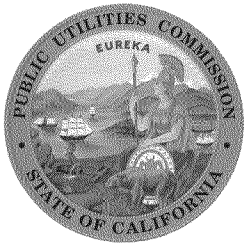# Integrating Cost Benefit Analysis

Sachu Constantine

CSI

CPUC

CPUC DG Cost-Benefit Decision

- **Decision 09-08-026, August 20, 2009**
    - To compare resource options, evaluate effectiveness of DG
    - Applies broadly, but intended specifically for CSI and SGIP
- **Adopts the following principles:**
    - Multiple Perspectives
    - Builds on EE avoided cost methodology
    - Uses actual rates and program data where available
    - Environmental benefits as in EE evaluation
    - Includes prospective evaluation of market transformation
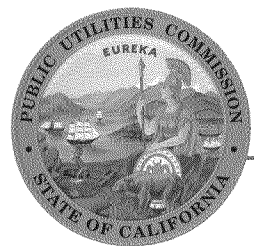
Cost-effectiveness of CSI as a Market Transformation Program

- Program goal is to achieve a self-sustaining market by end of program (2017)
- Cost-effectiveness should track program progress and provide information for improvements
- Framework uses existing tests to show trajectory

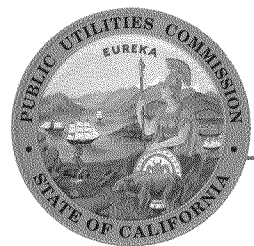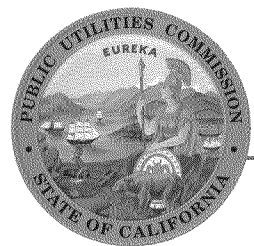| Participant (PCT)	Program Administrator Cost Test (PAC)	Total Resource Cost (TRC)
System payback and financials	Utility revenue requirement	Overall CA Cost-effectiveness
Will customers continue to buy PV?	How much is the ratepayer subsidy?	Does PV provide a lower cost for CA?
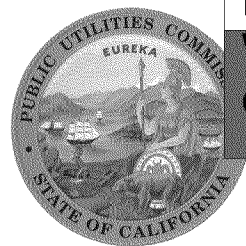
CA Avoided Cost Timeline

- 2001: CEC adopted Time Dependent Valuation for Title 24 Building Standards
- 2004-ongoing: CPUC adopted long-run forecast of energy efficiency avoided costs
- 2007: CEC revised TDV values including RA payments and capacity allocation
- 2009: E3 developed DG avoided costs

Avoided Cost Approach

- Non-proprietary, publicly available data
- Provide additional transparency by making spreadsheet freely available to download
- Differences to prior avoided cost framework adopted for energy efficiency
  - Updated 2008 price shape
  - Allocation of RA capacity value to hours
  - Added value of avoided renewable purchases

"Screen Shot" of A/C Spreadsheet

Components of Avoided Cost

- Generation
  - Energy
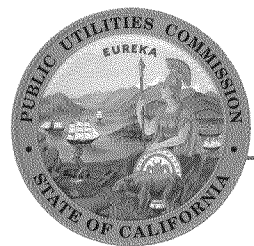 - Capacity
- Transmission & distribution
- Emissions
- Losses
- Ancillary services
- Avoided RPS purchases
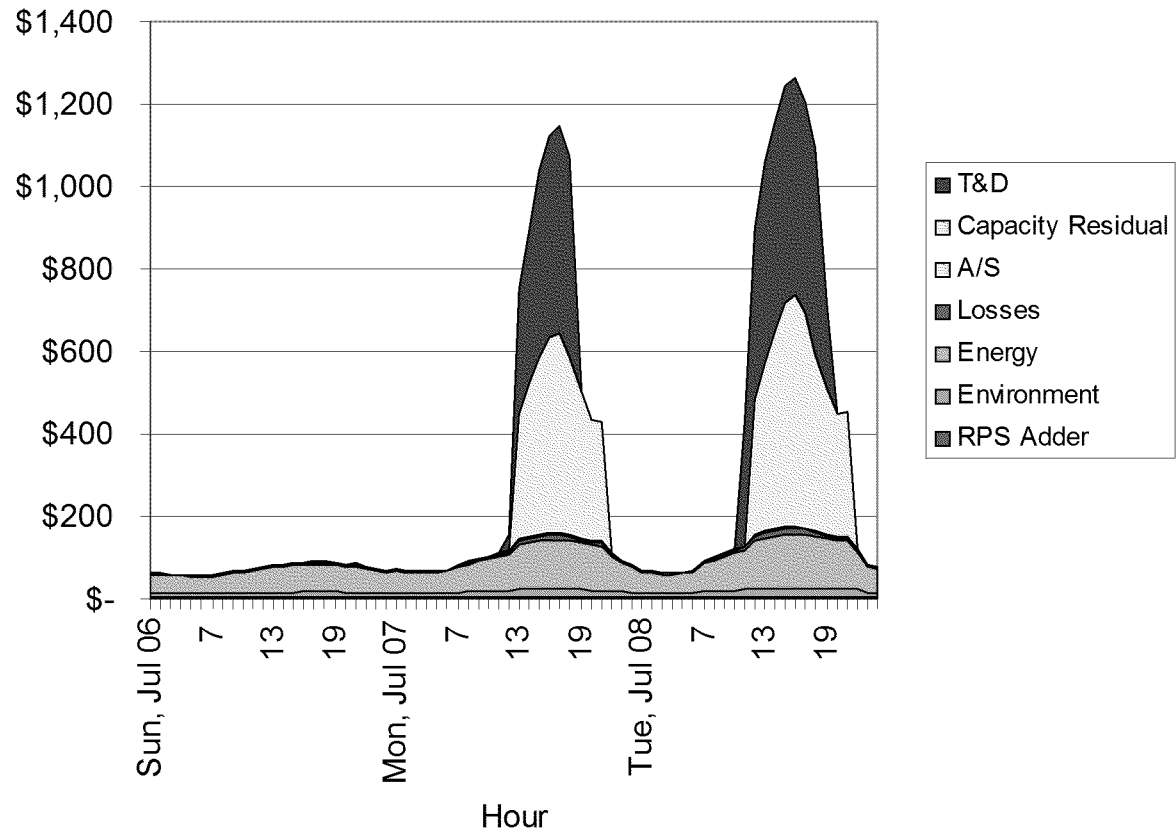
Avoided Generation Costs

- Energy
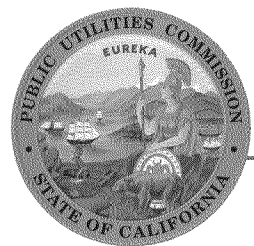 - Use historical price shapes from 2008 – 2009
  - Forecast using market data, then transition to long-run marginal cost of a CCGT
- Capacity
  - Use historical price of resource adequacy
  - Forecast assuming transition to full residual capacity value of CT
- For both components (energy & capacity), there are short run and long run values; the transition point between the two is the resource balance year

Allocation of Generation Capacity Value

- Capacity allocators are calculated for each of the top 250 load hours
- The allocator for each hour is inversely proportional to the difference between the peak period capacity and the load in that hour
  - Peak period capacity is the annual peak load plus the reserve margin
- Allocators are normalized to sum to 100%

Allocation of Generation Capacity Value

Top 300 Hours (2008)

Chronological Date (2008)
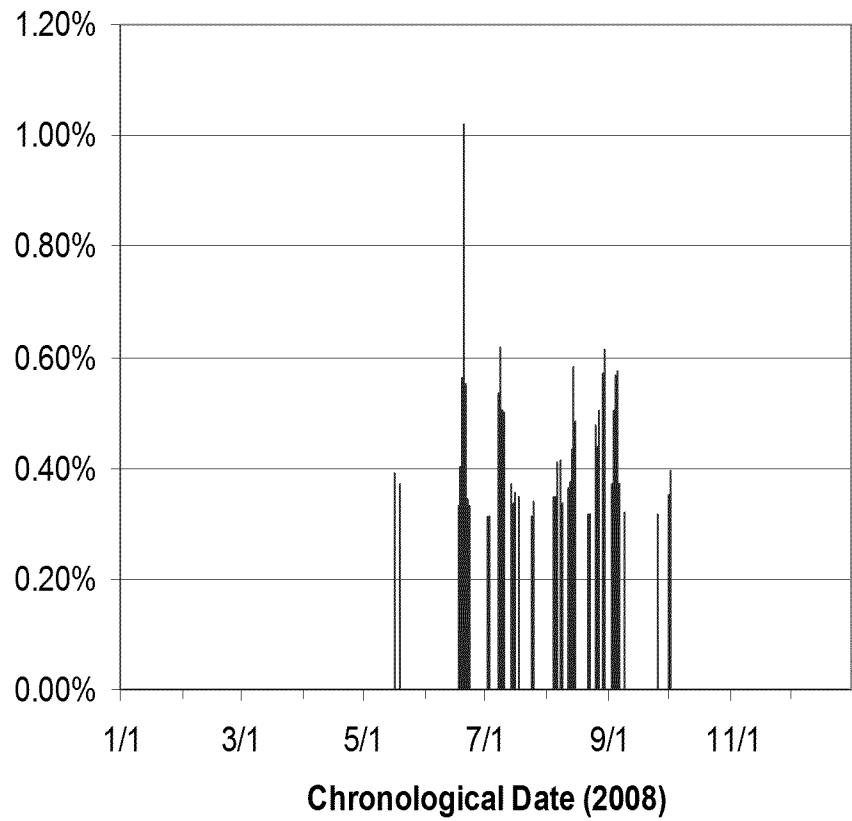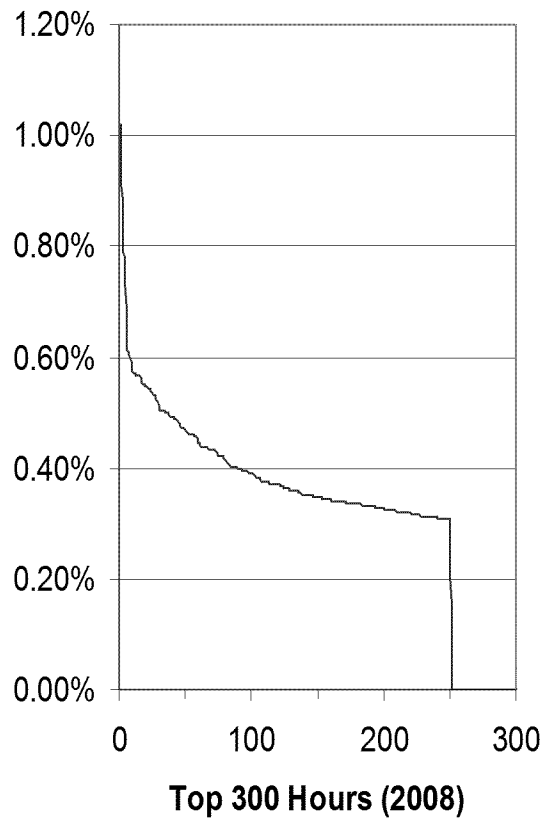
Capacity value is allocated to the top 250 load hours

Net Qualifying Capacity Equivalent (Sample Systems in CZ3)
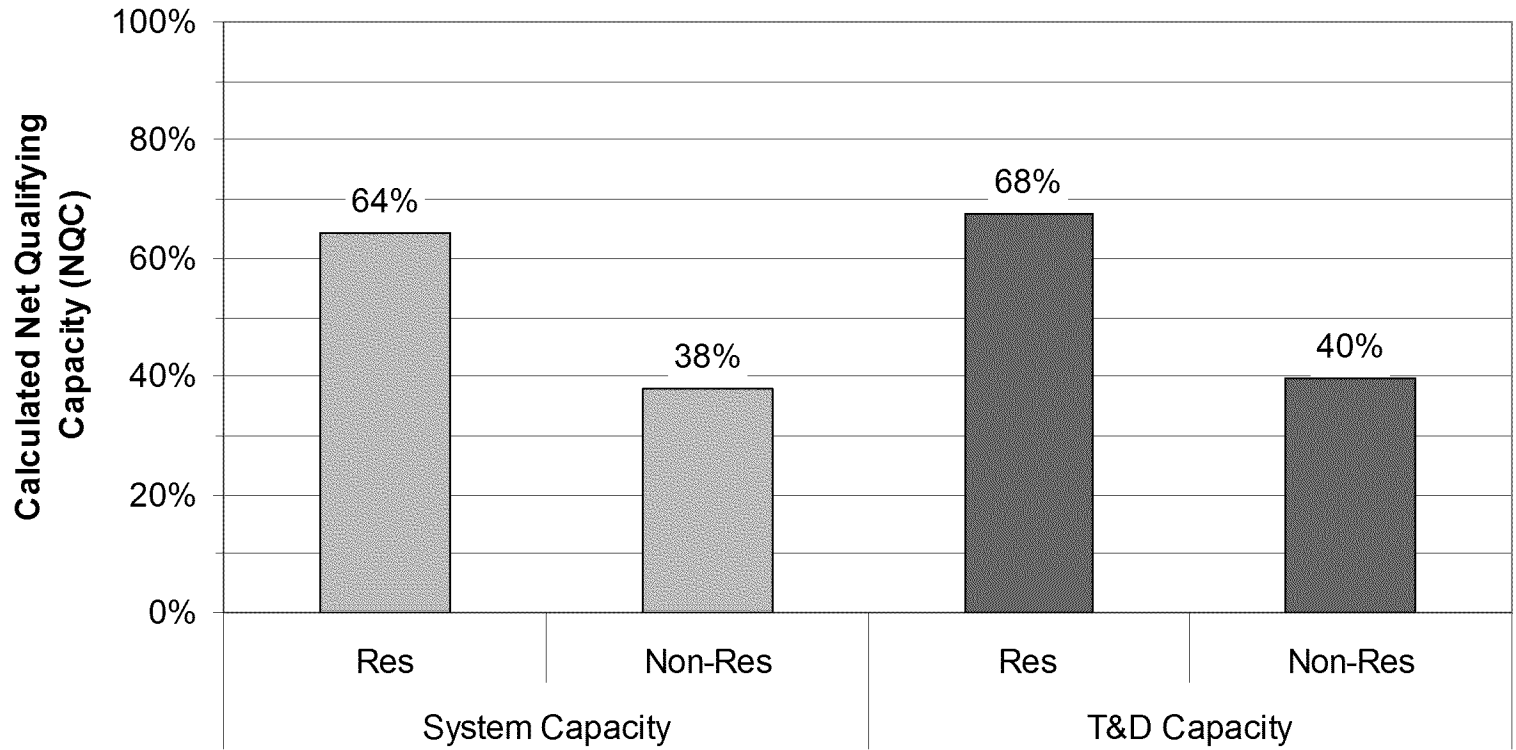
Losses and Ancillary Services

- Losses are calculated based on climate zone and TOU period
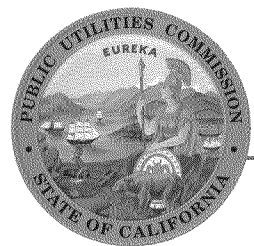 - Utility-specific TOU loss factors are used
- Avoided cost model assumes that ancillary services benefits in each hour are equal to 2.8% of market energy price and the value of losses

Environmental Benefits

- Cost of permits for criteria air pollutants is included in plant capital cost (and hence the capacity value)

- Carbon dioxide is assigned value based on mid-level Synapse price forecast

- Marginal emissions level is calculated based on implied heat rate of marginal generator

Avoided RPS Purchases

- Because NEM will reduce net retail sales in CA, there is also a benefit to the program in that it will reduce RPS requirements

- Model develops a levelized RPS Adder, which represents the additional benefit of avoided renewables purchases due to the reduction in retail sales

- The benefits of avoided RPS purchases do not begin until 2020, as it is assumed that CA will purchase renewables as fast as possible until then in order to achieve compliance with the 33% target

Calculation of the RPS Adder

- RPS Premium is the incremental cost of procuring renewable resources
    - Marginal delivered cost of renewables, less the market energy and capacity value of those resources, less average CO_2 emissions of a conventional plant
- RPS Adder is equal to the RPS Premium multiplied by 33% (the RPS portfolio requirement)
- Assumptions for marginal renewable resource based E3's 33% model (33% Reference Case)
    - Based on renewable resource bundle in Fairmont, CA