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Demand Response: Reaching Potential

Peak Load Management Alliance

April 29 – 30 210

Santa Monica, CA

Len Pettis

Chief of Plant, Energy and Utilities

California State University System

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50 million

cars off the road

278 million

metric tonnes
GHG reduction

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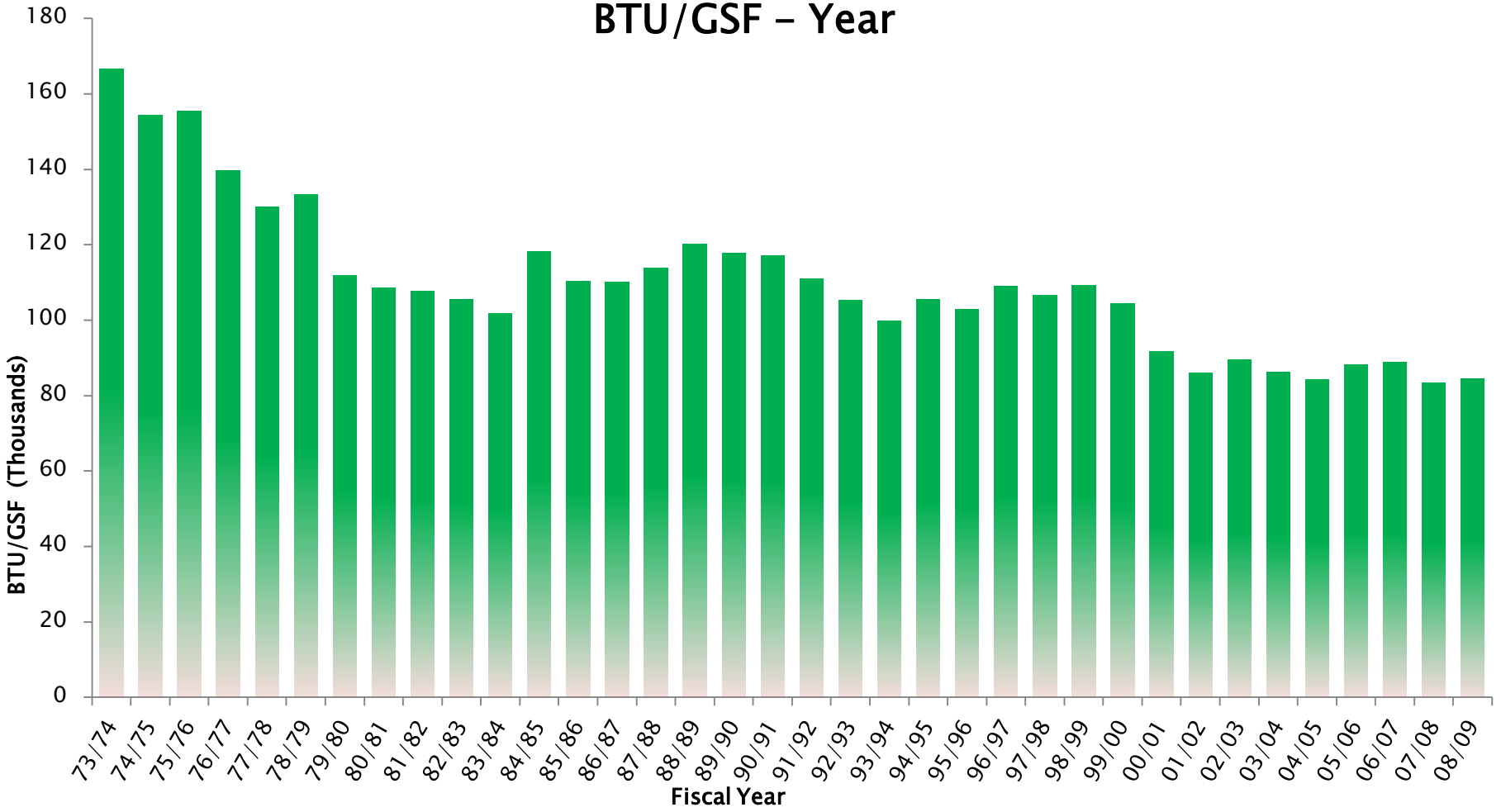
Systemwide Energy Consumption
BTU/GSF – Year



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Path to NZEC and Demand Response

- Communication
- Comprehensive Policy
- Energy Efficiency/ DR
- Distributed Generation/ DR
- Renewable Energy Resources/ DR
- Educated Workforce

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Campus Efficiency Efforts – Highlights

Campus News

CSUCI Gets New Green Designation

CSU Channel Islands (CI) was recently designated a California Cooperative Ecosystems Studies Unit (CESU). The individual CESUs are part of a national network that forges cooperative partnerships between universities and various federal agencies. In California, seven CSU campuses are designated as CESUs.

CI students and faculty work with agencies including the Minerals Management Service, the California Regional Water Quality Board, U.S. Fish and Wildlife Service, the County Resource Conservation District, and the United Nations. Read more

Smart Grid Training at Sacramento State

Sacramento State will receive American Recovery and Reinvestment Act funds for the development of a new training and workforce development program to enhance the region's growing smart grid system. Smart grid technology helps utility companies effectively respond to peak power demands through advanced metering systems that allow two-way communication between consumers and suppliers.

The funding will support Sacramento State's development of electrical/power engineers with smart grid credentials. Read more

CSUN Cuts Water Waste

Using incentive monies from the Metropolitan Water District and the Los Angeles Department of Water and Power, CSUN completed the installation of a Central Computerized Irrigation Control System.

The system will send messages to irrigation controllers all over the grounds, telling them how much watering the university's plants and grass need on any given day. This should reduce the campus' water footprint and costs. Read more

CSUF Partners on Produce

The Cal State Fullerton community is reducing the carbon footprint of eating healthy.

As part of the Community Supported Agriculture project, Cal State Fullerton is partnering with South Coast Farms to distribute 35-pound baskets full of locally-grown, freshly-picked, organic produce twice a month.

Prepaid baskets are distributed at the Fullerton Arboretum. Unclaimed baskets are donated to a nonprofit organization that provides food, transitional housing and support services to the hungry and homeless. Read more

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Campus Efficiency Efforts – Highlights

A Media Resource Highlighting California State University's Commitment to Sustainability

CSU Campuses Run on Fuel Cell Technology

April 22, 2010-- The California Public Utilities Commission has approved three CSU fuel cell projects allowing Cal State East Bay and San Francisco State University to be among the first college campuses in Northern California to feature this type of ultra clean, low emission, quiet, mini-power plant. Fuel cells allow greater efficiency in converting natural gas and water to energy, and the heat generated is also put to work in a process called cogeneration.

The CSU has been a long-time leader in fuel cell technology. CSU Northridge currently operates an award-winning 1 megawatt fuel cell, along with a rainforest to capture left-over carbon.

www.calstate.edu/PA/greensheet/

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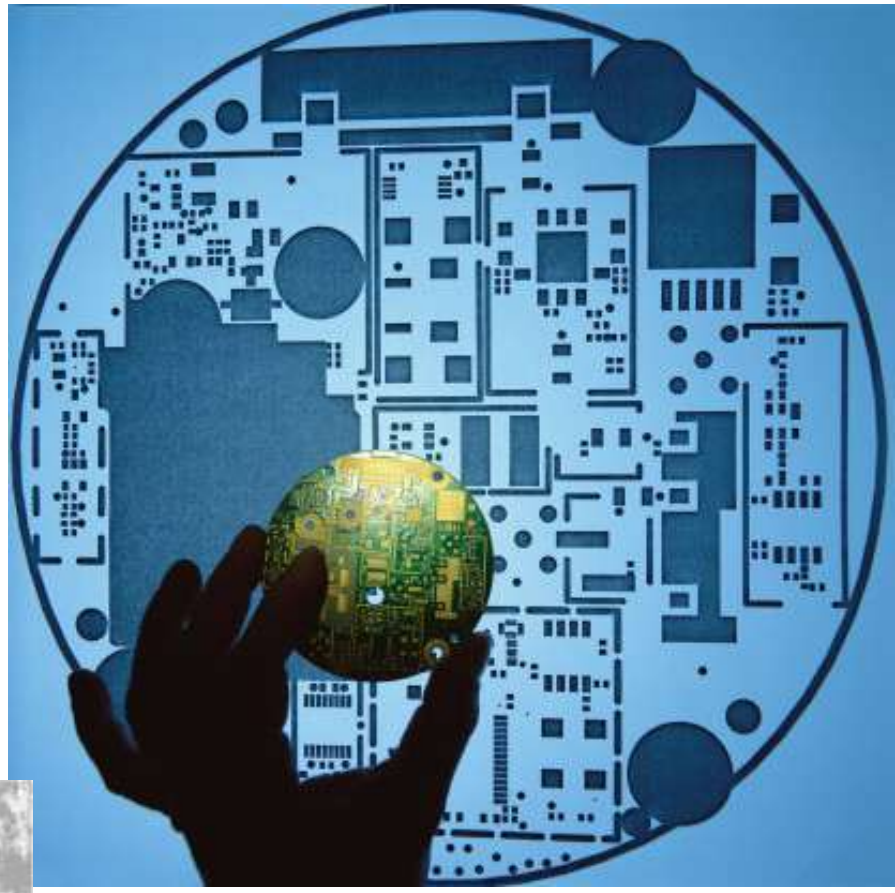
CSU Carbon Policy

- Developing guidelines
  - EE – DG – RE –
  - Water – TDM – WFD



Energy Efficiency and Commissioning

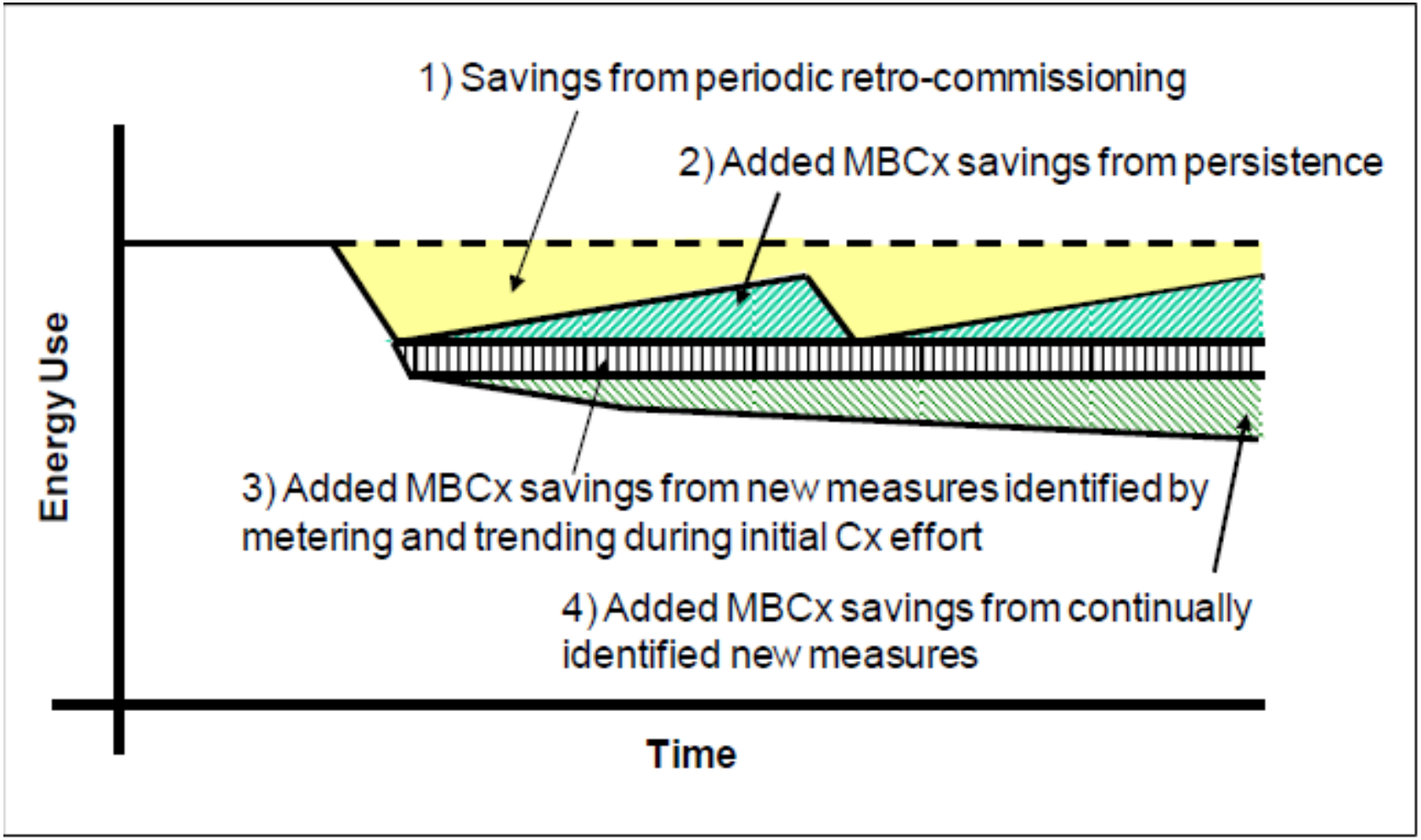


Figure 1. MBCx provides three streams of additional energy savings relative to RCx.

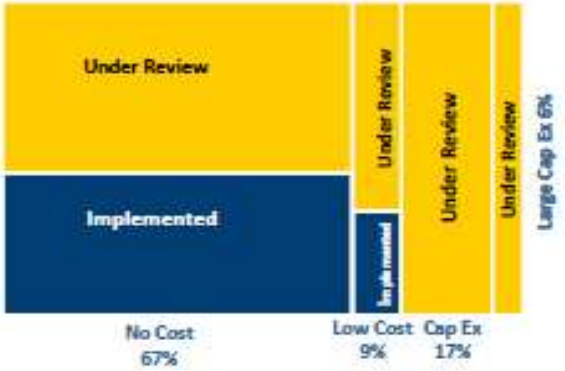
CSU Chico Monthly Scorecard for November 2009

MBCxE Energy Efficiency Measure Overview

	annual savings	
No Cost	$45,820	67%
Low Cost	$6,465	9%
Cap Ex	$11,874	17%
Large Cap Ex	$4,037	6%
All Identified EEMs	$68,196	

15.00% of Adressable Energy Spend

7.43% of Total Annual Energy Spend



Savings from MBCxE Energy Efficiency Measures

$68,196 $

per year	
$45,370	Under Review
-	In progress
$22,826	Implemented

593,012 kWh

per year	
394,522	Under Review
-	In progress
198,491	Implemented

- therms

per year	
-	Under Review
-	In progress
-	Implemented

291 tons of CO_2

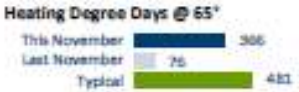
per year	
194	Under Review
-	In progress
98	Implemented

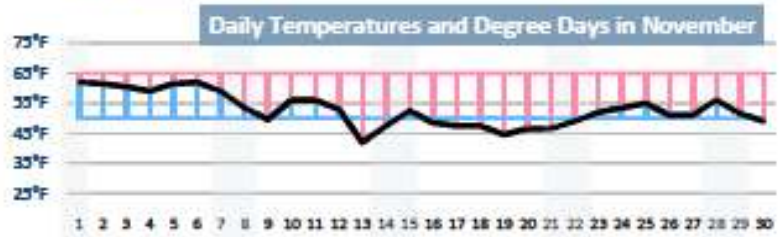
ENERNOC

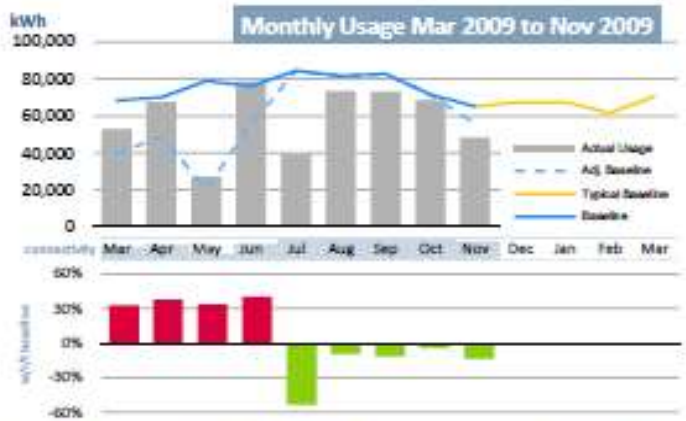
Student Services Center Electricity Usage

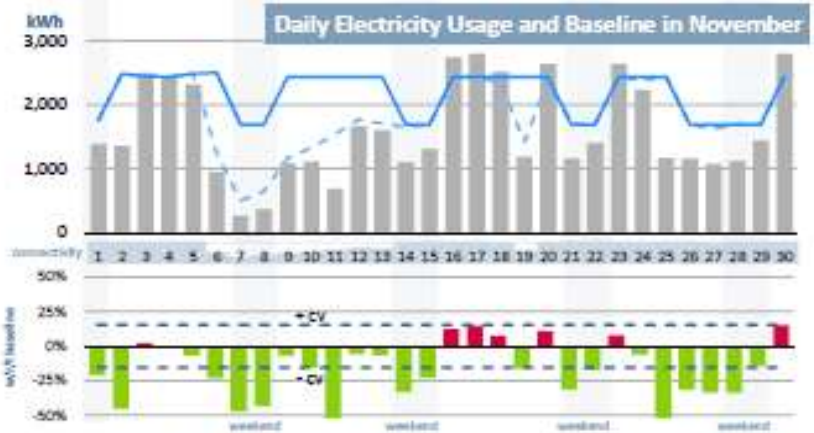
	November 2009		Year to date	
Usage	48,190 kWh	85.6% of readings	528,500 kWh	65.0% of readings
Adj Baseline	55,600 kWh		539,700 kWh	
	7,410 kWh		11,200 kWh	
	13.3% under baseline		2.1% under baseline	

The electrical baseline was derived from 5-minute interval data readings from March through June of 2009. This building's electricity usage baseline is dependent on occupancy and weather.
R^2=0.96 CV-RMSE=15.5%









Energy Intensity	November 2009	Year to date
Metered Usage	0.24 kWh/sf	2.64 kWh/sf
Adj Baseline	0.28 kWh/sf	2.70 kWh/sf

Energy Intensity	November 2009	Year to date
Metered Usage	0.24 kWh/sf	2.64 kWh/sf
Adj CEUS	0.80 kWh/sf	6.74 kWh/sf

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These are the new energy efficiency measures that the MBCxE team of Cogent and EnerNOC found this past month.

New Energy Efficiency Measures - Under Review

	Recommendation	Building	Equipment	Net Present Value (10 years @ 12% discount rate)	Estimated Cost	Payback (years)	Cost Category	Annual Savings: Value ($/yr)	Annual Savings: Electricity (kWh/yr)	Annual Savings: Natural Gas (therms/yr)	Annual Savings: CO_2 (tons/yr)
EEM 15	Implement Summer Setback Schedule	Student Services Building	AHU-1 SF	$41,005	$0	0.00	No Cost	$7,257	63,106	-	31
EEM 5	Convert AHU to VAV System	Performing Arts Center	AHU S-1	$21,108	$3,333	0.77	Low Cost	$4,326	37,615	-	18
EEM 19	Implement Summer Setback Schedule	Performing Arts Center	AHU S-3	$20,306	$0	0.00	No Cost	$3,594	31,251	-	15

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eIQ Economics

eIQ the intelligent grid

- 75 million GSF
- $0.85/GSF cost =

  $64 million
- 12 – 15% EE improvement =

  $20 million /yr
- Cost recovery 3 yrs

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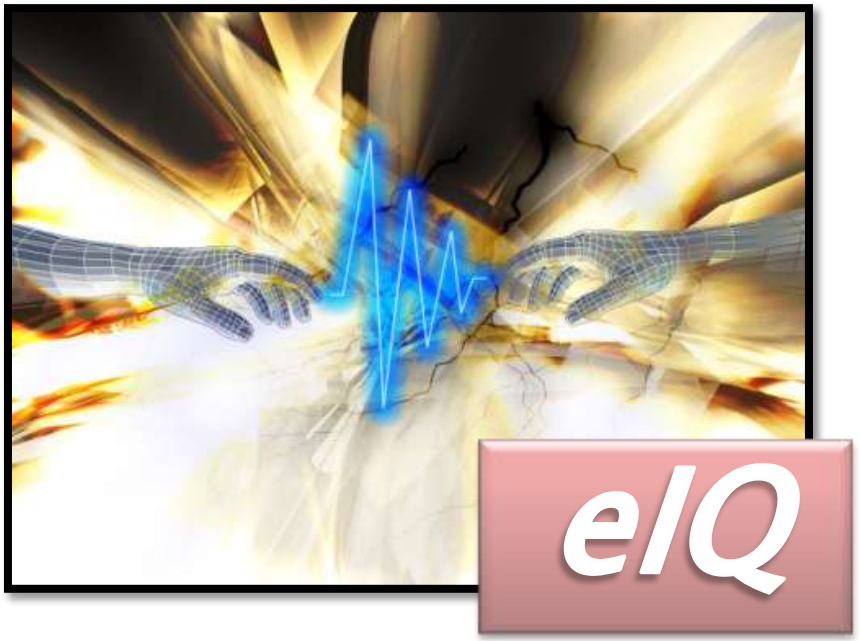
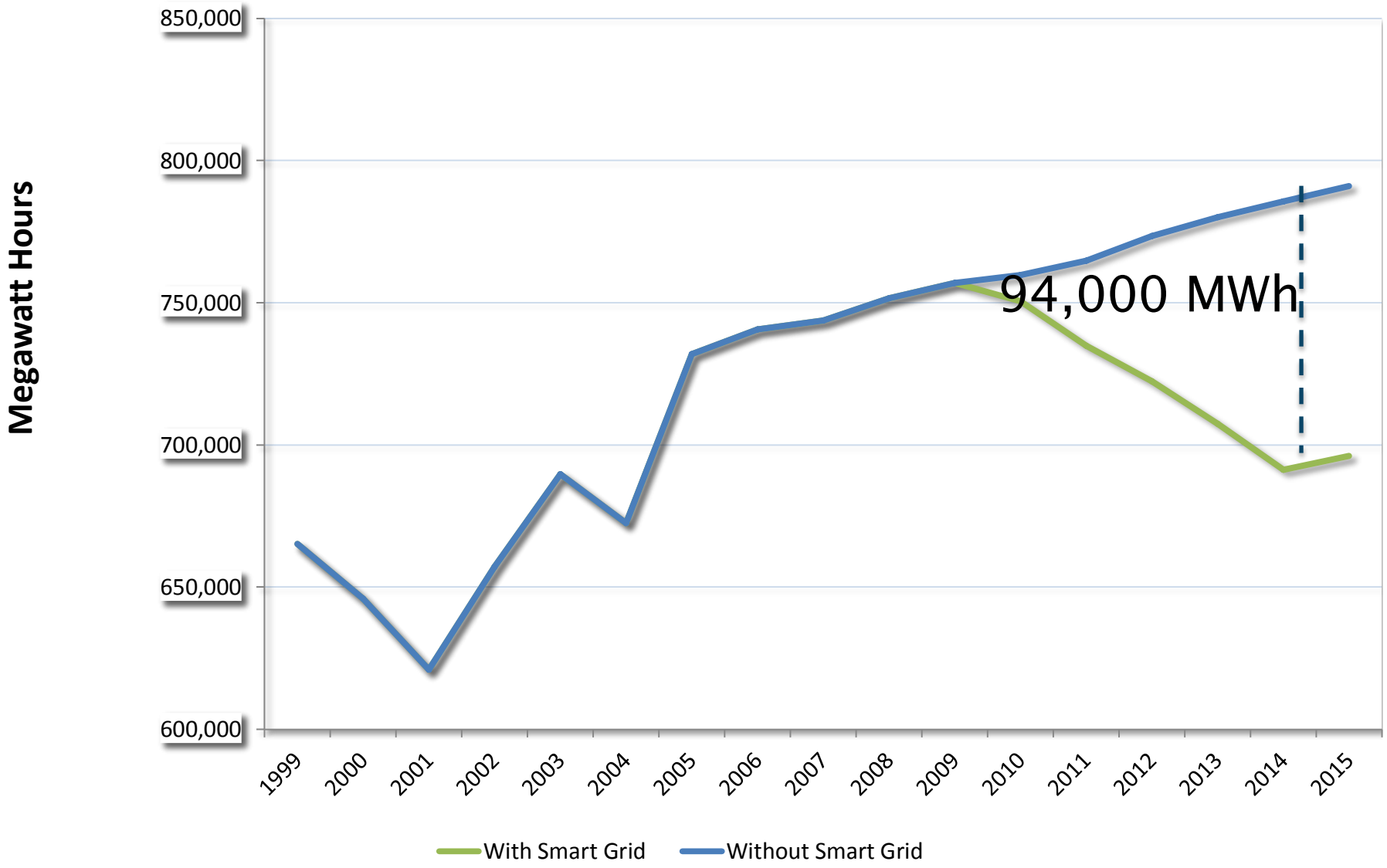
eIQ Societal Benefits

- 1,100 jobs
- 94,000 MWH/yr
- 5 MW DR
- 5M Therms/yr
- 31,000 metric tonnes GHG (5,695 cars off the road)
- New Gen, T&D avoided

Smart Grid of the future

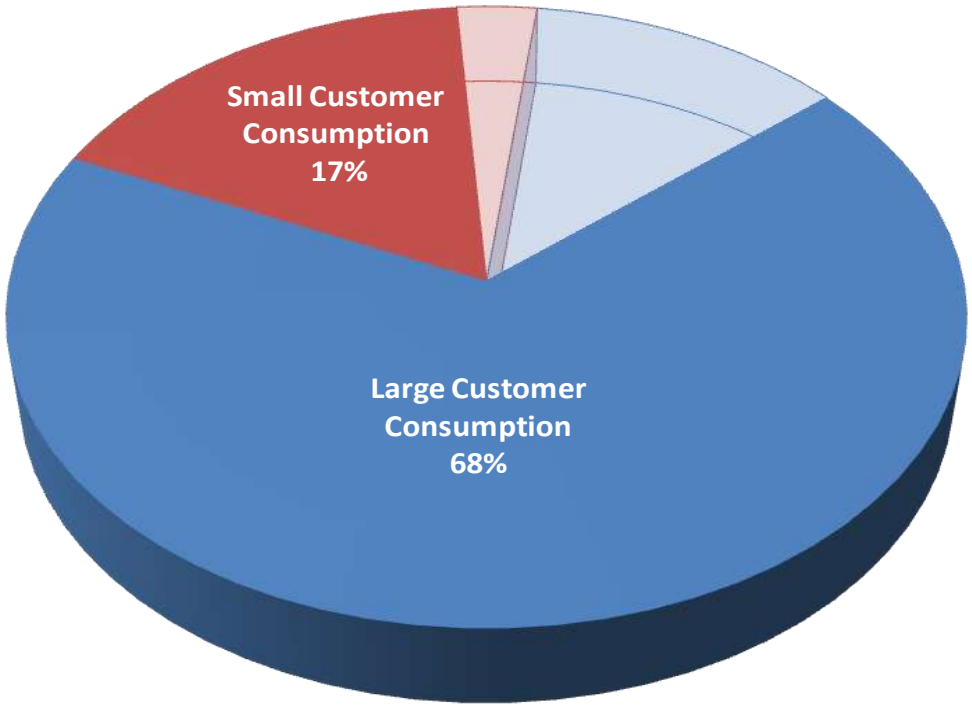



Megawatt Hours
850,000
800,000
750,000
700,000
650,000
600,000
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
94,000 MWh
With Smart Grid
Without Smart Grid

Scalable eIQ

Small Customer Savings 3%

Large Customer Savings 12%



CA-Elec Grid

East Coast-Elec Grid

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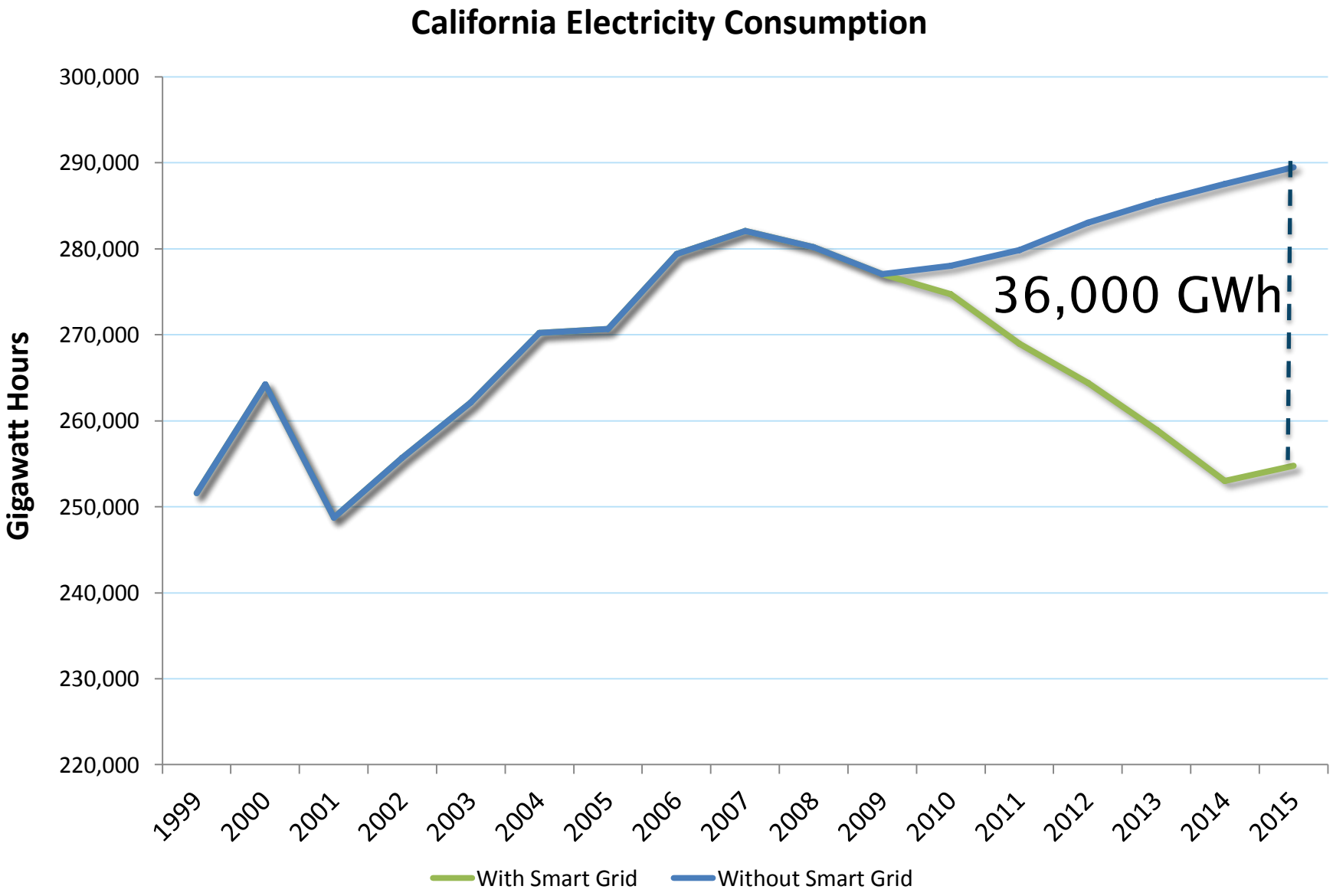

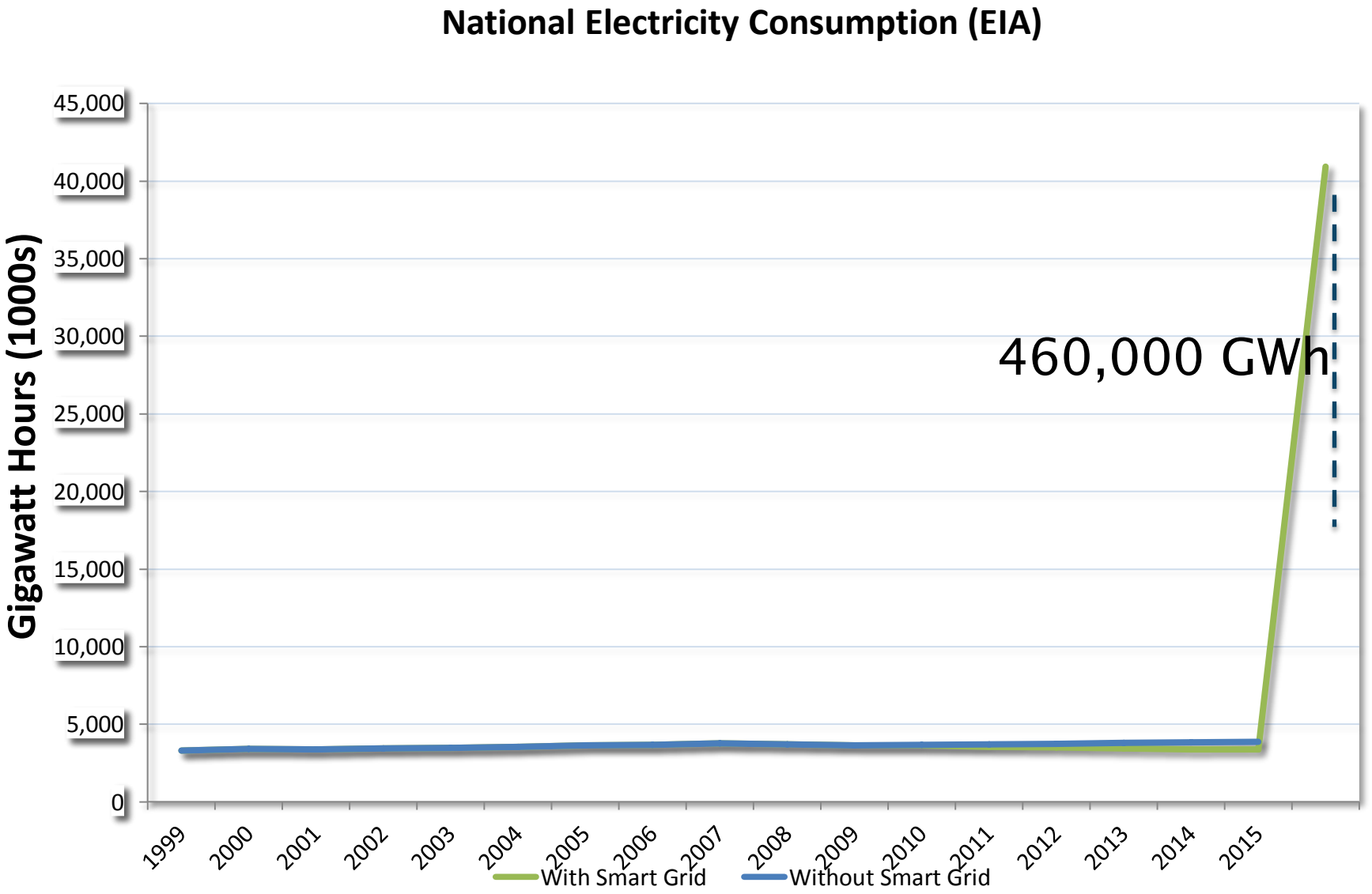
National Electricity Consumption (EIA)
Gigawatt Hours (1000s)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
460,000 GWh
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
With Smart Grid
Without Smart Grid

Why DR? Who Cares?... Risks

- Why
  - $$ – Social Responsibility – Good Policy
- Who Cares
  - Not many… till the lights go out!
- Risks
  - AMI malfunction and/or failure
  - Inconvenience to customers and operations
  - Administrative burden

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DR Provider Qualifications

- Market Place Experience
  - Site evaluation
  - DR systems analysis – testing
  - Web based portal tools – programs
  - CAISO credibility – settlement transaction record
  - Prompt payments
  - Coordination with ESP
  - Cost Share
  - General contract conditions – exceptions

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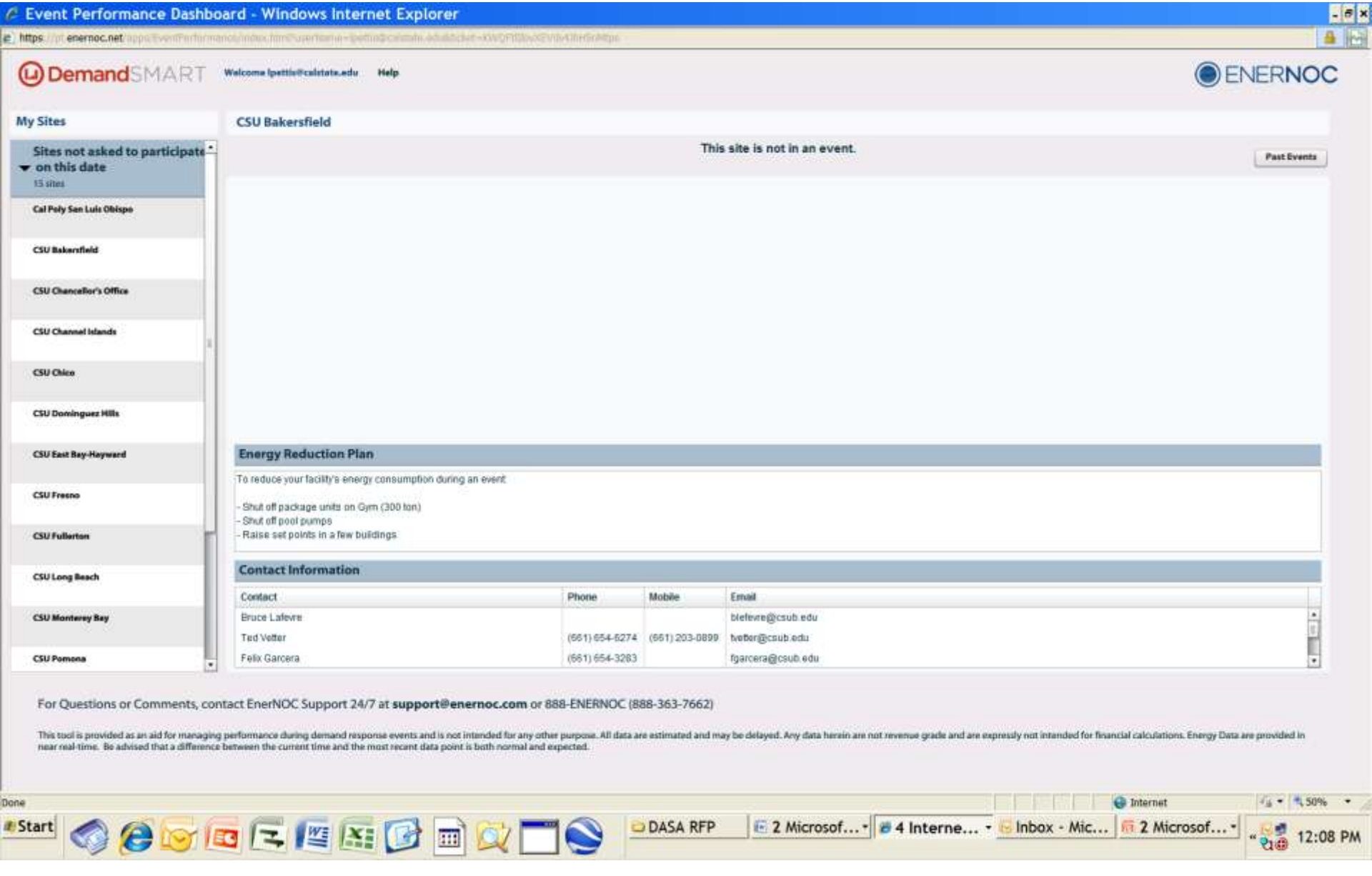

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What am I paying for peak energy?

- Capacity payment cost share
- Energy payment
- DSM factor

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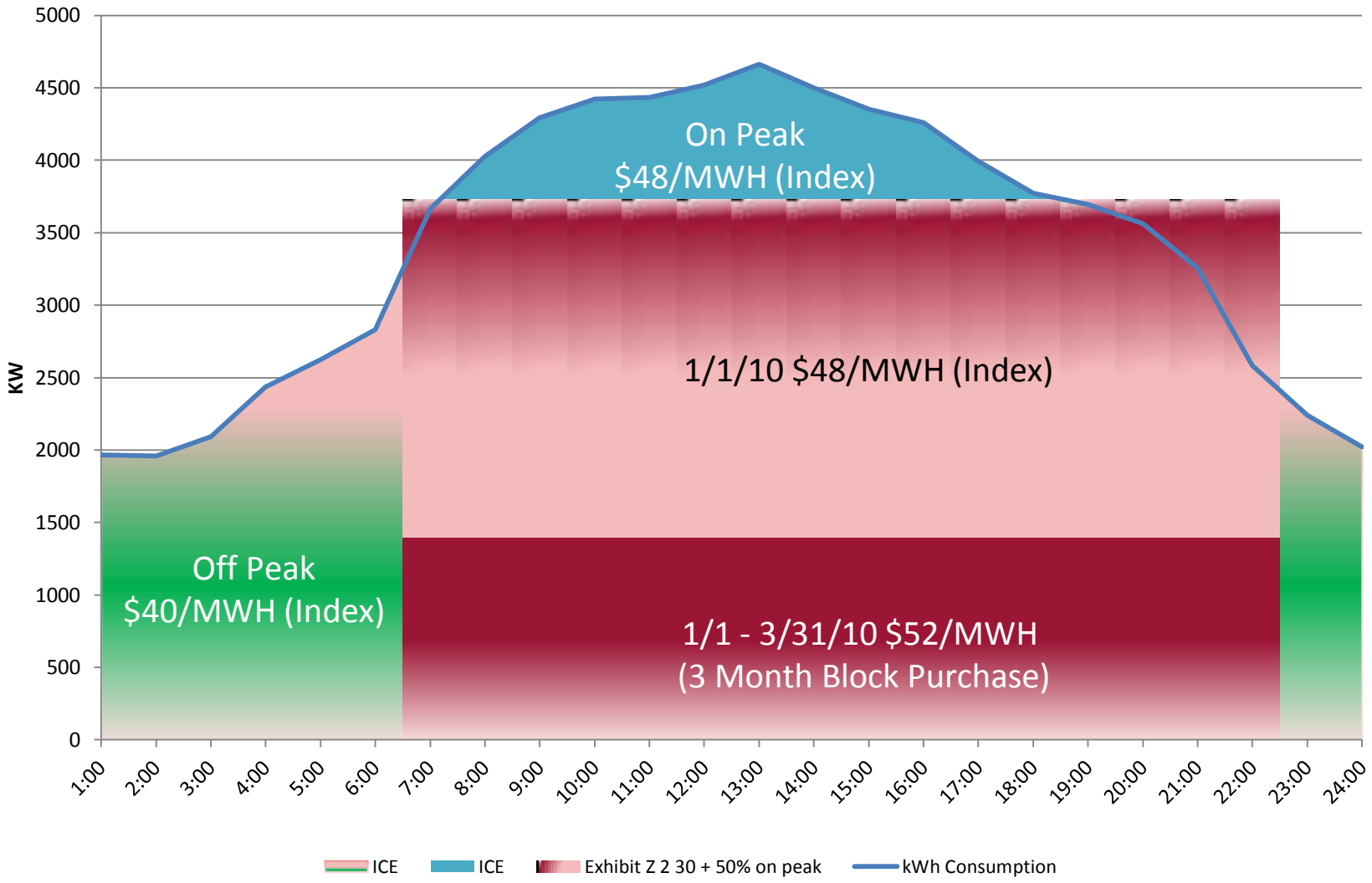
Block Energy Product



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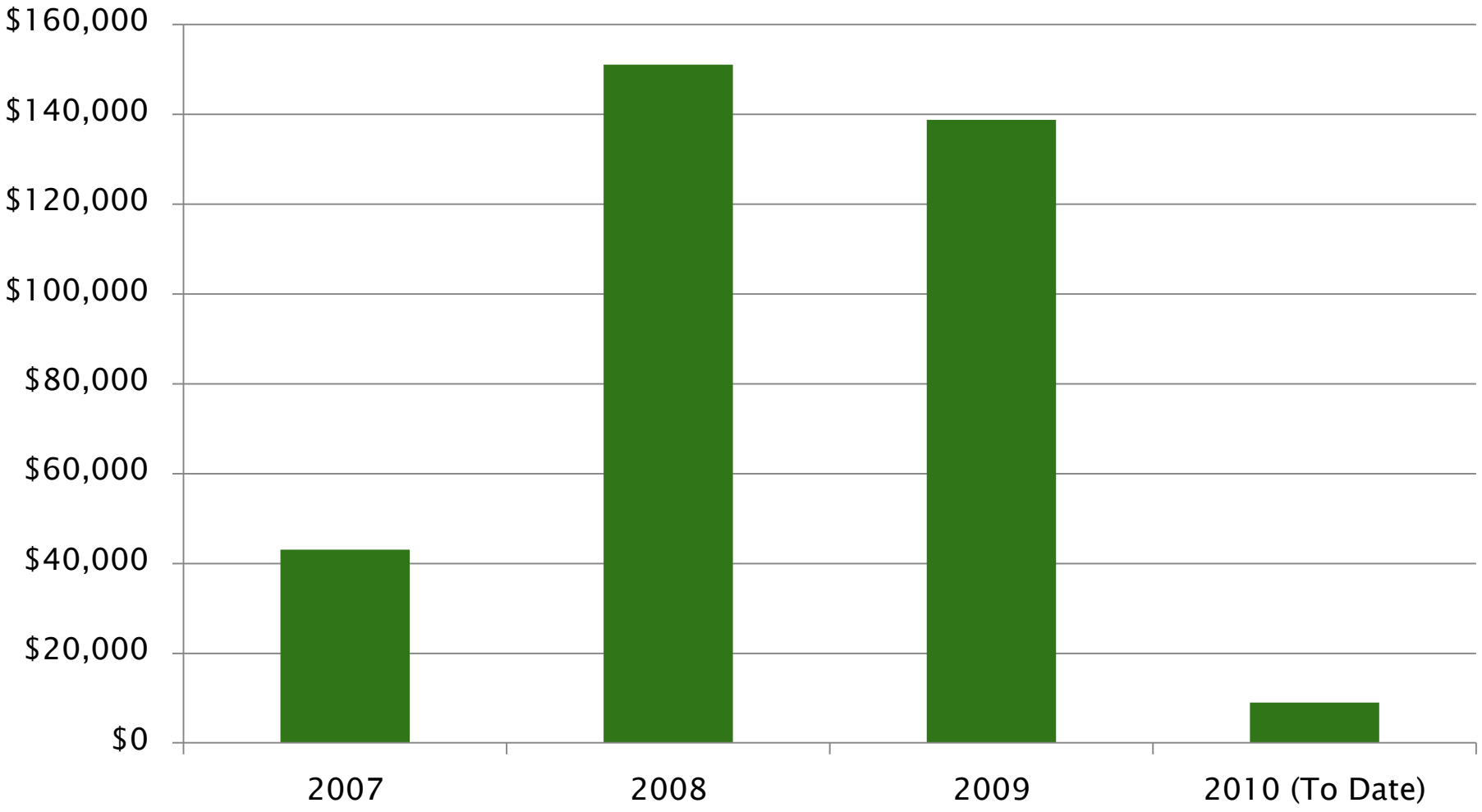
EnerNOC DR Payments



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Demand Response Payments

Estimated Payment	2004	2005	2006	2007	2008	2009	2010 (To Date)	Total for Campus
CSU Bakersfield				$3,000	$1,000	$1,000		$5,000
CSU Channel Islands					$1,000			$1,000
CSU Chico					$10,000	$11,000		$21,000
CSU Fresno State				$17,000	$1,000	$1,000		$19,000
CSU Fullerton					$75,000	$59,000	$5,000	$139,000
CSU Long Beach				$9,000	$30,000	$38,000	$3,000	$80,000
CSU Monterey Bay						$750		$750
CSU Pomona					$20,000	$16,000	$1,000	$37,000
*San Jose State **								$0
CSU San Marcos				$4,000	$4,000	$2,000		$10,000
*Cal Poly San Luis Obispo **								$0
Sonoma State University				$10,000	$9,000	$10,000		$29,000
Total	$0	$0	$0	$43,000	$151,000	$138,750	$9,000	**$341,750**

Barriers

- Complex changing rules
- Administrative cost

Challenges & Opportunities

- AMI implementation
- Auto DR
- NZEC

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50 million

cars off the road

278 million

metric tonnes
GHG reduction

If we don't get It Right, People will be mad, Blackouts will multiply

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EnerNOC

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Mike Anderson NAM

http://cx.lbl.gov/2009-assessment.html

Resources

DOE Energy Information Administration

California Energy Commission