

APPENDIX C: POTENTIAL ENERGY REDUCTION CALCULATIONS

Appendix C shows the calculations for potential energy reductions resulting from implementation of each quantifiable EAP strategy. For each strategy, calculation inputs are highlighted in yellow and results are highlighted in green.

Table C-1.1: Expand outreach and education on existing energy efficiency practices, programs, and financing options for residential and non-residential utility customers

Strategy 1.1: Expand outreach and education on existing energy efficiency practices, programs, and financing options for residential and non-residential utility customers		
Target: 50% of Existing Households Reduce Energy Use 30% by 2035		
Baseline Year	2010	
Target Year	2035	
Baseline Annual Residential Energy Use	18,539,471	kWh - Electricity
	1,143,480	Gallons - Propane
	1,529	Cords - Wood
Baseline Annual Non-Residential Energy Use (excludes municipal energy use)	40,431,402	kWh - Electricity
	755,277	Gallons - Propane
Baseline Number of Households	2,199	Housing Units
Target Percent of Households Participating	50%	of existing homes
Target Percent Energy Reduction From Baseline Year	30%	of energy use
2035 Participating Households = Baseline Households x Percent Participating =	1,100	Housing Units
2035 Residential Electricity Savings = Baseline Energy Use x Percent Participating x Percent Reduction =	2,780,921	kWh - Electricity
2035 Residential Propane Savings = Baseline Energy Use x Percent Participating x Percent Reduction =	171,522	Gallons - Propane
2035 Residential Wood Savings = Baseline Energy Use x Percent Participating x Percent Reduction =	229	Cords - Wood
2035 Non-Residential Electricity Savings = Baseline Energy Use x Percent Participating x Percent Reduction =	6,064,710	kWh -Electricity
2035 Non-Residential Propane Savings = Baseline Energy Use x Percent Participating x Percent Reduction =	113,292	Gallons - Propane

Table C-1.2: Improve the compliance with current California Building Energy Efficiency Standards (Title 24, Part 6) by providing information materials when available.

Strategy 1.2: Improve compliance with current California Building Energy Efficiency Standards (Title 24, Part 6) by providing informational materials when available.				
Target: 100% of New Construction meets Title 24 Green Building and Energy Efficiency Standards				
Baseline Year	2010			
Target Year	2035			
Residential				
Forecasted Energy Use Increase Without Title-24 Compliance	Electricity (kWh)	Propane (gallons)	Wood (cords)	
2010-2016	176,490	10,890	14	
2017-2019	151,481	9,337	13	
2020-2035	683,276	42,141	56	
Non-Residential				
Forecasted Energy Use Increase Without Title-24 Compliance	Electricity (kWh)	Propane (gallons)	Wood (cords)	
2010-2016	4,028,418	67,918	0	
2017-2019	1,110,763	20,565	0	
2020-2022	720,487	13,348	0	
2022-2024	702,028	12,989	0	
2025-2027	651,925	12,076	0	
2028-2030	632,587	11,717	0	
2031-2035	837,394	15,500	0	
2010 Housing Stock (DOF)	61.67%	Single Family		
	38.33%	Multi-Family		
2010 Percent of Residential Energy Use Associated with Space Heating, Cooling, Indoor Lighting and Water Heating (2010 CEC)	Electricity	Propane	Wood	
	32%	86%	86%	
2013 Title 24 Energy Savings Associated with Space Heating, Cooling, Indoor Lighting and Water Heating (2013 CEC)	Electricity	Propane	Wood	
	Single Family (SF)	36.4%	6.5%	6.5%
	Multi-Family (MF)	23.3%	3.8%	3.8%
	Non-Residential (Non-Res)	21.8%	16.8%	16.8%
Residential				
2035 Residential Energy Savings from 2013 Title 24	20,558	609	1	
2035 Residential Energy Savings from 2016 Title 24	19,774	570	1	
2035 Residential Energy Savings from 2019 Title 24	115,951	3,347	4	
Non-Residential				
2035 Non-Residential Energy Savings from 2013 Title 24	878,195	11,410	-	
2035 Non-Residential Energy Savings from 2016 Title 24	278,468	3,973	-	
2035 Non-Residential Energy Savings from 2019 Title 24	207,720	2,966	-	
2035 Non-Residential Energy Savings from 2022 Title 24	232,758	3,319	-	
2035 Non-Residential Energy Savings from 2025 Title 24	248,568	3,548	-	

2035 Non-Residential Energy Savings from 2028 Title 24	277,374	3,959	-
2035 Non-Residential Energy Savings from 2031 Title 24	422,254	6,023	-

Table C-1.3: Improve the energy efficiency of City buildings, facilities, and operations

Strategy 1.3: Improve the energy efficiency of City buildings, facilities, and operations		
Target: Reduce Energy Use in City Buildings by 30% and Public Lighting by 50% by 2035		
Baseline Year	2010	
Target Year	2035	
Baseline Annual Municipal Buildings Energy Use	374,383	kWh - Electricity
	5,194	Gallons - Propane
2035 Target Municipal Buildings Percent Energy Reduction	30%	of energy use
Baseline Annual Municipal Public Lighting Energy Use	266,352	kWh - Electricity
2035 Target Municipal Public Lighting Percent Energy Reduction	50%	of energy use
2035 Municipal Buildings Electricity Savings = Baseline Energy Use x Percent Reduction =	112,315	kWh - Electricity
2035 Municipal Buildings Propane Savings = Baseline Energy Use x Percent Reduction =	1,558	Gallons - Propane
2035 Street and Other Lighting Savings = Baseline Energy Use x Percent Reduction =	133,176	kWh - Electricity

Table C-2.1: Prepare for the inclusion of renewable energy systems in new construction and large retrofit projects in order to meet California Zero Net Energy Goals by providing informational materials when available.

Strategy 2.1: Prepare for the inclusion of renewable energy systems in new construction and large retrofit projects in order to meet California Zero Net Energy Goals by providing informational materials when available.			
Target: 100% of New Developments Meet Required Zero-Net-Energy Standards by 2035			
Baseline Year	2010		
Target Year	2035		
Residential	Electricity (kWh)	Propane (gallons)	Wood (cords)
Forecasted Energy Use Increase after meeting Title 24	567,325	38,794	52
Non-Residential	Electricity (kWh)	Propane (gallons)	Wood (cords)
Forecasted Energy Use Increase after meeting Title 24	529,540	11,994	0
2035 Target Percent Participation of new construction after Zero Net Energy standard implementation	100%	Residential	
	100%	Non-Residential	
Residential	Electricity (kWh)	Propane (gallons)	Wood (cords)

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2035 Energy Savings Meeting Zero Net Energy Goals: = Forecasted Energy Use after meeting Title 24 x Percent Participation =	567,325	38,794	52
Non-Residential	Electricity (kWh)	Propane (gallons)	Wood (cords)
2035 Energy Savings Meeting Zero Net Energy Goals: = Forecasted Energy Use after meeting Title 24 x Percent Participation =	529,540	11,994	-

Table C-2.2: Encourage renewable energy projects through education, outreach, and local leadership

Strategy 2.2: Encourage renewable energy projects through education, outreach, and local leadership		
Target: 55% of Existing Households and 30% Businesses Install Solar PV by 2035, 15% of Households and 5% of Businesses Install other form of renewable energy		
Baseline Year	2010	
Target Year	2035	
2035 Target Potential Installations	2,199	Residential HH 200
	432	Non-Residential 2010
Number Solar Systems Installed 2010 - 2016	317	Residential
	5	Non-Residential
Total kW of Solar Installed 2010 - 2016	2,111	kW Residential
	316	kW Non-Residential
Target Participating Solar Installations per Year (1.205 x the 2005-2016 Residential Average, 6.75 X 2005-2016 Non -Residential Average)	41	Residential Households per Year
	7	Non-Residential Installations per Year
2035 Number of Solar Participants = Target Participation Installations per Year x 19 years + Number of Existing Installations 2010-2016 =	1,099	Residential Participants
	136	Non-Residential Participants
2035 kW Solar Installed = Number of Participants x Total Size of Existing Installations / Number of Existing Installations =	7,321	kW Residential Installed
	8,603	kW Non-Residential Installed
2035 Solar-Produced Electricity Calculated using PVWatts Calculator ¹	10,980,395	kWh Residential Electricity Produced
	12,902,602	kWh Non-Residential Electricity Produced
2035 Wind-Produced Electricity = 142 Residential and 8 Non-Residential Participants x 7,444 kWh Estimated Average Annual Power Output of 90' Rotor Hub Calculated using Open EI ² =	1,054,567	kWh - Residential Electricity
	62,033	kWh - Non-Residential Electricity
2035 Propane Offset by geothermal heating = 5% Participants x Baseline Propane Use =	57,174	gallons – Residential Propane
	37,764	gallons - Non-Residential Propane
	35,448	gallons - Residential Propane

¹ PV Watts. National Renewable Energy Laboratory. – Accessed September 22, 2017. <http://pvwatts.nrel.gov/>

² Open EI. – Accessed September 22, 2017. http://en.openei.org/wiki/Small_Wind_Guidebook/How_Much_Energy_Will_My_System_Generate

2035 Propane Offset by solar water heating = 5% Participants x Baseline Propane Use x 62% of energy savings from solar hot water system ³ =	23,414	gallons - Non-Residential Propane
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Table C-3.1: Support Tuolumne Utilities District’s outreach and education efforts by providing information on existing and future programs.

Strategy 3.1: Support Tuolumne Utilities District’s outreach and education efforts by providing information on existing and future programs..		
Target: 100% of Households and Businesses Reduce Indoor Water Use by 35% by 2035		
Baseline Year	2010	
Target Year	2035	
Baseline Year Population served by Water Systems	4,903	People
2035 Estimated Population served by Water Systems	5,175	People
2010 TUD System Average Gallons Per Capita Per Day (GPCD)	123	Gallons / Capita / Day
Percent of Urban Water Demand (2013 CA WPU ⁴)	31%	Residential Indoor
	44%	Landscape Irrigation
	20%	Non-Residential Indoor
	5%	Water Losses
2035 Target Percent Reduction in Indoor and Outdoor Water Use	35%	of water use
2035 Estimated Reduced Indoor Water Use = 2010 GPCD * (Percent Res + Percent Non-Res) * Percent Reduction * 2035 Estimated Population * 365.25 Days Per Year / 1,000,000 =	41	Million Gallons
2035 Estimated Reduced Outdoor Water Use = 2010 GPCD * Percent Landscaping * Percent Reduction * 2035 Estimated Population * 365.25 Days Per Year / 1,000,000 =	36	Million Gallons
2035 Potable Water Energy Savings = Target Year Reduced Indoor and Outdoor Water Use * 2035 Estimated Potable Water Energy Use Intensity =	64,215	kWh - Electricity
2035 Wastewater Energy Savings = Target Year Reduced Indoor Water Use * 2035 Estimated Wastewater Energy Use Intensity =	34,473	kWh - Electricity

³ U.S. EPA. – Accessed September 22, 2017. <https://energy.gov/energysaver/solar-water-heaters>

⁴ 2013 California Water Plan Update.- Accessed September 22,2017. http://www.waterplan.water.ca.gov/docs/cwpu2013/2013-prd/Vol3_Ch03_UrbanWUE_PubReviewDraft_Final_PDFed_co.pdf

Table C-3.2: Encourage Tuolumne Utilities District to reduce water losses through proactive leak detection programs.

Strategy 3.2: Encourage Tuolumne Utilities District to reduce water losses through proactive leak detection programs.		
Target: 100% of Potable Water Systems Reduce Water Losses by 50% by 2035		
Baseline Year	2010	
Target Year	2035	
Baseline Year Population served by Water Systems	4,903	People
2035 Estimated Population served by Water Systems	5,175	People
2010 TUD System Average Gallons Per Capita Per Day (GPCD)	123	Gallons / Capita / Day
Percent of Urban Water Demand (2013 CA WPU)	31%	Residential Indoor
	44%	Landscape Irrigation
	20%	Non-Residential Indoor
	5%	Water Losses
2035 Target Percent Reduction in Water Losses	50%	of water losses
2035 Estimated Reduction in Water Losses = 2010 GPCD * Percent Water Losses * Percent Reduction * 2035 Population * 365.25 Days Per Year / 1,000,000 =	6	Million Gallons
2035 Potable Water Energy Savings from Reduced Water Losses = 2035 Reduced Water Losses * 2035 Estimated Potable Water Energy Use Intensity =	4,828	kWh / Year

Table C-3.3: Encourage Tuolumne Utilities District to improve the efficiency of their operations

3.3: Encourage Tuolumne Utilities District to improve the efficiency of their operations		
Target: Reduce Energy Intensity at Potable Water and Wastewater Facilities by 40% by 2035		
Baseline Year	2010	
Target Year	2035	
Baseline Annual Potable Water Energy Use	457,164	kWh - Electricity
Baseline Annual Potable Water Energy Intensity	2,081	kWh / Million Gallons
Baseline Annual Wastewater Energy Use	238,023	kWh - Electricity
Baseline Annual Wastewater Energy Intensity	1,355	kWh / Million Gallons
2035 Target Percent Energy Intensity Reduction	40%	of energy intensity
2035 Reduction in Potable Water Energy Intensity	832	kWh / Million Gallons
2035 Reduction in Wastewater Energy Intensity	542	kWh / Million Gallons
2035 Estimated Potable Water Use	143	Million Gallons
2035 Estimated Wastewater Generation	134	Million Gallons
2035 Potable Water Electricity Savings = 2035 Potable Water Use * 2035 Reduction in Potable Water Energy Intensity =	118,650	kWh - Electricity
2035 Wastewater Electricity Savings = 2035 Wastewater Use * 2035 Reduction in Wastewater Energy Intensity =	72,767	kWh - Electricity