

# **How and Why Customers Respond to Electricity Price Variability:**

## ***A Study of 2002 PRL Program Performance in New York***

**NYISO PRL WG**

**Albany NY**

**December 11, 2002**

**Neenan Associates**

**Lawrence Berkeley National Laboratory**

**Battelle Pacific Northwest National Laboratory**

# Presentation Outline

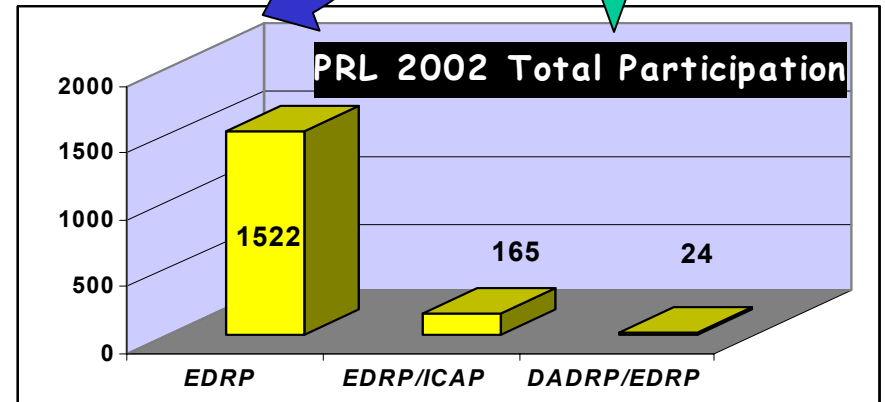
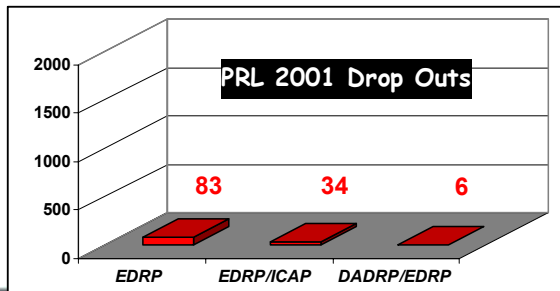
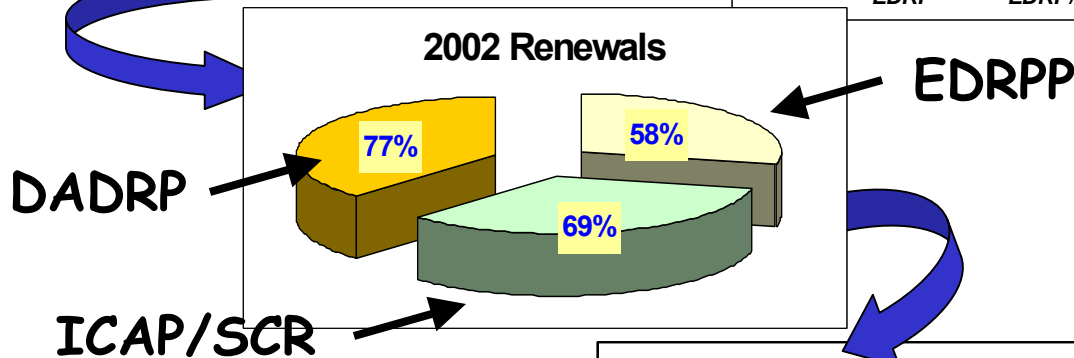
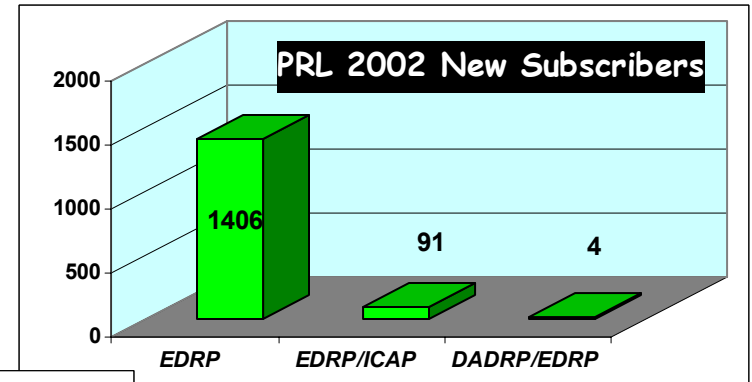
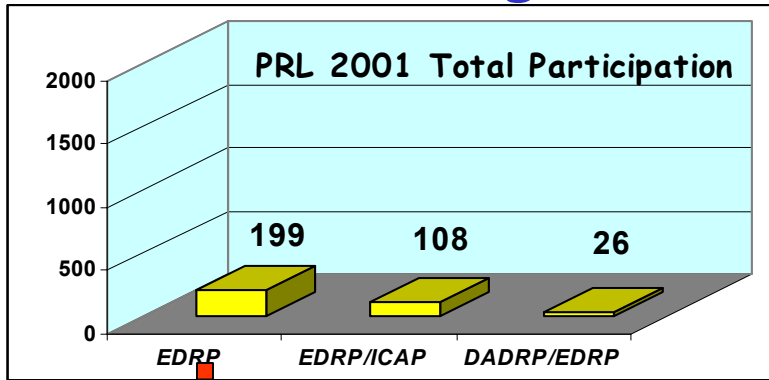
- ✓ **Performance details and comparisons**
- ✓ **A detailed look at who responds and why**
- ✓ **Moving forward**

# Overall Program Performance

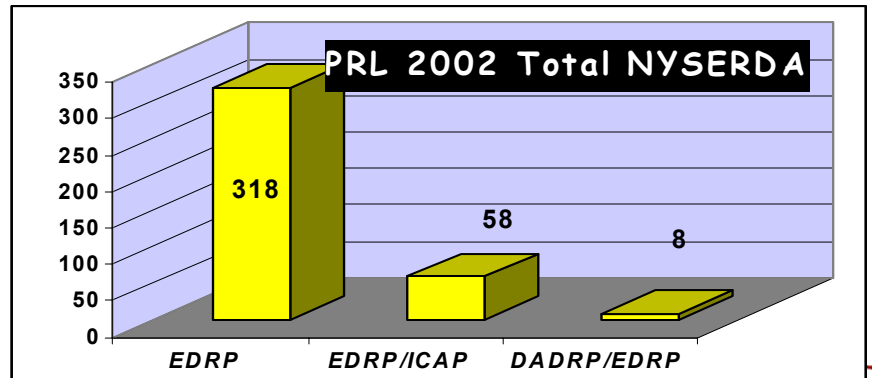
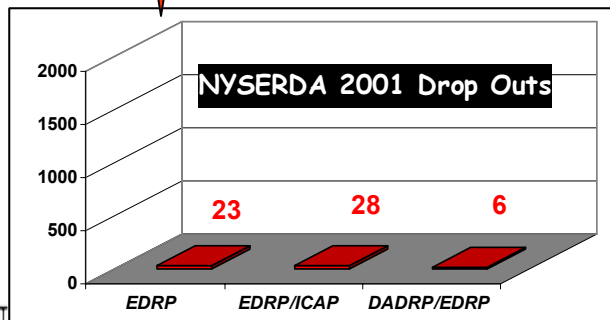
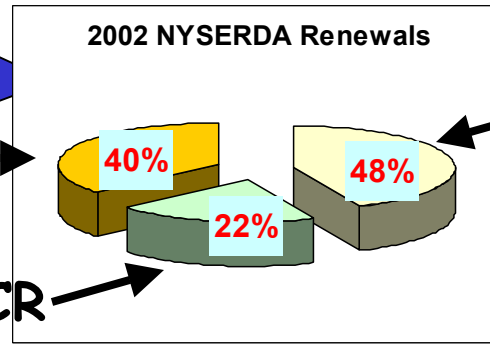
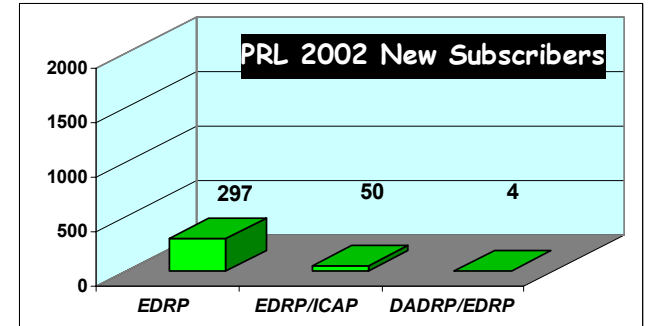
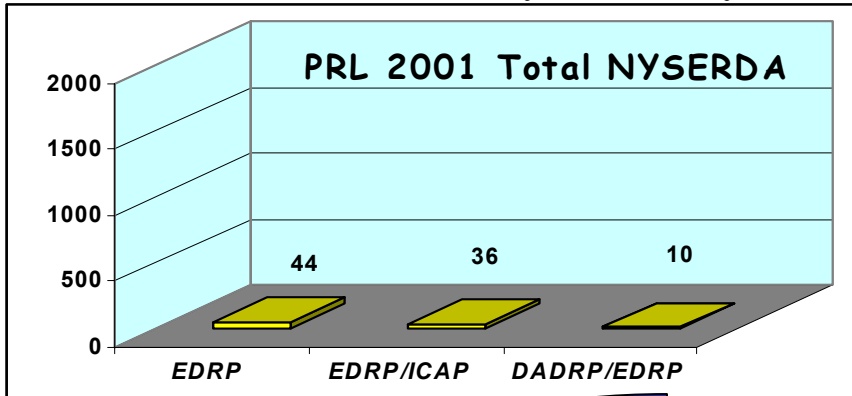
# New York: Summer 2002 Experience

	Participants/ MW	Events	Load Curtailed	Payments
<b>EDRP 2002</b>	1711 1481 MW	22 hr Downstate 10 hr Upstate	~668 MW 34% of CBL (summer)	\$3.3 mil
<b>2001</b>	<b>292/712</b>	<b>23/17</b>	<b>425/38%</b>	<b>\$4.2</b>
<hr/>				
<b>DADRP 2002</b>	<b>24</b>	1486 MWH scheduled	~14 MW (average)	\$0.1
<b>2001</b>	<b>16</b>	<b>2694</b>	<b>8</b>	<b>\$.2</b>

# Overall - High Retention, Large New Subscriptions

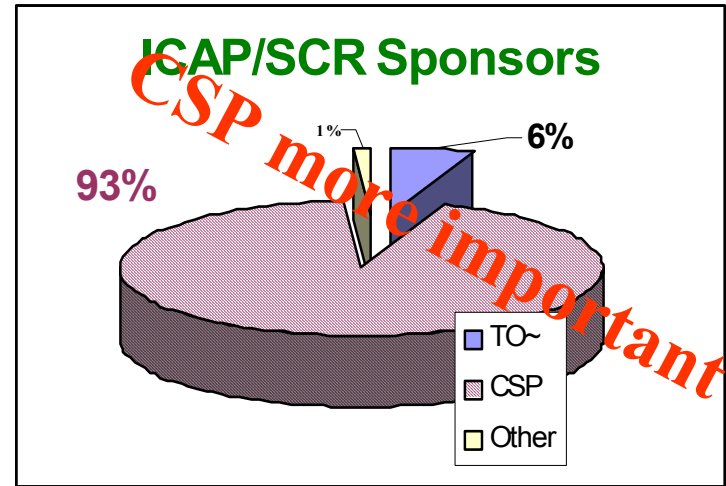
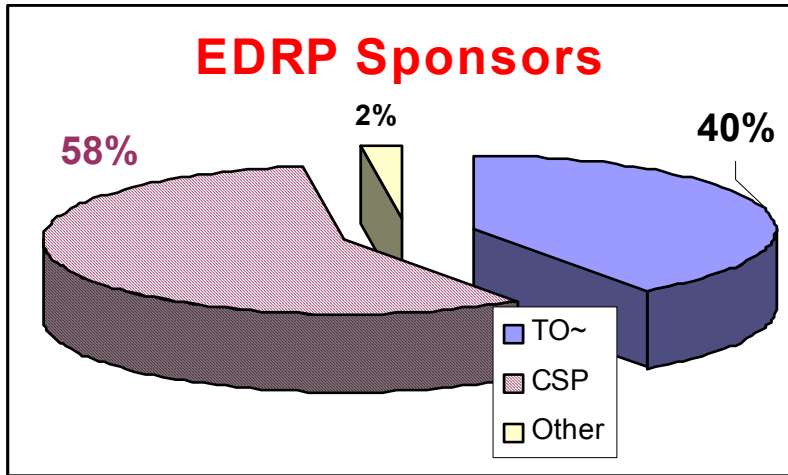


# NYSERDA - Lower retention, but strong new participant contribution

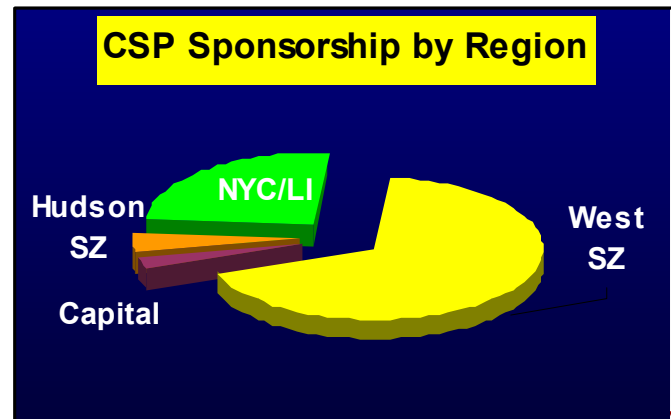
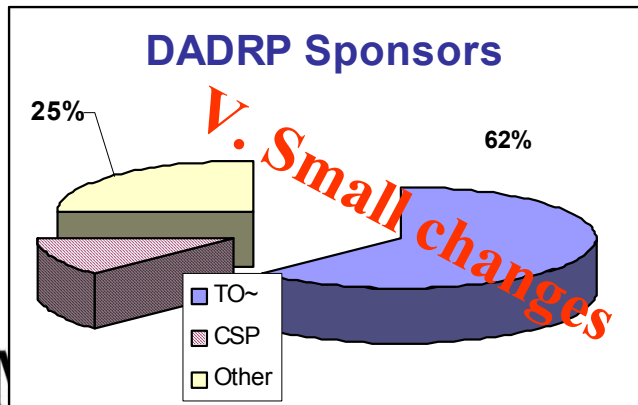


# The Role of CSPs in 2002

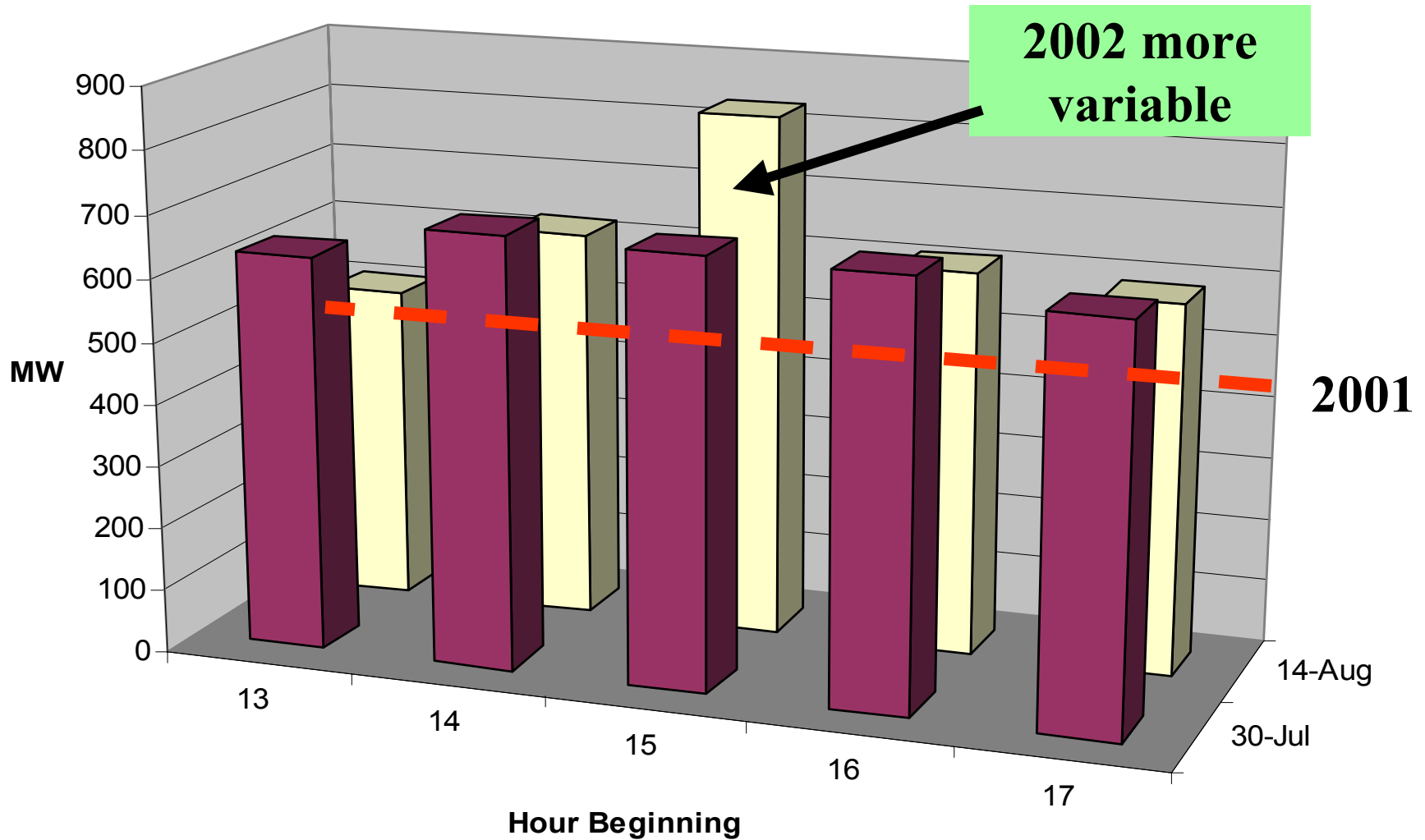
*Excluding LIPA*



- **EDRP:** TO's increased MW subscribed by 112%, CSPs by 95%
- **ICAP/SCR:** CSP increased MW by 130%, TO load stayed the same

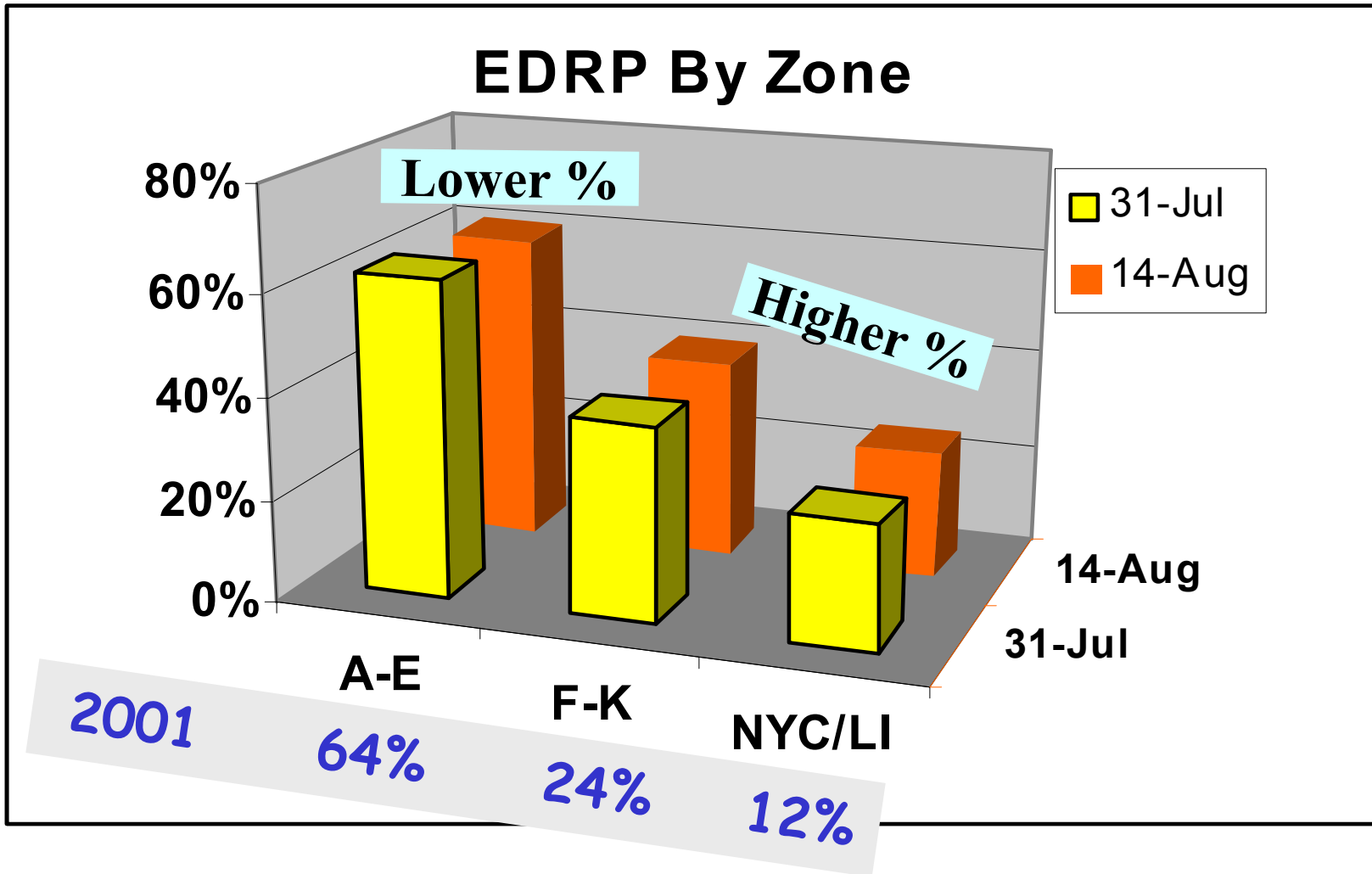


# EDRP Summer 2002 Performance

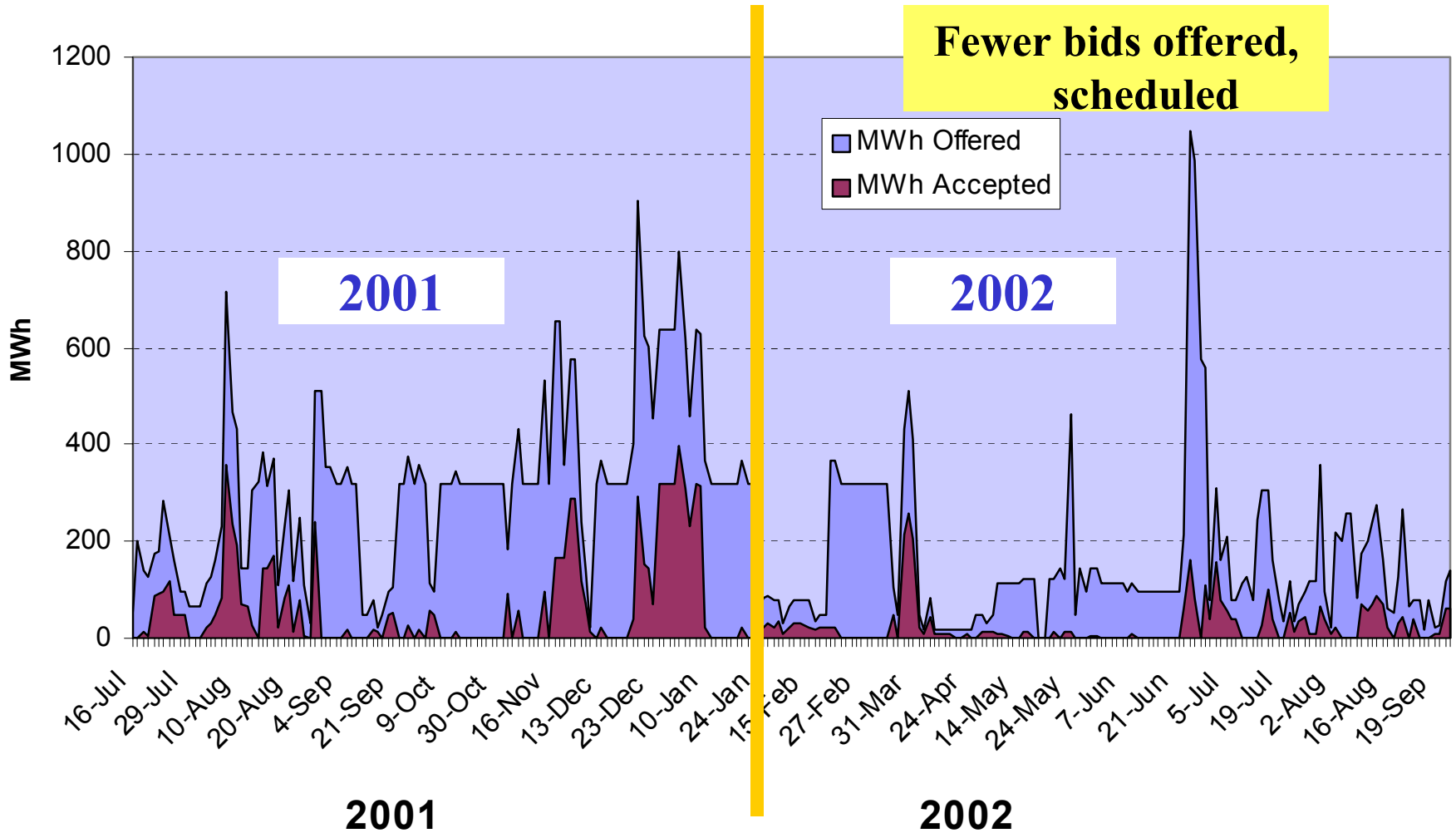




# EDRP More Load Curtailments still predominate in Western NY and Capital Region



# DADRP Bids and Scheduled Load



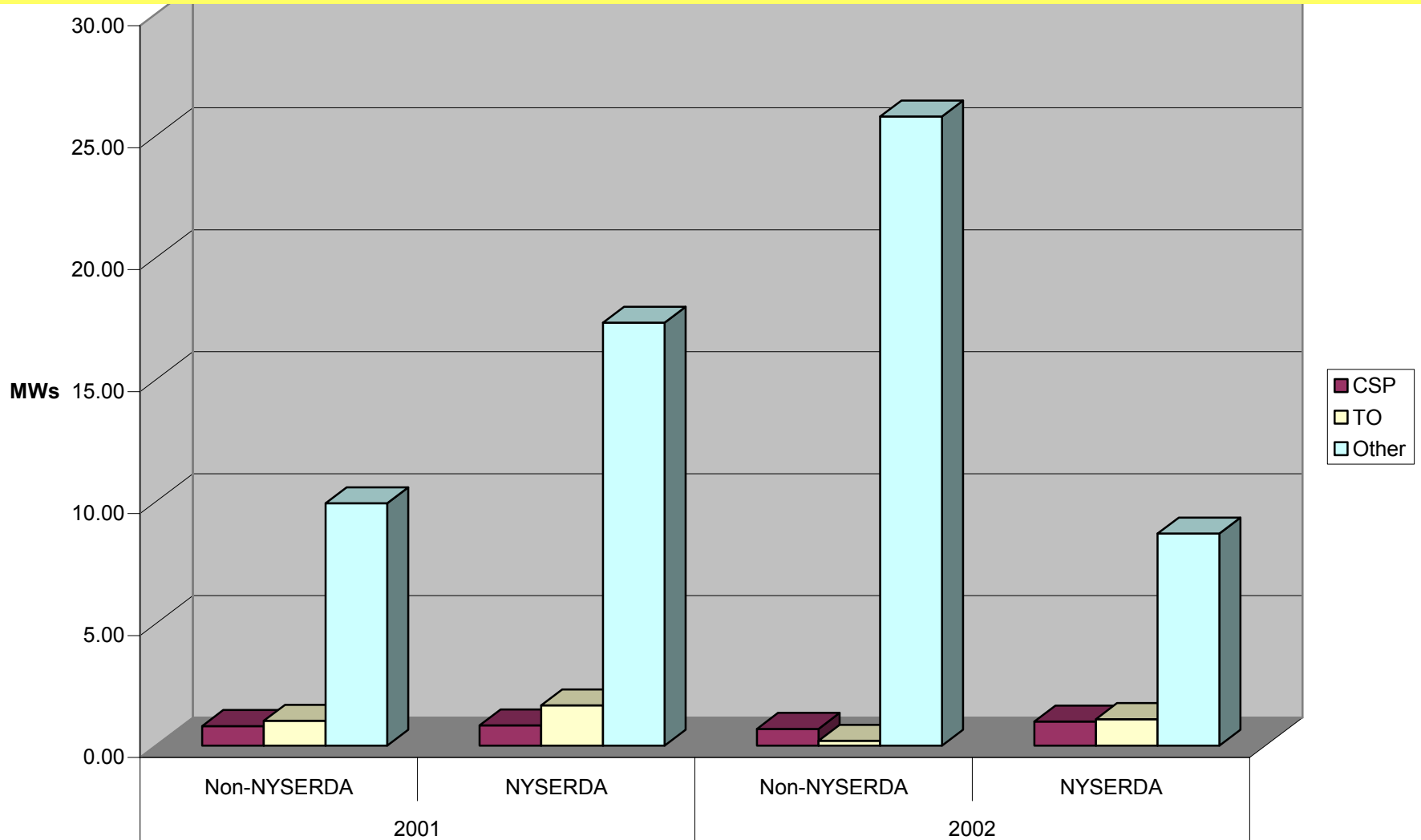
# Participant Program Performance Comparisons

# Summer 2002 Performance of NYSERDA-funded EDRP Participants vs. Non-NYSERDA Participants (cumulative)

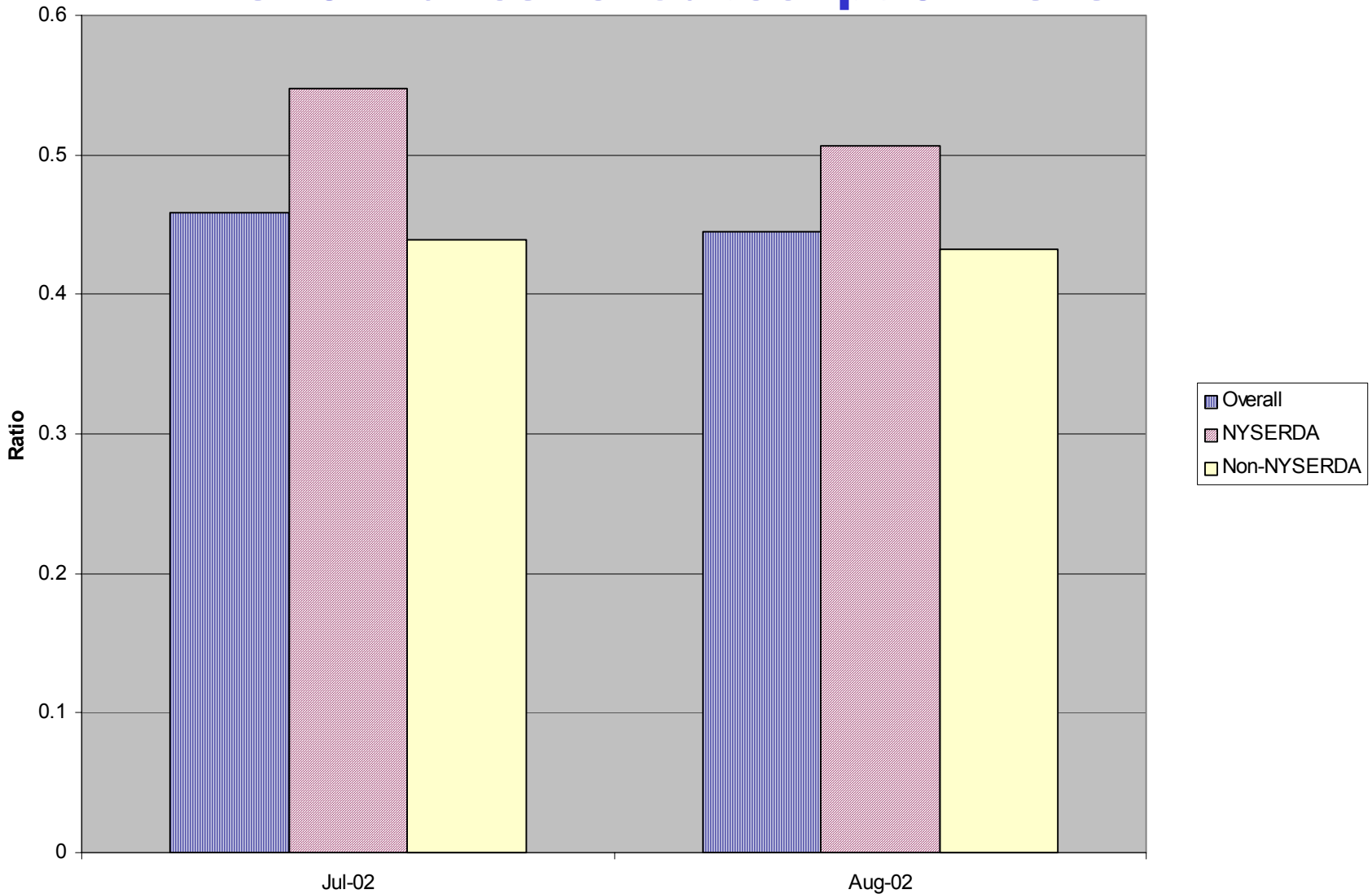
	All EDRP Subscribers			
	Overall Total Number of EDRP Subscribers	Total Pledged Hourly MW Reduction	Total Average Hourly MWH Performance	Wgt. Performance Ratio
Non-NYSERDA	1,368	1,167.1	493.2	0.42
Peak-Load Only	146	102.5	51.9	0.51
Enabl. Tech Only	185	187.8	110.9	0.59
Both	10	19.7	12.8	0.65
<b>Totals</b>	<b>1,709</b>	<b>1,477.0</b>	<b>668.8</b>	

	Subset of All EDRP Subscribers with positive EDRP Performance							
	Number of Customers	% of Total Analyzed	Total Pledged Hourly MW Reduction	% of Total Analyzed	Total Average Hourly MWH Performance	Wgt. Performance Ratio		
Non-NYSERDA	1,138	83%	988.6	85%	493.2	0.50	4,855.0	\$2,427,479
Peak-Load Only	40	27%	73.4	72%	51.9	0.71	518.8	\$259,377
Enabl. Tech Only	130	70%	170.5	91%	110.9	0.65	1,109.3	\$554,673
Both	9	90%	19.5	99%	12.8	0.66	128.2	\$64,093
<b>Totals</b>	<b>1,317</b>	<b>77%</b>	<b>1,252.0</b>	<b>85%</b>	<b>668.8</b>		<b>6,611.2</b>	<b>\$3,305,622</b>

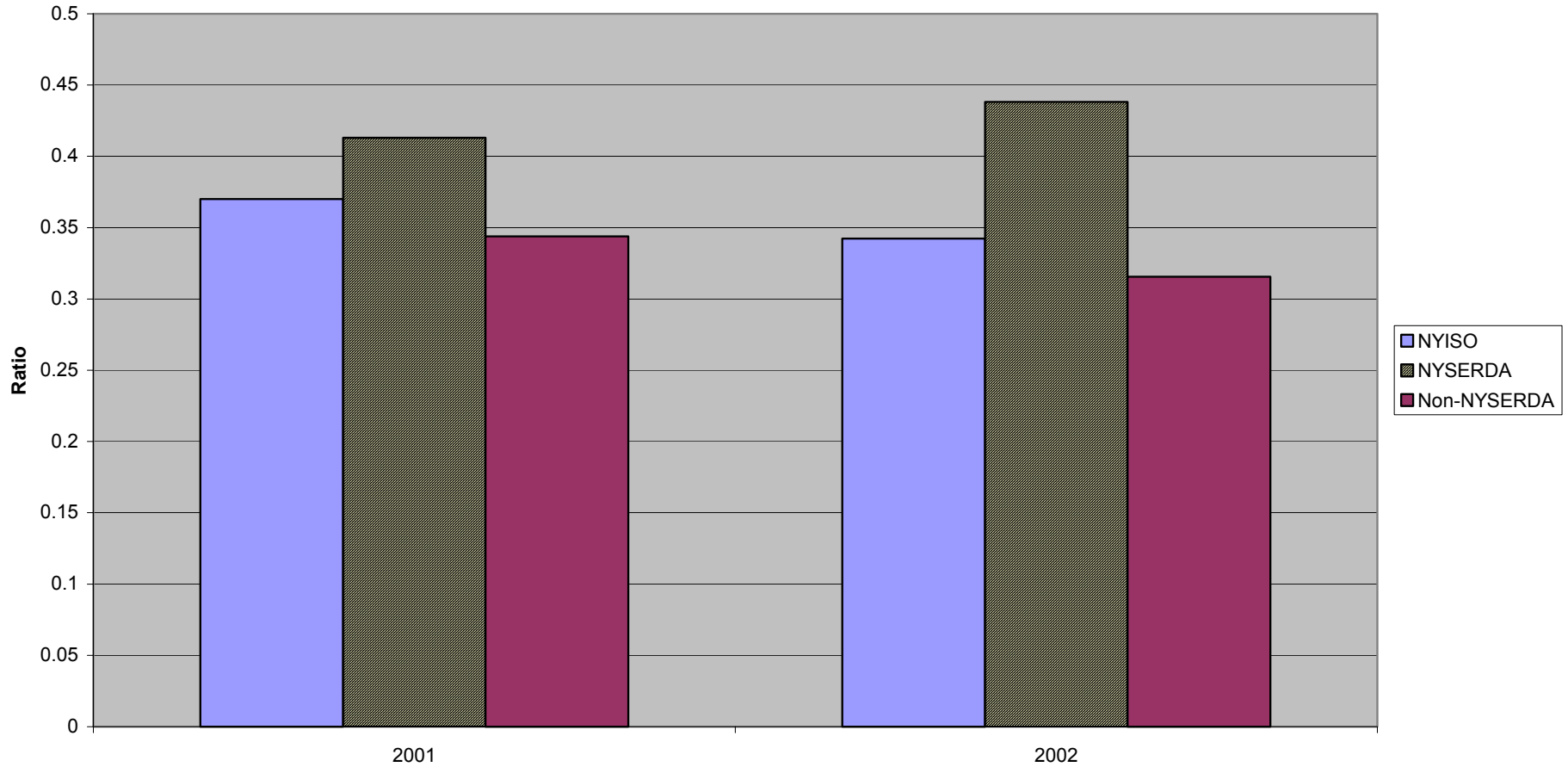
# Average Hourly EDRP Curtailments by CSP Type



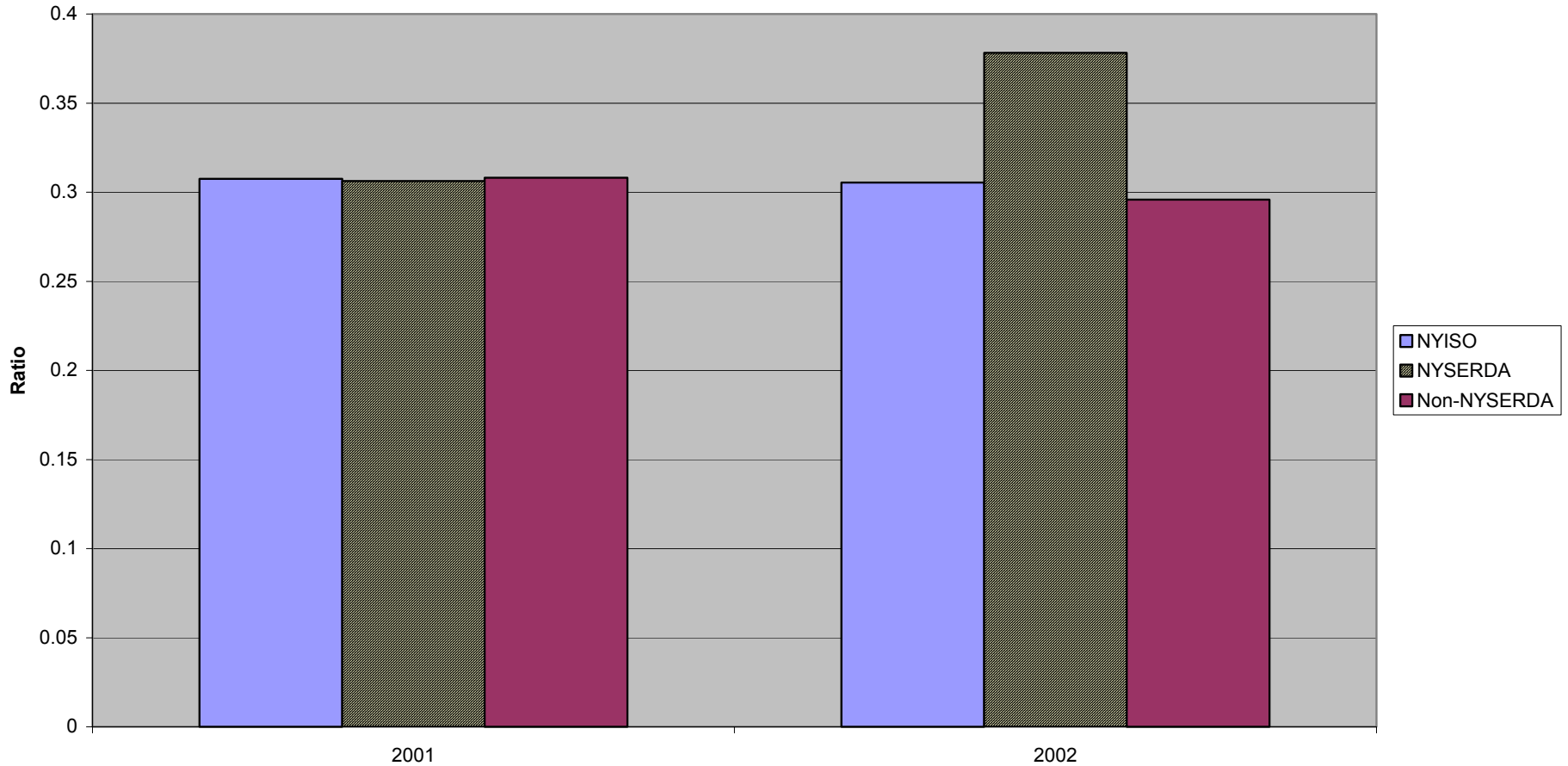
# EDRP Participant Actual Performance vs. Subscription Level



# Annual EDRP Curtailments Divided by CBL

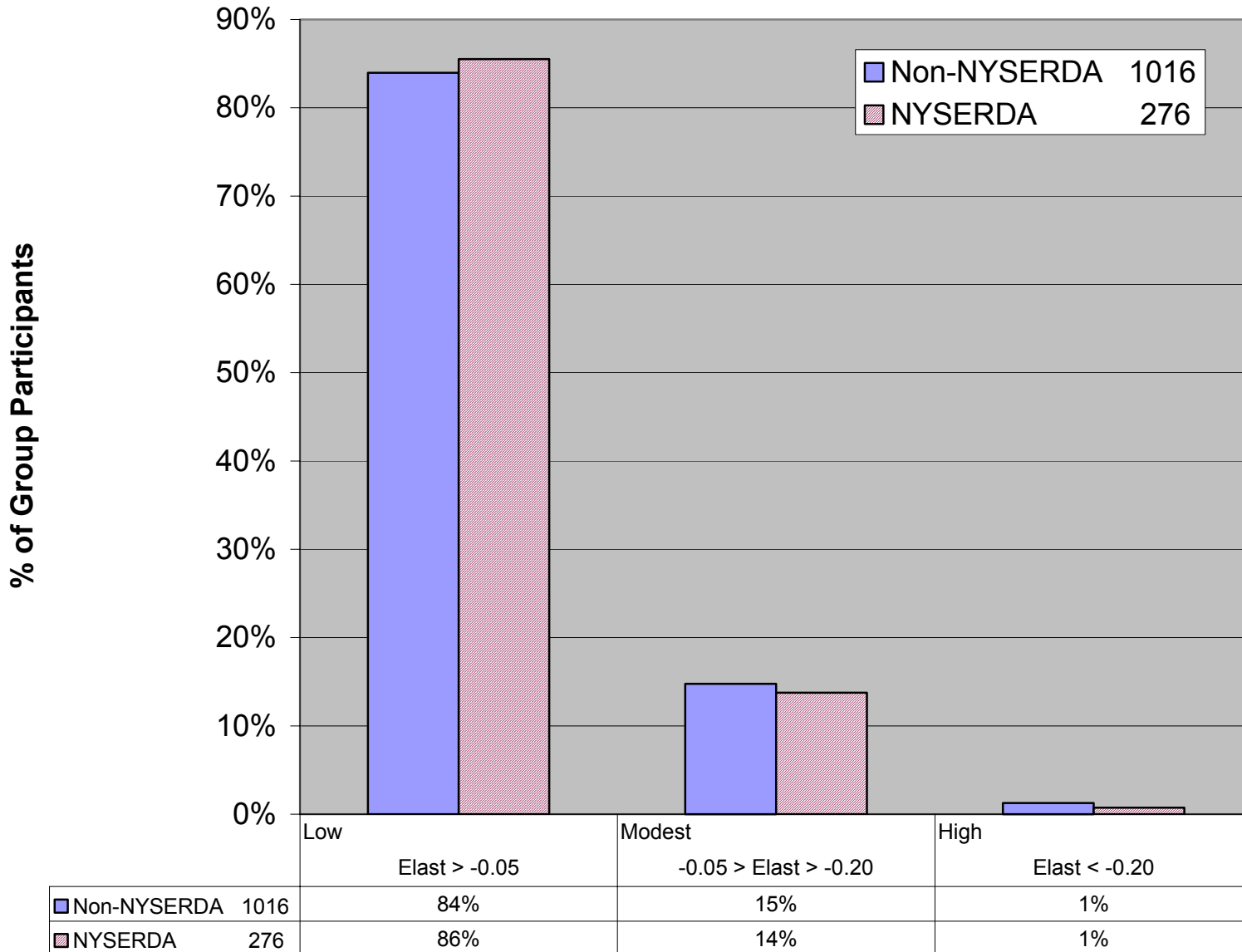


# Average Hourly EDRP Curtailment Divided by Hourly CBL

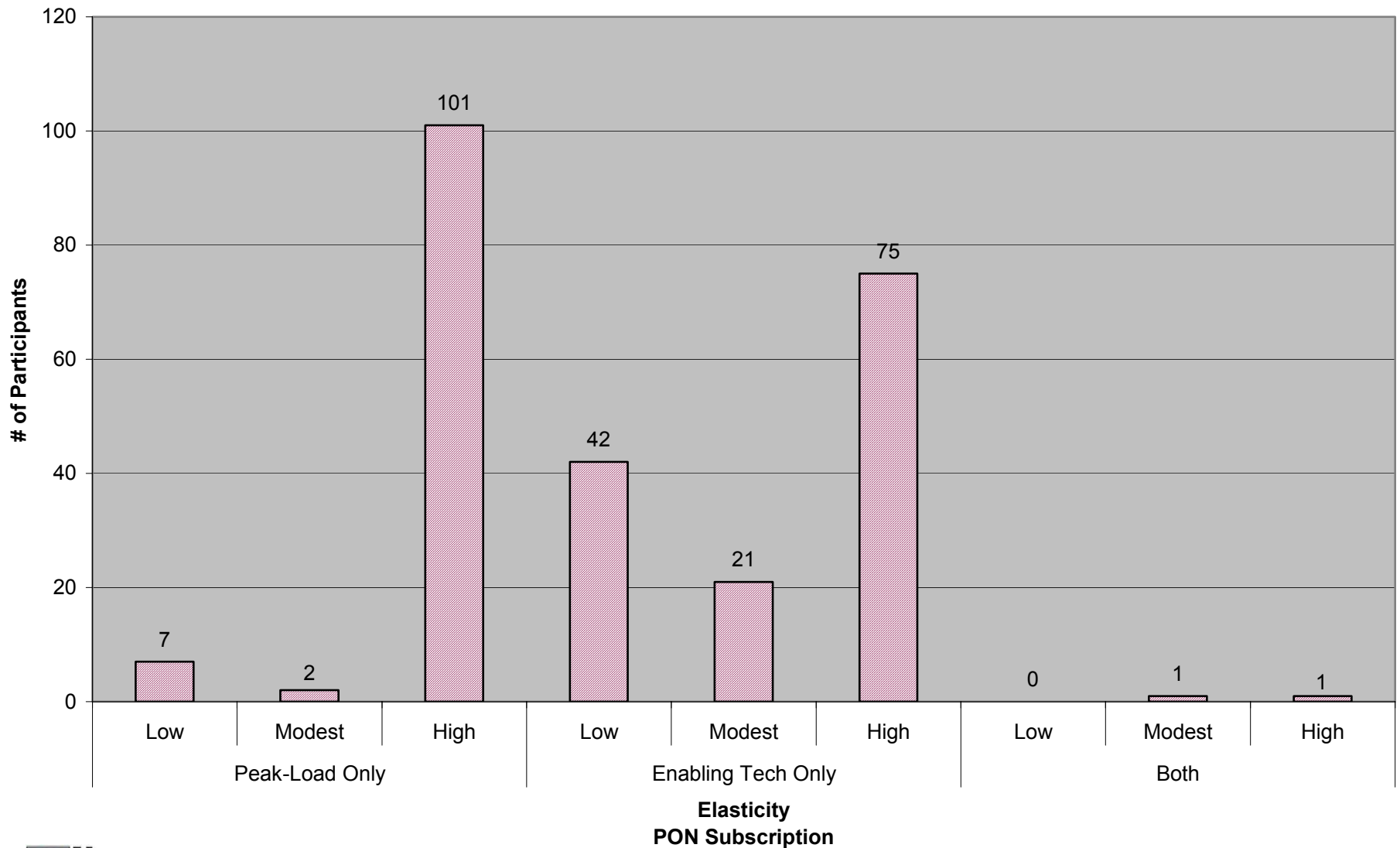




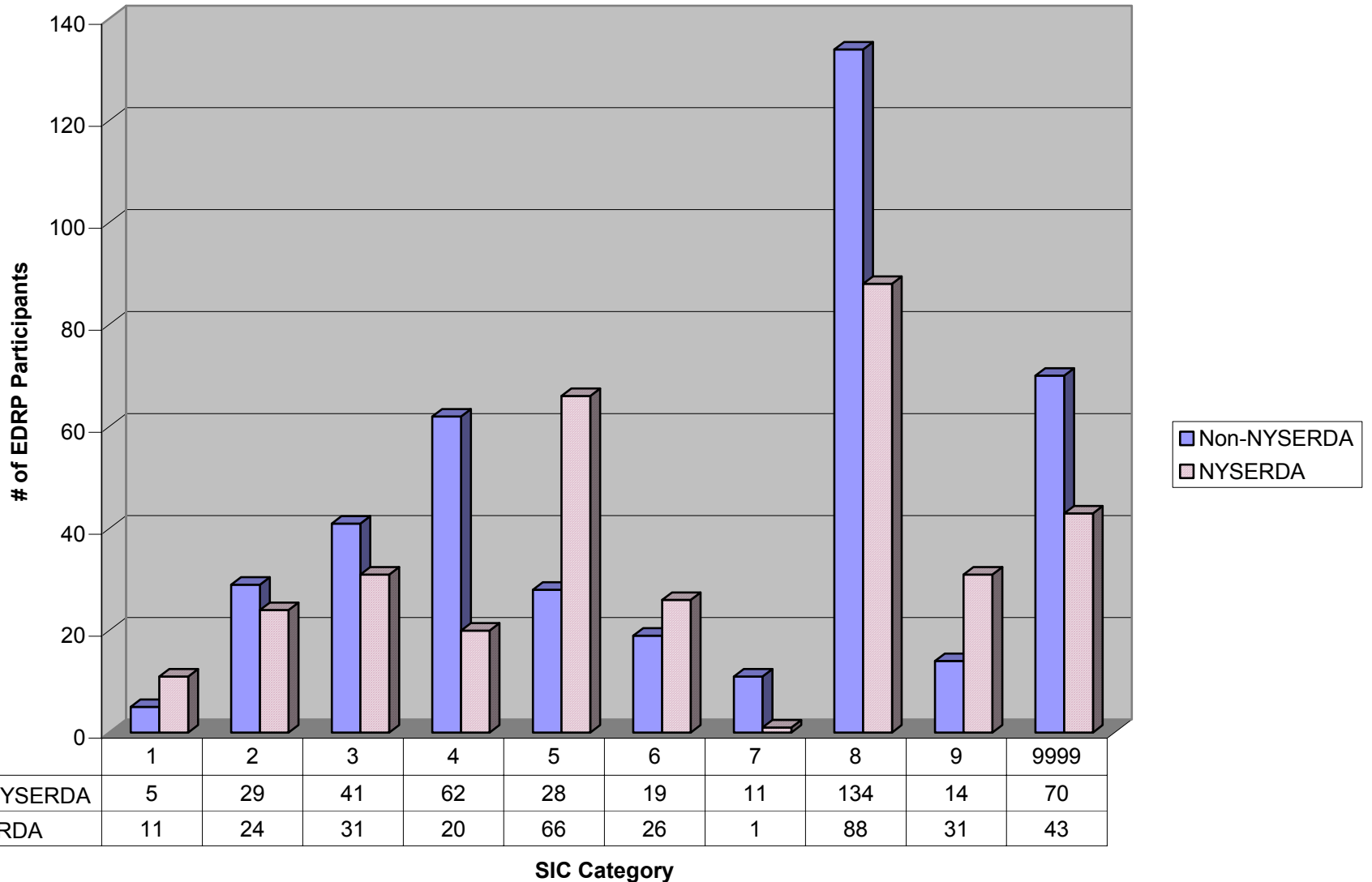
# EDRP Distribution of Response Elasticities



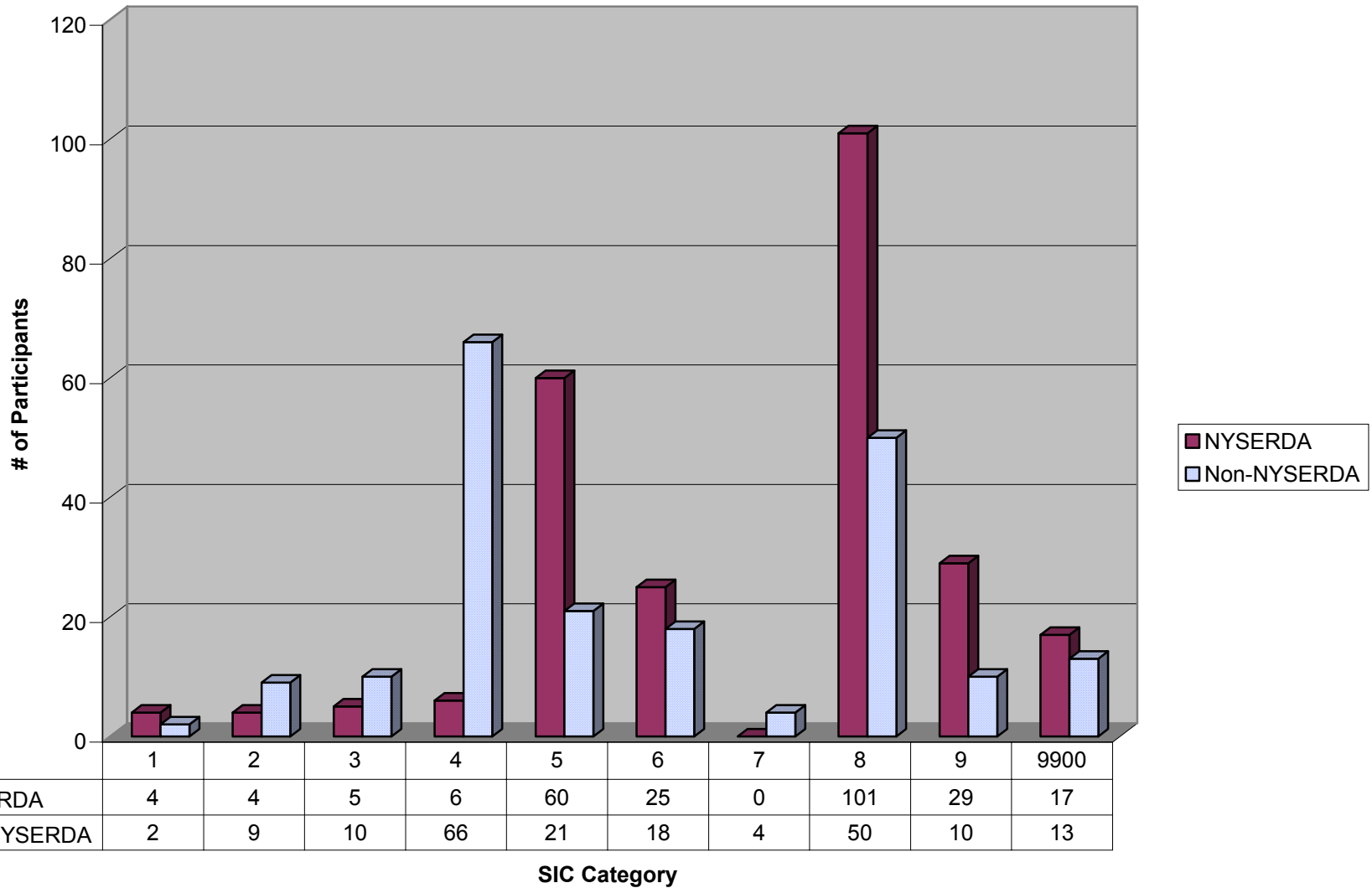
# Distribution of EDRP Elasticities by PON



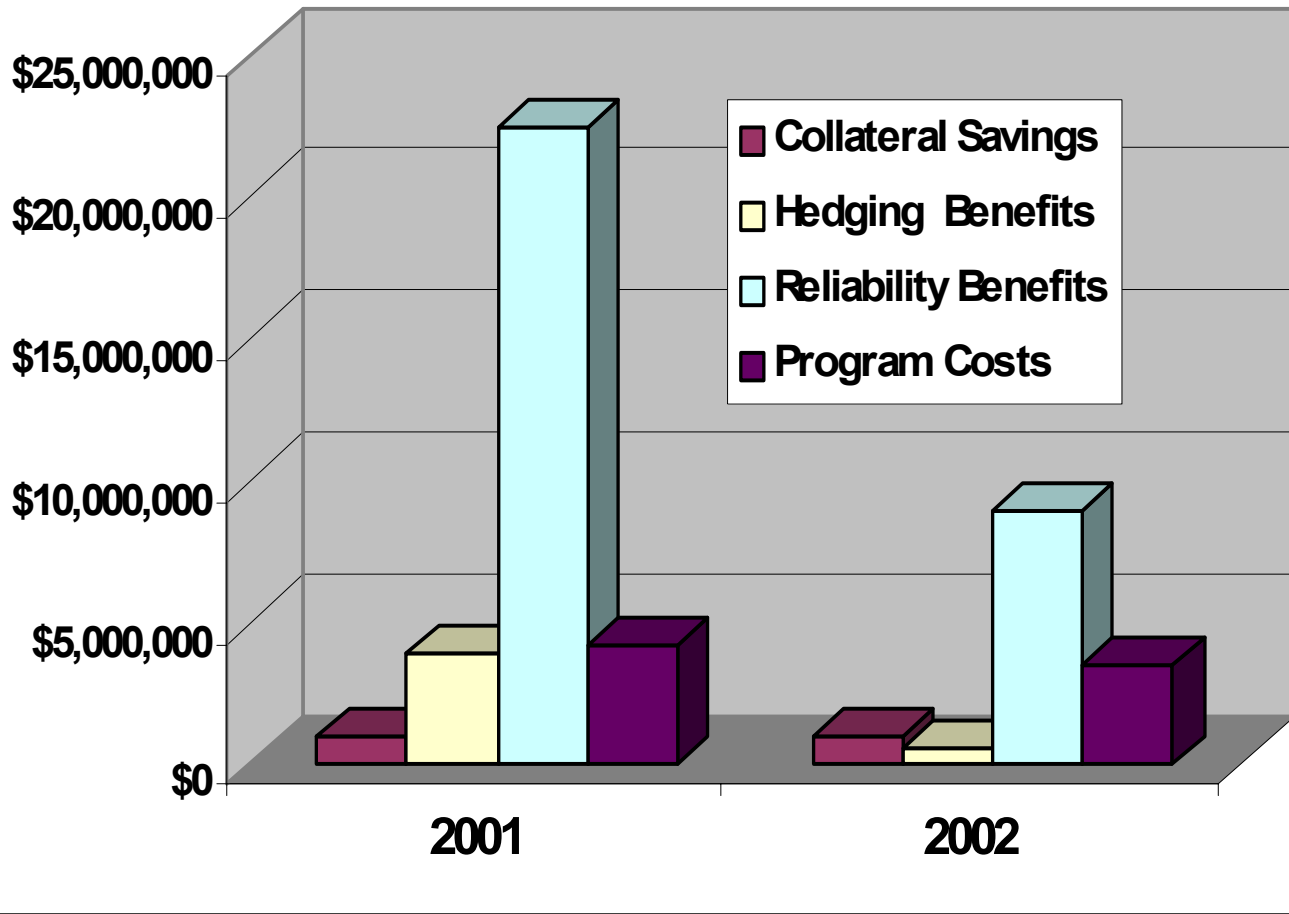
# SIC Participation: NYSERDA vs. nonNYSERDA



# Multi-Site Participation by SIC, NYSERDA vs. Non-NYSERDA



# EDRP Benefits



## Why Lower?

- Events in 2002 not as severe
- **Discount for excess curtailments**



# Key Drivers to Participation:

**Survey and PRL Audit Results**  
**Value of Enabling Technologies**  
**Barriers to DADRP: What's Wrong**  
**PRL "Business case"**

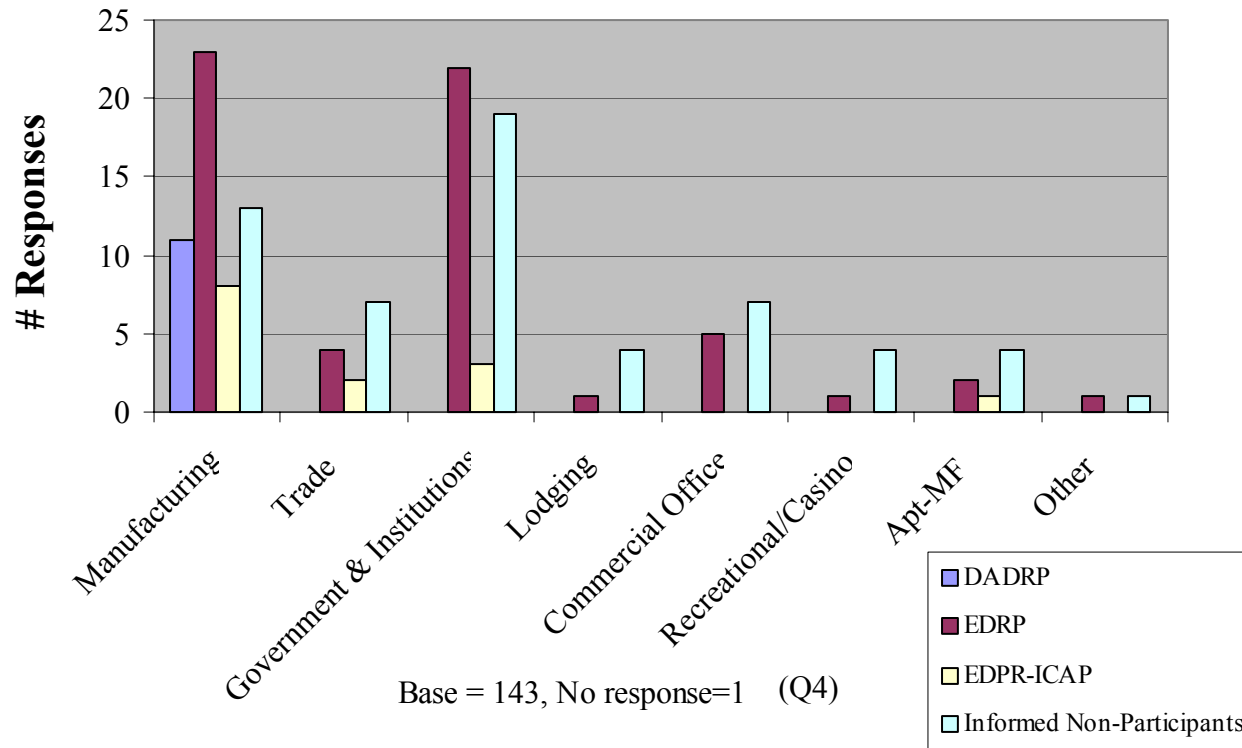
*Chuck Goldman*

*Jim Doane*

# Summary: Customer Survey & PRL Audit

- **144 Respondents: 18% response rate**
- **Characterize “typical” customer group**
  - **NP** have lower median summer peak demand (750 kW) vs.. DADRP (14 MW) and EDRP (1.7 MW)
  - **DADRP** are manufacturing firms
  - **NP** are Govt/institution (32%), manufacturing (22%), trade and comm. Office (~12% each)
- **Impediments to Shifting Electricity**
  - ~90% of commercial and ~60% of institutional customers identified occupant comfort
  - ~75% of industrial customers identified production schedules

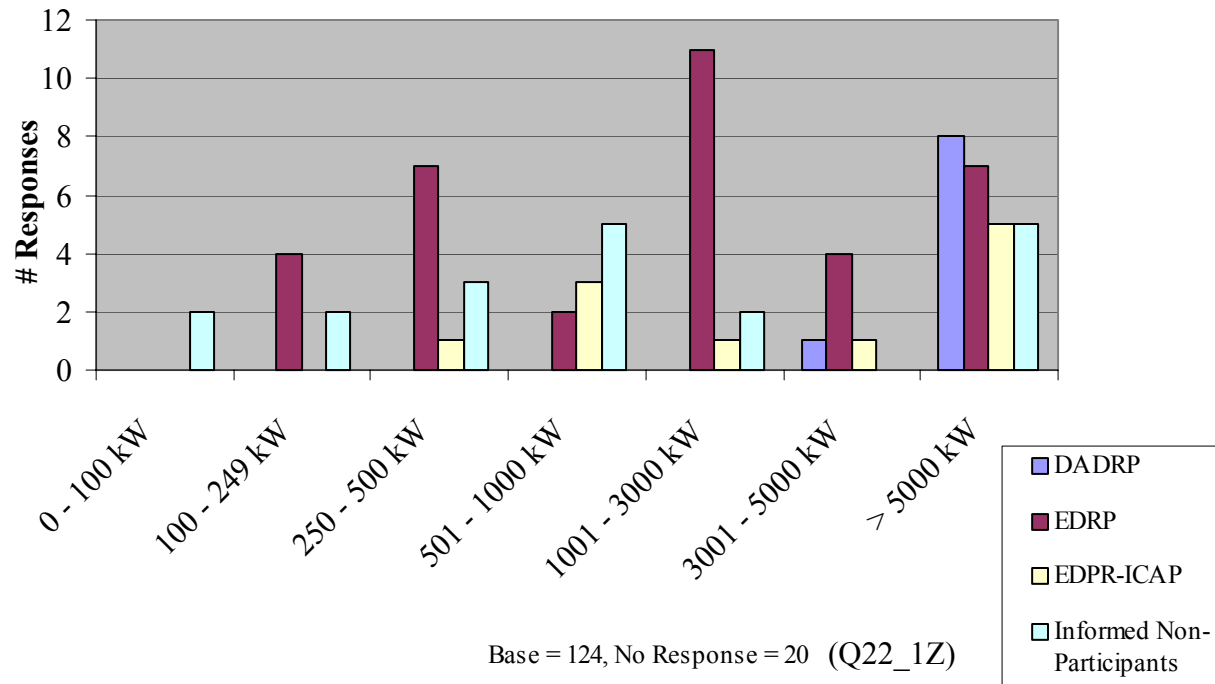
# Major Activity of Respondents



- **manufacturing (38%)**
- **govt./institutional/ many hospitals (33%)**
- **Non-participants are quite heterogeneous: govt./institutional (32%), manufacturing (22%), trade and commercial office (~12% each)**

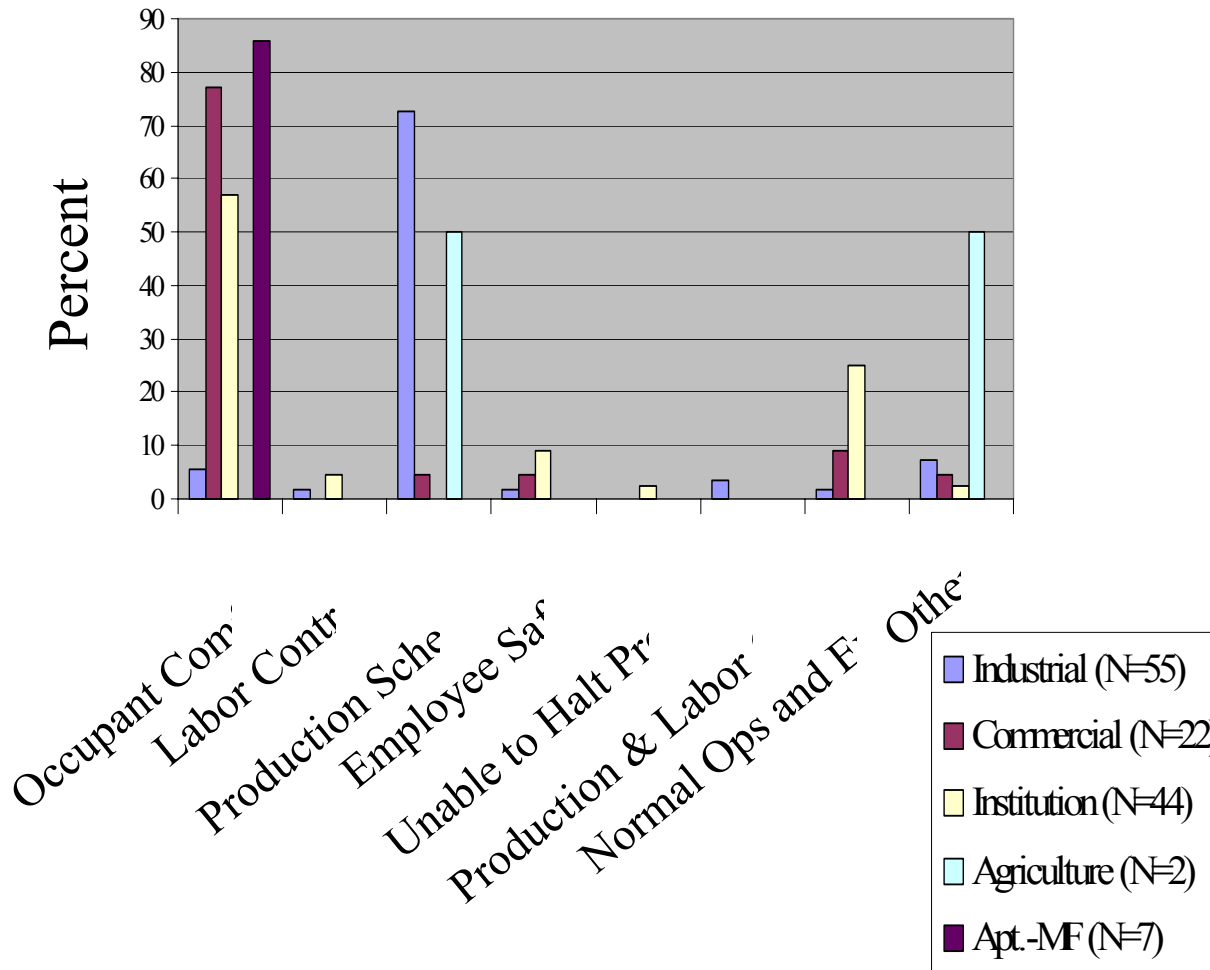


# Summer Peak Demand



- Median summer peak demand is significantly lower for non-participants (750 kW) vs. program participants
  - DADRP (14.5MW)
  - EDRP only (1.7 MW)
  - EDRP/ICAP (5 MW)

# Impediments to Shifting Electricity Usage during noon-6 pm



**Comfort largest impediment:**

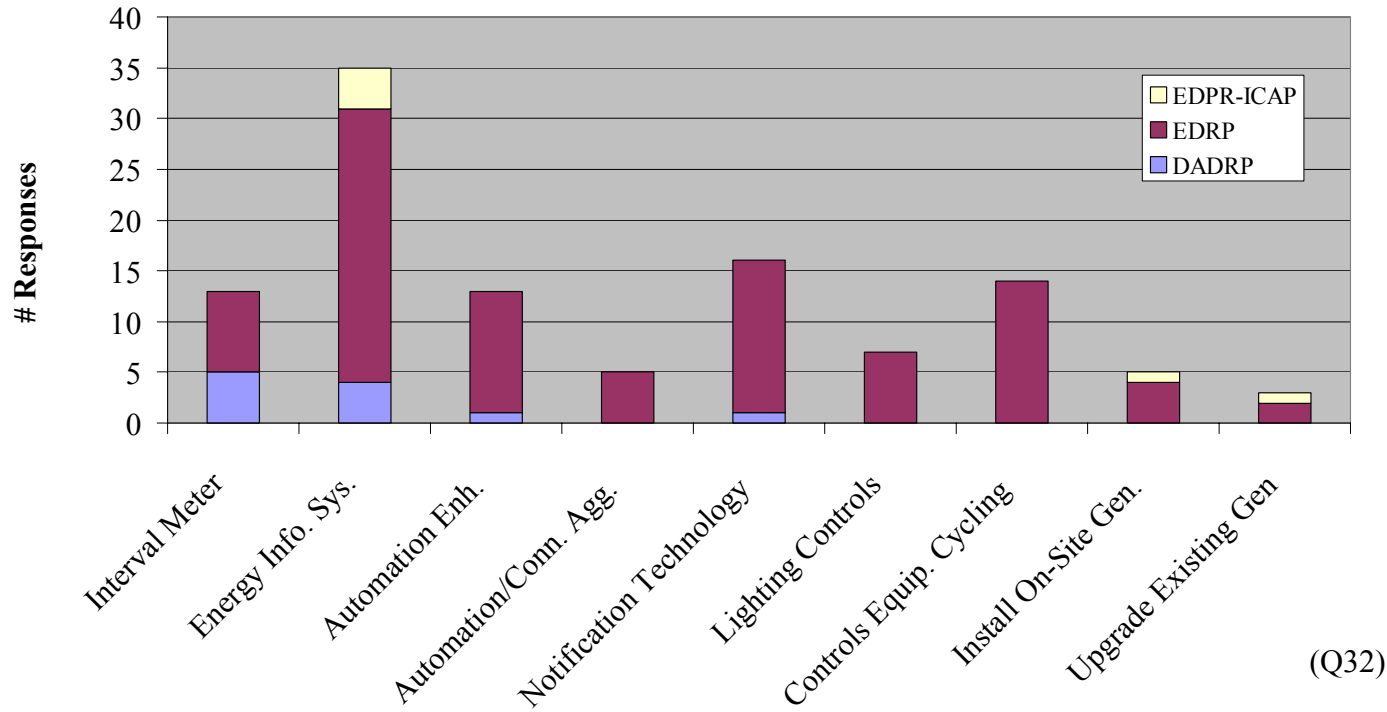
~80% commercial,  
~85% MF,  
~55% institutional

**Production schedule:**  
largest impediment for ~75% of industrial customers

**Other barriers:**

**Rate Design,  
Equipment Life,  
Other**

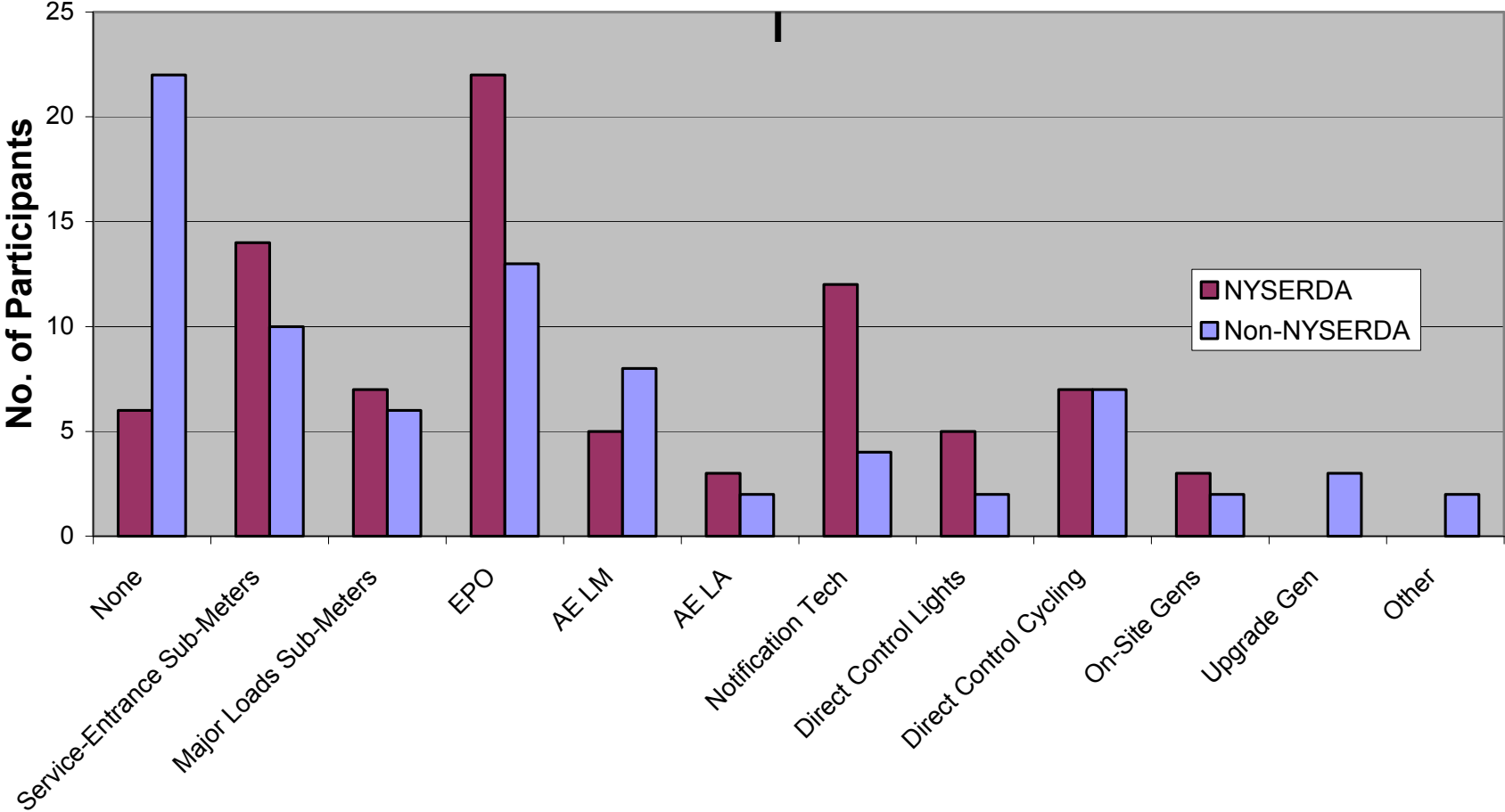
# Customer Survey: DR Enabling Technologies Installed



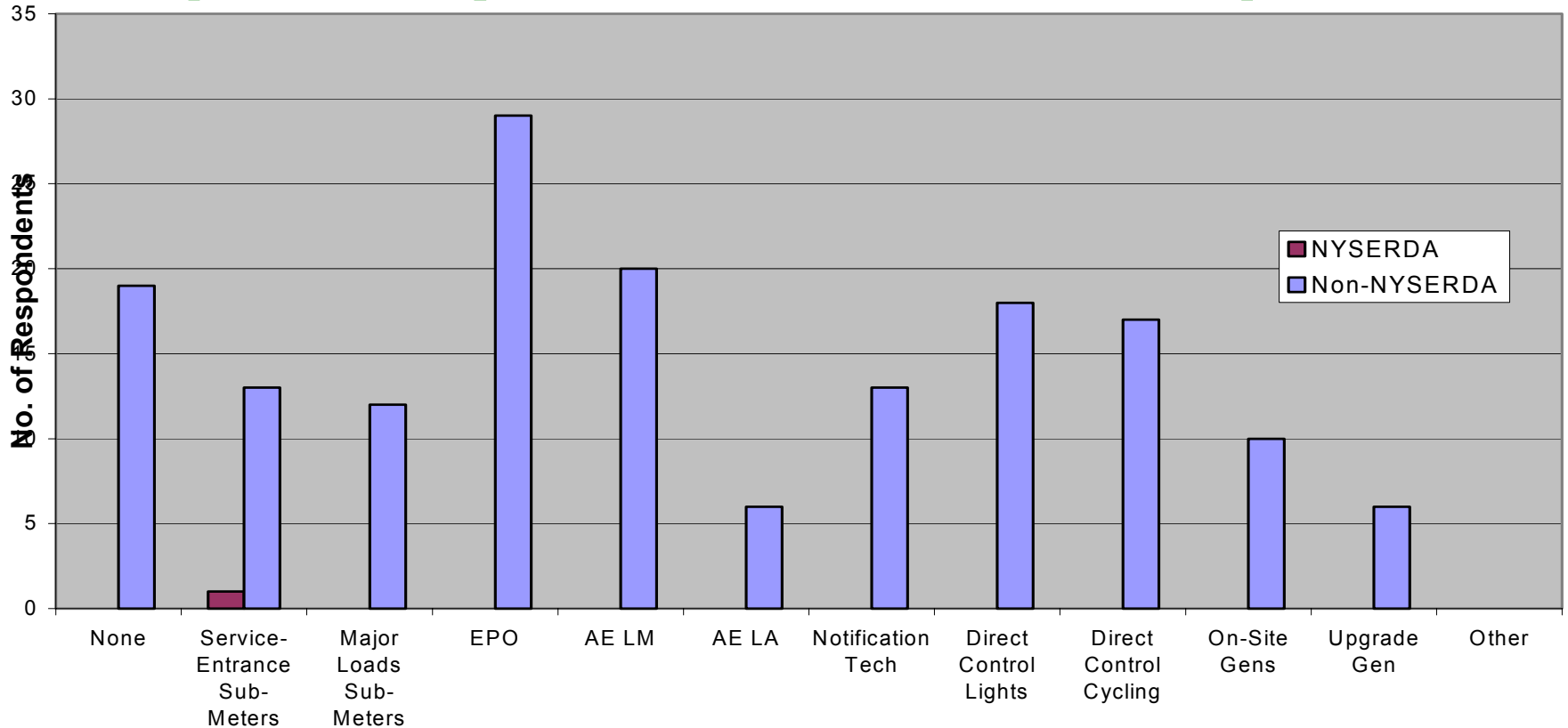
- **Most popular technologies:**

- **Energy information & management systems (63%)**
- **Notification/communications technologies (29%)**
- **Automation for load mgmt and aggregation (30%)**
- **Direct Load Control for lighting (13%) or equipment cycling (25%)**

# Impact PONs on Installation of Enabling Technologies among NYISO Program Participants



# Installation of DR Enabling Technologies reported by Informed Non-Participants



- **INPs report installing DR technologies at comparable rates to Program Participants -- WHY?**
- **~9% of installed DR technologies supported by NYSERDA funding**



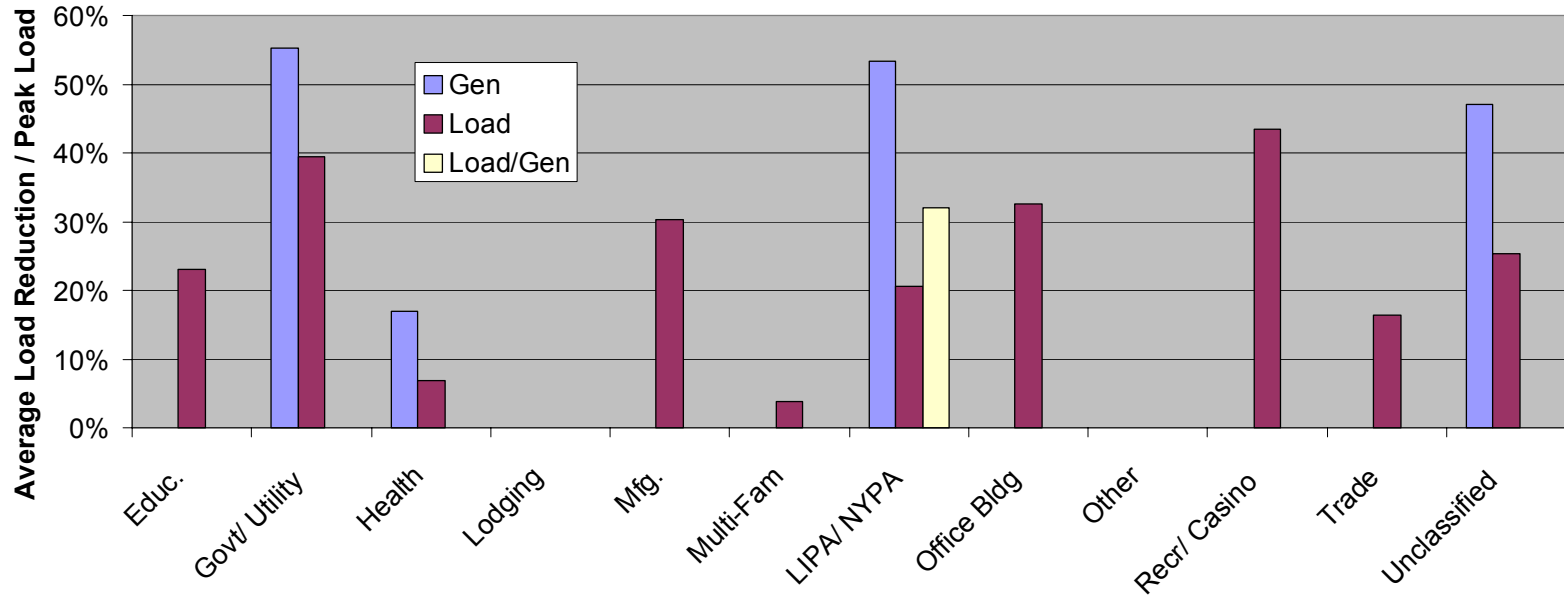
# Value of Enabling Technologies

*Chuck Goldman (LBNL/CERTS)*

*Michael Kintner-Meyer (PNNL)*

# DR Peak Performance Index (PPI) by Market Segment

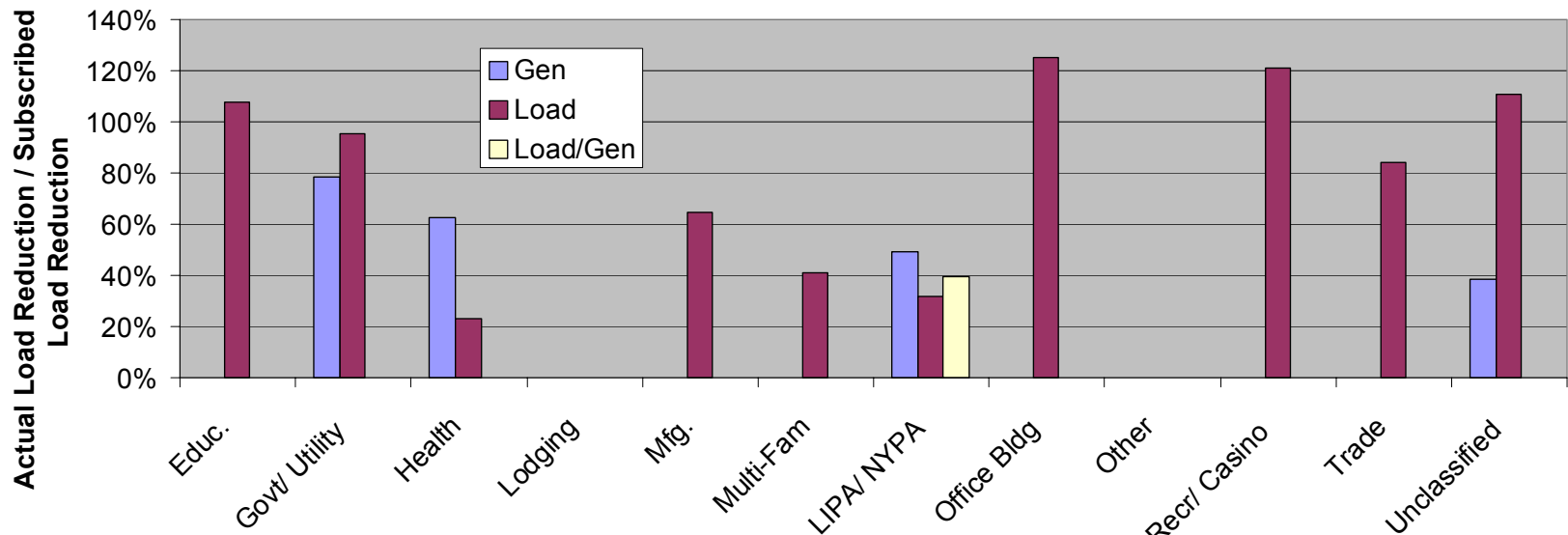
N	33	84	16	1	99	10	890	7	1	5	29	43
Total MW	30	123	28	1	558	9	549	8	1	5	26	137



- **PPI = Actual Load Reduction/CBL**
- **Average values are 50-55% for On-site Generation**
- **Average values for Load Reduction only ranges from 5% (MF, Health) to 20-30% (Educ.,Govt, Mfg)**
- **Under-served Markets = Comm. Office, MF,Lodging**

# Subscribed Performance Index (SPI): a customer reliability index?

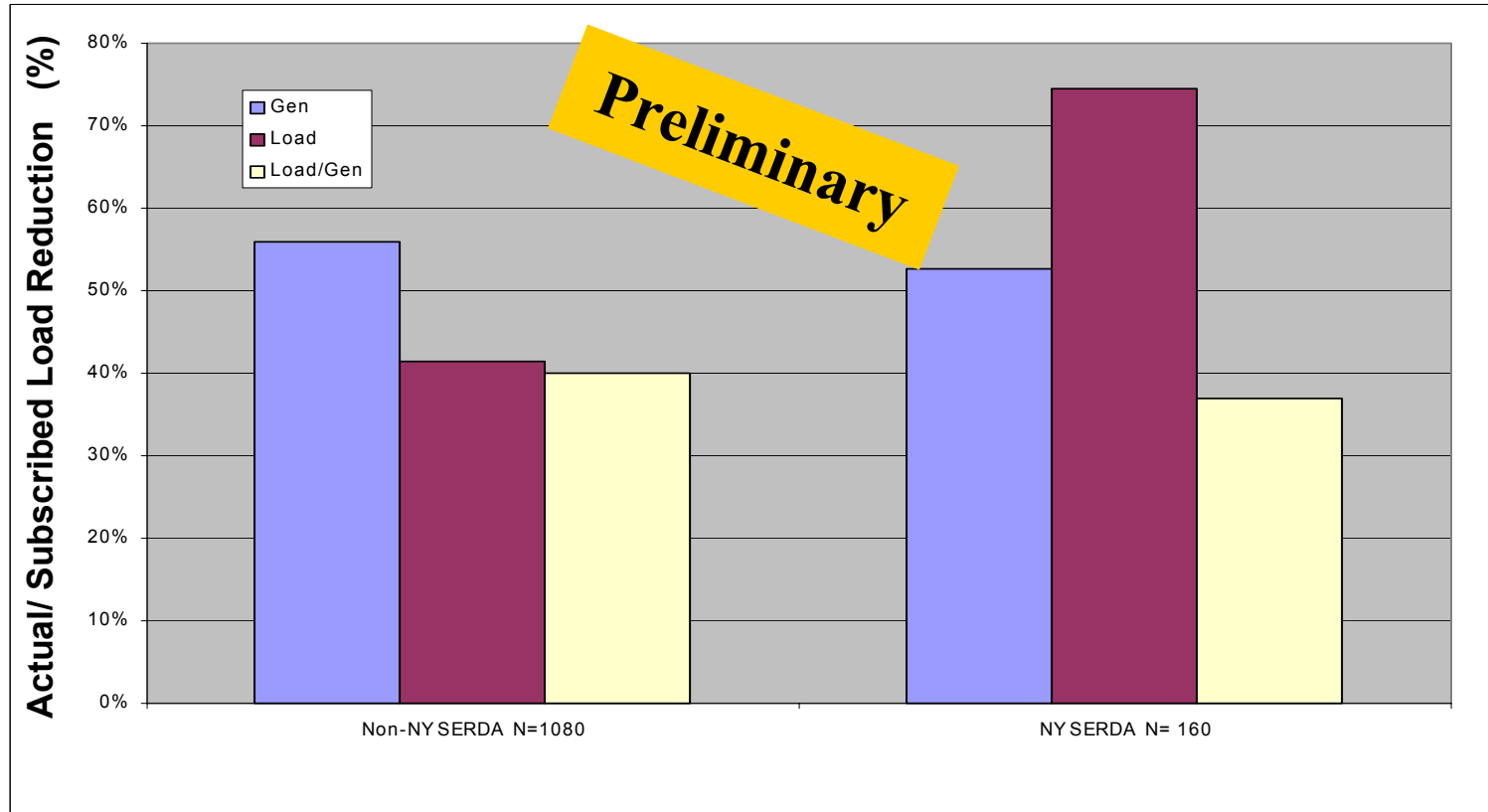
N	33	84	16	1	99	10	890	7	1	5	29	43
Total MW	30	123	28	1	558	9	549	8	1	5	26	137



- **SPI (actual/subscribed load reduction)**
- **For on-site generation, avg. SPI ranges between 50-60% for health care, LIPA/NYPA and 80% for govt**
- **For load reduction, avg. SPI are more variable across markets (20-120%): ~60% for mfg. and ~95% for govt.**



# Subscribed Performance Index (SPI) for NYSERDA vs. non-NYSERDA customers



- **NYSERDA-funded customers out-performed non-NYSERDA customers during EDRP events, particularly those using load reduction only strategies**

# EDRP/ICAP customers have superior performance compared to EDRP only

	N	Mean	Median
EDRP only	1105	42%	25%
EDRP/ICAP	113	96%	51%

- On average, EDRP/ICAP customers performed well when called (96%)
- EDRP customers delivered 42% of subscribed load reduction when called

**SPI = Average Load  
Reduction/Subscribed Load  
Reduction**



# Barriers to DADRP: What's Wrong

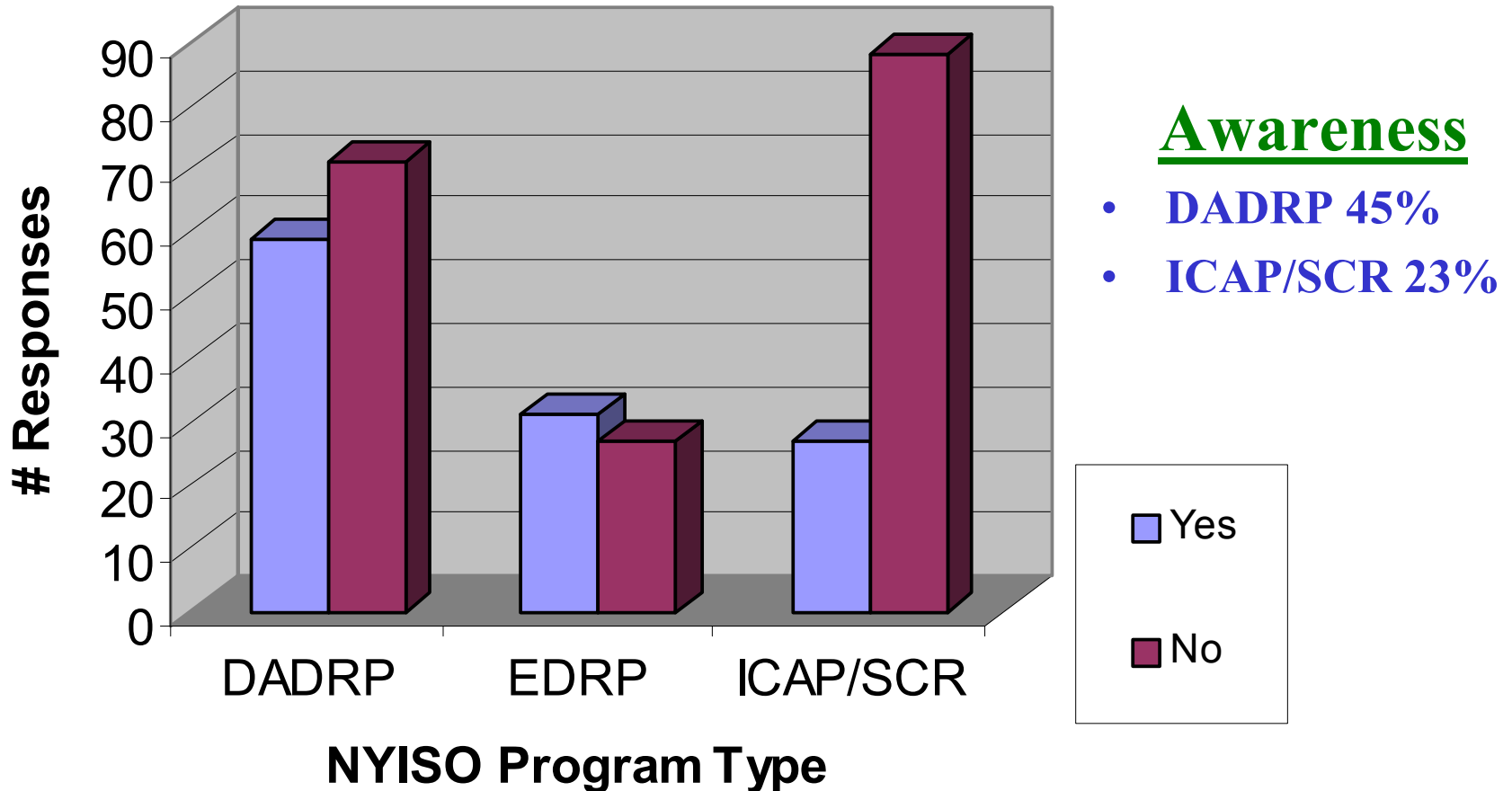
*Chuck Goldman (LBNL/CERTS)*

# Barriers to DADRP Participation

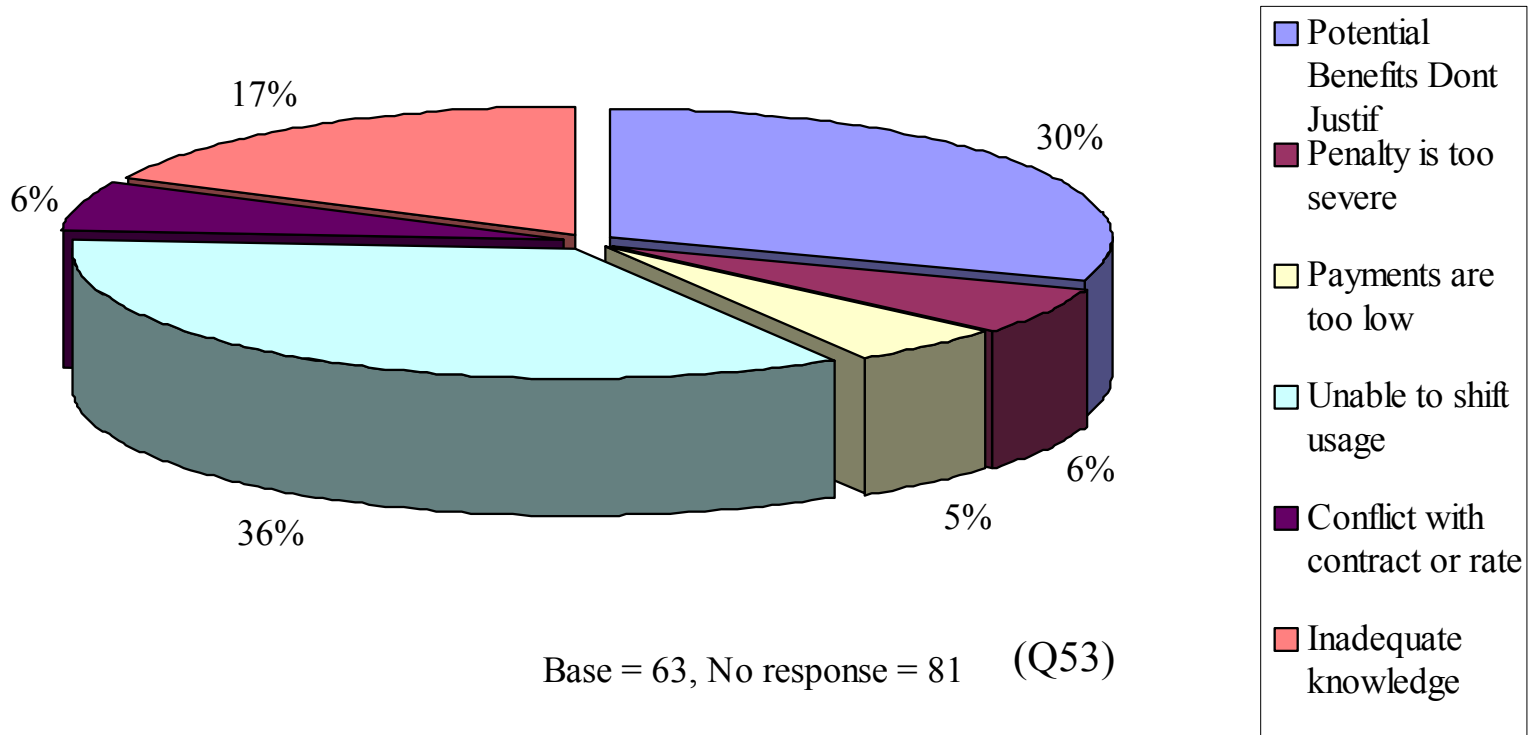
- **Organizational/institutional**
  - Low Program Awareness Levels (\*)
  - Information/knowledge barriers (\*)
  - Ancillary benefits of technologies not recognized (\*)
  - Concerns about occupant comfort
- **Economic/program-design related**
  - Potential benefits don't justify risks (\*)
  - High bid price thresholds short payback periods for DR investments (\*)
  - Perceived program design problems
- **Technology-related**
  - Limited assessments of DR enabling technologies

# Low Awareness Levels Limit Participation

## NYISO Program Awareness (Summary by Program)



# Primary Reason for Not Participating in DADRP



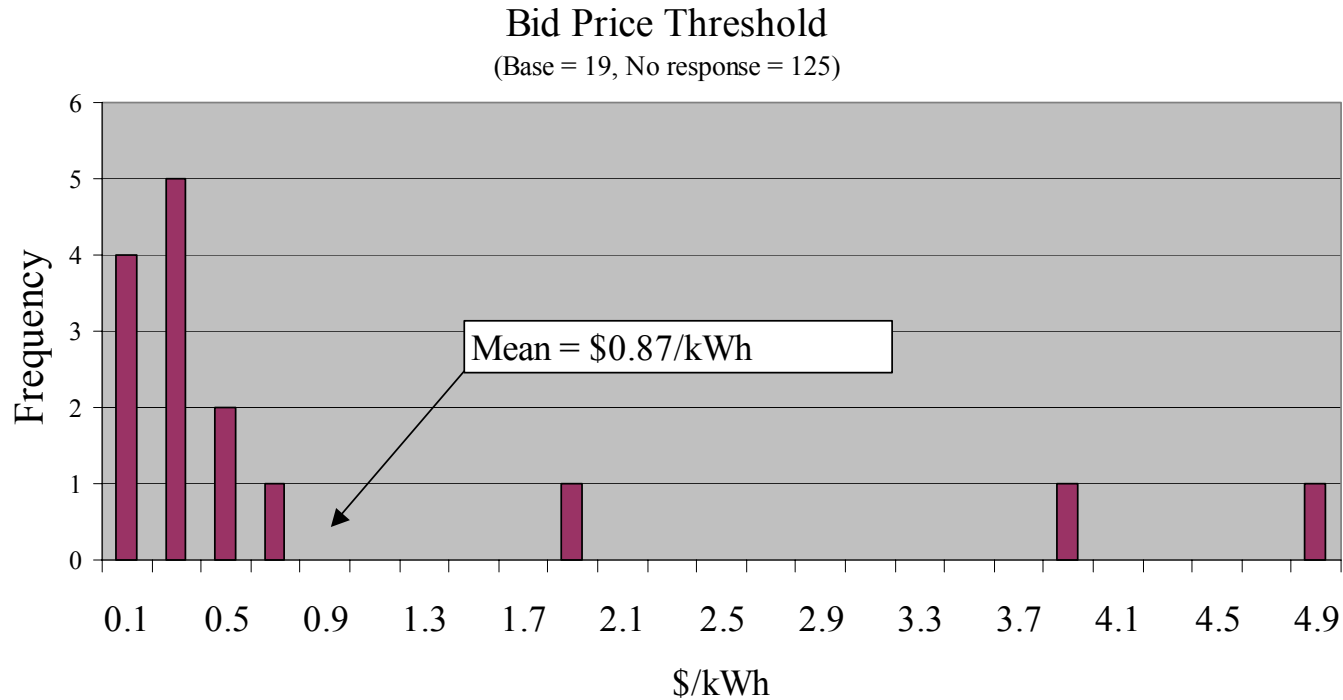
- Potential benefits don't justify risks (30%), inability to shift usage (36%) and inadequate knowledge of program requirements (17%) given as primary reason for not participating in DADRP

# Lack of bid price strategy is a key barrier to DADRP

	Creating Curtailment Plan		Monitoring Energy Prices		Determining Bid Prices	
	DADRP	Other	DADRP	Other	DADRP	Other
Not Comfortable	1	6	1	12	1	17
Comfortable	9	14	9	7	9	3
<b>Total</b>	<b>10</b>	<b>20</b>	<b>10</b>	<b>19</b>	<b>10</b>	<b>20</b>

- Confidence level of DADRP vs. EDRP participants
  - 85% not comfortable determining bid prices
  - 63% not comfortable monitoring energy prices
- Need education/training on market price formation so customers can develop and execute bidding strategy

# Bid price thresholds are high for many customers

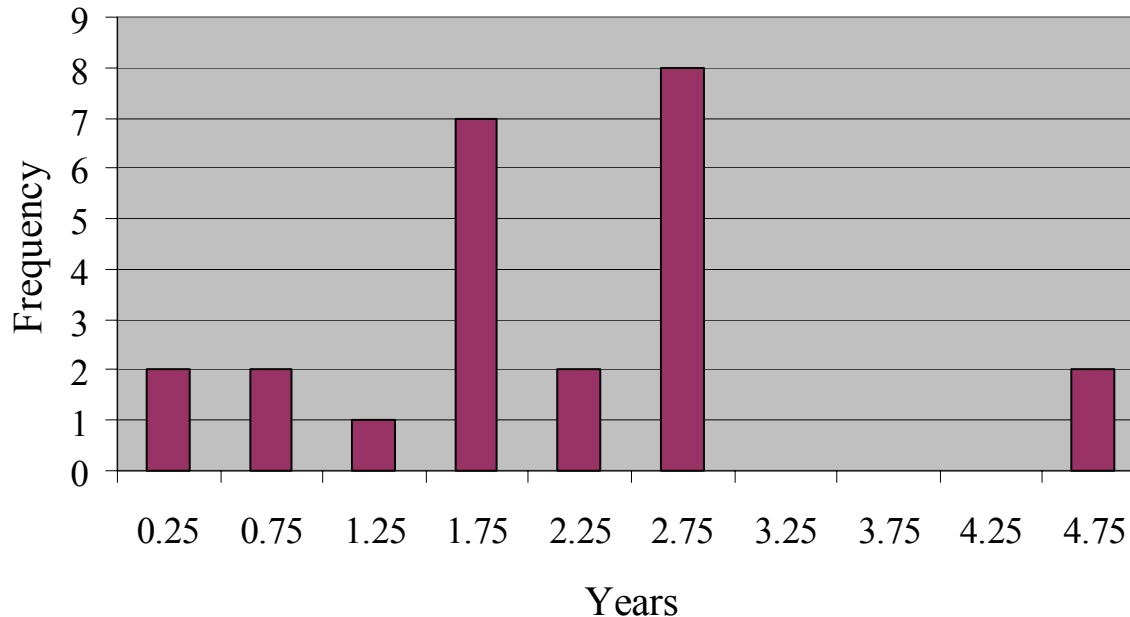


- Customers asked about their bid price minimum threshold
- Bid prices ranged from \$0.05 - 5.00/kWh with median value of ~\$0.50/kWh



# Customers require short paybacks on DR investments

Simple Payback Time  
(Base = 24, No response = 120)



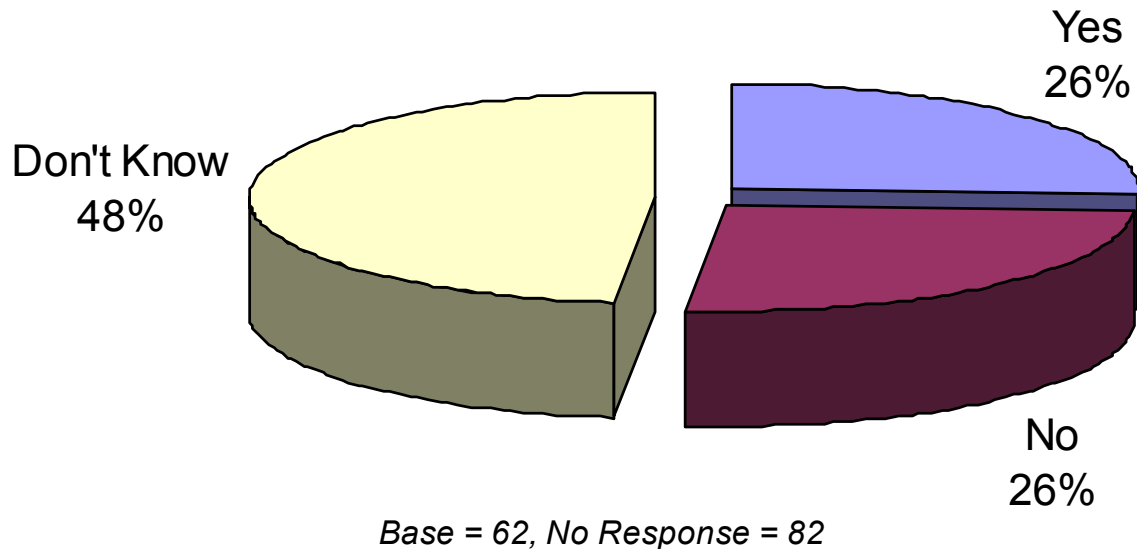
- **~80% of respondents were only interested in < 3 year payback for DR technologies**

# Customers don't recognize ancillary benefits of DR enabling technologies

- Asked to value benefits on 1(low) to 5 scale (high)
- Energy information tools ranked highest (3.5); Customers give mid-range values to benefits of other technologies

Technology	Benefit	Mean
1. Interval meters with two-way communication	Better manage peak energy and demand charges with day-after access to facility interval data	<b>2.78</b>
2. Load Control	Shed load and/or initiate on-site generation, in order to reduce demand charges	<b>2.87</b>
3. Upgrade switchgear for on-site generation	Increase load mgmt. flexibility to modify load profile for more desirable energy procurement	<b>2.61</b>
4. Upgrade on-site generation for dual-fuel capability	Fuel flexibility to mitigate fuel price volatility	<b>2.23</b>
5. Enhanced energy management or control system	Ability to schedule and/or automate load mgmt., and reduce labor for facility operations, increase reliability to integration with maintenance procedures	<b>2.97</b>
6. Energy information tools	View individual and multiple facility interval electricity data, increase understanding of loads for lower cost energy procurement	<b>3.47</b>

# More Flexible Approach to Submitting Bids May Help Mitigate Program Design Barriers



- Respondents asked whether they preferred to submit bids daily, weekly, or monthly; and whether they would participate if preferred method adopted
- 16 of 62 respondents said YES (26%); 50% unsure

# Summary: DADRP Evaluation Results

- **Barriers** are primarily organizational, institutional, information/knowledge, & customer economics
  - customers are skeptical: wary of investments with long paybacks and reluctant to undertake behavioral changes
  - most customers not yet comfortable bidding into “economic” program (but will respond to system emergency defined by ISO)
  - customers not yet convinced of “spill over” benefits of DR enabling technologies
- **Role of DR enabling technologies:** necessary but not sufficient condition to elicit sustained customer participation
- **Lack of stable DR market structure/program** rules limits interest by DR market makers and customers

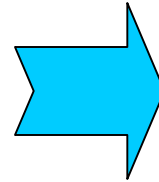
# Changing Market Landscape for PRL



*Bernie Neenan*

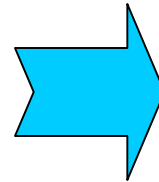
# Criticisms of NYISO PRL Programs

- **Can't sell what you don't own**
- **DR should not be considered a resource**



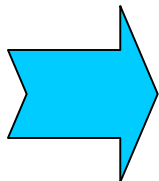
**ISO should not pay customers to curtail**

- **Net welfare benefits are very small**
- **Rent transfers are transient – generators will get their money in the long run**



**Any subsidies are unwarranted and ineffective**

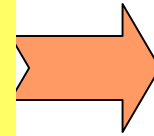
- **Avoiding the high cost is enough to get customers to participate**



***Only naturally occurring DR is desirable***

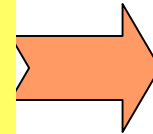
# Changing Market Character

➤ **FERC is leaving DR details to to states and localities**



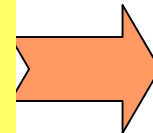
**We'll remain pioneers in DR design and implementation**

➤ **EDRP now the last resource dispatched**



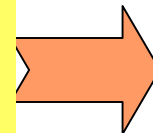
**EDRP benefits lower, ICAP higher**

➤ **Renovations to ICAP under consideration**



**Bidding adds new complexity, risk**

➤ **ISO emphasis on final-gavel pricing**



**PRL must be full integrated into ISO Scheduling and dispatch**



# Going Forward Recommendations

*Chuck Goldman (LBNL/CERTS)*

*Bernie Neenan*