THE IMPACT OF THE LOSS OF ELECTRIC GENERATION AT GLEN CANYON DAM
Overview of Study Findings

Background

The vast Colorado River system of dams, reservoirs, and diversions is facing an unprecedented water supply crisis. The 1922 Colorado River Compact, the legal foundation of this water system, was based on flawed assumptions that seriously overestimated Colorado River flow, underestimated public demand, and could not have foreseen the impacts of climate change. As a result, more water is allocated today than actually flows in the river. This water deficit is projected to increase significantly in the years ahead.[1]

The two main Colorado River reservoirs, Lake Powell, behind Glen Canyon Dam (GCD), and Lake Mead, behind Hoover Dam, are symptomatic of this crisis. These reservoirs have been hovering around half-full for the past decade. Studies have concluded that they are unlikely to both ever fill again, and could go dry within the next decade.[2] The stakes are high because the Colorado River supplies water to 40 million people and 4.5 million acres of agricultural lands.

GCD was authorized in 1956 as a part of the Colorado River Storage Project (CRSP). The primary purpose of the dam is to store excess water in Lake Powell for the upper basin states of Wyoming, Colorado, Utah, and New Mexico, which can be released, as needed, to Lake Mead downstream. A secondary purpose of the dam is to generate hydroelectricity, which is used to help fund operation of the Colorado River water delivery system and is sold at a discount to selected contractors[3]. As river flows continue to decline, Colorado River managers are increasingly concerned about maintaining Lake Powell to elevations that allow hydropower generation.

Some conservationists have questioned the benefits of attempts to preserve the status quo, and propose instead, fundamental changes in the management of the Colorado River system. For example, Glen Canyon Institute (GCI) has put forward the Fill Mead First (FMF) plan which would change the operation of GCD, allowing water to fill Lake Mead reservoir downstream before impounding it in Lake Powell. Others, such as former Commissioner of Reclamation, Daniel Beard, call for decommissioning and tearing down GCD, and permanently draining Lake Powell. These advocates contend that their plans could conserve large amounts of water now lost to seepage from Lake Powell, promote the restoration of Grand Canyon ecosystems, and allow the recovery of once-flooded portions of Glen Canyon.

Colorado River system managers are critical of such proposals because they argue that they would violate the Colorado River Compact. They also warn that these plans would jeopardize or eliminate hydroelectric power generation at GCD. They claim that this would cause spikes in

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[1] http://www.usbr.gov/lc/region/programs/crbstudy/finalreport/Executive%20Summary/CRBS_Executive_Summary_FINAL.pdf

[2] https://scripps.ucsd.edu/news/2487

[3] Theses contractors include publicly owned electric utilities, municipalities, irrigation districts, military bases, and native American tribes

rates for electric power customers and drastically reduce funding for the protection of endangered Colorado River fish species[4]. These contentions, however, are not well documented and questions have been raised about their accuracy.

Establishing an understanding of the economic impacts of a potential loss of electric generation at GCD is vitally important. Water managers and policy makers are now making far-reaching decisions on the management of the Colorado River, including how to allocate water between Lake Powell and Lake Mead. They need the best possible information on which to base these decisions.

The Glen Canyon Dam Hydropower Studies

In an effort to gain a greater understanding of these issues, Power Consulting, Inc. conducted a detailed analysis of the economic impacts to ratepayers in the region if Glen Canyon Dam (GCD) were to cease generating hydroelectric power. This research was reviewed by an independent panel of distinguished economists: David Marcus, Gail Blattenberger, and Spencer Phillips[5].

The study was done in three phases:

- Phase I, focuses on the economic value of current production of the electricity at GCD as well as the impact that not generating that electricity at GCD would have on the electric grid and on the regional economy;
- Phase II, focuses on the impact of the loss of GCD electric generation on the people and entities who directly or indirectly contract through the CRSP and Western Area Power Administration (Western) to receive their electricity.
- Addendum to Phase II, focuses on the financial costs and offsetting benefits if GCD were no longer able to generate hydropower.

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[4] Oritz, K. Western Slope is Refusing to Divert More Water to Front Range. New Channel 5 Grand Junction, Montrose, Glenwood Springs. Accessed 10.29.2015. https://web.archive.org/web/20140715021756/http:/www.krextv.com/story/western-slope-is-refusing-to-divert-more-water-to-front-range-20140711 and Harvey, N. To protect hydropower, utilities will pay Colorado River water users to conserve. High Country News. 8.4.2014. Accessed on 10.29.2015 https://www.hcn.org/blogs/goat/doi-and-utilities-partner-to-stave-off-colorado-river-power-woes and U.S. Bureau of Reclamation. Flow Regimes and Glen Canyon. Accessed on 10.29.2015. http://www.creda.org/Documents/Messaging2.pdf

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Phase I

GCD is the largest single electricity producer in the Colorado River Storage Project (CRSP), a system of hydroelectric power plants in the Upper Colorado basin. GCD functions as both a base load electric generating facility and a peaking facility. Electricity produced in the CRSP is marketed by the Western Area Power Administration (Western) to publicly owned electric utilities, Native American Tribes, Federal agencies, and electric generating cooperatives at cost-based, as opposed to market, prices. Should GCD go offline, any price increase for these customers would be the difference between their contracts with WAPA and market rate prices.

The analysis concentrates on the economic value of current production of the electricity at GCD as well as the impact that not generating that electricity at GCD would have on the electric grid and on the regional economy. A major objective is to determine the economic value of GCD in a contemporary market. Another objective is to assess the capacity available in the region to offset the broad impact of shutting down energy production at GCD.

The study concludes that the amount and value of electric energy generated at GCD is significant. However, it represents only a small fraction of regional electric production, can be easily replaced if lost, and has been declining for two decades. Specifically:

- The average annual value of the GCD electric energy is $153.3 million. This value is less than one half of one percent of the close to $31 billion in sales value from electric generation in the Western Electricity Coordinating Council (WECC), which includes GCD power.
- The economic value of the peak electric generating capacity of GCD is marginal, less than $47.8 million per year. In the contemporary market however, the actual value is much lower, due to the existence of excess capacity reserves in the region.
- The base load electricity produced at GCD could be easily replaced by currently operable generators. WECC estimates of excess reserve margins through 2024 total more than 56 times the effective electric capacity of GCD.
- Since 1996, GCD electric generation has been reduced by about a third and the capacity of GCD is reduced by more than half because of generation restrictions implemented to mitigate environmental impacts in the Grand Canyon, coupled with low reservoir elevations at Lake Powell. Any impacts due to the termination of GCD production must be weighed against the significant electric capacity that has already been lost, with no negative effects on the grid.

Phase II

This study examines the potential increased cost of electricity on the ~3.2 million customers that receive *some* of their electricity from GCD at a below-market price. The analysis divides the customers into 526 groups based on which utility they buy electricity from and the class of electric consumer that they are in. It assesses the average amount of GCD electricity that each of these groups consume, looks at the customers that are affected the most, and determines what the electricity is being used for.

The analysis concludes that the total economic value lost as a result of GCD no longer being used for electric generation would be significant. However, the increase in electric costs would be widely spread over the 3.2 million end-user customers. As a result, average electricity cost increases per year would be $0.96 for residential customers, $7.04 for commercial customers, and $75.77 for industrial customers. Less than one half of one percent of residential customers would experience cost increases of more than a $1 a month. The highest average residential increase would be $2.59 per month.

A small subset of customers receive all of their electricity from the CRSP — mostly sovereign nations, governments or government-owned or run enterprises. These customers could face a 2.5- to 2.7-fold increase if GCD electricity generation were lost. The largest electricity cost increase for these non-utility contractors would be borne by the Navajo Tribal Utility Authority (NTUA). It would have an annual electricity cost increase of approximately $1.3 million.

It is important to understand that non-utility contractors' electricity cost increases are not directly passed onto individual households but are, instead, borne entirely by the non-utility contractor. Residential customers who receive electricity from the NTUA would incur an annual cost increase of $1.83, the commercial customers would incur an annual increase of $20.89, and the industrial customers would incur an annual increase of $452.93. The NTUA owns four large casinos, ten shopping centers, a large number of businesses, a museum, a parks and recreation department, an arts and crafts enterprise, and numerous tribal government and social centers. The Navajo nation is home to 250,000 residents, and generated a net $81 million dollars from their 3 casinos in New Mexico alone in 2014.

Addendum

The Addendum to Phase II estimates the economic impacts and potential cost savings of implementing GCI's Fill Mead First (FMF) proposal to transfer water from Lake Powell to Lake Mead. FMF would lower Lake Powell, increasing the volume and pool elevation of Lake Mead, resulting in increased generating capability at Hoover Dam. The process of filling Lake Mead is broken into three phases of elevation: minimum power pool, dead pool, and natural river elevation. This study estimates transfer rates of water from Lake Powell to Lake Mead for the three potential FMF pool elevations.

A water balance model was constructed for the two reservoirs based on historical inflow and release data, estimates of monthly evaporative loss, and reasonable flow rates through the Grand Canyon. This highly simplified model was used to estimate the potential increase in pool elevation at Lake Mead over time.

The study identifies two types of potential cost savings associated with the FMF scenarios: 1) current costs associated with operating Glen Canyon Dam, and 2) costs associated with the loss of potential earnings.

Current costs associated with operating Glen Canyon Dam include:

- Operations and maintenance for the Glen Canyon Dam, which are shared between Western Area Power Administration and the Bureau of Reclamation

- Compliance with the requirements of the U.S. Fish and Wildlife Service and Endangered Species Act to protect endangered species
- Funding of the Glen Canyon Dam Adaptive Management Program, which studies the effects of dam operations on the Grand Canyon and can recommend changes in dam operations

Costs associated with the loss of potential earnings include:

- Hoover Dam hydropower revenue lost due to the low water levels at Lake Mead
- Value of water lost to Lake Powell seepage into the reservoir banks

Results are displayed in Table 1 below.

TOTAL ANNUAL COSTS AND POTENTIAL SAVINGS ASSOCIATED WITH GLEN CANYON DAM OPERATIONS

Current Costs Associated with Operating Glen Canyon Dam

Cost Category	**Cost/year**
Dam operation	$22,585,265
Compliance with USFWS and ESA	$1,900,000
GC Dam Adaptive Management Program	$10,472,367
TOTAL ANNUAL COST	**$34,957,632**

Costs Associated with Loss of Potential Earnings

Potential Earnings Loss Category	**Loss**
Foregone Hoover Dam hydropower	$11,787,080
Water lost to Lake Powell seepage	$28,057,286
TOTAL ANNUAL LOSS	**$39,844,366**
TOTAL POTENTIAL SINGLE-YEAR SAVINGS	***$74,801,998***

This study estimated that the implementation of the Fill Mead First proposal could result in total single-year cost savings of $74.8 million. This represents a savings equivalent to 49 percent of the total $153.3 million average annual value of electric power generated at GCD.

Summary of Findings

The study concludes that, if Glen Canyon Dam stopped generating hydropower, it would have a negligible impact on the western power grid, would raise electric rates by an average of 8 cents per month for residential customers of hydropower, and could save tens of millions of dollars each year in taxpayer subsidies and water lost to system inefficiencies.

- The average annual value of Glen Canyon Dam's electric energy represents less than one half of one percent of the sales value from electric generation in the western grid, and that the grid could readily absorb the loss of hydropower from the dam.
- The total impacts would be an increase of $16.31 million in electricity costs for consumers of Glen Canyon Dam power, but because they would be spread among 3.2 million customers, the individual impacts would be small in the vast majority of cases.
- The average annual value of the GCD electric energy is $153.3 million. This value is less than one half of one percent of the close to $31 billion in sales value from electric generation in the Western Electricity Coordinating Council (WECC).
- Average yearly cost increases would be $.08 per month for residential customers, $.59 per month for commercial customers, and $6.16 per month for industrial customers of Glen Canyon Dam electricity.
- A discontinuation of Glen Canyon Dam operations could have offsetting benefits of approximately $74.8 million annually, including savings of $34.9 million in management costs and potential earnings of as much as $39.8 million annually due to increased hydropower at Hoover Dam and conservation of water that would otherwise have seeped into the banks of Lake Powell.