

# Securing 100+kV Transmission Facilities in the Market Model

White Paper

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June 29, 2017, Rensselaer, NY

# Agenda

- Purpose
- Background
- Challenges
- Benefits
- Procedural Modifications
- Study
- Market Power Considerations
- Recommendation
- Timeline

# Purpose

# Purpose

- The 2015 State of the Market (SOM) report included a recommendation to model 100+kV transmission constraints as secured in the DA and RT markets
- The purpose of the NYISO's white paper is to outline the feasibility and potential costs and benefits of securing 100+kV transmission facilities in the market model
  - The study seeks to identify impact and the NYISO procedure changes necessary to effectuate the proposal

# Background

# Background

- **The NYISO is the NERC Transmission Operator (TOP) for the NYCA 230 kV and higher system**
- **The Transmission Owners (TOs) are the TOPs for the lower kV system**
  - The TOs are ultimately responsible to NERC for lower kV system security

# Background

- **The NYISO helps the TOs to manage these constraints through out-of-merit(OOM) generation actions, Day-Ahead Reliability Unit (DARU) actions, and Supplemental Resource Evaluations (SREs)**
  - These actions can lead to situations where market prices are not reflective of all actions required to maintain system reliability
- **Securing 100+kV transmission facilities in the market software will improve overall market efficiency and provide better targeted investment signals**

# Challenges



# Challenges

- **There are a number of benefits to securing 100+kV transmission facilities within the market model**
  - There are also a number of challenges that the NYISO may have to resolve to move forward
- **The technical considerations include:**
  - Computation size impacting software execution performance
  - Longer software execution time resulting in increased risk of later posting of the DAM
  - Network topology solutions to 100+kV transmission constraints are not currently available to the optimization algorithm
  - Transmission constraint price volatility due to cycling units at the 100+kV level
  - A lower CRM (relative to 230+kV lines) may be more appropriate for some lower kV facilities; this will require Graduated Transmission Demand Curve modifications
  - The Automated Mitigation Process (AMP) will likely require modification if constrained areas are identified in upstate New York
  - Much of the 100+kV system does not have local generation to resolve 100+kV transmission constraints, possibly resulting in pricing with the Graduated Transmission Demand Curve, which will require software modifications

# Benefits

# Benefits

- **Securing 100+kV transmission facilities in the market model would provide a number of benefits**
  - Optimality - The market software is likely able to provide a lower cost solution when securing these transmission constraints, compared to other means of securing these constraints
  - Price Formation/ Transparency – the current approach mutes price signals for investment that would improve system reliability and efficiency
    - The absence of transmission constraint costs in LBMPs can lead to inefficient investment; suppliers have no visibility into potential revenue opportunities, and policy makers and the TOs cannot easily quantify the benefits of transmission solutions
      - This lack of supply and transmission options can result in the need for reliability contracts that impose significant cost on consumers
- **Securing these facilities may also reduce power supplier guarantee payments (uplift)**

# Benefits

- **More efficient pricing will result in more efficient energy market incentives for existing resources and potential new market entrants**
- **It will become increasingly important to incorporate the impacts and value of maintaining transmission system reliability into wholesale electricity market prices**
  - A number of Distributed Energy Resources (DERs) are expected to be located at the 100+kV level in the future
    - Appropriate price signals will aid these resources in making informed investment decisions

# Procedural Modifications

# Procedural Modifications

- **The method NYISO would use to evaluate 100+kV transmission facilities for inclusion in the market model will be consistent with legacy constraint modeling efforts**
  - Identify candidate transmission facilities and contingencies
  - Verify expected constraint flows in the Day-Ahead and real time Energy market models
  - Identify generators with adequate shift factors to resolve candidate constraints
  - Determine if additional market power mitigation rules are necessary/ feasible
  - Develop process for notifying NYISO Stakeholders of DAM/RTM modeling changes to implement lower kV constraints

# Study

# Study

- **DA market simulation rerunning June 23, 2016 to November 2, 2016**
  - The 115 kV system, principally in the West, North, and Central were secured to Short Term Emergency (STE) for contingency conditions
- **Results are presented in the appendix**
  - It is important to note that market participant bidding behavior is likely to change with any market design revision
    - Simulation results provided here estimate potential market outcomes



# Market Power Considerations

# Market Power Considerations

- **Securing the underlying 100+kV transmission system in the market software has the potential to introduce new congested areas to the market**
  - Where these areas include a limited number of resources capable of resolving transmission constraints, the potential for market power exists
- **The simulation identified one upstate New York area where securing 100+kV facilities might be expected to permit the exercise of market power**
  - Securing 100+kV facilities might permit the exercise of market power in other upstate locations
  - The NYISO's current rules and software would need to be improved to permit the NYISO to implement appropriate mitigation rules for constrained load pockets outside of the currently defined "Constrained Area" (NYC)
  - The NYISO must work with stakeholders to identify the most effective mitigation method for load pockets located outside of NYC

# Market Power Considerations

- New rules must be developed to mitigate the potential impact of market power due to securing 100+kV facilities in the market model
- The NYISO's current AMP software does not allow for the creation of mitigated load pockets outside of NYC; potential options include:
  - Modify the definition of “Constrained Area” and extend AMP to any newly identified load pockets
  - Develop a capability to dynamically identify constrained areas where market power concerns exist
  - Mitigate without using an impact threshold

# Recommendation

# Recommendation

- **Given the previously discussed benefits, the NYISO recommends moving forward with a market design effort to secure select 100+kV transmission facilities within the market model**
  - The NYISO will begin working with stakeholders to further the market concepts and procedures necessary to support this effort

# Timeline

# Timeline

## ■ Q2 2017

- Discuss white paper

## ■ Q3 2017

- Develop Market Design Concept Proposal with stakeholders
- Complete Consumer Impact Analysis

# Appendix: Simulation Results



# West 115 kV Transmission Constraints

Constraining Element	Hour Count	Avg. Shadow Price
181 Packard-Gardenville		
Packard-Niagara Blvd.	913	\$215
Frankhauser-N.Broadway <sup>1</sup>	28	\$426
N.Broadway-Erie St. <sup>2</sup>	10	\$187
182 Packard-Gardenville		
Frankhauser-Walden <sup>3</sup>	177	\$640
Grand Island-American Std.	33	\$120
141 Gardenville-Dunkirk		
Gardenville-Cloverbank <sup>4,5</sup>	136	\$424
129/133 Packard-Huntley		
Walck Rd.-Zimmerman	210	\$198
130 Packard-Huntley		
Packard-Zimmerman <sup>5</sup>	67	\$159
191 Niagara-Packard <sup>6</sup>	39	\$80
192 Niagara-Packard	14	\$82
AT1 Niagara 230/115 <sup>7</sup>	80	\$175
BK3 Packard 230/115 <sup>8</sup>	41	\$164
103 Niagara-Swan Rd. <sup>9</sup>		
Niagara-Mountain	26	\$58
Mountain-Swan Rd.	50	\$92
38 Huntley-Gardenville <sup>10</sup>		
Huntley-Bufalo <sup>129</sup>	13	\$546

## Table Notes

<sup>5</sup> Oct. 31: 129/133 out

<sup>6</sup> Aug. 18-21: 192, 101 out

<sup>7</sup> Oct. 6-14: 66/71/AT2 out

<sup>8</sup> Packard BK3 held to STE; Aug. 17-19: 192, 101 out; Sep. 12 - 13: AT1, 70 out

<sup>9</sup> Jun. 27: 181-922 out; Jul. 16, Aug. 1-3: 102, 101 out

<sup>10</sup> Oct 10: 66/71/AT2/921 out



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# North/ Upper Mohawk Transmission Constraints

Constraining Element	Hour Count	Avg. Shadow Price
3,4 Browns Falls-Taylorville <sup>1</sup>	480	\$72
1 Higley-Browns Falls	104	\$116
2 Flat Rock-Browns Falls	7	\$101

## Table Notes

<sup>1</sup> Extended outages of lines 3 or 4 within study period

# Central Zone Transmission Constraints

Constraining Element	Hour Count	Avg. Shadow Price
716 Cortland - Clarks Corner <sup>1</sup>		
Cortland -Tuller Hill	72	\$188
Tuller Hill - Clarks Corner	45	\$198

## Table Notes

<sup>1</sup> Count total exclusive to Oct 10-13 due to multiple outages

<sup>2</sup> Milliken DARU

# Average Hourly Generation Shifts (MW)

Area	July	August	September	October <sup>1</sup>	October <sup>2</sup>
West	-106	-100	-117	-233	-170
North/Cedars	-16	-5	-11	-5	0
NYC	+7	+4	+13	+21	+14
Capital	+6	-2	+4	+3	+1
PJM	+31	+61	+52	+162	+88
IESO	+21	+22	+14	+23	+26

## Table Notes

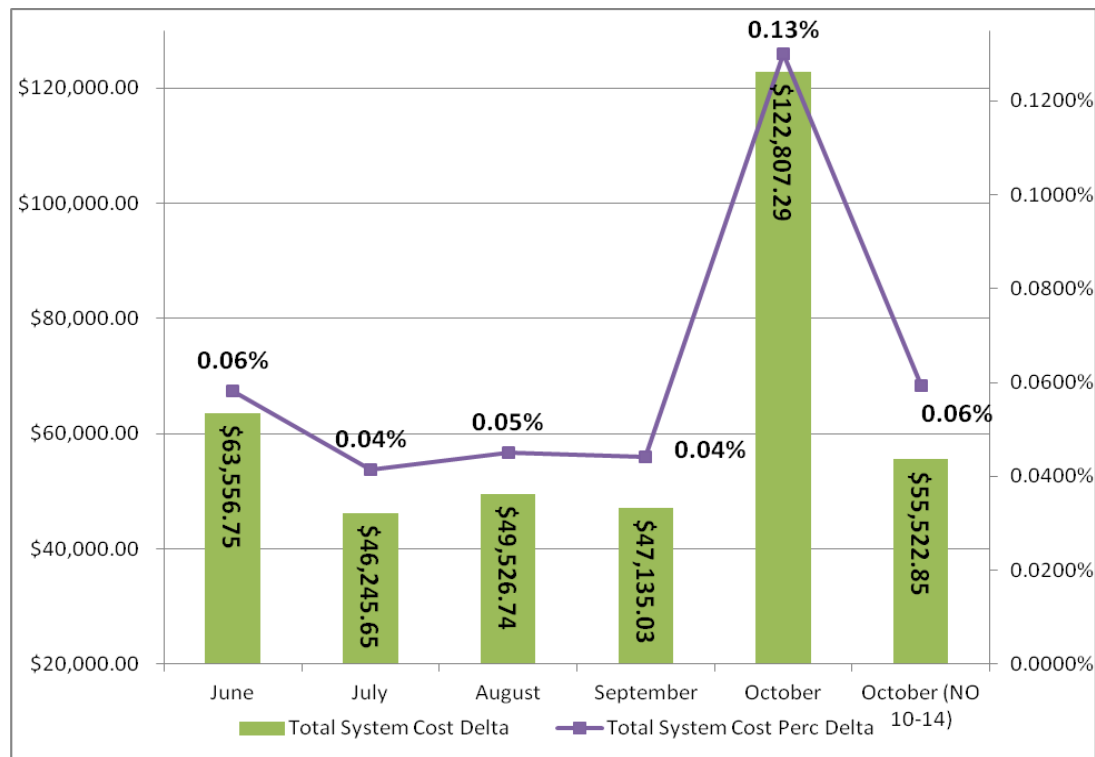
<sup>1</sup> Difference due to simultaneous outages requiring high levels of transmission relaxation; Oct 10-14

<sup>2</sup>Differences with data for Oct 10-14 removed

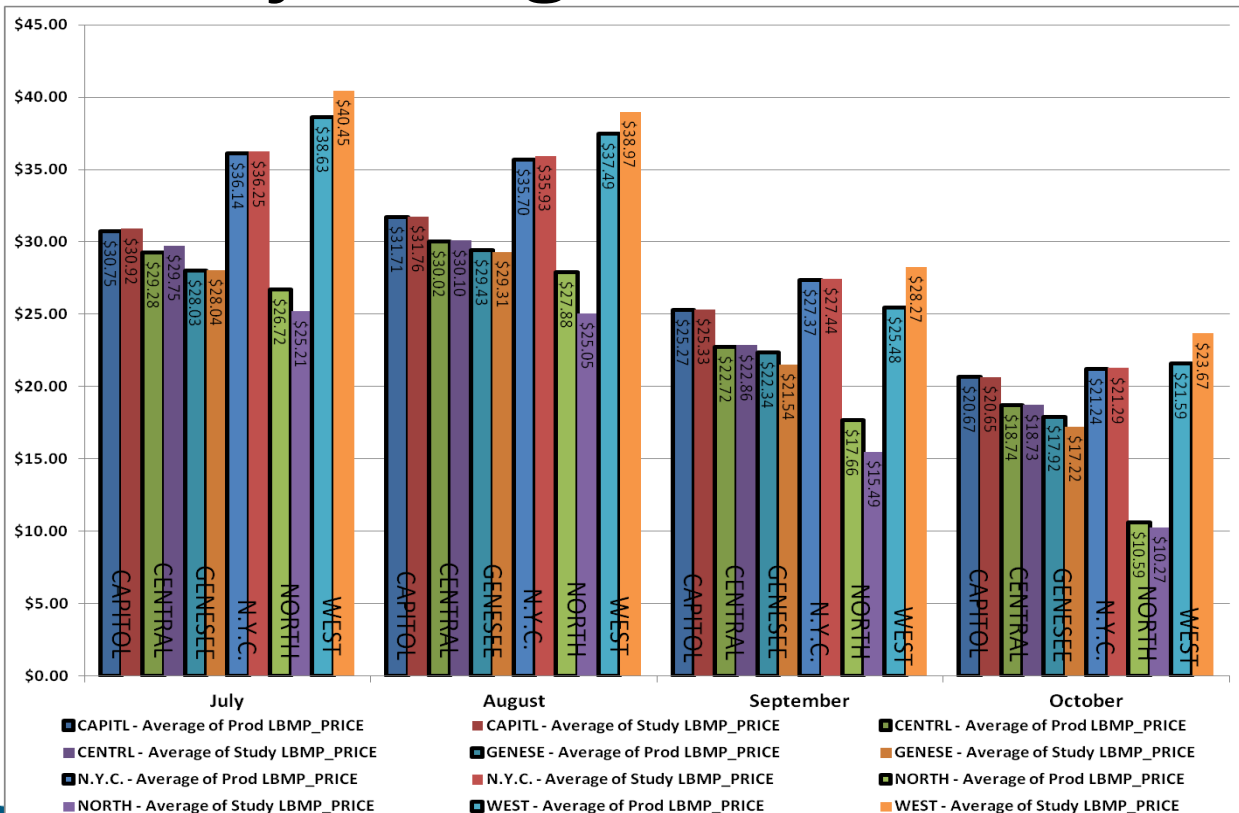


# Average Daily change in Total System Cost by Month

- This table shows total system cost, a measure of all resources (including virtuals) cleared in the DA market to serve all load
- The higher level in October includes the effects of simultaneous outages in the West and Central zones during Oct. 10 -14. The second, lower value excludes those days from the calculation.



# Hourly Average Zonal LBMP Changes by Month

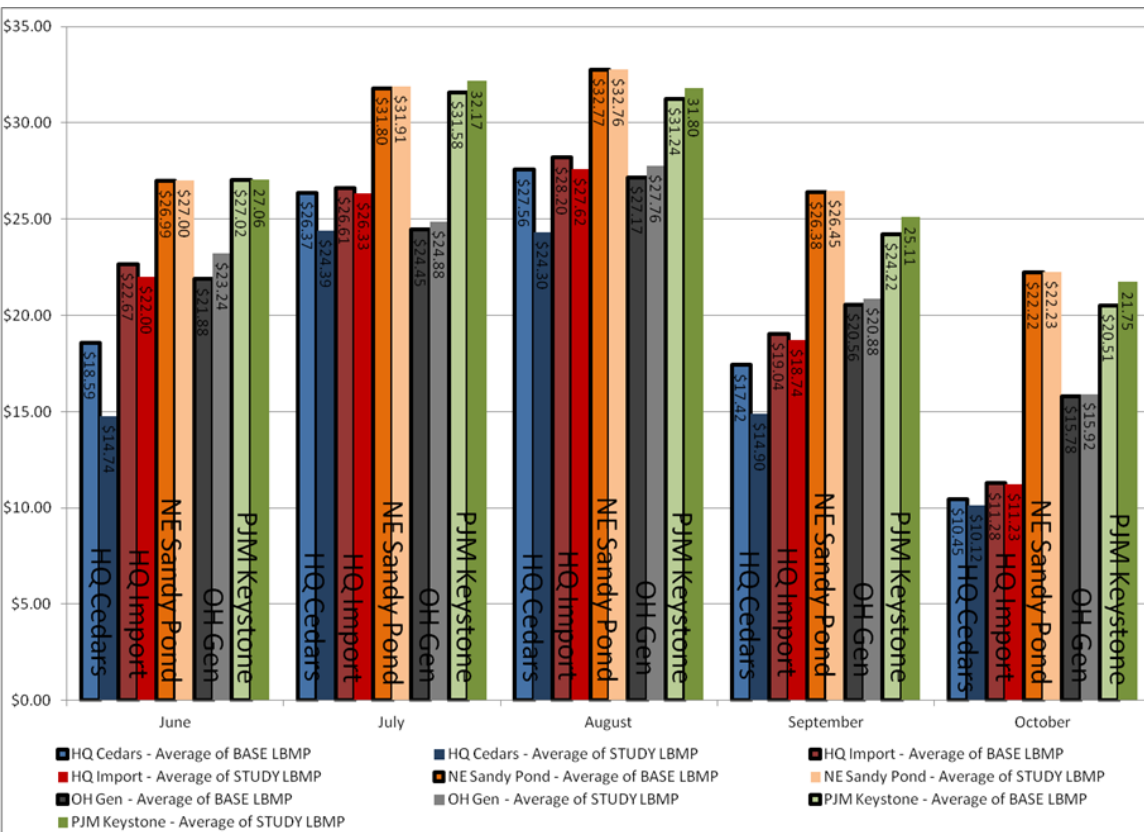


- The impact of a set of near-infeasible simultaneous outages in the West and Central zones during Oct. 10 - 14 is not included in this chart



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# Hourly Average Proxy Bus LBMP Changes by Month



- The impact of a set of near-infeasible simultaneous outages in the West and Central zones during Oct. 10 -14 is not included in this chart



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# The Mission of the New York Independent System Operator is to:

- Serve the public interest and
- Provide benefit to stakeholders 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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