

DEPARTMENT OF WATER RESOURCES

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TO: Distribution List

Water Code Section 147, which was added by AB 11 of the Fourth Extraordinary Session of 2009, requires the Department of Water Resources to prepare and submit an annual State Water Resources Development System (SWRDS) budget report to the chairpersons of the fiscal committees of the Legislature. The report is to include SWRDS expenditures and revenues for the previous two fiscal years and the projected expenditures and revenues for the current fiscal year. The attached report, covering fiscal years 2013-14 through 2015-16, is submitted in compliance with these requirements.

If you have any questions or need additional information, please contact me at (916) 653-7007, or your staff may contact Mark E. Andersen, Acting Deputy Director for the State Water Project, at (916) 653-8043.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark W. Cowin".

Mark W. Cowin
Director

Attachments

Distribution List

Electronic copy of transmittal letter and one-page Executive Summary distributed to members of the California Legislature.

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Executive Summary
Report to the Legislature
Section (§) 142 of the California Water Code
Report on reductions in GHG emissions for Annual Year 2015

In accordance with Section (§) 142(a) of the California Water Code, DWR is reporting the status of its efforts to reduce dependency on fossil fuels to the Legislature and the Governor. Senate Bill 85 added Section (§) 142 to the California Water Code to address reductions in GHG emissions associated with water and energy usage; specifically, §142(b) requires that DWR provide the report at least annually through 2015.

The report includes:

- (a) The status of any contracts DWR has for fossil fuel generated electricity and DWR's efforts to reduce its dependency on fossil fuels;
- (b) Changes to DWR's existing portfolio of energy contracts;
- (c) Reporting of greenhouse gas (GHG) emissions to The Climate Registry; and
- (d) Continued efforts to reduce GHG emission.



The Department of Water Resources Report on Reducing Dependency on Fossil Fuels and Changes to the Power Contracts Portfolio

Executive Summary

In recognition of the Department of Water Resources' (DWR) actions to reduce greenhouse gas (GHG) emissions, DWR was honored by the Environmental Protection Agency's (EPA) Center for Corporate Climate Leadership with the 2015 Climate Leadership Award in the Excellence in GHG Management category. DWR was the first public agency in the country to receive this honor.

This award reflects DWR's support of California's goals of mitigating climate change impacts and managing carbon emissions effectively by reducing its GHG emissions and fossil fuel dependency through the following actions:

- In October 2015, DWR executed a 20 year Power Purchase Agreement (PPA) with SunPower Corporation to purchase 9.5 Megawatts (MW) of solar photovoltaic (PV) power, with delivery expected to start in December 2016.
- In November 2015, DWR executed a 20 year PPA with Solverde 1, LLC, a subsidiary of sPower, to purchase 85 MW of solar PV power, with delivery expected to start in December 2016.
- In December 2015, DWR executed a 5 year PPA with Metropolitan Water District of Southern California (MWD) to purchase 51.4 MW of renewable power from its small hydro plants, with delivery starting on January 1, 2016.
- In 2014-2015, DWR installed energy efficient lights at four facilities, resulting in retail energy use reductions ranging from 11% to 40%.
- Throughout 2015, DWR also continued to:
 - a. Implement DWR's Climate Action Plan (CAP) to meet its emission reduction targets.
 - b. Refine and expand DWR programs to quantify and accurately report the impact of State Water Project (SWP) operation on California's emission reductions goals.
 - c. Identify and invest in clean and efficient energy resources including development of renewable projects on various SWP sites.
 - d. Purchase 34 MW of geothermal and landfill gas power from Alameda Municipal Power, with delivery continuing since October 15, 2012.



- e. Purchase 45 MW of solar PV power from RE Camelot, LLC, with delivery continuing since December 23, 2014.
- f. Reduce GHG emission when feasible by providing clean hydroelectric generation to the electric grid during the peak demand periods, and pumping during the off-peak periods when high emission generators are typically offline.
- g. Improve efficiency at key SWP hydroelectric facilities.
- h. Seek Leadership in Energy and Environmental Design. DWR received Platinum Leadership in Energy and Environmental Design – New Construction (LEED-NC) certification for its Pearblossom Operations and Maintenance Center building.

Introduction

In accordance with Section (§) 142(a) of the California Water Code, DWR is reporting the status of its efforts to reduce dependency on fossil fuels to the Legislature and the Governor. Senate Bill 85 added Section (§) 142 to the California Water Code to address reductions in GHG emissions associated with water and energy usage.

The State Water Project

DWR's mission is to manage the water resources of California in cooperation with other agencies, to benefit the state's people, and to protect, restore, and enhance the natural and human environments.

Consistent with its mission, DWR is charged with management of the SWP, the largest state-built, multi-purpose water project in the country and the third largest generator of clean hydropower in California. DWR operates the SWP pumping and generating facilities to (a) deliver up to 4.2 million acre-feet of water annually to 29 local water agencies, serving 25 million people and providing irrigation for 750,000 acres of farmland; (b) control floods; (c) comply with environmental regulations; (d) minimize cost of water deliveries; and (e) support electricity demand during critical peak demand periods. These responsibilities, combined with the variability of water supply required for its hydroelectric plants, render DWR's energy demand and supply highly variable and difficult to predict from year to year.



The SWP Power Portfolio

DWR develops and administers a comprehensive power resources program that includes forecasts of loads and resources, strategic timing of generation and pumping schedules, acquisition of power resources and transmission services, and short-term sales of energy surpluses. The SWP has a pumping capacity of approximately 2,600 MW, and the resources to support its pump load consist of the following:

- (1) Generation from SWP's own hydropower facilities and joint developments, shown in Table 1;
- (2) Source-specific power purchases, shown in Table 2; and
- (3) Market purchases.

Table 1: SWP Generating Facilities

Power Plant	Capacity (MW)
Hyatt	645
Thermalito	114*
Thermalito Diversion Dam	3
Gianelli (Joint development with US Bureau of Reclamation)	222**
William Warne	74
Castaic (Joint development with the Los Angeles Department of Water and Power)	214**
Alamo	17
Mojave Siphon	30
Devil Canyon	276
Total Capacity	1,595

* Currently not operational due to fire damage.

** Capacity listed is DWR's share and varies with water delivery.

**Table 2: SWP Source-Specific Power Purchases**

Power Plant & Fuel Type	Counterparty	DWR's Share of Capacity (MW)	Contract Status
Pine Flat (hydro)	Kings River Conservation District	165	Active
MWD Phase I (small hydro)	Metropolitan Water District	30	Active
Lodi Energy Center (natural gas)	Northern California Power Agency	101	Active
NCPA Geothermal 1 & 2 (geothermal) and Ameresco Ox Mountain Energy (landfill gas)	Alameda Municipal Power	34	Active
RE Camelot (solar)	Dominion Solar Holdings	45	Active
Pearblossom (solar)	SunPower Corporation	9.5	Energy delivery expected in December 2016
Solverde 1 (solar)	sPower	85	Energy delivery expected in December 2016
MWD Renewable (small hydro)	Metropolitan Water District	51.4	Energy delivery started on January 1, 2016
Total		520.9	

SWP annual power costs have ranged from \$76 million to \$220 million in the past seven years. The majority of the costs of the entire SWP, including power costs, are paid by the 29 local agencies holding long-term water supply contracts with DWR. Increased costs for power and transmission, coupled with reduced water availability, have contributed to the rise in the unit cost of water in recent years.

SWP Power Portfolio – Calendar Years 2009 through 2015

Averaged over the past seven years (2009 through 2015), SWP power resources comprise of 55% from hydroelectric generation, 30% from unspecified resources, 13% from fossil fuel, and 2% from renewable resources. The SWP's resource portfolios for calendar years 2009 through 2015 are summarized in Table 3.

Table 3: SWP Energy Portfolio¹ for Years 2009 – 2015

SWP Resources (GWh)	2009	2010	2011	2012	2013	2014	2015
Hydroelectric generation							
Alamo Power Plant	56	80	107	30	24	20	24
Castaic Power Plant	585	454	416	615	618	297	435
Devil Canyon Power Plant	561	1,002	1,306	952	579	218	270
Mojave Siphon Power Plant	32	62	85	60	35	11	16
Pine Flat Power Plant	270	513	795	247	115	75	19
Gianelli Pumping-Generating Plant	56	87	74	143	87	49	116
Hyatt - Thermalito Pumping-Generating Complex	1,451	1,546	2,210	1,638	1,491	662	589
Warne Power Plant	284	269	243	359	372	178	267
MWD Small Hydro	<u>102</u>	<u>121</u>	<u>145</u>	<u>119</u>	<u>109</u>	<u>54</u>	<u>56</u>
Total	3,397	4,134	5,381	4,163	3,430	1,564	1,792
Non-Hydro Renewable							
Alameda Municipal Power	-	-	-	42	181	190	182
Dominion Solar Holdings	-	-	-	-	-	2	129
Total	-	-	-	42	181	192	311
Market Purchase							
CAISO (Unspecified Energy)	<u>873</u>	<u>2,157</u>	<u>2,280</u>	<u>2,090</u>	<u>1,175</u>	<u>589</u>	<u>828</u>
Total	873	2,157	2,280	2,090	1,175	589	828
Fossil Fuel Generation							
Lodi Energy Center (Natural Gas)	-	-	-	40	406	440	567
Reid Gardner Unit No.4 Imports (Coal) ²	<u>1,175</u>	<u>901</u>	<u>850</u>	<u>1,036</u>	<u>473</u>	-	-
Total	1,175	901	850	1,076	879	440	567
Total Resources	5,445	7,192	8,511	7,371	5,665	2,785	3,498

Table 4: SWP Generation and Pump Load

Energy (GWh)	2009	2010	2011	2012	2013	2014	2015
SWP Pumping Plant Load	5,445	7,192	8,511	7,371	5,665	2,785	3,498
SWP Power Plant Generation ³	3,025	3,500	4,441	3,797	3,206	1,435	1,717

¹ Minor variances in subtotals or totals are due to rounding. GWh totals include line loss factors and station service. Data subject to change based on further validation and true-ups.

² Reid Gardner Power contract expired in July 2013.

³ SWP Power Plant Generation does not include Pine Flat and MWD Small Hydro contracts.



In 2015 the SWP delivered 1.4 million acre-feet of water using 3,498 GWh of energy. This energy comprised of 51% from hydroelectric resources, 24% from unspecified resources, 16% from fossil fuel resources and 9% from renewable resources.

As shown in Table 4, energy produced in 2015 by DWR owned and operated hydroelectric generation resources increased by 20% while its pump load demand increased 26% from 2014 levels.

CO₂ Emissions Summary and Accounting Methodology

DWR's GHG emissions for years 2009 through 2015 are summarized below. Hydroelectric and renewable energy are reported as having zero carbon emissions, and purchases from unspecified sources are reported using the default emissions rate provided by the California Air Resources Board (CARB) for unspecified imports.

Table 5: SWP Annual CO₂ Emissions (Million Metric Tons)

Source	2009	2010	2011	2012	2013	2014	2015
Reid Gardner Unit 4	1.00	1.02	0.94	1.21	0.56	0	0
Lodi Energy Center				0.02	0.16	0.17	0.22
Unspecified Energy	0.38	0.94	1.00	0.91	0.51	0.26	0.36
Net Emissions	1.38	1.96	1.94	2.14	1.23	0.43	0.58

For reporting year 2009, DWR applied emissions factors and guidelines consistent with the *California Climate Action Registry (CCAR) General Reporting Protocol* and the *Power/Utility Protocol*. These protocols integrate data sources and methodology from the EPA, the Energy Information Administration, and the Federal Energy Regulatory Commission. DWR transitioned to the new, nationally based registry by joining The Climate Registry (TCR) in February 2010. For the 2010 and later reporting years, DWR calculated GHG emissions applying methodology and emission factors consistent with TCR's *General Reporting Protocol* and the *Electric Power Sector (EPS) Protocol*. Starting in 2010, DWR selected independent verifiers to verify all of the emissions reports submitted to TCR.

DWR Emissions Reductions Programs and Strategies

In 2012, DWR began the GHG emissions reduction phase of its CAP, in which DWR commits to reducing its GHG emissions to 50 percent below 1990 levels by 2020 and 80 percent below 1990 levels by 2050. To achieve these goals, the CAP relies primarily on using renewable and cleaner energy sources and improving energy efficiency. In February 2015, DWR was honored by the EPA Center for Corporate Climate Leadership for its aggressive actions to reduce GHG emissions. DWR received the Climate Leadership Award in the Excellence in GHG Management (Goal Setting Certificate) category.



The development of reliable, clean, and renewable energy, and effective management of carbon emissions are critical for national and global security and for environmental health. To mitigate climate change impacts, DWR supports the state, national, and international goals of reducing GHG emissions through the following activities:

- Procured renewable energy:
 - a. Purchased 34 MW of geothermal and landfill gas power bundled with Renewable Energy Certificates (RECs) from Alameda Municipal Power. Delivery began October 15, 2012, and will continue through December 31, 2016.
 - b. Purchased 45 MW of solar PV power bundled with RECs from RE Camelot, LLC. Delivery began December 23, 2014, and will continue through December 31, 2034.
 - c. Purchased 9.5 MW of solar PV power bundled with RECs from a solar PV plant that will be built, owned, and operated by SunPower Corporation on DWR's property near its Pearblossom Pumping Plant in Los Angeles County. The plant is expected to be operational by December 2016. DWR will receive approximately 28,000 megawatt-hours (MWh) of energy per year for 20 years.
 - d. Purchased 85 MW of solar PV power bundled with RECs from Solverde 1, LLC. The facility is expected to be commercially operational by December 2016. DWR will receive approximately 240,000 MWh of energy per year for 20 years.
 - e. Purchased 51.4 MW of hydro power from MWD. Delivery began on January 1, 2016, and will continue through December 31, 2020. In addition to energy, MWD will provide local Resource Adequacy capacity, RECs, and scheduling coordinator services.
- Reduced retail energy use pursuant to the Governor's Executive Order B-18-12:
 - a. Upgraded lighting system at Sutter Maintenance Yard, which is estimated to reduce retail energy use by 20-25%, or 71,000 kWh annually.
 - b. Upgraded lighting system at Lost Hills O&M Sub-center, which is estimated to reduce retail energy use by 20%, or 81,000 kWh annually.
 - c. Upgraded lighting system at Oroville Field Division O&M Headquarters, which is estimated to reduce retail energy use by 11%, or 134,000 kWh annually.
 - d. Upgraded lighting system at Coalinga O&M Sub-center, which is estimated to reduce retail energy use by 40%, or 84,000 kWh annually.



- Participated in SMUD's Commercial Carbon Offset and Commercial Greenergy programs to reduce GHG emission.
- Received Platinum LEED-NC certification for its Pearblossom O&M Center building. This new 20,000 square foot administrative office building was built using strategies for improving performance across all key metrics: energy savings, water efficiency, improved indoor air quality, stewardship of resources, and sensitivity to climate impacts. The design includes a 34 kW solar system to power the facility.
- Implemented DWR's CAP to reduce SWP GHG emissions in compliance with the Governor's Executive Order S-3-05 (The Impacts of Climate Change).
- Balanced the SWP's electrical demands through self-generation of clean hydroelectric power, load management, and purchases that include renewable generation and generation from low-emission resources.
- Continued to analyze SWP transactions data for trends in energy use and GHG emissions. DWR also submitted annual GHG emission reports from 2009 through 2015 to CARB and TCR in accordance with the applicable requirements. The reports included energy data for SWP hydroelectric facilities, plant capacities, pump load, energy imported into California, energy exported out of California, fuel usage, and sulfur hexafluoride emissions.
- Communicated extensively with government and private entities to ensure that DWR's efforts align with national and state legislation and policy directives.
- Conducted feasibility studies to increase the efficiencies of pumps and turbines at SWP facilities through replacements and refurbishments. These programs reduce GHG emissions because the facilities would use less energy to move water and generate more energy with the same water flow and head. DWR has completed major energy efficiency projects at Hyatt Power Plant in 2006 and Edmonston Pumping Plant in 2011. DWR is evaluating the feasibility of additional energy efficiency upgrades at Edmonston Pumping Plant.
- Investigated the benefits and costs of replacing or refurbishing the turbine shutoff valves at the Hyatt Power Plant. The new valves would greatly reduce generation losses by preventing water from leaking through the unit's wicket gates, which would lead to additional generation of 40 GWh per year. The additional generation will reduce 17,000 metric tons of GHG emissions annually.
- Secured funding from the 2013-14 Greenhouse Gas Reduction Fund to replace turbine runners at Thermalito unit 1 and Hyatt unit 1. These projects will generate 19,833 MWh of additional clean hydroelectric energy per year and reduce about 6,247 metric tons of GHG emission annually. Hyatt unit 1 project is expected to be completed by May 2017, and the Thermalito unit 1 project is expected to be completed by June 2017.



- Reduced wholesale power grid emissions by offering clean hydroelectric generation to the market during the peak hours to displace energy from high GHG producing and inefficient generators that would otherwise be called upon by CAISO to meet California's peak electricity demand.
- Scheduled pump load when feasible during the off-peak hours when high emission generators are typically offline.
- Investigated and invested in high efficiency and renewable technologies:
 - a. DWR is examining two potential sites on its property to develop solar energy to support its retail use.
 - b. DWR is examining 12 sites within the SWP that may have potential for small hydro installations totaling approximately 33 MW (ranging from 0.5 to 12 MW). The sites will be analyzed based on capability for energy production, current energy prices, and CAISO market outlook
 - c. DWR is considering the feasibility of installing micro hydro-turbines on the outlet structures of the California Aqueduct. Further investigation will be conducted after the small hydro investigation discussed above is completed.
 - d. In 2010, DWR completed a power planning study to add a second 12 MW generation unit to the existing 18 MW small hydro energy recovery unit at Alamo Power Plant. DWR management is reviewing staff recommendations to proceed with the preliminary design and initiate the permitting process for adding the proposed unit.
 - e. DWR is researching how to provide water supplies during average and dry years for urban, agricultural and environmental purposes using clean hydroelectric resources to enhance the operational flexibility of the SWP.
 - f. At facilities capable of pump-back operations, DWR is investigating the options for pumping water back into the reservoir during off-peak hours and releasing it during on-peak hours when power is in greatest demand.

Conclusion

In addition to continuing its role as the state's third largest generator of clean hydropower, DWR is taking steps to reduce its overall dependency on fossil fuels through investigation and investment in cleaner and more efficient technologies such as efficiency improvements to existing SWP facilities and renewable energy resources. DWR's membership in TCR provides the vehicle for DWR to track and report its GHG emissions; evaluate its progress in meeting its GHG emissions reductions goals; and increase its role in mitigating the negative effects of climate change.

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TO: Distribution List

Attached is the Department of Water Resources (DWR) annual report to the Legislature on efforts to reduce dependency on fossil fuels and changes to its portfolio of power contracts for the State water Project. The passage of Senate Bill 85 in August 2007, which added Section (§) 142 to the California Water Code, requires DWR to submit an annual report addressing the reduction in its greenhouse gas emissions related to water and energy use.

This report highlights the progress DWR has made in reducing its State Water Project by investing in energy efficiency projects and by procuring renewable energy resources.

If you have any questions, please contact me at (916) 653-7007 or your staff may contact Mark E. Andersen, Acting Deputy Director for the State Water Project at (916) 653-8517.

Sincerely,

Mark W. Cowin
Director

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