

AFFORDABILITY

Issue: Is carbon-free electricity more expensive than coal or gas, and will the transition to carbon free electricity by 2030 result in utility rate increases for rate payers?

Short Answer

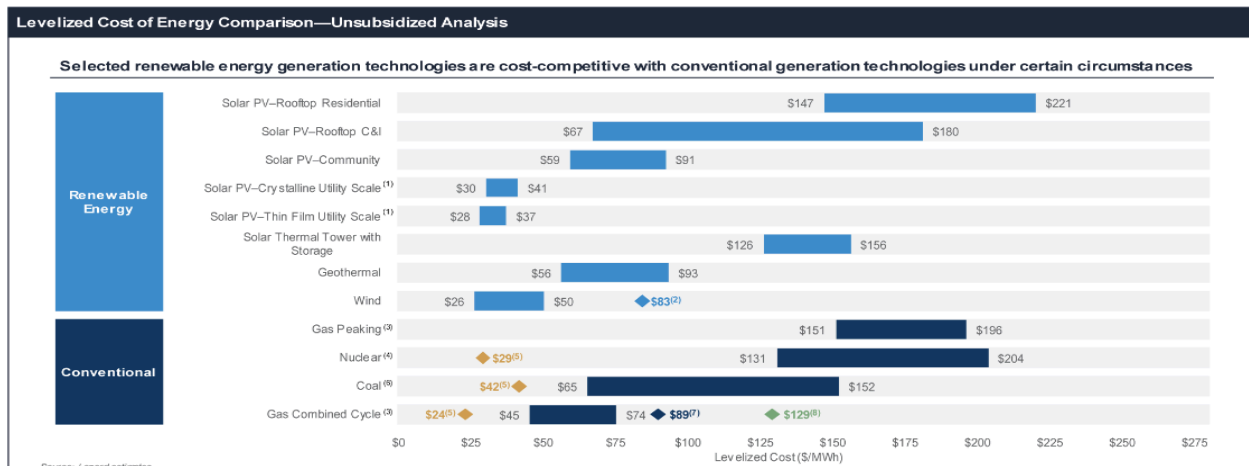
No. Electricity generated at distant solar and wind plants (“utility scale power”) is less expensive than electricity from coal and gas plants and has been for some time. At the present time about 50% of the electricity supply in Pasadena is sourced from carbon-free energy (including rooftop solar) and experts forecast that its cost advantage will increase because of federal incentive programs and technology advancement. While California’s utility rates have been increasing lately, it’s because of increasing fuel costs, inflation, insurance, and utility company expenses in response to wildfires — not because of renewable energy.

Point by Point Explanation

1. ***Utility scale wind/solar electricity is less expensive than gas and coal; studies by investment analysts, researchers and government agencies predict further decreases.***

As the Director General of the International Renewable Energy Agency (IRENA) stated: “Today, renewables are the cheapest source of power.”¹

One way of systemizing the comparison of national electricity costs is with Levelized Cost of Energy. LCOE is a measure of the average, net present value of a power project over its lifetime, including generation. It’s used for consistency when comparing different methods of electricity generation. Current LCOE shows wind and solar as having either lower or comparable LCOE to combined-cycle gas plants². See the Levelized Cost of Energy Comparison figure below³.

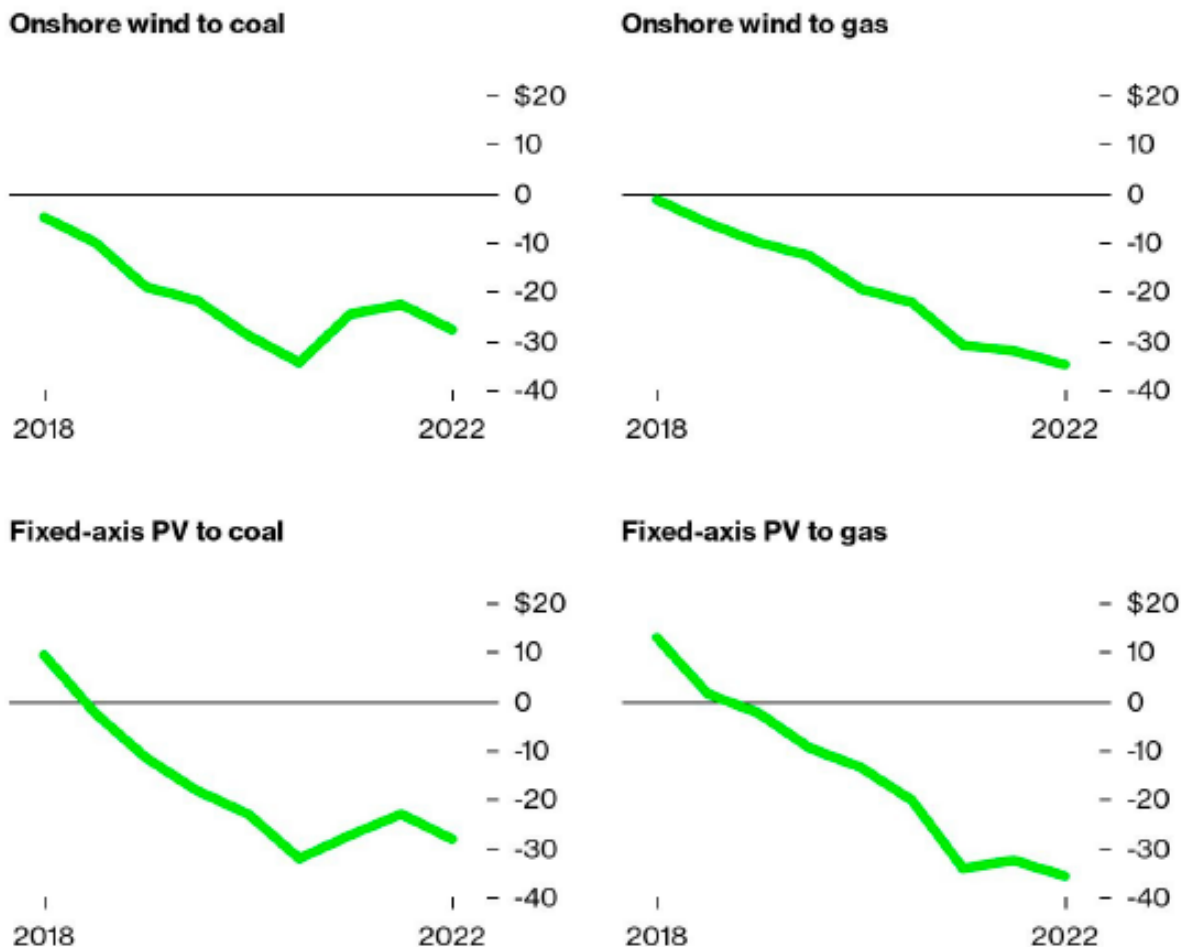


Utility solar can be as low as \$30-40/MWh. Yet without storage, solar-alone cannot offer 24/7 dispatchability. By adding storage, wholesale solar+battery costs rise to roughly \$90-120/MWh

(utility scale)⁴. For comparison, the wholesale cost of baseload, combined-cycle fossil gas energy is \$50-120/MWh (which *is* dispatchable)⁴.

Specific power purchase agreements signed by PWP might be higher or lower than national averages. For example, a contract for electric power from a utility-scale solar+battery plant with a cost of \$45/MWh was approved by City Council in November 2022⁵. (Substantially less than Lazard’s LCOE for solar+battery shown above.) For comparison, PWP’s contract price for local gas-fired power is \$27/MWh from Magnolia Power Plant (2018 IRP) and \$63/MWh for coal-fired power from Intermountain Power Plant (2018 IRP). The Magnolia price is low because it represents only the marginal cost of operating a fully depreciated plant. (PWP’s commitment to Magnolia power ends in 2036.)

Renewable energy is influenced by global trends; in 2022 inflation and supply-chain challenges increased the cost of renewables. But fossil-fueled power prices rose *even more*. The bottom line is that the cost gap between wind & solar and coal & gas has widened, not closed. The following figure from Bloomberg Financial compares costs since 2018⁶. The vertical axis represents \$/MWh.



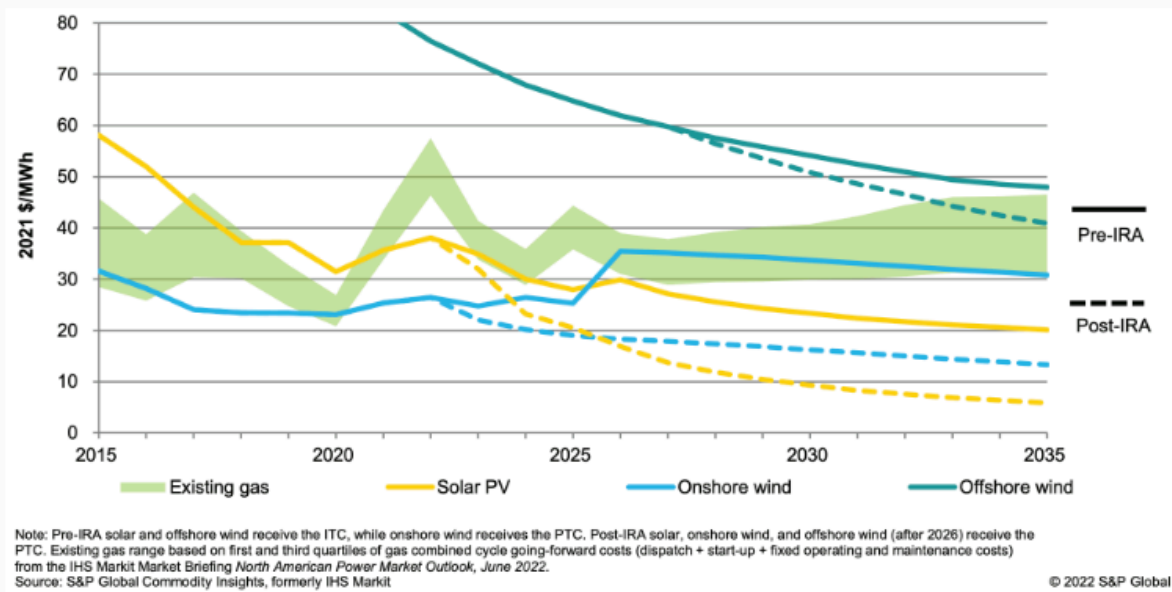
Cities roughly the same size as Pasadena that *already* have achieved 100% zero-carbon energy or 100% net-zero emissions (with affordable rates): Georgetown TX⁷ (utility rates⁸), Burlington VT⁹, Lancaster CA¹⁰. Some California cities planning for 100% zero-carbon energy or 100% net-zero emissions by 2030: Sacramento Municipal Utility District¹¹, City of San Jose¹², and Palo Alto¹³. All expect rates to remain affordable.

In sum, the narrative that transition to renewable energy power supply will cause rate increases is not based on fact.

2. *Even lower prices and more availability are forecast.*

Costs for utility-scale renewable energy are expected to decrease further in the next few years because of technology development and the Inflation Reduction Act which provides strong incentives for investment in new renewable energy production and distribution projects. The figure below¹⁴ illustrates this.

Wind and Solar LCOE Versus Gas Combined Cycle Variable Costs



Cost for storage (batteries of various types) is also predicted to decrease with a consequent drop in price. Nothing is surprising about that prediction, it's following a long-observed pattern of product development, from refrigerators through digital watches and flat-screen televisions, to solar panels. The National Renewable Energy Laboratory is predicting a 2030 price for battery storage to be 60% of its cost in 2022¹⁵. Recent news stories showing the proliferation of affordable battery storage are SMUD¹⁶ and megapack¹⁷.

3. ***The role of local rooftop solar.***

Rooftop solar (also called “distributed energy resources” or DER) is approximately 3 times more expensive to install in California than utility-scale solar (per installed kilowatt) because of diminished economies of scale.

The price comparison between utility and rooftop solar is deficient for at least two reasons:

- a) Utility-scale electricity generation costs do not include transmission access charges, transmission line construction costs and line-losses, as well as land-use and environmental costs which must be borne by utility-scale projects built far from the consumer.
- b) Upfront costs of DER are paid by private property owners (“customer generators”) not the rate payers nor the municipal budget. It is the customer (not PWP) who pays the upfront investment because they are incentivized to do so through net energy metering (NEM) payback. The customer-generator thereby provides the utility with capital savings equivalent to the cost of the solar modules. However if NEM is withdrawn, the growth in rooftop solar in Pasadena may slow (as experienced by other States under similar circumstances).

Recent grid modeling (performed at significantly higher fidelity than the legacy models employed by utilities) shows that optimal cost for the generator will be achieved by utility scale solar *plus* lots of rooftop solar (including battery storage)¹⁸. In other words, rooftop solar provides utilities with the flexibility to manage peak loads without requiring expensive, seldom-used, fossil-fuel peaker plants. In Pasadena, the Glenarm facility sits on 14 urban acres and operates only occasionally (~5%, using time as a metric).

4. ***IRA Subsidies Provide City-Owned Utilities with Rare Opportunities.***

The IRA provides strong subsidies for investment by cities and public-owned utilities in infrastructure and programs like bulk storage (batteries), community solar and associated workforce development. Specific benefits for utility customers are provided in the IRA and these provide opportunities to keep utility rates reasonable for ratepayers.¹⁹ A good summary guide to funds available under the IRA is provided by the Climate Mayors.²⁰

“You could power America with renewables from a technical and economic standpoint. The biggest obstacles are social and political - what you need is the will to do it.”

--Prof. Mark Z. Jacobson, Civil and Environmental Engineering, Stanford University

Reference material:

NREL Renewable Energy Futures Study

<https://www.nrel.gov/docs/fy12osti/52409-2.pdf>

World Economic Forum, “Renewable Energy is Cheaper than Previously Thought”, Oct. 2021

<https://www.weforum.org/agenda/2021/10/how-cheap-can-renewable-energy-get/>

“Wind and Solar Saving Texans \$20m a Day,” Rocky Mountain Institute, August, 2022

<https://rmi.org/wind-and-solar-are-saving-texans-20-million-a-day/>

“Renewable Power Remains Cost Competitive amid Fossil-Fuel Crisis”, July 2022

<https://www.irena.org/newsroom/pressreleases/2022/Jul/Renewable-Power-Remains-Cost-Competitive-amid-Fossil-Fuel-Crisis>

Cited sources:

¹ <https://www.irena.org/news/pressreleases/2021/Jun/Majority-of-New-Renewables-Undercut-Cheapest-Fossil-Fuel-on-Cost>

² Bloomberg, “Renewable Energy provides relief from rising power prices.” <https://www.bloomberg.com/news/articles/2022-07-14/renewable-energy-provides-relief-from-rising-power-prices>

³ Footnotes to this complex chart are not copied because of legibility, but can be view here: <https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/> (p. 1)

⁴ <https://www.lazard.com/media/451905/lazards-levelized-cost-of-energy-version-150-vf.pdf>

⁵ <https://www.cityofpasadena.net/commissions/wp-content/uploads/sites/31/2022-11-08-Municipal-Services-Committee-Agenda.pdf?v=1668470605424> (Item #19)

⁶ Bloomberg, Ibid.

⁷ <https://www.100-percent.org/georgetown-texas-usa/>

⁸ <https://gus.georgetown.org/water/rates/>

⁹ <https://nextcity.org/urbanist-news/for-burlington-vermont-going-100-renewable-energy-was-just-the-start>

¹⁰ <http://lancasterenergy.com/billing-rates/residential-rates/>

¹¹ <https://www.smud.org/en/Corporate/Environmental-Leadership/2030-Clean-Energy-Vision>

¹² <https://sanjosespotlight.com/how-san-jose-plans-to-be-carbon-neutral-in-nine-years/>

¹³ <https://www.paloaltoonline.com/news/2022/10/04/palo-alto-shoots-for-carbon-neutrality-by-2030>

¹⁴ <https://rmi.org/business-case-for-new-gas-is-shrinking/>

¹⁵ <https://www.nrel.gov/docs/fy21osti/79236.pdf>

¹⁶ <https://www.canarymedia.com/articles/energy-storage/ess-inks-largest-ever-us-flow-battery-purchase-with-sacramentos-utility>

¹⁷ <https://www.teslarati.com/tesla-megapack-off-grid-exclusive/>

¹⁸ The analysis by *Vibrant Energy* considers the power distribution system as a multi-parametric system to be optimized (everything between the energy source and its point of use), rather than the legacy method of treating the grid as a single, undifferentiated “load”. Optimizing for local solar on a 100% clean grid can reduce California ratepayers bills by \$4 billion dollars per year, vis-a-vis utility-scale only. Technical paper: https://www.vibrantcleanenergy.com/wp-content/uploads/2020/12/WhyDERs_TR_Final.pdf Explanatory webinar: <https://www.youtube.com/watch?v=8LugAsV--hc&t=27s>

¹⁹ <https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/02/fact-sheet-biden-harris-administration-announces-new-actions-to-lower-energy-costs-for-families/>

²⁰ <https://climatemayors.org/climate-mayors-and-c40-cities-provide-u-s-cities-with-guidebook-to-implement-historic-inflation-reduction-act/>