

# Executive Summary: Draft PA No. 9 – Renewables Purchase Programs

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## **Description**

A renewables purchase program would invest in renewable energy projects around California or in the United States. The substitution of renewables for grid power provides a GHG reduction. This assessment specifically addresses the following types of renewables purchase programs:

- Equity purchase through a joint powers authority (JPA)
- Direct power purchase agreement (PPA)
- PPA through a community choice aggregation (CCA)
- Renewable energy credits (RECs)

## **Amount of GHG Reduction**

SCWD and SqCWD could purchase any amount of renewable energy or RECs. For the purposes of this assessment, it is assumed that SCWD and SqCWD would purchase approximately 6,800 MWh per year, or 1,978 metric tons (MT) CO<sub>2</sub>e per year, which is the electricity use of the proposed desalination plant running at half capacity. Depending upon the extent of the project, this project has the ability to reduce 100% of the potential GHG reduction goals for SCWD and SqCWD.

## **Project Life and Sustainability**

JPA and PPA contract terms could be negotiated for various lengths of time. Since the life of the desalination project is expected to be 30 years, this assessment assumes the life of these contracts would also be 30 years. The contract could be renewed to maintain a sustainable project. RECs could be purchased annually each year for 30 years, once for the 30 year duration of the project, and anything in between.

## **Project Cost**

Power costs start at less than PG&E but escalate at a slightly faster rate, and therefore end up after 30 years with a lifecycle cost that is marginally more than purchased power from PG&E. Table ES-1 summarizes the estimated costs of the potential projects discussed above.

**Table ES-1: Renewables Purchase Program Summary**

Project	Project Life	Annualized GHG Reduction (MT CO <sub>2</sub> e/yr)	Capital Cost <sup>1</sup> (\$)	Average Annual Net Cost (\$/year)	Lifecycle Energy Cost (\$/kWh)	Lifecycle GHG Cost (\$/MT CO <sub>2</sub> e)
Join a JPA	30	1,978	\$100,000	\$200,600	\$0.014	\$48
Direct Access PPA	30	1,978	\$500,000	\$86,409	\$0.012	\$42
Join an Existing CCA	30	1,978	\$100,000	\$154,927	\$0.009	\$32
Create a Local CCA	30	1,978	\$3,000,000	\$564,293	\$0.050	\$176
Purchase RECs	30	1,978	\$0	\$32,986	\$0.003	\$11

<sup>1</sup> This represents the start-up cost of the various options.

# Draft Project Assessment No. 9 – Renewable Energy Purchase Programs

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## Description

This assessment estimates the energy savings and GHG reduction potential from the purchase of energy and/or environmental attributes from renewable energy projects.

## Background

Investing in renewable energy projects to serve an electricity load instead of purchasing electricity from the PG&E grid, which is in large part produced from fossil fuels, provides a GHG reduction benefit. Renewable energy technologies include solar photovoltaic (PV), wind turbines, solar thermal, geothermal, biomass, and fuel cells.

## Types of Projects

A renewable energy purchase program can be developed through a number of avenues, including:

- Equity Purchase
  - Local renewable energy project venture
  - Non-local renewable energy project venture
  - Joint Powers Authority (JPA)
- Power Purchase Agreement (PPA)
  - Direct access
  - Community Choice Aggregation (CCA)
- Renewable Energy Credits (RECs)

The major difference between these approaches is the level of involvement and level of risk assumed by SCWD and SqCWD in obtaining the GHG reduction benefits through renewable energy purchase programs. The following sections describe each type of renewables purchase.

## Equity Purchase

Local Projects: Local equity purchases are not considered in detail in this assessment. Project Assessment No. 10 discusses local solar projects, and Project Assessment No. 11 discusses fuel cells. Other technologies are not being pursued by SCWD and SqCWD at this time as an equity purchase.

Non-Local Projects: SCWD and SqCWD could invest in and own all or a portion of a renewable energy project that is located in another part of the state or country (such as the Mojave Desert, which has high solar resources). In an equity partnership, SCWD and SqCWD would be responsible for construction, operations and maintenance, and would acquire risk for the project. However, equity purchases often entail small (approximately 1 MW) projects, which can be more expensive than large-scale (approximately 10 to 250 MW) developments because of economies of scale. Since SCWD and SqCWD have a preference to evaluate local projects, this assessment does not further investigate non-local equity purchase projects.

Collaboration through a JPA: A joint powers authority (JPA) is an entity made up of several public agencies that owns and operates renewable energy projects through a joint equity purchase. SCWD and SqCWD would share risk and responsibility of owning the project with other members of the JPA. A higher level of management participation also would be required for equity partnership in a JPA. While terms of specific contracts vary, equity partners share the responsibility for the installation to meet performance requirements, and therefore they tend to participate in the decision-making and other aspects of the O&M of the installation.

### **Power Purchase Agreement**

Direct Access PPA: SCWD and SqCWD could purchase renewable energy through a direct access PPA, in which electricity and associated GHG reduction credits from a renewable energy project developed by a third party would be sold to SCWD and SqCWD for a contracted price and duration of time. Examples could include large-scale (approximately 10 to 250 MW) wind, solar, and hydropower projects.

One benefit of participating in a PPA is that SCWD and SqCWD would not have to develop expertise outside its existing water utility knowledge base or hire additional operational staff. In addition, PPAs could tap into locations with richer renewable resources, such as greater solar insolation in southern California and Arizona, or higher and more constant wind speeds in the Tehachapi Mountains. However, SCWD and SqCWD may prefer to invest in local renewable projects, which is possible but provides fewer options.

The requirements for direct access are highly complex. For instance, serving existing meters requires the creation of a Load Serving Entity (LSE), which would be expensive, difficult, and time-consuming to create. Even if the cost of renewable energy generation was low, SCWD and SqCWD could lose money for a number of years due to the set-up costs associated with the LSE contract.

SCWD and SqCWD could purchase renewable energy through a direct access structure. This scenario would be useful if magnitude of the project was small enough to serve the SCWD and SqCWD load. However, SCWD and SqCWD may want to consider founding or joining a (CCA) if they want to pursue a larger PPA or build larger local renewable projects.

Collaboration through a CCA: A community choice aggregation (CCA) is an entity or group of entities, such as a city or county or both, that purchases and/or generates electricity and sells it to the local community. CCAs allow communities to increase the amount of renewable energy in the portfolio. Pacific Gas & Electric (PG&E) would continue to delivery electricity through the grid and provide billing and customer services.

A benefit of developing a CCA is that it can serve as a business structure for procurement of direct PPAs for local renewable energy projects. There are a number of steps to start a CCA connected to PG&E, including an implementation plan, a service agreement, and exit fees. The Local Energy Aggregation Network (LEAN) organization provides information to help communities build their own CCAs. However, SCWD and SqCWD would have to develop the expertise and staff necessary to become an electricity provider. Another option would be to join an existing CCA, such as Marin Clean Energy.

### **Renewable Energy Credits**

RECs are tradable, non-tangible energy commodities that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource. RECs

represent the environmental attributes of the electricity produced and are sold separately from commodity electricity. For example, SCWD and SqCWD could buy RECs from a wind farm in southern California, which would include buying the greenhouse gas offsets. The RECs would have to be registered to ensure that no one else is claiming the environmental benefits.

One major benefit of RECs is the flexibility to buy them during the annual true-up process. For example, if SCWD and SqCWD operates the desalination plant more than anticipated in a given year and the normal GHG mitigation portfolio does not reduce or offset enough GHGs; SCWD and SqCWD could offset the remaining balance by purchasing RECs for one year. In addition, SCWD and SqCWD would not have to develop expertise outside existing water utility knowledge base or hire additional operational or administrative staff.

While certified RECs are legitimate and real, they are less tangible than equity ownership in a renewables generation project and could be more challenging politically.

## History and Technical Maturity

California's Renewable Portfolio Standard (RPS) policy requires the state's utilities, including PG&E, to increase the percentage of their portfolio generated from renewable electricity over time. PG&E and the State of California have numerous incentive programs that act as significant drivers promoting the development of renewable energy projects.

Many private companies utilize some combination of the different forms of renewable energy purchasing to offset their GHG emissions. Public agencies have been more likely to select direct ownership of renewable energy infrastructure, such as installing PV panels on administration buildings or cogeneration facilities at wastewater plants.

JPA: The Northern California Power Agency (NCPA) is a joint powers agency (JPA) founded in 1968 that currently has 14 members, including cities such as Palo Alto and Roseville, and water utilities such as Turlock Irrigation District and Placer County Water Agency. NCPA's portfolio includes about 95% renewables, which includes geothermal, hydroelectric, and natural gas facilities that NCPA owns and operates. However, the total load of **scwd**<sup>2</sup> may not be large enough to merit membership in NCPA. More information can be found at: <http://www.ncpa.com/>.

Direct Access PPA: PPAs have long been seen by private companies and a few large public agencies as an opportunity to reduce their exposure to volatile electricity prices. As a result of the California Solar Initiative in particular, numerous solar project developers have successfully partnered with public and private entities, and dozens of 10-to-30 year contracts are in place. For example, the San Francisco Public Utility Commission (SFPUC) has a PPA with Recurrent Energy on a 5 MW photovoltaic project located on the SFPUC Sunset Reservoir, which started up in December 2010.

SCWD and SqCWD could enter into a PPA with a renewable energy developer, or could join a CCA that has an existing knowledge of acquiring PPAs. There are two important considerations when evaluating a PPA company – track record and PPA terms. Terms include the price per kWh that the third party charges SCWD and SqCWD for the electricity generated, the annual escalator on the price, the length (15 to 25 years) of the contract, and potential buyout terms. PPA providers include SunPower, SunEdison, Solar Power Partners, SolarCity, Enfinity, SunWize, and Real Goods.

CCA: SCWD and SqCWD could join a CCA that has an existing knowledge of acquiring PPAs. Marin Clean Energy (MCE) is a CCA that has been serving customers since 2010. As of

August 2011, MCE serves over 13,000 customers in the cities and County of Marin. MCE has comparable prices to PG&E, but the benefit is that customers get a higher percent of renewables in the energy portfolio. Regular customers get approximately 27% renewables (versus 15% renewable currently from PG&E), and customers that pay a 1 cent per kWh premium are able to receive 100% renewables. The goal is to achieve about 70% renewables by 2020. However, MCE has indicated that they may not accept members outside of their local geographic area. More information can be found at: <http://marincleanenergy.info/>.

**RECs:** A few public agencies purchase RECs, including the City of Santa Monica, which purchases RECs to offset 100 percent of their fossil fuel consumption (Munves). The development of and participation in the renewable energy purchasing marketplace has been hampered by insecurity over regulatory policy and long-term market value of RECs, but the National Renewable Energy Laboratory projects, even under a low-growth scenario, a 33.7 terawatt-hour (million MWh) annual REC market in the United States by 2015 (Bird).

RECs are offered for sale by various vendors, with varying degrees of quality control. REC quality has been an issue in the media, with various programs being criticized as “green-washing.” To ensure the purchase of real and verifiable RECs, vendors should be recognized by organizations such as Green-e (<http://www.green-e.org/>). Green-e is a project of the non-profit organization Center for Resource Solutions. Green-e researches and verifies the quality of RECs, ensuring that the benefits offered are real and lasting for the environment. Other tracking systems include WREGIS (<http://www.wregis.org/>).

## Reliability and Operational Complexity

The reliability of the technology would vary by type of renewable energy. However, nearly all PPAs and RECs are from either wind or solar PV, which are considered and reliable.

In general, renewables purchase projects should not impact the SCWD or SqCWD water operations. Minimal project administration would be required to monitor PPA and REC contracts. Creation of a local CCA, however, would require significant project administration. A higher level of management participation also would be required for equity partnership in a JPA.

## Sustainability

JPA and PPA contract terms could be negotiated for various lengths of time. Since the life of the desalination project is expected to be 30 years, this assessment assumes the life of contract also would be 30 years. The contract could be renewed to maintain a sustainable project.

RECs could be purchased annually for the 30-year duration of the project, and could continue to be purchased in the future.

## Local Considerations

### **Economy and Education**

Local renewables projects likely would benefit the local community by creating or help to sustain local jobs. Projects would temporarily support jobs to build the projects and could create longer term operation and maintenance and administrative jobs. Development of local renewable projects also could provide an educational opportunity for the community. SCWD and SqCWD could make it a priority to pursue PPAs and RECs that are local.

## Environment

Potential environmental impacts would vary by type of renewable energy in the PPA and REC. However, nearly all PPAs and RECs are from either wind or solar PV.

Air: Solar PV and wind projects produce no air pollution or GHG emissions, and they prevent pollution and reduce GHG emissions by displacing conventional power generation sources.

Water: Installed solar PV and wind power systems use no process water to operate, nor do they contribute to water pollution. PV panels will need periodic maintenance washing to remove dust and grime and should use a biodegradable non-toxic cleaning solution. Remotely-installed panels without water availability will require that water be hauled to the location.

Wind turbines need no water for maintenance.

Land: Land use and space availability for solar PV panel or wind installations can be major constraints. Larger solar PV projects require large, unobstructed, and unshaded areas, typically 100 square feet per kW. A 5 MW system would therefore require 500,000 square feet, or about 12 acres. Acceptable locations will need to be assessed on a case-by-case basis. Land impacts would be mitigated if the installation space is on land that is already disturbed or improved. For example, a solar array installed on a parking area that is no longer needed, integrated within new shade structures installed over existing parking lots, or on a brownfields site could mitigate the impacts.

Large wind power installations require large, unobstructed areas with an adequate wind resource. Developers rely on the Wind Energy Resource Atlas of the United States and the U.S. Department of Energy's Wind Powering America program resources to identify appropriate areas. Unlike solar PV, wind installations have been successfully combined with other land uses, such as agriculture, which adds helpful flexibility to siting options.

Noise: Solar PV systems produce little noise pollution. Larger inverters can make a "humming" sound similar to transformers. The sound can be mitigated by locating inverters in an enclosure or within existing maintenance or electrical yards, and locating them away from residences.

Wind turbines produce a low-frequency noise that can be bothersome to neighbors. The noise can be mitigated by locating them away from residences.

Waste By-Products: Installed solar PV systems generate no waste by-products from their operation.

Installed wind turbine systems generate very little waste by-products from their operation or manufacture. Lubricants are the main waste and need to be disposed of properly.

Aesthetic/Visual: Visual impacts from solar PV installations coincide with space constraints, and solar PV systems impact a viewshed in proportion to the size of the project. Placement of the system is the main factor that affects visual impact. For example, roof-top systems integrating solar PVs into existing structures would minimize visual impacts, whereas utility-scale installations likely would occupy large open spaces that would be visible from a considerable distance.

Visual impacts from wind turbine installations are significant and often controversial. This can be mitigated by locating installations far from residences and recreational areas.

Wildlife, Habitat, and Endangered Species: California's *Desert Renewable Energy Conservation Plan* (DRECP) is designed to offer guidance that will ensure endangered species protection while facilitating renewable energy project development. The DRECP is still under development but draft guidance has been issued, and the participation of all major regulatory

jurisdictions ensures a streamlined approval process for projects. Any renewable energy purchase considered by SCWD and SqCWD should be verified to comply with DRECP guidelines.

Wind turbine projects have additional wildlife concerns because of historical problems with bird and bat kills, although newer wind turbines are of less concern. Wind turbines should be located away from migratory flyways and important bird and bat habitats. California's *Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development* report provides the necessary information to locate permissible wind installations that will minimize wildlife impacts.

## Energy Production, Energy Savings and GHG Reductions

A renewables project through an equity purchase or a PPA would produce renewable energy for use by SCWD and SqCWD. SCWD and SqCWD could choose to offset some or all of energy related to the SCWD and SqCWD desalination plant. The proposed desalination plant running at half capacity would use approximately 6,800 MWh per year, which could be produced by a 4.6 MW solar project or a 2.3 MW wind project, assuming respective rule-of-thumb capacity factors of 17 percent and 34 percent. This would result in an annual reduction of approximately 2,000 metric tons (MT) CO<sub>2</sub>e per year.

A REC program would purchase the carbon offsets from renewables energy projects but not the actual electricity commodity. SCWD and SqCWD could purchase medium and long-term RECs to build portfolios of reduction projects to meet GHG reduction goals, and/or could use REC purchases as an annual tool during the true-up process to meet GHG reduction goals. RECs may present less risk by providing an exact amount during the true-up process, whereas a solar or wind project may over or under perform in a given year.

Table 1 provides a summary of the energy production and GHG reduction from a renewables purchase program.

**Table 1: Estimated Energy Production and GHG Reduction – Renewables Program**

Project	Annual Energy Production (kWh/year)	Annual Metric Tons of CO <sub>2</sub> reduced	Lifetime Metric Tons of CO <sub>2</sub> reduced
Join a JPA	6,800,000	1,978	59,347
Direct Access PPA	6,800,000	1,978	59,347
Join an Existing CCA	6,800,000	1,978	59,347
Create a Local CCA	6,800,000	1,978	59,347
Purchase RECs	0	1,978	59,347

Depending upon the extent of the project, this project has the ability to reduce 100% of the potential GHG reduction goals for SCWD and SqCWD.

## Cost

For the potential projects discussed in this assessment (except RECs), the actual price is uncertain and unknown because prices vary based on projects and specific negotiations. The costs described below are examples of costs from similar types of projects and are meant to provide an order of magnitude cost estimate for a comparative tool in the GHG reduction project assessment process.

### **Capital/Startup Cost**

Creating a local CCA would be the most expensive project and would require legal, regulatory, and project administration costs. It is estimated that the capital/startup cost of creating a local CCA would be on the order of \$3 million.

Obtaining a direct access PPA also would require some upfront costs, including regulatory and legal fees, setting up a Load Serving Entity, and potentially obtaining certification by the California Independent System Operator (ISO) to deliver the electricity. It is estimated that the capital/startup cost of obtaining a direct access PPA would be on the order of \$500,000.

Joining an existing JPA or CCA is estimated to have a relatively smaller upfront cost on the order of \$50,000.

There would be no capital cost associated with RECs, since they are purchased on an on-going annual basis. However, REC contracts can be designed to be prepaid, and bond proceeds possibly could be used to pay the up-front amount.

### **Annual Cost**

Electricity: The actual cost of electricity from a JPA, direct access PPA, or CCA varies significantly based on the project and negotiations. This section provides examples of costs and savings.

PPA pricing is currently estimated at 13 to 14 cents per kWh, and a JPA is expected to have similar costs. The cost of electricity for SCWD, as an example, from July 2010 to June 2011 varied from 9 to 32 cents per kWh (depending on the time of day) and averaged overall 15 cents per kWh. Purchasing 6,800 MWh/year of electricity from a PPA at 14 cents per kWh, versus purchasing from PG&E at an average of 15 cents per kWh, could save SCWD or SqCWD approximately \$68,000 annually.

Unlike equity partnerships and PPAs, whose cost includes the generated power, RECs are “unbundled” from the electricity itself. In other words, a purchaser buys the GHG emissions reduction portion of the renewables project separately from the physical electricity commodity, so SCWD and SqCWD would not see any electricity cost savings.

Ongoing Program Administration: Creating a local CCA would require the most program administration for SCWD and SqCWD. It is expected that 2 FTEs would be needed to support a local CCA. A higher level of management participation also would be required for equity partnership in a JPA in decision-making and O&M aspects, which is estimated to require about 0.5 FTE.

After program startup, it is expected that participating in a direct access PPA, existing CCA, and REC purchase program would require minimal effort, or approximately about 0.1 FTE to support the program.

**RECs:** REC prices are based on a somewhat volatile market. Green-e certified RECs have recently been sold in the range of \$1 to \$9 per REC, while, according to the U.S. Department of Energy Green Power Network, August 2010 REC prices ranged from \$0.50 to \$5.60 per MWh. Prices vary according to the type of renewables, location and whether they are vintage or new projects. New 100% wind RECs are estimated to cost between \$0.50 to \$2 per MWh, while new 100% solar RECs are estimated to cost between \$2 and \$5 per MWh. REC prices are anticipated to continue to increase, so if RECs are purchased at \$2 per MWh, the annual program cost would be approximately \$16,000 to offset the 8,000 MWh/year estimated use of the SCWD and SqCWD desalination plant.

### PG&E Incentives

PG&E and the State of California have numerous incentive programs that act as significant drivers promoting the development of certain renewable energy projects. Incentives are not available for REC purchases, but they are available for certain PPA purchases, such as solar PV.

Table 2 provides a summary of the costs for a renewables purchase program. Annual costs are estimated to escalate similar to inflation.

**Table 2: Estimated Renewables Purchase Program Costs**

Project	Life (yr)	Capital Cost (\$)	Avg Annual Net Cost (\$/Yr)	Lifecycle Energy Cost (\$/KWh)	Lifecycle CO2 Reduction Cost (\$/MT)
Join a JPA	30	\$100,000	\$200,600	\$0.014	\$48
Direct Access PPA	30	\$500,000	\$86,409	\$0.012	\$42
Join an Existing CCA	30	\$100,000	\$154,927	\$0.009	\$32
Create a Local CCA	30	\$3,000,000	\$564,293	\$0.050	\$176
Purchase RECs	30	\$0	\$32,986	\$0.003	\$11

<sup>1</sup>Equity purchase costs (without a JPA) are discussed in Project Assessment No.10.

<sup>2</sup>For all costs (except RECs), price is assumed because PPA contract negotiations are uncertain. These costs provide an order of magnitude estimate.

### Summary of Advantages and Disadvantages

In general, purchasing renewable energy has several key advantages:

- Solar PV and wind are mature technologies with low risk.
- Depending upon the contract negotiated, a PPA could save SCWD and SqCWD money on their annual energy costs.
- Environmental impacts are relatively low.

For these types of renewable purchase programs, it is possible that the renewables projects would not be local. This could benefit SCWD and SqCWD by allowing them to tap into richer renewable resources elsewhere, but would not meet the preference/goal of evaluating local projects.

Some of the major differences between types of renewable purchase programs are the responsibility/risk, and the cost. These are compared in Table 3 below.

**Table 3: Renewables Purchase Program Comparison Matrix**

Project	SCWD and SqCWD Responsibility/Risk	Cost	Project Administration
Join a JPA	High	Low	Low
Direct Access PPA	Medium	Medium	Medium
Join an Existing CCA	Medium	Low	Low
Create a Local CCA	Medium	High	High
Purchase RECs	Low	Low	Low

Additional type-specific advantages and disadvantages are discussed below.

#### **Equity Purchase – Joining a JPA**

##### Disadvantages:

- May not allow new, non-local participants.

#### **PPA – Direct Purchase**

##### Disadvantages:

- Purchase contract process can be complex.

#### **Joining an Existing CCA**

##### Disadvantages:

- May not allow new, non-local participants.

#### **Creating a Local CCA**

##### Advantages:

- Creates an ownership structure to fund local projects.

##### Disadvantages:

- Significant project administration and start-up costs required.
- SCWD and SqCWD would need to develop expertise in the energy utility business.

#### **REC Purchase**

##### Advantages:

- Useful during annual true-up process.

##### Disadvantages:

- The general public does not understand how RECs are certified and often question whether RECs are real and permanent. SCWD and SqCWD may need to do public education about the rigor these RECs go through before pursuing a this option.

## References

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