

# **Fuel Assurance – Energy Market Design Concepts: Fuel Constrained Bidding**

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# Agenda

- ◆ **Fuel Constrained Bidding background**
- ◆ **Concept and benefits of Fuel Constrained Bidding**
- ◆ **Supporting market rules**
- ◆ **Fuel Constrained Bidding Proposal**
- ◆ **Next Steps**

# Background

- ◆ **As part of the Fuel Assurance Initiative, the NYISO is seeking energy market enhancements that ensure**
  - *Proper incentives exist for resources to plan their fuel needs appropriately*
  - *Functionality exists that allows suppliers to offer their resources efficiently subject to fuel or production limitations*

# Background

- ◆ **NYISO proposed Fuel Constrained Bidding as a concept to support the Fuel Assurance Initiative**
- ◆ **2013 and 2014 State of the Market reports recommended allowing suppliers to submit offers that better reflect fuel supply constraints in the day-ahead market**
- ◆ **Fuel Constrained Bidding is listed as a project for 2016 with a Q4 FRS deliverable**

# Fuel Constrained Bidding Concept

- ◆ An intertemporal energy offer, reflecting a generator or generators' total production capability over the day or subset of hours in a day, can be submitted in addition to hourly bids in the day-ahead market
  - *This construct will be optional and a supplement to the current bid structure; it does not replace any components of the existing three-part bid structure*
  - *Three-part hourly offers will still be submitted for each generator reflecting Min Gen, Start-up, and Incremental Energy costs*
    - With Fuel Constrained Bidding, an MP will submit Start-up, Min Gen, Incremental Energy, and Total Multi-hour/Daily Energy costs for a generator or generators

# Fuel Constrained Bidding Concept

- ◆ **Allows generators to submit offers that more accurately reflect fuel supply or production constraints in the day-ahead market**
  - *A generator or portfolio of generators can reflect multi-hour fuel or production constraints and associated costs in an intertemporal offer to be enforced over the 24 hour electric day or subset of hours in the electric day*
  - *Total capability is submitted as an intertemporal energy offer reflecting the incremental costs it may incur to procure various volumes of fuel or produce at various levels of output*

# Fuel Constrained Bidding

- ◆ **Benefits of this type of bidding functionality**
  - *More accurately reflects limited fuel supplies or production limitations and associated costs in the day-ahead market*
    - Today, resources manage multi-hour energy or fuel constraints in hourly bids
    - This design would reduce approximations of optimal run-hours and associated production levels and increase efficient dispatch of resources
  - *Allows generators to be scheduled subject to fuel or other production limitations, increasing market efficiency*
  - *Allows generators more flexibility to bid when OFOs are anticipated*
  - *Helps generators reflect expected real-time conditions in DAM bids*
  - *More efficiently captures fuel costs into energy offers*

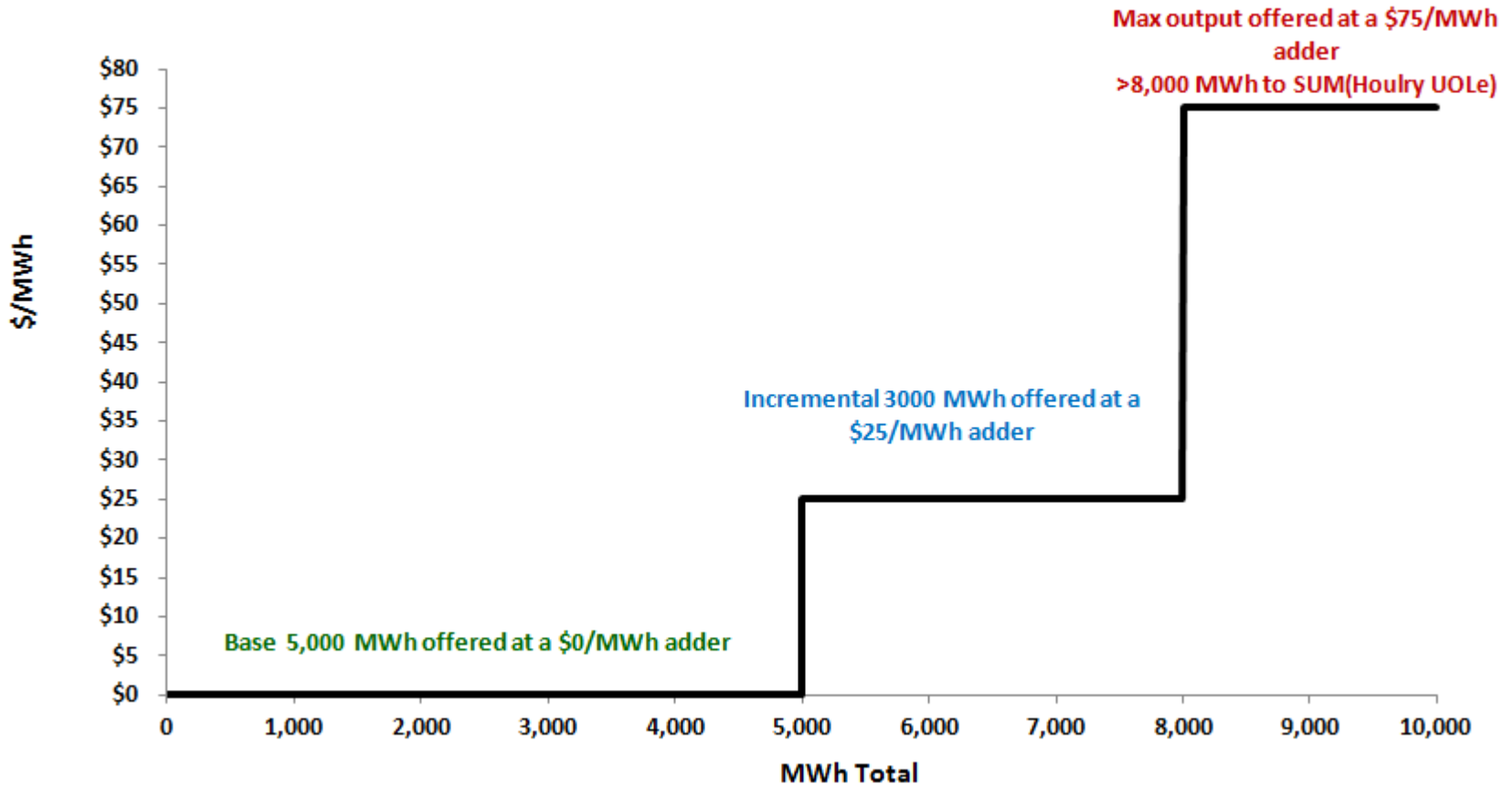
# Fuel Constrained Bidding Designs

- ◆ The following designs have been identified for modeling Fuel Constrained Bidding:
  - *1) Total Energy Curve*
  - *2) Fuel Cost and Efficiency Curve*

# Total Energy Curve Design

- ◆ The NYISO proposes to pursue the development of this design next year
- ◆ This design would require the MP to submit for an hour or subset of hours:
  - *Hourly three-part bids for a generator or each generator in a portfolio*
  - *A cost curve reflecting total energy capability in the timeframe (MWh) and cost to produce those MWhs (\$/MWh) for the generator or portfolio*

# Total Energy Curve Example



Total Energy Curve Bids	MWh 1	\$/MWh 1	MWh 2	\$/MWh 2	MWh 3	\$/MWh 3
		5,000	\$0	8,000	\$25	10,000

**Note: Existing bid features will not change. Hourly three-part bids for each generator are still submitted in conjunction with this offer**

# Total Energy Curve Design – Bid Composition

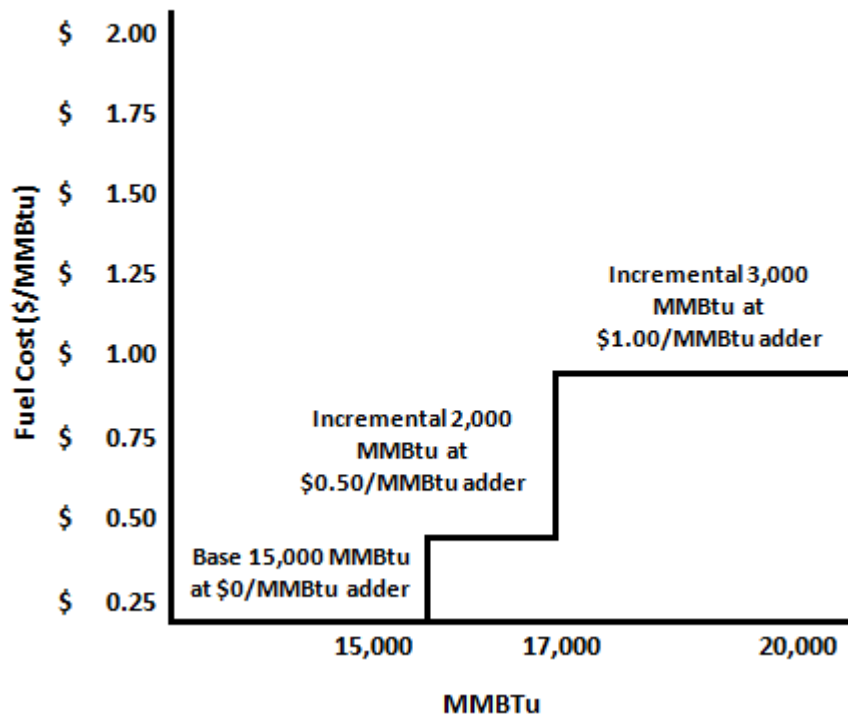
- ◆ **Costs expected to remain in existing hourly energy offers:**
  - *Variable costs associated with supplying energy within the hour between Min Gen and UOLe*
    - Eg. Incremental Heat Rate \* base fuel costs, base emissions costs, Min Gen Costs
  - *Variable O&M costs, Regulatory costs, Taxes, Rate Schedule 1*
- ◆ **Costs expected to be reflected in total energy offers**
  - *Expected costs to procure incremental amounts of fuel above a base level at base fuel price*
  - *Opportunity costs associated with daily production levels*
  - *Risk associated with higher levels of total daily production*
- ◆ **This design is not intended to reflect penalty costs of procuring gas**

# Fuel Cost and Efficiency Curve Design

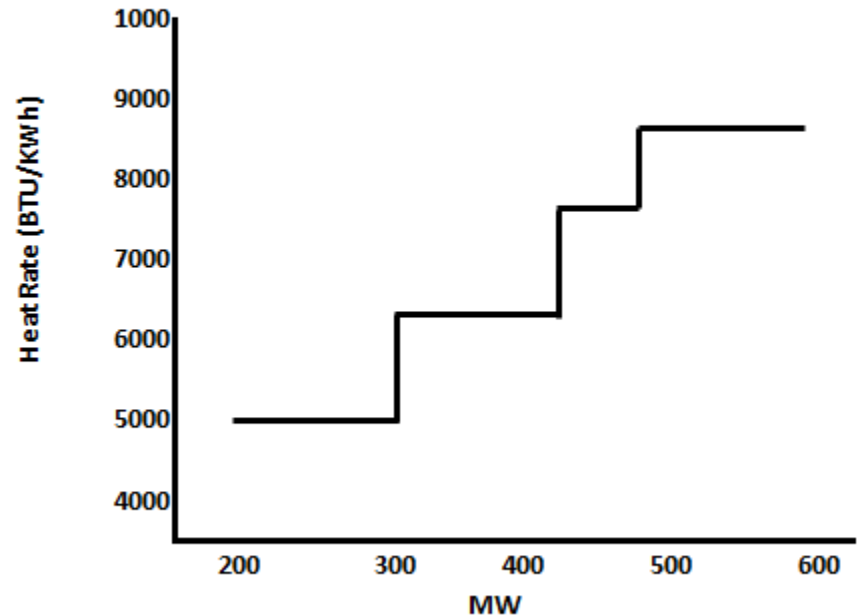
- ◆ The NYISO proposes to research and prototype this design further and to report back on its findings
- ◆ This design would require the MP to submit:
  - *Hourly three-part bids for a generator or each generator in a portfolio, with fuel adders removed from hourly bids*
  - *A cost curve reflecting incremental fuel purchases (eg. MMBtu) and cost to procure incremental volumes of fuel (\$/MMBtu) for the generator or portfolio*
  - *Heat input at Minimum Generation (eg. MMBtu/Hour) for each generator*
  - *Incremental heat rate curve reflecting the conversion between fuel (eg. BTU/KWh) and output (MW) for the generator or each generator in the portfolio*

# Fuel Cost and Efficiency Curve Example

Fuel Cost Curve for Generator or Portfolio



Incremental Heat Rate Curve for Each Generator



Note: Heat Input at Min Gen will also be submitted

**Note: Existing bid features will not change. Hourly three-part bids for each generator are still submitted in conjunction with this offer**

# Fuel Cost and Efficiency Curve Design – Bid Composition

- ◆ **Costs expected to remain in existing hourly energy offers:**
  - *Min Gen Costs*
  - *Base fuel and emissions costs*
  - *Variable O&M, Regulatory costs, Taxes , Rate Schedule 1*
- ◆ **Costs expected to be reflected in fuel cost curves**
  - *Expected costs to procure incremental amounts of fuel above a base level at base fuel price*
  - *Opportunity costs associated with higher levels of fuel consumption*
  - *Risk associated with higher levels of fuel consumption*
- ◆ **Incremental Heat Rate Curves reflect a generator’s conversion of fuel to output**
- ◆ **Heat Input at Minimum Generation reflects a generator’s conversion of fuel to output operating at Minimum Generation**
- ◆ **This design is not intended to reflect penalty costs of procuring gas**

# Price Formation

- ◆ **Since intertemporal offers will be enforced over multiple specified intervals, impacts to LBMP when the total energy curve is activated may be reflected over multiple intervals**
- ◆ **The optimization will continue to look at the whole 24 hour DAM horizon to minimize production cost, and these offers will not change the optimization objective function**
  - *Costs associated with intertemporal offers are just reflected as another component of the total production cost calculation*
  - *Co-optimization with ancillary services (regulation and reserves) will not change*
- ◆ **In each interval, we would still expect LBMP to be set by the cost of the next economic MWh**

# NYISO's Fuel Constrained Bidding Proposal

- The NYISO will seek BIC endorsement in November to pursue the design of a day-ahead intertemporal offer capability
- The NYISO proposes to pursue the Total Energy Curve design for a single generator and portfolio of generators next year, before pursuing more complex designs
- The NYISO proposes to research and prototype the Fuel Cost and Efficiency Curve design for a single generator and portfolio of generators and to report back on its findings
  - *The NYISO would like to better understand the impact of this design on bid curve convexities and software performance*
  - *The Fuel Cost and Efficiency Curve design will require more extensive changes to downstream market systems which is estimated to lengthen the implementation process by a year in comparison to the Total Energy Curve design*
  - *The development of the Total Energy Curve design will create the framework from which a more complex intertemporal bidding design can be implemented*

# Design Features

- ◆ **The Total Energy Curve design will include the following functionalities:**
  - *Available for day-ahead generator bidding as a supplement to the existing hourly bid structure*
  - *Allows MPs to reflect intertemporal energy and fuel constraints*
  - *Provides options to:*
    - Enforce a constraint over a subset of hours in the electric day
    - Enforce a level schedule for contiguous hours on flexibly scheduled resources, or for a minimum specified MW value (bidding in anticipation of an hourly OFO)
- ◆ **This bidding feature will be optional and available year-round**

# Supporting Market Rules

- ◆ The following market rule areas will be developed with stakeholder collaboration to support the Total Energy Curve design
  - *Bid validation*
  - *Bid conversion to RT*
  - *Mitigation and References*
  - *Settlements*

# BIC Vote - Purpose

- ◆ **As part of this effort, the NYISO will be looking for formal feedback from its Stakeholders**
  - *This feedback is important to understand whether it is appropriate to move forward with a Total Energy Curve design without the Efficiency Curve*
- ◆ **The request for endorsement will provide the NYISO direction on the market design concepts presented at this November 2015 BIC to establish:**
  - *Enough details to help stakeholders understand quantitative costs and benefits*
  - *Proposed implementation timeframe*
  - *Proposed tariff amendments*

**An additional BIC Vote would be necessary to approve any actual market changes**

# Next Steps

- ◆ **Seek BIC guidance on the Fuel Constrained Bidding proposal at the November 13<sup>th</sup> BIC meeting**

# **APPENDIX A: Market Efficiency Numerical Examples**

- ◆ **Example 1 - Adder in select hourly bids v. Adder in energy constraint**
- ◆ **Example 2 - Adder in all hourly bids v. Adder in energy constraint**

**Note: Examples are based on the Total Energy Curve design**

# Ex 1) Market Efficiency Example 1

## Adder in Select Hourly Bids v. Adder in Energy Constraint

- ◆ This example demonstrates how market efficiency and generator revenues can be improved through a generator’s reflection of opportunity cost adders in a Total Energy Curve rather than guessing when and where to place adders in hourly bids under the current bidding construct.
  - *Outcomes are summarized below; Bids, schedules, production costs, and revenues used in this example are detailed in the following two slides*

Gen 1 Strategy	Gen 1 Actual Production Cost	Total System Production Cost	Gen 1 Net Revenue
Adder placed in HB1 hourly bids (current bid construct)	\$ 7,500	\$ 25,250	\$ 9,750
Adder in Total Energy Curve (Fuel Constrained Bidding)	\$ 5,000	\$ 25,000	\$ 10,000

- *Gen 1’s actual production cost is reduced using the Fuel Constrained Bidding design*
  - Gen 1 was scheduled to produce 50 MWh more in HB2 under the current bidding construct, incurring additional production costs while its HB2 bid cost did not reflect incurring an adder cost
- *Gen 1’s revenues are increased using the Fuel Constrained Bidding design*
  - Under the current bidding construct, Gen 1’s was unable to perfectly predict where to reflect the adder in hourly bids. Its optimal strategy would be to reflect a \$10 adder in HB2 bids since it was scheduled to a MWh level incurring additional \$10/MWh costs, but it cannot predict these outcomes in advance
  - Fuel Constrained Bidding eliminates the need to guess when to reflect the adder in hourly bids. MWhs with an adder cost are scheduled only when needed by the optimization, looking across both hours
- *Total system production cost is reduced under the Fuel Constrained Bidding design as Gen 1 and Gen 2 are scheduled more efficiently*
- *Load payments and LBMPs remain the same in both scenarios in this example, but reductions in actual production costs should benefit loads in the long run*

# Ex 1) Market Efficiency Example 1 Details

## Adder in Select Hourly Bids (current bid construct)

- Gen 1 (300 MW UOL) incurs a fuel constraint where any MWh scheduled above 300MWh over a two hour timeframe incurs a \$10 opportunity cost. Assume no Min Gen or Start up costs.
- Today, Gen 1 must guess in which hours it should reflect an opportunity cost adder based on when and at what levels it anticipates to be dispatched over the timeframe
- Suppose Gen 1 guesses that load and LBMPs in HB2 will be higher. To be indifferent between being scheduled in HB1 versus HB2, Gen 1 places a \$10 opportunity cost adder in each of its HB1 hourly IE bids

### Offer curves

Name	Hour	MW1	\$/MWh1	MW2	\$/MWh2	MW3	\$/MWh3	MW4	\$/MWh4
GEN1	1	100	\$ 15	200	\$ 25	250	\$ 50	300	\$ 60
GEN1	2	100	\$ 5	200	\$ 15	250	\$ 40	300	\$ 50
GEN2	1	100	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65
GEN2	2	100	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65

### Load

Hour 1	Hour 2
500	650

### LBMPs

HB1	HB2
\$ 30.00	\$ 45.00

### Schedules

Name	HB1	HB2	Total
GEN1	200	250	450
GEN2	300	400	700

### Gen Payment

Name	HB1	HB2	Total
GEN1	\$ 6,000	\$ 11,250	\$ 17,250
GEN2	\$ 9,000	\$ 18,000	\$ 27,000

### Actual Production Cost (not bid production cost)

Name	HB1	HB2	Adder Cost	Total
GEN1	\$ 2,000	\$ 4,000	\$ 1,500	\$ 7,500
GEN2	\$ 7,000	\$ 10,750		\$ 17,750

### Net Revenues

Name	HB1	HB2	Adder Cost	Total
GEN1	\$ 4,000	\$ 7,250	\$ (1,500)	\$ 9,750
GEN2	\$ 2,000	\$ 7,250		\$ 9,250

### Load Payment

HB1	HB2
\$ 15,000	\$ 29,250

# Ex 1) Market Efficiency Example 1 Details

## Adder in Energy Constraint (Fuel Constrained Bidding)

- Instead of adding a \$10 adder to select IE offers, the adder is reflected in a Total Energy Curve where any MWh scheduled greater than 300MWh over these two hours incurs a \$10 adder
- Gen 1 no longer has to guess which hours are optimal to reflect the \$10 adder

### Offer curves

Name	Hour	MW1	\$/MWh1	MW2	\$/MWh2	MW3	\$/MWh3	MW4	\$/MWh4
GEN1	1	100	\$ 5	200	\$ 15	250	\$ 40	300	\$ 50
GEN1	2	100	\$ 5	200	\$ 15	250	\$ 40	300	\$ 50
GEN2	1	100	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65
GEN2	2	100	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65

### Gen 1 Total Energy Curve

	MW1	\$/MWh1	MW2	\$/MWh2
GEN1	300	\$ -	600	\$ 10.00

### Load

Hour 1	Hour 2
500	650

### LBMPs

HB1	HB2
\$ 30.00	\$ 45.00

### Schedules

Name	HB1	HB2	Total
GEN1	200	200	400
GEN2	300	450	750

### Actual Production Cost

Name	HB1	HB2	Constraint Cost	Total
GEN1	\$ 2,000	\$ 2,000	\$ 1,000	\$ 5,000
GEN2	\$ 7,000	\$ 13,000		\$ 20,000

### Load Payment

HB1	HB2
\$ 15,000	\$ 29,250

### Gen Payment

Name	HB1	HB2	Total
GEN1	\$ 6,000	\$ 9,000	\$ 15,000
GEN2	\$ 9,000	\$ 20,250	\$ 29,250

### Net Revenues

Name	HB1	HB2	Constraint Cost	Total
GEN1	\$ 4,000	\$ 7,000	\$ (1,000)	\$ 10,000
GEN2	\$ 2,000	\$ 7,250		\$ 9,250

## Ex 2) Market Efficiency Example 2

### Adder in All Hourly Bids v. Adder in Energy Constraint

- ♦ This example demonstrates how market efficiency can be improved through a generator’s reflection of opportunity cost adders in a Total Energy Curve rather than guessing and placing adders in all hourly bids under the current bidding construct (Note that the load and bids are different than in Example 1):
  - *Outcomes are summarized below; Bids, schedules, production costs, and revenues used in this example are detailed in the following two slides*

Gen 1 Strategy	Gen 1 Actual Production Cost	Total System Production Cost	Gen 1 Net Revenue
Adder placed in all hourly bids (current bid construct)	\$ 2,000	\$ 5,900	\$ 4,000
Adder in Total Energy Curve (Fuel Constrained Bidding)	\$ 2,500	\$ 5,400	\$ 4,500

- *Gen 1’s actual production costs increase due to an increased schedule using the Fuel Constrained Bidding design, but an increased schedule results in increased net revenue*
  - Gen 1 does not incur adder costs in this example with either strategy, but by reflecting adder costs more optimally using Fuel Constrained Bidding, the optimization can access Gen 1’s less expensive MWhs in HB1, increasing its inframarginal revenue
- *Gen 1’s revenues are increased using the Fuel Constrained Bidding design*
  - Under the current bidding construct, Gen 1’s was unable to perfectly predict where to reflect the adder in hourly bids. The optimization could have used its MWhs without an adder in HB1, but was unable to access these MWhs due to the inflated bid costs
  - Fuel Constrained Bidding eliminates the need to guess where to reflect the adder in hourly bids, and Gen 1 was able to collect additional inframarginal revenues by being scheduled in HB1
- *Total system production cost is reduced under the Fuel Constrained Bidding design as generation is scheduled more optimally*
- *Load payments and LBMPs remain the same in both scenarios in this example, but reductions in actual production costs should benefit loads in the long run*

# Ex 2) Market Efficiency Example 2 Details

## Adder in All Hourly Bids (current bid construct)

- Gen 1 (300 MW UOL) incurs a fuel constraint where any MWh scheduled above 300MWh over a two hour timeframe incurs a \$10 opportunity cost. Assume no Min Gen or Start up costs.
- Today, Gen 1 must guess in which hours it should reflect an opportunity cost adder based on when and at what levels it anticipates it can maximize revenues
- In this example, Gen 1 places the \$10 opportunity cost adder in all of its hourly IE bids

### Offer curves

Name	Hour	MW1	\$/MWh1	MW2	\$/MWh2	MW3	\$/MWh3	MW4	\$/MWh4
GEN1	1	100	\$ 15	200	\$ 25	250	\$ 50	300	\$ 60
GEN1	2	100	\$ 15	200	\$ 25	250	\$ 50	300	\$ 60
GEN2	1	180	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65
GEN2	2	180	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65

### Load

Hour 1	Hour 2
150	400

### LBMPs

HB1	HB2
\$ 10.00	\$ 30.00

### Schedules

Name	HB1	HB2	Total
GEN1	0	200	200
GEN2	150	200	350

### Gen Payment

Name	HB1	HB2	Total
GEN1	\$ -	\$ 6,000	\$ 6,000
GEN2	\$ 1,500	\$ 6,000	\$ 7,500

### Actual Production Cost (not bid production cost)

Name	HB1	HB2	Adder Cost	Total
GEN1	\$ -	\$ 2,000	\$ -	\$ 2,000
GEN2	\$ 1,500	\$ 2,400		\$ 3,900

### Net Revenues

Name	HB1	HB2	Adder Cost	Total
GEN1	\$ -	\$ 4,000	\$ -	\$ 4,000
GEN2	\$ -	\$ 3,600		\$ 3,600

### Load Payment

HB1	HB2
\$ 1,500	\$ 12,000

## Ex 2) Market Efficiency Example 2 Details

### Adder in Energy Constraint (Fuel Constrained Bidding)

- Instead of adding a \$10 adder to in all hourly IE offers, the adder is reflected in a Total Energy Curve where any MWh scheduled greater than 300MWh over these two hours incurs a \$10 adder
- Gen 1 no longer has to guess when it is optimal to reflect the \$10 adder

#### Offer curves

Name	Hour	MW1	\$/MWh1	MW2	\$/MWh2	MW3	\$/MWh3	MW4	\$/MWh4
GEN1	1	100	\$ 5	200	\$ 15	250	\$ 40	300	\$ 50
GEN1	2	100	\$ 5	200	\$ 15	250	\$ 40	300	\$ 50
GEN2	1	180	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65
GEN2	2	180	\$ 10	350	\$ 30	500	\$ 45	600	\$ 65

#### Gen 1 Total Energy Curve

	MW1	\$/MWh1	MW2	\$/MWh2
GEN1	300	\$ -	600	\$ 10.00

#### Load

Hour 1	Hour 2
150	400

#### LBMPs

HB1	HB2
\$ 10.00	\$ 30.00

#### Schedules

Name	HB1	HB2	Total
GEN1	100	200	300
GEN2	50	200	250

#### Gen Payment

Name	HB1	HB2	Total
GEN1	\$ 1,000	\$ 6,000	\$ 7,000
GEN2	\$ 500	\$ 6,000	\$ 6,500

#### Actual Production Cost

Name	HB1	HB2	Constraint Cost	Total
GEN1	\$ 500	\$ 2,000	\$ -	\$ 2,500
GEN2	\$ 500	\$ 2,400		\$ 2,900

#### Net Revenues

Name	HB1	HB2	Constraint Cost	Total
GEN1	\$ 500	\$ 4,000	\$ -	\$ 4,500
GEN2	\$ -	\$ 3,600		\$ 3,600

#### Load Payment

HB1	HB2
\$ 1,500	\$ 12,000

# **APPENDIX B: Price Formation Numerical Examples**

**Note: Examples are based on the Total Energy Curve design**

# Ex 1) Price Formation Scenario 1

- ♦ This example illustrates that hourly LBMPs will continue to reflect the cost of the next most economic MWh, even when a resource incurs an adder cost:
  - *Generator 1 (300 MW UOL) incurs a fuel constraint – the resource has enough fuel to run up to 300 MWh at a base fuel cost, but will incur a \$5/MWh adder to procure fuel to run above 300MWh over the two hour period*
  - *Generator 1 submits a total energy curve reflecting a \$5/MWh adder for any scheduled MWh exceeding 300MWh*
  - *Schedules materialize such that Gen 1 incurs the fuel adder*
  - *In HB1, LBMP is set by Gen 1 with the adder cost reflected. In HB2, LBMP is set by Gen 2 where the next economic MWh from Gen 2 is \$50. The cost of the next MWh from Gen 1 in HB2 is \$55, so the LBMP in HB2 is set by the more economic resource, Gen 2*
  - *Note that in HB2, Gen 1’s IE bid at schedule is \$30. Even with a \$5/MWh adder cost associated, Gen 1’s HB2 schedule is economic. The next MWh from Gen 1 would cost \$55.*

## Offer curves

Name	Hour	MW1	\$/MWh1	MW2	\$/MWh2	MW3	\$/MWh3	MW4	\$/MWh4
GEN1	1	50	\$ 20	100	\$ 25	200	\$ 30	300	\$ 50
GEN1	2	50	\$ 20	100	\$ 25	200	\$ 30	300	\$ 50
GEN2	1	100	\$ 60	300	\$ 65	500	\$ 70	4000	\$ 100
GEN2	2	100	\$ 45	300	\$ 50	500	\$ 70	4000	\$ 100

## Gen 1 Total Energy Curve

	MW1	\$/MWh1	MW2	\$/MWh2
GEN1	300	\$ -	600	\$ 5.00

## Load

Hour 1	Hour 2
250	350

## LBMPs

HB1	HB2
\$ 55.00	\$ 50.00

## Schedules

Name	HB1	HB2	Total
GEN1	250	200	450
GEN2	0	150	150

## Ex 2) Price Formation Scenario 2

- ♦ This example illustrates that hourly LBMPs will continue to reflect the cost of the next most economic MWh, and it is possible for a resource incurring an adder cost to be marginal in multiple hours:
  - *Bid discrepancies from Price Formation Example 1 are highlighted in yellow*
  - *Gen 1, even with the fuel adder, can provide the next economic MWh in both hours and LBMP in each hour remains reflective of the next economic MWh*
  - *These LBMP patterns arise today with the current bid structure, where a generator may be the marginal resource at the same cost over multiple consecutive hours even with varying load*

### Offer curves

Name	Hour	MW1	\$/MWh1	MW2	\$/MWh2	MW3	\$/MWh3	MW4	\$/MWh4
GEN1	1	50	\$ 20	100	\$ 25	200	\$ 30	300	\$ 50
GEN1	2	50	\$ 20	100	\$ 25	200	\$ 30	300	\$ 50
GEN2	1	100	\$ 60	300	\$ 65	500	\$ 70	4000	\$ 100
GEN2	2	100	\$ 50	300	\$ 65	500	\$ 70	4000	\$ 100

### Gen 1 Total Energy Curve

	MW1	\$/MWh1	MW2	\$/MWh2
GEN1	300	\$ -	600	\$ 5.00

### Load

Hour 1	Hour 2
250	350

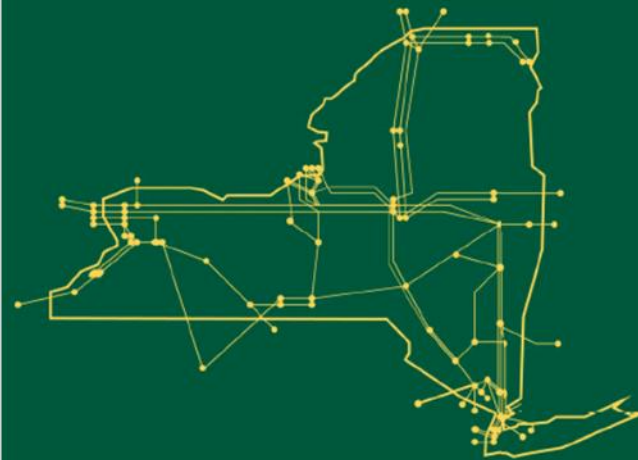
### LBMPs

HB1	HB2
\$ 55.00	\$ 55.00

### Schedules

Name	HB1	HB2	Total
GEN1	250	250	500
GEN2	0	100	100

The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



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