

# **East/West Reserve Optimization**

**New York Independent System Operator**

**Market Issues Working Group  
October 26, 2009**

# E/W Reserve Optimization

- ✓ *Background – How we got here*
  
- ✓ *Reserve Optimization Concept*
  
- ✓ *Cost /Benefit Analysis*
  1. Benefit estimate methodology
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  3. Cost estimate discussion
  
- ✓ *Recommendation*

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## ◆ Physical Self-Supply

- FERC ordered the NYISO to produce a schedule for providing a self supply option of reserves.
- In October, 2005, the Management Committee voted to move forward by advising the FERC that physical self supply was not suited to the NY financial market model and requesting its permission to look, instead, at financial self supply.

*Note: See attached MC motion from the 10/11/05 Meeting*

- FERC accepted the response and directed the NYISO to provide a schedule for developing a financial solution.

The NYISO buys all its reserves in the Day-Ahead market.

- Half of the ten-minute spinning reserves it procures Day-Ahead needs to be procured from Eastern resources.
- The current tariff provides two mechanisms which provide LSEs the ability to hedge against high reserve prices.
  - *Bidding (or contracting for a generator to bid) into the reserve market.*
  - *Entering into a contract for reserve price differences with a third party*
- Another option would be to settle reserves at locational settlement prices.
- Pursuant to the MC Oct. 2005 vote, the NYISO was directed to include in the development of that hedge an evaluation of the feasibility, costs and benefits of optimizing transmission capacity for reserves.
- Around other priority projects, the NYISO has been designing and carrying out an evaluation of the feasibility, costs and benefits of optimizing transmission capacity for reserves.
- On April 9, 2009, the FERC accepted the NYISO's latest schedule in this docket.

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- ◆ *Analyzing the feasibility, costs and benefits of optimizing transmission capacity:*
  - LECG performed several studies of East/west price differentials and west-to-east transmission availability in both the DAM and the RT markets and produced estimates of the **upper bounds** to potential financial benefits associated with adding further east/west reserve optimization.
  - The upper bounds to benefits were large enough to spark interest in attempting to determine what actual benefits might amount to before proceeding further with what promised to be a complex design and implementation.
  - The remainder of this discussion presents estimates of the **actual benefits** likely to be realized by further optimization and makes some recommendations.

- ◆ **Utilized unused DAM west to east transfer capacity to shift additional eastern reserve to more economic western resources.**
- ◆ **Remained consistent with the current scheduling method for the reserve markets.**
  - NYISO would continue to purchase all reserves in the DAM
  - Reserve suppliers failing to meet their DAM obligation would buy out at real-time reserve prices.
- ◆ **Provided an additional dispatch step that would be performed as follows:**
  - Added as the final SCUC dispatch step ***only*** when the normal DAM SCUC dispatch solution includes unused west to east transfer capacity ***and*** the eastern 10 minute reserve price exceeds the western price.
  - Performed with west to east transfer limits and eastern 10 minute reserve requirements reduced to reflect the unused transfer capacity discussed in step 1.
  - Consisted of a re-dispatch step ***only***, therefore retaining the secure unit commitment of SCUC.

- ◆ **The NYISO has limited its optimization analysis to the DAM.**
  - NYISO purchases all reserves in the DAM
  - Most RT reserve prices are very low (often \$0) yielding very limited benefit.
  - RT optimization would at minimum add substantial complexity with its attendant performance impact and financial cost.
  
- ◆ **If the NYISO continues design work on transmission optimization for reserves, the issue of RT optimization will need to be revisited.**

## Benefit Estimating Method

- ◆ NYISO developed a manual process model of the concept
  1. Chose an appropriate period to evaluate and identify the hours that present a potential benefit.

Evaluated all hours of the DAM solutions from **April 30, 2009 through July 31, 2009** to identify all hours in which Eastern 10 minute reserve prices exceeded western prices and there was unused west to east transfer capacity. These hours are designated as “active hours”.
  2. A representative subset of 23 “candidate days” were selected from the 50 days with “active hours” for individual evaluation of all active hours.
  3. For “active hours” within each “candidate day”, the west to east transfer limit and the eastern reserve limits were reduced by the unused capacity from the normal solution thus permitting economic reserve transfers from east to west up to the new eastern reserve limits.

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## Benefit Estimating Method (Continued)

- ◆ Manual process model of the concept
  4. For each “candidate day” we re-ran the final dispatch for the full day.
    - No changes were made to the original commitment for the days evaluated
  5. Reserve allocations and production costs of the modified dispatch were compared with those of the original dispatch to determine the realized benefit.

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## Benefit Estimating Method (Continued)

- ◆ Manual process model of the concept
  - All days in May, June and July 2009 were examined for active conditions.
  - 50 of the 93 days contained active hours.
  - 23 of the 50 identified days were selected as a representative profile and designated “candidate days” for more time consuming hourly data evaluation and modification.
    - The 23 selected days include all hours with total reserve price differentials summed over the active hours of \$20 or more and multiple days in each month were represented.
  - The 23 evaluated days include a total of 184 active hours
  - All active hours in these candidate days were modified to reflect new reserve and transfer limits and SCUC was re-run for each candidate day.

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## 23 Candidate Days Analysis Results Summary

Date	Active Hours Out of	Available Reserve Transfer Capacity MW	Reserve Transferred MW	Capacity Transferred % of Available	Production Cost Reduction \$
4/30/09	15	3021	1071	35.5	1438
5/1/09	14	2550	635	24.9	1617
5/3/09	14	2836	1544	54.4	3713
5/4/09	8	5480	1000	18.2	3642
5/5/09	9	5472	1000	18.3	4255
5/6/09	13	9134	1754	19.2	4882
5/7/09	17	9276	1345	14.5	5092
5/8/09	13	6651	1166	17.5	3700
5/23/09	8	4864	341	7.0	2568
5/24/09	7	4912	399	8.1	3176
6/5/09	1	406	10	2.5	5
6/7/09	1	865	128	14.8	345
6/22/09	14	9450	141	1.5	296
6/23/09	4	1960	51	2.6	261
6/24/09	3	2025	31	1.5	34
6/25/09	1	678	16	2.4	11
6/26/09	4	2905	148	5.1	1204
6/29/09	4	257	37	14.4	85
6/30/09	4	2097	367	17.5	696
7/6/09	6	4573	171	3.7	193
7/8/09	9	8179	663	8.1	1425
7/9/09	6	5259	151	2.9	825
7/10/09	9	7997	211	2.6	654
Totals	184	100847	12380	12.3	40117

“Active Hours “

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## Benefits Estimate

**The analysis utilized three means by which to estimate annual benefits of developing further optimization for the allocation of reserve between East and West.**

1. Direct production cost savings projection
2. Ratio of these benefit calculations to the upper bound benefit calculation
3. Application of average economic transfer observed to the upper bound benefit calculation

***Note: For purposes of these estimates we assume the summer quarter results to be representative enough of the other 3 quarters of a year to be the basis for an annual benefit estimate.***

### Method 1 – Direct production cost comparison

- $\$40,117 / .46$  for the 23 days =  $\$87,211$  savings estimate for the 50 active days in the evaluated quarter.
- $\$87,211 / .25$  per quarter =  **$\$348,844$  estimated savings per year.**
- Or an average of  $\$29,070$  savings per month

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## Benefits Estimate (Continued)

### Method 2 – Ratio of observed savings to upper bound estimate

**Another way of estimating probable benefit is to calculate the ratio of these observed benefits calculations to the upper bound benefit calculation for these days. There are two additional statistics we will use.**

- On the days with substantial benefits, **the ratio of actual benefits to potential benefits is always less than 23%**
- The **overall average over all the days we reran SCUC is 13.2%**.
- Since the historic upper bound on benefits has been around an average of \$900,000 a year, this implies that the **likely actual benefits are in the range of \$119,000 to \$207,000 a year.**

### Method 3 – Application of observed average transfer to upper bound estimate

**Yet another way of estimating the probable benefit is to calculate the ratio of observed transfer calculations to the available transfer capacity and apply that ratio to the upper bound benefit estimate.**

- On the days with the ten highest production cost savings **the observed average transfer was always less than 21 % of the available upper bound.**
- The **overall average for all the days we reran SCUC is 13.2%**.
- With an historic upper bound on benefits that has been around an average of \$900,000 a year, this method would estimate **likely actual benefits to be in the range of \$119,000 to \$189,000 a year.**

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## Benefit Conclusion

- ◆ Results from the methods used range from approximately \$120,000 to \$350,000.
  - Method 1 - direct production cost comparison – produced a noticeably higher result than methods 2 and 3. This may be attributed to the selection for the 23 day sample of the 10 highest benefit days of the 50 day period for nearly half of the “candidate days” to calculate the quarterly benefit.
  - Methods 2 and 3 benefits may be lower than Method 1 because the cost and transfer ratios determined by the detailed analysis are then applied to the upper bound benefit estimates **for entire annual periods**.
  - Method 1 is therefore recognized to be somewhat weighted toward the high side.

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## Benefit Conclusion

These potential economic benefit of additional optimization of reserve allocations appears to be limited in two ways.

- 1. Much of the time when east to west capacity is available to support such a transfer, West-east price differentials are minimal obviating the benefit to a transfer. Out of 93 analyzed days only 50 had 1 or more active hours.*
- 2. When the active hours are then re-dispatched with reduced eastern reserve minimums the average actual reserve transfer (east-to-west reserve transfer found to be economic) is only about 23% of the total available to be transferred in that hour.*

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## Cost Considerations

- ◆ **While detailed cost estimates have not been compiled, it would be safe to categorize this as a MAJOR initiative.**
  - A thumbnail view of potential costs suggests fairly costly impacts of:
    - SCUC processing and structural changes (data and process).
    - Settlements processing and structural changes (data and process).
    - General effort to avoid creating additional structural causes for DAM/RT and RTC/RTD price differentials.
    - Development of rules and processes to govern re-shifting western reserves to eastern resources when this is desirable in real-time operation.
  - In addition to financial costs these efforts will occupy many resources which are already in high demand for other important projects.
    - This initiative would compete with the same resources that are needed for: Interregional Transaction Coordination (all phases), Congestion Management, Buy Through of Congestion, Disaggregated Virtual Trading, Rest of State Reliability Mitigation, and many others.

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- ◆ **The current optimization process is constrained by fixed, reliability-dictated constraints on reserve location and transmission transfer limits.**
- ◆ **The remaining limited opportunity to improve the solution efficiency by relaxing the locational eastern reserve constraint when west to east transfer capacity is unused by the DAM solution provided limited economic benefits.**
- ◆ **If we were to relax the locational eastern reserve constraint when west to east transfer capacity is unused in the DAM, we expect cost savings of less than \$30,000/mo. When compared with the potential that such a solution is likely to be very costly, it does not appear that reserve optimization is practical based upon inadequate potential benefit.**
- ◆ **Next Steps:**
  - *The Oct MC vote also directed the NYISO to examine whether the price differentials between east and west indicated a locational reserve settlements option should be examined.*
  - *NYISO is seeking feedback from Market Participants on the results of this analysis and the direction which they want to go, given that it does not appear reserve optimization is practical based upon a relatively inadequate potential benefit.*

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The New York Independent System Operator (NYISO) is a not-for-profit corporation that began operations in 1999. The NYISO operates New York's bulk electricity grid, administers the state's wholesale electricity markets, and provides comprehensive reliability planning for the state's bulk electricity system.

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