

**CALMAC Study ID CPU0035.01  
Volume 2 of 15  
Appendix A**

**Embedded Energy in Water Studies  
Study 1: Statewide and Regional Water-Energy Relationship**

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California Public Utilities Commission  
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**Managed by  
California Institute for Energy and Environment**

**August 31, 2010**

# Appendix A Glossary

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## **Aquifer**

In hydrology, a rock layer that contains water and releases it in appreciable amounts. The rock contains water-filled pore spaces, and, when the spaces are connected, the water is able to flow through the matrix of the rock. An aquifer also may be called a water-bearing stratum, lens, or zone.

**ArcGIS** – ArcGIS is a suite consisting of a group of GIS software products produced by Environmental Systems Research Institute.

## **Bay-Delta Program**

The CALFED Bay-Delta Program is overseen by the California Bay-Delta Authority for the 25 state and federal agencies working cooperatively to improve the quality and reliability of the state's water supplies while restoring the Bay-Delta ecosystem.

## **Bulletin 132**

Beginning in 1963, Bulletin 132 is a series of annual reports, produced by the CDWR, which describe the status of the State Water Project operations and water deliveries. Each annual report updates information regarding project costs and financing, water supply planning, power operations, and significant events that affect the management of the State Water Project. Each annual report presents hydrologic information for the water year, capital construction information for the fiscal year, and water delivery, operations, maintenance, and other activities for the calendar year.

## **Bulletin 160**

Published by the CDWR every five years as required by the California Water Code. The Bulletin 160 series evaluates water supplies and assesses agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses (water balances). The last update to Bulletin 160 was published in 2009.

## **California Aqueduct**

The 444-mile long main aqueduct of the State Water Project, from the northern Delta to Antelope Valley where it divides into two branches, the East Branch and the West Branch.

## **Carryover Entitlement**

In some years and with CDWR's approval, SWP contractors may delay delivery of entitlement water to the next year.

## **Central Valley Project**

Operated by the USBR, the CVP is one of the world's largest water storage and transport systems. It has 22 reservoirs with a combined storage of 11 MAF, and delivers about 7 MAF in an average year. The CVP has multiple energy generating facilities and is a net energy producer.

The Delta-Mendota Canal and the San Luis Canal are the major energy consuming components of the CVP system.

### **Colorado River Aqueduct**

The CRA was constructed by MWD and can deliver up to 1 billion gallons of Colorado River water per day to metropolitan areas in Southern California. MWD owns and operates the CRA and is responsible for system operations and maintenance.

### **Depth-to-Groundwater**

Depth from the ground surface or top of casing to the water table below ground.

### **Drought**

Hydrologic conditions during a defined period, greater than one dry year, when precipitation and runoff are much less than average.

### **Dry Year Reserves**

The average annual supply of a water development system during a defined drought period.

### **End-use**

The terminal application or use of the water.

### **Energy Embedded in Water**

Accounts for the total energy required to deliver water to a given hydrologic region regardless of where that energy water consumed (i.e., indirect upstream energy).

### **Energy Intensity**

“Energy Intensity is defined as the amount of energy consumed per unit of water to perform water management-related actions such as desalting, pumping, pressurizing, groundwater extraction, conveyance, and treatment - for example, the number of kilowatt-hours consumed per million gallon (kWh/MG) of water. This concept is applied to water supplies, to components of the water use cycle, and to the total energy intensity of a unit of water throughout the entire water use cycle.” [Source: “California’s Water-Energy Relationship,” November 2005 [CEC-700-2005-011-SF], p. 4]

### **Hydrology**

A science related to the occurrence and distribution of natural water on the earth including the annual volume and the monthly timing of runoff.

### **Instream Minimum Flows**

Flows that are required to keep streams and those bodies of water downstream at minimum levels. This amount of water cannot be used by others and must be allowed to continue flowing down the stream. Since no others can use it, instream flows are treated as a form of water demand. Instream flows are managed by releases or diversions of water. Environmental water flows, specified by regulation. DWR uses a fairly constant number for environmental flows through its 30 year water planning horizon.

**Large Inter-Regional and Wholesale Water Systems**

While most wholesalers move water in similar ways, pumping water in canals and aqueducts, the distinguishing characteristics of each cause a wide range of energy use and energy intensity.

**Managed Wetlands**

Environmental water flows, specified by regulation. DWR uses a fairly constant number for environmental flows through its 30 year water planning horizon.

**Marginal Supply**

The next water supply source that an agency will resort to if additional water is needed.

**Net Energy Intensity**

The total energy requirement less the in-conduit hydropower generated as a by-product of water delivery operations.

**Regional Water Balances**

An analysis of the total developed/dedicated supplies, uses, and operational characteristics for a region.

**Required Delta Flows**

Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water.

**Sacramento Valley Hydrologic Index**

Used by CDWR to determine water year type based on measured unimpaired runoff at selected rivers.

**State Water Project**

A water storage and delivery system of reservoirs, aqueducts, powerplants, and pumping plants. Its main purpose is to store water and distribute it to 29 urban and agricultural contractors in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. The SWP includes 34 storage facilities, reservoirs, and lakes, 20 pumping plants, 4 pumping-generating plants, 5 hydroelectric power plants, and about 701 miles of open canals and pipelines.

**State Water Contractors**

Long-term contracts were signed between CDWR and public water agencies in the 1960s. There are 29 long-term State Water Project contractors who receive annual allocations, which are specified annual amounts of water, as agreed to in their contracts. Contractors repay principal and interest of the general obligation bonds that initially funded the SWP's construction and the revenue bonds that paid for additional facilities. They also pay all costs associated with maintaining and operating SWP's facilities. Contracts are due to expire in 2035.

**Study Plan**

The study plan is a part of the Work Plan, prepared by the Study Team, for each study. The study plan details each task required to meet the goals and objectives of each study.

**Study Team**

The team of GEI Consultants, Inc. and Navigant Consulting, Inc

**Technical Working Group**

A group of staff and consultants from CIEE and the CPUC formed to provide guidance in the conduct of the water-energy studies.

**Turn Over**

Each facility's operations are guided by a unique set of operating protocols. Many reservoirs are not large enough to capture all of the available precipitation and runoff within its watershed and may "turn over" several times in any water year. This means that a reservoir may capture and transport more water in any water year than its actual capacity.

**Uncontrolled Flows**

Water attributed to natural runoff.

**Wanger Decision**

On May 25, 2007, Judge Oliver W. Wanger, United States District Judge issued a decision that restricts withdrawals from the Delta for the protection of the Delta smelt.

**Water Banking**

Refers to the ability to store water supplies, or "bank" them, with another water agency that promises to return the banked water or suitable replacement water supplies when needed, or "called," by the owner of the water supplies.

**Water Demand Profile**

A water demand vs. time display for a particular region, agency, or end-user.

**Water Supply**

A "water supply" is defined as water that is ready to be conveyed to a beneficial end use, can be cost-effectively treated to the quality needed to serve its intended end use(s) within existing technologies, and can be cost-effectively delivered and used.

**Water-Use Cycle**

The California Water System is comprised of a network of components that collect or create water supply, treat and convey water to and from California's end users, and treat and dispose of or recycle wastewater from end uses. The major components of the water-use cycle in the state of California are: supply, conveyance, treatment, distribution, wastewater treatment, and recycling.

**Water Year**

A continuous 12-month period for which hydrologic records are compiled and summarized. Different agencies may use different calendar periods for their water years.

**Wild and Scenic Rivers**

Environmental flows in uncontrolled rivers and streams that are dedicated as “Wild” or “Scenic.” No water may be removed from these streams, thus treated as demand. These rivers may feed controlled reservoirs further downriver and may eventually turn into supply. Environmental water flows, specified by regulation. DWR uses a fairly constant number for environmental flows through its 30 year water planning horizon.