California tackles water-energy interdependence by getting decision-makers to talk

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How low can it go? The Hoover Dam in May 2015. Credit: David Feldman

Across the western U.S., water and power are linked. Hydropower provides about 21 percent of the region's electricity. Nearly 20 percent of California's electricity is used to move, treat and heat water.

Despite this interdependence, these resources are regulated by separate agencies, delivered by separate utilities and studied independently. This causes problems because ensuring resilience and reliability of both resources often requires understanding how they are interconnected.

As California's drought enters its fourth year and other western states cope with drought, utilities and policymakers are recognizing the urgency of resource management plans that reflect this vital link. Regardless of drought conditions, increasing power demands could adversely affect water availability.

The good news is: the more efficiently we use each resource, the more resilient the other becomes. Thus, "hoping for the best, but planning for the worst" is a sound basis for policy. Achieving more efficient use of both water and energy, though, requires policymakers and planners to develop integrated water-energy strategies – not something they commonly do now.

In May, the University of California and the U.S. Department of Energy jointly sponsored a first-of-its-kind workshop with utilities, regulators and researchers from throughout the West to discuss new ways of working together. At the end of two days, participants outlined several steps as a basis for more effectively managing water and electricity.

Joint planning

Water and energy links are basic to civilization. Ancient Rome and

China harnessed water power to saw wood, grind grain and provide locomotion. Today, most forms of electricity production depend on reliable water supplies for hydropower generation at dams and for cooling and steam at fossil fuel-powered and nuclear plants.

Participants said policymakers need to develop collaborative, long-term solutions.

"Think of ourselves 10 years from now, looking back at what we could have done differently at this moment," California Energy Commissioner David Hochschild urged participants. He noted that California's prescient decision to heavily invest in renewable energy is now helping ensure reliable electricity supplies amid the current drought. Solar photovoltaic panels and wind turbines do not require water to generate electricity.

Cooling towers in northern California: power plants rely heavily on water for cooling the steam using during power generation.

The Western Governors' Association's (WGA) Carlee Brown emphasized the importance of cross-jurisdictional partnerships and communication. For example, the WGA held a Drought Forum to share best practices across its 19 state members.

Participants discussed how to better "match" energy availability and water use through an approach developed by the California Independent System Operator, which tracks electricity generation throughout the day.

Tracking energy availability is useful, but participants agreed that, unlike the electricity sector, the water industry is wholly dependent upon the availability of its sources and can't "generate" water on demand. Statewide water rationing requires utilities to lower overall consumption, but customers can't be compelled to adjust water use on demand.

Energy and water can also be conserved through advanced automation and better forecasting. For example, foreknowledge of extreme weather events can help inform investment, siting and adaptation decisions for new power plants or water supply sources. Success, however, will depend on interagency coordination and data sharing.

The California Water Resource Control Board's Frances Spivy-Weber underscored opportunities for the state's water and energy agencies to undertake joint planning, while incorporating agricultural needs, as one means of furthering resilience. Better coordination of available water and electricity would make both services more resilient because

projections of future demands can better inform long-term planning decisions.

Bridging water-energy nexus

Adoption of combined water and energy efficiency programs faces hurdles. The Pacific Institute's Heather Cooley said there is inconsistent funding, weak staff support and lack of guidance regarding how to fairly divide costs among partners.

More reliable data on the energy intensity of water use could help overcome such barriers. The California Public Utility Commission is developing a "Water-Energy Cost Effectiveness Calculator." Commissioner Catherine Sandoval noted how this tool allows people to compare the energy demands imposed by different water uses, thereby permitting better forecasting, and—at household-scale—greater conservation.

Attendees recommended five forward-thinking next steps:

- first, a central database for water and energy utilities' operations, which protects personal and proprietary information, and could be used to assist planning
- second, certification programs such as the Environmental Protection Agency's (EPA) Energy Star, Water Sense and the US Green Building Program's Leadership in Energy and Environmental Design can play important roles in evaluating efficiency performance standards
- third, innovations that depict the impacts of different energy and water uses must be widely introduced: from precision water-energy reports on handheld devices in the home, to utility-level tools permitting better demand forecasting
- fourth, wastewater reuse, desalination and irrigation technologies

have become much more energy efficient, but greater investment in research and development can yield even more improvements
- finally, we must find creative ways to fund innovations: cap and trade funds or surcharges on utility bills could help secure funding for efficiency incentive programs or research and development.

Encouraging investment in efficiency programs requires agreement on how to assign benefits and costs to participants. Targeting areas offering the greatest savings is also important. And, demonstration projects that water and electrical utilities can work on together are needed.

Such projects, if successful, build mutual trust and bolster further collaboration. For example, water utilities could adopt incentive programs similar to those used by electric utilities to provide funds for rebates on efficient appliances. They could also research how to adjust rates while ensuring utilities aren't financially penalized. Since water and energy savings result, both sectors could fund such programs.

No new regulations are thought to be needed, but motivating collaboration between energy and water utilities does require major changes in practice. For example, utilities should do follow-on assessments of joint efficiency programs and share information on costs relative to benefits.

California has already taken a number of actions to reduce the amount of water used in power generation. It requires power plant developers to consider dry cooling—or using air, rather than water, to cool steam used in generators. It also has a statewide renewable portfolio standard to generate 33 percent of electricity through renewable energy by 2020 and a low-carbon fuel standard.

Having both water and electricity utilities actively collaborate on

planning and efficiency would make California a unique case again.

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