# County of San Diego

# RENEWABLE ENERGY PLAN

November 2019


*Prepared for:*

County of San Diego
Department of General Services

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# Credits

The County of San Diego Department of General Services, Energy and Sustainability Program directed the development of this report.

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The consultants, Brummitt Energy Associates, Inc. and Dersch Design & Engineering, make no guarantee that energy predictions and savings will be achieved as estimated, except that services were performed pursuant to generally accepted standards of practice in effect at the time services were performed. Many factors in the construction and operation of facilities will affect energy use, which are outside of consultant's ability to control. This report is based on our understanding of the facilities at this time. These results are subject to change with changes to current conditions and assumptions.


Alpine Branch Library, a touchstone of sustainable design practices and the first Zero Net Energy facility built by a local government entity in San Diego County.

# Contents



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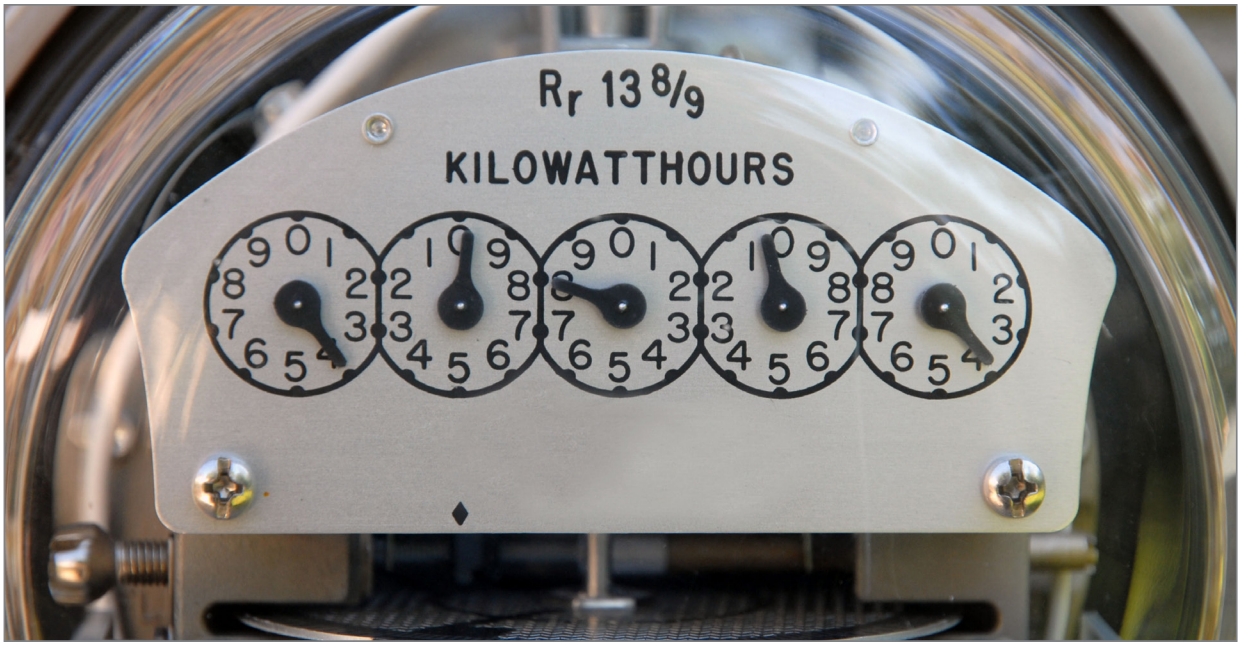
# Units of Energy

| Term | Definition |
|---|---|
| W (Watt) | A measure of power. Another name for Joules per second. |
| kW (Kilowatt) | 1000 watts. A measure of the amount of electricity flowing into a building's electricity distribution system, from the grid or from on-site PV, at a moment in time. This point-in-time demand fluctuates, depending on how many lights are turned on or off, for example. Turning on a 100 watt light requires 100 watts of electricity, or 0.1 kW. |
| kWh (Kilowatt per hour) | A measure of the amount of kW used per hour. These units are cumulative, and once tallied, make up most of the cost of a utility bill. Illuminating a 100 watt light for 24 hours uses up 2400 watts, or 2.4 kW (100 watts × 24 hours). |
| MW (Megawatt) | 1000 kilowatts. |
| KVA (Kilovoltamere) | A measure of the power in an electrical circuit. For most residential applications, the voltage and current in AC circuits are in phase, and the KVA power is equal to the kilowatts (kW). |

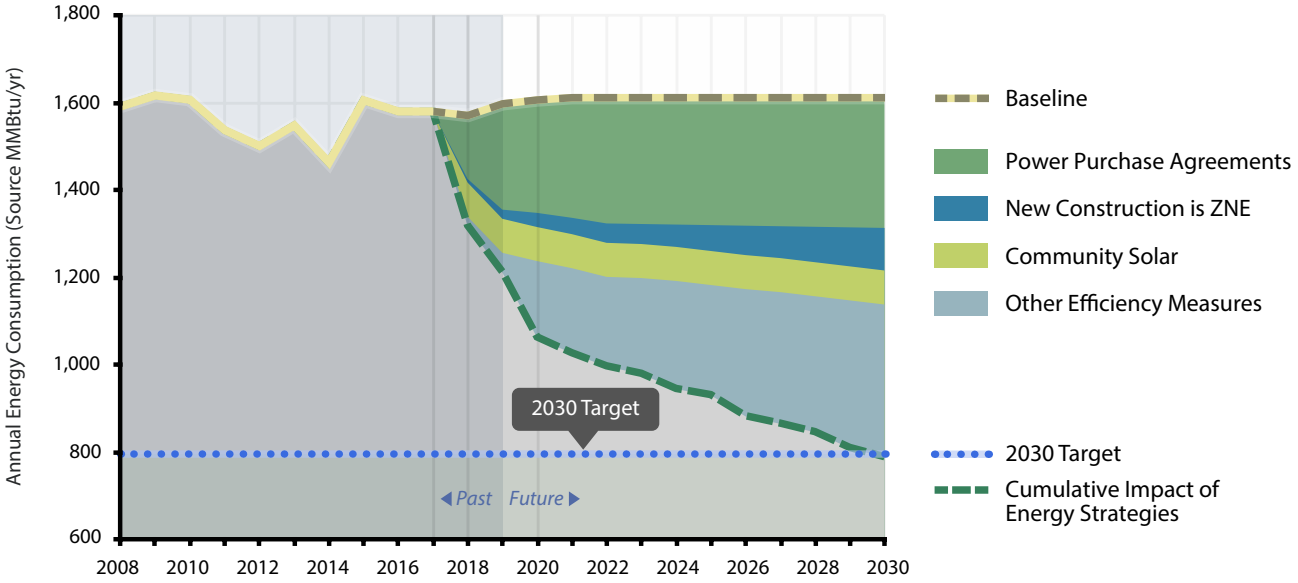



Analog electricity meter.

# Executive Summary

The County of San Diego's Renewable Energy Plan outlines a series of measures to transition the County's $19 million annual electricity consumption from "dirty" fossil-fuel grid electricity to clean, renewable power sources. This plan follows the guidance established by the County's award-winning Zero Net Energy (ZNE) Portfolio Plan, which set a pathway for reducing the County's total energy footprint by improving energy efficiency and increasing the use of renewable energy.

*Figure 01: Total Energy Footprint Reduction Strategies Graph*




The strategies within the Renewable Energy Plan are on course to greatly reduce County's total energy footprint.

The Renewable Energy Plan documents the County's Renewable Energy Program, already in operation, which consists of three components to increase renewable energy usage in County facilities:

1. Enact Power Purchase Agreements for large-scale renewable power installations
2. Install County-owned photovoltaic systems at new Zero Net Energy facilities and at existing sites
3. Purchase green power (100% community solar) through SDG&E's EcoChoice program

The County anticipates that using renewable power will be less expensive than electricity purchased conventionally from the grid, and produce significantly less greenhouse gas emissions in the process. Unlike traditional fuel sources, renewable energy sources like solar, wind, and water, constantly replenish themselves, and produce no greenhouse gas emissions during their operation. In addition, renewable energy facilities may require less maintenance than traditional energy generators, cutting labor and repair costs.

The cost performance of renewable energy continues to improve for several reasons.[1] First, continuous research and development efforts have led to increased efficiencies in core renewable technologies. Second, global demand and competitive bidding have led to an increase in the scale of manufacturing, further driving down production costs. Third, optimization of supply chains around the world continue to promote a decrease in the cost of raw materials, such as the silicon and aluminum in solar cells. Harnessing renewable energy is not only an environmentally conscious course of action, it is also a smart economic decision.

Renewable energy produced on-site and saved within on-site energy storage systems, such as battery energy storage, reduces stress on the grid (a processes known as grid harmonization) and lessens greenhouse gas emission. An on-site renewable energy system also contributes to building resiliency, which describes an energy system that can accommodate power outages and emergencies that cause grid failure, allowing for ongoing facility operations.

San Diego County Operations Center Commons, site of an 18 kW photovoltaic system.

This report presents strategies to increase the County's use of renewable power, outlines funding sources to begin deployment, and offers guidelines to consider when implementing battery energy storage system installations. The County recognizes that providing appropriate maintenance of County-owned PV systems is essential to obtain ongoing maximum production of these generators.

Through the creation and implementation of the Renewable Energy Program, the County of San Diego has demonstrated leadership, fiscal and environmental responsibility, and principled long-term planning. Although some additional costs are associated with the implementation of this program, the net result will be an overall reduction in electric utility costs.

By the end of 2018, on-site renewables provided almost 5% of the County's total electricity consumption. By the end of 2019, this will have risen to over 8%. With the existing and upcoming renewable energy strategies outlined in this plan, the County is on a path to meet its ambitious renewal energy goals.

1 https://www.freeingenergy.com/why-does-the-cost-of-renewable-energy-continue-to-get-cheaper-and-cheaper/

# Background

## California Goals

Buildings require a significant amount of energy to operate and maintain, serving as one of the largest contributors of greenhouse gas (GHG) generation locally and throughout the State of California. To address this level of power consumption, the State of California has established "big bold energy reduction goals" (including zero net energy for 50% of existing buildings by 2030), and enacted legislation (such as Senate Bill 32 Global Warming Solutions Act of 2017) that set aggressive GHG reduction goals for the state. Achieving these reduction goals will depend in part on the success of demand-side renewable energy programs. The County of San Diego developed its Renewable Energy Program to support these measures and help the State reach its renewable initiatives.

## County Goals

The County of San Diego is implementing an ambitious Renewable Energy Program that it began developing in 2013, with County Operations as a central focus of these efforts. The primary goal of this program is to incrementally transition the County's $19 million average annual operational electricity cost from "dirty" fossil-fuel-generated grid electricity to renewable clean power. The County's Zero Net Energy Portfolio Plan calls for reducing overall energy usage from a 2017 baseline by 50% by 2030. The Plan's reduction projections come from a decreased reliance on the electricity and natural gas sectors of its portfolio, as well as bolstering its sources of power derived from renewable generation. Delivery of this renewable power will have a lower cost than electricity purchased conventionally from the grid, and require less greenhouse gas production in the process.

The County of San Diego Renewable Energy Program originated from the County's Strategic Energy Plan of 2013. Amongst other goals, the Strategic Energy Plan calls for an increased deployment of distributed generation systems, which are technologies that efficiently deliver electricity near its place origin. Implementation is ongoing with several components already underway. In 2017, the County formerly adopted its Zero Net Energy Portfolio Plan, which describes six strategies to reduce operational energy use and lower greenhouse gas emissions, three of which are included in this Renewable Energy Plan: 1) Enact Power Purchase Agreements, 2) Require ZNE for Future Capital Projects, and 3) Purchase Community Solar Electricity. These components are described below.

# Existing Conditions

The County's total electricity consumption (excluding electricity provided by PV) for owned and leased facilities was about 112,027,000 kWh in calendar year 2018. At of the end of 2018, twenty-six PV installations were in operation, totaling 5.2 MW of power capacity and generating an average of 7,800,000 kWh annually.

*Figure 02: Existing County Facilities Equipped with Photovoltaic Systems*

| | Site | PV System Size (kW) | Year Installed |
|---|---|---|---|
| 1 | East Mesa Detention Facility (EMJDF Meter) | 1000 | 2011 |
| 2 | Sweetwater Summit Campground | 210 | 2013 |
| 3 | North County Regional Center | 100 | 2002 |
| 4 | South Bay Regional Center, System 1 | 100 | 2002 |
| 5 | Guajome Regional Park | 99 | 2012 |
| 6 | Ramona Library | 50 | 2011 |
| 7 | El Cajon Library | 45 | 2002 |
| 8 | Lakeside Community Center | 45 | 2010 |
| 9 | Boulevard Fire and Rescue | 40 | 2015 |
| 10 | Edgemoor Skilled Nursing Facility | 32 | 2008 |
| 11 | Lincoln Acres Library | 26 | 2012 |
| 12 | Fallbrook Community Center | 25 | 2010 |
| 13 | COC Conference Center | 18 | 2012 |
| 14 | Agua Caliente County Park | 14 | 2013 |
| 15 | Lakeside Teen Center | 12 | 2007 |
| 16 | Spring Valley Community Center | 11 | 2012 |
| 17 | San Elijo Lagoon Visitor Center | 5 | 2007 |
| 18 | Wilderness Gardens Preserve | 5 | 2012 |
| 19 | Goodan Ranch | 3 | 2007 |
| 20 | Waterfront Park Concession Stand | 2 | 2014 |

# Plan Components

The Renewable Energy Plan has three components to reduce greenhouse gas emissions from grid electricity generation: 1) Enact Power Purchase Agreements, 2) Require ZNE for Future Capital Projects, and 3) Purchase Community Solar Electricity.

## Enact Power Purchase Agreements

The first phase of the Power Purchase Agreement (PPA) implementation strategy identified 11.3 MW DC of PV located at seven existing facility sites – these systems will generate around 17,000,000 kWh annually when construction is complete. Five sites will receive large-scale systems ranging up to 3.2 MW, and two smaller systems are planned. One system was installed in late 2018; two systems are expected to come online in 2019, and the other four will be completed in 2020 and 2021.

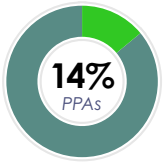
Over the years, the County has experienced challenges in procuring renewable energy through the PPA mechanism. These difficulties include: requirements to modify existing electrical equipment; site constraints that require alterations to existing paving, affecting operations, customer access, and traffic control; and obstacles coordinating all stakeholders (potentially including neighbors), which is time and labor intensive.

Photovoltaic system at Sweetwater Summit Regional Park.

Acquiring PPA funding can be time-consuming. These funding contracts do not follow a conventional solicitation process, require individual negotiation, and ultimately need approval from the Board of Supervisors. As PPAs are developer-driven projects, they may require additional attention and scrutiny from County Project Managers.

As future PPA facilities become active, some sites may potentially go beyond being Zero Net Energy and turn Net Positive – producing more renewable energy than they consume. In these cases, the electricity would need to be assigned to other meters through an SDG&E tariff specifically intended for local governments called Renewable Energy Self Generation - Bill Credit Transfer (RES-BCT) or other appropriate tariff.

This strategy is expected to offset 14% of the County's total electric use by 2030.



# Install PV for Existing and New Zero Net Energy Facilities

An important component of the County's Energy Plan is to ensure that new and replacement facilities, including major changes and renovations, are designed, constructed, and operated to be ZNE. This combination of energy efficiency and renewable systems is the most cost-effective way to achieve energy reductions. This strategy is also consistent with the State of California's mandate for its own new facilities to be ZNE.

The County's strategic initiative to include PV on new facilities by designing and building ZNE for all new construction has resulted in four facilities already occupied. The first two of these were the Alpine and Imperial Beach branch libraries which became operational in 2016 and 2017, respectively. Two more new facilities were opened in 2018: the new ZNE Borrego Springs Library and the ZNE Health and Human Services Agency office building in Oceanside. These facilities will bring the total amount of square footage of County ZNE buildings to almost 100,000 square feet.

Two more buildings are currently under construction, with another four in the design and solicitation phase. Once complete, these projects will bring the County's on-site PV generation capacity of its new ZNE facilities to an average of 5.1 million kWh per year.

This strategy is expected to offset 8% of the County's total electric use by 2030.

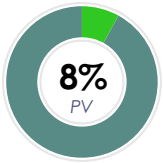
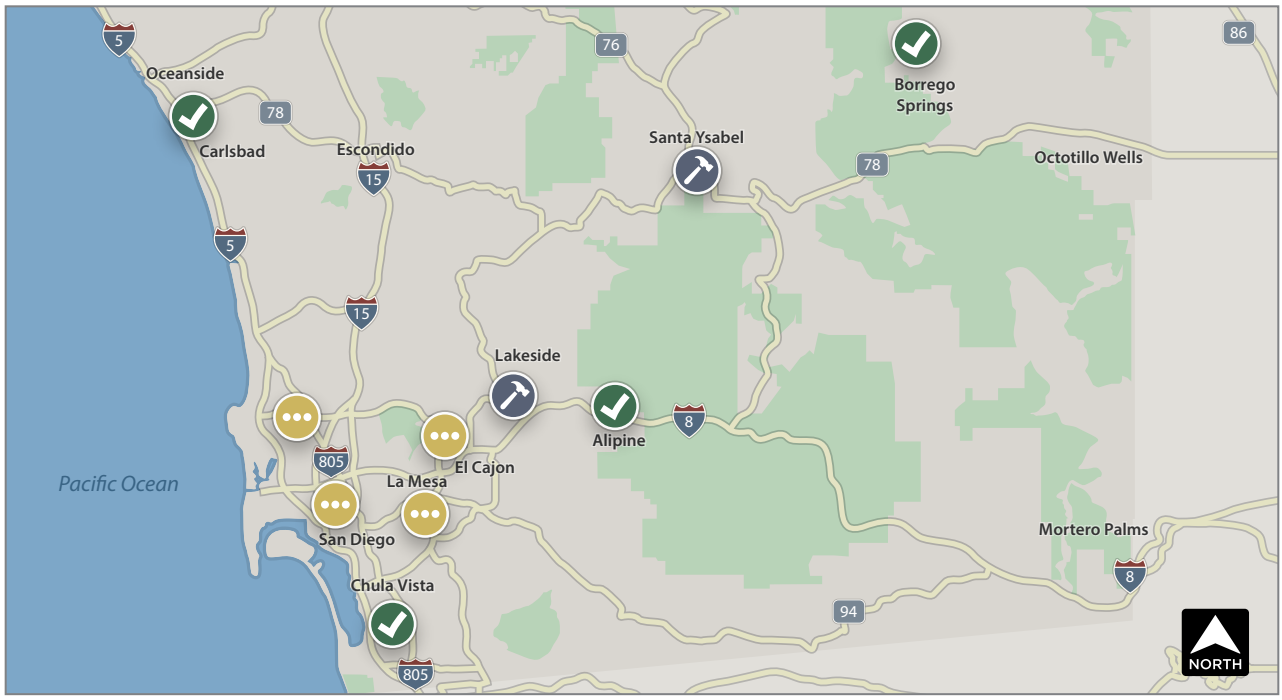



*Figure 03: Map of ZNE New Construction Projects*



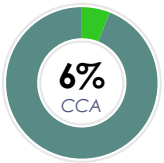
## Purchase Community Solar Electricity

Small facilities are inherently less adaptable to GHG emission reduction initiatives because of their modest scale, which makes it difficult to find substantive energy efficiency projects for them. Consequently, the County found that a more promising reduction approach at such sites is to increase their use of grid-supplied energy sourced from renewable power. In January of 2018 the County began to participate in SDG&E's EcoChoice program. Unlike GreenTags programs which may generate renewable power anywhere in the country, EcoChoice is power generated by PV systems located in SDG&E territory. In effect, portions of large PV arrays are assigned to the customer meter, along with the Renewable Energy Credits, or carbon reduction, of that power. The utility does not count that power towards their own compliance with the State of California required Renewable Portfolio Standard. The tariff offered by SDG&E provides 100% renewable power to participants at costs equal to or less than regular SDG&E rates and tariffs.

The County converted all non-Direct Access building meters to EcoChoice with the 100% renewable power option. Because these accounts serve the County's smallest loads and buildings, they can not readily support PV systems on-site and are and are poor candidates for reducing energy use.

SDG&E's EcoChoice program uses local PV systems.

From March through December 2018, the 230 County accounts using the EcoChoice tariff received 6,214,864 kWh of renewable power, equivalent to 7,700,000 kWh/year. At this rate, the County anticipates that the strategy of purchasing community solar power will deliver its estimated energy savings on schedule.




This strategy is expected to offset 6% of the County's total electric use by 2030.

## Renewable Percentage of Portfolio

As municipalities near County operations transition to Community Choice Aggregation (CCA),[1] the percentage of renewable electricity used by operations will continue to grow, increasing the amount of the grid's electricity derived from renewable sources.

1 Community Choice Aggregation, also known as Community Choice Energy, is an alternative to the investor owned utility energy supply system in which local entities aggregate the buying power of individual customers within a defined jurisdiction in order to secure alternative energy supply contracts. CCAs allow consumers to either lower their costs or to have more control of their energy mix, mainly with access to "greener" generation portfolios than local utilities. Whereas the State of California requires 50% of electricity used in the state to be provided by renewable sources by 2030, through the Renewable Portfolio Standard, CCA statewide are attempting to accelerate that rate to 90% by 2030.

The County currently acquires electricity from two energy providers, as described previously: SDG&E and CalPine Energy Solutions (CES). The percentage of renewable energy in the portfolios of these providers is based on compliance with the State's Renewable Portfolio Standard (RPS) as well as procurement obligations. CalPine Energy Solution's percentage is as required by RPS and will be 33% in 2020. SDG&E's percentage is determined by contracts with generators and is expected to be 45% in 2020 (exceeding RPS).

The matrix in ***Figure 04*** describes the total amount of renewable electricity procured and generated on-site for County facilities, extrapolated for 2020 and predicted for 2030. By the end of 2020, the net percentage of renewable energy used by County operations will be 41.6% and the percentage generated on County sites will be 9.38%.

In the 2030 Scenario A, the assumptions included in the calculations expect that procurement percentages will reflect the following conditions: 1) SDG&E will no longer be an electricity commodity provider but instead the County will be purchasing electricity from a Community Choice Aggregator (CCA), and 2) the accounts that are currently supplied with electricity from CES will remain direct access accounts. These renewable portfolio percentages will result in an overall County electricity portfolio renewable percentage of 70.78%, which will exceed the 60% required by RPS, but be lower than the 90% required by the adopted Climate Action Plan (CAP) for the unincorporated county.

Scenario B for 2030 assumes that the County will purchase a larger percentage (90%) of renewable electricity from CES, exceeding the 60% legally required by RPS. This will result in an alignment with the CAP but will likely increase the cost of electricity from direct access.

*Figure 04: Renewable Electricity Generated On-site for County Facilities*

| Renewable Percentage of Total County Operational Electricity | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Current (2020) | | | Future (2030) Scenario A | | | Future (2030) Scenario B | | |
| | kWh | Percent Renewable | Total Renewable kWh | kWh | Percent Renewable | Total Renewable kWh | kWh | Percent Renewable | Total Renewable kWh |
| **Purchased Electricity** | **112,027,113** | | | **92,982,504** | | | **92,982,504** | | |
| SDG&E Bundled | 5,923,205 | 45% | 2,665,442 | | | | | | |
| SDG&E EcoChoice | 7,924,115 | 100% | 7,924,115 | | | | | | |
| CalPine | 98,179,793 | 33% | 32,399,332 | 81,489,228 | 60% | 48,893,537 | 81,489,228 | 90% | 73,340,305 |
| Future CCA | | | | 11,493,276 | 90% | 10,343,948 | 11,493,276 | 90% | 10,343,948 |
| **On-site Generation** | | | | | | | | | |
| Owned | 2,049,554 | 100% | 2,049,554 | 9,488,154 | 100% | 9,488,154 | 9,488,154 | 100% | 9,488,154 |
| PPA | 9,549,451 | 100% | 9,549,451 | 13,017,551 | 100% | 13,017,551 | 13,017,551 | 100% | 13,017,551 |
| Total from All Sources | 123,626,118 | | | 115,488,209 | | | 115,488,209 | | |
| Total from Renewable Sources | 54,587,894 | | | 81,743,190 | | | 106,189,959 | | |
| Percentage Renewable | 44.16% | | | 70.78% | | | 91.95% | | |
| Total On-site Generation | 11,599,005 | | | 22,505,705 | | | 22,505,705 | | |
| Percentage Renewable (On-site) | 9.38% | | | 19.49% | | | 19.49% | | |

# Funding

## PV on Existing Sites

The County has used a variety of funding sources to acquire its portfolio of PV systems. These include direct County funding, grants and low-interest California Energy Commission (CEC) loans, capital project funding, and PPAs.

The earliest County-owned PV systems, beginning in 2003, were procured through special one-time funding. The County signed its first PPA contract in 2011 for a 1 MW PV system at the East Mesa Detention Facility.

Photovoltaic system at East Mesa Detention Facility in Otay Mesa.

Between 2012 and 2017, the County installed twenty other PV systems at existing facilities using a combination of grants, CEC loans, and direct County funding.

See Appendix A

Procurement through the PPA funding mechanism has enabled the County to acquire solar energy by the same means as it acquires electricity from the utility - priced by the kWh, and has enabled the County to enjoy the benefits of on-site solar generation without the upfront capital investment. Because the price per kWh paid through these agreements is less than that paid to SDG&E, deploying renewable energy saves money. The County licenses the use of property to a PPA provider, acquires the Renewable Energy Credits (RECs) associated with the PV system, and typically has the option to purchase the PV system at the end of the term.

## ZNE for New Facilities

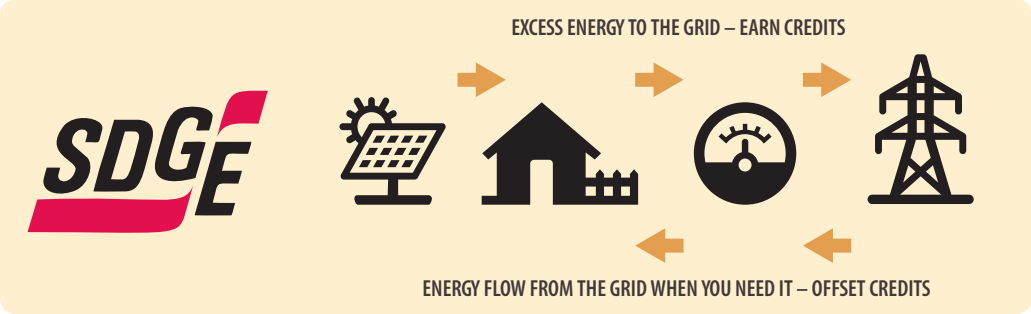
New facilities are funded through the Capital Needs program, which is fed from the General Fund, and must be approved by the Board of Supervisors. The proposed cost estimates of new construction projects are developed by General Services and, since 2014, ZNE projects include the premium upcharge for renewables as well as the additional administrative costs associated with energy modeling, submeter installation, and deep energy efficiency technologies. This upcharge has tended to range from 5 – 10% of total project cost (including soft costs). Recent annual Capital budgets have trended in the $100 million range over the last 5 years and are expected to continue or increase in the future.

Because the premium for ZNE facilities is already factored into these construction budgets, there are no unplanned costs associated with renewable energy for these projects. As these facilities are built and include PV systems, the County will recoup upfront costs via the reduction in utility costs over time. Return on investment on these facilities has been in the 10 to 12-year range and will shorten as these technologies drop in cost. When the project budget cannot accommodate ZNE funding, a PPA strategy may be an option.

## Purchase Community Solar Electricity

Purchasing community solar power through the EcoChoice program results in no net difference in annual electricity costs over the standard bundled rate for the most recent calendar year, and most sources expect the cost to remain at this level or even improve. Participation in the utility's EcoChoice program for 100% renewable power is a win-win for the County of San Diego and County taxpayers.

Future efforts to increase the portion of renewable energy in the County's electricity portfolio focus on: completing all seven of the Phase 1 Power Purchase Agreement (PPA) projects; continuing to ensure new capital projects include PV to the maximum extent practical; seeking funding to install PV systems on existing facilities where feasible; working with the County's Direct Access (DA) provider to assess the possibility to expand the percentage of renewable energy in the fuel mix provided; and exploring future PPAs for additional on-site renewable power.




Excerpt from an SDG&E introductory guide to consumers about incorporating solar energy.

# Other Grid Harmonization Measures

Grid harmonization[1] refers to a collection of strategies that maximize the County's use of photovoltaic output, while also limiting energy exports to the grid. Harmonization helps make energy generation and distribution systems more efficient, increases grid reliability, and reduces greenhouse gas emissions.

## Planning for Battery Energy Storage Systems (BESS)

The County has been building zero net energy facilities since 2014, leading the way in the region to reduce dependency on fossil fuel sourced electricity. Analysis of the daily energy use profile at most County facilities reveals that there are times when reliance on grid electricity is necessary (during times of low or no sunlight).

In order to truly achieve zero net carbon facilities (those that do not produce any emissions) it is necessary to extend the benefits of solar power into non-daylight hours, through battery energy storage systems (BESS). The combination of on-site renewable generation and on-site energy storage is a key driver statewide for achieving reduced GHG emissions.


ENGIE Storage GridSynergy system.

Battery Energy Storage Systems (BESS) allow facility owners to reduce their electricity costs, improve reliability, and reduce stress on California's electric grid. Pairing BESS with on-site PV or other renewable energy resources can lower carbon emissions by mitigating the County's demand for fossil-fuel based grid power, and enable more variable energy sources (i.e. solar, wind) to enter California's electrical power mix. Battery energy storage lowers the flood of renewable electricity onto the grid during peak renewable production times, and lessens demand during evening hours. Both of these effects support grid harmonization.

See Appendix B

PPA proposals may include both PV and BESS. New Construction projects are pre-planning for BESS space and infrastructure so that it may be added in the future when it becomes cost-effective for a given site.

1 https://ww2.energy.ca.gov/renewables/tracking_progress/documents/energy_efficiency.pdf

Refer to ***Appendix B*** for a general BESS plan and ***Appendix C*** for high-level feasibility guidelines for a BESS installation. If the general indicators are positive, then the next step is to perform an engineering and detailed cost analysis.

*See* ***Appendix C***

## Solar Powered Electric Vehicle Charging

Electric vehicle (EV) technology is already part of the County's service fleet, and the County plans to increase this initiative as a greenhouse gas reduction measure. A transition to electric vehicles requires a cost-effective and reliable battery charging strategy. Solar powered charging can reduce the County's reliance on electricity supplied from the grid, which supports grid harmonization.

In 2018, the County's Fleet Division purchased one solar powered portable station from a local San Diego company to serve EVs at the County Operations campus. This two-port charging station includes a battery that allows for the system to operate day or night. During daylight hours the solar array sends the majority of power produced to directly charge vehicles, and stores the excess energy in the battery for use at night. With a 4.3 kW array, the battery stores up to 40 kWh.

Photovoltaic charging unit at the County Operations campus for electric vehicles.

This solution is ideal for EV charging at hard-to-adapt locations, since these units do not require any infrastructure placement or project management and can be implemented in a much shorter timeframe – simply purchase and move onto the site.

The County Board of Supervisors has approved funding to replace fleet Vehicles with EVs and to deploy additional units at other County-owned sites for fleet vehicle charging over the next five years, as part of a board-approved EV Roadmap.

# Appendices

## Appendix A: PV Systems on County Sites

*Figure 05: PPA Funding, Phase 1: PV on Existing Facilities*

| Site | PV System Size (kW) | Date of Installation | Procurement |
|---|---|---|---|
| South Bay Regional Center, System 2 | 1,400 | Dec 2018 | PPA |
| COC Fleet Services (Additional) | 2,255 | 2020 | PPA |
| NCRC | 2,915 | 2021 | PPA |
| Edgemoor Skilled Nursing Facility | 1,160 | 2020 | PPA |
| EMDF (Additional) | 3,200 | 2021 | PPA |
| Rancho San Diego Sheriff Substation | 205 | 2020 | PPA |
| Rancho San Diego Library | 180 | 2020 | PPA |
| TOTAL | 11,315 | | |

*Figure 06: Capital Projects: ZNE New Construction*

| Site | PV System Size (kW) | Date of Installation | Procurement |
|---|---|---|---|
| Alpine Library | 72 | May 2016 | Renewables Special Fund |
| Imperial Beach Library | 88 | Apr 2017 | Project |
| North Coastal Live Well Center | 296 | Aug 2018 | Project |
| Borrego Springs Library | 122 | Dec 2018 | PPA |
| East County ARCC – Santee | 219 | Fall 2019 | Project |
| Santa Ysabel Nature Center | 36 | Fall 2019 | Project |
| TOTAL | 833 | | |

*Figure 07: Capital Projects: ZNE New Construction in Solicitation as of June 2019*

| Site | PV System Size (kW) | Date of Installation | Procurement |
|---|---|---|---|
| Lakeside Library | 95 | Spring 2021 | Project |
| Ohio Street Probation Office | 147 | Summer 2021 | Project |
| Southeast Live Well Center | 810 | Fall 2021 | Project |
| Juvenile Justice Campus | 1,500 | Fall 2021 | TBD |
| TOTAL | 2,552 | | |

*Figure 08: On-site PV Owned by the County*

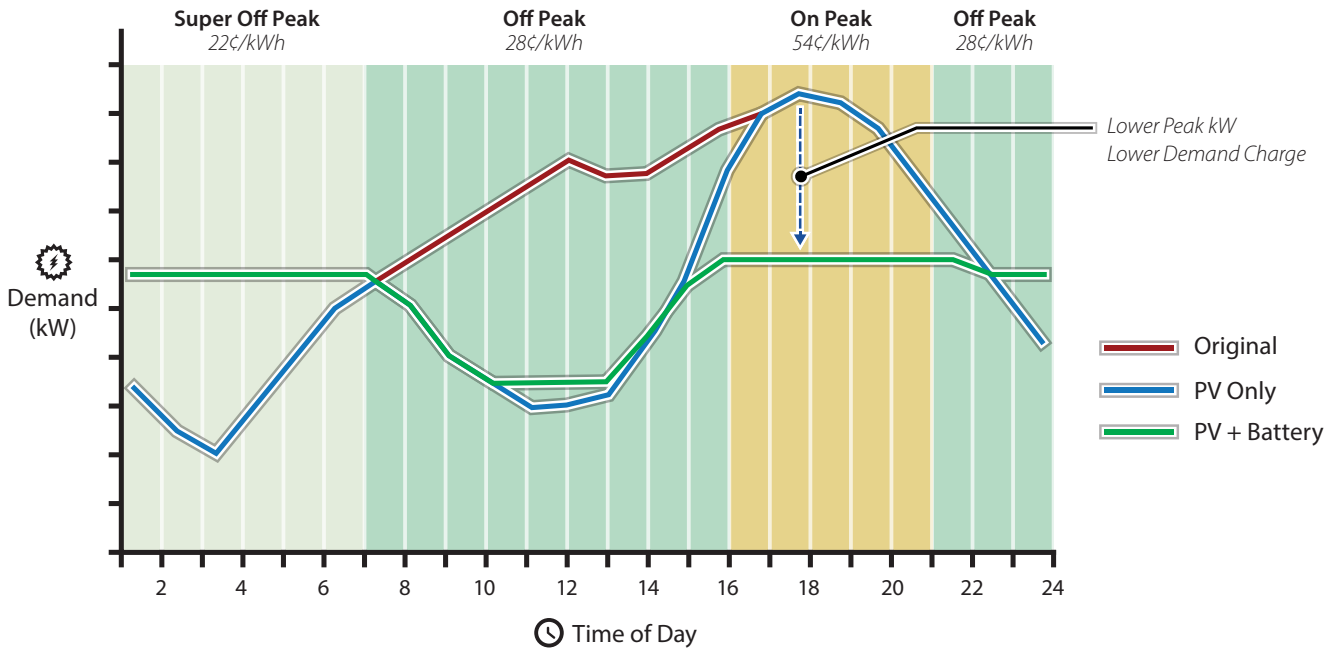
| Site | PV System Size (kW) | Date of Installation | Procurement |
|---|---|---|---|
| Agua Caliente County Park | 14 | 01/12/2013 | General Fund |
| Boulevard Fire and Rescue | 40 | 05/19/2015 | Project |
| COC Conference Center | 18 | 07/26/2012 | Project |
| East Mesa Detention Facility (EMJDF Meter) | 1,000 | 11/21/2011 | PPA |
| Edgemoor Skilled Nursing Facility | 32 | 09/25/2008 | General Fund |
| El Cajon Library | 45 | 12/26/2002 | CEC Loan |
| Fallbrook Community Center | 25 | 11/25/2010 | Grant |
| Goodan Ranch | 3 | 11/08/2007 | General Fund |
| Guajome Regional Park | 99 | 09/08/2012 | General Fund |
| Lakeside Community Center | 45 | 11/25/2010 | Grant |
| Lakeside Teen Center | 12 | 11/08/2007 | |
| Lincoln Acres Library | 26 | 05/26/2012 | General Fund |
| North County Regional Center | 100 | 12/26/2002 | CEC Loan |
| Ramona Library | 50 | 02/09/2011 | General Fund |
| San Elijo Lagoon Visitor Center | 5 | 11/08/2007 | General Fund |
| South Bay Regional Center, System 1 | 100 | 12/26/2002 | CEC Loan |
| Spring Valley Community Center | 11 | 11/14/2012 | |
| Sweetwater Summit Campground | 210 | 07/25/2013 | General Fund |
| Waterfront Park Concession Stand | 2 | 05/10/2014 | |
| Wilderness Gardens Preserve | 5 | 01/05/2012 | General Fund |
| TOTAL | 1,841 | | |

# Appendix B: Battery Energy Storage Systems (BESS) Planning

The primary reason to consider adding BESS is to reduce electricity costs. Batteries can be charged either by grid power during off-peak times or by renewable energy systems during times of advantageous renewable production. BESS can also reduce GHG by shifting clean power to times when fossil-generated power would otherwise be used.

Commercial customers typically pay for total electricity consumed ($/kWh) and peak demand charges ($/kW), among other fees. The peak demand charges are meant to discourage customers from creating large power spikes, which put undue stress on the utility's electrical infrastructure. These peak demand charges can be costly, especially during times when electrical demand on the grid is already high (referred to as "On Peak" periods). BESS can reduce peak demand charges by storing electrical energy during non-peak periods and discharging it later instead of pulling expensive electricity from the grid. This process of deferred discharge, known as "peak shaving," can reduce energy costs and helps provide financial justification for customers to install a BESS at their facility.

*Figure 09: Typical Electrical Demand Profile with Impacts of Solar PV and BESS*




A smart BESS can recharge its batteries not only when power production is in excess, but also at times when electricity rates are cheap. The system can then discharge its power reserves when electricity rates are expensive again, thus reducing the overall electricity bill. BESS can also employ energy arbitrage to reduce electricity costs. Many commercial facilities are on time-of-use (TOU) rate schedules. In the TOU framework, the price of electricity ($/kWh) varies throughout the day. As shown in ***Figure 09***, electricity rates can be twice as high during "On Peak" periods as they are during "Super Off Peak" periods.

In addition to reducing electricity costs, BESS can provide support during demand response (DR) events. (Demand response describes how an electric utility customer adjusts power consumption to better match available supply. It can take the form of voluntary rationing or postponement to take advantage of price incentives.) DR provisions would enable electric utilities to curtail electricity demand at the facility level during periods when electrical demand on the grid is exceptionally high – that is, if the facility owner is enrolled in their DR program.

BESS can also reduce greenhouse gas emissions, especially when coupled with on-site renewable generation like solar PV. A facility that has solar PV may generate more renewable electricity than it can use during the middle of the day or weekend. This excess electricity flows through the meter and onto the grid to be used elsewhere.[1] As the sun goes down, solar PV production drops out, and the facility must consume electricity from the grid. That grid electricity often comes from large, fossil-fuel power plants many miles away. Due to losses from fuel combustion and electricity transmission, the amount of source energy required at that plant is more than three times higher than the actual electricity consumed at the customer's facility. With BESS, the customer can store the excess on-site solar PV electricity during the day and use that clean electricity later. As a result, less electricity needs to be generated at the far-off power plant, reducing energy demand and greenhouse gas emissions.

Battery energy storage systems fall right in line with the County's Renewable Energy Program. BESS allows facilities to reduce and stabilize energy costs and reduce greenhouse gas emissions by consuming less fossil-fuel based power from the grid. Solar PV combined with storage systems have also become more enticing to PPA providers due to the recently updated time-of-use rates, which can aid in the County's plan to increase deployment of distributed energy resources.

## BESS Design Considerations and Incentives

*See **Appendix C***

Battery energy storage systems offer many advantages, but there are some important factors to consider before deploying them at a facility. The BESS Scorecard found in ***Appendix C*** provides guidance when deciding whether to pursue BESS at a facility.

- **A** Does the facility have high electricity demand charges?
- **B** Does the facility experience regular power spikes, and when do they occur?
- **C** Is there enough space available for a BESS and its associated infrastructure?
- **D** Will the power distribution system accommodate BESS?
- **E** Is solar PV being considered as a future installment?
- **F** Does the site have solar PV already installed?
- **G** Are incentives available? Is PPA procurement an option?

1 California and other states with ample solar PV power (i.e. Hawaii) occasionally experience days where there is too much solar PV electricity pumped into the grid. To avoid damaging electrical lines and equipment, the state has to send this excess electricity to neighboring states (often at a loss) or curtail electrical production by disconnecting solar PV plants. Large BESS deployments would enable the state to capture this excess electricity and save it for use later.

# Appendix C: BESS Scorecard

*Figure 10: Sample Evaluation Form for Battery Energy Storage Systems*

BESS PROJECT SCORECARD

| QUESTIONS | YES | NO |
|---|---|---|
| **Are demand charges ($/kW) big chunk of electric bill?** BESS can greatly reduce demand charges. Answer YES if site > 100 kW demand and demand charges are >20% of total bill. | ☐ | ☐ |
| **Are power spikes regular and predictable?** Obtain 15-minute interval electrical metering data. Regularly occuring power spikes are much easier to reduce than sporadic ones, which may occur when BESS is discharged. | ☐ | ☐ |
| **Is electric usage ($/kWh) high during On-Peak periods?** On-Peak periods vary depending on the tariff and season. If electric consumption is high during costly On-Peak periods, BESS can shift time of usage to reduce costs. | ☐ | ☐ |
| **Do you control the electrical power system outright?** Interconnecting a BESS requires modifications to the building's electrical power system. If the electrical power equipment is controlledby a different party it may prove difficult to install a BESS. | ☐ | ☐ |
| **Is there enough space for the battery units?** A typical BESS unit will go outside. See the BESS Space Requirement section for further guidance. | ☐ | ☐ |
| **Is there enough space for electrical distribution equipment?** The BESS will need a clear path fo conduit back to the main switchboard. If the facility has a solar PV system, allocate up to 15 feet of additional linear wall space. | ☐ | ☐ |
| **Can this be covered by a Power Purchase Agreement?** Publicly-owned facilities cannot take advantage of most incentive and rebate programs. However, PPA, providers can take advantage of them and pass the savings along. | ☐ | ☐ |

PROJECT NAME _____

ADDRESS _____

_____

CONTACT _____

EMAIL _____

| Tally Responses | YES | NO |
|---|---|---|
| < 3 Yes's = Likely Not | | |
| 4 to 5 Yes's = Maybe | | |
| > 5 Yes's = Definitely | | |

# Appendix D: List of Acronyms

| Term | Definition |
|---|---|
| $/kW | Dollars per Kilowatt |
| $/kWh | Dollars per Kilowatt Hour |
| BESS | Battery Energy Storage Systems |
| CAP | Climate Action Plan |
| CCA | Community Choice Aggregation |
| CEC | California Energy Commission |
| CFC | California Fire Code |
| DA | Direct Access |
| DC | Direct Current |
| DR | Demand Response |
| EMS | Energy Management System |
| EV | Electric Vehicle |
| GHG | Greenhouse Gas |
| HVAC | Heating, Ventilation, Air Conditioning |
| ITC | Investment Tax Credit |
| KVA | Kilo Volt Amperes |
| KW | Kilowatt |
| KWh | Kilowatt hour |
| MACRS | Modified Accelerated Cost Recovery System |
| MW | Megawatt (1000 kW) |
| NEC | National Electrical Code |
| PPA | Power Purchase Agreements |
| PV | Photovoltaic |
| REC | Renewable Energy Credits |
| RES-BCT | Renewable Energy Self Generation Bill Credit Transfer |
| ROI | Return on Investment |
| RPS | Renewable Portfolio Standard |
| SDG&E | San Diego Gas & Electric Company |
| SGIP | Self-Generation Incentive Program |
| TDV | Time Dependent Valuation |
| TOU | Time of Use |
| UPS | Uninterruptible Power Supply |
| ZNE | Zero Net Energy |

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County of San Diego

# RENEWABLE ENERGY PLAN

BRUMMITT ENERGY ASSOCIATES INC

Dersch Design & Engineering

# County of San Diego, California