

































## 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
<b>Commercial/Industrial and Residential</b>				
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
<b>GHG Reductions from E-1.3 (MTCO2e)</b>				
		-	3,694	18,470



**Energy Reduction Measure Quantification (Continued)**

<b>E-1.4</b>				
<b>Reduce Energy Use Intensity at County Facilities</b>	<b>2014</b>	<b>2020</b>	<b>2030</b>	<b>2050</b>

*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
<b>Total Electricity</b>	<b>142,925</b>	<b>143,840</b>	<b>145,353</b>	<b>148,270</b>
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
<b>Total Natural Gas</b>	<b>2,340,734</b>	<b>2,348,873</b>	<b>2,362,438</b>	<b>2,389,568</b>

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 <b>below 2014 levels</b>	<b>10%</b>	<b>20%</b>	<b>20%</b>
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 <sub>2e</sub> )	4,827	7,346	8,037
Emissions savings from reduced natural gas (MTCO <sub>2e</sub> )	1,659	3,355	3,541
<b>GHG Reductions from E-1.4 (MTCO<sub>2e</sub>)</b>	<b>6,486</b>	<b>10,702</b>	<b>11,578</b>

## Energy Reduction Measure Quantification (Continued)

E-2.1				
Increase Renewable Electricity		2020	2030	2050
<b>Background Calculations</b>				
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 <sub>2e</sub> /MWh)			0.474	0.474
Estimated Renewable Energy Program (REP) Emission Factor (MTCO <sub>2e</sub> /MWh)			0.045	0.040
Average SDGE Emission Factor (MTCO <sub>2e</sub> /MWh)			0.237	0.237
REP Participation Rate			80%	90%
REP Renewable Mix			90%	90%
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)			91%	92%
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 <sub>2e</sub> )			283,069	307,908
Emissions related to Electricity Use from participating customers with REP program (MTCO <sub>2e</sub> )			53,217	52,344
Emissions Reductions (MTCO <sub>2e</sub> )			229,852	255,564
<b>GHG Reductions from E-2.1 (MTCO<sub>2e</sub>)</b>			<b>229,852</b>	<b>255,564</b>

**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>				
<b>Non-residential</b>				
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
<b>Non-residential Electricity Reduction from solar systems under this measure (MWh)</b>		-	<b>56,693</b>	<b>56,693</b>
<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
<b>Total</b>	<b>188,130</b>	<b>18,377</b>	<b>169,753</b>	<b>22,816</b>

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
<b>Total</b>	<b>1,235</b>	<b>819</b>	<b>142</b>
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>	<b>Total</b>		
<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		
<b>Total</b>	<b>11,120</b>		

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

**Energy Reduction Measure Quantification (Continued)**

<b>E-2.3 (Continued)</b>					
Calculated Size of <b>residential</b> solar permits approved from July 2013 through January 2017 for <b>existing buildings only</b>	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 <b>existing residential</b> 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
<b>Feasibility Assessment</b>				
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%
<b>Percent of Electricity use in Existing Homes offset by solar (Feasibility Check)</b>		<b>32%</b>	<b>80%</b>	<b>82%</b>

GHG Reductions from E-2.3 (MTCO2e)	114,571	260,322	260,322
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<b>E-2.4</b>				
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
<b>Baseline</b>		
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
<b>Target</b>		
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
<b>Reduction in Organics</b>		
Percent reduction in organics compared to baseline	43%	Calculated. Assume that emissions are proportional to organics content in waste

#### Forecasted Emissions Reductions

	2030	2050
GHG Emissions from Waste Disposal (MTCO2e)	185,492	201,915
Emissions reductions from SWP (MTCO2e)	79,052	86,052

	2020	2030	2050
GHG Reductions from SW-1.1 (MTCO2e)	-	79,052	86,052

**Water and Wastewater Reduction Measure Quantification**

Assumptions	2020	2030	2050
San Diego County Average Electricity Emissions Factor (MTCO <sub>2e</sub> /MWh)	0.302	0.237	0.237
Natural Gas Emissions Factor (MTCO <sub>2e</sub> /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: <a href="https://water.usgs.gov/edu/qa-home-percapita.html">https://water.usgs.gov/edu/qa-home-percapita.html</a> . Assumes water is also used for washing produce, 5 cooking, and drinking.			
Kitchen faucet water use per day per household with dishwasher (HH) (minutes)			<a href="https://www.energystar.gov/products/appliances/dishwashers/key_product_criteria">https://www.energystar.gov/products/appliances/dishwashers/key_product_criteria</a>
Average dishwasher cycles per unit per year	215		
Average dishwasher cycles per year per HH	215		
Average American family wash loads per year		300	<a href="https://www.energystar.gov/products/appliances/clothes_washers">https://www.energystar.gov/products/appliances/clothes_washers</a>
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**

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

	For water reductions only		
GHG Reductions from W-1.1 (MTCO <sub>2e</sub> )		-	303

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

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

	Assumed to be included in E-1.1		
GHG Reductions from W-1.1 (MTCO <sub>2e</sub> )		-	6,263

**Water and Wastewater Reduction Measure Quantification (Continued)**

<b>W-1.2</b>				
<b>Reduce Outdoor Water Use</b>	<b>2014</b>	<b>2020</b>	<b>2030</b>	<b>2050</b>
<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 <sub>2</sub> 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
<b>GHG Reductions from W-1.2 (MTCO<sub>2</sub>e)</b>		-	17,535	19,087
Electricity savings from local water distribution and treatment (MWh) to calculate E-2.1		-	7,406	8,062

<b>W-1.3</b>				
<b>Reduce Potable Water Consumption at County Facilities</b>	<b>2014</b>	<b>2020</b>	<b>2030</b>	<b>2050</b>
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		kWh/MG		
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 <b>below 2014 levels</b>		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
<b>GHG Reductions from W-1.3 (MTCO<sub>2</sub>e)</b>		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.

<b>Background and Assumptions</b>	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	2.31

  

<b>Water Demand</b>	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

<b>Rain Barrel Savings</b>	2020	2030	2050
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
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%
Annual water savings per year under this measure (gal)		3,788,883	10,103,688
Percent of landscaping demand of participating buildings		4.4%	7.2%
Percent of landscaping demand offset by this measure		0.022%	0.089%
<b>Emissions reductions from water savings (MTCO2e) (million gallons X MTCO2e/MG) (see beginning of calculation)</b>		10	23

<b>Existing Countywide Rooftop Area</b>				
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>				
<b>Calculating Residential Rooftop Space in San Diego County</b>				
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>		
<i>Calculations based on methods used in NREL's PV Watts Calculator http://pvwatts.nrel.gov/pvwatts.php</i>				
<b>Estimated Unincorporated San Diego County Roofspace (Scaled from entire county) (sqft)</b>				
	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

<b>GHG Reductions from W-2.1 (MTCO2e)</b>	10	23	23
Electricity savings from local water distribution and treatment (MWh) to calculate E-2.1	3.70	9.86	9.86

**Agriculture Reduction Measure Quantification**

<b>Assumptions</b>					
		2020	2030	2050	
San Diego County Average Electricity Emissions Factor (MTCO <sub>2</sub> e/MWh)		0.260	0.237	0.237	
Cropland in SD County (acres)	97,432	96,051	95,313	94,494	
<b>A-1.1</b>					
<b>Convert Farm Equipment to Electric</b>		<b>2020</b>	<b>2030</b>	<b>2050</b>	
<b>Background Information</b>					
Emissions from Agricultural Equipment Except for Irrigation Pumps. Scaled by change in cropland. (MTCO <sub>2</sub> e)	86,087	84,867	84,215	83,491	
Percent of Equipment Converted to Electric or Alternative Fuel		0%	8%	8%	
<b>GHG Reductions from A-1.1 (MTCO<sub>2</sub>e)</b>		-	6,737	6,679	
<b>A-1.2</b>					
<b>Convert Stationary Irrigation Pumps to Electric</b>		<b>2014</b>	<b>2020</b>	<b>2030</b>	<b>2050</b>
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 <sub>2</sub> )	11,768	296	3,251	3,251	
Diesel Emission Factor (kg CO <sub>2</sub> /gal)	10.21				
Calculated fuel use of converted pumps (gal)	1,152,982	28,954	318,491	318,491	
<a href="#">Energy content of diesel (kBTU/gal) - lower heating value</a>	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 <sub>2</sub> e)		0.13	1.33	1.33	
<b>GHG Reductions from A-1.2 (MTCO<sub>2</sub>e)</b>		295	3,249	3,249	
Calculated electricity use in electric pumps for selected option (kWh)		509	5,597	5,597	

**Agriculture Reduction Measure Quantification (Continued)**

<b>A-2.1</b>				
<b>Increase Residential Tree Planting</b>	<b>2014</b>	<b>2020</b>	<b>2030</b>	<b>2050</b>
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
<b>GHG Reductions from A-2.1 (MTCO2e)</b>		-	1,244	2,243
<b>A-2.2</b>				
<b>Increase County Tree Planting</b>		<b>2020</b>	<b>2030</b>	<b>2050</b>
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
<b>Percent Coverage by new trees</b>	<b>Very Low--&gt;</b>	<b>0.001%</b>	<b>0.018%</b>	<b>0.062%</b>
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
<b>GHG Reductions from A-2.2 (MTCO2e)</b>		496	1,735	4,213