



# California's Approach to Designing a Net Energy Metering (NEM) Tariff



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# California





## Presentation topics

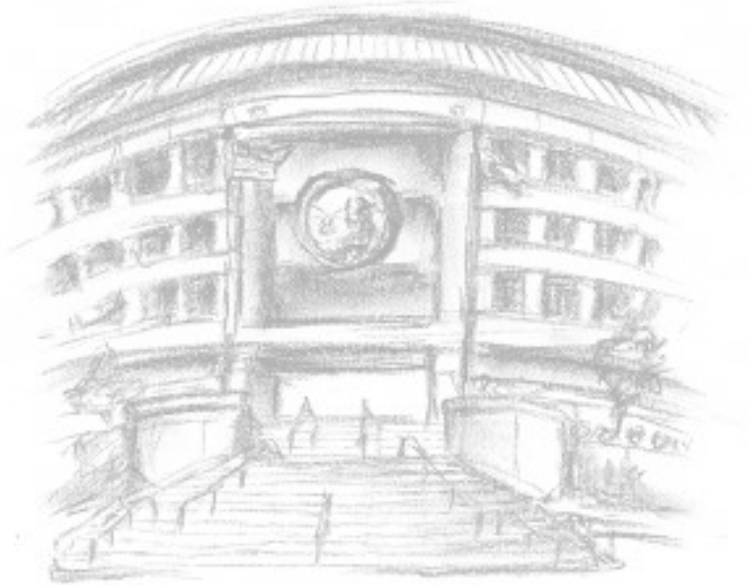
- California's energy market and commitment to clean energy
- NEM tariff design
- Complementary customer generation policies
- Customer solar trends
- Lessons learned





# California Public Utilities Commission: about us

- State agency headquartered in San Francisco
- Regulates telecommunications, electric, natural gas, water, railroad and some transportation companies
- Responsible for ensuring that customers have safe, reliable utility service at reasonable rates
- Five Commissioners are appointed by the Governor of California and confirmed by the California Senate







# Energy market is large, diverse

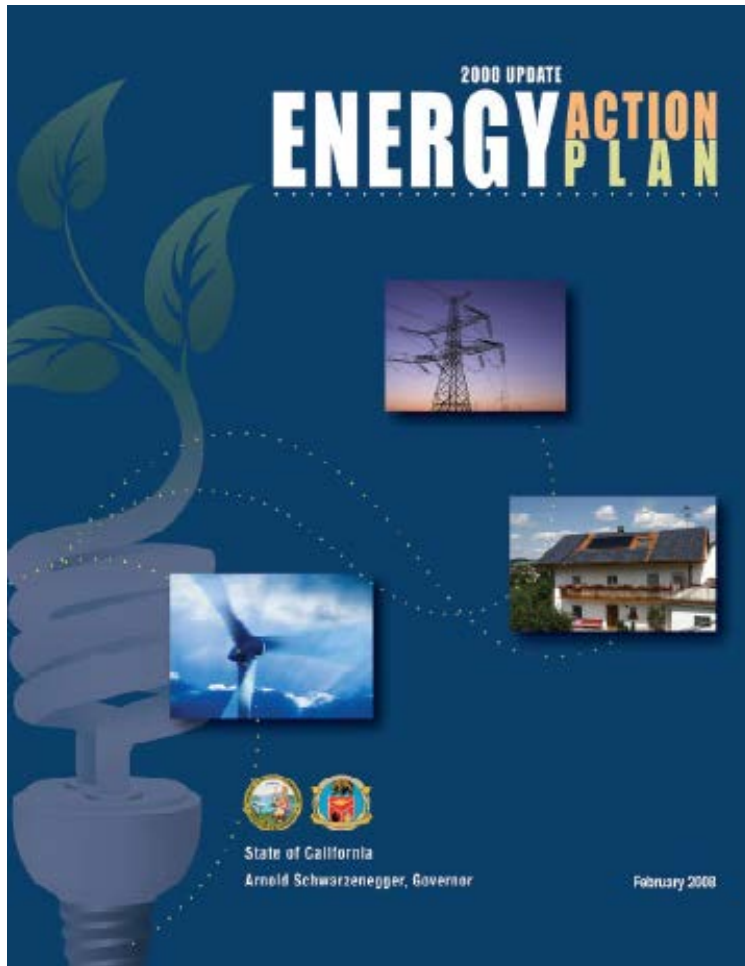
California Statistics			
Population	38 million		
Electric customers	11 million		
In-state generation resource mix		Energy	Capacity
	Nat. Gas	61%	62%
	Nuclear	8%	3%
	Hydro	10%	16%
	Coal	<1%	<1%
	Renewable	20%	19%
Annual electricity consumption	302 TWh		
Peak load	60 GW		
Geographic diversity	70% of electricity from in state		
Power plants	1,008		
Electric rates	Residential tiers range from \$0.13-\$0.36; lower for commercial and low income residents		

Dependence on natural gas = volatile electric prices / lack of diversity





# California is Committed to Clean Energy



“Loading Order” of Energy Resources:

- Energy efficiency
- Demand response
- Distributed generation
- Renewable generation
- Cleanest available fossil resources

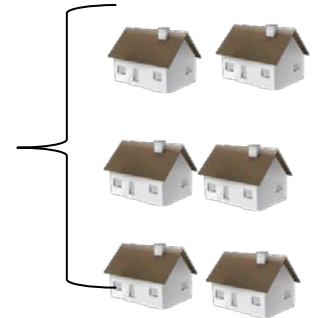
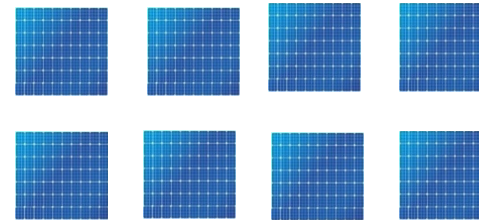




# Three sizes of renewables policies target each market

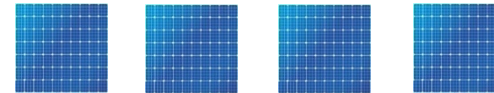
## Utility-Scale

- > 20 Megawatts
- Energy for thousands of homes
- *Renewables Portfolio Standard*



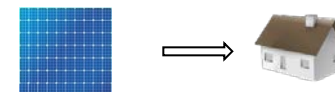
## Distributed Generation

- 1 - 20 MW
- Energy for 200-4,000 homes
- *Feed-in tariff, Renewable Auction Mechanism*



## Customer-Side

- < 1 MW
- Distribution Grid
- Energy for 1 to 200 homes
- *Net Energy Metering and California Solar Initiative*





# Net Energy Metering (NEM) tariff designed for customer generation



David McNew/[Getty Images](#)



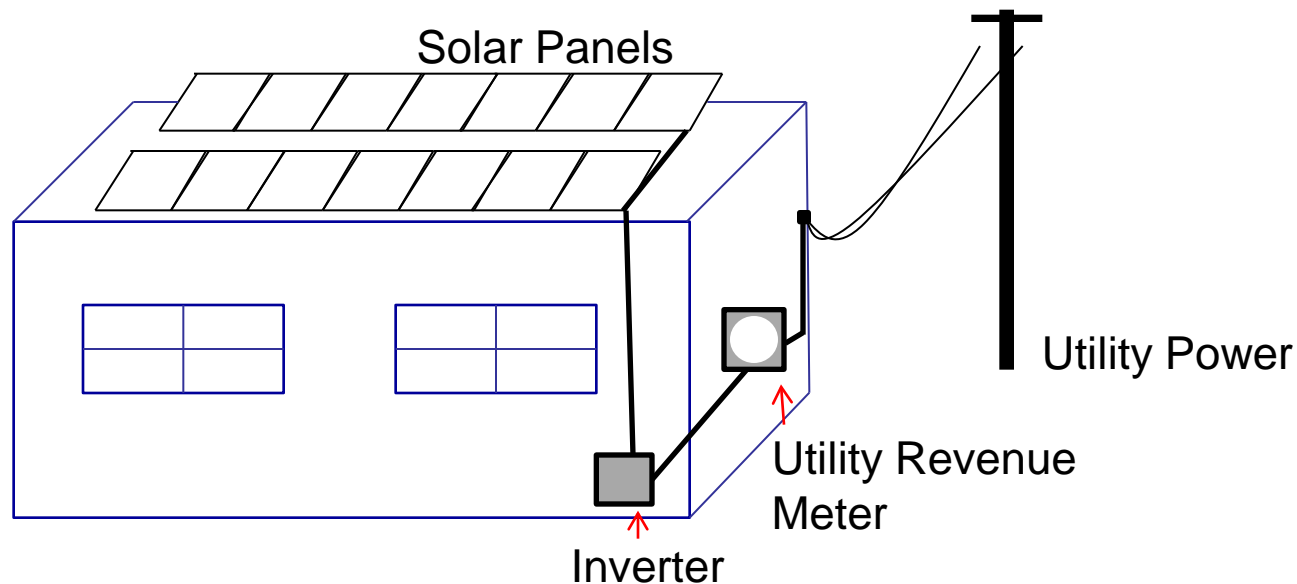
Stone Brewing Co., North County San Diego  
Courtesy: Stone Brewing Co.







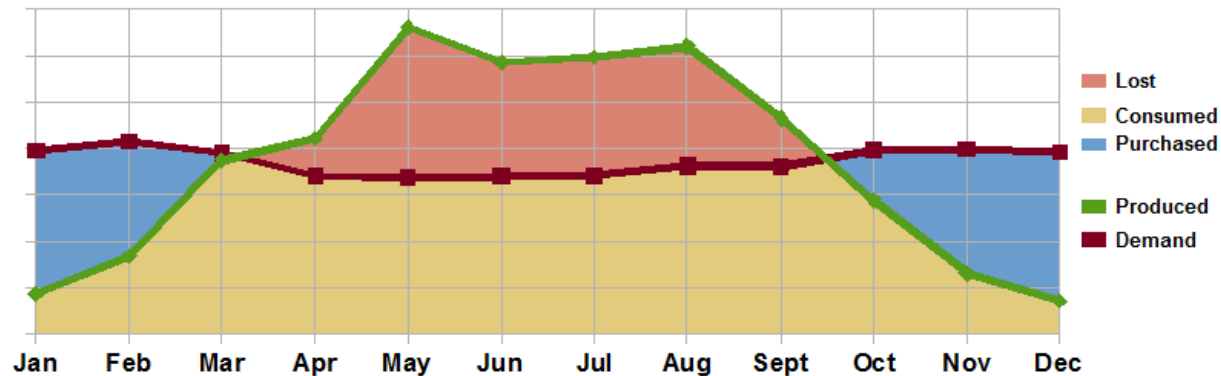
# NEM allows customers to serve onsite energy needs and be compensated for exports



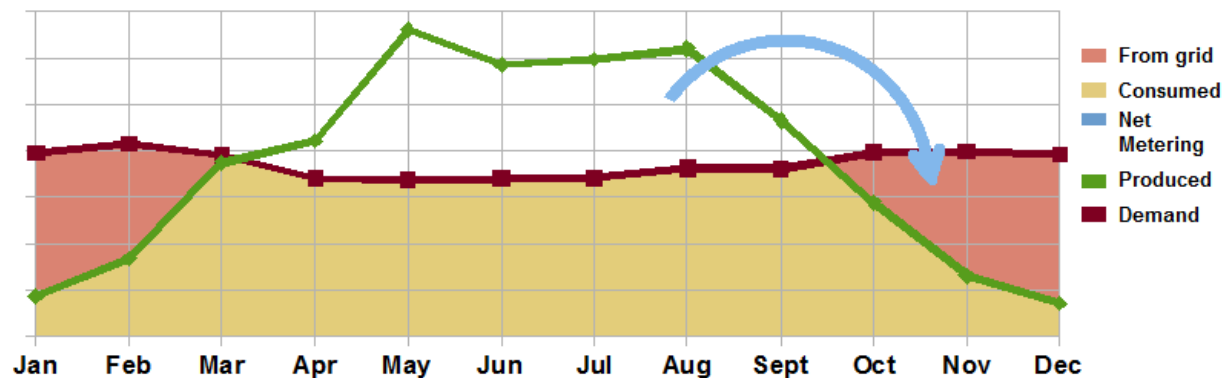


# Customers can offset their annual load, regardless of shape of their load curve

## Without Net Metering



## With Net Metering





# What are the rules?

- **Eligible renewable technologies:** Solar, wind, biomass, geothermal, renewable fuel cells, small hydroelectric generation, digester gas, municipal solid waste conversion, landfill gas, hydro technologies.
  - Storage systems paired with generator receive NEM benefits
- **Facility:** Sized to serve annual peak onsite electricity needs, up to 1 MW.
- **Export/Import:** NEM customer only pays for the net annual imports
- **Credits:** Bill credits are provided at the full retail rate. NEM customers can rollover excess bill credits up to a year. At end of year, NEM Customers are paid for any net excess kWh exported to utility on an annual basis.
- **Secondary benefits:** Avoided interconnection application and distribution upgrade fees, faster interconnection processing times
- **Program capacity cap:** Current NEM ends July 1, 2017, or the date on which a utility reaches 5% of aggregate customer peak demand.





# Complementary policies needed to jumpstart the market

- California Solar Initiative "Million Solar Roofs": \$3.4 billion subsidy program for 3,000 MW by 2016
- Self-Generation Incentive Program: \$83 million/ year for non-solar customer DG that reduces greenhouse gas emissions
- Federal Investment Tax Credit: 30% tax credit for residential and commercial systems until 2017

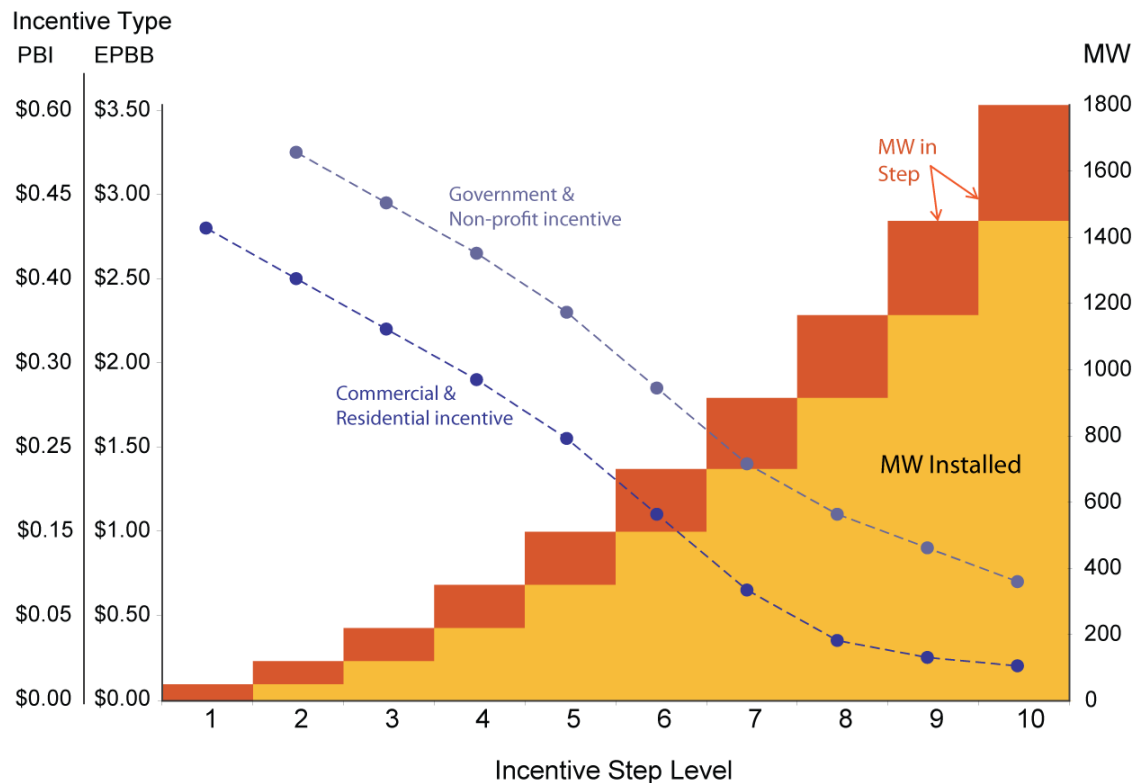






# California Solar Initiative has driven the market since 2006

**Goals:** 1) Create self-sustaining solar market, 2) Ensure customer protection, 3) Reach all Californians, including low income



PBI: Performance Based Incentive, paid over 5 years, in \$ / kWh  
 EPBB: Expected Performance Based Buydown, paid upfront, in \$ / W





# Trend: Installed solar largely uses NEM

## Solar Interconnections and Solar NEM Customers by Utility

	Total MWs Interconnected	Total Customers Interconnected	MW on NEM tariffs	Customers on NEM Tariffs
PG&E	1,109 MW	114,639	1,039 MW	114,619
SCE	786 MW	77,266	674 MW	77,155
SDG&E	247 MW	31,997	246 MW	31,963
<b>Total</b>	<b>2,142 MW</b>	<b>223,902</b>	<b>1,959 MW</b>	<b>223,737</b>

*Data is through March 2014. Includes CSI, NSHP, ERP and SGIP data, but not POU or RPS data.*

## Progress Towards the 5% NEM Cap

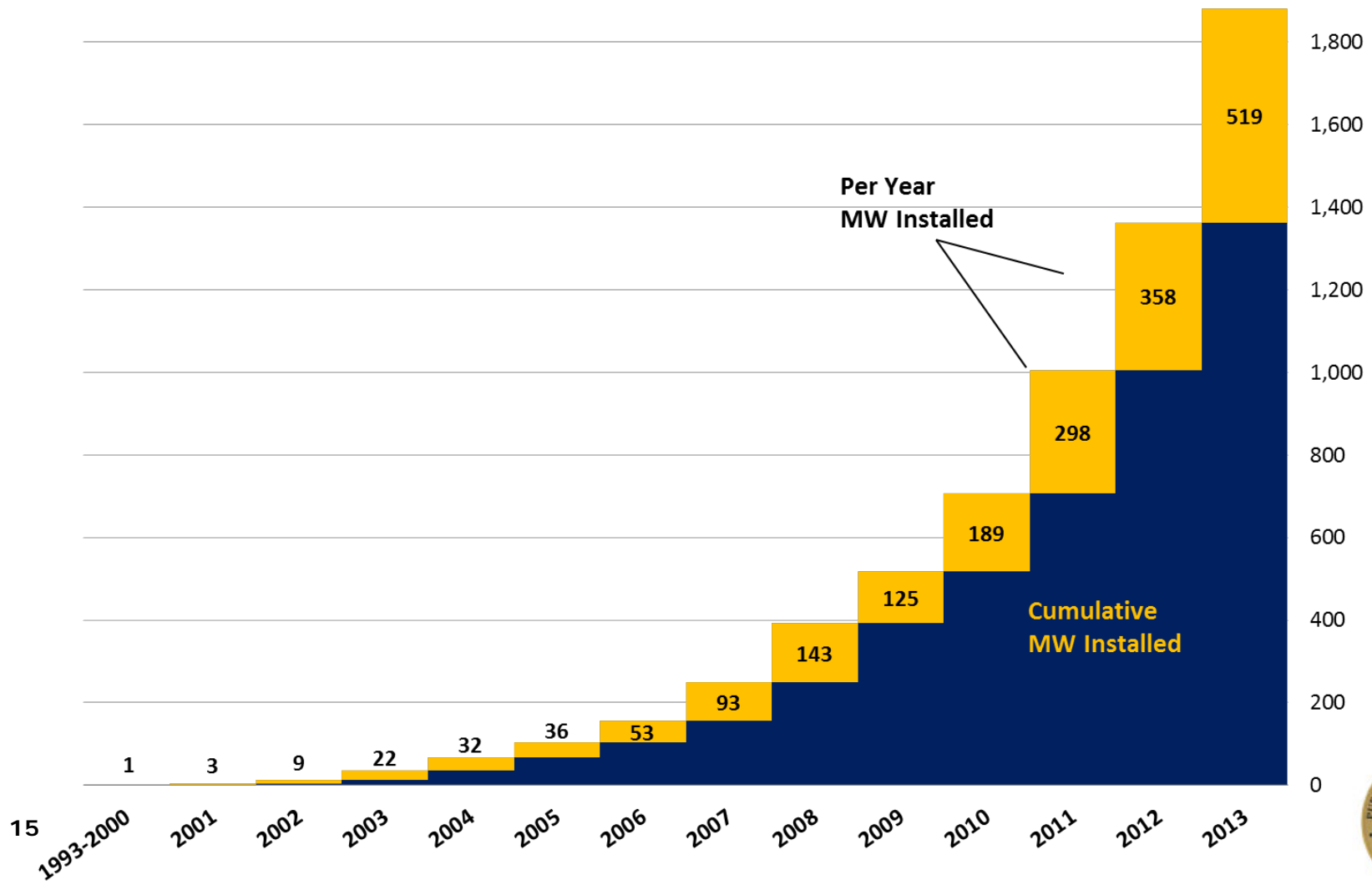
	MW on NEM Tariffs	Aggregate Customer Peak Demand	Progress towards 5 Percent NEM Cap
PG&E	1,050 MW	48,177 MW	2.18%
SCE	704 MW	44,807 MW	1.57%
SDG&E	270 MW	12,134 MW	2.23%

*Data is through March 2014. Includes all NEM-eligible systems.*





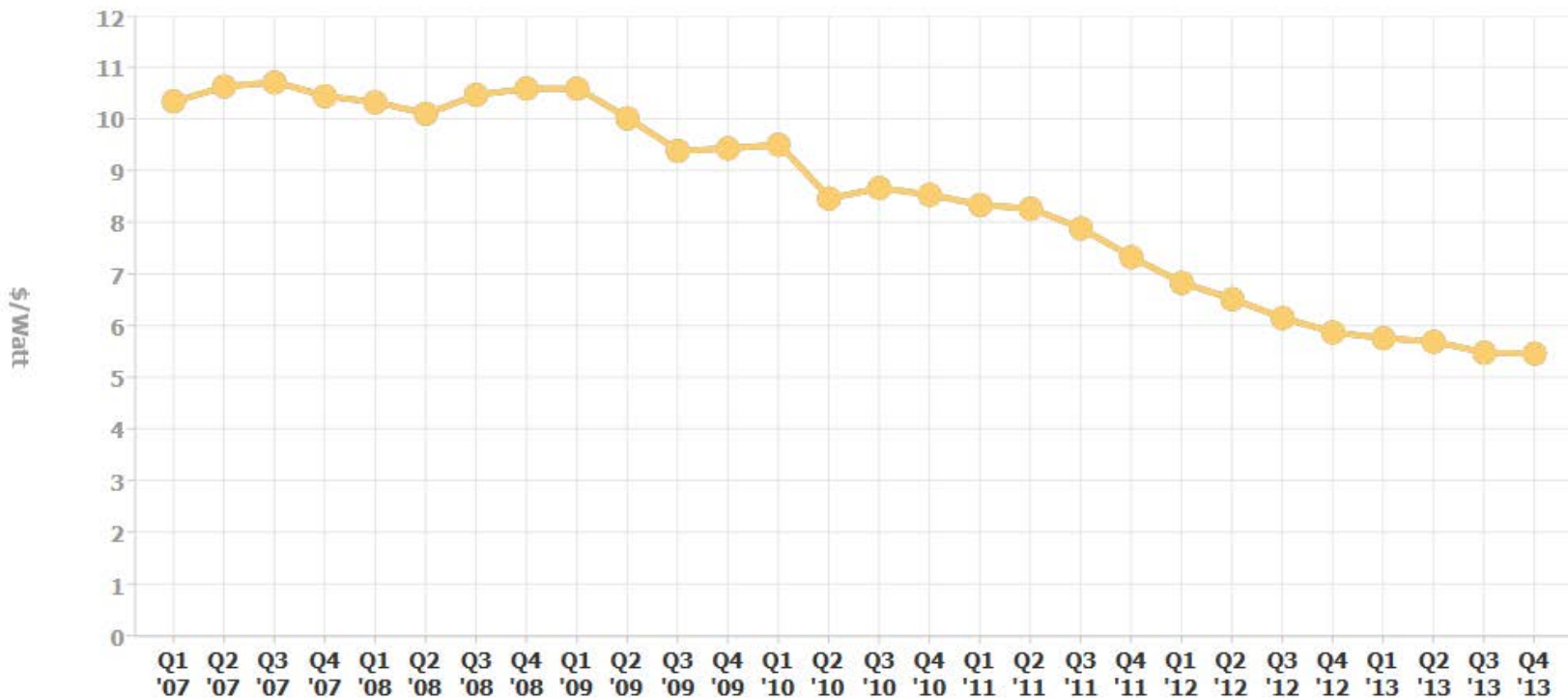
# Trend: Customer solar capacity growing





## Trend: System costs have decreased 47%

From **\$10.47/Watt** in 2007 to **\$5.50/Watt** in 2013







# Lesson #1: Innovative policies needed to reach all Californians

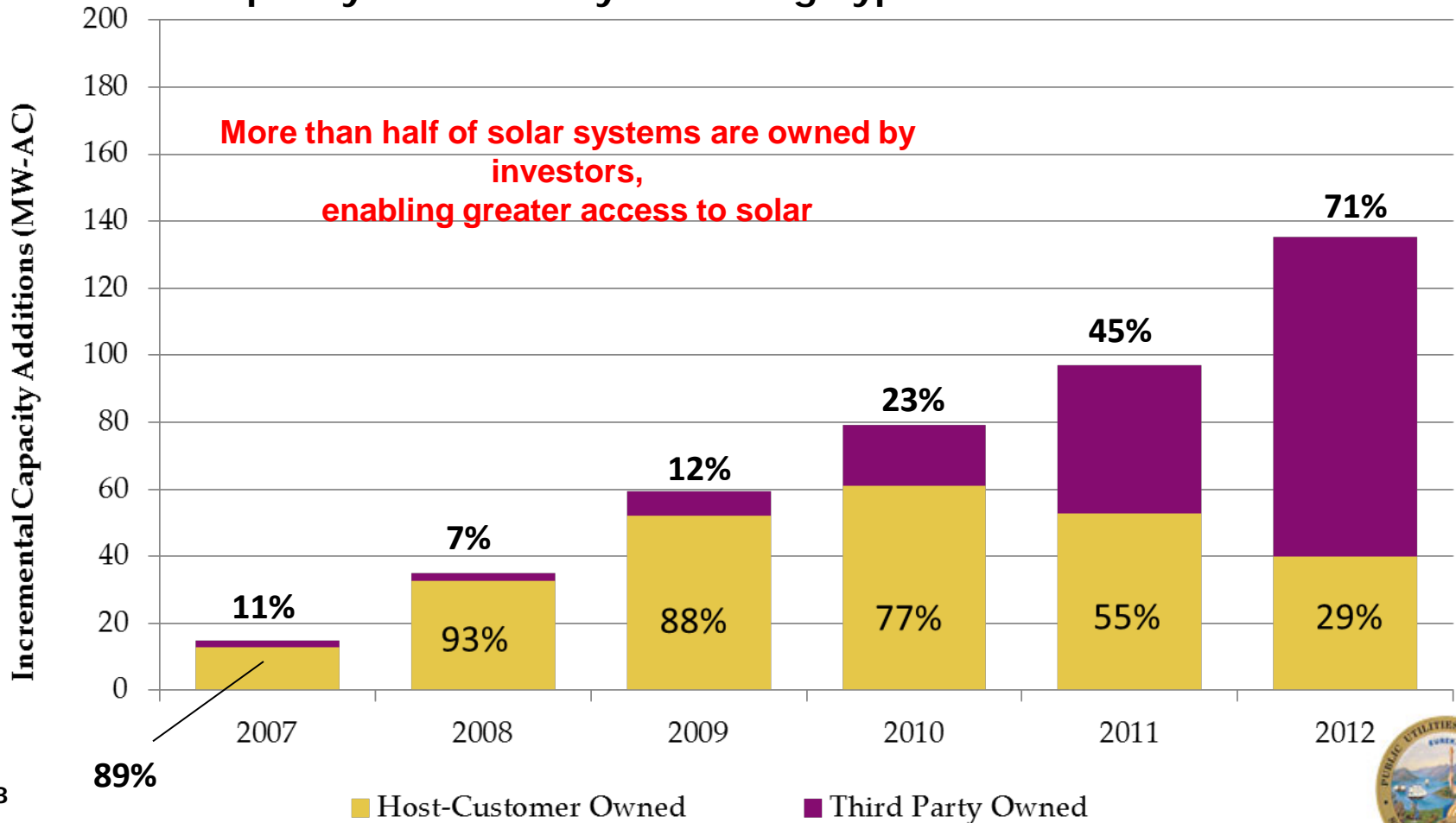
- **NEM variations for multitenant buildings, properties with multiple meters**
  - Virtual Net Energy Metering, NEM Aggregation
- **CSI Incentives allocated to many types of customers**
  - Residential customers in houses and apartment buildings (\$489 million; 602 MW)
  - Non-Residential customers from businesses, government agencies, schools, hospitals (\$1.458 billion; 1,147 MW)
  - Low Income residential customers (\$216 million)





## Lesson #2: Attracting private investment is key

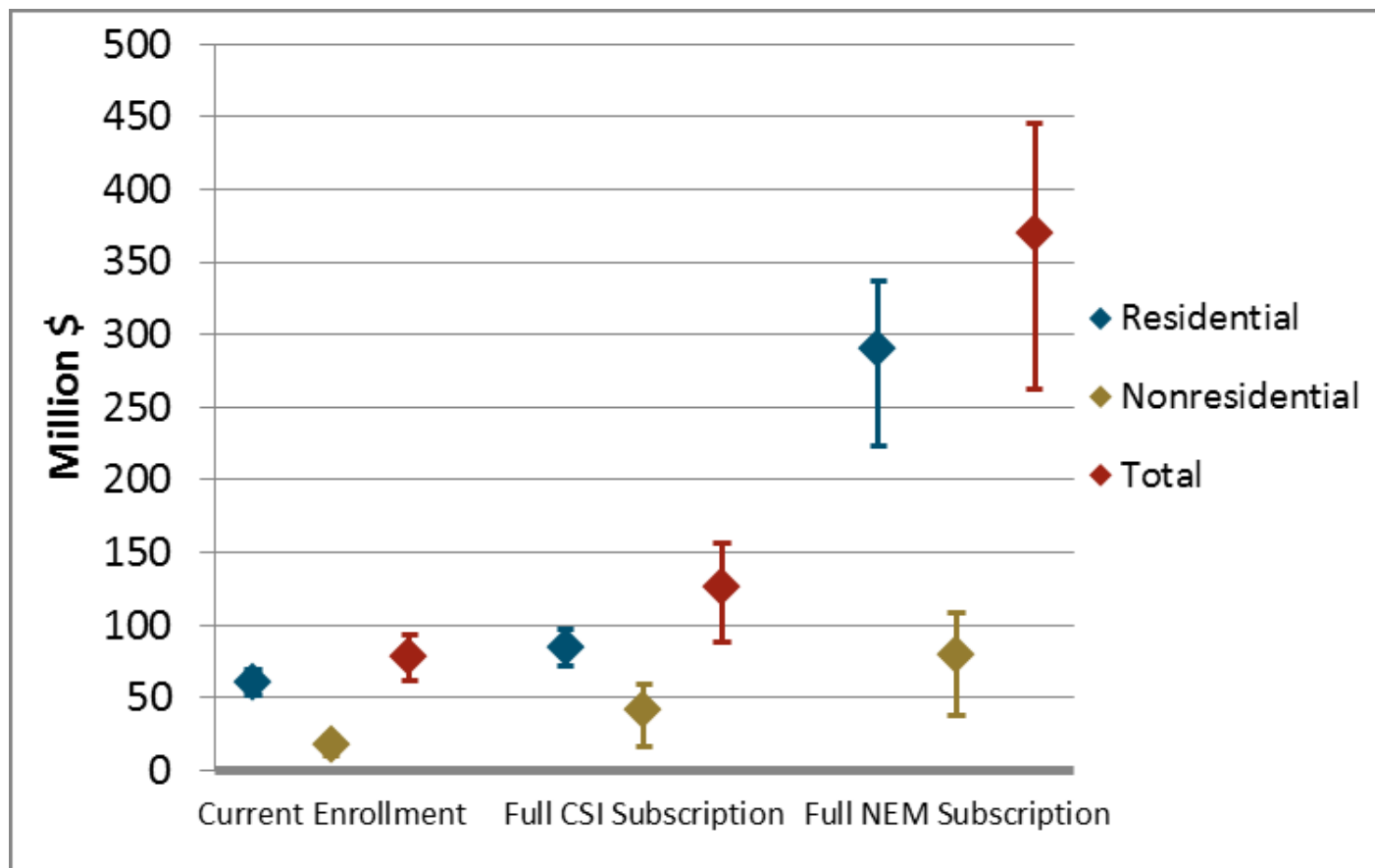
Incremental Capacity Additions by Financing Type for Residential Installations





# Lesson #3: “High costs” of NEM are due to our rate design, not NEM itself

Net Cost of NEM Exports in 2020 (Millions \$2012/year)





## Lesson #4: After market transformation, NEM rates must be reconsidered

- **New law directs the CPUC to develop a new tariff or standard contract.** Requirements for Commission:
  - Ensure that customer-sited renewable distributed generation continues to grow sustainably
  - Include alternatives designed for the growth of distributed generation among residential customers in disadvantaged communities
  - Ensure that the successor tariff is based on the costs and benefits of the renewable electrical generation facility, and benefits of the tariff to all customers and the electrical system are approximately equal to the total costs
  - Allow distributed generation projects sized to customer load that are greater than 1 MW in size







## Conclusions: Lessons Learned

### Design incentives for specific market segment

- NEM for grid-connected customers who will benefit from import/export
- Simple, transparent and equitable billing/pricing for customer programs

### Leverage state funds by attracting private capital

- Long-term price signals
- Availability of funds, market certainty
- Clear, transparent rules

### Fair compensation is a balancing act

- Price must fairly value energy exports without overpaying = public support
- Price should make economics of DG work = successful policy





# Backup / extra slides





# 2013 NEM Ratepayer Impacts Evaluation

- ❑ Cost-Benefit Analysis (compares the reduction in NEM customer bills to the reduction in utility costs): NEM generation currently results in a net cost to other ratepayers of \$79-\$252 million per year, reaching \$370 million - \$1 billion per year in 2020 with a complete build-out to the 5% NEM cap.
- ❑ Cost of Service Analysis (compares compare the resulting bills of NEM customers to their full cost of service after accounting for NEM generation): On average, NEM customers pay slightly more than their cost of service.
- ❑ Customers installing NEM systems have an average median household income of \$91,210, compared to the median income in California of \$54,283 and in the IOU service territories of \$67,821.





# Assembly Bill 327 (Perea, 2013)

- Directs the Commission to establish a transition period for customers to remain enrolled on NEM tariffs, and develop a new successor tariff or standard contract to NEM by December 31, 2015. In developing the new contract or tariff, the Commission must:
  - Ensure that customer-sited renewable distributed generation continues to grow sustainably
  - Include alternatives designed for the growth of distributed generation among residential customers in disadvantaged communities
  - Ensure that the successor tariff is based on the costs and benefits of the renewable electrical generation facility, and that the total benefits of the tariff to all customers and the electrical system are approximately equal to the total costs
  - Allow distributed generation projects sized to customer load that are greater than 1 MW in size







# Numerous Clean Energy Policies

<b>Renewables Standard</b>	• Highest in US, 33% by 2020
<b>Greenhouse Gas Cap</b>	• 1990 levels by 2020
<b>Electric Car Mandate</b>	• 15% of sales by 2025
<b>Energy Efficiency</b>	• Gets first priority in resource planning
<b>Decoupling</b>	• Utility profits not tied to sales volume
<b>Smart Grid</b>	• One of the earliest & largest adopters of AMI
<b>Solar Rooftops</b>	• Goal set for 1 million by 2016
<b>Nuclear</b>	• New plants prohibited by state law





# NEM has many program elements

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## Eligible Technologies

Solar, wind, biomass, geothermal, renewable fuel cells, small hydroelectric generation, digester gas, municipal solid waste conversion, landfill gas, hydro

## Pricing

Full Retail Credit based on Customer's Otherwise Applicable Tariff

## Netting

Bill credit for net annual exports; payment for excess bill credits at year end

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## Secondary Program Elements

Avoided interconnection application and distribution upgrade fees, faster interconnection processing times

Rate component exemptions (departing load charges, standby charges, etc.)

Customers retain Renewable Energy Credits

Storage systems eligible for same benefits if paired with NEM generator

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## Variations to NEM

Virtual Net Energy Metering (allows multiple customers to get benefits from one NEM system), Fuel Cell NEM, and the Renewable Energy Self-Generation Bill Credit Transfer Program





# CSI Program Budget

Program Component	Budget (\$ Millions)	Goal
General Market Solar Program (includes PV and electric displacing solar thermal technologies)	\$1,897	1,750 MW
Single-family Affordable Solar Homes (SASH)	\$108	TBD (see note)
Multifamily Affordable Solar Housing (MASH)	\$108	TBD (see note)
Research, Development, Demonstration, and Deployment (RD&D)	\$50	N/A
Solar Water Heating Pilot Program (SWHPP)	\$2.6	750 SWH systems
Sub-Total: CSI Electric Budget (Electric Displacing)	\$2,167	1,940 MW
CSI Thermal Program (Gas-Displacing)	\$250	585 million therms
Total CSI Budget	\$2,417	

**Table 1: CSI Budget by Program Component**

*Source: CPUC D.06-12-033, p. 28 established goal of the general market program as 1,750 MW. In addition, D.10-01-022 established the CSI Thermal Program pursuant to AB 1470 (Huffman, 2008) and SB 1 (Murray, 2006).*

*Note: The CPUC decisions on MASH and SASH did not explicitly adopt a MW per program goal; however, the CPUC did adopt a total CSI program goal of 1,940 MW in D.06-12-033. The Legislature, via AB 217, set a goal of installing an additional 50 MW total. The CPUC will address the revised goal in its implementation of AB 217 this year.*

[1] The CSI-Thermal goal of 585 million therms is the equivalent of 200,000 SWH residential systems.





# CSI EPBB Rebate levels

**Table 1: CSI EPBB Rebate Levels per Incentive Step**

	Incentive in Step ( <i>EPBB, \$/Watt</i> )		
Step	Residential	Commercial	Government Non-profit
1	n/a	n/a	n/a
2	\$2.50	\$2.50	\$3.25
3	\$2.20	\$2.20	\$2.95
4	\$1.90	\$1.90	\$2.65
5	\$1.55	\$1.55	\$2.30
6	\$1.10	\$1.10	\$1.85
7	\$0.65	\$0.65	\$1.40
8	\$0.35	\$0.35	\$1.10
9	\$0.25	\$0.25	\$0.90
10	\$0.20	\$0.20	\$0.70







# CSI General Market Current Incentives

**Table 1: Current General Market Statewide Solar Incentive Step Levels**

Program Administrator	Customer Class	Current Step	EPBB Incentive Value (\$/Watt)	PBI Incentive Value (\$/kWh)	MW Remaining in Step	MW Under Review
CCSE (San Diego)	Residential	10	\$0.20	\$0.025	7.15	14.74
	Commercial	9	\$0.25	\$0.032	13.37	2.31
	Government/ Tax-exempt		\$0.90	\$0.114		
PG&E	Residential	Program Fully-Subscribed				
	Commercial					
	Government/ Tax-exempt					
SCE	Residential	10	\$0.20	\$0.025	N/A	7.29
	Commercial	9	\$0.25	\$0.032	57.34	14.98
	Government/ Tax-exempt		\$0.90	\$0.114		





# Trend: Third party owned systems

CPUC's \$2 billion investment has leveraged billions more

More than half of solar systems are owned by investors, enabling greater access to solar

