NATURAL RESOURCES DEFENSE COUNCIL

August 12, 2011

Bureau of Reclamation
Attn: Ms. Pam Adams, LC-2721
P.O. Box 61470
Boulder City, NV 89006-1470
Via Email: ColoradoRiverBasinStudy@usbr.gov

Re: **Recommendations Regarding Basin Study Demand Scenarios**

Dear Ms. Adams:

I am writing to offer the Natural Resources Defense Council's recommendations regarding the development of demand scenarios for the Bureau's Colorado River Basin Water Supply and Demand Study. NRDC has over 370,000 members and on-line activists in the seven Basin states, with a great deal at stake in the future management of the river. The Study is a challenging and long-overdue effort to address issues related to climate change, the long-term yield of the river, ecosystem needs, as well as options to meet demands from urban, agricultural, Native American and industrial water users.

NRDC has been analyzing the potential implications of proposed oil shale development on water management in the Basin and our recommendations are particularly focused in this area. We will provide you with the detailed results of that analysis shortly. However, given the Study's timeline for the development of demand scenarios, we write now to offer our initial recommendations. These recommendations also briefly address other important factors in determining future demand, such as investments in renewable energy, coal, water efficiency and alternative water sources.

Current Demands: We recommend that the Study determine the availability of undeveloped surface and groundwater supplies in excess of the Upper Basin's Compact obligations. Over the past decade, demand has consistently exceeded supply in the Lower Basin. Despite the fact that total Upper Basin consumptive uses are below total Compact entitlements, reservoir levels have continued to drop – until this year. Indeed, rising demand has been the major cause of the decline of Lake Mead levels, rather than the drought.

The Study's Interim Report #1 confirms that long-term average river flows were overestimated in the Compact. A determination regarding the availability of additional Upper Basin supplies is particularly important given the anticipated increases in demand that will likely emerge from some of the demand scenarios currently under development. Determining the status of existing supplies is also critical, given the

111 Sutter Street
20th Floor
San Francisco, CA 94104
TEL 415 875-6100 FAX 415 875-6161

Study's anticipated nine percent reduction in future average annual flows, as a result of climate change.

Finally, a well-developed understanding of the relationship of current demands and the yield of the river will serve as a baseline in determining the potential water management impacts of oil shale development. For example, to what extent would water consumed by oil shale development come from remaining undeveloped Upper Basin water and to what extent would this water use come at the expense of other existing uses, such as agriculture? What impact would oil shale development have on the challenges facing the Upper Basin in meeting Compact obligations?

Potential Water Demand Related to Oil Shale, Coal, Renewables and Efficiency: Our analysis has focused on the Government Accountability Office's[1] estimates of potential future oil shale development. The long-term future of the oil shale industry is highly uncertain, as a result of economic, technological, environmental and water resource issues. Therefore, we recommend that the Study adopt a careful approach that analyzes a full range of potential oil shale development.

NRDC opposes the development of this energy source, particularly in the Colorado River Basin, because of its potential impacts on public land, fish and wildlife, greenhouse gas emissions, as well as water resources. However, we recommend that potential demand from this industry be carefully evaluated in the Study, as this potential demand has significant implications for future water availability. We offer the following specific recommendations.

Current Trends Scenario: The storyline for the current trends scenario in the Study's Interim Report No. 1 states that this scenario will assume that "(f)ossil fuel development and, in particular, oil-shale development occurs according to current plans."[2] It is necessary, therefore, to define what is meant by "current plans." Given that there are no industrial-scale facilities permitted or constructed in the Basin, we recommend that this current trend be reflected in this scenario. The current trend regarding oil shale is ongoing technical evaluation – not full-scale industrial development. In short, we recommend that this scenario include current research projects, but not industrial-scale development.

Enhanced Environment and Healthy Economy: We recommend that this scenario include no water use by oil shale –either for existing research projects, or for industrial-scale development.

The Study should include ambitious investments in renewable energy sources in this scenario. Some renewable energy sources (e.g. thermoelectric solar) will require some water. However, different solar technologies have different water requirements. For

---

[1] Government Accountability Office, 2002. *Energy and Water Nexus, A Better and Coordinated Understanding of Water Resources Could Help Mitigate the Impacts of Potential Oil Shale Development*.

[2] Bureau of Reclamation, June 2011. *Colorado River Basin Water Demand and Supply Study Interim Report #1, Technical Report C*, p C-9.

example, dry-cooled thermoelectric solar can require "make up" water for boiler systems and water to wash heliostats. However, wet-cooled solar has dramatically greater water requirements. We agree with the storyline in the Interim Report, which states that "(r)enewable energy requirements continue, with an emphasis on dry cooling"[3]. With regard to solar energy generation, we recommend that the scenario assume a priority for dry-cooled solar thermoelectric projects and solar PV. The report should include a discussion of the California Energy Commission's current restrictive policy,[4] which represents a de facto prohibition on wet cooling for solar facilities in California's desert regions, except in very limited circumstances. This scenario should also assume significant investments in wind. Wind and solar PV have very low water use requirements.

In this scenario, we further recommend an analysis of a significant, gradual reduction in coal-fired power plants in the Basin and the reduction of associated water use. This scenario should assume the reduction of coal-fired power, beginning with the least efficient and most polluting plants. We also encourage consideration of the use of reclaimed water for power plant cooling and other needs.

As the storyline also indicates, this scenario should include substantial investments in water use efficiency. We recommend that the study include the implementation of a broad range of programs that could produce significant reductions in water use. We support the proposed inclusion of WaterSmart and EnergyStar, as well as landscape irrigation technologies. We recommend a comprehensive approach to landscape efficiency, including turf replacement and other rebate programs, local ordinances, water budgets, water rate structures and advanced irrigation systems. We recommend a similarly broad approach to indoor residential, commercial, industrial and institutional efficiency opportunities.

This scenario should include an ambitious regional efficiency performance target. For example, in 2010, California enacted legislation (SB 7X 7) requiring a reduction in per capita urban water use of 20 percent by 2020. The planning horizon for the Basin Study extends to 2060 – 40 years beyond the California requirement. Therefore, at a minimum, we recommend that this scenario include a similar Basin-wide target of a 20 percent reduction in per capita water use by 2020. A long-term target is also worthy of consideration. Such a target should take into account the trend, identified by the Pacific Institute, of a one percent annual decrease in per capita urban water use in from 1990 to 2008.[5]

We also recommend that the agricultural water use efficiency section of this scenario focus on the D2 branch, which assumes greater investment in efficiency, as well as

---

[3] Bureau of Reclamation, June 2011. *Colorado River Basin Water Demand and Supply Study Interim Report #1, Technical Report C*, p C-13.

[4] 32 California Energy Commission, *Preliminary Staff Assessment, Beacon Solar Energy Project, Application For Certification (08-AFC-2), Kern County* (Posted April 1, 2009), p. 4.9-5.

[5] Michael J. Cohen, June 2011. *Municipal Deliveries of Colorado River Basin Water*. Pacific Institute, p. iii.

cropping changes and yield improvements. As in the case of urban water use, we recommend a comprehensive approach to agricultural water use efficiency. For example, some California farmers have found that, through crop changes, improved irrigation technology, participation in water markets and even reduced irrigated acreage, they can generate greater revenue using less water than they did a decade ago.

Finally, we recommend that this scenario include investments in other water management tools that can augment supplies available from the river. For example, Southern California agencies that rely in part on the Colorado River have recently adopted new Urban Water Management Plans. NRDC has reviewed 11 of these plans, all of which include investments in tools, such as water recycling, that extend beyond efficiency. The most dramatic example of this Southern California trend toward developing local water supplies is the Los Angeles Department of Water and Power, which is planning to reduce its reliance on Metropolitan Water District imports from the Colorado River and the San Francisco Bay-Delta from 52% of LADWP supplies today to 24% by 2035[6]. LADWP plans to achieve this goal through investments in efficiency, water recycling, improved groundwater management and stormwater capture. Across Southern California, these tools have the potential to generate substantial increased water supplies. For example, the California State Water Resources Control Board has adopted a state-wide target of two million acre-feet of recycled water by 2030.

We recognize that all of these alternative water supply sources may not have the same potential across the Basin. But we recommend that the Study determine where these and other alternative water tools could be useful in providing supplies that would reduce pressure on the Colorado River. In particular, we recommend an investigation of the potential of these alternatives in regions outside of the Basin that use imported Colorado River water.

Expansive Growth: Our analysis, using GAO numbers, suggests that a full-scale oil shale industry, producing 1.55 million barrels of oil a day, would require approximately 360,000 acre-feet of Upper Basin water per year. This is a mid-range analysis. Oil shale development at the upper end of this range would require more than one million acre-feet per year. We recommend that this scenario analyze the mid-range water use for oil-shale, as well as a branch that would analyze the impacts of a higher level of oil shale development.

If this scenario includes new coal or natural gas power plant capacity, we recommend that any new plants and new units at existing facilities should be required to utilize closed-cycle dry cooling. In some circumstances, the use of closed-cycle wet cooling could be appropriate where sufficient quantities of reclaimed water are available. The use of once-through cooling should be prohibited.

[6] Los Angeles Department of Water and Power, May 2011. *Los Angeles Department of Water and Power Urban Water Management Plan*. Los Angeles, p. 228.

We also recommend that the Study adopt a different name for this scenario. We believe that an "Enhanced Environment and Healthy Economy" scenario could represent sustainable, expansive growth for the region. On the other hand, the current "Expansive Growth" scenario, which includes unsustainable resource consumption, would likely result in significant conflict, shortages and significant economic costs. In short, this scenario might not produce "expansive growth," but rather maximum resource consumption. Although it may be an appropriate scenario for the Study, we do not believe that it is appropriately named.

Coal and CCS: For all scenarios, we recommend that the Study analyze the potential water supply impacts of the increased use of carbon capture and sequestration technology (CCS) for coal-fired power plants in the Basin. Given the extended time horizon for the Study, it is reasonably foreseeable that CCS may be required for coal-fired power plants. The Department of Energy's National Energy Technology Laboratory has determined that CCS has a significant water footprint[7] that should be analyzed in all scenarios.

Characteristics and Implications of Demand in Different Sectors: The interim report defines demand as "water needed to meet identified uses."[8] We recommend that these definitions also include "demand hardening" as well, meaning the flexibility inherent in different water use categories.

Water managers have long believed that more efficient water use could be less flexible, or "harder" in times of future shortage. It is often assumed that a community that has made significant investments in water use efficiency will have less remaining flexibility in the future. In the context of this study, we recommend that the Study extend this concept of demand hardening to consider the impact of moving water from one sector to another. In the traditional approach to this issue, water managers argue that demand is hardened by management changes that increase the efficiency of water use in a service area. There is limited evidence suggesting significant demand hardening in municipal uses, as a result of investments in efficiency. NRDC believes that efficient communities retain significant flexibility to reduce water use further in times of shortage. However, clearly, demand can be "hardened" in a region by moving water from one use to another use that has less flexibility.

For example, generally speaking, agriculture is relatively flexible water use. Farmers make many decisions on a year-to-year basis, particularly those growing annual crops. Farmers can, over a relatively short time horizon, change crops, improve irrigation technology, engage in deficit irrigation, make decisions regarding cultivated acreage, enter into water transfer agreements and more. Urban water use also includes significant flexibility. In the short term, urban residents can reduce water use through

---

[7] J.P. Cifnero, U.S. Department of Energy, National Energy Technology Laboratory; R.K. Munson and J.T. Murphy, Leonardo Technologies Inc; and B.S. LaSH, March 1 2010. *Determining Carbon Capture and Sequestration's Water Demands*. POWER.

[8] Bureau of Reclamation, June 2011. *Colorado River Basin Water Demand and Supply Study Interim Report #1, Technical Report C*, p C-9.

reduced irrigation, investments in less water-intensive landscapes, improved irrigation technology, water saving fixtures and appliances, and personal behavior changes. On the other hand, industrial demand, such as oil shale development, may be dramatically less flexible in comparison with other uses.

Large-scale oil shale development is likely to require significant reallocation of water from other uses, particularly agriculture[9]. Given the potential water demand of large scale oil shale development, the transfer of water from a flexible industry to one with a "harder" water demand could have significant management impacts. In the short term, such a change could reduce the flexibility of communities in the Upper Basin to engage in voluntary agricultural water transfer agreements, particularly during extended droughts. Over the long, term, such a transition to an industry with a harder demand could increase the challenges in meeting the Upper Basin's compact obligations, and make it more difficult to implement a Basin-wide strategy to adapt to a drier future.

In short, demand is not simply a number. The flexibility associated with different water uses is essential to evaluating long-term demand implications and management options. The concept of demand hardening, in this case by moving water from one sector to another within a state, is an important concept to be captured by the Study.

As this study proceeds, we look forward to offering additional recommendations. Thank you for considering these comments.

Sincerely,

Barry Nelson
Senior Policy Analyst

[9] *Water on the Rocks: Oil Shale Water Rights in Colorado*. Western Resource Advocates, 2009. http://www.westernresourceadvocates.org/land/wotrreport/index.php