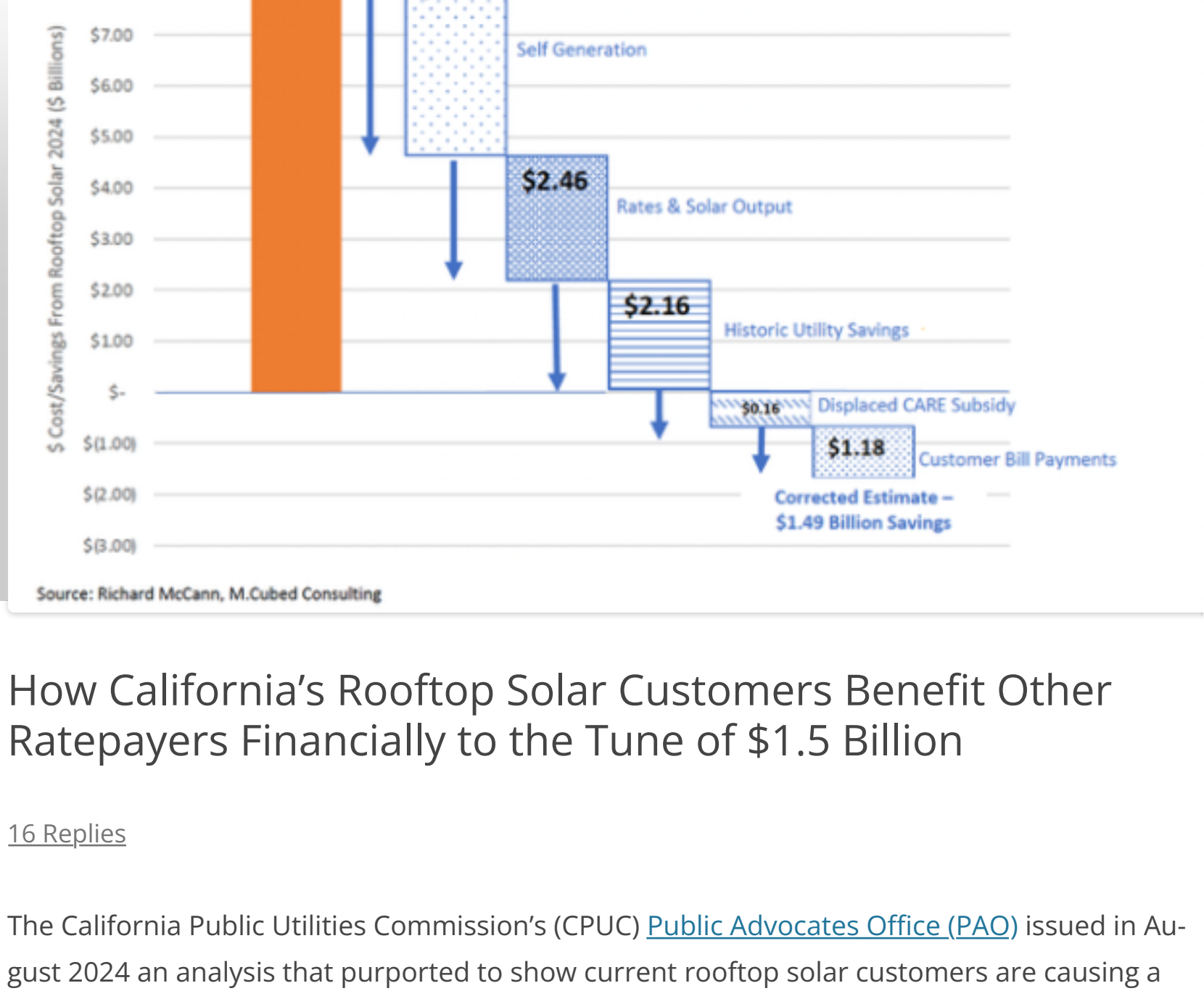
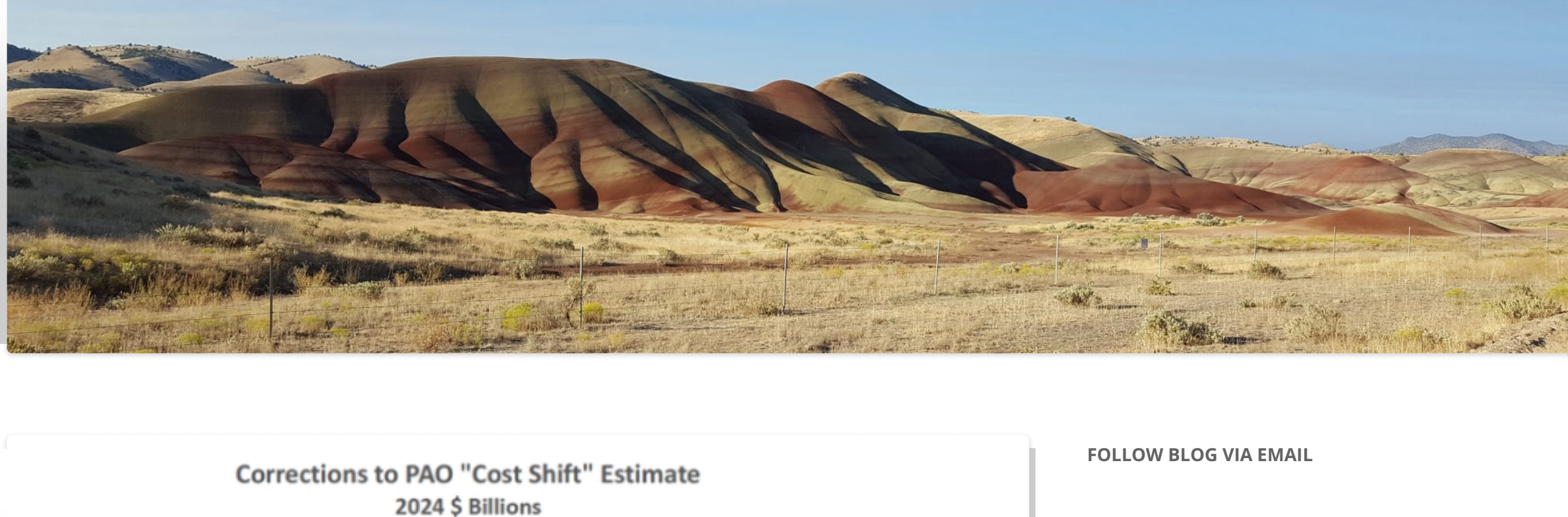


Economics Outside the Cube

Musings from M.Cubed on the environment, energy and water

MUSINGS AND TIDBITS ABOUT M.CUBED M.CUBED WEBPAGE



How California's Rooftop Solar Customers Benefit Other Ratepayers Financially to the Tune of \$1.5 Billion

16 Replies

The California Public Utilities Commission's (CPUC) [Public Advocates Office \(PAO\)](#) issued in August 2024 an analysis that purported to show current rooftop solar customers are causing a "cost shift" onto non-solar customers amounting to \$8.5 billion in 2024. Unfortunately, this rather simplistic analysis started from an incorrect base and left out significant contributions, many of which are unique to rooftop solar, made to the utilities' systems and benefitting all ratepayers. After incorporating this more accurate accounting of benefits, the data (presented in the chart above) shows that rooftop solar customers will in fact save other ratepayers approximately **\$1.5 billion in 2024**.

The following steps were made to adjust the original analysis presented by the PAO:

- Rates & Solar Output:** The PAO miscalculates rates and overestimates solar output. Retail rates were calculated based on utilities' advice letters and preceding workpapers. They incorporate time-of-use rates according to the hours when an average solar customer is actually using and exporting electricity. The averages are adjusted to include the share of net energy metering (NEM 1.0 and 2.0) and net billing tariff (NBT or "NEM 3.0") customers (8% to 18% depending on the utility) who are receiving the California Alternate Rates for Energy program's (CARE) low-income rate discount. (PAO assumed that all customers were non-CARE). In addition, the average solar panel capacity factor was reduced to 17.5% based on the state's distributed solar database. [1] Accurately accounting for rates and solar outputs amounts to a \$2.457 billion in benefits ignored by the PAO analysis.
- Self Generation:** The PAO analysis included solar self-consumption as being obligated to pay full retail rates. Customers are not obligated to pay for energy to the utility for self-generation. Solar output that is self-consumed by the solar customer was removed from the calculation. Inappropriately including self-consumption as "lost" revenue in PAO analysis amounts to \$3,989 billion in a phantom cost shift that should be set aside.
- Historic Utility Savings:** The PAO fails to account for the full and accurate amount of savings, and the shift in the system created by rooftop solar that has lowered costs and rates. The historic savings are based on distributed solar displacing 15,000 megawatts of peak load and 23,000 gigawatt-hours of energy since 2006 compared to the California Energy Commission's (CEC) 2005 Integrated Energy Policy Report forecast. [2] Deferred generation capacity valuation starts with the CEC's cost of a combustion turbine [3] and is trended to the marginal costs filed in the most recent decided general rate cases. Generation energy is the mix of average California Independent System Operator (CAISO) market prices in 2023. [4] and utilities' average renewable energy contract prices. [5] [Avoided transmission costs](#) are conservatively set at the current unbundled retail transmission rate components. [Distribution investment savings](#) are the weighted average of the marginal costs included in the utilities' general case filings from 2007 to 2021. Accounting for utility savings from distributed solar amounts to \$2.165 billion ignored by the PAO's calculation.
- Displaced CARE Subsidy:** The PAO analysis does not account for savings from solar customers who would otherwise receive CARE subsidies. When CARE customers buy less energy from the utilities, it reduces the total cost of the CARE subsidy born by other ratepayers. This is equally true for energy efficiency. The savings to all non-CARE customers from displacing electricity consumption by CARE customers with self-generation is calculated from the rate discount times that self-generation. Accounting for reduced CARE subsidies amounts to \$157 million in benefits ignored by the PAO analysis.
- Customer Bill Payments:** The PAO analysis does not account for payments towards fixed costs made by solar customers. Most NEM customers do not offset all of their electricity usage with solar. [6] NEM customers pay an average of \$80 to \$160 per month, depending on the utility, after installing solar. [7] Their monthly bill payments more than cover what are purported **fixed costs**, such as the service transformer. A justification for the \$24 per month customer charge was a purported under-collection from rooftop solar customers. [8] Subtracting the variable costs represented by the Avoided Cost Calculator from these monthly payments, the remainder is the contribution to utility fixed costs, amounting to an average of \$70 per month. (In comparison for example, PG&E customer also pay at least \$15 per month in a minimum fixed charge today. [9]) Accounting for fixed cost payments adds \$1.18 billion in benefits ignored by the PAO analysis.

The correct analytic steps are as follows:

$$\begin{aligned} \text{NEM Net Benefits} &= [(kWh \text{ Generation [Corrected]} - kWh \text{ Self Use}) \times \text{Average Retail Rate Compensation [Corrected]}] \\ &- [(kWh \text{ Generation [Corrected]} - kWh \text{ Self Use}) \times \text{Historic Utility Savings } (\$/kWh)] \\ &- [(CARE/FERA kWh \text{ Self Use} \times \text{CARE/FERA Rate Discount } (\$/kWh)] \\ &- [(kWh \text{ Delivered} \times (\text{Average Retail Rate } (\$/kWh) - \text{Historic Utility Savings } (\$/kWh))] \end{aligned}$$

Advertisement

$$\begin{aligned} \text{NBT Net Benefits} &= [(kWh \text{ Generation [Corrected]} - kWh \text{ Self Use}) \times \text{Average Retail Rate Compensation [Corrected]}] \\ &- [(kWh \text{ Generation [Corrected]} - kWh \text{ Self Use}) \times \text{Avoided Cost (Corrected)} (\$/kWh)] \\ &- [(CARE/FERA kWh \text{ Self Use} \times \text{CARE/FERA Rate Discount } (\$/kWh)] \\ &- [(Net kWh Delivered \times (\text{Average Retail Rate } (\$/kWh) - \text{Historic Utility Savings } (\$/kWh))] \end{aligned}$$

This analysis is not a value of solar nor a full benefit-cost analysis. It is only an adjusted ratepayer-impact test calculation that reflects the appropriate perspective given the PAO's recent published analysis. A full benefit-cost analysis would include a broader assessment of impacts on the long-term resource plan, environmental impacts such as greenhouse gas and criteria air pollutant emissions, changes in reliability and resilience, distribution effects including from shifts in environmental impacts, changes in economic activity, and acceleration in technological innovation. Policy makers may also want to consider other non-energy benefits as well such as local job creation and supporting minority owned businesses.

This analysis applies equally to [one conducted](#) by Severin Borenstein at the University of California's Energy Institute at Haas. Borenstein arrived at an average retail rate similar to the one used in this analysis, but he also included an obligation for self-generation to pay the retail rate, ignored historic utility cost savings and did not include existing bill contributions to fixed costs.

The supporting workpapers are posted [here](#).

Thanks to Tom Beach at Crossborder Energy for a more rigorous calculation of average retail rates paid by rooftop solar customers.

[1] PAO assumed a solar panel capacity factor of 20%, which inflates the amount of electricity that comes from solar. For a more accurate calculation see California Distributed Generation Statistics. <https://www.californiadgstats.ca.gov/charts/>.

[2] This estimate is conservative because it does not include the accumulated time value of money created by investment begun 18 years ago. It also ignores the savings in reduced line losses (up to 20% during peak hours), avoided reserve margins of at least 15%, and suppressed CAISO market prices from a 13% reduction in energy sales.

[3] CEC, *Comparative Costs of California Central Station Electricity Generation Technologies*, CEC-200-2007-011-SF, December 2007.

[4] CAISO, 2023 Annual Report on Market Issues & Performance, Department of Market Monitoring, July 29, 2024.

[5] CPUC, "2023 Padilla Report: Costs and Cost Savings for the RPS Program," May 2023.

[6] Those customers who offset all of their usage pay minimum bills of at least \$12 per month.

[7] PG&E, SCE and SDG&E data responses to CALSSA in CPUC Proceeding R.20-08-020, escalated from 2020 to 2024 average rates.

[8] CPUC Decision 24-05-028.

[9] CPUC Proceeding Rulemaking 22-07-005.

[10] The average bill for NBT customer is not known at this time.

Advertisement

Share this: [Twitter](#) [Facebook](#) [Email](#) [LinkedIn](#) [Print](#)

[Reblog](#) [Like](#) Be the first to like this.

Related

- Replying to PAO's response on its rooftop solar "cost shift" analysis January 31, 2025 In "Energy innovation"
- Response to Borenstein's critique of our assessment of the benefits of rooftop solar February 3, 2025 In "Energy innovation"
- Has rooftop solar cost California ratepayers more than the alternatives? February 24, 2022 In "Energy innovation"

This entry was posted in [Energy innovation](#) and tagged [California](#), [climate change](#), [distributed energy resources](#), [electricity rates](#), [M.Cubed](#), [PG&E electricity rates](#), [renewables](#), [SCE](#), [SDG&E](#), [solar rooftop](#) on November 14, 2024.

[← How to properly calculate the marginal GHG emissions from electric vehicles](#) [California's perceived "solar glut" problem is actually a "nuclear glut" problem → and electrification](#)

16 thoughts on "How California's Rooftop Solar Customers Benefit Other Ratepayers Financially to the Tune of \$1.5 Billion"

Richard McCann Post author
February 7, 2025 at 11:16 AM

Here's my response to a critique by Severin Borenstein at UCI posted January 2025: <https://mcubedecon.com/2025/02/03/response-to-borensteins-critique-of-our-assessment-of-the-benefits-of-rooftop-solar/>

★ Like

Reply ↓

Richard McCann Post author
February 7, 2025 at 11:14 AM

Here's my response to a critique by PAO posted November 2024. <https://mcubedecon.com/2025/01/31/replying-to-paos-response-on-its-rooftop-solar-cost-shift-analysis/>

★ Like

Reply ↓

Pingback: [Response to Borenstein's critique of our assessment of the benefits of rooftop solar | Economics Outside the Cube](#)

Pingback: [Replying to PAO's response on its rooftop solar "cost shift" analysis | Economics Outside the Cube](#)

Pingback: [Arizona rooftop solar customers will have a monthly fee added to their bills in 2025 - pv magazine USA](#)

Pingback: [Energy experts urge California Governor to reject anti-rooftop solar executive order - pv magazine USA - News Solartex](#)

Pingback: [Energy experts urge California Governor to reject anti-rooftop solar executive order - pv magazine USA](#)

Ben
December 6, 2024 at 8:11 AM

Given your economic analysis saying "California's Rooftop Solar Customers Benefit Other Ratepayers Financially to the Tune of \$2.3 Billion"

Any thoughts about the LA Times news article,...

Solar power glut boosts California electric bills. Other states reap the benefits

In the last 12 months, California has curtailed production of enough solar energy to power 518,000 homes for a year.

Californians, whose electric rates are roughly twice the national average, are essentially paying far more capacity than they are unable to use.

The solar glut raises questions about the state's plan to generate all its electricity from carbon-free sources by 2045.

California is making so much solar energy that large commercial operators are increasingly forced to stop production, raising questions about the state's costly plan to shift entirely to carbon-free sources of electricity.

<https://www.latimes.com/environment/story/2024-11-24/california-has-so-much-solar-power-that-increasingly-it-goes-to-waste>

★ Like

Reply ↓

Richard McCann Post author
December 6, 2024 at 8:45 AM

I will post a new blog on Monday morning addressing the misperceptions in this article. Bottom line is that we have a nuclear power glut, not a solar glut.

★ Like

Reply ↓

Pingback: [California's rooftop solar is a benefit, not a cost, to the state - Colombia Inteligente](#)

Pingback: [Concessionárias da Califórnia colocam solar no telhado como bode expiatório para as altas na tarifa - pv magazine Brasil](#)

Pingback: [City Council Watch - November 19, 2024 - Glendale Environmental Coalition](#)

Pingback: [California utilities scapegoat rooftop solar for high electricity rates - solosolare.it](#)

Richard McCann
November 15, 2024 at 2:48 PM

PV Magazine carried this story on the analysis as well as the broader issues behind the push for the "cost shift" myth: <https://pv-magazine-usa.com/2024/11/15/california-utilities-scapegoat-rooftop-solar-for-high-electricity-rates/>

★ Like

Reply ↓

Pingback: [California utilities scapegoat rooftop solar for high electricity rates - pv magazine USA](#)

Richard McCann
November 15, 2024 at 8:47 AM

Jeff St. John at Canary Media wrote this story about the study: <https://www.canarymedia.com/articles/solar/californias-rooftop-solar-is-a-benefit-not-a-cost-to-the-state>

★ Like

Reply ↓

Leave a comment

Start a Blog at WordPress.com.

Privacy & Cookies: This site uses cookies. By continuing to use this website, you agree to their use. To find out more, including how to control cookies, see here: [Cookie Policy](#)

FOLLOW BLOG VIA EMAIL

Enter your email address to follow this blog and receive notifications of new posts by email.

Follow

Follow Economics Outside the Cube

RECENT POSTS

Response to Borenstein's critique of our assessment of the benefits of rooftop solar

Replying to PAO's response on its rooftop solar "cost shift" analysis

California's perceived "solar glut" problem is actually a "nuclear glut" problem

How California's Rooftop Solar Customers Benefit Other Ratepayers Financially to the Tune of \$1.5 Billion

How to properly calculate the marginal GHG emissions from electric vehicles and electrification

RECENT COMMENTS

Richard McCann on How California's Rooftop...

Richard McCann on How California's Rooftop...

Anthony K on Yet another misconstrued view...

Richard McCann on Response to Borenstein's criti...

Response to Borenstein on How California's Rooftop...

CATEGORIES

Select Category

Energy innovation

Falling outside economics. Other economic thoughts. Risks of climate change. Valuing the environment. Water resources management.

TAGS

AB 32 agricultural water use agriculture alternative energy Ben-Dela benefit-cost analysis building decarbonization CAISO California cap and trade carbon tax CCA climate change coal community choice aggregation community solar gardens CPUC Davis DER distributed energy re-sources distribution planning drought economic incentives economics electricity markets electricity rates electric vehicles energy economics energy efficiency Energy Institute at Haas energy management energy resources environmental economics environmental policy GHG greenhouse gases ground water infrastructure incentive based regulation innovation policy M.Cubed market design net energy metering nuclear power PCIA PG&E PG&E electricity rates regulation reliability renewables risk and vulnerability BPS SCE SDG&E sociology solar power solar rooftop storage technological innovation vehicles subsidies transmission transportation UC Energy Institute urban water use utility rates water resource management water rights water transfers wildfires zero net energy

BLOGS I FOLLOW

Electric City News
It's simpler than it looks
Traveling at the Speed of Bike
Energy Matters
Solar Roof Dynamics
State Power Project
Blog
Free exchange
Real Time Economics
Center for Environmental Policy and Behavior
blogs
Environment + Energy - The Conversation
Jfleck at Inkstain
www.circleofblue.org/waternews/
Valley Economy
UCLA Blueprint
Alex Breitter's Environment Blog
Water Programming: A Collaborative Research Blog
Blog - Renewable Energy Resilience
Private Water Law
Berkeley News

POSTS I LIKE

I am wondering... (2/2/25) on Traveling at the Speed of Bike

ARCHIVES

Select Month

META

Register
Log In
Entries feed
Comments feed
WordPress.com

BLOG STATS

76,346 hits

Advertisements

Chat w/
Online
Experts 24/7

A Technician Will Answer Your Questions in Minutes. Chat Now.

JustAnswer

Open >

Advertisements