# 2. Water Resource and Power Generating Risk

- **The Public Utilities Commission's primary responsibility is to provide water of high quality and sufficient quantity to its customers. However, 80 percent of the Hetch Hetchy Enterprise's revenues come from the generation of hydroelectric power, equal to $106 million in FY 2003-2004. Because the Public Utilities Commission has not established an effective risk management program that provides the tools necessary to balance water storage and supply requirements against hydroelectricity generating obligations to its customers, the Hetch Hetchy Enterprise risks serious financial consequences, particularly in years when inflows to the Hetch Hetchy reservoir system are at median or below median levels.**

- **For example, the Hetch Hetchy Enterprise did not generate sufficient electricity to meet its obligations to customers over the past three years, when there were below median water flows. As a result, the Department was required to spend nearly $50 million on purchased power in order to meet base electricity obligations to its customers. In 2003 alone, the Hetch Hetchy Enterprise purchased an estimated $12.7 million in power to supplement the hydroelectric power that it generated to meet its base obligations to customers and to allow certain capital improvements.**

- **By establishing a comprehensive risk management program, the Public Utilities Commission would be better able to plan for hydroelectric power needs during low water years and during the construction of capital projects, thereby reducing its dependence on purchased power. At a minimum, such plan should (i) define the risk criteria that are inherent when making decisions to release water and generate hydroelectricity, (ii) determine risk thresholds that the Public Utilities Commission is willing to tolerate when releasing water to generate hydroelectricity, and (iii) provide policy direction and procedures to ensure that decisions to release water and generate hydroelectricity are within the Public Utilities Commission's risk parameters.**

## Managing Risk in a Water First Environment

The Hetch Hetchy Enterprise manages water storage and supply for the Hetch Hetchy reservoir system, and generates hydroelectric power from the flow of water from the reservoirs downstream. The Hetch Hetchy Enterprise functions within the City's water first policy, which was formally established in the City's Charter in 2002, upon San Francisco voters' approval of Proposition E, and after the State Legislature's adoption of Assembly Bill 1823, specifying that the City shall assign higher priority to the delivery of water to the Bay Area than to the generation of electric power.

Since the 1913 Raker Act, the primary responsibility of the Hetch Hetchy Enterprise has been delivery of water to San Francisco residents and suburban customers. Generating hydroelectric power for San Francisco municipal customers, including the Port and Airport tenants, for the Modesto and Turlock Irrigation Districts, and for Norris Industries, a Federal munitions factory in Riverbank, California, is a byproduct of water supply and downstream flow.

The 1998 deregulation of the California electricity market created a new operating environment for the Hetch Hetchy Enterprise. The Hetch Hetchy Enterprise has had to reconsider or renegotiate its agreements with the Pacific Gas and Electric Company and the Modesto and Turlock Irrigation Districts, resulting from the 1998 deregulation, as discussed in the Introduction to this management audit report.

In 2001, the Hetch Hetchy Enterprise entered into a long-term power purchase agreement with Calpine Corporation, which provided scheduled future electricity deliveries over a five-year period from July 1, 2001 through June 30, 2006. Under the long-term power purchase agreement, the Hetch Hetchy Enterprise was obligated to purchase a minimum amount of electricity from the Calpine Corporation even if the electricity were not required for operations. The Hetch Hetchy Enterprise could resell the surplus electricity purchased from the Calpine Corporation on the market. Shortly after the Public Utilities Commission entered into the five-year power purchase agreement, the market price of electricity fell significantly below the amount specified in the agreement. As discussed in the Introduction to this management audit report, the Public Utilities Commission renegotiated the long-term power purchase agreement with the Calpine Corporation, although the Hetch Hetchy Enterprise is still obligated to purchase power under the agreement at above market rates. As discussed in the Introduction, the expected loss to the Hetch Hetchy Enterprise, as measured by the difference between the price of power purchased under the Calpine agreement and the market price of electricity, from March of 2003, when the long-term power purchase agreement was re-negotiated, through June of 2006, when the long-term power purchase agreement expires, is approximately $26.1 million.

## The Public Utilities Commission's Efforts to Establish a Risk Management Committee

In response to the new challenges facing the Hetch Hetchy Enterprise in the deregulated electricity market and the experience of the long-term power purchase agreement with Calpine Corporation, the Public Utilities Commission established a risk management process to assess risks to the Hetch Hetchy Enterprise and to recommend policies to the Public Utilities Commission's executive level managers.

The Public Utilities Commission's Risk Management Committee began meeting in January of 2002 to discuss the risks associated with generating hydroelectric power and purchasing energy to meet firm power obligations for the City's municipal load, long-term power sales agreements with Modesto and Turlock Irrigation Districts, and retail customers, including the Airport tenants and Norris Industries. The Risk Management Committee consisted of representatives from the Public Utilities Commission

Administration's Financial Services Division and from the Hetch Hetchy Enterprise's Water and Power Operations and Power Policy Divisions. According to the January 30, 2002 agenda, the initial tasks for the Risk Management Committee included:

(a) Developing initial risk management policies and guidelines.

(b) Selecting a contractor to serve as a risk management consultant.

(c) Discussion of legal issues regarding the Turlock Irrigation District and Modesto Irrigation District agreements, and re-negotiation of the Public Utilities Commission's long-term contract with Calpine to purchase electricity.

(d) Discussion of the Public Utilities Commission's energy projects.

According to staff members participating in the Risk Management Committee, the role of the committee was to look at the Hetch Hetchy Enterprise's energy practices, including looking at San Francisco municipal customers' and Modesto and Turlock Irrigation Districts' electricity requirements, the supply of water to retail and wholesale customers, and capital expenditures for the Hetch Hetchy Enterprise, including alternative power proposals presented by the Power Policy Division.

The Risk Management Committee was intended to review, discuss, and evaluate hydroelectric and alternative power proposals, and adopted "Interim Risk Management Guidelines and Policies" in 2002. Under these guidelines, the Risk Management Committee was responsible for reviewing all major power purchases and sales, and hydroelectric and alternative power capital projects with a value greater than $250,000. The Risk Management Committee was intended to set criteria for reviewing and evaluating these purchases, sales, and projects.

Once the Risk Management Committee reviewed proposals for power purchases, sales, and projects, the Risk Oversight Committee, consisting of executive level managers within the Public Utilities Commission, would set policy and recommend proposals to the General Manager and the Public Utilities Commission.

## Foundation of the Risk Management Committee

Prior Consultant Reports on Establishing Risk Management Process

Prior to the establishment of the Risk Management Committee in 2002, the Public Utilities Commission received two prior reports that recommended strengthening the risk management of generating and purchasing electricity.

*FY 1999-2000 Audit Comments*

According to the FY 1999-2000 Hetch Hetchy Enterprise financial audit by the independent financial auditor, KPMG, LLC, the 1998 deregulation of the electric industry created a substantially changed market for electricity. In the audit report, KPMG, LLC stated that the Public Utilities Commission would be increasing electricity trading and scheduling activities in order to generate incremental electricity revenues and reduce the overall costs of electricity. The audit report recommended that the Public Utilities Commission document formal policies, procedures and controls for electricity generation, trading, and scheduling activities. Among other things, the audit recommended that the Public Utilities Commission:

- Ensure that it has programs to manage credit risk.
- Establish operational controls.
- Ensure appropriate risk reporting.
- Establish and measures key performance indicators.
- Ensure that market controls are in place, including periodic third-party validation of the Public Utilities Commission's principal pricing and valuation methodology.

In response to the FY 1999-2000 audit report, the Public Utilities Commission stated that it was undertaking new initiatives, including:

- Forming a Risk Oversight Committee and Risk Management Committee comprised of managers from the Public Utilities Commission, the City Attorney's Office, the Controller's Office, and the Mayor's Office.
- Selecting an outside consultant to serve as a risk management advisor, including conducting risk management assessments.
- Reviewing the Public Utilities Commission's financial service functions to ensure internal controls, segregation of duties, and financial reporting.

*Energy Risk Management Consultant's Assessment*

The Public Utilities Commission selected an outside contractor, D. Randall Abe, to conduct an independent risk assessment. D. Randall Abe submitted his initial assessment and recommendations to the Public Utilities Commission in May of 2001. The consultant's report made several recommendations regarding the Public Utilities Commission's operating philosophy, delegation of authority, and business practices, including recommendations that the Public Utilities Commission should:

- Develop "risk metrics" to quantify and report its overall portfolio risk, including the risk of price volatility in the deregulated electricity market.

- Develop information systems and analytical tools to assist in operations and risk management.

- Develop an independent financial risk management function, separate from operational management, with independent reporting to the executive management team, the Commission, and the Board of Supervisors.

Selection of a Risk Management Consultant

In January of 2002, the Public Utilities Commission adopted a resolution recognizing the need for a Public Utilities Commission-wide risk management framework and directives, and authorizing the issuance of a Request for Proposals to select a risk management consultant to assist in the development of a Public Utilities Commission-wide risk management framework, including an entity-wide financial risk assessment, development of appropriate risk management policies and procedures, and the implementation of a risk management structure. The Public Utilities Commission Financial Services Division did not issue the Request for Proposal for risk management services for the Hetch Hetchy Enterprise until May of 2002. Proposals were due in mid-July and the contract was to be awarded in August of 2002. Because twelve firms responded to the initial Request for Proposal, the Public Utilities Commission Financial Services Division invited four candidates to oral interviews and selected the top candidate, R.W. Beck, on September 13, 2002.

Upon completion of negotiations with R.W. Beck, Financial Services Division staff presented the contract to the Public Utilities Commission for approval in January of 2003, one year after the initial resolution authorizing selection of a risk management consultant. The letter formally awarding the contract to R.W. Beck was mailed in May of 2003.

Delays in Implementing the Risk Management Assessment

The contract with R.W. Beck expected five tasks to be achieved over a one-year period, beginning in May of 2003 and completed in May of 2004. The five tasks were:

- Task 1: Enterprise risk assessment.

- Task 2: Development of risk management policies and procedures.

- Task 3: Development of a risk management strategy,

- Task 4: Specification of risk metrics and quantitative tools.

- Task 5: Implementation support.

The final report for Task 1, the enterprise-wide risk assessment of the Hetch Hetchy Enterprise, was not submitted to the Public Utilities Commission until April of 2004, after an internal management review of the draft report. The Public Utilities Commission approved a contract amendment in April of 2004, combining task orders and extending

the timeline for completing the risk assessment, developing policies and procedures, and implementing a risk management program through April of 2005.

## The Public Utilities Commission's Failure to Fully Implement the Risk Management Program

On January 8, 2002 the Public Utilities Commission adopted their risk management policy statement to "institutionalize risk management as a San Francisco Public Utilities Commission management tool and functional activity …" In this resolution, the Public Utilities Commission specified its overarching risk management goals to include:

- Establishing an institutional business culture that exemplifies best practices in water, sewer and power utilities' risk management.

- Providing a risk management infrastructure replete with appropriate policies, procedures, and systems to facilitate Commission and management decision making, control, and spending.

- Developing and implementing an effective, streamlined ability to enter into appropriate and approved transactions of various terms swiftly and with confidence.

- Implementing practical internal controls with clearly defined segregation of duties, and delegations of authority that are commensurate with accountability and capability.

In a report to the Public Utilities Commission in January of 2002, Financial Services Division staff stated that the initial focus of the risk management program would be:

- Developing and implementing an enterprise-wide risk management framework to establish risk management as a management tool and functional activity.

- Implementing financial and energy risk management protocols for the Hetch Hetchy Enterprise to address the risks inherent in the California electric and gas utility business environment.

- Fully implementing the Owner Controlled Insurance Program to manage the Public Utilities Commission's construction insurance coverage requirements and mitigate ongoing construction and engineering related risk exposures.

In its June 24, 2002 minutes, the Risk Management Committee agreed to delay discussion of risk management issues for the Water and Clean Water Enterprises until completion of the Request for Proposals process to select the risk management consultant. Upon selection of the consultant, the Risk Management Committee would then decide on its scope of review for the Water and Clean Water Enterprises. Responsibility for implementation of the Owner Controlled Insurance Program was allocated to the Infrastructure Division and was not part of the Risk Management Committee process.

The Risk Management Committee defined its basic functions and duties to include review of the Hetch Hetchy Enterprise's water supply and electricity generation capabilities, regulatory developments, and water supply and electricity generation policies. The Risk Management Committee also intended to review all power purchases and sales, and hydroelectric and alternative power projects with values greater than $250,000.

The Risk Oversight Committee was to be made up of executive level managers for Planning, Operations, Power Policy, and Business Services Divisions, and was intended to establish policies to balance water supply and hydroelectric power generation and to evaluate and recommend major power purchases and sales and power projects.

The Public Utilities Commission responded to the independent financial auditor's 2000 recommendations to document formal policies, procedures and controls for hydroelectric power generation, trading, and scheduling activities, stating that the Public Utilities Commission was forming a Risk Management Committee and Risk Oversight Committee to mitigate risk exposures from the deregulation of the electricity industry. Although the Risk Management Committee was intended to evaluate power sales and purchases and proposals for hydroelectric and alternative power projects, and the Risk Oversight Committee was intended to be the executive level body to set policy and recommend contracts and proposals to the Public Utilities Commission, the Risk Oversight Committee met only four times.

The Risk Management Committee continued to meet during 2003 and the first eight months of 2004, but without the commitment and direction from executive level management through the Risk Oversight Committee, the Risk Management Committee ceased to meet in August of 2004.

## Inadequate Management of Inherent Risks in Balancing Water and Power Operations

The May of 2001 risk assessment, conducted by D. Randall Abe, stated that although the Hetch Hetchy Enterprise's historical operating philosophy has been "water first", the policy remained unwritten. In September of 2002 the State Legislature adopted Assembly Bill 1823, which specified that the City shall assign higher priority to the delivery of water to the Bay Area than to the generation of electric power. Further, Assembly Bill 1823 required that the City make its plans of operation of the Hetch Hetchy system available to the public upon request. In November of 2002, the San Francisco voters approved Proposition E and the City added a provision to the Charter that the Public Utilities Commission would "operate hydroelectric generation facilities in a manner that causes no reasonably anticipated adverse impacts on water service and habitat".

Water Supply and Power Generation Decision Making Process

Through the risk management program, the Public Utilities Commission should have developed formal protocols and procedures to determine the balance of water supply and hydroelectric power generation. The risk management program should have (i) defined

the risk inherent in decisions to release water and generate hydroelectricity, (ii) established the level of risk that the Public Utilities Commission was willing to tolerate in releasing water to generate hydroelectricity, and (iii) developed policies and procedures to ensure that decisions to release water and generate hydroelectricity were within the Public Utilities Commission's risk parameters.

Because the Public Utilities Commission failed to fully implement the risk management program, including establishing clear risk management policies and protocols and providing executive level leadership, decisions to release water to generate hydroelectricity have fallen to mid-level staff. Day to day operating decisions to release water to generate hydroelectric power are based on mid-level staff members' tolerance for risk rather than on Public Utilities Commission's defined policies.

*Operating Rules Based on Computer Models*

In 1997, an outside consultant prepared a draft report, which the Public Utilities Commission never made final, entitled *Baseline Water Demands and System Operations; Hetch Hetchy Water and Power Project and Bay Area Water Supply Facilities*. According to this report, the Hetch Hetchy Enterprise is operated to conserve water from the Tuolumne River watershed for municipal consumption. Additional uses of Hetch Hetchy water include generating hydroelectric power, providing flows for fisheries and wild and scenic corridors, and providing flows for recreation.

Operating the Hetch Hetchy Enterprise, including determining the timing and amount of water release from the three reservoirs in Yosemite National Park and the Stanislaus National Forest, downstream through the power plants, is based on a combination of formal and informal rules. The Hetch Hetchy operation needs to meet three obligations: (i) maintain sufficient water supply in the Hetch Hetchy system reservoirs to meet water demand of wholesale and retail customers in the San Francisco Bay Area; (ii) meet Hetch Hetchy's water obligations to the Turlock and Modesto Irrigation Districts; and (iii) meet instream flow release requirements below Hetch Hetchy Project dams. The Hetch Hetchy Enterprise has few formal operating rules. The Raker Act sets flow bypass requirements for Modesto and Turlock Irrigation Districts, while the Fourth Agreement with the Modesto and Turlock Irrigation Districts establishes a water bank account in New Don Pedro Reservoir. Instream flow release requirements for Hetch Hetchy dams are set in a series of right-of-way stipulations between the City and the Department of Interior that were negotiated between 1950 and 1987. A 1995 memorandum from the Hetch Hetchy General Manager specifies water levels at the Hetch Hetchy, Lake Eleanor, and Cherry Lake reservoirs at various dates to ensure sufficient capacity for winter rainfall.

The Hetch Hetchy Enterprise's operating plans are based on computer models that simulate system operations, incorporating numerous assumptions that are intended to represent actual operating conditions. The current operating model is intended to define water levels that can be sustained during a defined drought sequence. The Hetch Hetchy Reservoir levels dropped significantly during the six-year drought from 1987 through 1992. The Hetch Hetchy Enterprise's "defined drought sequence" is based on the 1987

through 1992 drought, which was one of the more severe drought sequences in Hetch Hetchy history. The defined drought sequence extends the six-year duration of the 1987 through 1992 drought by two years, which represent the severe drought of 1976-1977, to achieve an eight-year drought sequence.

*Decision-making process*

The Water Operations Analyst in the Water Enterprise's Water Supply and Treatment Division coordinates decisions to release water from the reservoirs, downstream through the power houses, with the Manager of the Energy Services Section at the Hetch Hetchy Enterprise's Moccasin Power House. Operating the reservoirs and making decisions to release water are based upon several factors, including:

- Ensuring that the reservoirs are full on July 1 of each year, when the annual snow melt and run-off is complete in most years.
- Ensuring that the reservoirs have capacity to hold additional water resulting from storms.
- Holding water in the reservoirs early in the year, until the approximate quantity of snow pack and water content for the year is known.
- Once the approximate quantity of snow is known, controlling releases of water from the reservoirs to maximize efficiency and revenues and reduce downstream risks.
- Preserving water quality.

The quantitative analysis for releasing water from the reservoirs is based on the monthly operating summary spreadsheet, which includes data on the cumulative rainfall, the amount of snow, cumulative inflows into the reservoirs, and climate. Projections of reservoir inflows and the availability of water in the reservoirs to be released downstream, through the powerhouses, are routinely updated, based on changes in the data.

Risks of Insufficient and Excess Water Supply

Since the drought years of 1987 through 1992, the Public Utilities Commission has been able to meet its water requirements for its San Francisco and suburban customers. However, in addition to the risk of insufficient water supply, the Hetch Hetchy system faces the risk of holding too much water in the reservoirs to accommodate new inflow. The system loses use of the water that overflows, or "spills" from the reservoirs when inflow to the reservoirs exceeds capacity.

Over the past ten years, the Hetch Hetchy system typically loses some water through spills during the period from April to August when snow is melting and inflows to the reservoirs are at their highest point. As shown in Table 2.1, in 1995 through 1999 the inflow of water to the reservoirs during the April to August period exceeded the median year inflow, resulting in high reservoir levels and water spills. In 2000 through 2003, the

average April to August inflow to the reservoirs was equal to or less than median year inflow, although some spills still resulted. Some spills occurred in May and June of relatively dry years due to increased snow melt run-off during those years. Although the system operators try to ensure that the reservoirs have capacity to hold additional water resulting from storms or increased run-off, unpredictable or extraordinary weather events can result in spills. Generally, the goal is to minimize water spills through controlled release of water from the reservoirs.

## Table 2.1

## Estimated Amount of Acre Feet of Water Spills from the Hetch Hetchy System Reservoirs, April through August

## 1994 through 2003

| 0 | Index [1] | April | May | June | July | August | Total |
|---|---|---|---|---|---|---|---|
| **1994** | 0.53 | 0 | 0 | 0 | 0 | 0 | 0 |
| **1995** | 1.88 | 1,706 | 158,453 | 143,022 | 299,187 | 24,401 | 626,769 |
| **1996** | 1.25 | 750 | 153,457 | 113,806 | 10,342 | 0 | 278,355 |
| **1997** | 1.22 | 633 | 144,754 | 101,814 | 0 | 0 | 247,201 |
| **1998** | 1.67 | 1,041 | 1,930 | 214,505 | 185,111 | 0 | 402,587 |
| **1999** | 1.13 | 385 | 85,501 | 100,691 | 5,159 | 0 | 191,736 |
| **2000** | 1.01 | 1,083 | 43,055 | 65,921 | 0 | 0 | 110,059 |
| **2001** | 0.61 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2002** | 0.85 | 0 | 1,303 | 13,981 | 0 | 0 | 15,284 |
| **2003** | 0.97 | 0 | 38,829 | 187,444 | 0 | 0 | 176,273 |

Source: Public Utilities Commission

[1] The index is based on a median water year, in which the April through August inflow to the Hetch Hetchy system reservoirs equals 588,000 acre feet.

Available Electricity Supply

The Hetch Hetchy Enterprise provides electricity to the City's municipal load customers, which include City facilities, the Port, the Airport, and San Francisco Unified School District and Community College District facilities, to the Modesto and Turlock Irrigation Districts, and to Airport tenants and Norris Industries, a Federal munitions factory in Riverbank, California. Hydroelectricity is generated by the flow of water from the three Hetch Hetchy system reservoirs, Lake Eleanor, Cherry Lake, and Hetch Hetchy, through the four powerhouses, Holm, Kirkwood, Moccasin, and Moccasin Low Head. In addition to generating hydroelectricity, the Hetch Hetchy Enterprise purchases electricity through its long-term power purchase agreement with Calpine Corporation and on the wholesale electricity market.

Electricity that is to be used by the City's municipal customers, Modesto and Turlock Irrigation Districts, and Norris Industries each day is scheduled on the State's electricity grid. The amount of electricity resources, including hydroelectric power generated by the Hetch Hetchy Enterprise and purchased power, that are scheduled on the electricity grid must equal the amount of electricity that is required by the City's municipal customers, Modesto and Turlock Irrigation Districts, and Norris Industries. Because electricity cannot be stored, the Hetch Hetchy Enterprise must purchase electricity if it is not able to generate a sufficient amount of hydroelectric power to meet its obligations at any given time. Conversely, if the Hetch Hetchy Enterprise generates more hydroelectric power or has more power purchases under the long-term power purchase agreement with the Calpine Corporation than is required to meet its obligations, the surplus electricity must be offered to Modesto and Turlock Irrigation Districts if it comes from Hetch Hetchy, or it can be sold on the market if it comes from contract purchases or if hydroelectric power is refused by Modesto and Turlock Irrigation Districts.

*Insufficient Hydroelectric Power Generation to Meet the Hetch Hetchy Enterprise's Obligation to its Customers*

Over the past seven years, the amount of electricity generated by the Hetch Hetchy Enterprise as a percentage of its total electricity resources has decreased. As shown in Table 2.2, the total gigawatt hours of electricity generated by the Hetch Hetchy Enterprise, which includes banked electricity, decreased from 2,321 gigawatts in 1997 to 1,596 gigawatts in 2003, a decrease of 725 gigawatts or 31.25 percent.

Between 1997 and 2003, the Hetch Hetchy Enterprise's obligation to the City's municipal customers, the Modesto and Turlock Irrigation Districts, and Norris Industries increased by 109 gigawatts annually, or approximately 6.3 percent. Inflows to the Hetch Hetchy Reservoir system from precipitation and snow pack run-off were greater than average in 1997 through 1999.

As shown in Table 2.2, in the past three years, the Hetch Hetchy Enterprise has not generated sufficient electricity to meet its obligations to its municipal and Airport

customers, Norris Industries, and the Modesto and Turlock Irrigation District. The Hetch Hetchy reservoir system had median inflows in May through August of 2000, but due to the energy crisis, the Hetch Hetchy Enterprise generated 2,120 gigawatts of electricity, exceeding the seven-year average of 1,907 gigawatts.

In 2001, May through August inflows to the Hetch Hetchy reservoir system were 67 percent of median inflows, resulting in below average electricity generation of 1,443 gigawatts, which met only 85 percent of the Hetch Hetchy Enterprise's obligation to its customers, requiring the Hetch Hetchy Enterprise to purchase additional electricity to meet its obligation. In 2002, although May through August inflows to the Hetch Hetchy Enterprise's reservoir system were 85 percent of median inflows, the Hetch Hetchy Enterprise met 97 percent of its obligation to its customers. However, in 2003, in which May through August inflows to the Hetch Hetchy Enterprise were 97 percent of median inflows, the Hetch Hetchy Enterprise generated only 1,596 gigawatts of electricity, or only 87 percent of its obligation to its customers. The estimated cost to the Hetch Hetchy Enterprise for power purchases to meet its obligation to its customers in 2003 is approximately $12,684,863 and for the three-year period from 2001 through 2003 was approximately $49.5 million.

Although weather patterns and water supply are the main determinants of hydroelectric power generation, within given levels of inflows to the reservoirs, system operators can determine how much water to release to generate hydroelectric power. The Hetch Hetchy Enterprise has not generated sufficient electricity to meet its obligations to its customers over the past three years, and lacks an effective risk management program to ensure optimal hydroelectric power generation, especially in years with average and above average reservoir inflows.

Further, without an effective risk management program, the Public Utilities Commission has no process to plan for the risks to the Hetch Hetchy Enterprise's ability to generate hydroelectric power during the construction of the Public Utilities Commission's Water System Capital Improvement Program projects. For example, in 2003 the Hetch Hetchy Enterprise shut down the Moccasin Power House for 85 days due to capital improvements to the Priest Reservoir bypass, contributing to below average hydroelectric power generation in a water year in which water inflows were 97 percent of median inflow, insufficient hydroelectric power generation to meet its obligations to its customers, and estimated purchased power costs of $12.7 million to meet its obligations to its customers.[1]

[1] As noted below, the Hetch Hetchy Enterprise saved an estimated $973,000 by swapping electricity with Arizona power companies and Sempra, a California-based power company, during the shut down of the Moccasin Power House to make capital improvements to the Priest Reservoir bypass.

## Table 2.2

## Hetch Hetchy Enterprise Electricity Generation in Annual Gigawatts Compared to Electricity Obligations in Annual Gigawatts to the City Departments, the Airport Tenants, Modesto and Turlock Irrigation Districts, and Norris Company[2]

### Gigawatts Generated in 1997 through 2003

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|
| **Electricity Resources** | | | | | | | |
| Hetch Hetchy System Generation | 2,321 | 2,156 | 1,955 | 2,120 | 1,443 | 1,755 | 1,596 |
| Electricity Purchases | 263 | 259 | 374 | 277 | 458 | 456 | 488 |
| Total Electricity Resources | 2,584 | 2,415 | 2,329 | 2,397 | 1,901 | 2,211 | 2,083 |
| Generation as a Percentage of Electricity Resource | 90% | 89% | 84% | 88% | 76% | 79% | 77% |
| **Electricity Obligations** | | | | | | | |
| Municipal customers | 752 | 833 | 838 | 846 | 847 | 832 | 849 |
| Airport Tenants | 201 | 200 | 201 | 205 | 145 | 141 | 149 |
| Norris Industries | 4 | 5 | 5 | 6 | 8 | 9 | 9 |
| Modesto Irrigation District | 509 | 530 | 536 | 687 | 512 | 540 | 548 |
| Turlock Irrigation District | 267 | 265 | 266 | 338 | 255 | 295 | 288 |
| Subtotal, Electricity Obligations | 1,733 | 1,833 | 1,847 | 2,082 | 1,767 | 1,817 | 1,842 |
| Surplus Sales to Districts | 72 | 12 | 43 | 53 | 81 | 203 | 98 |
| Surplus Sales to Market | 652 | 478 | 263 | 128 | 45 | 93 | 40 |
| Surplus to PG&E Bank | 127 | 92 | 176 | 134 | 8 | 98 | 103 |
| Total Obligation [1] | 2,584 | 2,415 | 2,329 | 2,396 | 1,902 | 2,211 | 2,083 |
| Generation as a Percentage of Electricity Obligations [2] | 134% | 118% | 106% | 102% | 82% | 97% | 87% |
| Power Purchases to Meet Obligations (in Gigawatts) | 0 | 0 | 0 | 0 | 324 | 62 | 246 |
| Estimated Cost of Power Purchases to Meet Obligations [3] | $0 | $0 | $0 | $0 | $32,857,825 | $3,943,419 | $12,684,863 |

Source: Public Utilities Commission

[1] Differences between total electricity resources and total electricity obligation are due to rounding.

[2] These electricity obligations are to Municipal customers, the Airport, Norris Industries, and the Modesto and Turlock Irrigation Districts.

[3] Costs are based on FY 2001-2002 through FY 2003-2004 actual power purchase expenditures.

[2] The Hetch Hetchy Enterprise hydroelectric power generation, shown as the number of gigawatts generated annually, includes electricity that is banked with the Pacific Gas and Electric Company for credit during periods of surplus hydroelectric or purchased power that is scheduled on the State grid, and electricity generated by the Southeast Water Pollution Control Treatment Plant cogeneration facility.

Risks Inherent in the Decision Making Process

The Hetch Hetchy Enterprise has an inherent conflict in the decision making process to release water and generate power. Although the Public Utilities Commission's primary responsibility is to provide high quality drinking water to its customers, more than 80 percent of the Hetch Hetchy Enterprise's revenues come from the generation of hydroelectric power, equal to $106 million in FY 2003-2004, and these revenues pay not only for the Hetch Hetchy Enterprise's operating and capital costs, but also for the City's and Public Utilities Commission's policy objectives, including providing free electricity to the Asian and Fine Arts Museums and reduced-price electricity to the Moscone Center and Candlestick Park, and providing funding for alternative power projects and for the Power Policy Division's personnel and operating budget. Also, the Hetch Hetchy Enterprise began providing free electricity for streetlights in FY 2002-2003.

*The Impact of the Public Utilities Commission's Obligations and Policies on Hetch Hetchy Electricity Generation and Revenues*

The Hetch Hetchy Enterprise is responsible for providing electricity to the City's municipal customers, and to the Turlock and Modesto Irrigation Districts. The water first policy implies that decisions to release water are based upon water supply and quality criteria, and production of electricity is a by-product of water release decisions based on supply and quality. If the Hetch Hetchy Enterprise does not generate sufficient hydroelectric power to meet its electricity load obligations to the City's municipal customers and the Turlock and Modesto Irrigation Districts, the Hetch Hetchy Enterprise must meet its electricity load obligations through power purchases under the long-term power purchase agreement with Calpine Corporation or on the wholesale electricity market at a higher cost than hydroelectric power generated by Hetch Hetchy. The obligations to provide firm power to Turlock Irrigation District terminates in December 2005 under the proposed settlement, and the obligation to provide firm power to Modesto Irrigation District terminates in December 2007 under the amended and restated long-term power sales agreement.

Further, the Public Utilities Commission is considering providing retail electricity to non-municipal customers who are currently served by the Pacific Gas and Electric Company. Hydroelectric power generated by the Hetch Hetchy Enterprise might be one source of electricity for the retail electricity portfolio.

*The Impact of the Water System Capital Improvement Program on the Hetch Hetchy Water Supply and Power Generation*

The implementation of the Water System Capital Improvement Program, which will remove portions of the Hetch Hetchy system from operation for periods of time during construction, will pose added risks to the Hetch Hetchy system's water supply and power generation. In FY 2003-2004, the Hetch Hetchy hydroelectric power generation system was inoperable for two months during capital improvements to the Priest Reservoir. During that time the Hetch Hetchy Enterprise entered into an electricity swap with Arizona power companies and Sempra, a California-based company, with estimated

savings of $973,000 compared to purchasing electricity on the market. Operating decisions to balance water supply and hydroelectric power generation, as well as policy decisions impacting the Hetch Hetchy Enterprise's hydroelectric power generation and revenues, will need to consider the impact of the Water System Capital Improvement Program.

## Necessary Changes to the Risk Management Process

Establishing an Effective Risk Management Process

The Public Utilities Commission General Manager should establish an effective risk management process that includes executive-level staff and develops protocols to determine optimal levels of hydroelectric power generation within the water first policy. Even small variations in hydroelectric power generation can have large impacts on the Hetch Hetchy Enterprise's revenues and expenditures. Based on FY 2003-2004 hydroelectricity revenues and power purchase expenditures, a one percent increase in hydroelectricity generation could increase revenues by approximately $1.0 million.

The April of 2004 risk assessment by R.W. Beck identified several areas of Hetch Hetchy Enterprise risk, including:

- Uncertainty about water supply and power generation.
- Volatile electricity market prices.
- Operational risk resulting from lack of clarity of policies, processes and procedures for managing seasonal and short-term water and electricity resources and for evaluating power projects.
- City and State policies and regulations impacting water supply and electricity generation decisions or electricity revenues.
- Conflicting priorities within the Public Utilities Commission, including the lack of a Hetch Hetchy Enterprise business plan.
- Potential costs resulting from disputes regarding the terms of the 1987 Interconnection Agreement between the Public Utilities Commission and the Pacific Gas and Electric Company.

Under the current task plan for the ongoing risk management evaluation which has a revised due date of April of 2005, R. W. Beck will evaluate risk management strategies, draft risk management policies, and develop an integrated risk control operating procedures manual. The ongoing risk management evaluation will also include recommending risk management measures, and developing methods to address weather-related risks and water-power interplay. In establishing a new risk management committee, the General Manager should consider the R.W. Beck risk assessment in defining the scope and membership of the risk management committee.

The risk management committee should continue to be responsible for evaluating the financial impact of power purchases and sales, and hydroelectric and alternative power initiatives, and should present the evaluation to the Public Utilities Commission when the Commission is considering policy initiatives.

In Section 7 of this report, the management audit has recommended transfer of responsibility for the Streetlight Management Program from the Public Utilities Commission to either the Department of Public Works. Currently, the Manager, Streetlights and Special Projects position is responsible not only for the Streetlight Management Program but also for Hetch Hetchy Enterprise risk management functions. Upon transfer of the Streetlight Management Program out of the Public Utilities Commission, the Public Utilities Commission will need to re-evaluate the functions of the existing Manager, Streetlights and Special Projects position. Specifically, the Public Utilities Commission should evaluate, define, and expand the risk management functions of this position and specify how the risk management functions of this position will promote and support the Public Utilities Commission's risk management process. To ensure segregation of risk management functions from the operating decisions of the Public Utilities Commission, this position should be reassigned from the Hetch Hetchy Enterprise Department to the Business Services Division.

Designating Responsibility for Water Supply and Power Generation Decisions

Currently, operating decisions regarding water supply and hydroelectric power generation are made collaboratively by the Manager of the Energy Services Section and the Water Operations Analyst in the Water Supply and Treatment Division. When disagreements arise on the timing or amount of water to be released, decisions are referred to the Acting Director of Power Operations and the Acting Director of Water Operations. Public Utilities Commission staff report that the decision-making process has worked relatively well over the past year. However, the successful collaboration depends more on the collaboration of the individuals rather than established protocols or organizational process.

The Hetch Hetchy Enterprise lacks the necessary analytical tools to model water supply decisions and electricity load schedules. The Public Utilities Commission's delay in implementing these analytical tools is discussed in Section 3 of this report. Successful implementation of these analytical tools will aid in making operating decisions regarding water supply and power generation.

Currently, the Hetch Hetchy Enterprise is co-managed by two directors, one with responsibility for water operations and the other with responsibility for power operations. Both of these managers are in acting positions. The General Manager should designate one existing executive level manager with authority and expertise in managing water supply and power generation to be responsible for making coordinated operating decisions regarding water supply and power generation.

# Conclusions

The Public Utilities Commission faces significant risks in balancing water supply and hydroelectricity generation, including releasing too much water and risking insufficient water supply or conversely failing to release sufficient water and "spilling" excess water, thus losing the water for both water supply and hydroelectricity generation. The Public Utilities Commission has failed to implement a risk management program to define these risks and the Public Utilities Commission's tolerance for risk. In the absence of clear risk management policies and protocols and leadership from executive level managers, decisions to release water to generate hydroelectricity have devolved to mid-level staff. Day to day operating decisions to release water to generate hydroelectric power are based on mid-level staff members' tolerance for risk rather than on Public Utilities Commission's defined policies. Consequently, the Public Utilities Commission has failed to ensure that hydroelectricity revenues are optimal within the water first policy.

# Recommendations

The Public Utilities Commission General Manager should:

2.1 Establish an effective risk management process that includes leadership by executive-level staff.

2.2 Consider the R.W. Beck risk assessment in defining the scope and membership of the risk management committee.

2.3 Establish the responsibility of the Risk Management Committee to include evaluating the financial impact of power purchases and sales and power initiatives and presenting the evaluation to the Public Utilities Commission when the Commission is considering policy initiatives.

2.4 Re-evaluate the functions of the existing Manager, Streetlights and Special Projects position upon transfer of the Streetlight Management Program to the Department of Public Works, as recommended in Section 7, including evaluating, defining and expanding the risk management functions of this position and specifying how the risk management functions of this position will promote and support the Public Utilities Commission's risk management process. To ensure segregation of risk management functions from the operating decisions of the Public Utilities Commission, this position should be reassigned from the Hetch Hetchy Enterprise Department to the Business Services Division.

2.5 Designate one existing executive level manager with authority and expertise in managing water supply and power generation to be responsible for making coordinated operating decisions regarding water supply and power generation.

# Costs and Benefits

The purpose of the risk management function is to identify and mitigate the financial and operating risks inherent in the Hetch Hetchy Enterprise Department's balancing of water supply and power generation. By defining the Public Utilities Commission's risks in balancing water supply and hydroelectric power generation, establishing the level of risk that the Public Utilities Commission will tolerate, and developing risk management protocols, the Public Utilities Commission can better determine the optimal level of hydroelectric power generation within given levels of reservoir inflows. Even small variations in hydroelectric power generation can have large impacts on the Hetch Hetchy Enterprise's revenues and expenditures. Based on FY 2003-2004 hydroelectricity revenues and power purchase expenditures, a one percent increase in hydroelectricity generation could increase revenues by approximately $1.0 million.