FERC Order 755 Frequency Regulation Compensation

NYISO Proposal – part II

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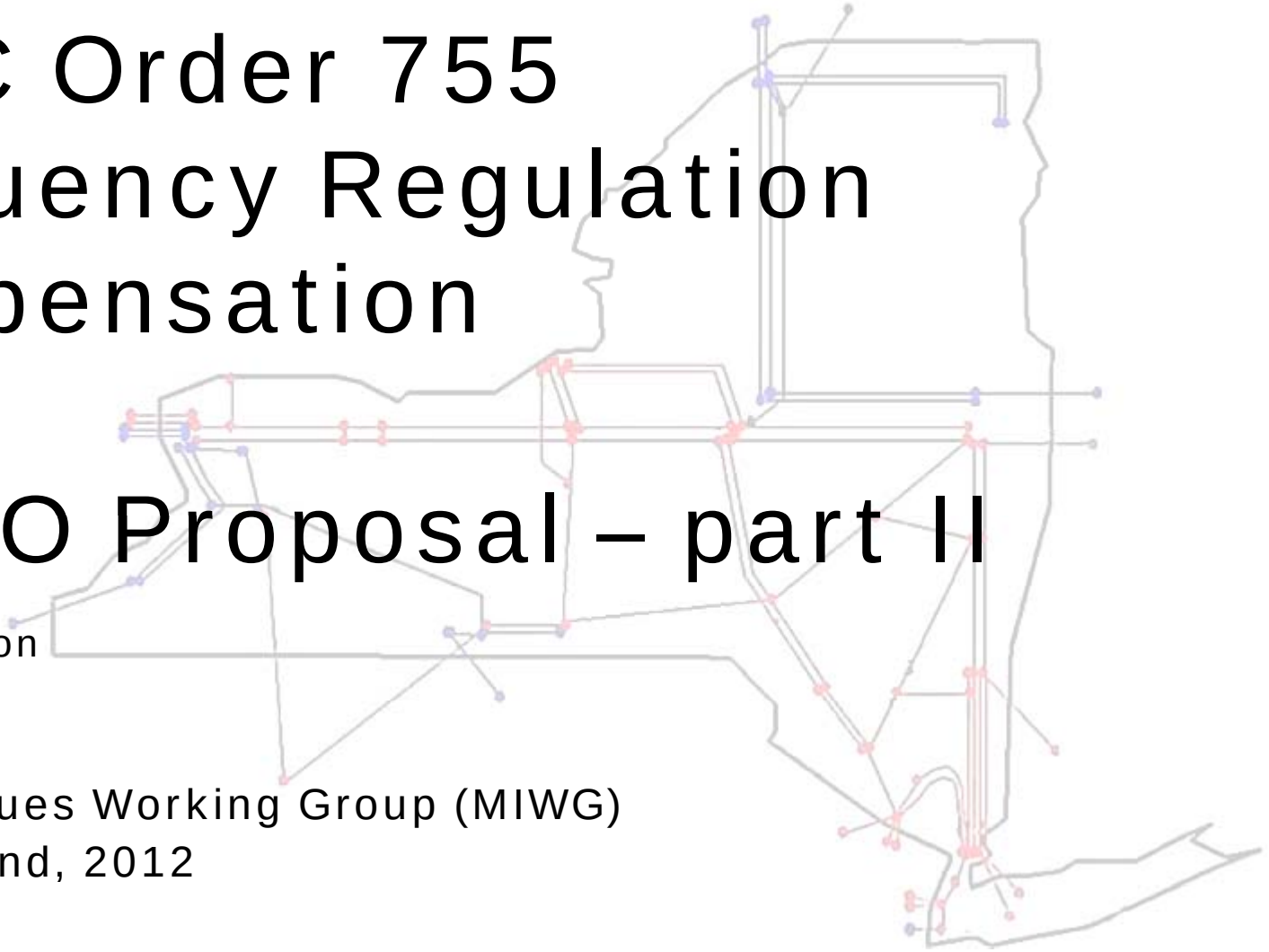
Market Issues Working Group (MIWG)
February 2nd, 2012



Background

- On January 19th, 2012, NYISO presented its proposal to comply with FERC Order 755 regarding Frequency Regulation Compensation.
- That presentation can be found at: http://www.nyiso.com/public/webdocs/committees/bic_miwg/meeting_materials/2012-01-19/Reg_Compensation.pdf
- This presentation expands upon the January 19th presentation with additional details and examples.

FERC Order Requirements (recap)

- Must compensate resources with a Capacity payment that includes lost opportunity costs.
- Must additionally compensate resources based on their actual performance.
- Two-part bid required.
- Uniform Clearing Price must be market based.
- Must treat all resources equally when measuring accuracy.
- Tariff amendments due April 28th, 2012.
- Implementation complete October 25th, 2012.

NYISO proposal in a nutshell

- Market Participants will offer both a Regulation Capacity bid price (as they do today) and a new Regulation Movement bid price for both the Day-Ahead Market (DAM) and the Real-Time Market (RTS). They will also provide a six-second Regulation Response Rate, in addition to the five-minute Regulation Response Rate.

- Both DAM and RTS will optimize Regulation offers using the combined Capacity bid price and the Movement bid price of each bidder (the two bid components are summed together into a single value).

- Suppliers with DAM Regulation Capacity Schedules will be paid for scheduled Regulation Capacity using the DAM Regulation Capacity Clearing Price.

- Suppliers with RTD Regulation Capacity Schedules will be paid for incremental (above the DAM scheduled) Regulation Capacity using the RTD Regulation Capacity Clearing Price.

- Suppliers with RTD Regulation Capacity Schedules will also be paid for the absolute number of MWs they were instructed to move in real-time by AGC for ACE correction. This settlement will use the RTD Regulation Movement Clearing Price.

Day-Ahead

- The Regulation bid price for each Resource passed into the DAM evaluation is the sum of each bidder's Regulation Capacity bid price plus Regulation Movement bid price
  - *NYISO recognizes that this involves combining bid prices for different units of measure ($/MWhrenergy and $/MWmovement).*
  - *Summing them together provides a simple mechanism to prevent creating incentives for very expensive movement offers and very low capacity offers.*

- DAM Regulation Capacity Clearing Price
  - *The DAM Regulation Capacity Clearing Price will reflect only a price for Regulation Capacity, including lost opportunity costs; It will be set as the Regulation Capacity Bid Price plus lost opportunity cost (as determined by the optimization) of the marginal unit.*
  - *It is possible that the DAM Regulation Capacity Clearing Price will not always be sufficient to cover the bid-in Regulation Capacity costs of all cleared resources due to the two-part bidding that is being summed together. Modifications to Day-ahead BPCG will be necessary to deal with this outcome.*

- DAM Settlement is:

  DAM Regulation Capacity Schedule * DAM Regulation Capacity Clearing Price

- There is no Regulation Movement scheduled in the DAM. Only a Capacity schedule is awarded. There will also be no DAM Regulation Movement Clearing Price.

DAM Example

- NYISO regulation requirement for hour = 60mw
  - *Assumes no Lost Opportunity Cost*

DAM Regulation Bids

Provider	$RegBidMW_{capacity}$	$RegBid\$_{capacity}$	$RegBid\$_{movement}$	Combined Bid $
A	20	$6.75	$0.45	$7.20
B	10	$7.10	$0.05	$7.15
C	40	$0.00	$3.00	$3.00
D	100	$6.75	$0.80	$7.55

DAM Regulation Capacity schedule

Provider	Schedule	DAM Regulation Capacity clearing price = $6.75 (Provider A's Regulation Capacity Bid Price)
A	10mw (marginal)	
B	10mw	
C	40mw	
D	0mw	

Note: The clearing price of $6.75 does not cover the bid-in cost of $7.10 for Provider B. Therefore, Provider B's Payment minus Cost [$67.50 – $71.00] will be included in the NASR portion of the DAM BPCG Calculation. DAM BPCG is discussed later in the presentation.

DAM Regulation Capacity settlement

Provider	Reg Sched $MW_{capacity}$	Reg Clearing $Price_{capacity}$	DAM $Settlement_{capacity}$
A	10	$6.75	$67.50
B	10	$6.75	$67.50
C	40	$6.75	$270.00
D	0	$6.75	$0.00

Real-time

- The Regulation bid price for each Resource passed into each RTS evaluation is the sum of each bidder's real-time Regulation Capacity bid price plus real-time Regulation Movement bid price.
  - *Similar to other ancillary products for capacity – the real-time Regulation Capacity bid price must be zero;*
  - *Market Participants may not increase their Regulation Movement bid price above their accepted DAM Regulation Movement bid price.*

- Real-time Regulation Capacity Clearing Prices
  - *Regulation Capacity Clearing Prices exclude bid prices for Regulation Movement; It will be set as the lost opportunity cost (as determined by the optimization) of the marginal unit.*

- Real-time Regulation Movement Clearing Prices
  - *Regulation Movement Clearing Prices will be set at the Regulation Movement bid price of the marginal unit for the interval; (This is a slight revision to the Jan 19th presentation which described the movement clearing price as using the highest movement bid price of the units with a Regulation Capacity Schedule).*
  - *It is possible that the Real-time Regulation Movement Clearing Price will not always be sufficient to cover the bid-in Regulation Movement costs of all cleared resources. Modifications to RT BPCG will be necessary to deal with this outcome.*

- There is no Regulation Movement scheduled in RTS. Only a Regulation Capacity schedule is awarded.

- RT Settlement for Regulation Capacity is:

  (RTD Regulation Capacity Schedule - DAM Regulation Capacity Schedule) * RT Regulation Capacity Clearing Price

RTD Example

- NYISO regulation requirement for hour = 60mw
  - *Assumes $27 Lost Opportunity Cost, and no DAM schedules*

HAM Regulation bids

Provider	$RegBidMW_{capacity}$	$RegBid\$_{capacity}$	$RegBid\$_{movement}$	Combined Bid $
A	20	$0	$0.45	$0.45
B	10	$0	$0.05	$0.05
C	40	$0	$3.00	$3.00
D	100	$0	$0.80	$0.80

RTD Regulation Capacity schedule

Provider	RTD Regulation Sched $MW_{capacity}$	RTD Regulation Capacity clearing price = $27.00 (assumes marginal Provider D had a lost opportunity cost of $27)	RTD Regulation Movement clearing price = $0.80
A	20		
B	10		
C	0		
D	30 (marginal)		

RTD Regulation Capacity settlement in one RT Interval

Provider	Reg Sched $MW_{capacity}$	Reg Clearing $Price_{capacity}$	RT $Settlement_{capacity}$ Time Weighted
A	20	$27.00	$45.00
B	10	$27.00	$22.50
C	0	$27.00	$0.00
D	30	$27.00	$67.50

Movement

- Every six-seconds, the NYISO dispatches Regulation-scheduled Resources with an allocated share of the MWs needed for ACE correction. These allocated MWs will now be known as "Movement MWs." In order to fairly allocate Movement MWs across the Resources with Regulation Capacity Schedules, changes in the deployment of ACE correction within AGC are necessary.

- Regulation Movement will be allocated as follows:
  - *Allocate Movement MWs to all units proportionally, based on the amount of Regulation Movement MWs they are able to provide in the next six seconds using their six-second response rates (new value provided by regulating resources).*
  - *This is slightly different than today, where Movement MWs are allocated first to Limited Energy Storage Resources (LESRs), and then to units proportionally based on their RTD Regulation Capacity Schedule.*
    - AGC will continue to manage around the current state of charge for LESRs.
  - *For settlement purposes, Movement MWs for an interval will be the summation of the absolute up and down Movement MWs directed by AGC for ACE correction.*
  - *An AGC signal directed to a Resource for Energy or for state of charge management will not be counted as a Movement MW for settlement purposes. Any AGC MW directed against ACE for state of charge management will be deducted from the total Movement MWs for settlement purposes.*

Movement - continued

- Regulation Performance Index ("PI") – NYISO already measures the accuracy of regulating resources via the Regulation Performance Index, as further described in the Billing and Accounting Manual. NYISO is not proposing to change the way the PI is calculated.
  - *In order to comply with the FERC order's requirement of applying a standard measurement of accuracy to all resources, NYISO must change the current practice of automatically assigning a Regulation Performance Index = 1 for Limited Energy Storage Resources.*

- NYISO proposes to use the PI in RT settlements for regulation movement:

  RT Regulation Movement settlement = Total Regulation Movement MW * RT Regulation Movement Clearing Price * Regulation Performance Index

Movement - continued

- In addition, NYISO proposes a Regulation Performance Charge:
  - *For regulating providers selected for capacity by RTD, but not responding (or responding poorly) to AGC 6-second signals, there will be a charge applied.*
  - *The charge will be based on the RTD Regulation Capacity MWs which were not actually provided, plus 10%. The calculation will use the higher of the RT Regulation Capacity Clearing Price or the DAM Regulation Capacity Clearing Price.*
    - The purpose of the 10% adder is to prevent the no-risk option of being scheduled Day-Ahead and in real time for Regulation Capacity and not performing when instructed.

$$\text{Regulation Performance Charge} = \Big(\big((\text{RTD Regulation Capacity Schedule} * \text{Reg Perf Index}) - \text{RTD Regulation Capacity Schedule}\big) * 1.1\Big) * \text{Max}\big(\text{DAM Regulation Capacity Clearing Price}, \text{RTD Regulation Capacity Clearing Price}\big)$$

- Example

  Unit A with a 10MW RTD Regulation Capacity Schedule, a 0.6 Reg Performance Index, and a DAM Regulation Capacity Clearing Price = $7

  - Regulation Performance Charge = (((10MW * 0.6) – 10MW)) * 1.1) * $7
  - Regulation Performance Charge = -4MW * 1.1 * $7
  - Regulation Performance Charge = $30.80

Movement Example

- Assumes 104 mws of movement, prorated across the three resources based on 6 second capability.

Regulation Movement MWs

Provider	$RegMW_{Movement}$	Response Rate
A	34.67mw	1.2mws per 6s
B	57.77mw	2.0mws per 6s
D	11.56mw	0.4mws per 6s

Settlement for regulation movement in one RT Interval

Provider	$RegMW_{Movement}$	Reg Perf Index	RTD $RegPrice_{Movement}$	Movement Payment
A	34.67	1.0	$0.80	$27.74
B	57.77	0.8	$0.80	$36.97
D	11.56	0.2	$0.80	$1.85

Movement – historical examples

- Determining the precise amount of Regulation Movement MWs instructed by AGC solely for ACE correction is not possible with the current data available. However, we manually reverse-engineered the data in six different hours to estimate the amount of Regulation Movement MWs instructed by AGC for ACE correction across all regulating units during those hours:

- *Monday, January 23 2012, HB06*
  - Regulation Capacity for the hour = 275MWh
  - Average of RTD Regulation Capacity Prices = $7.25
  - Estimated Movement MWs during hour = 2,280mws
- *Friday, December 9 2011, HB08*
  - Regulation Capacity for the hour = 275MWh
  - Average of RTD Regulation Capacity Prices = $20.00
  - Estimated Movement MWs during hour = 1,250mws
- *Tuesday, November 22 2011, HB07*
  - Regulation Capacity for the hour = 275MWh
  - Average of RTD Regulation Capacity Prices = $6.00
  - Estimated Movement MWs during hour = 2,164mws
- *Saturday, August 13 2011, HB03*
  - Regulation Capacity for the hour = 175MWh
  - Average of RTD Regulation Capacity Prices = $5.75
  - Estimated Movement MWs during hour = 3,310mws
- *Monday, April 12th, 2010, HB10*
  - Regulation Capacity for the hour = 200MWh
  - Average of RTD Regulation Capacity Prices = $32.00
  - Estimated Movement MWs during hour = 1,242mws
- *Thursday, March 18 2010, HB17*
  - Regulation Capacity for the hour = 275MWh
  - Average of RTD Regulation Capacity Prices = $32.00
  - Estimated Movement MWs during hour = 1,368mws

Mitigation and controls

- As per the order's requirement to submit tariff provisions for market power mitigation measures under the redesigned Regulation market design, NYISO is currently considering appropriate conduct and impact thresholds.
  - *Reference levels will need to be established in Reference Level Software for Regulation Movement Bid Price and 6-Second Response Rates.*
- Implementation will include temporary bid caps for Regulation Movement Bid Price until sufficient market history with bidding behavior and regulation movement can be analyzed.
- NYISO's proposal includes combining the two-part bid prices to prevent a high/low bidding game between Capacity and Movement bids.
- NYISO's existing rules preventing suppliers of DAM Regulation Capacity from increasing Regulation Capacity bid prices between day-ahead and real-time will be applied to the new Regulation Movement bid price.

Miscellaneous Settlements

- The FERC Order will result in significant differences in the Regulation market from the current market design. Therefore, miscellaneous settlements, besides those directly related to providing Regulation service, require modification.

- Persistent Under-Generation Charges – charge which may be applied to non-regulating resources whose actual performance is below their schedule.
  - *Current formula, eligibility, and exclusions will remain exactly as they are today, with the exception that the Marginal Clearing Price of Regulation used will be the higher of the RTD Regulation Capacity Clearing Price or DAM Regulation Capacity Clearing Price.*

- Overgeneration Charges – charge which may be applied to wind resources who fail to reduce output when under a Wind Output Limit instruction from the NYISO.
  - *Current formula, eligibility, and exclusions will remain exactly as they are today, with the exception that the Marginal Clearing Price of Regulation used will be the higher of the RTD Regulation Capacity Clearing Price or DAM Regulation Capacity Clearing Price.*

Miscellaneous Settlements continued

- Bid Production Cost Guarantee (BPCG) - current BPCG formulas do not fully consider regulation service cost. Changes to the design and pricing of regulation service in response to FERC Order 755 necessitate modifications to existing DAM and RT BPCG formulas.
  - *Current DAM BPCG:*

    Hourly DAM BPCG = Energy Bid Cost + Mingen Cost + Startup Cost
    - Energy Revenue – Net Ancillary Services Revenue (NASR)

    Daily BPCG = Max (∑ Hourly DAM BPCG, 0)

    where NASR = VSS payment + Max (DAM Reg. Service payment – DAM Reg. Bid Cost, 0) + (DAM Reserves payment – DAM Reserves Bid Cost)

    Note: LESRs are currently ineligible for DAM BPCG.

  - *Proposed change to NASR component in DAM BPCG:*
    - NASR = VSS payment + *(DAM Reg. Capacity Service payment – DAM Reg. Capacity Bid Cost)* + (DAM Reserves payments – DAM Reserves Bid Cost)
    - Allow LESRs to be eligible for the NASR component of the formula (other components will remain zero for LESRs).

Miscellaneous Settlements continued

- *Current RT BPCG:*

  Hourly RT BPCG = ∑ ((Increm. Energy Cost + Mingen Cost – Energy Revenue – ($NASR_{TOT}$ - $NASR_{DA}$) – RRAP + RRAC) x int sec/3600) + Startup Cost

  Daily RT BPCG = Max (∑ Hourly RT BPCG, 0)

  where $NASR_{TOT}$ = VSS payment + Max (RT Reg. Service payment – RT Reg. Bid Cost, 0) + (RT Reserves payment – RT Reserves Bid Cost) + VSS LOC

  RT Reg. Service payment is based on a performance index = 1

  Note: LESRs are currently ineligible for RT BPCG.

- *Proposed change to NASR component in RT BPCG :*
  - $NASR_{TOT}$ = VSS payment + *(RT Reg. Capacity Service payment – RT Reg. Capacity Bid Cost + RT Reg. Movement payment - RT Reg. Movement Bid Cost)* + (RT Reserves payments – RT Reserves Bid) + *VSS LOC*
    Reg Movement Payment is based on a performance index = 1

    - Allow LESRs to be eligible for the NASR component of the formula (other components will remain zero for LESRs).

Next steps

- Feb 17th, 2012 MIWG – Continued discussions
- March/April – Tariff language reviewed at MIWG and/or BIC
- April 28th 2012 –File tariff amendments
- October 25th, 2012 – Deadline to implement solution