Supply Price Flexibilities & Market Ef

Simulation of 2001 EDRP Events

Preliminary Results for Capital Zone

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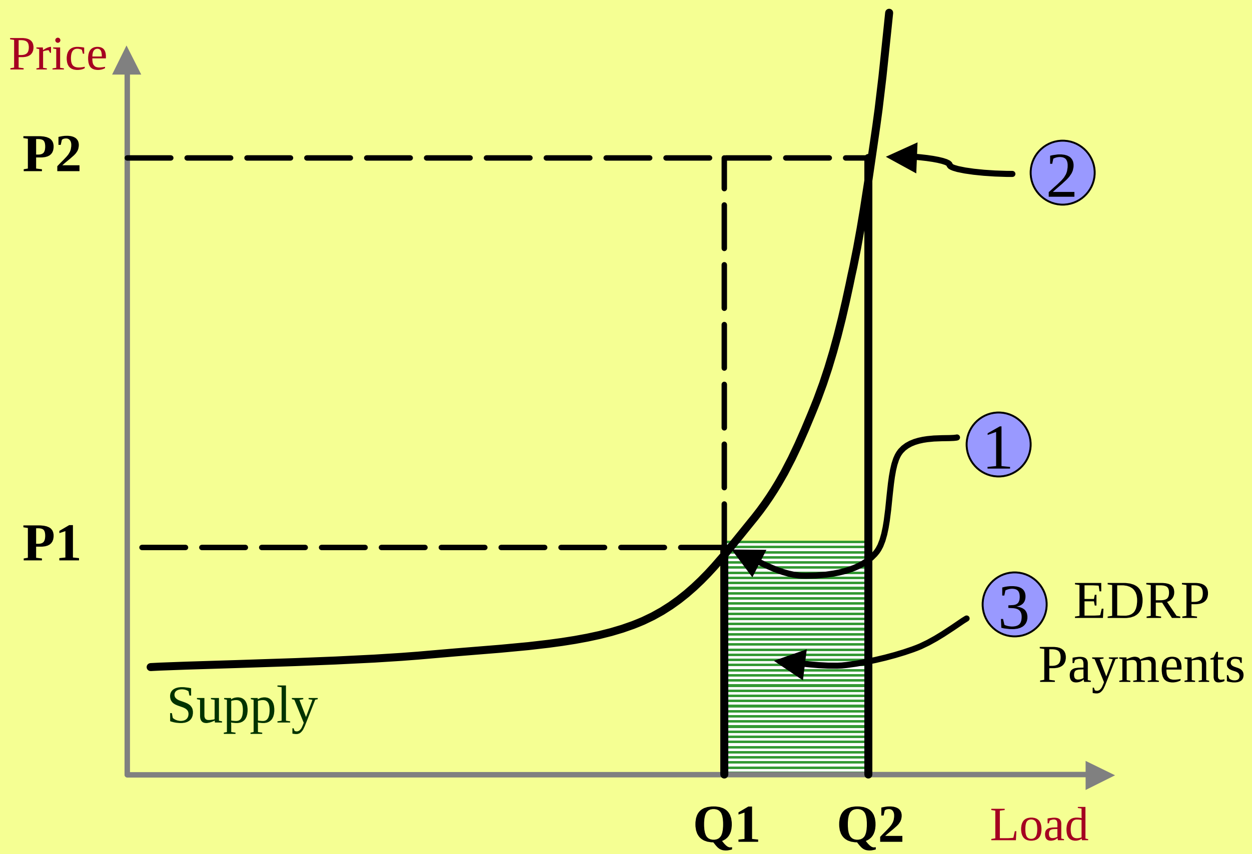
Presentation Agenda

1. Discuss Preliminary Estimates of Effects of EDRP Events on NYISO Electricity Markets
   - Illustrate using the Capital Zone
   - Focus on
     a) Price Effects
     b) EDRP Payments
     c) Alternative Perspectives on EDRP Benefits
2. Describe Conceptual Approach and Supply Modeling Challenges

Market Adjustments f



1. Demand and Equilibrium Price, Q1 and P1, after EDRP Event called yielding load reduction of Q2 – Q1, equilibrium observed in the data.

2. Demand and Equilibrium Price without EDRP Load Reduction, Q2 and P2.

3. Program Payments: (Q2 – Q1) x P1 or $500, whichever is higher

Capital Zone-EDRP Events
August 7-10, 2001

Avg. Hourly EDRP Load	70 MW
Avg. % of Hourly Load	3.5 %
Avg. % Change in LBMP	32.%

Price Flexibility = 32% ÷ 3.5% = 9.3

Total Zonal EDRP Payments	$0.9 Million

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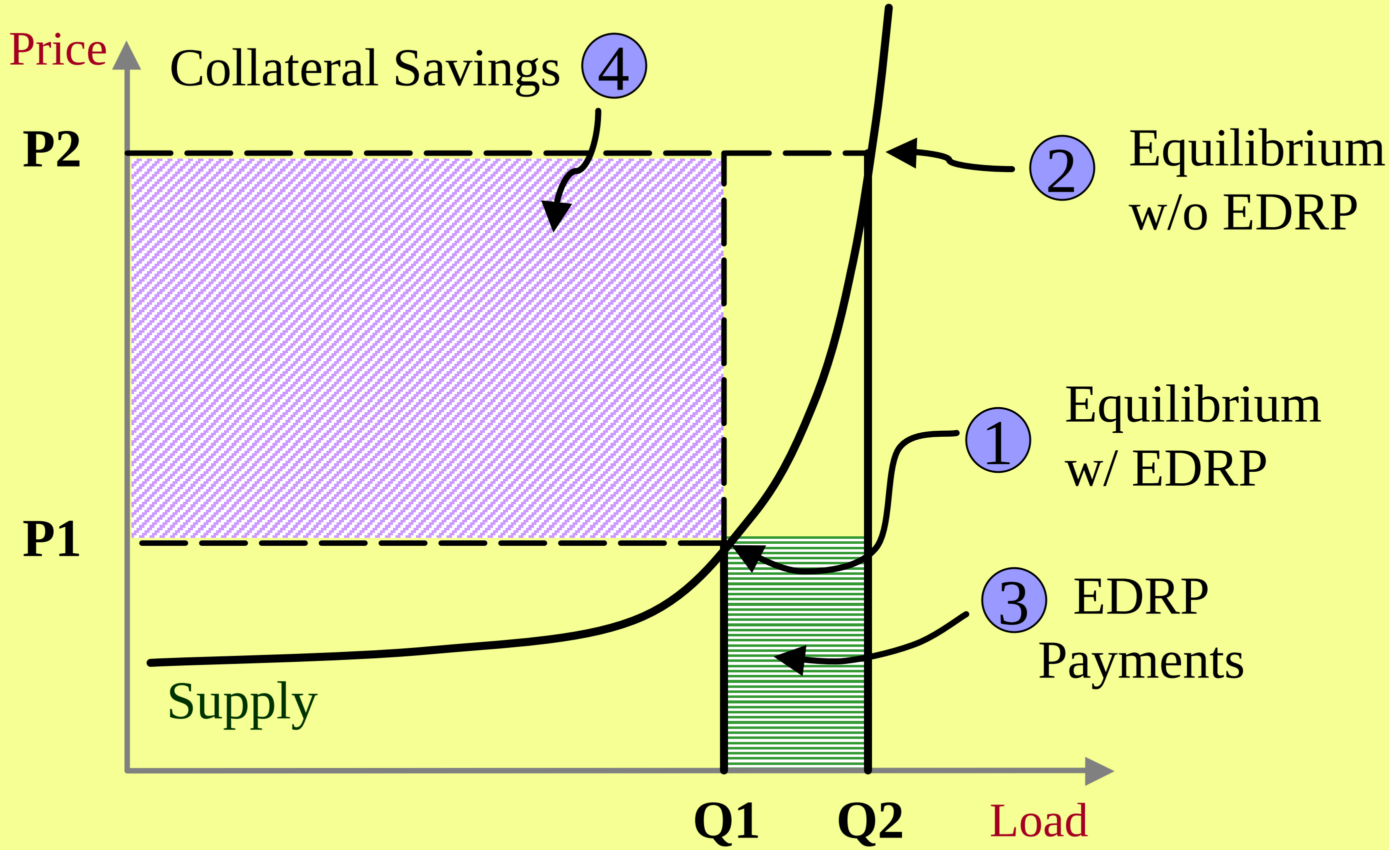
Three alternative perspectives on EDRP benefits:

1. Collateral Savings
2. Effects on Price and Price Volatility
3. Value of Expected Unused Energy (VEUE)

EDRP Event Collateral Savings



4 Collateral Savings = Q1 x (P2 – P1) = **$3.2 Million**

These savings equal current market benefits, if all load is purchased in the Real-Time Market.

EDRP Event Ef
Price Volatility

Weekday Hours 6 AM - 10 PM	W/ EDRP	W/O EDRP	**Change**
Average August LBMP	$72.83	$77.14	**– $4.31**
Std Dev. August LBMP	113.1	128.8	**– 15.7**
Coef. Var. August LBMP	1.5	1.7	**– 0.2**

- EDRP affects average LBMP but also volatility
- If all load in the Real-Time market is hedged, the benefit from EDRP events could be viewed as the change in the cost of the hedge

EDRP Event Ef
Price Volatility

- The reduction in the cost of hedging load due to a decrease in average price would be $ 1.9 Million
- Further reductions would be expected due to lower price volatility
- To calculate the complete effect would need to know customers' aversion to risk

Change in Average August LBMP	$4.31
Number of Hours Covered	352
Monthly Maximum Demand	2,100
Load Factor	0.6
Reduction in Cost of Hedge	**$1.9 Million**

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EDRP Event Value of Unused Energy (VEUE)

- EDRP called to boost reserve margins when expected to fall below acceptable levels
- Helps restore system security by reducing the “Loss of Load Probability” (LOLP)
- From this perspective, EDRP benefits are the Value of Expected Unused Energy =

  (Change in LOLP) x (Outage Cost/MW) x (Load)

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EDRP Event Value of Unused Energy (VEUE)

- By using outage cost estimates from other applications, we can get some idea of the range in the required change in LOLP due to EDRP that would make VEUE equal to EDRP payments.

	Capital Zone	
Outage Cost	$1,500/MW	$2,500/MW
Load	2,100 MW	2,100 MW
EDRP Payments	$ 0.9 Million	$ 0.9 Million
Change in LOLP needed to equate VEUE with EDRP Payments	**0.28**	**0.17**

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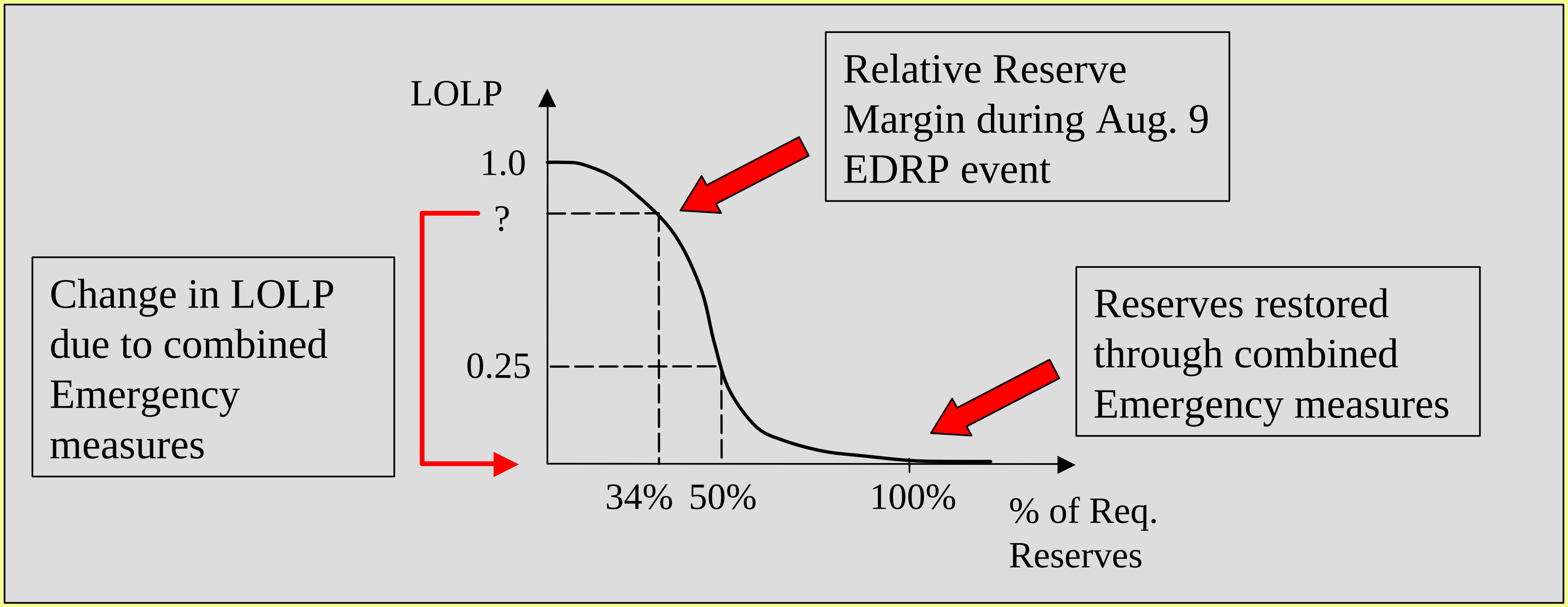
EDRP Event Value of Unused Energy

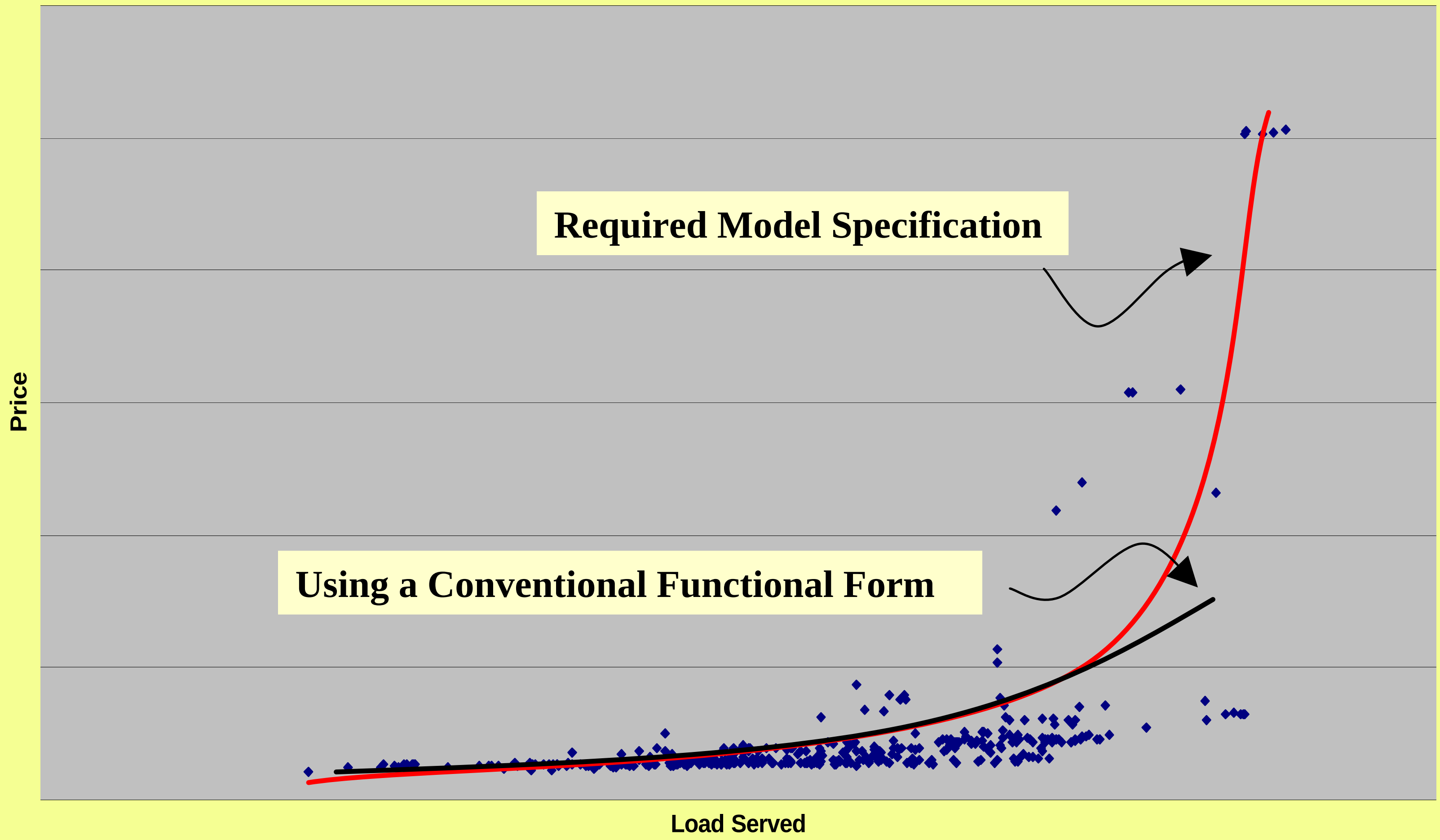
- To make sense of the implied changes in LOLP, we need to know the relationship between reserves and probability of a system outage.



Modeling Challenges

- "Hockey Stick" Supply Function is characterized by Separate Regimes -- Low, Medium, and High Price Response
- Each Regime must be modeled separately, forcing consistency at points where Regimes change
- Account for the range in LBMPs at nearly identical demand levels

Scatter Diagram of Clearing LBMP vs. Load



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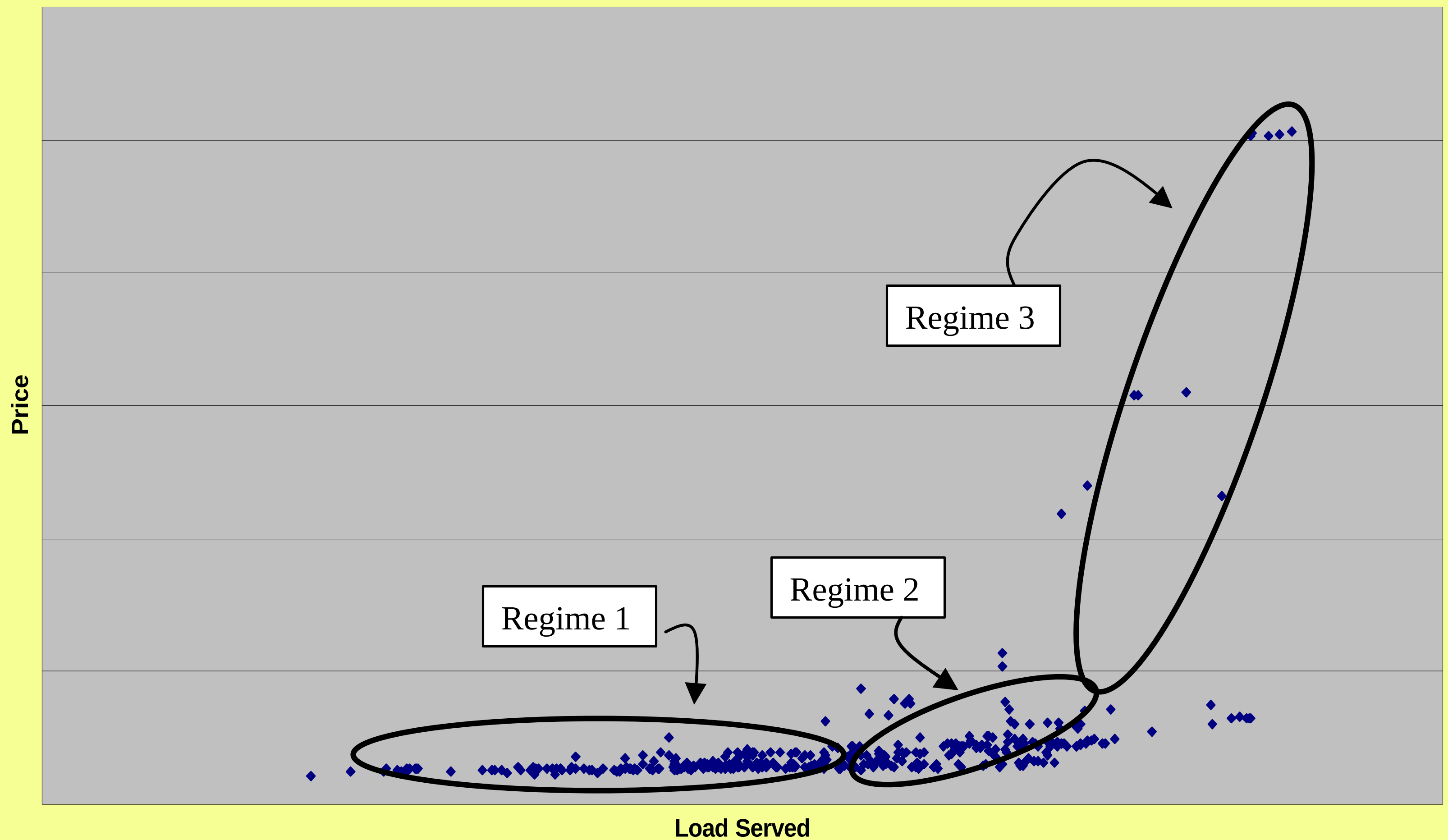
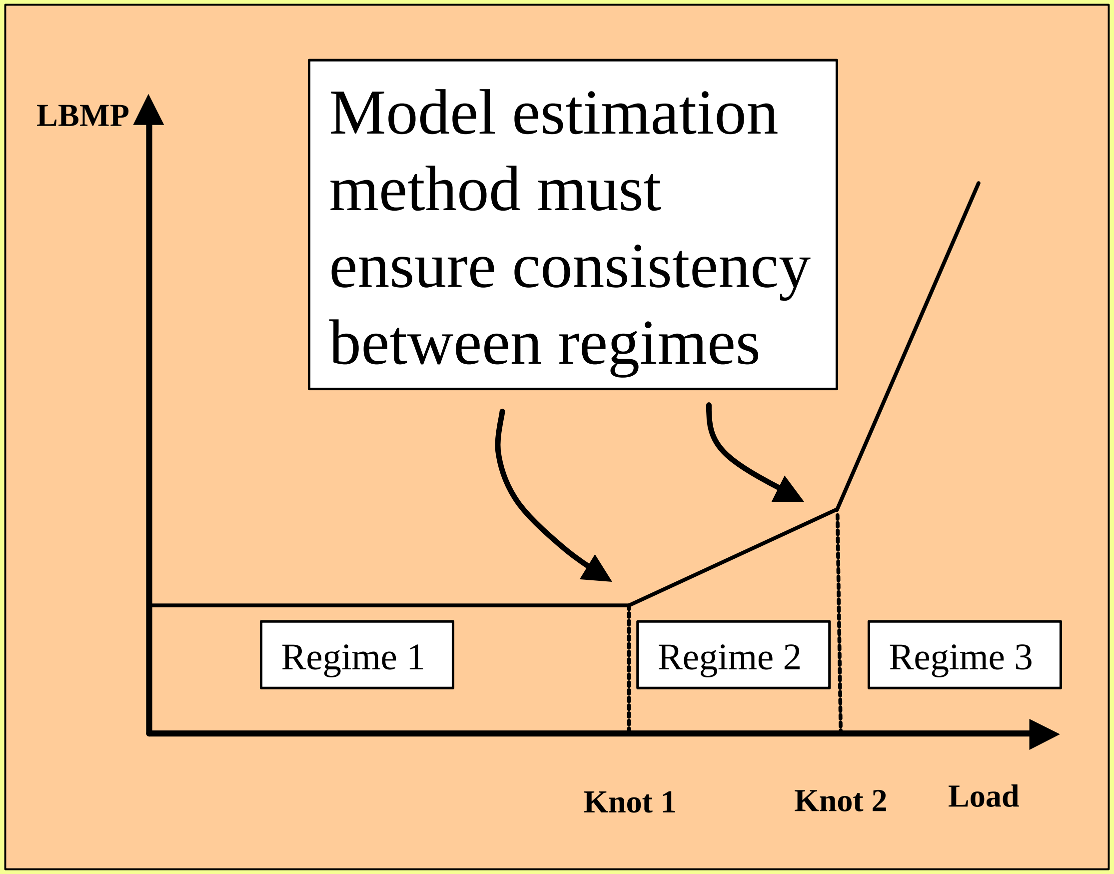
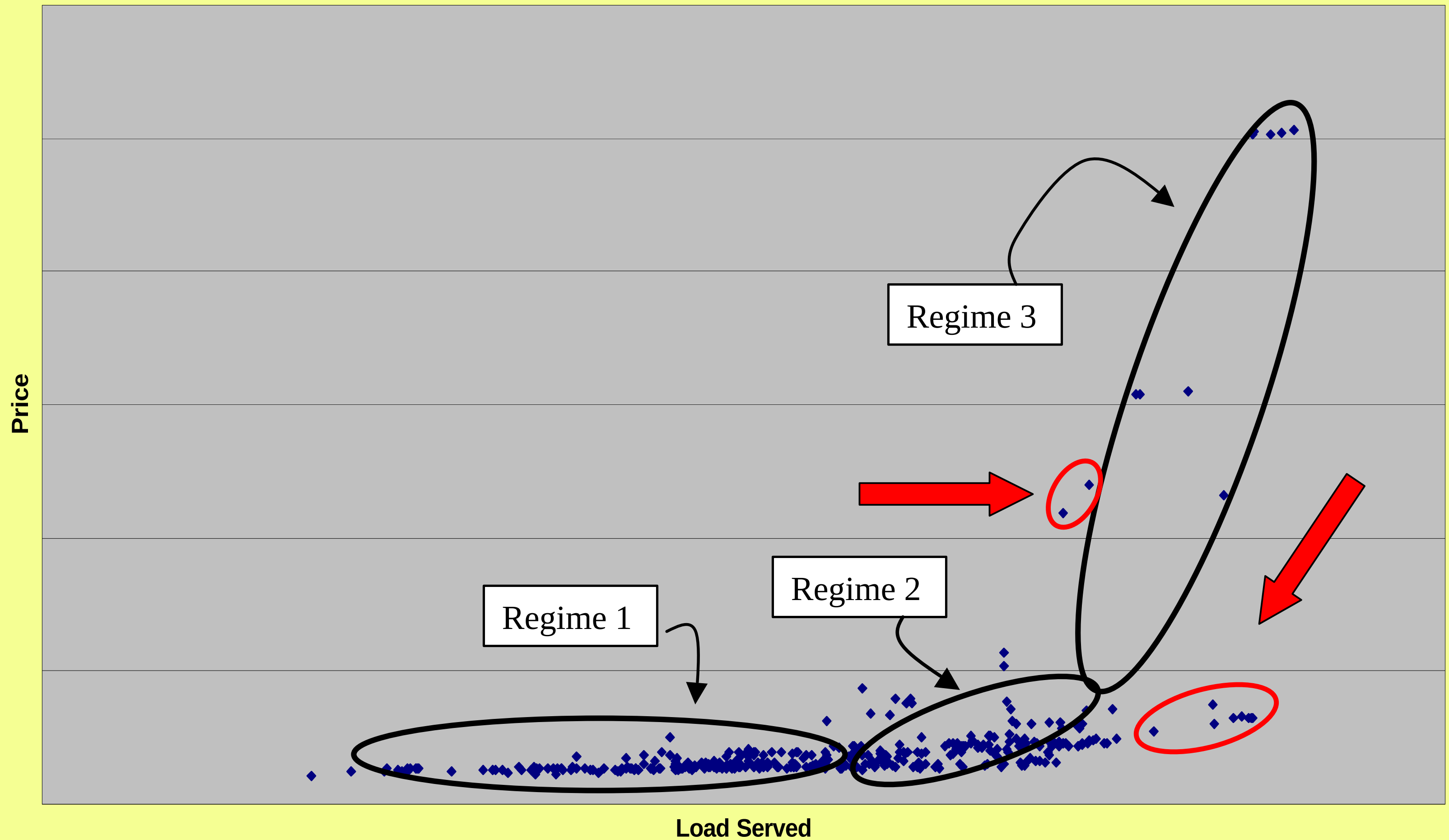


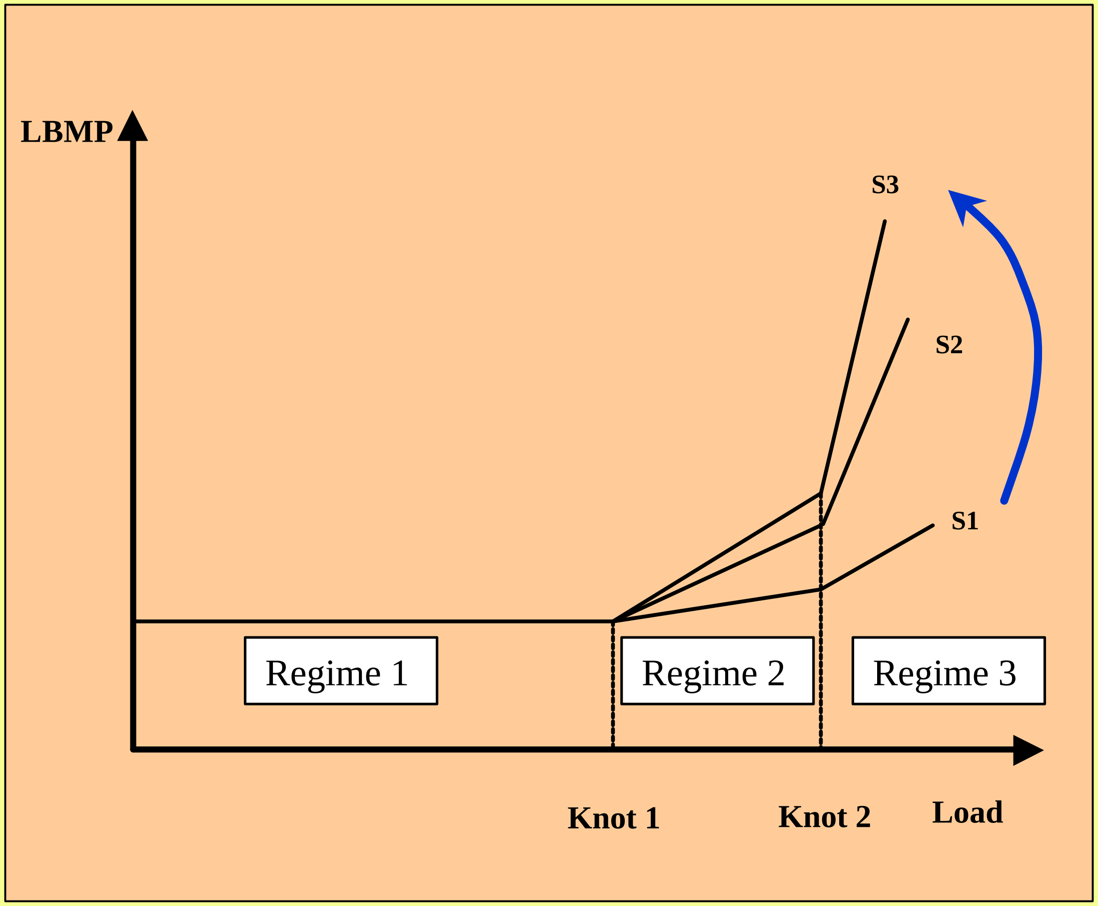
Spline Model Specif



Modeling Apparent Outliers



Final Model Specif



Supply Shift due to:

- Transmission Constraints,
- Generator Availability,
- Demand in Adjacent Zones,
- Others

Concluding Observations

- Have identified several important components to EDRP and DADRP benefits
- Have resolved the important conceptual issues in modeling Electricity Supply
- Initial estimated equations for both Real-Time and Day-Ahead Markets are encouraging
- Initial simulation results appear reasonable
- Currently summarizing performance data for both DADRP and EDRP as basis for final simulation