

Energy Reduction Measure Quantification (Continued)

E-1.3			
Improve Building Energy Efficiency in Existing Development	2020	2030	2050
<p><i>This calculation assumes participating buildings would have energy efficiency improvements equivalent to the difference between 2008 and 2016 Title 24 standards. This assumption is based on energy efficiency improvement data available from the CEC and CPUC. Energy efficiency gains under this measure only apply to commercial/industrial and residential uses. It does not apply to agricultural energy uses.</i></p> <p><i>Also, residential propane is not included in this calculation because a larger portion of energy use for propane is used for cooking, as opposed to space and water heating. However, there is currently no data to identify that portion or an applicable ratio. In addition, the inventory did not include Non-residential propane use.</i></p>			
Background Data			
Number of Existing Households as of 2014	163,354	163,354	163,354
Participation Rates			
Participation rate of existing buildings becoming retrofitted to meet 2016 Energy Efficiency Standards under this measure			
Residential	0%	1%	5%
Commercial	0%	1%	5%
Residential Energy Reductions			
Energy usage from existing buildings (w/o 2016 Title 24 Energy Efficiency Standards)			
<i>Electricity (MWh)</i>	1,377,278	1,377,278	1,377,278
<i>Natural Gas (therms)</i>	28,860,437	28,860,437	28,860,437
Participating Existing Energy Use Only (w/o 2016 Title 24 Energy Efficiency Standards)			
<i>Electricity (MWh)</i>	-	13,773	68,864
<i>Natural Gas (therms)</i>	-	288,604	1,443,022
<i>Annual Electricity use per existing home (MWh/household)</i>	8.43	8.43	8.43
<i>Number of Existing Households affected</i>	-	1,634	8,168
Minimum percent reduction from existing electricity use by upgrading to 2016 Title 24 Energy Efficiency Standards			
	46%	46%	46%
Minimum percent reduction from existing natural gas use by upgrading to 2016 Title 24 Energy Efficiency Standards			
	46%	46%	46%
Existing Energy Use Only (w/ 2016 Title 24 Energy Efficiency Standards)			
<i>Electricity (MWh)</i>	-	7,437	37,186
<i>Natural Gas (therms)</i>	-	155,846	779,232
Energy Reductions			
<i>Electricity (MWh)</i>	-	6,335	31,677
<i>Natural Gas (therms)</i>	-	132,758	663,790
Emissions Reductions (MTCO _{2e})			
<i>Electricity</i>	-	1,502	7,512
<i>Natural Gas</i>	-	909	4,547
Commercial/Industrial Energy Reductions			
Energy usage from existing buildings (w/o 2016 Title 24 Energy Efficiency Standards)			
<i>Electricity (MWh)</i>	957,016	957,016	957,016
<i>Natural Gas (therms)</i>	22,744,894	22,744,894	22,744,894
Participating Existing Energy Use Only (w/o 2016 Title 24 Energy Efficiency Standards)			
<i>Electricity (MWh)</i>	-	9,570	47,851
<i>Natural Gas (therms)</i>	-	227,449	1,137,245

Energy Reduction Measure Quantification (Continued)

E-1.3 (Continued)				
	2014	2020	2030	2050
Minimum percent reduction from existing electricity use by upgrading to 2016 Title 24 Energy Efficiency Standards		34%	34%	34%
Minimum percent reduction from existing natural gas use by upgrading to 2016 Title 24 Energy Efficiency Standards		34%	34%	34%
New Energy Use Only (w/ 2016 Title 24 Energy Efficiency Standards)				
<i>Electricity (MWh)</i>		-	6,364	31,821
<i>Natural Gas (therms)</i>		-	151,254	756,268
Energy Reductions				
<i>Electricity (MWh)</i>		-	3,206	16,030
<i>Natural Gas (therms)</i>		-	76,195	380,977
Emissions Reductions (MTCO2e)				
<i>Electricity</i>		-	760	3,801
<i>Natural Gas</i>		-	522	2,610
Commercial/Industrial and Residential				
Energy Reductions				
<i>Electricity (MWh)</i>		-	9,541	47,707
<i>Natural Gas (therms)</i>		-	208,953	1,044,767
Emissions Reductions (MTCO2e)				
<i>Electricity</i>		-	2,263	11,313
<i>Natural Gas</i>		-	1,431	7,157
<i>Total</i>		-	3,694	18,470
GHG Reductions from E-1.3 (MTCO2e)		-	3,694	18,470

Energy Reduction Measure Quantification (Continued)

E-1.4				
Reduce Energy Use Intensity at County Facilities	2014	2020	2030	2050

Propane and diesel use is not included in these calculations because the County primarily uses these fuels for facilities in emergency generators.

Electricity Use at County Facilities County-wide (MWh)

Facility Type	2014	2020	2030	2050
Airports	755	771	797	849
Buildings & Other Facilities	133,837	134,387	135,305	137,139
Public Lighting	7,594	7,879	8,354	9,305
Wastewater/Water Facilities	739	802	897	977
Total Electricity	142,925	143,840	145,353	148,270
Total Electricity in the unincorporated County (from CRIS data)	44,051	44,559	45,394	46,956
Percent of Electricity use in the unincorporated County	31%	31%	31%	32%

Natural Gas Use at County Facilities (therms)

Airports	6,730	6,954	7,329	8,077
Buildings & Other Facilities	2,334,004	2,341,919	2,355,110	2,381,492
Total Natural Gas	2,340,734	2,348,873	2,362,438	2,389,568

Facility Type	Forecasting Methodology
Airport	County plans to construct accessory facilities at the Palomar Airport, however this project has not yet been funded through 2020. Assume no change in airport operations in future years.
Building & Other Facilities	County's 5-year plan through 2020. Assumed growth rate continues through 2050.
Lighting	County's 5-year plan through 2020. Assumed growth rate continues through 2050.
Wastewater/Water Facilities	County Population

Percent reduction in energy use below 2014 levels	10%	20%	20%
Target Annual Electricity Use (MWh)	128,633	114,340	114,340
Target Annual Natural Gas Use (Therms)	2,106,661	1,872,587	1,872,587
Annual Electricity Reductions (MWh)	15,207	31,013	33,930
Annual Electricity Reductions in the unincorporated County (MWh)	4,711	9,685	10,745
Annual Natural Gas Reductions (therms)	242,212	489,851	516,981
Emissions savings from reduced electricity (MTCO _{2e})	4,827	7,346	8,037
Emissions savings from reduced natural gas (MTCO _{2e})	1,659	3,355	3,541
GHG Reductions from E-1.4 (MTCO_{2e})	6,486	10,702	11,578

Energy Reduction Measure Quantification (Continued)

E-2.1				
Increase Renewable Electricity		2020	2030	2050
Background Calculations				
Forecasted County electricity from existing and new development (MWh)		2,633,427	2,788,644	3,051,096
Reductions from other measures (MWh)	<i>Existing or New</i>	<i>Residential or Non-residential</i>		
	<i>E-1.1 New only</i>		101,364	371,522
	<i>E-1.2 New and Existing</i>		-526	-526
	<i>E-1.3 Existing Only</i>		9,541	47,707
	<i>New and Existing (County only) Excludes municipal electricity use outside the County</i>			
	<i>E-1.4</i>		9,685	10,745
	<i>E-2.2 New only</i>		56,693	56,693
	<i>E-2.3 Existing Only</i>		1,097,768	1,097,768
	<i>New and Existing (County only) Excludes municipal electricity use outside the County</i>			
	<i>E-2.4</i>		7,142	7,242
	<i>T-1.1 New only</i>		4,595	4,595
	<i>T-1.2 New only</i>		169	1,855
	<i>T-3.1 New and Existing</i>		2,611	2,647
	<i>W-1.2 Excludes electricity use outside the County</i>		7,406	8,062
	<i>W-1.3 Excludes electricity use outside the County</i>		73	73
	<i>W-2.1 New and Existing</i>		10	10
	<i>A-1.2 New and Existing</i>		-1	-6
	<i>Total Reductions from Other Measures</i>		1,296,531	1,608,387
<i>Note: W-1.1, A-1.1, T-3.2, and T-3.3 were not included. W-1.1 savings are already included in E-1.1. A-1.1, T-3.2, and T-3.3 are not clear as to what part of the reductions are coming from electricity vs. other fuels, so it is more conservative to assume no electric replacements are being made.</i>				
Non-Renewable Emissions from Local Utility (MTCO _{2e} /MWh)			0.474	0.474
Estimated Renewable Energy Program (REP) Emission Factor (MTCO _{2e} /MWh)			-	-
Average SDGE Emission Factor (MTCO _{2e} /MWh)			0.237	0.237
REP Participation Rate			80%	90%
REP Renewable Mix			100%	100%
REP Member Participation Rate in 100% renewable option			6%	15%
<i>City of Fairfax's current participation rate with similar subsidy program for Deep Green which is limited to 100 households</i>	6%			
Overall Renewable Mix of REP (includes those choosing the 100% renewable option)			100%	100%
Adjusted County Electricity Use (MWh)			1,492,113	1,442,709
Electricity Use of Participating Customers (MWh)			1,193,690	1,298,438
Emissions related to Electricity Use from participating customers without REP program (MTCO _{2e})			283,069	307,908
Emissions related to Electricity Use from participating customers with REP program (MTCO _{2e})			-	-
Emissions Reductions (MTCO _{2e})			283,069	307,908
GHG Reductions from E-2.1 (MTCO _{2e})			283,069	307,908

Energy Reduction Measure Quantification (Continued)

E-2.2				
Increase Renewable Energy in Non-Residential Development		2020	2030	2050
<i>Measure only applies to new buildings built before ZNE standards are required.</i>				
Non-residential				
New Non-residential grid-based Electricity Use (w/ 2016 code) (MWh)		73,695	136,688	326,929
Reductions from other measures that affect new Non-residential buildings (MWh)	E-1.1	-	6,299	196,541
Adjusted New Non-residential grid-based Electricity Use (MWh) (Reflects new buildings built through 2029. ZNE standards applied to new buildings after 2030.)		73,695	130,388	130,388
	2014-2017	2018-2019	2020-2029	2040-2050
New Non-residential Electricity Use for buildings built through these years (MWh)	49,130	24,565	56,693	-
Percent of electricity from Non-residential buildings built through these years that install solar under this measure (Note that ZNE standards will begin requiring solar in 2030 for Non-residential developments. This is already captured in E 1.1)	0%	0%	100%	0%
Electricity offset by this measure in new Non-residential buildings built through these years (MWh)	0	0	56,693	0
New Non-residential grid-based Electricity Use for buildings built through these years AFTER SOLAR installation (MWh)	49,130	24,565	-	-
		2020	2030	2050
Cumulative Adjusted New Non-residential grid-based Electricity Use for all buildings built since 2018 under this measure (MWh)		73,695	73,695	73,695
Non-residential Electricity Reduction from solar systems under this measure (MWh)		-	56,693	56,693
<i>("Adjusted New Non-residential grid-based Electricity Use" minus "Cumulative Adjusted New Non-residential grid-based Electricity Use for all buildings built since 2018")</i>				
Total Electricity Reduction (MWh)		-	56,693	56,693
GHG Reductions from E-2.2 (MTCO2e)		-	13,444	13,444

Energy Reduction Measure Quantification (Continued)

E-2.3

Install Solar Photovoltaic in Existing Homes

This assumes that buildings with solar would opt out of the Renewable Energy Program (REP). (See measure discounts in E-2.1). Also assumes that permitted solar panels are constructed six months after permits are approved. An assumption of 5.06 kW per home allows the calculated electricity generated by solar per existing home to match the average energy use per existing home in 2020. With additional improvements in energy efficiency from other measures, some homes may still see lower energy use compared to solar electricity generation post-2020.

Solar permits approved from July 2013 through January 2017 for existing and new construction	Total kW	Total Non-residential kW	Total Residential kW	Number of Residential Permits
<i>Fiscal Year 13/14</i>	32,680	0	32,680	4,583
<i>Fiscal Year 14/15</i>	57,359	8,854	48,505	6,165
<i>Fiscal Year 15/16</i>	70,617	7,149	63,468	8,674
<i>Fiscal Year 16/17 (through January 2017)</i>	27,474	2,374	25,100	3,394
Total	188,130	18,377	169,753	22,816

Annual kWh per kW in San Diego County	1,665
Average solar size per residence based on average electricity demand per existing household as of 2014 (kW)	5.06

Calculating Residential solar permits for **new construction only** with only information on number of new building permits.
Assume all new homes construct minimum solar requirement as a conservative approach.

Number of New Home Building Permits	Custom Homes	Tract Homes	Mobile Homes (Private Lot)
<i>Fiscal Year 13/14</i>	298	218	39
<i>Fiscal Year 14/15</i>	351	292	29
<i>Fiscal Year 15/16</i>	380	256	45
<i>Fiscal Year 16/17 (through January 2017)</i>	206	53	29
Total	1,235	819	142
Size per system (kW)	5.06	5.06	5.06
Annual electricity generated per system (kWh)	8,433	8,433	8,433
<i>Assumed Solar Panel Size if all New Construction installed Solar (kW)</i>	Total		
<i>Fiscal Year 13/14</i>	2,810		
<i>Fiscal Year 14/15</i>	3,403		
<i>Fiscal Year 15/16</i>	3,448		
<i>Fiscal Year 16/17 (through January 2017)</i>	1,458		
Total	11,120		

Source: County of San Diego 2017. NREL PV Watts Calculator

Energy Reduction Measure Quantification (Continued)

E-2.3 (Continued)					
Calculated Size of residential solar permits approved from July 2013 through January 2017 for existing buildings only	kW	Number of Existing Residential Permits			
		Months			
<i>Fiscal Year 13/14</i>	29,870	12	4,028		
<i>Fiscal Year 14/15</i>	45,102	12	5,493		
<i>Fiscal Year 15/16</i>	60,020	12	7,993		
<i>Fiscal Year 16/17 (through January 2017)</i>	23,642	7	3,106		
Total	158,633	43	20,620		
Average annual size	44,270	N/A	N/A		
		2014-2017	2018-2019	2020-2029	2040-2050
Target annual number of homes (residential permits approved) within these years		5,754	10,027	8,200	-
Target annual size of solar permits for existing residential buildings approved within these years (kW)		44,270	50,773	41,523	-
Size of solar permits approved within these years (kW)		177,079	101,547	415,229	
Installation rate: Percent of permitted solar panel actually constructed	95%				
			2020	2030	2050
Cumulative size of all rooftop solar systems in operation from 2014 (kW)			264,695	659,162	659,162
Average solar size per residence (kW/unit)			5.06	5.06	5.06
Target cumulative number of existing residential units with solar since 2014			52,273	130,175	130,175
			2020	2030	2050
Annual kWh generated per kW of solar PV in San Diego County	1,665				
Annual Electricity Generated by new Solar PVs from new permits in existing residences (MWh)			440,822	1,097,768	1,097,768
Feasibility Assessment					
Existing Electricity Usage in Residential land uses (MWh)			1,377,278	1,377,278	1,377,278
Electricity Reductions from Existing Residential land uses from other Measures (MWh) (excludes measures that only affect Non-residential, new construction, or any energy use not used on existing residential land uses, such as water consumption)					
<i>E-1.2</i>			0	-526	-526
<i>E-1.3</i>			-	6,335	31,677
Adjusted Electricity Usage from Existing Residential land uses (MWh)			1,377,278	1,371,468	1,346,126
Number of Existing Residential units			163,354	163,354	163,354
Electricity Usage per Existing Residence (MWh/residence)			8.43	8.40	8.24
Number of Existing Residences with Solar under this measure			52,273	130,175	130,175
Electricity use in participating residences (MWh)			440,729	1,092,905	1,072,711
Annual Electricity Generated by new Solar PVs from new permits (MWh)			440,822	1,097,768	1,097,768
Unused electricity generated (MWh)			94	4,863	25,058
Percent of electricity sent back into grid			0%	0%	2%
Percent of Electricity use in Existing Homes offset by solar (Feasibility Check)			32%	80%	82%
GHG Reductions from E-2.3 (MTCO2e)			114,571	260,322	260,322
E-2.4					
Increase Use of On-Site Renewable Electricity Generation for County Operations			2020	2030	2050
County electricity use after the implementation of E-1.4 (MWh)			128,633	114,340	114,340
Percent of renewable electricity generated on-site			10%	20%	20%
Electricity offset (MWh)			12,863	22,868	22,868
GHG Reductions from E-2.4 (MTCO2e)			4,083	5,417	5,417

Solid Waste Reduction Measure Quantification

SW-1.1

Increase Solid Waste Diversion

See additional quantification on separate sheets.

From implementation of Zero Waste diversion program (80% diversion)

		Source
Baseline		
Total Unincorporated Waste Accepted by Landfills in 2014 (wet short tons)	449,323	Unincorporated County of San Diego 2014 Greenhouse Gas Emissions Inventory and Projections
Total Unincorporated Waste Accepted by Landfills in 2030 (Post-diversion) (tons)	545,308	Scaled with population
Organics Content in Unincorporated SD County	66%	Calculated from CalRecycle Data. Date unreported.
Total Unincorporated Waste Accepted by Landfills in 2030 (Post-diversion) - organics only (tons)	362,486	
Current Diversion Rate	62%	CalRecycle
Total Unincorporated Generated Waste (tons)	1,435,022	Calculated
Target		
Target Diversion Rate	80%	Assumed
Target Disposal Tonnage under 80% diversion rate	287,004	Calculated
Target Diverted Tonnage under 80% diversion rate	1,148,018	Calculated
Waste disposal reduction under 80% diversion rate compared to baseline (ton)	258,304	Calculated
Organics content in reduced waste	60%	Estimated from HF&H Calculations
Additional Diverted waste generation under 80% diversion rate - organics only (ton)	154,483	Calculated
Reduction in Organics		
Percent reduction in organics compared to baseline	43%	Calculated. Assume that emissions are proportional to

Forecasted Emissions Reductions

	2030	2050	
GHG Emissions from Waste Disposal (MTCO ₂ e)	185,492	201,915	
Emissions reductions from SWP (MTCO ₂ e)	79,052	86,052	
	2020	2030	2050
GHG Reductions from SW-1.1 (MTCO ₂ e)	-	79,052	86,052

Water and Wastewater Reduction Measure Quantification

Assumptions	2020	2030	2050
San Diego County Average Electricity Emissions Factor (MTCO _{2e} /MWh)	0.302	0.237	0.237
Natural Gas Emissions Factor (MTCO _{2e} /therm)		0.00685	

W-1.1

Increase Water Efficiency in New Residential Development

Note that this measure will not be in effect until after 2020.

	Mandatory Reqmt/ Standard Equivalent	Measure Reqmt/Energy Star Rating	Requirement Metric	
Kitchen Faucet Flow Rate (gal per minute)	1.8		1.5 Flow Rate	
Dishwasher water use (gal/cycle)	5		3.5 Energy Star Appliance - standard size	
Dishwasher energy use (kWh/year)	307		270 Energy Star Appliance - standard size	
Clotheswasher water use (gal/cycle)	16.82		9.25 Energy Star Appliance - 2.5 cu-ft front loading	
Clotheswasher energy use (kWh/cycle)	7.93		5.95 Energy Star Appliance	
Assumption based on water usage used for dishwashing and standard flowrate: https://water.usgs.gov/edu/qa-home-percapita.html . Assumes water is also used for washing produce, 5 cooking, and drinking.				
Kitchen faucet water use per day per household with dishwasher (HH) (minutes)			https://www.energystar.gov/products/appliances/dishwashers/key_product_criteria	
Average dishwasher cycles per unit per year	215			
Average dishwasher cycles per year per HH	215			
Average American family wash loads per year		300	https://www.energystar.gov/products/appliances/clothes_washers	
Average clotheswasher cycles per year per HH		300		
	2014	2020	2030	2050
Households in Unincorporated San Diego County	162,805	163,354	174,741	204,604
Number of new households since 2014		549	11,936	41,799

Activity in New Households Only

Water use with standard equipment (MG/year)			
Kitchen Faucets		39	137
Dishwashers		13	45
Clotheswashers		60	211
Total		112	393
Water use with Tier 1 equipment (MG/year)			
Kitchen Faucets		33	114
Dishwashers		9	31
Clotheswashers		33	116
Total		75	262
Water Savings (MG/year)			
Kitchen Faucets		7	23
Dishwashers		4	13
Clotheswashers		27	95
Total		37	131
Emissions per gallon of water (MTCO _{2e} /MG) (see calculation in measure W-2.1)			
		2.31	2.31

GHG Reductions from W-1.1 (MTCO_{2e})	For water reductions only	-	87	303
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Note that this measure will not be in effect until after 2020.

Electricity use with standard equipment (kWh/year)			
Dishwashers		3,662,284	12,824,625
Clotheswashers		28,408,473	99,481,091
Total		32,070,757	112,305,716
Electricity use with Tier 1 equipment (kWh/year)			
Dishwashers		3,222,810	11,285,670
Clotheswashers		21,306,355	74,610,818
Total		24,529,165	85,896,488
Electricity Savings (kWh/year)			
Dishwashers		439,474	1,538,955
Clotheswashers		7,102,118	24,870,273
Total		7,541,592	26,409,228

GHG Reductions from W-1.1 (MTCO_{2e})	Assumed to be included in E-1.1	-	1,788	6,263
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Water and Wastewater Reduction Measure Quantification (Continued)

W-1.2				
Reduce Outdoor Water Use	2014	2020	2030	2050
<i>This measure only applies to potable water use in outdoor landscaping, and not all outdoor applications.</i>				
Residential and Non-residential Landscape irrigation water use per capita per day (gallons) (Assumed for 2014)	94 Source: California Water Plan Update 2013 Vol. 3. Table 3-2. Based on 2009 gallons and population.			
Modified Unincorporated County Population	454,599	493,604	551,712	600,560
Estimated annual water demand for landscaping based on 2014 rates (MG)	15,631	16,972	18,970	20,649
In existing development		15,631	15,631	15,631
In new development		1,341	3,339	5,019
Percent reduction in outdoor landscaping water use rates from 2014 rates				
In existing development		0%	40%	40%
In new development		0%	40%	40%
Annual Water Reduction (MG)				
In existing development		-	6,252	6,252
In new development		-	1,336	2,007
TOTAL		-	7,588	8,260
Emissions per gallon of water (MTCO ₂ e/MG) (see calculation in measure W-2.1)		2.53	2.31	2.31
Remaining water use for landscape irrigation (MG)				
In existing development		15,631	9,378	9,378
In new development		1,341	2,003	3,011
GHG Reductions from W-1.2 (MTCO₂e)		-	17,535	19,087
Electricity savings from local water distribution and treatment (MWh) to calculate E-2.1		-	7,406	8,062

W-1.3				
Reduce Potable Water Consumption at County Facilities	2014	2020	2030	2050
Imported Potable water consumption at all County facilities (HCF)	622,568			
Imported Potable water consumption at all County facilities (Million gallons)	466	472	481	501
Forecasting method: Employee growth				
County Employee Count Forecast	19205	19,444	19,841	20,636
Electricity Use from Potable Water Consumption (MWh)	4,988	5,049	5,153	5,359
Electricity intensity per million gallons of imported potable water (includes conveyance, treatment, and distribution) (Average for the County)				
Water Activity		<i>kWh/MG</i>		
Upstream Supply and Conveyance		9,727		
Local water distribution		292		
Conventional water treatment		684		
Total (kWh/MG)		10,703		
Total (MWh/MG)		10.70		
Percent reduction in potable water consumption at County facilities below 2014 levels		15%	20%	20%
Water use forecast with water reduction (MG)		396	373	373
Electricity Use with water reduction (MWh)		4,239	3,990	3,990
Difference in electricity use (MWh)		810	1,163	1,369
GHG Reductions from W-1.3 (MTCO₂e)		244	276	325
Electricity savings from local water distribution and treatment (MWh) to calculate E-2.1		58	73	73

Water and Wastewater Reduction Measure Quantification (Continued)

W-2.1

Increase Rain Barrel Installations

Note: Rainwater catchment would only be used for landscaping uses.

Background and Assumptions	2014	2020	2030	2050
Modified Unincorporated County Population	454,599	493,604	551,712	600,560
Water Use (million gallons)	45,678	49,597	55,436	60,344
Emissions from water use (MTCO2e)	134,269	125,616	128,104	139,446
Emissions per gallon (MTCO2e/MG)		2.53	2.31	
Water Demand		2020	2030	2050
Landscaping water demand after W-1.2 (MG)		16,972	11,382	12,390
Total roof sqft in County (see below)		116,938,533	130,255,005	144,445,872
Annual landscaping water demand per roof sqft (gal/sqft)		145	87	86
Annual landscaping water demand per barrel (see below) (gal/sqft)		72,568	43,691	42,887
Rain Barrel Savings				
Annual Rainfall in San Diego, CA (inches) (height per any unit area)	10.13	<i>Source: Western Regional Climate Center 2016</i>		
Number of rain barrels installed starting in 2020		1,200	3,200	3,200
Rain barrel size (gal)	50			
Average roof collection area per barrel (e.g., half of a low-rise house roof slanted in a single direction) (sqft)	500			
Maximum annual rain collected per average roof per barrel (gal/barrel)	3,157			
Annual rain collected per roof sqft (gal/sqft)	6.31			
Annual rain collected under this measure (assuming average roof area per barrel) (gal)		3,788,883	10,103,688	10,103,688
Maximum annual barrel fillings per year (feasibility check)		3,157	3,157	3,157
Utilization/Emptying rate (Rate at which barrels are emptied everytime it is full so there is no wasted water to overflow)		100%	100%	100%
Annual water savings per year under this measure (gal)		3,788,883	10,103,688	10,103,688
Percent of landscaping demand of participating buildings		4.4%	7.2%	7.4%
Percent of landscaping demand offset by this measure		0.022%	0.089%	0.082%
Emissions reductions from water savings (MTCO2e) (million gallons X MTCO2e/MG) (see beginning of calculation)		10	23	23

Existing Countywide Rooftop Area

Area of commercial/industrial roofspace in 2005 (sqft) (Anders and Bailek 2009)	235,047,321
Area of residential roofspace in 2010 (sqft) (calculated below)	646,002,117
Sum of roofspace (sqft)	881,049,438
<i>Source: Anders and Bailek 2009 (https://www.sandiego.edu/law/documents/centers/epic/060309_ASESPVPotentialPaperFINAL_000.pdf)</i>	

Calculating Residential Rooftop Space in San Diego County

Matching PV rating (kW) from NREL PV Calculator	2,772,000	<i>Source: Anders and Bailek 2009</i>
sq meter per kW	1	<i>PV Watts Calculator Default</i>
sqft per sq meter	10.76391042	<i>PV Watts Calculator Default</i>
Module efficiency	0.16	<i>PV Watts Calculator Default</i>
Size of PV area needed (sf)	186,484,748	<i>Calculated</i>
Tilt Degree	30	<i>Source: Anders and Bailek 2009</i>
Footprint of PV area needed (sqft)	161,500,529	<i>Calculated</i>
% sqft roof	50%	<i>Source: Anders and Bailek 2009</i>
% homes suitable	50%	<i>Source: Anders and Bailek 2009</i>
Footprint of Available Rooftop (sqft)	646,002,116.66	<i>Calculated</i>

*Calculations based on methods used in NREL's PV Watts Calculator
http://pvwatts.nrel.gov/pvwatts.php*

Estimated Unincorporated San Diego County Roofspace (Scaled from entire county) (sqft)

	2014	2020	2030	2050
Commercial/Industrial	13,890,169	15,498,609	16,873,464	21,025,604
Residential	93,424,065	101,439,924	113,381,541	123,420,268
Total	107,314,235	116,938,533	130,255,005	144,445,872
All Existing Roofspace (as of 2014)	107,314,235	107,314,235	107,314,235	107,314,235
All New Roofspace (since 2014)	-	9,624,299	22,940,770	37,131,637

GHG Reductions from W-2.1 (MTCO2e)	10	23	23
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Electricity savings from local water distribution and treatment (MWh) to calculate E-2.1	3.70	9.86	9.86
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Agriculture Reduction Measure Quantification

Assumptions

		2020	2030	2050
San Diego County Average Electricity Emissions Factor (MTCO _{2e} /MWh)		0.260	0.237	0.237
Cropland in SD County (acres)	97,432	96,051	95,313	94,494

A-1.1

Convert Farm Equipment to Electric

Background Information

		2020	2030	2050
Emissions from Agricultural Equipment Except for Irrigation Pumps. Scaled by change in cropland. (MTCO _{2e})	86,087	84,867	84,215	83,491

		2020	2030	2050
Percent of Equipment Converted to Electric or Alternative Fuel		0%	8%	8%

GHG Reductions from A-1.1 (MTCO _{2e})		-	6,737	6,679
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A-1.2

Convert Stationary Irrigation Pumps to Electric

		2014	2020	2030	2050
Number of Diesel Pumps in San Diego County. Scaled by change in cropland.	159	157	156	154	
Total Number of Pumps Converted			4	44	44
Percent of Pump Energy Converted			3%	28%	28%
Emissions from Diesel Pumps to be Converted (MTCO ₂)	11,768	296	3,251	3,251	

Diesel Emission Factor (kg CO ₂ /gal)	10.21				
Calculated fuel use of converted pumps (gal)		1,152,982	28,954	318,491	318,491
Energy content of diesel (kBTU/gal) - lower heating value		128	128	128	128
Efficiency of diesel pump (%)		35%	35%	35%	35%
Energy required by pumps (kBTU)		51,851	1,302	14,323	14,323

Efficiency of electric pump (%)		75%	75%	75%	75%
Calculated electricity use in electric pumps (kBTU)		69,134	1,736	19,097	19,097
Calculated electricity use in electric pumps (kWh)		20,261	509	5,597	5,597
Emissions from electricity use (MTCO _{2e})			0.13	1.33	1.33

GHG Reductions from A-1.2 (MTCO _{2e})		295	3,249	3,249
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Calculated electricity use in electric pumps for selected option (kWh)		509	5,597	5,597
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Agriculture Reduction Measure Quantification (Continued)

A-2.1				
Increase Residential Tree Planting	2014	2020	2030	2050
Modified Number of Single Family Residences in Unincorporated County (detached units) (Excluding Camp Pendleton units)	134,815	146,436	164,009	178,110
Number of New SFRs starting in 2020		-	17,573	31,674
Trees planted per home		2	2	2
Total trees planted since 2020		0	35,146	63,348
Default Annual CO2 accumulation per tree for Miscellaneous Trees (MT CO2e/tree/year) (From Appendix A of CalEEMod v2016.3.1)	0.0354			
Annual Sequestration from Planted Trees (MTCO2e/year)		-	1,244	2,243
GHG Reductions from A-2.1 (MTCO2e)		-	1,244	2,243
A-2.2				
Increase County Tree Planting		2020	2030	2050
Annual Tree Planting Targets starting in 2017	3500			
Annual Tree Planting Targets starting in 2020	3500			
Total number of Trees Planted since 2017		14,000	49,000	119,000
Feasibility Test				
Average Tree Canopy Area of mature tree (sqft)	50			
Total Acres of Planted Tree Canopy (Acres)		4.0	56.24	136.59
Total undeveloped acres in the County (Acres) (SANDAG)		346,055	306,876	219,557
Percent Coverage by new trees	Very Low-->	0.001%	0.018%	0.062%
Default Annual CO2 accumulation per tree for Miscellaneous Trees (MT CO2e/tree/year) (From Appendix A of CalEEMod v2016.3.1)	0.0354			
Annual Sequestration from Planted Trees (MTCO2e/year)		496	1,735	4,213
GHG Reductions from A-2.2 (MTCO2e)		496	1,735	4,213