Alternative Methods for Determining LCRs

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Agenda

- **Phase 2: Refining the Methodology**
  - Accounting for Unavailability
  - Preliminary Results and Assumptions
  - Optimization Results with Preliminary Transmission Security
- **Phase 3: Market Simulations**
  - Initial Results
- **Phase 4: Defining Process**
  - Timeline
- **Next Steps**
- **Questions**

Phase 2: Transmission Security

N-1-1 Transmission Security

- Required by NERC, NPCC, and NYSRC for designing the system
- N-1-1 analysis is performed using a NYCA coincident peak powerflow case
  - Snapshot in time: A single NYCA-wide generator dispatch to secure all Bulk Power Transmission Facilities (BPTFs)
- A reliability criteria violation is identified when any allowable re-dispatch of the system cannot alleviate a thermal overload
  - If overloads occur, system is dispatched to minimize overloads

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Transmission Security Methodology

- N-1-1 analysis was conducted to determine the transmission security import limits into each Locality
- These import limits were used to determine the minimum available capacity required for each Locality
- To translate this minimum available capacity into a market requirement the methodology needs to account for capacity unavailability
- To account for capacity unavailability, the 5-year zonal EFORd was used to calculate minimum locational capacity requirements

Example Calculation

Transmission Security Requirements	Formula	Zone X
Load Forecast (MW)	[A] = Given	12,000
Transmission Security Import Limit (MW)	[B] = Given	1,500
Transmission Security UCAP Requirement (MW)	[C] = [A]-[B]	10,500
Transmission Security UCAP Requirement (%)	[D] = [C]/[A]	87.5%
5 Year EFORd (%)	[E] = Given	8.0%
Transmission Security ICAP Requirement (MW)	[F] = [C]/(1-[E])	11,413
Transmission Security LCR Floor (%)	[G] = [F]/[A]	**95.1%**

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Accounting for Unavailability

Translation to account for Unavailability

- **Unavailability is accounted for in**
  - Previous study on locational requirements[1]
    - Established the historical basis for the 80% in-city requirement
  - Other ISO/RTOs (*i.e.*, ISO-NE)

[1]"In-City Capacity Requirement Study", Stone & Webster, 1996

ISO-NE Local Sourcing Requirements

- Local Sourcing Requirements (LSR) for an import-constrained zone is the amount of capacity needed to satisfy "*the higher of*" either (i) the Local Resource Adequacy (LRA) or (ii) the Transmission Security Analysis (TSA)[2]

[2]"ISO New England Installed Capacity Requirement, Local Sourcing Requirements and Capacity Requirement Values for the System-Wide Capacity Demand Curve for the 2019/20 Capacity Commitment Period", ISO New England Inc., January 2016 , available at: https://www.iso-ne.com/static-assets/documents/2016/01/icr_values_2019_2020_report_final.pdf

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ISO-NE Transmission Security Analysis

- A deterministic reliability screen of a transmission import-constrained area
- Determines the requirements of the sub-area in order to meet its load through internal generation and import capacity

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ISO-NE Transmission Security Analysis

$$TSA\ Requirement = \frac{(Need - Import\ Limit)}{1 - (Assumed\ Unavailable\ Capacity/Existing\ Resources)}$$

- Explicitly accounts for the unavailability of capacity prior to making it a market requirement
- The forced outage of fast-start (peaking) generation is based on an assumed value of 20% for the analysis instead of being based on historical five-year average generating unit performance

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NYISO Transmission Security Methodology Proposal

- Based on
  - Peak load within the locality (*i.e.*, need)
  - N-1-1 import limit into the locality
  - Locality 5 year EFORd (*i.e.*, unavailability)
- Determines the minimum capacity market requirement for the localities
- These minimum market requirements are used as LCR floors within the optimization

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Preliminary Results and Assumptions

Preliminary Transmission Security LCR Floors

Transmission Security Requirements	G-J	Zone J	Zone K
Load Forecast (MW)	16,061	11,670	5,427
Transmission Security Import Limit (MW)	3,250	3,250	400
Transmission Security UCAP Requirement (MW)	12,811	8,420	5,027
Transmission Security UCAP Requirement (%)	79.76%	72.15%	92.63%
5 Year EFORd (%)	10.50%	9.99%	10.06%
Transmission Security ICAP Requirement (MW)	14,314	9,355	5,589
Transmission Security LCR Floor (%)	**89.12%**	**80.16%**	**102.99%**

*Values are preliminary and subject to change

Preliminary Transmission Security LCR Floors

	Zone J LCR	G-J LCR	Zone KLCR
Preliminary Transmission Security LCR Floors	80.16%	89.12%	102.99%

- These values are preliminary and subject to change
- These preliminary floors are used in the market simulation analysis and will be utilized in the consumer impact assessment

Overview of Preliminary Analysis

- Analyzed the N-1-1 thermal transfer limits for the NYCA interfaces associated with the G-J, Zone J, and Zone K Localities
- Used the final Summer 2017 Operating base case
  - Rebuilt case to conduct the N-1-1 analysis
  - PARS and Generation Dispatch maintained initial schedule in analysis

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Line Rating Assumptions

- The G-J Locality and Zone K were calculated assuming Long Term Emergency (LTE) ratings
  - Consistent with NYISO Normal Operating and planning criteria
- Zone J was calculated assuming Normal line ratings
  - Based on NYSRC Local Reliability Rule (G1)

Boundary Assumptions

- The analysis calculates the N-1-1 transmission security import limits using the NYCA bulk power transmission facilities (BPTF) into each Locality
  - Zone J: Dunwoodie South interface
  - Zone K: ConEd-LIPA interface
  - G-J: UPNY-SENY interface
- The external transmission facilities are not incorporated in the analysis since these facilities cannot meet the Locality capacity requirements

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UPNY-SENY

Name	Line ID	Voltage (kV)
Mohawk (Zone E) – Hudson Valley (Zone G)		
Coopers Corners-Middletown*	CCRT34	345
Coopers Corners-Dolson Ave*	CCDA42	345
West Woodbourne 115/69	T152	115/69
Capital (Zone F) – Hudson Valley (Zone G)		
Athens-Pleasant Valley*	91	345
Leeds-Pleasant Valley*	92	345
*Leeds-Hurley Ave.	301	345
Hudson-Pleasant Valley*	12	115
Blue Stores E-Pleasant Valley*	13-987	115
Blue Stores W-Pleasant Valley*	8	115
*Feura Bush-North Catskill	2	115

* Indicates the metered end of the circuit

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Dunwoodie South

Name	Line ID	Voltage (kV)
Dunwoodie (Zone I) – NYC (Zone J)		
*Dunwoodie-Mott Haven	71	345
*Dunwoodie-Mott Haven	72	345
Sprain Brook-Tremont*	X28	345
*Sprain Brook-West 49th Street	M51	345
*Sprain Brook-West 49th Street	M52	345
*Sprain Brook-Academy	M29	345
*Dunwoodie-Sherman Creek	99031	138
*Dunwoodie-Sherman Creek	99032	138
*Dunwoodie-East 179th Street	99153	138
Long Island (Zone K) – NYC (Zone J)		
*Lake Success-Jamaica	903	138
*Valley Stream-Jamaica	901L_M	138

* Indicates the metered end of the circuit

ConEd – LIPA

Name	Line ID	Voltage (kV)
Dunwoodie (Zone I) – Long Island (Zone K)		
*Dunwoodie-Shore Road	Y50	345
*Sprain Brook-East Garden City	Y49	345
NYC (Zone J) – Long Island (Zone K)		
Jamaica-Valley Stream*	901L_M	138
Jamaica-Lake Success*	903	138

* Indicates the metered end of the circuit

Treatment of UDRs

- UDRs are treated as supply-side resources and at a level consistent with their elections
- UDRs are not considered as part of the import capability when calculating the N-1-1 import limits

N-1-1 Base Case

- Updated Summer 2017 Operating base case
  - Inclusion of transmission and generation facility additions and retirements
- All system elements modeled as in service
- All generation represented

Contingencies

- **In the N-1-1 analysis**
  - 1st Contingency: Removal of the most limiting single element contingency
  - 2nd Contingency: NPCC defined contingency

Zone J Contingencies

Limiting Element	Rating	Limiting Contingency
(2) Mott Haven – Rainey (Q11) 345 kV	@NORM 707 MW L/O	Mott Haven – Rainey (Q12) 345 kV
(3) Mott Haven – Rainey (Q11) 345 kV	@NORM 707 MW L/O	(SB: Sprain Brook 345 RS4) Sprain Brook – W. 49th St. (M52) 345 kV Sprain Brook 345/138 Transformer BKS6

Zone K Contingencies

Limiting Element	Rating	Limiting Contingency
Dunwoodie – Shore Rd. (Y50) 345 kV	@LTE 914 MW[3] L/O	Sprain Brook – East Garden City (Y49) 345 kV
Dunwoodie – Shore Rd. (Y50) 345 kV	@LTE 914 MW[3] L/O	New Bridge – Duffy Ave. (501) 345 kV

[3] LIPA rating for Y50 circuit is based on 70 % loss factor and rapid oil circulation.

G-J Contingencies

Limiting Element	Rating	Limiting Contingency
(1) Leeds – Pleasant Valley (92) 345 kV	@LTE 1538 MW L/O	Athens – Pleasant Valley (91) 345 kV
(2) Leeds – Pleasant Valley (92) 345 kV	@LTE 1538 MW L/O	(SB: East Fishkill 345 #5) Roseton – East Fishkill (RFK305) 345 kV East Fishkill 345/115 kV Transformer BK1

Optimization with Transmission Security

Base Case with Transmission Security Limits

Scenario	Zone J LCR	Zone K LCR	G-J LCR	Cost ($ million)
Current LCR Methodology	81.4%	103.2%	91.3%	$4,441.90
Refined Optimized Methodology without Transmission Security Limits (TSL)	78.0%	105.3%	91.5%	$4,402.89
Refined Optimized Methodology with Transmission Security Limits (TSL)	80.16%	104.15%	90.71%	$4,424.37

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Base Case with Transmission Security Limits

Scenario	Zone J LCR	Zone K LCR	G-J LCR
Current LCR Methodology	9,495 MW	5,603 MW	14,664 MW
Refined Optimized Methodology without Transmission Security Limits (TSL)	9,102 MW	5,715 MW	14,696 MW
Refined Optimized Methodology with Transmission Security Limits (TSL)	9,355 MW	5,652 MW	14,570 MW

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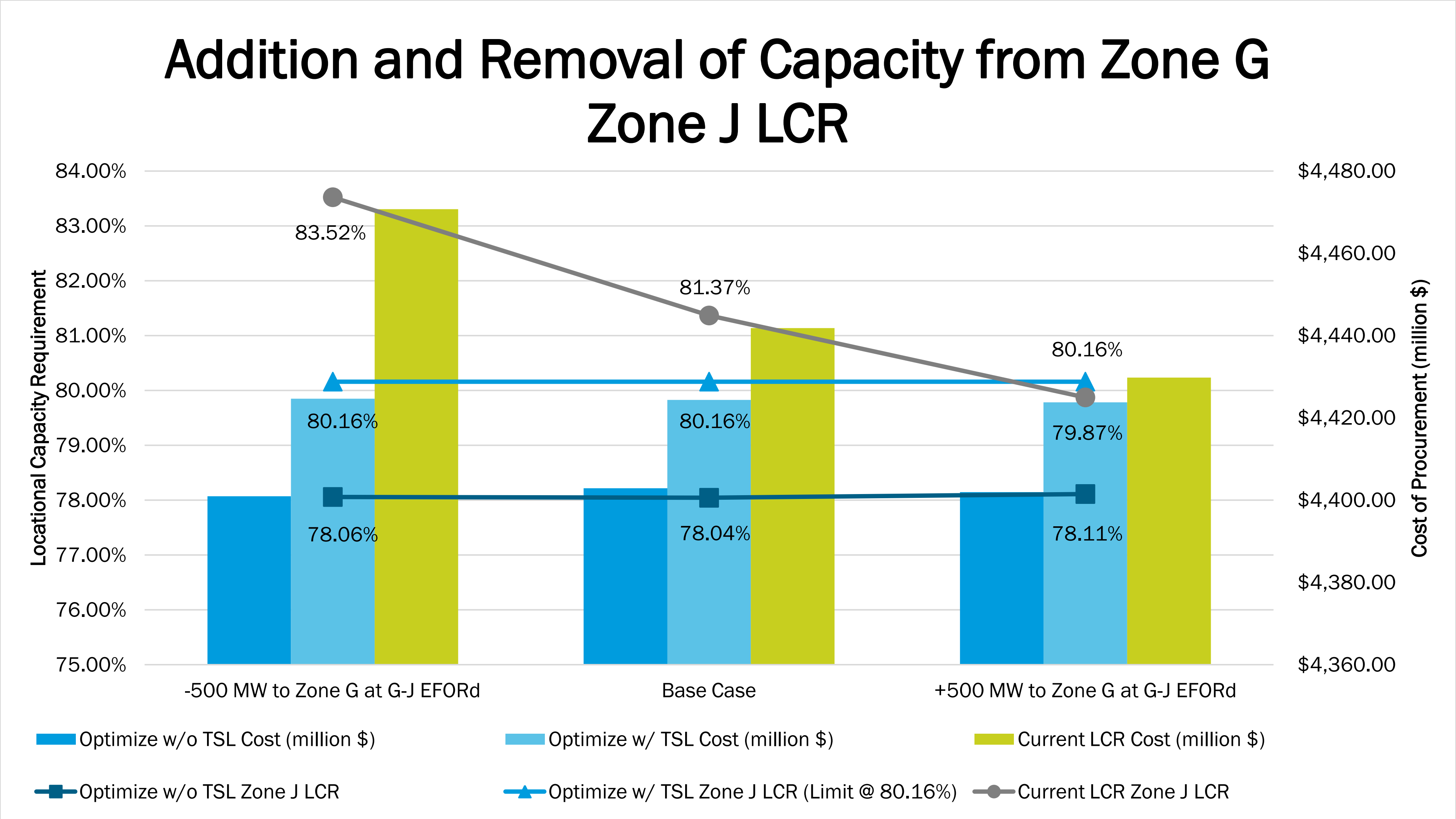
Phase 3: Market Simulations

Market Simulation Sensitivities

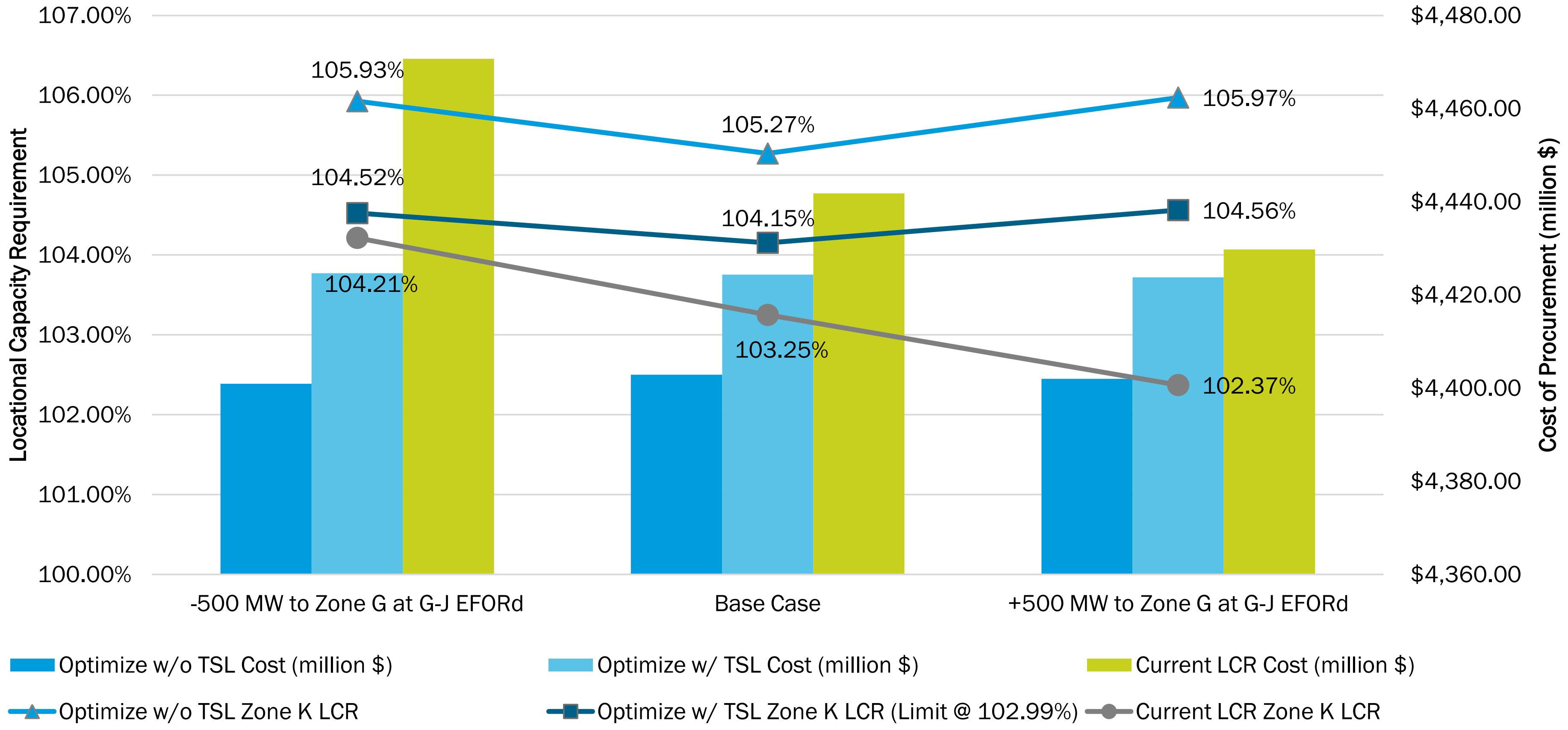
- +/- 500 MW to Zone G at G-J EFORd
- +/- 500 MW to Zone J at J EFORd
- +/- 500 MW to Zone K at K EFORd
- +/- 500 MW to Zone F at F EFORd

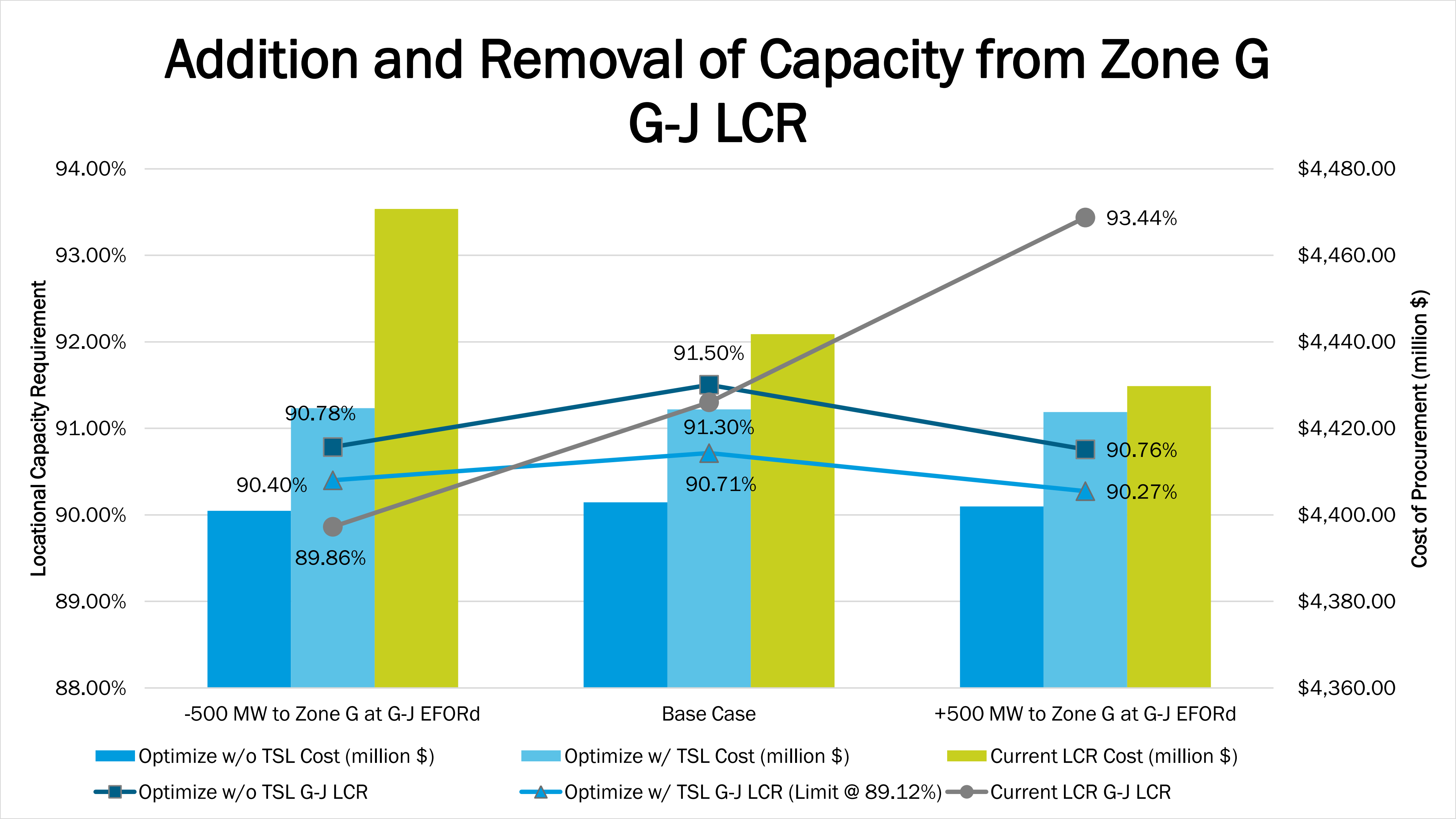
Market Simulations: +/- 500 MW to Zone G



Addition and Removal of Capacity from Zone G
Zone J LCR
84.00%
83.00%
82.00%
81.00%
80.00%
79.00%
78.00%
77.00%
76.00%
75.00%
Locational Capacity Requirement
$4,480.00
$4,460.00
$4,440.00
$4,420.00
$4,400.00
$4,380.00
$4,360.00
Cost of Procurement (million $)
83.52%
81.37%
80.16%
80.16%
80.16%
79.87%
78.06%
78.04%
78.11%
-500 MW to Zone G at G-J EFORd
Base Case
+500 MW to Zone G at G-J EFORd
Optimize w/o TSL Cost (million $)
Optimize w/ TSL Cost (million $)
Current LCR Cost (million $)
Optimize w/o TSL Zone J LCR
Optimize w/ TSL Zone J LCR (Limit @ 80.16%)
Current LCR Zone J LCR

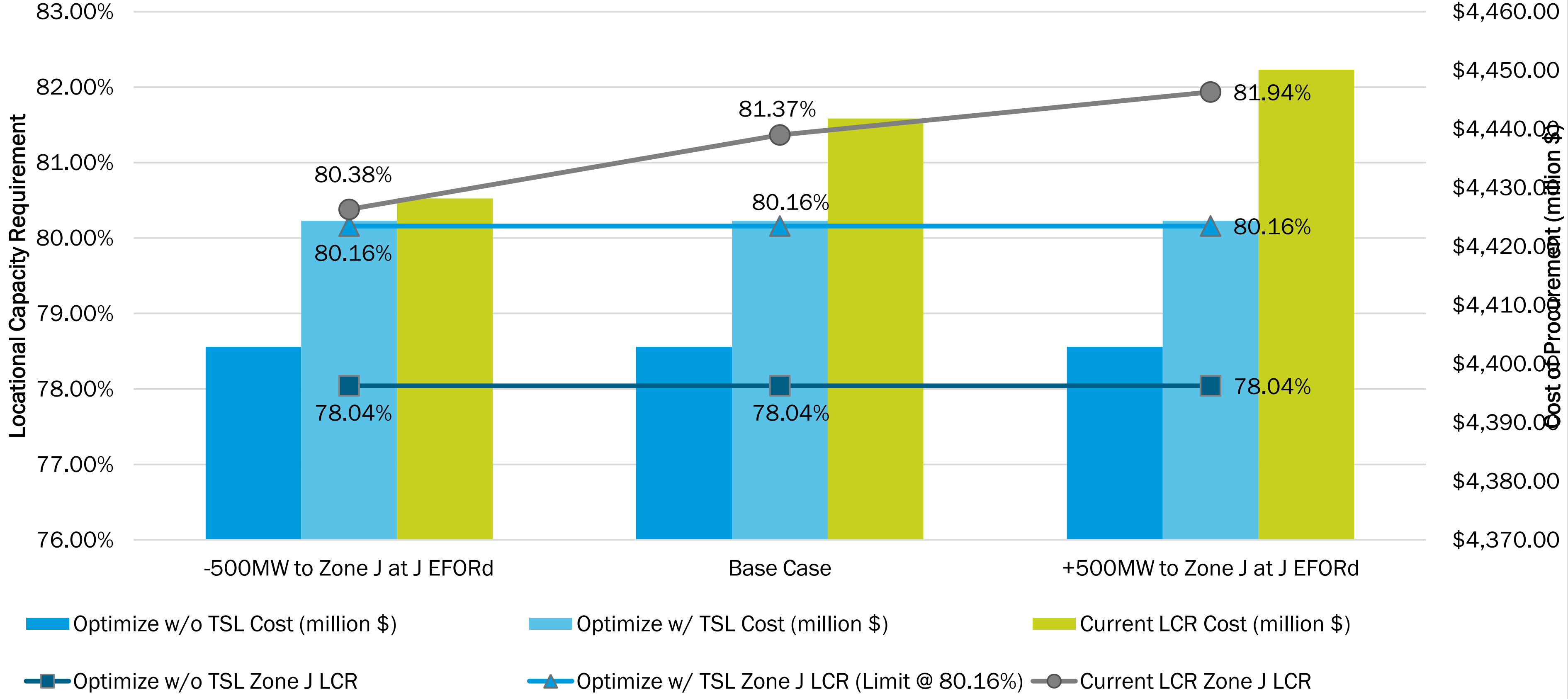
Addition and Removal of Capacity from Zone G Zone K LCR



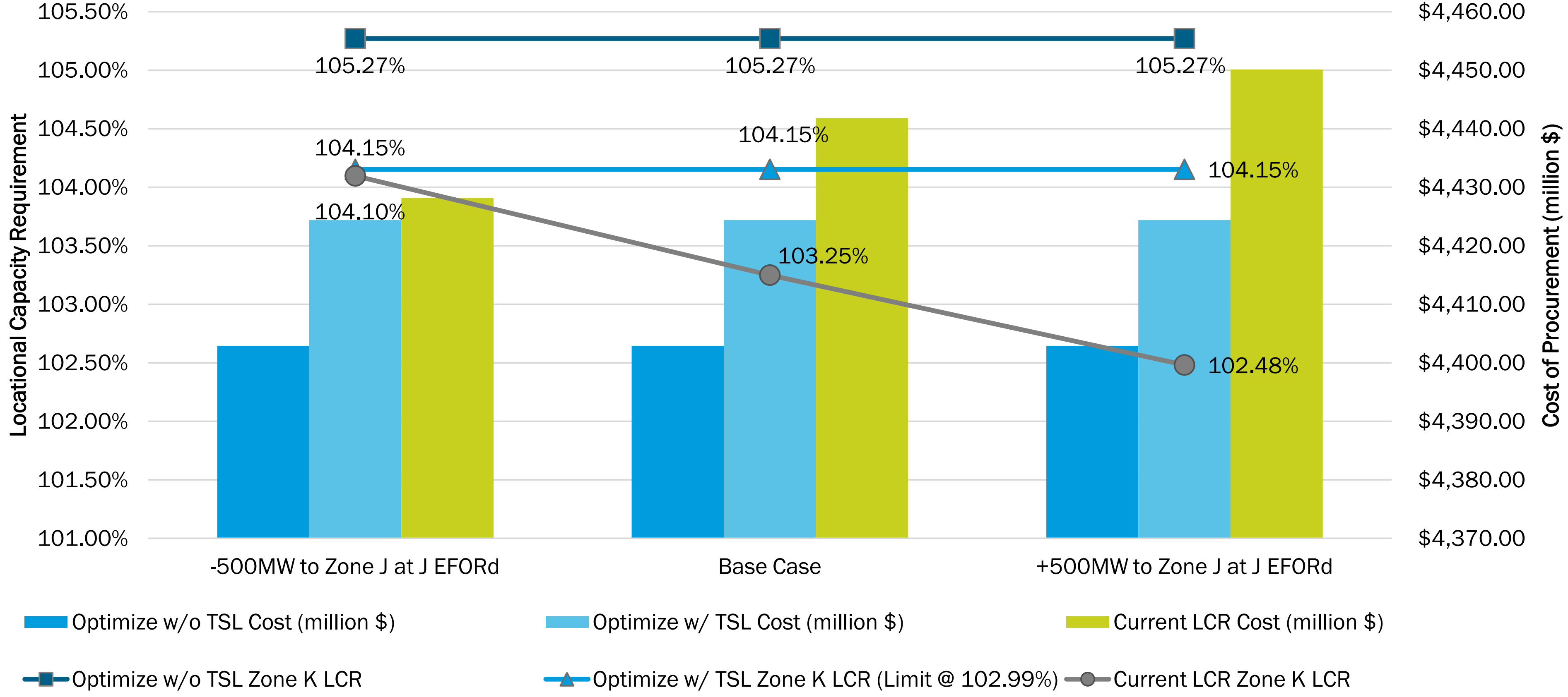

Addition and Removal of Capacity from Zone G
G-J LCR
94.00%
93.00%
92.00%
91.00%
90.00%
89.00%
88.00%
Locational Capacity Requirement
$4,480.00
$4,460.00
$4,440.00
$4,420.00
$4,400.00
$4,380.00
$4,360.00
Cost of Procurement (million $)
93.44%
91.50%
90.78%
91.30%
90.76%
90.40%
90.71%
90.27%
89.86%
-500 MW to Zone G at G-J EFORd
Base Case
+500 MW to Zone G at G-J EFORd
Optimize w/o TSL Cost (million $)
Optimize w/ TSL Cost (million $)
Current LCR Cost (million $)
Optimize w/o TSL G-J LCR
Optimize w/ TSL G-J LCR (Limit @ 89.12%)
Current LCR G-J LCR

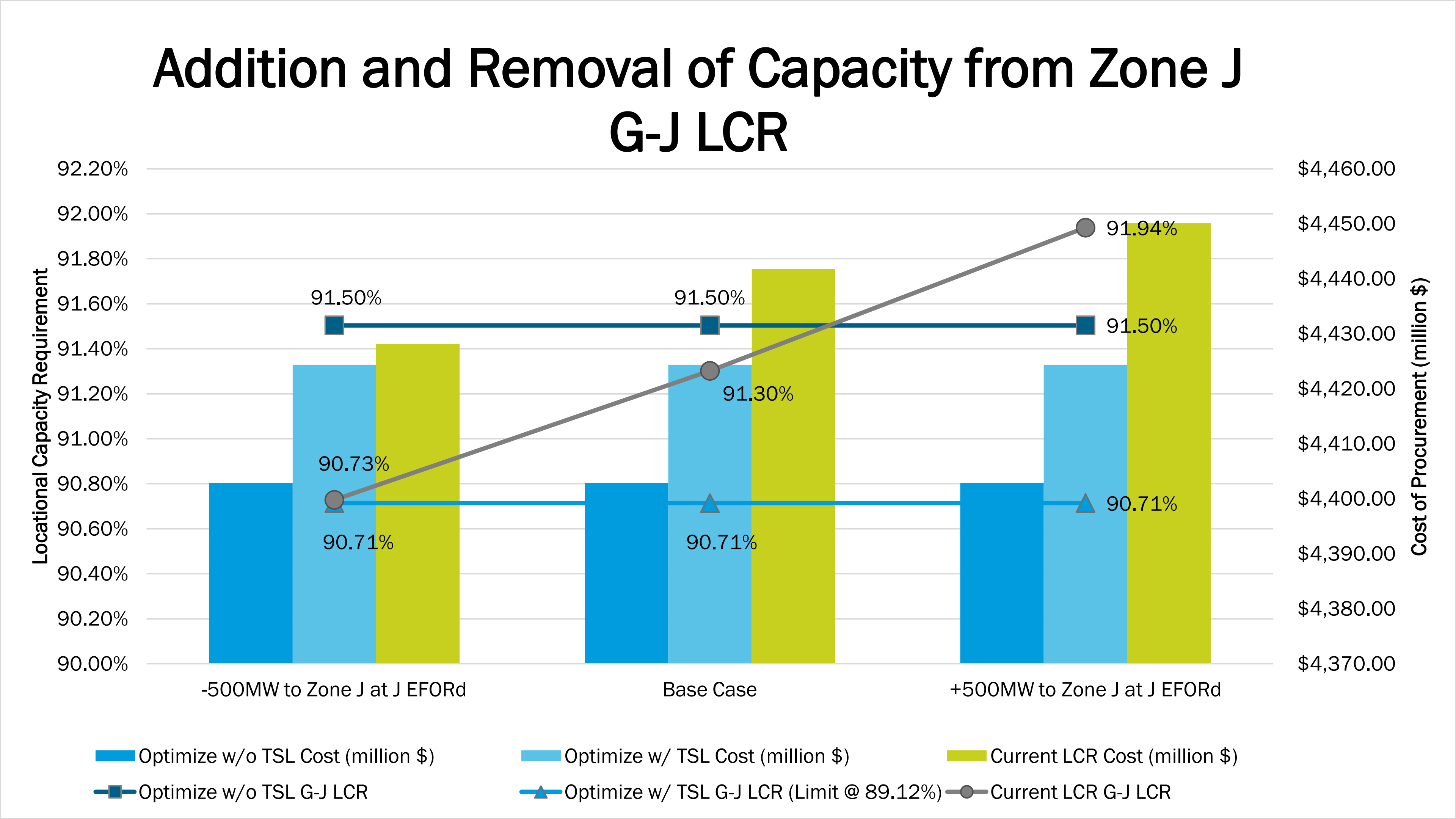
Market Simulations: +/- 500 MW to Zone J

Addition and Removal of Capacity from Zone J
Zone J LCR



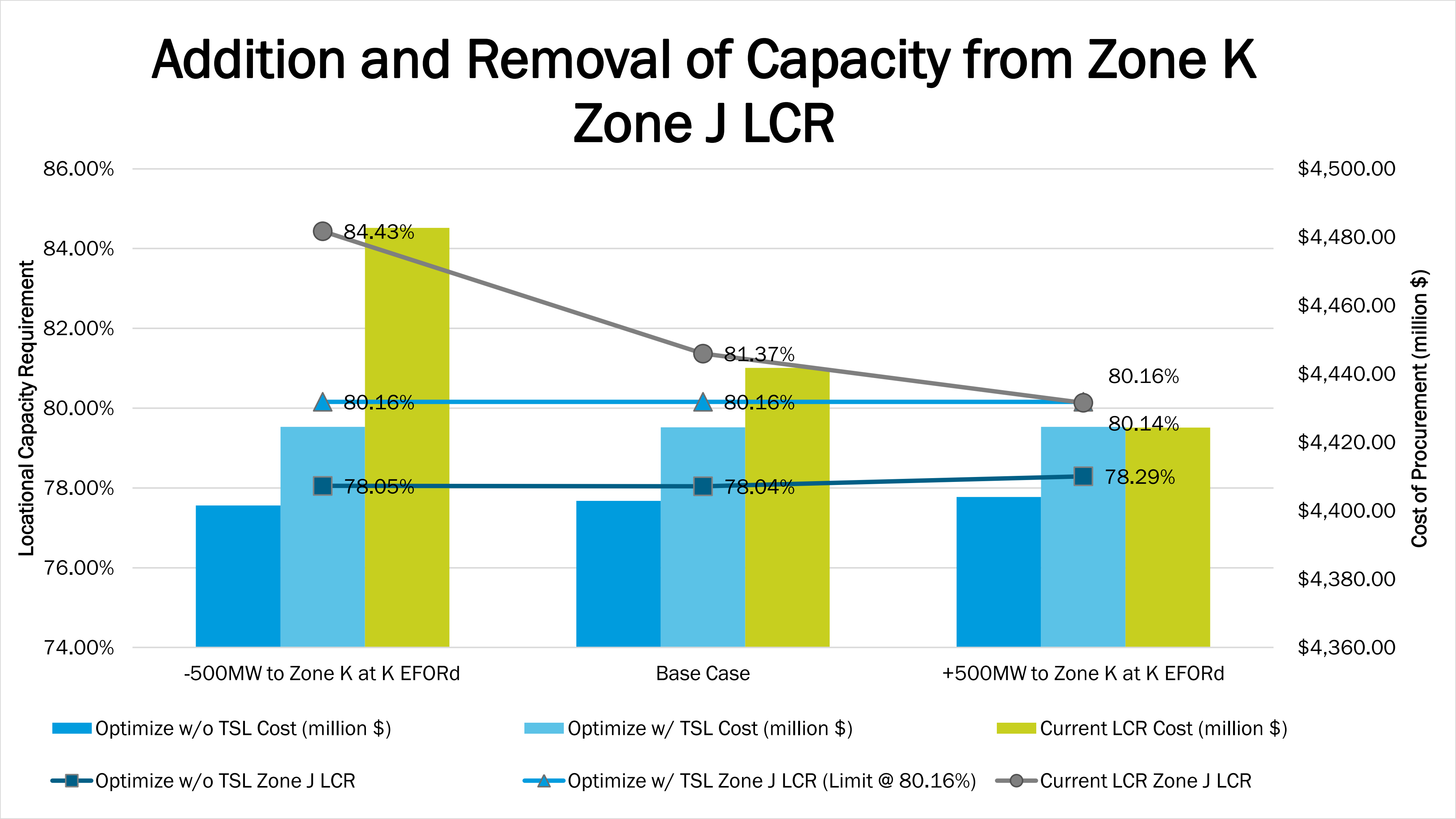
Addition and Removal of Capacity from Zone J
Zone K LCR



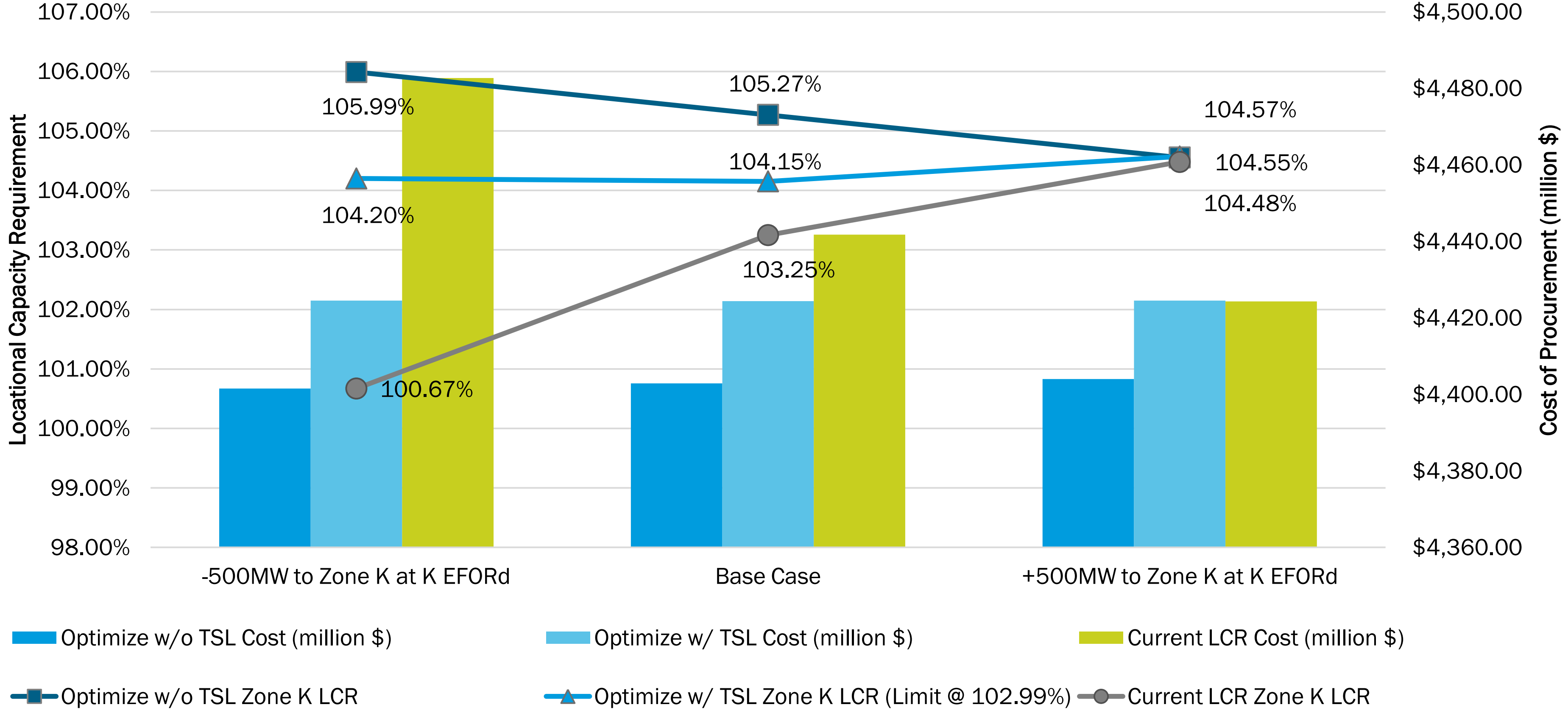


Addition and Removal of Capacity from Zone J
G-J LCR
92.20%
92.00%
91.80%
91.60%
91.40%
91.20%
91.00%
90.80%
90.60%
90.40%
90.20%
90.00%
Locational Capacity Requirement
$4,460.00
$4,450.00
$4,440.00
$4,430.00
$4,420.00
$4,410.00
$4,400.00
$4,390.00
$4,380.00
$4,370.00
Cost of Procurement (million $)
91.50%
91.50%
91.50%
91.94%
91.30%
90.73%
90.71%
90.71%
90.71%
-500MW to Zone J at J EFORd
Base Case
+500MW to Zone J at J EFORd
Optimize w/o TSL Cost (million $)
Optimize w/ TSL Cost (million $)
Current LCR Cost (million $)
Optimize w/o TSL G-J LCR
Optimize w/ TSL G-J LCR (Limit @ 89.12%)
Current LCR G-J LCR

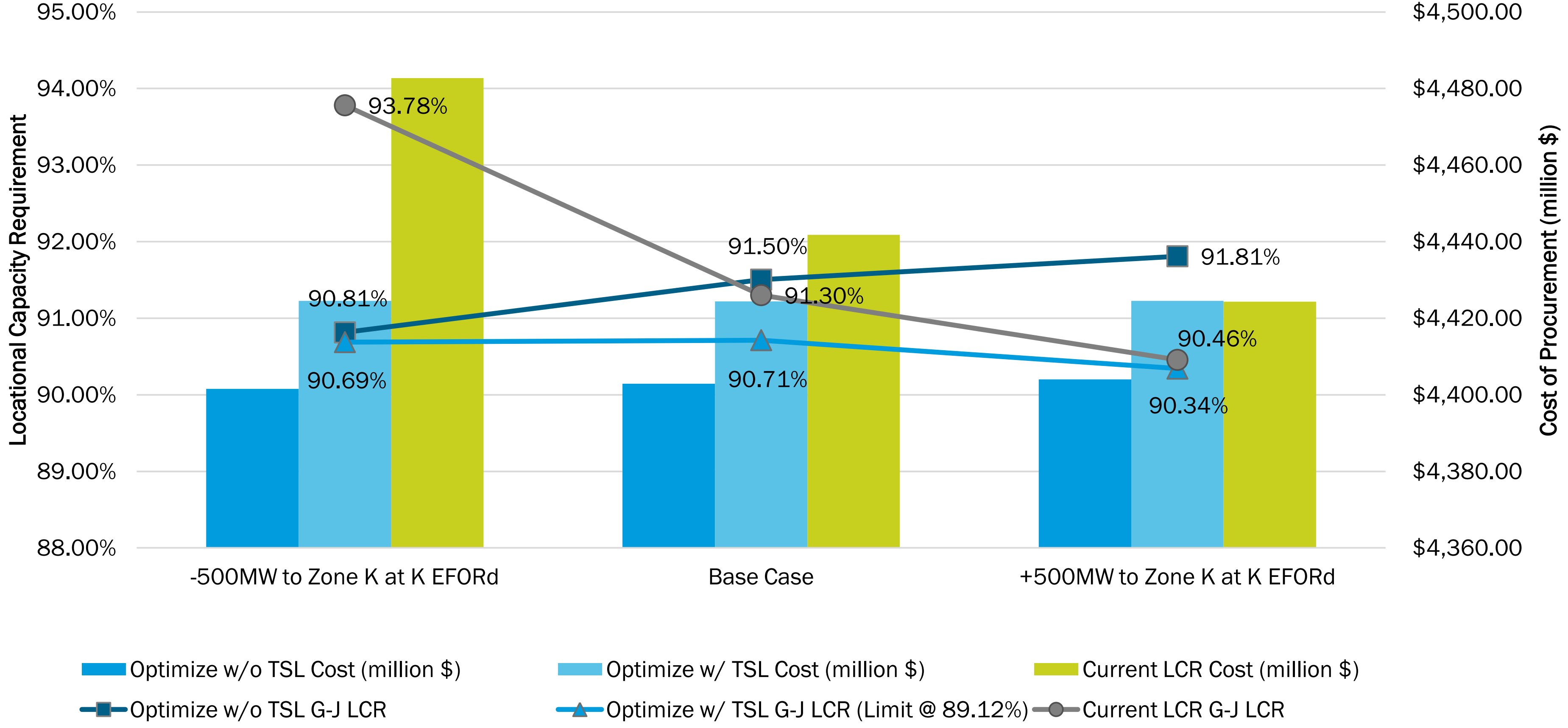
Market Simulations: +/- 500 MW to Zone K


Addition and Removal of Capacity from Zone K
Zone J LCR
86.00%
84.00%
82.00%
80.00%
78.00%
76.00%
74.00%
Locational Capacity Requirement
$4,500.00
$4,480.00
$4,460.00
$4,440.00
$4,420.00
$4,400.00
$4,380.00
$4,360.00
Cost of Procurement (million $)
84.43%
81.37%
80.16%
80.16%
80.16%
80.14%
78.05%
78.04%
78.29%
-500MW to Zone K at K EFORd
Base Case
+500MW to Zone K at K EFORd
Optimize w/o TSL Cost (million $)
Optimize w/ TSL Cost (million $)
Current LCR Cost (million $)
Optimize w/o TSL Zone J LCR
Optimize w/ TSL Zone J LCR (Limit @ 80.16%)
Current LCR Zone J LCR

Addition and Removal of Capacity from Zone K
Zone K LCR

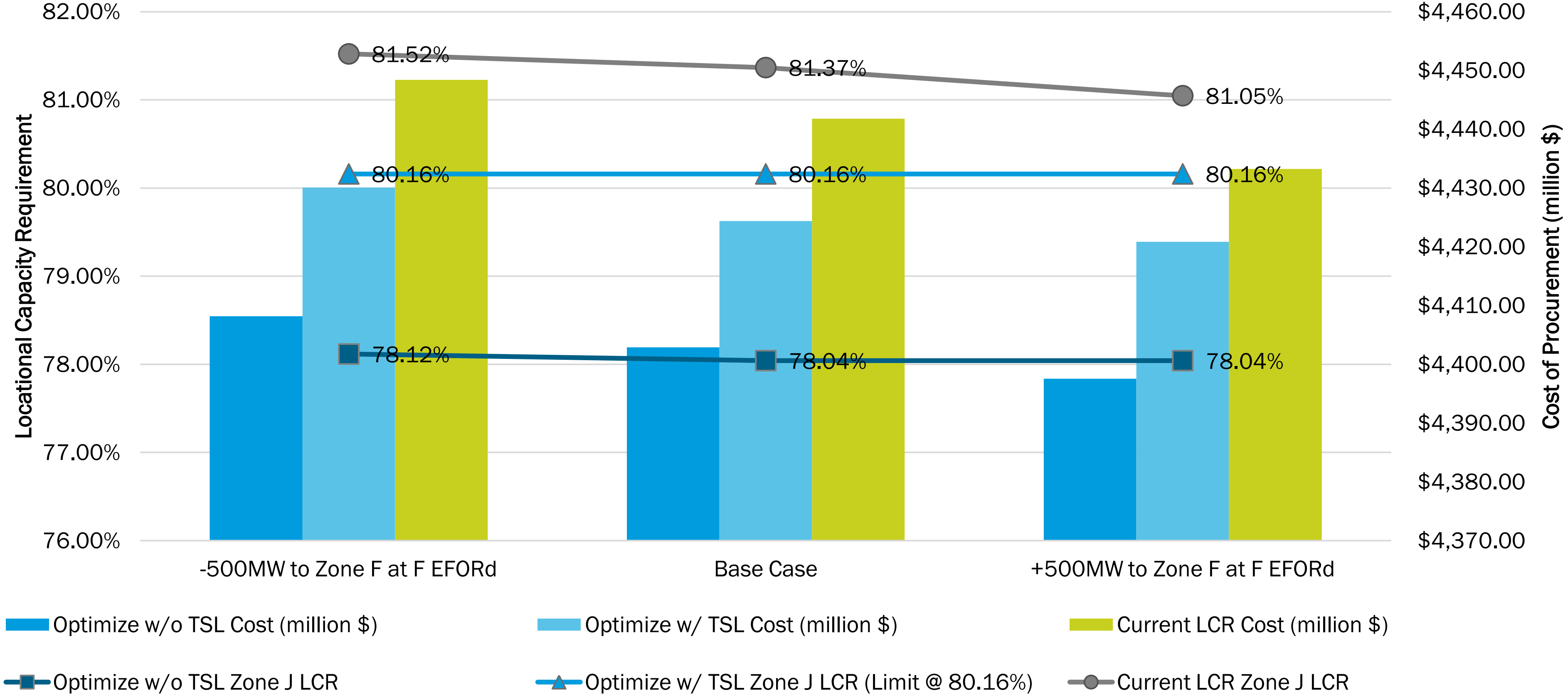


Addition and Removal of Capacity from Zone K G-J LCR

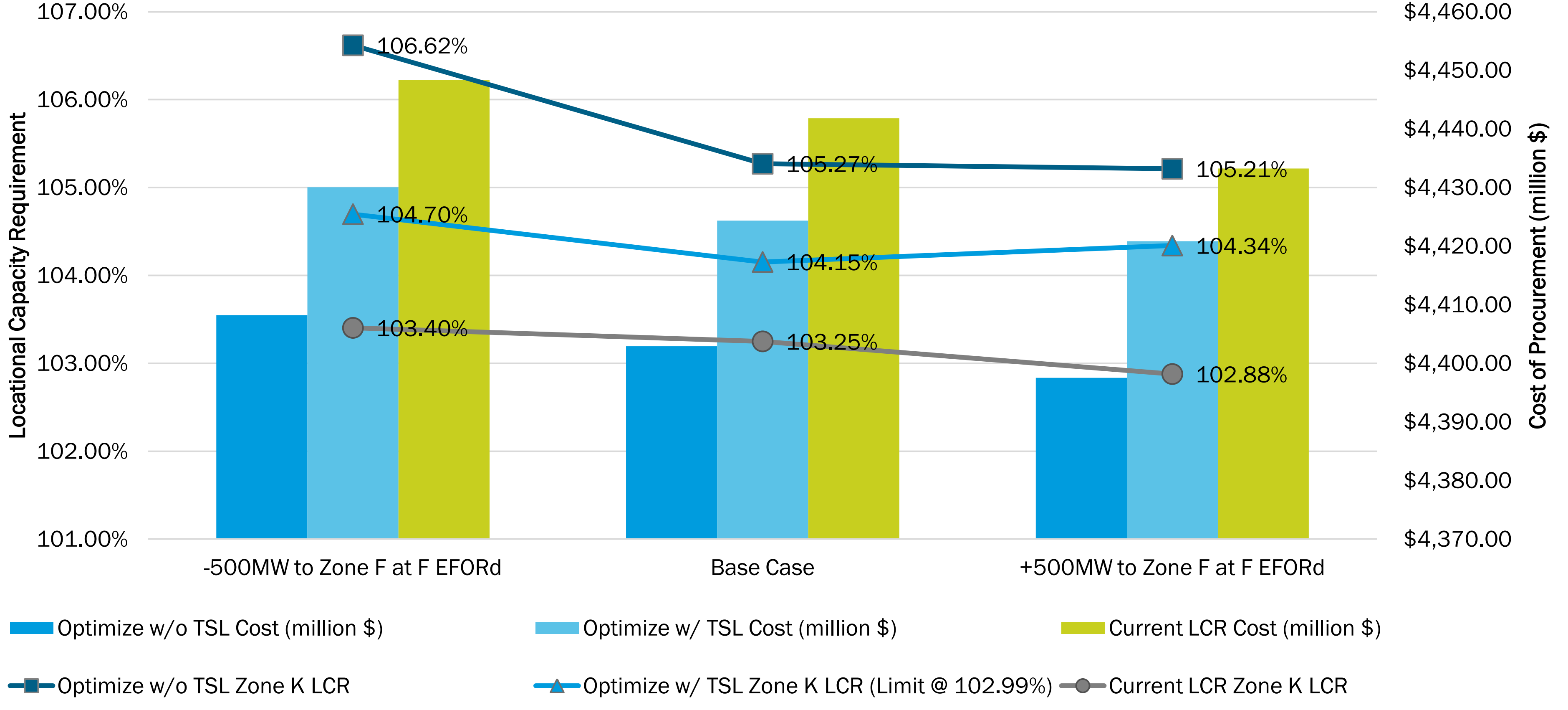


Market Simulations: +/- 500 MW to Zone F

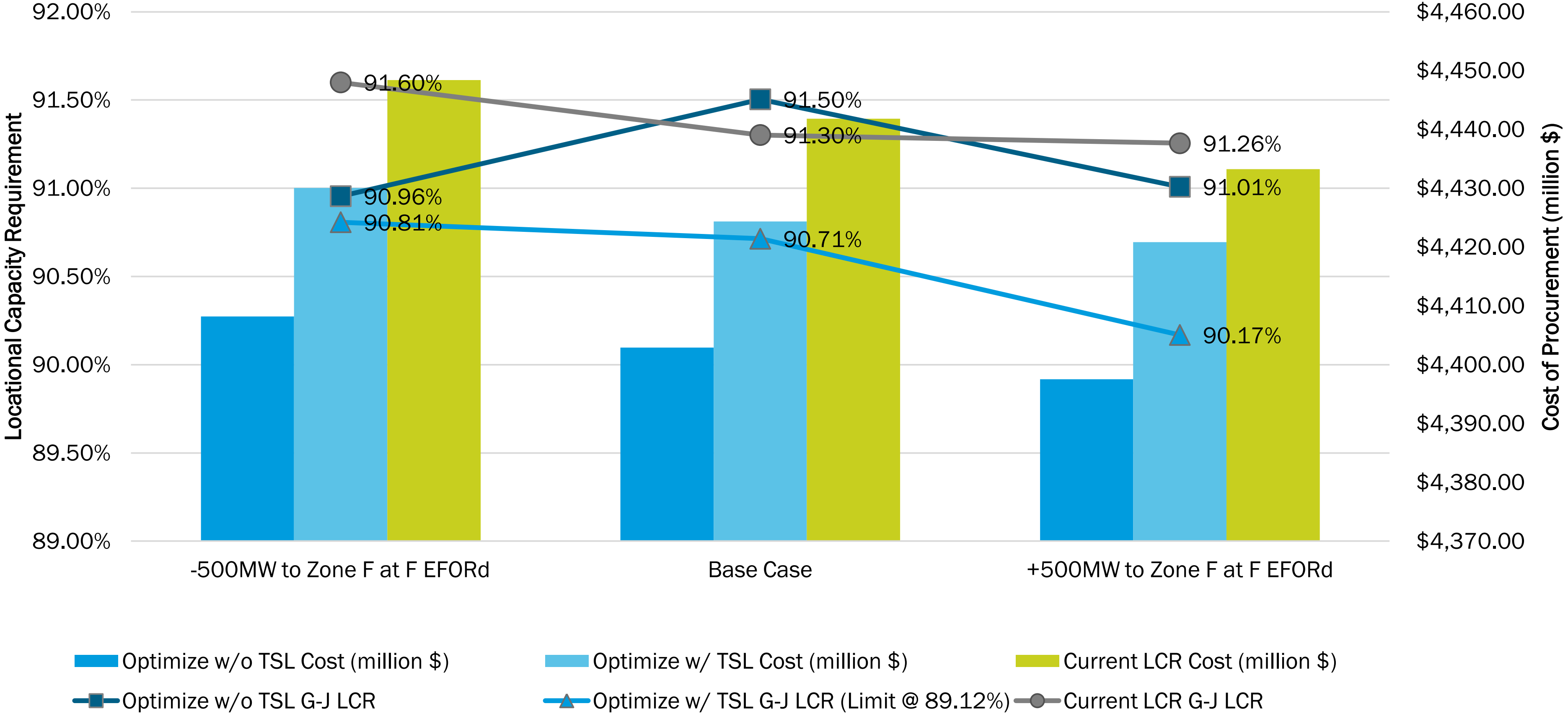
Addition and Removal of Capacity from Zone F Zone J LCR



Addition and Removal of Capacity from Zone F
Zone K LCR



Addition and Removal of Capacity from Zone F G-J LCR

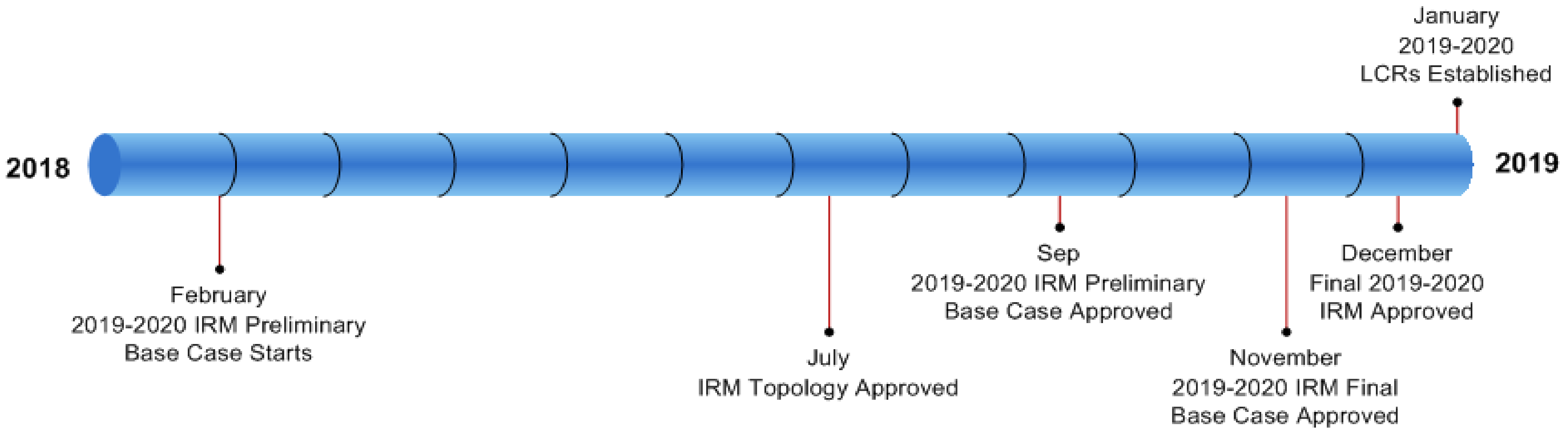


Initial Market Simulation Results

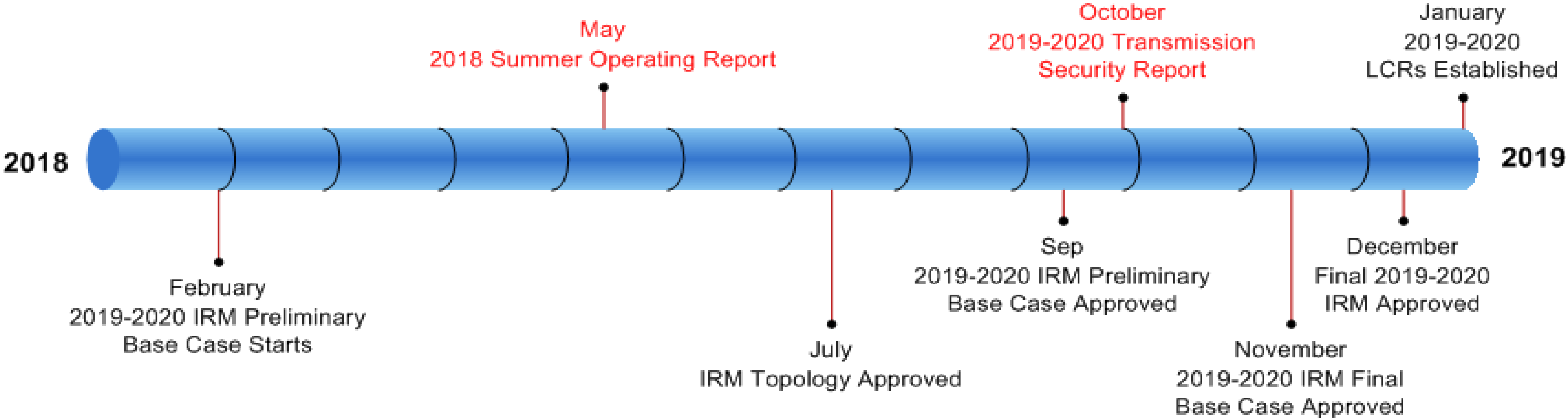
- The optimization methodology is more stable than the current LCR methodology
- The optimization methodology results in a lower cost than the current LCR methodology both with and without transmission security floors

Phase 4: Defining Process

Current Timeline



Timeline Additions



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LCR Setting Timeline

- No alterations to the current timeline are needed to accommodate the alternative methodology for determining LCRs
- Transmission security analysis used in the alternative methodology would be conducted and reported prior to October 1st
  - This analysis would utilize an updated base case used in the Summer Operating Report

Next Steps

Other Next Steps

- The NYISO will consider input received during today's ICAP Working Group meeting
- Additional comments sent to deckels@nyiso.com will be considered
- The NYISO will return to a future ICAPWG meeting to discuss its progress and adjustments to the plan after considering comments and results

2017 Project Development

Phase	Objective	Specific Topics:
Proof of Concept	Demonstrate alternative methodology in relation to guiding principles (*i.e.*, least cost, stability, robust, predictability)	Generation +/- Unit net CONE +/- Transmission +/-
Refine Methodology	Modify the alternative method to ensure that all aspects have a purpose and are being performed as a result of sound market and engineering principles	Unit net CONE curves Potential Bounds Modeling methodology
Market Simulations	Simulate market situations to demonstrate performance of methodology	Changes in resources Topological changes Locality configurations
Defining Process	Develop a process for the methodology that ensures guiding principles are being achieved over time	Develop process of method Process timeline Transition methods
Demonstrating Market Benefits	Demonstrate the methodology results in market benefits and resolve any issues that arise from its implementation	Consumer impact Multiyear simulation Cost allocation
Final Market Design	Summarize all findings and develop a final market design for implementation	Develop final market design

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Questions?

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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Appendix

Scenario	Optimized LCR without Transmission Security Floors (%)			Optimized Cost (million)
	Zone J	Zone K	G-J	
Base Case	78.04%	105.27%	91.50%	$ 4,402.89
+500 MW to Zone G at G-J EFORd	78.11%	105.97%	90.76%	$ 4,401.96
-500 MW to Zone G at G-J EFORd	78.06%	105.93%	90.78%	$ 4,400.95
+500MW to Zone J at J EFORd	78.04%	105.27%	91.50%	$ 4,402.89
-500MW to Zone J at J EFORd	78.04%	105.27%	91.50%	$ 4,402.89
+500MW to Zone K at K EFORd	78.29%	104.55%	91.81%	$ 4,404.03
-500MW to Zone K at K EFORd	78.05%	105.99%	90.81%	$ 4,401.55
+500MW to Zone F at F EFORd	78.04%	105.21%	91.01%	$ 4,397.54
-500MW to Zone F at F EFORd	78.12%	106.62%	90.96%	$ 4,408.19

Scenario	Optimized LCR with Transmission Security Floors (%)			Optimized Cost (million)
	Zone J	Zone K	G-J	
Base Case	80.16%	104.15%	90.71%	$4,424.37
+500 MW to Zone G at G-J EFORd	80.16%	104.56%	90.27%	$4,423.79
-500 MW to Zone G at G-J EFORd	80.16%	104.52%	90.40%	$4,424.65
+500MW to Zone J at J EFORd	80.16%	104.15%	90.71%	$4,424.37
-500MW to Zone J at J EFORd	80.16%	104.15%	90.71%	$4,424.37
+500MW to Zone K at K EFORd	80.16%	104.57%	90.34%	$4,424.52
-500MW to Zone K at K EFORd	80.16%	104.20%	90.69%	$4,424.55
+500MW to Zone F at F EFORd	80.16%	104.34%	90.17%	$4,420.83
-500MW to Zone F at F EFORd	80.16%	104.70%	90.81%	$4,430.07

Scenario	Current LCR Methodology (%)			Optimized Cost (million)
	Zone J	Zone K	G-J	
Base Case	81.4%	103.2%	91.3%	$ 4,441.80
+500 MW to Zone G at G-J EFORd	79.87%	102.37%	93.44%	$ 4,429.79
-500 MW to Zone G at G-J EFORd	83.52%	104.21%	89.86%	$ 4,470.71
+500MW to Zone J at J EFORd	81.94%	102.48%	91.94%	$ 4,450.11
-500MW to Zone J at J EFORd	80.38%	104.10%	90.73%	$ 4,428.17
+500MW to Zone K at K EFORd	80.14%	104.48%	90.46%	$ 4,424.31
-500MW to Zone K at K EFORd	84.43%	100.67%	93.78%	$ 4,482.72
+500MW to Zone F at F EFORd	81.05%	102.88%	91.26%	$ 4,433.26
-500MW to Zone F at F EFORd	81.52%	103.40%	91.60%	$ 4,448.38