PG&E's Smart Grid Program

Program Overview

May 25, 2012

Pacific Gas and Electric Company

Energy services to 15 MM people:

- 5.5 MM Electric customer accounts
- 4.5 MM Natural Gas accounts

70,000 square miles with diverse topography and climate zones

20,000 employees

A regulated investor-owned utility

Independent Transmission System Operator

Newsweek GREEN RANKINGS 2009

GREEN RANKINGS 2010 POWERED BY factual

Ranked the greenest utility in the United States in 2009 and 2010

Smart Grid Vision

Customer Service Drivers
- Reliable
- Safe and Secure
- Cost Effective

Energy Policy Drivers
- AB 32
- CA Solar Initiative
- 33% RPS
- Demand Response
- ZNE Buildings
- Electric Vehicles

SB17 SG Characteristics
- Reliable
- Resist Attack
- DG & Storage
- Efficiency
- Empower Customers
- Power Quality and Reduced Outages
- Enable Markets
- Intermittent Resources

Engaged Consumers

Smart Markets

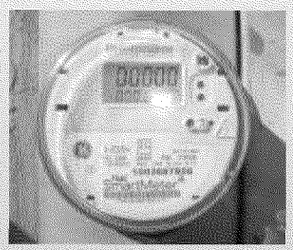
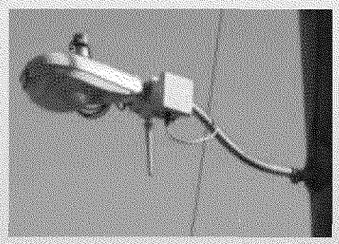
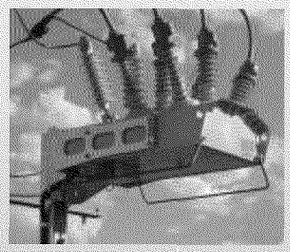
Smart Utilities

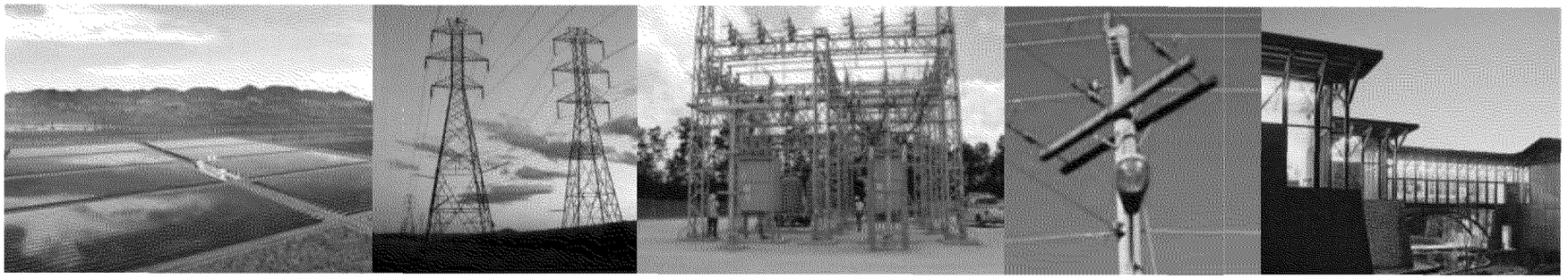
PG&E's Smart Grid Vision

PG&E's vision for the Smart Grid is to provide customers **safe, reliable, secure, cost -effective, sustainable** and flexible energy services through the integration of advanced communications and control technologies to transform the operations of our electric network, from generation to the customer's premise.

A Smart Grid

Overlay with intelligence and automation

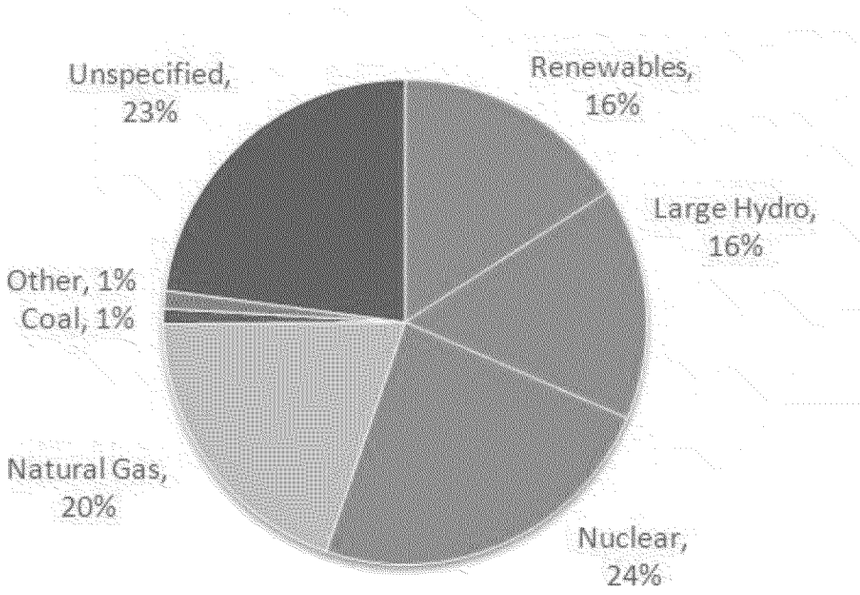
Sense	Communicate	Compute	Control
			



Power Plants	Transmission Networks	Substations	Distribution Networks	Consumers

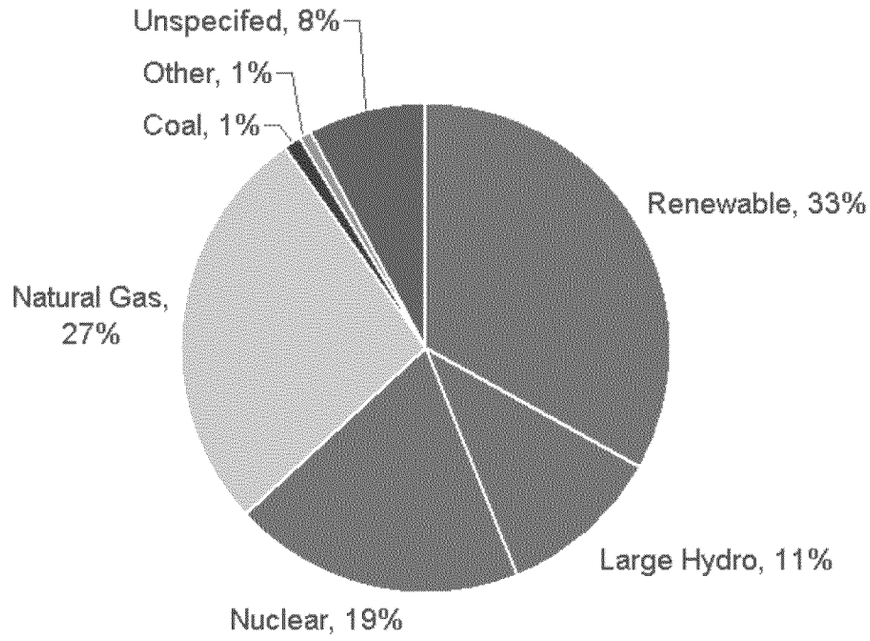
A Growing Reliance On Renewables

2010



56% Non-GHG emitting

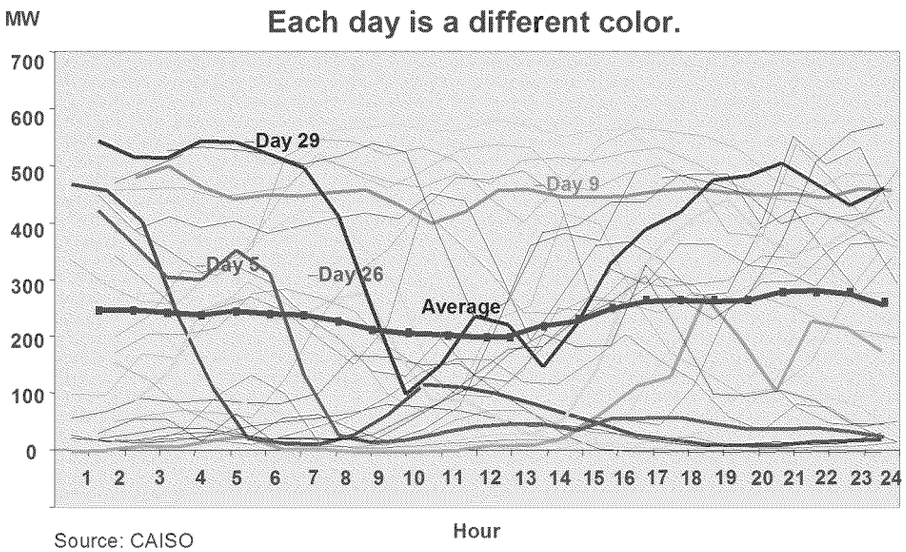
2020



~63% Non-GHG emitting

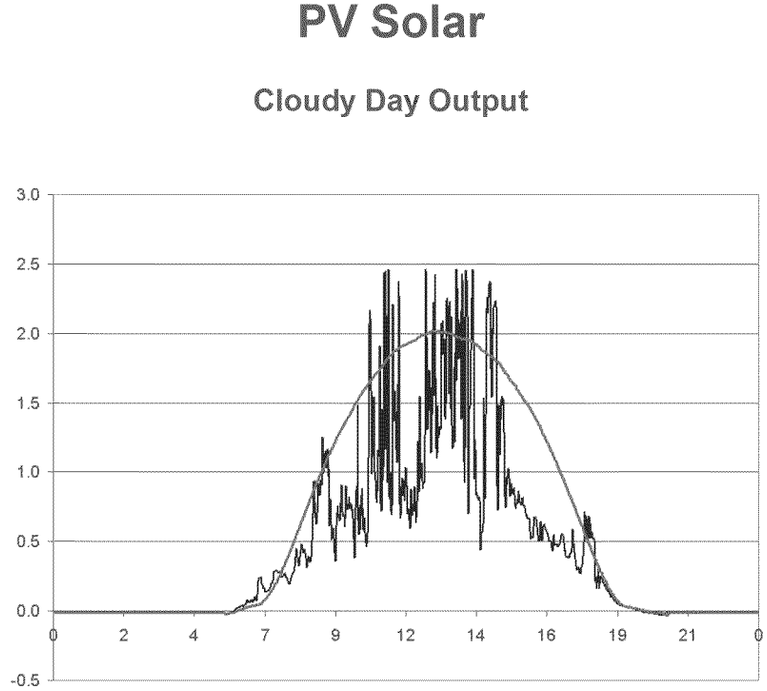
Variability, Unpredictability

Wind



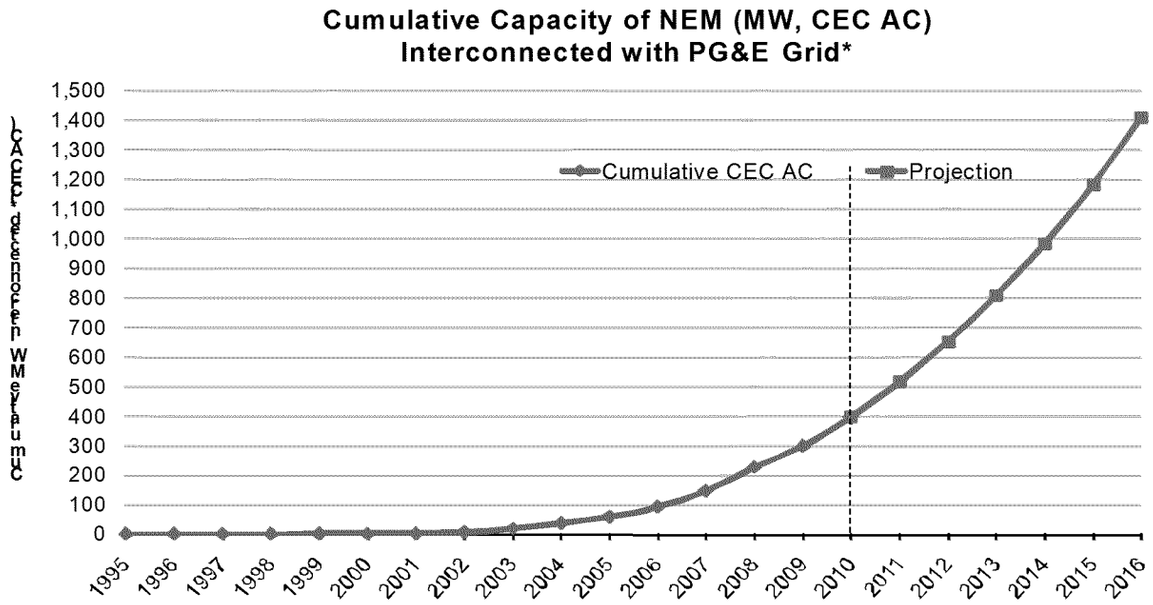
Source: CAISO

PV Solar

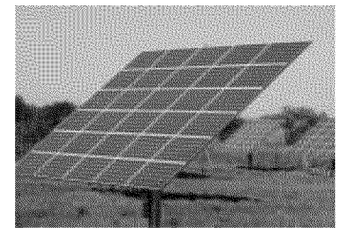


Customer Generation

More than 65,000 PG&E customers have onsite solar generation



* Includes all PV and Wind NEM (and VNEM) projects, excludes Non-Export projects



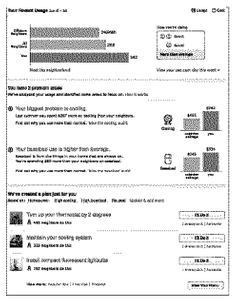
~35% of US residential PV interconnections are in PG&E's service territory

Smart Grid In Progress

Engaged Consumers

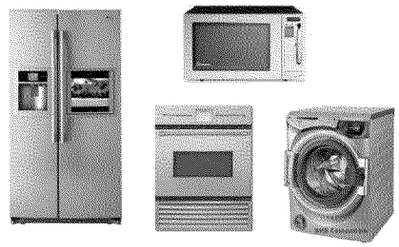
Green Button Download My Data ®

Online Information



Home Energy Reports

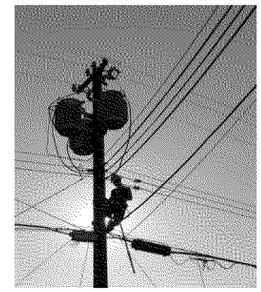
Smart Markets



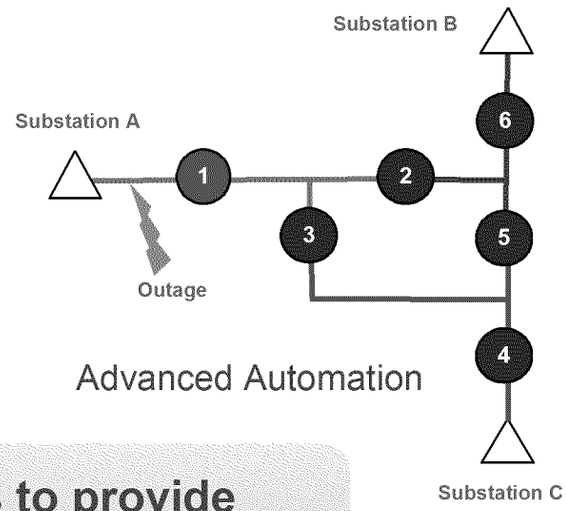
Customer Energy Management

Automated Demand Response

Smart Utility



Outage and Load Management

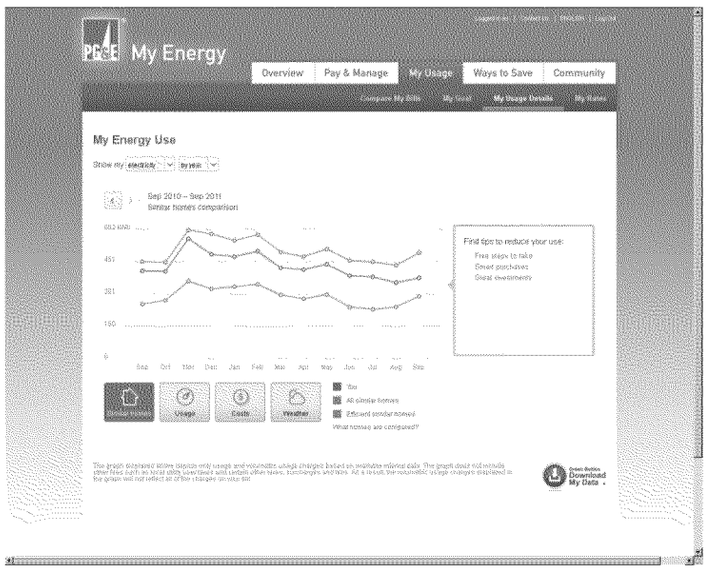


Advanced Automation

PG&E is using Smart Grid technologies to provide customers with benefits today

Green Button for Customers

The future of energy management



- For the first time, customers can send personalized energy data to third parties
- Designate up to 13 months of data to be delivered in a single file
- Based on the OpenSG OpenADE NAESB ESPI 1.0 format

Green Button
Download My Data ®

Since its launch, over 220,000 customers have clicked the Green Button to download their data from PG&E's Website

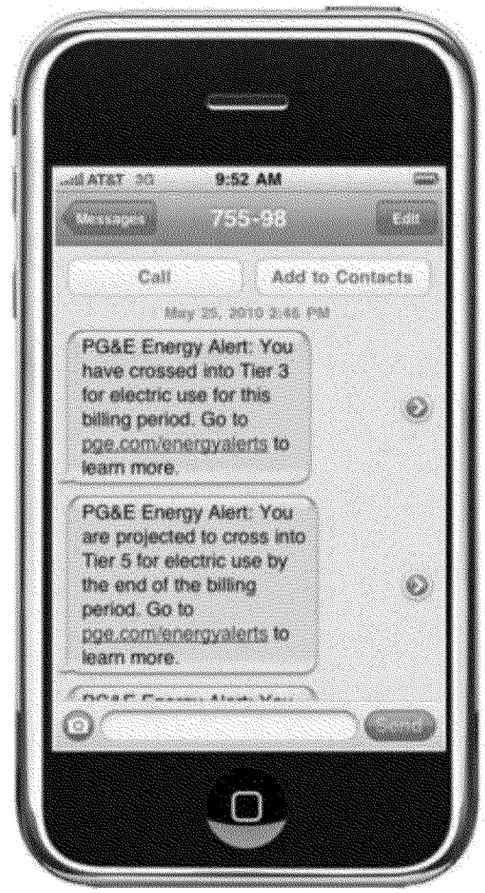
Energy Alerts

Provide customers early warning of high usage

- When actual usage-to-date crosses Tiers 3 and 4
- When usage is forecast to cross Tiers 3 and 4 by end of billing period

Delivered via:

- Email
- Text message
- Outbound phone call



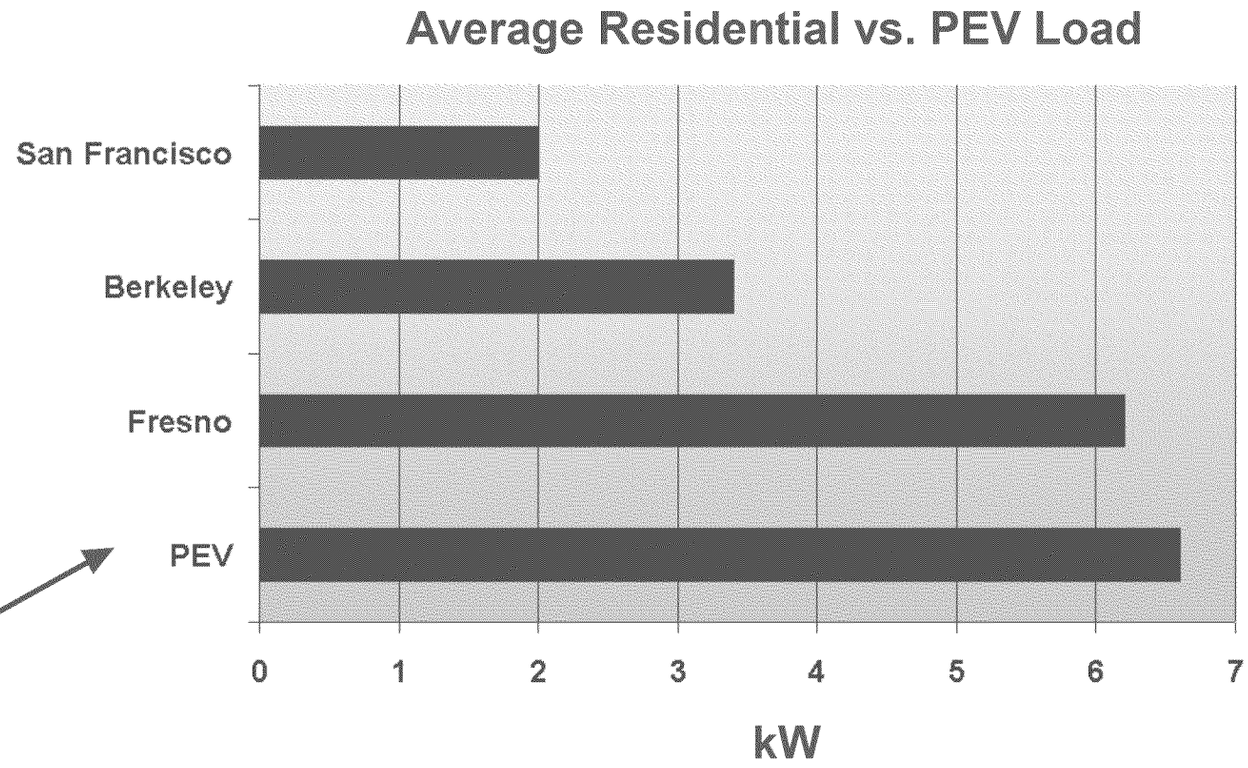
Over 70,000 of PG&E's customers are signed up for Energy Alerts

PEV Charging Loads are Significant

7.2 kW

240V/30A

4 hours



PEV Charge = 1- 3 Homes

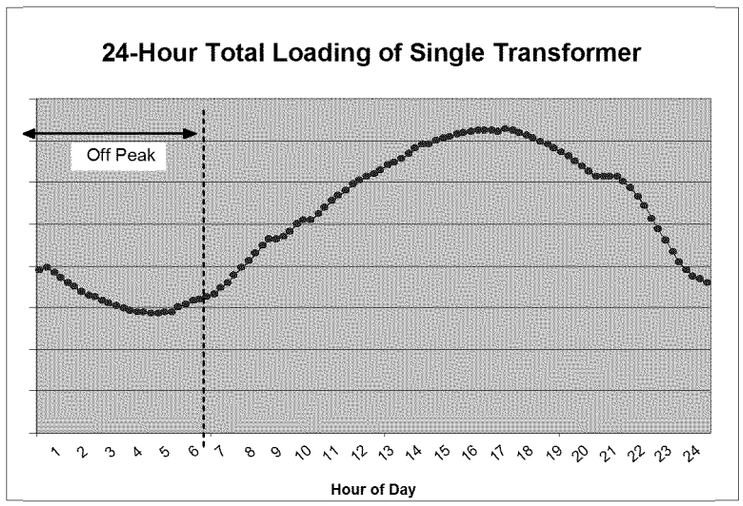
Distribution Transformer Loading

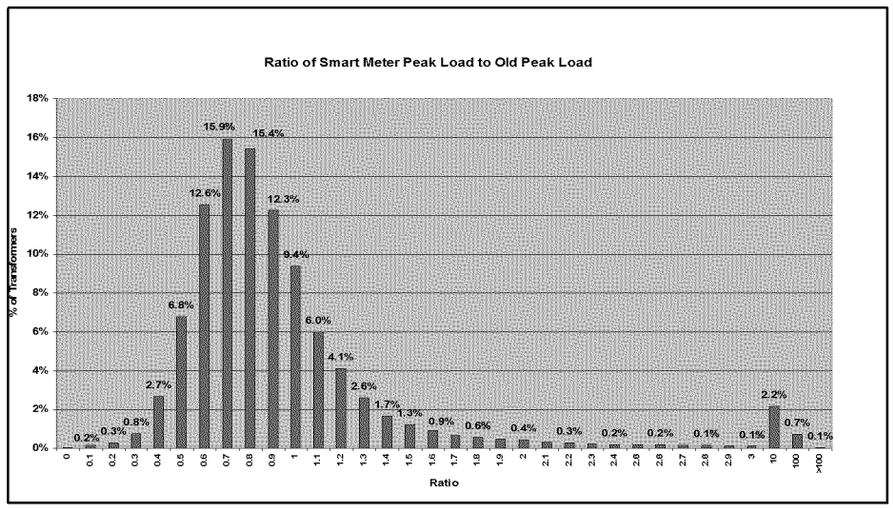
Before SmartMeter™

- Single monthly kilowatt-hour readings for all customers on transformer were added together
- Mathematical model to estimate demand on the transformer
- Compared estimated demand to transformer capacity

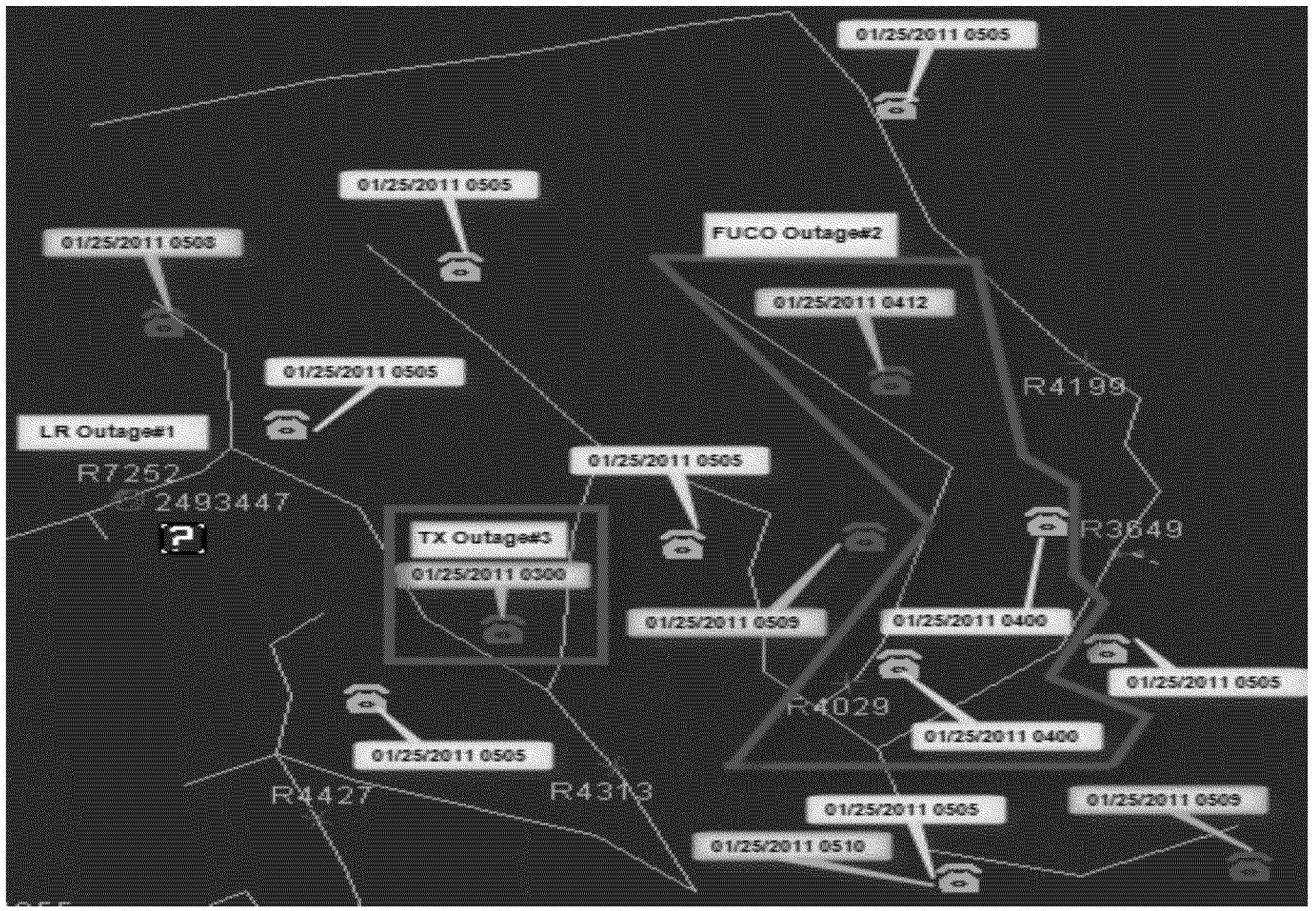
With SmartMeter™

- Hourly kilowatt-hour readings for each customer (average demand over the last hour) are added together
- Compares demand to transformer capacity





SmartMeter Outage Management

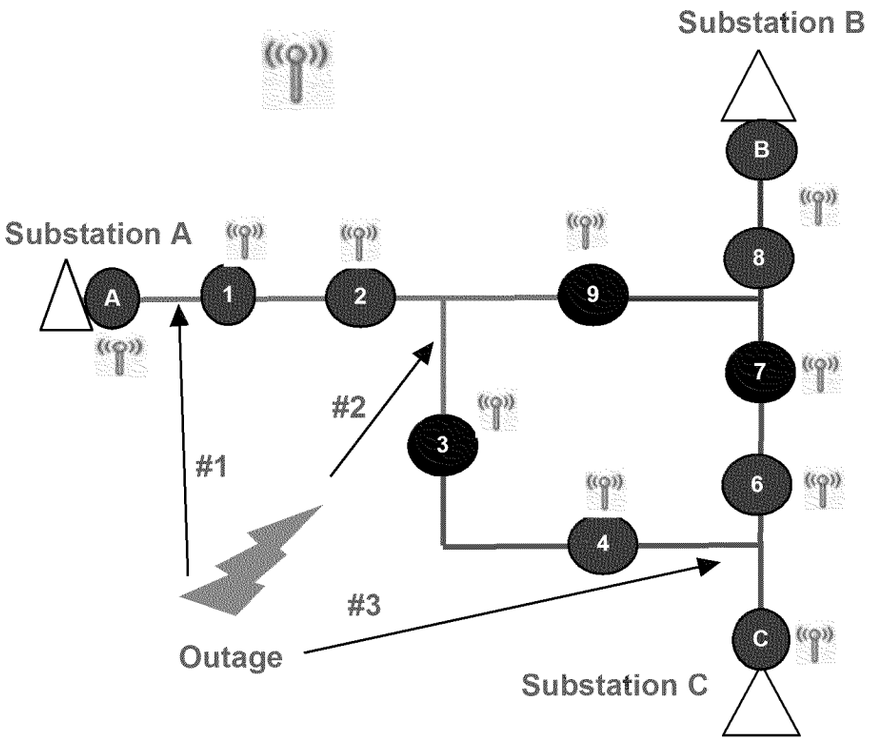


SmartMeters have the ability to reduce the restoration time by identifying the source side device sooner and confirming restoration from the control center

13

Fault Location Isolation & Service Restoration

- System must be designed to isolate faulted line sections and restore a significant amount of affected customers **within five minutes of outage**
- Automate the entire circuit's mainline protection zone utilizing "self-healing" Fault Location, Isolation, and Service Restoration schemes.



PHASE I

- 400 Circuits
- Worst Performing
- Adjacent Circuits
- Urban / Suburban
- Improve SAIFI & SAIDI

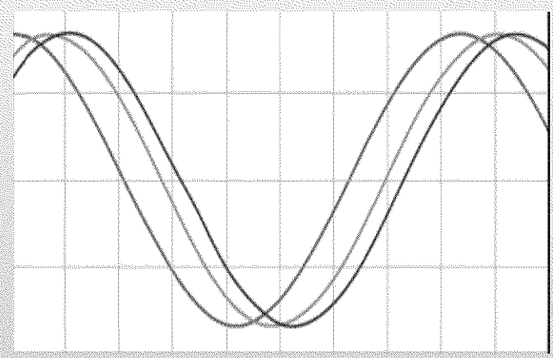
Western Interconnection Synchrophasor Project

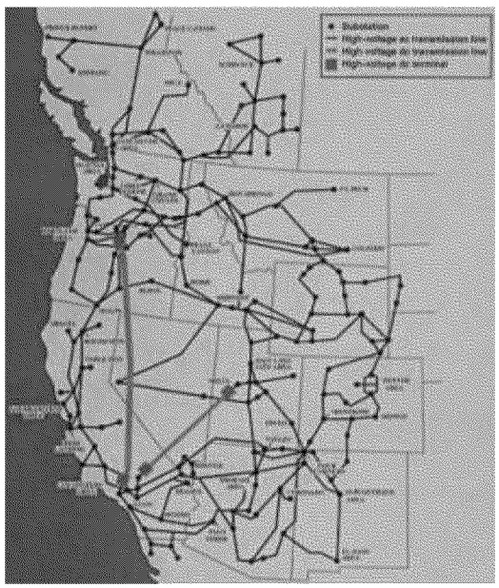
Synchrophasors:

Measure electric system in near real time

Devices throughout the grid

Synchronized to an absolute time reference





Collaborate with transmission system operators across the Western Interconnection

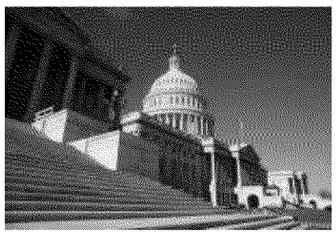
Evaluate benefits of phasor monitoring for managing grid reliability

PG&E's DR portfolio at a glance

8	**In-house retail DR programs targeting commercial, industrial, agricultural, and mass market customers**
12	**Number of active third-party aggregators that provide DR resources to PG&E**
303	**Total MW* of peak load-shed available from in-house DR programs**
244	**Total MW* of peak load-shed available from third-party aggregators**
~60	**Annual administration and incentive budget ($MM) for in-house DR programs**
~20	**Annual cost of PG&E's third-party aggregator programs / contracts**

* Filing year 2011 ex ante DR load impact estimates for 2011

Implementation Approach

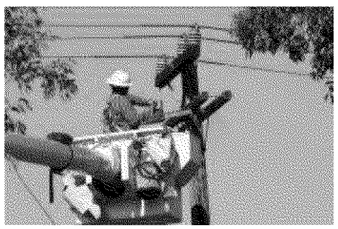


Standards definition

- Shape and validate the standards that will underlie future smart-grid implementations

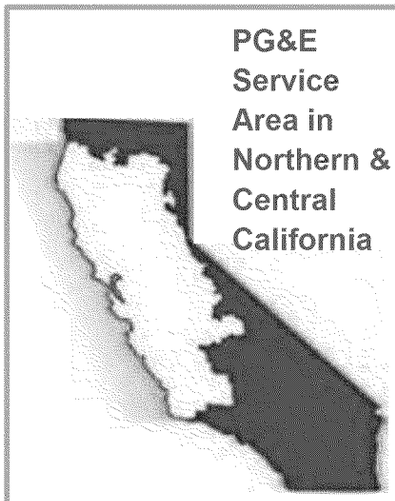
Testing

- Prototyping and testing of smart-grid technologies before piloting
- Accelerate technology development and ensures standards compliance early on
- Develop preliminary customer communications to support pilots



Controlled Pilots

- Implement tested technologies in a real-world but controlled setting to demonstrate value
- Work with customers to prepare for the new technologies and services



Targeted deployment

- Extend pilots to targeted roll-outs based on benefits
- Insights used to feed the next cycle of technology deployment