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California Energy Commission

STAFF PAPER

Staff Review and Analysis for Trinity Public Utility District's Application for a Solar Photovoltaic Determination

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Gavin Newsom, Governor
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ABSTRACT

The California Energy Commission (CEC) adopted Building Energy Efficiency Standards (California Code of Regulations, Title 24, Part 1, Chapter 10, and Part 6) that go into effect on January 1, 2020, requiring the installation of solar photovoltaic systems on newly constructed, low-rise residential buildings in §150.1(c)14. As part of the adoption, §10-109(k) Photovoltaic System Requirement Determination, states, "The Commission may, upon written application or its own motion, determine that the photovoltaic requirements in §150.1(c)14 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, or interconnection fees, 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 (Trinity PUD) submitted an application on March 15, 2019, for a CEC determination regarding whether the solar photovoltaic (PV) system requirements should apply to homes in its service area. CEC staff has reviewed the application and found it complete. Staff has performed a cost-effectiveness analysis based on the public agency rules adopted by Trinity PUD and recommends approval of the application. This staff report documents the analysis completed in making the recommendation.

Keywords: Solar photovoltaic determination, 10-109(k), solar PV requirement, solar, PV, Building Energy Efficiency Standards.

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EXECUTIVE SUMMARY

Background

On May 9, 2018, the California Energy Commission (CEC) adopted the *2019 Building Energy Efficiency Standards* (2019 Energy Code), which include new solar photovoltaic (PV) requirements for all newly constructed low-rise residential buildings in §150.1(c)14. Low-rise residential buildings are defined as single-family houses, duplexes, and townhomes, as well as multifamily buildings that are three stories or fewer. These requirements, along with the rest of the 2019 Energy Code, go into effect January 1, 2020.

As part of the adoption, §10-109(k) Photovoltaic System Requirement Determination states, "The Commission may, upon written application or its own motion, determine that the photovoltaic requirements in §150.1(c)14 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, or interconnection fees, causes the Commission's cost effectiveness conclusions, made pursuant to Public Resources Code 25402(b)(3), to not hold for particular buildings."

The regulations require that an applicant must provide information regarding the differences between public agency rules and CEC's cost-effectiveness determinations, including any information requested by the CEC to enable 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.

The regulations only apply to the buildings that are subject to the 2019 Energy Code solar PV requirements. Because the public rules affecting the CEC's cost-effectiveness analysis can change, determinations made by the CEC for the three-year code cycle beginning January 1, 2020, must be readdressed by the CEC for subsequent code cycles.

Trinity Public Utility District submitted an application to the CEC on March 15, 2019, for a determination, as specified under §10-109(k), of whether the solar PV system

requirements should apply to newly constructed, low-rise residential buildings in its service territory.

Recommendation

CEC staff reviewed the Trinity application and performed a life-cycle cost-effectiveness analysis to determine if Trinity's public agency rules would cause solar PV not to be cost-effective in its service territory. Staff found that applying Trinity's residential rates and net-energy-metering rules for the analysis resulted in solar PV not being cost-effective. The results showed that the cost savings generated from having solar PV were less than the solar PV system cost, a benefit-to-cost ratio of less than 1.0.

Based on the analysis presented, staff has determined that Trinity's rules regarding residential rates and compensation for customer-owned generation cause the CEC's cost-effectiveness conclusion for solar PV systems not to hold.

CHAPTER 1:
Trinity Public Utility District

Summary of Trinity Public Utility District (PUD) 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 hydropower to its customers.

Trinity PUD divides its residential service territory into two geographic zones, Geographic Zone A and Geographic Zone B. Geographic Zone A customers pay an energy rate of $0.055, and Geographic Zone B customers pay an energy rate of $0.078; electricity generation from solar photovoltaic (PV) systems installed on customers' homes are compensated at these same rates. In addition, Trinity PUD net-energy-metering (NEM) rules require customers with solar PV to pay an administrative charge of $10 per month.

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 in March 2023 (Geographic Zone B). Beginning in April 2023, customers in Geographic Zone B will be reclassified to Geographic Zone A rates, aligning rates across Trinity PUD territory (See Appendix B, Residential Energy Rate Schedule).

On March 15, 2019, Trinity PUD submitted an application identifying that its residential energy rates of $0.055 and $0.078 per kilowatt-hour are lower than the energy rates used by the California Energy Commission (CEC) when determining cost-effectiveness of solar PV system requirements, and that the 2019 residential solar PV requirements are not cost-effective when the Trinity PUD rates are used. Trinity PUD compensates customers at the full retail rate for any customer-owned on-site generation (See Appendix C, Renewable Electric Generating Facility Net Metering and Solar Power Incentive). CEC staff requested that Trinity PUD supply a copy of its residential energy rate schedule.

Trinity PUD's application includes:

- A cover letter that summarizes the proposal.
- A residential energy rate schedule.
- Meeting minutes of the public hearing on March 14, 2019.

The application noted that Trinity PUD conducted a public hearing March 14, 2019, and approved the decision to seek a determination from the CEC under Title 24, Part 1, §10-109(k).

Staff made the application available for comment to interested parties by posting it on CEC's website.[1] The application was docketed (19-BSTD-05) for a 60-day public comment period, which concluded August 5, 2019.

Staff also considered:

- An email of support for the application from the Trinity County administrative officer.
- Trinity PUD's "Renewable Electric Generating Facility Net Metering and Solar Power Incentive."
- Trinity PUD's "Interconnection Agreement for Net Energy Metering From Solar Electric Generating Facilities."
- Trinity PUD's Fiscal Year 2019-2020 budget.

1 California Energy Commission Proceedings. https://ww2.energy.ca.gov/dockets/index_cms.php.

CHAPTER 2:
Staff Analysis

Staff Analysis of Trinity PUD Application

Development of the new solar PV requirement for newly constructed low-rise homes for the 2019 Energy Code relied largely on two main sources to develop technical information and determine cost-effectiveness:

- *2019 Time Dependent Valuation Methodology Report*[2]
- *Measure Proposal Rooftop Solar PV Systems*[3]

These reports describe the CEC's life-cycle cost method used to evaluate proposed changes to the 2019 Energy Code and specifically, the energy cost-savings method used for determining the cost effectiveness of the solar PV requirement. CEC staff used the same life-cycle cost approach to determine the cost-effectiveness of solar PV systems subject to the public agency rules adopted by Trinity PUD to establish residential rates and solar PV compensation.

Staff developed a spreadsheet to perform calculations for the Trinity PUD application.

Life-Cycle Cost-Effectiveness Determination

Staff evaluated whether the implementation of the Trinity PUD rules would cause the cost-effectiveness of the solar PV not to hold. The CEC used Trinity PUD's residential

2 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.

3 California Energy Commission. September 2017. *Building Energy Efficiency Measure Proposal to the California Energy Commission for the 2019 Update to the Title 24 Part 6 Building Energy Efficiency Standards Rooftop Solar PV System.* https://efiling.energy.ca.gov/GetDocument.aspx?tn=222201&DocumentContentId=27371.

rates, net-energy-metering (NEM) compensation rules, California Building Energy Code Compliance software (CBECC-Res 2019) 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 measure, this ratio would be the present value of 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 Production

The 2019 Energy Code requires a solar PV system that generates enough electricity to match the annual electricity consumption needed by a mixed-fuel, low-rise home, which is designed to comply with the energy efficiency 2019 Energy Code requirements. The solar PV size and the annual generation are calculated using CBECC-Res 2019. CBECC-Res 2019 is an open-source software program that demonstrates compliance with the low-rise residential 2019 Energy Code when using the performance approach. The National Renewable Energy Laboratory algorithms underlying the PV Watts program are installed in CBECC-Res for PV system analysis. CBECC-Res establishes energy budget requirements, including PV system size requirements.

To determine the PV size for the life-cycle cost calculation, a weighted average from CBECC-Res runs for the CEC's two low-rise, residential, single-family prototype homes is used. These homes met all standard design requirements, including:

Energy efficiency

- High-performance attic (certain climates): R19 below deck.
- High-performance walls (certain climates): 0.043 U-factor wall.
- Quality insulation inspection (QII).
- High-performance windows: U-factor 0.30, SHGC 0.23 for cooling climates and 0.50 for mild climates
- Doors: U-factor 0.20.
- 2016 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) 62.2 ventilation rates.
- Heating, ventilation and air-conditioning (HVAC) fan efficacy: 0.40 watts per cubic feet per minute (W/cfm).

- Federal appliance standard efficiency for furnaces, air conditioners, and water heaters.

Solar PV system

- 170° south-facing orientation.
- 5/12 pitch roof.
- 96 percent inverter efficiency.
- Standard module type.
- No shading.

Climate Zone

Trinity PUD is almost entirely in Climate Zone 16. A small, remote area of Trinity PUD's service territory could be in Climate Zone 2, but Trinity PUD service lines do not extend there. CEC staff concluded, based on CBECC-Res 2019 runs for the two prototype houses used for 2019 Energy Code analysis, that an average PV size of 2.72 kilowatts is required in Climate Zone 16. This system produces 4,627 kilowatt-hours per year.

Figure 1: Weighted Average PV Size and Production for Prototype Homes (CBECC)

	2,100 Square Foot Prototype (45%)	2,700 Square Foot Prototype (55%)	Weighted Average
PV Size	2.46	2.94	**2.724**
Annual Production	4,176	4,996	**4,627**

Source: CEC staff

The CBECC-Res 2019 run reports for the 2,100- and 2,700-square-foot prototype houses are in Appendix D.

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 2019 Energy Code development in 2016. The inputs for these parameters are unchanged by Trinity PUD's public agency rules for residential rates and PV compensation.

PV Cost per Watt

The PV cost-per-watt input of $3.08 per watt was obtained from the *Measure Proposal Rooftop Solar PV Systems*[4] report. In 2016, the incremental first cost was determined to be $2.93 per watt according to National Renewable Energy Laboratory's (NREL) estimate of the first quarter 2016 cost of a 5.6 kilowatt residential solar PV system installed in California. This cost includes 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.

Applying inflation rates and NREL cost reduction forecast assumptions, the incremental cost was estimated to be $2.63 per watt in 2020 dollars. A lifetime incremental maintenance cost was then added to account for periodic equipment maintenance and two inverter replacements over 30 years. This addition resulted in the solar PV system cost of $3.08 per watt in 2020 dollars.

Complete information regarding PV cost per watt can be found in Chapter 5 of the *Measure Proposal Rooftop Solar PV Systems*[5] report.

Energy Escalation

Staff obtained the energy escalation input of 2.7 percent from the *2019 TDV Methodology Report.*[6] The report references the *2015 Integrated Energy Policy Report (IEPR)*, which calculates average residential rates for Pacific Gas and Electric, 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 2019 low-rise residential energy code requirements used a compound average growth rate of 2.7 percent per year nominal increase for forecasting residential rates.

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4 Ibid.

5 Ibid.

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.

It is possible that the retail rates for Trinity PUD will escalate at a lower rate than 2.7 percent. Staff reviewed the Trinity PUD *Fiscal Year (FY) 2019/2020 Budget,*[7] which forecasts rates out to FY 2023-24. Trinity PUD does not forecast any rate escalation out to the end of the forecast period. (See page 6 of the "Five-Year Financial Forecast" section.[8]) Page 2 of the "Budget Memorandum" section[9] identifies some risks that may require rate escalation after that period. Staff could have lowered the 2.7 percent escalation rate to account for the zero escalation rate for the first four years of the analysis period but did not do so because that would not have changed the cost-effectiveness conclusions.

Discount Rate

The real discount rate input of 3 percent was obtained from the *2019 TDV Methodology Report.*[10] All cost-effectiveness analyses completed for 2019 Energy Code requirements used a 3 percent real (inflation-adjusted) discount rate to calculate the net 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 Analysis Period

The life-cycle analysis period of 30 years was obtained from the *2019 TDV Methodology Report.*[11] All cost-effectiveness analyses completed for 2019 low-rise residential California Energy Code requirements used a life-cycle analysis period of 30 years. It is the long-standing practice for the cost-effectiveness of low-rise residential energy code requirements to use a life-cycle period of 30 years.

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7 Trinity PUD. *Fiscal Year 2019/2020 Budget.*
https://www.trinitypud.com/pdf/financials/budgets/Fiscal%20Year%202019-2020%20(PDF).pdf.

8 Ibid.

9 Ibid.

10 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.

11 Ibid.

Present Value of Cost Savings

The first-year energy cost savings were determined by the annual generation calculated from CBECC-Res 2019, the Trinity PUD energy rate schedule, and its solar PV compensation rules. Trinity PUD's solar PV compensation rules allow all customers with solar PV to receive monetary credit for all electricity generated by the solar PV system. The monetary credit is equal to energy rates specified in the customer's rate schedule.

The solar PV generation calculated from CBECC-Res 2019 for the homes in Trinity PUD service area (Climate Zone 16) was 4,627 kilowatt-hours annually. Multiplied by the rate schedule of $0.055 for Geographic Zone A and $0.078 for Geographic Zone B resulted in first-year energy cost savings of $254.49 and $360.91, respectively.

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 net present value function (NPV) in Microsoft Excel® to perform the calculation for each geographic zone.

For Geographic Zone A, the first-year energy cost savings of $254.49 was escalated over the 30-year period. The NEM charge of $120 ($10/month) was subtracted annually from the energy cost savings to determine a net annual cost savings. Staff applied the NPV to the annual cost savings for the 30-year period, resulting in a present value of cost savings of $4,755.44.

For Geographic Zone B, staff escalated the first-year energy cost savings of $360.91 for four years. Because Geographic Zone B is reclassified to Geographic Zone A rates in April 2023, the energy cost savings for Years 5 through 30 are the same as those determined for Geographic Zone A. Staff subtracted the NEM charge of $120 ($10/month) annually from the energy cost savings to determine a net annual cost savings. The NPV was applied of the net annual cost savings for the first four years, which resulted from escalation of the first-year energy cost of $360.91, and to the net

cost savings for Years 5 through 30, which escalated from the first-year energy cost of $254.49. This calculation resulted in a total present value of cost savings of $5,166.92.

Calculations are in Figure 2 and Figure 3 in the “Life-Cycle Cost-Effectiveness Results” section below.

Present Value of PV System Cost

The present value of PV system cost is determined by the PV size as calculated by CBECC-Res 2019 and PV cost per watt as described earlier in the assumptions. The solar PV production estimated by CBECC-Res 2019 for the prototype home in Trinity PUD service area was 2.72 kilowatts annually. Multiplied by the PV cost per watt assumption of $3.08 resulted in a PV system cost of $8,389.92.

Life-Cycle Cost-Effectiveness Results

CEC staff developed a spreadsheet including all equations and assumptions discussed in the previous sections. Applying Trinity PUD’s retail energy rates and NEM rules for Geographic Zone A and Geographic Zone B into the spreadsheet resulted in both cases not being cost-effective.

As shown in Figures 2 and 3, the benefit-to-cost ratio for Geographic Zone A and Geographic Zone B were 0.57 and 0.62, respectively, both lower than the benefit-to-cost threshold of 1.0. The analysis determines that the Geographic Zone A customer who installs solar PV loses $3,634.48 over the life cycle, while the Geographic Zone B customer loses $3,223.00.

Figure 2: Results for Geographic Zone A

Inputs	
Applicant	Trinity PUD Zone A
Climate Zone	16
Retail Energy Rate ($/kWh)	$0.055
Compensation for Generation ($/kWh)	$0.055
Monthly NEM Participation Charge	$10.00
PV Size (kW)*	2.724
Annual Production (avoided kWh)*	4,627

Assumptions	
PV Cost per Watt ($/W)	3.08
Energy Escalation Rate	2.70%
Discount Rate, Real	3.00%
Life Cycle Period (years)	30

Results	
Present Value of PV System Cost	$8,389.92
First Year Energy Cost Savings	$254.49
Present Value of Cost Savings	$4,755.44
Net Savings	$(3,634.48)
Benefit-to-Cost Ratio	0.57

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$254.49	$261.36	$268.41	$275.66	$283.10	$290.75	$298.60	$306.66	$314.94	$323.44	$332.17	$341.14	$350.35	$359.81	$369.53
NEM Charge	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00
Cost Savings	$134.49	$141.36	$148.41	$155.66	$163.10	$170.75	$178.60	$186.66	$194.94	$203.44	$212.17	$221.14	$230.35	$239.81	$249.53

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$379.51	$389.75	$400.28	$411.08	$422.18	$433.58	$445.29	$457.31	$469.66	$482.34	$495.36	$508.74	$522.47	$536.58	$551.07
NEM Charge	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00
Cost Savings	$259.51	$269.75	$280.28	$291.08	$302.18	$313.58	$325.29	$337.31	$349.66	$362.34	$375.36	$388.74	$402.47	$416.58	$431.07

Present Value of Cost Savings: $4,755.44

Source: CEC staff

Figure 3: Results for Geographic Zone B

Inputs	
Applicant	Trinity PUD Zone B
Climate Zone	16
Retail Energy Rate ($/kWh)	$0.078
Compensation for Generation ($/kWh)	$0.078
Monthly NEM Participation Charge	$10.00
PV Size (kW)*	2.724
Annual Production (avoided kWh)*	4,627

Assumptions	
PV Cost per Watt ($/W)	3.08
Energy Escalation Rate	2.70%
Discount Rate, Real	3.00%
Life Cycle Period (years)	30

Results	
Present Value of PV System Cost	$8,389.92
First Year Energy Cost Savings	$360.91
Present Value of Cost Savings	$5,166.92
Net Savings	$(3,223.00)
Benefit-to-Cost Ratio	0.62

$0.078/kWh escalation from 2020-2023 (escalation based on first year energy cost of $360.91)

Year	1	2	3	4
PV Savings	$360.91	$370.65	$380.66	$390.94
NEM Charge	$120.00	$120.00	$120.00	$120.00
Cost Savings	$240.91	$250.65	$260.66	$270.94

$0.055 per kWh escalation from 2024 forward (escalation based on first year energy cost of $254.49, same as Geographic Zone A)

Year	5	6	7	8	9	10	11	12	13	14	15
PV Savings	$283.10	$290.75	$298.60	$306.66	$314.94	$323.44	$332.17	$341.14	$350.35	$ 359.81	$ 369.53
NEM Charge	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$ 120.00	$ 120.00
Cost Savings	$163.10	$170.75	$178.60	$186.66	$194.94	$203.44	$212.17	$221.14	$230.35	$ 239.81	$ 249.53

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
PV Savings	$379.51	$389.75	$400.28	$411.08	$422.18	$433.58	$445.29	$457.31	$469.66	$482.34	$495.36	$508.74	$522.47	$ 536.58	$ 551.07
NEM Charge	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$120.00	$ 120.00	$ 120.00
Cost Savings	$259.51	$269.75	$280.28	$291.08	$302.18	$313.58	$325.29	$337.31	$349.66	$362.34	$375.36	$388.74	$402.47	$ 416.58	$ 431.07

Present Value of Cost Savings: $5,166.92

Source: CEC staff

CHAPTER 3:
Conclusion

Staff Recommendation

Based on staff's analysis, staff recommends that the California Energy Commission determine that the public agency rules of the Trinity PUD regarding residential rates and compensation for customer-owned generation cause the Energy Commission's cost-effectiveness conclusion for solar PV systems not to hold. This recommendation applies to newly constructed, low-rise homes in the Trinity PUD service territory subject to the 2019 Energy Code.

GLOSSARY

American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) is a professional association seeking to advance heating, ventilation, air conditioning and refrigeration systems design and construction.

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

National Renewable Energy Laboratory (NREL) is a government-owned facility funded through the United States Department of Energy with areas of research and development in renewable electricity, energy productivity, energy storage, systems integration, and sustainable transportation.

Performance Approach is an approach to show compliance with the 2019 Energy Standards by using an approved software program to model a proposed building and compare it to a calculated energy budget.

PV Watts is a calculator developed by NREL that estimates the energy production and cost of solar photovoltaic systems.

R-Value is the measure of the thermal resistance of insulation or any material or building component expressed in ft^2-hr-^oF/Btu.

Solar Heat Gain Coefficient (SHGC) is the ratio of the solar heat gain entering the space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

U-factor is the overall coefficient of thermal transmittance of a fenestration, wall, floor, or roof/ceiling component, in Btu/(hr x ft^2 x ^oF), including air film resistance at both surfaces.

APPENDIX A: Resources

Trinity Public Utility District Solar PV Determination Application documents and other information submitted to the California Energy Commission Docket
https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-BSTD-05.

2019 Time Dependent Valuation Methodology Report
https://efiling.energy.ca.gov/getdocument.aspx?tn=216062.

Building Energy Efficiency Measure Proposal to the California Energy Commission for the 2019 Update to the Title 24 Part 6 Building Energy Efficiency Standards Rooftop Solar PV System.
https://efiling.energy.ca.gov/GetDocument.aspx?tn=222201&DocumentContentId=27371.

2019 Building Energy Efficiency Standards
https://ww2.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf.

Frequently Asked Questions on the 2019 Solar PV Requirements
https://ww2.energy.ca.gov/title24/2019standards/documents/Title24_2019_Standards_detailed_faq.pdf.

APPENDIX B:
Trinity PUD Application

1. Cover letter proposal summary
2. Trinity PUD's Residential Energy Rate Schedule
3. Meeting minutes of the public hearing on March 14, 2019.

TRINITY P.U.D.
"Serving Trinity County Since 1982"

March 15, 2019

Maziar Shirakh, P.E.
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California Energy Commission
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Sacramento, CA 95814-5512
Maziar.Shirakh@energy.ca.gov

Re: Trinity Public Utility District's Request for a Residential Photovoltaic Determination

Dear Mr. Shirakh,

On behalf of the Trinity Public Utility District (TPUD), I am writing to seek a determination from the California Energy Commission (CEC) under Section 10-109(k) of the 2019 Energy Code. Section 10-109(k) allows the Commission to determine that the photovoltaic requirements of Section 150.1(c)14 should not apply, if the Commission finds that the Commission's cost-effectiveness conclusions are not accurate. TPUD seeks a determination that Section 150.1(c)14 is not cost-effective and should not apply for all residential housing in the TPUD service area.

While the CEC's ambitious goal to wean California from fossil-fuel based energy generation is admirable, this requirement is not cost-effective in the TPUD service area. The TPUD service territory is unique and energy policy in California reflects its unique situation. Specifically, TPUD distributes and sells 100% carbon-free hydropower that is fully compliant with California's Renewables Portfolio Standard. We also serve the poorest county in the state of California, and our remote location makes building in Trinity County more expensive than elsewhere, exacerbating our desperate housing shortage.

TPUD's low rates simply make rooftop solar uneconomic in TPUD's service area. The CEC, in adopting the rooftop solar mandate appears to have relied, in part, on cost-effectiveness conclusions developed by its consultant, E3. Upon review of the E3 report, TPUD believes that some of the assumptions within this report are not correct as applied to TPUD. Trinity PUD's residential rate schedule is attached showing our residential energy charge, which ranges from $.05545 per kWh to $.07822 per kWh depending on the geographic area of our system. By 2023, even this higher rate will be reduced, making rates within all of TPUD's service area roughly $.055 per kWh. With this clarification, we believe the CEC would have reached different conclusions about the cost-effectiveness of the Section 150.1(c)14 mandate within TPUD's service area.

On behalf of Trinity Public Utilities District, I respectfully request that the California Energy Commission make the determination under Section 10-109(k) of the 2019 Energy Code that the photovoltaic requirements of Section 150.1(c)14 do not apply within Trinity Public Utilities District's service area.

Sincerely,

Paul Hauser
General Manager

Enclosure
cc (email only): Rebecca Westmore
Mike McGuire
Jim Woods
Drew Bohan

PRIMARY
RESIDENTIAL SERVICE A

APPLICABILITY

This schedule is applicable to single-phase and polyphase residential service in single-family dwellings and in flats and apartments separately metered by the District; to single-phase and polyphase service in common areas in a multifamily complex; to a second single-phase service to a single-family residential premise for service to domestic water pumping and unattached outbuildings and barns; to residential single-phase and polyphase service supplied to a mobile home park or residential RV Park through one meter on a single premise and submetered to all individual tenants. Residential service shall not be applicable to or available for new three-phase service after December 1, 1995, resale for profit, standby or auxiliary service, service to any single motor exceeding a nameplate rating of ten (10) horsepower, or any equipment which will cause excessive voltage fluctuations.

Any Residential service that uses more than 9,999 kWh in any given month will be reclassified to Rate Schedule 3, General Service/Commercial Service A. Once reclassified, and after twelve (12) consecutive months with usage below 10,000 kWh, the owner may petition the District's General Manager for reclassification back to Rate Schedule 1. Residential services that service a common area in a multifamily complex, or a service supplying power to a mobile home park or residential RV Park through one meter will be exempt from reclassification to Rate Schedule 3.

MONTHLY RATE

	GEOGRAPHIC ZONE A	GEOGRAPHIC ZONE B
System Access Charge	$24.00	$24.00
Energy Charge - kWh	$.05545	$.07822

GEOGRAPHIC ZONES

Customers within the geographic boundaries of the District that existed on June 30, 1993, and in the geographic boundaries of the Hayfork Valley P.U.D. that existed on June 30, 1993 are classified customers within the Geographic Zone A, all other customers are classified as within the Geographic Zone B, , and shall be reclassified Geographic Zone A no later than April 1, 2023. The geographic boundaries shall be determined by records kept by the County Clerk.

DROUGHT RELIEF SURCHARGE

To the charges computed under the above rate, including any adjustments, shall be added applicable Drought Relief surcharges pursuant to Rate Schedule No. 18, Drought Relief Surcharge.

TAX CLAUSE

To the charges computed under the above rate, including any adjustments, shall be added the applicable proportionate part of any taxes or governmental impositions which are, or may in the future be, assessed on the basis of gross revenues of the District and/or the price or revenue from the electric energy or service sold and/or the volume of energy generated or purchased for sale and/or sold hereunder. As of the date this rate was approved, two such assessments existed: (1) the specified per kWh tax established by the California Energy Commission; and, (2) a 2.85% of revenue "Public Benefit" surcharge on total revenue from power sold.

GUARANTEED PAYMENTS

When a customer agrees pursuant to the District Line Extension Policy, to guarantee certain payments, such payments may supersede the rates established herein.

TERMS AND CONDITIONS

1. The District shall not be liable for any damages, direct, consequential, or any other, if this rate is terminated or the provisions thereof changed by action of the Board of the District or any regulatory agency, state or federal, or by action of any court.

2. The rates stated herein are subject to such changes as may be authorized by the Board of Directors of the District from time to time.

AVAILABILITY

Throughout the entire District's service area where the facilities of the District are available of adequate capacity and reasonably accessible to the customer service panel.

Date Effective: April 12, 2018
Date Approved: April 12, 2018
Resolution No.: 18-03

_____
Clarence W. Rose, President

Trinity Public Utilities District
MINUTES OF THE SPECIAL BOARD MEETING
March 14, 2019

Location:	Trinity Public Utilities District Community Room Weaverville, California
Board Present:	Thomas Ludden, Richard Morris, Kelli Gant, Mike Rourke, Clarence Rose
Board Absent:	None
Others Present:	Paul Hauser, Jim Underwood, Julie Catanese, Andy Lethbridge, Karen Palmer, Sarah Sheetz, John Brower, Evan Barrow, Lisa Barrow, Joseph Taylor, Jim Aven, Amy Gittelsohn, Andrew Franklin, Jaime Green and Doug Morrison.

1. President Rose called the meeting to order at 1:30 p.m.

2. Public Input

There were no comments from the Public.

3. Public Hearing

A Public Hearing was conducted regarding the Trinity Public Utilities District's intention to submit an application to the California Energy Commission seeking a determination that the photovoltaic requirements of Section 150.1(c)14 of the 2019 Energy Code shall not apply on the basis of cost effectiveness.

Mr. Hauser reviewed the Report with the Board. The District has been working to avail ourselves of the exemption due to the low electric rates in the District.

President Rose opened the Public Hearing at 1:37 p.m.

John Brower commented that depending upon geographical location, some residents may desire to seek solar installations.

President Rose clarified that individuals will still have the ability to install solar if desired, however, beginning in 2020, without this exemption, all residents in California will be required to install rooftop solar on new construction.

Director Gant further clarified that Trinity Public Utilities District is already 100% carbon free. Requiring rooftop solar is expensive, and Trinity County is the second poorest county in the state.

Joseph Taylor of Taylor Construction stated he supports the request for an exemption.

Evan Barrow of Hayfork supported the request for an exemption.

There being no further comments, President Rose Closed the Public Hearing at 1:46 p.m.

After a brief discussion, Director Ludden made a motion authorize the General Manager to submit an application to the California Energy Commission seeking a determination that the photovoltaic requirements of Section 150.1(c)14 of the 2019 Energy Code shall not apply on the basis of cost effectiveness. Director Rourke seconded the motion.

The motion passed with the following voice vote:

Ayes:	Thomas Ludden, Richard Morris, Kelli Gant, Mike Rourke, Clarence Rose
Noes:	None
Absent:	None
Abstain:	None

12. Adjournment

President Rose adjourned the meeting at 1:47 p.m.

_____

Clarence Rose, President

ATTEST: _____

Michael D. Rourke, Clerk

APPENDIX C:
Additional Information

1. Email of support for the Trinity PUD application to the CEC from the Trinity County Administrative Officer
2. Trinity PUD Renewable Electric Generating Facility Net Metering and Solar Power Incentive (specifies NEM Rules)
3. Trinity PUD Interconnection Agreement for Net Energy Metering from Solar Electric Generating Facilities

From: Richard Kuhns [mailto:rkuhns@trinitycounty.org]
Sent: Thursday, March 7, 2019 7:43 AM
To: Paul Hauser
Subject: RE: Exemption to California's Rooftop Solar Mandate

Paul,

Thank you for the update, the county has no objection to the exemption. TPUD's utility rates are one of this county's selling points. I will pass this along to the Planning Department as an advisory.

Again thank you,

Richard Kuhns, Psy.D
County Administrative Officer
County of Trinity
(530) 623-1382

From: Paul Hauser <phauser@trinitypud.com>
Sent: Thursday, March 7, 2019 6:55 AM
To: Richard Kuhns <rkuhns@trinitycounty.org>
Subject: Exemption to California's Rooftop Solar Mandate

Richard,

TPUD has been working on getting an exemption to the requirement that all new single family construction have roof-top solar that is to begin in 2020. I had a meeting with the California Energy Commission yesterday where CEC staff laid out the steps that we need to take to get this exemption. Senator McGuire's office has been instrumental in moving this forward.

There is nothing that the County needs to do, but I want to make sure that you do not object to us getting the exemption for Trinity County? The basis of the exemption is TPUD's low rates making solar uneconomic. The exemption would still allow builders to install solar on new homes, but would not require it. This will allow homes in Trinity County to be built at a lower cost.

I need to schedule a public hearing at the next PUD Board Meeting on this topic in order to move forward, but wanted to check with you before doing so.

Paul Hauser
General Manager
Trinity Public Utilities District
P.O. Box 1216
Weaverville, CA 96093
(530) 623-4564

RENEWABLE ELECTRIC GENERATING FACILITY NET METERING AND SOLAR POWER INCENTIVE

APPLICABILITY

This schedule is applicable to any single-phase and polyphase service metered by the District. This Rate Schedule is intended to meet the requirements of Sections 387.5 and 2827 and 2827.10 of the Public Utilities Code and Section 25782 of the Public Resources Code. This incentive is to terminate on January 1, 2019.

SOLAR INCENTIVE

Fifty cents ($.50) per installed Watt for systems up to a maximum of five (5) kilowatts, declining to zero dollars ($0) per installed Watt on January 1, 2016.

1. All components in the solar electric system shall be new and unused, and have not previously been placed in service in any other location or for any other application.

2. The solar electric system shall have a warranty of not less than ten years to protect against defects and undue degradation of electrical generation output.

ELIGIBILITY CRITERIA

1. The customer shall execute an Interconnection Agreement For Net Energy Metering From Renewable Electric Generating Facilities.

2. The renewable electric generating facility shall be of a type listed in paragraph (1) of subdivision (a) of Section 25741 of the Public Resources Code and shall be in full compliance with all applicable design, installation, and electrical output standards, regulations, codes and this Rate Schedule.

3. The renewable electric generating facility shall be intended primarily to offset part or all of the consumer's own electricity demand.

4. The renewable electric generating facility shall be located on the same premises of the end-use customer where the customer's own electricity demand is located.

5. The renewable electric generating facility shall be connected to the District's electrical distribution system.

6. The renewable electric generating facility shall have District meters in place to monitor and measure the system's performance and the quantity of electricity generated by the system.

7. The renewable electric generating facility shall be installed in conformance with the manufacturer's specifications and in compliance with all applicable electrical and building code standards.

TERMS AND CONDITIONS

1. Any reduction in greenhouse gas credits will accrue to the benefit of all District customers. The District shall retain the applicable credits for each renewable electric generating facility that is provided net metering benefits under this rate schedule.

2. The District may retain expert consultants to review and inspect the design and installation of any renewable electric generating facility, to be sure that the facility, currently or in the future, will:

a. not impose unsafe conditions on the Districts system, to District employees, or other District customers.
b. not introduce unacceptable harmonics or otherwise reduce the quality of power deliveries to other District customers.
c. be in full compliance with all applicable design, installation, and electrical output standards, regulations, codes and this Rate Schedule.

The expert consultant may also review and determine the Installed Wattage of the facility.

The District's cost for such review and inspection, excluding time spent by District Staff, and the cost of providing meters in accordance with the Net Generating Interconnection Agreement (IA) will be deducted from the Solar Incentive

3. The District shall not be liable for any damage caused to the customer's equipment as a direct or indirect result of the renewable electric generating facility.

4. The District shall not be liable for any damages, direct, consequential, or any other, if this rate is terminated or the provisions thereof changed by action of the Board of the District or any regulatory agency, state or federal, or by action of any court.

5. The rates stated herein are subject to such changes as may be authorized by the Board of Directors of the District from time to time. However, the incentive rate, effective at the time an Interconnection Agreement for Net Metering from Solar Generating Facilities is fully executed, shall remain applicable for a period of sixty (60) days from such execution, after which the then current incentive rate shall apply.

6. Net energy metering is available to customers on a first-come-first-served basis until the time that the total rated generating capacity used by customer-generators exceeds five percent of the District's aggregate customer peak demand.

7. Net energy metering customers shall not be exempt from the Public Benefit Charge imposed by the District pursuant to Public Utilities Code Section 385.

ENERGY PRODUCED (NET METERING)

Both the customer's electric consumption and the energy produced by the solar electric system shall be metered by separate meters, owned, maintained, and read by the District.

Should, during any billing month, the renewable electric generating facility generate more energy than the customer consumes, resulting in excess energy flowing into the District's system, the customer will be eligible to receive a monetary credit. Such credit shall be equal to the product of the energy charge, in the applicable Rate Schedule, times the net amount of energy that flowed into the District's system, during that billing month.

The monetary credit will be used to reduce amounts owed by the customer during subsequent billing months for any energy consumed that is greater than the energy generated by the renewable electric generating facility. Every year after the end of December the District will provide a refund to customer-generators that have so elected, any net-generation credit from the preceding year, which is based on the District's average avoided cost of power (Western's cost of power that is billed to the District) for that calendar year.

The District shall provide the customer with the net electricity consumption information on each monthly bill. The bill shall include an administrative charge of ten dollars ($10) per billing month in addition to any flat charges or network access fees paid by all customers within the rate class to reduce cross subsidization between customers.

The foregoing is applicable only to the energy charge component of the applicable Rate Tariff.

All other applicable charges, regardless of the amount of energy produced by the renewable electric generating facility, shall fully apply as though the renewable electric generating facility did not exist.

DEFINITIONS
Watt – The average amount of energy produced over an interval of fifteen continuous minutes.

Installed Watt - Shall initially be set at eighty percent (80%) of the lesser of the nameplate output of the solar panels or the name plate output of the power conditioning equipment. If after installation the solar system output, measured by a District approved meter, is greater then the Installed Watt shall be increased to the metered amount. However, in no invent will the Solar Incentive be applied to an amount that is greater than, the lesser of the nameplate output of the solar panels or the name plate output of the power conditioning equipment.

AVAILABILITY
Throughout the entire District's service area.

Date Effective: February 12, 2015
Date Approved: February 12, 2015
Resolution No.: 15-02

_____
Kelli Gant, President

INTERCONNECTION AGREEMENT FOR NET ENERGY METERING FROM SOLAR ELECTRIC GENERATING FACILITIES OF 1,000 KILOWATTS OR LESS

_____ ("Customer-Generator") and Trinity Public Utilities District, referred to collectively as "Parties" and individually as "Party," consistent with the California Utilities Code agree as follows:

1. **INTRODUCTION**

Customer-Generator has elected to interconnect and operate its solar electric generating facility in parallel with the Trinity Public Utilities District (The District) electric grid. The solar electric generating facility is intended primarily to offset part of all of the Customer-Generator's own electrical requirements.

a) Installed watts: _____ kW

b) Customer account number: _____

c) Site Address:

d) Facility will be ready for operation on or about: _____
(date)

2. **NET ENERGY**

Customer-Generator agrees that the energy generated by the solar electric generating facility shall be metered and billed in accordance with the District's Rate Schedule No. 17 (Solar Incentive) as it may be amended or superseded from time to time.

3. **INTERRUPTION OR REDUCTION OF DELIVERIES**

The District shall not be obligated to accept or pay for, and may require Customer-Generator to interrupt or reduce, deliveries of available energy:

a. When necessary in order to construct, install, maintain, repair, replace, remove, investigate, or inspect any of the District's equipment or part of the District system; or

b. If the District determines that curtailment, interruption, or reduction is necessary because of emergencies, forced outages, force majeure, or compliance with prudent electrical practices.

Whenever possible, The District shall give Customer-Generator reasonable notice of the possibility that interruption or reduction of deliveries may be required.

Notwithstanding any other provision of this Agreement, if at any time the District determines that either (a) the Customer-Generator's facility, or its operation, may endanger District personnel, or (b) the continued operation of Customer-Generator's facility may endanger the integrity of the District's system, the District shall have the right to disconnect the Customer-Generator's facility from the District's system. The Customer-Generator's facility shall remain disconnected until such time as the District is satisfied that the condition(s) referenced in (a) or (b) of this paragraph have been corrected.

4. **INTERCONNECTION**

Customer-Generator shall deliver any energy in excess to the Customer-Generators load to the District at the District's meter. Deliveries to third parties will not be allowed.

The Customer-Generator shall be responsible for and provide at the customer expense all necessary labor, equipment, materials, and related facilities in addition to, or in substitution for, standard metering facilities that are required in order to take and sell power through one meter socket: 1) a meter that is able to measure electrical flow in two directions, and 2) a meter that is able to measure the energy and peak capacity of the solar electric generating system. The District will provide the meters at the customer's expense. The District will be responsible for meter reading and meter maintenance.

Customer-Generator shall not commence parallel operation of the facility until written approval of the interconnection facilities has been given by the District. The District shall provide written approval within ten (10) working days from the utility's receipt of the inspection clearance of the governmental authority having jurisdiction. Such approval shall not be unreasonably withheld. The District shall have the right to have representatives present at the initial testing of Customer-Generator's protective apparatus. Customer-Generator shall notify the District five (5) working days prior to the initial testing. In no event shall such inspection by the District relieve Customer-Generator from its obligation to comply with all governmental and regulatory requirements.

5. MAINTENANCE AND PERMITS

Customer-Generator shall:

a) Maintain the Customer-Generator's facility and interconnection facilities in a safe and prudent manner and in conformance with all applicable laws and regulations; and

b) Obtain any governmental authorizations and permits required for the construction and operation of the Customer-Generator's facility and interconnection facilities.

c) Customer-Generator shall reimburse the District for any and all losses, damages, claims, penalties, or liability it incurs as a result of Customer-Generator's failure to obtain or maintain any governmental authorizations and permits required for construction and operation of Customer-Generator's facility.

6. ACCESS TO PREMISES

The District may enter Customer-Generator's premises:

a) To inspect, at reasonable hours, Customer-Generator's protective devices and read or test meters; and

b) To disconnect, with or without notice, the interconnection facilities if, as set forth in section 3, a hazardous condition exists and such immediate action is necessary to protect persons.

7. RENEWABLE ENERGY OR GREENHOUSE GAS CREDITS

The Customer-Generator agrees that District shall retain all renewable energy credits and greenhouse gas credits, or similar credits as may be developed in the future, that are associated with each watt of solar electric generation installed that receives a solar incentive pursuant to the District's Rate Schedule No. 17.

8. INDEMNITY AND LIABILITY

7.1 Each Party as indemnifier shall defend, save harmless and indemnify the other Party and the directors, officers, employees, and agents of such other Party against and from any and all loss, liability, damage, claim, cost, charge, demand, or expense (including any direct, or consequential loss, liability, damage, claim, cost, charge, demand, or expense, including attorneys' fees) for injury or death of persons including employees of either Party and damage to property including property of either Party arising out of or in connection with:

a) The engineering, design, construction, maintenance, repair, operation, supervision, inspection, testing, protection, or ownership of; or

b) The making of replacements, additions, betterments to, or reconstruction of, the indemnifier's facilities. This indemnity shall apply, notwithstanding the active or passive negligence of the indemnified. However, neither Party shall be indemnified hereunder for its loss, liability, damage, claim, cost, charge,

demand, or expense resulting from its own sole negligence or willful misconduct.

7.2 Notwithstanding the indemnity of Section 7.1, and except for a Party's willful misconduct or sole negligence, each Party shall be responsible for protecting its facilities from possible damage by reason of electrical disturbances or faults.

7.3 The provisions of this Section 7 shall not be construed to relieve any insurer of its obligations to pay any insurance claims in accordance with the provisions of any valid insurance policy.

7.4 Except as otherwise provided in Section 7.1, neither Party shall be liable to the other Party for consequential damages incurred by that Party. Nothing in the Agreement shall create any duty to, any standard of care with reference to, or any person not a party to, it.

9. AMENDMENTS, MODIFICATIONS OR WAIVER

Any amendments or modifications to this Agreement shall be in writing and agreed to by both Parties. The failure of any Party at any time or times to require performance of any provision hereof shall in no manner affect the Party's right at a later time to enforce the same. No waiver by any Party of the breach of any term or covenant contained in this Agreement, whether by conduct or otherwise, shall be deemed to be construed as a further or continuing waiver of any such breach or a waiver of the breach of any other term or covenant unless such waiver is in writing

10. NOTICES

All written notices shall be directed as follows:

Trinity Public Utilities District
Attn: General Manager
26 Ponderosa Lane
P.O. Box 1216
Weaverville, CA 96093

CUSTOMER-GENERATOR: _____
(name)

Address: _____

City: _____

11. TERM OF AGREEMENT

This Agreement shall become effective as of the last date set for in Section 12 and shall continue in full force and effect until:

a) service is disconnected by the District pursuant to District policies that may change from time to time, or

b) the District receives a request to change the name on the account, in which case the new customer shall either execute a replacement to this agreement or permanently disconnect the solar electric generating system from the District's system, at said customer's sole expense, or

c) the solar electric generating system is permanently disconnected from the District system, or

d) the solar electric generating system is not installed and approved by the District within six (6) months from the execution of this Agreement.

12. SIGNATURES

IN WITNESS WHEREOF, the Parties hereto have caused two originals of this Agreement to be executed by their duly authorized representatives. This Agreement is effective as of the last date set forth below.

Trinity Public Utilities District

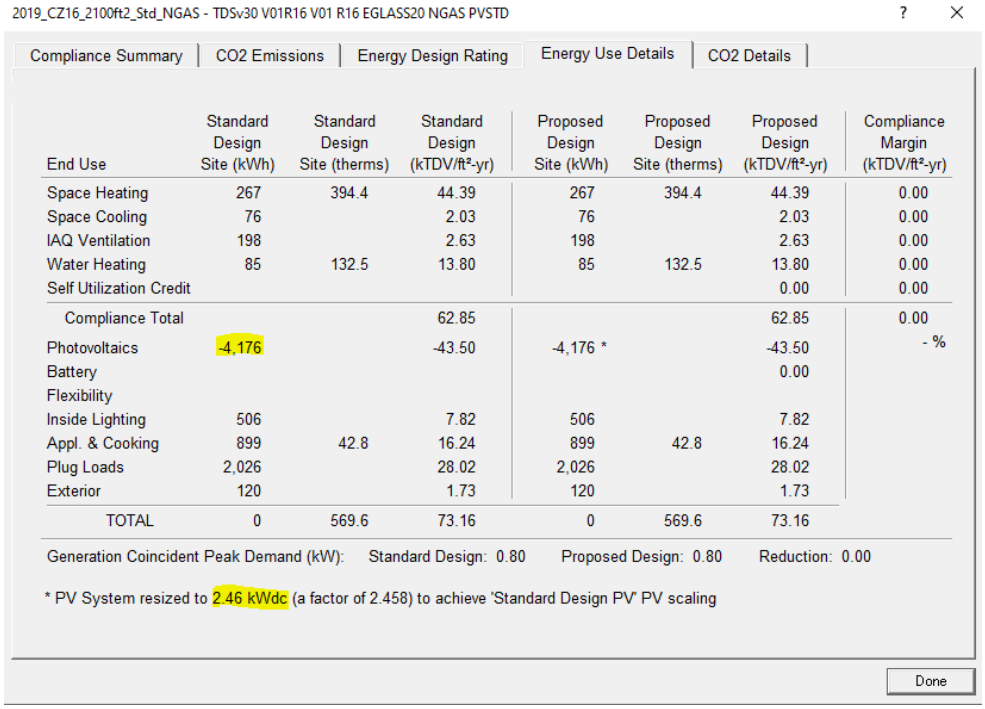
Dated: _____, 20___ _____
General Manager

Customer:

Dated: _____, 20__ _____

APPENDIX D:
CBECC-Res Run Reports

Figure D-1: CBECC-Res PV Size and Generation for 2,100 SF Prototype



2019_CZ16_2100ft2_Std_NGAS - TDSv30 V01R16 V01 R16 EGLASS20 NGAS PVSTD

Compliance Summary | CO2 Emissions | Energy Design Rating | Energy Use Details | CO2 Details

End Use	Standard Design Site (kWh)	Standard Design Site (therms)	Standard Design (kTDV/ft²-yr)	Proposed Design Site (kWh)	Proposed Design Site (therms)	Proposed Design (kTDV/ft²-yr)	Compliance Margin (kTDV/ft²-yr)
Space Heating	267	394.4	44.39	267	394.4	44.39	0.00
Space Cooling	76		2.03	76		2.03	0.00
IAQ Ventilation	198		2.63	198		2.63	0.00
Water Heating	85	132.5	13.80	85	132.5	13.80	0.00
Self Utilization Credit						0.00	0.00
Compliance Total			62.85			62.85	0.00
Photovoltaics	-4,176		-43.50	-4,176 *		-43.50	- %
Battery						0.00	
Flexibility							
Inside Lighting	506		7.82	506		7.82	
Appl. & Cooking	899	42.8	16.24	899	42.8	16.24	
Plug Loads	2,026		28.02	2,026		28.02	
Exterior	120		1.73	120		1.73	
TOTAL	0	569.6	73.16	0	569.6	73.16	

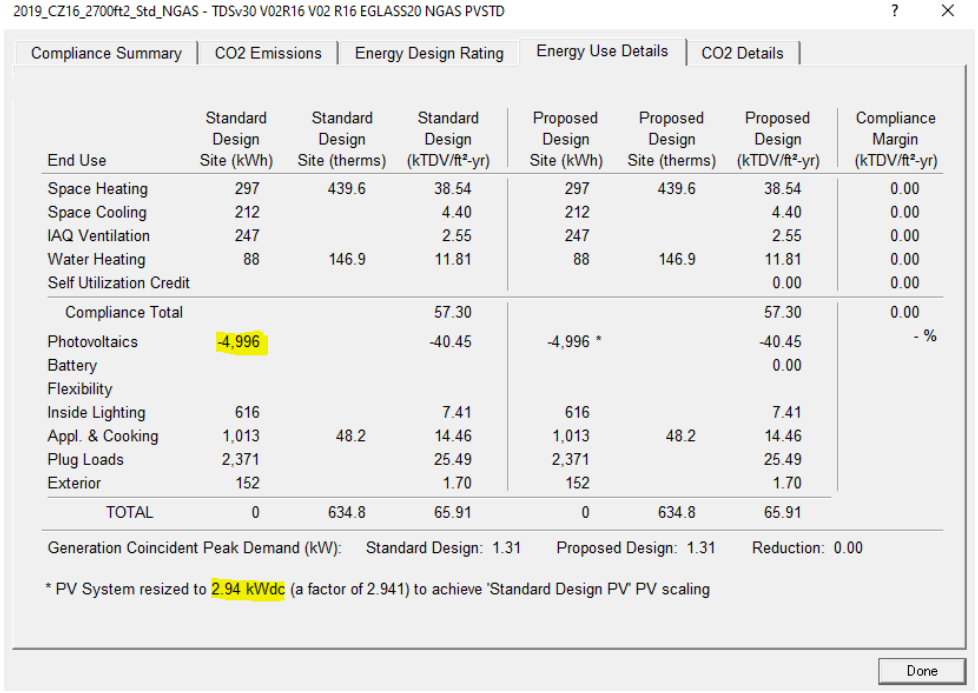
Generation Coincident Peak Demand (kW): Standard Design: 0.80 Proposed Design: 0.80 Reduction: 0.00

* PV System resized to 2.46 kWdc (a factor of 2.458) to achieve 'Standard Design PV' PV scaling

Done

Source: CEC staff

Figure D-2: CBECC-Res PV Size and Generation for 2,700 SF Prototype



2019_CZ16_2700ft2_Std_NGAS - TDSv30 V02R16 V02 R16 EGLASS20 NGAS PVSTD

Compliance Summary | CO2 Emissions | Energy Design Rating | Energy Use Details | CO2 Details

End Use	Standard Design Site (kWh)	Standard Design Site (therms)	Standard Design (kTDV/ft²-yr)	Proposed Design Site (kWh)	Proposed Design Site (therms)	Proposed Design (kTDV/ft²-yr)	Compliance Margin (kTDV/ft²-yr)
Space Heating	297	439.6	38.54	297	439.6	38.54	0.00
Space Cooling	212		4.40	212		4.40	0.00
IAQ Ventilation	247		2.55	247		2.55	0.00
Water Heating	88	146.9	11.81	88	146.9	11.81	0.00
Self Utilization Credit						0.00	0.00
Compliance Total			57.30			57.30	0.00
Photovoltaics	-4,996		-40.45	-4,996 *		-40.45	- %
Battery						0.00	
Flexibility							
Inside Lighting	616		7.41	616		7.41	
Appl. & Cooking	1,013	48.2	14.46	1,013	48.2	14.46	
Plug Loads	2,371		25.49	2,371		25.49	
Exterior	152		1.70	152		1.70	
TOTAL	0	634.8	65.91	0	634.8	65.91	

Generation Coincident Peak Demand (kW): Standard Design: 1.31 Proposed Design: 1.31 Reduction: 0.00

* PV System resized to 2.94 kWdc (a factor of 2.941) to achieve 'Standard Design PV' PV scaling

Done

Source: CEC staff