



Rate Design Basics

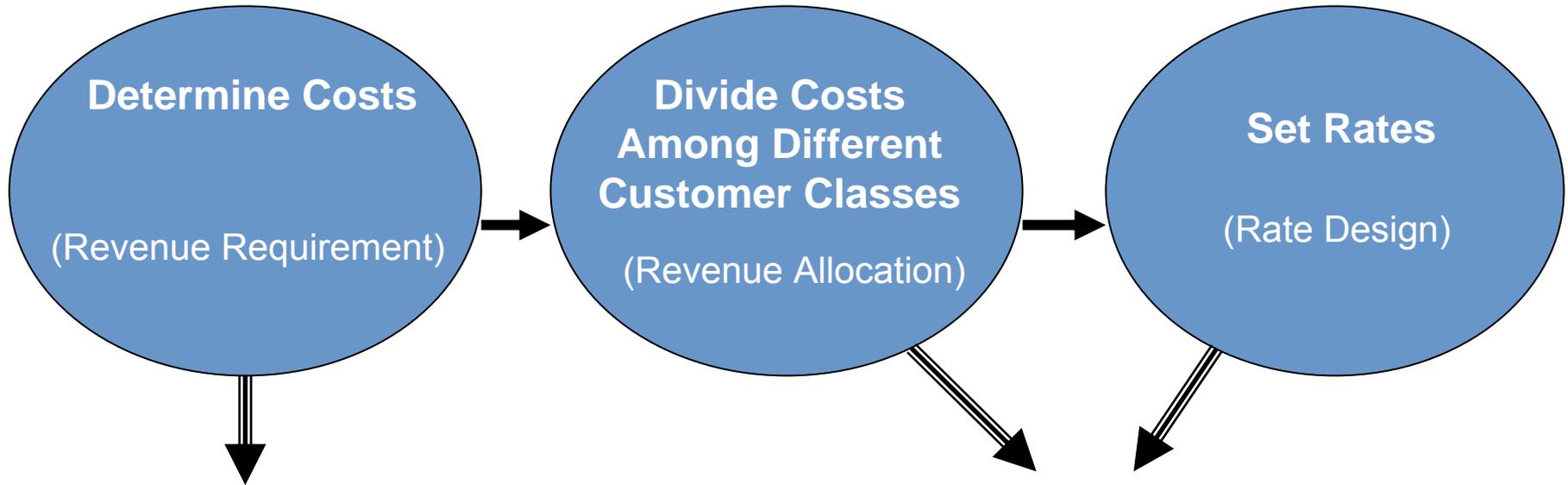
August 2011



Presentation Overview

- Ratemaking -- The Big Picture
- Marginal Cost Determination
- Revenue Allocation
- Basic Rate Design
 - ▶ Residential Rates
 - ▶ Time-varying Rates

CPUC Electricity Ratemaking Process



Proceedings:

- General Rate Cases (“GRC”), Phase I
- Energy Resource Recovery Account (ERRA)
- Other Cost Recovery Applications, i.e. AMI, Energy Efficiency, Low-Income

Proceedings:

- General Rate Cases, Phase II
- Rate Design Windows (“RDW”)
- Other Proceedings
 - ▶ Recently, utilities have included cost recovery proposals in other proceedings

Marginal Cost

*Revenue Allocation & Rate Design
are based on the utility's Marginal Costs*

- **What is a Marginal Cost?:** The cost of providing an additional unit of electricity

Type of Marginal cost	Type of Charge
Energy (Generation)	Energy / Usage (kWh)
Capacity (Generation, T&D)	Demand (kW) and / or Volumetric (kWh)
Customer (Facility Costs, Meter Reading, Billing, Customer Service)	Customer and / or Volumetric (kWh)

Marginal Cost

Why do we base Revenue Allocation and Rate Design on Marginal Costs?

- Producing at a level of Q_0 and charging a price of P_0 maximizes **Economic Welfare**

- ▶ **Economic Welfare** =
Consumer Surplus + Producer Surplus

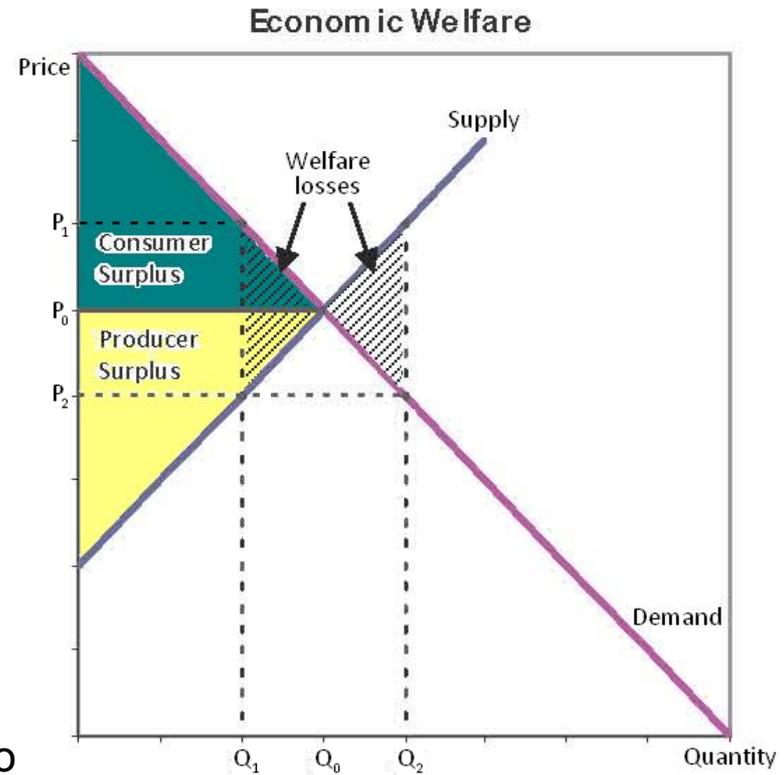
- ▶ **Consumer Surplus** =
Consumer Value – Retail Price

- ▶ **Producer Surplus** =
Retail Price – Marginal Production Cost

- Any departure from Q_0 produces a **Welfare Loss**

- CPUC first implemented marginal cost-based ratemaking in the late 1970's after the oil embargo

- ▶ To promote energy conservation when fuel prices were skyrocketing
- ▶ Before that, CPUC used an embedded cost allocation



Marginal Generation Capacity Costs

A hot topic in Marginal Cost ratemaking

- In theory, market prices tend towards short-run marginal costs so that surpluses and shortages can be mitigated
- In ratemaking, the goal is a middle ground between long-run and short-run marginal costs in order to:
 - ▶ Promote rate stability over time
 - ▶ Encourage purchases of energy consuming products that will reflect what electricity will cost over the entire product lifecycle (up to 15 years)
- In the current environment of generation capacity surpluses, the appropriate length of time is greatly debated in GRCs

Marginal Costs in Revenue Allocation

Reflecting Marginal Costs in ratemaking requires adjustment:

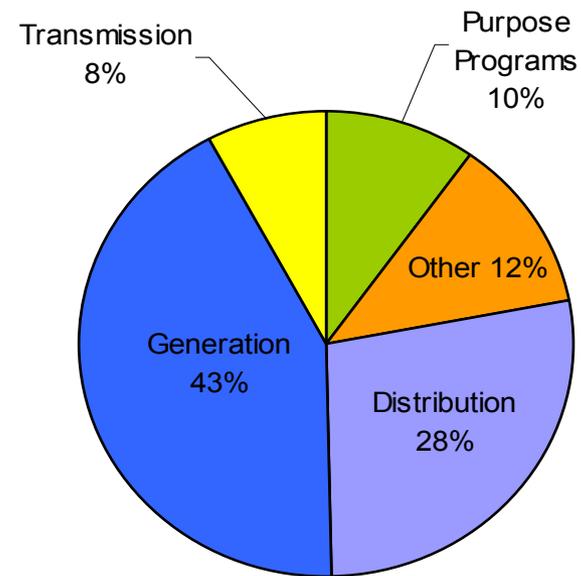
- Utilities are allowed to collect the authorized revenue requirement, which reflects average costs, not marginal costs
- Charging marginal costs could yield a revenue requirement over- or under-collection
- In electric ratemaking, unlike unregulated markets, it is difficult to correct for under- and over-collections through product differentiation, market segmentation, and price discrimination
- CPUC devised a revenue allocation process known as “equal percentage of marginal costs” aka *EPMC revenue allocation*
 - ▶ *How it works:* Revenues allocated to each customer class are equal to the percentage of the total costs they would be responsible for if all customers were charged marginal costs
 - ▶ *In rate design:* Marginal costs must be scaled up or down so that they collect the revenues allocated to the class

Revenue Allocation

Categories of Costs

Allocation of Generation, Distribution and other Revenue Requirements

- **Generation and Distribution:** Separately allocated using EPMC
- **Transmission:** FERC jurisdictional and allocated by embedded costs
- **Public Purpose Programs:** Allocated mostly by equal cents/kWh
- **Other Costs (i.e. SGIP, CSI):** Allocated by various methods



*Reflects Revenue Req's. for PG&E in
2011 Annual Electric True-Up filing*

**errors due to rounding*

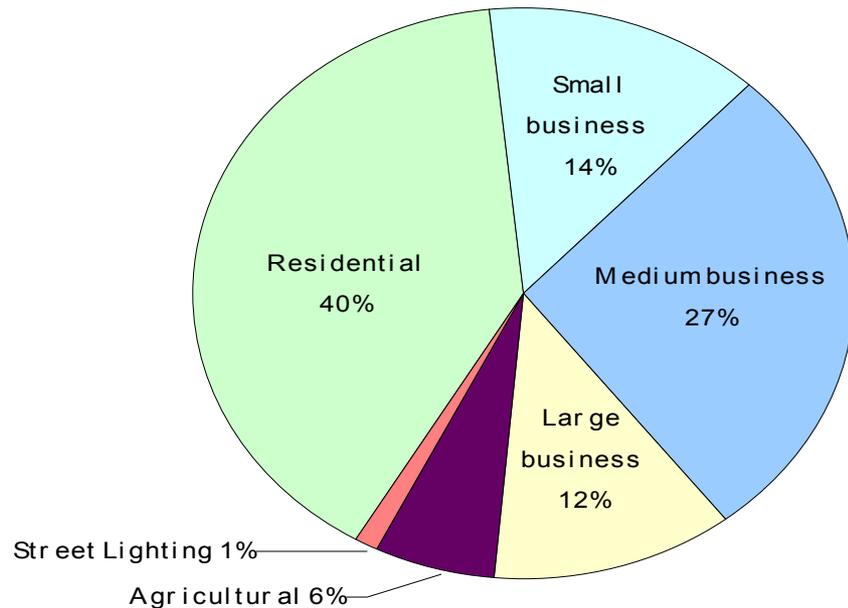
Public Purpose Programs (PPP)

- PPP costs are determined by state statutes or CPUC proceedings:
 - ▶ **California Alternate Rates for Energy (CARE):** Rate discount program for low-income residential customers
 - ▶ **Energy Savings Assistance Program (ESAP):** Provides low-income households with weatherization and energy efficiency services
 - ▶ **Energy Efficiency (EE):** Provides subsidies to residential and business customers designed to support energy efficiency
 - ▶ **Research and Development (R&D):** Provides funds to conduct research on science or technology for providing or improving utility services
- Additional PPP costs are determined in GRCs and other proceedings on a program basis

Revenue Allocation

Impact on Customer Classes

Example: Percent of PG&E Total Electric Revenue Requirement Allocated to Various Customer Classes



Reflects Costs for PG&E in 2011 Annual Electric True-Up



Rate Design

*Once Revenue Allocation is determined,
Rates are developed for each customer class*

- **Rate Design:** Typically involves balancing several competing goals
 - ▶ Fair and Equitable to all Customers
 - ▶ Stable and Predictable
 - ▶ Stable Revenue Collection
 - ▶ Reflective of Social Costs of Energy Production and Consumption
 - ▶ Affordable Universal Services
 - ▶ Understandable
 - ▶ Incentive to Conserve
 - ▶ Economically Efficient

- **Residential Rates:** Increasing block tiered volumetric rates established since the Energy Crisis, which promote conservation and ensure affordable basic usage

- **Commercial, Industrial, Agricultural Customers:** Fixed charges and volumetric rates



Rate Design – Residential

- **Prior to 2001 Energy Crisis:** Only 2 tiers of residential rates:
 - ▶ Baseline
 - ▶ Above Baseline
- **Baseline Rates:** Designed to provide affordable rates for basic uses of energy
- **Increasing Block or Inverted Rate Structure:** Designed to promote conservation for usage above Baseline



Rate Design – Residential

Baseline Allowances

- Baseline Program approved by the Legislature in 1988:
 - “The Commission shall designate a baseline quantity of gas and electricity which is necessary to supply a significant portion of the reasonable energy needs of the average residential customer”* [P. U. Code §739]
- Baseline Allowance calculation:
 - ▶ Quantity is set at 50% - 60% of average consumption in a given climate zone
 - During the 2001 Energy Crisis they were set at the upper end of this range
 - ▶ Different quantities calculated for summer and winter seasons
 - Higher baseline quantities are available for customers with defined medical needs



Baseline Quantities by Zone

PG&E Example

PG&E Service Territory Map



Source: PG&E website

Baseline Quantities (kWh Per Month)

San Francisco (Baseline Area "T")

	Summer	Winter
Electric	249	298
All-Electric	341	614

Stockton (Baseline Area "S")

	Summer	Winter
Electric	484	380
All-Electric	599	982

- Baseline quantities vary by average consumption, geography, and season
- Baseline quantities adjusted in GRCs



Impact of 2001 Energy Crisis

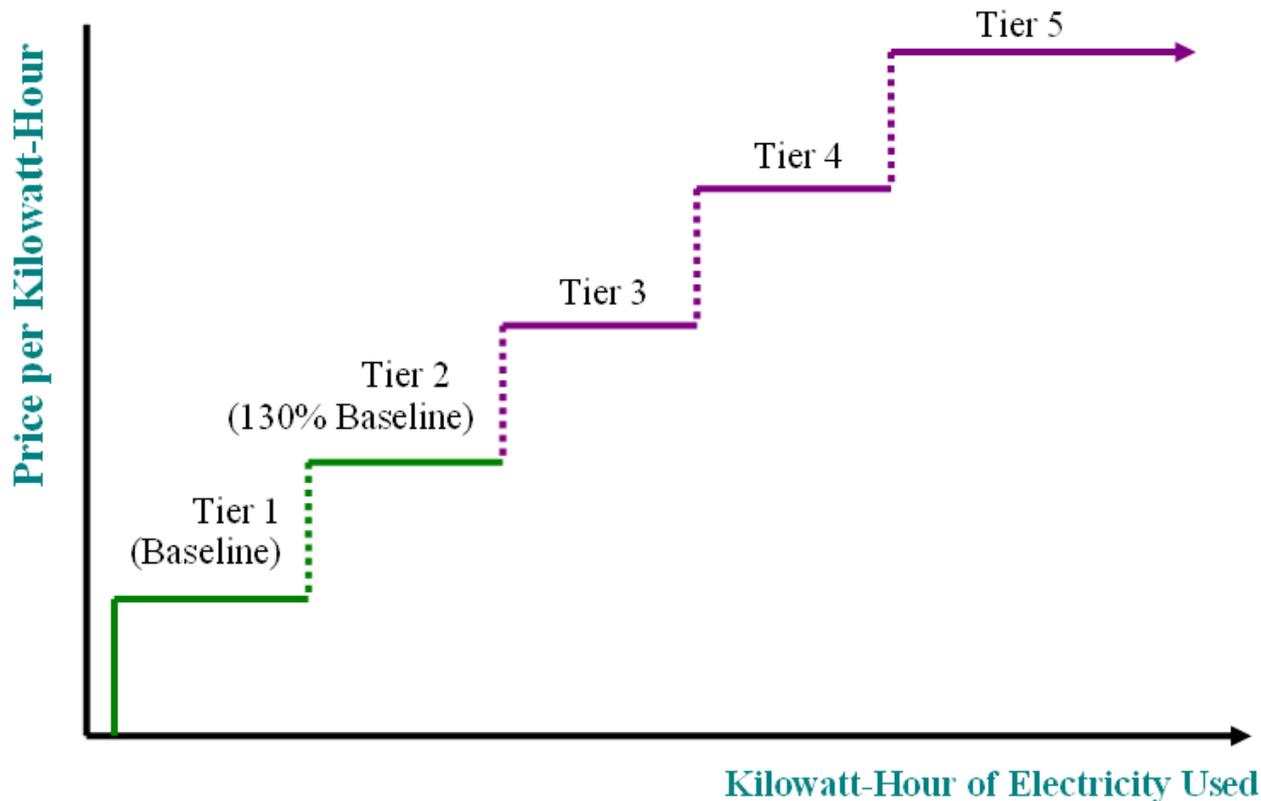
- Electricity Crisis started in 2000 and was characterized by skyrocketing electricity costs and rotating outages
- IOUs could not sufficiently recover the high cost of electricity under the rate freeze instituted by electric restructuring statute AB 1890
- Legislature required the Department of Water Resources to purchase electricity for utility ratepayers
- In 2001, the Legislature passed AB 1X, which protected residential customers from the worst impacts of the energy crisis
- AB 1X prohibited increases in rates for usage up to 130% of baseline usage



Rate Design - Residential

Increasing Block Rates

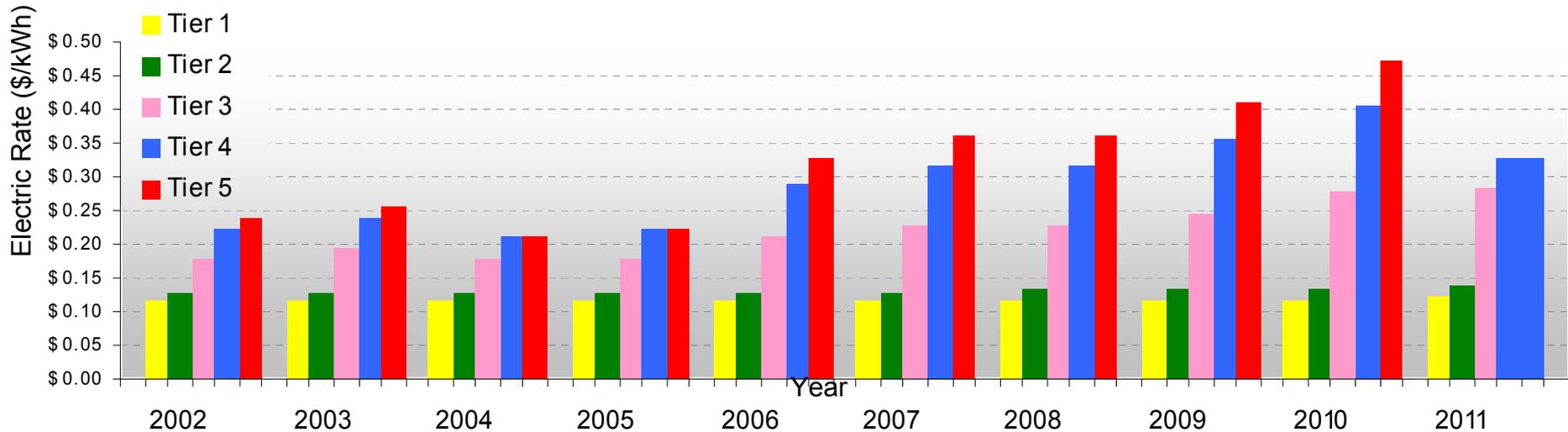
- The higher the usage, the higher the price per unit
- Similar to marginal tax bracket system



Rate Design - Residential

Historical View of Rates

PG&E Residential Electric Rates 2002-Present*



*Source: PG&E historical tariffs

- CPUC enacted rate surcharges and created 5 tiers of increasing block rates for residential customers
- Tier 3, 4, and 5 rates were increasing due to increased revenue requirements



Senate Bill 695 Reforms to AB 1X

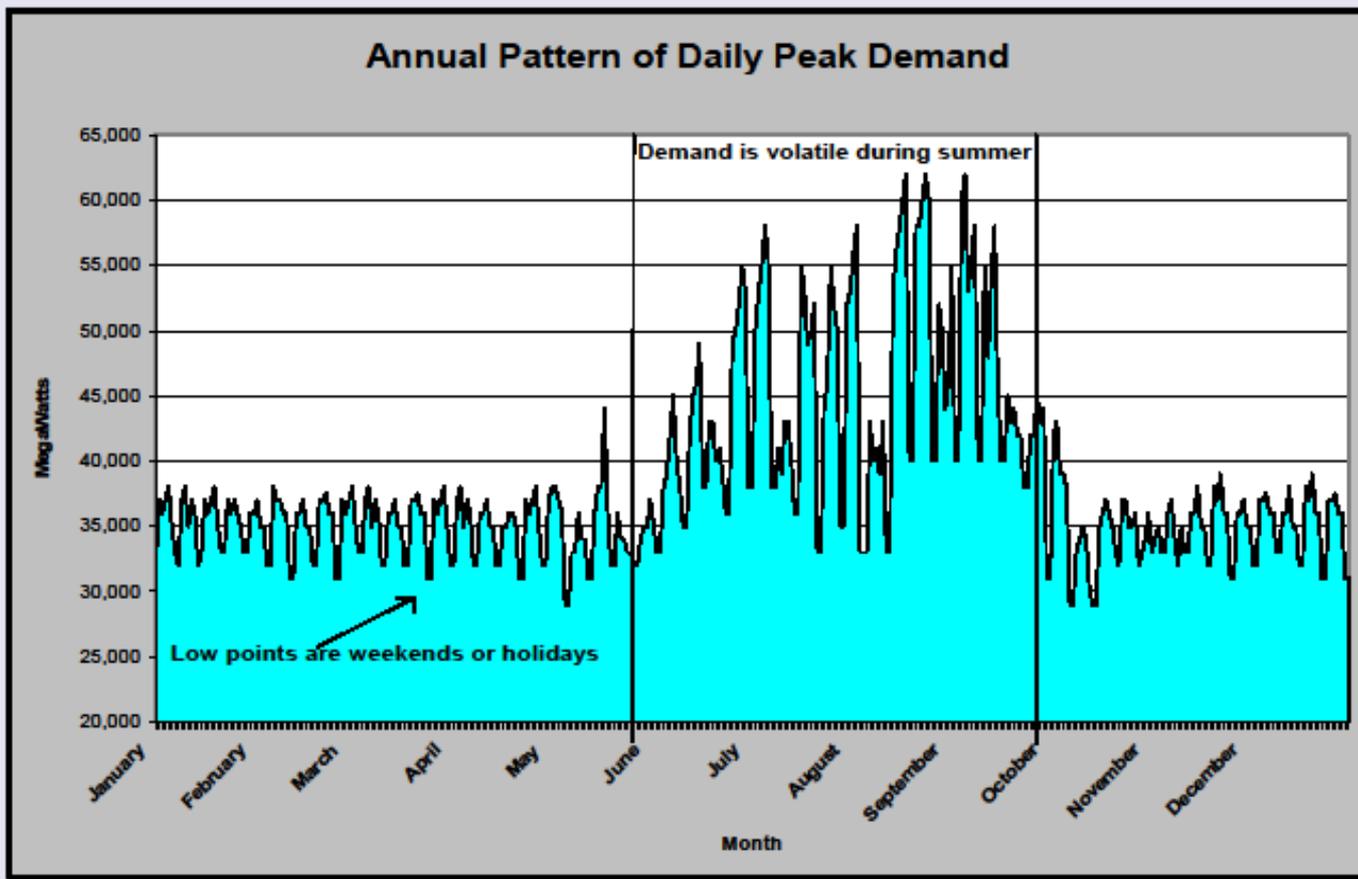
SB 695 enacted in 2009 to moderate rate increases in tiers 3–5:

- Allows 3 – 5% increases per year to non-CARE Tiers 1 & 2 (Tier 5 recently eliminated)
- Allows increases to CARE rates of up to 3% per year based on the annual percentage increase in benefits of the CalWORKS program
 - ▶ Permits PG&E to introduce a new CARE Tier 3 rate with a capped introductory rate
- Imposes an overall cap on residential non-CARE Tier 1 rates of 90% of system average rates (including fixed customer charge revenues)
- Addresses Time Variant Pricing (TVP) for residential customers:
 - ▶ Does not allow mandatory TVP for residential customers
 - ▶ Permits default (opt out) TVP without bill protection starting in 2014
 - ▶ Allows default (opt out) real time pricing without bill protection starting in 2020
 - ▶ Prohibits penalties for opting out of TVP
- Parties have argued whether SB 695 puts limitations on a residential customer charge



The Basis for Time Variant Pricing

Demand is Volatile During Summer



Source: California Energy Commission



Types of Time Variant Pricing

■ Time Variant Pricing (TVP):

- ▶ Customers are charged varying prices depending on when they use electricity
- ▶ Includes time-of-use pricing and dynamic pricing

■ Time of Use (TOU) Pricing:

- ▶ Pre-determined rates that apply to pre-determined time periods (on-peak, mid-peak, or off-peak)
- ▶ Does not reflect market or electric system conditions on a day-ahead or near real-time basis

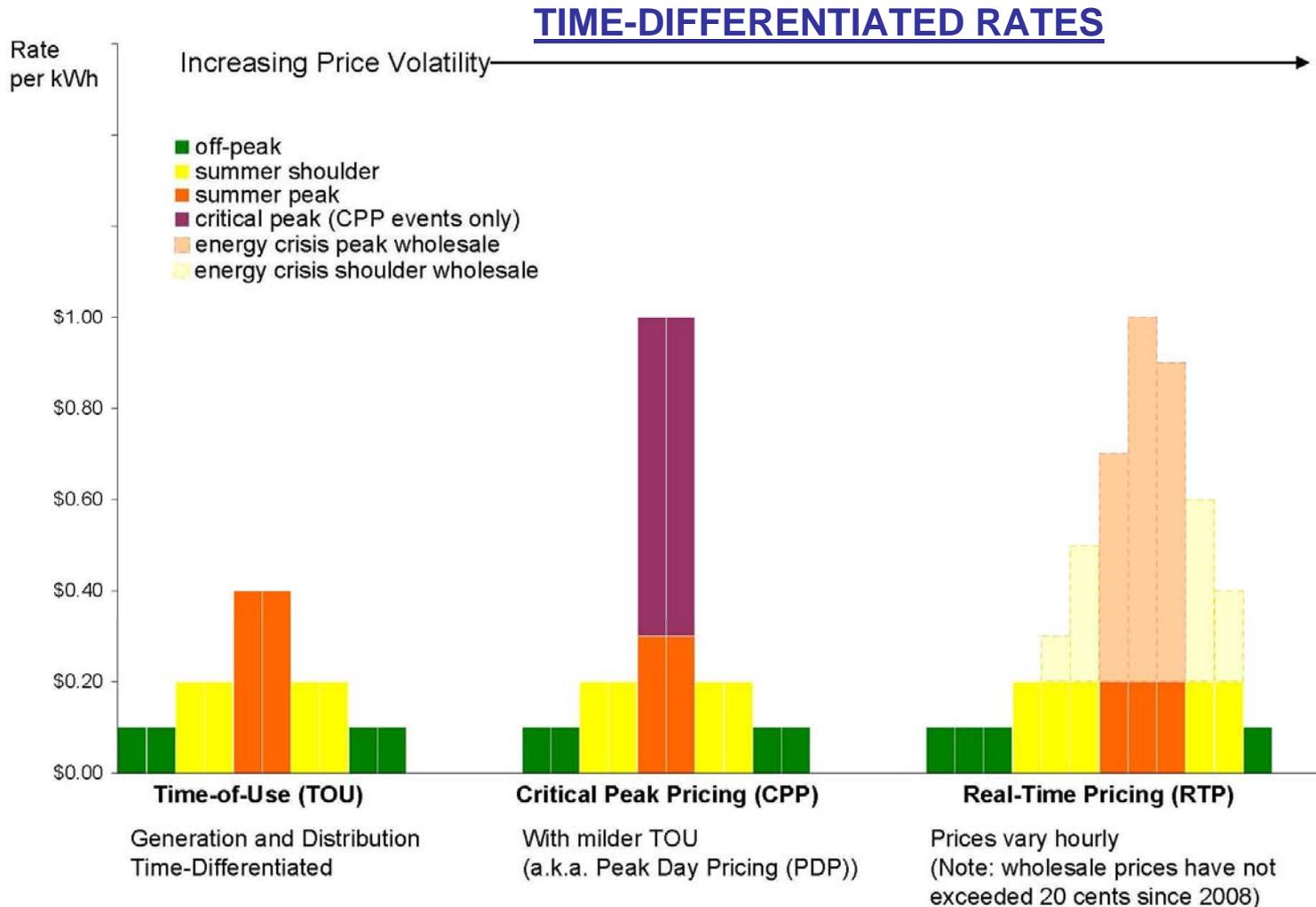
■ Dynamic Pricing:

- ▶ Rates are allowed to vary to reflect market / system conditions
- ▶ *Critical Peak Pricing (CPP)*: A dynamic rate that allows a predetermined short-term price increase to reflect system conditions expected on the following day
- ▶ *Real Time Pricing*: A dynamic rate that allows price itself to be adjusted typically on an hourly basis to reflect near real-time system conditions



Rate Design – Time Variant Pricing

Time Variant Pricing Rate Design



Rate Design - Time-Variant Pricing

CPUC Timetable for Dynamic Pricing

PG&E Schedule for Implementing Dynamic Pricing

	Current Rate Design	New Default Rate Design	New Optional Rate Design	Current Default Implementation Date
Large Commercial & Industrial	Mandatory TOU	TOU w/ CPP Overlay	TOU Only	May 1, 2010
Small & Medium Commercial	Most on Flat Rates	TOU w/ CPP Overlay	TOU Only	Nov. 1, 2012 (originally May 2011)
Residential	Tiered, non-TOU	N/A (same as current)	TOU or CPP	



