# 2001 California Energy Crisis: What Happened, Who's to Blame and Lessons Learned

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# Outline

- Original California Energy Market Design
- California Market & System Conditions Leading to Crisis
- The Root Causes of the California Crisis
- Significant Contributing Factors
- Measures Reflecting the Crisis
- Who's to Blame
- Lessons Learned
- Can this Happen Elsewhere?

# California Energy Market Situation (Before 1997)

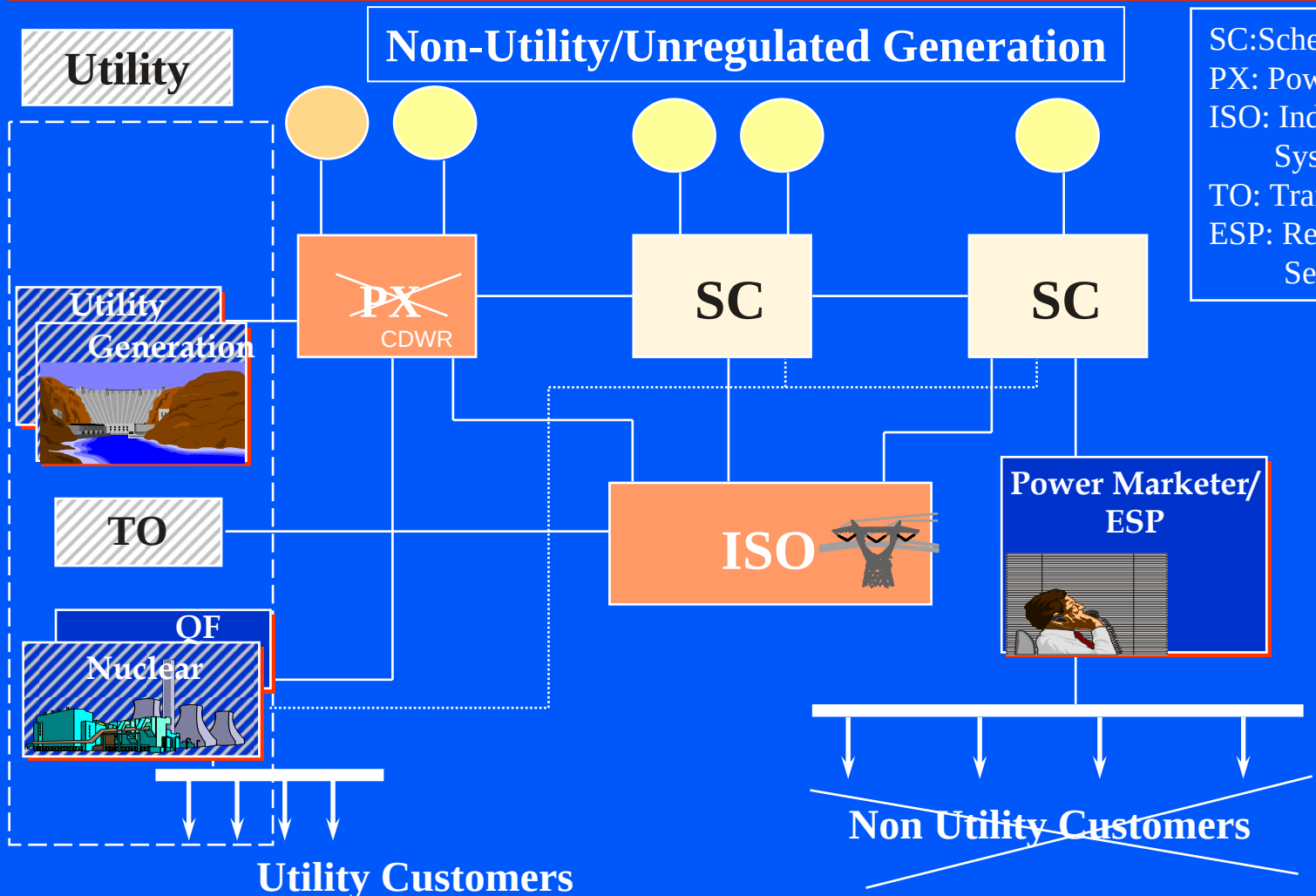



- Net importer of power
- Just recovering from a state wide recession which reduced power demand
- Had not approved a new major generation facility in 8 years
- Had not approved capacity upgrades to any transmission lines in 5 years

# First Market Initiative

- California Public Utility Commission (CPUC) issues Blue Book (April 1994)
- CPUC issues Order on Market Structure (December 20, 1995)
- Law AB1890 passes (September 23, 1996)
- Independent System Operator (ISO) and Power Exchange (PX) become operational on April 1, 1998
- Two years of successful operation on April 1, 2000
- Summer 2000: San Diego customers experience very high wholesale prices

# Market Structure



# Major Market Elements

- ISO/PX Separation
- Divestiture of utility fossil generation
- No long & medium term power contracts for the incumbent utilities allowed
- Utilities mandated to buy/sell from PX
- Retail rate freeze during transition period (could be up to 4 years)
- Incumbent utilities are the suppliers of last resort
- No fuel or wholesale cost adjustments allowed

# Major Market Elements

- Uniform price auctions
- Absence of installed capacity requirement
- Energy markets
  - Multiple Scheduling Coordinators
  - Absence of centralized unit-commitment
- Congestion management (Decentralized self-management of congestion)
  - Zonal model
  - Balanced schedules
  - Iteration for decentralized congestion management
  - Firm Transmission Rights (FTR) Auctions
  - Existing contracts and “phantom” congestion

# Major Market Elements

- Ancillary Services markets
  - Separate and sequential markets
  - Frequent price inversions
  - Two-part bid evaluated by capacity bid alone
- Real-time balancing market
- Reliability Must Run (RMR) Contracts
- Stakeholder governing board
  - Rejected in favor of “independent” board
- Single state jurisdiction

# Reasons for Forcing Utilities to Buy Spot

- Transparent pricing to ensure against self-dealing
- Avoid potential of new stranded costs for default provider
- Encourage independent retailers
  - Customers wanting price hedges should seek them from ESPs
- Wanted to help set establish liquidity in the PX (albeit this did not justify precluding financial hedges)

# Generation Divestiture

| Power Plant | Purchaser | Nameplate Capacity MW | Book Value $million | Sale Price $million |
|---|---|---|---|---|
| Morro Bay, Moss Landing, Oakland | Duke Energy Corp. | 2,881 | 390.2 | 501.0 |
| Contra Costa, Pittsburg, Potrero | Southern Energy | 3,166 | 318.3 | 801.0 |
| Geysers (Sonoma & Lake Counties) | Calpine Corp. | 1,353 | 273.1 | 212.8 |
| | PG&E Subtotal | *7,401* | *981.6* | *1,514.8* |
| Alamitos, Huntington Beach, Redondo Beach | AES Corp. | 4,706 | 224.1 | 781.0 |
| Cool Water, Etiwanda, Ellwood, Mandalay, Ormond Beach | Houston Industries | 4,019 | 288.3 | 277.0 |
| El Segundo, Long Beach | NRG Energy and Destec | 1,583 | 168.8 | 116.6 |
| San Bernadino, Highgrove | Thermo Ecotek | 300 | (4.3) | 9.5 |
| | SCE Subtotal | *10,607* | *676.9* | *1,184.1* |
| Encina, Kearny, and other Peakers | NRG Energy and Dynegy | 1,347 | 94.8 | 365.0 |
| South Bay | San Diego Unified Port District | 833 | 64.4 | 110.0 |
| | SDG&E Subtotal | *2,180* | *159.2* | *475.0* |
| | ***Total*** | ***20,187*** | ***1,818*** | ***3,174*** |

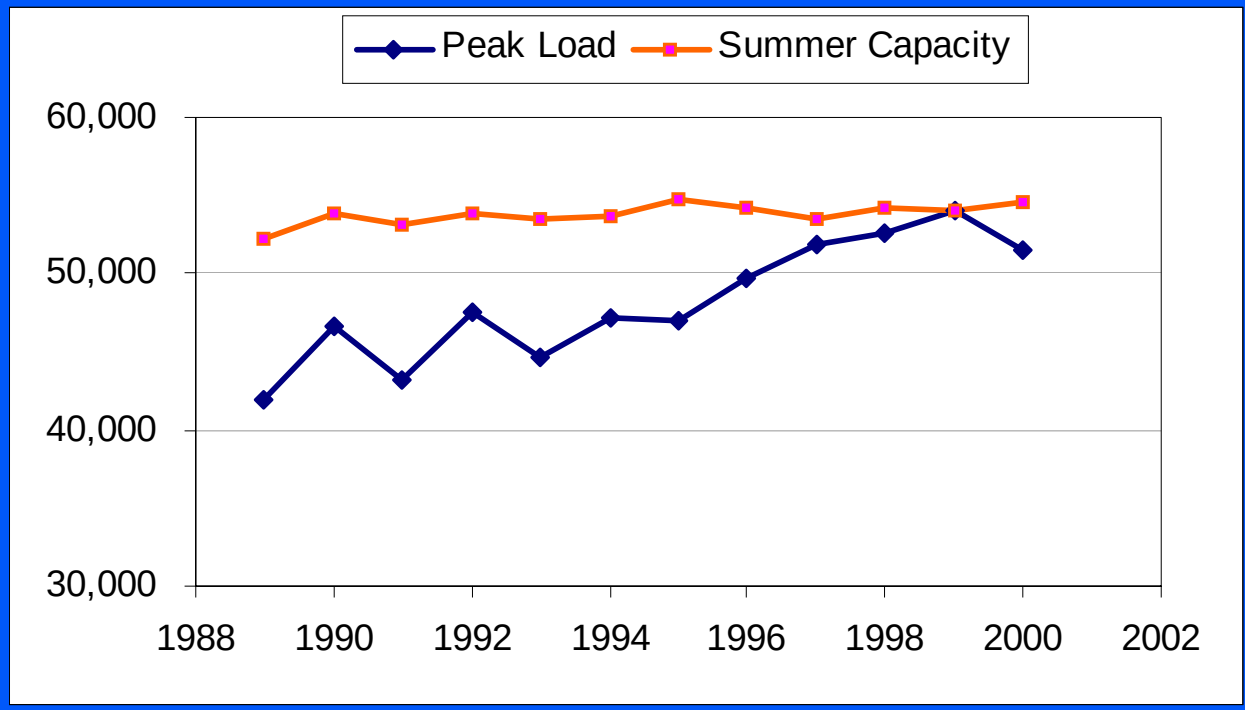
# Our Original Concerns about the Market Design

- Does it make sense to separate the PX from the ISO?
- Is Locational Marginal Pricing (LMP) better than zonal congestion management after all?
- Are single state ISOs more amenable to political interference?
- Do sequential auctions for Energy and Ancillary Services perform well?
- Do balanced schedules ensure decentralized self-management of congestion?
- Should uniform price auctions be abandoned in power markets?
- Are price caps necessary?
- Are independent governing boards better than stakeholder boards?

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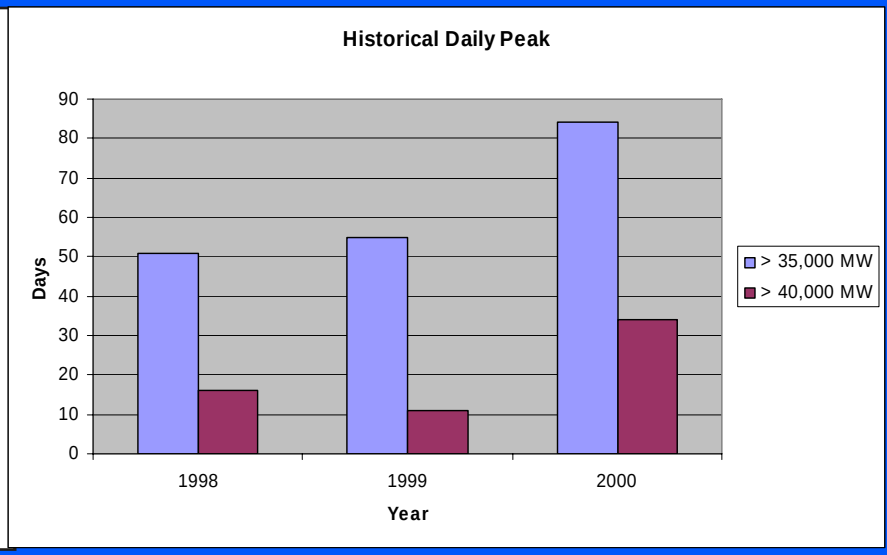
# Load Growth in California



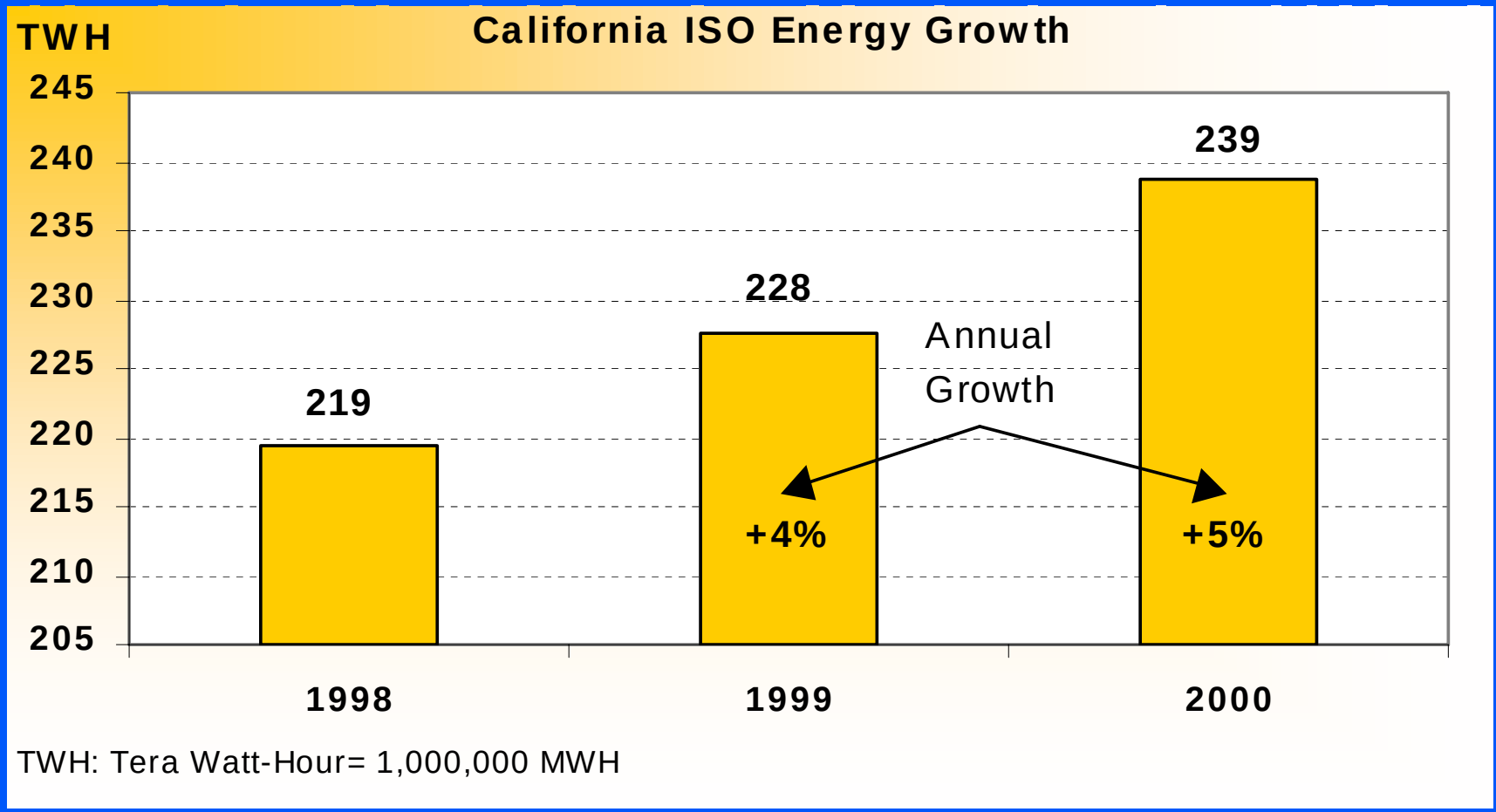
# Load Growth in California

- Annual load growth has been more than 1000 MW per year with only a small amount of new generation built in the 90's
- Energy consumption is also growing so the existing plants have to run many more hours at full load to meet the demand

| Historical Daily Peak | | | |
|---|---|---|---|
| (Number of days Load exceeds threshold value) | | | |
| Load | **1998** | **1999** | **2000** |
| > 35,000 MW | 51 | 55 | 84 |
| > 40,000 MW | 16 | 11 | 34 |

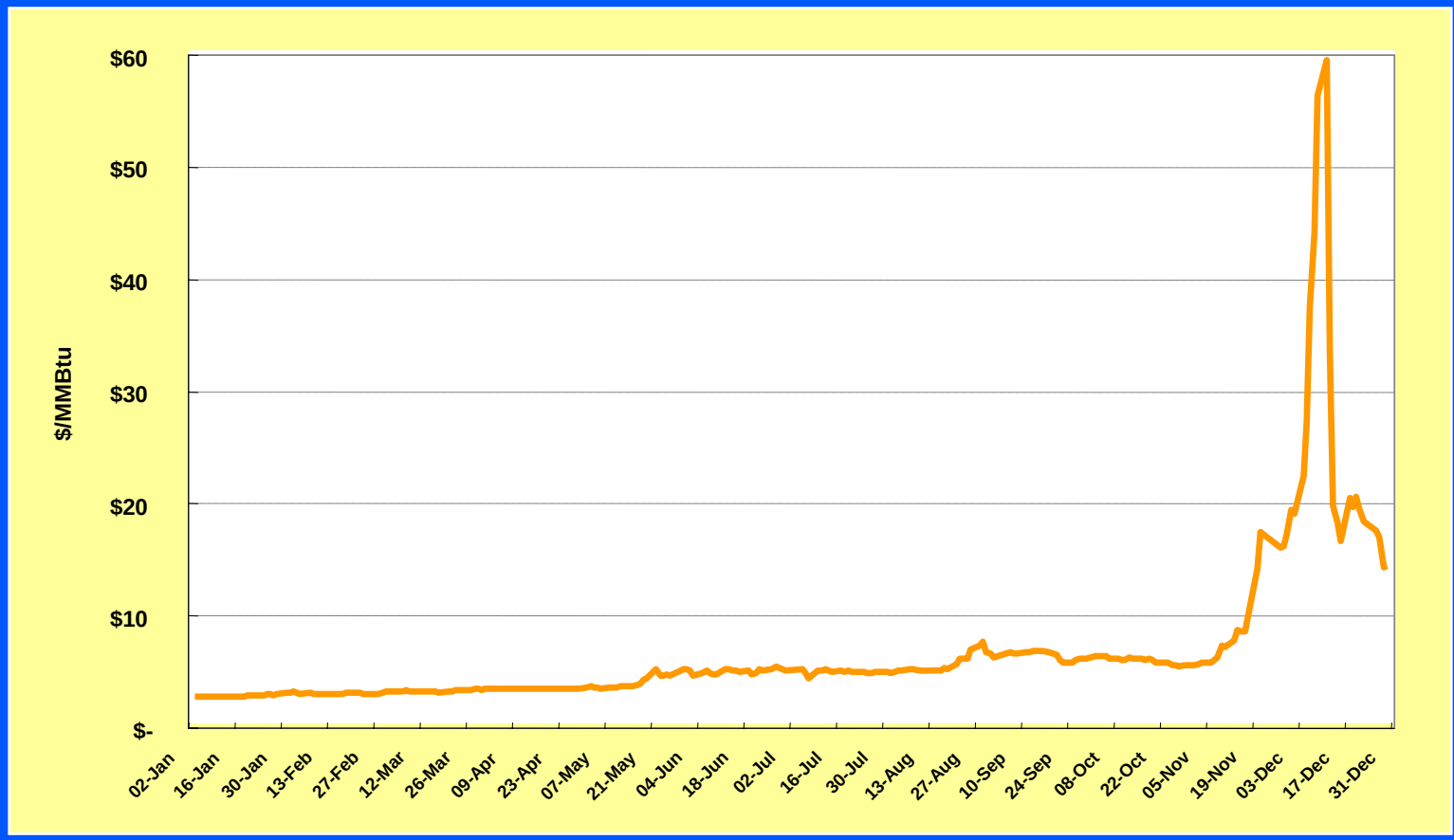


# Growth in Energy Consumption

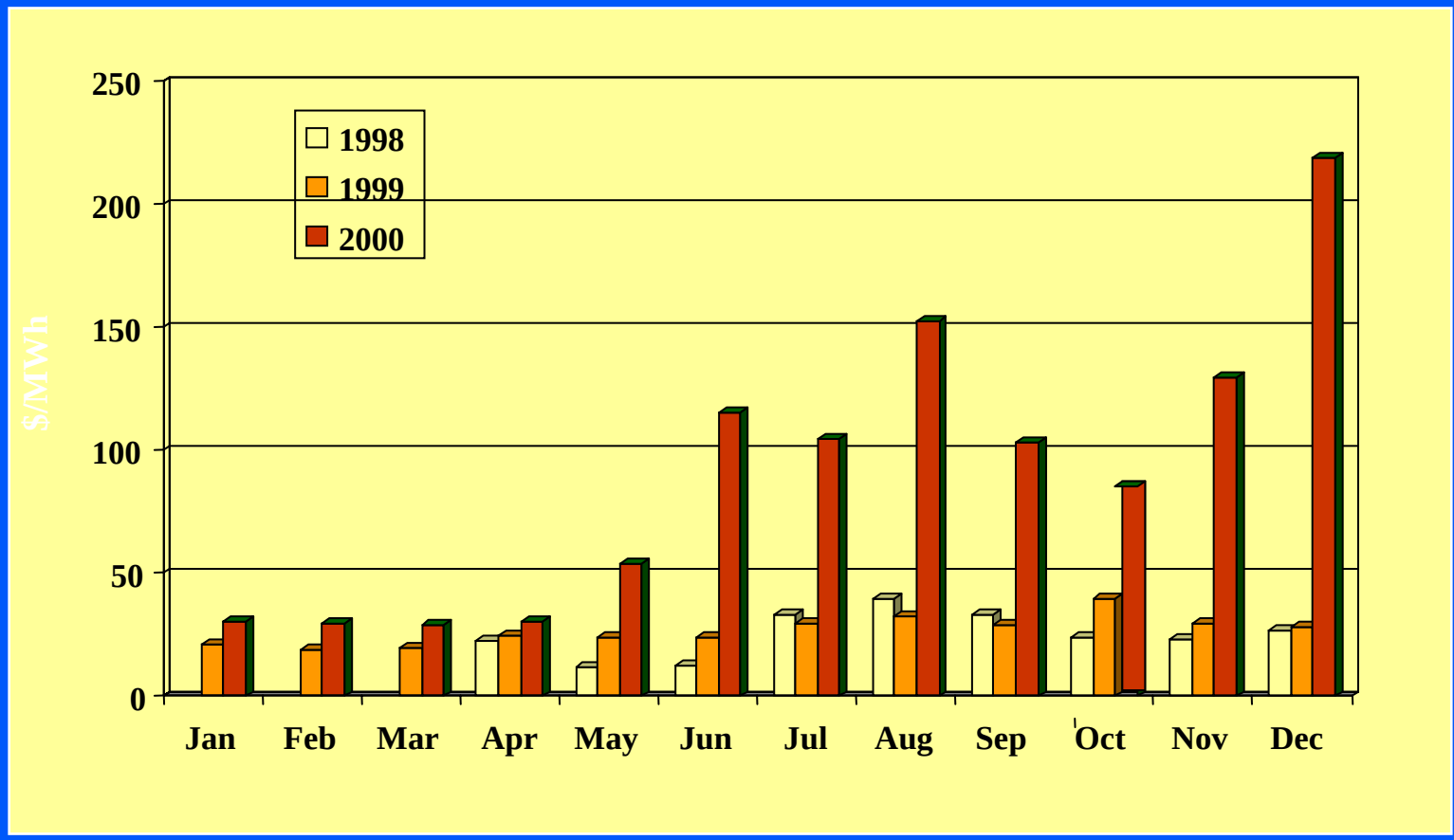



TWH: Tera Watt-Hour= 1,000,000 MWH

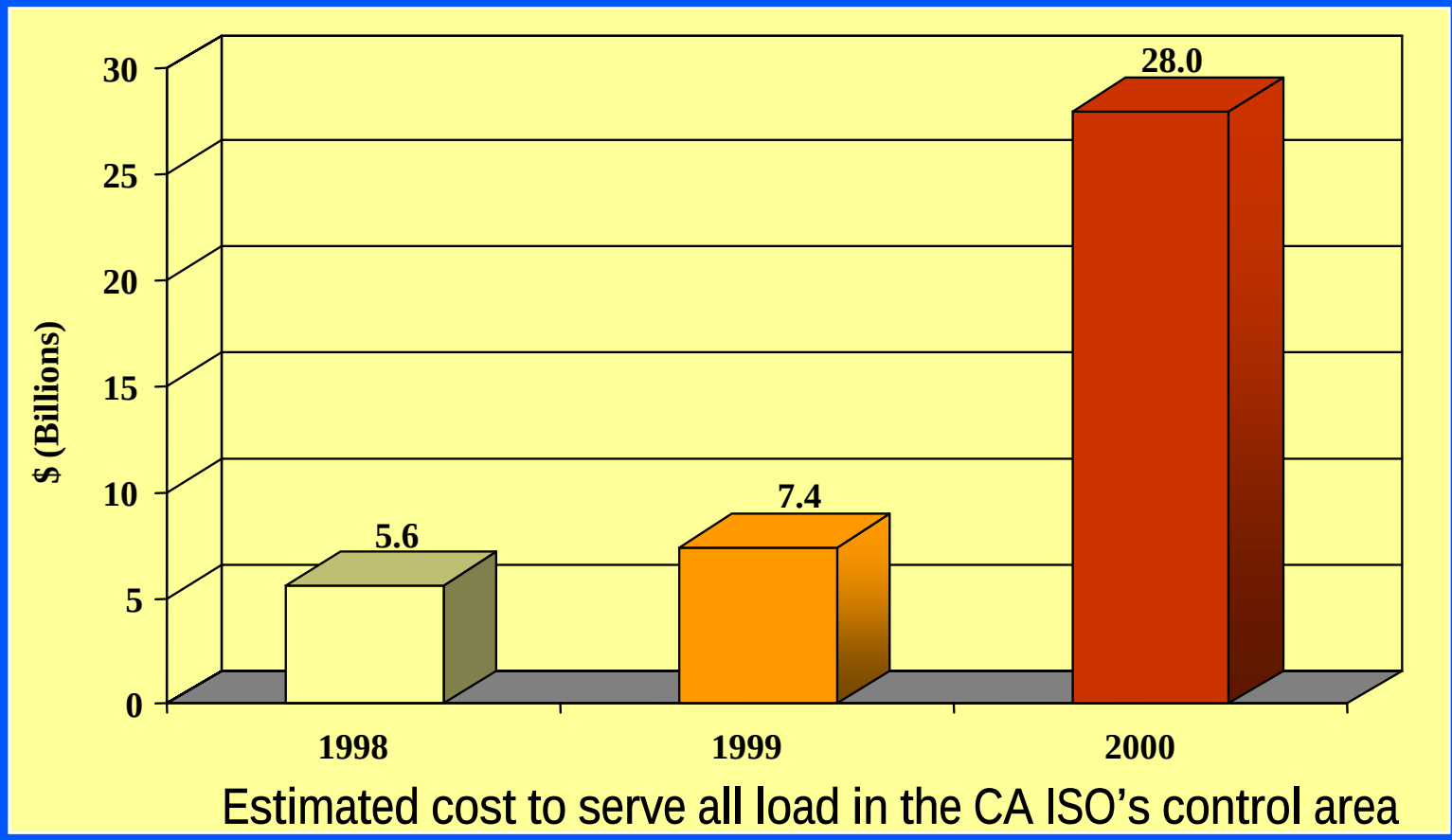
# Natural Gas Prices in 2000



# Average California PX Day-Ahead Prices



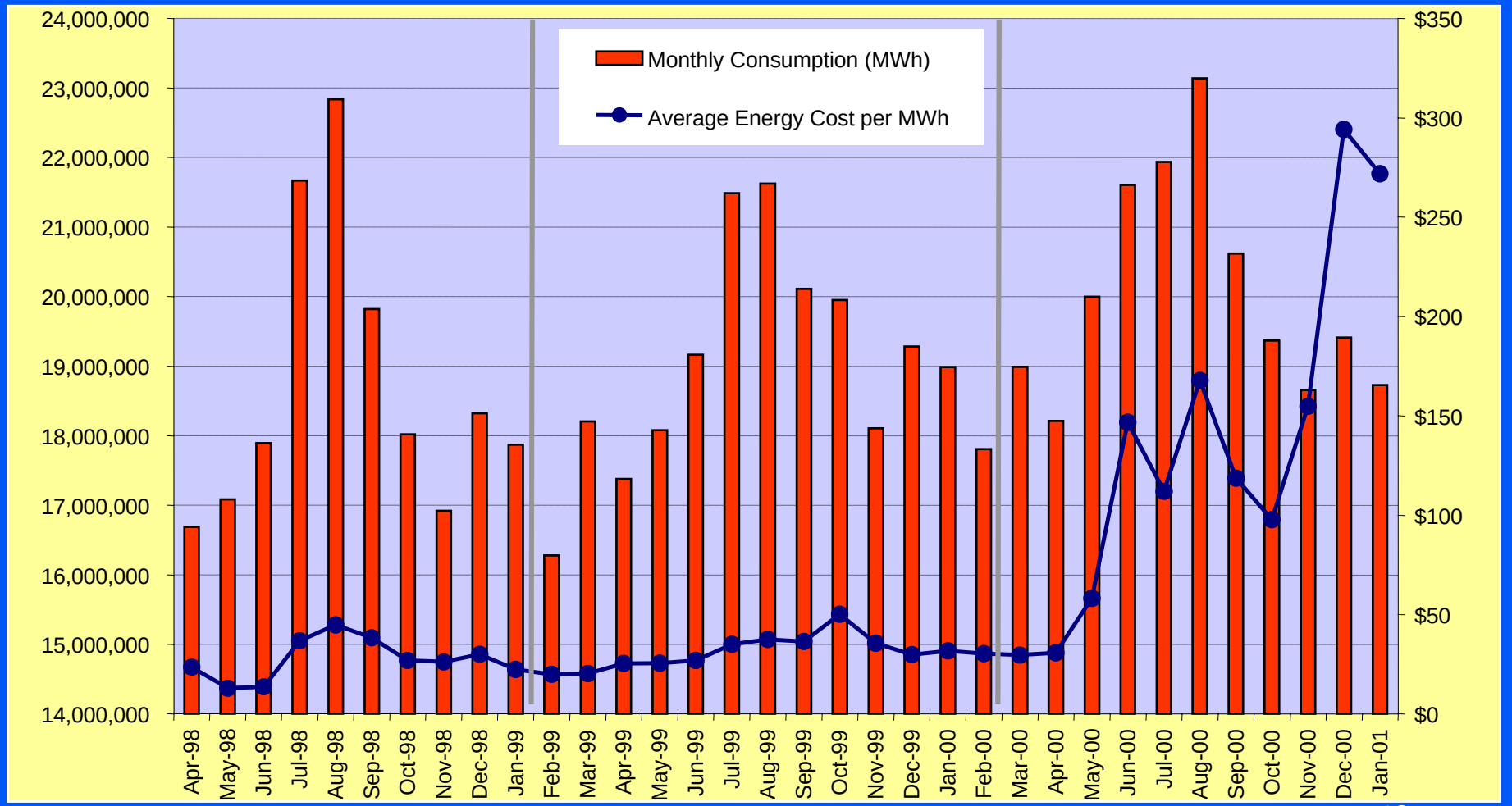
# Total Energy and Ancillary Services Cost



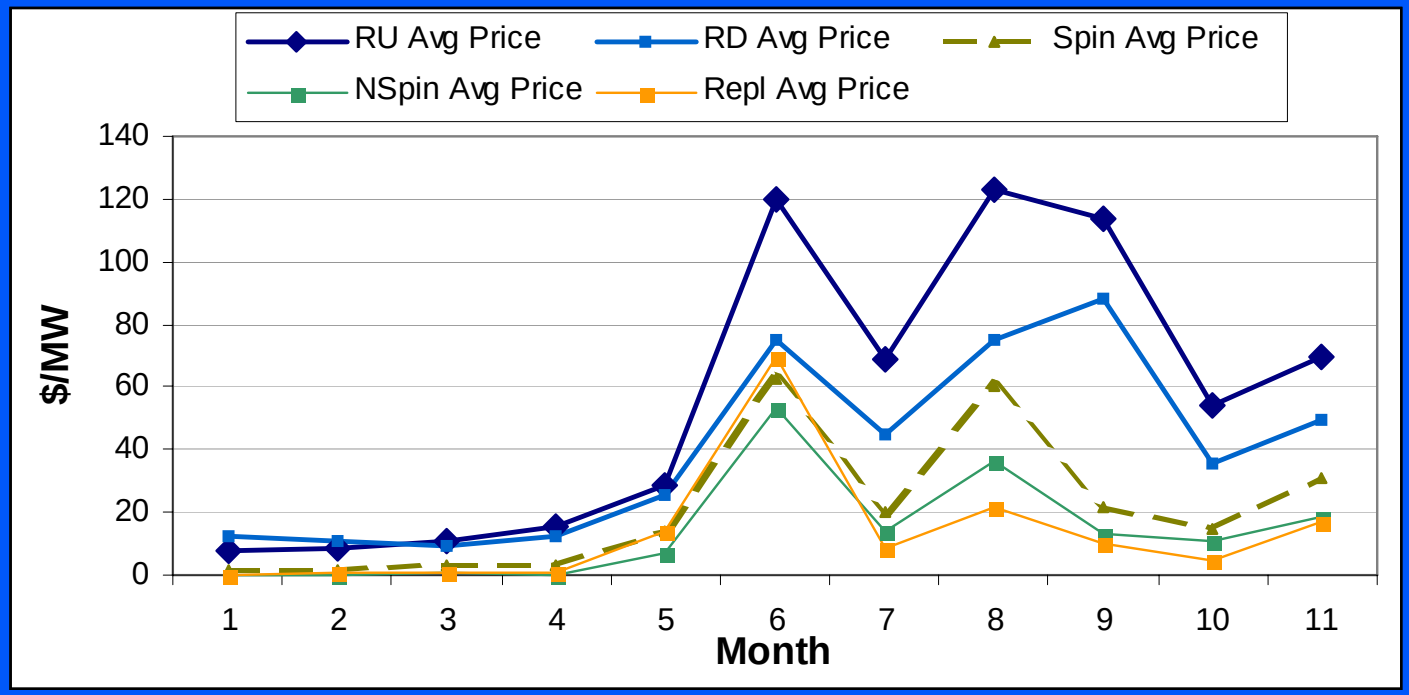

Estimated cost to serve all load in the CA ISO's control area

Source: ISO Board material, January 2001

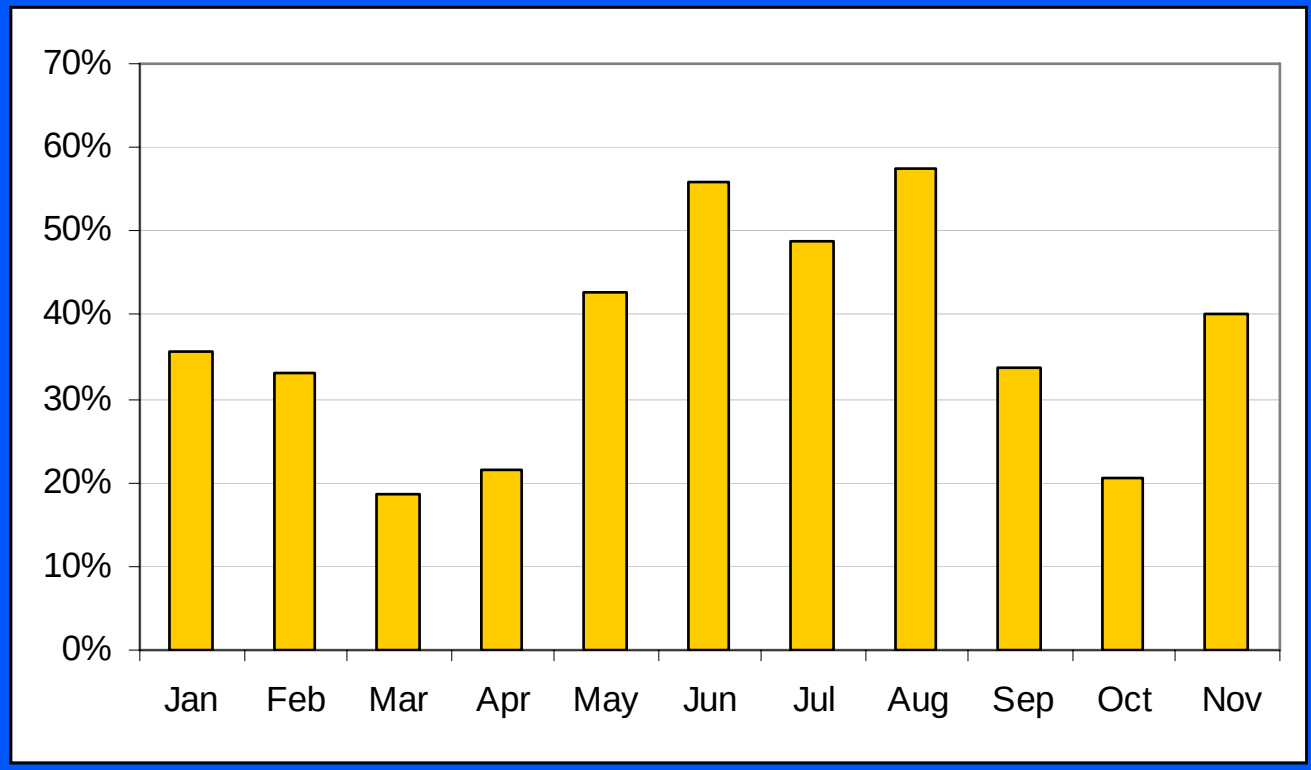
# Monthly Load and Price Trends (April 1998 to December 2000)



# NP15 A/S Prices (2000)

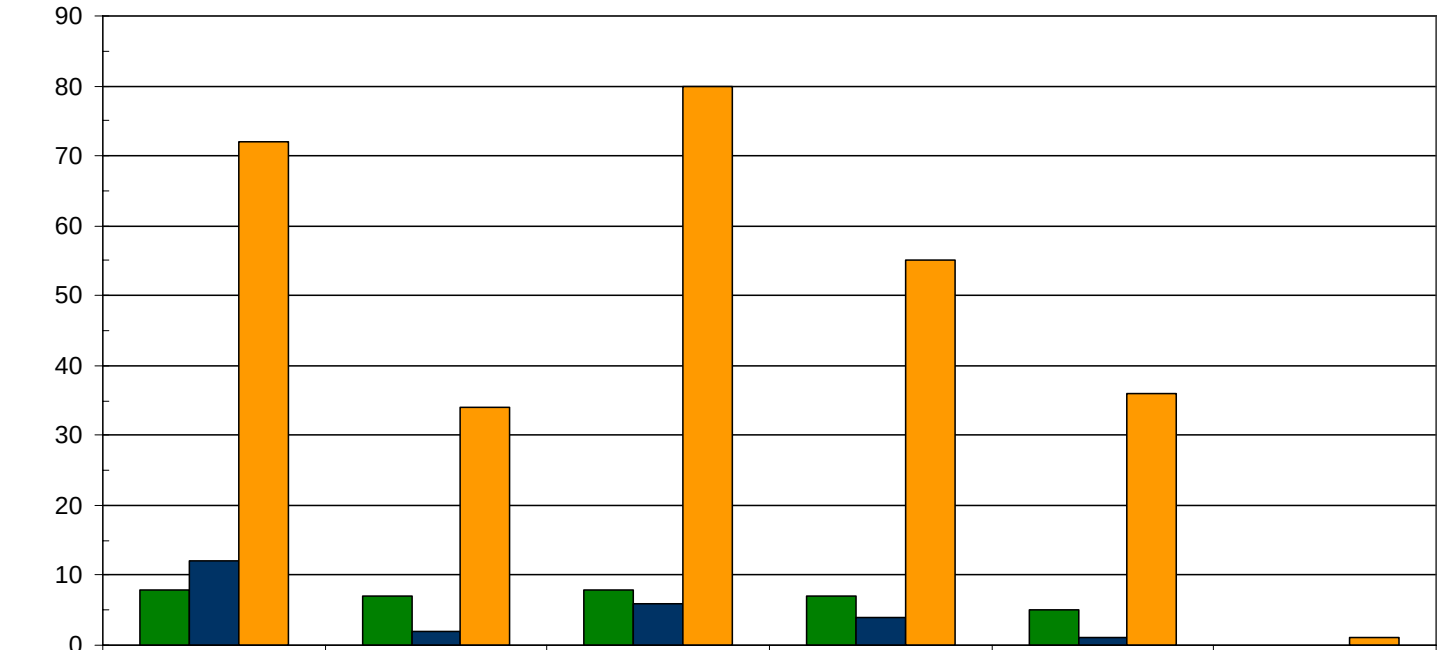


# NP15 A/S Price Reversal Frequency in 2000



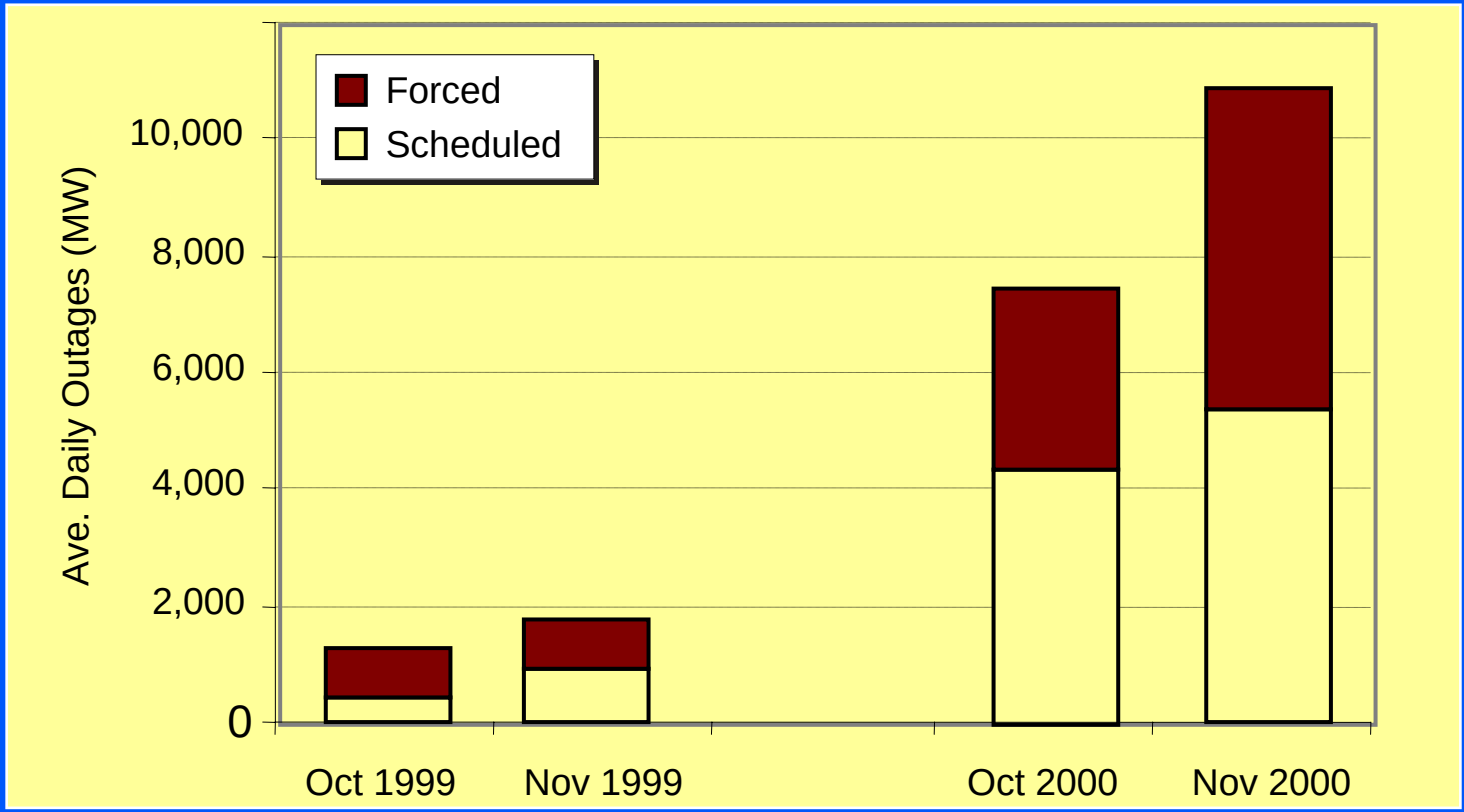

If Reg = 4, Spin = 3, Non-spin = 2, Repl. Res = 1,
a price reversal occurs if Price_i > Price_j for i < j where i,j denote the type of A/S

# Alerts, Warnings, and Emergencies




| | No Touch | Alert | Warning | Stage 1 Emergency | Stage 2 Emergency | Stage 3 Emergency |
|---|---|---|---|---|---|---|
| 1998 | 8 | 7 | 8 | 7 | 5 | 0 |
| 1999 | 12 | 2 | 6 | 4 | 1 | 0 |
| 2000 | 72 | 34 | 80 | 55 | 36 | 1 |

# Capacity Outages

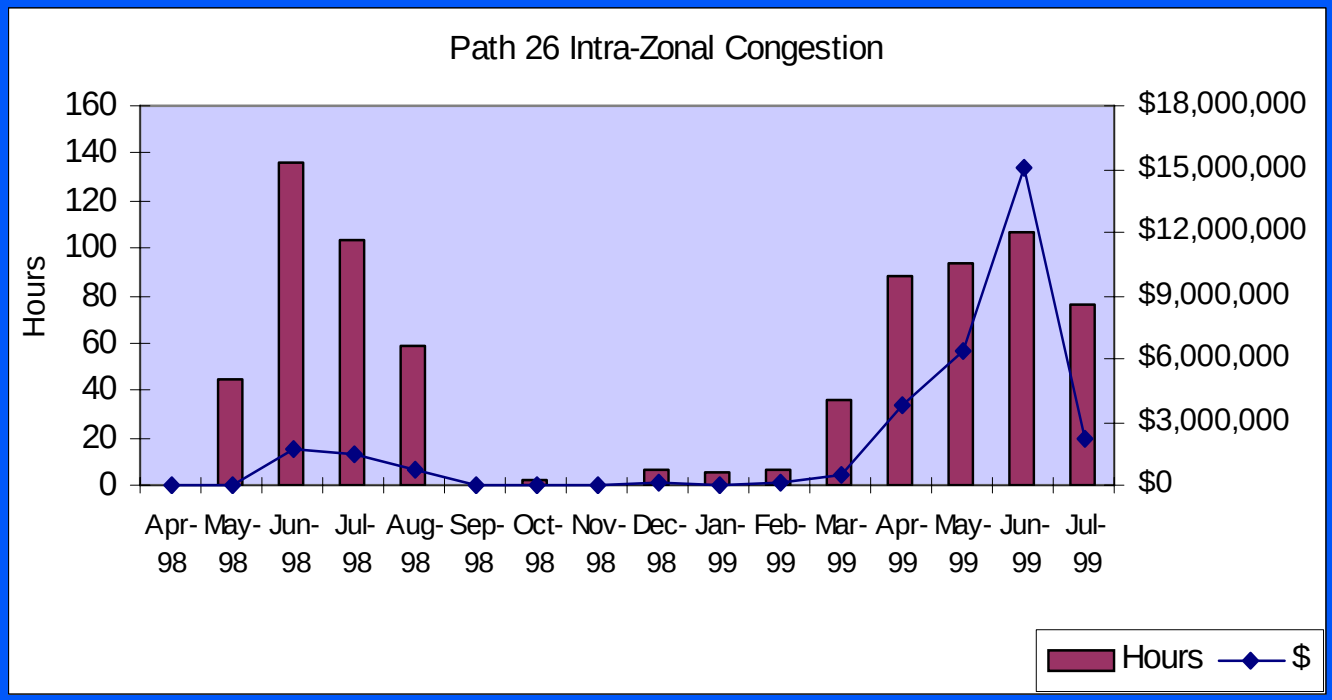



- October 2000 total outages (MW) are 4 times higher than October 1999
- November 2000 total outages (MW) are 5 times higher than November 1999

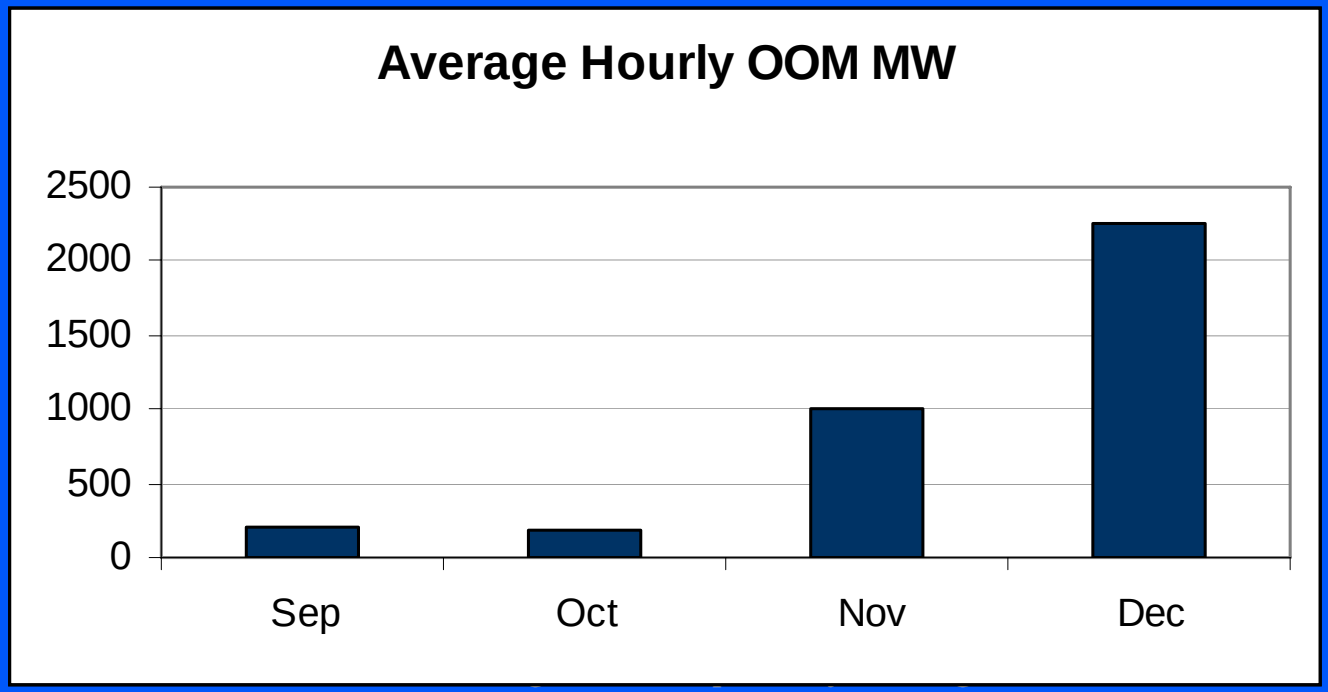
Source: “Market Analysis Report” by the ISO on December 1, 2000

# Intra-Zonal Costs in Southern California (SP15)

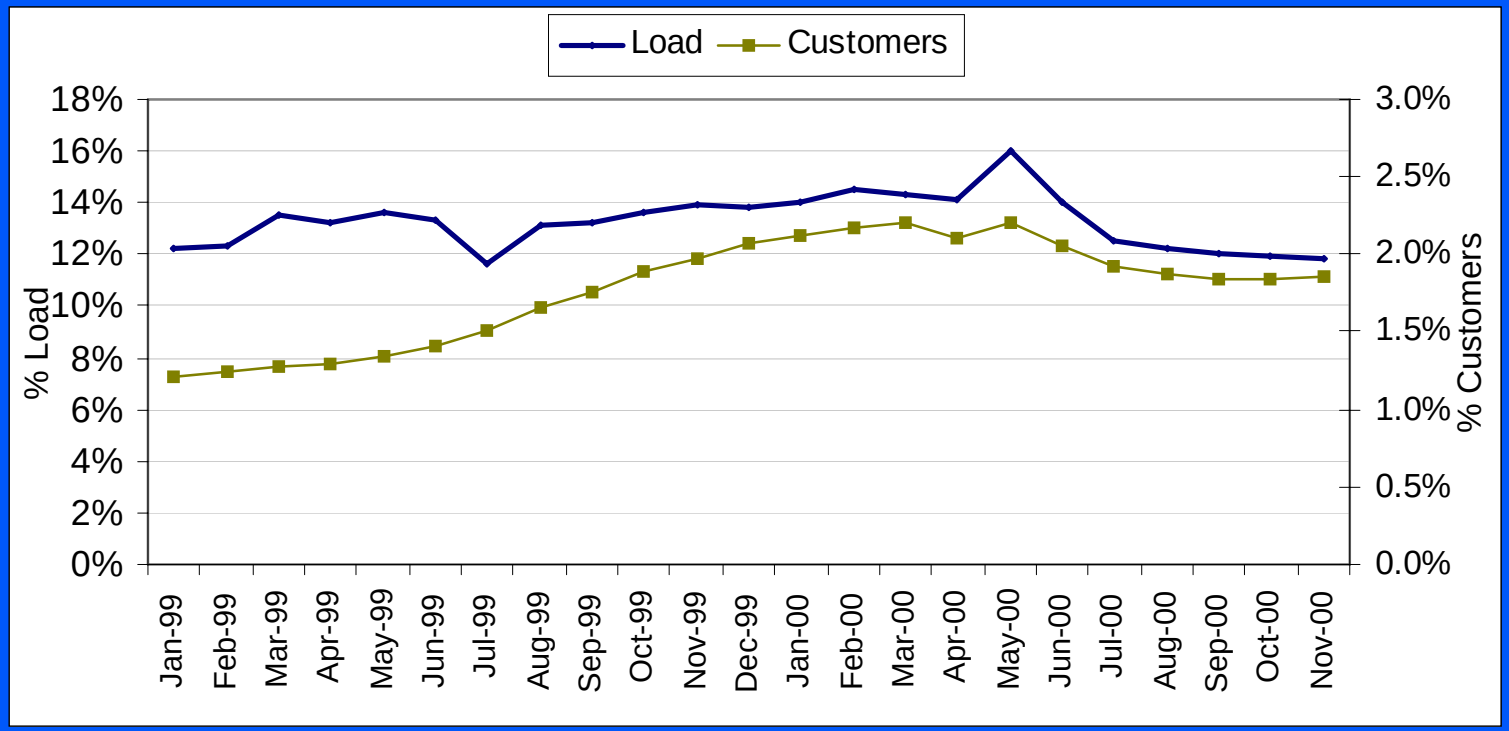
Intra-zonal congestion costs on Path 26 exceeded the threshold to trigger the creation on a new zone ZP26



# ISO Out-of-Market (OOM) Purchases (2000)



# Retail Customer Switching in California




Recently enacted AB1X State Law suspends retail competition indefinitely

# FERC's 11/1/2000 Report

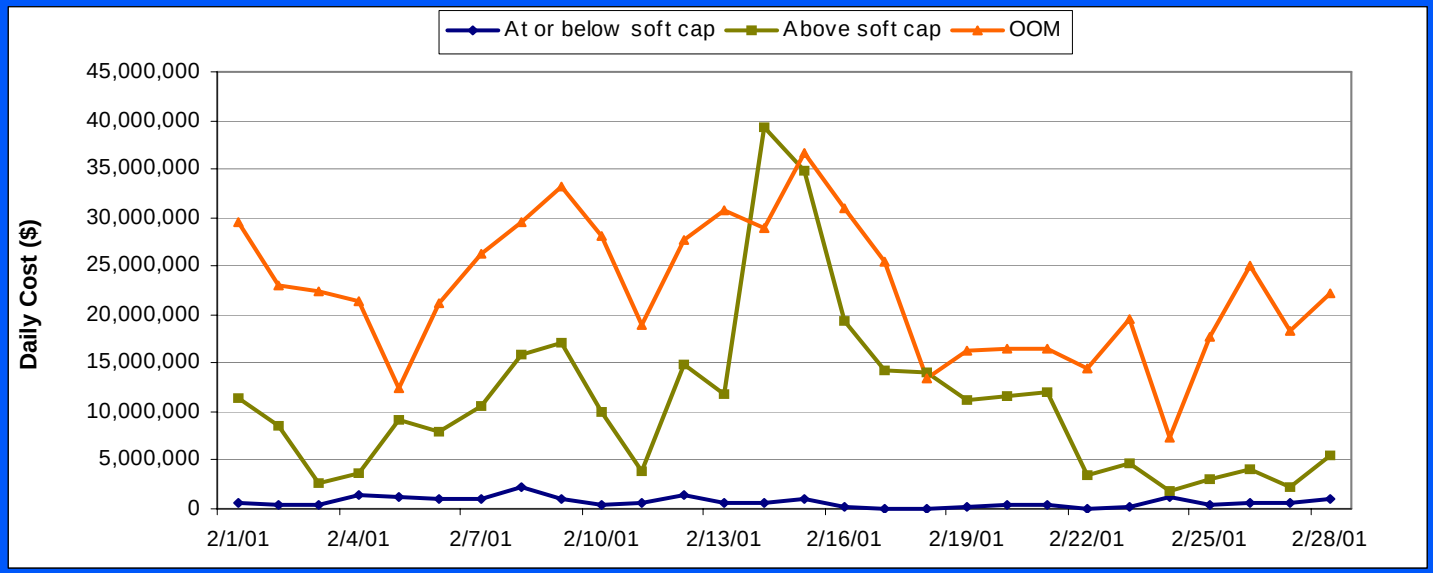
- California market is "seriously flawed"
- Rates have been "unjust and unreasonable"
- "California market structure and rules provide the opportunity for sellers to exercise market power when supply is tight"
- Insufficient study to determine the exercise of market power by individual sellers

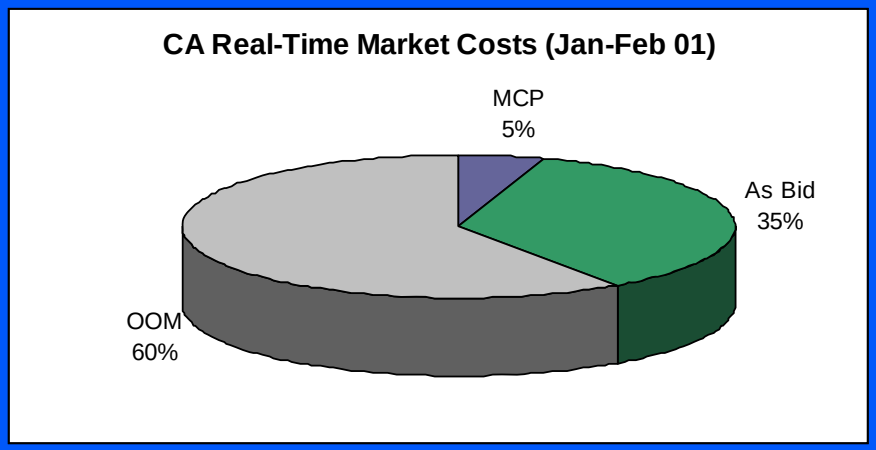
# FERC's 11/1/2000 Order

- Eliminate stakeholder boards
- Eliminate requirements for utilities to buy from the PX
- 150 $/MWh "soft cap"
- 100 $/MWh penalty for underscheduling load by more than 5 percent

Balanced Schedules "*We are also concerned that some of the underscheduling problems may be a result of the existence of many individual scheduling coordinators that are required to submit balanced schedules to the ISO. We therefore direct the ISO and the PX to pursue establishing an integrated day ahead market in which all demand and supply bids are addressed in one venue.*"

# "Soft" Caps and Rising Uplifts




Total Cost = $1,721,557,841

MCP = $84,451,350
*average price: 149 $/MWh*

As Bid = $608,300,507
*average price: 360 $/MWh*

OOM = $1,028,805,984
*average price: 323 $/MWh*

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# Root Causes of the California Energy Crisis

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6. Market Power

5. De-linking Wholesale from Retail Prices

4. Insufficient Forward Contracting

3. Inadequate Demand Responsiveness to Hourly Prices (Wholesale/Retail)

2. Insufficient Transmission Capacity

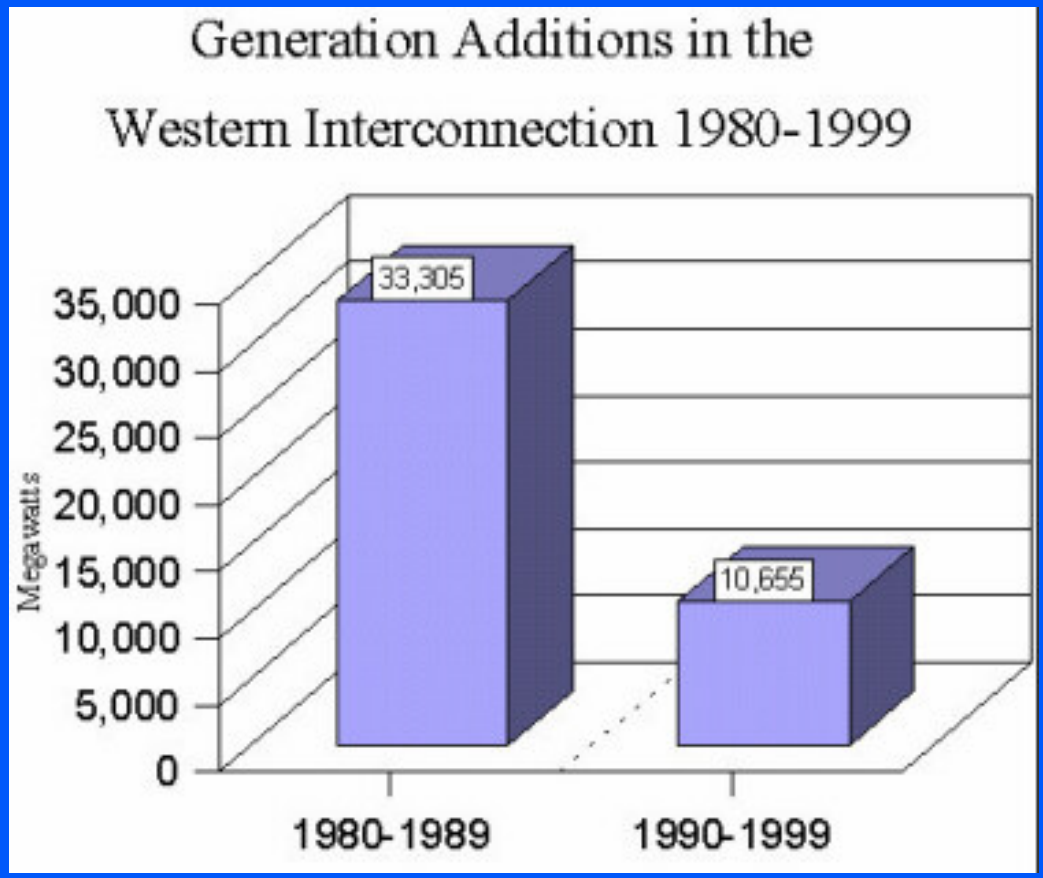
1. Inadequate Generation Supply



# Inadequate Generation Supply

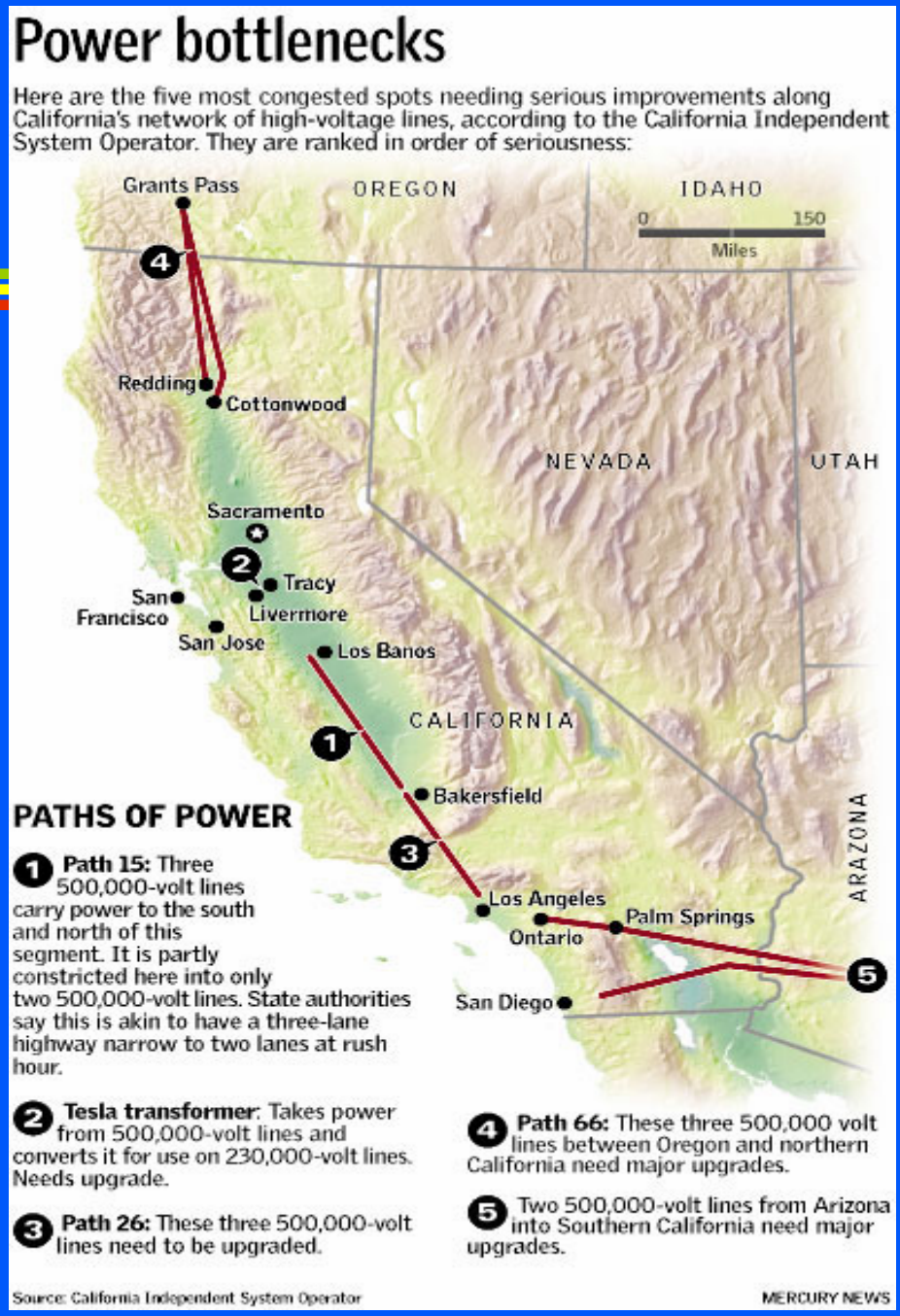
- No new large plants built for over 10 years
- Outages on existing plants have jumped from historical average of 7% to between 15% to 30% (varies by plant)
- CAISO contracted with suppliers for 1,200 MW of new peaking capacity for Summer 2001
- Need expedited siting and incentives for prompt construction
- Imports from out-of-state are rapidly declining

# Generation Additions - Western Interconnection



# Insufficient Transmission

- Path 15 limits flows from south to north which contributes to power shortages in Northern California
- 122 upgrade projects representing an investment of over $1 Billion have been approved by CAISO
- Long-term grid planning process and transmission infrastructure upgrades are vital to a reliable electric system for the State



# Inadequate Demand Responsiveness (to Hourly Prices)

- Same rates for on-peak and off-peak usage do not provide a financial incentive for customers to change their usage patterns
- Need to create programs for financing and installing hourly meters for consumers, to enhance responsiveness to variation in hourly prices
- Expand voluntary load reduction programs
- Expand energy efficiency incentives and education programs
- Support energy conservation programs

# Insufficient Forward Contracting

- Reduce the customers exposure to volatile wholesale energy prices through long-term forward contracting
- Create incentives and financial assurances for Utilities and generation owners to forward contract, to cover 80% to 90% of anticipated load.
- Recommend that Buyers and Sellers hedge their risks of price volatility by signing contracts of varying duration (3 months to 5 years)

# De-Linking Wholesale from Retail Prices

- The Law required that customers who remain under the three incumbent utilities, Pacific Gas and Electric, Southern California Edison and San Diego Gas and Electric retail levels were frozen to levels 10 % below 1996 levels until the incumbent utilities recover their “stranded costs” (i.e. the difference of book value and market value of the generating assets) or March 2002 whichever occurred first

# De-Linking Wholesale from Retail Prices

- The stranded costs were estimated to be $ 28 Billion
- The major assumption in this design was that PX/ISO prices will continue to drop, therefore creating enough revenues to cover the stranded costs
- During the crisis, as we have seen, the wholesale prices increased substantially and exceeded the retail prices; all utilities were losing money
- At the peak of the crisis PG&E was loosing $1 Mission an hour

# De-Linking Wholesale from Retail Prices




- This was the key factors that led to the insolvency of Pacific Gas and Electric company
- Key Lesson: Politicians should never allow this condition, even for the short term; under these conditions the credit rating of the companies can deteriorate rapidly, force them to borrow at much higher rates and it will become difficult to impossible to find partners to buy energy
- Summary: One sided competition is a very serious condition that if unchecked can lead to a financial disaster that in turn can lead to security and reliability nightmare

# Market Power

- Two ways were used to exercise market power: economic withholding and physical withholding
- Economic withholding
  - Submit bids at prices much higher producer's marginal cost
  - Most often observed in CA ISO real time market
- Physical withholding
  - Restrict output or withhold capacity from bidding into market
  - Most serious problem in period of tight supply

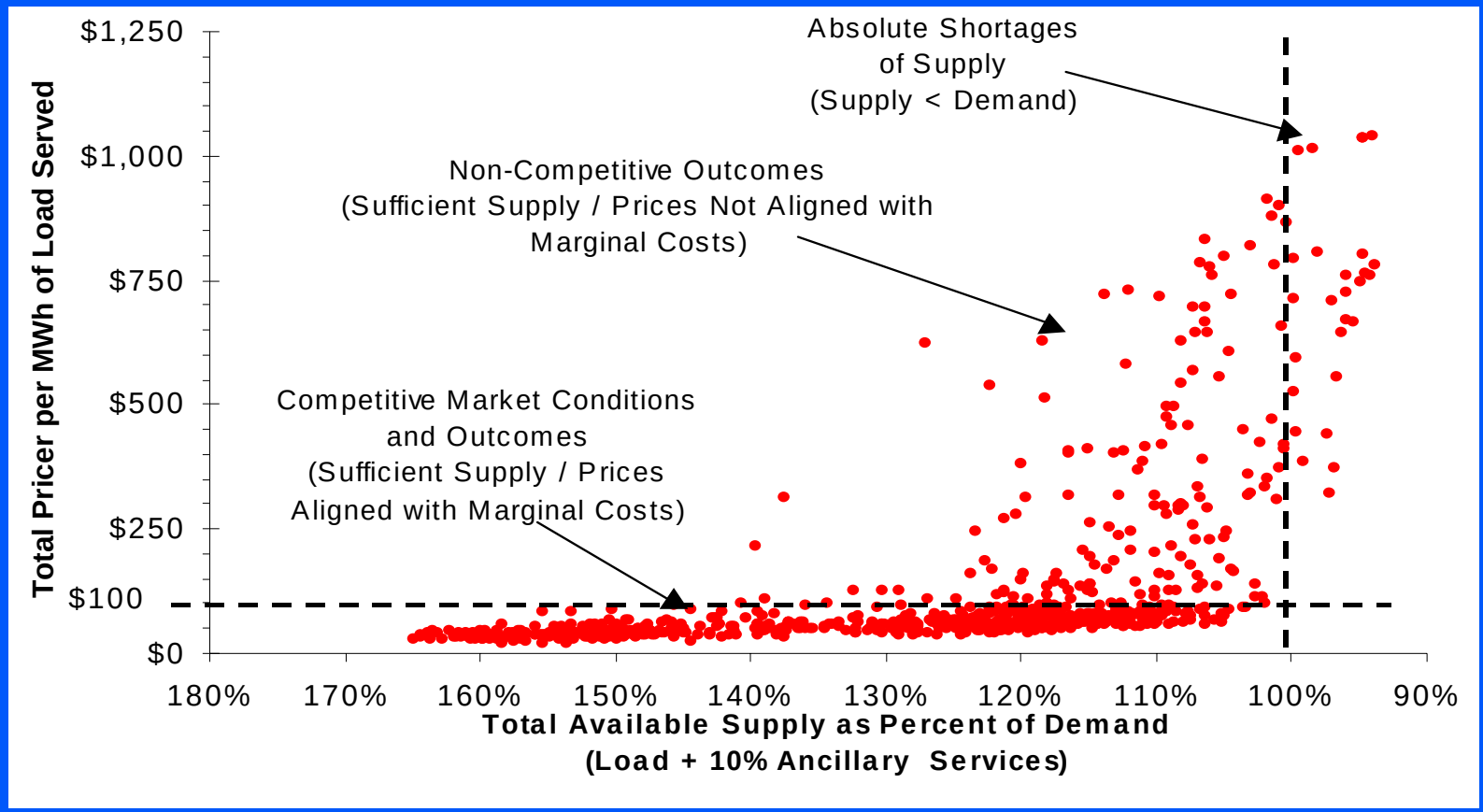
# Market Power

- Practical monitoring index: Price-cost mark-up — market clearing price above system marginal cost
- Market share criteria are static and does not reflect the dynamics in power market, where supply and demand condition fluctuate from hour to hour. while some hours may be competitive, others are not
- Market share criteria fail completely when there is shortage in the market; e.g. when supply margin is less than 5%, a supplier with 5% market share can demand extremely high prices
- With demand growth, low hydro availability and dramatically reduced imports, supply margins fell  below 10% and often down to zero; this allowed suppliers to be pivotal in setting prices; therefore market power became excessive and sustained in most hours

# Market Power

- Astronomical mark-up : Approximately $8 billion for 12 months from May 2000 to May 2001 in PX/ISO markets
- Estimated mark-up is enough money to pay for 13,000 MW of new power plants
- Variable profits are multiples of fixed revenue requirement for power plants

# Scarcity or Market Power?




* Source: *Report on California Energy Market Issues and Performance: May-June*, 2000, Prepared by the Department of Market Analysis, August 10, 2000

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# Significant Contributing Factors

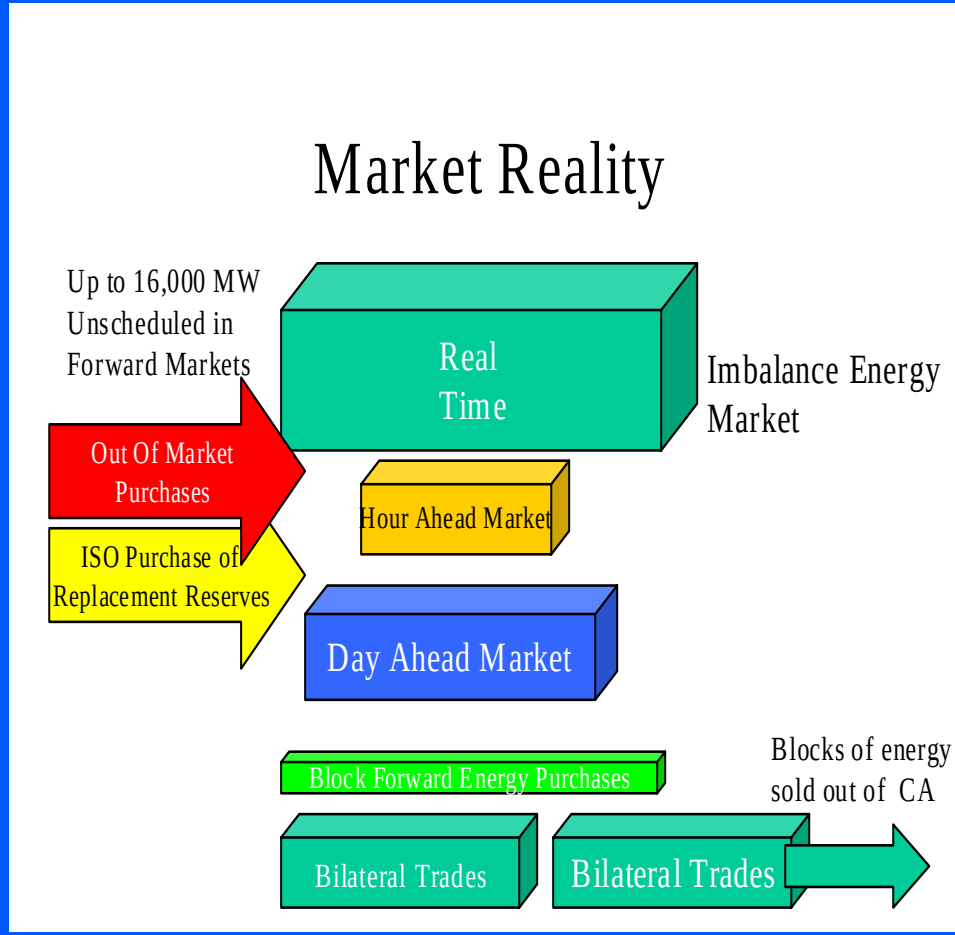
- Assumption that competition would automatically lower prices (that led to the wrong incentives and market rules)
- Complacency, uncertainty and regulation deterred construction of new generation and transmission
- Rest of West assumed to be in perpetual surplus
- California Energy Commission (CEC) process required at least 2 year for major projects -- key re-powering projects rejected or delayed
- Assumptions that gas would always be cheap were wrong; total reliance on gas as the fuel for new generation is wrong

# Significant Contributing Factors

- High level of capacity unavailable due to scheduled maintenance and forced outages
- Low hydro and imports
- High spot market gas prices/NOx emissions costs
- High NOx emissions costs for some units
- Flawed market structure and misplaced incentives
  - Mandatory utility purchases from PX, combined with PX bidding structure, drove prices unreasonably high
- Most customers don't see price signals; if so, delayed by weeks

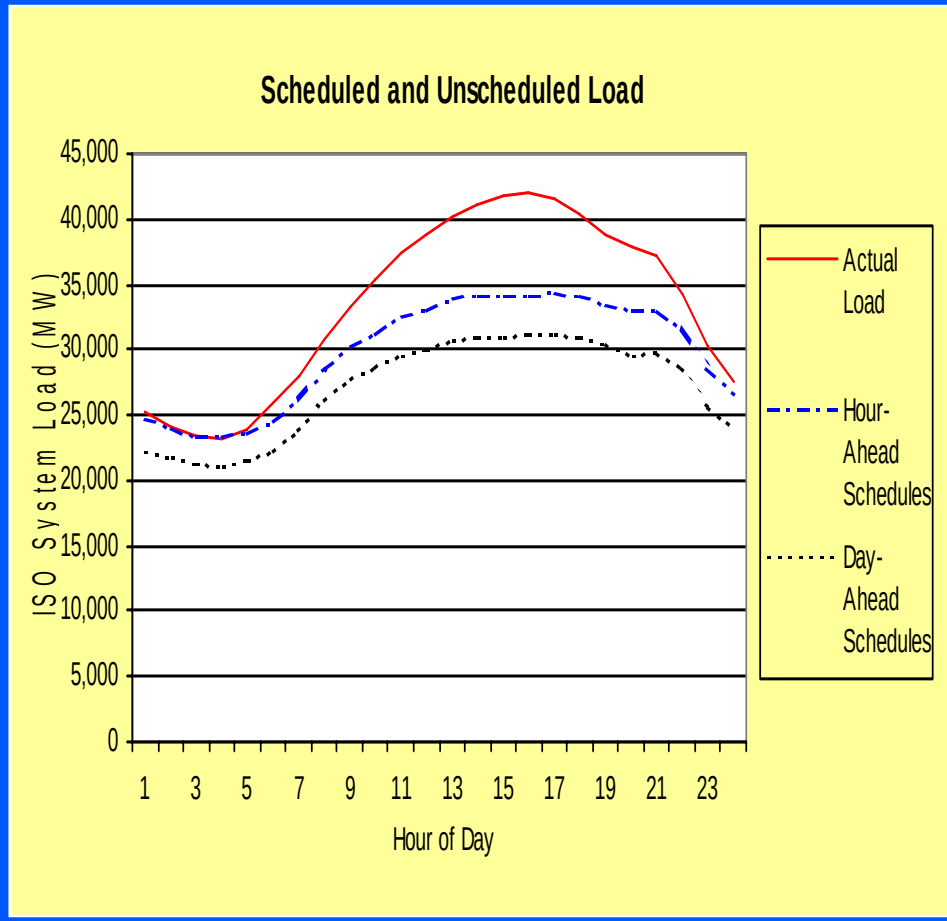
# Significant Contributing Factors

- Under-Scheduling in Forward Markets
- Lesson 1: Institute requirement for Participants to schedule 95% of their expected load and equal quantities of generation in the forward markets
- Lesson 2: Ensure schedule feasibility through redesign of congestion management markets. This means move to a nodal market with full transmission representation in the market clearing



# Significant Contributing Factors

- Shortfall from Under-Scheduling
- Average under-scheduling at Hour 16: 5,170 MW all days in August, 2000
- 6,200 MW peak days in May - Sept.
- Unscheduled load as high as 13,052 MW after DA market, 9,852 after HA
- Result: $104 million net cost of Out-of-Market real-time energy purchases (May - Aug 2000)

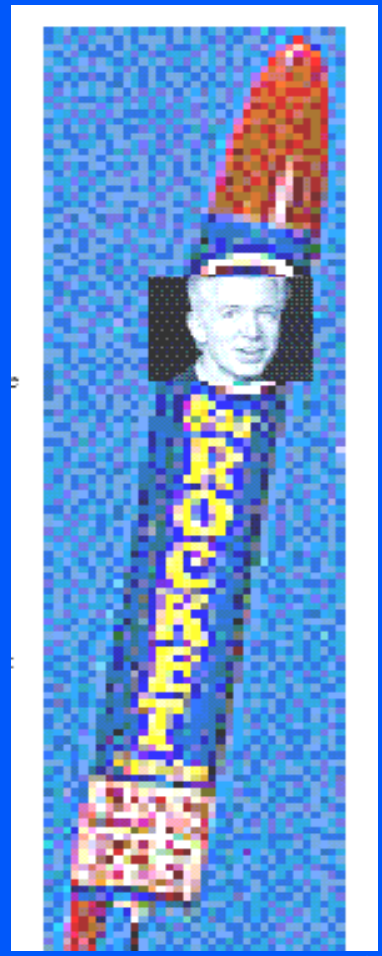


# Significant Contributing Factors

- The Energy Crisis in California is recorded in history as a political failure mainly, NOT a market failure!!!!
- Failure of politicians and public officials to address problems in Autumn 2000 (to avoid political costs) has contributed directly to the energy market meltdown
- Lack of timely response by utilities due to asymmetric incentives

# Significant Contributing Factors

- Politicians played the Blame Game: "Anywhere they wear cowboy hats, they probably have handkerchiefs across their face, because they are robbing us blind," [Maviglio] said. "The bad guys are clearly the out-of-state generators."



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# Measuring the Crisis

- March 31, 1998 – California energy market opens
- July 1999 -- Customers of the Sempra Energy, Unit of San Diego Gas and Electric, becomes the first in the nation to pay free market prices without a safety net after price freeze lifted; Rates remain frozen for customers of the state's two other investor-owned utilities
- Late spring 2000 - Wholesale power prices start to soar as supplies struggle to keep pace with surging demand linked to a buoyant economy
- June 2000 - San Diego customers get a harsh free market lesson when higher wholesale power prices triple their rates
- June, 2000 -- Power prices on the PX set a new on-peak average record of $474.53/MWh as rolling blackouts plagued the Bay Area

# Measuring the Crisis

- June 14, 2000 - A localized series of blackouts is ordered in the San Francisco Bay Area due to a power shortage; California lurches through a series of power emergencies during the summer amid soaring demand for air conditioning during heat waves
- July, 2000 -- Electric bills for June usage reach SDG&E customers; prices doubled in one month; The CA ISO imposes $500/MWh cap
- August, 2000 -- Underscheduling by utilities reaches roughly one-third of total daily load; The CA ISO reduces cap to $250/MWh
- Sept. 6, 2000 – California Governor Gray Davis signs into law a rate cap for San Diego Gas and Electric customers after public outcry
- October, 2000 -- Utilities and others start to ring the alarm bells about market dysfunction and growing debt burden; credit quality concerns with Credit Agencies begin to arise

# Measuring the Crisis

- November, 2000 -- Utilities seek emergency rate increases; inaction by State officials; credit quality issues create reluctance by generators and marketers to sell to California utilities
- Nov. 17 - SoCal Edison files with state regulators to raise customers rates by 9.9 percent, effective January 1, 2001, to help recover billions of dollars in uncollected power costs
- Nov. 22 - PG&E files to raise rates by 16.5 percent, effective January 1, 2001
- Nov. 29 - Consumers file a $1 billion class action lawsuit accusing 14 energy companies of manipulating prices
- December, 2000 -- Utilities warn of bankruptcies; Rolling blackouts and daily Stage 3 alerts; Prices soar over $1000 per MWh in first half of month

# Measuring the Crisis

- Dec. 4 - California utilities ask consumers to refrain from turning on Christmas lights until after 8 p.m. to save power
- Dec. 7 - The CA ISO issues its first ever highest-level Stage 3 alert, but rolling blackouts across the state are narrowly averted after the Clinton Administration takes emergency action to boost power supplies
- Dec. 13 - The Clinton administration takes rare action of invoking emergency powers to prevent blackouts in California after a dozen of power generators refuse to sell electricity to state utilities due to concerns about credit worthiness

# Measuring the Crisis

- Dec. 15 - The Federal Energy Regulatory Commission (FERC) orders California utilities to begin negotiating long-term contracts of up to 20 years instead of relying on volatile spot market and rejects calls for a regional wholesale price cap
- Dec. 27 - U.S. natural gas futures hit a record high $10.10 per million Btu, about four times above year-ago prices
- January, 2001 -- Utilities default on more than $1 billion in securities and purchased power obligations; CPUC grants 10% temporary surcharge
- Jan. 4, 2001 - The California Public Utility Commission (PUC) orders independent audits of PG&E and SoCal Edison and approves an average 10 percent increase in retail rates. But action seen as too little, too late on Wall Street

# Measuring the Crisis

- Jan. 5 - Moody's Investors Service and Standard & Poor's downgrade PG&E and SoCal Edison credit ratings to one level above junk bond ratings. Fitch cuts ratings even lower
- Also, the state treasurer proposes long-term plan to create a new state authority able to issue up to $10 billion in bonds to help utilities build power plants and transmission lines
- Meanwhile, U.S. Energy Secretary Bill Richardson under Orders from President Clinton extends through Jan. 10 emergency order mandating that power generators and marketers sell power to California to prevent blackouts

# Measuring the Crisis

- Jan. 5 - SoCal Edison says it will cut 1,450 jobs, or 13 percent of its workforce, over the next few months, bringing to 1,850 the total number of job cuts for the company since the California power crisis began
- Jan. 8 - In his State of the State address, Gov. Davis calls the state's electricity deregulation a ``colossal and dangerous failure''. He vows to save the state's two biggest utilities from bankruptcy, proposing a new California power authority and a crackdown on price-gougers

# Measuring the Crisis

- Jan. 9 - Davis flies to Washington to press his plan with utility executives, federal regulators and the Clinton administration's top economic officials. Washington calls the meeting to prevent reverberations throughout the U.S. economy from California's severe power shortage. PG&E and SoCal Edison have run up some $12 billion in power costs in recent months
- After the meeting, a vaguely-worded statement is issued for ways to solve the crisis, including helping utilities negotiate long-term contracts to buy electricity

# Measuring the Crisis

- Jan. 10 - PG&E asks Gov. Davis for help to buy natural gas for customers, saying it does not have enough cash coming in to pay its bills. Meanwhile, FERC Chairman James Hoecker, a Democrat appointee of President Clinton, announces his resignation, effective January 18
- Jan. 11 - The California ISO says up to two million residents will lose power in an unprecedented series of rolling blackouts, but the state is rescued by emergency help from Canada and the Pacific Northwest
- Jan. 12 - The governors of California, Oregon and Washington urge federal energy officials to impose ``effective price controls'' to stabilize the western states' chaotic wholesale power market

# Measuring the Crisis

- Jan. 16 - California declares a statewide Stage 3 alert for the third time, citing a severe power shortage, but averts rolling blackouts. Meanwhile, SoCal Edison says it cannot pay some $596 million it owes creditors. The state's top two utilities see their credit ratings cut to low junk status by leading rating agencies, putting them in default of bank loans and credit lines and moving them closer to bankruptcy
- Jan. 17 - Rolling blackouts are ordered statewide for the first time ever in a desperate bid to avoid overloading the state's power grid. Also PG&E says it defaults on $76 million of commercial paper, the second California utility to default
- Jan. 18 - A fresh wave of blackouts hit parts of northern and central California for a second straight day. Some two million Californians have experienced rolling blackouts.

# Measuring the Crisis

- February, 2001 -- Legislature approves $10 billion to back up long term electricity purchases by State; Utilities continue non-payments and defaults; Federal government ends emergency orders and refuses to order price caps; Utilities closer to bankruptcy as suppliers sue to collect payment
- Jan. 19 - President Bill Clinton declares a natural gas supply emergency in California and orders out-of-state suppliers to continue selling gas to PG&E after the utility says several energy firms refuse to sell it gas on credit because of fears they will not be paid
- Also, Republican Curtis Hebert is appointed by President George W. Bush to head the FERC, one of its firstr actions as President of the US.

# Measuring the Crisis

- Jan. 23 - The Bush administration extends emergency orders forcing out-of-state companies to supply electricity and natural gas to California utilities through Feb. 6, but warns there will be no further extensions. The emergency orders were extended several times by the outgoing Clinton administration.
- Jan. 25 - U.S. Federal Reserve Chairman Alan Greenspan says the California energy crisis could undermine economic growth and affect the rest of the economy if not urgently addressed

# Measuring the Crisis

- Jan. 28 - President George W. Bush says it is up to the state to dig itself out of a self-inflicted hole
- Jan. 29 - Officials say California has already burned through its $400 million energy emergency fund in less than two weeks, forcing the state to begin scrounging for more public money to keep the electricity flowing
- Jan. 29 - The California PUC releases results of audit into SoCal Edison that reveals a company hemorrhaging red ink and deep in debt -- but one which, until recently, still managed to disburse billions of dollars in dividends to shareholders

# Measuring the Crisis

- Jan. 30 - PG&E audit reveals that officers were slow to recognize signs pointing toward the energy crisis and did not act to develop steps to conserve cash until Dec 2000
- Jan. 31 – PX ceases operations in the DA market
- Feb. 2 - Gov. Davis signs a bill to allow the state to sign long-term energy contracts with suppliers and sell up to $10 billion of bonds to buy power

# Measuring the Crisis

- Feb. 8. - The state treasurer proposes buying the transmission lines from California's two nearly bankrupt utilities. Lawmakers have also mulled taking over the utilities' hydroelectric plants or having the state issue bonds to ease their debt in return for stock warrants
- Also, Gov. Davis orders an expedited approval process for new power plant construction, saying it would help bring 20,000 megawatts of new generation on line by July 2004
- He also eased emissions controls on older plants

# Measuring the Crisis

- Utilities have defaulted on over $6 billion of obligations to generators, banks and commercial paper holders
- State is indebted by more than $3 billion for power purchases (averaging $50 million per day) which cannot be collected from customers
- Utilities are junk bond credits; problems have spread to utilities throughout the West
- PG&E filed for reorganization under Chapter 11 in San Francisco bankruptcy court on April 6, 2001

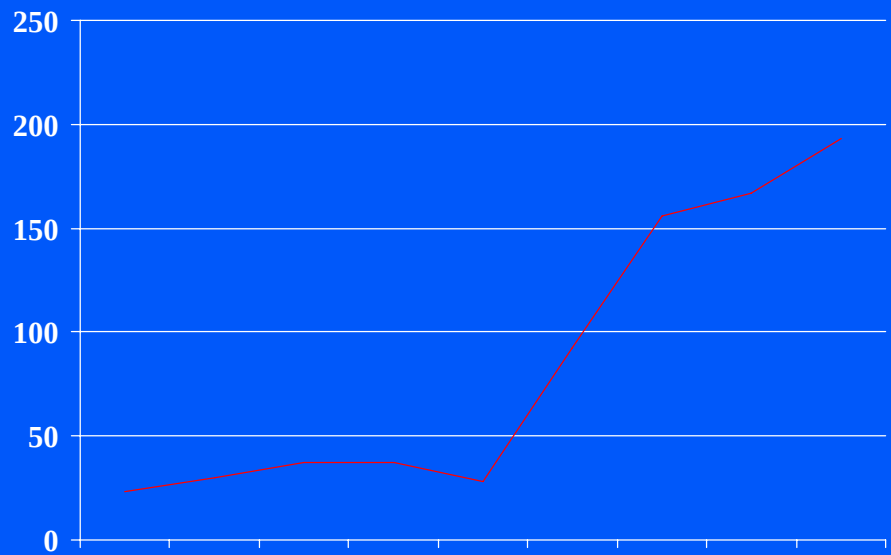
# Regional Issue - Not Just California

- The California Power Grid is highly integrated with the rest of the West
- Prices increasing throughout Western Region
- Supply shortage in Southwest and Northwest as well as California
- Competition for scarce supplies drives up price
- Cheap Northwest hydro power is disappearing
- Need rain/snow of biblical proportions in Sierra's and Columbia River basin to catch up
- Rates are increasing in many areas - business are shutting down and laying off workers

# Summarizing the Crisis

- Wholesale power prices +10 times higher than a year ago
- Blackouts have gone from threat to reality in Northern California
- PG&E bankrupt
- Suspension of CalPX operations
- State making long-term power purchases

**Southern California electricity spot prices**
**On-peak quarterly average**
**($ per MWh)**

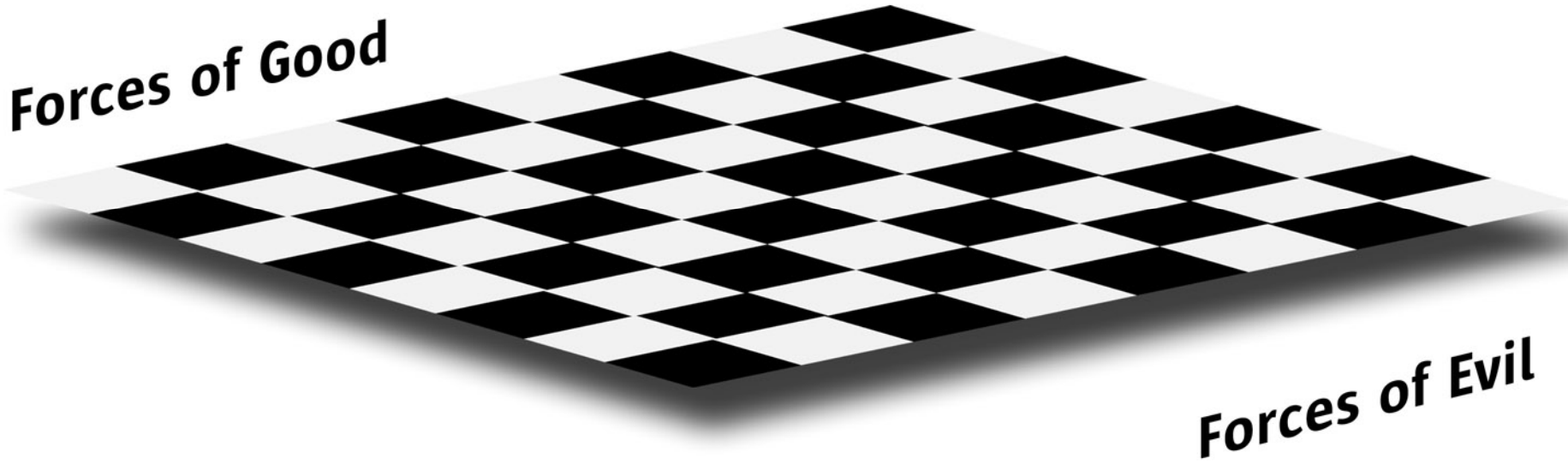



* Q1 2001 is an estimated

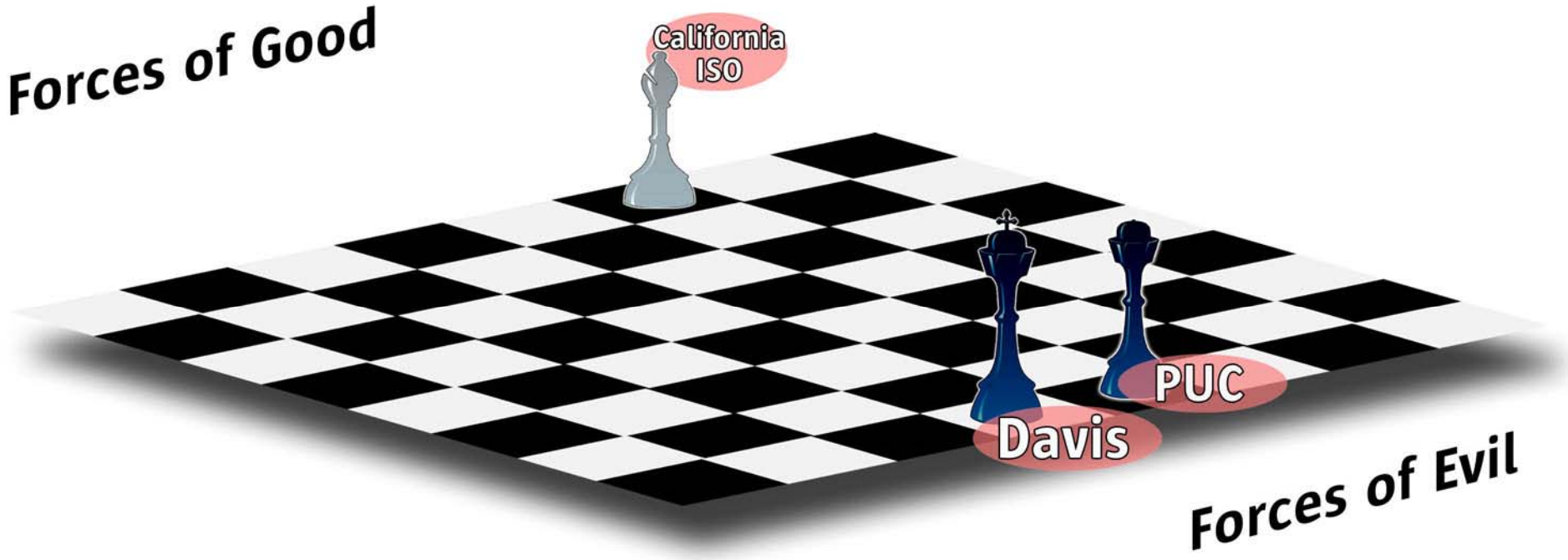
*Source: Cambridge Energy Research Associates*

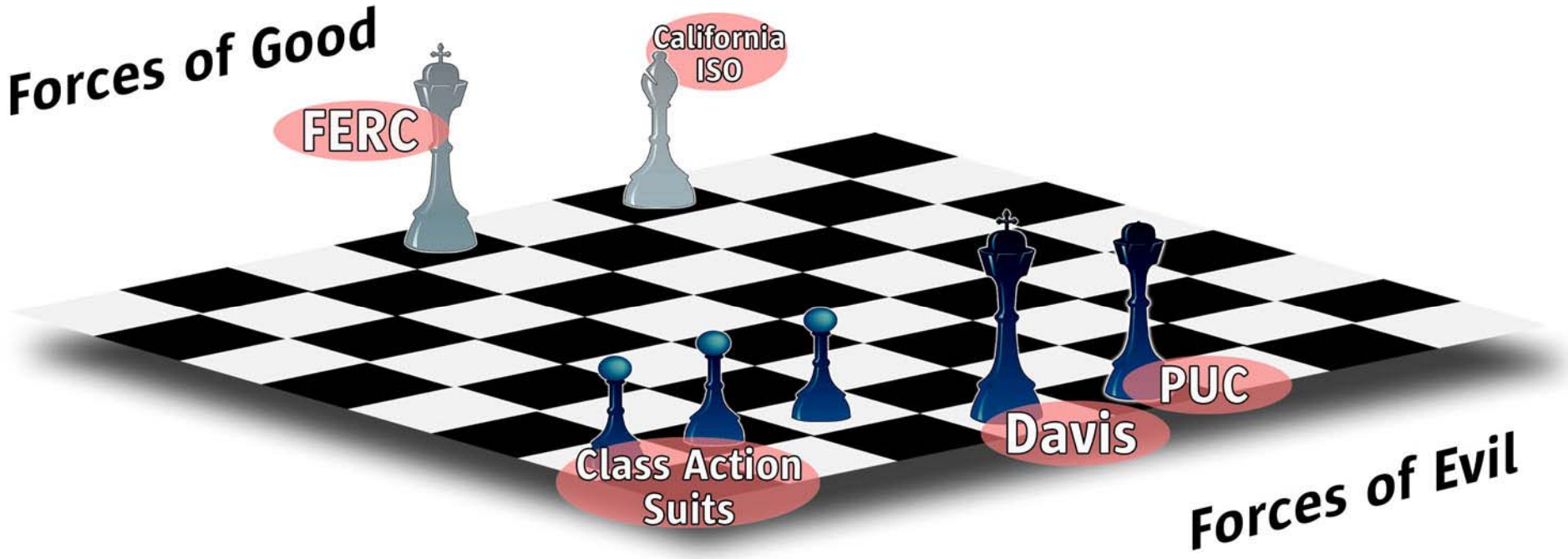
# Outline

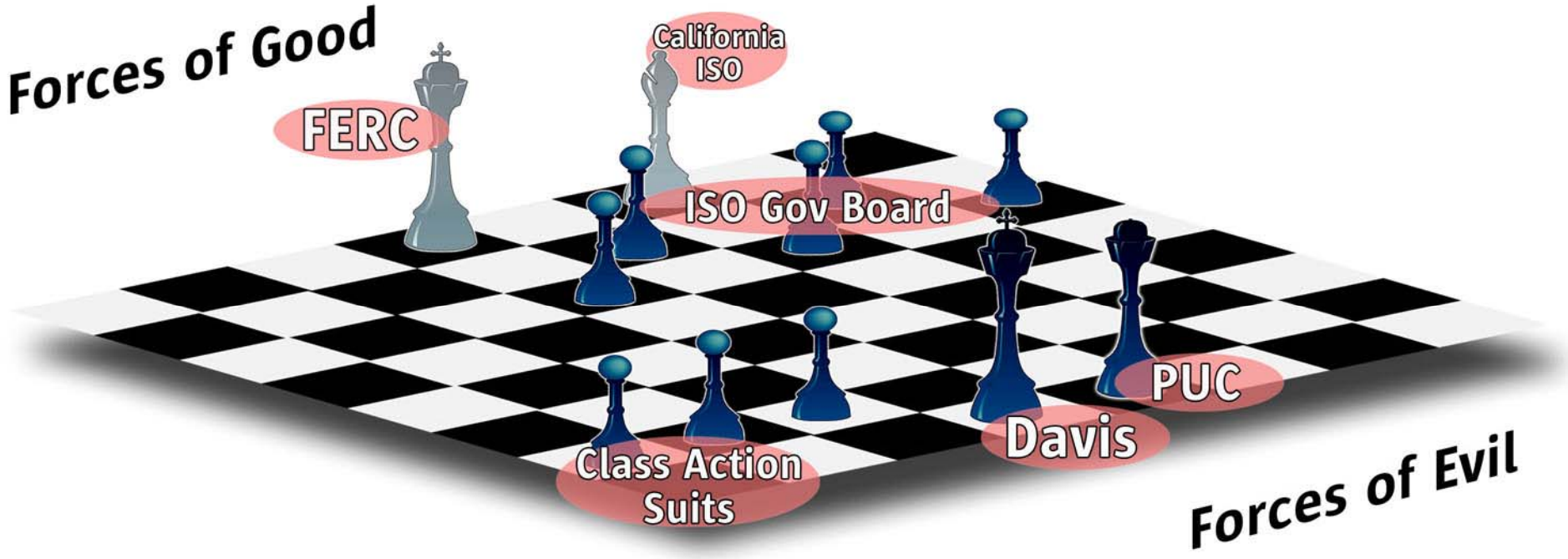
- Original California Energy Market Design
- California Market & System Conditions Leading to Crisis
- The Root Causes of the California Crisis
- Significant Contributing Factors
- Measures Reflecting the Crisis
- Who's to Blame
- Lessons Learned
- Can this happen elsewhere?


Forces of Good
Forces of Evil


Forces of Good
California
ISO
Forces of Evil


Forces of Good
California ISO
PUC
Davis
Forces of Evil


Forces of Good
FERC
California ISO
Class Action Suits
Davis
PUC
Forces of Evil


Forces of Good
FERC
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ISO Gov Board
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# Outline

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# Lessons Learned

- Avoid Partial Deregulation Among Utilities and Other Suppliers
- Identify Specific Responsibility for Adequate Supply; institute a Capacity Market
- Insure Compatibility of Retail Rate Design and Wholesale Market
- Allow Significant Forward Contracting & Hedging
- Encourage Price Responsive Demand
- Effective Market Power Mitigation for Electricity and Gas
- Effective State and Federal Regulatory Coordination

# Solutions

- Build new generation and transmission
- Energy Conservation
- Ensure Forward Contracting (as a hedging mechanism)
- Consumer demand responsive to prices
- Mitigate Market Power
- Regional Cooperation

# Development of a New Market Design

Market Stabilization Plan (April 6, 2001)

- Eliminates the balanced schedules requirement and "market separation" constraint
- Requires the ISO to operate a day-ahead energy market using centralized unit-commitment
- Minimizes total energy and ancillary services costs simultaneously across all hours
- Develop a Full Transmission Model that is part of the clearing of the markets
- Institute Locational Marginal pricing

# Development of a New Market Design

- Eliminates replacement reserves as a separate product (centralized unit commitment will make this unnecessary)
- Require bids to be consistent across day-ahead, hour-ahead and real-time markets
- Apply resource specific bid caps to all participating generators
- Implement a rigorous Market Power Mitigation process
- Introduce a Capacity market
- Restricts rights to export power

# Outline

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# Key Questions for Your Market




- Is the market a net importer ?
- What is the reserve capacity for generation in the market – under 10%
- What percentage of the power is dependent on environmental factors (rain, wind, surf) – over 20%?
- What is the ability to build new generation capacity – limited?
- How fast is the market growing, how many years of reserve exist – under 3 years?

# Key Questions for Your Market

- Are Utilities limited to short term markets for power?
- Are the retail prices capped, but wholesale prices floating?
- Are additional sources of power limited (transmission links to outside markets)
- If the two largest facilities were down for maintenance, would the reserve fall under 5%
- Is the government limited in its ability to react in a crisis?

# Key Questions for Your Market

- Are consumers neutral to negative about utilities?
- Can the Environmentalists successfully challenge the Utilities on needed facilities?
- Can Facilities be delayed for more than a year by legal, or environmental challenges?

# Market Score

- 4 or fewer “yes” answers – California style crisis is not a problem in your market
- 5 to 7 “yes” answers – Review your market carefully; act fast
- 8 or more “yes” answers – Problems similar to California could happen in your market

# Conclusion

- California Energy Crisis: Policy failure mainly, not a market failure
- The *market* works reasonably well with sufficient supply margins and price responsive demand; but market can be severely constrained by regulatory restrictions and incomplete deregulation
- As a result of the crisis California instituted measures and provided incentives for generation and transmission upgrades
- It also moved from a decentralized to a more centralized market just as some other jurisdictions (e.g, UK) are moving in the reverse direction and implemented very rigorous market power mitigation measures