30-minute reserve products

NYCA Operating Reserves with Zone J

NYCA (Zone A – K)	
A=most severe NYCA Operating Capability Loss (1310 MWs)	
10 Min Spinning Reserve	½ A=655 MWs NYSRC Rule
10 Min Total Reserve	A=1310 MWs NYSRC Rule
30 Min Reserve	2xA=2620 MWs NYSRC Rule

A	WEST
B	GENESE
C	CENTRL
D	NORTH
E	MHK VL
F	CAPITL
G	HUD VL
H	MILLWD
I	DUNWOD
J	N.Y.C.
K	LONGIL



East (Zone F – K)	
A=most severe NYCA Operating Capability Loss (1310 MWs)	
10 Min Spinning Reserve	¼ A=330 MWs NERC, NPCC Rule
10 Min Total Reserve	1200 MWs NYSRC Rule
30 Min Reserve	1200 MWs NERC, NPCC Rule

NYC (Zone J)	
10 Min Total Reserve	500 MWs
30 Min Reserve	1000 MWs

SENY (Zone G – K)	
10 Min Spinning Reserve	0 MWs
10 Min Total Reserve	0 MWs
30 Min Reserve	1300 MWs NYSRC Rule

Long Island (Zone K)	
10 Min Spinning Reserve	0 MWs
10 Min Total Reserve	120 MW NERC, NPCC Rule
30 Min Reserve	270 – 540 MWs Max limits NYSRC Rule

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Overview of Calculated Impact

Overview of Calculated Impact

- **The NYISO calculated the following potential impacts from implementing the proposed Zone J reserve requirements within the market software:**
  - The energy market impact ranges from an estimated short-run cost of roughly $7.6 million to $13.2 million per year.
    - It is important to note the scale of this impact to the total value of energy market transactions of approximately $4 billion in 2017.
- **The capacity market impact is an estimated near-term savings of roughly $3 million per year from the potential downward pressure on the reference point values due to potential increases in net Energy and Ancillary Services revenues.**
  - It is important to note that the capacity market estimate considers only one year of Energy and Ancillary Services revenues impacted by the Zone J reserve region, and thus additional benefits would be realized as additional years are impacted.
  - Additionally, the net EAS model treats the current Zone J peaking plant (frame turbine unit) as a block loaded 30-minute gas turbine, which is unable to capture 10-minute reserve revenues or reflect incentives for 10-minute resources.
- **The impact analysis methodology and results are further described in the following slides.**

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Calculated Energy Market Impact – Approach 1

Energy Market Impacts

- The analysis performed by NYISO reveals a potential energy market consumer impact of including the Zone J reserve requirements within the market software ranging from a cost increase of $7.6 million to $13.2 million annually.
- Two approaches were used to calculate these impacts, as further discussed in the next few slides.

Concepts for Consideration – Approach 1

- **Given the expedited timeline of this analysis, several assumptions in the data analysis need to be considered when analyzing the results presented:**
  - The calculated impact did not account for any latent (i.e., available but not scheduled) reserves when determining whether there would have been a potential "shortage" in meeting the proposed Zone J reserve requirements.
    - Instead, actual, real-time reserve schedules based on current reserve requirement procurements were considered.
      - Reserves schedules indicate that sufficient reserves to fulfill the proposed 10-minute Zone J reserve requirement were scheduled approximately 93% of the time, while reserves to fulfill the 30-minute requirement were scheduled approximately 97% of the time.
    - Data show that, after accounting for latent reserves, in approximately 97% of 15-minute intervals between 12/2017 and 12/2018, sufficient quantities of reserve capability would have been available to fulfill the proposed 10-minute Zone J reserve requirement, while the 30-minute requirement would have been fulfilled in approximately 99% of the intervals.
  - Shifting schedules on generators outside of NYC, imports/exports, and interface constraints (i.e., transmission) to free up reserves on NYC units were not considered as being able to supply incremental energy under this approach.
  - In practice, the market software may have been able to commit/dispatch to fulfill the proposed Zone J reserve requirements and avoid potential "shortages" identified using this approach.
    - Approach 1 did not include any re-runs of market outcomes to account for available resource commitment/dispatch opportunities to meet the proposed Zone J reserve requirements.
  - The estimated impact is not adjusted to reflect any potential offset resulting from reducing uplift costs by expressly procuring the Zone J reserve requirements within the market software.
- **Based on these assumptions, the NYISO believes that the results of this approach represent a conservative (i.e., higher magnitude) estimate of the potential consumer impact at $13.2 million.**

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Energy Market Impact Methodology – Approach 1

- To calculate potential consumer impacts, Approach 1 utilized a spreadsheet analysis to evaluate the price impact of procuring additional reserves in NYC.
- The potential impact of procuring additional operational reserves in Zone J was estimated for energy market LBMPs and reserve clearing prices.
  - The amount of additional reserves required was approximated by using the actual real-time 10-minute and 30-minute scheduled reserves.
  - The amount of reserves actually scheduled on resources located in Zone J was compared to the proposed requirements (500 MW of 10-minute reserves and 1,000 MW of 30-minute reserves) to determine intervals in which a potential "shortage" in meeting the proposed Zone J reserve requirements could have occurred.

Energy Market Impact Methodology – Approach 1

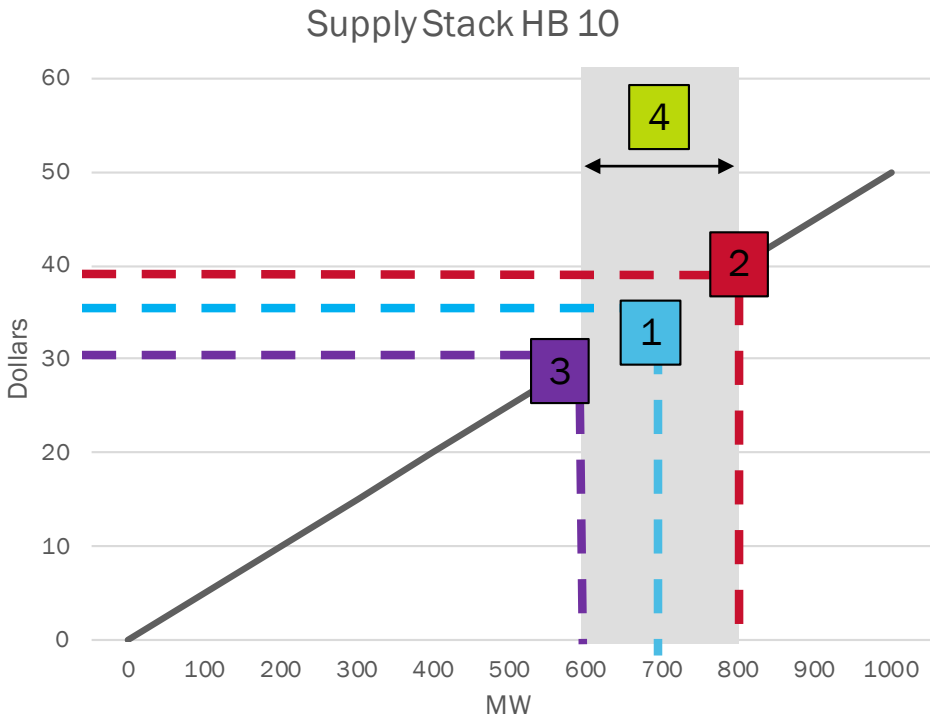
- **The increase in the average hourly LBMPs and ancillary services clearing prices was estimated by evaluating the supply stack for a given hour in the real-time market, based on the MW of the potential Zone J reserve "shortage"**
  - In the context of this analysis, a potential "shortage" in meeting the proposed Zone J reserve requirements refers to the difference between the proposed reserve requirements (500 MW of 10-minute reserves and 1,000 MW of 30-minute reserves) and the actual real-time reserve schedules for Zone J resources resulting from procurement of the reserve requirements currently included in the market software.
  - The evaluation was limited to analyzing the supply stack within Zone J.
  - NYISO calculated the price impact by looking at the average percent difference between incremental bids (Change Case 1).
  - Further details regarding the methodology utilized are provided in the Appendix.
- **A representative day was selected for each season based on frequency of potential "shortages" and average LBMPs:**
  - Winter: December, *January*, February
  - Spring: March, *April*, May
  - Summer: June, *July*, August
  - Fall: September, *October*, November

  *The italicized month within each season includes the representative day selected for such period

Energy Market Impact Methodology – Approach 1

- **An average supply curve cost increase for each sample day was then applied to all intervals for a given season in which a potential "shortage" was identified.**
  - Actual pricing outcomes in intervals without an identified potential "shortage" were not adjusted.
  - The impact to average hourly LBMPs was determined by averaging the increase across all intervals in a given hour.
  - The results were also used to calculate the change in DAM LBMPs used for the capacity analysis.
    - The same hours in which a potential "shortage" in real-time were also adjusted Day-Ahead using the average increases determined by the real-time analysis.
  - The lost opportunity cost of providing energy was calculated to determine the impact to ancillary service clearing prices.

Energy Market Impact Methodology – Approach 1



1 Incremental energy cost for scheduled energy in Zone J for a given hour.

2 New incremental energy cost for scheduled energy with higher reserve requirement for a given hour.*

3 Incremental energy cost of unit dispatched down to provide new reserve requirement.*

4 Estimated opportunity cost included in ancillary services clearing price.*

*The analysis of potential market outcomes accounts for the proposed $25/MWh reserve demand curve for NYC reserves

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Calculated Energy Market Impact – Approach 2

Concepts for Consideration – Approach 2

- **A limited simulation was conducted with the Day-Ahead Market software for the July 16, 2018 market day.**
  - Zone J was modeled in the market software, instead of the current SENY reserve region.
    - The proposed 10-minute (500 MW) and 30-minute (1,000 MW) reserve requirements for Zone J were modeled.
  - This approach considers all latent reserve available on July 16, 2018, as well as commitment/dispatch opportunities available to the software across the entire supply portfolio.
  - This analysis considers one day, and may over or under-estimate the impact when extrapolated to estimate a potential annual impact.
  - The procurement of the reserve was co-optimized with energy, reserves, and regulation.

Energy Market Impact Methodology – Approach 2

- **The percent price impact from the baseline for each hour of July 16, 2018 was calculated for energy and ancillary services.**
  - The energy percent price impact was then applied to the RT TWI LBMP from each day in 2018, and multiplied by the RT TWI actual load from 2018 to estimate the potential cost impact of the proposed Zone J reserve requirements on energy costs.
  - The ancillary service percent price impact was applied to hourly average RT ancillary services prices from each day in 2018 to estimate the potential cost impact the proposed Zone J reserve requirements on reserve costs.
    - Each reserve price was multiplied by the reserve requirement for the respective region. In conducting the analysis, the East of Central-East reserve region (Load Zones F-K) was assumed to have a 1,300 MW 30-minute reserve requirement because the SENY reserve region was used to model the Zone J reserve region.

Region	Requirement		
	Spin	10	30
NYCA	325	110	1320
EAST	330	700	300
Zone J	0	500	1000

- **This approach calculates a potential $7.6 million short-term increase in annual consumer energy and ancillary reserves costs.**

Calculated Capacity Market Impact

Reference Point Impact Methodology – Approach 1

- **Using the 2019-2020 ICAP Demand Curve inputs and parameters, revised net EAS revenue offset values and resulting reference price values were calculated to estimate the impact the proposed NYC reserve requirements could potentially have on the NYC ICAP Demand Curve.**
  - New DAM and RT LBMPs and Ancillary Service prices were generated for each hour of year 3 of the study period (9/1/2017 – 8/31/2018) for Zone J only, using the results of the energy market analysis.
    - Data for study year 1 & 2 (9/1/2015 - 8/31/2017) was retained and unadjusted.
  - These new prices were fed through the net EAS model to estimate a revised net EAS revenue offset value for Zone J, which was used to determine a revised reference price value for the 2019-2020 NYC ICAP Demand Curve.
    - Current Zone J peaking plant is a dual-fuel simple cycle F class frame unit.
      - This unit can only provide 30 minute reserve products due to its start up time and the block loaded dispatch utilized in the Net EAS model.
  - The change case was based on the change in energy market LBMPs and reserve clearing prices calculated as part of the energy market analysis.
    - The capacity market analysis utilized only the revised DAM and RTM prices developed as part of Approach 1 from the energy market analysis.
  - All other inputs and parameters of the annual update for 2019-2020 were held constant.

Reference Point Impact Analysis – Approach 1

- **The estimated impacts on Zone J net EAS revenues for 2019-2020 and the resulting reference price for the 2019-2020 NYC ICAP Demand Curve are provided in the table to the right.**
  - Additional details regarding the net EAS revenue estimates for NYC are provided in the Appendix.
- **Due to the characteristics of the Zone J peaking plant technology and the dispatch algorithm used to generate net EAS revenues, the change in net EAS revenues is relatively small.**
  - The changes to the reset process implemented in 2016 were intended to allow for the ICAP Demand Curves to capture changes in market conditions over time, including the impacts of changes to market rules.
  - As contemplated by the revised procedures, the resulting impacts of implementing the proposed Zone J reserve requirements in the wholesale market should be rolled into net EAS revenue estimates through the annual update process.

Scenario	Zone J Net EAS Revenue	Zone J Reference Price
Base Case	$35.32	$21.95
Change Case	$35.74	$21.89

Capacity Market Impact Analysis – Approach 1

- **Using the revised reference price calculated for the 2019-2020 NYC ICAP Demand Curve, the potential short-term annual impact to the Zone J capacity market costs was estimated.**
  - The only change between the Base Case and the Change Case was the NYC ICAP Demand Curve reference point value.
    - 2019-2020 IRM, LCRs, and load forecasts were used in both cases.
    - Consistent supply stack and system de-rating factor was used in both cases.

Scenario	Summer ($M)	Winter ($M)	Annual ($M)
Base Case	$844	$218	$1,061
Change Case	$841	$217	$1,058
Savings	**$2**	**$1**	**$3**

Next steps:

Review stakeholder feedback in assessing whether to proceed with a stakeholder vote at the March 2019 BIC/MC meetings.

Zone J Operating Reserves Timeline

- **An accelerated stakeholder engagement process and deployment timeline is required to implement a Zone J reserve requirement in June 2019.**
- **Proposed schedule for accelerated deployment:**
  - January and February 2019 (MIWG/ICAPWG)
    - Present/discuss market design, associated tariff revisions, and market impacts.
  - March 2019
    - Depending on stakeholder feedback, seek stakeholder approval at BIC and MC.
  - April 2019
    - Assuming stakeholder approval is sought and obtained in March 2019, seek Board of Directors approval.
    - Assuming approval by the Board of Directors, file tariff revisions with FERC seeking approval to implement in June 2019.

More Granular Operating Reserves Timeline

- The Zone J reserve requirement is one of three components of the 2019 More Granular Operating Reserves project.
- The deliverable for the remaining two components (evaluating load pocket reserves and reviewing reserve performance) remains a Market Design Complete in Q3 2019.
  - If, based on stakeholder feedback, an accelerated implementation of the proposed Zone J reserve requirements is not further pursued at this time, it will be folded back into the broader project and its associated timeline.
- A typical consumer impact assessment will be completed as part of the remaining components of the project.
- Proposed stakeholder engagement plan:
  - Q2 2019
    - Present/discuss Market Design Concept Proposal.
  - Q3 2019
    - Present/discuss complete Market Design proposal and associated tariff revisions.

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Appendix

Energy Market Impact: Methodology Example

Operating Reserves			
HB	Existing Incremental Energy Cost	New Incremental Energy Cost	% Change
10	$ 35.00	$ 36.75	5.00%
11	$ 40.00	$ 42.00	5.00%
13	$ 40.00	$ 42.00	5.00%
16	$ 35.00	$ 36.75	5.00%
17	$ 35.00	$ 36.75	5.00%
19	$ 50.00	$ 51.00	2.00%
		Average	**4.50%**

1. Identify the hourly intervals with potential Zone J reserve "shortages" for each sample day.
2. Evaluate the existing incremental energy (IE) cost for the applicable hour.
3. Determine a new IE from the real-time hourly supply stack in Zone J based on the MW value of the potential Zone J reserve "shortage."
4. Calculate the percent change between IE costs for each interval.
5. Calculate an average percent change. The average value determined for each representative day is then applied to all other intervals within its representative season for which a potential "shortage" of Zone J reserves was identified, and then averaged across all intervals to develop an hourly LBMP increase.

Note: Data is for illustrative purposes only, and does not represent data utilized in the actual analysis.

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Energy Market Impact: Analysis Example

Real-Time Interval	Potential Shortage	LBMP Percent Impact
10:05	Y	4.5%
10:10	N	0.0%
10:15	Y	4.5%
10:20	Y	4.5%
10:25	N	0.0%
10:30	Y	4.5%
10:35	N	0.0%
10:40	N	0.0%
10:45	Y	4.5%
10:50	Y	4.5%
10:55	N	0.0%
	Average Hourly Impact	2.5%

1

2

3

Day	Hour	RT TWI Load Zone LBMP	RT TWI Load (MWh)
10	10	$ 35.00	5000

	Average Percent Impact
Percent/Dollar Impact	$ 35.02
Estimated Cost to Load	$ 175,122.73
Baseline Cost to Load	$ 175,000.00
Estimated Impact	$ 122.73

4

1. Identify five-minute intervals with potential “shortages” in meeting the proposed Zone J reserve requirements.
2. Calculate potential impact for each interval in which a potential “shortage” is identified.
3. Calculate the average hourly impact across all intervals.
4. Calculate approximate cost to load per hour based on real-time time-weighted interval zonal LBMPs and load.

Note: Data is for illustrative purposes only, and does not represent data utilized in the actual analysis.

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Capacity Market Impact: Net EAS Revenue Offset Tables

- Base Case information

Run Hours - Zone J Base Case													
Day-Ahead Commitment		Energy				Reserve				None				Total
Real-Time Dispatch		Energy	Reserve	Buyout	Limited	Energy	Reserve	Buyout	Limited	Energy	Reserve	None	Limited	
Yr 1	September 2015 - August 2016	2,320	0	354	0	229	0	2,792	0	84	0	3,005	0	8,784
Yr 2	September 2016 - August 2017	2,020	0	338	0	84	1	1,146	0	152	0	5,019	0	8,760
Yr 3	September 2017 - August 2018	1,727	0	169	0	35	0	237	0	221	0	6,371	0	8,760

Net EAS Revenues - Zone J Base Case														
Day-Ahead Commitment		Energy				Reserve				None				Total
Real-Time Dispatch		Energy	Reserve	Buyout	Limited	Energy	Reserve	Buyout	Limited	Energy	Reserve	None	Limited	
Yr 1	September 2015 - August 2016	$22.95	$0.00	$3.48	$0.00	$5.17	$0.00	$3.85	$0.00	$1.34	$0.00	$0.00	$0.00	$36.78
Yr 2	September 2016 - August 2017	$18.54	$0.00	$2.85	$0.00	$1.12	$0.00	$1.87	$0.00	$3.41	$0.00	$0.00	$0.00	$27.80
Yr 3	September 2017 - August 2018	$27.02	$0.00	$2.20	$0.00	$1.20	$0.00	$0.76	$0.00	$5.90	$0.00	$0.00	$0.00	$37.07

Average:	$33.89
VSS Rev:	$1.43
Net EAS Offset:	$35.32

Capacity Market Impact: Net EAS Revenue Offset Tables

- ## Change Case Results – Year 3
  - Years 1 and 2 are consistent across both cases

Run Hours - Zone J Change Case														
Day-Ahead Commitment		Energy				Reserve				None				Total
Real-Time Dispatch		Energy	Reserve	Buyout	Limited	Energy	Reserve	Buyout	Limited	Energy	Reserve	None	Limited	
Yr 3	Base Case	1,727	0	169	0	35	0	237	0	221	0	6,371	0	8,760
Yr 3	Change Case	1,727	103	75	0	35	28	209	0	223	0	6,360	0	8,760

Net EAS Revenues - Zone J Change Case														
Day-Ahead Commitment		Energy				Reserve				None				Total
Real-Time Dispatch		Energy	Reserve	Buyout	Limited	Energy	Reserve	Buyout	Limited	Energy	Reserve	None	Limited	
Yr 3	Base Case	$27.02	$0.00	$2.20	$0.00	$1.20	$0.00	$0.76	$0.00	$5.90	$0.00	$0.00	$0.00	$37.07
Yr 3	Change Case	$28.03	$1.17	$1.18	$0.00	$1.20	$0.06	$0.69	$0.00	$6.01	$0.00	$0.00	$0.00	$38.35

Feedback/Questions?

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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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