Lessons from California
The Role of Demand Response

Energy Markets in Turmoil
Institute for Regulatory Policy Studies

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Christensen Associates

- Economic and engineering consulting for electric power industry
- 20 years of experience in designing and evaluating pricing strategies –
  - TOU
  - Real-time pricing (NiMo, Georgia Power, KCP&L)
  - Market-based interruptible load programs
- Unbundling; pricing transmission and ancillary services

The California Energy Crisis

- High wholesale prices
- Rolling blackouts
- Financial/debt crisis – bankruptcy
- State take-over of power purchases
- Charges of market manipulation

California Background -- *Supply*

- No new capacity in ’90s
- Utilities sold ½ of generation (fossil) to Duke, Dynegy, AES, Mirant, Reliant, etc.
- No long-term power contracts
- California imports 20 – 25% of power requirements (NW hydro; SW fossil)
- Tight capacity margin

California Background -- *Demand*

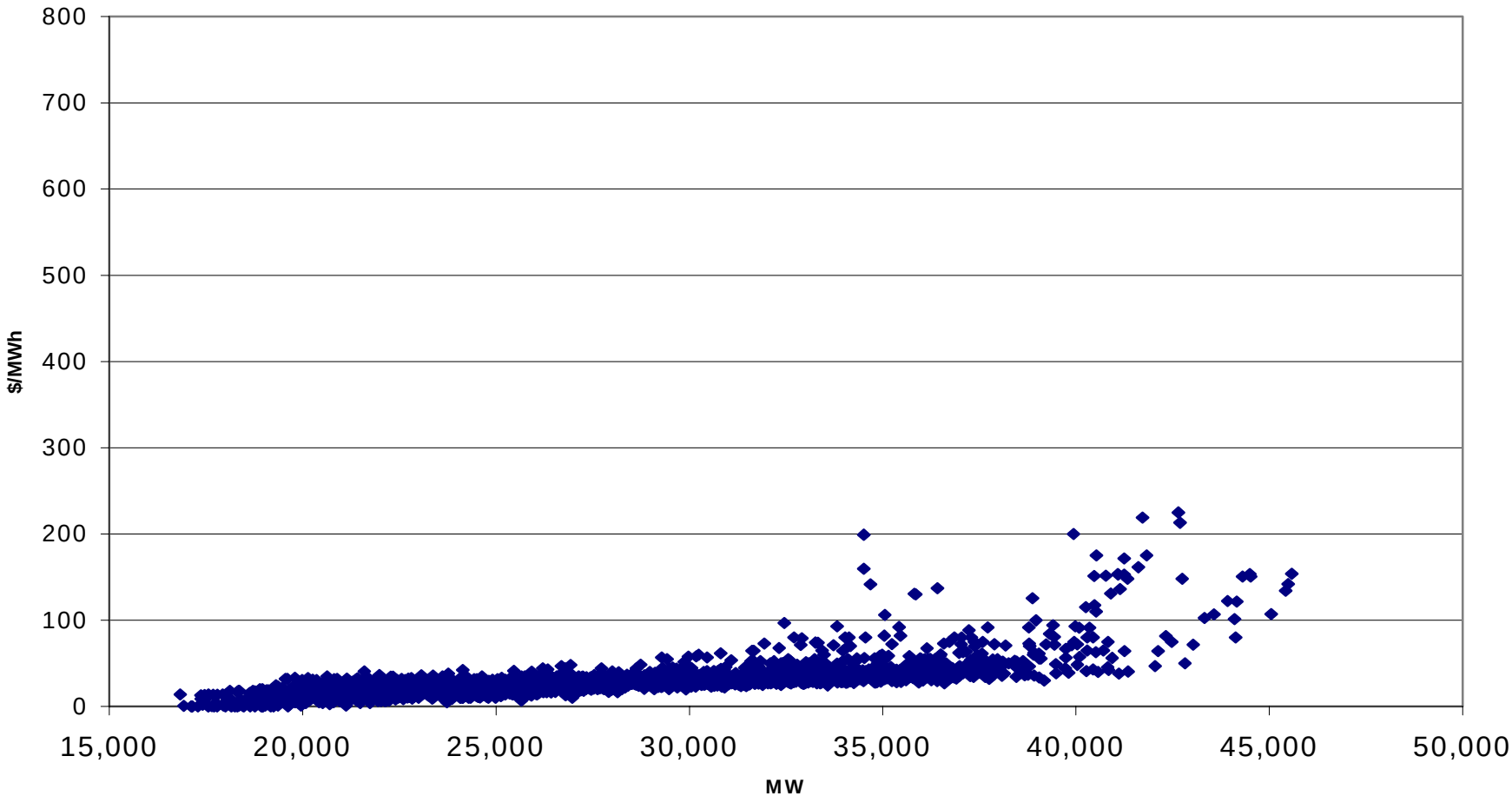
- Modest growth in early 90s
- *Rapid growth* since 1995 in Calif. and in the Southwest & Northwest
- *Rate freeze*, with 10% discount until 2002 (or when "stranded costs" recovered)
- *SDG&E* rate freeze lifted in 1999

Background – *Wholesale Markets*

- All power bought and sold in *spot market*
- PX *day-ahead* energy; ISO *real-time* energy, reserves & ancillary services
- ISO *price cap* ($750/MWh ⇒ 500 ⇒ 250)
- 30% + of energy left unscheduled for ISO real-time market on high-price days

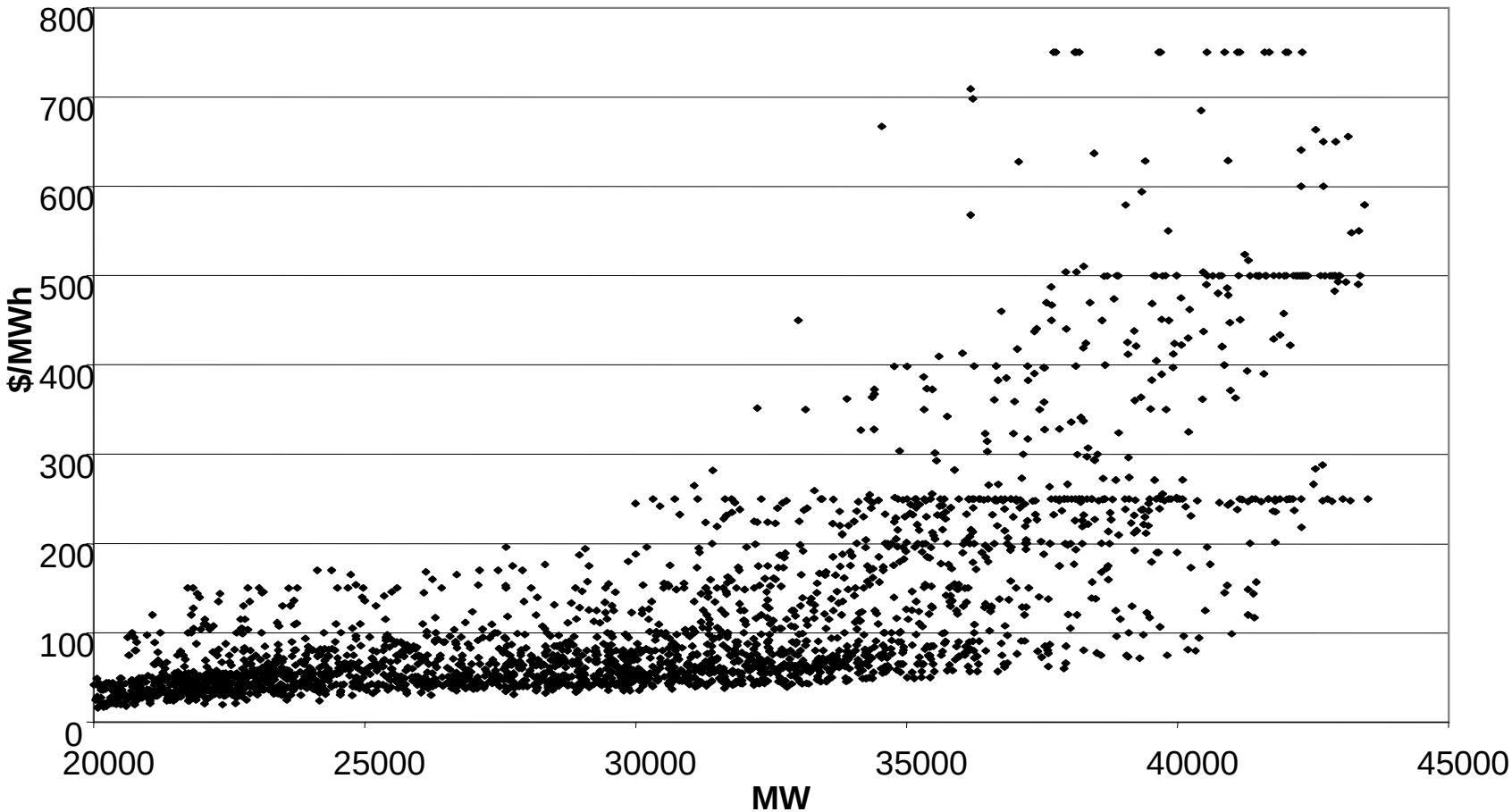
PX Prices and ISO Load

(*May – September 1999)*



PX Prices and Total ISO Load

(May 15 - August 31, 2000)



Utilities "Buy High" and "Sell Low"
(*May – August, 2000*)

Financial Impacts of California Crisis
Summer 2000

- *Wholesale costs* – **$13.5 billion** (May – Sept.)
- *Expected costs* under rate freeze **--** $5 billion
- *Utility debt* **-- $8 billion** (now $13 billion+)
- Customer *cost of outages*
  (*e.g.*, $400 million for 4 days of rolling blackouts in early 2001)

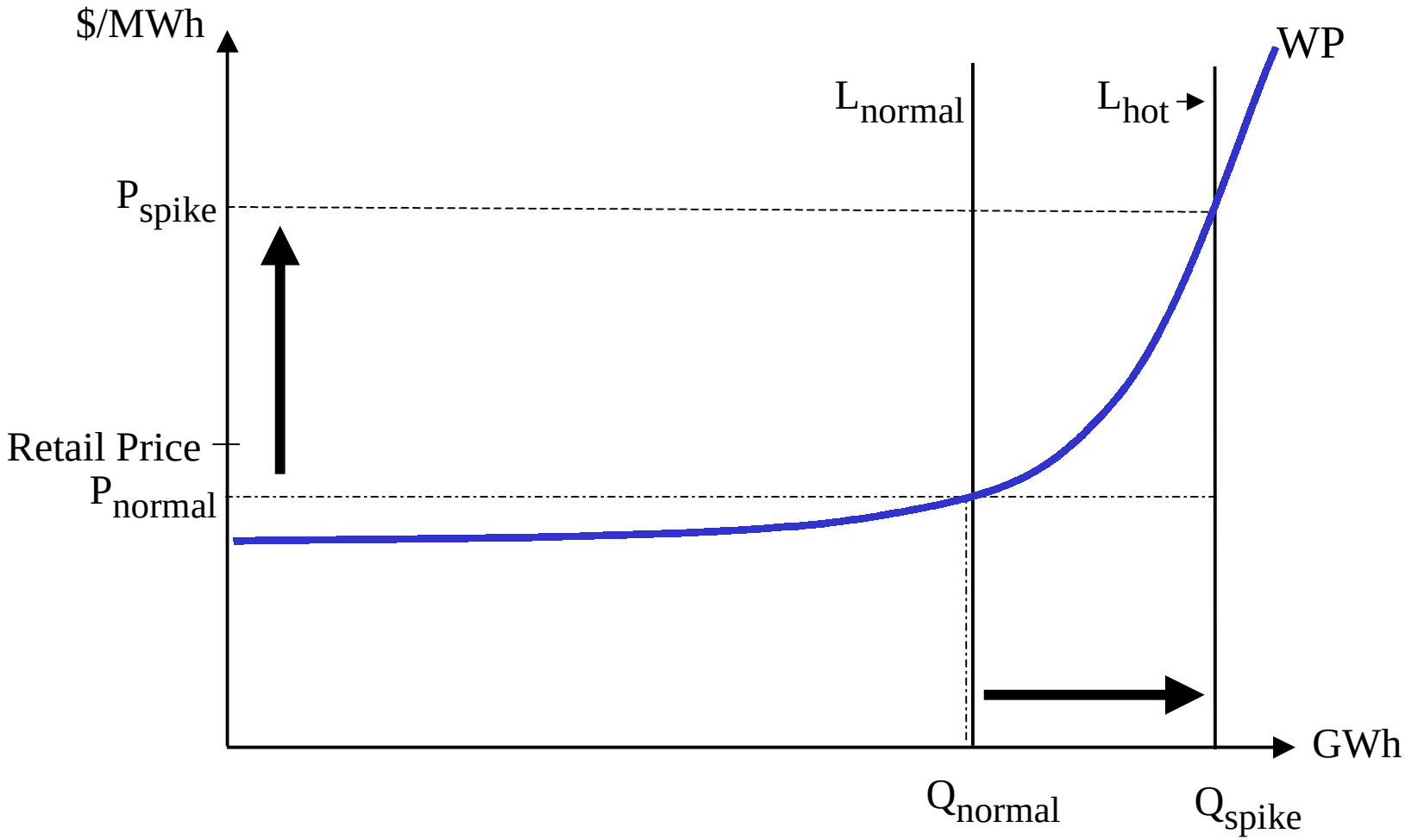
What Went Wrong in Summer 2000?

- "*Perfect storm*" hit an already tight market
  - Unexpected *outages*
  - *Low imports* (low hydro, high demand outside)
  - High natural gas prices
- Market design problems
  - No hedging (*financial effect*)
  - Price caps (*affected multiple markets*)
  - Strategic bidding/withholding?
- *No demand response* (except San Diego)

What Continues to go Wrong?

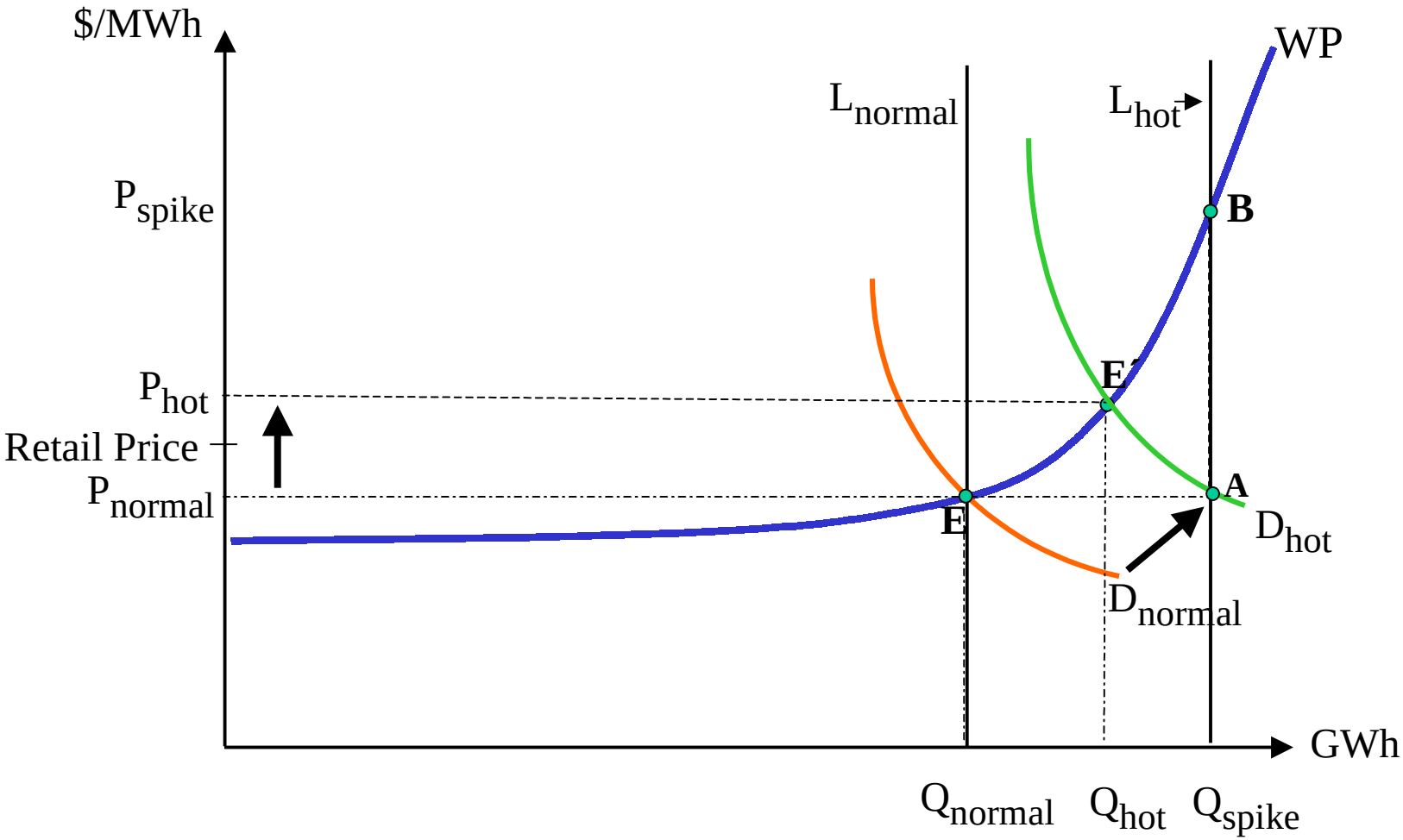
- *Financial/debt crisis* continues
  - Utility debt from 2000 still exists
  - Generators not paid; some independents shutting down
- Continuing *high natural gas prices*
- *Political/regulatory gridlock* -- retail energy prices still below wholesale costs
- *Insufficient capacity* for summer
- *No demand response* (new buy-back and RTP programs planned for the summer)

Disconnected Markets –
Fixed price ⇒ no demand response



The Markets Connected

Demand Response Yields Lower Wholesale Prices



Benefits of Demand Response Programs

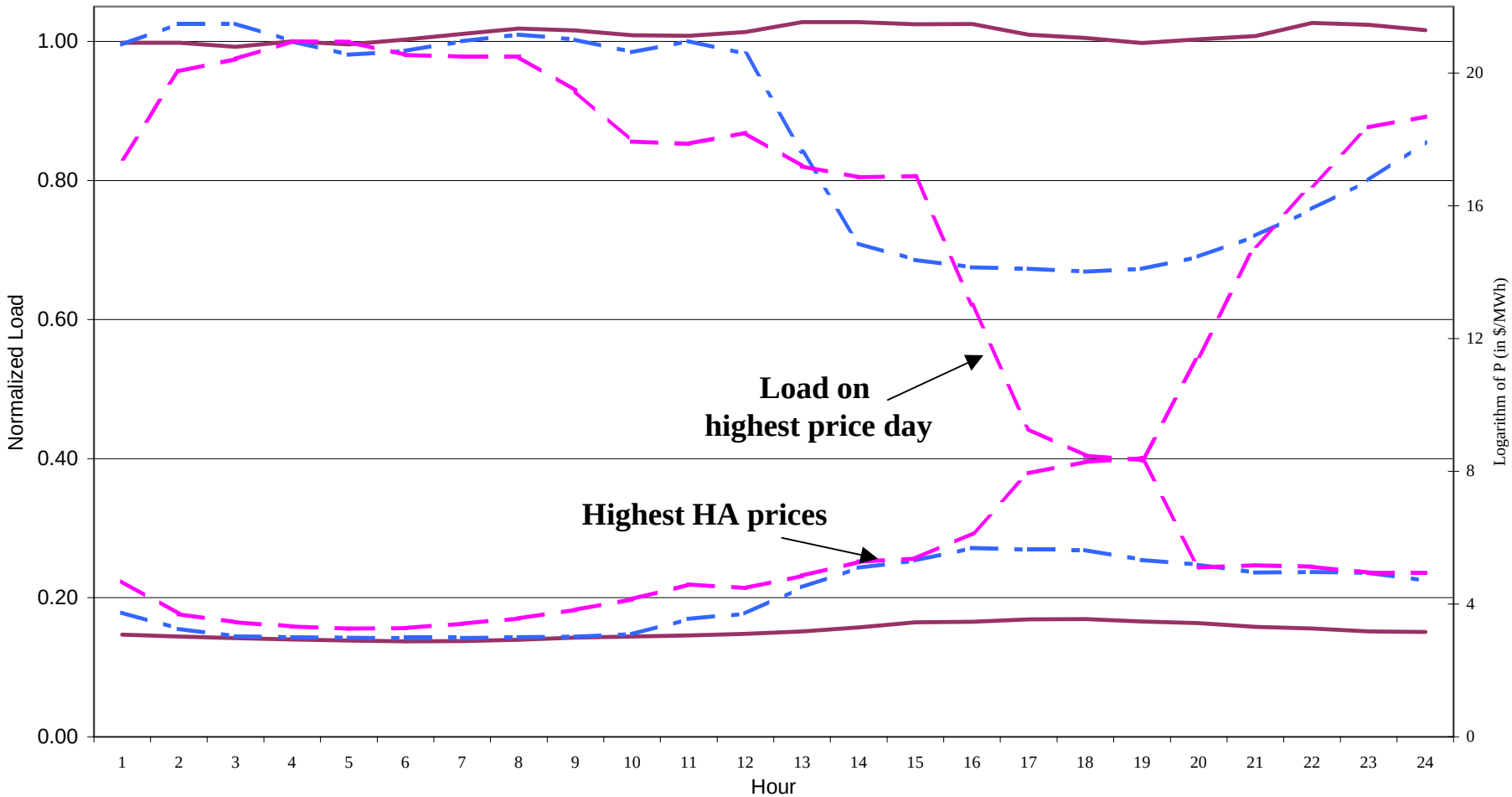
- *Prices* signal customers the cost of power
- Customer *demand response* helps balance supply and demand
- *Reduces wholesale prices*, by factor of 10+ (*e.g.*, $\Downarrow$ load by 2.5% $\Rightarrow$ WP $\Downarrow$ by 25%)
- Reduces market power of suppliers

Types of Demand Response Programs

- *Demand-side bidding*
- "*Buy-back*," or pay-for-performance interruptible
  - Suppliers buy load relative to baseline at price tied to market price
- *Real-time (hourly) pricing*
  - Full-time
  - Whenever prices exceed specified level

Example of Demand Response – *Georgia Power RTP*

(Demand response = 250 MW; 60% of reference load)



Estimated Effect of Demand Response
(Braithwait-Faruqui; March 15 PUF)

If RTP offered to California large C&I customers:

- Load reduction in high-price hour – 2.4%
- Reduction in wholesale price – 24%
- Drop in summer wholesale costs -- $700 M

For Additional Information:

- Customer Response to Market Prices – *How Much Can You Expect When You Need it Most?*, Steven Braithwait and Michael O'Sheasy, EPRI Pricing Conference, July 2000.
- Residential TOU Response in the Presence of Interactive Communication Equipment, Steven Braithwait, in *Pricing in Competitive Electricity Markets*, Ahmad Faruqui, Ed.
- Demand Response – *The Ignored Solution to California's Energy Crisis*, Steven Braithwait and Ahmad Faruqui, in *Public Utilities Fortnightly*, March 15, 2001.
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