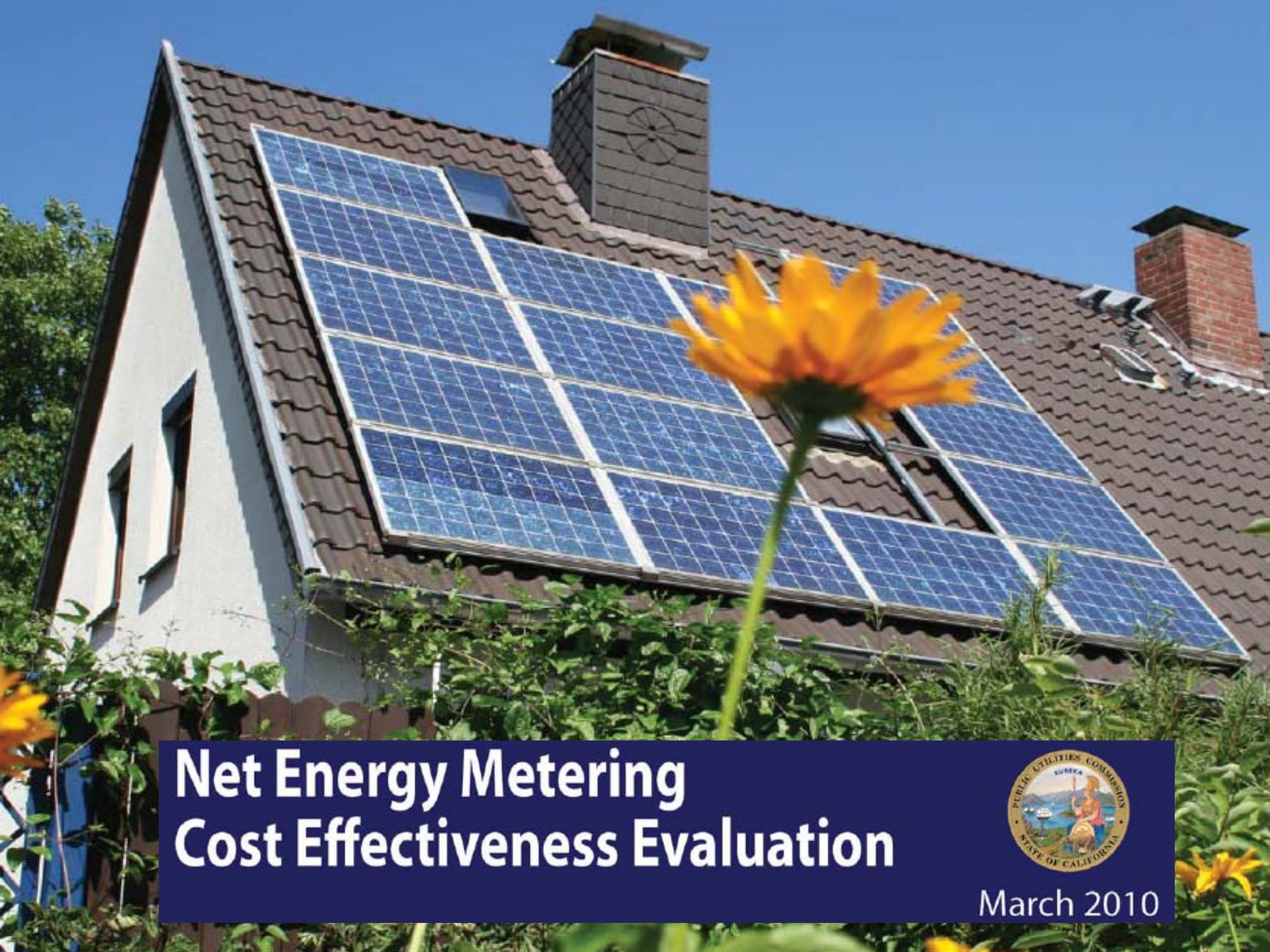


Net Energy Metering Cost Effectiveness Evaluation

March 2010

Workshop Overview

- NEM Cost Effectiveness Evaluation required by PU Code 2827
- NEM is integral to California's support for Distributed Generation
- CPUC asked E3 to investigate NEM in parallel with CSI
- Public Discussion of Results and Methodology

CPUC Key Highlights

NEM PV installs through 2008:

- Will cost ratepayers about $230 million over their Lifecycle, or about $20 million per year
- Provide energy at a levelized net cost ~$0.12/kWh
  - Significant difference between Residential and Commercial sectors
- Receive an Average lifecycle ‘subsidy’ ~$0.88/Watt, with a net ~ $0.54/Watt for ratepayers
- Would be only marginally impacted by AB 920

Agenda

Energy and Environmental Economics, Inc.

1. Introduction
2. Methodology and Approach
3. Data and Analysis
4. Results and Conclusions
5. Question and Answer

Introduction

E3 Background

Energy and Environmental Economics, Inc.

- **E3 Overview**
  - E3 is an electricity consulting firm founded in 1989 in San Francisco
  - Clients span local, state and federal government, small and large public- and investor-owned electric utilities, and energy technology companies
  - Experienced in marrying engineering-economic analysis with public policy decision-making and stakeholder process
  - Approximately 20 staff in energy economics, policy, and resource planning

E3 Expertise

Energy and Environmental Economics, Inc.

- Practice Areas

Areas of Expertise			
	Renewables	Distributed Generation	EE and DR
	Resource Planning	T & D Planning	Rate Design

- Have supported multiple CPUC proceedings
  - R.04-04-025 Energy Efficiency Avoided Costs
  - R.04-04-026 Market Price Referent
  - R.06-04-009 GHG Modeling for AB 32
  - R.08-02-007 Long-Term Procurement Planning

About Clean Power Research

- A clean energy focused consulting, research and software firm that was founded in 1998 by Tom Hoff
- CPR manages and operates a comprehensive suite of PV software tools which include: PowerClerk®, SolarAnywhere®, PVSimulator™, PowerTariffs, Clean Power Estimator® and PVCheck
- Offices in Seattle, WA and Napa, CA

CLEAN POWER® RESEARCH

CSI Cost-effectiveness Project

1. **NEM Cost-Effectiveness Evaluation**
   - Public Utility (PU) Code 2827 (c)(4)
   - "submit a report to the Governor and the Legislature on the costs and benefits of net energy metering."

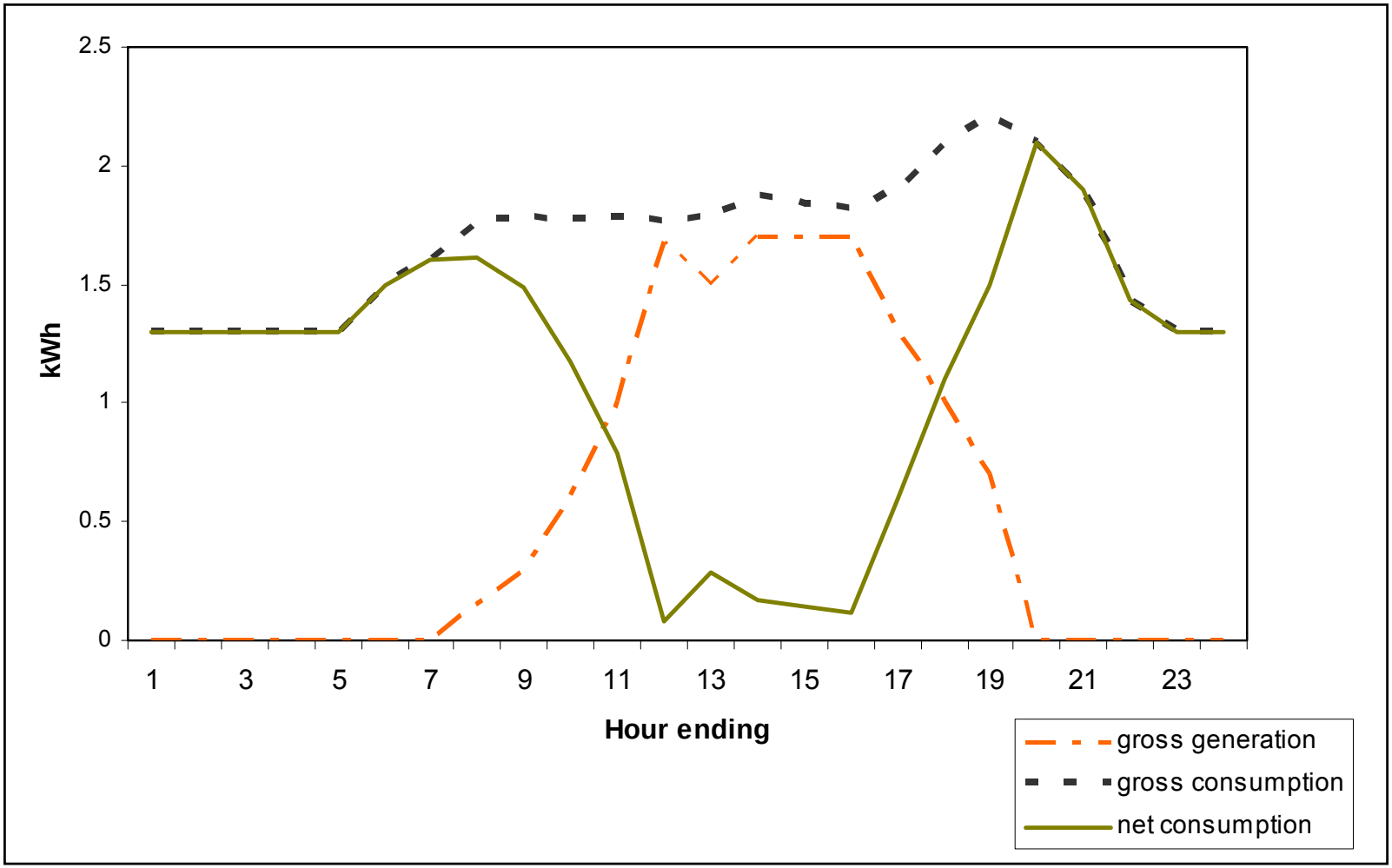
2. CSI Cost-Effectiveness Evaluation
   - Target Workshop date in end of April, 2010

3. Comparative DG Cost-Effectiveness
   - Completed in Summer / Fall 2010
   - Coordination with LTPP Process (R.08-02-007)

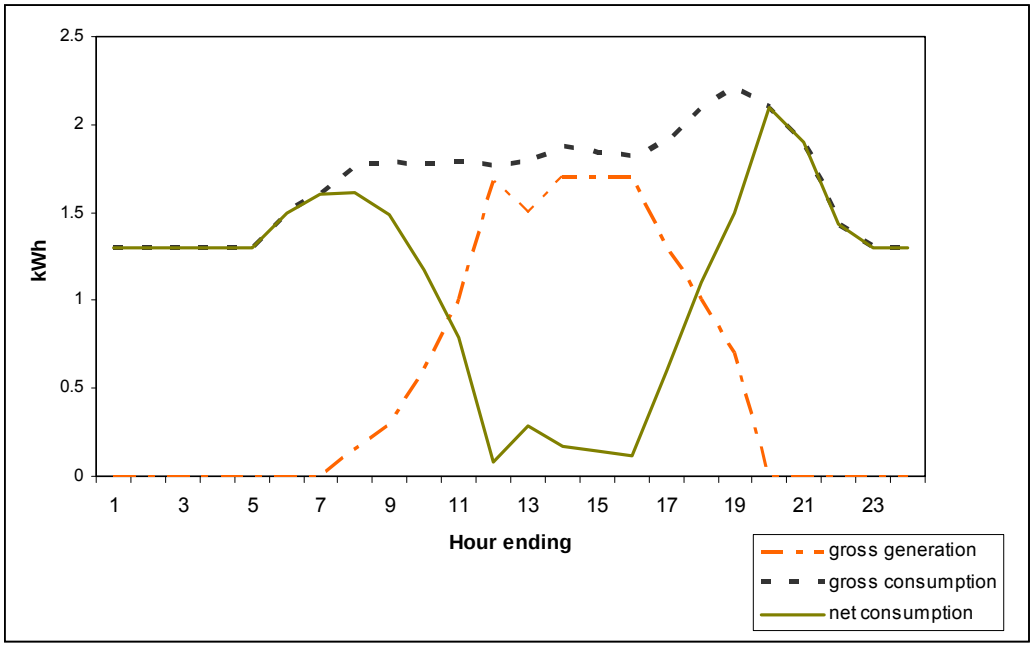
How NEM Works

Example 1:

Relatively uniform load, PV output never exceeds load



Example 1

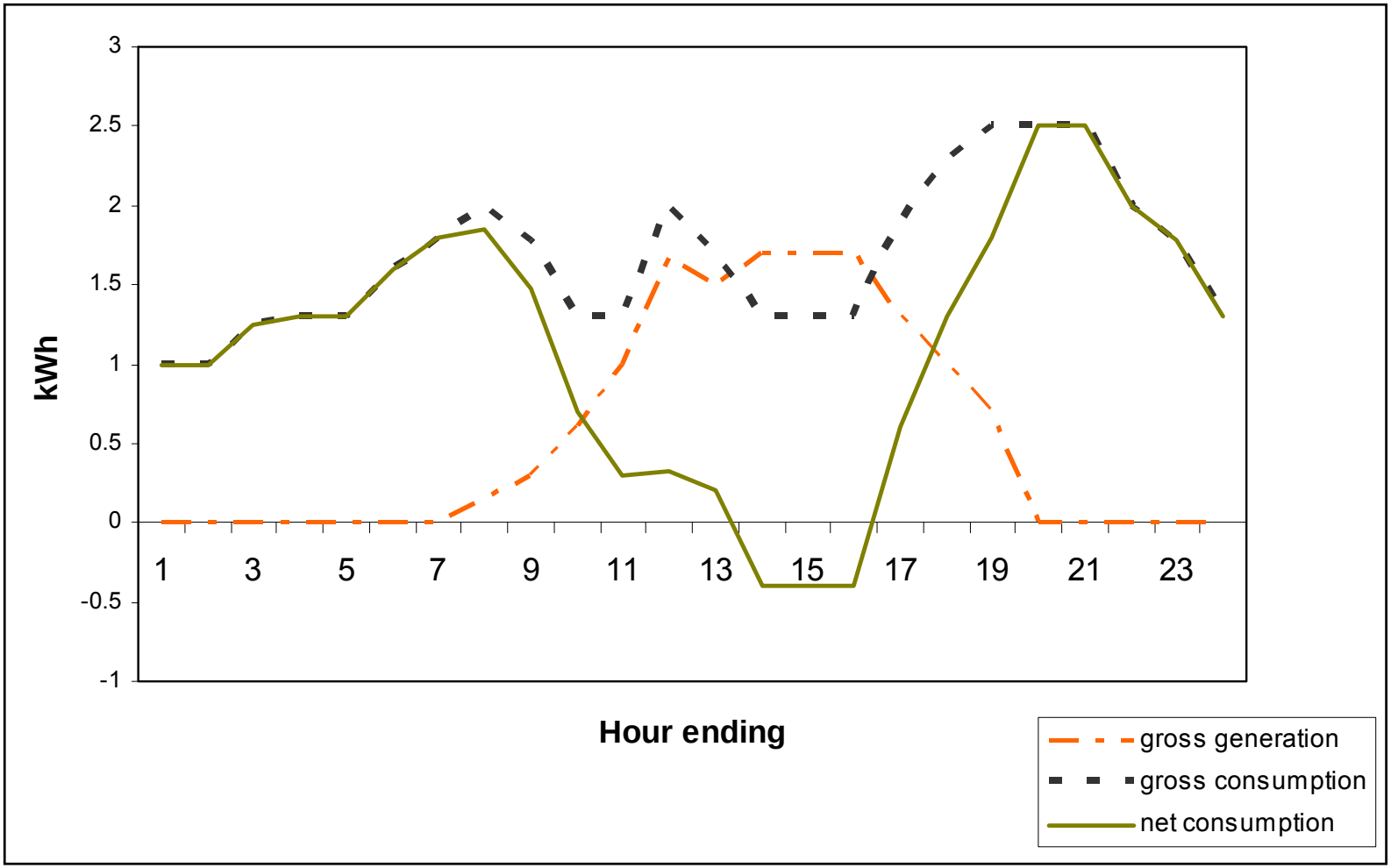


Gross Load	1,200 kWh / month
Gross PV Output	400 kWh / month
Export Energy	0 kWh

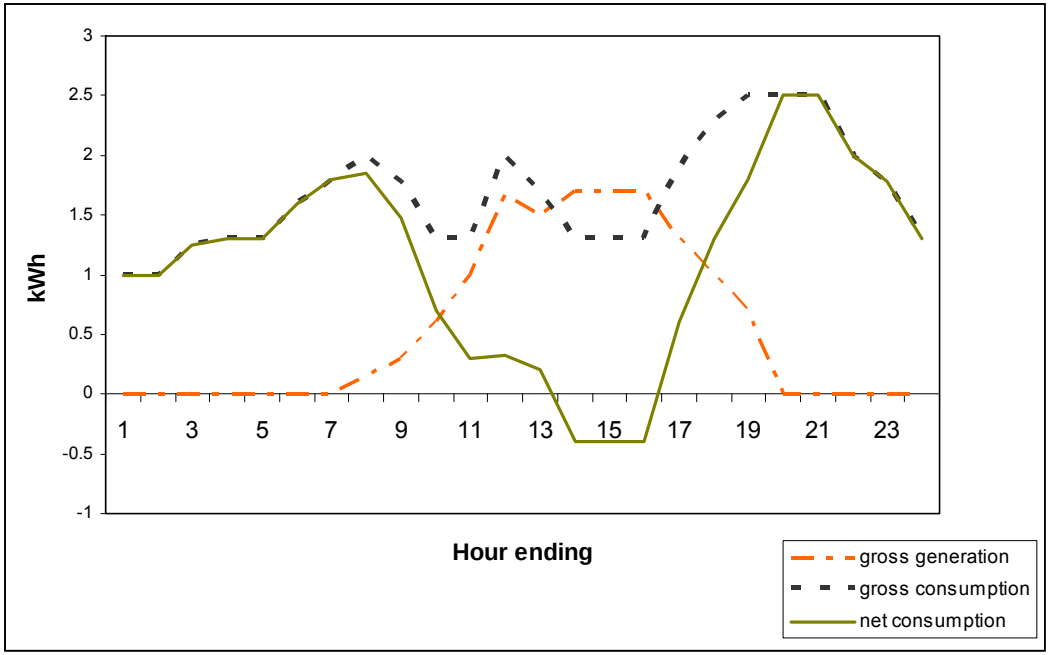
NEM does not change customer bill

Example 2:

Same PV Output, more erratic load



Example 2



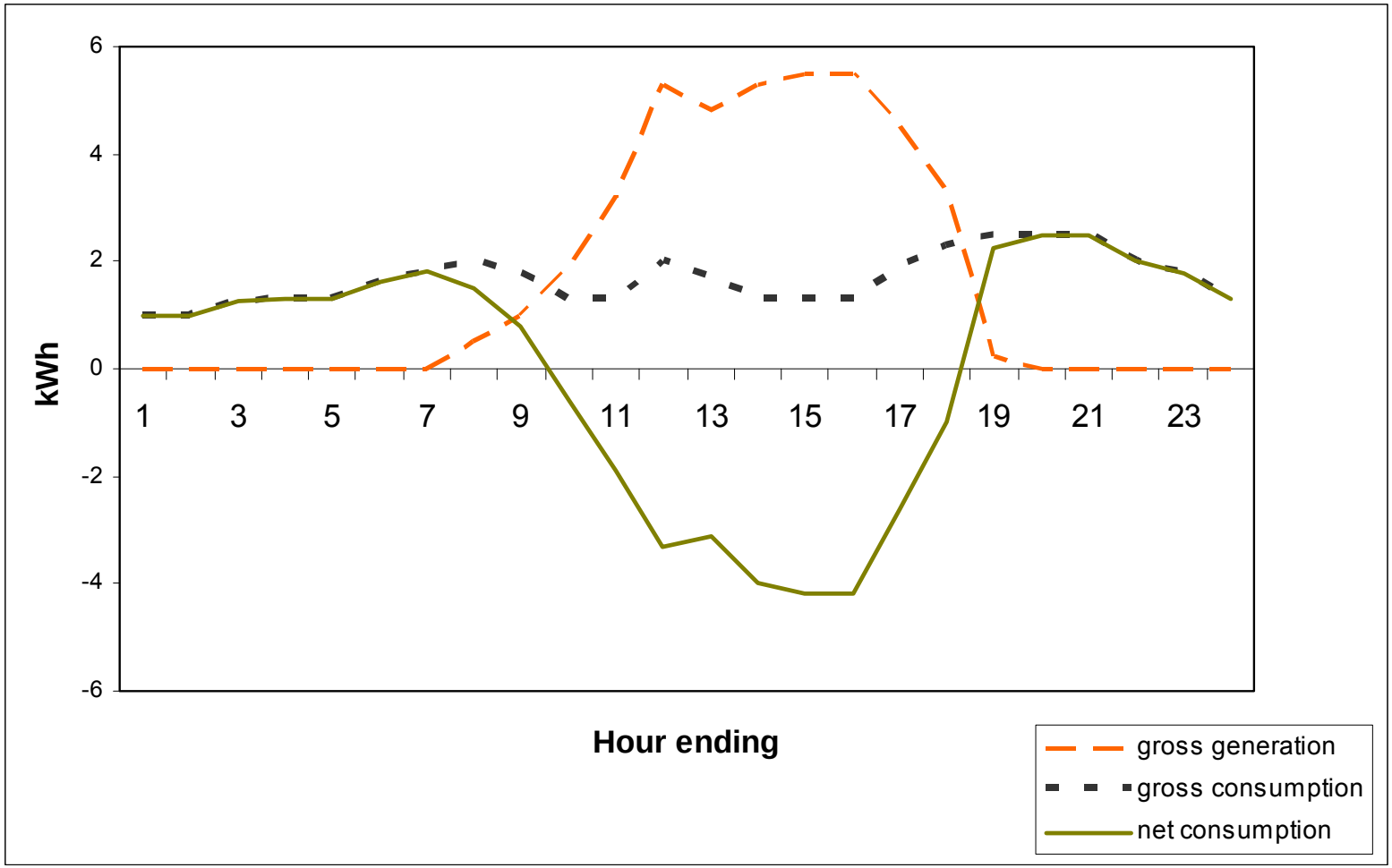
Gross Load	1,200 kWh / month
Gross PV Output	400 kWh / month
Export Energy	36 kWh

	Old Bill	New Bill
Tier 4	302	0
Tier 3	314	180
Tier 2	134	134
Tier 1	450	450
Total	1200	764

First 364 kWh directly offsets Tier-4 and part of Tier-3. Export credit is applied against remaining Tier-3.

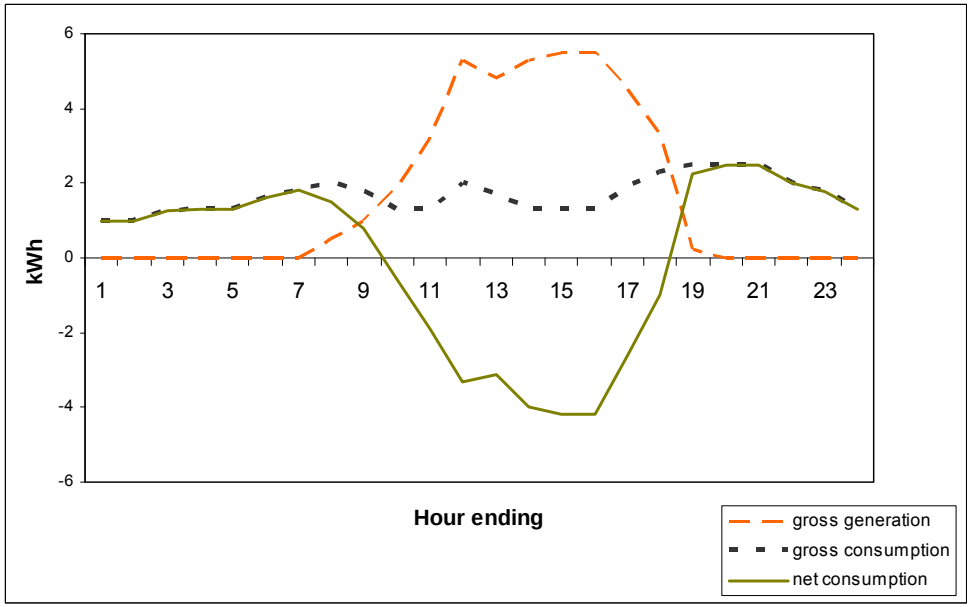
Example 3:

Same Load as Example 2, larger PV system



Example 3

453 kWh directly offsets Tier-4 and part of Tier-3. NEM credit for 747 kWh offsets remainder of Tier-3 and Tiers 1 and 2.



Gross Load	1,200 kWh / month
Gross PV Output	1,231 kWh / month
Export Energy	747 kWh

	Old Bill	New Bill
Tier 4	302	0
Tier 3	314	0
Tier 2	134	0
Tier 1	450	0
Total	1200	0

	Carryover Credit
Tier 4	0
Tier 3	0
Tier 2	0
Tier 1	31
Total	31

Net-excess generation carried over as a $ credit, working up the tiers

Bill Impacts May Vary Widely

Gross Load	1,200 kWh / month
Gross PV Output	400 kWh / month
Export Energy	0 kWh

No bill impacts from NEM

Gross Load	1,200 kWh / month
Gross PV Output	400 kWh / month
Export Energy	36 kWh

	Old Bill	New Bill
Tier 4	302	0
Tier 3	314	180
Tier 2	134	134
Tier 1	450	450
Total	1200	764

All in Tier-3

Gross Load	1,200 kWh / month
Gross PV Output	1,231 kWh / month
Export Energy	747 kWh

	Old Bill	New Bill
Tier 4	302	0
Tier 3	314	0
Tier 2	134	0
Tier 1	450	0
Total	1200	0

Multiple Tiers, much in Tier-1

	Carryover Credit
Tier 4	0
Tier 3	0
Tier 2	0
Tier 1	31
Total	31

One Final Note - TOU

On a TOU rate it is possible to be have a $ carryover while being a net consumer of electricity

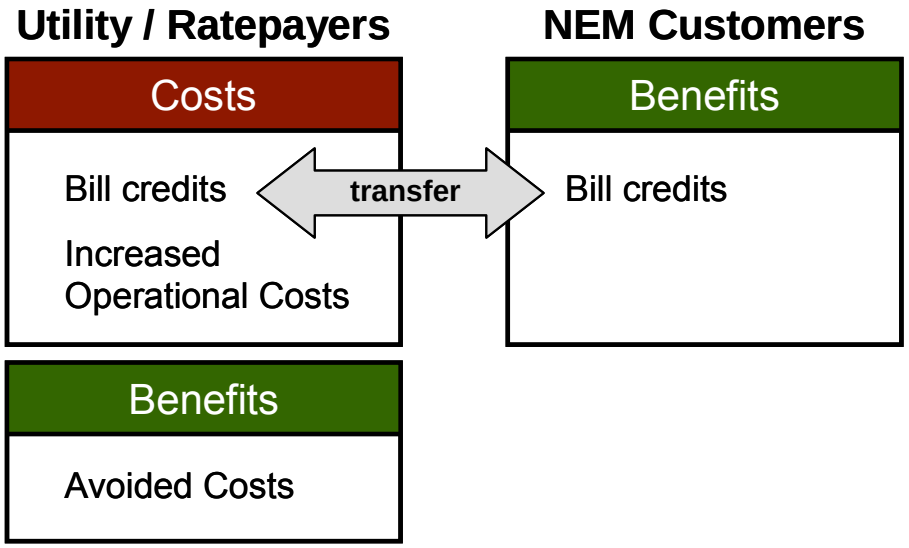
	Net kWh	Avg Rate	Charges
Peak Period	(960) (Net export)	0.35	($336)
Off-Peak Period	1,200	0.15	180
Total	240		($156)

Credit carried over to following month

Framework for NEM Analysis

NEM Cost-Effectiveness

- Research Question: What are the costs and benefits that directly arise from NEM?



- ***Not*** an evaluation of the cost-effectiveness of Solar PV or the CSI program.

Additional Considerations

- Only considers photovoltaic generation
- Evaluates the ratepayer costs of NEM consistent with DG Cost-Benefit Decision*
  - Avoided cost development posted publicly for stakeholder comment
- Includes AB920 assessment, but does not presuppose approach for AB920 implementation

* Decision (D.) 09-08-026

Focus of Study is Solar PV

	PG&E	SCE	SDG&E	Total	(%)
Fuel Cell	**3**	**2**	**4**	**9**	**(0%)**
Residential	-	-	-	-	
Non-Residential	*3*	*2*	*4*	*9*	
Hybrid[1]	17	**-**	**-**	**17**	**(0%)**
Residential	-	-	-	-	
Non-Residential	*17*	-	-	*17*	
Solar PV	**26,864**	**8,659**	**5,721**	**41,244**	**(99%)**
Residential	*25,124*	*7,926*	*5,330*	*38,380*	
Non-Residential	*1,740*	*733*	*391*	*2,864*	
Wind / Solar	**76**	**-**	**7**	**83**	**(0%)**
Residential	*71*	-	*7*	*78*	
Non-Residential	*5*	-	-	*5*	
Wind	**69**	**217**	**12**	**298**	**(1%)**
Residential	*55*	*202*	*10*	*267*	
Non-Residential	*14*	*15*	*2*	*31*	
Biogas	**1**	**4**	**1**	**6**	**(0%)**
Residential	-	-	-	-	
Non-Residential	*1*	*4*	*1*	*6*	
Total	***27,030***	***8,882***	***5,745***	***41,657***	***(100%)***
Residential	*25,250*	*8,128*	*5,347*	*38,725*	
Non-Residential	*1,780*	*754*	*398*	*2,932*	

- 99% of customers
- 95% of capacity
- 88% of generation

AB 920 (2009) Included

- AB 920 Summary
  - Customers no longer forfeit credits remaining at end of year
    - Roll forward indefinitely
    - Receive compensation at a to-be-determined valuation
  - Customers may begin receiving compensation in January 2011
- Disclaimer: Treatment of AB 920 in NEM analysis does not reflect a broader policy position on implementation of AB 920

Study Approach

… review of the approach described from the November 20, 2009 workshop…

Analysis Steps for NEM Report

1. Analysis of existing system performance
2. Analysis of billing data and installs
3. Bill calculations by rate and segment
4. Utility avoided cost calculations
5. Net NEM cost by rate and customer size

Stakeholder Feedback Incorporated from the November Workshop

- Lifecycle perspective rather than single year or costs/benefits to-date.
- Careful attention to data quality and completeness of metered output data
- Sensitivity excluding T&D Avoided Cost benefits
- Sensitivity on Standby Charges
- Transparency

1. Analysis of Existing Systems

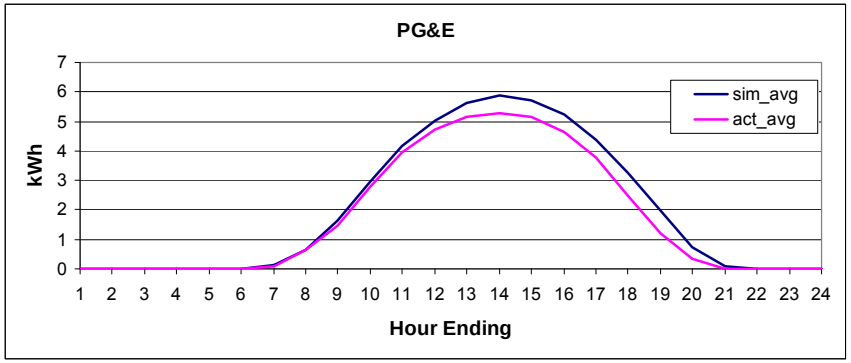
- Analysis of existing PV installations to calculate capacity factor
  - *Cap Factor* = *f* (kW ac, customer type, location)
  - Annual Output = Cap. Factor * kW ac * hours
- Need identified to simulate residential systems because of poor data availability on small systems
- Results show:
  - Capacity Factors broken down by size, customer type, and location
  - Determine representative selection of PV output profiles
    - {A, B, C, D, E}

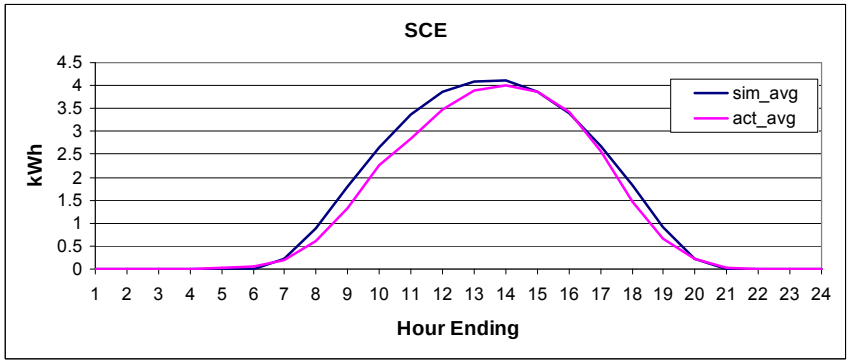
Available Data

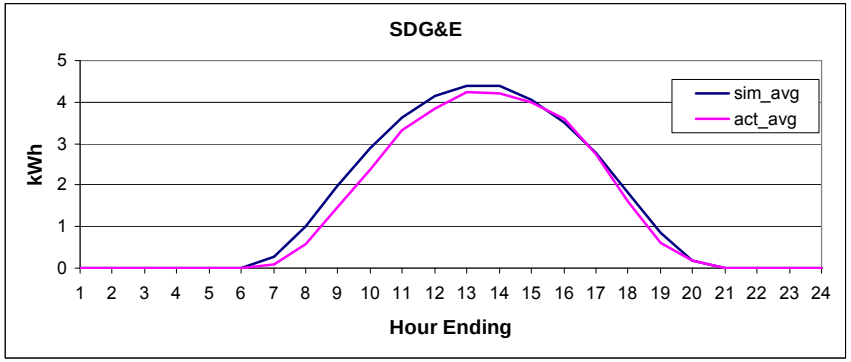
Data Source	Number of Records			
	PG&E	SCE	SDG&E	Total
Generation capacity for NEM customer Solar PV	**26,864**	**8,659**	**5,721**	**41,244**
Installed PV generation capacity and other PV system characteristics from the PowerClerk database	18,555	7,180	3,702	29,437
NEM customer billing data from the utilities, which provides monthly consumption net of PV generation	25,537	5,768	6,685	37,990
Itron SGIP hourly metered 2008 PV generation	303	177	77	557
Hourly metered 2008 PV generation from CSI PMRS providers	39	20	10	69
Billing data successfully linked to PV capacity data (Row 3 linked to Row 1 or Row 2)	***19,310***	***5,247***	***6,679***	***31,236***

Simulation to Augment Available Output Data

- Metered output data were incomplete – required simulation for representative profiles for each bin
- 294 of 624 output shapes were purely simulated, many of remainder were augmented through simulation
- Method used linear regression to fit simulated data to available metered data







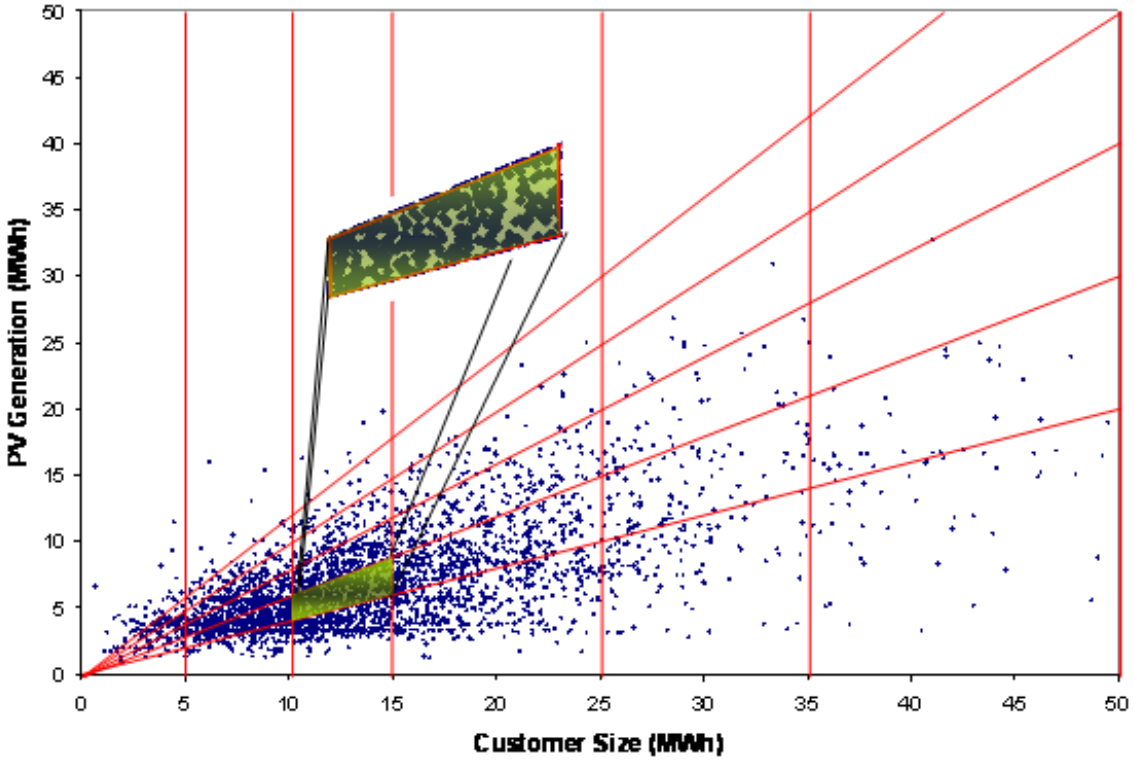
Capacity Factors

Utility	Climate Zone	Customer Class	
		Residential	Non-Residential
PG&E	Coast	15.4%	15.3%
	Desert/Mountain	16.1%	16.6%
	Hills	14.8%	16.7%
	Valley	15.7%	17.9%
SCE	CEC Zone 6	14.7%	16.8%
	CEC Zone 8	17.3%	16.2%
	CEC Zone 9	17.8%	19.6%
	CEC Zone 10	19.8%	16.1%
	CEC Zone 13	16.8%	17.0%
	CEC Zone 14	20.6%	17.7%
	CEC Zone 15	19.6%	20.7%
	CEC Zone 16	19.5%	18.5%
SDG&E	Coastal	18.0%	16.0%
	Mountains	17.9%	20.1%
	Desert	21.0%	20.4%
	Inland	17.4%	20.2%

2. Analysis of Billing Data and Installed Systems by Customer

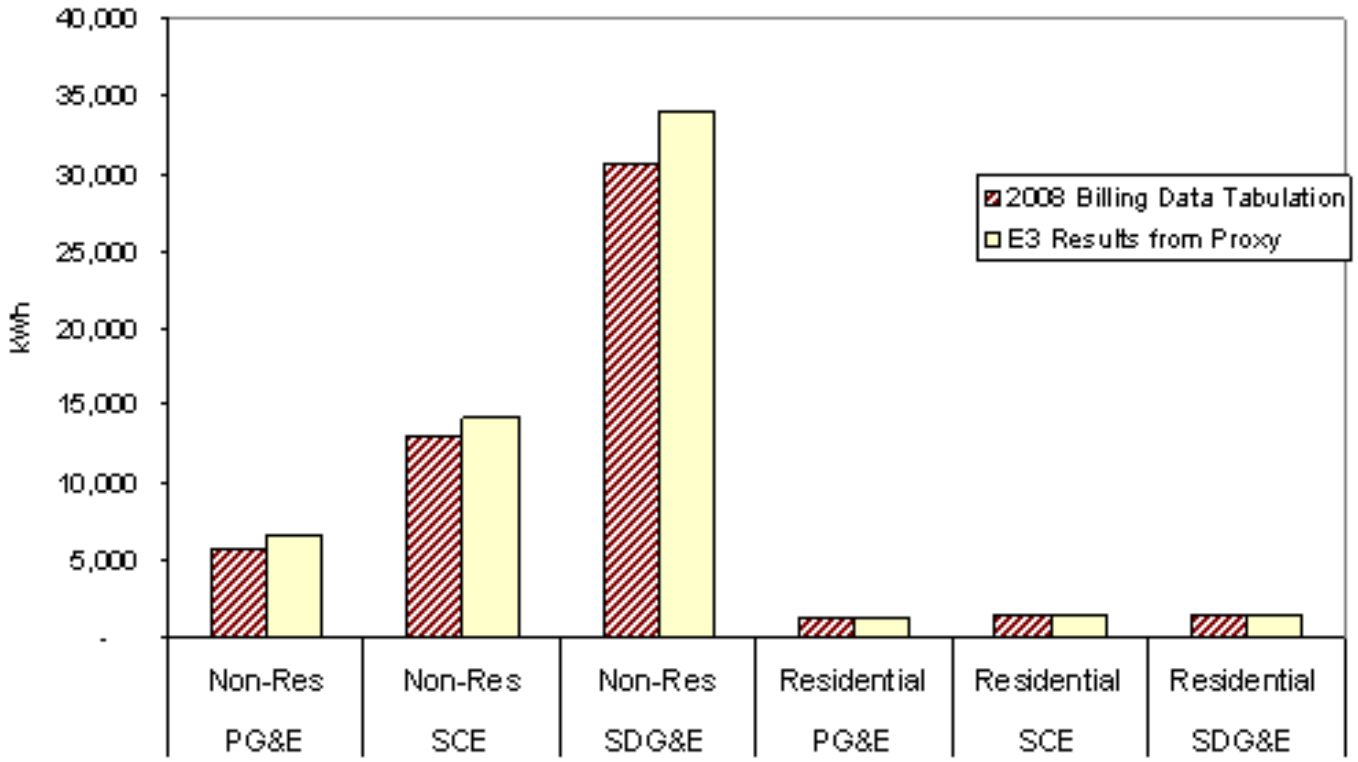
- Categorize customers by:
  - Customer Type
  - Climate Zone
- Count the number of customers in each segment of customer size and PV output
- Tabulate other metrics such as the share of PV generation that is exported by category

“Binning” of Account Data



- 86 groupings like chart above – Utility, Climate zone, Customer Class, Rate
- 1,253 bins like the one highlighted – Customer Size, Ratio of Generation to Load.

Benchmarking of Estimated 12-Month Export Balance Against Utility Billing Data



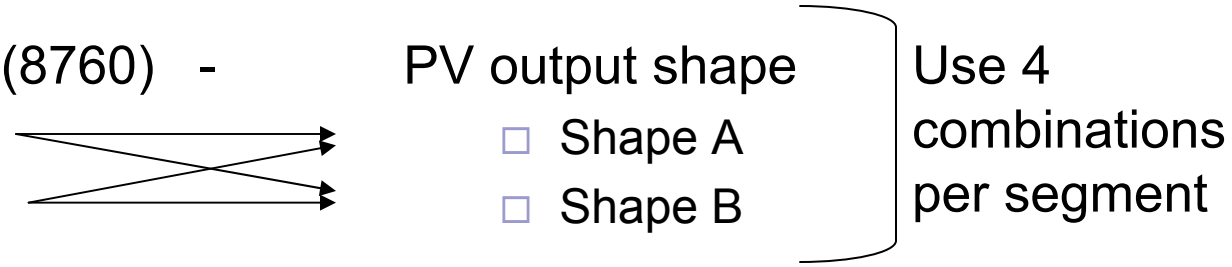
Net Load Shapes by Bin

Where data is available

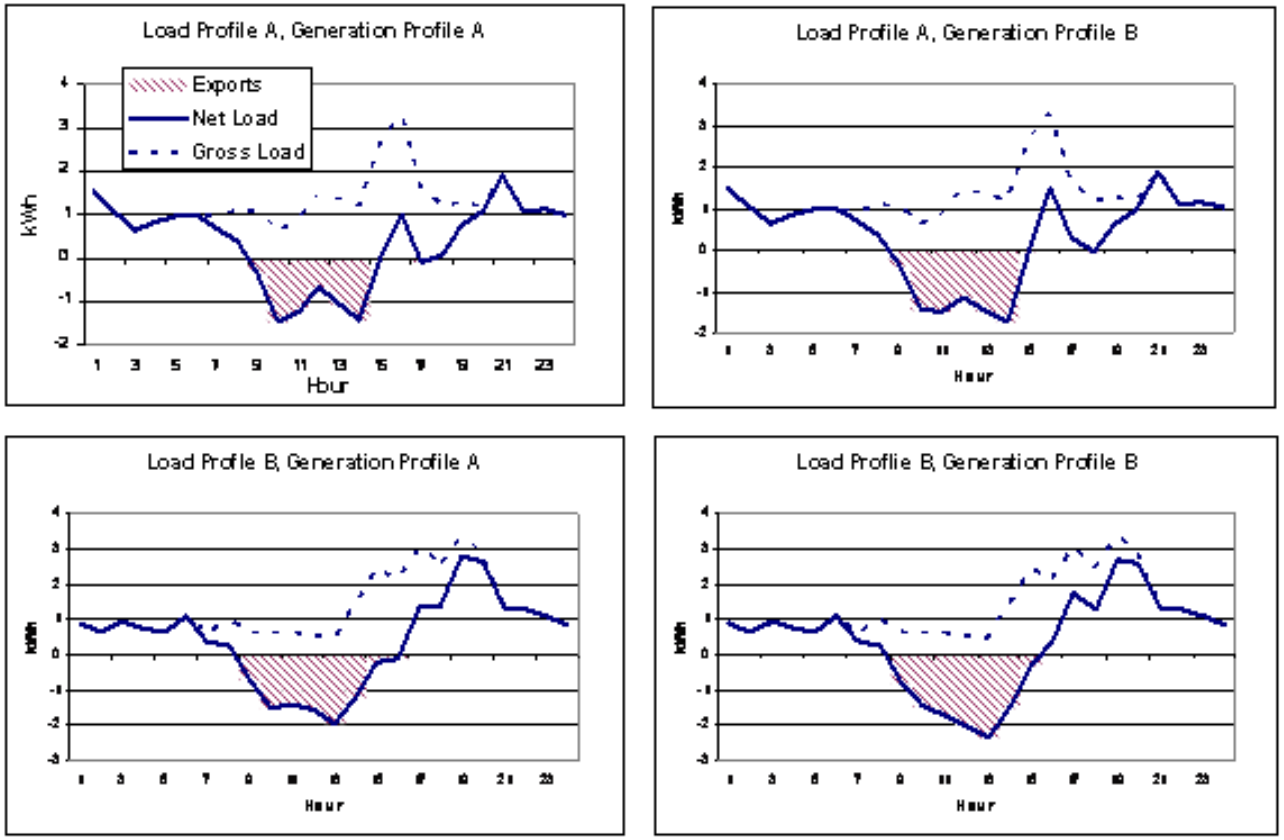
- Use actual hourly load shapes – less than 2% of accounts

Where data is not available

- Use load research shapes and metered PV output shapes
- For each category, run bill calculations based on combinations of:
  - customer load shapes (statistical profiles)
  - PV output shapes (selected from Step 1)
- Focus on categories with the majority of customers

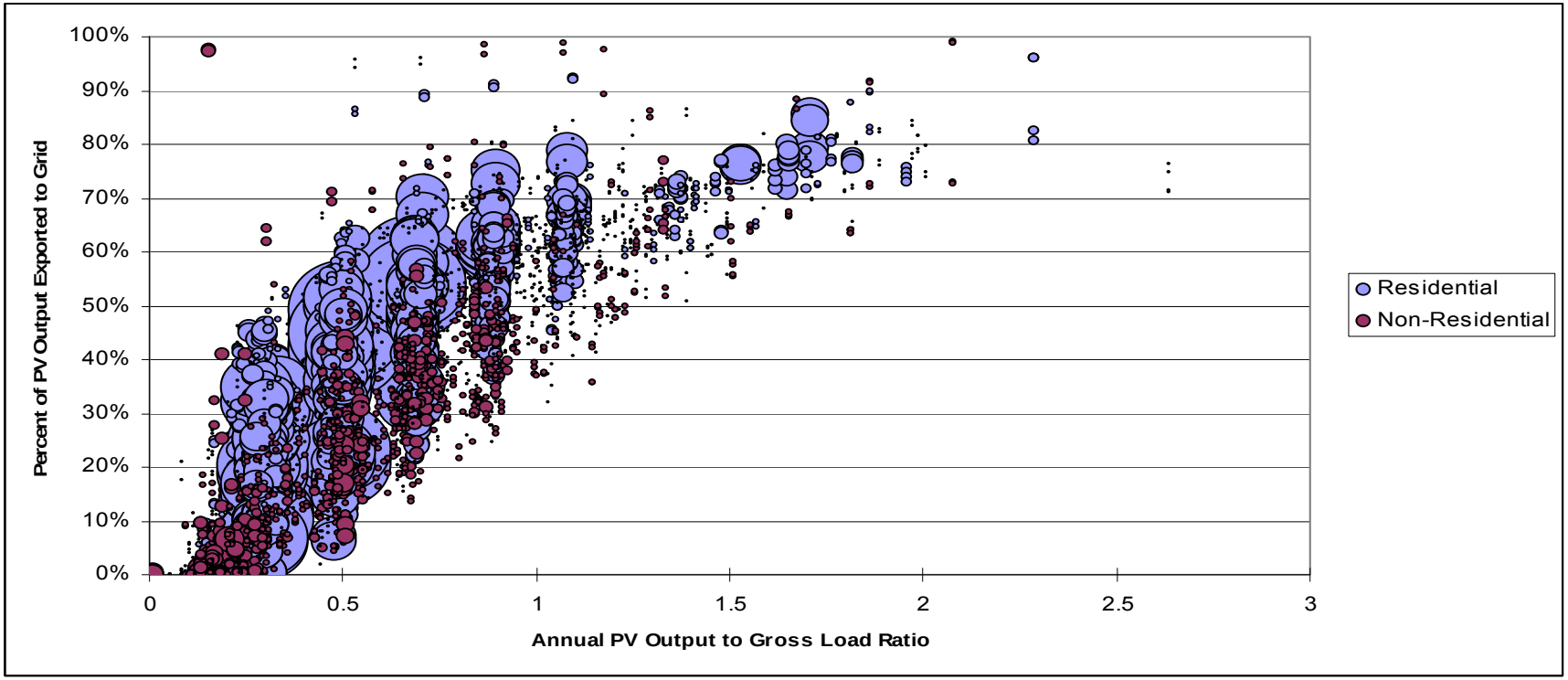


Representative Profiles for Each Bin



- **Output profiles**: Randomly selected from available profiles
- **Load profiles**: Sort available load shapes by load factor and pick load shapes representing the 33rd and 67th percentiles.

Percent of Generation Exported by Customer Class



Note: Bubble size proportional to the number of accounts represented

3. Calculate Bill Changes

- Clean Power Research rate analysis tool
  - Inputs; location, rate, hourly consumption profile
  - Outputs; annual bill and billing determinants
- Bills estimated with and without NEM for each hourly load shape for each bin
  - With NEM – meter spins backward, carryover credits
  - Without NEM – export hours treated as zero load
- Bill calculation tool available on E3 web site:
  - http://www.ethree.com/CPUC_CSI.html

CLEAN POWER® RESEARCH

Breakdown of Rates Evaluated

Utility	Rate	# of Accounts	Total Nameplate kW
PG&E	A1	504	9,314
	A10_TOU-S	3	491
	A10S	289	31,737
	E1	15,143	74,677
	E19S	47	17,289
	E1M	142	847
	E20PF	7	5,219
	E7	1,920	9,738
	E8	933	7,931
	Other	322	11,751
SCE	D	4,759	29,326
	GS1	164	2,162
	SG2	178	11,606
	Other	146	14,301
SDG&E	A	156	1,933
	A6	173	23,639
	DR	6,271	28,633
	Other	79	3,706
Total		*31,236*	*284,299*

Lifecycle Costs and Benefits

- 20-year analysis period – 2008-2027
- Vintage of solar installed through 2008
- Annual extrapolation of 2008 benefits and costs

Annual degradation in PV Output	1.25%
Rate increase in nominal dollars	4.47%
Discount rate (average utility WACC)	8.65%

Exported vs. Offset Energy

Comparison of Billing Effects

	Total – All Utilities	**Percent**
Direct Offset	$1,119,309	75%
NEM Bill Impacts (including AB 920 effects)	$373,910	25%
Total Bill Effects	*$1,493,219*	*100%*

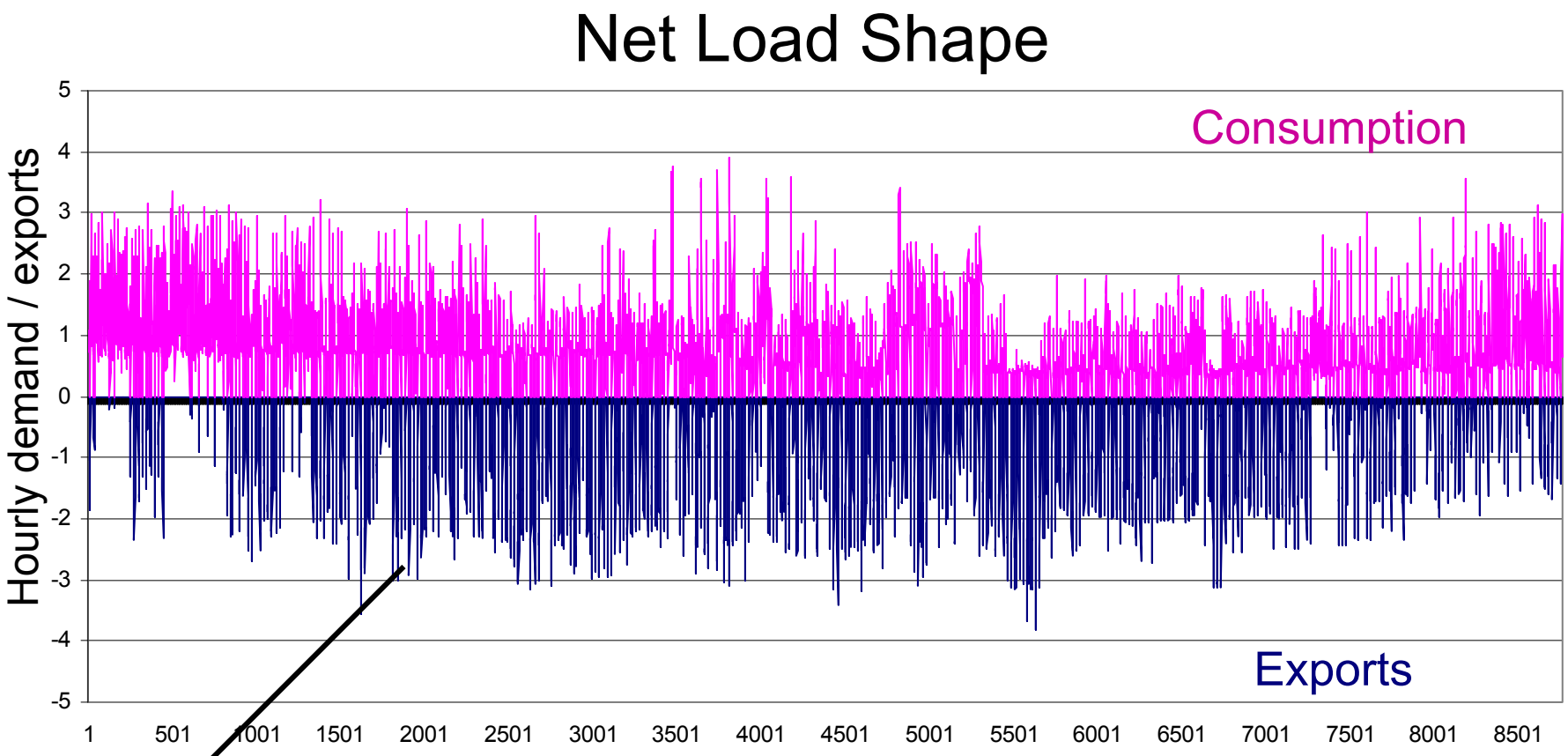
4. Calculate Utility Avoided Costs

- Using avoided cost methodology:

  $$\text{Annual Value} = \Sigma\ (\text{Utility Value}_{\text{Hour}}\ (\$/\text{kWh}) * \text{kWh Exported}_{\text{Hour}})$$

- Lifecycle value = NPV (Annual Values)
- Avoided cost values and export data are chronologically aligned
  - 2008 avoided costs for 2008 net kWh exported
- Data sources
  - 2008 market data, 2008 CAISO loads, 2008 PV output and exports
  - Methodology of avoided cost development

Avoided cost of exported energy



Utility avoided costs only from exports

CPUC DG Cost-Benefit Decision

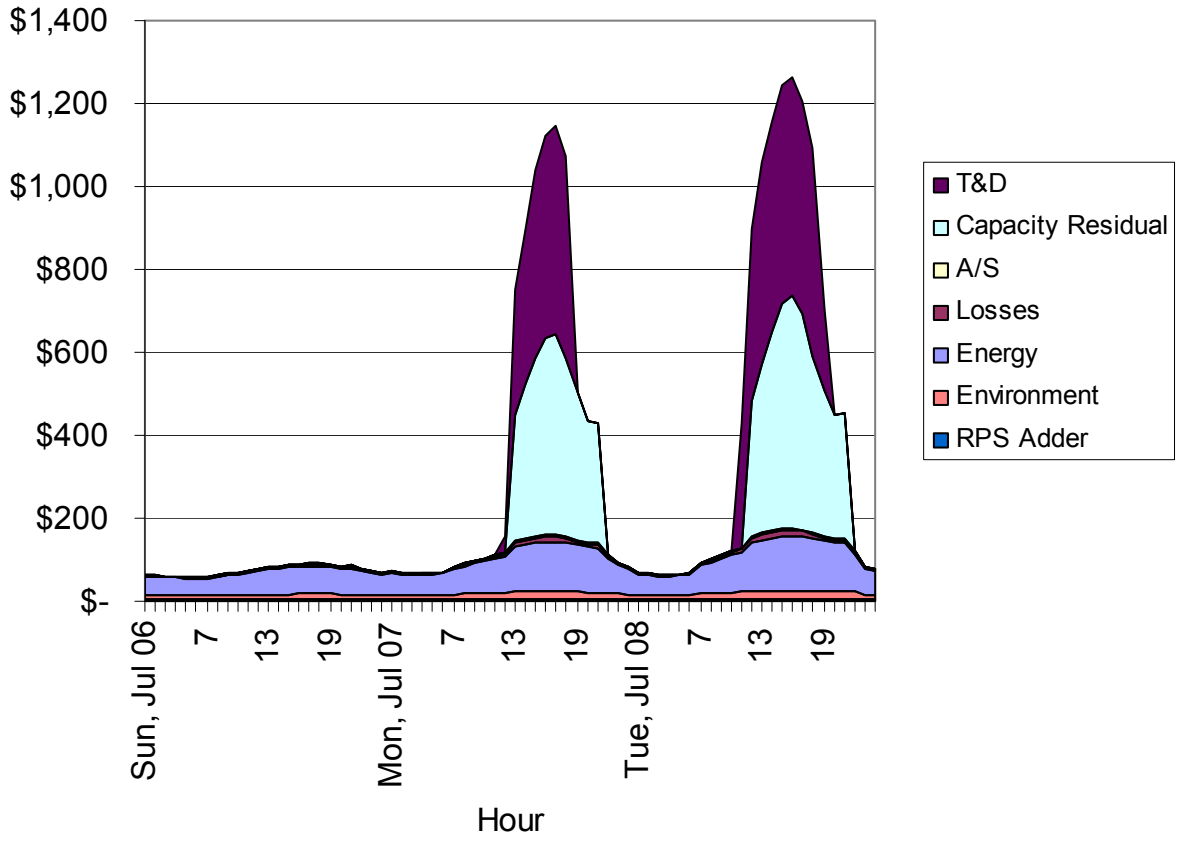
- Decision 09-08-026, August 20, 2009
  - To compare resource options, evaluate effectiveness of DG
  - Applies broadly, but intended specifically for CSI and SGIP
- Adopts the following principles:
  - Multiple Perspectives
  - Builds on EE avoided cost methodology
  - Uses actual rates and program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

Avoided Cost Approach

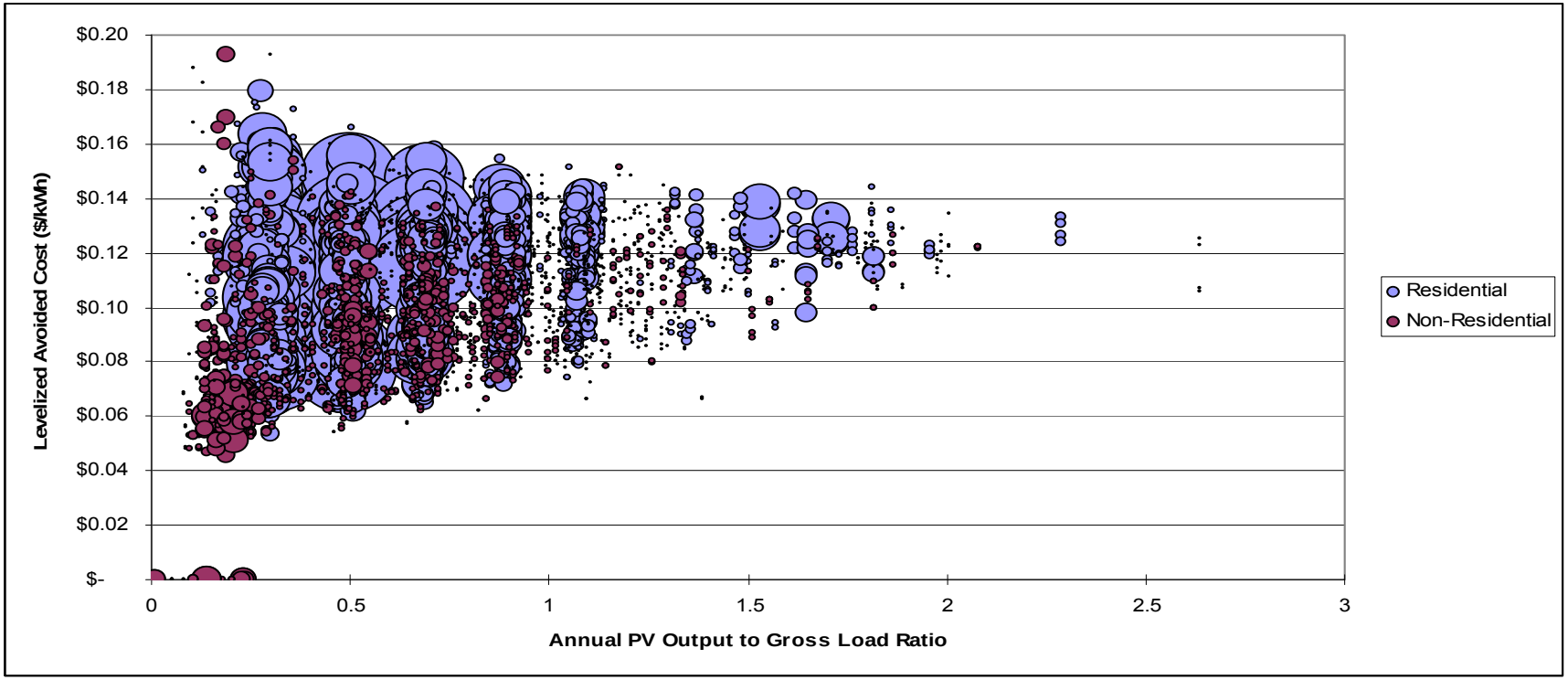
- Non-proprietary, publicly available data
- Provide additional transparency by making spreadsheet freely available to download
- Differences to prior avoided cost framework adopted for energy efficiency
  - Updated 2008 price shape
  - Allocation of RA capacity value to hours
  - Added value of avoided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

Components of Avoided Cost

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



Avoided Cost by Customer Class



Note: Bubble size proportional to the number of accounts represented

5. Net Cost of NEM by Rate Class

- Compute net cost per customer for each load shape and bin
  - Net cost = utility cost of NEM – utility value of NEM
- Compute total net cost by multiplying by number of customers in each bin
- Add billing and interconnection costs
- Tabulate lifecycle results

Incremental Billing Costs

PG&E

Billing Method	PG&E
Automatic NEM billing	$15.55
Manual NEM billing	$29.34

SDG&E

Billing Method	SDG&E
Residential	$5.96
Non-Residential	$17.44

SCE

Customer Type	SCE
Residential	$3.02
Non-Residential	
< 20 kW	$2.95
20 – 200 kW	$2.97
TOUs < 200 kW	$2.34
TOUs > 200 kW	$0.00

Weighted Average

Customer Type	PG&E	SCE	SDG&E
Residential	$18.31	$3.02	$5.96
Non-Residential	$18.31	$2.55	$17.44

Scaling of results

- Linked PV capacity and billing data = 31,236
- Total solar NEM accounts = 41,244
- Scaled up to include value for accounts not represented
  - By *capacity* rather than number of customers

Results

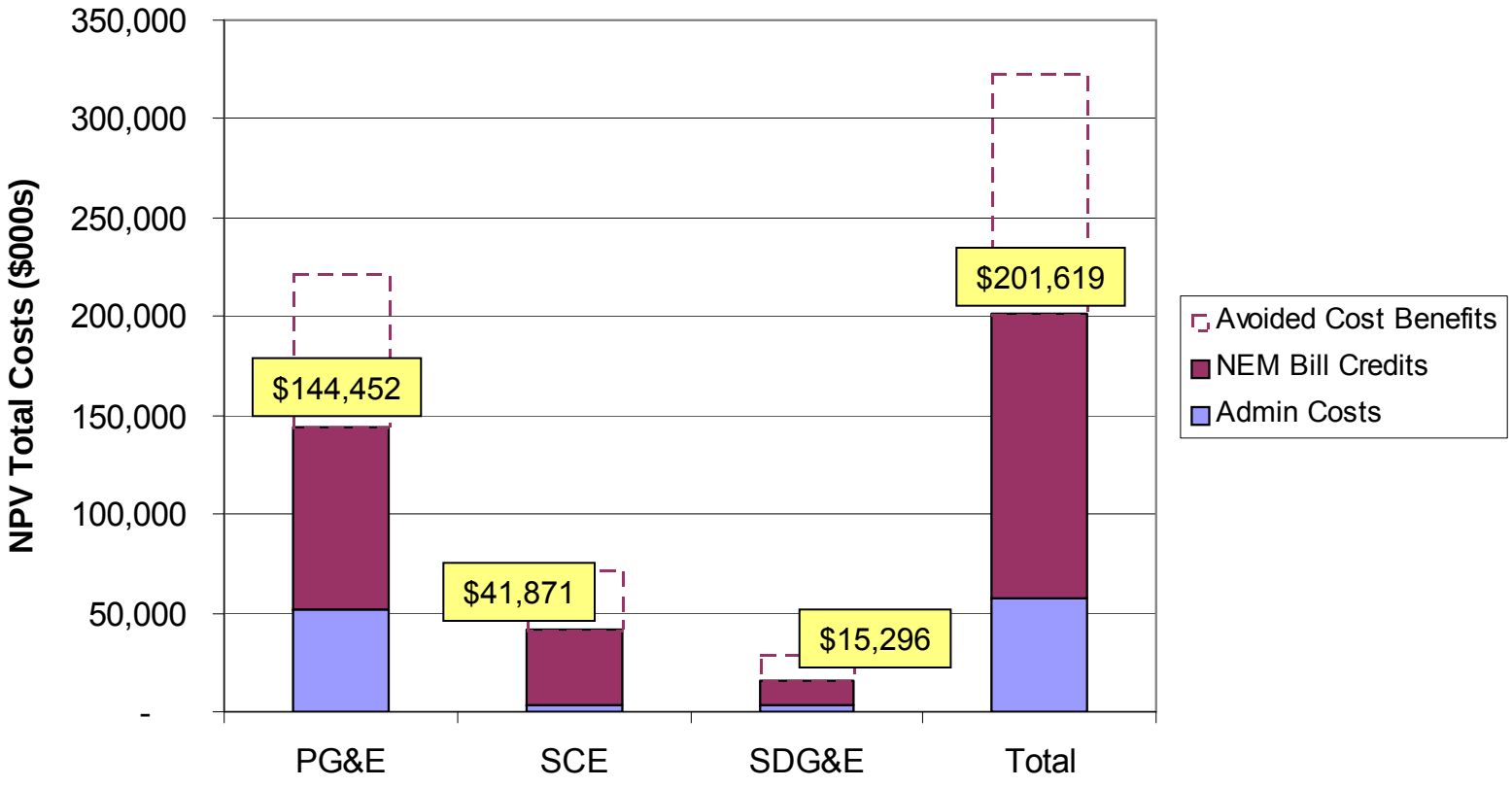
Net Present Value (NPV)	20-year analysis period, 2008 $, discount rate = average utility WACC
Annualized Value	Uniform annual stream of costs that would result in same NPV value
Levelized Value	Annualized value per kWh exported

Total NEM Costs (NPV)

($000s)

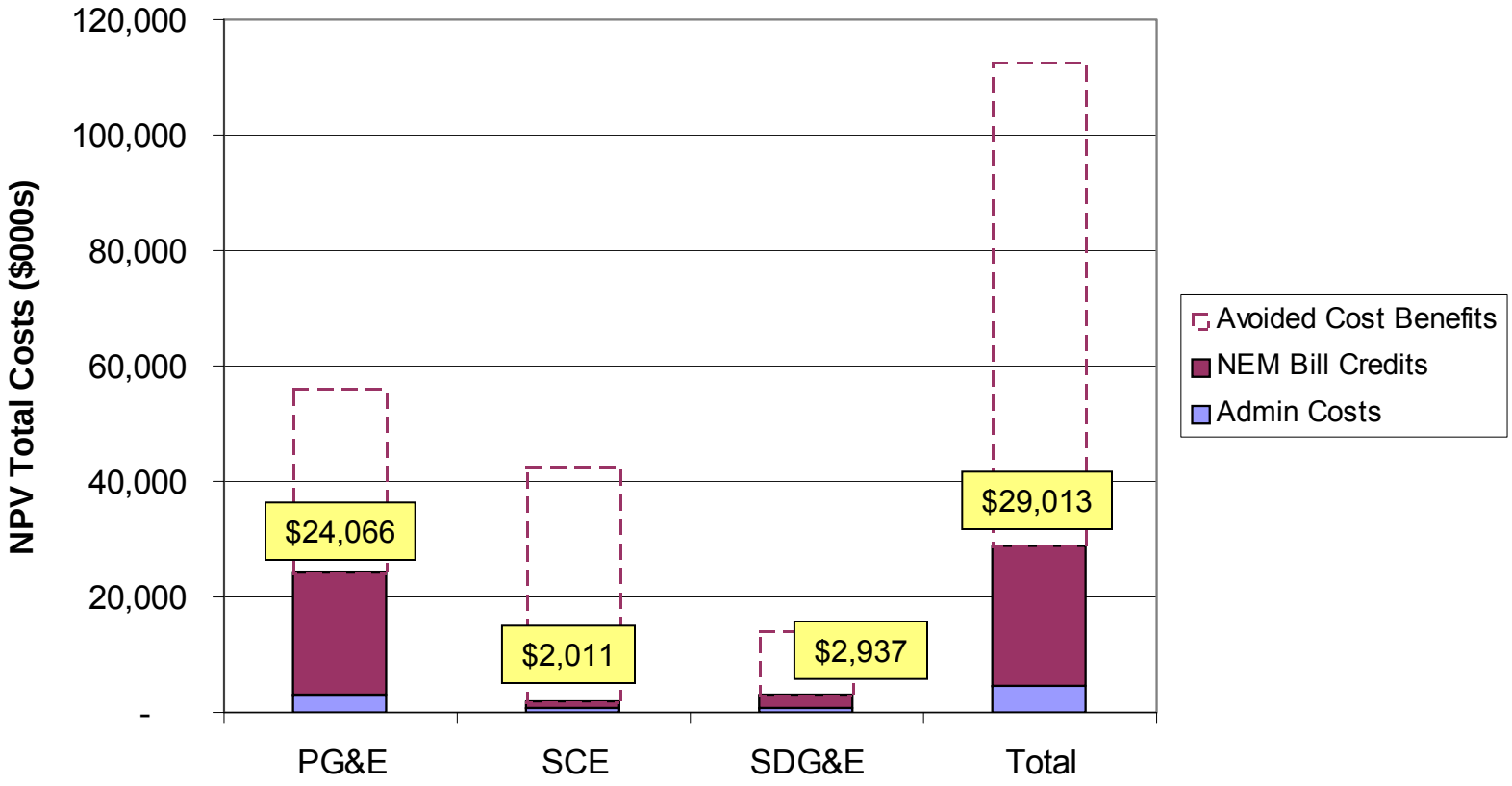
	Residential	Non-Residential	Total
PG&E	**($144,452)**	**($24,066)**	**($168,519)**
SCE	**($41,871)**	**($2,011)**	**($43,882)**
SDG&E	**($15,296)**	**($2,937)**	**($18,232)**
All Utilities	**($201,619)**	**($29,013)**	**($230,632)**

Residential NEM Costs (NPV)



Note: costs are expressed as positive values for ease of representation

Non-Residential NEM Costs (NPV)



Note: costs are expressed as positive values for ease of representation

Total NEM Costs (Annualized)

($000s)

	Residential	Non-Residential	Total
PG&E	**($12,327)**	**($2,054)**	**($14,380)**
SCE	**($3,573)**	**($172)**	**($3,745)**
SDG&E	**($1,305)**	**($251)**	**($1,556)**
All Utilities	**($17,205)**	**($2,476)**	**($19,681)**

Total NEM Costs ($/kWh-exported)

	Residential	Non-Residential	Total
PG&E	**($0.22)**	**($0.07)**	**($0.17)**
SCE	**($0.14)**	**($0.01)**	**($0.06)**
SDG&E	**($0.14)**	**($0.03)**	**($0.08)**
All Utilities	**($0.19)**	**($0.03)**	**($0.12)**

Annualized NEM Cost as percent of Utility Revenue

Through 2008, lifecycle annualized

	Net NEM Cost (Annualized $000s)	Total Revenue ($000s)	Percent	Implied Rate Increase ($/kWh)
PG&E	$14,380	$11,373,950	0.13%	0.00018
SCE	$3,745	$12,107,743	0.03%	0.00005
SDG&E	$1,556	$2,534,874	0.06%	0.00009
Total	**$19,681**	**$26,016,568**	**0.08%**	**0.00011**

2020 forecast, assuming achievement of CSI program goals

	Net NEM Cost (Annualized $000s)	Total Revenue ($000s)	Percent	Implied Rate Increase ($/kWh)
PG&E	$100,463	$15,921,596	0.63%	0.00106
SCE	$26, 164	$16,763,730	0.16%	0.00026
SDG&E	$10,871	$3,603,089	0.30%	0.00051
Total	**$137,497**	**$36,288,415**	**0.38%**	**0.00064**

Upfront Equivalents ($/W installed)

Equivalent upfront ratepayer cost ($/W)

	Residential	Non-Residential	Total
PG&E	($1.19)	($0.20)	($0.70)
SCE	($0.92)	($0.02)	($0.34)
SDG&E	($0.65)	($0.09)	($0.32)
Total	($1.06)	($0.12)	($0.54)

Equivalent upfront participant incentive ($/W)

	Residential	Non-Residential	Total
PG&E	$1.41	$0.44	$0.92
SCE	$1.53	$0.50	$0.87
SDG&E	$1.09	$0.40	$0.69
Total	$1.40	$0.46	$0.88

Sensitivities

Interconnection Cost

- Not included in Base Case because of limited data – only one utility provided

Levelized $/kWh

	Base Case	With Interconnection Costs	Percent Change
Bill Impacts	($0.193)	($0.193)	
Incremental Operational Cost	($0.032)	($0.044)	
Avoided Cost	$0.106	$0.106	
Net NEM Cost	($0.119)	($0.132)	+ 10%

Standby Charges

- Base Case does not include loss of Standby Charge revenue
  - Assumes that Standby Charges would not apply even in the absence of NEM
- Sensitivity tests loss of Standby Charge revenue

Levelized $/kWh

	Base Case	With Interconnection Costs	Percent Change
Bill Impacts	($0.193)	($0.209)	
Incremental Operational Cost	($0.032)	($0.032)	
Avoided Cost	$0.106	$0.106	
Net NEM Cost	($0.119)	($0.135)	+ 13%

T&D Avoided Costs

- Base Case includes T&D investment deferral benefits from reduced congestion
  - Consistent with Energy Efficiency Avoided Cost methodology
- Sensitivity excludes T&D avoided cost benefits

Levelized $/kWh

	Base Case	With Interconnection Costs	Percent Change
Bill Impacts	($0.193)	($0.193)	
Incremental Operational Cost	($0.032)	($0.032)	
Avoided Cost	$0.106	$0.092	
Net NEM Cost	($0.119)	($0.133)	+ 12%

Incremental Billing Costs

- Sensitivity eliminates incremental billing costs
- Upper bound on benefits from improved billing efficiencies

Levelized $/kWh

	Base Case	With Interconnection Costs	Percent Change
Bill Impacts	($0.193)	($0.193)	
Incremental Operational Cost	($0.032)	-	
Avoided Cost	$0.106	$0.106	
Net NEM Cost	($0.119)	($0.087)	- 27%

Range of Sensitivities

	Base Case	"Lowest" Cost	"Highest" Cost
20-year NPV ($000s)	($230,632)	($168,812)	($311,285)
20-year Annualized ($000s)	($19,681)	($14,405)	($26,563)
Levelized ($/kWh-exported)	($0.12)	($0.09)	($0.16)

Distribution of Impacts

Annualized Costs ($/Customer)

	Customer Size	PG&E	SCE	SDG&E	Wtd Average
Residential	0 to 5 MWh	**($147)**	($33)	**($47)**	**($118)**
	5 to 10 MWh	($226)	($135)	($112)	($197)
	10 to 15 MWh	($446)	($258)	($273)	($385)
	15 to 25 MWh	($656)	($526)	($383)	($588)
	25 to 35 MWh	($1,158)	($899)	($810)	($1,034)
	35 to 50 MWh	($1,802)	($1,460)	($1,015)	($1,601)
	50 to 100 MWh	($3,144)	($2,474)	($1,552)	($2,711)
	100 to 500 MWh	($15,002)	($4,217)	($16,821)	($10,368)
	Over 500 MWh	($133,608)		($62)	($95,187)
	Average	($537)	($465)	($305)	($493)
Non-Residential	0 to 5 MWh	($297)	($156)	($198)	($205)
	5 to 10 MWh	($354)	($206)	($346)	($292)
	10 to 15 MWh	($391)	($139)	**($47)**	($233)
	15 to 25 MWh	($511)	($221)	($552)	($343)
	25 to 35 MWh	($578)	($96)	($466)	($295)
	35 to 50 MWh	($809)	($194)	($726)	($397)
	50 to 100 MWh	($989)	($255)	($826)	($551)
	100 to 500 MWh	($1,401)	($32)	($763)	($613)
	Over 500 MWh	($4,091)	**$623**	($989)	($1,975)
	Average	($1,407)	($84)	($781)	($650)
Average		($589)	($386)	($338)	($508)

Levelized Cost ($/kWh-exported)

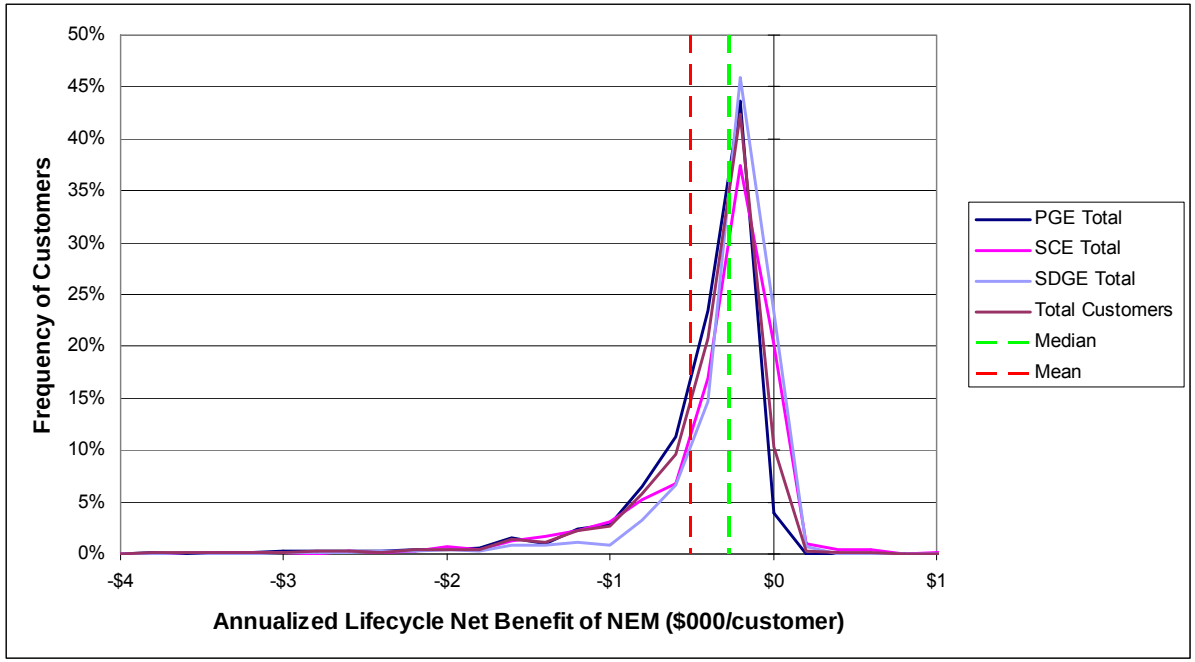
	Customer Size	PG&E	SCE	SDG&E	Wtd Average
Residential	0 to 5 MWh	($0.08)	($0.02)	($0.03)	($0.06)
	5 to 10 MWh	($0.11)	($0.06)	($0.06)	($0.10)
	10 to 15 MWh	($0.21)	($0.10)	($0.13)	($0.18)
	15 to 25 MWh	($0.27)	($0.15)	($0.21)	($0.22)
	25 to 35 MWh	($0.33)	($0.20)	($0.25)	($0.27)
	35 to 50 MWh	($0.37)	($0.20)	($0.25)	($0.29)
	50 to 100 MWh	($0.37)	($0.23)	($0.24)	($0.30)
	100 to 500 MWh	($0.34)	($0.23)	($0.25)	($0.30)
	Over 500 MWh	($0.31)			($0.31)
	Average	($0.22)	($0.14)	($0.14)	($0.19)
Non-Residential	0 to 5 MWh	($0.13)	($0.07)	($0.03)	($0.08)
	5 to 10 MWh	($0.14)	($0.06)	($0.09)	($0.10)
	10 to 15 MWh	($0.13)	($0.03)	($0.01)	($0.06)
	15 to 25 MWh	($0.12)	($0.06)	($0.10)	($0.09)
	25 to 35 MWh	($0.15)	($0.02)	($0.06)	($0.06)
	35 to 50 MWh	($0.11)	($0.03)	($0.09)	($0.06)
	50 to 100 MWh	($0.10)	($0.02)	($0.07)	($0.05)
	100 to 500 MWh	($0.08)	($0.00)	($0.02)	($0.03)
	Over 500 MWh	($0.05)	$0.01	($0.03)	($0.03)
	Average	($0.07)	($0.01)	($0.03)	($0.03)
Average		($0.17)	($0.06)	($0.08)	($0.12)

AB 920 Effect (% of total bill impacts)

	Customer Size	PG&E	SCE	SDG&E	Total
Residential	0 to 5 MWh	11.42%	14.45%	12.68%	12.07%
	5 to 10 MWh	0.96%	1.56%	1.97%	1.21%
	10 to 15 MWh	0.19%	0.50%	0.74%	0.32%
	15 to 25 MWh	0.05%	0.09%	0.19%	0.07%
	25 to 35 MWh	0.13%	0.01%	0.12%	0.09%
	35 to 50 MWh	0.10%	0.10%	0.05%	0.10%
	50 to 100 MWh	0.00%	0.00%	0.13%	0.01%
	100 to 500 MWh	0.00%	0.00%	0.00%	0.00%
	Over 500 MWh	0.00%			0.00%
	Sub Total	0.60%	0.53%	1.20%	0.64%
Non-Residential	0 to 5 MWh	23.84%	10.70%	50.27%	20.18%
	5 to 10 MWh	7.67%	9.32%	5.24%	8.29%
	10 to 15 MWh	11.85%	30.45%	14.64%	23.00%
	15 to 25 MWh	2.03%	1.75%	0.00%	1.78%
	25 to 35 MWh	0.20%	9.81%	14.86%	6.13%
	35 to 50 MWh	2.72%	19.23%	5.62%	12.27%
	50 to 100 MWh	1.12%	0.00%	9.37%	1.63%
	100 to 500 MWh	0.21%	2.23%	0.83%	1.25%
	Over 500 MWh	0.00%	0.02%	3.94%	0.48%
	Sub Total	0.54%	3.28%	3.50%	1.98%
Total		0.58%	1.56%	2.00%	1.03%

Distribution Frequency

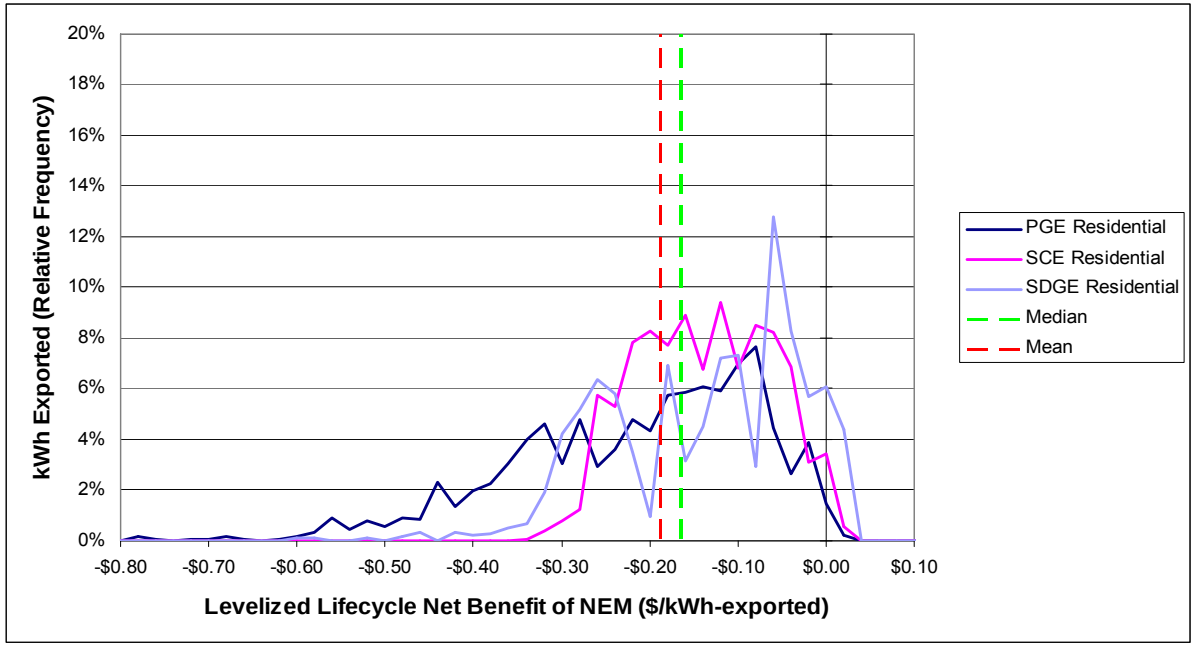
Annualized Cost per Customer; Res & Non-Res



	PG&E	SCE	SDG&E	Weighted Average
Mean	($589)	($386)	($338)	($508)
Median	($329)	($218)	($172)	($277)

Majority of customers "cost" less than $300/year. A small number of customers each export a much larger amount of energy, driving the average per-customer NEM cost to more than $500/year.

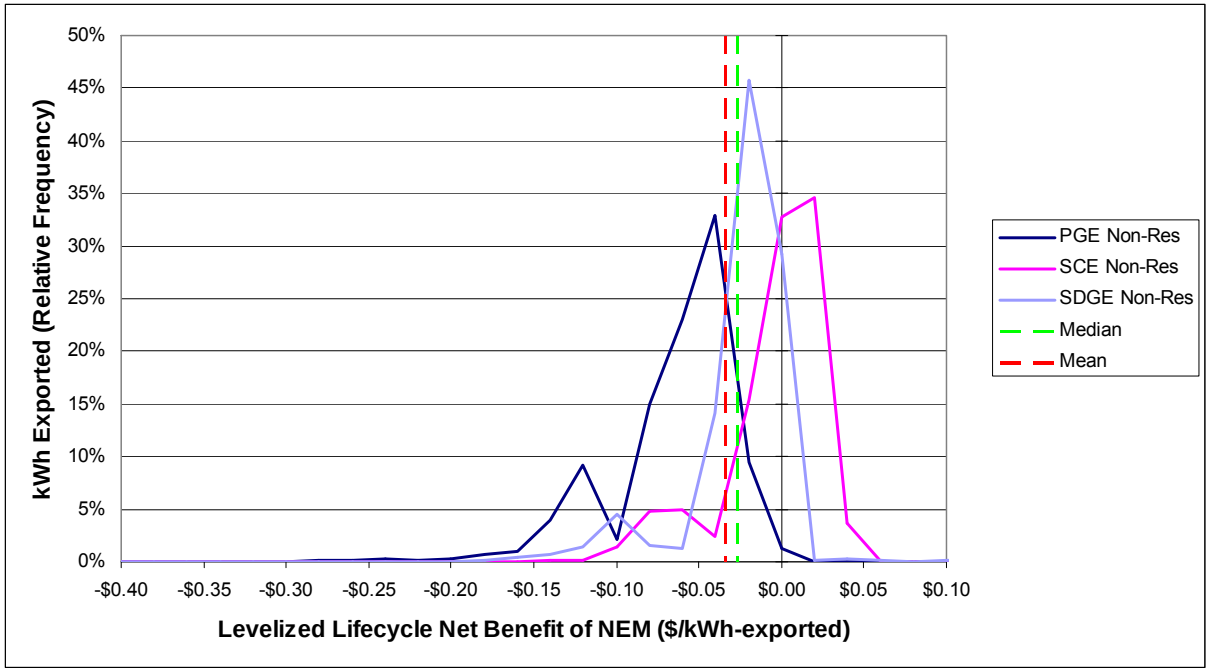
Frequency Distribution: Levelized $/kWh-exported, Residential



	PG&E	SCE	SDG&E	Weighted Average
Mean	($0.22)	($0.14)	($0.14)	($0.19)
Median	($0.19)	($0.14)	($0.11)	($0.16)

On a per-kWh-exported basis, the “cost” differential between mean and median customers is small. Eliminating the highest absolute cost customers (previous slide) would not result in a significant drop in overall NEM costs if the total kWh remained the same.

Frequency Distribution: Levelized $/kWh-exported, Non-residential



	PG&E	SCE	SDG&E	Weighted Average
Mean	($0.07)	($0.01)	($0.03)	($0.03)
Median	($0.06)	$0.00	($0.02)	($0.03)

On a per-kWh-exported basis, the “cost” differential between mean and median customers is small.

Any Questions?

CSI Cost-effectiveness

Target date end of April for workshop on draft results.

CSI Report - Primary Research Questions

- How should we calculate cost-effectiveness for a market transformation program?
- What is the cost-effectiveness of CSI applications…
  - Installed in 2007 and 2008?
  - Projected to be installed through 2017?
- What additional metrics can we use to measure progress of CSI towards the program goals?

Cost-effectiveness of CSI as a Market Transformation Program

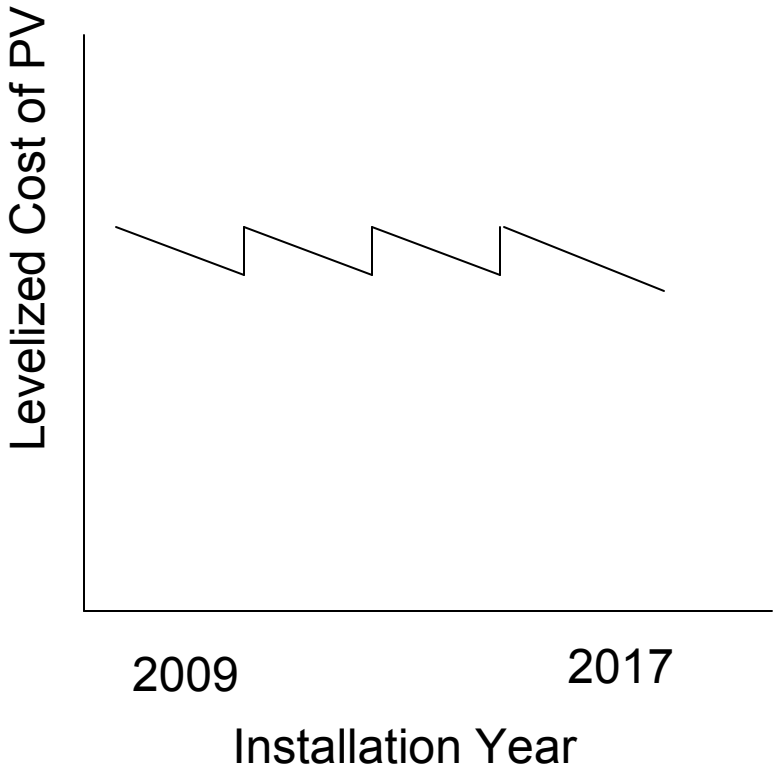
- Program goal is to achieve a self-sustaining market by end of program (2017)
- Cost-effectiveness should track program progress and provide information for improvements
- Framework uses existing tests to show trajectory

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?

Drivers of future cost-effectiveness

Framework allows assessment of key drivers

- ↑ Customer bill savings
  - Rate increases improve economics
- ↓ PV system cost
  - Learning rates decrease costs
- ↑ Avoided cost projections
  - Utility avoided cost increases, RPS
- ↓ CSI tiers
  - CSI tiers decrease over time
- ↓ Federal tax credit
  - Federal tax credit expires in 2017



Cost-Effectiveness Results

- Historical cost-effectiveness results show typical EM&V
- Forecasts capture market transformation effects
  - Scenarios of system cost reductions
    - Cost reduction path to hit payback level without incentives
    - Learning curve progress ratio

B/C Ratio Results

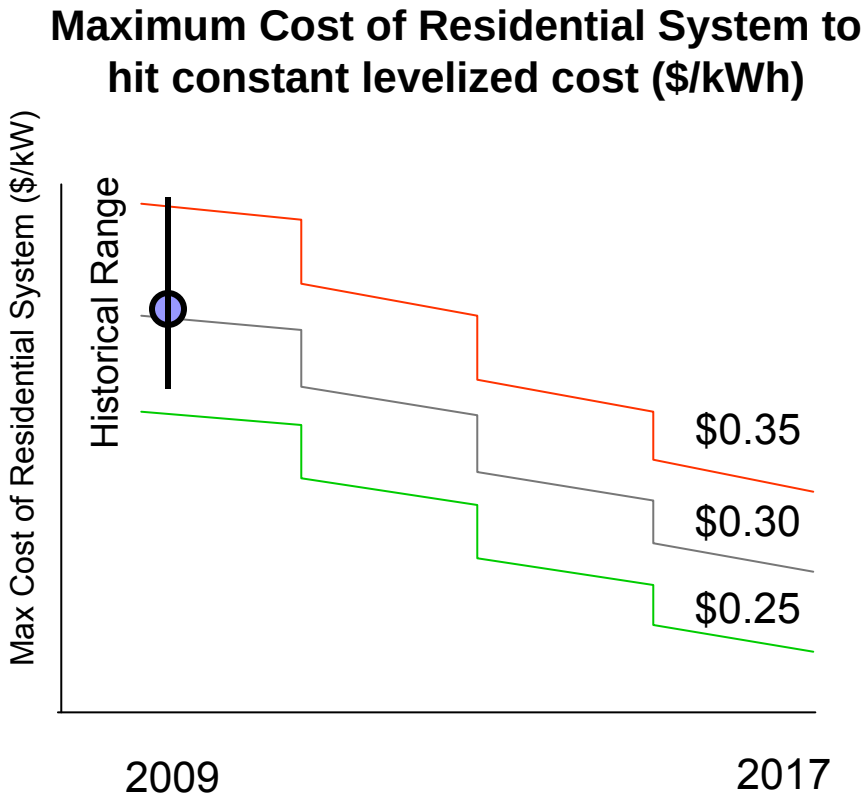
		Participant Cost Test PCT	Program Administrator Cost Test PAC	Total Resource Cost Test TRC
Historical	2007			
	2008			
	2009			
Forecast	2010			
	2011			
	2012			
	2013			
	2014			
	2015			
	2016			
	2017			
	2018			
	2019			
	2020			

Scenarios

Cost Trajectory Forecast

Top Down Analysis

- Cost trajectory shows required CA price points to hit cost levels
  - Levelized cost linked to customer adoption
- Provides metric to track program progress



Additional metrics to track progress?

- Number of installations in California
  - Progress toward capacity targets
  - Labor costs and efficiency
  - PV company health and labor force
- World-wide installations and manufacturing
  - California share of module purchases
  - California impact on learning curves for modules

Analysis Tool

- Single installation cost-effectiveness spreadsheet for public use
  - Avoided cost estimation
  - System cost and levelized cost calculation
  - Customer bill impact (CPR) module
- Scenarios on key inputs, ‘what if analysis’
  - System cost, learning rates, rate escalation, natural gas costs, RPS costs, others