

Webinar Basics

- 1. You must dial in on a phone line to hear the audio portion of this webinar. Please refer to your webinar registration confirmation for the dial in instructions.**
- 2. The handouts for this webinar were emailed this morning to the email address used to register for this webinar. They are also available online at *www.cashnet.org/meetings*.**
- 3. We will hold questions and answers to the end of the webinar. Please use the dialogue box on the left side of the screen to enter your questions throughout the webinar.**
- 4. If you can not see the entire slide, please right click on your Internet Explorer menu bar at the top of your screen and deselect some of the menu options.**
- 5. If at any time you experience technical difficulties, please call the C.A.S.H. office at (916) 448-8577.**

The Energy Landscape in California and Opportunities for Lowering M&O Expenditures

Presented by:
Russell Driver
Newcomb | Anderson | McCormick
San Francisco
February 3, 2009

Presented to...



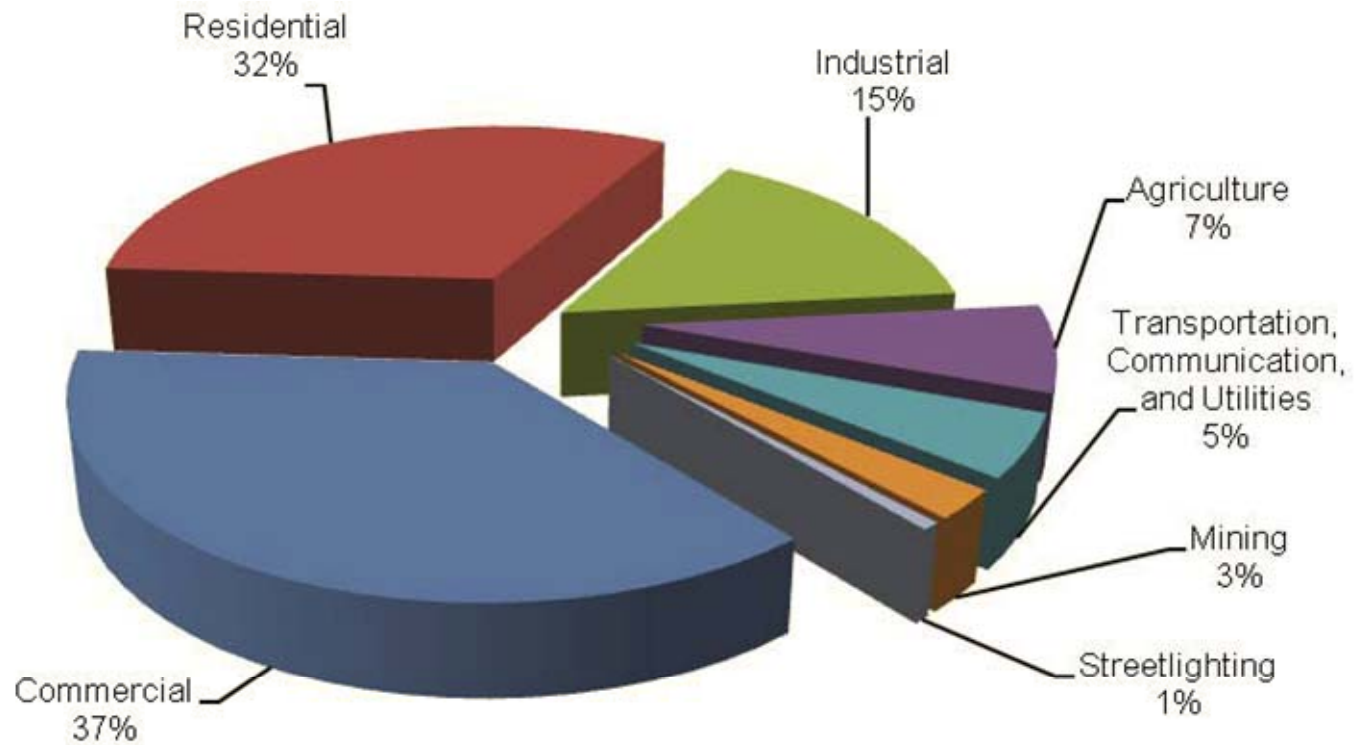
CALIFORNIA'S
COALITION
for ADEQUATE
SCHOOL HOUSINGSM



Agenda

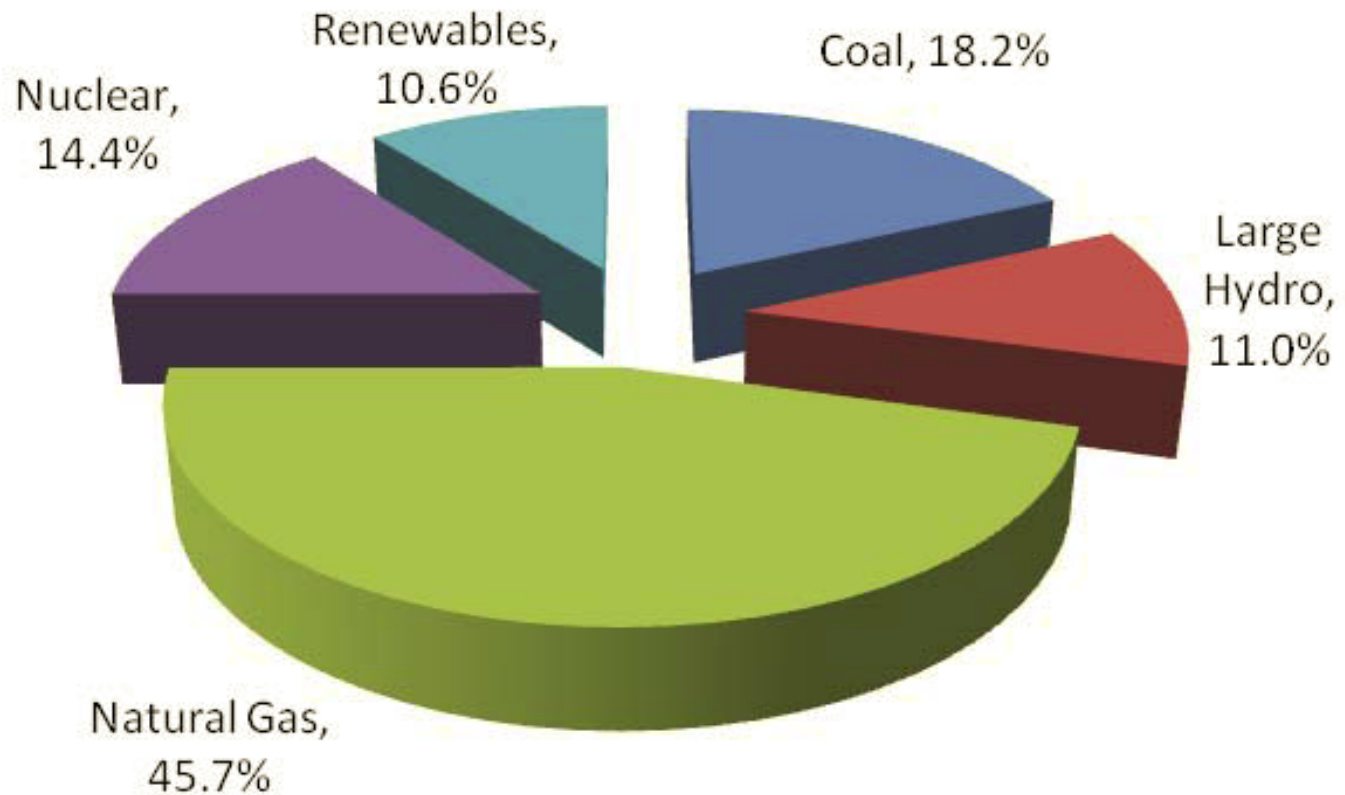
- Welcome and Introductions
- California Energy Industry Basics
- Energy Efficiency in California
- Solar Opportunities in California
- Q&A

Californians Consumed 286,000 GWh in 2008



Source: California Energy Commission

Generation Mix Dominated by Natural Gas



Source: California Energy Commission

CA Energy Industry Key Players

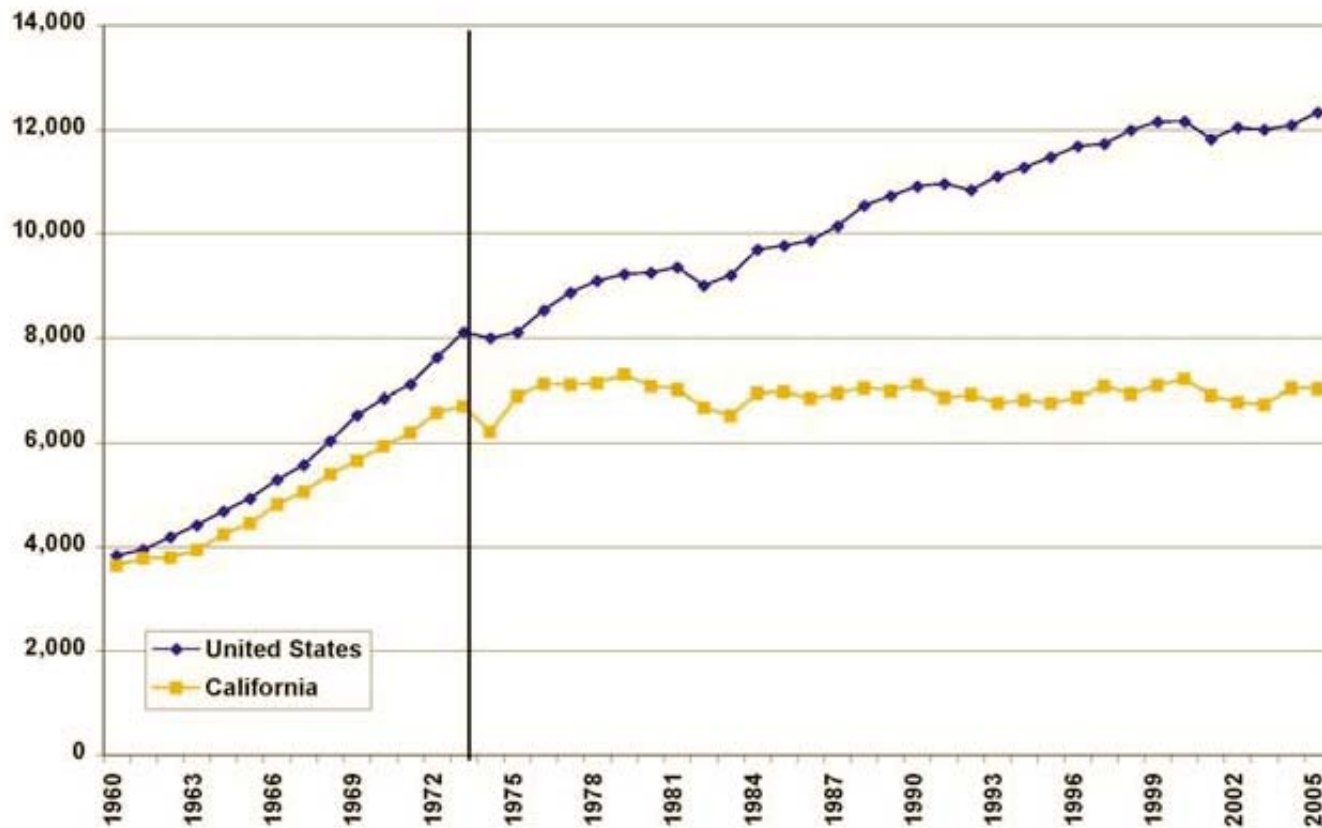
- Four Investor Owned Utilities (IOU)
 - PG&E, SCE, SDG&E, SCG
- Numerous Publicly Owned (Municipal) Utilities
- Regulators
 - CPUC – California Public Utilities Commission: Regulates IOUs
 - CEC - California Energy Commission: Policy, Planning, Forecasting, Licensing

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- ***Energy Efficiency in California***
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Energy Efficiency: CA's Highest Priority Resource

Per Capita Electricity Sales in Kilowatt Hours per Person



Source: California Energy Commission

Why Energy Efficiency?

- Reduce energy supply costs and lower bills
- Maintain reliability
- Reduce price volatility
- Protect environment – reduce pollution and greenhouse gas
- Contribute to water savings

Comprehensive Policy and Regulatory Framework

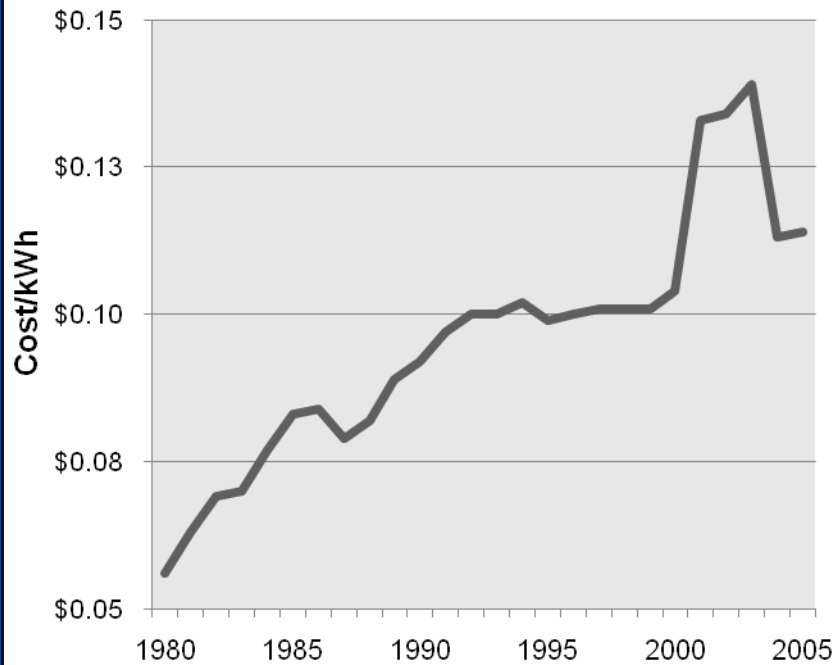
- Energy Action Plans I and II – coordinated implementation for state policies
- Long-Term Energy Efficiency Strategic Plan
- Minimum building and appliance efficiency standards
- “Loading Order”: efficiency first
- Energy savings goals for IOUs
- Decoupling of IOU revenues from sales volume
- Public Goods Charge collected from all customers to fund EE programs

Types of Energy Efficiency Incentive Programs

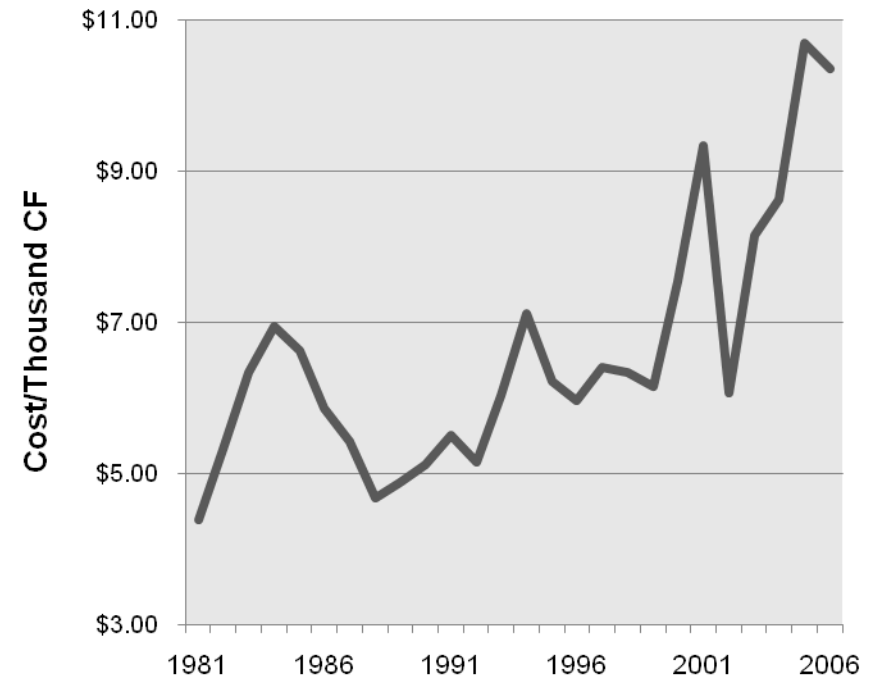
- Retrocommissioning
 - Low cost/no cost
 - Controls and set points
 - Behavior changes
- Retrofit
 - Equipment upgrades
 - Systems projects
 - Process-related
- New Construction
 - Includes gut rehab
 - Systems
 - Whole building
- Demand Reduction
 - Incentives for shedding peak demand

The Cost of Doing Nothing

Retail Price of Electricity 1980 - 2005



Retail Price of Natural Gas 1980 - 2006



Source: California Energy Commission

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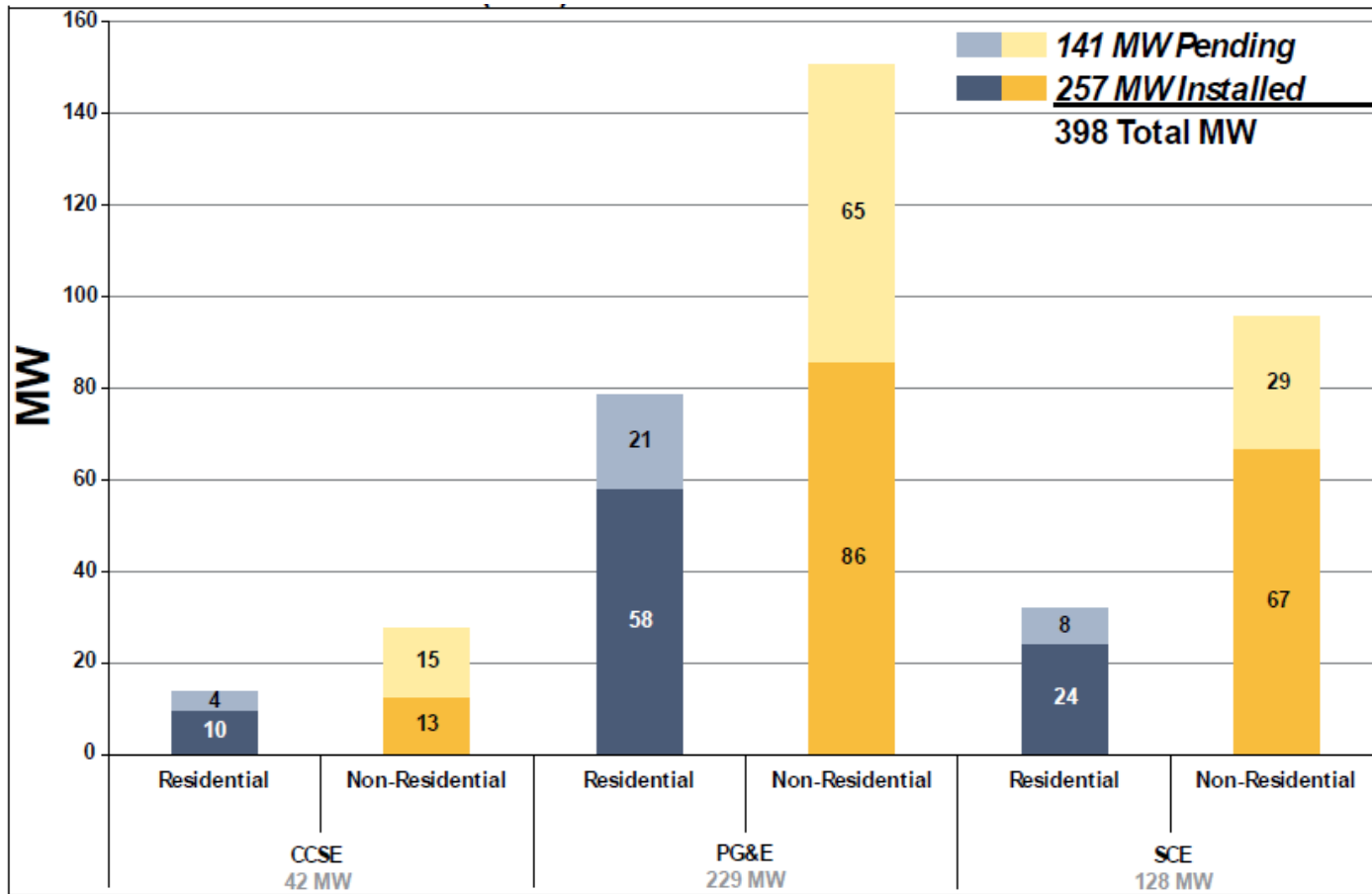
The Solar Industry in California

- CA has the largest, strongest and most mature solar PV market in the US with 550 MW of installed capacity
- Diversified installer base tapping in the global PV equipment market
- Supportive regulatory environment with Net Metering, California Solar Initiative and other programs in addition to Federal incentives

Relevant Solar Programs

- **California Solar Initiative (CSI)**
 - The California Solar Initiative provides cash back for installing solar for existing homes, commercial, industrial, government, non-profit, and agricultural properties
 - The current incentive rate for government projects is \$026 per kWh generated
- **Net Energy Metering**
 - Energy generated by the PV system is used to offset the customer's electricity bill
 - A "net meter" is installed to measure the difference between electricity supplied to the customer by PG&E and electricity the customer exports to the grid
 - Charges and credits are reconciled after 12 monthly billing periods
 - Eligible for CSI incentives
- **Feed-In Tariffs**
 - the energy produced by the PV system in excess of the customer load is purchased by PG&E at a predetermined rate
 - system size is limited to 1.5 megawatts
 - Not eligible for CSI
- **“Virtual” Net Energy Metering (AB 2466)**
 - AB2466 allows a local government (including school districts) to install renewable generation at one location within its geographic boundary and generate credits that can be used to offset charges at one or more other locations
 - Policy regarding CSI eligibility under development

Capacity of Pending and Installed CSI Applications



Source: www.CaliforniaSolarStatistics.ca.gov, September 30, 2009.

Solar Incentives Under CSI

- The California Solar Initiative has a budget of \$2,167 million over 10 years, and the goal is to reach 1,940 MW of installed solar capacity by 2016
- Incentives for large systems (over 10 kW) are provided for the energy generated over the first five years the system is operational
- Currently, the incentive for schools is \$0.26 per kWh in the PG&E service area and \$0.32 in the SCE service area
- Incentive rates decline over time, depending on the quantity of solar installed

Current Incentive Status

- Current incentive levels can be found on the Trigger Tracker website: <http://www.csi-trigger.com/>

California Solar Initiative
Statewide Trigger Point Tracker

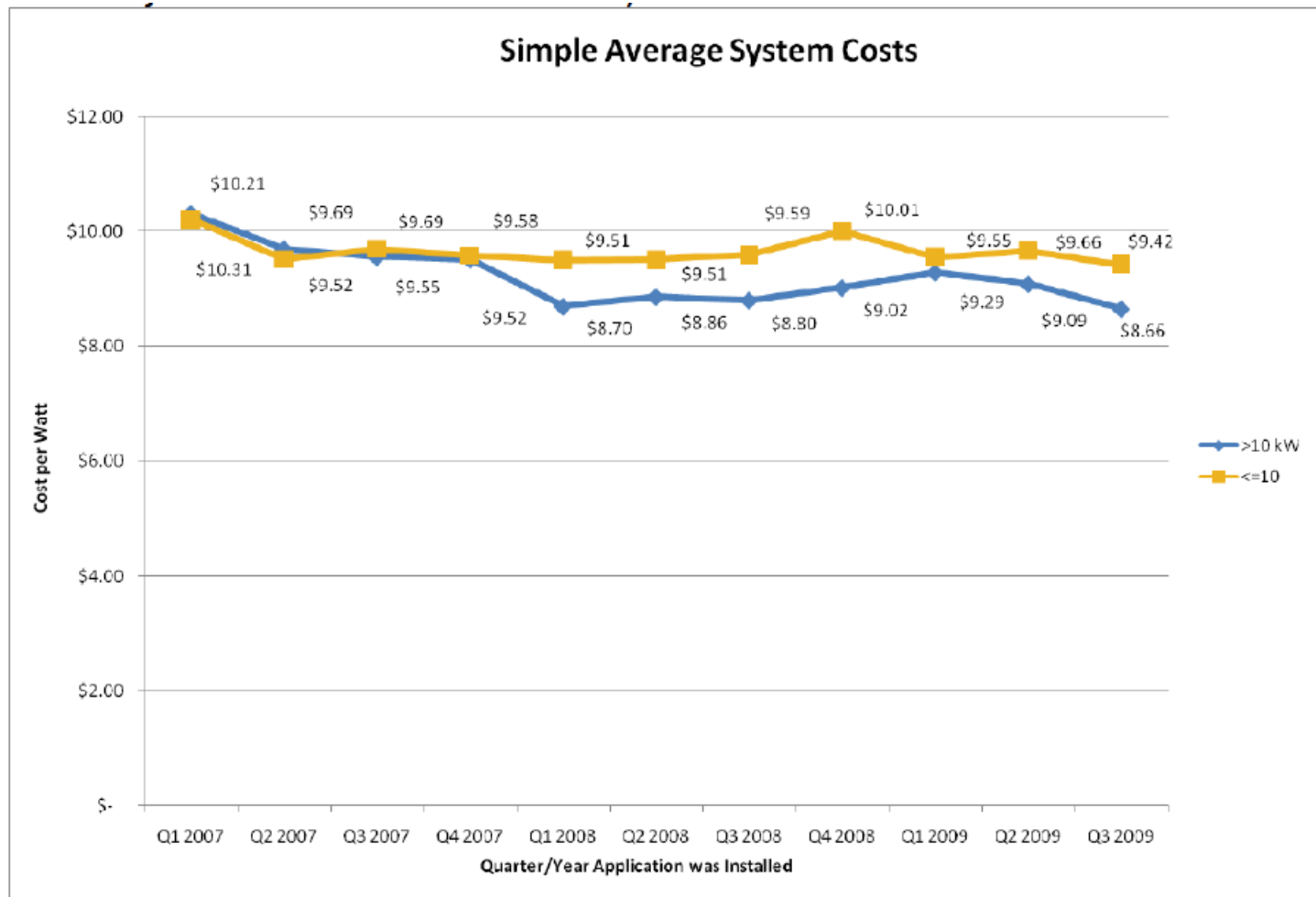
GO SOLAR CALIFORNIA | Center for Sustainable Energy CALIFORNIA | PG&E Pacific Gas and Electric Company | SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL Company

Last updated 1/29/2010

| Administrator | Customer Class * | Current Step | Initial MW in Step | Unused MW from Previous Steps | Revised Total MW in Step | Issued Conditional Reservation Letters (MW) | MW Remaining | MW Under Review |
|---------------|------------------|--------------|--------------------|-------------------------------|--------------------------|---|--------------|-----------------|
| PGE | Residential | 6 | 27.40 | 0.85 | 28.25 | 14.71 | 13.54 | 0.59 |
| | Non-Residential | 6 | 55.60 | 22.42 | 78.02 | 27.43 | 50.59 | 6.55 |
| SCE | Residential | 4 | 19.70 | 1.15 | 20.85 | 11.36 | 9.50 | 2.00 |
| | Non-Residential | 5 | 49.30 | 32.06 | 81.36 | 39.61 | 41.74 | 8.46 |
| CCSE | Residential | 6 | 6.50 | 0.06 | 6.56 | 2.46 | 4.10 | 0.31 |
| | Non-Residential | 6 | 13.10 | 0.28 | 13.38 | 5.85 | 7.53 | 2.39 |

| Step | Statewide MW in Step | EPBB Payments (per Watt) | | | PBI Payments (per kWh) | | |
|------|----------------------|--------------------------|-----------------|-----------------------|------------------------|-----------------|-----------------------|
| | | Residential | Non-Residential | | Residential | Non-Residential | |
| | | | Commercial | Government/Non-Profit | | Commercial | Government/Non-Profit |
| 1 | 50 | n/a | n/a | n/a | n/a | n/a | n/a |
| 2 | 70 | \$2.50 | \$2.50 | \$3.25 | \$0.39 | \$0.39 | \$0.50 |
| 3 | 100 | \$2.20 | \$2.20 | \$2.95 | \$0.34 | \$0.34 | \$0.46 |
| 4 | 130 | \$1.90 | \$1.90 | \$2.65 | \$0.26 | \$0.26 | \$0.37 |
| 5 | 160 | \$1.55 | \$1.55 | \$2.30 | \$0.22 | \$0.22 | \$0.32 |
| 6 | 190 | \$1.10 | \$1.10 | \$1.85 | \$0.15 | \$0.15 | \$0.26 |
| 7 | 215 | \$0.65 | \$0.65 | \$1.40 | \$0.09 | \$0.09 | \$0.19 |
| 8 | 250 | \$0.35 | \$0.35 | \$1.10 | \$0.05 | \$0.05 | \$0.15 |
| 9 | 285 | \$0.25 | \$0.25 | \$0.90 | \$0.03 | \$0.03 | \$0.12 |
| 10 | 350 | \$0.20 | \$0.20 | \$0.70 | \$0.03 | \$0.03 | \$0.10 |

The Cost of Solar is Declining



Source: Chart data was derived from the filtered data set on www.CaliforniaSolarStatistics.ca.gov, September 30, 2009. The data is derived from simple \$/watt averages on a per-project basis, listed in nominal dollars.

Key Considerations for Solar Projects

- Several considerations have a significant effect on the viability of a potential solar project.
 - The price of energy purchased from PG&E and annual escalation rate
 - The amount of energy consumed and the profile of that consumption
 - The total lifecycle cost of the solar system, including operations and maintenance
 - PPA rates

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Newcomb|Anderson|McCormick – Firm Overview

- 18 full-time, San Francisco-based energy professionals including 4 Program Managers
- Successfully designed, developed and implemented programs, policies and projects to enable clients to achieve their sustainability and energy goals
- Deep industry experience exclusively in Professional Energy Management Activities
- Focus on energy efficiency and renewables programs
- Over \$300 million in annual energy savings as a result of our efforts

THE PATH TO “GREEN”

ONE STEP AT A TIME....




Presented by:
Steven Plaxco
Director of Maintenance and Facilities
Yuba City Unified School District

GREEN CONCERNS FOR M&O

- ◆ M&O is a key stakeholder – “Green” cannot succeed without M&O support!
- ◆ M&O must be part of the planning process.
- ◆ M&O is a crucial partner, particularly when investigating design needs at existing school sites.
- ◆ M&O must be provided the resources and training necessary to operate and maintain the energy systems.

STARTING THE GREEN GARDEN

- ◆ Start small to ensure success...then build upon that success.
 - ◆ Test the “soil” (baseline).
 - ◆ Fertilize (educate the end user and gain support).
 - ◆ Plant and watch it grow!
 - ◆ Enjoy the fruits of your labor!!
- 

DEVELOP THE BASELINE

- ◆ How are you doing now?
- ◆ Review past energy usage.
- ◆ Use your energy provider as a resource:
PGE Portfolio Manager

<http://www.pge.com/benchmarking>

- ◆ CHPS Operations Report Card

<http://www.chps.net/dev/Drupal/node/44>

ASSESS YOUR SCHOOLS

- ◆ Perform an energy audit to determine improvements with quick payback potential...lamp retrofits, energy management controls, etc.
- ◆ California Energy Commission Bright Schools Program audits available at NO COST!! (up to 200,000 s.f.)

<http://www.energy.ca.gov/efficiency/brightschoools>

COST AVOIDANCE

Relamping energy savings for 476,000 sf

| Year | Program Savings | | | | Annual Gross Savings | Debt Service | Cashflow |
|--------------|---------------------|-------------------|------------------|------------------|----------------------|-----------------------|-------------------|
| | Energy | Operational | Construction* | Rebate | | | |
| 0 | \$ - | \$ - | \$ 50,000 | \$ - | \$ 50,000 | \$ 0 | \$ 50,000 |
| 1 | \$ 95,973 | \$ 7,800 | \$ - | \$ 35,700 | \$ 139,473 | \$ (104,940.72) | \$ 34,532 |
| 2 | \$ 98,852 | \$ 8,034 | \$ - | \$ - | \$ 106,886 | \$ (104,940.72) | \$ 1,945 |
| 3 | \$ 101,818 | \$ 8,275 | \$ - | \$ - | \$ 110,093 | \$ (104,940.72) | \$ 5,152 |
| 4 | \$ 104,872 | \$ 8,523 | \$ - | \$ - | \$ 113,396 | \$ (104,940.72) | \$ 8,455 |
| 5 | \$ 108,018 | \$ 8,779 | \$ - | \$ - | \$ 116,797 | \$ (104,940.72) | \$ 11,857 |
| 6 | \$ 111,259 | \$ 9,042 | \$ - | \$ - | \$ 120,301 | \$ (104,940.72) | \$ 15,361 |
| 7 | \$ 114,597 | \$ 9,314 | \$ - | \$ - | \$ 123,910 | \$ (104,940.72) | \$ 18,970 |
| 8 | \$ 118,035 | \$ 9,593 | \$ - | \$ - | \$ 127,628 | \$ (104,940.72) | \$ 22,687 |
| 9 | \$ 121,576 | \$ 9,881 | \$ - | \$ - | \$ 131,457 | \$ (104,940.72) | \$ 26,516 |
| 10 | \$ 125,223 | \$ 10,177 | \$ - | \$ - | \$ 135,400 | \$ (104,940.72) | \$ 30,460 |
| 11 | \$ 128,980 | \$ 10,483 | \$ - | \$ - | \$ 139,462 | \$ 0 | \$ 139,462 |
| 12 | \$ 132,849 | \$ 10,797 | \$ - | \$ - | \$ 143,646 | \$ 0 | \$ 143,646 |
| 13 | \$ 136,835 | \$ 11,121 | \$ - | \$ - | \$ 147,955 | \$ 0 | \$ 147,955 |
| 14 | \$ 140,940 | \$ 11,455 | \$ - | \$ - | \$ 152,394 | \$ 0 | \$ 152,394 |
| 15 | \$ 145,168 | \$ 11,798 | \$ - | \$ - | \$ 156,966 | \$ 0 | \$ 156,966 |
| Total | \$ 1,784,994 | \$ 145,072 | \$ 50,000 | \$ 35,700 | \$ 2,015,765 | \$ (1,049,407) | \$ 966,358 |

| | |
|--------------------------------|------------|
| Total Project Cost | \$ 873,823 |
| Financing Rate | 3.45% |
| Energy Savings Escalation | 3.00% |
| Operational Savings Escalation | 3.00% |

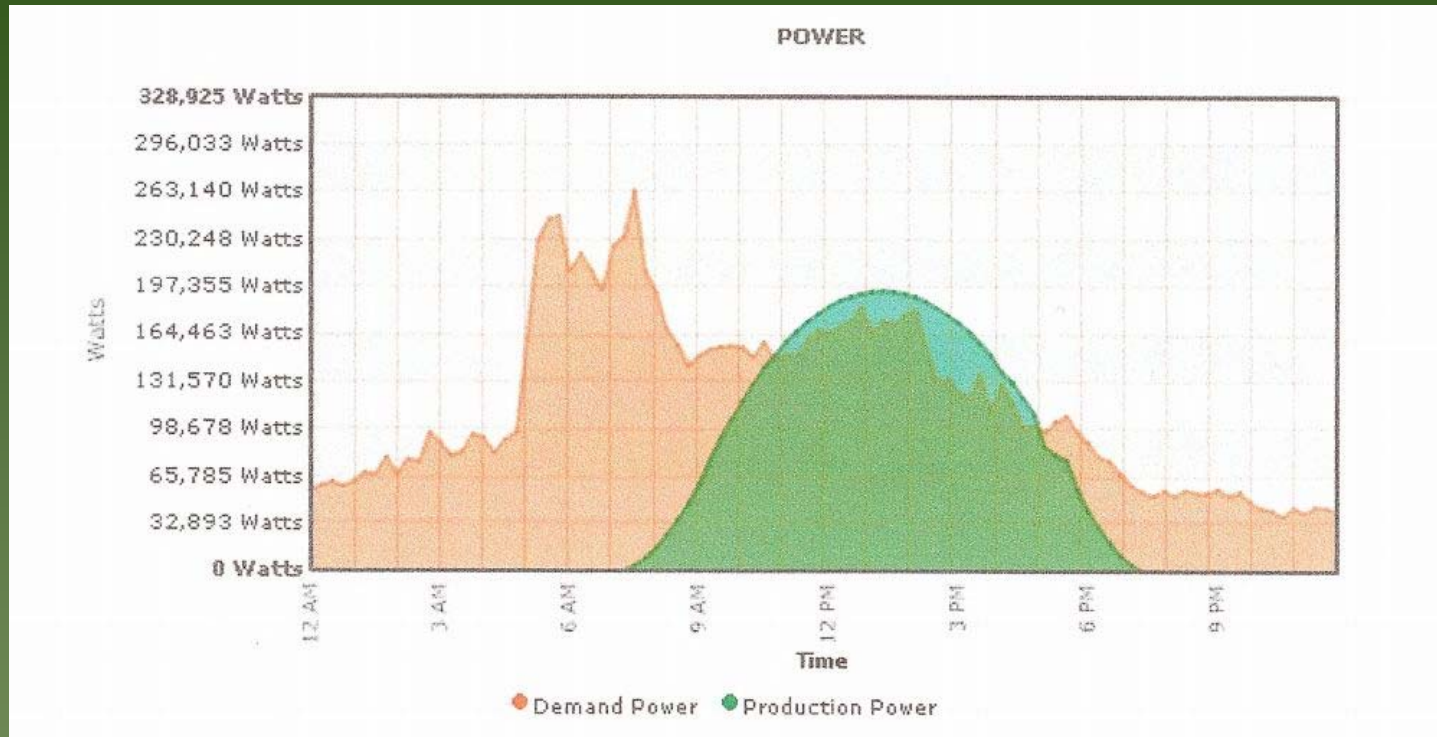
HARVEST THE SUN!

- ◆ Photovoltaic (solar) power works!
- ◆ YCUSD owned 300 KW plant installed at 86,000+ s.f. K-8 campus provides up to 50% of energy over the year.
- ◆ Maintenance cost expended for past 4 years is minimal (washing panels).
- ◆ Thin-film panels built into roofing system are almost indestructible.
- ◆ Electrical cost averages \$0.10 per KWh versus \$0.20 at non-solar campus.

RIVERBEND SCHOOL - YCUSD




TYPICAL SOLAR OUTPUT



| | |
|--|----------------------|
| Electricity Consumed by this facility | 33,846.10 kWh |
| Electricity (Units) produced by Solar System | 32,412.10 kWh |
| 'Net' Electricity purchased from utility company so far today | 1,434.00 kWh |
| DAILY ENERGY USAGE | |
| Peak Power used by facility | 299.25 kW |
| Peak Power produced by Solar System so far today | 196.19 kW |
| Peak Power provided by utility so far today | 297.18 kW |

WHAT ABOUT PPA's?

- ◆ Power Purchase Agreements
 - ◆ Solar provider pays for system installation at no cost to district.
 - ◆ District agrees to purchase solar generated power at reduced price for a set term.
 - ◆ Solar provider owns and maintains plant.
- 

TYPICAL PPA COST AVOIDANCE

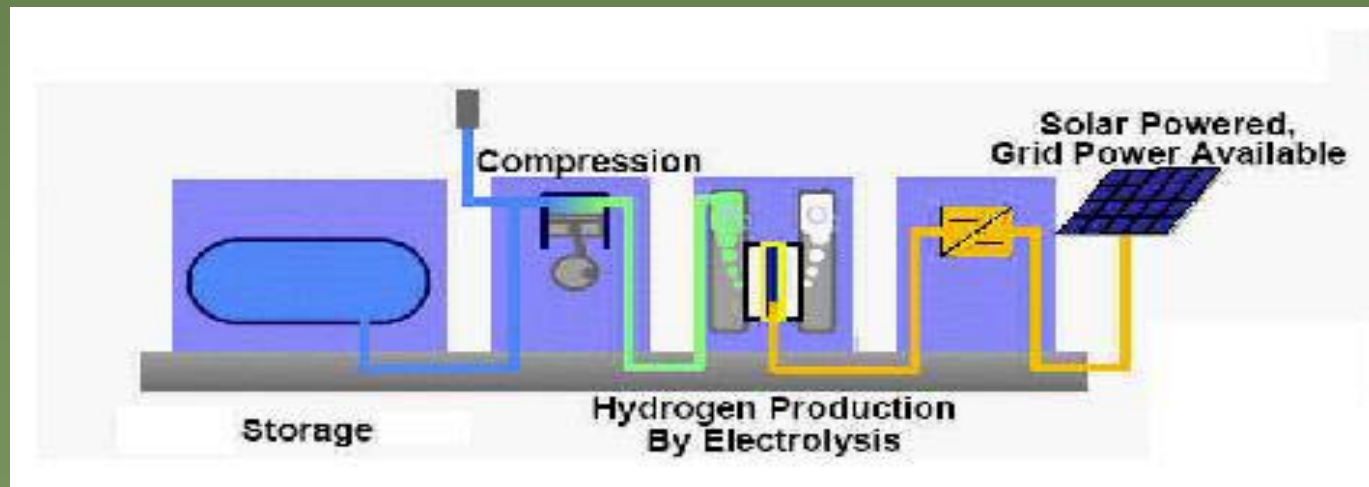
River Valley High School - River Valley HS East

| Utility Information | | System Information | | PPA Information | |
|---------------------|--------|---------------------|-------------|--------------------|----------|
| Utility: | PGE | System Size: | 657 kW DC | PPA Rate: | \$0.1750 |
| Meter Number: | 5P2508 | System Type: | Fixed | PPA Escalator: | 3.50% |
| Current Tariff: | E-19 S | Production Y1: | 958,997 kWh | Term Length: | 20 Years |
| Proposed Tariff: | A-6 | Annual Degradation: | 0.50% | Utility Escalator: | 4.50% |

| Year | Utility Bill (No Solar) | SPP Bill | Remaining Utility Bill | Combined Utility & SPP Bill | Forecasted Annual Savings | Forecasted % Annual Savings |
|-----------------------|----------------------------|-----------|---------------------------|--------------------------------|------------------------------|--------------------------------|
| 1 | \$256,612 | \$167,825 | \$76,248 | \$244,073 | \$12,540 | 4.89% |
| 2 | \$268,160 | \$172,830 | \$80,690 | \$253,520 | \$14,640 | 5.46% |
| 3 | \$280,227 | \$177,985 | \$85,373 | \$263,358 | \$16,870 | 6.02% |
| 4 | \$292,837 | \$183,293 | \$90,308 | \$273,601 | \$19,236 | 6.57% |
| 5 | \$306,015 | \$188,760 | \$95,509 | \$284,268 | \$21,747 | 7.11% |
| 6 | \$319,786 | \$194,389 | \$100,988 | \$295,378 | \$24,408 | 7.63% |
| 7 | \$334,176 | \$200,187 | \$106,762 | \$306,949 | \$27,227 | 8.15% |
| 8 | \$349,214 | \$206,158 | \$112,844 | \$319,001 | \$30,213 | 8.65% |
| 9 | \$364,929 | \$212,306 | \$119,250 | \$331,557 | \$33,372 | 9.14% |
| 10 | \$381,350 | \$218,638 | \$125,998 | \$344,637 | \$36,714 | 9.63% |
| TOTAL 10 YEARS | | | | | \$236,966 | |
| 11 | \$398,511 | \$225,159 | \$133,105 | \$358,264 | \$40,247 | 10.10% |
| 12 | \$416,444 | \$231,875 | \$140,588 | \$372,462 | \$43,982 | 10.56% |
| 13 | \$435,184 | \$238,790 | \$148,467 | \$387,257 | \$47,927 | 11.01% |
| 14 | \$454,767 | \$245,912 | \$156,763 | \$402,675 | \$52,092 | 11.45% |
| 15 | \$475,232 | \$253,247 | \$165,496 | \$418,743 | \$56,489 | 11.89% |
| TOTAL 15 YEARS | | | | | \$477,703 | |
| 16 | \$496,617 | \$260,800 | \$174,689 | \$435,489 | \$61,128 | 12.31% |
| 17 | \$518,965 | \$268,578 | \$184,366 | \$452,944 | \$66,022 | 12.72% |
| 18 | \$542,319 | \$276,588 | \$194,549 | \$471,138 | \$71,181 | 13.13% |
| 19 | \$566,723 | \$284,838 | \$205,267 | \$490,104 | \$76,619 | 13.52% |
| 20 | \$592,226 | \$293,333 | \$216,544 | \$509,877 | \$82,349 | 13.90% |
| TOTAL 20 YEARS | | | | | \$835,002 | |

WHAT THE FUTURE HOLDS

- ◆ Geothermal Heat Pumps
- ◆ Thermal Energy Storage (Ice Bank)
- ◆ Wind Generators
- ◆ Hydrogen Generators/Fuel Cells
- ◆ Solar Vacuum Tubes w/Absorption HVAC



RESOURCES

<http://www.dsa.dgs.ca.gov/OtherProg/workgroup>

<http://www.dsa.dgs.ca.gov/OtherProg/gridneutral>

Questions or Comments?

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