Date of Hearing: May 7, 2025

ASSEMBLY COMMITTEE ON UTILITIES AND ENERGY
Cottie Petrie-Norris, Chair
AB 1334 (Wallis) – As Amended March 26, 2025

SUBJECT: Solar energy: official state energy

SUMMARY: Establishes solar energy as the official state energy.

EXISTING LAW:

1) Establishes the Bear Flag as the State Flag of California. (Government Code § 420)

2) Designates various official state emblems from the state gemstone to the state folk song, state dance, state tall ship, state reptile, state marine reptile, and state lichen, among many others. (Government Code §§ 420 – 429.9) Includes:

   a) "Eureka" as the official State Motto. (GOV 420.5)

   b) "The Golden State" as the official State Nickname. (GOV 420.75)

   c) The golden poppy (Eschscholzia californica) as the official State Flower. (GOV 421)

   d) The California redwood (Sequoia sempervirens, Sequoia gigantean) as the official state tree. (GOV 422)

   e) The almond (Prunus dulcis, Prunus amygdalus), walnut, pistachio, and pecan as the official state nuts. (GOV 422.3)

   f) The California valley quail (Lophortyx californica) as the official bird and avifaunal emblem of the State. (GOV 423)

   g) Denim as the official state fabric. (GOV 423.6)

   h) Blue and gold as the official state colors. (GOV 424)

   i) Surfing as the official state sport. (GOV 424.7)

   j) The California Grizzly Bear (Ursus Californicus) as the official state animal. (GOV 425)

   k) San Joaquin Soil as the official State Soil. (GOV 425.9)

   l) California Golden Chanterelle (Cantharellus californicus) as the official state mushroom. (GOV 425.11)

3) Establishes the California Solar Initiative, and declares the state goal to "install solar energy systems with a generation capacity equivalent of 3,000 megawatts, to establish a self-sufficient solar industry in which solar energy systems are a viable mainstream option for both homes and businesses in 10 years, and to place solar energy systems on 50 percent of new homes in 13 years." (Public Resources Code §§ 25780-25784)

4) Required the California Energy Commission (CEC) to establish eligibility criteria for solar energy systems to receive ratepayer incentives and prohibited the provision of ratepayer incentives for solar energy systems that failed to meet the CEC's criteria. Existing law specified minimum requirements the CEC must include in criteria for eligible solar systems and required the CEC to provide assistance to builders and contractors to ensure the efficient and correct installation of solar systems. (Public Resources Code § 25780)

5) Established the Public Interest Energy Research, Demonstration, and Development Program at the CEC in 2006, and required the CEC to allocate funding to fund photovoltaic and solar thermal electric technologies. (Public Resources Code § 25744.5)

6) Requires every electric utility, defined to include electrical corporations, local publicly owned electric utilities, and electrical cooperatives, to develop a standard contract or tariff for Net Energy Metering (NEM), for generation by a renewable electrical generation facility, and to make this contract or tariff available to eligible customer-generators, upon request on a first-come-first-served basis until the time that the total rated generating capacity used by eligible customer generators exceeds five percent of the electric utility's aggregate customer peak demand. (Public Utilities Code § 2827)

7) Requires the California Public Utilities Commission (CPUC), for a large electrical corporation, as defined, to have developed a second standard contract or tariff to provide NEM to additional eligible customer-generators in the electrical corporation's service territory and imposes no limitation on the number of new eligible customer-generators entitled to receive service pursuant to this second standard contract or tariff. (Public Utilities Code § 2827.1)

8) Requires the CPUC to ensure that the second standard contract or tariff made available to eligible customer-generators by large electrical corporations ensures that customer-sited renewable distributed generation continues to grow sustainably. Requires the CPUC, in developing this standard contract or tariff, to include specific alternatives designed for growth among residential customers in disadvantaged communities. (Public Utilities Code § 2827.1(b)(1))

9) Required the CPUC, in implementing the California Solar Initiative, to authorize ratepayer-funded incentives for up to the first megawatt of solar energy systems that meet the CEC's criteria. Required the incentives to decline every year, at a rate of no less than 7% per year. Makes the incentive zero on December 31, 2016, except for solar installations on specified affordable housing. (Public Utilities Code §§ 2851-2852)

10) Establishes the policy that all of the state's retail electricity be supplied with a mix of RPS-eligible and zero-carbon resources by December 31, 2045, and 100% of electricity procured to serve all state agencies by December 31, 2035, for a total of 100% clean energy. Requires the California Public Utilities Commission (CPUC), in consultation with the California Energy Commission (CEC), California Air Resources Board (CARB), and all California balancing authorities, to issue a joint report to the Legislature by January 1, 2021, reviewing and evaluating the 100% clean energy policy. (Public Utilities Code § 454.53)

11) Establishes the Solar on Multifamily Affordable Housing Program (SOMAH), also known as the Multifamily Affordable Housing Solar Roofs Program, which allocates $100 million from utility Cap and Trade revenues to fund solar energy system installations on qualified multifamily affordable housing. Ended program funding collection in 2020, allocation on June 30, 2026, and awarding through December 31, 2032. (Public Utilities Code § 2870)

12) Establishes a program to support installation of 200,000 solar water heaters by 2017 funded by up to $250 million in gas ratepayer surcharges. This program is administered by investor-owned utilities under the supervision of the CPUC, and paid by natural gas customers. Publicly-owned utilities can also adopt and implement separate solar thermal incentive programs under this existing statute. (Public Utilities Code §§ 2860- 2867.4)

FISCAL EFFECT: None. This bill is non-fiscal.

CONSUMER COST IMPACTS: None.

BACKGROUND:

Steal My Sunshine – To harness solar energy one may employ two technology types, solar photovoltaic (PV) or solar thermal technology, which serve distinct applications. Solar PV systems convert sunlight directly into electricity using semiconductor materials. In contrast, solar thermal systems capture the sun's heat to warm water or air, making them ideal for domestic hot water, space heating, and some industrial uses. PV systems are typically lower in maintenance and easier to scale, while solar thermal offers higher efficiency for heat production. These technologies provide complementary roles: solar PV addresses electricity demand, while solar thermal reduces fossil fuel use for heating, as detailed in Table 1.

Table 1: Comparison between Solar PV and Thermal Technologies.

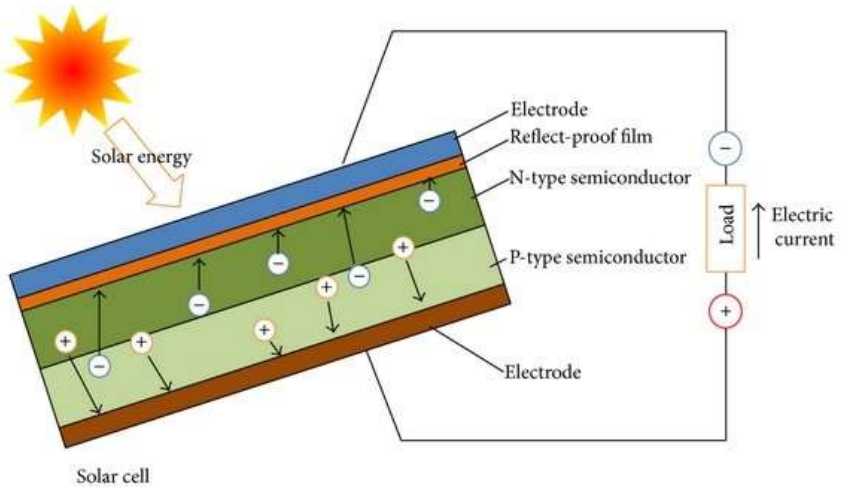
Feature	Solar Photovoltaic (PV)	Solar Thermal
Primary Output	Electricity	Heat (hot water, air, or fluid)
Technology	Semiconductor panels (e.g., silicon)	Collectors (flat-plate or evacuated tubes)
Efficiency	~15–22% (electric conversion)[1]	~60–70% (heat conversion)[2]
Best Use	Powering homes, businesses, grid	Domestic hot water, space heating, industrial heat
Scalability	High (rooftops to solar farms)	Less (best for specific heat needs)
Maintenance	Low (mainly panel cleaning, inverter checks)	Moderate (fluid systems, pumps, insulation)

[1] Green, M. A., Dunlop, E. D., Hohl-Ebinger, J., Yoshita, M., Kopidakis, N., & Hao, X. (2022). Solar cell efficiency tables (Version 60). *Progress in Photovoltaics: Research and Applications*, 30(7), 687–701.
[2] Kalogirou, S. A. (2004). Solar thermal collectors and applications. *Progress in Energy and Combustion Science*, 30(3), 231–295.

Energy Storage	Electric batteries (e.g., lithium-ion)	Thermal storage (e.g., insulated tanks)

Solar PV cells have been used since the 1950s for absorbing solar energy and converting it directly into electrical current.[3] The semiconductor material captures photons from sunshine. The absorbed photon creates what is known as an electron-hole pair. An electron-hole pair is a simple but important concept in how solar panels work. To greatly simplify, imagine an atom as a building with floors, where each floor is an energy level. Normally, electrons "live" on specific floors. When sunlight hits a solar cell, the energy from the light can kick an electron up to a higher floor, giving it enough energy to move freely. But when the electron leaves its original spot (the lower floor), it leaves behind a "hole," analogous to an empty seat. That hole behaves like a positive charge because something negatively charged (the electron) is missing. Together, they're called an electron-hole pair, and they are the basic engine behind how solar cells convert sunlight into electricity.

Figure 1: Schematic of Solar PV cell.[4]



The movement of billions of these electrons in the same direction under an internal electric field – formed by the joining of materials with positive charges (p-type) and negative charges (n-type) – creates a current. A number of solar cells compose a solar module which can be used as an electricity generator, as shown in Figure 1.[4] The direct current (DC) from the solar module is then converted to alternating current (AC) by an inverter, making it suitable for use in homes and businesses. PV systems are modular and can be scaled from small rooftop installations to large solar farms. The efficiency of solar panels depends on factors like cell material, sunlight

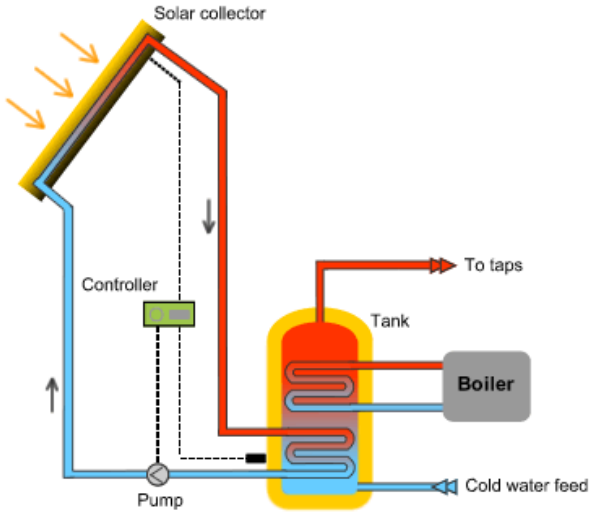
[3] Among the many advancements made at Bell Labs during that time; Smithsonian Museum; "Bell Telephone Labs experimental P/N photovoltaic cell;" https://www.si.edu/object/bell-telephone-labs-experimental-pn-photovoltaic-cell%3Anmah_1805541#:~:text=Bell%20Labs%20researchers%20Daryl%20Chapin,the%20technology%20to%20other%20companies.

[4] Zhange, H., et al.; "Photovoltaics: Reviewing the European Feed-in-Tariffs and Changing PV Efficiences and Costs;" *The Scientific World Journal*; 2014 (4): 404913; https://www.researchgate.net/publication/263354977_Photovoltaics_Reviewing_the_European_Feed-in-Tariffs_and_Changing_PV_Efficiencies_and_Costs

intensity, and temperature.[5] PV solar technology has become a cornerstone of renewable energy due to its scalability, sustainability, and rapidly decreasing costs.[6]

Solar thermal systems operate by absorbing solar energy via heating a working fluid – typically water, air, or a heat-transfer fluid like glycol. This process begins with solar collectors, such as flat-plate collectors or evacuated tube collectors, which are designed to maximize absorption while minimizing heat loss. The absorbed energy heats the fluid circulating through pipes within the collector. The heated fluid is then stored in insulated tanks or directed to a heat exchanger to supply domestic hot water, space heating, or industrial process heat. A typical schematic for a residential heating application is shown in Figure 2.[7]

Figure 2: Schematic of solar thermal system for a residential heating application.[7]



In more advanced applications like concentrated solar power (CSP), mirrors or lenses focus sunlight to a central receiver, heating a fluid to high temperatures (often above 500°C), which can drive steam turbines for electricity generation.[8,9] The Ivanpah Solar Energy Generating System, a 386 megawatt project in the Mojave Desert in San Bernardino County, is an example of this CSP design.[10] Solar thermal system efficiency depends on collector type, solar insolation, ambient temperature, and heat loss control.

While solar thermal technology offers high efficiency for heating applications, it presents several limitations. Solar thermal systems are primarily suited for producing heat, making them less versatile than PV systems which generate electricity for a wide range of uses. Solar thermal installations also require significant space and precise orientation for optimal performance, which can be impractical in dense urban areas. Moreover, solar thermal systems often involve more complex plumbing, pumps, and heat transfer fluids, resulting in higher maintenance requirements and potential reliability issues over time.

Here Comes the Sun King: California's History of Solar Development – The 1920s marked a period of early development of solar technologies in the form of solar thermal hot water heating. One of the most notable innovations came from California, where the abundance of sunlight and

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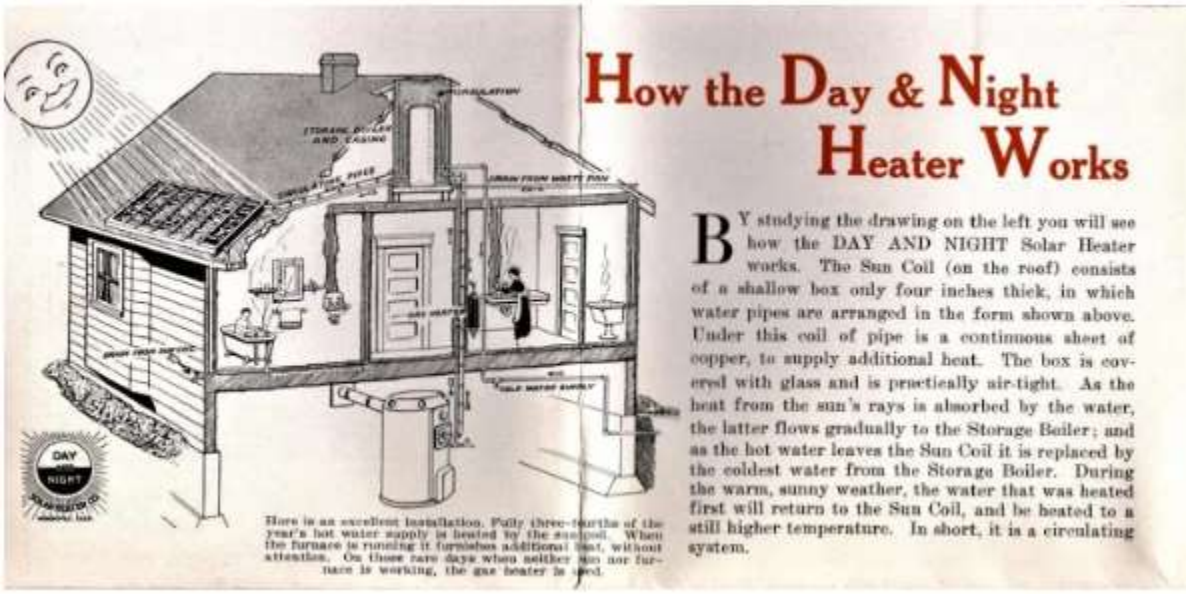
[5] Green, M. A., Emery, K., Hishikawa, Y., Warta, W., & Dunlop, E. D. (2015). Solar cell efficiency tables (version 45). *Progress in Photovoltaics: Research and Applications*, 23(1), 1-9.
[6] International Energy Agency (IEA); *Renewables 2023: Analysis and forecast to 2028*; 2023 https://www.iea.org/reports/renewables-2023
[7] From Solar Sun Spain website; "How Solar Works;" https://www.solarsunspain.com/how-solar-works/
[8] International Energy Agency – Solar Heating and Cooling Programme (IEA-SHC). (2022). *Solar Heat Worldwide: Global Market Development and Trends*. Retrieved from https://www.iea-shc.org/solar-heat-worldwide
[9] Kalogirou, S. A. (2004). Solar thermal collectors and applications. *Progress in Energy and Combustion Science*, 30(3), 231–295.
[10] CEC; "Ivanpah Solar Energy Generating System;" https://www.energy.ca.gov/powerplant/solar-thermal/ivanpah-solar-energy-generating

demand for residential hot water led to the commercialization of rooftop solar water heaters. William J. Bailey improved upon earlier designs with his "Day and Night" solar water heater,[11] which separated the solar collector from the storage tank, allowing for more efficient heat retention and broader application.[12] By the mid-1920s, tens of thousands of these systems were installed in Southern California, illustrating both the technical feasibility and market potential of solar thermal systems.[13] However, the rise of cheap fossil fuels and the expansion of natural gas infrastructure in subsequent decades stalled this early momentum.

Figure 3: Day & Night Heater Company Pamphlet advertisement, Monrovia, CA, 1920s.[11]



The invention of the modern solar PV cell by Bell Laboratories in 1954 marked a new chapter in the history of renewable energy, laying the foundation for today's global solar industry. Building on earlier research into the photoelectric effect, scientists developed the first practical silicon solar cell capable of converting sunlight directly into electricity at efficiencies of around 6%.[14,15] Despite early limitations, the Bell Labs PV cell established the technological principles that underpin modern solar panels.

In California, electric ratepayers have long subsidized the cost of renewable resources, which has overwhelmingly meant solar technologies. Some of the earliest programs were the California Solar Initiative, the Solar Water Heating and Efficiency Act, and the Net Energy Metering (NEM) program.

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[11] Homestead Museum; "Solar Panels in the Roaring Twenties: A Day & Night Solar Heater Company Pamphlet, ca. 1921;" August 22, 2019; https://homesteadmuseum.blog/2019/08/22/solar-panels-in-the-roaring-twenties-a-day-night-solar-heater-company-pamphlet-ca-1921/
[12] Yergin, D; *The Prize: The Epic Quest for Oil, Money & Power*. Simon & Schuster; 1991.
[13] Morris, J.; *Energy in the 21st Century*. Nova Science Publishers; 2006.
[14] Perlin, J. *From Space to Earth: The Story of Solar Electricity*. Harvard University Press. 1999.
[15] Smithsonian Institution. "Sunshine to Electricity: 50 Years of Photovoltaics." National Museum of American History. 2004.

In 1997, California's NEM program began, prompted by SB 656 (Alquist, Chapter 369, Statutes of 1995). It allows customers who install eligible renewable electrical generation facilities to serve onsite energy needs and receive credits on their electric bills for surplus energy sent to the electric grid. Most customer-sited, grid-connected solar in California is interconnected through NEM tariffs. Enrollment in the first NEM program, now colloquially known as "NEM 1.0," continued and was phased out between 2016 and 2017. NEM 1.0 was not meant to be cost-effective. Rather, the NEM tariff, and the larger state program, was meant to encourage adoption of rooftop solar so that manufacturing and installation costs could come down. This effort was successful: rooftop solar installation grew considerably from 2006 through 2012. The Legislature per AB 327 (Perea, Chapter 611, Statutes of 2013) called for and the CPUC has adopted changes to the NEM program twice since.[16] The result of these changes led to a drop in the compensation rooftop solar customers receive.[17]

In 2005, the CPUC adopted a decision (D. 05-12-044) providing ratepayer incentives for solar development. Subsequent, multiple decisions led the CPUC to adopt policies establishing the California Solar Initiative (CSI). The Legislature codified and clarified requirements for the CSI in SB 1 (Murray, Chapter 132, Statutes of 2006), also dubbed the "Million Solar Roofs Initiative." SB 1 aimed to install one million solar energy systems on homes, schools, farms, and businesses across the state by 2019. CSI allocated over $2 billion in rebates to incentivize solar adoption, targeting the installation of 3,000 megawatts (MW) of distributed solar capacity by 2016. The program surpassed expectations, achieving its 3,000 MW goal by 2015, four years ahead of schedule, and reaching one million solar installations by 2019.[18]

In 2007, the Legislature passed The Solar Water Heating and Efficiency Act of 2007 (AB 1470, Huffman, Chapter 536, Statutes of 2007), which established the CSI-Thermal program. The program was a $250 million, 10-year statewide program aimed at accelerating the adoption of solar thermal technologies. The Act directed the CPUC to create performance-based incentives for installing solar water heating systems that displace natural gas usage in homes, businesses, and public buildings. The program set a goal of deploying 500,000 solar thermal systems by 2017, with at least 10% of funds allocated to affordable housing projects. To finance the initiative, the CPUC was authorized to impose a surcharge on natural gas customers – estimated at approximately 13¢ per month for the average residential user – while exempting certain low-income ratepayers.[19]

In the original 2007 legislation establishing the CSI-Thermal program, the CPUC was required to determine if the program would be cost effective to customers. In the decision that established the program,[20] the CPUC assumed natural gas prices would increase and installation costs for solar water heaters would decrease over the course of the program. Accepting these assumptions made the CSI-Thermal program cost effective. However, in the decade since the original study,

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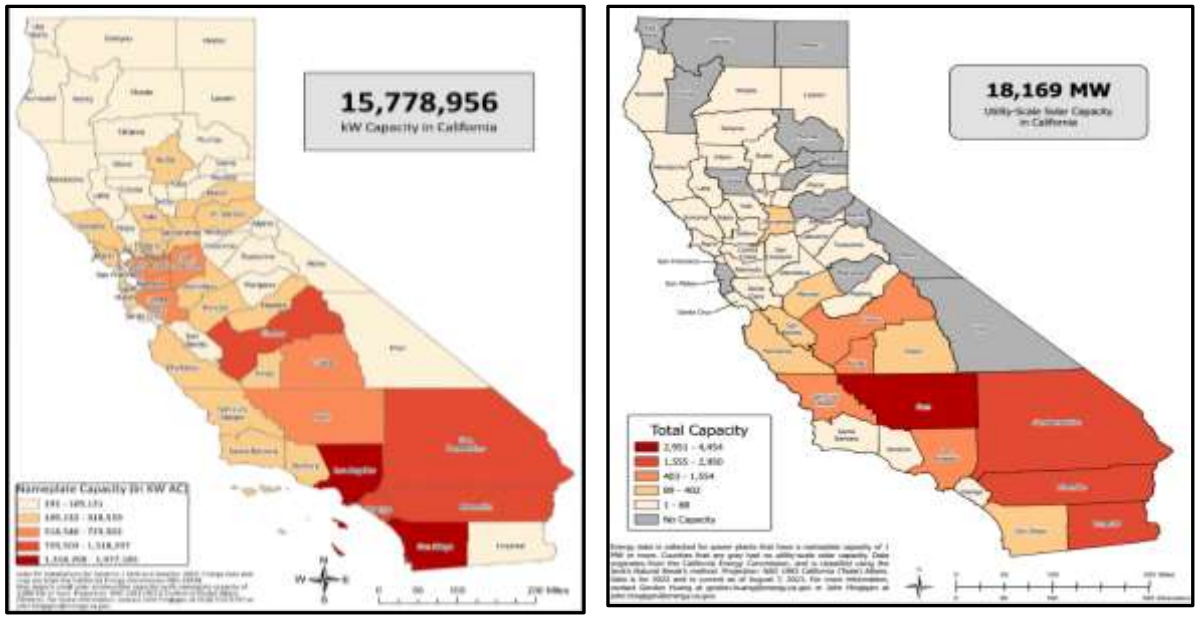
[16] D. 22-12-056
[17] CPUC, "Fact Sheet: Modernizing NEM to Meet California's Reliability and Climate Goals;" November 10, 2022. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/net-energy-metering-nem/nemrevisit/final-fact-sheet-nem.pdf
[18] Itron and Verdant; "California Solar Initiative Final Impact Evaluation;" January 28, 2021; https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/csi-progress-reports/csi-2/csi_evaluation-report.pdf
[19] CPUC Memoradum re: AB 1470 (Huffman); April 3, 2007; https://docs.cpuc.ca.gov/word_pdf/REPORT/66234.pdf
[20] CPUC D. 10-01-022

the cost of natural gas in California remained lower than the high reached in the summer of 2008,[21] while the costs of single-family system installations remained high. These amplifying trends explain why, as of early 2014, the CPUC acknowledged "the CSI-Thermal Program is not on pace to meet the Commission's expectations."[22]

The Legislature and the state energy agencies have adopted other solar energy programs in the subsequent years to further encourage the adoption of these technologies and to advance adoption by certain communities. Some of these programs include the Solar on Multifamily Affordable Housing Program (SOMAH),[23] various other community solar programs,[24] and the CEC's Title 24 rooftop solar and solar-ready requirements.[25]As of 2023, California leads the United States in solar energy production, generating approximately 68,816 gigawatt-hours (GWh) of electricity from solar power, encompassing both utility-scale and rooftop solar installations, as shown in Figure 4. [26,27] Texas ranks second with around 31,739 GWh of solar electricity produced, though Texas has experienced rapid growth in solar capacity, adding approximately 6.5 gigawatts (GW) in 2023;[28] the fastest rate of growth nationwide.

Figure 4: Solar PV Capacity for systems 1MW and smaller, 2023 (left) and ("Utility") Solar PV Capacity 1MW or greater, 2022 (right).[26]



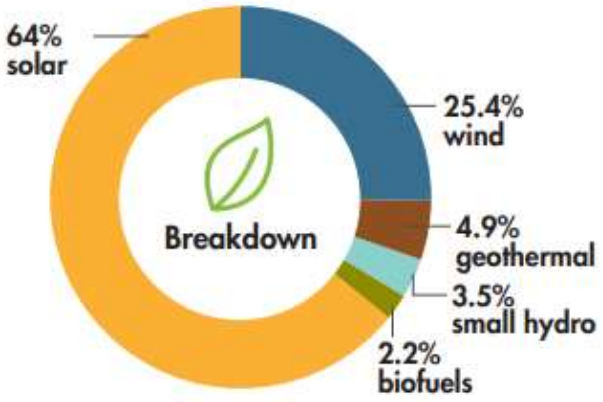
[21] https://www.eia.gov/dnav/ng/hist/n3010ca3M.htm
[22] *Review of the Incentive Levels and Progress of the California Solar Initiative-Thermal Program;* CPUC Energy Divison; Jan. 29, 2014
[23] Public Utilities Code § 2870
[24] See April 23rd analysis for AB 1260 (Ward, 2025); https://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=202520260AB1260#
[25] CEC, "Solar PV, Solar Ready, Battery, and Electric Ready;" https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/energy-code-support-center/solar
[26] CEC Solar PV datasets; https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::solar-pv-capacity-for-systems-1-mw-and-smaller-2023/about and https://caenergy.maps.arcgis.com/home/item.html?id=2ecfe33c90924b1f9b12b84f9f98a796
[27] Climate Central; *A Decade of Growth in Solar and Wind Power: Trends Across the U.S.*; April 3, 2024; https://assets.ctfassets.net/cxgxgstp8r5d/5Vty7kLXwx4csHEm4ztlJ7/a9f69694c2af467387cb3c088f171127/2024WindSolar_Edited.pdf
[28] Ryan Kennedy, "The top five states for solar deployment in 2023;" *PV Magazine;* March 8, 2024; https://pv-magazine-usa.com/2024/03/08/the-top-five-states-for-solar-deployment-in-2023

COMMENTS:

1) *Author's Statement.* According to the author, "State symbols, like the state flower (California poppy), the state mammal (grizzly bear) or the newly minted state crustacean (Dungeness crab), embody our unique identity, heritage and values. They tell our story. By adding a state energy to this esteemed list, we emphasize the importance of clean energy in combating climate change. Choosing solar as the official state energy not only highlights California's abundant sunshine but also our environmental stewardship. It reflects our commitment to sustainability and innovation. This symbolic gesture reinforces our priorities in addressing climate change and fostering sustainable practices for generations to come."

2) *The Star of the Show.* As noted by the author and in the text of this measure, solar energy has advanced California's renewable goals at a remarkable pace and at a declining cost. It is a zero-carbon resource that relies on the sun's power, which is abundant in the state. While contract costs for solar and wind technologies were some of the highest two decades ago, during the start of the California Solar Initiative, those costs have decreased an average of 1.3% per year from 2007 to 2023.[29] Solar contracts are now some of the cheapest, averaging under 6¢ per kilowatt-hour in 2023. [Compared to a high of 22¢ per kilowatt-hour in 2007.]

Figure 5: Installed renewable resources in California Independent System Operator (CAISO) area, April 2025 [30]



Solar now makes up the largest percentage of renewable resources installed in the state as of April 2025, and shown for utility-scale projects in Figure 5.[30] In total, utility-scale solar makes up approximately 17% of California's total electric generation in 2023.[31] On the distributed side, as of 2024, the NEM program had enabled 1.8 million project installations, equating to roughly 16 gigawatts (GWs) of customer-sited renewable generation, almost all of which is rooftop solar,[32] as shown in Figure 4 above. Now, rooftop solar systems reduce the demand on the electric grid by as much as 25% during midday when the sun is shining.[33]

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[29] Pg. 21; CPUC; *2024 Padilla Report*; May 2024; https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2024/2024-padilla-reportvfinal.pdf
[30] Percentage for 21, 043MW of solar from 32,902MW of total renewables; CAISO Key Statistics; https://www.caiso.com/documents/key-statistics-mar-2025.pdf
[31] https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2023-total-system-electric-generation
[32] https://www.californiadgstats.ca.gov/charts/nem/
[33] CPUC Fact Sheet; "Modernizing California's Net Energy Metering Program to Meet our Clean Energy Goals." December 13, 2021.

This progress – led largely by solar – has allowed California to run on 100% carbon-free energy for portions of the day, for over 100 days.[34]

In order to meet our statewide 100% by 2045 Clean Energy goals, California is projected to need roughly triple its current electricity power capacity and will need to build roughly 6 GWs of new solar (and wind and battery storage) resources annually, triple the annual build rate from 2021. These equate to roughly 69 GW of utility-scale and 28 GW of customer-sited solar needed by 2045; the most of any renewable resource and marking an unprecedented rate of growth.[35]

3) *Ain't No Sunshine When It's Gone.* While solar energy offers significant environmental and economic benefits, and is firmly part of California's clean energy future, it also comes with important challenges. One of the first major issues was of bird impacts from solar energy facilities, particularly large-scale solar thermal power plants. The most high-profile example was the Ivanpah Solar Electric Generating System in California's Mojave Desert, mentioned above. Ivanpah uses concentrated solar power (CSP) with mirrors that focus sunlight onto central towers to produce steam and generate electricity. Soon after it launched, reports emerged that birds were being injured or killed by flying through the intense heat zones near the towers which could reach temperatures above 500°C. Early estimates suggested that thousands of birds were killed annually at Ivanpah, some literally ignited mid-flight.[36] Studies conducted by the U.S. Geological Survey and other independent researchers highlighted that CSP plants like Ivanpah posed significantly higher risks to birds than PV solar farms, which have fewer heat-related hazards.[37] PV systems may still impact birds through habitat displacement, collision with reflective panels, or behavioral disruption, but they generally do not cause the severe thermal injuries associated with CSP.[38]

   Other issues from solar arise from its intermittency, with consequences of both day-to-day operations (California's "duck curve") as well as overall production (solar curtailment). Grid operators must constantly match the amount of power being produced (supply) with the amount of power needed to run homes and businesses (demand) to prevent the grid from overloading. During the middle of the day, California's renewable resources, especially solar generation facilities, sometimes generate more electricity than is needed to serve demand. Typically, the market automatically reduces,[39] or curtails, the renewable generation to match supply with demand. Renewable curtailment occurs most frequently in spring and fall when supply is high due to California's characteristic sunny and breezy climate, but demand is low due to that same moderate climate. Such

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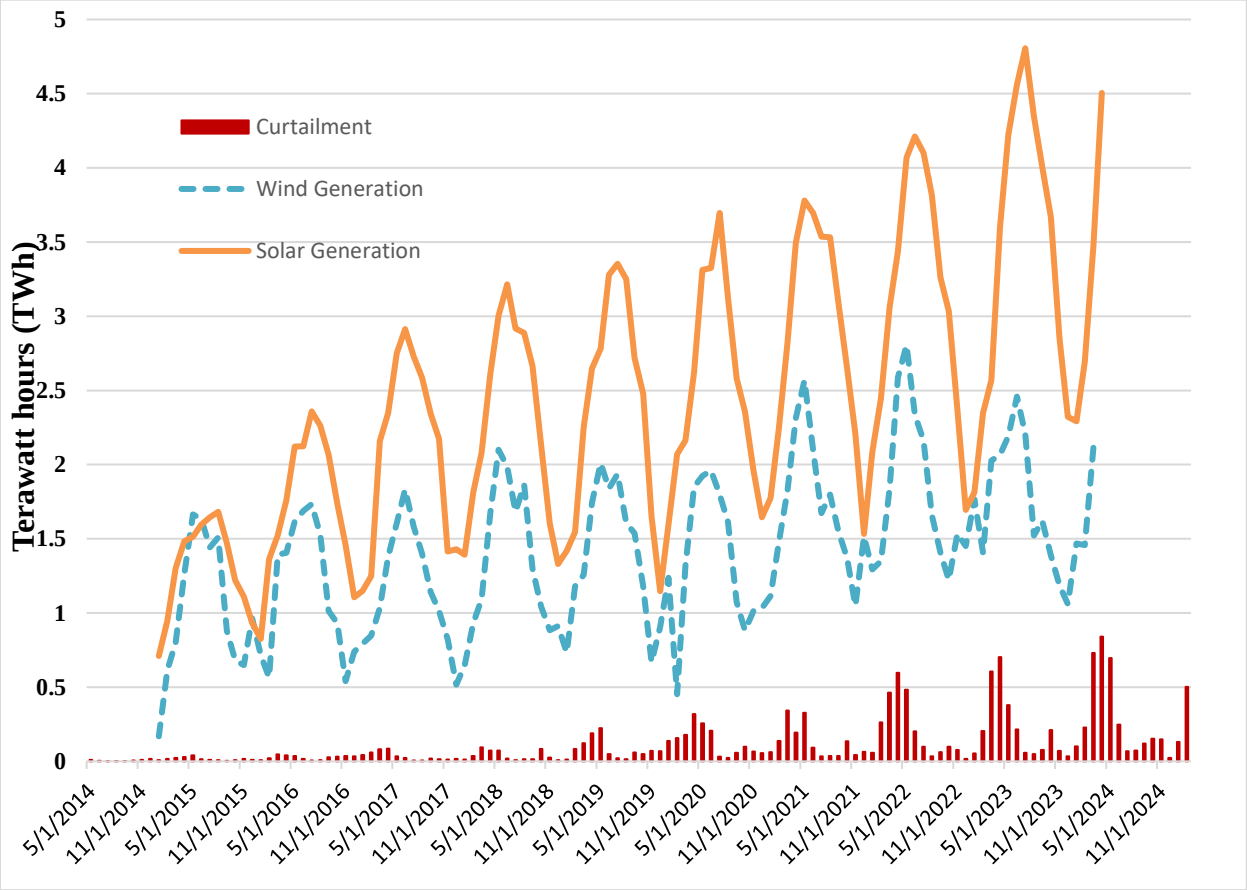
[34] Alejandro Lazo, "California hits milestone toward 100% clean energy but has a long way to go;" *CalMatters*; August 19, 2024; https://calmatters.org/environment/climate-change/2024/08/california-clean-power-progress-grid/
[35] CEC; *2021 SB 100 Joint Agency Report Summary;* March 2021; https://efiling.energy.ca.gov/GetDocument.aspx?tn=239588&DocumentContentId=73021
[36] Louis Sahagun, "This Mojave Desert solar plant kills 6000 birds a year. Here's why that won't change anytime soon." *The Los Angeles Times.* September 2, 2016; https://www.latimes.com/local/california/la-me-solar-bird-deaths-20160831-snap-story.html
[37] Kagan, R. A., Viner, T. C., Trail, P. W., & Espinoza, E. O. "Avian mortality at solar energy facilities in southern California: A preliminary analysis." *National Fish and Wildlife Forensics Laboratory*. 2014.
[38] Walston, L. J., Rollins, K. E., Smith, K. P., & LaGory, K. E. *A Review of Bird Mortality at Solar Energy Facilities in the United States.* Argonne National Laboratory. 2016.
[39] Often by reducing the resource price to below zero, making the generator pay to put electrons on the grid.

conditions produce an abundant supply of solar and wind generation, as shown in Figure 6.[40] Curtailment, therefore, is the deliberate reduction in generator output – either through negative market prices or a direct order to reduce output – below what would have otherwise been produced.

Figure 6: CAISO reported monthly metered generation of solar (orange, solid line) and wind (blue, dashed line),[41] alongside monthly curtailment of solar and wind combined (red bars)[42] from April 2014 - April 2024.



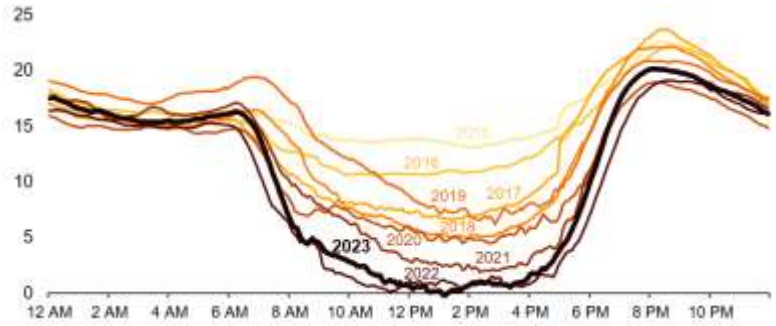
Curtailment is a common operational tool. Yet, as increasing amounts of renewable generation come online without commensurate amounts of demand to consume generation midday, oversupply conditions will continue to occur. Also shown in Figure 6, over the last decade both solar and wind generation and curtailment have increased. However, the proportion of curtailment relative to generation has grown over the last decade. While only a little more than 0.4% of total wind and solar production

[40] Solar is the majority of the energy curtailed in CAISO: 95% in 2022 and 94% in 2023; https://www.eia.gov/todayinenergy/detail.php?id=60822
[41] CAISO Monthly Metered Renewable Generation data, in terawatt-hours; last accessed 03.25.2025; https://www.caiso.com/documents/monthlyrenewablesperformancereport-apr2024.html
[42] CAISO wind and solar curtailments data, in terawatt-hours; last accessed 03.30.2025; https://www.caiso.com/about/our-business/managing-the-evolving-grid#renewable-curtailment

were curtailed in 2015, that number has grown to a little more than 4% curtailed in 2023;[43] representing a 900% increase in under a decade.

California's "duck curve" refers to the daily pattern of electricity demand that emerges as solar energy production peaks midday and then drops sharply in the late afternoon, just as electricity demand rises in the evening. This creates a steep ramp in required power generation from other sources, resembling the shape of a duck's back and neck. The curve illustrates the challenge of integrating high levels of solar energy into the grid; specifically, the need for flexible resources like battery storage, demand response, or fast-ramping natural gas to maintain reliability during the sunset hours when solar power rapidly declines but demand remains high. The duck curve has become a central concern in California's clean energy planning.[44]

Figure 7: California's duck curve; CAISO lowest net load day each spring (March-May, 2015-2023) in GWs.[44]



Finally, the end-of-life management of solar panels has grown as a more prominent concern in recent years as some of the earliest panels are being replaced with newer technologies with greater efficiencies. Many of these vintage solar panels contain potentially hazardous materials like lead or cadmium. As large volumes of panels begin to reach retirement age, experts estimate that by 2050, the U.S. could generate 10 million metric tons of solar panel waste, underscoring the urgent need for scalable recycling infrastructure.[45,46] Legislative efforts have attempted to address some of these sustainability issues.[47]

4) *You are My Sunshine, My Only Sunshine.* This bill establishes solar energy as the official state energy. As stated above, solar production is the most prominent renewable resource operating on California's grid, comprising roughly 17% of total generation.[48] Solar energy has received generous state support to help accelerate this proliferation, as detailed in the background section above. While the state's policy support and abundant

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[43] Averaging over the entire year's wind+solar generation and wind+solar curtailment.
[44] US EIA; "As solar capacity grows, duck curves are getting deeper in California;" *Today in Energy*; June 21, 2023; https://www.eia.gov/todayinenergy/detail.php?id=56880
[45] Endalkachew Sahle Demessie; U.S. EPA; "EPA Tools & Resources Webinar: Renewable Energy Management: Solar Panel Recycling;" September 27, 2023; https://www.epa.gov/system/files/documents/2023-10/508-compliant-toolsresource_webinar_solar-panel-recycling_09262023.pdf
[46] IRENA; *End-of-Life Management Solar Photovoltaic Panels;* June 2016; https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_IEAPVPS_End-of-Life_Solar_PV_Panels_2016.pdf
[47] AB 864 (Ward, 2025); AB 2 (Ward, 2023) – Died Senate Appropriations; SB 489 (Monning, Chapter 419, Statutes of 2015)
[48] https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2023-total-system-electric-generation

sunlight have positioned solar energy as a cornerstone of California's renewable energy strategy, it is not alone in sharing California's clean energy future; nor was it the first to jumpstart California's clean energy progress.

California has been a pioneer in the development of various power generation technologies in the United States. Notably, the state was home to the first privately funded, commercially viable nuclear power plant in the U.S.—the Humboldt Bay Nuclear Power Plant Unit 3. This 63 MW boiling water reactor, operated by Pacific Gas and Electric Company, commenced operations in August 1963. The plant was placed on inactive status in 1988.[49]

California also led with the establishment of the Altamont Pass Wind Farm in the early 1980s. This site became one of the first large-scale wind farms in the United States, featuring thousands of small turbines and, at one point, was considered the largest wind farm globally in terms of capacity.[50]

Furthermore, California has been at the forefront of geothermal energy development. The state hosts The Geysers, the largest geothermal field in the world, which began operations in the 1960s and continues to be a significant source of renewable energy. Other major geothermal locations include the Salton Sea area in Imperial County, the Coso Hot Springs area in Inyo County, and the Mammoth Lakes area in Mono County.[51]

Given the rich history of California's various energy resources, the committee may wish to consider whether solar energy alone should be considered the state energy resource. Or would a "zero carbon electron" or a combination of resources – á la AB 1067 (Gray, Chapter 49, Statutes of 2017) which designated the almond, walnut, pistachio, and pecan *each* as the official state nut – better capture California's abundance.

5) *Need for Amendments.* This bill includes a reference to the Ivanpah Solar Power Plant, which as mentioned above is a large scale solar thermal plant in San Bernardino County. While considered cutting edge when it began operating in 2013, it has since proved less efficient and more costly than its PV counterparts. It also consumes natural gas to maintain efficiency, has a history of environmental concerns, and is scheduled for closure in 2026.[52] *As such, the committee recommends striking reference to Ivanpah, and rather referencing an early PV technology such as the Desert Sunlight Solar Farm in Riverside County*.[53] In addition, this bill includes reference to some older statistics, such as California as the fifth – rather than fourth[54] – largest economy, and the 2022 state generation and installation numbers. *The committee recommends updating these*

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[49] CEC; "Nuclear Power Reactors in California;" https://www.energy.ca.gov/sites/default/files/2020-03/Nuclear_Power_Reactors_in_California_ada.pdf
[50] Ava Community Energy; "Solving Wind Energy in Altamont;" November 19, 2021; https://avaenergy.org/from-the-ceos-desk/solving-wind-energy-in-altamont-pass/
[51] CEC; "Geothermal Energy;" https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy
[52] James Leggate; "Older Ivanpah Solar Plant in California Will Close Units, as Tech Shifts;" *ENR West*; February 13, 2025; https://www.enr.com/articles/60307-older-ivanpah-solar-plant-in-california-will-close-units-as-tech-shifts
[53] USDOE Loan Programs Office, "Desert Sunlight" Project Summary; https://www.energy.gov/lpo/desert-sunlight
[54] Christal Hayes and Peter Hoskins; "California passes Japan as fourth largest economy;" *BBC*; April 24, 2025; https://www.bbc.com/news/articles/cly80zlk1lyo

statistics. Finally, the committee recommends striking reference to solar energy being the most reliable form of energy, as other technologies have higher capacity factors; the measurement of how frequently the facility operates at its maximum output over a year.[55]

6) *Related Legislation.*

AB 443 (Bennett, 2025) requires the CEC to assess, as specified, the potential for using curtailed solar and wind generation to produce hydrogen. Status: In the Assembly Committee on Appropriations, after passage in this committee on April 2, 2025, on an 18-0 vote.

AB 666 (Rogers, 2025) establishes Bigfoot as the official state cryptid. Status: In the Assembly Committee on Arts, Entertainment, Sports, and Tourism.

AB 864 (Ward, 2025) exempts solar PV modules, not identified as hazardous waste and treated as universal waste, from state hazardous waste requirements if the solar PV modules are transferred to a designated recycler for legitimate recycling as authorized under federal law and regulation. Status: In the Assembly Committee on Appropriations, after passage in the Assembly Committee on Environmental Safety and Toxic Materials on April 29, 2025, on a 7-0 vote.

AB 942 (Calderon, 2025) makes two changes to NEM customer-generator arrangements: 1) requires new property owners inheriting solar systems to take service under the current, not the inherited, NEM tariff; and 2) ends Climate Credit allocations to NEM customers starting on January 1, 2026. Status: In the Assembly Committee on Appropriations, after passage in this committee on April 30, 2025, on a 10-5-3 vote.

7) *Prior Legislation.*

AB 1797 (Wood) designated the Dungeness crab (Metacarcinus magister) as the official state crustacean. Status: Chapter 667, Statutes of 2024.

AB 3118 (Wallis, 2024) would have designated solar energy as the official state energy. Status: Died in this committee.

AB 797 (Irwin) extends by two years, from August 1, 2018, to August 1, 2020, the CSI-Thermal Program of rebates to customers of investor-owned utilities and broadens the program by replacing all references to "solar water heating systems" with reference to "solar thermal systems." Status: Chapter 473, Statutes of 2017.

AB 1067 (Gray) designated the almond (Prunus dulcis, Prunus amygdalus), walnut, pistachio, and pecan each as the official state nut. Status: Chapter 49, Statutes of 2017.

SB 489 (Monning) authorizes photovoltaic modules (known as solar panels) to be managed as universal waste. Status: Chapter 419, Statutes of 2015.

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[55] Nuclear and geothermal ranking highest. See EIA data: https://www.eia.gov/todayinenergy/detail.php?id=14611&src=email#:~:text=Baseload%20generators%2C%20like%20nuclear%20units,%2C%20river%20flow%2C%20and%20snowmelt.

AB 327 (Perea) instituted several rate reforms and required the CPUC to adopt a successor NEM tariff no later than December 31, 2015. Status: Chapter 611, Statutes of 2013.

AB 1470 (Huffman) established the Solar Water Heating and Efficiency Act, a $250 million, 10-year statewide program aimed at accelerating the adoption of solar thermal technology. Established a program goal of deploying 500,000 solar thermal systems by 2017, with at least 10% of funds allocated to affordable housing projects. Status: Chapter 536, Statutes of 2007.

SB 1 (Murray), dubbed the "Million Solar Roofs Initiative," created policies to install one million solar energy systems on homes, schools, farms, and businesses across the state by 2019. Status: Chapter 132, Statutes of 2006.

SB 656 (Alquist) required every electric utility, including electrical corporations, which offer residential service to develop a standard tariff providing for NEM to eligible customer-generators. Applies only to those systems that produce up to 10 kilowatts and would be restricted to 0.1 percent of a utility's peak demand. Status: Chapter 369, Statutes of 1995.

REGISTERED SUPPORT / OPPOSITION:

Support

California Solar & Storage Association
Large-scale Solar Association

Opposition

None on file.

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