Demand Response Programs: Configuring Load as a Resource for Competitive Electricity Markets

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Overview of Presentation

- Key Policy Questions
- Types of Demand Response Programs
- DR Program Results: 2001
- Lessons Learned

DR Programs and Electricity Markets - Policy Questions

- How much demand response is needed?
- What has been performance of markets in eliciting demand response?
- Is this response sufficient to improve system reliability or economic efficiency? (e.g., value & costs of DR “insurance”)

Demand Response Program Types

- C/I Non-firm Rates
  - Up-front payment; typically bill or rate discounts for curtailments to pre-set Firm Service Level
- Direct Load Control
  - Utility interrupts customer loads (e.g., a/c, water heating)
- Demand Bidding - Call option
  - Reservation and energy reduction payments
  - Customers selects Strike Price. LSE can "call" the customer, requiring them to reduce load or face penalties, when projected Mkt. Price > Strike Price
- Demand Bidding - "Quote option"
  - Purely voluntary. Customers pledge to curtail loads at specified time, price ("pay-per-interruption event")
- Dynamic Pricing (e.g., real-time pricing)

Case Studies of DR Programs

Independent System Operators

- ISO NE, NYISO, PJM, CA ISO

Utilities

- Ameren, BGE, Cinergy, ComEd, Dominion Virgina, KCPL, Nevada, Otter Tail, NYSEG, PacifiCorp, PGE, PSE, SDG&E, Sierra Pacific, Xcel Energy, SCE, PG&E

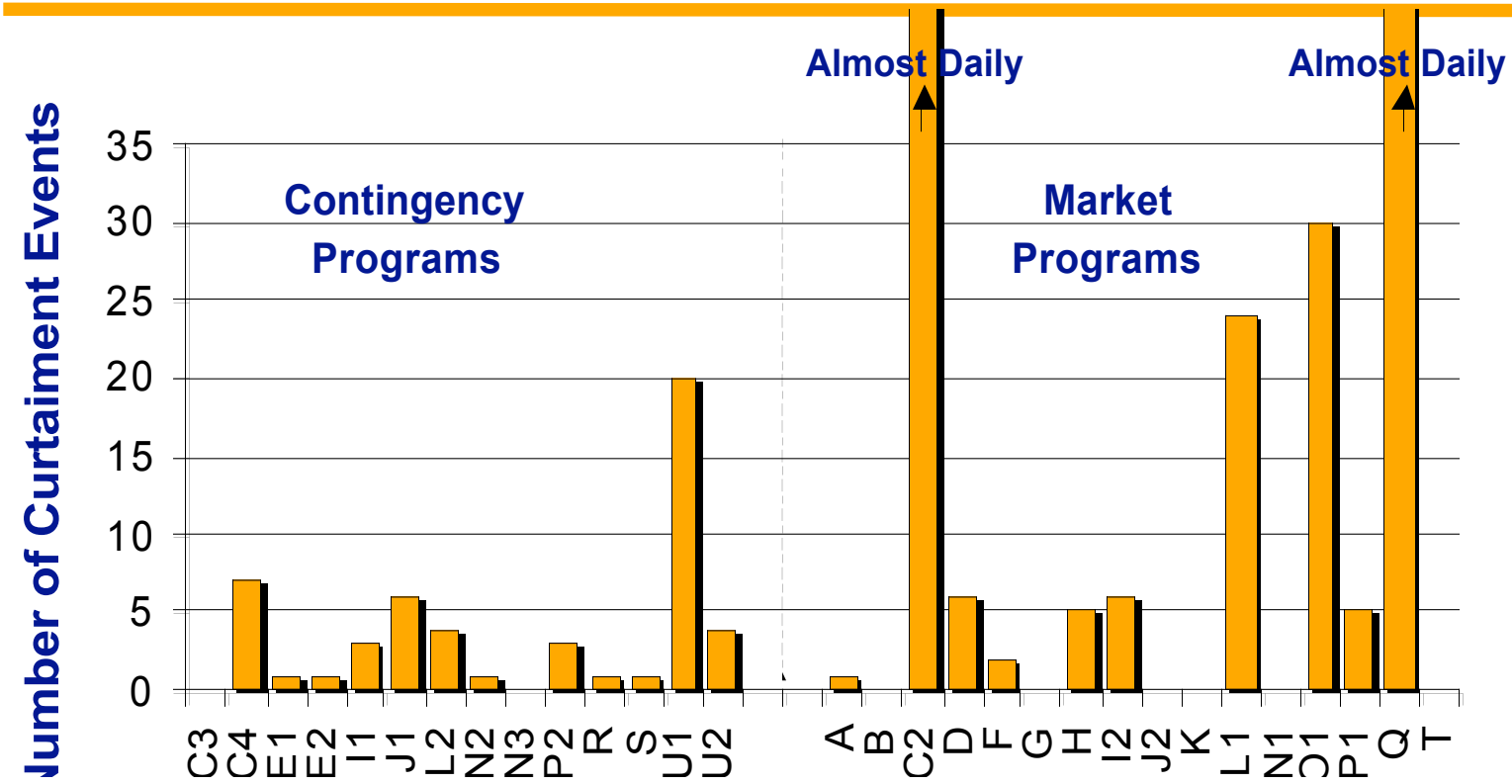
Retail Energy Suppliers/Aggregators (e.g., CSP)

- AES NewEnergy, ConsumerPowerLine, Global Energy

Federal Power Marketing Authorities

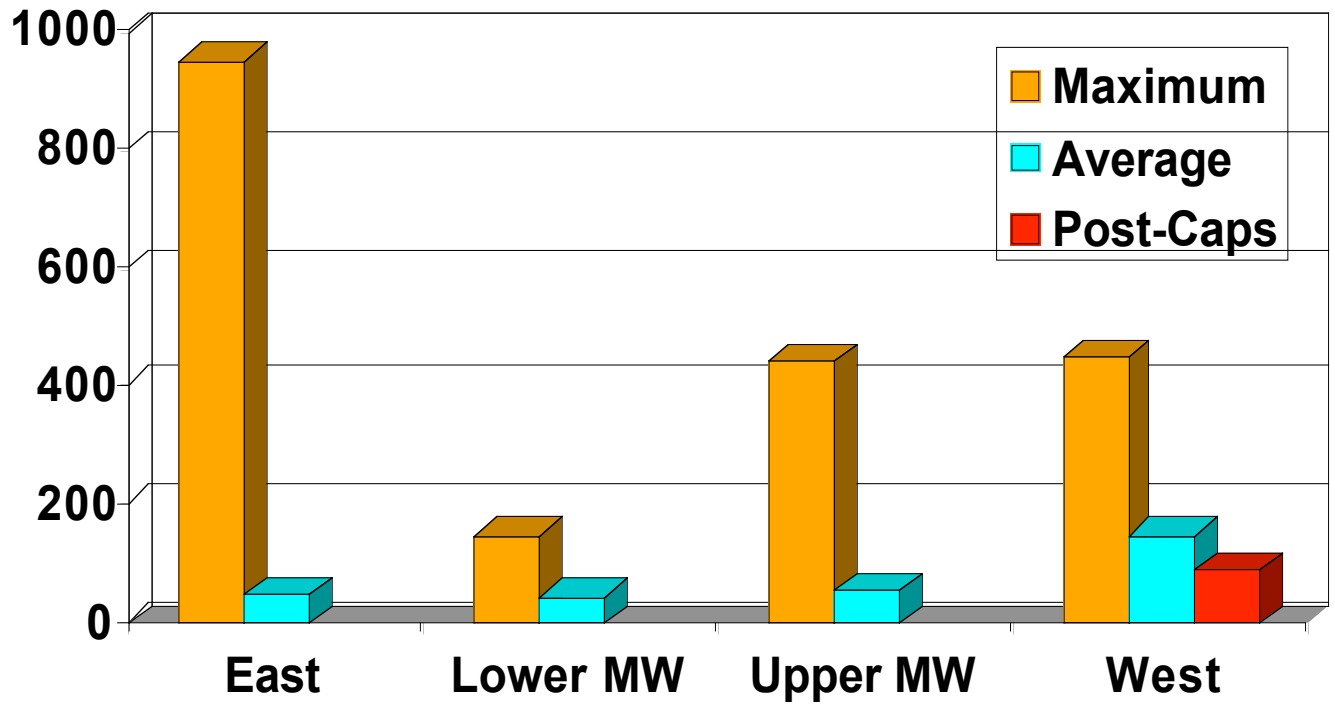
- BPA

System Events and DR Market Activity: Summer 2001

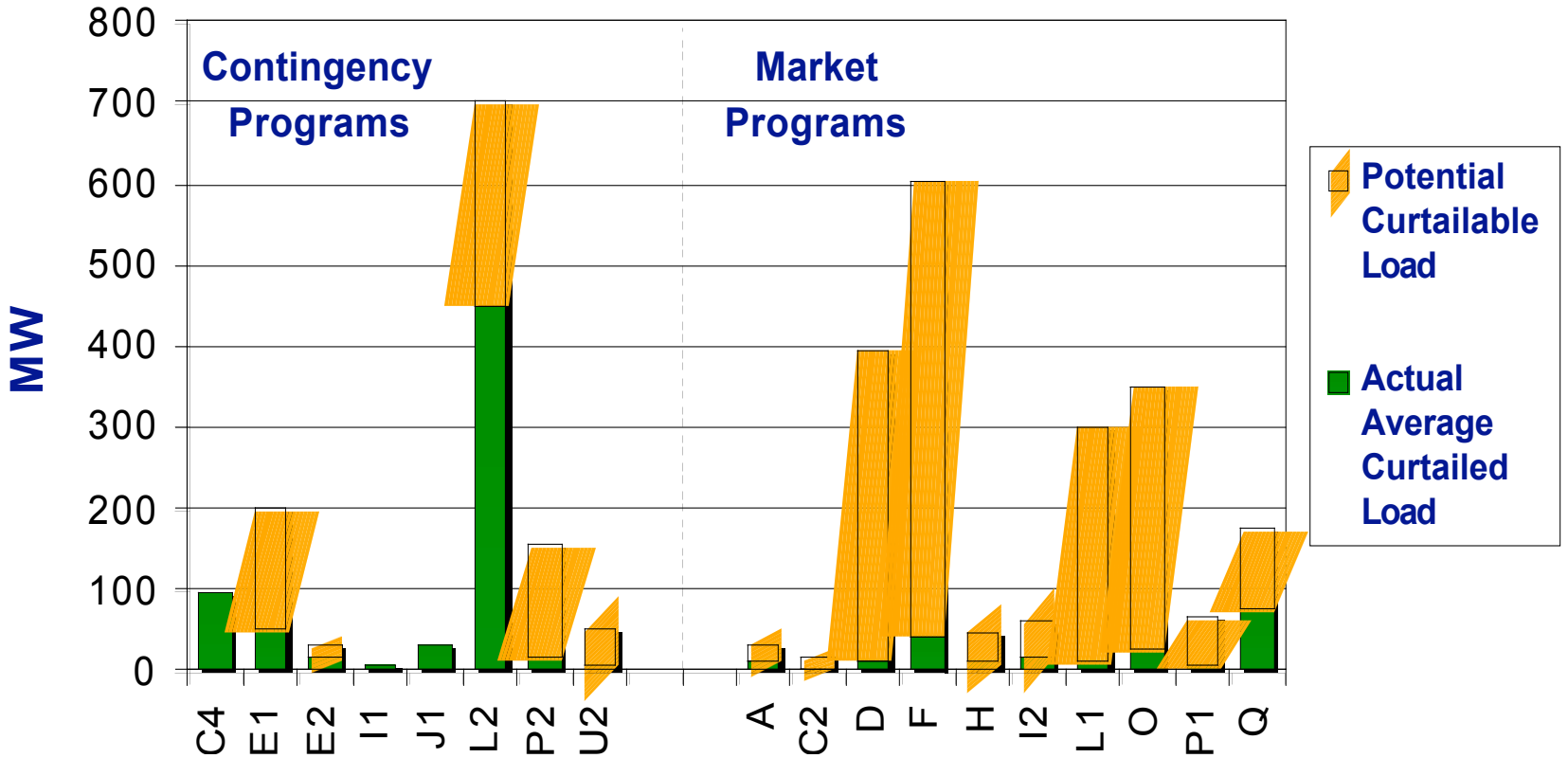


- **14 programs operated once or not at all**
- **However, several programs played critical role in mitigating system emergencies**

Summer 2001 Wholesale Prices ($/MWH)



Actual Performance of DR Programs: Summer 2001



- NYISO EDRP provided ~425 MW (L2)
- CAISO only called once (E1,E2)

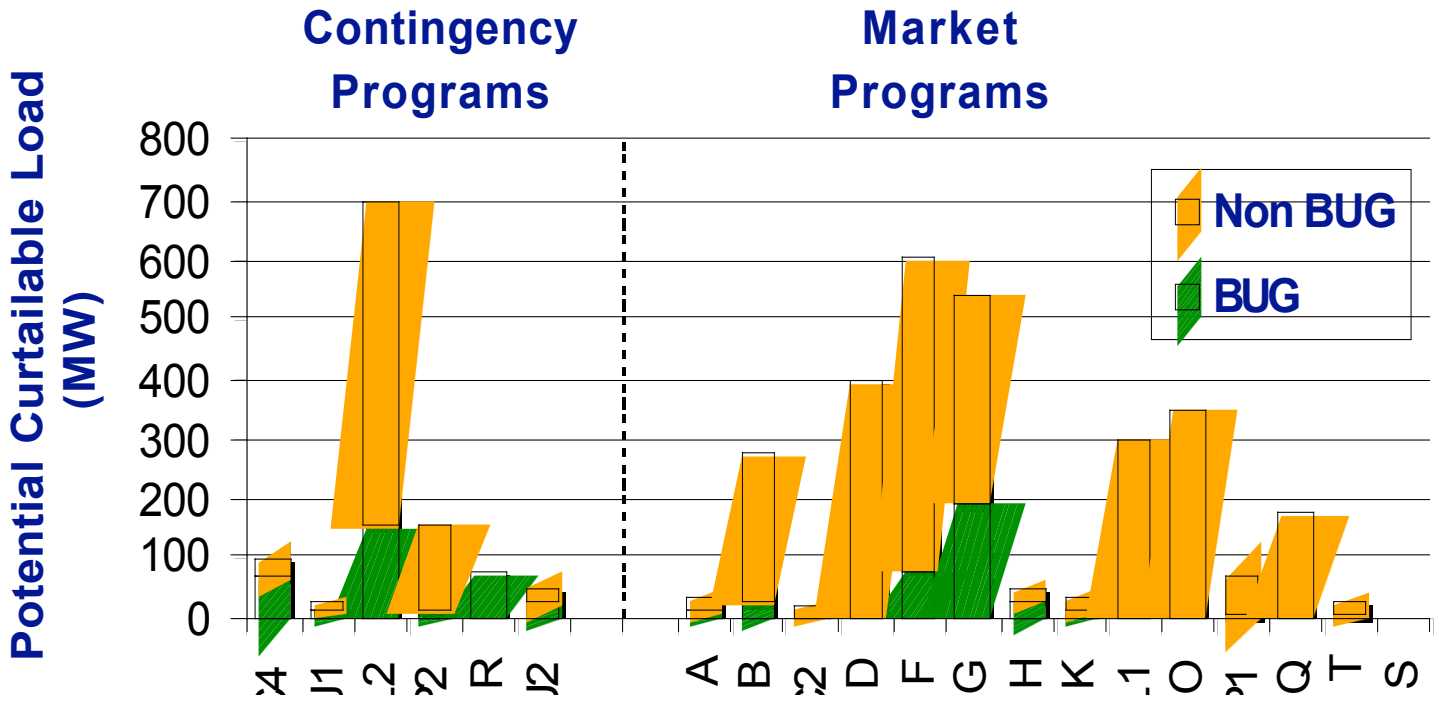
Actual Performance of DR programs

Average Values for Case Study Programs

Program Type	Number of Programs	Potential Curtailable Load (MW)	Actual Curtailed Load (MW)	Actual/Potential
Contingency	8	158	84	62%
Market	10	204	21	17%

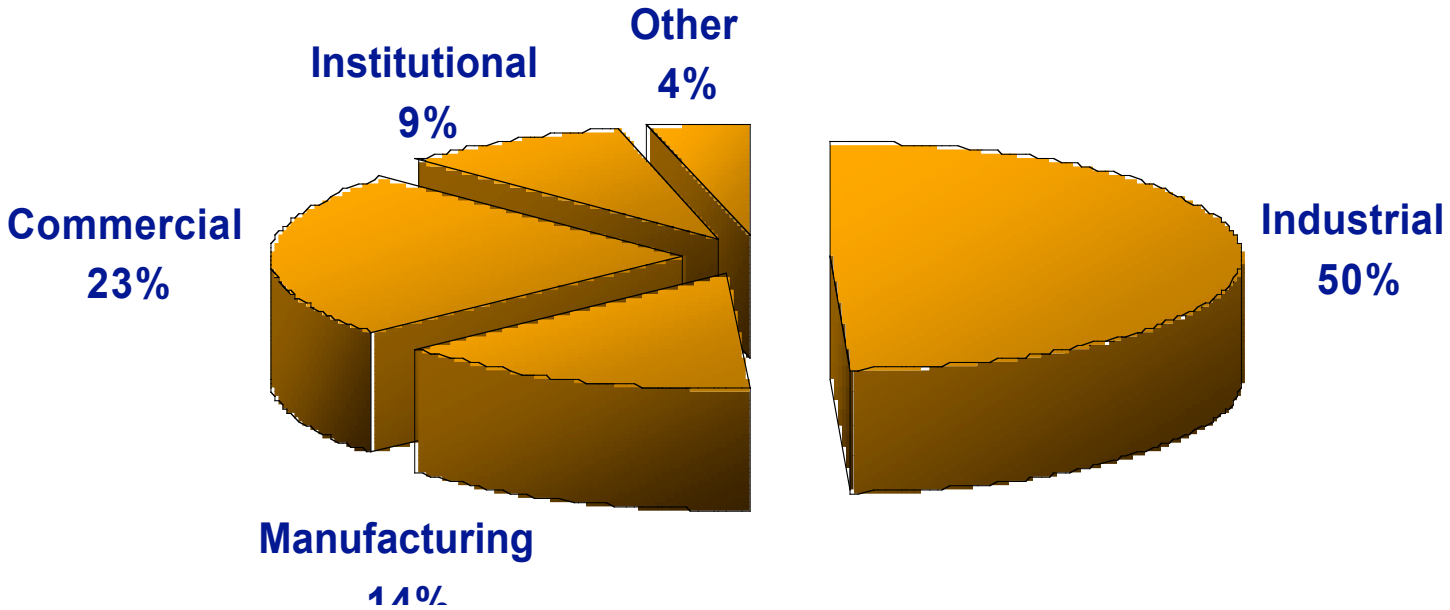
- Load relief from "market-driven" DR programs is often less predictable than "contingency-related" DR programs
- Why?
  - - Incentive Mechanisms (e.g., penalties)
  - - Low wholesale electricity prices
  - - Definitional issues: Potential curtailable load?

Back-up Generators: Balancing "reliability" and environmental concerns?



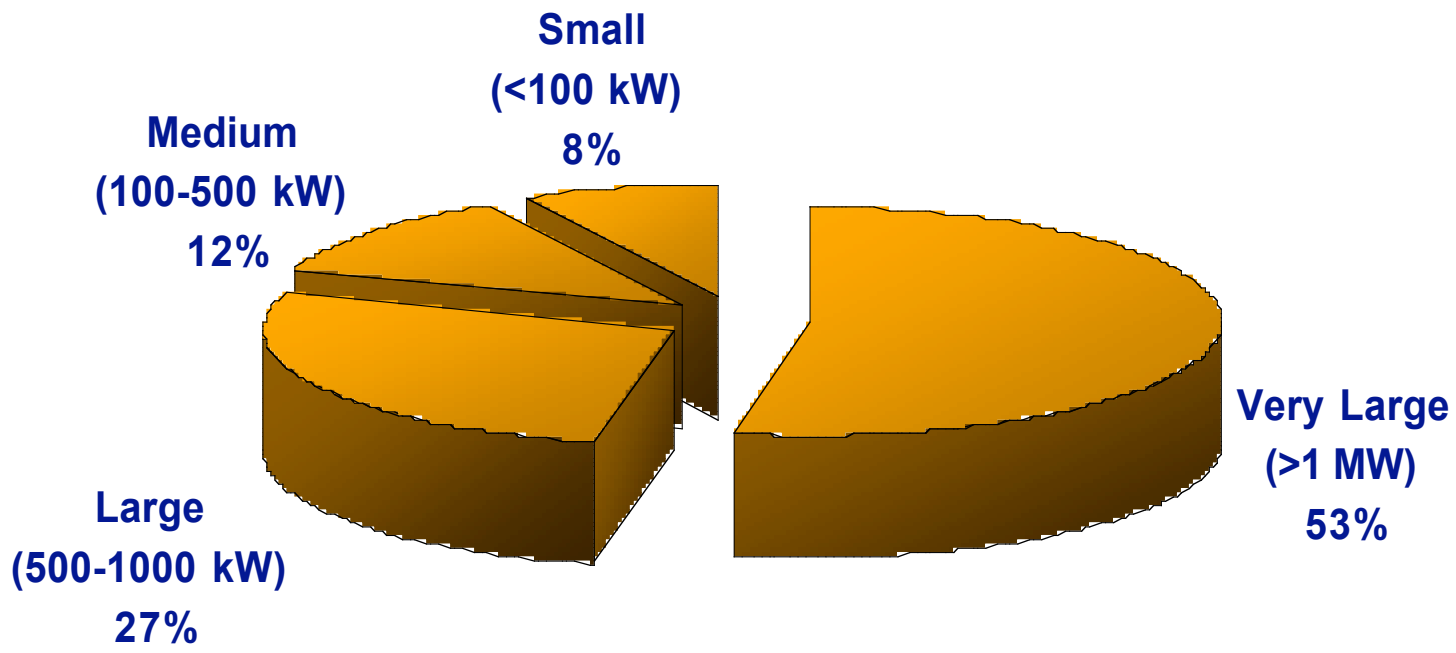
- BUGs are popular load curtailment strategy
- Environmental impacts are major concern, particularly for diesel-fired BUGs

What types of customers participate in DR programs?



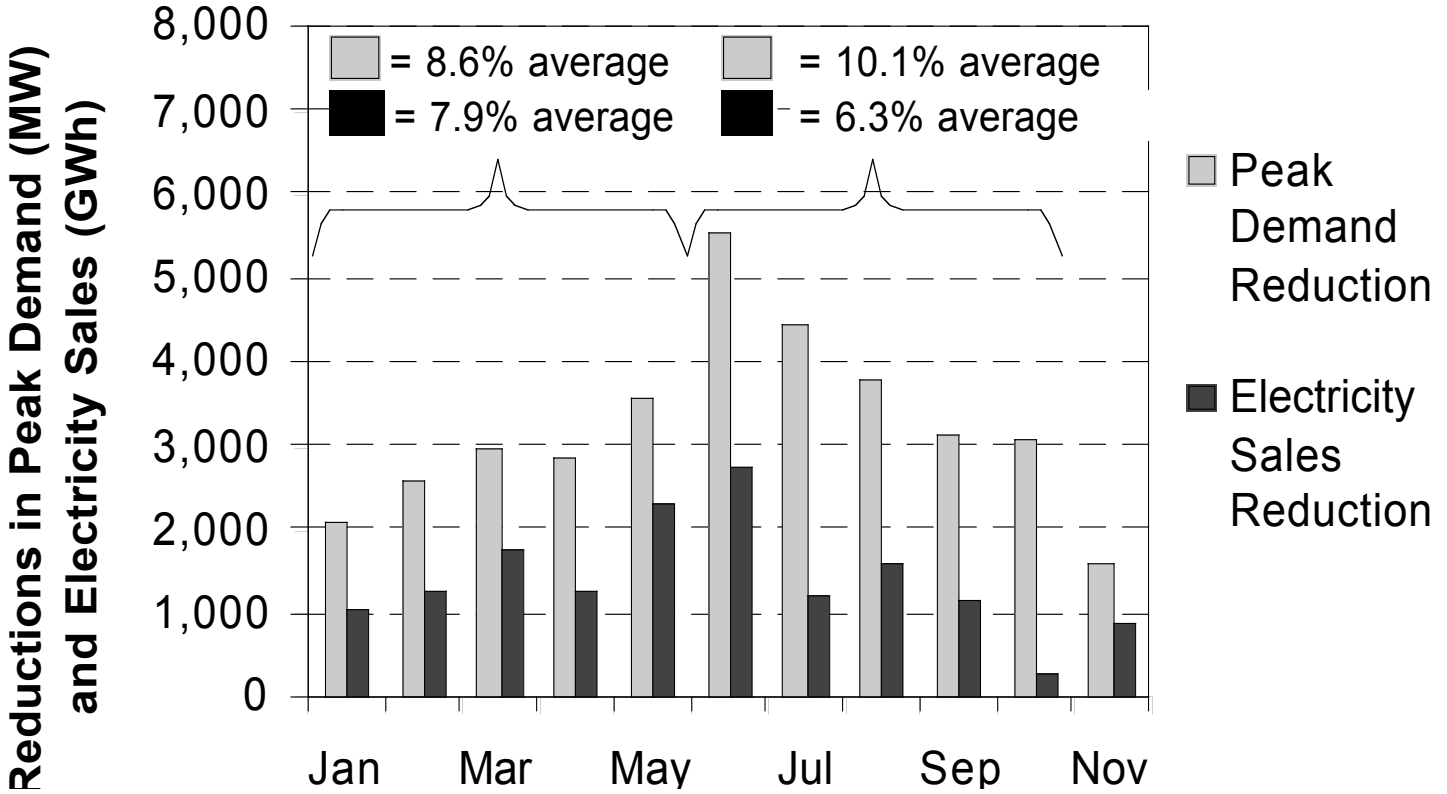
- **Industrial customers are backbone of current DR programs in our sample**
- **Increasing activity by commercial, institutional customers**

Current DR Programs target largest C/I customers



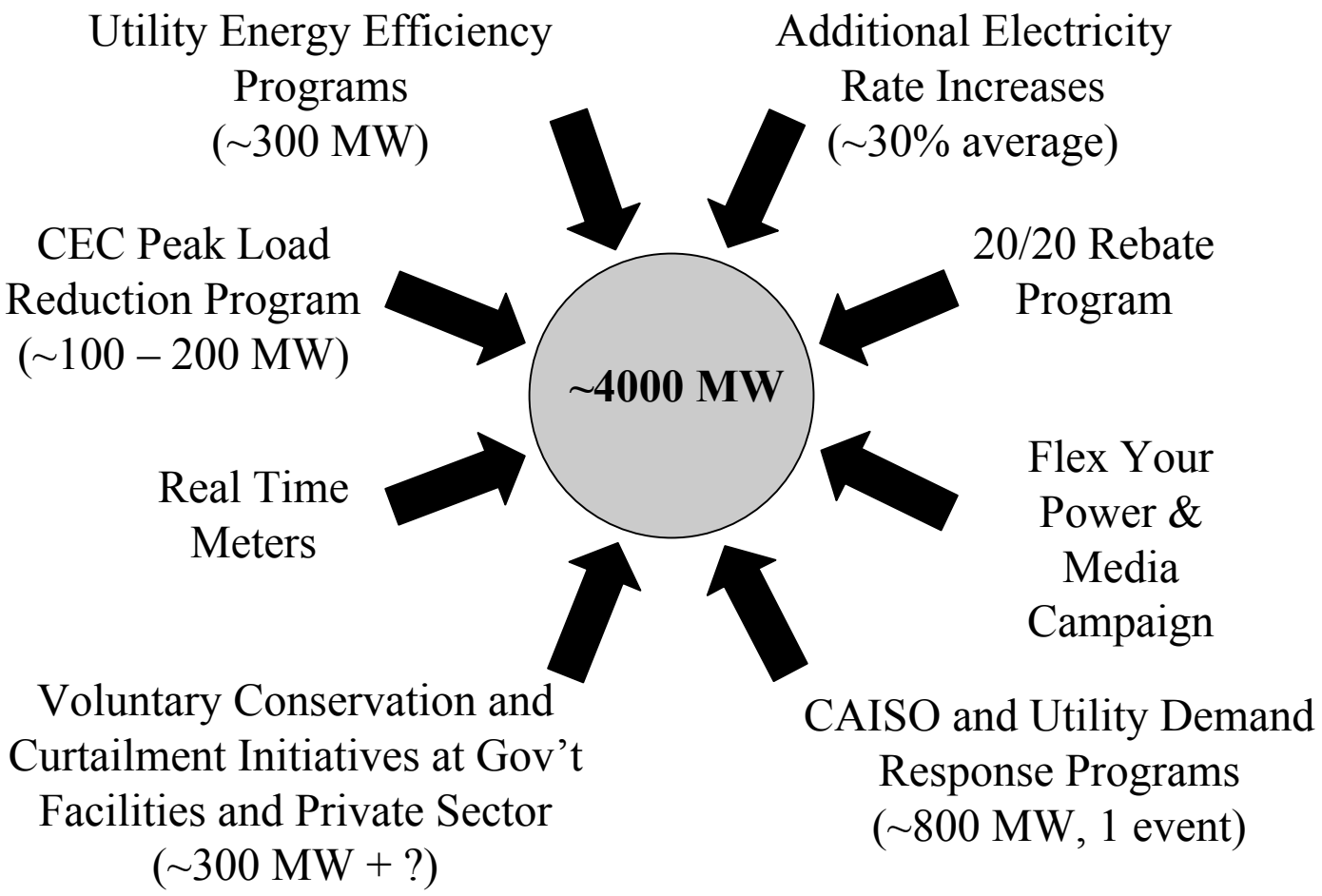
- **Why? - metering, savings potential, transaction costs, program design rules**
- **Challenge: tapping DR potential of medium/small customers**

Customer Load Reductions rescued CA during 2001 Crisis

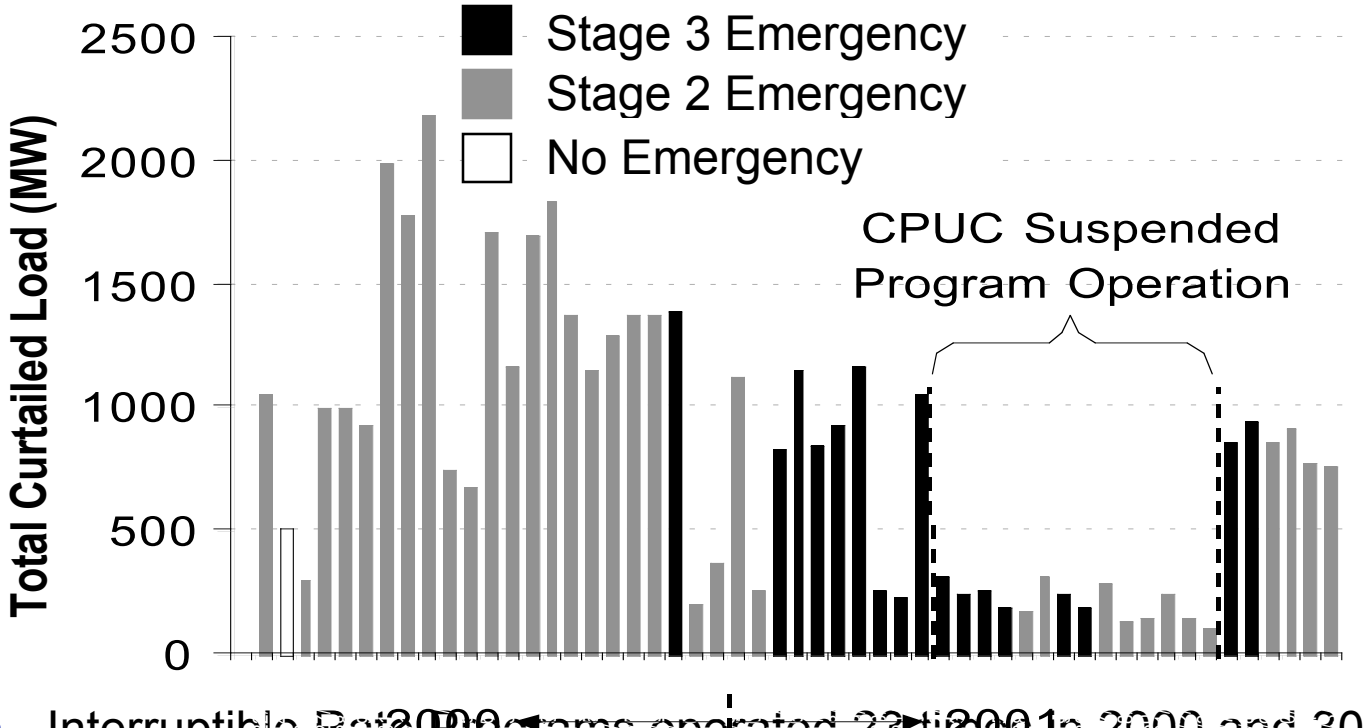


- 6-8% reduction in electricity sales; 10% reduction in monthly peak demand
- Data normalized for weather and economic growth (based on CEC analysis

Contributing Factors to CA Demand Reduction: Role of EE (Summer 2001)



Performance of California Load Mgmt Programs during the Crisis



- Interruptible Rate Programs operated 23 times in 2000 and 30 times in 2001
- GOOD NEWS: Critical to avoiding rotating outages on at least five occasions in 2000
- BAD NEWS: Frequent operation caused many customers to refuse curtailment requests and drop out

Summary: DR Industry at Crossroads

- ISO programs growing in importance; but need to work out ISO roles/responsibilities in DR market
  - ISO DR Programs = ~1500 MW (2001) vs ~200 MW (2000)
- Near-term outlook for "Market-driven" DR programs is unclear
  - New capacity additions + slowing economy = lower wholesale prices forecast for 2002
  - Will there be much activity if customers require >$150-200/MWh to bid in large amounts of load
- Ambivalence & regional variations regarding role of backup and on-site generators (e.g., diesel-fired)
- FERC Regional RTO Rulemaking – key forum for defining "rules of the game"

DR Industry: Challenges & Opportunities

- Key role of Intermediaries for long-term viability of DR market
  - Utilities: Incentives to perform??
  - Retail energy suppliers: DR is not stand-alone business, so vibrant retail market is enabling condition
  - Curtailment Service Providers: niche players? Who will want to play – ESCOs?
- Reposition existing Utility Load Management assets
- Recognize that customers are NOT generators; loads are diverse & respond to multiple objectives
- Making the case for "Public Benefits" value of "demand response" market