Demand Response Economics in Indiana

Policy Concerns & Issues

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Market Structure for Demand Side Resources

1. Mechanisms similar to PJM programs with option for Day Ahead Market ISO dispatch, Real Time Market ISO dispatch or Real Time Market Customer/Self Scheduled Demand Reductions
2. Whenever net benefits to market buyers outweigh the total costs paid to demand responders, pay full LMP for reduced MWh regardless of the level of LMP.
   - Equal marginal payment for equivalent marginal value between Demand Response and generation resources
   - Floor for full LMP payment level of approximately $50/MWh to ensure that benefits always outweigh the cost to consumers
3. Allocate payments for reduced loads to those market participants who are short in that market (Day Ahead or Real Time)
   - Simple allocation to the most direct beneficiaries, market participants purchasing in the market to which the resource was actually provided
   - Eliminates current potential for a “flat” or “long” LSE to be allocated costs from which they may not immediately and directly benefit
4. Self Scheduled Real Time resources charged the Real Time Operating Reserve Rate in order to be treated equivalently to self scheduled generation resources
5. This way IN consumers only pay for Demand Response that lowers their net costs but get to benefit from Demand Response without going to retail competition structure with all that added harm to consumers

Demand Response Mechanics

Numerical Examples

Shutdown/Load Shift Economics

- At an LMP of $300 plant stops production for 1 hour, sheds 10 MWh
- Revenue LMP-G&T
  - ($300 – 60) x 10 MWh = $2400
- Cost: 15 tons production at a later time
  - $60 x 15 = $900 power for replacement product
  - $60 x 3 = $180 unproductive/restart power
- Net benefit to Demand Responder $1320
- Total payment to LSE
  - ($900 + $180) = $1080
  - LSE sells 8 MWh extra at $60 for DR bonus of $480

Shutdown/Load Shift Energy Consumption

- At an LMP of $300 plant stops production for 1 hour, sheds 10 MWh
- Shed 10 MWh
- Lost 15 units of production (10 for the hour curtailed and 5 from the 30 minutes required to restart the process) therefore required to use 13 MWh to replace the 10 MWh shed for DR
- Load Shift was based on the expectation that the production could be produced during a later period when prices are lower by at least a factor of 1.8 (lower efficiency effect)
- Load bears all the risk that the current $/MWh will be sufficient to at least off-set the cost of production during the alternate period
- LSE sells 80% more energy at contract rate as DR bonus

Beneficiaries of Demand Response

- Demand Responder (as long as customer gets paid for reducing load)
- LSE Serving the Demand Responder
  - Sells replacement electricity to DR at a later time
  - Sells extra electricity due to efficiency penalty
- Shorts/Buyers in the relevant market (due to lowering of LMP)

Value To Market of Demand Response

Guaranteeing Market Participants Benefit From Demand Response Payments

Methodology

- Rebuild PJM energy market supply curve 8/1/2007
- Determine average incremental supply offer MWh (proxy for amount of load response required to actually change prices on average)
- Incremental MWh required times LMP is cost to market participants required to change LMP
- Determine average incremental change in LMP
- Change in LMP times market clearing MWh is value to market of the change in LMP

Supply Curve Mechanics

- Rebuild supply curve completely between $45/MWh and $60/MWh in order to develop a data set for the $50/MWh range
- $50/MWh always clears somewhere above a PJM system load level of 80,000 MWh in the Day Ahead market
- Assume that the MWh of demand response required to change the LMP are offered and paid the full LMP

Supply Curve Highlights

- Average incremental MWh offer block of 46.8 MWh per incremental offer
- Median incremental MWh offer block of 17.0 MWh per incremental offer
- Average incremental $/MWh between offer blocks of $0.22 per incremental MWhs
- Median incremental $/MWh between offer blocks of $0.11 per incremental MWhs

Supply Curve Highlights

$ 2,340	Payment to Demand Resource Average MWh offers
$ 17,280	Savings to Market Buyers Using Average MWh offers
$ 14,940	**Net System Benefit Based on Average Incremental Offers**

$ 850	Payment to Demand Resource Median MWh offers
$ 8,800	Savings to Market Buyers Using Median MWh offers
$ 7,950	**Net System Benefit Based on Median Incremental Offers**

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