

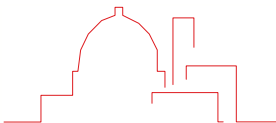


# SMUD SOLAR

**SACRAMENTO MUNICIPAL UTILITY DISTRICT**  
**Sacramento, California, USA**

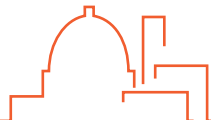
Jaspal Deol, P.E.  
Manager, Customer Operations

August 5, 2008



# Two Decades of Solar Leadership

- 1,190 Installations of distributed PV – 10.6 MW
  - Residential new home and retrofit applications
  - Neighborhood PV (Non-Profits)
  - Commercial (Large & Small)
  - Utility Scale



**SMUD**

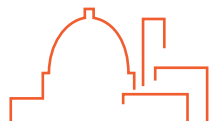
SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# PV Mix of Systems

Customer Type	January Number of New Systems	January Installed kW	2008 Number of New Systems	2008 Installed kW	2008 Total Number of Systems	2008 Total Installed kW	2008 Total kWh
PV 1 Residential	0	0.0	0	0.0	170	545	12,579
PV 2 Residential	1	2.3	1	2.3	413	1,137	61,716
SMUD Contractor Driven Residential	5	18.8	10	37.8	122	506	29,834
Residential New Construction	34	67.6	49	94.2	394	784	30,254
PV 1 Commercial	0	0.0	0	0.0	36	1,145	38,674
PV 2 Commercial	0	0.0	0	0.0	64	1,388	20,949
SMUD Contractor Driven Commercial	0	0.0	0	0.0	14	939	30,370
Utility Scale	0	0.0	0	0.0	18	3,769	114,617
Self Install	0	0.0	0	0.0	29	579	3,549
Other	1	1.9	1	1.9	6	19	1,284
<b>TOTAL</b>	<b>41</b>	<b>90.7</b>	<b>61</b>	<b>136</b>	<b>1,266</b>	<b>10,811</b>	<b>343,826</b>

Thru January 2008



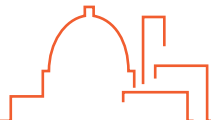
**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Power To Do More.

# Senate Bill (SB) 1- Impacts

- 3,000 MW California 10-year goal
- SMUD portion is 125 MW
  - \$130 million dollar commitment
  - Solar surcharge is part of Jan. 08 rate increase
    - 1/10 of a cent per kWh
  - We need to install as much solar every year as we have in the last 20 years
- CSI California Solar Initiative – Gov. million solar roof plan
- Rebates will decline over time



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Power To Do More.

# How SMUD will meet SB1 Targets

- Large commercial projects
- Residential new construction
- Residential Retrofit
- Solar Shares
- New business strategies
- Utility scale projects
  - do not contribute to SB1 goal
  - SB1 states customer sited projects
  - Possible legislative changes



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# Commercial Installations



Commercial	# of Installs	kW	Incentives
2006	3	109	\$ 290,000
2007	5	299	\$ 897,000
2008	28 applications	15.8 MW	\$ 44,036,000



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

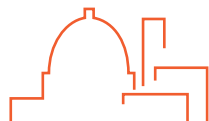
*The Power To Do More.*



# SMUD Solar Smart

## Current Participation Levels

- Over 4,200 Homes
- Over 6MW
- 12 Builder Partners
- Average system about 2kW
- Upgraded energy efficiency measures also required
- Transforming the market—solar part of every new home



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# SolarSmart Homes

## Required Efficiency Measures

<b>Measure</b>	<b>Base</b>	<b>SolarSmart New Homes</b>
Attic Insulation	R-38	R-38
<b>Radiant Barrier</b>	No	<b>Yes</b>
<b>Wall Insulation</b>	R-13	<b>R-13 + 1" R-4.2 Foam</b>
<b>Quality Installation*</b>	No	<b>Yes</b>
<b>Low Air Infiltration*</b>	No	<b>Yes</b>
Windows	Energy Star	Energy Star
<b>FURN AFUE</b>	0.80	<b>0.90+</b>
<b>A/C SEER</b>	13 (3.7 ton)	<b>14 SEER/12 EER (3.1 ton)</b>
<b>ACCA Design*</b>	No	<b>Yes</b>
<b>Duct Testing*</b>	No	<b>Yes</b>
<b>Fluorescent Lighting</b>	T-24	<b>Yes all recessed fixtures</b>
<b>Solar PV</b>	NA	<b>2kW AC Solar System</b>



\*verified upgrades



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Power To Do More.

# Residential Retrofit



Residential	# of Installs	kW	Incentives
2006	26	115	\$ 322,000
2007	59	190	\$ 490,000
2008 thru July	38	129	\$ 309,000
Pending	24	129	\$ 238,000

*Average System Size: 3.4 kW*

*Average duration: 15 weeks*

*Average Install Cost: \$9.50/watt*



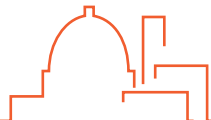
**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# Solar Shares

- Large installations, no site issues, made available to all customers in small units, 20 year contracts
- Launched July 14, 2008 (35% subscribed in first week)



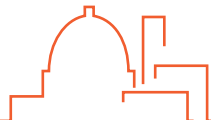
**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# 2007 - 2016 Incentives

<b>INCENTIVES</b>	<b>Step 1</b>	<b>Step 2</b>	<b>Step 3</b>	<b>Step 4</b>	<b>Step 5</b>	<b>Step 6</b>	<b>Step 7</b>	<b>Step 8</b>	<b>Step 9</b>	<b>Step 10</b>
Buydown (\$/W)	\$3.00	\$2.50	\$2.20	\$1.90	\$1.55	\$1.10	\$0.65	\$0.35	\$0.25	\$0.20
PBI 5-yr (\$/kWh)	NA	\$0.40	\$0.35	\$0.30	\$0.25	\$0.17	\$0.10	\$0.06	\$0.04	\$0.03
PBI 10-yr (\$/kWh)	NA	\$0.24	\$0.21	\$0.18	\$0.15	\$0.11	\$0.06	\$0.03	\$0.02	\$0.02
<b>GOALS - MW</b>	<b>4.9</b>	<b>8.5</b>	<b>9.5</b>	<b>10.0</b>	<b>10.5</b>	<b>13</b>	<b>14.5</b>	<b>17.0</b>	<b>17.5</b>	<b>19.6</b>
Commercial	0.3	5.0	6.0	6.5	7.5	9.5	10.0	12.0	11.5	11.5
Residential	4.6	3.5	3.5	3.5	3.0	3.5	4.5	5.0	6.0	8.1
Res Retro	0.1	0.5	0.5	1.0	1.0	1.0	1.5	1.5	2.0	3.1
New Solar Homes	4.5	3.0	3.0	2.5	2.0	2.5	3.0	3.5	4.0	5.0



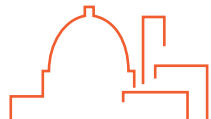
**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# Step Balance

<b>Bucket (MW)</b>	<b>Step 1</b>	<b>Step 2 \$2.50</b>	<b>Step 3 \$2.20</b>	<b>Step 4 \$1.90</b>	<b>Step 5 \$1.55</b>	<b>Step 6 \$1.10</b>	<b>Step 7 \$0.65</b>	<b>Step 8 \$0.35</b>	<b>Step 9 \$0.25</b>	<b>Step 10 \$0.20</b>
<b>Commercial Goal</b>	0.3	5.0	6.0	6.5	7.5	9.5	10.0	12.0	11.5	11.5
<i>Remaining 3/31/08</i>	0	0	0.391	2.48	6.5	9.0	10.0	12.0	11.5	11.5
<b>Res Retro Goal</b>	0.1	0.5	0.5	1.0	1.0	1.0	1.5	1.5	2.0	3.1
<i>Remaining 3/31/08</i>	0	.253	0.5	1.0	1.0	1.0	1.5	1.5	2.0	3.1
<b>SolarSmart Goal</b>	4.5	3	3	2.5	2	2.5	3	3.5	4	5
<i>Remaining 3/31/08</i>	0	0	2.0	2.5	2.0	2.5	3.0	3.5	4.0	5.0



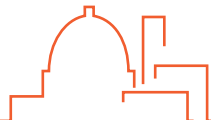
**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

## SMUD Financing is Available for PV

- **Up to 120 months** (reviewing for possible change to 20 years)
- **7.5% Interest**
- **Subject to credit approval**



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# Photovoltaic Models

- 3<sup>rd</sup> Party PPA
- Ownership
- Over-generation
- Remote Sites



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# Clean Power Estimator

<http://smud.cleanpowerestimator.com/smud.htm>



## System Summary

Net system cost after all incentives:	\$20,500
PV system electricity production:	5,396 kWh/year
Electricity production supplied by system:	51%
Carbon dioxide emission reduction:	5,975 lbs per year
Internal rate of return:	5%
Net present value:	-\$6,366
Years to payback:	30.7

## General Assumptions

**Rate** Net Metered Residential Rate - Non-Electric Space Heating (Rate RSO)

**Technologies** PV only

**Recalculation** After each input

**PV System**

**Size** 3,000 Watt-ac PV System

**Cost** \$30,000 (Use default cost)

**Tilt** 30°

**Orientation** South

## Financial Assumptions

**Incentive Option** EPBB

**Electric Bill** \$100 per month

**Escalation** 1.5% per year

**Payment** Home Equity Loan

**Down Payment** 0%

**Loan Life** 30 years

**Loan Rate** 8.00%

## TAX CONSIDERATIONS

**Tax Status** Single

**Tax. Income** \$100,000 per year

Place cursor over the ? symbols for help

Select... **Net Cost - Year 1** Monthly Electric Bill Daily PV Production Daily Electricity Use

Monthly PV Output Net Cash Flow Net Cash Flow Detail Pollution Prevention

### Net Cost Detail - Year 1

System Cost	\$30,000
Incentives	
SMUD EPBB (Res.) 100%	\$7,500
DT	
Federal Tax Credit (Res.)	\$2,000
less Total Incentives	\$9,500
<b>NET COST FOR YEAR 1</b>	<b>\$20,500</b>

*This represents cost details for the first year of this system. Tax credits and other benefits received overtime are not fully represented.*

Powered by Clean Power Research (c)1998-2007

Select... **Net Cost - Year 1** Monthly Electric Bill Daily PV Production Daily Electricity Use

Monthly PV Output Net Cash Flow Net Cash Flow Detail Pollution Prevention

### Monthly Electric Bill

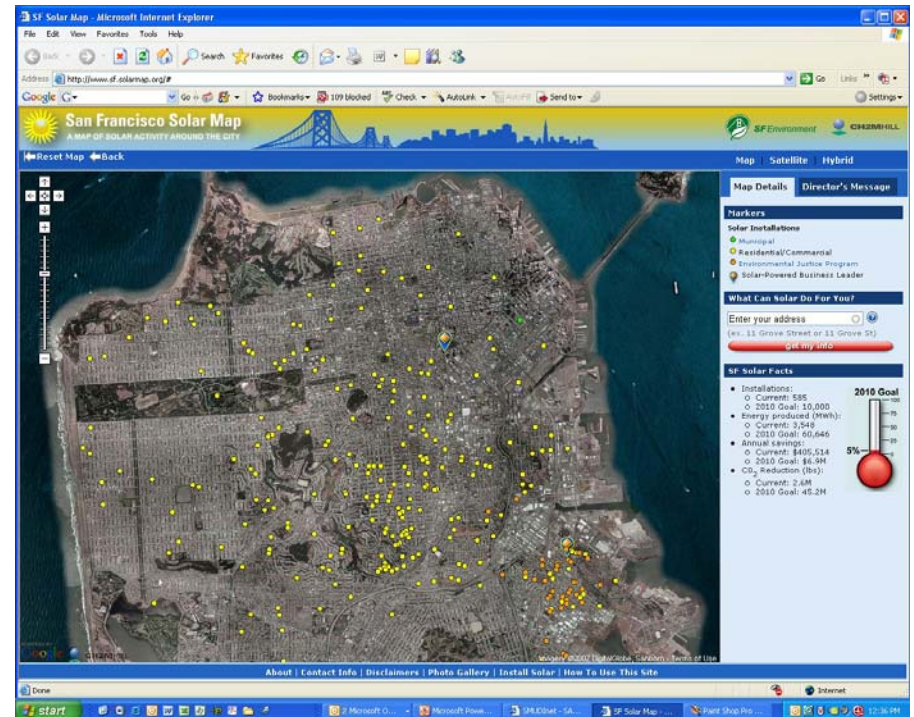
	Without PV system	With PV system	Bill Savings
January	\$137	\$103	\$34
February	\$128	\$87	\$41
March	\$92	\$55	\$38
April	\$75	\$29	\$46
May	\$83	\$24	\$59
June	\$92	\$28	\$64
July	\$130	\$48	\$82
August	\$105	\$35	\$70
September	\$107	\$40	\$67
October	\$74	\$31	\$43
November	\$77	\$52	\$25
December	\$100	\$81	\$18
<b>TOTAL</b>	<b>\$1,200</b>	<b>\$614</b>	<b>\$586</b>

**This PV system will reduce your annual electric bill by 49%**



# Coming Soon

- **PowerClerk on-line application process**
  - Application/Program Training
- **Sacramento Solar Map**
  - Coming soon – see SF example
  - <http://www.sf.solarmap.org/#>
- **Solar Showroom**
- **SMUD & Contractor Communications**
  - Tell us your needs



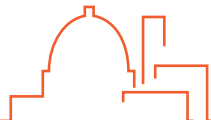
**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Power To Do More.

# Non-Utility Generation (examples)

- Keifer Landfill Gas (methane gas)
  - 9MW's connected at 69kV
  - 3-3MW Caterpillar engines using methane gas
- UCD Medical Center
  - 25MW's LM2500 machine
  - Connected to 21 kV
  - Natural Gas
- 1MW's Photovoltaic (proposed)
  - Connection to 12 kV



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# Questions?



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*

# More Information

[www.smud.org](http://www.smud.org)

[www.ourgreencommunity.org](http://www.ourgreencommunity.org)



Thank You



**SMUD**

SACRAMENTO MUNICIPAL UTILITY DISTRICT

*The Power To Do More.*