DOCKETED	
Docket Number:	22-BSTD-04
Project Title:	2022 Energy Code Photovoltaic and Battery Storage Cost Effectiveness Determinations
TN #:	251992
Document Title:	Revised Staff Review and Analysis of Trinity Public Utility District's 2022 Non Residential Determination
Description:	*** This document supersedes TN 251982 ***
Filer:	Muhammad Faisal Saeed
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	8/28/2023 3:19:46 PM
Docketed Date:	8/28/2023

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

STAFF REPORT

Revised Staff Review and Analysis of Trinity Public Utility District's Application for a Solar Photovoltaic and Battery Storage Cost Effectiveness Determination for Nonresidential Buildings

August 2023 | CEC-400-2023-006-REV

California Energy Commission

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ABSTRACT

The California Energy Commission's (CEC) *2022 Building Energy Efficiency Standards* (Energy Code) went into effect on January 1, 2023. The 2022 Energy Code requires the installation of solar photovoltaic systems and battery storage systems for newly constructed nonresidential buildings and for newly constructed high-rise multifamily buildings. In conjunction with those requirements, section 10-109(k) of the 2022 Energy Code states, "The Commission may … determine that the photovoltaic or battery storage requirements … shall not apply, if the Commission finds that implementation of public agency rules regarding utility system costs and revenue requirements, compensation for customer-owned generation, interconnection fees, or other factors, causes the Commission's cost effectiveness conclusions, made pursuant to Public Resources Code 25402(b)(3), to not hold for particular buildings."

The Trinity Public Utility District applied on November 21, 2022, for a CEC determination regarding whether the solar photovoltaic system and battery storage system requirements should apply to nonresidential and high-rise multifamily buildings in its service area. Staff docketed an original staff report for public comment on June 12, 2023. In response to information provided and concerns raised with the original staff report by Trinity Public Utility District's General Manager, staff has prepared this revised report. Staff has performed a cost-effectiveness analysis based on the public agency rules adopted by Trinity Public Utility District. Staff finds that the solar photovoltaic system requirements andthe battery storage system requirements are not cost effective for nonresidential buildings. Staff recommends that the CEC determine that the 2022 Energy Code solar photovoltaic system and battery storage requirements are not applicable to newly constructed nonresidential buildings in the Trinity Public Utility District

Keywords: Solar photovoltaic determination, Battery storage determination, 10-109(k), solar PV requirement, solar, PV, Building Energy Efficiency Standards, cost effectiveness

Please use the following citation for this report:

Saeed, Muhammad Faisal, and Bill Pennington. 2023. *Staff Review and Analysis of Trinity Public Utility District's Application for a Solar Photovoltaic Cost Effectiveness Determination for Nonresidential Buildings.* California Energy Commission, Publication Number: **CEC-400-2023-006-REV**

EXECUTIVE SUMMARY

Background

On August 11, 2021, the California Energy Commission (CEC) adopted the *2022 Building Energy Efficiency Standards* (Energy Code), which include new solar photovoltaic (PV) system and battery storage system requirements for all newly constructed nonresidential and high-rise multifamily buildings. High-rise multifamily buildings are multifamily buildings that have four or more habitable stories. These requirements, along with the rest of the 2022 Energy Code, went into effect on January 1, 2023.

In conjunction with those requirements, section 10-109(k) states,

> "The Commission may, upon written application or its own motion, determine that the photovoltaic or battery storage requirements … shall not apply, if the Commission finds that the implementation of public agency rules regarding utility system costs and revenue requirements, compensation for customer-owned generation, interconnection fees, or other factors, causes the Commission's cost effectiveness conclusions … to not hold for particular buildings."

The regulations require that an applicant must provide information regarding the differences between the public agency rules specified in section 10-109(k) above and the cost effectiveness determinations that the CEC made in adopting the PV and battery storage requirements, including supplementary information requested by the CEC to enable a full review of the application. Applications from public agencies must be submitted to the CEC only after public review within the jurisdiction of the agency or service area of the utility. The regulations do not require applicants to submit a cost-effectiveness analysis.

After receiving an application and determining that it is complete, the executive director must make the application package available to interested parties and provide a 60-day public comment period. The executive director may request additional information to evaluate the application. The executive director must make a recommendation on the application and place the application package, any additional information considered, and the recommendation on the business meeting calendar for the full Commission to consider.

Trinity Public Utility District (PUD) submitted an application to the CEC on November 21, 2022, for a determination, as specified under section 10-109(k), of whether the solar PV system and battery storage requirements should apply to newly constructed nonresidential and high-rise multifamily residential buildings, in its service area. The application was released for a 60-day comment period, ending January 9, 2023. No comments were received. Staff docketed its original staff report on June 12, 2023. The original staff report was available for public comment until June 27, 2023. No comments were submitted to the docket. However, Trinity PUD's General Manager contacted CEC

staff to identify that Trinity PUD has a Public Benefit Discount that applies a 20 percent discount to the rates and charges that would otherwise be due for schools. He also raised the following concerns with the analysis documented in the original report:

- Trinity PUD intends beginning February 11, 2026, that any additional revenue requirements will come from increases to the fixed charge portion of TPUD rates. TPUD does not anticipate any increases in energy (volumetric) charges for the next 30 years.
- Trinity PUD believes that the availability of solar energy in their service area is lower than that used for the climate zone in which Trinity PUD is located.

During the course of the review of these concerns, staff concluded that the vast majority of buildings in the Trinity PUD service area are relatively small. Staff determined that the retail prototype that was used for the original staff report was larger than almost all of the retail buildings in Trinity PUD's service area. Staff decided to use a smaller retail prototype for analysis for the revised staff report.

CEC staff revised its analysis to address these matters.

Recommendations

Solar Photovoltaic System Requirements

CEC staff reviewed the Trinity PUD application and performed a life-cycle cost effectiveness analysis to determine if Trinity PUD's public agency rules would cause solar PV systems to not to be cost effective in its service area.

Staff found that applying Trinity PUD's commercial rates and NEM rules for the analysis resulted in solar PV systems being not cost effective for nonresidential buildings. The results showed that the energy cost savings from having solar PV generation for nonresidential buildings were lower than the solar PV system cost, resulting in a benefit-to-cost ratio of less than 1.0.

Based on the analysis presented, staff recommends that the CEC determine that Trinity PUD's rules regarding commercial rates, NEM compensation and participation charges for customer-owned generation cause the CEC's cost effectiveness conclusion for solar PV systems to change for nonresidential buildings in Trinity PUD's service area. Staff recommends that the CEC determine that solar PV systems not be required for nonresidential buildings in Trinity PUD's service area for the 2022 Energy Code.

Battery Storage System Requirements

The 2022 Energy Code states that all buildings that are required to have a PV system shall also have a battery storage system. Since CEC staff determine that solar PV systems will not be cost effective using Trinity PUD's commercial rates, NEM compensation and participation charges for customer-owned generation, battery storage systems will not be required as well.

CHAPTER 1:
Trinity Public Utility District

Summary of Trinity Public Utility District Application

Trinity PUD serves most of Trinity County, covering 2,100 square miles of mountain terrain and serving about 7,200 customers. It distributes and sells 100 percent hydroelectric power to its customers.

Trinity PUD divides its residential and commercial service area into two geographic zones, Geographic Zone A and Geographic Zone B, which historically have had different rates. The difference in rates between the two zones is based on which part of the Trinity PUD distribution system served each zone at the time distribution assets were acquired from investor-owned utilities. All debts associated with the purchase of the older parts of the distribution system have been paid (Geographic Zone A). The other parts of the distribution system were acquired through a bond purchase in 1993, and those bonds will be paid as of March 2023 (Geographic Zone B).

As part of its application, Trinity PUD submitted its Commercial Service A Rate Schedule, which includes its adopted rates for 2022-2025. In 2022/2023, Geographic Zone A customers pay an energy rate of $0.07508, and Geographic Zone B customers pay an energy rate of $0.09011. The commercial rates for Geographic Zone A will be $0.07758 for 2023/2024, $0.08008 for 2024/2025, and $0.08259 for 2025/2026; and for Geographic Zone B will be $0.08761 for 2023/2024, $0.08511 for 2024/2025, and $0.08259 for 2025/2026.

Under Trinity PUD NEM rules, Trinity PUD compensates customers at the full retail rate for any customer-owned generation. In addition, Trinity PUD NEM rules require customers with solar PV to pay an administrative charge of $10 per month.

The Trinity PUD application states that the 2022 Energy Code solar PV requirements and battery storage requirements for specific nonresidential buildings are not cost effective when the Trinity PUD rates are used.

Trinity PUD's application includes:

- Trinity PUD's Request for Nonresidential and High-Rise Residential Solar Photovoltaic and Battery Storage with attached Commercial Service A Rate Schedule

Trinity PUD's request included an attachment of the minutes of the Trinity PUD Board public meeting that Trinity PUD conducted on November 10, 2022, where the Board approved the decision to seek a determination from the CEC under Title 24, Part 1, section 10-109(k).

Staff also considered the following materials to inform this analysis:

- Trinity PUD's NEM rules specified in Renewable Electric Generating Facility Net Metering and Solar Power Incentive Rate Schedule
- Letter from Trinity PUD's General Manager, stating that Trinity PUD does not anticipate any increases in volumetric rates for the next 30 years
- Trinity PUD Public Benefit Discount rate schedule available to schools

CHAPTER 2:
Staff Analysis

Staff Analysis of Trinity PUD Application

Development of the new solar PV and battery requirements for specific newly constructed nonresidential buildings for the 2022 Energy Code relied largely on two main sources to develop technical information and determine cost effectiveness:

- *2022 Time Dependent Valuation of Energy for Developing Building Efficiency Standards. 2022 Time Dependent Valuation (TDV) and Source Energy Metric Data Sources and Inputs*
- 2022 Nonresidential PV and Battery Storage Measure Proposal

These reports describe the CEC's life-cycle cost method used to evaluate proposed changes to the 2022 Energy Code and, specifically, the energy cost-savings method used for determining the cost effectiveness of the solar PV and battery requirement. CEC staff published the original Staff Review for Trinity Public Utility District's Non-Residential Application for a Solar PV Determination on June 12, 2023, which used the same life-cycle cost approach to determine the cost effectiveness of solar PV and battery systems subject to the public agency rules adopted by Trinity PUD to establish commercial rates and Net Energy Metering (NEM) solar PV compensation and participation charge. However, in this revised staff report, CEC staff has made some changes to this approach as described below:

Life-Cycle Cost Effectiveness Determination – Photovoltaic Systems

Staff evaluated whether the implementation of the Trinity PUD rules would cause the cost effectiveness of the solar PV systems to not hold within its territory. The CEC used Trinity PUD's commercial rates for nonresidential buildings, NEM compensation and participation charge rules, California Building Energy Code Compliance software (CBECC-2022) runs, and the inputs described below to evaluate cost effectiveness.

A measure is cost effective if the benefit-to-cost ratio is greater than 1.0. The ratio is calculated by dividing the total present value of the life-cycle cost benefits by the present value of the total incremental costs. Specific to the solar PV system, this ratio would be the present value of the energy cost savings divided by the present value of the PV system costs.

Equation 1: Benefit-to-Cost Ratio

$$\text{Benefit-to-Cost Ratio} = \frac{\text{Present Value of Cost Savings}}{\text{Present Value of PV System Costs}}$$

Calculating PV Size and Annual Generation

The 2022 Energy Code requires a solar PV system that generates the electrical output (kW_{PV}) calculated based on equation 140.10-A for specified nonresidential buildings. The solar PV size is calculated using CBECC 2022 for nonresidential buildings.

In the original staff report, CEC staff used CBECC 2022 to determine annual energy usage of all commercial building prototypes and the annual solar generation (kWh). However, Trinity PUD's General Manager raised a concern that he believes that buildings in the Trinity PUD service area receive less solar insolation than determined for the original report for climate zone 16. Staff used the PV-Watts calculator (which is based on the same solar calculation algorithms in CBECC) to evaluate the solar production for Weaverville, California (the largest city in the Trinity PUD service area). Staff compared those results to the PV-Watts results for Blue Canyon, California, which is the representative weather station for climate zone 16 and found that there is somewhat less solar insolation and resulting solar production in Weaverville. For the revised staff report, staff used the PV-Watts calculator to determine the solar production for Weaverville. Staff used the same inputs for the PV-Watts Calculator as are used with CBECC:

Location: Weaverville, CA

Module Type: Standard

Array Type: Fixed Open Rack

System Losses:

Soiling (%):	2
Shading (%):	2
Snow (%):	0
Mismatch (%):	0
Wiring (%):	2
Connections (%):	0.5
Light-Induced Degradation (%):	1.5
Nameplate Rating (%):	1
Age (%):	5
Availability (%):	3

Tilt: 22.6 degrees (roof slope of 5:12)

Azimuth: 170 degrees

In the original staff report, staff used a retail prototype that was larger than almost all retail buildings in Trinity PUD's service area. In the revised staff report, staff used a

smaller retail prototype for the analysis. Based on the Weaverville PV-Watts production and the smaller retail prototype, CEC staff determined, based on CBECC 2022 compliance software computer runs for hotel, office, school, restaurant, retail, and warehouse prototypes used for 2022 Energy Code analysis, that average PV sizes are as shown in the table 1.

Table 1: PV Size and Annual Generation for Prototypes for Nonresidential Building Types (CBECC)

	School Prototype	Retail Prototype	Office Prototype	Hotel Prototype	Warehouse Prototype
PV Size (kW)	26	27.3	14.3	22	25.9
Annual Generation (kWh)	36,514	38,340	20,085	30,897	36,374

Source: CEC staff

Inputs Used for Life-Cycle Cost Effectiveness Calculation

Inputs for the following parameters in the life-cycle cost calculation were consistent with those used to determine the cost effectiveness of the solar PV system measure proposal during the 2022 Energy Code development except where noted. The inputs for these parameters are unchanged by Trinity PUD's public agency rules for commercial rates and NEM PV compensation and participation charge.

Present Value (NPV) Cost per Watt

The present value cost-per-watt input was obtained from the *2022 Nonresidential PV and Battery Storage Measure Proposal* report. The lifetime present value costs for PV systems of different sizes are provided in the following table.

Table 2: Lifetime Present Value Costs for Photovoltaic System (10% ITC)

PV Size (kWdc)	Lifetime Present Value of Costs (2023 $/W)
10	3.26
20	2.96
50	2.59
100	2.36
200	2.15
500	1.90
1000	1.73

Source: 2022 Nonresidential PV and Battery Storage Measure Proposal, page 64,

The lifetime present value costs include the costs for the PV module, inverter, structural balance of system, electrical balance of system, supply chain costs, sales tax, installation labor, permitting, inspection, interconnection, customer acquisition, general and administrative overhead, and net profit to the installer. The lifetime present value costs also include the 10% federal Investment Tax Credit (ITC) available at the time the report was drafted.

For the analysis for Trinity PUD's application, staff updated the value for the solar PV system lifetime present value cost by applying the 30% federal Solar Investment Tax Credit (ITC) in the Inflation Reduction Act passed by the U.S. Congress in 2022. The revised lifetime present value cost with current 30% ITC is shown in Table 3 below.

Table 3: Lifetime Present Value Costs for Photovoltaic System (30% ITC)

PV Size (kWdc)	Lifetime Present Value of Costs (2023 $/W)
10	2.59
20	2.35
50	2.07
100	1.89
200	1.72
500	1.53
1000	1.40

Source: CEC Staff

Energy Escalation

Staff obtained the energy escalation input of 2.7 percent from the *2019 Time Dependent Valuation of Energy for Developing Building Efficiency Standards: 2019 Time Dependent Valuation (TDV) Data Sources and Inputs* report. The report references the *2015 Integrated Energy Policy Report (IEPR)*, which calculates average rates for Pacific Gas and Electric Company, Southern California Edison, San Diego Gas & Electric, Los Angeles Department of Water and Power, and Sacramento Municipal Utility District through 2026. All cost effectiveness analyses completed for the 2019 Energy Code requirements used a compound average growth rate of 2.7 percent per year nominal increase for forecasting rates. Staff has used the same percentage for the 2022 Energy Code.

In the original staff report, staff used an energy escalation rate of 2.6 percent. However, based on the letter received that stated that Trinity PUD's volumetric rates aren't expected to increase for the next 30 years, staff used an escalation rate of zero percent in the revised analysis.

Discount Rate

The real discount rate input of 3 percent was obtained from the *2019 Time Dependent Valuation of Energy for Developing Building Efficiency Standards: 2019 Time Dependent Valuation (TDV) Data Sources and Inputs report*. All cost effectiveness analyses completed for Energy Code requirements used a 3 percent real (inflation-adjusted) discount rate to calculate the present value. It is a long-standing practice for the cost effectiveness analysis of energy code requirements to use a 3 percent real discount rate.

Life-Cycle Period of Analysis

The life-cycle period of analysis of 30 years was obtained from the *Time Dependent Valuation of Energy for Developing Building Efficiency Standards: 2022 Time Dependent Valuation (TDV) and Source Energy Metric Data Sources and Inputs* report. All cost effectiveness analyses completed for 2022 California Energy Code requirements used a

life-cycle period of analysis of 30 years (2023–2052). It is long-standing practice for the cost effectiveness of Energy Code requirements to use a life-cycle period of analysis of 30 years.

Present Value of Energy Cost Savings

The first-year energy cost savings for the revised staff analysis were determined by the by CBECC 2022 (Climate Zone 16) and the annual energy generation was calculated by PV-Watts Calculator for Weaverville for all commercial building prototypes including the smaller retail building prototype, Trinity PUD's Commercial Service A Rate Schedule, Trinity PUD's Public Benefit Discount rate schedule available to schools, and Trinity PUD's Renewable Electric Generating Facility Net Metering and Solar Power Incentive rules.

Table 1 (p.5) shows the PV size and annual generation for the prototypes for each of the specific nonresidential building types determined in the revised staff analysis for the Trinity PUD service area.

Table 4 shows the annual energy cost savings for each nonresidential building type for each of the first three years of the 30-year lifetime of buildings subject to the 2022 Energy Code. The energy cost savings for these years were determined by multiplying the annual generation (kWh) shown in Table 1 by the commercial rates for each of these years currently adopted by Trinity PUD as shown below.

Table 4: Energy Cost Savings for Nonresidential Buildings

Non-residential Building Type	Energy Cost Savings for Geographic Zone A 2023/2024 (Commercial Rate $0.07758, School Rate $0.06204)	Energy Cost Savings for Geographic Zone A 2024/2025 (Commercial Rate $0.08008, School Rate $0.06406)	Energy Cost Savings for Geographic Zone A 2025/2026 (Commercial Rate $0.08259 School Rate $0.06607)	Energy Cost Savings for Geographic Zone B 2023/2024 (Commercial Rate $0.08761 School Rate $0.07008)	Energy Cost Savings for Geographic Zone B 2024/2025 (Commercial Rate $0.08511 School Rate $0.06808)	Energy Cost Savings for Geographic Zone B 2025/2026 (Commercial Rate $0.08259 School Rate $0.06607)
School	$2,266	$2,339	$2,413	$2,559	$2,486	$2,413
Office	$1,558	$1,608	$1,659	$1,760	$1,709	$1,659
Hotel	$2,397	$2,474	$2,551	$2,707	$2,630	$2,552
Warehouse	$2,822	$2,913	$3,004	$3,187	$3,096	$3,004
Retail	$2,974	$3,070	$3,167	$3,359	$3,263	$3,167

Source: CEC Staff

Staff calculated the present value of the energy cost savings by using an equivalent method to the standard financial equation for calculating present value of a growing annuity, as shown below. This equation calculates the present value of total future cost savings based on the annual cost savings, the discount rate, the growth (escalation) rate, and the number of periods compounded.

Equation 2: Present Value

$$\text{Present Value} = \frac{P}{r-g} \times \left[1 - \left(\frac{1+g}{1+r}\right)^{n}\right]$$

P = annual cost savings
r = discount rate = 3%
g = growth (escalation) rate per period of = 0%
n = number of periods of analysis period = 30 years

CEC staff used the present value function in Microsoft Excel® to perform the calculation for each geographic zone.

For both Geographic Zone A and Geographic Zone B, the annual energy cost savings for 2023/2024, 2024/2025, and 2025/2026 shown in Table 4 determined the energy cost savings for the first three years of the 30-year period. The energy cost savings for each nonresidential building type for both Geographical Zone A and Geographical Zone B for 2025/2026 were escalated with 0% escalation rate over the remainder of the 30-year period. The administrative charge included in the Trinity PUD NEM rules (NEM charge) of $120/year ($10/month) was subtracted each year from the energy cost savings to determine a net annual energy cost savings. Staff calculated the NPV of the annual energy cost savings for each year of the 30-year period, resulting in the total 30-year present value of energy cost savings as shown in Table 5 for each building category and for both Geographic Zone A and B.

Table 5: Present Value of Energy Cost Savings for Nonresidential Buildings

Nonresidential Building Type	30-year Present Value of Energy Cost Savings for Geographic Zone A_	30-year Present Value of Energy Cost Savings for Geographic Zone B
School	$44,724	$45,147
Office	$30,016	$30,307
Hotel	$47,441	$47,888
Warehouse	$56,267	$56,794
Retail	$59,436	$59,991

Source: CEC Staff

Present Value of PV System Cost

The present value of the PV system cost is determined by multiplying the PV size as determined by PV-Watts for Weaverville shown in Table 1 by the lifetime present value PV costs per watt for the PV size shown in Table 3 that is applicable to each building category prototype (interpolating when necessary). As a result, lifecycle cost of PV for different building types are shown below.

Table 6: Present Value of PV System Cost for Nonresidential Buildings

Building Types	Present Value of PV System Cost
School	$59,644
Office	$35,561
Hotel	$51,289
Warehouse	$59,439
Retail	$62,295

Source: CEC Staff

Net Savings and Benefit to Cost Ratios of the PV Systems

The net savings of the PV system cost is determined by subtracting the present value of PV system costs (Table 6) from 30-year present value of energy cost savings (Table 5). The benefit to cost ratio is determined by dividing the present value of energy cost savings by the present value of PV system costs.

Table 7: Net Savings and Benefit to Cost Ratio of PV Systems for Nonresidential Buildings

Building Types	Geographic Zone A	Geographic Zone A	Geographic Zone B	Geographic Zone B
	Net Savings	Benefit to Cost Ratio	Net Savings	Benefit to Cost Ratio
School	-$14,920	0.75	-$14,497	0.76
Office	-$5,545	0.84	-$5,254	0.85
Hotel	-$3,848	0.92	-$3,401	0.93
Warehouse	-$3,172	0.95	-$2,645	0.96
Retail	-$2,859	0.95	-$2,304	0.96

Source: CEC Staff

Life-Cycle Cost Effectiveness Determination – Solar Photovoltaic Systems

As shown in table 7 above, the net savings are negative and the benefit to cost ratio is less than zero for every building type. Thus, the revised staff analysis determines that PV systems are not cost effective for any building type in the areas served by Trinity PUD.

Life-Cycle Cost Effectiveness Determination – Battery Storage Systems

Section 140.10(b) of the Energy Code specifies that battery storage requirements for certain non-residential buildings are required only when the solar PV system is required by section 140.10(a). As stated above, the revised staff analysis determines that PV systems are not cost effective in Trinity PUD's service area. Thus, the Energy Code would not require battery storage systems in Trinity PUD's service area.

CHAPTER 3:
Conclusion

Staff Recommendation

Based on the revised CEC staff analysis in this report made in response to the Trinity PUD comments on the original staff report, staff recommends that the CEC determine that the public agency rules of the Trinity PUD regarding commercial rates, NEM compensation and participation charges for customer-owned generation cause the CEC's cost effectiveness conclusion for solar PV systems to not hold for specific newly constructed nonresidential buildings. Therefore, Solar PV system requirements in the 2022 Energy Code would not apply to newly constructed nonresidential buildings in the Trinity PUD service area. Therefore, battery storage system requirements in the 2022 Energy Code also would not apply to newly constructed nonresidential buildings in the Trinity PUD service area.

GLOSSARY

California Energy Commission (CEC) is the state agency leading the state of California to a 100 percent clean energy future for all. As the state's primary energy policy and planning agency, the Energy Commission is committed to reducing energy costs and environmental impacts of energy use while ensuring a safe, resilient, and reliable supply of energy.

CBECC (California Building Energy Code Compliance) is an open-source compliance software that may be used by code agencies, rating authorities, or utility programs in the development of energy codes, standards, or efficiency programs. Architects, engineers, and energy consultants may also use CBECC to demonstrate compliance with energy codes or beyond-code programs.

Climate zones are the 16 geographic areas of California for which the CEC has established typical weather data, prescriptive packages, and energy budgets.

Energy Code, also referred to as the California's Building Energy Efficiency Standards, is adopted by the CEC to reduce wasteful and unnecessary energy consumption in newly constructed buildings, and additions and alterations to existing buildings. The Energy Code is updated every three years. Buildings whose permit applications are applied for on or after January 1, 2023, must comply with the 2022 version of the Energy Code.

Integrated Energy Policy Report (IEPR) is the state's comprehensive energy policy report prepared by the California Energy Commission. It provides a cohesive approach to identifying and addressing the state's pressing energy needs and issues. The report, which is crafted in collaboration with a large number of stakeholders, develops and implements energy plans and policies.

Net Energy Metering (NEM) is a billing mechanism that compares the amount of electricity generated by customer-owned solar energy systems to the amount of electricity that the customer consumes and provides compensation for the amount that is consumed and the amount that is generated in excess of the consumption following rules established for the utility.

Photovoltaic (PV) systems are composed of one or more solar-electric panels combined with an inverter and other electrical and mechanical hardware that use energy from the sun to generate electricity.

PV-Watts Calculator is a public domain calculator provided by the U.S. National Renewable Energy Laboratory (NREL) that estimates the energy production of grid-connected photovoltaic (PV) energy systems throughout the world. It allows homeowners, small building owners, installers and manufacturers to easily develop estimates of the performance of potential PV installations.

Trinity Public Utility District (Trinity PUD) is a public agency responsible for providing electrical power to a large part of Trinity County, CA.

APPENDIX A:
Resources

California Energy Commission. June 2020. Time Dependent Valuation of Energy for Developing Building Efficiency Standards. 2022 Time Dependent Valuation (TDV) and Source Energy Metric Data Sources and Inputs.
https://efiling.energy.ca.gov/GetDocument.aspx?tn=233345&DocumentContentId=65837

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Solar Photovoltaic and Battery Storage Cost-Effectiveness Determination for Nonresidential Buildings (original staff report)
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Trinity Public Utilities District. January 1, 2011. Public Benefit Discount Rate Schedule
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Trinity Public Utilities District. February 12, 2015. Renewable Electric Generating Facility Net Metering and Solar Power Incentive Rate Tariff
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Trinity Public Utilities District. July 14, 2023. Non-Residential PV Analysis
https://efiling.energy.ca.gov/GetDocument.aspx?tn=251152&DocumentContentId=86091