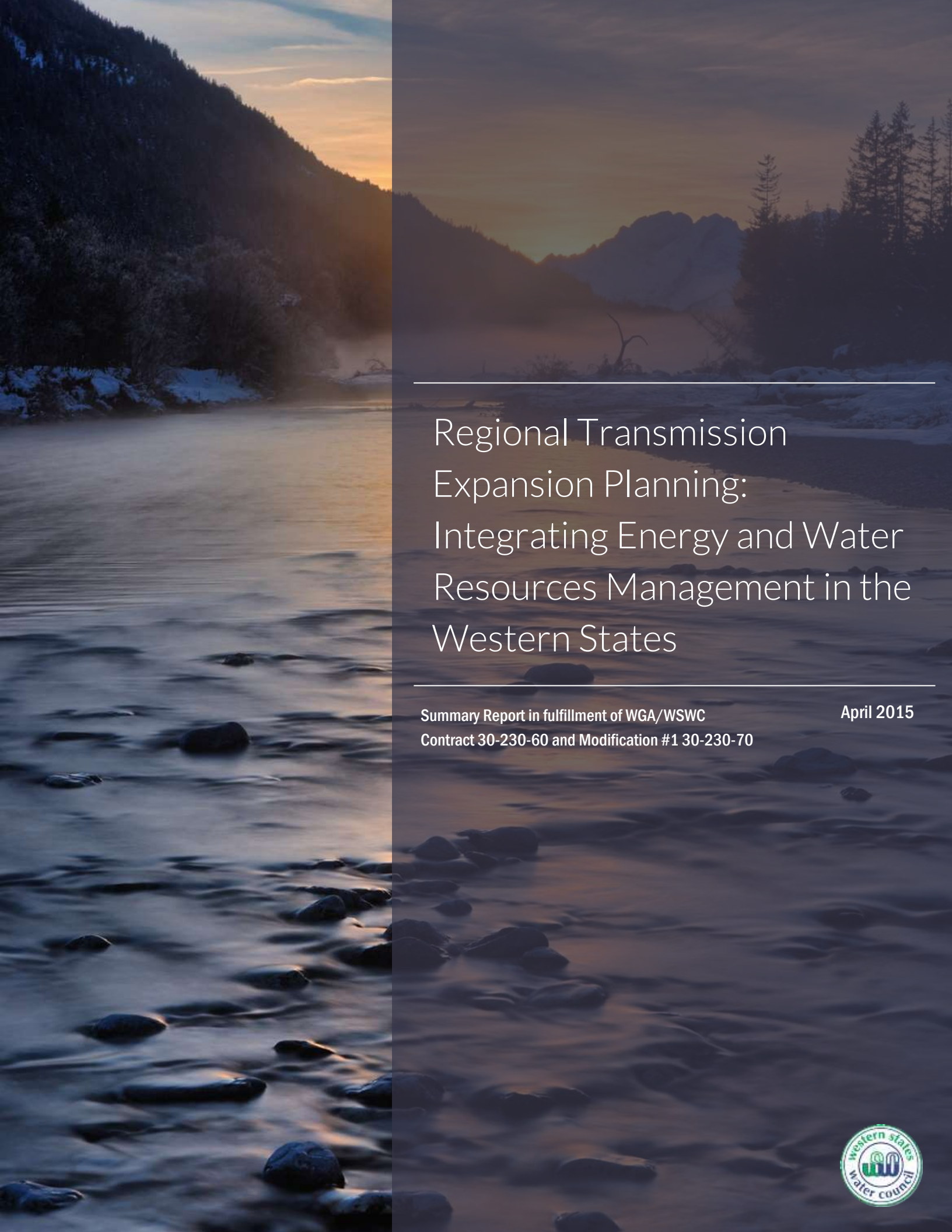

Regional Transmission Expansion Planning: Integrating Energy and Water Resources Management in the Western States

Summary Report in fulfillment of WGA/WSWC
Contract 30-230-60 and Modification #1 30-230-70

April 2015

WESTERN STATES WATER COUNCIL
5296 Commerce Drive, Suite 202
Murray, UT 84107
Phone: (801)685-2555
www.westernstateswater.org

Tony Willardson
Executive Director
twillardson@wswc.utah.gov

Nathan Bracken
Asst. Director & Legal Counsel
nbracken@wswc.utah.gov

Sara G. Larsen
WaDE Program Manager
saralarsen@wswc.utah.gov

Photo Credit - Pg. 5: P. Tyrrell
Boulder Lake Drainage, Wyoming

Executive Summary

In the West, water is a scare resource, subject to increasing demands from growing uses. Water defines the quality of our lives and our environment. It can also circumscribe economic opportunities, including the development of our energy resources. There is no substitute for water. In comparison, western energy resources are abundant and diverse, and play a critical role in meeting the nation's needs for fuel and electricity. Increasing demands for new uses related to energy extraction, production, and transmission has and will have impacts on existing users and uses, including the environment. Many western rivers and aquifers are already fully appropriated, meaning there are more rights recognized to the use of water than the available supply. New energy development will have to compete with existing uses with prior rights such as irrigated agriculture, as well as growing municipal and industrial uses, and environmental demands.

Scarcity has led to the development of an appropriative system of rights to the use of water that provides economic and social stability and reduces conflicts. It recognizes a senior right to the first use to which water is put. This "first-in-time-first-in-right" principle has been criticized, but it provides certainty and a reasonably efficient market in water rights, that may allow energy companies to secure access to water even in dry years through leasing and other agreements. Water for energy may also be acquired through permanent transfers, sometimes over long distances, or the use of municipal wastewater or brackish waters. Treatment and transport of water consume energy and increase costs.

Drought impacts water and energy resources and exacerbates the allocation and management challenges. Both water and energy demands and supplies are effected. Air conditioning, irrigation and other water and power demands rise with temperatures. Hydropower accounts for twice the percentage of power generation in the West as the national average, and drops with flows. Also, higher temperatures negatively impact thermoelectric power generation efficiencies.

Executive Summary (con't)

Power production is expected to be a major driver of new water demand over the next decade.[1] The National Electricity Technology Laboratory has estimated that between the years 2005 and 2030, thermoelectric water consumption will increase by 42-63 percent.[2] While still small compared to total western water use, this is significant. The magnitude of the impact of future energy demands for water on other western water uses is at present uncertain. This is largely due to the general lack of accessible, reliable, and comprehensive data and information related to existing water uses, water supplies, and water availability, as well as summary data on market transfers of water from one use to another. For example, comprehensive information on transfers of water between uses, including agricultural use to electric power production and related energy needs, is currently not generally compiled by state water right administrators in any systematic way.

As part of the Council's deliberations related to the work described in this report, a policy position was adopted and forwarded for WGA's review that suggested numerous actions for further consideration to better integrate water and energy planning and policy.[3] Each, with illustrative examples, is included in the Recommendations section of this report. Three are highlighted here.

Figure 1. Lake Mead Generators
Photo: Southern Nevada Water Authority

First, western states and federal agencies should support new and continued data gathering, analyses, and research needed to better understand the extent and limitations of our water and energy resources, specifically existing and projected future supplies and demands. Without a clearer understanding of present consumptive uses of water regionally, as well as refined projections of future energy development, an accurate and comprehensive assessment of the impacts to existing water users, and the cost of acquiring water for specified energy projects, is problematic. With WGA support, the WSWC initiated a Water Data Exchange (WaDE) program as a part of the Regional Transmission Expansion Project (RTEP) discussed in this report, to improve accessibility to available state data and information. WaDE deployment will be a significant step forward in understanding and evaluating our water resources and future changes in demands.

Second, better integration of water and energy policies and programs will require a concerted effort and the governors' continuing leadership, including continuing state participation in forums such as the State Provincial Steering Committee (SPSC), Scenario Planning Steering Group (SPSG), and Environmental Data Task Force (EDTF) as well as other similar groups.

[1] Western Electricity Coordinating Council (WECC), 10-yr Regional Transmission Plan: Plan Summary, 2011. See: http://www.wecc.biz/library/StudyReport/Documents/Plan_Summary.pdf.
[2] National Energy Technology Laboratory, Estimating Freshwater Needs to Meet Future Thermoelectric Generation Requirements, 2008. See: http://www.netl.doe.gov/technologies/coalpower/ewr/pubs/2008_Water_Needs_Analysis- Final_10-2-2008.pdf.
[3] Western States Water Council, 2015. POSITION #378 of the WESTERN STATES WATER COUNCIL regarding Integrating Water and Energy Planning and Policy, adopted in Tulsa, Oklahoma on April 17, 2015. See: http://www.westernstateswater.org/wp-content/uploads/2012/10/WSWC-Resolution-regarding-Integrating-Water-and-Energy-Policy-and-Planning_2015Apr17.pdf.

Additional joint meetings, workshops, symposia, and webinars would be helpful in bringing water and energy planners together more regularly to better understand the energy/water nexus and consider appropriate collaborative actions to improve management of both resources.

Third, a public education effort is needed to communicate the value of energy and water conservation, and to encourage the use of "smart" technologies to improve the measurement and management of water and energy consumption, in the short and long-term. Consumers often don't understand or appreciate the fact that when they turn on their faucet they use energy as well as water, and conversely when they switch on the light they are also consuming water. Sometimes the best way to reduce residential energy use is through water conservation measures.

Water is critical to energy development and its distribution. Hydropower and thermoelectric generation and transmission are two examples. Unlike energy resources, water is only "consumed" when it is rendered unavailable for other uses, such as through evaporative cooling. Water withdrawals from rivers and streams for thermoelectric power production may be considerable, but depending on the cooling technology used, the water may largely be returned to the hydrologic system where it is available to reuse. Power production accounts for some 41 percent of U.S. water withdrawals, but only about three percent of consumption. In the West, irrigated agriculture is the predominant water use in an arid climate, accounting for most of the withdrawals and diversions, as well as consumptive use through evapotranspiration from fields.

It has been said that "water runs uphill to money," and money can move water geographically and between uses. In general, when it comes to decisions regarding where to site a power plant or other energy project, water-related costs are usually not now sufficiently high enough to "move the needle." New investment in energy development will likely provide sufficient capital to acquire the necessary water resources. However, money does not always dictate the highest and best use of water, which is generally considered public property, until it is put to use in private enterprise. The public interest as expressed by social values and environmental protections will continue to be important considerations. Moreover, economic markets for water are limited both by the willingness of existing users to sell, and also the availability of the infrastructure needed to move water. Compared to electricity, water is much more difficult to move, given its volume and weight. It is also important to note that water withdrawals, transfers and treatment consume significant amounts of energy in the West.

Proposed water transfers and related markets are regulated by western states, which apply appropriative principles designed to protect existing users, including third parties, from injury. Water right information, specifically data on consumptive use, is another limiting factor. Western water law defines, measures and limits the exercise of water rights based on consumptive use. Transfers of water between uses are limited to the amount consumptively used in the past. However, consumptive

use is often difficult to determine, even on a case-by-case basis. Little data and no comprehensive summary of consumptive uses exist.

Against this backdrop, the Western States Water Council (WSWC) entered into an agreement with the Western Governors' Association (WGA) to assist with a Regional Transmission Expansion Project (RTEP) funded by the Department of Energy and designed to "enhance the states' capacity to effectively participate in [energy] transmission planning and development, and substantially improve the quality of information available to state and federal policy makers and regulators, as well as industry planners." [45] Regarding the energy and water nexus, WGA committed to work with state water managers and other agencies, as well as experts on water requirements of electric generation technologies to evaluate water issues associated with the siting, transmission, and mix of energy supplies, with a goal of anticipating challenges and assisting with development of future energy scenarios within existing and future water resource constraints. A more complete explanation of the RTEP effort is included in Appendix A.

Of note, the water availability models developed and enhanced through the RTEP efforts are valuable scoping level planning tools, but not sufficiently refined to provide reliable information for site-specific and project-specific decision-making, due largely to the limited availability of data on consumptive water uses and marketability. This has been a consistent RTEP theme, and the work was focused on planning considerations, not siting level information for new thermoelectric generation. Obtaining such information is a laborious and expensive process as there is no westwide database on water rights and water uses. However, the work undertaken by RTEP partners and the Western States Water Council (WSWC) described in this report, with the support of the Western Governors' Association (WGA), has been a significant step forward in the development of such a repository. WaDE deployment will facilitate more refined modeling in the future. This work will also provide valuable assistance in the development of a national assessment of water availability and uses, presently being undertaken by the U.S. Geological Survey (USGS), as well as future studies of energy and water needs.

The WSWC, representing state water managers appointed by the governors, agreed to assist in undertaking a number of tasks, the completion of which are described in detail in this report. These included: Task 1(a) assisting in compiling assessments from western states regarding water availability, water consumption and withdrawals, and projected water demands for municipal/industrial, agricultural, recreational, and environmental uses; Task 1 (b) assessing current and projected water scarcity by large river basin or aquifer system in the West, including both a physical and legal perspective; Task 1(c) considering drought and the potential implications of climate change and how they may affect river flows and water supply availability for energy development; Task 1(d) seeking to identify opportunities for the use of non-potable water resources; Task 2 preparing an analysis of legal, institutional, and administrative issues associated with new permits or transfers of water for energy development; Task 3(a) identifying policies that promote water-efficient energy technologies; Task 3(b) considering likely impacts to other water users and ways to mitigate or otherwise minimize those impacts; Task 3(c) convening water managers, electricity generators and regulators to make recommendations to the Governors for how electricity and water providers can better coordinate; and Task 4 participating in work with the national laboratories, and other efforts under RTEP, including the State and Provincial Steering Group, Scenario Planning Steering Group, and Environmental Data Task

[4] WGA Statement of Project Objectives, 2009.

Force, which advise the Western Electric Coordinating Council (WECC) and its Transmission Expansion Planning Policy Committee (TEPPC). The WSWC served as liaison to ensure incorporation of water interests, and convened its members to assist in a review of the national labs' modeling efforts.[6]

In undertaking these tasks, it became apparent that much of the data and information needed to accomplish the anticipated work were simply not available or not easily accessible, and that obtaining such information would be a laborious and expensive process. Therefore, the WSWC initiated a westwide effort that would include making available information from WSWC member states on state water rights and water uses, as well as derived data and summary information on water availability from state and federal sources. This initiative became the WSWC's Water Data Exchange (WaDE) and a major focus of much of the WSWC's work under the WGA service agreement.[7] This effort has included the development of a data exchange framework, database schemas, data exchange methods, mapping tools, web services, and data access portals. Beta testing with data from Colorado, Utah, and Wyoming is underway. As noted hereafter in detail, the WSWC's work with WGA's leadership has been essential in identifying and implementing the initial steps necessary to improve the water information and data available for sound decision-making related to future electric power generation and transmission planning, as well as to better integrate water and energy resources planning, conservation, development and management. The RTEP effort has helped develop a clearer understanding of the interrelated nature of our water and energy resources, and the importance of a collaborative approach to their conservation, development, management and wise use. It has also led to the development of valuable relationships that need to be encouraged.

[6] WGA Service Agreement/Contract Number 30-23—60, Exhibit A – Western States Water Council Scope of Work , executed November, 24, 2010. See Appendix C.
[7] Modification #1 to WGA Contract, executed on January 3, 2012.