

SMUD's Advanced Lighting Controls Rebate Program

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May 2013



Advanced Lighting Controls Program

Background

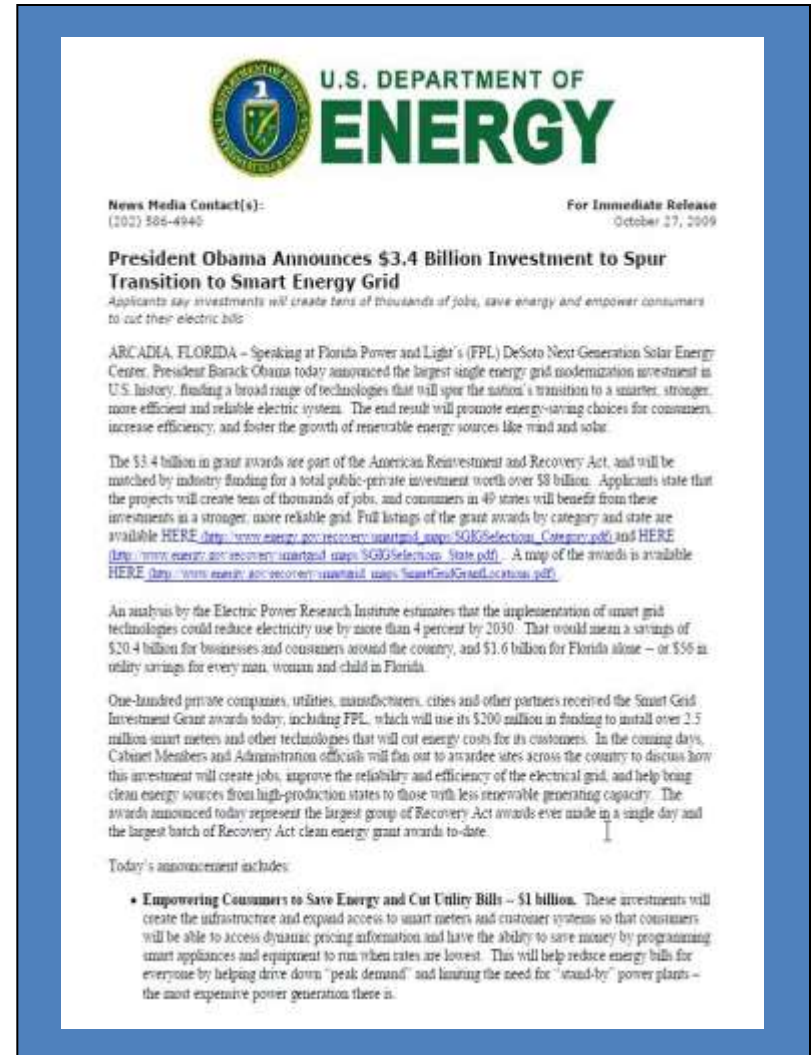
2010 - 2011: Three demonstration projects

- Wireless controls
- LED lighting fixtures
- Energy savings: 53 - 90%
- Demand savings: 50 - 60%
- Positive feedback from participants
- Simple payback: please don't ask!



Smart Grid Investment Grant (SGIG)

- October 2009 DOE Announcement
 - SGIG grants to 100 entities
 - \$203 million to California
 - \$127.5 award to SMUD for a \$308 million project
 - SMUD received 63% of the SGIG funds that went to California



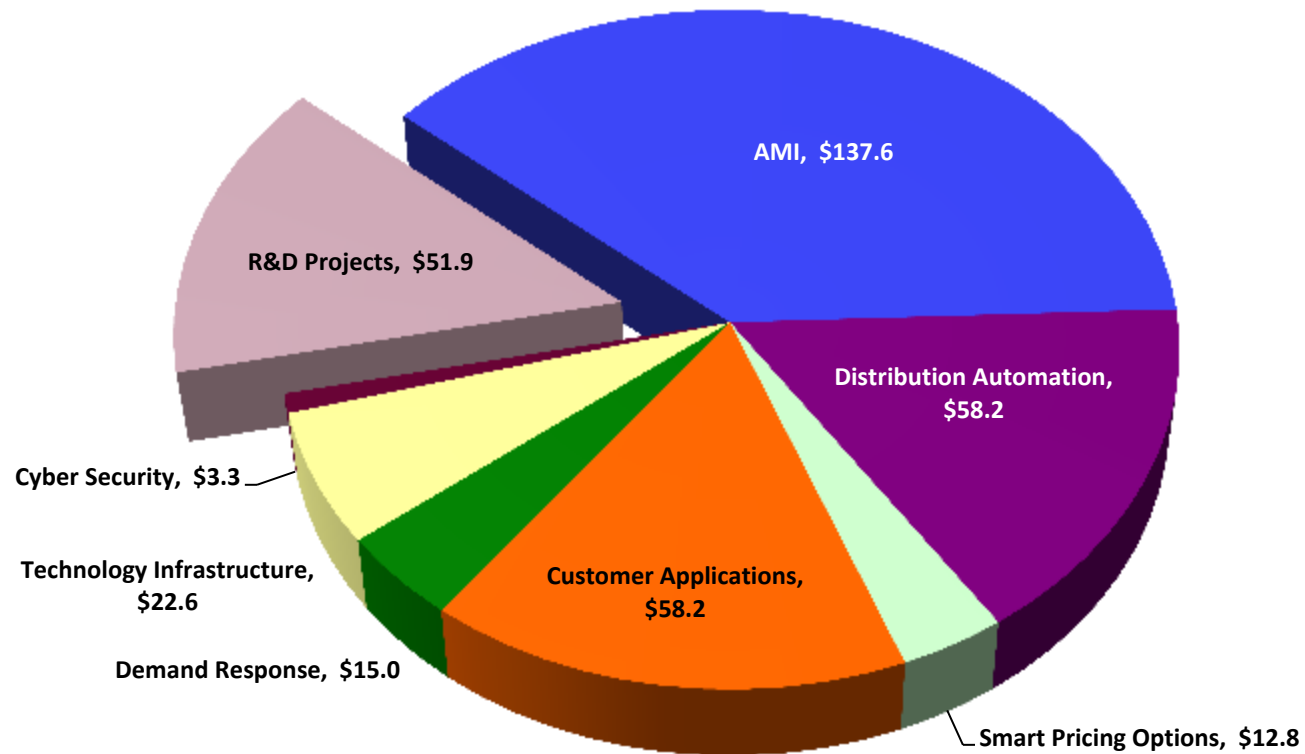
Acknowledgement/Disclaimer

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Smart Grid Budgets

Smart Grid Budget \$359.6M (\$307.7M SGIG + \$51.9M R&D)

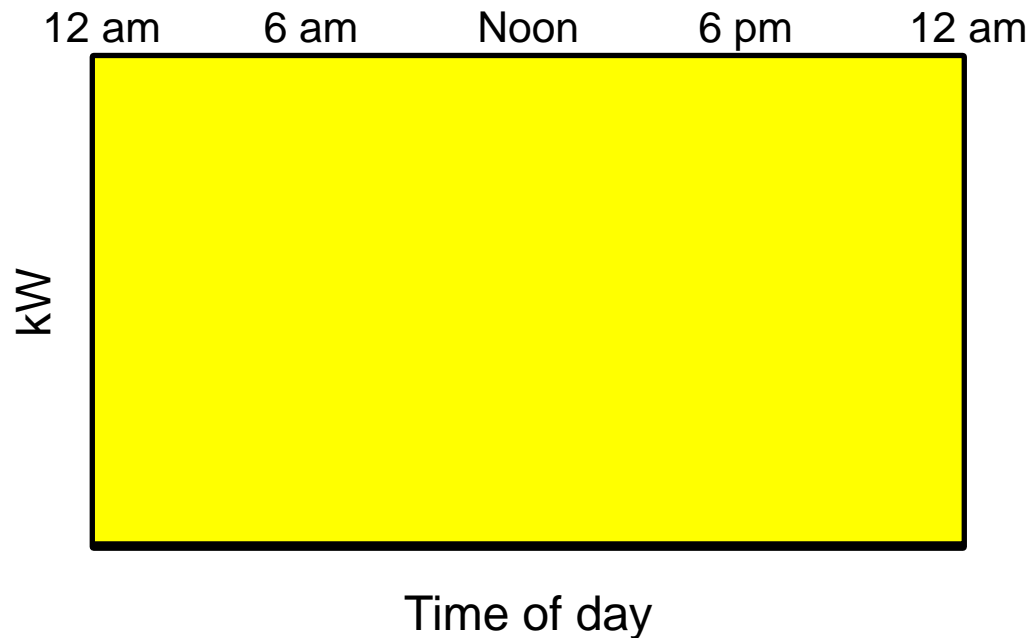


Control Strategies

- Control strategies include:
 - Scheduling
 - Tuning
 - Daylight Harvesting
 - Occupancy Sensing
 - Personal Control (dimming)
 - Variable Load Shedding (demand response)

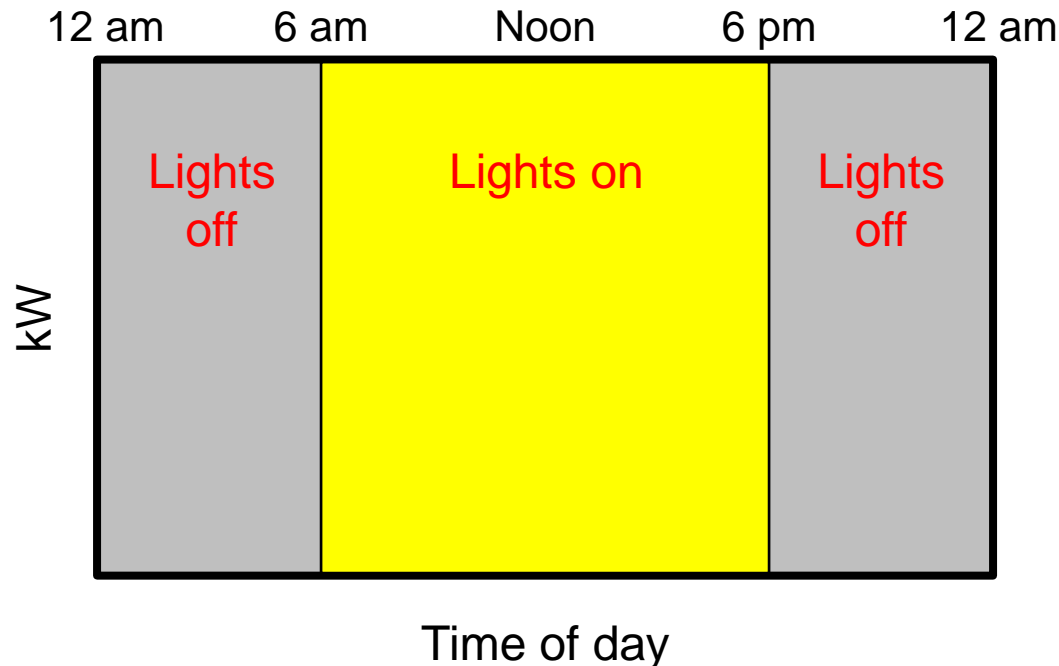
Control Strategies

- Lighting continually on 24/7



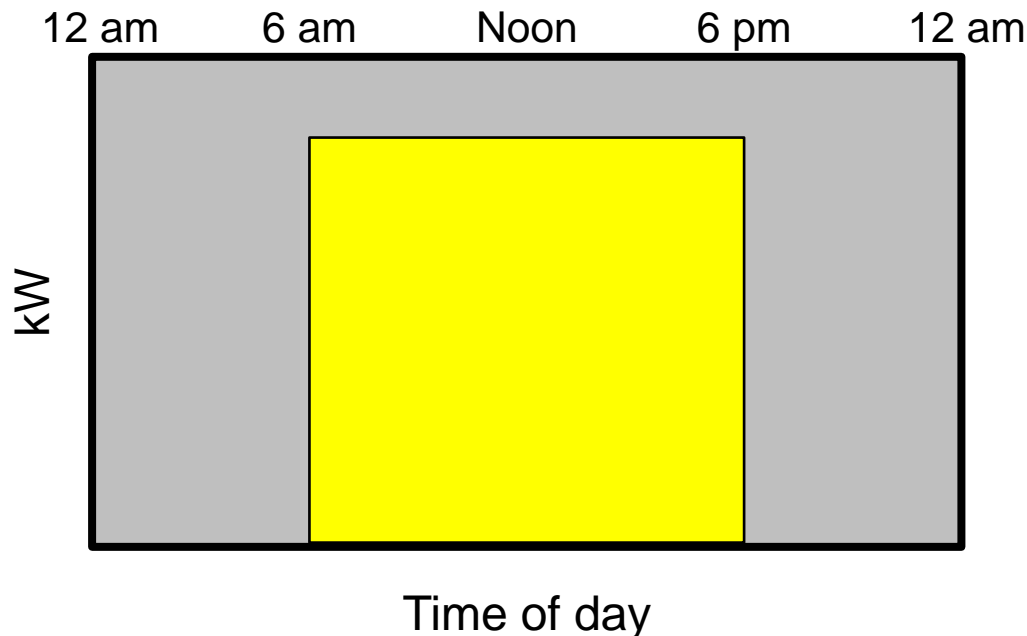
Control Strategies

- Scheduling: lights turn on/off at predetermined times



Control Strategies

- Tuning or “task tuning”: setting a default maximum light level in the workspace providing the right amount of light initially

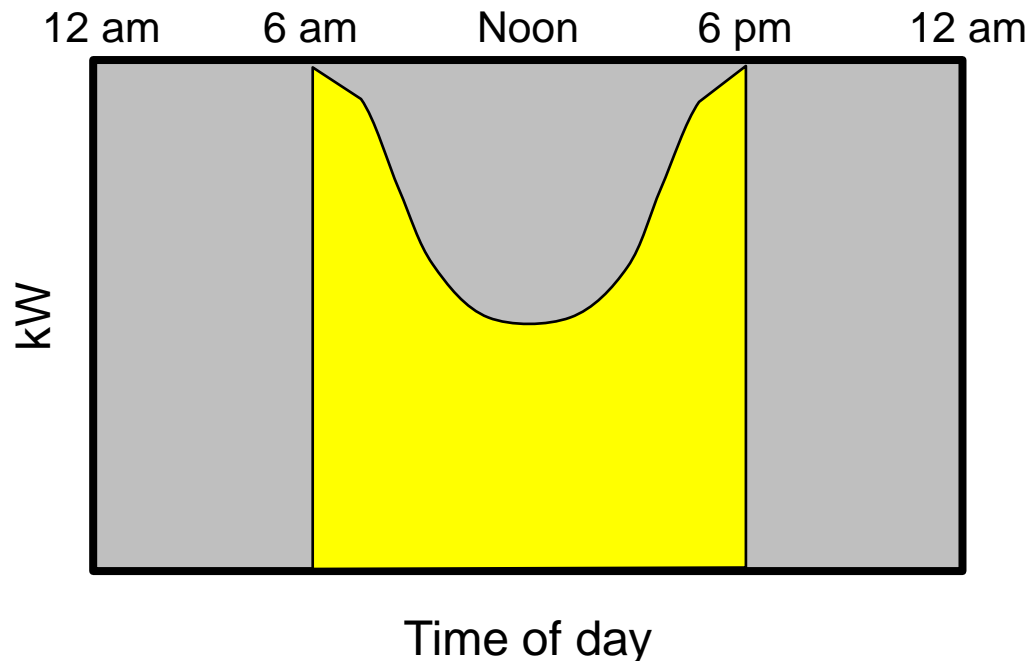


38% Savings

Lawrence Berkeley
National Laboratory
(LBNL) report

Control Strategies

- Daylight Harvesting: using daylight to offset the amount of electric lighting needed to properly light a space

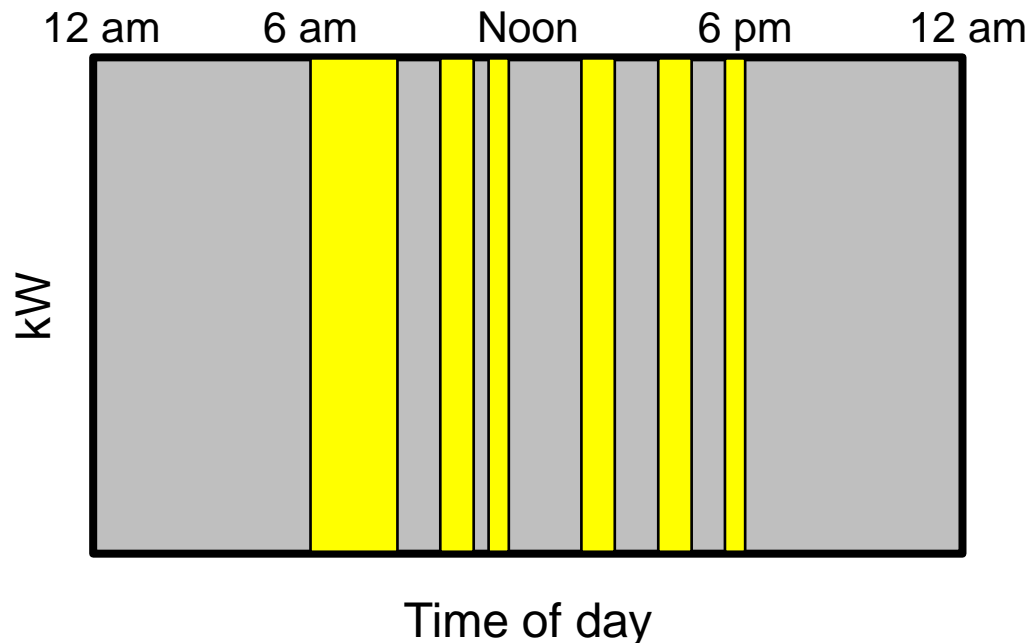


39% Savings

Lawrence Berkeley
National Laboratory
(LBNL) report

Control Strategies

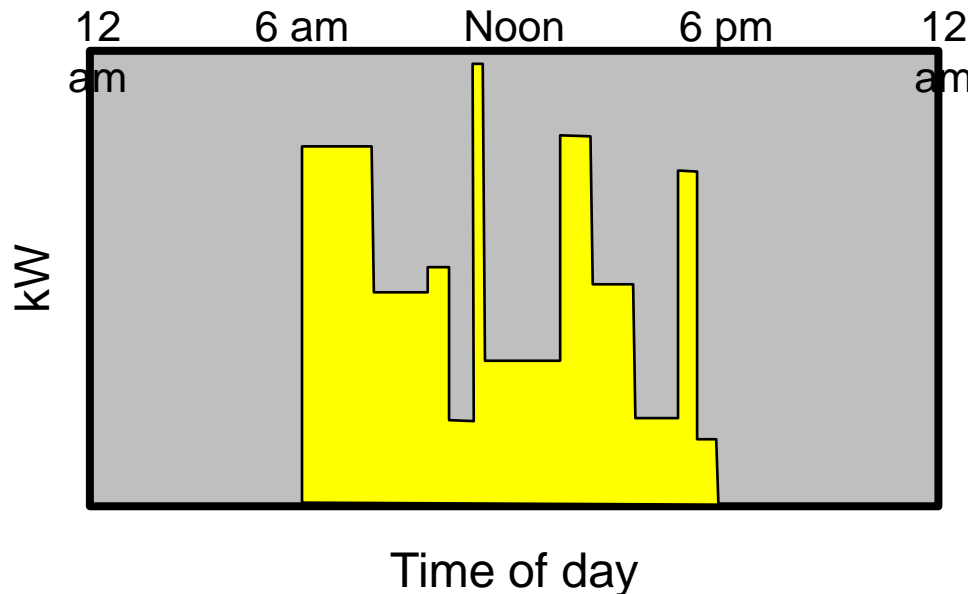
- Occupancy Sensing or Vacancy Sensing: turning off the lights when a space is unoccupied



28% Savings
Lawrence Berkeley
National Laboratory
(LBNL) report

Control Strategies

- Personal Control (dimming): user has total control of his/her lighting to dim as needed for the task at hand

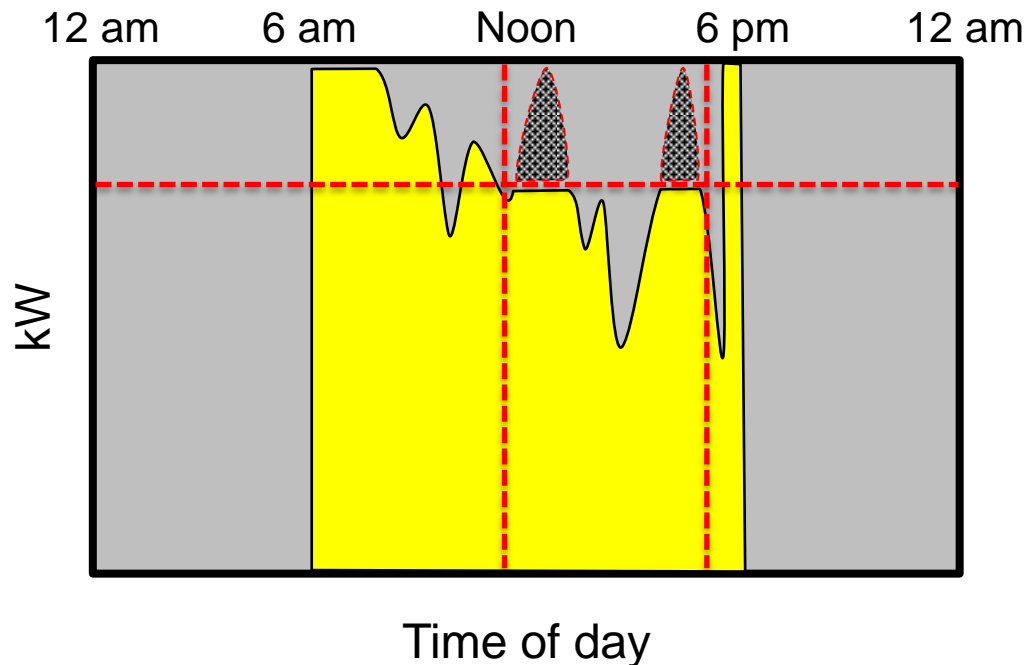


**34%
Savings**

Lawrence Berkeley
National Laboratory
(LBNL) report

Control Strategies

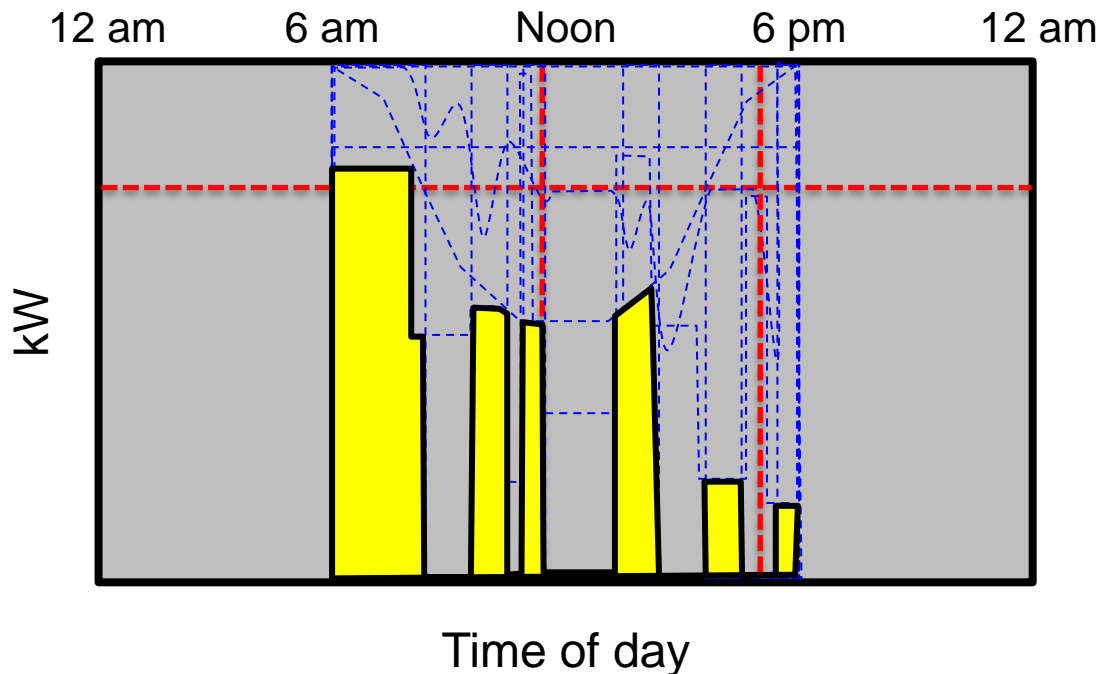
- Variable Load Shedding (demand response):
reducing lights during periods of peak demand



Control Strategies

- Optimization of all control strategies results in 40% (LBNL report)...

with redesign **70-90%** energy savings!



Advanced Lighting Controls Program

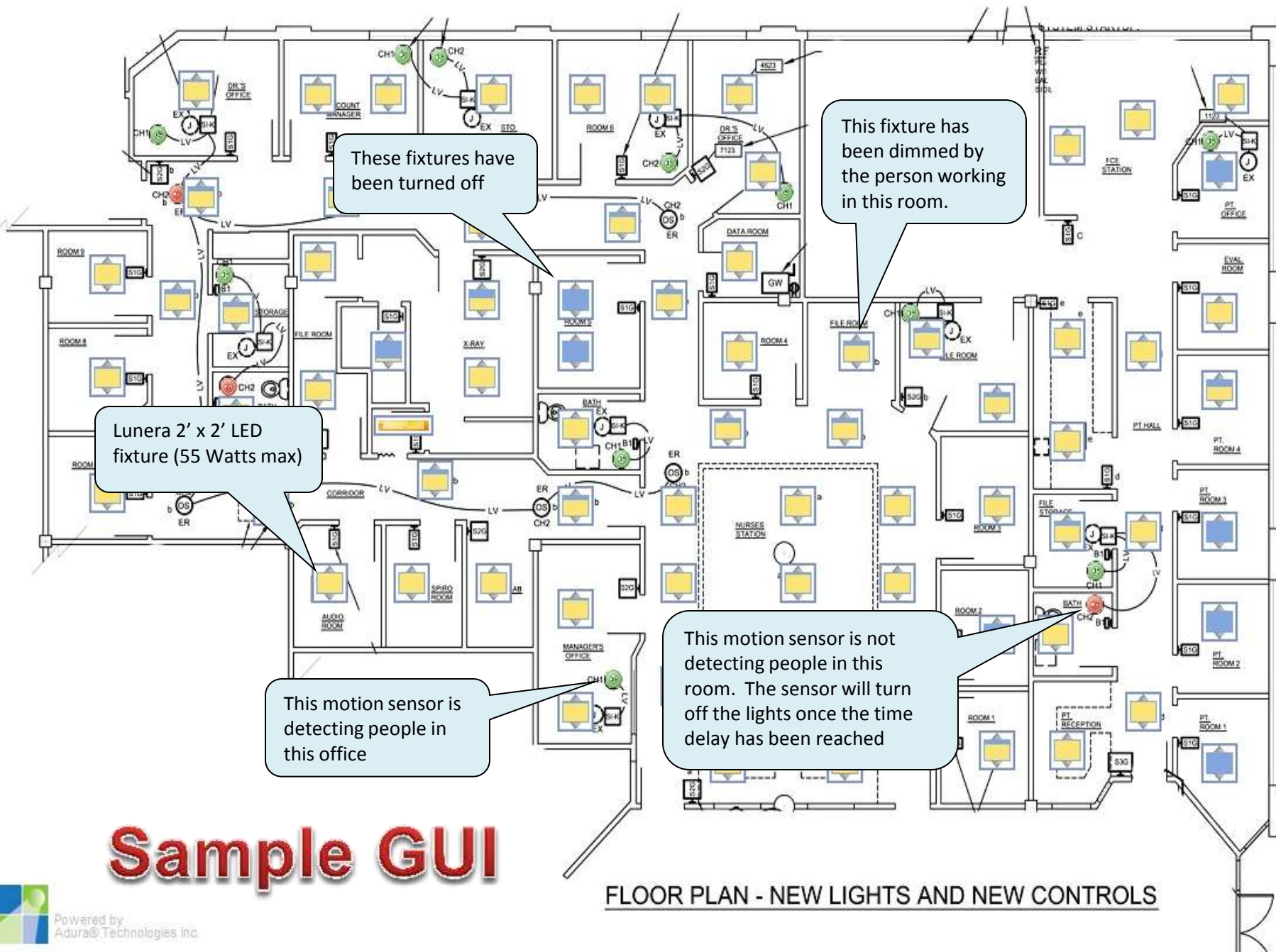
2012 Program Overview

- Customer incentive: \$0.30 per kWh saved (calculated first year savings) up to a maximum of \$100,000 per project, not to exceed 80% of the total cost of the project
- Savings and incentives will be calculated using SMUD's Savings Calculation Spreadsheet
- Retrofit applications only: new construction projects are not eligible
- Must use systems listed on SMUD's Qualified Products List
- Program start: 1/30/12 End: 2/1/2013

ALC Program: **System Requirements**

Graphical User Interface (GUI) and control system with the following features:

1. Ability to display the “near real time” status of the lighting fixtures (i.e. on, off dimmed mode) overlaid onto a floor plan or reflected ceiling plan of the controlled space. “Near real time” is defined as being updated at intervals of no longer than every three minutes.
2. Ability to modify operating schedules for the lighting fixtures within each lighting control zone via internal as well as external means (software interface, Internet connection, Smartphone, etc.).



ALC Program: **System Requirements (cont.)**

Graphical User Interface (GUI) features (continued):

3. Ability to measure, track and generate reports for the following parameters in each lighting control zone:
 - Energy consumption (kWh)
 - Electrical demand (kW)
 - Estimated energy savings (compared to original lighting system)
 - Estimated utility bill cost savings (compared to original lighting system)

[dashboard](#) [sublocations](#) [zones](#)

System Savings

Since Install Date



\$108.35

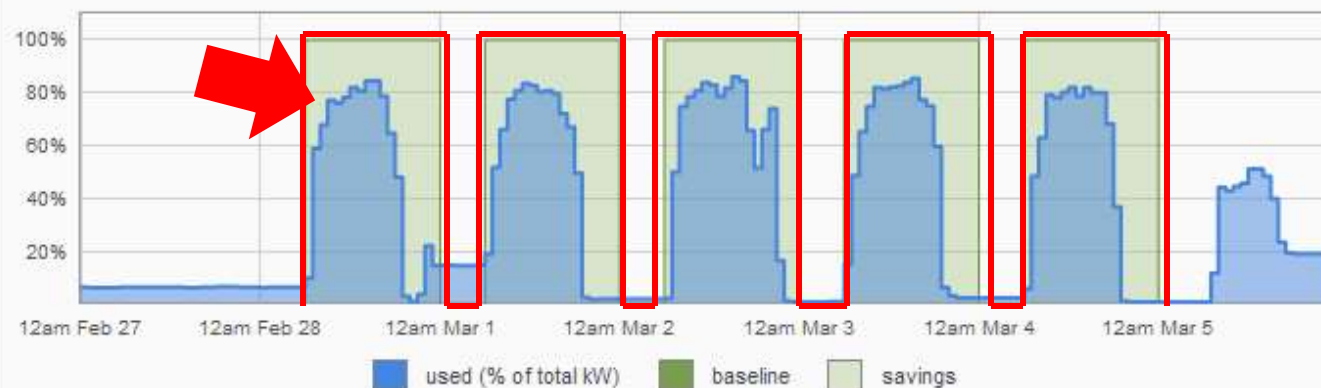


773.94 kWh

405.5 lb CO₂Energy History [Daily](#) / [Weekly](#) / [Monthly](#)

Sunday, February 27th, 2011 - Saturday, March 5th, 2011

Sample Dashboard


Total
266.92 kWh

Max
4.14 kW
Mar 2nd 3:00 pm

Min
57 W
Mar 2nd 11:00 pm

Avg
1.59 kW

Hour Avg
1.59 kWh

Comparisons

This week vs. last week total

Week to Date	Last Week Total
109.11 kWh	268.77 kWh

Today vs. yesterday

Today So Far	Yesterday Total
33.31 kWh	53.76 kWh

Today vs. this day last week

Today So Far	Last Tue Total
33.31 kWh	47.66 kWh

ALC Program: **System Requirements (cont.)**

Auto Demand Response (ADR) capable:

- Broadband Internet connection, DSL or better, with continuous connectivity to the Internet.
- Ability to communicate via the Internet with OpenADR version 1.0 (and its successors) compliant interface(s) to include an OpenADR software client; Client Logic with Integrated Relay (CLIR); or similar hardware/software devices, such as JACE devices, that are capable of being configured to utilize OpenADR protocol to trigger programmed AutoDR strategies within the facility(s).
- Programming functionality and configurability to enable AutoDR strategies to be designed and implemented (e.g. lighting system demand limiting).

ALC Program: **System Requirements (cont.)**

Auto Demand Response (ADR) capable (continued):

- Ability to be configured to respond to an OpenADR signal sent via the Internet from a Demand Response Automation / Management system or Demand Response Service Provider.
- Digital controls capable of responding to EMCS control signals for the purpose of effecting changes in the facility electrical load through preprogrammed AutoDR control strategies in the EMCS Compatible with OpenADR, Internet-based AutoDR protocol.
- Ability to select any lighting control zone for inclusion in DR load shed.

Companies Contacted (as of January 24, 2013)

Acura Technologies

Autani Corporation

Automated Logic

CAN2GO

Cloudbeam

Cooper Controls

Convia

Crestron

Daintree

Digital Lumens

Direct Digital Controls

Delmatic

Delta Controls

Encelium Technologies

Enlighted Inc

EnOcean

Exergy

FMB

Greenworx

Honeywell

Illumra

Johnson Controls

Leviton Manufacturing

Lighting Control and Design

Lumenergi

Lutron Electronics Co, Inc.

McWong Inc

nLight (SensorSwitch, Acuity)

Philips Controls

Redwood Systems

Siemens

Synergy Lighting Controls (Acuity)

Universal Lighting Technologies

Wattstopper

Qualified Products (as of January 24, 2013)

CAN2GO

Daintree Networks

Delta Controls

Digital Lumens

Encelium

enlighted

Exergy

Lumenergi

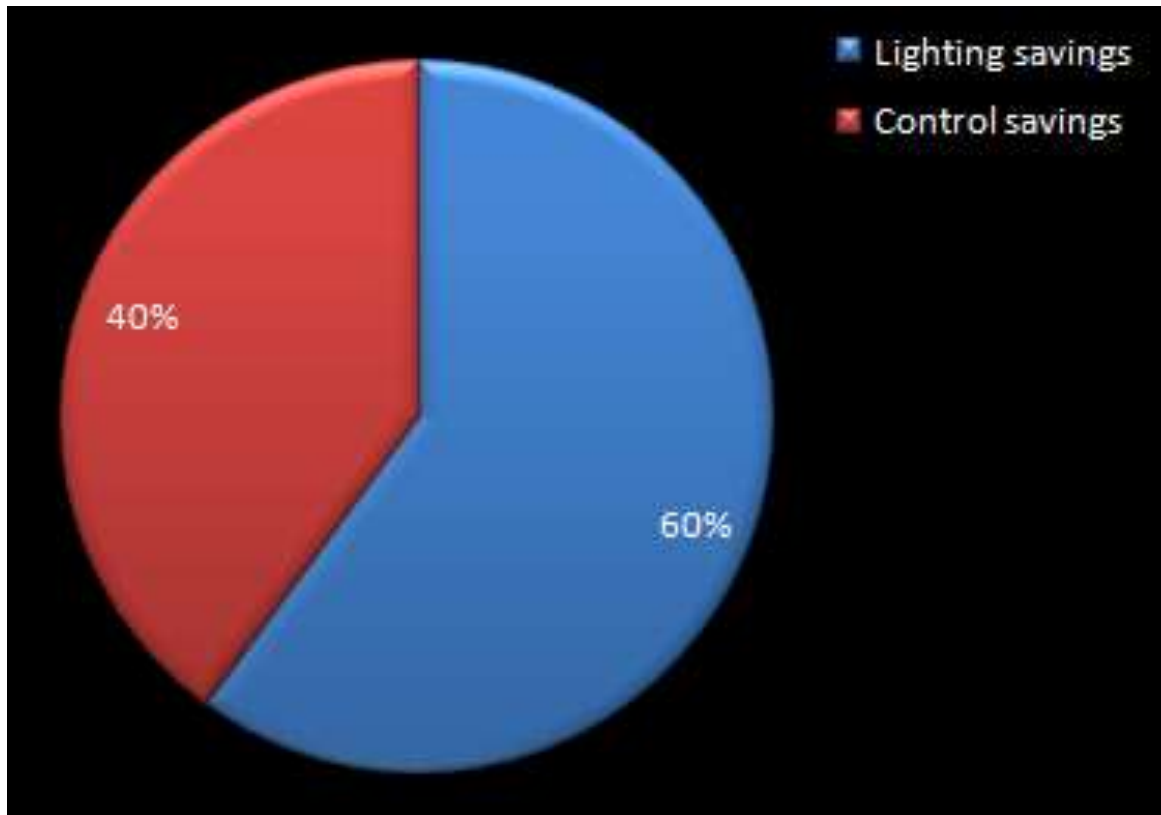
Lutron Electronics Co, Inc.

nLight (SensorSwitch, Acuity)

Philips OccuSwitch Wireless Controls

Synergy Lighting Controls (Acuity)

A Glance at the Savings



Savings from lighting upgrades: 2,505,672 kWh / year


Savings from controls: 1,661,322 kWh / year

Total estimated savings: 4,166,994 kWh / year

Winners

- Applications that save BIG energy, BIG dollars and *improve* lighting quality. What is ready NOW?
 - Parking garages
 - Big box retail
 - Industrial / Warehouses






Case Study Results

Office Retrofit Case Study

- Original Lighting System
 - Three-lamp fluorescent troffers (T8 / T12)
 - Manual wall switches (in board /outboard)
- New Lighting System
 - Redesign
 - 2 x 4 LED luminaires
 - 2 x 2 LED luminaires
 - LED downlights
 - Control narrative
 - Wireless controls
- Results
 - 91% energy reduction
 - 73% demand reduction
 - Simple payback 9.9 years*



* Simple payback with research grant was 3.1 years



Existing Lighting System

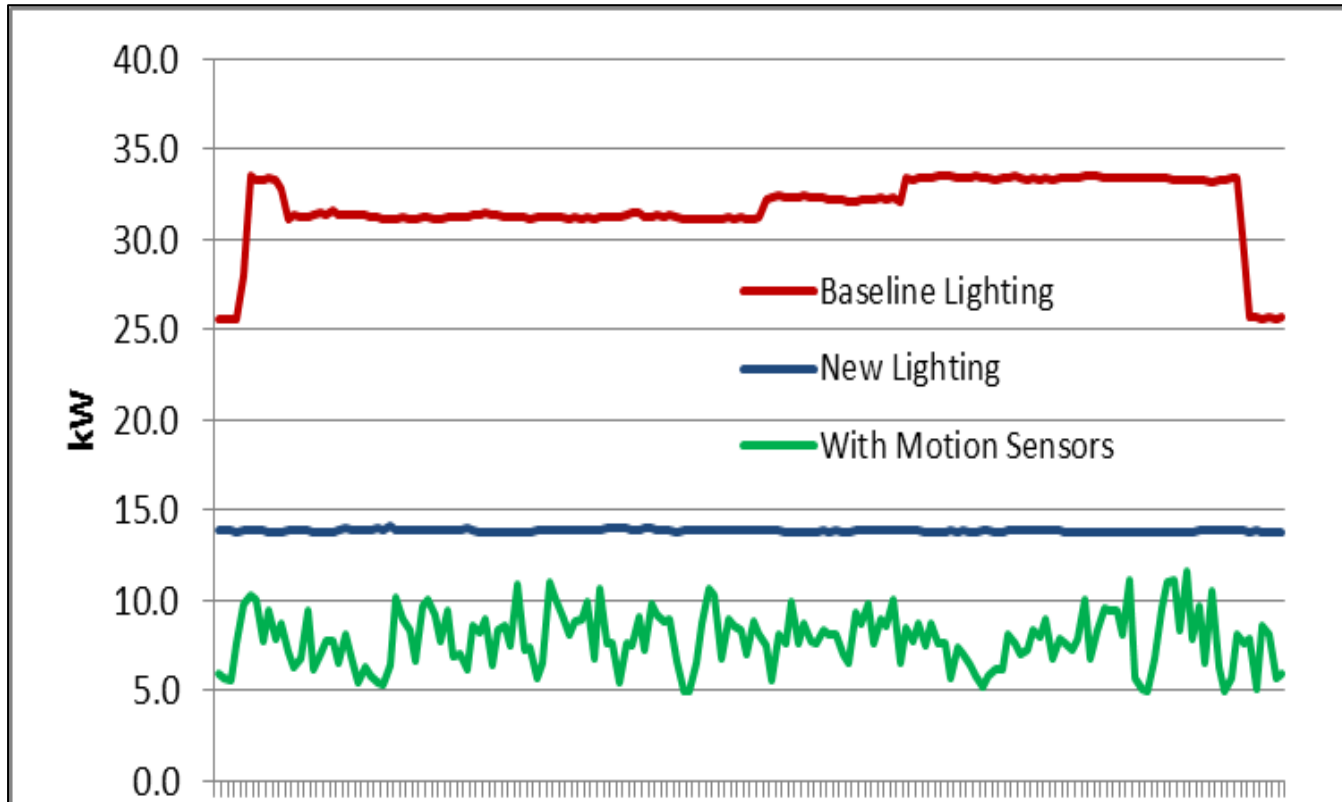
- 400 Watt HPS
- 8,760 hours per year
- Controls: breaker panel

A photograph of a large warehouse interior. In the foreground, a black forklift is partially visible. In the background, a yellow forklift is parked among tall stacks of cardboard boxes. The ceiling is high with several bright, circular LED lights. A green vertical pole stands in the center of the aisle.

New Lighting System

- 160 Watt dimmable LED
- Some luminaires relocated
- Controls: dimming and on/off via motion sensors

Case Study Results



Simple payback = 4.7 years* (\$0.11 kWh)

Simple payback with utility incentives = **1.7 years***

Advanced Lighting Controls Program

Results

2012 Advanced Lighting Controls Incentive Program

- \$1.4 million incentives
- 14 projects
- Energy savings: 50 - 90%
- Simple paybacks: 1.5 – 10 years



Advanced Lighting Controls Program

2013 Program Overview

- Customer incentive: \$0.25 per kWh saved (calculated first year savings) up to a maximum of \$100,000 per project, not to exceed 80% of the total cost of the project
- Bonus for using a CALCTP certified contractor of \$200 per kW saved (lighting retrofit only)
 - “The California Advanced Lighting Controls Training Program (CALCTP) is a statewide initiative aimed at increasing the use of lighting controls in commercial buildings and industrial facilities.”
- Savings and incentives will be calculated using SMUD’s Savings Calculation Spreadsheet
- Must use systems listed on SMUD’s Qualified Products List

Questions?

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