

# Integrated Demand-Side Resources

**Enabling A Sustainable Electric System**



**Duane Larson**  
**Director, Mass Market**  
**Energy Solutions and Service**  
**Integrated Demand-side Management**  
**Pacific Gas and Electric Company**



# Pacific Gas and Electric Company



## Energy services to 15 MM people:

- 5.1 MM Electric customer accounts
- 4.3 MM Natural Gas accounts

70,000 square miles with diverse topography and climate zones

20,000 employees

A regulated investor-owned utility

5% of US population, 1% of emissions



**Ranked the greenest utility in the United States**



# PG&E's Electric System: Peak Demand = Frequently Idle Capacity

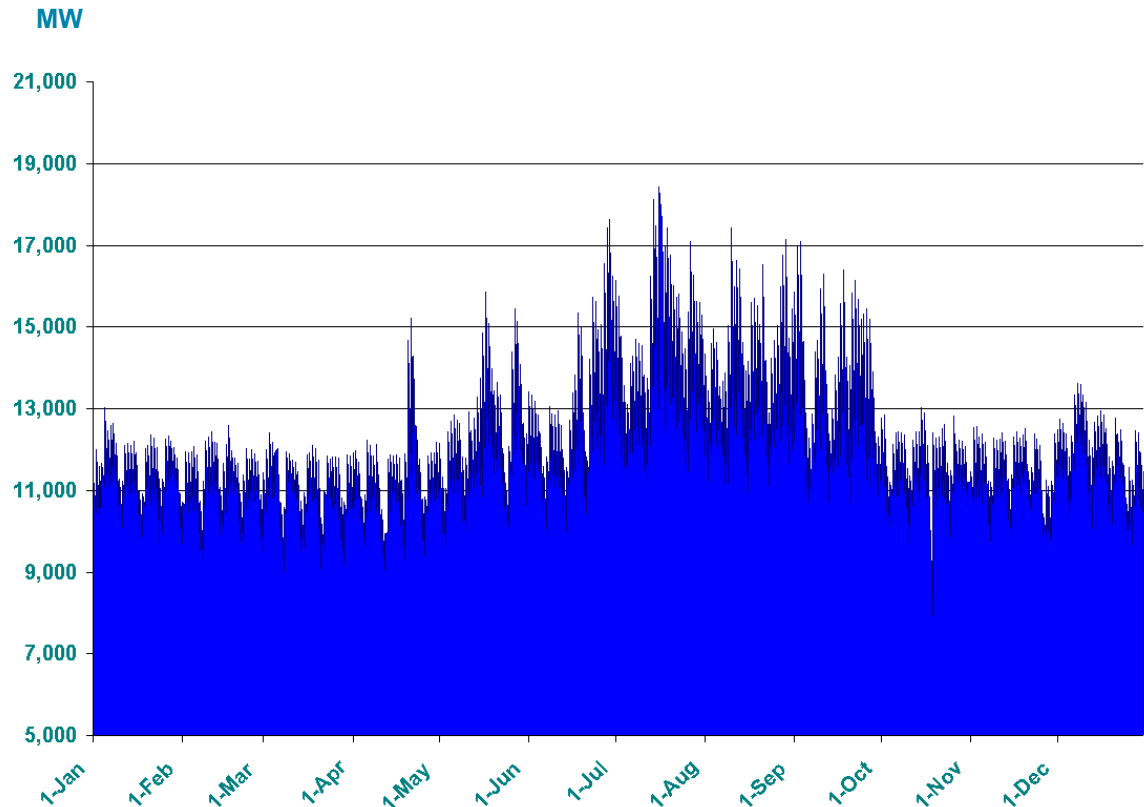
Temperate climate with  
summer extremes

Summer demand can  
spike to ~2X normal  
demand

Significant capacity sits  
idle most of the time:

- 5% of CA capacity used only 50 hours per year
- 25% of CA capacity used only 10% of the time

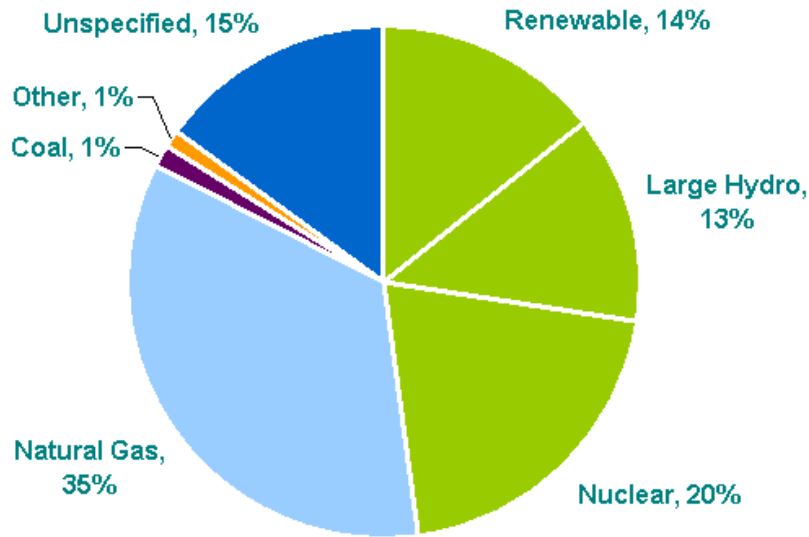
## 2009 Electric Demand





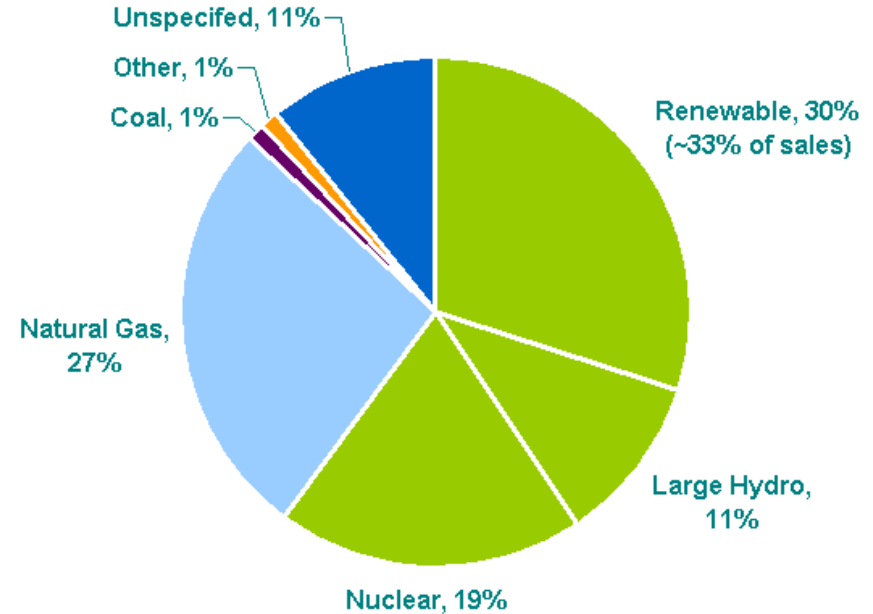
# A Growing Reliance On Renewables

2009



47% Non-emitting

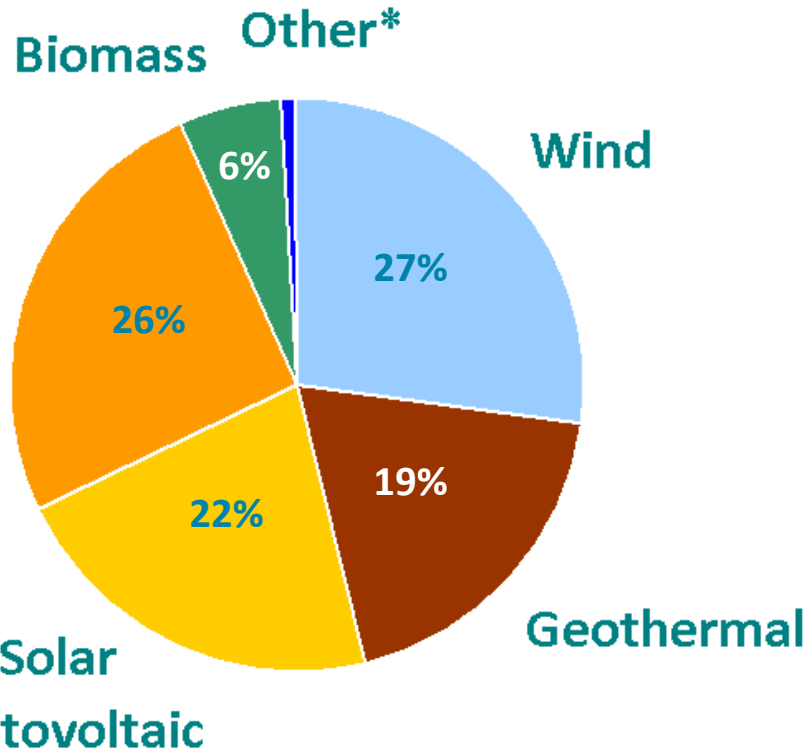
2020



~60% Non-emitting

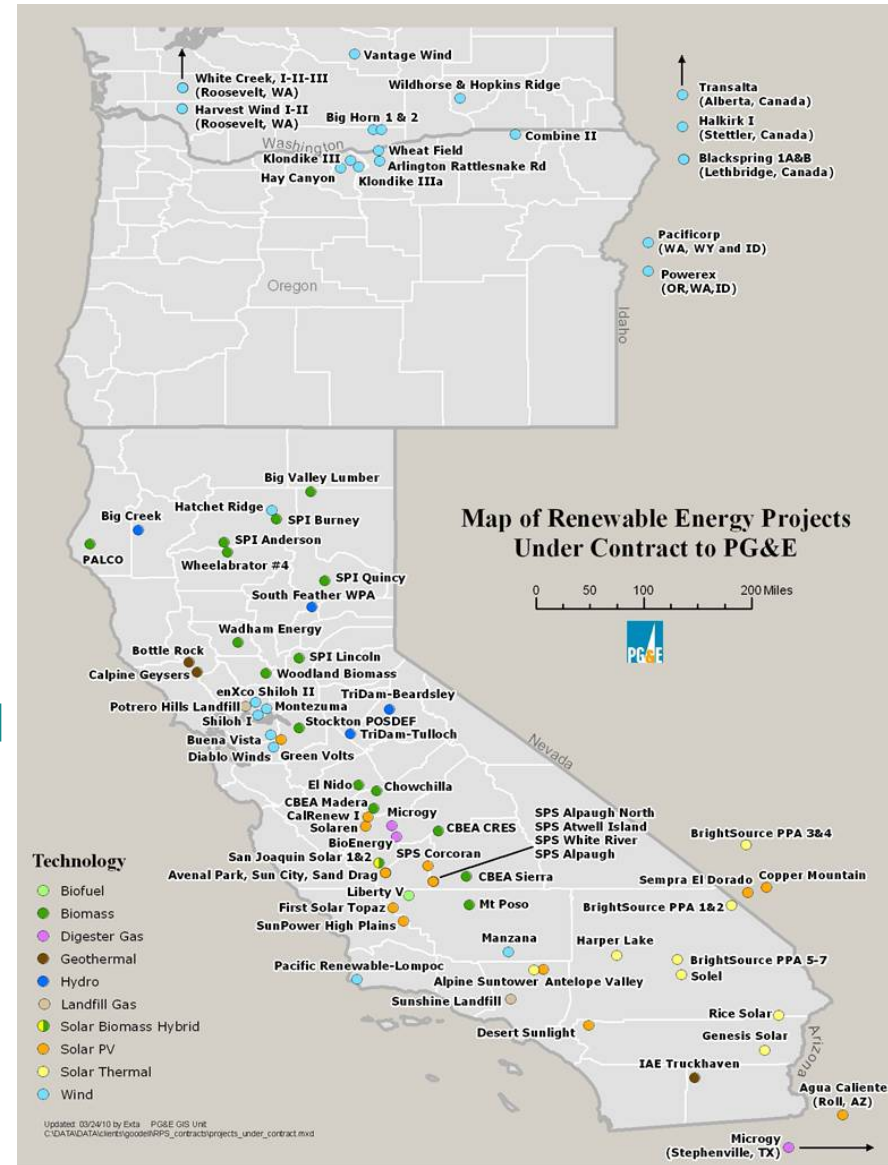


# Diverse Mix of RPS Contracts



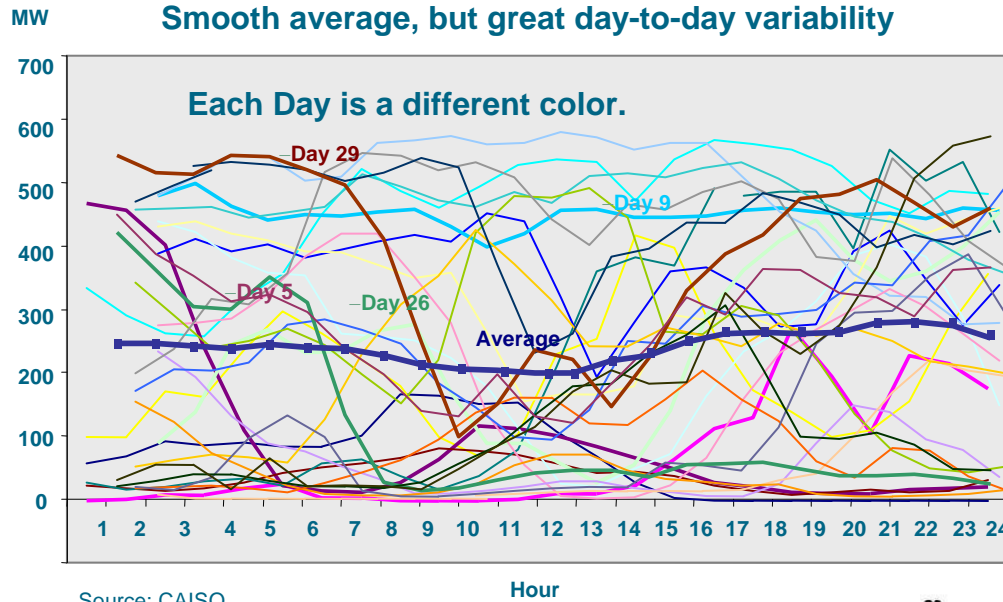
**% of MWh contracted  
As of September 2010**

\* Other (1%): Small Hydro, Biogas, Landfill Gas, Ocean/Tidal/Wave

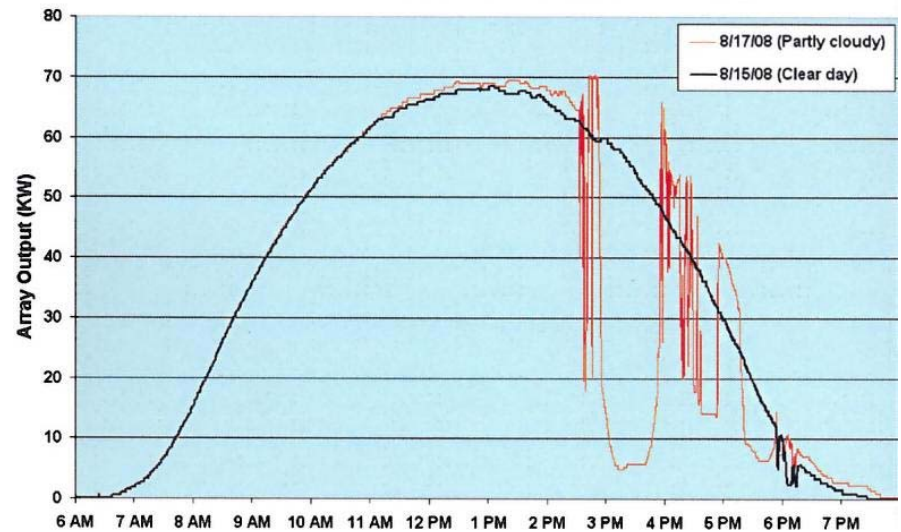




# Renewable Intermittency Challenge



Nevada 70 KW polycrystalline array(ten second data)





# Electric Demand is a Balancing Resource

## Renewable Resources



**Smart Grid**

## Balancing Resources

**Demand-side Resources**



**Storage**

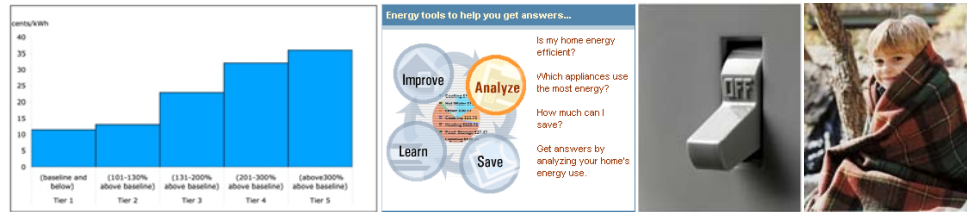


**Back-up Generation**



# Demand-Side Resources

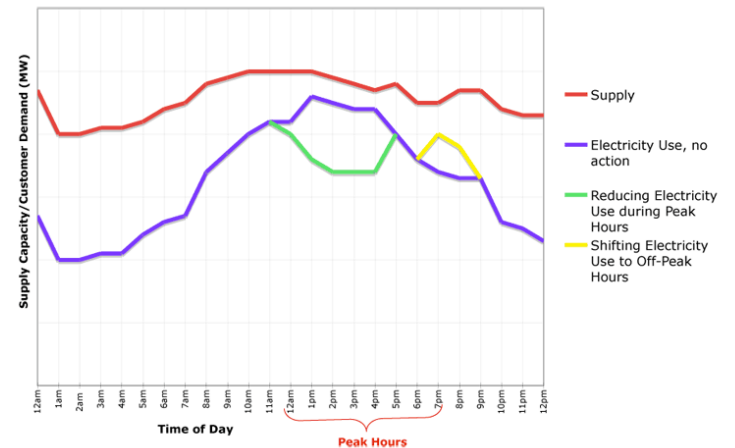
## Conservation



## Energy Efficiency



## Demand Response





# Customer Segmentation





# Integrated Demand-Side Programs

**Energy Awareness**

**Energy Efficiency**

**Demand Response**

**Voluntary Load Control**

**Time-variable Pricing**

**Customer Energy Management**

**Electric Vehicles**

**Customer Generation**





# SmartMeter™ Program Technology Foundation

## Automated meter reading for all gas and electric customers

- 7 million advanced meters installed
- 10 million by mid-2012

## Frequent meter reads

- Hourly intervals for electricity
- Daily intervals for gas

## Customer benefits today and a platform for future innovation



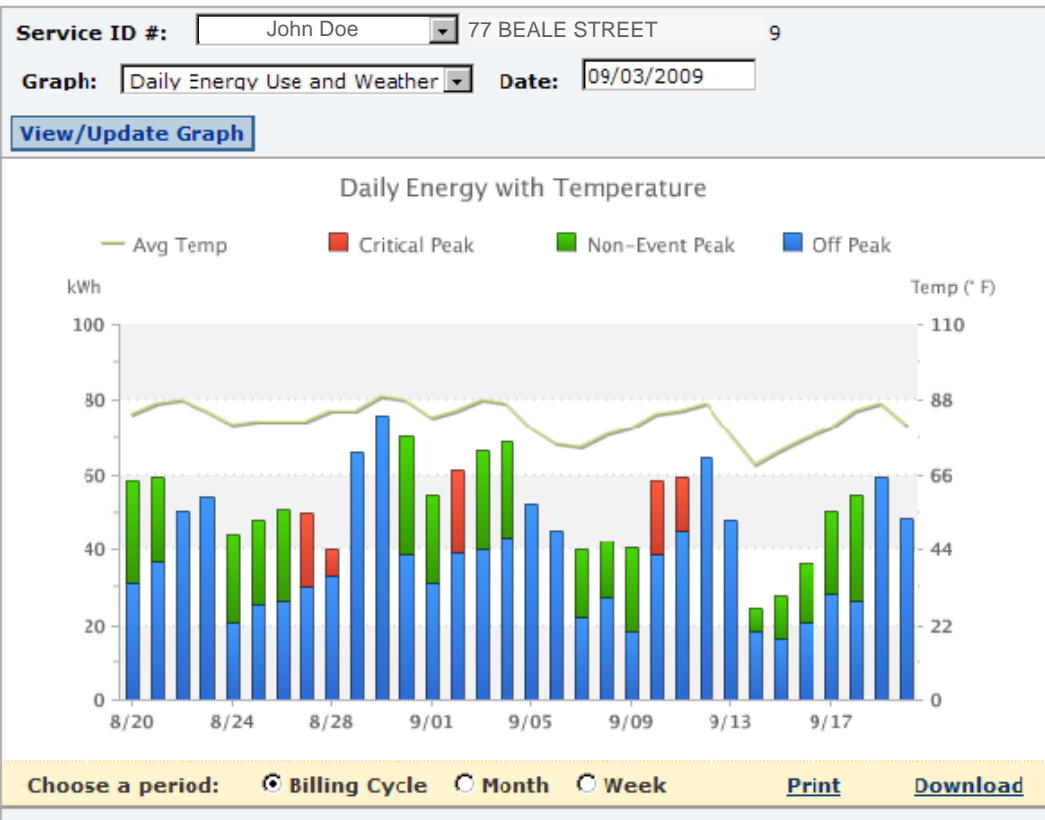


# Customers Can View Their Energy Use

## SmartMeter™ Usage

Please note that SmartMeter™ usage for today will be available tomorrow between 3-10 pm.

Please be aware that the energy usage data presented here may differ slightly from the energy usage data reflected on your monthly bill. Be assured that prior to your monthly bill date, your energy usage data is validated to ensure you receive an accurate bill.



Secure customer access through PGE.com

Energy use by hour or day

View by billing cycle, month, or week

For SmartRate customers, colors designate critical peak, peak, and off-peak

Temperature overlay



# Energy Alerts

## Provide customers early warning of high usage

- When actual usage-to-date crosses Tier 3, 4, 5
- When usage is forecast to cross Tier 3, 4, 5 by end of billing period

## Delivered via:

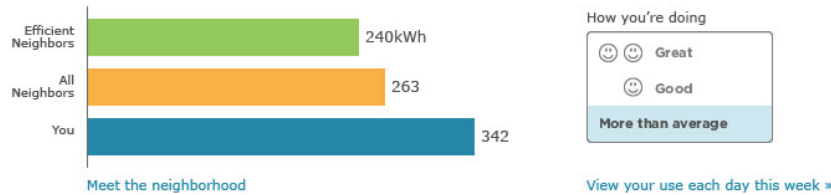
- Email
- Text message
- Outbound phone call

average residential customer uses in each territory. In the winter, all-



# Future: Personalized Energy Advice

Your Recent Usage Jun 6 - 16 Usage Cost



### Comparative Norms

- Help customers understand their usage in the context of a bigger picture
- “What does one kWh mean?”

## You have 2 problem areas

We've analyzed your usage and identified some areas to focus on. How it works

### Your biggest problem is cooling.

Last summer you spent \$287 more on cooling than your neighbors. Find out why you use more than normal. Take the cooling audit.



### Deep Dive into Usage

- Interval usage patterns lead to insights on customer behavior
- Educate customers on how they use energy daily
- Incent customers to change their behavior and proactively manage their energy usage

### Your baseload use is higher than average.

Baseload is from the things in your home that are always on. You're spending \$89 more than your neighbors on baseload.

Find out why you use more than normal. Take the baseload audit



## We've created a plan just for you

Based on: Homeowner High cooling High baseload No pool Update & add more

- Turn up your thermostat by 2 degrees** (435 neighbors do this)  I already do it | No thanks
- Maintain your cooling system** (333 neighbors do this)  I already do it | No thanks
- Install compact fluorescent lightbulbs** (192 neighbors do this)  I already do it | No thanks



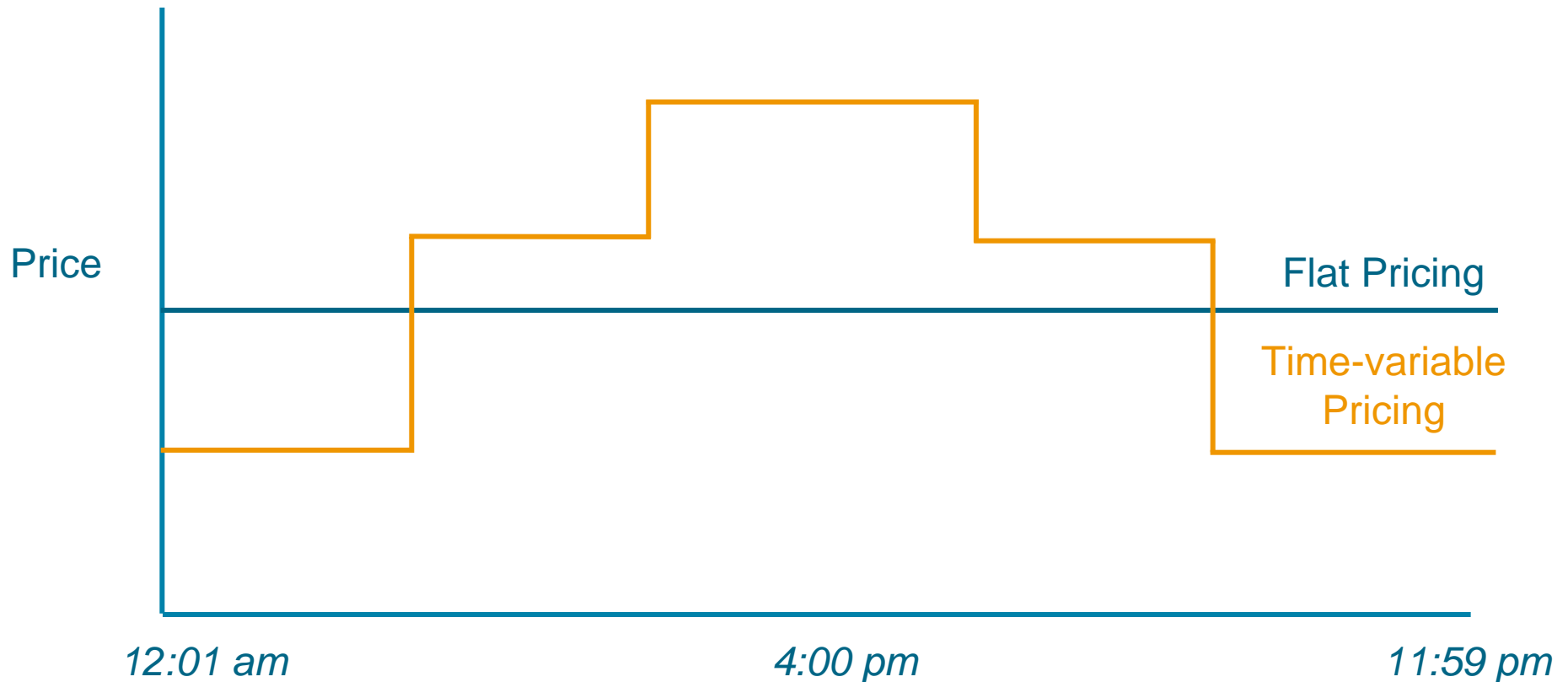
### Relevant, actionable tips

- Insights generated from interval usage can lead to personalized and actionable tips for the customer

View more: Popular tips | Free tips | Projects



# Time-Variable Electric Pricing Plans



Customers Save When They Shift their Electricity Use To Nights and Weekends



# Expanding Customer Technologies



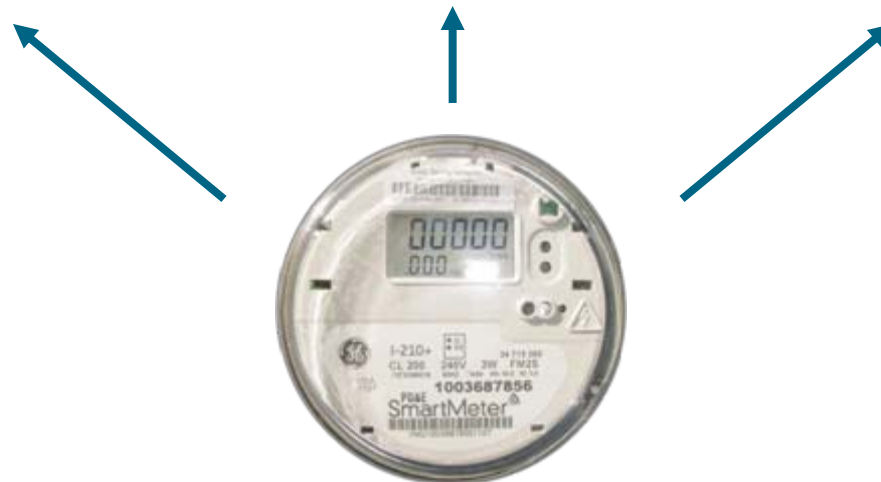
Automated in-premise energy management



On-site generation and storage

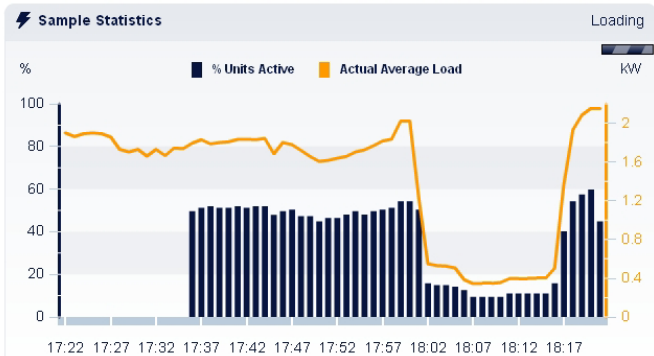
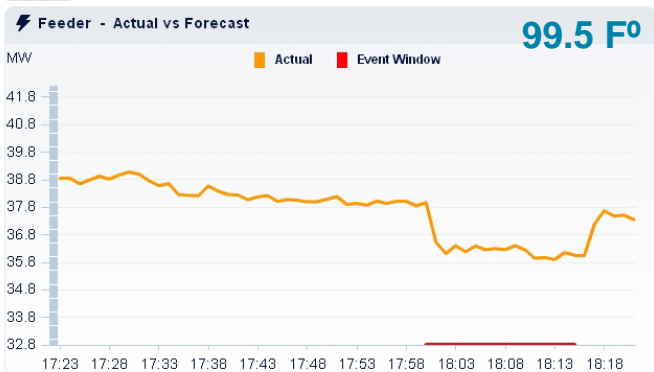


Smart charging for electric vehicles





# SmartAC: Automated AC Cycling



## Customers:

Volunteer for the program

Receive a free load management device

Have the option of opting out for the day

## Results in 2009:

Clear reductions in customer loads

Customers highly satisfied and stay with the program



# Smart Appliances



Smart Refrigerator



Barcode Scanning Microwave



Internet Controlled Refrigerator- oven



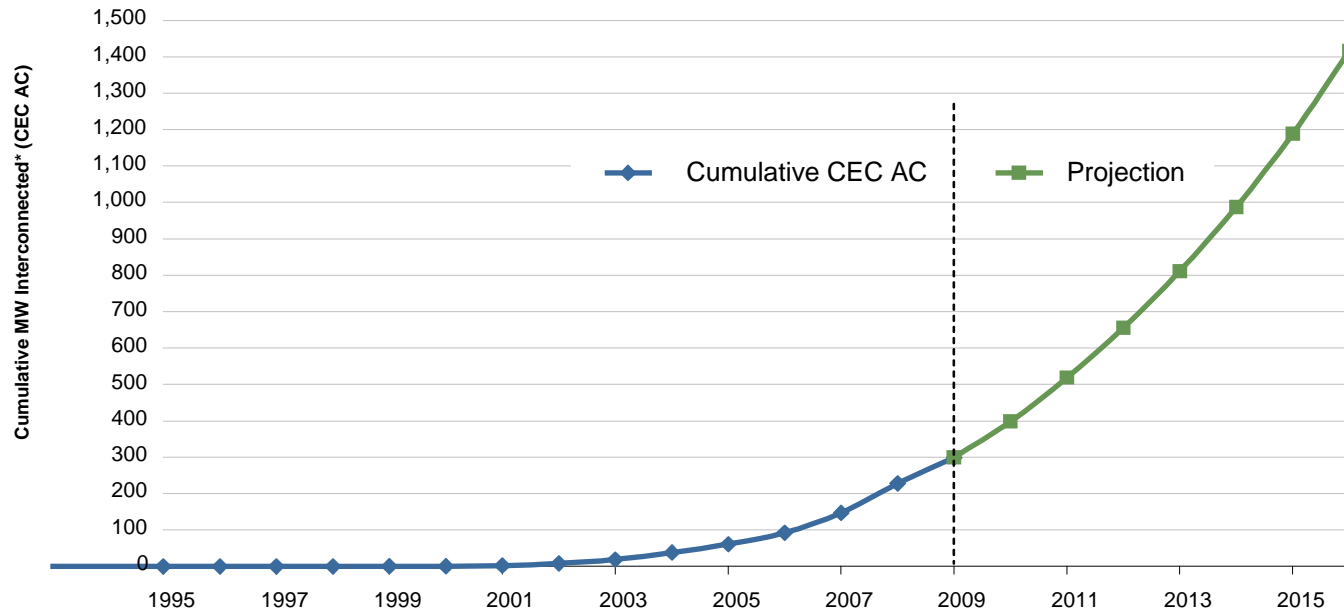
Smart Laundry Room Appliances



# Customer Generation



Cumulative Capacity of NEM (MW, CEC AC)  
Interconnected with PG&E Grid



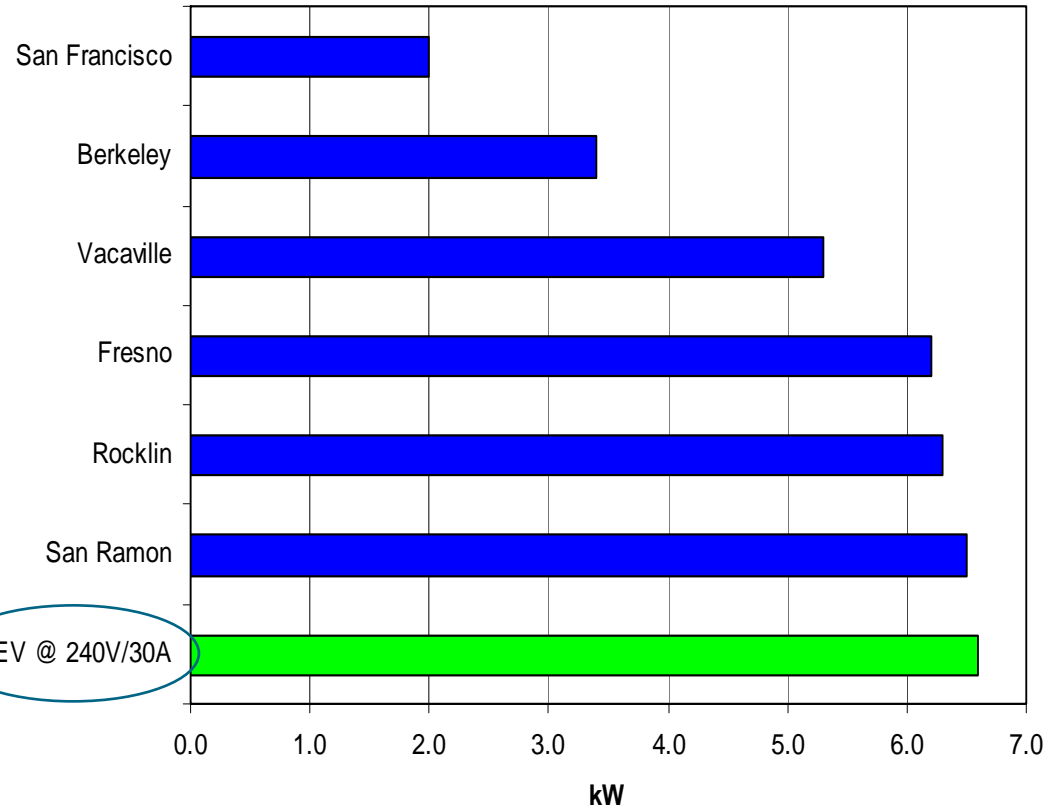
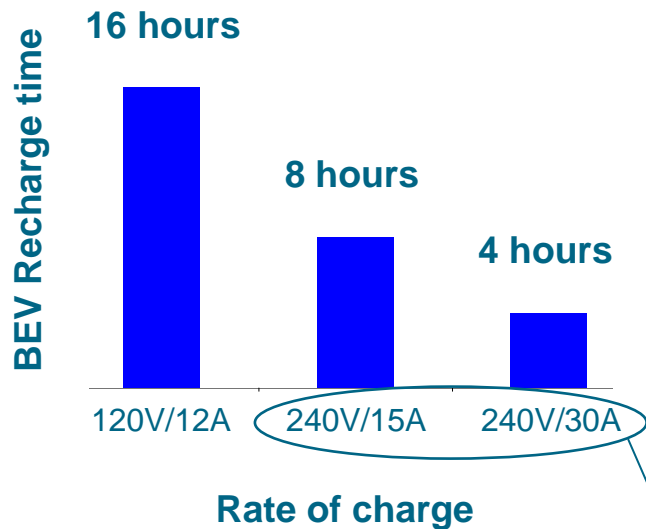


# Plug-in Electric Vehicle Energy Demand

Customers will prefer a 240V charge to shorten recharge times



PEV charging is a large load for PG&E customers, comparable to average peak summer load of a single home





# Partnership With Customers

## Customer Action

**Invest** in equipment to lower and/or shift energy use (i.e. energy efficiency)

**Conserve:** use less energy at all times

**Shift** energy use from peak times to off-peak times



***Savings***

## PG&E Support

**Automation equipment:**  
Technical infrastructure to enable automation of energy use

### Innovative programs and service offerings

- Energy efficiency
- Time-of-day electric prices
- Demand response
- Individualized energy use information

**Energy use education and training**



# At PG&E, We Are Committed To Sustainability

