Demand Response Hardware and Tariffs: California's Vision and Reality

Reference Design Workshop
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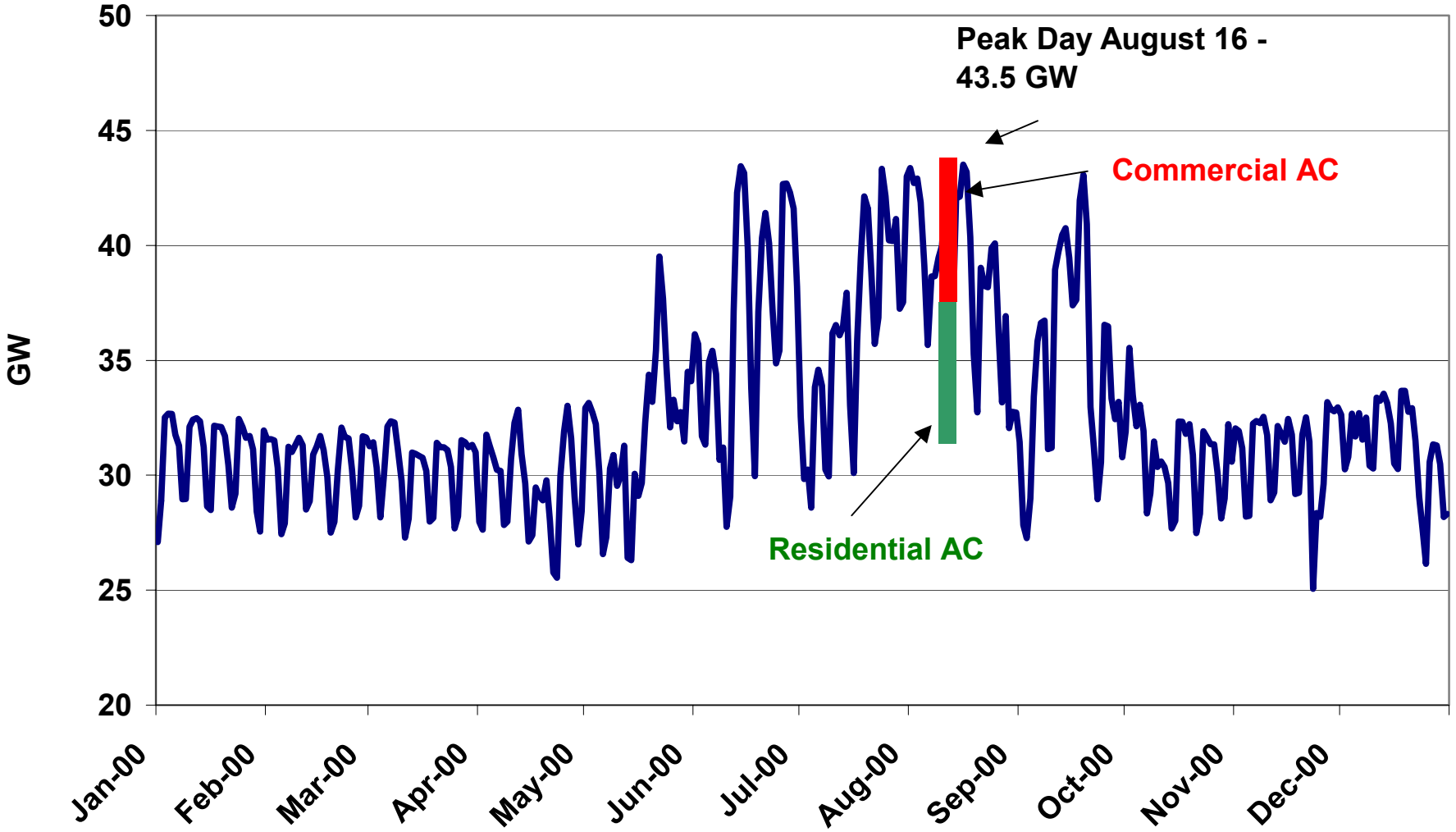
Cal ISO Daily Peak Loads

January 1, 2000 - December 31, 2000



DR Policy

- Joint Proceeding – CEC and CPUC (R.02-06-001)
  - Peevey, Rosenfeld and McPeak
- Working Group 2 > 200 kW
  - All have interval meters and TOU tariff
  - 26 MW on CPP tariff
- Working Group 3, Residential and Small Commercial
  - 2,500 customers in a Statewide Pricing Pilot (SPP)
- Utility Business Plans for Automated Meter Infrastructure
  - In preliminary filings, PG&E and Sempra appear favorable toward AMI; SCE disinclined
- Many other states and countries moving forward with AMI
- Early Goal for Price Sensitive Demand Response
  - ~ 1% per year = 5% 5 years after t=0

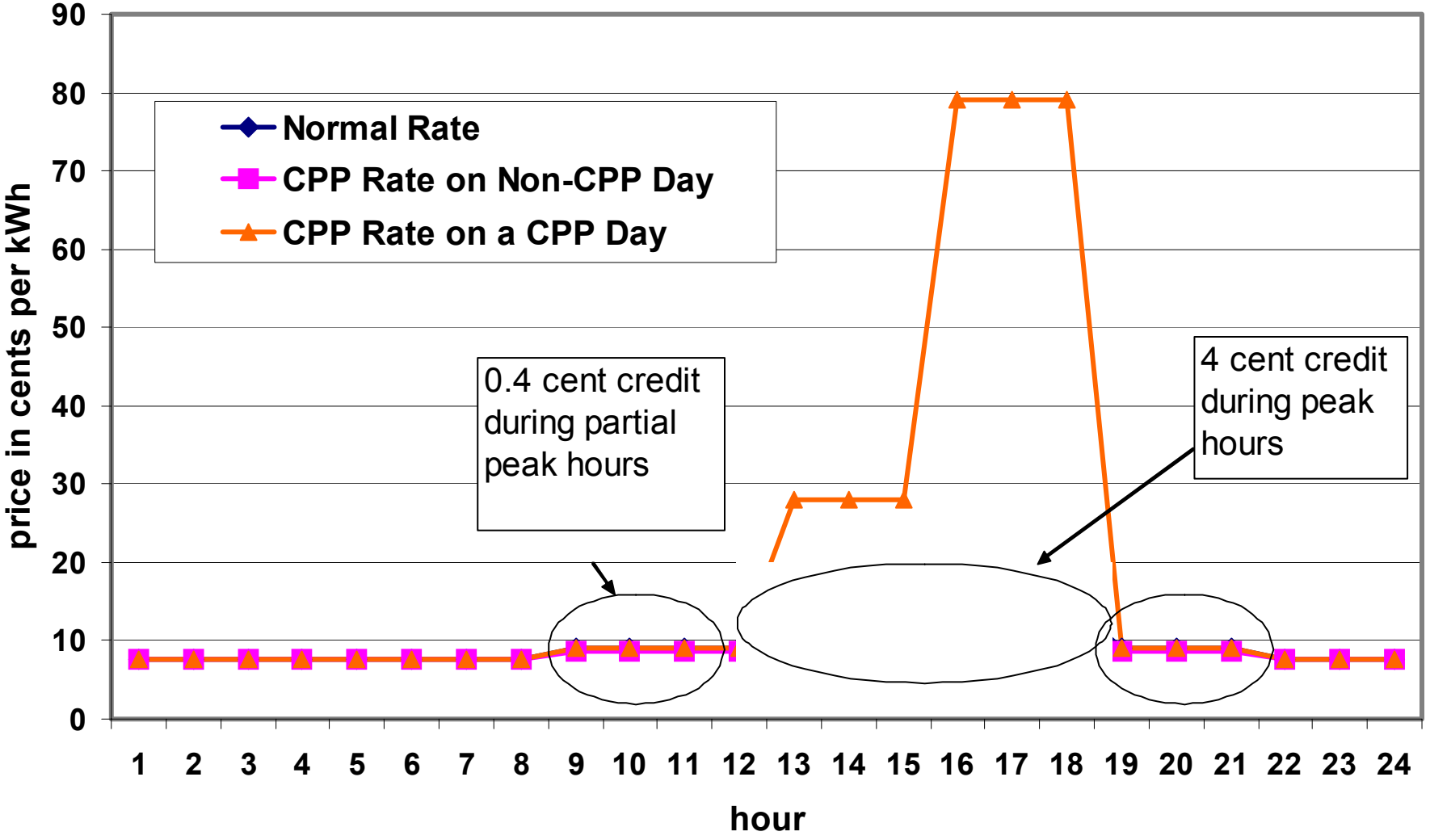
DYNAMIC PRICING vs. TOU PRICING

- **Time-of-Use** (TOU) is typically 3 time blocks published in advance for entire season
  - Peak, Shoulder, Off-Peak
  - Can't foresee weather or equipment failures
- **Critical Peak Pricing** (CPP) is a high price imposed on a few days a year when energy is expensive or system conditions are critical or near critical
  - Non-CPP hours are less expensive as a result
  - Day-ahead notification offers additional time for response
- **Real-Time Pricing** (RTP) is hourly real-time marginal cost of a kWh
  - Reflects hot weather, scarcity, or equipment failure
  - Day ahead notification offers additional time for response

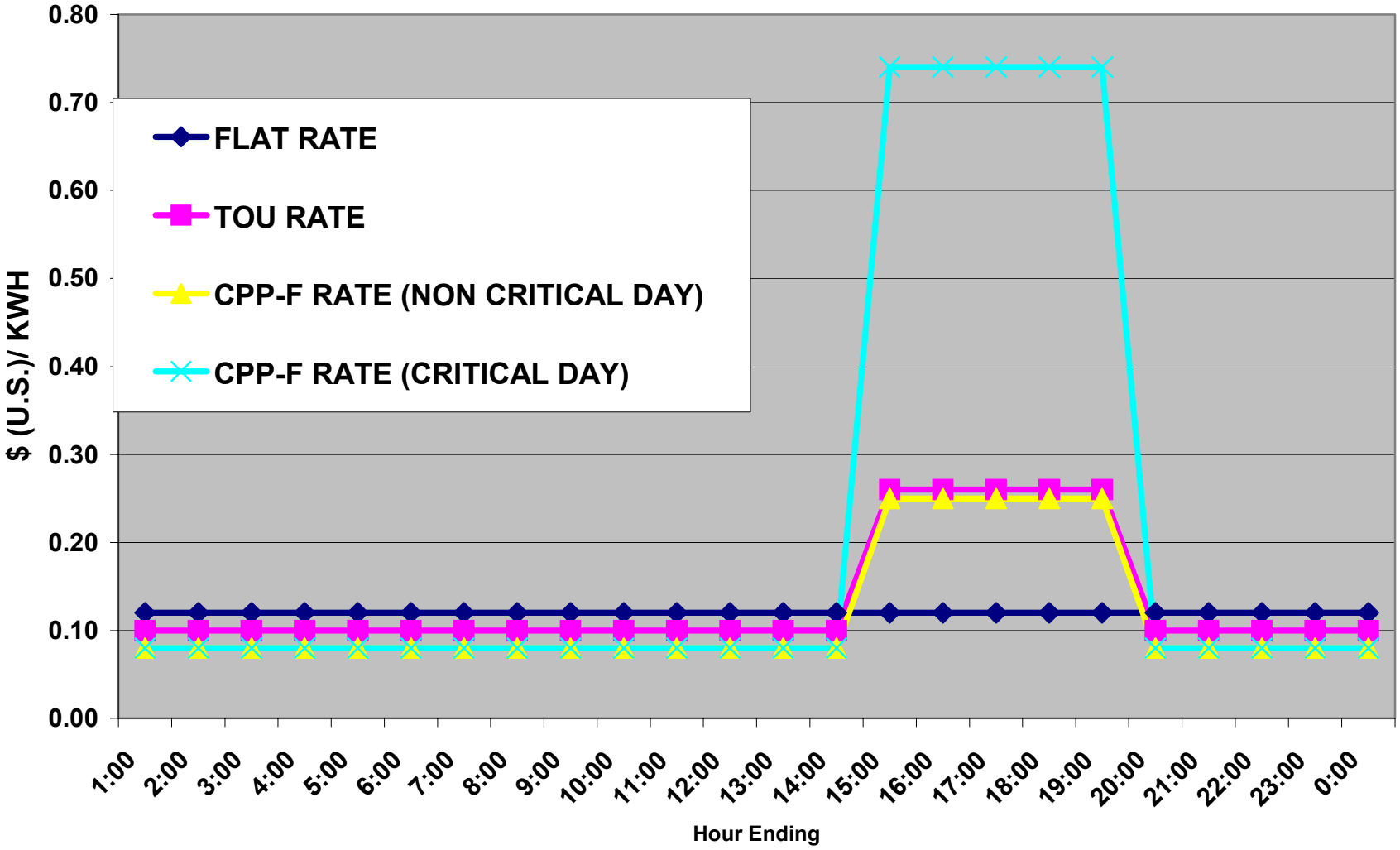
Vision – Customer Choice

- If economic, customers should have a choice of the following rates:
- Residential and Small Commercial (< 200 kW)
  - Default: CPP
  - Options: TOU
- Large Customers (200 kW to 1 MW)
  - Default: CPP
  - Options: TOU, RTP
- Very Large Customers (> 1 MW)
  - Default: RTP
  - Options: TOU, CPP

Example of Summer CPP Rates for Larger Customers (> 200 kW)



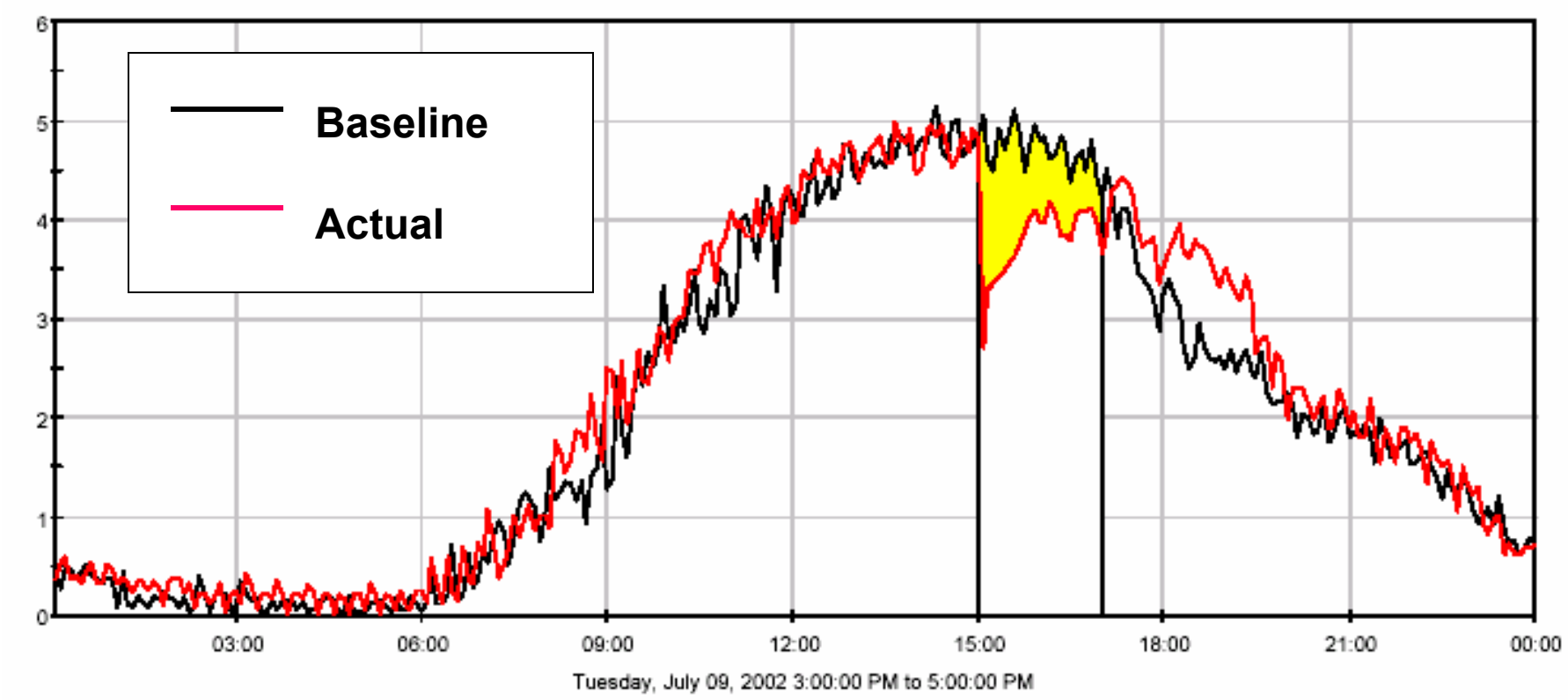
Tariffs being Tested in California Pilot



Demand Response Programs and Tariffs
Investor Owned Utilities as of July 2004
MW Available

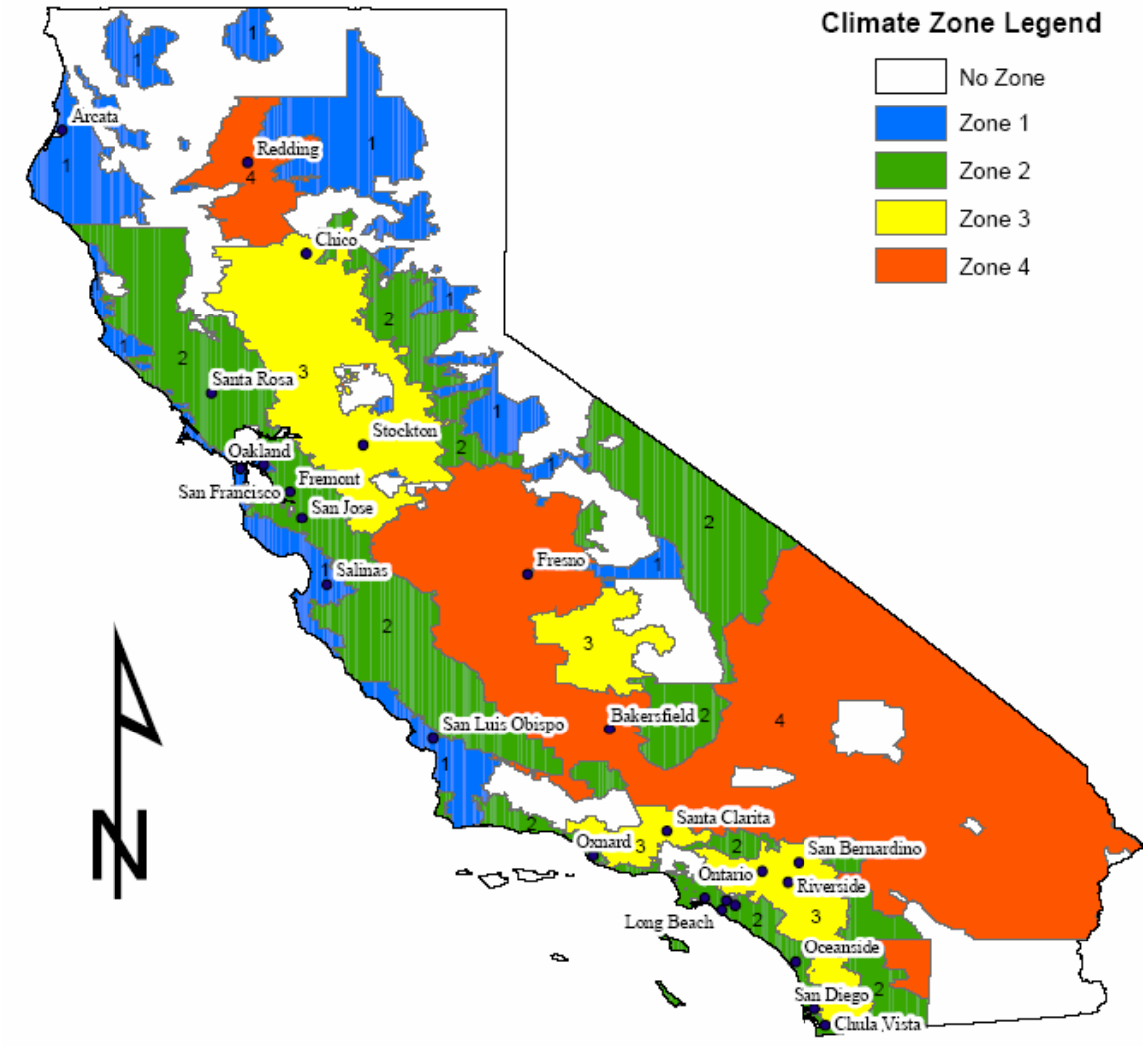
	SDGE	SCE	PGE	Total by Program
Interruptible/Curtailable	25	572	330	**927**
Demand Bidding	13	87	102	**202**
Critical Peak Pricing	**8**	**1**	**17**	**26**
Power Authority Partnership	3	117	214	**334**
AC Cyclers/Smart Thermostat	3	239	0	**242**
Backup Generators	31	0	0	**31**
Total by Utility	**83**	**1,016**	**663**	
			Grand Total	**1,762**

Example of Smart Thermostat Response for Small Commercial Cust. Thermostat Raised 4 deg. F.

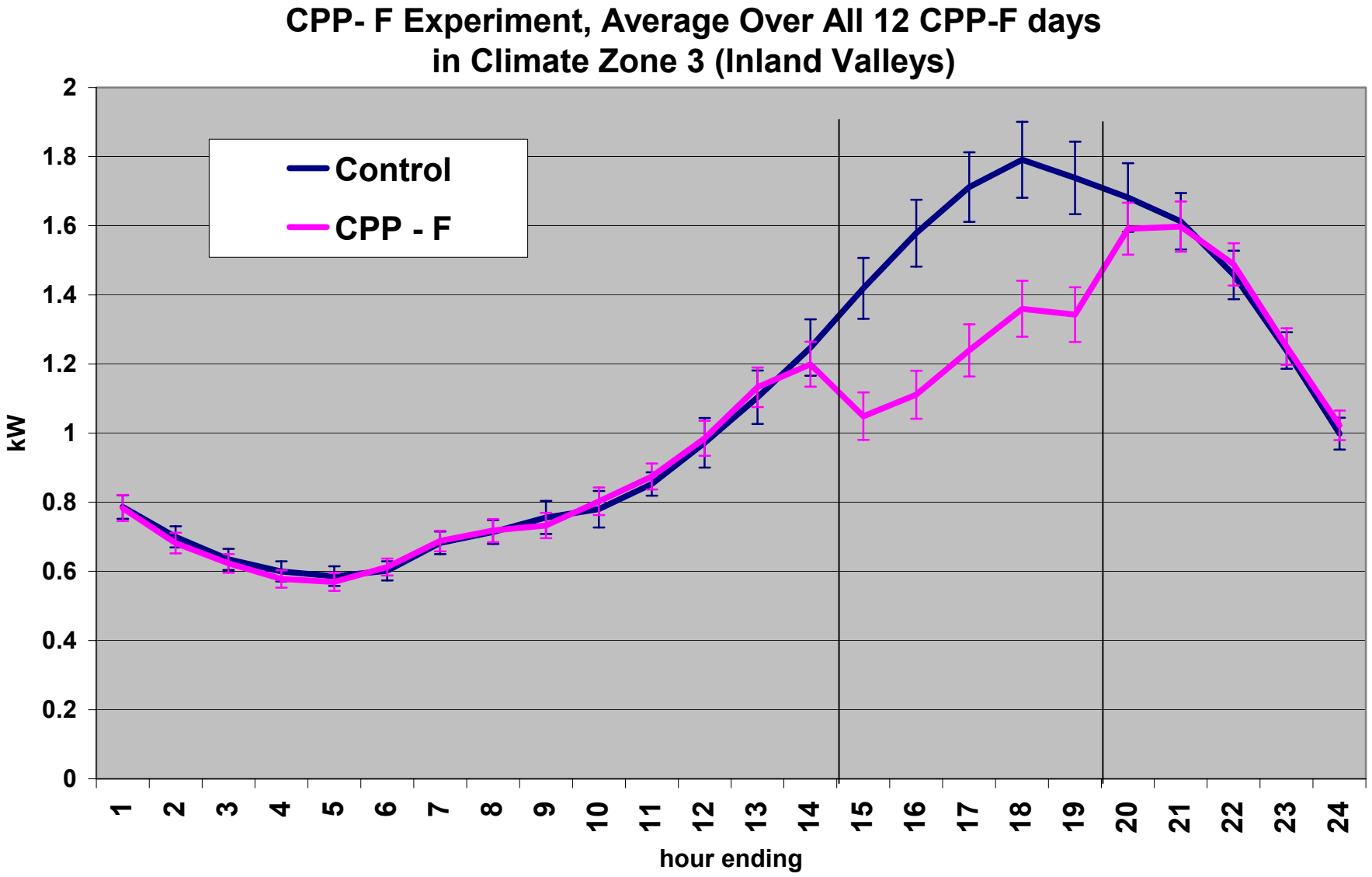


Source: Program Impact Evaluation of the 2002 SCE Energy $mart Thermostat Program Final Report, RLW Analytics, 2/28/2003

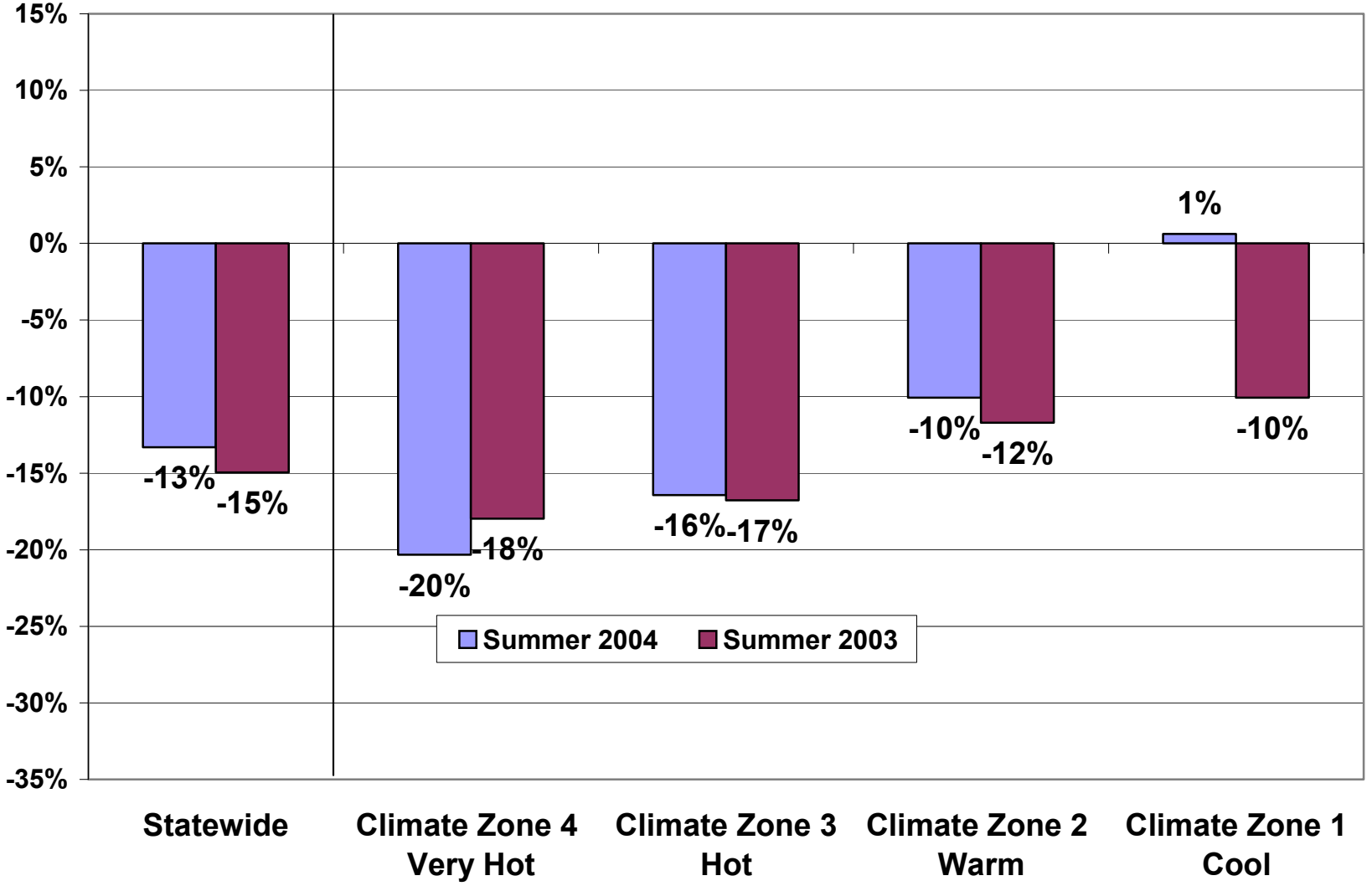
SPP climate zones vary from cool Zone 1 to very warm Zone 4



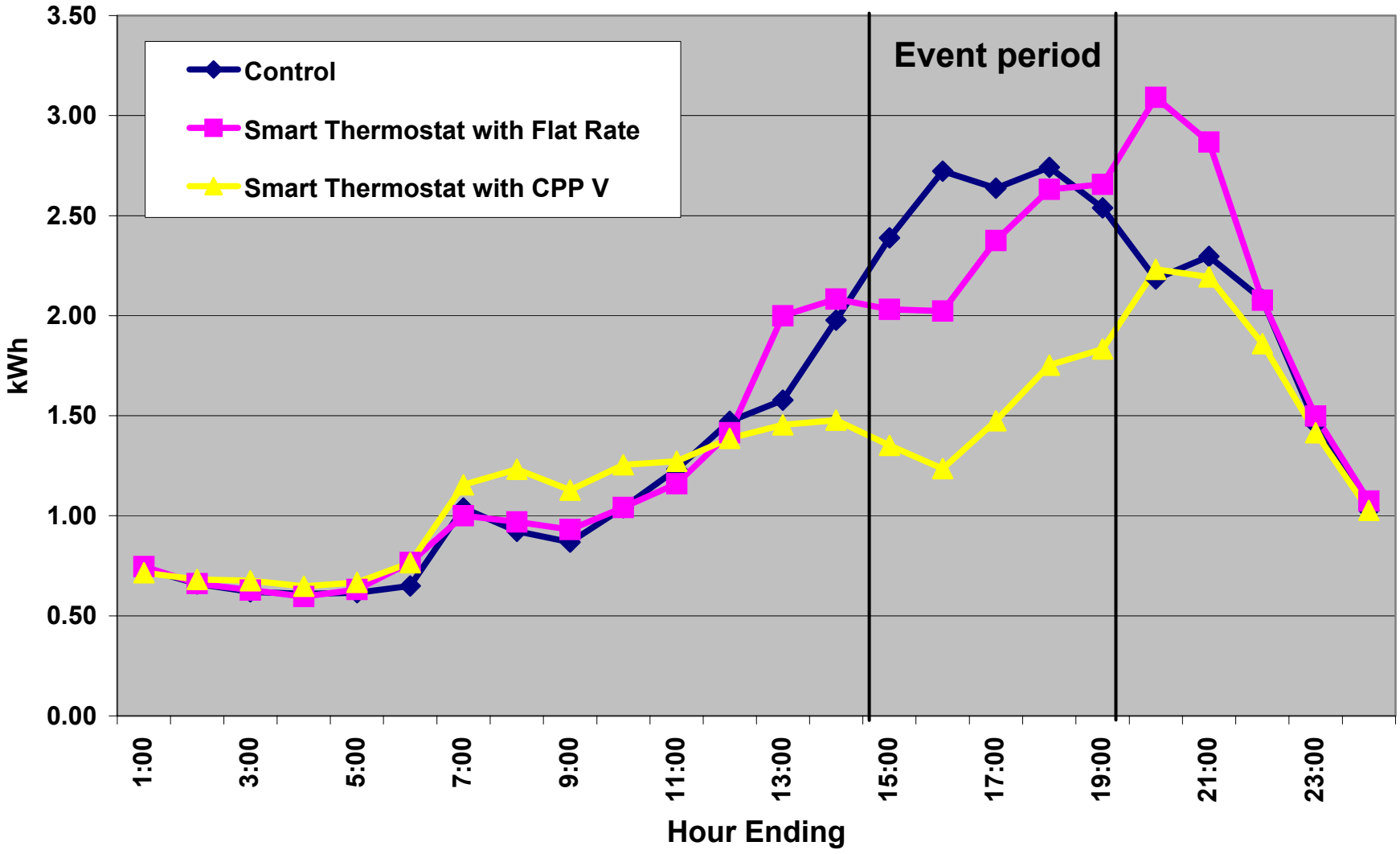
Source: CRA presentation, May 22 Chicago Pricing Conference


CPP- F Experiment, Average Over All 12 CPP-F days
in Climate Zone 3 (Inland Valleys)
Control
CPP - F
kW
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
hour ending

CPP_F Savings Compared to Control during CPP Peak Period Using Difference of Differences

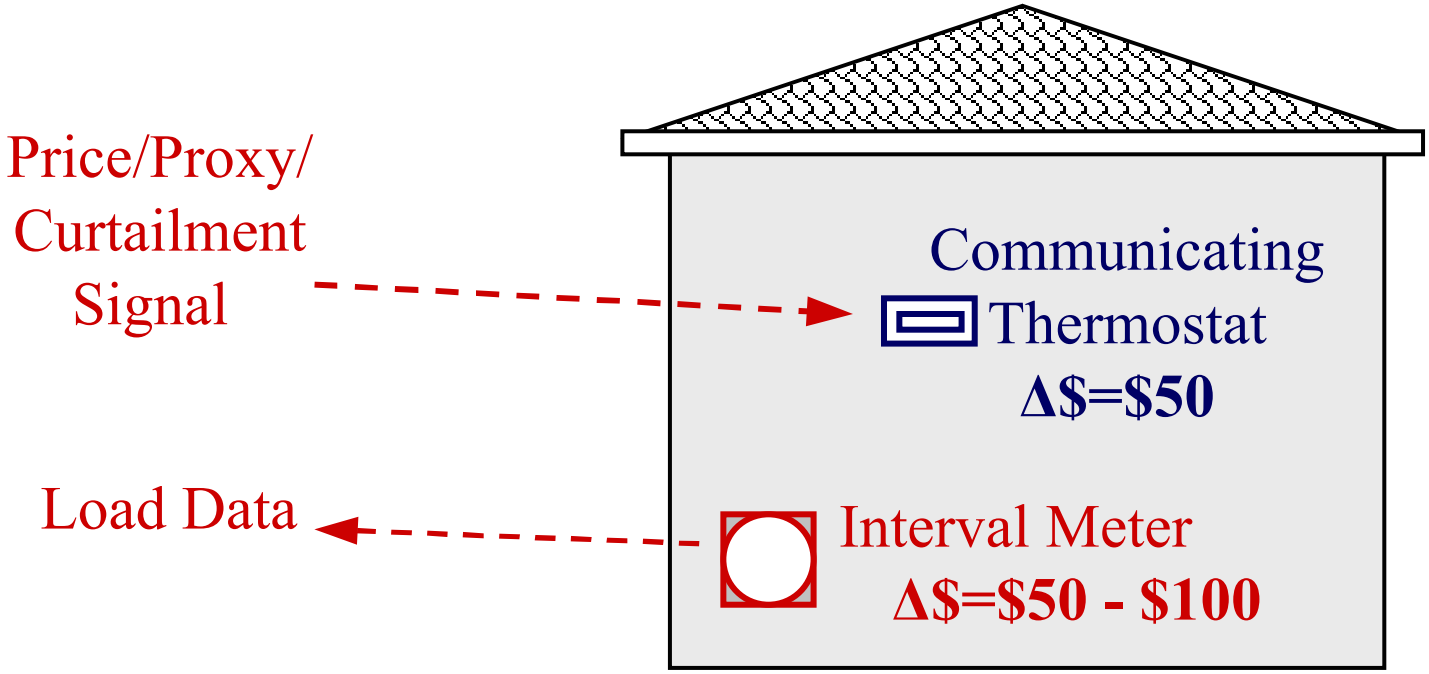


SDG&E CPP_V Experiment on August 31, 2004



Minimum Data Flow:
Curtailment Signal and Load Data

Cost of Avoided Load: $100-150 per kW



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Reference Design -- Next Steps

- Reference Designs (good for the next 15-20 years!)
  - Meters that can be used with evolving tariffs and regulations
  - Thermostats or User Interface
    - Communications and Programmability
    - Override capabilities (economic vs. reliability)
- My / CEC's Issues
  - How broad of a design?
    - Meters *only* vs. Meters *and* DR systems
    - Fast response to under-voltage and under-frequency
    - Measure, and track, reactive power
  - Easy access of customers to their own data
  - Net metering and performance-based (kWh-based) incentives for photovoltaics or distributed generation