

**UPDATE ON DETERMINING THE COSTS AND BENEFITS OF
CALIFORNIA'S NET METERING PROGRAM
AS REQUIRED BY ASSEMBLY BILL 58**



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1. Executive Summary

This report provides an update on current regulatory proceedings that are developing a comprehensive cost-benefit methodology to assess costs avoided and incurred by ratepayers, customer-generators, and utilities through distributed generation (DG), including net metered DG. Cost effectiveness tests utilized for energy efficiency projects may also be applicable to net metering and other distributed generation.

Some costs and benefits may be applicable to all distributed generation (DG) projects, while, others are unique to net metered systems and other clean and renewable technologies. Net metering receives unique support through rate and tariff exemptions. California-style net metering is not widely utilized in Germany or Japan, nations which lead the world in installed solar capacity and production. Policymakers should consider utility billing options other than simple net metering to value net metered generation, increase collection of public benefits and other charges, and raise the net metering capacity cap to 5% of peak demand. Legislation may be required to augment current net metering laws.

Upcoming Policy Decisions Will Inform and Enhance Net Metering Options

- CPUC and CEC are developing a comprehensive cost/benefit methodology for all procurement resources, including net metering.
- Net metering receives unique support through special rates and tariffs.
- Legislation may be required to enhance or replace net metering laws.
- New utility billings options could stimulate small solar installations and increase collection of public benefit charges.



2. Report Background and Purpose

Assembly Bill (AB) 58, adopted in September 2002,¹ requires the CPUC to conduct an assessment of the economic and environmental costs and benefits of net metering, beneficial and adverse effects on public benefits programs and special purpose surcharges, and to propose different methods to ensure that the public benefits charge remains a nonbypassable charge.

The CPUC is in the midst of a regulatory proceeding to develop a methodology to evaluate distributed generation. This report provides an update on net metering activities and the cost benefit methodology development process underway. In a formal CPUC decision later this year, we will adopt a DG cost-benefit methodology developed through our public process.

3. The CPUC Is Leading A Coordinated Effort To Quantify Costs And Benefits Of All Resource Procurement Options

Developing strategies to assess the costs and benefits of net metering is part of a much larger effort by the CPUC, the CEC, and other stakeholders to quantify the costs and benefits of customer- and utility-side procurement options in the Energy Action Plan loading order, which include energy efficiency, demand response, renewables, and distributed generation. In 2004, the CPUC began the process to quantify and integrate the values of these procurement options to evaluate the utilities' long-term resource plans, set proper rebate levels, and assess cost-effectiveness of various rate and financial incentives and other programs.

The CPUC is also exploring ways to implement Governor Schwarzenegger's proposed Solar Initiatives. Key components of the Governor's proposal include financial incentives and a time-of-use pricing plan

¹ Now Chapter 836, Section 2, California Public Utilities Code.



for solar-generated power. In November 2004, we solicited preliminary comments on program design issues from utilities, consumer groups, solar manufacturers and developers, and environmental advocates. CPUC and CEC staffs expect to complete a joint proposal which utilizes the public comments in April 2005. We expect to take more proposals from these and other entities wishing to participate in program development.

4. California Utilizes Two Common Forms of Net Metering To Encourage Small Customer-Side Renewables Installation

Net metering is one policy option to promote installation of small, customer-side, grid-connected generation to serve onsite load. Most net metering laws are enacted to support and encourage customer choice of renewable generating systems. Additional policy goals for net metering may also include the desire to reduce environmental impacts, diversify energy fuel sources, stimulate economic development, improve distribution system reliability, and reduce distribution system costs.

Elements of Net Metering

- Allows solar, wind, biogas, and fuel cells up to 1 megawatt.
- Requires only a basic utility meter.
- Customer production is credited against consumption.
- Simple net metering values wind and solar generation at the bundled retail rate.
- Public benefit and DWR charges paid on net consumption (wind and solar).
- Biogas and fuel cell generators receive credit for generation only, and pay the bundled retail rate for all bundled rate components.
- Enrollment cap equals one-half of one percent of utility aggregate peak demand.

In 1995, California was one of the first states to formally adopt net metering for wind and solar systems with capacity size of 10 kilowatts (kW) or



under.² Net metering was expanded in 2001 to include systems sized up to 1 megawatt (MW), and again in 2003 to introduce a pilot net billing program for biogas digesters and fuel cells through 2005.³ California law stipulates that net metering is available to generating facilities intended to offset part or all of the customer’s electrical needs. Since January 2001, utility customers have installed 596 net metered projects totaling 25.1 MW.

4.1 Simple Net Metering

Net Metering Installations Since January 2001 (10KW – 1 MW)		
Utility	# of Projects	MW
SCE	340	12.0
PG&E	168	8.4
SDG&E	88	4.7
Total	596	25.1

Source: California Energy Commission
http://www.energy.ca.gov/distgen/interconnection/rule21_stats.html

The simplest version of net metering only requires a meter capable of running backward when the generator produces electricity, and forward (normal operation) when the customer takes energy from the grid. Customer-generators bank excess generation when the system produces more power than the customer requires, and are billed only for net consumption. The on-site

generation is valued at the utility’s bundled retail rate, which may or may not reflect the value of the generation. A customer-generator does not receive payment for net generation. California utilizes this version of net metering for wind and solar systems.

4.2 Net Billing

A second type of net metering used in California is also known as net billing. The utility charges the customer retail rates for consumption, and pays the customer a different rate, such as avoided costs or the unbundled generation rate component, for their production. Net billing provides more

² Net metering does not include systems eligible for qualifying facility (QF) status under PURPA.

³ California Public Utilities Code 2827.



flexible rate design, which can be based on net or gross production and consumption. Since net billing involves multiple rates, it may require a bi-directional meter or two individual meters to measure customer generation and usage. California customer-generators utilizing biogas digesters and fuel cells are eligible for net billing tariffs through the end of 2005. Customers on this tariff continue to pay distribution, transmission, and public benefit charges on energy delivered by the utility, and are required to take utility service under a time-of-use rate schedule.

4.3 Net Metering And Net Billing Customers Receive Other Rate And Economic Incentives.

California's net metering law, Public Utilities Code §2827, exempts net metering customer-generators from "standby rates," which are monthly charges based on costs the utility incurs for installing and maintaining distribution infrastructure to serve the customer's load when the customer's generating system is not operating. Section 2827 also exempts customer-generators from any additional demand, interconnection, or other charges not paid by a customer without net metering. Most, if not all, net-metered systems received incentives from the California Public Utilities Commission (CPUC), the California Energy Commission (CEC) or various local and federal rebate programs. Beginning in 2001, net metered solar and wind systems, up to 200 kW, qualify for a state tax credit in an amount equal to the lesser of 15 percent of the cost paid for the purchase and installation after deducting the value of any municipal, state, or federal sponsored financial incentives, or \$4.50 per rated watt of the solar or wind energy system. For taxable years beginning on or after January 1, 2004, and before January 1, 2006, the credit percentage will change to 7.5%.



A multi-stakeholder effort led by the CPUC and CEC established uniform interconnection standards for Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SCE). This effort made California one of the first states to adopt a simplified process to streamline interconnection for net metering systems certified by a nationally recognized laboratory, such as Underwriters Laboratories (UL).

4.4 Legislation Caps Statewide Net Metering Capacity at One-Half Of One Percent

Net metering laws in California require all electric service providers operating in the PG&E, SCE, and SDG&E service territories to make net metering available to customers until net metered generating capacity exceeds one-half of one percent of the electric service provider's aggregate customer peak demand. Among other reasons, the net metering cap was adopted and retained due to the unknown impacts of increased customer-owned generation on the grid, particularly after the maximum capacity size was increased from 10 KW to 1 MW.

Figure 1 illustrates the status of various electric service providers' progress toward the net metering cap through December 2004.

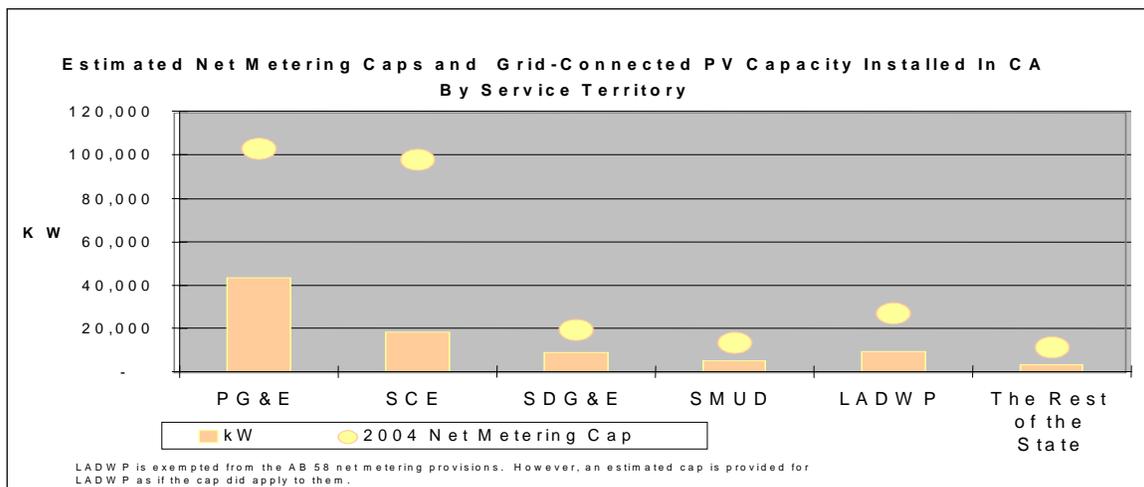


Figure 1. Net Metering Cap Status as of December 2004
[\[http://www.energy.ca.gov/renewables/emerging_renewables/2005-01-18_GRID_PV.XLS\]](http://www.energy.ca.gov/renewables/emerging_renewables/2005-01-18_GRID_PV.XLS)



5. The California Standard Practice Manual Provides A Framework To Assess The Costs And Benefits Of Net Metering

To help us prepare this report, we drew on public comments and testimony regarding cost-benefit valuation submitted in our current DG proceeding. Many parties support methodological perspectives that are used in two reference documents: the *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects (SPM)*⁴, and the *Forecast of Cost Effectiveness and Externality Adders* (Energy and Environmental Economics, or E3).

Regulators and utilities have used tests in the SPM for years to value the costs effectiveness of energy efficiency programs. Some experts believe these tests could also be utilized to quantify the costs and benefits of renewables, net metered projects, and distributed generation.

Developed under contract to the CPUC Energy Division, the E3 report provides quantitative inputs for avoided costs and environmental and other adders designed to capture the benefits of various energy market resources, such as energy efficiency, renewables, and other self-generation.

The CPUC is evaluating whether to adopt these inputs for energy efficiency, and how these inputs and SPM cost effectiveness tests could be used to evaluate renewables, distributed generation, and net metered projects.

In the following sections, we identify costs and benefits associated with net metering. We note that most of these costs and benefits are not exclusive to net metering, and may apply to other types of customer-side generation.

⁴ The “California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects” designates five tests for programs, each of which captures the costs and benefits of a program from a different perspective.



6. Costs And Benefits Are Classifiable

Simply stated, costs and benefits of net metered and other customer-side generation can be categorized as mechanical or technical, economical, societal, and environmental, and may accrue to customer-generators, of utility ratepayers, utilities, and society at large. At a recent joint staff workshop conducted by the CPUC and CEC, participants contributed to a list of proposed costs and benefits that could be used to evaluate net metering. We note that in some instances, similar components appear as both a cost and a benefit, which is likely due to the individualized perspectives of the market participants.

6.1 Benefits

1. Reduction or deferral in distribution and transmission capital investment.
2. Reduced T&D line losses.
3. Avoided commodity costs - energy & capacity.
4. Enhanced reliability.
5. Improved stability and power quality.
6. Provision of Ancillary Services/VAR support.
7. Environmental Impacts.
8. Lower market prices for power.
9. Increased employment in California and tax revenue.
10. National security benefits/reduced security risk to grid.
11. Conservation of natural gas.
12. Avoided utility cost of capital/finance costs.
13. Avoided utility administrative, maintenance, insurance, and installation costs.
14. Tax and other incentives.
15. Credits for incremental environmental benefits of deploying renewables.

6.2 Costs

1. Costs to mitigate distribution system impacts (e.g., interconnection study costs, upgrade costs).
2. Utility revenue loss due to displaced usage of transmission and distribution (T&D) facilities.



3. Lower market prices for power, payments for installed capacity.
4. Lost power sales opportunities.
5. Public benefit and other special surcharges. Similar to capacity services, net metering customers pay these charges on their net, rather than total consumption.
6. Utility/DWR revenue loss due to avoided commodity purchase - energy, capacity, standby service costs, and bonds.
7. Costs for enhanced reliability.
8. Improved stability and power quality.
9. Ancillary services/VAR support.
10. Increased employment and taxes.
11. Costs for increased national security.
12. Conservation of natural gas.
13. Building code or local permitting requirements.
14. Loss of utility plant investment revenue.
15. Administrative, maintenance, installation costs.
16. Special metering.
17. Cost of tax and other incentives

6.3 Avoided Costs Are Quantifiable

The E3 report observes that in addition to mitigating price increases and volatility and deferring T&D investments, distributed energy resource programs can also reduce negative externalities (e.g., carbon dioxide) in the production and consumption of electricity and natural gas. Typically, these reductions are quantified as “avoided costs.”

The term "avoided cost" refers to the total cost avoided by the customer-generator, ratepayer, and the utility through a reduction in energy usage, production, and purchase.

As shown in Figure 2, E3's avoided cost strategy accounts for time and location variations across IOU planning areas and climate zones within California.

These are known as "area- and time-specific" (ATS) avoided costs. In quantifying avoided costs, E3 includes adders to capture factors not embedded



in the market price (or marginal cost) of energy, such as environmental impacts, T&D capacity and line losses, ancillary services, and the price effect of demand reduction.

Figure 2: Time and area dimensions of Avoided costs and externality adders

Avoided Cost Stream	Time Dimension	Area Dimension
Avoided Electricity Generation	Hourly	Utility specific
Avoided Electric Transmission and Distribution	Hourly	Utility, planning area and climate zone specific
Avoided Natural Gas Procurement	Monthly	Utility specific
Avoided Natural Gas Transportation and Delivery	Monthly	Utility specific
Environmental Externality Adder	Annual value, applied by hour according to implied heat rate	System-wide (uniform across state)
Reliability Adder	Annual value	System-wide (uniform across state)
Price Elasticity of Demand Adder	TOU period (on- vs. off-peak) by month	System-wide (uniform across state)

As parties to multiple CPUC resource-valuation proceedings observe, some costs and benefits are easier to quantify than others. Not all parties agree as to which costs and benefits should be valued or how values should be reflected. The CPUC notes, “...the value of DG depends on the perspective of the viewer, i.e., a customer who is deciding whether to install DG, a utility deciding from among energy resource options, a utility ratepayer, or the DG merchant. There is also a societal perspective, one the Commission has historically considered in weighing the benefits of energy efficiency programs.” (R.04-03-017 Scoping Memo, August 6, 2004.)



7. CPUC Next Steps: Adopting A Cost and Benefit Methodology In 2005

The CPUC is scheduled to hold evidentiary hearings from May 11 through May 13, 2005 to solicit additional testimony on cost-benefit issues. We expect to adopt a cost-benefit methodology before the end of 2005. We look forward to providing the Governor, Legislature, and interested parties with an analysis of net metering which utilizes that methodology before the end of the year.

Until then, policymakers have several options to support installation and usage of small customer-side renewables, as outlined in Section 8 below.

8. Policymakers Could Consider Modifications To The Net Metering Program

California supports the largest net metering program in the world. Solar installations account for 99% of California's net metering projects, yet the state lags behind Japan and Germany in numbers of individual solar installations and capacity. Currently, neither Japan, Germany, nor any participating EU countries utilize California-style net metering. Japan and the EU point to a number of contributing factors to their successful solar proliferation, including sustained availability of government and utility support, low-to no-cost loans, lower mortgage rates for homebuyers that purchase solar systems, and performance-based incentives such as favorable "feed-in" tariffs that compensate solar customer-generators at a rate higher than their bundled retail rate for consumption.

8.1 Policymakers Could Consider Utility Billing Options Other Than Simple Net Metering To Increase Collection Of Public Benefit And Other Special Charges.

For example, the utilities could:

1. Estimate the customer-generator's gross consumption, and bill public benefits and other special charges accordingly.



2. Install a second meter to separately measure a customer-generator's production and consumption, and bill customer for public benefits and other special charges based on gross consumption.
3. Install an advanced meter to continuously measure the amount of production and consumption during peak and off-peak periods. Customer's production and consumption kWhs would be valued according to the rates or costs in effect during the time period when the transaction occurs. These rates could also be subsidized to replace upfront rebates with incentives based on generator output.

If California policymakers decide to transition from capacity-based rebates to performance-based incentives, as currently being explored by the CPUC, the CEC, the Governor's Solar Initiative, and as proposed in SB 1, advanced metering will be required. This is true whether rates are based on time-of-use, time-of-production, avoided costs, or higher feed-in rates. If the Solar Initiative emulates initiatives similar to those adopted by Japan and Germany, customer-generators could take advantage of low-interest loans or mortgage loan options to finance customer-side renewable projects. Ratepayer distribution rates and public benefits charges currently used to pay customer rebates for the CPUC and CEC incentive programs could be gradually reallocated toward feed-in tariffs and interconnection costs not recovered from the customer-generator.

Policymakers must also consider the jurisdictional implications associated with allowing solar customers to sell power directly to the IOU through a feed-in tariff, as opposed to the current bill reduction approach through net metering. In the current DG proceeding, the CPUC may consider whether a wholesale transaction tariff is required in order to allow sales from a net-metered customer-generator to the IOU.



8.2 Policymakers Should Consider Increasing The Maximum Net Metering Cap To 5%.

Only two California utilities, SDG&E and SMUD, are approaching the current net metering capacity cap of 0.5% of utility aggregate customer peak demand. Net metering capacity in all investor-owned utilities' service territories increased post-2001 due to a number of factors: incentives available through the SGIP, legislation to augment eligible system size from 10KW to 1 MW, and cohesive interconnection policies. If PV subsidies continue or expand, most customer-generators are likely to take service on a net metering tariff in the absence of other rate options. As noted in the CEC's 2004 IEPR update, grid impacts due to net metering systems are negligible at current levels. Policymakers should continue to monitor statewide net metering levels, and consider legislation to increase the maximum cap to 5% of aggregate peak demand. To ensure continuity, the higher cap should go into effect well in advance of utilities reaching the current 0.5% cap.

