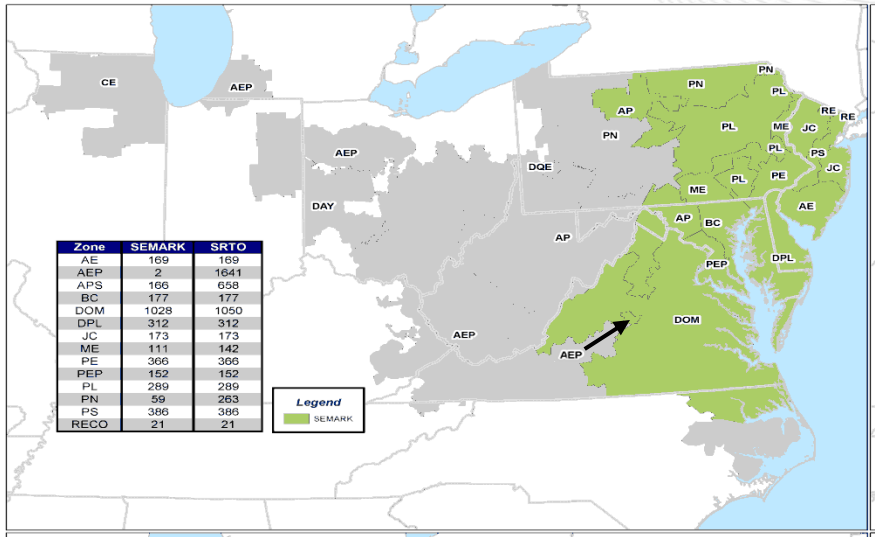
Evolution of Scarcity Pricing In the PJM Market

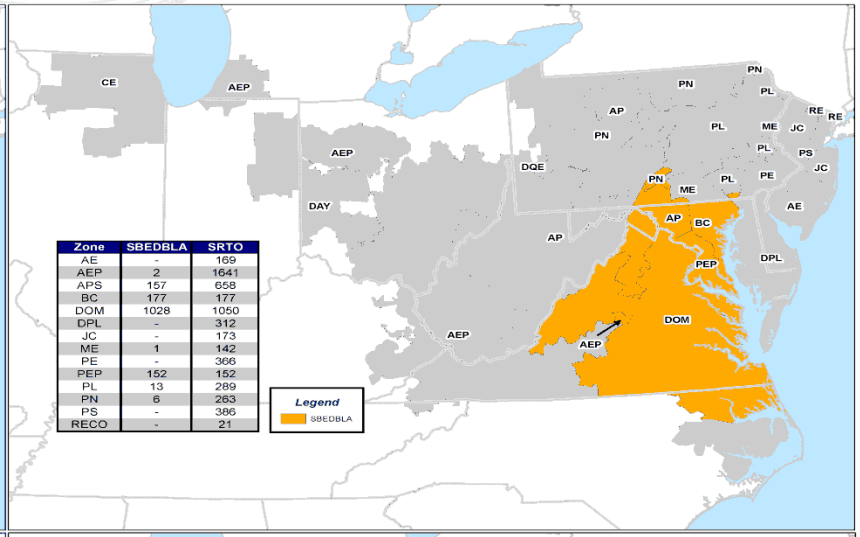
Andrew Ott
Sr. Vice President, Markets, PJM
Harvard Electricity Policy Group Meeting
March 13, 2009
La Jolla, CA

- PJM market rules currently include a limited form of scarcity pricing
- Scarcity pricing may be implemented in PJM only for specific regions of the RTO footprint
- Scarcity pricing regions are regions of the PJM market that have the potential to be transmission import or transfer limited due to an EHV (500 kV or greater) constraint.

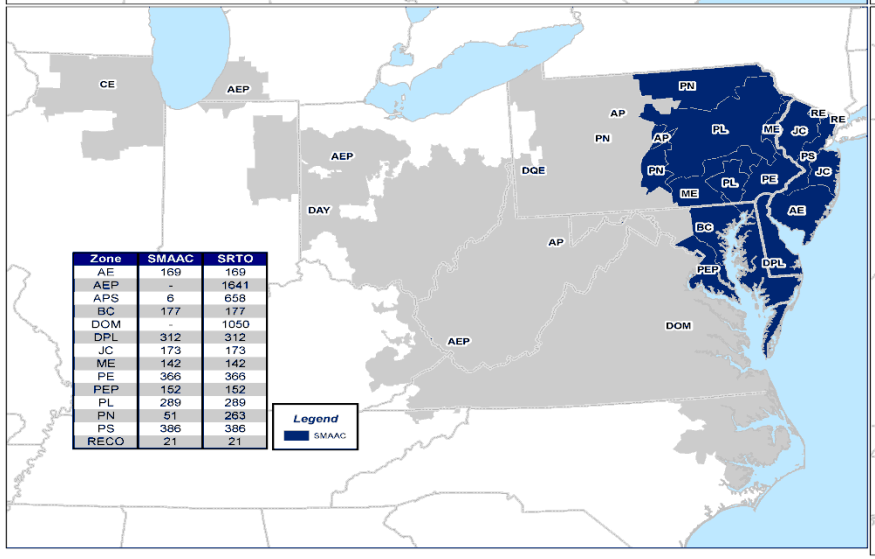
PJM Scarcity Pricing Regions



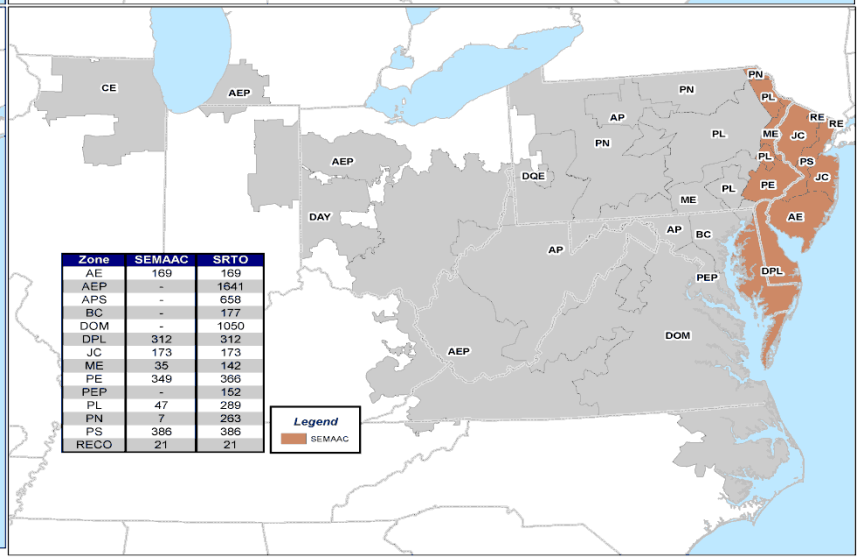
Zone	SEMARK	SRTO
AE	169	169
AEP	2	1641
APS	166	658
BC	177	177
DOM	1028	1050
DPL	312	312
JC	173	173
ME	111	142
PE	366	366
PEP	152	152
PL	289	289
PN	59	263
PS	386	386
RECO	21	21



Zone	SBEDBLA	SRTO
AE	-	169
AEP	2	1641
APS	157	658
BC	177	177
DOM	1028	1050
DPL	-	312
JC	-	173
ME	1	142
PE	-	366
PEP	152	152
PL	13	289
PN	6	263
PS	-	386
RECO	-	21



Zone	SMAAC	SRTO
AE	169	169
AEP	-	1641
APS	6	658
BC	177	177
DOM	-	1050
DPL	312	312
JC	173	173
ME	142	142
PE	366	366
PEP	152	152
PL	289	289
PN	51	263
PS	386	386
RECO	21	21



Zone	SEMAAC	SRTO
AE	169	169
AEP	-	1641
APS	-	658
BC	-	177
DOM	-	1050
DPL	312	312
JC	173	173
ME	35	142
PE	349	366
PEP	-	152
PL	47	289
PN	7	263
PS	386	386
RECO	21	21

Scarcity Pricing Triggers

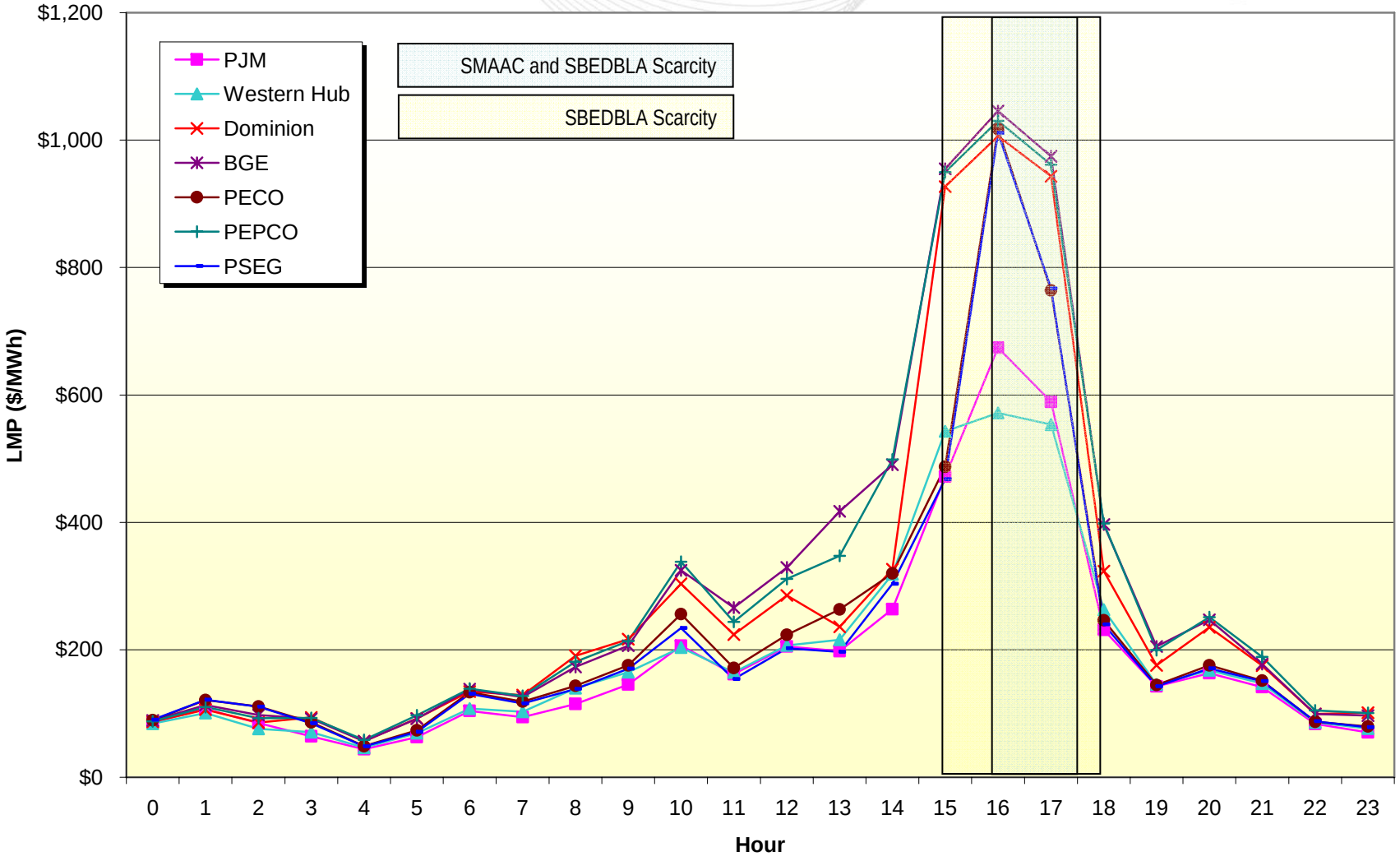
The following dispatch actions initiate a scarcity pricing event:

- Begin to dispatch on-line generators which are partially designated as Maximum Emergency (MaxE) into emergency output levels.
- Begin to dispatch on-line generators which are designated entirely as MaxE, above their designated minimum load points .
- Begin to dispatch any offline generators that are designated entirely as MaxE and that have start times less than or equal to 30 minutes.
- Voltage reduction
- Emergency energy purchases.
- Manual load dump

Scarcity Pricing – Energy Price Calculation

- The price in the entire Scarcity Pricing Region is set based on the highest market-based offer price operating under PJM direction to supply either energy or reserves.
- Offer caps for local market power mitigation are lifted in the Scarcity Pricing Region during a scarcity pricing event.
- System Operators may direct generating units in the Scarcity Pricing Region to reduce from their maximum output for system or local transmission control. These reductions will be treated as reductions for reliability (opportunity cost compensation).
- Generation in the Scarcity Pricing Region is subject to the overall offer cap $1000 per MWh.

Scarcity Pricing Event – August 8, 2007



Need for Scarcity Pricing Reform

- Scarcity is only triggered in real-time and only in the event of actual emergency procedures.
- Approach of shortage not signaled in advance.
- No opportunity for price response to resolve the operating reserve shortage.
- Result is substantial price volatility leading up to the event.
- Increase in prices may occur too late to allow resources, including demand, to respond efficiently.
- A more gradual increase in prices as scarcity approaches would be more efficient.

Principles for Scarcity Pricing

1. Price should equal the marginal willingness to pay, or allocate energy to those parties that value it most
2. Should not provide incentives to depart from offering supply at marginal cost or exercise market power
3. Emergency actions should not paradoxically lead to lower prices even for a short period of time
4. Prices and actions should provide system control during scarcity events.

- These principles lead to the conclusion that an operating reserve demand curve is necessary in concept, but the implementation details remain to be discussed

Operating Reserve Demand Curve

- Develops a willingness to pay for reserves which when co-optimized with energy will translate into energy prices reflecting the marginal willingness to pay as defined by the reserve demand curve.
- Because the willingness to pay is expressed and can set the energy price, there is much less incentive for supply to offer anything but marginal cost as prices will rise during scarcity regardless of the supply offers.
  - Market power mitigation need not be lifted
  - No question about whether prices were a result of scarcity or market power

Operating Reserve Demand Curve

- Defining scarcity based on non-emergency capacity and incorporating into the operating reserve demand paradigm should also prevent prices from paradoxically falling just before scarcity, sending the right signal.
- With the co-optimization of energy and reserves, prices should be set so suppliers are indifferent between producing energy and providing reserves , thus making system control easier in that units directed to be backed down to maintain reserve levels are economically as well off as producing energy.

Principles for Implementing an Operating Reserve Demand Curve

1. Price increases during scarcity should be synchronized with reserve levels and/or emergency actions
2. Pricing and the real-time reserve situation should be transparent , predictable, and easy to follow for market participants
3. Determination of scarcity (operating reserve shortage) and corresponding prices should be done on a locational basis
4. Provides price signals and revenue streams that are consistent with existing capacity markets and system control

Concluding Thoughts

- Based on economic principles and real-time operational needs, an operating reserve demand curve makes the greatest sense for scarcity pricing.
- The implementation details matter both operationally and in putting stakeholders at ease with the approach.
  - Transparency and linking prices to reserve levels and/or emergency actions helps in both areas
  - Acknowledging the need for an offset of scarcity revenues from capacity revenues underscores the main goal of appropriate scarcity pricing is operational performance at times of system stress, not a method to ensure going forward costs are recovered
  - Locational aspects are absolutely necessary for operational performance