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Comment Received From: Rich Harkness
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**WRITTEN COMMENTS for Disadvantaged Communities Advisory
Group Meeting Agenda items 2 and 5**

See the attached document.

Additional submitted attachment is included below.

Dear Advisory Group Members,

I note that a key objective of your group is to reduce the cost of electricity to disadvantaged community members. I would like to inform you of a new way to help accomplish that goal. Its called “remote-solar”.

Its called “remote-solar” because it would allow homeowners and renters to purchase solar panels and battery storage in large utility-scale solar farms where power can be generated six times less expensively than with rooftop solar. They would be operated somewhat like “solar condominiums” where each customer owns a share of the entire solar farm. The solar energy generated by any given customer would be transmitted to his or her home thru the grid and the customer would pay the utility company a transmission and distribution fee for that. In the utility company billing process most of that solar energy would be used to offset or replace the energy the customer took from the grid and used at home. Sometimes (like in summer) if the customers generated more energy that he/she used the utility would pay the usual NEM 3.0 rate for that excess it just as they do for rooftop solar customers. If the customer used more than he/she produced (typically in winter) they would be billed for any extra grid energy needed, again this is how rooftops solar works.

Remote-solar is a new concept that has not been used elsewhere but its similar in several respects to “direct access” and rooftop solar. It uses no new technology and does not require any federal, state or utility company funding.

This may seem like a form of community solar but its fundamentally different, especially since the customer's solar energy that is self-consumed at home is not sold to the utility company for a dollar credit as it is with community solar. Instead since the customer owns it its free (just like rooftop solar used at home is free), except for the transmission fee. That makes a huge financial difference and makes remote-solar a very attractive investment.

This concept has been evaluated in detail by remote solar advocates. Our financial model shows that a remote-solar system for a average California household would cost about \$4800 (compared with about \$34,000 for a comparable rooftop system), reduce the

customers electric bills by over 30%, payback in less than 5 years with an ROI of about 20%. This should make it affordable and attractive to a wide range of incomes.

Remote solar would be especially attractive to renters because their remote-solar account could be married to their new electric meter if they moved, or it could be sold.

Remote-solar advocates became a Party to the CPUC proceedings on green energy and community solar over a year ago and submitted a formal Motion under Docket A22-05-022 asking the CPUC to seriously consider this idea and establish rules and a tariff so it could become available to customers. We have received no feedback on this idea. The IOUs immediately filed asking the CPUC to dismiss this idea, likely because they don't want more completion. However it's only by introducing new programs or ideas that disturb the status quo that we are going to be able to reduce customers electric bills and produce more renewable energy. As a leader in renewable energy California should do that.

We respectfully request that your group and CPUC's Customer Advocates organization make sure that remote-solar is carefully vetted by an objective team of experts, and certainly not handed over to the IOUs to evaluate as was community solar.

I have two long whitepapers and several short reports on this concept plus a powerpoint presentation that I would like to present to your team. please let me know how we can help. Meanwhile a short 11 page description and one even shorter one-page description is attached below. Please get back to me on this.

Respectfully,

—Rich Harkness, BSEE, PhD, retired from a career in new business and strategic planning in aerospace and telecom industries, author of a book on global warming: <https://www.amazon.com/Global-Warming-technical-economic-political-ebook/dp/B082WN38T2>, personal website: <https://www.richard-c-harkness.com/>, retired in Santa Rosa

Remote-solar: a new way to reduce energy costs and save GHG

California wants to increase renewable energy, lower electricity costs, reduce the cost of new homes, and increase EV sales. A new idea called “remote-solar” could help achieve these goals because it would allow homeowners and renters to purchase solar panels and battery storage in large new solar farms which can generate electricity very inexpensively. Think of them as solar condominiums. The electricity so produced would be sent thru the grid to their homes.

Remote-solar may seem radical but actually it’s a lot like rooftop solar except the panels are not on your roof and its much less expensive. With rooftop solar the energy produced by your panels travels thru wires directly into your house. And the solar energy used in your home is free since you already bought the panels that produced it. With remote-solar the energy used in your home would be free for the same reason, but -figuratively speaking- it must travel thru the grid from a remote solar farm to reach your home so you would pay the utility company what’s called a transmission and distribution (T&D) fee to transport it.

Paying the utility company to transport energy is not a new idea. Utility companies charge their own customers a T&D fee, which appears on their bills. Consumer Choice Aggregators (CCAs) pay the utility company to transport their electricity from their solar farms and other sources to their customers, and that T&D fee appears on their bills. If community solar becomes available their customers will also pay to use the grid. Likewise remote-solar customers would pay for grid use because it’s a fair and established practice.

Because solar panels with battery storage in large utility-scale solar farms is about six times cheaper (in \$/kWh) than rooftop panels with battery storage, it turns out that, even after paying the utility company for grid use, remote-solar is far less expensive than rooftop solar. That’s its key advantage.

Another detail affects the financials. Sometimes rooftop systems produce less energy than the home needs so the customer pays the utility company or CCA for any extra grid energy needed. At other times they produce more so that excess energy is sent back into the grid for NEM credits. Remote solar would operate the same way.

In short, remote-solar would use almost the same billing scheme as rooftop solar. The main difference is that the operator of the remote-solar farm would report how much power the customers remote-solar system produced each month so the utility company can compare it with what the electric meter says the home used. Its simple and transparent. Note that community solar uses a very different billing approach, and has other differences, so remote-solar is NOT the same as community solar. As a result, remote-solar could reduce electric bills by about 40% whereas community solar usually achieves only 5 to 20%.

If the above provisions are reasonable, which it seems they are, then it remains to quantify the financial costs and benefits for an average remote-solar customer. A remote-solar system sized to generate as much power as the average California home uses (6500 kWh/yr.) would cost the

customer about \$4800 up front. (A comparable rooftop system would cost about \$34,000.) The \$4800 would be paid back in about 5 years from lower electric bills. The customer's return on that \$4800 investment (ROI) would be about 20%/yr. making remote-solar superior to most stock and bond investments.

Because of its very favorable financials remote-solar is a powerful concept, able to scale enough to make a real difference. It could be a rare win-win for both consumers and the environment. Lower electricity costs would then increase EV sales by reducing the cost of EV "fuel" and help make other home electrification projects cost-effective. Current state law requires new homes to have rooftop solar. If remote-solar were accepted as a substitute it would reduce the price of new homes.

Finally, remote-solar is a way to continue making progress in spite of recent Federal policies harming renewable energy.

At this time remote-solar is still a concept. The CPUC has been formally asked to evaluate it and if deemed feasible, establish a tariff to offer customers this new choice. Support is needed to make that evaluation happen.

Harkness dated Nov. 18, 2025

Remote-Solar

By R.C. Harkness, as of Dec. 12th, 2025

Overview:

California is faced with these three problems: the need to increase renewable energy in order to mitigate climate change, the need to reduce people's electric bills, and the high cost of new housing. A potential new way for homeowners and renters to obtain solar power could help solve these problems. It's called "remote-solar" because rather than install solar panels on the roof it would allow customers to purchase solar panels and battery storage in large utility-scale solar farms and have the energy they produce sent (figuratively speaking) thru the electric grid to their homes. Actually, the grid is akin to a lake. The solar farm would export energy into the lake (grid) in one place and customers would take it out at home.

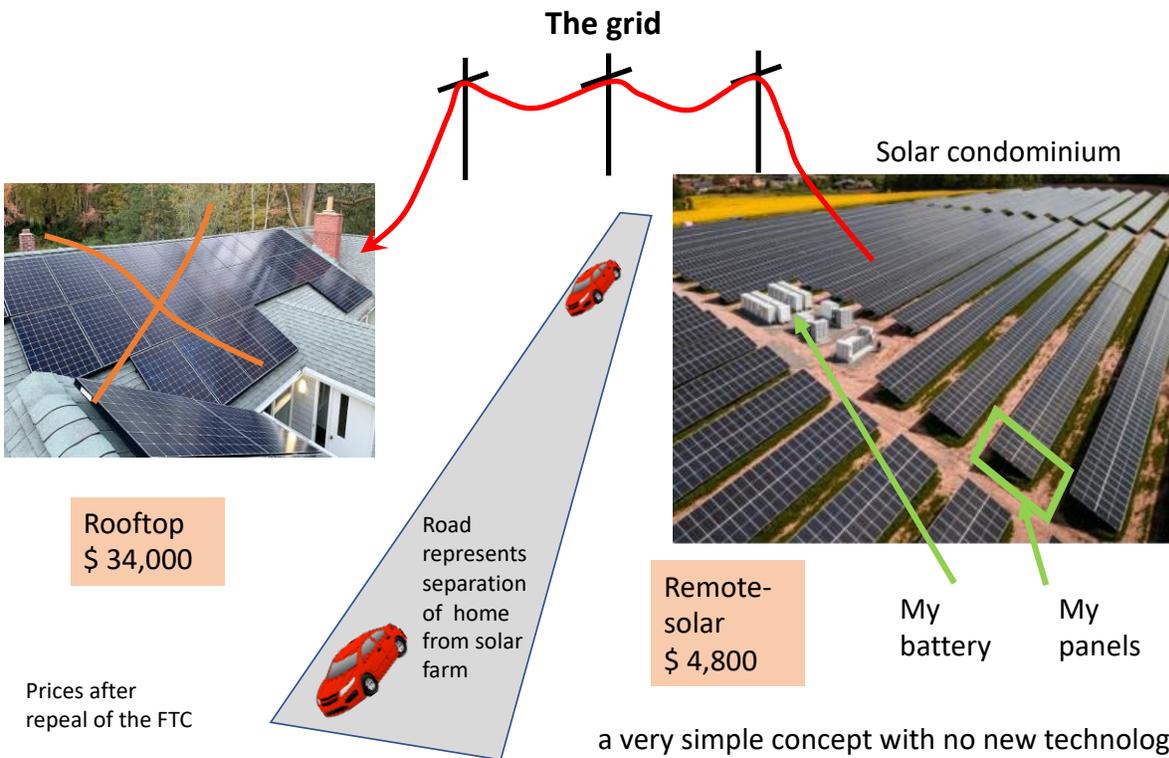
The easiest way to think of remote-solar is to say it's like rooftop solar, except it's not on your roof and its much less expensive. The diagram below illustrates the essence of remote-solar vs. rooftop solar.

No new technology is needed because we all get some of our power today from remotely located solar farms, many of which are in the central valley. However, the financial aspects of remote-solar would be quite different.

The financial attractiveness of remote-solar stems from the fact that -due to economies of scale, optimum panel orientation and other factors- it's very inexpensive to generate power in large solar farms. There are no other less expensive power sources.

In an era when many climate initiatives have been frustrated, remote-solar is something that CAN BE DONE because it requires no new technology, no government or utility company funds, and is financially attractive even after the switch to NEM 3.0 and repeal of the FTC for solar.

Remote-solar: the physical aspect



Remote-solar would reduce a customer's electric bill while also saving greenhouse gas (GHG); a rare win-win for consumers and the environment.

Utility-scale solar is about six times less expensive (in \$/kWh generated) than rooftop solar. \$4800 vs. \$34,000 for panels plus battery storage in this example. That little known fact inspired the concept of remote-solar as a way homeowners and renters could take advantage of that cost difference. Of course, the customer would need to pay for using the grid.

Remote-solar is still a concept. It awaits vetting by experts and approval by the CPUC. At first it might appear similar to "community solar", but its fundamentally different and promises much better results for a customer.

How would it work?

Remote-solar envisions many thousands of ordinary homeowners and renters buying panels and battery storage in large utility-scale solar farms, probably located far from their homes. Think of each as a solar condominium where each customer owns a fraction of the entire solar farm. To get it going prospective customers would place their money (say an average of about \$4800) in an escrow account where it would be invested in the S&P index or money market

funds per their choice. When enough customers had done that to accumulate sufficient funds to build a solar farm, the solar farm developer would begin construction. This process might take several years during which the developer would withdraw money as needed. The details of how to manage this to minimize risk to both the customer and developer need to be worked out because the rate that initial deposits might grow and development costs might change can't be known up front.

The utility companies like PG&E and community choice aggregators (CCAs) like MCE would be required to advertise the availability of remote-solar on their websites -as they do other ideas for saving energy or reducing electric bills- and provide a way for customers to contact prospective remote-solar farm developers.

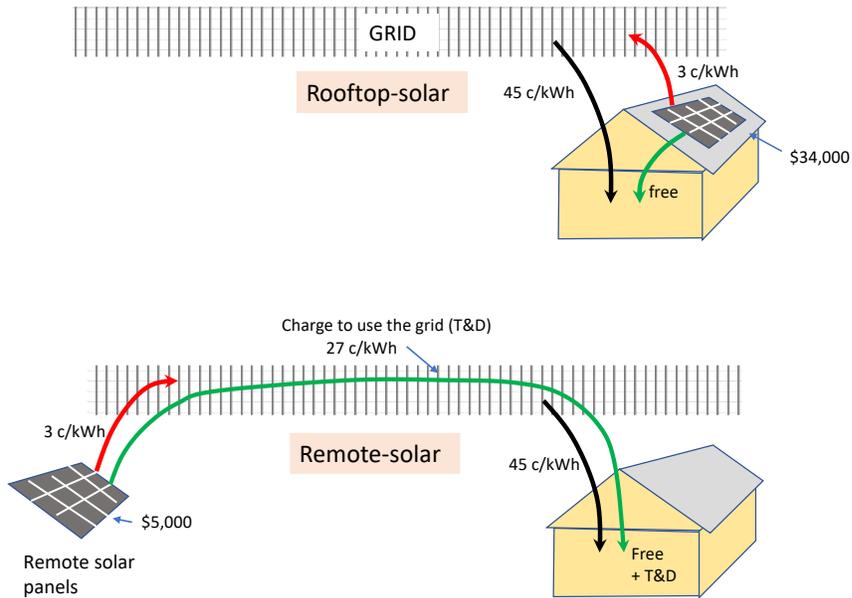
Power generated by a customer's remote solar system would be exported into the grid and - figuratively speaking- transported to his/her home for a transmission and distribution (T&D) fee.

Once the system was operational, the utility would compute the difference between the amount of energy the home consumed each month (as reported by their electric meter) and the amount of energy the solar farm exported into the grid on their behalf (as reported to the utility company by the solar farm operator). The amount of solar power used to offset or replace what their home used would be free. But if their panels and battery in the remote-solar farm did not produce enough to offset their monthly consumption the utility would charge the usual electric rates (about 40 to 50 cents per kWh) for the grid energy used to make up the difference. This will mainly happen in the winter when solar production is lowest. When the reverse is true the utility would credit the customer (at NEM 3.0 rates of 3 to 7 cents/kWh) for any energy their remote solar system exported above what their home used because that's how rooftop solar works. This way of handling the financials is new and has not been used anywhere else to the authors knowledge. It would require the California Public Utility Commission or CPUC to establish new rules and a tariff to enable it.

Remote-solar should be especially beneficial to renters because their remote-solar account could be married to their new electric meter if they moved. Or it could be sold.

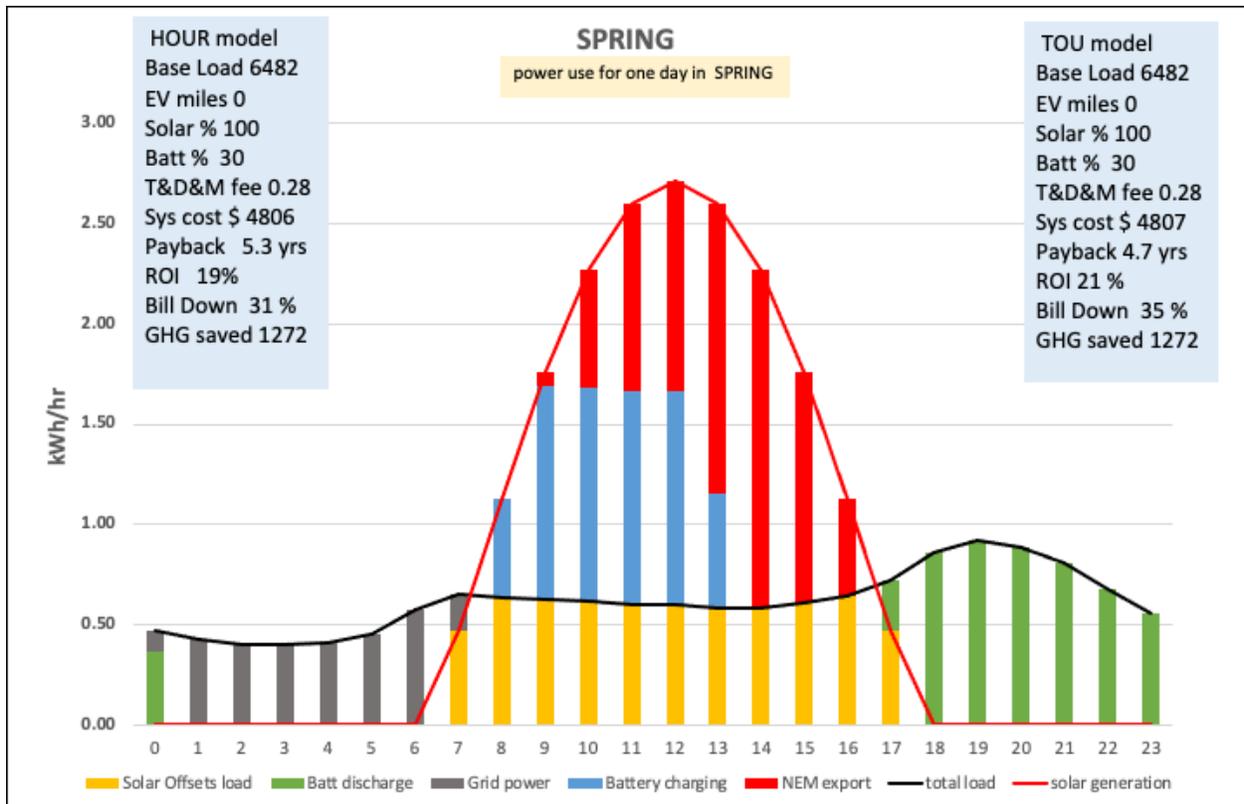
The diagram below helps show how remote-solar is similar to rooftop solar in certain ways, and different in others. The green lines show solar power used at home. Black is grid power. Red is excess solar exported for NEM credits.

There is precedent for being able to transport energy thru the grid and pay the IOUs for grid use. It's done for the CCA's, Direct Access customers, and would be done for community solar customers. Currently the transmission and distribution (T&D) fee plus some other fees total about 27 c/kWh.



How the power is handled by the solar farm operator and the utility company.

The chart below was produced by the author's financial model. It shows how all the power associated with a remote-solar customer is handled.



The red curve shows how solar production or generation varies by hour of day. The black line shows how average home load varies. When the sun comes up solar power first satisfies the home load (yellow bars) then the excess is used to charge the battery (blue bars). Any still remaining is exported for NEM credit (red bars). After sunset the energy stored in the battery is exported back into the grid (green bars) where it helps satisfy the evening load. If the array and battery are large enough it can also satisfy the load after midnight, but in this example some grid power (gray bars) is needed.

Since energy in the yellow and green bars is used to satisfy the customer's own home load, that power is called self-use power. Since self-use power is free to rooftop customers, it's a key provision of remote solar that self-use power also be free for remote-solar customers. In other words, since the customer owns the means of production, he or she should own the product it produces.

The battery is very beneficial because it exports much of the solar after sunset (green bars) thus reducing the need for GHG intensive power from either natural gas peaker plants or dirty power imported from out of state. This practice has become common in the power industry since battery costs have declined.

Data in the blue boxes provide details about this particular model run using two different ways the utility could compute a customer's bill. Time-of-use or TOU billing would work best for remote-solar. It's very simple. At the end of each month the solar farm operator would tell the utility how much solar power this customer's remote-solar system generated that month, during peak hours and during off-peak hours. The utility company would compare that with what the home actually consumed as reported by the electric meter. It's a simple calculation. If the solar generated exceeded the home load the customer would get credited at the average peak (about 3 c/kwh) and off-peak NEM rates (about 7 c/kWh) during that month, because that's how rooftop solar works. If the solar didn't satisfy the load then the customer is billed the normal rates for any grid power needed. The gray bars show that. The self-use power itself (yellow and green bars) is free, except a T&D charge and perhaps some other smaller fees are levied on it. The T&D fee is, by far, the largest part of a remote-solar bill as shown below.

Because the billing scheme proposed for remote-solar is very important the chart below shows how it would be done, and how a customer's (hypothetical) bill would look if formatted for maximum clarity.

Suggested format of utility bill for a customer with remote-solar

Power details for month of March	Peak period Power kWh	Peak period utility rates c/kWh	Peak period charge or credit \$	Off-peak Power kWh	Off-peak period utility rates c/kWh	Off-peak period charge or credit \$	T&D rate c/kWh	T&D Charge \$
Home consumed	100			200				
Remote-Solar produced	30			250				
Solar used for home	30			200			25	\$57.50
Excess solar exported	0	7	0	30	3	(\$1.50)		
Grid power used	70	50	\$35	0	40	0		

Charge for grid power	\$ 35.00
Charge for T&D	\$ 57.50
RSP's O&M fee (at 1 c/kWh)	\$ 2.80
Credit for excess solar (at NEM 3.0 rates)	\$ (1.50)
TOTAL CHARGE FOR THIS MONTH	\$93.80

From electric meter →

Reported by solar farm →

Self-use power →

There is no price put on self-use power →

Easy for IOU's and CCA's to implement. Similar to NEM 3.0 billing.

Financial results

The model is useful in showing the financial and GHG results for a range of different solar array and battery size options, as shown in the table below. Theoretically a customer could choose any of these but the CPUC may want to limit those choices. (Today rooftop solar is allowed to produce no more than 100% of annual home load.) The author feels the combination shown in the red box is a good compromise between the different options so usually cites it as an example. All these model runs were for an average CA. household, which consumes about 6500 kWh/year.

This table also shows that there are complex non-intuitive tradeoffs between capital costs, payback, ROI and GHG savings.

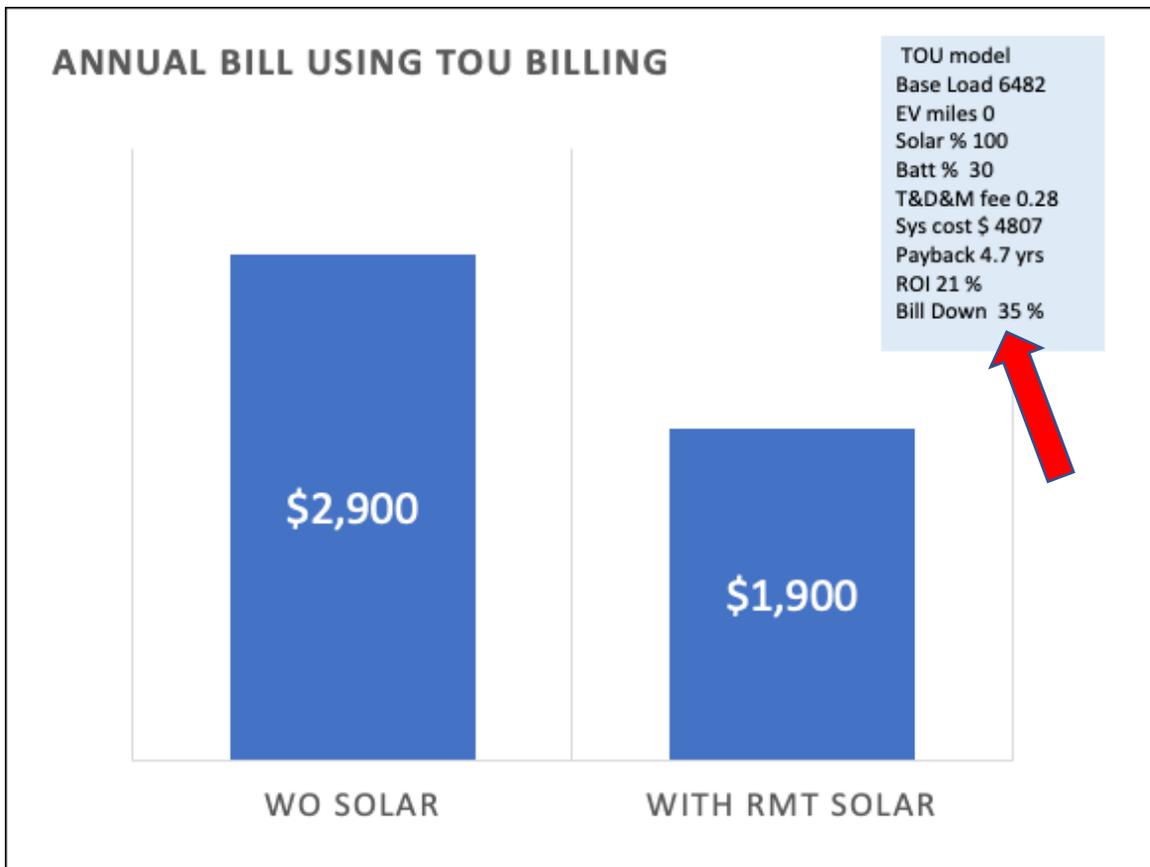
Results of TOU model runs: Copy cell P5 and pastespecial>values into appropriate table cell after each run

battery & array %	batt=0%	10	20	30	40	50	70
array=10%							
30		\$ 1626 5.2 yrs ROI 19 % GHG 303 Bill -11%					
50	\$ 1837 3.6 yrs ROI 28 % GHG 494 Bill -18%	\$ 2281 4.1 yrs ROI 24 % GHG 562 Bill -19%					
70			\$ 3380 4.3 yrs ROI 23 % GHG 862 Bill -27%	\$ 3824 4.8 yrs ROI 21 % GHG 916 Bill -28%	\$ 4268 5.3 yrs ROI 19 % GHG 945 Bill -28%		
100	\$ 3474 5.5 yrs ROI 18 % GHG 987 Bill -22%		\$ 4362 4.5 yrs ROI 22 % GHG 1174 Bill -33%	\$ 4806 4.7 yrs ROI 21 % GHG 1272 Bill -35%	\$ 5250 5.1 yrs ROI 19 % GHG 1355 Bill -35%		\$ 6582 6.6 yrs ROI 15 % GHG 1338 Bill -34%
150	\$ 5112 6.9 yrs ROI 15 % GHG 1481 Bill -26%		\$ 6000 5.5 yrs ROI 18 % GHG 1667 Bill -38%	\$ 6444 5.6 yrs ROI 18 % GHG 1764 Bill -40%	\$ 6888 5.9 yrs ROI 17 % GHG 1869 Bill -40%		\$ 8220 7.1 yrs ROI 14 % GHG 2095 Bill -40%
200				\$ 8081 6.5 yrs ROI 15 % GHG 2254 Bill -43%		\$ 8969 7.3 yrs ROI 14 % GHG 2451 Bill -43%	
Date of Model runs	base load kWh/yr			RSP's O&M \$/kWh	Utility's T&D \$/kWh	Utilities' Misc fees \$/kWh	EV miles per day
Dec 10,2025	6482			\$ 0.01	\$ 0.25	\$ 0.02	0

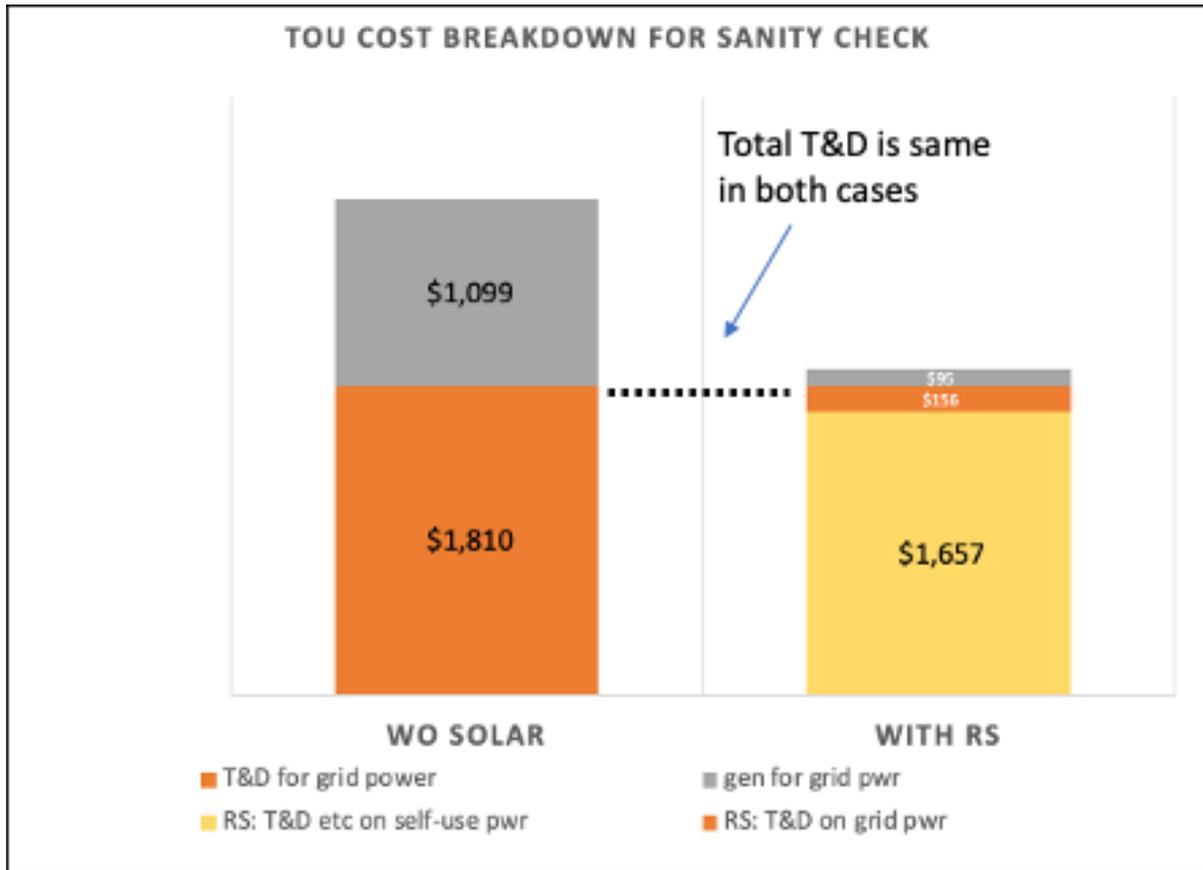
Reduce customer electric bills:

There has been widely reported pushback against high electric bills in California. Because power produced in utility-scale solar farms is so inexpensive the essence of remote-solar is to give customers an efficient way to obtain it. That can be done if customers buy their own panels and storage and have the utilities and CCA’s bill it in the manner described above; in other words if the CPUC tariffs remote-solar and it becomes available.

The chart below compares the bill for a customer without solar vs. with remote-solar. It’s based on the run in the red cell. In this run the customer’s electric bill would go down 35% thus saving him/her \$1000 a year. Note the modest \$4800 up-front investment needed, and the short payback period of 4.7 years. (To put this in perspective Wood Mackenzie estimates that under the new rules the payback period for rooftop solar will be 14-15 years.) The 21% ROI would beat the S&P index fund by a wide margin. Thus remote-solar should be a very good investment. That’s key to widescale adoption, and the ability to save a significant amount of GHG. These very attractive financials are what makes remote-solar special. And they all stem from the very low cost of utility-scale solar and the billing scheme being proposed.



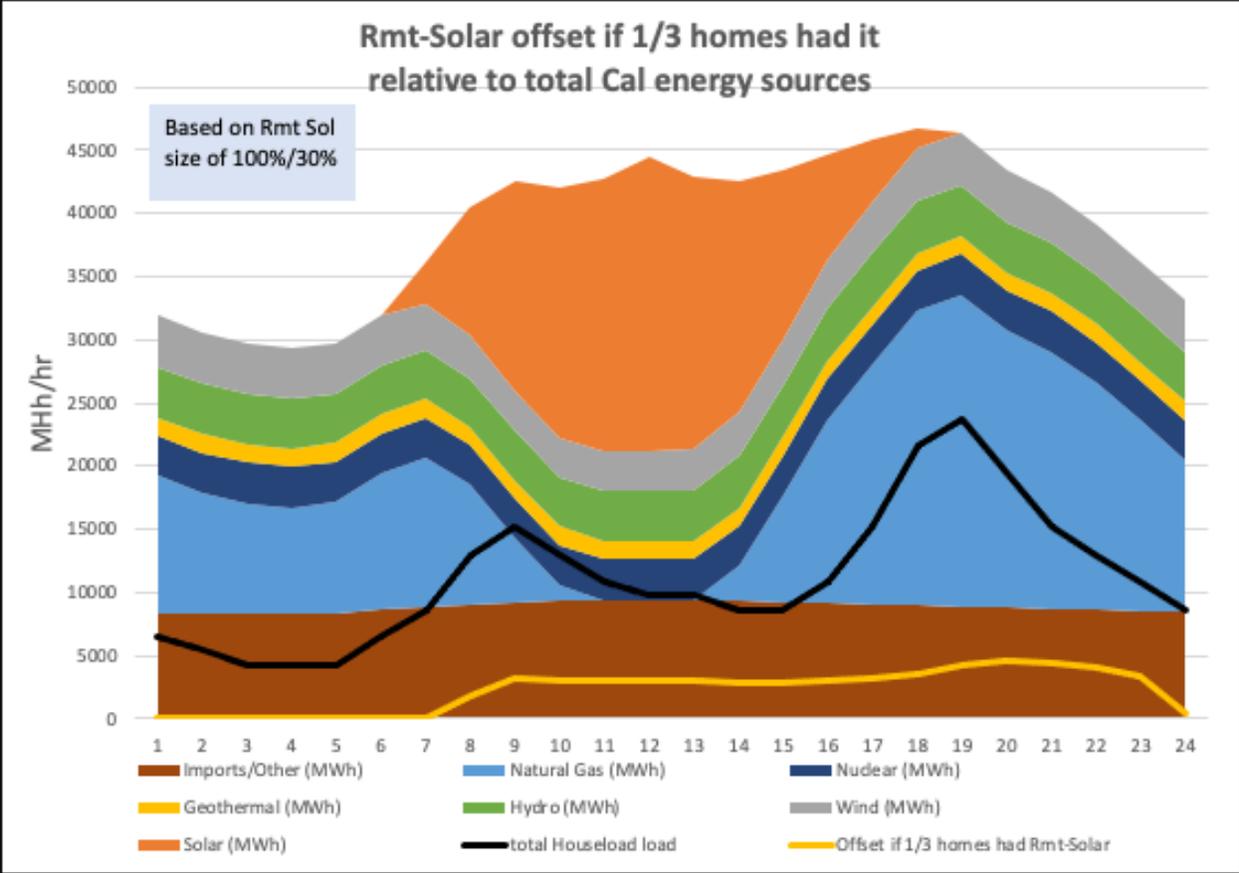
This chart shows that T&D charges would comprise a large part of a customer’s bill.



Reduce greenhouse gas emissions:

Since remote-solar is financially attractive it is expected to attract many customers and create new solar farms. This will help achieve the CA. state goals to increase renewable power and the reduce greenhouse gas (GHG) emissions, which the planet needs. Although battery storage is not necessarily a part of a remote-solar system it is quite inexpensive in utility-scale solar farms so making it a tariff requirement for remote-solar seems desirable, and still results in a reasonable up-front cost. In this example where the entire system costs \$4800, \$3500 is for the array and \$1300 is for the battery.

The battery saves GHG by exporting stored solar energy in the peak evening hours to reduce the use of power generated by plants burning natural gas. See the light blue area in the chart below. Note how gas use spikes after sunset, as do GHG emissions. The goal is to reduce them. CAISO calls this the “duck curve” problem.



Because remote-solar would reduce the cost of electricity-and thus the cost for EV “fuel”- it should encourage more people to buy EVs. Same thing for other fossil fuel substitutes like heat pumps. To “electrify everything” that now uses fossil fuel it’s necessary to reduce the cost of electricity.

Reduce new home and apartment prices:

Another key concern in California is the high cost of building new housing. Today state law requires every new home or apartment building to have rooftop solar. Today a home rooftop system sized to produce the same amount of electricity as the above cited example would cost about \$34,000, whereas an equivalent remote-solar system would only cost about \$4800. IF remote-solar were available perhaps the building law could be changed to make it an acceptable substitute. The absence of a rooftop system would also reduce the cost of homeowners insurance. Those rebuilding homes destroyed by wildfires might find this alternative attractive because it would speed recovery, lower cost, and of course lower electric bills going forward.

Other benefits:

Remote-solar would work well for renters because if they moved, they could simply link their remote-solar account to their new electric meter. It would also work well for homeowners whose roof was not suitable for solar panels. And there are other benefits.

Scalability:

With these favorable financials remote-solar has the ability to scale enough to make a real difference in our quest for more renewable energy. In other words it would be a bold, not timid or marginal, program as some others have been.

Status:

The author has formally requested -under Docket A22-05-022- that the CPUC consider remote-solar and establish the needed rules and tariff to enable it if they find remote-solar should become another customer choice, and serves the public interest. As of now they have not moved on this Motion. Ideally, the next step after this idea is vetted by experts would be for the California Energy Commission to implement a pilot program to demonstrate remote-solar in the real world. Meanwhile the author is seeking expert opinion on the idea and help moving it forward.

If California wants to remain a leader in green energy and fighting climate change it should seriously consider new ways of doing so, like remote-solar.

*Some make excuses for why something can't be done,
but progress depends on true leaders finding ways it can be done.*

A detailed description and financial analysis of remote-solar can be found in whitepapers attached to "Remote Solar Advocates" Motion filed with the CPUC under Docket A22-05-022 or at the following two sites: <https://www.richard-c-harkness.com/wp-content/uploads/Solar-6-to-1-Whitepaper.pdf> and <https://www.richard-c-harkness.com/wp-content/uploads/Final-Remote-solar-whitepaper.pdf> NOTE: the financial model has been undated since these papers were written. This short description quotes financials results current as of Dec. 2025.