

DEPARTMENT OF WATER RESOURCES

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TO: Distribution List

The supplemental Report of the 2007 Budget Act (item 3860-001-0001), Dated August 2007, requires the Department of Water Resources (DWR) to report to the Chairs of the Senate and Assembly fiscal committees on DWR's efforts to reduce dependency on fossil fuels and changes to its portfolio of power contracts for both the State Water Project and the California Energy Resources Scheduling (CERS) Division. The passage of the Senate Bill (SB) 85 in August 2007, which added Section (§) 142 to the California Water Code, requires DWR to submit an annual report addressing the reductions 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 emissions by investments in energy efficiency projects and plans to phase out a fossil fuel contract. It also characterizes the energy portfolio of CERS, which was created during California's 2000-2001 energy crisis in response to calls by the Governor and the Legislature for DWR to purchase power for California's Investor Owned Utilities.

If you have any questions, please contact me at (916) 653-7007 or your staff may contact Carl A. Torgersen, 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

Enclosures

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

Executive Summary

The Department of Water Resources (DWR) supports California's goals of mitigating climate change impacts and effective management of carbon emissions. Consequently, as DWR meets California's water needs, it is also reducing its greenhouse gas (GHG) emissions and fossil fuel dependency through the following actions:

- In February 2013, DWR executed an agreement with RE Columbia to purchase 45 MW of solar renewable power. The facility is under construction in California and expected to begin commercial operation by 2015.
- In July 2013, DWR ceased to import energy from the coal-fired Reid Gardner Power plant.
- In 2013, DWR completed construction of a Leadership in Energy and Environmental Design-New Construction (LEED-NC) project at its Pearblossom Operations and Maintenance Center.
- Throughout 2013, DWR also continued to
 - Implement DWR's Climate Action Plan to not only meet but to exceed California's emission reduction targets for 2020.
 - Refine and expand DWR programs to quantify and accurately report the SWP's operational impact on California's emission reductions goals.
 - Identify and invest in technologies that increase the SWP's percentage mix of cleaner and more efficient resources including development of renewable projects on various SWP sites.
 - Purchase renewable energy from Alameda Municipal Power and develop an RFP to be issued in 2014 to purchase additional renewable power.
 - Reduce wholesale grid emission when feasible by providing clean hydroelectric generation to the electric grid during critical peak hours and pumping during the off-peak hours when high emission generators are typically offline.
 - Improve efficiency at key SWP hydroelectric facilities to annually save approximately 48,000 metric tons of carbon dioxide equivalent (CO₂e).



Introduction

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

- (1) The status of any contracts it has for fossil fuel generated electricity and its efforts to reduce its dependency on fossil fuels; and
- (2) Changes to the existing energy portfolio that alters the contracts' costs, term, quantity, or composition of resources that deliver power under the contracts.

The State Water Project

DWR is classified in the North American Industry Classification System under the Public Administration of Environmental Quality Program Sector. This industry includes government establishments primarily engaged in the administration, regulation, and enforcement of water resource programs, flood control programs, drainage development and water resource consumption programs, and coordination of these activities at intergovernmental levels. 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 provide irrigation for 750,000 acres of farmland; (b) control flood; (c) comply with environmental regulations; (d) minimize cost of water deliveries; and (e) support the electricity grid during critical periods of peak demand. 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, the 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 2600 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	DWR's Share of Capacity (MW)
Hyatt	645
Thermalito (not operational due to fire damage)	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	1595

* Capacity 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 hydros)	Metropolitan Water District	30	Active
Reid Gardner (coal)	NV Energy	235	Terminated in July 2013
Lodi Energy Center (natural gas)	Northern California Power Agency	94	Active
NCPA Geothermal 1 & 2 (geothermal) and Ameresco Ox Mountain Energy (landfill gas)	Alameda Municipal Power	34	Active
Columbia (solar)	RE Columbia	45	Active – Energy delivery expected by 2015
Total		603	

SWP annual power costs have ranged from \$190 million to \$410 million in recent 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 raised the unit cost of water in recent years.

SWP Power Portfolio – Calendar Years 2009 through 2013

Averaged over the past five years (2009 through 2013), SWP power resources comprise of 54.7% from hydroelectric generation, 31.9% from unspecified resources, 12.8% from fossil fuel, and 0.6% from renewable resources. The SWP's resource portfolio for calendar years 2009-2013 and projection for 2014 and 2015 is summarized in Table 3 below.

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	82	83
Castaic Power Plant	585	447	416	615	618	534	538
Devil Canyon Power Plant	561	1,002	1,306	952	579	986	979
Mojave Siphon Power Plant	32	62	85	60	35	78	78
Pine Flat	270	514	795	247	115	244	244
Gianelli Pumping-Generating Plant	56	87	74	143	87	89	112
Hyatt - Thermalito Power Plant Complex	1,451	1,546	2,210	1,638	1,491	1,625	1,759
Warne Power Plant	284	269	243	359	372	328	337
Small Hydro	<u>102</u>	<u>100</u>	<u>145</u>	<u>119</u>	<u>109</u>	<u>125</u>	<u>127</u>
Total	3,397	4,107	5,381	4,163	3,430	4,091	4,257
Non-Hydro Renewable							
Alameda Municipal Power Agreement	-	-	-	42	183	192	182
Total	-	-	-	42	183	192	182
Market Purchase							
CAISO (Unspecified Energy)	2,983	3,369	2,294	2,100	1,174	1,058	1,635
Total	2,983	3,369	2,294	2,100	1,174	1,058	1,635
Fossil Fuel Generation							
Lodi Energy Center (Natural Gas)	-	-	-	40	406	459	492
Reid Gardner Unit No.4 Imports (Coal)	1,175	819	850	1,036	473	-	-
Total	1,175	819	850	1,076	879	459	492
Total Resources	7,555	8,295	8,525	7,381	5,667	5,800	6,566
Sales (Surplus Energy)	1,476	1,784	0	0	0	0	0
Total (Net) Resources	6,079	6,511	8,525	7,381	5,667	5,800	6,566

Table 4: SWP Generation and Pump Load

Energy (GWh)	2009	2010	2011	2012	2013	2014	2015
SWP Pumping Plant Load	5,445	7,191	8,511	7,371	5,665	5,800	6,566
SWP Power Plant Generation	2,441	3,046	4,025	3,182	2,588	3,188	3,348

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.



In 2013, the SWP delivered 2.1 million acre-feet of water using 5.7 million MWh of energy, representing less than 3% of total electricity usage in California. This energy comprised of 61% from hydroelectric resources, 21% from unspecified resources, 16% from fossil fuel resources, and 3% from renewable resources.

Changes in 2013 from the previous years in the volume of renewable and fossil fuel resources reflect the expiration of the Reid Gardner contract and the first full year of delivery from the Alameda and Lodi Energy Center contracts in 2013.

As shown in Table 4, energy produced in 2013 by DWR owned and operated hydroelectric generation resources decreased by 19% while its pump load demand decreased 23% from 2012 levels. The key driver of this reduction was hydrology. The fire at the Thermalito Power Plant was another factor in the reduction of hydroelectric generation.

CO₂ Emissions Summary and Accounting Methodology

DWR's GHG emissions for years 2009 through 2013 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 rates.

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

Source	2009	2010	2011	2012	2013
Reid Gardner Unit 4	1.0	0.8	0.9	1.2	0.5
Lodi Energy Center				0.01	0.15
Purchases (Unspecified Energy)	1	1.1	1	0.9	0.5
Gross Emissions	2.0	1.9	1.9	2.1	1.2
Surplus Sales	0.4	0.4	0	0	0
Net Emissions	1.6	1.5	1.9	2.1	1.2

Through 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 Environmental Protection Agency (EPA), the Energy Information Administration (EIA), 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 emissions factors consistent with TCR's *General Reporting Protocol* and the *Electric Power Sector (EPS) Protocol*. DWR selected an independent verifier for its 2012 emissions reports to TCR.



DWR Emissions Reductions Programs and Strategies

The development of reliable, clean, and renewable energy sources 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 goal of reducing GHG emissions, expanding energy efficiency programs and renewable energy resources, and implementing low-carbon fuel standards through the following activities:

- Executed an agreement with RE Columbia in February 2013 to purchase 45 MW of solar renewable resources. The facility is under construction in California and expected to begin commercial operation by 2015.
- Ceased to import energy from the Reid Gardner coal-fired generator in Nevada upon the expiration of this contract with NV Energy.
- Completed construction of a Leadership in Energy and Environmental Design-New Construction (LEED-NC) project in 2013 at its Pearblossom Operations and Maintenance Center. DWR is pursuing a LEED-NC Gold Level Certification for this new 20,000 square foot administrative office building, which was built using strategies for improving performance across all key metrics: energy savings, water efficiency, improved indoor environmental quality, stewardship of resources, and sensitivity to impacts. The design includes a 34 kW solar system to power the facility.
- Implemented DWR's Climate Action Plan to reduce SWP GHG emissions in compliance with the Governor's Executive Order S-3-05 (The Impacts of Climate Change) and Assembly Bill 32 (AB 32 -- The California Global Warming Solutions Act of 2006).
- 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 participated in TCR and submitted the fifth annual Mandatory Greenhouse Gas Reports to the CARB in May 2013 in accordance with the requirements of AB32 to provide consistent and transparent mechanisms to report, update, track, and verify DWR's carbon footprint. The report included energy data for SWP hydroelectric facilities, plant capacities, pump load, energy imported into California, and energy exported out of California.



- Communicated extensively with government and private entities to ensure that its efforts align with national and State legislation and policy directives.
- Investigated the benefits and costs of replacing or refurbishing the turbine shutoff valves at the Hyatt Power Plant. New valves could greatly reduce generation losses by preventing water from leaking through the unit's wicket gates, which could lead to a potential savings of 40 GWh per year. The savings would displace SWP market energy purchases for a potential reduction of 17,000 metric tons of GHG emissions annually.
- Reduced wholesale power grid emissions by offering clean hydroelectric generation to the market during the peak hours to displace energy from 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.
- Invested substantial resources in engineering feasibility and design studies to increase the efficiencies of pumps and turbines at SWP facilities through replacements and refurbishments. The programs substantively reduce overall GHG emissions since SWP facilities would use less energy to move water and generate more energy with same water flow and head. For example, DWR has completed major energy efficiency projects at the Edmonston Pumping Plant and Hyatt Power Plant that resulted in an estimated reduction of 48,000 metric tons of CO₂ annually. DWR is evaluating the feasibility of additional energy efficiency upgrades at Edmonston, which would start in 2020. Table 6 illustrates the cumulative energy savings and fossil fuel emissions equivalents associated with the energy efficiency improvements from 2003 through 2020.

Table 6: SWP Energy Efficiency and Emissions Reductions (2003–2020)

Energy Efficiency Program	Cumulative Energy Savings (MWH)		Emissions Reductions (Metric Tons CO ₂)	
	Hyatt Generation	Edmonston Pumping	Hyatt Generation	Edmonston Pumping
Years				
2003-2007	306,949	5,951	84,108	1,631
2008-2020	1,721,443	773,202	471,698	211,867
Total (2003-2020)	2,028,392	779,153	555,806	213,498
CUMULATIVE TOTAL	2,807 Giga-watt hours		0.77 Million metric tons CO₂	



- Investigated and invested in high efficiency and renewable technologies such as combined-cycle, combined heat and power, solar, and wind energy to increase the SWP's portion of cleaner and more efficient resources. Below are examples of these investments and investigations:

Low Emission Power Purchases - DWR currently purchases energy from the Lodi Energy Center, which is a high efficiency natural gas combined cycle generator with one of the lowest GHG emissions rates in California.

Renewable Power Purchase - DWR currently purchases geothermal and landfill gas renewable energy from Alameda Municipal Power. In addition, DWR is developing an RFP for renewable resources to be issued in 2014.

Solar Investigation - DWR is coordinating with transmission providers and conducting feasibility studies for the development of a solar project near DWR's Pearblossom Pumping Plant.

Small Hydro Investigation - DWR is examining 12 sites within the SWP that may have the 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 and CAISO market outlook, and the renewable energy credit component. If any of the projects proceed, the tentative online date for the initial projects would be 2020.

Micro Hydro Investigation - DWR is considering an investigation into whether micro hydro generation could be installed on the outlet structures of the California Aqueduct. This investigation would follow the conclusion of the small hydro investigation discussed above.

Second Unit at DWR's Alamo Power Plant - 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. If the project proceeds, the tentative online date would be 2018.

Sites Reservoir Storage Projects - DWR is researching how to provide water supplies in average and dry years for urban, agricultural and environmental purposes using clean hydroelectric resources to enhance the inherent operational flexibility of the SWP.

Pump-back operations – DWR is investigating the use of water that is in excess of downstream flow requirements at those facilities capable of pump-back operations. This water could be pumped back into a reservoir during off-peak hours and then released during on-peak hours when power is in greatest



demand. However, pump-back operations are often not feasible due to environmental requirements. Also, pump-back operation at the Thermalito Power Plant is not possible because the plant is not operational due to fire damage.

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 the CCAR and TCR and its participation in AB32 mandated reporting regulations provide the vehicle for DWR to track and report its GHG emissions, evaluate its progress in meeting and exceeding California's GHG emissions reductions goals, and increase its role in mitigating the negative effects of climate change.