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DPG 12-208

March 30, 2012

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

SUBJECT: Comment Letter – Statewide Mercury Policy – CEQA Scoping Comments

The Sacramento Municipal Utility District (SMUD) appreciates the opportunity afforded by the State Water Resources Control Board (State Board) to provide comments on the scoping of the State Board's CEQA project to establish a Statewide Mercury Policy and Mercury Control Program for Reservoirs. SMUD takes a special interest in this program given our ownership of the Upper American River Project (UARP), a hydroelectric project in the headwaters of the American River that consists of eleven reservoirs and eight powerhouses. The UARP is SMUD's most important generating facility, providing significant value to SMUD customer-owners not only in the production of 688 MW of clean and sustainable energy, but also offering abundant recreational opportunities, including reservoir fishing. Slab Creek Reservoir, the most-downstream UARP reservoir and lynchpin of the system as it controls water into the 224MW White Rock Powerhouse, is listed under Section 303(d) of the Clean Water Act, as a water body impaired for mercury.[1]

With this interest at stake, coupled with a strong commitment to environmental stewardship and understanding of the need to protect humans and wildlife from consumption of excessive amounts of mercury, SMUD offers the following comments.

[1] A 2009 report by PBS&J noted that mercury concentrations in fish tissues exceed the USEPA human health consumption criterion of 0.3 ppm for Sacramento pikeminnow at Slab Creek Reservoir, and tissue mercury concentrations for Sacramento sucker are borderline in the reservoir. The report concluded that subject to further monitoring, there appear to be no mercury bioaccumulation problems that would pose a human health risk for brown trout from Slab Creek. PBS&J, "Mercury Bioaccumulation Technical Report," January 2009, p. 2-7 (Prepared for SMUD, in re FERC Project No. 2101, Upper American River Project). The report concludes:

> "In comparison to other lakes and reservoirs, UARP reservoirs have lower tissue mercury concentrations than do the same fish species from waterbodies in the Mother Lode or in waterbodies that are exposed to natural mercury deposits. While some mercury originates in the rocks of the Sierra Nevada, most mercury that ultimately enters the aquatic food web of UARP reservoirs is probably from atmospheric deposition. This conclusion is consistent with research that demonstrates mercury bioaccumulation in fish tissue from fish collected in pristine environments worldwide (e.g., alpine and arctic lakes). UARP reservoir operations do not appear to contribute to or enhance the mercury bioaccumulation process in fish."

General Comment on the Proposed Mercury Control Program for Reservoirs

The Summary for CEQA Scoping Meetings posted by the State Board explains that the first phases of a Statewide Mercury Policy will include establishment of a control program designed to attain water quality objectives in reservoirs. It lists three likely implementation plan elements of this control program, including, "*Changes in approaches to reservoir management that will modify water chemistry to reduce creation of the most biologically available form of mercury.*"

SMUD's fundamental concern is that it is premature to consider implementation of reservoir management measures to attempt to control mercury before the State Board has basic knowledge of the sources of mercury entering California reservoirs, the role of reservoirs in exacerbating the buildup of mercury (inorganic and methylated) in the water column and food web, and the efficacy of various potential control measures. Not only is it critical to manage reservoirs effectively for power generation, and for water storage and flood control, but the State Board itself already regulates flows from hydro project reservoirs to achieve multiple water quality and biological goals. It is critical to determine the fundamental need for and efficacy of any new operational measures before considering them in a mercury policy.

How methyl mercury is manifested in the aquatic environment is seasonal and will vary with changes in organic matter availability, nutrient concentrations, oxygen levels, and hydrological interactions in a water body. Understanding this complicated natural process and the environmental variables influencing the formation of methyl mercury is extremely challenging. There is a great deal of variability among water bodies in how mercury is processed. Different types of water bodies can have different ranges of methylation, with wetlands generally expected to have higher percentages of methyl mercury than lakes, and lakes less than rivers or streams.[2]

The rates of bacterial methylation of mercury are dependent on a wide range of environmental variables that affect Hg2+ availability and the populations of bacteria themselves. The physical and chemical conditions affecting methylation include dissolved oxygen, pH, dissolved organic carbon, salinity, nutrients, selenium, temperature, sulfate and sulfide. Some parameters, such as pH and dissolved organic carbon, can create different impacts on the water column than they do on sediments. There are still other factors affecting bioaccumulation in fish populations.

Given this complexity, and that the dynamics enhancing methylation in lakes and reservoirs are particularly uncertain and of unknown importance to bioaccumulation, SMUD suggests that proceeding to develop reservoir management controls is premature. SMUD would encourage coordination among state agencies to consolidate and enhance knowledge base on these issues, while SWRCB proceeds with the development of water quality objectives and the broader framework for a Statewide Mercury Policy.

CEQA Alternatives

The Summary lists only two alternatives for the Mercury Control Program for Reservoirs. The first is the "no action" alternative, which is described as addressing California's 74 reservoirs listed as impaired by mercury on an individual basis, such as through the TMDL process for individual water bodies. In turn, the TMDLs would be implemented through individual site cleanup orders, waste discharge requirements, waivers of waste discharge requirements, NPDES permits, and other enforcement actions as appropriate. Alternative 2 is described as a statewide control program for which implementation requirements would likely be similar, and would likely also be designed within a TMDL framework.

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[2]PBS&J, "Mercury Bioaccumulation Technical Report," January 2009, p. 2-7 (Prepared for SMUD, in re FERC Project No. 2101, Upper American River Project); U.S. Environmental Protection Agency, "Mercury Study Report to Congress, Vol. III: Fate and Transport of Mercury in the Environment," December 1997 (EPA-452-R-97-005).

The Summary includes a list of potential implementation actions, which include measures to reduce upland contributions to reservoirs, development and implementation of reservoir management plans, fisheries management in reservoirs, minimizing mercury in sewage and stormwater, and statewide, national and global measures to reduce atmospheric deposition of mercury. Since the Summary does not address how a statewide approach would affect the selection and development of control measures, we assume the State Board proposes to establish guidelines for when particular control measures should be employed, or to mandate the use of measures for all impaired reservoirs.

Regardless of whether a statewide policy is used, it is critical to base any implementation plan on a clear understanding of the complex systems and pathways by which mercury is converted to methyl mercury and bioaccumulated in reservoir food webs. It must integrate the results of scientific studies performed in California and elsewhere into a clear foundation for a policy that deals with all aspects of the issue simultaneously, and then apply this understanding to the unique characteristics of each individual reservoir.

Thus, SMUD recommends that the State Board evaluate a third alternative that would consider the individual characteristics of each reservoir, including the significance of any threat to human health based on the nature of affected fish species and the specific causes of mercury bioaccumulation. These causes would then be addressed using a watershed approach that encompasses the entire river/reservoir system, along with the surrounding land resources. SMUD believes this approach will have the best chance of success in achieving the statewide fish tissue objectives for mercury being developed concurrently by the State Board. This approach would be critical to understanding and minimizing the environmental impacts of the program, as well.

The program should also ensure that it identifies the degree to which factors affecting mercury-related conditions in a reservoir are controllable, and who has control over them. In the Potential Implementation Actions table of the scoping materials, the State Board correctly identifies ongoing potential point and nonpoint mercury sources such as mine sites, atmospheric deposition, and upland land management activities in the reservoir watershed, such as timber harvesting, road development, fire management and other upland erosion-causing activities, which increase the influx of dissolved organic carbon and suspended sediments.

The mercury contamination in UARP water bodies such as Slab Creek Reservoir may be largely out of SMUD's control, a condition that would render mandated reservoir remediation measures ineffective. For example, a 2009 fire in the South Fork American River watershed above Slab Creek Reservoir could have contributed significant methyl mercury runoff into the reservoir, a cause and effect mechanism found in a Canadian study of the relationship between fire and mercury.[3] This dynamic involved increased bioaccumulation not only due to contributions of mercury from upland soils, but also, in even larger part, due to complex changes in the food chain associated with increased nutrient contributions.

These concerns are supported by findings over the past few decades of high concentration of mercury in lake-dwelling fish of wilderness areas. Mercury contamination in Sierra Nevada reservoirs may be a systemic problem primarily associated with a combination of atmospheric deposition and watershed land management. These issues need to be fully considered as the State Board develops the Mercury Control Program for Reservoirs.

As described, proposals to include measures aimed at affecting reservoir water chemistry could unduly impose significant regulatory burden and operational restrictions on California's water and power supplies without proof that paradigm changes in California's utility operations would

[3] Erin Kelly, David W. Schindler, Vincent L. St. Louis, David B. Donald, and Katherine E. Vladicka, Proceedings of the National Academy of Sciences, "Forest fire increases mercury accumulation by fishes via food web restructuring and increased mercury inputs" (December 2006).

actually reduce methylated mercury levels in California's waters. Additional study should precede development of any specific policy proposals that would include implementation measures affecting the operation of reservoirs. If the proposed project is pursued, however, a number of specific concerns must be addressed during CEQA review of the proposed actions and its alternatives.

Public Utility Impacts of Potential Modifications to Water Storage and Discharge Patterns in Reservoirs

The State Board identifies "*modification of water storage and discharge patterns to reduce methyl mercury production,*" as an example of an implementation action under the Mercury Control Program for Reservoirs. Potential modifications to reservoir operations are of significant concern to SMUD based on two considerations: (1) the current understanding of the complex physical, chemical, and biological interactions in Sierra Nevada reservoirs is not sufficient to predict or quantify the effectiveness of modified operations to alter mercury dynamics; and (2) there is potential for significant impacts to the direct and indirect benefits provided by water supply and hydroelectric reservoirs, as well as other unintended impacts on social and natural resources.

Many reservoirs in the Sierra Nevada provide invaluable energy and grid services to California. Water management in reservoirs throughout the state is constrained by the license conditions of the Federal Energy Regulatory Commission (FERC). These constraints are in place to provide protection for a number of natural resources including, but not limited to, water quality, aquatic resources, terrestrial resources, and recreation. Modifying the operations of a hydroelectric reservoir could potentially conflict with the FERC license requirements. In its CEQA process, the State Board should evaluate the impacts of reservoir reoperation on the following services and values provided by hydroelectric projects.

Power Generation and Capacity

The UARP, like other hydroelectric projects, provides significant amounts of energy to SMUD's Sacramento customer-owners. SMUD's energy planners utilize precise water management algorithms to ensure water is stored in reservoirs in a manner that minimizes uncontrolled spills and maximizes the delivery of power when it is most needed – primarily during summer months. If reoperation requires reservoirs to maintain high water elevations during spring runoff, for example, the net effect is a higher incidence of spill and concomitant reduction in energy production.

A primary value of hydro is its dispatchable capacity, or the use of stored water to meet demand throughout summer months. Any reservoir reoperation that reduces the dispatchable capacity of reservoirs would force SMUD to acquire alternative sources of reliable energy as backup. Backup power sources generally are derived from fossil fuel based sources such as gas-fired power plants.

Thus, the CEQA analysis should consider the impact of reservoir reoperation on power energy production and dispatchable capacity. Reductions in both power products will require replacement power, which must be analyzed in the CEQA evaluation with respect to impacts on greenhouse gas emissions.

Grid Services and Integration of Variable Renewable Resources

Another value of hydropower is its flexibility as a power source. This ability of hydro to rapidly alter generation is critical to reliability of the power grid and the provision of ancillary services such as regulation up, regulation down, and spinning reserves. This role has become even more critical with the state mandate to achieving a renewable resource portfolio of 33% by 2020. Because wind and solar energy is inherently variable, hydropower will play a critical role

integrating these important energy resources into the grid.[4] SMUD is currently contemplating adding a pumped-storage facility to the UARP, using Slab Creek Reservoir as a lower reservoir, which will increase our ability to integrate an even higher penetration of variable resources beyond 2020. Thus, constraints on reservoir operations created by the Mercury Control Program could significantly impact the hydropower ancillary services needed for grid stability and the integration of variable renewable power sources. In the case of the UARP, these impacts could reduce the value of the pumped-storage facility.

Air Quality and Greenhouse Gas Impacts of Potential Modifications to Water Storage and Discharge Patterns in Reservoirs

As explained above, hydro provides great benefit in providing dispatchable capacity that can support the use of renewable wind and solar capacity. Reducing support for solar and wind power could increase the proportion of energy required from fossil fuel sources. In addition, any reductions in overall hydropower generation resulting from reservoir management measures would require replacement via other sources of power, which will generally be fossil fuel-based sources. The CEQA analysis of any proposed change in reservoir operation must therefore consider the environmental impacts of increases in generation from fossil fuel-based sources, including air quality, public health and greenhouse gas impacts.

Water Supply and Flood Control Impacts of Potential Modifications to Water Storage and Discharge Patterns in Reservoirs

Reservoirs throughout California play a critical role in providing water for a variety of consumptive uses. The CEQA process must evaluate impacts of reservoir reoperation on the change in the volume and timing of delivery of water for agricultural and municipal uses. Similarly, the impact of reservoir reoperations on flood control services from California reservoirs must be considered.

Reservoirs throughout California have a critical role in the storage of water for beneficial uses. The CEQA process must evaluate impacts of reservoir reoperation on the volume, and timing of delivery of water affecting the water rights of downstream users under various water year conditions.

Recreational and Aesthetic Impacts of Potential Modifications to Water Storage and Discharge Patterns in Reservoirs

An important value of California reservoirs is recreation, including boating, fishing, and swimming. These values are significantly enhanced by the visual appeal of near full reservoir water bodies. Reoperation of reservoirs can impact aesthetic values and recreational opportunities. The potential losses of these values should be evaluated and addressed in the CEQA process. In addition, the CEQA analysis should consider the effects on natural resources of displaced recreationalists traveling to other reservoirs creating crowding issues, or being induced to choose more attractive land-based activities on adjacent natural areas, which state or federal agencies may be ill-equipped to manage.

Water Quality and Aquatic Resources Impacts of Potential Modifications to Water Storage and Discharge Patterns in Reservoirs

An increased incidence and magnitude of reservoir spill events resulting from a mandated reoperation has the potential to significantly impact water quality and aquatic resources. If reservoirs are forced to release water early in the spring months, the resulting stored water may

[4] California Independent System Operator, "Integration of Renewable Resources: Transmission and operating issues and recommendations for integrating renewable resources on the CAISO-controlled grid" (November 2007); Electric Power Research Institute, "Quantifying the Value of Hydropower in the Electric Grid" (In Press).

be warmer, thereby resulting in increased water temperatures in downstream reaches. Spill events can also result in impacts to downstream aquatic resources, disrupting amphibian breeding, and rearing of young-of-the-year resident fish populations.

The State Board should also consider potentially competing mandates embodied in its 401 certification of hydro FERC licenses, which require minimum releases, reservoir lake level targets or requirements, pulse flows, and other water management requirements. A policy proposing changes to reservoir operations is likely to conflict with these requirements.

Changes in Fisheries Management in Reservoirs

The State Board identifies "*fisheries management in reservoirs*" as another key implementation action planned for inclusion under the Mercury Control Program for Reservoirs. Examples include, "Manage nutrients/algae to improve production (at the base of the food web) and reduce Methyl mercury concentrations." During the CEQA process the State Board needs to consider whether increasing the algae levels will actually lower the mercury levels in fish and the potential for increased algae levels to impact water quality of public water supplies. Additionally, the State Board is developing proposed policies for Biological Objectives and Nutrients in Inland Surface Waters, which may be incompatible with this potential action.

Another fisheries management example listed by the State Board is, "Promote abundance of species and sizes of reservoir fish that accumulate smaller amounts of mercury in their tissue." The summary indicates this measure might be accomplished by reducing stocking of introduced species, promoting intensive fishing of species with higher mercury levels, or encouraging native anadromous fisheries, such as salmon and steelhead. During the CEQA process, the State Board needs to consider whether these actions will actually lower the mercury levels in fish tissue, and whether agencies could realistically manage such ecosystem changes. These concepts appear quite speculative given current knowledge and given the complexity of managing natural systems.

Additionally, neither the State Board nor SMUD has the authority to fully implement these actions. Fish stocking and the level of fishing allowed are under the jurisdiction of the California Department of Fish and Game and the US Fish and Wildlife Service.

Tailoring Methyl Mercury Objectives to Water Body Types and Conditions

In addition to the potential fisheries management actions, the State Board should also consider a tiered approach to setting the methyl mercury fish tissue objective that applies to the State's water bodies. A wide range of reservoir and river conditions, fishing patterns, fish consumption rates, wildlife conditions, and mercury concentrations exist throughout the state. Having one fish tissue objective that fits all possible conditions is not reasonable. SMUD encourages the State Board to consider a tiered system of fish tissue objectives. Areas of documented high fish consumption rates, high methyl mercury levels, and easy or year-round access should have lower fish tissue objectives. Areas of lower fish consumption rates, low methyl mercury levels, and difficult or seasonal access should have higher fish tissue objectives.

In summary, before proposing specific types of operational control measures for reservoirs, there must be a scientific basis for the premise that changes to reservoir operation will result in measurable change to mercury levels. SMUD urges instead that the State Board continue to examine the sources of mercury and organic carbon to water bodies in the State with the highest methylation potential, and further study of the dynamics of mercury bioaccumulation. Consideration of implementation measures should be based on an understanding of the significance, controllability and causes of mercury levels, methylation of mercury, and bioaccumulation in each reservoir. We look forward to the opportunity to participate in further discussion of these issues.

SMUD appreciates the opportunity to comment on this proposed action and looks forward to working with the State Board on this issue. If you have questions or would like additional information concerning our comments, please contact David Hanson at 916-732-6703 or David.Hanson@smud.org; or Brad Gacke at 916-732-5434 or Brad.Gacke@smud.org.

Sincerely,

Scott Flake
Manager, Power Generation