DOCKETED	
Docket Number:	22-BSTD-04
Project Title:	2022 Energy Code Photovoltaic and Battery Storage Cost Effectiveness Determinations
TN #:	250598
Document Title:	Staff Review for Trinity Public Utility District's Non-Residential Application for a Solar PV Determination
Description:	N/A
Filer:	Muhammad Faisal Saeed
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/12/2023 11:39:38 AM
Docketed Date:	6/12/2023

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

STAFF REPORT

Trinity Public Utility District's Application for a Solar Photovoltaic and Battery Storage Cost-Effectiveness Determination for Nonresidential Buildings

June 2023| CEC-400-2023-006

California Energy Commission

Muhammad Faisal Saeed
Bill Pennington
Author

Will Vicent
Branch Manager
Building Standards Branch

Michael J. Sokol
Director
Energy Efficiency Division

Drew Bohan
Executive Director

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. As a result of specific exceptions in the 2022 Energy Code, the solar photovoltaic and battery storage system requirements do not apply to high-rise multi-family buildings or multi-tenant nonresidential buildings in the Trinity Public Utility District, and to nonresidential buildings that have lower conditioned floor area as explained in this 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 are cost effective, but that the 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 requirements are applicable to newly constructed nonresidential buildings in the Trinity Public Utility District, but that the battery storage system requirements are not applicable.

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. 2022. *Staff Review and Analysis for Trinity Public Utility District's Application for a Solar Photovoltaic Determination for Nonresidential and High-Rise Multifamily Buildings.* California Energy Commission, Publication Number: **CEC-400-2023-006**

TABLE OF CONTENTS

Abstract i

Executive Summary iii

Background iii

Exception for Multi-tenant Buildings iii

Exception for Smaller Nonresidential Buildings iv

Recommendations v

CHAPTER 1: Trinity Public Utility District 1

Summary of Trinity Public Utility District Application 1

CHAPTER 2: Staff 3

Staff Analysis of Trinity PUD Application 3

Life-Cycle Cost-Effectiveness Determination – Photovoltaic Systems 3

Calculating PV Size and Annual Generation 4

Climate Zone and PV System Size 4

Inputs Used for Life-Cycle Cost-Effectiveness Calculation 4

Present Value of Energy Cost Savings 7

Present Value of PV System Cost 10

Net Savings and Benefit to Cost Ratios of the PV Systems 11

Life-Cycle Cost-Effectiveness Determination – Battery Storage Systems 21

APPENDIX A: Resources ..... A

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. Exception for Multi-tenant Buildings.

The 2022 Energy Code provides an exception to the photovoltaic and battery storage system requirements for multi-tenant buildings in areas where a load serving entity does not provide either a Virtual Net Metering (VNEM) or community solar program.[1] The Trinity PUD does not provide a VNEM or community solar program. Thus, the solar photovoltaic and battery storage system requirements do not apply to high-rise multi-family buildings or multi-tenant nonresidential buildings in the Trinity PUD.

Exception for Smaller Nonresidential Buildings

The 2022 Energy Code provides an exception to the photovoltaic and battery system requirements for buildings requiring less than 4 kWdc calculated using equation 140.10-A.[2] As a result, no PV or battery storage will be required for the following building types when the conditioned floor area of the building is less than the following thresholds:

Table 1: Minimum Conditioned Floor Area for Buildings to Require PV

Building Type	Minimum Conditioned Floor Area (Square Feet) to Require PV
Grocery	1,527
Office, Financial Institutions, Unleased Tenant Space	1,544
Retail	1,527
School	3,150
Warehouse	10,256
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	10,256

[1] 2022 California Energy Code, Exception 5 to section 170.2(g) for multi-family buildings and Exception 5 to section 140.10(a) for multi-tenant nonresidential buildings.

[2] 2022 California Energy Code, Exception 2 to section 140.10(a)

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 cost-effective for nonresidential buildings. The results showed that the energy cost savings from having solar PV generation for nonresidential buildings were greater than the solar PV system cost, resulting in a benefit-to-cost ratio of greater than 1.0.

Based on the analysis presented, staff recommends that the CEC determine that Trinity PUD's rules regarding commercial rates and NEM compensation and participation charge for customer-owned generation do not 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 be required for nonresidential buildings in Trinity PUD's service area. Exceptions in the Energy Code discussed above for multi-tenant buildings and for smaller buildings apply to nonresidential buildings in Trinity PUD's service territory.

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.

For nonresidential buildings, staff recommends that the CEC make a determination that solar PV systems be required in Trinity PUD's service area for specific newly constructed nonresidential building types, leading to the need for a determination for whether battery storage systems should also be required for these same buildings. Trinity PUD's commercial rates are the same for every hour of the year. If Trinity PUD's rates continue to not be differentiated by time-of-day, there will be no compensation for load shifting resulting from battery storage systems, and battery storage systems will not be cost effective in Trinity PUD's service area. Since cost effectiveness is determined over a 30-year period, a critical question is whether or not the cost for Trinity PUD to acquire power to meet building demand is likely to be differentiated by time-of-day at some point in that 30-year period, warranting a future change to time-differentiated rates.

Trinity PUD is unique among all utilities in the state as being served by 100% large hydroelectric power with priority allocation of such power by federal law likely to last throughout the 30-year period. Thus, it is extremely unlikely that Trinity PUD's rates will change to provide compensation for battery storage system load shifting over that period. Staff recommends that the CEC make a

determination that battery storage systems not be required for nonresidential buildings in Trinity PUD's service area.

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 https://efiling.energy.ca.gov/GetDocument.aspx?tn=247659&DocumentContentId=81989

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:

- Trinity PUD's NEM rules specified in Renewable Electric Generating Facility Net Metering and Solar Power Incentive Rate Schedule. https://www.trinitypud.com/secure/pdf/rates/Rate%20Schedule%2017%20Renewable%20Electric%20Generating%20Facility%20Net%20Metering%20and%20Solar%20Power%20Incentive%20021215.pdf

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* [3]
- *2022 Nonresidential PV and Battery Storage Measure Proposal* [4]

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 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 NEM solar PV compensation and participation charge.

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.

---

[3] 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

[4] California Energy Commission. May 2021. Nonresidential PV and Battery Storage Measure Proposal https://efiling.energy.ca.gov/GetDocument.aspx?tn=237776&DocumentContentId=71014

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.

Climate Zone and PV System Size

Trinity PUD is almost entirely in Climate Zone 16. A small, remote area of Trinity PUD's service area could be in Climate Zone 2, but Trinity PUD service lines do not extend there at this time. For that reason, CEC staff's analysis is limited to Climate Zone 16.

CEC staff concluded, 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 below:

Table 2: 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	55.2	14.3	22	25.9
Annual Generation (kWh)	42,287	93,186	23,258	36,596	48,400

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*[5] report. The lifetime present value costs for PV systems of different sizes are provided in the following table:

Table 3: 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	1.9
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:

[5] https://efiling.energy.ca.gov/GetDocument.aspx?tn=237776&DocumentContentId=71014.

Table 4: 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	1.4

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.[6] 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.

It is possible that the commercial rates for Trinity PUD will escalate in the future at a lower or higher rate than 2.7 percent. Staff reviewed the Trinity PUD newly published Commercial Service A Rate Schedule and determined that Trinity PUD rates escalate by $0.0250/kWh from 2022 to 2025, an escalation rate of 3.3 percent. The rates under Commercial Service B Rate Schedule de-escalate (go down) by $0.0250/kWh from 2022 to 2025, an escalation rate of – 2.9 percent. The 2025 rates for Zone A and Zone B have been equalized in the currently adopted Trinity PUD rate schedules, eliminating the historical differences between the two Zones. After 2025 the rates are likely to escalate at a rate that is dependent largely on the annual rainfall feeding the Central Valley hydroelectric power system serving Trinity PUD and the inflation rate for other components of system cost. Over the 30-year period of cost effectiveness, it is

[6] California Energy Commission. February 2017. Time Dependent Valuation of Energy for Developing Building Efficiency Standards: 2019 Time Dependent Valuation (TDV) Data Sources and Inputs. https://efiling.energy.ca.gov/GetDocument.aspx?tn=216062&DocumentContentId=23878.

impossible to predict with certainty whether California will have droughts or higher than normal rains. Staff did not change the 2.7 percent escalation rate used for the Energy Code cost effectiveness analysis. Varying this rate over a substantial range would not change the cost-effectiveness conclusions.

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.[7] 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.[8] 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 were determined by the annual generation calculated by CBECC 2022, the Trinity PUD's commercial rate Schedules, and the Trinity PUD's Renewable Electric Generating Facility Net Metering and Solar Power Incentive rules.

Table 1 (p. 11) shows the PV size and annual generation for the prototypes for each of the specific nonresidential building types determined by CBECC 2022 for the Trinity PUD service area (Climate Zone 16).

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:

---

[7] Ibid.

[8] Op. Cit.

Table 5: Energy Cost Savings for Nonresidential Buildings

Non-residential Building Type	Energy Cost Savings for Geographic Zone A 2023/2024 (Commercial Rate $0.07758)	Energy Cost Savings for Geographic Zone A 2024/2025 (Commercial Rate $0.08008)	Energy Cost Savings for Geographic Zone A 2025/2026 (Commercial Rate $0.08259)	Energy Cost Savings for Geographic Zone B 2023/2024 (Commercial Rate $0.08761)	Energy Cost Savings for Geographic Zone B 2024/2025 (Commercial Rate $0.08511)	Energy Cost Savings for Geographic Zone B 2025/2026 (Commercial Rate $0.08259)
School	$3281	$3,386	$3,492	$3,705	$3,599	$3,492
Office	$1,804	$1,863	$1,921	$2,038	$1,979	$1,921
Hotel	$2,839	$2,931	$3,022	$3,206	$3,115	$3,022
Warehouse	$3,755	$3,876	$3,997	$4,240	$4,119	$3,997
Retail	$7,229	$7,462	$7,696	$8,164	$7,931	$7,696

Source: CEC Staff

Staff calculated the present value of the 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 = 2.7%
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 5 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 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 6: 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	$128,724	$143,411
Office	$78,929	$79,279
Hotel	$126,258	$126,809
Warehouse	$168,143	$168,872
Retail	$327,063	$328,466

Source: CEC Staff

Calculation results are shown in Table 9 through Table 18 in the "Life-Cycle Cost-Effectiveness Results" section below.

Present Value of PV System Cost

The present value of the PV system cost is determined by multiplying the PV size as calculated by CBECC 2022 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 7: Present Value of PV System Cost for Nonresidential Buildings

Building Types	Present Value of PV System Cost
School	$59,644
Office	$35,561
Hotel	$87,974
Warehouse	$59,438
Retail	$113,231

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 8: 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	$86,805	2.46	87,445	2.47
Office	$43,368	2.22	$43,718	2.23
Hotel	$74,969	2.46	$75,520	2.47
Warehouse	$108,705	2.83	$109,434	2.84
Retail	$213,832	2.89	$215,236	2.90

Source: CEC Staff

Life-Cycle Cost-Effectiveness Results

CEC staff developed a spreadsheet including all equations and inputs discussed in the previous sections. The life-cycle cost effectiveness analysis inputs and results are shown for each nonresidential building type in Tables 9 to 18 shown below.

Table 9: Results for Geographic Zone A Cost Savings of School Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$3,281	$3,386	$3,492	$3,587	$3,684	$3,783	$3,885	$3,990	$4,098	$4,209	$4,322	$4,439	$4,559	$4,682	$4,808
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$3,161	$3,266	$3,372	$3,467	$3,564	$3,663	$3,765	$3,870	$3,978	$4,089	$4,202	$4,319	$4,439	$4,562	$4,688

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$4,938	$5,071	$5,208	$5,349	$5,493	$5,642	$5,794	$5,950	$6,111	$6,276	$6,445	$6,619	$6,798	$6,982	$7,170
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$4,818	$4,951	$5,088	$5,229	$5,373	$5,522	$5,674	$5,830	$5,991	$6,156	$6,325	$6,499	$6,678	$6,862	$7,050

Source: CEC Staff

Present Value of Cost Savings: $147,088.91

Table 10: Results for Geographic Zone B Cost Savings of School Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$3,705	$3,599	$3,492	$3,587	$3,684	$3,783	$3,885	$3,990	$4,098	$4,209	$4,322	$4,439	$4,559	$4,682	$4,808
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$3,585	$3,479	$3,372	$3,467	$3,564	$3,663	$3,765	$3,870	$3,978	$4,089	$4,202	$4,319	$4,439	$4,562	$4,688

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$4,938	$5,071	$5,208	$5,349	$5,493	$5,642	$5,794	$5,950	$6,111	$6,276	$6,445	$6,619	$6,798	$6,982	$7,170
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$4,818	$4,951	$5,088	$5,229	$5,373	$5,522	$5,674	$5,830	$5,991	$6,156	$6,325	$6,499	$6,678	$6,862	$7,050

Source: CEC Staff

Present Value of Cost Savings: $147,088.91

Table 11: Results for Geographic Zone A Cost Savings of Office Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$1,804	$1,863	$1,921	$1,973	$2,026	$2,081	$2,137	$2,195	$2,254	$2,315	$2,377	$2,441	$2,507	$2,575	$2,645
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$1,684	$1,743	$1,801	$1,853	$1,906	$1,961	$2,017	$2,075	$2,134	$2,195	$2,257	$2,321	$2,387	$2,455	$2,525

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$2,716	$2,789	$2,865	$2,942	$3,021	$3,103	$3,187	$3,273	$3,361	$3,452	$3,545	$3,641	$3,739	$3,840	$3,944
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$2,596	$2,669	$2,745	$2,822	$2,901	$2,983	$3,067	$3,153	$3,241	$3,332	$3,425	$3,521	$3,619	$3,720	$3,824

Source: CEC Staff

Present Value of Cost Savings: $78,929

Table 12: Results for Geographic Zone B Cost Savings of Office Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$2,038	$1,979	$1,921	$1,973	$2,026	$2,081	$2,137	$2,195	$2,254	$2,315	$2,377	$2,441	$2,507	$2,575	$2,645
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$1,918	$1,859	$1,801	$1,853	$1,906	$1,961	$2,017	$2,075	$2,134	$2,195	$2,257	$2,321	$2,387	$2,455	$2,525

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$2,716	$2,789	$2,865	$2,942	$3,021	$3,103	$3,187	$3,273	$3,361	$3,452	$3,545	$3,641	$3,739	$3,840	$3,944
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$2,596	$2,669	$2,745	$2,822	$2,901	$2,983	$3,067	$3,153	$3,241	$3,332	$3,425	$3,521	$3,619	$3,720	$3,824

Source: CEC Staff

Present Value of Cost Savings: $79,280

Table 13: Results for Geographic Zone A Cost Savings of Hotel Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$2,839	$2,931	$3,022	$3,104	$3,188	$3,274	$3,362	$3,453	$3,546	$3,642	$3,740	$3,841	$3,945	$4,052	$4,161
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$2,719	$2,811	$2,902	$2,984	$3,068	$3,154	$3,242	$3,333	$3,426	$3,522	$3,620	$3,721	$3,825	$3,932	$4,041

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$4,273	$4,389	$4,507	$4,629	$4,754	$4,882	$5,014	$5,150	$5,289	$5,431	$5,578	$5,729	$5,883	$6,042	$6,205
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$4,153	$4,269	$4,387	$4,509	$4,634	$4,762	$4,894	$5,030	$5,169	$5,311	$5,458	$5,609	$5,763	$5,922	$6,085

Source: CEC Staff

Present Value of Cost Savings: $126,258

Table 14: Results for Geographic Zone B Cost Savings of Hotel Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$3,206	$3,115	$3,022	$3,104	$3,188	$3,274	$3,362	$3,453	$3,546	$3,642	$3,740	$3,841	$3,945	$4,052	$4,161
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$3,086	$2,995	$2,902	$2,984	$3,068	$3,154	$3,242	$3,333	$3,426	$3,522	$3,620	$3,721	$3,825	$3,932	$4,041

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$4,273	$4,389	$4,507	$4,629	$4,754	$4,882	$5,014	$5,150	$5,289	$5,431	$5,578	$5,729	$5,883	$6,042	$6,205
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$4,153	$4,269	$4,387	$4,509	$4,634	$4,762	$4,894	$5,030	$5,169	$5,311	$5,458	$5,609	$5,763	$5,922	$6,085

Source: CEC Staff

Present Value of Cost Savings: $126,809

Table 15: Results for Geographic Zone A Cost Savings of Warehouse Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$3,755	$3,876	$3,997	$4,105	$4,216	$4,330	$4,447	$4,567	$4,690	$4,817	$4,947	$5,081	$5,218	$5,359	$5,503
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$3,635	$3,756	$3,877	$3,985	$4,096	$4,210	$4,327	$4,447	$4,570	$4,697	$4,827	$4,961	$5,098	$5,239	$5,383

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$5,652	$5,804	$5,961	$6,122	$6,287	$6,457	$6,631	$6,811	$6,994	$7,183	$7,377	$7,576	$7,781	$7,991	$8,207
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$5,532	$5,684	$5,841	$6,002	$6,167	$6,337	$6,511	$6,691	$6,874	$7,063	$7,257	$7,456	$7,661	$7,871	$8,087

Source: CEC Staff

Present Value of Cost Savings: $168,144

Table 16: Results for Geographic Zone B Cost Savings of Warehouse Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$4,240	$4,119	$3,997	$4,105	$4,216	$4,330	$4,447	$4,567	$4,690	$4,817	$4,947	$5,081	$5,218	$5,359	$5,503
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$4,120	$3,999	$3,877	$3,985	$4,096	$4,210	$4,327	$4,447	$4,570	$4,697	$4,827	$4,961	$5,098	$5,239	$5,383

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$5,652	$5,804	$5,961	$6,122	$6,287	$6,457	$6,631	$6,811	$6,994	$7,183	$7,377	$7,576	$7,781	$7,991	$8,207
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$5,532	$5,684	$5,841	$6,002	$6,167	$6,337	$6,511	$6,691	$6,874	$7,063	$7,257	$7,456	$7,661	$7,871	$8,087

Source: CEC Staff

Present Value of Cost Savings: $168,872

Table 17: Results for Geographic Zone A Cost Savings of Retail Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$7,229	$7,462	$7,696	$7,904	$8,117	$8,337	$8,562	$8,793	$9,030	$9,274	$9,524	$9,782	$10,046	$10,317	$10,596
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$7,109	$7,342	$7,576	$7,784	$7,997	$8,217	$8,442	$8,673	$8,910	$9,154	$9,404	$9,662	$9,926	$10,197	$10,476

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$10,882	$11,175	$11,477	$11,787	$12,105	$12,432	$12,768	$13,113	$13,467	$13,830	$14,204	$14,587	$14,981	$15,385	$15,801
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$10,762	$11,055	$11,357	$11,667	$11,985	$12,312	$12,648	$12,993	$13,347	$13,710	$14,084	$14,467	$14,861	$15,265	$15,681

Source: CEC Staff

Present Value of Cost Savings: $327,063

Table 18: Results for Geographic Zone B Cost Savings of Retail Prototype Building

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$8,164	$7,931	$7,696	$7,904	$8,117	$8,337	$8,562	$8,793	$9,030	$9,274	$9,524	$9,782	$10,046	$10,317	$10,596
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$8,044	$7,811	$7,576	$7,784	$7,997	$8,217	$8,442	$8,673	$8,910	$9,154	$9,404	$9,662	$9,926	$10,197	$10,476

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$10,882	$11,175	$11,477	$11,787	$12,105	$12,432	$12,768	$13,113	$13,467	$13,830	$14,204	$14,587	$14,981	$15,385	$15,801
NEM Charge	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120	$120
Cost Savings	$10,762	$11,055	$11,357	$11,667	$11,985	$12,312	$12,648	$12,993	$13,347	$13,710	$14,084	$14,467	$14,861	$15,265	$15,681

Source: CEC Staff

Present Value of Cost Savings: $328,467

Life-Cycle Cost-Effectiveness Determination – Battery Storage Systems

Staff's recommendation that the CEC make a determination that solar PV systems be required for specific newly constructed nonresidential buildings in Trinity PUD's service area, leads to the need for a determination for whether battery storage systems should also be required for those same nonresidential buildings. Trinity PUD's commercial rates are the same for every hour of the year. If Trinity PUD's rates continue to not be differentiated by time-of-day, there will be no compensation for load shifting resulting from battery storage systems, and battery storage systems will not be cost effective in Trinity PUD's service area. Since cost effectiveness is determined over a 30-year period, a critical question is whether or not the cost for Trinity PUD to acquire power to meet building demand is likely to be differentiated by time-of-day at some point in that 30-year period, warranting a future change to time-differentiated rates.

Trinity PUD is unique among all utilities in the state as being served by 100% large hydroelectric power. In 1955 the United States Congress enacted Public Law 34-386 authorizing the construction and maintenance of dams and powerplants on the Trinity River with a total generating capacity of approximately 233 MW to provide energy in Trinity County and to other facilities of the Central Valley project. The Trinity River Division Act required that Trinity County customers be allocated first preference for the resulting power.[9] This unique access to substantial large hydroelectric power is also recognized by the California Renewable Portfolio Standard (RPS) that states, "A public utility district that receives all of its electricity pursuant to a preference right adopted and authorized by the United States Congress pursuant to section 4 of the Trinity River Division Act of August 12, 1955 (Public Law 84-386) shall be in compliance with the renewable energy procurement requirements of this article."[10] Figure 1 shows the Trinity PUD Power Content Label available from the CEC RPS program[11]. As long as Trinity PUD maintains its current statutorily recognized preference for Trinity River Division hydroelectric power, Trinity PUD is not obligated to add other renewable resources, such as utility scale solar photovoltaic or wind, which would have variable availability that would lead to time differentiated costs.

---

[9] Trinity River Division Act, Public Law 34-386, section 4, August 12, 1955. https://www.congress.gov/84/statute/STATUTE-69/STATUTE-69-Pg719.pdf

[10] California Renewable Portfolio Standard Rules.Public Utilities Code, section 399.21(g), https://www.energy.ca.gov/sites/default/files/2021-09/Final%20Regulations%20w.o.%20underline%20strikethrough%209.22_ADA.pdf, p. 13

[11] Trinity Public Utility District Power Content Label, https://www.energy.ca.gov/filebrowser/download/650

Figure 1 Trinity Public Utilities District Power Content Label

Version: July 2018

2017 POWER CONTENT LABEL		
Trinity Public Utilities District		
ENERGY RESOURCES	**Power Mix**	**2017 CA Power Mix****
Eligible Renewable	**100%**	**29%**
Biomass & biowaste	0%	2%
Geothermal	0%	4%
Eligible hydroelectric	100%	3%
Solar	0%	10%
Wind	0%	10%
Coal	**0%**	**4%**
Large Hydroelectric	**0%**	**15%**
Natural Gas	**0%**	**34%**
Nuclear	**0%**	**9%**
Other	**0%**	**<1%**
Unspecified sources of power*	**0%**	**9%**
TOTAL	**100%**	**100%**
* "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources. ** Percentages are estimated annually by the California Energy Commission based on the electricity sold to California consumers during the identified year.		
For specific information about this electricity product, contact:	**Trinity Public Utilities District 530-623-4564**	
For general information about the Power Content Label, please visit:	http://www.energy.ca.gov/pcl/	
For additional questions, please contact the California Energy Commission at:	844-454-2906	

The Western Area Power Administration (WAPA) is the administrator for federal power transmission. In California WAPA's Sierra Nevada Region, WAPA administers the Central Valley Project, which includes the Trinity River Division[12]. Every five years WAPA re-calculates the "Maximum Entitlement of First Preference Customers" (MEFPC) of WAPA power based on average power availability over the prior twenty years. Historically, the MEFPC for Trinity PUD has been in the range of 361,500 MWh. In 2019 WAPA notified Trinity PUD that the MEFPC for the years 2020 through 2024 would be 302,600 MWh for First Preference Customers located in Trinity County.[13] Table 8 shows the actual WAPA power billed energy for Trinity PUD between July 2004 through December 2021. Over this historical period the Trinity PUD billed energy increased by about 2,785 MWh per year. Comparing the FY 2021-22 billed energy of 140,657 MWh to the MEFPC set-aside for Trinity PUD of 302,600 MWh, the remaining available MEFPC would be 161,943 MWh. Assuming the historical annual increase in billed energy of 2,785 MWh per year continues into the future, the remaining MEFPC set-aside for Trinity PUD would not be exhausted for the next 58 years (2079-2080). Without major, unprecedented

[12] Western Area Power Administration. WAPA Serves California Fact Sheet, https://www.wapa.gov/newsroom/FactSheets/Documents/State%20Fact%20Sheets/FactSheetCalifornia.pdf,

[13] Western Area Power Administration. June 7, 2019. Maximum Entitlement of First Preference Customers Letter from WAPA to Trinity Public Utility District. https://efiling.energy.ca.gov/GetDocument.aspx?tn=250189&DocumentContentId=84913

change in either the MEFPC or annual usage over the coming 30 years, Trinity PUD would not have to change to other power sources.

Table 8. Actual Trinity PUD Billed Energy 2004-2021[14]

FY	Total Billed Energy (MWh)
2004-05	90,527
2005-06	94,813
2006-07	95,065
2007-08	98,080
2008-09	94,592
2009-10	94,200
2010-11	102,918
2011-12	107,747
2012-13	108,184
2013-14	108,306
2014-15	104,517
2015-16	111,856
2016-17	120,423
2017-18	120,577
2018-19	118,556
2019-20	126,855
2020-21	143,569
2021-2022	140,657
2022-2023 (through December, 2022)	66,977

Source: Trinity Public Utility District

Trinity PUD's rates are not time-differentiated because Trinity PUD is a First Preference Customer for Trinity River Division WAPA hydropower and has no other sources of power. Trinity PUD is subject to WAPA's Central Valley Project Rate Schedule CV-F13.

[14] Trinity Public Utility District. WAPA Billed Energy (kWh)

As a 100% First Preference (FP) Customer, Trinity PUD is billed each month for the total usage in that month with no time-differentiation.[15]

Since adding battery storage systems to photovoltaic systems does not currently result in energy bill savings given Trinity PUD's commercial rates and is unlikely to do so over the 30-year period, staff finds that battery storage is not cost effective and recommends that the CEC make a determination that battery storage systems not be required for nonresidential buildings in Trinity PUD's service area.

[15] Western Area Power Administration, Rate Schedule CV-F13, https://www.wapa.gov/regions/SN/rates/Documents/Rate_Schedules/CV-F13.pdf

CHAPTER 3:
Conclusion

Staff Recommendation

Based on CEC staff's analysis, staff recommends that the CEC determine that the public agency rules of the Trinity PUD regarding commercial rates and NEM compensation and participation charge for customer-owned generation cause the CEC's cost-effectiveness conclusion for solar PV systems to hold for specific newly constructed nonresidential buildings. Therefore, Solar PV system requirements in the 2022 Energy Code would apply to newly constructed nonresidential buildings in the Trinity PUD service area. Staff also recommends that the CEC determine that since the Trinity PUD commercial rates do not now and are unlikely over the coming 30 years to vary by time-of-day, causes the CEC's cost effectiveness conclusion for battery storage systems not to hold, therefore, battery storage system requirements in the 2022 Energy Code 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.

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

Trinity River Division Act, Public Law 84-386, August 12, 1955
https://www.congress.gov/84/statute/STATUTE-69/STATUTE-69-Pg719.pdf

California Energy Commission. February 2017. Time Dependent Valuation of Energy for Developing Building Efficiency Standards. 2019 Time Dependent Valuation (TDV) Data Sources and Inputs.
https://efiling.energy.ca.gov/GetDocument.aspx?tn=216062&DocumentContentId=23878

California Energy Commission. July 2018. Trinity Public Utility District Power Content Label,
https://www.energy.ca.gov/filebrowser/download/650

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

California Energy Commission. May 2021. Nonresidential PV and Battery Storage Measure Proposal
https://efiling.energy.ca.gov/GetDocument.aspx?tn=237776&DocumentContentId=71014

California Energy Commission. July 2021. Renewable Portfolio Standard Regulations. section 3204(b)(2) Exemptions and Adjustments pursuant to Public Utilities Code, section 399.30(g),
https://www.energy.ca.gov/sites/default/files/2021-09/Final%20Regulations%20w.o.%20underline%20strikethrough%209.22_ADA.pdf, p. 13

2022 California Building Energy Code. August 2022.
https://www.energy.ca.gov/sites/default/files/2022-12/CEC-400-2022-010_CMF.pdf
Trinity Public Utility District. February 12, 2015. Renewable Electric Generating Facility Net Metering and Solar Power Incentive Rate Schedule
https://www.trinitypud.com/secure/pdf/rates/Rate%20Schedule%2017%20Renewable%20Electric%20Generating%20Facility%20Net%20Metering%20and%20Solar%20Power%20Incentive%20021215.pdf

Trinity Public Utilities District. November 21, 2022. Request for Non-Residential and High-Rise Residential Solar Photovoltaic and Battery Storage Determination with attached Commercial Service A Rate Schedule
https://efiling.energy.ca.gov/GetDocument.aspx?tn=247659&DocumentContentId=81989

Western Area Power Administration. June 7, 2019. Maximum Entitlement of First Preference Customers in Trinity County.
https://efiling.energy.ca.gov/GetDocument.aspx?tn=250189&DocumentContentId=84913

Western Area Power Administration. Schedule Of Rates for Base Resource and First Preference Power, Rate Schedule CV-F13
https://www.wapa.gov/regions/SN/rates/Documents/Rate_Schedules/CV-F13.pdf

Western Area Power Administration. WAPA Serves California Fact Sheet,
https://www.wapa.gov/newsroom/FactSheets/Documents/State%20Fact%20Sheets/FactSheetCalifornia.pdf