

Locational Based Marginal Pricing

Mathangi Srinivasan

Senior Market Trainer, Market Training, NYISO

Market Overview Course

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Locational Based Marginal Pricing

- Attendees will be able to
 - Explain the Basics Behind LBMP
 - Complete Simple LBMP Examples
 - Identify the Impacts of Congestion

LBMP – The Basics

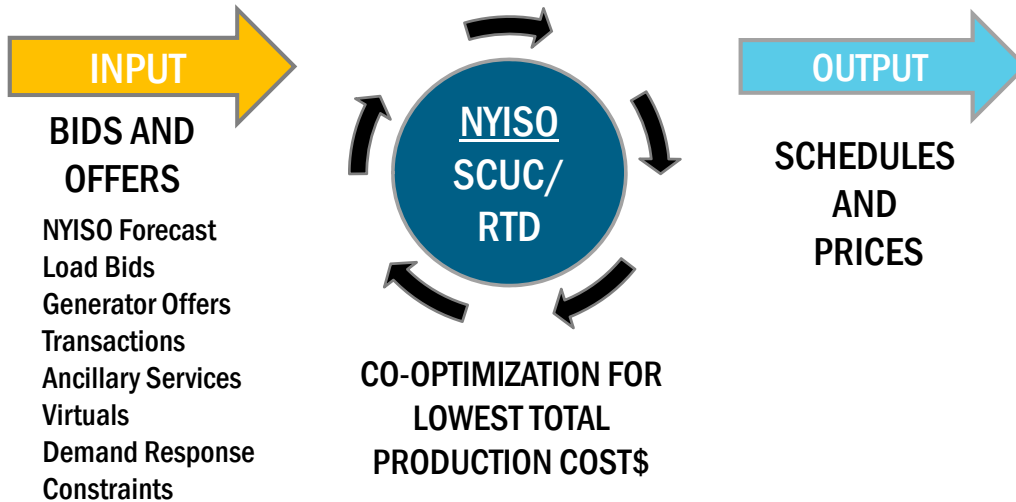
- LBMP is

Cost to provide the Next MW of Load at a Specific Location in the grid

LBMP – The Basics

- LBMP is established for the Day Ahead Market and the Real Time Market
 - Day Ahead Market
 - Security Constrained Unit Commitment (SCUC)
 - Hourly Prices
 - Real Time Market
 - Real Time Dispatch (RTD)
 - 5 Minute Interval Prices

LBMP: Co-Optimized Based on Bids and Offers



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LBMP – The Basics



- LBMP is made up of three components:
 - Marginal Energy Price
 - Basic Component of LBMP, calculated at Marcy
 - Marginal Loss Price
 - Captures Losses along path to Load
 - Transmission Losses
 - Marginal Congestion Price
 - Costlier units Dispatched to avoid exceeding Transmission Limits

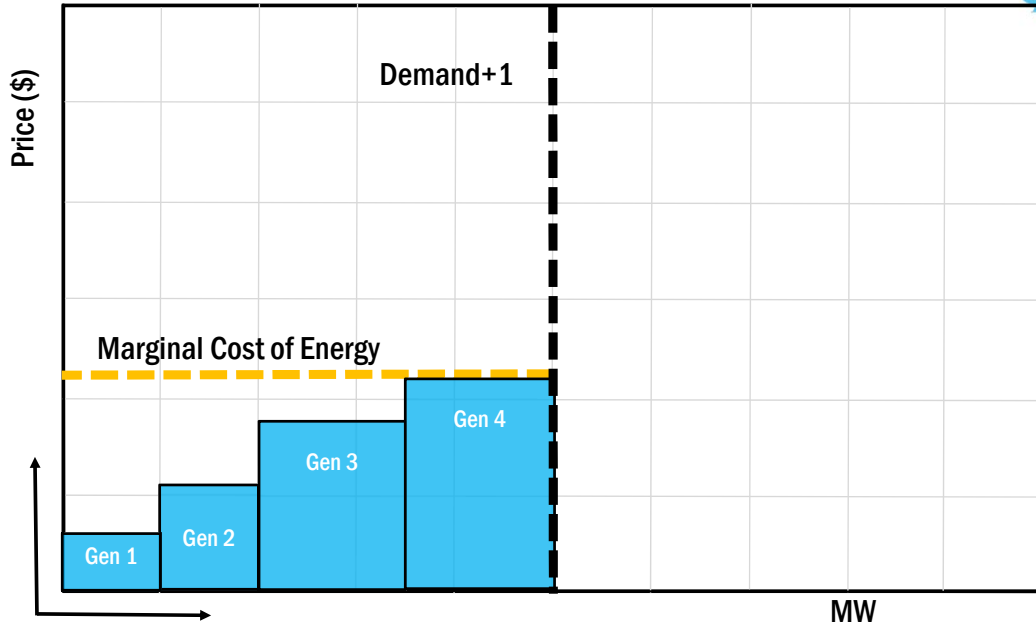
$$\text{LBMP} = \text{Energy} + \text{Loss} - \text{Congestion}$$

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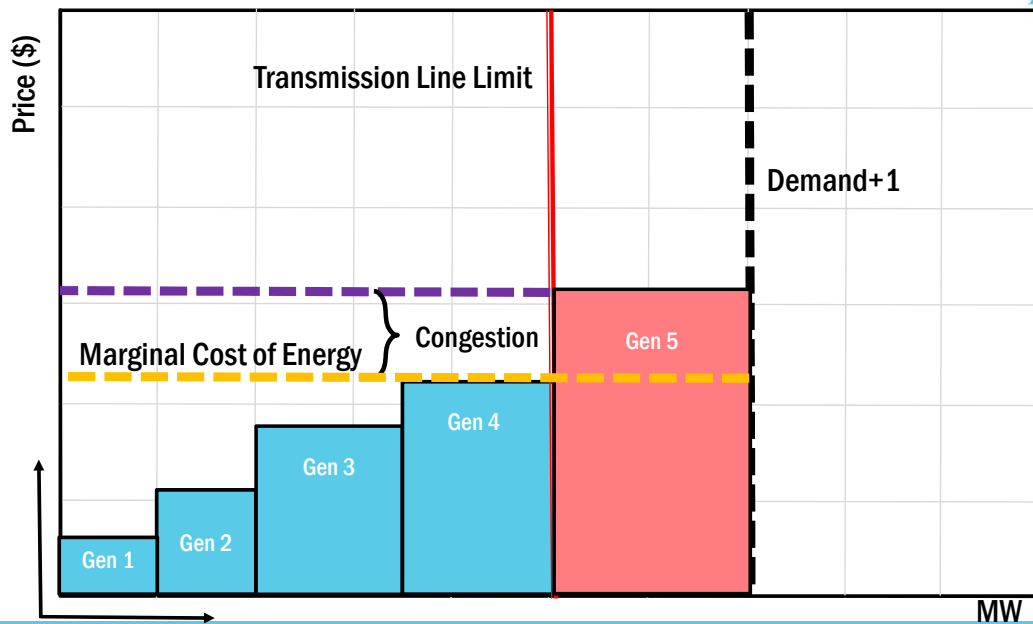
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Determining the Marginal Energy Price

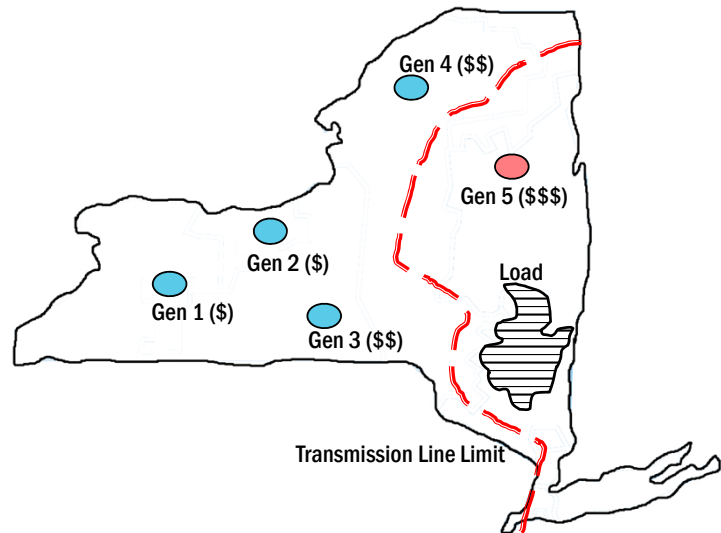


Determining the Marginal Congestion Price



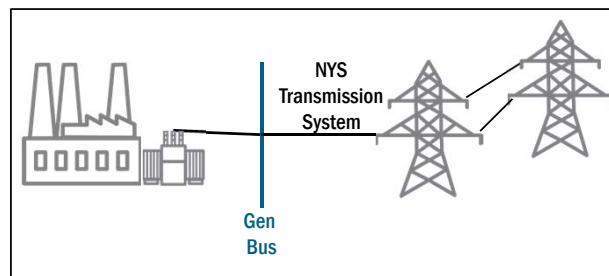
LBMP - Congestion

- Marginal Congestion Price Component
 - Difference between 2 marginal prices creates congestion component



Generators – Gen Bus LBMP

- LBMP for Generators
 - Based on Generator Bus
 - LBMP calculated at Bus where Generator injects power

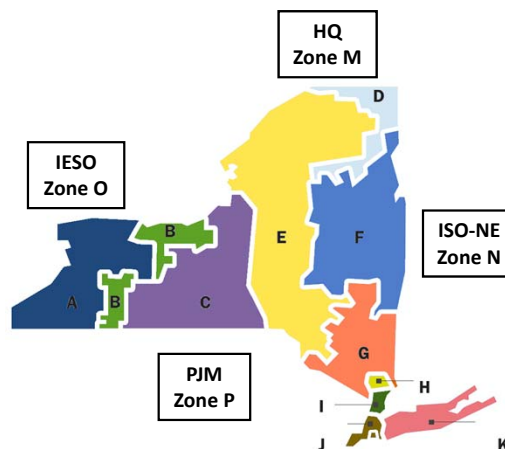


Load Serving Entity – Zonal LBMP



- LBMP for Load
 - Based on Zone where Load is Located
 - One Zonal LBMP for entire Zone
 - Load Weighted Average

NYCA Load Zones		
A- West	E- Mohawk Valley	I- Dunwoodie
B- Genesee	F- Capital	J- NYC
C- Central	G- Hudson Valley	K- Long Island
D- North	H- Millwood	

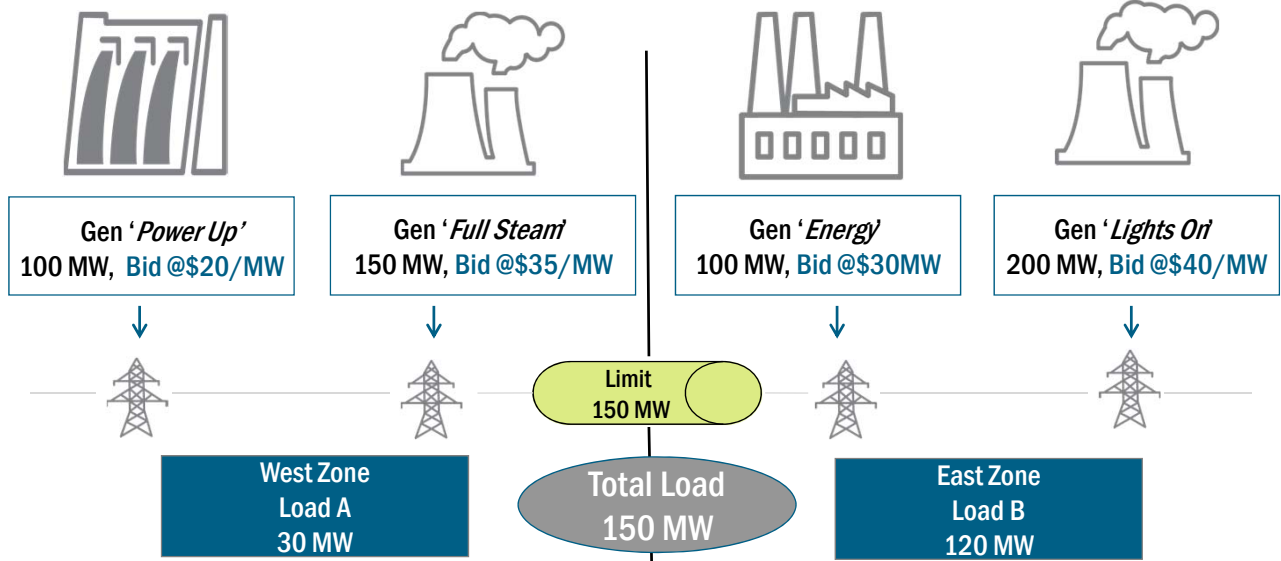


Example 1: Energy Only No Losses and No Congestion

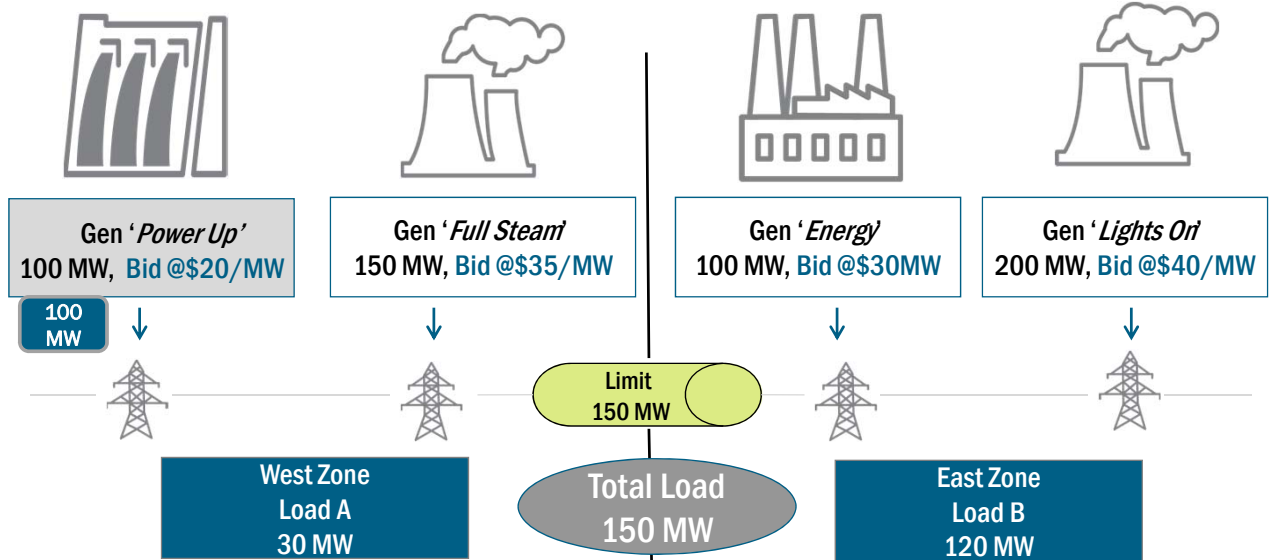


Total Load = 150 MW

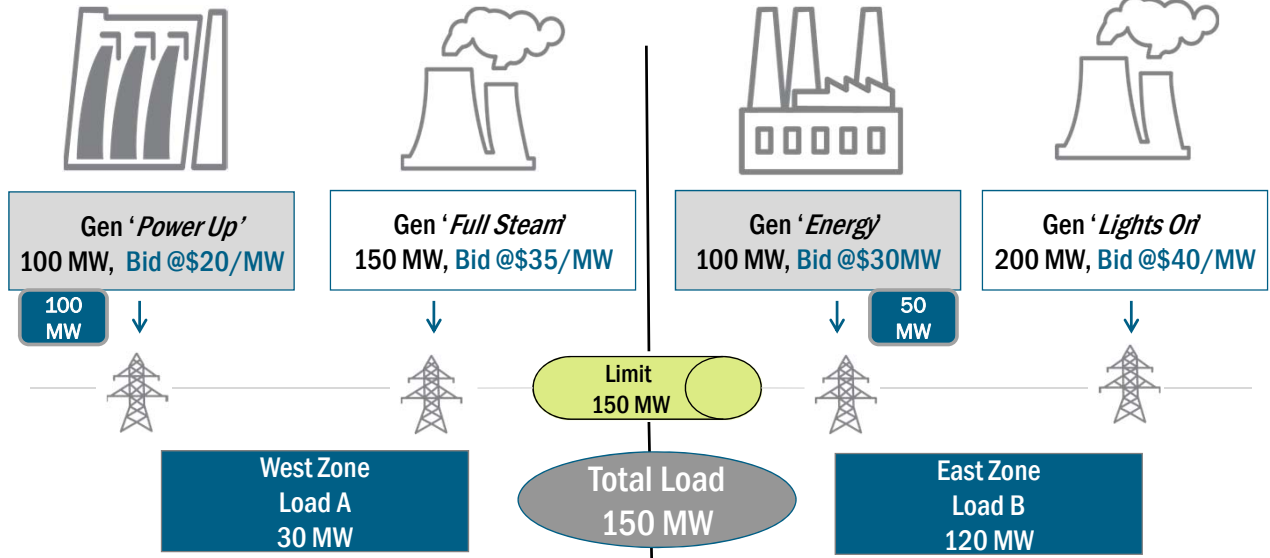
Example 1: Energy Only



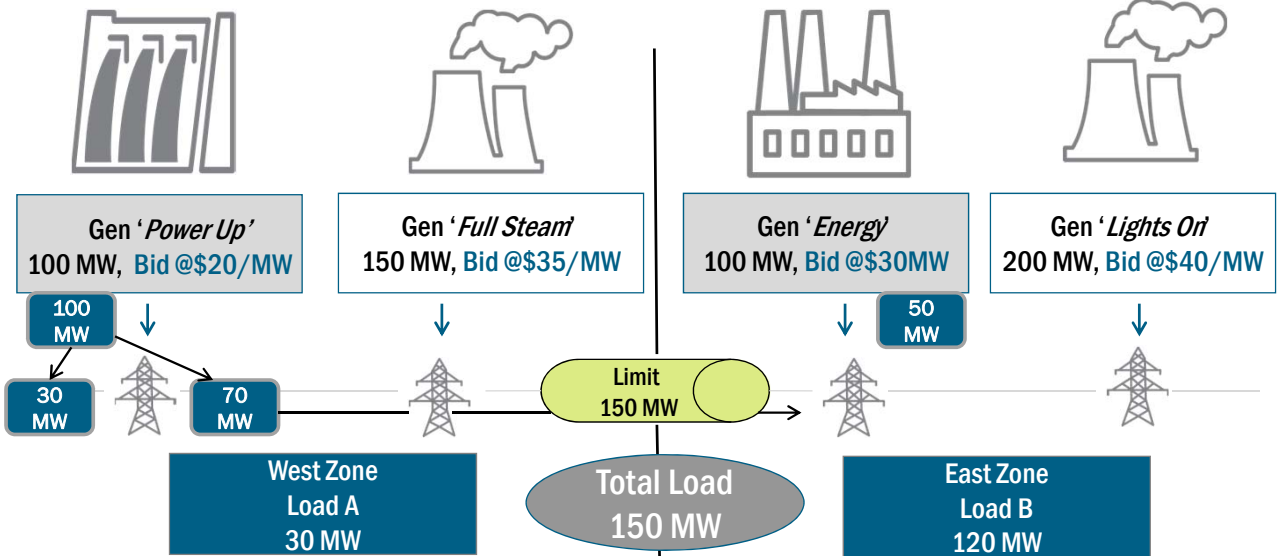
Example 1: Energy Only



Example 1: Energy Only



Example 1: Energy Only



Example 1: Energy Only - Results



Gen 'Power Up'
100 MW, Bid @\$20/MW



Gen 'Full Steam'
150 MW, Bid @\$35/MW



Gen 'Energy'
100 MW, Bid @\$30/MW



Gen 'Lights On'
200 MW, Bid @\$40/MW

Energy Loss \$30.00
Congestion \$0.00
LBMP -\$30.00

West Zone
Load A
30 MW

West Zone LBMP \$30.00

Limit 150 MW
Total Load 150 MW

Energy Loss \$30.00
Congestion -\$0.00
LBMP -\$30.00

East Zone
Load B
120 MW

East Zone LBMP \$30.00

Example 1: Energy Only - Results



Gen 'Power Up', 100 MW
Bid \$20, Paid \$30



Gen 'Full Steam', 150 MW
Bid \$35, Paid \$0



Gen 'Energy', 100 MW
Bid \$30, Paid \$30



Gen 'Lights On', 200 MW
Bid \$40, Paid \$0

West Zone

East Zone

Generators receive \$30/MW (LBMP)

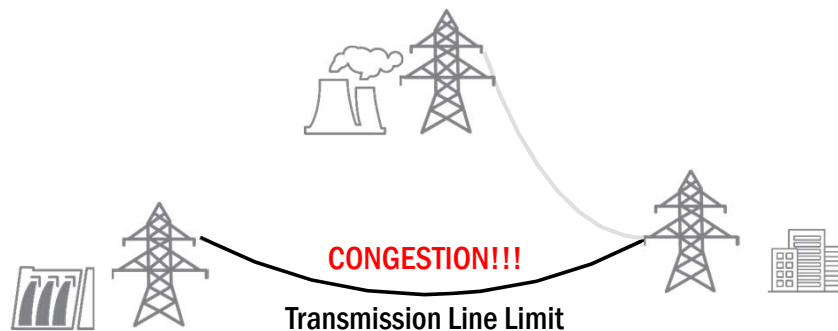
Example 1: Energy Only - Results

Loads Charged \$30/MW (LBMP)



Congestion

Congestion occurs when the Power flow reaches the Transmission Limit



Congestion

- To maintain efficient and reliable Transmission system
 - Transmission limits cannot be exceeded
 - When Transmission limits reached, generators from different buses are dispatched to meet load
- When there is congestion, LBMPs can differ between buses

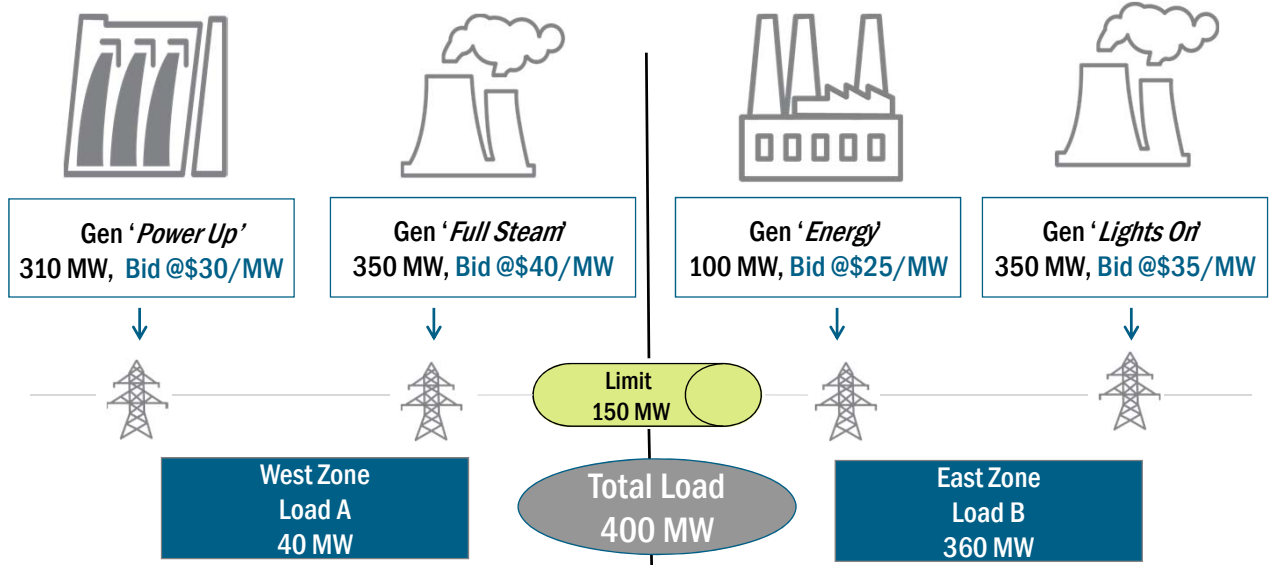
Example 2: Energy and Congestion

No Losses

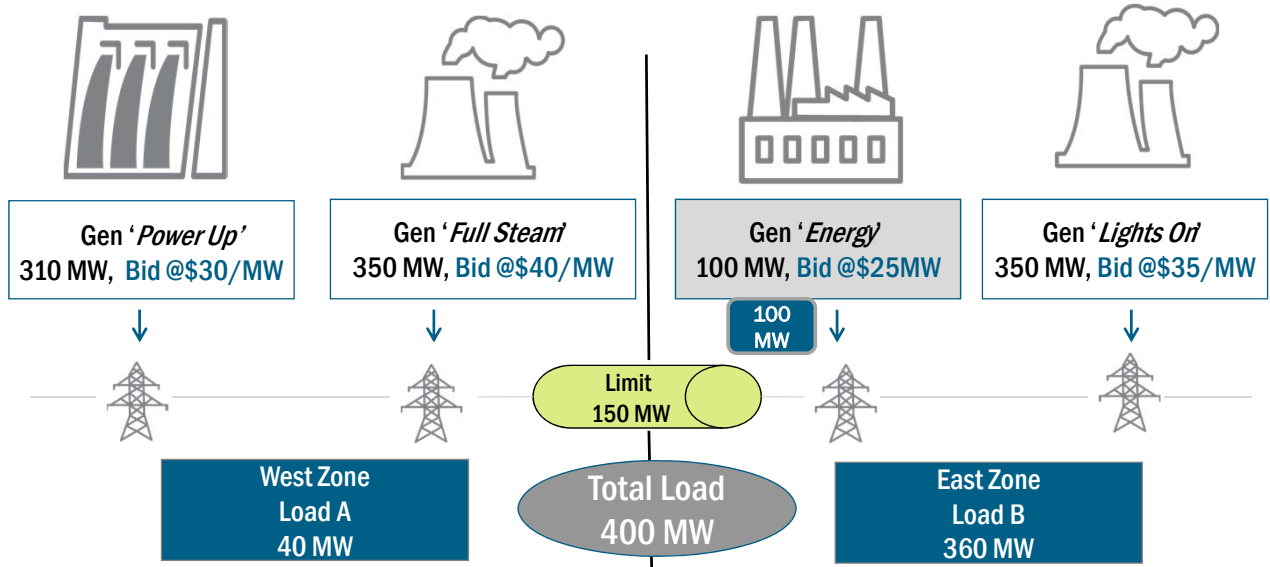


Total Load
400 MW

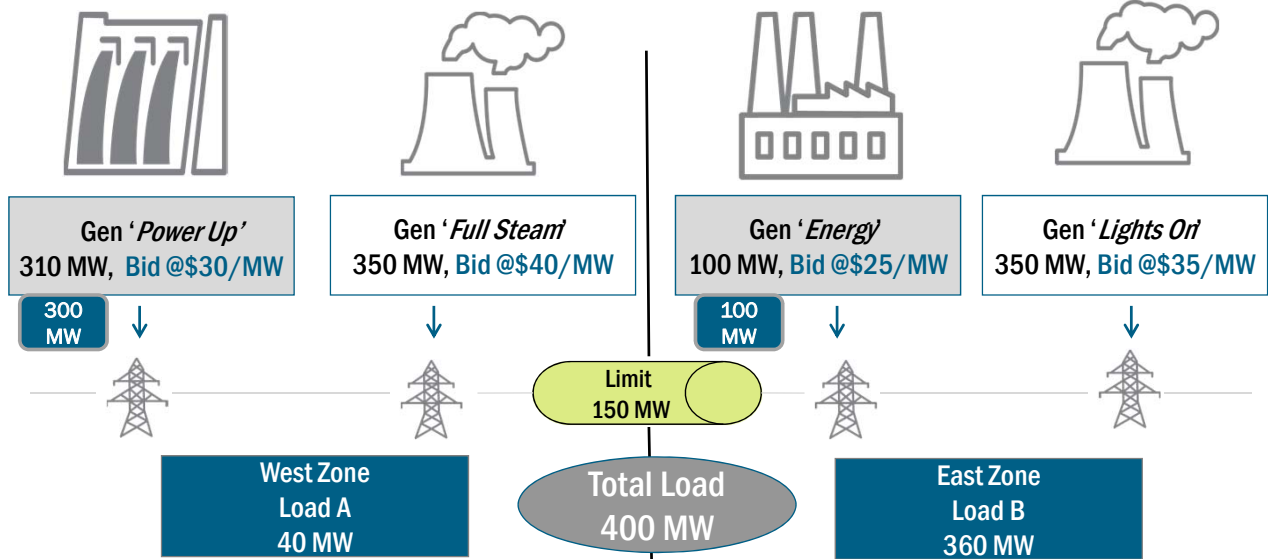
Example 2: Energy and Congestion



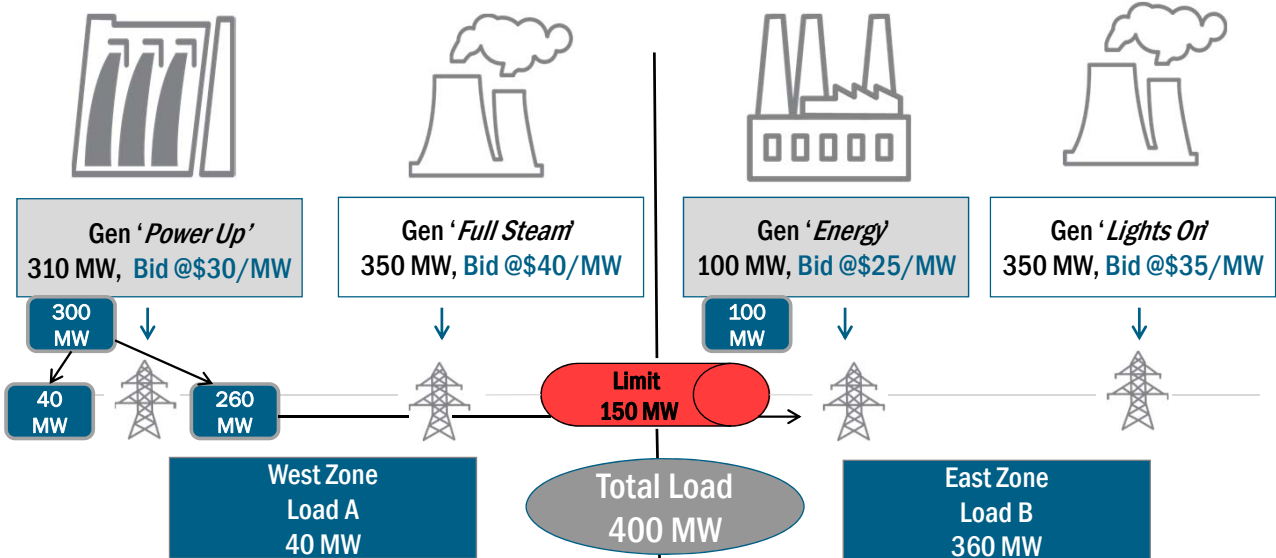
Example 2: Energy and Congestion



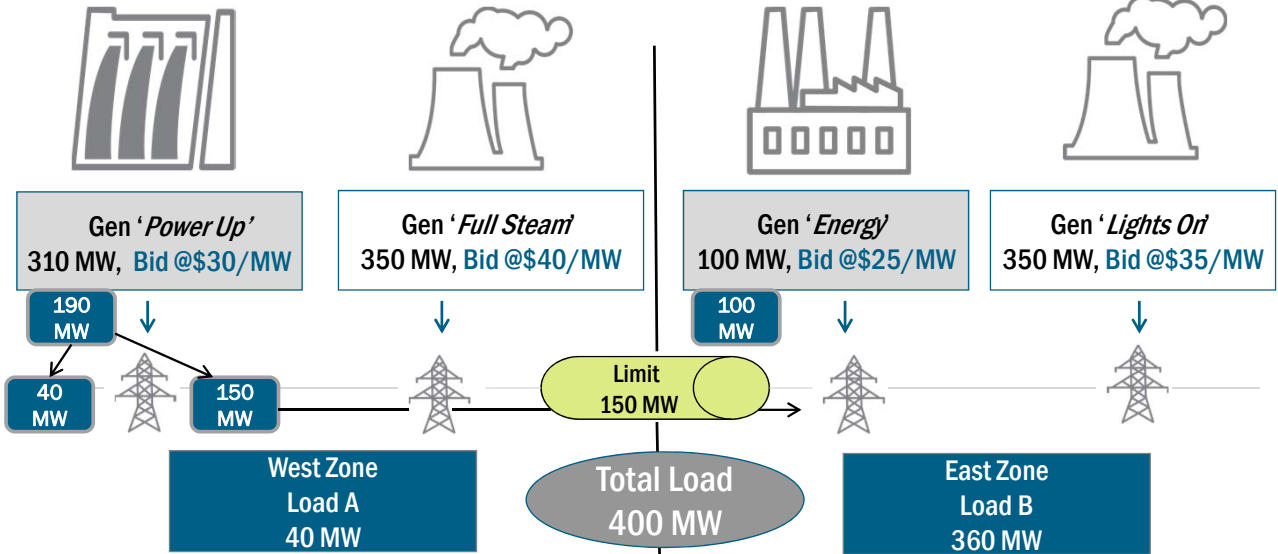
Example 2: Energy and Congestion



Example 2: Energy and Congestion



Example 2: Energy and Congestion

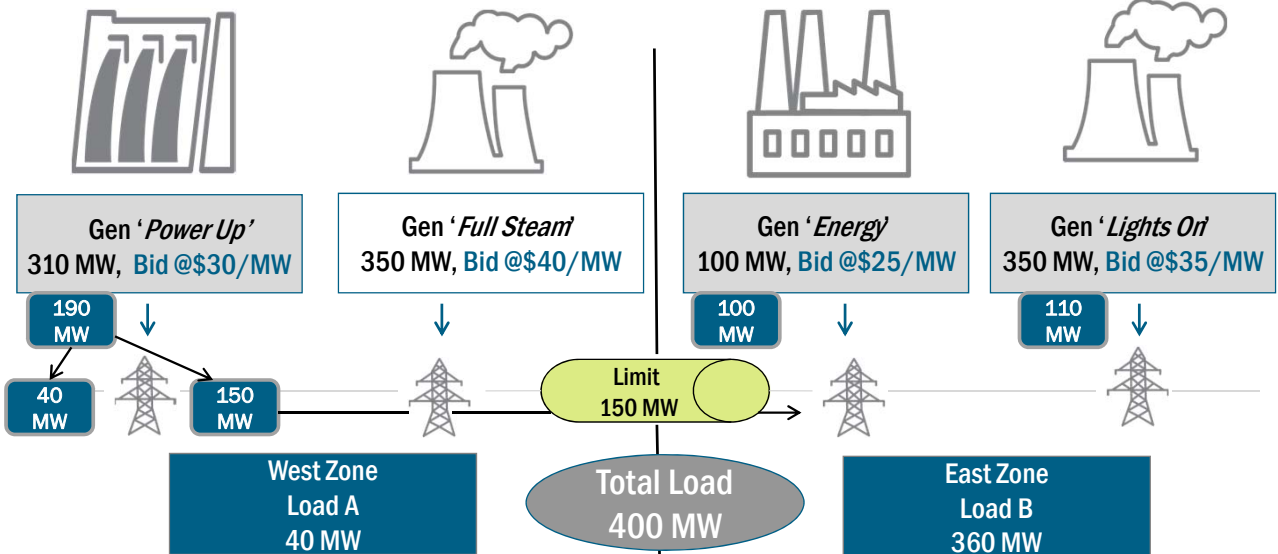


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Example 2: Energy and Congestion

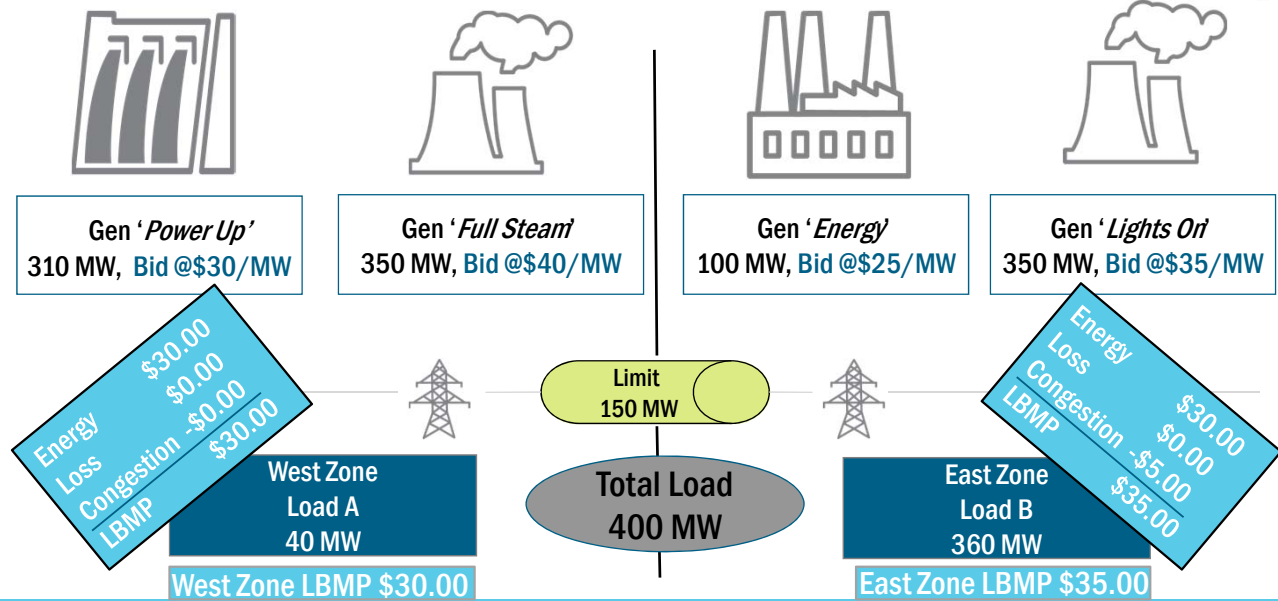


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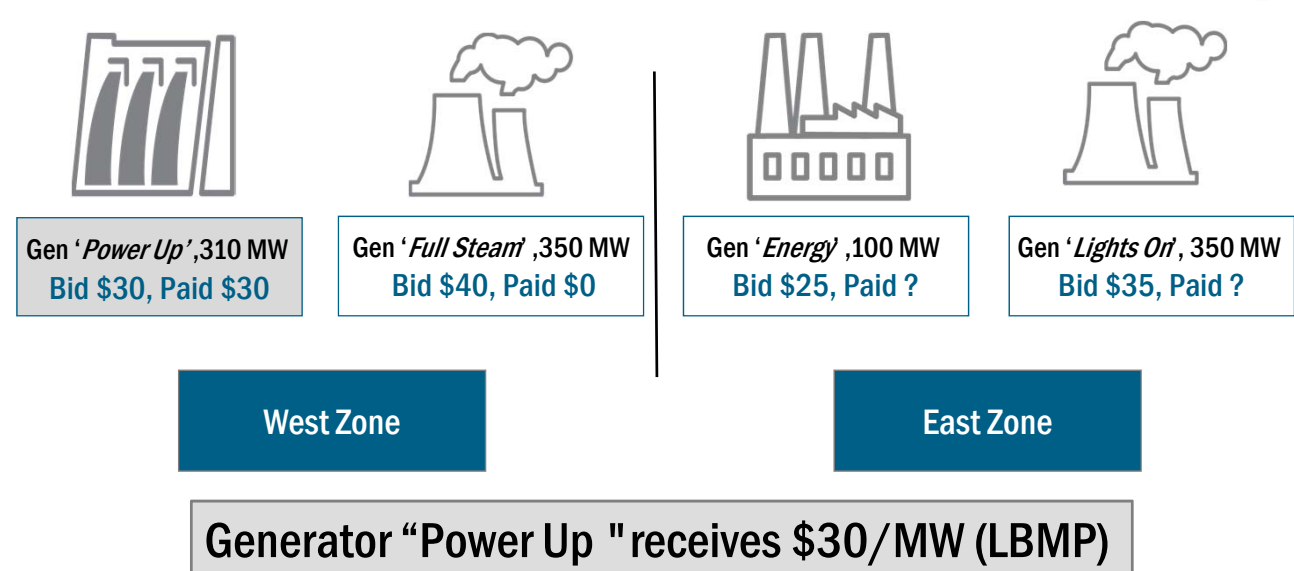
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Example 2: Energy and Congestion - Results



Example 2: Energy and Congestion - Results



Example 2: Energy and Congestion - Results



Gen 'Power Up', 310 MW
Bid \$30, Paid \$30



Gen 'Full Steam', 350 MW
Bid \$40, Paid \$0



Gen 'Energy', 100 MW
Bid \$25, Paid \$35



Gen 'Lights On', 350 MW
Bid \$35, Paid \$35

West Zone

East Zone

Generators, East of the interface receive \$35/MW (LBMP)

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Example 2: Energy and Congestion - Results

Loads in West Zone
Charged \$30/MW (LBMP)



West Zone
Load A
40 MW

Loads in East Zone
Charged \$35/MW (LBMP)



East Zone
Load B
360 MW

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Let's Review



LBMP is the cost to provide the?

- a) Exact MW of Load at a specific location in grid
- b) Next MW of Load at a specific location in grid

LBMP is established through?

- a) Economic Dispatch process
- b) Random Generation Selection

LBMP is comprised of?

- a) One Single Price Component
- b) Three Separate Price Components

Let's Review



LBMP for Load is?

- a) Established at each LSE's location
- b) Established at a Zonal level

LBMP for a Generator is?

- a) Established at a Zonal level
- b) Established at the Generator Bus

Additional Resources

- **Tariffs - OATT & MST**
- **Day Ahead Scheduling Manual**
- **Transmission and Dispatching Operations Manual**
- **Market Participant User's Guide**
- **Technical Bulletins**

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