Retail Demand Response Program Survey: Preliminary Results

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Overview

- Objectives and Approach
- Survey response
- Retail DR Portfolio Characteristics
  - Program typology
  - Existing DR resource contribution
    - Number of programs
    - Potential Load Reduction (MW)
- Key Program design and operational features
  - Availability, Notice, Operational triggers
  - Resource Adequacy treatment
- Customer Incentives and Compensation
- Discussion of Results

Survey Purpose and Objectives

- Information Gap: Lack of comprehensive comparative summary of DR assets in MISO footprint in terms of program design and operational features
- Proposed MISO Emergency Demand Response tariff will rely heavily on existing retail program features and operational practices (including M&V protocols)
- Comprehensive survey can help:
  - characterize and assess variability in existing retail DR program features and operational practices
  - provide information for assessing impacts of proposed wholesale market DR tariff rules/practices

Approach

- Survey template developed by LBNL and RAP (with input from OMS members)
- State PUCs transmitted surveys to utilities
  - Many states only sent to MISO utility members
  - Some states did not send survey to rural coops and municipal utilities not under their jurisdiction
- Utilities sent survey response to their State PUC and LBNL
- LBNL analyzed survey data, including
  - Q/A (e.g., some follow-up interviews, consistency checks)
  - Coding of qualitative responses
  - Data analysis
  - MISO-wide and state-specific reports

Survey Response

- Utilities from 10 states responded to survey
- 37 responses received
  - 33 MISO members
    - 2 respondents did not have any DR programs
  - 4 MISO non-members (LGE, KU, Eastern Kentucky Cooperative, Kentucky Power, Mid-American)
- 119 DR programs
  - 106 programs offered by MISO members
- Potential load reduction capability of enrolled customers = 4,335 MW (in 96 programs)
  - MISO members = 3,578 MW (in 88 programs)

Benchmarking the Survey Response

Reference	Existing DR Resource Contribution (MW)	Comments
ISO/RTO Council (Oct. 2007)	8,645 MW	DR that qualifies as capacity resources: ~8,000 MW Price-responsive demand bid into spot market: 2,971 MW Dispatchable DR: 20 MW
FERC (Sept. 2007)	4,099 MW	Interruptible (62%) and direct load control (38%)
MWDRI Program Design Survey (Nov 2007)	3,578 MW	Interruptible, DLC, Economic DR resources of MISO member utilities

References:

•ISO/RTO Council, 2007, "Harnessing the Power of Demand: How ISOs and RTOs Are Integrating Demand Response into Wholesale Electricity Markets"

•FERC, 2007, "Assessment of Demand Response and Advanced Metering: Staff Report"

Survey Results

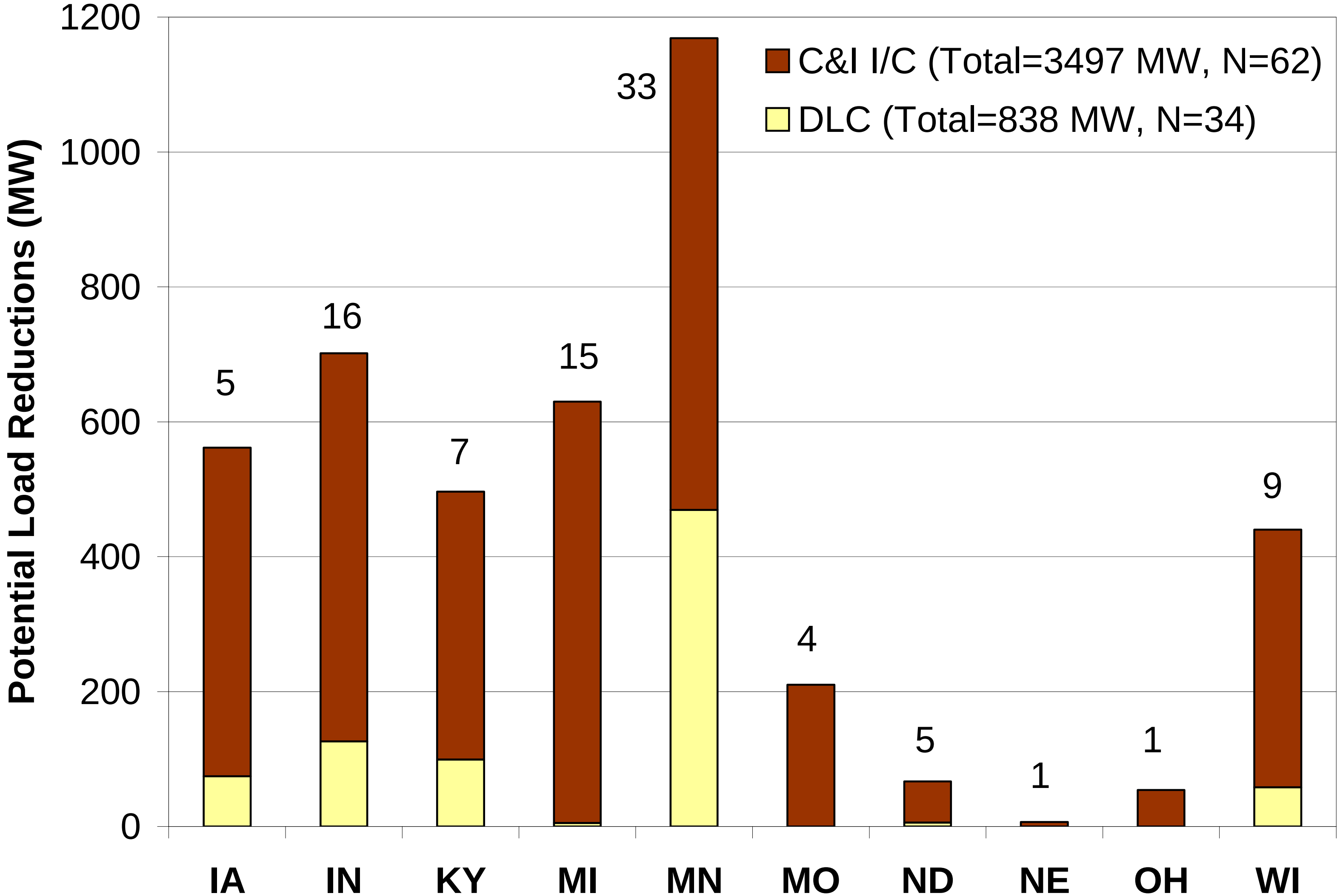
Program Types

- **Interruptible/Curtailable (C&I I/C):** Curtailment options integrated into retail tariffs that provide a rate discount or bill credit for agreeing to reduce load. Penalties may be assessed for failure to curtail. Interruptible programs have traditionally been offered to large industrial and commercial customers.

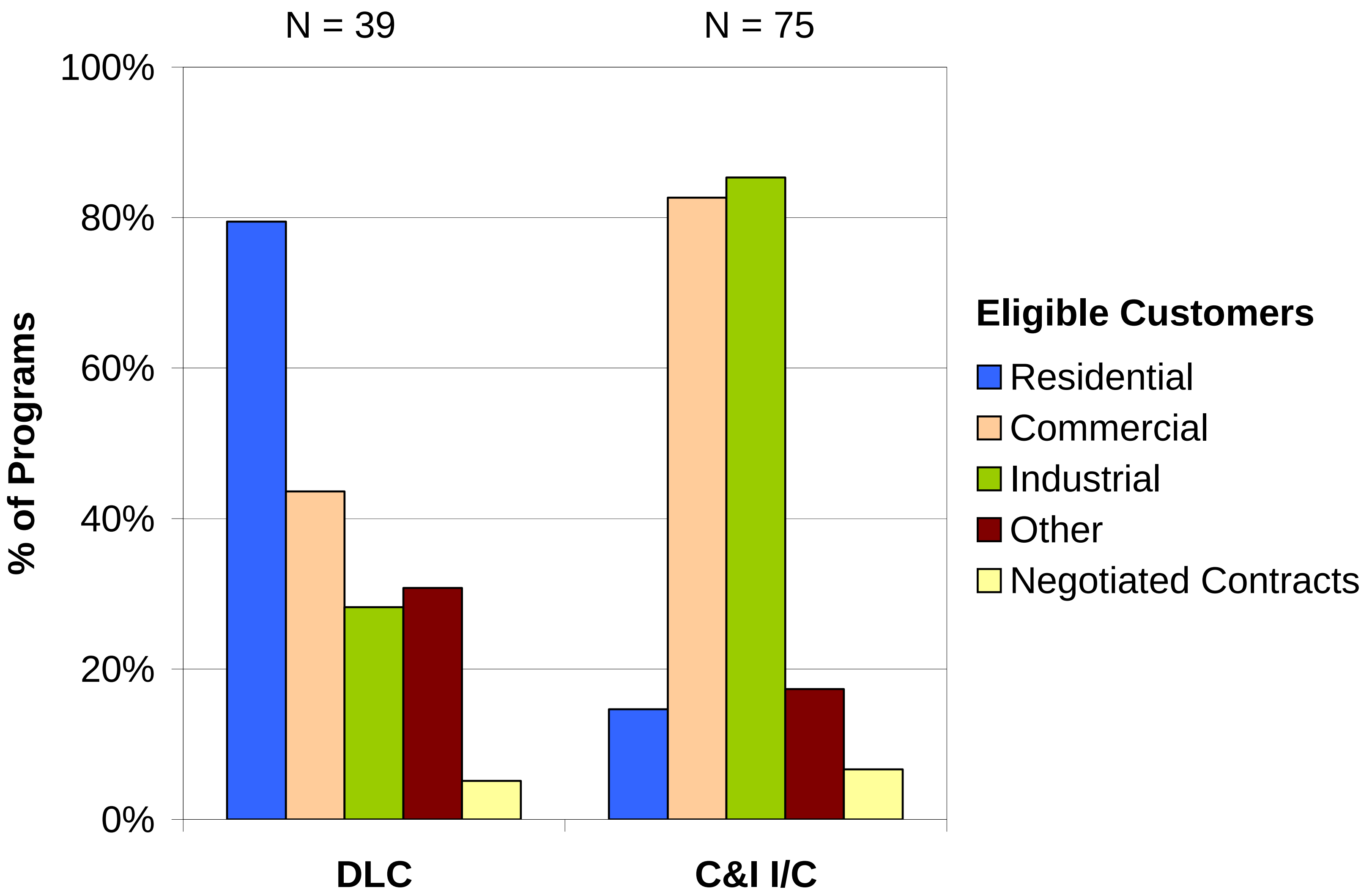
- **Direct Load Control (DLC):** A DR activity by which the program operator remotely shuts down or cycles a customer's electrical equipment (e.g. air conditioner, water heater) on short notice. DLC programs are primarily offered to residential or small commercial customers.

- **Economic:** A DR program where customers offer bids to curtail based on market prices. Mainly offered to large customers, but some utilities allow aggregation of small customer loads.

Existing DR Resources and Programs: State breakdown



Eligible Customer Class for each DR Program Type



Seasonal Availability

Program Type	Summer only	Summer & Winter	Winter only	Year-round	TOTAL
DLC	16	3	2	18	**39**
Economic	0	0	0	5	**5**
Interruptible/ Curtailable	15	2	2	56	**75**
TOTAL	**31**	**5**	**4**	**79**	**119**

- DR Program availability:
  - Year-round: 66%
  - Summer: 97%
  - Reflects transition from winter to summer peaking for many upper mid-western utilities
- DLC Programs: 54% are available specifically in summer and/or winter (i.e. not year-round)
- Interruptible/curtailable tariffs: 75% are available year-round

Advance Notice

Program Type	Number of Programs				
	Less than 30 minutes	30 minutes – 2 hrs	2 - 4 hrs	4 - 12 hrs	Day-ahead
DLC	27	1	0	0	0
Economic	0	1	0	1	3
Interruptible /Curtailable	25	31	7	1	5
TOTAL	52	33	7	2	8

Number of DR programs = 102

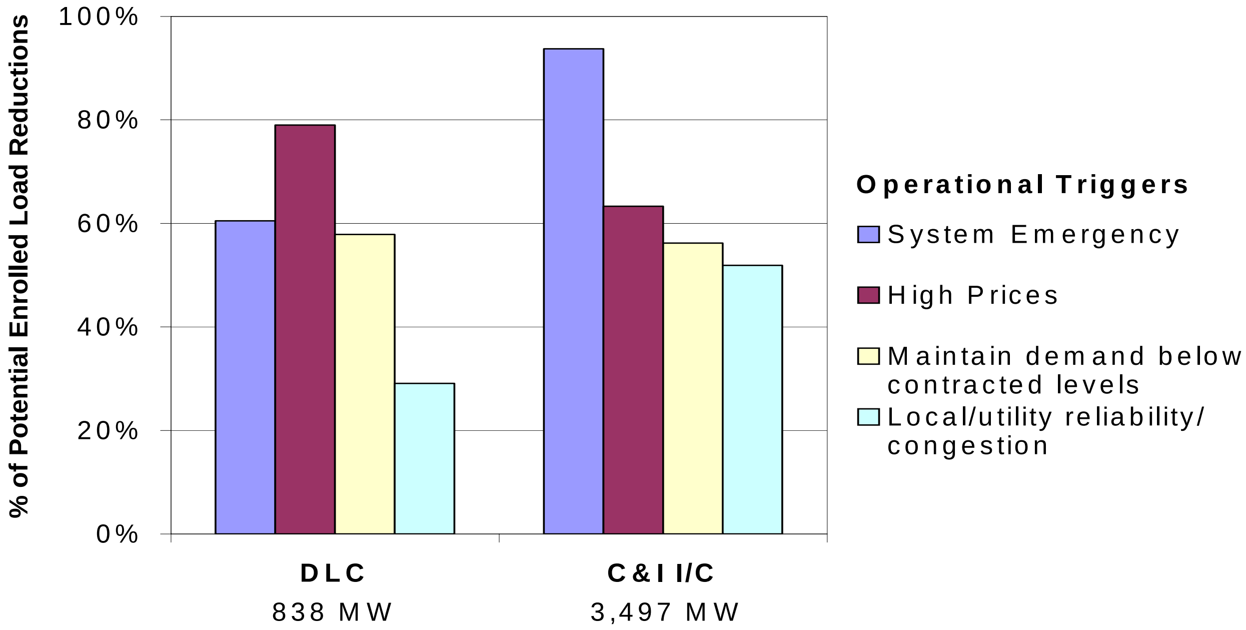
Program Type	Potential Enrolled Load Reductions (MW)				
	Less than 30 minutes	30 minutes – 2 hrs	2 - 4 hrs	4 - 12 hrs	Day-ahead
DLC	723	10	0	0	0
Economic	0	0	0	0	154
Interruptible /Curtailable	1,221	1,873	202	7	31
TOTAL	1,944	1,883	202	7	185

Total Potential Load Reductions = 4223 MW

Operational Triggers

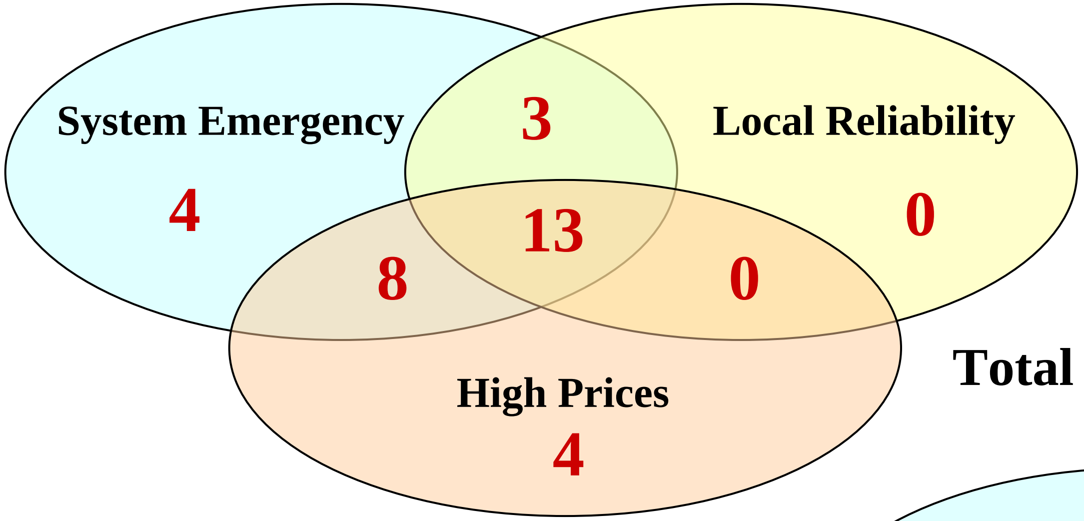
Program Type	Number of Programs			
	System Emergency	High Prices	Maintain demand below contracted levels	Local/utility reliability/ congestion
DLC	28	25	21	16
Economic	1	5	0	1
I/C	66	49	35	42
TOTAL	95	79	56	59

Number of DR programs = 117

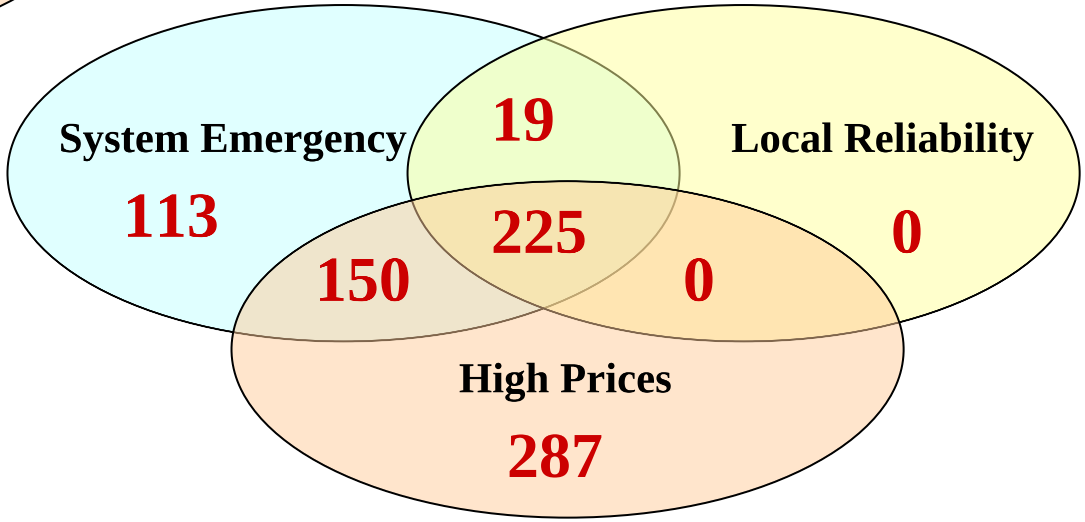


DLC Operational Triggers

Number of DR programs (Total = 28)

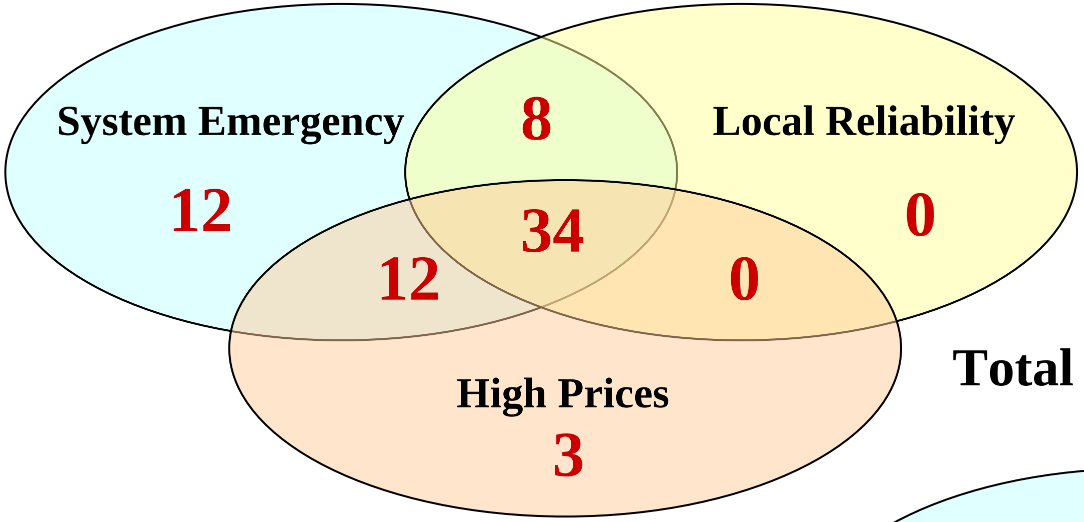


Total Potential Load Reductions (MW)
(Total = 794 MW)

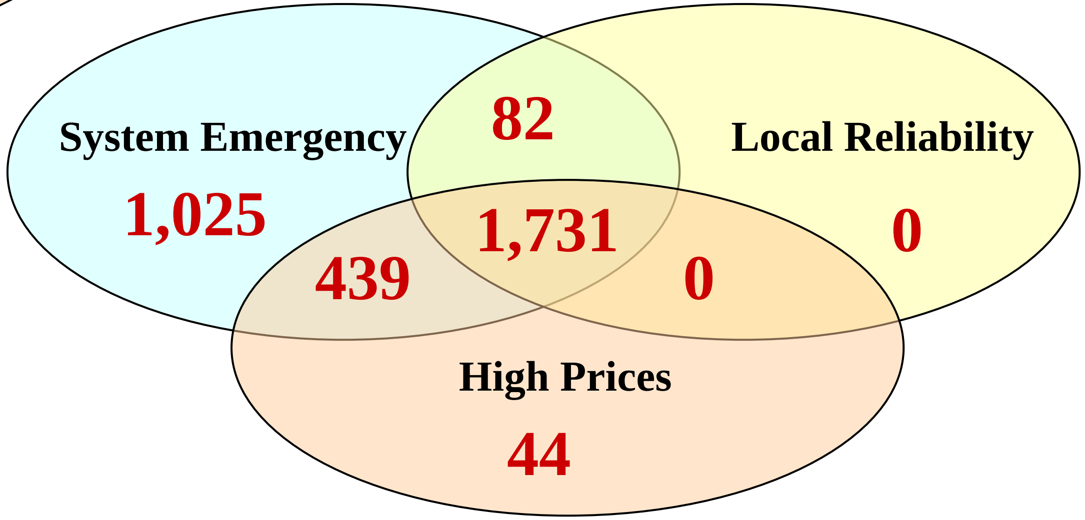


Interruptible/Curtailable Tariffs: Operational Triggers

Number of DR programs (Total = 67)



Total Potential Load Reductions (MW)
(Total = 3,321 MW)



Some Participation by DR Resources in MISO Energy Markets

- 13 DR programs bid into MISO Day-Ahead Energy Market
  - 9 I/C programs, 3 DLC programs, and 1 economic program
  - Potential load reductions ~580 MW (~100% from I/C programs)
  - All 13 programs are triggered for economic reasons
- However, 66 of 78 DR Programs claim they can trigger program for "economic" reasons; but do not appear to bid load reductions into MISO market
  - Are they "price takers"?
  - To what extent are utilities calling DR resources for "economic market conditions" and how often/well do customers respond to these calls?

Role of DR in Resource Adequacy
(Number of Programs)

% of Programs that Count Towards Planning Reserves

State	DLC (%)	I/C (%)
IA	100	67
IN	100	89
KY	100	100
MI	100	46
MN	59	29
MO	-	33
ND	-	33
NE	-	0
OH	100	100
WI	100	56

- Survey Question: Are potential enrolled load reductions counted towards Planning Reserves?
- Utilities report that 63 DR programs count towards planning reserves
  - Program Type Breakdown
    - 36 Interruptible/Curtailable
    - 26 DLC
    - 1 Economic DR program

Role of DR in Resource Adequacy

Enrolled Load Reductions (MW) that Count Towards Planning Reserves

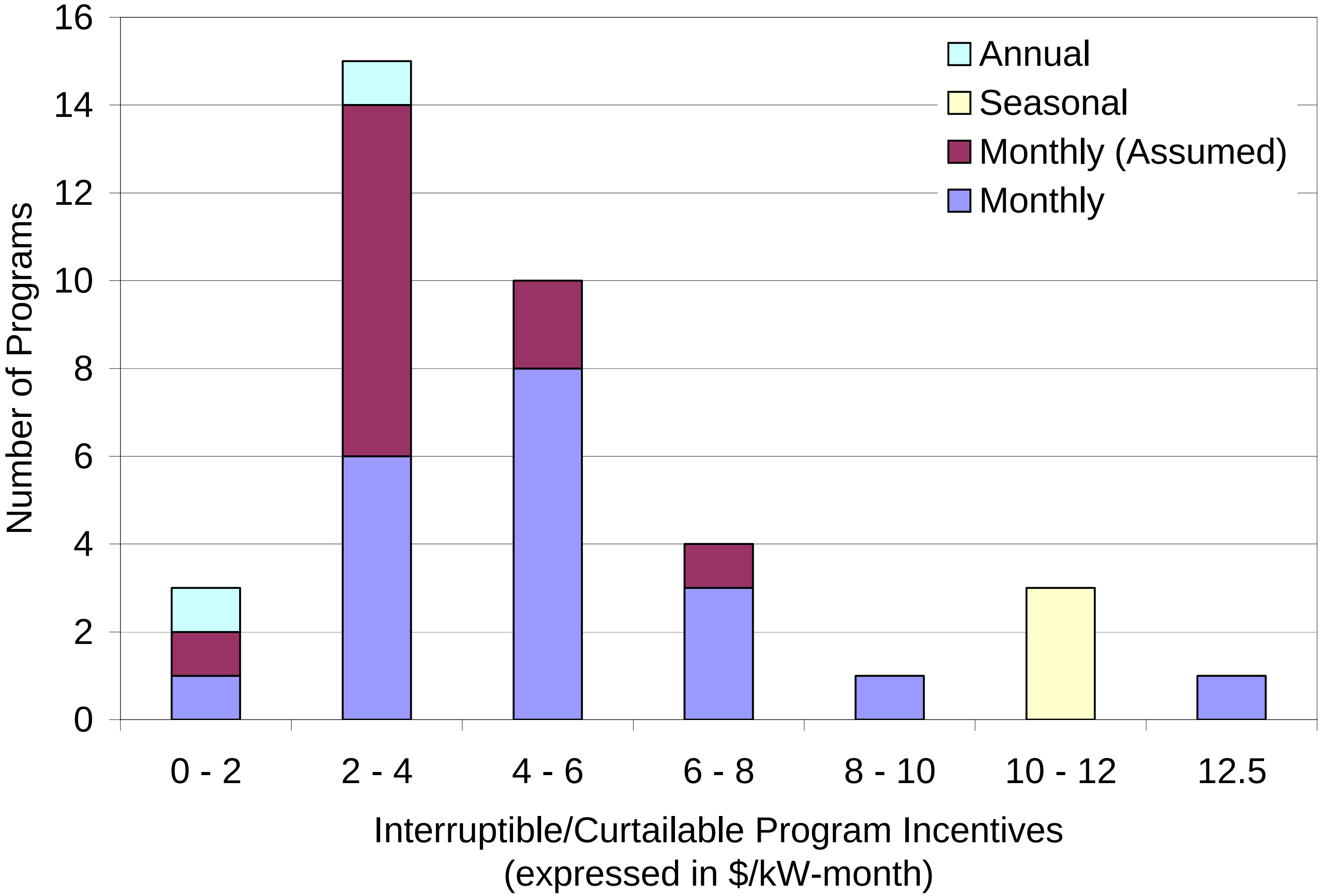
State	DLC	C&I I/C
IA	75	443
IN	126	466
KY	99	387
MI		444
MN	179	38
MO		190
ND		2
WI	58	112
TOTAL	**537**	**2,082**

- 2619 MW of potential load reductions from these 63 programs
  - ~80% from Interruptible/Curtailable programs

Other Program Features

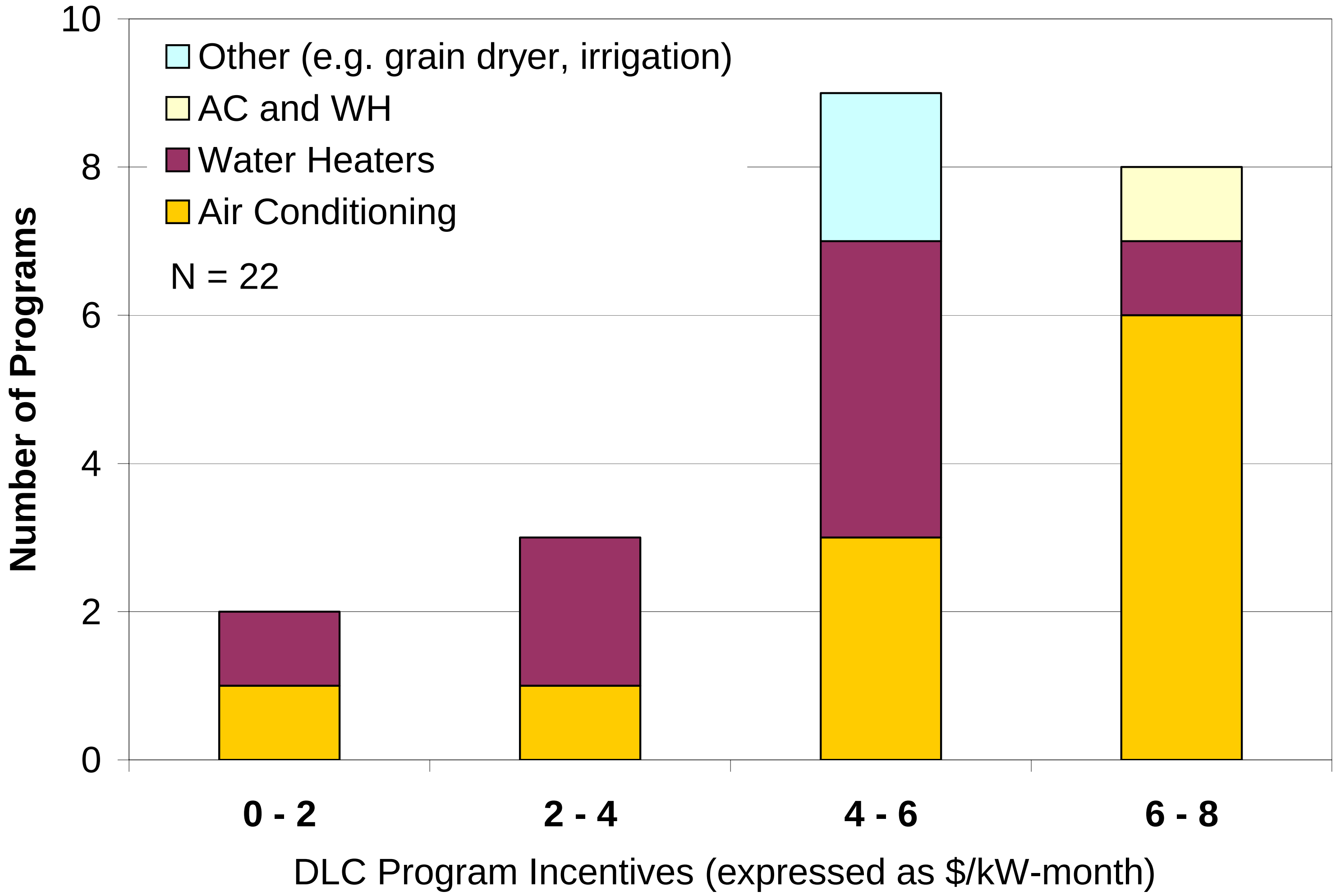
- 36% of programs do not have any limits on the number of events that can be called each year
- 46% of programs allow for participation of onsite generators
  - There are no constraints on participating onsite generators in 50% of these programs

Interruptible/Curtailable Tariffs: Customer Incentives

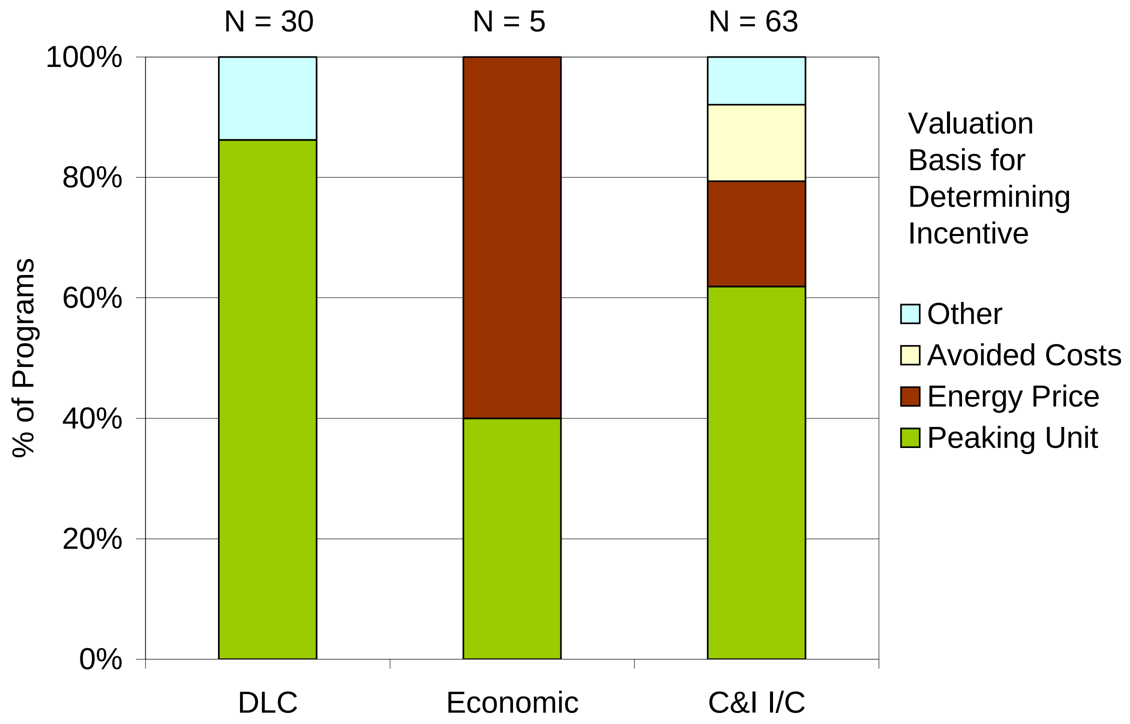


N = 37

DLC Program: Customer Incentives



Basis for Valuation of DR Programs



Program Type	Potential Enrolled Load Reductions (MW)				
	Peaking Unit	**Energy Price**	**Avoided Costs**	**Other**	**Total**
DLC	731	-	3	53	787
Economic	100	54	-	-	154
Interruptible	2,096	283	450	237	3,066
Total	**2,927**	**337**	**453**	**290**	**4,007**

Penalties

- 5 programs (4 I/C and 1 economic) had a $/MWh penalty
- 20 programs (17 C&I I/C and 3 DLC) had $/kW penalty
- 7 programs had other penalties such as removal from further participation in the program
- 4 I/C tariffs require customers to “buy-through”
  - The incentive payment for these programs was 10 cents/ kWh and min load reduction 100 kW
- 27 programs indicated that there were no penalties for non-performance

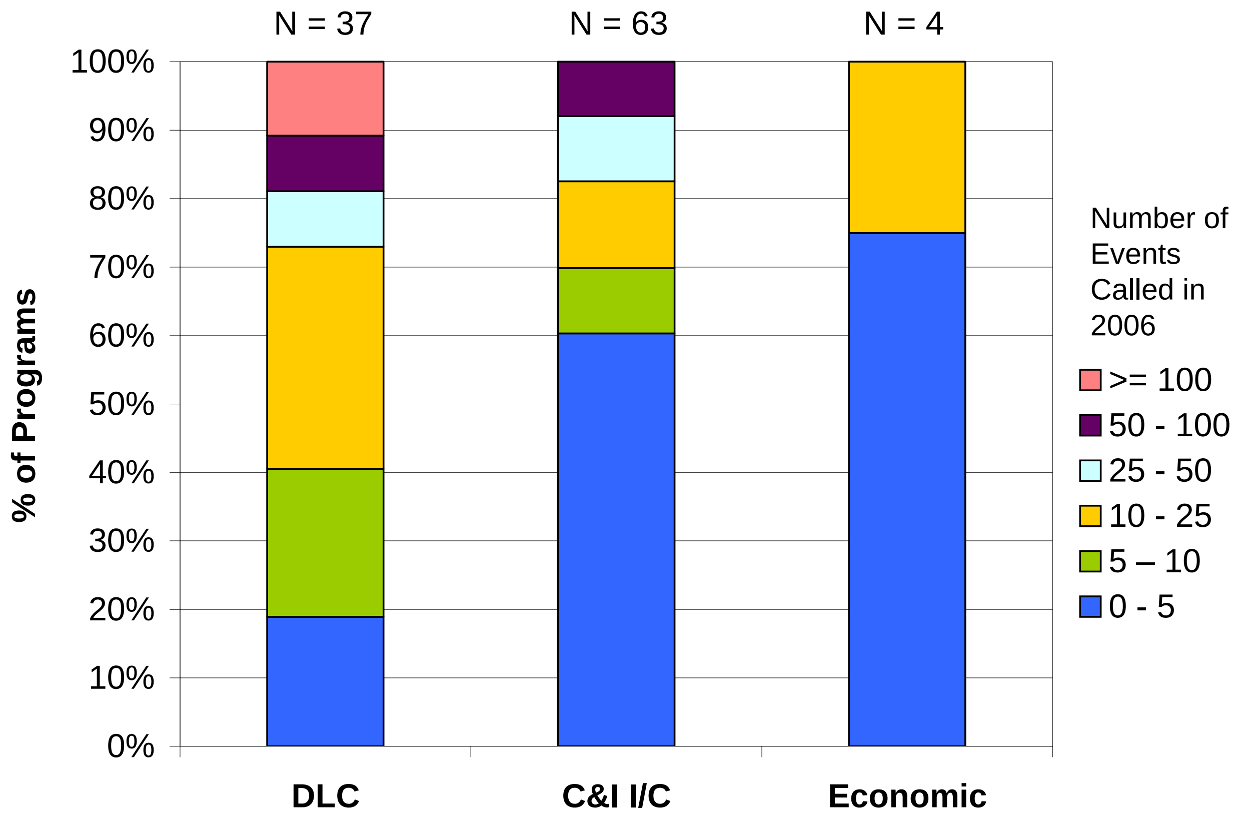
Buy-Through Option

- 25% of the programs provided the customers the opportunity to buy through a load curtailment event. The cost of buying through was typically:
  - Market rate (with or without additional penalty)
  - Tariff rate (with or without additional penalty)
  - Specified in contract

Measurement and Verification of Load Reductions

- About 50% of the programs provided details about their M&V protocols
  - 29 Interruptible/Curtailable programs
    - 80% rely on interval meter data for conducting M&V
  - 26 DLC Programs
    - 77% measure aggregate load impacts at substation-level using SCADA
    - 19% use samples of participants with interval meters to estimate load impacts
- 54% of the DR programs have been evaluated recently (i.e. 2006 and 2007)

DR Event History: Frequency



- DLC Programs: ~80% were activated more than 5 times in 2006
- Interruptible/curtailable tariffs: ~40% called more that 5 times
- On average, DR events were called more frequently in 2006 as compared with previous years

Willingness to allow MISO to call for load reductions

Will DR program participants be willing to allow MISO to call on them to reduce loads?	Number of Programs
Don't know	62
No objection to MISO calls	15
Likely to object (either the program administrator or the customer)	29

- Many utilities don't know if program participants will accept MISO event calls
- About 25% of DR programs (19% of potential load reductions), customers and/or program administrators are not willing to allow MISO to call for load reductions

Key Findings: Discussion

- Substantial uncertainty in the magnitude of DR resources available in MISO foot-print and OMS states

- M&V of DR Load Impacts
  - Additional information needed or M&V protocol development for ~50% of programs
  - Not possible to determine if consistent, standardized M&V approaches are being employed for I/C and DLC programs in the region
  - DLC resources are most difficult to measure load impacts; but are available with the shortest advance notice
- Operational practices: DR programs, traditionally used for reliability purposes, appear to be morphing towards more economic uses
  - 10% of the programs (~14% of enrolled load reductions) bid into MISO day-ahead energy market
  - 68% of programs are triggered for economic reasons
  - 61% of C&I I/C programs are operated for both system emergencies and economic reasons

Key Findings: Discussion (cont.)

- Advance Notice
  - – 46% of Potential Load reductions available with less that 30 minutes notice:
    - Opportunity to provide Ancillary Services if telemetry/communications issues can be resolved
  - – 45% of potential load reductions available with 30 minutes to 2 hours notice
  - – Relationship of advanced notice to DR Value (e.g. ISO-NE Emergency DR programs)

Key Findings: Discussion (cont.)

- Customer Incentives
  - Average value of incentive for I/C tariffs are $5/kW-month (or $60/kW-year) and that of DLC programs is $6/kW-month (or $72/kW-year)
  - Significant variation in incentives across programs
  - DLC incentives offered for water heaters are lower than those for air conditioning units
- Resource Adequacy
  - Nearly all utilities count DLC Programs to meet Planning Reserves
  - For interruptible/curtailable tariffs, practices among utilities are more varied

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Background slides

Buy-Through Option

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