

Energy Price Formation Problem Statement

MRC

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Monitoring Analytics

Many Aspects of Price Formation

- **Price formation is not an issue limited to the mathematical calculation of LMPs.**
- **Other Important Aspects**
 - **Demand Curve Modelling**
 - **Market Participant Behavior**
 - **Manual Actions by PJM Operators**
- **All aspects relate to prices and uplift levels.**

Demand Curves

- **Operating Reserve Demand Curve**
 - Price increases with declining levels of reserves
 - Significant impact on market revenues
 - ERCOT relies on ORDC for capacity cost recovery.
- **Transmission Penalty Factor Demand Curves**
 - Similar to ORDC
 - In progress, PJM MIC

Shortage Pricing Potential Impact

Potential Scarcity Rent as a Percent of Net Revenue for 2016

Penalty Factor (\$/MWh)	MAD Zone				RTO Zone			
	Scarcity Rent (\$/MW-yr)	Percent Coal Net Revenue	Percent of CC Net Revenue	Percent Nuclear Net Revenue	Scarcity Rent (\$/MW-yr)	Percent of Coal Net Revenue	Percent of CC Net Revenue	Percent Nuclear Net Revenue
\$300	\$5,500	6%	3%	2%	\$2,725	7%	2%	2%
\$500	\$9,167	11%	5%	4%	\$4,542	11%	4%	3%
\$850	\$15,583	18%	9%	6%	\$7,721	19%	6%	4%
\$1,000	\$18,333	21%	11%	7%	\$9,083	23%	7%	5%
\$2,000	\$36,667	42%	22%	15%	\$18,167	45%	14%	10%
\$3,000	\$55,000	63%	33%	22%	\$27,250	68%	22%	16%
\$4,000	\$73,333	85%	44%	30%	\$36,333	90%	29%	21%
\$5,000	\$91,667	106%	55%	37%	\$45,417	113%	36%	26%
\$6,000	\$110,000	127%	66%	45%	\$54,500	135%	43%	31%
\$7,000	\$128,333	148%	77%	52%	\$63,583	158%	50%	36%

Market Participant Behavior

- **Offer levels: high and low markups**
- **Physical parameters**
 - **Inflexibility increases system costs, no matter how prices calculated.**
 - **LMP calculation does not address flexibility.**
- **Response to dispatch instructions**
- **Self scheduling practices**
- **Load bidding and virtual trading**

Self Scheduling and Offer Flexibility

Self Scheduled, Pool Scheduled, and Dispatchable Energy, 2017

	Self Scheduled			Pool Scheduled			Total MWh
	Dispatchable	Eco. Min.	Block Loaded	Dispatchable	Eco. Min.	Block Loaded	
Energy (MWh)	90,773,149	164,360,689	220,270,669	100,394,489	132,006,318	23,728,794	731,534,107
Percent of Energy	12%	22%	30%	14%	18%	3%	100%

- **Self scheduled, inflexible energy, 52 percent of generation, is not eligible to set price under PJM's Modified LMP proposal.**
- **Only 21 percent of generation is inflexible and pool scheduled.**
- **Flexibility would be better addressed directly.**

PJM Manual Actions

- **Defining constraints**
 - **Especially defining constraints that do not represent congestion.**
- **Setting and altering operating constraint limits**
- **Setting and altering transmission penalty factors**
- **Choosing load forecasts and Tier 1 biasing**
- **Manual commitment of resources without an applicable reserve product.**

PJM Problem Statement is Too Narrow

- **PJM's Problem Statement does not encompass alternative proposals other than PJM's proposal.**
- **Stakeholders should discuss the overall objectives of price formation.**
- **The stakeholder group should receive education and information about any and all aspects of energy market price formation.**
- **A broad perspective is necessary for informed decision making.**

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