

# **Congestion Accounting in a Multi-Settlement Market**

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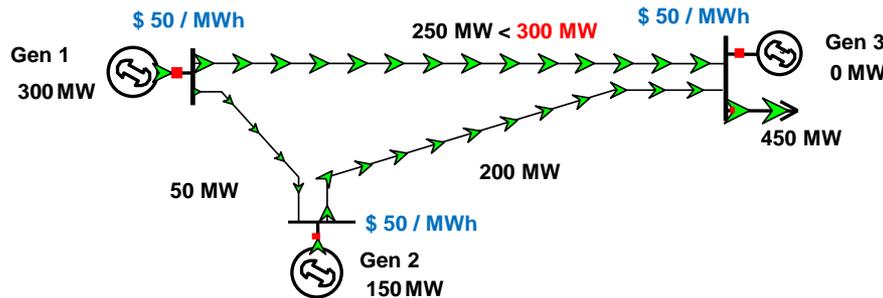
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# Day-Ahead + Balancing Congestion ≠ Real-Time Congestion

## DAY-AHEAD

No Constraint is binding



## Day-Ahead Settlement

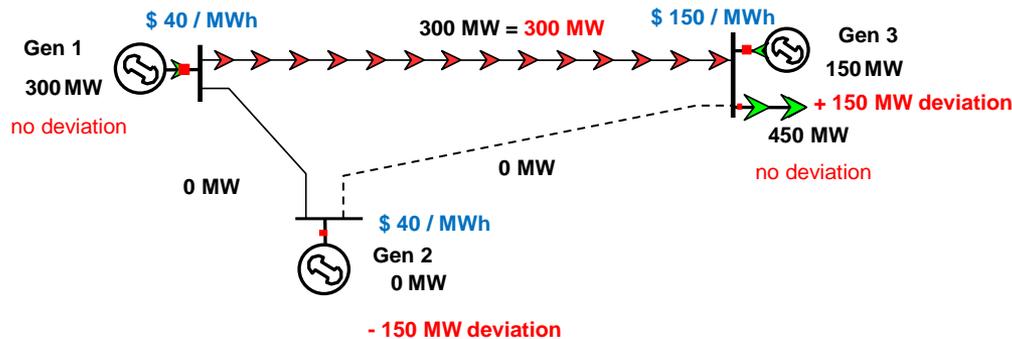
<b>Payment</b>	Demand	\$	22,500
<b>Credit</b>	Gen 1	\$	15,000
	Gen 2	\$	7,500
	Gen 3	\$	-

## Balancing Market Settlement

<b>Payment</b>	Demand	\$	-
<b>Credit</b>	Gen 1	\$	-
	Gen 2	\$	(6,000)
	Gen 3	\$	22,500

## REAL-TIME

Line is forced out and causes real-time congestion addressed by generation redispatch



## Two-Settlement Market

Day-Ahead Congestion = 0

Balancing Congestion = -\$16,500

## Single Settlement Market

Real-Time Congestion = \$33,000

## Single Real-Time Settlement

<b>Payment</b>	Demand	\$	67,500
<b>Credit</b>	Gen 1	\$	12,000
	Gen 2	\$	-
	Gen 3	\$	22,500

# Discussion

- The three node network shows a day-ahead market with no congestion and uniform LMPs at all three nodes (losses are ignored for simplicity)
  - Gen 1 has 300 MW capacity at zero cost, Gen 2 has 200 MW capacity with first 100 MW at 40\$/MWh and next 100 MW at 50 \$/MWh, Gen 3 has 200 MW at 150\$/MWh
- In real-time, a transmission line outage between Gen 2 and Gen 3 results in congestion on transmission line between Gen 1 and Gen 3 requiring generation redispatch
  - the output of an expensive generator (Gen 3) is increased and the output of a less expensive generator (Gen 2) is decreased (these are the only two deviations from the day-ahead schedules)
  - LMPs are no longer the same reflecting congestion
  - Balancing congestion is -\$16,500
  - **Total congestion = Day-Ahead Congestion + Balancing Congestion = -\$16,500**
- Now imagine the same real-time conditions in a single settlement market where real-time LMPs apply to entire generation and load (as opposed to just deviations)
  - **Real-time congestion = \$33,000**

# Conclusion

- Negative balancing congestion does not necessarily imply a reduction in congestion
- A total congestion metric that uses the sum of day-ahead and balancing congestion may understate the actual congestion in the system

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