Highlights from the Evaluation of California's Statewide Base Interruptible Program (BIP)

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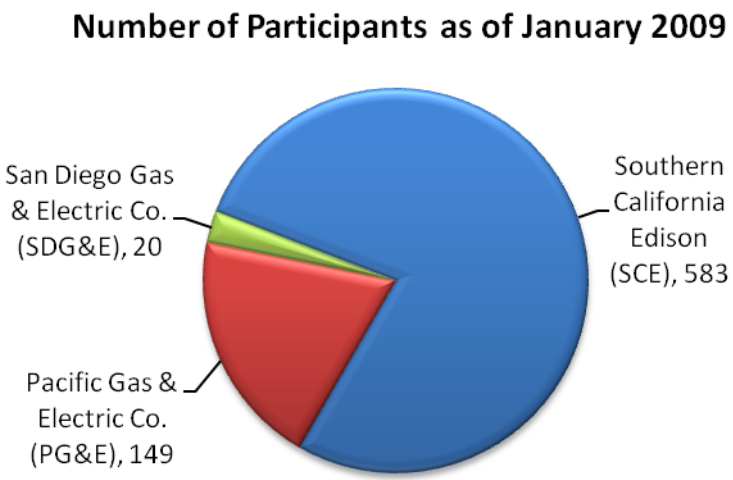
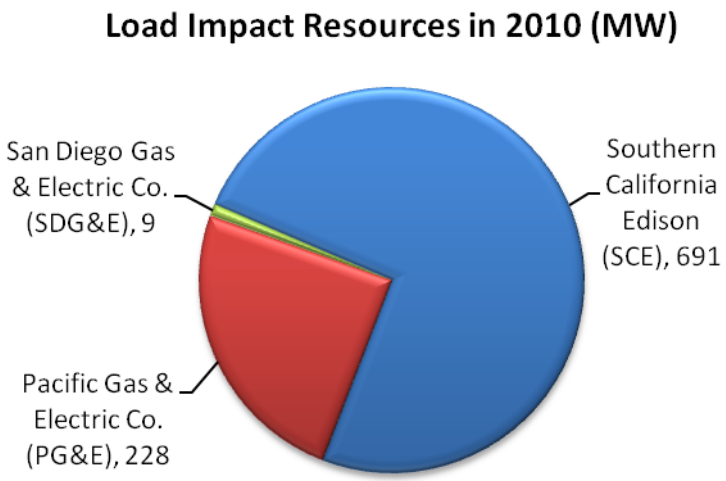
Overview

- BIP load impact resources in 2010
  - PG&E participants to be rolled in PeakChoice at the end of 2010
- Program design
- Evaluation methodology
- Regression model accuracy and validation
- Over/under performance analysis
- Key questions going forward
- Link to complete evaluation

BIP is California's Largest DR Program

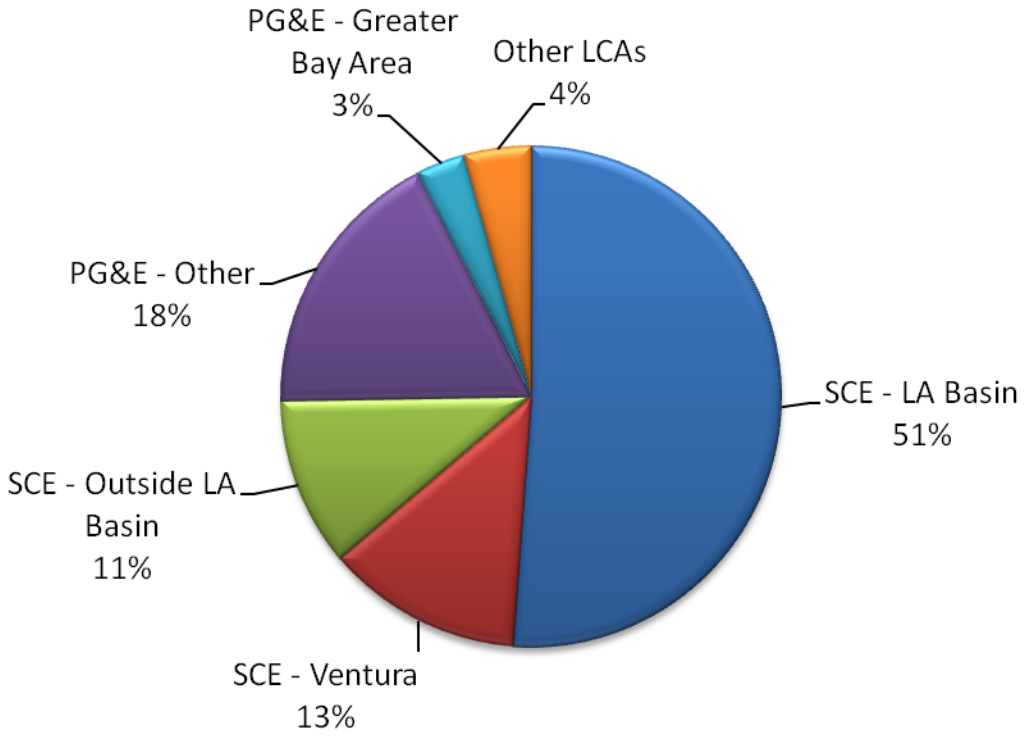




- Total for California
  - 752 participants as of January 2009
  - Over 900 MW of load impact resources in 2010

Distribution of Load Impact Resources in 2010 by LCA*

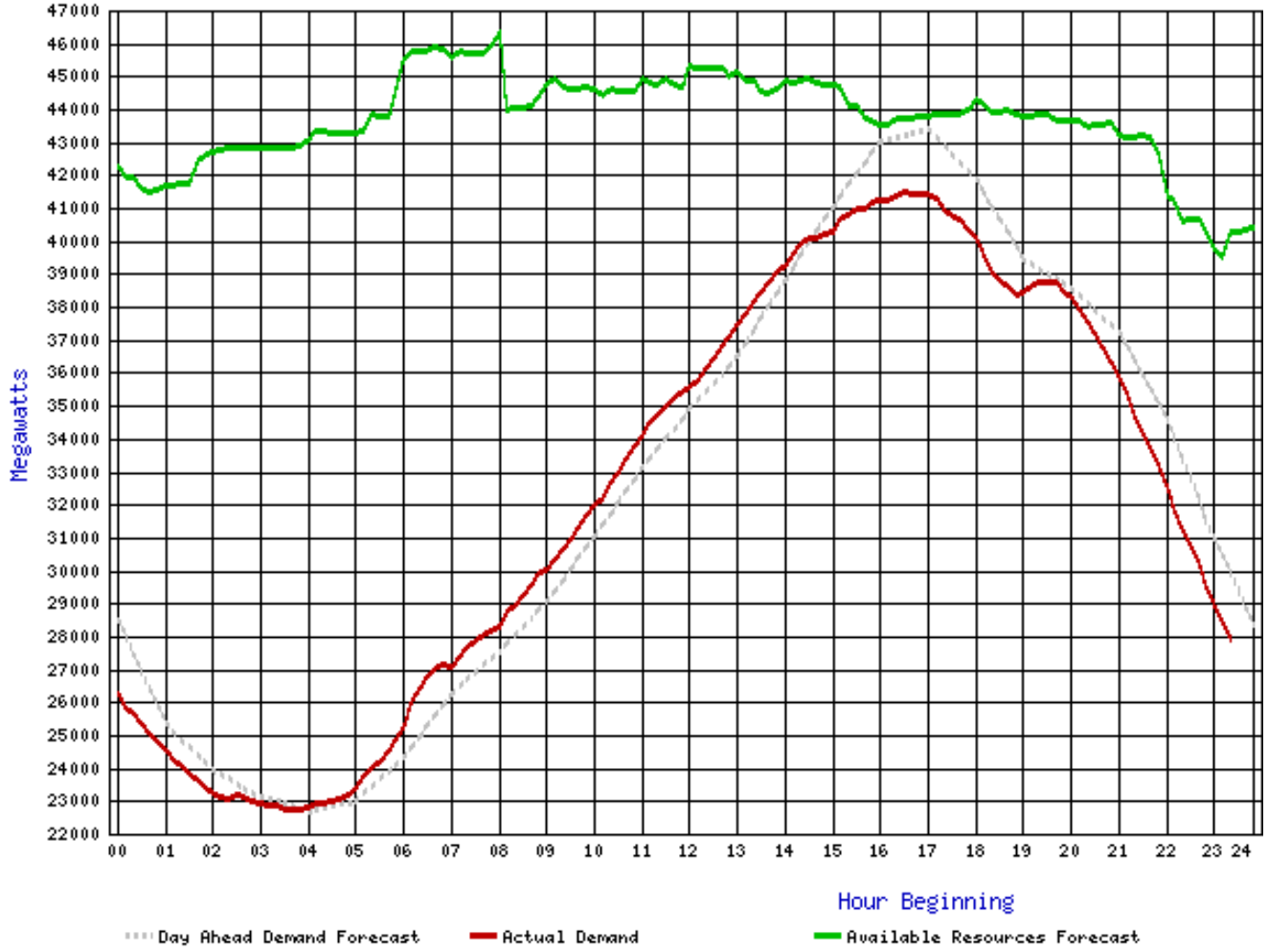
Typical Event Day Under 1-in-2 Weather Conditions



- Impacts are concentrated in the LA Basin
- SCE accounts for 75% of overall load impacts
- The Other LCA for PG&E has the second largest share of load impacts

* LCA = Local Capacity Area

BIP impacts show up in system load



BIP programs are similar across utilities

- **Eligibility** – Committed load reduction must meet two requirements:
  - At least 100 kW
  - At least 15% of maximum demand
- **Incentive** – Monthly capacity credit based on difference between average peak period demand and firm service level (FSL)
- **Penalty** – Excess energy charges for failure to reduce load to FSL during events
- **Event trigger** – CAISO system emergency or local emergency
- **Notification lead time** – Most participants are enrolled in the 30-minute notification option
  - SCE – 90%
  - PG&E – 100%
  - SDG&E – 95%

BIP payments and penalties vary slightly across utilities

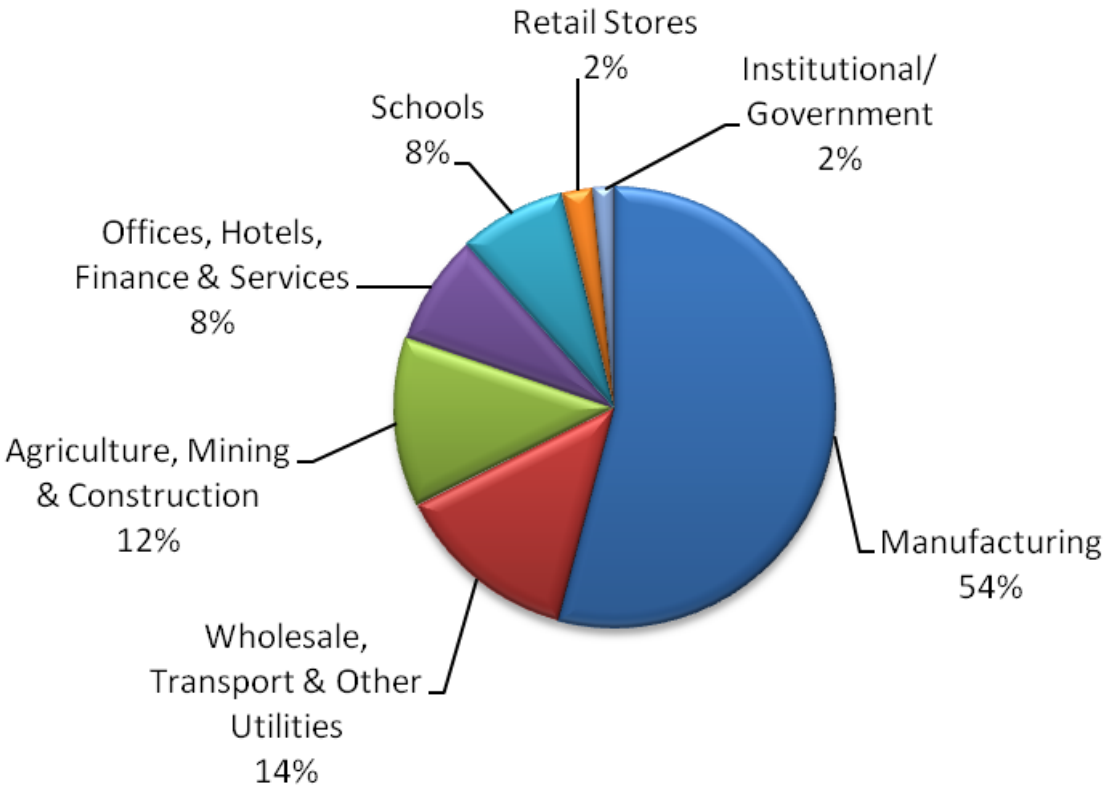
Utility	Time Period	Average Capacity Credit (per kW)	Average Penalty (per kWh)
SCE	Summer On-Peak	$16.00	$9.95
	Summer Mid-Peak	$4.90	
	Winter Mid-Peak	$1.90	
PG&E	Summer On-Peak	$8.50	$6.00
	Winter Mid-Peak	$8.50	
SDG&E	11am to 6pm	$7.00	$4.50

- SCE BIP participants receive much higher capacity payments during the 4-month summer season (June - September)
  - Much lower capacity payments during the 8-month winter season average them out to around PG&E and SDG&E levels on an annual basis
- SDG&E BIP customers receive lower capacity payments, but have lower penalties for non-performance

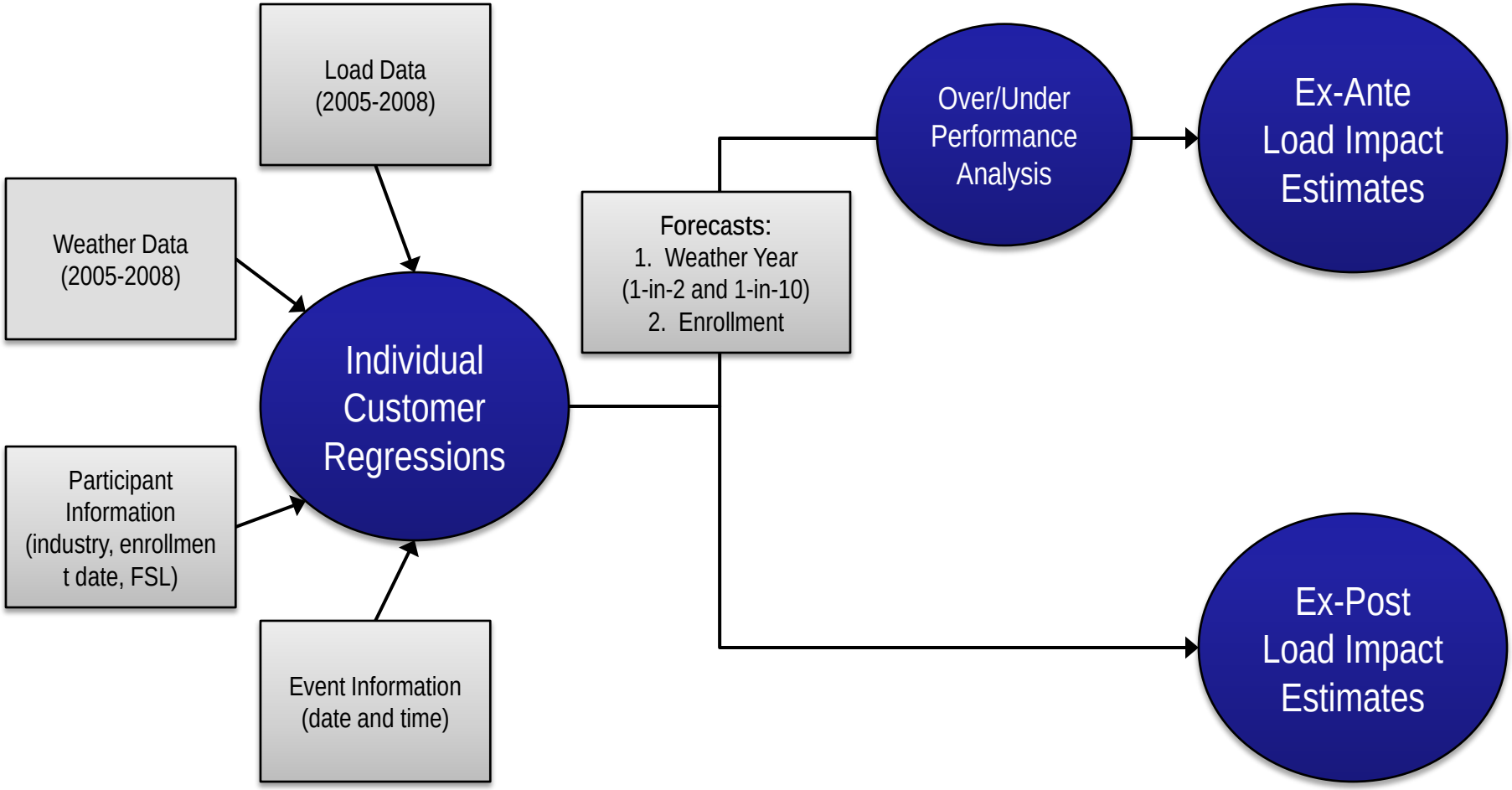
Participation is not evenly distributed

- Most of the participants come from the manufacturing sector, which may be because of the 100 kW load reduction commitment

- Manufacturing accounts for an even greater proportion of load impact resources in 2010 (70%)



The BIP evaluation conformed to the requirements of California's load impact protocols

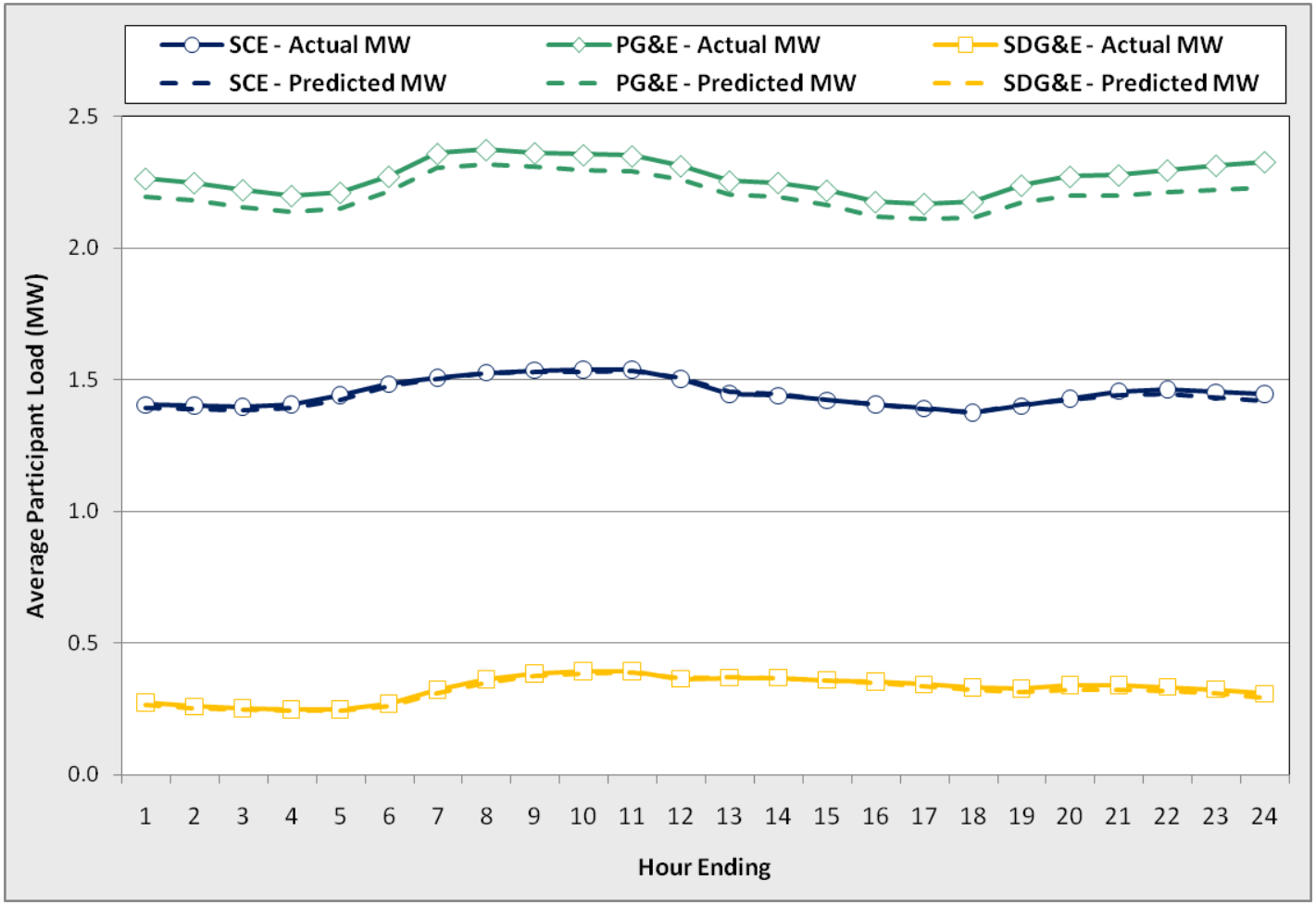


Why individual customer regressions?

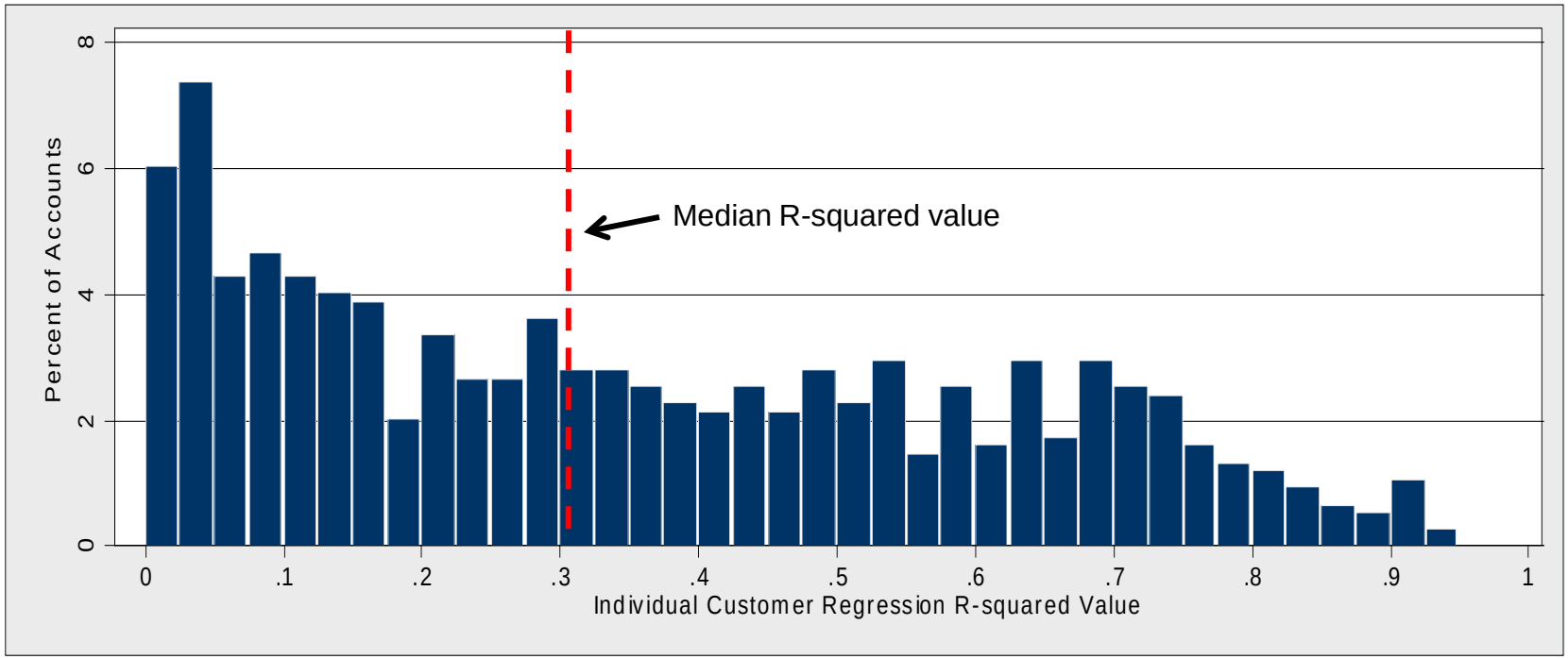
- Changing participant mix and availability of data
  - No need for percentage variables that reflect the change in participant mix
  - If an individual customer is in the manufacturing industry, that does not change over time so such a variable is unnecessary
- Can “slice and dice” results however needed
  - By utility, industry, LCA, etc.
- Can customize regressions for different sets of participants
  - Key variables and type of regression model can change depending on industry, load shape, electric rate, operations, size
  - TOU rate blocks are slightly different for each utility
  - Some customers participate in RTP rates

How well do the individual regressions predict participant load on an average summer weekday?

- SCE and SDG&E individual regressions are very accurate
  - Average error during event period (2pm to 6pm) is less than 1%
- PG&E individual regressions under predict slightly
  - Average error during event period (2pm to 6pm) is 2.5%
  - Leads to more conservative load impact estimates

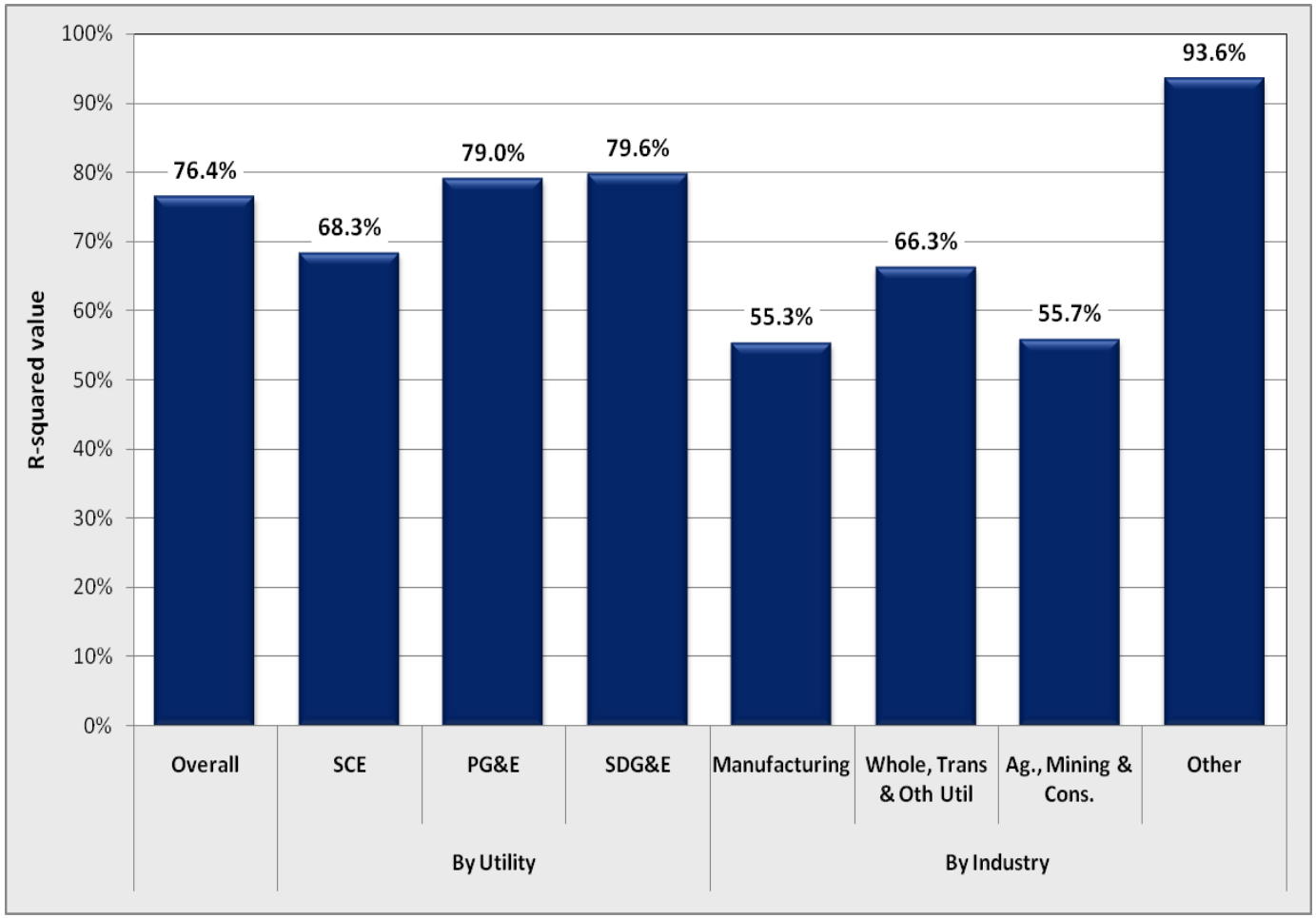


R-squared values from the individual regressions are distributed around a median of 31%



- However, the aggregate R-squared value is 76%
- In other words, the individual regression models used are able to explain 76% of the variation in aggregate load
- No lags of kW were used because model was needed for ex-ante estimation purposes
- Many participants had a flat load shape and do not have a lot of non-random variation to explain

Aggregate R-squared values vary by industry

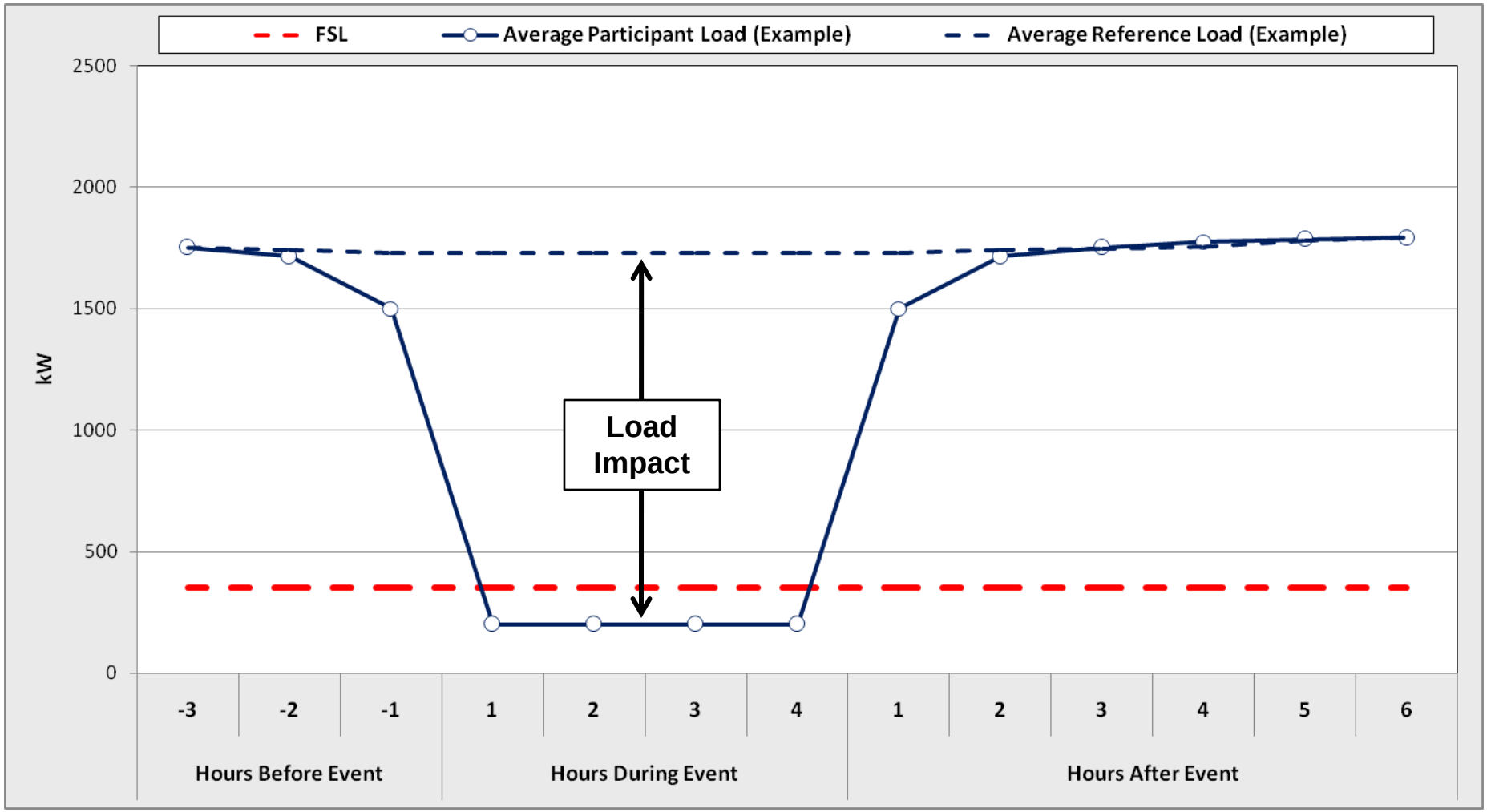


- Manufacturing customers have the most difficult load to predict
- The R-squared value for SCE is lower because it has a higher proportion of participants in manufacturing
- Participants in the "other" category (mostly offices and schools) have the easiest load to predict

Why over/under performance adjustment?

- Conventional load impact coefficients cannot be used
- Therefore, an over/under performance analysis was conducted based on pooled data from:
  - 07/24/2006 event for SCE and PG&E – 610 participants
  - 08/28/2008 event for PG&E – 141 participants
- Results of this analysis were incorporated into the ex-ante load impact estimates
  - Event day behavior was adjusted for over/under performance depending on the industry of the participant
  - Important pre- and post-event behavior was also incorporated
  - Provided more realistic event day behavior for ex-ante estimates
- Provided insight into how participants in various industries behave differently on event days

Why over/under performance adjustment? (cont'd.)



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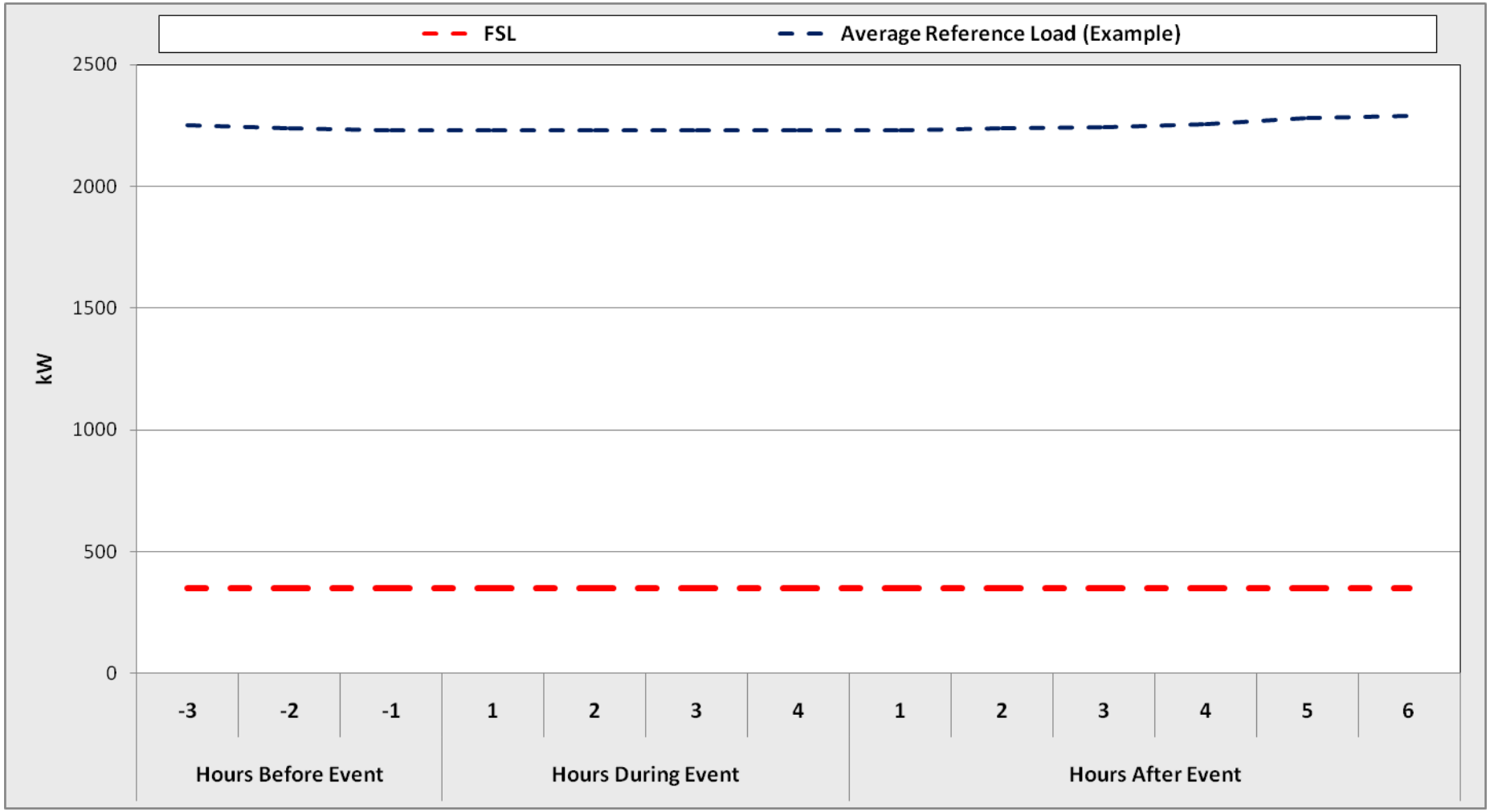

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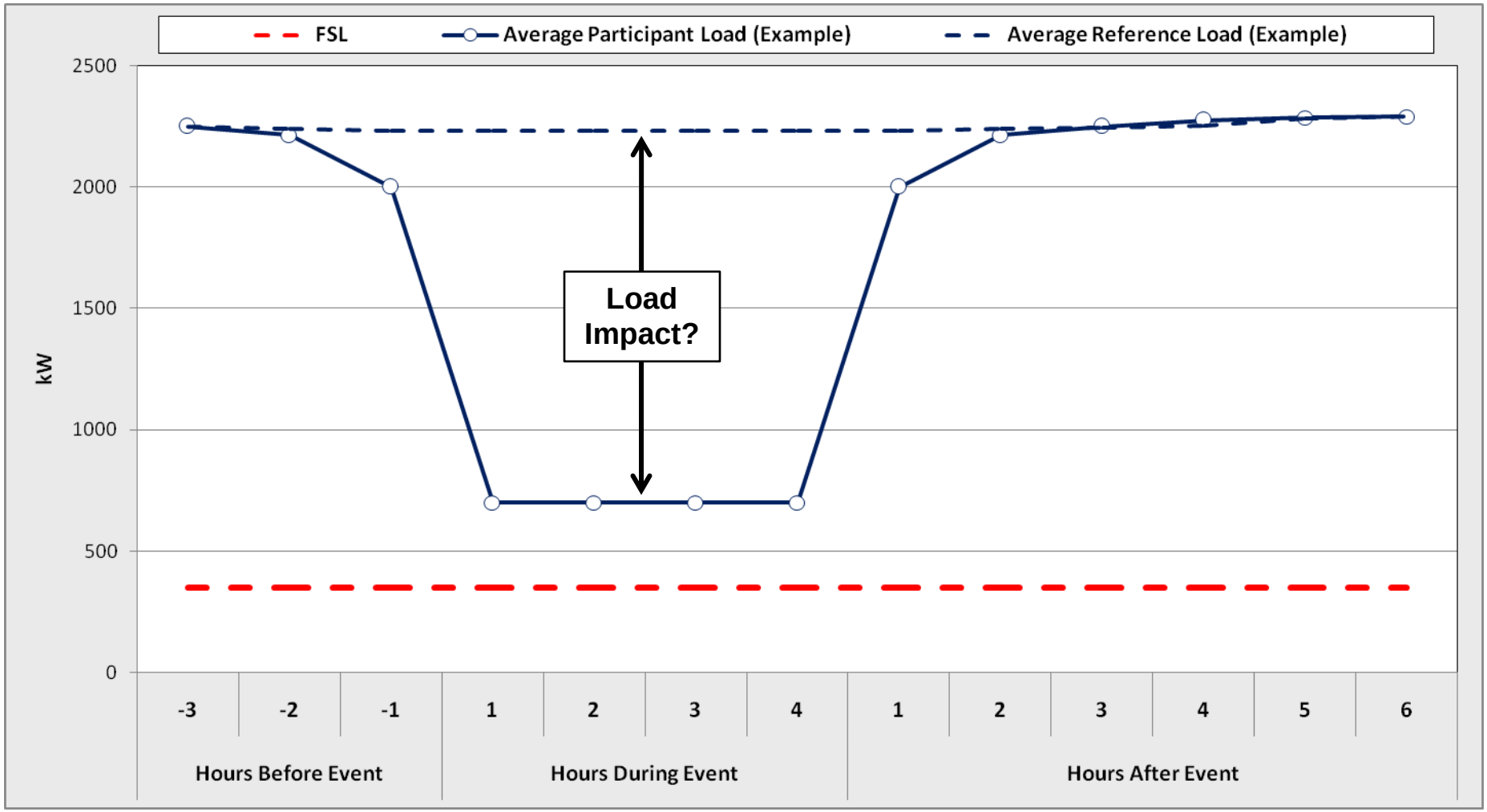

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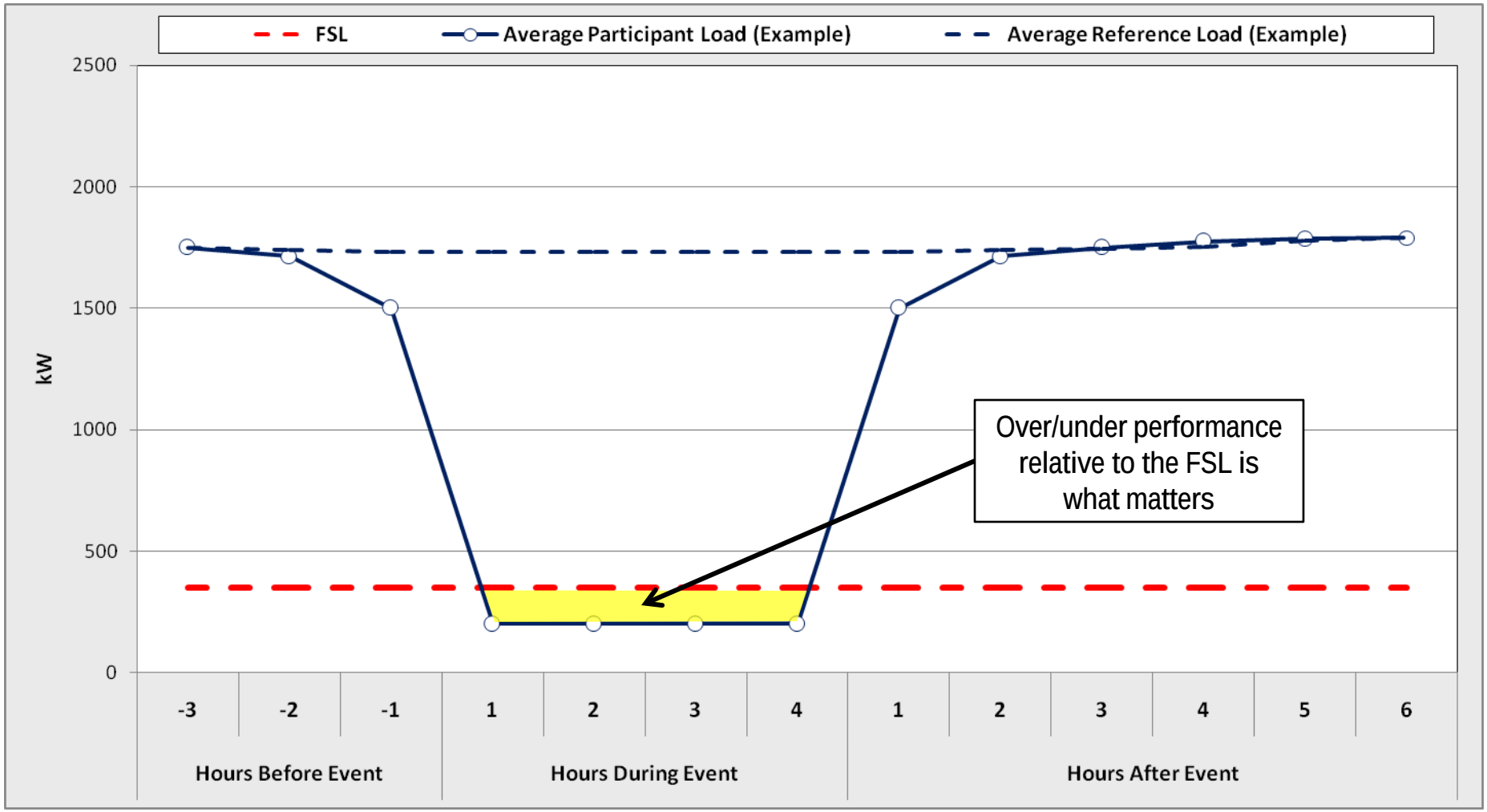

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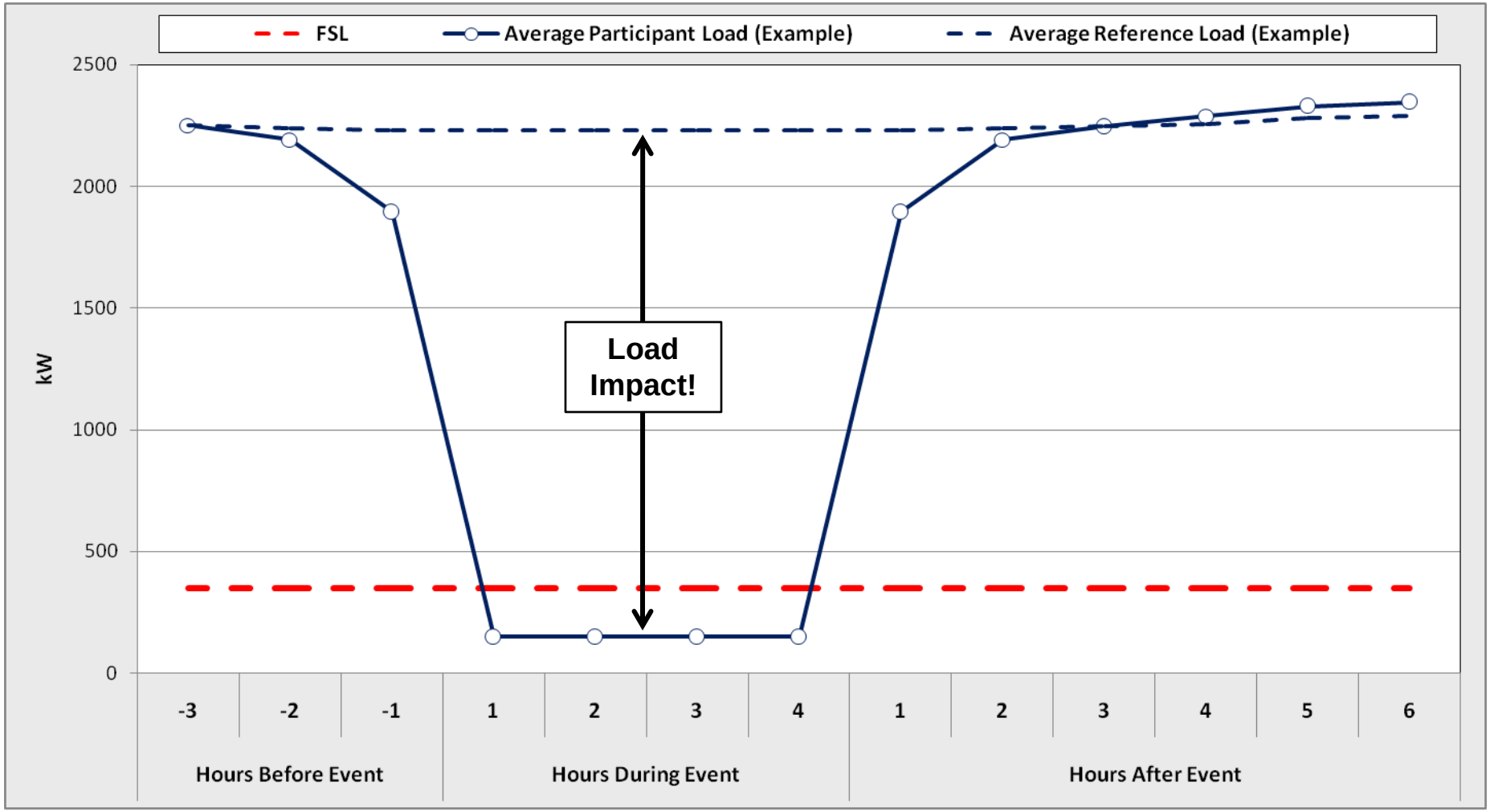
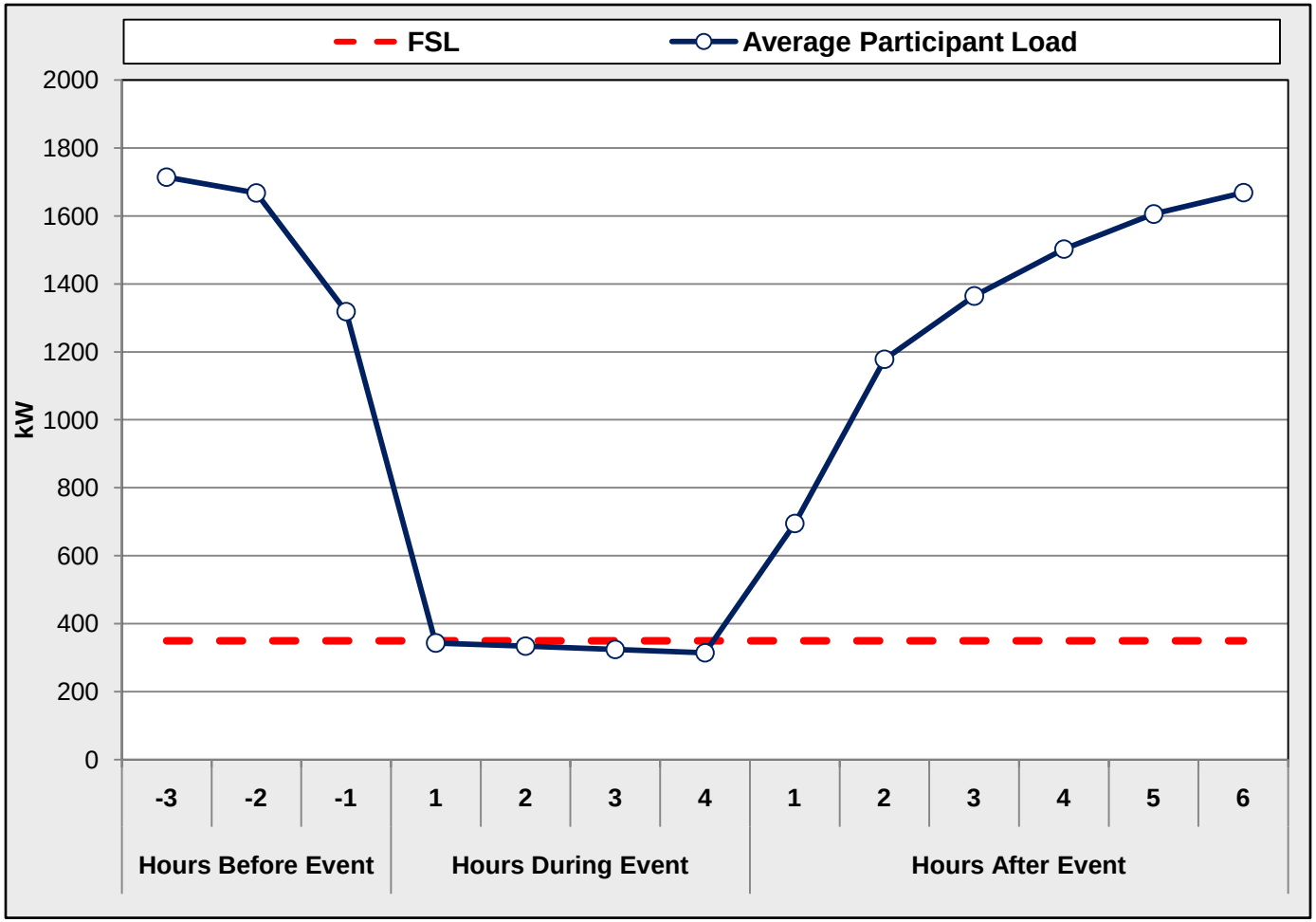


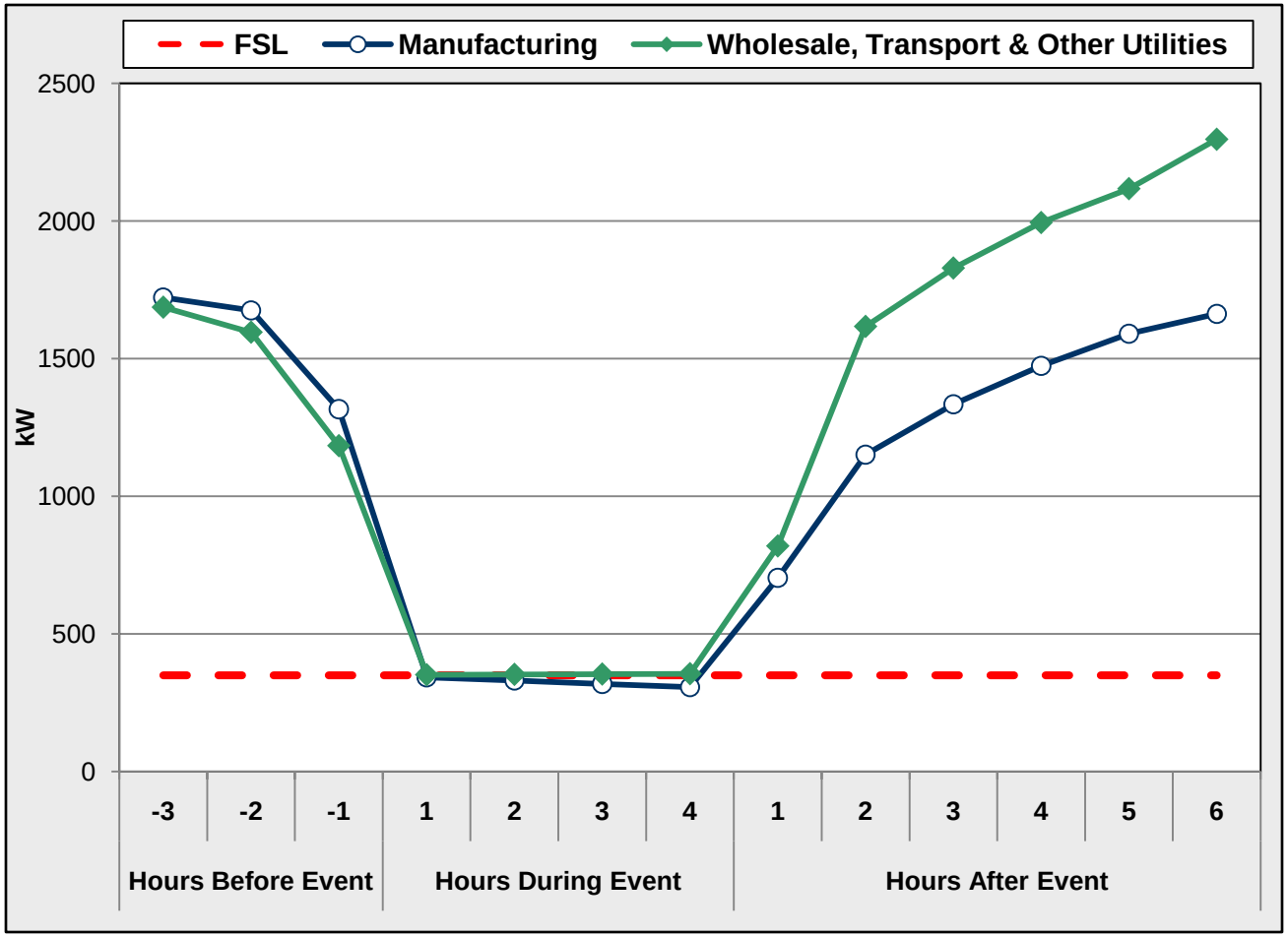
The average participant performs as expected during events (includes non-performers)



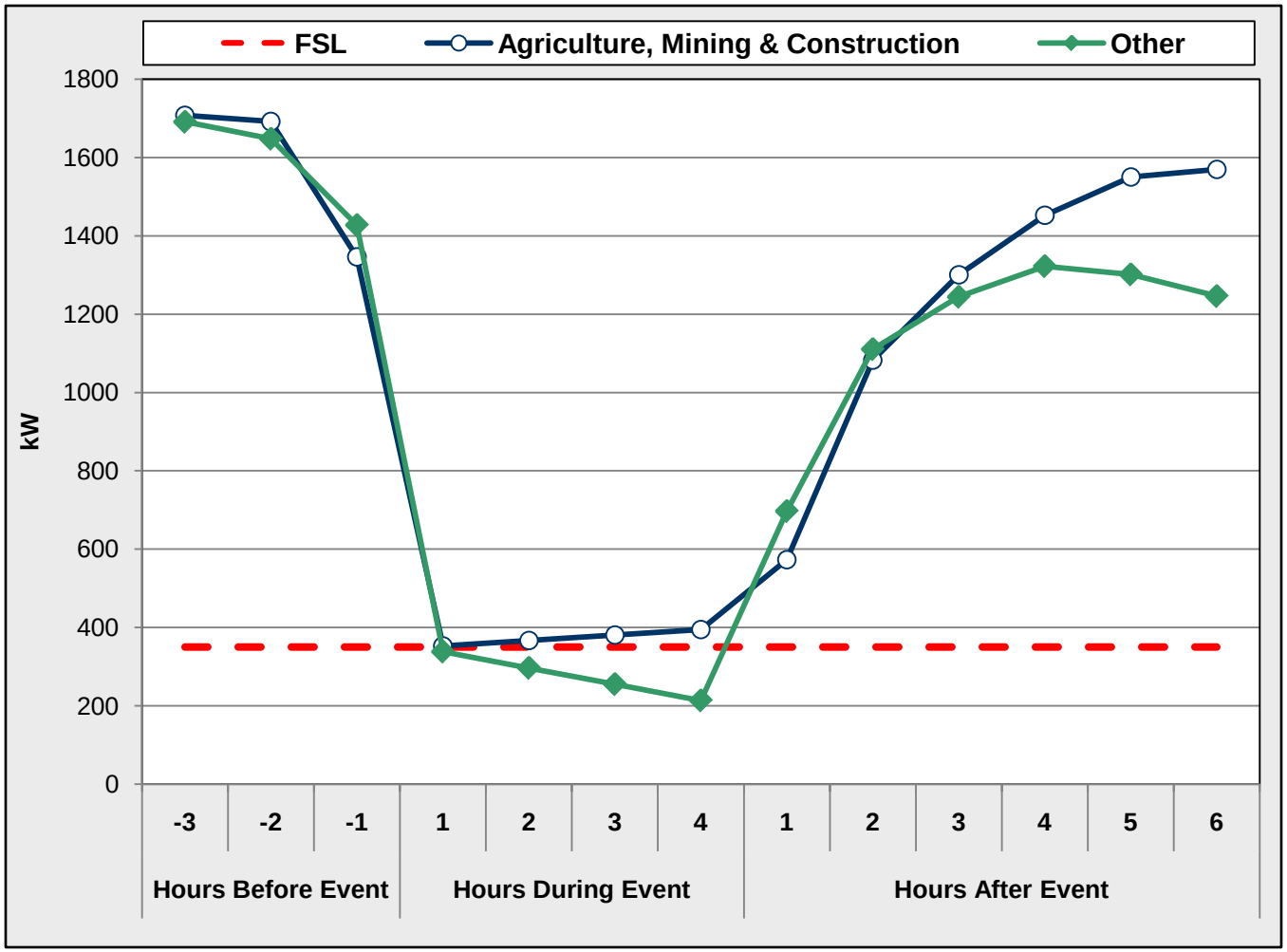
- Average participant was around 1,700 kW 3 hours before the event
- The average FSL was around 350 kW
- There are substantial load impacts before and after the event
  - Load begins to drop 2 hours before the event
  - Load does not return to 1,700 kW until 7 hours after the event ends

Compliance relative to the FSL is driven by the two main industry segments of BIP

- Considering that manufacturing comprises 54% of BIP participants, the average event -day load shape looks similar to the average participant in the manufacturing sector
- Participants in wholesale, transport & other utilities drop load nearly exactly to their FSL
- In addition, participants in this industry increase load back to normal within two hours after the event and engage in substantial post-event load shifting



Performance varies by industry



- Participants in the "other" category (mostly offices and schools) over-perform on average
- Participants in the agriculture, mining & construction sector slightly under-perform on average
- Over/under performance likely varies by event conditions, but this is difficult to capture with data for only two events

BIP is a well-designed program

- Works well for large commercial and industrial customers
  - Load impacts are predictable – participants perform as expected
  - Substantial impacts outside of event window, especially after events
  - Baselines assume that load is relatively higher on event days (i.e., top 15 out of last 20 days)
- Capacity payments are calculated ex-post
  - BIP provides capacity payments at the end of the month based on actual capacity for that month
  - Capacity bidding programs let participants elect their capacity at the beginning of the month
- Straightforward settlement
  - Did participant reduce load below FSL or not?
  - No baseline calculation necessary – easier for customer to manage load

Some key uncertainties remain…

- How will the effectiveness of BIP change as the program design changes?
  - PG&E BIP participants to be rolled into PeakChoice at the end of 2010
  - CAISO would like to see program called not just in case of emergency, but to avoid an emergency
  - Will the current participant mix that provides predictable load reductions remain in the program?
  - How will the performance of new enrollees differ from that of current participants?

For any questions, please contact…

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For the complete evaluation, please visit…

http://calmac.org/search.asp
Search: “BIP”

http://www.calmac.org/publications/BIP_Statewide_Load_Impact_Report_-_Final_Non-Redlined_Version.pdf