Energy Master Plan

Waterworks Roadmap to Sustainable Operations

2015

The Districts seeks to improve, optimize, and reduce its energy consumption and greenhouse gas emissions by developing an energy master plan. The plan identifies a portfolio of cost effective programs and projects to reduce the Districts' future energy usage and costs, as well as greenhouse gas emissions.

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Los Angeles County Waterworks Districts Energy Master Plan

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1 Executive Summary

The Los Angeles County Waterworks Districts' (Districts) mission is to provide reliable, high-quality water in a safe, cost-effective, sustainable, and environmentally responsible manner. Since the 1960's electric rates have been steadily increasing from 2.5¢ per kilowatt hour (kWh) to 10 per kWh in 2010. Due to such a significant increase, the Districts have spent approximately $3.5 million a year for its electricity consumption in recent years. Additionally, the Districts expect to consume more electricity to meet larger customer demands in the future. The consumption of greater amounts of electricity means more emissions of greenhouse gases (GHG) generated in the process of creating power from fossil fuels. As public servants and stewards of the environment, it is our job to be responsible and as such use electricity efficiently.

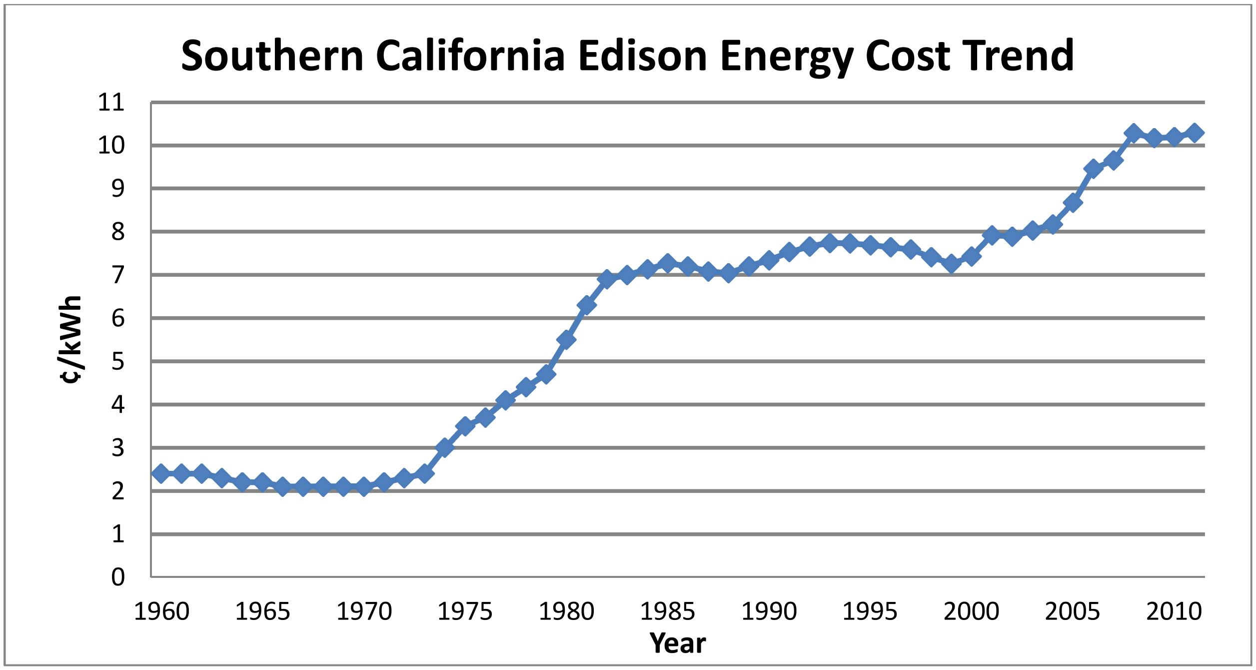


Figure 1 – Energy Rate Cost Trend

Prior to 2014, the Districts initiated programs like a well maintenance program, optimization of electric rates, and a renewable energy program to mitigate rising costs in electricity and increases in electrical consumption. From 2007 to 2014, these programs have reduced electrical consumption by approximately 5 million kWh and avoided close to a million dollars in utility costs.

Although, these programs have been successful, there is a lot more that can be done. Looking into the future, in 20 years it is estimated that electric costs will increase from $3.5 million per year to $11.5 million per year and electrical consumption will go from 31 million kWh per year to 49 million kWh. These forecasts are summarized in Figure 2.

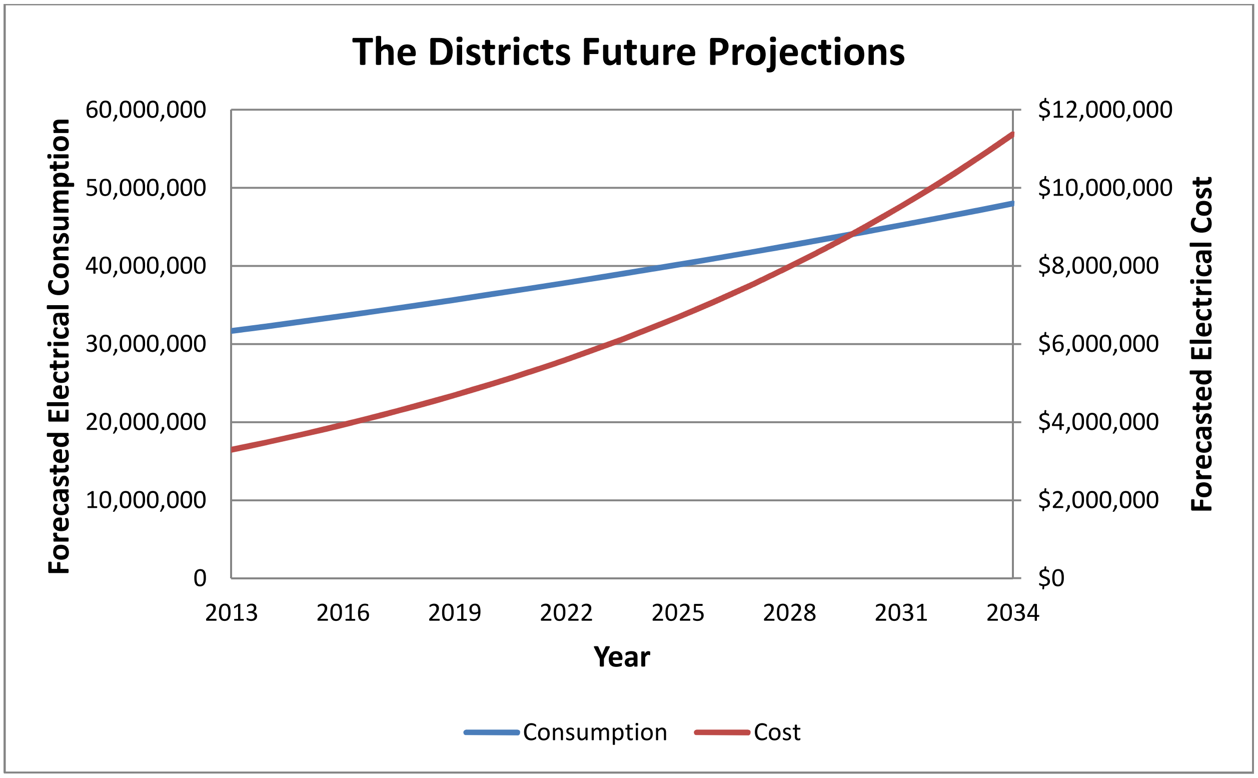


Figure 2 – Summary Forecast for the Districts Cost and Consumption

An energy master plan (EMP) is a practical next step in the Districts' progress of managing electrical costs and environmental concerns. The EMP provides the Districts an organized, systematic, and long-term strategy towards this lasting issue of maintaining reasonable rates for its services. The EMP identifies a portfolio of 15 cost effective programs and projects, (summarized in the appendix, Section 10.3), to reduce the Districts' future energy usage and costs, as well as reduce GHG emissions

These 15 identified projects when implemented by 2020 have the potential to reduce both the Districts' electrical costs and electrical consumption by about one third by 2034; saving about $73 million with $31 million invested, resulting in a net savings of $42 million. Figures 3 and 4 forecast electrical costs and consumption, respectively, with the recommended EMP projects.

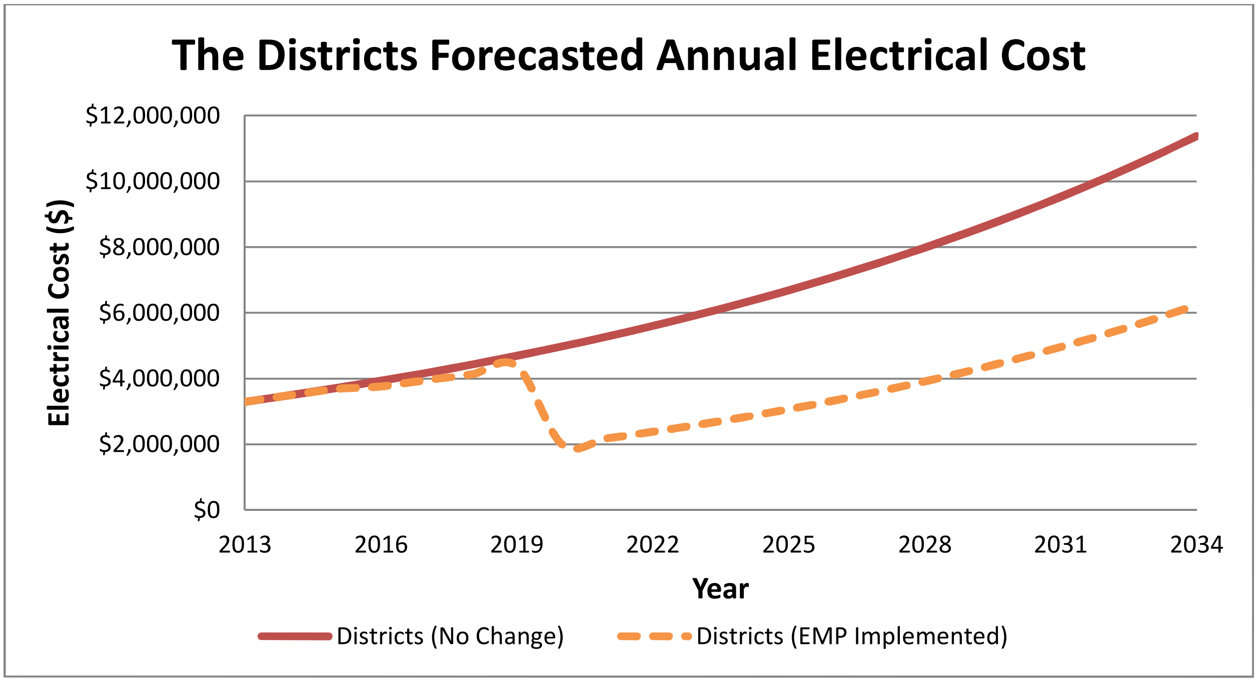


Figure 3 – Forecasted Electrical Costs

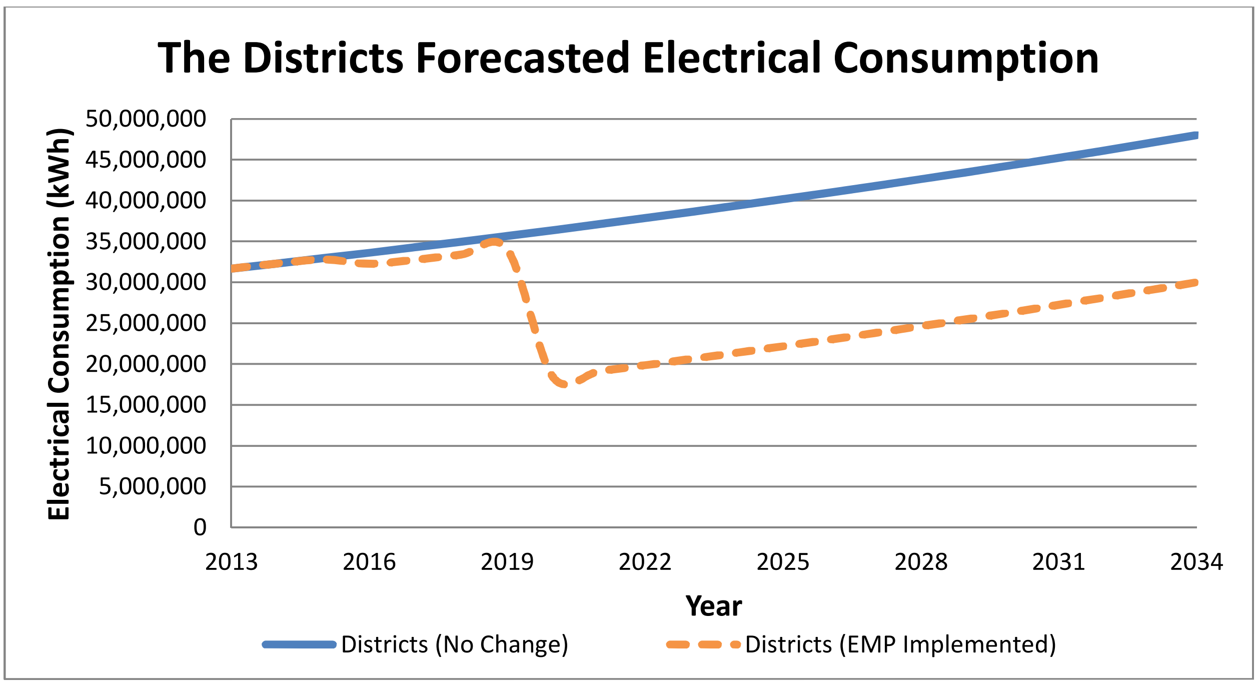


Figure 4 – Forecasted Electrical Consumption

An EMP is an important element for ongoing Districts operations because it provides long-term operational vision. This master plan should be revised every three to five years because, as time moves forward and projects complete, new opportunities for efficient energy management, cost savings, and GHG reductions will present themselves in the form of new projects and new technologies.

2 Master Plan Startup

2.1 Master Plan Goal

The Districts seeks to improve, optimize, and reduce its energy consumption and GHG emissions by developing an energy master plan. The plan identifies a portfolio of cost effective programs and projects to reduce the Districts' future energy usage and costs, as well as GHG emissions.

2.2 Greenhouse Gas Emissions

Gases that trap heat in the atmosphere are often called GHG. Some GHGs such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities (i.e. volcano eruptions and processing limestone into cement). Other GHGs are created and emitted solely through human activities. The categories of GHGs typically referred to by most inventories include carbon dioxide, methane, nitrous oxide and the fluorinated gases (i.e., sulfur hexafluoride, hydroflurocarbons (HFCs) and perfluorocarbons (PFCs)).

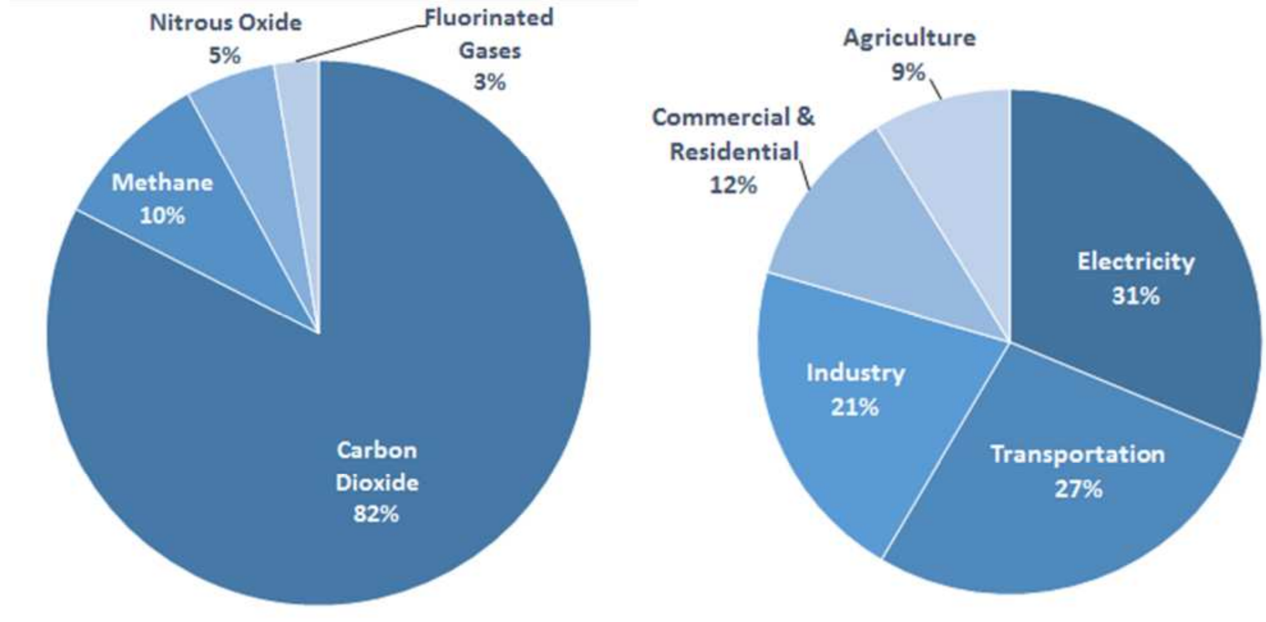
Carbon Dioxide (CO_2): Carbon dioxide enters the atmosphere through the burning of fossil fuels, incineration and landfill disposal of solid waste, trees, wood products, and also as a result of other chemical reactions (for example, manufacturing of cement). Carbon dioxide is also removed from the atmosphere (or "sequestered") when plants absorb it as part of the biological carbon cycle.

Methane (CH_4): Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from the decay of organic waste, and are a major byproduct of municipal landfills. Agriculture is also a major source of methane generated as a waste product by livestock.

Nitrous Oxide (N_2O): Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Nitrous oxide is also used as a component of anesthesia medications.

Fluorinated Gases: HFCs, PFCs, and sulfur hexafluoride are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances. These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as High Global Warming Potential gases ("High GWP gases"). Fluorinated ethers including the common anesthesia gases sevoflurane, desflurane and isoflurane are derivatives of hydrofluorocarbons and have significant GWP.

U.S. Greenhouse Gas Emissions in 2013



Total Emissions in 2013 = 6,673 million MT of CO_2 equivalent

Source: EPA.gov

A common unit of measurement for CO_2 is a metric ton, but what does a metric ton (MT) of CO_2 look like? About 12 MT of CO_2 are released each year as a result of energy being consumed by the average American household. If the average car travels 10,000 miles per year, it will emit 4.2 MT of CO_2.

2.3 Previous Energy Efficiency Efforts

The previous energy efficiency efforts will look at the Districts' efforts starting in 2007. From 2007 to the present the Districts initiated a series of programs to increase energy efficiency. These programs include a well maintenance program, optimizing electric rates, and a renewable energy program. In short, from 2007 to 2014, these programs have reduced electrical consumption by approximately 5 million kWh and avoided close to a million dollars in utility costs.

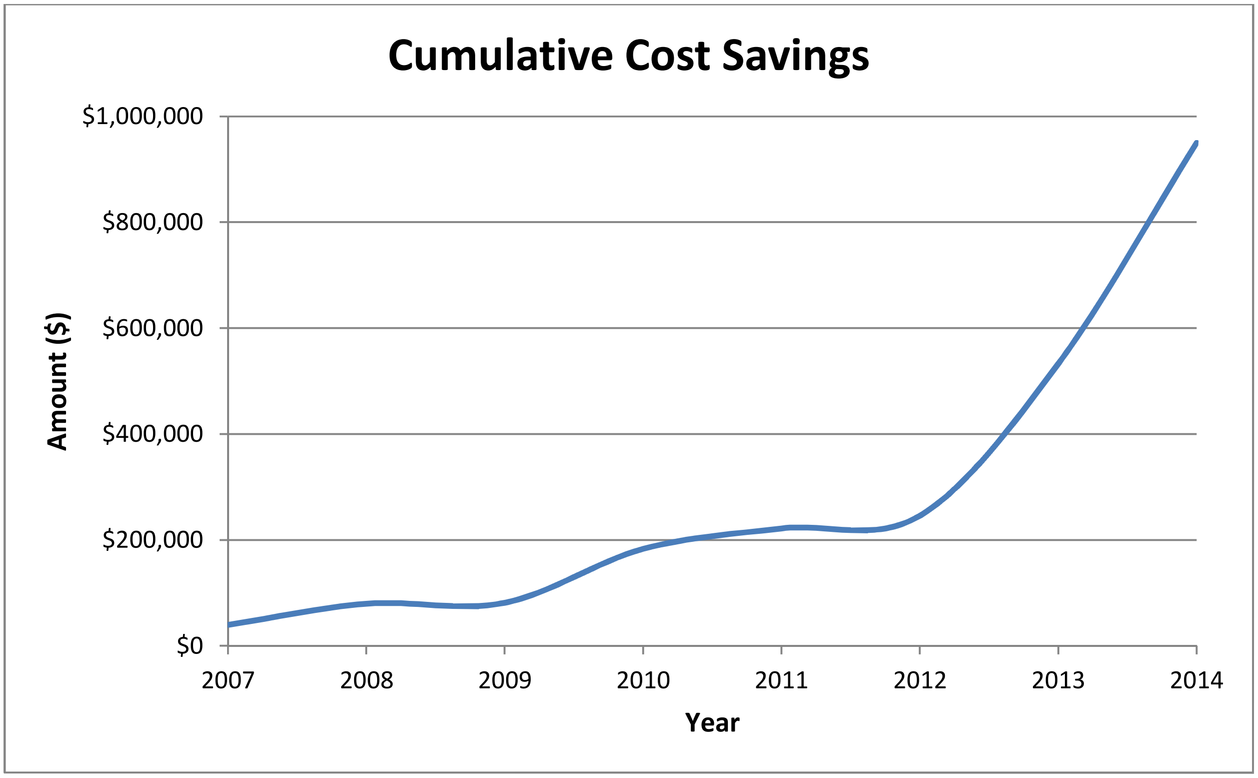


Figure 5 – The Districts' Previous Energy Efficiency Efforts – Cost Savings

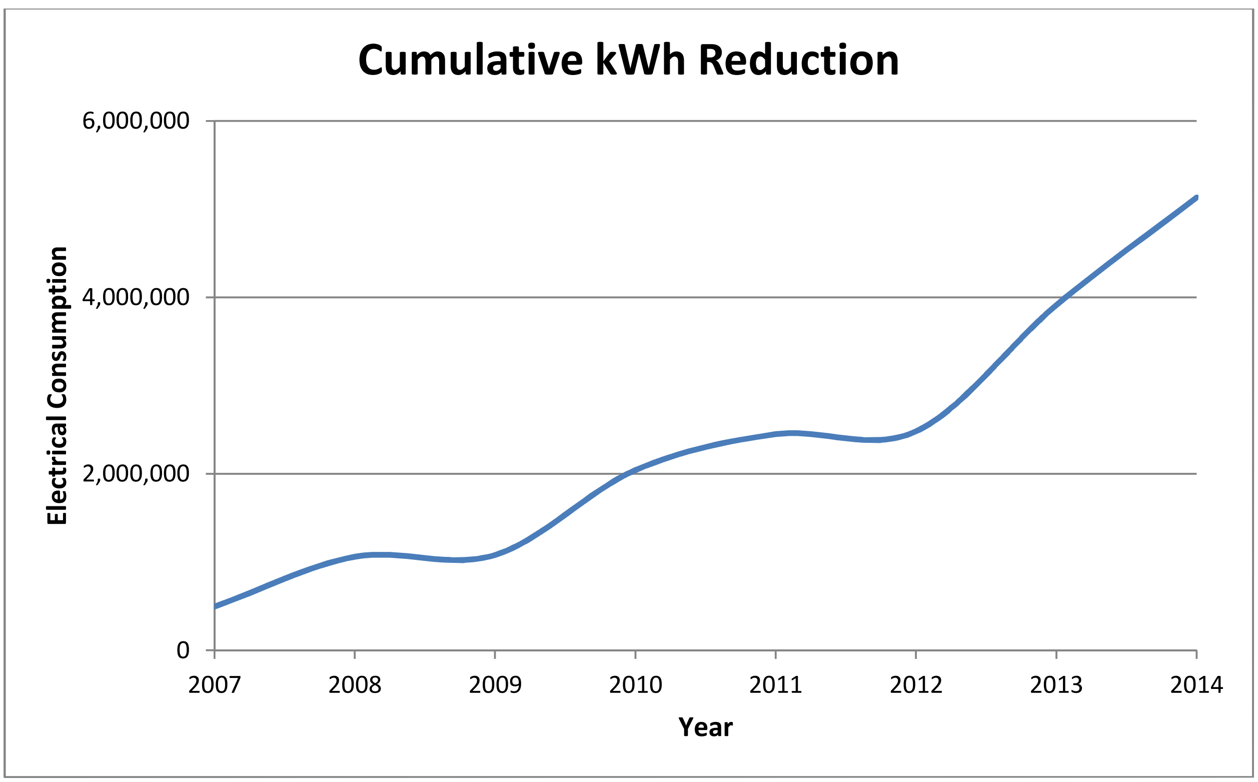


Figure 6 – The Districts' Previous Energy Efficiency Efforts – Energy Reduction

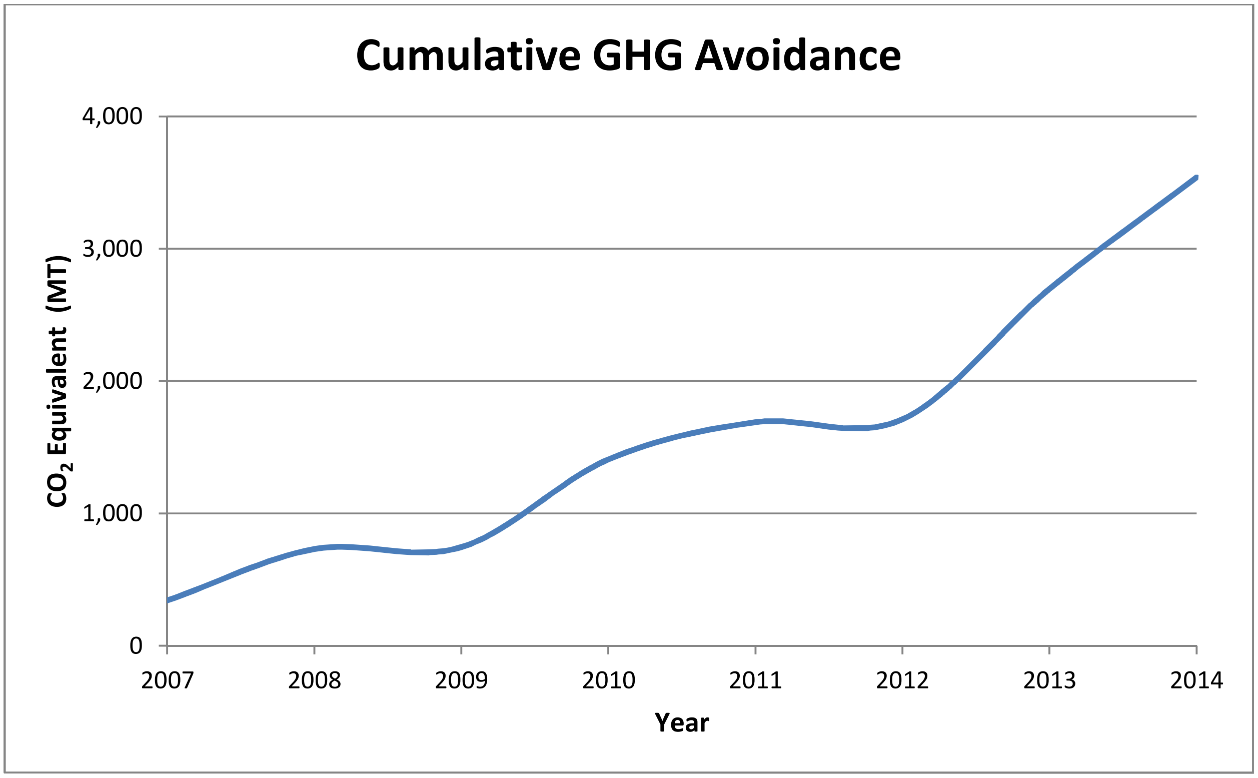


Figure 7 – The Districts' Previous Energy Efficiency Efforts – Greenhouse Gas Avoidance

2.3.1 Well Maintenance Program

In 2007, the Districts launched an effort to develop a proactive Well Maintenance and Efficiency Program. This unique program takes a new innovative pro-active approach linking together a network of electro-mechanics, engineers, water analysis lab staff, and well contractors in the entire evaluation, procedural selection, and high standard performance process. Everyone participates in reducing energy, improving mechanical efficiency, water quality, and protecting the environment.

Since implementation, the program saved $307,000 and reduced its electrical consumption by 3 million kWhs.

2.3.2 Optimizing Electric Rates

In the past, electrical service accounts were under Southern California Edison's (SCE) general service rate structure. This rate structure typically belongs to residential consumers, whom typically consume relatively low amounts of electricity and are billed at higher rates. The Districts' first approach to efficient electrical usage was to verify that electrical service accounts were billed under appropriate rate structures, in the Districts' case, pumping and agriculture. The value of this change has not been calculated, but it is estimated to be in the millions of dollars. This change was made in the 1990's.

In the last few years, SCE introduced a "Time of Use" (TOU) modification to their rate structures. TOU means that there is a different cost for electricity depending on the hour that it is consumed. In the fall of 2012 and spring of 2013, the Mechanical Engineering Unit of the

Districts performed analysis on the water system to determine if it was able to store enough water in water tanks such that during the day they could meet the demand of the customers without pumping and recharge during the nights. The findings supported the hypothesis and in the summer of 2013 timeclocks were installed on key pumping stations to restrict pumping from 12 p.m. to 6 p.m. on weekdays. This simple operational change in when electricity was consumed saved the Districts approximately $120,000 in four months.

Another action taken to optimize the electrical service accounts was to substantiate Option A and B modifiers to rate schedules. SCE implemented Option A and B into their rate schedules at the start of 2014. These options give power consumers two different ways of purchasing electricity during peak intervals. If a consumer has a small device and consumes a substantial amount of electricity, Option B is more economical. If a consumer has a large device and consumes an insignificant amount electricity, Option A is more economical. These are just two possible situations of many that would describe an optimum choice for Option A or B; a calculation using a formula is required to determine optimization. Furthermore, options may only be changed once in a month 12 interval.

The optimizing formula was applied to each electrical account to determine the best choices for the planned operation of each account. If no action was taken, SCE would have chosen default options for each account. By performing the optimization process, it resulted in a difference from SCE's default selection. The difference offered a savings of approximately $50,000 for one calendar year.

2.3.3 Renewable Energy

On January 31, 2012, the Los Angeles County Board of Supervisors approved the proposal for District 40 to construct a $2 million Solar Power System at a water well field in Lancaster. Of the $2 million construction cost, $650,000 was reimbursed to District 40 by the California Solar Initiative Program.

The system is a 350-kilowatt, ground mounted single-axis tracker solar photovoltaic system, producing approximately 860,000 kilowatt-hours per year. The solar photovoltaic panels are installed at a 2.5 acre District 40 facility on 5th Street West at Avenue K-8 in Lancaster. The panels are powering the three groundwater wells and four booster pumps on that site.

The project's life expectancy is estimated to be 25 years and the payback period of the District's share of the project cost is estimated to be 12 years, beyond which the District's cost for the generated power is zero. Money to pay for the work came from the District's accumulated capital outlay (ACO) fund budget from 2012 and 2013.

As of May 2015 the site has generated 2,051,279 kWh and reduced operating costs by $534,000 through a combination of living rebates and avoided electrical costs.

3 Establishing a Baseline/Present State

A baseline is established to measure performance of future programs and projects identified in the plan. The baseline is constructed using 3 years' worth of data from total electrical usage at pump stations, money spent on electricity, total water supplied (purchased and pumped), pump efficiency tests, and GHG emissions, which are extrapolated from electrical usage. The information gathered on water supplied and pump efficiencies will not be a subject of discussion in this report. It was gathered for future comparison.

3.1 Data for Baseline

Data used to develop the baseline was collected for all of the Districts and in the case of District 40, each region was delineated. The data supporting the electrical costs and usage was collected from bills provided by SCE for three of Los Angeles Department of Public Works accounts: 2-00-416-9710, 2-07-884-4222, and 3-026-8375. Information regarding water usage and cost was gathered from the Water Resources Unit, of the Districts, database logging water purchases and production. Information pertaining to pump efficiency and performance was assembled from the latest available SCE Efficiency and Summary Test performed on each pump in the distribution network.

3.2 Energy Baseline Summary

The data displayed in Table 1 depicts an average of data collected over three calendar years, 2011, 2012, and 2013. Data is organized into three topics: Energy, Water, and Metrics.

- Energy – This topic summarizes information pertaining to electrical cost and consumption.
    - Consumption is the recorded amount electricity measured through a meter for an average year using three years' worth of data.
    - Cost is the billed amount for that measured consumption through the meter for an average year using three years' worth of data.
- Water – This topic summarizes water available to the Districts.
    - Purchased is the volume of water provided by a water wholesaler. The wholesalers available to the Districts are Antelope Valley East Kern (AVEK), Los Angeles Department of Water and Power (LADWP), Castaic Lake Water Agency (CLWA), and the Metropolitan Water District (MWD).
- Metrics – Values used to rate operational parameters.
    - ¢/kWh – cost per kilowatt hour is a simplistic way of evaluating a unit cost for electricity
    - $/AF – cost per acre foot (AF) is an approximate cost per unit of water accounting for pumping cost. Maintenance and employee salaries are not included into this metric.
    - kWh/AF – kilowatt per acre foot is an approximation for the energy involved to move one acre foot of water from the source to the customer in the distribution system. This number is more relevant on a micro scale because the topography of the entire districts vary considerably.

	Energy		Water		Metrics		
District	Consumption (kWh)	Cost ($)	Purchased (AF)	Groundwater (AF)	¢/kWh	$/AF	kWh/AF
21	44,572	6,760	60	0	15.2	112.04	739
29	5,660,918	683,984	8,667	0	12.1	78.92	653
36	1,434,350	166,685	709	555	11.6	131.83	1,134
37	3,034,931	303,001	661	2,069	10.0	111.02	1,112
40	22,484,177	2,237,514	31,254	18,967	10.0	44.55	448
Region							
4	15,327,471	1,484,055	22,067	15,988	9.7	39.00	403
24	615,704	67,328	596	415	10.9	66.60	609
27	656,777	72,936	0	661	11.1	110.28	993
33	n/a	n/a	814	0	n/a	n/a	n/a
34	2,733,320	285,343	6,734	315	10.4	40.48	388
35	453,115	46,293	0	319	10.2	144.98	1,419
38	1,609,271	161,678	1,043	1,099	10.0	75.45	751
39	96,722	19,324	0	168	20.0	115.17	576
Total	31,669,792	3,297,751	41351.7	22933.2	10.4	51.30	493

Table 1 – Baseline Metric Summary Table

3.3 Forecasting

Once a baseline was established, it was important to determine future trends. Using a conservative 2% increase estimate in annual electrical consumption based on population growth and a 4% increase in annual electrical cost based on observed electrical costs trends observed from SCE bills between 2010 and 2014. The following forecasting charts were developed.

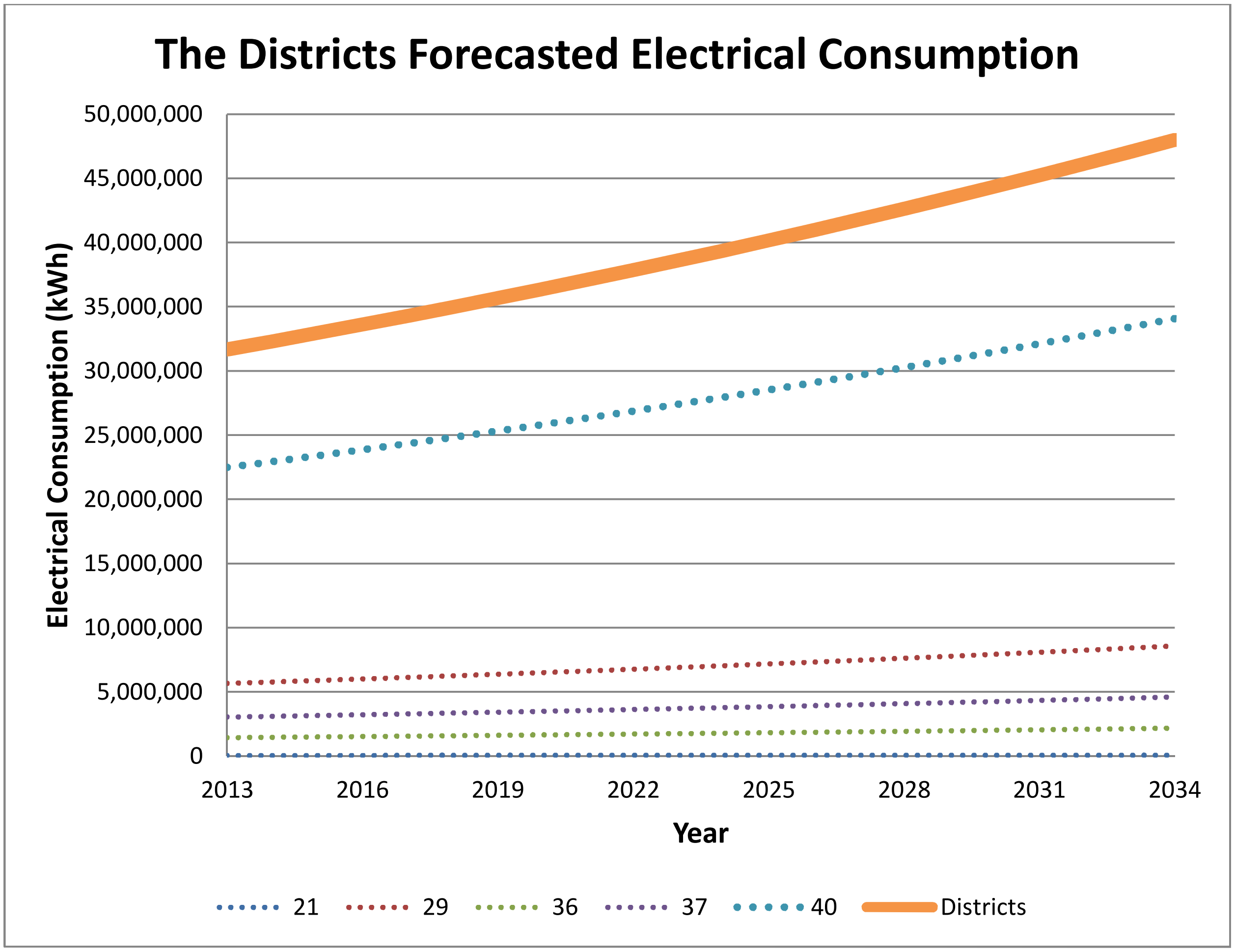


Figure 8 – Forecasted Annual Electrical Consumption

Figure 8 shows annual electrical consumption for the Districts. Annual consumption is shown by multiple plots. The solid orange line depicts an amalgamation of District data to give a Districts' total and the dotted lines show individual districts. The data starts with a baseline value and then progresses through time with an assumed 2% annual increase. The growth in electrical consumption is based on population growth. While the population of the communities the Districts serves, so will the amount electricity required to deliver larger volumes of water.

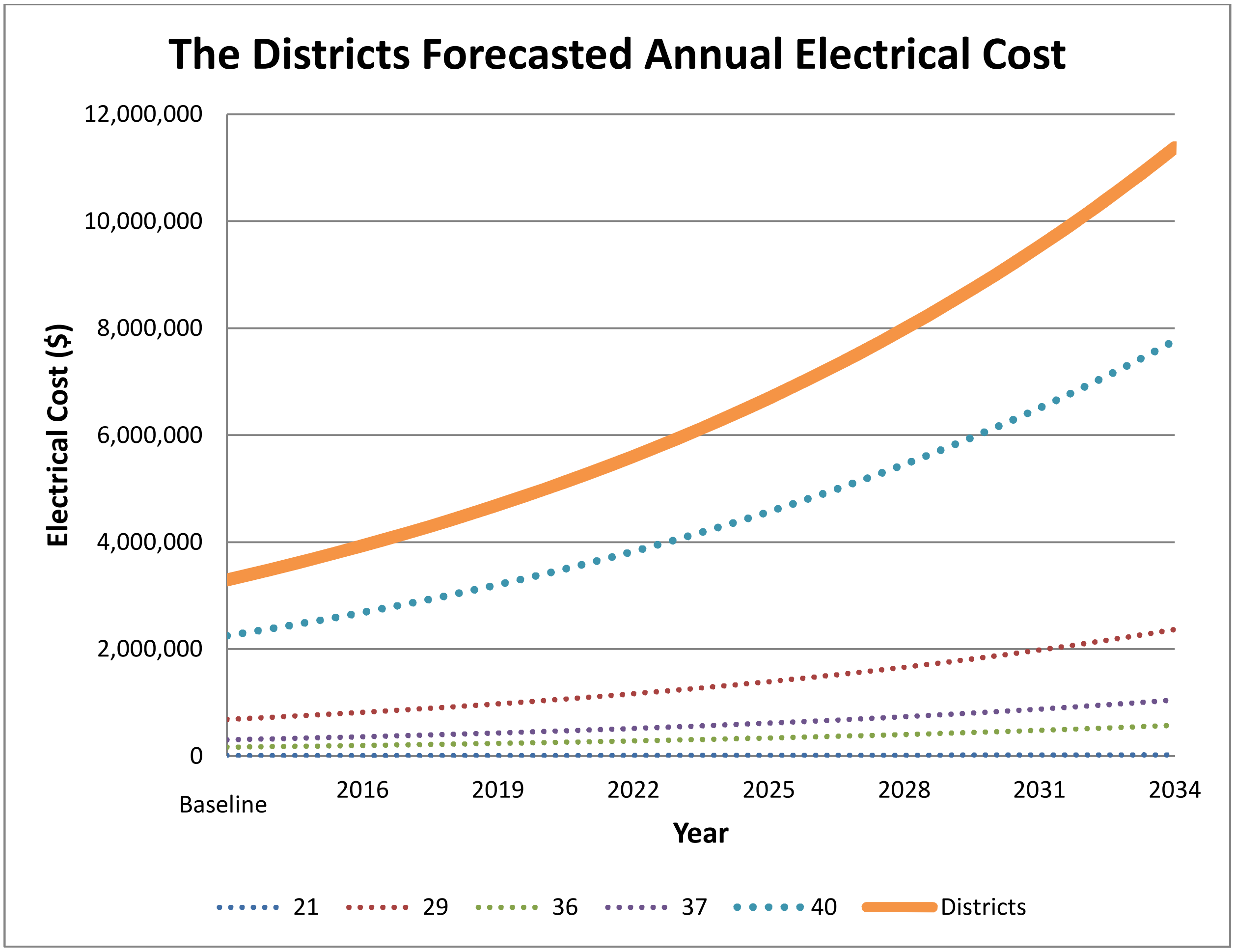


Figure 9 – Forecasted Annual Electrical Cost

Figure 9 shows annual electrical costs for the Districts. Annual costs are shown by multiple plots. The solid orange line depicts an amalgamation of District data to give a The Districts total and the dotted lines show individual districts. The data starts with a baseline value and then progresses through time with an assumed 2% annual increase in consumption and 4% increase in electricity costs. The growth in electrical consumption is based on population growth and the increase in electricity costs is based on observed historical increases in electric bills from 2010 to 2014.

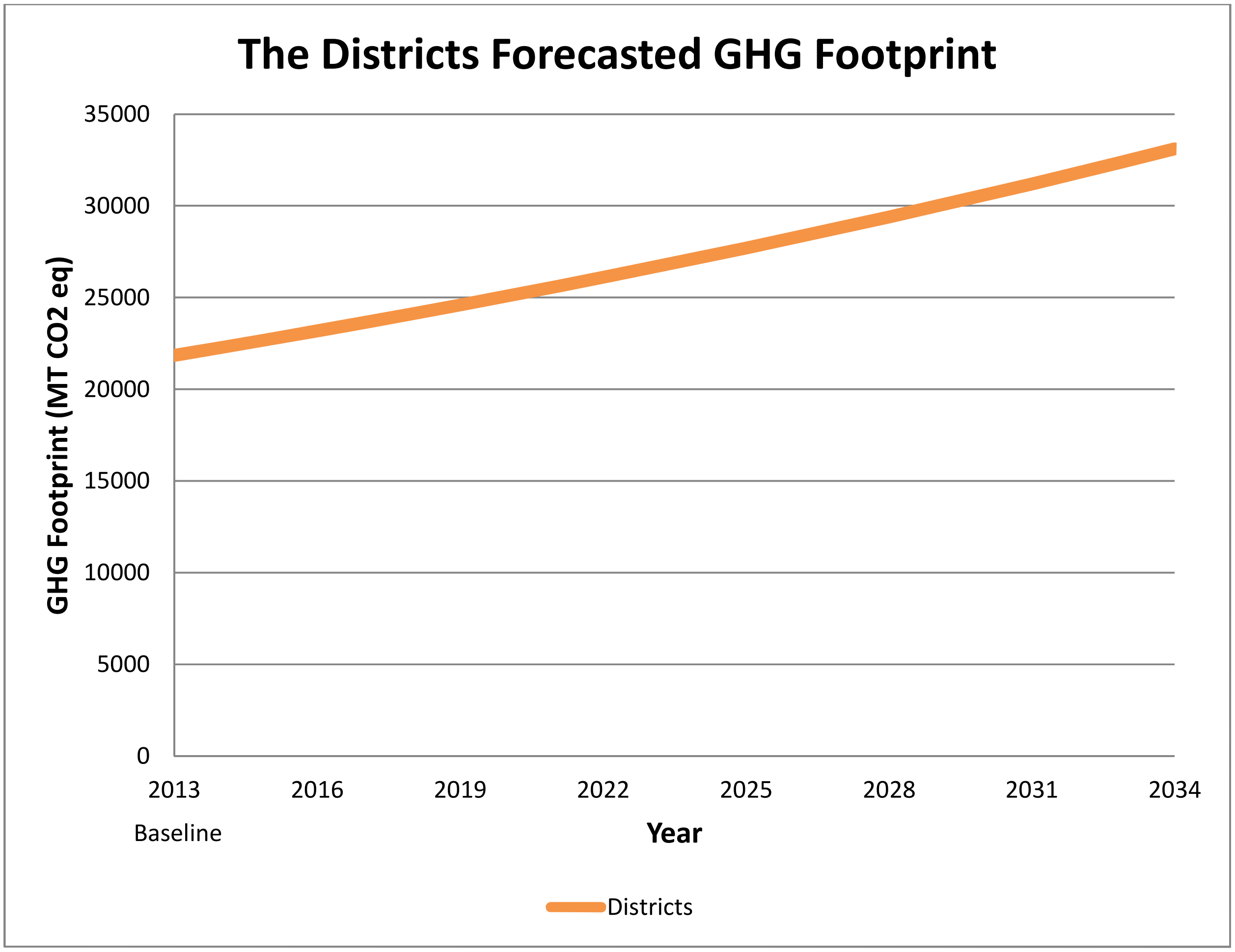


Figure 10 – Forecasted Annual Greenhouse Gas Emissions

Figure 10 shows annual GHG emissions for the Districts. Annual GHG emissions are shown as a single plot. The solid orange line depicts an amalgamation of individual District data to give a Districts total. The data starts with a baseline value and then progresses through time with an assumed 2% annual increase of electrical consumption. GHG emissions are determined using a United States Environmental Protection Agency (USEPA) conversion factor from kWh to CO_2 equivalence. It should be noted, that every power company has a different assortment for power generation. While the USEPA conversion factor produces a quantity of CO_2 equivalence, it is only an estimate and should not be used with 100% confidence.

4 Project Identification

4.1 Introductory Project Identification

A preliminary project list was prepared through a series of brainstorming sessions with project proposers. They were encouraged to express ideas that would benefit the water distribution system, no matter how grounded. This list includes numerous projects and project concepts; the complexity of the projects varying from simple to extremely difficult. Projects are classified into three categories; current projects, new projects, and project concepts.

A current project is defined as a project that has a well-defined scope of work, and or project concept report drafted. This project consists of some or all of the following documentation; project feasibility studies, detailed drawings/plans & specifications, detailed estimates for project cost, environmental permit, social acceptability of the project and other requirements for fund sourcing. This project may also be under construction. Given the timeline for the completion of this EMP, if a project started off as a current project, and during the time towards completion of the EMP the project was completed, the project will still be considered in the scope of projects for the EMP.

Examples of current projects include micro hydro turbine, installing solar panels at the North Maintenance Area (NMA) Office, and reconfiguring a pump station.

A new project is defined as a project that has the potential to be drafted into a Project Concept Report at any time. The project has no completion goal and no capital invested. However, this type of project is very close to being shovel ready.

Examples of new projects include upgrade all pump motors to ultra-high efficient.

A project concept is defined as a project that is only an idea. There is no well-defined scope of what needs to happen to complete the project, whom will complete the project, and how much the project will cost.

Examples of project concepts include implementing new SCE rate schedules, expanding water reuse programs.

4.1.1 Summary of Project Identification Meetings

A total of 45 project ideas were conceived during the project identification phase. A complete summary of these projects can be found in the Appendix, Section 10.2.

4.2 Project Compiling and Classification

The next step is to qualitatively evaluate each project or concept through an initial screening process. This step is an elimination procedure. It is looking at the practicality of completing the project, initial impression of cost/benefit, and resources available to complete and implement. Table 2 shows a summary of the projects selected for further analysis.

#	Project Title	District
1	VFD for Intermediate Zone at Calm Garden PS	37
2	NMA Office Solar Carport	40
3	Lancaster HQ Interior Lighting Equipment Upgrade	40
4	Electric Vehicles for meter readings - Lancaster	40
5	Modify Vehicle Fleet	29/40
6	Micro Hydro Turbine @ M7W	40
7	Electric Vehicles for meter readings - Malibu	29
8	Coastline Drive 12" Waterline Replacement	29
9	Sweetwater System Improvement	29
10	5 MW Solar Field	40
11	Malibu Chlorine Injection System	29
14	Coolwater System Improvements	40
15	Micro Hydro Turbine @ 3 Locations	29/40

Table 2 – Summary of Projects for Assessment

5 Project Assessments

A project assessment is a quantitative evaluation of each project or concept.

Each of the projects brainstormed was assessed in order to determine the effectiveness, applicability, feasibility, total capital investment, and potential savings associated with the project concept. By performing a project assessment, it helps "level the playing field" when evaluating projects against one another.

Every project was assessed using a common template containing the following elements:
- Brief technical description
- Appropriate sizes or scale and space requirements
- Potential energy production or GHG reduction
- Cost (capital, incentives & grants, operation and maintenance (O&M) and life cycle cost
- Impacts on operations and required support facilities

5.1 Project Assessment Cost Template

The purpose of the assessment template is to develop and organize the raw data associated with each project. Raw data is organized into six sections with several items. Expanded details pertaining to the sections of the project assessment template can be found in the Appendix in Section 10.5.

- **Primary Equipment/Program Costs**

This section is dedicated towards capital investment of the project itself. This section is trying to determine the fixed and engineering costs to get the project to an operational state.

  - Unit Investment Cost
  - # of Units
  - Equipment Life
  - Engineering Costs (% of Project Cost)
  - Engineering Costs
  - Fuel Costs ($/yr)

- **Utility Management**

This section is dedicated towards electricity, either consumption or production.

  - kW per Unit
  - Capacity Factor
  - Annual kWh Produced
  - Annual kWh Saved
  - Water Savings (AF)

- **GHG Reductions**

This section is dedicated to GHG reductions. GHG reductions will appear in two cases: reduction in gasoline consumption or reduction of electrical consumption either through improvement in operations or production of renewable energy.

  - Annual CO_2 Reduction (MT)

- **O&M Costs**
  - # of Full Time Employees
  - O&M Cost ($/kWh, $/Hr, $/ft))

- **Other equipment costs**

The purpose of this section is to identify additional costs burdened by a project. For example, if a new pump station were desired, it would require a construction to install the pumps. The construction would require a building, foundation, installation, permitting, construction management, etc. Another example could be new equipment is installed and it requires an outside consultant to configure the device to work with the Districts' system, the cost required to install and configure the system would be included here.

- **Incentives/Rebates: SCE's Customized Incentives/Rebates**

This section is dedicated towards direct monies earned or received as a result of the project.

  - Incentive ($/kWh)
  - # of years for Incentive
  - Rebate
  - # of years for Rebate
  - Offset value ($/metric tons CO_2)

5.2 Assessing Projects

Using the information collected from the project identification form, completed project assessment cost forms, and other available information, a project assessment write up was composed. A project assessment aims to describe a problem, a proposed solution, estimated project cost, potential savings over 20 years, and GHG elimination over the same time period. These assessments will be used to determine a project priority. Table 3 shows summary information from the project assessments. There are two columns for project cost, Net Project Cost shows a value to construct the project, Energy Project Cost shows a value if the project is associated strictly with energy efficiency, in other words, the project is not part of a capital needs project.

ID#	Project Title	Dist	Net Project $	Energy Project $	20 Year Savings	Project Net Savings	20 Year GHG (MT CO_2)
1	VFD for Intermediate Zone at Calm Garden PS	37	$212,000	$212,000	$429,467	$217,467	1,820
2	NMA Office Solar Carport	40	$900,000	$150,000	$976,000	$826,000	2780
3	Lancaster HQ Interior Lighting Equipment Upgrade	40	$63,000	$63,000	$79,279	$16,279	336
4	Electric Vehicles for meter readings - Lancaster	40	$320,000	$20,000	$359,314	$339,314	580
5	Modify Vehicle Fleet	29/ 40	$6,300,000		$1,652,387	$1,652,387	2,480
6	Micro Hydro Turbine @ M7W	40	$1,460,000	$890,000	$2,708,852	$1,818,852	11,440
7	Electric Vehicles for meter readings - Malibu	29	$161,000	$12,000	$170,158	$158,158	280
8	Coastline Drive 12" Waterline Replacement	29	$1,467,000		$579,097	$579,097	2,460
9	Sweetwater System Improvement	29	$500,000		$115,230	$115,230	276
10	5 Megawatt Solar Field Array in Antelope Valley	40	$20,900,000	$20,900,000	$51,949,725	$31,049,725	172,380
11	Malibu Chlorine Injection System	29	$3,000,000		$160,000	$160,000	40
12	Carbon Mesa Rd to Fire Station System Enhancement	29	$4,742,000		$236,578	$236,578	780
13	Sweetwater Mesa System Design and Construction	29	$8,700,000		$437,798	$437,798	1,640
14	Coolwater System Improvements	37	$330,000		$728,000	$728,000	2,120
15	Micro Hydro Turbine @ 3 Locations	29/ 40	$9,800,000	$8,754,410	$12,307,328	$3,552,918	52,000
			Totals	**$31,001,410**	**$72,889,213**	**$41,887,803**	**251,412**

Table 3 – Summary of Assessed Projects

6 Project Scoring and Ranking

The scoring and ranking section of the EMP offers a means of quantifying the importance of a project. This step is instrumental to determining a project implementation schedule and funding.

6.1 Evaluation Criteria and Weighting

Evaluation criteria and weighting is the first step into determining a priority list for the projects and the assessments that relate to them. An evaluation criterion is a category on which to examine the projects through. During the development of the evaluation criteria several topics were considered. Some of the topics considered include cost, environmental impacts, technology maturity, adequate size, political and community impacts, greenhouse gas impacts, and operational impacts. The final criteria are summarized in table 4.

Weighting is a point value assigned to an evaluation criterion to determine an importance factor. The point value assigned is numerical number used to demonstrate the significance of a given criterion. The weights for the chosen criteria are in table 4.

Evaluation Criteria	Description	Weight
Cost/Cost-Effectiveness	• How does this project cost compare to the other projects and to the continued purchase of electricity? • Relative level of capital, operations and maintenance (O&M), and present worth life - cycle costs for the proposed projects. • Cost - effectiveness evaluation by dividing the annualized life - cycle cost by the estimated amount of GHG reduced or kWh produced, to determine a $/MT CO_2 or $/kWh value for the proposed project. • Expected life of the asset. • Incentives.	30
Operational Impacts	• General operations and maintenance complexity. • Additional support utility requirements. • Number of different processes and equipment. • Level of automation and ease of operation. • Staffing and maintenance requirements.	5
GHG & Environmental Impacts	• Amount of energy saved, renewable energy produced, or GHG mitigated by a proposed project. • Reduction of local energy consumption and/or local GHG emissions. • How well do the reductions in GHG compare to the other projects and to continued purchases of electricity?	20
Project Development & Constructability	• Where is the project in the design phase? • Has it begun construction? • Does it have funding? • Number of available suppliers. • Experienced vendors available. • Proven performance, stage of research and/or development, reliability, and sustainability of the proposed project.	45

Table 4 – Evaluation Criteria and Weighting Table

6.2 Scoring and Ranking

Once an evaluation criteria as well as category weighting were developed, a meeting with project proposers was scheduled. The purpose of the meeting was to review the projects that received assessments and score them within each evaluation criterion using the determined weights. The following table presents the findings of this meeting along with a total score for each project

Evaluation Criteria Score Card

	Category																																				
Project #	Cost/Cost-Effectiveness (0-30)									Operational Impacts (0-5)									GHG Impacts & Environmental Impacts (0-20)									Project Development & Constructability (0-45)									Total Score
1	30	30	30	30	30	30	30	30	30	5	5	4	3	5	5	5	4	5	10	2	5	10	8	7	10	8	8	45	45	45	36	45	40	45	45	43	85.3
2	15	18	20	20	18	25	20	17	19	5	5	5	5	5	5	5	5	5	20	20	20	20	20	20	20	20	20	40	45	40	45	45	40	44	45	43	87.1
3	26	26	30	30	25	20	20	25	25	2	2	3	3	3	2	3	2	2	0	15	10	10	5	5	5	7	7	40	40	40	40	37	35	40	30	38	72.5
4	20	20	16	16	20	23	22	20	20	4	4	3	4	5	5	4	3	4	3	20	15	20	20	15	20	20	17	40	28	23	35	30	33	35	30	32	72.0
5	30	26	23	23	30	26	23	23	25	3	5	4	4	3	5	4	4	4	8	20	20	15	8	20	20	15	16	40	14	23	20	40	14	23	20	24	69.2
6	29	28	23	23	29	28	23	23	25	5	4	3	3	5	4	3	3	4	15	20	20	20	20	20	20	20	19	45	32	45	23	45	32	45	40	38	86.5
7	20	20	16	16	20	23	22	20	20	4	4	3	4	5	5	4	3	4	3	20	15	20	20	15	20	20	17	23	27	23	23	30	25	28	30	26	66.3
8	29	28	23	23	29	28	23	23	25	5	4	3	3	5	4	3	3	4	15	20	20	20	17	18	15	20	18	40	32	40	23	35	40	45	40	37	83.9
9	20	18	25	25	15	15	20	20	20	5	5	5	5	5	5	5	5	5	15	10	20	20	15	10	12	20	15	10	12	10	15	8	20	15	10	13	52.5
10	30	30	25	25	30	25	25	20	26	5	5	5	5	5	5	5	5	5	20	20	20	20	20	20	20	20	20	10	12	10	15	8	20	15	10	13	63.8
11	15	15	15	0	15	15	15	15	13	4	3	4	4	5	3	2	4	4	10	7	10	5	8	10	5	5	8	10	5	5	10	6	7	10	10	8	32.1
12	8	15	10	20	14	25	20	30	18	5	5	5	5	5	5	5	5	5	15	18	20	20	15	17	20	20	18	30	30	35	30	40	35	40	38	35	75.6
13	8	15	10	10	14	10	5	6	10	5	5	5	5	5	5	5	5	5	15	10	20	20	15	10	12	20	15	35	30	20	30	40	30	30	38	32	61.6
14	25	25	28	30	25	30	27	30	28	5	5	5	5	5	5	5	5	5	15	17	16	20	20	14	18	20	18	30	45	45	38	40	40	35	45	40	89.8
15	30	28	26	23	30	28	26	23	27	5	5	5	3	5	5	5	3	4	20	20	20	20	20	20	20	20	20	10	12	5	8	10	15	10	5	9	60.4

Table 5 – Results of Project Scoring

6.3 Priority Projects

When all the projects were evaluated and scored, a total score was calculated. Projects scoring above 85 are considered priority 1. The lower the priority number, the greater the importance of the project, and the sooner the project should be implemented into the Districts' system. The priorities with corresponding score ranges are summarized in the following table.

Priority 1	100-85
Priority 2	84-75
Priority 3	74-65
Priority 4	65-0

Table 6 – Priority Ranking Cutoffs

7 Project Implementation

Project implementation describes an execution timeline for the 15 projects assessed during section 5. Based on the priority order determined in section 6 of the EMP process a project implementation plan was designed.

7.1 Project Assignments

Projects will be assigned to the most appropriate section within the Districts to implement. The following is a summary of the proposed section assignments.

Project	Priority	Assigned
VFD for Intermediate Zone at Calm Garden PS	1	NMA
Micro Hydro Turbine @ M7W	1	WQ
Coolwater System Improvements	1	NMA
NMA Office Solar Carport	1	PM
Coastline Drive 12" Waterline Replacement	2	PM
Carbon Mesa Rd to Fire Station System Enhancement	2	PM
Electric Vehicles for meter readings – Lancaster	3	NMA
Electric Vehicles for meter readings – Malibu	3	SMA
Modify Vehicle Fleet	3	NMA/SMA
Lancaster HQ Interior Lighting Equipment Upgrade	3	NMA/EM
5 Megawatt Solar Field Array in Antelope Valley	4	WQ/PM
Micro Hydro Turbine @ 3 Locations	4	WQ/PM
Malibu Chlorine Injection System	4	PM
Sweetwater Mesa System Design and Construction	4	PM
Sweetwater System Improvement	4	PM

Table 7 – Project Assignments

7.2 Funding

Because the EMP will be implemented and refined over many years, the financial plan should be robust, yet flexible to accommodate changes in project timing, capital requirements, interest rates and inflation, and system and customers' requirements or changes in law.

Table 8 shows proposed funding sources for the implementation of the identified projects in the Plan.

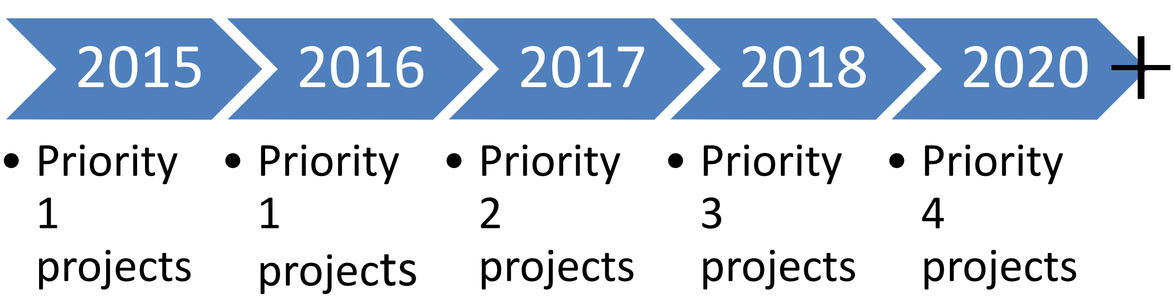
Project	Priority	Funding
VFD for Intermediate Zone at Calm Garden PS	1	General fund D37
Micro Hydro Turbine @ M7W	1	ACO 40
Coolwater System Improvements	1	General fund D38
NMA Office Solar Carport	1	ACO 40
Coastline Drive 12” Waterline Replacement	2	ACO 29
Carbon Mesa Rd to Fire Station System Enhancement	2	Phase 1 Master plan (Bond & ACO Fund)
Electric Vehicles for meter readings – Lancaster	3	General fund NMA
Electric Vehicles for meter readings – Malibu	3	General fund SMA
Modify Vehicle Fleet	3	General fund NMA
Lancaster HQ Interior Lighting Equipment Upgrade	3	General fund NMA
5 Megawatt Solar Field Array in Antelope Valley	4	ACO 40
Micro Hydro Turbine @ 3 Locations	4	ACO 29/40
Malibu Chlorine Injection System	4	ACO 29
Sweetwater Mesa System Design and Construction	4	ACO 29
Sweetwater System Improvement	4	ACO 29

Table 8 – Project Funding Sources

Most of the projects will be funded by the internal funding sources such as general funds and ACO funds. Additionally, the projects identified in the District 29 Master Plan will partially be funded by revenue bonds that will be issued in the future. The Districts will also look for opportunities with Federal and State funding programs such as State Revolving Fund (SRF), U.S. Bureau of Reclamation WaterSmart, Integrated Regional Water Management (IRWM), and Proposition 1.

7.3 Scheduling

A project implementation schedule was constructed based on the priority order determined. With proper funding sources allocated, it is suggested that the projects assessed in the EMP follow a proposed implementation schedule with construction of priority 1 projects in 2015 and 2016, and the remaining projects roughly each year with priority 4 projects completing around and beyond 2020.



7.4 Energy Master Plan Project Forecasting

The goal of the EMP is to prepare a portfolio of projects that aims to reduce electrical costs, electrical consumption, and reduce GHG emissions. If the Districts implement all or any of the projects assessed in this plan, it will see a reduction in costs, consumption, and GHG emissions. Following the implementation schedule for all the proposed projects, respective charts were developed to estimate the change in annual electrical consumption and cost, and GHG emissions.

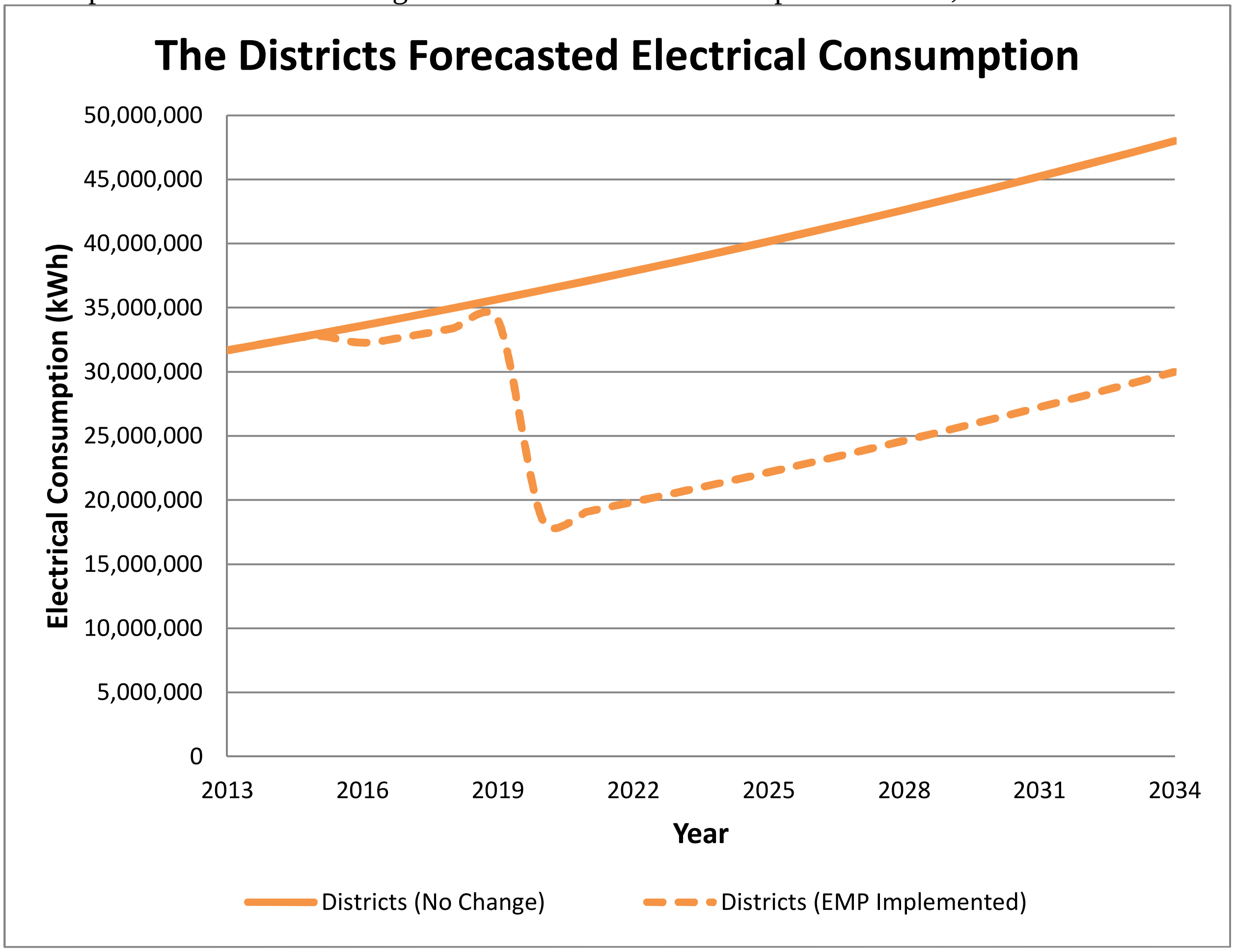


Figure 11 – Forecasted Annual Electrical Consumption with Implemented EMP Projects

Figure 11 shows annual electrical consumption for all the Districts. There are two plots in the chart. The solid line depicts the baseline, which was determined in the beginning stages of the EMP process. The dashed line is a potential annual electrical consumption for all the Districts using the proposed implementation schedule for the selected projects. The figure shows a potential annual reduction of approximately 18 million kWh after 10 years and the same reduction in 20 years.

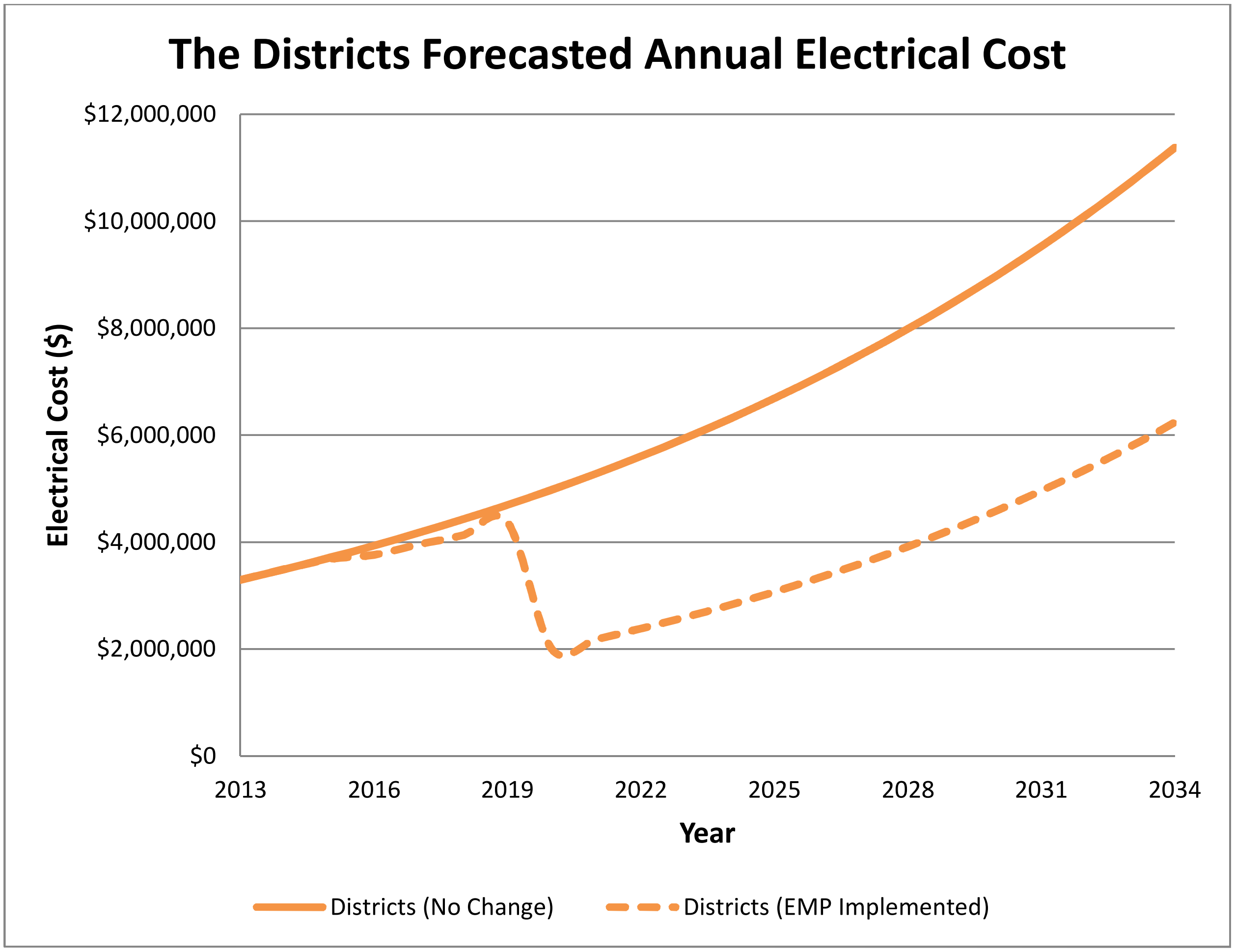


Figure 12 – Forecasted Annual Electrical Cost with Implemented EMP Projects

Figure 12 shows annual electrical cost for all the Districts. There are two plots in the chart. The solid line depicts the baseline, which was determined in the beginning stages of the EMP process. The dashed line is a potential annual electrical cost for all the Districts using the proposed implementation schedule for the selected projects. The figure shows a potential annual savings of approximately $4 million after 10 years and $5 million in 20 years.

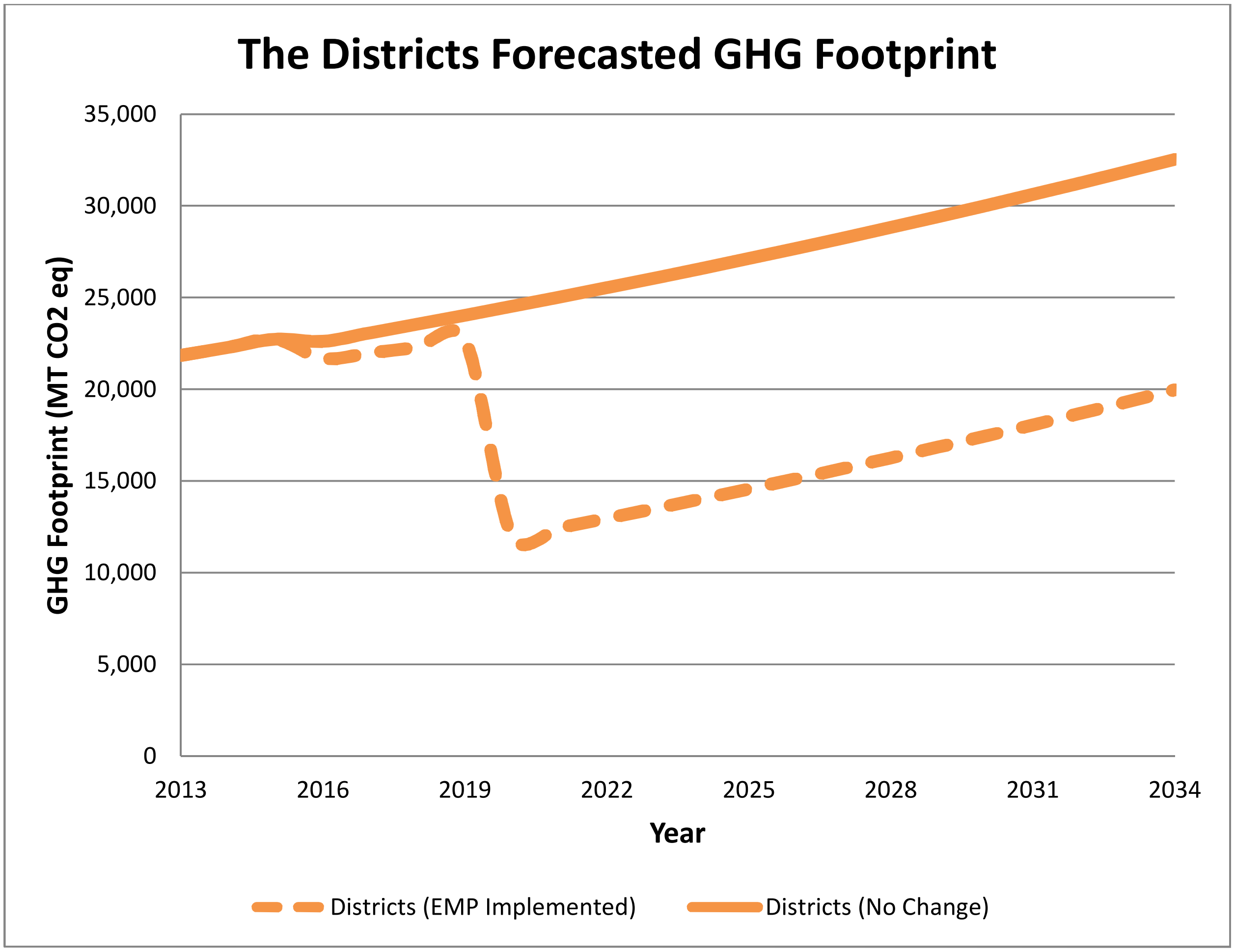


Figure 13 – Forecasted Annual Greenhouse Gas Emissions with Implemented EMP Projects

Figure 13 shows annual GHG elimination for all the Districts. There are two plots in the chart. The solid line depicts the baseline, which was determined in the beginning stages of the EMP process. The dashed line is a potential annual GHG reduction for all the Districts using the proposed implementation schedule for the selected projects. The figure shows a potential annual elimination of approximately 12,500 MT of CO_2 after 10 years and the same elimination in 20 years.

8 Follow Up

8.1 Project Tracking

Once a project is completed, it is recommended to track the progress of the project with respect to energy reductions, cost savings, and GHG elimination. Tracking is also important for the future. It gives the Districts the opportunity to record data that is pertinent to GHG emissions. It will come in handy if a time comes that the Districts need to report to a state agency and present a record of GHG emissions.

8.2 Updates

The EMP is a living document. As time moves forward, projects complete; new opportunities for efficient energy management, cost savings, and GHG reductions will present themselves in the form of new projects and new technologies. As such, an EMP will be updated every 3 to 5 years to add new projects.

9 Items for Further Action

During the process of the EMP, 45 project ideas were presented and 15 projects were selected. Nevertheless, the remaining 30 projects are worth further consideration in the future. Given the time frame allotted for the completion of this plan, it was not possible to thoroughly consider each idea at the project assessment level. Thus, the projects were marked and moved to a list of projects for consideration at a later time. These projects will be further considered during iterations of the EMP.

10 Appendix

10.1 Project Description Form

Project presented by: ____

Project title: ____

Brief technical description:

____
____
____
____
____
____
____
____

ESTIMATIONS
Estimated cost: ____

Estimated energy savings / energy generation / GHG reduction / conserved water:

____
____
____

10.2 First Iteration of Project Ideas

#	Project Category	Project Status	District	Project Title
1	Energy Efficiency	Completed Project	40	Install Programmable Thermostats
2	Energy Efficiency	New Project	37	VFD for Intermediate Zone at Calm Garden PS
3	Energy Efficiency	New Project	40	Lancaster HQ Lighting Equipment Upgrade
4	Energy Efficiency	Current Project	40	Redesign of Coolwater PS
5	GHG Project	Current Project	40	Electric Vehicles for meter readings / CNG Vehicles
6	GHG Project	Current Project	40	Modify Vehicle Fleet
7	GHG Project	New Project	40	Micro Hydro Turbine @ M7W & M5E
8	GHG Project	New Project	40	Wind Turbines
9	Efficiency Project	Current Project	40	SCADA Upgrade
10	Efficiency Project	New Project	40	Customer Water Meter Upgrade
11	Water Conservation	New Project	29	2000' pipe line Water main replacement on Coastline Dr. between PCH and Castlerock Rd.
12	Energy Efficiency	New Project	40	AVEK treatment plant in Palmdale / Get Treatment plant in Acton

13	Water Conservation Energy Efficiency	Current Project	29	Upgrade meters that are older than 15 years old (Replace with AMR meters)
14	Renewable Electricity	Project Concept	29	5 Megawatt Solar Field Array in Antelope Valley
15	Energy Efficiency	Project Concept	29	Survey a site for a New Tank and Pump Station between Topanga Beach and Forks
16	Energy Efficiency	New Project	29	Smaller pumps added for use during only during SCE Peak hours
17	Water Conservation Energy Efficiency	New Project	29	Strengthen SCADA Network
18	Water Conservation	New Project	29	Mixers for Tanks in Dist. 29
19	Renewable Electricity	Project Concept	29	Solar Panels in the Malibu Office Parking Lot
20	Efficiency Project	Current Project	29	Carbon Mesa Rd to Fire Station System enhancement (ES09 & EFF22)
21	GHG Emissions	Project Concept	29	Electric Vehicle Fleet
22	Energy Efficiency	Current Project	29	Sweetwater Mesa System Design and Construction
23	Energy Efficiency	New Project	29	Upgrade swing joints to different flexible joints
24	Energy Efficiency	Current Project	29	PCH from Broad Beach Road to Nicholas Beach water main Replacement
25	Water Conservation	New Project	29	Solarbees for Tanks in Dist. 29
26	Energy Efficiency	New Project	29	Authorize staff to conduct feasibility studies
27	Energy Efficiency	New Project	29	Topanga Beach Booster Pump Station Upgrade
28	Energy Efficiency	New Project	29	Pump Station Upgrade @ Las Flores
29	Energy Efficiency	New Project	29	Pump Station Upgrade @ Malibu Beach
30	Energy Efficiency	New Project	29	Pump Station Upgrade @ Carbon Canyon Fire House
31	Energy Efficiency	New Project	29	Pump Station Upgrade @ Lower Big Rock
32	Energy Efficiency	New Project	29	Pump Station Upgrade @ Marie Canyon
33	Efficiency Project	Current Project	29	Valve Replacement at PCH and Las Flores Canyon
34	Efficiency Project	Current Project	29	Malibu Branch Feeder Repairs (Phase III)
35	Efficiency Project	Current Project	29	(Pt. Dume System Improv.) Dume Tank to Lower Busch System
36	Efficiency Project	Current Project	29	Sweetwater East Pump Station Modification
37	Energy Efficiency	Current Project	29	Serra Pump Station Modification
38	Energy Efficiency	Current Project	29	(EV1,EFF20) Las Flores Mesa System Improvements
39	Energy Efficiency	Current Project	29	(ES09)Carbon Mesa Tank
40	Efficiency Project	Current Project	29	(EFF22)Pipe Upgrades from Carbon Mesa Rd to Fire Station
41	Efficiency Project	Current Project	29	(Eff 24)Tuna Canyon Rd.

42	Efficiency Project	Current Project	29	Encinal Canyon water mains Ph I Upper Encinal Pipeline Replacement
43	Energy Efficiency	New Project	29	ARV Maintenance Program
44	Efficiency Project	Current Project	29	Las Flores Canyon Road (EFF19)
45	Energy Efficiency	New Project	29	SCE Infrastructure Upgrade

10.3 Projects Selected for Assessment

#	Project Title	District
1	VFD for Intermediate Zone at Calm Garden PS	37
2	NMA Office Solar Carport	40
3	Lancaster HQ Interior Lighting Equipment Upgrade	40
4	Electric Vehicles for meter readings - Lancaster	40
5	Modify Vehicle Fleet	29/40
6	Micro Hydro Turbine @ M7W	40
7	Electric Vehicles for meter readings - Malibu	29
8	Coastline Drive 12” Waterline Replacement	29
9	Sweetwater System Improvement	29
10	5 MW Solar Field	40
11	Malibu Chlorine Injection System	29
14	Coolwater System Improvements	40
15	Micro Hydro Turbine @ 3 Locations	29/40

10.4 Project Assessments and Forms

10.4.1 VFD for Intermediate Zone at Calm Garden PS

Project Assessment #1

Install two VFD's at the Calm Garden pump station in order to reduce amount of pumping needed to serve customers in Calm Garden.

Net Capital Cost
$212,000

Energy Project Cost
$212,000

Project Savings	
First Year	20 years (w/ 4% inflation)
$14,500	$430,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
91 (8 homes, 20 cars)	1820 (160 homes, 400 cars)

PROJECT # 1
Variable Frequency Drive Motors for Intermediate Zone at Calm Garden Pump Station

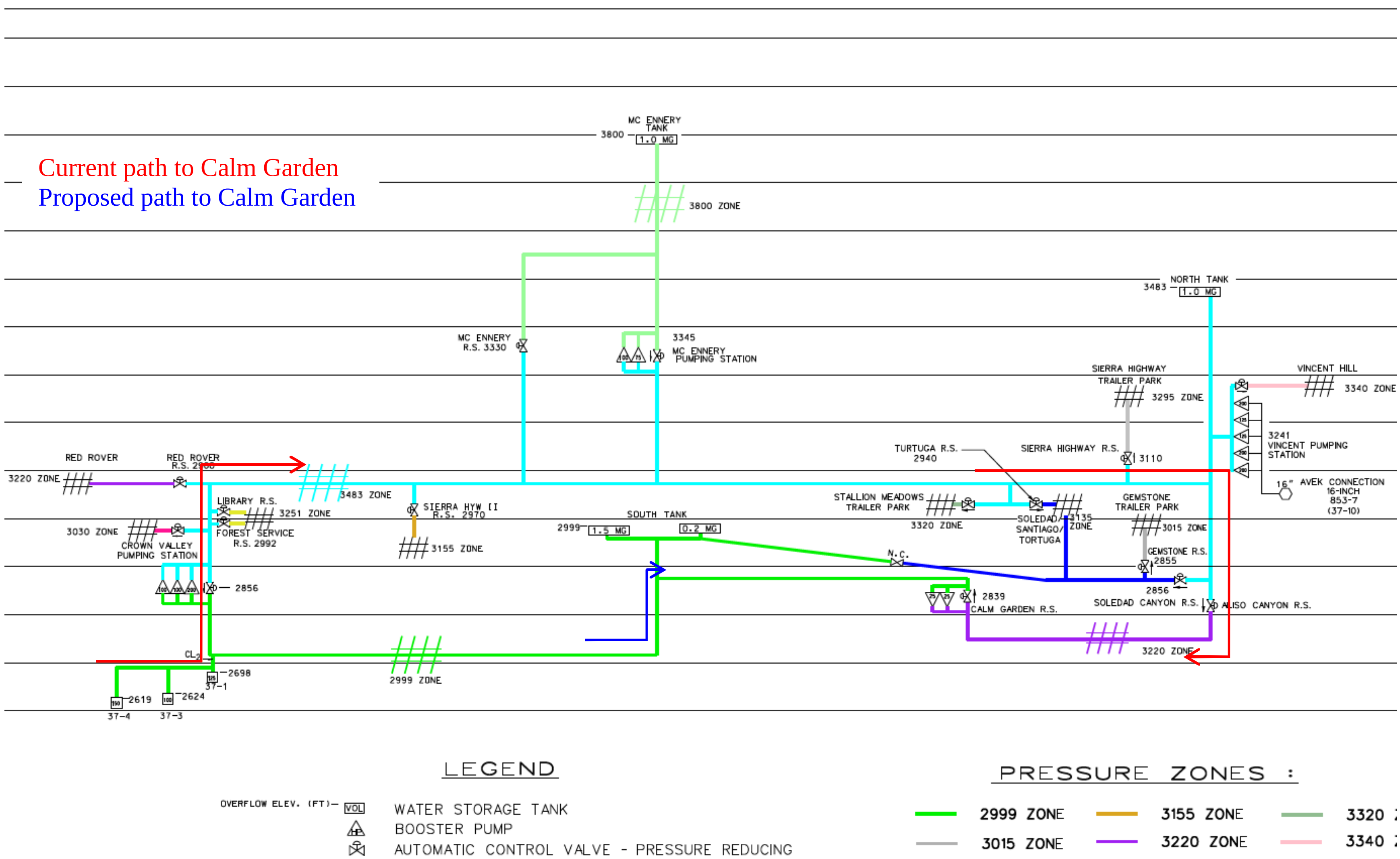
Problem

Waterworks District No. 37, Acton, has three wells: 37-1, 37-3, and 37-4. They pump to the South Tank which is the 2999 pressure zone. Crown Valley pump station pushes water from the 2999 pressure zone to the North Tank in the 3483 pressure zone. Aliso Canyon pressure reducing station reduces the 3483 pressure zone to the 3220 pressure zone.

Currently, there are two pumps at Calm Garden; however, these pumps do not operate. These pumps move water into a closed system. In a closed system, if there is no demand, pressure can quickly increase, causing the pressure in the system to reach shutoff limit for the pump. As demand in the area increases, pressure in the system will drop, this will cause the pumps to turn on. It has been observed that the demand in the system causes these pumps to turn on and off in a manner that does not allow them to adequately cool before starting again. Starting an electric motor while it is hot it bad for the longevity.

Solution

By directly pumping from the South Tank in the 2999 pressure zone into Calm Garden at the 3220 pressure zone, Crown Valley pump station can reduce the amount it pumps to the 3483 pressure zone. This would reduce the power consumption at Crown Valley pump station, and reduce the demand on the 3483 zone. This will require the installation of two variable frequency drive (VFD) controllers and motors optimized for VFD at Calm Garden pressure regulator/pump station. Given changes in water demand in this system, the VFD’s would be able to meet various demand conditions by speeding up or slowing down the motor in order to avoid turning off the pump completely.



Current path to Calm Garden
Proposed path to Calm Garden
MC ENNERY TANK
3800
1.0 MG
3800 ZONE
NORTH TANK
3483
1.0 MG
MC ENNERY R.S. 3330
3345 MC ENNERY PUMPING STATION
SIERRA HIGHWAY TRAILER PARK
3295 ZONE
VINCENT HILL
3340 ZONE
3241 VINCENT PUMPING STATION
16" AVEK CONNECTION 16-INCH 853-7 (37-10)
TURTUGA R.S. 2940
SIERRA HIGHWAY R.S.
3110
RED ROVER
RED ROVER R.S. 2900
3220 ZONE
3483 ZONE
LIBRARY R.S.
3251 ZONE
SIERRA HYW II R.S. 2970
3155 ZONE
FOREST SERVICE R.S. 2992
3030 ZONE
CROWN VALLEY PUMPING STATION
2856
SOUTH TANK
2999
1.5 MG
0.2 MG
STALLION MEADOWS TRAILER PARK
3320 ZONE
SOLEDAD/SANTIAGO/TORTUGA
3135 ZONE
GEMSTONE TRAILER PARK
3015 ZONE
GEMSTONE R.S. 2855
N.C.
2856
2839
CALM GARDEN R.S.
SOLEDAD CANYON R.S.
ALISO CANYON R.S.
3220 ZONE
CL2
2698
37-1
2619
37-4
2624
37-3
2999 ZONE
LEGEND
OVERFLOW ELEV. (FT) VOL WATER STORAGE TANK
BOOSTER PUMP
AUTOMATIC CONTROL VALVE - PRESSURE REDUCING
PRESSURE ZONES :
2999 ZONE
3015 ZONE
3155 ZONE
3220 ZONE
3320
3340

Cost & Benefit

The proposed modification would cost approximately $212,000, including installation over a 20 year time period. The benefit of this modification greatly outweighs the cost. Approximately $15,000 annually could be saved in electrical costs by eliminating the pumping of 224 acre feet of water. Over a 20 year time period, with 4% inflation each year, this modification could save close to $430,000. The savings were calculated by the difference in electrical cost of pumping 224 acre feet of water from the 2999 to the 3220 zone using the current water path and the proposed path.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 132,000 kWh will be reduced annually which will eliminate 91 metric tons of carbon dioxide emission from fossil fuels. These 91 metric tons is equivalent to the emissions driven by about 20 passenger cars annually or the energy used by approximately 8 homes each year.

LADPW Project Assessment Cost Form

Project Title: VFD for Intermediate Zone at Calm Garden PS   Project # 1

Primary Equipment/Program Costs

15000	Unit Investment Cost
2	# of Units
8	Equipment Life
20	Engineering Costs (% of Project Cost)
$20,000.00	Engineering Costs
n/a	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
132,000	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

91	Annual CO_2 Reduction (MT)
19.2	Emissions from passenger cars
10240	gallons of fuel

$14,467	Average Annual Savings

O&M Costs

0	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
0	TOTAL

Results

$36,000	First Year Cost
$31,000	First Year Cost Utility Power
$3,600	10 Year Average Cost
$48,676.53	10 Year Average Utility Cost
$3,750	Lifecycle Cost
$1,606,487	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$14,467.20	$30,000.00	$20,000.00	$50,000.00	$50,000.00				$50,000.00		$35,532.80		91
2016	$15,041.55										$20,491.25		91
2017	$15,638.70										$4,852.55		91
2018	$16,259.55										-$11,407.00		91
2019	$16,905.06										-$28,312.06		91
2020	$17,576.19										-$45,888.25		91
2021	$18,273.96										-$64,162.21		91
2022	$18,999.44										-$83,161.65		91
2023	$19,753.72	$40,962.42	$27,308.28	$68,270.70	$68,270.70				$68,270.70		-$171,186.07		91
2024	$20,537.94										-$191,724.01		91
2025	$21,353.30										-$213,077.30		91
2026	$22,201.02										-$235,278.32		91
2027	$23,082.40										-$258,360.73		91
2028	$23,998.77										-$282,359.50		91
2029	$24,951.53										-$307,311.03		91
2030	$25,942.10										-$333,253.13		91
2031	$26,972.00	$55,930.66	$37,287.11	$93,217.77	$93,217.77				$93,217.77		-$453,442.90		91
2032	$28,042.79										-$481,485.69		91
2033	$29,156.09										-$510,641.78		91
2034	$30,313.59										-$540,955.37		91

10.4.2 North Maintenance Area Office Solar Carport

Project Assessment #2

Install 139 kW generating capacity solar panels in NMA customer and employee parking to increase use of renewable energy use for Districts.

Net Capital Cost	Energy Project Cost
$900,000	$150,000

Project Savings	
First Year	20 years (w/ 4% inflation)
$31,200	$976,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
139 (13 homes, 29 cars)	2,780 (260 homes, 580 cars)

PROJECT # 2
North Maintenance Area Solar Carport

Problem

The Los Angeles County Waterworks Districts North Maintenance Area (NMA) field office is a 23,000 square foot building located at 260 E. Ave. K-8, in the City of Lancaster. It was constructed in 2002 and houses approximately 80 billing, maintenance, and water service personnel for Districts No. 40, 37, and 36. Additionally, there are two active wells located on the site. Wells 4-70 and 4-71 are located at the southwest and northeast corners of the parking lot, respectively.

The parking areas outside of the office building are paved. The northwest corner is dedicated to customer parking, the northeast corner dedicated to employee parking, and remaining space is utilized for maintenance vehicles and equipment storage as shown in Figure A.

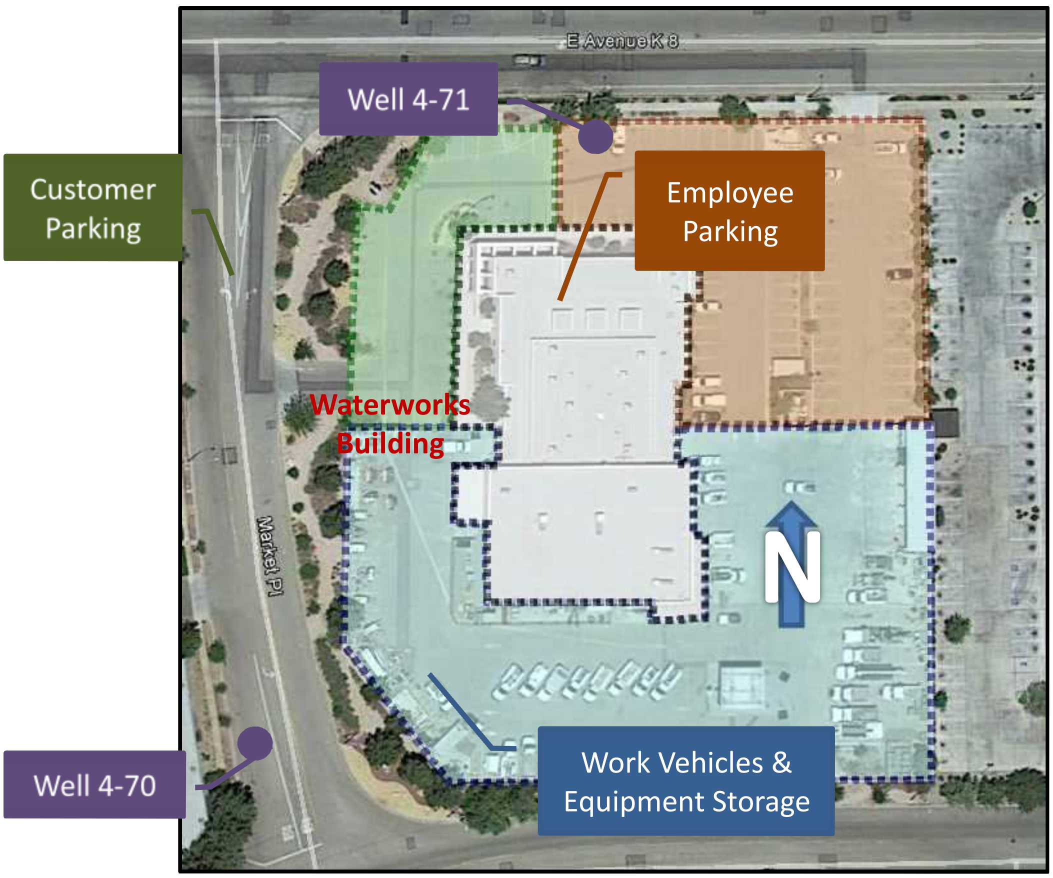


Figure A. Site Map

These locations receive a tremendous amount of solar radiation. During the summer time it heats the ground making the surrounding areas feel hotter and makes the interior vehicles hot and unpleasant. Throughout the year this solar radiation degrades paint on cars.

Solution

As a benefit to Waterworks customer and employees carports should be installed. As a side benefit to installing carports to the parking lot it has been proposed to install solar panels on top of them. The structures would have a minimal impact on the usability of each parking space and would not likely reduce the number of spaces available at the site. Efforts were also made to reduce impacts to the site as a whole (including vegetation, fencing, and curb) and provide enough clearance from the two wells for future maintenance. A total of 54 existing parking spaces could be utilized to construct a 139 kW system.

Current energy consumption at the site includes daily office operations and usage of wells 4-70 and 4-71. Billing information from Southern California Edison (SCE) shows that about 569,000 kWh was consumed at the site in 2014.

Cost & Benefit

The proposed 139 kW system would cost approximately $900,000, including design, construction of the carports, and 20 years of maintenance. Though, $900,000 is the total cost of the project, the solar panels with installation is roughly $150,000. This system is rated to generate approximately 202,000 kWh annually, reducing electrical costs by approximately $31,200 annually. Over a 20 year time period, with 4% inflation each year, this installation could save close to $1 million, giving the solar panel construction project a net project savings of about $700,000.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 139 metric tons of carbon dioxide will be avoided annually by generating energy on-site rather than pulling from the electrical grid. 139 metric tons of carbon dioxide is equivalent to the emissions from 29.3 passenger cars and the energy usage from about 13 homes.

LADPW Project Assessment Cost Form

Project Title: North Maintenance Area Solar Carport Project # 2

Please fill in yellow boxes.

Primary Equipment/Program Costs

629483	Unit Investment Cost
1	# of Units
25	Equipment Life
	Engineering Costs (% of Project Cost)
134575	Engineering Costs
	Fuel Costs ($/yr)

Utility Management

139	kW per Unit
	Capacity Factor
202000	Annual kWh Produced
	Annual kWh Saved
	Water Savings (AF)

GHG Reductions

139	Annual CO_2 Reduction (MT)

$31,179	Average Annual Savings

O&M Costs

	# of Full Time Employees
.025 $/W	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
	Rebate
	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1544	Consultant Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$31,179	$629,483	$134,575	$764,058			$6,678		$739,558		$739,558		139
2016	$32,574						$6,678		$713,662		$713,662		139
2017	$34,032						$6,678		$686,309		$686,309		139
2018	$35,555						$6,678		$657,432		$657,432		139
2019	$37,146						$6,678		$626,965		$626,965		139
2020	$38,808						$6,678		$594,836		$594,836		139
2021	$40,545						$6,678		$560,969		$560,969		139
2022	$42,359						$6,678		$525,289		$525,289		139
2023	$44,254						$6,678		$487,713		$487,713		139
2024	$46,235						$6,678		$448,156		$448,156		139
2025	$48,304						$6,678		$406,531		$406,531		139
2026	$50,465						$6,678		$362,743		$362,743		139
2027	$52,724						$6,678		$316,698		$316,698		139
2028	$55,083						$6,678		$268,293		$268,293		139
2029	$57,548						$6,678		$217,423		$217,423		139
2030	$60,123						$6,678		$163,978		$163,978		139
2031	$62,814						$6,678		$107,843		$107,843		139
2032	$65,625						$6,678		$48,896		$48,896		139
2033	$68,562						$6,678		-$12,987		-$12,987		139
2034	$71,630						$6,678		-$77,939		-$77,939		139

10.4.3 Lancaster HQ Interior Lighting Equipment Upgrade

Project Assessment #3

Upgrade Lancaster HQ interior overhead lights from fluorescent to LED.

Net Capital Cost	Energy Project Cost
$63,000	$63,000

Project Savings	
First Year	20 years (w/ 4% inflation)
$2,670	$79,300

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
17 (1.5 homes, 4.7 cars)	336 (30 homes, 94 cars)

PROJECT # 3
Lancaster Headquarters Interior Lighting Equipment Upgrade

Problem

LA County Waterworks District office in Lancaster, California, is located in an approximately 22,000 square-foot building that consumed roughly 548,000 kWh in 2014. A recent ASHRAE Level I Energy Assessment conducted by FCI Management Consultants. The goal of this preliminary energy efficiency feasibility report was to provide the District with energy efficiency measure (EEM) identification and recommendations for the allocated facility. The major contributors to the electric load at this facility include Lighting, HVAC, Water Heating, Plug Loads and 2 wells (4-70, 4-71).

Currently, Linear Fluorescents lighting fixtures are the predominant lighting source at the facility. The fluorescent fixtures inside the facility are principally 4ft, 32-watt T8 lamps with electronic ballasts. Though the Interior light fixtures are T8's, there is an opportunity for savings if it were to be retrofitted with LED fluorescents (Plug-and-Play LED Replacement Tubes).

Solution

FCI personal prepared a report. In that report there is a summary of recommendations. The recommendation regarding the interior lighting is upgrade all the 4ft, 32-watt T8 linear fluorescent lamps with electronic ballasts to LED fluorescents (Plug-and-Play LED Replacement Tubes).

Cost & Benefit

Based on SCE's Solutions Directory, 9th edition, there is an incentive of $0.08 per kWh saved when upgrading to LED fixtures.

Estimated annual electrical savings are approximately 24,000 kWh and $2,700. The cost to purchase the recommended lighting equipment is approximately $17,400 and a ballpark estimate to install the lighting is $6,300. Over a time span of 20 years, the cost to purchase and install lighting equipment is roughly $63,000. This investment will provided a net project savings of nearly $16,300, accounting for 4% inflation each year.

This upgrade makes financial sense in the long term. Over time the savings from money spent on electricity will pay for the new lighting devices themselves as well reduce the operation cost, assuming the current light fixtures remain undisturbed.

Each year, this modification to the lighting will reduce electrical consumption by about 24,000 kWh and will reduce greenhouse gas emissions by 16.8 metric tons. This is equivalent to the emissions from 4.7 cars driven each year or the total energy used by 1.5 homes.

LADPW Project Assessment Cost Form

Project Title: NMA HQ Lighting Upgrade (Indoors) Project # 3

Please fill in yellow boxes.

Primary Equipment/Program Costs

41	Unit Investment Cost
424	# of Units
12.8	Equipment Life
n/a	Engineering Costs (% of Project Cost)
6300	Engineering Costs
n/a	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
24367	Annual kWh Saved
	Water Savings (AF)

GHG Reductions

16.8	Annual CO_2 Reduction (MT)

$2,670.62	Average Annual Savings

O&M Costs

0	# of Full Time Employees
0	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
0.08 $/kWh	Rebate
one time per purchase	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

N	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	rage 2012-2013 Water Production Cost ($
$385.60	erage 2012-2013 Water Purchase Price ($/
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$2,671		$6,300		$17,384	0	0	0	$21,013		$21,013		16.8
2016	$2,777		$0			0	0	0	$18,237		$18,237		16.8
2017	$2,887		$0			0	0	0	$15,350		$15,350		16.8
2018	$3,001		$0			0	0	0	$12,348		$12,348		16.8
2019	$3,121		$0			0	0	0	$9,228		$9,228		16.8
2020	$3,245		$0			0	0	0	$5,983		$5,983		16.8
2021	$3,373		$0			0	0	0	$2,610		$2,610		16.8
2022	$3,507		$0			0	0	0	-$897		-$897		16.8
2023	$3,647		$0			0	0	0	-$4,544		-$4,544		16.8
2024	$3,791		$0			0	0	0	-$8,335		-$8,335		16.8
2025	$3,942		$0			0	0	0	-$12,277		-$12,277		16.8
2026	$4,098		$0			0	0	0	-$16,375		-$16,375		16.8
2027	$4,261		$0			0	0	0	-$20,636		-$20,636		16.8
2028	$4,430		$10,556		$29,127	0	0	0	$19,046		$19,046		16.8
2029	$4,606		$0			0	0	0	$14,440		$14,440		16.8
2030	$4,789		$0			0	0	0	$9,651		$9,651		16.8
2031	$4,979		$0			0	0	0	$4,672		$4,672		16.8
2032	$5,177		$0			0	0	0	-$505		-$505		16.8
2033	$5,382		$0			0	0	0	-$5,887		-$5,887		16.8
2034	$5,596		$0			0	0	0	-$11,483		-$11,483		16.8

10.4.4 Electric Vehicles for Meter Readings - NMA

Project Assessment #4

Replace 80% of Lancaster's meter reading fleet to electric vehicles.

Net Capital Cost	Energy Project Cost
$320,000	$20,000

Project Savings	
First Year	20 years (w/ 4% inflation)
$12,100	$360,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
29 (2.6 homes, 6 cars)	580 (52 homes, 120 cars)

PROJECT # 4
Electric Vehicles for meter readings - Lancaster

Problem

Electric vehicles range and reliability has grown over the years. It is now suspect that some of the vehicles used for routine tasks like meter reading may be able to be performed with electric vehicles. District 40 staff tracked mileage for meter reading routes and discovered that most of the routes with exceptions for meter reading in Val Verde and on the far east side of Antelope Valley are within the range allowed by many electric vehicles. District 40 staff has opportunities for having four electric vehicles for NMA.

Solution

A suitable electric car to meet the requirements of the Districts will be selected. The candidate will replace 4 of NMA's meter reading vehicles and eliminate about 29,000 miles driven by gasoline engines annually. Charging stations at the Lancaster office would need to be installed to increase the reliability of the electric vehicle fleet; whether it is a slow charge or fast charge station. For the purpose of this report, it will be assumed that the districts will move forward with a slow charge option.

Cost & Benefit

Slow Charge Equipment: Commercial-grade, 240 V, plus required utility upgrades and site improvements: $20,000. If the Nissian Leaf is chosen as the electric car, its manufacturer suggested retail price is approximately $30,000. The implementation of an electric vehicle fleet will save District 40 approximately $12,100 annually on gasoline costs, or $360,300 over 20 years using 4% inflation each year. This approximation was determined using measured fuel consumption for an entire year and an assumed rate of gasoline of $4.00 per gallon minus the electrical costs needed to charge the Leafs for a year. The cost for electricity to charge the Leafs for the same mileage as the meter readers did during fiscal year 2011-2012 would be $818. It is quite obvious the gasoline cost compared to the electrical cost is far greater.

If four Leafs replaced current meter reading vehicles, Waterworks will reduce emissions its' by 28.7 metric tons of carbon dioxide per year. This conversion will also help the county to meet the governor's Executive Order B-30-15 of reducing greenhouse gas emissions to 40% of what was recorded in 1990 by 2030.

LADPW Project Assessment Cost Form

Project Title: Electric Vehicles for meter readings - Lancaster — Project # 4

Please fill in yellow boxes.

Primary Equipment/Program Costs

$30,000.00	Unit Investment Cost
4	# of Units
10	Equipment Life
17%	Engineering Costs (% of Project Cost)
$20,000.00	Engineering Costs
$818.00	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
n/a	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

28.7	Annual CO_2 Reduction (MT)

$12,104.00	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost ($/yr)	Incentives	GHG Reduction (MT/yr)
2015	$12,104.00	$120,000.00	$20,000.00	$140,000.00	$140,000.00	$0.00		$818.00	$128,714.00	0	28.7
2016	$12,584.53							$850.47	$116,979.95		28.7
2017	$13,084.13							$884.24	$104,780.05		28.7
2018	$13,603.57							$919.34	$92,095.82		28.7
2019	$14,143.64							$955.84	$78,908.02		28.7
2020	$14,705.14							$993.79	$65,196.67		28.7
2021	$15,288.93							$1,033.24	$50,940.98		28.7
2022	$15,895.90							$1,074.26	$36,119.33		28.7
2023	$16,526.97							$1,116.91	$20,709.27		28.7
2024	$17,183.09							$1,161.25	$4,687.43		28.7
2025	$17,865.26	$177,117.59						$1,207.35	$165,147.11		28.7
2026	$18,574.51							$1,255.28	$147,827.88		28.7
2027	$19,311.92							$1,305.12	$129,821.08		28.7
2028	$20,078.60							$1,356.93	$111,099.41		28.7
2029	$20,875.72							$1,410.80	$91,634.49		28.7
2030	$21,704.49							$1,466.81	$71,396.81		28.7
2031	$22,566.16							$1,525.04	$50,355.69		28.7
2032	$23,462.03							$1,585.59	$28,479.24		28.7
2033	$24,393.48							$1,648.53	$5,734.30		28.7
2034	$25,361.90							$1,713.98	-$17,913.61		28.7

10.4.5 Modify Vehicle Fleet

Project Assessment #5

Right size The Districts vehicle fleet to optimize each maintenance activity necessary to maintain our current level of customer service, safely.

Net Capital Cost	Energy Project Cost
$6,300,000	$0

Project Savings	
First Year	20 years (w/ 4% inflation)
$55,700	$1,652,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
124 (11 homes, 26 cars)	2,480 (220 homes, 520 cars)

PROJECT # 5
Modify Vehicle Fleet

Problem

The NMA has historically dealt with a shortage of vehicles needed to do all necessary tasks. It was noticed that NMA had a lot more 13 series vehicles than needed and not enough smaller vehicles, because of this, often unneeded fuel consumption for tasks that don't require larger vehicles occurred. This added significant unneeded fuel consumption to operational costs.

The SMA has typically had enough vehicles to do core functions but has a larger inventory than needed to do its' work.

These shortcomings for vehicle efficiencies calls for a development of an inventory for both Waterworks NMA and SMA with appropriate sizes and amounts of vehicles for each yard to do required duties in order to maximize operational efficiencies.

Solution

NMA will replace nine 13 series[1] with nine 6 series vehicles and an additional three 5 series vehicles.

SMA will be shedding five 8 series vehicles and three 13 series vehicles while adding one of each of 3, 5, and 9 series vehicles in the future.

A summary of the fleet modification with images can be seen in the "Waterworks Fleet by Vehicle Series" table on the following page.

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[1] **Waterworks Fleet by Vehicle Series**

Vehicle Series	Current Number of Vehicles	Recommended Number of Vehicles	Net Change in Number of Vehicles
NMA			
3 Series – Hybrid	3	3	0
5 Series – Right Hand Drive Jeeps	5	8	3
6 Series – 1/2 Ton Pickup	10	19	9
8 Series – 3/4 Ton Pickup	2	2	0
9 Series – Utility Truck	16	16	0
13 Series – Senior WSW Truck	17	8	-9
Total	**53**	**56**	**3**
SMA			
3 Series – Hybrid	2	3	1
5 Series – Right Hand Drive Jeeps	1	2	1
6 Series – 1/2 Ton Pickup	11	11	0
8 Series – 3/4 Ton Pickup	8	3	-5
9 Series – Utility Truck	9	10	1
13 Series – Dump Truck	8	5	-3
Total	**39**	**34**	**-5**

A Waterworks Districts report was prepared. The intent of this report is to develop an implementation plan to right sized fleets for both Waterworks NMA and SMA. Included in the report will be a three year procurement plan for each yard.

Cost & Benefit

This project is a special situation. The project cost will be ignored because vehicle purchases are a necessary and occur at approximate regular intervals.

Savings are seen in the form of gasoline reduction. By right sizing the vehicle fleet for the North and South yards during the first year, approximately $55,600 will be saved and over 20 years with 4% inflation each year, approximately $1.65 million. These savings were calculated using estimates from a vehicle fleet operating without modification and a fleet with optimization. The savings were determined using compare and contrast of fuel consumption of the two potential fleets. Approximately 13,900 gallons of gasoline will be reduced annually which will eliminate 124 metric tons of carbon dioxide emission from fossil fuels. These 124 metric tons is equivalent to the emissions driven by about 26 passenger cars annually or the energy used by approximately 11 homes each year.

Waterworks Fleet by Vehicle Series


03 Series - Hybrid


05 Series - Right Hand Drive Jeeps


06 Series - 1/2 Ton Pickup


08 Series - 3/4 Ton Pickup


09 Series - Utility Truck


13 Series - Senior WSW Truck (NMA)


13 Series Dump - Malibu Only

LADPW Project Assessment Cost Form

Project Title: Modify Vehicle Fleet — Project # 5

Please fill in yellow boxes.

Primary Equipment/Program Costs

$2,866,000.00	Unit Investment Cost
61	# of Units
10 years	Equipment Life
n/a	Engineering Costs (% of Project Cost)
n/a	Engineering Costs
4	Fuel Costs ($/gallon)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
n/a	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

124	Annual CO_2 Reduction (MT)

$55,663	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2014	$55,663	$716,500.00	0	0	0	0				0	0	0	124
2015	$57,873	$716,500.00	0	0	0	0				0	0	0	124
2016	$60,170	$716,500.00	0	0	0	0				0	0	0	124
2017	$62,559	$716,500.00	0	0	0	0				0	0	0	124
2018	$65,043	$0.00	0	0	0	0				0	0	0	124
2019	$67,625	$0.00	0	0	0	0				0	0	0	124
2020	$70,310	$0.00	0	0	0	0				0	0	0	124
2021	$73,101	$0.00	0	0	0	0				0	0	0	124
2022	$76,003	$0.00	0	0	0	0				0	0	0	124
2023	$79,020	$0.00	0	0	0	0				0	0	0	124
2024	$82,157	$1,060,420.00	0	0	0	0				0	0	0	124
2025	$85,419	$1,060,420.00	0	0	0	0				0	0	0	124
2026	$88,810	$1,060,420.00	0	0	0	0				0	0	0	124
2027	$92,336	$1,060,420.00	0	0	0	0				0	0	0	124
2028	$96,002	$0.00	0	0	0	0				0	0	0	124
2029	$99,813	$0.00	0	0	0	0				0	0	0	124
2030	$103,776	$0.00	0	0	0	0				0	0	0	124
2031	$107,896	$0.00	0	0	0	0				0	0	0	124
2032	$112,179	$0.00	0	0	0	0				0	0	0	124
2033	$116,632	$0.00	0	0	0	0				0	0	0	124

10.4.6 Micro Hydro Turbine @ M7W

Project Assessment #6

Install pressure reducing turbine at M7W to generate renewable energy.

Net Capital Cost	Energy Project Cost
$1,460,000	$890,000 w/ rebates and grants

Project Savings	
First Year	20 years (w/ 4% inflation)
$91,000	$2,710,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
572 (52 homes, 120 cars)	11,440 (1,040 homes, 2,400 cars)

PROJECT # 6
Micro Hydro Turbine @ M7W

Problem

The M7W pressure reducing facility is supplied with potable water from Antelope Valley East Kern Water Agency's Quartz Hill Water Treatment Plant located in Palmdale, CA. The M7W station provides potable water to much of the surrounding Palmdale and Lancaster areas and contains approximately 8 million gallons of on-site storage capacity. The facility contains multiple Pressure Reducing Valves (PRV's) and multiple pumps on site. The M7W facility has a maximum demand of approximately 325 kilowatts (kW) and consumed an estimated 2,816,000 kilowatt-hours (kWh) in 2014.

The existing load on the M7W PRV site consists of several pumps including four 150HP wells and three 60HP booster pumps. These 4 wells are for pumping groundwater into the 2555 zone if water is not available from the 2914 zone. The three booster pumps provide backup supply to the 2750 zone. In addition to the well pumps, there is miscellaneous lighting, controls, ventilation and other equipment which adds to the base load at the site.

This location receives water from AVEK at a pressure of 2914 ft of head and the PRV's reduce the pressure down to 2555 ft. All of the reduced energy is dissipated as heat.

Solution

A single hydraulic pressure reducing turbine is proposed to be installed at the M7W facility. This hydro turbine will be a vertical shaft Francis turbine rated for 215kW at maximum flow rate of 10.5CFS. The hydro turbine is designed to operate on the pressure differential between the 2914 zone and the 2555 zone and capable of operating over a variable flow range from 1.5CFS up to 10.5CFS. The Francis turbine will be installed in the place of one of the four 12-inch PRV valves at the M7W facility. The estimated annual generation of the hydro turbine generation equipment is 830,000kWh per year.

Cost & Benefit

Total cost for design and installation is $1.5 Million. Once the earned rebates ($200,000) and grants ($365,000) are factored into the cost, the total construction cost for Waterworks is approximately $940,000. Average annual savings is estimated to be $91,000. Over a 20 year time period, total savings with 4% inflation is estimated to be $2.7 million. In the span of 20 years the difference between the savings and net project cost will be approximately $1.85 million. In the long run, this project is very beneficial to Waterworks.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 830,000 kWh will be reduced annually which will eliminate 572 metric tons of carbon dioxide emission from fossil fuels. This 572 metric tons is equivalent to the mileage driven by about 120 passenger cars or the energy used by approximately 52 homes each year.

LADPW Project Assessment Cost Form

Project Title: Micro Hydro Turbine @ M7W Project # 6

Please fill in yellow boxes.

Primary Equipment/Program Costs

1,500,000	Unit Investment Cost
1	# of Units
15-25 years	Equipment Life
	Engineering Costs (% of Project Cost)
	Engineering Costs
N/A	Fuel Costs ($/yr)

Utility Management

261	kW per Unit
40 to 95	Capacity Factor
830000	Annual kWh Produced
N/A	Annual kWh Saved
N/A	Water Savings (AF)

GHG Reductions

572	Annual CO_2 Reduction (MT)

$90,968	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

$365,000	Grant

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
200000	Rebate ($/W @ 1.13/W)
1	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$90,968	$1,500,000	$0	$1,500,000	$935,000	$0.00		$0.00	$844,032.00		$844,032.00		572
2016	$94,607	$0	$0	$0	$0	$0.00		$0.00	$749,425.28		$749,425.28		572
2017	$98,391	$0	$0	$0	$0	$0.00		$0.00	$651,034.29		$651,034.29		572
2018	$102,327	$0	$0	$0	$0	$0.00		$0.00	$548,707.66		$548,707.66		572
2019	$106,420	$0	$0	$0	$0	$0.00		$0.00	$442,287.97		$442,287.97		572
2020	$110,676	$0	$0	$0	$0	$0.00		$0.00	$331,611.49		$331,611.49		572
2021	$115,104	$0	$0	$0	$0	$0.00		$0.00	$216,507.95		$216,507.95		572
2022	$119,708	$0	$0	$0	$0	$0.00		$0.00	$96,800.27		$96,800.27		572
2023	$124,496	$0	$0	$0	$0	$0.00		$0.00	-$27,695.72		-$27,695.72		572
2024	$129,476	$0	$0	$0	$0	$0.00		$0.00	-$157,171.55		-$157,171.55		572
2025	$134,655	$0	$0	$0	$0	$0.00		$0.00	-$291,826.41		-$291,826.41		572
2026	$140,041	$0	$0	$0	$0	$0.00		$0.00	-$431,867.47		-$431,867.47		572
2027	$145,643	$0	$0	$0	$0	$0.00		$0.00	-$577,510.17		-$577,510.17		572
2028	$151,468	$0	$0	$0	$0	$0.00		$0.00	-$728,978.58		-$728,978.58		572
2029	$157,527	$0	$0	$0	$0	$0.00		$0.00	-$886,505.72		-$886,505.72		572
2030	$163,828	$0	$0	$0	$0	$0.00		$0.00	-$1,050,333.95		-$1,050,333.95		572
2031	$170,381	$0	$0	$0	$0	$0.00		$0.00	-$1,220,715.31		-$1,220,715.31		572
2032	$177,197	$0	$0	$0	$0	$0.00		$0.00	-$1,397,911.92		-$1,397,911.92		572
2033	$184,284	$0	$0	$0	$0	$0.00		$0.00	-$1,582,196.40		-$1,582,196.40		572
2034	$191,656	$0	$0	$0	$0	$0.00		$0.00	-$1,773,852.25		-$1,773,852.25		572

10.4.7 Electric Vehicles for Meter Readings - SMA

Project Assessment #7

Replace 100% of SMA's meter reading fleet to electric vehicles.

Net Capital Cost	Energy Project Cost
$161,000	$12,000

Project Savings	
First Year	20 years (w/ 4% inflation)
$5,700	$170,200

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
14 (1.2 homes, 3 cars)	280 (24 homes, 60 cars)

PROJECT # 7
Electric Vehicles for meter readings - Malibu

Problem

Electric vehicles range and reliability has grown over the years. It is now suspect that some of the vehicles used for routine tasks like meter reading may be able to be performed with electric vehicles. District 29 staff tracked mileage for meter reading routes and discovered that most of the routes are within the range allowed by many electric vehicles. District 29 staff has opportunities for having two electric vehicles for SMA.

Solution

A suitable electric car to meet the requirements of the Districts will be selected. The candidate will replace 2 of SMA’s meter reading (series 5) vehicles and eliminate about 14,600 miles driven by gasoline engines annually. Charging stations at the Malibu office would need to be installed to increase the reliability of the electric vehicle fleet; whether it is a slow charge or fast charge station. For the purpose of this report, it will be assumed that the districts will move forward with a slow charge option.

Cost & Benefit

Slow Charge Equipment: Commercial-grade, 240 V, plus required utility upgrades and site improvements: $12,000. If the Nissian Leaf is chosen as the electric car, its manufacturer suggested retail price is approximately $30,000. The implementation of an electric vehicle fleet will save District 29 approximately $5,700 annually on gasoline costs, or $170,200 over 20 years using 4% inflation each year. This approximation was determined using measured fuel consumption for an entire year and an assumed rate of gasoline of $4.00 per gallon minus the electrical costs needed to charge the Leafs for a year. The cost for electricity to charge the Leafs for the same mileage as the meter readers did during fiscal year 2011-2012 would be $418. It is quite obvious the gasoline cost compared to the electrical cost is far greater.

If two Leafs replaced current meter reading vehicles, Waterworks will reduce emissions its’ by 13.7 metric tons of carbon dioxide per year. This conversion will also help the county to meet the governor’s Executive Order B-30-15 of reducing greenhouse gas emissions to 40% of what was recorded in 1990 by 2030.

LADPW Project Assessment Cost Form

Project Title: Electric Vehicles for Meter Reading - Malibu   Project # 7

Please fill in yellow boxes.

Primary Equipment/Program Costs

$30,000.00	Unit Investment Cost
2	# of Units
10	Equipment Life
17%	Engineering Costs (% of Project Cost)
$20,000.00	Engineering Costs
$418.00	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
n/a	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

13.7	Annual CO_2 Reduction (MT)

$5,732.00	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	verage 2012-2013 Utility Cost ($/kWh
$175.08	ge 2012-2013 Water Production Cost
$385.60	ge 2012-2013 Water Purchase Price (
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost ($/yr)	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$5,732.00	$60,000.00	$12,000.00	$72,000.00	$72,000.00	$0.00		$418.00		0	$66,686.00		13.7
2016	$5,959.56							$434.59			$61,161.03		13.7
2017	$6,196.15							$451.85			$55,416.73		13.7
2018	$6,442.14							$469.79			$49,444.37		13.7
2019	$6,697.90							$488.44			$43,234.91		13.7
2020	$6,963.80							$507.83			$36,778.94		13.7
2021	$7,240.26							$527.99			$30,066.66		13.7
2022	$7,527.70							$548.95			$23,087.91		13.7
2023	$7,826.55							$570.74			$15,832.10		13.7
2024	$8,137.27							$593.40			$8,288.23		13.7
2025	$8,460.32	$88,558.79						$616.96			$89,003.67		13.7
2026	$8,796.19							$641.45			$80,848.93		13.7
2027	$9,145.40							$666.92			$72,370.45		13.7
2028	$9,508.47							$693.40			$63,555.37		13.7
2029	$9,885.96							$720.92			$54,390.34		13.7
2030	$10,278.43							$749.54			$44,861.45		13.7
2031	$10,686.49							$779.30			$34,954.26		13.7
2032	$11,110.74							$810.24			$24,653.76		13.7
2033	$11,551.83							$842.41			$13,944.34		13.7
2034	$12,010.44							$875.85			$2,809.74		13.7

10.4.8 Coastline Drive 12" Waterline Replacement

Project Assessment #8

Replace aging pipeline to Coastline drive to minimize pumping, reduce leak occurrences, add system redundancy, and improve water supply reliability for residents served by this water line.

Net Capital Cost	Energy Project Cost
$1,467,000	$0

Project Savings	
First Year	20 years (w/ 4% inflation)
$19,500	$580,000

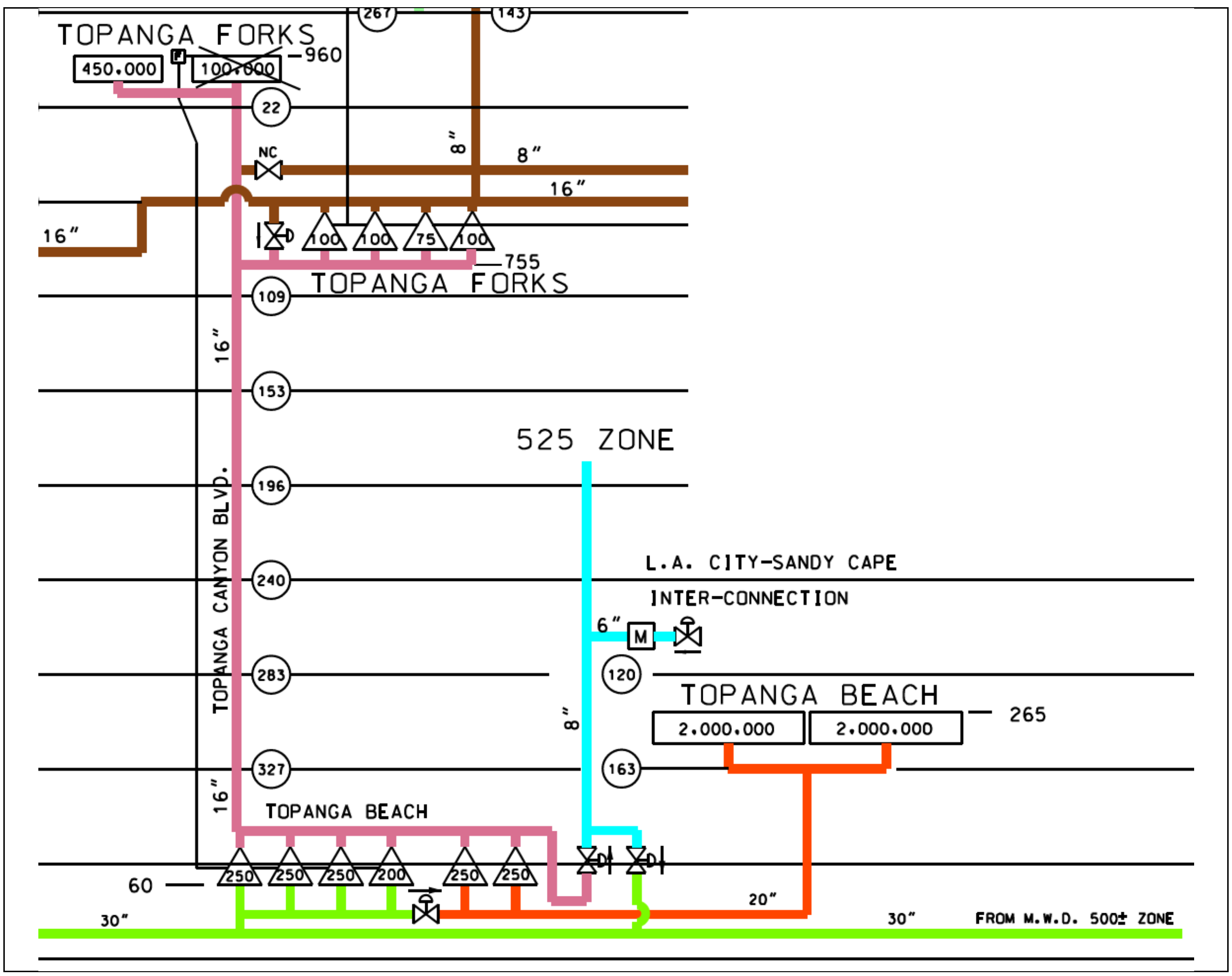
Green House Gas Reductions (MT of CO_2)	
First Year	20 years
123 (11 homes, 26 cars)	2,460 (220 homes, 520 cars)

PROJECT # 8
Coastline Drive 12” Waterline Replacement

Problem

The existing pipeline that connects the customers on Coastline drive to the transmission main is dated. The new connection between the Los Angeles County Waterworks District No. 29 (Malibu) and the Metropolitan Water District's water system has increased the pressure condition in the Malibu Branch Feeder (MBF) along Pacific Coast Highway (PCH). Because of the enhanced pressure, approximately 2,000 linear feet of 12-inch diameter steel and asbestos-concrete water line on Coastline Drive has experienced multiple leaks since 2013 due to the increase of pressure on PCH. Currently, the entire 525-foot PZ is back fed by the 960-foot PZ via the Topanga Beach Pumping/Regulating Station.

A cost analysis determined the energy cost, associated with pumping water to the 960-foot PZ and regulating it to the 525-foot PZ, is approximately $1,625 per month, or $19,500 per year. The energy cost calculation was based on average monthly water consumption of the customers in the 525-foot PZ and the Southern California Edison energy required in pumping all that water.



Solution

In order to utilize the increased pressure on PCH and decrease pumping costs, construct a new pipeline line directly from PCH to Coastline Drive (525-foot PZ) and regulate the 960-foot PZ only during emergencies or peak demand. An investigation using a hydraulic model discovered that the 525- foot PZ can be directly fed from PCH.

The proposed project will replace approximately 2,000 linear feet of aging 12-inch diameter steel and asbestos-concrete water line with new 12-inch diameter steel CMC&L water line along Coastline Drive between Pacific Coast Highway and Castlerock Road. It is recommended that the proposed line be placed next to the existing line, which will be abandoned in place. A sewer line runs along Coastline Drive, which will need to be avoided during construction of the water line.

Additionally, install a new check valve at the intersection of Pacific Coast Highway and Coastline Drive to prevent water from back flowing to PCH from the 525-foot pressure zone.

Cost & Benefit

The proposed modification would cost approximately $1.5 million, including installation. The project will reduce the risk of leaks, add system redundancy, improve water supply reliability for residents served by this water line, and reduce electrical costs approximately $19,500 annually. Over a 20 year time period, with 4% inflation each year, this modification could save close to $580,000 in operating costs. The savings were calculated by determining the electrical cost of pumping 19 acre feet, or 6.3 million gallons (consumption in 2013) of water from PCH to the 960 zone and then regulating down to the 525 pressure zone.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 178,000 kWh will be reduced annually which will eliminate 123 metric tons of carbon dioxide emission from fossil fuels. These 123 metric tons is equivalent to the emissions driven by about 26 passenger cars annually or the energy used by approximately 11 homes each year.

LADPW Project Assessment Cost Form

Project Title: Coastline Drive 12" Waterline Replacement   Project # 8

Please fill in yellow boxes.

Primary Equipment/Program Costs

1467000	Unit Investment Cost
n/a	# of Units
40-90 years	Equipment Life
13	Engineering Costs (% of Project Cost)
188000	Engineering Costs
n/a	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
177990	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

123	Annual CO_2 Reduction (MT)

$19,508	Average Annual Savings

O&M Costs

0	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	rage 2012-2013 Water Production Cost ($/
$385.60	erage 2012-2013 Water Purchase Price ($/
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$19,507.70			$1,467,000				$0	$1,467,000		$1,447,492.30		123
2016	$20,282.16										$1,427,210.14		123
2017	$21,087.36										$1,406,122.77		123
2018	$21,924.53										$1,384,198.24		123
2019	$22,794.93										$1,361,403.31		123
2020	$23,699.89										$1,337,703.42		123
2021	$24,640.78										$1,313,062.64		123
2022	$25,619.02										$1,287,443.62		123
2023	$26,636.09										$1,260,807.53		123
2024	$27,693.55										$1,233,113.99		123
2025	$28,792.98										$1,204,321.01		123
2026	$29,936.06										$1,174,384.95		123
2027	$31,124.52										$1,143,260.43		123
2028	$32,360.17										$1,110,900.26		123
2029	$33,644.86										$1,077,255.40		123
2030	$34,980.56										$1,042,274.83		123
2031	$36,369.29										$1,005,905.54		123
2032	$37,813.15										$968,092.38		123
2033	$39,314.34										$928,778.05		123
2034	$40,875.12										$887,902.93		123

10.4.9 Sweetwater System Improvement

Project Assessment #9

Install new pipeline from PCH to Sweetwater water storage tank to reduce leak occurrences and improve water supply reliability for residents served by this water line.

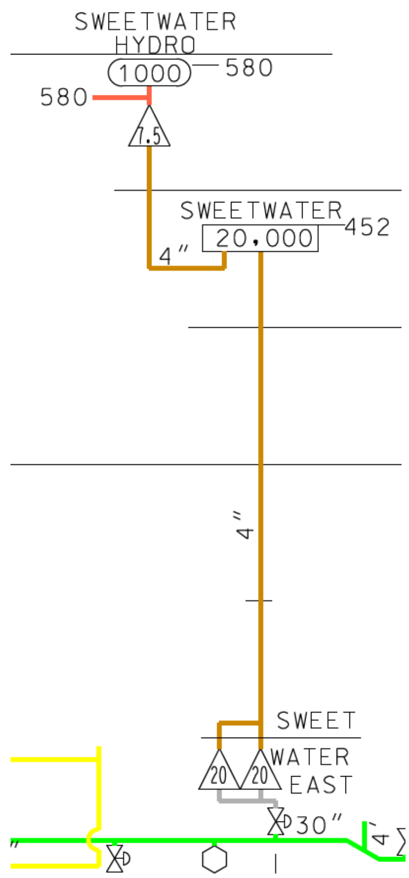
Net Capital Cost	Energy Project Cost
$500,000	$0

Project Savings	
First Year	20 years (w/ 4% inflation)
$3,880	$115,230

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
13.8 (1.3 homes, 3 cars)	276 (26 homes, 60 cars)

PROJECT # 9
Sweetwater System Improvement

Problem



The Sweetwater Pump Station delivers water from the 325 pressure zone to the Sweetwater Tank (452 pressure zone). The new connection between the Los Angeles County Waterworks District No. 29 (Malibu) and the Metropolitan Water District's water system has increased the pressure condition in the Malibu Branch Feeder (MBF) along Pacific Coast Highway (PCH). Because of the enhanced pressure the 380 Linear Feet (LF) of piping between PCH and this pump station has experienced multiple leaks and the water main is very difficult to repair when it leaks.

Solution

We recommend bypassing the Sweetwater East Pump Station and directly feed the Sweetwater Tank from the 30-inch main along PCH. The pressure will be regulated at PCH via a regulator to serve the 452 pressure zone. The existing 380 Linear Feet (LF) of piping between PCH and this pump station is a 4-inch steel, tar-coated water main acquired from the Malibu Water Company, extending into the back of a hill. There are two options to bypass the pump station. Option 1 is to install approximately 1,600 LF of piping on Sweetwater Canyon Road from PCH to Beckledge Terrace. Option 2 is to replace the existing pipeline between PCH and the Sweetwater Pump Station. An altitude valve will be installed to avoid overflowing the Sweetwater Tank.

Cost & Benefit

The proposed modification, based on option 1, would cost approximately $500,000. The project will reduce the risk of leaks, improve water supply reliability for residents served by this water line, and reduce electrical costs approximately $3,900 annually. Over a 20 year time period, with 4% inflation each year, this modification could save close to $115,000 in operating costs.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 20,000 kWh will be reduced annually which will eliminate 13.8 metric tons of carbon dioxide emission from fossil fuels. These 13.8 metric tons is equivalent to the emissions driven by about 3 passenger cars annually or the energy used by approximately 1 home each year.

LADPW Project Assessment Cost Form

Project Title: Sweetwater Sysyem Improvement Project # 9

Please fill in yellow boxes.

Primary Equipment/Program Costs

500000	Unit Investment Cost
	# of Units
70	Equipment Life
	Engineering Costs (% of Project Cost)
	Engineering Costs
	Fuel Costs ($/yr)

Utility Management

	kW per Unit
	Capacity Factor
	Annual kWh Produced
20000	Annual kWh Saved
	Water Savings (AF)

GHG Reductions

13.8	Annual CO_2 Reduction (MT)

$3,881.54	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
	Rebate
	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$3,881.54	$500,000.00		$500,000.00					$496,118.46		$496,118.46		13.8
2016	$4,035.63								$492,082.83		$492,082.83		13.8
2017	$4,195.85								$487,886.98		$487,886.98		13.8
2018	$4,362.42								$483,524.56		$483,524.56		13.8
2019	$4,535.61								$478,988.95		$478,988.95		13.8
2020	$4,715.68								$474,273.27		$474,273.27		13.8
2021	$4,902.89								$469,370.38		$469,370.38		13.8
2022	$5,097.53								$464,272.85		$464,272.85		13.8
2023	$5,299.90								$458,972.95		$458,972.95		13.8
2024	$5,510.31								$453,462.64		$453,462.64		13.8
2025	$5,729.07								$447,733.57		$447,733.57		13.8
2026	$5,956.51								$441,777.05		$441,777.05		13.8
2027	$6,192.99								$435,584.06		$435,584.06		13.8
2028	$6,438.85								$429,145.21		$429,145.21		13.8
2029	$6,694.47								$422,450.74		$422,450.74		13.8
2030	$6,960.24								$415,490.50		$415,490.50		13.8
2031	$7,236.56								$408,253.94		$408,253.94		13.8
2032	$7,523.86								$400,730.08		$400,730.08		13.8
2033	$7,822.55								$392,907.53		$392,907.53		13.8
2034	$8,133.11								$384,774.42		$384,774.42		13.8

10.4.10 5 Megawatt Solar Field Array in Antelope Valley

Project Assessment #10

Install a 5 megawatt solar field in the Antelope Valley and generate about 50% of District 40's energy from green energy.

Net Capital Cost	Energy Project Cost
$20,900,000	$20,900,000

Project Savings	
First Year	20 years (w/ 4% inflation)
$1,750,000	$52,000,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
8,619 (786 homes, 1,815 cars)	172,380 (15,720 homes, 36,300 cars)

PROJECT # 10
Construct a 5 Megawatt Solar Field

Problem

District 40 requires approximately 25.9 gigawatt hours (GWh) of electricity annually in order to deliver water to all of its customers. It takes approximately $3 million annually to pay for that electricity. Every year, electric rates go up, it has been estimated from previous electric bills to be about 4% annually. With rising electric costs and deteriorating water infrastructure, it is challenging to maintain current water rates for the customers.

Solution

To maximize the purchase of new land to develop new wells, purchase enough land to place a 5 megawatt (MW) solar field. According to estimates from consultants, the minimum land required to place a 5 MW solar field is 30 acres.

In order to reduce electric costs, utilize the location of the Antelope Valley and construct a means of collecting solar energy and providing it the counties facilities. Generating solar energy from sunlight has proven its value in the Antelope Valley. A 5 MW solar field has the capability of generating 12.5 million kWh (12.5 GWh) annually; this would help significantly reduce the annual budget on electricity. Southern California Edison provides numerous rebate and incentive programs to its customers; one of which is the RES-BCT program. Simply put, the RES-BCT program allows a customer to generate renewable energy at an SCE meter and transfer excess energy as bill credits to one or several other SCE accounts.

Cost & Benefit

The proposed solar field would cost approximately $20.9 million, including design, construction, tying the field into the electrical grid, and 20 years of maintenance. The benefit of this modification greatly outweighs the cost. Approximately $1 million annually could be saved in electrical costs through the RES-BCT program. Over a 20 year time period, with 4% inflation each year, this modification could save close to $31 million. The savings were calculated by approximating the rebate earned from SCE for each kWh transferred from the solar field into their electrical grid at 14¢ per kWh. Total estimated production multiplied by cost will yield $1 million.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 12.5 million kWh will be reduced annually which will eliminate 8,619 metric tons of carbon dioxide emission from fossil fuels. These 8,619 metric tons is equivalent to the emissions driven by about 1,815 passenger cars annually or the energy used by approximately 786 homes each year.

LADPW Project Assessment Cost Form

Project Title: Construct 5 Megawatt Solar Field   Project # 10

Please fill in yellow boxes.

Primary Equipment/Program Costs

3000000	Unit Investment Cost
5	# of Units
25 years	Equipment Life
n/a	Engineering Costs (% of Project Cost)
n/a	Engineering Costs
	Fuel Costs ($/yr)

Utility Management

1000	kW per Unit
	Capacity Factor
12500000	Annual kWh Produced
12,500,000	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

8619	Annual CO_2 Reduction (MT)

$1,750,000	Average Annual Savings

O&M Costs

0	# of Full Time Employees
$25	O&M Cost ($/kW)

Other Equipment Costs

$1,200,000	Purchase land
$1,200,000	Develop well
$1,000,000	Install infrastructure

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
	Rebate
	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

N	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$1,750,000	$15,000,000	$0	$2,200,000	$0	$0	$125,000	$0	$15,575,000		$15,575,000		8619
2016	$1,819,475	$0	$0	$0	$0	$0	$129,963	$0	$13,885,488		$13,885,488		8619
2017	$1,891,708	$0	$0	$0	$0	$0	$135,122	$0	$12,128,901		$12,128,901		8619
2018	$1,966,809	$0	$0	$0	$0	$0	$140,486	$0	$10,302,579		$10,302,579		8619
2019	$2,044,891	$0	$0	$0	$0	$0	$146,064	$0	$8,403,751		$8,403,751		8619
2020	$2,126,073	$0	$0	$0	$0	$0	$151,862	$0	$6,429,540		$6,429,540		8619
2021	$2,210,479	$0	$0	$0	$0	$0	$157,891	$0	$4,376,953		$4,376,953		8619
2022	$2,298,235	$0	$0	$0	$0	$0	$164,160	$0	$2,242,878		$2,242,878		8619
2023	$2,389,475	$0	$0	$0	$0	$0	$170,677	$0	$24,080		$24,080		8619
2024	$2,484,337	$0	$0	$0	$0	$0	$177,453	$0	-$2,282,804		-$2,282,804		8619
2025	$2,582,965	$0	$0	$0	$0	$0	$184,497	$0	-$4,681,271		-$4,681,271		8619
2026	$2,685,509	$0	$0	$0	$0	$0	$191,822	$0	-$7,174,958		-$7,174,958		8619
2027	$2,792,123	$0	$0	$0	$0	$0	$199,437	$0	-$9,767,644		-$9,767,644		8619
2028	$2,902,970	$0	$0	$0	$0	$0	$207,355	$0	-$12,463,259		-$12,463,259		8619
2029	$3,018,218	$0	$0	$0	$0	$0	$215,587	$0	-$15,265,890		-$15,265,890		8619
2030	$3,138,042	$0	$0	$0	$0	$0	$224,146	$0	-$18,179,786		-$18,179,786		8619
2031	$3,262,622	$0	$0	$0	$0	$0	$233,044	$0	-$21,209,364		-$21,209,364		8619
2032	$3,392,148	$0	$0	$0	$0	$0	$242,296	$0	-$24,359,216		-$24,359,216		8619
2033	$3,526,816	$0	$0	$0	$0	$0	$251,915	$0	-$27,634,116		-$27,634,116		8619
2034	$3,666,831	$0	$0	$0	$0	$0	$261,916	$0	-$31,039,031		-$31,039,031		8619

10.4.11 Malibu Chorine Injection System

Project Assessment #11

Install automated disinfection system to reduce nitrification occurrences, improve water quality, and increase worker service workers efficiency.

Net Capital Cost	Energy Project Cost
$3,000,000	$0

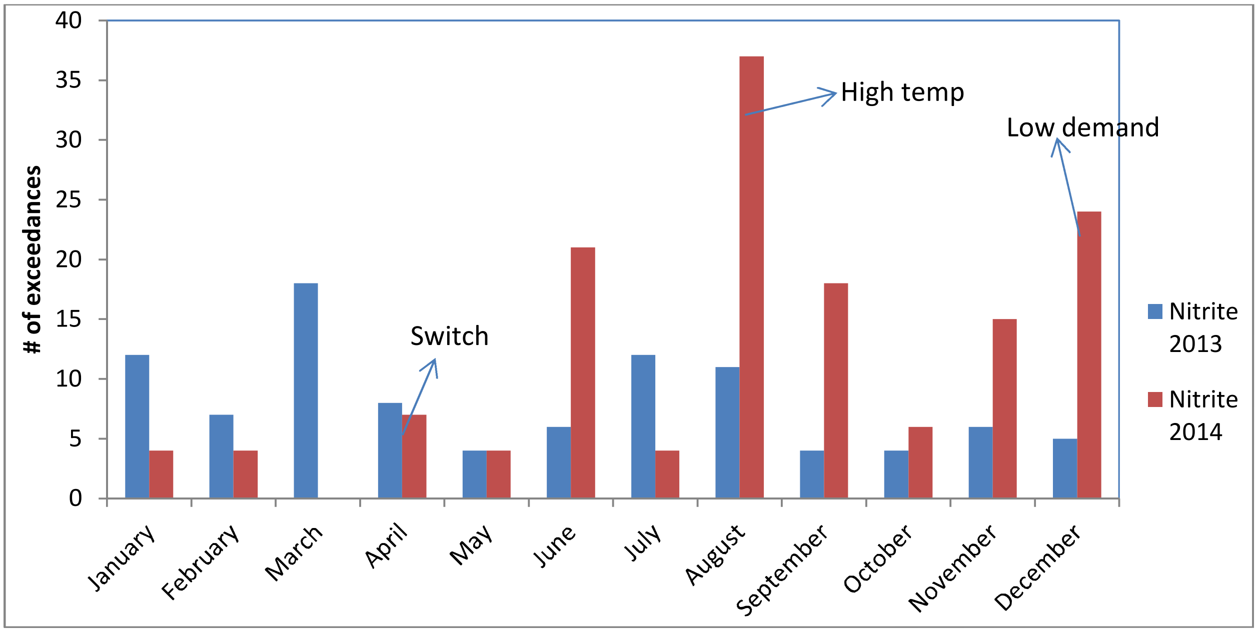
Project Savings	
First Year	20 years (w/ 4% inflation)
$5,400	$160,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
12 (1.1 homes, 2.5 cars)	240 (22 homes, 50 cars)

PROJECT # 11
Malibu Disinfection System

Problem

Metropolitan Water District changed operations and started to supply District 29 with Colorado water through Weymouth Plant instead of Jensen Plant, due to severe drought. As a result, the water that is flowing through the systems sees longer detention times and has lower chlorine residuals which leads to a higher risk for nitrification.



In order to reduce the occurrence of nitrate exceedance, the Malibu field office water quality team is visiting each tank more frequently each month, at least 50% more. This added task is impeding with the staff's routine tasks. To return the water to drinking water quality standards, water must be flushed and/or be dosed with a form of disinfectant, typically sodium hypochlorite (bleach). The nitrification matter is not a recent issue; water in the Malibu system tends to have a longer detention time than other systems in the districts. Going as far back as 2008, there have been issues with nitrification in the system.

Solution

To better manage the working hours available to the field staff, an automated disinfection system could reduce nitrification occurrences. There are three proposed locations for the system; Topanga Beach Pump Station, Sunset Mesa Tank Site, and Malibu Beach Pump Station.

The automated disinfection system would consist of chlorine gas in pressurized containers, a structure to facilitate protection and replacing the containers, and lastly an infrastructure to inject chlorine into the drinking water.

Cost & Benefit

The cost for this project has been estimated to be approximately $1 million per station for a total cost of $3 million. By implementing an automated disinfection system, it will reduce the occurrences of nitrification in the drinking water system. As a result of less nitrification issues, the water quality staff will spend less of their time responding to these issues, approximately 40 hours each month; which is equivalent to about $24,000 in labor and $5,400 in fuel costs, annually. Focusing on savings on fuel and accounting for inflation, over 20 years savings are estimated to be $160,000. Also, less water will be flushed, and the risk of violating drinking water standards becomes less of a concern. Further benefits of this addition helps ensure that Waterworks deliverers high quality water to its customer by maintaining residual decontaminate concentrations to reduce the risk of bacterial growth, as well as maintain taste and odor of the water.

Reduction in fuel consumption also means reduction in greenhouse gas emissions. This project is estimated to reduce about 12 metric tons of carbon dioxide annually which is equivalent to removing 3 vehicles off the road.

LADPW Project Assessment Cost Form

Project Title: Automated Chlorine Disinfection System   Project # 11

Please fill in yellow boxes.

Primary Equipment/Program Costs

1000000	Unit Investment Cost
3	# of Units
20	Equipment Life
	Engineering Costs (% of Project Cost)
	Engineering Costs
	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
	Annual kWh Saved
	Water Savings (AF)

GHG Reductions

12	Annual CO_2 Reduction (MT)

$5,400	Average Annual Savings

O&M Costs

0	# of Full Time Employees
0	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$5,400	$3,000,000	$0	$0	$0	$0	$0	$0	$2,994,600				12
2016	$5,614	$0	$0	$0	$0	$0	$0	$0	$2,988,986				12
2017	$5,837	$0	$0	$0	$0	$0	$0	$0	$2,983,148				12
2018	$6,069	$0	$0	$0	$0	$0	$0	$0	$2,977,079				12
2019	$6,310	$0	$0	$0	$0	$0	$0	$0	$2,970,769				12
2020	$6,560	$0	$0	$0	$0	$0	$0	$0	$2,964,209				12
2021	$6,821	$0	$0	$0	$0	$0	$0	$0	$2,957,388				12
2022	$7,092	$0	$0	$0	$0	$0	$0	$0	$2,950,296				12
2023	$7,373	$0	$0	$0	$0	$0	$0	$0	$2,942,923				12
2024	$7,666	$0	$0	$0	$0	$0	$0	$0	$2,935,257				12
2025	$7,970	$0	$0	$0	$0	$0	$0	$0	$2,927,287				12
2026	$8,287	$0	$0	$0	$0	$0	$0	$0	$2,919,000				12
2027	$8,616	$0	$0	$0	$0	$0	$0	$0	$2,910,384				12
2028	$8,958	$0	$0	$0	$0	$0	$0	$0	$2,901,427				12
2029	$9,313	$0	$0	$0	$0	$0	$0	$0	$2,892,113				12
2030	$9,683	$0	$0	$0	$0	$0	$0	$0	$2,882,430				12
2031	$10,068	$0	$0	$0	$0	$0	$0	$0	$2,872,363				12
2032	$10,467	$0	$0	$0	$0	$0	$0	$0	$2,861,896				12
2033	$10,883	$0	$0	$0	$0	$0	$0	$0	$2,851,013				12
2034	$11,315	$0	$0	$0	$0	$0	$0	$0	$2,839,698				12

10.4.12 Carbon Mesa Road to Fire Station System Enhancement

Project Assessment #12

Upgrade Carbon Mesa 580 pressure zone to The Districts minimum standards and allow possibility to by-pass pump station.

Net Capital Cost
$4,740,000

Energy Project Cost
$0

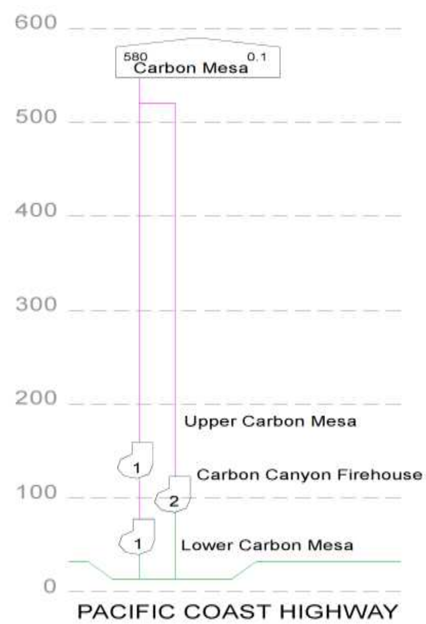
Project Savings	
First Year	20 years (w/ 4% inflation)
$8,000	$237,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
39 (3.6 homes, 8.2 cars)	780 (72 homes, 164 cars)

PROJECT # 12
Carbon Mesa Road to Fire Station System Enhancement

Problem

The Carbon Canyon Subsystem along Carbon Canyon serves the 580 pressure zone (PZ). The Carbon Mesa Tank is fed by three pumps (Carbon Canyon Fire House, Lower Carbon Mesa and Upper Carbon Mesa) from the transmission main line. The Lower Carbon Mesa and upper Carbon Mesa pumps are in series and all three pump stations operate simultaneously. The hydraulic schematic for Carbon Canyon subsystem is shown.

<table>
<tr><td>Lower Carbon Mesa Pump Station
22209 Pacific Coast Highway
Ground Elevation: 75
Suction Pressure Zone: 325
Discharge Pressure Zone: 580</td><td rowspan="3">
</td></tr>
<tr><td>Carbon Canyon Fire Hose Pump Station
3960 Carbon Canyon Road
Ground Elevation:100
Suction Pressure Zone: 325
Discharge Pressure Zone: 580</td></tr>
<tr><td>Upper Carbon Mesa Pump Station
22529 Carbon Mesa Road
Ground Elevation: 120
Suction Pressure Zone: 325
Discharge Pressure Zone: 580</td></tr>
</table>

The water mains in this system are undersized, the water flow through the system does not meet Waterworks standard for fire flow.

Solution

In order to meet Waterworks standard in this area a water system upgrade is proposed. The proposed upgrade is along the Carbon Canyon Firehouse pipeline. The project will replace approximately 8,000 linear feet of 2” pipe to 8” pipe. This replacement will improve the hydraulics of the system and would allow the tank in this area to be directly fed from the transmission line. In addition to the main line upgrade, increasing the water tank volume to 250,000 gallons is needed. The new tank and additional upgrades listed above will provide improved storage capacity and adequate distribution capacity for domestic and fire protection water demands in the system. Lastly, it is recommended that the existing pump stations be replaced by a sole pump station with two pumps capable of moving 125 gallons per minute. These pumps will be used in case of emergencies.

Cost & Benefit

This project is estimated at $4.7 million dollars. With the completion of the project, this system will be able to operate under the pressure provided by the transmission main, thus eliminating the need for a pump station to move water in the system. However, there will be a pump station in case of emergencies. Operating the system from the pressure provided by the transmission main will reduce operating costs approximately $8,000 annually. Accounting for inflation, over 20 years savings are estimated to be $240,000. Reduction in electrical consumption also means reduction in greenhouse gas emissions. This project is estimated to reduce about 39 metric tons of carbon dioxide annually which is equivalent to removing 8.2 vehicles off the road and energy used by 3.6 homes.

LADPW Project Assessment Cost Form

Project Title: Carbon Mesa System Upgrade Project # 12

Please fill in yellow boxes.

Primary Equipment/Program Costs

$4,742,000	Unit Investment Cost
1	# of Units
70 years	Equipment Life
	Engineering Costs (% of Project Cost)
	Engineering Costs
	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
56,816	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

39.2	Annual CO_2 Reduction (MT)

$7,969.48	Average Annual Savings

O&M Costs

0	# of Full Time Employees
0	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

N	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$7,969.48			$4,742,000	$4,742,000		0	0	$4,734,030.53				39.2
2016	$8,285.86								$4,725,744.66				39.2
2017	$8,614.81								$4,717,129.85				39.2
2018	$8,956.82								$4,708,173.03				39.2
2019	$9,312.41								$4,698,860.62				39.2
2020	$9,682.11								$4,689,178.52				39.2
2021	$10,066.49								$4,679,112.03				39.2
2022	$10,466.13								$4,668,645.90				39.2
2023	$10,881.63								$4,657,764.27				39.2
2024	$11,313.63								$4,646,450.63				39.2
2025	$11,762.78								$4,634,687.85				39.2
2026	$12,229.77								$4,622,458.08				39.2
2027	$12,715.29								$4,609,742.79				39.2
2028	$13,220.09								$4,596,522.71				39.2
2029	$13,744.92								$4,582,777.78				39.2
2030	$14,290.60								$4,568,487.19				39.2
2031	$14,857.93								$4,553,629.25				39.2
2032	$15,447.79								$4,538,181.46				39.2
2033	$16,061.07								$4,522,120.39				39.2
2034	$16,698.70								$4,505,421.69				39.2

10.4.13 Sweetwater Mesa System Design and Construction

Project Assessment #13

Upgrade Sweetwater Mesa 380 pressure zone to The Districts minimum standards and allow possibility to by-pass pump station.

Net Capital Cost	Energy Project Cost
$8,700,000	$0

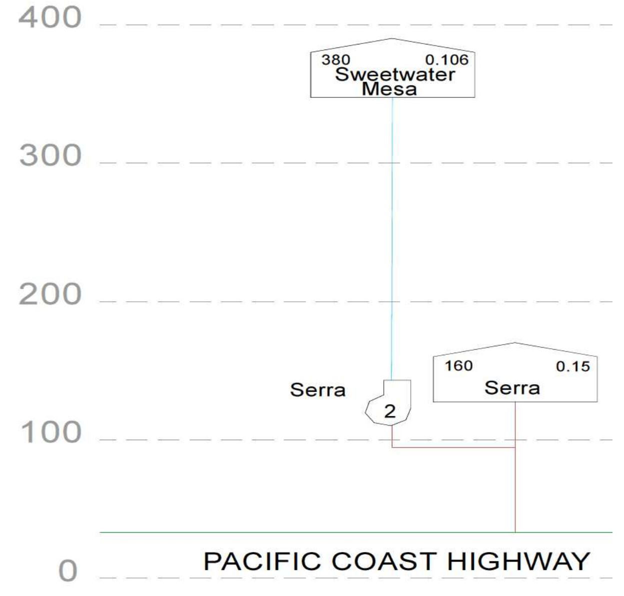
Project Savings	
First Year	20 years (w/ 4% inflation)
$14,750	$438,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
82 (8 homes, 17 cars)	1,640 (160 homes, 340 cars)

PROJECT # 13
Sweetwater Mesa System Design and Construction

Problem

The Sweetwater Mesa system is served by two gravity storage tanks named Sweetwater Mesa and Serra Tank which operate in the 380-foot and 160-foot pressure zones (PZ), respectively. These two tanks provide water storage for approximately 137 service connections. Sweetwater Mesa Tank is fed by two 40 horsepower pumps at the Serra Tank site through approximately 2,600 linear feet of 4" Asbestos Concrete (AC) water line along Sweetwater Mesa Road. The existing steel Sweetwater Mesa Tank, constructed in 1962, has an operational capacity of 0.093 million gallons (MG) and serves approximately 75 customers. The existing concrete Serra Tank, constructed in 1937, has an operational capacity of 0.13 MG and serves approximately 62 customers. The cumulative operational storage for both Tanks equals 0.22 MG. Currently, the 380-ft PZ cannot back-feed into the 160-ft PZ for maintenance of pressure and/or additional storage. The 160-ft PZ system receives its water directly from the Malibu 30-inch transmission water main along Pacific Coast Highway (PCH) via two pressure regulating valves. These connections also serve as the system's required fire protection. The hydraulic schematic for Sweetwater Mesa subsystem is shown.

<table>
<tr>
<td>Serra Pump Station Pump A
3670 Sweetwater Mesa Road
Ground Elevation: 150
Suction Pressure Zone: 325
Discharge Pressure Zone: 380</td>
<td rowspan="2">
</td>
</tr>
<tr>
<td>Serra Pump Station Pump B
3670 Sweetwater Mesa Road
Ground Elevation: 150
Suction Pressure Zone: 325
Discharge Pressure Zone: 380</td>
</tr>
</table>

A hydraulic analysis conducted by the Waterworks Design Unit found the required storage for the Sweetwater Mesa system to be 1.72 MG, including all approved developments such as the La Paz Ranch and Lumber Yard. This amount includes approximately 1.0 MG for maximum day demand (MDD) and 0.72 MG for fire protection. The existing system has a deficiency of 1.48 MG making the existing storage capacity far below current waterworks standards. This required storage, coupled with the undersized water mains in Sweetwater Mesa Road, and portions of

Cross Creek Road, Civic Center Way and Pacific Coast Highway, do not provide sufficient capacity to provide fire flow protection for the service area.

Solution

In order to meet Waterworks standard in this area a water system upgrade is proposed. Upgrading approximately 8,020 linear feet of various undersized pipes (4", 6", & 10") to 12" CMC & CML pipe will improve the hydraulics of the system. This improvement would allow the Sweetwater Mesa Tank to be directly fed from the transmission line. In addition to the main line upgrade, increasing the water tank volume at Sweetwater Mesa to 1 million gallons is needed. This project, in addition to increasing storage capacity and upsizing deficient water mains, will also improve the systems' energy efficiency by allowing the new Upper Sweetwater Tank (418-ft PZ) to be filled directly from the Malibu 30-inch transmission water main since sufficient pressure is available.

Cost & Benefit

This project is estimated at $8.7 million dollars. With the completion of the project, this system will be able to operate under the pressure provided by the transmission main, thus eliminating the need for a pump station to move water in the system. However, there will be a pump station in case of emergencies. Operating the system from the pressure provided by the transmission main will reduce operating costs approximately $14,700 annually. Accounting for inflation, over 20 years savings are estimated to be $440,000. An annual reduction of approximately 119,000 kWh will be eliminated as a result of this system modification. This reduction in electrical consumption is equivalent to removing about 82 metric tons of carbon dioxide annually which is comparable to removing 17 vehicles off the road and 8 homes energy usage.

LADPW Project Assessment Cost Form

Project Title: Sweetwater Mesa System Improvement   Project # 13

Please fill in yellow boxes.

Primary Equipment/Program Costs

$8,700,000	Unit Investment Cost
1	# of Units
70	Equipment Life
n/a	Engineering Costs (% of Project Cost)
n/a	Engineering Costs
n/a	Fuel Costs ($/yr)

Utility Management

n/a	kW per Unit
n/a	Capacity Factor
n/a	Annual kWh Produced
118892	Annual kWh Saved
n/a	Water Savings (AF)

GHG Reductions

82	Annual CO_2 Reduction (MT)

14747.83	Average Annual Savings

O&M Costs

n/a	# of Full Time Employees
n/a	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

n/a	Incentive ($/kWh)
n/a	# of years for Incentive
n/a	Rebate
n/a	# of years for Rebate
	Offset value ($/metric tons CO_2)
n/a	TOTAL

Results

	First Year Cost
$0	First Year Cost Utility Power
$1,242,857	10 Year Average Cost
$0	10 Year Average Utility Cost
$8,700,000	Lifecycle Cost
$0	Lifecycle Utility Cost

Rates

	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$14,748			$8,700,000							$8,685,252		82
2016	$15,333										$8,669,919		82
2017	$15,942										$8,653,977		82
2018	$16,575										$8,637,402		82
2019	$17,233										$8,620,169		82
2020	$17,917										$8,602,252		82
2021	$18,628										$8,583,623		82
2022	$19,368										$8,564,255		82
2023	$20,137										$8,544,118		82
2024	$20,936										$8,523,182		82
2025	$21,768										$8,501,415		82
2026	$22,632										$8,478,783		82
2027	$23,530										$8,455,253		82
2028	$24,464										$8,430,788		82
2029	$25,436										$8,405,353		82
2030	$26,445										$8,378,908		82
2031	$27,495										$8,351,412		82
2032	$28,587										$8,322,826		82
2033	$29,722										$8,293,104		82
2034	$30,902										$8,262,202		82

10.4.14 Coolwater Pump Station Modifications

Project Assessment #14

Amend the configuration of the Coolwater pump station to increase operations and energy efficiency, and improve water quality.

Net Capital Cost	Energy Project Cost
$330,000	$0

Project Savings	
First Year	20 years (w/ 4% inflation)
$24,500	$728,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
106 (10 homes, 22 cars)	2120 (200 homes, 440 cars)

PROJECT # 14
Coolwater Pump Station Modifications

Problem

The proposed project is located in Waterworks District No. 40, Antelope Valley, Region 38, Lake Los Angeles (District). The Lake Los Angeles area is an unincorporated community that consists of rural developments and vacant land east of the City of Palmdale. The distribution system consists of the 2850-foot and the 2992 pressure zones (PZ). There are approximately 2,350 customers in the 2850 PZ and 1,150 in the 2992 PZ. The water supply comes from two wells (38-3 and 38-4) and two Antelope Valley-East Kern Water Agency (AVEK) connections (Conn 38-4 and Conn 38-6). Water is pumped at an approximate rate of 1,325 gpm from the two wells to 177th Street East pump station fore bay tank. The water from the wells and the AVEK connections is then pumped to the Butte Tanks (three tanks totaling 3.2 million gallons (MG)) in the 2992 PZ. The Buttes tanks supply customers in the 2992 PZ directly and in the 2850 PZ after it gets reduced in pressure. This results in inefficient operations, poor water quality, and insufficient fire flow.

Solution

There are system modifications proposed at the Coolwater Pump Station to increase operations and energy efficiency, and improve water quality. First item is to install a pressure regulator on Pump “B” and keep Pump “A” as a booster. Also, construct a new above ground pressure reducing station at the Coolwater Pump Station site to regulate water from AVEK’s 2911 PZ into the 2850 PZ. This regulating station will also regulate down from the 2992 PZ to the 2850 PZ, maintaining a connection between the 2850 PZ and the gravity water storage at Buttes Tank site. Last item is to install approximately 100 linear feet of 12-inch diameter steel pipe to connect Booster Pump “C” to 2992 PZ pipe that runs along Coolwater Ave. and install approximately 200 linear feet of 12-inch diameter steel pipe along Coolwater Ave. to feed the 2850 PZ from the pump station site.

Cost & Benefit

This project is estimated at ($30,000 pressure regulator, $30,000 for pressure reducing station, $270,000 for pipeline). With the completion of the project, this system will be able to serve the 2850 PZ directly, thus eliminating the need for a pump station to move water to that system. However, there will be a network of pipes and pump station in case of emergencies. Operating the system from the pressure provided by the reduced pressure from AVEK can reduce operating costs up to approximately $24,500 annually. Accounting for inflation, over 20 years savings are estimated up to $730,000. Reduction in electrical consumption also means reduction in greenhouse gas emissions. This project is estimated to reduce about 106 metric tons of carbon dioxide annually which is equivalent to removing 22 vehicles off the road.

LADPW Project Assessment Cost Form

Project Title: Coolwater Pump Station Modification — Project # 14

Please fill in yellow boxes.

Primary Equipment/Program Costs

330000	Unit Investment Cost
	# of Units
	Equipment Life
	Engineering Costs (% of Project Cost)
	Engineering Costs
	Fuel Costs ($/yr)

Utility Management

	kW per Unit
	Capacity Factor
	Annual kWh Produced
153796	Annual kWh Saved
	Water Savings (AF)

GHG Reductions

106	Annual CO_2 Reduction (MT)

24522.24	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
	Rebate
	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	Average 2012-2013 Water Production Cost ($/AF)
$385.60	Average 2012-2013 Water Purchase Price ($/AF)
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$24,522.24			$330,000.00	$330,000.00		$0.00	$0.00	$305,477.76				106
2016	$25,495.77								$279,981.99				106
2017	$26,507.96								$253,474.03				106
2018	$27,560.32								$225,913.71				106
2019	$28,654.47								$197,259.25				106
2020	$29,792.05								$167,467.20				106
2021	$30,974.79								$136,492.41				106
2022	$32,204.49								$104,287.91				106
2023	$33,483.01								$70,804.90				106
2024	$34,812.29								$35,992.62				106
2025	$36,194.33								-$201.71				106
2026	$37,631.25								-$37,832.96				106
2027	$39,125.21								-$76,958.17				106
2028	$40,678.48								-$117,636.65				106
2029	$42,293.42								-$159,930.07				106
2030	$43,972.46								-$203,902.53				106
2031	$45,718.17								-$249,620.70				106
2032	$47,533.18								-$297,153.88				106
2033	$49,420.25								-$346,574.13				106
2034	$51,382.23								-$397,956.36				106

Project Assessment #15

Install 3 pressure reducing turbine at various locations to generate renewable energy. 1) MWD interconnection 2) AVEK interconnection at M5E 3) AVEK interconnection at L12-60W.

Net Capital Cost	Energy Project Cost
$9,800,000	$8,760,000 w/ rebates

Project Savings	
First Year	20 years (w/ 4% inflation)
$413,000	$12,310,000

Green House Gas Reductions (MT of CO_2)	
First Year	20 years
2,600 (237 homes, 547 cars)	52,000 (4,740 homes, 10,940 cars)

PROJECT # 15
Micro Hydro Turbine at 3 Locations

Problem

Waterworks requires approximately 30.6 gigawatt hours (GWh) of electricity annually in order to deliver water to all of its customers. It takes approximately $4.2 million annually to pay for that electricity. Every year, electric rates go up, it has been estimated from previous electric bills to be about 4% annually. With rising electric costs and deteriorating water infrastructure, it is challenging to maintain current water rates for the customers.

Solution

Three hydraulic pressure reducing turbines are proposed to be installed at various locations around the Districts. These hydro turbines will be optimized for the chosen locations. The proposed sites are located in District 29 and 40. One will be located at the Metropolitan Water District interconnection zone for Malibu. The two other locations will be in District 40, at the Antelope Valley East Kern interconnection at M5E and the Antelope Valley East Kern interconnection at L12-60W.

Preliminary estimates of generating capacity are based on average pressure and flow rates at the sites collected from the SCADA historian. The generating capacity for each site is as follows:

MWD interconnection	408 kW
AVEK interconnection at M5E	350 kW
AVEK interconnection at L12-60W	185 kW

The combined generating capacity of the 3 locations is estimated to be approximately 3.77 million kWh or 3.77 GWh, approximately 10% of Waterworks electrical consumption.

Cost & Benefit

Total cost for design and installation is estimated to be $9.8 Million. Once the earned rebates ($1,065,590) are factored into the cost, the total construction cost for Waterworks is approximately $8.75 million. Average annual savings is estimated to be $413,000. Over a 20 year time period, total savings with 4% inflation is estimated to be $12.3 million. In the span of 20 years the difference between the savings and net project cost will be approximately $3.55 million. In the long run, this project is very beneficial to Waterworks.

Additional benefits come in the form of reduced greenhouse gas emissions. Approximately 3.77 million kWh will be reduced annually which will eliminate 2,600 metric tons of carbon dioxide emission from fossil fuels. These 2,600 metric tons is equivalent to the mileage driven by about 547 passenger cars or the energy used by approximately 237 homes each year.

LADPW Project Assessment Cost Form

Project Title: Micro Hydro Turbine @ 3 Sites — Project # 15

Please fill in yellow boxes.

Primary Equipment/Program Costs

$10,000	Unit Investment Cost
943	# of Units
15-25 years	Equipment Life
	Engineering Costs (% of Project Cost)
$130,000.00	Engineering Costs
N/A	Fuel Costs ($/yr)

Utility Management

1	kW per Unit
40 to 95	Capacity Factor
3,771,000	Annual kWh Produced
N/A	Annual kWh Saved
N/A	Water Savings (AF)

GHG Reductions

2600	Annual CO_2 Reduction (MT)

$413,301.60	Average Annual Savings

O&M Costs

	# of Full Time Employees
	O&M Cost ($/kWh, $/Hr, $/ft))

Other Equipment Costs

Incentives/Rebates

SCE's Customized Incentives/Rebates

	Incentive ($/kWh)
	# of years for Incentive
1065590	Rebate ($/W @ 1.13/W)
1	# of years for Rebate
	Offset value ($/metric tons CO_2)
	TOTAL

Results

	First Year Cost
	First Year Cost Utility Power
	10 Year Average Cost
	10 Year Average Utility Cost
	Lifecycle Cost
	Lifecycle Utility Cost

Rates

Y	Use Cash v. Borrow (Y/N)
4.0%	Loan/Bond Rate
1.0%	Loan/Bond Issuance Cost %
2.5%	Inflation
3.1%	Real Discount Rate
5.7%	Nominal Discount Rate
$72,000	Cost per FTE ($/yr)
$0.1096	Average 2012-2013 Utility Cost ($/kWh)
$175.08	erage 2012-2013 Water Production Cost ($/
$385.60	verage 2012-2013 Water Purchase Price ($/A
3.97%	Utility/Fuel Escalator

Year	Annual Generation or Savings	Equipment Cost	Engineering Cost	Total Capital Cost	Total Capital Cost Less Incentives	Annual Debt Service ($/yr)	O&M Cost ($/yr)	Fuel Cost ($/yr)	Total Cost	Incentives	Total Net Cost	Utility Cost	GHG Reduction (MT/yr)
2015	$413,302	$9,430,000	$390,000.00	$9,820,000	$8,754,410	0		0	$8,341,108		$8,341,108		2600
2016	$429,834	0	0	0	0	0		0	$7,911,275		$7,911,275		2600
2017	$447,027	0	0	0	0	0		0	$7,464,248		$7,464,248		2600
2018	$464,908	0	0	0	0	0		0	$6,999,340		$6,999,340		2600
2019	$483,504	0	0	0	0	0		0	$6,515,835		$6,515,835		2600
2020	$502,845	0	0	0	0	0		0	$6,012,991		$6,012,991		2600
2021	$522,958	0	0	0	0	0		0	$5,490,032		$5,490,032		2600
2022	$543,877	0	0	0	0	0		0	$4,946,156		$4,946,156		2600
2023	$565,632	0	0	0	0	0		0	$4,380,524		$4,380,524		2600
2024	$588,257	0	0	0	0	0		0	$3,792,267		$3,792,267		2600
2025	$611,787	0	0	0	0	0		0	$3,180,479		$3,180,479		2600
2026	$636,259	0	0	0	0	0		0	$2,544,221		$2,544,221		2600
2027	$661,709	0	0	0	0	0		0	$1,882,511		$1,882,511		2600
2028	$688,178	0	0	0	0	0		0	$1,194,334		$1,194,334		2600
2029	$715,705	0	0	0	0	0		0	$478,629		$478,629		2600
2030	$744,333	0	0	0	0	0		0	-$265,704		-$265,704		2600
2031	$774,106	0	0	0	0	0		0	-$1,039,810		-$1,039,810		2600
2032	$805,070	0	0	0	0	0		0	-$1,844,880		-$1,844,880		2600
2033	$837,273	0	0	0	0	0		0	-$2,682,153		-$2,682,153		2600
2034	$870,764	0	0	0	0	0		0	-$3,552,918		-$3,552,918		2600

10.5 Project Assessment Form Content Descriptions

- **Primary Equipment/Program Costs**

This section is dedicated towards capital investment of the project itself. This section is trying to determine the fixed and engineering costs to get the project to an operational state.

  - Unit Investment Cost

The purpose for this is to get an estimate on cost for a unit. The definition for a unit is broad. A unit could be the cost per linear foot installed, the cost for a single device, or more general cost per unit ($/gal, $/hr, $/hp). For example the project is to install 1000' of pipe. The cost per unit in this case would be an average cost per liner foot installed. Another example is a new storage tank, list a cost to build it per 10,000 or 100,000 gallons.

  - # of Units

How many units are proposed? For example the project is to install 1000' of pipe. The number of units would be 1000'.

  - Equipment Life

How long is the functional life of the proposed project? If a portion of the project which has a large capital investment (>15% of total project cost) needs to be replaced 5 years into the project functional life.

  - Engineering Costs (% of Project Cost)

How much of the project is spent designing? What portion of the cost is dedicated towards engineers working on the project?

  - Engineering Costs

What is the anticipated dollar amount to be spent with designing the project?

  - Fuel Costs ($/yr)

This element applies to vehicles and operations that require fuel to operate. Projects that would fulfill this item would be natural gas microturbines or a vehicle. If the project does not meet this item place a dash in the yellow box.

- **Utility Management**

This section is dedicated towards electricity, either consumption or production.

  - kW per Unit

If installing a pump how many kW/HP does it require? If installing renewable energy, how many kW does it generate?

  - Capacity Factor

This item is specific to renewable energy sources. If a project is able to generate electricity this factor applies. $Capacity\ Factor = \frac{theorethical\ electrical\ generation}{Total\ possible\ electrical\ generation}$ The capacity factor will look at electric potential on a timescale of a year

  - Annual kWh Produced

How many kilowatt hours can be created in one year?

  - Annual kWh Saved

If a proposed project is a revision to a current process and there is a way to reduce electricity, how many kilowatt hours is it?

  - Water Savings (AF)

If a project is targeted to save water, what is the anticipated water savings? For example a water mainline is prone to leaks and that is a reason for the replacement, how much water loss is reduced? Another example, there is a change to a piping network; a closed end is now connected to a loop, thus eliminating the need to flush water from the closed end.

- **GHG Reductions**

This section is dedicated to greenhouse gas reductions. Greenhouse gas reductions will appear in two cases: reduction in gasoline consumption, or reduction of electrical consumption either through improvement in operations or production of renewable energy.

  - Annual CO_2 Reduction (MT)

This value is calculated based on kWh reduced or reduction in fuel combusted.

- **O&M Costs**
  - # of Full Time Employees

Once the project is operational, what is the man power up keep? In a 40 hour work week (or spaced out over the year) how much time does that employee dedicate to the operation and maintenance of the project?

  - O&M Cost ($/kWh, $/Hr, $/ft))

Once the project is operational, what are the material costs? If a pump is installed and it requires a service every 5,000 hours of operation, what is the cost averaged on an hourly basis?

- **Other equipment costs**

The purpose of this section is to identify additional costs burdened by a project. For example, if a new pump station were desired, it would require a construction to install the pumps. The construction would require a building, foundation, installation, permitting, construction management, etc. Another example could be new equipment is installed and it requires an outside consultant to configure the device to work with the The Districts system, the cost required to install and configure the system would be included here.

- **Incentives/Rebates: SCE's Customized Incentives/Rebates**

This section is dedicated towards direct monies earned or received as a result of the project.

  - Incentive ($/kWh)

In the case of the solar plant, WWD was able to sell back electricity to the grid at a rate of 5 ¢ per kWh. Another example is the demand response program, how much does SCE pay for rebate program.

  - # of years for Incentive

How long does the incentive last? The solar project has a contract to sell power back to SCE for 5 years. Demand response programs are renewed each year.

  - Rebate

Is there a rebate available for the purchase and installation of the product?

  - # of years for Rebate

Is the rebate paid as a onetime amount? Is it paid on intervals throughout the following years?

  - Offset value ($/metric tons CO_2)

10.6 Evaluation Criteria

Evaluation Criteria	Description	Weight
Cost/Cost-Effectiveness	How does this project cost compare to the other projects and to continued purchases of electricity? Relative level of capital, operations and maintenance (O&M), and present worth life-cycle costs for the proposed projects. Cost-effectiveness evaluation by dividing the annualized life-cycle cost by the estimated amount of GHG reduced or kWh produced, to determine a $/MT CO_2 or $/kWh value for the proposed project. Expected life of the asset. Incentives.	30
Operational Impacts	General operations and maintenance complexity. Additional support utility requirements. Number of different processes and equipment. Level of automation and ease of operation. Staffing and maintenance requirements.	5
GHG & Environmental Impacts	Amount of energy saved, renewable energy produced, or GHG mitigated by a proposed project. Reduction of local energy consumption and/or local GHG emissions. How well do the reductions in GHG compare to the other projects and to continued purchases of electricity?	20
Project Development & Constructability	Where is the project in the design phase? Has it begun construction? Does it have funding? Number of available suppliers. Experienced vendors available. Proven performance, stage of research and/or development, reliability, and sustainability of the proposed project.	45

10.7 Evaluation Score Card

Evaluation Criteria Score Card

Category

Project Assessment #	Cost/Cost-Effectiveness (0-30)									Operational Impacts (0-5)									GHG Impacts & Environmental Impacts (0-20)									Project Development & Constructability (0-45)									Total Score
1	30	30	30	30	30	30	30	30	30	5	5	4	3	5	5	5	4	5	10	2	5	10	8	7	10	8	8	45	45	45	36	45	40	45	45	43	85.3
2	15	20	13	10	10	15	12	10	13	3	5	2	3	5	5	5	5	4	2	0	5	10	10	10	5	5	6	41	36	45	45	30	30	40	45	39	62.0
3	26	26	30	30	25	20	20	25	25	2	2	3	3	3	2	3	2	2	0	15	10	10	5	5	5	7	7	40	40	40	40	37	35	40	30	38	72.5
4	20	20	16	16	20	23	22	20	20	4	4	3	4	5	5	4	3	4	3	20	15	20	20	15	20	20	17	40	28	23	35	30	33	35	30	32	72.0
5	30	26	23	23	30	26	23	23	25	3	5	4	4	3	5	4	4	4	8	20	20	15	8	20	20	15	16	40	14	23	20	40	14	23	20	24	69.2
6a	29	28	23	23	29	28	23	23	25	5	4	3	3	5	4	3	3	4	15	20	20	20	20	20	20	20	19	45	32	45	23	45	32	45	40	38	86.5
6b	30	28	26	23	30	28	26	23	27	5	5	5	3	5	5	5	3	4	20	20	20	20	20	20	20	20	20	10	12	5	8	10	15	10	5	9	60.4
7	20	20	16	16	20	23	22	20	20	4	4	3	4	5	5	4	3	4	3	20	15	20	20	15	20	20	17	23	27	23	23	30	25	28	30	26	66.3
8	29	28	23	23	29	28	23	23	25	5	4	3	3	5	4	3	3	4	15	20	20	20	17	18	15	20	18	40	32	40	23	35	40	45	40	37	83.9
9	15	20	13	10	10	15	12	10	13	3	5	2	3	5	5	5	5	4	2	0	5	10	10	10	5	5	6	41	36	45	45	30	30	40	45	39	62.0
10	30	30	25	25	30	25	25	20	26	5	5	5	5	5	5	5	5	5	20	20	20	20	20	20	20	20	20	10	12	10	15	8	20	15	10	13	63.8
11	15	15	15	0	15	15	15	15	13	4	3	4	4	5	3	2	4	4	10	7	10	5	8	10	5	5	8	10	5	5	10	6	7	10	10	8	32.1
12	8	15	10	20	14	25	20	30	18	5	5	5	5	5	5	5	5	5	15	18	20	20	15	17	20	20	18	30	30	35	30	40	35	40	38	35	75.6
13	8	15	10	10	14	10	5	6	10	5	5	5	5	5	5	5	5	5	15	10	20	20	15	10	12	20	15	35	30	20	30	40	30	30	38	32	61.6
14	25	25	28	30	25	30	27	30	28	5	5	5	5	5	5	5	5	5	15	17	16	20	20	14	18	20	18	30	45	45	38	40	40	35	45	40	89.8
15	15	18	20	20	18	25	20	17	19	5	5	5	5	5	5	5	5	5	20	20	20	20	20	20	20	20	20	40	45	40	45	45	40	44	45	43	87.1
16	20	18	25	25	15	15	20	20	20	5	5	5	5	5	5	5	5	5	15	10	20	20	15	10	12	20	15	10	12	10	15	8	20	15	10	13	52.5

10.8 Summary Presentation

Los Angeles County Waterworks Districts
Energy Master Plan

Previous Efficiency Efforts

Background of Waterworks energy efficiency efforts

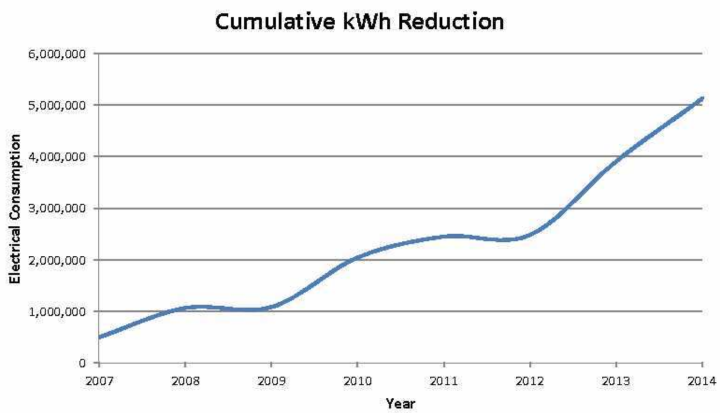
- Timeclocks
- Appropriate rate schedules
- High efficiency motors
- Routine well maintenance
- 350 kW Solar power
- Numerous other efforts

ENERGY MASTER PLAN

LACWD
LOS ANGELES COUNTY WATERWORKS DISTRICTS

Previous Efficiency Efforts

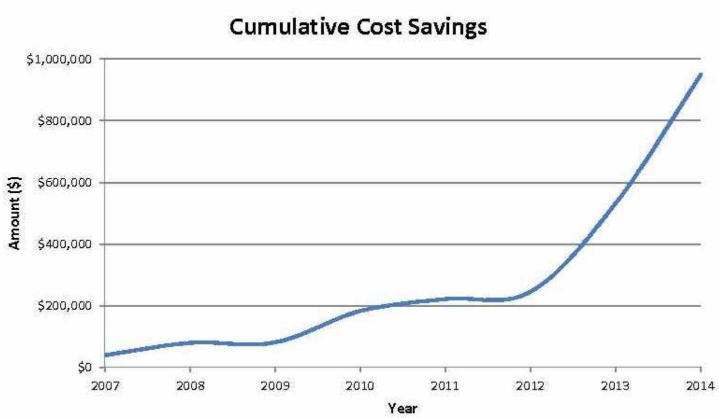
Efforts have reduced 5.1 million kWh since 2007



ENERGY MASTER PLAN

Previous Efficiency Efforts

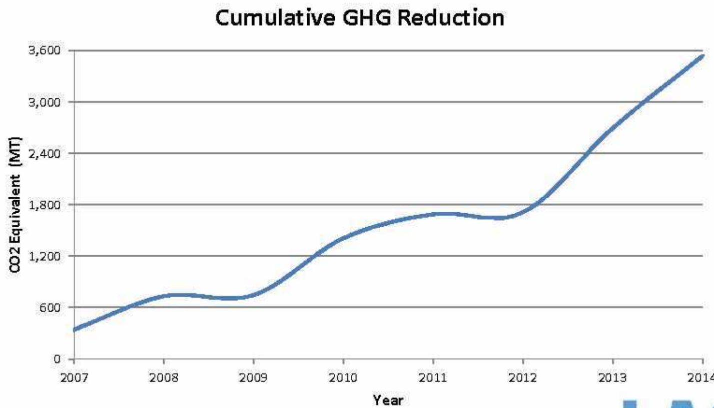
Efforts have saved close to $1 million since 2007



ENERGY MASTER PLAN

Previous Efficiency Efforts

Efforts have eliminated 3,600 metric tons of greenhouse gas emissions since 2007 (327 homes or 755 cars)



ENERGY MASTER PLAN

Goal of Master Plan

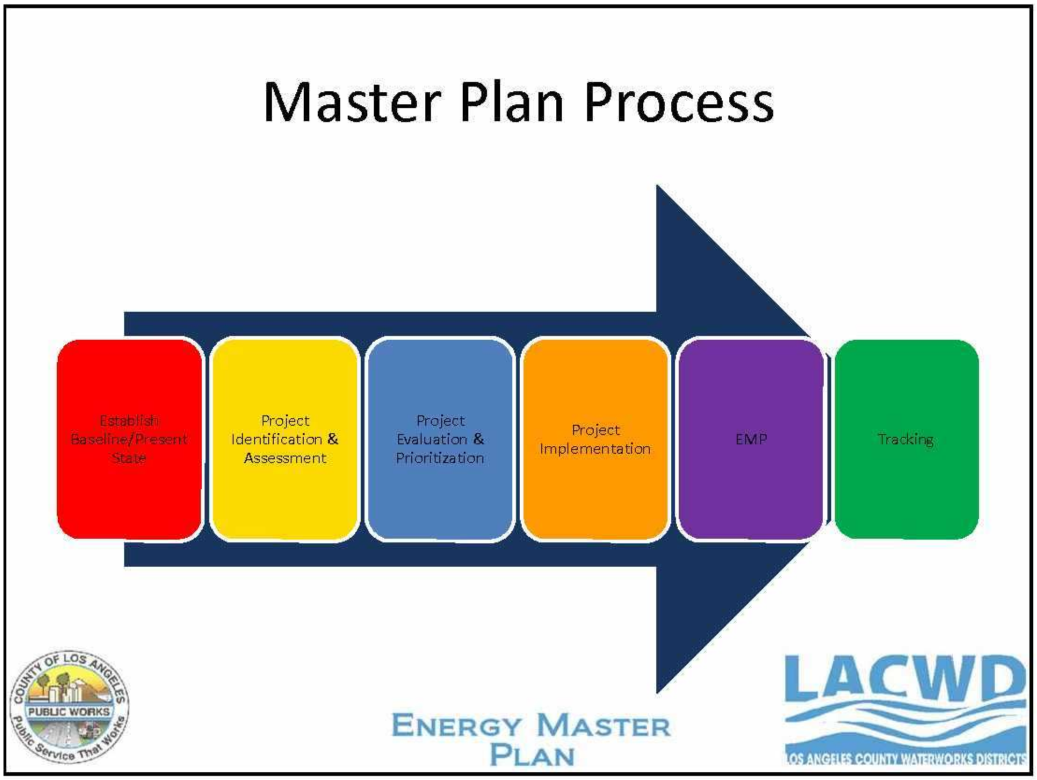
Identify a portfolio of programs and projects to

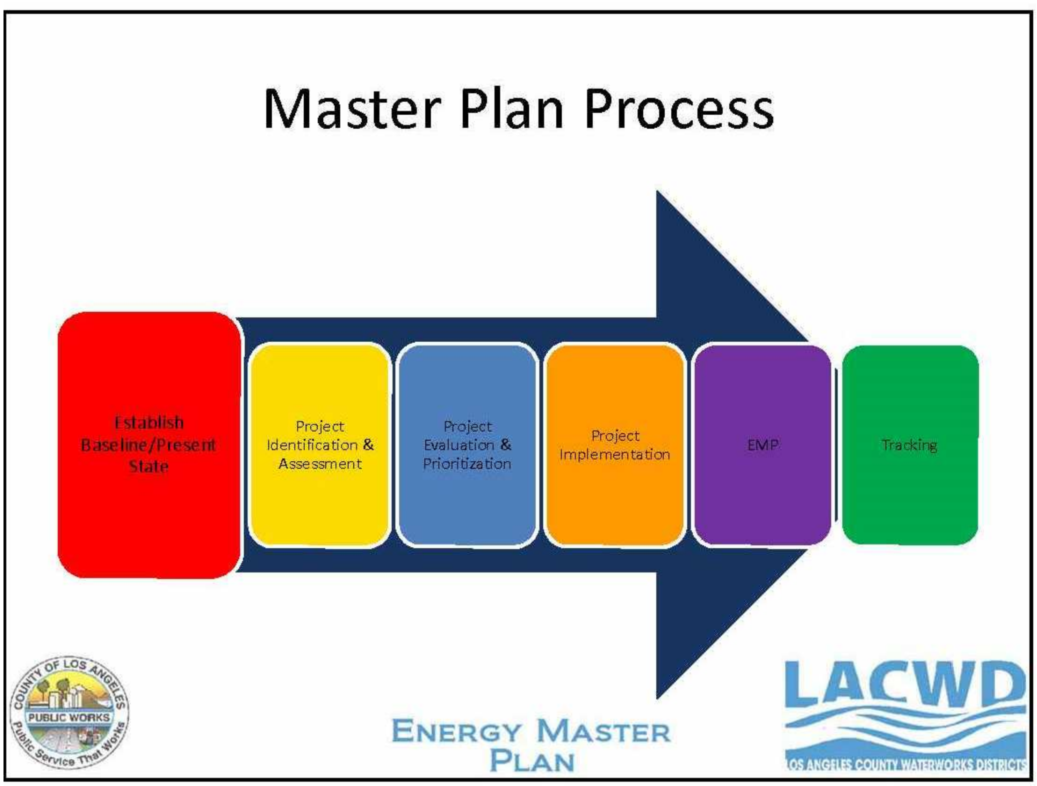
- Reduce the Districts' future energy usage
- Reduce costs
- Reduce greenhouse gas emissions

Anticipation of regulatory requirements

- Energy conservation
- Greenhouse gas reduction

ENERGY MASTER PLAN


Master Plan Process
Establish Baseline/Present State
Project Identification & Assessment
Project Evaluation & Prioritization
Project Implementation
EMP
Tracking
COUNTY OF LOS ANGELES
PUBLIC WORKS
Public Service That Works
ENERGY MASTER PLAN
LACWD
LOS ANGELES COUNTY WATERWORKS DISTRICTS


Master Plan Process
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Project Identification & Assessment
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Project Implementation
EMP
Tracking
COUNTY OF LOS ANGELES
PUBLIC WORKS
Public Service That Works
ENERGY MASTER PLAN
LACWD
LOS ANGELES COUNTY WATERWORKS DISTRICTS

Establish Baseline/Present State

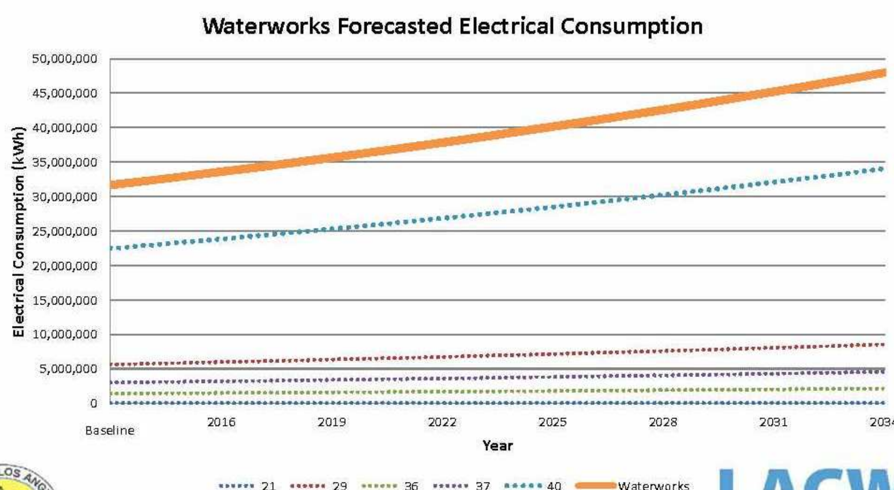
- Baseline tries to determine a reference point
- Baseline is defined as
  - Average of data from 2011, 2012, & 2013
    - Electrical consumption
    - Electrical cost
    - Greenhouse gas emissions

ENERGY MASTER PLAN

LACWD

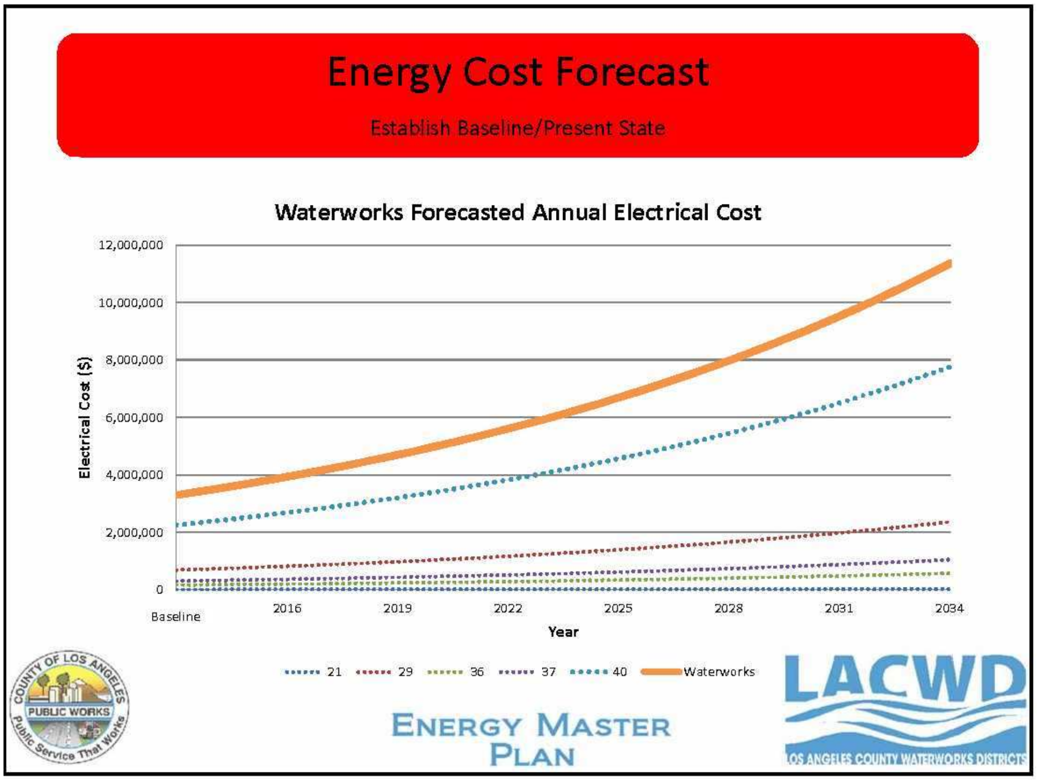
Energy Consumption Forecast

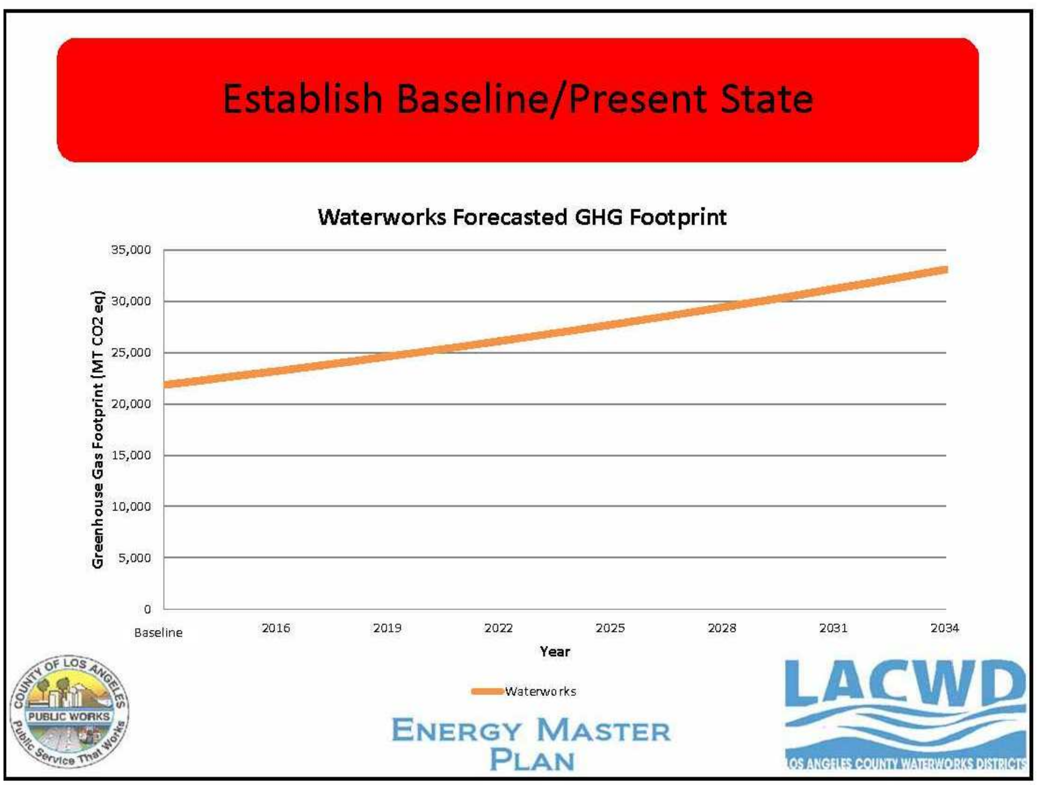
Establish Baseline/Present State



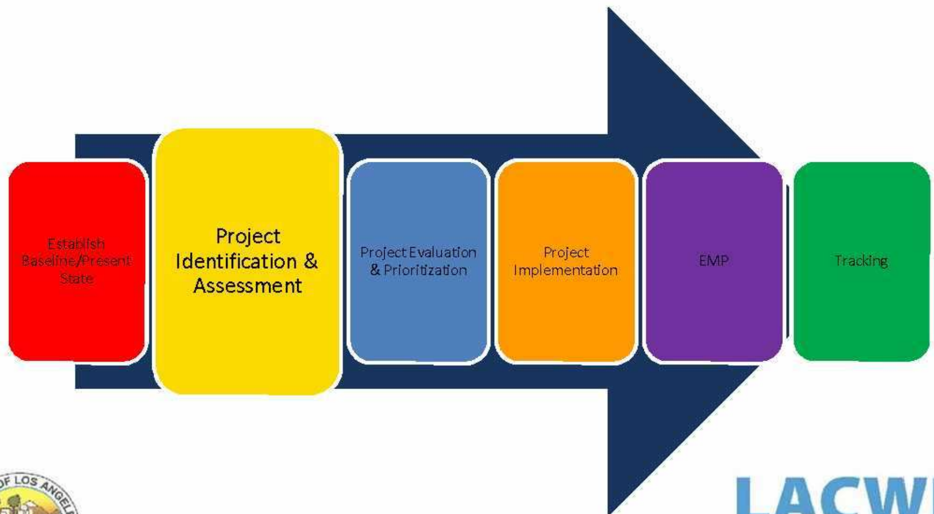
ENERGY MASTER PLAN

LACWD


Energy Cost Forecast
Establish Baseline/Present State
Waterworks Forecasted Annual Electrical Cost
Electrical Cost ($)
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
Baseline
2016
2019
2022
2025
2028
2031
2034
Year
21
29
36
37
40
Waterworks
ENERGY MASTER PLAN
LACWD
LOS ANGELES COUNTY WATERWORKS DISTRICTS


Establish Baseline/Present State
Waterworks Forecasted GHG Footprint
Greenhouse Gas Footprint (MT CO2 eq)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Baseline
2016
2019
2022
2025
2028
2031
2034
Year
Waterworks
ENERGY MASTER PLAN
LACWD
LOS ANGELES COUNTY WATERWORKS DISTRICTS

Master Plan Process



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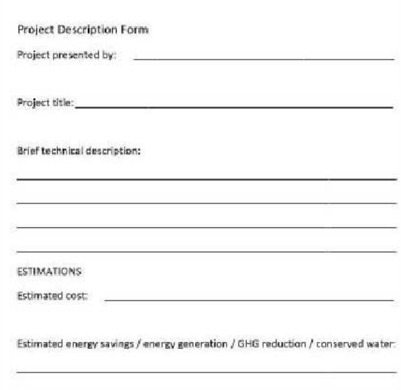
Project Identification

Project Identification & Assessment

1. Project Identification form
    a. Idea that positively affects water system
    b. 45 project ideas
        i. Meet with project proposers
2. Project compiling
    a. Qualitative approach to filtering meaningful projects
    b. 45 projects to 15 projects assessed



Project Description Form

Project presented by: ____________________

Project title: ____________________

Brief technical description:

ESTIMATIONS

Estimated cost: ____________________

Estimated energy savings / energy generation / GHG reduction / conserved water:

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Project Assessment

Project Identification

4. Project assessment
   a. Quantitative approach to measuring 15 projects
   b. Project assessment form
      i. Meet with project proposers
   c. Sample project assessment
5. Finalized project assessment
      i. Meet with project proposers

PROJECT # 12
Carbon Mesa Rd to Fire Station System Enhancement

Problem

The Carbon Canyon Subsystem along Carbon Canyon serves one zone (580). The Carbon Mesa Tank is fed by three pumps (Carbon Canyon Fire House, Lower Carbon Mesa and Upper Carbon Mesa) from the transmission main line. The Lower Carbon Mesa and upper Carbon Mesa pumps are in series and all three pump stations operate simultaneously. The hydraulic schematic for Carbon Canyon subsystem is shown.

Lower Carbon Mesa Pump Station
22209 Pacific Coast Highway
Ground Elevation: 75
Suction Pressure Zone: 325
Discharge Pressure Zone: 580

Carbon Cyn. Fire Hose Pump Station
3960 Carbon Canyon Road
Ground Elevation:100
Suction Pressure Zone: 325
Discharge Pressure Zone: 580

Upper Carbon Mesa Pump Station
22529 Carbon Mesa Road
Ground Elevation: 120
Suction Pressure Zone: 325
Discharge Pressure Zone: 580

The water mains in this system are undersized, the water flow through the system does not meet Waterworks standard for fire flow.

Solution

In order to meet Waterworks standard in this area a water system upgrade is proposed. Upgrading approximately 8,000 linear feet of 2" pipe to 8" pipe will improve the hydraulics of the system. This improvement would allow the tank in this area to be directly fed from the transmission line. In addition to the main line upgrade, increasing the water tank volume to 250,000 gallons is needed. The new tank and additional upgrades listed above will provide improved storage capacity and adequate distribution capacity for domestic and fire protection water demands in the system. Lastly, it is recommended that the existing pump stations be replaced by a sole pump station with two pumps capable of moving 125 gpm. These pumps will be used in case of emergencies.

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Summary of Project Assessment

Project Identification & Assessment

- 15 Projects were assessed
  – Cost
  – Savings
  – Greenhouse gas reductions

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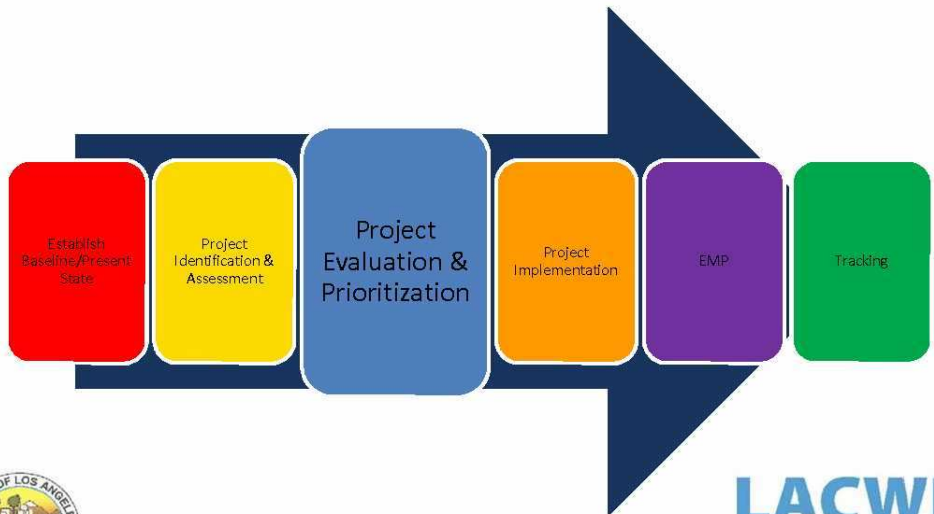
Master Plan Process



ENERGY MASTER PLAN

Project Evaluation

Project Evaluation & Prioritization

- Developed procedure to measure project ideas objectively.
  - Meet with project proposers to render scores
    - Project Development & Constructability
    - Cost/Cost-Effectiveness
    - GHG Impacts and Environmental Impacts
    - Operational Impacts

Evaluation Criteria

Project Assessment #	Category			
	Cost/Cost-Effectiveness (0-30)	Operational Impacts (0-5)	GHG Impacts & Environmental Impacts (0-20)	Project Development & Constructability (0-45)
1				
2				
3				
4				
5				

ENERGY MASTER PLAN

Project Prioritization

Project Evaluation & Prioritization

Project Name	Priority	Net Capital Cost	Energy Project Cost	20 Year Savings	Net Potential Value of Savings
VFD for Intermediate Zone at Calm Garden PS	1	$212,000	$212,000	$430,000	$218,000
Micro Hydro Turbine @ M7W	1	$1,460,000	$935,000	$2,709,000	$1,818,000
Coolwater System Improvements	1	$330,000	$0	$728,000	$728,000
NMA Office Solar Carport	1	$900,000	$150,000	$976,000	$692,000
Coastline Drive 12" Waterline Replacement	2	$1,467,000	$0	$580,000	$580,000
Carbon Mesa Rd to Fire Station System Enhancement	2	$4,742,000	$0	$237,000	$237,000
Electric Vehicles for meter readings - Lancaster	3	$320,000	$20,000	$360,000	$340,000
Electric Vehicles for meter readings - Malibu	3	$161,000	$12,000	$171,000	$159,000
Modify Vehicle Fleet	3	$6,300,000	$0	$1,653,000	$1,653,000
Lancaster HQ Interior Lighting Equipment Upgrade	3	$63,000	$63,000	$80,000	$17,000
5 Megawatt Solar Field Array in Antelope Valley	4	$20,900,000	$20,900,000	$52,000,000	$31,100,000
Micro Hydro Turbine @ 3 Locations	4	$9,800,000	$8,755,000	$12,308,000	$3,553,000
Malibu Chlorine Injection System	4	$3,000,000	$0	$160,000	$160,000
Sweetwater System Improvements	4	$500,000	$0	$116,000	$116,000
Sweetwater Mesa System Design and Construction	4	$8,700,000	$0	$438,000	$438,000
			$31,046,000	$72,900,000	$41,840,000

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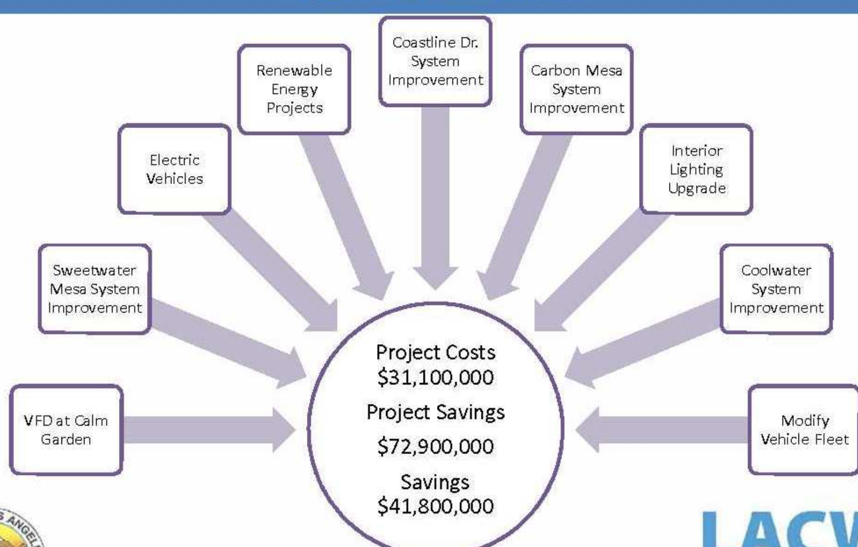
Energy Project Amalgamation

Project Evaluation & Prioritization



ENERGY MASTER PLAN

Project Prioritization

Project Evaluation & Prioritization

Project Name	Priority	Annual kWh Reduction	20 Year kWh Reduction	20 Year GHG Drop (MT CO_2)
VFD for Intermediate Zone at Calm Garden PS	1	133,000	2,660,000	1,820
Micro Hydro Turbine @ M7W	1	830,000	16,600,000	11,440
Coolwater System Improvements	1	154,000	3,080,000	2,120
NMA Office Solar Carport	1	202,000	4,040,000	2,780
Coastline Drive 12" Waterline Replacement	2	179,000	3,580,000	2,460
Carbon Mesa Rd to Fire Station System Enhancement	2	57,000	1,140,000	780
Electric Vehicles for meter readings - Lancaster	3	0	0	580
Electric Vehicles for meter readings - Malibu	3	0	0	280
Modify Vehicle Fleet	3	0	0	2,480
Lancaster HQ Interior Lighting Equipment Upgrade	3	25,000	500,000	336
5 Megawatt Solar Field Array in Antelope Valley	3	12,506,000	250,120,000	172,380
Micro Hydro Turbine @ 3 Locations	4	3,773,000	75,460,000	52,000
Malibu Chlorine Injection System	4	0	0	240
Sweetwater System Improvements	4	21,000	420,000	276
Sweetwater Mesa System Design and Construction	4	119,000	2,380,000	1,640
			360,000,000	**251,400**

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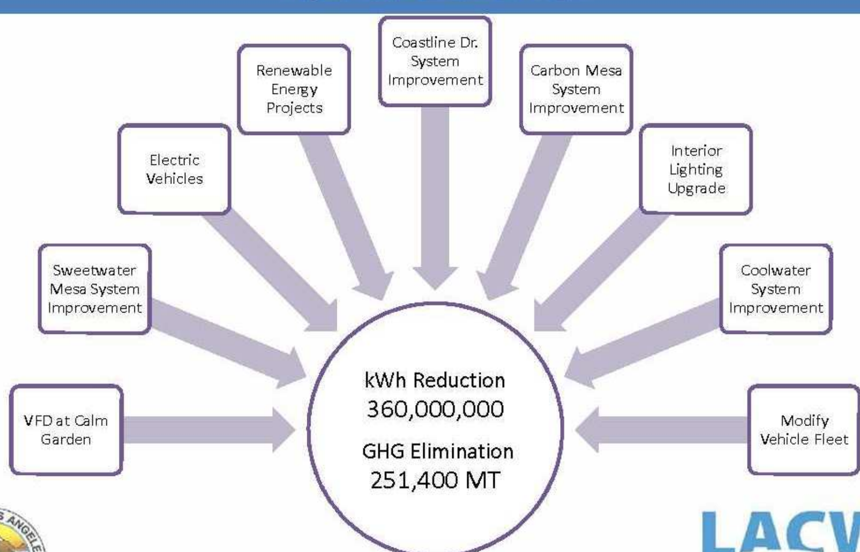
Energy Project Amalgamation

Project Evaluation & Prioritization



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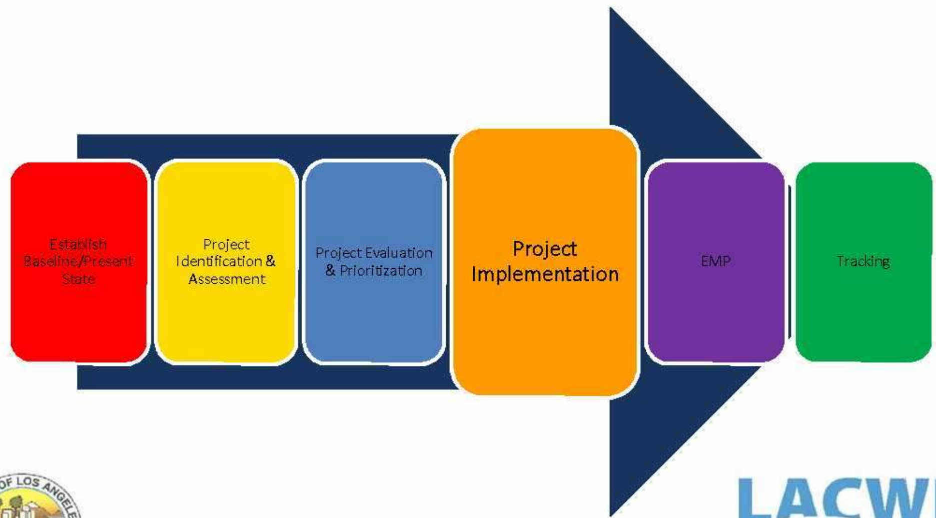
Master Plan Process



Energy Master Plan

Project Implementation

- Assign project to appropriate section
- Investigate funding
- Prepare project schedule

Energy Master Plan

Project Implementation

Project	Priority	Assigned	Funding
VFD for Intermediate Zone at Calm Garden PS	1	NMA	General fund D37
Micro Hydro Turbine @ M7W	1	WQ	ACO 40
Coolwater System Improvements	1	NMA	General fund D38
NMA Office Solar Carport	1	PM	ACO 40
Coastline Drive 12" Waterline Replacement	2	PM	ACO 29
Carbon Mesa Rd to Fire Station System Enhancement	2	PM	Phase 1 Master plan (Bond & ACO Fund)
Electric Vehicles for meter readings – Lancaster	3	NMA	General fund NMA
Electric Vehicles for meter readings – Malibu	3	SMA	General fund SMA
Modify Vehicle Fleet	3	NMA/SMA	General fund NMA
Lancaster HQ Interior Lighting Equipment Upgrade	3	NMA/EM	General fund NMA
5 Megawatt Solar Field Array in Antelope Valley	4	WQ/PM	ACO 40
Micro Hydro Turbine @ 3 Locations	4	WQ/PM	ACO 29/40
Malibu Chlorine Injection System	4	PM	ACO 29
Sweetwater Mesa System Design and Construction	4	PM	ACO 29
Sweetwater System Improvements	4	PM	ACO 29

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Project Schedule

Project Implementation

- 2015 – Priority 1 projects
- 2016 – Priority 1 projects
- 2017 – Priority 2 projects
- 2018 – Priority 3 projects
- 2020+ – Priority 4 projects

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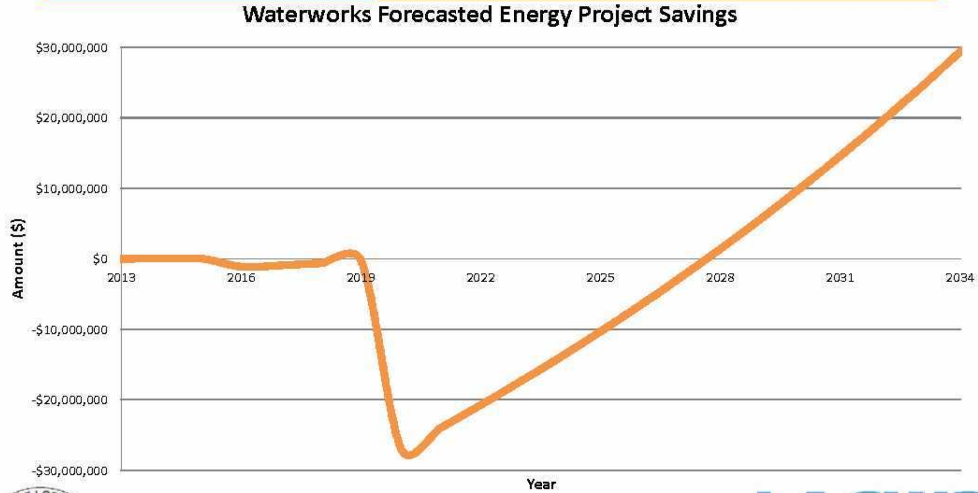
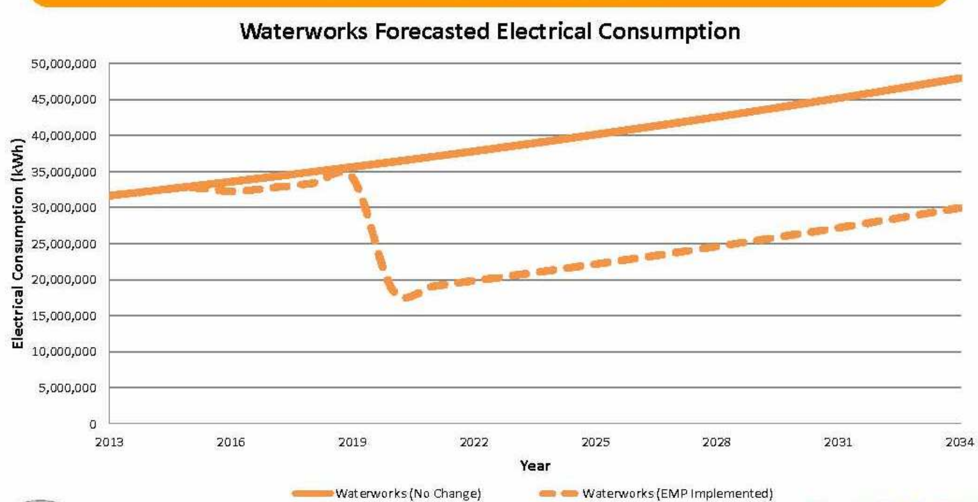
Energy Master Plan Projects
Net Present Value

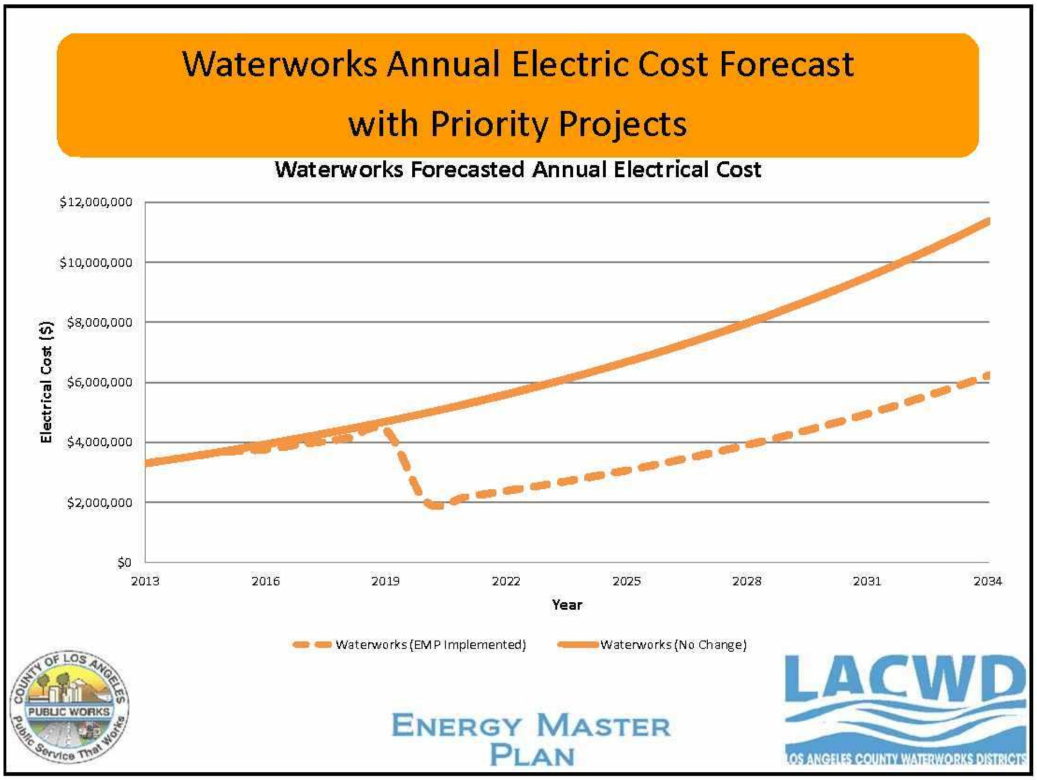


ENERGY MASTER PLAN

Waterworks Electrical Consumption Forecast with Priority Projects



ENERGY MASTER PLAN


Waterworks Annual Electric Cost Forecast
with Priority Projects
Waterworks Forecasted Annual Electrical Cost
Electrical Cost ($)
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
2013
2016
2019
2022
2025
2028
2031
2034
Year
Waterworks (EMP Implemented)
Waterworks (No Change)
ENERGY MASTER PLAN
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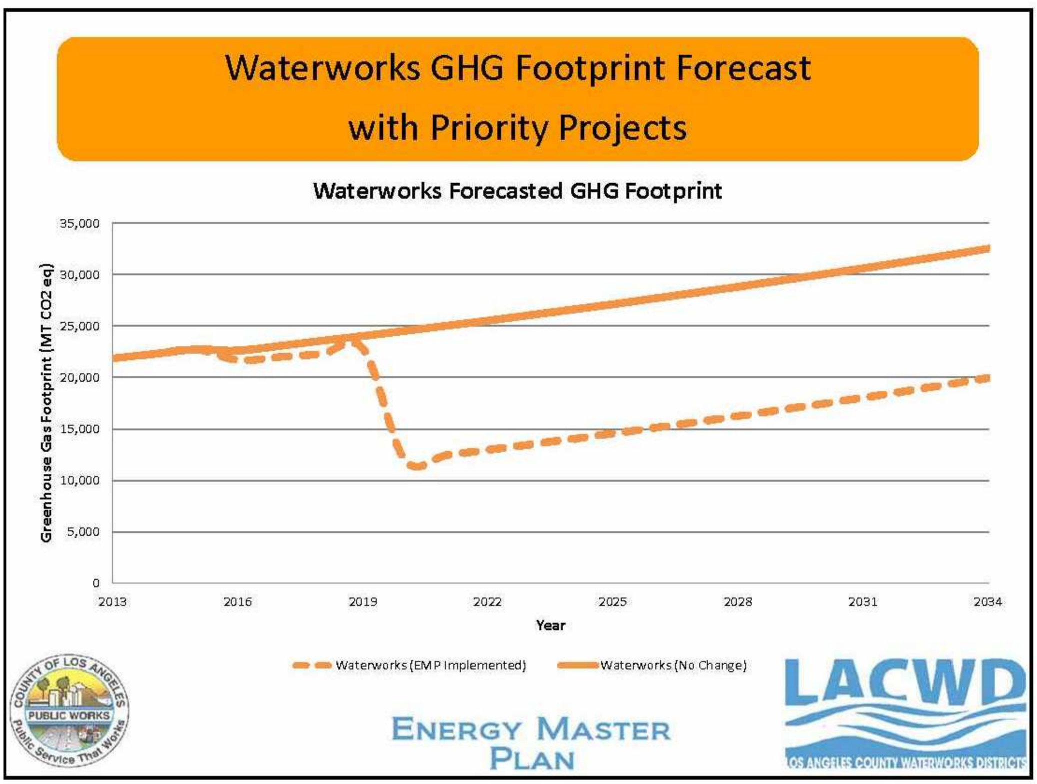
LOS ANGELES COUNTY WATERWORKS DISTRICTS


Waterworks GHG Footprint Forecast
with Priority Projects
Waterworks Forecasted GHG Footprint
Greenhouse Gas Footprint (MT CO2 eq)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2013
2016
2019
2022
2025
2028
2031
2034
Year
Waterworks (EMP Implemented)
Waterworks (No Change)
ENERGY MASTER PLAN
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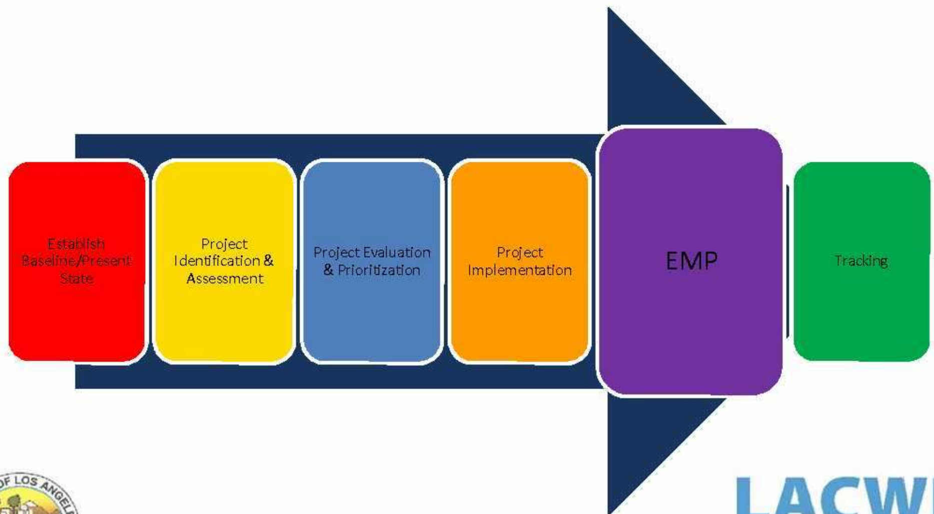
Master Plan Process



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EMMP

- Draft Summary Report

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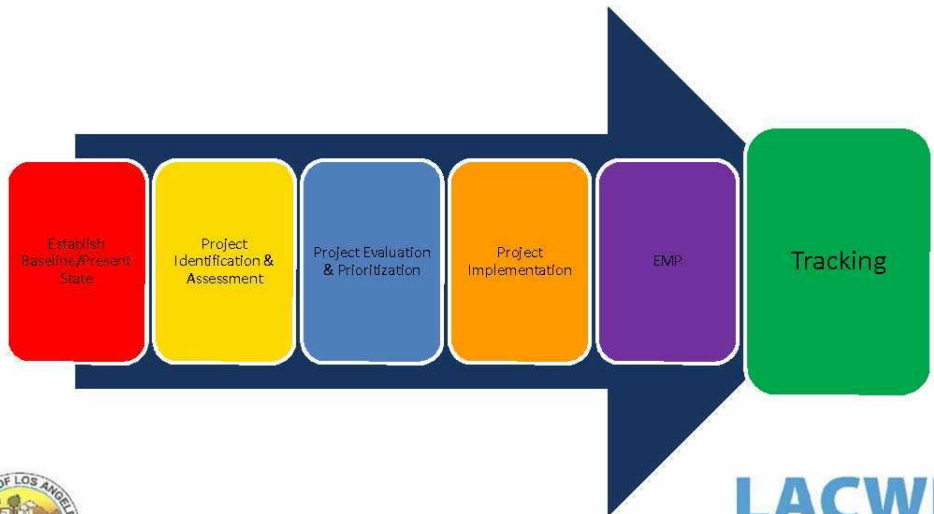
Master Plan Process



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Tracking

- Each year after project completion monitor energy consumption and savings.
- Every 3 to 5 years, update the plan.

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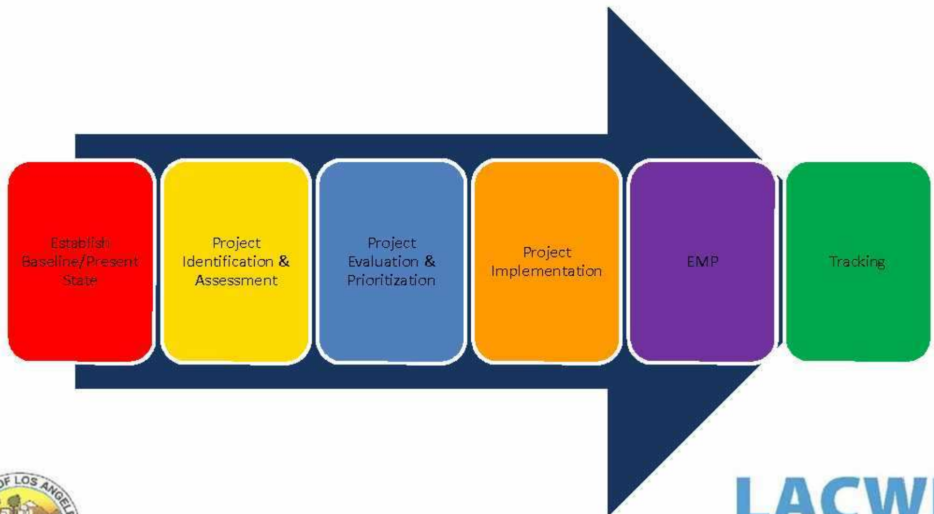
Master Plan Process



ENERGY MASTER PLAN

Master Plan Summary

- Implementing the 15 projects by 2034 can:
  - Reduce operations costs: $29.5 million
  - Reduce electrical consumption: 276 million kWh
  - Eliminate greenhouse gas emissions:

    193,200 MT CO_2 equivalence

    (40,700 cars or 17,630 homes)

ENERGY MASTER PLAN

10.9 Acronyms

AC ..... Asbestos Concrete
ACO ..... Accumulated Capital Outlay
AF ..... Acrefoot
AVEK ..... Antelope Valley East Kern
CFS ..... Cubic Feet per Second
CH4 ..... Methane
CLWA ..... Castaic Lake Water Agency
CO2 ..... Carbon Dioxide
EEM ..... Energy Efficiency Measure
EMP ..... Energy Master Plan
GHG ..... Greenhouse gas
GWh ..... Gigawatt hour
GWP ..... Global Warming Potential
HCF ..... Hydroflurocarbon
HQ ..... Headquarters
IRWM ..... Integrated Regional Water
kW ..... kilowatt
LADWP ..... Los Angeles Department of Water and Power
LED ..... Light Emitting Diode
MBF ..... Malibu Branch Feeder
MDD ..... Max Day Demand
MG ..... Million Gallons
MT ..... Metric ton
MW ..... Megawatt
MWD ..... Metropolitan Water District
N2O ..... Nitrous Oxide
NMA ..... North Maintenance
O&M ..... Operation and Maintenance
PCF ..... Perfluorocarbons
PCH ..... Pacific Coast Highway
PRV ..... Pressure Reducing Valve
PZ ..... Pressure Zone
SCE ..... Southern California Edison
SMA ..... South Maintenance Area
SRF ..... State Revolving Fund
The Districts ..... The Los Angeles County Waterworks Districts'
TOU ..... Time of Use
VFD ..... Variable Frequency Drive