



Consumer Protections Under the California Solar Initiative



October 20, 2016

Molly Sterkel
California Public Utilities Commission

What do consumers care about? ("keep it simple")

1. System Performance

Does the system work the way I expected?

2. Contractor Performance

Did the contractor give me what they promised me?

3. Price & system size

Did I get a good price for what I bought / did I buy the right amount?

Solar Program Memory Lane



'I DON'T REMEMBER COMING
THIS WAY...'

Historical Context of CSI Authorization

The State of CA decided to invest \$3 billion in the CSI program in the 2005-6 time period.

- There was 130 MW of cumulative installed capacity.
- System prices were \$9+/watt.
- Rebates were \$3+/watt, but availability was boom/bust.
- Memories of the solar thermal bust was prevalent.
- Few (any?) of today's "largest solar contractors" existed.
- Market transformation and cost reductions were a major goal of policy makers.
- CSI program design proposals were focused on supporting those policy goals.

Letting the Sun Shine on Solar Costs:
An Empirical Investigation of Photovoltaic
Cost Trends in California

Ryan Wiser, Mark Bolinger, Peter Cappers,
and Robert Margolis

Environmental Energy
Technologies Division

January 2006

Installed Costs info from 2005

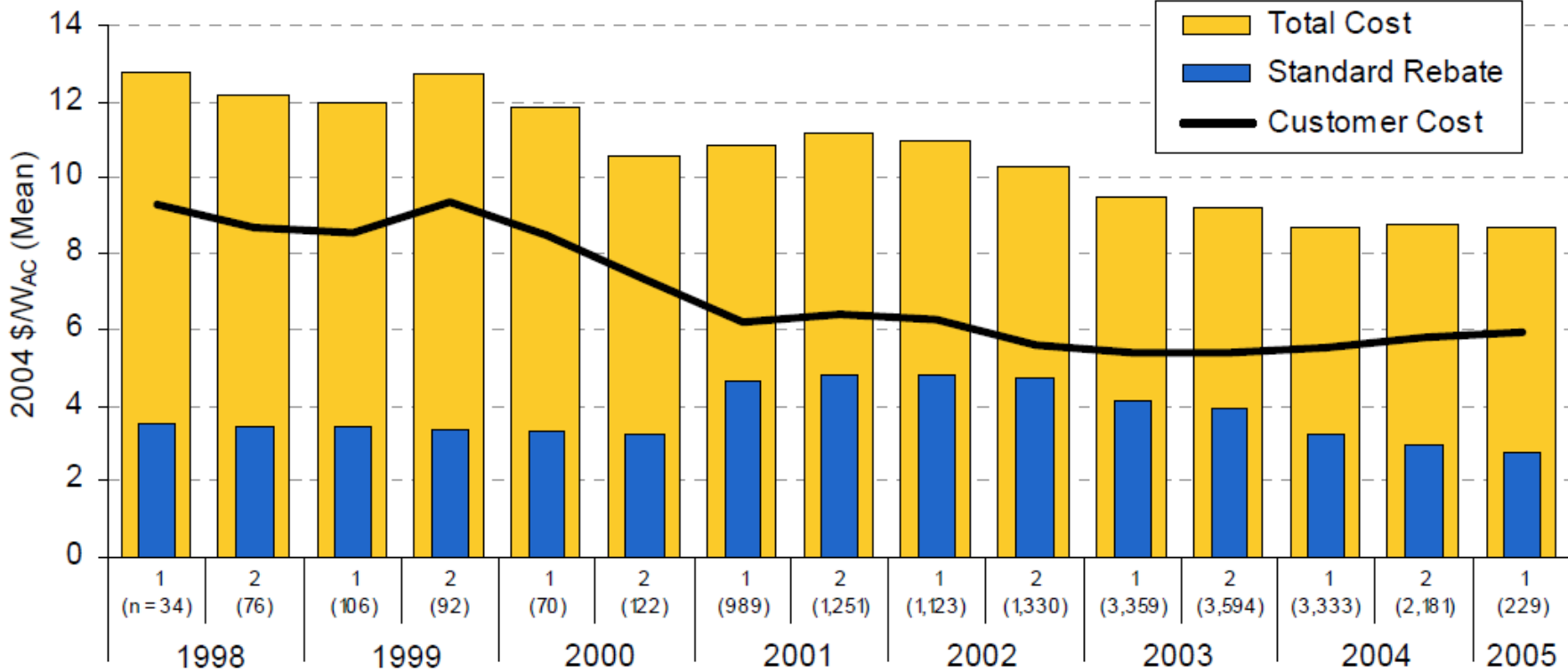


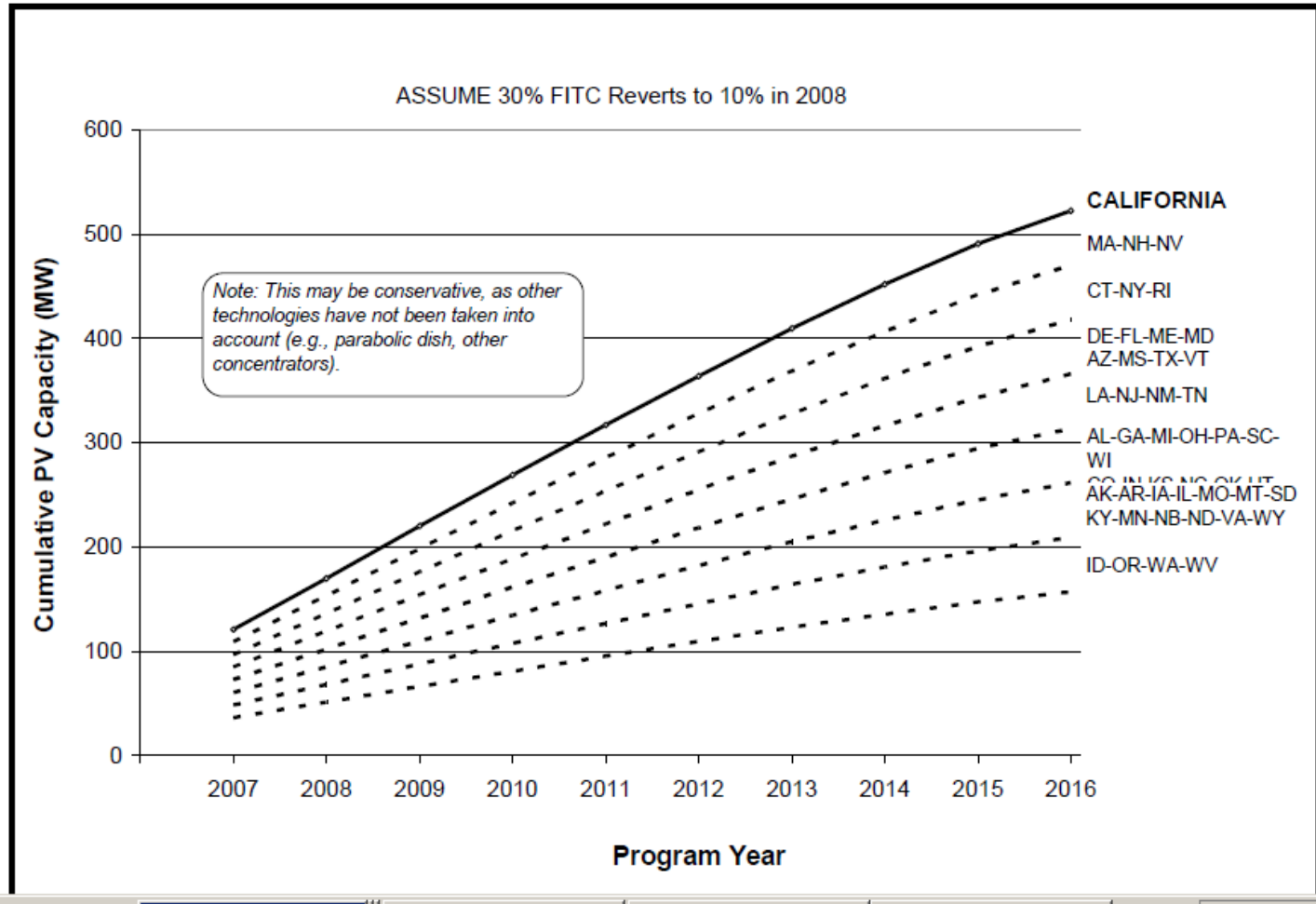
Figure ES-3. Impact of Standard Rebate Level on Average Installed Costs (CEC)

Prior to CSI...

- **System Performance**
 - Rebated systems required equipment warranties but not performance monitoring
 - Rebates paid based on capacity ratings, not performance
 - Performance monitoring occurred *programmatically* as part of evaluation
 - Performance monitoring occurred when customers reviewed utility bills and occasionally as part of system installation contract (largest systems only)
- **Contractor Performance**
 - Potential for customer disappointment identified as major “risk” to ongoing market transformation (*holy grail*)
 - Customer frustration with utility interconnection process common
 - Contractors subject to slightly different rules depending on program
 - Residential program managed by CEC (Emerging Renewables Program),
 - C&I program managed by CPUC (Self Generation Incentive Program)
- **Price of Systems & System Size**
 - No real-time or transparent information on price or quantities of equipment sold
 - Some program evaluation and program data released periodically
 - Rebates capped at 50% of system cost – sometimes with strange results
 - Varying incentives by size seen as programmatic action to encourage price reduction
 - Reducing price seen as a critical long term goal of solar programs
 - Having a sustainable/steady program (without interruptions of rebate offers) seen as means to help reduce price

Where we were headed...

Figure 8-4: Cumulative PV Capacity Impacts versus Program Year and State (\$1 Billion Total Program – Hawaii Excluded)



CSI Consumer Protection Measures: System Performance

(1) Entire program design focused on performance –paid incentives based on actual or expected performance

- a. Performance-Based Incentives – PBI incentive based on actual recorded performance over 5 years
- b. Expected Performance Based Buydown (EPBB) – EPBB based on estimated performance in EPBB calculator.



(2) Required Customer Disclosure of Expected Performance using standardized calculator – EPBB Calculator

(3) Required Warranties on Equipment and Installation

- a. All equipment had to have a 10-year manufacturer performance warranty of not less than 15% output decline.
- b. All contractors had to offer a 10-year warranty on repair or replacement of system on anything not covered by manufacturer warranty and of not less than 15% output decline due to installation issues.

(4) Required System Performance Monitoring

- a. **Initially *Independent* Performance Monitoring and Reporting Services (PMRS) were required of all PBI, and larger EPPB Systems** so as to “help customers maximize their investment in solar” (D.06-08-028, p. 76.)
- b. **In 2008, CPUC revised *independence* PMRS requirements (replaced with protocols) and hammered out key details on metering accuracy requirements (D. 08-01-030)**
- c. **PBI Systems** – Required subscription to service from an eligible PMRS provider that met the requirements under the Performance Data Provider (PDP) qualification process
- d. **EPBB Systems** – Initially required for systems 30-100 kW, later for all systems greater than 10 kW



Key Impact of System Performance Focus

- Motivated Contractors to focus on performance
 - Predict performance consistently
 - Train 1000s of new workforce to use a SunEye correctly
 - Offer performance guarantee, instead of just offering warranty on equipment
- Disclosure to Customers
 - Contractors had to provide predicted performance to customers using one standardized EPBB Calculator (that accounted for equipment, shading, tilt, azimuth, location)
- Created/Exploded PMRS Industry
 - Rule changes allowed for PMRS to become integrated with solar installation contractors, yet audit-able, accurate, and trusted
- Supported Growth of Industry
 - Performance focus harmonized with industry-wide need for accuracy and integrity – created 3rd party verified performance records that provided industry with access to financing/capital
 - Program design sent strong policy message at key moment in growth of industry, especially PPA/third-party ownership model



CSI Consumer Protection Measures: Contractor Performance

(1) Program required valid CSLB license

- Customers with in-flight rebate applications where contractor CSLB license was suspended were contact by Program Administrators

(2) Program required random on site inspections

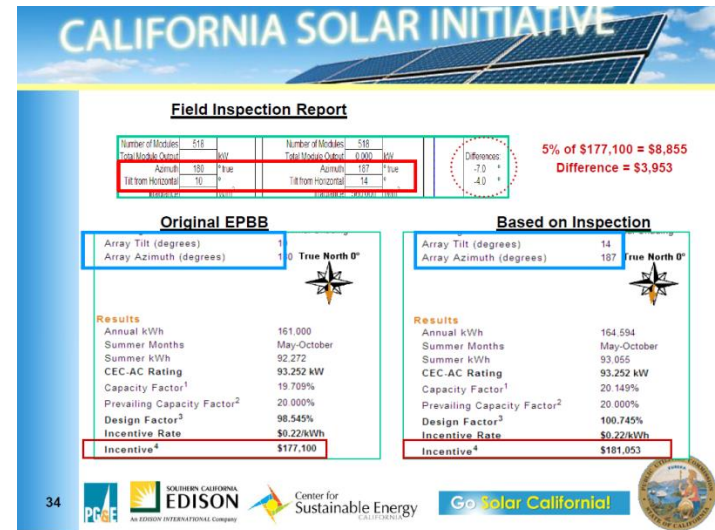
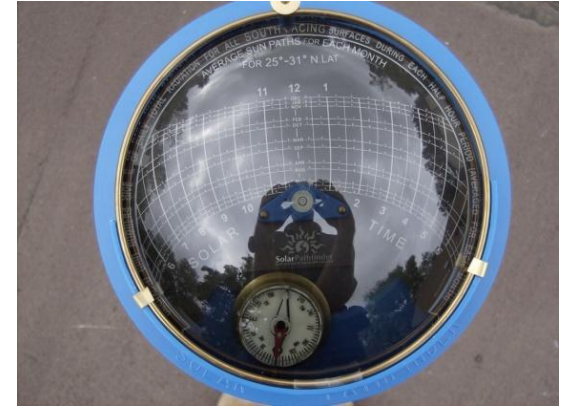
- Verified installation characteristics and EPBB claims
- Became aware of variations across local permitting jurisdictions (e.g. fire codes) or safety issues

(3) Program required copy of signed installation contract

- Provided some transparency into industry contracting practices and provided program with data on industry trends
- Led to some programmatic changes over time based on trends

(4) Program performed post-installation inspections.

- Multiple failures could lead to program disqualification.
- Inspections included physical review of the installed system, paperwork errors, or the breaking of program rules.
- Contractors learned quickly to be accurate.



Key Impacts of Contractor Performance Focus

- (1) Trained contractors on program requirements – supported growth of many contractors entering the business**
 - Make accurate solar estimates and savings claims.
 - Optimize customer for rebate or NEM (sometimes shade analysis and tilt meant you had to choose one over the other)
- (2) Disqualified a small number of contractors for program violations**
- (3) Program Evaluations reviewed contractor performance issues**
 - Evaluations were able to review large amount of performance data in aggregate
 - Provided a wealth of information to industry and policy makers: long term impact of shading, Analysis of Washing vs. Not-Washing, System Design performance over time, Panel Degradation
 - Published data in manner to support decision makers/industry, but not call out failures by name – looked for trends and ways program design could address
- (4) Program Administrators were able to provide customers with a 3rd party Resource**
 - Provided access to trusted 3rd party information
 - Referred customers to CSLB or City Attorneys or CPUC
 - We often became the first ear to hear about contractor problems

CSI Consumer Protection Measures: System Cost and Size

- (1) Required EE Audit Signed by Host Customer (acknowledge load history)**
- (2) Provided customer with independent source of information**
 - Consumer information on web and marketing materials about expected savings, shopping for solar, utility electricity rates or NEM program, utility interconnection process, ITC information, etc.
- (3) Program limited eligible rebate system size to historic customer load**
 - Allowed exception for building remodel/expansion or expected EV purchase
 - Protected customers from egregious oversizing of systems
 - Net Surplus Compensation (exogenous to CSI Program design) removed contractor incentive to minimize customer wrath by not oversizing system (“don’t worry, you’ll get paid something...”)
- (3) System Cost Cap -> (“High Cost Justification and Acknowledgement Form “)**
- (4) Transparency of program data on system costs & number of contractors**
 - Released weekly on California Solar Statistics
 - Showed all system pricing information & key installation characteristics
 - Helped industry with financing, validated sales claims
 - Helped policy makers with timely information about industry
 - Helped consumers shop
 - Shows huge diversity in industry – Apparently dominated by a handful of large companies but Contractor list still shows thousands of companies

Growth of Solar Contractors

| Contractors | # of Projects | # of Contractors |
|--------------------|---------------|------------------|
| With >100 projects | 422,893 | 520 |
| With <100 projects | 87,264 | 15,216 |
| Total | 510,157 | 15,736 |

[NEM Currently Interconnected Data Set](#)

Current as of Jul. 31, 2016 (24.2MB)

<http://www.californiadgstats.ca.gov/downloads/>

Non-Third Party Owned Systems

(All Systems under 6 kW near 94127 in SF)

| Contractors (w/4+installs)*** | # of Projects | Average of System Size (kW) | Average of Cost per Watt (\$) | Min of Cost per Watt (\$) | Max of Cost per Watt (\$) |
|------------------------------------|---------------|-----------------------------|-------------------------------|---------------------------|---------------------------|
| High Definition Solar | 9 | 1.8 | \$10.10 | \$2.14 | \$12.10 |
| Fidelity Home Energy | 16 | 3.1 | \$7.60 | \$6.60 | \$9.94 |
| clean solar | 5 | 3.3 | \$7.30 | \$5.98 | \$8.59 |
| Luminalt Energy Corporation | 72 | 3.4 | \$6.98 | \$5.43 | \$8.91 |
| A1 Solar Power | 6 | 3.8 | \$6.92 | \$5.48 | \$7.98 |
| Green NRG | 5 | 3.7 | \$6.57 | \$5.54 | \$8.00 |
| Albion Power Company | 12 | 4.3 | \$6.31 | \$5.22 | \$8.53 |
| Mr. Roofing | 5 | 2.5 | \$6.19 | \$5.83 | \$6.38 |
| Elite Electric Inc | 4 | 3.1 | \$6.09 | \$5.73 | \$6.44 |
| Occidental Power | 19 | 3.4 | \$6.08 | \$4.56 | \$9.75 |
| SolarCity | 48 | 2.9 | \$5.96 | \$5.79 | \$7.77 |
| SolarCity Corporation | 24 | 3.2 | \$5.93 | \$5.89 | \$5.95 |
| Elite Electric Inc. | 9 | 3.3 | \$5.76 | \$5.40 | \$6.44 |
| The Solar Company | 7 | 3.4 | \$5.71 | \$4.42 | \$6.95 |
| All Bay Solar | 7 | 3.0 | \$5.56 | \$4.44 | \$9.64 |
| Free Energy Systems | 9 | 3.4 | \$5.52 | \$5.16 | \$6.49 |
| SolarFirst INC dba FirstPV | 5 | 3.8 | \$5.27 | \$4.51 | \$7.21 |
| PetersenDean Inc | 4 | 3.0 | \$5.20 | \$4.80 | \$6.16 |
| Sungevity | 7 | 2.4 | \$5.16 | \$4.62 | \$5.56 |
| Slingshot Power | 4 | 4.9 | \$5.00 | \$4.36 | \$5.45 |
| Golde Gate Electric | 8 | 3.2 | \$4.95 | \$4.13 | \$7.37 |
| Sungevity Inc | 11 | 2.9 | \$4.82 | \$4.08 | \$5.50 |
| Golden Gate Electric | 64 | 3.3 | \$4.64 | \$4.12 | \$11.00 |
| SKYTECH SOLAR | 21 | 3.6 | \$4.33 | \$3.81 | \$5.10 |
| Sunrun Installation Services, Inc. | 9 | 3.7 | \$4.25 | \$3.88 | \$4.59 |
| SunPower Corporation | 21 | 1.5 | \$4.20 | \$3.09 | \$4.81 |
| Grand Total | 411 | 3.2 | \$5.82 | \$2.14 | \$12.10 |

California Solar Statistics data pulled: July 4, 2016, All installations near 94127 in SF.

Data returned 697 projects installed 8/3/2015-5/5/2016. Excluded all projects over 6 kW.

*** Excludes data from 74 projects from **52 additional contractors** that had less than 4 installs.

Third Party Owned Systems in SF

(All Systems under 6 kW near 94127 in SF)

| Contractor | # of Projects | Average of System Size (kW) | Average of Cost per Watt (\$) | Min of Cost per Watt (\$) | Max of Cost per Watt (\$) |
|------------------------------------|---------------|-----------------------------|-------------------------------|---------------------------|---------------------------|
| SolarCity Corporation | 41 | 3.1 | \$6.19 | \$5.16 | \$10.28 |
| SolarCity | 79 | 3.4 | \$5.90 | \$4.70 | \$6.05 |
| Solar City | 1 | 5.3 | \$5.83 | \$5.83 | \$5.83 |
| Vivint Solar Developer, LLC. | 2 | 4.8 | \$5.23 | \$5.21 | \$5.24 |
| SolarFirst INC dba FirstPV | 2 | 3.9 | \$5.21 | \$4.21 | \$6.20 |
| RGS Energy | 1 | 4.1 | \$4.79 | \$4.79 | \$4.79 |
| Sunrun Installation Services Inc. | 1 | 2.9 | \$4.41 | \$4.41 | \$4.41 |
| Sungevity | 2 | 3.6 | \$4.32 | \$4.04 | \$4.60 |
| Sungevity Inc. | 3 | 2.7 | \$4.25 | \$4.24 | \$4.27 |
| Quick Systems, Inc. | 1 | 2.4 | \$3.97 | \$3.97 | \$3.97 |
| Sunrun Installation Services, Inc. | 21 | 3.4 | \$3.81 | \$2.39 | \$5.08 |
| Sungevity Inc | 1 | 4.0 | \$3.21 | \$3.21 | \$3.21 |
| Mr. Roofing | 2 | 2.5 | \$2.88 | \$1.44 | \$4.31 |
| Sunrun Installation Services Inc | 1 | 3.0 | \$2.65 | \$2.65 | \$2.65 |
| GCI SOLAR | 1 | 2.9 | \$1.34 | \$1.34 | \$1.34 |
| Solar Service Center, LLC. | 1 | 4.8 | \$1.24 | \$1.24 | \$1.24 |
| Grand Total | 160 | 3.3 | \$5.47 | \$1.24 | \$10.28 |

Where we ended... Or are we just beginning?

California Leads the Nation in Distributed Generation

591,197 Solar Projects 4,581 Megawatts (MW) Installed



Data Current Through 2016-07-31

One Happy Customer At A Time

