STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 942360001
(916) 653-5791

APR 20 2010

TO: Distribution List

Attached is the fifth report to the Chairs of the Senate and Assembly fiscal committees on the Department of Water Resources' (DWR) energy use and purchasing activities. This is a supplemental report required by the 2007 Budget Act (Item 3860-001-0001), dated August 2007.

The report discusses the energy related activities of DWR's State Water Project, the California Energy Resources Scheduling Division, and the Office of Water Use Efficiency and Transfers related to its statutory and regulatory authority and disbursement of bond funds.

If you have any questions, please contact me at (916) 653-7007 or your staff may contact Veronica Hicks, Chief of DWR's State Water Project Power and Risk Office at (916) 574-1295.

Sincerely,

Mark W. Cowin
Director

Attachments

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Sacramento, California 95814

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Secretary of the Senate
State Capitol, Room 400
Sacramento, California 95814

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California Natural Resources Agency
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The California Department of Water Resources Summary Report to the California State Legislature Regarding its Energy Use and Purchasing Activities, January 1, 2010

This report articulates the Department of Water Resources' (DWR's) annual energy consumption and related reductions in greenhouse gases as required by the Budget Act of 2007,[1] and consistent with Assembly Bill (AB) 1585.[2]

- Carbon dioxide (CO_2) emission levels from State Water Project (SWP) operations will meet the California AB 32 goal of reducing greenhouse gas (GHG) emissions to 1990 levels 12 years earlier than the 2020 deadline.
- DWR's coal based energy contract with Nevada Power Company expires in July 2013. DWR will replace this energy source with resources that reduce the emissions associated with the SWP's power purchase portfolio.
- DWR will issue a request for bids for renewable energy for the SWP, and enter into partnerships with public agencies to solicit renewable energy.
- From 2003 through 2011, DWR's hydroelectric energy efficiency programs (refurbishing or replacing units at SWP facilities) will save 930,000 megawatt hours, and 0.28 million metric tonnes of CO_2 emissions.
- In June 2009, DWR submitted its Mandatory Greenhouse Gas Report to the California Air Resources Board (CARB). The report included data related to the SWP generation, pumploads, hydroelectric unit capacities, and the SWP power purchase portfolio for year 2008.
- In July 2009, DWR submitted its independently verified 2008 CO_2 emissions inventory report to the California Climate Action Registry (CCAR). DWR has thus achieved the status of Climate Action Leader for a second consecutive reporting year.
- DWR sponsors the Subsidence Mitigation Rice Cultivation Research and Farm Scale Wetlands Demonstration Projects[3] within the Western Delta.
- DWR applied for certification of its New Science Center, and the Pearblossom Administration Building through the Leadership in Energy and Environmental Design Silver Standard.[4]
- DWR continues to collaborate with federal, State and local agencies to increase water use efficiency and thereby reduce GHG emissions related to water use. For example, in April 2009, DWR launched a committee to consider sustainability and ecosystem stewardship in its current and future activities.
- The California Energy Resource Scheduling (CERS) meets 19 percent of investor owned utilities (IOU) customers' electricity demands, with 1 percent renewable, 48 percent natural gas, and 51 percent unspecified energy.

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[1] <http://www.lao.ca.gov/2007/supp_report/supp_rpt_2007.pdf>
[2] <http://www.leginfo.ca.gov/pub/09-10/bill/asm/ab_1551-1600/ab_1585_bill_20100226_chaptered.pdf>
[3] <http://www.water.ca.gov/deltainit/docs/Interim-Delta-Actions.pdf>
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- Phase out imports of coal-based energy from Nevada derived from the long term participation agreement for a portion of the electricity generated by Reid Gardner Plant Unit No. 4, and to replace this source of energy with less carbon-intensive resources;
- Reduce fossil fuel use and increase energy efficiency in State Water Project (SWP) operations;
- Reduce energy and water consumption through DWR's statutory and regulatory authority and through disbursement of bond funds; and
- Reduce fossil fuel use in its California Energy Resources Scheduling (CERS) Division contracts and to replace that fuel with less polluting energy resources.

Hydropower meets the definition of a renewable energy resource since it is produced by converting resources that are non-depletable or naturally replenishable to electricity.[1] The California Renewables Portfolio Standard (RPS) limits the size of hydroelectric power that qualifies under its RPS to 30 MW capacity, since large hydroelectric generation already represents a technologically mature and fully commercialized industry.[2]

Over the last 18 years, the SWP has generated enough clean emissions hydroelectric power to meet from 35 to 60 percent of its energy resource needs annually, depending on annual precipitation and water demands. In addition to generating its own hydroelectric power, DWR has implemented hydroelectric energy efficiency programs, which contribute substantially to savings in pumpload requirements and to increased hydrogeneration capacity.

[1] <http://www.oas.org/dsd/publications/Unit/oea79e/ch05.htm>
[2] <http://www.awea.org/policy/rpsmechste.html>

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[1] <http://www.cas.org/ced/publications/Untitled27Serch05.htm>
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Executive Summary

This report is an update on DWR's energy related activities. In summary:

- Carbon dioxide (CO_2) emission levels from SWP operations will meet the California Assembly Bill (AB) 32 goal of reducing greenhouse gas (GHG) emissions to 1990 levels well in advance of the 2020 deadline (12 years early).

- DWR's Reid Gardner energy contract expires in 2013, at which point, DWR will replace this energy with cleaner resources, significantly reducing the emissions related to the SWP's power purchase portfolio.

- DWR plans to issue a request for bids for renewable energy for the SWP and enter into partnerships with public agencies to solicit renewable energy.

- Through 2011, by refurbishing or replacing hydroelectric units at SWP facilities, the SWP's energy efficiency programs will save an estimated 932,000 megawatt hours (MWh), and 280 thousand metric tonnes (MT) of CO_2 emissions.

- In July 2009, DWR submitted its CO_2 emissions inventory report for 2008 to the California Climate Action Registry (CCAR). In October 2009, this emissions report was certified by an independent verifier. Following the CCAR's final review, DWR anticipates being awarded status of Climate Action Leader for the second year in a row.

- In June 2009, DWR submitted its 2008 Mandatory Greenhouse Gas Report to the California Air Resources Board (CARB). The report included data related to the SWP generation, pumploads, hydroelectric unit capacities, and the SWP power purchase portfolio for calendar year 2008.

- To determine the rate of land accretion and the potential for carbon sequestration for farming within the Western Delta, DWR is sponsoring Subsidence Mitigation Rice Cultivation Research and Farm Scale Wetlands Demonstration Projects.[3]

- DWR applied for Leadership in Energy and Environmental Design (LEED) Silver Standard certification of its New Science Center in Solano County, and the Pearblossom Administration Building, in Los Angeles County.[4]

- DWR continues to collaborate with federal, State and local agencies to increase water use efficiency and thereby reduce GHG emissions related to water use.

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The Department of Water Resources Operations Update

DWR is an agency of the State of California, headquartered in Sacramento, responsible for monitoring, conserving, and developing California's water resources, providing public safety, and preventing property damage related to water resources. DWR's mission mandates that all projects undertaken shall benefit the State's people, and to protect, restore, and enhance natural ecosystems and human environments.

DWR policies to implement effective measures to address climate change and reduce GHG emissions associated with California's water management objectives are evolving as DWR gains insight and experience with its ongoing programs and pilot projects. DWR's strategy in managing the SWP incorporates these objectives within the context of meeting its regulatory, hydrologic, and environmental responsibilities. What follows is a discussion of the key factors that influence DWR's strategies and programs in general, as well as SWP water delivery operations specifically.

California's Drought

In February 2009, Governor Schwarzenegger declared a drought state of emergency[5] and directed DWR and other State agencies to provide assistance to the communities impacted by the drought. On March 30, 2009, DWR provided the Governor with an update on drought conditions and recommended strategies.[6] DWR holds public workshops to provide updates on drought impacts and response activities. DWR action plans for addressing California's drought conditions continuing into 2010 and beyond include increased water conservation, a 2010 drought water bank, a long-term water transfer program, improvements to the California Irrigation Management Information System, and meeting with California Emergency Management Agency and other State and local agencies to coordinate emergency response activities.[7]

DWR's California Water Plan staff and State Agency steering committee are working on a draft of a 5-year Statewide Drought Contingency Plan. The plan will articulate a coordinated State government strategy to prepare for, respond to, and recover from drought. A final plan will be released in conjunction with the next water plan update due in February 2010.

[5] http://www.gov.ca.gov/proclamation/11557/
[6] http://www.water.ca.gov/news/newsreleases/2009/040209droughtrpt-gov.pdf
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Hydrologic Conditions

California faces severe water supply problems across the State. The three-year drought, from 2006 to the present, is evident in the well-below normal reservoir storage levels throughout California. At the end of water year 2009,[8] statewide reservoir storage levels equaled 17 million acre feet (MAF), which is 80 percent of average and 46 percent of capacity. Individual reservoirs remain at much lower levels. For example, as of October 30, 2009, San Luis Reservoir was at 42 percent of its average level. The reservoir did not benefit from last winter's rains due to regulatory and environmental limitations on water transfers through the Delta. San Luis stores water transferred through the Delta for both State and federal water projects. San Luis storage levels will continue falling as water project deliveries increase.

Sierra snowpack represents one-third of California's water supply. April 1 is the historic peak of Sierra snowpack development and marks the beginning of the snowmelt period. On April 1, 2009, statewide snowpack was 80 percent of average. The final snow survey of the season on May 1, 2009 measured statewide snowpack water content at 60 percent of average. As of May 27, 2009, the State's snowpack water content stood at 20 percent of average.

Water year 2006-07 was the first of three dry years, ending with 53 percent of average statewide runoff. Water year 2007-08 ended with 63 percent of average annual precipitation across the State, and 60 percent of average statewide runoff. Water year 2008-09 ended with 76 percent of average annual precipitation and 65 percent of average statewide runoff. January, April, July, August, and September 2009 were exceptionally dry months.

State Water Project Deliveries

Continuing dry conditions and Delta pumping restrictions are reflected in the SWP's diminishing hydroelectric pumpload and generation over the past three years. Table 1 summarizes the changes in the pumpload and hydrogeneration for the State Water Project plants for 2007 through September 2009.

Table 1. SWP Hydroelectric Plants

SWP Owned and Operated Hydroelectric Plants			
State Water Project Resources (gigawatt hours)	2007	2008	2009
	Quarters 1-4	Quarters 1-4	Quarters 1-3
SWP Pumping Plant Load	9,801	6,043	3,532
SWP Power Plant Generation	4,262	2,281	1,686

[8] The water year is the 12-month period, starting on October 1 and ending September 30.

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As a consequence of hydrologic drought conditions and related environmental and regulatory conditions, 2009 water deliveries to the SWP contractors were restricted. In October 2008, DWR's initial allocation for water delivery requests to the SWP contractors for 2009 was 15 percent, the second lowest in the SWP's history. As the water year developed, the allocations were gradually increased. On May 20, 2009, the final water allocation was at 40 percent of SWP contractors' requests. On December 1, 2009, DWR announced the initial 2010 water allocation of 5 percent of total contracted water deliveries to SWP contractors. Five percent is the lowest initial allocation percentage since the SWP began delivering water in 1967.[9]

Climate Change

In June 2005, Executive Order S-05-05 mandated the preparation of biennial science assessment reports on climate change impacts and adaptation options for California. The first Climate Action Team (CAT) Assessment Report was produced in March 2006, followed by the 2008 Assessment Report, which provided new information and scientific findings. In March 2009, the Climate Action Team (CAT) released its Draft Biennial Report to the Governor and Legislature. The report suggests that without action, severe climate change impacts are possible for the State's vulnerable water supplies, as well as for agriculture, forestry, energy, water and health, and problems related to sea-level rise. The CAT report synthesizes research by scientists from prominent universities and research institutions. DWR is an active member of the CAT team.

Sustainability of natural resources may be the defining issue of 21st Century. It is the policy of DWR to become a sustainability leader and ecosystem steward within State government and the California water community by promoting, advocating, and facilitating sustainability practices throughout its business operations and the SWP. DWR is developing guidelines for implementing its new Sustainability Policy, informed by industry best practices. DWR will formalize the guidelines by April 2010.

The California State Water Project

The SWP is the largest State-owned, multipurpose water project in the country and its operations are critical to the resources and economy of California. The SWP's system spans nearly the entire State, from Lake Oroville in Northern California to Pyramid, Castaic, Silverwood and Perris reservoirs in Southern California. The SWP delivers an average of 3.3 million acre-feet (AF) of water per year to 29 public agency water contractors throughout California. These deliveries serve the water needs for over 24 million Californians and irrigate 750,000 acres of farmland.

The SWP is the third largest generator of clean hydropower in California. Its water conveyance system includes 33 water storage facilities, 700 miles of canals and pipe lines, 20 pumping plants, 4 pumping-generating plants and 5 hydroelectric power plants.

[9] http://www.waterplan.water.ca.gov/docs/enews/2009/cwp_e-news120209.pdf

As a consequence of hydrologic drought conditions and related environmental and regulatory conditions, 2009 water deliveries to the SWP contractors were restricted. In October 2008, DWR's initial allocation for water delivery requests to the SWP contractors for 2009 was 16 percent, the second lowest in the SWP's history. As the water year developed, the allocations were gradually increased. On May 20, 2009, the final water allocation was at 40 percent of SWP contractors' requests. On December 1, 2009, DWR announced the initial 2010 water allocation of 5 percent of total contracted water deliveries to SWP contractors. Five percent is the lowest initial allocation percentage since the SWP began delivering water in 1967.[2]

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The SWP also acquires energy from an off-aqueduct hydroelectric power plant, and imports thermal energy from Nevada. The SWP's generation sources exceed 1,900 MW capacity. On average, the SWP generates five billion kilowatt-hours (kWh) of clean hydroelectric energy each year. The SWP's hydroelectric pumping facilities represent approximately 2,600 MW of capacity.

The State Water Project Energy Portfolio Recent Statistics – 2007 and 2008

Bulletin 132, *Management of the California State Water Project*, is a series of annual reports that describe the status of SWP operations and water deliveries. Each annual report updates information regarding project costs and financing, water supply planning, power operations, significant events that affect the management of the SWP, hydrologic information for the water year, fiscal year capital construction information, and water delivery, operations, maintenance, and other activities.

Bulletins 132-08 and 132-09, which reflect SWP operations in calendar years 2007 and 2008 respectively, will be published in 2010 and 2011. Data reported in this series of legislative reports represents data collected, analyzed, and reviewed prior to the final approval and publication. In summary, total SWP generation resources (including the SWP owned hydroelectric generation and resources from its long-, medium-, and short-term bilateral contracts) equaled 12,000 gigawatt hours (GWH) in 2007, and 8,000 GWH in 2008. The SWP's total generation resources for the first three quarters in 2009 equaled 6,500 GWH. This marked decrease in generation resources reflects the profound impact of regulatory, environmental, and hydrologic conditions, which result in reduced water deliveries and hydroelectric energy resources for the SWP.

Phasing Out Reid Gardner Plant – Acquiring Less Carbon-Intensive Energy

The electric power needed to operate the SWP comes from its own and jointly developed hydroelectric facilities, long- and short-term purchase agreements, and a 30 year agreement with Nevada Power Company. Since July 25, 1983, DWR has received up to 235 MW from one of four units at the Reid Gardner coal-fired generation facility located in Moapa, Nevada. In May 2007, DWR formally notified the plant's owner that DWR will not renew this agreement, which expires on July 25, 2013. DWR plans on replacing this fossil fuel based energy with a combination of cleaner, more efficient resources, improvements to the SWP system, and renewable energy resources. For January 2007 through September 2009, CO_2 emissions for Reid Gardner Unit No. 4 imported energy are shown in Figure 1.[10]

[10] The drop in emissions for April 2007 and May 2008, are due to the unit taken out of service to perform maintenance and improvements.

The SWP also acquires energy from an off-aqueduct hydroelectric power plant, and imports thermal energy from Nevada. The SWP's generation sources exceed 1,900 MW capacity. On average, the SWP generates five billion kilowatt-hours (kWh) of clean hydroelectric energy each year. The SWP's hydroelectric pumping facilities represent approximately 2,800 MW of capacity.

The State Water Project Energy Portfolio Recent Statistics – 2007 and 2008

Bulletin 132, Management of the California State Water Project, is a series of annual reports that describe the status of SWP operations and water deliveries. Each annual report updates information regarding project costs and financing, water supply planning, power operations, significant events that affect the management of the SWP, hydrologic information for the water year, fiscal year capital construction information, and water delivery, operations, maintenance, and other activities.

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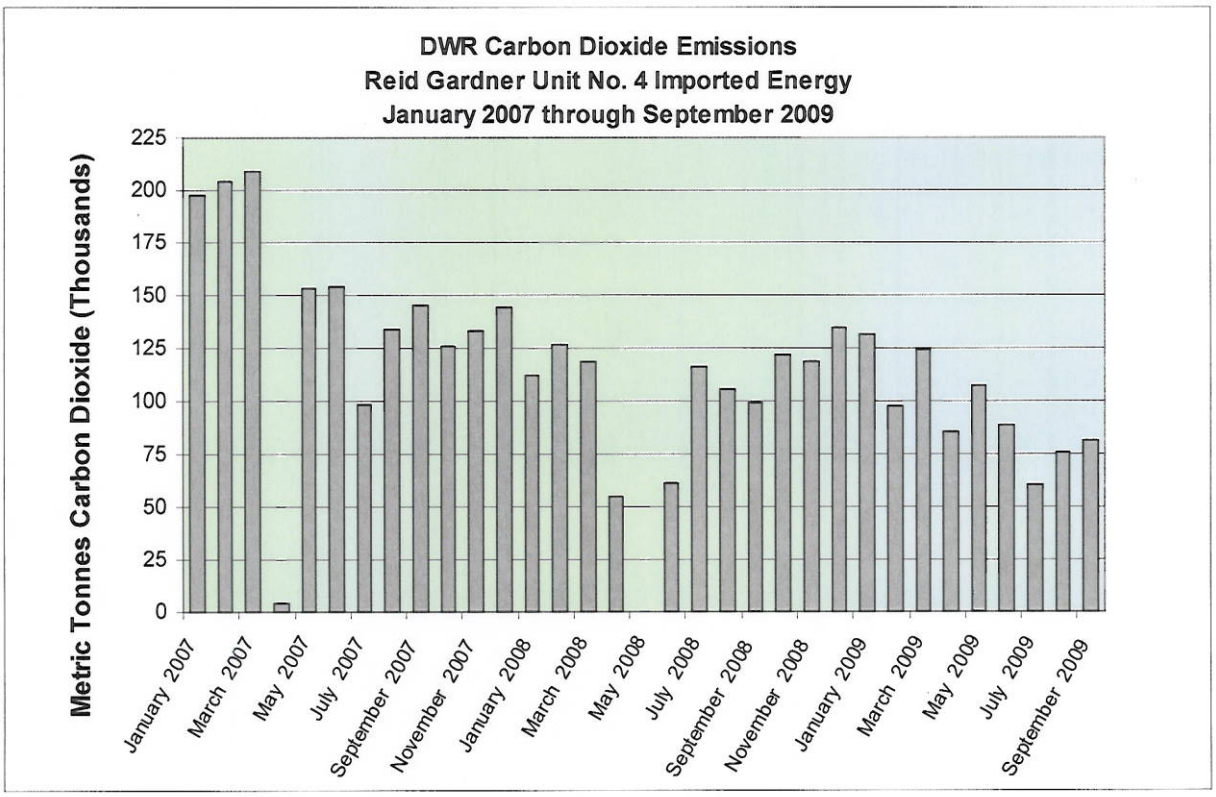
Figure 1. CO_2 Emissions from SWP Energy Received from Reid Gardner Unit No. 4 in 2007 through September 2009



CO_2 emissions for the 2007, 2008, and the first three quarters of 2009 for the SWP portfolio are also summarized in Table 2. Consistent with the CCAR protocols, hydroelectric, nuclear, and renewable energy resources are assigned zero carbon emissions factors. Reid Gardner Unit No. 4 CO_2 emissions data was retrieved from the U.S. Department of Energy (DOE) Environmental Protection Agency's (EPA) *Clean Air Markets Database* (CAMD).[11] Emissions for the SWP's purchases and exchanges from unspecified sources are estimated using CCAR 2007 emissions rates reported by its members,[12] direct reporting by counterparties to DWR on their specific emissions rates, and CCAR recommended regional default factors derived from the U.S. DOE EPA[13] *Emissions & Generation Resource Integrated Database* (eGRID).

The SWP Power Purchase Portfolio MWh and metric tonnes of carbon dioxide represents gross emissions levels. However, when SWP power purchases exceed the energy required to serve the SWP's pumpload, DWR sells its surplus energy. SWP sales transactions are not tied to specific generation resources, other than under its

[11] <http://camddataandmaps.epa.gov/gdm/>

[12] <http://www.climateregistry.org/CARROT/public/reports.aspx>

[13] Emissions & Generation Resource Integrated Database (eGRID) provides information on the air quality attributes of almost all the electric power generated in the United States. eGRID2006 Version 2.1, April 2007 (year 2004 data), <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>

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Demand Response program where specified pumpload is interrupted. The SWP emissions rate is calculated using the SWP's total estimated metric tonnes CO_2 divided by MWh from all SWP generation sources. This derived rate yields a net emissions level as shown below.

In 2008, the SWP's gross CO_2 emissions decreased by 19 percent from 2007 emissions, consistent with diminished water deliveries, drought conditions, and regulatory constraints. When sales and exchanges out are taken into consideration, the 2008 reduction in emissions equals 25 percent.

Table 2. SWP Energy Portfolio CO_2 Emissions for 2007, 2008, and First Three Quarters of 2009

State Water Project CO_2 Emissions (million metric tonnes Carbon Dioxide)			
Source	**2007 Emissions (Annual)**	**2008 Emissions (Annual)**	**2009 Emissions (Through September)**
Reid Gardner Unit No. 4	1.4	1.2	0.8
Market Purchases & Exchanges In	1.8	1.4	0.8
Gross Emissions	**3.2**	**2.6**	**1.6**
Market Sales & Exchanges Out	0.7	0.6	0.3
Net Emissions	**2.5**	**2.0**	**1.3**

Efficient Energy Technology - Non-Renewable Resources Generation

CO_2 emissions from electric power generation are influenced by the efficiency factors associated with converting fossil fuels into electricity, as well as the type of fuel used. Emissions factors associated with coal-fired generation are almost twice that of natural gas powered generation. In a typical power plant, only 30 percent of the energy is actually converted into electricity. Improvements in generation efficiency by replacing traditional power generators with more efficient technologies can result in lower CO_2 emissions. Consequently, DWR is investigating ownership interest and contractual agreements in technologies such as combined-cycle generation. Energy from combined-cycle gas turbines is rated for emissions that average 800 pounds CO_2 per MWh. The first phase of investigations is complete. Final studies include obtaining a plant license from the California Energy Commission for a new state-of-the-art combined-cycle gas plant.

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State Water Project System Enhancements - New Small Hydroelectric Generation Capacity

Generation from a small hydroelectric facility that commences commercial operations or is repowered on or after January 1, 2006 is eligible for the California Renewable Portfolio Standard (RPS), if the facility meets all of the following criteria:[14]

- The facility is 30 MW or less, with an exception for eligible efficiency improvements made after January 1, 2008, as discussed below.
- The facility is located in-State or satisfies the out-of-state requirements.
- The facility does not "cause an adverse impact on instream beneficial uses or cause a change in the volume or timing of streamflow."[15]

DWR entered into Phase II of its East Branch Enlargement Project, including conducting further engineering investigations into the viability of adding a new small hydroelectric generator at the SWP Alamo Power Plant. The new unit would add 14 MW capacity of small hydrogeneration, which qualifies under California's RPS, and will further reduce the SWP's carbon footprint. Through 2011, DWR will continue its environmental and right-of-way acquisition efforts for this project, as well as develop and refine the unit's design and performance specifications. Final design is expected to be completed in September 2015.

Energy Efficiency Improvements

In 2006, DWR completed the construction of a new reservoir known as the Tehachapi East Afterbay. The Afterbay provides water storage for the SWP's "Valley String" (Dos Amigos, Buena Vista, Teerink, Chrisman, and Edmonston pumping plants). The facility consists of a 910 AF reservoir, inlet channel, outlet channel, bypass, and appurtenant structures.

The new reservoir enables DWR to reduce pumping operations of the Valley String plants during peak energy demand periods, and to provide reliability services to the California electrical grid. The Afterbay provides additional storage capacity by allowing a seasonal reduction in on-peak load, which simultaneously reduces market reliance on poorer quality thermal units that emit higher amounts of GHGs during peak energy demand periods.

DWR is continuing feasibility studies for using renewable technologies such as small hydroelectric, wind energy, and solar projects within its system.

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[14] <http://www.energy.ca.gov/2007publications/CEC-300-2007-006/CEC-300-2007-006-ED3-CMF.pdf>

[15] Public Utilities Code Section 399.12(c)(1)(A).

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Reducing Fossil Fuel Use and Increasing Energy Efficiency in SWP Operations

The SWP's hydroelectric power generation allows for reduced reliance on thermal generation. Consistent with the spirit of AB 32 and DWR's mission to enhance California's natural and human environments, DWR conducts multi-faceted engineering studies and programs to improve water-to-energy conversion of all SWP equipment and facilities. DWR's improvement programs include pump and turbine replacements and refurbishments, to ensure that the SWP's hydroelectric units perform at the highest levels of energy efficiency. Major energy efficiency projects have been undertaken at the A.D. Edmonston Pumping and the Edward Hyatt Power plants, resulting in state-of-the-art performance levels exceeding 90 percent efficiency.

For the January 2010 legislative report, DWR updated its calculations for the CO_2 emissions reductions associated with the SWP Energy Efficiency programs at Hyatt and Edmonston from 2003 through 2020 by using the average of its annual CCAR emissions rates calculated from January 2007 through September 2009.[16]

Table 3. SWP Energy Efficiency Savings and Resulting CO_2 Emissions Reductions Years 2003 – 2020

Energy Efficiency Program	Cumulative Energy Savings (megawatt hours)		Cumulative Emissions Reductions (metric tonnes CO_2)		Equivalent Emissions Savings[17]
Years	**Hyatt Generation**	**Edmonston Pumping**	**Hyatt Generation**	**Edmonston Pumping**	**Automobile Equivalents**
2003-2007	306,949	5,951	90,590	1,756	16,852
2008-2020	1,721,443	763,000	508,053	225,186	133,803
Total by Plant	**2,028,392**	**768,951**	**598,643**	**226,942**	**150,654**
CUMULATIVE TOTAL	**2,797 million megawatt hours**		**0.83 million metric tonnes CO_2**		**150,654 autos**

Under Phase II of the East Branch Enlargement program, DWR is studying the feasibility of adding two new pumps at the Pearblossom Pumping Plant. Each new pump would provide 22 MW additional pumping capacity.

The new unit installations are expected to increase energy efficiency by approximately 0.5 percent per pump, and reduce DWR's carbon footprint, since this installation results in less energy required to pump water. The new units will be installed by the close of 2017.

[16] DWR's 2007 CCAR emissions calculations were also updated to reflect the emissions rates for counterparties whose emissions rates for 2007 were not available at the time DWR submitted its 2007 report to the CCAR.

[17] 5.48 metric tonnes CO_2e for an average passenger vehicle (http://www.epa.gov/OMS/climate/420f05004.htm)

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Under Phase II of the East Branch Enlargement program, DWR is studying the feasibility of adding two new pumps at the Peachblossom Pumping Plant. Each new pump would provide 22 MW additional pumping capacity.

The new unit installations are expected to increase energy efficiency by approximately 0.5 percent per pump, and reduce DWR's carbon footprint, since this installation results in less energy required to pump water. The new units will be installed by the close of 2017.

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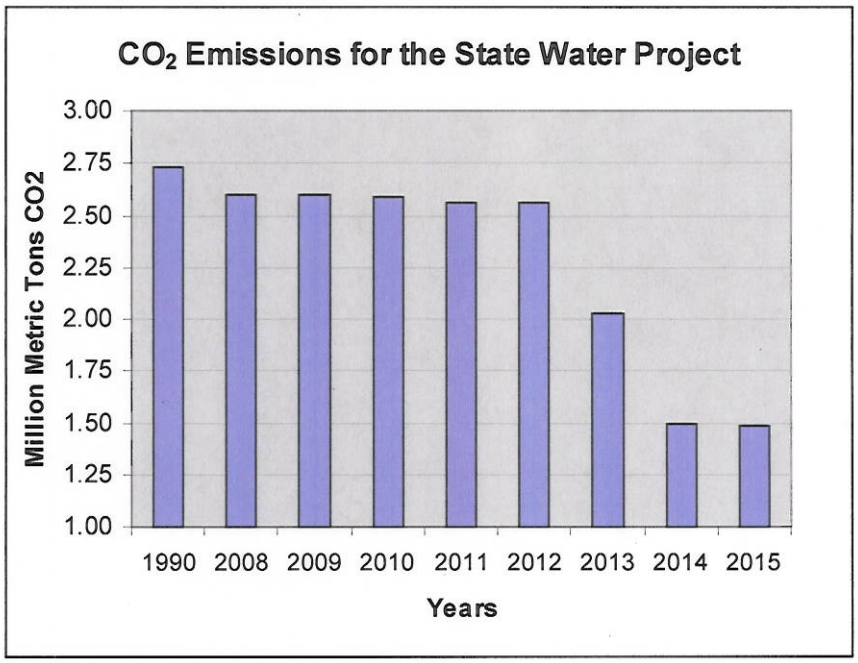
Forecast of SWP Emission Reductions

DWR forecasts a reduction in SWP CO_2 emissions by: (1) replacing its coal based energy with resources that generate lower emissions, (2) increasing its hydrogeneration through energy efficiency projects, and (3) increasing the level of renewable energy resources in its portfolio. As a result of the energy efficiency programs and future power purchases enumerated in the paragraphs above, DWR expects to reduce emission levels associated with 2008 SWP operations by over one MMT of CO_2 by 2015. This forecast reduction is calculated using parameters associated with the most recent power purchases and sales transactions to a 10-year average hydroelectric generation and pumpload, to account for fluctuating hydrologic conditions from year to year. Forecast CO_2 reductions through the year 2015 are illustrated in Figure 2.

Figure 2. SWP Incremental Forecast CO_2 Emissions Reductions



Reducing Fossil Fuel Use and Increasing Energy Efficiency in SWP Facilities

The U.S. Green Building Council (USGBC) is a 501(c)(3) nonprofit community of leaders that have developed a recognized standard for green building and development. USGBC's LEED Green Building Rating System promotes reliable building design and performance measurement systems.[18] LEED certification provides independent, third-party verification that a building project meets the highest green building and performance measures.

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LEED provides a complete framework for meeting sustainability goals and assessing building performance in six categories: Sustainable Sites; Water Efficiency; Energy and Atmosphere; Materials and Resources; Indoor Environmental Quality; and Innovation and Design Process. LEED certification assigns progressive levels (Certified, Silver, Gold and Platinum) that can be achieved based on the number of points awarded to a building project.

DWR plans to design and construct its New Science Center (a total of 105,527 square feet for the Center's three buildings) located in Solano County, and the Pearblossom Administration Building (a single building measuring 15,000 square feet), located in Los Angeles County at the SWP Southern Field Division Area Control Center, to meet the requirements for LEED's Silver certification program. As a result, these new facilities will:

- Lower operating costs
- Reduce waste sent to landfills
- Conserve energy and water
- Reduce GHG emissions
- Demonstrate DWR's commitment to environmental stewardship and social responsibility

DWR is currently engaged in the design review phase for these projects. Final designs are expected to be completed in 2009.

Reducing Energy Use and Water Consumption – DWR's Water Use Efficiency Programs

The Governor has identified conservation as one of the key ways to provide water for Californians, and protect and improve the Delta ecosystem. He has directed State agencies to develop and implement a more aggressive plan to help achieve a 20 percent reduction in per capita water use statewide by 2020. This directive builds upon the *California Water Plan Update 2005*, which identified water use efficiency as a "foundational action" for California water management.

To implement this goal, DWR is collaborating with the California Energy Commission, the California Public Utilities Commission, the State Water Resources Control Board, and the Department of Public Health to develop and implement various measures and strategies to increase water use efficiency and thereby reduce GHG emissions related to water use. To support this implementation, this conservation initiative will need to utilize the many Integrated Regional Water Management (IRWM) planning efforts throughout California. Since 2008, the five-agency group has been developing information that will form the basis of recommendations to the Governor in 2009 and will be incorporated into the 2009 California Water Plan Update.

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The Governor's conservation goal has been placed into statute with the enactment of Senate Bill 7 of the Seventh Extraordinary Session of 2009 (SBX7 7), part of the 2009 comprehensive water package. SBX7 7 creates a framework for future planning and actions by urban and agricultural water suppliers to reduce California's water use. The new law requires the development of agricultural water management plans and requires urban agencies to reduce statewide per capita water consumption. The new law gives DWR many new responsibilities including development of conservation targets, development of standardized technical methods, convening of advisory groups, and development of standardized water information reporting systems.

DWR will offer technical assistance to agricultural water suppliers as they prepare water management plans pursuant to SBX7 7. DWR is also working to improve agricultural water management and planning tools such as the California Irrigation Management Information System (CIMIS). DWR expects to develop additional agricultural water conservation programs consistent with the new law.

The primary benefit of improving water use efficiency is to increase supply reliability by lowering demand and cost-effectively stretching existing water supplies. Another important benefit of improving water use efficiency is based on the relationship between GHG emissions and the use of fossil fuels. This relationship is key to the reduction of GHG emissions through water use efficiency because approximately 19 percent of all electricity and 30 percent of natural gas (non-power plant) are used to convey, treat, distribute, and use water.

Reducing Fossil Fuel Use in the CERS Contracts – Replacement with Less Polluting Energy Resources

In response to California's 2000-2001 energy crisis, the Governor and the Legislature directed DWR to purchase electricity for California's investor-owned utilities (IOUs) and to assemble a portfolio of long-term power contracts to provide reliable electric service at the lowest-possible price. DWR created the California Energy Resources Scheduling (CERS) Division which entered into power contracts to provide more than 20 percent of the electricity used by IOUs' customers. These power contracts provided the guaranteed revenue that allowed for the financing and construction of over 5,000 MW of state-of-the-art natural gas-fired power plants. These cleaner, more fuel efficient natural gas-fired power plants have significantly reduced reliance on older, less-efficient plants in the State.

DWR originally entered into contracts with 28 counterparties to provide 56 energy products. Six of the agreements were for renewable power, and included two contracts totaling 31 MW for biomass power, one 25 MW contract for geothermal power, and three contracts for a total of 172 MW of wind power.

The contracts also provided a guaranteed source of revenue that allowed DWR's counterparties to secure financing for the construction of over 5,000 MW of new energy-efficient gas-fired power plants that were built between 2001 and 2003. These new

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The contracts also provided a guaranteed source of revenue that allowed DWR's counterparties to secure financing for the construction of over 5,000 MW of new energy-efficient gas-fired power plants that were built between 2001 and 2003. These new

generation plants displaced power from older, dirtier, less efficient fossil generation in the State and have contributed to a reduction in carbon emissions of approximately 1.51 million metric tonnes annually.

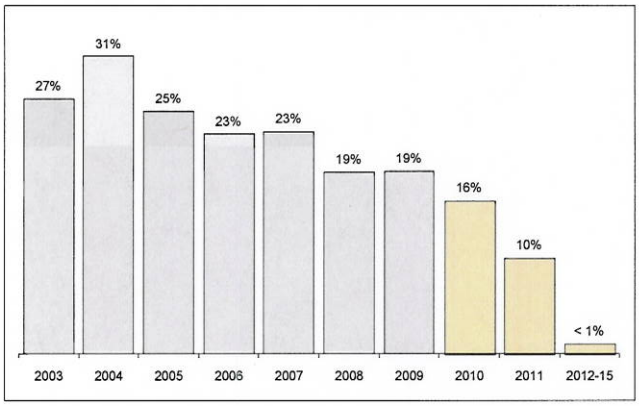
The Legislature required DWR to consider a number of factors when entering into contracts for power, including the intent to achieve an overall portfolio of energy contracts offering reliable service at the lowest possible price and to secure as much power under contract as possible from renewable energy resources.

As opportunities for contract amendments arise, DWR considers options that could both increase the amount of energy from renewable resources in its portfolio and provide reliable, reasonably-priced electricity.

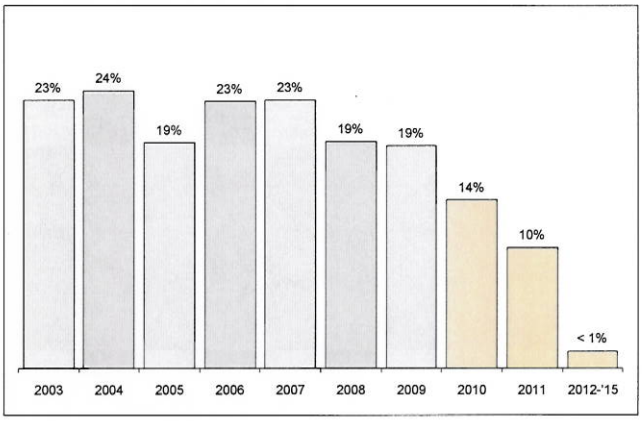
Eight years after the energy crisis, DWR continues to provide electricity that will meet nearly 16 percent of the IOU customers' electricity demands in 2010. Twenty-five contracts remain in effect with an estimated cost of $4.9 billion. By 2012, only four contracts will remain providing less than 1 percent of the IOU's customers' demand. The last contract expires in 2015, as illustrated in Figure 3.

Figure 3. CERS Contracts as a Percent of IOU Peak Capacity & Annual Energy Demand

Peak Demand



Annual Energy



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The Generation Mix of the CERS Portfolio

For 2010, the estimated mix of generation from the CERS portfolio is:

Table 4. CERS Generation Energy Portfolio in 2010

Source	Contract Capacity (MW)	Energy (GWh)
Wind	172	462
Natural Gas	4,799	13,451
Non-Specific	2,713	21,146
TOTAL	7,614	35,059

While most of the energy in the DWR portfolio comes from newly constructed, fuel efficient, natural gas-fired plants, some of the DWR contracts are with power marketers who do not own any generation, or with counterparties that have the option to provide power from market sources when it is cheaper to do so. Roughly, 60 percent of the energy CERS contracts are forecasted to provide in 2010 will come from non-specific market sources, which cannot be traced back to a specific generator. The source of the power could be hydro, nuclear, biomass, wind, solar, natural gas, or coal or some mix of these resources. Electricity from CERS contracts with renewable energy resources will provide 1 percent of the CERS total, while electricity generated from natural gas facilities is estimated to provide 39 percent.

Between now and when the CERS contracts end in 2015, DWR will have limited opportunity to re-negotiate the contracts to increase the amount of electricity derived from renewable energy resources.

Role in Statewide Energy Supply

DWR's authority to enter into new contracts ended in 2002. Its temporary role in providing power limits its ability to renegotiate contracts to bring **new** renewable energy projects on-line. Developers of new renewable energy projects need long-term contracts in order to get financing for the projects.

For DWR to replace fossil generation in the portfolio of contracts with renewable energy, and still limit its involvement in energy markets to no longer than 2015, would require DWR to compete against the California IOUs for power from existing renewable energy projects. This would only exacerbate the problem the IOUs are currently facing in meeting the State's renewable portfolio standard goal.

Due to the unique circumstances of the CERS contracts and limitations on contract term-renegotiation, it is unlikely that fossil fuel use in the portfolio of CERS will be appreciably reduced.

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