A Market-Based Approach to Ensuring Reliability in California

An EPRI Proposal

February 16, 2000

Implementing a Market-Based Approach

- Design market-based framework
- Inventory resources
- Assess feasibility
- Develop action plan
- Research product concepts
- Field-test products
- Launch products

Potential Benefits

- Borenstein, Bushnell and Wolak (1999) "Measuring Market Power in California's Restructured Electricity Market," showed that during first year of operation CA energy prices were approximately 22% above competitive benchmark
  - Roughly $600 million dollars
- This exercise of market power can be eliminated with significant demand-side participation

Additional Benefits

- Enhanced Reliability
- Lower Price Volatility
- Greater Product Diversity
- Heightened Rate of Customer Choice

Step 1: Design Market-Based Framework

- Specify policy objectives
- Examples might include
  - Meet California's energy needs at least cost
  - Provide benefits of competition to end users
  - Mitigate price volatility
  - Ensure price transparency
  - Encourage End User choice

Step 1 (continued)

- Identify market participants
  - Energy Users
  - Utility Distribution Companies (UDCs)
  - Energy Service Providers (ESPs)
  - Regulators
- List strategies that permit End Users to modify demand patterns

Strategic Premises

- Markets allocate resources more efficiently than "command-and-control" systems
- Offer end users a menu of choices
- Let them self-select into options that best meet their needs
- One size does not fill all

Step 2: Inventory Resources

- Identify resource types
- Quantify market potential by region
- Examples
  - Pricing (RTP, buy-back rates)
  - Communication systems (Internet)
  - Control systems (RTP controller, EMS)
  - Time-flexible end-use equipment (TES)
  - Internet-based “negawatt” exchanges

Step 3: Assess Feasibility

- Review prior California experience with innovative pricing and load management programs
- Identify current barriers to implementation (e.g., CTC recovery, lack of metering)
- Review demand response in other US markets, using EPRI's StatsBank library

End User Profile *StatsBank*

- Current version
  - Database of End User flexibility parameters -- measures of load response to hourly prices
  - Data on nearly 1,000 End Users from several utilities' RTP programs
- Future plans
  - Expand to include additional input data -- overall elasticities, product choice parameters, covariance and load volatilities

StatsBank -- What's in it?

- End User-level data on within- and between-day flexibility parameters (FP) and associated characteristics
  - SIC code
  - Size (kW category)
  - Load factor
  - Prior rate (especially interruptible)
  - Self-generation capability

StatsBank -- How to use it?

- User-friendly menu for database inquiry
- Examples of typical requests
  - Mean and range of FP values by SIC code
  - Typical FP values by SIC code for 1 to 2 MW End Users with no self-generation
  - Average FP for End Users > 3 MW that had previously chosen an interruptible rate

Step 3 (continued)

- Review lessons from competitive markets in England and Wales, Australia, Nordic countries
- Assess how much of California's market potential can be achieved, by region and time-frame
- EPRI's Product Mix model can be used to simulate market response

Step 4: Develop Action Plan

- Estimate outage costs by market segment
- Identify and prioritize market opportunities
- Establish short-term and long-term goals by market segment and geographical region
- Create enabling regulatory policies

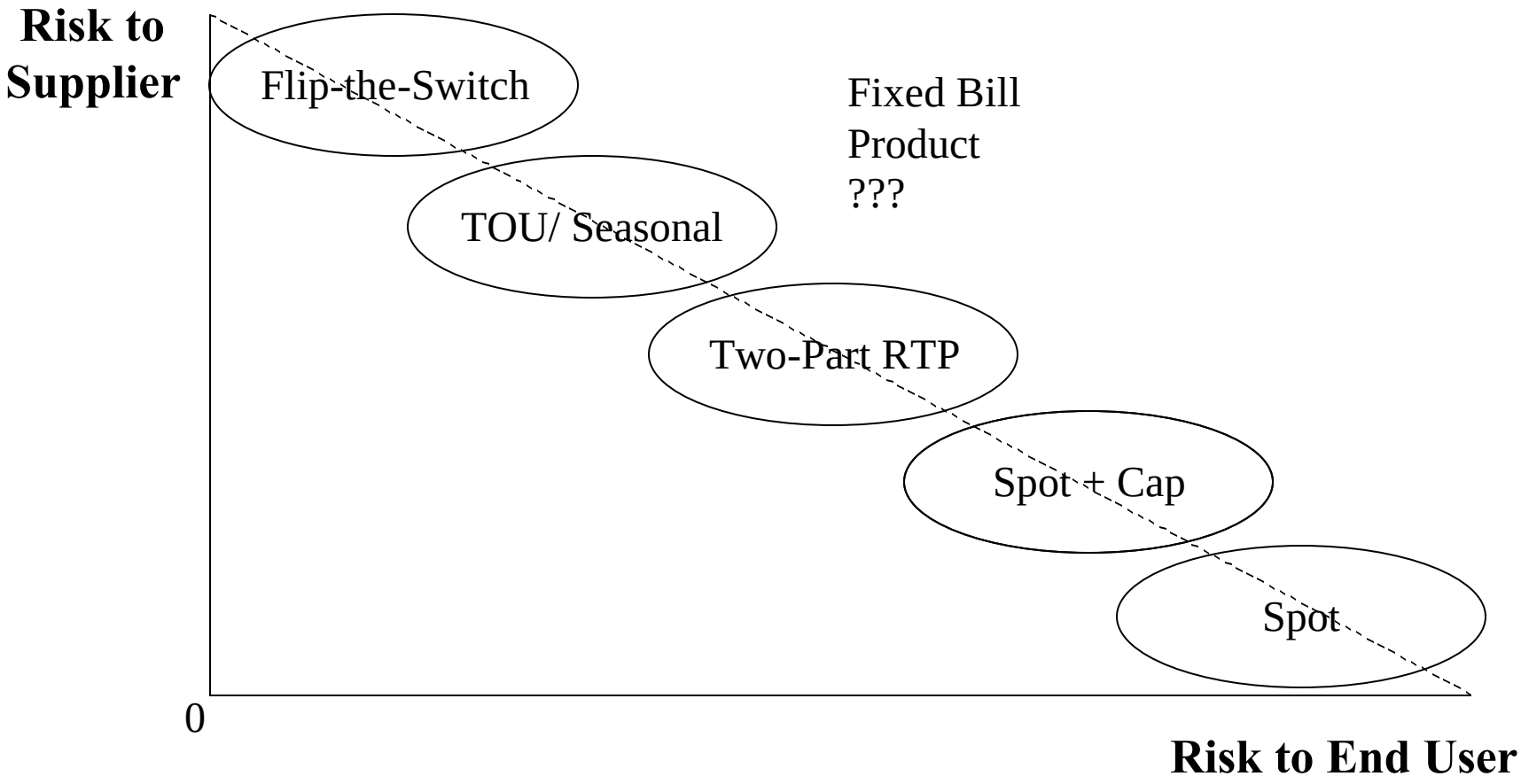
Step 5: Research Product Concepts

- Conduct focus groups to flesh out ideas
- Translate ideas into marketable product concepts
- Concepts should cover the entire spectrum of possibilities, ranging from information to pricing to technologies to financing

A Retail Menu

Guaranteed Prices	Market-Based Prices
Flat	Spot
TOU	Occasional RTP
Seasonal	Buy-back
Fixed Bill	Dispatchable Interruptible
Customer Risk Management	
Price Caps & Collars	Weather Hedges

Risk Differentiated Products



Pricing Products: Duke's View

- CTC loans
- PX arbitrage discounts
- Post transition period
- Load curtailment

Pricing Options: CAL PX View

- Pay for Performance -- UDC
- Call Option -- CalPX
- Demand Ancillary Service bids
- Diversity of options to:
  - fit end user situations
  - provide several implementation options in case of institutional hurdles

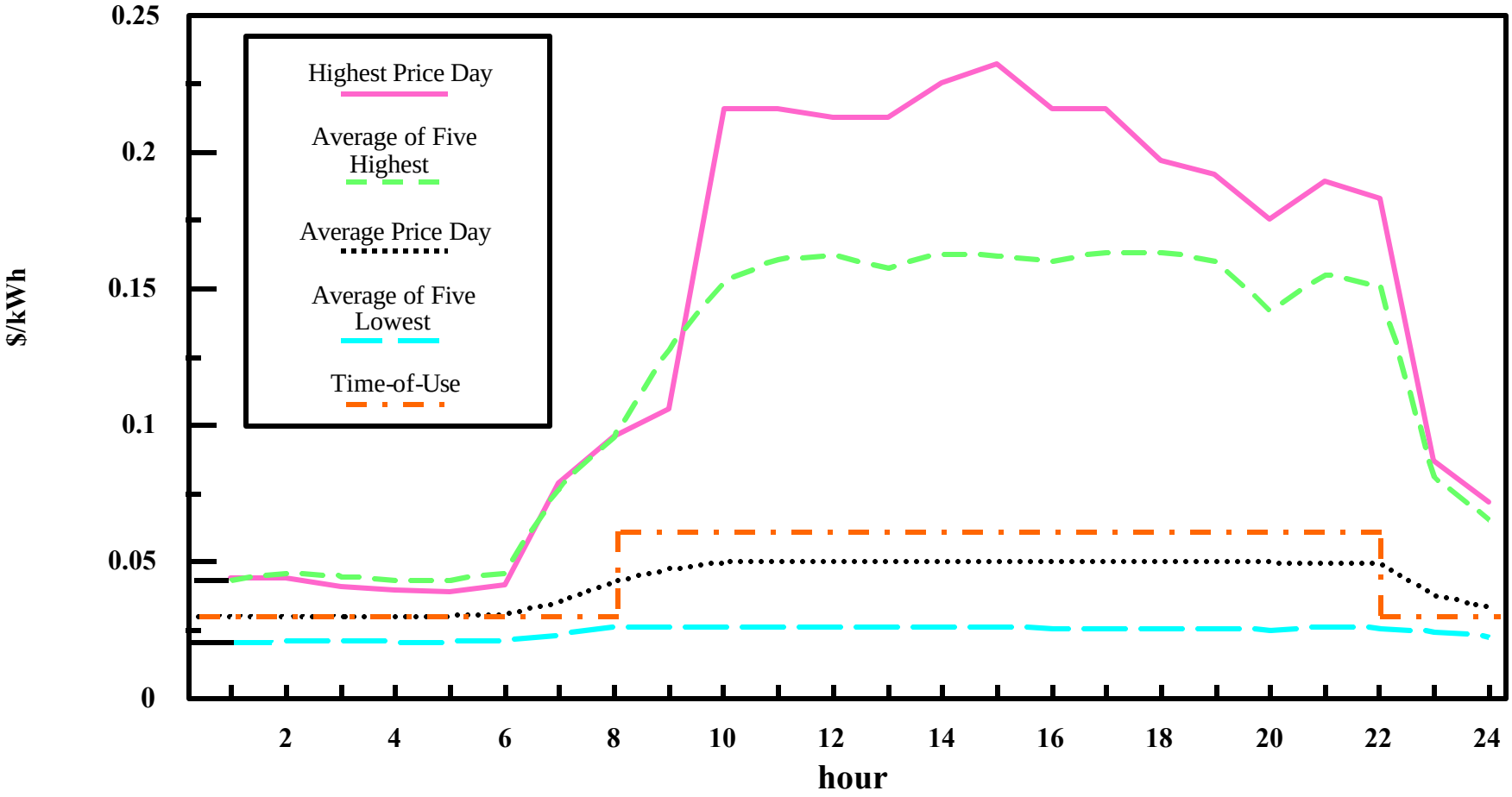
Step 6: Field-test Products

- Choose segments and regions for field-testing
- Narrow the list of products
- Conduct field testing to identify likely magnitudes of demand response, and barriers to full-scale launch
- Identify end user recruitment strategies

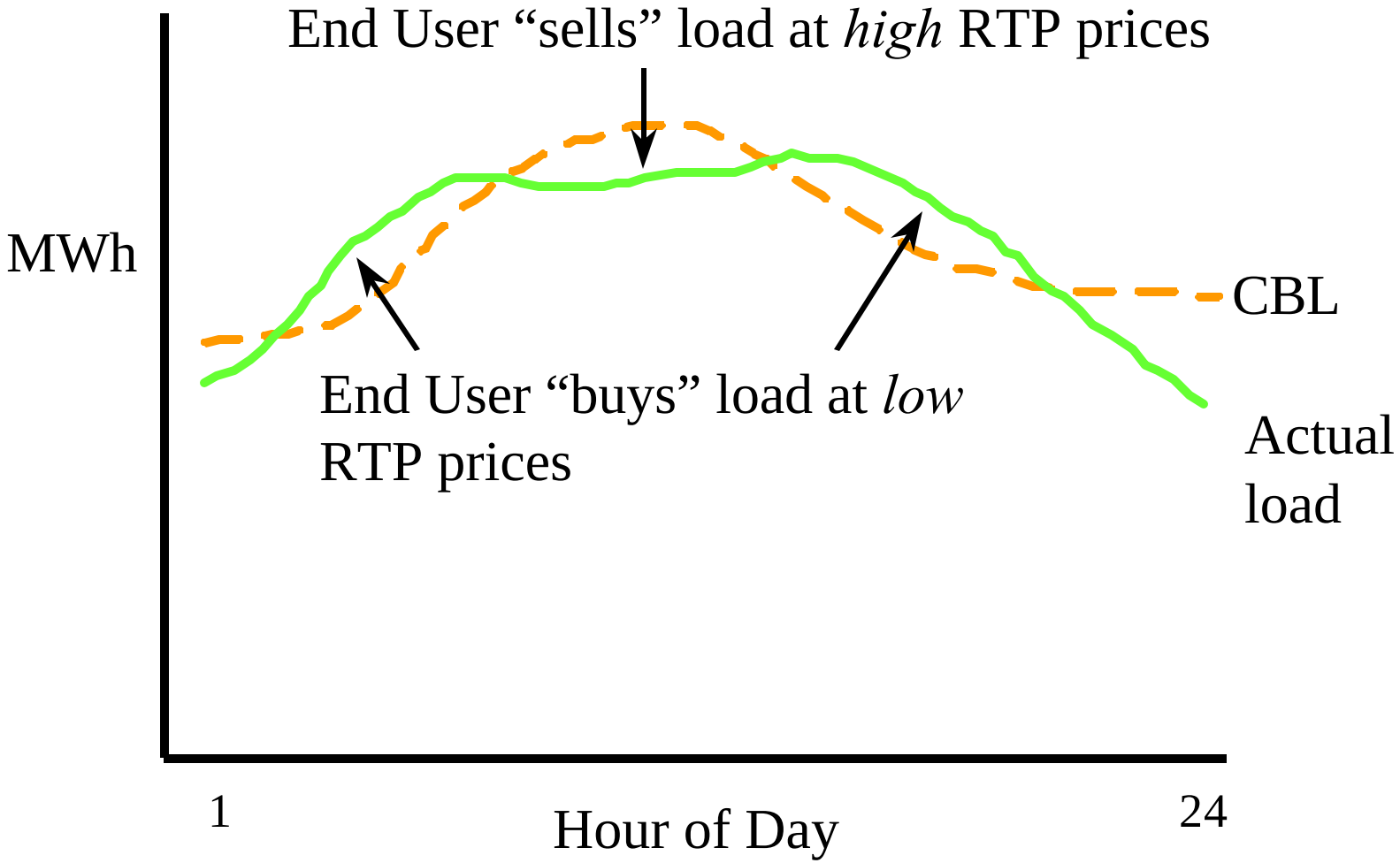
Step 7: Implement Full-Scale Launch

- Create a marketing platform and obtain buy-in from all stakeholders
- Recruit end-users, UDCs, and ESPs
- Launch products
- Monitor and evaluate results
- Modify product designs as appropriate

RTP Prices: One Utility's Experience



Incremental Energy Charges



Do End Users Respond to RTP?

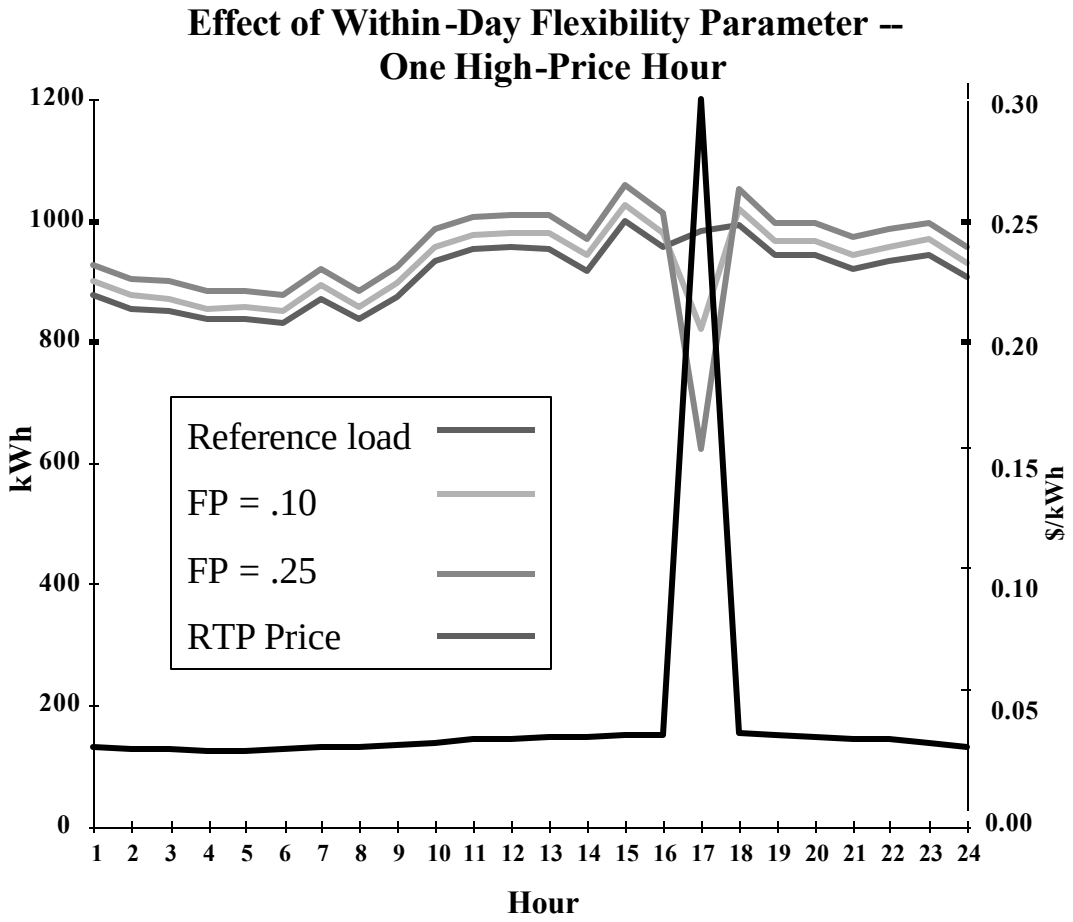
Portion of End Users found to respond significantly to RTP prices 60-75%

Range of flexibility parameters .01 - .40
(Approximately equal to negative of own-price elasticity)

A short-period price spike of 10 to 20 times the typical price can yield load reductions of 10 to 20% (e.g., 150 MW from 1,000 MW of load)

Measure of Price Responsiveness-- *Flexibility Parameters*

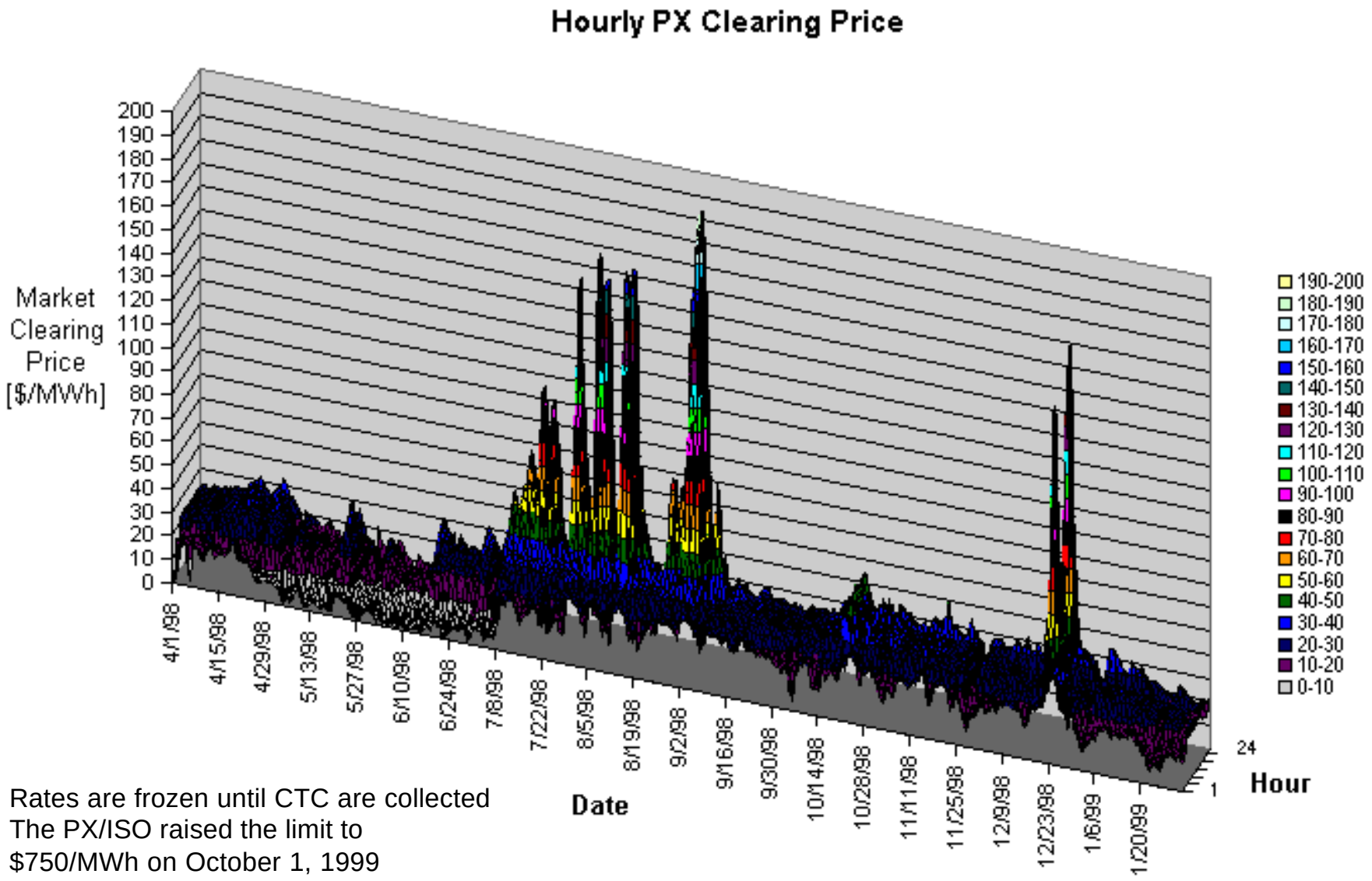
- Ability to shift load *within* and *between* days
- E.g., % shift in load within a day in response to given % change in price
- Source of information-- EPRI StatsBank



Appendix A:Mitigating wholesale price volatility

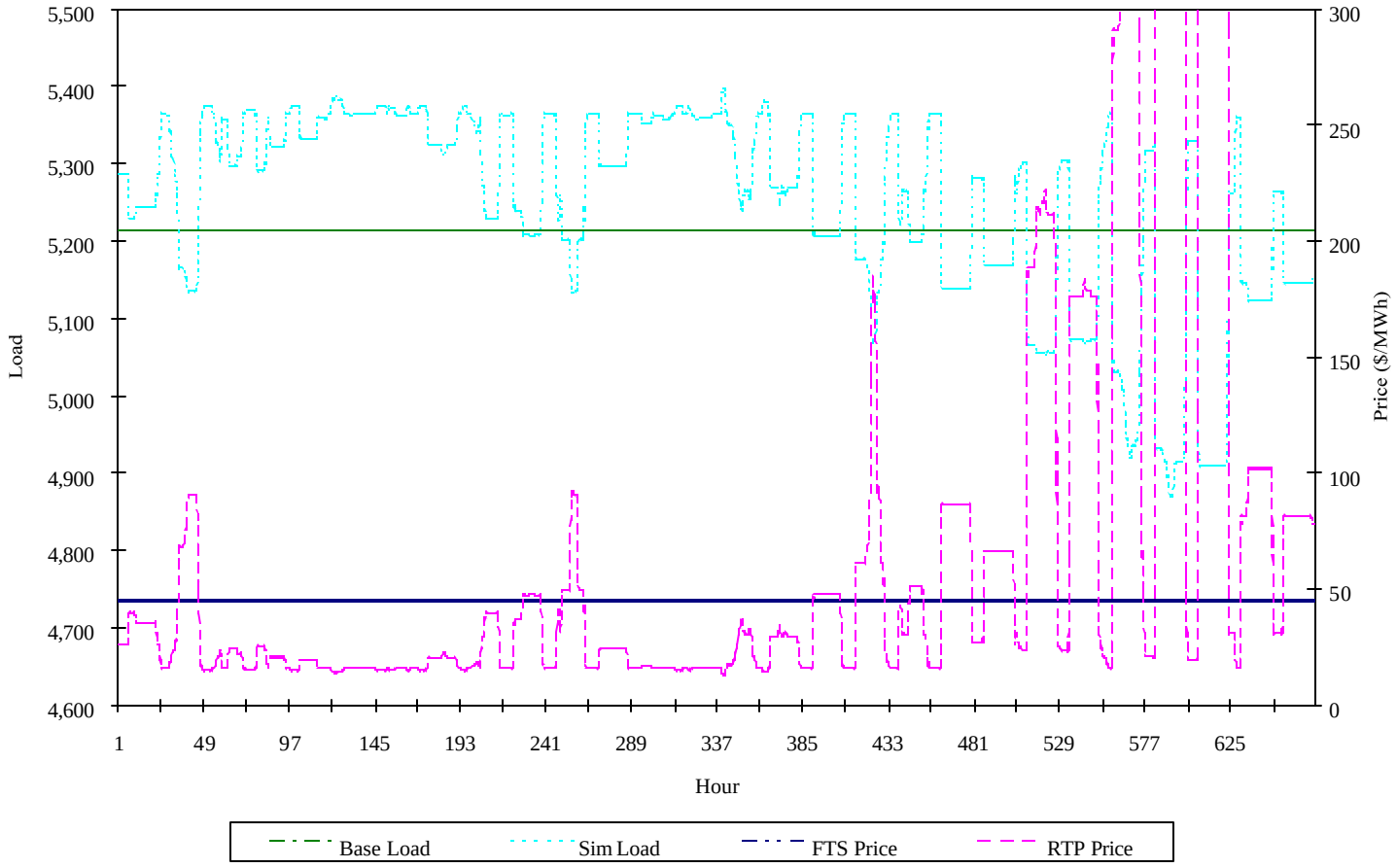
- See paper by Caves-Eakin-Faruqui, to appear in April issue of The Electricity Journal
- A modest amount of load (<10%) on market-based spot prices can mitigate price volatility by one-half to two-thirds, under very conservative assumptions about demand response (e.g, elasticity of .2)

California System Price Volatility



- Rates are frozen until CTC are collected
- The PX/ISO raised the limit to $750/MWh on October 1, 1999

Price and Load Shapes: A Simulation



Mitigating the Price Spike

Assumptions: 8.75% on RTP, elasticity = 0.2

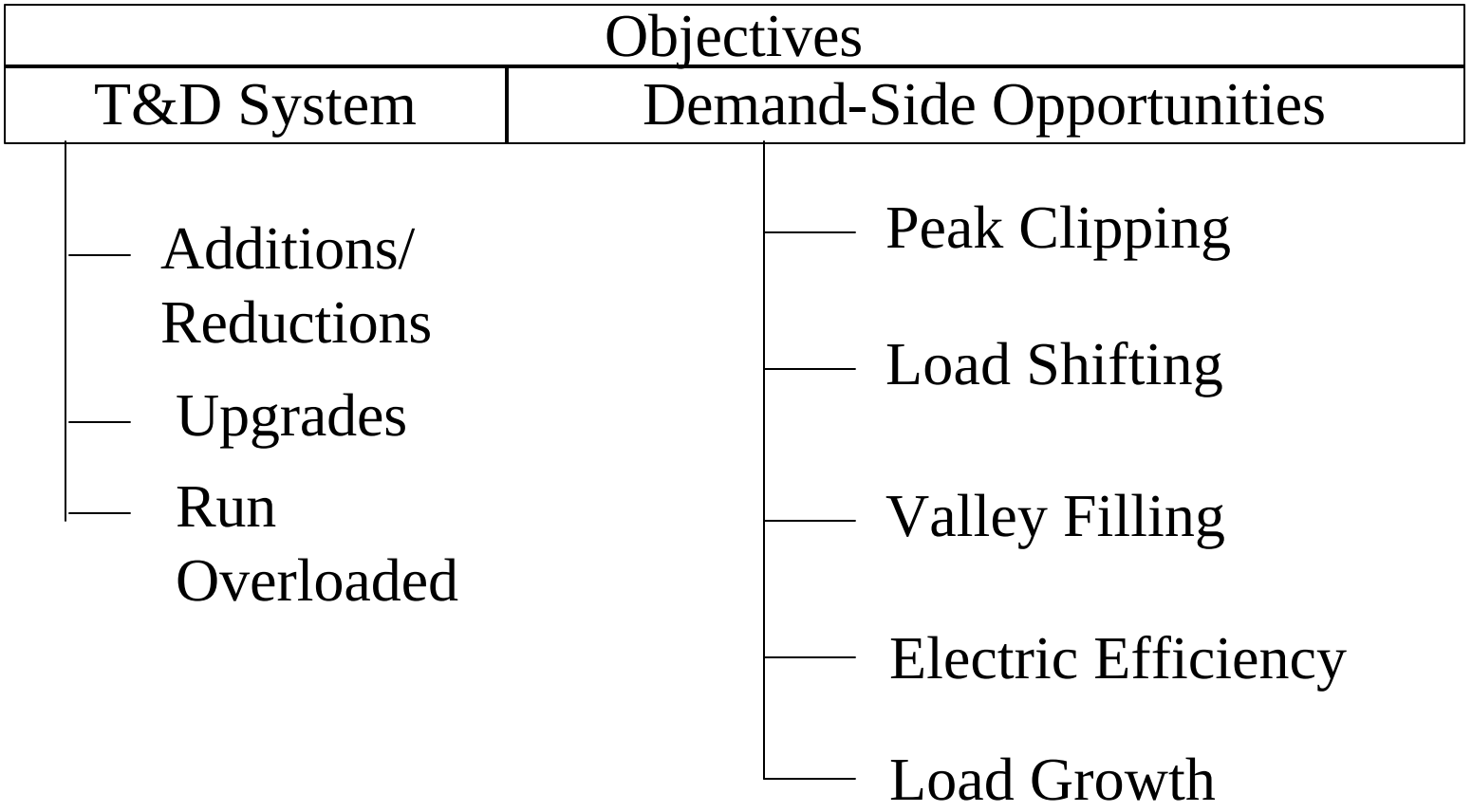
Observed Price ($/MWh)	Simulated Price ($/MWh)	Percent Change
$7500	$2656	-65%
$5000	$1963	-61%
$2300	$1092	-53%
$415	$281	-32%
$60	$58	-3%
$30	$31	+3%
$17	$17	+0%

Sensitivity Analysis

Price Elasticity of Demand

% of load on real-time rate	.05	.10	.15	.20	.25
1%	$7137	$6871	$6672	$6521	$6407
5%	$5910	$4975	$4369	$3950	$3648
10%	$4766	$3508	$2803	$2359	$2057
15%	$3920	$2597	$1939	$1553	$1304
20%	$3280	$2001	$1423	$1103	$903

Appendix B: Assessing Market Potential



Assessing Market Potential - Decision Matrix

	Power Capacity		
	Constrained	Comfortable	Rich
Energy			
Constrained	T&D System • Additions • Upgrades • [Run overloaded] Customer • Peak Clipping • Electric Efficiency	T&D System • [Reductions] Customer • Load Growth • Electric Efficiency	T&D System • Reductions Customer • Load Growth • [Electric Efficiency]
Comfortable	T&D System • Additions • Upgrades • [Run overloaded] Customer • Peak Clipping • Load Shifting • Valley Filling	T&D System • [Reductions] Customer • Load Growth • Valley Filling • [Load Shifting]	T&D System • Reductions Customer • Load Growth • [Valley Filling] • [Load Shifting]
Rich	T&D System • Additions • Upgrades • [Run overloaded] Customer • Peak Clipping • Load Shifting • [Valley Filling]	T&D System • [Reductions] Customer • Load Growth • Peak Clipping • Valley Filling • Load Shifting	T&D System • Reductions Customer • Load Growth • Peak Clipping • Valley Filling • Load Shifting

Assessing Market Potential
-- Program Selection --